Disassembly and Assembly of Starter

Removal:

1. Remove starter (see Job No. 15 — 1).

Disassembly:

2. Remove end cap (3) after unscrewing the two fixing screws (Fig. 15 — 4/1).

3. Lift the carbon brushes off the surface of the collector and support them with the brush springs.

4. Use an SW 17 wrench to steady the flatted washer at the collector bearing and unscrew the hexagon nut which is in front of it. Then remove the snap ring, the flatted washer, the thrust washer and the plastic washer.

5. Remove the cable running from the field winding to the solenoid switch (5) by unscrewing the hexagon nut on the solenoid switch (Fig. 15 — 4/1).

6. After unscrewing the two hexagon screws, remove the solenoid switch (5) from the drive bearing (4) (Fig. 15 — 4/1).

7. Unscrew the hexagon nut together with lock washer from the pivot pin of the engaging lever (6) and knock out the pivot pin with a suitable drift.

8. Unscrew the two hexagon nuts with lock washer from the threaded bolts at the armature housing and take the drive bearing (4) off the armature housing.

9. Remove the armature forward, paying attention to the parts of the armature brake: the washer, the large corrugated washer, the thrust washer and the friction washer.

Checking:

10. Fix the armature between two suitable wooden jaws (Bosch No. EF 1062) and test the pinion free-wheel.

11. Pull the cotter pin out of the hexagon screw at the front end of the armature shaft.

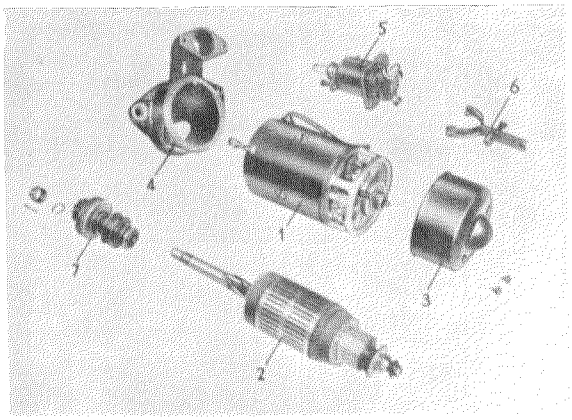

Fig. 15 — 4/1

1 Armature housing
2 Armature
3 End cap
4 Drive bearing
5 Solenoid switch
6 Engaging lever
7 Roller free-wheel with pinion

12. Unscrew the castle nut from the armature shaft. **Caution, left-hand thread.** Then press out the snap ring with a screw driver and take off the pinion assembly.

Note: When removing the snap ring, take care that the thread is not damaged.

13. Check the pinion for burrs on the front edge of the teeth and if necessary, carefully file away the burrs.

    If more serious damage is discovered or if the operation of the free-wheel is unsatisfactory, the complete pinion assembly must be replaced.

14. Check the bearing bushing in the drive bearing and in the collector bearing for wear. If necessary, press out the old bearing bushings and press in new ones.

15. Remove any dirt and oil from the carbon brushes with a clean rag. Badly worn carbon brushes must be replaced. Place the carbon brushes in the brush holders and check for free movement.

16. Check the pressure springs for the carbon brushes and if necessary, replace them. This

check should be made with a suitable spring scale, e. g. the Bosch Spring Scale EF 1244. The brush pressure should be 800–900 grams.

17. Check the collector for eccentricity. Out-of-round or charred collectors must be lightly turned-off. Under no circumstances must emery cloth or a file be used. When turning, do not remove more material from the collector than is absolutely necessary to obtain a perfectly smooth surface.

    The smallest permissible diameter of the collector is 33.5 mm. After turning-off, the segments must be sawn out 0.6—0.7 mm deep with a collector saw (e. g. Bosch EFAW 10). The segments can also be sawn out with a special tool (see Job No. 15 — 13, Fig. 15 — 13/1). After this, the collector must once more be turned-off with a stock reduction of 0.1 mm. Do not use the same turning tool for rough-turning and finish-turning and only use carbide-tipped tools (Widia). The maximum permissible run-out for the collector is 0.03 mm.

18. Check the armature and exciter coil windings for short-circuit or short-circuit to ground (see Job No. 15 — 5).
    Check and if necessary, correct the adjustment dimension "a" on the solenoid switch (see Job No. 15 — 2).

Assembly:

19. Slide the pinion onto the armature shaft, place the snap ring in the groove and screw on the castle nut. **Caution, left-hand thread!**

20. Cotter the castle nut.

21. Stick the friction washer (plastic washer) for the armature brake onto the inside of the collector bearing with high-viscosity grease.

22. Slide the washer and the large corrugated washer onto the rear end the armature shaft in such a way that the convex side of the large corrugated washer points to the collector. Then push on the thrust washer in such a way that the flanging on the stamped square also points to the collector.

23. Slide the armature, with the parts of the armature brake fitted in position, into the armature housing.

24. Push the plastic washer, the thin thrust washer and the flatted washer onto the armature shaft from the rear.
    Put on the lock washer and screw on the hexagon nut, holding the flatted washer steady with an SW 17 wrench.

25. If necessary, smear the threaded bolts in the armature housing with sealing compound and place them in position. A proper seal must be made as otherwise water can penetrate into the starter.

26. Fix the starter, with the pinion side up, in a vice.

27. Push the pinion upward until it butts against the castle nut and fit the engaging lever in the guide ring. The bearing which is on the side of the engaging lever must point toward the small bore for the pivot pin in the drive bearing.

28. Now press the engaging lever upward toward the armature shaft and at the same time slide the drive bearing over the engaging lever and slide in the armature shaft. When this is done, care must be taken to ensure that the engaging lever does not slip out of the guide ring.

29. Tighten up the drive bearing with the hexagon nuts and the lock washer.

30. Push the pivot pin into the drive bearing and the engaging lever; then put on the lock washer and screw on the hexagon nut.

Note: After assembly, the engaging lever should be moved in order to check once more whether it is properly seated in the guide ring. The pinion must be able to be pushed until it butts against the castle nut.

31. Screw the solenoid switch onto the drive bearing. When doing this, insert the bolt of the solenoid switch fork joint in the recess of the engaging lever.

32. Connect the cable from the field coil to the solenoid switch.

33. Move the carbon brushes into their working position by fitting the pressure springs.

34. Put on the end cap and screw it up.

Installation:

35. Install the starter (see Job No. 15 — 1).