JOHN DEERE SNOWMOBILES
(Serial No. 2,551-   )
Service Manual
SM-2100 (Aug-74)

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(All information, illustrations and specifications contained in this service manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.)

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INTRODUCTION

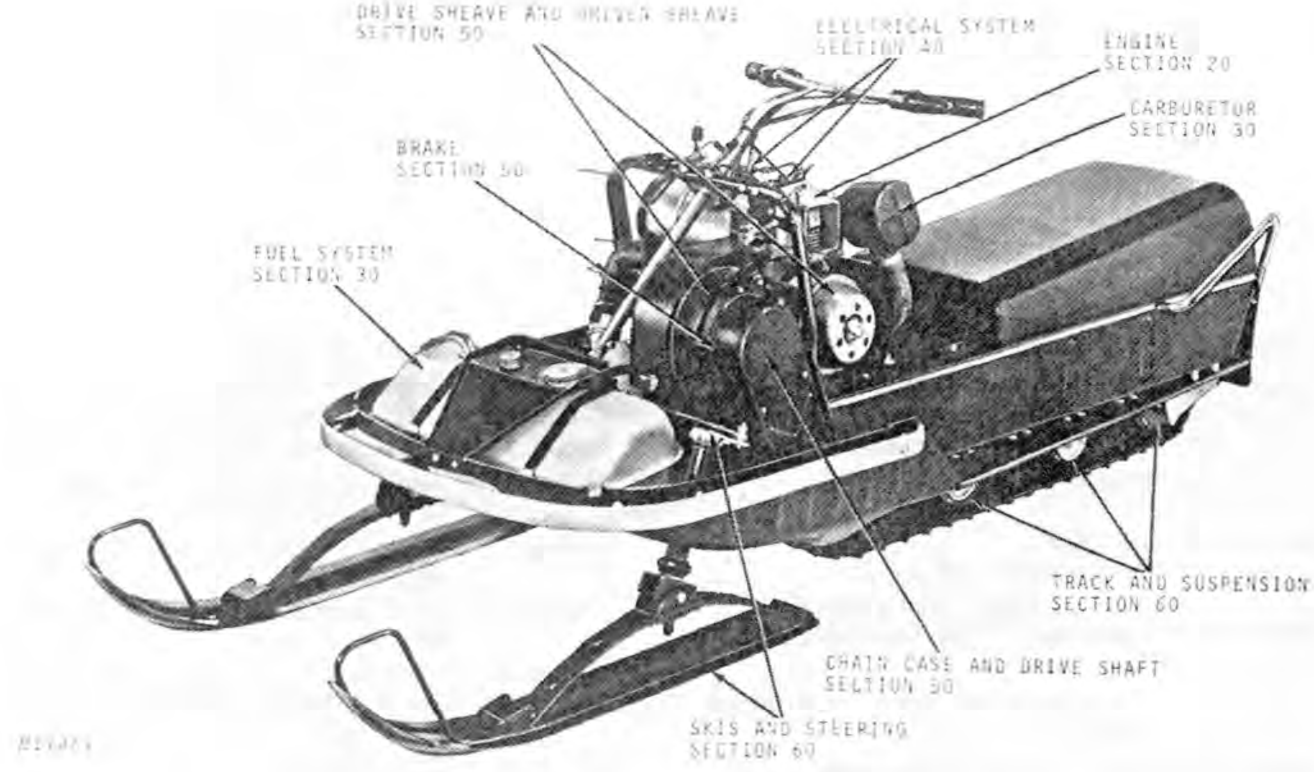

Fig. 1-Components Covered in this Service Manual

This service manual contains service and maintenance information for John Deere Snowmobiles (Serial No. 2,551-   ).

The manual is divided into sections. Each section pertains to a certain component or operational system of the machine. The information is divided into groups within each section.

Emphasis is placed on diagnosing malfunctions, analysis, and testing. Diagnosing malfunctions lists possible troubles, their causes and how to correct them. Under specific components these troubles are analyzed to help you understand what is causing the problem, so you can correct it rather than just replace parts and have the same problem keep recurring.

Specifications are found in the last group of each section. Special service tools are in a separate section—Section 70.

Hood, console, tunnel, and pan repair are not covered in this service manual.

Extensive repair to the hood and console is not recommended because of the low cost of a new item. However, minor cracks and holes can be repaired using plastic patching kits or fiberglass repair kits available at local auto supply stores. Follow manufacturer's instructions.

On all snowmobiles with aluminum tunnels, minor tunnel and pan damage can be repaired by pop-riveting soft 0.060-inch aluminum over the tear, crack or puncture. The steel tunnel on JDX4 Snowmobiles (Serial No.   -20,000) can be welded. If the pan and tunnel are damaged extensively, a complete assembly is available by contacting your Branch service department.

A pan reinforcement is also available which can be pop-riveted directly over the damaged pan. It may be necessary to drill new holes in order for this pan to fit properly.

⚠ This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

NOTE: Metric equivalents have been included, where applicable, throughout this service manual.

This manual may be kept in its own cover, or it may be removed and filed in your service manual rack or Consumer Products Service Information Binder.

Section 10
GENERAL
Group 5
MACHINE IDENTIFICATION

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SERIAL NUMBERS

Machine Serial Number

Each snowmobile is assigned an individual machine serial number. This serial number is stamped into the rear right-hand side of the tunnel, Fig. 1.

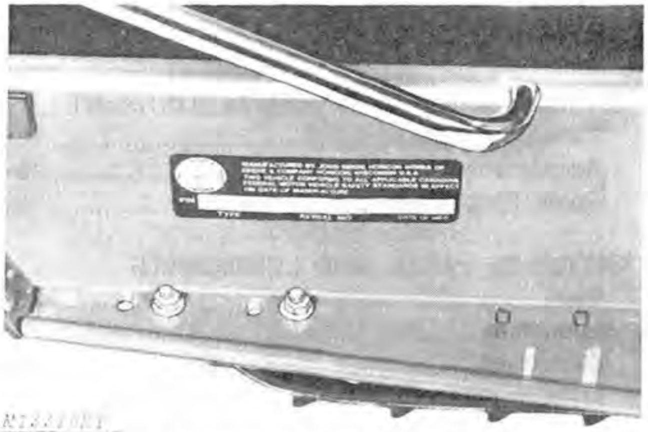


Fig. 1-Machine Serial Number Location

Engine Serial Number

Each snowmobile engine is assigned an individual serial number. Engine serial number plate locations are as follows:

On all Kohler engines, the serial number plate, Fig. 2, is located on the rear of the blower housing. The same is true on CCW engines used in snowmobiles (Serial No. -20,000).

CCW and Kioritz engines used in snowmobiles (Serial No. 20,001-) have the serial number plate on the front of the blower housing, Fig. 3.

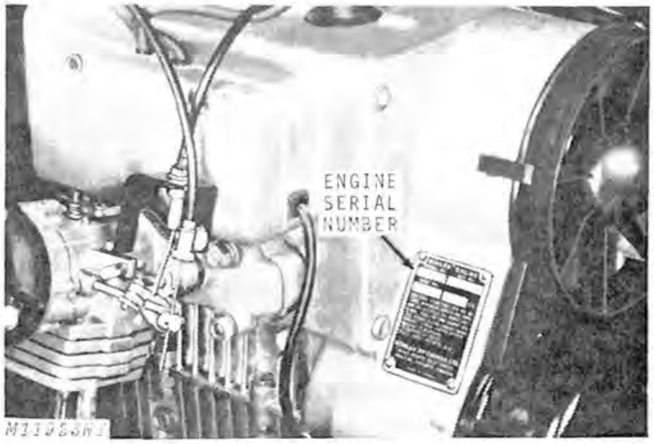


Fig. 2-Kohler Engine Serial Number Plate Location - Also CCW Engines for Snowmobiles (Serial No. -20,000)

Fig. 3-CCW and Kioritz Engine Serial Number Plate Location for Snowmobiles (Serial No. 20,001-)

VINTAGE INFORMATION

1972 Model Year

Snowmobile Model	400	500
Serial Number Code No. (Type)* Engine Manufacturer Engine Model No.	(2,551-11,000) 4000A CCW** KEC-340 Piston-Ported	(2,551-11,000) 5000A CCW** KEC-440 Piston-Ported

1973 Model Year

Snowmobile Model	400	500	600	JDX4	JDX8
Serial Number Code No. (Type)* Engine Manufacturer Engine Model No.	(11,001-20,000) 4000B CCW** KEC-340/4 Piston-Ported	(11,001-20,000) 5000B CCW** KEC-440/4 Piston-Ported	(2,551-20,000) 6000B CCW** KEC-440/4 Piston-Ported	(2,551-20,000) JDX4B (K)*** K295-2AX Piston-Ported	(2,551-20,000) JDX8B CCW** KEC-440/21 Reed Valve

1974 Model Year

Snowmobile Model	Bogie Suspension System			
	300	400	500	600
Serial Number Code No. (Type)* Engine Manufacturer Engine Model No.	(20,001-30,000) 3000C (K)*** K295-2AX Piston-Ported	(20,001-30,000) 4000C CCW** KEC-340/5 Piston-Ported	(20,001-30,000) 5000C CCW** KEC-440/5 Piston-Ported	(20,001-30,000) 6000C CCW** KEC-440/5 Piston-Ported

Snowmobile Model	Slide Suspension System			
	JDX4 Special	JDX6	JDX8	JD295/S †
Serial Number Code No. (Type)* Engine Manufacturer Engine Model No.	(20,001-30,000) JDX4C CCW** KEC-340/5 Piston-Ported	(20,001-30,000) JDX6C CCW** KEC-400/22 Reed-Valve	(20,001-30,000) JDX8C CCW** KEC-440/22 Reed-Valve	(20,001-30,000) JD295/SC Kioritz**** KEC-295RS/2 Piston-Ported

**With the exception of JDX4, JDX4 Special, JDX6, and JDX8, the first three digits signify model number. The fourth digit is a filler. The letter after all code numbers signifies year manufactured. EXAMPLE: "A" = 1972, "B" = 1973, "C" = 1974, "D" =1975, etc.*

***Canadian Curtiss Wright (CCW)*

****Kohler of Canada (K)*

*****Manufactured for John Deere by Kioritz Corp., Japan.*

†JD295/S can be equipped with either a slide suspension, bogie suspension or bogie-slide suspension.

VINTAGE INFORMATION—Continued
1975 Model Year

Snowmobile Model	Bogie Suspension System			
	300	400	600	800
Serial Number	J300D 030001M	J400D 030001M	J600D 030001M	J800D 030001M
Code No. (Type)*	J300D	J400D	J600D	J800D
Engine Make	Kohler**	Kioritz***	Kioritz***	Kioritz***
Engine Model No.	K295-2AX Piston-Ported	KEC-340/5 Piston-Ported	KEC-440/5 Piston-Ported	KEC-440/22 Reed-Valve

Snowmobile Model	Slide Suspension System		
	JDX4	JDX6	JDX8
Serial Number	JDX4D 030001M	JDX6D 030001M	JDX8D 030001M
Code No. (Type)*	JDX4D	JDX6D	JDX8D
Engine Make	Kioritz***	Kioritz***	Kioritz***
Engine Model No.	KEC-340/22A Reed-Valve	KEC-400/22 Reed-Valve	KEC-440/22A Reed-Valve

**The first digit (J) signifies (Snowmobile) and the next three digits signify model number. The letter (D), after the model number, signifies the year manufactured. EXAMPLE: "D" = 1975, "E" = 1976 etc.*

***Kohler of Canada*

****Kioritz Corporation, Japan.*

Group 10
SPECIFICATIONS

MACHINE SPECIFICATIONS

FUEL SYSTEM

Capacity (U.S. Gallons)
JD295/S (20,001-30,000) .... 2.2 (8.3 l)
1975 Snowmobiles (30,001-) .... 6.50 (24.6 l)
All Other Snowmobiles (-30,000) ... 5.50 (20.98 l)
Mixing Ratio
JD295/S 20:1
All Other Snowmobiles 50:1
Filters .... Two located in pickup line
Fuel Pump:
Walbro Carburetor ... Diaphragm-type, integral with carburetor
Bendix Carburetor .... Impulse-type, located in the inlet line
Mikuni Carburetor .... Impulse-type located in the inlet line

ELECTRICAL SYSTEM

Charge System .... Flywheel Alternator
Capacity:
400 and 500 (-11,000) .... 75 Watts
400 and 500 (11,001-30,000) ...... 120 Watts
JDX4 (-20,000) .... 100 Watts
All Other Models .... 120 Watts
Ignition System:
JD295/S .... Capacitor Discharge
All Other Models .... Energy Transfer Magneto
Point Gap:
JDX4 (-20,000) .... 0.016±0.002 in.
300 .... 0.016±0.002 in.
400, 500, 600, 800, JDX4,
JDX4 Special, JDX6, JDX8 ... 0.014±0.002 in.
JD295/S .... See Ignition Timing
Plug Gap .... 0.020 in.
Ignition Timing:
JDX4 (-20,000) . 0.090±0.005 in. BTDC
300 (20,001-30,000) ... 0.090±0.005 in. BTDC
400, 500, 600, JDX8
(-20,000) .... 0.023±0.005 in. BTDC
400, 500, 600, JDX4 Special
(20,001-30,000) .... 0.015±0.003 in. BTDC
JDX6, JDX8 (20,001-30,000) .. 0.015±0.003 in. BTDC
300 (30,001-) ... 0.090±0.005 in. BTDC
400, 600 (30,001-) 0.015±0.003 in. BTDC
800, JDX4, JDX6, JDX8
(30,001-) .... 0.009±0.003 in. BTDC
JD295/S (20,001-30,000)
(Engine Running) .... 0.118 in. BTDC
Electric Start, Optional .... 12-Volt, DC

POWER TRAIN

Transmission .... Two-sheave variable
Salsbury Model:
780 .... 300 (20,001-30,000)
300 (30,001-)
400, JDX4 (-20,000)
910 .... 500 (-11,000)
850 .... 500 (11,001-20,000)
600, JDX8 (-20,000)
John Deere (Comet) Model:
100C .... 400, 500, 600, JDX4 Special
JD295/S, JDX6, JDX8 (20,001-30,000)
101C 400, 600, 800, JDX4, JDX6,
JDX8 (30,001-)
Final Drive .... Enclosed chain
Standard Ratio:
300 (20,001-22,625) 2.19:1
300 (22,626-30,000) 2.44:1
300 (30,001-) 2.44:1
JD295/S (-30,000) 2.44:1
JDX6, JDX8 (-30,000) 2.05:1
400, 600, 800, JDX4, JDX6, JDX8
(30,001-) 2.05:1
All Other Models 2.19:1
Optional Ratio .... 2.44:1 or 2.67:1
Brake .... External Band
Stop Light .... Standard

MACHINE SPECIFICATIONS—Continued

SUSPENSION

Trailing Arm Bogie 300 (20,001-30,000)
400, 500, 600, JDX4, JDX8 (-20,000)
300, 400, 600, 800 (30,001-)
Slide Rail Suspension JDX4 Special, JDX6, JDX8 (20,001-30,000) JDX4, JDX6, JDX8 (30,001-)
JD295/S .... Bogie, Bogie-Slide, or Slide Suspension, optional
Number of Bogie Wheels 15
Drive Sprockets .... Molded Polyethelene
Track Material:
Polyurethane .... 400, 500, 600, JDX4, JDX8 (-20,000) 400, 500, 600 (20,001-30,000) 300, 400, 600, 800 (30,001-)
Rubber ...... 300, JDX4 Special, JDX6, JDX8, JD295/S (20,001-30,000) JDX4, JDX6, JDX8 (30,001-)
Track Width:
600 .... 18 in.
All Other Models .... 15.5 in.
Track Drive .... Involute

CHASSIS AND BODY

Tunnel and Pan:
JDX4 (-20,000) .... Steel
All Other Models .... Aluminum
Hood and Console .... Fiberglass
Windshield .... Polycarbonate
Overall Length, All Models .... 103.4 in.
Overall Width, All Models .... 34.5 in.
Overall Height:
300, 400, 500, 600, 800 .... 44 in.
JDX4, JDX4 Special, JDX6, JDX8, JD295/S .... 40 in.

ENGINE SPECIFICATIONS

NOTE: The serial numbers shown are snowmobile serial numbers and not engine serial numbers.

Item	400 (-11,000)	500 (-11,000)
Engine Model No.	KEC-340 Piston-Ported	KEC-440 Piston-Ported
Manufacturer	CCW (Canadian Curtiss-Wright)	CCW (Canadian Curtiss-Wright)
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two
Cylinder Sleeve	Cast Iron	Cast Iron
Bore (Millimeters)	60	68
Stroke (Millimeters)	60	60
Displacement (Cubic Centimeters)	339	436
Compression Ratio	8.2:1	7.8:1
Horsepower	28 @6750 rpm	36 @6750 rpm
Ignition Type	Magneto	Magneto
Ignition Manufacturer	Kokusan	Denso
Lighting Coil Output	12-Volt, 75-Watt	12-Volt, 75-Watt
Carburetor Manufacturer	Walbro	Walbro
Carburetor Model No.	WR	WD
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

ENGINE SPECIFICATIONS—Continued

Item	400 (11,001-20,000)	500 (11,001-20,000)	600 (2,551-30,000)
Engine Model No.	KEC-340/4 Piston-Ported	KEC-440/4 Piston-Ported (1973) KEC-440/5 Piston-Ported (1974)	KEC-440/4 Piston-Ported (1973) KEC-440/5 Piston-Ported (1974)
Manufacturer	CCW (Canadian Curtiss-Wright)	CCW (Canadian Curtiss-Wright)	CCW (Canadian Curtiss-Wright)
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two	Two
Cylinder Sleeve	Cast Iron	Cast Iron	Cast Iron
Bore (Millimeters)	60	68	68
Stroke (Millimeters)	60	60	60
Displacement (Cubic Centimeters)	339	436	436
Compression Ratio	7.85:1	7.65:1	7.65:1
Horsepower	28 @ 6750 rpm	36 @ 6750 rpm	36 @ 6750 rpm
Ignition Type	Magneto	Magneto	Magneto
Ignition Manufacturer	Kokusan	Denso	Denso
Lighting Coil Output	12-Volt, 120-Watt	12-Volt, 120-Watt	12-Volt, 120-Watt
Carburetor Manufacturer	Walbro	Walbro	Walbro
Carburetor Model No.	WDA-32	WDA-32	WDA-32
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

Item	JDX4 (-20,000)	JDX8 (-20,000)	JDX8 (20,001-30,000)
Engine Model	K295-2AX Piston-Ported	KEC-440/21 Reed Valve	KEC-440/22 Reed Valve
Manufacturer	Kohler (Canada)	CCW (Canadian Curtiss-Wright)	CCW (Canadian Curtiss-Wright)
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two	Two
Cylinder Sleeve	Cast Iron	Cast Iron	Cast Iron
Bore (Millimeters)	57.5	66	66
Stroke (Millimeters)	56.0	64	64
Displacement (Cubic Centimeters)	295	438	438
Compression Ratio	7.0:1	7.9:1	7.9:1
Horsepower	25 @ 6750 rpm	40 @ 6750 rpm	40 @ 6750 rpm
Ignition Type	Magneto	Magneto	Magneto
Ignition Manufacturer	Robert Bosch	Denso	Denso
Lighting Coil Output	12-Volt, 100-Watt	12-Volt, 120-Watt	12-Volt, 120-Watt
Carburetor Manufacturer	Walbro	Walbro	Walbro
Carburetor Model No.	WDA-37	WDA-34	WRA-31
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

ENGINE SPECIFICATIONS—Continued

Item	300 (20,001-30,000)	400 (20,001-30,000) JDX4 Special (20,001-30,000)	JDX6 (20,001-30,000)
Engine Model	K295-2AX Piston-Ported	KEC-340/5 Piston-Ported	KEC-400/22 Reed Valve
Manufacturer	Kohler (Canada)	CCW (Canadian Curtiss-Wright)	CCW (Canadian Curtiss-Wright)
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two	Two
Cylinder Sleeve	Cast Iron	Cast Iron	Cast Iron
Bore (Millimeters)	57.5	60	63
Stroke (Millimeters)	56.0	60	64
Displacement (Cubic Centimeters)	295	339	399
Compression Ratio	7.0:1	7.85:1	7.9:1
Horsepower	25 @ 6750 rpm	32 @ 6750 rpm	36 @ 6750
Ignition Type	Magneto	Magneto	Magneto
Ignition Manufacturer	Robert Bosch	Kokusan	Denso
Lighting Coil Output	12-Volt, 120-Watt	12-Volt, 120-Watt	12-Volt, 120-Watt
Carburetor Manufacturer	Walbro	Bendix	Walbro
Carburetor Model No.	WDB-31	1612	WRA-31
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

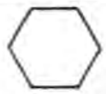
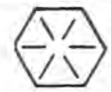
Item	300 (30,001-)	400 (30,001-)	600 (30,001-)
Engine Model	K295-2AXY Piston-Ported	KEC 340/5 Piston-Ported	KEC 440/5 Piston-Ported
Manufacturer	Kohler (Canada)	Kioritz (Japan)	Kioritz (Japan)
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two	Two
Cylinder Sleeve	Cast-Iron	Cast-Iron	Cast-Iron
Bore (mm)	57.5	60	68
Stroke (mm)	56.0	60	60
Displacement (cc)	295	339	436
Compression Ratio	7.0:1	7.85:1	7.65:1
Horsepower	28 @ 6750 rpm	32 @ 6750 rpm	36 @ 6750 rpm
Ignition Type	Magneto	Magneto	Magneto
Ignition Manufacturer	Robert Bosch	Kokusan	Denso
Lighting Coil Output	12 Volt, 120-Watt	12 Volt, 120-Watt	12 Volt, 120-Watt
Carburetor Manufacturer	Walbro	Walbro	Walbro
Carburetor Model No.	WDB-31	WDA-32	WDA-32
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

ENGINE SPECIFICATIONS—Continued

Item	JDX4 (30,001-)	JDX6 (30,001-)	JDX8 (30,001-)
Engine Model	KEC-340/22A Reed Valve	KEC-400/22 Reed Valve	KEC-440/22A Reed Valve
Manufacturer	Kioritz (Japan)	Kioritz (Japan)	Kioritz (Japan)
Type of Engine	Two-Stroke, Air Cooled	Two-Stroke, Air Cooled	Two-Stroke, Air Cooled
Number of Cylinders	Two	Two	Two
Cylinder Sleeve	Cast Iron	Cast Iron	Cast Iron
Bore (mm)	58	63	66
Stroke (mm)	64	64	64
Displacement (cc)	339	399	438
Compression Ratio	7.5:1	7.9:1	7.9:1
Horsepower	34 @ 6750 rpm	36 @ 6750 rpm	46 @ 7000 rpm
Ignition Type	Magneto	Magneto	Magneto
Ignition Manufacturer	Kokusan	Denso	Denso
Lighting Coil Output	12-Volt, 120-Watt	12-Volt, 120-Watt	12-Volt, 120-Watt
Carburetor Manufacturer	Walbro	Walbro	Walbro
Carburetor Model No.	WRA-31	WRA-31	WRA-31
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

Item	800 (30,001-)	JD295/S (20,001-30,000)
Engine Model	KEC 440/22 Reed-Valve	KEC 295 RS/2 Piston-Ported
Manufacturer	Kioritz (Japan)	Kioritz (Japan)
Type of Engine	Two-Stroke, Air Cooled	Two-Stroke, Air Cooled
Number of Cylinders	Two	Two
Cylinder Sleeve	Cast Iron	Cast Iron
Bore (mm)	66	55.9
Stroke (mm)	64	60
Displacement (cc)	438	294.5
Compression Ratio	7.9:1	7.5:1
Horsepower	46 @ 7000 rpm	40 @ 8000 rpm
Ignition Type	Magneto	Capacitor Discharge
Ignition Manufacturer	Denso	Wico
Lighting Coil Output	12-Volt, 120-Watt	12-Volt, 120-Watt
Carburetor Manufacturer	Walbro	Mikuni (Dual)
Carburetor Model No.	WRA-31	VM34-55
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (only)

BOLT TORQUE CHART

Grade of Bolt		SAE-2	SAE-5	SAE-8	Socket or Wrench Size	
Min. Tensile Strength		64,000 PSI	105,000 PSI	150,000 PSI		
Grade Marking on Bolt						
U.S. Standard					U.S. Regular	
Bolt Dia.	U.S. Dec. Equiv.		TORQUE IN FOOT POUNDS		Bolt Head	Nut
1/4	.250	6	10	14	7/16	7/16
5/16	.3125	13	20	30	1/2	1/2
3/8	.375	23	35	50	9/16	9/16
7/16	.4375	35	55	80	5/8	11/16
1/2	.500	55	85	120	3/4	3/4
9/16	.5625	75	130	175	13/16	7/8
5/8	.625	105	170	240	15/16	15/16
3/4	.750	185	300	425	1-1/8	1-1/8
7/8	.875	*160	445	685	1-5/16	1-5/16
1	1.000	250	670	1030	1-1/2	1-1/2

Multiply readings by 12 for inch pound values.

**"B" Grade bolts larger than 3/4-inch are sometimes formed hot rather than cold which accounts for the lower recommended torque.*

NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

SET SCREW SEATING TORQUE CHART

Screw Size	Cup Point	Square Head
	Torque in Inch Pounds	
#5	9	—
#6	9	—
#8	20	—
#10	33	—
1/4	87	212
5/16	165	420
3/8	290	830
7/16	430	—
1/2	620	2100
9/16	620	—
5/8	1225	4250
3/4	2125	7700

Divide readings by 12 for foot pound values.
NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

Group 15
TUNE-UP AND ADJUSTMENT

TUNE-UP GUIDE

Operation	Specification	Reference
Clean or replace spark plug	Clean electrodes Clean insulation Set gap at 0.020 in. (0.508 mm)	Sec. 40, Group 10
Replace and gap breaker points	CCW Engines - Set gap at 0.014 ± 0.002 in. (0.356 ± 0.050 mm) Kioritz Engines - Set gap at 0.014 ± 0.002 in. (0.356 ± 0.050 mm) Kohler Engines - Set gap at 0.016 ± 0.002 in. (0.406 ± 0.050 mm)	Sec. 40, Group 10 or 12
Time ignition system	CCW Engines - Snowmobiles (Serial No. -20,000) 0.023 ± 0.005 in. BTDC (0.584 ± 0.127 mm) CCW Engines - Snowmobiles (Serial No. 20,001-30,000) Reed Valve Engines - 0.009 ± 0.003 in. BTDC (0.229 ± 0.076 mm) Piston-Ported Engines - 0.015 ± 0.002 in. BTDC (0.381 ± 0.050 mm) Kioritz Engines - Snowmobiles (Serial No. 30,001-) Reed Valve Engines - 0.009 ± 0.003 in. BTDC (0.229 ± 0.076 mm) Piston-Ported Engines - 0.015 ± 0.002 in. BTDC (0.381 ± 0.050 mm) Kohler Engines 0.090 ± 0.005 in. BTDC (2.286 ± 0.127 mm) (with cam in advanced) position.	Sec. 40, Group 10 or 12
Adjust carburetor	High-speed needle Idle mixture needle Idle stop screw	Sec. 30, Group 10, 12, or 13
Recondition carburetor	Clean carburetor and install carburetor kit	Sec. 30, Group 10, 12

ADJUSTMENTS

Adjustment	Specification	Reference
Brake	....	Section 50, Group 35
Sheave Alignment	....	Section 50, Group 25
Track	....	Section 60, Group 20
Skis	....	Section 60, Group 25
Fan Belt	....	Section 20, Groups 15, 20, or 25

SPARK PLUG CHART

(Serial No. 2,551-20,000)

MODEL	BRAND	COLD**	NORMAL	HOT**
JDX4	AC	S41XL—AM52639	S42XL—AM52561	S43XL—AM52643
	Champion	N-2—AM52640	N-3—AM52432	N-4—AM52644
	Champion*	N-59G—AM52641	N-3G—AM52614	N-4G—AM52645
400-500-600	AC	S-41F-AM52272	S-42F—AM52301	—
	Champion	L-78—AM52266	L-81—AM52303	L-86—AM52646
	Champion*	L-4G—AM52613	L-6G—AM52304	L-9G—AM52647
JDX8	AC	—	S40F—AM52271	S41F—AM52272
	Champion	L-77J—AM52642	L-78—AM52266	L-81—AM52303
	Champion*	L-3G—AM52302	L-4G—AM52613	L-6G—AM52304

(Serial No. 20,001-30,000)

MODEL	BRAND	COLD**	NORMAL	HOT**
300	AC	S41XLR—AM53008	S42XLR—AM53007	S43XLR—AM53018
	Champion	RN2—AM53001	RN3—AM53006	RN4—AM53019
	Champion*	N59G—AM52641	RN3G—AM53016	RN4G—AM53020
400-500-600	AC	S41XLR—AM53008	S42XLR—AM53007	S43XR—AM53018
JDX4 Special	Champion	N57—AM53014	RN2—AM53001	RN3—AM53006
JDX6, JDX8	Champion*	N57G—AM53015	N2G—AM53488	RN3G—AM53016
JD295/S	AC	—	SV4XL—AM53223	—
	Champion	—	N-19V—AM53187	—

(Serial No. 30,001-   )

MODEL	BRAND	COLD**	NORMAL	HOT**
300	AC	S41XLR—AM53008	S42XLR—AM53007	S43XLR—AM53018
	Champion	RN2—AM53001	RN3—AM53006	RN4—AM53019
	Champion*	N59G—AM52641	RN3G—AM53016	RN4G—AM53020
400-600-	AC	S41XLR—AM53008	S42XLR—AM53007	S43XLR—AM53018
JDX4,	Champion	N57—AM53014	RN2—AM53001	RN3—AM53006
JDX6	Champion*	N57G—AM53015	N2G—AM53488	RN3G—AM53016
800	AC	S40XLR—AM53487	S41XLR—AM53008	S42XLR—AM53007
JDX8	Champion	N57—AM53014	RN2—AM53001	RN3—AM53006
	Champion*	N57G—AM53015	N2G—AM53488	RN3G—AM53016

** Gold-Palladium plugs. Use N59G in place of N2G in the 800 and JDX8 Snowmobiles for high performance or continuous high-speed operation.*

*** Use "hot" or "cold" plugs only under circumstances explained in the operator's manual. The "normal" heat range plug is proper for most snowmobiling.*

Group 20
FUEL AND LUBRICANTS

FUEL

The 2-cycle snowmobile engines require that oil be mixed with gasoline. It is important that quality gasoline and oil are used and mixed thoroughly in the proper ratio. Too little oil results in engine damage, while too much oil will cause spark plug fouling and excessive smoking.

NOTE: Some gasoline anti-freeze additives could cause carburetor diaphragm damage.

IMPORTANT: Gasoline must be of regular or premium grade with an octane rating of 90 or higher. For continued high speed operation, premium fuel is recommended. DO NOT use nonleaded gasoline. Mix gasoline with John Deere Snowmobile Oil, which is an ashless, 2-cycle oil without metallic additives. John Deere Snowmobile Oil meets Boating Industry Association (BIA) test qualification TC-W and test procedure BIA-312-69. It is available in 1-pint and 1-quart "pop-top" cans.

For the first 3 tanks of fuel used in the snowmobile, mix gasoline and oil in a 20 to 1 ratio. After this break-in period, mix gasoline and oil in a 50 to 1 ratio.

IMPORTANT: If snowmobile oil other than John Deere is used, it must be mixed in a 20 to 1 ratio. However, a 20 to 1 ratio increases the possibility of spark plug fouling.

NOTE: The 800 (J800D 030001M-) and JDX8 (JDX8D 030001M-) require PREMIUM gasoline at all times.

IMPORTANT: Use ONLY a 20 to 1 ratio of PREMIUM gasoline and oil in the JD295/S Snowmobile.

Mix fuel according to the following procedure:

Pour the required amount of John Deere Snowmobile Oil into a clean container, add one-half the necessary gasoline and shake vigorously. Add the remainder of the gasoline and agitate the mixture thoroughly. The Snowmobile Gasoline Can, Fig. 1, is ideal for snowmobile use. Mix gasoline and oil in a separate container. Never mix in the snowmobile tank.

Fig. 1-Correct Gasoline-to-Oil Mixture Ratio

LUBRICANTS

Oil used in the chain case should be a good grade of SAE 30. Remove the lower access plug (Fig. 2) from the chain case to check the lubrication level.

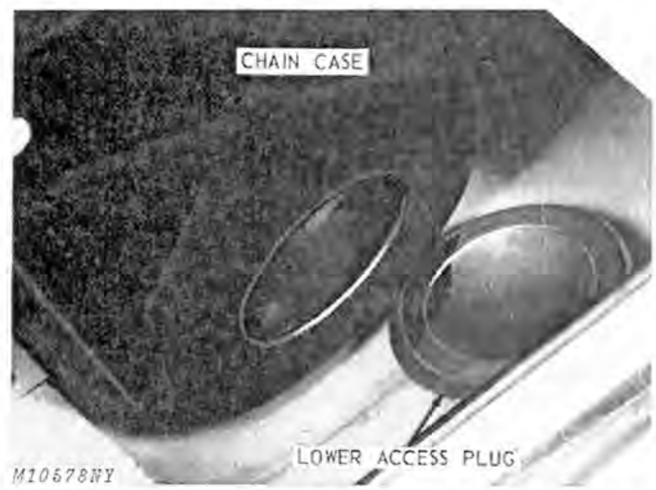


Fig. 2-Checking Oil Level in Chain Case

Oil should be 1/4 inch to 1/2 inch (6.35 to 12.7 mm) below the lower access hole in the chain case.

Remove oil from chain case with a syringe or sponge.

CAPACITIES

Fuel Tank (Plastic) .... 6.50 U.S. gal. (24.6 l)
Fuel Tank (Steel) .... 5.50 U.S. gal. (20.9 l)
Chain Case .... 5 oz. (150 ml)

SERVICE INTERVALS

Chain Case (Oil Change) ... 200 hours or 2 years

Section 20
ENGINE
Group 5
GENERAL INFORMATION

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> *NOTE: Service procedures for CCW and Kioritz engines are identical. Use the information in this section for either piston-ported or reed valve engines*

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DESCRIPTION

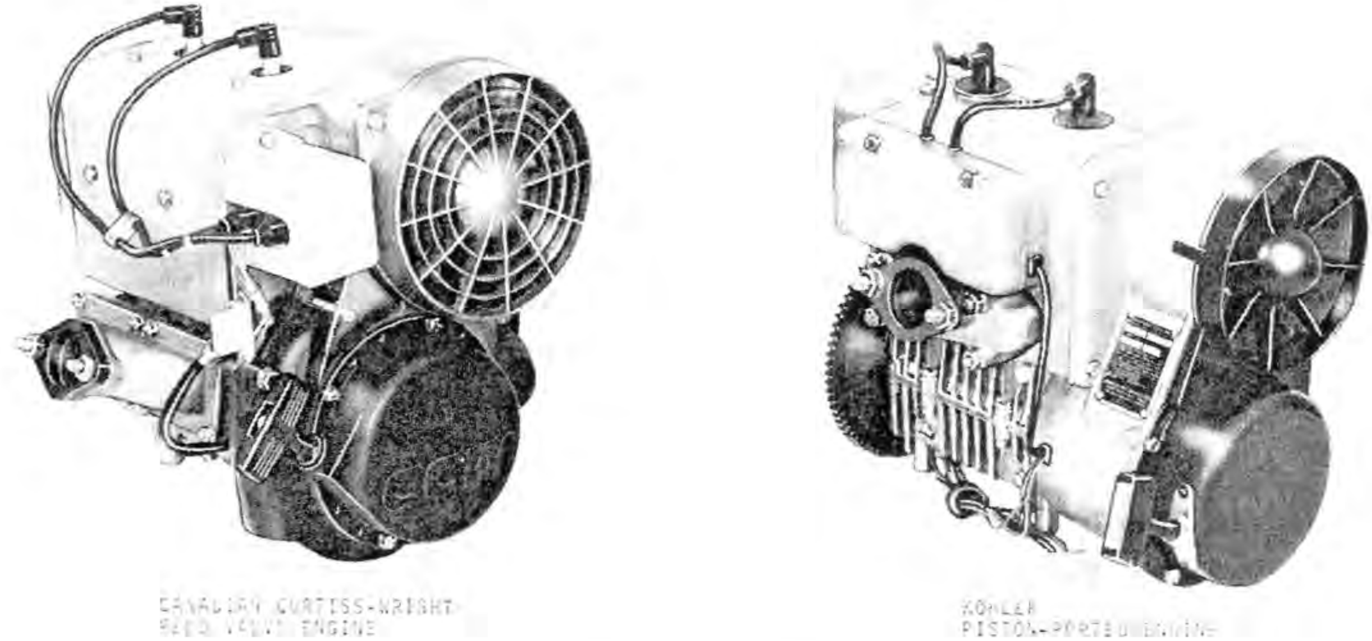

Fig. 1-John Deere Snowmobile Engines

The engines, Fig. 1, used in John Deere Snowmobiles are 2-cylinder, 2-cycle, air-cooled engines.

The 2-cycle engine is especially adaptable for snowmobile use because it offers a relatively small and lightweight package with high power output. The 2-cycle engine also can be operated at extreme angles without loss of lubrication. Design simplicity is another point in favor of the 2-cycle engine. No valves, tappets or camshaft are required.

The 2-cycle engine provides a power stroke for every revolution of the crankshaft as opposed to a power stroke for every other revolution in a conventional 4-cycle engine. This accounts for the high horsepower-to-weight ratio of the 2-cycle engine.

See "Principle of Operation" on next page for basic fundamentals of 2-cycle piston-ported and reed valve engine operation.

Four sequences are shown under "Principle of Operation". Remember, however, that two sequences must take place with every stroke of the piston.

Example: As the piston moves upward, compression of the previous charge occurs in addition to fuel mixture intake into the crankcase.

The engines feature ball bearings for crankshaft support and needle bearings at crankpin and piston pin locations.

Detailed specifications for the engines are covered in Section 10 and in Group 35 of this section.

PRINCIPLE OF OPERATION

Piston-Ported Engines

Stroke 1 - Power, Exhaust, Fuel Transfer

Power

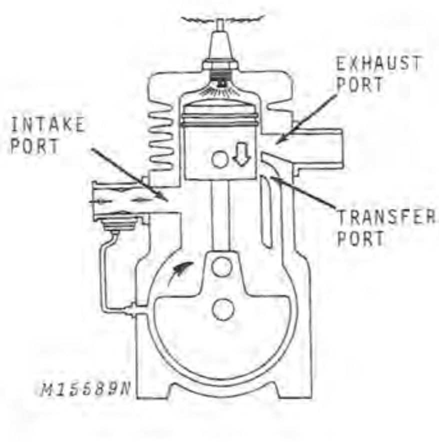

Fig. 2-Power Stroke

Slightly before top dead center (TDC) ignition occurs, Fig. 2. Pressure of the burning gases, caused by combustion, pushes the piston downward. This action provides power to turn the crankshaft through the connecting rod.

Before the piston reaches the end of its downward movement, it exposes the "exhaust port" and the "transfer port". The "intake port" remains closed. The intake and exhaust ports are located on opposite sides of the cylinder.

Exhaust

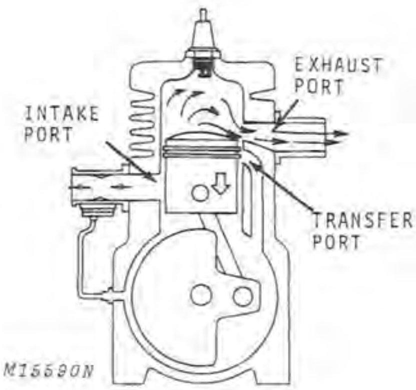

Fig.3-Power Stroke and Exhaust

The exhaust port, Fig. 3, is uncovered first. Hot gases, which are still under pressure from combustion, escape through the open exhaust port.

Fuel Transfer

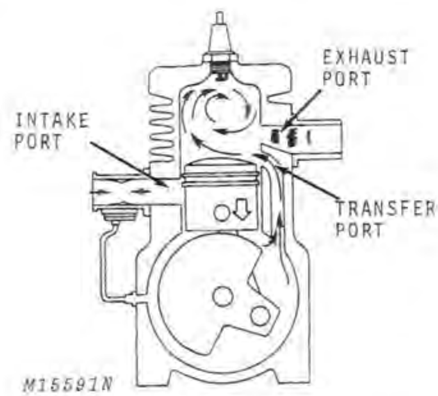

Fig. 4-Power Stroke and Fuel Transfer

After uncovering the exhaust port, the transfer port, Fig. 4, is uncovered. As the piston moves downward it exposes the transfer port, but still keeps the intake port closed. The piston, moving downward, pressurizes the crankcase and causes the fuel-air mixture in the crankcase to move up and out the transfer port into the combustion chamber. The pressure developed in the crankcase is only slight pressure, but it is enough to force the new charge of fuel and air into the combustion chamber. This new charge also helps to drive out the remaining exhaust gases.

Stroke 2 - Compression, Intake

Compression and Intake

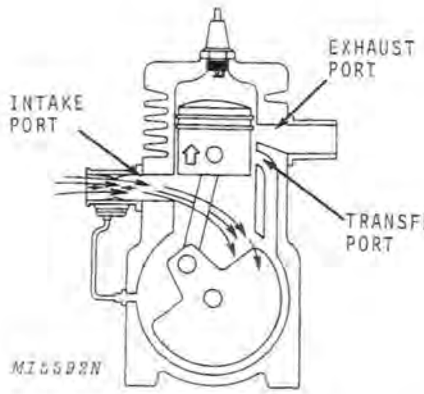

Fig. 5-Compression Stroke and Intake

As the piston moves upward, it closes off the transfer and exhaust ports and opens the intake port, Fig. 5. Upward movement of the piston creates a partial vacuum (low pressure) in the crankcase. Atmospheric pressure forces a new charge of fuel and air from the carburetor through the intake port into the crankcase.

The piston moves upward, compressing the fuel-air mixture. Just before the piston reaches TDC, a spark from the spark plug ignites the mixture, and it starts to burn. This begins another power stroke.

Reed Valve Engines

Stroke 1 - Power, Exhaust, Fuel Transfer

Power

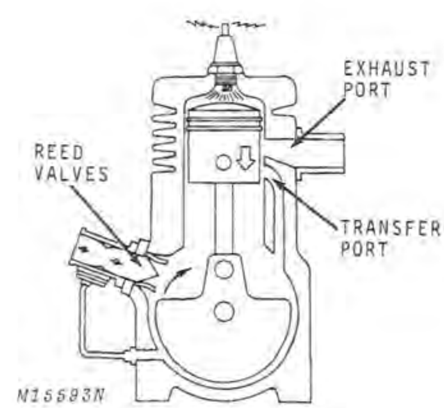

Fig. 6-Power Stroke

Slightly before top dead center (TDC), ignition occurs, Fig. 6. Pressure of the burning gases, caused by combustion, pushes the piston downward. This action provides power to turn the crankshaft through the connecting rod.

Before the piston reaches the end of its downward movement, it exposes the "exhaust port" and the "transfer port". The "reed valves" remain closed. The intake (reed valve) and exhaust ports are located on opposite sides of the cylinder.

Exhaust

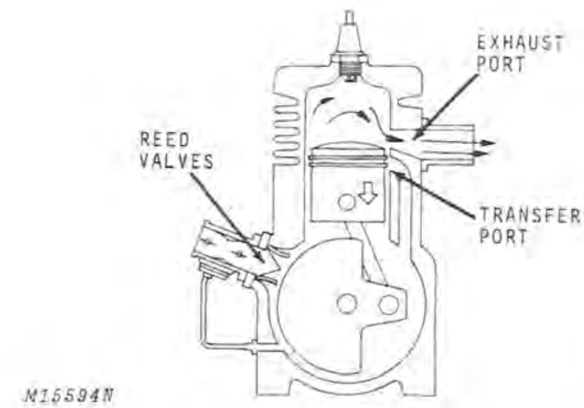

Fig. 7-Power Stroke and Exhaust

The exhaust port, Fig. 7, is uncovered first. Hot gases, which are still under pressure from combustion, escape through the open exhaust port.

PRINCIPLE OF OPERATION—Continued

Fuel Transfer

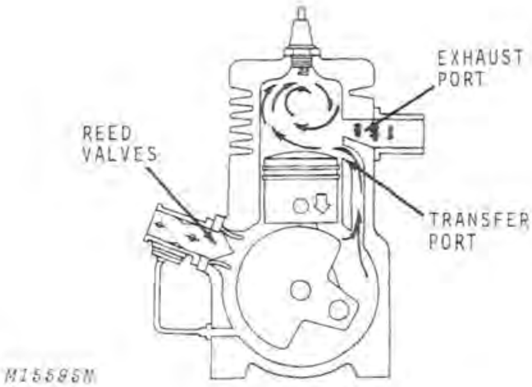

Fig. 8-Power Stroke and Fuel Transfer

After uncovering the exhaust port, the fuel transfer port, Fig. 8, is uncovered. As the piston moves downward, it exposes the transfer port. The piston moving downward pressurizes the crankcase. This pressure holds the reed valves closed and causes the fuel-air mixture in the crankcase to move up and out the transfer port into the combustion chamber. The pressure developed in the crankcase is only slight pressure, but it is enough to force the new charge of fuel and air into the combustion chamber. This new charge also helps to drive out the remaining exhaust gases.

Stroke 2 - Compression, Intake

Compression and Intake

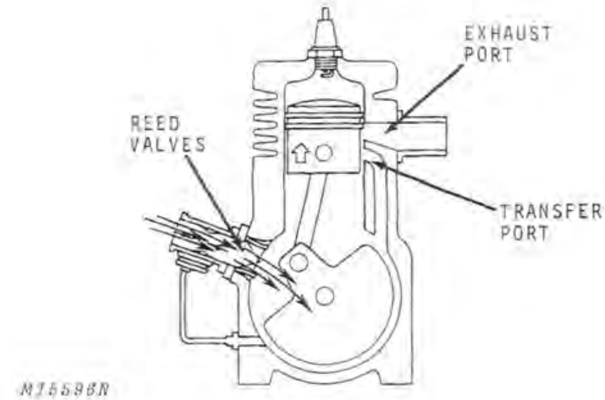

Fig. 9-Compression Stroke and Intake

As the piston moves upward, it closes the transfer and exhaust ports. Upward movement of the piston creates a partial vacuum (low pressure) in the crankcase. Atmospheric pressure forces a new charge of fuel and air from the carburetor through the reed valves, Fig. 9, into the crankcase.

The piston moves upward, compressing the fuel-air mixture. Just before the piston reaches TDC, a spark from the spark plug ignites the mixture, and it starts to burn. This begins another power stroke.

Group 10
ENGINE ANALYSIS AND INSPECTION

ANALYSIS

Most engine trouble is of a minor, non-chronic nature due to electrical or fuel system difficulties. Make the following two checks to help isolate the cause of engine problems.

Spark Test

Fig. 1-Checking Spark at Plug

Install a wood screw in spark plug connector and hold 1/8 inch (3 mm) from spark plug base, Fig. 1. Turn ignition switch "ON" and crank engine. A weak spark or no spark indicates electrical system difficulties. See Section 40. Check both cylinders.

If spark is good but engine will not start, check to see if fuel is getting to carburetor. If fuel is available and engine will not start, make compression test. See also "Diagnosing Malfunctions," page 10-5, in this group.

Compression Test

Fig. 2-Testing Engine Compression

Remove spark plugs and place a compression gauge in one of the spark plug holes, Fig. 2.

Set choke and hold throttle in open position.

Hold compression gauge firmly in spark plug hole and crank engine vigorously. Test both cylinders for 125 to 175 psi compression. Pressure should not vary by more than 10 psi between cylinders.

If compression pressure is low, check cylinder head gaskets for leakage. If head gaskets are not leaking it is a good possibility that pressure is leaking by worn or stuck piston rings, damaged pistons or damaged cylinder walls.

Analysing Causes of Engine Failure

The majority of 2-cycle engine failures are due to excessive heat. Following is a list of the primary causes of snowmobile engine failure.

Fuel

Because the 2-cycle engine relies on a gasoline-oil mixture for lubrication, the mixture ratio and the quality of oil used are very important. The oil must retain its lubrication properties at extremely high temperatures. The oil must have an ashless base so it will not cause deposit build-up from burning with the gasoline.

The gasoline must have a sufficiently high octane rating (90 or higher) to prevent "knocking" or "detonation" from high temperatures, high compression and advanced ignition timing.

Fuel-Air Mixture

Regardless of the quality of fuel used, the fuel-air mixture must be correct to maintain good, reliable engine performance.

The high speed mixture needle setting on the carburetor is probably the most common cause of engine failure. Often a "too lean" fuel mixture will appear to the inexperienced customer as making his 2-cycle engine run "better."

Under a high-speed, "no-load" situation, however, the carburetor should be set to provide maximum performance under load and then backed-off (turned counterclockwise) an additional 1/8-turn.

A lean fuel-air mixture also can be caused by air leakage at the following points:

1. Between crankcase halves.
2. Around crankshaft seals.
3. Between intake manifold and engine.
4. Between carburetor and intake manifold.

Dirt

The silencer used on the snowmobile is not intended to filter incoming air. The snowmobile is designed to operate on clean snow-covered areas, not in dirty, dusty conditions. Operation in conditions other than snow is not recommended.

Pistons coming from a snowmobile engine which has been run in dirt appear shot-peened. This type of failure is considered non-warranty, because the snowmobile was not designed for use under these conditions.

Ignition Timing

Overadvanced timing causes combustion temperatures to rise to the detrimental point. Overadvanced timing also causes "knocking" or "detonation."

Retarded timing can cause excessive heat in the exhaust port area of the cylinder.

Spark Plugs

If a spark plug has too "hot" a heat range for an engine or an operating condition, the electrodes cannot cool sufficiently between power strokes. This causes the electrodes to glow "red hot." Pre-ignition and detonation follow which bring temperatures up to a damaging level.

A spark plug of the correct heat range that is not properly seated with its gasket against the cylinder head can run "hot" due to improper heat conduction to the cylinder head and cooling fins.

Heat

Although excessive heat can be attributed to most of the preceding causes of engine failure, lack of cooling on the engine exterior is also an important factor to consider when viewing an engine damaged from excessive heat.

Lack of engine cooling can be caused by one of the following:

1. Snow-plugged louvers in the hood.
2. Dirty or damaged cylinder or cylinder head cooling fins.
3. Damaged cooling fan.
4. Slipping fan belt.
5. Broken fan belt.
6. Operating in "hot" weather.
7. Plugged or restricted exhaust system.

The following pictures show engine components damaged from excessive heat. The cause of the excessive heat could be almost any of the preceding, except dirt damage.

With the exception of a broken defective fan belt, the conditions caused by excessive heat would be non-warranty items attributed to customer misuse or improper adjustments.

Fig. 3-Ring Breakage Damage

Fig. 3 illustrates a piston damaged from pre-ignition or detonation caused by excessive heat. When part of the piston broke away, a piece of exposed ring also broke away and caused extensive damage to the cylinder head and the head of the piston.

The piston pin color gives an indication of the excessive heat involved.

Ring and piston land breakage as shown in Fig. 3, without the indication of heat, would be caused by improper assembly of the engine.

The arrow on the head of the piston must point toward the exhaust port side of the engine. If not, ring end gaps will pass over the exhaust port, open slightly and catch, causing breakage.

Fig. 4 illustrates a piston which became excessively hot, started to melt and eventually scuffed and seized to the cylinder.

Notice how the severe melting and scuffing occurred on the exhaust port side of the piston and cylinder. Also notice the aluminum throw-off (from melting) adhering to the cylinder head.

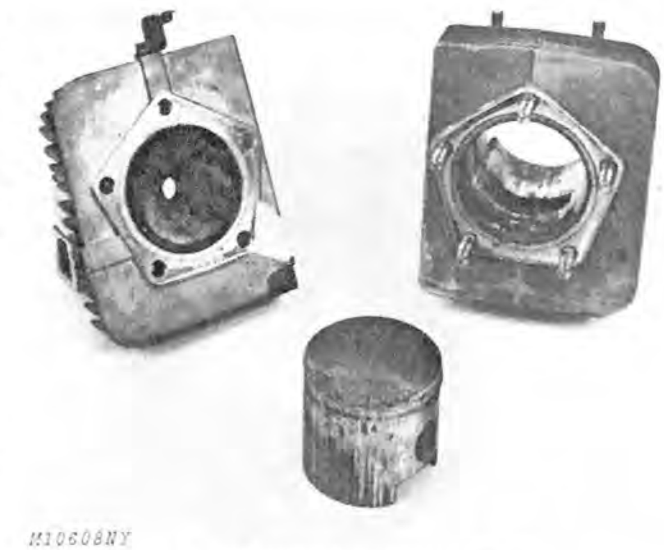

Fig. 4-Piston and Cylinder Scuffing

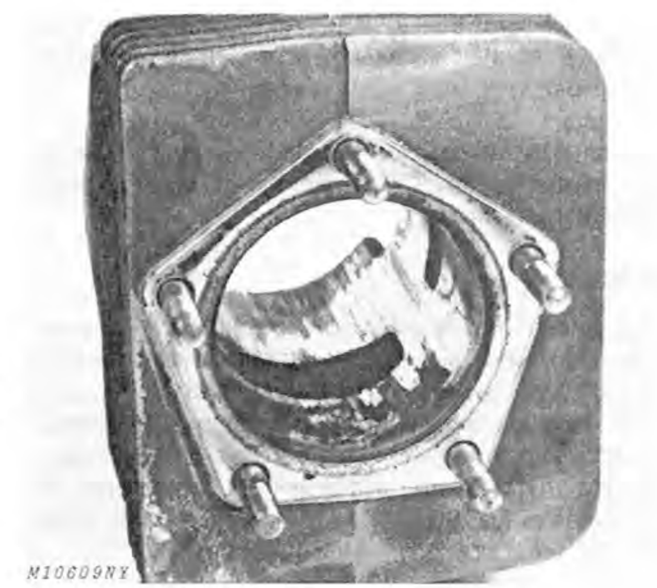

Fig. 5-Cylinder Scuffing

Fig. 5 illustrates a close-up view of a scuffed cylinder. Note how the aluminum piston material transferred to and adhered to the cast iron cylinder wall from the excessive heat.

NOTE: Damaged cylinders can often be salvaged by scraping aluminum off the cylinder bore with a knife or bearing scraper. Use care when doing this to prevent additional marring of the cylinder. Light honing will remove score marks.

Analysing Causes of Engine Failure—Continued

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Fig. 6-Melted and Scuffed Piston

Excessive heat due to pre-ignition caused the piston, Fig. 6, to melt away, freeze the rings and scuff the cylinder wall.

Notice how the top of the piston is starting to melt away in the center. Continued usage would cause complete burn-through.

Pre-ignition

Pre-ignition in the combustion chamber is caused by an excessively hot surface (most commonly this is the end of the spark plug). When ignition comes early, the temperature of the hot surface rises further and advances the time of ignition. This is "run-away" (pre-ignition). Because of pre-ignition, the heating of parts takes place. The piston will generally melt away near the area where pre-ignition originates.

Once pre-ignition begins, the fuel charge will fire even with the ignition shut-off.

Detonation (Knock)

Combustion begins normally with the spark.

Spontaneous combustion (an explosion) can take place at some combination of:

1. Mixture
2. Temperature
3. Pressure
4. Time
5. Fuel octane rating

At a given combination of mixture, temperature, and pressure, a certain octane fuel requires a specific time to explode. Low octane requires less time than high octane. Therefore, to avoid "knock", a higher octane will permit full combustion before enough time lapses to have a "knock" take place.

If temperature or pressure rises, the time requirement is reduced. Lean mixtures require higher octane fuel to avoid "knock". Leaner mixtures also cause less internal cooling.

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Fig. 7-Piston Burn-Through

Piston burn-through, Fig. 7, is usually caused by spark plugs with too "hot" a heat range. This is generally referred to as spark plug induced pre-ignition.

Always locate and correct the cause of the problem before putting an engine back into service. Warn and advise the customer of the dangers of tampering with carburetor settings, using poor quality gasoline and oil, and of using spark plugs with heat ranges other than those recommended for use in his machine or for his type of operation.

DIAGNOSING MALFUNCTIONS

Engine

Engine Will Not Start

Carburetor and/or fuel pump faulty.

Spark plugs fouled or faulty.

Breaker points worn or pitted.

Coil and condenser weak or faulty.

Fuel lines obstructed.

Head gasket leaking.

Electrical connections loose.

Engine Starts With Difficulty

Carburetor out of adjustment.

Choke not functioning properly.

Spark plugs fouled.

Ignition coil weak.

Breaker points worn or pitted.

Fuel mixture incorrect.

Ignition out of time.

Water in fuel system.

Faulty reed valve.

Drain plugs loose or missing.

Engine Won't Crank

Piston seized.

Crankshaft seized to bearings.

Connecting rod broken.

Faulty recoil starter.

Engine Will Not Idle Properly

Carburetor idle adjustments incorrect.

Spark plugs fouled or improperly gapped.

Head gasket leaking.

Fuel mixture incorrect.

Crankshaft seal leaking.

Spark retarding mechanism malfunctioning.

Impulse tube to fuel pump obstructed or leaking.

Drain plugs loose or missing.

Engine Misses At High Speeds

Spark plugs fouled or improperly gapped.

Breaker points dirty or improperly gapped.

Ignition out of time.

Fuel pump faulty.

Head gasket leaking.

Ignition coil weak.

Carburetor high-speed adjustment incorrect.

Impulse tube to fuel pump obstructed or leaking.

Engine Overheated

Carburetor out of adjustment.

Ignition out of time.

Spark plugs incorrect.

Air leak in intake system or crankcase.

Cooling fan broken or damaged.

Cooling fan drive belt broken or slipping.

Cooling fins obstructed or damaged.

DIAGNOSING MALFUNCTIONS—Continued

Engine—Continued

Engine Runs Rough and Smokes

Carburetor adjusted too rich.

Choke not opening properly.

Muffler obstructed.

Water in fuel.

Engine Kicks Back and Backfires

Spark plug wires reversed.

Flywheel key sheared.

Condenser faulty.

Ignition out of time.

Spark advance mechanism malfunctioning.

Engine Loses Power

Carburetor out of adjustment.

Engine overheating.

Breaker points dirty or improperly gapped.

Ignition out of time.

Ignition coil weak.

Spark plugs improperly gapped.

Muffler obstructed.

Reed valves not closing properly.

Engine Lacks Acceleration

High-speed needle set too lean.

Fuel pump faulty.

Fuel mixture incorrect.

Breaker points worn or dirty.

Ignition out of time.

Faulty reed valve.

Recoil Starter

Pawls Not Extending When Rope Is Pulled

Friction spring broken allowing friction plate to rotate.

Retaining nut loose.

Pawls Not Returning When Rope Is Released

Return spring broken.

Return spring not assembled properly.

Rope Not Returning

Main spring broken or unhooked.

No lubrication between friction plate and washer.

INSPECTION

NOTE: Normally, "Inspection" would be located in each group after disassembly. To keep from being repetitious in each of the engine groups, inspection has been grouped with analysis.

Clean all parts except stator assembly with cleaning solvent.

Inspecting Fan and Fan Belt

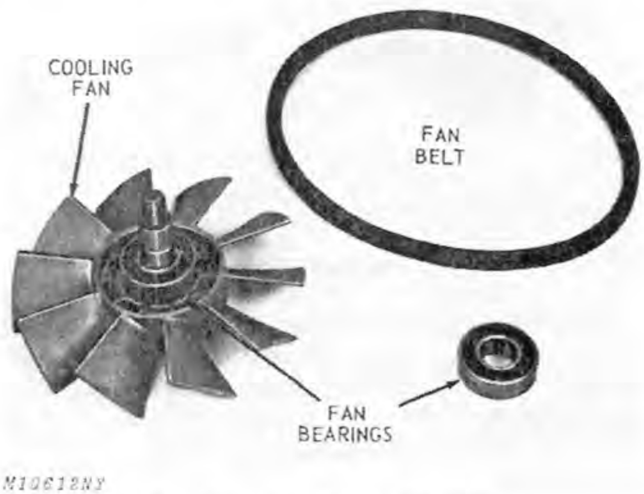

Fig. 8-Inspecting Fan and Fan Belt

Inspect fan, Fig. 8, for cracked, broken or damaged fins. Dress nicks or dents with a file. If fins are cracked or broken, fan must be replaced.

Inspect fan bearings, Fig. 8, for wear or looseness. Replace if necessary.

Replace fan belt, Fig. 8, if frayed, stretched, or deteriorated.

Inspecting Crankcase

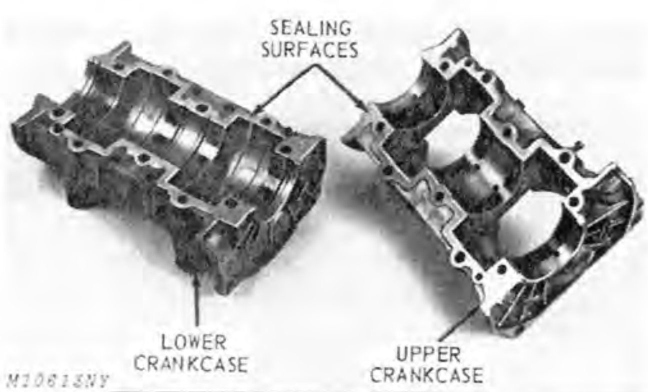

Fig. 9-Inspecting Crankcase Halves

Visually inspect crankcase sealing surfaces, Fig. 9, for deep scratches, scoring or pitting. Inspect bearing and oil seal retaining inserts for wear, scoring or conditions that could cause leaks.

NOTE: Minor indication of crankshaft bearing outer race "rotation" in the crankcase halves can be considered normal.

Replace crankcase halves if damaged. Crankcase halves are available only in a matched set.

Inspecting Cylinder Head

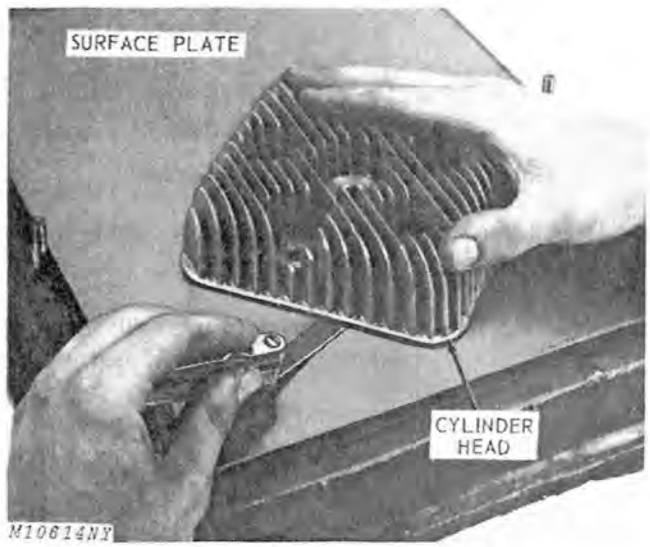

Fig. 10-Checking Cylinder Head Flatness

Carefully scrape carbon from cylinder head and exhaust ports of cylinders. Use a soft metal (nonferrous) scraper to avoid damage. A wooden spatula works well for cleaning exhaust ports.

Use a spark plug tap (14 mm) to clean carbon from spark plug threads in cylinder head, if required.

Place cylinder heads on a surface plate, Fig. 10, and measure at various points between head and surface plate with a feeler gauge.

Inspecting Cylinder

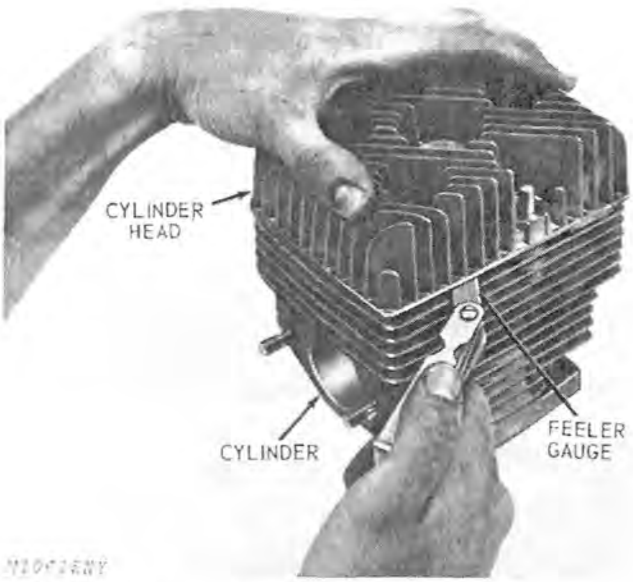

Fig. 11-Checking Cylinder Distortion

Install a serviceable cylinder head on cylinders. Install without gasket or hold-down nuts.

Measure for distortion between studs with a feeler gauge, Fig. 11. Maximum allowable distortion is 0.002 inch (0.05 mm).

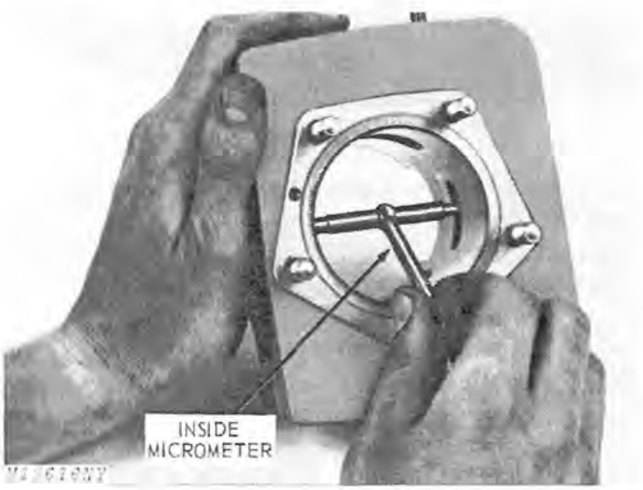

Fig. 12-Measuring Cylinders

Measure cylinders with an inside micrometer, Fig. 12. Measure parallel with the crankshaft and at right angles to crankshaft at both top and bottom of ring travel. If at all possible, salvage cylinder as explained on page 20-10-3.

Replace cylinders on CCW and Kioritz engines if over 0.005-inch oversize.

Cylinders on Kohler engines can be rebored oversize 0.020 to 0.040-inch (0.508 to 1.016 mm).

Honing Cylinder Bore

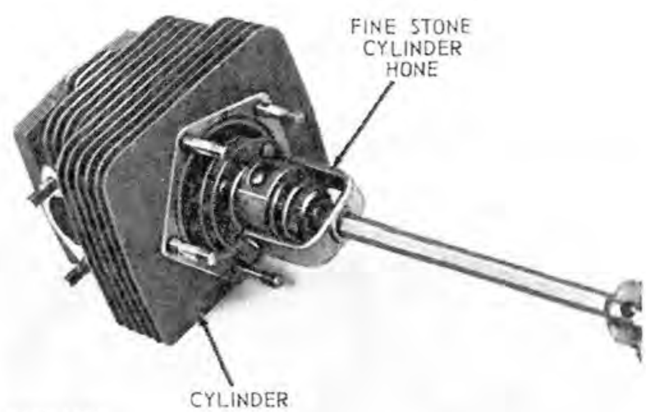

Fig. 13-Honing Cylinder Bore

If cylinder is within wear tolerance, but lightly scored, hone by running a fine stone cylinder hone lightly in cylinder, Fig. 13. Follow manufacturer's recommendations. On CCW and Kioritz engines. Do not hone over 0.005 inch oversize or cylinder will have to be replaced.

Clean thoroughly with detergent and water to remove all particles.

Reboring Cylinders (Kohler Engines)

Measure cylinder bore for wear. Using inside micrometer or bore gauge, check the area just below top of bore. Wear will be indicated by a "step" worn into the wall. Measure at right angles (90°) to the piston pin axis at the top where most wear occurs.

NOTE: Use a "hone" for reboring the cylinder. Use coarse honing stones for removing most of the bore and medium honing stones for finishing. Use hones for cast iron. BE SURE the correct hone is used and that stones are not worn.

1. Anchor the cylinder before reboring.

2. Set the drill press to operate from 450 to 700 rpm.

3. Lower the hone to the point where the lower end extends 1/2 to 3/4 inch (1.2 cm to 1.9 cm) past the end of the cylinder.

4. Rotate the adjusting nut on the hone until the stones come in contact with the cylinder wall at the narrowest point.

5. Turn the hone by hand. If you cannot turn it, the hone is too tight. Loosen hone until it can be turned by hand.

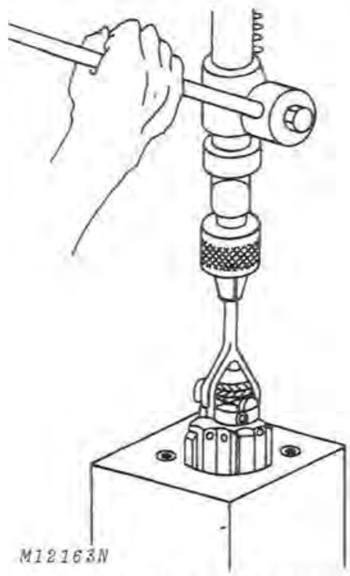

Fig. 14-Honing the Cylinder

6. Start the drill. Move the hone up and down in the cylinder approximately 40 cycles per minute, Fig. 14. Follow the hone manufacturer's recommendations.

NOTE: Some hones require oil and some will not work with even a small amount of oil on the cylinder wall.

7. Check the diameter of the cylinder regularly during honing. (Stop the drill before measuring and remove the hone from the cylinder.)

8. When the cylinder is approximately 0.002-inch (0.050 mm) within the desired bore specification, change to medium stones and finish the bore. Finish should not be perfectly smooth, but should have a 45-degree cross-hatch pattern.

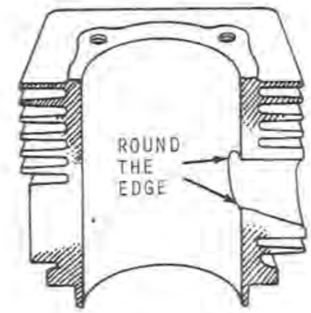

Fig. 15-Rounding Edges of Ports

9. After reboring, remove any burrs that may have formed at edges of ports. Use a pencil grinder or emery cloth and just round the edges of the ports, Fig. 15.

IMPORTANT: Be careful when rounding the ports. Take off only enough to allow the rings to pass the port freely. If the port is rounded too much, hot exhaust gases may blow by the rings on the piston down-stroke, burning the rings.

10. Clean the cylinder thoroughly. Use soap, warm water and clean rags. Clean the cylinder wall for a "white glove" inspection. A clean white rag should not show soil from the cylinder wall.

IMPORTANT: DO NOT use solvent or gasoline because these fluids only wash all the oil from the cylinder wall. They do not remove metal particles produced during honing.

11. Dry the cylinder and coat it with 2-cycle engine oil.

Inspecting Piston and Piston Pin

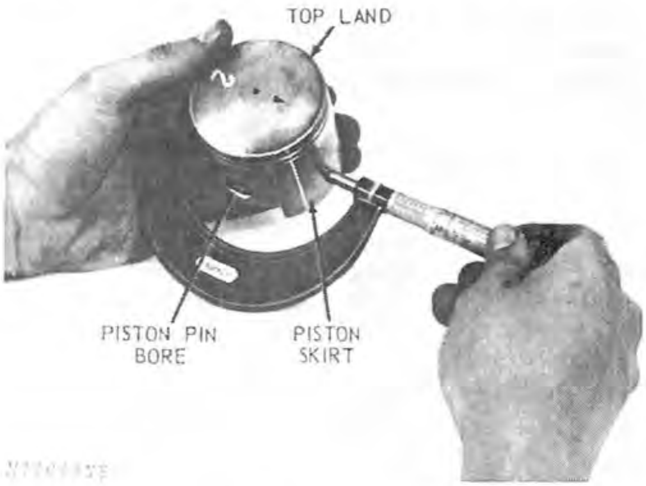

Fig 16-Measuring Piston

Clean piston ring grooves with a ring groove cleaner or the broken section of an old ring if proper tool is not available.

Inspect piston for evidence of scoring, pitting, or corrosion.

Measure piston at right angles to piston pin for wear at top land and at skirt, Fig. 16. Measure piston pin bore with an inside micrometer.

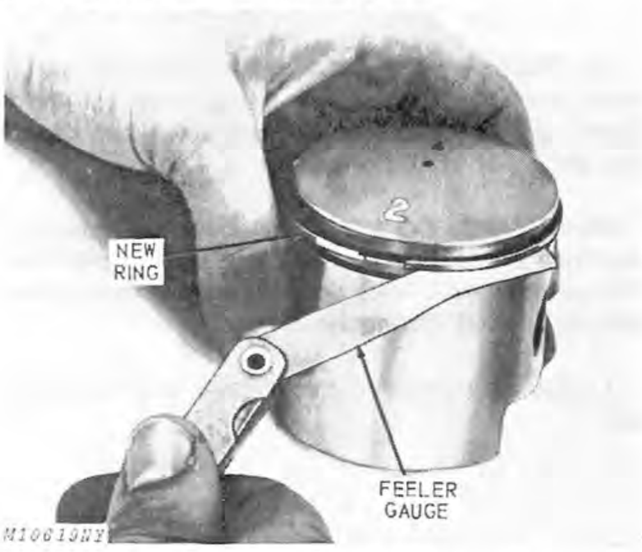

Fig. 17-Measuring Ring Side Clearance

Install a new ring into ring groove and measure side clearance with a feeler gauge as shown, Fig. 17.

Fig. 18-Measuring Piston Pin

Measure piston pin with a micrometer, Fig. 18.

Inspecting Crankshaft and Connecting Rod

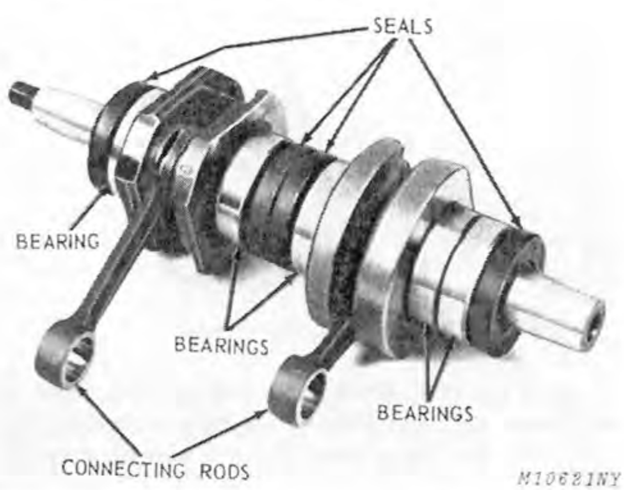

Fig. 19-Inspecting Crankshaft and Connecting Rod

Inspect threads on each end of crankshaft, Fig. 19. Inspect keyway on flywheel end and taper on each end of crankshaft for scoring or wear.

Inspect ball bearings for wear, free movement, and security. The outer bearings are replaceable. If inner bearings are worn, the crankshaft assembly must be replaced.

Inspect seals for wear or damage. Outer seals are replaceable, while inner seals are available only with the complete crankshaft assembly.

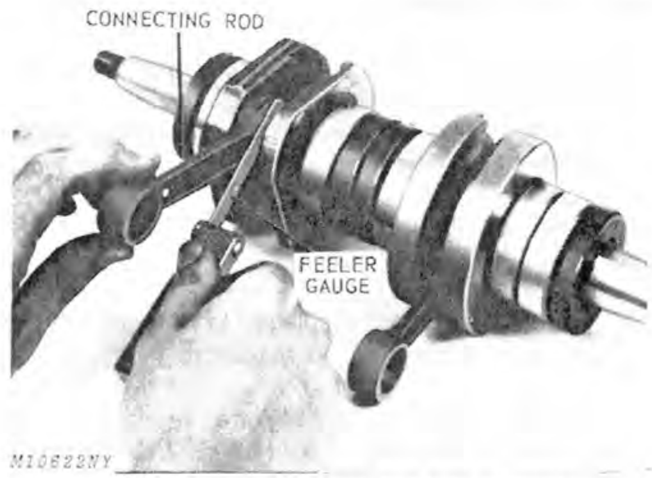

Fig. 20-Measuring Connecting Rod Side Clearance

Measure connecting rod side clearance with a feeler gauge, Fig. 20.

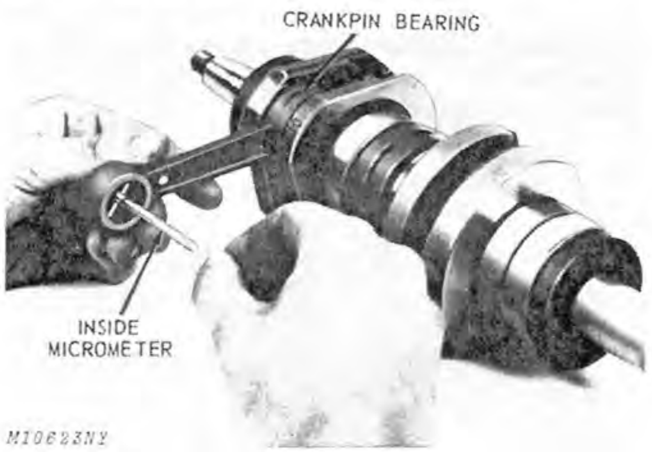

Fig. 21-Measuring Connecting Rod Small End

Inspect crankpin, Fig. 21, and piston pin needle bearings for wear or looseness. Piston pin bearings are available for service while crankpin bearings are available with the complete crankshaft assembly only.

Measure connecting rod small end diameter with an inside micrometer, Fig. 21. Replace crankshaft assembly if not within tolerance, or if badly scored.

Removing Crankshaft Outer Bearings

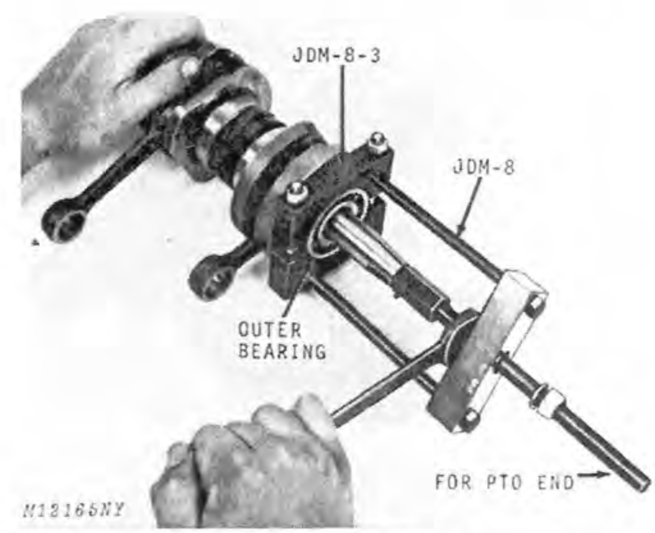

Fig. 22-Removing Crankshaft Outer Bearings

If inspection reveals outer seals and bearings are defective, they can be replaced.

Remove Woodruff key from flywheel end of crankshaft and slide seals off crankshaft.

Remove outer bearings as shown in Fig. 22 using crankshaft bearing tool. Thread other end of puller into PTO end of crankshaft to remove PTO end bearings.

PRESSURE TESTING THE ENGINE

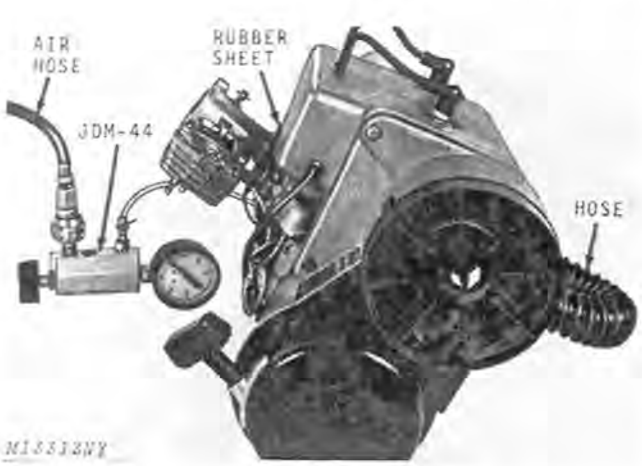

Fig. 23-Pressure Testing the Engine

If detonation-type piston failures have been experienced and a fuel lean-out is suspected, the following procedure should be performed:

Convenience Tool JDM-44 comes complete with the necessary items to seal the intake and exhaust system and pressure test the crankcase. Pressure test the engine as follows:

1. Seal exhaust system as follows:
Kohler Engines - Connect exhaust pipes using hose and clamps (supplied with JDM-44, Fig. 23).
CCW and Kioritz Engines - Place rubber sheet (supplied with JDM-44) between exhaust manifold and cylinders. Use manifold gaskets as templates to cut stud holes in rubber sheet.

2. Seal intake system by placing rubber sheet between carburetor and intake manifold, Fig. 23. Use carburetor gasket as a template to cut stud holes in rubber sheet.

3. Install and torque spark plugs to 15 to 20 ft-lbs. (20 to 27 Nm).

4. Connect pressure regulator to impulse fitting. Close valve (clockwise) on regulator.

5. Connect shop air to pressure regulator. Open valve until gauge reads 7 psi (48 kPa). Close valve.

6. Gauge needle should not drop below 5 psi (34 kPa) for at least 10 seconds.

7. If needle drops too rapidly, open valve on regulator to maintain 7 psi (48 kPa). A water and liquid soap solution applied to seals and seams will help to locate leakage. Correct leakage before putting engine back in service.

REPLACING PTO END BEARING SEAL

NOTE: The following seal replacement is for CCW and Kioritz engines. Kohler engine seals are removed in a different manner.

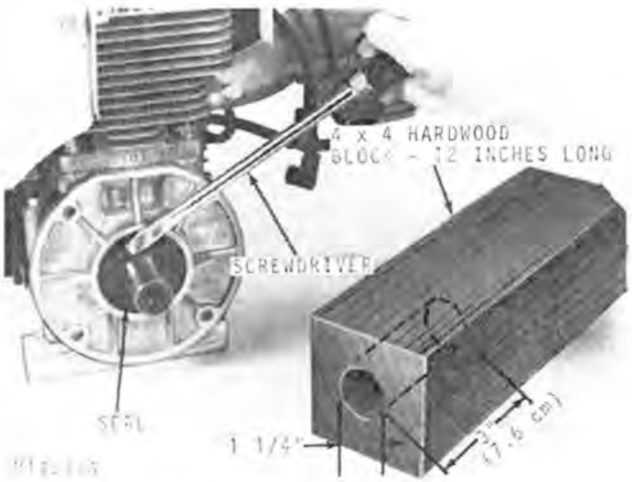

Fig. 24-Replacing PTO End Bearing Seal

When a drive belt breaks and winds around back side of clutch (fixed face), check PTO end of crankshaft seal because it is often damaged. This seal can be replaced in the snowmobile without removing engine. Proceed as follows:

1. Remove clutch.

2. Use a cold chisel to make a slot in old seal. Pry old seal out with a long screwdriver blade, Fig. 24.

IMPORTANT: Use care not to chisel too deep or damage to crankshaft and/or bearing may result.

3. Clean crankshaft surface.

4. Coat inner and outer seal surfaces with STP or equivalent for ease of installation. Do not use snowmobile oil as a lubricant.

5. Install new seal by using a 4 x 4-inch (10.1 x 10.1 cm) block of hard wood, 12 inches (30.5 cm) long with a 1-1/4-inch (3.14 cm) diameter hole drilled 3 inches (7.6 cm) deep in end of block. Place tool over crankshaft, align seal, and drive seal into place until flush with crankshaft. Be careful not to cock seal.

Group 15
CCW AND KIORITZ PISTON-PORTED ENGINE OVERHAUL

GENERAL INFORMATION

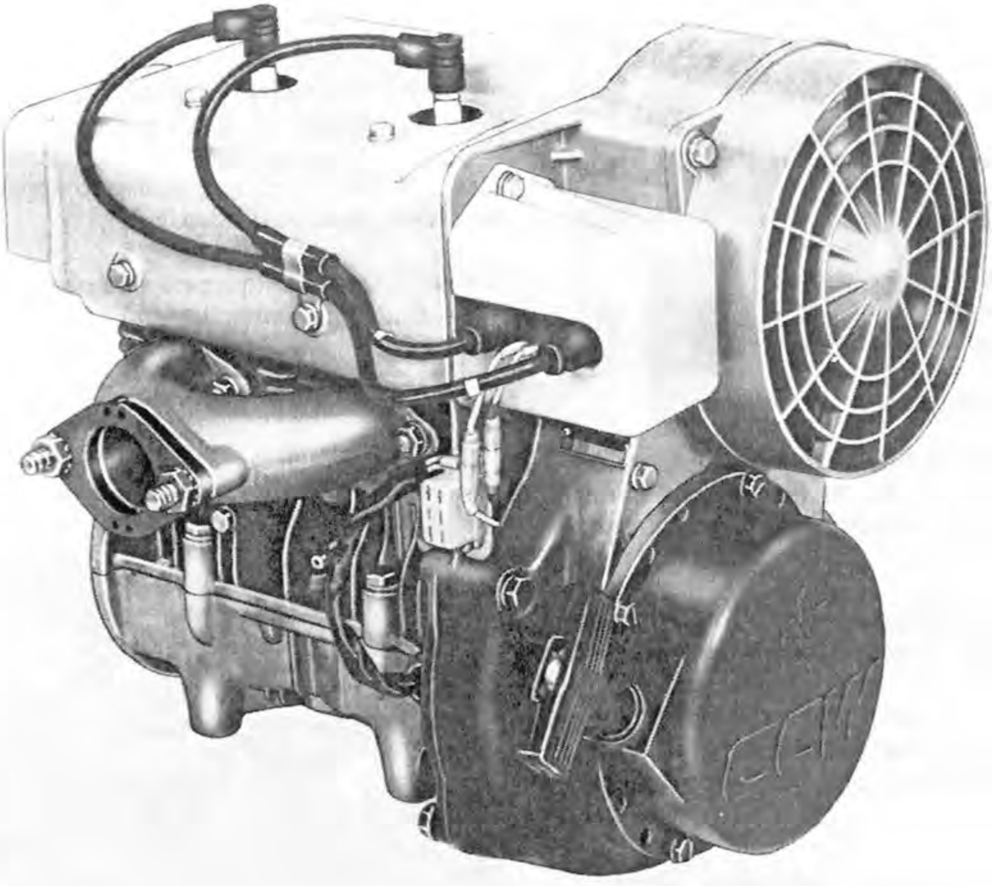

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Fig. 1-CCW and Kioritz Piston-Ported Snowmobile Engine

The CCW (Canadian Curtiss-Wright) and Kioritz piston-ported engines, Fig. 1, feature ball bearing supported crankshafts. These engines have five ball bearings; two between crankthrows, one on the flywheel end, and two on the PTO end of the crankshaft. Needle bearings are used at both crankpin and piston pin locations.

The crankshaft, inner ball bearings and seals, connecting rods and crankpin bearings are available only as a complete assembly. If any of these parts are worn or damaged an entire crankshaft assembly must be installed. The complete assembly also includes outer seals and bearings, which may, however, be purchased separately. The crankcase upper and lower halves are available only as a matched set.

REMOVING ENGINE

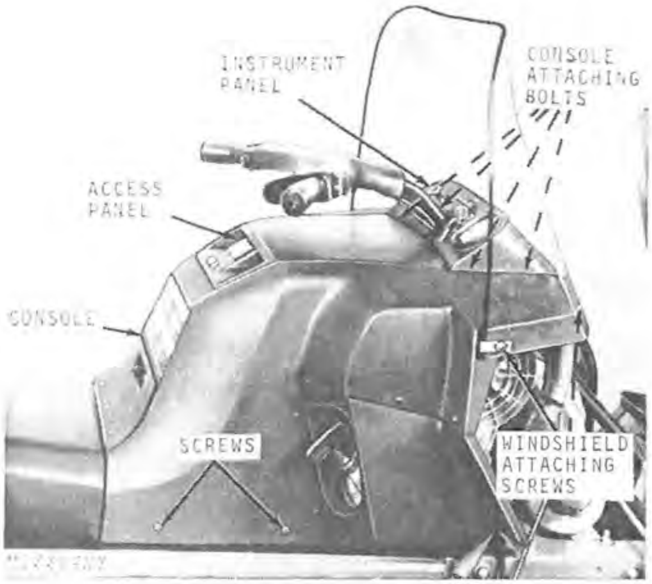


Fig. 2-Removing Console and Windshield

Remove the windshield by removing the six attaching screws, Fig. 2. Remove the access panel from the top of the console. Remove the left-hand access panel.

NOTE: Disconnect fuel lines from primer and wiring from heat gauge if snowmobile is so equipped.

Remove the screws securing the lower console to the tunnel. Loosen the four console attaching bolts, located under the console, on each side of the instrument panel.

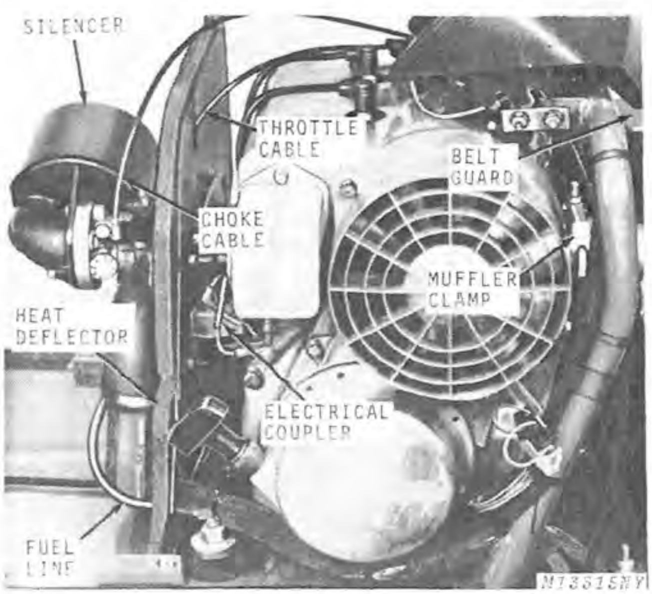


Fig. 3-Disconnecting Engine from Snowmobile

Remove console by lifting it up and sliding it rearward. The instrument panel remains in place and need not be removed.

Disconnect choke and throttle cables, Fig. 3. Remove silencer and air hose. Disconnect fuel lines from the carburetor.

Remove heat deflector and fuel pump (if snowmobile is so equipped). Disconnect electrical coupler from the engine.

Loosen clamp securing muffler to engine. Remove drive belt guard and drive belt.

If snowmobile is equipped with electric starter, remove lead from starter terminal. Disconnect ground strap from engine.

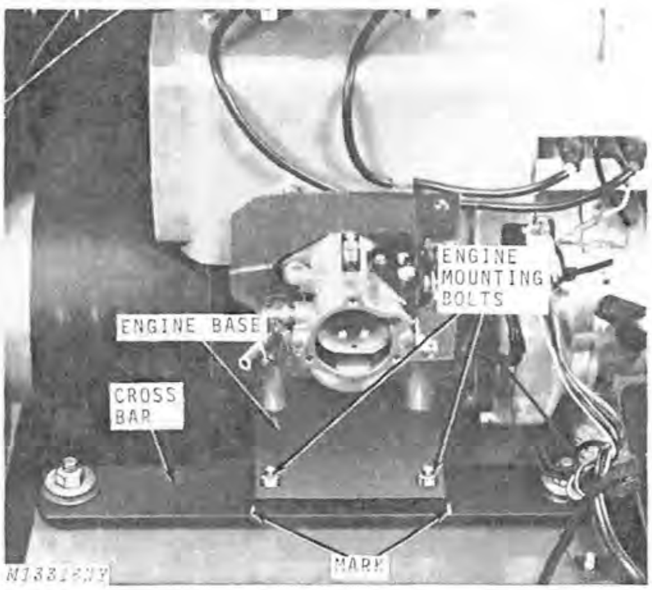


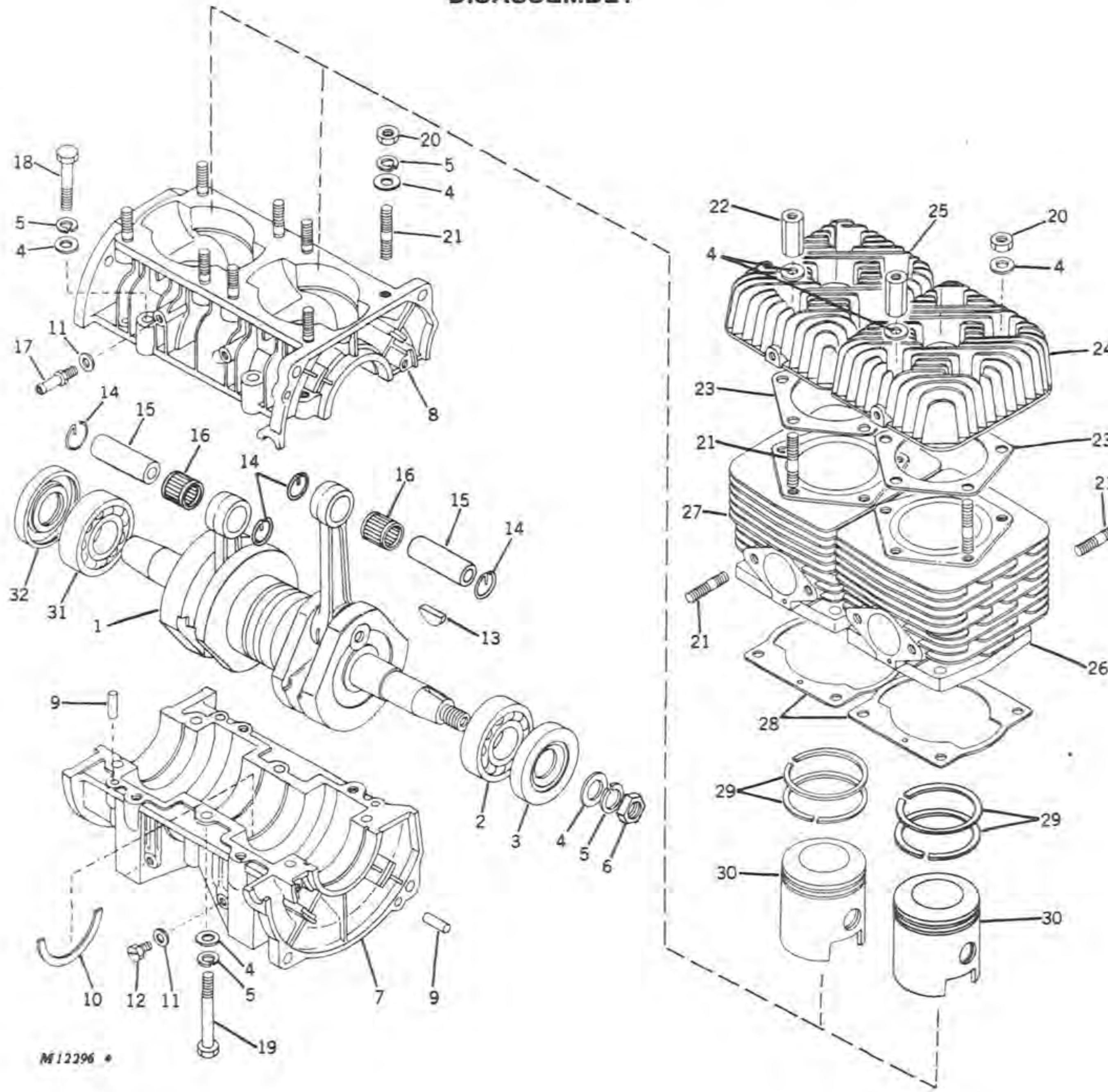
Fig. 4-Marking Engine Mounts

Mark cross bars, Fig. 4, so that drive and driven sheaves will be in correct alignment when engine is installed after repair. Mark both front and rear cross bars.

Disconnect muffler bracket from front of engine base. Remove four bolts securing engine base to cross bars. Lift engine from snowmobile. Remove engine base from engine.

Place engine on a workbench and thoroughly clean exterior surfaces, using cleaning solvent. The bench-mounted service fixture (JDM-16), shown in Figs. 6 and 7, is ideal for servicing snowmobile engines.

DISASSEMBLY



1—Crankshaft Assembly
2—Ball Bearing (Flywheel end)
3—Oil Seal (Flywheel end)
4—Washer
5—Lock Washer
6—Flywheel Nut
7—Lower Crankcase Half
8—Upper Crankcase Half
9—Dowel Pin (4 used)
10—Bearing Retaining Clip (4 used)
11—Gasket
12—Drain Screw
13—Woodruff Key
14—Circlip (4 used)
15—Piston Pin
16—Needle Bearing
17—Impulse Tube Fitting
18—Cap Screw, 8 x 65 mm (4 used)
19—Cap Screw, 8 x 45 mm (6 used)
20—Nut, 8 mm
21—Stud (8 used)
22—Special Nut (2 used)
23—Head Gasket (2 used)
24—Cylinder Head (R.H.)
25—Cylinder Head (L.H.)
26—Cylinder (R.H.)
27—Cylinder (L.H.)
28—Cylinder Base Gasket (2 used)
29—Ring Set
30—Piston
31—Ball Bearing (PTO end) (2 used)
32— Oil Seal (PTO end)

Fig. 5-Exploded View of CCW and Kioritz Piston-Ported Engine

Removing Exterior Components

NOTE: To prevent loss and to speed assembly, keep attaching hardware with each part as it is removed.

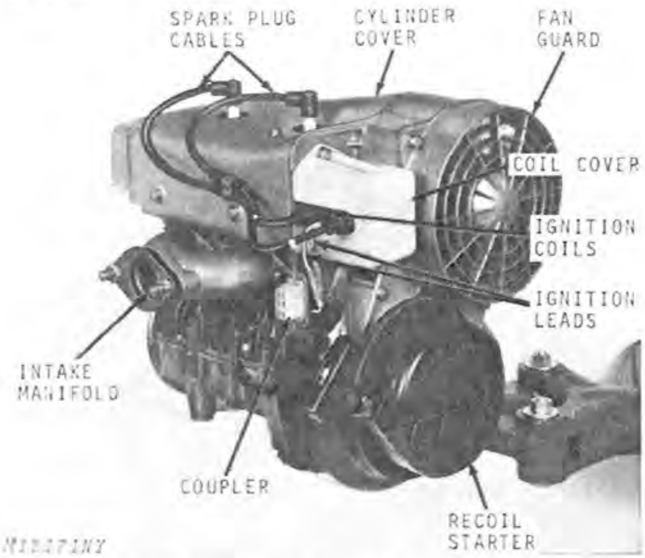


Fig. 6-Removing Exterior Components

Disconnect spark plug cables and remove plugs, Fig. 6. Disconnect the two ignition leads between the ignition coils and the coupler. Remove coil cover and high tension coils with spark plug cables.

Remove the ten bolts securing cylinder cover to engine and remove cover, Fig. 6. Remove intake and exhaust manifolds from engine. Do not remove carburetor from intake manifold unless carburetor service is required. Remove recoil starter and plastic fan guard.

Remove starter motor if engine is so equipped.

Remove drive sheave. See Section 50, Groups 10, 15 or 17 for procedure and special tools required.

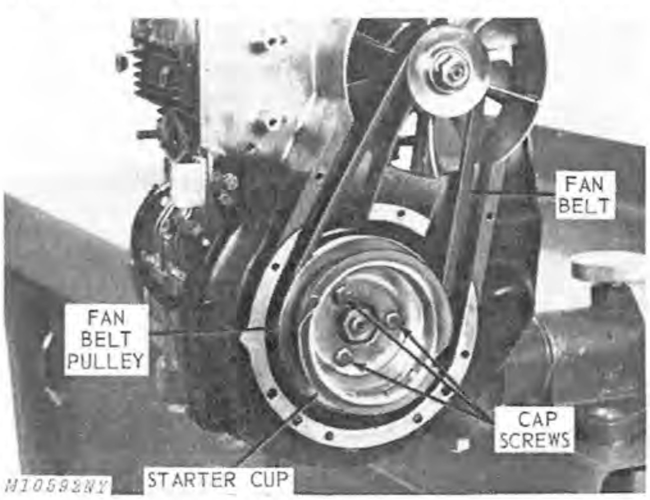


Fig. 7-Removing Starter Cup, Fan Belt and Fan Belt Pulley

Remove the three cap screws securing starter cup and fan belt pulley to flywheel. Remove cup, pulley and window plate (not illustrated) from flywheel and remove fan belt, Fig. 7.

Checking Crankshaft for Twist

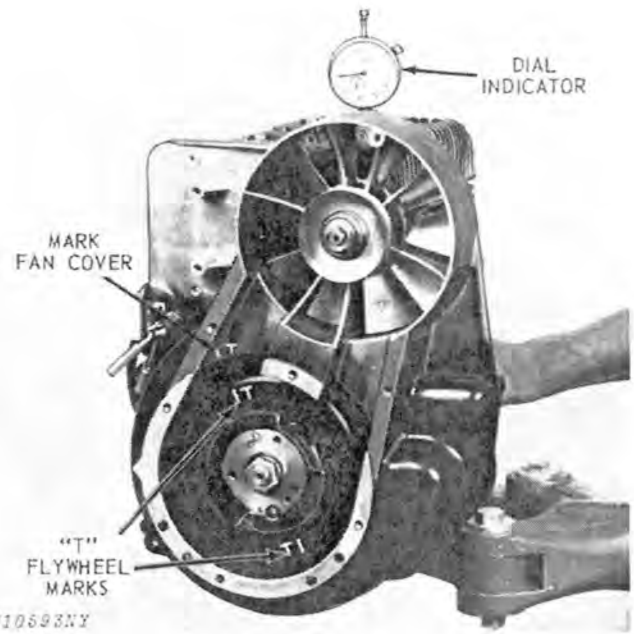


Fig. 8-Checking Crankshaft for Twist

If crankshaft twist between journals is suspected, make the following check prior to further disassembly.

Set up dial indicator on No. 1 piston to determine TDC (Top Dead Center). With piston at TDC, mark fan cover to align with "T" mark on flywheel, Fig. 8.

Move dial indicator to No. 2 piston and rotate flywheel 180 degrees to align other "T" mark on flywheel with mark on fan cover.

With marks aligned, dial indicator should indicate No. 2 piston is at TDC or within 0.003 inch either way of TDC.

The crankshaft assembly must be replaced if crankshaft is twisted.

Removing Flywheel

NOTE: Flywheel and stator removal for the 295RS/2 engine (JD295/S Snowmobile) is covered in Section 40, page 40-13-6.

Removing Flywheel—Continued

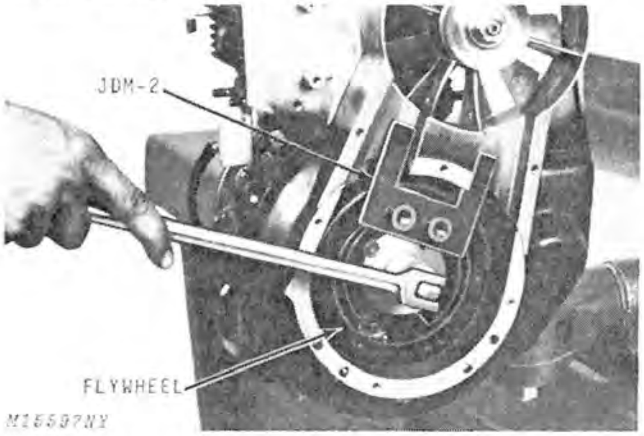


Fig. 9-Removing Flywheel Retaining Nut

Lock flywheel, using tool JDM-2, Fig. 9. Remove retaining nut, lock washer and flat washer securing flywheel to crankshaft.

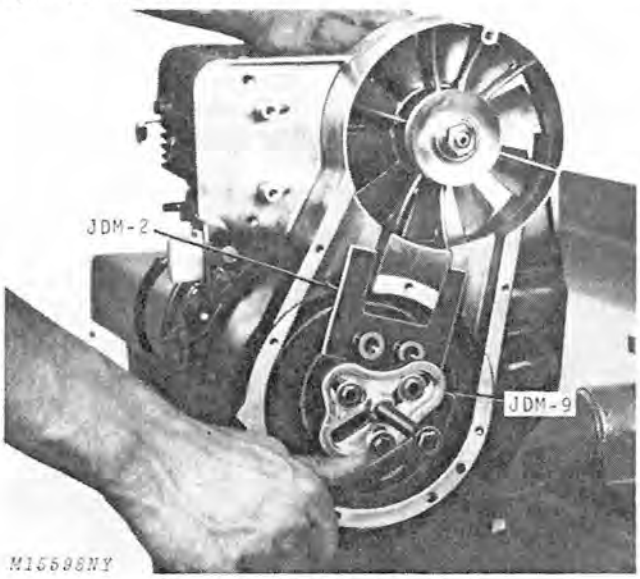


Fig. 10-Breaking Flywheel Loose

Install JDM-9, flywheel puller, Fig. 10, using the three tapped holes in the flywheel. Hold flywheel with JDM-2 tool and tighten puller center bolt to 35 to 40 ft-lbs (47 to 54 Nm).

NOTE: Do not overtorque center bolt of flywheel puller. Do not hammer on end of puller bolt because damage to crankshaft or bearings may result.

If flywheel does not break loose, leave puller in place and remove fan cover assembly.

NOTE: Fan cover must be removed before flywheel can be removed.

With tension on the puller and fan cover removed, strike flywheel with a plastic or wood mallet in line with flywheel keyway.

Removing Fan Cover

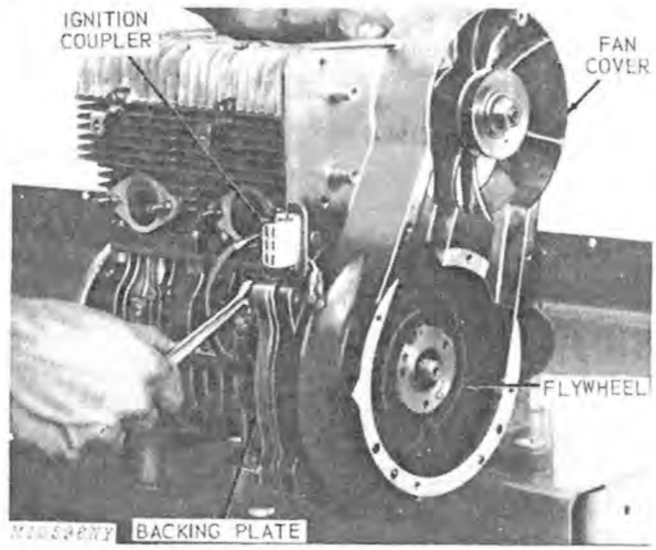


Fig. 11-Removing Fan Cover

Remove the ignition coupler, Fig. 11, from the fan cover and remove the four bolts securing the fan cover to the backing plate.

Remove fan cover and flywheel, Fig. 11.

Removing Stator Assembly

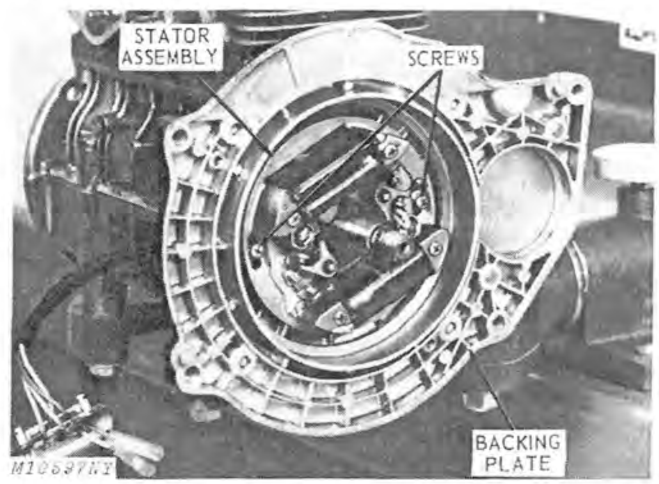


Fig. 12-Removing Stator Assembly

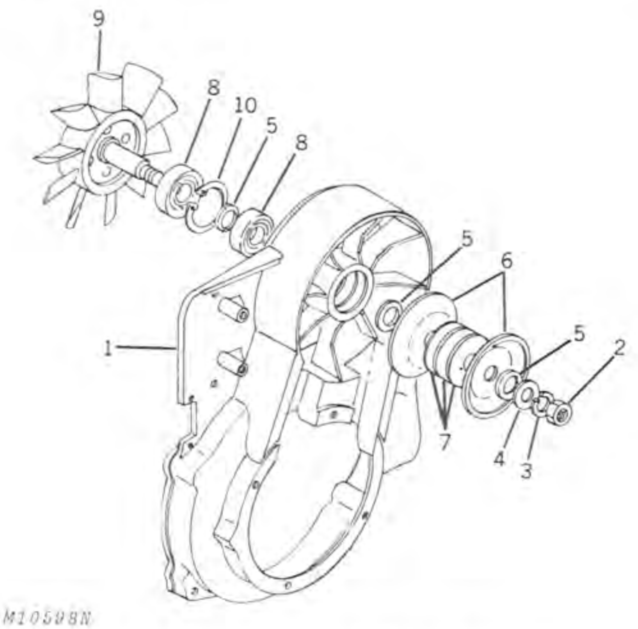
Remove the four bolts securing the backing plate to crankcase halves and remove backing plate, Fig. 12.

Remove the two screws securing stator assembly, Fig. 12, and remove assembly.

NOTE: Store stator assembly inside flywheel to insure retention of magnetic properties.

Disassembling Fan Cover

NOTE: Snowmobile engine cooling fans can be to the inside or outside of the fan cover. Refer to Figs. 13 and 14 as examples of the inside and outside design.



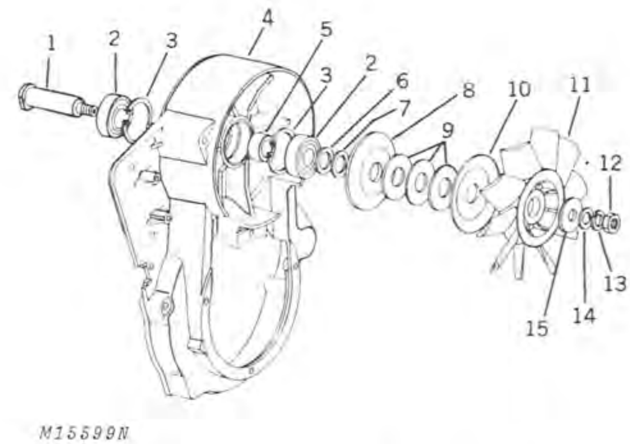
1—Fan Cover
2—Retaining Nut
3—Lock Washer
4—Flat Washer
5—Spacer
6—Pulley Half
7—Belt Adjustment Spacer
8—Ball Bearing
9—Fan Assembly
10—Snap Ring

Fig. 13-Exploded View of Fan Inside Cover

If inspection reveals damaged cooling fan blades or worn fan shaft bearings, further disassembly, is necessary to replace parts.

Remove retaining nut, washers, pulley halves and spacer from fan shaft, Fig. 13. In Fig. 14 the fan must also be removed. Drive fan assembly out of bearings by tapping lightly with a soft mallet. Inner bearing should remain on shaft, and can be pulled off fan shaft. Carefully drive outer bearing out of fan cover with a soft drift.

Replace parts as necessary.



1—Fan Shaft
2—Ball Bearing (2 used)
3—Snap Ring (2 used)
4—Fan Cover
5—Bearing Spacer
6—Back-up Washer (Thick)
7—Back-up Washer (Thin)
8—Driven Pulley (Inner Half)
9—Spacers (3 used)
10—Driven Pulley (Outer Half)
11—Cooling Fan
12—Nut
13—Lock Washer
14—Washer
15—Outer Spacer

Fig. 14-Exploded View of Fan Outside Cover

Removing Cylinder Heads

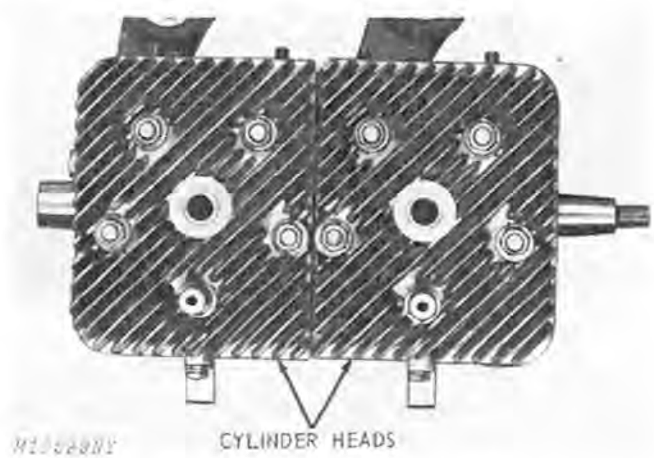


Fig. 15-Removing Cylinder Heads

Remove both cylinder heads, Fig. 15. Discard cylinder head gaskets.

Checking Crankshaft Runout

Before proceding further with engine disassembly make the following check to determine crankshaft condition.

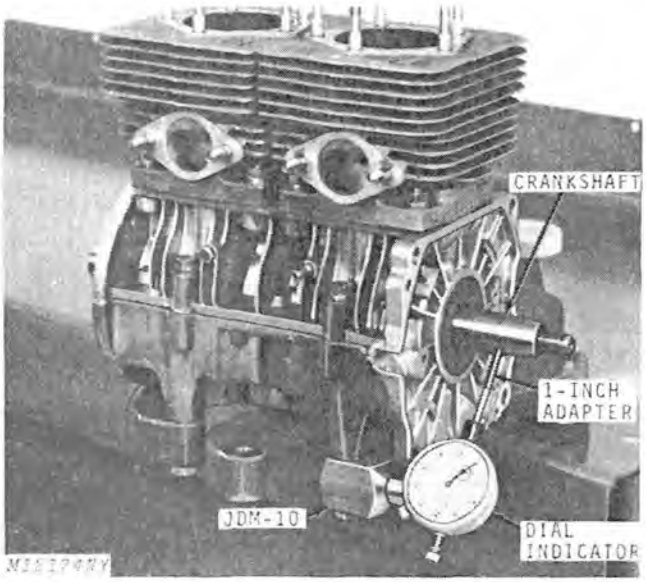


Fig. 16-Checking for Bent Crankshaft

Set up a dial indicator against crankshaft at the junction of the tapered and parallel sections of shaft, Fig. 16. Use the JDM-10 dial indicator mounting bracket, Fig. 16.

Rotate crankshaft. Maximum permissible runout is 0.0035 inch (0.0889 mm). Replace crankshaft assembly if not within limits. Check both ends of crankshaft.

Removing Cylinders

Remove the four nuts, lock washers and washers securing each cylinder.

Remove cylinders, sliding them up over pistons, Fig. 17. Discard cylinder base gaskets.

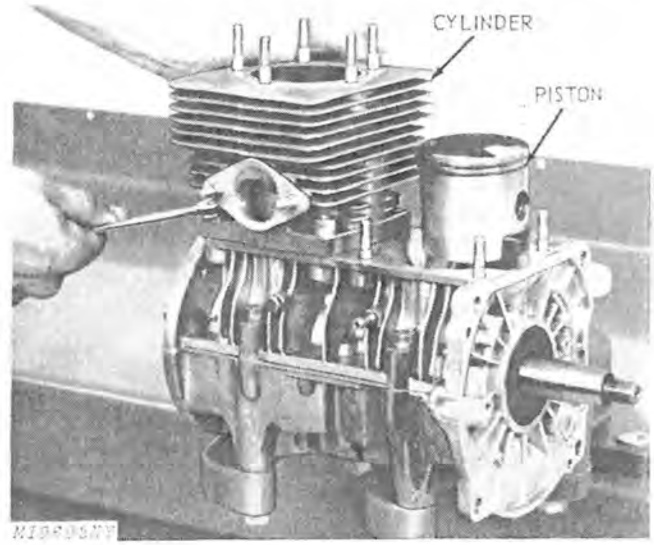


Fig. 17-Removing Cylinders

Removing Piston Rings

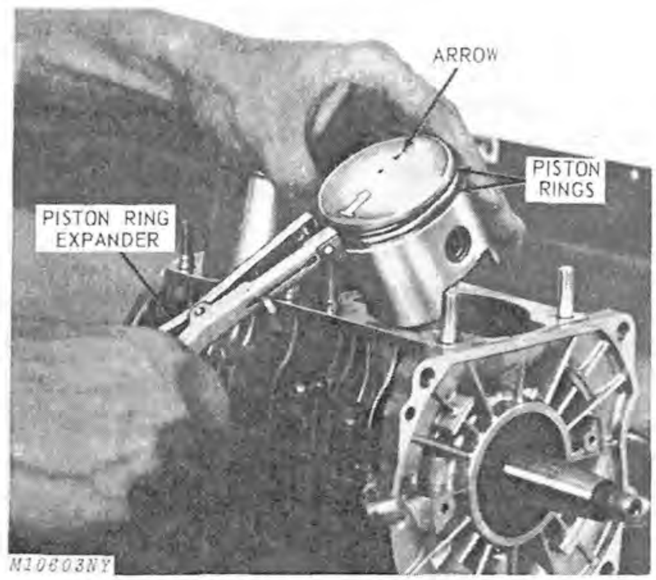


Fig. 18-Removing Piston Rings

Remove piston rings from pistons using a ring expander tool, Fig. 18.

Note arrow, Fig. 18, directed toward front or exhaust port side of engine. If no arrow is legible, inscribe pistons accordingly.

NOTE: Rings can be left on pistons to protect ring grooves until you are ready to install new rings.

Removing Pistons

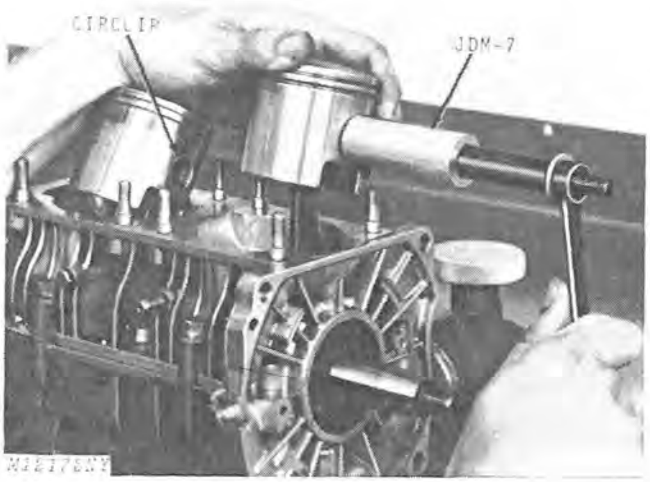


Fig. 19-Removing Pistons

Mark piston domes (1) and (2) so each piston is installed in its respective cylinder upon assembly.

Remove two circlips, Fig. 19, from each end of piston pin.

Install JDM-7 piston pin tool, Fig. 19, and pull piston pin out of each piston. Remove needle bearings from connecting rods.

Removing Crankshaft

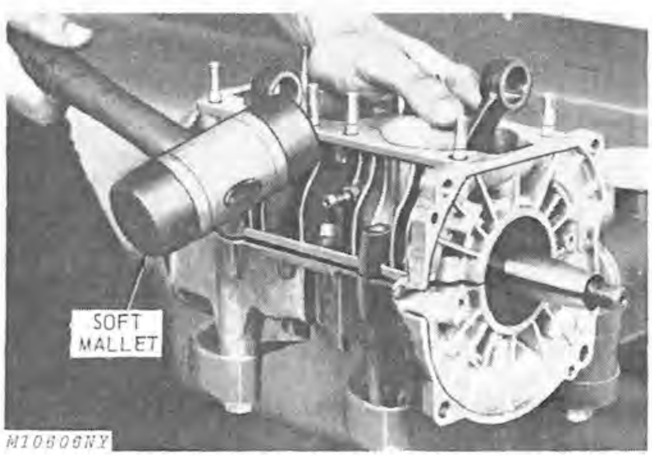


Fig. 20-Splitting Crankcase Halves

Remove the cap screws securing the crankcase halves together. Separate halves by tapping the upper crankcase half lightly with a soft mallet, Fig. 20.

IMPORTANT: Do not pry crankcase halves apart with a screwdriver. This will damage crankcase sealing surface.

Lift crankshaft from lower crankcase half and remove four bearing retaining clips (10, Fig. 5).

Removing Crankshaft Outer Bearings

If outer seals and bearings are defective, replace them.

Remove Woodruff key from flywheel end of crankshaft and slide seals off crankshaft.

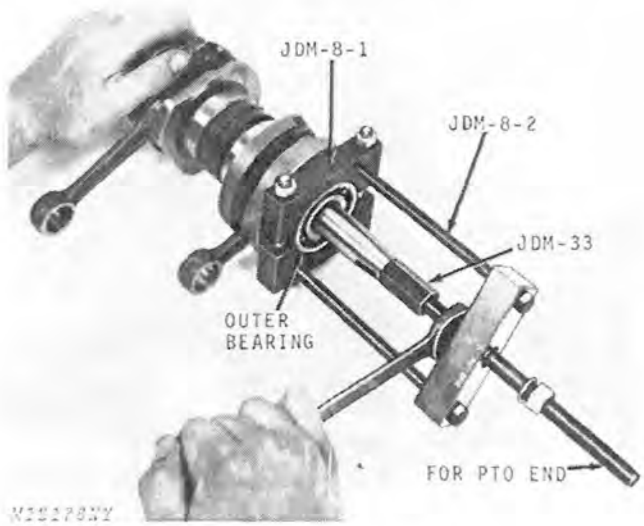


Fig. 21-Removing Crankshaft Outer Bearings

Remove outer bearings, Fig. 21, using crankshaft bearing tools, as shown.

Thread other end of puller onto PTO end of crankshaft to remove PTO end bearings.

INSPECTION

Prior to inspection, clean all parts except crankshaft assembly and ignition parts in a suitable cleaning solvent.

For analysis and inspection of parts refer to Group 10 of this section.

ASSEMBLY

Installing Outer Crankshaft Bearings and Seals

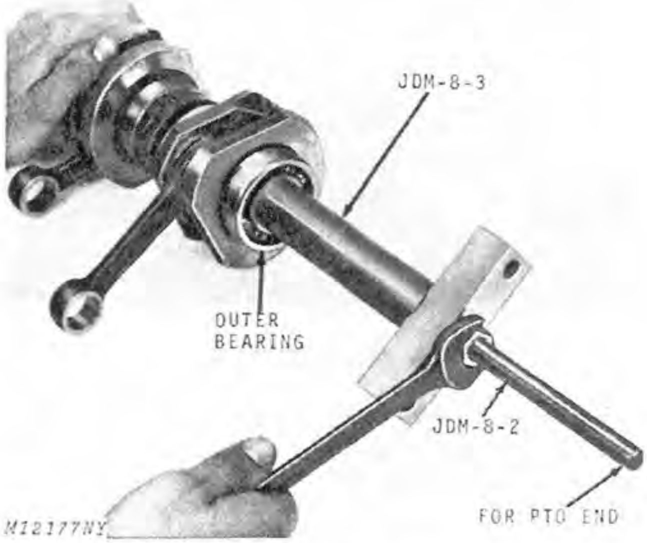


Fig. 22-Installing Outer Crankshaft Bearing

Apply a light film of 2-cycle engine oil to crankshaft and inner race of ball bearing.

Press bearings onto crankshaft, as shown, Fig. 22, until bearing is firmly seated against counterweight. Be sure that bearing is started true and not cocked on shaft.

Thread other end of crankshaft bearing tool into PTO end of crankshaft for installing PTO end bearings.

NOTE: CCW and Kioritz Piston-Ported Engines use two ball bearings on PTO end of crankshaft.

IMPORTANT: Cover keyway on flywheel end of crankshaft with tape to prevent damage to new seal.

Lubricate and install seals, lip inward, on each end of crankshaft.

Installing Crankshaft

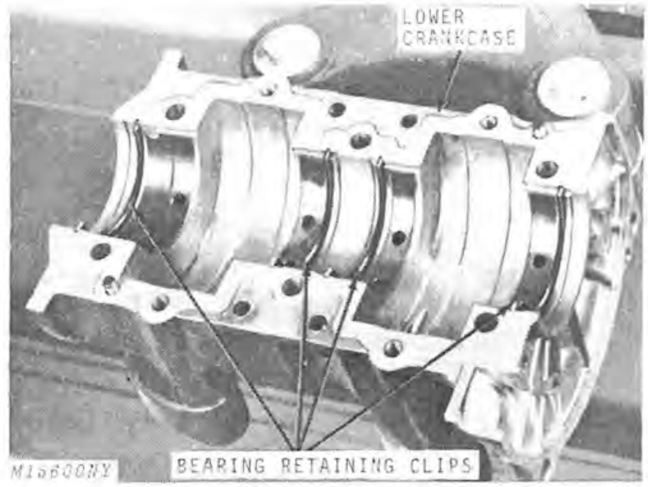


Fig. 23-Installing Bearing Retaining Clips

Insert the four bearing retaining clips into crankcase lower half as shown, Fig. 23.

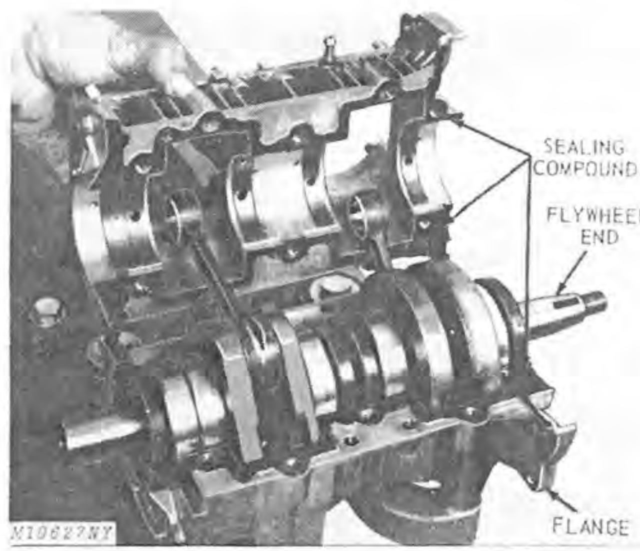


Fig. 24-Installing Crankshaft

Install crankshaft assembly into lower crankcase half, Fig. 24, being certain bearing retaining clips do not become dislodged. Position seals tightly against clips. Flywheel end of crankshaft must be on same end as flanged end of crankcase.

Liberally coat crankshaft and bearings with 2-cycle engine oil.

IMPORTANT: Apply M64850 Silicone Rubber Adhesive evenly to mating surfaces of both crankcase halves, Fig. 24.

Install upper crankcase half, being certain seals are not cocked.

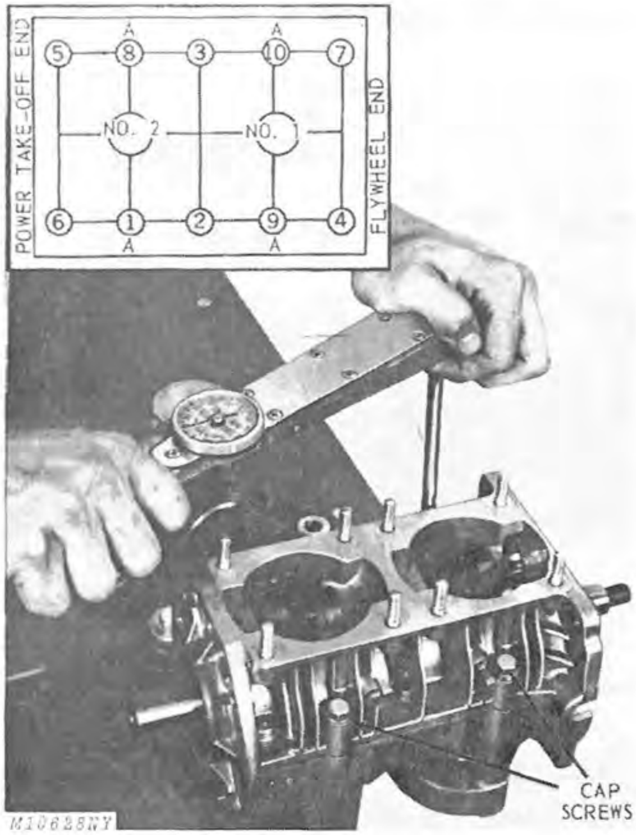


Fig. 25-Torquing Crankcase Cap Screws

Install cap screws, washers, and lock washers and torque evenly in sequence shown (see inset, Fig. 25) to 15 to 18 ft-lbs, (20 to 24 Nm). The letter "A" signifies the upper four cap screws.

Installing Pistons

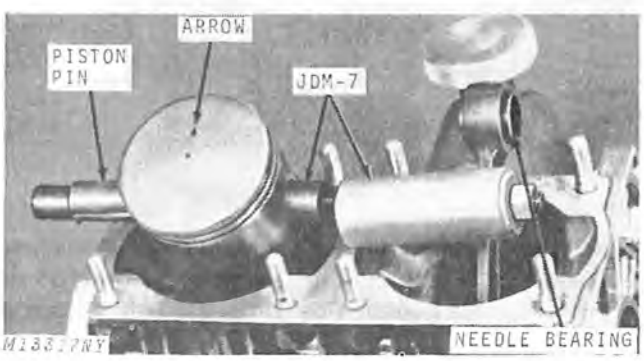


Fig. 26-Installing Piston Pin

Lubricate piston pin needle bearings with 2-cycle engine oil and install into connecting rods, Fig. 26. Install piston over connecting rod.

IMPORTANT: Arrows on piston crowns must point forward or toward exhaust side of engine.

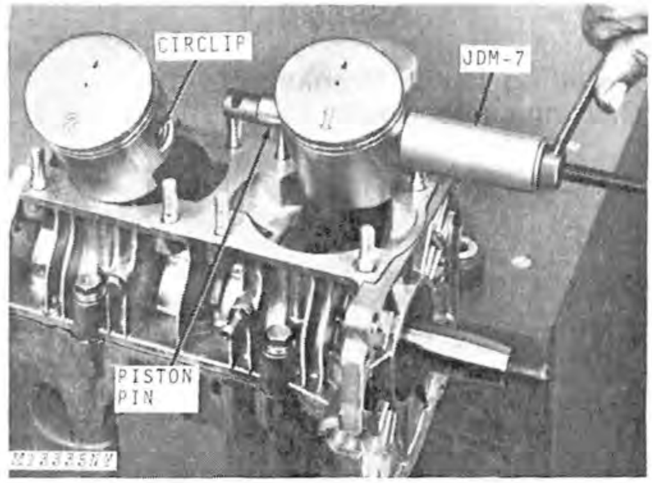


Fig. 27-Installing Pistons

Assemble piston pin tool as shown, Fig. 26, using line-up spacer to properly position parts. Pull piston pin into position, Fig. 27.

Install four new piston pin retaining circlips, Fig. 27. Be certain clips have adequate tension in grooves so they cannot slip out while engine is operating.

Installing Piston Rings

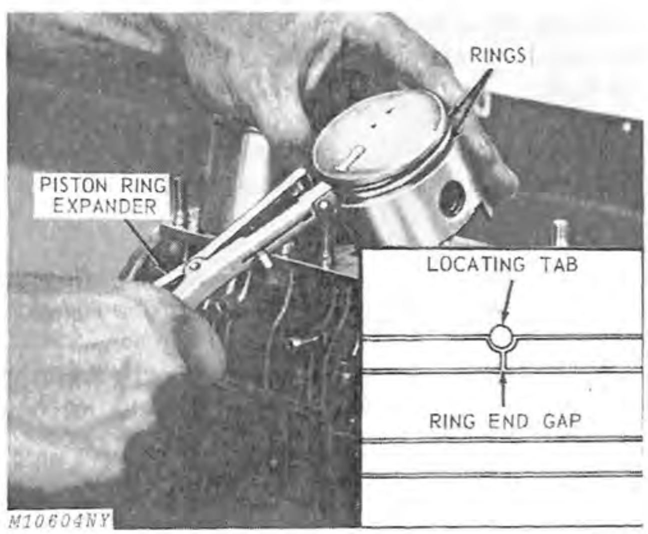


Fig. 28-Installing Piston Rings

Install piston rings using ring expander tool as shown, Fig. 28. Note locating tabs for ring end gaps in inset, Fig. 28. Rings cannot be installed upside down or ends will not position properly around locating tabs. If using your fingers to install rings, spread rings with your thumbs.

IMPORTANT: Install chrome ring or keystone ring in top groove of the piston. Refer to Fig. 29 for the proper installation of the keystone ring.

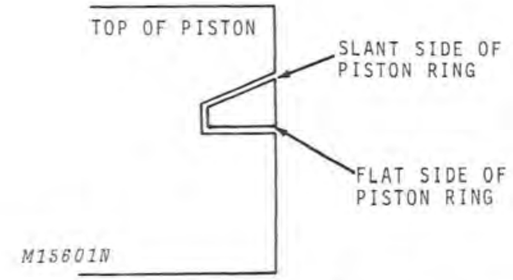


Fig. 29-Proper Installation of Keystone Ring

Installing Cylinders

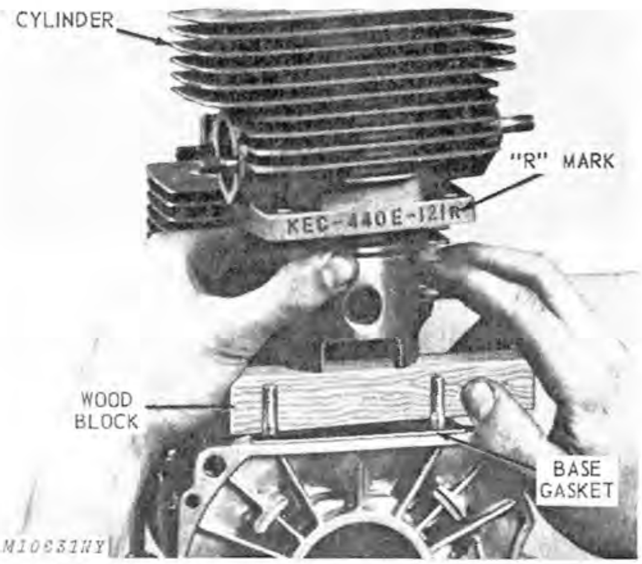


Fig. 30-Installing Cylinder Over Piston

Install new base gaskets, Fig. 30, over cylinder hold-down studs. Lubricate pistons, rings, and cylinder bores with 2-cycle snowmobile engine oil.

Place a suitable wood block under piston, Fig. 30, for support.

Cylinder base flanges are stamped "L" and "R." Install "R" cylinder on flywheel end of engine, Fig. 30, and "L" cylinder on PTO end.

Compress rings with fingers, Fig. 30, or suitable ring compressor, and slide cylinder down over piston.

IMPORTANT: Be certain ring end gaps are positioned around locating tabs as shown in inset, Fig. 28.

Install washers, lock washers and nuts on eight studs. **Do not** tighten. Install intake manifold and tighten nuts securing intake manifold to cylinders, Fig. 31.

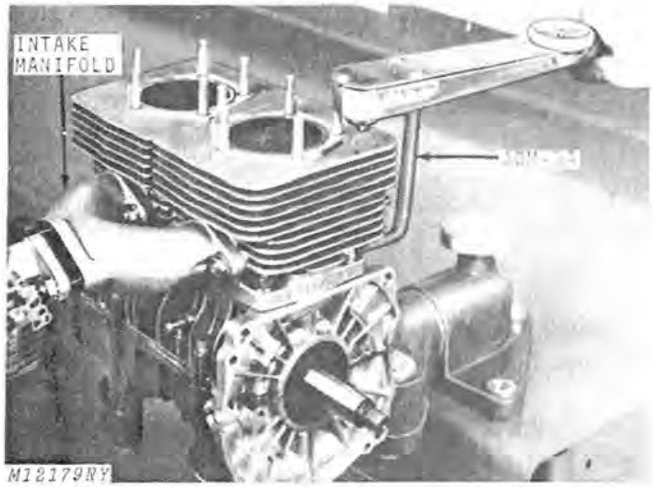


Fig. 31-Torquing Cylinders to Crankcase

Torque six cylinder nuts to 15 to 18 ft-lbs (20 to 24 Nm), using the JDM-5A cylinder nut wrench, Fig. 31. Remove the intake manifold to provide access and torque the remaining two nuts.

IMPORTANT: Intake manifold must be in place before tightening the six cylinder nuts to properly align cylinders. Misalignment will cause air leakage and severe engine damage will result.

Installing Cylinder Heads

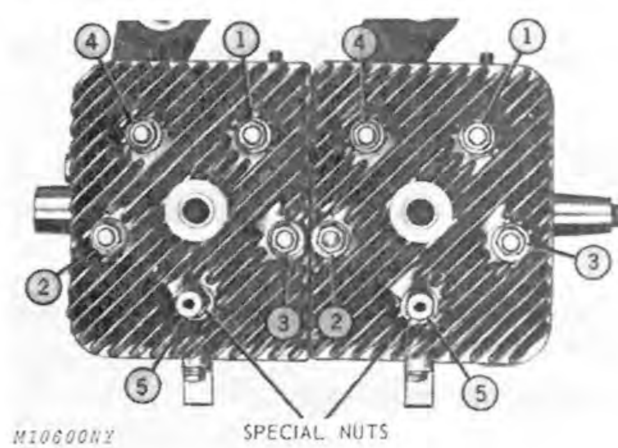


Fig. 32-Installing Cylinder Heads

Install new cylinder head gaskets on cylinder. "TOP" is stamped on top side of gasket.

NOTE: Install head gaskets dry. Do not use Permatex or other sealant on gaskets.

Install cylinder heads, washers, and retaining nuts and torque to 15 to 18 ft-lbs (20 to 24 Nm) following sequence shown in Fig. 32. Note location of two special nuts, Fig. 32.

Installing Stator Assembly

NOTE: Refer to Section 40, page 40-13-6 for the proper procedure of installing the stator on the 295RS/2 engine used in the JD295/S Snowmobile.

Install stator assembly and secure with two retaining screws, Fig. 33. Install wires and rubber grommet in recess provided in crankcase flange.

Install new breaker points and condensers if necessary. See Section 40, Group 10.

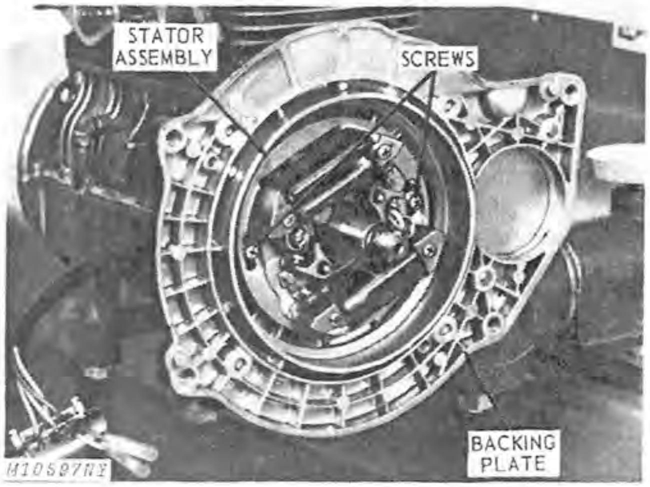


Fig. 33-Installing Stator Assembly

Install backing plate, Fig. 33, to crankcase with four cap screws.

Install Woodruff key in crankshaft and install flywheel, washer, lock washer, and retaining nut. Install fan cover before tightening nut, so JDM-2 flywheel holding tool can be used, Fig. 34.

See Section 40, Group 10 for flywheel centrifugal advance mechanism repair.

Assembling Fan Cover

Assemble fan as shown in Figs. 13 and 14 on page 20-15-6 if previously disassembled.

Torque retaining nut to 28 to 31 ft-lbs (38 to 42 Nm). Attach fan cover to backing plate with four cap screws, and attach ignition coupler to fan cover.

Tightening Flywheel Nut

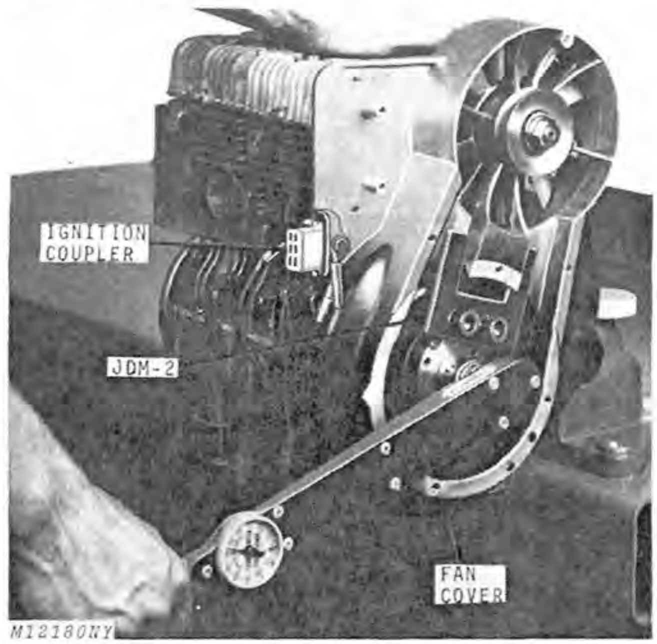


Fig. 34-Tightening Flywheel Nut

Lock flywheel to crankshaft using JDM-2 tool, Fig. 34. Tighten flywheel retaining nut to 45 to 50 ft-lbs torque (61 to 67 Nm).

Timing Ignition

Before proceeding with engine assembly, adjust breaker points and time ignition. Refer to Section 40, Group 10.

Adjusting Fan Belt Tension

Install fan belt, window plate, fan belt pulley, and recoil starter cup and secure with three cap screws, Fig. 35.

Check fan belt tension as shown, Fig. 35. If belt can be deflected by hand more than 3/8-inch (9 mm) remove retaining nut on fan shaft and remove outer pulley half.

Remove one of the large spacers from between pulley halves and place it outside outer pulley half. Reassemble and torque retaining nut to 28 to 31 ft-lbs (37 to 42 Nm).

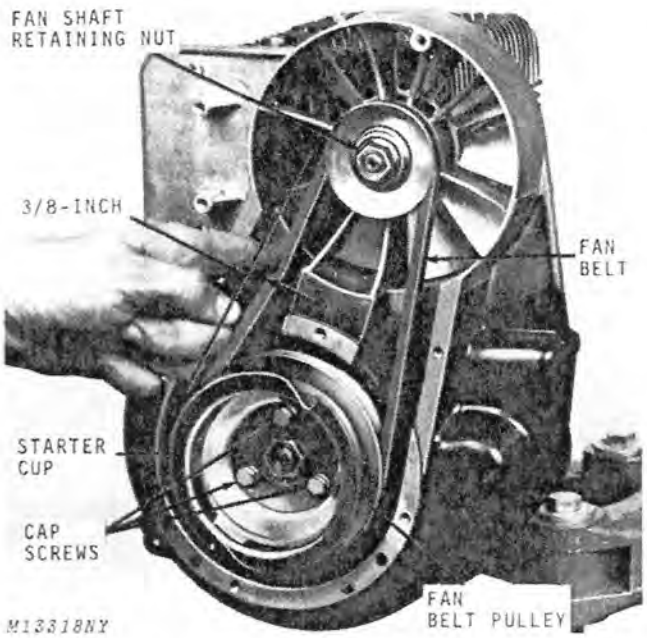


Fig. 35-Checking Fan Belt Tension

Recheck fan belt tension. If necessary, remove additional washers to obtain correct belt tension.

Installing Exterior Components

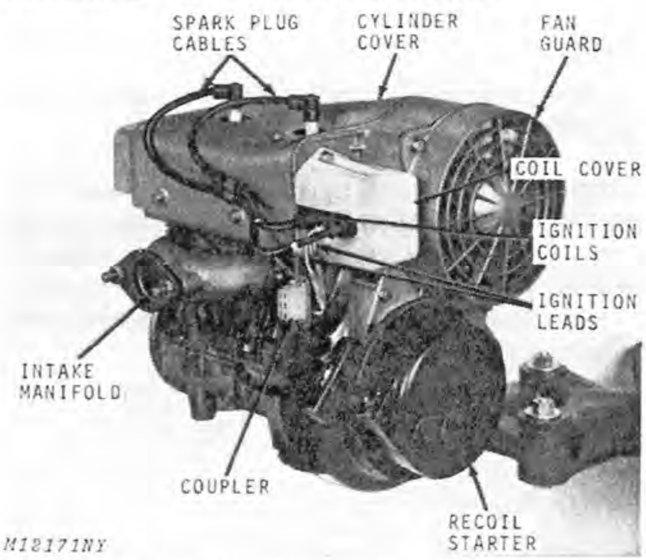


Fig. 36-Installing Exterior Components

Install intake and exhaust manifolds on engine using new gaskets. Use M64850 Silicone Rubber Adhesive on the exhaust manifold gaskets. Torque outer two nuts to 10 to 12 ft-lbs (13 to 16 Nm). Tighten inner two nuts securely. Connect impulse tube to crankcase fitting. All nuts can be torqued on 1974 engines.

Install plastic fan guard, recoil starter and cylinder cover on engine, Fig. 36. See Group 30 of this section for recoil starter repair.

Install spark plugs of proper heat range and connect spark plug cables, Fig. 36. See spark plug chart, Section 10, Group 15. Spark plug cables are coded No. 1 and No. 2. The No. 1 cylinder is nearest fan cover.

Attach engine base to lower crankcase half. Install starter motor if engine is so equipped.

Install drive sheave. See Section 50, Groups 10, 15 or 17 for procedure.

INSTALLING ENGINE

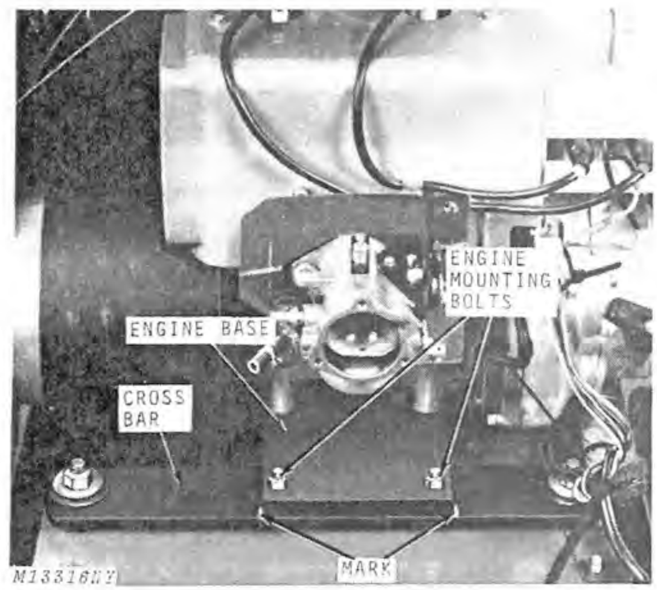


Fig. 37-Installing Engine in Snowmobile

Install and bolt engine in place using marks made prior to engine removal as a guide, Fig. 37. Refer to Section 50, Group 25 for sheave alignment specifications and procedure.

Connect muffler bracket to engine base and muffler to engine. Install drive belt and belt guard.

If snowmobile is equipped with electric start, connect cable to starter and ground strap to engine.

Install heat deflector and fuel pump (if snowmobile is so equipped). Connect electrical coupler to the engine.

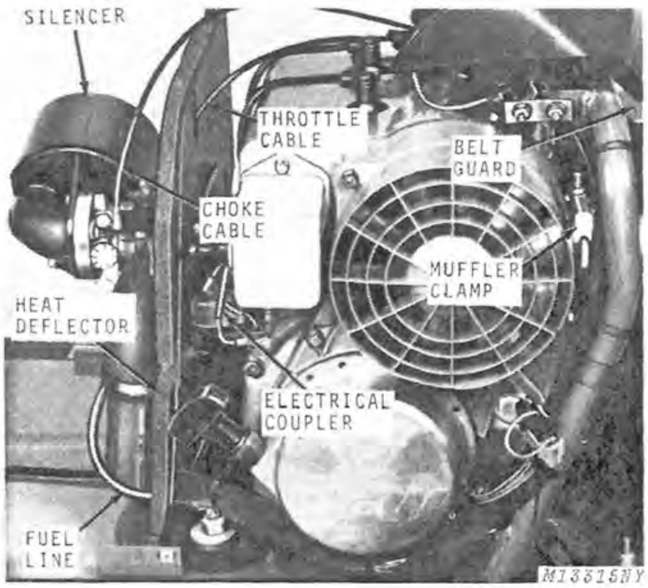


Fig. 38-Making Connections to Engine

Connect fuel lines, choke and throttle cables, and install silencer and air hose, Fig. 38.

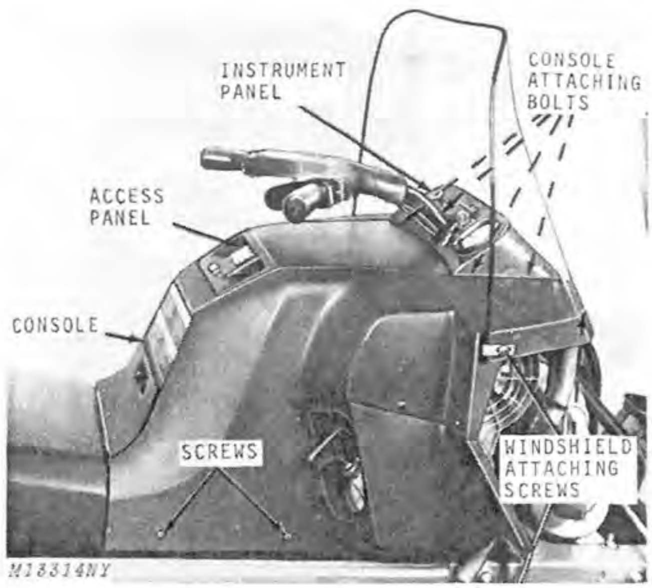


Fig. 39-Installing Console and Windshield

Slide console down and forward into position, Fig. 39. Install screws at lower side positions and tighten the console attaching bolts on each side of the instrument panel.

Install heat gauge and primer if snowmobile is so equipped.

Install top access panel, left-hand access panel and windshield.

IMPORTANT: A 5 to 10 percent power loss may be expected on a newly overhauled engine until it has been subjected to a suitable run-in period. Carefully run the engine at varying speeds for the first 2 hours or 25 miles of operation.

Group 20
CCW AND KIORITZ REED VALVE ENGINE OVERHAUL

GENERAL INFORMATION

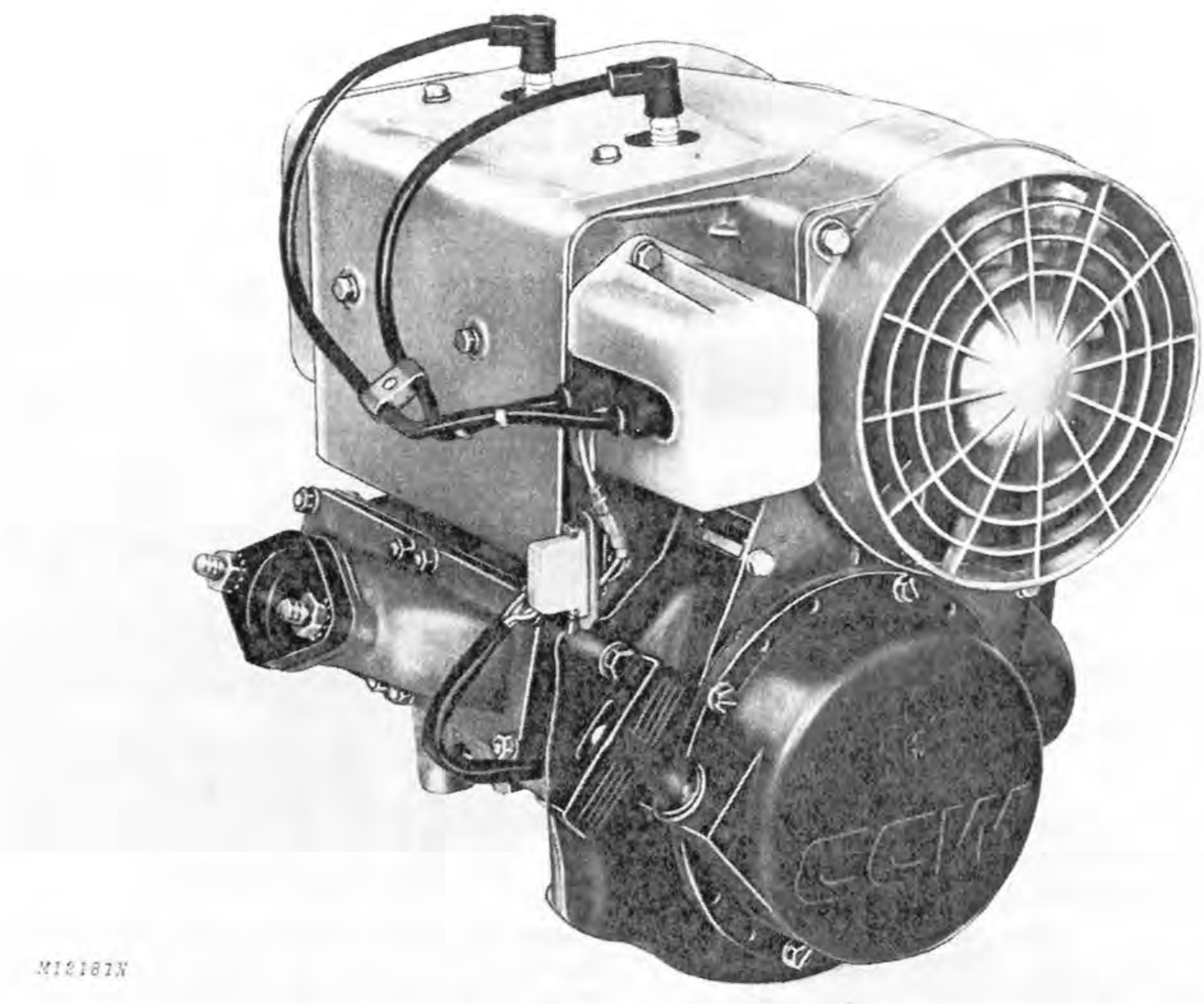


Fig. 1-CCW Reed Valve Engine

CCW (Canadian Curtiss-Wright) and Kioritz reed valve engines, Fig. 1, have five ball bearings; two between crank-throws, one on the flywheel end, and two on the PTO end of the crankshaft. Needle bearings are used at both crankpin and piston pin locations.

The crankshaft, inner ball bearings and seals, connecting rods and crankpin bearings are available only as a complete assembly. If any of these parts are worn or damaged an entire crankshaft assembly must be installed. The complete assembly also includes outer seals and bearings which may, however, be purchased separately. The crankcase upper and lower halves are available only as a matched set.

Oversize pistons are not available for service.

The reed valve engine has metric handware. Always use proper tools when servicing the engine.

See Group 5 for "Principle of Operation".

REMOVING ENGINE

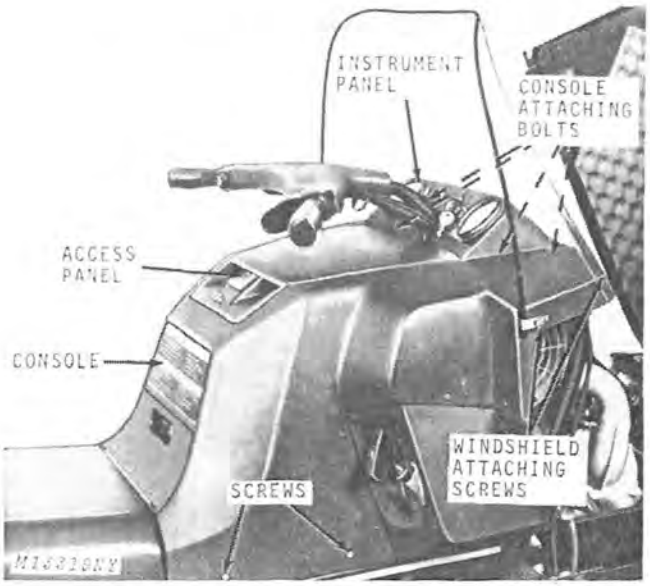


Fig. 2-Removing Console and Windshield

Remove the windshield by removing the six attaching screws, Fig. 2. Remove the access panel from the top of the console. Remove the left-hand access panel.

Remove the three screws securing the lower console to the tunnel. Loosen the four console attaching bolts, located under the console, on each side of the instrument panel.

Remove console by lifting it up and sliding it rearward. The instrument panel remains in place and need not be removed.

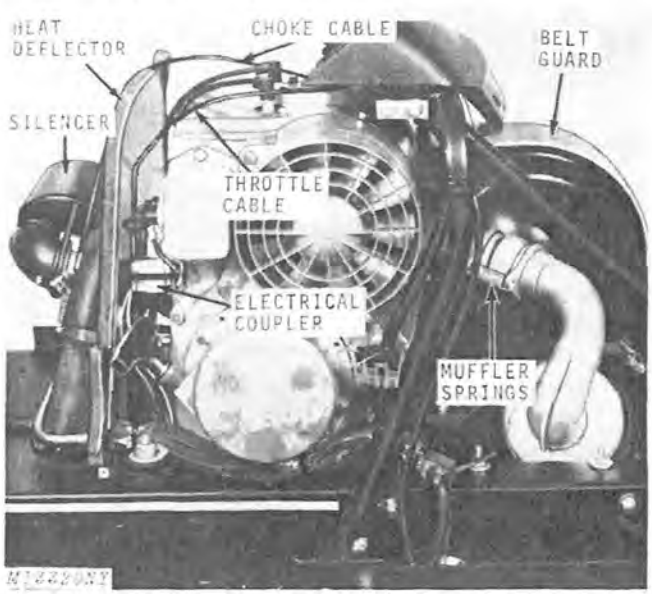


Fig. 3-Disconnecting Engine from Snowmobile

Disconnect choke and throttle cables, Fig. 3. Remove silencer and air hose. Disconnect fuel lines from the carburetor.

Remove heat deflector. Disconnect electrical coupler from the engine.

Remove muffler springs. Remove drive belt guard and drive belt.

If snowmobile is equipped with electric starter, remove lead from starter terminal. Disconnect ground strap from engine.

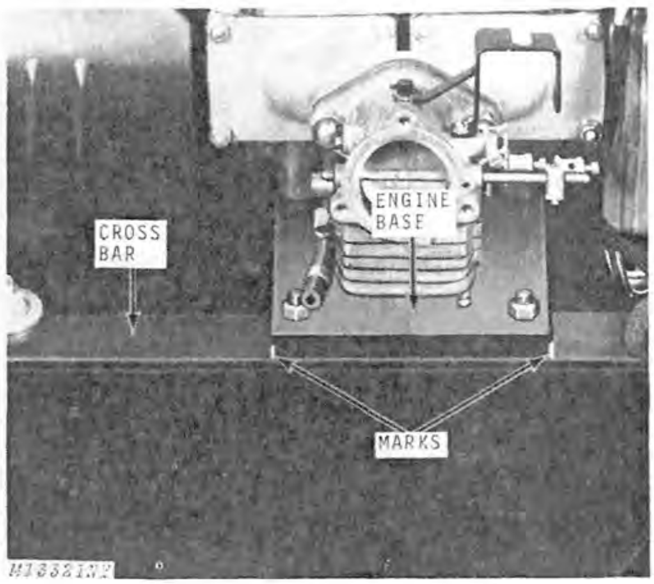


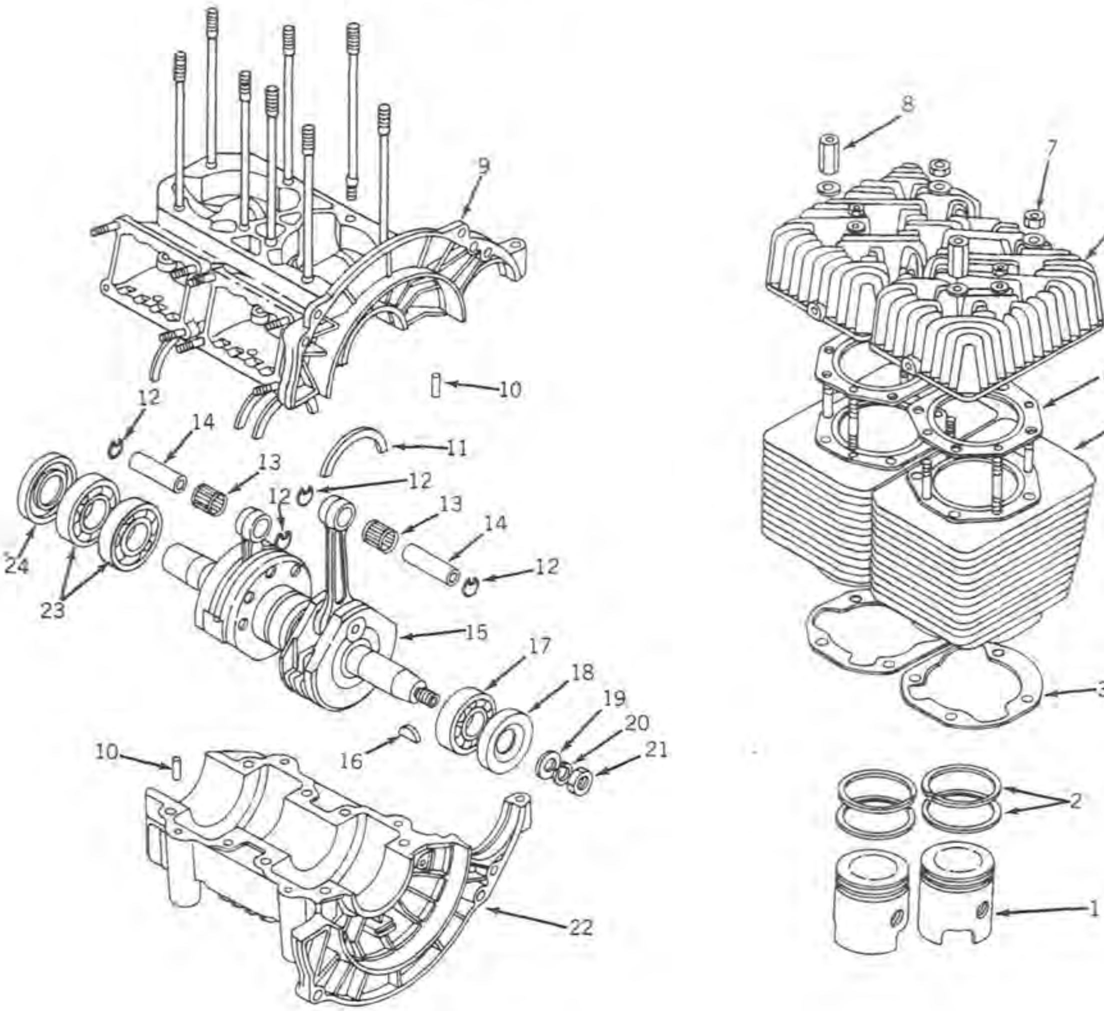
Fig. 4-Marking Engine Mounts

Mark cross bars, Fig. 4, so that drive and driven sheaves will be in correct alignment when engine is installed after repair. Mark both front and rear cross bars.

Disconnect muffler bracket from engine base. Remove four bolts securing engine base to cross bars. Lift engine from snowmobile. Remove engine base from engine.

Place engine on a workbench and thoroughly clean exterior surfaces using cleaning solvent. The bench mounted service fixture (JDM-16), shown in Figs. 6 and 7, is ideal for servicing snowmobile engines.

DISASSEMBLY



1—Piston
2—Rings
3—Cylinder Base Gasket
4—Cylinder
5—Head Gasket
6—Cylinder Head
7—Nut
8—Special Long Nut
9—Upper Crankcase Half
10—Dowel
11—Bearing Retaining Clip
12—Circlip
13—Connecting Rod Needle Bearings
14—Piston Pin
15—Crankshaft Assembly
16—Woodruff Key
17—Crankshaft Bearing (fan end)
18—Oil Seal (fan end)
19—Washer
20—Lock Washer
21—Nut
22—Lower Crankcase Half
23—Crankshaft Bearing (PTO end)
24—Oil Seal (PTO end)

Fig. 5-Exploded View of CCW Reed Valve Engine

Removing Exterior Components

NOTE: To prevent loss and to aid in assembly, keep attaching hardware with each part as it is removed.

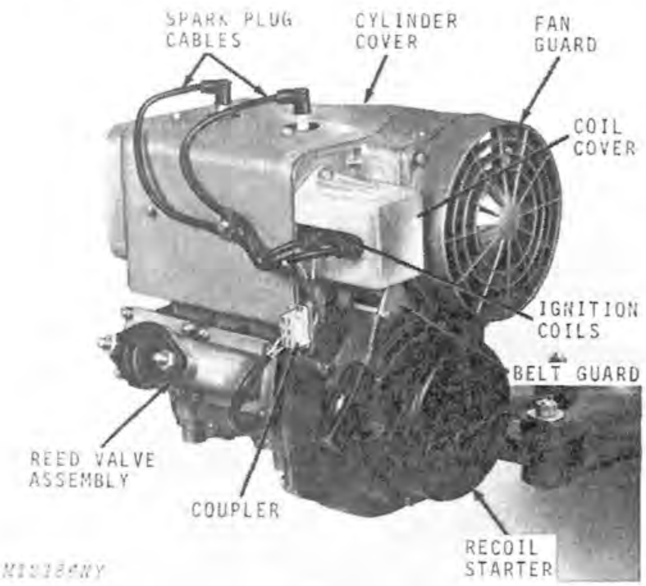


Fig. 6-Removing Exterior Components

Disconnect spark plug cables and remove plugs, Fig. 6. Disconnect the two ignition leads between the ignition coil and coupler. Remove coil cover and high tension coils with spark plug cables.

Remove the bolts securing cylinder cover to engine and remove cover, Fig. 6. Remove exhaust manifolds. Remove starter motor, if so equipped.

Remove recoil starter assembly, starter cup, belt sheave and window plate from flywheel.

Remove drive sheave. See Section 50, Groups 15 or 17 for procedure and special tools required.

Removing Flywheel

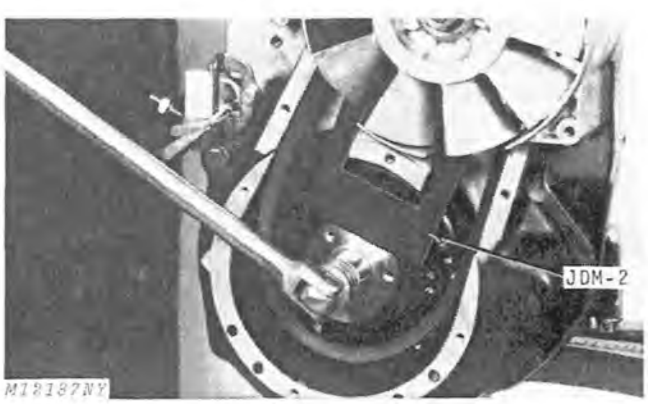


Fig. 7-JDM-2 Flywheel Holding Tool

Install JDM-2 flywheel holding tool, Fig. 7. Remove retaining nut, lock washer and flat washer securing flywheel to crankshaft.

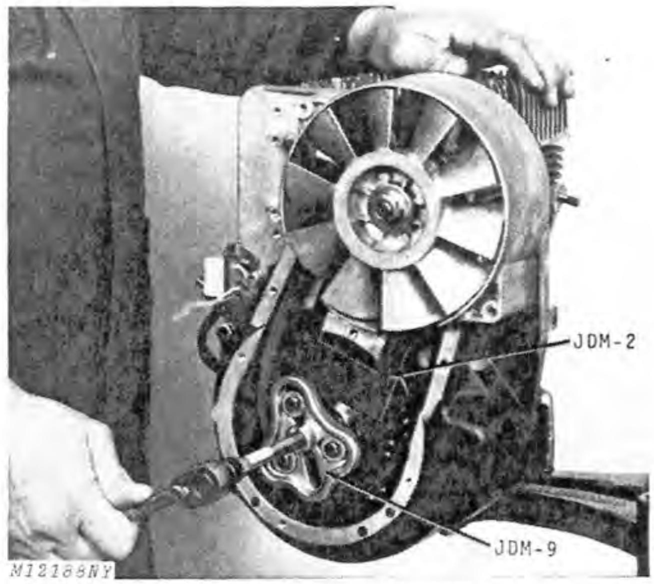


Fig. 8-Removing Flywheel

Install JDM-9, flywheel puller, Fig. 8, using the three tapped holes in the flywheel. Hold flywheel with JDM-2 tool and tighten puller center bolt to 35 to 40 ft-lbs (47 to 54 Nm).

NOTE: Do not overtorque center bolt of flywheel puller. Do not hammer on end of puller bolt because damage to crankshaft or bearings may result.

If flywheel does not break loose, leave puller in place and remove fan cover assembly.

NOTE: Fan cover must be removed before flywheel can be removed.

With tension on the puller and fan cover removed, strike flywheel with a plastic or wood mallet in line with flywheel keyway.

Removing Cylinder Heads

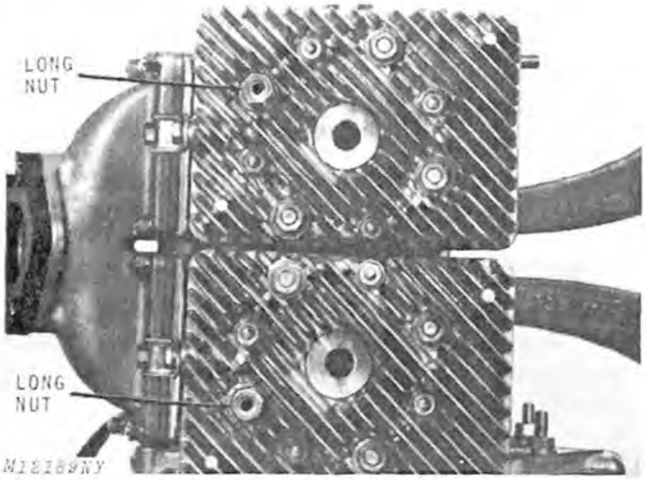


Fig. 9-Removing Cylinder Heads

Remove eight cylinder head retaining nuts, Fig. 9. Remove cylinder heads and discard gaskets.

Checking Crankshaft Runout

Before proceeding further with engine disassembly, check crankshaft runout.

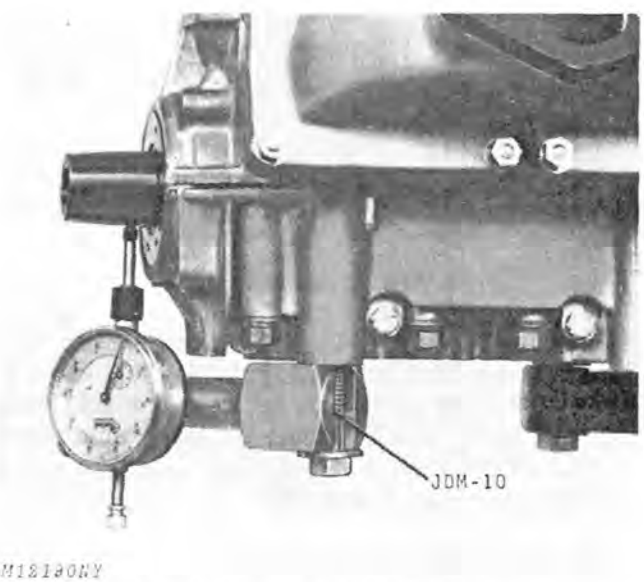


Fig. 10-Checking Crankshaft Runout

Install a dial indicator against the crankshaft at the junction of the tapered and parallel sections of the shaft, Fig. 10. Rotate crankshaft and check runout Maximum permissible runout is 0.0035-inch (0.0889 mm). If not within limits, replace crankshaft assembly.

Lift cylinders off studs and discard cylinder base gaskets.

Removing Pistons

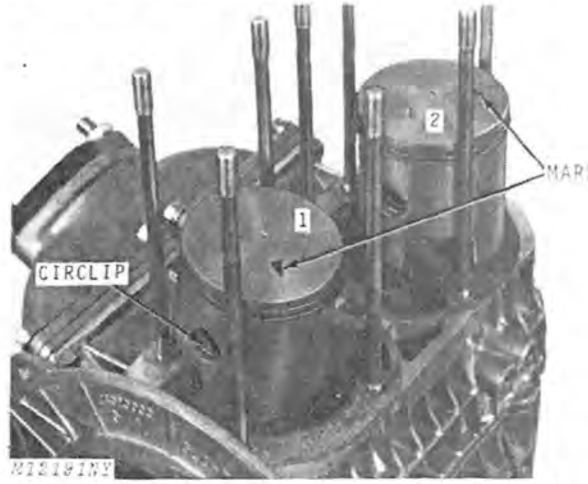


Fig. 11-Mark on Piston Crown Exhaust Port Side

Before removing pistons, be sure piston crowns are marked on the exhaust port side, Fig. 11. If no mark is legible, inscribe pistons accordingly. Mark pistons "1" and "2" and scribe mark on piston toward the exhaust port side.

NOTE: Pistons "1" and "2" are not interchangeable. Install correctly during reassembly.

Remove circlips from each end of piston pin.

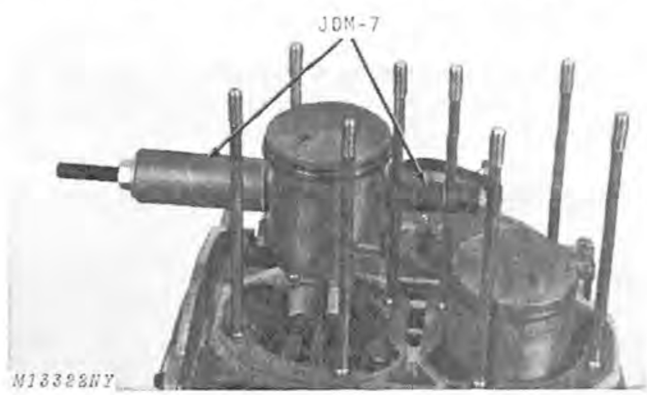


Fig. 12-Removing Pistons

Use the piston pin tool and guide furnished with the JDM-7 tool set to remove piston pins, Fig. 12. (JDM-32 piston pin guide can be used also.)

NOTE: Because JDX6 and JDX8 Snowmobiles (Serial No. 20,001-) have larger piston pins, use the piston pin guide from the JDM-7 tool set only for removal.

IMPORTANT: Do not damage connecting rod needle bearings when removing piston pins.

Remove needle bearings from connecting rods.

Leave old rings on pistons to protect ring grooves.

Removing Crankshaft

Remove reed valve assembly.

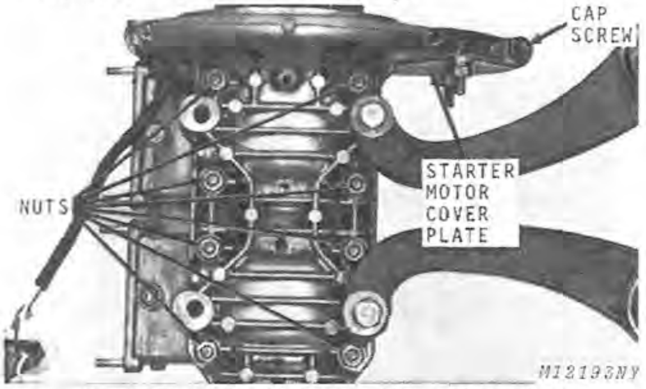


Fig. 13-Removing Nuts from Bottom of Crankcase

Remove eight nuts and washers from bottom of crankcase, Fig. 13. Remove starter motor cover plate, cap screw by cover plate, and two screws securing stator plate, before separating crankcase halves. Use a soft hammer and lightly tap the halves to separate.

IMPORTANT: Do not pry crankcase halves apart with a screwdriver. This will damage crankcase sealing surfaces.

Remove stator assembly and store in flywheel until ready for reassembly.

Remove crankshaft by lifting upward. Note the four bearing retaining clips located in the UPPER or TOP half of the crankcase.

Reed Valve Service

Fig. 14-Reed Valve Assembly

Disassemble and clean reed valve assembly, Fig. 14.

A faulty reed valve can usually be detected by excessive fuel "spit-back" through the carburetor, causing a "popping" noise.

Inspect reeds for cracking or warpage. Inspect reed seating surfaces for damage or wear.

IMPORTANT: Prolonged running of an engine with a faulty reed valve could cause a seized piston. This is due to the lean fuel mixture caused by improper fuel transfer on the pistons downstroke.

Disassembling Fan Cover

If inspection reveals damaged cooling fan blades or worn fan shaft bearings, further disassembly is necessary to replace parts.

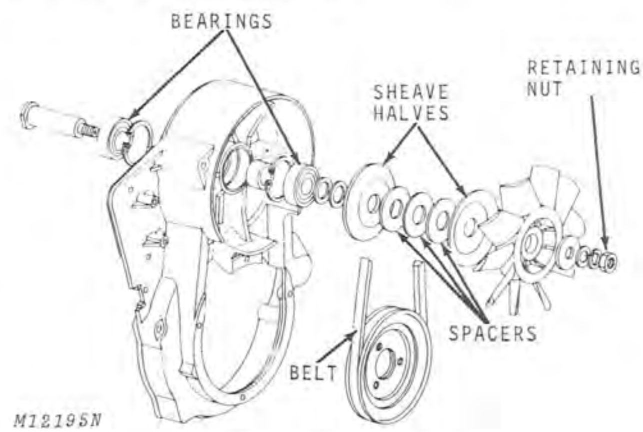


Fig. 15-Fan Assembly

Remove retaining nut, washers, fan, sheave halves and spacers from fan shaft, Fig. 15. Drive assembly out of bearings by tapping lightly with a soft mallet. Inner bearing should remain on shaft, and can be pulled off fan shaft. Carefully drive outer bearing out of fan cover with a soft drift.

Replace parts as necessary.

INSPECTION

Prior to inspection, clean all parts except crankshaft assembly and ignition parts in a suitable cleaning solvent.

For analysis and inspection of parts refer to Group 10 of this section.

ASSEMBLY

Assembling Fan Cover

Assemble fan as shown in Fig. 15, if previously disassembled to replace worn parts.

Torque retaining nut to 28 to 31 ft-lbs (38 to 42 Nm).

Replacing Crankshaft Bearings

Removing Crankshaft Outer Bearings

NOTE: Refer to Group 10, page 20-10-11 for proper procedure for removing outer bearings.

Installing Outer Crankshaft Bearings and Seals

Apply a light film of 2-cycle engine oil to crankshaft and inner race of ball bearing.

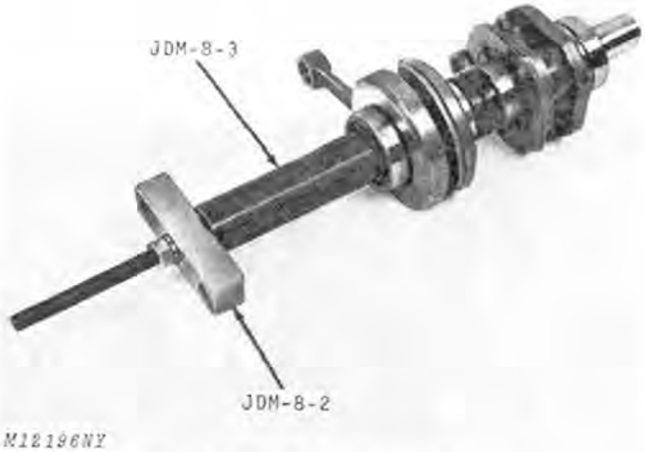


Fig. 16—Installing Outer Crankshaft Bearing

Assemble JDM-8-2 and JDM-8-3 as shown in Fig. 16 to install outer bearings. Press bearings onto crankshaft until bearing is firmly seated against counterweight. Be sure bearing is started true and is not cocked on shaft.

Thread other end of crankshaft bearing tool into PTO end of crankshaft for installing PTO end bearings.

NOTE: Reed valve engines use two ball bearings on PTO end of crankshaft.

Lubricate and install seals, lip inward, on each end of crankshaft.

IMPORTANT: Cover keyway on flywheel end of crankshaft with tape to prevent damage to new seal.

Installing Crankshaft

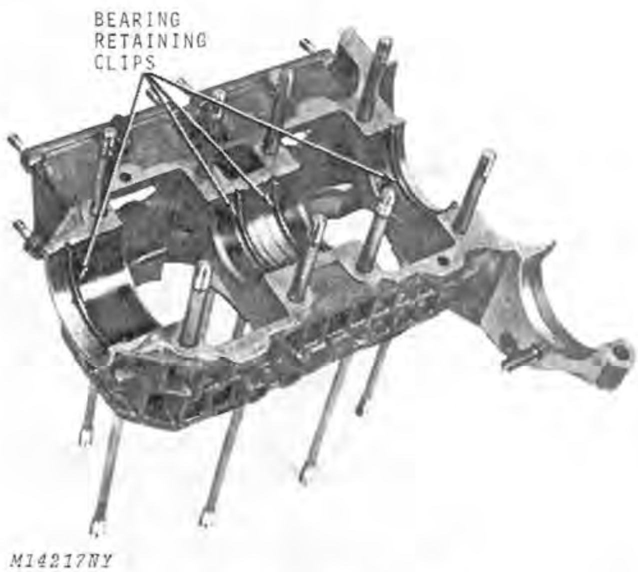


Fig. 17—Installing Crankshaft

Stand upper crankcase half on studs and install bearing retaining clips, Fig. 17. Liberally coat crankshaft and bearings with 2-cycle oil and install in upper crankcase half. Check to be sure bearing retaining clips do not become dislodged.

IMPORTANT: Apply an even coat of M64850 (Silicone Rubber Adhesive) to sealing surfaces of both crankcase halves.

NOTE: DO NOT permit sealer to run into interior of crankcase halves.

Install stator assembly over crankshaft. Be sure rubber grommet on stator assembly wiring leads is positioned in the recess between upper and lower crankcase halves. Install the lower crankcase half to the upper half. Be sure the two dowel pins are properly engaged with mating holes in opposite half of crankcase.

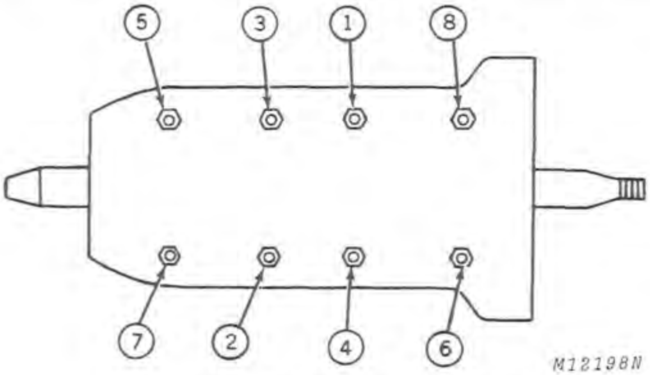


Fig. 18-Nuts on Lower Crankcase Half

Install flat washers, lock washers and nuts. Torque nuts to 15 to 18 ft-lbs (20 to 24 Nm) in sequence shown in Fig. 18.

Installing Pistons and Piston Rings

Lubricate connecting rod needle bearings with 2-cycle engine oil and install in connecting rods.

Place piston over connecting rod. Be sure port areas of piston skirt and crankcase align. No. 1 and No. 2 pistons are not interchangeable.

Be sure scribe mark (marked during disassembly) on piston crown is toward the exhaust port side.

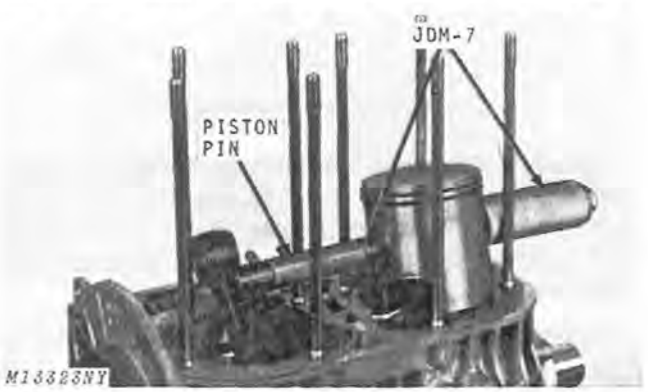


Fig. 19-Installing Piston Pin

Use the piston pin tool and guide furnished with the JDM-7 tool set and pull piston pin into position, Fig. 19. (JDM-32 piston pin guide can be used also.)

NOTE: Because JDX6 and JDX8 Snowmobiles (Serial No. 20,001-) have larger piston pins, use the piston pin guide from the JDM-7 tool set only for installation.

Install four new piston pin circlips. Be sure clips have adequate tension to remain in place during engine operation.

If necessary, remove old rings and install new piston rings as follows:

Use your fingers or a ring expander tool (page 20-15-10) and install either a CHROME or KEYSTONE ring in top groove depending on piston being used. When using your fingers, spread rings with thumbs.

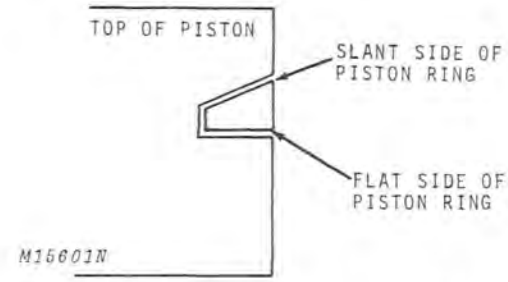


Fig. 20-Proper Installation of Keystone Ring

Fig. 20 shows the proper installation of a KEYSTONE ring.

Installing Cylinders and Cylinder Heads

Install new base gaskets over cylinder studs.

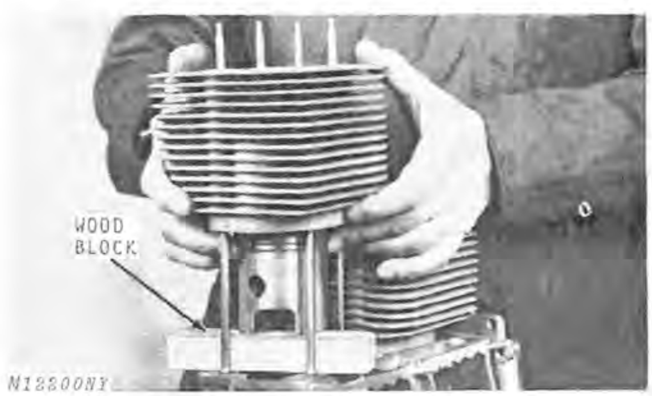


Fig. 21-Installing Cylinders

Lubricate pistons, rings and cylinders with 2-cycle engine oil. Place a suitable wood block between piston and crankcase to steady piston, Fig. 21. Compress rings with fingers and gently slide cylinder over each ring.

IMPORTANT: Be sure rings are centered on locating pins to prevent ring breakage.

Install exhaust manifold with new gaskets. Use M64850 Silicone Rubber Adhesive on the exhaust manifold gaskets. Install exhaust manifold and tighten securely. This aligns cylinders.

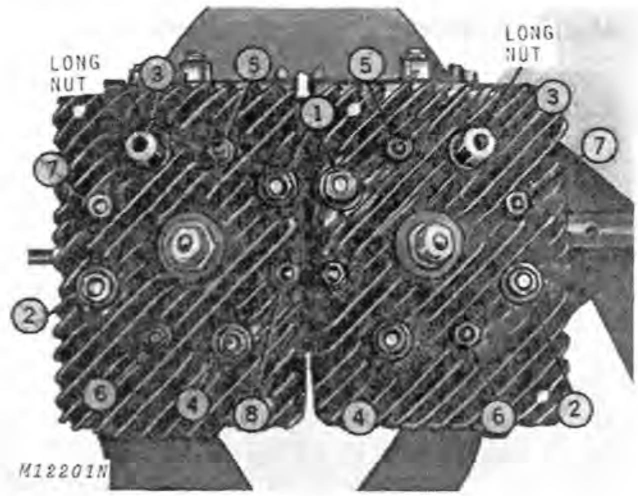


Fig. 22-Cylinder Head Torquing Sequence

Install NEW cylinder head gaskets (no sealant) and cylinder heads. Use flat washers under nuts and install nuts. Use special long nuts in locations shown in Fig. 22. Torque cylinder stud nuts 1, 2, 3, and 4 in sequence to 11.5 to 14.5 ft-lbs (15.6 to 19.7 Nm). Complete torquing sequence by tightening cylinder head stud nuts 5, 6, 7, and 8 in sequence shown, to 5.0 to 6.5 ft-lbs (6.8 to 8.8 Nm).

Installing Reed Valve Assembly

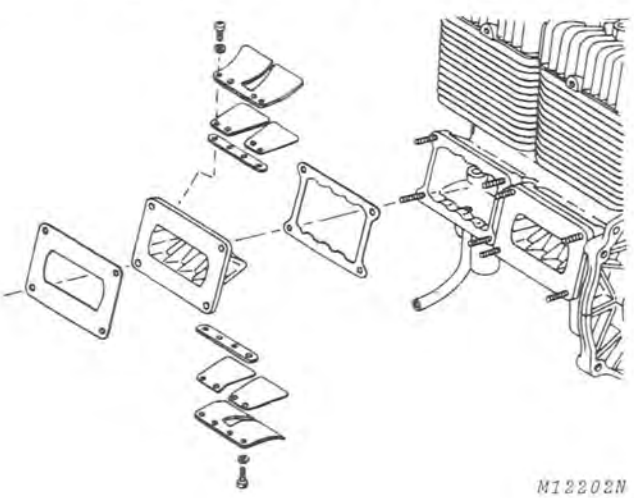


Fig. 23-Installing Reed Valves

Assemble reed valves carefully, Fig. 23. Maximum allowable "hang open" between reed valve and body is 0.060 inch (1.524 mm). Reed valve and body should form a "light-tight" seal when pinched together with finger pressure. If reeds are warped beyond allowable clearance or cracked, they must be replaced.

Use new gaskets and install reed valve assembly on crankcase. Tighten nuts securely.

Installing Flywheel

NOTE: Be sure stator plate is securely in place before installing flywheel.

Wipe crankshaft clean and install Woodruff key. Position flywheel and install flat washer, lock washer and nut. Install fan cover and secure with four cap screws, lock washers and flat washers.

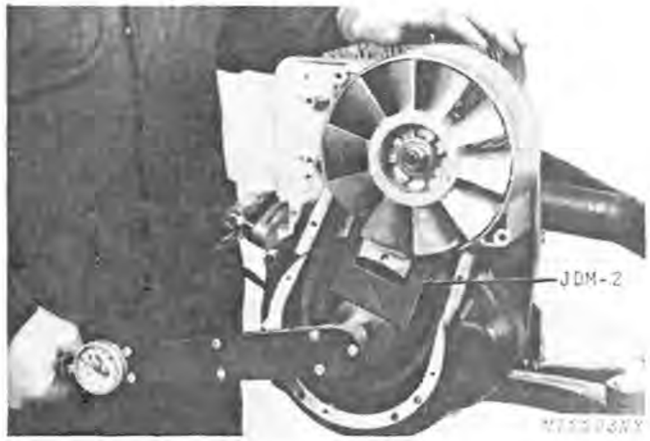


Fig. 24-Installing Flywheel

Use JDM-2 holding tool and a torque wrench, tighten flywheel nut, Fig. 24, to 45 to 50 ft-lbs (61 to 67 Nm).

Timing Ignition

Install electrical coupler and coils, Fig. 24.

Adjust breaker points and time ignition. Refer to Section 40, Group 10.

Adjusting Fan Belt Tension

Install fan belt, window plate, belt sheave and starter cup. Secure to flywheel with three 6 x 15MM cap screws and lock washers.

IMPORTANT: DO NOT use 6 x 22MM cap screws from recoil starter in this location. Longer cap screws will make centrifugal advance mechanism inoperative.

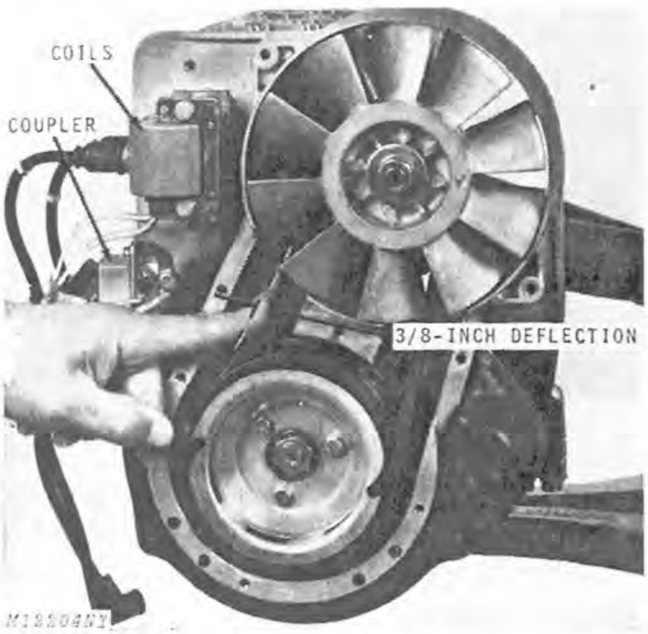


Fig. 25-Checking Fan Belt Tension

Check fan belt for proper tension, Fig. 25. A properly adjusted fan belt should deflect approximately 3/8-inch (9 mm) when flexed by hand at a point near center of belt span.

To adjust belt, remove fan retaining nut, using JDM-30 spanner wrench to keep fan from turning.

Remove fan, belt and outer sheave half. Remove one of the larger spacers from between pulley halves and place it outside outer pulley half. Reassemble and torque retaining nut to 28 to 31 ft-lbs (38 to 42 Nm).

Installing Exterior Components

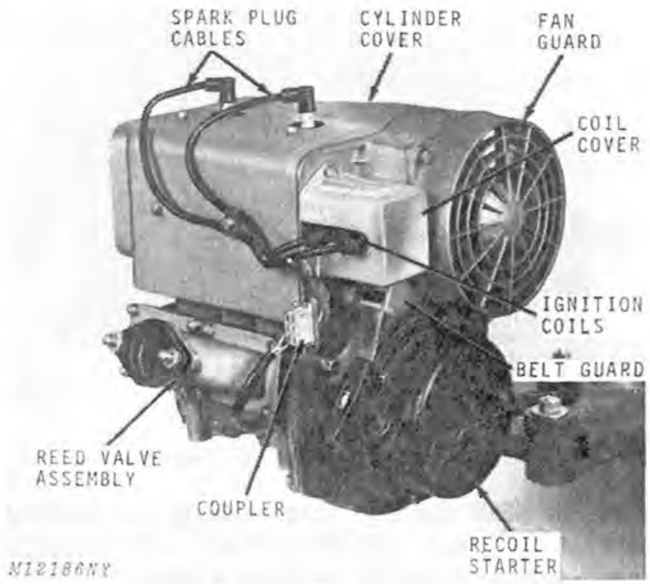


Fig. 26-Installing Exterior Components

Install starter motor, if so equipped and starter mounting plate.

Install fan guard, recoil starter and cylinder cover on engine, Fig. 26.

Install coil cover.

Connect the two ignition leads between the ignition coils and coupler.

Install spark plugs of proper heat range and connect spark plug cables.

Install drive sheave. See Section 50, Group 15 or 17. Torque retaining nut to 50 ft-lbs.

INSTALLING ENGINE

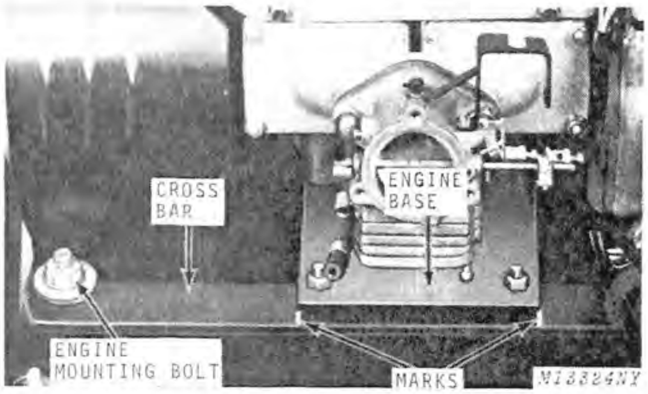


Fig. 27-Installing Engine in Snowmobile

Install and bolt engine in place using marks made prior to engine removal as a guide, Fig. 27. Refer to Section 50, Group 25, for sheave alignment specifications and procedure.

Connect muffler bracket to engine base and muffler to engine. Install drive belt and belt guard.

If snowmobile is equipped with electric start, connect cable to starter terminal and ground strap to engine. Install heat deflector. Connect electrical coupler to the engine.

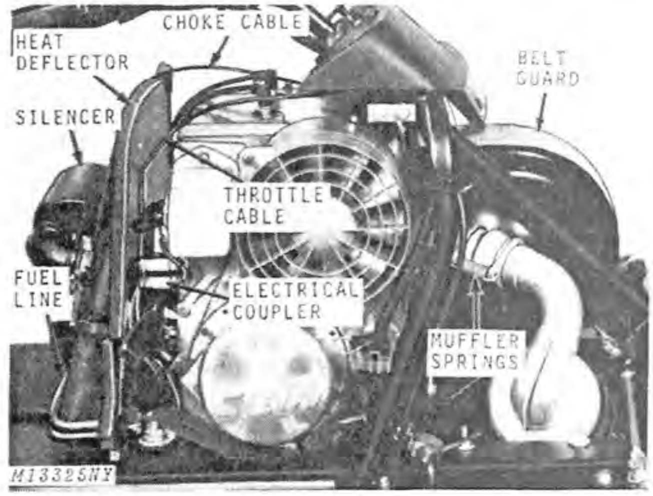


Fig. 28-Making Connections to Snowmobile

Connect fuel lines, choke and throttle cables, and install silencer and air hose, Fig. 28.

Fig. 29-Installing Console and Windshield

Slide console down and forward into position, Fig. 29. Install three screws at lower side positions and tighten the two console attaching bolts on each side of the instrument panel. Install top and left-hand access panels.

Attach windshield with screws previously removed.

IMPORTANT: After engine overhaul, carefully run the engine at varying speeds for the first 2 hours, or 25 miles of operation.

Group 25
KOHLER PISTON-PORTED ENGINE OVERHAUL

GENERAL INFORMATION

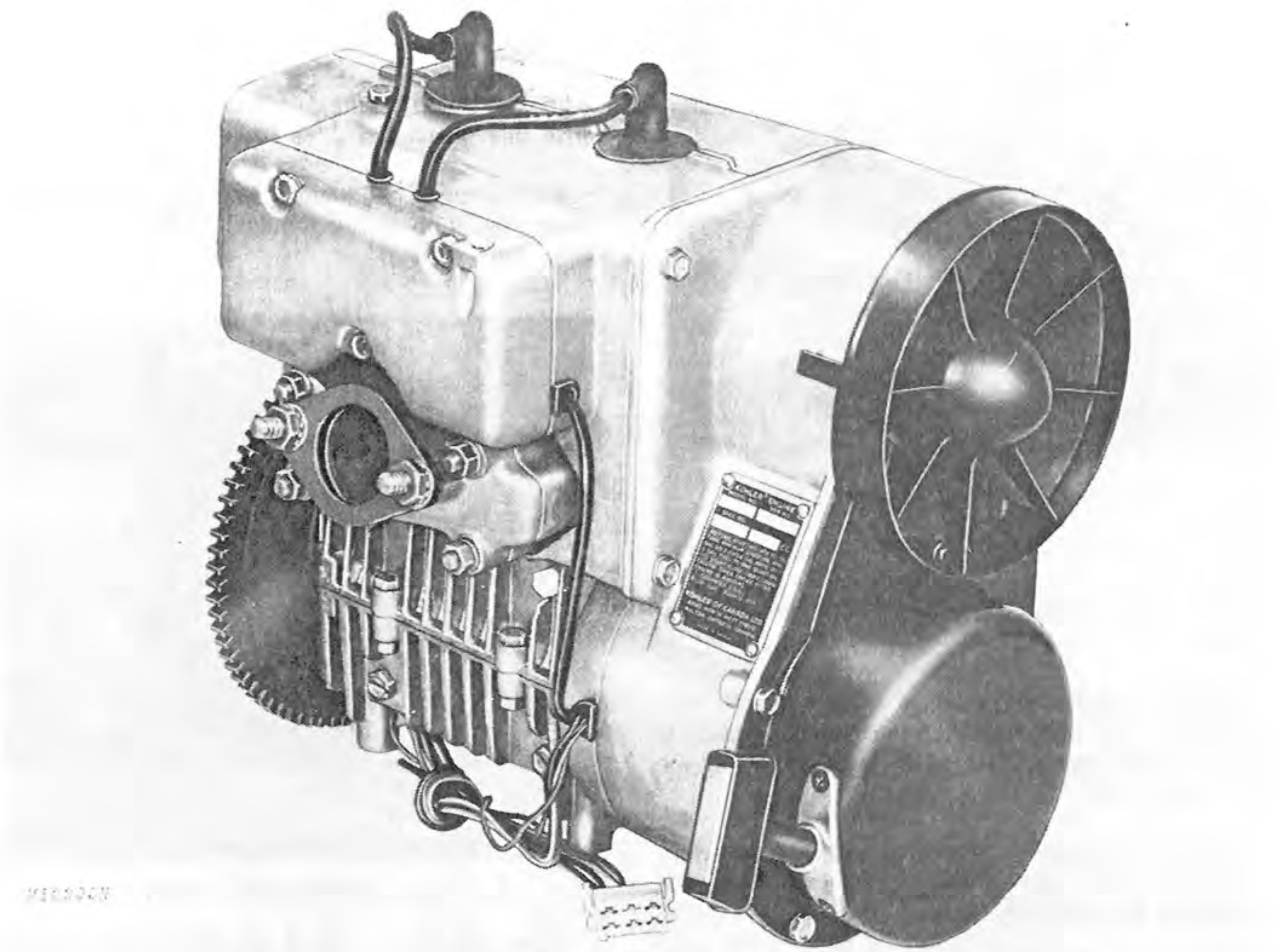


Fig. 1-Kohler Engine

The Kohler piston-ported engine, Fig. 1, is a 2-cylinder, 2-cycle, air-cooled, engine. The engine has four ball bearings; two between crank throws, one on the flywheel end, and one on the PTO end of the crankshaft. Needle bearings are used at both crankpin and piston pin locations.

The crankshaft, inner ball bearings and seals, connecting rods and crankpin bearings are available only as a complete assembly. If any of these parts are worn or damaged, an entire crankshaft assembly must be installed. The complete assembly also includes outer seals and bearings which may, however, be purchased separately. The crankcase upper and lower halves are available only as a matched set.

Oversize piston and rings (0.020 inch and 0.040 inch) are available.

See Group 5 for "Principle of Operation".

REMOVING ENGINE

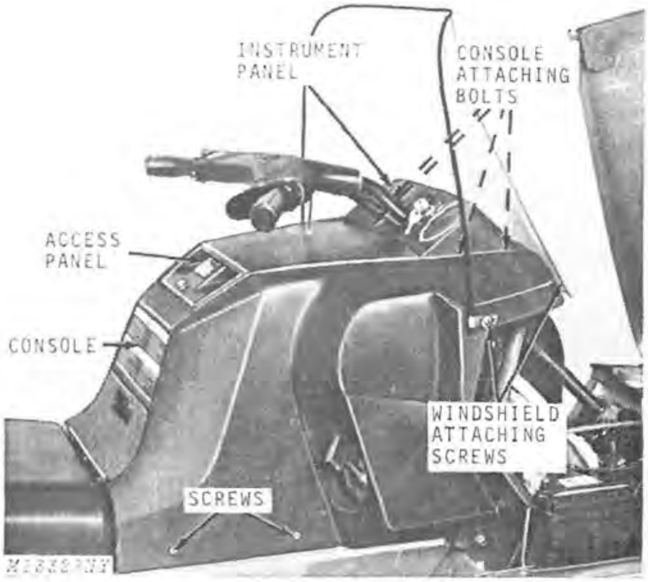


Fig. 2-Removing Console and Windshield

Remove the windshield by removing the six attaching screws, Fig. 2. Remove the access panel from the top of the console. Remove the left-hand access panel.

Remove the three screws securing the lower console to the tunnel. Loosen the four console attaching bolts, located under the console, on each side of the instrument panel.

Remove console by lifting it up and sliding it rearward. The instrument panel remains in place and need not be removed.

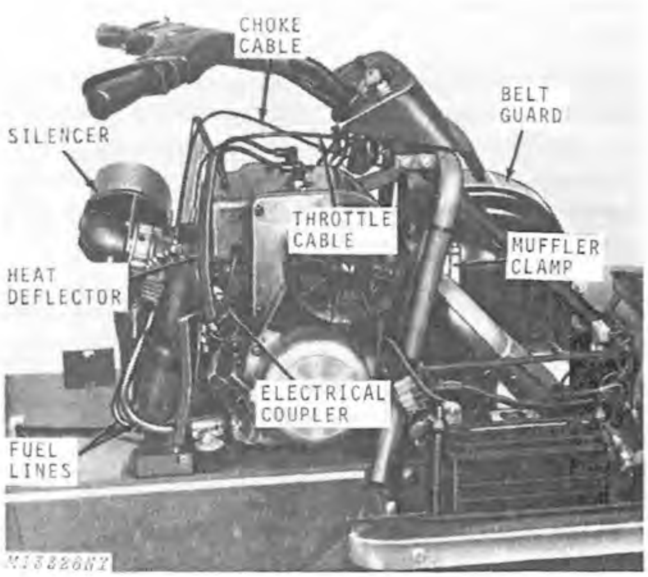


Fig. 3-Disconnecting Engine from Snowmobile

Disconnect choke and throttle cables, Fig. 3. Remove silencer and air hose. Disconnect fuel lines from the carburetor.

Remove heat deflector.

Loosen clamp securing muffler to engine. Remove drive belt guard and drive belt.

If snowmobile is equipped with electric starter, remove lead from starter terminal. Disconnect ground strap from engine.

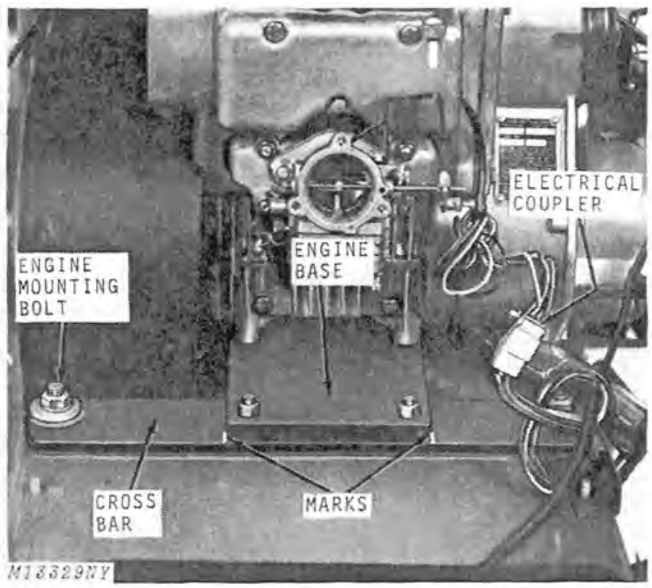


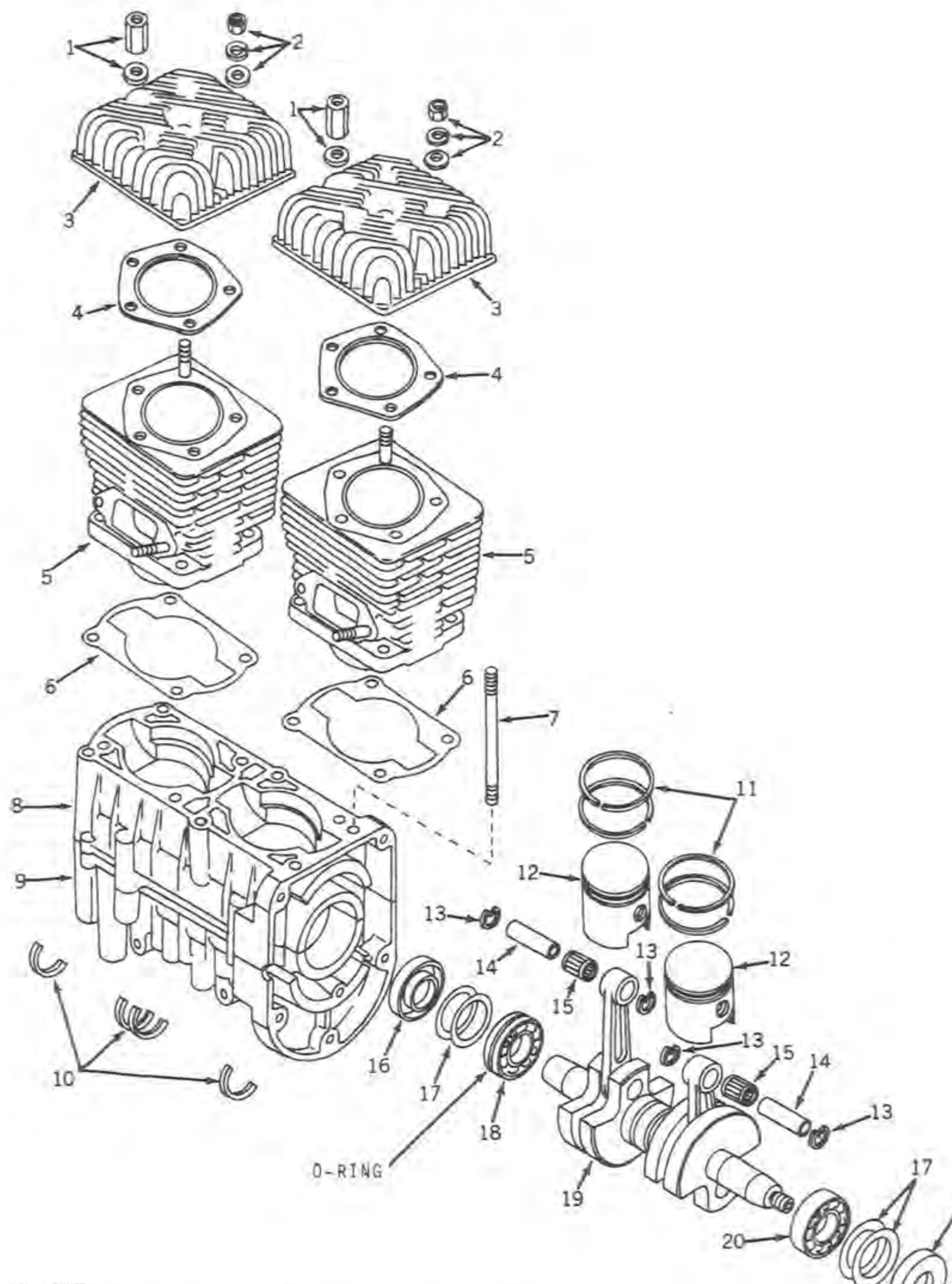
Fig. 4-Marking Engine Mounts

Mark cross bars, Fig. 4, so that drive and driven sheaves will be in correct alignment when engine is installed after repair. Mark both front and rear cross bars. Disconnect electrical coupler from the engine.

Disconnect muffler bracket from engine base. Remove four bolts securing engine base to cross bars. Lift engine from snowmobile. Remove engine base from engine.

Place engine on a workbench and thoroughly clean exterior surfaces using cleaning solvent. The bench mounted service fixture (JDM-16). shown in Figs. 6 and 7, is ideal for servicing snowmobile engines.

DISASSEMBLY



1—Special Long Nut and Washer
2—Nut and Washer
3—Cylinder Head
4—Head Gasket
5—Cylinder
6—Cylinder Base Gasket
7—Thru Bolts
8—Upper Crankcase Half
9—Lower Crankcase Half
10—Oil Seal Retaining Ring
11—Rings
12—Piston
13—Circlip
14—Piston Pin
15—Connecting Rod Needle Bearings
16—Oil Seal (PTO end)
17—Shims
18—Crankshaft Bearing (PTO end) with O-Ring
19—Crankshaft Assembly
20—Crankshaft Bearing (Flywheel end)
21—Oil Seal (Flywheel end)

Fig. 5-Exploded View of Kohler Engine

Removing Exterior Components

Remove engine base from engine.

Install engine on JDM-16 bench mounted service fixture, Fig. 6.

Remove recoil starter assembly.

Remove drive sheave. Refer to Section 50, Group 10.

Remove electric starter, if engine is so equipped.

Remove lower fan sheave and fan belt.

Removing Ring Gear and Hub

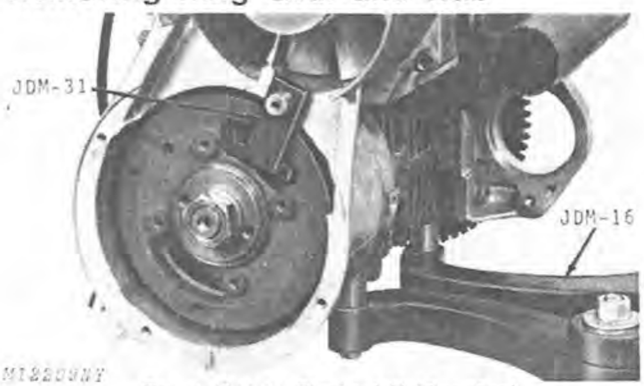


Fig. 6-JDM-31 Flywheel Holding Tool

Install JDM-31 flywheel holding tool as shown in Fig. 6.

Fig. 7-Removing Ring Gear Hub

Remove four socket-head ring gear retaining screws and remove ring gear.

Install JDM-9 puller as shown in Fig. 7, and remove ring gear hub. The JDM-31 flywheel holding tool previously installed will prevent the crankshaft from turning.

NOTE: If ring gear and hub are one piece use JDM-9 puller and remove as described above.

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Removing Flywheel

Remove flywheel retaining nut and washers.

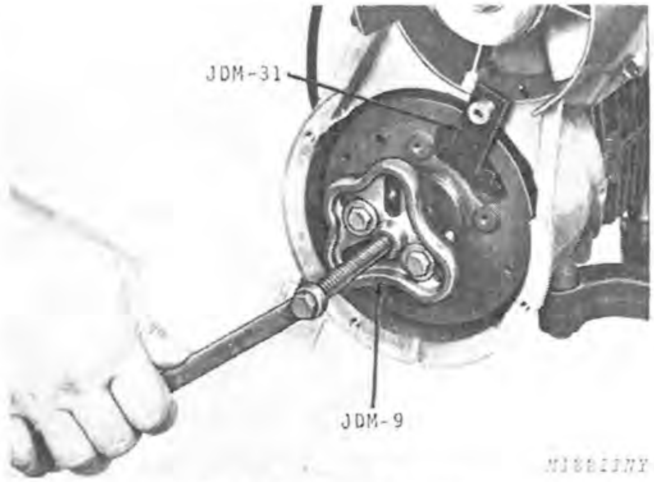


Fig. 8-Removing Flywheel

Install JDM-9 puller, Fig. 8, and remove flywheel.

Remove JDM-31 flywheel holding tool.

NOTE: Use puller ONLY to remove flywheel. Do not strike puller center bolt with hammer or crankshaft bearing damage may result.

Removing Shrouds and Fan Housing

Remove coil cover. Disconnect stator leads from coils and remove coils.

Remove intake and exhaust manifolds.

Remove front and rear engine shrouds.

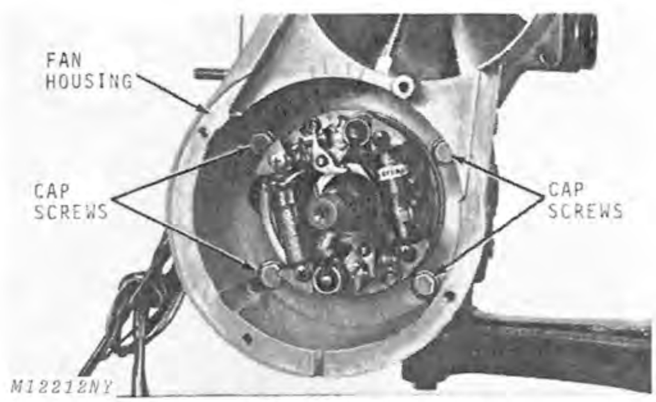


Fig. 9-Removing Fan Housing

Remove fan housing and stator as an assembly, Fig. 9.

Remove starter bracket, if engine is so equipped.

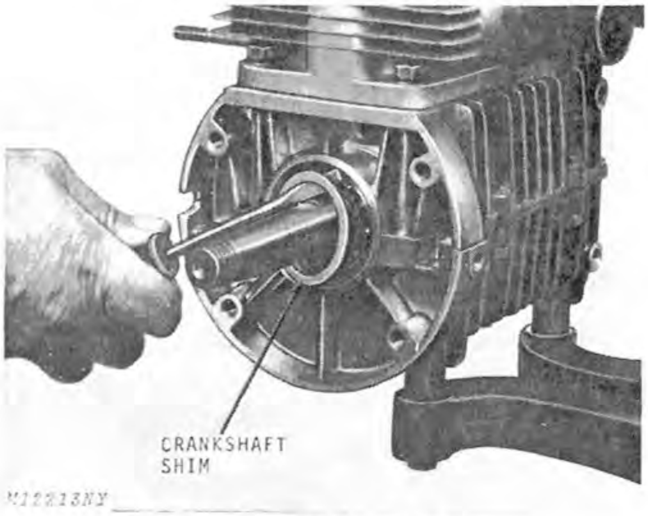


Fig. 10-Removing Crankshaft Shims

Remove shims from crankcase as shown in Fig. 10. Save shims for reuse during assembly.

Removing Cylinder Heads and Cylinders

Remove spark plugs.

Remove both cylinder heads. Discard cylinder head gaskets.

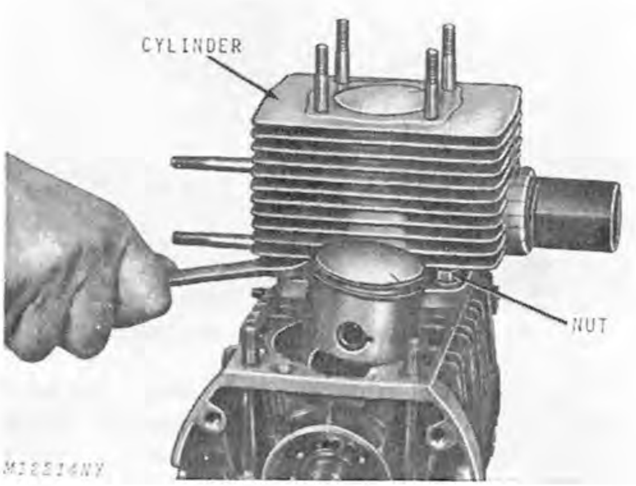


Fig. 11-Cylinder Removal

Remove cylinders, Fig. 11. Discard cylinder-to-crankcase gaskets.

NOTE: For proper procedure on reboring cylinders and rounding ports, see page 20-10-8.

Removing Pistons

Mark pistons so they may be installed in same manner as removed. Place mark on side of engine toward exhaust port, Fig. 12.

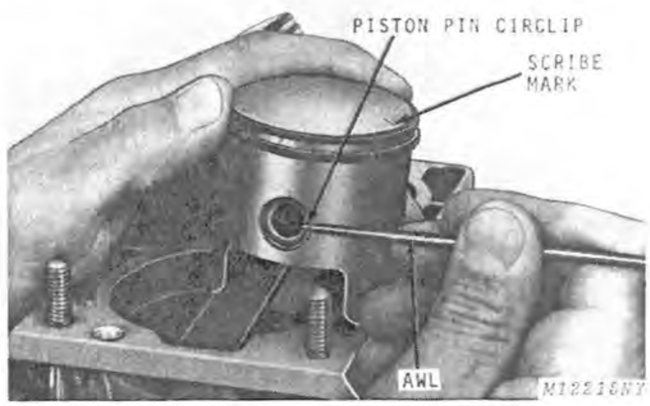


Fig. 12-Removing Piston Pin Locks

Remove piston pin circlips with a sharp awl. Rotate end of circlip slightly past indentation. Insert awl under circlip and pry circlip out gently, Fig. 12.

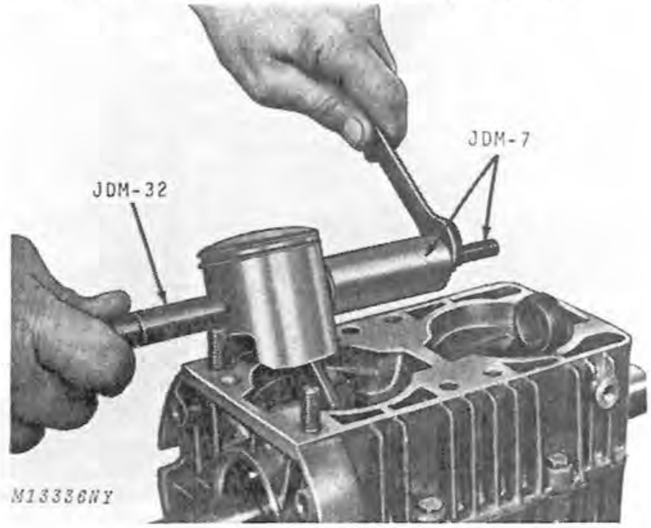


Fig. 13-Removing Piston Pins

After all piston pin circlips have been removed, assemble piston pin remover from JDM-7 tool set with JDM-32 piston pin guide and remove piston pins, Fig. 13. In some cases, piston pin may be pushed out of piston with guide and hand pressure only.

Removing Crankshaft

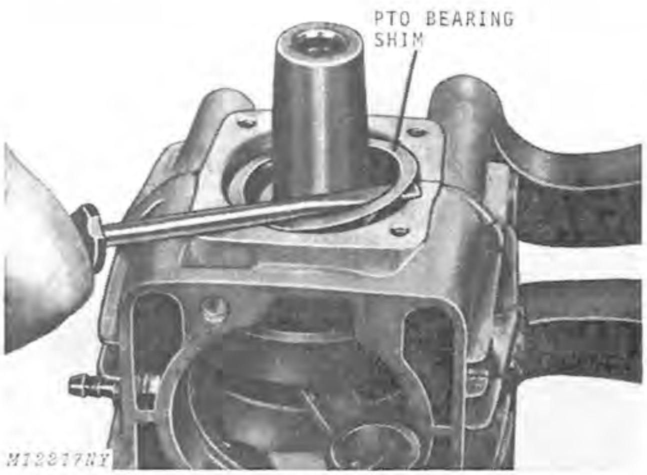


Fig. 14-Removing PTO Bearing Shims

Remove PTO bearing end plate and shims, Fig. 14. Save shims for reuse during assembly.

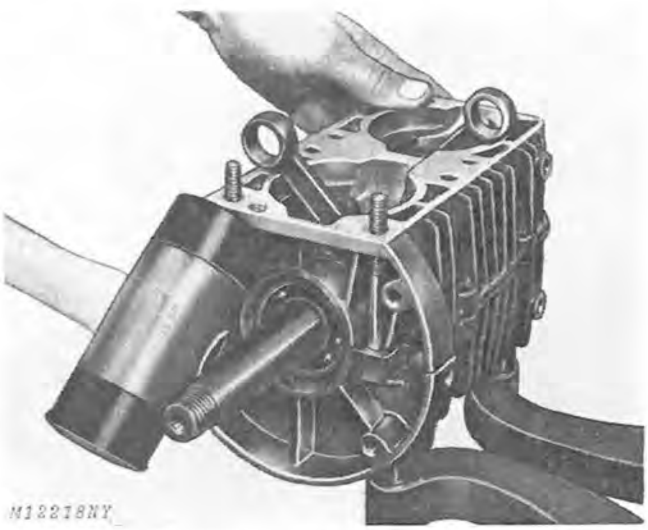


Fig. 15-Separating Crankcase Halves

Remove all crankcase retaining cap screws and tap the upper crankcase half with a soft mallet, Fig. 15, to separate the crankcase.

IMPORTANT: DO NOT pry crankcase halves apart with a screwdriver. This will damage crankcase sealing surfaces.

Lift out crankshaft carefully.

ANALYSIS AND INSPECTION

Clean all parts, except electrical components and crankshaft assembly, with a safe cleaning solvent.

It may be necessary to soak sealing surfaces of crankcase halves with solvent to soften sealant prior to clean up.

Refer to Group 10 in this Section for "Analysis" and "Inspection" of parts. See "Specifications," Group 35, for measurements and dimensions.

ASSEMBLY

Replacing Crankshaft Bearings

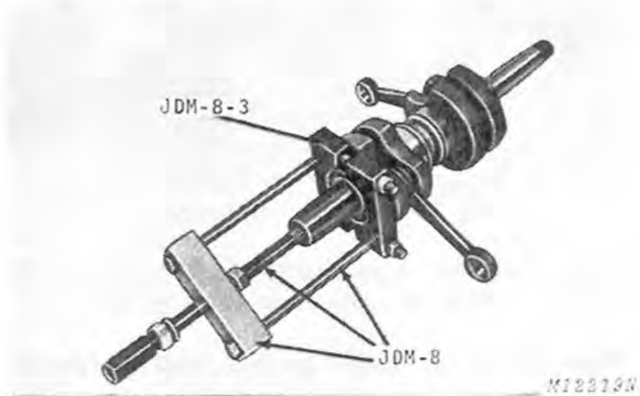


Fig. 16-Removing PTO End Bearing

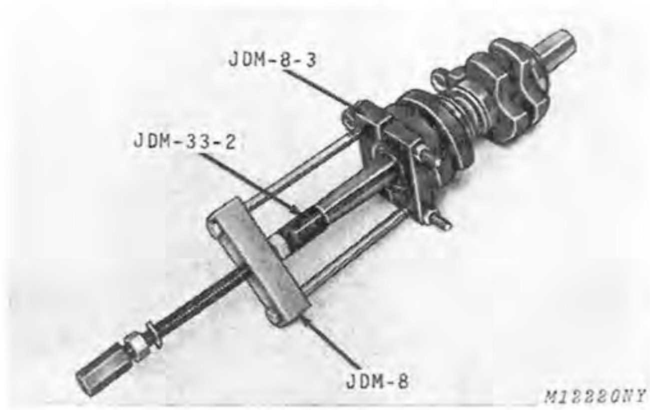


Fig. 17-Removing Flywheel End Bearing

The PTO and flywheel end bearings can be replaced if necessary. Use JDM-8 puller and JDM-8-3 splitter, Fig. 16, to remove PTO end bearing. In addition to the above, JDM-33-2 adapter is required when removing or installing flywheel end bearing, Fig. 17.

To install bearings use JDM-8-3, splitter, Fig. 18. JDM-33-2 adapter must still be used on the crankshaft end.

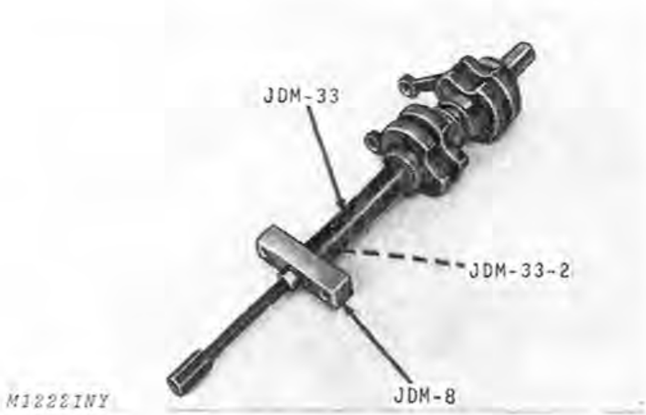


Fig. 18—Installing Flywheel End Bearing

Adjusting Crankshaft End Play

Use the following procedure to determine crankshaft end play and shim requirements.

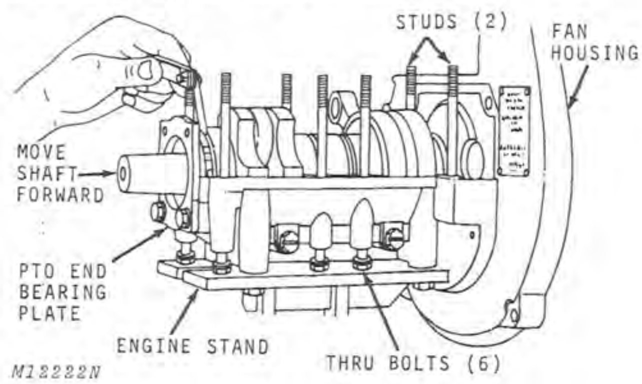


Fig. 19—Measuring Crankshaft End Play

Place crankshaft in lower crankcase half and install fan housing and PTO end bearing plate with new gasket, Fig. 19. Be sure O-ring is around PTO end bearing, Fig. 5.

Push the crankshaft toward fan housing and measure clearance between PTO crankshaft bearing and PTO end bearing plate with a feeler gauge. The correct crankshaft end play is 0.006 to 0.012 inch.

To determine the number of 0.006-inch shims required, subtract a nominal 0.009 inch from feeler gauge measurement. Install an equal number of shims at each end of the crankshaft whenever possible.

After shim requirements have been determined, remove PTO end bearing plate and fan housing. Leave crankshaft in lower crankcase half.

Installing Crankshaft

IMPORTANT: Apply M64850 (Silicone Rubber Adhesive) to the clean crankcase half mating surfaces. DO NOT use excessive adhesive because engine damage can result from adhesive contaminating crankshaft and rod bearings.

Install upper crankcase half and loosely install four 1/4-inch diameter crankcase side bolts.

Install PTO end bearing plate and shims.

IMPORTANT: DO NOT tighten end bearing plate cap screws until cylinders have been installed and torqued. Premature tightening of PTO end bearing plate can cause an air leak between crankcase halves.

Installing Pistons and Rings

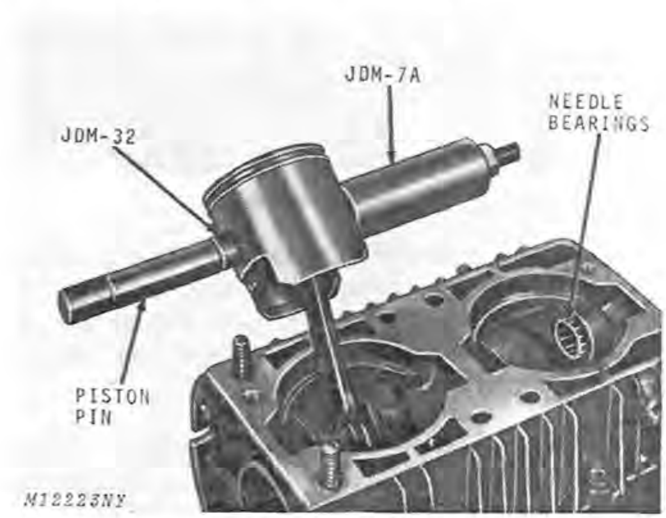


Fig. 20—Installing Pistons

Install needle bearings in connecting rods, Fig. 20.

Place piston over connecting rod and use piston pin tool from JDM-7 tool set and JDM-32 piston pin guide to install piston pin, Fig. 20. Using guide will prevent rod bearing damage by holding piston, bearing and rod in alignment.

If new rings are to be installed, do so at this step of re-assembly. Leaving the old rings on pistons until this step, provides piston ring groove protection.

To install rings on piston, gently spread ring with hands and slide ring on piston. "L" ring goes in the top groove. Be sure the ring gap is positioned over the small locating pins in the ring grooves.

Installing Cylinders

Install NEW cylinder gaskets.

NOTE: Gaskets must be installed correctly to avoid partial coverage of transfer port. This assembly error will cause poor engine performance.

Lubricate pistons, rings and cylinder bore with 2-cycle engine oil.

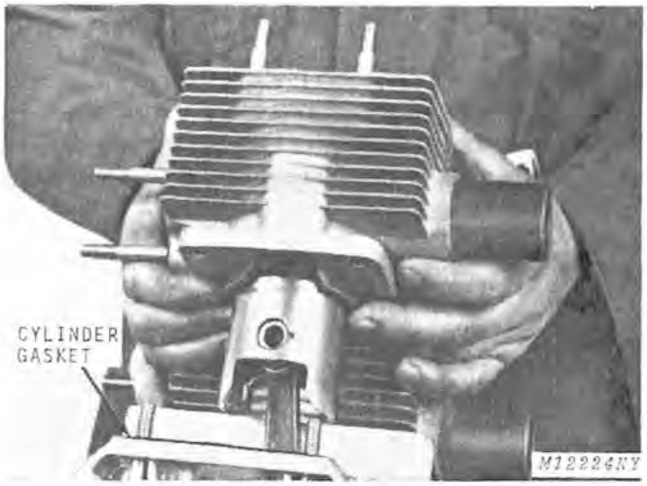


Fig. 21-Installing Cylinders

Place a suitable wood block under skirt of piston, Fig. 21. This will stabilize piston and permit both hands to be used to compress rings and slip cylinder over piston. Be sure piston ring ends are located around locating pins.

Install cylinder bolts, washers and nuts. Use special serrated lock washers on two stud nuts on fan housing end. DO NOT tighten nuts at this time.

Install intake manifold, Fig. 22, to cylinders using NEW gaskets. Tighten nuts to 15 to 18 ft-lbs. This procedure aligns cylinders and intake manifold.

Use JDM-5A cylinder nut wrench and torque wrench, Fig. 22. Torque center crankcase bolts FIRST, then tighten end bolts to 15 to 18 ft-lbs. Torque four 1/4-inch crankcase side bolts and PTO end bearing plate cap screws to 8 to 10 ft-lbs.

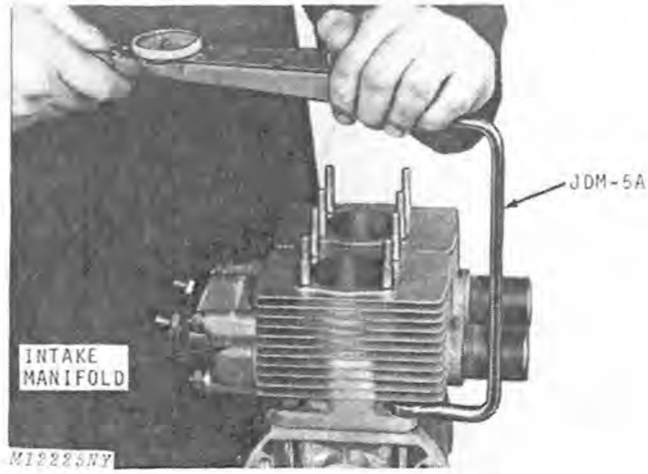


Fig. 22-Torquing Cylinder Bolts

Installing Cylinder Heads

Install NEW cylinder head gaskets. NO gasket adhesive is required.

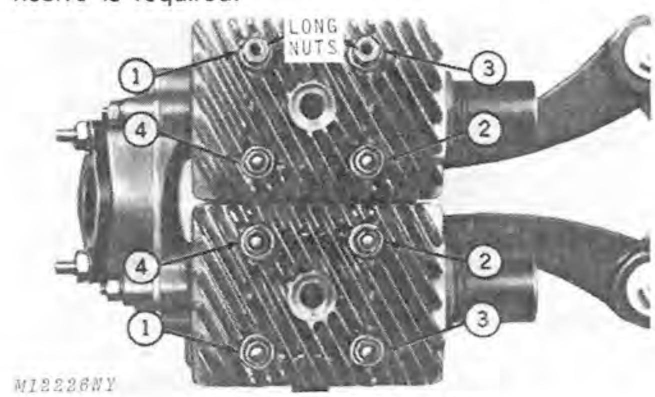


Fig. 23-Installing Cylinder Heads

Install cylinder heads with raised bosses toward the exhaust side of engine, Fig. 23. Torque cylinder head nuts to 15 to 18 ft-lbs. in the sequence shown in Fig. 23.

Installing Fan Housing and Stator

Install fan housing and stator assembly, use NEW O-ring between fan housing and crankcase. Be sure correct number of shims are properly inserted and seated in crankcase when fan housing is positioned. Tighten the four fan housing-to-crankcase cap screws to 15 to 18 ft-lbs.

Install engine shrouds, exhaust manifold using NEW gaskets, and ignition coils.

NOTE: Blue/red wire goes to No. 1 coil (closest to ring gear) and blue wire to No. 2 coil.

Timing Ignition

NOTE: Ignition cam can be removed from flywheel and placed on crankshaft to set each set of points to 0.016 inch.

Refer to Section 40, Group 10 for proper procedure in adjusting points and timing engine.

Installing Flywheel

Install flywheel on crankshaft. Be sure keyway in flywheel is aligned with key in crankshaft.

Use JDM-31 flywheel holding tool, Fig. 6, to restrain flywheel from turning and torque retaining nut to 90 ft-lbs.

IMPORTANT: DO NOT use impact wrench to tighten flywheel retaining nut because this could cause flywheel or engine damage.

Installing Ring Gear Hub and Ring Gear

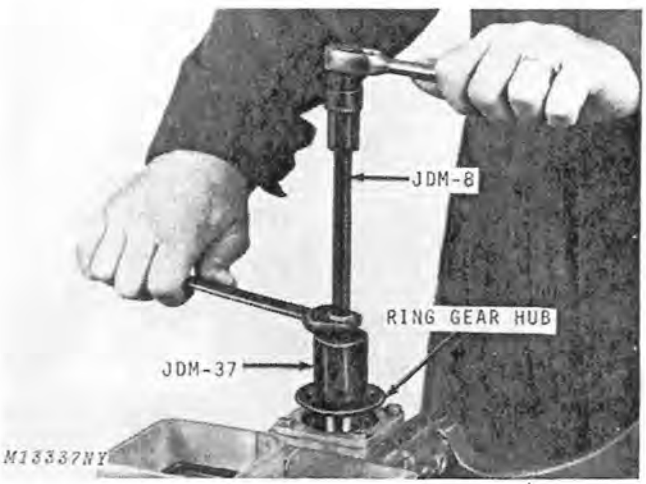


Fig. 24-Installing Ring Gear Hub

Use JDM-37 gauge, bolt and nut from JDM-8 puller and install ring gear hub, Fig. 24. JDM-37 gauge installs and locates ring gear hub on crankshaft.

After hub is properly positioned, install ring gear and tighten four socket-head retaining screws.

NOTE: If ring gear is a one piece gear, install recess in gear toward the inside and flat side of the gear toward the outside. Use JDM-37 tool and install gear until tool bottoms on crankshaft.

Remove JDM-31 flywheel holding tool.

Install lower sheave, fan belt and starter cup.

Adjusting Fan Belt Tension

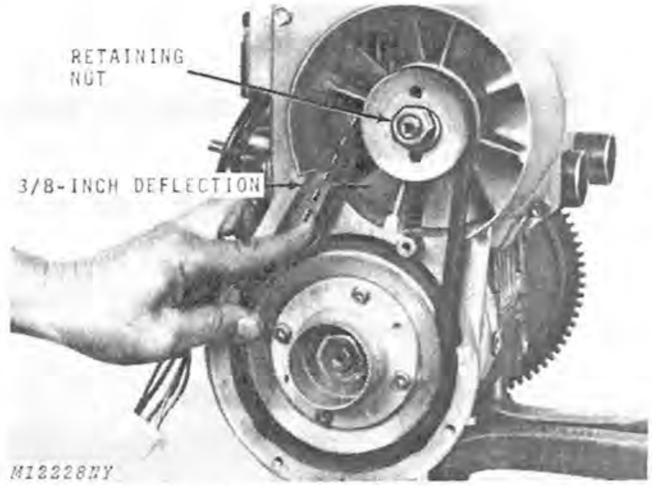


Fig. 25-Checking Fan Belt Tension

Check fan belt for proper tension, Fig. 25. A properly adjusted fan belt should deflect approximately 3-8 inch when flexed by a 15 lb. pull at a point near center of belt span.

To adjust belt, remove fan retaining nut, using JDM-30 spanner wrench to keep fan from turning.

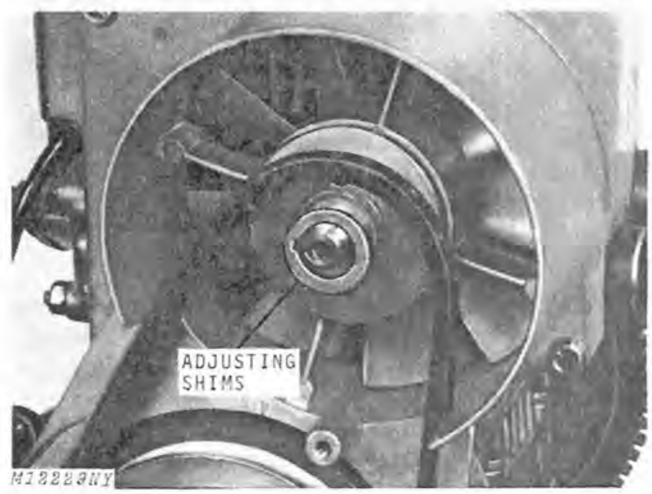


Fig. 26-Fan Adjusting Shims

Remove outer fan sheave half, Fig. 26, to expose adjusting shims. Remove one or more shims. Reassemble and check for 3/8-inch belt deflection. Repeat until proper tension is achieved.

Use JDM-30 spanner wrench to hold fan and torque fan hub nut to 35 ft-lbs.

Installing Exterior Components

Install coil cover and exhaust manifold.

Install recoil starter assembly.

Install drive sheave. Refer to Section 50, Group 10.

Install starter bracket and starter if engine is so equipped.

Remove engine from JDM-16 mounting bracket and install engine base to engine.

INSTALLING ENGINE

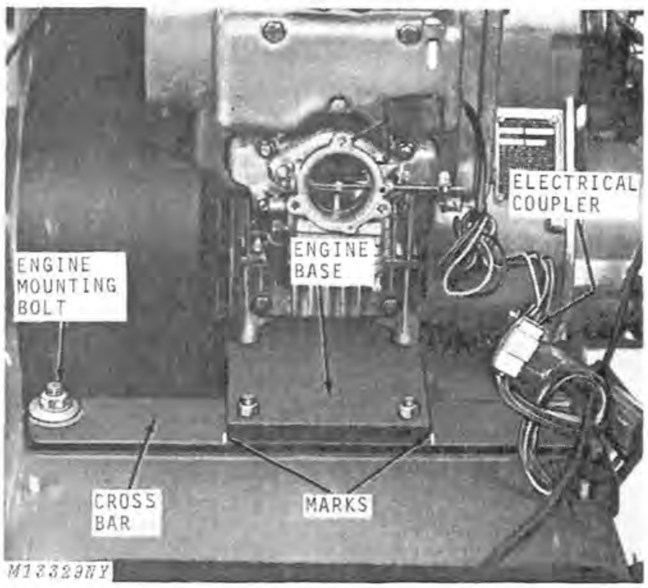


Fig. 27-Installing Engine in Snowmobile

Install and bolt engine in place using marks made prior to engine removal as a guide, Fig. 27. Refer to Section 50, Group 25 for sheave alignment specifications and procedure.

Connect muffler bracket to engine base and muffler to engine. Install drive belt and belt guard.

If snowmobile is equipped with electric start, connect cable to starter terminal and ground strap to engine. Install heat deflector. Connect electrical coupler to the engine.

Connect fuel lines, choke and throttle cables, and install silencer and air hose, Fig. 28.

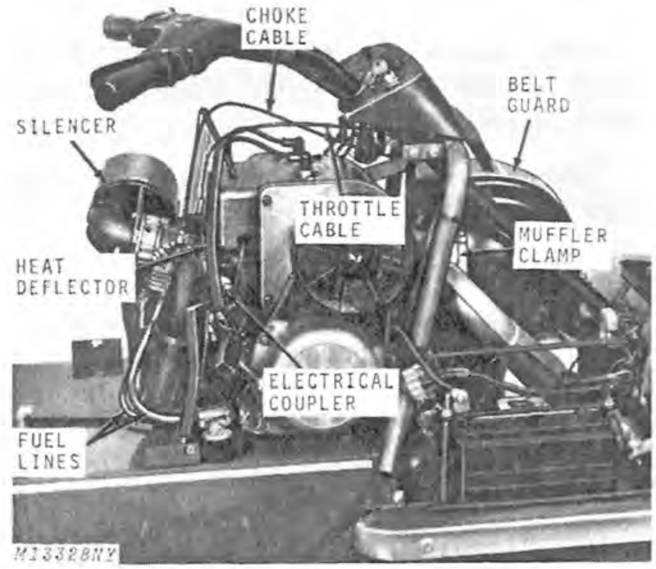


Fig. 28-Making Connections to Engine

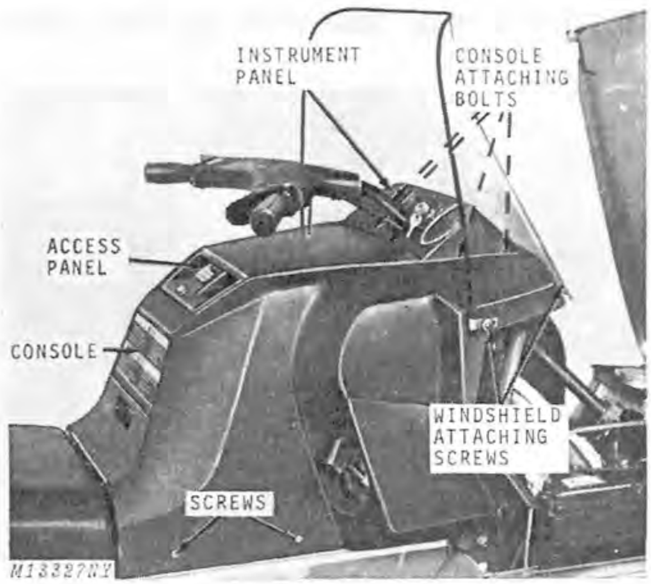


Fig. 29-Installing Console and Windshield

Slide console down and forward into position, Fig. 28. Install three screws at lower side positions and tighten the two console attaching bolts on each side of the instrument panel. Install top access panel and left-hand access panel.

Attach windshield with screws previously removed.

IMPORTANT: After engine overhaul, carefully run the engine at varying speeds for the first 2 hours, or 25 miles of operation.

Group 30
RECOIL STARTERS
CCW AND KIORITZ ENGINES

GENERAL INFORMATION

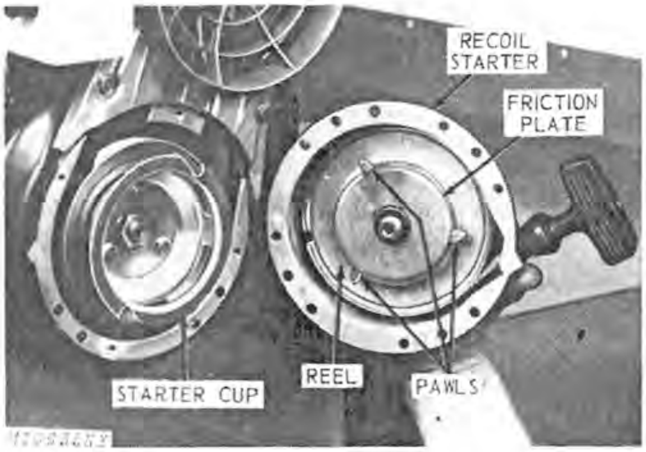


Fig. 1-CCW Recoil Starter

Principle of Operation

When the starter rope is pulled, the friction plate does not turn, thus forcing the pawls out and into contact with the starter cup, Fig. 1. After the pawls are extended, the friction plate rotates with the reel.

When the rope is released, the recoil spring retracts the rope back onto the reel. The return spring (7, Fig. 2) rotates the friction plate to retract the pawls when the rope is retracted.

Operation

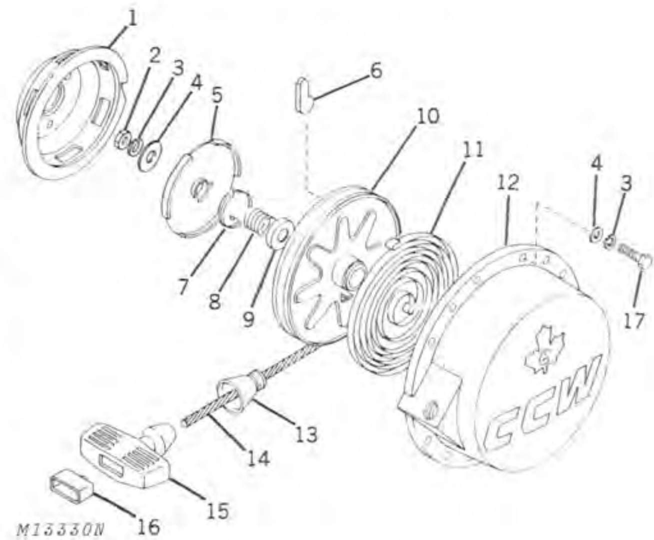
Pull handle slowly until pawls engage with starter cup; then pull vigorously.

Hold handle during recoil. Do not let rope snap back on recoil.

In the event of recoil starter failure, it is possible to start the engine by removing the recoil starter and winding a rope around the starter cup.

Refer to "Diagnosing Malfunctions" in Group 5 of this section for trouble-shooting hints.

DISASSEMBLY



1—Starter Cup
2—Nut
3—Lock Washer
4—Washer
5—Friction Plate
6—Pawl (3 used)
7—Return Spring
8—Friction Spring
9—Cup Washer
10—Reel
11—Recoil Spring
12—Case
13—Rope Guide
14—Rope
15—Handle
16—End Piece
17—Cap Screw

Fig. 2-Exploded View of Recoil Starter

Disassembling Recoil Starter

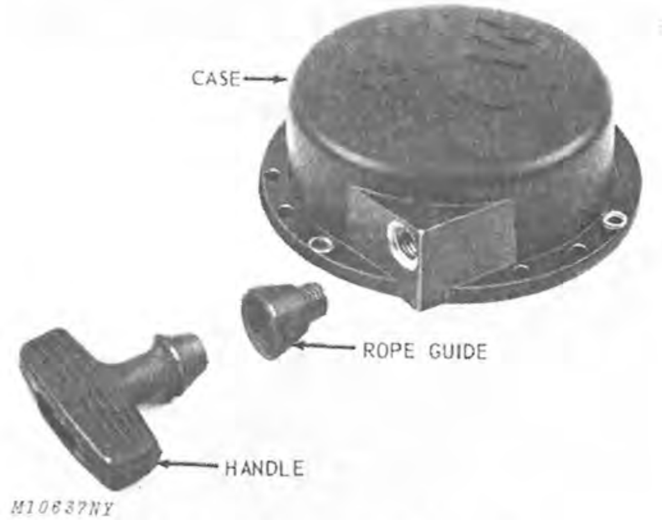


Fig. 3-Removing Handle and Rope Guide

Untie knot in recoil starter handle and let rope recoil into case. Thread rope guide, Fig. 3, out of case.

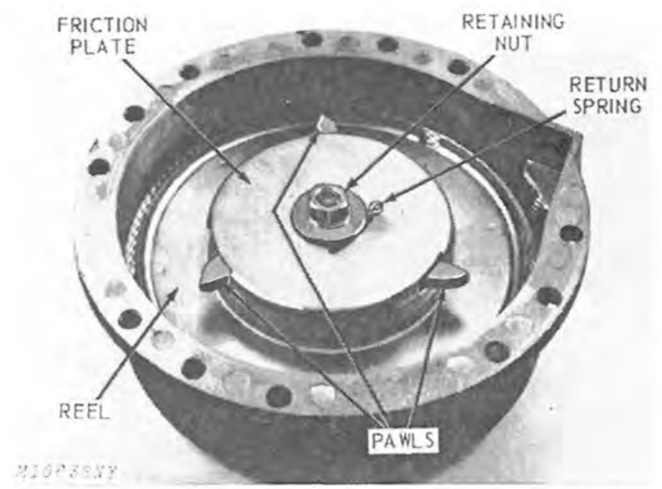


Fig. 4-Disassembling Recoil Starter

Remove the retaining nut, Fig. 4, and the lock washer, and washer from the reel shaft. Remove friction plate, return spring, friction spring and cupped washer. Remove the three pawls.

Lift reel, Fig. 4, with rope, out of case. Remove recoil spring from case. Remove rope from reel if rope replacement is necessary.

INSPECTION

Thoroughly clean all parts except rope in cleaning solvent prior to inspection.

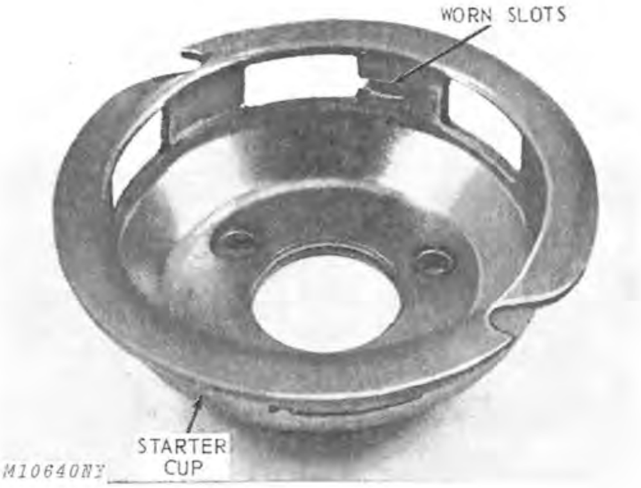


Fig. 5-Inspecting Starter Cup

Inspect the recoil starter cup on engine for excessively worn rectangular slots as shown, Fig. 5. Replace if necessary.

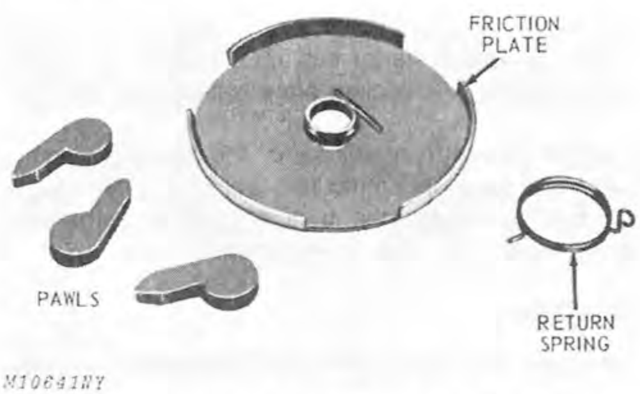


Fig. 6-Inspecting Pawls, Friction Plate and Return Spring

Inspect the three pawls and friction plate for wear, Fig. 6. Inspect the return spring and friction spring and replace if cracked, broken, or distorted.

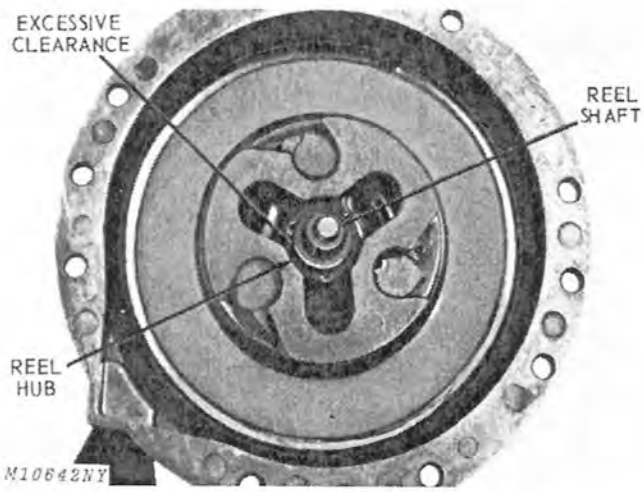


Fig. 7-Inspecting Reel and Reel Shaft

Inspect reel hub and reel shaft for excessive clearance, Fig. 7. Replace parts if necessary.

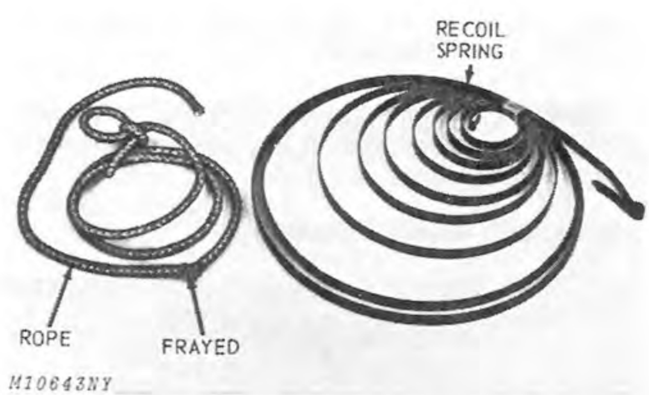


Fig. 8-Inspecting Rope and Recoil Spring

Replace rope if frayed, Fig. 8, or broken. Replace recoil spring if broken or distorted. Inspect condition of spring ends, and bend if necessary, so spring properly engages the tabs on reel and case when installed.

ASSEMBLY

Installing Rope

Fig. 9-Installing Rope into Reel

Install rope through hole in reel. Loop and tie knot as shown, Fig. 9.

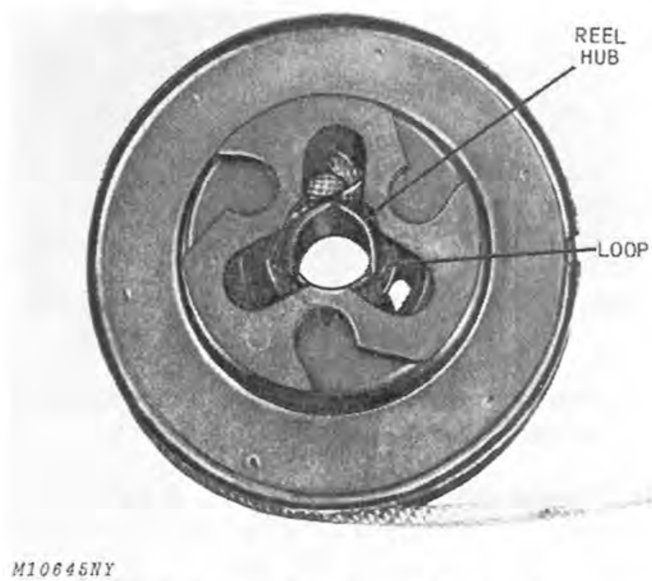


Fig. 10-Installing Rope Around Reel Hub

Place loop around reel hub and pull tight, Fig. 10. Wind rope counterclockwise around reel when viewed as shown, Fig. 10.

Installing Recoil Spring

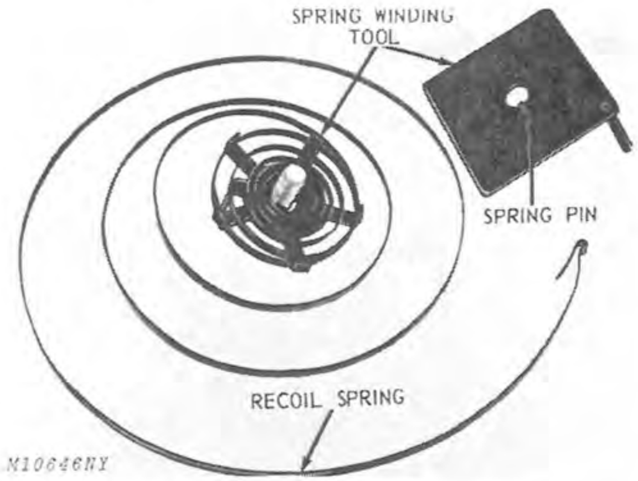


Fig. 11-Installing Recoil Spring Into Winding Tool

Place recoil spring into spring winding tool as shown, Fig. 11, so spring will be wound into tool by winding clockwise.

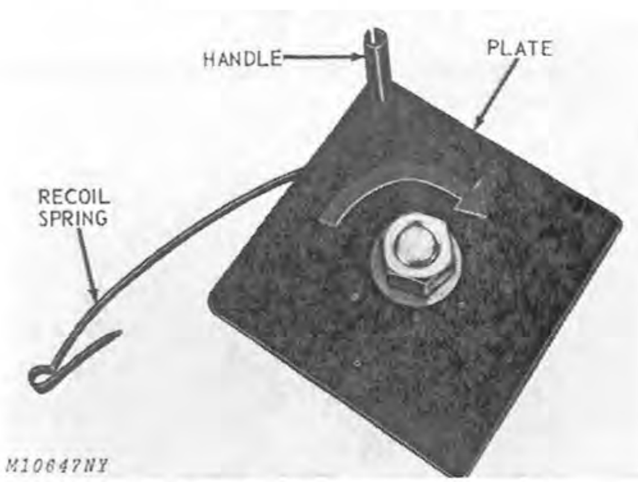


Fig. 12-Winding Recoil Spring Into Winding Tool

Assemble winding tool and wind plate, with handle, clockwise to wind spring into tool, Fig. 12.

Let plate with handle unwind and remove bolt and plate.

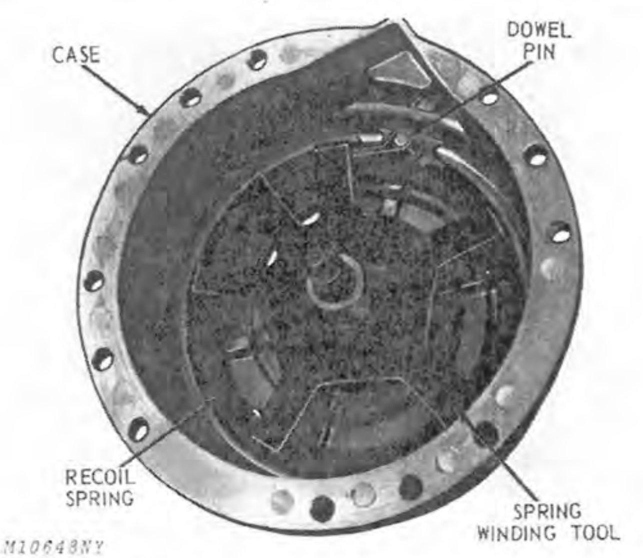


Fig. 13-Installing Recoil Spring Into Case

Set spring winding tool with spring into place in case with loop on spring end positioned as shown, Fig. 13, around dowel pin.

Carefully pull winding tool off recoil spring, leaving spring in position in case. Lightly coat spring with low temperature grease.

Installing Reel Assembly

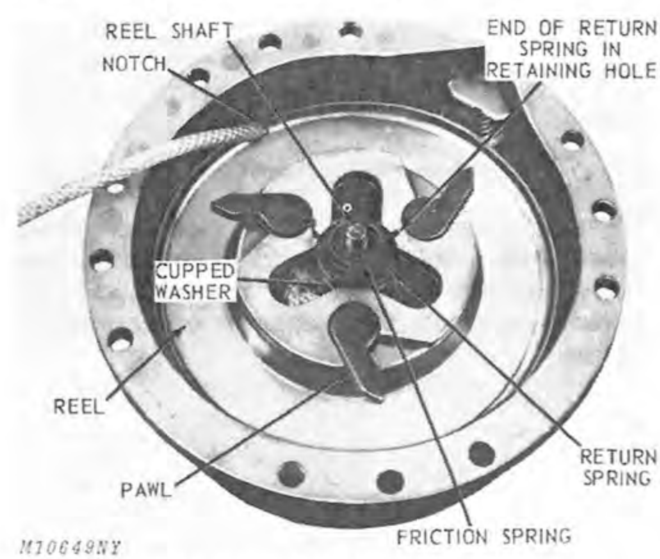


Fig. 14-Installing Reel, Pawls, and Springs

Apply a light film of low-temperature grease to the reel shaft.

Place end of rope through notch in reel and place reel in position on reel shaft, Fig. 14.

NOTE: Position inner end of recoil spring away from reel shaft or reel will not drop into position properly.

Place cupped washer, cup up, onto reel shaft. Place friction spring and return spring into place, Fig. 14.

IMPORTANT: End of return spring must be placed into retaining hole in reel, Fig. 14, or pawls will not retract properly.

Apply a light film of low-temperature grease to the three pawls and position them as shown, Fig. 14.

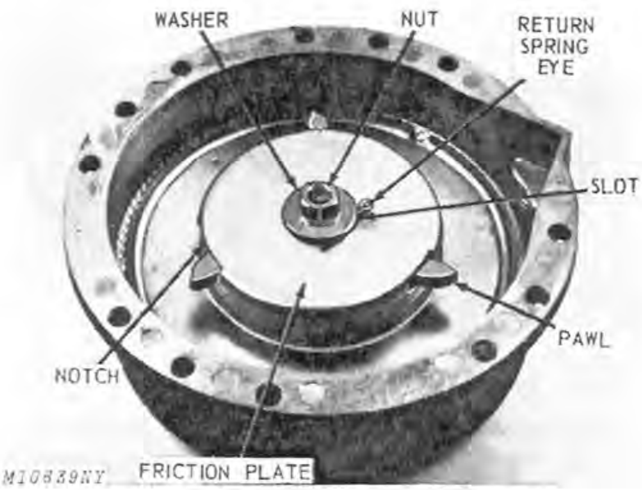


Fig. 15-Installing Friction Plate

Slip eye of return spring, Fig. 15, through slot in friction plate and position friction plate so notches line up with pawls. Install washer, lock washer and nut and tighten securely. Lubricate washer with PT569 Never-Seez between the washer and the friction plate.

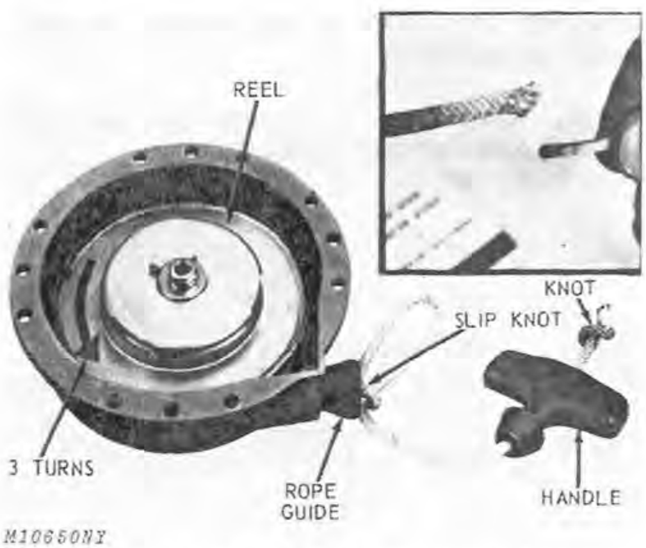


Fig. 16-Installing Rope Guide and Handle

Tension reel by winding it three turns counterclockwise. Insert rope through eye of case and rope guide and tie a slip knot, Fig. 16. Thread rope guide into case.

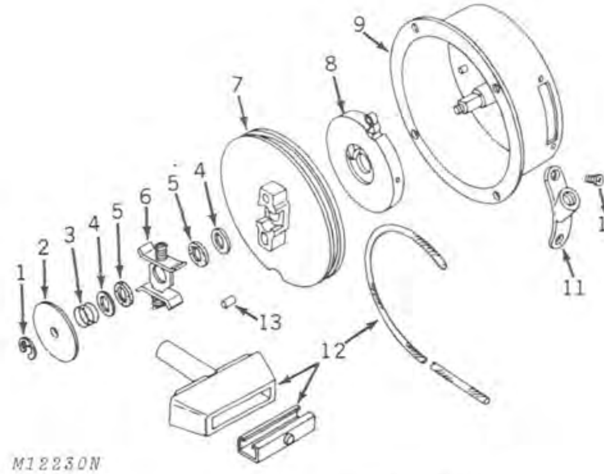
NOTE: It may be necessary to heat end of rope with a match to fuse strands (see inset, Fig. 16). This will enable rope to be threaded easily through rope guide and handle.

Insert end of rope through handle, tie a knot, Fig. 16, and pull knot into handle. Untie slip knot and check operation of recoil starter.

Pawls should extend when rope is pulled and retract when rope is released. Rope should recoil sharply back into case.

KOHLER ENGINES ON JDX4 (Serial No. -20,000) AND 300 SNOWMOBILES (Serial No. 20,001-21,504)

DISASSEMBLY



1—Circlip
2—Retainer Washer
3—Brake Spring
4—Steel Washer
5—Fiber Washer
6—Pawl Assembly
7—Pulley Assembly
8—Recoil Spring
9—Housing
10—Guide Screw
11—Rope Guide
12—Rope Assembly
13—Rope Lock

Fig. 17-Kohler Engine Recoil Starter Assembly for JDX4 Snowmobiles (Serial No. -20,000) and 300 Snowmobiles (Serial No. 20,001-21,504)

To prepare recoil starter for disassembly, remove rope handle, Fig. 17, and allow pulley to unwind.

Remove circlip, retainer washer, brake spring, steel washer, fiber washer, and pawl assembly.

Lift out recoil spring.

NOTE: There is no service on the recoil spring. The recoil spring is serviced in a steel case.

ASSEMBLY

Fig. 18-Recoil Spring Installed in Housing

Install recoil spring in housing as shown in Fig. 18.

To service rope in pulley proceed as follows:

Remove any pieces of old rope remaining in pulley. Save the rope lock that the pulley end of the rope is wrapped around.

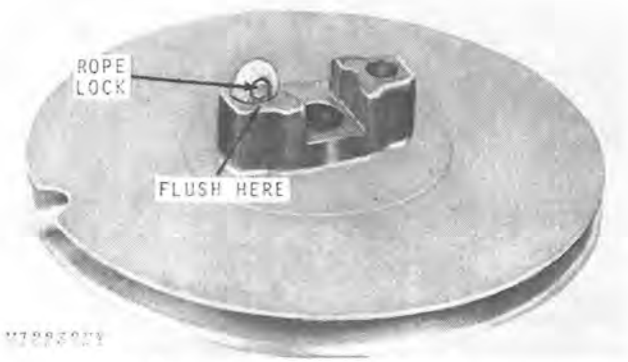


Fig. 19-Rope Installed in Pulley

Fuse both ends of the new rope with a match. Then bend one end of rope into a "U" shape around the rope lock, Fig. 19, and insert into hole in pulley hub. Be sure loop is flush with top of pulley hub, Fig. 19. Run the rope in the groove on inside of pulley. Wrap the rope around the pulley in a counterclockwise direction (when facing outside face of pulley).

Pull the open end of the rope through the notch in the pulley.

Install pulley with rope in housing.

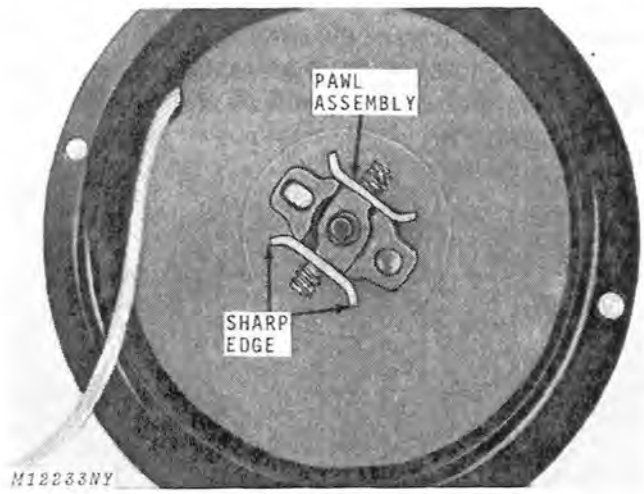


Fig. 20-Pawl Assembly

Install steel washer, fiber washer and pawl assembly as shown in Fig. 20. Then install fiber washer, steel washer, brake spring, retainer washer and circlip.

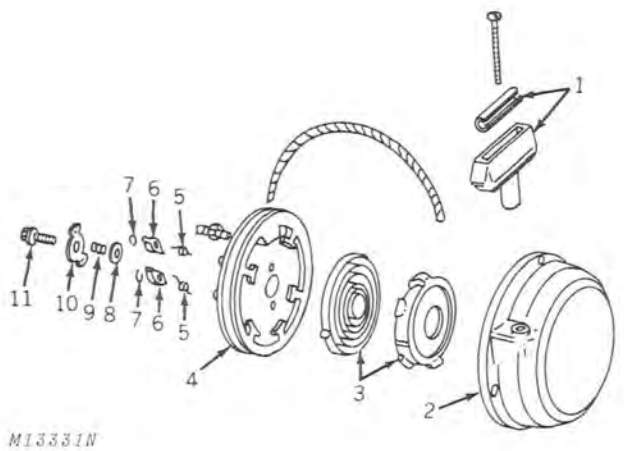
Pre-tension pulley by rotating counterclockwise 3-1/2 to 4 turns; then, hold in this position and thread rope end through the rope guide.

Pull the rope out about 6 inches, tie a slip knot in the rope to prevent it from retracting. Insert the rope through the handle and hole in retainer. Tie a permanent knot in the end of the rope and then install the retainer in the handle.

Release the slip knot and guide the rope slowly back into the retracted position.

KOHLER ENGINE ON 300 SNOWMOBILE (Serial No. 21,505-)

DISASSEMBLY



1—Handle
2—Housing
3—Spring and Keeper
4—Pulley
5—Pawl Spring
6—Pawl
7—Retaining Rings
8—Brake Washer
9—Brake Spring
10—Pawl Cam
11—Center Screw

Fig. 21-Kohler Engine Recoil Starter Assembly for 300 Snowmobiles (Serial No. 21,505-)

To prepare recoil starter for disassembly, remove rope handle, Fig. 21, and allow pulley to unwind.

Remove center screw, pawl cam, brake spring and brake washer.

Remove retaining rings, pawls and pawl springs.

Lift pulley, spring and keeper assembly out of housing.

NOTE: There is no service on the recoil spring. The recoil spring is serviced in a steel case.

INSPECTION

Replace rope if broken or frayed.

Check pawls and starter cup engagement surfaces for wear.

Check pawl return springs for adequate tension.

ASSEMBLY

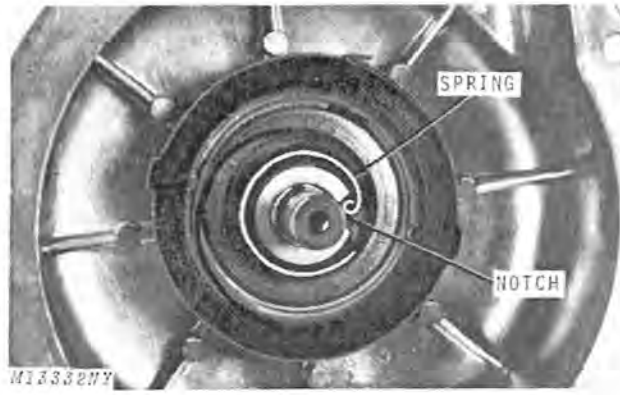


Fig. 22-Installing Recoil Spring in Housing

Install spring and keeper assembly into housing, placing loop on end of spring into notch as shown in Fig. 22. Apply a liberal coat of grease to outer spring surfaces and to pulley shaft.

Lubricate pawl pivot shafts with oil. Install pawl springs, pawls and retaining rings on pulley.

Fig. 23-Installing Pulley in Housing

To install a new rope, fuse both ends of the new rope with a match. Insert the rope through the hole in the pulley and tie a permanent knot in the end of the rope. Wrap the rope around the pulley in a counter-clockwise direction. File a small notch in pulley rim as shown in Fig. 23. This will permit easier spring pretensioning.

Hold rope in notch, and install pulley into housing. Rotate pulley until it drops in place, Fig. 23.

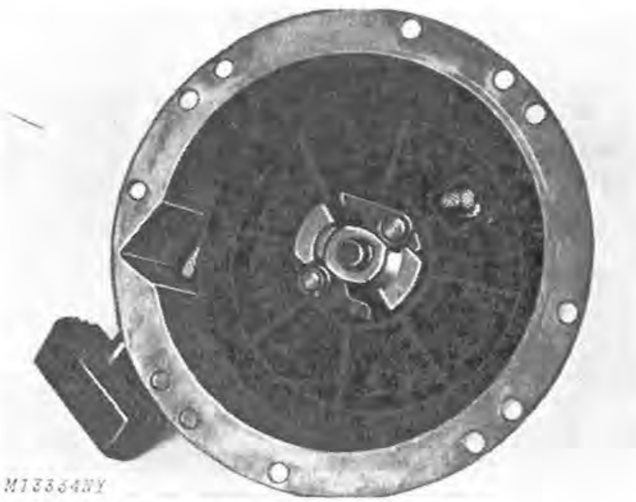


Fig. 24-Recoil Starter Assembled

Install brake washer, brake spring and pawl cam. Lubricate center screw bearing surfaces with a light coat of grease. Install center screw and torque to 60 in-lbs.

Hold rope in notch and wind pulley counterclockwise two turns. Insert rope through hole in housing. Pull rope out about 12 inches and tie a slip knot in the rope to prevent it from retracting.

Insert the rope through the handle and hole in the retainer. Tie a permanent knot in the end of the rope and then install the retainer in the handle.

Release the slip knot and guide the rope slowly back into the retracted position, Fig. 24.

Group 35
SPECIFICATIONS

SPECIFICATIONS

Item	New Part Dimension				Wear Tolerance
	300 JDX4	400* JDX4 Special	500	600	
Cylinder Bore	2.2631 in. to 2.2651 in. (57.483 mm to 57.534 mm)	2.3622 in. to 2.3629 in. (59.999 mm to 60.018 mm)	2.6772 in. to 2.6779 in. (68.001 mm to 68.019 mm)	2.6772 in. to 2.6779 in. (68.001 mm to 68.019 mm)	0.005 in. (0.127 mm)
Connecting Rod Small End	0.7872 in. to 0.7876 in. (19.995 mm to 20.005 mm)	0.8664 in. to 0.8669 in. (22.007 mm to 22.019 mm)	0.8664 in. to 0.8669 in. (22.007 mm to 22.019 mm)	0.8664 in. to 0.8669 in. (22.007 mm to 22.019 mm)	0.0005 in. (0.0127 mm)
Connecting Rod Side Clearance	0.008 in. to 0.016 in. (0.203 mm to 0.406 mm)	0.014 in. to 0.016 in. (0.356 mm to 0.406 mm)	0.014 in. to 0.016 in. (0.356 mm to 0.406 mm)	0.014 in. to 0.016 in. (0.356 mm to 0.406 mm)	+0.004 in. (+0.1016 mm)
Crankshaft Runout	0.0012 (0.030 mm)	0.0035 in. (0.089 mm)	0.0035 in. (0.089 mm)	0.0035 in. (0.089 mm)	
Crankshaft Twist					0.003 in. off TDC (0.076 mm)
Piston Top Land	2.2504 in. to 2.2516 in. (57.160 mm to 57.191 mm)	2.3500 in. to 2.3510 in. (59.690 mm to 59.715 mm)	2.6650 in. to 2.6660 in. (67.691 mm to 67.716 mm)	2.6650 in. to 2.6660 in. (67.691 mm to 67.716 mm)	———
Piston at Skirt	2.2600 in. to 2.2608 in. (57.404 mm to 57.424 mm)	2.3570 in. to 2.3580 in. (59.868 mm to 59.893 mm)	2.6720 in. to 2.6730 in. (67.869 mm to 67.894 mm)	2.6720 in. to 2.6730 in. (67.869 mm to 67.894 mm)	0.005 in. (0.127 mm)
Piston Pin Bore	0.6300 in. to 0.6302 in. (16.002 mm to 16.007 mm)	0.7083 in. to 0.7087 in. (17.991 mm to 18.001 mm)	0.7083 in. to 0.7087 in. (17.991 mm to 18.001 mm)	0.7083 in. to 0.7087 in. (17.991 mm to 18.001 mm)	No Clearance Permissible
Piston Pin	0.6297 in. to 0.6299 in. (15.994 mm to 15.999 mm)	0.7084 in. to 0.7087 in. (17.993 mm to 18.001 mm)	0.7084 in. to 0.7087 in. (17.993 mm to 18.001 mm)	0.7084 in. to 0.7087 in. (17.993 mm to 18.001 mm)	———
Ring Groove Clearance (top)	0.0022 in. to 0.0037 in. (0.056 mm to 0.094 mm)	0.004 in. (0.1016 mm)	0.004 in. (0.1016 mm)	0.004 in. (0.1016 mm)	+0.002 in. (+0.0508 mm)
Ring Groove Clearance (bottom)	0.0012 in. to 0.0024 in. (0.030 mm to 0.061 mm)	0.003 in. (0.0762 mm)	0.003 in. (0.0762 mm)	0.003 in. (0.0762 mm)	+0.002 in. (+0.0508 mm)
Crankshaft O.D. (PTO End)*	30 mm	30 mm*	30 mm	30 mm	———
Crankshaft End Play	0.006 in. to 0.012 in. (0.1524 mm to 0.3048 mm)	0.003 in. (0.0762 mm)	0.003 in. (0.0762 mm)	0.003 in. (0.0762 mm)	———

400 Snowmobiles up to Serial No. 11,000 had 25 mm crankshafts.

SPECIFICATIONS—Continued

Item	New Part Demension JDX6	800 JDX8*	JD295/S	Wear Tolerance
Cylinder Bore	2.6000 in. to 2.6007 in. (66.04 mm to 66.058 mm)	2.6000 in. to 2.6007 in. (66.04 mm to 66.058 mm)	2.2047 in. to 2.2050 in. (55.999 mm to 56.007 mm)	0.005 in. (0.127 mm)
Connecting Rod Small End	0.7870 in. to 0.7878 in. (19.990 mm to 20.010 mm)	0.7870 in. to 0.7878 in. (19.990 mm to 20.010 mm)	0.8660 in. to 0.8667 in. (21.996 mm to 22.014 mm)	0.0005 in. (0.0127 mm)
Connecting Rod Side Clearance	0.014 in. to 0.016 in. (0.3556 mm to 0.4064 mm)	0.014 in. to 0.016 in. (0.3556 mm to 0.4064 mm)	0.014 in. to 0.016 in. (0.3556 mm to 0.4064 mm)	+0.004 in. (0.1016 mm)
Crankshaft Runout	0.0035 in. (0.0889 mm)	0.0035 in. (0.0889 mm)	0.0008 in. (0.0203 mm)	
Crankshaft Twist				0.003 in. off TDC (0.0762 mm)
Piston at Top Land	2.5880 in. to 2.6000 in. (65.735 mm to 66.04 mm)	2.5880 in. to 2.6000 in. (65.735 mm to 66.04 mm)	2.1870 in. to 2.1880 in. (55.550 mm to 55.575 mm)	———
Piston at Skirt	2.5953 in. to 2.6000 in. (65.921 mm to 66.04 mm)	2.5953 in. to 2.6000 in. (65.921 mm to 66.04 mm)	2.1950 in. to 2.1960 in. (55.753 mm to 55.778 mm)	0.005 in. (0.127 mm)
Piston Pin* Bore	0.7083 in. to 0.7087 in. (17.991 mm to 18.001 mm)	0.6296 in. to 0.6300 in.* (15.992 mm to 16.002 mm)	0.7080 in. to 0.7087 in. (17.983 mm to 18.001 mm)	No Clearance Permissable
Piston Pin*	0.7084 in. to 0.7087 in. (17.993 mm to 18.001 mm)	0.6297 in. to 0.6300 in. (15.994 mm to 16.002 mm)	0.7083 in. to 0.7087 in. (17.991 mm to 18.001 mm)	———
Ring Groove Clearance (top)	0.004 in. (0.1016 mm)	0.004 in. (0.1016 mm)	0.002 in. to 0.0035 in. (0.0508 mm to 0.0889 mm)	+0.002 in. (0.0508 mm)
Ring Groove Clearance (bottom)	0.003 in. (0.0762 mm)	0.003 in. (0.0762 mm)	0.002 in. to 0.0035 in. (0.0508 mm to 0.0889 mm)	+0.002 in. (0.0508 mm)
Crankshaft O.D. (PTO End)	30 mm	30 mm	30 mm	———
Crankshaft Endplay	0.003 in. (0.0762 mm)	0.003 in. (0.0762 mm)	.008 in. (0.2032 mm)	———

**JDX8 and 800 Snowmobiles beginning with Serial No. 20,001 have the same piston pin bore and piston pin as the 400, 500, 600, JDX4 Special and JDX6 Snowmobiles.*

SPARK PLUG SPECIFICATIONS

(Serial No. -20,000)

MODEL	BRAND	COLD**	NORMAL	HOT**
JDX4	AC	S41XL—AM52639	S42XL—AM52561	S43XL—AM52643
	Champion	N-2—AM52640	N-3—AM52432	N-4—AM52644
	Champion*	N-59G—AM52641	N-3G—AM52614	N-4G—AM52645
400-500-600	AC	S-41F—AM52272	S-42F—AM52301	————
	Champion	L-78—AM52266	L-81—AM52303	L-86—AM52646
	Champion*	L-4G—AM52613	L-6G—AM52304	L-9G—AM52647
JDX8	AC	————	S40F—AM52271	S41F—AM52272
	Champion	L77J—AM52642	L78—AM52266	L-81—AM52303
	Champion*	L-3G—AM52302	L-4G—AM52613	L-6G—AM52304

(Serial No. 20,001-30,000)

MODEL	BRAND	COLD**	NORMAL	HOT**
300	AC	S41XLR—AM53008	S42XLR—AM53007	S43XLR—AM53018
	Champion	RN2—AM53001	RN3—AM53006	RN4—AM53019
	Champion*	N59G—AM52641	RN3G—AM53016	RN4G—AM53020
400-500-600 JDX4 Special JDX6, JDX8	AC	S41XLR—AM53008	S42XLR—AM53223	S43XLR—AM53018
	Champion	N57—AM53014	RN2—AM53001	RN3—AM53006
	Champion*	N57G—AM53015	N2G—AM53488	RN3G—AM53016
JD295//S	AC	————	SV4XL—AM53223	————
	Champion	————	N19-V—AM53187	————

(Serial No. 30,001-)

MODEL	BRAND	COLD**	NORMAL	HOT**
300	AC	S41XLR—AM53008	S42XLR—AM53007	S43XLR—AM53018
	Champion	RN2—AM53001	RN3—AM53006	RN4—AM53019
	Champion*	N59G—AM52641	RN3G—AM53016	RN4G—AM53020
400, 600 JDX4, JDX6	AC	S41XLR—AM53008	S42XLR—AM53007	S43XLR—AM53018
	Champion	N57—AM53014	RN2—AM53001	RN3—AM53006
	Champion*	N57G—AM53015	N2G—AM53488	RN3G—AM53016
800, JDX8	AC	S40XLR—AM53487	S41XLR—AM53008	S42XLR—AM53007
	Champion	N57—AM53014	RN2—AM53001	RN3—AM53006
	Champion*	N57G—AM53015	N2G—AM53488***	RN3G—AM53016

**Gold-Palladium plugs.*

***Use "hot" or "cold" plugs only under circumstances explained in operator's manual. The "normal" heat range plug is proper for most snowmobiling.*

****Use N59G in place of N2G in the 800 and JDX8 Snowmobiles (Serial No. 30,001-) for high performance or continuous high-speed operation.*

(Specifications and design subject to change without notice.)

Torque for Hardware

	Torque	
Location	KIORITZ AND CCW	KOHLER
Crankcase	15 to 18 ft-lbs (20.337 Nm to 24.405 Nm)	————
Cylinder-to-Crankcase	15 to 18 ft-lbs (20.337 Nm to 24.405 Nm)	15 to 18 ft-lbs (20.337 Nm to 24.405 Nm)
Cylinder Head	15 to 18 ft-lbs (20.337 Nm to 24.405 Nm)	15 to 18 ft-lbs (20.337 Nm to 24.405 Nm)
Intake and Exhaust Manifold	10 to 12 ft-lbs (13.558 Nm to 16.270 Nm)	15 to 18 ft-lbs (20.337 Nm to 24.405 Nm)
Flywheel-to-Crankshaft	60 ft-lbs (81.360 Nm)	85 to 90 ft-lbs (115.245 Nm to 122.024 Nm)
Fan Pulley Retaining Nut	28 to 31 ft-lbs (37.963 Nm to 42.030 Nm)	30 to 40 ft-lbs (40.675 Nm to 54.233 Nm)
PTO End Bearing Plate	————	8 to 10 ft-lbs (10.847 Nm to 13.558 Nm)
Spark Plug	14 ft-lbs (18.981 Nm)	14 ft-lbs (18.981 Nm)

Section 30
FUEL SYSTEM
Group 5
GENERAL INFORMATION

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Litho in U.S.A.

PRINCIPLE OF OPERATION

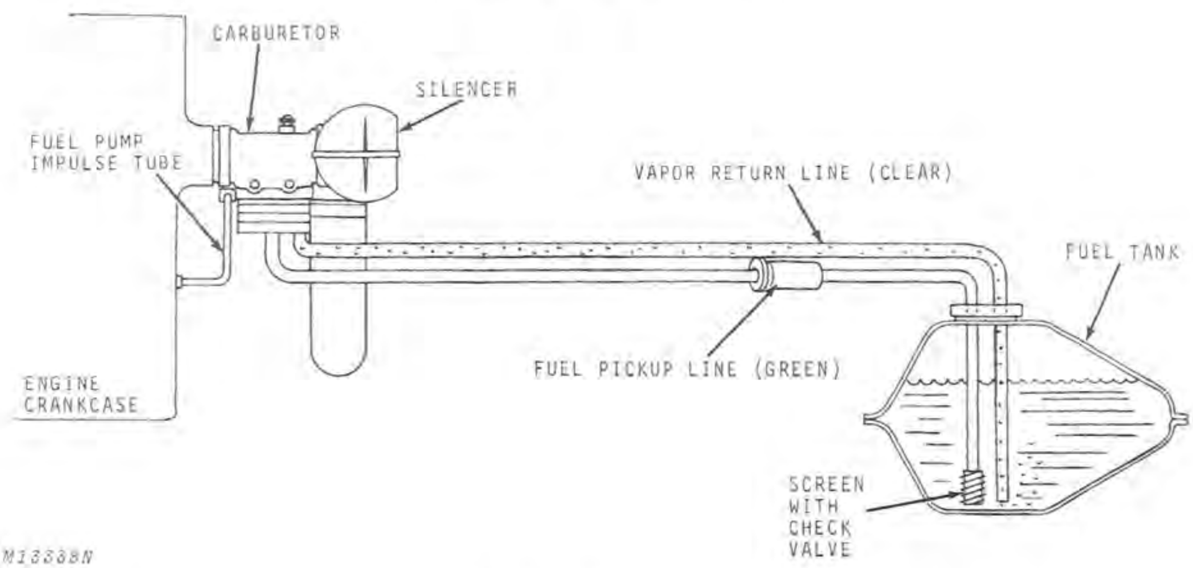


Fig. 1-Fuel System

The fuel system, Fig. 1, consists of a fuel tank, fuel line or lines, in-line fuel filter and carburetor. The Walbro carburetor has an integral fuel pump. An auxiliary impulse pump is provided with the Bendix carburetor.

Gasoline must be mixed with a good-quality oil that is suitable for use in 2-cycle, air-cooled, snowmobile engines (see page 10-20-1 for gasoline and fuel specifications). The oil in the fuel is the only lubrication the engine receives.

IMPORTANT: Too lean a fuel mixture starves the engine of lubrication and causes severe engine damage. This is especially true on the reed valve engines. Never adjust the carburetor on the reed valve engines less than 7/8 of a turn open.

The steel fuel tank has a capacity of 5.50 U.S. gallons (20.8 l) and the plastic fuel tank has a capacity of 6.50 U.S. gallons (24.6 l). A fuel gauge and separate fill opening are standard equipment on all snowmobiles except the JDX4 (Serial No. -20000). The fuel gauge was optional equipment on these machines. A spill tray prevents fuel from collecting in the pan of the snowmobile.

The fuel pickup line in the tank has a self-cleaning screen with a ball-type check valve. This valve prevents fuel from running from the carburetor back to the tank when the engine is stopped.

The nylon screen in the in-line fuel filter has a self-cleaning action. Pulsation of the screen shakes loose contamination such as dirt, rust and small fibers. Loose contamination collects at the base of the cone.

A fuel pump is necessary because the carburetor is mounted higher than the fuel tank. The fuel pumps (integral diaphragm-type Walbro carburetors or auxiliary impulse-type Bendix and Mikuni carburetors) operate off differential pressure in the engine crankcase.

The chart below shows the Snowmobiles by Serial Number and the carburetor used:

SNOWMOBILE		CARBURETOR	
Model	Serial Number	Manufacturer	Series
400	(-11000)	Walbro	WR-7
500	(-11000)	Walbro	WD-8
400,500	(11001-20000)	Walbro	WDA-32
600	(-20000)	Walbro	WDA-32
JDX4	(-20000)	Walbro	WDA-37
JDX8	(-20000)	Walbro	WDA-34
300	(20001-)	Walbro	WDA-31
400,500, 600,JDX4 Special	(20001-30000)	Bendix	1612
JDX6,JDX8	(20001-30000)	Walbro	WRA-31
JD295/S	(20001-30000)	Mikuni	VM34-55
400,600	(30001-)	Bendix	1612
800,JDX4, JDX6,JDX8	(30001-)	Walbro	WRA-31

All carburetors permit operation at any angle. The Walbro carburetors have a recirculating feature which requires a vapor return line to carry excess fuel and vapors back to the fuel tank. The Bendix carburetors do not require a return line because they are float-type carburetors.

The fuel lines are color-coded for convenience. The green line is the fuel pickup line; the clear line, the vapor return line, Fig. 1.

A silencer is used to quiet incoming air and to catch fuel that may spit back out of the carburetor.

CRANKCASE DRAIN PLUGS

If engine is extremely flooded, remove drain plugs, Fig. 2, from lower crankcase half and allow fuel to drain. Install drain plugs.

See "Diagnosing Malfunctions" if problem persists.

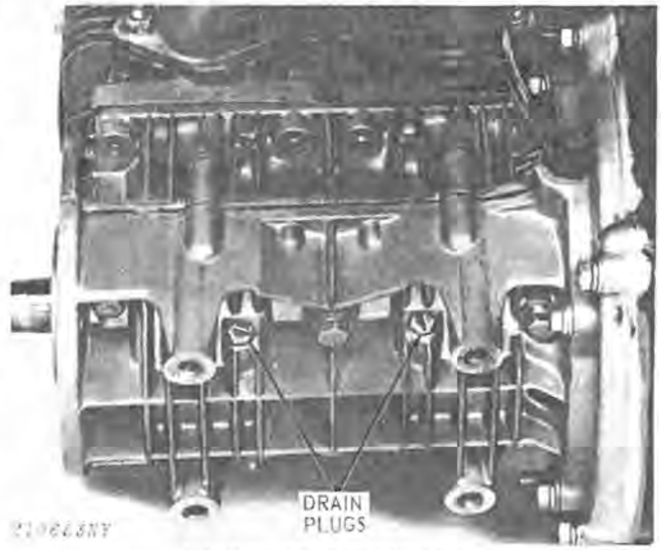


Fig. 2-Crankcase Drain Plugs

DIAGNOSING MALFUNCTIONS

Carburetor too Rich

Mixture needles out of adjustment.

Diaphragm lever set too high.

Dirt under inlet needle valve.

Metering lever spring not seated properly.

Fuel pump diaphragm leaking.

Dirt under umbrella check valve.

Mixture needles damaged.

Choke plate not opening properly.

Silencer restricted.

Lean Fuel-Air Mixture

Carburetor too lean. (See next column)

Air leakage at carburetor mounting gasket, heat spacer gasket or intake manifold gaskets.

Air leakage at crankshaft seals or crankcase mating surfaces. (See Section 20)

In-line fuel filter plugged or restricted.

Carburetor Too Lean

Mixture needles out of adjustment.

Dirt in idle fuel channels.

Metering lever set too low.

Leaking nozzle check valve diaphragm.

Hole in metering diaphragm.

Fuel pump pulse line plugged.

Leaking manifold gaskets.

Leaking diaphragm check valve.

Fuel pump diaphragm malfunctioning.

Dirty fuel inlet screen in carburetor.

Dirty fuel pickup strainer in fuel tank.

Fuel lines dirty.

Restricted gas gauge vent.

In-line fuel filter plugged or restricted

PRESSURE TESTING OF CARBURETOR

The JDM-44 Pressure Testing Tool can be used to pressure test Walbro carburetors as follows:

1. Plug vapor return fitting or hold thumb over fitting.

2. Connect pressure regulator to shop air. Regulator valve must be turned "OFF" (clockwise).

Fig. 3-JDM-44 Connected to Carburetor

3. Connect pressure regulator to center carburetor fitting, Fig. 3.

4. Open regulator valve very slightly. Pressure should build to "breakaway" pressure indicated in the chart.

Carburetor Model Number	Inlet Needle Valve Breakaway (psi)
WR-7, WD-8 WDA-32, WDA-37 WDB-31	13 to 17 psi
WDA-34	8 to 10 psi
WRA-31	6 to 9 psi

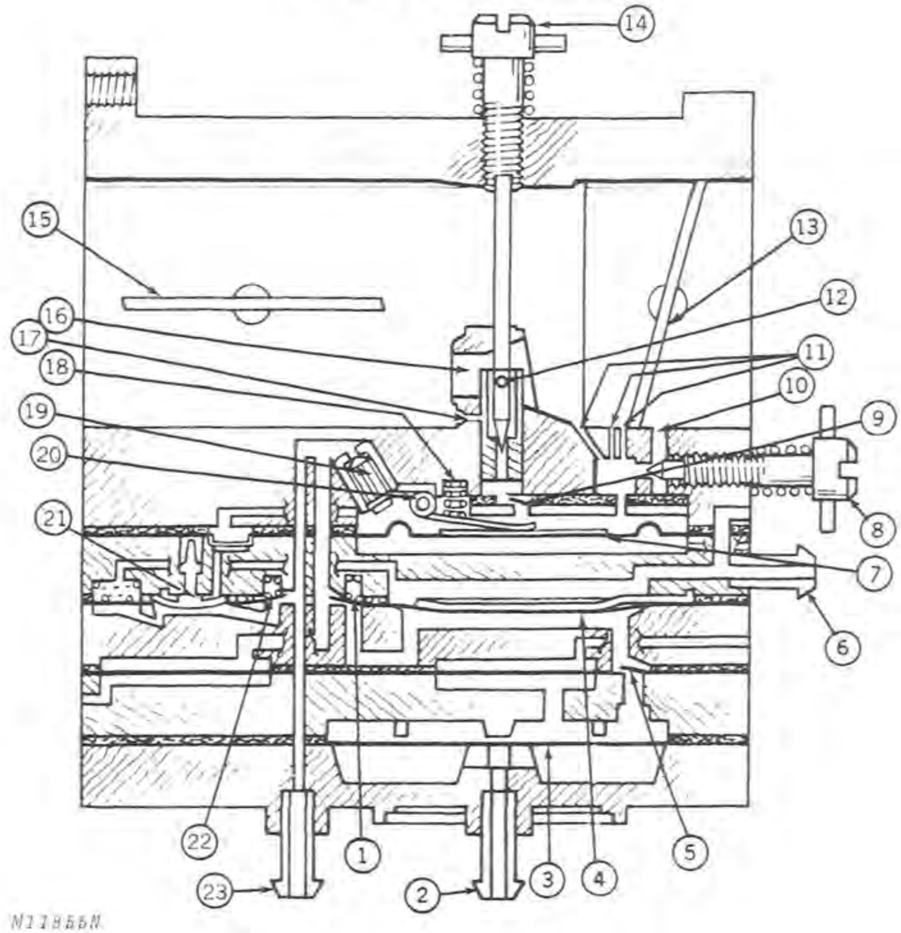
If pressure does not build, a stuck or damaged needle valve could be suspected. Also, check torque on four screws securing carburetor plates.

If "breakaway" readings vary from specification, the wrong metering lever spring could be the trouble.

If pressure regulator valve is turned "OFF" with carburetor pressurized, slow "leak-back" can be considered normal. However, excessive "leak-back" would indicate a malfunctioning needle valve or leaking gaskets.

Group 10
WALBRO CARBURETORS

GENERAL INFORMATION



1—Fuel Pump Outlet Check Valve
2—Fuel Inlet
3—Filter Screen
4—Filter Pump Diaphragm
5—Fuel Pump Inlet Check Valve
6—Impulse Inlet
7—Metering Diaphragm
8—Idle Mixture Needle
9—Main Nozzle Check Valve
10—Idle Discharge Port
11—Secondary Idle Discharge Ports
12—Main Nozzle
13—Throttle Plate
14—High-Speed Mixture Needle
15—Choke Plate
16—Venturi
17—Nozzle Air Bleed
18—Metering Lever Spring
19—Needle Valve
20—Metering Lever
21—Umbrella Check Valve
22—Outlet Check Valve
23—Vapor Return Outlet

Fig.1-Cutaway View of Walbro WDA-34 Carburetor

The Walbro carburetors, Fig. 1, used on John Deere Snowmobiles (refer to page 30-5-2 to determine what carburetor model is used on snowmobile in question) are all basically the same. Differences are as follows:

The WR-7 and WD-8 carburetors differ in the mounting flange and throat size.

The WDA-34 and WDA-37 carburetors differ from the WDA-32. The WDA-32 does not have an air bleed hole (17,Fig.1) at the base of the boost venturi. The WDA-37 has a 0.035-inch air bleed hole at the base of the boost venturi. The WDA-34 has a 0.060-inch air bleed hole at the base of the boost venturi, a larger bypass hole in the circuit plate and a lighter metering lever spring.

The WDA-31 and WRA-31 have the same mounting flange but differ in throat size and metering lever springs.

These carburetors are of the diaphragm-type, which allows engine operation at any angle.

The carburetors have an integral fuel pump operating off differential pressure in the crankcase. Crankcase pressure is transmitted to the carburetor by an external impulse tube.

A recirculating device in the carburetor returns excess fuel and vapors to the fuel tank to prevent vapor lock.

The same repair kit can be used on all Walbro carburetors.

PRINCIPLE OF OPERATION

Refer to Fig. 1, page 30-10-1 for carburetor part identification.

Fuel, pumped from the fuel tank, enters the carburetor through the inlet fitting (2) and then passes through the filter screen (3).

Fuel entering the discharge port areas must pass the needle valve (19) which is controlled by the metering diaphragm (7). Excess fuel and vapors bypass the needle valve and are pumped back to the fuel tank, passing through the vapor return outlet (23).

Choke and Starting Operation

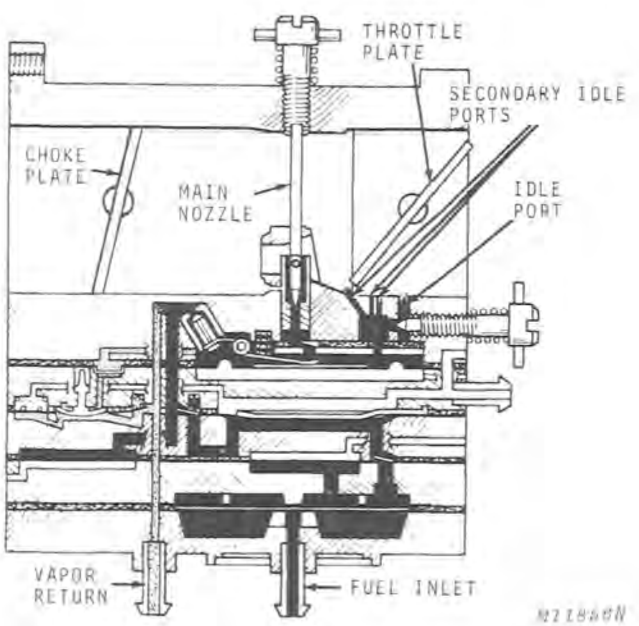


Fig. 2-Choke and Starting Operation

With the choke plate (15, Fig. 1) closed and the throttle plate (13) in intermediate position (Fig. 2), fuel is discharged out of all ports and nozzles to provide the rich mixture necessary for starting.

Idle Operation

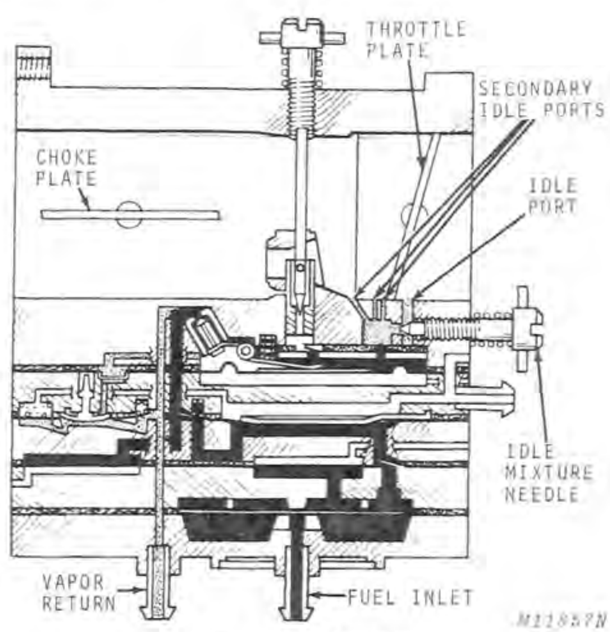


Fig. 3-Idle Operation

When idling, the choke plate is open and the throttle plate is in the closed position (Fig. 3). Idle speed is controlled by an idle stop screw on the throttle plate linkage. Fuel is mixed with air, which enters the secondary idle discharge ports and this mixture is then discharged out the idle discharge port.

Intermediate Operation

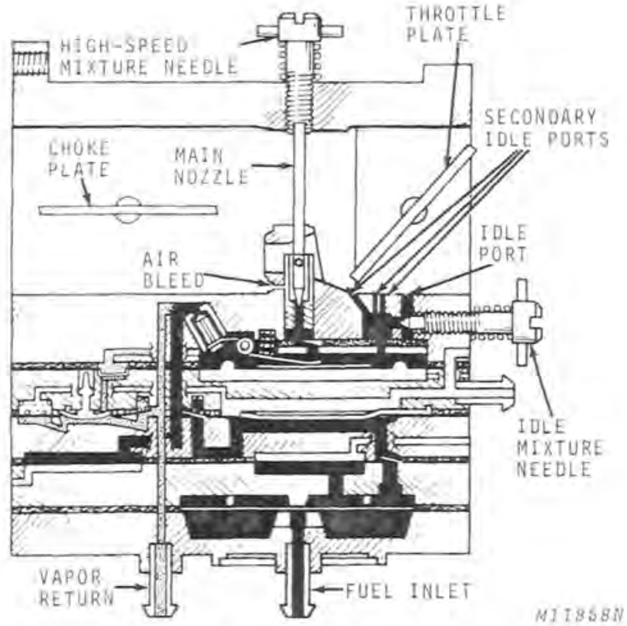


Fig. 4-Intermediate Operation

At part throttle the throttle plate is positioned to expose the secondary idle discharge ports (Fig. 4). Fuel is discharged through the idle system discharge port and the secondary idle discharge ports. Air enters the air bleed and main nozzle, is mixed with fuel, and is discharged from the secondary idle and idle discharge ports.

Full Throttle Operation

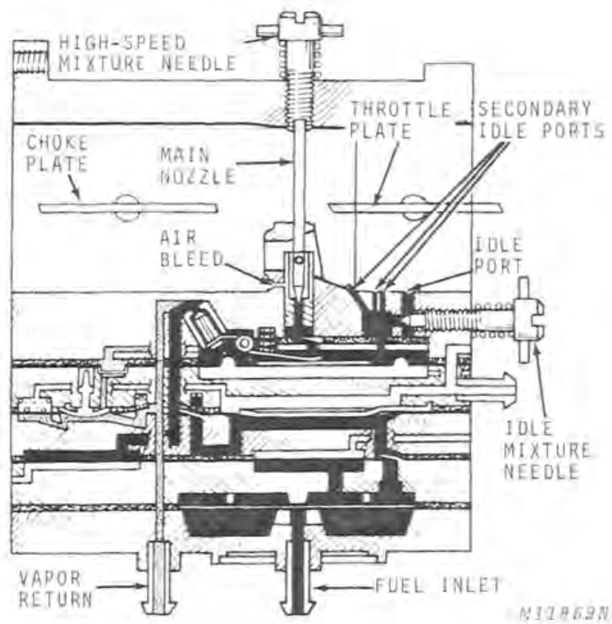
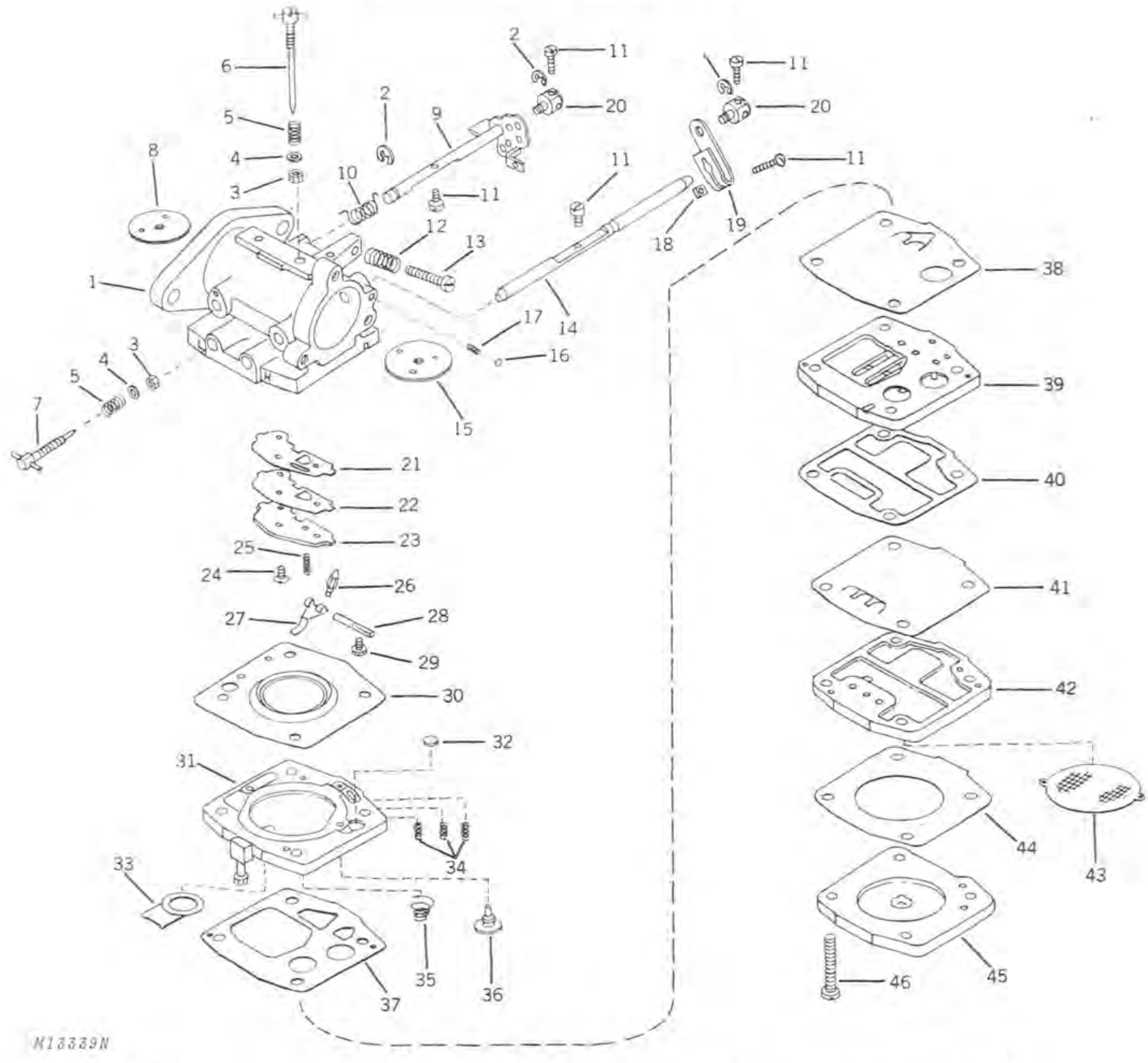


Fig. 5-Full Throttle Operation

At full throttle, both choke and throttle plates are in the full open positions (Fig. 5). Air is mixed with fuel through the air bleed and this mixture is discharged through the main nozzle and secondary idle and idle discharge ports.

DISASSEMBLY AND REPAIR



1—Carburetor Body
2—Retaining Ring
3—Packing Ring
4—Washer
5—Needle Spring
6—High-Speed Mixture Needle
7—Idle Mixture Needle
8—Throttle Plate
9—Throttle Shaft
10—Throttle Return Spring
11—Screw
12—Spring
13—Idle Stop Screw
14—Choke Shaft
15—Choke Valve
16—Detent Ball
17—Detent Spring
18—Nut
19—Choke Lever
20—Swivel
21—Circuit Plate Gasket
22—Circuit Diaphragm
23—Circuit Plate
24—Circuit Plate Screw (3 used)
25—Metering Lever Spring
26—Needle Valve
27—Metering Lever
28—Lever Pin
29—Lever Pin Screw
30—Metering Diaphragm
31—Metering Diaphragm Plate
32—Screen
33—Fuel Pump Spring
34—Valve Spring
35—Pressure Spring
36—Check Valve
37—Fuel Pump Gasket
38—Fuel Pump Diaphragm
39—Fuel Pump Plate
40—Check Valve Gasket
41—Check Valve Diaphragm
42—Filter Plate
43—Filter Screen
44—Fuel Inlet Gasket
45—Cover Plate
46—Cover Screw (4 used)

Fig. 6-Exploded View of Walbro Carburetor

Removing Carburetor

Remove windshield and console.

Disconnect choke and throttle cables, fuel inlet and vapor return lines, and fuel pump impulse tube from carburetor.

Remove the silencer and throttle and choke bracket, Fig. 9, and carburetor from intake manifold.

Disassembling Carburetor

Prior to disassembly, carefully clean the exterior surfaces of the carburetor using cleaning solvent.

IMPORTANT: Never use compressed air to clean an assembled carburetor because diaphragm damage may result.

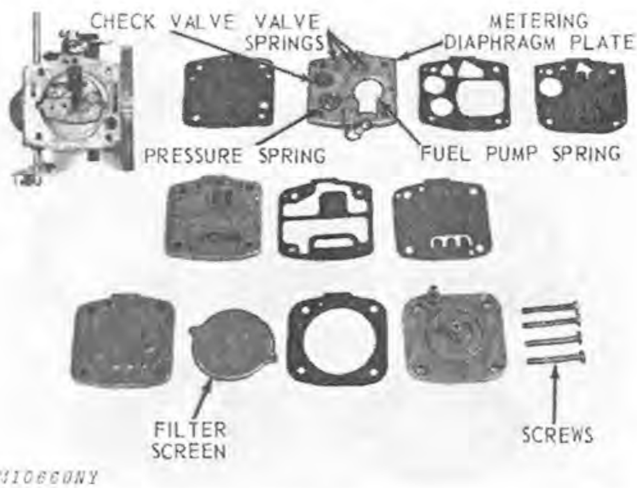


Fig. 7-Disassembling Plates

Remove four screws, Fig. 7, securing plates and diaphragms to carburetor body. Remove plates, diaphragms, gaskets and filter screen.

Remove three valve springs, check valve, pressure spring, screen and fuel pump spring from metering diaphragm plate, Fig. 7. See Fig. 6 for location of screen (32).

Remove the screw securing the lever pin, Fig. 8, and remove lever, lever pin, needle valve and spring.

Remove the three screws securing circuit plate, Fig. 8, and remove circuit plate, circuit plate diaphragm and two gaskets.

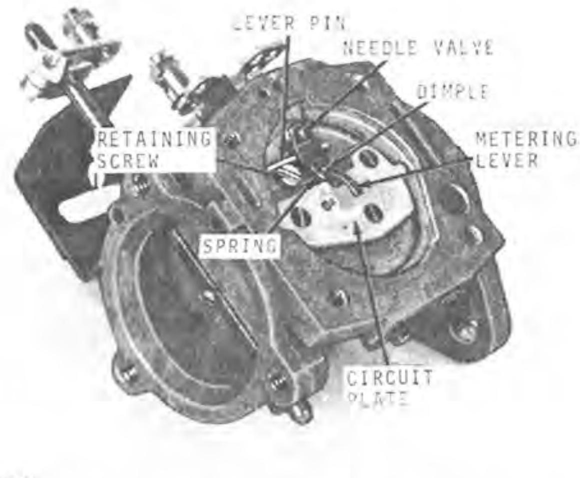


Fig. 8-Removing Needle Valve and Circuit Plate

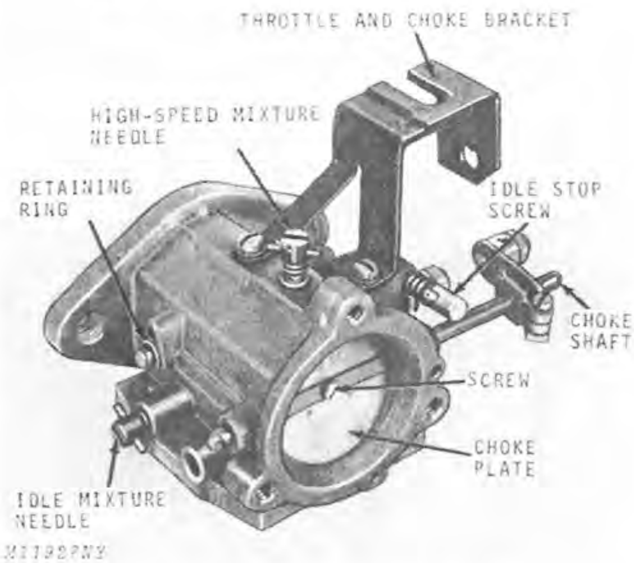


Fig. 9-Removing Mixture Needles

Remove idle and high-speed mixture needles. Fig. 9, from carburetor body, and disassemble packing rings, washers and springs from needles.

Remove screw and choke plate, Fig. 9, from choke shaft, and remove choke shaft from carburetor body. Remove detent ball and spring.

Remove retaining ring, Fig. 9, throttle plate screw and throttle plate from throttle shaft, and remove throttle shaft from carburetor body.

Remove throttle bracket and idle stop screw, Fig. 9.

Cleaning Carburetor

Clean all metallic parts in a carburetor cleaning solvent. Do not place gaskets or diaphragms in solvent.

IMPORTANT: Never clean holes or passages with small drill bits or wire because a slight enlargement or burring of these holes will change the performance of the carburetor. No method of cleaning other than solvent should be used.

Place carburetor parts in a suitable basket and immerse basket in a container of carburetor cleaning solution.

Allow parts to remain in solution from one to two hours. Then remove and rinse with fresh cleaning solvent. Dry with compressed air, making sure all holes are open and free of carbon and dirt. Never use rags or waste paper to dry the parts. Any lint may plug jets or channels and affect operating efficiency of carburetor.

INSPECTION

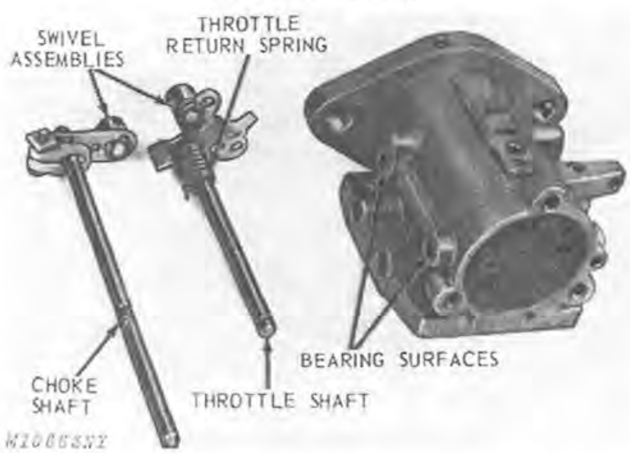


Fig. 10-Inspecting Carburetor Body and Shafts

Inspect shaft bearing surfaces in carburetor body, Fig. 10, for excessive wear. Inspect bearing surfaces on choke and throttle shaft for wear.

Excessive clearance between shafts and body will allow air to enter, causing a detrimental, lean mixture.

Inspect choke and throttle plates for damage. Also inspect swivel assemblies on choke and throttle levers for wear. Inspect condition of throttle return spring, Fig. 10.

Replace parts if necessary.

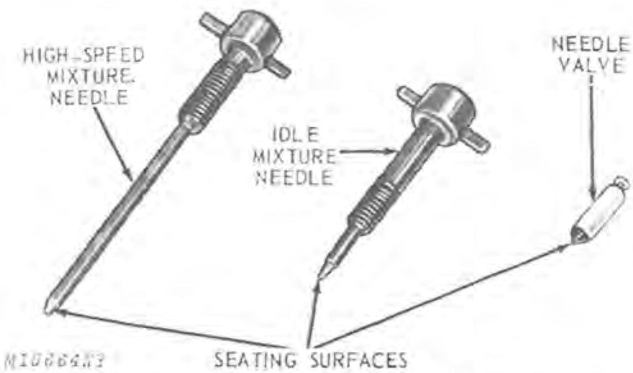


Fig. 11-Inspecting Mixture Needle and Needle Valve

Inspect mixture needles and needle valve seating surfaces for pitting or wear, Fig. 11. Replace if necessary.

Fig. 12-Inspecting Diaphragms and Gaskets

Inspect all diaphragms for distortion, cracks, or punctures, Fig. 12.

Inspect all gaskets for damage or tears, Fig. 12. Carefully inspect carburetor mounting gasket and heat spacer gasket.

IMPORTANT: Air leaks between the carburetor and the engine will lean out the air-fuel mixture causing severe damage to the engine.

ASSEMBLY

Carburetor Repair Kit

Fig. 13-Carburetor Repair Kit

Use the repair kit, Fig. 13, to completely rebuild the carburetor.

A gasket and diaphragm kit, which is included in the repair kit, is also available for service if complete rebuilding is not necessary.

Throttle Assembly

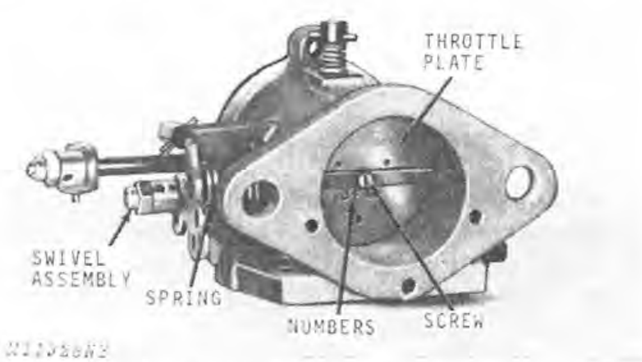


Fig. 14-Installing Throttle Shaft and Plate

Replace throttle lever swivel assembly, Fig. 14, if worn.

Install throttle shaft, with spring, in carburetor body and secure with retaining ring. Insert throttle plate as shown, Fig. 14, with numbers facing out and below shaft. Secure with screw (use Loctite on screw).

IMPORTANT: Close throttle plate and allow it to center itself properly to seal inside carburetor body before tightening screw.

Choke Assembly

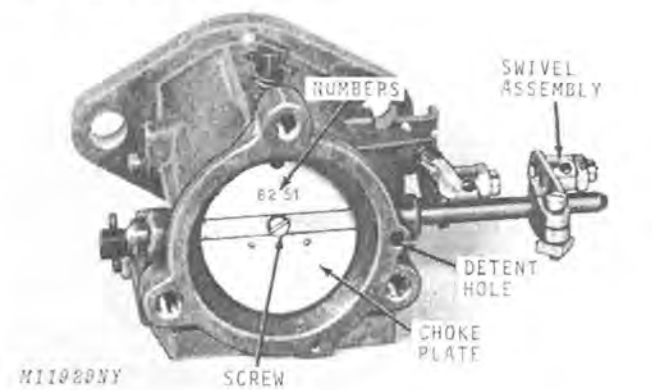


Fig. 15-Installing Choke Shaft and Plate

Replace choke lever swivel assembly, Fig. 15, if worn. Install detent spring and detent ball in hole in carburetor body.

Install choke shaft in carburetor body. Insert choke plate as shown, Fig. 15, with numbers facing out and notch on top. Secure with screw (use Loctite on screw). Be certain plate is positioned properly within carburetor body before tightening screw.

Mixture Needle Assembly

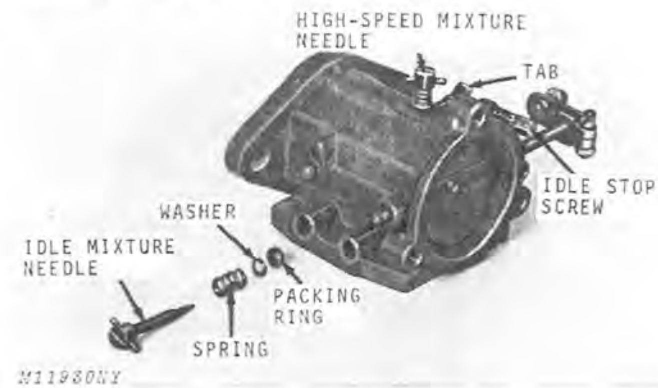


Fig. 16-Installing Mixture Needles

Install spring, washer and packing ring on each mixture needle, Fig. 16, and install needles in carburetor body. Install idle stop screw and spring.

Carefully seat both needles using finger pressure only. Do not force as this will damage needle and seat.

Open high-speed mixture needle 7/8 turn. Open idle mixture needle 1 turn.

Turn idle stop screw in until it contacts the tab on the throttle lever; then turn one additional turn.

NOTE: These are preliminary adjustments only and will have to be reset with machine in operation. See page 30-10-10 for adjustments.

Circuit Plate Assembly

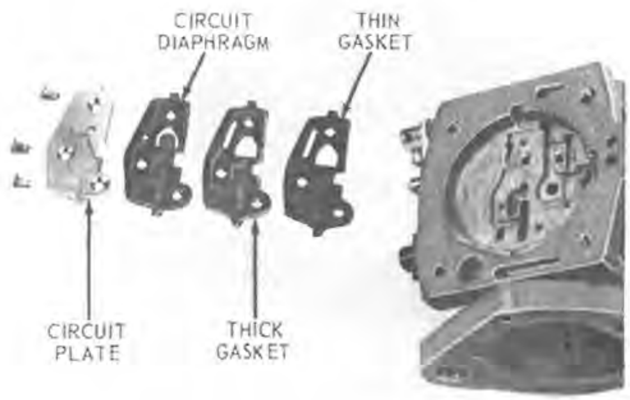


Fig. 17-Installing Circuit Plate Assembly

Install thin gasket, thick gasket, circuit diaphragm and circuit plate as shown, Fig. 17. Secure with three screws.

Needle Valve Assembly

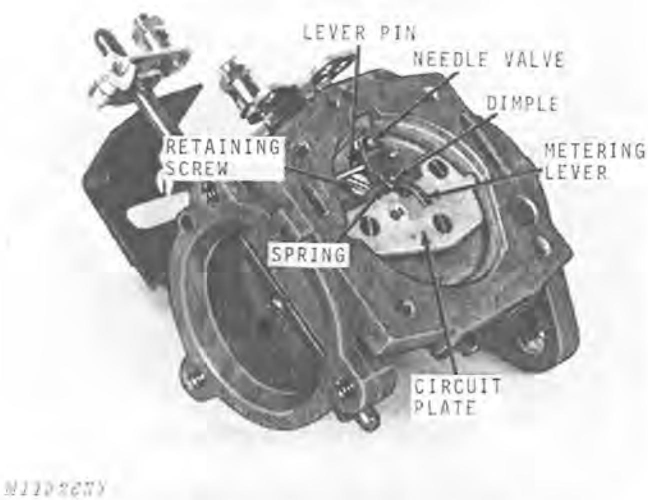


Fig. 18-Installing Needle Valve Assembly

Place spring in cavity in carburetor body. Place needle valve in tab on metering lever and install lever pin through metering lever, Fig. 18.

Install assembly in proper position in carburetor body and secure with screw, Fig. 18. Make certain spring is positioned around dimple in metering lever, Fig. 18.

NOTE: Metering lever springs are not included in the Carburetor Repair Kit because one spring will not service all carburetors. Use metering lever springs as outlined in the chart below.

Carburetor Model Number	Carburetor Part No.	Metering Lever Spring Part No.
WR-7	AM52007	M64836
WD-8	AM52267	M64836
WDA-32	AM52339	M64836
WDA-34	AM52558	M64835
WDA-37	AM52557	M64836
WRA-31	AM52875	M64834
WDB-31	AM52876	M64836

Adjusting Metering Lever

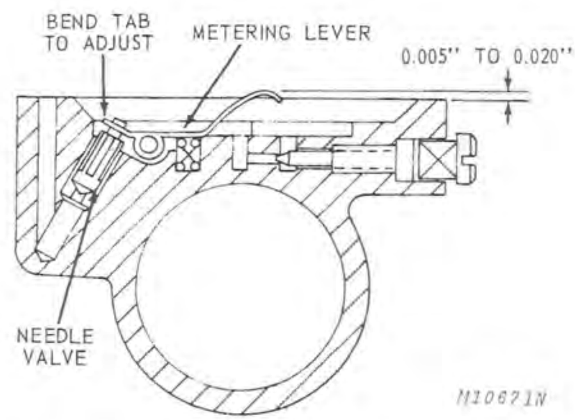


Fig. 19-Adjusting Metering Lever

Invert carburetor and lay a straight edge across carburetor body. The metering lever should be 0.005 to 0.020 inch (0.127 to 0.508 mm) above the carburetor body as shown in Fig. 19. Adjust as necessary by bending needle valve tab on metering lever.

Metering Diaphragm Plate Assembly

Install the three valve springs, pressure spring, check valve, and fuel pump spring in metering diaphragm plate as shown, Fig. 20.

Install small screen (32, Fig. 6, page 30-10-4) in other side of metering diaphragm plate.

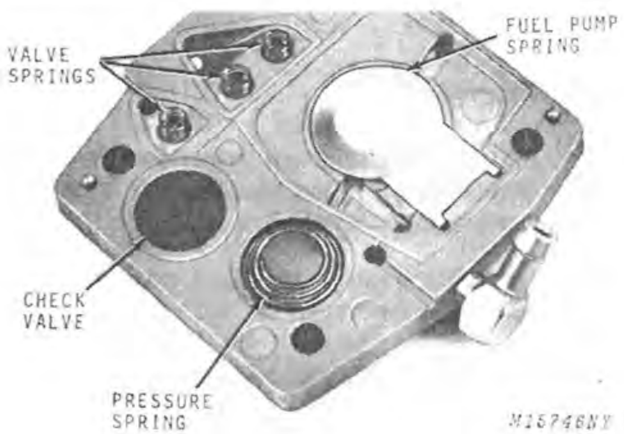
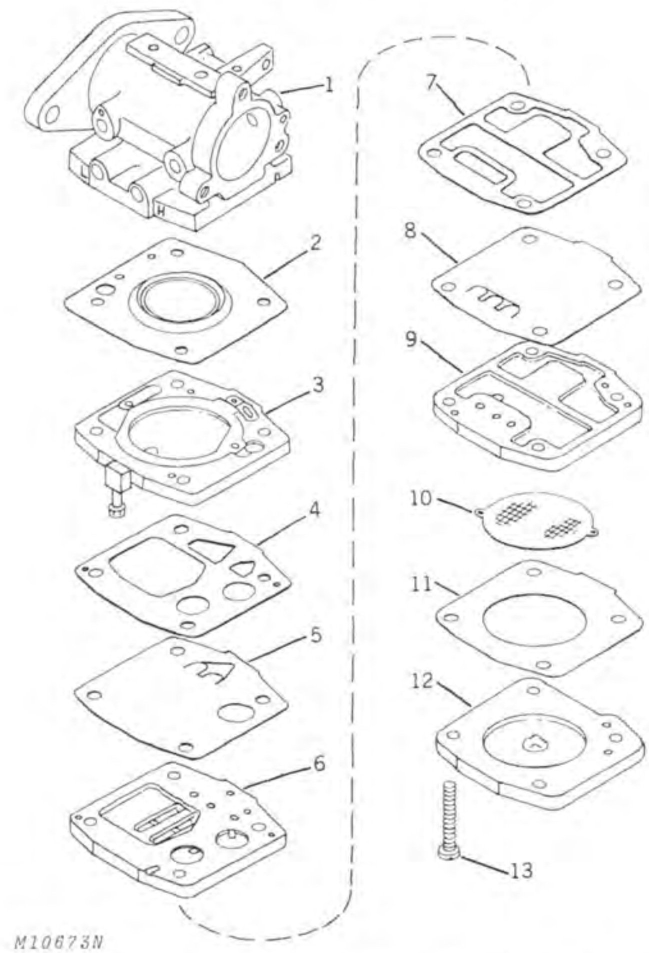


Fig. 20-Metering Diaphragm Plate Assembly

Diaphragm and Plate Assembly



1—Carburetor Body
2—Metering Diaphragm
3—Metering Diaphragm Plate
4—Fuel Pump Gasket
5—Fuel Pump Diaphragm
6—Fuel Pump Plate
7—Check Valve Gasket
8—Check Valve Diaphragm
9—Filter Plate
10—Filter Screen
11—Fuel Inlet Gasket
12—Cover Plate
13—Cover Screw (4 used)

Fig. 21-Diaphragm and Plate Assembly

Assemble diaphragms, gaskets, filter screen, and plates to carburetor body as shown, Fig. 21. Install and tighten four cover screws to 20 to 25 in-lbs (2.26 to 2.82 Nm) torque.

Installing Carburetor

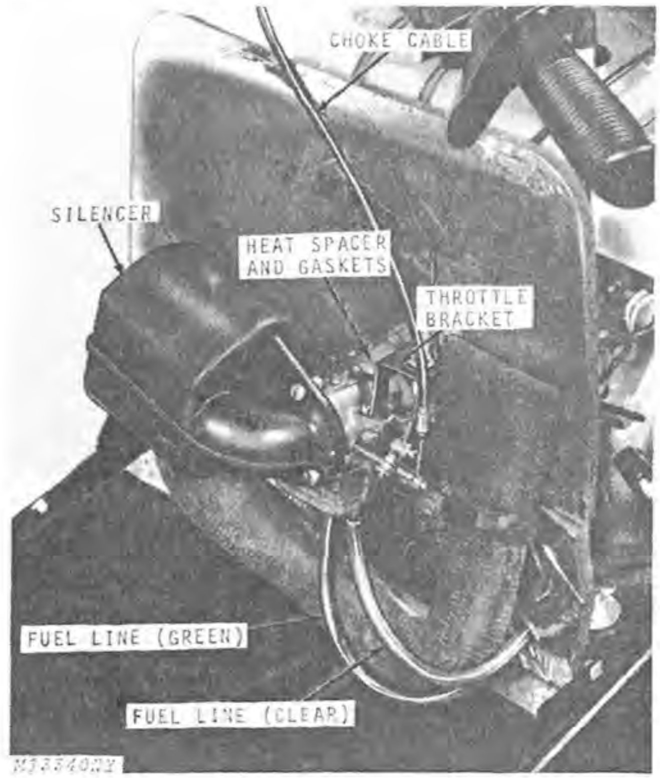


Fig. 22-Installing Carburetor on Engine

Install new gasket, heat spacer, new gasket, small square heat shield, new gasket and carburetor. Tighten nuts securely. Install silencer and throttle bracket, Fig. 22.

Connect fuel pickup line (green) to center fitting under carburetor and vapor return line (clear) to other lower fitting. Connect impulse tube to angle fitting on left-hand side of carburetor.

Connect choke cable to choke lever, making certain choke is in full open position when choke button on instrument panel is pushed in.

Connect throttle cable to throttle lever. Adjust so throttle lever strikes stop or fully opens when throttle control on handlebar is fully actuated.

IMPORTANT: Be certain dowel on end of throttle cable is properly positioned in recess of throttle control on handlebar.

DO NOT install console and windshield until carburetor adjustments have been made.

ADJUSTMENT

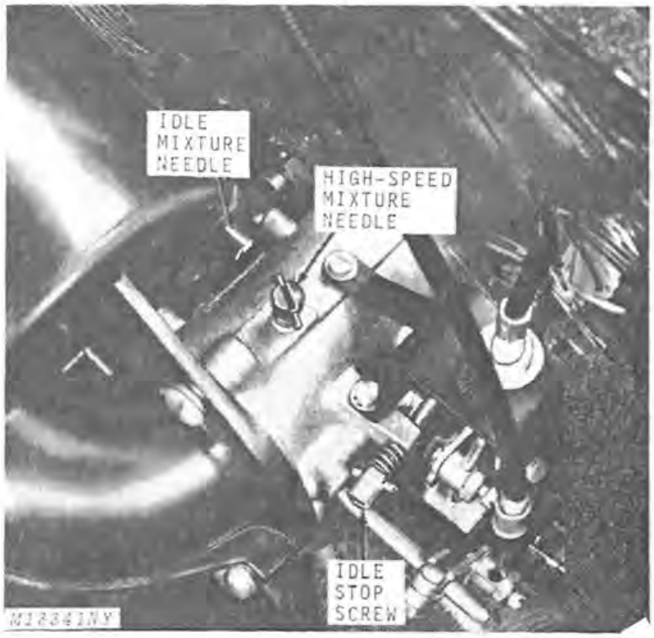


Fig. 23-Adjusting Carburetor

Make preliminary carburetor adjustments, Fig. 23, as follows:

High-speed mixture needle: 7/8 turn open.

Idle mixture needle: 1 turn open.

NOTE: On the 800 and JDX8 Snowmobiles (Serial No. 30001-) back the high-speed and idle mixture needles out 1-1/8 turns for preliminary adjustments.

Start Engine

CAUTION: Block up snowmobile track and be certain throttle control is functioning properly before starting engine.

With the engine warmed up, adjust the idle mixture needle until the engine reaches highest rpm without opening the throttle. Then set idle stop screw so engine idles between 2200 to 2600 rpm.

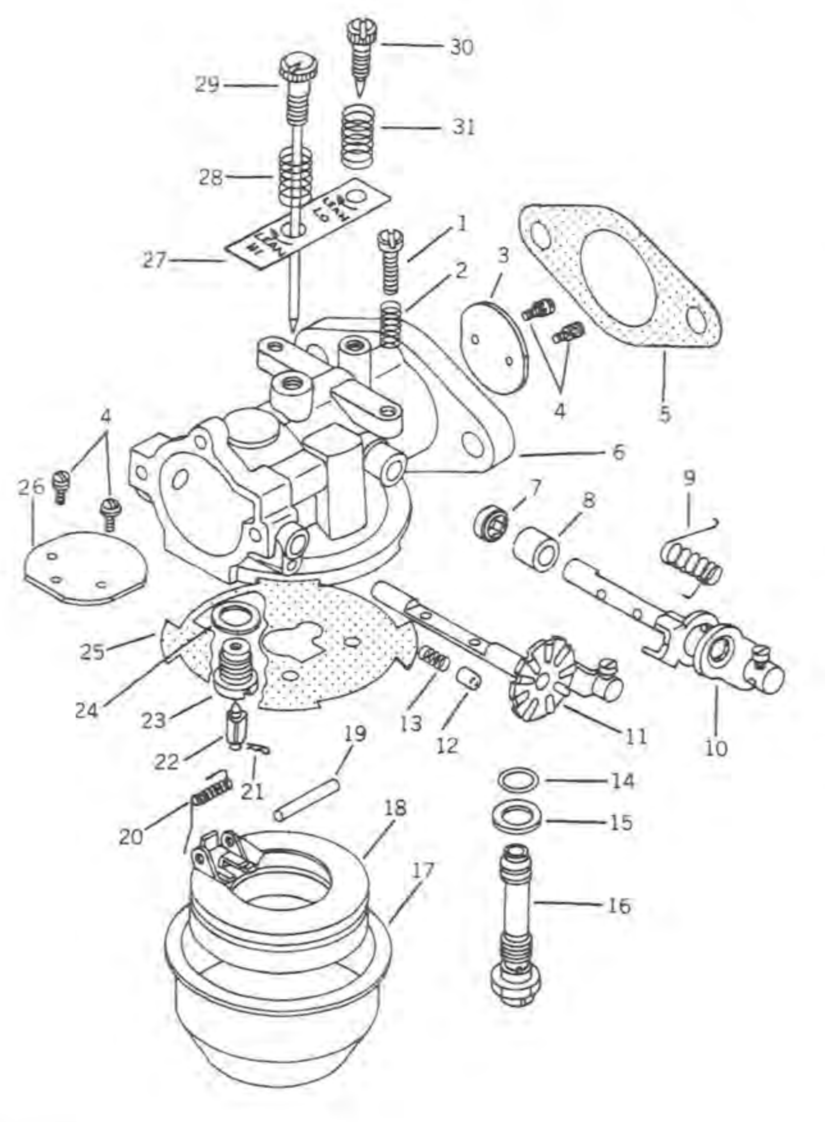
Take snowmobile for a short trial run or use dynamometer and make final adjustments. Adjust high-speed mixture needle until full engine performance is obtained, then open high-speed mixture needle an additional 1/8 turn.

IMPORTANT: Too lean an adjustment will cause engine damage, such as piston burn-through and scored piston and cylinder walls. Under no circumstances should the carburetor setting on the reed valve engines be set less than 7/8 turn open.

Install console and windshield after adjusting carburetor. Carburetor mixture needles can be adjusted with console installed.

Group 12
BENDIX CARBURETOR

GENERAL INFORMATION



1—Throttle Stop Screw
2—Spring
3—Throttle Plate
4—Screws and Lockwashers
5—Flange Gasket
6—Carburetor Body
7—Throttle Shaft Seal
8—Seal Retainer
9—Throttle Return Spring
10—Throttle Lever
11—Choke Shaft and Lever
12—Friction Pin
13—Friction Pin Spring
14—O-ring
15—Washer
16—Main Jet and Discharge Tube
17—Fuel Bowl
18—Float
19—Float Axle
20—Float Spring
21—Fuel Valve Spring Clip
22—Fuel Valve
23—Fuel Valve Seat
24—Gasket
25—Bowl-to-Body Gasket
26—Choke Plate
27—Identification Plate
28—Spring
29—High-Speed Needle (Idle Tube)
30—Low-Speed Needle
31—Spring

M13342N

Fig. 1-Exploded View of Bendix Carburetor

The Bendix Model 1612 Carburetor, Fig. 1, is a horizontal, side-draft carburetor with adjustable high and low-speed needles and a stabilized ring-shaped float. The carburetor is not equipped with an integral fuel pump. An auxiliary impulse pump is required between the fuel tank and the carburetor.

No vapor return line is necessary. Vapors are discharged through two vents in the carburetor body.

PRINCIPLE OF OPERATION

Fuel Supply Operation

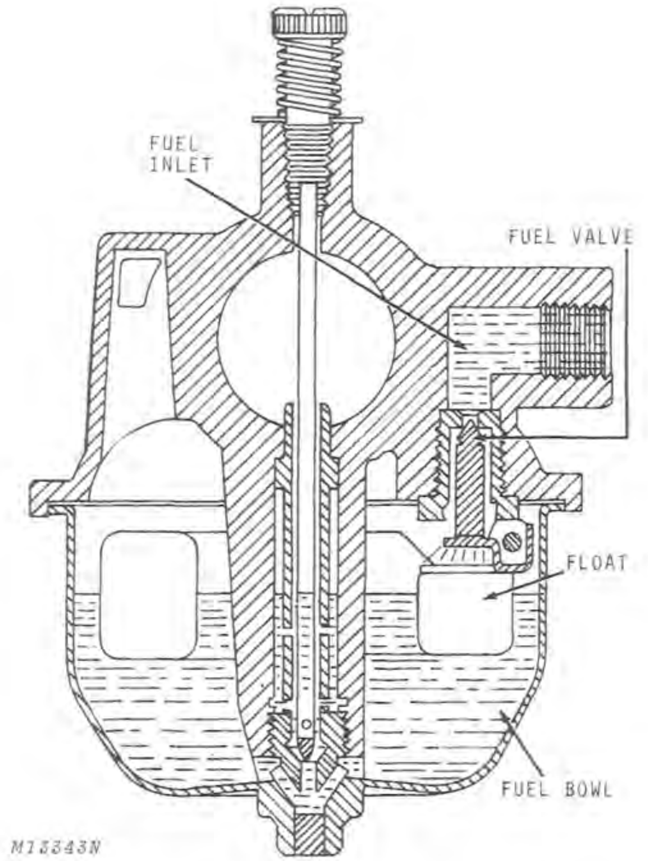


Fig. 2-Fuel Supply Operation

Fuel under pressure from the fuel pump enters the fuel bowl, Fig. 2, through the fuel inlet and the fuel valve. The fuel level in the bowl is automatically maintained by the float which opens and closes the fuel valve to supply the varying fuel flow demands of the engine.

Idle and Intermediate Operation

The fuel for idle and intermediate operation is delivered from the main metering well, Fig. 3, through the center of the high-speed needle (idle tube), and is mixed in the idle channel leading to the idle discharge holes with air entering through the idle air bleed.

NOTE: The idle tube also serves as the adjustable high-speed needle valve.

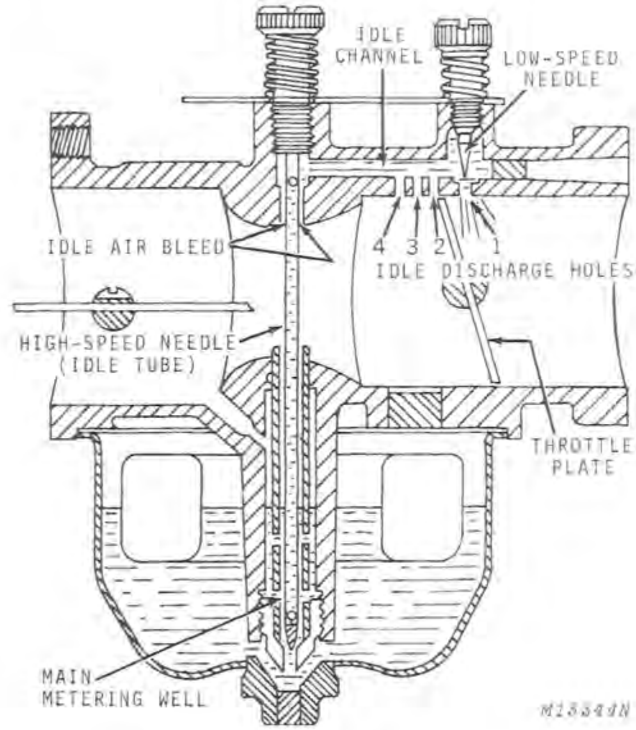


Fig. 3-Idle and Intermediate Operation

At slow idle speed, the throttle plate is positioned as shown in Fig. 3 to expose only the No. 1 idle discharge hole to engine vacuum. Air is admitted to the idle channel through Nos. 2, 3 and 4 idle discharge holes and idle air bleed hole. This air mixes with the fuel-air mixture in the channel and is discharged through No. 1 idle discharge hole.

As the throttle plate is opened, the Nos. 2, 3, and 4 idle discharge holes begin to discharge fuel-air mixture to supply the increased fuel required at higher engine speed.

The low-speed needle regulates the fuel-air flowing through idle discharge hole. Turning the low-speed needle IN (clockwise) results in a leaner mixture. Turning the low-speed needle OUT (counterclockwise) provides a richer mixture. The idle speed is set by adjusting the throttle stop screw, not the low-speed needle.

Full Throttle Operation

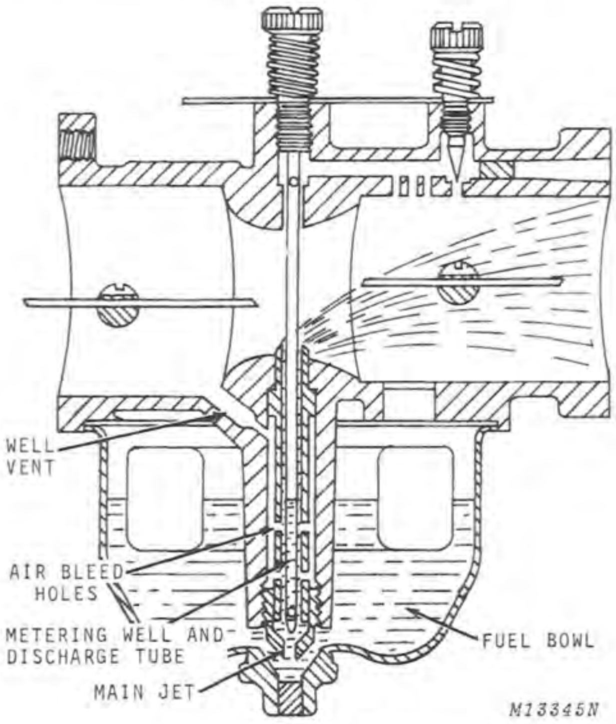


Fig. 4-Full Throttle Operation

The fuel for full throttle operation, Fig. 4, is drawn from the fuel bowl through the main jet metering well and discharge tube.

NOTE: The main discharge tube also incorporates the seat for the high-speed needle valve.

A series of air bleed holes in the discharge tube permits the air from the well vent to enter the fuel through the discharge tube, below the fuel level in the fuel bowl. This reduces the density of the fuel and enables it to flow freely at low suction. As the fuel flows through the metering well and tube, it mixes with air entering through the well vent to provide the correct fuel-air mixture ratio for all engine speeds and loads.

At high engine speeds (and high suction) the proportion of air-to-fuel through the main metering system is reduced to provide the richer mixture needed for peak performance.

DISASSEMBLY AND REPAIR

Removing Carburetor

1. Remove windshield and console.
2. Remove silencer with air intake tube and spacer.
3. Disconnect choke and throttle cables.
4. Disconnect fuel inlet line from the carburetor.
5. Disconnect impulse line from the fuel pump.
6. Remove heat deflector and fuel pump.
7. Remove choke and throttle cable bracket from carburetor.
8. Remove carburetor with heat deflector from engine.

Disassembling Carburetor

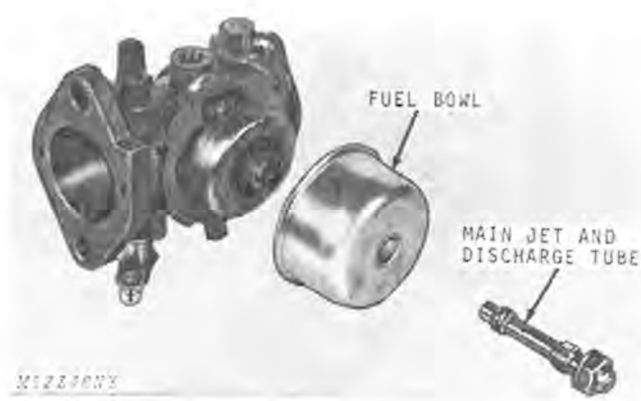


Fig. 5-Removing Main Jet and Discharge Tube

Invert carburetor and remove main jet and discharge tube, Fig. 5.

Remove fuel bowl from body.

Fig. 6-Removing Fiber Washer and O-ring

Remove fiber washer and O-ring from main jet and discharge tube, Fig. 6.

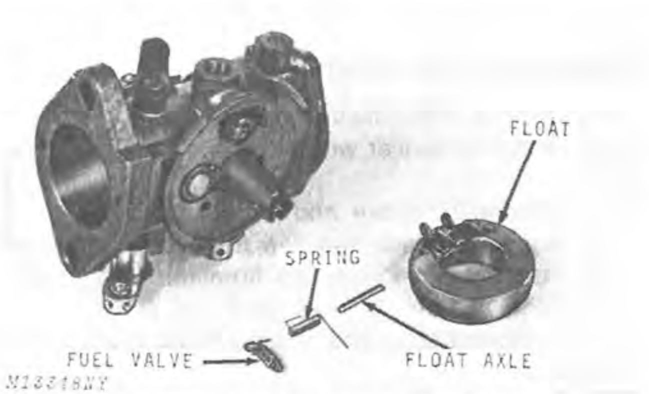


Fig. 7-Removing Float and Float Spring

Use a wire (paper clip) to push float axle out of float hinges. Remove float and float spring, Fig. 7. Remove fuel valve with spring clip from body.

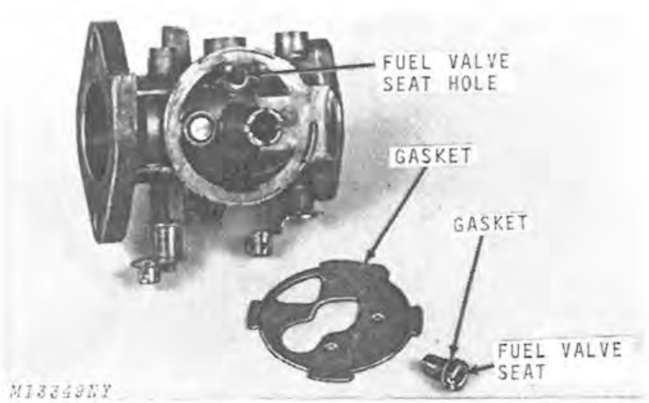


Fig. 8-Removing Fuel Valve Seat

Remove gasket, fuel valve seat and gasket, Fig. 8, from the body.

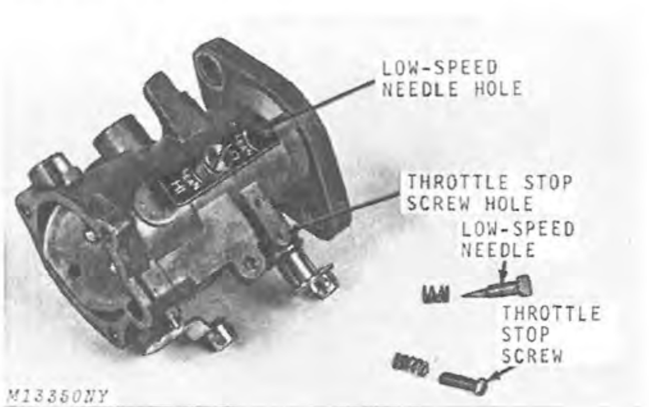


Fig. 9-Removing Low-Speed Needle

Remove low-speed needle and spring, Fig. 9. Then remove throttle stop screw and spring.

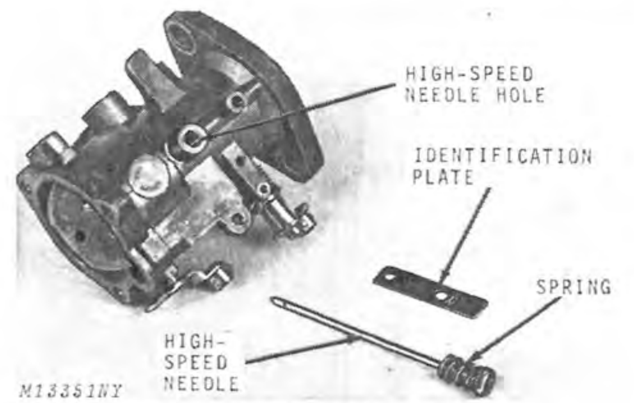


Fig. 10-Removing High-Speed Needle

Remove high-speed needle, spring and identification plate, Fig. 10.

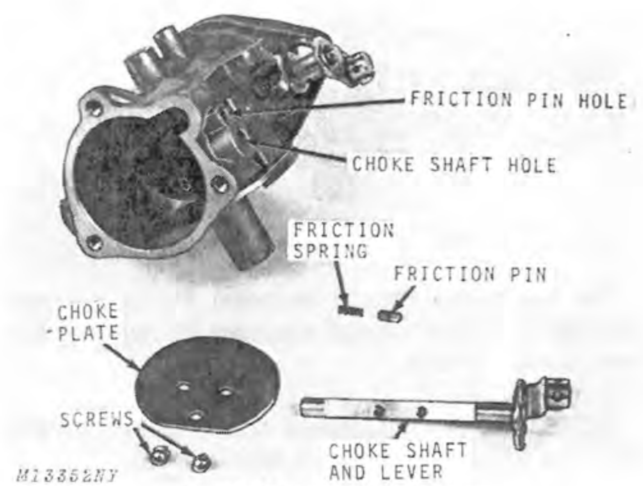


Fig. 11-Removing Choke Plate

Close choke plate and remove screws. Remove plate from air intake opening and slide choke shaft and lever out of body. Remove friction spring and pin, Fig. 11.

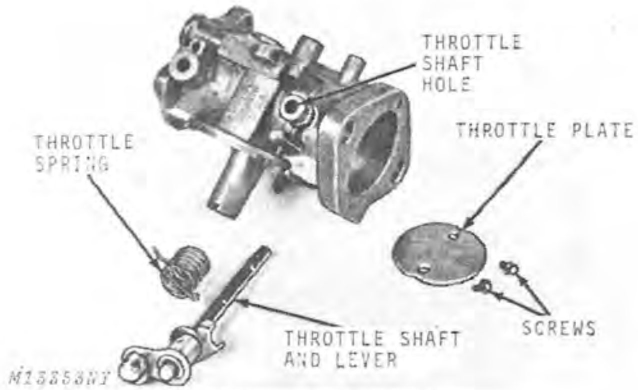


Fig. 12-Removing Throttle Plate

Close throttle plate and remove two screws. Remove throttle plate and slide throttle shaft and lever out of body. Remove spring from throttle shaft, Fig. 12.

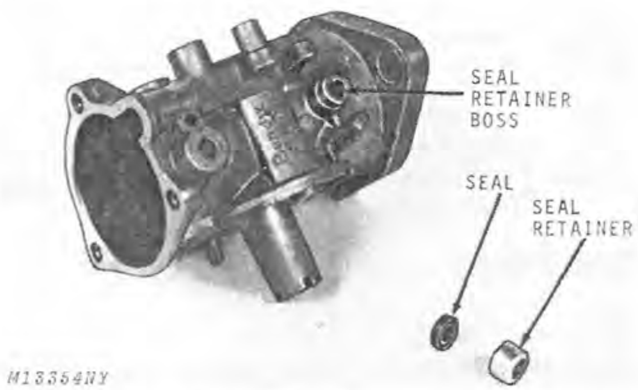


Fig. 13-Removing Seal Retainer and Seal

Remove seal retainer and seal, Fig. 13, from throttle shaft opening.

NOTE: Use channel lock pliers to remove seal and retainer. Discard seal and retainer.

Cleaning and Inspection

Thoroughly clean all metal parts in carburetor cleaner and rinse in solvent.

Blow out all passages and channels in body with compressed air. Reverse the air flow through each passage to be sure all dirt particles are removed.

IMPORTANT: Never use a wire or drill to clean out the jets.

Inspect all parts. Replace any damaged or worn parts.

ASSEMBLY

Throttle Assembly

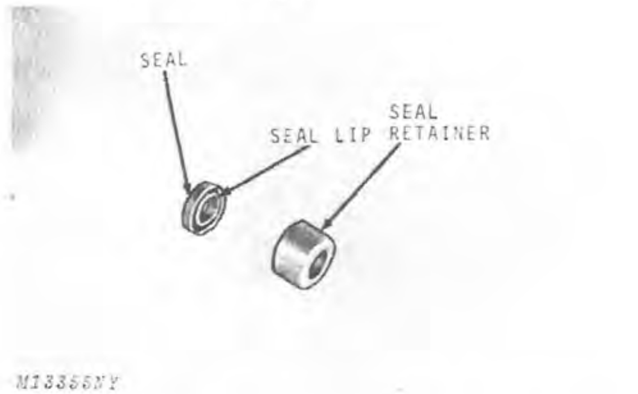


Fig. 14-Installing NEW Throttle Shaft Seal and Retainer

Install NEW throttle shaft seal into NEW seal retainer (lip on seal must be facing into the retainer), Fig. 14. Position seal and retainer over boss on carburetor body, Fig. 13. Tap seal and retainer in place lightly with a plastic hammer.

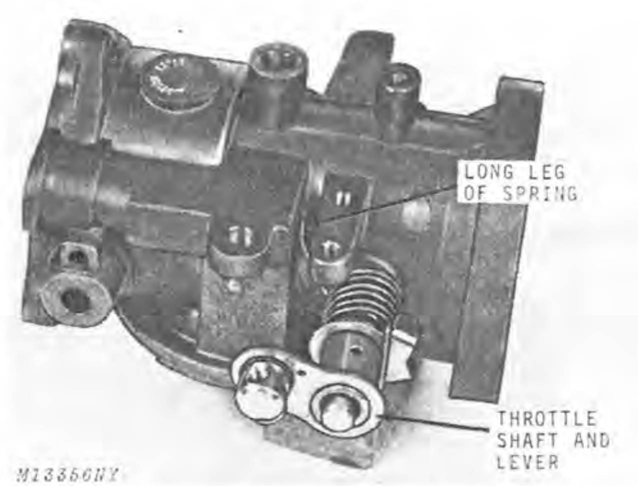


Fig. 15-Installing Throttle Shaft

Install throttle return spring on throttle shaft. Lubricate throttle shaft seal with oil and install throttle shaft and lever, Fig. 15. Long leg of throttle return spring goes UP between bosses on carburetor body.

IMPORTANT: Use care installing throttle shaft so the sharp edge (where throttle plate connects) does not cut or damage seal.

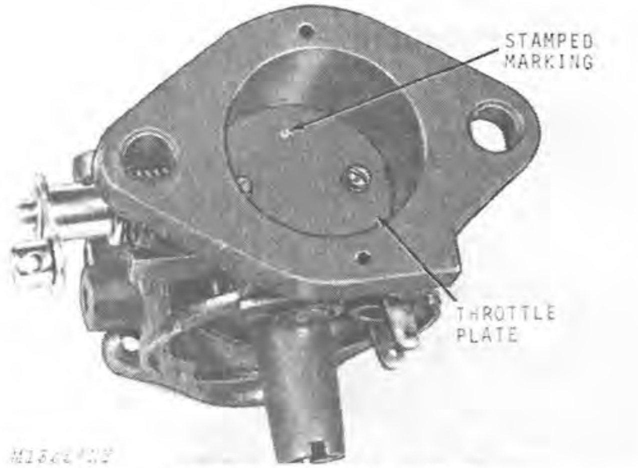


Fig. 16-Installing Throttle Plate

Rotate throttle shaft counterclockwise 1/3 turn until flat center section faces toward manifold opening. Assemble throttle plate loosely to shaft with screws, Fig. 16 (use Loctite on screws).

NOTE: Throttle plate must be installed with stamped marking facing OUT and toward the top, Fig. 16.

Snap throttle plate open and shut several times to center plate, and then tighten screws, holding the throttle plate seated in the casting. Be sure the plate is held tightly closed.

Choke Assembly

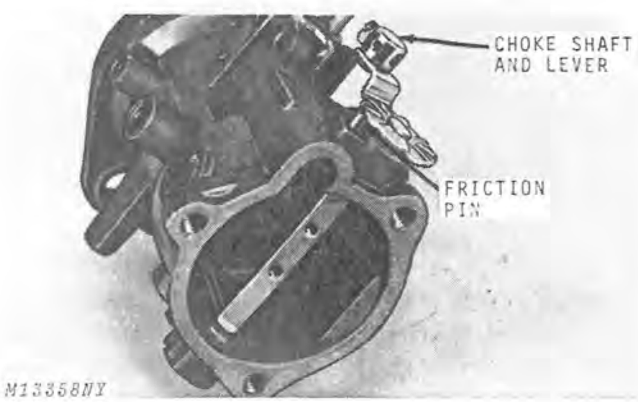


Fig. 17-Installing Choke Shaft and Friction Pin

Insert spring and friction pin in hole in body, Fig. 17. Install choke shaft and lever in choke shaft hole. Seat shaft in hole in opposite side of bore.

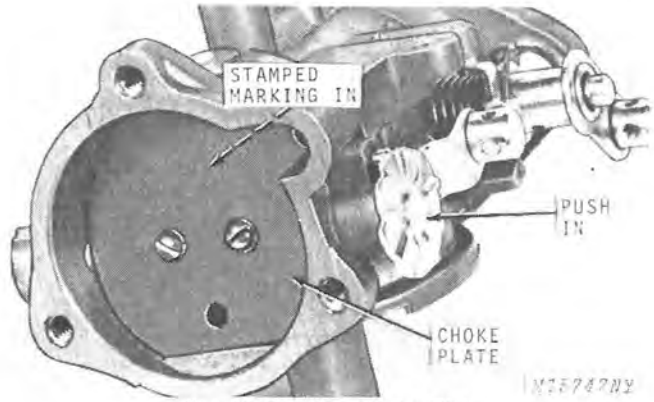


Fig. 18-Installing Choke Plate

Rotate choke shaft until flat center section faces toward manifold opening. Assemble choke plate loosely to shaft with screws, Fig. 18) (use Loctite on screws).

NOTE: Choke plate must be installed with stamped markings facing IN and toward the top, Fig. 18. This is just the opposite of the throttle plate.

Snap choke plate open and shut several times to center plate; push in on shaft, and then tighten screws. Be sure the shaft is pushed in and the choke plate is tightly closed.

Fuel Valve

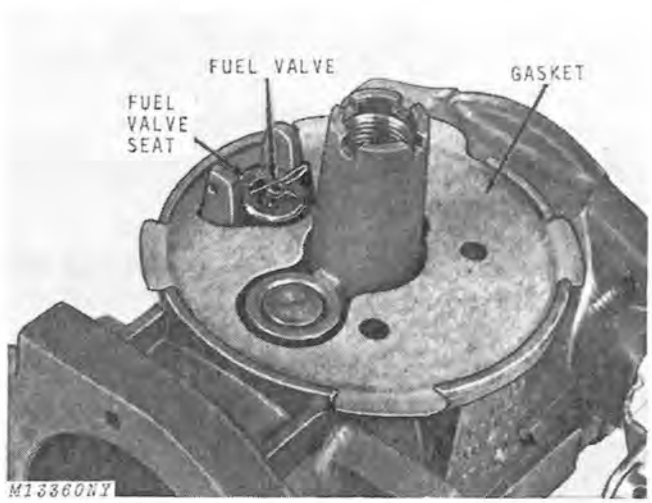


Fig. 19-Installing Gasket, Fuel Valve Seat and Fuel Valve

Invert carburetor body and install bowl-to-body gasket, Fig. 19. Install gasket on fuel valve seat and install seat in body. Tighten seat to 60 in-lbs torque. Install spring clip on fuel valve and place valve in seat, Fig. 19.

Float Assembly

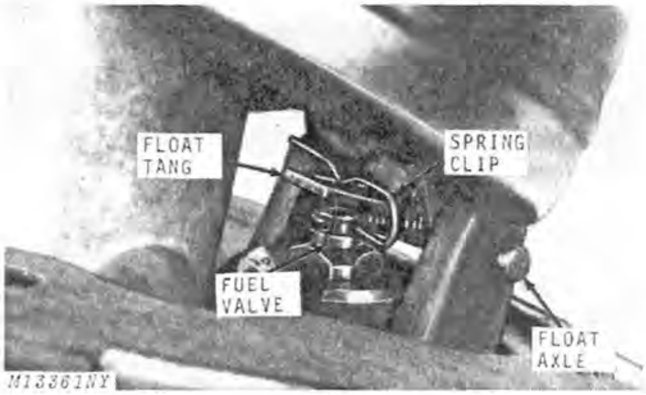


Fig. 20-Installing Float, Spring and Axle

Install float spring, float and float axle.

NOTE: Tang on float must be positioned between spring clip and fuel valve. Tang must fit loosely between spring clip and fuel valve, Fig. 20.

Fig. 21-Clearance Between Float and Gasket

With the carburetor inverted, the bottom surface of the float should be 1/8 inch (3.18 mm) from the gasket surface at a point on float farthest from the hinge. Use a 1/8 inch drill as shown in Fig. 21 to determine if float is correct. To adjust float, use needle nose pliers to bend tang that contacts the fuel valve.

NOTE: Drill must lay on flat surface of gasket as shown in Fig. 21.

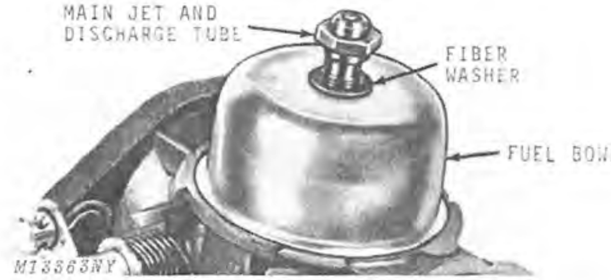


Fig. 22-Installing Fuel Bowl

Install fiber washer on main jet and discharge tube, and install O-ring.

NOTE: Lubricate O-ring with oil to aid in installation of the main jet.

Position fuel bowl on body, making sure long leg of float spring is INSIDE of fuel bowl. Install main jet and discharge tube through hole in fuel bowl and tighten securely, Fig. 22.

Throttle Stop Screw

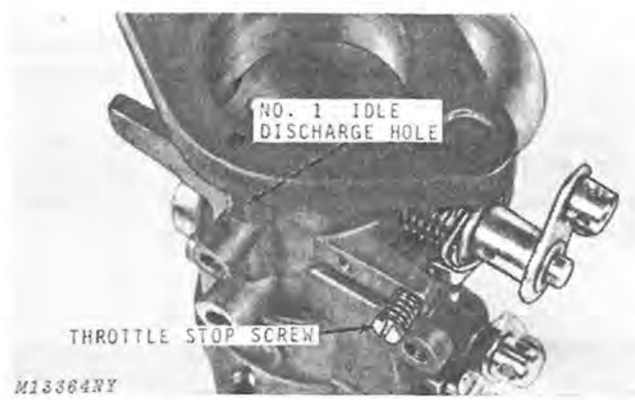


Fig. 23-Throttle Stop Screw Preliminary Adjustment

Install throttle stop screw and spring, Fig. 23. Adjust screw to open throttle plate slightly, but not enough to uncover the No. 2 idle discharge hole, Fig. 3.

See Fig. 9 and place identification plate in place, and install low-speed needle and spring. Screw needle IN until it seats lightly against the No. 1 idle discharge hole; then back it out 1-3/4 turns as a preliminary adjustment.

Refer to Fig. 10 and install spring on high-speed needle and install needle through identification plate and into discharge tube on opposite side of venturi. Screw needle in until it seats LIGHTLY, then back it out 1-1/2 turns as a preliminary adjustment.

Installing Carburetor

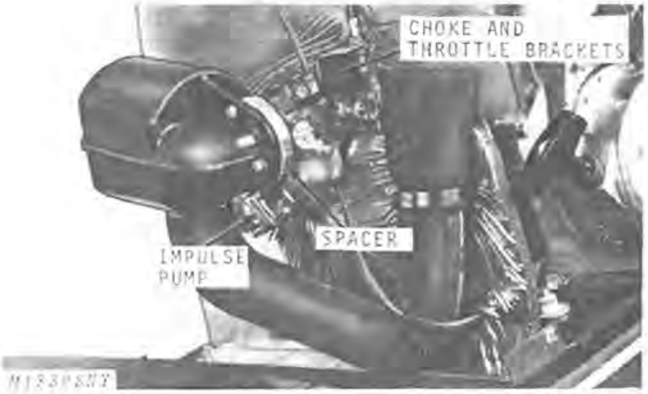


Fig. 24-Installing Carburetor to The Engine

Install carburetor on engine, Fig. 24.

Install choke and throttle cable bracket to the carburetor.

Install heat deflector and fuel pump. Connect impulse line to the fuel pump and fuel line from fuel pump to the carburetor.

Connect choke cable to choke lever. Be sure choke plate is in full open position when choke button on instrument panel is pushed in.

Connect throttle cable to throttle lever. Adjust so throttle fully opens when throttle control on handlebar is fully actuated.

Install spacer and silencer with air intake tube.

DO NOT install console and windshield until carburetor adjustments have been made and all connections have been checked for fuel leaks.

ADJUSTMENT

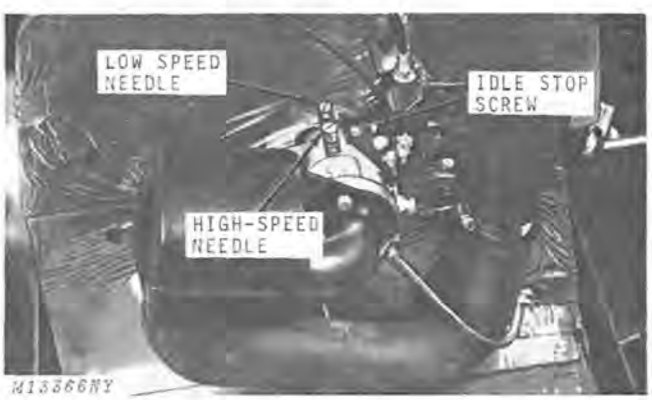


Fig. 25-Adjusting Carburetor

Three adjustments are possible on the carburetor; the high-speed needle, low-speed needle and idle stop screw, Fig. 25.

CAUTION: Block up snowmobile track and be certain throttle control is functioning properly before starting engine.

NOTE: Turn the low-speed and high-speed needles clockwise until lightly seated. DO NOT FORCE. Back high-speed needle out 1-1/2 turns and low-speed needle 1-3/4 turns.

Adjusting Low-Speed Needle

1. Start the engine. Warm-up the engine by taking snowmobile for a ride or by using a dynamometer.

2. Turn low-speed needle clockwise (slowly) until engine falters (looses rpm), then back needle out 1/4 turn.

NOTE: This is important for easier hot starting.

Adjusting Idle Stop Screw

The idle stop screw is adjusted only when a change in idle speed is required. Set the idle speed at 2200 to 2600 rpm.

Generally, if the idle stop screw is adjusted, the low-speed needle will have to be readjusted.

Adjusting High-Speed Needle

IMPORTANT: Never set the high-speed needle with the track off the ground and the engine in a "no-load" situation. The engine must be under load to prevent engine damage from overspeeding and to obtain proper carburetor adjustment.

1. Start engine and take snowmobile for a high-speed trial run in a large, level area or use a dynamometer.
2. Stop, turn high-speed needle 1/8 turn clockwise and make another trial run.
3. Continue this procedure, turning high-speed needle 1/8 turn or less at a time, clockwise or counterclockwise, until optimum performance is obtained.
4. Turn needle 1/4 turn counterclockwise for final adjustment.

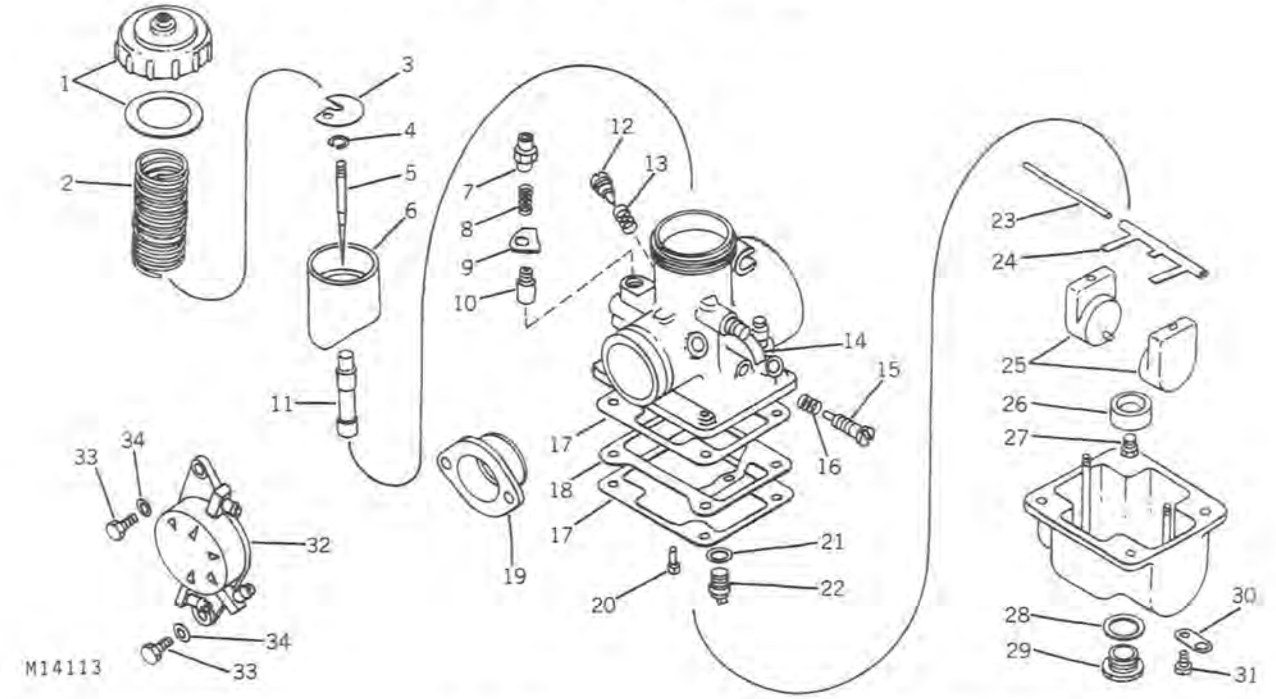
IMPORTANT: Too lean (clockwise) a high-speed needle setting may seriously damage the engine by excessive heat build-up.

NOTE: High-altitude requires a leaner carburetor setting. Above 5000 feet altitude turn high-speed needle 1 turn open.

If, after setting high-speed needle correctly, engine falters or hesitates on acceleration, it may be necessary to lean or enrichen low-speed needle slightly to correct this condition.

Group 13
MIKUNI CARBURETOR

GENERAL INFORMATION



1—Mixing Chamber Cap
2—Throttle Valve Spring
3—Plate
4—E-Ring
5—Jet Needle
6—Throttle Valve
7—Starter Plunger Cap
8—Starter Plunger Spring
9—Washer
10—Starter Plunger
11—Needle Jet
12—Air Screw
13—Air Screw Spring
14—Vent Tube
15—Idle Adjusting Screw
16—Idle Adjusting Screw Spring
17—Gasket (2 used)
18—Baffle Plate
19—Rubber Mount
20—Pilot Jet
21—Washer
22—Needle Valve Assembly
23—Float Arm Pin
24—Float Arm
25—Float (2 used)
26—Ring
27—Main Jet
28—Washer
29—Drain Plug
30—Plate
31—Screw with Lock Washer (4 used)
32—Fuel Pump
33—Screw (2 used)
34—Washer (2 used)

Fig. 1-Mikuni VM34-55 Carburetor

The Mikuni VM34-55 Carburetor, Fig. 1, is a twin-float, fixed-jet, throttle-valve carburetor. It consists of four systems: The starter system, float system, pilot system and main system.

Starter System

The starter system consists of the starter jet and starter plunger. This system eliminates the need for a choke apparatus in the carburetor bore, thereby increasing efficiency and making rapid acceleration possible.

Float System

The float system consists of two independent floats and a needle valve. This system maintains fuel at a constant level in the float chamber. A baffle plate is used to prevent rippling of the fuel during varying engine speeds or when traveling over rough terrain.

Pilot System (Idle and Slow Speed)

The pilot system consists of the pilot jet, air screw, pilot outlet and bypass. The ratio of fuel-air mixture for idling and slow speed is controlled by the pilot jet and air screw.

Main System

The main system consists of the jet needle, needle jet, main jet, air jet and throttle valve. The fuel-air mixture ratio is controlled by a combination of these components of which the main jet is very important.

PRINCIPLE OF OPERATION

Starter System

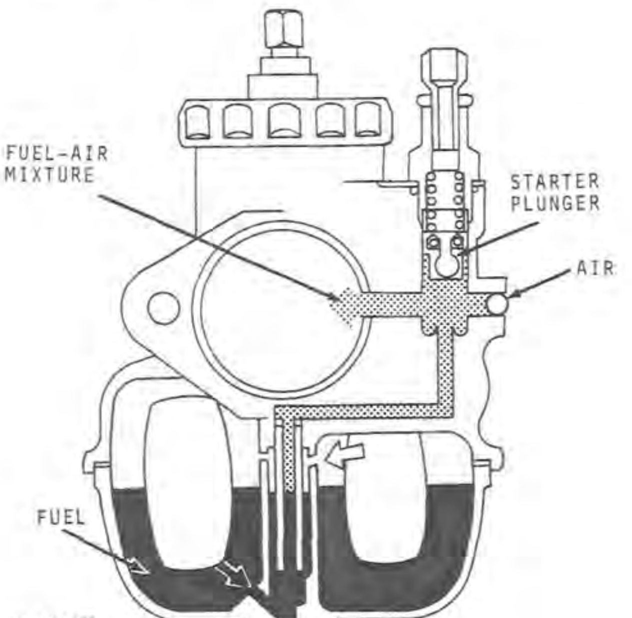


Fig. 2-Starter System

NOTE: The throttle valve must be closed. The starter system requires negative pressure in the inlet pipe in order to function.

The starter system, Fig. 2, is opened and closed by the starter plunger. Moving the starter lever on the dash up lifts the starter plunger and opens the starter system.

Fuel is metered through the starter jet and mixed with air in the emulsion tube. This mixture flows into the plunger area, mixes with more air from the air intake and is then drawn into the engine through the carburetor throat.

Float System

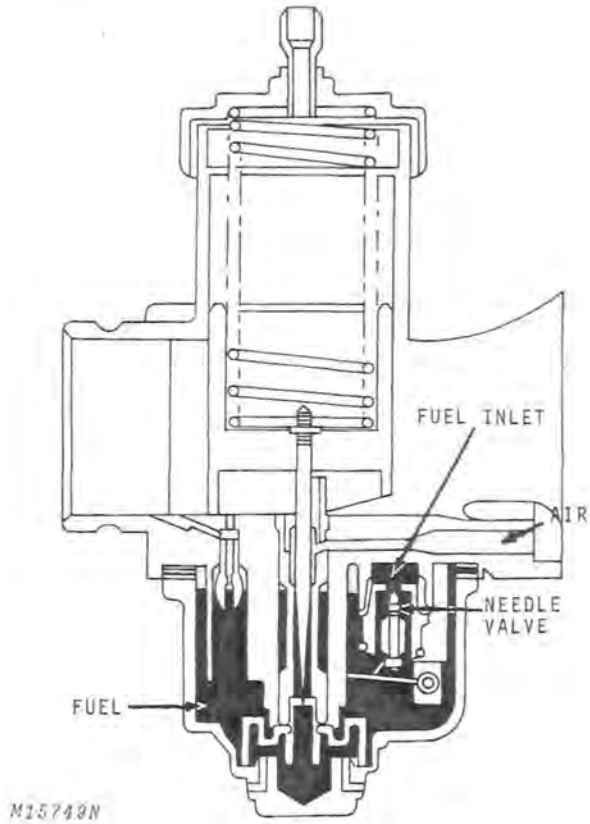


Fig. 3-Float System

The function of the float system, Fig. 3, is to maintain the correct level of fuel in the float chamber under all operating conditions. The float system consists of two floats. This design aids in maintaining the proper fuel level under high-angle operating conditions.

When the fuel level drops in the float chamber, the floats and float arm with actuating tab drop. Fuel under pressure from the fuel pump is forced through the needle valve seat, around the needle valve and into the float chamber. As fuel in the float chamber approaches the correct level, the floats raise contacting the float arm with actuating tab which in turn contacts the needle valve. The needle valve is seated against the valve seat, stopping fuel flow into the float chamber.

Under actual operating conditions, the fuel level and floats automatically position themselves so that the inward flow of fuel to the carburetor is equal to the outward flow of fuel to the engine.

Pilot System (Idle and Slow Speed)

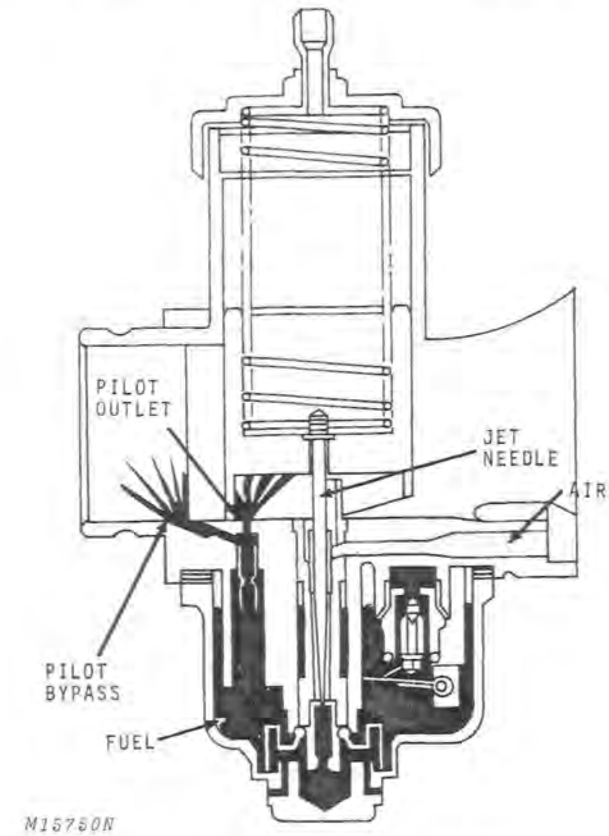


Fig. 4-Pilot System (Idle and Slow Speed)

The pilot system, Fig. 4, controls the fuel-air mixture from idle or closed throttle position until the throttle valve is opened sufficiently to allow the main metering system to function.

At idle speed the throttle valve is closed and the velocity of air flowing through the needle jet is low. This low negative pressure is not strong enough to draw fuel from the needle jet of the main system.

Fuel during idle is supplied by the pilot outlet and bypass. Fuel metered by the pilot jet is mixed with air from the air intake and bypass before the fuel enters the carburetor bore.

As the throttle valve is opened wider for low-speed operation, the pilot outlet cannot supply the required fuel. The fuel then enters the carburetor bore through the bypass as well as the pilot outlet.

Main System

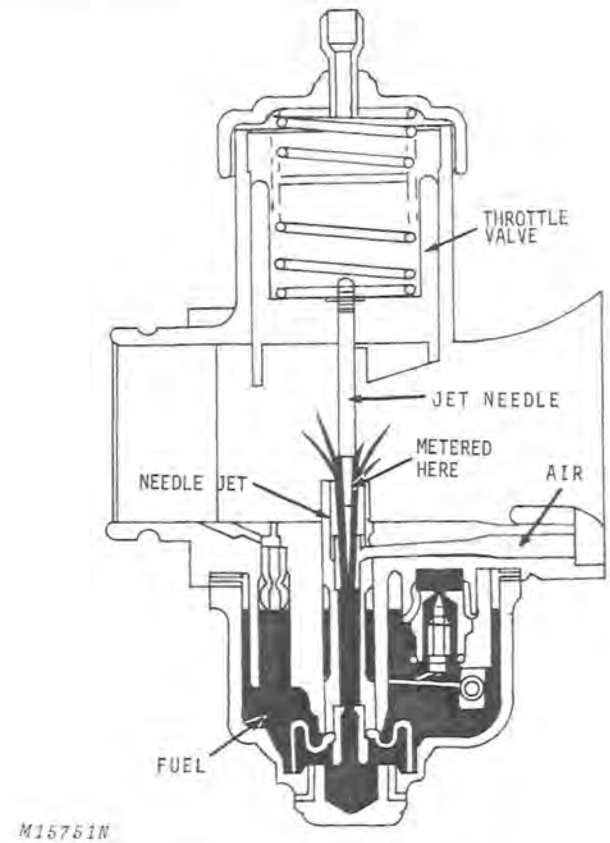


Fig. 5-Main Metering System

The main metering system, Fig. 5, starts to function when the throttle valve is opened about 1/4 of the way. Opening the throttle valve also causes the jet needle to move up. This causes the air flowing through the needle jet to increase, thereby increasing negative pressure which causes a sucking action to take place.

From 1/4 to 3/4 open throttle, the fuel passes through the main jet and is metered in the clearance between the needle jet and jet needle. The fuel is then mixed with air that is metered through the air intake, thereby atomizing the fuel. This mixture is then mixed with air flowing through the main bore before entering the engine.

During this operation the cutaway (slant) of the throttle valve controls the negative pressure on the needle jet, thereby regulating the amount of fuel that is injected into the engine.

When the throttle valve is fully opened, for high-speed operation, fuel is metered entirely by the main jet.

REMOVAL

1. Remove windshield and console. Remove air cleaner.

2. Disconnect fuel pump-to-carburetor fuel line from the carburetor.

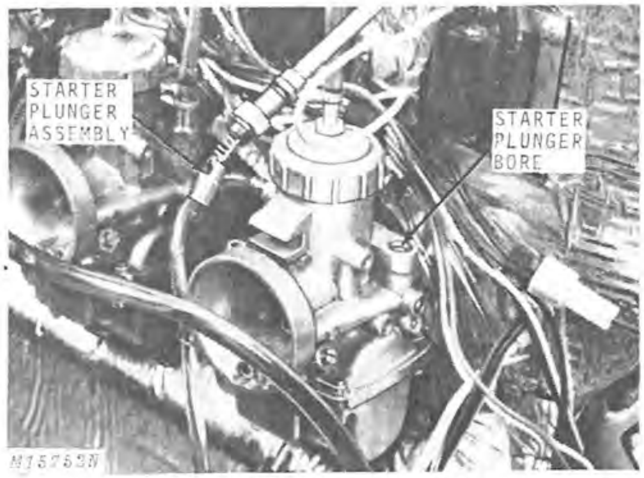


Fig. 6-Removing Starter Plunger Assembly

3. Loosen lock nut on starter cable and remove starter plunger assembly from mixing chamber body, Fig. 6.

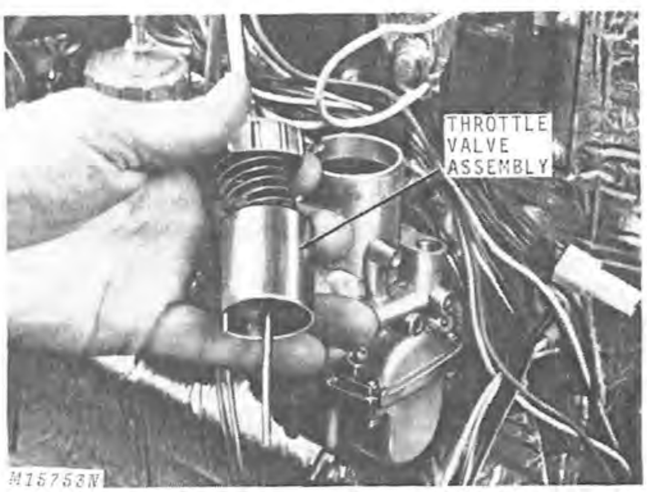


Fig. 7-Removing Throttle Valve Assembly

4. Remove mixing chamber cap, throttle valve spring, plate, E-ring, jet needle and throttle valve, Fig. 7. These components come out as an assembly.

5. Remove drain plug and drain the fuel into a shallow pan. Reinstall drain plug.

CAUTION: Use care when draining fuel from the carburetor. Gasoline is dangerous, even when mixed with oil. Avoid fires due to smoking or careless maintenance practices.

6. Loosen clamp and remove carburetor from the rubber mount.

DISASSEMBLY

Remove idle adjusting screw with spring and air screw with spring.

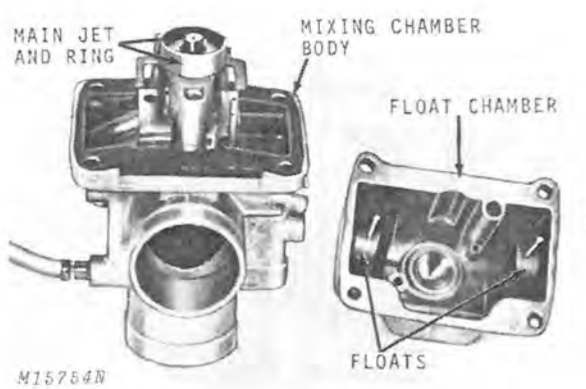


Fig. 8-Removing Float Chamber and Floats

Remove float chamber with floats from mixing chamber body, Fig. 8.

Remove main jet and ring. Use a 15/64-inch socket or box end wrench to remove main jet.

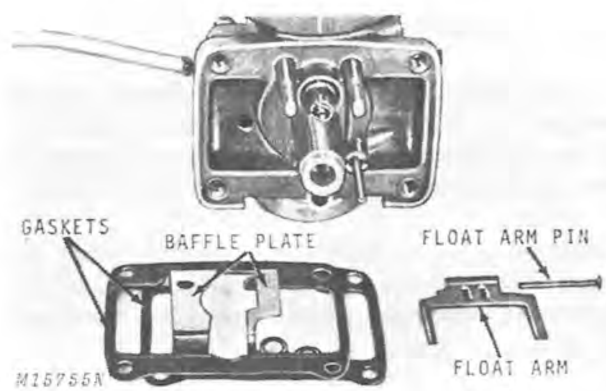


Fig. 9-Removing Float Arm Assembly and Baffle Plate

Remove float arm pin, float arm, baffle plate and gaskets, Fig. 9.

Remove inlet needle valve assembly and washer.

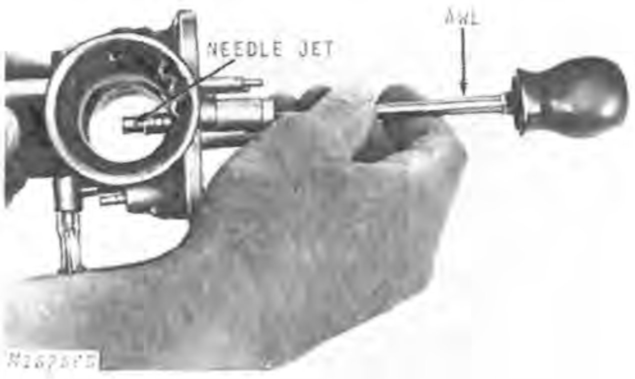


Fig. 10-Removing Needle Jet from Mixing Chamber

Remove needle jet carefully from the mixing chamber by pushing from the bottom, Fig. 10.

INSPECTION AND REPAIR

Cleaning Carburetor

IMPORTANT: Never clean jets or passages with small drills or wire. A slight enlargement or burring of jets or passages will change the performance of the carburetor.

Place carburetor parts in carburetor cleaner (PT503). Do not place gaskets in cleaner.

Allow parts to remain in cleaner for one to two hours. Remove and rinse parts with solvent. Dry parts with compressed air, making sure all holes are open and free of dirt. Never use rags or paper to dry the parts. Lint may plug jets or passages and affect operating efficiency of the carburetor.

NOTE: Rinse mixing chamber body and float chamber in hot water. This will neutralize the corrosive action of the carburetor cleaner on the aluminum of these parts.

Inspecting Carburetor

Inspect mixing chamber body and float chamber for cracks or damage that might cause fuel leaks.

Check all springs for damage or distortion.

Inspect idle adjusting screw and air screw for seating surface damage or stripped threads.

Inspect main jet and pilot jet for damage or stripped threads.

NOTE: Main jet and pilot jet should be clean and shiny. Any abrasions will cause a lean fuel-air mixture and possible engine damage.

Remove retainer and inlet valve from inlet valve seat. Inspect seating surface on inlet valve and seat for damage. Be sure retainer is not binding or hindering movement of inlet valve.

Inspect needle jet and jet needle for damage. Jet needle should slide freely within the needle jet.

NOTE: The E-ring on the jet needle should be installed in the third (middle) groove. This fine-tunes the mid-range mixture ratio.

Install floats on float guides in float chamber. Move floats up and down to be sure they are not binding on guides. Floats must work freely to maintain a constant fuel level in the float chamber.

Inspect float pin and float arm. Float arm should not bind on pin.

Check starter plunger. Plunger should move freely in passage of mixing chamber.

Place throttle valve in mixing chamber body and move up and down to check for sticking or wear. Be sure guide pin in mixing chamber body is not broken off. This would allow throttle valve to rotate, causing erratic carburetor operation.

ASSEMBLY

Installing Pilot Jet

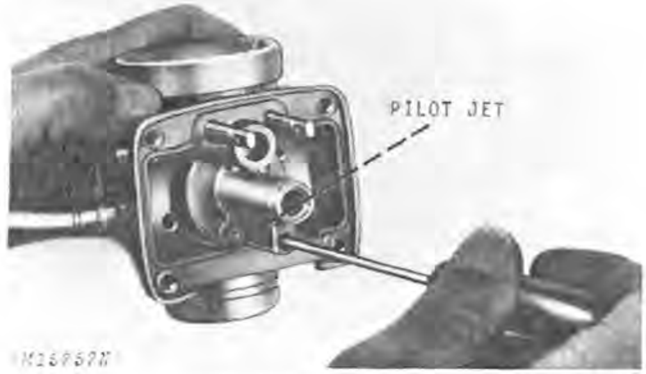


Fig. 11-Installing Pilot Jet

Use a small screwdriver and install pilot jet, Fig. 11. Tighten by turning clockwise.

Installing Baffle Plate, Needle Valve and Float Arm

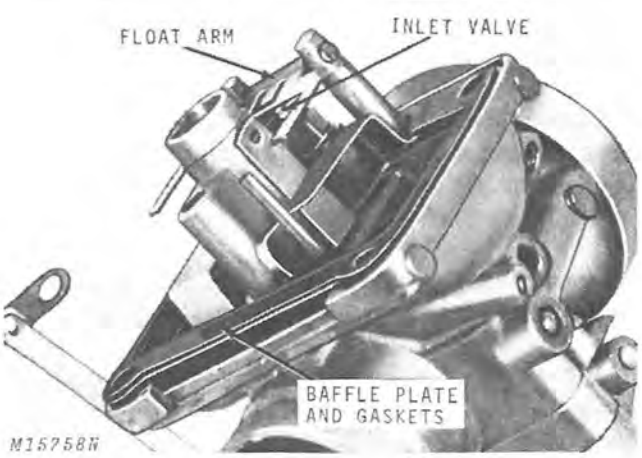


Fig. 12-Installing Baffle Plate, Needle Valve and Float Arm

Install gasket and baffle plate on mixing chamber. Install the second gasket on top of baffle plate, Fig. 12.

Install new washer on inlet needle valve seat and install seat in mixing chamber body. Install inlet valve (point down) and retainer, Fig. 12.

Install float arm and secure with float arm pin, Fig. 12.

Float Level Adjustment

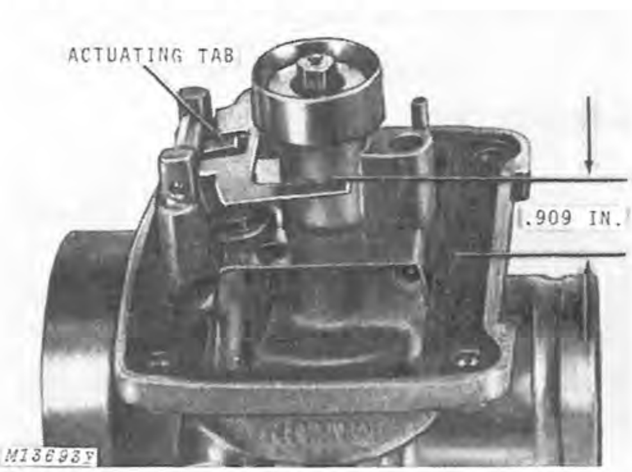


Fig. 13-Float Level Adjustment

Measure the distance from the gasket surface to the top of the float arm. The distance should be 0.909 inch (23 mm). Bend the float arm actuating tab as necessary until proper distance is obtained, Fig. 13.

Installing Needle Jet

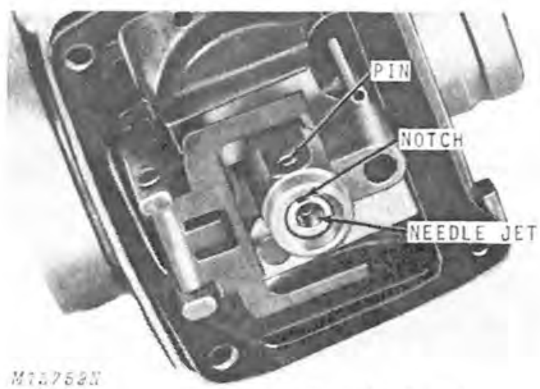


Fig. 14-Installing Needle Jet

Install needle jet, making sure notch on needle jet is correctly aligned with pin in bore in mixing chamber, Fig. 14. Place ring over needle jet bore, (recess in ring next to bore) and screw main jet into needle jet.

Installing Floats

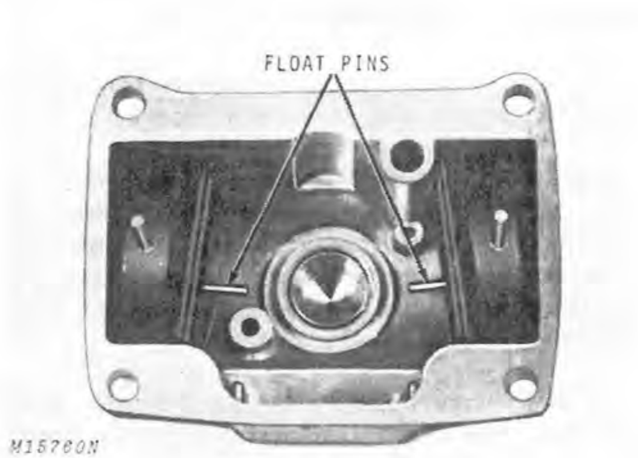


Fig. 15-Installing Floats in Float Chamber

Install floats over float pins. Pins on floats must be down and pointing to the inside of float chamber, Fig. 15.

Attach float chamber to mixing chamber with four screws.

Install air screw spring (13) and air screw (12), Fig. 1. Turn the screw in until it just seats. DO NOT force. Back screw out one full turn as a preliminary adjustment.

Install idle adjusting screw (15) and spring (16), Fig. 1, until screw is just flush with the inside of the bore.

INSTALLATION

Position carburetor in rubber mount and secure with clamp. Install fuel line from pump to carburetor.

Installing Throttle Valve

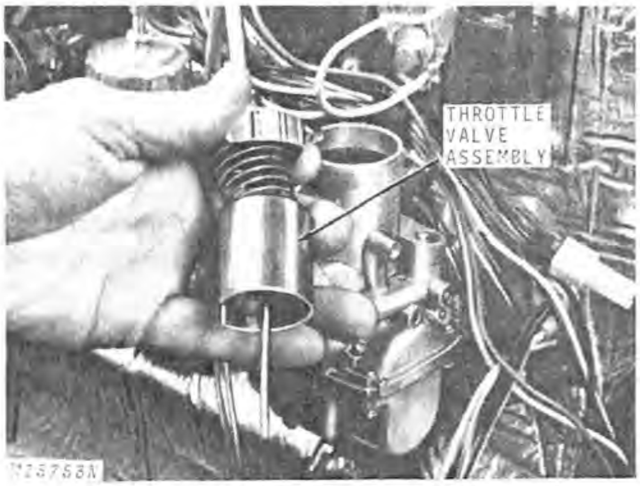


Fig. 16-Installing Throttle Valve

Place E-ring (4) on middle groove of jet needle (5) and install jet needle in throttle valve (6), Fig. 1.

Guide throttle cable end button through cap, spring and slot in throttle valve, Fig. 16. Slide cable into narrow part of slot in throttle valve. Install plate between spring and throttle valve with tab on plate in the slot of the throttle valve. This locks the cable to the throttle valve.

Compress throttle valve spring and tighten cap to mixing chamber.

Installing Starter Plunger

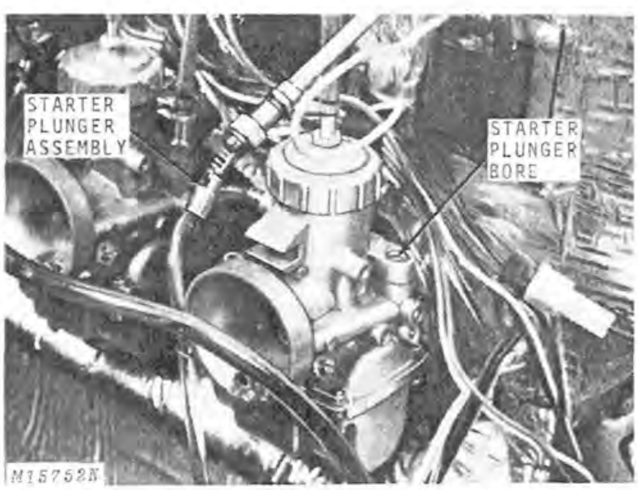


Fig. 17-Installing Starter Plunger

Be sure starter lever on instrument panel is down. Guide starter cable end button through cap and spring. Hook end button in starter plunger, Fig. 17. Place washer on mixing chamber body. Install the assembly and tighten cap.

Adjust and synchronize carburetor as explained below.

ADJUSTMENT

IMPORTANT: DO NOT run engine when adjusting carburetor.

Starter System

The starter system is opened and closed by the starter plunger and operates by negative inlet pipe pressure. The throttle valve must be closed when starting the engine; otherwise, the fuel-air mixture will be too lean for starting.

The fuel-air mixture for starting is metered through independent jets.

NOTE: When the starter lever on the dash is down, the starter plunger should be all the way down in the bore. There should be slight freeplay between the lever and the dash.

Adjust the starter plungers on both carburetors as follows:

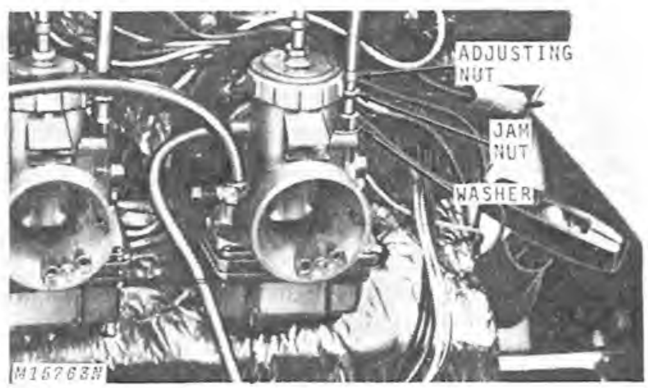


Fig. 18-Adjusting Starter Plunger

1. Be sure the starter lever on the dash is down.

2. Look in the starter plunger air hole at the 3 o'clock position in the carburetor throat. Starter plunger should be all the way down.

3. Loosen jam nut and turn adjusting nut clockwise to bring the starter plunger down. Tighten jam nut.

IMPORTANT: If the starter plunger is not down tight in the bore, the carburetor will run "RICH" and will affect the main jet system. This could cause a problem when attempting to find the correct main jet for top engine performance.

Synchronizing the Carburetors

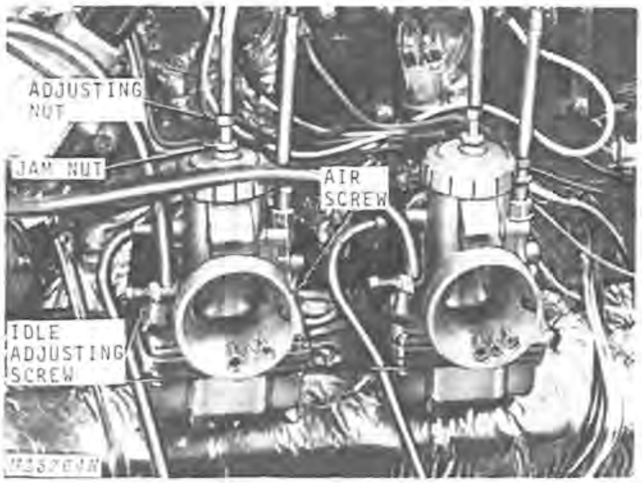


Fig. 19-Carburetor Adjustments

1. Loosen jam nuts, Fig. 19, on both throttle cables and turn the adjusting nuts clockwise until the throttle valves fully seat in the carburetor bores. Lock the jam nuts and adjusting nuts in place.

2. Turn both idle adjusting screws clockwise until the screws contact the throttle valve. When the screws contact the valve, the valve will begin to raise. Turn the idle adjusting screws an additional two turns clockwise.

3. Loosen the jam nuts, on both throttle cables and turn the adjusting nuts counterclockwise until all slack is removed from the throttle cables. Lock the jam nuts and adjusting nuts in place.

4. Look into the throat of both carburetors and slowly compress the throttle lever on the handgrip. Both throttle valves should begin to raise at exactly the same time. If throttle valve movement does not occur as specified, repeat steps 1, 2 and 3.

5. Carefully turn both pilot air screws clockwise until a slight seating resistance is felt. DO NOT force screws because this could damage air screw and seat. Back air screws out (counterclockwise) one complete revolution.

6. The idle speed may not be correct for normal operation even though the carburetors are synchronized. To check engine for proper idle, proceed as follows:

a. Install air intake silencer and run the engine until operating temperature is obtained.

IMPORTANT: DO NOT at any time run the engine with the air intake silencer removed. To do so will cause the engine to run "LEAN" and could cause engine failure.

b. If engine will not idle or if increased idle rpm is desired, turn the idle adjusting screws clockwise until desired idle is obtained.

NOTE: Set both idle adjusting screws equally. If the idle adjusting screws are not equal, repeat steps 2 through 5.

Selecting Main Jets

Main jets are graduated in steps of ten: 140, 150, 160, 170, 180, 190, 200 and 210. The larger the number, the bigger the jet orifice which will give a richer fuel-air mixture.

1. Be sure air intake silencer is installed. Run the snowmobile at full throttle on a dynamometer or in a large level area. If the engine labors at full throttle, the main jet (orifice) is too large. Install the next smaller size main jet and repeat the full throttle operation. Change main jets as necessary until satisfactory engine performance is attained at full throttle. Check condition of spark plug to determine engine performance.

2. If the engine runs satisfactorily at full throttle to begin with, the main jet should still be checked for proper size by checking the condition of the spark plug to determine engine performance. It is possible for the main jet to contribute to the engine running "LEAN". If a lean condition exists, install a main jet two sizes larger. Run the snowmobile at full throttle on a dynamometer or in a large level area. If the engine labors, use the next smaller size main jet. The engine should now give satisfactory performance. Recheck condition of spark plug.

When adjustments are satisfactory, install console and windshield.

Group 15
SILENCERS

400 AND 500 SNOWMOBILES (Serial No. -11,000)

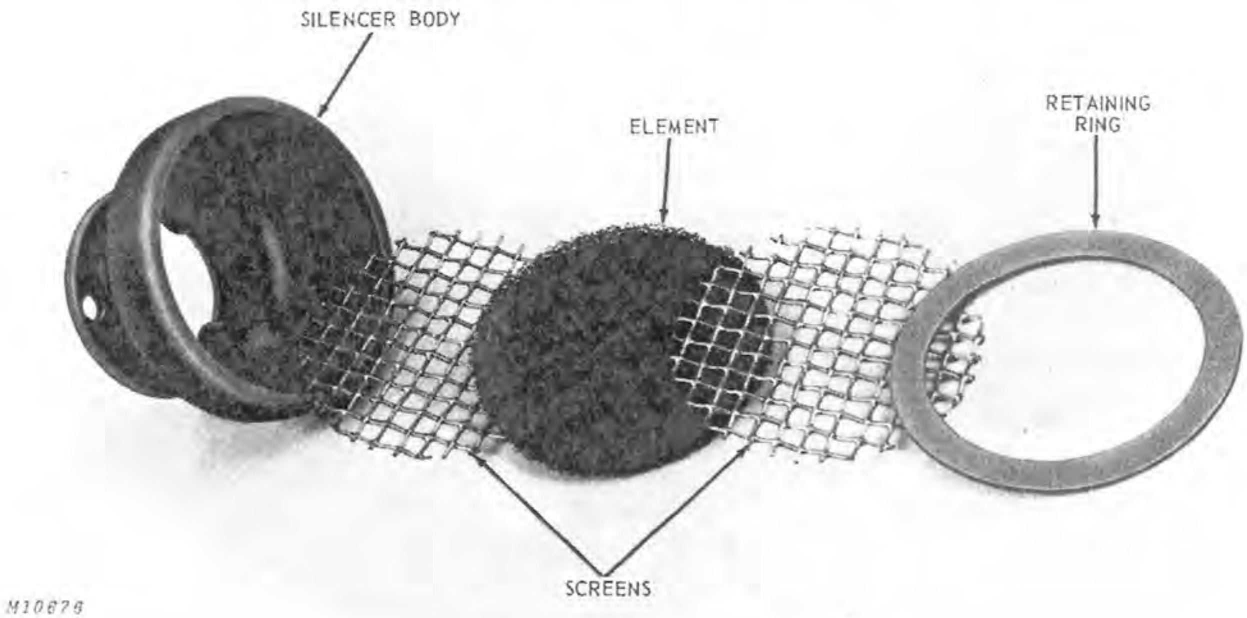


Fig. 1-Exploded View of Donaldson Silencer

General Information

John Deere 400 and 500 Snowmobiles (Serial No. -11,000) feature the Donaldson silencer, Fig. 1.

The function of the silencer is to quiet the sound of rushing air, and to catch fuel that spits back out of the carburetor throat.

The silencer is not intended to finely filter incoming air, because the snowmobile should be operated only on clean, snow-covered areas. The silencer does keep large particles and objects out of the engine, however.

Service

To remove element and screens for service, pry retaining ring, Fig. 1, out of silencer body with a screwdriver. Lift out screens and element.

Wash element and screens in cleaning solvent, dry and replace. Insert retaining ring.

NOTE: The element is installed dry. No lubrication is required.

400 AND 500 SNOWMOBILES (Serial No. 11,001-)
300, 600, 800, JDX4, JDX4 SPECIAL, JDX6 AND JDX8 SNOWMOBILES

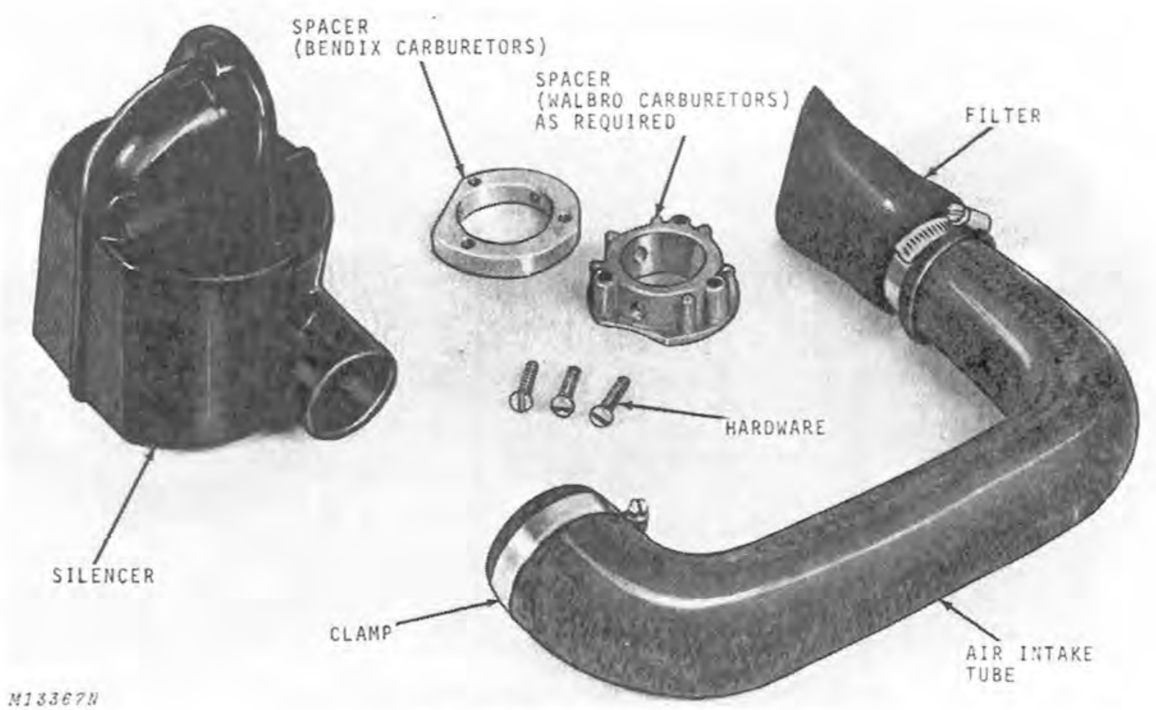


Fig. 2-Silencer Components

General Information

NOTE: The silencer and components in Fig. 2, are used on all snowmobiles except 400 and 500 (Serial No. -11,000) and JD295/S (Serial No. 20,001-30,000).

The function of the silencer, Fig. 1, is to quiet the sound of rushing air, and to catch fuel that spits back out of the carburetor throat.

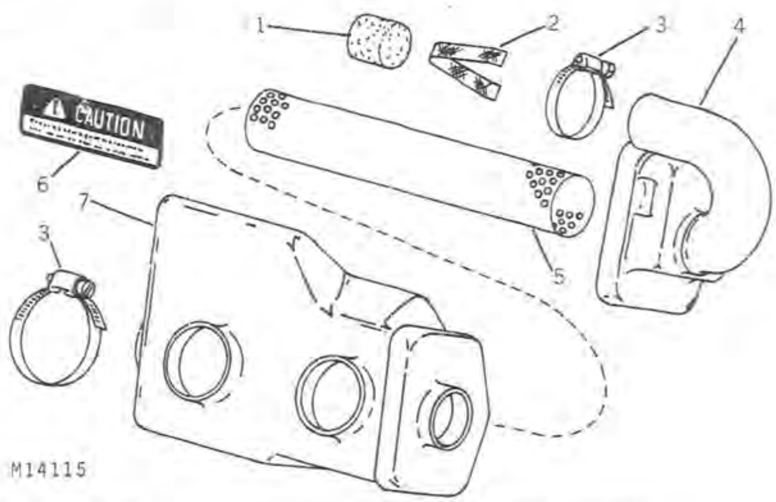
The silencer is not intended to filter incoming air because the snowmobile should be operated only on clean, snow-covered areas.

Service

There is no service on the silencer. If the silencer is cracked or damaged in any way it must be replaced.

IMPORTANT: NEVER run the snowmobile with the silencer removed. Lean mixtures, loss of power and engine damage will result if the engine is run without the silencer.

JD295/S SNOWMOBILE (Serial No. 20,001-30,000)



1—Foam Filter
2—Screen
3—Hose Clamp (3 used)
4—Resonating Chamber
5—Perforated Tube
6—Silencer Decal
7—Intake Silencer

Fig. 3-Silencer Components

General Information

The function of the silencer, Fig. 3, is to quiet the sound of rushing air to both carburetors on the JD295/S Snowmobile (Serial No. 20,001-30,000).

The silencer is not intended to filter incoming air because the snowmobile should be operated only on clean snow-covered areas.

Service

There is no service on the silencer. If the silencer is cracked or damaged, it must be replaced.

Group 20
FUEL TANK, SCREEN AND IN-LINE FUEL FILTER

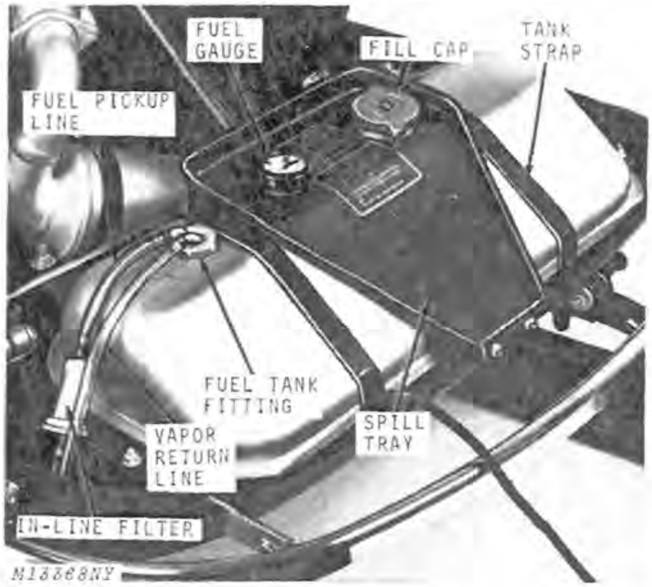


Fig. 1-Fuel Tank Assembly

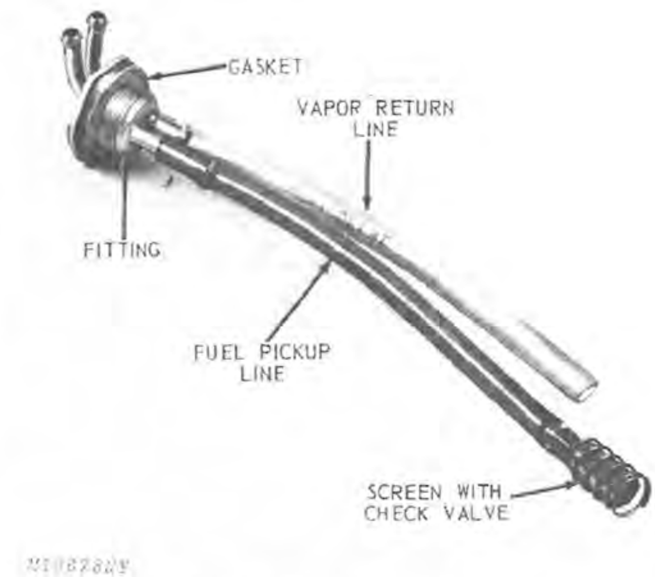


Fig. 2-Fuel Tank Fitting, Lines and Screen

GENERAL INFORMATION

The fuel tank features a fuel gauge, a separate fill opening, and a spill tray. The spill tray directs spilled fuel out of the machine, rather than into the snowmobile pan area. The terne-plate steel tank has a capacity of 5.50 U.S. gallons.

The fuel tank, Fig. 1, may have two fuel lines (Walbro Carburetors) or one fuel line (Bendix Carburetors). When two lines are used, the green line is for fuel pick-up and the clear line for vapor return. When one line is used it will be green, indicating fuel pick-up.

The pick-up line is connected to a self-cleaning screen with internal ball check valve, Fig. 2. This screen and ball check valve are located in the fuel tank and prevent fuel from running back out of the carburetor and lines when the engine is stopped.

The in-line fuel filter is located in the fuel pick-up line between the fuel tank and carburetor. The nylon screen in the in-line fuel filter has a self-cleaning action. Pulsation of the screen shakes loose contamination such as dirt, rust and small fibers. Loose contamination collects at the base of the cone.

The fuel tank cap is sealed. The vent for the tank is in the gas gauge cap.

SERVICE

Screen

To remove pickup screen, disconnect fuel lines from fitting, and remove fitting from fuel tank, Fig. 1. Remove pickup screen with check valve from end of line, Fig. 2.

Clean screen with gasoline and compressed air. Replace assembly if screen is damaged or if check valve does not restrict backward flow of fuel. Replace gasket on fuel line fitting, Fig. 2, if necessary.

Fuel Tank

Clean fuel tank if dirt deposits have been detected in tank. Remove tank by disconnecting fuel lines and unbolting tank straps, Fig. 1. Fold straps forward. Remove two bolts securing spill tray to front edge of pan, Fig. 1.

If tank has major damage, it should be replaced. Minor damage or leaks can be soldered or patched, if practical.

CAUTION: Do not attempt to solder tank unless proper precautions are taken.

In-line Fuel Filter

Change the filter annually or when packed contamination starts to build up at the base of the cone.

Group 25
SPECIFICATIONS

SPECIFICATIONS

Item	Dimension	Page Reference
Idle Speed (Walbro Carburetors)	2200 to 2600 rpm	30-10-10
Idle Speed (Bendix Carburetor)	2200 to 2600 rpm	30-12-8
Metering Lever Adjustment (Walbro Carburetors)	0.005 to 0.020 in.	30-10-8

TORQUE FOR HARDWARE

Location	Torque
Carburetor Cover Screws (Walbro Carburetors)	20 to 25 in-lbs
Fuel Valve Seat (Bendix Carburetor)	60 in-lbs

Section 40
ELECTRICAL SYSTEM
Group 5
GENERAL INFORMATION

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PRINCIPLE OF OPERATION

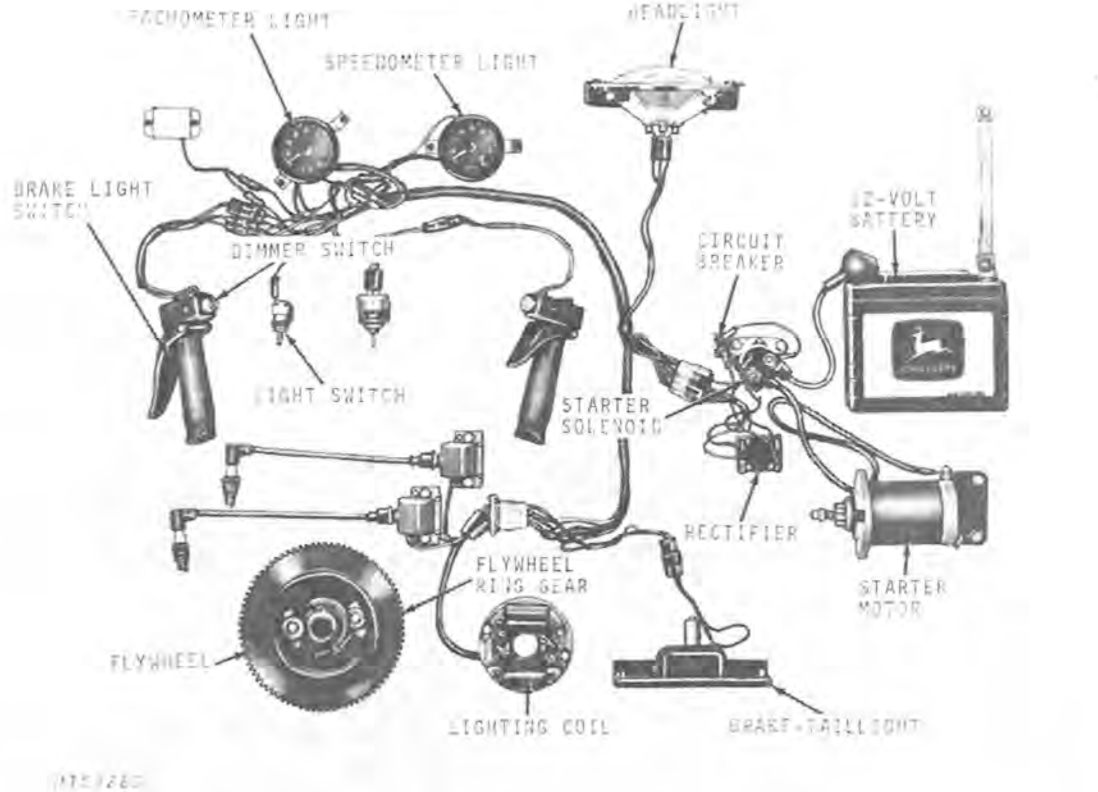

Fig. 1-John Deere Snowmobile Electrical System with Electric Start Option (1973 Models)

John Deere Snowmobiles have a flywheel alternator which provides power for the lighting system. When equipped with the electric start option, the alternator also charges the battery through a rectifier, Fig. 1.

The rectifier changes AC current to DC current for charging the battery.

A voltage regulator in the system (except 400 and 500 Snowmobiles, Serial No. 2551-11,000) limits the average AC voltage, allowing only the voltage needed in the system, at a given time.

A magneto-type ignition system is used with dual ignition coils, breaker points, and condensers. Ignition generating coils are mounted on a stator plate within the flywheel while the ignition coils are mounted on the engine. This is called "Energy Transfer" ignition system.

An "ON-OFF" switch on the instrument panel switches the headlight and taillight "ON" and "OFF". A brake light switch turns the brake light on when the brakes are applied. On 400 and 500 Snowmobiles (Serial No. 2551-11,000) the headlight comes on with the stop light.

The three-position ignition switch has "OFF", "ON" and "START" positions. "OFF" position grounds out the magneto. "ON" position opens the ignition circuit, and on electric start models, closes a circuit making it possible for the alternator to charge the battery. "START" position energizes the starter solenoid, cranking the engine (electric start).

An emergency stop switch also grounds the magneto when depressed.

The electric start option includes a battery box, solenoid, starter motor, circuit breaker and rectifier. A 12-volt manifold-vented battery is used with the electric start kit.

Refer to "Wiring Diagram" and "Diagnosing Malfunctions", in this group, to aid in understanding the electrical system and diagnosing malfunctions.

WIRING DIAGRAM

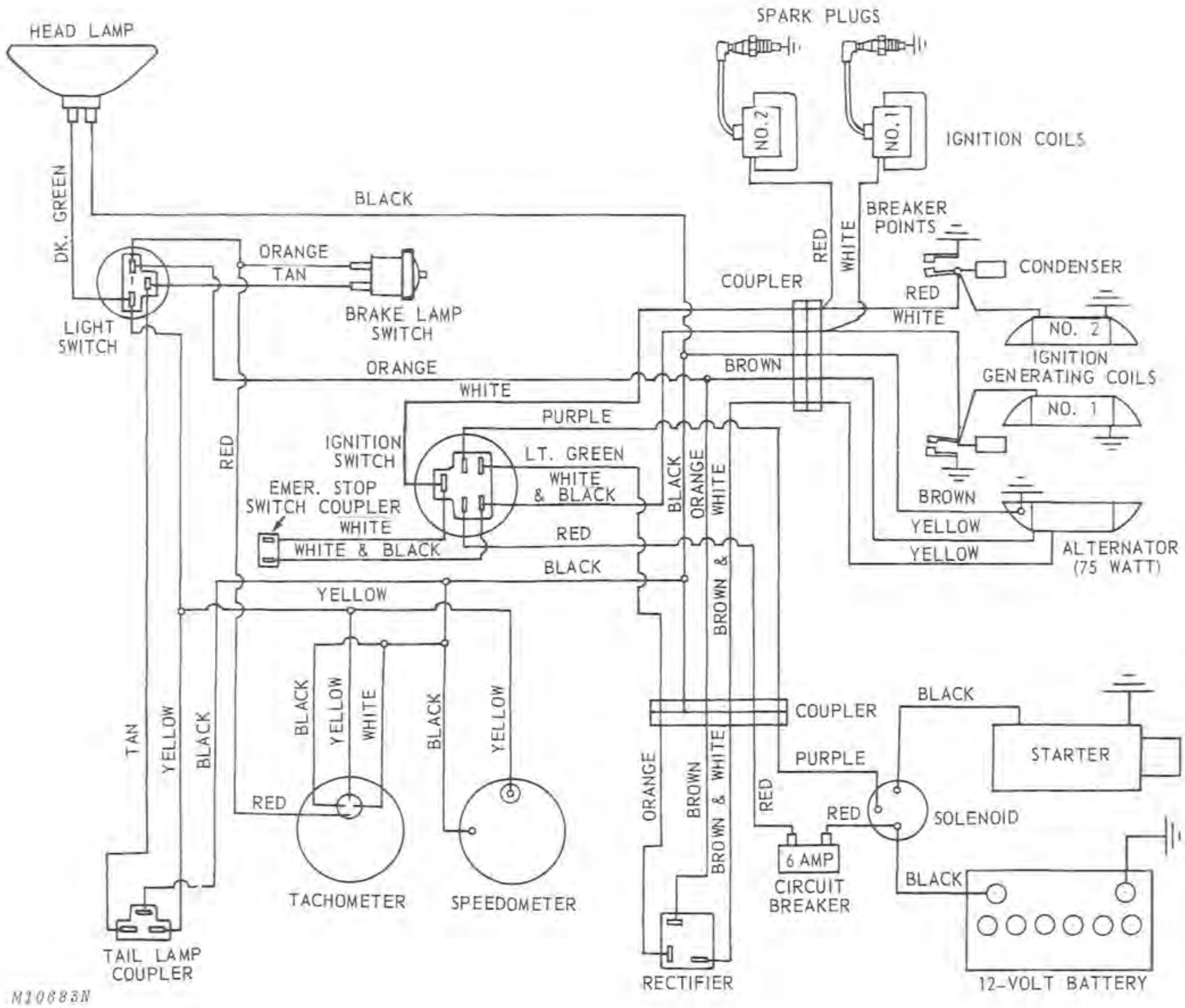

Fig. 2-Wiring Diagram with Electric Start 400 and 500 Snowmobiles (Serial No. 2551-11,000)

WIRING DIAGRAM

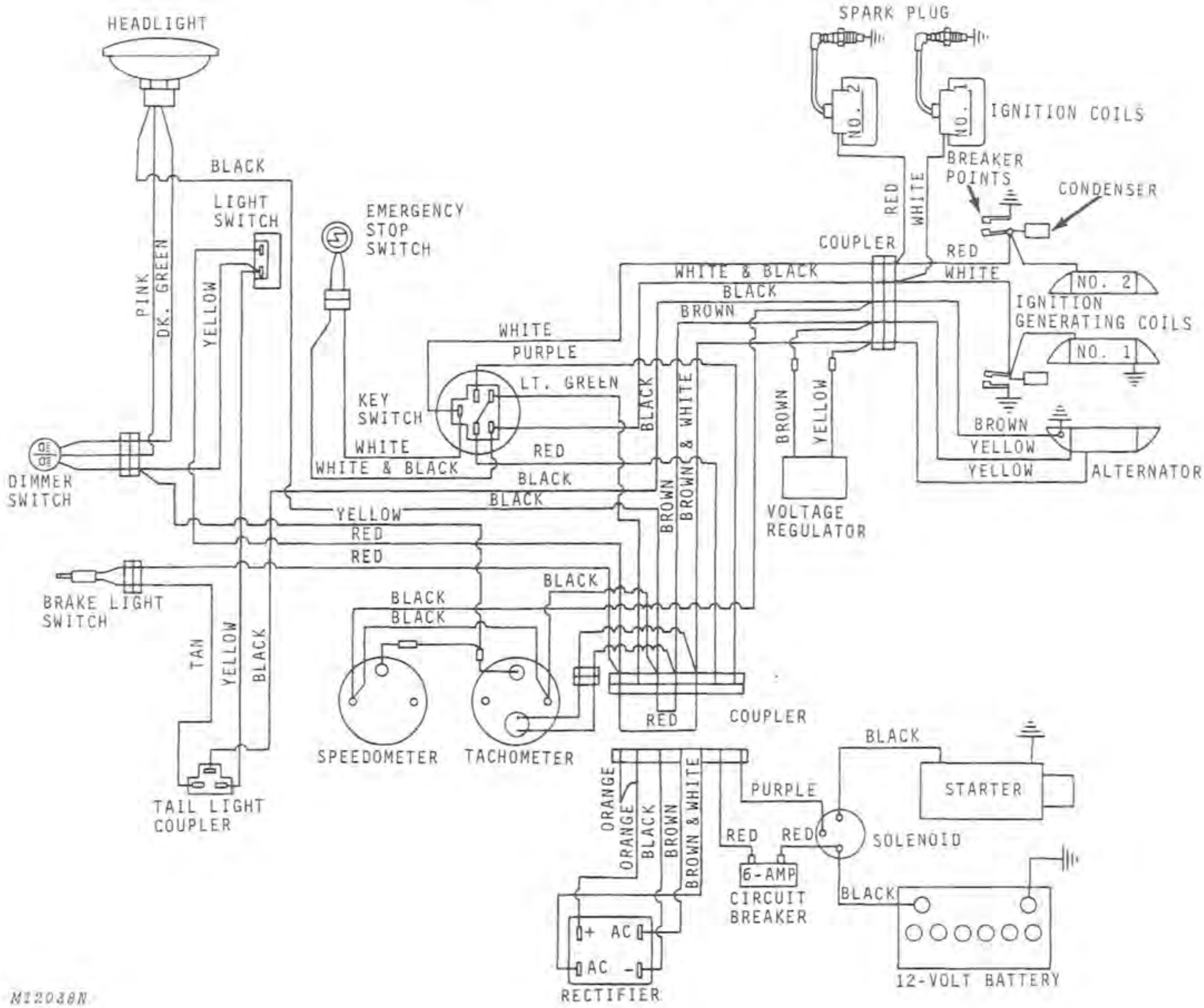

Fig. 3-Wiring Diagram with Electric Start
400 and 500 Snowmobiles (Serial No. 11,001-20,000)
600, JDX4 and JDX8 Snowmobiles (Serial No. 2551-20,000)

WIRING DIAGRAM

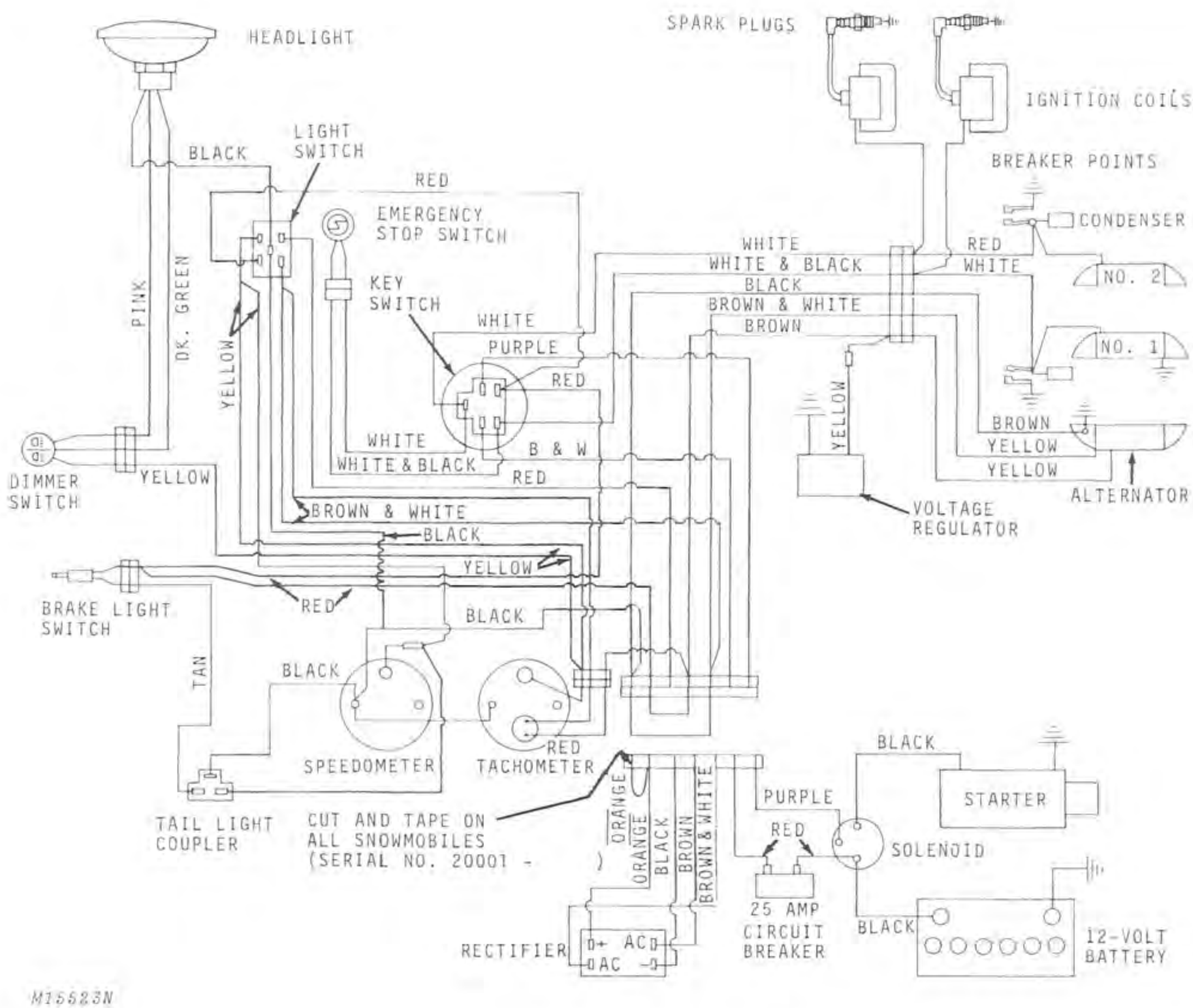

Fig. 4-Wiring Diagram with Electric Start
All Snowmobiles (Serial No. 20,001-)

WIRING DIAGRAM

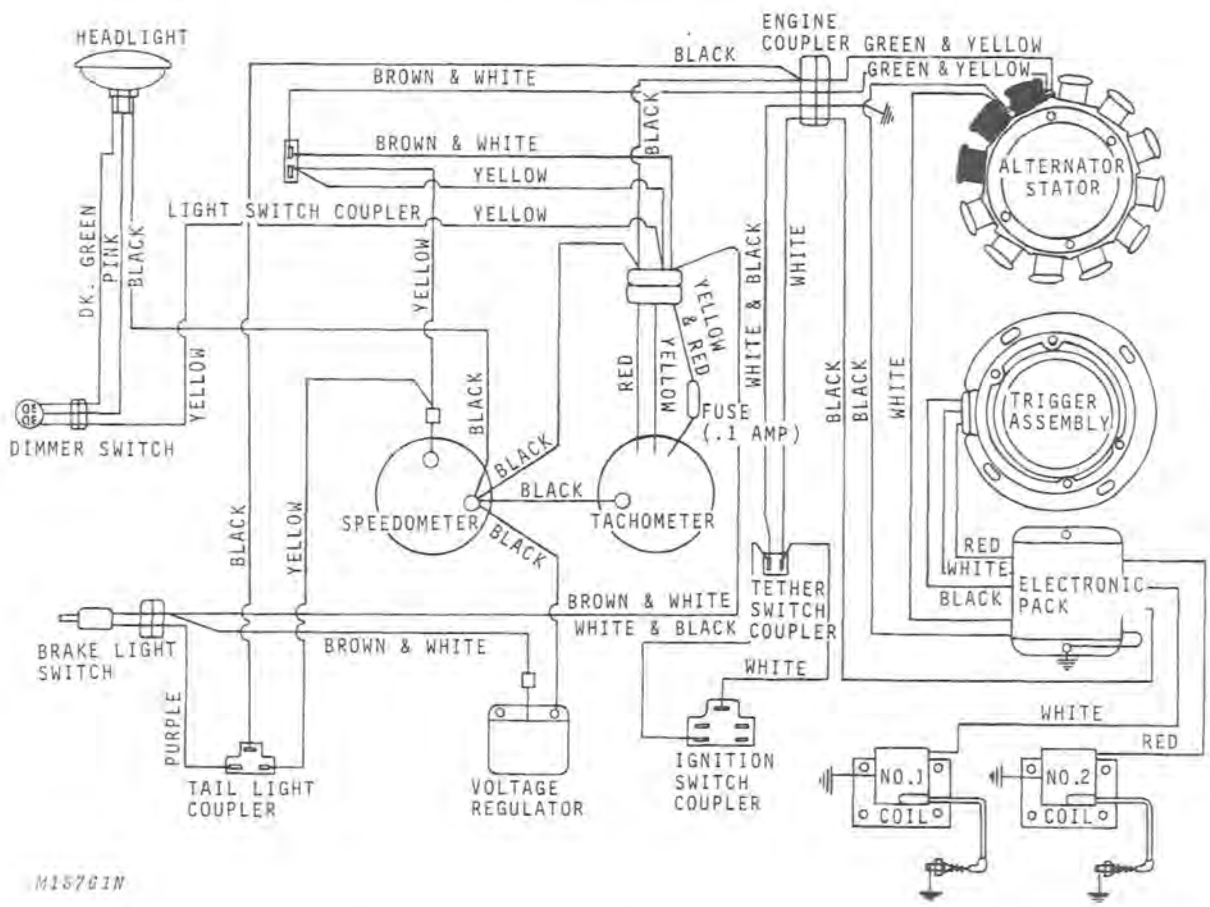

Fig. 5-Wiring Diagram For JD295/S Snowmobile (Serial No. 20,001-30,000)

NOTE: The JD295/S Snowmobile wiring harness does not provide for an electric start kit.

TESTING

Instructions are provided in each group for testing electrical components. The purpose of the tests is to isolate the cause of trouble in the ignition system, lighting system, or electric start system.

Recommended test procedures for dealers having their own test equipment are outlined in Groups 10, 13, 15 and 20 of this section.

High quality test equipment is a must for accurate diagnosis of electrical malfunctions. Always follow the procedures outlined by the manufacturer of the test equipment to supplement instructions contained in this manual.

NOTE: Because there are many manufacturers of test equipment, each with its own specific operating instructions, it is important to follow the manufacturer's recommendations if the procedures in this manual should contradict those of the manufacturer.

DIAGNOSING MALFUNCTIONS

Ignition System

Engine Hard to Start

Spark plugs improperly gapped, fouled, or defective.

Breaker points improperly gapped or pitted.

Coil or condenser weak.

Engine not timed properly.

Electrical connections loose or corroded.

Engine Misfires

Spark plugs improperly gapped, fouled, or defective.

Electrical connections loose or corroded.

Breaker points improperly gapped or pitted.

Coil or condenser weak.

Engine not timed properly.

Spark plug heat range incorrect.

Engine Overheating

Engine not timed properly.

Spark plug heat range too hot.

Engine Kicks Back and Backfires

Spark plug wires reversed.

Condenser faulty.

Engine not timed properly.

Breaker points faulty.

Spark retarding mechanism faulty.

DIAGNOSING MALFUNCTIONS—Continued

Lights Will Not Light

Electric connections loose or wires damaged.

Lighting coils faulty.

Light switch faulty.

Bulbs burned out.

Voltage regulator faulty.

Brake Light Will Not Light

Brake light switch faulty.

Electrical connections loose or wires damaged.

Bulb burned out.

Bulbs Burn Out Often

Wrong type bulbs used.

Voltage regulator faulty.

Lights Too Bright or Too Dim

Voltage regulator faulty.

Electric Start Kit

Battery Discharged

Battery defective.

Electrolyte level low.

Voltage regulator faulty.

Lighting coil faulty.

Ignition switch faulty.

Rectifier faulty.

Circuit breaker faulty.

Electrical connections loose or wires damaged.

Battery case dirty.

Cracked Battery Case or Terminals

Discharged battery exposed to freezing temperatures.

Battery hold-down attached improperly.

Rough handling.

Battery cables attached improperly.

Starter Will Not Operate

Electrical connections loose or wires damaged.

Battery discharged.

Starter solenoid faulty.

Starter motor faulty.

Circuit breaker faulty.

Ignition switch faulty.

Poor Starter Performance

Commutator or brushes worn, dirty or oil-saturated.

Armature binding.

Shorts, opens, or grounds in armature.

Brush springs weak.

Group 10
IGNITION SYSTEM

PRINCIPLE OF OPERATION

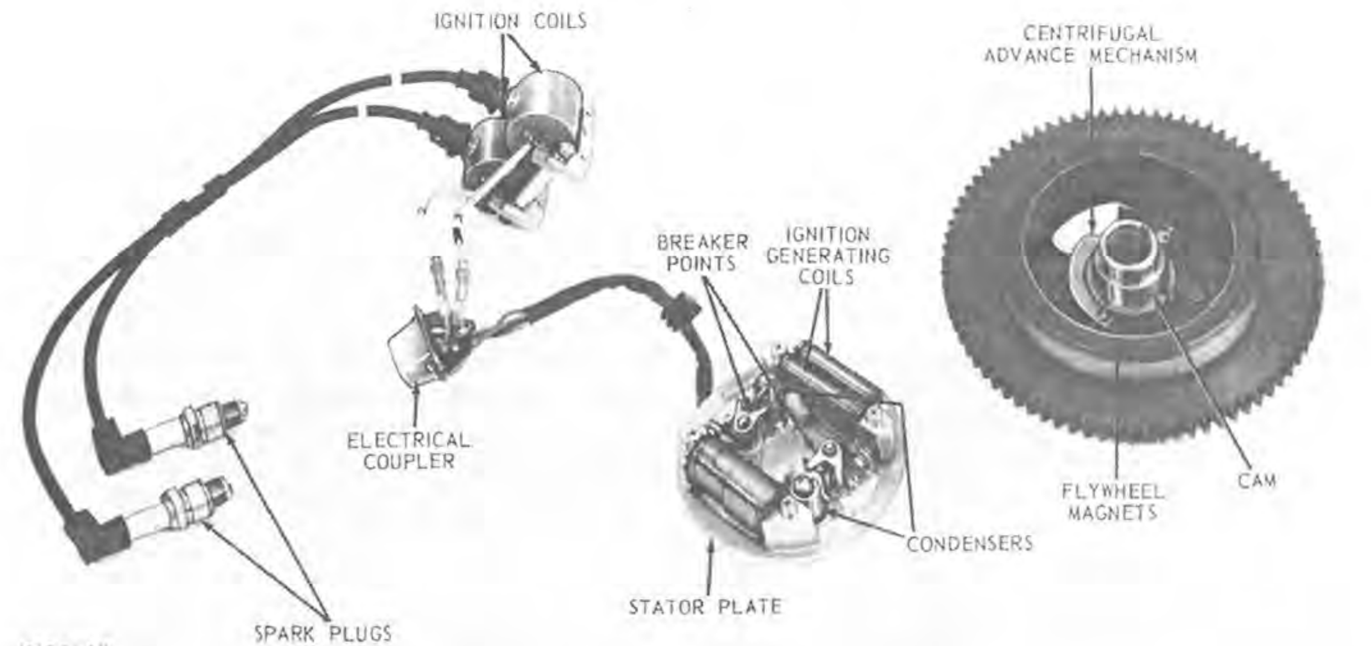

Fig. 1-Magneto System Components (CCW Engine)

The John Deere Snowmobiles feature a magneto-type, energy transfer ignition system, Fig. 1. The Kohler engine has a Robert Bosch ignition system. The CCW and Kioritz engines utilize either a Kokusan or Denso ignition system. See Specifications, Group 25, for systems used on each machine. All systems function in the same manner and similar procedures can be used for testing and repair.

NOTE: The JD295/S Snowmobile (Serial No. 20,001-30,000) features a CDI (Capacitor Discharge Ignition). See Group 13 for explanation and testing of the capacitor discharge ignition.

The ignition system consists of two ignition generating coils, two sets of breaker points, two condensers, and two ignition coils, Fig. 1. Each cylinder has separate components.

As the flywheel rotates, the magnets within the flywheel, Fig. 1, rotate past the ignition generating coils, generating a current within the coils.

The flywheel also contains a cam which opens and closes the breaker points at the correct time to fire the spark plugs, Fig. 1. This cam is linked to flyweights which advance the cam, and thus the ignition timing, as engine speed increases.

With the breaker points closed, the ignition generating coil builds with current flowing through the points to ground. When the points open, the current in the ignition generating coil collapses through the primary windings of the ignition coil to ground. This induces the high voltage in the secondary windings of the ignition coil necessary to fire the spark plug.

Condensers are used to momentarily absorb current when the points open and the field collapses. This prevents the points from arcing.

As the plug fires when the points open, the timing of the engine is affected by the position of the stator and breaker points in relationship to the cam lobe on the flywheel. The stator is movable to make timing adjustment possible.

When in the "OFF" position, the ignition switch connects the leads from each set of breaker points together to ground out the system. An emergency stop switch performs the same function when depressed.

See "Wiring Diagram" and "Diagnosing Malfunctions" in Group 5 of this section.

Spark Plug

A spark plug consists of two electrodes separated from each other by an air gap. The side electrode is connected to the shell of the spark plug which is grounded. The center electrode is completely insulated from the shell.

The high voltage produced in the secondary windings of the ignition coil, is applied to the center electrode and causes a spark to jump the gap to the side electrode. This spark ignites the fuel-air mixture and starts the combustion process in the cylinder.

The gap between electrodes is critical because it affects the entire range of engine performance—starting, idling, accelerating, power, and top speed.

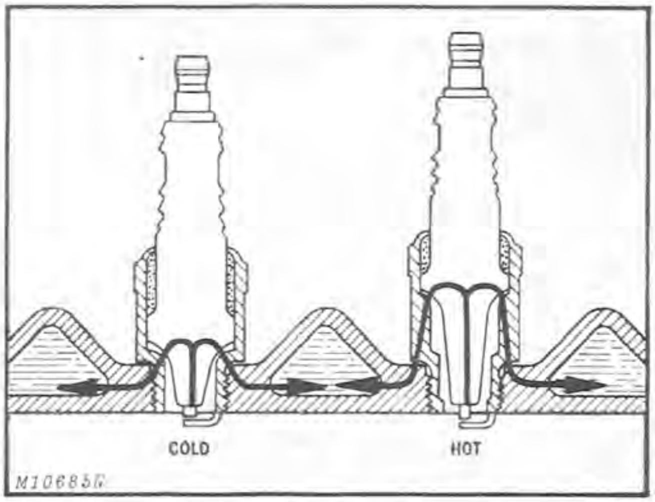

Fig. 2-Spark Plug Heat Ranges

Spark plugs must operate within a specific temperature range to give good performance.

The path for heat escape is through the insulating material, the plug shell, the gasket and threads to the cylinder head. By varying the construction of the insulator, the spark plug manufacturer is able to produce spark plugs with different heat-dissipating characteristics, Fig. 2.

The spark plug heat range has a very important effect on 2-cycle engine performance. A hotter than normal plug may be necessary for continuous slow-speed operation to prevent spark plug fouling. For long, sustained, cross-country operation or racing, a colder plug is best because it prevents engine overheating.

IMPORTANT: Spark plugs with too "hot" a heat range can cause engine damage such as piston burn-through. See spark plug charts.

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If a spark plug has too "hot" a heat range for an engine or an operating condition, the electrodes can not cool sufficiently between power strokes. This causes the electrodes to glow "red hot". Pre-ignition and detonation follow which bring temperatures up to a damaging level.

1972-1973 JOHN DEERE SNOWMOBILE SPARK PLUG CHART

(SERIAL NO. -20,000)

MODEL	BRAND	COLD**	NORMAL	HOT**
(JDX4)	AC	S41XL -AM52639	S42XL -AM52561	S43XL -AM52643
	Champion	N-2 -AM52640	N-3 -AM52432	N-4 -AM52644
	Champion*	N-59G -AM52641	N-3G -AM52614	N-4G -AM52645
(400, 500, 600)	AC	S41F -AM52272	S42F -AM52301	—
	Champion	L-78 -AM52266	L-81 -AM52303	L-86 -AM52646
	Champion*	L-4G -AM52613	L-6G -AM52304	L-9G -AM52647
(JDX8)	AC	—	S40F -AM52271	S41F -AM52272
	Champion	L-77J -AM52642	L-78 -AM52266	L-81 -AM52303
	Champion*	L-3G -AM52302	L-4G -AM52613	L-6G -AM52304

1974 JOHN DEERE SNOWMOBILE SPARK PLUG CHART

(Serial No. 20,001-30,000)

MODEL	BRAND	COLD**	NORMAL	HOT**
(300)	AC	S41XLR -AM53008	S42XLR -AM53007	S43XLR -AM53018
	Champion	RN-2 -AM53001	RN-3 -AM53006	RN-4 -AM53019
	Champion*	N-59G -AM52641	RN-3G -AM53016	RN-4G -AM53020
(400, 500 600, JDX4 JDX6, JDX8)	AC	S41XLR -AM53008	S42XLR -AM53007	S43XLR -AM53018
	Champion	N-57 -AM53014	RN-2 -AM53001	RN-3 -AM53006
	Champion*	N-57G -AM53015	N-2G -AM53488	RN-3G -AM53016
(JD295/S)	AC	—	SV4XL -AM53223	—
	Champion	—	N-19V -AM53187	—

1975 JOHN DEERE SNOWMOBILE SPARK PLUG CHART

(Serial No. 30,001-)

MODEL	BRAND	COLD**	NORMAL	HOT**
(300)	AC	S41XLR -AM53008	S42XLR -AM53007	S43XLR -AM53018
	Champion	RN-2 -AM53001	RN-3 -AM53006	RN-4 -AM53019
	Champion*	N59G -AM52641	RN-3G -AM53016	RN-4G -AM53020
(400, 600) (JDX4, JDX6)	AC	S41XLR -AM53008	S42XLR -AM53007	S43XLR -AM53018
	Champion	N-57 -AM53014	RN-2 -AM53001	RN-3 -AM53006
	Champion*	N57G -AM53015	N-2G -AM53488	RN-3G -AM53016
(800, JDX8)	AC	S40XLR -AM53487	S41XLR -AM53008	S42XLR -AM53007
	Champion	N-57 -AM53014	RN-3 -AM53001	RN-3 -AM53006
	Champion*	N57G -AM53015	N-2G -AM53488	RN-3G -AM53016

*Gold-Palladium plugs. Use N-59G (AM52641) in place of N-2G (AM53488) on 1975 800 and JDX8 Snowmobiles for high performance or continuous high-speed operation.

**Use "hot" or "cold" plugs only under circumstances explained in operator's manuals. The "normal" heat range plug is proper for most snowmobiling.

Spark plugs for snowmobiles vary in reach; they are either 1/2 inch (12.70 mm) or 3/4 inch (19.05 mm). Of the snowmobiles in the 1972-1973 John Deere Snowmobile Spark Plug Chart, only the JDX4 Snowmobile uses a 3/4-inch (19.05 mm) reach plug—all other machines use a 1/2-inch (12.70 mm) reach plug.

All snowmobiles in the 1974 and 1975 John Deere Snowmobile Spark Plug Charts use 3/4-inch (19.05 mm) reach, resistor-type spark plugs. A resistor-type plug does not reduce firing-tip voltage but does minimize radio and television interference generated by the ignition system.

ANALYSIS

Spark Plug

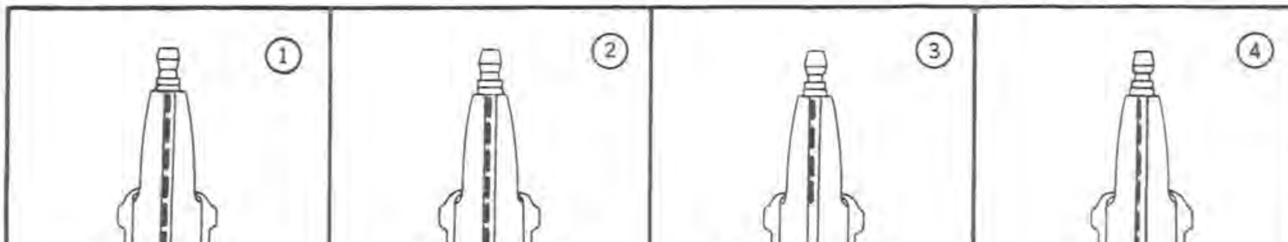


Fig. 3-Spark Plug Misfires

In nearly every case of spark plug failure, the cause must be corrected before new or recondtioned spark plugs are installed. Otherwise, servicing will again be needed in a short time.

Fig. 3 illustrates what takes place in a faulty spark plug during ignition. The numbered statement below tell what causes the misfirings.

1. *Normal ignition* occurs when a spark of adequate energy is delivered at the correct instant across the electrode gap as shown.

2. *Tracking ignition* occurs when the spark, jumping from one deposit "island" to another, ignites the fuel charge at some point along the insulator nose. The effect is to retard ignition timing.

3. *Pre-ignition* occurs when some surface in the combustion chamber becomes hot enough to fire the fuel-air mixture before the spark occurs.

4. *Erosion* of the plug electrodes may prevent voltage from jumping the gap.

5. *Deposits* may have bridged the gap so that the coil voltage is drained away without a spark occurring.

6. *Flashover* is caused by moisture or dirt or by a worn out terminal boot. This allows voltage to short across the outside of the insulator.

7. *Cracks* in the plug insulator may allow high voltage to short circuit to the ground.

8. *Deposits* formed on the insulator surface may drain away voltage.

Fig. 4-Normal Spark Plug

A spark plug with brown or grayish-tan color, few combustion deposits, and with electrodes not burned or eroded, Fig. 4, indicates normal operation.

The ignition timing, carburetor adjustments and spark plug heat range are all correct. A spark plug having this appearance can be gapped, cleaned, and reinstalled.

Fig. 5-Worn Out Spark Plug

Eventually, corrosive exhaust gases and high voltage spark will erode the electrodes, Fig. 5. Spark plugs in this condition require more voltage to fire and can cause hard starting and engine misfire.

Replace with new plugs of proper heat range.

Fig. 6-Overheated Spark Plug

A spark plug with light gray or chalky-white color and with excessively burned electrodes, Fig. 6, indicates an overheated situation.

This can be caused by too "lean" a carburetor setting, air leaks at intake manifold or carburetor gaskets, engine overloading, or clogged exhaust ports. A spark plug with too "hot" a heat range could also be at fault.

Fig. 7-Gap-Bridged Spark Plug

A spark plug shorted out by combustion deposits fused between electrodes, Fig. 7, is called gap-bridging.

This condition is caused by excessive carbon in the cylinder. A rich fuel mixture, improper gasoline-oil mixture, poor quality gasoline or oil, or plugged exhaust ports could be the cause of the excessive carbon.

M10690N

Fig. 8-Wet-Fouled Spark Plug

A black color and a damp, oily film over the firing end, Fig. 8, indicates a wet-fouled spark plug.

This condition is caused by excessive oil in the fuel mixture, carburetor adjustments too "rich", too "cold" a spark plug, or weak ignition output. Excessive idling could also be at fault.

M10691N

Fig. 9-Aluminum Throw-Off on Spark Plug

A metallic "gob" of gray metal adhering to electrodes and plug core, Fig. 9, indicates excessive heat caused by pre-ignition. The excessive heat melts the piston and this metal adheres to the spark plug.

Pre-ignition can be caused by too "hot" a spark plug, incorrect ignition timing, carbon deposits in the combustion chamber, or too "lean" a carburetor setting.

Breaker Points

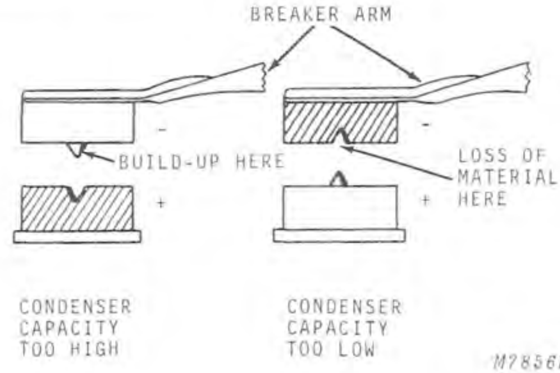


Fig. 10-Breaker Point Build-Up

If burned breaker points occur frequently, the condition of the condenser should be suspected. If the condenser has too small a capacity, metal will transfer from the stationary contact to the movable contact. If the capacity is too large, the metal will build up on the stationary contact, Fig. 10.

TESTING

Preliminary Engine Test

Several factors contribute to the overall performance of an ignition system. All components must be in good condition and the spark must be properly timed.

Hard starting, low power, and erratic operation can often be attributed to faulty ignition. If poor ignition is suspected, the first thing to do is to determine if the ignition system is actually at fault. A simple operational test will determine this.

Fig. 11-Checking Spark at Plug

Install a wood screw in spark plug connector and hold 1/8-inch from spark plug base while cranking engine, Fig. 11, with ignition switch "ON". Check both cylinders.

A weak spark or no spark indicates ignition system difficulties. Test further to isolate problem.

A sharp, snappy spark indicates coils, breaker points, and condenser are in good condition.

Test Equipment

The Model 98 Merc-O-Tronic Analyzer, Fig. 12, is one of the most precise and versatile testers available for checking ignition system components.

The following tests are made using the Merc-O-Tronic Analyzer. If different equipment is used, the same tests should be made, but follow the test equipment manufacturer's recommendations for procedures.

Fig. 12-Model 98 Merc-O-Tronic Analyzer

Analyzer Test

Prior to testing the circuitry or any electrical component it is first necessary to test the operation and battery power of the analyzer. To do this proceed as follows:

1. Turn the adjustment screw on the front of the analyzer meter so that needle pointer aligns with "O" reading on Scale No. 1, Fig. 12.

2. Remove two screws securing analyzer cover and tip cover to rear. This allows access to the battery.

3. Attach the BLACK test lead of analyzer to negative post of analyzer battery.

4. Attach the RED test lead of analyzer to positive post of analyzer battery.

5. Turn the volt scale switch to the "ON" position.

6. Read RED figures on top of Scale No. 1. Reading must be no less than 6 volts; if less, replace analyzer battery.

NOTE: For Kohler engine ignition coil power test and ignition coil insulation test, the analyzer battery has insufficient voltage to produce exact readings. Disconnect analyzer battery cables and connect each cable to appropriate post of 12-volt battery (See Fig. 23). Test condition of 12-volt battery as explained in analyzer test.

CAUTION: Perform tests with analyzer and components on an insulated or wooden table top to prevent any leakage or shock hazard.

Electrical Tests for CCW Engines

Testing Ignition Coil Power

Remove stator plate and high-tension coils from engine prior to testing.

IMPORTANT: Perform this test as quickly as possible to avoid coil damage.

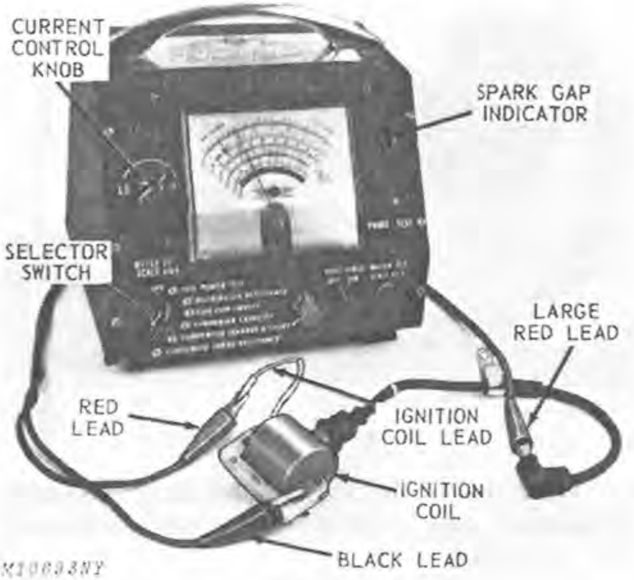


Fig. 13-Testing Coil Power

1. Connect the large red lead to the spark plug connector, Fig. 13.

2. With Denso system (See Specifications, Group 25.) connect other red lead to ignition coil lead and black lead to coil laminations, Fig. 13.

3. With Kokusan system (See Specifications, Group 25.) connect black lead to ignition coil lead and other red lead to coil laminations.

IMPORTANT: Kokusan system has reverse polarity and black and red leads must be reversed.

4. Set the current control knob to "LO" and set selector switch to position No. 1 Coil Power Test, Fig. 13.

5. Slowly turn the current control knob clockwise until the current value on scale No. 1 reaches operating amperage. See "Specifications", Group 25.

6. The spark gap indicator should fire steadily. If the spark is faint, the coil is defective and should be replaced.

If the coil tests good, perform the high-speed test as follows:

7. Continue to turn the current control knob clockwise until maximum meter reading is reached. Spark gap indicator should continue to fire steadily. If not, replace coil.

Repeat test for the other ignition coil.

Testing Ignition Coil Insulation

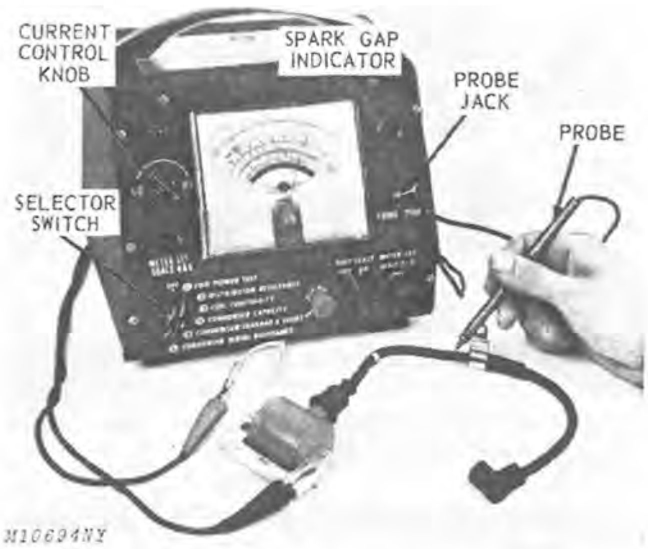


Fig. 14-Ignition Coil Insulation Test

IMPORTANT: Perform this test as quickly as possible to avoid coil damage.

1. Connect the small red lead and the black lead in the same manner as outlined under "Testing Ignition Coil Power." Disregard large red lead.

2. Plug the insulation test probe, Fig. 14 into the probe test jack of the analyzer.

3. Turn selector switch to position No. 1 Coil Power Test, and turn current control knob until maximum current reading is obtained, Fig. 14.

4. Pass the test probe tip over the insulating surface of the ignition coil and spark plug cable. If insulation is cracked, leaking or damaged, a spark discharge will be noted at the leaking surface.

Repeat test for the other ignition coil.

Electrical Tests for CCW Engines—Continued

Testing Ignition Coil Continuity

Fig. 15-Ignition Coil Continuity Test

1. Turn selector switch to position No. 3 Coil Continuity. Attach red and black test leads temporarily and adjust meter adjustment knob to "Zero" meter on right-hand side of scale.

2. Connect the black test lead to coil laminations of ignition coil and the red lead to spark plug connector, Fig. 15. Read red figures on scale No. 3.

If resistance is not within specifications, replace coil. See "Specifications", Group 25.

Repeat test for the other ignition coil.

Testing Ignition Coil Primary Resistance

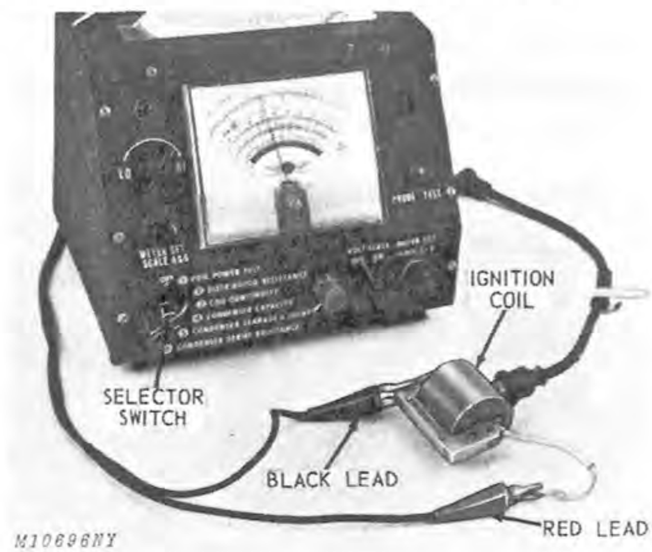


Fig. 16-Primary Resistance Test

1. Turn selector switch to position No. 2 Distributor Resistance. "Zero" meter on right-hand side of scale with adjustment knob.

2. Connect the black test lead to coil laminations of ignition coil and the red test lead to the ignition lead on coil, Fig. 16.

3. Resistance should be within specifications when read on scale No. 2. Replace coil if not within limits. See "Specifications", Group 25.

Repeat test for the other ignition coil.

Testing Low Tension Circuit Resistance

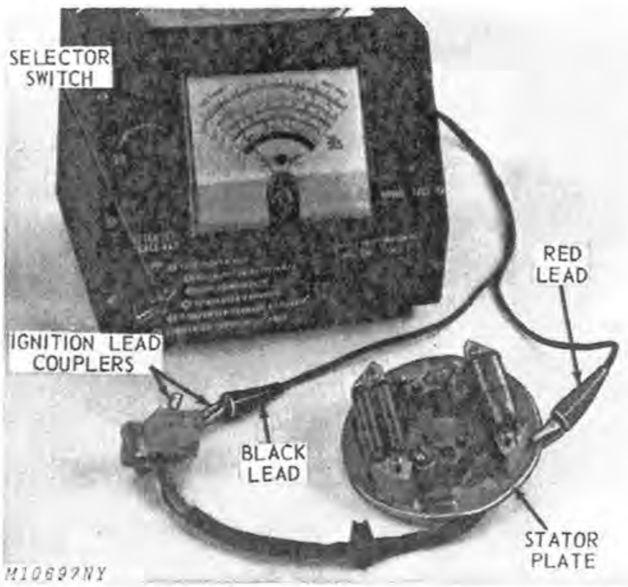


Fig. 17-Low Tension Circuit Resistance Test

1. Turn selector switch to position No. 2 — Distributor Resistance. Attach red and black leads temporarily to "Zero" meter on left-hand side of "OK" block.

2. Connect black test lead to the white ignition lead coupler and the red test lead to stator plate, Fig. 17.

3. Meter needle should remain in the "OK" block. If not, check condition of No. 1 breaker points. Clean if necessary and test again.

Repeat test but with the black test lead connected to red ignition lead coupler.

Testing Ignition Generating Coil Resistance

1. Turn selector switch to position No. 2 — Distributor Resistance, Fig. 18. "Zero" meter on right-hand side of scale with adjustment knob.

2. Connect red test lead to white ignition lead coupler and black test lead to stator, Fig. 18. Place cardboard between No. 1 breaker points to insulate, Fig. 18.

3. If resistance reading is not within specifications, replace ignition generating coil(s). See "Specifications", Group 25.

4. Repeat above test for other ignition generating coil by connecting red lead to red ignition lead coupler and by placing cardboard between No. 2 breaker points.

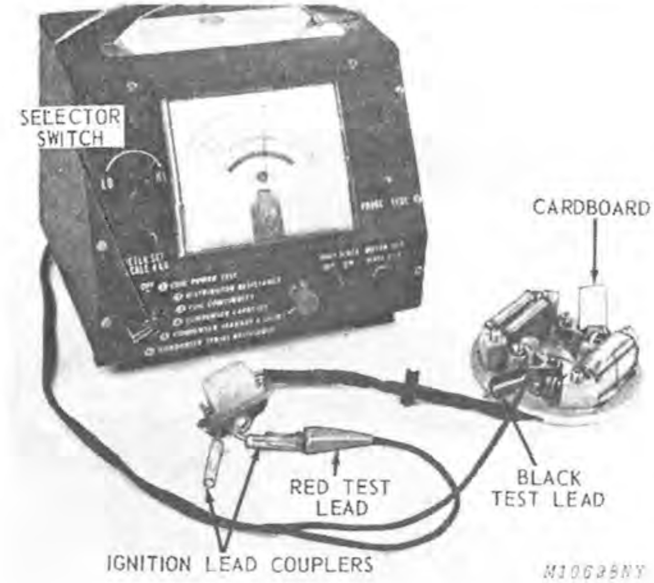


Fig. 18-Ignition Generating Coil Resistance Test

Testing Lighting Coil Continuity

NOTE: Stator assembly need not be removed from engine to make this test.

This test can be made with an accurate ohmmeter or the Model 98 Merc-O-Tronic Analyzer, Fig. 19.

Turn selector switch to position No. 2 — Distributor Resistance. "Zero" meter on right-hand side of scale.

Insert paper clips into two yellow lead connectors in coupler, Fig. 19. Attach tester leads and read scale No. 2. Reading must be within specifications. See "Specifications", Group 25.

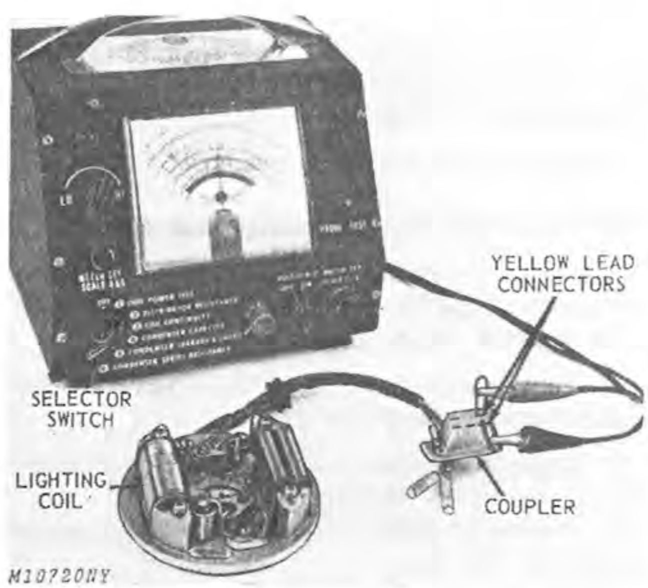


Fig. 19-Testing Lighting Coil Continuity

Electrical Tests for CCW Engines—Continued

Testing Condenser Capacity

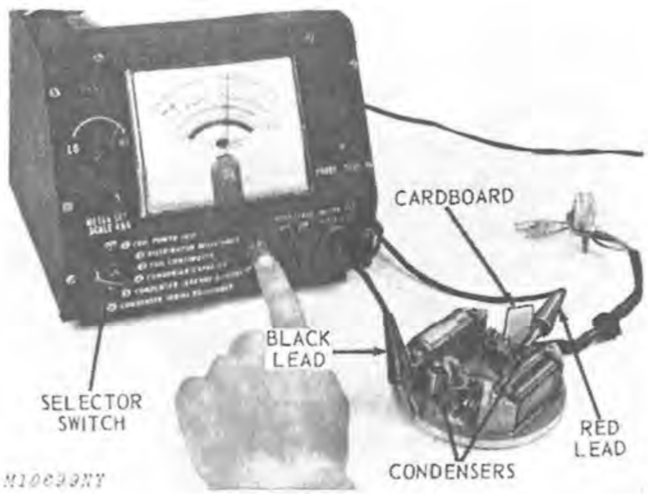


Fig. 20-Condenser Capacity Test

1. Place a piece of cardboard between breaker points and unsolder ignition generating coil lead from condenser terminal, Fig. 20.

2. Plug the analyzer into a 115-volt outlet and turn the selector switch to position No. 4 — Condenser Capacity. Temporarily attach red and black test leads, depress red button on meter, and "Zero" needle on right-hand side of scale by turning adjustment knob.

3. Connect the red test lead to the condenser terminal and connect black test lead to stator plate, Fig. 20.

4. Depress red button and read scale No. 4. If not within specifications, replace condenser. See "Specifications", Group 25.

Repeat test for the other condenser.

Testing Condenser for Leakage and Short

1. Make the electrical connections and preparations as outlined for "Testing Condenser Capacity." Plug analyzer into a 115-volt outlet.

2. Turn selector switch to position No. 5 — Condenser Leakage and Short, Fig. 21.

3. Depress red button and hold for 15 seconds. Read scale No. 5. The needle will move to the right and must return within range of the narrow black bar at the left, Fig. 21.

Repeat test for the other condenser.

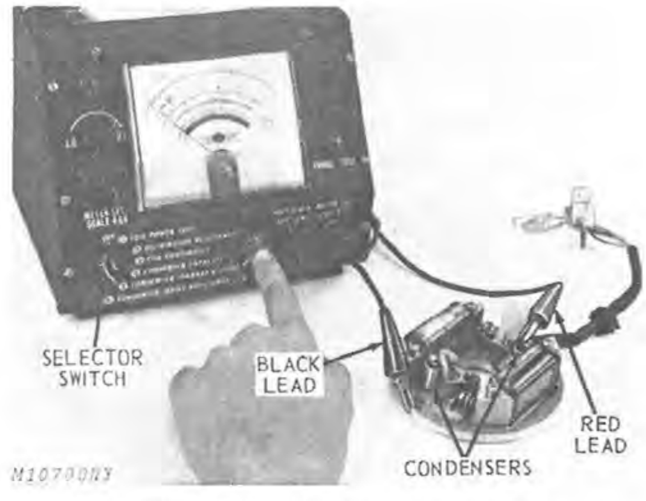


Fig. 21-Condenser Leakage and Short Test

Testing Condenser Series Resistance

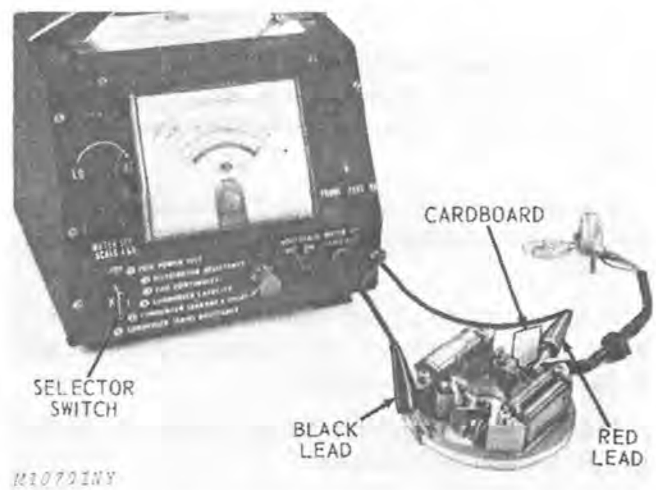


Fig. 22-Series Resistance Test

1. Place selector switch in position No. 6 — Condenser Series Resistance. Temporarily attach red and black test leads, and "Zero" needle on right-hand side of dial.

2. Make the electrical connections and preparations as outlined for "Testing Condenser Capacity."

3. Needle must be within the "OK" green block on scale No. 6, Fig. 22. If not, replace condenser.

Repeat test for the other condenser.

Electrical Tests for Kohler Engines

NOTE: For Kohler engine ignition coil power test and ignition coil insulation test, the analyzer battery has insufficient voltage to produce exact readings. Disconnect analyzer battery cables and connect each cable to appropriate post of 12-volt battery. Test condition of 12-volt battery as explained in analyzer test.

CAUTION: Perform tests with analyzer and components on an insulated or wooden table top to prevent any leakage or shock hazard.

Testing Ignition Coil Power

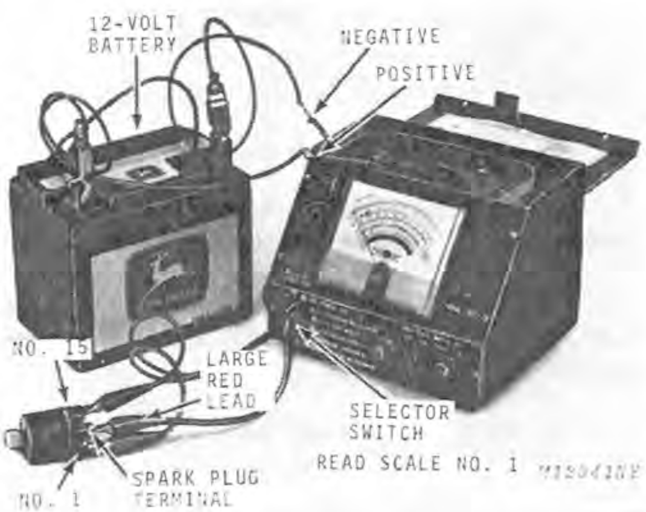


Fig. 23-Testing Ignition Coil Power

IMPORTANT: Complete this test as quickly as possible. Upon completion of test, turn selector switch "OFF" and current control knob to "LO" position.

1. Connect the BLACK test lead to ignition coil terminal No. 15 and RED test lead to terminal No. 1. Connect the single large RED test lead to the spark plug terminal, Fig. 23.

2. Set current control knob to "LO" position, turn selector switch to No. 1 — Coil Power Test.

3. Slowly turn the current control knob clockwise and note current value on Scale No. 1. When operating amperage reaches 0.6 amp., note the spark gap indicator on the right-hand side of analyzer. It should fire steadily. If the spark is faint, the coil is defective and should be replaced. If the coil is good, perform the high speed test in Step 4.

4. Continue turning the current control knob clockwise to obtain maximum meter reading. The spark gap should fire steadily. If the spark is faint, coil is defective and should be replaced.

5. Repeat test for other ignition coil.

Testing Ignition Coil Insulation

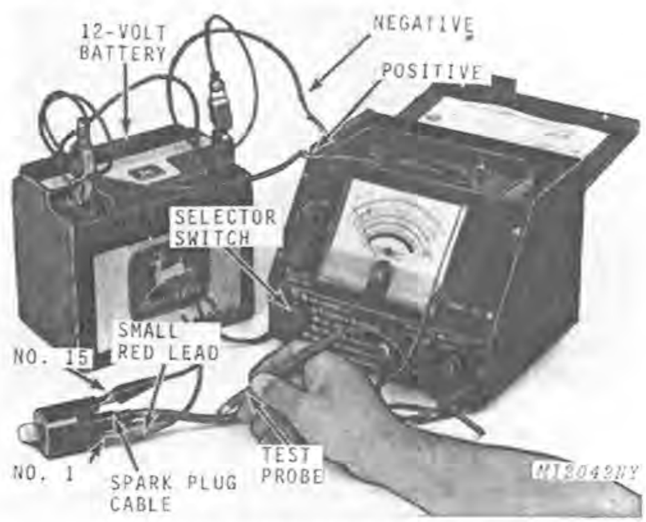


Fig. 24-Testing Ignition Coil Insulation

IMPORTANT: Do not allow test probe to linger at any one point during test operation. Complete test rapidly because this is a severe test for a coil.

1. Connect the BLACK test lead to terminal No. 15 and the RED test lead to No. 1 terminal of ignition coil, Fig. 24. DO NOT connect the single RED test lead. Install spark plug wire in center hole.

2. Plug the insulation test probe into the "jack" located in the front right-hand side of the analyzer.

3. Turn selector switch to position No. 1 — Coil Power Test.

4. Turn current control knob clockwise to obtain maximum current reading.

IMPORTANT: Do not exceed maximum meter reading.

5. Pass the insulation test probe tip over the insulated surface of the coil and spark plug wire. If coil insulation or spark plug wire is cracked, leaking or damaged, a spark discharge will be noted at the cracked or leaking surface.

6. Repeat test for other ignition coil.

Electrical Tests for Kohler Engines—Continued

NOTE: At this point of the test, disconnect 12-volt battery and reinstall a good analyzer battery.

Testing Ignition Coil Resistance (Secondary)

Fig. 25-Testing Ignition Coil Resistance (Secondary)

1. Turn the selector switch to position No. 3 — Coil Continuity.

2. Temporarily connect the RED and BLACK test leads together.

3. Turn meter adjustment screw until pointer aligns with position "0" on scale No. 3 (right-hand side of scale). Disconnect the RED and BLACK test leads.

4. Connect the BLACK test lead to terminal No. 15 of the coil, Fig. 25.

5. Connect the RED test lead to the spark plug terminal of the coil.

6. Read the RED figures of scale No. 3. The values on the RED scale No. 3 are in OHM's and must be multiplied by 100. Secondary resistance should be between 7,300 and 8,500 ohms. Meter reading must be between specification limits, if not, replace coil.

7. Repeat test for other ignition coil.

Testing Ignition Coil Resistance (Primary)

Fig. 26-Testing Ignition Coil Resistance (Primary)

1. Turn selector switch to position 2 — Distributor Resistance—for checking low ohm values.

2. DO NOT connect RED and BLACK test leads. Turn meter adjustment screw until pointer aligns with position "0" on scale No. 2.

3. Connect the BLACK test lead to terminal No. 15 and the RED test lead to terminal No. 1 of the coil, Fig. 26.

4. Read the RED figures on scale No. 2. Meter reading should be 1.8 to 2.0 ohms (primary resistance). If reading is not within specifications, replace coil.

5. Repeat test for other ignition coil.

Testing Ignition Generating Coil Continuity

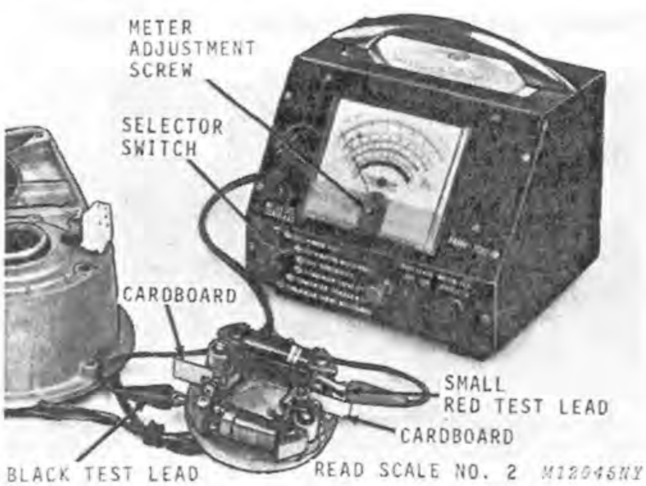


Fig. 27-Testing Ignition Generating Coil Continuity

1. Turn selector switch to position 2 — Distributor Resistance—for checking low ohm values.

2. Turn meter adjustment screw until pointer aligns with position "0" on scale No. 2.

3. Insulate breaker points by placing a small piece of cardboard between points, Fig. 27.

4. Connect the BLACK test lead to one breaker point terminal and the RED test lead to the other breaker point terminal.

5. Read the RED figures on scale No. 2. Meter reading should be 1.9 to 2.8 ohms. If not, replace ignition generating coil.

Testing Lighting Coil Continuity

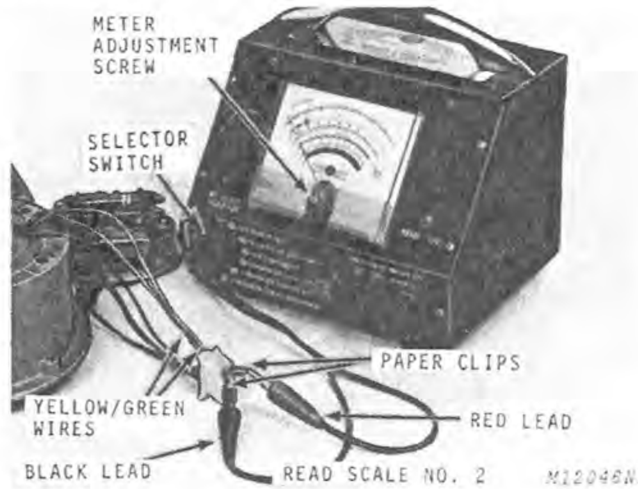


Fig. 28-Testing Lighting Coil Continuity

1. Turn selector switch to position 2 — Distributor Resistance—for checking low ohm values.

2. Turn meter adjustment screw until pointer aligns with position "0" on scale No. 2.

3. Connect the BLACK test lead to one of the yellow/green wires and the RED test lead to the other yellow/green wire, Fig. 28.

4. Read the RED figures on scale No. 2. Meter reading should be .4 to .6 ohms. If not, replace the lighting coil.

Electrical Tests for Kohler Engines—Continued

Testing Condenser Capacity

Fig. 29-Testing Condenser Capacity

1. Unsolder wire on top of condenser.

2. Plug the analyzer into a 115-volt, 60 cycle, AC outlet.

3. Turn selector switch to position 4 — Condenser Capacity.

4. Temporarily connect the RED and BLACK test leads together.

5. Depress RED button and turn meter adjustment screw until pointer aligns with position "0" on scale No. 4. Disconnect red and black test leads.

6. Connect the RED test lead to condenser lead weldment, Fig. 29.

7. Connect the BLACK test lead to armature plate (ground).

8. Depress RED button and read scale No. 4. Condenser capacity must be between .26 to .30 mfd. If not, replace condenser. If condenser is within specification, DO NOT resolder wire to condenser but proceed with "Condenser Leakage and Short Test."

9. Repeat test for other condenser.

Testing Condenser For Leakage And Shorts

Fig. 30-Testing Condenser for Leakage and Shorts

NOTE: For this test, leave the analyzer plugged into the 115-volt, 60 cycle, AC outlet.

1. Turn selector switch to position No. 5 — Leakage and Short Test.

2. Connect RED test lead to condenser lead weldment and BLACK test lead to armature plate (ground), Fig. 30.

3. Depress RED button and hold for a minimum of 15 seconds. Read scale No. 5. Meter pointer will move to the right and must return within range of the narrow black bar at the left. If not, read scale No. 5 and check if condenser is shorted or leaking. In either case, replace condenser.

If condenser is good, disconnect analyzer from AC outlet, disconnect analyzer leads and resolder wire to condenser.

IMPORTANT: Use caution when resoldering wire to condenser. Too much heat can destroy the condenser.

4. Repeat test for other condenser.

Testing Condenser Series Resistance

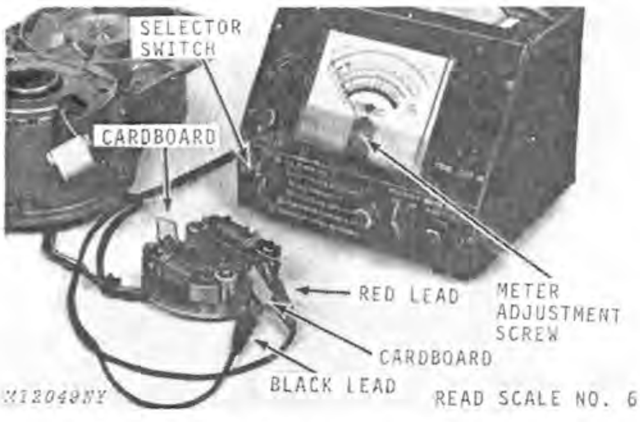


Fig. 31-Testing Condenser Series Resistance

1. Insert a piece of cardboard between breaker points.

2. Turn selector switch to position No. 6 — Condenser Series Resistance Test.

3. Temporarily connect the RED and BLACK test leads together.

4. Turn meter adjustment screw until pointer aligns with set line on scale No. 6. Disconnect red and black test leads.

5. Connect the RED test lead to breaker point terminal, Fig. 31.

6. Connect the BLACK test lead to armature plate. Meter pointer must be within OK green block on scale No. 6. While testing, move and "wiggle" the condenser lead. Observe meter pointer for movement. Loose connections can cause trouble when condenser is subjected to vibration. If pointer remains in OK green block on scale 6, the condenser is good. If pointer moves into the red section on scale No. 6 the condenser is defective and must be replaced.

Testing Emergency Stop Switch

Disconnect the coupler to the emergency stop switch, Fig. 32. Connect a flashlight tester across the two terminals in coupler.

Test light should **not** light with emergency stop switch in operating position, but should light when switch is depressed.

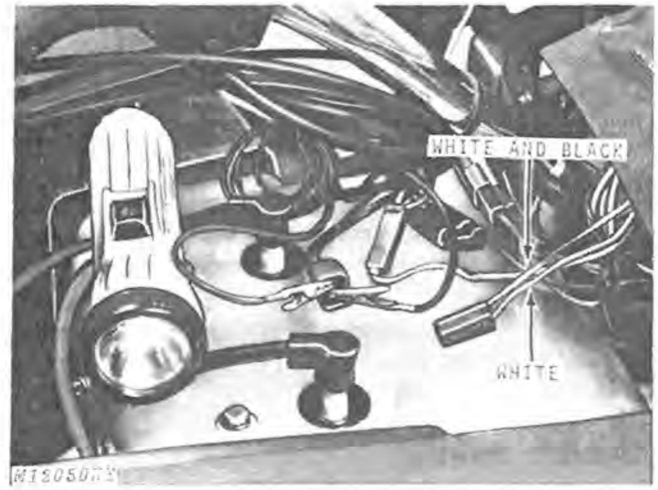


Fig. 32-Testing Emergency Stop Switch

Testing Ignition Switch

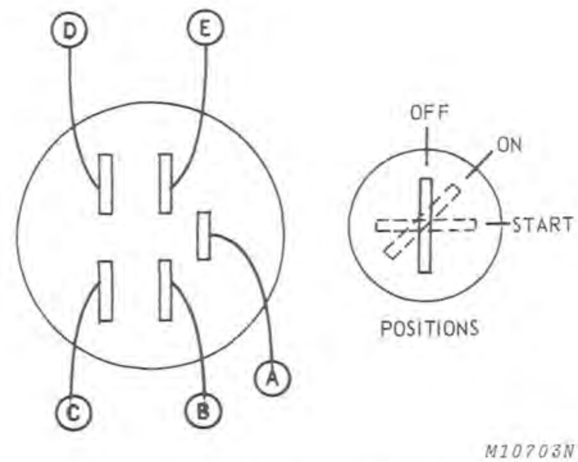


Fig. 33-Testing Ignition Switch

The ignition switch can be tested with a test light. Check for continuity between terminals with switch placed in each of three positions.

See Fig. 33 and chart below for correct current flow diagram. If switch is defective it must be replaced.

Position	Closed	Open
OFF	A & D	B, C, E
ON	C & E	A, B, D
START	B & E	A, C, D

INSPECTION

Inspect all wiring and leads for cracked, broken or frayed insulation or wires. Inspect condition of terminal and solder connections.

Spark Plugs

Analyze spark plug condition. Replace plugs if inspection reveals improper heat range or if worn out.

Plugs can be cleaned and regapped if electrodes are not worn badly, or if fouled due to overchoking or "rich" carburetor settings.

Breaker Points

Inspect breaker points for pitting and material transfer. If either is excessive, points must be replaced.

Also inspect points for proper alignment and gap.

Flywheel Assembly

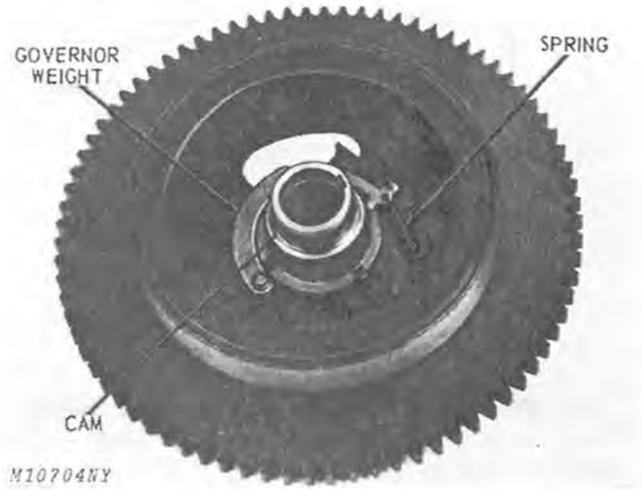


Fig. 34-Inspecting Flywheel Advance Mechanism

Inspect cam, governor weights, and spring for freeness of operation, Fig. 34. Inspect cam for wear at point of contact with governor weight(s). Replace spring(s) if stretched or broken. Replace cam if worn excessively.

REPAIR

Checking Spark Plug Gap

Fig. 35-Checking Spark Plug Gap

If inspection and analysis reveal plugs are still serviceable, clean and regap, Fig. 35. Set plug gap at 0.020 inch (0.508 mm).

Replacing Ignition Coils

CCW Engines

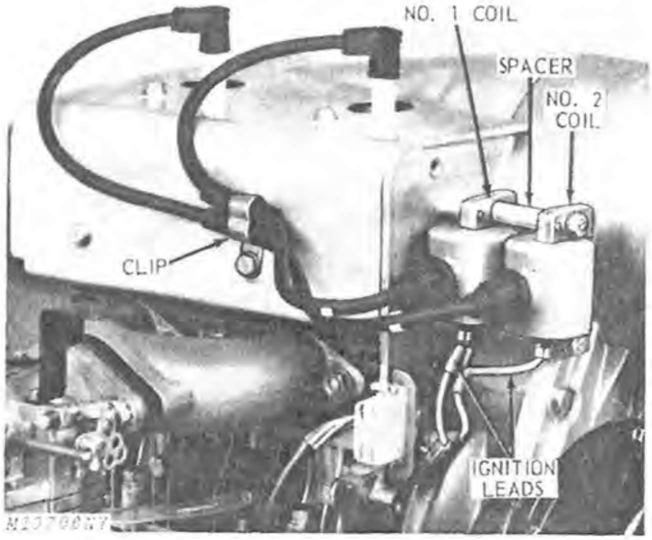


Fig. 36-Replacing Ignition Coils (CCW Engines)

Remove plastic coil cover. Disconnect two ignition leads between coils and large coupler, Fig. 36. Remove spark plug cables from spark plugs and clip. Remove ignition coils from fan cover. Take note of the two long spacers.

Install coils by reversing removal procedure. Note color code of ignition leads; No. 1 — white, No. 2 — red.

Kohler Engines

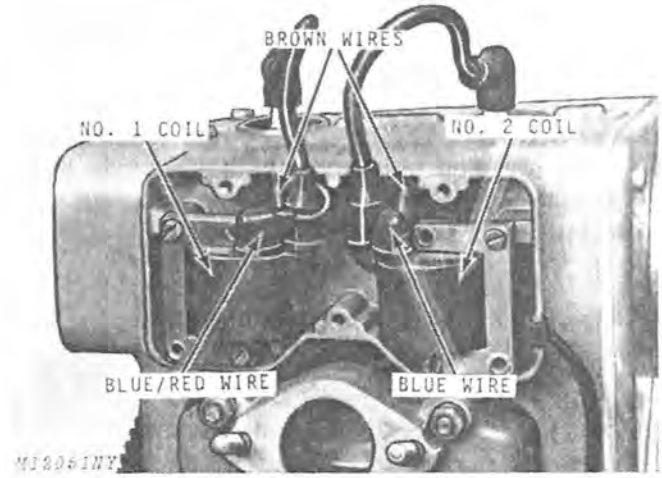


Fig. 37-Replacing Ignition Coils (Kohler Engines)

Remove coil cover. Remove slotted hex. head screws securing coils to engine, Fig. 37. Disconnect red/blue wire, blue wire and brown wires from the coils. Remove spark plug cables from the spark plugs and remove coils.

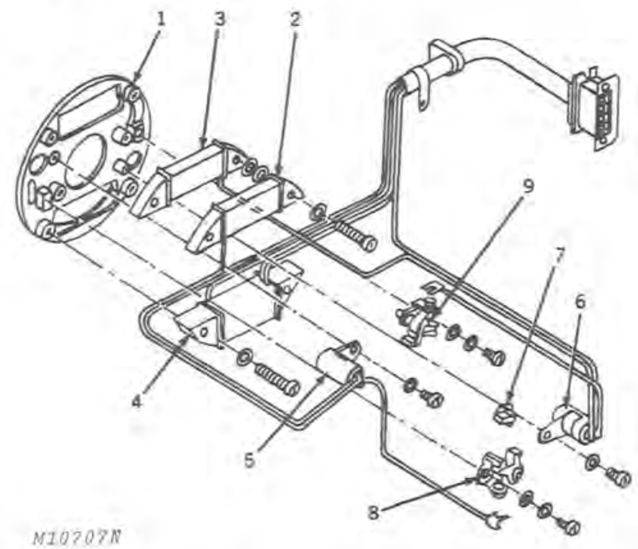
Install coils by reversing the removal procedure. Install brown wires to the coils. Install red/blue wire to No. 1 coil and blue wire to No. 2 coil.

Repairing Stator Assembly

CCW Engines

Remove recoil starter, fan cover, and flywheel to provide access to stator assembly. If stator assembly is to be removed from engine, it is also necessary to remove backing plate.

IMPORTANT: The breaker points, ignition generating coil and condenser with the white leads are for No. 1 cylinder while the components with the red leads are for No. 2 cylinder.



1—Stator Plate
2—No. 1 Ignition Generating Coil (white leads)
3—No. 2 Ignition Generating Coil (red leads)
4—Lighting Coil
5—Condenser (white leads)
6—Condenser (red leads)
7—Felt Oil Pad and Holder
8—Breaker Points (white leads)
9—Breaker Points (red leads)

Fig. 38-Kokusan Stator Assembly

Condensers

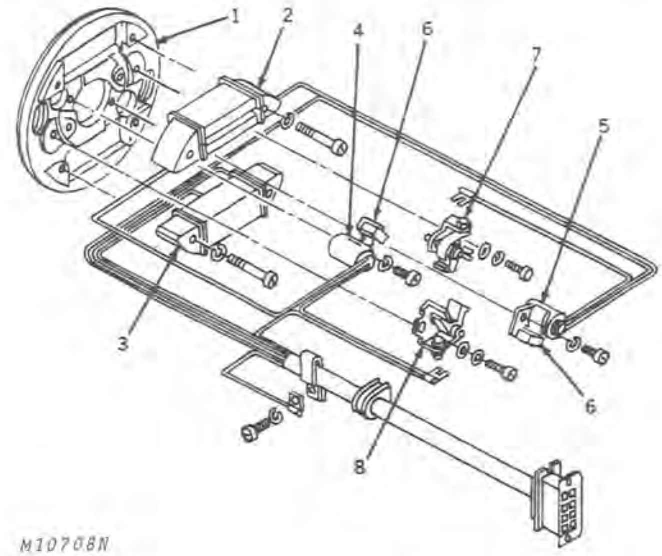
Loosen the soldered leads on the condenser terminal. Remove the screw securing the condenser to the stator plate and remove condenser, Figs. 38 and 39.

Install new condenser and solder leads to terminal. Repeat procedure for other condenser.

IMPORTANT: Use caution when resoldering wire to condenser. Too much heat can destroy the condenser.

Lighting Coil

See Group 15 of this section for lighting coil replacement.



1—Stator Plate
2—Ignition Generating Coils
3—Lighting Coil
4—Condenser (red leads)
5—Condenser (white leads)
6—Felt Oil Pad
7—Breaker Points (white leads)
8—Breaker Points (red leads)

Fig. 39-Denso Stator Assembly

Ignition Generating Coils

Both ignition generating coils must be replaced as a unit on the Denso system, Fig. 39. With the Kokusan system, they can be replaced separately, Fig. 38.

Loosen each coil lead from the condenser terminal with a soldering gun. Remove the two screws securing the coils to the stator plate and remove.

Install new coil(s) and secure the stator plate. Solder leads to condenser terminals noting color code.

NOTE: It may be necessary to remove breaker points to provide access to ignition generating coil leads.

Breaker Points

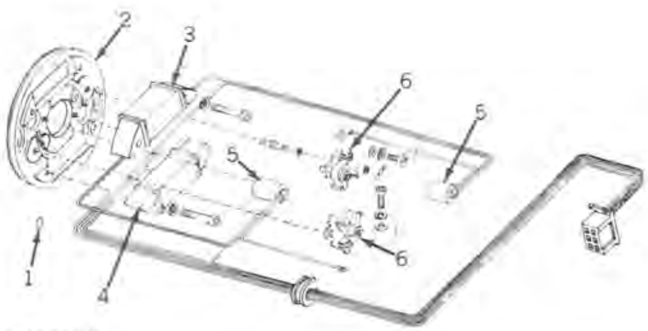
Loosen breaker point terminal and remove leads. Remove screw securing breaker points to stator plate and remove breaker points, Fig. 38 and 39.

Install new breaker points and attach leads. Flywheel must be installed to adjust points.

Felt Oil Pads

Replace felt oil pads, Fig. 38 and 39, if their lubricating capacity is questionable. Oil pads with one o two drops of light oil whenever breaker points are re placed.

Kohler Engines



1—Felt Oil Pad
2—Stator Plate
3—Lighting Coil
4—Ignition Generating Coil
5—Condenser
6—Breaker Points

Fig. 40-Bosch Stator Assembly

Remove recoil starter, fan drive sheave, fan belt and flywheel to provide access to stator assembly. If stator assembly is to be removed from engine proceed as follows: Remove coil cover, disconnect blue/red wire and blue wire from coils and remove coils. This frees the wiring harness so it can be removed with ventilator housing and stator assembly, and also makes reassembly of wiring harness to coils easier.

Remove ventilator housing with stator assembly and wiring. Remove stator from ventilator housing.

Condensers

Unsolder leads on condenser, Fig. 40. Make a condenser driver from a 1/2-inch hardwood dowel by drilling a 1/4-inch hole 1/4-inch deep in one end. This will prevent damage to solder terminal of condenser. Drill a 3/4-inch hole in a 2x4x6-inch block of wood. Place condenser over hole and drive out with wooden driver. Insert new condenser and use wood driver to install condenser flush with bottom of stator plate. Re-solder leads to condenser.

IMPORTANT: Use minimum heat to solder or condenser will be ruined.

Lighting Coil

See Group 15 of this section for lighting coil replacement.

Ignition Generating Coils

Loosen each coil from the condenser terminals with a soldering gun. Remove coil from stator plate. On Kohler engines (Serial No. - 722605694) it is necessary to remove the 23-watt lighting coil before the ignition generating coil can be removed. Engines (Serial No. 722605695 - 722611674) are equipped with a single 100-watt lighting coil which allows easier removal of the ignition generating coil. Beginning with Serial No. 732701001 a 23-watt and 100-watt lighting coil is used and the 23-watt coil must be removed before the ignition generating coil can be removed.

Install new coil and secure to stator plate. Solder leads to condenser terminals (note color codes), where necessary, install 23-watt lighting coil.

NOTE: It may be necessary to remove breaker points to provide access to ignition generating coil leads.

Breaker Points

Remove leads from breaker point terminal and remove breaker points from stator plate.

Install new breaker points and attach leads. Adjust breaker points as explained under "Adjustment" in this Group.

Felt Oil Pads

Replace felt oil pad if lubricating capacity is questionable. Oil pad with one or two drops of light oil whenever breaker points are replaced.

Repairing Flywheel Assembly

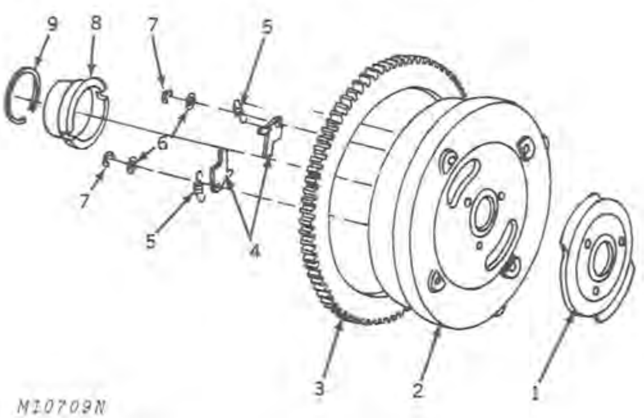
See Section 20, Group 10 for flywheel removal and installation instructions. See Specifications, Group 25, this section for ignition systems of each machine.

CCW Engine with Kokusan Ignition

Remove snap ring, (9, Fig. 41) and slide cam (8) off collar. Inspect cam and collar for scoring or wear. Replace if necessary.

To replace governor weights (4) remove retaining rings (7). Replace governor springs (5) if stretched or broken.

Lubricate flywheel collar and governor weight mechanism with a light film of grease prior to installing cam.



1—Window Plate
2—Flywheel
3—Ring Gear
4—Governor Weight
5—Governor Spring
6—Washer
7—Retaining Ring
8—Cam
9—Snap Ring

Fig 41-Kokusan Flywheel Assembly

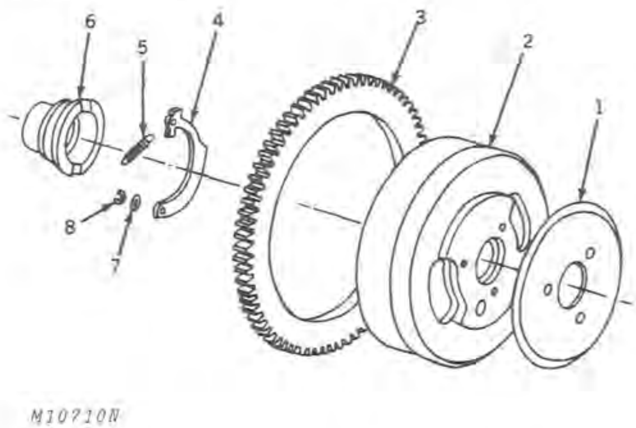
NOTE: Do not over-lubricate. Excessive lubrication could contaminate breaker points and cause ignition failure.

Install governor weights and springs and secure with retaining rings. Install cam and secure with snap ring.

IMPORTANT: Install cam with cam lobe positioned slightly to the left of keyway.

If flywheel ring gear has broken or badly worn teeth the entire flywheel assembly must be replaced because the ring gear is not serviced separately.

CCW Engine with Denso Ignition



1—Window Plate
2—Flywheel
3—Ring Gear
4—Governor Weight
5—Governor Spring
6—Cam
7—Washer
8—Retaining Ring

Fig. 42-Denso Flywheel Assembly

Remove retaining ring (8, Fig. 42), and governor weight (4). Lift cam (6) off flywheel collar.

Inspect cam and collar for scoring and wear. Inspect condition of governor spring. Replace defective parts.

Lubricate flywheel collar and governor weight mechanism with a light film of grease prior to installing cam.

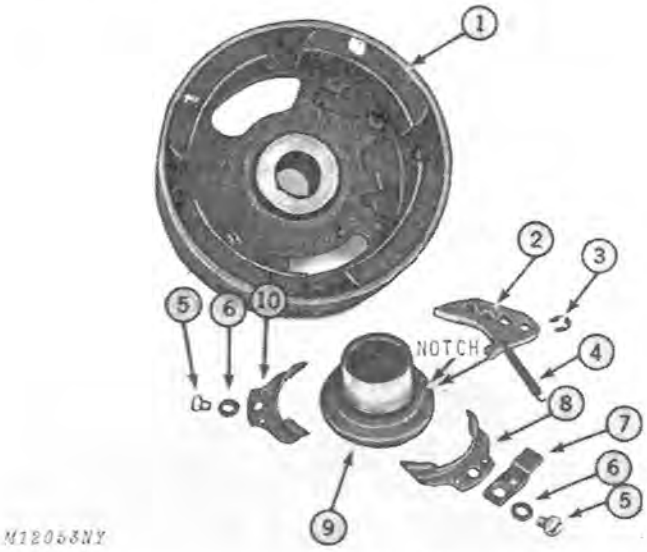
NOTE: Do not over-lubricate. Excessive lubrication could contaminate breaker points and cause ignition failure.

Install cam onto flywheel collar. Install governor weight and spring and secure with retaining ring.

IMPORTANT: Keyways in flywheel collar and cam must be aligned.

If flywheel ring gear has broken or badly worn teeth the entire flywheel assembly must be replaced because the ring gear is not serviced separately.

Kohler Engine with Bosch Ignition



1—Flywheel
2—Flyweight
3—Retaining Clip
4—Spring
5—Screw
6—Washer
7—Spring Retainer
8—Cam Retainer
9—Cam
10—Cam Retainer

Fig. 43-Bosch Flywheel Assembly

See Section 20, Group 25 for flywheel removal and installation instructions.

To replace cam (9, Fig. 43) remove screws (5) and washers (6), spring retainer (7) and cam retainers (8 and 10) and lift out cam. Inspect cam, spring retainer and cam retainers for wear or damage. Replace as necessary.

To replace flywheight (2), remove retaining clip (3), disconnect spring (4) from pin in flywheel (1). Remove flyweight and spring. Inspect flyweight and spring for wear or damage. Replace as necessary.

NOTE: When installing either cam (9) or flyweight (2) be sure protrusion on flyweight is properly positioned in notch of cam, Fig. 43.

The ring gear on Kohler engines is on the opposite end of the crankshaft from the flywheel. See Section 20, Group 25 for ring gear removal and installation. Inspect and replace ring gear as necessary.

ADJUSTMENT

Adjusting Breaker Points—CCW Engines

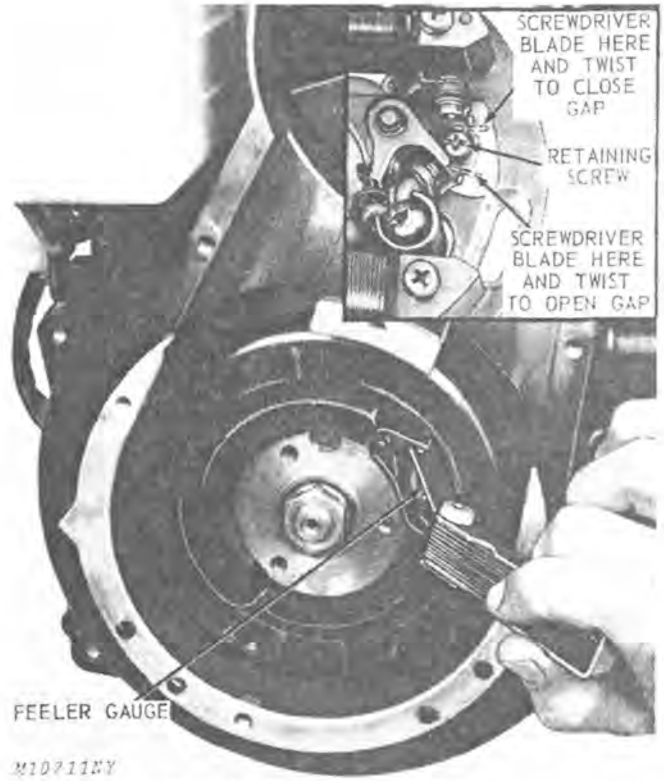


Fig. 44-Adjusting Breaker Points

Remove recoil starter, starter cup, lower fan belt pulley, and window plate to provide access to breaker points. Flywheel must be installed to adjust breaker points, because breaker point cam is part of flywheel.

NOTE: On CCW engines it is possible to adjust points with flywheel removed by installing cam (6, Fig. 42) from flywheel to crankshaft.

Remove spark plugs and install dial indicator with 1-inch adapter into No. 1 cylinder spark plug hole. No. 1 cylinder is on flywheel side of engine.

Rotate crankshaft clockwise until No. 1 piston is slightly past TDC and No. 1 set of breaker points is completely open.

NOTE: No. 1 breaker points have white leads and No. 2 breaker points have red leads.

Loosen No. 1 breaker point retaining screw. Use a feeler gauge and adjust points to 0.014-inch (0.3556 mm), Fig. 44. Tighten retaining screw.

NOTE: Recheck point gap after tightening retaining screw because tightening screw can affect point gap setting.

Insert dial indicator in No. 2 cylinder spark plug hole and repeat procedure for the No. 2 cylinder.

IMPORTANT: Check ignition timing after adjusting points.

Timing Ignition—CCW Engines

NOTE: The following is the timing range for CCW engines:

400, 500, 600 and JDX8 (Serial No. -20,000) 0.023 ± 0.005 in. (0.5842 ± 0.127 mm).
400, 500, 600 and JDX4 Special (Serial No. 20,001-) 0.015 ± 0.003 in. (0.3810 ± 0.0762 mm).
JDX6 and JDX8 (Serial No. 20,001-) 0.009 ± 0.003 in. (0.2286 ± 0.0762 mm).
400 and 600 (Serial No. 30,001-) 0.015 ± 0.003 in. (0.3810 ± 0.0762 mm).
JDX4, JDX6, JDX8 and 800 (Serial No. 30,001-) 0.009 ± 0.003 in. (0.2286 ± 0.0762 mm).

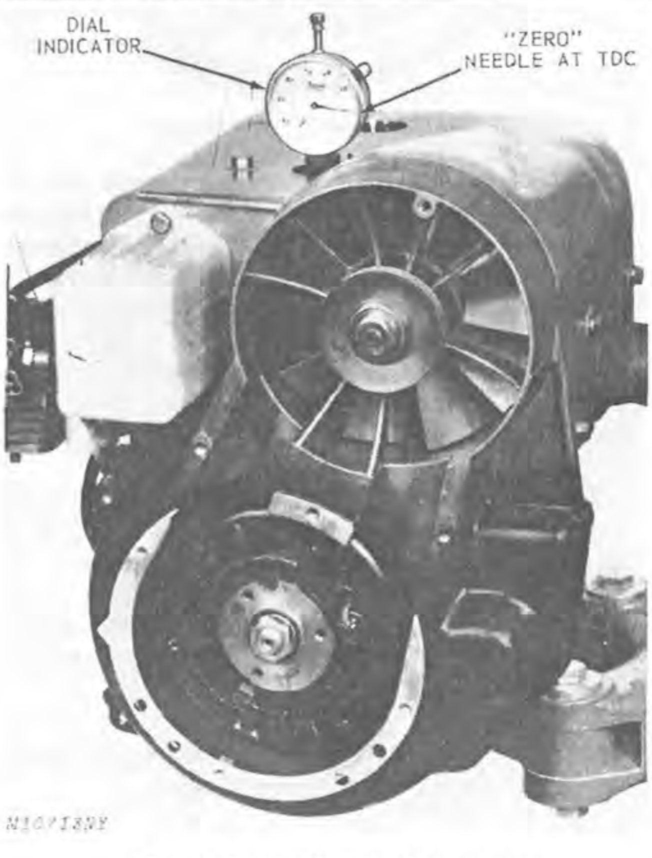


Fig. 45-Finding TDC with Dial Indicator

Install dial indicator with 1-inch adapter into No. 1 spark plug hole, Fig. 45.

Rotate crankshaft until No. 1 piston is at TDC. "ZERO" the dial indicator with piston in this position.

Disconnect the two ignition leads, (red and white) between the coupler and ignition coils, Fig. 46. Attach one clip of flashlight tester to "white" lead and the other clip to ground.

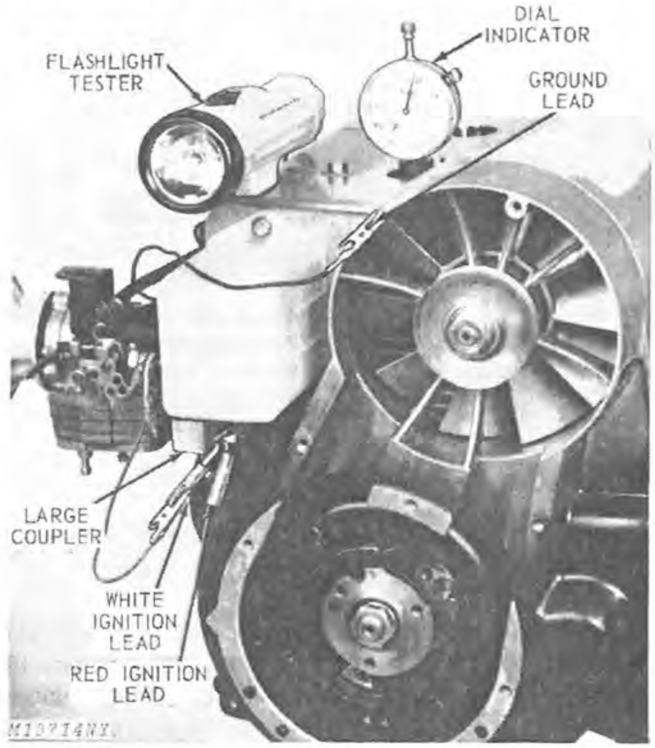


Fig. 46-Attaching Flashlight Tester

IMPORTANT: If engine timing is being done with the engine in the snowmobile. Disconnect the large white coupler from the engine to the wiring harness.

Rotate crankshaft counterclockwise until dial indicator reads correctly for the engine being timed, Fig. 46.

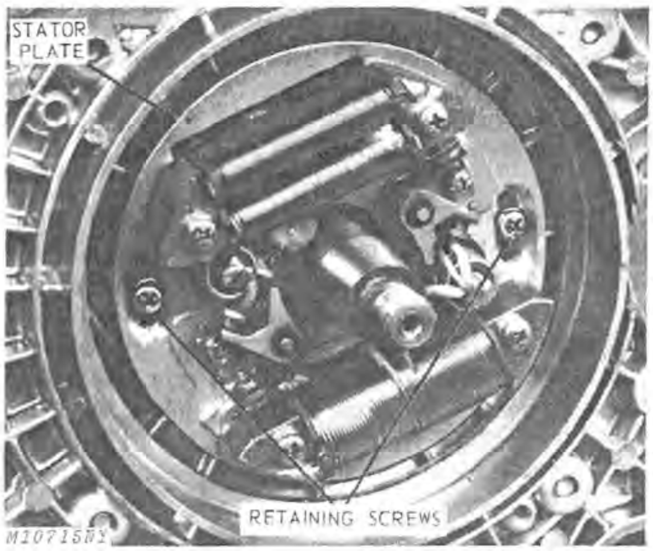


Fig. 47-Rotating Stator Plate (Flywheel Removed for Illustration Purposes Only)

With piston in this position, the points should just be starting to open, causing the test light to dim. If the points do not start to open with the piston in this position, loosen the two screws, Fig. 47, securing stator plate and rotate stator plate until test light dims. Tighten stator plate screws.

NOTE: The test light dims or changes in intensity when the points open. The test light will not go out because there is a circuit through the ignition generating coils to ground when the points are open.

IMPORTANT: Tightening the stator plate screws can affect point gap. Always recheck breaker point gap. The timing dimension can vary from the low to the high tolerance BTDC. In higher altitudes the more advanced figure will give slightly better performance.

With No. 1 piston timed, move dial indicator to No. 2 cylinder and move flashlight clip from the "white" lead to "red" lead. Leave ground of test light connected.

Proceed as outlined for No. 1 piston. Flashlight tester should dim with No. 2 piston at the correct setting BTDC. If flashlight tester does not dim with the piston in this position, DO NOT rotate stator plate to correct timing because this will change timing for No. 1 piston which has already been set.

Adjust No. 2 cylinder breaker points within tolerance until points just start to open and flashlight tester dims with piston in required position.

NOTE: Closing the point gap "retards" ignition timing and opening the gap "advances" timing.

It is important to get both cylinders timed to the same BTDC dimensions for the smoothest engine operation.

Replace window plate, fan belt pulley, recoil starter cup, and recoil starter. Connect the two ignition leads, red-to-red and white-to-white. Install spark plugs and check engine for operation.

Adjusting Breaker Points and Timing Ignition—Kohler Engines

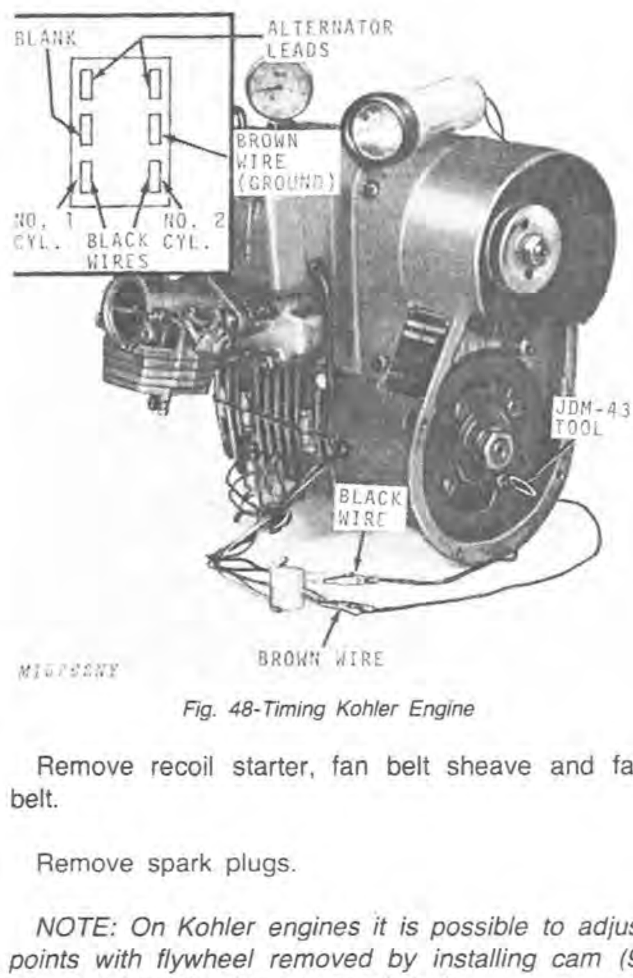


Fig. 48-Timing Kohler Engine

Remove recoil starter, fan belt sheave and fan belt.

Remove spark plugs.

NOTE: On Kohler engines it is possible to adjust points with flywheel removed by installing cam (9, Fig. 43) from flywheel to crankshaft.

Install dial indicator with 1-inch adapter in No. 1 cylinder spark plug hole, Fig. 48, (No. 1 cylinder is located on the PTO side of engine).

Locate top dead center (TDC) for No. 1 piston, "ZERO" dial indicator and adjust No. 1 set of breaker points (lower set) to 0.016-inch (0.4064 mm).

Move point cam flyweight, located in largest window of flywheel, to full advance position. Insert JDM-43 tool through small hole immediately above flywheel window to hold flyweight in full advance position.

NOTE: Flyweight must be held in full advanced position or a false reading will result.

Connect black lead from test light to brown wire in coupler. Connect red lead from test light to No. 1 cylinder (black wire) in coupler.

Turn flywheel counterclockwise until test light brightens (points just closing). Note reading on dial indicator. Loosen and move stator plate until light brightens at 0.090 ± 0.005-inch (2.286 ± 0.127 mm) reading on dial indicator. Tighten stator plate screws. Recheck, because tightening stator plate screws can affect setting.

Move dial indicator to No. 2 cylinder spark plug hole (cylinder closest to fan housing). Move red test light lead to No. 2 cylinder (black wire) in coupler. Leave black lead from the test light connected to the brown wire in the coupler.

Turn flywheel counterclockwise to check point closing. Light should brighten at 0.090 ± 0.005-inch (2.286 ± 0.127 mm) reading on dial indicator.

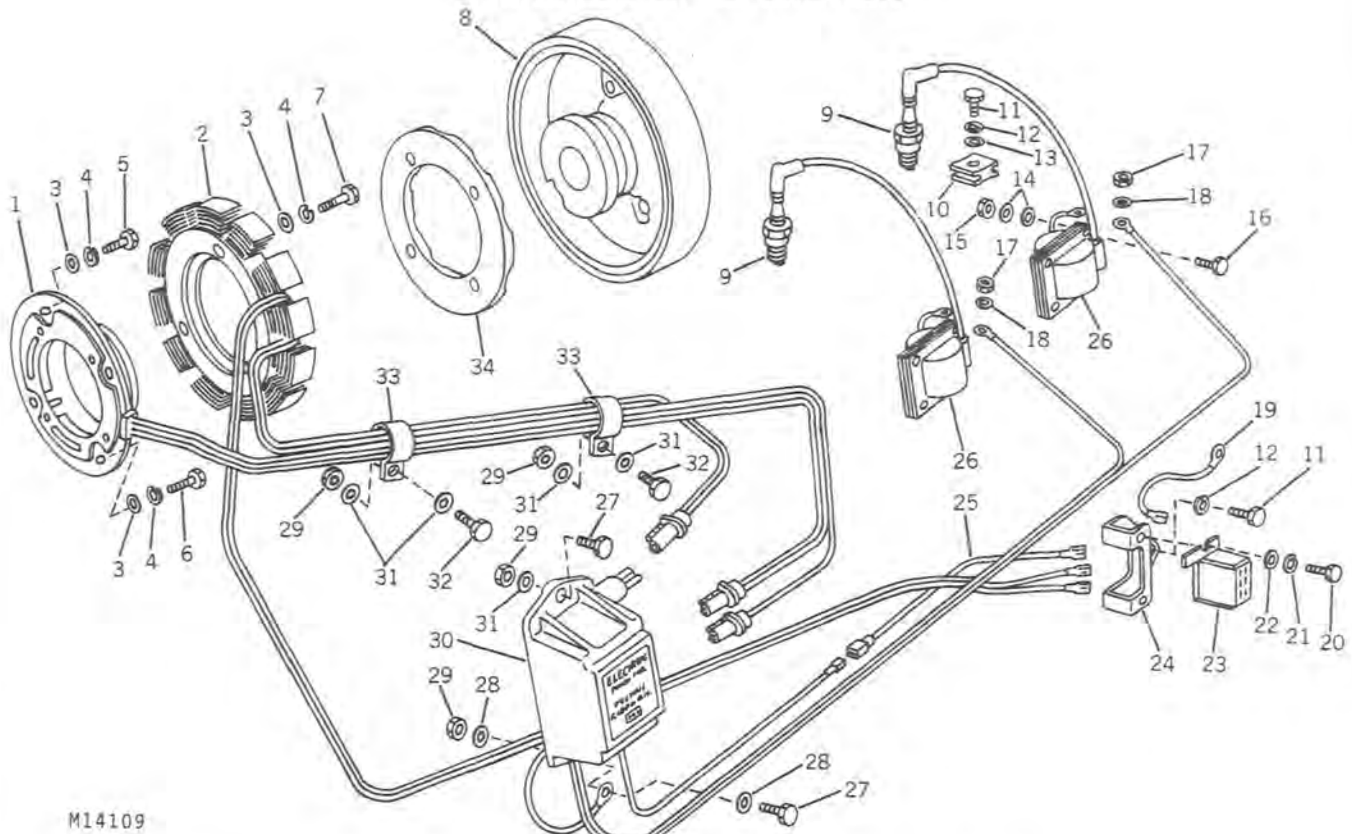
Adjust No. 2 breaker points (upper set) between 0.014 to 0.018-inch (0.356 to 0.457 mm) until dial indicator reading is within specified range. DO NOT move stator plate when adjusting timing on No. 2 cylinder. This would affect setting on No. 1 set of points.

NOTE: Both pistons should be within 0.005-inch (0.127 mm) of each other by the dial indicator when point setting is completed.

Install fan belt, fan belt sheave and recoil starter.

Group 13
CAPACITOR DISCHARGE IGNITION (CDI)

PRINCIPLE OF OPERATION



1—Trigger Assembly
2—Stator Assembly
3—5mm Washer
4—Lock Washer
5—5mm x 15mm Screw
6—5mm x 20mm Screw
7—5mm x 30mm Screw
8—Flywheel Assembly
9—Spark Plug
10—Clamp
11—6mm x 15mm Bolt
12—Lock Washer
13—6mm Washer
14—No. 10 Internal-Tooth Lock Washer
15—No. 10 Nut
16—No. 10 x 1-Inch Screw
17—No. 6 Nut
18—No. 6 Internal-Tooth Lock Washer
19—Lead Wire
20—3mm x 8mm Screw
21—Lock Washer
22—3 mm Washer
23—Coupler
24—Coupler Holder
25—Lead Wire
26—Coil Assembly
27—1/4 x 1-Inch Bolt
28—1/4-Inch Internal-Tooth Lock Washer
29—1/4-Inch Lock Nut
30—Electronic Pack
31—9/32 x 5/8 x 0.060-Inch Washer
32—1/4 x 3/4-Inch Bolt
33—J-Clamp
34—Stiffener Plate

Fig. 1-Exploded View of Capacitor Discharge Ignition

The Electromag Capacitor Discharge Ignition (CDI) System, Fig. 1, consists of a permanent magnet flywheel alternator and solid-state capacitor. The electromag supplies high-voltage for ignition and generates current required for the lighting system.

The flywheel (8, Fig. 1) incorporates a special flexible magnet and is mounted on the engine crankshaft. The flywheel and magnet revolve around the stator assembly (2), which is fixed to the engine. Current is generated in the twelve pole windings of the stator.

Nine poles supply power for the lighting system and three poles supply power for the ignition. The electronic pack (30) incorporates the ignition capacitors and solid-state circuitry for charging and discharging the capacitors. The timing rotor of the flywheel (8) revolving within the trigger assembly (1) triggers the electrical voltage discharge of the capacitors to the ignition coils (26). The coils "step-up" the electrical voltage to a level high enough to insure successful firing of the surface-gap spark plugs (9).

Spark Plugs

NOTE: Use a Champion N-19V (AM53187) or AC SV 4XL (AM53223) surface-gap spark plugs in the JD295/S Snowmobile. No additional plugs or heat ranges are required.

A cracked external insulator or a plug that is carbon-tracked will not allow the plug to function properly.

If the spark plug center electrode is burned back 1/32-inch (0.794 mm) below the insulator, replace the plug. Do not replace the plug unless the electrode is burned back, the external insulator is cracked or the plug is carbon-tracked.

Heavily carboned plugs can fire properly with CD ignition.

TESTING

CAUTION: High energy ignition systems can produce injurious electrical shock. Always stop engine and remove "tether" plug or key before touching or working on any ignition parts. DO NOT hold spark plugs, leads or connectors in hand to check for spark.

Preliminary Check

Remove windshield and console.

Be sure all plug-in connections are clean and tight and that no leads are broken or grounded out. Check key switch and "tether switch" (emergency stop switch).

IMPORTANT: Do not check the CDI system for continuity with a 12-volt test light. To do so will destroy the system. Do not attempt tests unless the system is completely and properly grounded.

Testing the Ignition System

The best method of locating a faulty component is to use an ohmmeter and measure resistances.

NOTE: Be sure the ohmmeter is accurate and the batteries are fresh. Periodically zero the meter during the tests.

Testing Trigger Assembly

1. Disconnect the two black plugs (of the wiring harness) from the electronic pack. These are the leads from the trigger assembly. One plug has a black wire and a white wire and the other plug has a single red wire.

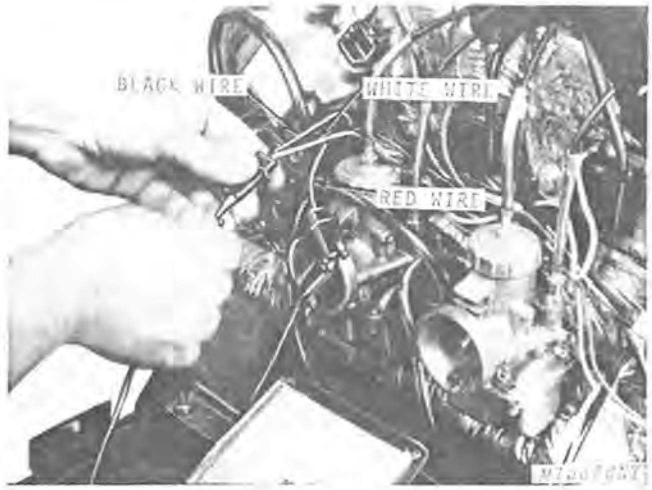


Fig. 2-Testing Trigger Assembly

2. Connect the ohmmeter leads between the red wire terminal and the white wire terminal of the two wiring harness plugs, Fig. 2. The ohmmeter should indicate from 100 to 300 ohms.

3. Leave the ohmmeter lead connected to the white wire terminal, and move the other ohmmeter lead from the red wire terminal to the black wire terminal. The ohmmeter should again indicate from 100 to 300 ohms.

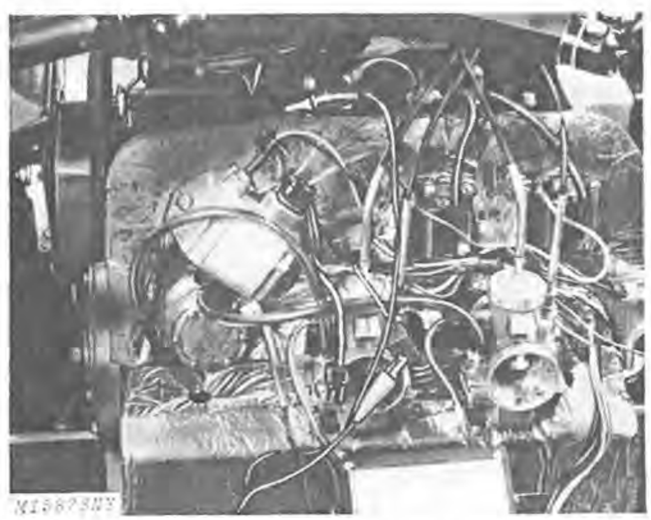


Fig. 3-Testing For An Open Circuit

4. Disconnect ohmmeter leads from wiring harness plugs. Connect one ohmmeter lead to the engine block, Fig. 3. Use the other lead to check the

black wire, white wire and red wire of the wiring harness plugs. The ohmmeter should indicate an open circuit and not register a reading at any of the plug wires.

5. If the readings are not as indicated in Steps 2 through 4, the trigger assembly is defective and must be replaced.

NOTE: When installing trigger assembly wiring connectors to electronic pack, they can be installed only one way. The pack is so designed that the connectors will only attach to the proper terminal.

Testing Stator Assembly

1. Disconnect the stator lead from the white terminal on the electronic pack.

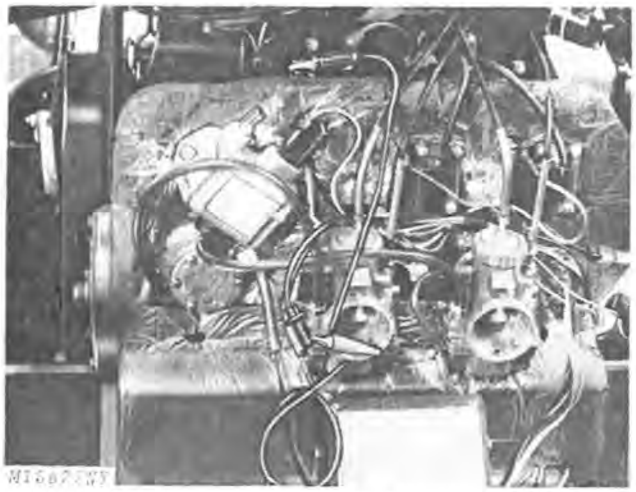


Fig. 4-Testing Stator Assembly

2. Connect one ohmmeter lead to the engine block. Connect the other ohmmeter lead to the black wire terminal of the stator plug, Fig. 4. The ohmmeter should indicate from 30 to 100 ohms.

3. Leave one ohmmeter lead connected to the engine block. Move the other ohmmeter lead from the black wire terminal to the white wire terminal of the stator plug. The ohmmeter should indicate from 2000 to 3000 ohms. (Change ohmmeter scale and reset ohmmeter to zero, if necessary).

4. If the ohmmeter readings are not as indicated in steps 2 and 3, the stator assembly is defective and must be replaced.

Testing Coils (With an Ohmmeter)

Check each coil separately.

1. Disconnect the primary lead from each coil (red or white lead).

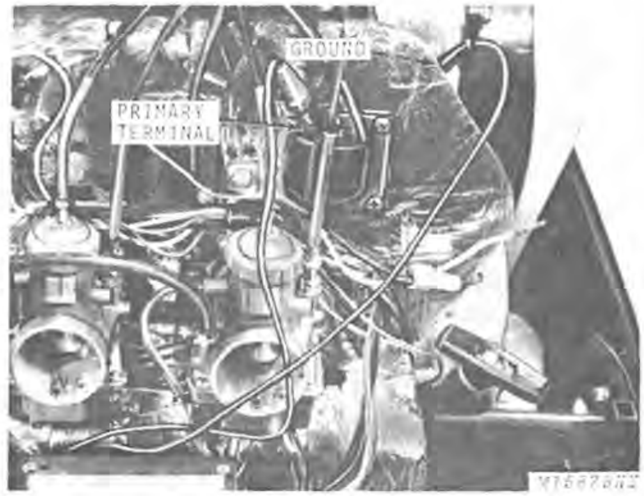


Fig. 5-Testing Coils

2. Connect one ohmmeter lead to the ground connection of the coil. Connect the other ohmmeter lead to the primary terminal of the coil, Fig. 5. The ohmmeter should indicate from 0.1 to 0.5 ohms.

NOTE: Because of the low primary resistance, be sure the ohmmeter has previously been set at zero.

3. Leave one lead of the ohmmeter connected to the ground of the coil. Move the other lead from the primary terminal to the spark plug terminal. The ohmmeter should indicate from 100 to 300 ohms.

4. If the ohmmeter readings are not as indicated in Steps 2 and 3, the coil is defective and must be replaced. Use the ohmmeter and check each coil high tension lead for continuity before replacing the coil.

IMPORTANT: If all trigger assembly, stator assembly and coil assembly tests have been within specifications, any additional ignition problem is probably due to the electronic pack. Replace the electronic pack because too many variables are possible when attempting to check solid-state circuitry (electronic pack) with an ohmmeter.

NOTE: The best method for locating ignition problems is to use an ohmmeter and measure resistances, as the preceding tests have shown. However, if an ohmmeter is not available, the test procedures on page 13-4 can be used.

Testing Coils (Without an Ohmmeter)

CAUTION: High energy ignition systems can produce injurious electrical shock. Always stop engine and remove "tether" plug or key before touching or working on any ignition parts. DO NOT hold spark plugs, leads or connectors in hand to check for spark.

1. Disconnect a plug wire from one cylinder and connect it to a new spark plug. Turn the ignition switch to the "RUN" position, pull the starter rope and check for a spark at the test plug.

2. Test both cylinders in the same manner. If sparks are observed at the test plug for both cylinders, the engine problem is carburetion, timing or mechanical failure.

3. If a spark discharge is observed at one cylinder but not the other, the problem is the coil, high tension lead, trigger assembly or electronic pack.

4. Disconnect the primary lead from the non-firing coil (red or white lead). Disconnect the primary lead from the firing coil and install it on the non-firing coil.

CAUTION: DO NOT hold the primary lead on the coil primary terminal because a severe electrical shock may result.

Turn the ignition switch to "RUN" and pull the starter rope. If the non-firing coil NOW produces a spark, the coil is good. Reconnect the primary leads to the proper coils and proceed to "Testing Trigger Assembly and Electronic Pack." If the non-firing coil did not produce a spark it is defective and must be replaced.

Testing Trigger Assembly and Electronic Pack (Without an Ohmmeter)

1. Make three short jumper leads using small alligator clips on each end of jumper.

2. Disconnect both black plugs from the electronic pack. DO NOT disconnect white plug from the electronic pack.

3. Connect the first jumper lead from the white wire of the wiring harness plug to the white connector of the electronic pack, Fig. 6.

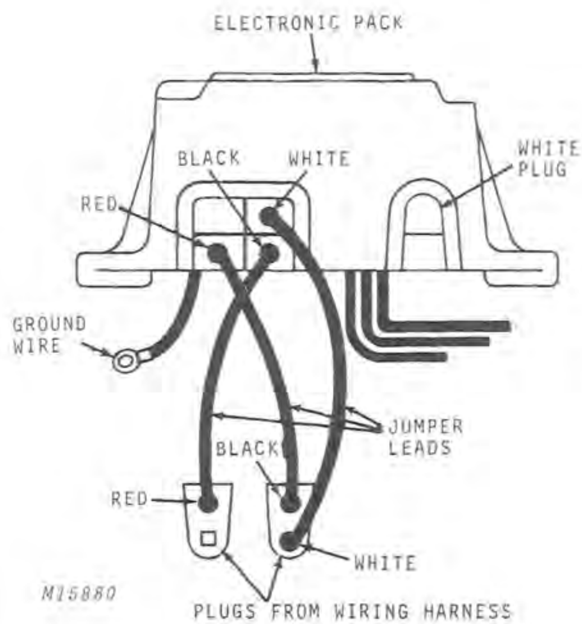


Fig. 6-Jumper Lead Connections

4. Connect the second jumper lead from the black wire of the wiring harness plug to the red connector of the electronic pack, Fig. 6.

5. Connect the third jumper lead from the red wire of the wiring harness plug to the black connector of the electronic pack, Fig. 6.

NOTE: Be sure all connections in Steps 3, 4, and 5 are good.

6. Turn the ignition switch to "RUN" and pull the starter. If the non-firing coil (Step 4 under "Testing Coils") now produces a spark, the problem is in the trigger assembly and it must be replaced. If the non-firing coil still does not produce a spark, the problem is in the electronic pack and it must be replaced.

IMPORTANT: Do not operate the starter with the wiring harness plugs completely disconnected from the electronic pack, internal damage will result to the electronic pack.

Testing the Alternator System

Testing Alternator System (With an Ohmmeter)

Use an ohmmeter to make the following preliminary checks.

1. Disconnect the wiring harness plug from the connector at the engine.

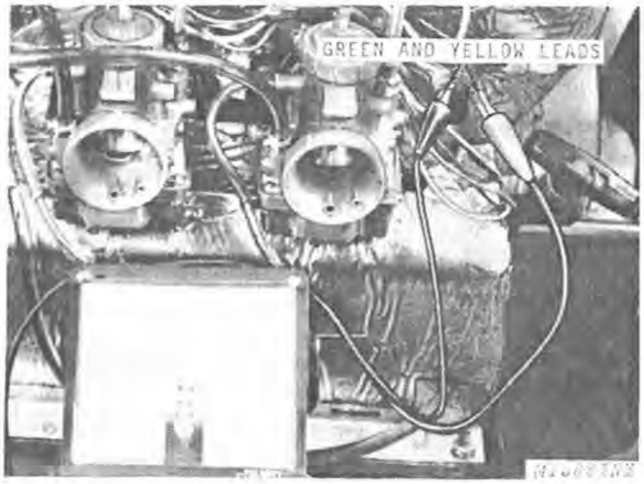


Fig. 7-Testing Stator For Continuity With Ohmmeter

2. Probe the two green and yellow leads in the engine connector. The ohmmeter should show a reading of 0.2 to 0.6 ohms, Fig. 7.

3. Ground one lead of the ohmmeter to the engine and with the other lead, probe each green and yellow lead in the engine connector. The ohmmeter should show a zero reading.

NOTE: No reading in Step 2 would indicate an open circuit and a reading from either lead in Step 3 would indicate a grounded circuit.

4. If a problem is indicated in either Step 2 or Step 3, check the green and yellow wires for worn or broken insulation or a broken lead.

Testing Alternator System (With an AC Voltmeter)

1. Disconnect the wiring harness plug from the connector at the engine.

2. Disconnect the two green and yellow leads from the engine connector. Reinstall wiring harness plug to engine connector. See "IMPORTANT" following Step 4 in right-hand column.

Fig. 8-Testing Stator With AC Voltmeter or Test Bulb

3. Connect the AC voltmeter to the two green and yellow leads, Fig. 8.

4. Start and run the engine at approximately 4000 rpm. The AC voltmeter should indicate 40 to 70 volts. If the stator does not produce the voltage indicated, then it must be replaced.

IMPORTANT: Be sure to reconnect the wiring harness plug to the engine connector in Step 2. The engine will run with the wiring harness plug disconnected but CAN NOT BE STOPPED. With the wiring harness connected, the engine can be stopped with the key switch or the "tether" switch (emergency stop switch).

Testing Alternator System (With a Test Bulb)

1. Disconnect the wiring harness plug from the connector at the engine.

2. Disconnect the two green and yellow leads from the engine connector. Reinstall wiring harness plug to engine.

3. Connect the test bulb to the two green and yellow leads, Fig. 8.

4. Start and run the engine at approximately 2000 rpm. The test bulb should have a soft orange glow. As engine speed is increased the bulb will become brighter. At approximately 7000 rpm the bulb should be at normal brightness.

REPAIR

Removing Flywheel, Stator and Trigger Assemblies

NOTE: Engine has been removed from snowmobile for photographic purposes.

Remove fan guard, recoil start and lower fan sheave.

IMPORTANT: DO NOT USE A HAMMER TO REMOVE THE FLYWHEEL. Hammering on the flywheel bends the rim, causing the flywheel to wobble.

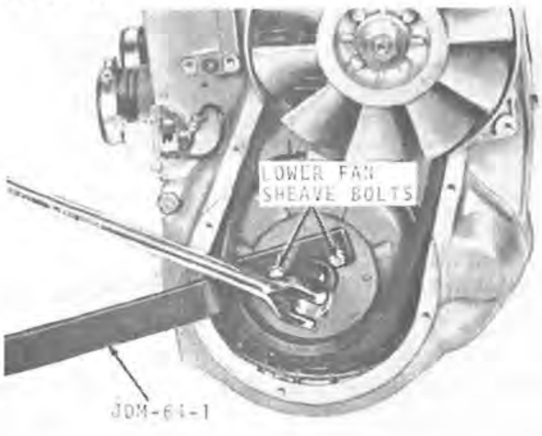


Fig. 9-Removing Retaining Nut

Use two of the bolts that secure lower fan sheave to attach JDM-64-1 Flywheel Holding Tool to the flywheel, Fig. 9. Remove retaining nut and remove two cap screws securing JDM-64-1 Flywheel Holding Tool to the flywheel.

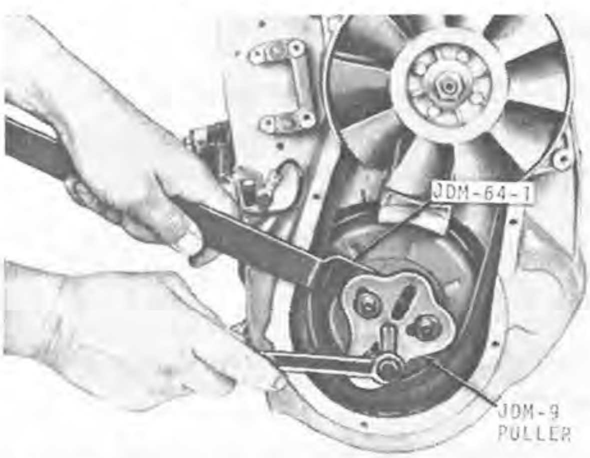


Fig. 10-Removing Flywheel

Install JDM-9 Puller Assembly as shown in Fig. 10. Two of the puller bolts should be installed through JDM-64-1 Flywheel Holding Tool. This provides a method of holding the flywheel while tightening the puller bolt. The flywheel and stiffener plate come off as an assembly.

Remove stator and trigger assembly.

NOTE: Screws securing stator and trigger assembly are held with Loctite. Insert a Phillips-head screwdriver in each screw and rap end of screwdriver with a hammer. This will break Loctite loose and make screw removal easier.

Installing Flywheel, Stator and Trigger Assemblies

Install trigger and stator assemblies. Use Loctite on each screw and tighten securely.

NOTE: When installing trigger assembly, position all four screws in the center of their slots. In most cases this will be the correct timing position for the trigger assembly.

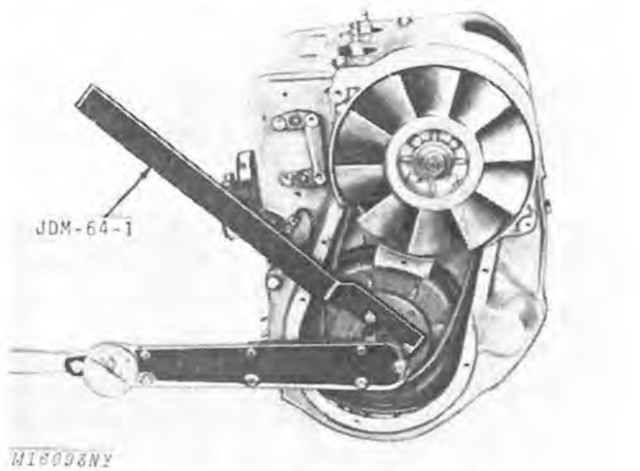


Fig. 11-Installing Flywheel Retaining Nut

Install flywheel and torque retaining nut to 60 ft-lbs (81.34 Nm), Fig. 11.

Remove JDM-64-1 Flywheel Holding Tool and install lower fan sheave.

TIMING IGNITION

Check and adjust ignition timing as follows:

1. Install dial indicator in No. 1 spark plug hole.

2. Rotate flywheel to locate TDC (Top Dead Center) and "zero" dial indicator.

3. Rotate flywheel counterclockwise (opposite normal rotation) until dial indicator reads 0.118 inch (2.99 mm) BTDC (Before Top Dead Center).

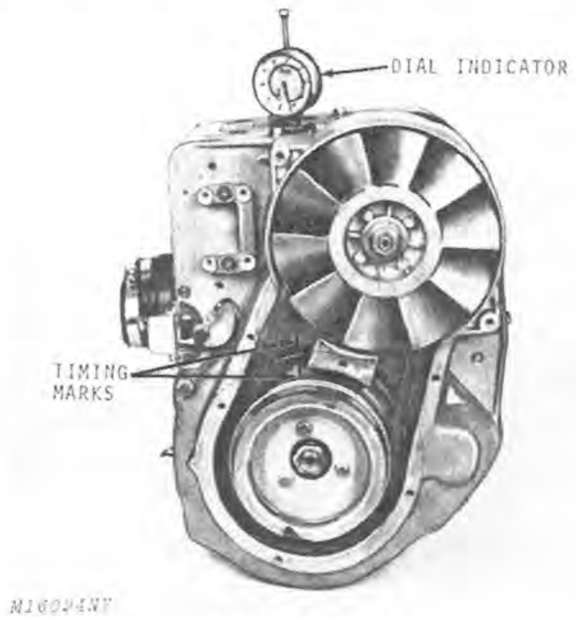


Fig. 12-Timing Marks

4. Hold flywheel in this position and mark a line (use black felt pen) on fan cover and flywheel as shown in Fig. 12.

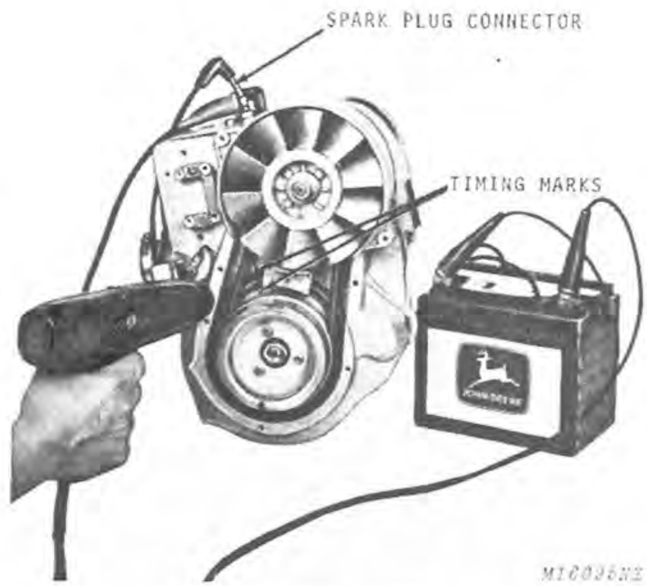


Fig. 13-Timing Ignition

5. Remove dial indicator and reinstall spark plug.

6. Connect a timing light to No. 1 spark plug lead and to a 12-volt battery as shown in Fig. 13.

7. Start engine with a rope. Run engine at approximately 4000 rpm.

8. Aim timing light at timing marks on flywheel and fan cover. Marks should match.

9. If timing marks do not match, remove flywheel and stator. Loosen four screws securing trigger assembly. Rotate trigger assembly clockwise to retard timing or counterclockwise to advance timing. Tighten screws securely.

10. Reassemble and recheck timing. Use Loctite on stator screws.

Group 15
LIGHTING SYSTEM

PRINCIPLE OF OPERATION

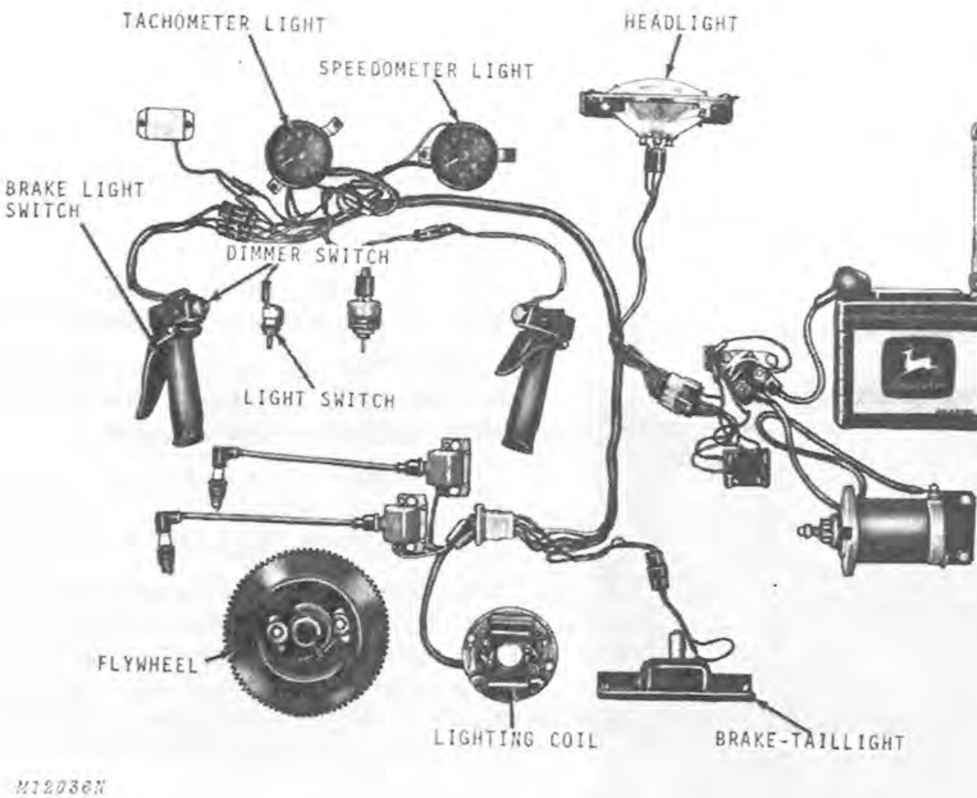


Fig. 1-Components of Snowmobile Lighting System (1973 Models)

The lighting system on John Deere Snowmobiles consists of a lighting coil mounted on the stator plate, a light switch, dimmer switch, brake light switch, headlight, speedometer light and a combination brake and taillight, Fig. 1. The tachometer is also equipped with a light bulb.

The flywheel contains four permanent magnets which rotate past the lighting coil, causing alternating current to flow. This AC current supplies power for the lighting system on manual start models. When equipped with an electric start kit, the lighting coil is used to charge the battery through a rectifier. The rectifier changes the AC current to DC current to make battery charging possible. See Group 20 of this section for testing and repair of electric start kit.

A light switch mounted on the instrument panel switches the lights "ON and OFF". A brake light switch switches the brake light "ON" when the brake is applied.

See Group 20 of this section for testing and repair of battery charging system.

TESTING

The following tests are designed to isolate the cause of trouble in the lighting system. A complete guide for diagnosing malfunctions appears in Group 5 of this section.

Visually inspect all wiring and couplers prior to testing to be certain that they are not at fault. Also check for burned out light bulbs.

Testing Lighting Coil and Voltage Regulator

NOTE: 400 and 500 Snowmobiles (Serial No. -11,000) were not equipped with a voltage regulator.

400 and 500 Snowmobiles (Serial No. -11,000)

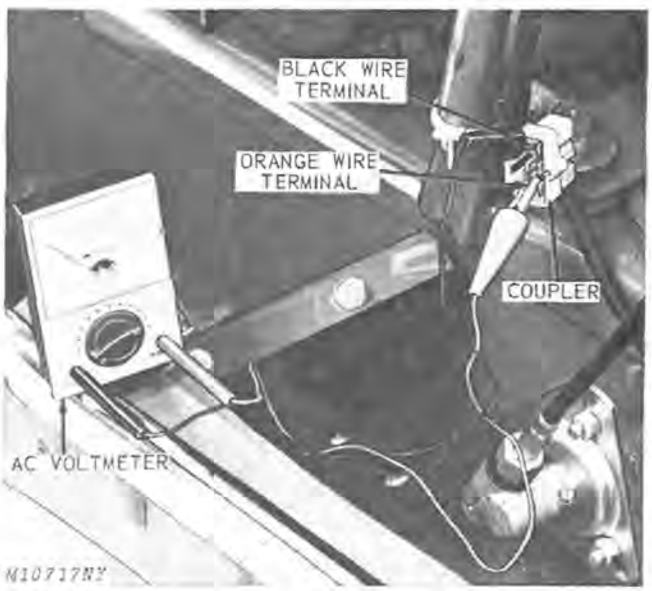


Fig. 2-Testing Lighting Coil Output

If snowmobile is equipped with electric start kit, disconnect coupler, Fig. 2, to the electric start system.

Block up snowmobile track securely so engine can be run at operating speeds without danger.

IMPORTANT: Do not operate engine with drive belt removed. Engine could overspeed and cause engine and drive sheave failure.

Connect an AC voltmeter to the orange and black wire terminals in the coupler, Fig. 2.

Turn on the lights and start the engine. The AC voltage output should be from 12 to 15 volts at 6000 rpm. If lower than this, the lighting coil appears to be defective. Make continuity test to verify. If this test proves coil satisfactory, check wiring and connections.

If voltage output is higher than this, check light bulbs for operation. Output voltage will build as the load is decreased.

1973, 1974 and 1975 Snowmobiles

Manual Start

Block up snowmobile track securely so engine can be run at operating speeds without danger.

IMPORTANT: Do not operate engine with drive belt removed. Engine could overspeed and cause engine and drive sheave failure.

The lighting coil supplies power for the lighting system. It is not possible to obtain an accurate reading of lighting coil output with an ordinary voltmeter.

The voltage regulator will malfunction in only two ways: An "OPEN" condition will cause ALL the lights in the system to burn out (at engine speeds over idling); and a "SHORTED" condition will prevent ANY of the lights from lighting. A defective lighting coil will also prevent the lights from lighting.

NOTE: If only one light in the system burns out, the light is defective and should be replaced.

Test the system as follows:

1. Install a NEW taillight bulb.

2. With the lights "OFF", start and run the engine at approximately 6000 rpm; then, apply the brake. The new taillight bulb will burn out immediately if the voltage regulator is defective. Replace the voltage regulator. If the taillight does not burn out, the voltage regulator is working properly.

3. Disconnect the voltage regulator from the electrical system.

NOTE: When checking headlight intensity with the voltage regulator disconnected, run the engine at idle speed ONLY. The lighting system is unregulated and a faster engine speed will cause the lighting coil output to "burn out" the lights.

4. Start and run the engine at IDLE SPEED ONLY. Turn the lights "ON". If the headlight lights and has good brilliance, the lighting coil is functioning. If the headlight is dim or will not light at all, the lighting coil is malfunctioning and should be replaced. Headlight intensity should remain uniform at all engine speeds.

Electric Start

When equipped with electric start, the lights are powered by the battery and the function of the lighting coil is to recharge the battery.

Test lighting coil output as follows:

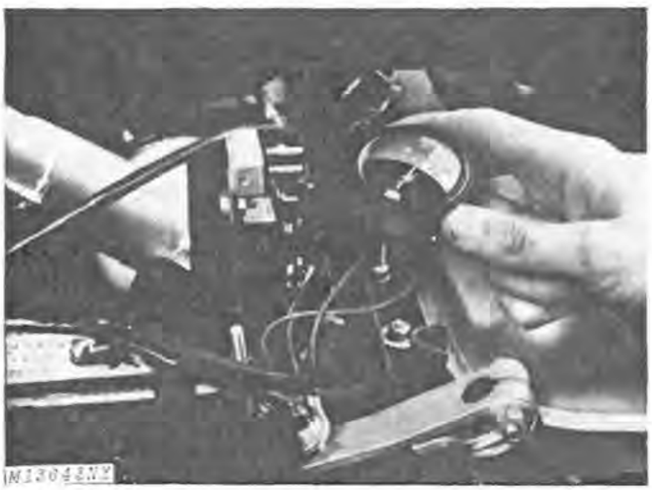


Fig. 3-Testing Lighting Coil Output

1. Disconnect wires to circuit breaker and connect to a tractor DC ammeter (AM33296) as shown in Fig. 3.

2. Block up snowmobile track securely so engine can be run at operating speeds without danger. Run the engine at 6000 to 7000 rpm. On 1973 snowmobiles the output should be 5 to 10 amps with the lights "OFF" and 1 to 2 amps with the lights "ON". On 1974 and 1975 Snowmobiles the output should be 2 to 4 amps with the lights "OFF" and 3 to 5 amps with the lights "ON".

3. If output is not as specified, disconnect voltage regulator and recheck. If output increases, voltage regulator is defective. If output does not increase, check the key switch, rectifier and wiring. If still no output is indicated, the lighting coil could be defective.

4. Disconnect electric start and reinstall manual start coupler. Headlights are now powered by the lighting coil. Test as outlined under "Manual Start", page 40-15-2.

NOTE: 1973, 1974 and 1975 Snowmobiles with electric start can be operated with the voltage regulator disconnected. If voltage regulator is proven defective, it can be temporarily disconnected. However, higher charging rates will result with the lights "OFF" when operating the snowmobile. Customer should be instructed to check battery water level frequently.

IMPORTANT: 1973 snowmobiles should NOT be run for prolonged periods with the lights "OFF" and the voltage regulator disconnected because of the high battery charge rate. This will cause the battery electrolyte to boil away.

Testing Light Switch

All Snowmobiles (Serial No. -20,000)

Remove windshield and loosen bolts securing instrument panel. Lift panel up to provide access to back side of light switch. Remove coupler from light switch.

Fig. 4-Testing Light Switch

Connect an ohmmeter or flashlight tester across light switch terminals in "ON" position. If switch does not show continuity as indicated in Fig. 4, switch must be replaced.

All Snowmobiles (Serial No. 20,001-)

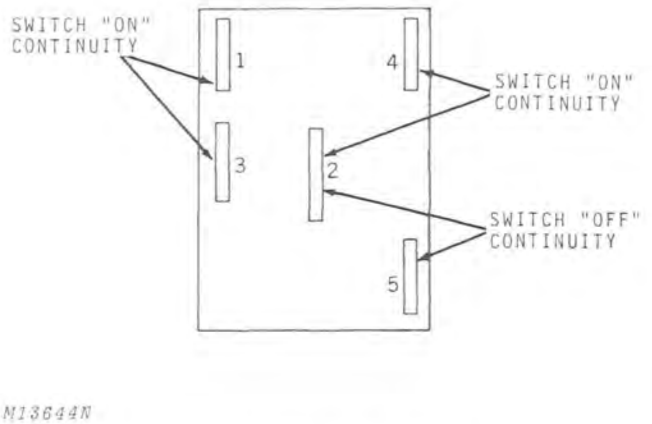


Fig. 5-Testing Light Switch

Remove windshield and loosen bolts securing instrument panel. Lift panel up to provide access to back side of light switch. Remove coupler from light switch.

Connect an ohmmeter or flashlight tester across terminals 1 and 3 and 2 and 4 with switch in the "ON" position. Continuity should be indicated.

Turn switch "OFF" and check for continuity across terminals 2 and 5. If switch does not show continuity as indicated in Fig. 5, switch must be replaced.

NOTE: Continuity should not be indicated on any other combination except as indicated.

Testing Brake Light Switch

400 and 500 Snowmobiles (Serial No. -11,000)

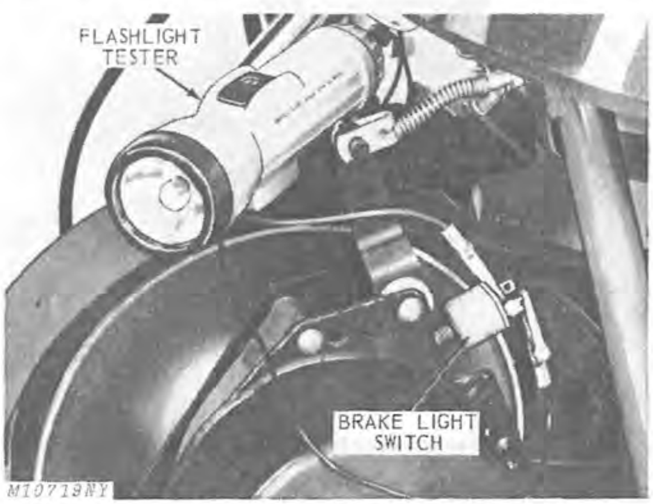


Fig. 6-Testing Brake Light Switch

Remove the two couplers to the brake light switch. Connect an ohmmeter or flashlight tester across the switch terminals, Fig. 6.

Continuity should be indicated when the brake is applied. If not, adjust the switch, test again. If still malfunctioning, replace brake light switch.

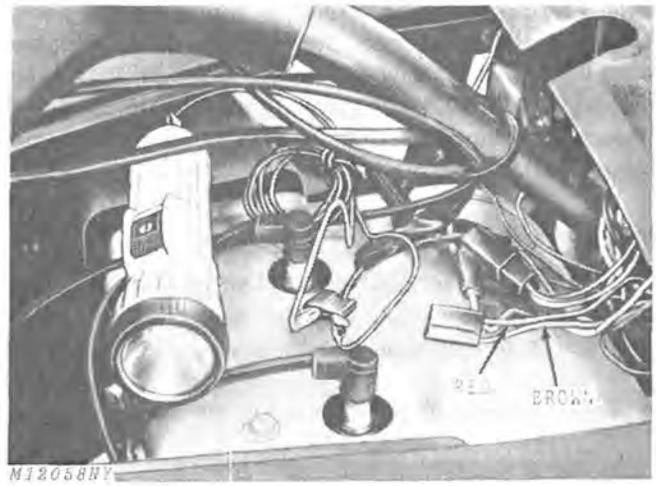


Fig. 7-Testing Brake Light Switch

Remove coupler to the brake light switch. Connect an ohmmeter or flashlight tester across the two switch terminals, Fig. 7. Continuity should be indicated when the brake is applied. If not, replace switch.

Testing Headlight Dimmer Switch

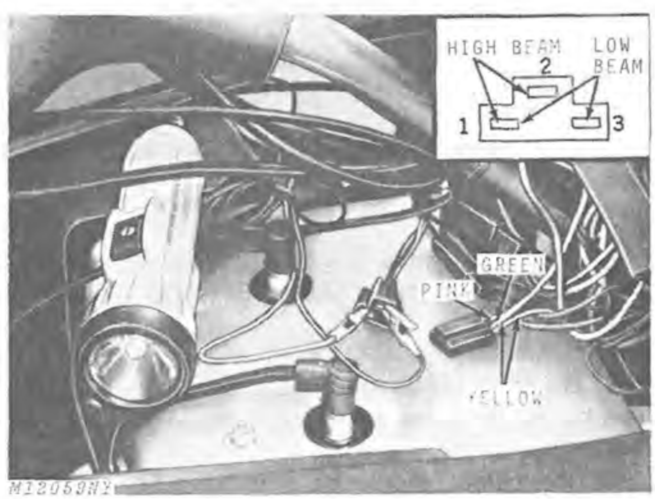


Fig. 8-Testing Headlight Dimmer Switch

Remove coupler from wiring harness. Connect test light between terminals 1 and 2 (high beam), Fig. 8. Actuate dimmer switch. Test light should light. Connect test light between terminals 1 and 3 (low beam). Actuate dimmer switch. Test light should light. If switch does not function correctly, replace it.

REPAIR

Replacing Lighting Coil

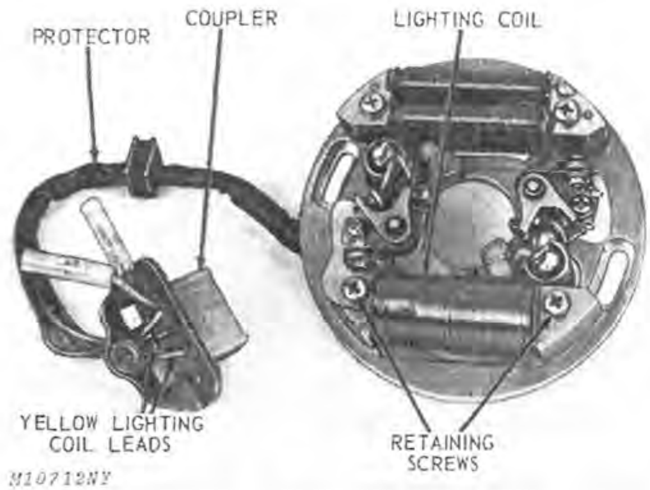


Fig. 9-Replacing Lighting Coil (CCW Engine)

Remove recoil starter, fan cover, flywheel, and backing plate. Remove stator assembly. See Section 20, Group 10 for procedures.

Remove two screws securing lighting coil to stator plate, Fig. 9. Remove two yellow lead connectors from coupler and pull wires through protector, Fig. 9.

Thread new yellow coil wires through protector and secure new lighting coil to stator plate. Install new connectors to yellow wires and insert into coupler, Fig. 9.

See Section 20, Group 10, for assembly and torque specifications.

NOTE: On Kohler engines (Serial No. -722605694) the engines are equipped with two lighting coils. a 75-watt coil and a 23-watt coil in parallel. Engines (Serial No. 722605695-732701000) are equipped with a single 100-watt lighting coil. For replacement parts on engines with the 75-watt and 23-watt coils a single 100-watt coil is available. Should either the 75-watt or 23-watt coil fail, remove both and replace with the single 100-watt lighting coil. Beginning with Serial No. 732701001, 23-watt and 100-watt lighting coils are used.

ADJUSTMENT

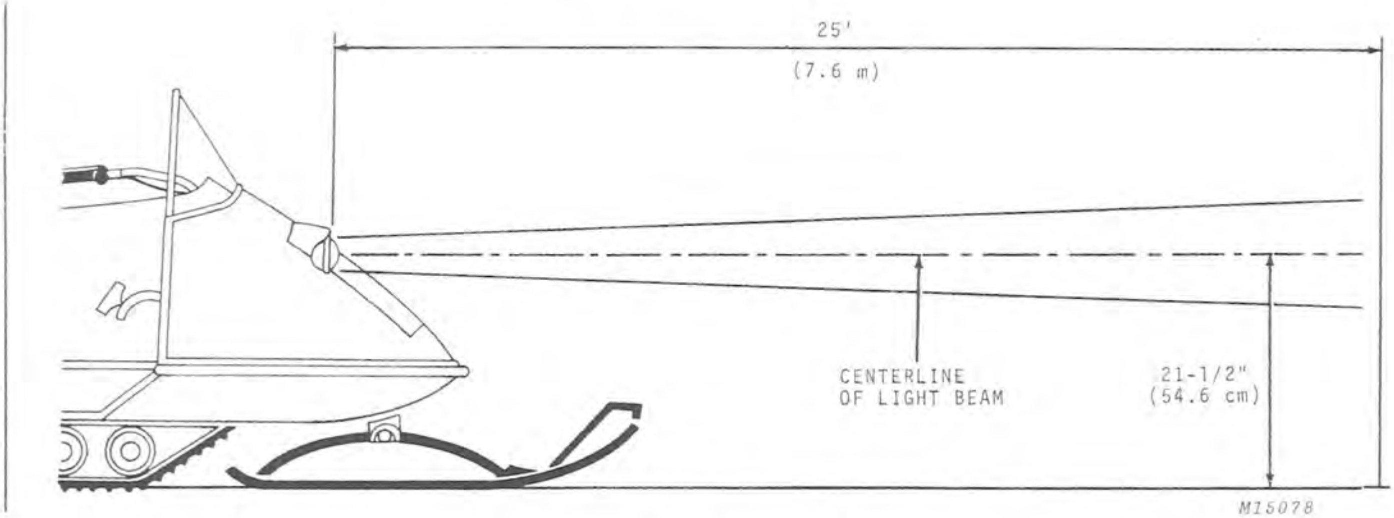


Fig. 10-Correctly Aimed Snowmobile Headlight

Position snowmobile on a flat surface with the headlight 25 feet (7.62 m) from a vertical surface, Fig. 10. With an operator on the seat and the headlight on **high** beam, the light beam centerlines should be straight ahead of the machine and 21-1/2 inches (54.6 cm) above the ground level.

All Snowmobiles (Serial No. -30,000)

To adjust beam, turn adjusting screws by headlight, as shown in Fig. 11.

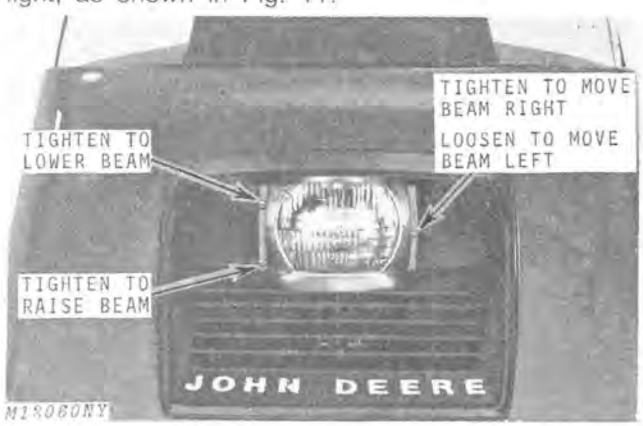


Fig. 11-Headlight Adjusting Screws

NOTE: To adjust beam (400 and 500 Snowmobiles, Serial No. -11,000), loosen two headlight attaching screws and shim behind top edge of headlight as necessary to obtain 21-1/2 inch (54.6 cm) dimension.

All Snowmobiles (Serial No. 30,001-)

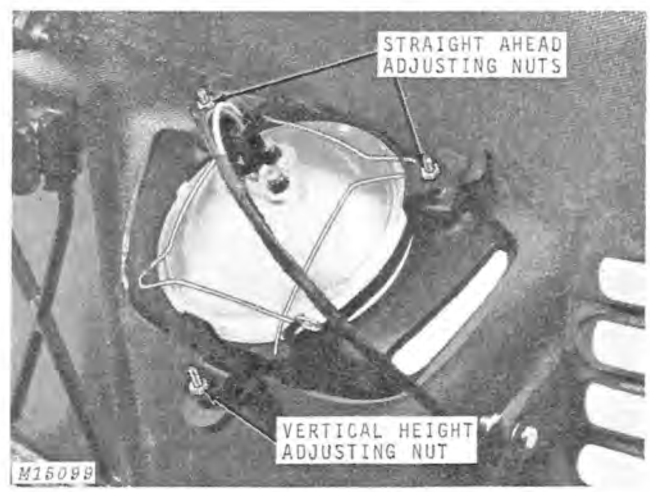


Fig. 12-Headlight Adjusting Screws

Loosen or tighten top two adjusting nuts as necessary, Fig. 12, to position the light beam straight ahead.

Loosen or tighten the vertical height adjusting nut to raise or lower the light beam.

If hood latches are loose, allowing hood and headlight to flutter, adjust as follows: Close hood and secure with latches. Loosen two forward pivot bolts and slide hood forward in bumper bracket slots until latches are tight. Tighten pivot bolts securely.

Group 20
ELECTRIC START KIT

PRINCIPLE OF OPERATION

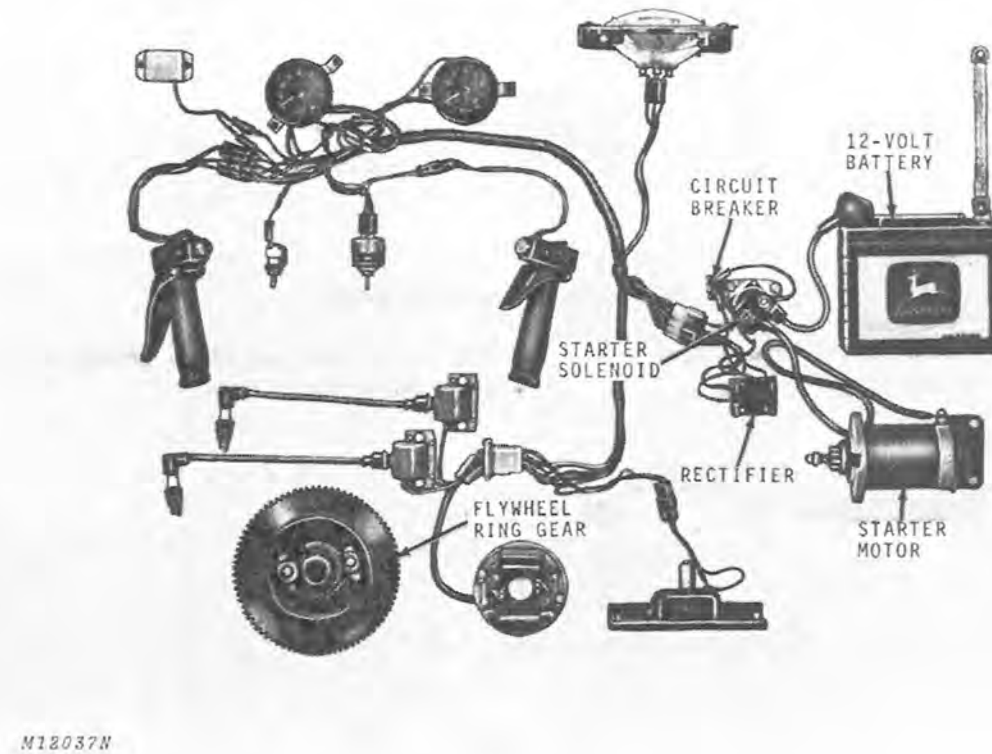


Fig. 1-Electric Start Kit Components

The electric start kit, Fig. 1, consists of a 12-volt battery, starter solenoid, starter motor, rectifier and circuit breaker. A battery box, wiring harness, and battery cables are also included.

NOTE: Ring gear must be ordered separately and installed on engine when using the electric start kit on 300 Snowmobiles (Serial No. 21,505-).

When the ignition switch is turned to the "START" position, battery current is directed to the starter solenoid by the purple lead. This activates the solenoid which connects the battery directly to the starter motor.

As the starter motor begins to rotate, the bendix-type drive moves into mesh with the flywheel ring gear and rotates the crankshaft.

Once the engine is started, the lighting coil, mounted on the stator plate within the flywheel, generates alternating current. This alternating current is changed to direct current in the rectifier. The direct current recharges the battery.

A circuit breaker protects the system from short circuits or electrical overload. The circuit breaker resets automatically after opening.

See "Wiring Diagram" and "Diagnosing Malfunctions" in Group 5 of this section.

PRINCIPLE OF OPERATION—Continued

1972 Snowmobiles:
400 and 500 (Serial No. -11,000)

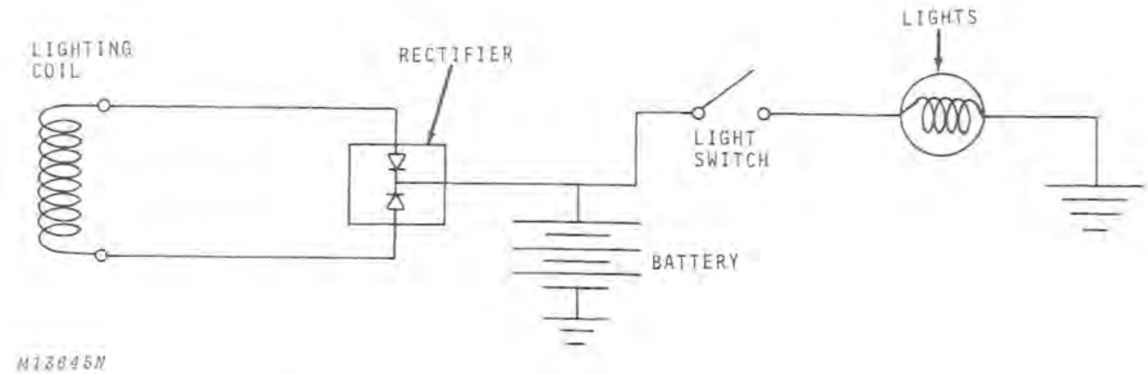


Fig. 2-1972 Snowmobile Lighting and Charging System

The full output of the alternator lighting coil, Fig. 2, is converted to DC current by the rectifier.

The DC current can either charge the battery or operate the lights or both.

1973 Snowmobiles:
400 and 500 (Serial No. 11,001-20,000)
600, JDX4 and JDX8 (Serial No. -20,000)

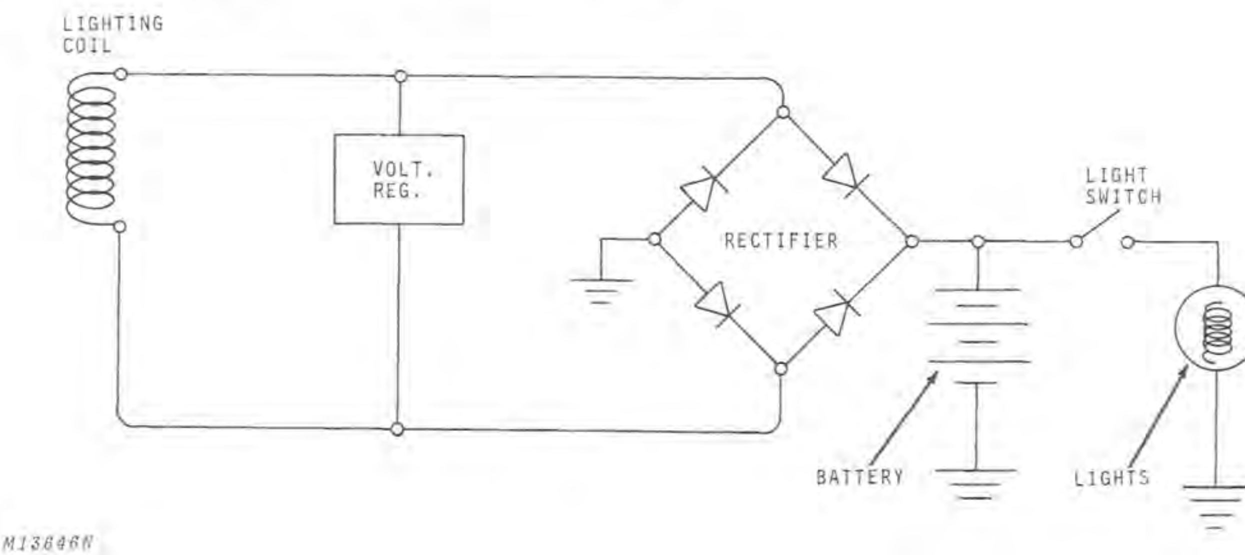


Fig. 3-1973 Snowmobile Lighting and Charging System

The voltage regulator, Fig. 3, limits the output of the lighting coil AC voltage by shorting out a portion of the AC wave. The regulated AC current is converted by the rectifier to DC current which either charges the battery or operates the lights or both. Because the center of the alternator is not connected to ground, a 4-diode rectifier is required, rather than the 2-diode-type used on 1972 Snowmobiles.

1974 Snowmobiles:
300, 400, 500, 600, JDX4 Special, JDX6 and JDX8 (Serial No. 20,001-30,000)

1975 Snowmobiles:
300, 400, 600, 800 JDX4, JDX6 and JDX8 (Serial No. 30,001-)

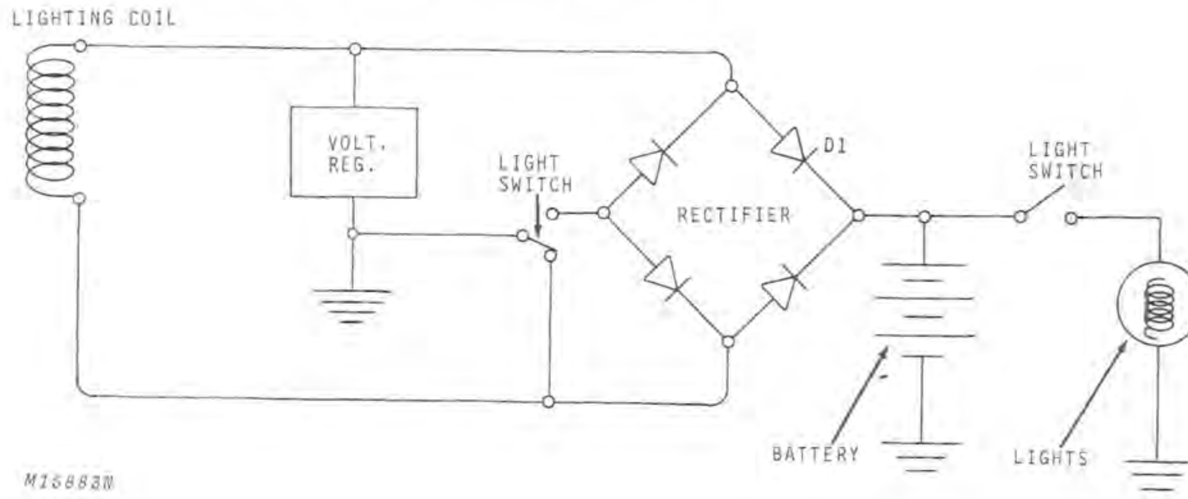


Fig. 4-1974 and 1975 Snowmobile Lighting and Charging Systems

The voltage regulator does not affect battery charging on electric start snowmobiles, unless the regulator is defective and shorting out the system. A second set of contacts on the light switch selects a half wave or full wave rectification for charging the battery. With lights "OFF", Fig. 4, only one of the diodes, D1, conducts current to the battery during half of the AC cycle. With lights "ON" the 1974 and 1975 lighting systems are identical to the 1973 system except the voltage regulator does not function because it is not connected across the entire AC signal.

Battery

Fig. 5-John Deere Snowmobile Battery

The 12-volt, 32-amp-hr. storage battery, Fig. 5, is of the lead-acid variety. Lead is used in the construction of the cell plates and a sulfuric acid solution serves as the electrolyte.

The 12-volt battery has a hard rubber case with six individual cells. Each cell contains a specific number of sets of negative and positive plates.

All plates of like charge are interconnected so that the accumulative charges are present at the positive and negative battery terminals.

As a battery discharges and the energy is not replenished, the sulfuric acid is withdrawn from the electrolyte and the lead sulfate deposits build up on the plates. This causes the specific gravity of the electrolyte to diminish. Charging the battery reverses the chemical reaction, restoring the electrolyte to its original potential.

IMPORTANT: A discharged battery will freeze and damage the battery. Always keep battery fully charged when used in sub-zero weather.

John Deere snowmobile batteries feature a manifold vent system, Fig. 5. This system vents all six cells into a discharge tube which extends below the snowmobile pan. The six fill caps are not vented as in a conventional battery.

The battery base also has a tube extending below the pan to discharge water or acid which might accumulate in this area.

TESTING

Testing Battery

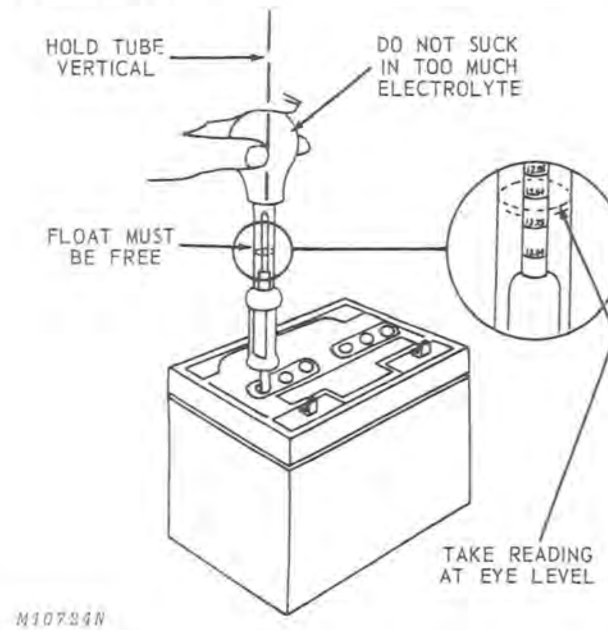


Fig. 6-Testing Specific Gravity

Checking Specific Gravity

To determine whether the battery is capable of meeting the requirements of the starter motor, it is necessary to duplicate operating conditions by subjecting the battery to a load test. To obtain a true test, the battery should be at least 75 percent charged. This can be determined by taking a hydrometer reading, Fig. 6.

The following table illustrates typical ranges of specific gravity (amount of unused sulfuric acid remaining in the solution) for a cell in various states of charge, with respect to its ability to crank the engine at 80°F. Initial full-charge specific gravity is either 1.260 or 1.280.

Specific Gravity	Capacity
1.260 to 1.280	100%
1.230 to 1.250	75%
1.200 to 1.220	50%
1.170 to 1.190	Very little useful capacity
1.140 to 1.160	
1.110 to 1.130	Discharged

Checking Battery Voltage

With a battery in good condition, each cell contributes approximately 1.95 to 2.08 volts. If battery charge is low and less than 0.05 volt-difference is noted between the highest and lowest cells, the battery may be recharged.

If the difference is more than 0.05 volts, this could indicate a cracked plate or other damage which could call for replacement of the battery.

There are two methods of testing battery capacity. Battery electrolyte temperature should be at or near 80°F. for these tests.

Before making either of the two following tests, first check electrolyte level in battery. Add water if necessary. If water is added, be sure it is thoroughly mixed with the underlying electrolyte by charging. Battery voltage should be 11.5 to 12.6 volts before testing.

Using the first method, crank the engine for 15 seconds with the starter motor and measure the battery voltage. If voltage is less than 9.6 volts at the end of 15 seconds, replace battery.

As a second method, use high-rate discharge test equipment, Fig. 7.

Discharge the battery by means of a heavy-duty carbon pile at a rate of 3 times the ampere-hour capacity. Follow equipment manufacturer's recommendations for testing.

If after 15 seconds the battery voltage is less than 9.0 volts, the battery fails to meet the load test, indicating loss of capacity or internal short circuits. Any battery that passes the load test is a good battery and can be relied upon to fulfill the requirements of the starter motor under normal conditions.

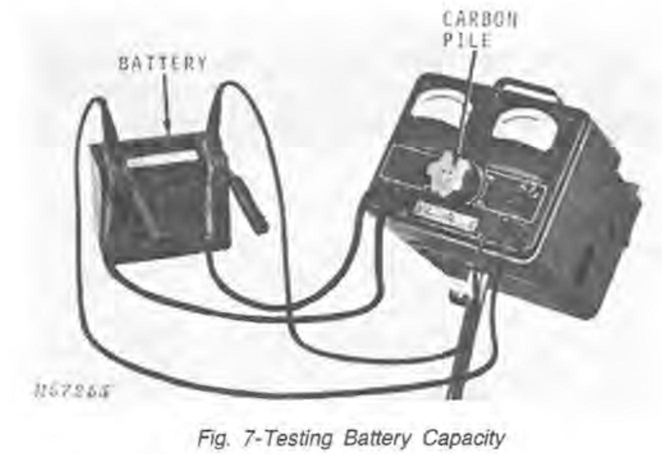


Fig. 7-Testing Battery Capacity

Testing Starter

If starter fails to crank engine or cranks very slowly, make the following checks:

1. Inspect cranking circuit wiring for loose or badly corroded connections or damaged wiring.

2. Check condition of battery to be certain battery is charged and not defective.

3. Crank engine with recoil starter to determine if engine turns freely and is not seized.

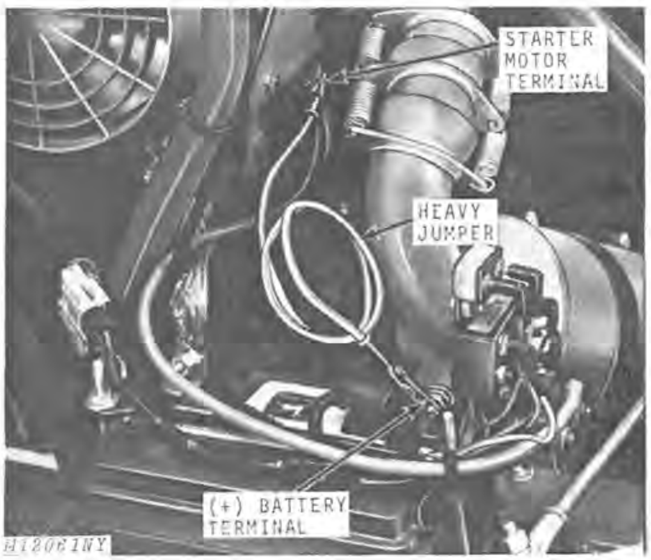


Fig. 8-Testing Starter Operation

CAUTION: Remove spark plug wires prior to making the following test.

If the above checks revealed no defects and the starter still will not crank engine, place a heavy jumper lead from positive (+) battery terminal directly to starter terminal, Fig. 8.

This eliminates the ignition switch, circuit breaker and starter solenoid from the circuit. If starter cranks engine, then one of these items is defective.

If starter still will not crank engine, starter is defective and must be removed and disassembled for further testing.

Service on the starter motor is limited to three assemblies. These are: the armature; the end cap assembly, which includes the brushes and springs; and the pinion drive assembly, which includes the drive gear, anti-drift spring, spring cup and nut.

Testing Starter Magnets

Check to make sure the magnets are bonded to the housing.

Check magnets for magnetism.

Testing Armature

If the trouble has not yet been located, test the armature for opens, shorts, and grounds as follows:

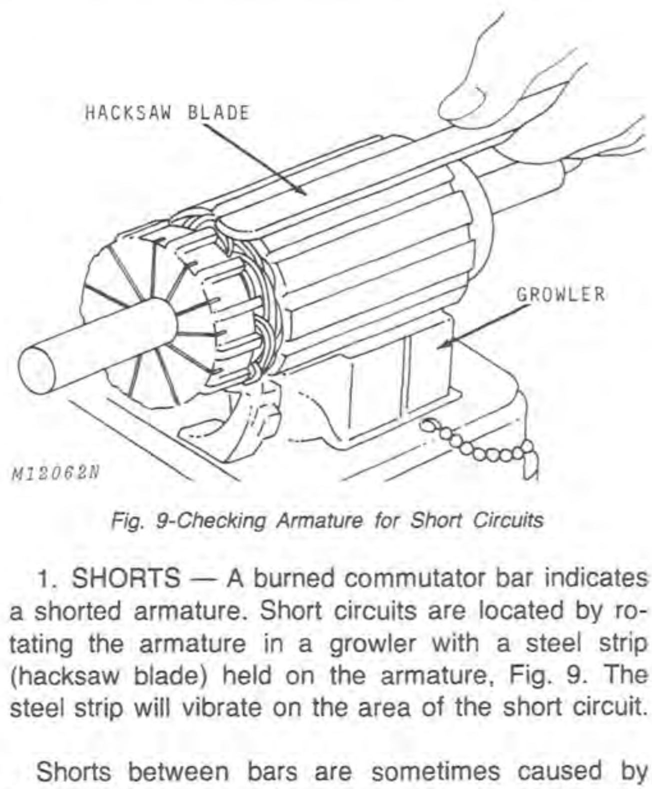


Fig. 9-Checking Armature for Short Circuits

1. SHORTS — A burned commutator bar indicates a shorted armature. Short circuits are located by rotating the armature in a growler with a steel strip (hacksaw blade) held on the armature, Fig. 9. The steel strip will vibrate on the area of the short circuit.

Shorts between bars are sometimes caused by brush dirt or copper between bars. Inspect for this condition. Undercut commutator insulation 1/32-inch to eliminate these shorts.

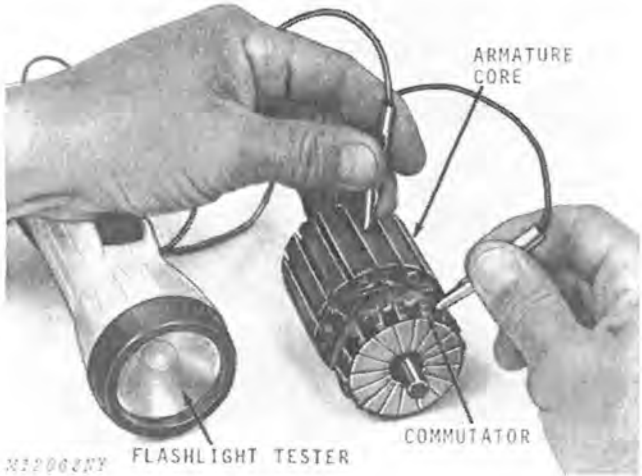


Fig. 10-Checking Armature for Grounds

2. GROUNDS — Grounds in the armature can be detected by use of a test light and prods. If the lamp lights when one test prod is placed on the commutator and the other prod on the armature core or shaft, the armature is grounded, Fig. 10.

3. OPENS — Inspect for loose connections at the points where the conductors are joined to the commutator. Poor connections cause arcing and burning of the commutator. If bars are not badly burned, resolder leads in riser bars.

If armature checks good on the above test, but the commutator is worn, dirty, out of round, or has high insulation, turn down the commutator and undercut insulation 1/32-inch.

If armature is defective, replace armature.

Testing Starter Solenoid

The solenoid is a sealed magnet switch and cannot be repaired. If testing reveals a defective unit, it must be replaced.

Remove and insulate cable from starter terminal. Connect test light across two large terminals, Fig. 11, of starter solenoid.

With a jumper lead, connect positive (+) battery post to small terminal on solenoid, Fig. 11. If in good condition, the solenoid plunger will snap in, light the test lamp, and hold until the jumper is removed.

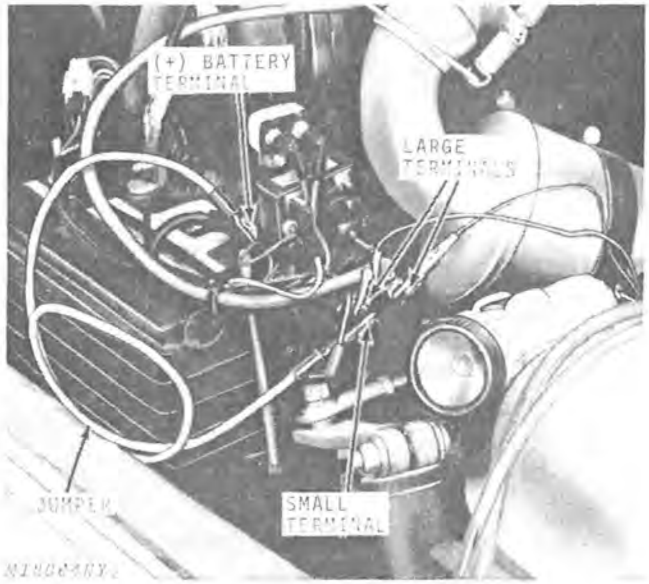


Fig. 11-Testing Starter Solenoid

Testing Circuit Breaker

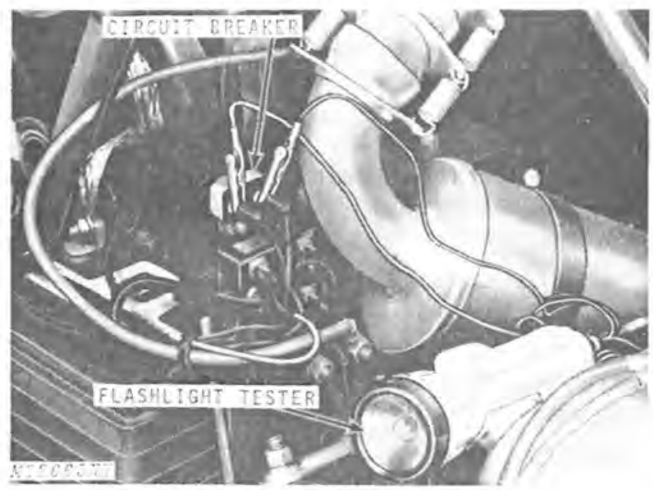


Fig. 12-Testing Circuit Breaker

Test light must light when connected across circuit breaker terminals, Fig. 12. If circuit breaker is found defective, it must be replaced.

The circuit breaker terminals are designated "BAT" and "AUX". Short red lead from starter solenoid must be connected to the "BAT" terminal of circuit breaker, Fig. 12.

The circuit breaker should reset automatically after opening due to electrical overload.

Testing Ignition Switch

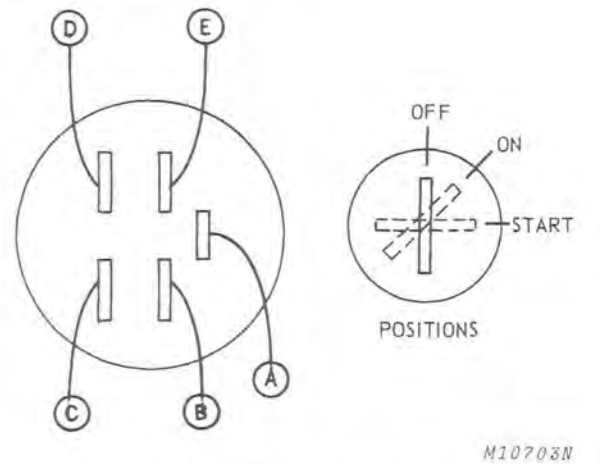


Fig. 13-Testing Ignition Switch

Remove windshield and loosen four bolts securing instrument panel. Lift panel out to provide access to back side of ignition switch. Remove coupler from ignition switch.

The ignition switch can be tested with a test light. Check for continuity between terminals with switch placed in each of three positions.

See Fig. 13 and chart below for correct current flow diagram. If switch is defective it must be replaced.

Position	Closed	Open
OFF	A & D	B, C, E
ON	C & E	A, B, D
START	B & E	A, C, D

Testing Rectifier

1972 Snowmobiles

Disconnect three connectors from rectifier, Fig. 14.

Connect positive (red) lead of test light to output terminal of rectifier and negative lead to one of two input terminals, Fig. 14. Test light should light. Connect negative lead to other input terminal, Fig. 14. Test light should light once again. Reverse positive and negative tester leads. Test light should not light. Replace rectifier if found defective.

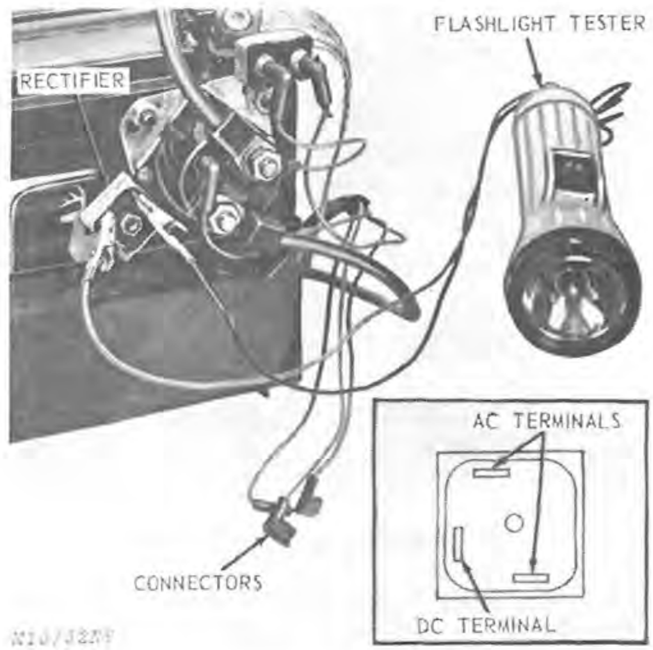


Fig. 14-Testing Rectifier

1973, 1974 and 1975 Snowmobiles

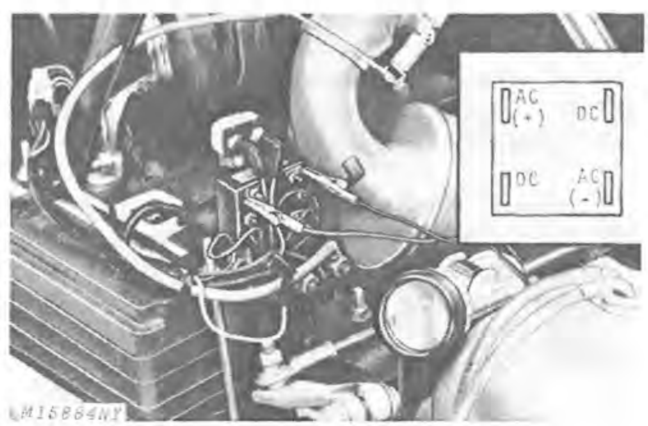


Fig. 15-Testing Rectifier

Disconnect four connectors from rectifier. A diode exists between each of the four terminals in the rectifier. Test the four diodes one at a time by connecting a test light to two adjacent terminals, Fig. 15.

Test with leads on two top terminals; two bottom terminals, two left terminals and two right terminals. Reverse terminal contacts in each test set-up. Do not test terminals in a diagonal pattern.

With leads connected one way, test light should light. With leads reversed, a high resistance or open condition should be indicated. Repeat test for the other three diodes. If rectifier is defective, replace it.

Testing Charging System

The lighting coil, which is used to provide current for the lighting system, is also used to charge the battery when the snowmobile is equipped with electric start.

Refer to Group 15 of this section for testing the DC voltage output of the lighting coil.

If battery is not being charged properly, make the DC amperage test.

CAUTION: Block up snowmobile track securely so engine can be run at operating speeds without danger.

IMPORTANT: Do not operate engine with drive belt removed. Engine could overspeed and cause engine and drive sheave failure.

IMPORTANT: Start engine using recoil starter. Do not start engine with electric starter when meter is attached or meter will be damaged.

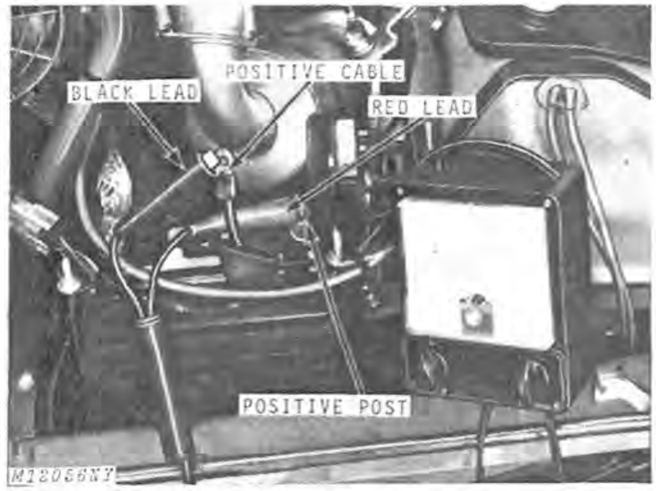


Fig. 16-Testing Charging System

Disconnect the positive battery cable and connect the red meter lead to cable, Fig. 16. Connect black meter directly to positive (+) battery terminal.

Year	Lights	Amperes
1972	OFF	4 - 6
	ON	0 - 2
1973	OFF	5 - 10
	ON	1 - 2
1974	OFF	2 - 4
1975	ON	3 - 5

Run the engine at 6000 to 7000 rpm. DC output should be as indicated in the chart above. If not, test rectifier, circuit breaker, voltage regulator, and ignition switch. Also check condition of wiring and connections.

REPAIR

Battery

Removing Battery

To avoid injury from a spark or short circuit, disconnect negative (—) battery cable first. Then remove rubber boot and disconnect positive (+) cable, Fig. 17

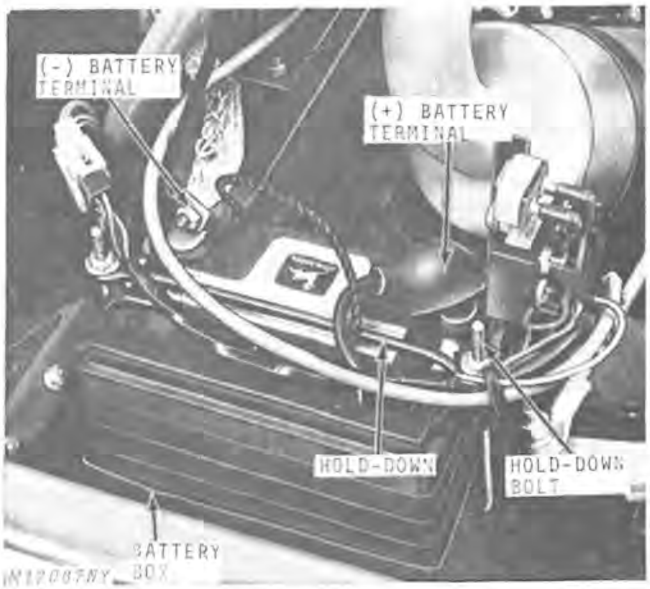


Fig. 17—Removing Battery

Loosen two hold-down bolts, Fig. 17, unhook bolts from box and remove hold-down. Disconnect vent tube from battery and lift battery from box.

Servicing Battery and Battery Box

Good battery servicing should include the following items:

1. Clean battery and battery box.
2. Inspect cables and ground strap.
3. Clean terminals and ground strap connection.
4. Inspect hold-downs.
5. Inspect battery case for leaks.
6. Make hydrometer test.
7. Add water if necessary. Use caution to protect snowmobile from electrolyte damage.
8. Recharge battery if less than 75% charged.
9. Inspect condition of battery vent tube and battery box drain tube.

Activating New Battery

Activate a new battery before installing it in snowmobile. This will prevent damage to machine in case electrolyte spills.

Add electrolyte until plates are just covered. Leave cell caps off while charging. Charge at 7 amps. for 30 minutes. After initial charge, do not charge battery at more than 5 amps.

Charging the battery will increase battery temperature and raise the electrolyte level. If electrolyte is still below the ring in the battery neck, add enough electrolyte to fill to the bottom of the ring.

Advise customers to add water as recommended in the operator's manual. A healthy battery will consume about one teaspoon of water per cell each month.

CAUTION: While charging battery, hydrogen and oxygen gases are emitted which are very explosive. Therefore, keep open flames and sparks away from battery.

Cleaning Battery

Corrosion around the battery terminals is normal. However, an accumulation of corrosion over a long period can shorten the life of the battery. Therefore, keep battery terminals as clean as possible.

To clean terminals, remove battery from snowmobile. Remove all corrosion using a wire brush. Wash terminals using a solution of one part ordinary baking soda to four parts water. Do not permit cleaning solution to enter battery cells.

Wash entire battery, battery box and hold-down components with clear water. Do not get water in electrical couplers.

Installing Battery

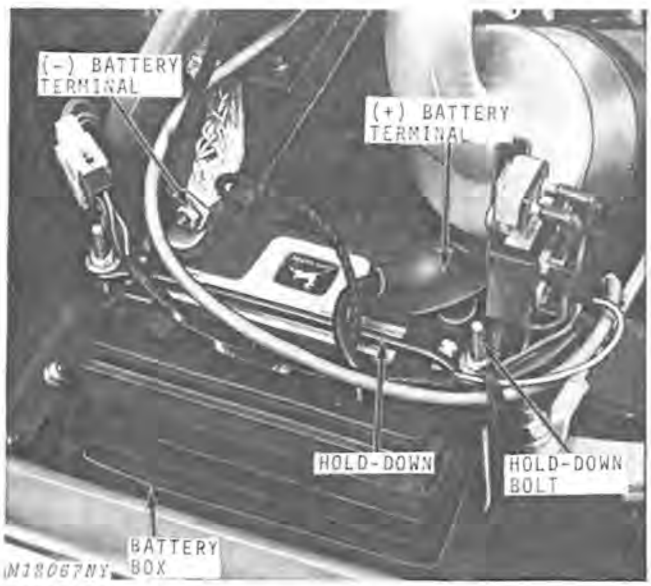


Fig. 18-Installing Battery

Clean and dry battery exterior. Check condition of battery box rubber pads and replace if necessary. Place battery in box as shown, Fig. 18. Clean and install battery hold-down and bolts. Tighten securely, but not so tight rubber pads under battery are completely compressed.

Attach vent tube to battery. Attach positive (+) battery cable first and install rubber boot; then attach negative (−) cable, Fig. 18.

IMPORTANT: Be careful when attaching battery cables to prevent breaking or loosening battery terminals.

Checking Battery Electrolyte Level

Periodically check the level of the electrolyte in the battery cells. This should be done at least once a week during peak operating periods.

Proper level is to the bottom of the ring (filler neck) so that the tops of the battery plates are covered.

IMPORTANT: Do not overfill.

Add only distilled water to the battery. If not available, be sure to use clean, soft water. Avoid water with a high mineral content.

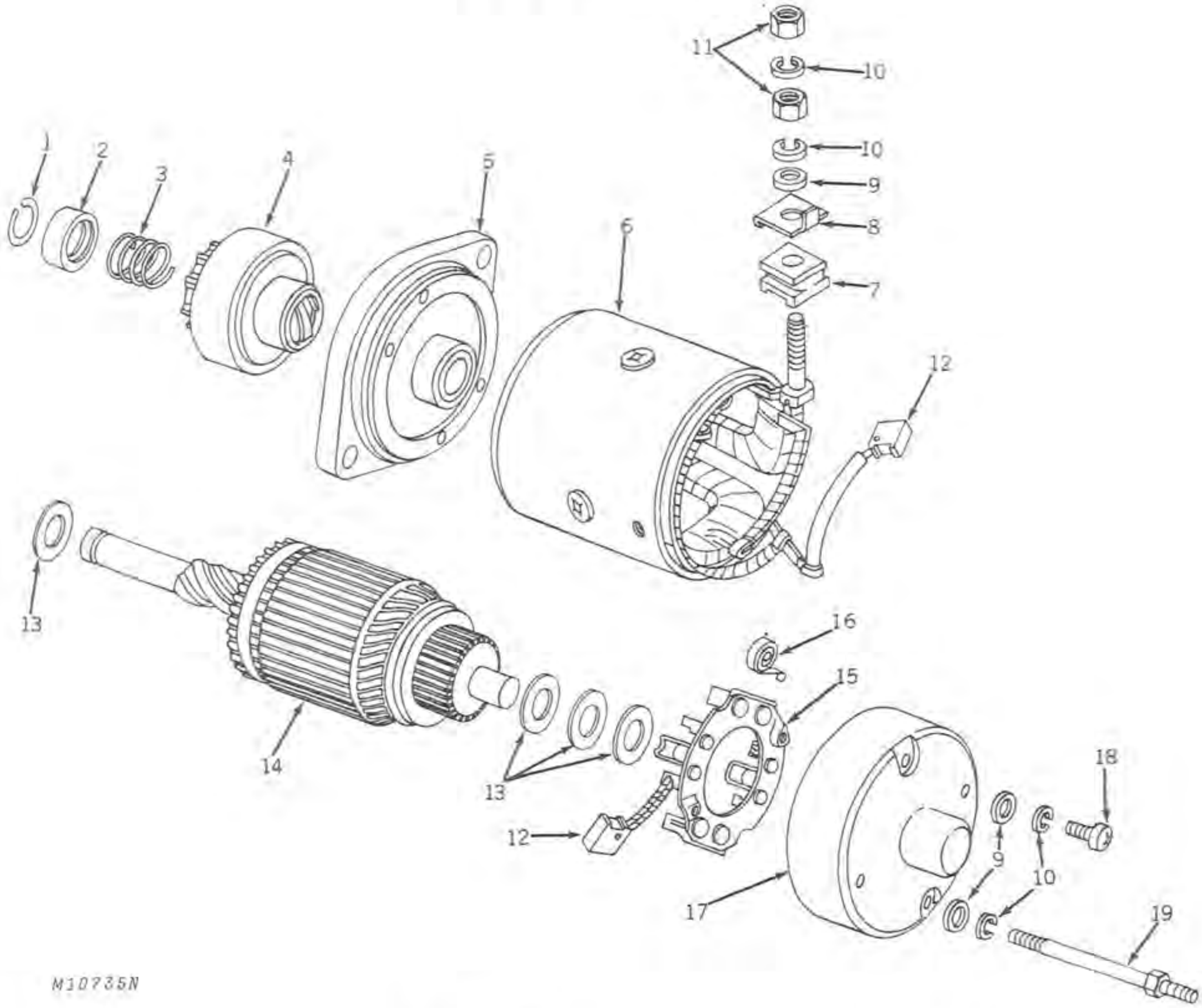
Never add acid to the battery unless electrolyte is lost by spilling. To add acid to the battery will unbalance the 10 to 1 sulfuric acid-to-water ratio.

Always wait until after checking specific gravity before adding water to the battery. This will assure a true reading. If level is too low to check specific gravity, add water and operate system for a few minutes to mix water and electrolyte; then check.

In freezing weather, never add water to the battery unless snowmobile will be operated for a period of time to allow mixing of the water and electrolyte.

IMPORTANT: A discharged battery will freeze and break battery case. Always keep battery fully charged.

Starter
(1972 Snowmobiles)



1—Retaining Ring
2—Pinion Stop
3—Anti-drift Spring
4—Starter Pinion Gear
5—Drive End Cap
6—Housing and Field Assembly
7—Insulator
8—Metal Clip
9—Washer
10—Lock Washer
11—Nut
12—Brush
13—Spacing Washer
14—Armature
15—Brush Plate
16—Brush Spring (2 used)
17—End Cap
18—Screw (2 used)
19—Thru Bolt (2 used)

Fig. 19-Exploded View of Snowmobile Starter Motor

Repair to the 1972 snowmobile starter motor, Fig. 19, is limited to the brush assembly and the starter drive assembly because these are the only parts available for service.

The armature commutator, however, can be cleaned or turned on a lathe if dirty or worn unevenly.

Disassembling Starter

Disconnect cable to starter terminal. Remove two socket head cap screws securing starter end cap bracket to engine. Remove two nuts and washers securing starter to fan cover and lift out starter.

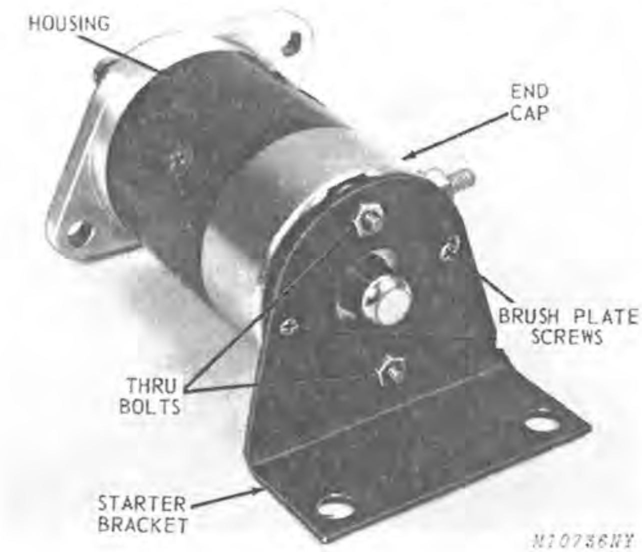


Fig. 20-Disassembling Starter Motor

Remove starter bracket, Fig. 20. Remove two thru bolts, and two brush plate screws, Fig. 20. Remove end cap from housing and slide housing off of armature. Be careful not to lose spacing washers from end of armature shaft.

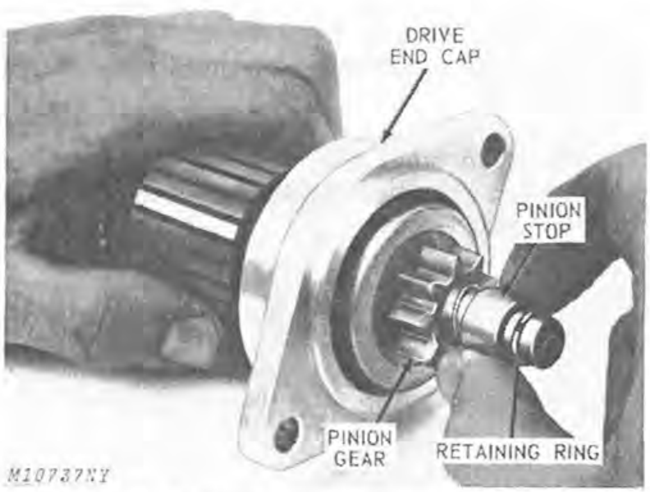


Fig. 21-Removing Starter Drive Retaining Ring

Slide pinion stop back on armature shaft until retaining ring is exposed, Fig. 21. Remove retaining ring from armature shaft.

Slide starter drive components, drive end cap and spacing washer off armature shaft, Fig. 21.

Cleaning Starter

Clean starter components with a rag saturated in cleaning solvent. **Do not** wash or dip field coils or armature in cleaning solvent.

Clean end cap and drive end cap bushings with a clean, dry cloth. Do not use cleaning solvent because this will remove lubricant from oil-impregnated bushings.

See "Repairing Armature" on page 40-20-14 for additional commutator cleaning methods.

Inspecting Starter

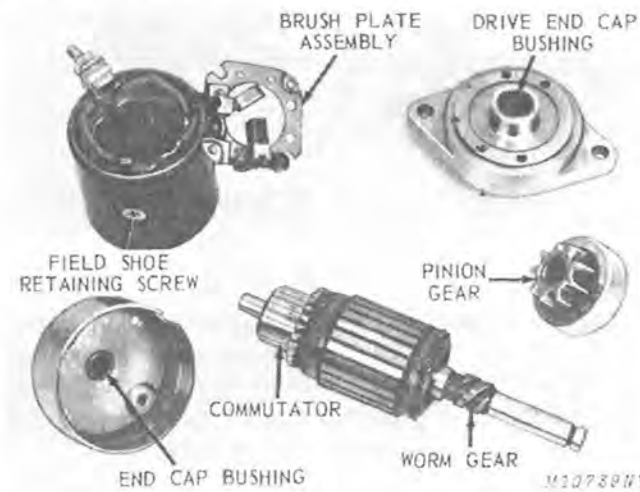


Fig. 22-Inspecting Starter Components

Inspect armature shaft bearing surfaces and end cap and drive end cap bushings for excessive wear, Fig. 22. If badly worn, armature will drag fields and reduce starter efficiency. Replace starter if bearings are extremely loose.

Inspect four field shoe retaining screws, Fig. 22, to be certain field shoes are tight to inside of housing.

Inspect starter pinion gear, Fig. 22, and flywheel ring gear teeth for excessive wear. Inspect pinion gear and armature worm gear teeth for wear or binding. Replace starter drive if necessary.

Inspect commutator and brushes for wear. Turn down commutator and replace brush plate assembly if necessary. Inspect brush springs for tension.

Replacing Brushes

Brushes are available only in a kit which includes two brushes and leads, two brush springs and brush plate, and holder.

Brushes should be replaced if worn to 5/16 inch or less, if worn unevenly, or if oil-saturated.

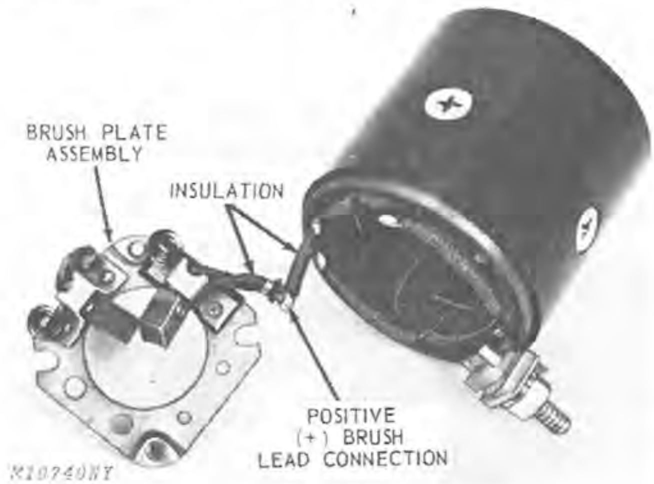


Fig. 23-Replacing Brushes

Loosen positive (+) brush lead connection with a soldering gun, Fig. 23. Install new brush kit by soldering positive (+) brush lead to field coil lead. Position insulation in place on brush lead and field coil lead and tape connection if necessary.

Repairing Armature

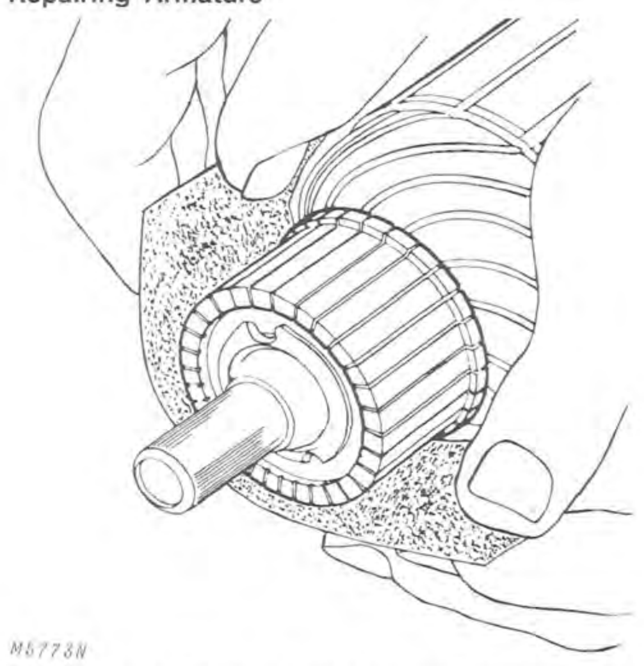
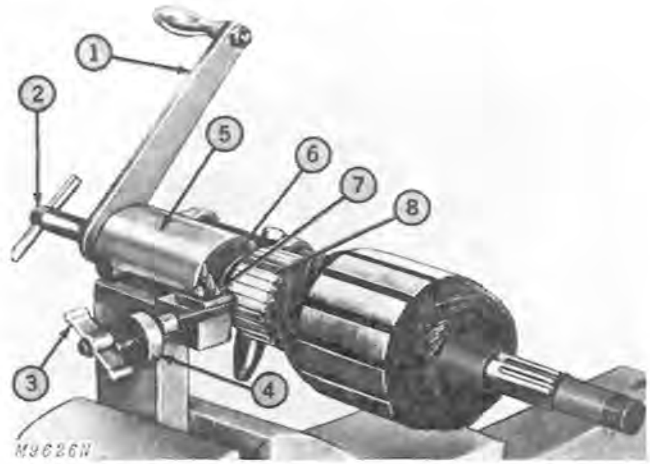


Fig. 24-Cleaning Commutator with Sandpaper

When inspecting the starter armature, also note the condition of the commutator. If the commutator is glazed or dirty, it can be cleaned by placing the armature in a lathe. While the armature is rotating, hold a strip of number 00 sandpaper lightly against the commutator, moving the sandpaper back and forth, Fig. 24.



1—Operating Handle
2—Removal Screw
3—Clamp Wing Nut
4—Tool adjusting Nut
5—Frame
6—Mandrel
7—Lock Wing Nut
8—Commutator

Fig. 25-Armature and Lathe

Blow out all dust after sanding the commutator. If the commutator is rough, out of round, has high mica, or is extremely dirty, it will require "turning down" in a lathe and undercutting the mica between the bars, Fig. 25.

Never clean armatures in a degreasing-tank or with degreasing compounds because damage to the insulation might occur.

Assembling Starter

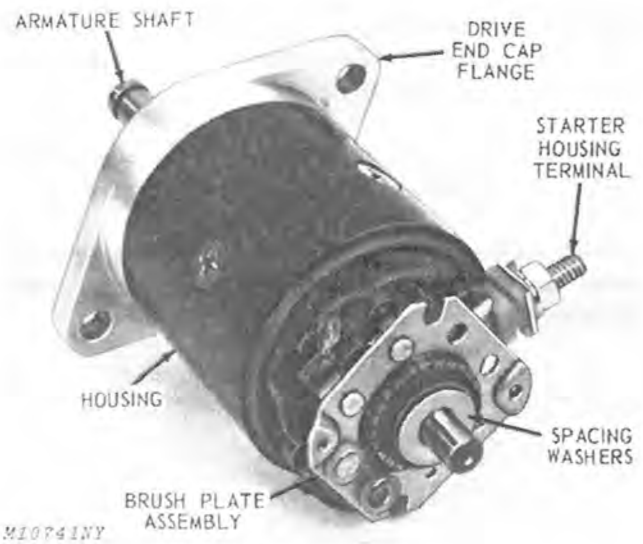


Fig. 26-Starter Assembly

Place a light film of oil on armature shaft bearing surfaces. Place one spacing washer on drive end of armature and three spacing washers on commutator end of armature.

Install drive end cap on armature and slide starter housing over armature, Fig. 26. Index drive end cap and housing together so drive end cap flange is positioned as shown, Fig. 26, in relationship to the starter housing terminal.

Install brushes in place in brush holder and place unit over commutator as shown, Fig. 26. Be certain brush springs are positioned correctly.

Install end cap and check armature end play. Remove end cap and add or remove spacing washers, as necessary, to obtain 0.005 to 0.015-inch end play.

Install end cap and secure brush plate to end cap with two screws, Fig. 27. Install thru bolts, Fig. 27, and torque to 70 in-lbs.

Position bracket as shown, Fig. 27, over thru bolts and secure with lockwashers and nuts. Do not tighten nuts until after starter has been installed.

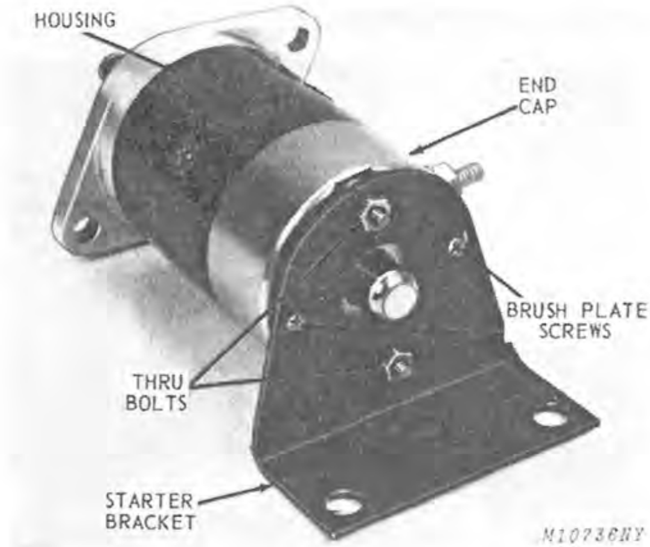


Fig. 27-Installing End Cap and Bracket

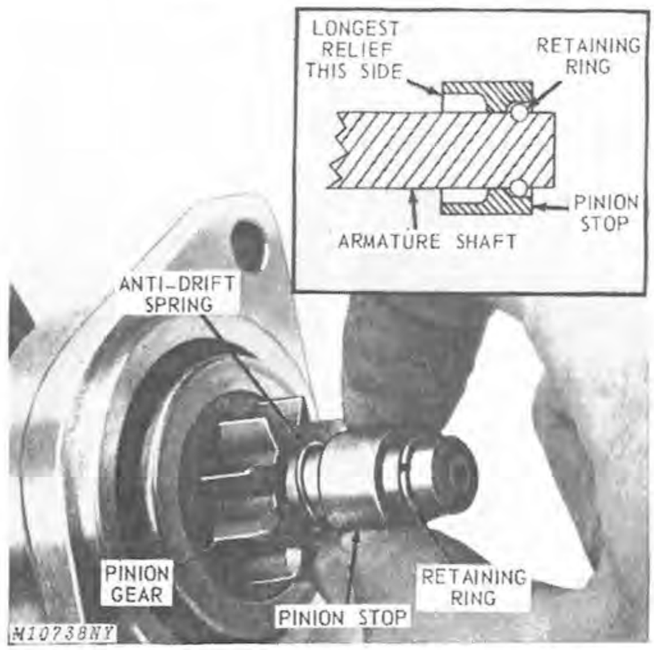


Fig. 28-Starter Drive Assembly

Lubricate worm gear teeth on armature shaft with low temperature grease.

Install pinion gear, anti-drift spring, and pinion stop onto armature shaft, Fig. 28.

NOTE: Pinion stop must be installed as shown in inset, Fig. 28.

Install retaining ring, Fig. 28, in groove in end of armature shaft. Pinch ring tight to shaft with a pliers, and slide pinion stop over retaining ring as shown in inset, Fig. 28.

Installing Starter Motor

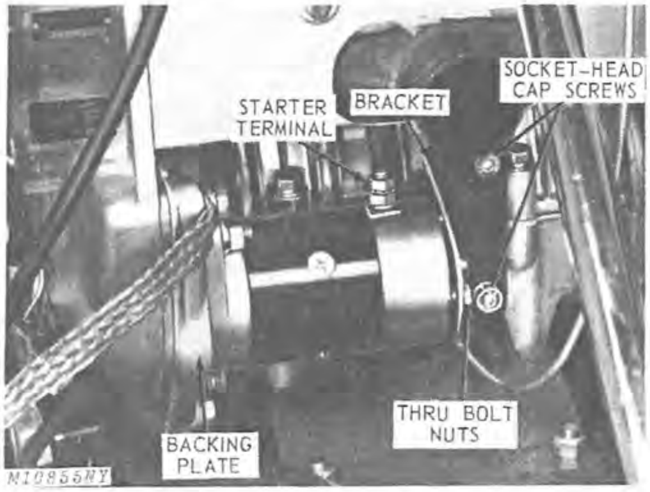


Fig. 29-Installing Starter on Engine

Position starter as shown, Fig. 29. Secure starter to backing plate with two washers, lock washers and nuts and tighten firmly. Secure bracket to engine crankcase with two lock washers and socket-head cap screws and tighten firmly.

Tighten two nuts securing bracket to starter thru bolts, Fig. 29. Attach cable to starter terminal.

IMPORTANT: Thru bolt nuts securing bracket must be tightened last to prevent starter misalignment.

Starter
(1973, 1974 and 1975 Snowmobiles)

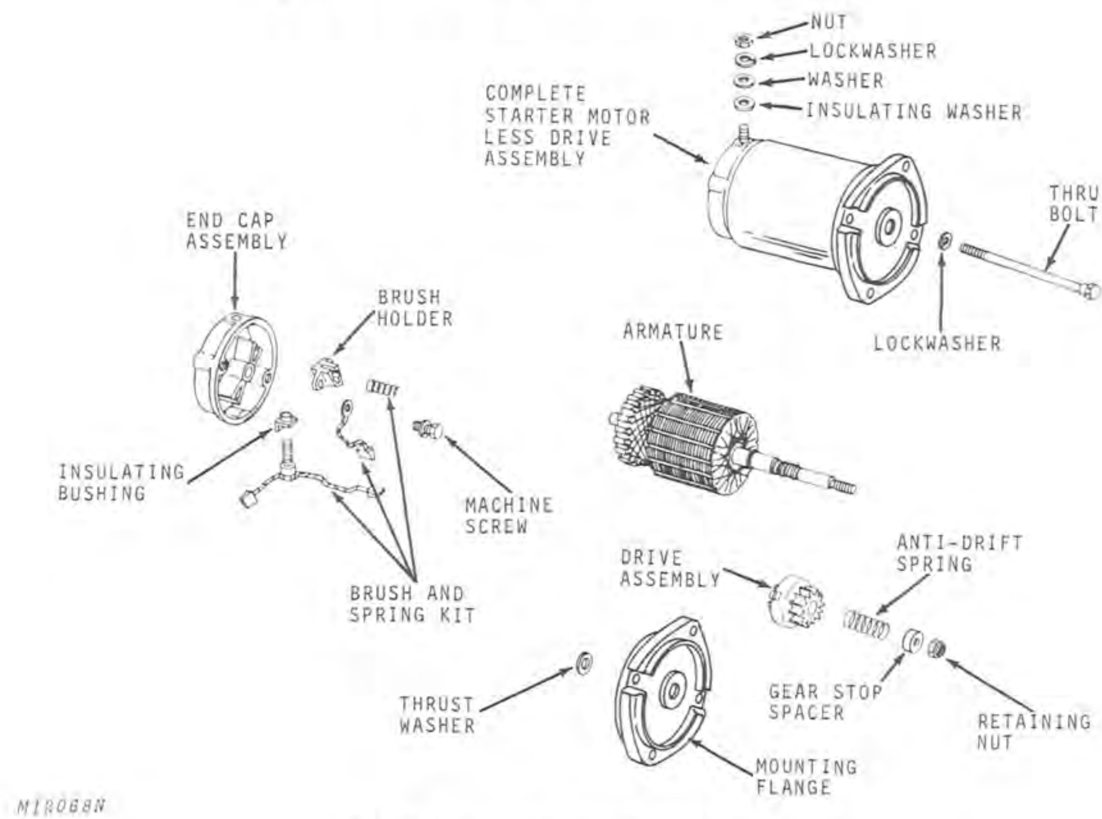


Fig. 30-Permanent Magnet Starting Motor

Repair to the starter is limited to the brushes, end cap, mounting bracket, armature and starter drive assembly, Fig. 30. Any of these parts can be replaced if found to be defective. Fields in this starter are permanent magnets and no service is required or possible. Any serious defect in the magnets will require a complete starter replacement.

Removing Starter

Disconnect ground cable from the battery.

Disconnect solenoid-to-starter cable from starter terminal.

Remove mounting bolts securing starter to engine and mounting bracket to engine, remove starter and mounting bracket.

Remove mounting bracket from starter.

Disassembling Starter Drive

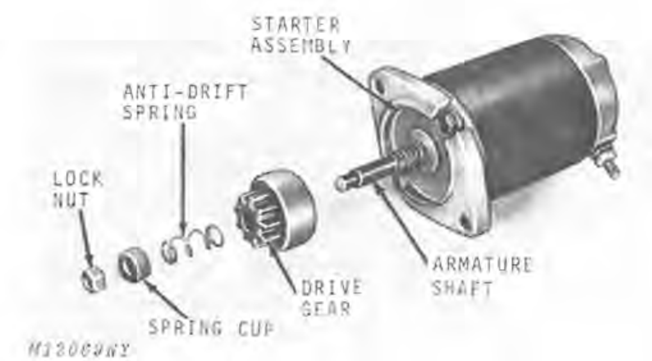


Fig. 31-Starter Drive

Hold drive gear and unscrew lock nut, Fig. 31. Remove drive parts from armature shaft.

Disassembling Starter

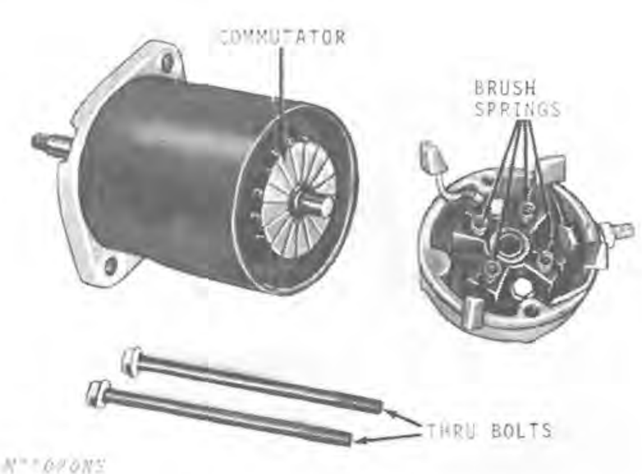


Fig. 32-Disassembling Starter

Remove the two thru bolts which hold the end cap and mounting bracket to starter housing. Remove end cap carefully, Fig. 32, to avoid losing brush springs which will pop out when end cap is removed. Tap mounting bracket lightly with a hammer to free it from the housing.

NOTE: Take care not to lose the thrust washer when removing mounting bracket.

Inspection

Clean and inspect starter drive components for excessive wear. Replace parts as necessary.

Inspect bearings in end cap and mounting bracket. Also inspect armature shaft. If armature shaft has excessive play in bearings, replace end cap and mounting bracket. It may be necessary to replace armature if bearing surfaces are worn badly. Excessive bearing play will allow armature to rub against fields.

Clean and inspect commutator. If surfaces are badly grooved, true up on a lathe and undercut mica. Brushes must make good contact with commutator.

Replacing Brushes

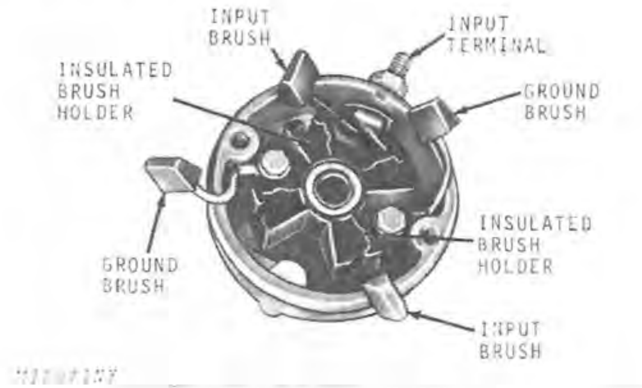


Fig. 33-Replacing Brushes

Replace brushes whenever they show any appreciable amount of wear. To replace input brush assembly, remove nuts and washers from terminal and pull the brushes out through the inside of the cap. When assembling, place the input brush into the insulated brush holders.

The leads from the ground brushes are attached to the metal screws which secure the insulated brush holders to the end cap, Fig. 33. Place these brushes in the non-insulated brush holders.

Assembling Starter

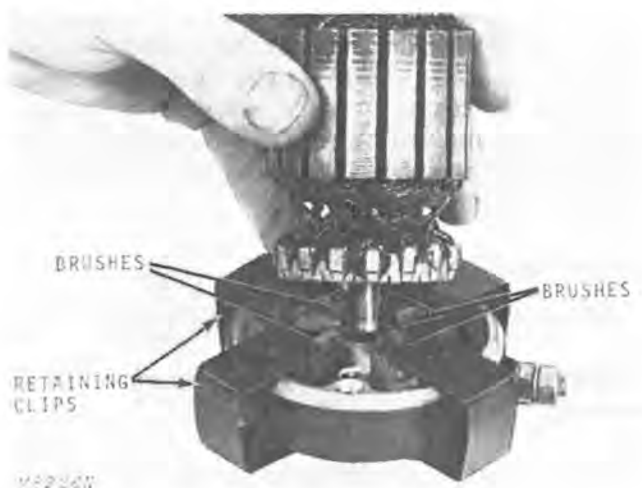


Fig. 34-Installing Brushes

The preparation of the starter end cap is the first step in the assembly of the starter.

First, place brush springs into brush holders. Then, in succession, place each brush in its respective holder with the beveled side up.

Compress brush spring and place a U-shaped retaining clip made of banding steel onto each brush, Fig. 34.

Wipe commutator clean with a dry cloth and lubricate armature shaft with a small amount of light grease.

Place armature into end cap, Fig. 34, and remove U-shaped brush retaining clips.

Place starter housing over armature while exerting down pressure on the armature. This prevents brush springs from pushing armature up and away from end cap. If this occurs, reload brushes into end cap and reassemble.

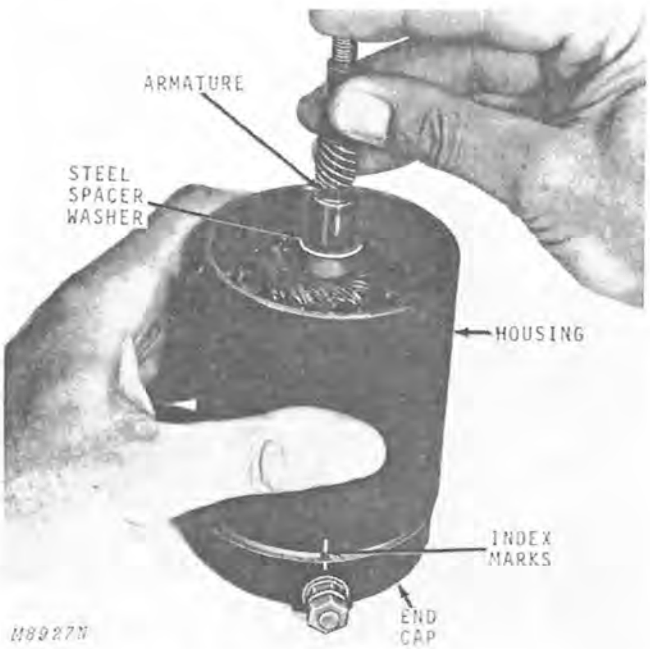


Fig. 35-Aligning Index Marks

Align housing with end cap using the index marks on cap and housing, Fig. 35.

NOTE: The starter housing has a mark and an indentation on the inside which must fit into the two indentures on the drive end cap.

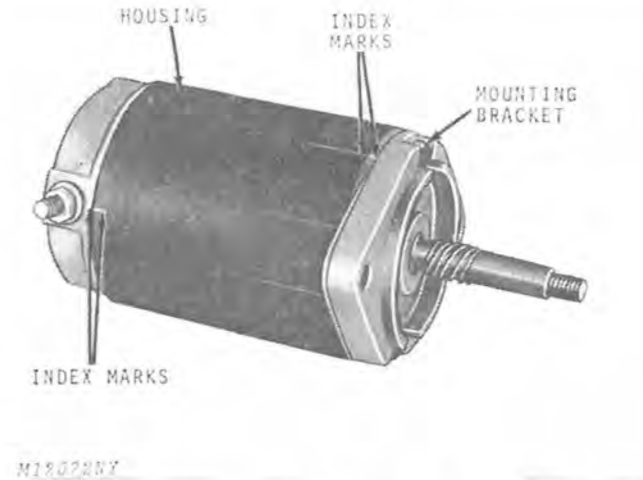


Fig. 36-Mounting Bracket Index Marks

Place steel spacer washer onto armature shaft and install mounting bracket over armature shaft.

NOTE: Align marks on mounting bracket with mark on housing, Fig. 36.

Insert thru bolts and torque to 70 in-lbs.

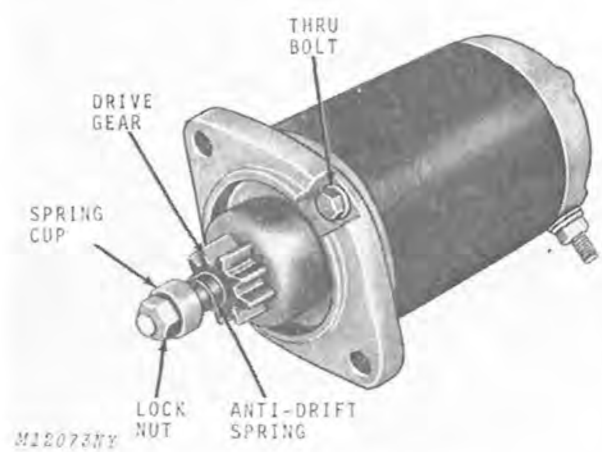


Fig. 37-Installing Drive Assembly

Install starter drive gear, anti-drift spring, spring cup, and lock nut on armature shaft. Torque lock nut to 45 to 50 in-lbs, Fig. 37.

Install starter in snowmobile, attach solenoid to starter wire, and connect battery ground cable to the battery.

Litho in U.S.A.

Group 25
SPECIFICATIONS

SPECIFICATIONS
1972 Snowmobiles

Model	Serial No.	Ignition	Engine
400	2,551-11,000	Kokusan	CCW 340 Piston-Ported
500	2,551-11,000	Denso	CCW 440 Piston-Ported

Item	Kokusan Ignition	Denso Ignition
Spark Plug Gap	0.020 inch	0.020 inch
Breaker Point Gap	0.014 inch ± 0.002	0.014 inch ± 0.002
Timing Dimension (BTDC)	0.023 inch ± 0.005	0.023 inch ± 0.005
Ignition Coils:		
Operating Amperage	0.5 amp.	1.3 amp.
Secondary Resistance	5.2 K ohms ± 10%	8.35 K ohms ± 15%
Primary Resistance	1.65 ohms ± 10%	.37 ohms ± 10%
Ignition Generating Coils Resistance	1.19 ohms ± 10%	1.10 ohms ± 10%
Condenser Capacity	.18 microfarad ± 10%	.25 microfarad ± 10%
Lighting Coil Resistance	.35 to 0.41 ohms	.36 to 0.44 ohms
Lighting Coil AC Output	12 to 15 volts	12 to 15 volts
Lighting Coil DC Amperage Output	4 to 6 amp.	4 to 6 amp.
Starter Motor:		
Armature End Play	0.005 to 0.015 inch	0.005 to 0.015 inch

SPECIFICATIONS—Continued
1973 Snowmobiles

Model	Serial No.	Ignition	Engines
400	11,001-20,000	Kokusan	CCW 340/4 Piston-Ported
500	11,001-20,000	Denso	CCW 440/4 Piston-Ported
600	2,551-20,000	Denso	CCW 440/4 Piston-Ported
JDX4	2,551-20,000	Robert Bosch	K295-2AX Piston-Ported
JDX8	2,551-20,000	Denso	CCW 440/21 Reed Valve

Item	Kokusan Ignition	Denso Ignition	Robert Bosch Ignition
Spark Plug Gap	0.020 inch	0.020 inch	0.020 inch
Breaker Point Gap	0.014 inch ± 0.002	0.014 inch ± 0.002	0.016 inch ± 0.002
Timing Dimension (BTDC)	0.023 inch ± 0.005	0.023 inch ± 0.005	0.090 inch ± 0.005
Ignition Coils:			
Operating Amperage	0.5 amp.	1.3 amp.	0.6 amp.
Secondary Resistance	5.2 ohms ± 10%	8.35 K ohms ± 15%	7300 to 8500 ohms
Primary Resistance	1.65 ohms ± 10%	.37 ohms ± 10%	1.8 to 2.0 ohms
Ignition Generating Coil			
Resistance	1.19 ohms ± 10%	1.10 ohms ± 10%	1.9 to 2.8 ohms
Condenser Capacity	.18 microfarad ± 10%	.25 microfarad ± 10%	.26 to .30 microfarad
Lighting Coil Resistance	.35 to .41 ohms	.36 to .44 ohms	.4 to .6 ohms
Lighting Coil AC Output	12 to 15 volts	12 to 15 volts	12 to 15 bolts
Lighting Coil DC Amperage Output	4 to 6 amp.	4 to 6 amp.	4 to 6 amp.
Starter Motor:			
Armature End Play	0.005 to 0.015 inch	0.005 to 0.015 inch	0.005 to 0.015 inch

1974 Snowmobiles

Model	Serial No.	Ignition	Engine
300	20,001-30,000	Robert Bosch	K295-2AX Piston-Ported
400	20,001-30,000	Kokusan	CCW 340/5 Piston-Ported
500	20,001-30,000	Kokusan	CCW 440/5 Piston-Ported
600	20,001-30,000	Kokusan	CCW 440/5 Piston-Ported
JDX4 Special	20,001-30,000	Kokusan	CCW 340/5 Piston-Ported
JDX6	20,001-30,000	Denso	CCW 400/22 Reed Valve
JDX8	20,001-30,000	Denso	CCW 440/22 Reed Valve

Item	Kokusan Ignition	Denso Ignition	Robert Bosch Ignition
Spark Plug Gap	0.020 inch (0.508 mm)	0.020 inch (0.508 mm)	0.020 inch (0.508 mm)
Breaker Point Gap	0.014 inch ± 0.002 (0.356 mm ± 0.050)	0.014 inch ± 0.002 (0.356 mm ± 0.050)	0.016 inch ± 0.002 (0.406 mm ± 0.050)
Timing Dimension (BTDC)	0.015 inch ± 0.003 (0.381 mm ± 0.076)	0.009 inch ± 0.003 (0.228 mm ± 0.076)	0.090 inch ± 0.005 (2.286 mm ± 0.127)
Ignition Coils:			
Operating Amperage	1.3 amp.	1.3 amp.	0.6 amp.
Secondary Resistance	5.2 K ohms ± 10%	8.35 K ohms ± 15%	7300 to 8500 ohms
Primary Resistance	1.65 ohms ± 10%	.37 ohms ± 10%	1.8 to 2.0 ohms
Ignition Generating Coil			
Resistance	1.59 ohms ± 10%	1.3 to 1.4 ohms	1.9 to 2.8 ohms
Condenser Capacity	.18 microfarad ± 0.02	0.3 microfarad ± 10%	.26 to .30 microfarad
Lighting Coil Resistance	.22 ohms ± 10%	.19 ohms ± 10%	.4 to .6 ohms
Lighting Coil AC Output	12 to 15 volts	12 to 15 volts	12 to 15 volts
Lighting Coil DC Amperage Output	2 to 4 amp.	2 to 4 amp.	4 to 6 amp.
Starter Motor:			
Armature End Play	0.005 to 0.015 inch (0.127 to 0.381 mm)	0.005 to 0.015 inch (0.127 to 0.381 mm)	0.005 to 0.015 inch (0.127 to 0.381 mm)

TORQUE FOR HARDWARE

Item	Torque
Starter Thru Bolts	70 in-lbs

1975 SNOWMOBILES

Model	Serial No.	Ignition	Engine
300	30,001-	Robert Bosch	K295-2AXY Piston-Ported
400	30,001-	Kokusan	KEC 340/5 Piston-Ported
600	30,001-	Kokusan	KEC 440/5 Piston-Ported
800	30,001-	Denso	KEC 440/22 Reed Valve
JDX4	30,001-	Kokusan	KEC 340/22A Reed Valve
JDX6	30,001-	Denso	KEC 400/22 Reed Valve
JDX8	30,001-	Denso	KEC 440/22A Reed Valve

Item	Kokusan Ignition	Denso Ignition	Robert Bosch Ignition
Spark Plug Gap	0.020-inch (0.508 mm)	0.020 inch (0.508 mm)	0.020 inch (0.508 mm)
Breaker Point Gap	0.014 inch ± 0.002 (0.356 mm ± 0.050)	0.014 inch ± 0.002 (0.356 mm ± 0.050)	0.016 inch ± 0.002 (0.406 mm ± 0.050
Timing Dimension (BTDC)	0.015 inch ± 0.003 (0.381 mm ± 0.076)	0.009 inch ± 0.003 (0.228 mm ± 0.076)	0.090 inch ± 0.005 (2.286 mm ± 0.127)
Ignition Coils:			
Operating Amperage	1.3 amp	1.3 amp	0.6 amp
Secondary Resistance	5.2 K ohms ± 10%	8.35 K ohms ± 15%	7300 to 8500 ohms
Primary Resistance	1.65 ohms ± 10%	.37 ohms ± 10%	1.8 to 2.0 ohms
Ignition Generating Coil			
Resistance	1.59 ohms ± 10%	1.3 to 1.4 ohms	1.9 to 2.8 ohms
Condenser Capacity	.18 microfarad ± 0.02	0.3 microfarad ± 10%	.26 to .30 microfarad
Lighting Coil Resistance	.22 ohms ± 10%	.19 ohms ± 10%	.4 to .6 ohms
Lighting Coil AC Output	12 to 15 volts	12 to 15 volts	12 to 15 volts
Lighting Coil DC			
Amperage Output	2 to 4 amp.	2 to 4 amp.	4 to 6 amp.
Starter Motor:			
Armature End Play	0.005 to 0.015 inch (0.127 to 0.381 mm)	0.005 to 0.015 inch (0.127 to 0.381 mm)	0.005 to 0.015 inch (0.127 to 0.381 mm)

LIGHT BULB CHART

1972 Snowmobiles

Location	Size	Number
Headlight	12-Volt, 60 Watt	AM52194
Brake-Taillight	12 Volt	AM52202
Speedometer Light	12-Volt	AT22970
Tachometer Light	12-Volt	AM52847 or AM31284

1973 Snowmobiles

Location	Size	Part Number
Headlight	12-Volt, 60 Watt	AM52309
Brake-Taillight	12-Volt	AM52619
Speedometer Light	12-Volt	AM52847
Tachometer Light	12-Volt	AM52847

1974 and 1975 Snowmobiles

Location	Size	Part Number
Headlight	12-Volt, 60 Watt	AM52956
Brake-Taillight	12-Volt	AM52916
Speedometer Light	12-Volt	AM52847
Tachometer Light	12-Volt	AM52847

SPARK PLUG CHART

See Page 40-10-2 for Spark Plug Recommendations.

TORQUE FOR HARDWARE

Item	Torque
Starter Thru Bolts	70 in-lbs (7.90 Nm)

Litho in U.S.A.

Section 50
POWER TRAIN
Group 5
GENERAL INFORMATION

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PRINCIPLE OF OPERATION

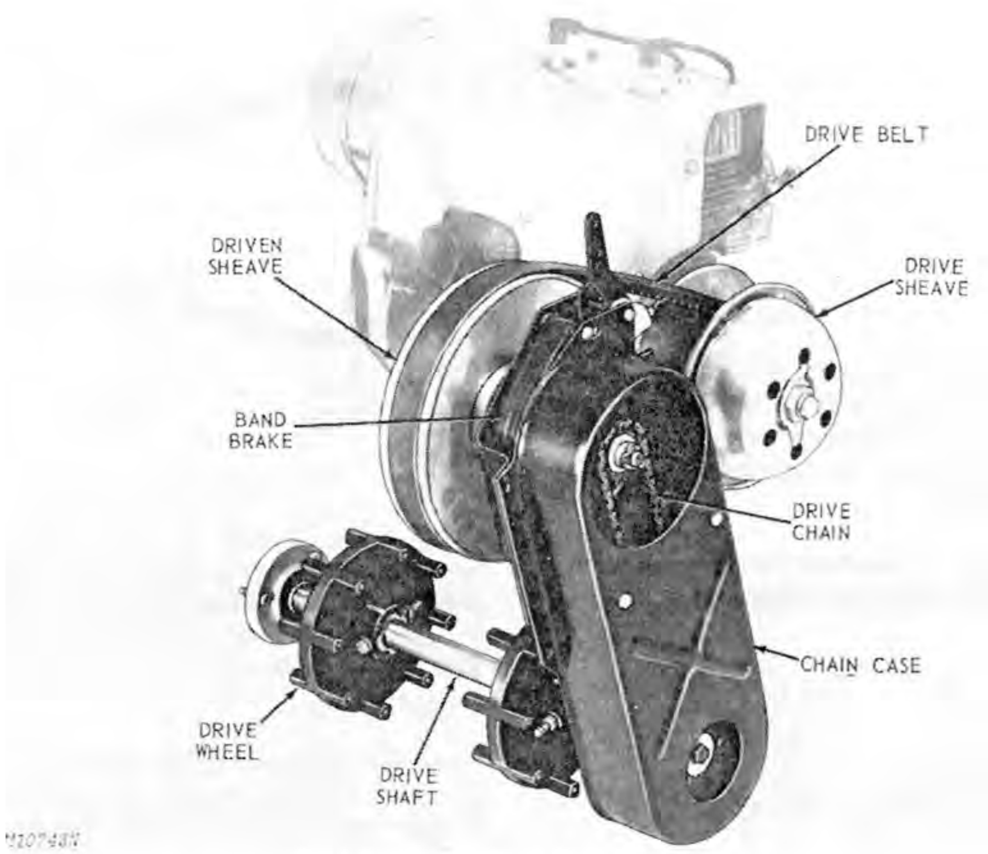


Fig. 1-Snowmobile Power Train Components

The power train consists of a drive sheave, drive belt, driven sheave, band brake, secondary shaft, chain case with sprockets and drive chain, and a drive shaft, Fig. 1.

Drive Sheave

The drive sheave is mounted on the engine crankshaft and functions as a centrifugally-operated clutch and variator.

When stopped or at idle speeds (3000 rpm and lower), the sides of the sheave do not contact the drive belt, thus providing a de-clutched condition, Fig. 2.

As engine speed is increased, the centrifugally-actuated roller weights of the Salsbury 780 and 910 drive sheaves follow the contour of the bowl-shaped ramp plate and force the sheave halves together. This engages the drive belt with the sheave, Fig. 2, and starts the snowmobile moving.

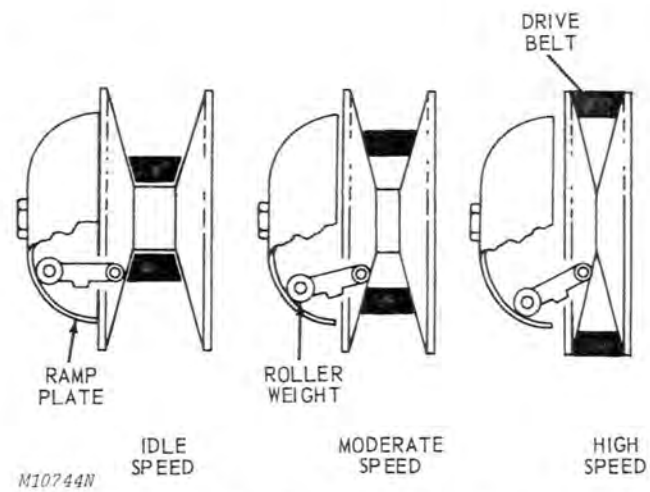


Fig. 2-Salsbury 780 and 910 Drive Sheave Operation

When engine reaches top rpm, the sheave halves are as close together as possible. Notice how the drive belt continues to ride out as speed increases and the sheave halves come together, Fig. 2. This action provides a smooth transition from slow to fast snowmobile travel speed as engine speed increases.

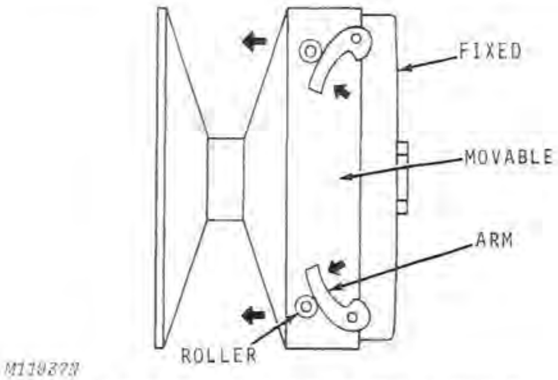


Fig. 3-Salsbury 850 Drive Sheave Operation

As the speed of the Salsbury 850 drive sheave, Fig. 3, increases, centrifugal force causes the arms to swing out against the rollers on the movable half of the sheave. This forces the sheave halves together, engaging the belt.

A further increase in speed will bring the belt to the outer circumference, providing maximum speed.

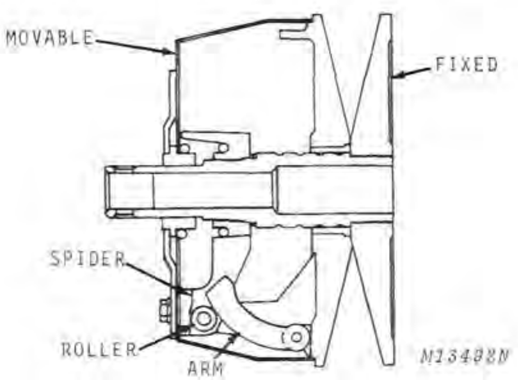


Fig. 4-John Deere (Comet) 100C Drive Sheave Operation

As the speed of the John Deere (Comet) 100C drive sheave, Fig. 4, increases, centrifugal force causes the arms in the movable face to swing out against the rollers of the spider on the fixed face. This forces the sheave halves together, engaging the belt.

A further increase in speed brings the belt to the outer circumference, providing maximum speed.

Driven Sheave

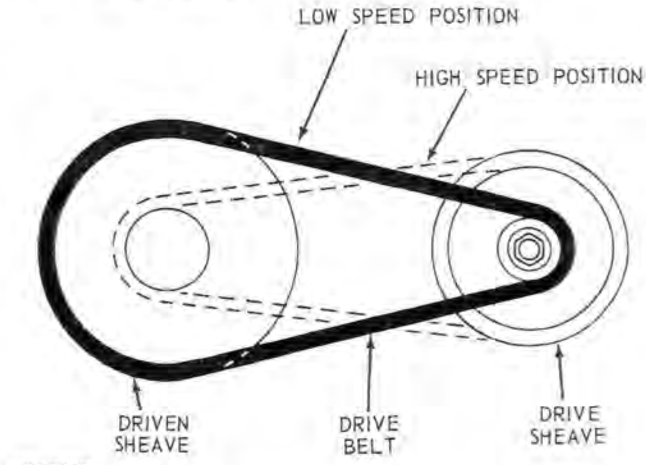


Fig. 5-Driven Sheave Operation

The driven sheave is spring-loaded in the slow speed position. As the speed of the drive sheave increases and the drive belt rides out on the drive sheave, the driven sheave opens against spring tension, allowing the belt to ride deeper in the driven sheave, Fig. 5.

The driven sheave works with the drive sheave to provide a smooth transition from a low speed ratio to a high speed ratio as engine speed increases.

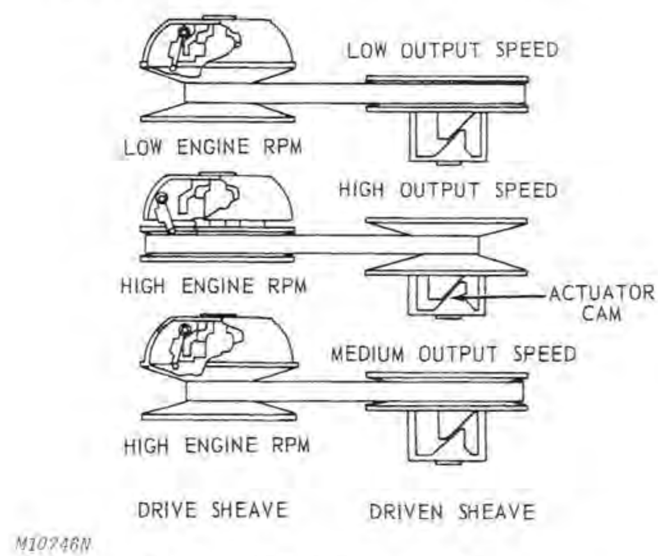


Fig. 6-Torque Sensitive Driven Sheave

The driven sheave does more than act as a take-up for the action of the drive sheave. The driven sheave is also "torque-sensitive".

Note how the driven sheave rides on the cam actuator as it opens to obtain high speed position, Fig. 6.

Normal rotational force on this cam actuator works to keep the driven sheave in the low speed position.

If an increased load or high torque requirement occurs (such as climbing a steep hill) after the snowmobile is up to speed, the cam actuator in the driven sheave forces the sheave halves together, thus obtaining a slower travel speed while maintaining high engine rpm for increased torque, Fig. 6.

In Fig. 6, the top and bottom drawings have the same drive belt position. However, increased speed of the engine in the lower drawing, causes a difference in the output speed of the driven sheave.

The drive and driven sheaves are matched to the engine and to each other to provide smooth clutching, speed, and torque-sensitive operation.

Chain Case and Drive Chain

The fully-enclosed steel chain case houses an ASA double-strand chain, two sprockets, and two spring loaded tension blocks. The chain and sprockets are oil-bath lubricated.

The spring-loaded tension blocks maintain proper chain tension when both accelerating and decelerating. No chain tension adjustment is necessary.

Brake

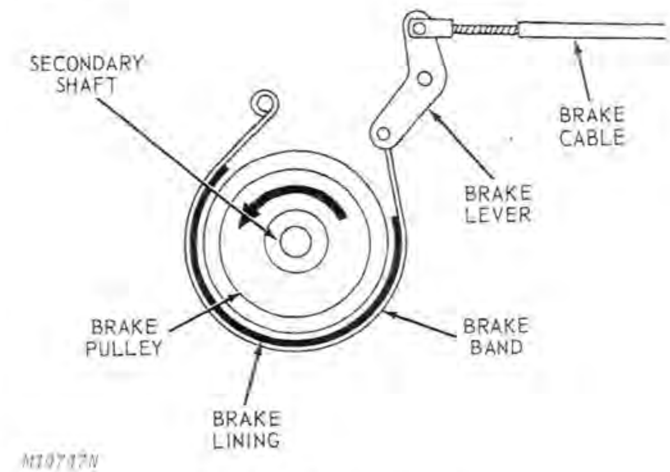


Fig. 7-Band Brake Operation

The band brake operates on a steel pulley on the secondary shaft, Fig. 7, and is actuated by the brake cable. The brake is self-energizing. When the brake is applied, the rotation of the pulley tends to wrap the brake band around it, thus providing smooth, positive braking.

HIGH TORQUE-HIGH ALTITUDE KITS

Machine Identification			Additional Modifications For High Altitudes	
Model	Serial No.	Torque Kit	Roller Arm Kit	35° Torque Cam
400, 500	(2,551-11,000)	AM52270	None	None
400	(11,001-20,000)	AM52270	AM52632	M64213
500	(11,001-20,000)	AM52270	AM52874	None
500 - With Conversion	(11,001-20,000)	AM52270	AM53003	None
JDX4	(2,551-20,000)	AM53097	AM52724	M64213
JDX8	(2,551-20,000)	AM52605	AM52874	None
JDX8 - With Conversion	(2,551-20,000)	AM52605	None	None
600	(2,551-20,000)	AM52270	AM52874	None
600 - With Conversion	(2,551-20,000)	AM52270	AM53003	None
300	(20,001-22,626)	AM53097	AM52724	M64213
JDX4 Special, 400, 500, 600	(20,001-30,000)	AM52270	AM53003	None
JDX6, JDX8	(20,001-30,000)	AM52605	None	None
300	(30,001-)	AM53097	AM52724	M64213
400, 600, JDX4	(30,001-)	AM52270	AM53003	None
800, JDX6, JDX8	(30,001-)	AM52605	None	None

General Information

NOTE: 300 Snowmobiles beginning with Serial No. 22,626 have the AM52270 High-Torque kit installed as standard equipment at the factory.

For every 1000 feet above sea level a 3 percent power loss occurs in 2-cycle engines.

To obtain and maintain proper engine speed of 6500 to 7000 rpm at altitudes above 5000 feet:

1. Install high torque kit.
2. Adjust carburetor.
3. Modify drive or driven sheave as necessary.

See the chart above for high torque kits and modifications. Refer to Section 30, Groups 10, 12 and 13 for carburetor adjustments.

NOTE: DO NOT adjust or modify sheaves to provide engine speeds in excess of 7000 rpm.

High Torque Application

High torque kits are available for all machines. The correct kit should be installed if the customer uses his snowmobile for pulling heavy loads, riding double frequently, or for adverse trail or mountain riding.

High Altitude Applications

Installation of the high-torque kit only, often provides satisfactory operation at altitudes above 5000 feet. However, if the machine does not maintain engine top speed of 6500 to 7000 rpm, further modification will be necessary. This can be accomplished by adding the roller arm kit and 35 degree torque cam as indicated in the chart above.

DIAGNOSING MALFUNCTIONS

Salsbury 780 and 910 Drive Sheaves

Sheave Clutching at Too Low rpm

Roller weight springs weak or broken.

Roller weight springs incorrect.

Sheave Clutching at Too High rpm

Roller weight springs incorrect.

Roller weights sticking or binding.

Nylon spline liners worn excessively causing binding.

Ramp plate bent or damaged.

Roller weights and springs not replaced as a complete set causing unbalanced action and binding.

Salsbury 850 and John Deere (Comet) 100C Drive Sheaves

Sheave Clutching at Too Low rpm

Spring weak or broken.

Incorrect roller arm (weights) being used.

Sheave Clutching at Too High rpm

Wrong spring.

Drive sheave dirty internally.

Worn spider buttons.

Clutch Sticking

Mold release from belt builds up on center post and movable face can not slide properly.

Erratic Shifting

Oil or grease on drive or driven sheaves.

All Clutches

Drive Belt Not Operating Smoothly in Drive Sheave

Sheave faces rough grooved, pitted or scored.

Drive belt defective.

Driven Sheave

Driven Sheave Not Opening Properly

Nylon ramp buttons worn.

Ramp on movable face damaged.

Movable sheave half binding on fixed half.

Incorrect spring installed.

Spring pretensioned improperly.

Driven Sheave Opening Too Easily

Spring weak or broken.

Spring pretensioned improperly.

Drive Belt

Uneven Belt Wear

Sheaves misaligned.

Engine mounts loose.

Drive Belt Glazed

Excessive slippage.

Oil on sheave surfaces.

Belt Worn Narrow in One Section

Excessive slippage caused by stuck track.

Belt Too Tight at Idle Speed

Engine idle set too fast.

Incorrect distance between sheaves.

Incorrect belt length.

Belt Edge Cord Breakage

Sheaves misaligned.

Brake

Brake Not Holding Properly

Brake cable out of adjustment.

Brake lining worn.

Brake lining oil-saturated.

Key sheared on brake pulley.

Brake Not Releasing Properly

Return spring weak or broken.

Brake lever bent or damaged causing binding.

Chain Case Assembly

Chain Case Leaking

Gaskets on drive shaft bearing flangettes or secondary shaft bearing flangettes damaged.

O-ring on drive shaft or secondary shaft bearings damaged.

Welds on case seam cracked or broken.

Rapid Chain and Sprocket Wear

Insufficient oil in chain case.

Sprockets out of alignment due to improper assembly.

Chain tension block springs broken.

Group 10
SALSBURY 780 AND 910 DRIVE SHEAVES

GENERAL INFORMATION

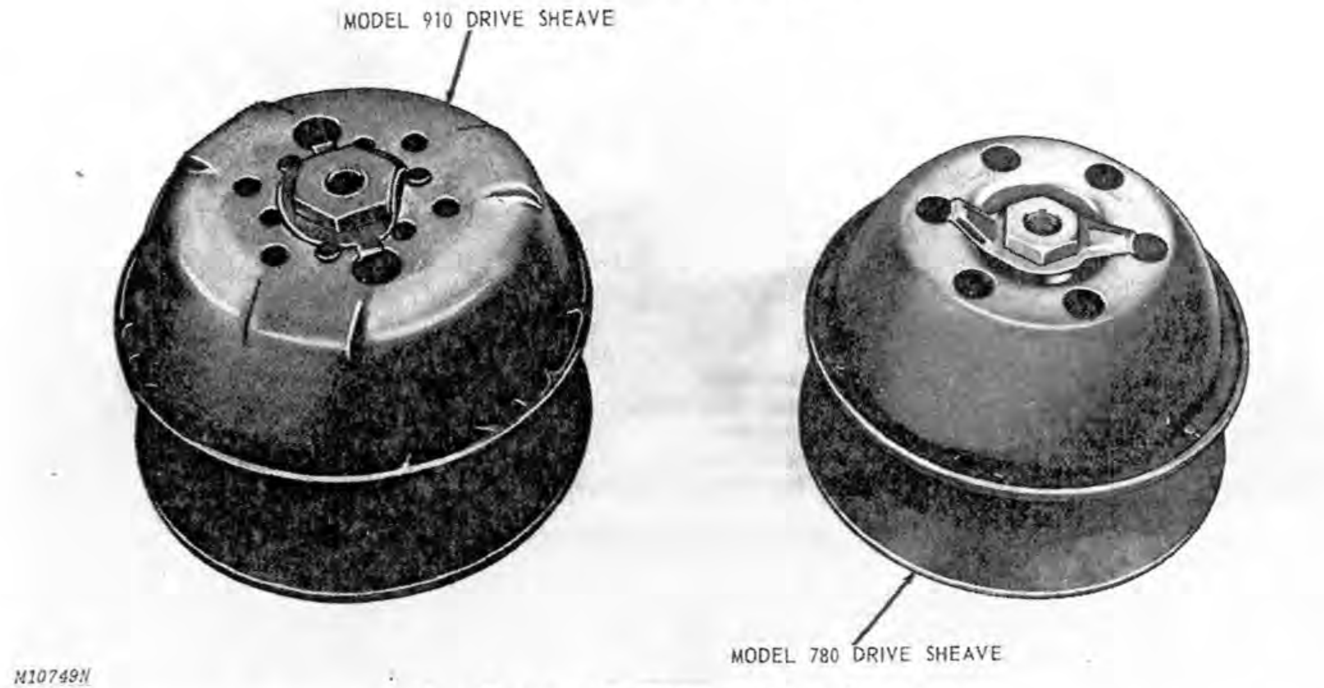


Fig. 1-Salsbury Model 780 and 910 Drive Sheaves

The Model 780 Torque-Converter Drive Sheave, Fig. 1, is used on the 300 Snowmobile (Serial No. 20,001-) and JDX4 and 400 Snowmobiles (Serial No. -20,000)—yet differs on these machines.

NOTE: The difference is the roller arm assemblies and bore size of the sheaves. The bore size is smaller on the 300 and JDX4 (1.159 to 1.163-inch) than on the 400 (1.180 to 1.184-inch). To differentiate between them, the roller arm assemblies on the 400 are painted YELLOW; on the 300 and JDX4, PURPLE.

The Model 910 Torque-Converter Drive Sheave is used on the 500 Snowmobile (Serial No. -11,000).

The service procedure is exactly the same for each of these clutches. Be sure the correct parts are used for the particular clutch being serviced.

IMPORTANT: Never operate the engine with the drive belt removed. The engine could overspeed and cause possible engine and drive sheave failure.

CAUTION: To check drive sheave operation, block up the snowmobile securely so track can be run at operating speeds without danger.

The centrifugally-operated drive sheave is both a clutch and variator. See Group 5 of this section for "Principle of Operation".

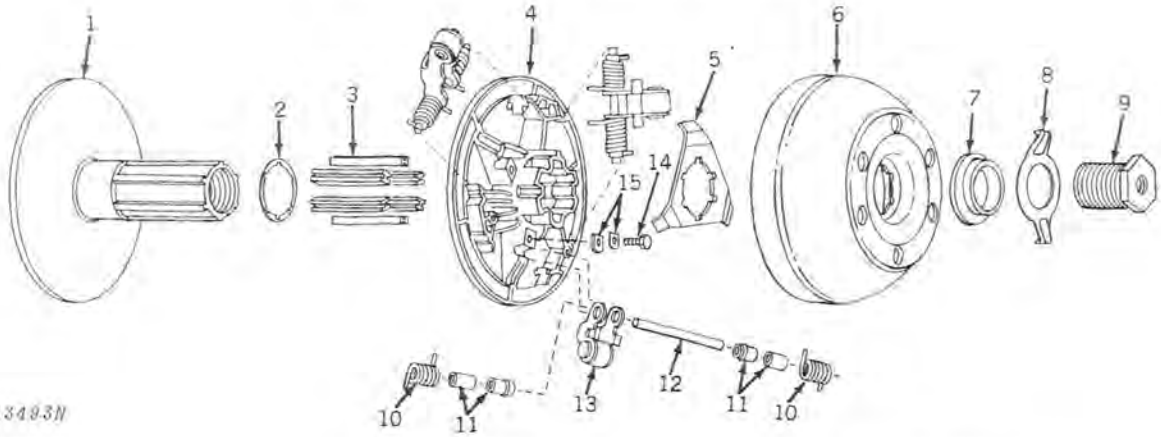
The drive sheave is "matched" to the driven sheave and to the engine to provide smooth operation. It is important to use the proper sheaves or sheave components for repair.

IMPORTANT: Do not use the 780 or 910 drive sheaves on any other snowmobile models because they are each "matched" to the engine and driven sheaves in the 300, 400, JDX4 and 500.

The springs within the drive sheave are "sized" to provide belt engagement at approximately 3500 rpm.

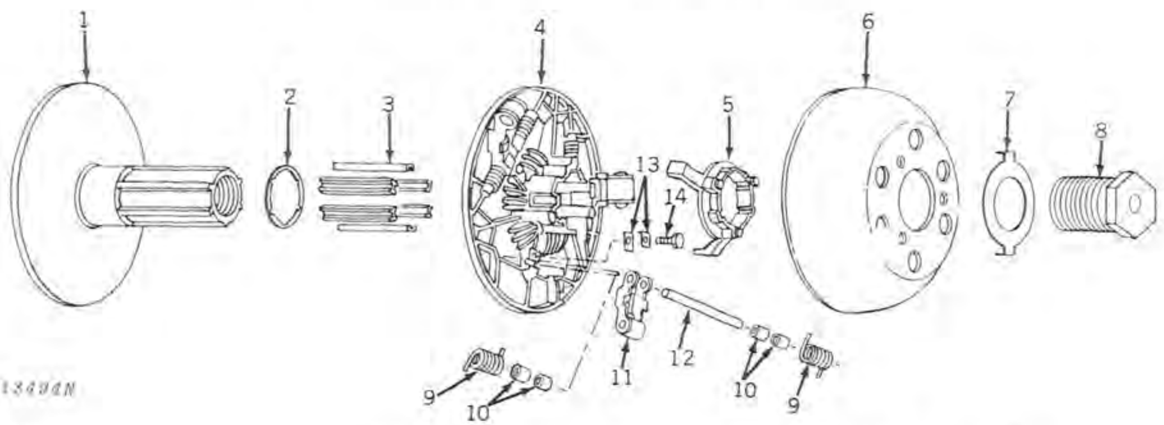
Group 5 of this section contains "Diagnosing Malfunctions" to help correct problems associated with the drive sheave.

DISASSEMBLY AND REPAIR



1—Fixed Face
2—Idler Bearing Washer
3—Spline Liner
4—Movable Face
5—Retractor
6—Ramp Plate
7—Ramp Plate Washer
8—Lock Plate
9—Ramp Plate Nut
10—Roller Arm Spring (6 used)
11—Bushing (12 used)
12—Pin (3 used)
13—Roller Arm (3 used)
14—Cap Screw (3 used)
15—Lock Plate

Fig. 2-Exploded View of Salsbury Model 780 Drive Sheave



1—Fixed Face
2—Idler Bearing Washer
3—Spline Liner (6 used)
4—Movable Face
5—Retractor
6—Ramp Plate
7—Lock Plate
8—Ramp Plate Nut
9—Roller Arm Spring (6 used)
10—Bushing (12 used)
11—Roller Arm (3 used)
12—Pin (3 used)
13—Lock Plate
14—Cap Screw (3 used)

Fig. 3-Exploded View of Salsbury Model 910 Drive Sheave

Removing Drive Sheave From Engine 400 and 500 Snowmobiles (Serial No. -11,000)

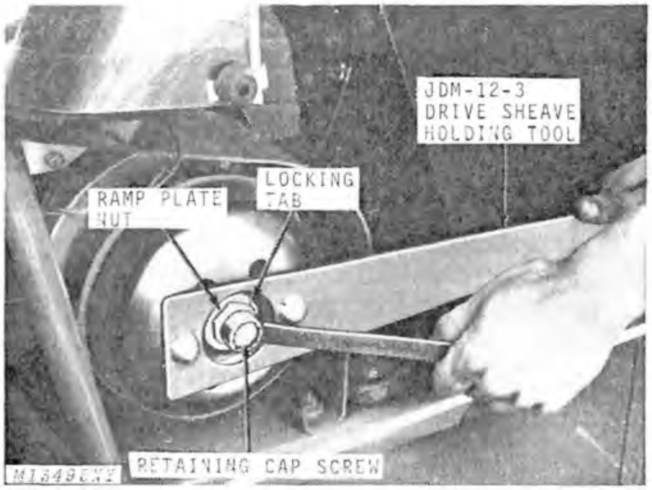


Fig. 4-Removing Sheave Retaining Cap Screw

Remove access panel from left-hand side of console. Remove drive belt.

Secure drive sheave with JDM-12-3 drive sheave holding tool, Fig. 4, and remove retaining cap screw.

Bend back locking tab on large ramp plate nut, Fig. 4, and remove nut. Use JDM-12-3 drive sheave holding tool to prevent turning.

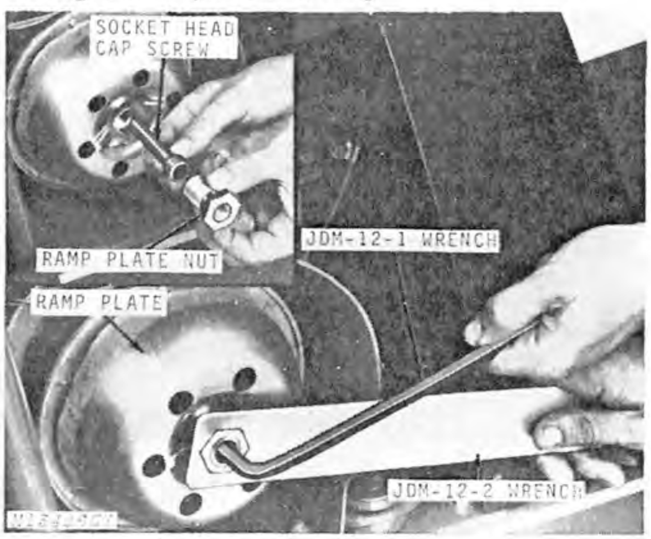


Fig. 5-Removing Drive Sheave

Thread JDM-12-1 socket-head cap screw into end of crankshaft and reinstall large ramp plate nut (inset, Fig. 5).

Hold JDM-12-1 socket-head cap screw with JDM-12-1 wrench and tighten large ramp plate nut with JDM-12-2 wrench until drive sheave is removed, Fig. 5.

Removing Drive Sheave From Engine

NOTE: This removal procedure applies to all Snowmobiles except the 400 and 500 (Serial No. -11,000).

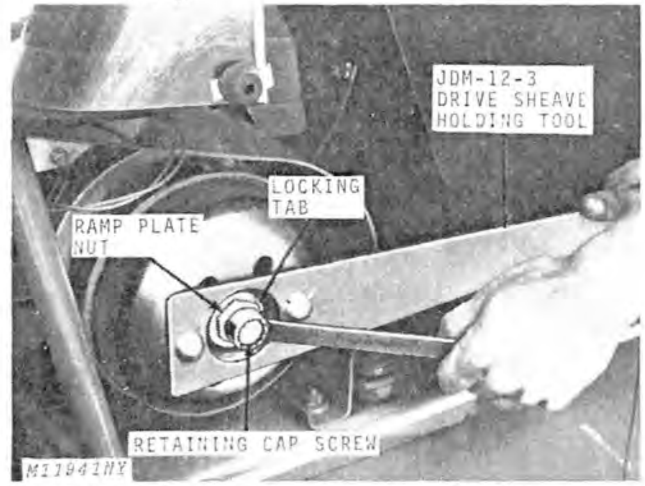


Fig. 6-Removing Sheave Retaining Cap Screw

Remove access panel from left-hand side of console. Remove drive belt.

Secure drive sheave with JDM-12-3, drive sheave holding tool, Fig. 6, and remove retaining cap screw.

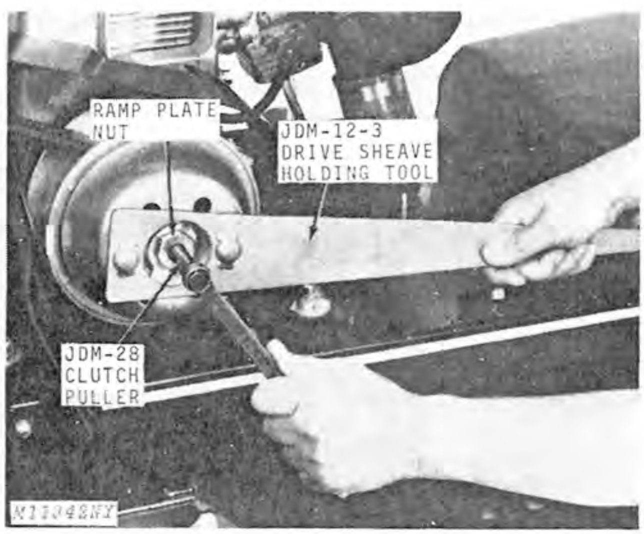


Fig. 7-Removing Drive Sheave

Use JDM-12-3 drive sheave holding tool, Fig. 7, to prevent drive sheave from turning and screw JDM-28 clutch puller into large ramp plate nut. Turn JDM-28 clutch puller in until drive sheave comes loose from the shaft.

Disassembling Drive Sheave

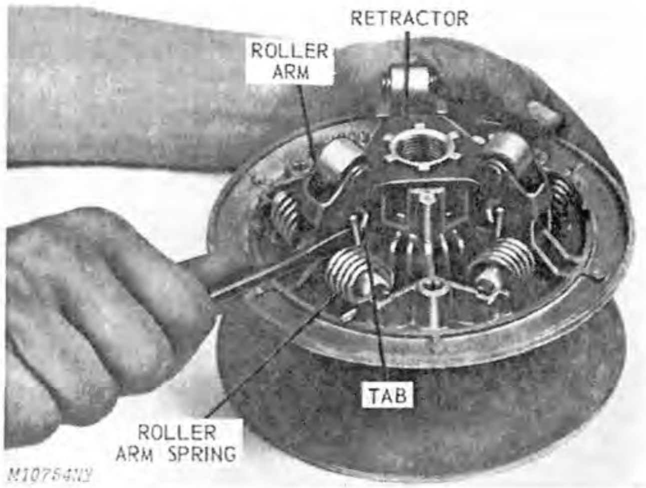


Fig. 8-Releasing Roller Arm Springs

Remove ramp plate nut, lock plate, ramp plate washer (Model 780 only) and ramp plate.

Release the six roller arm springs by prying springs off tabs on roller arms with a screw driver, Fig. 8.

Slide movable face of sheave sharply against retractor, Fig. 8, to remove retractor from hub.

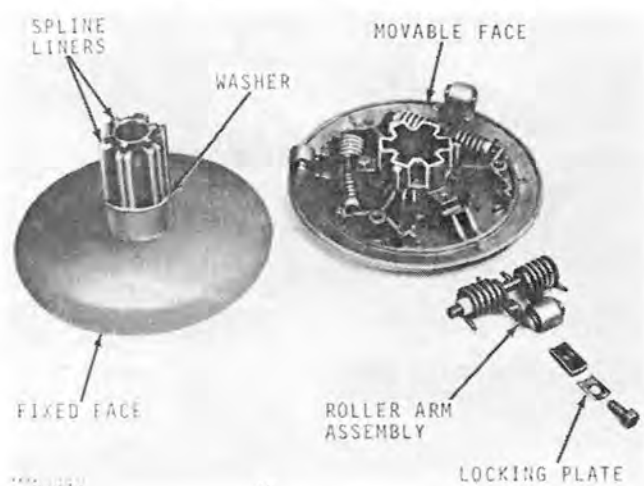


Fig. 9-Disassembling Drive Sheave

Remove movable face of sheave. Bend locking plates and remove the three cap screws securing roller arm assemblies, Fig. 9. Remove and disassemble.

Remove spline liners, from fixed face of sheave, Fig. 9.

INSPECTION

Clean all parts with cleaning solvent.

Inspecting Sheave Faces

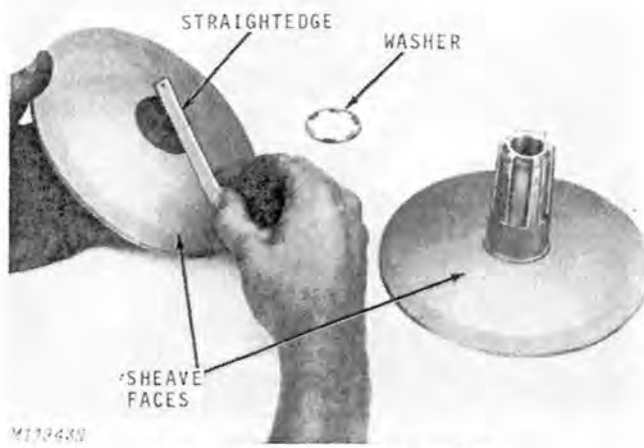


Fig. 10-Inspecting Sheave Faces

Check face of sheaves with a straightedge, Fig. 10, to determine amount of wear. Replace if badly worn, grooved, scored, or pitted.

Replace washer if worn or damaged, Fig. 10.

Inspecting Spline Liners

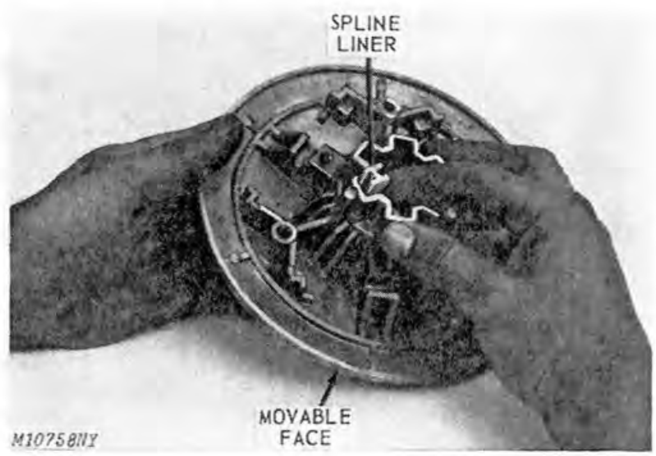


Fig. 11-Inspecting Spline Liners

Place spline liners in grooves of movable face to check clearance, Fig. 11. Replace liners, or both liners and movable face, as required to eliminate excessive clearance which could cause binding and improper operation.

Inspecting Roller Arm Assemblies

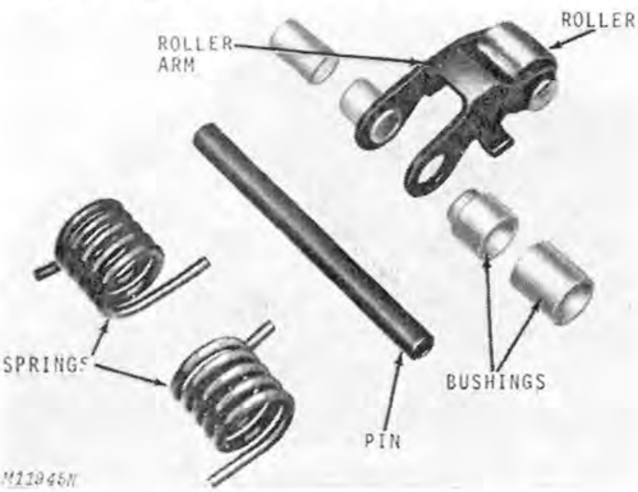


Fig. 12-Inspecting Springs, Roller Arms, and Pins

Inspect springs, Fig. 12, for wear, pits or cracks. Replace as a complete set if one or more is defective.

IMPORTANT: All springs must be replaced as a set to keep the spring tension balanced. An unbalanced condition will cause binding and improper operation.

Inspect pins and bushings, Fig. 12, for wear and replace as a set if worn or damaged.

Examine rollers on roller arms, Fig. 12, for security. Replace if loose or binding. Also inspect pivot surfaces of roller arms for excessive wear.

Replace roller arms as a complete set if found defective.

Inspect ramp plate and replace if badly worn or cracked.

ASSEMBLY

Assembling Fixed Sheave Half

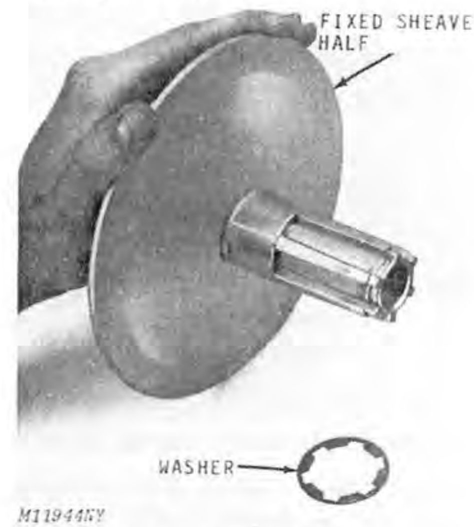


Fig. 13-Installing Washer

Install washer onto fixed half of sheave, Fig. 13.

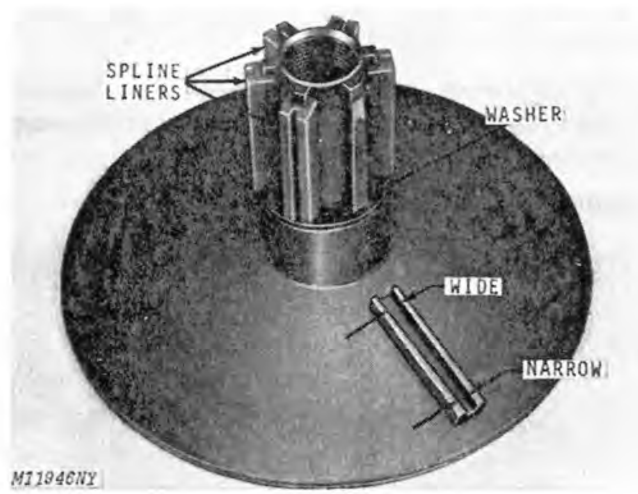


Fig. 14-Installing Spline Liners

Install spline liners, Fig. 14. Inner surfaces of liners are tapered, making it impossible to install them upside-down.

Assembling Movable Sheave Half

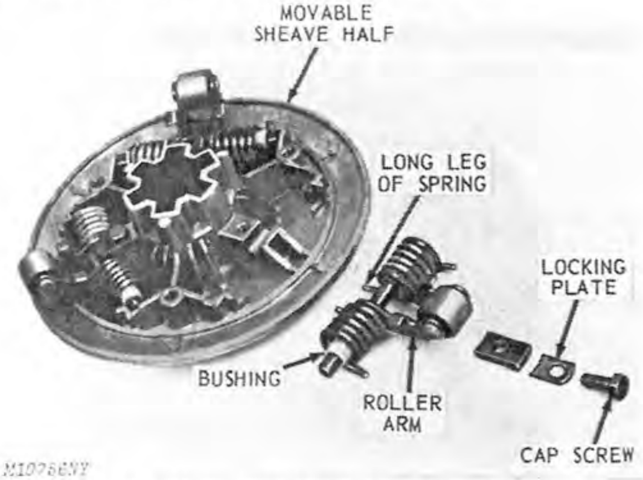


Fig. 15-Installing Roller Arm Assemblies

Install roller arms, bushings, and springs onto pins, Fig. 15. The long leg of springs, Fig. 15, must be installed next to roller arm. Springs are not interchangeable.

Install assemblies into place in movable sheave half and secure with locking plates and cap screws, Fig. 15.

Tighten three cap screws to 60 to 85 in-lbs. torque. Bend locking plate over one flat of cap screw head to secure, Fig. 16.

Installing Retractor

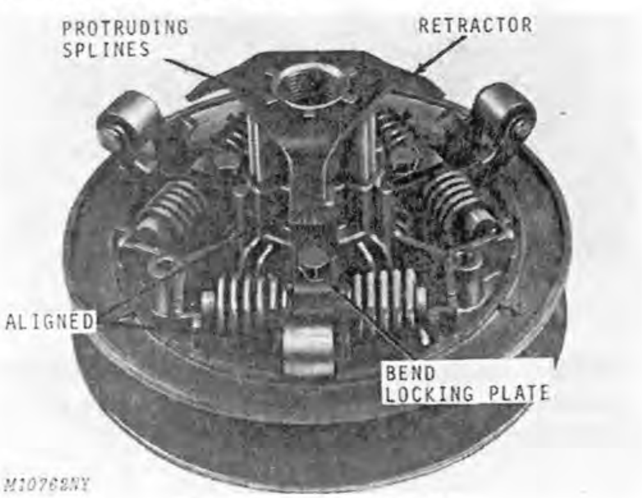


Fig. 16-Installing Retractor

Slide movable sheave half over splines of fixed sheave half, Fig. 16. Install retractor over splines until seated. The splines must protrude slightly above retractor, (on Model 780), Fig. 16, to engage ramp plate.

IMPORTANT: The three ramp arms on retractor must align with the three roller arm assemblies as shown, Fig. 16.

Engaging Roller Arm Springs

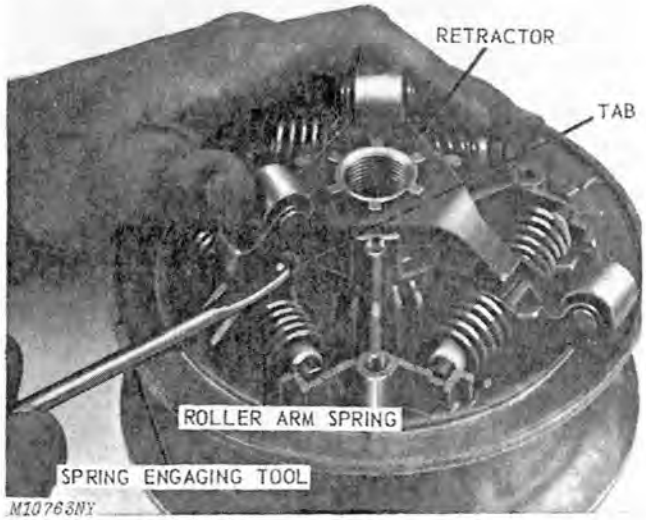


Fig. 17-Engaging Springs on Roller Arm

Slide movable sheave half up to retractor and swing roller arms inward, Fig. 17.

Using spring engaging tool, rotate long leg of spring, (next to roller arm) until engaged with tab on roller arm, Fig. 17. Repeat procedure for other five springs.

Installing Ramp Plate

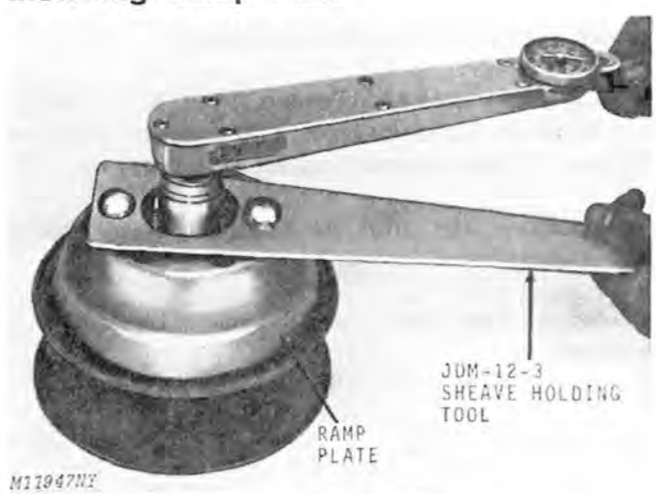


Fig. 18-Installing Ramp Plate

Install ramp plate, ramp plate washer, (Model 780 only), lock plate and ramp plate.

IMPORTANT: The three raised surfaces on the ramp plate (Model 910 only) must align with the three roller arms.

Using JDM-12-3 drive sheave holding tool, Fig. 18, torque retaining nut to 125 ft-lbs on Model 780 and 150 ft-lbs on Model 910. Lock ramp plate nut by bending locking plate over one flat of nut.

Installing Drive Sheave

Clean tapered bore in drive sheave and PTO end of crankshaft. Drive sheave must be assembled clean and dry.

Install drive sheave and secure with retaining cap screw and lock washer. Torque cap screw to 50 ft-lbs, using JDM-12-3 drive sheave holding tool to prevent rotation, Fig. 19.

IMPORTANT: Retaining cap screw must be SAE grade 5 or better (3 marks on head).

Install drive belt and access panel.

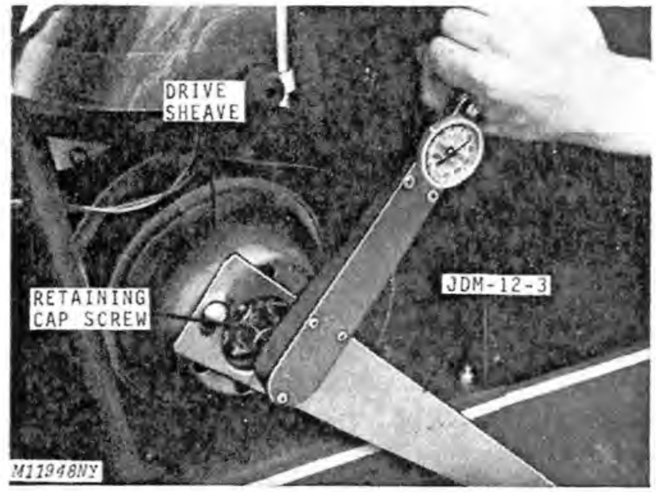


Fig. 19-Installing Drive Sheave

Group 15
SALSBURY 850 DRIVE SHEAVE

GENERAL INFORMATION

M11949NY

Fig. 1-Salsbury 850 Drive Sheave

The Salsbury model 850 Torque Converter Drive Sheave, Fig. 1, is used on the 500 Snowmobile (Serial No. 11,001-20,000) and 600 and JDX8 Snowmobiles (Serial No. -20,000).

IMPORTANT: Do not attempt to use this drive sheave on any other snowmobile. It is "matched" to the engines and driven sheaves on the 500, 600 and JDX8.

The centrifugally-operated drive sheave is both a clutch and variator. See Group 5 of this section for "Principle of Operation".

IMPORTANT: Never operate the engine with drive belt removed. The engine could overspeed and cause possible engine and drive sheave failure.

CAUTION: To check drive sheave operation, block up snowmobile securely so track can be run at operating speeds without danger.

The drive sheave is "matched" to the engine and driven sheave to provide smooth operation.

It is important to always use the proper sheaves or sheave components for repair.

The weights and ramps within the drive sheave are designed to provide belt engagement at approximately 3800 rpm.

Group 5 of this section contains "Diagnosing Malfunctions" to help correct problems associated with the drive sheave.

DISASSEMBLY AND REPAIR

Removing Drive Sheave from Engine

Remove access panel from left-hand side of console. Remove driven sheave belt guard and drive belt.

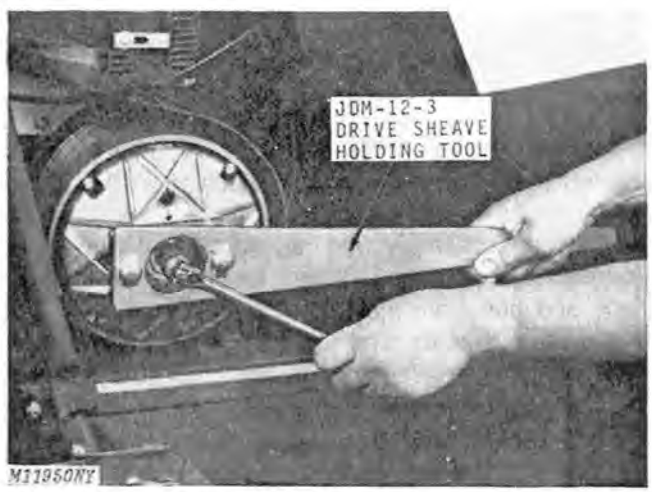
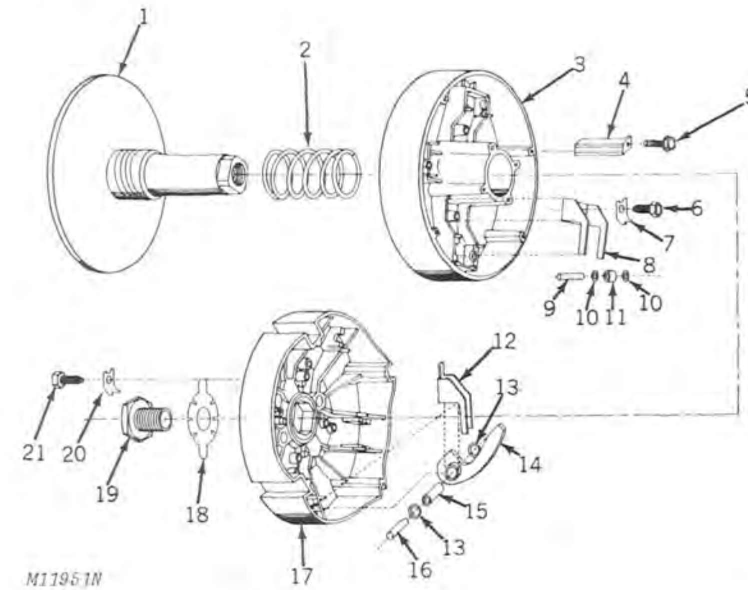


Fig. 2-Removing Retaining Cap Screw

Secure drive sheave with JDM-12-3 drive sheave holding tool and remove retaining cap screw, Fig. 2.

Use JDM-12-3 drive sheave holding tool to prevent drive sheave from turning and screw JDM-28 clutch puller into large special screw. Turn JDM-28 clutch puller in until drive sheave comes loose from the shaft.

Disassembling Drive Sheave



1—Fixed Face and Hub
2—Spring
3—Movable Face
4—Slide Bearing
5—Screw
6—Screw
7—Lock Plate
8—Roller Arm
9—Pin
10—Plastic Washer
11—Roller
12—Arm Clamp
13—Plastic Washer
14—Arm
15—Bearing
16—Pin
17—Housing
18—Lock Plate
19—Special Screw
20—Lock Plate
21—Screw

Fig. 3-Exploded View of Salsbury 850 Drive Sheave

Loosen special screw (19, Fig. 3) until there is clearance between screw and housing (17).

Hold the assembly and rap special screw with a hammer, Fig. 4. This will free tapered stem of fixed face and hub from movable face assembly (3). Remove special screw and lock plate (20). Lift housing (17) with arm assemblies (14) from movable face assembly (3).

Remove slide bearings (4) from movable face assembly.

Remove arm assemblies (14) from housing (17).

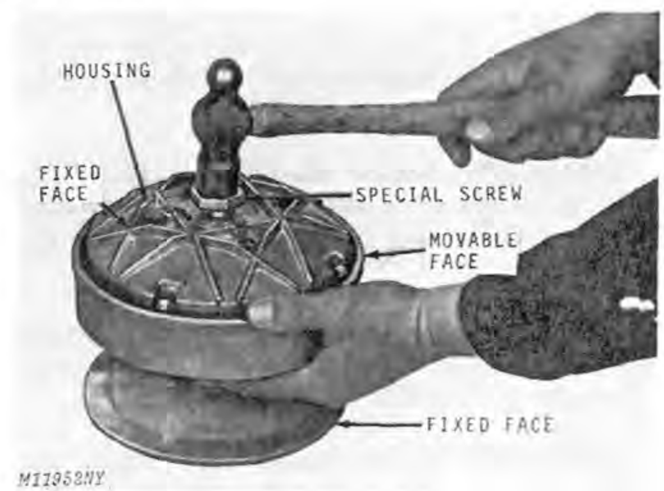


Fig. 4-Removing Fixed Face From Movable Face

INSPECTION

Clean all parts thoroughly in cleaning solvent.

Check face of sheaves to determine amount of wear. Replace if badly worn, grooved, pitted or scored.

Check guide wear in housing. An abrasive action sometimes takes place between bearing and housing causing guides in housing to wear.

Check slide bearings for cracks.

Check face of roller arms for wear.

Check for grooves in rollers. Rollers should also rotate freely.

Check for worn bearings in rollers which could cause rollers to be loose.

ASSEMBLY

Installing Arm Assemblies

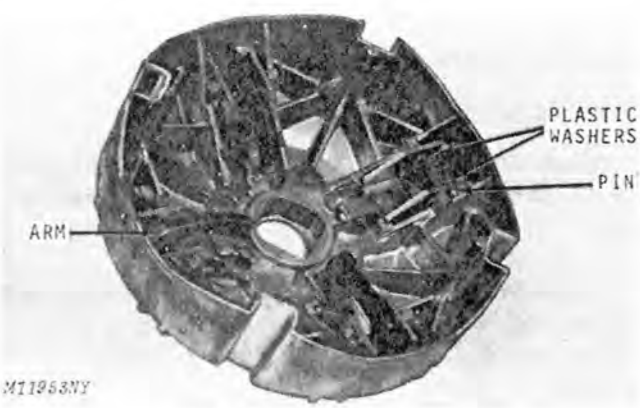


Fig. 5-Arm Assemblies

Install arm assemblies in housing, Fig. 5.

Installing Slide Bearings

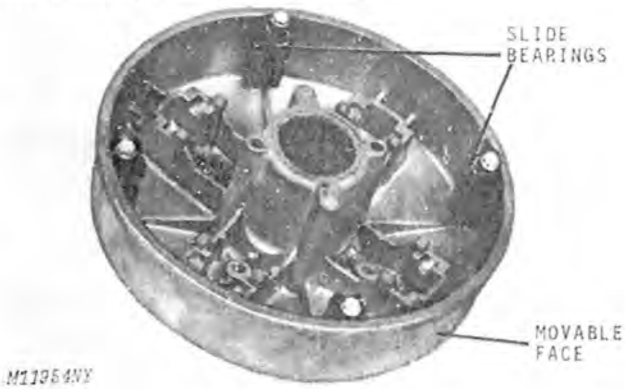


Fig. 6-Slide Bearings

Install slide bearings in movable face assembly and secure with screws, Fig. 6.

Installing Roller Assemblies

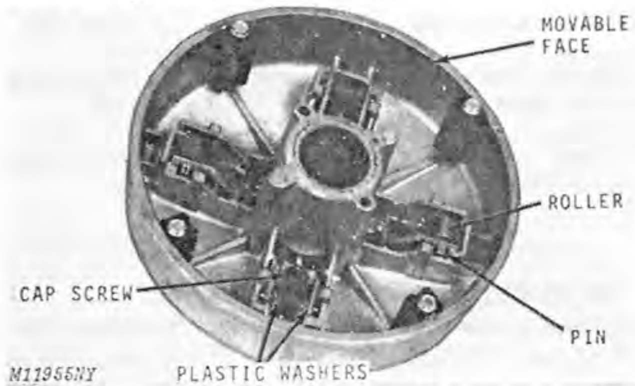


Fig. 7-Roller Assemblies

Install roller assemblies in movable face assembly and secure with locking plates and cap screws, Fig. 7.

Installing Movable Face

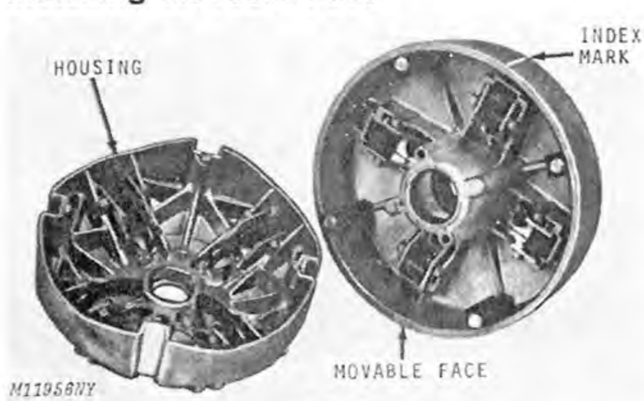
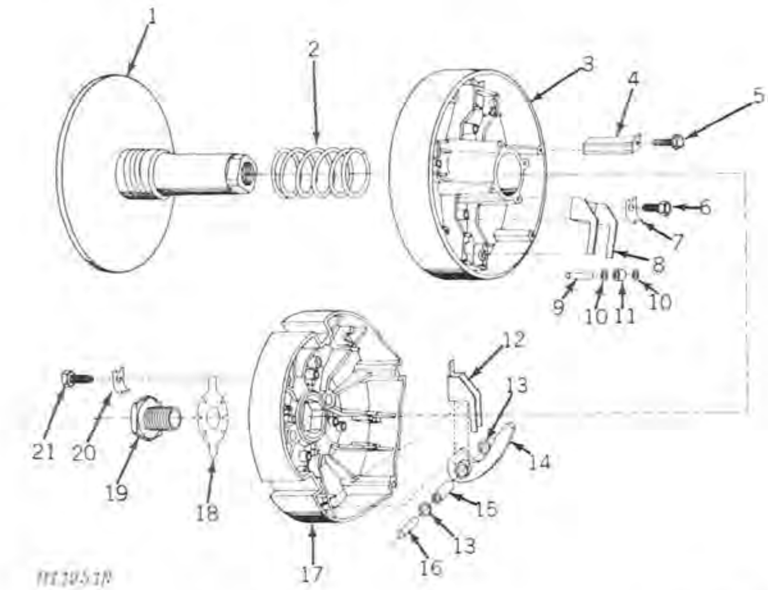


Fig. 8-Installing Movable Face Over Housing

Place housing with arms on workbench, Fig. 8 and install movable face over housing. Be sure to align index marks on face and housing.



1—Fixed Face and Hub
2—Spring
3—Movable Face
4—Slide Bearing
5—Screw
6—Screw
7—Lock Plate
8—Roller Arm
9—Pin
10—Plastic Washer
11—Roller
12—Arm Clamp
13—Plastic Washer
14—Arm
15—Bearing
16—Pin
17—Housing
18—Lock Plate
19—Special Screw
20—Lock Plate
21—Screw

Fig. 9-Exploded View of Salsbury 850 Drive Sheave

Install spring (2) on fixed face and hub (1, Fig. 9) and place assembled clutch over hub. Be sure to line up square on hub with square in housing. Press down to compress spring and install lock plate (18) and special screw (19). Use JDM-12-3 drive sheave holding tool to hold assembly and tighten special screw to 76 ± 8 ft-lbs torque. Bend lock plate up against flat of special screw to secure the screw.

Installing Drive Sheave

Clean drive sheave bore and PTO end of crankshaft. Drive sheave must be assembled, clean and dry.

Install drive sheave and secure with retaining cap screw and lockwasher. Tighten cap screw to 50 ft-lbs torque using JDM-12-3 drive sheave holding tool to prevent rotation.

IMPORTANT: Retaining cap screw must be SAE grade 5 or better (3 marks on head).

Install drive belt, driven sheave belt guard and access panel.

Group 17
JOHN DEERE (COMET) DRIVE SHEAVE

GENERAL INFORMATION

M13497NY

Fig. 1-John Deere (Comet) 100C Drive Sheave

The John Deere (Comet) 100C Drive Sheave, Fig. 1, is used on 400, 500, 600, JDX4 Special, JDX6 and JDX8 Snowmobiles, (Serial No. 20,001-30,000).

The John Deere (Comet) 101C Drive Sheave is used on the 400, 600, 800, JDX4, JDX6 and JDX8 Snowmobiles (Serial No. 30,001-).

The difference between the 100C and 101C Drive Sheaves is as follows: The 100C has a replaceable bronze bushing in the cover, a non-replaceable bronze bushing in the movable face and a steel hub on the fixed face; the 101C has a replaceable minlon bushing in the cover, a hardened steel insert in the movable face and replaceable bronze alloy bushing on the hub of the fixed face.

The 100C can be converted to a 101C by using the AM53476 Movable Sheave and Bushing Kit.

NOTE: The 101C drive sheave used on the JD295/S Snowmobile (Serial No. 20,001-30,000) was equipped with the minlon bushing in the cover, steel insert in the movable face and bronze alloy bushing on the hub of the fixed face.

NOTE: The 100C drive sheave was installed on many 1973 Model 500, 600, and JDX8 Snowmobiles as part of Modification Program 160.

IMPORTANT: Never operate the engine with the drive belt removed. The engine could overspeed and cause possible engine and drive sheave failure.

CAUTION: To check drive sheave operation, use a dynamometer or block up the snowmobile securely, so the track can be run at operating speeds without danger.

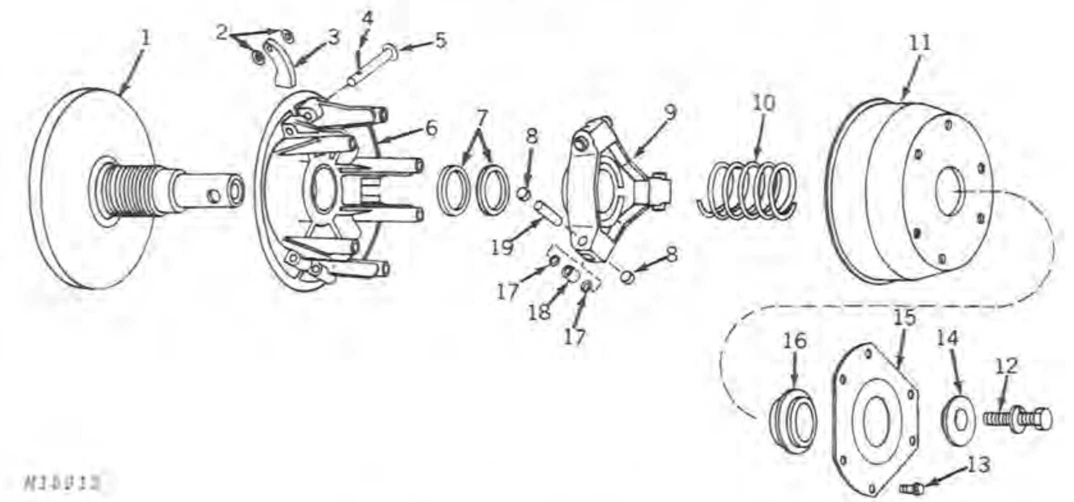
The drive sheave provides belt engagement at approximately 3800 rpm.

The centrifugally-operated drive sheave is both a clutch and variator. See Group 5 of this section for "Principle of Operation."

The drive sheave is "matched" to the driven sheave and to the engine to provide smooth operation. It is important to use the proper components for repair.

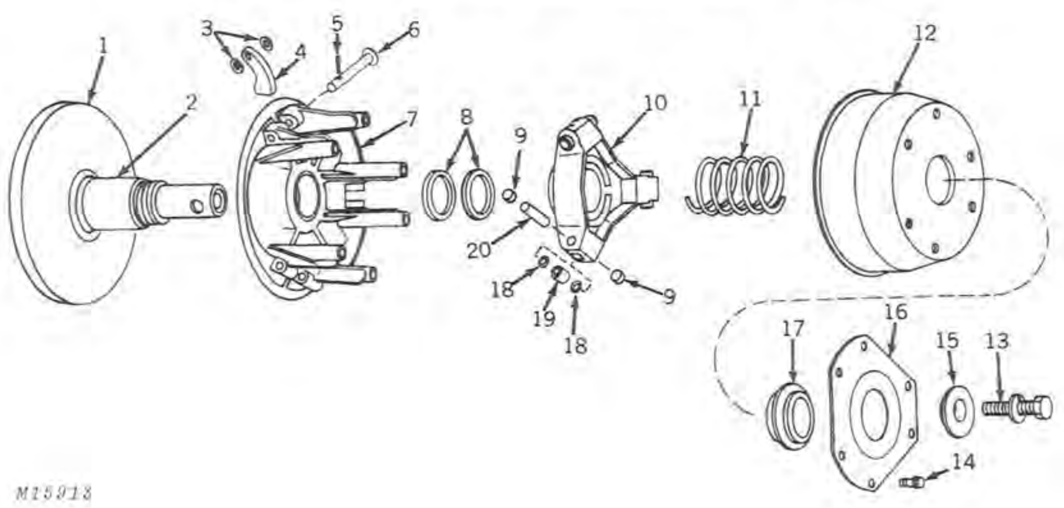
Group 5 of this section contains "Diagnosing Malfunctions" to help correct problems associated with the drive sheave.

DISASSEMBLY AND REPAIR



1—Fixed Face Sheave
2—Nylon Washers (6 used)
3—Roller Arm (3 used)
4—Spring Pin (3 used)
5—Pivot Pin (3 used)
6—Movable Face Sheave
7—Spacing Washer (2 used)
8—Button (6 used)
9—Spider
10—Spring
11—Cover
12—Retaining Cap Screw with Lock Washer
13—Cap Screw (6 used)
14—Pilot Washer
15—Cover Plate
16—Bronze Bushing
17—Nylon Washer (6 used)
18—Roller (3 used)
19—Pin (3 used)

Fig. 2-Exploded View of John Deere (Comet) 100C Drive Sheave



1—Fixed Face Sheave
2—Bronze Bushing
3—Nylon Washers (6 used)
4—Roller Arm (3 used)
5—Spring Pin (3 used)
6—Pivot Pin (3 used)
7—Movable Face Sheave
8—Spacing Washer (2 used)
9—Button (6 used)
10—Spider
11—Spring
12—Cover
13—Retaining Cap Screw with Lock Washer
14—Cap Screw (6 used)
15—Pilot Washer
16—Cover Plate
17—Minlon Bushing
18—Nylon Washers (6 used)
19—Roller (3 used)
20—Pin (3 used)

Fig. 3-Exploded View of John Deere (Comet) 101C Drive Sheave

Removing Drive Sheave From Engine

Remove left-hand access panel. Remove drive belt shield and drive belt.

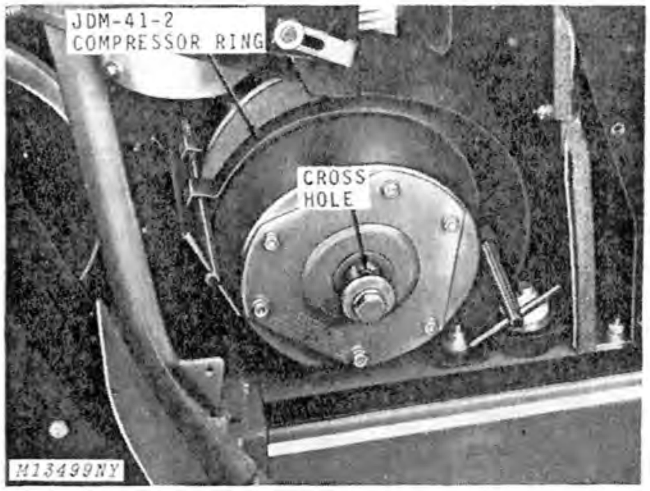


Fig. 4-Compressor Ring Installed

Use JDM-41-2 compressor ring to compress movable face to expose cross hole in hub, Fig. 4.

Fig. 5-JDM-41-4 Installed on Hub

Install JDM-41-4 two-piece nut around hub. Engage pins on nut in hub cross hole, Fig. 5.

Hold nut with JDM-12-2 tool and remove retaining cap screw, lock washer and pilot washer. Install JDM-41-1 puller bolt into hub, until drive sheave comes loose from the crankshaft, Fig. 6.

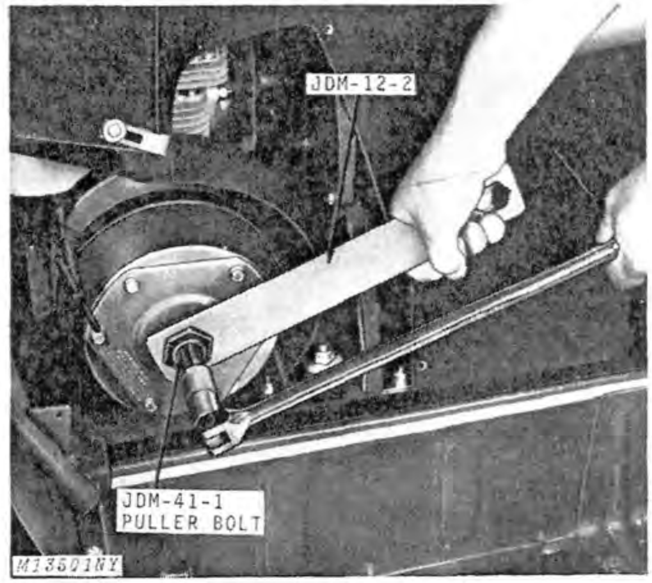


Fig. 6-Removing Drive Sheave

Disassembling Drive Sheave

Remove every other screw securing drive sheave cover to movable face. Remove the three remaining cap screws equally, a few turns at a time. This allows the cover to come off slowly and equally. Remove cover, cover plate and spring.

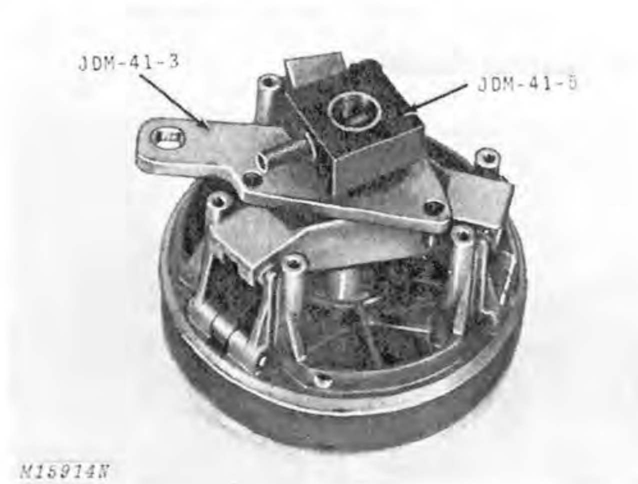


Fig. 7-JDM-41-3 Spider Tool Installed

Place JDM-41-3 spider tool over hub with spring pins on tool engaging spider, Fig. 7. Install JDM-41-5 hub lock tool over hub with pin of tool through cross hole in hub.

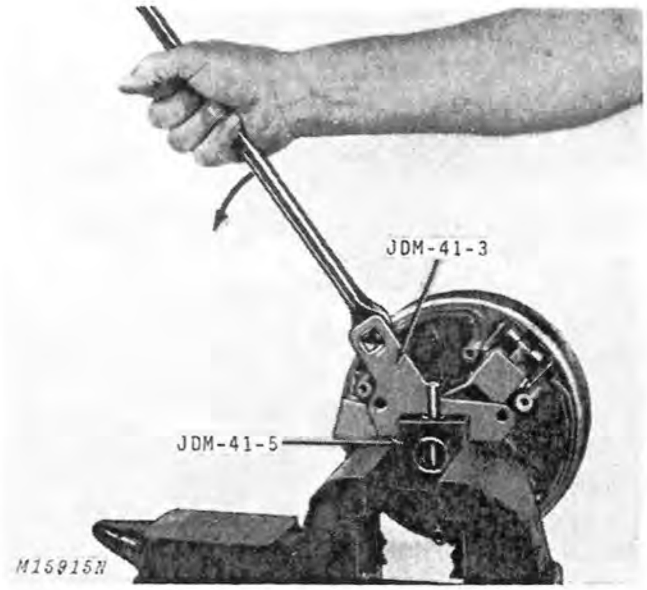


Fig. 8-Removing Spider From The Hub

Clamp assembly very securely into vise and install a 1/2-inch drive long handle into spider tool, Fig. 8, and turn counterclockwise to loosen spider from the hub.

Remove JDM-41-3 and JDM-41-5. Turn spider off the hub by hand.

INSPECTION AND REPAIR

Inspecting Bushings

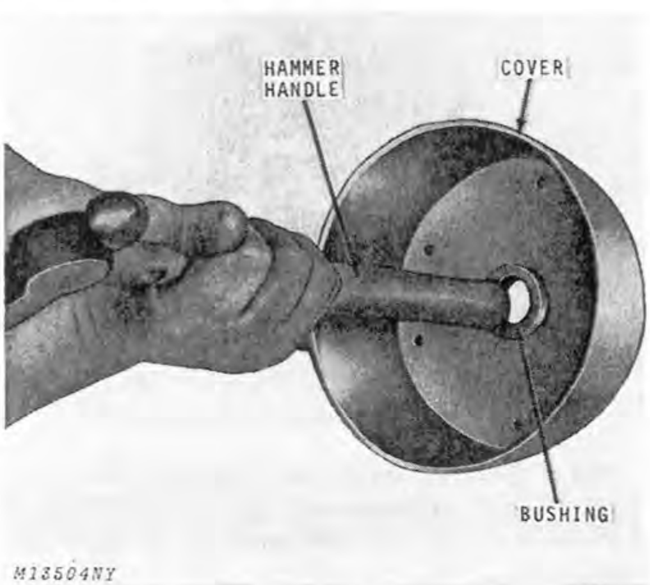


Fig. 9-Removing Bushing

Inspect bushing in cover and cover plate. If worn or damaged, replace bushing. Use a hammer handle to drive bushing from cover, Fig. 9. Use the same method to remove bushing from cover plate. Install new bushing in cover plate and then into cover. Be sure holes in plate line up with holes in cover.

Inspecting Guide Buttons and Rollers

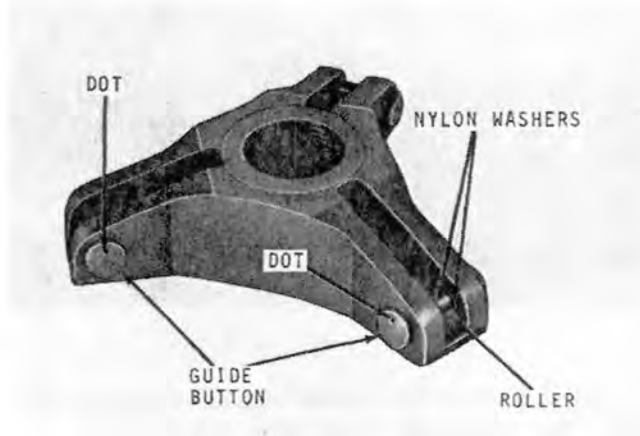


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Fig. 10-Installing Guide Buttons

Inspect guide buttons and rollers in spider. Replace if necessary. Use pliers to remove guide buttons. Then remove pin, roller and two nylon washers. Place roller in spider with a nylon washer on each side of the roller. Install pin and guide buttons, Fig. 10. Tap buttons gently until they are seated.

NOTE: Small dot on guide buttons must be positioned straight up or straight down, Fig. 10. This allows bearing surface of guide button to match bearing surface in movable face.

Inspecting Roller Arms

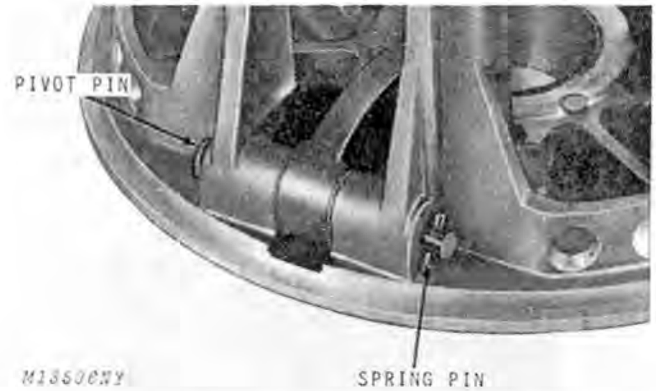


Fig. 11-Removing Spring Pin From Pivot Pin

Inspect roller arms for wear and replace as necessary. Use side cutters to remove spring pin, Fig. 11, from the end of the pivot pin. Remove pivot pin, roller arm and two nylon washers.

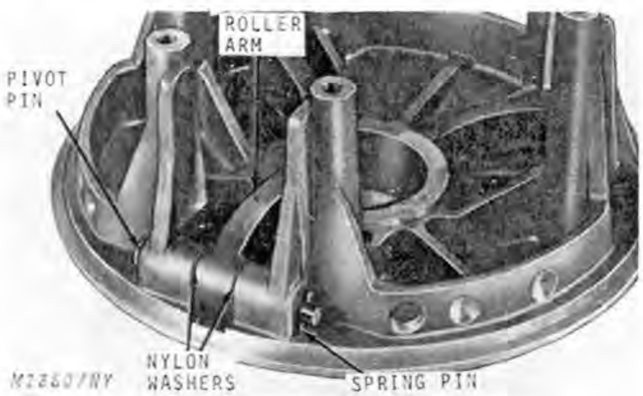


Fig. 12-Installing Pivot Pin

Install roller arm in movable face with a nylon washer on each side of the arm. Install pivot pin from left to right, Fig. 12, and install NEW spring pin through pivot pin.

Inspecting Fixed and Movable Faces

Check sheave faces for pitting or wear and replace as necessary.

NOTE: If bearing in movable face is worn or damaged, a new movable face must be used. The bearing is not replaceable.

Inspect bushing of fixed face hub (101C) for damage or excessive wear. Measure outside diameter of fixed face hub bushing and inside diameter of movable face bearing. Maximum allowable clearance is 0.030 inch (0.762 mm). If clearance is greater than 0.030 inch (0.762 mm), replace movable face and install new bushing on fixed face.

Use a cold chisel to carefully cut the old bushing from the fixed face hub.

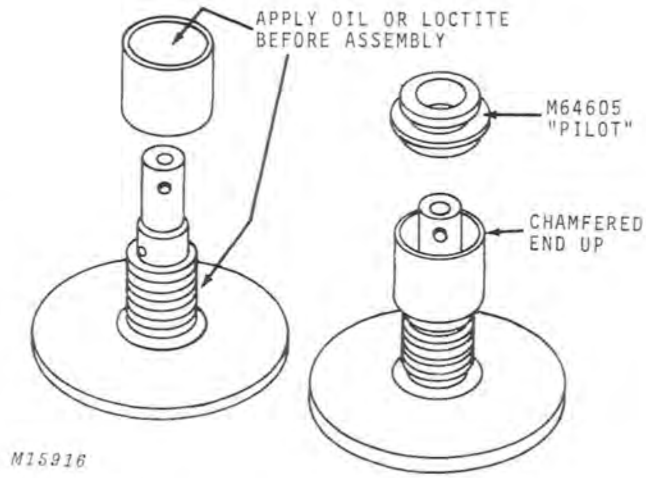


Fig. 13-Installing Fixed Sheave Bushing

Install new bronze bushing with chamfered end UP as shown in Fig. 13.

NOTE: Check fit of bushing. If bushing is too tight, coat the inside diameter of the bushing and outside diameter of the fixed face hub with 30W oil. If bushing is too loose, coat inside diameter of bushing and outside diameter of fixed sheave hub with Loctite to secure bushing to hub.

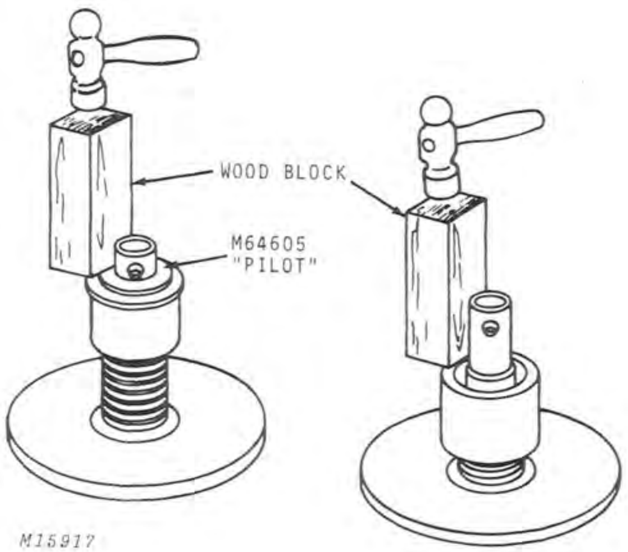


Fig. 14-Seating the Fixed Sheave Bushing

Use an old M64605 bronze bushing from the cover as a "pilot" tool to install bushing, Fig. 14. Install the new bushing down on the hub until "pilot" contacts the threaded portion of the hub shoulder.

When the "pilot" contacts the hub, remove "pilot" and seat the bushing with a block of wood as shown in Fig. 14. Bushing should seat "gently" against the fixed face sheave.

Remove all excess oil or Loctite before continuing with assembly.

ASSEMBLY

Lubricating Drive Sheave

Lubricate the drive sheave before assembly. Use Never-Seez Lubricant (PT569) on the following:

1. Spider-to-hub threads.
2. Rollers and roller pins in the spider.
3. Roller arms and roller pins in the movable face.
4. Guide buttons in the spider and on mating surface of movable face.
5. Movable face bushing.
6. Bushing in cover.

Assembling Drive Sheave

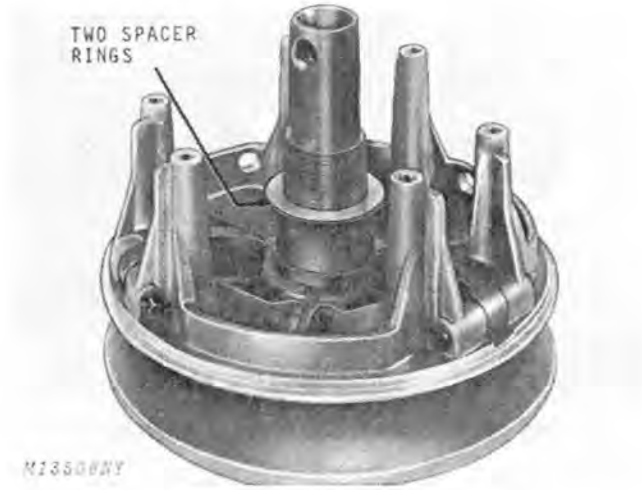


Fig. 15-Installing Spacer Rings

Install movable face over fixed face hub and place two spacer rings on hub, Fig. 15.

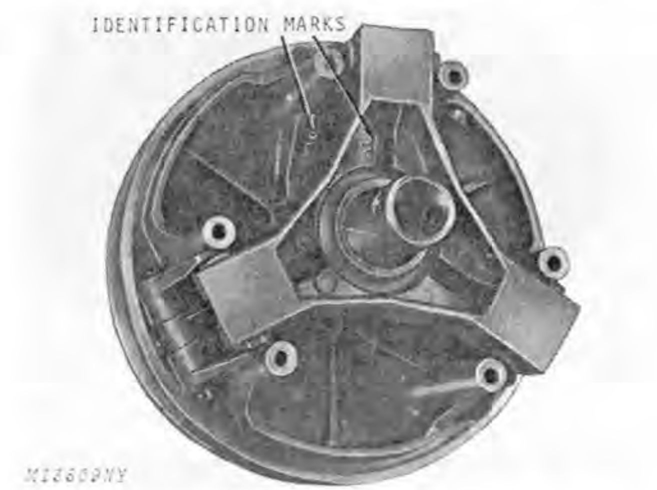


Fig. 16-Identification Marks on Spider and Movable Face

Install spider on movable face, aligning identification marks on spider with identification marks on movable face, Fig. 16. Proper alignment of these marks is necessary for proper balance of the drive sheave.

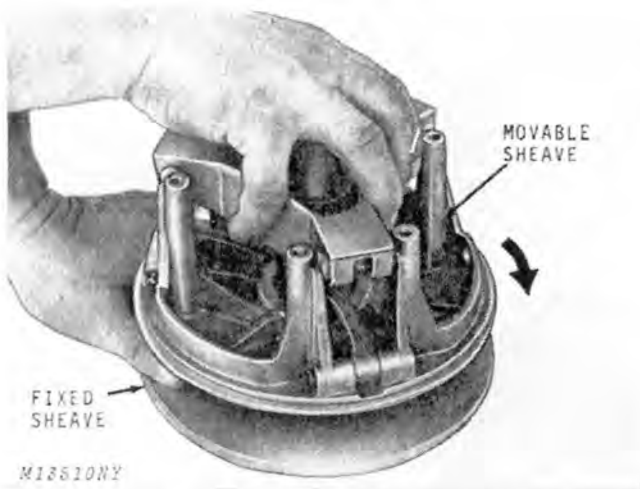


Fig. 17-Installing Spider and Movable Face

With one hand, grasp the spider assembly and movable sheave as shown in Fig. 17. Hold the fixed sheave with the other hand and turn the spider and movable sheave clockwise to start the threads of the spider onto the hub post. Continue to tighten the assembly as far as possible by hand.

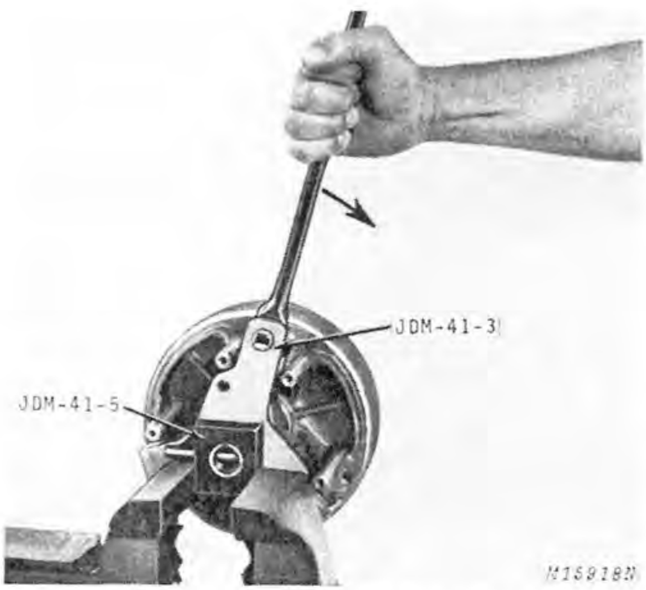


Fig. 18-Tightening Spider to The Hub

Place JDM-41-3 spider tool over hub with spring pins on tool engaging spider. Install JDM-41-5 hub lock over hub. Clamp assembly very securely into vise. Install a 1/2-inch drive long handle in JDM-41-3 and turn clockwise to tighten spider to hub, Fig. 18.

Remove JDM-41-3 and JDM-41-5 tools.

Install spring, cover and cover plate assembly. Tighten the six screws evenly and securely.

Installing Drive Sheave

Clean crankshaft tapered surface and place drive sheave on crankshaft.

Use JDM-41-2 compressor ring, Fig. 19, and compress movable face to expose cross hole in hub.

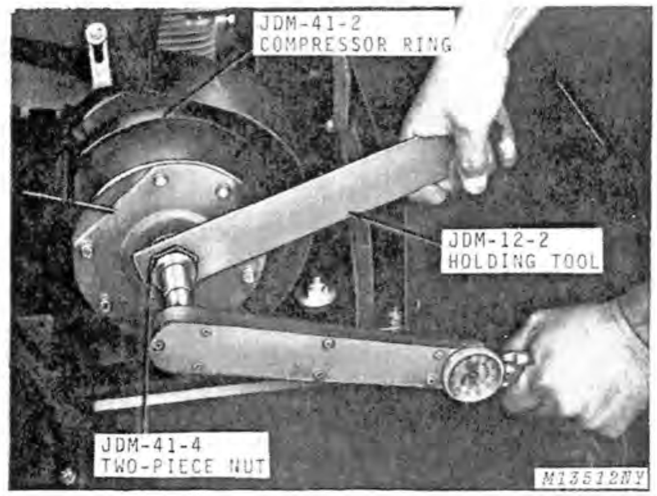


Fig. 19-Installing Drive Sheave

Install JDM-41-4 two-piece nut and hold with JDM-12-2 tool.

Install lock washer and pilot washer onto retaining cap screw. Install and torque retaining cap screw to 50 ft-lbs (67.79 Nm), Fig. 19.

IMPORTANT: Do not torque the retaining cap screw more than 50 ft-lbs (67.79 Nm) because it will "swell" the hub end causing the drive sheave to "stick."

Install drive belt, belt guard and left-hand access panel.

Group 20
SALSBURY 780, 850 AND 910 DRIVEN SHEAVES

GENERAL INFORMATION

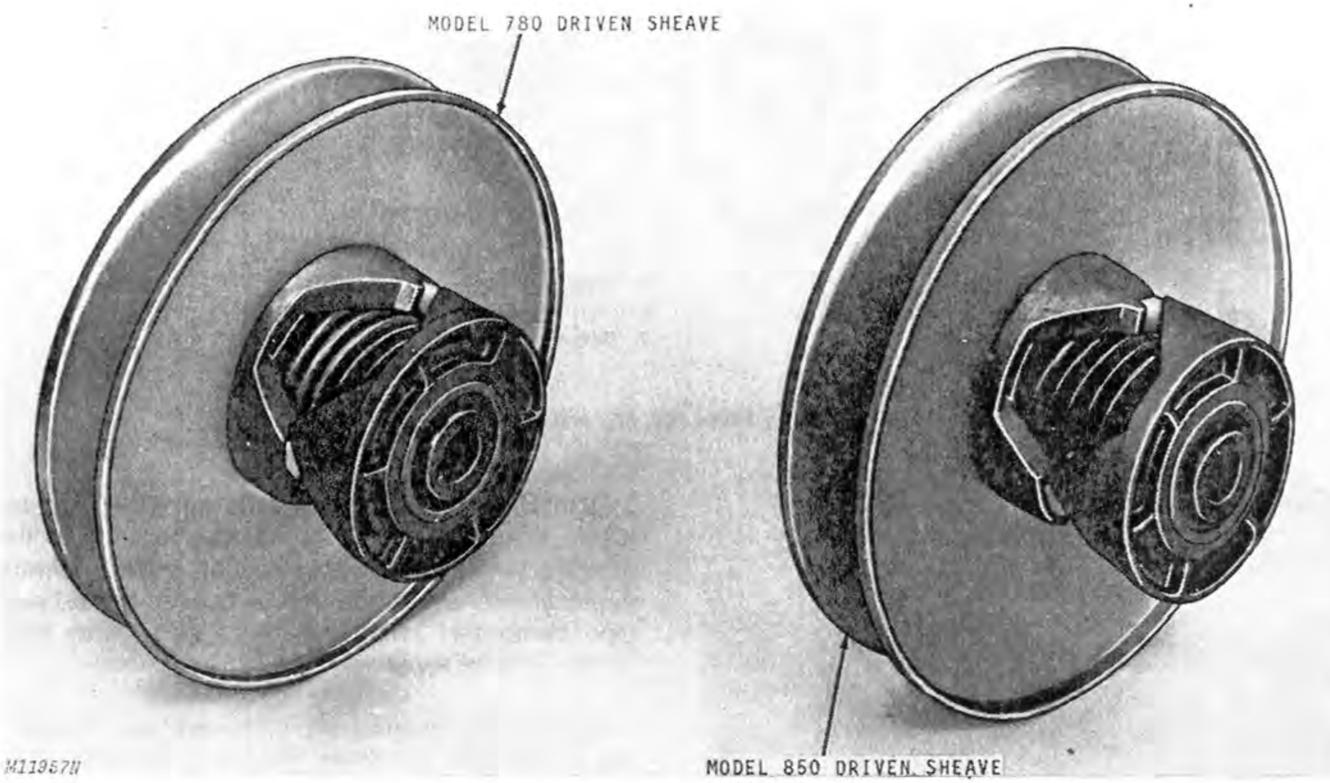


Fig. 1-Model 780 and Model 850 Driven Sheaves

The driven sheave acts as a take-up for the action of the drive sheave. The driven sheave is also "torque-sensitive." See "Principle of Operation" in Group 5 of this section.

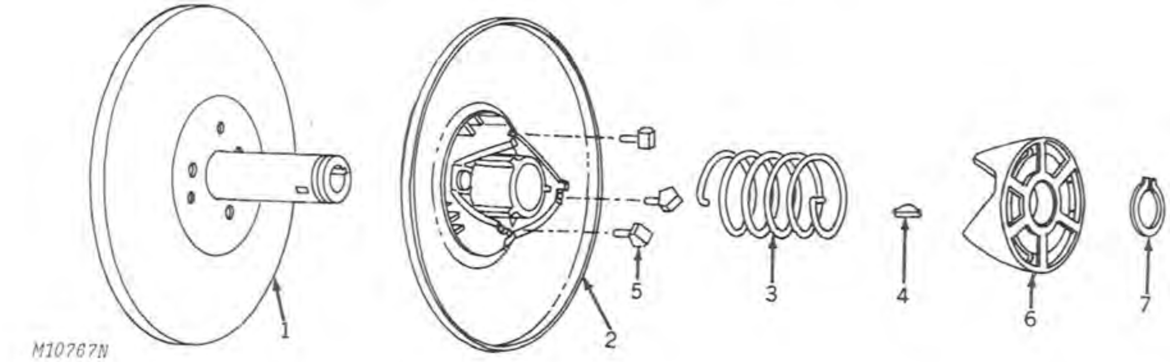
Model	Serial No.	Sheave
JDX4,400	(-20,000)	780
500	(-11,000)	910
500	(11,001-20,000)	850
JDX8,600	(-20,000)	850
300	(20,001-)	780

It is important not to interchange driven sheaves between snowmobile models because they are "matched" to the engine and drive sheaves.

The driven sheaves are basically of the same design and the same procedures can be used for maintenance.

Group 5 of this section contains "Diagnosing Malfunctions" to help correct problems associated with the driven sheave.

DISASSEMBLY AND REPAIR



1—Fixed Face Assembly
2—Movable Face Assembly
3—Coil Spring
4—Key
5—Slipper (3 used)
6—Cam Bracket
7—Retaining Ring

Fig. 2-Exploded View of Model 780, 850 and 910 Driven Sheaves

Removing Driven Sheave 400 and 500 Snowmobiles (Serial No. -11,000)

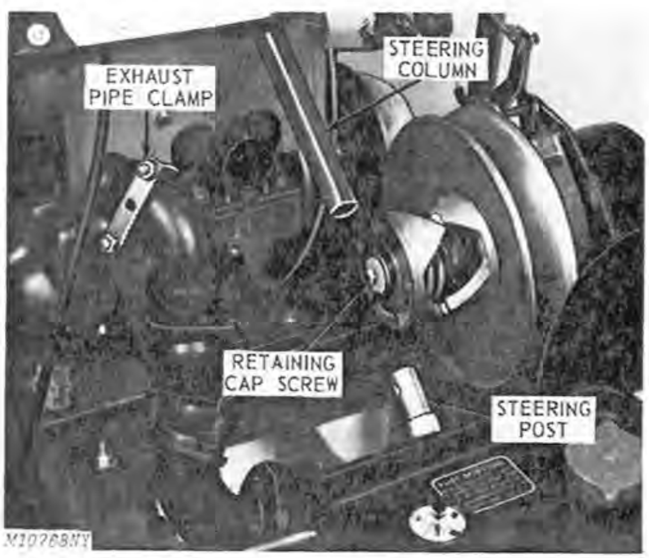


Fig. 3-Removing Driven Sheave From Secondary Shaft

Remove drive belt. Remove the cap screw and tapered sleeves securing the steering column to the steering post and slide the steering column upward approximately six inches, Fig. 3. Loosen the exhaust pipe clamp and swing exhaust system away from driven sheave as shown, Fig. 3.

Remove the retaining cap screw and two washers, Fig. 3, securing the driven sheave to the secondary shaft.

Slide driven sheave off secondary shaft and remove from the snowmobile.

NOTE: For removing the driven sheave on all other Snowmobiles, refer to page 50-22-1.

Disassembling Driven Sheave

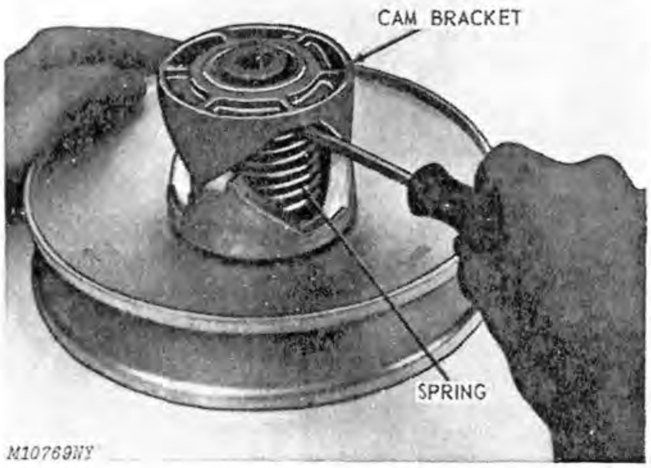


Fig. 4—Releasing Spring Tension

Release end of spring from lug in cam bracket, Fig. 4, by prying end of spring with a screwdriver.

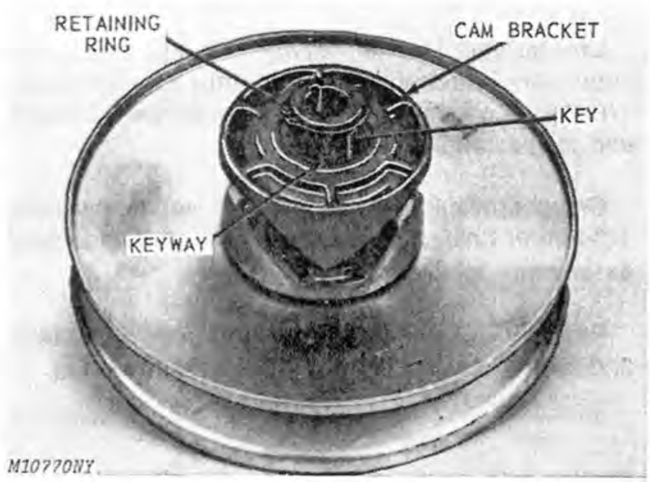


Fig. 5-Removing Retaining Ring

Push down on cam bracket until key, Fig. 5, is exposed. Then rotate cam bracket slightly to misalign key with keyway, Fig. 5, to prevent cam bracket from sliding back against retaining ring.

Remove retaining ring, Fig. 5. Rotate cam bracket to align keyway with key and remove cam bracket and spring from driven sheave assembly.

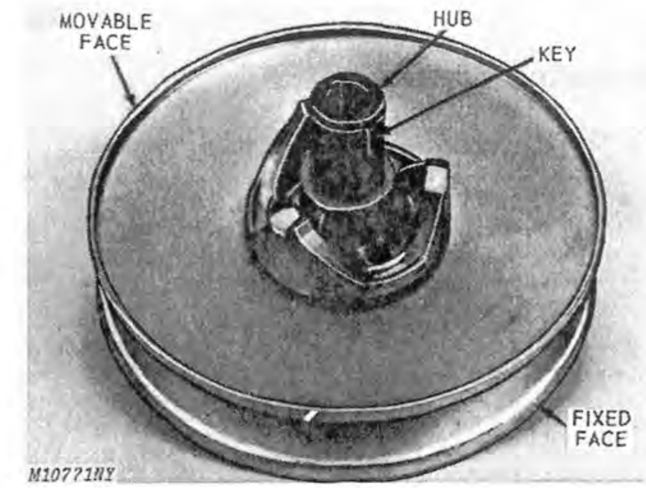


Fig. 6-Removing Movable Face

Remove key from hub of fixed face and slide movable face off hub, Fig. 6.

INSPECTION

Thoroughly clean all components with cleaning solvent except bushing in movable face. This bushing is oil-impregnated and solvent will remove the oil. Clean movable face bushing with a clean, dry cloth.

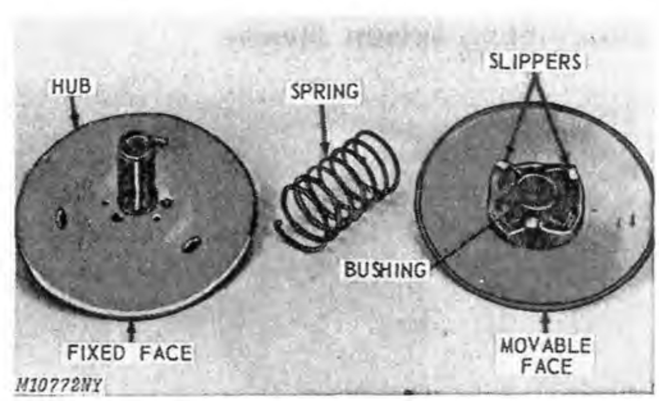


Fig. 7-Points to Inspect on Driven Sheave

Inspect movable face bushing and fixed face hub, Fig. 7, for wear. Replace parts as necessary. Excessive looseness could cause binding.

Inspect spring, Fig. 7, for cracks or pits. Replace if necessary.

Inspect slippers, Fig. 7, for wear and replace as a set if worn. If not replaced as a set, binding and improper sheave operation could result.

Check sheave faces with a straightedge. Replace if badly worn, grooved, scored, or pitted.

ASSEMBLY

Installing Slippers

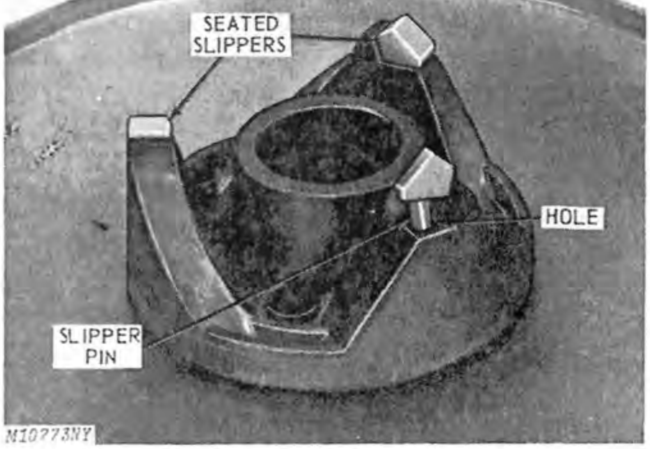


Fig. 8-Installing Slippers on Movable Face

Remove old slippers by grasping and pulling upward with a pliers.

Install new slippers only as a complete set (3 slippers). Press down until seated firmly, Fig. 8.

Assembling Driven Sheave

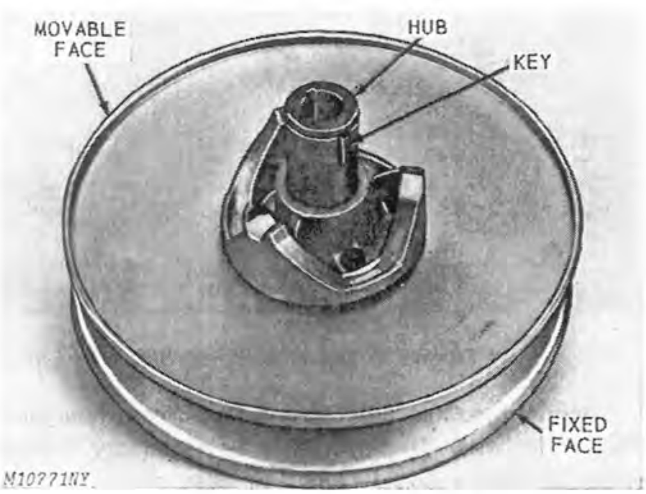


Fig. 9-Installing Movable Face

Install movable face dry. **Do not** use oil or grease.

Place movable face over hub of fixed face and install key, Fig. 9.

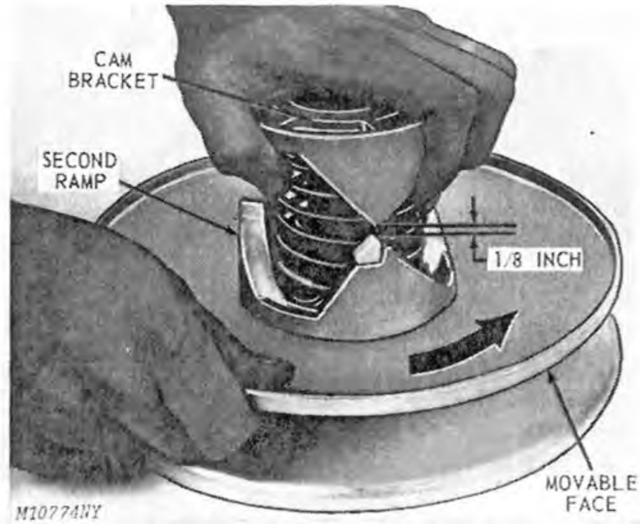


Fig. 10-Tensioning Driven Sheave

Install spring and cam bracket. Engage spring end around a squared off lug in cam bracket. Engage other end of spring around a lug in movable face.

Line up cam bracket keyway with key in hub and slide cam bracket onto hub until approximately 1/8-inch of clearance remains between peak of ramp and slipper, Fig. 10.

Grasp movable face and rotate counterclockwise 1/3 turn or until second ramp on movable face passes starting point, Fig. 10.

Press down on cam bracket until key is exposed, and then rotate slightly to misalign keyway, Fig. 11.

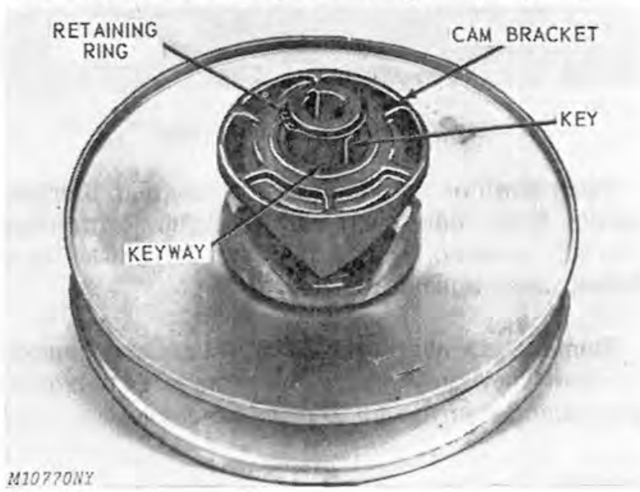


Fig. 11-Installing Retaining Ring

Install retaining ring, Fig. 11, with sharp edge away from cam bracket.

Align keyway with key and allow cam bracket to slide up against retaining ring.

Installing Driven Sheave

400 and 500 Snowmobiles (Serial No. -11,000)

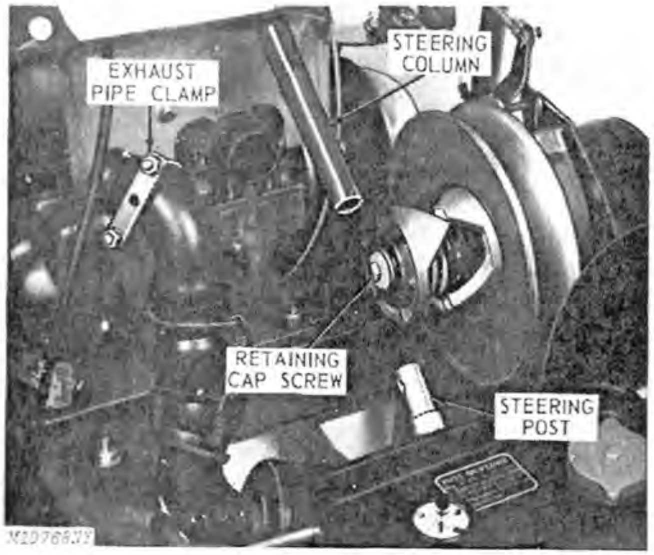


Fig. 12-Installing Driven Sheave

Install driven sheave over secondary shaft. Be certain key is in place on secondary shaft and spacing washer is in place between chain case bearing and driven sheave.

Install retaining cap screw with two washers, Fig. 12, and torque to 20 ft-lbs.

Slide steering column into position over steering post, Fig. 12, and install two tapered sleeves, cap screws, nut and washers.

Connect exhaust pipe to exhaust manifold and tighten clamp, Fig. 12. Install drive belt.

See Group 25 of this section for drive belt alignment procedures and specifications.

NOTE: For installing driven sheave on all other Snowmobiles, refer to page 50-22-3.

Group 22
JOHN DEERE (COMET) DRIVEN SHEAVE

GENERAL INFORMATION

Fig. 1-John Deere (Comet) Driven Sheave

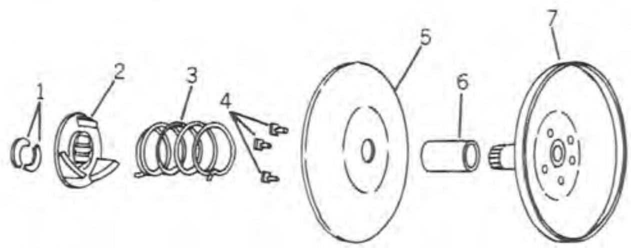
The John Deere (Comet) Driven Sheave, Fig. 1, is used on 400, 500, 600, JDX4 Special, JDX6 and JDX8 Snowmobiles (Serial No. 20,001-30,000), and 400, 600, 800, JDX4, JDX6 and JDX8 Snowmobiles (Serial No. 30,001-).

NOTE: The driven sheave was installed on many 1973 model 500, 600, and JDX8 Snowmobiles as part of Modification Program 160.

The driven sheave acts as a take-up for the action of the drive sheave. The driven sheave is also "torque-sensitive." See "Principle of Operation" in Group 5 of this section.

Group 5 also contains "Diagnosing Malfunctions" to help correct problems associated with the driven sheave.

DISASSEMBLY AND REPAIR



M13514N

1—Retaining Ring (2 used)
2—Fixed Cam
3—Spring
4—Buttons (3 used)
5—Movable Face Sheave
6—Bushing
7—Fixed Face Sheave

Fig. 2-Exploded View of Driven Sheave

Removing Driven Sheave

Remove belt shield and drive belt.

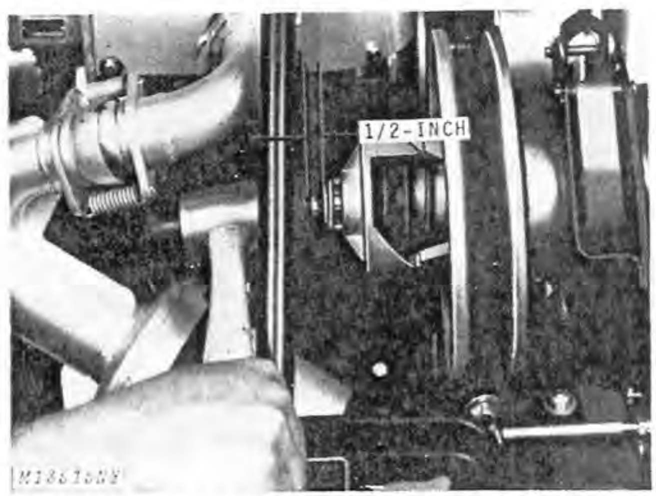


Fig. 3-Removing Driven Sheave

Back retaining cap screw out approximately 1/2 inch (12.70 mm), Fig. 3. Use a mallet and carefully tap secondary shaft toward chain case.

IMPORTANT: Shaft will only move 1/2 inch (12.70 mm) before key in secondary shaft contacts bearing inner race. Additional pounding will cause bearing damage.

Remove cap screw and washers and slide driven sheave off shaft.

Disassembling Driven Sheave

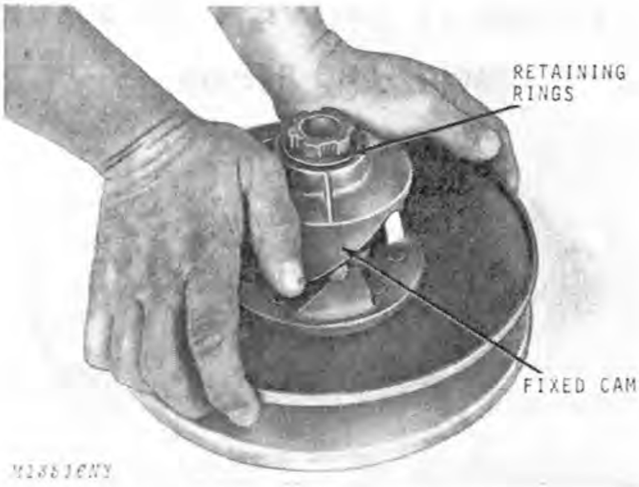


Fig. 4-Removing Retaining Rings

Depress fixed cam and remove retaining rings, Fig. 4.

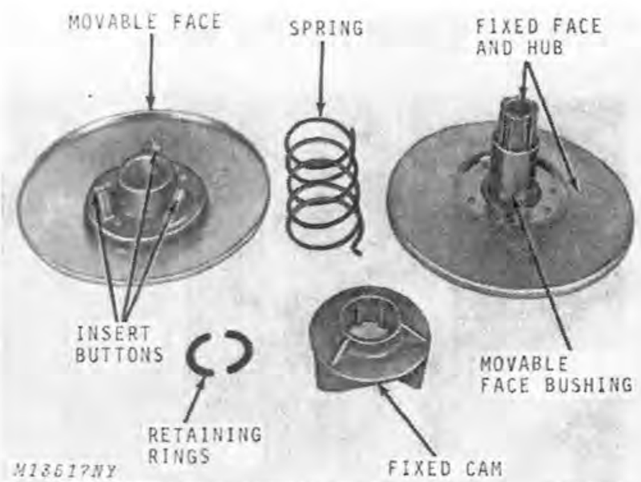


Fig. 5-Fixed Cam, Spring and Movable Face

Remove fixed cam, spring and movable face, Fig. 5.

INSPECTION AND REPAIR

Thoroughly clean all components with solvent except the movable face bushing, Fig. 6. This bushing is oil-impregnated and solvent will remove the oil. Clean movable face bushing with a clean, dry cloth.

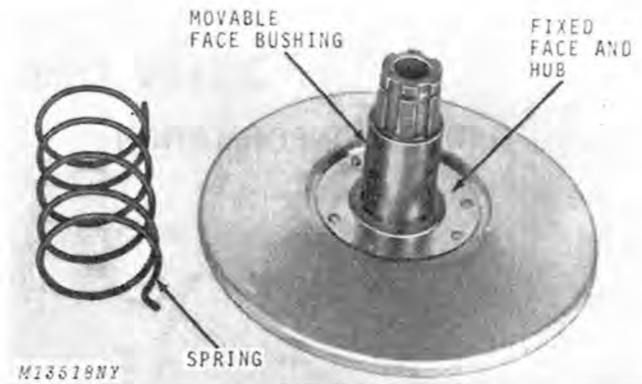


Fig. 6-Movable Face Bushing and Fixed Face Hub

Inspect movable face bushing and fixed face hub, Fig. 6, for wear. Replace parts as necessary. Excessive looseness could cause binding.

Inspect spring for cracks or pits. Replace as necessary.

Check sheave faces with a straightedge. Replace if badly worn, grooved, scored, or pitted.

Inspect insert buttons for wear, Fig. 5. Buttons and mating surfaces on fixed cam must be smooth. Replace insert buttons as a set if worn. If not replaced as a set, binding and improper sheave operation could result.

ASSEMBLY

Lubricate movable face bushing with a light coat of Never-Seez Lubricant (PT569). Excess lubrication will sling out onto sheave faces and cause drive belt glazing and slippage.

NOTE: Spring in the driven sheave is pretensioned differently for different model snowmobiles. See chart on page 50-22-3.

Pretensioning Driven Sheave

As temperature or altitude increases, engine horsepower decreases. The drive system now upshifts too rapidly for an engine with less horsepower. In order to counteract this, the drive system must be modified to obtain proper maintenance speed (6500-7000 rpm). Low maintenance speed results in poor performance.

NOTE: The JD295/S Snowmobile has an engine maintenance speed of 7700-8100 rpm.

Additional driven sheave pretension increases engine speed; less pretension decreases speed.

The John Deere (Comet) driven sheave can be pretensioned six different ways as shown in the chart below.

NOTE: Installation of high-torque kits and clutch modification (Program 160) may also be necessary.

IMPORTANT: Do not adjust to provide engine speed in excess of 7000 rpm or 8100 rpm (JD295/S).

Lay fixed sheave and post flat with post up. Assemble movable sheave - insert spring tang into movable sheave hole number.	With fixed cam engaged on very top of fixed sheave and post spline, rotate movable sheave counterclockwise the following number of degrees and push down on fixed cam. Insert snap ring to lock fixed cam.	Allow movable sheave to snap back (clockwise) in place to approximate number of degrees.	Pounds of spring tension when measured at sheave radius.
4	160°	120°	22 lbs. [9.9 kg]
3	160°	120°	20 lbs. [9.0 kg]
2	130°	90°	16 lbs. [7.2 kg]
1*	130°	90°	12 lbs. [5.4 kg]
4	70°	30°	8 lbs. [3.6 kg]
3**	70°	30°	6 lbs. [2.7 kg]

**This is factory setting for 1974 Model 400, JDX4, JDX6, JDX8 and JD295/S Snowmobiles and 1975 Model 400, 800, JDX4, JDX6 and JDX8 Snowmobiles.*

***This is factory setting for 1974 and 1975 Model 600 Snowmobile and also for 1973 Model 500, 600 and JDX8 Snowmobiles with clutch modification (Program 160).*

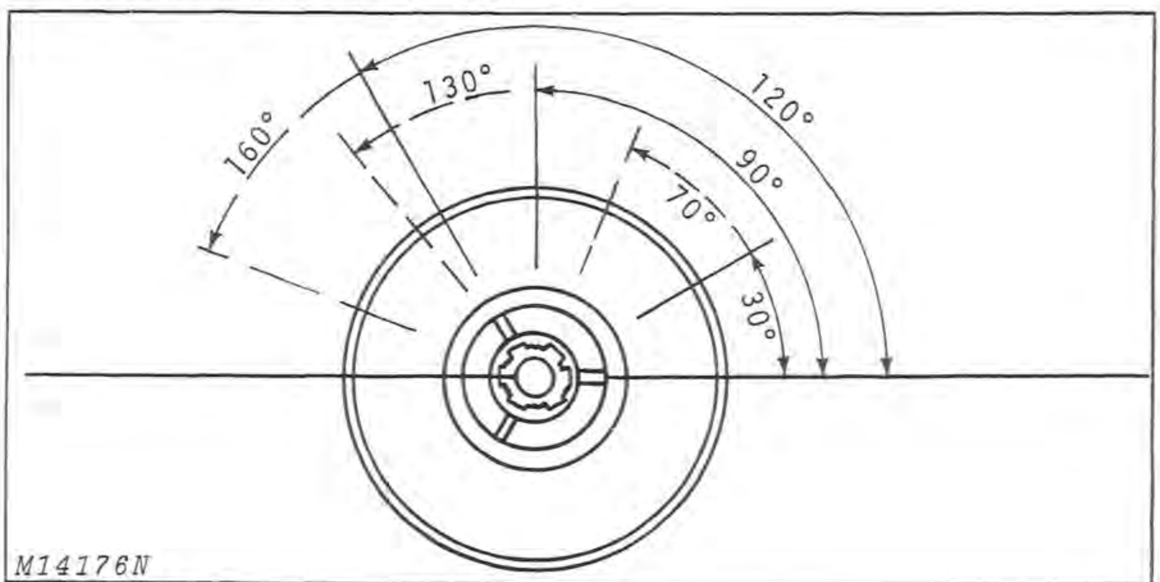


Fig. 7-Degrees of Rotation

Assembling Driven Sheave

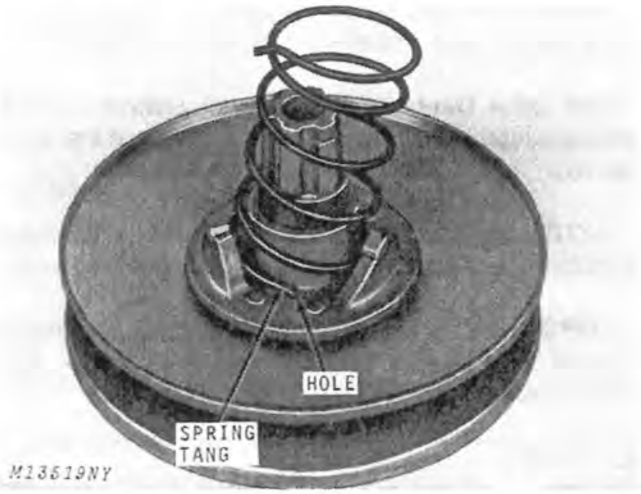


Fig. 8-Spring Tang in Hole

Install spring and place spring tang in the proper hole as indicated in the chart on page 50-22-3 and as shown in Fig. 8.

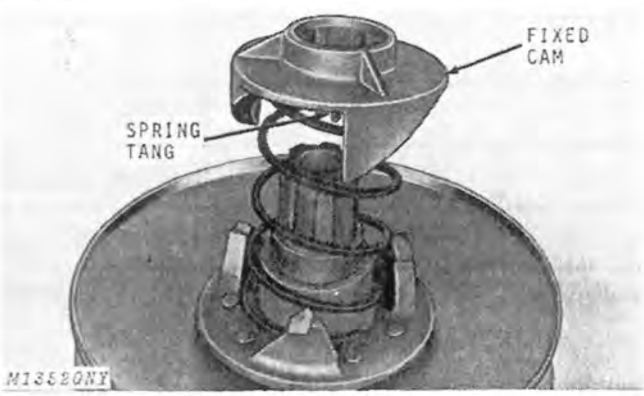


Fig. 9-Spring Tang Behind Cam

Install fixed cam, hooking spring tang behind a cam, Fig. 9. Align splines and push down on fixed cam until flush with end of hub.

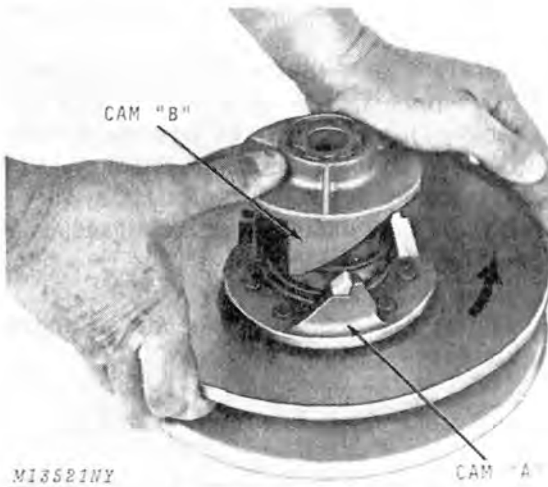


Fig. 10-Installing Movable Face

Rotate movable face counterclockwise until cam "A" passes cam "B", Fig. 10.

Push down on fixed cam and install retaining rings, (sharp edge up).

Installing Driven Sheave

Install driven sheave over shaft. Be certain key is in place on shaft and spacing washer is in place between chain case bearing and driven sheave.

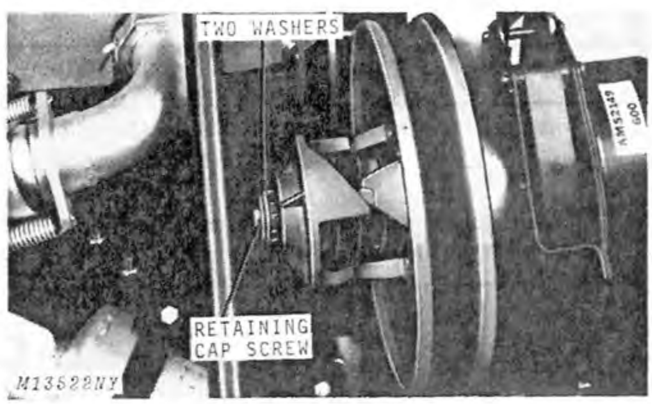


Fig. 11-Installing Driven Sheave

Install retaining cap screw with two washers, Fig. 11, and torque to 20 ft-lbs (27.12 Nm).

Install drive belt and belt shield.

See Group 25 of this section for alignment procedures.

Group 25
DRIVE BELT

GENERAL INFORMATION

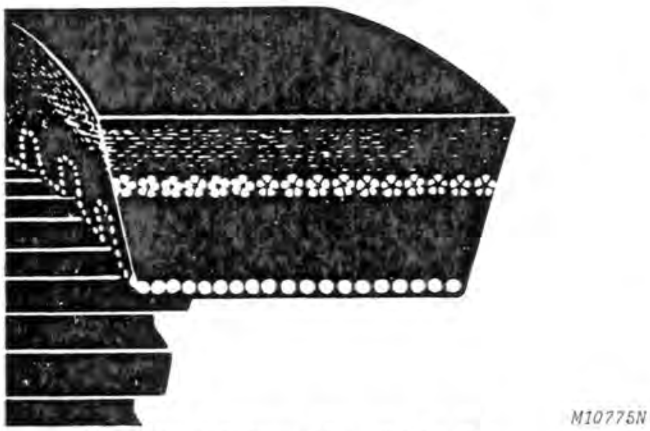


Fig. 1-Cutaway View of Drive Belt

The function of the drive belt is to transmit power from the drive sheave to the driven sheave.

The snowmobile drive belt contains layers of cords, Fig. 1, close to the outer surface.

The drive belts are not interchangeable between snowmobiles even though the width may be the same.

Model	Serial No.	Belt Width
JDX4, 400	(-20,000)	1-3/16 inches (30.16 mm)
300	(20,001-)	1-3/16 inches (30.16 mm)
500, 600, JDX8	(-20,000)	1-1/4 inches (31.75 mm)
400, 500, 600, JDX4 Special, JDX6, JDX8 JD295/S	(20,001-30,000)	1-1/4 inches (31.75 mm)
400, 600, 800, JDX4, JDX6, JDX8	(30,001-)	1-1/4 inches (31.75 mm)

The drive belt should be replaced when its width is reduced by 1/8-inch (3.175 mm) or more because snowmobile performance will be affected.

REPAIR

Removing Drive Belt

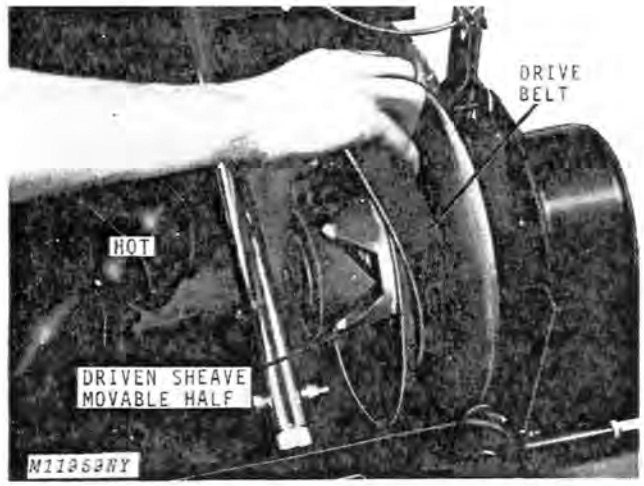


Fig. 2-Removing Drive Belt

Loosen wing nuts and remove driven sheave belt shield to provide access, Fig. 2. Remove access panel from left-hand side of console.

Standing on right-hand side of snowmobile, grasp movable half of driven sheave and turn it counterclockwise, while pulling, to open sheave. Pull belt upward as shown, Fig. 2, to allow belt to be worked over and off top of driven sheave.

Work belt off of drive sheave and remove belt from snowmobile.

Installing Drive Belt

Place belt around drive sheave. Open driven sheave as described above and work belt into place around driven sheave. Position belt shield and tighten wing nuts, Fig. 2. Install access panel.

IMPORTANT: Do not pry belt over sheaves.

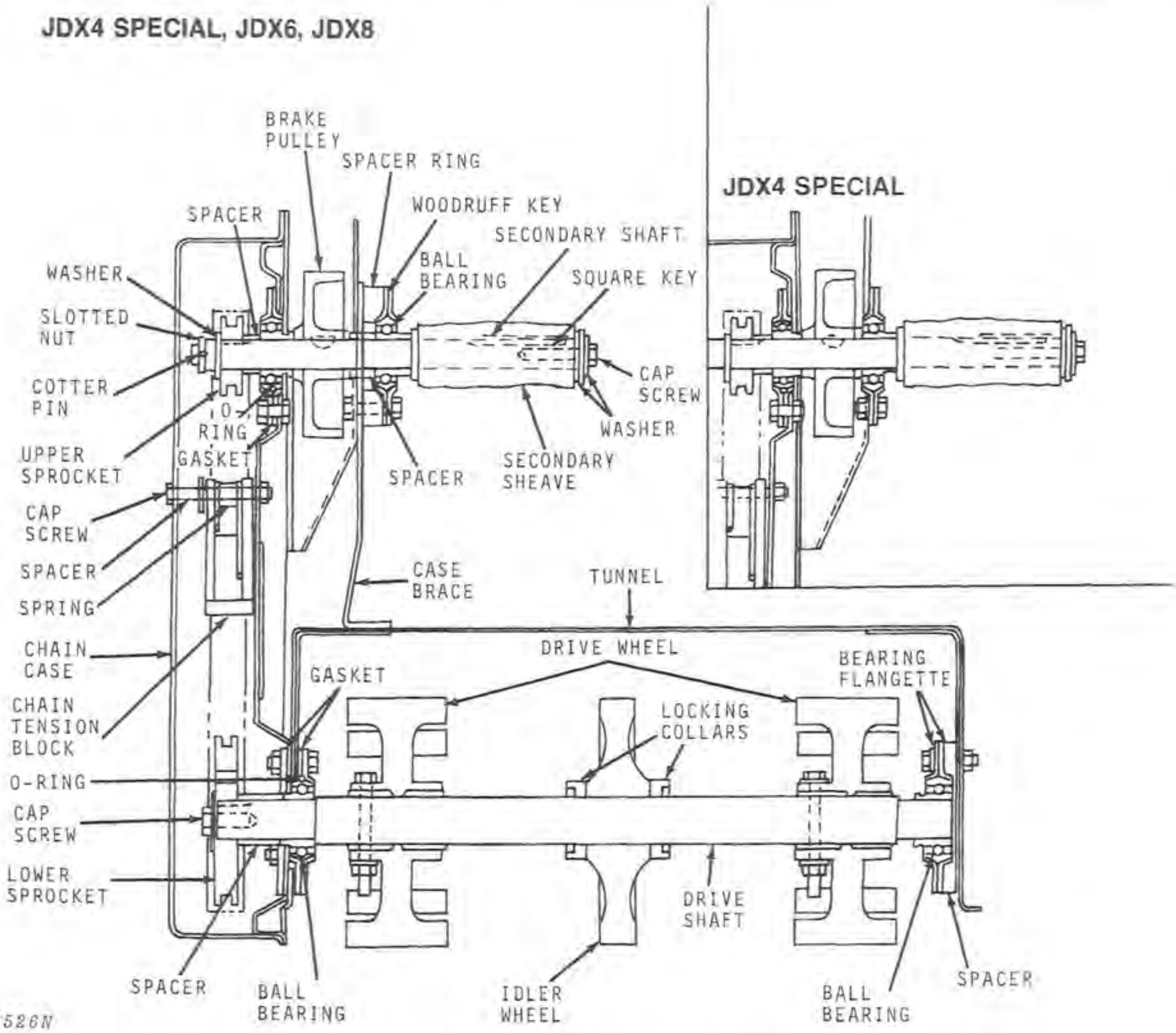
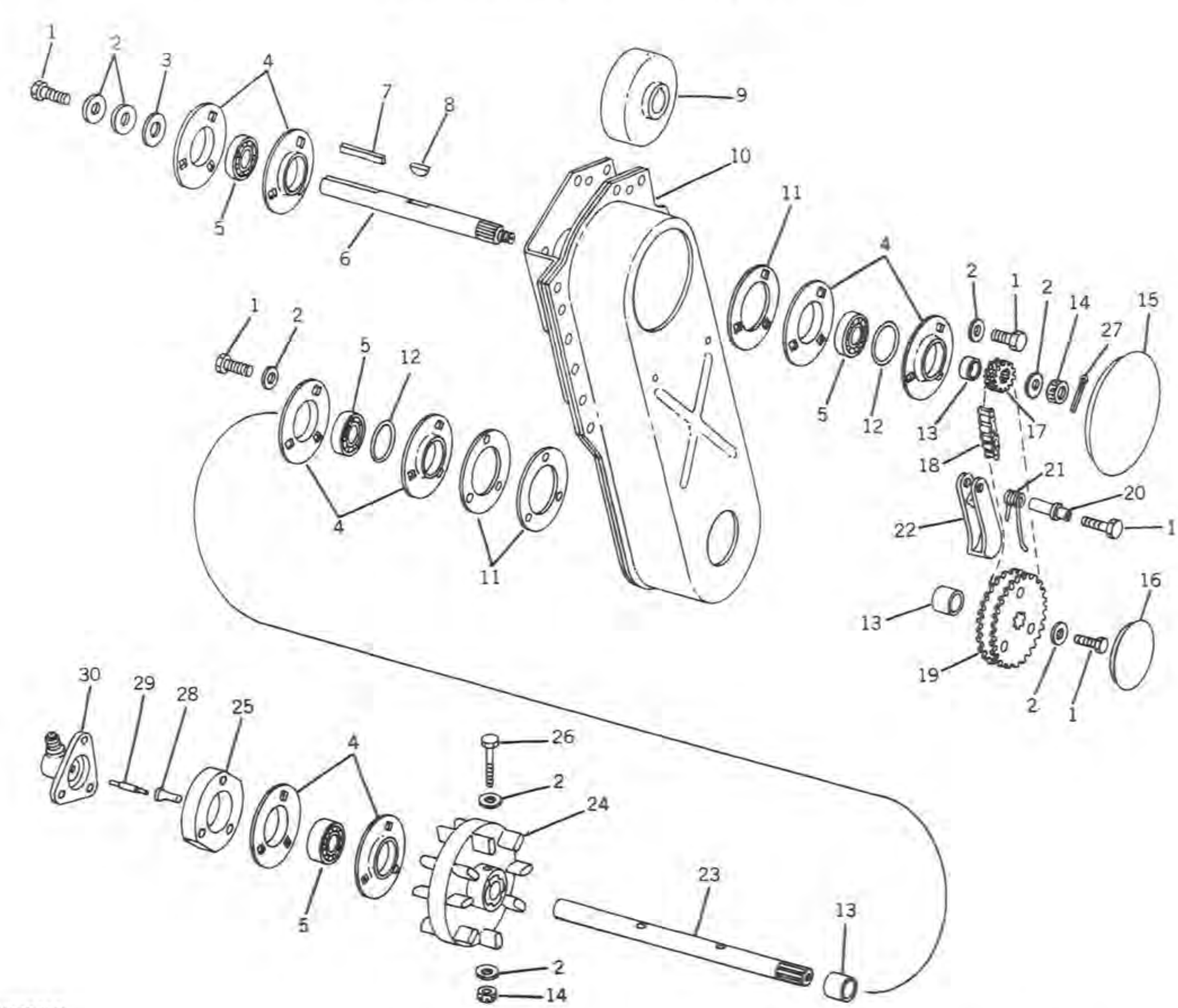


Fig. 2-Sectioned View of a Typical Chain Case — JDX4 Special, JDX6 and JDX8 Snowmobile Illustrated

DISASSEMBLY AND REPAIR



1—Cap Screw
2—Washer
3—Spacing Washer
4—Bearing Flangette
5—Ball Bearing
6—Secondary Shaft
7—Square Key
8—Woodruff Key
9—Brake Pulley
10—Chain Case
11—Gasket
12—O-Ring
13—Spacer
14—Nut
15—Upper Rubber Plug
16—Lower Rubber Plug
17—Upper Sprocket
18—Drive Chain
19—Lower Sprocket
20—Tension Block Spacer (2 used)
21—Tension Spring (2 used)
22—Chain Tension Block (2 used)
23—Drive Shaft
24—Drive Wheel (2 used)
25—Bearing Spacer
26—Bolt
27—Cotter Pin
28—Speedometer Drive Insert
29—Speedometer Core
30—Speedometer Drive

Fig. 3-Exploded View of Chain Case, Secondary Shaft and Drive Shaft

Removing Drive Chain

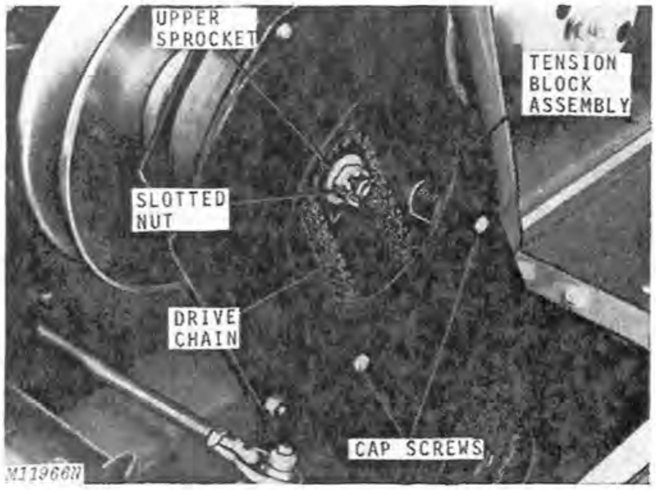


Fig. 4-Removing Drive Chain

Remove two rubber access plugs in chain case.

Remove two cap screws, Fig. 4, securing chain tension blocks and lift tension block assemblies out of chain case.

Remove cotter pin, slotted nut, washer, and upper sprocket from secondary shaft, Fig. 4. Remove spacer from behind upper sprocket.

Work drive chain off lower sprocket and lift chain and upper sprocket out upper access hole in chain case.

Removing Secondary Shaft and Brake Pulley

Remove the driven sheave from the secondary shaft. See Group 20 of this section for instructions. Disconnect steering shaft and slide shaft up. Remove the square key from the secondary shaft.

Remove the drive chain and upper sprocket from the secondary shaft.

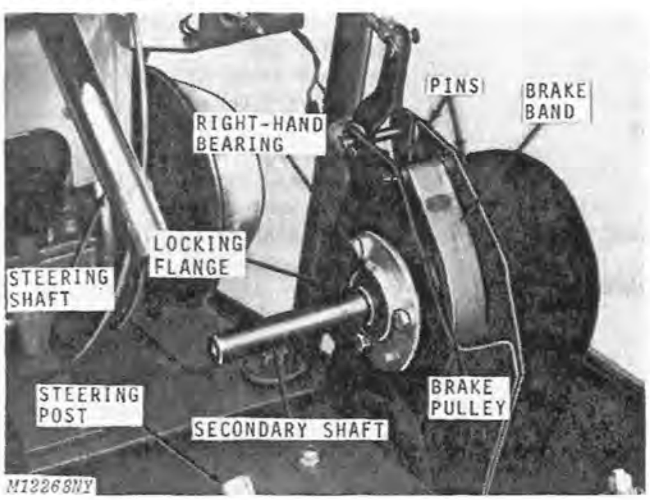


Fig. 5-Removing Secondary Shaft

Remove the three cap screws securing the right-hand bearing flangettes to the chain case. Remove flangettes and bearing from secondary shaft, Fig. 5.

Slide secondary shaft out of other bearing and out of brake pulley. Remove left-hand bearing flangettes, bearing, and O-ring if replacement is necessary.

To remove brake pulley, disconnect brake cable from brake arm and remove two pins securing brake band and brake arm to chain case, Fig. 5. Do not lose spacers. Lift brake band and brake pulley out of chain case.

NOTE: Brake band can be replaced without removing secondary shaft and brake pulley. See Group 35 of this section.

Removing Lower Sprocket

NOTE: Drive chain must be removed prior to removing lower sprocket.

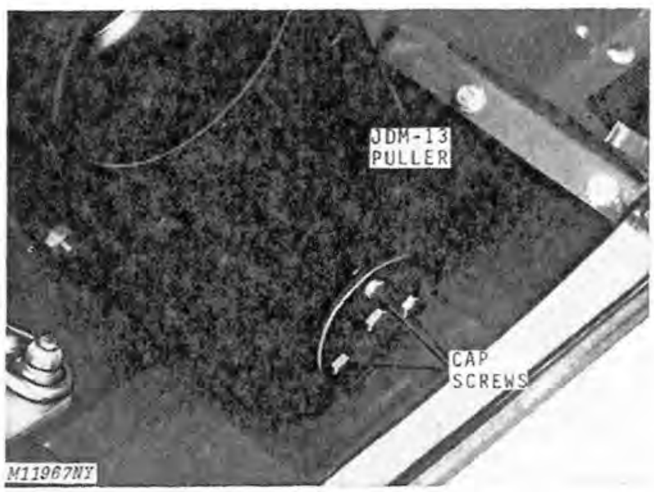


Fig. 6-Removing Lower Sprocket

Remove the cap screw and washer securing the lower sprocket to the drive shaft.

Attach special puller JDM-13, Fig. 6, to drive shaft and sprocket. Tighten three cap screws, threaded into sprocket, evenly, until sprocket is free of drive shaft. Remove puller and lift sprocket from upper access hole. Remove spacer next to lower bearing from drive shaft.

Removing Drive Shaft

The drive chain and lower sprocket must be removed as outlined on page 50-30-3 before the drive shaft can be removed.

Loosen track and remove rear idler assembly to provide access to drive shaft. If track is to be removed, bogie assemblies or slide suspension must also be removed. See Section 60 for details.

IMPORTANT: Drain fuel tank, and remove battery and chain case oil if snowmobile is to be inverted. Chain case oil can be removed with a syringe.

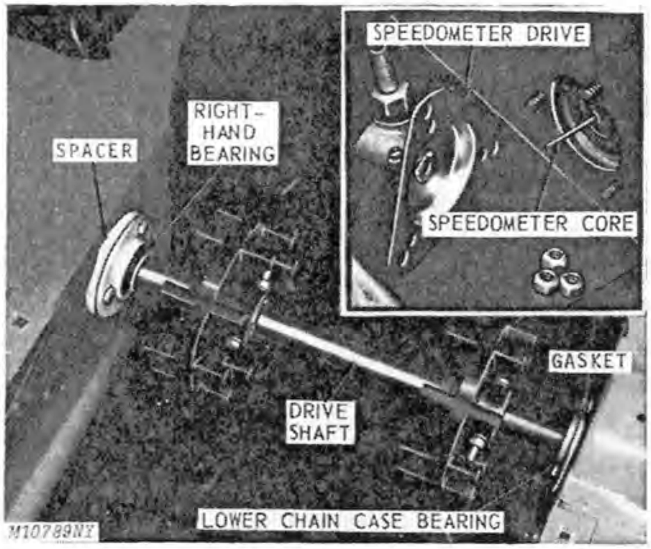


Fig. 7-Removing Drive Shaft Bearing Flangette Bolts

If snowmobile is equipped with electric start, remove the battery box to provide access to the right-hand drive shaft bearing.

Remove the three bolts securing the right-hand bearing flangettes, spacer and the speedometer drive to the tunnel, Fig. 7.

Remove the speedometer drive and the short speedometer core from the drive shaft (inset, Fig. 7).

NOTE: On Snowmobiles with slide suspension, remove the bolts securing the drive wheels to the shaft and slide the drive wheels toward the center of the shaft.

Loosen the three cap screws securing the lower chain case bearing flangettes to the chain case, Fig. 7.

Lift right-hand end of shaft out of tunnel just far enough for drive wheels to clear tunnel, Fig. 8. Pull drive shaft out of lower chain case bearing. If replacement is necessary, remove right-hand bearing and drive wheels from drive shaft. Remove lower chain case bearing, flangettes, and O-ring.

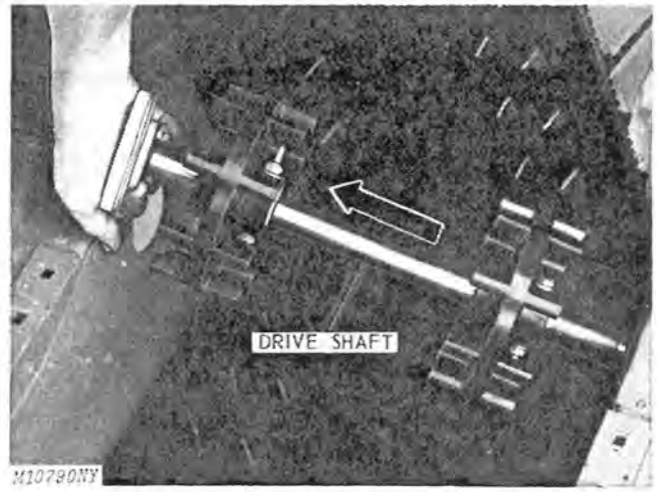


Fig. 8-Removing Drive Shaft

Removing Chain Case

Fig. 9-Removing Chain Case

The drive shaft must be removed before the chain case can be removed.

Remove the three cap screws securing lower chain case bearing to tunnel and chain case, Fig. 8. Remove bearing flangettes, O-ring and bearing.

Remove drive belt and disconnect brake cable from brake arm.

Remove two bolts securing chain case to tunnel, Fig. 9, and remove chain case.

See "Removing Secondary Shaft and Brake Pulley" on page 50-30-4 if further disassembly of chain case is desired.

INSPECTION

Thoroughly clean all components prior to inspection.

Inspecting Secondary Shaft

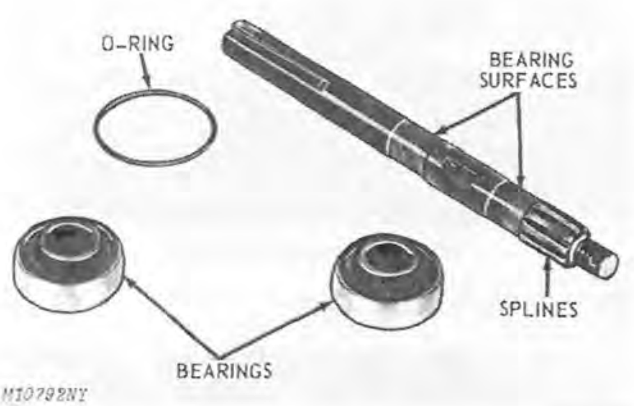


Fig. 10-Inspecting Secondary Shaft and Bearings

Inspect secondary shaft bearing surfaces, Fig. 10, for evidence of bearings turning on shaft. Also inspect condition of splined end and threads. Replace shaft if found defective.

Inspect secondary shaft bearings, Fig. 10, and replace if binding, worn, or noisy. Install a new O-ring on left-hand bearing if it is crimped or damaged.

Inspecting Drive Chain, Sprockets and Tension Blocks

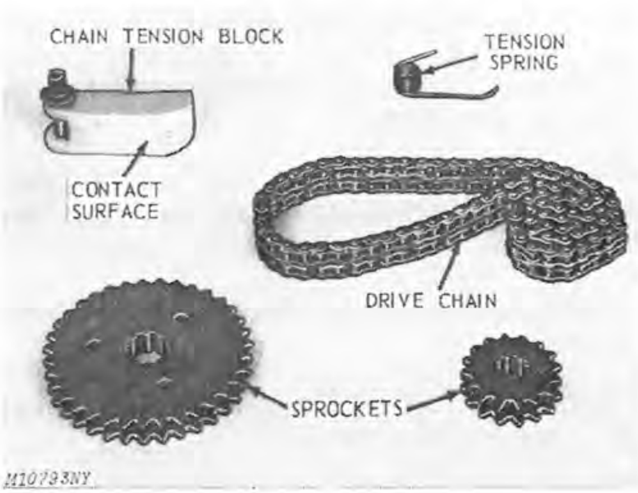


Fig. 11—Inspecting Drive Chain Components

Inspect drive chain, Fig. 11, for excessive wear. Replace if badly worn or broken. Drive chain is an endless chain and cannot be repaired.

Inspect sprocket teeth, Fig. 11, for wear. If a new drive chain is installed, replace sprockets also because a new chain will not properly match worn sprockets.

Rapid chain and sprocket wear could be caused by sprocket misalignment from improper assembly or from lack of lubrication.

Replace chain tension blocks, Fig. 11, if contact surfaces are worn deeply. Replace tension springs if cracked, broken, or pitted.

Inspecting Drive Shaft Assembly

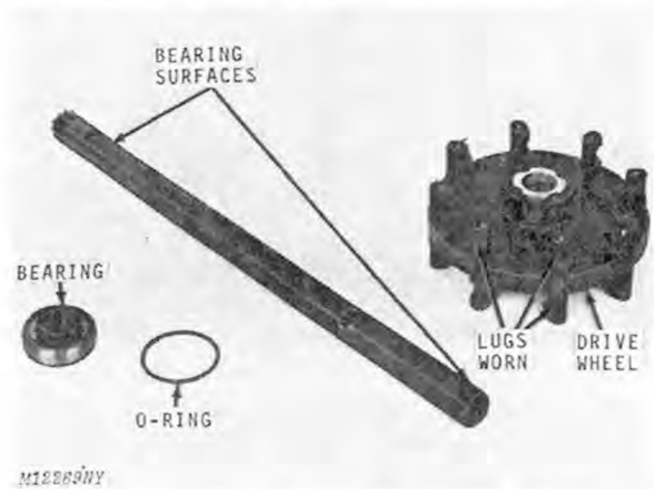


Fig. 12—Inspecting Drive Shaft Components

Inspect drive shaft bearing surfaces, Fig. 12, for evidence of bearings turning on shaft. Also inspect speedometer drive insert, Fig. 12, for tightness.

Inspect drive shaft bearings, Fig. 12, and replace if binding, worn, or noisy. Use a new O-ring on lower chain case bearing if crimped or damaged.

Inspect drive wheels and replace if lugs are worn down to metal center as shown, Fig. 12. Rapid wear of this type on the leading edge of the drive lugs indicates snowmobile was run without snow lubrication.

Wear on the trailing edge of the drive lugs is normal after many hours of regular operation.

Inspecting Chain Case

Inspect chain case, Fig. 13, for cracks, broken welds, or other damage that could cause chain and belt misalignment or oil leakage.

Install new rubber access hole plugs, Fig. 13, if damaged or not sealing properly. Oil leakage could result.

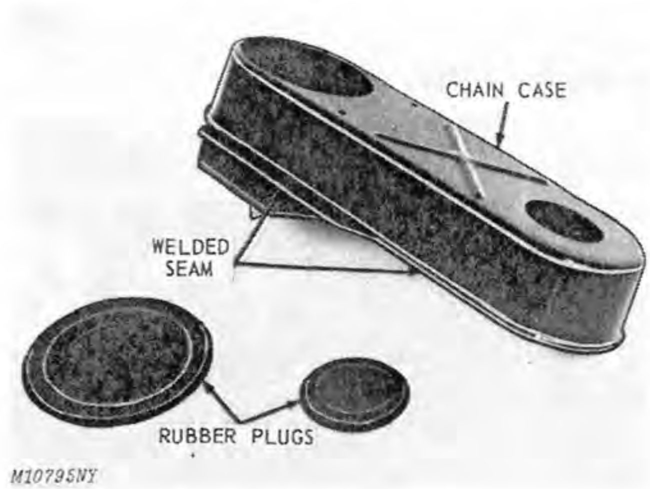


Fig. 13—Inspecting Chain Case

ASSEMBLY

Installing Chain Case

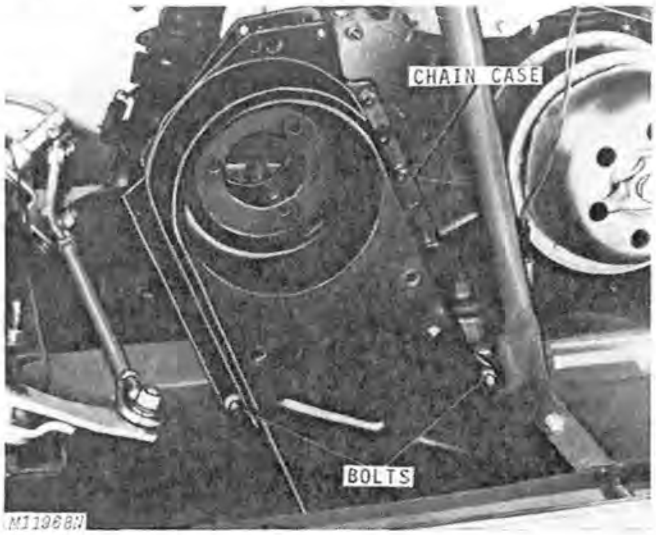


Fig. 14-Installing Chain Case

Using gasket sealer, install new gaskets on both sides of tunnel where left-hand drive shaft bearing mounts. See Figs. 1 and 2, pages 50-30-1 and 50-30-2, for location.

Install chain case in place and secure with two bolts, Fig. 14. **Do not** tighten bolts until lower bearing has been installed.

Installing Drive Shaft

Fig. 15-Assembling Drive Shaft

Install drive wheels and spacer on drive shaft as shown, Fig. 15.

IMPORTANT: Do not tighten bolts because drive wheel cracking could result. Tighten only until washers make contact.

NOTE: On Snowmobiles with slide suspension do not install bolt through drive wheels and shaft at this time.

Lubricate and install O-ring over lower chain case bearing, Fig. 15. Install bearing flangettes, bearings, and spacer on drive shaft.

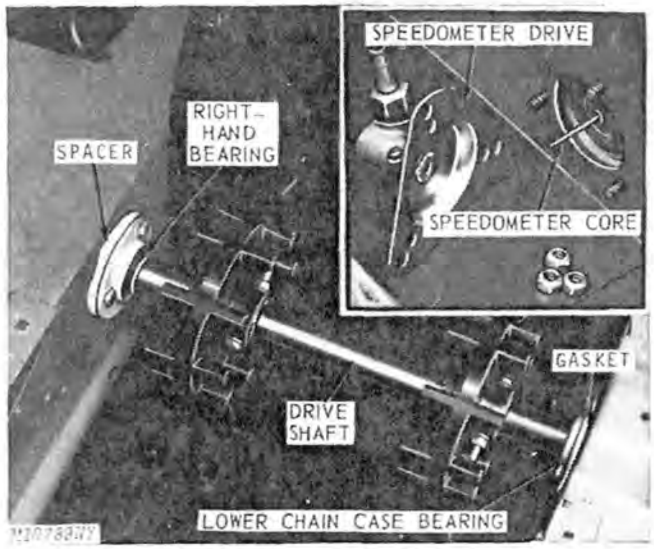


Fig. 16-Installing Drive Shaft

IMPORTANT: Locking flanges on bearings must face splined end of drive shaft as shown, Fig. 15, to obtain proper chain and sprocket alignment.

Place track in tunnel.

Place splined end of drive shaft in tunnel and drop other end of drive shaft down into position.

Secure lower chain case bearing flangettes to chain case with three cap screws, Fig. 16. Do not tighten until right-hand bearing is secured to tunnel.

IMPORTANT: Be certain O-ring is in correct position on bearing and between flangettes or oil leakage will result. Be certain gasket is in position between flangette and tunnel.

NOTE: On Snowmobiles with slide suspension, install bolt through drive wheels and shaft.

Insert short speedometer core into end of drive shaft (inset, Fig. 16). Bolt bearing flangettes, spacer, and speedometer drive to tunnel with three bolts, Fig. 16. Tighten all bolts and cap screws securely.

Tighten two bolts securing chain case to tunnel, Fig. 14.

Install rear idler assembly and adjust track tension. See Section 60 for details and adjustments.

Installing Lower Sprocket

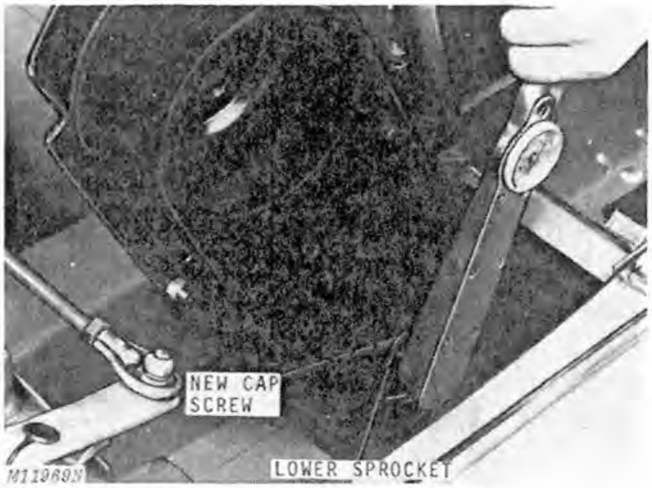


Fig. 17-Installing Lower Sprocket

Place spacer on drive shaft and install lower sprocket over drive shaft splines.

Install a new cap screw and washer and torque to 30 to 38 ft-lbs, Fig. 17. The cap screw has nylon locking material and can be tightened only once.

Installing Secondary Shaft and Brake

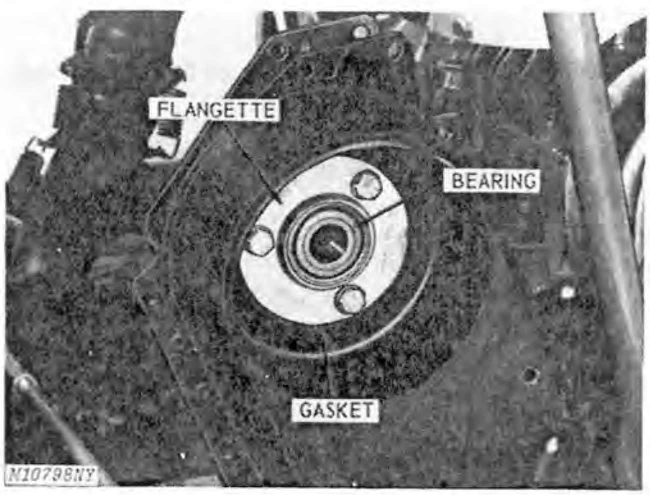


Fig. 18-Installing Upper Chain Case Bearing

Using gasket sealer, install a new gasket on chain case where upper bearing mounts, Fig. 18.

Lubricate and install O-ring around bearing. Install inner flangette, bearing with O-ring, and outer flangette and secure to chain case with three cap screws. **Do not** tighten.

IMPORTANT: Locking flange on bearing must face right-hand side of snowmobile to obtain proper chain alignment.

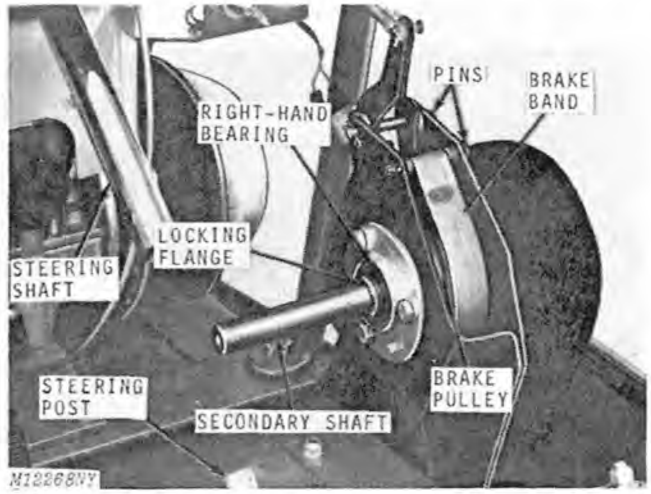


Fig. 19-Installing Secondary Shaft

Install brake band, with brake arm attached, around brake pulley.

Lower brake pulley and brake band into position in chain case with cupped side of brake pulley facing toward right-hand side of machine. See Figs. 1 and 2 on pages 50-30-1 and 50-30-2.

Install Woodruff key in secondary shaft and slide shaft through brake pulley and upper chain case bearing.

Install bearing flangettes and bearing. Secure with three cap screws, Fig. 19, but **do not** tighten.

IMPORTANT: Locking flange on bearing must face right-hand side of snowmobile as shown, Fig. 19, to obtain proper sheave alignment.

Adjust secondary shaft to make it perpendicular to chain case before tightening six cap screws securing bearings. Tighten cap screws securely.

Install brake arm and band assembly on chain case. Attach brake cable to brake arm. See Group 35 of this section for brake maintenance and adjustment.

Installing Drive Chain

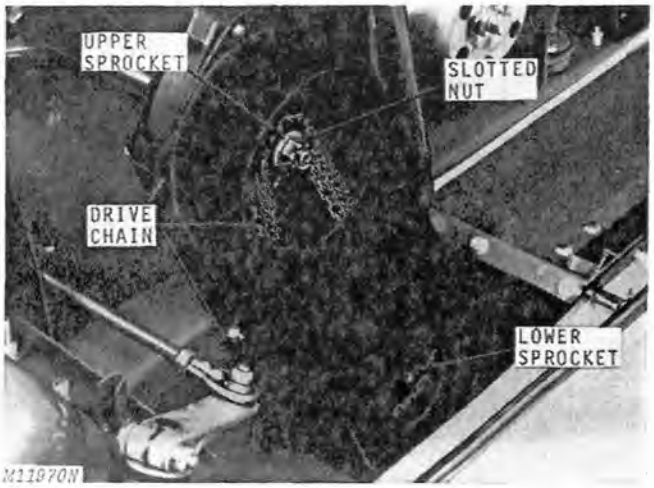


Fig. 20-Installing Drive Chain

Install spacer over secondary shaft inside chain case. Install drive chain around upper sprocket and place sprocket and chain into chain case. Work chain around lower sprocket and place upper sprocket in position on secondary shaft, Fig. 20.

Install washer and slotted nut, Fig. 20. Tighten nut until washer and nut are tight against shoulder on secondary shaft. Insert cotter pin.

IMPORTANT: The secondary shaft must always receive its final torque from the driven sheave retaining cap screw. If the drive chain is installed with the driven sheave in place, loosen driven sheave retaining cap screw before tightening slotted nut on other end of shaft; then torque driven sheave retaining cap screw to 20 ft-lbs.

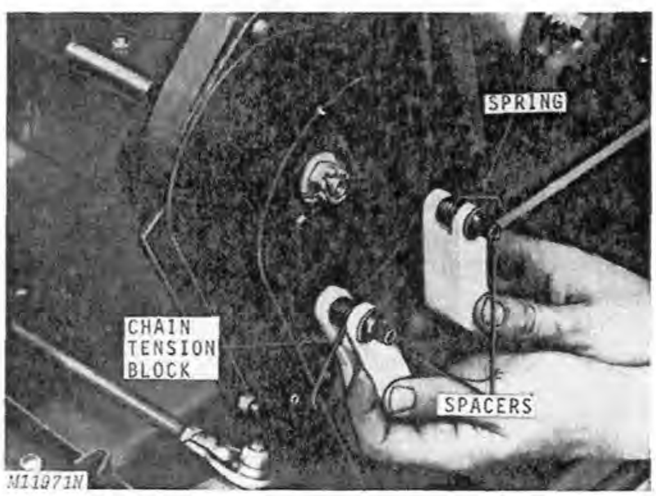


Fig. 21-Installing Chain Tension Blocks

Assemble tension block assemblies as shown, Fig. 21, and install in chain case. Install two retaining cap screws and torque to 90 to 110 in-lbs.

Installing Driven Sheave

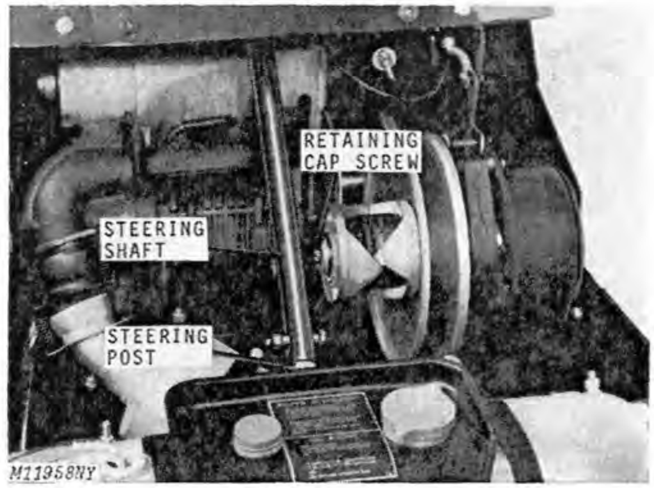


Fig. 22-Installing Driven Sheave

Install spacing washer as required over secondary shaft. Insert key in keyway on secondary shaft.

Slide driven sheave, Fig. 22, over secondary shaft. Install cap screw and two washers and torque to 20 ft-lbs.

Install drive belt. Attach steering shaft to steering post.

IMPORTANT: Pour 5 ounces of SAE 30 oil into the chain case and install rubber plugs.

Place a light film of oil on rubber plugs to make installation easier.

Group 35
BRAKE SYSTEM

GENERAL INFORMATION

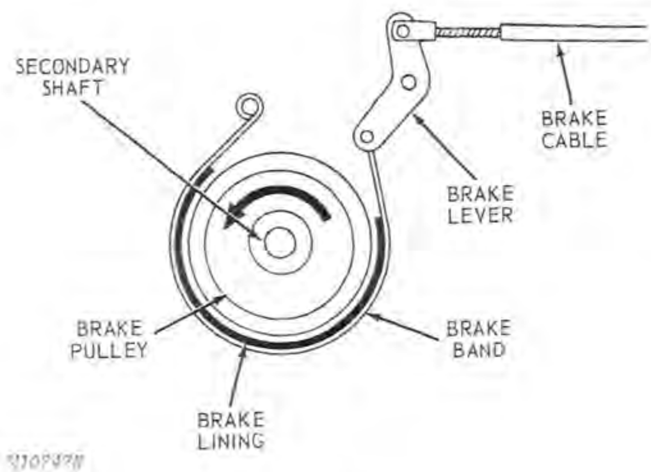


Fig. 1-Band Brake

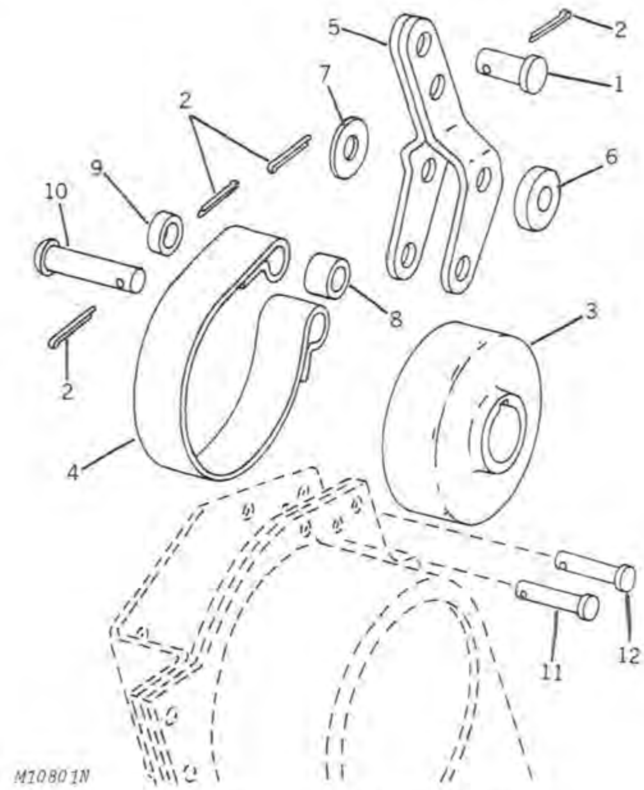
The band-type brake, Fig. 1, acts on a brake pulley which is mounted on the secondary shaft.

The brake has a self-energizing feature that gives smooth, positive braking with little effort. As the brake is actuated, the band tends to wrap itself around the pulley.

The brake band can be adjusted easily and can be replaced without disassembling the secondary shaft.

If both the secondary shaft and the brake band are to be serviced, replace the brake band after removing the secondary shaft. See Group 30 of this section.

DISASSEMBLY AND REPAIR



1—Cable Attaching Pin
2—Cotter Pin (4 used)
3—Brake Pulley
4—Brake Band With Lining
5—Brake Arm
6—Thick Washer
7—Thin Washer
8—Thick Spacer
9—Thin Spacer
10—Brake Arm Attaching Pin
11—Anchor Pin
12—Pivot Pin

Fig. 2-Exploded View of Brake System

Removing Brake Band

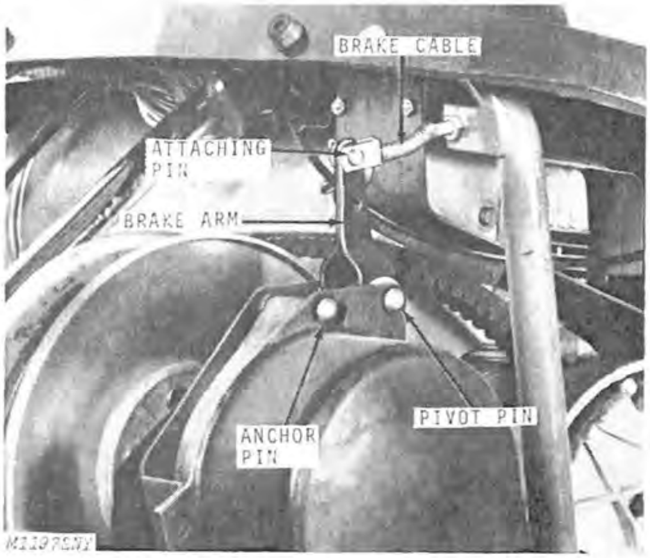


Fig. 3-Disconnecting Brake Band

Remove driven sheave belt guard.

Disconnect brake cable from brake arm, Fig. 3. Remove anchor pin and pivot pin. Do not lose spacers and washers.

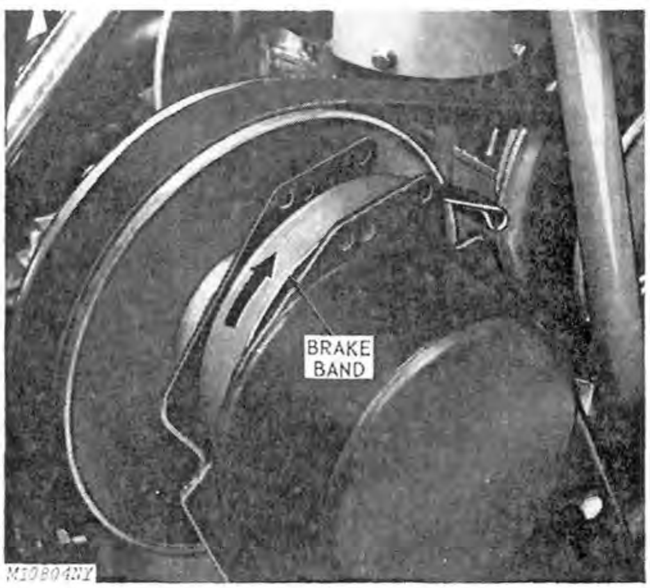


Fig. 4-Removing Brake Band

Rotate brake band forward slightly and remove pin connecting brake arm to brake band. Rotate band backward and out from under brake pulley, Fig. 4.

Inspecting Brake Components

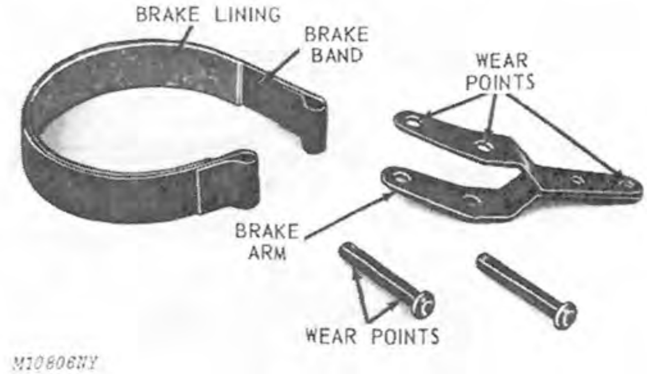


Fig. 5-Inspecting Brake Components

Replace brake band, Fig. 5, if lining is oil-contaminated, or if no more adjustment is left to tension brake properly. If lining is oil-contaminated, see Group 30 of this section for secondary shaft maintenance.

Inspect brake arm, anchor pin, and pivot pin, Fig. 5, for wear at bearing surfaces. Replace if worn excessively, because brake adjustment and safety of operation could be affected.

ASSEMBLY

Installing Brake Band

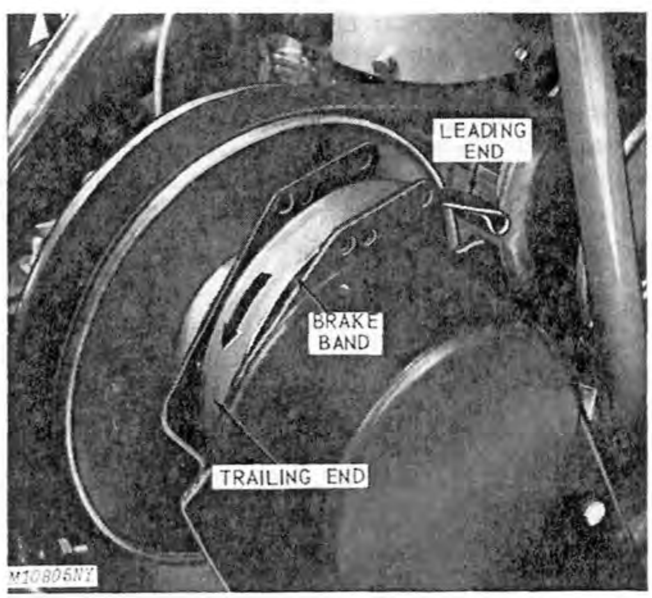


Fig. 6-Installing Brake Band

Rotate band forward and into position around brake pulley, Fig. 6. Trailing end of brake band must be inserted first.

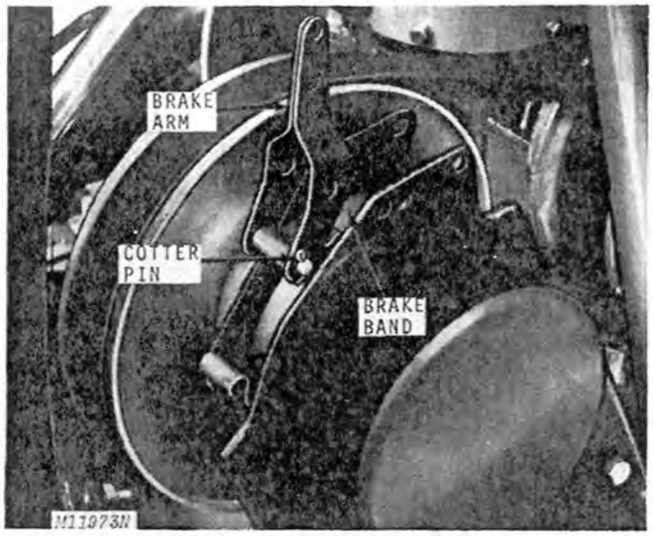


Fig. 7-Attaching Brake Arm

Rotate brake band forward sufficiently to allow room to attach brake arm to brake band, Fig. 7. Secure pin with cotter pin.

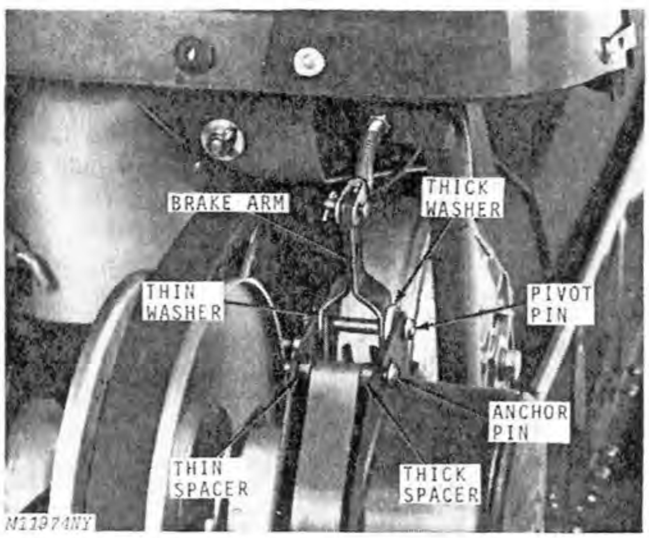


Fig. 8-Connecting Brake Band

Install anchor pin through forward hole in chain case, two spacers, and brake band, Fig. 8. Note different thicknesses of spacers. Thick spacer must be on chain case side of brake band, Fig. 8.

Install pivot pin through chain case, two washers, and brake arm. Note different thicknesses of washers. Thick washer must be on chain case side of brake arm, Fig. 8.

Connect brake cable to brake arm and reinstall driven sheave belt guard.

ADJUSTMENT

Adjusting Brake Band

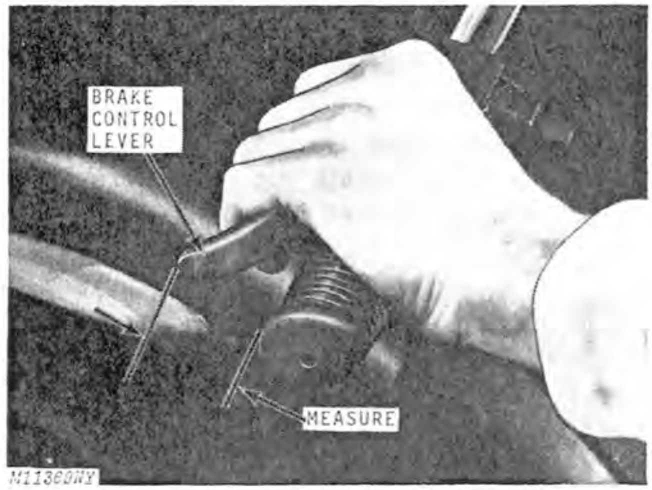


Fig. 9-Brake Control Properly Adjusted

When brake is properly adjusted, track should lock when brake control is depressed to within one inch of handgrip, Fig. 9.

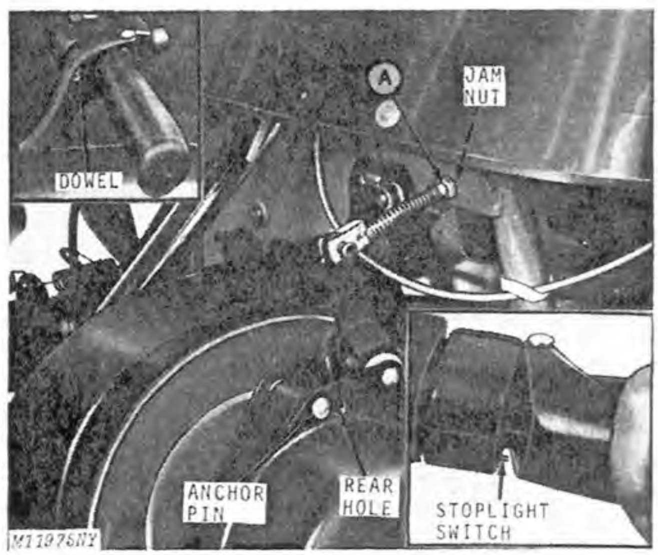


Fig. 10-Adjusting Brake Cable

To increase brake tension, back off nut "A", Fig. 10, several turns and tighten jam nut behind bracket. Reverse this procedure to decrease brake tension.

NOTE: Be certain dowel on end of brake cable is seated properly in recess of brake control lever (see upper inset), Fig. 10.

In time, adjustment will be used up on cable. When this occurs, loosen the cable adjustment and move the anchor pin to the rear hole. Readjust brake as explained previously. When the adjustment is used up with the pin in the rear hole, replace the brake lining, moving the anchor pin back to the front hole.

After adjusting brake, check operation of stoplight switch (see lower inset), Fig. 10. Check for a "frozen" switch if stoplight does not work.

Adjusting Brake Light Switch 400 and 500 Snowmobiles (Serial No. -11,000)

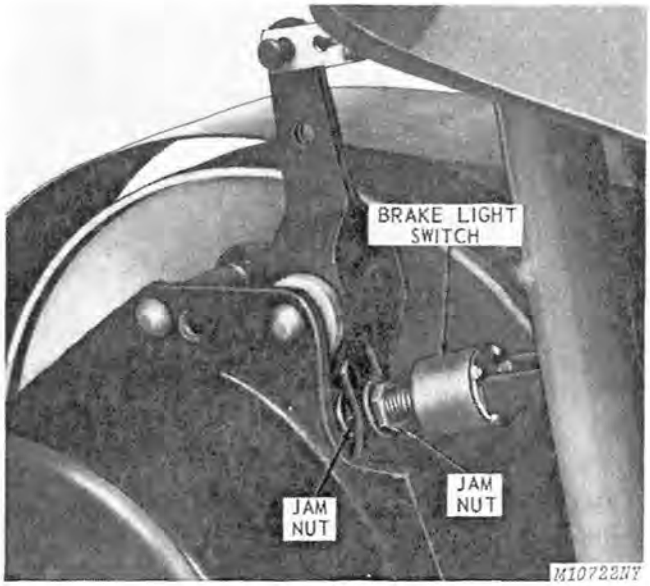


Fig. 11-Adjusting Brake Light Switch

Brake light switch adjustments are made with two jam nuts, Fig. 11. Loosen nuts and position switch so switch button is completely depressed when brake band is in a relaxed position. Tighten jam nuts securely.

Switch button should extend completely when brake is applied.

Group 40
SPECIFICATIONS

SPECIFICATIONS

Drive Belt Total Width:
- JDX4, 400 Snowmobiles (Serial No. -20,000) .... 1-3/16 in.
- 300 Snowmobile (Serial No. 20,001-) .... 1-3/16 in.
- 500, 600, JDX8 Snowmobiles (Serial No. 2,551-) .... 1-1/4 in.
- 400, JDX4 Special, JDX6 Snowmobiles (Serial No. 20,001-) .... 1-1/4 in.

Drive Belt Effective Length: (Outside Diameter)
- JDX4, 400 Snowmobiles (Serial No. -20,000) .... 42.938 in.
- 300 Snowmobile (Serial No. 20,001-) .... 42.938 in.
- 500, 600, JDX8 Snowmobiles (Serial No. 2,551-) .... 44.62 in.
- 400, JDX4 Special, JDX6 Snowmobiles (Serial No. 20,001-) .... 44.62 in.

Drive Sheave Parallel Offset:
- Snowmobiles with Salsbury Clutch .... 0.250 in.
- Snowmobiles with John Deere (Comet) Clutch .... 0.300 in.

Torque for Hardware

Location	Torque
Drive Sheave Roller Arm Pin Retaining Cap Screw (Salsbury Clutch)	60 to 85 in-lbs
Drive Sheave Ramp Plate Nut: (Salsbury Clutch)	
JDX4, 400 Snowmobiles (Serial No. -20,000)	125 ft-lbs
300 Snowmobile (Serial No. 20,001-)	125 ft-lbs
500, 600, JDX8 Snowmobile (Serial No. -20,000)	150 ft-lbs
Drive Sheave Retaining Cap Screw:	
780, 850, 910 Salsbury Drive Sheave	50 ft-lbs
John Deere (Comet) 100C Drive Sheave	50 ft-lbs
Driven Sheave Retaining Cap Screw (All Snowmobiles)	20 ft-lbs
Chain Case Lower Sprocket Retaining Cap Screw	30 to 38 ft-lbs
Chain Case Tension Block Cap Screws	90 to 110 in-lbs.
Steering Shaft Cap Screw - All Snowmobiles (Serial No. -20,000)	20 ft-lbs

Section 60
SUSPENSION
Group 5
GENERAL INFORMATION

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DESCRIPTION

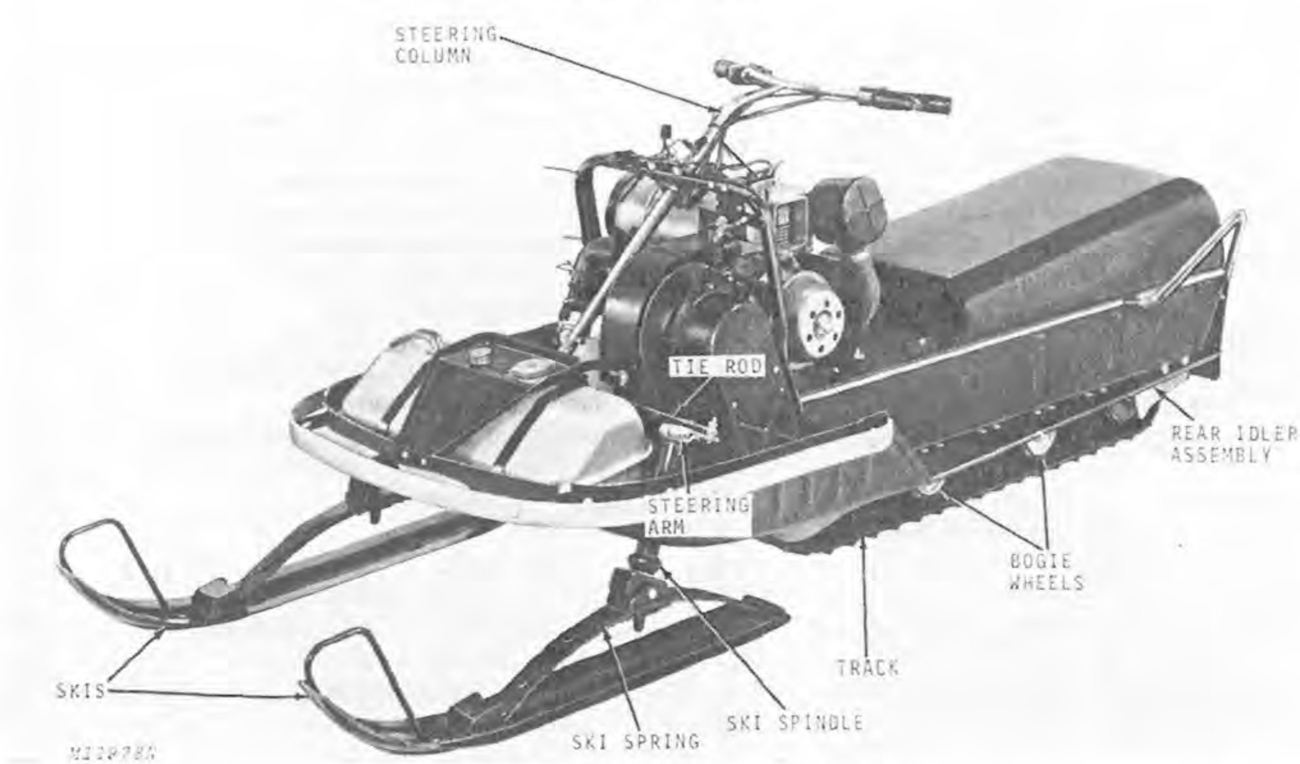


Fig. 1-Bogie Suspension Components

The bogie suspension system, Fig. 1, consists of the skis and steering mechanism, the track assembly (including the bogie system) and the rear idler assembly.

A trailing arm bogie suspension system provides a smoother ride than the traditional inverted "V" suspension system. The bogie assemblies are designed in such a way that they can not come loose from the tunnel, even if bent or damaged severely.

Litho in U.S.A.

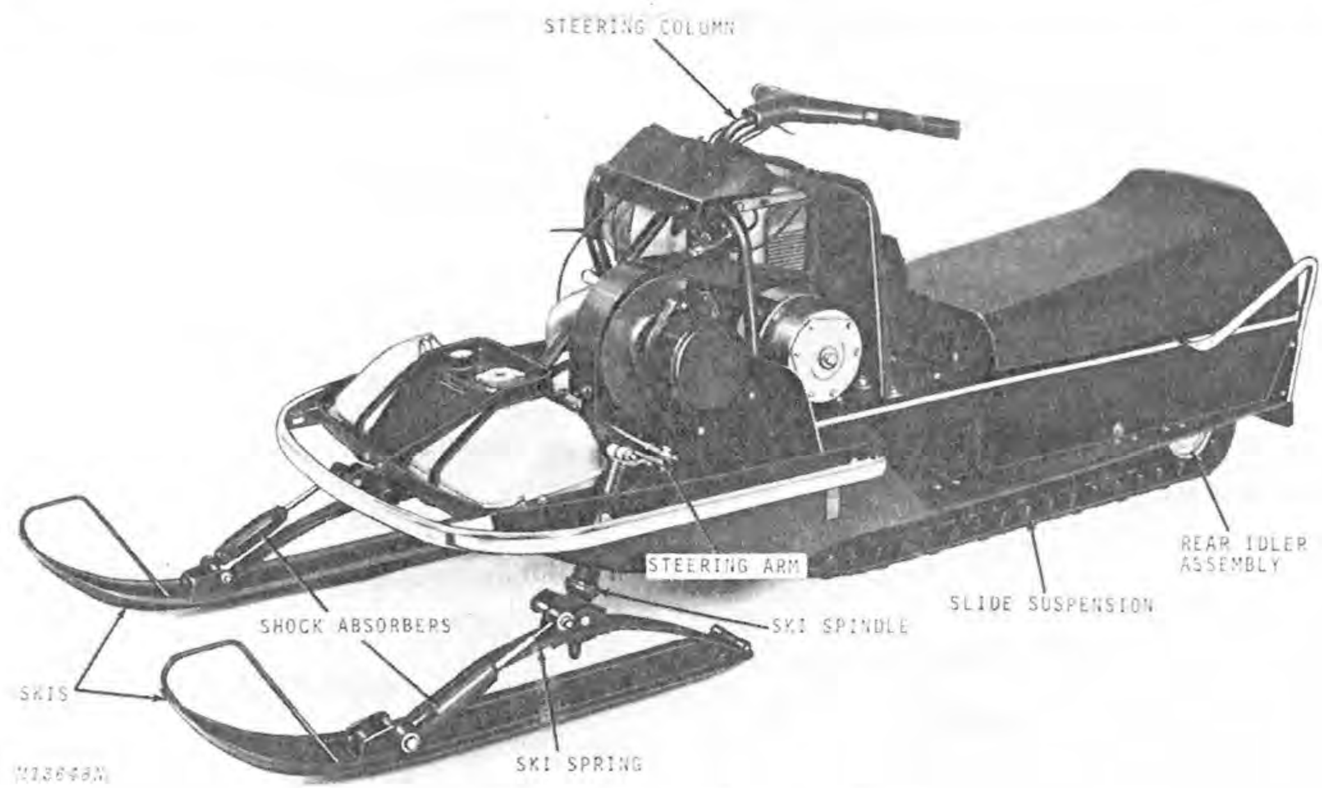


Fig. 2-Slide Suspension Components

The slide suspension system, Fig. 2, consists of the skis and steering mechanism, the track assembly (including the slide suspension) and the rear idler assembly. The system also incorporates a weight transfer adjustment, replaceable wear bars, adjustable suspension springs and hydraulic shock absorbers. The combination of these features and adjustments will give excellent ride and performance.

The rear idler shaft (bogie or slide) turns in rubber-mounted, sealed ball bearings. The idler assembly is easily adjusted to properly tension the track.

The molded polyurethane or rubber track has lugs on the inside surface of the track which engage with the drive wheels on the drive shaft for maximum efficiency.

The skis have replaceable wear rods. Ski springs are replaceable only as a complete set. Ski spindles and tie rods are designed to bend rather than break when subjected to severe shock loads, providing additional operator safety.

DIAGNOSING MALFUNCTIONS

Track Assembly

Track Edge Frayed

Track out of alignment.

Track Grooved On Inner Surface

Track run excessively tight.

Bogie wheel(s) frozen.

Rear idler shaft bearings frozen.

Track Drive Ratcheting

Track too loose.

Rear Idlers Turning on Shaft

Rear idler shaft bearings frozen.

Bogie Wheels Not Turning Freely

Bogie wheel bearing worn or damaged.

Bogie Assemblies Not Pivoting Freely

Bogie tube and axle bent excessively.

Skis and Steering

Loose Steering

Steering post bushing loose. (Serial No. -20,000).

Steering post or steering column cap screw loose. (Serial No. -20,000).

Tie rod ends loose.

Spindle bushings worn.

Spindle splines stripped.

Skis Not Turning Equally In Both Directions

Tie rods adjusted improperly.

Steering arms installed improperly.

Rapid Ski Wear

Skis out of alignment.

Wear rods worn out.

Spring wear plate worn out.

Group 10
BOGIE SUSPENSION

GENERAL INFORMATION

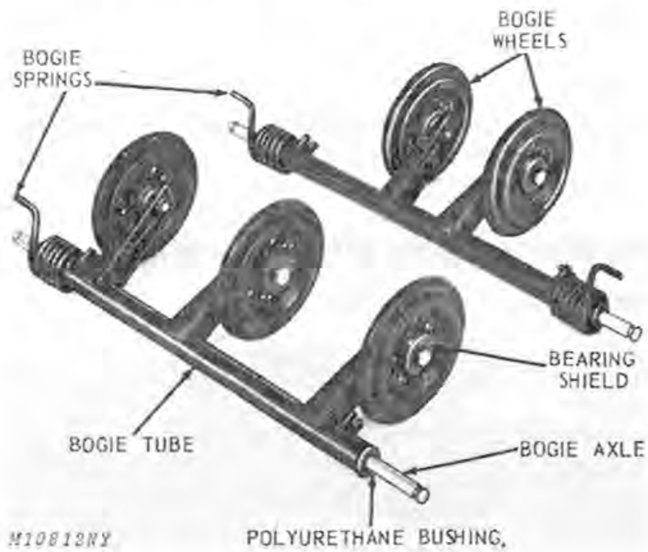


Fig. 1-Bogie System

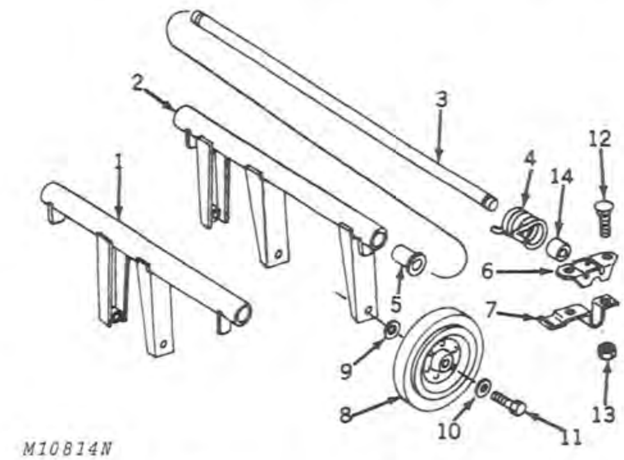
The trailing arm bogie system, Fig. 1, offers a smooth ride. Six independent bogie wheel assemblies are used; three 2-wheel and three 3-wheel.

The bogie wheels have sealed ball bearings that require no lubrication. The bogie arms pivot on the bogie axles which are supported by polyurethane bushings.

The bogie assemblies and springs are attached to the tunnel with clips (Serial No. -20,000), Fig. 2. A bogie rail is used beginning with Serial No. 20,001, Fig. 11. Attaching the bogie assemblies in this manner makes the units capable of sustaining severe shock and damage without coming loose or becoming inoperative.

See "Diagnosing Malfunctions" in Group 5 of this section.

DISASSEMBLY AND REPAIR



1—2-Arm Bogie Tube
2—3-Arm Bogie Tube
3—Bogie Axle
4—Bogie Spring
5—Bogie Axle Bushing
6—Bogie Axle Clip
7—Bogie Axle Clamp
8—Bogie Wheel
9—Spacing Washer
10—Washer
11—Cap Screw
12—Carriage Bolt
13—Lock Nut
14—Spacer

Fig. 2—Exploded View of Bogie System

Replacing Bogie Wheels

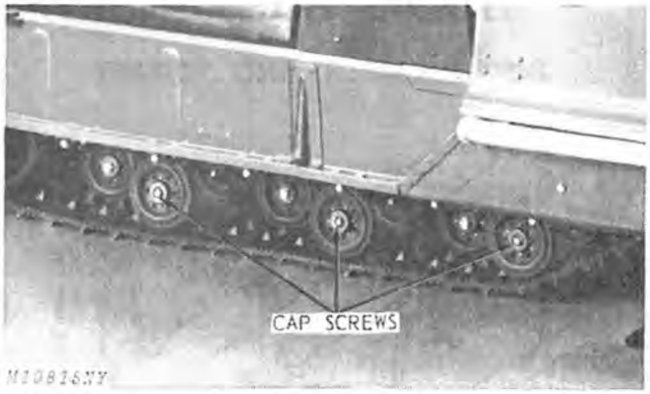


Fig. 3-Replacing Black Bogie Wheel

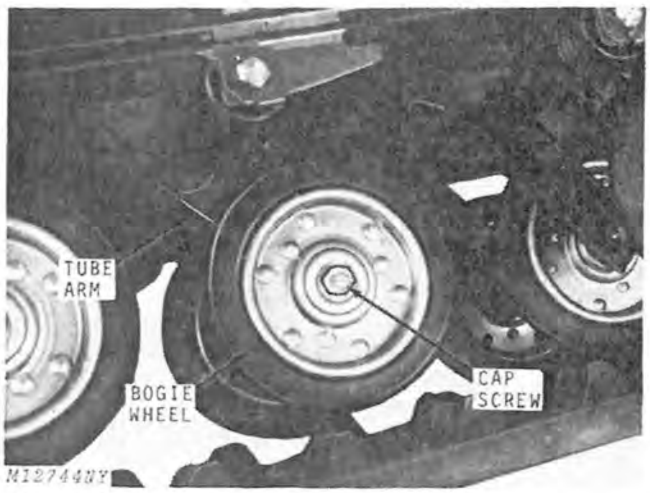


Fig. 4-Replacing Silver Bogie Wheel

Periodically inspect bogie wheels, Figs. 3 and 4, for freeness of operation. If a bogie wheel is stuck (won't turn) it must be replaced because track damage will result. Remove cap screw securing bogie wheel to tube arm and remove wheel.

When installing a NEW BLACK bogie wheel be certain spacing washer is between bogie wheel and bogie tube arm. Secure with cap screw and washer. Tighten cap screw firmly.

When installing a NEW SILVER bogie wheel be certain shoulder on wheel is next to the tube arm. Install and tighten cap screw.

IMPORTANT: If shoulder on wheel is not next to the tube arm, wheel will bind and not turn freely.

NOTE: The silver bogie wheel will substitute for the black bogie wheel. However, DO NOT use the spacing washer between the silver bogie wheel and the tube arm.

Removing Bogie Wheel Assemblies

(Serial No. -20,000)

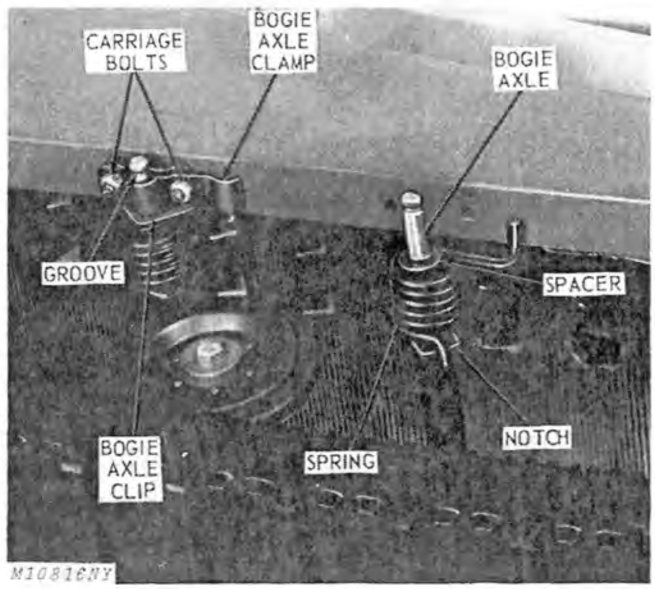


Fig. 5-Removing Bogie Wheel Assemblies

Block up rear of machine and relieve track tension by adjusting rear idler assembly forward.

Remove two carriage bolts from each side of bogie assembly to be removed, Fig. 5. Remove the bogie axle clip and clamp from each end of axle and remove bogie assembly.

Remove springs, spacers, axle, and axle bushings if replacement is required.

(Serial No. 20,001-)

Block up rear of machine and relieve track tension by adjusting rear idler assembly forward.

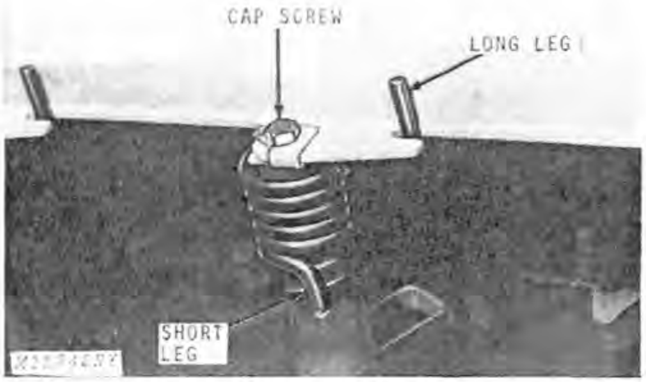


Fig. 6-Removing Bogie Wheel Assemblies

Straighten the locking tabs, Fig. 6, securing cap screws that hold the axle. Remove one cap screw. It may be necessary to hold the opposite cap screw to prevent axle rotation.

Pull bogie assembly down to clear the tunnel and off the axle far enough to permit use of locking pliers to hold the axle. Remove remaining cap screw.

INSPECTION

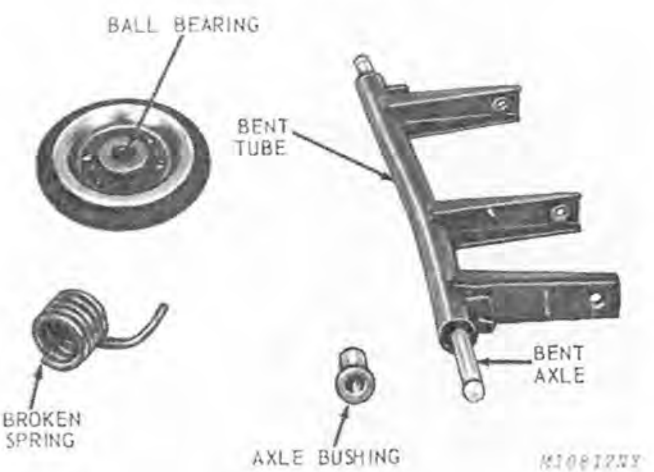


Fig. 7-Inspecting Bogie System Components

Inspect condition of bogie wheel ball bearings. Replace bogie wheel if it is excessively loose or does not turn freely.

Replace bogie springs if cracked or broken.

Replace bogie tubes if tube or arms are bent, Fig. 7. Replace axle if bent.

Replace axle bushings, Fig. 7, if worn or damaged.

Bent bogie assemblies are caused by hitting obstructions with the snowmobile.

NOTE: If bogie tube is bent slightly but is not interfering with bogie axle it need not be replaced, providing freeness of operation is maintained.

ASSEMBLY

Assembling Bogie Assemblies

Black Bogie Wheel Assembly

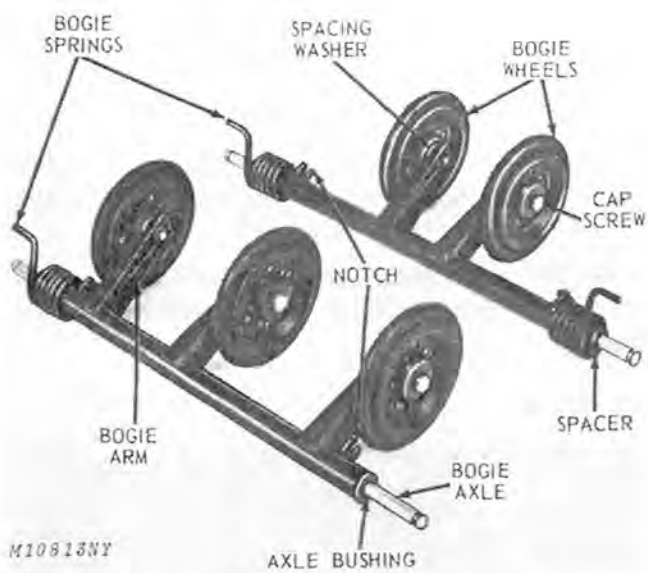


Fig. 8-Assembling Black Bogie Wheel Assembly

Bolt bogie wheels to bogie tube arms with cap screw and washer. Note spacing washer between each bogie wheel and bogie arm, Fig. 8. Tighten securely.

Place polyurethane bushing into both ends of bogie tube and install bogie axle, Fig. 8.

Install spacers and springs on bogie tube ends. Note the notch in the bogie tube to accept the short leg of the spring, Fig. 8.

NOTE: Bogie springs are not interchangeable between right and left-hand sides. Install as shown, Fig. 10, with long leg of spring toward back of machine.

Silver Bogie Wheel Assembly

NOTE: When assembling the silver bogie wheel assembly do not use a spacer between the wheel and the tube arm. Otherwise assembly is the same as for the black bogie wheel assembly.

Installing Bogie Assemblies

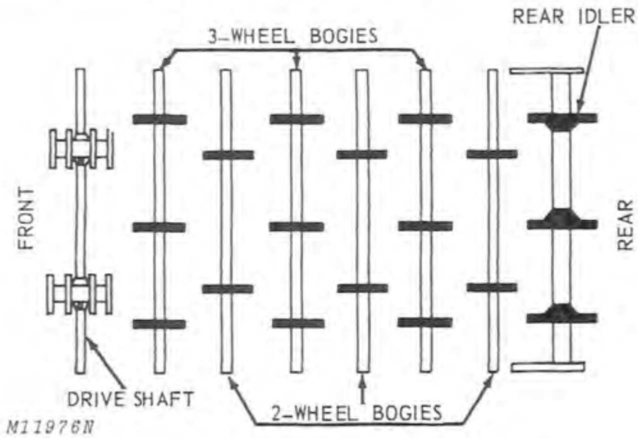


Fig. 9-Positioning Bogie Assemblies in Tunnel

Install bogie assemblies as shown, Fig. 9. Install front and rear bogies first working toward the middle. Install middle two assemblies last.

IMPORTANT: Bogie assemblies must be installed as shown, Fig. 9, or interference will result.

(Serial No. -20,000)

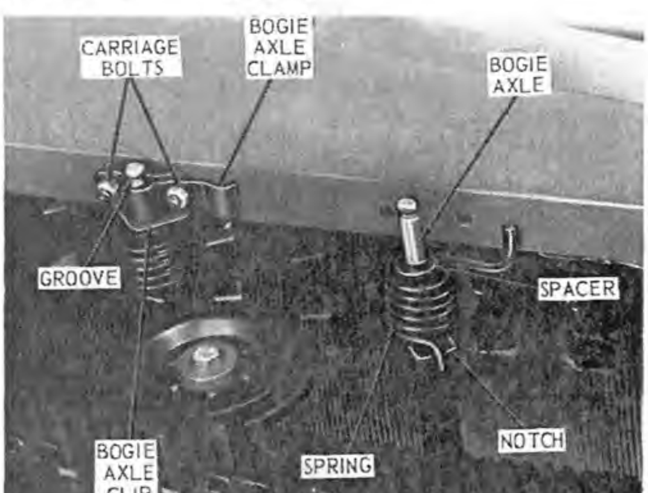


Fig. 10-Installing Bogie Assemblies

Secure each end of axle and spring to tunnel with clip, clamp and two carriage bolts, Fig. 10.

IMPORTANT: Bogie axle clip must be properly positioned in groove on each end of bogie axle. Check position of spring legs. Short leg must be retained in notch in bogie tube and long leg must be under clamp and toward rear of machine, Fig. 10.

(Serial No. 20,001-)

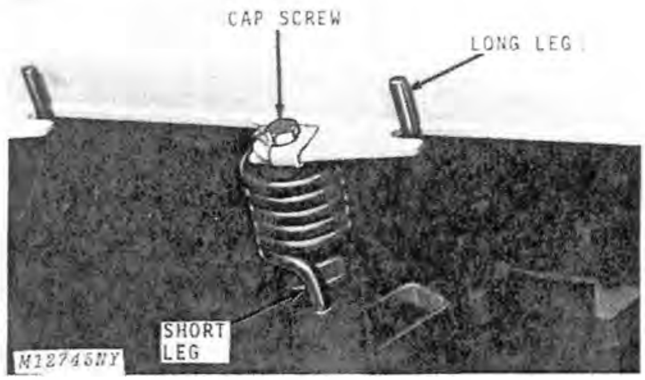


Fig. 11-Installing Bogie Axle Assemblies

Position the bogie assembly in the tunnel between the bogie rails with the long leg of spring toward the rear and in the notch on the bogie rail and the short leg of spring in the tube arm, Fig. 11.

Secure each end of bogie axle to the bogie rail with a locking plate and cap screw. Tighten each cap screw and bend one end of locking plate to secure the cap screw.

Tension and align track as instructed in Group 20 of this section.

Group 12
SLIDE SUSPENSION

GENERAL INFORMATION

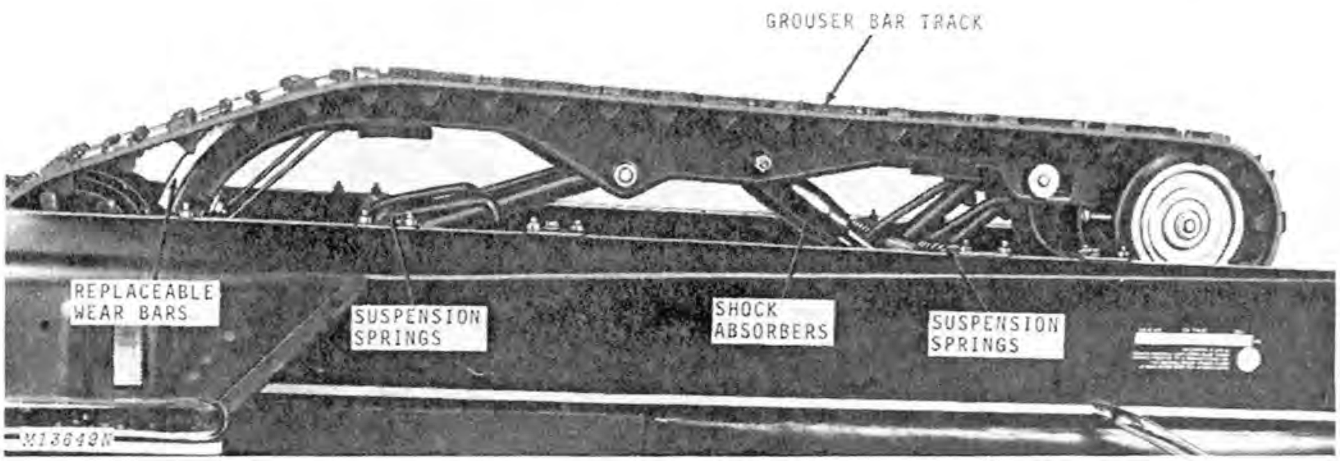


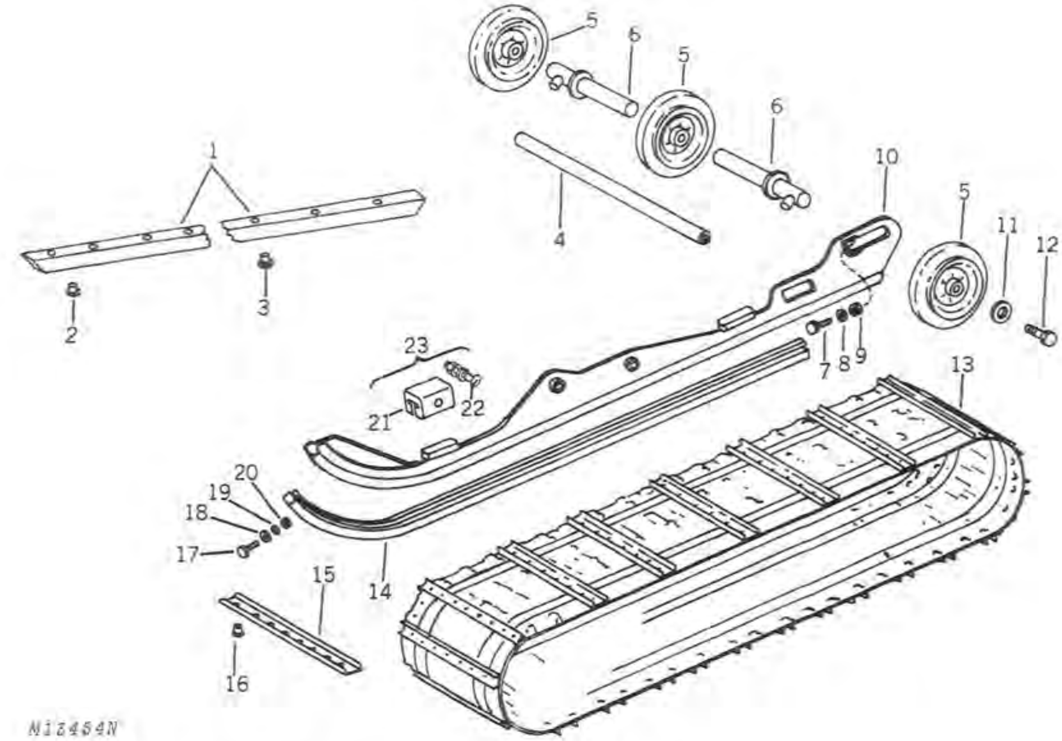
Fig. 1-Slide Suspension System

The slide suspension system, Fig. 1, consists of replaceable wear bars, shock absorbers, adjustable suspension springs, and a molded grouser bar track.

Replaceable polyethylene wear bars give low sliding friction with the track. Shock absorbers dampen the suspension and the adjustable springs permit varying the degree of ride from soft to firm.

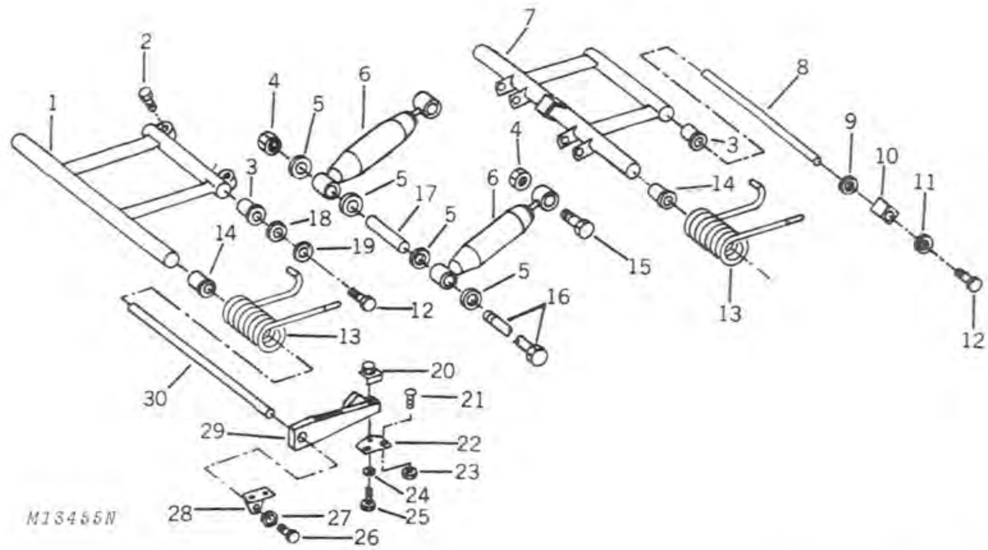
The molded rubber bars and lugs in the track give good traction on ice and during cornering. The molded-in-steel grouser bars permit the use of replaceable polyethylene wear bars on the slides and provide good traction for acceleration. The steel grouser bars are also replaceable.

DISASSEMBLY AND REPAIR



1—Tunnel Wear Strip
2—Pop Rivet
3—Semi Tubular Rivet
4—Rear Idler Axle
5—Rear Wheel
6—Wheel Spacer
7—Cap Screw
8—Nut
9—Lock Washer
10—Slide Rail
11—Washer
12—Cap Screw
13—Track
14—Slide Wear Bar
15—Grouser Bar
16—Steel Pop Rivet
17—Cap Screw
18—Washer
19—Washer
20—Lock Nut

Fig. 2-Exploded View of Rear Idler, Track and Slide Rails



1—Front Pivot
2—Locking Bolt
3—Bearing
4—Lock Nut
5—Washer
6—Shock Absorber
7—Rear Pivot
8—Pivot Shaft
9—Washer
10—Rear Slip Bearing
11—Washer
12—Cap Screw
13—Pivot Spring
14—Bearing
15—Cap Screw
16—Shock Absorber Shaft
17—Spacer
18—Washer
19—Washer
20—Adjusting Arm Clip
21—Round Head Bolt
22—Adjusting Plate
23—Lock Nut
24—Washer
25—Cap Screw
26—Locking Bolt
27—Washer
28—Front Reinforcement Bracket
29—Adjusting Arm
30—Pivot Shaft

Fig. 3-Exploded View of Slide Rail Pivots and Springs

Removing Slide Suspension

IMPORTANT: Siphon all fuel from the fuel tank and use a syringe to remove all oil from the chain case.

Use convenience tool JDST-24, Snowmobile Lift and Repair Stand. Raise and rotate the machine to provide easy access to the slide suspension.

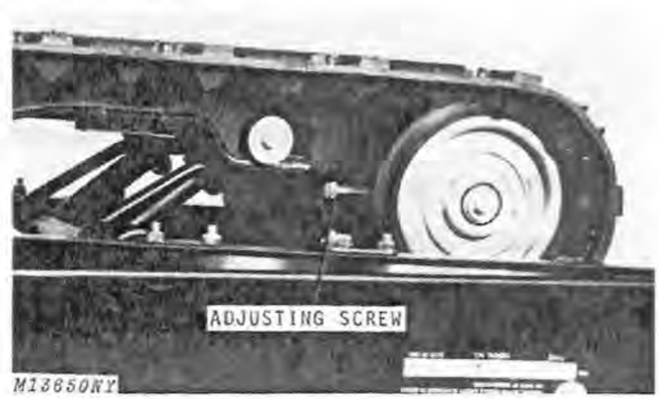


Fig. 4-Track Adjusting Screws

Back out adjusting screws, Fig. 4, to relieve track tension.

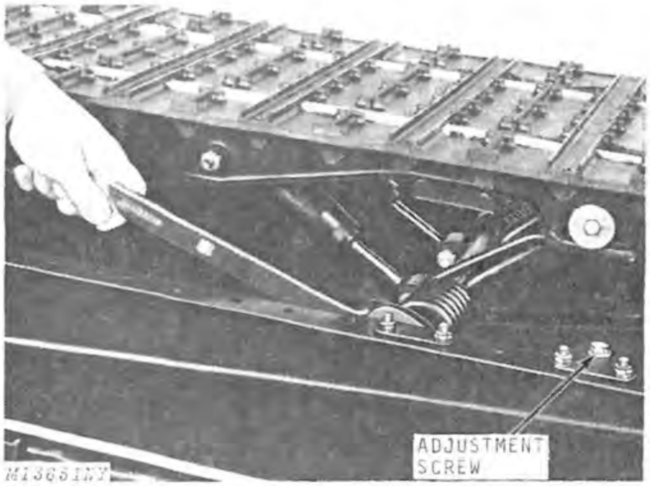


Fig. 5-Removing Spring Adjusting Screws

Use a large 1-1/4-inch wrench to relieve spring tension, Fig. 5, and remove four adjustment screws, (two on each side).

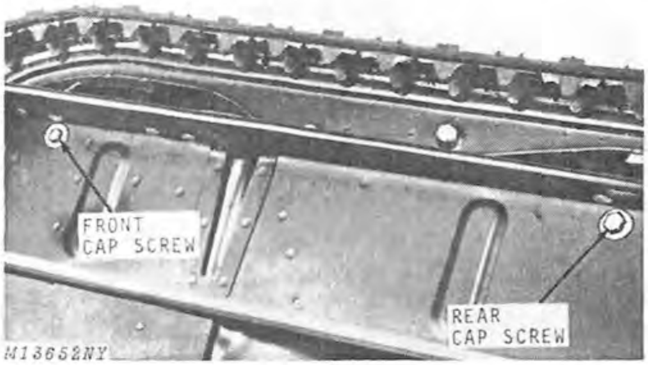


Fig. 6-Cap Screws Securing Suspension to Tunnel

Remove four cap screws securing suspension to tunnel, Fig. 6, and remove suspension.

Replacing Tunnel Wear Bars

Remove windshield and console. Console must be removed to allow access to front rivets on tunnel wear bars.

The polyethylene tunnel wear bars prevent the steel grouser bars from damaging the tunnel.

Fig. 7-Tunnel Wear Bars

Remove the suspension. Lay the track over the front of the machine to expose the tunnel wear bars, Fig. 7. Remove two cap screws securing seat and remove seat.

Chisel off the old rivets from the top or seat side.

Install new wear bars using pop-rivets in the front three holes and semi-tubular rivets in the remaining four holes.

NOTE: Install all rivets from the wear bar side.

Install suspension, seat, console and windshield.

Replacing Slide Suspension Wear Bars

Remove the suspension.

Remove retaining nut and bolt, Fig. 8, securing front of wear bar to suspension.

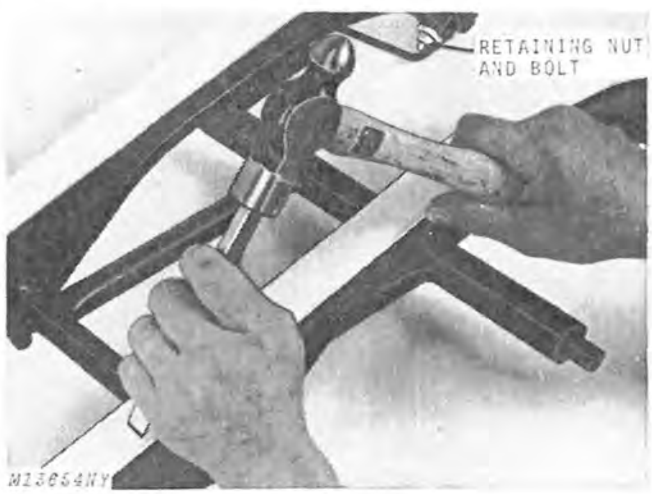


Fig. 8-Removing Slide Rail Wear Bar

Using a chisel and hammer, as shown in Fig. 8, drive the wear bar to the rear to remove it.

NOTE: In some cases the wear bars are difficult to remove because the opening in the rail is too narrow.

Use the following method:

1. Drill a 3/8-inch diameter hole in the center of the wear bar, 18 inches (45.7 cm) from the rear of the bar. This hole should be 3/4-inch (1.9 cm) deep.

NOTE: Drill carefully so that drill bit does not contact the metal rail.

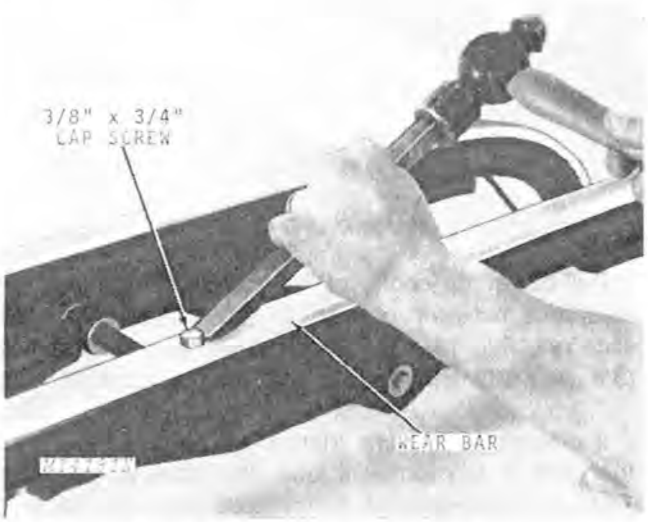


Fig. 9-Removing Slide Rail Wear Bar

2. Install a 3/8 x 3/4-inch cap screw and use a chisel or steel bar to drive wear bar out rear, Fig. 9.

3. Check the width of the opening in the rail. It should be 0.44 to 0.50-inch (11.1 to 12.7 mm) in width. If the measurement is less, carefully pry open the rail to the correct measurement before installing a new wear bar.

Lubricate rail with grease. Install new wear bar from the rear, and use a soft mallet to drive it into place. Do not use a chisel for installation. Install retaining bolt and nut to secure wear bar.

Replacing Wear Blocks

NOTE: The suspension need not be removed to replace wear blocks.

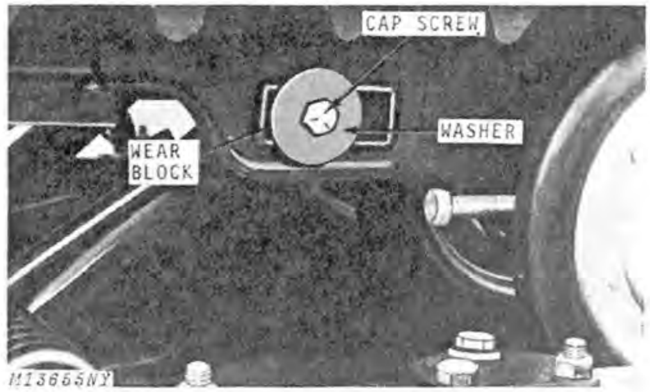


Fig. 10-Replacing Rear Wear Blocks

Remove cap screw, washer and wear block from each end of lower pivot shaft, Fig. 10.

Install new wear block. Install cap screw and washer. Tighten cap screw securely.

Replacing Idler Wheels

Remove suspension.

Remove cap screw and washer from one side of idler axle, Fig. 11.

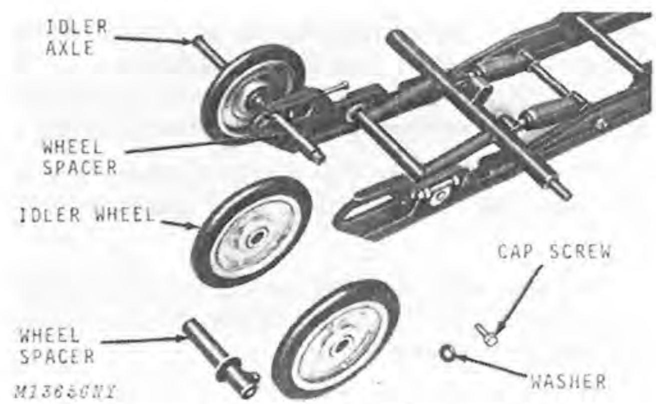


Fig. 11-Removing Rear Idler Axle, Wheels and Spacers

Drive axle out the other side and remove idler wheels and wheel spacers, Fig. 11.

To reassemble; install axle through one rear idler wheel and one spacer, center idler wheel, spacer and third idler wheel. Use washer and tighten cap screw to secure axle. Use Loctite on cap screw.

INSTALLING SLIDE SUSPENSION

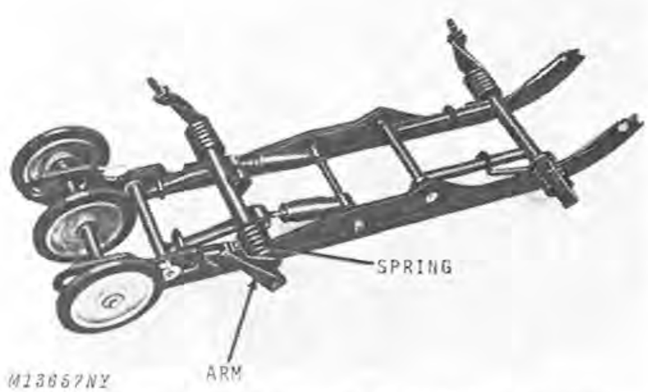


Fig. 12-Arms and Springs Installed on Slide Suspension

Assemble springs and arms to the slide suspension as shown in Fig. 12.

Install suspension with arms and springs inside track into place in tunnel. Install front two cap screws and then rear two cap screws, Fig. 6. Tighten all four cap screws securely.

NOTE: It is important to keep these four screws tight. Advise customer to check them periodically and tighten if necessary.

Use a large 1-1/4-inch wrench over the end of the spring arm, Fig. 5. Press down on wrench to pivot spring arm to allow installation of spring adjustment screw and special nut. Turn adjustment screw through nut until screw is just flush with nut. Repeat procedure on remaining three adjustment screws.

NOTE: Adjust these four screws to give a firm or soft ride after the track has been adjusted, page 12-7.

Turn both track adjusting screws in until the track is fairly tight, Fig. 4. DO NOT tighten the jam nuts on the adjusting screws.

Remove snowmobile from convenience tool JDST-24, Snowmobile Lift and Repair Stand.

Install 5 ounces (150 ml) of SAE-30 oil in chain case and refill fuel tank with proper fuel-oil mixture.

ADJUSTING TRACK TENSION

Tip the snowmobile onto its left side.

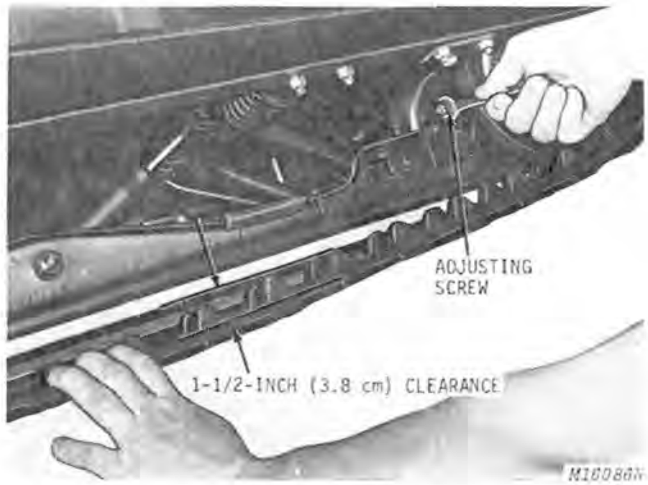


Fig. 13-Adjusting Track Tension

Pull out at the center of the track and measure the clearance between one of the grouser bars and the slide rail, Fig. 13. Clearance should be 1-1/2 inches (3.8 cm) with a moderate pull on the track.

If clearance is more than 1-1/2 inches (3.8 cm), the track is too loose; if less, the track is too tight. Turn adjusting screw in to increase track tension and out to decrease track tension. When adjustment is correct, tighten jam nut.

Tip the snowmobile onto its right side and repeat the track adjustment.

NOTE: Measure the adjustment screw on each side from the head of the screw to the jam nut. Both sides must be adjusted equally.

ADJUSTING SUSPENSION SPRINGS

Turning adjusting screws in (clockwise) gives a firm ride; turning adjusting screws out (counter-clockwise) gives a soft ride. Adjust screws equally, side-to-side.

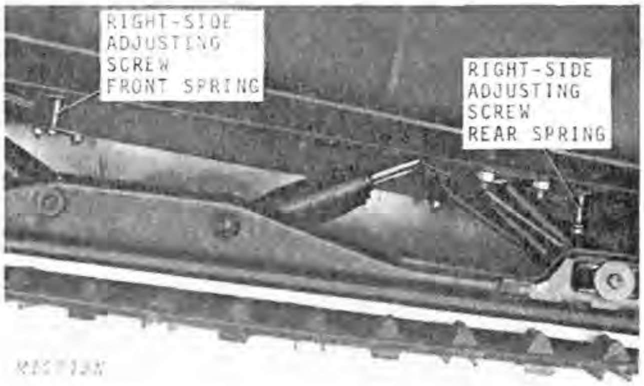


Fig. 14-Suspension Spring Adjusting Screws

IMPORTANT: Never turn adjusting screws, Fig. 14, all the way out. At least two threads on each screw must protrude through its respective adjusting nut.

NOTE: For the smoothest ride, leave the front adjusting screws loose with two threads protruding through the nuts. Tighten rear screws sufficiently to prevent suspension from "bottoming" on all but the severest bumps.

A firm setting should be used if a passenger is riding with the operator.

ADJUSTING STEERING RESPONSE (SKI LIFT)

NOTE: All snowmobiles with slide suspension come from the factory adjusted for maximum steering response on the skis.

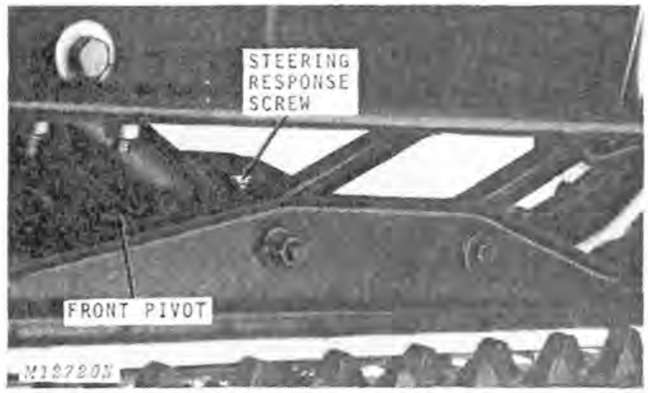


Fig. 15-Steering Response Adjusting Screws

Adjusting the steering response screws, Fig. 15, (one on each side of the front pivot bracket) transfers weight to or from the rear of the track, allowing the snowmobile to ride lighter or heavier on the skis.

Adjust as follows:

1. Turning the screws out decreases steering response and gives lift to the skis.

2. Turning the screws in increases steering response and decreases lift on the skis.

3. Adjust screws equally.

IMPORTANT: Never back screws out any further than "flush" with the weld nut.

CAUTION: When steering response screws are backed out the maximum allowable distance, sudden starts will lift the skis completely off the snow. Inform the operator to avoid this type of start because of lack of steering and the possibility of injury to the operator, passenger or both.

Group 15
REAR IDLER ASSEMBLY AND HEAVY-DUTY SUSPENSION KIT

GENERAL INFORMATION

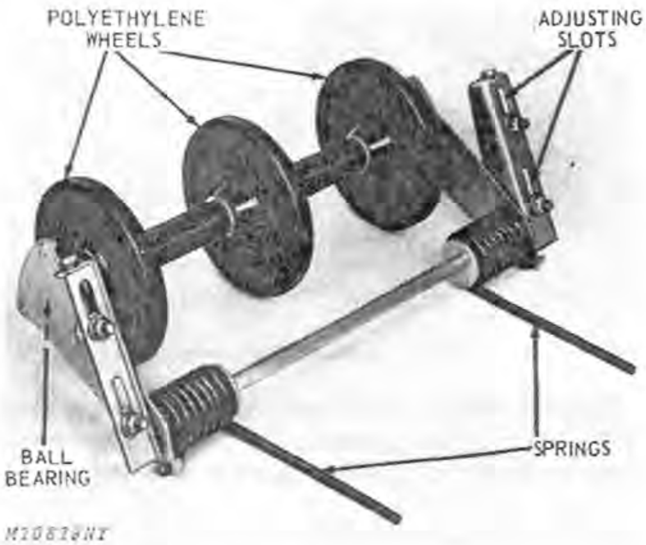


Fig. 1-Rear Idler Assembly

The rear idler shaft, Fig. 1, has three polyethylene wheels and is supported on each end by a rubber-mounted ball bearing.

The rear idler assembly, Fig. 2, is cushioned by two large springs and is adjustable to compensate for track stretching.

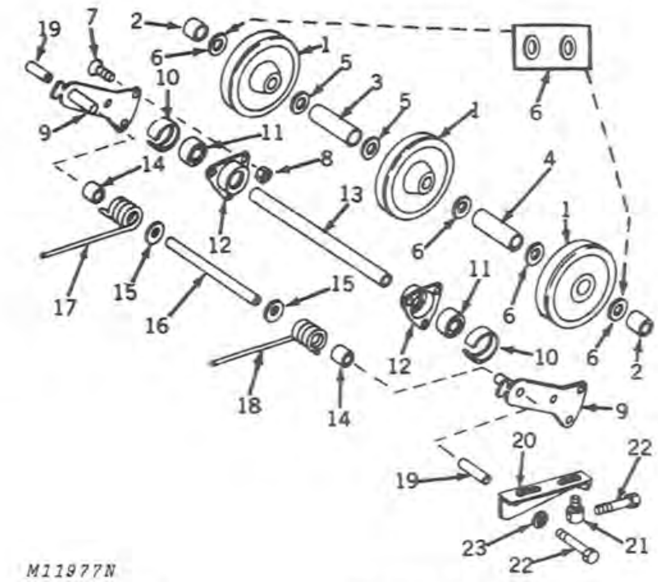
See "Diagnosing Malfunctions" in Group 5 of this section.

NOTE: The rear idler wheel spacing has been changed on the following snowmobiles:

JDX4 (Serial No. 9304-20000)
400 (Serial No. 15834-)
500 (Serial No. 14183-)
JDX8 (Serial No. 7996-20000)

Refer to Fig. 2. Spacers (3 and 4) have been shortened 0.15 inch allowing both outside idler

DISASSEMBLY AND REPAIR



1—Idler Wheel
2—Spacer
3—Long Spacer
4—Short Spacer
5—Spring Washer
6—Washer
7—Countersunk Screw
8—Lock Nut
9—Pivot Arm
10—Bearing Retainer
11—Ball Bearing
12—Bearing Flange
13—Idler Shaft
14—Spring Spacer
15—Large Washer
16—Pivot Rod
17—Idler Spring (L.H.)
18—Idler Spring (R.H.)
19—Pivot Arm Spacer
20—Adjusting Bracket
21—Trunnion
22—Cap Screw
23—Lock Washer

Fig. 2-Exploded View of Rear Idler Assembly

wheels to move in toward the center of the snowmobile. Two additional 0.075-inch washers (6) have been added on the outside of each outer idler wheel to compensate for the 0.15 inch removed from the spacers.

Be sure to use the correct spacers and washers when repairing rear idler assemblies.

Removing Rear Idler Assembly

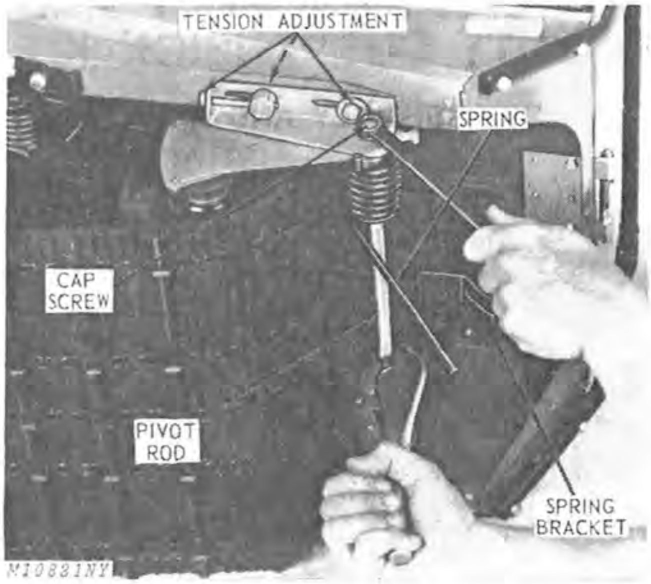


Fig. 3-Removing Rear Idler Assembly

Loosen track tension by adjusting rear idler assembly forward. Unhook the long leg of the two large springs from the spring brackets underneath the tunnel, Fig. 3.

Clamp a Vise-Grip to the pivot rod and remove cap screw from each end of pivot rod, Fig. 3. Remove springs, spacers and washers. Remove rear idler assembly from inside track.

Disassembling Rear Idler Assembly

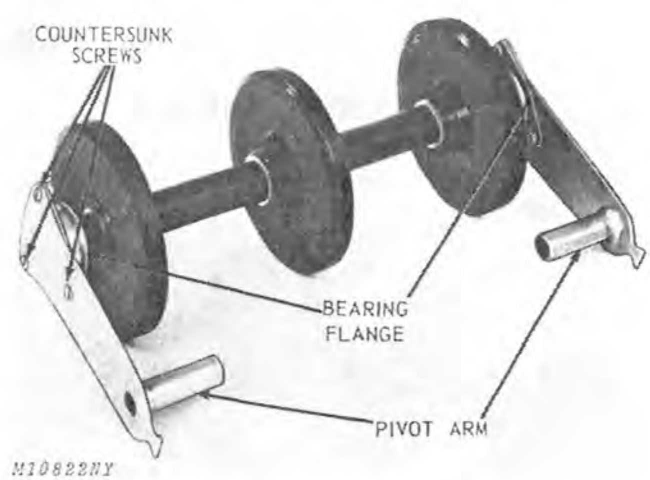


Fig. 4-Removing Pivot Arms

Remove three countersunk screws securing each pivot arm to bearing flanges, Fig. 4. Remove rubber bearing retainer strips from around each bearing.

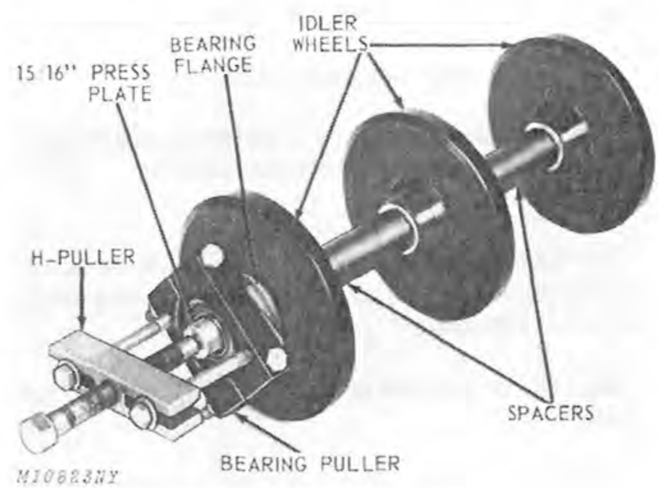


Fig. 5-Removing Outer Bearings

Slide bearing flange toward idler wheel as far as possible. Clamp special bearing puller around bearing with puller lip behind bearing, Fig. 5. See "Special Tools", Section 70.

Install an H-puller with 15/16 inch-press plate on bearing puller and pull bearing off shaft, Fig. 5. Remove bearing flange, spacer and washer. Repeat procedure for other bearing.

Slide or press three idler wheels, two spacers and washers off idler shaft, Fig. 5.

INSPECTION

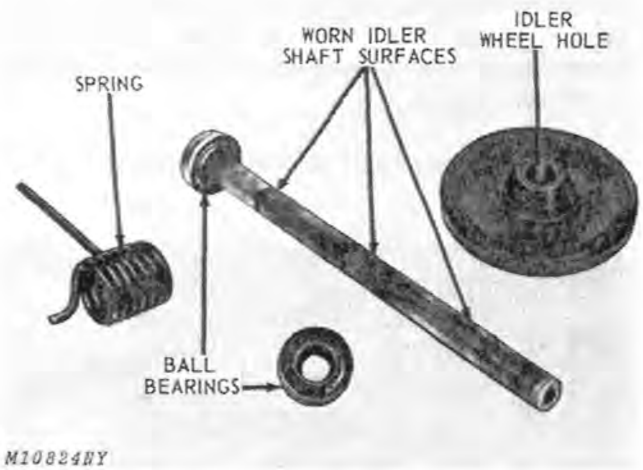


Fig. 6-Inspecting Rear Idler Components

Inspect the two ball bearings, Fig. 6, for freeness of operation. Replace if stuck or excessively loose and noisy. Ball bearings must be a tight press fit onto shaft. Replace shaft if loose.

Operating the snowmobile in dirt can cause the bearings to freeze which forces the idler wheels to turn on the shaft. Inspect the shaft and idler wheel holes, Fig. 6, for evidence of this condition. Idler wheels must be a snug fit over idler shaft. Replace parts as necessary.

Inspect springs, Fig. 6, and replace if broken, cracked or damaged.

Inspect pivot arms and adjusting brackets mounted on tunnel. Replace if worn, bent or damaged.

ASSEMBLY

Assembling Rear Idler Assembly

NOTE: The rear idler wheel spacing has been changed on the following snowmobiles:

JDX4 (Serial No. 9304-20000)
400 (Serial No. 15834-)
500 (Serial No. 14183-)
JDX8 (Serial No. 7996-20000)

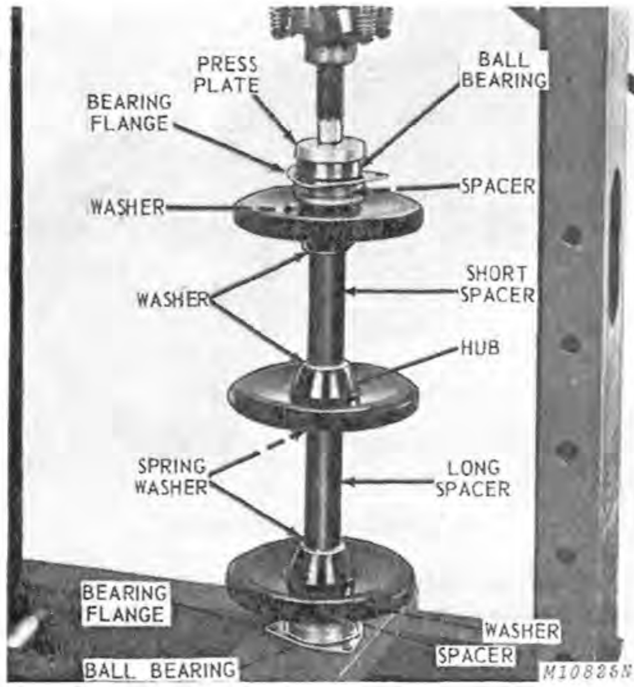


Fig. 7-Pressing Bearings onto Idler Shaft

Refer to Fig. 2, page 60-15-1. Spacers (3 and 4) have been shortened 0.15 inch allowing both outside idler wheels to move in toward the center of the snowmobile. Two additional 0.075-inch washers (6) have been added on the outside of each outer idler wheel to compensate for the 0.15 inch removed from the spacers.

Be sure to use the correct spacers and washers when repairing rear idler assemblies.

Assemble idler wheels, spacers, washers, bearing flanges and bearings to idler shaft as shown, Fig. 7. Apply Loctite to ball bearing inner races.

IMPORTANT: Short spacer must be on side of middle idler wheel with extended hub, Fig. 7. This will properly "center" middle idler wheel.

Install spring washers on each side of long spacer. Install washers on each side of short spacer and on outside of each idler wheel, Fig. 7. Install a spacer on outside of each outer idler wheel, next to washer.

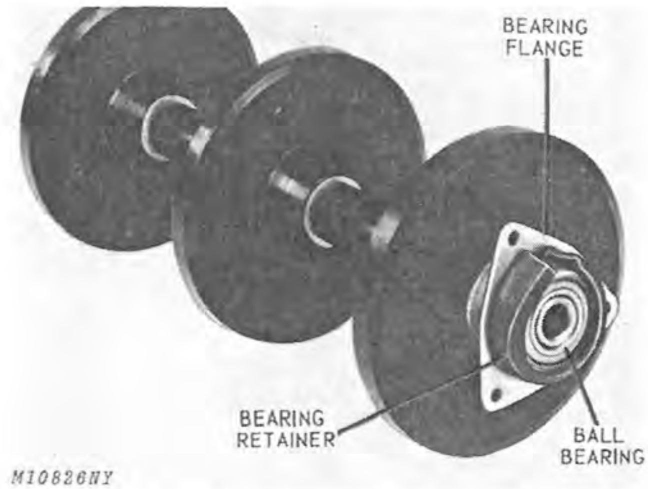


Fig. 8-Installing Bearing Retainers

Place assembled unit into press, Fig. 7, and press ball bearings onto idler shaft until **flush** with ends of shaft.

Coat outer surface of rubber bearing retainer, Fig. 8, with liquid detergent to make it slippery. Wrap bearing retainer around bearing and pull bearing flange over retainer and bearing.

Installing Rear Idler Assembly

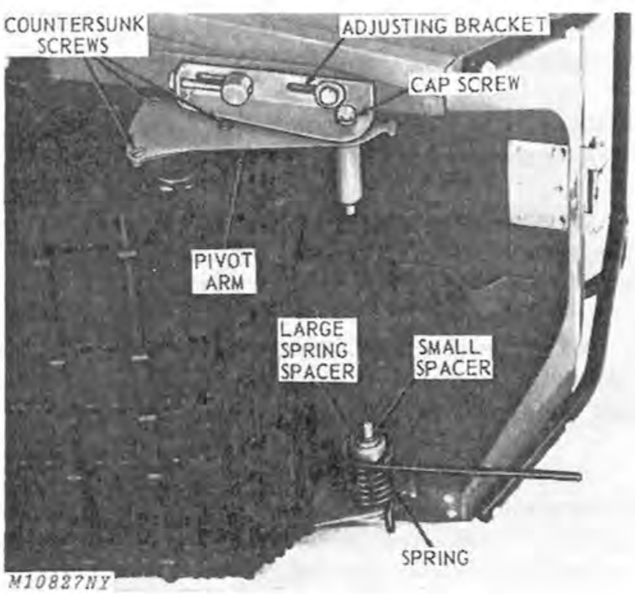


Fig. 9-Installing Rear Idler Assembly

Attach pivot arms, Fig. 9, to bearing flange with six countersunk screws and lock nuts. Tighten securely.

Slide idler assembly through track. Install cap screws and lock washers through adjusting bracket and into pivot arms, Fig. 9. Install small spacers over cap screws inside pivot arm tubes. Install large spring spacers over pivot arm tubes. Install springs as shown, Fig. 9.

NOTE: Springs are not interchangeable left to right.

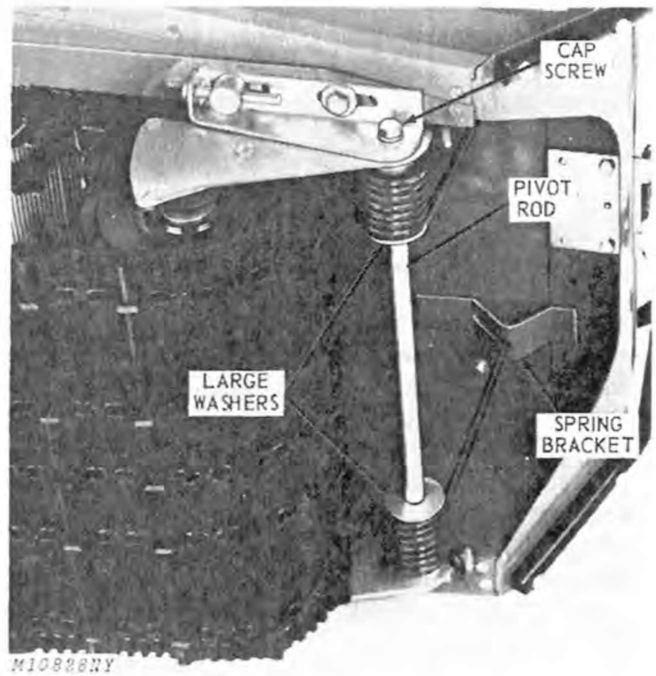


Fig. 10-Installing Rear Idler Assembly

Place a large washer over each cap screw. Install pivot rod and thread cap screws into each end of pivot rod, Fig. 10. Tighten securely.

Hook long leg of springs into slots in spring brackets, Fig. 10. Tension track as instructed in Group 20 of this section.

HEAVY-DUTY SUSPENSION KIT

NOTE: The heavy-duty suspension kit is standard equipment on all 600 Snowmobiles (Serial No. 20,001-).

The purpose of this kit is to reduce the tendency of the suspension to "bottom" when trail riding with a driver and passenger.

The kit includes one right-hand and one left-hand heavy-duty rear pivot spring, three right-hand and three left-hand heavy-duty bogie axle springs. Springs are painted dull aluminum for identification purposes.

Removing and Installing Bogie Axle Springs

Refer to Group 10 for removal and installation procedure.

NOTE: Heavy-duty bogie springs go on the rear three sets of bogies only, Fig. 11. During installation of the spring on the bogie tube, some interference may be encountered in the slot on the bogie tube that anchors the end of the spring. File the slot on the tube slightly to allow spring to seat.

IMPORTANT: File the anchor slot. DO NOT file the end of the spring. The bogie springs are "shotpeened" and filing the spring could result in premature failure.

NOTE: DO NOT install heavy-duty bogie springs on front bogies at any time. This will result in poor steering response on hard packed snow surfaces.

Removing and Installing Rear Pivot Springs

Block up rear of machine. Unhook the long leg of both rear pivot springs from the spring brackets, Fig. 11. Use Vise-Grip pliers to hold pivot rod and loosen cap screw on each end. Pull cap screws out only far enough to free pivot rod and remove large washers. Remove rear pivot springs.

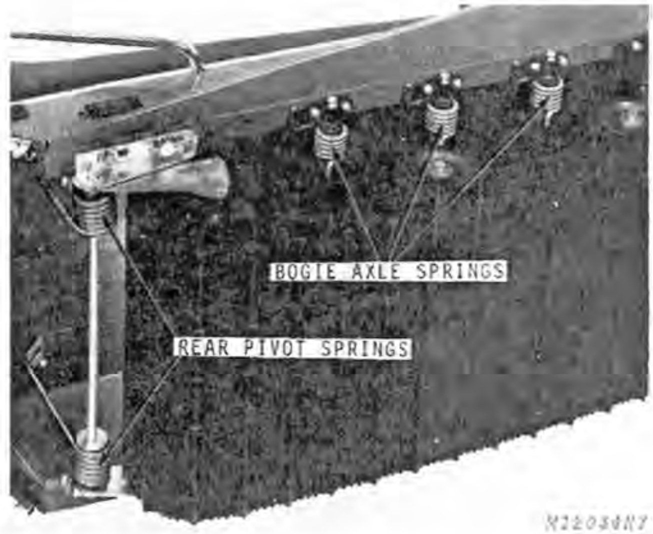


Fig. 11-Heavy-Duty Rear Suspension Kit

Install right and left-hand heavy-duty rear pivot springs.

NOTE: DO NOT attempt to install long leg of spring in spring bracket at this time.

Install large washers on end of each cap screw between cap screw and pivot rod. Carefully start cap screws in each end of pivot rod. Hold pivot rod with Vise-Grip pliers and tighten each cap screw securely.

Install long leg of each heavy-duty rear pivot spring in spring brackets.

Remove blocking from rear of machine.

NOTE: Adjust track tension as outlined on page 60-20-10.

GATES "POLY" TRACK ANALYSIS

NOTE: The Gates Polyurethane Track is rugged and long-lasting, providing proper tension and alignment are maintained. The majority of track failures are caused by operator abuse.

Failures Covered Under Warranty

Ply Separation

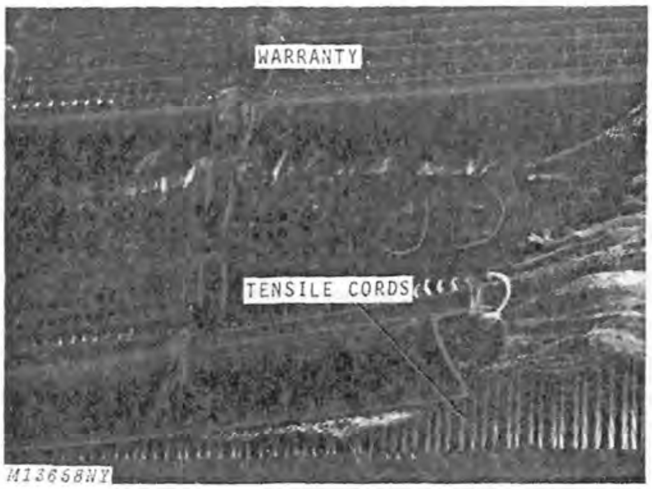


Fig. 2-Ply Separation

Ply separation can be identified by obvious parting of the polyurethane from the tensile cords, Fig. 2, with a probability of good adhesion to the woven fabric.

Face Cracks

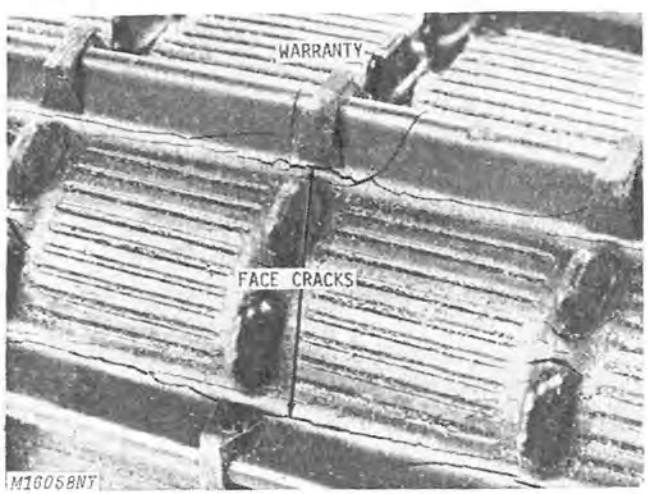


Fig. 3-Face Cracks

The polyurethane material appears to be hard, dry and brittle, Fig. 3. Numerous hairline cracks appear in all directions but are always identified with heavier lateral cracks.

Poor Cure

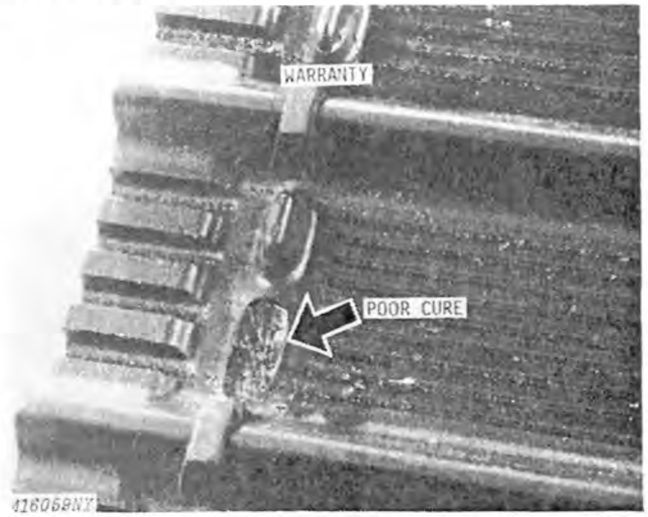


Fig. 4-Poor Cure

The black polyurethane material has a soft gummy feel, somewhat like latex gloves. The sipes (ice cleats) can be torn out with your fingers, Fig. 4.

Visible Fabric

This is a factory shipping error and should be discussed with the Area Service Manager prior to delivery of the snowmobile. No claim for Warranty will be accepted after delivery.

Tensile Cord Mislocated

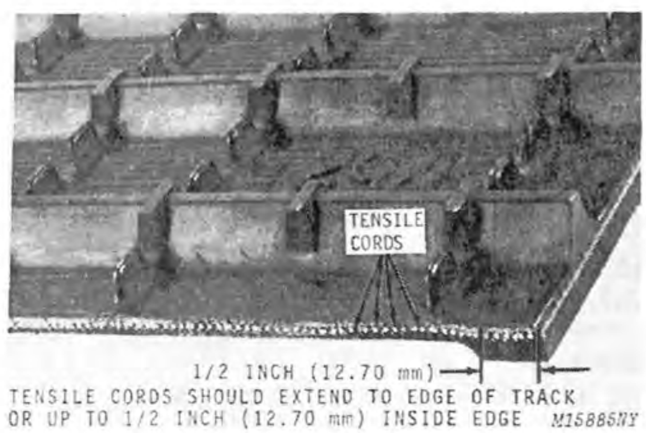


Fig. 5-Tensile Cords

The heavy tensile cords, Fig. 5, which are wound radially should extend to the edge of the track or not more than 1/2 inch (12.70 mm) inside the edge.

Tensile Cables

Each track has two woven steel cables running the full radial length of the track. The two woven steel cables are for tensile purposes only and the LOCATION IS NOT CRITICAL. Cables can be located with a magnet or by visually examining a cross section of the track.

Inspection of a damaged or torn area (edge of track) may indicate that a cable is missing. It probably has been ripped away from the failed area and can be easily found by cutting a cross section of the track in another area.

If the entire edge has shredded away, so has the cable. NEVER ASSUME THE CABLE WAS MISSING.

Variation in Track Thickness

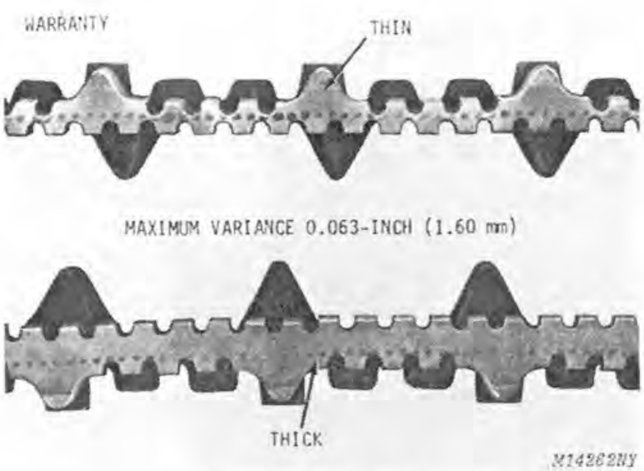


Fig. 6-Variation in Track Thickness

A great variation in thickness, Fig. 6, could cause the track to vibrate and thump. A 0.063-inch (1.60 mm) variance in track thickness is the maximum allowed. Use a caliper and inside micrometer for measurements. Measurements should be taken 3 inches (7.62 cm) in from the edge of the track on both sides, in four or five different places around the track.

Non-Warranty Failures

Obstruction Damage

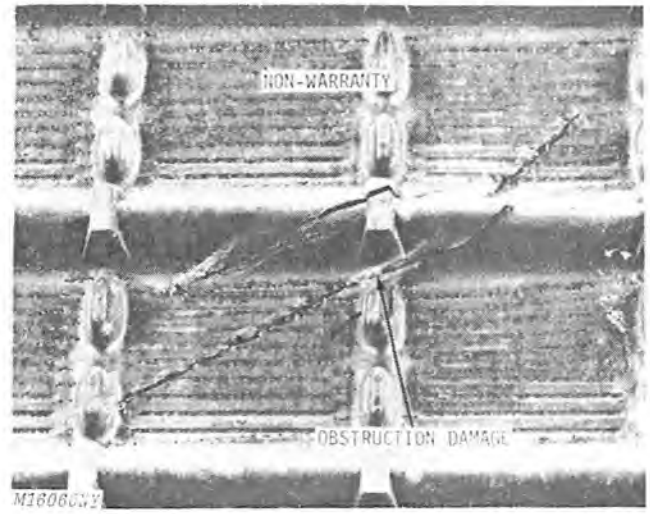


Fig. 7-Obstruction Damage

Apparent cuts, slashes or gouges in the surface of the track, Fig. 7, are caused by obstructions such as broken glass, sharp rocks or buried steel. The track is highly resistant to obstructions but, invariably, damage will occur (especially to the edge) during rapid acceleration or side-skidding over foreign objects.

Face Damage

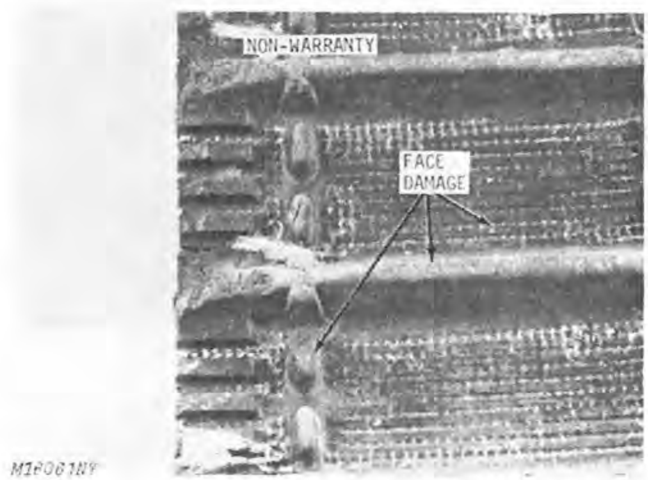


Fig. 8-Face Damage

Excessively worn track face, cross bars, or sipes (ice cleats), Fig. 8, are all caused by operating on extremely rough and dry terrain such as non-snow covered fields, railroad and highway right-of-ways, gravel roads and other non-approved snowmobile field conditions.

Lug Damage

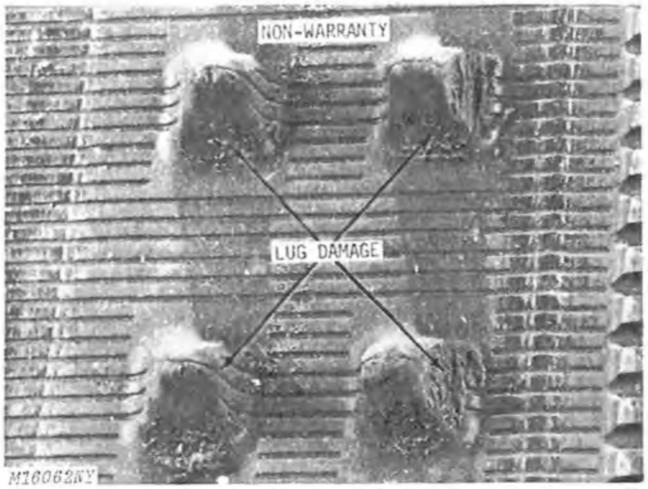


Fig. 9-Lug Damage

Lug damage to the sides or rear edges of the lug, Fig. 9, is usually caused by lack of snow lubrication. Excessive track tension or dirt or soil (summer operating conditions) entering the drive mechanism are also frequent causes.

Racheting Damage

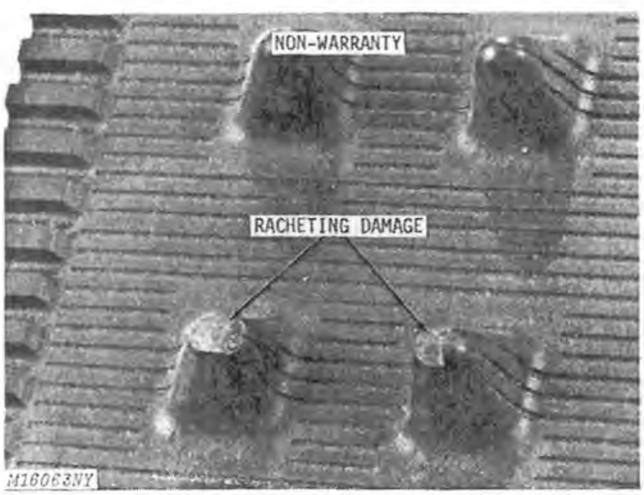


Fig. 10-Racheting Damage

Racheting damage to the top of the lugs, Fig. 10, is caused by insufficient track tension, pulling too great a load, or frequent prolonged periods of rapid acceleration. Constant "jack-rabbit" starts are not necessary with a snowmobile.

Over-Tension Damage

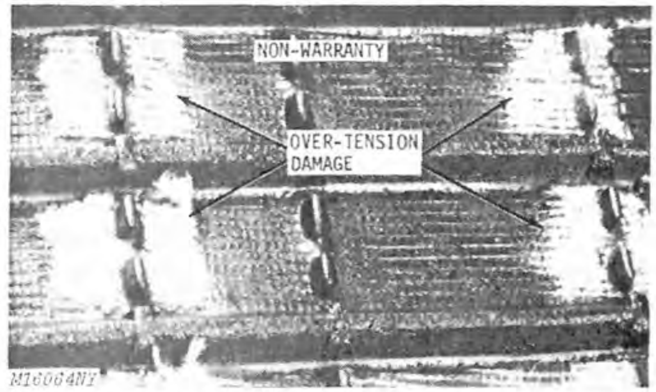


Fig. 11-Over-Tension Damage

Tightening the track too much causes the three rear idler wheels to push excessively into the track. This will cause the fabric to break, Fig. 11, and the track to become "fuzzy" on the face from rear idler wheel pressure.

Loose Track Damage

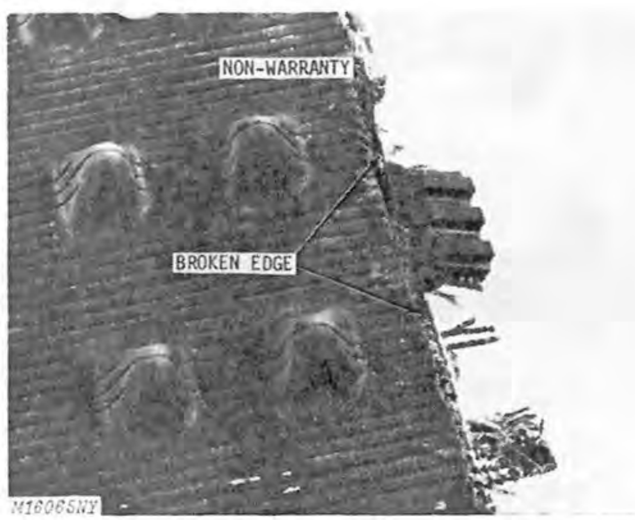


Fig. 12-Loose Track Damage

Operating with a loose track causes the outer edge to flex too much, resulting in damage as shown in Fig. 12. Some wear on the driving lugs may also be visible. Riding double (excessive weight) without the heavy-duty rear suspension kit (optional equipment) can also cause the track to flex and break the edge.

Impact Damage

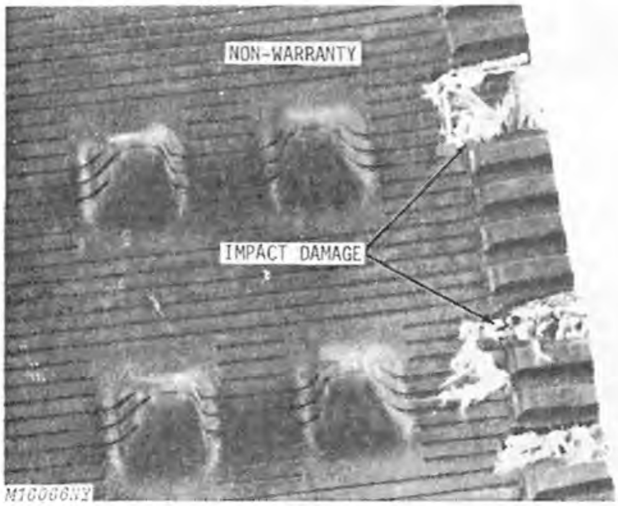


Fig. 13-Impact Damage

Impact damage to the edge of the track, Fig. 13, is usually caused by frequent riding on rough or frozen ground or ice, or insufficient track tension allowing the track to "pound" against the track stabilizers inside the tunnel. (1972 and 1973 Snowmobiles) Excessive flexing of the track on corrugated trails or crossing buried ridges (logs) can also cause impact damage.

Edge Damage

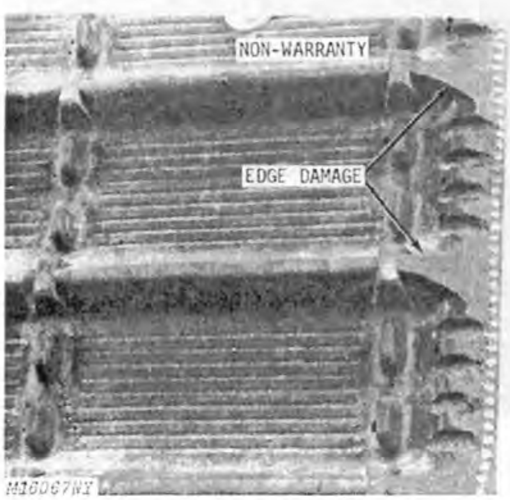


Fig. 14-Edge Damage

Edge damage of the type illustrated in Fig. 14, or similar damage, is the fault of the operator. The most frequent cause is tipping the snowmobile on its side to clear the track or engine, allowing the track to come in contact with an abrasive surface.

DISASSEMBLY AND REPAIR

Removing Track From Snowmobile

Remove tension blocks, drive chain and lower sprocket from chain case as outlined in Group 30 of Section 50. Remove chain case oil with a syringe or sponge.

Remove battery and battery box, if snowmobile is so equipped, and tip snowmobile over on its side.

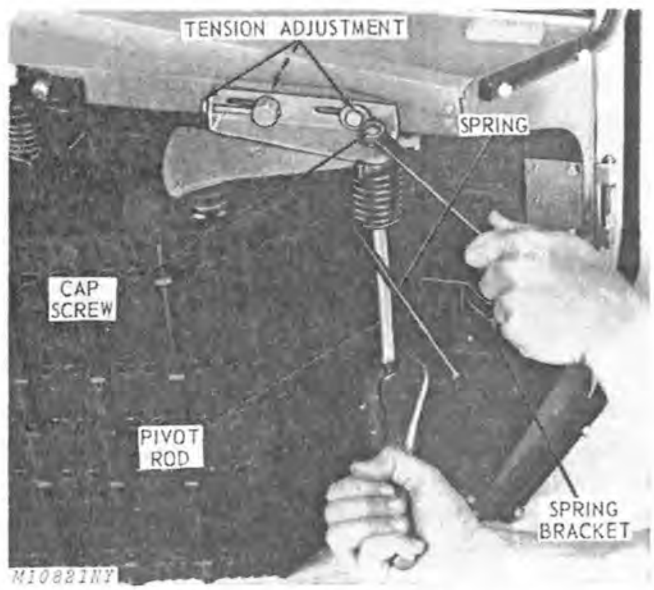


Fig. 15-Removing Rear Idler Assembly

Loosen track tension by adjusting rear idler assembly forward. Unhook the long leg of the two large springs from the spring brackets underneath the tunnel, Fig. 15.

Clamp a Vise-Grip to the pivot rod and remove cap screw from each end of the pivot rods, Fig. 15. Remove springs, spacers and washers. Remove rear idler assembly from inside track.

Removing Track From Snowmobile —Continued

1972 and 1973 Snowmobiles (Serial No. -20,000)

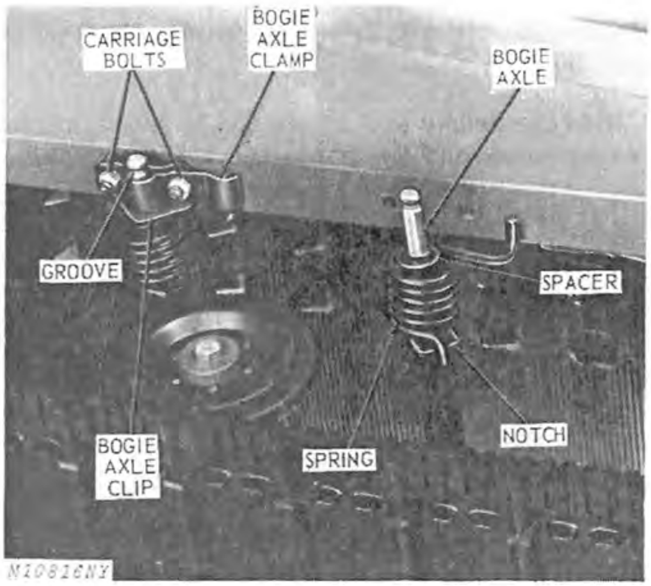


Fig. 16-Removing Bogie Wheel Assemblies

Remove two carriage bolts from each side of bogie assembly, Fig. 16. Remove the bogie axle clip and clamp from each end of axle and remove bogie assembly. Remove all six bogie assemblies.

1974 and 1975 Snowmobiles (Serial No. 20,001-)

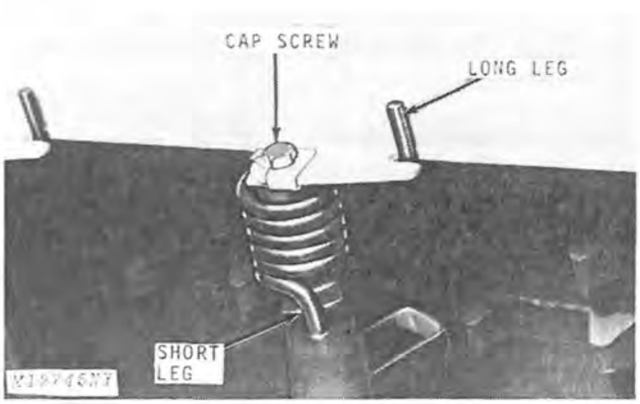


Fig. 17-Removing Bogie Wheel Assemblies

Straighten locking plates and remove cap screws from each end of bogie tube, Fig. 17, and remove bogie assembly. Remove all six bogie assemblies.

All Snowmibiles

Remove the three cap screws securing the right-hand bearing flangettes, spacer and the speedometer drive to the tunnel, Fig. 18.

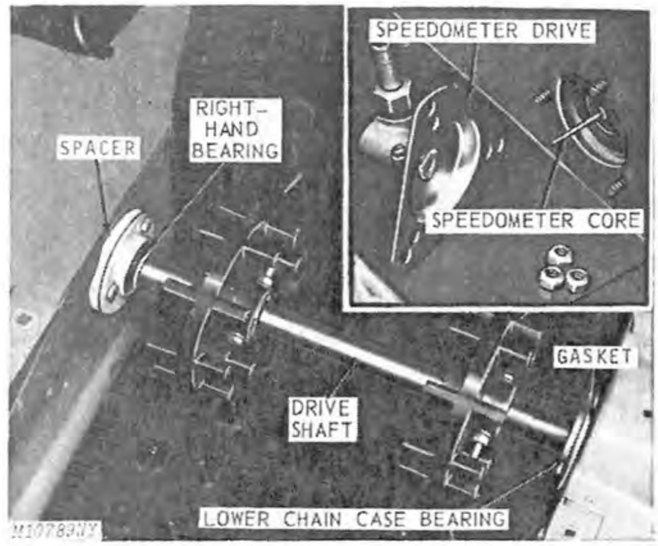


Fig. 18-Removing Drive Shaft Bearing Flangette Bolts

Remove the speedometer drive and the short speedometer core from the drive shaft (inset, Fig. 18).

Loosen the three cap screws securing the lower chain case bearing flangettes to the chain case, Fig. 18.

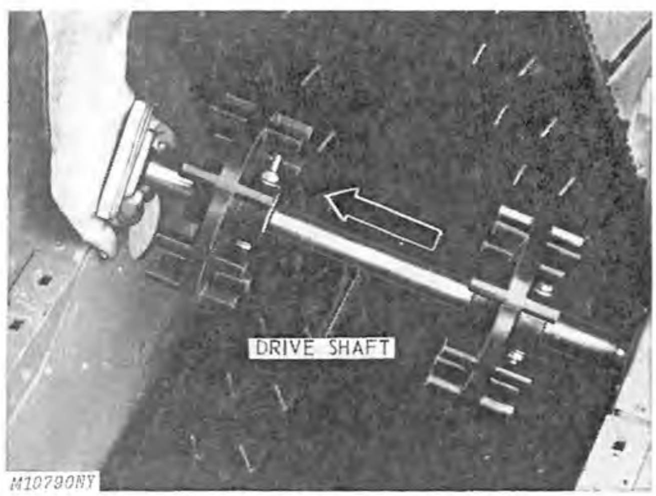


Fig. 19-Removing Drive Shaft

Lift right-hand end of shaft out of tunnel just far enough for drive wheels to clear tunnel, Fig. 19. Pull drive shaft out of lower chain case bearing. Remove lower chain case bearing, flangettes, and O-ring.

Remove track from snowmobile. See "Track Analysis" beginning on page 60-20-2. See Section 50, Group 30, if repair to drive shaft assembly is required. See Groups 10 and 15 of this section if repair to bogie assemblies or rear idler assembly is required.

ASSEMBLY

Installing Track and Drive Shaft

Install new track in snowmobile tunnel. On directional tracks be sure arrow points in direction of track rotation.

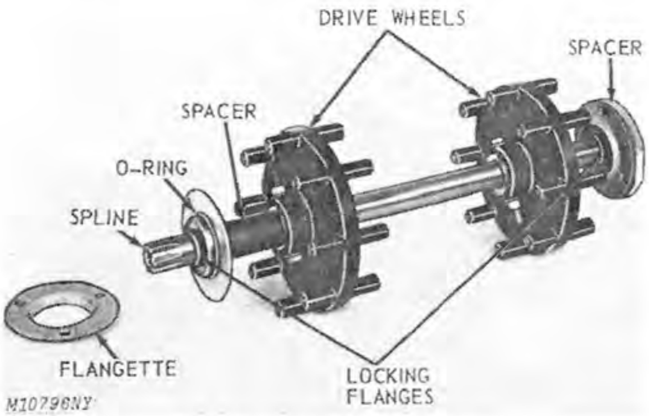


Fig. 20-Assembling Drive Shaft

Assemble spacers, bearings and bearing flangettes to drive shaft as shown, Fig. 20. Lubricate and install O-ring on lower chain case bearing, Fig. 20.

IMPORTANT: Locking flanges on bearings must face splined end of drive shaft as shown in Fig. 20.

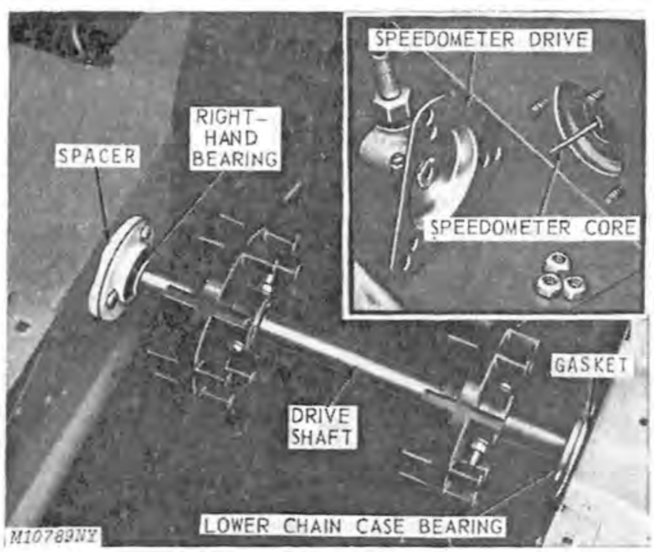


Fig. 21-Installing Drive Shaft

Install a new gasket where lower chain case bearing mounts on tunnel, Fig. 21.

Position drive shaft assembly in tunnel by placing splined end of drive shaft into place and dropping other end of drive shaft down into position. Fig. 21.

Secure lower chain case bearing flangettes to chain case with three cap screws, Fig. 21. Do not tighten until right-hand bearing is secured to tunnel.

IMPORTANT: Be certain O-ring is in correct position on bearing and between flangettes, or oil leakage will result. Be certain gasket is in position between flangette and tunnel.

Insert short speedometer core into right-hand end of drive shaft (inset, Fig. 21). Attach bearing flangettes, spacer and speedometer drive to tunnel with three cap screws, Fig. 21. Tighten all cap screws securely.

Installing Rear Idler Assembly

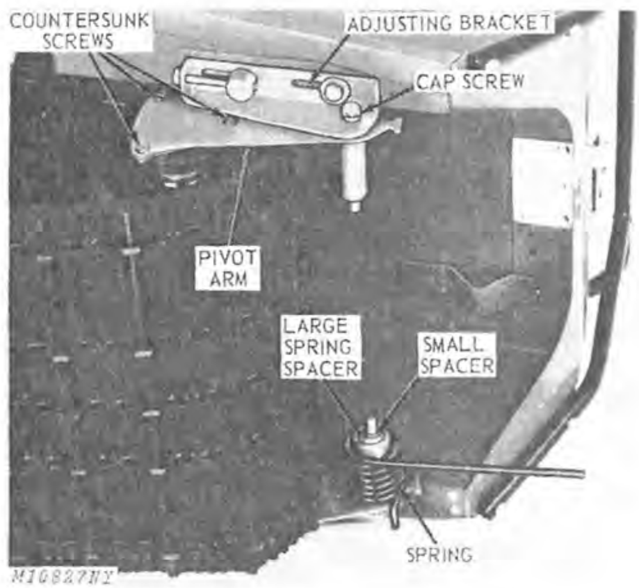


Fig. 22-Installing Rear Idler Assembly

Slide idler assembly through track. Install cap screws and lock washers through adjusting bracket and into pivot arms, Fig. 22. Install small spacers over cap screws inside pivot arm tubes. Install large spring spacers over pivot arm tubes. Install springs as shown, Fig. 22.

NOTE: Springs are not interchangeable left to right.

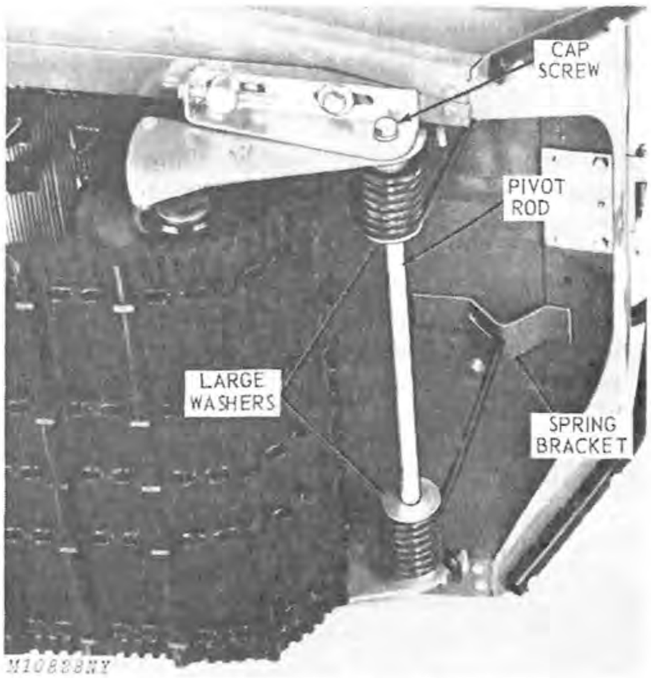


Fig. 23-Installing Rear Idler Assembly

Place a large washer over each cap screw. Install pivot rod and thread cap screws into each end of pivot rod, Fig. 23. Tighten securely. Hook long leg of springs into slots in spring brackets, Fig. 23.

Installing Bogie Assemblies

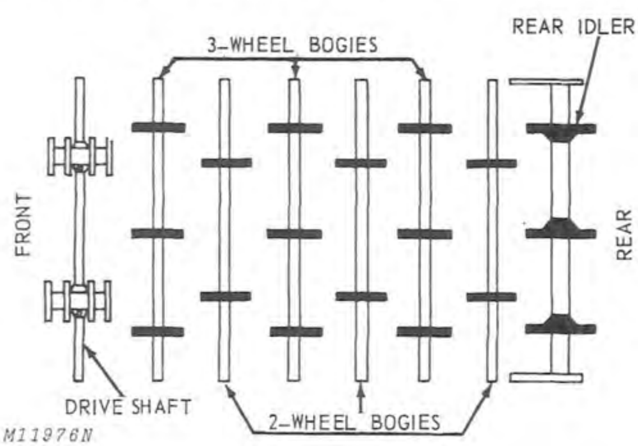


Fig. 24-Positioning Bogie Assemblies in Tunnel

Install bogie assemblies as shown, Figs. 24 and 25. Install front and rear bogies first working toward the middle. Install middle two assemblies last.

IMPORTANT: Bogie assemblies must be installed as shown, Fig. 24, or interference will result.

1972 and 1973 Snowmobiles (Serial No. -20,000)

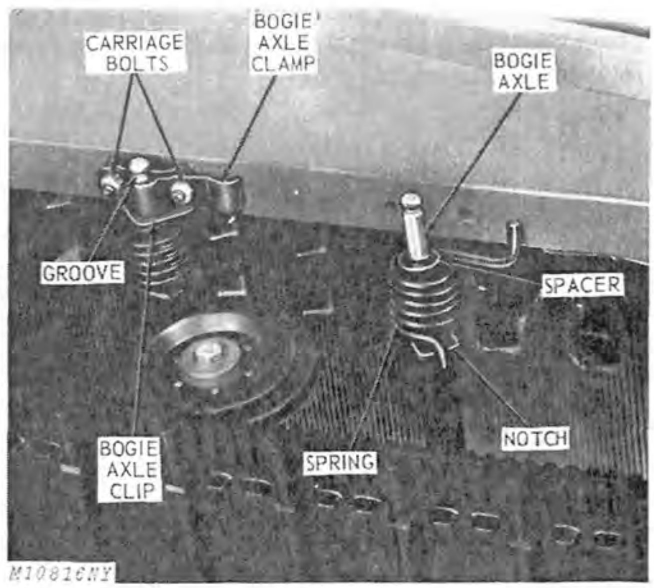


Fig. 25-Installing Bogie Assemblies

Secure each end of axle and spring to tunnel with clip, clamp and two carriage bolts, Fig. 25.

IMPORTANT: Bogie axle clip must be properly positioned in groove on each end of bogie axle. Check position of spring legs. Short leg must be retained in notch in bogie tube and long leg must be under clamp and toward rear of machine, Fig. 25.

1974 and 1975 Snowmibiles (Serial No. 20,001-)

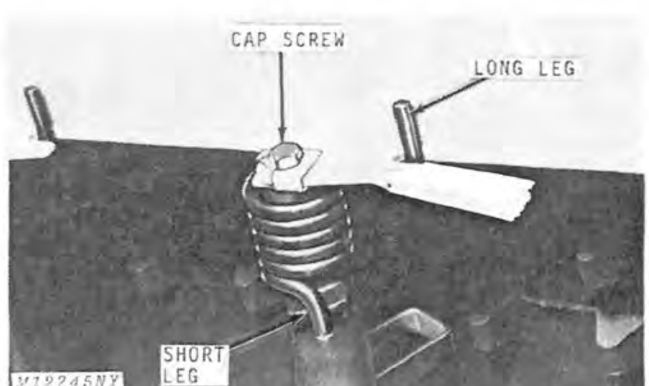


Fig. 26-Installing Bogie Assemblies

Secure each end of bogie tube to tunnel with locking plate and cap screw, Fig. 26. Be sure short leg of spring is in notch of bogie tube arm and long leg is under notch of the bogie rail. Tighten cap screw and bend locking plate.

Installing Lower Sprocket

Fig. 27-Installing Lower Sprocket

Place spacer onto drive shaft and install lower sprocket over drive shaft splines.

Install a new cap screw and washer and torque to 30 to 38 ft-lbs (40.7 to 51.4 Nm), Fig. 27. The cap screw has nylon locking material and can be tightened only once.

Installing Drive Chain

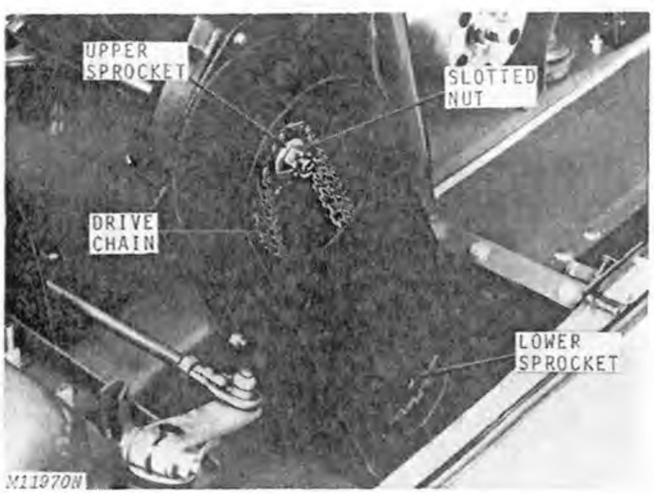


Fig. 28-Installing Drive Chain

Install spacer over secondary shaft inside chain case. Position drive chain around upper sprocket and place sprocket and chain into chain case. Work chain around lower sprocket and place upper sprocket in position on secondary shaft, Fig. 28. Loosen sheave retaining cap screw.

Install washer and slotted nut, Fig. 28. Tighten nut until washer and nut are tight to shoulder on secondary shaft. Insert cotter pin.

IMPORTANT: The secondary shaft must always receive its final torque from the driven sheave retaining cap screw. Torque driven sheave retaining cap screw to 20 ft-lbs (27.1 Nm) after tightening slotted nut.

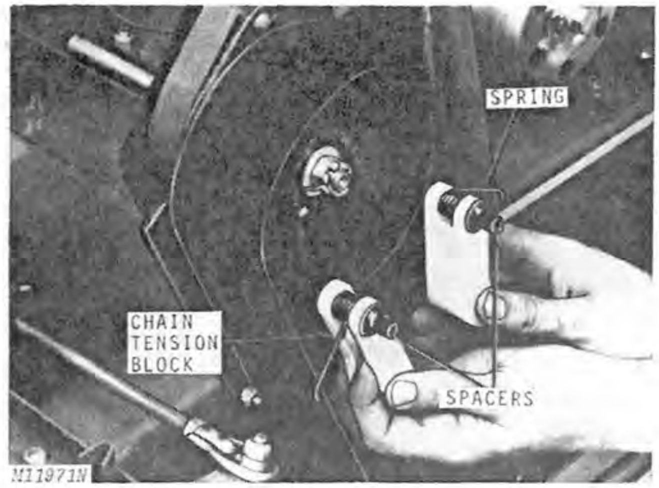


Fig. 29-Installing Chain Tension Blocks

Assemble chain tension block assemblies as shown, Fig. 29, and install into chain case. Install two retaining cap screws and torque to 90 to 110 in-lbs (10.17 to 12.43 Nm).

IMPORTANT: Pour 5 ounces (0.150 ml) of SAE 30 oil into chain case and install rubber plugs. Tension track.

ADJUSTING TRACK TENSION

Proper track tension is very important and is the key to obtaining maximum track life. Check track tension as follows:

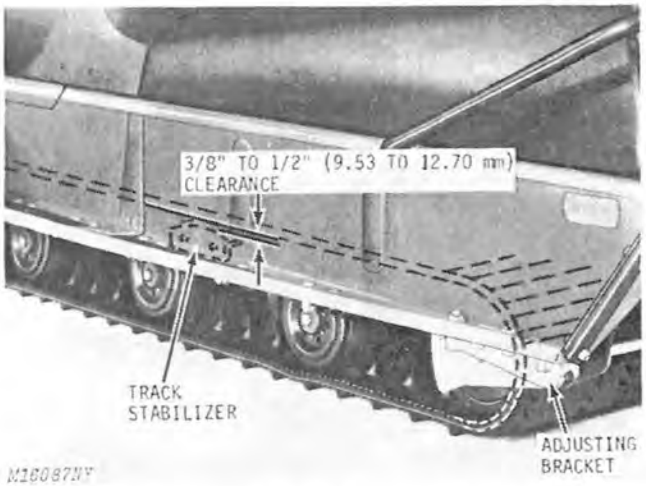


Fig. 30-Clearance Between Track and Stabilizer All Machines (Serial -20,000)

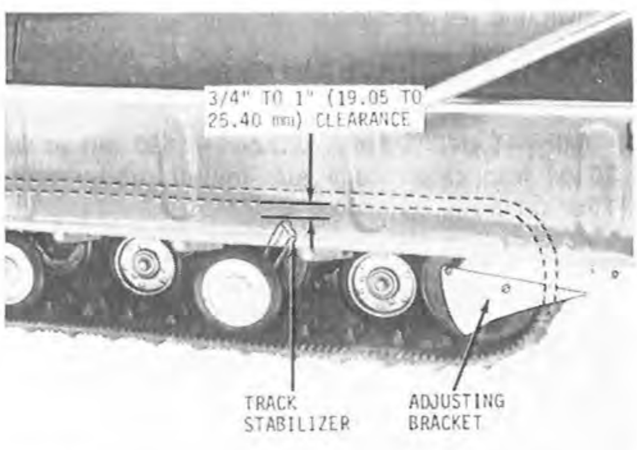


Fig. 31-Clearance Between Track and Stabilizer All Bogie Machines (Serial No. 20,001-)

1. Place machine on a level surface with an operator on the seat.

2. Check clearance between the track stabilizers and the track. Fig. 30 gives the correct clearance for all machines up to Serial No. 20,000. Fig. 31 gives the correct clearance for all bogie machines beginning with Serial No. 20,001.

3. If clearance is more than indicated in Figs. 30 and 31 track is too tight; if less, track is too loose.

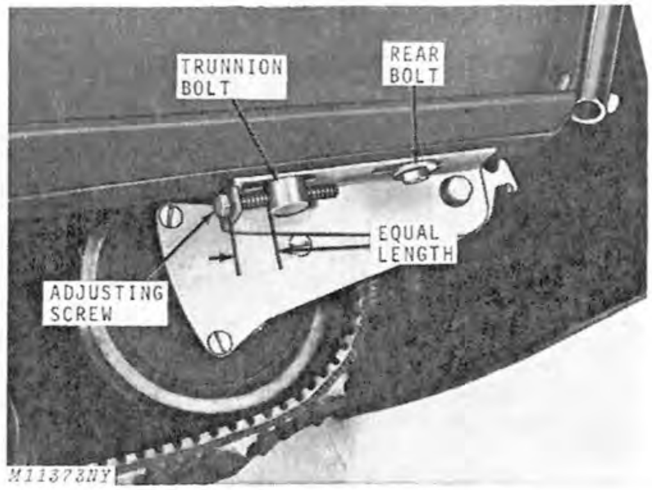


Fig. 32-Trunnion Bolt and Adjusting Screw

Adjust as follows:

1. Loosen trunnion bolt and rear bolt on both sides of snowmobile, Fig. 32.

2. Turn adjusting screws into trunnions to increase track tension. Adjust both sides equally. Tighten bolts.

IMPORTANT: Both sides must be adjusted equally with an equal length between screw head and trunnion bolt. Unequal adjustment will cause improper track alignment and possible track damage.

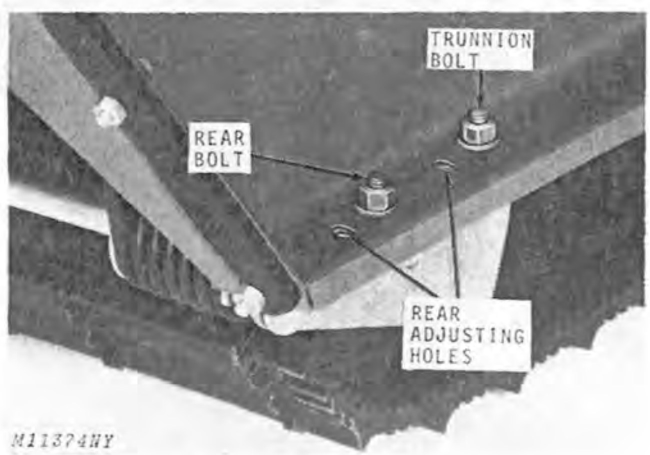


Fig. 33-Rear Adjusting Holes

In time, adjustment will be used up on adjusting screws. When this occurs, transfer rear bolts to rear holes, Fig. 33; then, trunnion bolts to rear holes. Adjust track tension as outlined previously.

Group 22
GOODYEAR TRACKS

GENERAL INFORMATION

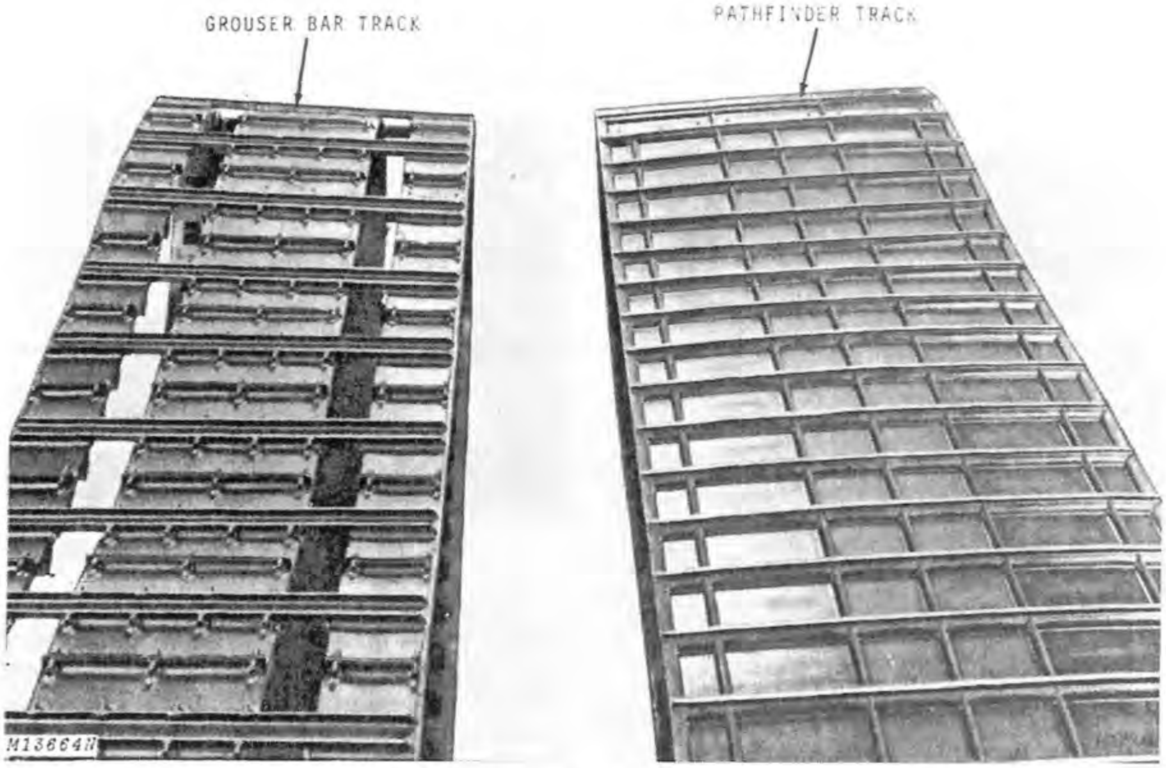


Fig. 1-Goodyear Grouser Bar and Pathfinder Tracks

Model*	Serial No.	Track
300	(20,001-30,000)	Pathfinder
JD295/S, JDX4 Special, JDX6, JDX8	(20,001-30,000)	Grouser Bar
JDX4, JDX6, JDX8	(30,001-)	Grouser Bar

**For snowmobile models not listed in the above chart, see Group 20 of this section.*

The Goodyear Pathfinder track, Fig. 1, is a molded rubber track with polyester and nylon fabric, fiberglass cord and transverse polyester tire cord. No steel cables are used in this track.

The Goodyear Grouser Bar track, Fig. 1, is a molded rubber track with nylon fabric and fiberglass cord. The steel grouser bars are molded into the rubber and are replaceable.

Both tracks are equipped with lugs on the inside of the track which engage with lugs on the drive wheels to provide smooth, efficient transfer of power.

GOODYEAR GROUSER BAR TRACK ANALYSIS

NOTE: The Grouser Bar and Pathfinder Tracks are rugged and long-lasting, providing proper tension and alignment are maintained. The majority of track failures are caused by operator abuse.

Failures Covered Under Warranty

Ply Separation

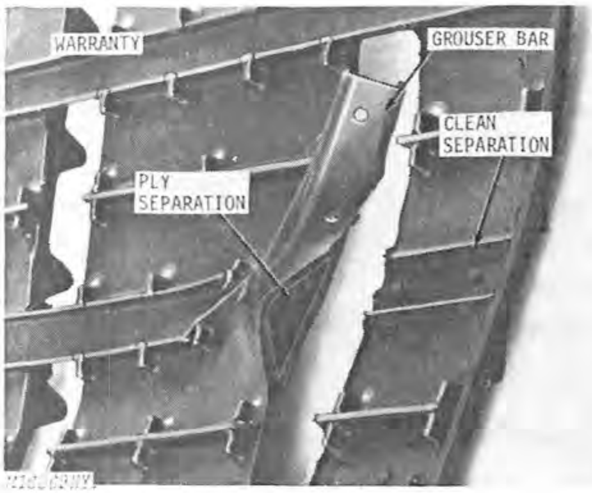


Fig. 2-Ply Separation

Ply separation can be identified by obvious parting of the rubber from the tensile cords, Fig. 2, on any of the three belts.

Track Stretch

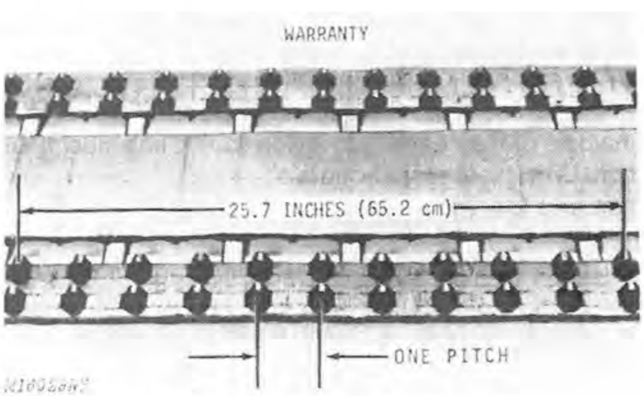


Fig. 3-Measuring Track for Stretch

Track stretch occurs only on a used track. The first indication of track stretch is running out of adjustment on the track-adjusting screws, making it impossible to adjust the track. Remove the used track and lay it flat. Measure ten pitches on the track. This distance should not exceed 25.7 inches (65.2 cm), Fig. 3.

NOTE: A pitch is the distance (center-to-center) from one drive lug to the other.

Poor Bond

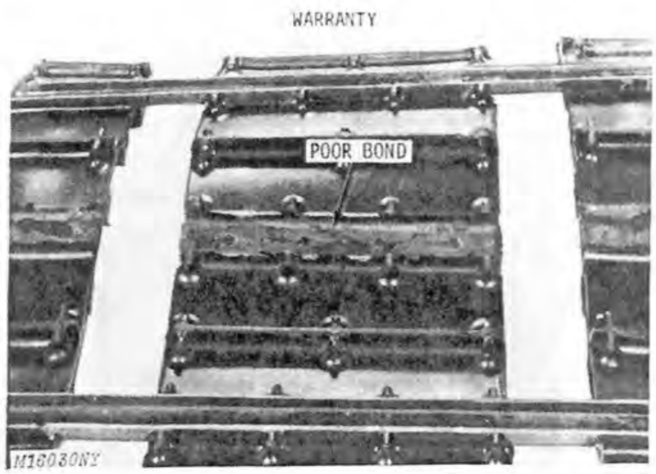
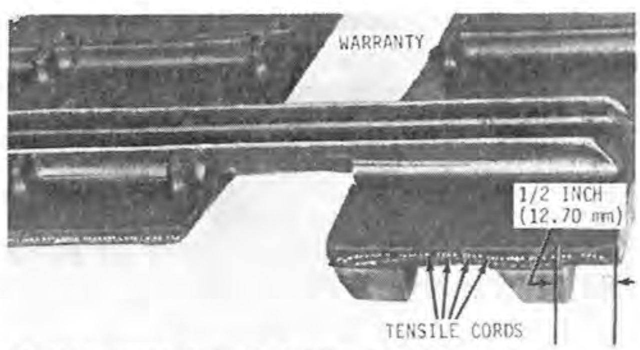


Fig. 4-Poor Bond of Rubber to Grouser Bar

If a grouser bar dislodges due to poor bond of the rubber to the metal bar, it can be identified by clean, straight, untorn lines of rubber, usually across the face of all three belts, Fig. 4. Such a failure will occur EARLY in the use period.

The metal grouser bar if found, will not have much, if any, rubber adhering to it.

Tensile Cord Mislocated



TENSILE CORDS SHOULD EXTEND TO EDGE OF TRACK OR UP TO 1/2 INCH (12.70 mm) INSIDE EDGE

Fig. 5-Tensile Cord

The heavy tensile cords, Fig. 5, which are wound radially, should extend to the edge of the track or not more than 1/2 inch (12.70 mm) inside the edge.

Variation in Track Thickness

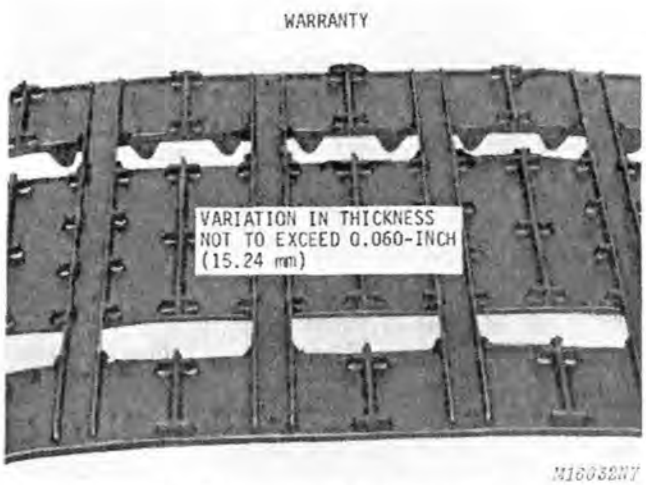


Fig. 6-Variation in Track Thickness

A great variation in thickness, Fig. 6, could cause the track to vibrate and thump. A 0.060-inch (1.52 mm) variance in track thickness is the maximum allowed. Use a caliper and inside micrometer for measurements. Measurements should be taken on each belt of the track in four or five different places around the track.

Non-Warranty Failures

Obstruction Damage

Apparent cuts, slashes or gouges in the surface of the track are caused by obstructions such as broken glass, sharp rocks or buried steel. The track is highly resistant to obstructions but, invariably, damage will occur during rapid acceleration or side-skidding over foreign objects.

If the grouser bar is bent, broken, cracked or torn from the track due to buried objects, obstructions or road hazards, neither repair nor replacement will be considered for warranty.

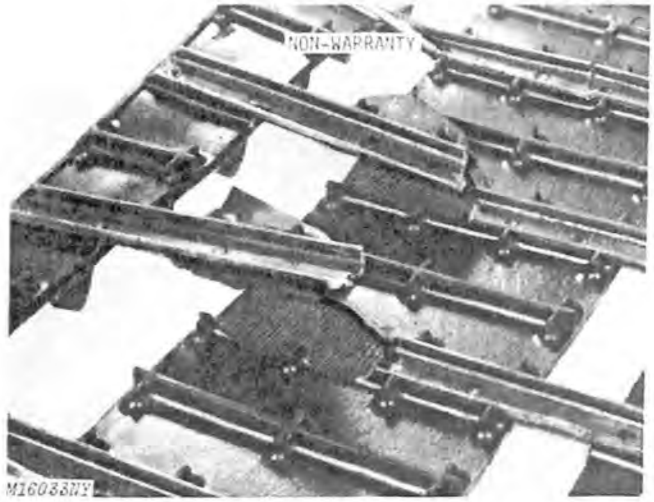


Fig. 7-Grouser Bar Torn from the Track

When the grouser bar is torn from the track, rubber will be torn away from the bonding area, Fig. 7. The metal grouser bar will be bent, broken or damaged and will have rubber adhering to the bar.

Worn Grouser Bars

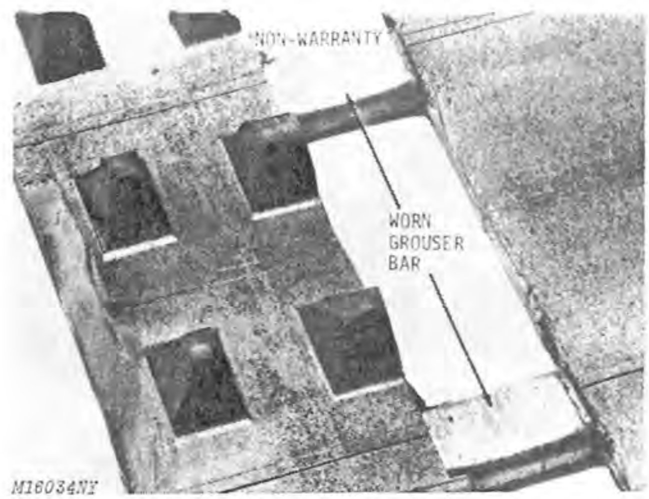


Fig. 8-Worn Grouser Bars

Excessively worn grouser bars, Fig. 8, are related to operating on rough and dry terrain such as non-snow covered fields, railroad and highway roadsides, gravel roads and other non-approved snowmobile field conditions.

The polyethylene suspension wear bar becomes hot and sand, dirt and grit imbed in the wear bar causing wear on the grouser bars. The suspension wear bars must be replaced.

Lug Damage

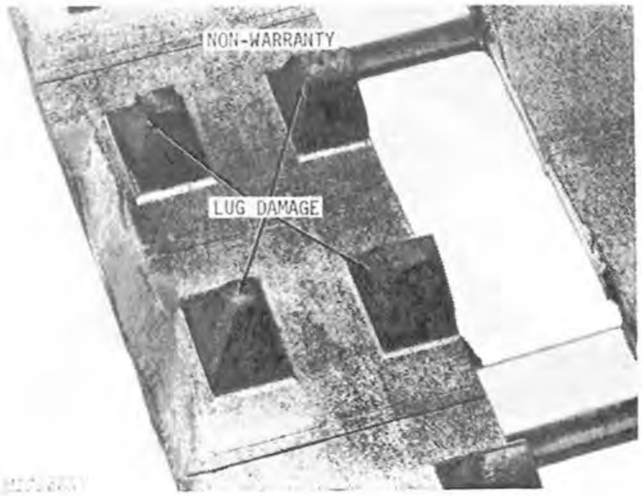


Fig. 9-Lug Damage

Lug damage, Fig. 9, to the sides or rear edges of the lug is usually caused by lack of snow lubrication. Excessive track tension, dirt or soil, (summer operating conditions) entering the drive mechanism is also a frequent cause.

Racheting Damage

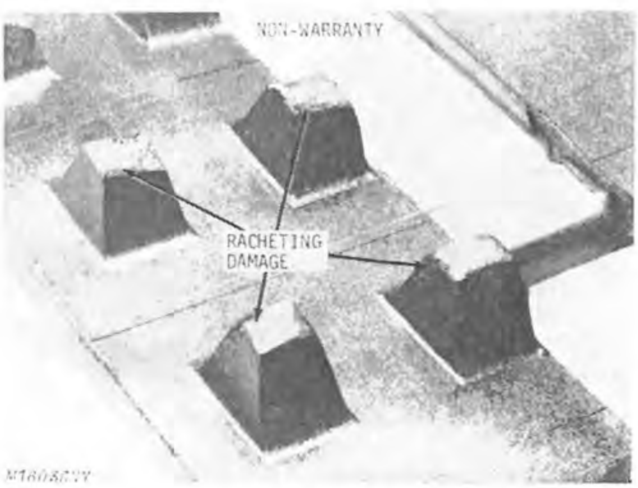


Fig. 10-Racheting Damage

Racheting damage, Fig. 10, to the top of the lugs is caused by insufficient track tension, pulling too great a load, or frequent prolonged periods of rapid acceleration. Constant "jack-rabbit" starts are not necessary with a snowmobile.

Over-Tension Damage

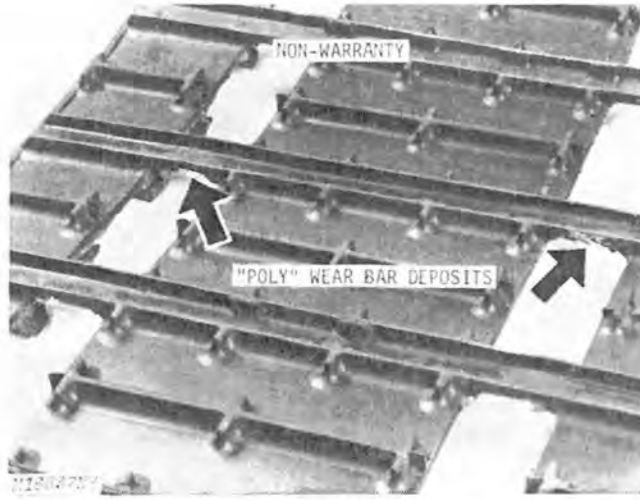


Fig. 11-Over-Tension Damage

Tightening the track too much causes excessive friction between the polyethylene wear bars and the grouser bars. The wear bars wiil melt and adhere to the grouser bars, Fig. 11.

The first indication of this condition is that the track may "stick" or have a tendency to "lock-up", causing loss of engine horsepower.

Loose Track Damage

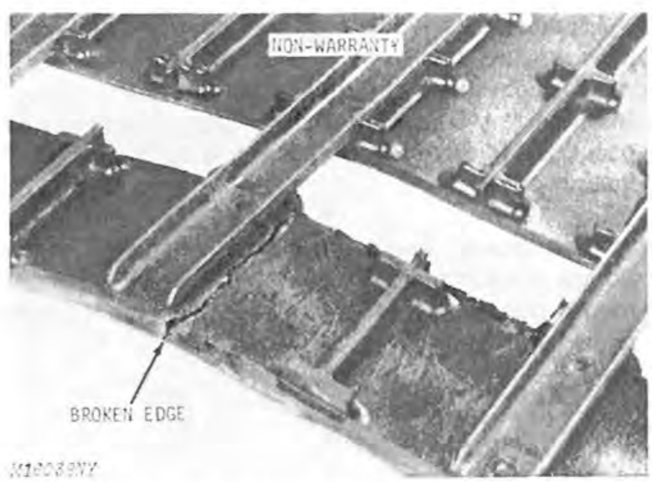


Fig. 12-Loose Track Damage

Operating a track loose causes the outer edge to flex too much, resulting in damage as shown in Fig. 12. Some wear on the driving lugs may also be visible. Riding double (excessive weight) can also cause the track to flex and break the edge.

Impact Damage

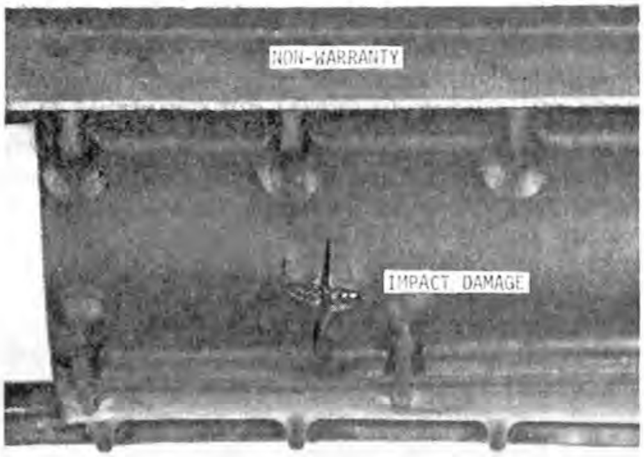


Fig. 13-Impact Damage

Impact damage, Fig. 13, will cause the rubber on the tread side to open up allowing the cords to become visible. This will happen in more than one place.

Edge Damage

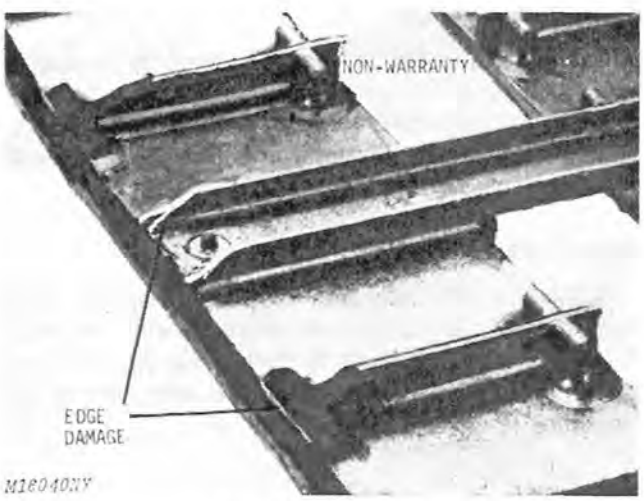


Fig. 14-Edge Damage

Edge damage of the type illustrated in Fig. 14, or similar damage, is the fault of the operator. The most frequent cause is tipping the snowmobile on its side to clear the track, allowing the track to come in contact with an abrasive surface.

Broken Grouser Bar

Grouser bar breakage is normal and expected in the center belt area of the track.

Grouser bars are notched and installed in a staggered pattern (1975 Snowmobiles). This predetermines the fatigue area for grouser bar breakage, preventing breaks in unwanted areas. If the grouser bar breaks but still remains securely bonded to the center of the track, it is not necessary to replace the grouser bar.

GOODYEAR PATHFINDER TRACK ANALYSIS

Failures Covered Under Warranty

Track Stretch

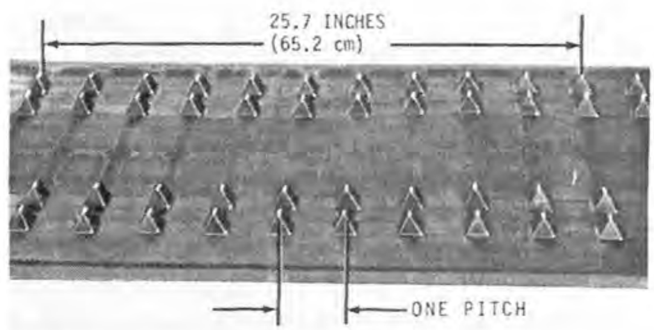


Fig. 15-Measuring Track for Stretch

Track stretch occurs only on a used track. The first indication of track stretch is running out of adjustment on the track adjusting screws, making it impossible to adjust the track.

Remove the used track and lay it flat. Measure 10 pitches on the track. This distance should not exceed 25.7 inches (65.2 cm), Fig. 15.

NOTE: A pitch is the distance (center-to-center) from one drive lug to the other.

Variation in Track Thickness

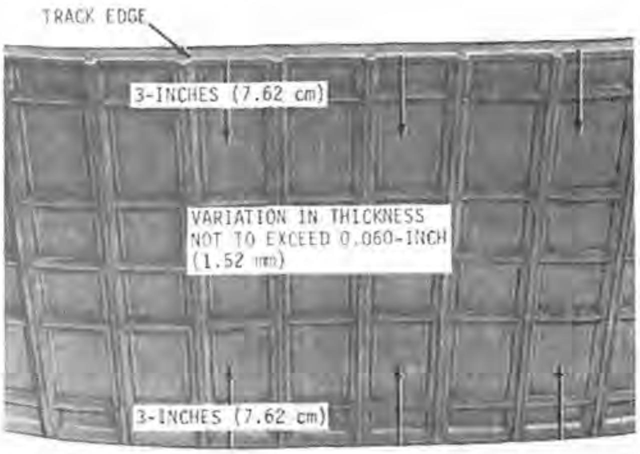


Fig. 16-Variation in Track Thickness

A great variation in thickness, Fig. 16, could cause the track to vibrate and thump. A 0.060-inch (1.52 mm) variance in track thickness is the maximum allowed. Use a caliper and inside micrometer for measurements. Measurements should be taken 3 inches (7.62 cm) in from the edge of the track, on both sides, in four or five different places around the track.

Ply Separation

Ply separation can be identified by obvious parting of the rubber from the tensile cords.

Face Cracks

Face cracks are usually a "craze" cracking of the rubber with numerous hairline cracks running in all directions.

Non-Warranty Failures

Obstruction Damage

Apparent cuts, slashes or gouges in the surface of the track are caused by obstructions such as broken glass, sharp rocks or buried steel. The track is highly resistant to obstructions but, invariably, damage will occur during rapid acceleration or side-skidding over foreign objects.

Face Damage

Excessively worn track face, cross bars or sipes (ice cleats) are all related to operating on extremely rough and dry terrain such as non-snow covered fields, railroad and highway right-of-ways, gravel roads and other non-approved snowmobile field conditions.

Lug Damage

Lug damage to the sides or rear edges of the lug is usually caused by lack of snow lubrication. Excessive track tension, dirt or soil, (summer operating conditions) entering the drive mechanism is also a frequent cause.

Racheting Damage

Racheting damage to the top of the lugs is caused by insufficient track tension, pulling too great a load, or frequent prolonged periods of rapid acceleration. Constant "jack-rabbit" starts are not necessary with a snowmobile.

Over-Tension Damage

Tightening the track too much causes the three rear idler wheels to push excessively into the track. This will cause the fabric to break, and the track will become "fuzzy" on the face from rear idler wheel pressure.

Loose Track Damage

Operating a track loose causes the outer edge to flex too much resulting in damage to the edge. Some wear on the driving lugs may also be visible. Riding double (excessive weight) can also cause the track to flex and break the edge.

Impact Damage

Impact damage to the edge of the track is usually caused by frequent riding on rough or frozen ground or ice, or insufficient track tension allowing the track to "pound" against the track stabilizers inside the tunnel. Excessive flexing of the track on corrugated trails or crossing buried ridges (logs) can also cause impact damage.

Edge Damage

Edge damage is the fault of the operator. The most frequent cause is tipping the snowmobile on its side to clear the track, allowing the track to come in contact with an abrasive surface.

DISASSEMBLY AND REPAIR

Removing and Installing Track

NOTE: To remove and install the Pathfinder and Grouser Bar Tracks, follow the procedure outlined on page 60-20-5.

The same procedure can be followed for removing the drive assembly from the slide suspension with one exception. Remove the bolts securing drive wheels to the shaft and slide the drive wheel in to provide room for removing cap screws from the flangettes.

Replacing Grouser Bars

NOTE: Bent or broken grouser bars can be replaced individually. If the grouser bar is broken in the center but still securely attached to the belts it need not be replaced.

Remove the suspension. See page 60-12-3.

NOTE: If the JDST-24 Lift and Repair Stand is not available, turn the snowmobile on its side and remove the suspension.

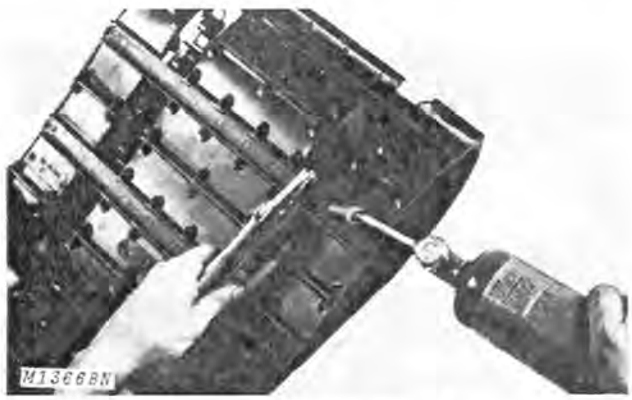


Fig. 17-Removing Grouser Bar (Track Removed for Illustration Purposes)

CAUTION: Be sure fuel tank has been drained and capped. Keep propane torch away from fuel tank area.

Use a propane torch and apply heat to the grouser bar, Fig. 17.

Clamp a "Vise-Grip" pliers to the grouser bar and twist the bar loose from the belt.

NOTE: Use minimum heat required and break grouser bar loose from one belt at a time.

Two different methods (pop rivets or bolt and nut) are acceptable for installing a new grouser bar.

Position new grouser bar in place. Drill eight 3/16 inch (4.762 mm) holes in belts using the new grouser bar as a template.

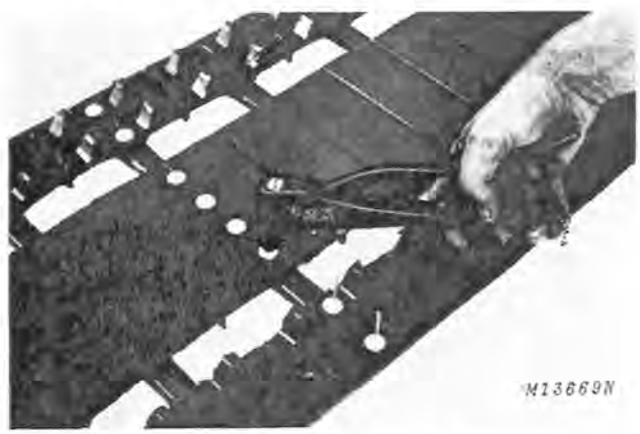


Fig. 18-Installing Grouser Bar (Pop Rivets) (Track Removed for Illustration Purposes)

1. Use JDM-18 Pop Rivet Tool with eight steel shank pop rivets (M64720), Fig. 18, to secure grouser bar to track. Pop rivets are installed from the inside or drive lug side of the track.

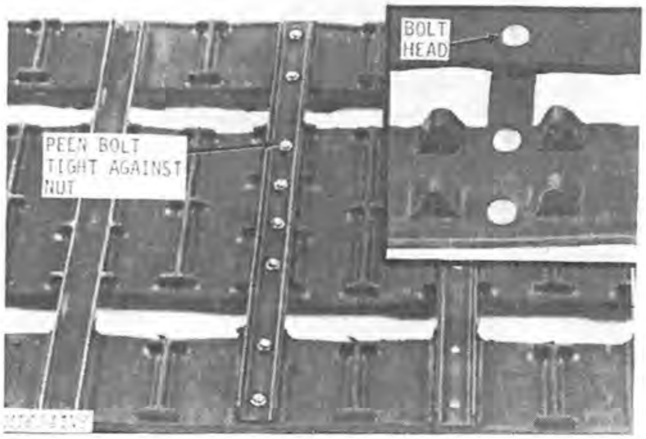


Fig. 19-Installing Grouser Bar (Bolt and Nut)

2. Use eight bolts and nuts (AM53418), Fig. 19, to secure grouser bar to track. Install bolt from the inside or drive lug side of the track, with nut to the outside. Tighten nut securely and then peen the bolt tight against the nut using two hammers; one for backing and the other for peening.

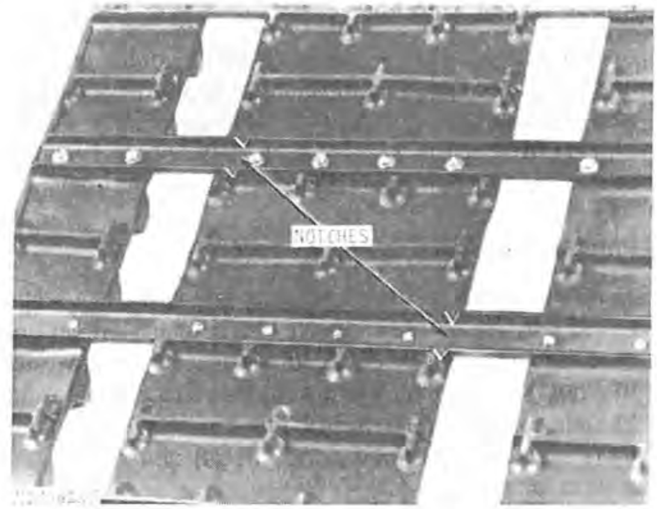


Fig. 20-Grouser Bars Installed in a Staggered Pattern

NOTE: When installing new grouser bars, notches in bars should be installed in a staggered pattern as shown in Fig. 20. This predetermines the fatigue area for grouser bar breakage, preventing breaks in unwanted areas.

IMPORTANT: On some early tracks, the grouser bars are molded directly under the track drive lugs. On these tracks, move grouser bar forward or rearward 1-1/4 inches (31.75 mm) (from original position) before riveting in place.

Install suspension. See page 60-12-6.

ADJUSTING TRACK TENSION

Grouser Bar Track

Refer to page 60-12-6 for proper procedure.

Pathfinder Track

Refer to page 60-20-10 for proper procedure.

Group 25
SKIS AND STEERING

GENERAL INFORMATION

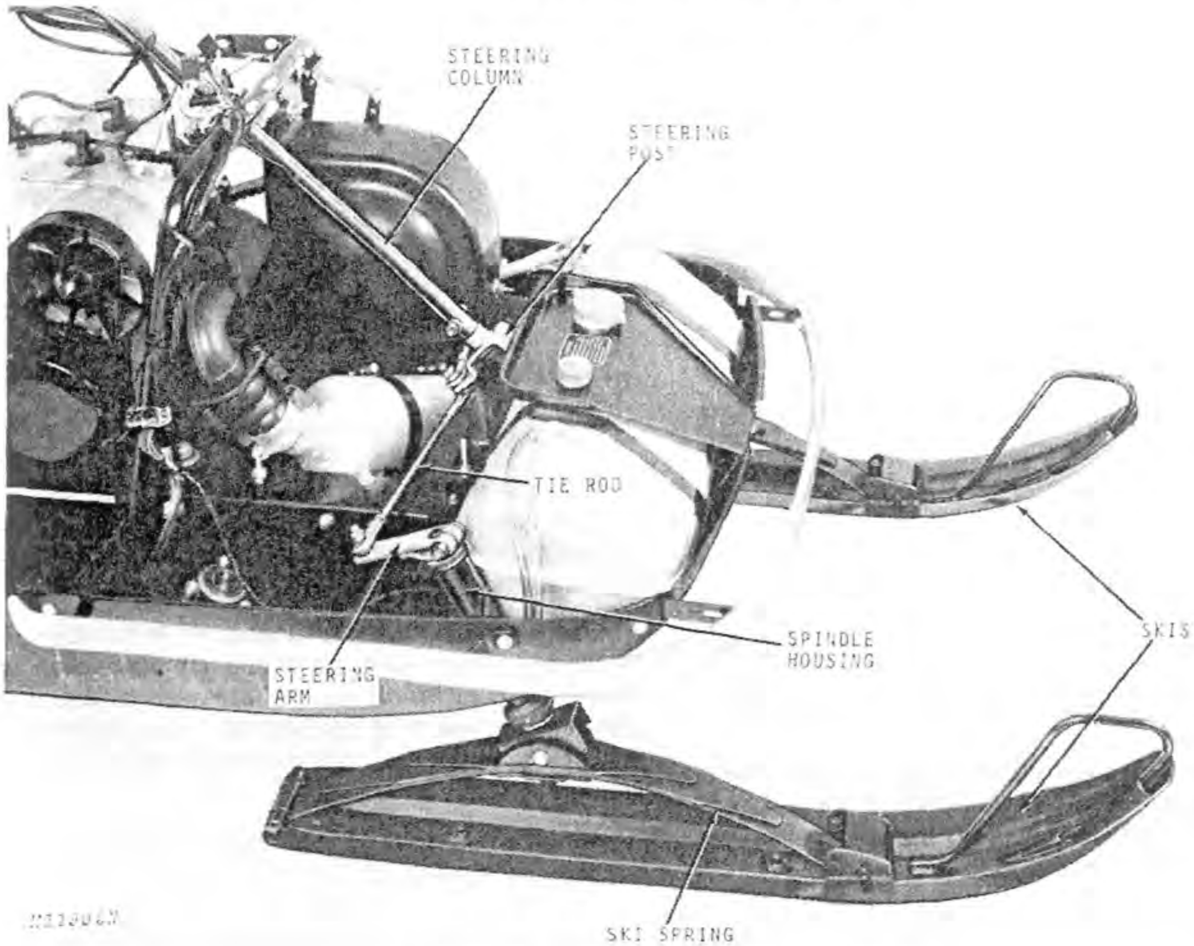


Fig. 1-Skis and Steering (Serial No. -20,000)

The skis, Fig. 1, have replaceable wear rods and wear plates. The 3-leaf ski springs are replaceable as a complete unit only. Because spring leaves wear out simultaneously, replacing only the broken leaf would result in early failure of another leaf.

The ski spindles are completely rubber-mounted and are isolated from the spindle housing to reduce shock and vibration.

The tie rod ends are color-coded for convenience; silver color indicates right-hand threads, gold color indicates left-hand threads. Both the tie rods and the spindles are designed to bend rather than break when subjected to severe shock loads.

The handlebar steering column is mounted in rubber at the top and fastens to the steering post at the bottom. The steering post is mounted in a replaceable nylon bushing.

The steering post and steering column are fastened together with a cap screw, nut and two tapered sleeves.

NOTE: All machines beginning with Serial No. 20,001 have a one-piece steering column. The tapered sleeves have been eliminated.

See "Diagnosing Malfunctions" in Group 5 of this section.

ANALYSIS

CAUTION: Worn, bent, or damaged ski and steering components are unsafe. Remember, a snowmobile travels at near-highway speeds.

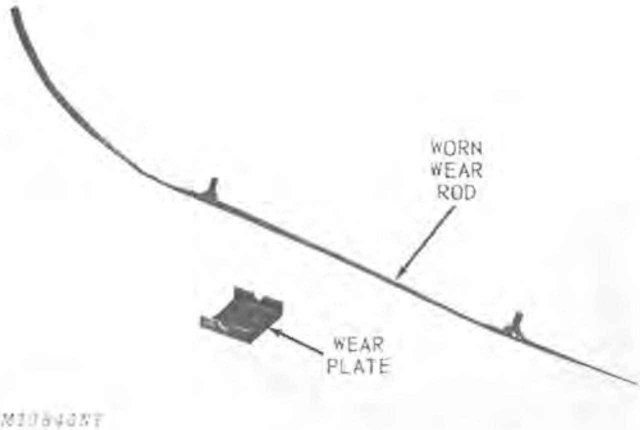


Fig. 2-Wear Plate and Wear Rod

Replace the wear rods on the skis if worn as shown in Fig. 2. Rapid wear of this type indicates operation without snow lubrication. Worn wear rods are unsafe because they cause a loss of snowmobile maneuverability.

Replace the ski wear plates, Fig. 2, if badly worn or damaged. If a worn out wear plate is not replaced, the ski spring will wear through the ski, making ski replacement necessary.

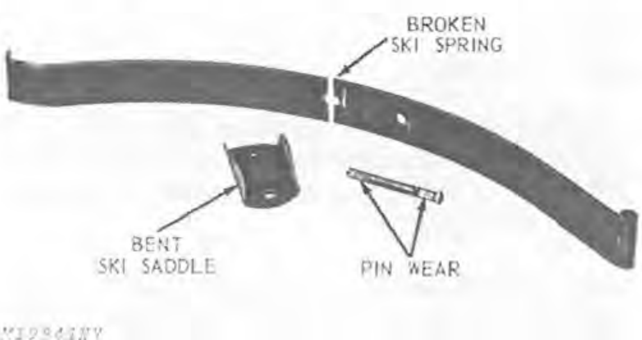


Fig. 3-Ski Spring, Saddle and Pin

Replace ski springs if found broken, Fig. 3, or damaged.

Inspect ski saddles, Fig. 3, and replace if bent or damaged. A bent saddle indicates ski was subjected to severe forces, such as hitting an obstruction at high speed, or landing on one ski after jumping.

Replace ski attaching pins, Fig. 3, if worn.

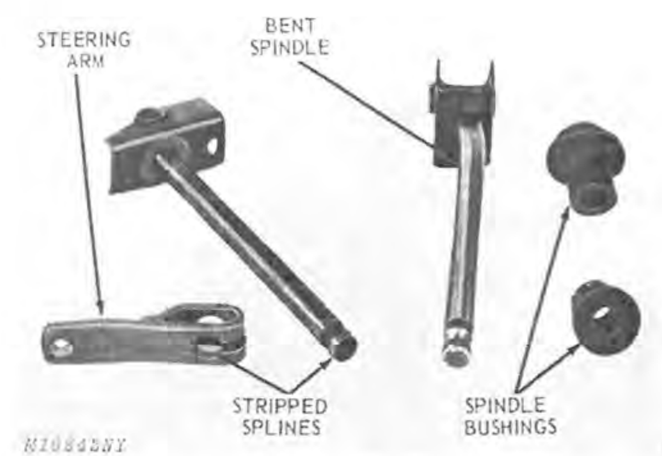


Fig. 4-Steering Arm, Spindles and Bushings

Stripped spindle and steering arm splines, Fig. 4, indicate operation without steering arm attaching cap screws tight or improper installation of steering arm. Never force steering arms into place.

A bent spindle, Fig. 4, indicates ski was subjected to severe forces such as hitting an obstruction at high speed or landing on one ski after jumping. Whenever damage of this type is found, closely examine the rest of the ski and steering mechanism for bends, damage or cracks.

Replace ski spindle bushings, Fig. 4, if worn, cracked or damaged.

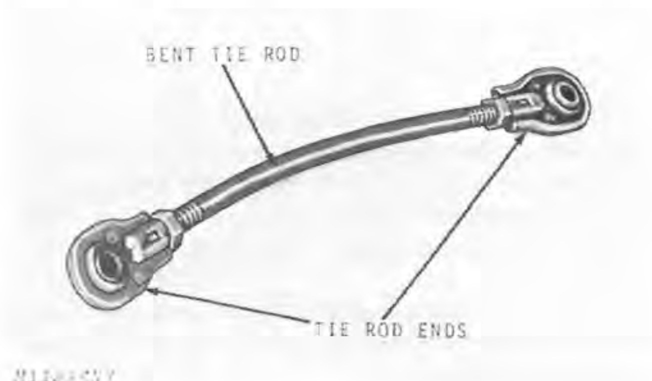
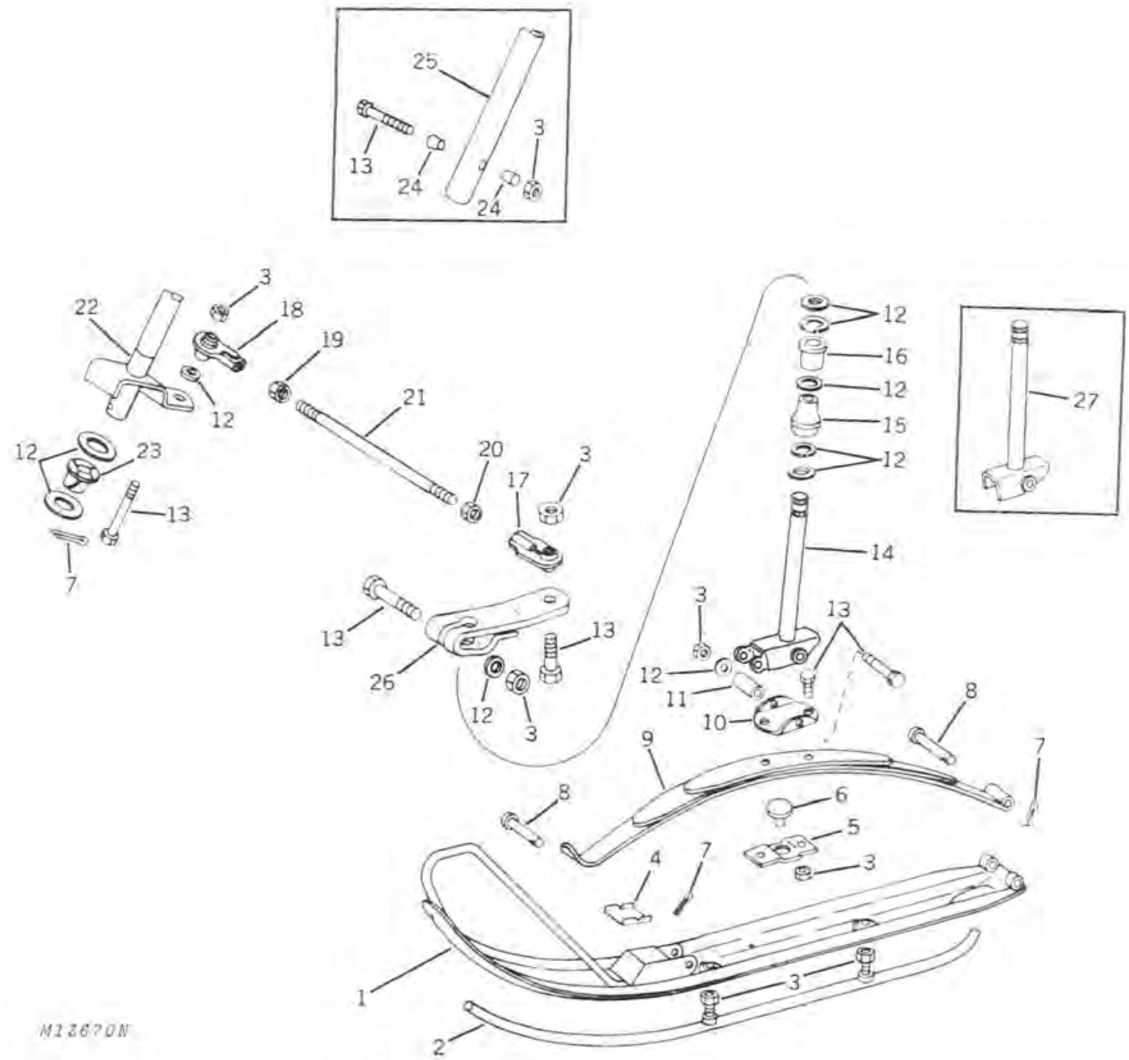


Fig. 5-Tie Rod Assembly

A bent tie rod, Fig. 5, indicates ski was subjected to severe forces. Replace the tie rod and closely inspect the rest of the steering mechanism for damage.

Replace tie rod ends, Fig. 6, if excessively loose. A loose tie rod end can cause sloppy steering and could be a safety hazard.

REPAIR



1—Ski
2—Wear Rod
3—Lock Nut
4—Wear Plate
5—Bumper Retainer
6—Ski Bumper
7—Cotter Pin
8—Drilled Pin
9—Ski Spring
10—Ski Saddle
11—Spacer
12—Washer
13—Cap Screw
14—Spindle
15—Lower Spindle Bushing
16—Upper Spindle Bushing
17—Tie Rod End (RH Threads)
18—Tie Rod End (LH Threads)
19—Jam Nut (LH Threads)
20—Jam Nut (RH Threads)
21—Tie Rod
22—Steering Post and Column
23—Steering Post Bushing
24—Tapered Sleeve
25—Handlebar Column
26—Steering Arm
27—Steering Spindle

Fig. 6-Exploded View of Skis and Steering Mechanism

NOTE: On all Snowmobiles prior to Serial No. 20,001, the steering post and column are separate pieces and are secured together by tapered sleeves, bolt and nut. Beginning with Serial No. 20,001, the steering post and column are welded. A steering spindle change also occured with Serial No. 20,001. Refer to Keys 14 and 27 in Fig. 6.

Replacing Ski Wear Rods

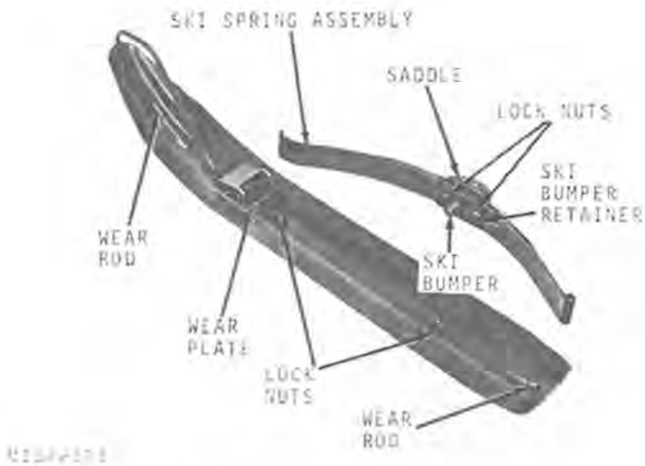


Fig. 7-Ski Maintenance

Remove the two lock nuts, Fig. 7, securing the wear rod to the ski. Pry wear rod down to get studs out of holes; then slide rod forward to remove back of rod from rear hole in ski, and remove.

Place forward end of new wear rod in position and slide it rearward, positioning back end of rod and two studs into holes in ski. Install lock nuts and tighten securely.

Replacing Wear Plates

NOTE: Ski spring does not have to be removed to replace wear plate as shown in Fig. 7.

Remove pin securing forward end of ski spring. Lift spring up slightly and slide out old wear plate, Fig. 7.

Slide new wear plate into position, drop forward end of spring and secure with pin and cotter pin.

Replacing Ski Springs

Ski springs are only available as an assembly including a saddle, bumper and bumper retainer, Fig. 7.

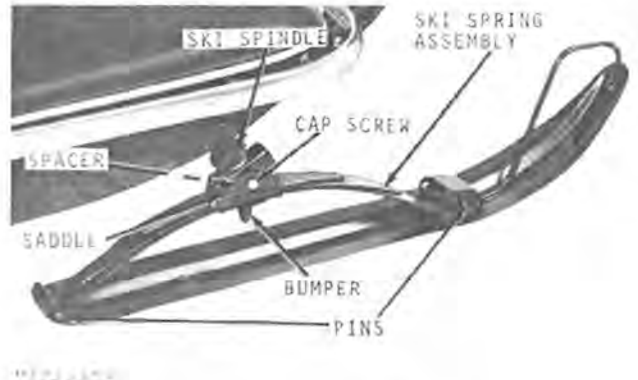


Fig. 8-Replacing Ski Springs

Remove the lock nut, washer and cap screw, Fig. 8, securing the ski and spring assembly to the ski spindle. Remove the two cotter pins and pins, Fig. 8, securing the spring assembly to the ski and remove spring assembly. Install new wear plate if necessary.

Install new spring assembly and secure to ski with two pins and cotter pins. With spacer in place in ski spindle, attach ski and spring assembly to spindle with cap screw, washer and lock nut. Torque to 39 ft-lbs.

Replacing Ski Bumpers and Saddles

Remove the two lock nuts and cap screws securing the saddle and bumper retainer to the ski springs, Fig. 7. Remove the bumper retainer. Install a new bumper and secure with bumper retainer, two cap screws and lock nuts. Tighten firmly.

To replace saddle, remove it from spring as outlined above. Remove cap screw, washer and lock nut securing saddle to ski spindle. Replace in opposite order.

IMPORTANT: Check condition of two cap screws securing saddle and bumper retainer to ski spring. Replace if worn. Nuts should be tightened to 35 to 40 ft-lbs torque.

Replacing Ski Spindles

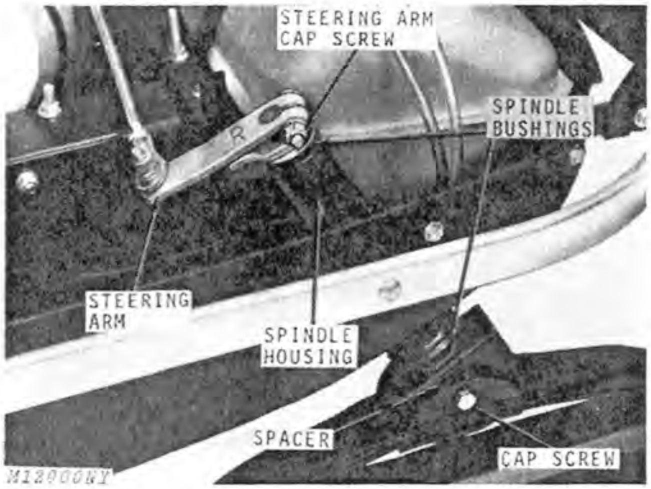


Fig. 9-Removing Ski Spindle

Remove the lock nut, washer and cap screw, Fig. 9, securing the ski and spring assembly to the spindle. Remove the ski and spring assembly and remove the spacer from the ski spindle. Remove the cap screw securing the steering arm to the spindle and drive spindle down and out of spindle housing. Replace bushings if worn, damaged, or cracked.

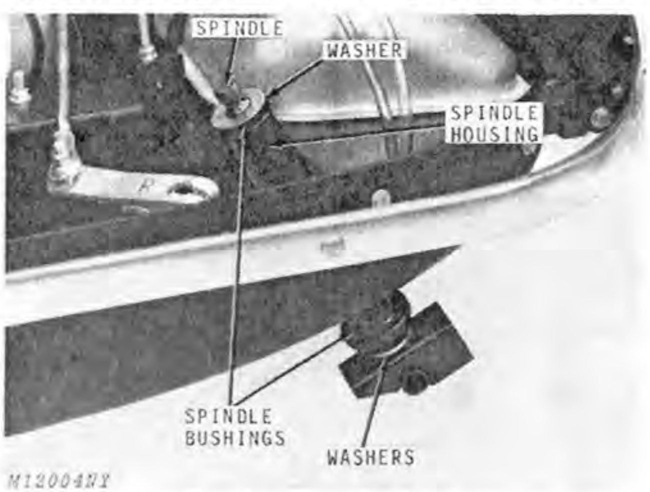


Fig. 10-Installing Ski Spindle

Install two washers and lower spindle bushing in place on ski spindle, Fig. 10. Install a washer and upper spindle bushing on top of spindle housing. Slide ski spindle up into place from bottom. Place two or more washers over spindle on top of upper bushing, Fig. 10.

NOTE: Use as many washers in this position as necessary to take the play out of spindle and spindle bushings with the steering arm installed.

Install spacer in spindle and install ski and spring assembly, Fig. 9. Secure with cap screw, washer and lock nut. Torque to 39 ft-lbs.

Replacing Steering Arms

With handlebars positioned to steer straight ahead, position skis so they are parallel and pointing straight ahead.

With skis and handlebars in this position, place steering arm over spindle and secure with cap screw, washers and lock nut, Fig. 9. Tighten securely.

IMPORTANT: Do not force steering arm over spindle or splines will be damaged. Align splines before installing. Align skis after installation.

NOTE: If tie rod assembly has been replaced, adjust tie rod to 11-7/8 inches (hole center-to-hole center) before placing steering arm over spindle. See Fig. 12.

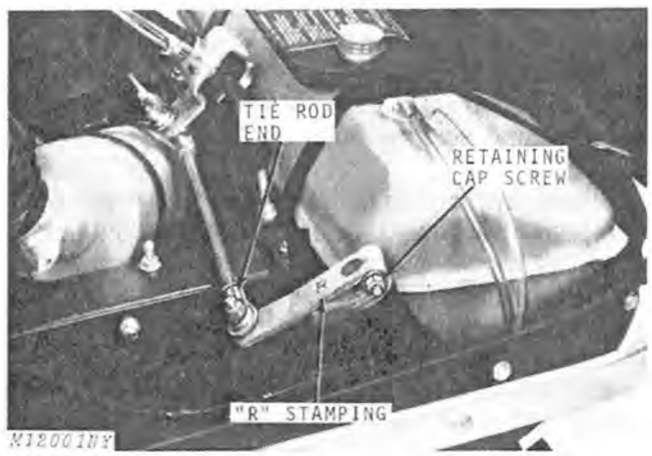


Fig. 11-Replacing Steering Arm

Remove tie rod end cap screw and steering arm retaining cap screw and lift steering arm off ski spindle.

Steering arms are stamped "L" and "R". "R" steering arm must be replaced on right-hand side of snowmobile, Fig. 11. Attach steering arm to tie rod end.

With handlebars positioned to steer straight ahead, position skis so they are parallel and pointing straight ahead. See "Adjustment", page 60-25-7.

With skis and handlebars in this position, place steering arm over spindle and secure with cap screw, washers and lock nut, Fig. 11. Tighten securely.

IMPORTANT: Do not force steering arm over spindle, or splines will be damaged. Align splines before installing. Align skis after installation.

Replacing Tie Rod Assembly

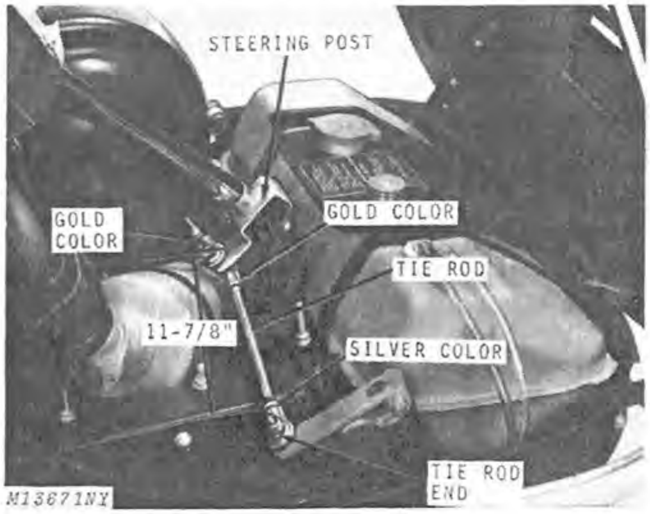


Fig. 12-Tie Rod Assembly

Remove cap screws securing tie rod ends to steering post and steering arms, Fig. 12.

Adjust new tie rods to 11-7/8-inch dimension (hole center-to-hole center) as shown, Fig. 12. Each tie rod must have one silver-colored end and one gold-colored end. Silver color indicates right-hand threads. Gold color indicates left-hand threads.

IMPORTANT: Do not at any time adjust the tie rod to exceed 12-1/4-inches from center-hole to center-hole. If necessary, to maintain the correct dimension of 11-7/8-inches, move the steering arm in one serration, allowing the long part of the steering arm to move toward the center of the snowmobile.

Attach gold-colored tie rod ends to steering post; silver-colored ends to steering arms. Secure with cap screws and lock nuts, positioning lock nuts on top as shown, Fig. 12. Tighten securely.

IMPORTANT: A washer must be placed on each side of steering post, Fig. 12. Right-hand tie rod must be installed below steering post, Fig. 12, and left-hand tie rod above post. Align skis after installation.

Replacing Steering Post Assembly

To replace steering post bushing, Fig. 13, remove cotter pin and washer from end of steering post. Slide steering column back sufficiently to replace bushing and then slide it back into place. Secure with washer and cotter pin.

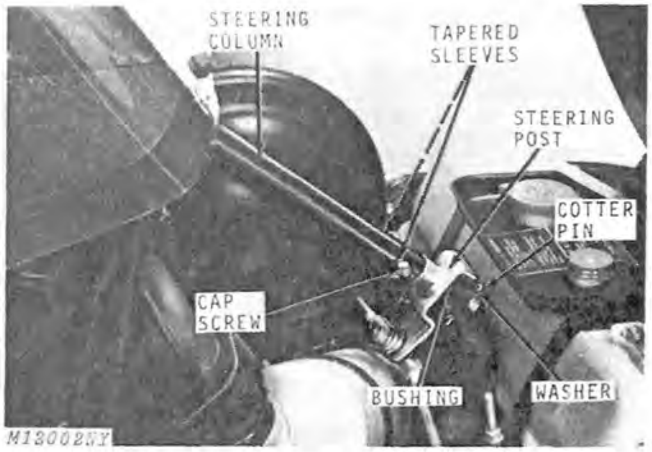


Fig. 13-Steering Post Assembly

To replace steering post, the steering column cap screw, nut and tapered sleeves must be removed. Remove tie rods from steering post. Remove cotter pin and washer securing post to frame. Replace in opposite order.

Inspect tapered sleeves on steering column cap screw, Fig. 13. Replace if damaged. Tighten this cap screw to 20 ft-lbs.

NOTE: Procedure is the same for all machines beginning with Serial No. 20,001 with the exception of the tapered sleeves which have been eliminated.

Replacing Steering Column Bushing

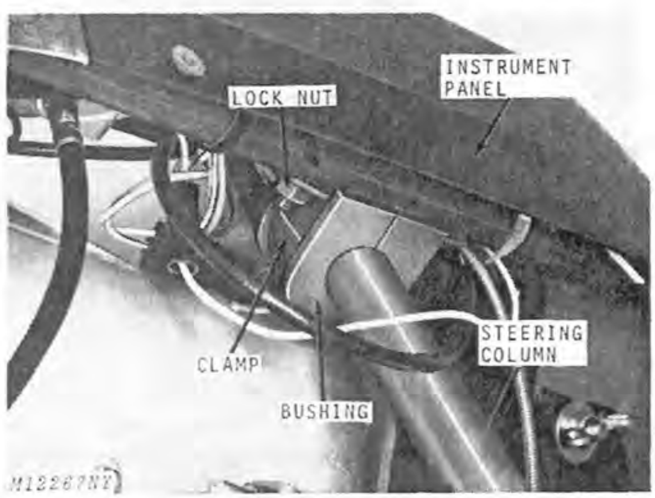


Fig. 14-Steering Column Bushing

Remove two lock nuts and clamp securing bushing, Fig. 14. Open bushing and remove from steering column. Install in opposite order.

ADJUSTMENT

Aligning Skis

Fig. 15-Correctly Aligned Skis

When properly aligned, skis are parallel (equal distance at "A" and "B") with skis pointing straight forward and handlebars positioned to steer straight ahead, Fig. 15.

IMPORTANT: Measure from parallel sides of skis only; not from tapered ends.

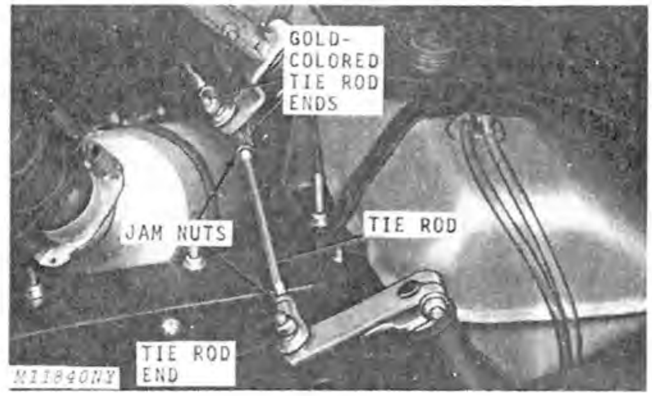


Fig. 16-Adjusting Tie Rods

To properly align skis, loosen jam nuts on tie rod ends. Remember, gold-colored tie rod ends have left-hand threads which must be loosened opposite the normal rotation, Fig. 16.

Turn tie rods to lengthen or shorten, as required, to make skis parallel and keep handlebars in alignment with skis. Tighten jam nuts securely.

IMPORTANT: When tightening jam nuts on tie rods, be certain tie rod ends are still free to swivel after jam nuts are tight.

IMPORTANT: Hold the tie rod with vice grips after the adjustment is made and while the jam nut is being tightened. Damage or stripping of the threads may occur within the ball joint if tie rod is not held.

ELIMINATING LOOSE STEERING

The three major causes of loose (sloppy) steering are as follows. Tighten and replace parts as necessary.

1. Loose steering column cap screw.
2. Excessively worn tie rod ends.
3. Excessively worn spindle bushings.

CAUTION: Make it a habit frequently to check steering components and hardware for condition and tightness. Remember snowmobiles travel at near-highway speeds.

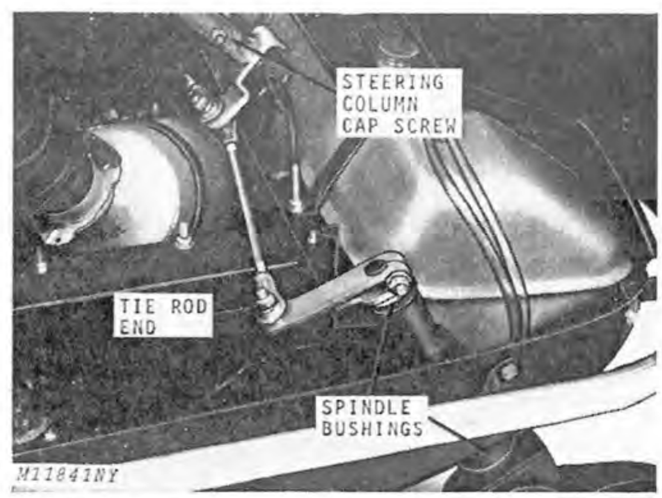


Fig. 17-Correcting Loose Steering

Group 30
SPECIFICATIONS

SPECIFICATIONS

Item	Specifications
Track Tension	Rear screw head one-half covered when man is seated on snowmobile
Track Alignment	Equal distance between track and pivot arms
Ski Alignment	Parallel
Approximate Tie Rod Length (Hole Center-to-Hole Center)	11-7/8 in.

Torque for Hardware

Location	Torque
Lower Chain Case Sprocket Retaining Cap Screw	30 to 38 ft-lbs
Driven Sheave Retaining Cap Screw	20 ft-lbs
Ski Mounting Cap Screw	39 ft-lbs
Steering Column Cap Screw—All Snowmobiles (Serial No. -20,000)	20 ft-lbs
Ski Saddle to Ski Spring	35 to 40 ft-lbs

Section 70
SERVICE TOOLS

Group 5
ESSENTIAL SERVICE TOOLS

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Hand Tools	10-3

The essential tools listed in this group will service all John Deere Snowmobiles. These essential tools are required for all snowmobile dealers. They can be ordered from:

Service Tools Inc.
1901 Indiana Avenue
Chicago, Illinois 60616

ENGINE TOOLS

Fig. 1-Flywheel Holding Tools

Flywheel Holding Tools, Fig. 1, consists of JDM-31 Kohler Flywheel Holding Tool and JDM-2 CCW Flywheel Holding Tool. These tools prevent the flywheel from rotating while removing and installing the retaining nut.

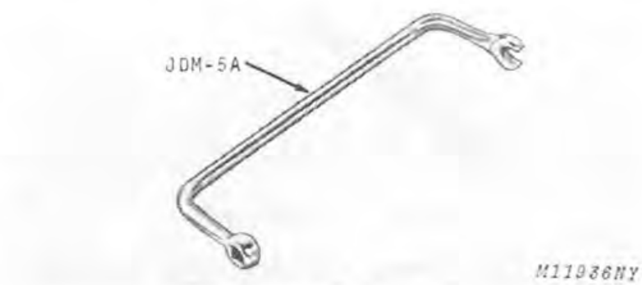


Fig. 2-Cylinder Nut Wrench

JDM-5A Cylinder Nut Wrench, Fig. 2, provides a means of removing and retorquing the cylinder-to-crankcase nuts on CCW engines.

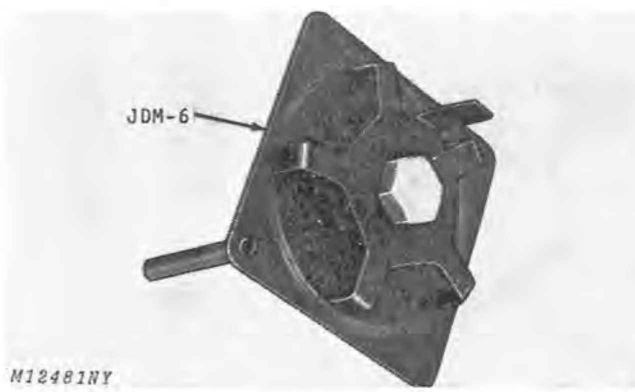


Fig. 3-Starter Spring Winding Tool

JDM-6 Starter Spring Winding Tool, Fig. 3, enables recoil starter springs to be rewound in a fast, safe and easy operation.

ENGINE TOOLS—Continued

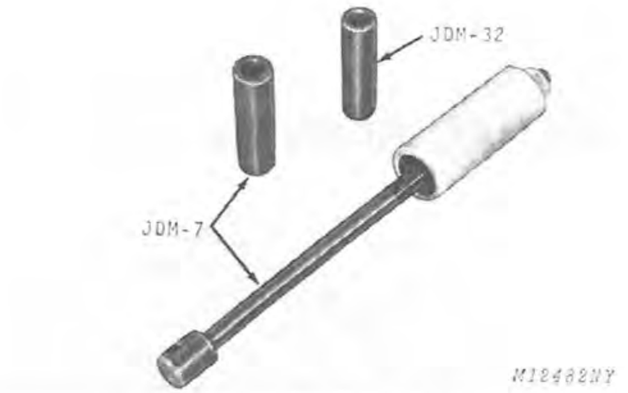


Fig. 4-Piston Pin Service Tools

With the JDM-7 Piston Pin Service Set and JDM-32 Piston Pin Adapter, Fig. 4, you can remove and install piston pins on all CCW and Kohler engines without damage to piston or rod bearings.

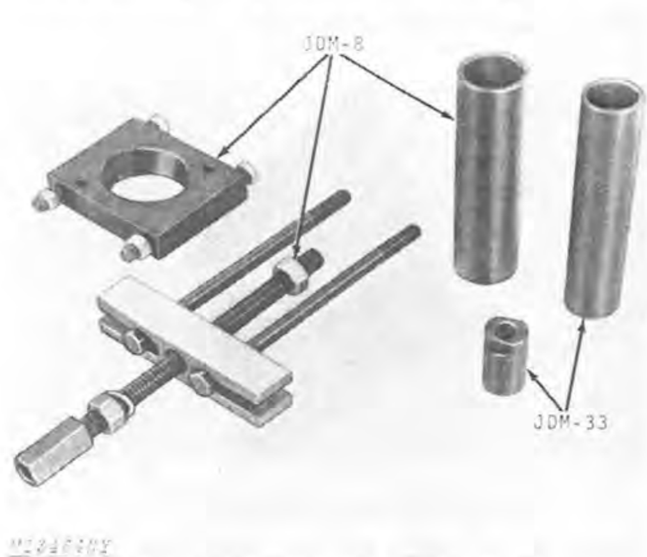


Fig. 5-Crankshaft Bearing Service Set and Bearing Tool Adapter Kit

JDM-8 Crankshaft Bearing Service Set and JDM-33 Bearing Tool Adapter Kit, Fig. 5, are used to remove and install the crankshaft bearings on CCW and Kohler engines. These tools can also be used to remove the rear idler bearings on the bogie suspension system.

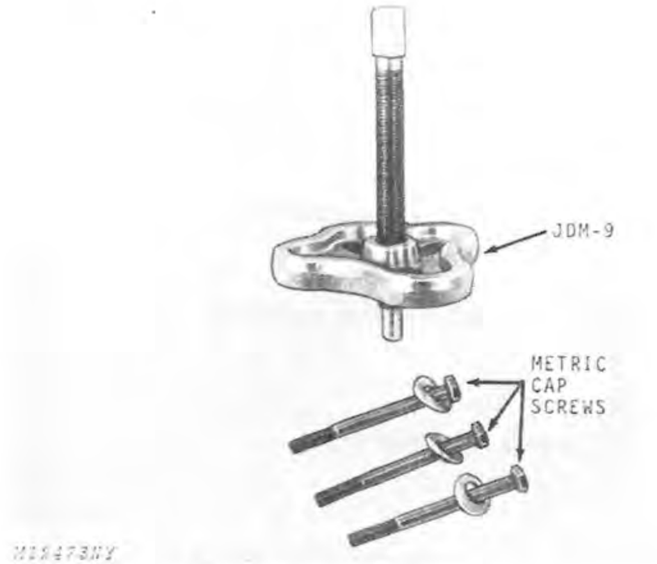


Fig. 6-Flywheel Puller Assembly

JDM-9 Flywheel Puller Assembly, Fig. 6, is a versatile puller that includes metric cap screws and washers to remove the flywheel of CCW engines. It can also be used with U.S. standard cap screws to remove the flywheel and ring gear mounting flange on Kohler engines.

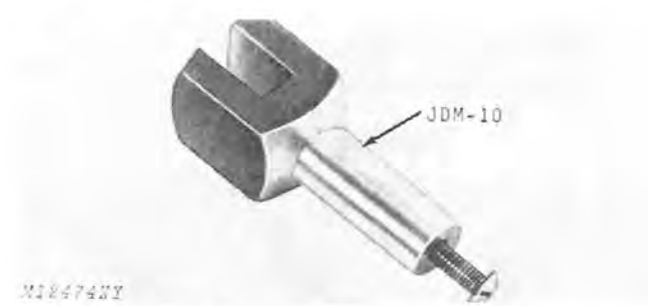


Fig. 7-Dial Indicator Mounting Bracket

JDM-10 Dial Indicator Mounting Bracket, Fig. 7, is used with JDM-15 or equivalent dial indicator to measure the crankshaft runout on all CCW and Kohler engines.

Fig. 8-Spanner Wrench

JDM-30 Spanner Wrench, Fig. 8, is used to hold the axial cooling fan during assembly and disassembly procedures on Kohler 295-2AX engines and CCW 440/21, 400/22 and 440/22 reed valve engines. It is also used on CCW 440/4, 340/5 and 440/5 piston ported engines.

Fig. 9-Ring Gear Hub Installation Gauge

JDM-37A Ring Gear Hub Installation Gauge, Fig. 9, is used to install and properly position the starter ring gear hub or ring gear on the crankshaft of Kohler engines. It is used with JDM-8 Crankshaft Bearing Set.

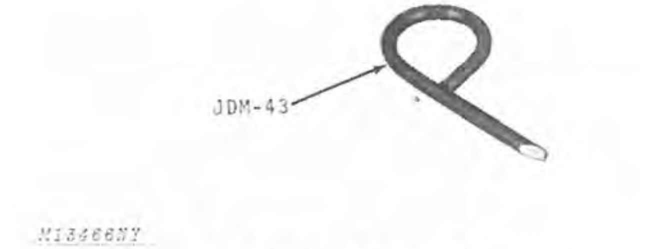


Fig. 10-Kohler Flyweight Tool

JDM-43 Flyweight Tool, Fig. 10, retains engine flyweight in the "advance position" when timing Kohler engines.

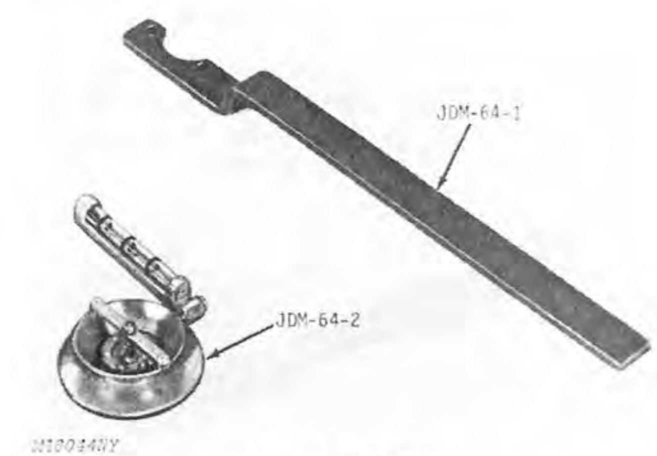


Fig. 11-Tool Set

JDM-64 Tool Set, Fig. 11, is used on the JD295/S and JD340/S Snowmobiles. JDM-64-1 Flywheel Holding Tool prevents the flywheel from rotating while removing and installing the retaining nut. JDM-64-2 Air Flow Meter is used to fine tune the Mikuni carburetors.

CLUTCH TOOLS

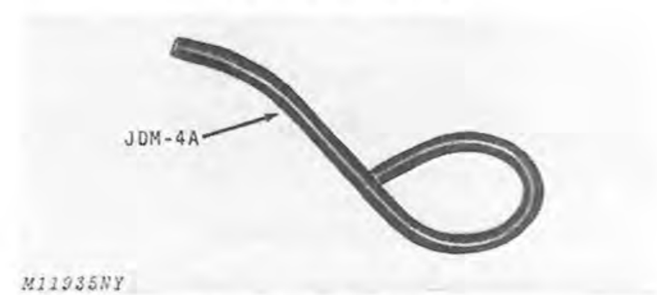


Fig. 12-Clutch Spring Tool

JDM-4A Clutch Spring Tool, Fig. 12, is used to assemble clutch springs on the roller arms of Salsbury Model 780 and 910 Primary Clutches.

CLUTCH TOOLS—Continued

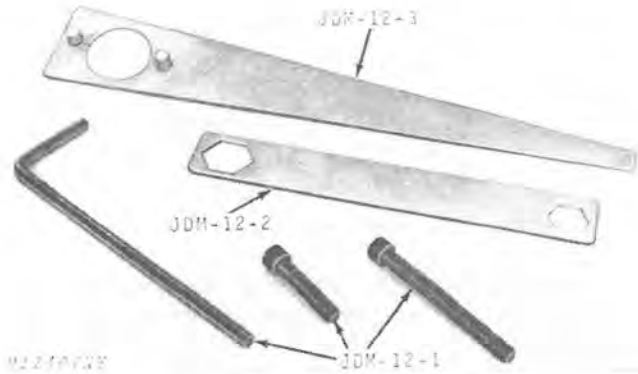


Fig. 13-Salsbury Clutch Service Set

The JDM-12 Salsbury Clutch Service Set, Fig. 13, contains a ramp plate holding tool, ramp plate nut wrench and clutch assembly puller to service the Model 780 and 910 Salsbury Clutches.

Fig. 14-Clutch Puller

JDM-28 Clutch Puller, Fig. 14, is used to remove all primary clutches from either CCW or Kohler engines. It is used in conjunction with JDM-12-3 Spanner Wrench and JDM-29 Holding Tool Adapter.

Fig. 15-850 Clutch Adapter

JDM-29 850 Clutch Adapter, Fig. 15, is used with the JDM-12-3 Spanner Wrench to hold the Model 850 Clutch during removal and installation.

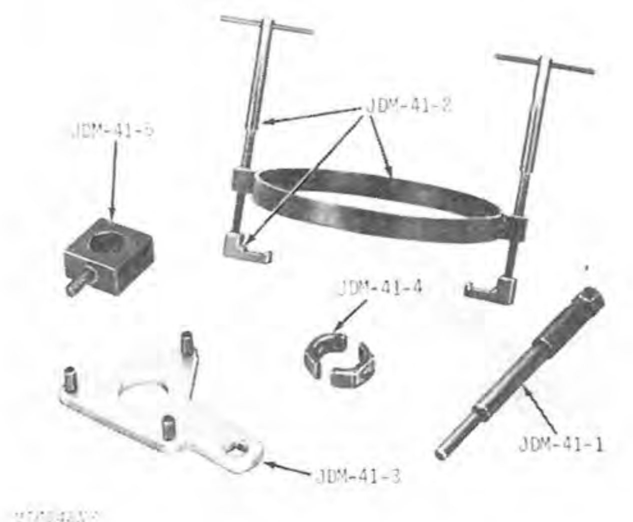


Fig. 16-John Deere (Comet) Drive Sheave Set

JDM-41-A John Deere (Comet) Drive Sheave Set, Fig. 16, is used to remove, disassemble and assemble the Drive Sheave. The set consists of JDM-41-1 Puller, JDM-41-2 Screw Assembly with Swivel and Ring, JDM-41-3 Spider Tool and JDM-41-4 Two-Piece Nut and JDM-41-5 Hub Lock.

Fig. 17-Clutch Alignment Tool

JDM-42 Clutch Alignment Tool, Fig. 17, assures the accurate alignment of John Deere (Comet) and Salsbury Drive and Driven Sheaves.

ELECTRICAL TOOLS

Fig. 18-Continuity Tester

JDM-14 Continuity Tester, Fig. 18, is used in conjunction with JDM-15 Timing Indicator to quickly and accurately establish engine timing. It may also be used to locate open or closed electrical circuits.

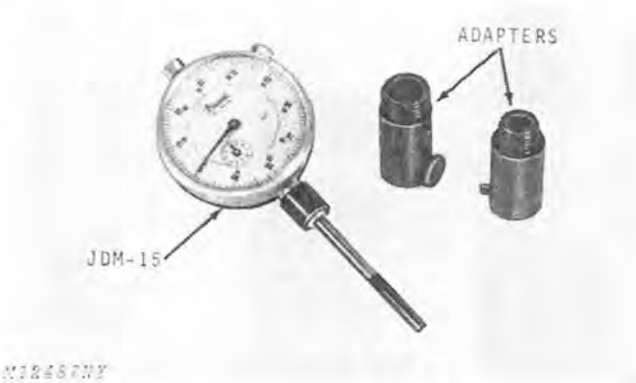


Fig. 19-Snowmobile Timing Indicator

JDM-15 Snowmobile Timing Indicator, Fig. 19, is a dial indicator graduated in 0.001-inch increments with a 1-inch range and collar for fastening into the 14 mm and 18 mm spark plug hole. The adapters are also included. Use the indicator with the JDM-14 Continuity Tester to establish engine timing. The dial indicator can also be used with the JDM-10 Mounting Bracket to measure crankshaft runout. In addition, this tool is required to check crankshaft twist. It can be used on all CCW and Kohler engines.

MISCELLANEOUS TOOLS

Fig. 20-Sprocket Puller

JDM-13 Sprocket Puller, Fig. 20, is used to remove the lower drive sprocket from the chain case on all John Deere Snowmobiles.

HAND TOOLS

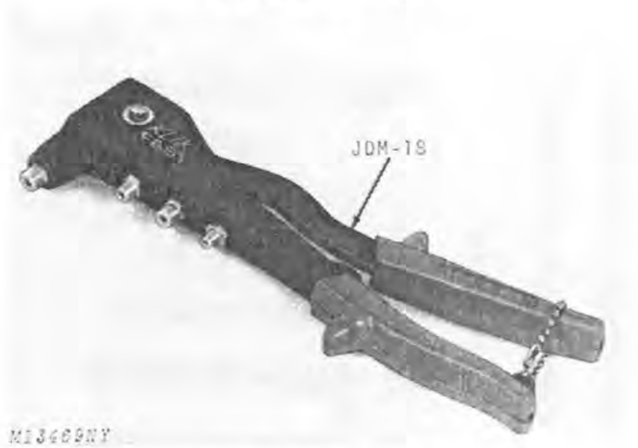


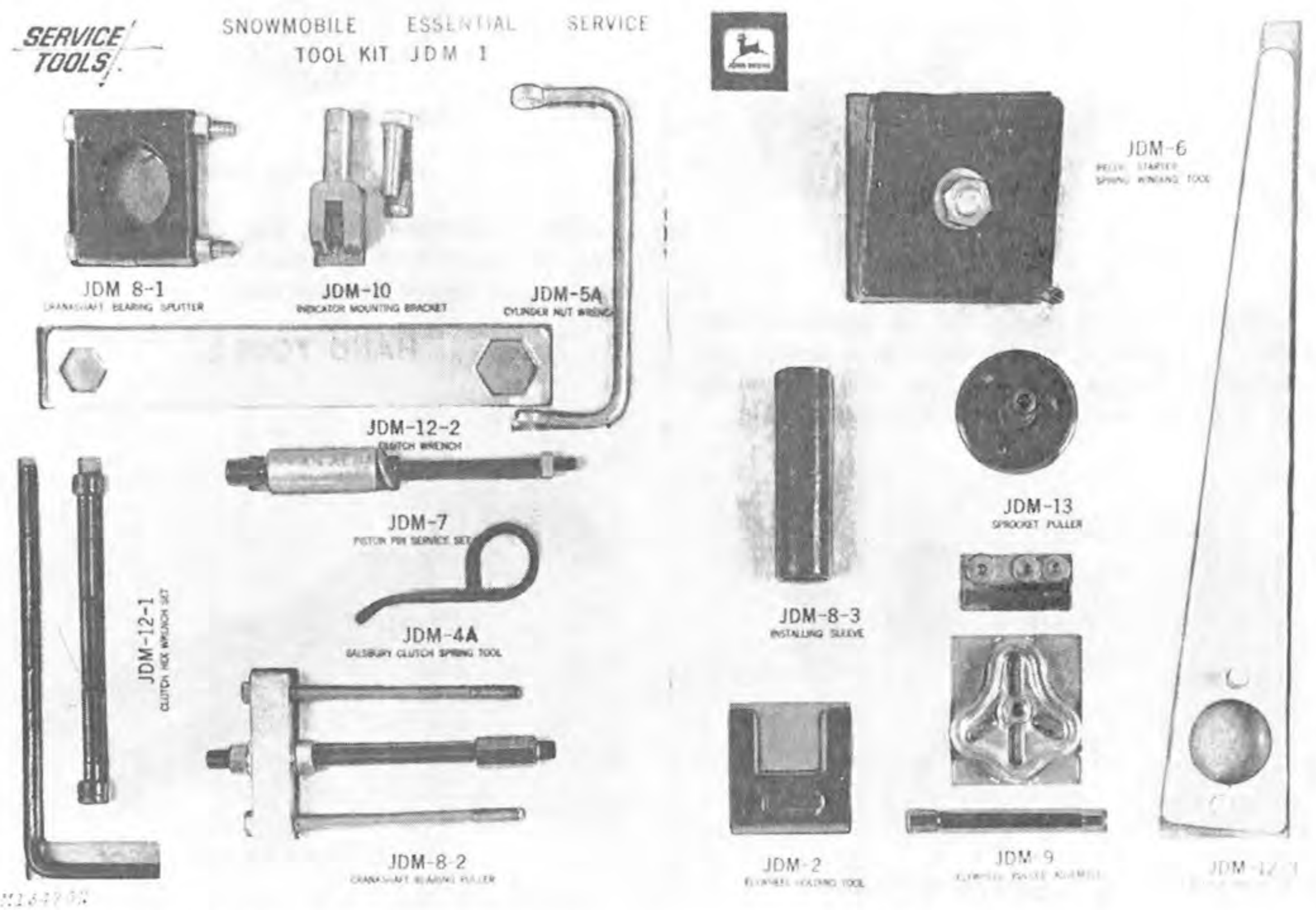
Fig. 21-Pop Rivet Tool

JDM-18 Pop Rivet Tool, Fig. 21, is a heavy-duty hand-operated tool which can be used with up to 3/16-inch diameter steel core rivets. This tool can be used to replace the rivets of the grouser bars on the cleated tracks and for general application of pop rivets on the snowmobile chassis.

TOOL KITS

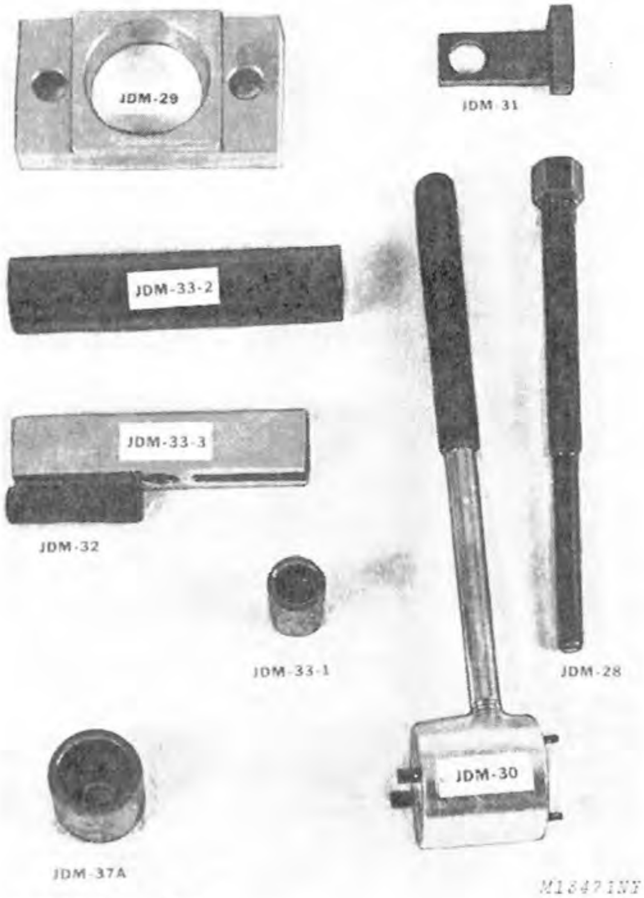
Figs. 22, 23 and 24 illustrate essential service tools. JDM-1 is the 1972 tool kit, JDM-1-B was added for 1973 Snowmobiles and JDM-1-C has been added for 1974 Snowmobiles.

These tool kits should be in all dealer shops to properly service snowmobiles.



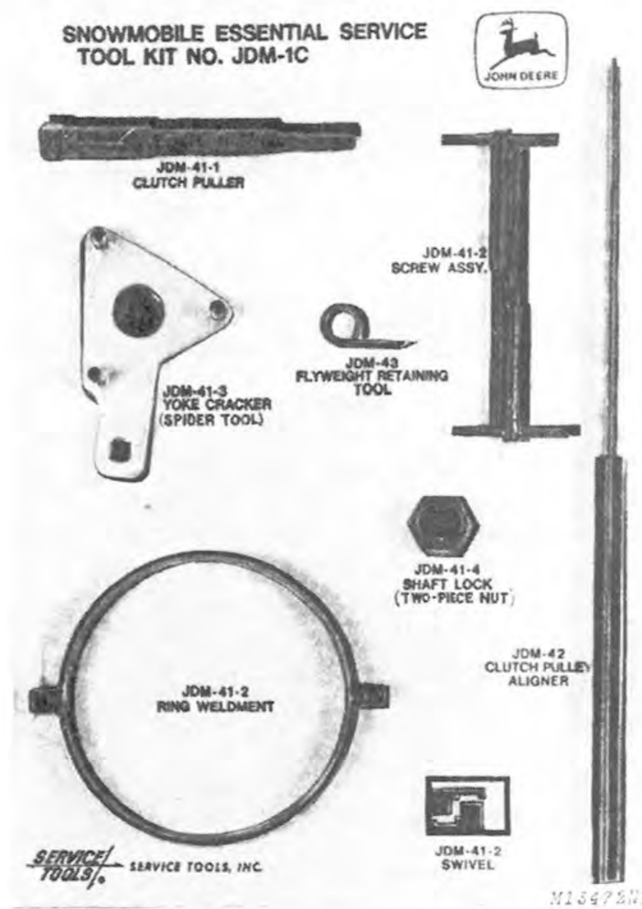
JDM-2 Flywheel Holding Tool
JDM-4A Salsbury Clutch Spring Tool
JDM-5A Cylinder Nut Wrench
JDM-6 Recoil Starter Spring Winding Tool
JDM-7 Piston Pin Service Set
JDM-8-1 Crankshaft Bearing Splitter
JDM-8-2 Crankshaft Bearing Puller
JDM-8-3 Installing Sleeve
JDM-9 Flywheel Puller Assembly
JDM-10 Indicator Mounting Bracket
JDM-12-1 Clutch Hex Wrench Set
JDM-12-2 Clutch Wrench
JDM-12-3 Clutch Holding Fixture
JDM-13 Sprocket Puller

Fig. 22-JDM-1 Tool Kit - 1972



JDM-28 Clutch Puller
JDM-29 850 Clutch Adapter
JDM-30 Spanner Wrench
JDM-31 Flywheel Holding Tool
JDM-32 Piston Pin Adapter
JDM-33-1, JDM-33-2, JDM-33-3 Bearing Tool Adapter Kit
JDM-37A Ring Gear Hub Installation Gauge

Fig. 23-JDM-1-B Tool Kit - 1973



JDM-41-1 Clutch Puller
JDM-41-2 Screw Assembly, Swivel and Ring
JDM-41-3 Spider Tool
JDM-41-4 Two-Piece Nut
JDM-42 Clutch Pulley Aligner
JDM-43 Flyweight Retaining Tool

Fig. 24-JDM-1-C Tool Kit - 1974

Group 10
CONVENIENCE SERVICE TOOLS

These tools are strictly for the convenience of the mechanic. They are not required but they will make any job quicker and easier.

SNOWMOBILE SUPPORT TOOLS

Fig. 1-Snowmobile Dolly

JDM-17A Snowmobile Dolly, Fig. 1, is excellent for moving snowmobiles in or out of the service shop or display area. Large 400 x 8 pneumatic tires make for easy operation. One model fits all snowmobiles.

Fig. 2-Rear Stand

JDM-27 Rear Stand, Fig. 2, is designed to hold the snowmobile track off the floor when the machine is being serviced or stored.

JDST-24 Snowmobile Lift and Repair Stand, (Not Illustrated), is designed for most makes and models of snowmobiles. Raises and rotates machines for preventive maintenance work. Allows serviceman to position the unit at a convenient working height to service or repair difficult-to-reach components. Can also be used in the sales showroom to show customers all the snowmobile features, including the undercarriage.

JDM-26 Fold-A-Ramp Loading Platform, (Not Illustrated), is a 41-inch wide, 1000 pound capactiy ramp that attaches to a pickup tail gate. Folded the ramp is 36 inches high. When ramp is lowered it extends 7 feet to the ground, making it easy to load or unload snowmobiles.

41332 Tool Storage Panel (Not Illustrated) is a standard 24 x 28-1/2-inch pegboard panel for storage of tools not assigned to a specific tool board. Uses standard pegboard hangers on 1 inch centers. Organizes and stores tools for ready accessibility. Complete with large "SERVICE TOOLS FOR JOHN DEERE" decals.

ENGINE TOOLS

Fig. 3-Bench Mounted Service Fixture

JDM-16 Bench Mounted Service Fixture, Fig. 3, will become an indispensable item in your shop. The universal design enables you to mount all consumer product engines, as well as hydrostatic units, selective control valves, hydraulic pumps and many more components. When mounted, any component weighing 350 pounds or less may safely be rotated 360 degrees with positive stops at 90 degree increments.

Fig. 4-Ring Compressor

JDM-35 Ring Compressor, Fig. 4 is a band-type ring compressor with two adapters, capable of use with piston diameters of 2-1/8 inch to 2-5/8 inch. Holds rings in compressed position when installing piston in all John Deere snowmobile engines.

Fig. 5-Piston Lock Ring Plier

JDM-36 Piston Lock Ring Plier, Fig. 5 provides an easy way to install all sizes of piston pin lock rings safely and easily without destroying the rings.

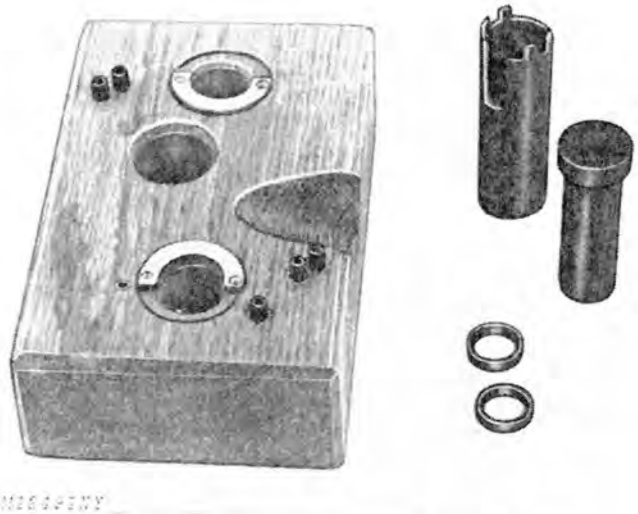


Fig. 6-Condenser Installation and Removal Tool

JDM-38 Condenser Installation and Removal Tool, Fig. 6, is used to remove, install and stake condensors. Used to service Bosch ignition systems on Kohler engines.

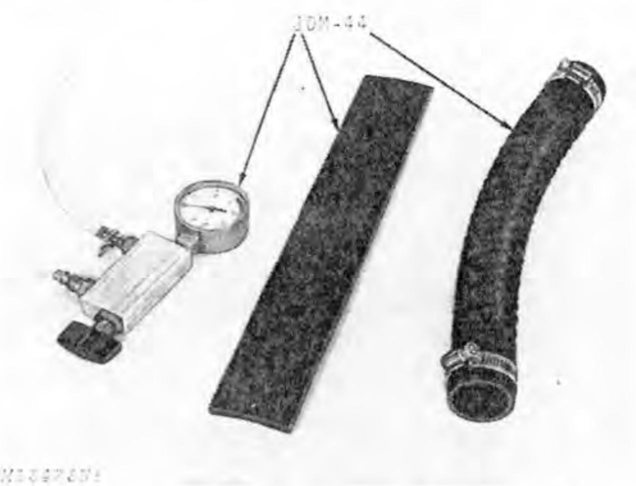


Fig. 7-Pressure Testing Tool

JDM-44 Pressure Testing Tool, Fig. 7, consists of a control valve, pressure gauge, rubber sheet, hoses and clamps. These items are used to seal the intake and exhaust system to pressure test the engine crankcase for Kohler or CCW engines.

HAND TOOLS

JDM-19 (10mm), JDM-20 (13mm), JDM-21 (22mm) Metric Sockets, Fig. 8 are high-quality, alloy steel, 12-point sockets with a 3/8-inch square drive.

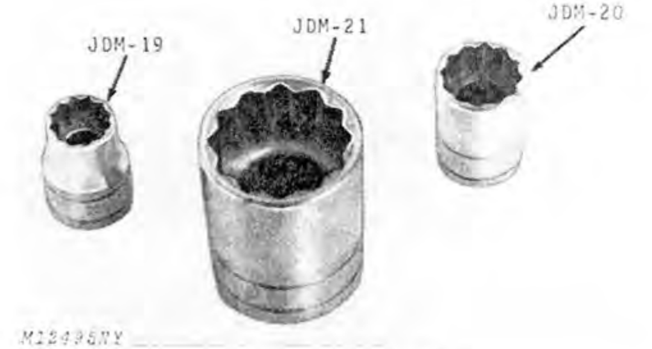


Fig. 8-Metric Sockets

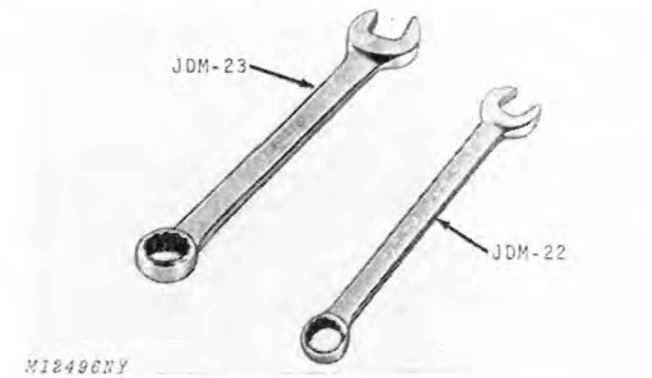


Fig. 9-Metric Wrenches

JDM-22 (10mm) and JDM-23 (13mm) Metric Wrenches, Fig. 9, are both constructed from high-quality alloy steel.

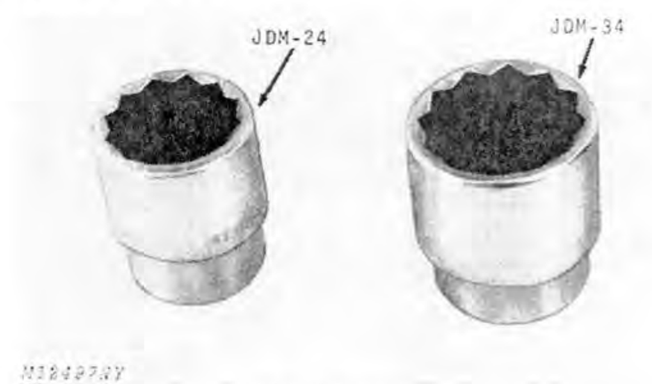


Fig. 10-Sockets

JDM-24 1-1/8-inch Socket and JDM-34 1-3/8-inch Socket are 12-point sockets with a 1/2-inch square drive, Fig. 10.

JDM-25 1-1/2-inch Socket and Adapter (Not Illustrated is a 12-point socket with 3/4-inch square drive and 3/4-inch to 1/2-inch square drive reducing adapter.