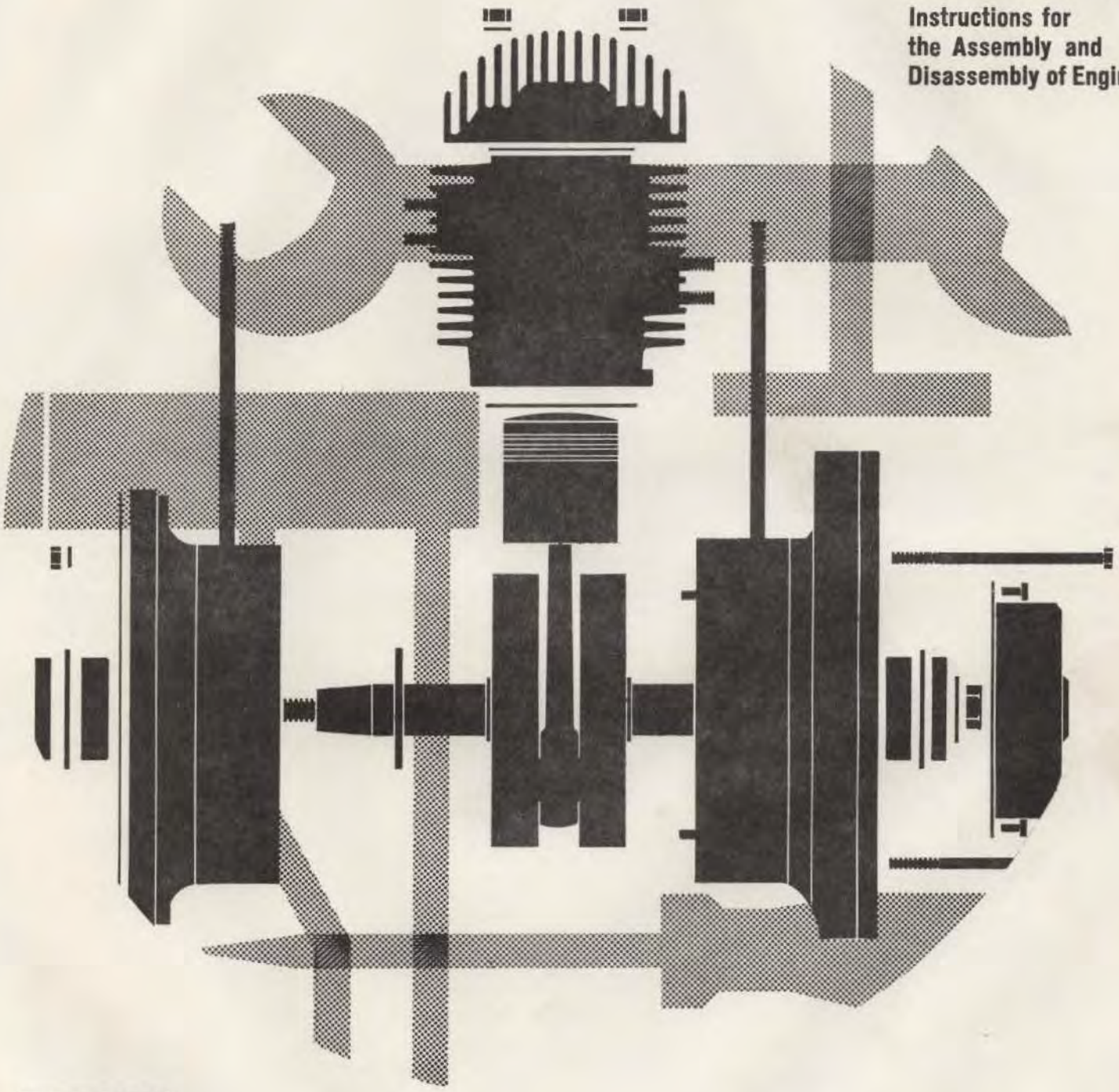
HIRTH MOTOREN KG

7141 BENNINGEN/NECKAR · KREIS LUDWIGSBURG · WEST GERMANY

Model 54 R

Instructions for the Assembly and Disassembly of Engine



WISCONSIN MOTOR CORPORATION

ISSUE MM-324

EXCLUSIVE SALES AND SERVICE REPRESENTATIVES FOR HIRTH ENGINES

Technical data - Hirth Type 54

Engine output	15 DIN H.P. at 5000 R.P.M.
Direction of rotation	Counter-clockwise in view of Power Take-Off Shaft
Bore	75 mm. 2.95 ins.
Stroke	68 mm. 2.67 ins.
Cylinder displacement	300 ccm. 18.30 cu. ins.
Ignition unit	Bosch dynamo magneto ignition with advance timing

Ignition timing	to be set when engine is **not** running 7° before TDC equal to 0,50 mm (0,020 ins.)
	advances automatically when engine is running: 25° before TDC equal to 3,95 mm (0,156 ins.)
Recommended spark plug	Champion UK 10 or Bosch M 225 T1
Spark plug gap	0,5+0,1 mm (0,02+0,004 ins.)

Dismantling the engine - 54 R

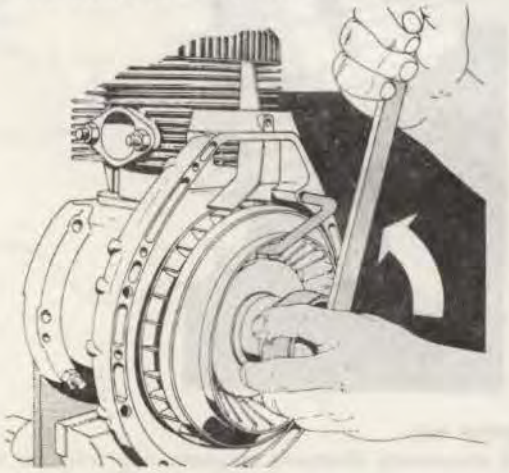
1. Dismount engine from vehicle and remove attaching parts.
2. Mount engine on bench vice by using mounting plate W 40.

Fan housing

3. Remove fan housing complete with recoil starter. In doing so, remove the socket head cap screws and nuts and insert screwdriver into dismantling grooves of fan housing, and lift off.

Fan wheel

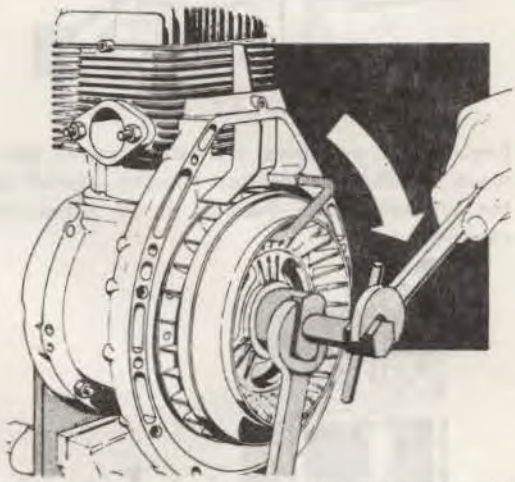
4. Apply holding device W 103 for fan wheel. Loosen catch piece for recoil starter with special wrench W 106. Remove catch piece and cover plate.



5. Remove hexagon nut on crankshaft with socket wrench (wrench size 24 mm).
6. Screw fan wheel puller W 79 on thread of fan wheel, hold against it with open-end 32 mm wrench in areas provided for that purpose, and tighten thrust screw of fan wheel puller until fan wheel comes loose. Remove spring washer on crankshaft.

Ignition

7. Remove screw which serves to fasten ignition wire clip to fan housing. Unwind spark plug socket. Slip off ignition wire strap with connecting wire piece. Unscrew light, ground and short-circuit wire from connector.
8. Remove armature plate which is fastened with 3 cylindrical head screws. Spread a bit of oil on rubber



socket for ignition wire on crankcase housing, through which the cables are run, in order to remove cable with armature plate more easily.

Cylinder

9. After removing remaining screws, remove air guide plate.
10. Remove cylinder head and gasket by loosening the 4 hexagon nuts with 13 mm socket wrench. Lift off cylinder. Take out air directing plate.

Piston

11. Remove piston pin retaining ring by using interior snap-ring pliers. Push out piston pin with drift pin W 39/4. If necessary, apply light hammer strokes. While doing it, support piston with hand and then remove piston.
12. Slide needle cage from small-end hole of connecting rod. It is suggested that it be mounted on piston pin, for safekeeping.

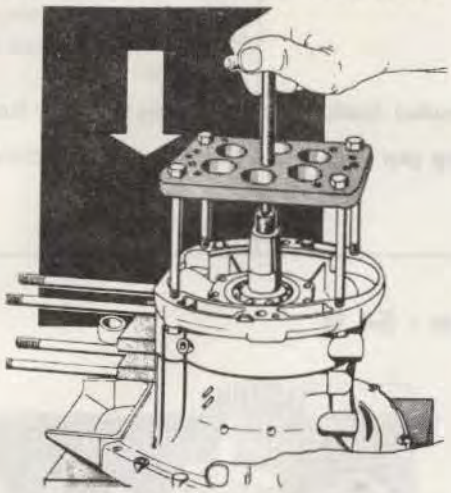
Bearing cover

13. Unscrew bearing cover on ignition side of shaft and remove with gasket.
14. Release engine from bench vice. Place with ignition side on two square wooden pieces W 110. Unscrew mounting plate.
15. Unscrew cover of bearing on P.T.O. side of shaft. If there is a Woodruff key in crankshaft, remove it to ensure that oil seal will not be damaged.
16. Remove crankshaft circlip with external snap-ring pliers.

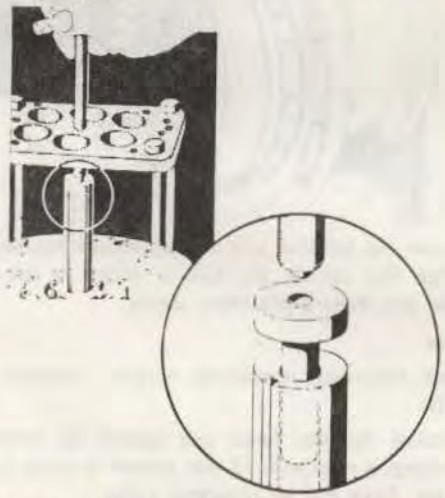
Crankcase

17. Remove 11 hexagon nuts, which serve to fasten the two halfmembers of the crankcase housing, with socket wrench 10 mm.

18. Attach crankcase separator W 105 to crankcase housing flange. Pull off flange with thrust screw.



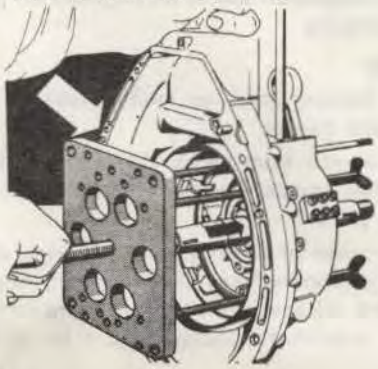
18a Engines with cylindrical crankshaft require that thrust piece W 105/4 be inserted into the internal bore of the crankshaft and that the thrust screw be subsequently applied.



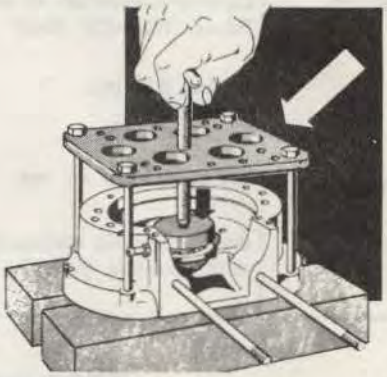
19. Gently use rubber mallet to drive housing screws outward. Take care that the sealing surface remains undamaged.

Crankshaft

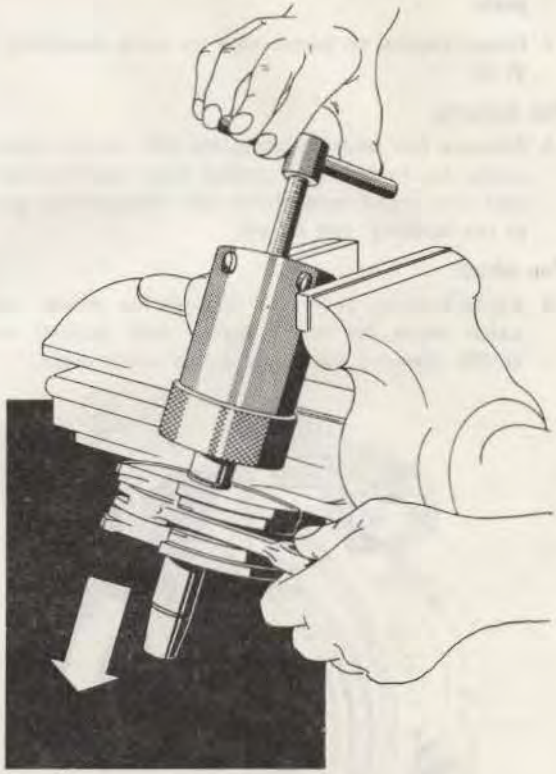
20. Press out crankshaft with ball bearing from fan side of crankcase halfmember. For this purpose apply device W 105 with 3 tie rods W 105/2. By using thrust screw push crankshaft outward.



21. Place crankcase housing with P.T.O. flange on wooden pieces. Stick thrust plate W 105/3 on bearing. Push out bearing using crankcase separator W 105 and thrust screw.



22. Remove grooved ball bearing on ignition side from crankshaft with bearing puller W 107.



Magneto ring

23. If necessary, dismount magneto ring from fan wheel. To do this, loosen the 4 socket head cap screws. The magneto ring is usually removable by hand. If this should not be the case, remove magneto ring by way of the two holes in the fan wheel by striking gently and evenly with a brass drift pin. If it should happen that the two plastic plugs, mounted in the above holes, are damaged, new plugs will have to be inserted from inside of fan wheel when assembling the engine.

24. Wash engine parts in cleaning solvent. Carefully remove any remains of sealing material from sealing surfaces.

25. Replace defective parts.

Assembling of engine - 54 R

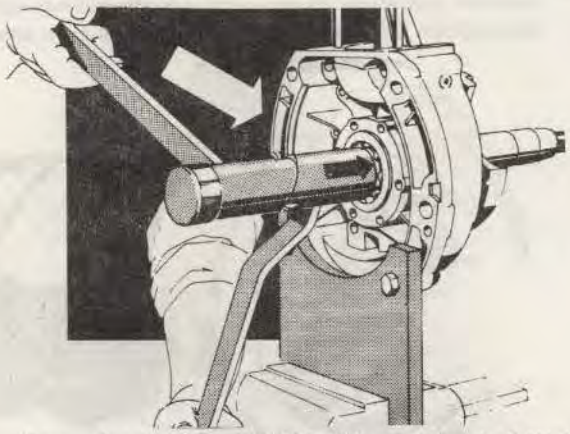
Ball bearing

1. Heat P.T.O. halfmember of crankcase housing to 212 degrees but not above 285 degrees (100 to 140 degrees centigrade). Insert ball bearing into ball bearing seat until it catches collar. Let cool off before you continue to assemble.

2. Lock crankcase flange on mounting plate W 40 and mount on bench vice.

Crankshaft

3. Insert the P.T.O. side of the crankshaft, through bearing, as illustrated.



Screw feeding-in tool W 36 with mounting bolt W 37/1 on threading of crankshaft end. By means of the two lever arms pull in crankshaft to the end of the bore of the tool. Make sure that the connecting rod is directed upward. Next, insert mounting ring W 37/4 under mounting bolt and repeat feeding-in process. Pull in crankshaft right up against the grooved ball bearing.

3a. **Crankshaft with cylindrical shaft.** Pulling in of crankshaft is done as described in point 3, but make sure that you use mounting bolt W 37/6.

4. Insert circlip on the crankshaft, P.T.O. side.

Crankcase housing

5. Mount crankcase flange, turned by 180 degrees, on bench vice.

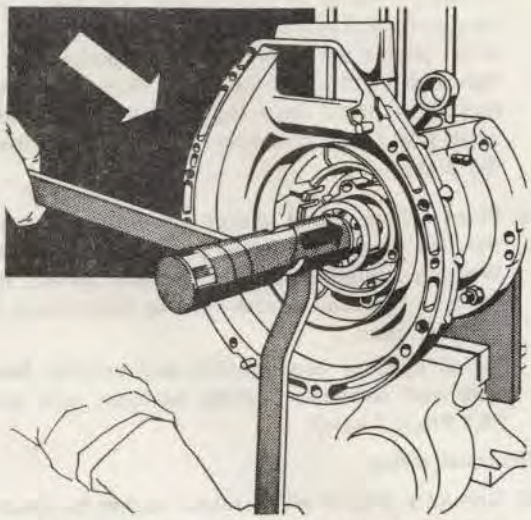
6. Spread evenly sealing compound over sealing area of crankcase flange.

7. Heat crankcase halfmember, ignition side, to 212 degrees but not more than 285 degrees (100 to 140 degrees centigrade), and mount on flange. Pay close attention to fitting pins. Install ball bearing on crankshaft and with device W 36 pull it in into the end of the shaft. In performing this task, use mounting bolt W 37/1 with two mounting rings W 37/4. If needed, add one to two additional rings.

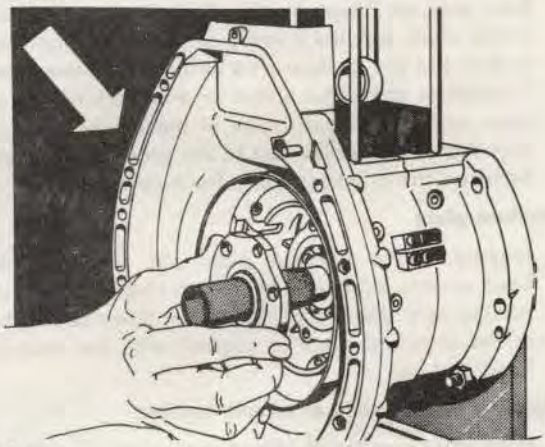
8. Join crankcase housing and flange with 9 hexagon screws and aluminum flat washers. Tighten nuts with 8 ft. lbs pressure (0,8—1 kpm).

Radial oil seal rings

9. Replace both oil seals if necessary. Oil seal lip must point inward (i.e., spring of retaining ring points to grooved ball bearing).
Install gasket and bearing cover. In order not to damage oil seal, please use assembly sleeve W 23 on

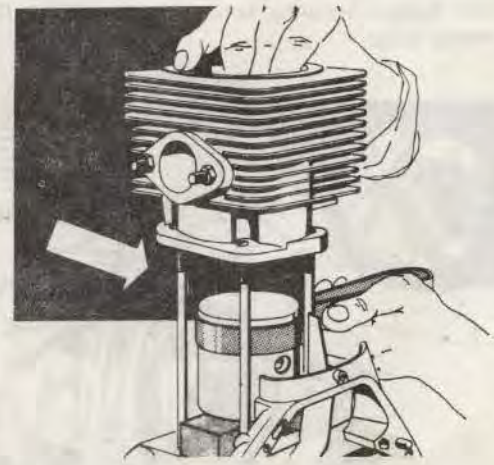


crankshaft, ignition side and push bearing cover over sleeve.
Do not forget to install gasket. Tighten both covers, but first dip screws into sealing compound. **Warning:** the cover with the cut-outs belongs on the ignition side.



Piston

10. Insert cylinder base gasket. Push needle cage into small-end hole (of connecting rod). Oil. Slip piston over connecting rod. Piston must be mounted in such a manner that the arrow which is stamped into the top of the piston points, in the direction of the exhaust port.



Cylinder and cylinder head

11. Insert air directing plate. Place piston supporting wooden block W 24 under piston. Oil piston and working surface of cylinder. Adjust piston rings in a manner which places the safety pin of the piston ring groove between the thrust of the piston rings. With the piston ring strap press rings together. Mount cylinder (exhaust port in the direction of the arrow on the top of the piston).

12. Place cylinder head gasket with rough side on cylinder. The smooth side must point to the cylinder head. **Warning:** When reassembling, head gasket must always be replaced or else blow-by might occur through cylinder head.

    Install cylinder head gasket and cylinder head with nuts and washers. Tighten hexagon nuts evenly at 18.1 ftlb (2.5 kpm).

Electrical wiring

13. Spread a drop of oil on rubber socket for ignition wire in crankcase housing, to pull wire through more easily. Push armature plate over crankshaft. For engines which have exhaust flange on left side, looking at the P.T.O. shaft, pull 3 wires (brown: ground; yellow: light; black: short-circuit) through lower rubber socket and ignition wire through upper rubber socket. For engines which have exhaust flange on the right side, looking at the P.T.O. shaft, pull the 3 wires through the upper rubber socket and the ignition wire through the lower socket. The cables should be pulled in until the armature plate rests on the fitting in place of the crankcase. Ascertain that the 3 cables rest in the precast enlargement between the crankcase and the bearing cover.

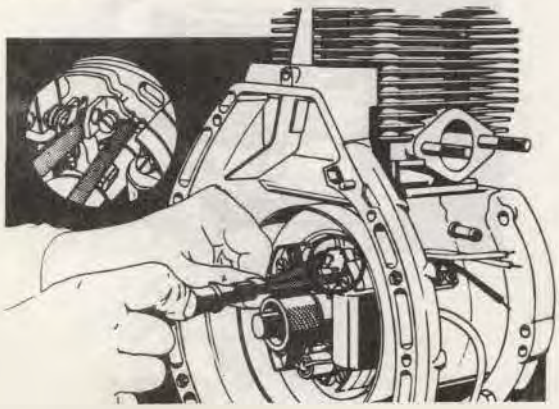
Armature plate

14. Slightly tighten armature plate with three cylindrical head screws, toothed washers and flat washers, while making sure that the centre of the three oblong holes in the armature plate is aligned with the cylindrical head screws.

Adjusting the distance of circuit breaker

15. Push setting collar W 109 on crankshaft. In doing this, the circuit breaker must be in take-off position. Adjust distance of circuit breaker to 0.016" (0.4 mm). First loosen slightly the securing bolt of the contact plate. Push a feeler gauge of a thickness of 0.016" (0.4 mm) between the contacts. With screwdriver adjust for correct distance by using the cut-outs in the armature plate and the contact plate.

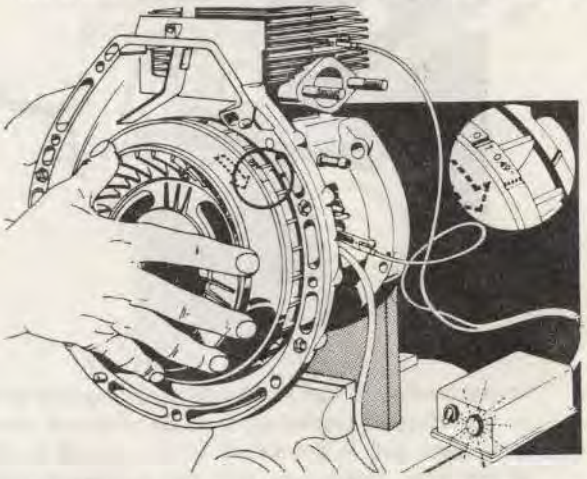
    Then tighten securing bolt of contact plate. Remove setting collar.



Ignition position

16. Push Woodruff key into keyway. Affix fan wheel to taper. Place ignition timing device no. 080.11 on a non-conducting surface of work bench and connect one wire clamp to ground (the housing) and the other wire clamp to the black short-circuit wire. A distinctly visible line mark below the upper right dowel pin is scribed on crankcase flange. On the circumference of the fan wheel there is a line mark with the notation "O.T.". which means "top dead centre".

    Turn fan wheel until the notation O.T. is aligned with the line mark on the housing and then turn on ignition timing device. Turn fan wheel approximately 45 degrees to the left and then to the right until the circuit breaker just starts to separate. (Whith battery operated ignition adjustment device, there will be a change



    in buzzer tone and control light brightens). In this position the distance, measured on the circumference of the wheel, from the O.T. notation on the fan wheel to the line mark on the crankcase should be 0.49" (12.5 mm), amounting to 7 degrees before the upper dead centre. If this measure is smaller (retarded ignition), then turn armature plate to the left. If the distance is larger (advanced ignition), then turn armature plate to the right. When the ignition position is properly set, tighten the three cylindrical head screws on the armature plate.

17. Connect light wire (yellow), ground wire (brown) and short-circuit wire (black) to the connector. Pull protecting hose and cable clip over ignition wire. Mount spark plug hood, but make sure that the threaded rod is pushed firmly exactly in the centre of the wire until noticeable resistance is felt. Afterwards, screw in hood completely bv slowly turning it clockwise. Insert spark plug into hood and put on cylinder head. By quickly turning fan wheel check ignition once more. Ignition spark must jump between electrodes of the spark plug. Screw in spark plug. Spark plug gap 0,016—0,020 ins.

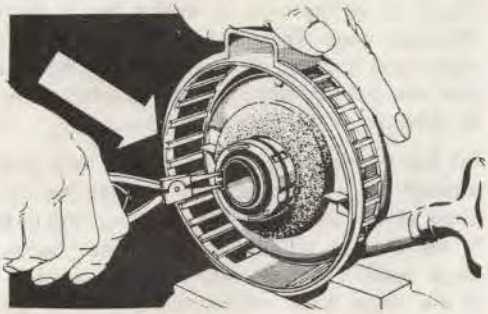
18. Mount and tighten air guide plate, making certain that the ignition wire clip is held fast by the proper screw. Snap on spark plug hood.

19. Keep fan wheel from turning with holding device, as seen in illustration 1, and tighten fan wheel. Put on cover plate and tighten catch piece. Install fan housing with starter. Attach remaining parts.

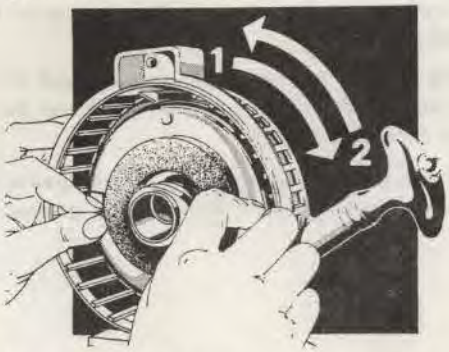
20. Test-run engine. After the first test possibly tighten cylinder head once more with torque wrench at 18.1 ftlb. (2,5 kpm).

Dismantling the recoil starter

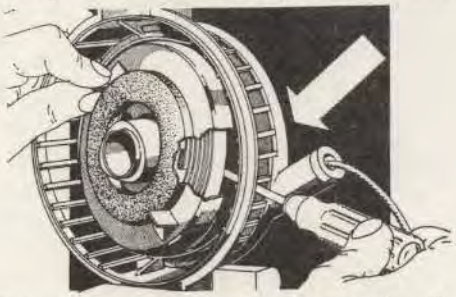
1. Unscrew 4 fillister head screws with a socket screw key 5 DIN 911. Release the starter from the fan housing using light taps with a rubber mallet.
2. Grip the starter in a vice.
3. Remove the circlip with circlip pliers. Take out the lock washer which lies behind it.



4. Draw off the cage with rollers from the curved section.
5. Turn the spring cover slightly to the right and lift it a little. Then turn the spring cover to the left until the spring tension is released.



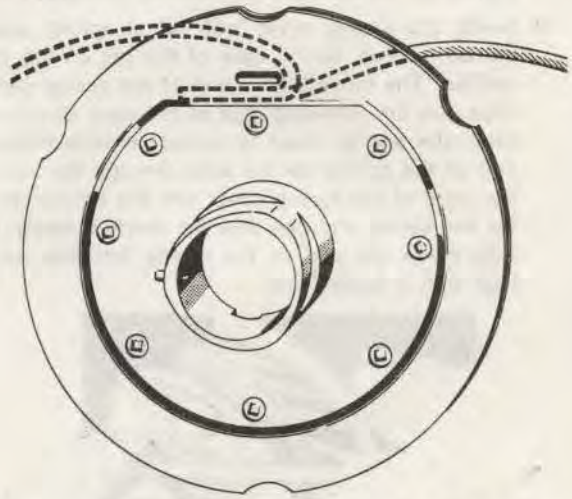
6. **Carefully** draw out the spring cover with spring, or else the spring will jump out. Press the loop end of the spring off the retaining clip with a screwdriver.



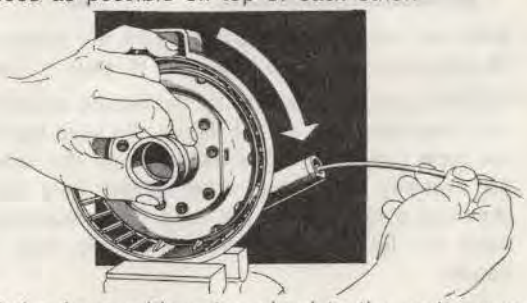
7. Pull the wire rope attached to the handle right out.
8. Turn the curved section with rope disc so that the cut-outs spaced evenly around the circumference of the rope disc match the three pins which are driven into the starter housing. Only then can the curved section be removed.
9. If the hole in the rope guide bushing is very worn, rotate out the bush. If the outside diameter of the bush has been damaged for any reason and it is no longer possible to rotate it out, heat up the starter housing. This will soften the plastic bush and enable it to be easily removed.
10. Wash all the components in cleaning solvent.

Assembling the recoil starter

1. Knock in the rope guide bushing with a hammer.
2. Assemble the handle. Push the end of the rope through the handle and the clamp ring. The clamp ring is conical and the larger diameter must be at the top. Bend the end of the rope into a loop so that the end of the rope can be pushed back again half way through the handle. Then fit the clamp piece into the loop of the rope so that the rope lies in the grooves in the clamp piece until the clamp piece jams tight with the rope in the clamp ring.
3. Smear the journal, thrust washer and bore of the curved section with Molykote Paste G. Ensure that the pin locks on the curved section.
4. Pull the rope through the rope guide bushing. Hold the hub of the rope disc upwards and push the free end of the rope from the right under the stud, so that the end of the rope protrudes about 0.4—0.6 ins. beyond the stud to the left. Bend the rope back over the stud by 180° and coil up 2 to 3 turns tightly in this direction.

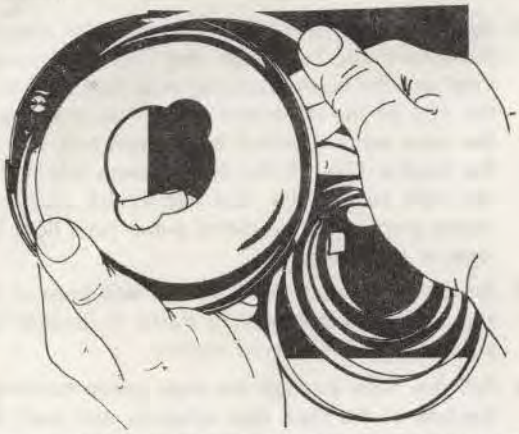


5. Push the curved section with rope disc over the journal on the starter housing. Ensure that 3 cut-outs in the rope disc match the 3 pins and that a 4th cut-out is close to the rope guide in the starter housing. Coil up the rope by clockwise rotation of the rope disc. At the same time, by holding tight the protruding rope, ensure that the rope windings lie as close as possible on top of each other.



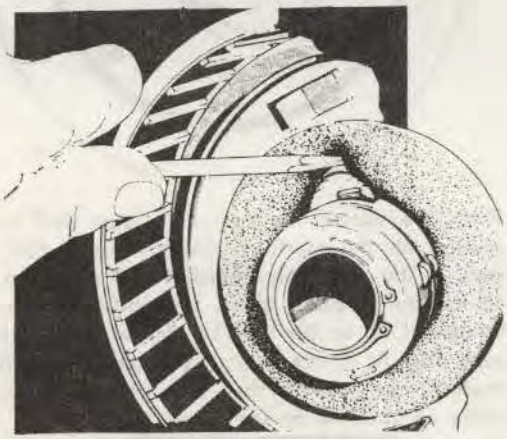
6. If the foam rubber ring glued to the spring cover is damaged, renew the ring. Remove the old foam rubber ring cleanly. Glue the new foam rubber ring centrally to the bore of the spring cover using a glue which is suitable for glueing foam rubber to metal. When the adhesive has set, assemble the spring cover.
7. If the spring has jumped out, place the loop in the end of the coil spring over the riveted pin in the spring

cover. Coil up the spring from outside to inside in a clockwise direction. Take care that the spring does not jump out.



New replacement springs are coiled up and supplied bound with a wire. Cut this wire. While doing so, press down the spring with a suitable tool, so that the uncoiling spring does not jump out of the cover. Lightly oil the spring with a thin oil (SAE 20).

8. Guide the spring cover with spiral spring over the curved section, taking care of the pin on the curved section. The curved inner end of the spring generally slips into the retaining lugs of the rope disc by itself when the spring cover is turned anti-clockwise. The end of the spring can be seen through the cut-out in the bore of the spring cover and the correct position for the spring end can thus be checked easily. Carefully press the end of the spring into the retaining lugs with a screwdriver.



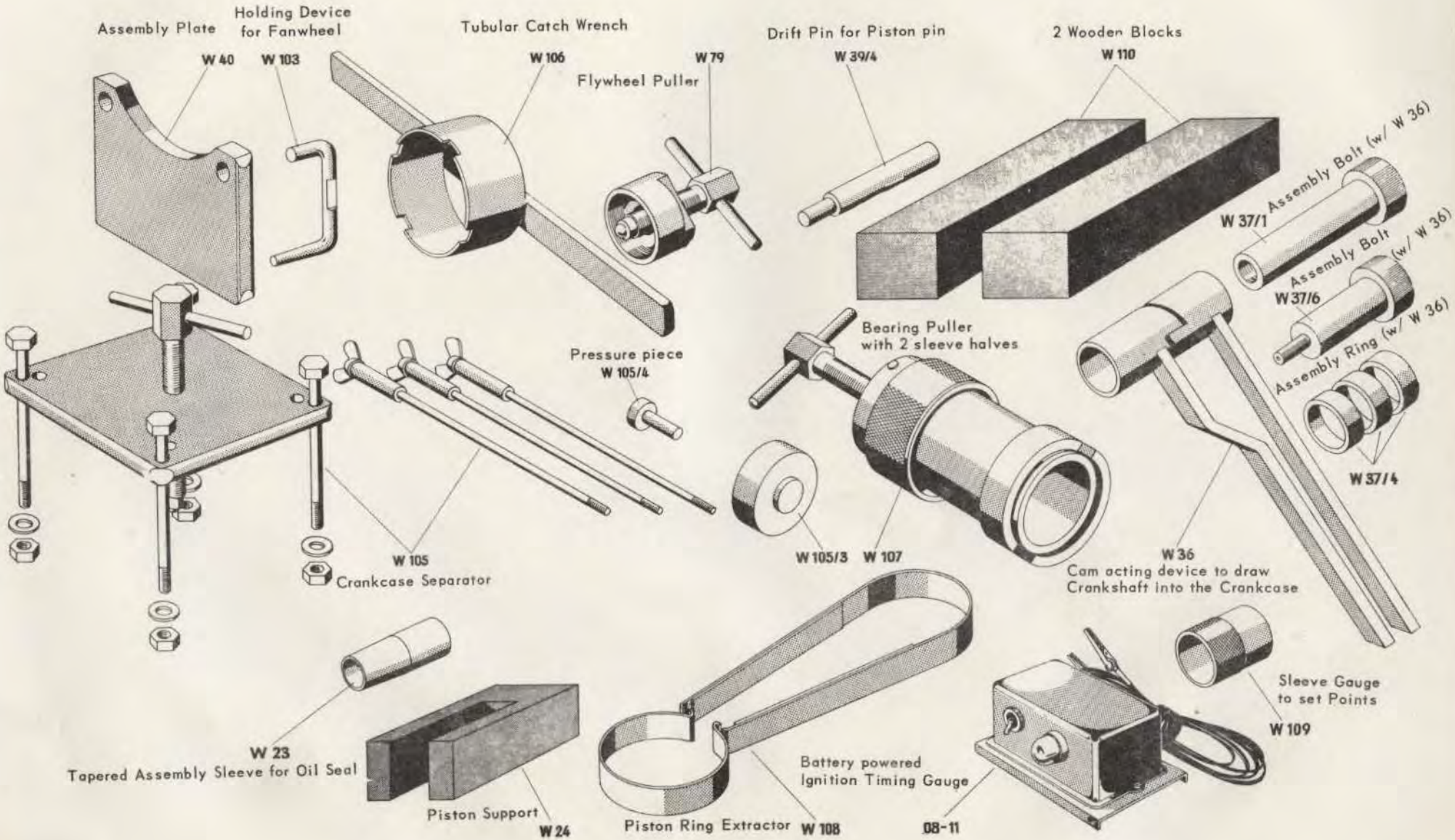
9. With the help of the two lugs, turn the spring cover 10 ratchet positions to the right (1 step = $^1/_3$ turn).
10. Pull the rope out smoothly by the handle several times up to the stop (Do not let the handle snap back when the rope runs back). This ensures that the rope coils up properly. With the rope pulled fully out, the checking dimension of the rope guide bushing must have the following length to the stop face of the handle.

Order no.	Total length	Check length
Rope		
15 B 14	1920 mm = 75.6"	1250—1330 mm = 49.2"—52.4"
15 H 2	2250 mm = 88.6"	1580—1630 mm = 62.2"—64.2"
15 J 2	2380 mm = 93.7"	1710—1790 mm = 67.3"—70.5"

If the rope is too long, turn the spring cover one more step to the right (1 step = approx. 10 cm = 3.9 ins.); if the rope is too short, release it one step (see Dismantling, no. 5).

11. Smear both sides of the two washers and lock washer with Molykote.
12. Slide one washer over the journal. Push the roller cage over the journal with its open end so that the pin fitted on the curved section lies in the cut-out in the roller cage. The cage has two cut-outs for left and right hand running, which are marked by a cast arrow. Use the cut-out whose arrow points in the direction of rotation of the curved section.
13. Fit the second washer. Fit one or two lock washers against the second washer so that the corrugations show to the outside. Fit the locking ring in the groove in the journal. When pulling out the starter rope, the cage must remain at rest until the pin hits the stop. If the cage does not hit the pin, fit a second lock washer.
14. Insert 3 clamp rollers in the pockets in the cage with cold resistant grease (e. g. Aero Shell Grease 4 or Mobil Grease no. 22). Fit the circlip. Insert the annular spring over the cage into the grooves for the clamp rollers.

    Note Clamp rollers, cage pockets and the running surface of the curved section must **not** be smeared with Molykote.
15. Pull out the rope with the handle and grease with cold resistant grease. (See item 14 for grease).



Set of Special Tools for Complete Assembly and Disassembly of the HIRTH engine 54 R