



SERVICE MANUAL

VOLVO 164 1971

GROUP 33

STARTER MOTOR

TOOLS

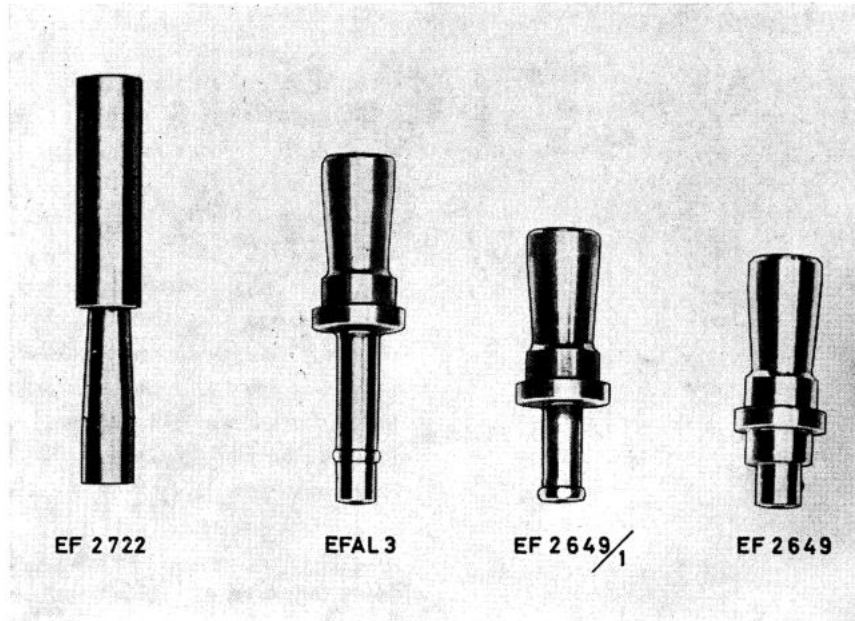


Fig. 3-26 Bosch special tools

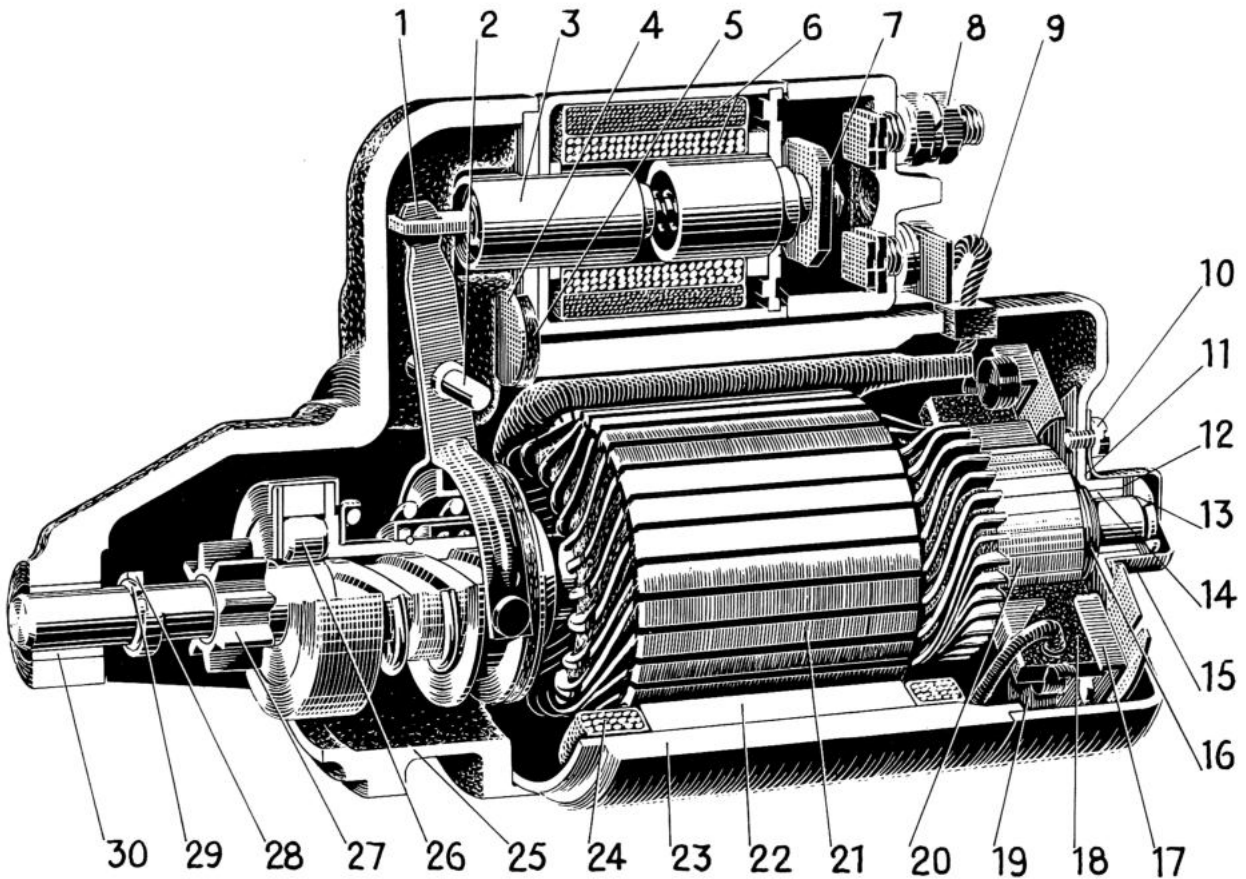
- EF 2722 Sleeve and drift for fitting circlip
- EFAL 3 Smoothing drift
- EF 2649/1 Smoothing drift
- EF 2649 Drift for fitting bush

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DESCRIPTION

The starter motor, Fig. 3-27, is fitted on the flywheel housing on the left-hand side of the engine. It consists of a 4-pole series-wound motor. The pinion on the starter motor rotor shaft moves axially to engage with the flywheel ring gear. The pinion is controlled by a solenoid.

An extra contact is built into the solenoid for by-pass connecting of the pre-coupling resistor on the ignition coil.



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Fig. 3-27. Starter motor

- | | | |
|------------------------------|--------------------------|---------------------|
| 1. Shift lever | 11. Rubber gasket | 21. Armature |
| 2. Pivot pin | 12. Shims | 22. Pole shoe |
| 3. Plunger | 13. Lock washer | 23. Stator |
| 4. Steel washer | 14. Bush | 24. Field winding |
| 5. Rubber washer | 15. Commutator end frame | 25. Drive end frame |
| 6. Winding | 16. Adjusting washers | 26. Roller bearing |
| 7. Contact plate | 17. Brush holder | 27. Pinion |
| 8. Terminal for battery lead | 18. Brush | 28. Stop ring |
| 9. Connection lead to field | 19. Bush spring | 29. Snap ring |
| 10. Screw | 20. Commutator | 30. Bush |

REPAIR INSTRUCTIONS

REMOVING

1. Remove the cable terminal from the battery negative terminal studs.
2. Disconnect the leads from the starter motor.
3. Unscrew the bolts which hold the starter motor to the flywheel housing and lift it off.

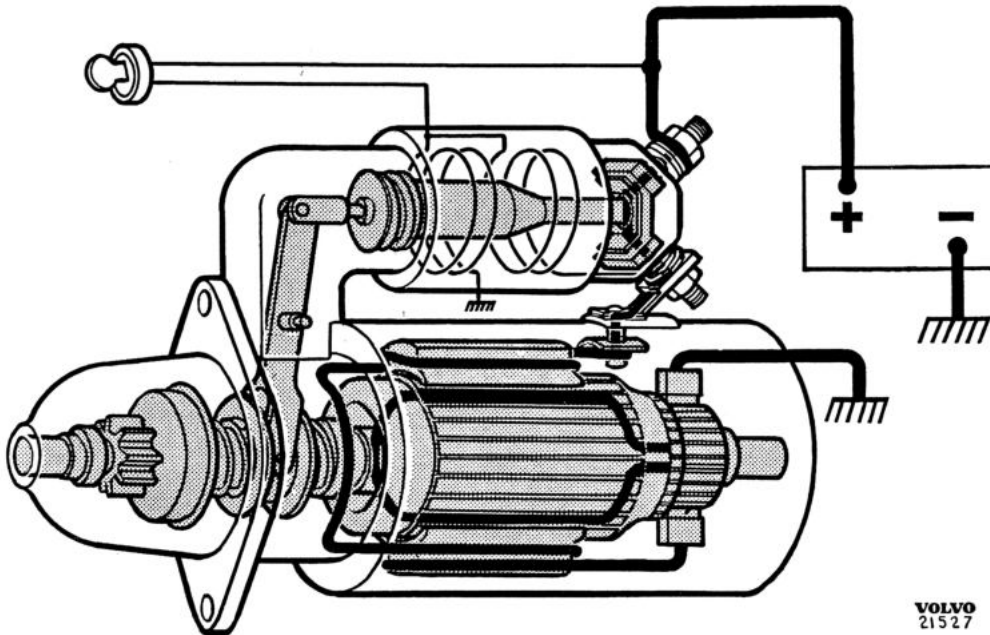


Fig. 3-28. Starter motor, general arrangement

DISMANTLING THE STARTER MOTOR

1. Remove the small cover on the front end of the shaft.
2. Lift off the lock washer and adjusting washers as shown in Figs. 3-31 and 3-32.
3. Remove the two bolts holding the commutator bearing end and remove the frame.
4. Lift up the brushes and holders.
5. Remove the bridge from the armature shaft. N.B. The washers are as shown in Fig. 3-34. When the bridge is removed, the “—” brushes follow also, but “+” brushes will remain in the field winding.

6. Unscrew the nut which holds the field terminal connection to the control solenoid.
7. Unscrew the attaching screws for the control solenoid. Remove the solenoid.
8. Remove the drive end frame and armature from the stator.
9. Remove the rubber washer and metal washer, see Fig. 3-36.

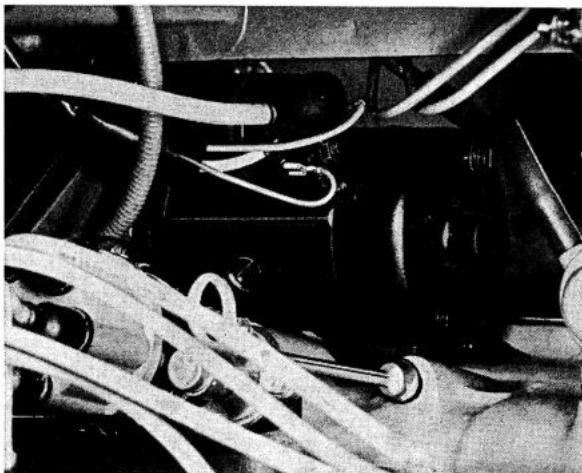


Fig. 3-29. Starter motor installed

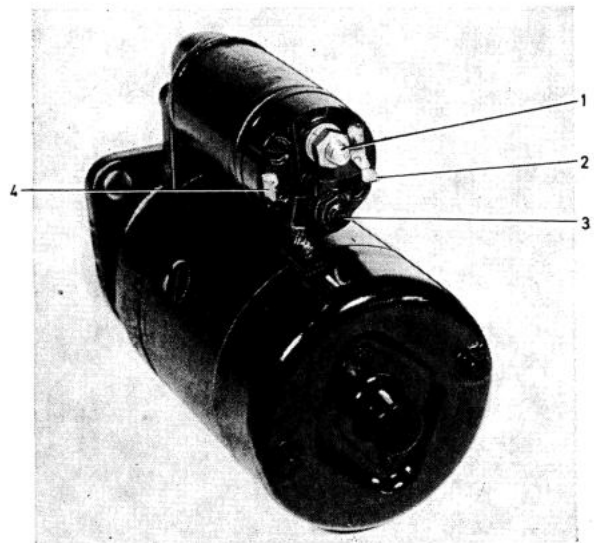


Fig. 3-30. Starter motor terminals

- | | |
|-------------------------|---------------------|
| 1. From battery | 3. To field winding |
| 2. From ignition switch | 4. To ignition coil |

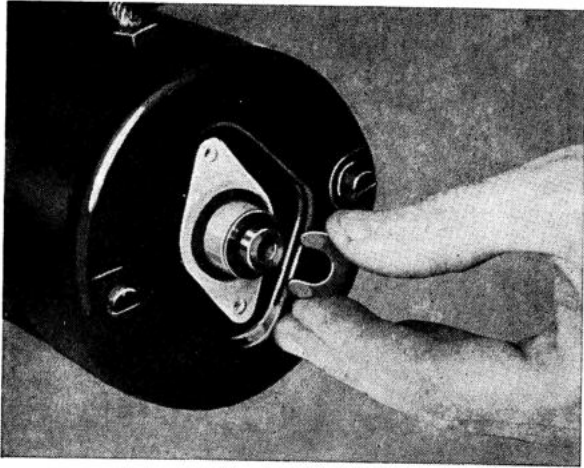


Fig. 3-31. Removing the lock washer

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10. Remove the screw on which the shift lever is carried.
11. Lift the armature with pinion and arm out of the drive end frame.
12. Knock back the stop washer and remove the snap ring on the armature shaft.
13. Remove the stop washer and pull off the starter pinion.

INSPECTING

Examine the armature for mechanical damage such as a bent or worn shaft, scored commutator and damaged windings.

If the armature shaft is bent or worn, the armature should be replaced.

If the commutator is scored or unevenly worn, it should be turned. The commutator diameter must not be less than 33 mm (1.3").

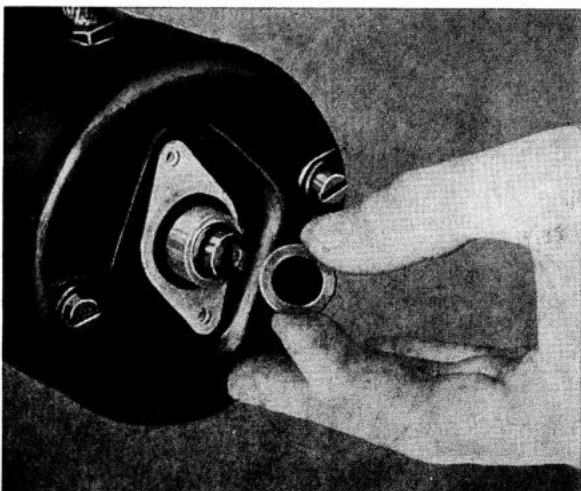


Fig. 3-32. Removing adjusting washers

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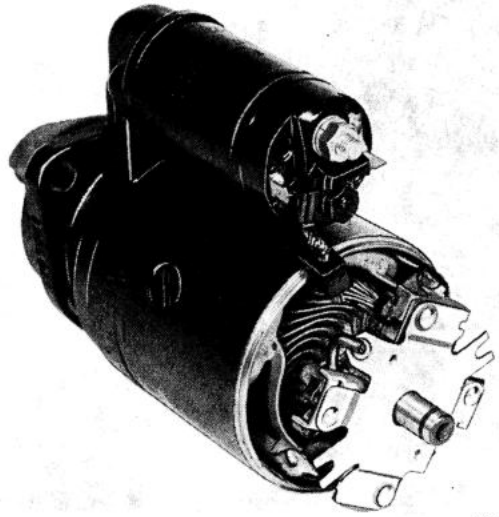


Fig. 3-33. Starter motor with bearing frame removed

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The commutator should be checked with a micrometer after turning. A radial throw of 0.08 mm (0.003") can be considered permissible. The insulation between the laminations should be milled down to 0.4 mm (0.016") below the surface of the laminations, see Figs. 3-38 and 3-39. This work is carried out in a special apparatus, or if such is not available, with a ground-off hacksaw blade.

Examine the armature for shorting by placing it in a growler machine. Switch on and hold a hacksaw blade a few mm from the armature, see Fig. 3-40. If the blade vibrates in any position when the armature is rotated, one of the following faults can be the reason: Shorting through the armature frame, shorting in the commutator or between the windings.

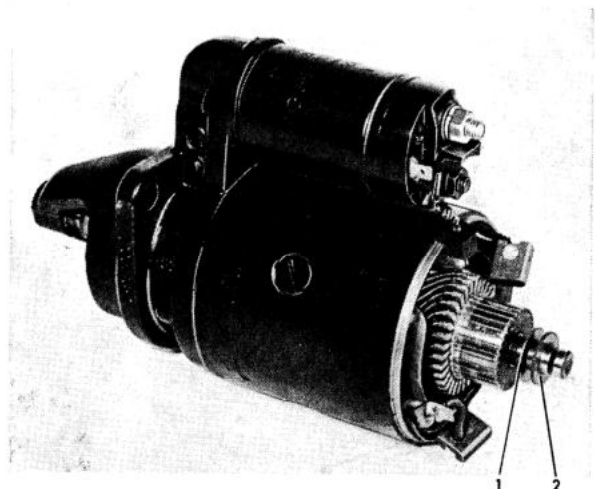


Fig. 3-34. Starter motor with brush bridge removed

1. Steel washer
2. Fiber washer

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Fig. 3-35. Control solenoid

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Check the stator with 40 V A.C., see Fig. 3-41. Examine the drive end frame with brush holders. If any of these parts are damaged or excessively worn, they must be replaced. A bearing clearance of up to 0.12 mm (0.005") may be considered permissible. Inspect the other parts and replace any that are damaged or worn. The snap ring should always be replaced with a new one, since when being removed it may have been damaged or lost its tension.

CHECKING THE CONTROL SOLENOID

If the control solenoid does not function, first check that the battery is in good condition. If there is no fault in the battery, connect a lead between the battery positive terminal and the control solenoid contact screw for the control lead. If the control solenoid still does not engage the starter pinion and main current, it should be removed from the starter

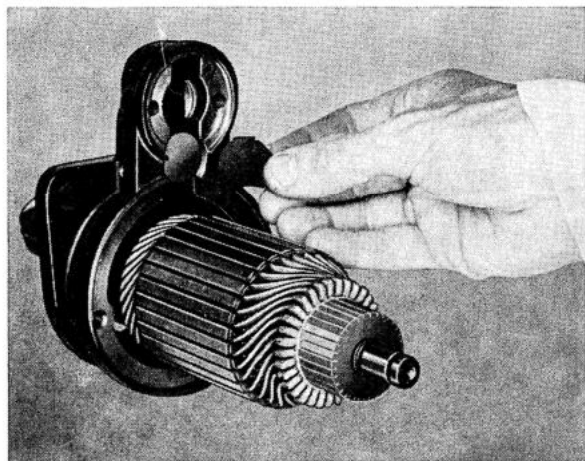


Fig. 3-36. Removing the sealing washer

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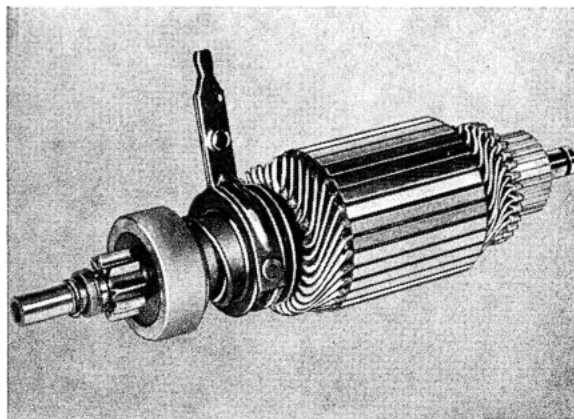


Fig. 3-37. Armature with pinion

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motor. If, on the other hand, it engages satisfactorily, examine the starter switch and leads.

When the control solenoid has been removed, it should be wiped clean. Then press the plunger in several times and test again by connecting it to a battery. If the control solenoid does not function after the above measures, replace it with a new one.

REPLACING THE BRUSHES

When replacing the brushes the starter motor is removed and dismantled. The brushes are soldered loose from their attachments in the brush holder and field winding respectively. The new brushes should be soldered on quickly and with sufficient heat. Solder must not be allowed to run down into the brush leads as this will prevent the movement of the brushes in the brush holders and may reduce the brush spring pressure. Brushes which have worn down shorter than 14 mm (9/16") should be replaced with new ones.

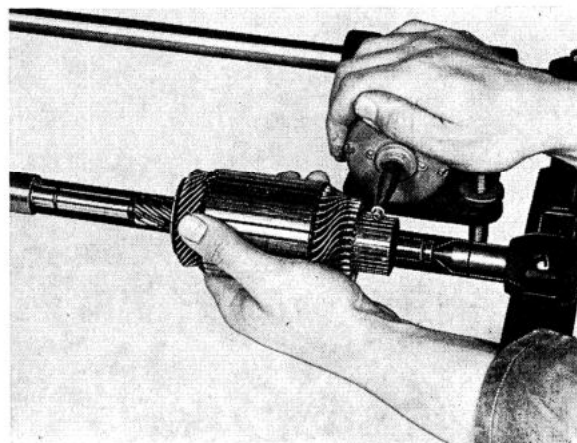


Fig. 3-38. Milling the commutator

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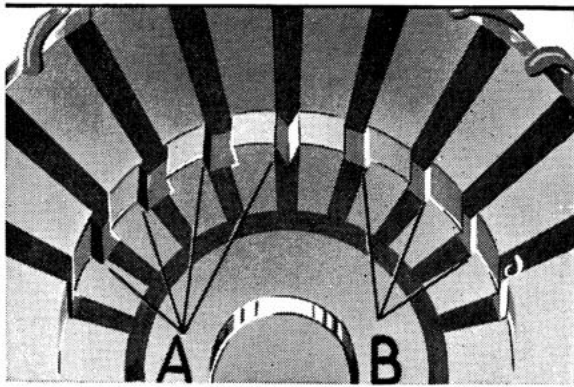


Fig. 3-39.

A. Incorrect milling B. Correct milling

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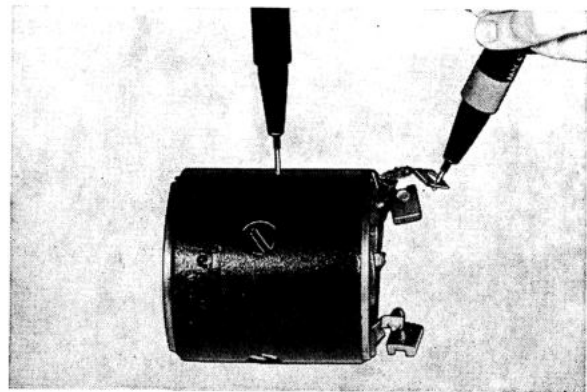


Fig. 3-41. Checking the stator

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FITTING THE SELF-LUBRICATING BUSHES

The self-lubricating bushes are only worn insignificantly during operation if they are lubricated in the correct manner. If lubrication is neglected, the bushes dry out, with the result that they are worn quickly. For replacement purpose, bushes are supplied ready-machined to suitable dimensions. When being fitted, the bushes should not be machined internally or externally since the pores can then be partially blocked up, resulting in reduced lubricating capacity.

1. Drive out the worn bushes with the help of a suitable tool.
2. Clean the hole for the bushes and cut away any burr.
3. Press in the new bushes with the help of a suitable drift.

N.B. Before a self-lubricating bush is fitted, it should lie in light oil for at least 1 hour.

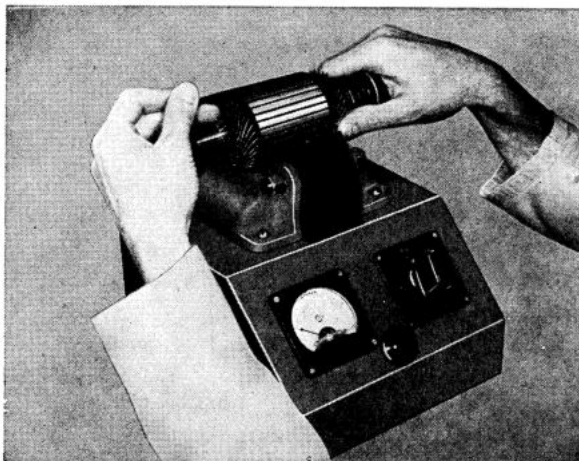


Fig. 3-40. Testing the armature

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REPLACING THE FIELD WINDINGS

1. If the starter motor has not been dismantled, this must be done. Follow the instructions under the heading "Dismantling".
2. Mark the pole shoes and pole housing in a suitable manner so that they come in the same position when assembling.
3. Then place the stator in the rotary clamping block as shown in Fig. 3-42 (Bosch EFAW 9) or similar and unscrew the pole screws.

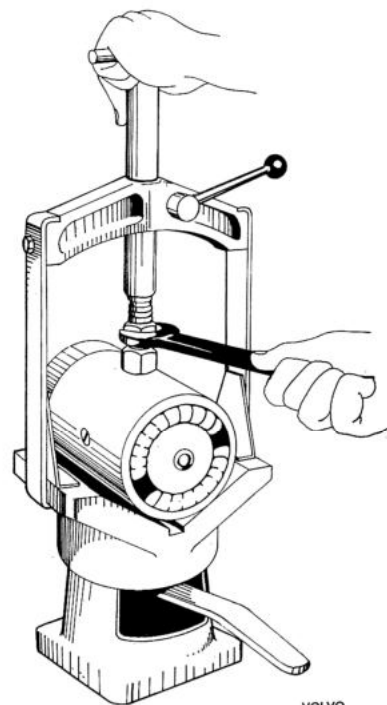


Fig. 3-42. Rotary clamping block for removing field windings

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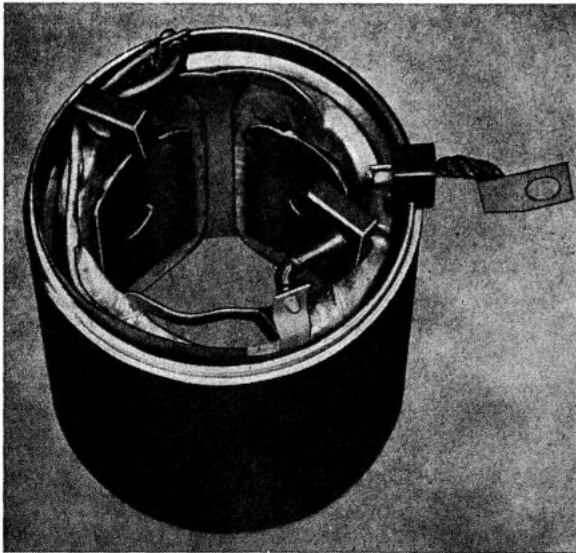


Fig. 3-43. Stator with soldered brushes

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4. Before fitting new field coils, these should be heated slightly. Then place the pole shoes in position in the field coils and slide them into the stator. Tighten the pole screws slightly. Press in a suitable drift. Set up the stator in the rotary clamping block and tighten the pole shoes.
5. Press out the drift with a press. Check the field windings fitted for breakage and shorting.

ASSEMBLING

1. Lubricate the parts of the starter motor according to Fig. 3-45.

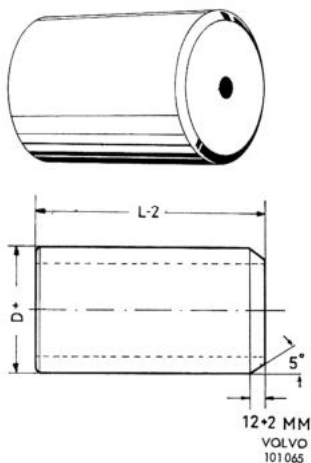
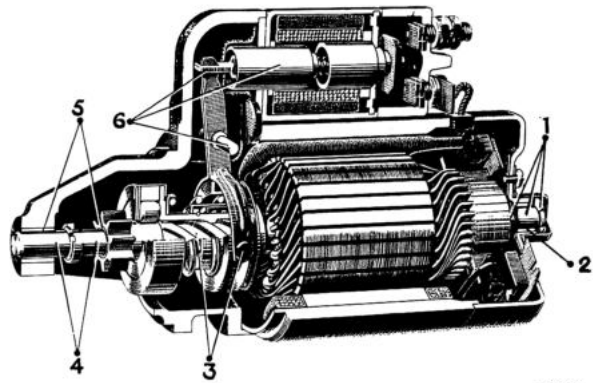


Fig. 3-44. Press drift for fitting field windings

D=66.04—66.09 mm (2.599—2.602") L=85 mm (3.346")



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Fig. 3-45. Lubricating scheme for starter motor

Use Bosch lubricant (or equivalent) in accordance with the following directions:

1. Ft 2 V 3. Place a thin layer of grease on the insulation washers, the shaft end, the adjusting washers and lock washer.
2. Ol 1 V 13. Place the bush in oil for 1 hour before fitting.
3. Ft 2 V 3. Apply plenty of grease in the rotor thread and the engaging lever groove.
4. Ft 2 V 3. Place a thin layer of grease on the armature shaft.
5. Ol 1 V 13. Place the bushes in oil for 1 hour before fitting.
6. Ft 2 V 3. Lubricate the engaging lever joints and the iron core of the solenoid with a thin layer of grease.

2. Fit the starter pinion on the armature shaft, and the wear washer as well as the snap ring. Secure the wear washer in position.
3. Fit the shift lever on the pinion. Fit the armature in the drive end frame.
4. Fit the screw for the shift lever.
5. Fit the metal washer and rubber washer in the drive end frame.
6. Fit the stator on the armature and the end shield.
7. Secure the solenoid in the shift lever. Screw tight the solenoid.
8. Fit the washers on the armature shaft as known in Fig. 3-34.
9. Place the brush bridge in position. Fit the brushes.
10. Fit the commutator bearing frame. Screw the starter motor together with the two through bolts.
11. Fit the adjusting washers and the snap ring on the shaft end. Check the axial clearance of the armature. If necessary, adjust with the washers until the play agrees with the values in the "Specifications".
12. Screw on securely the small casing over the shaft end.

FITTING

1. Place the starter motor in position and secure it.
2. Connect the electric cables.
3. Fit the lead terminal on the negative pole stud of the battery.