

Disassembly and Reassembly of Transmission

Job-No.

26 — 4

A. Removal and Installation of Transmission Case Top Cover, including Disassembly and Reassembly

Removal:

1. Shift the shifting shaft lever (2) to neutral (see Fig. 26 — 4/1) and unscrew the hexagon screws for the transmission case top cover.

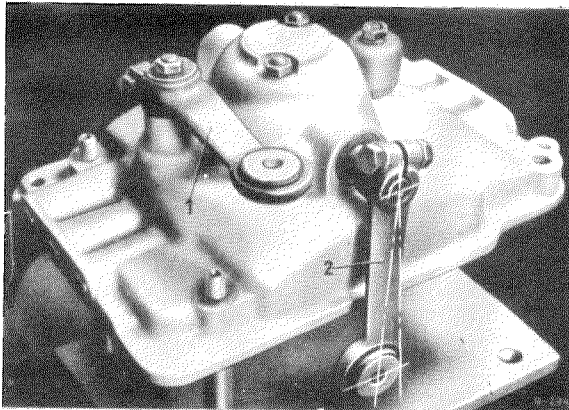


Figure 26 — 4/1

1 Selector finger lever
2 Shifting shaft lever

2. Insert a screw driver in the recess of the cover, prize up the cover and remove it (Fig. 26 — 4/2).

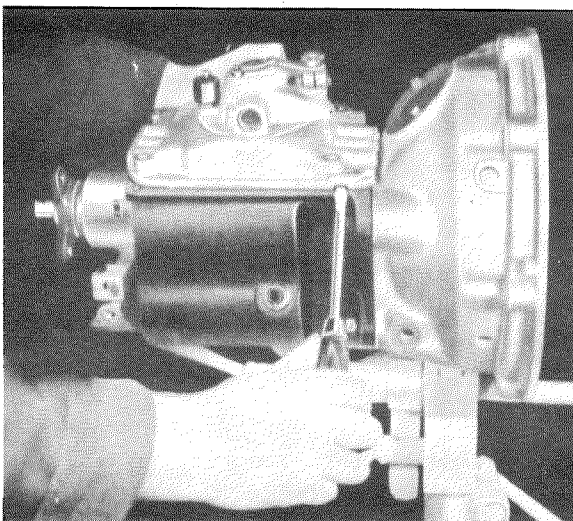


Fig. 26 — 4/2

3. Remove the gasket between transmission case and top cover. Cover up the transmission case.

Disassembly:

4. Drive out the key for the shift rail mounting with a drift (Fig. 26 — 4/3).

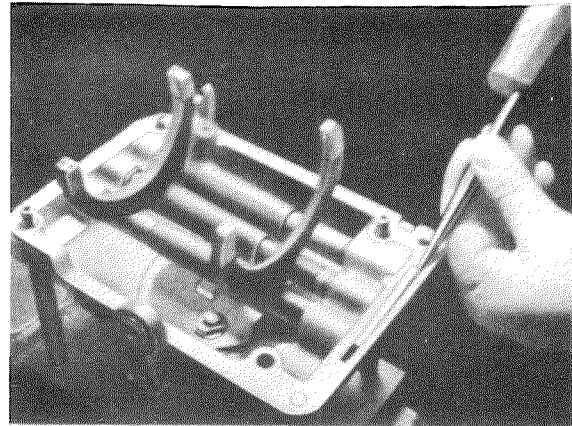


Fig. 26 — 4/3

5. Drive out the shift rails from the top cover with a drift.

Caution! Retain the steel balls and pressure springs in place by inserting a suitable bolt (Fig. 26 — 4/4). Make sure that the spacer tubes and spacer rings do not drop into the cover!

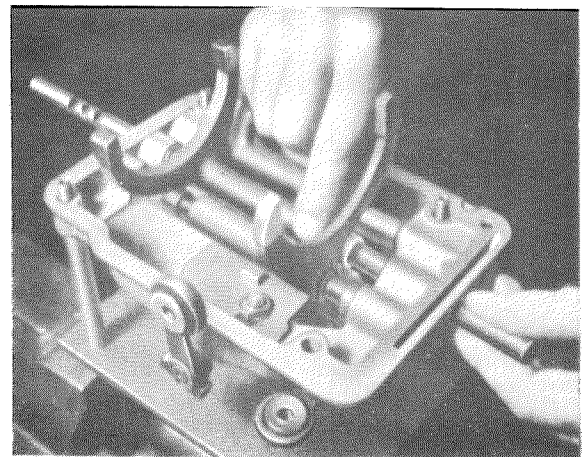


Fig. 26 — 4/4

6. Remove the shift forks and slide the spacer tube and the spacer rings onto the appropriate shift rails or make a note of the dimensions.

7. Unscrew the reversing light switch.
Remove the pressure pin, the pressure spring together with bar, and the shim.

8. Before removing the selector finger lever and the shifting shaft lever, mark the relative positions of levers and shafts if they have not been marked before. Remove the lever nuts and take off the two levers.

9. Remove the guide plate and the selector finger.

10. Remove the snap ring in front of the end cover. Use a suitable drift to drive out the shifting shaft in the direction of the end cover, removing the end cover at the same time (Fig. 26 — 4/5). Remove the washer and the shifting finger.

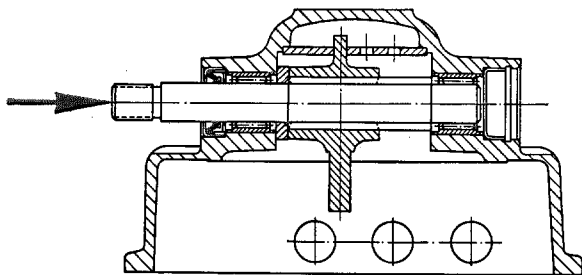


Fig. 26 — 4/5

11. Push the needle bearing out of the bore in the transmission case top cover; drive out the sealing ring.

On cars with right-hand drive, the procedures outlined in paragraphs 10 and 11 differ as follows:

- 10 a. Remove the snap ring in front of the sealing ring. Use a 5 mm \varnothing drill to drill a hole in the end cover and use a suitable drift to drive out the shifting shaft (Fig. 26 — 4/6). Remove the washer and the shifting finger.

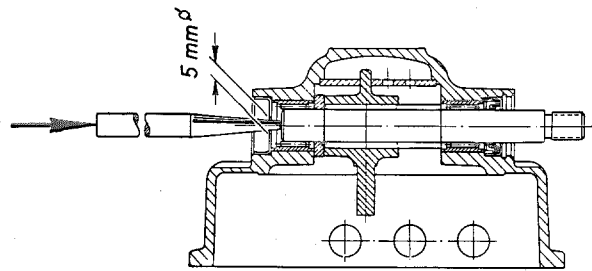


Fig. 26 — 4/6

- 11 a. Push the needle bearing out of the bore in the transmission case top cover. Press out the end cover. Drive out the sealing ring.

- 12 a. Remove the fixing screws for the stop plate and remove the stop plate (Fig. 26 — 4/7).

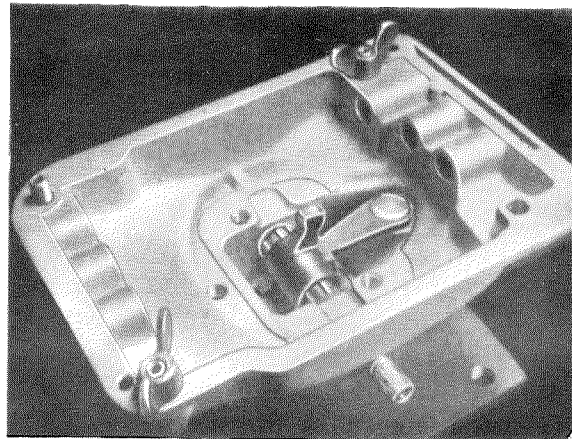


Fig. 26 — 4/7

13. Thoroughly clean all parts. Check the separating surface of the top cover for evenness and, if necessary, refinish by hand.

Reassembly:

14. Install the stop plate (3) in the top cover and screw down lightly (Fig. 26 — 4/7 and 26 — 4/8). Before screwing down the stop plate, insert Assembly Fixture 191 589 02 31 in the top cover to make sure that the longitudinal slots in the stop plate run parallel to the shift rails.

Note: If the assembly fixture is not available, screw down the guide plate provisionally and then align the stop plate with the slots in the guide plate.

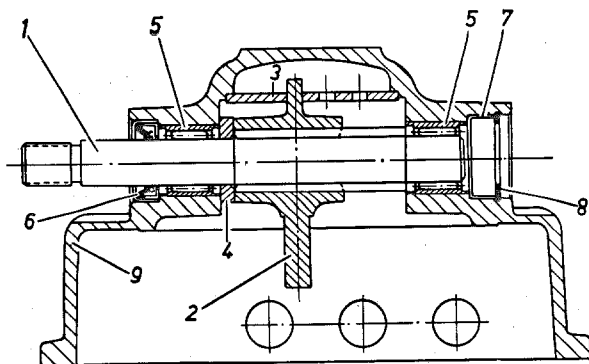


Fig. 26—4/8

- | | |
|-------------------|------------------|
| 1 Shifting shaft | 5 Needle bearing |
| 2 Shifting finger | 6 Sealing ring |
| 3 Stop plate | 7 End cover |
| 4 Washer | 8 Snap ring |

15. Insert the shifting shaft (1) from the right (seen in the direction of travel) into the top cover in such a way that the serrated end projects from the top cover at the left (Fig. 26—4/8).

16. When inserting the shifting shaft, slide on at the same time the washer (4) and the shifting finger (2). The shifting finger must slide freely on the shifting shaft.

17. Slide the two needle bearings (5) onto the shaft and gently press them into the cover, using Fitting Bolt 187 589 02 39.

18. In order to avoid damage to the sealing ring lip by the serrations, use Fitting Sleeve 187 589 05 61 to slide the sealing ring (6) onto the shifting shaft. Use Fitting Bolt 187 589 03 39 to press the sealing ring into the cover.

19. Use Fitting Bolt 187 589 01 39 to press the end cover (7) into the opposite bore at the transmission case top cover and install the snap ring (8) in front of it.

Check whether the shifting finger can be moved on the shaft and whether the shaft turns easily.

On cars with right-hand drive the procedures outlined in paragraphs 15—19 are modified as follows:

15 a — 19 a. The shifting shaft is fitted into the cover in such a way that the serrated end projects from the cover toward the right (seen in the direction of travel). For this reason the sealing ring must be pressed into the bore at the right side and secured by the snap ring. The end cover is pressed into the bore at the left (Fig. 26—4/9).

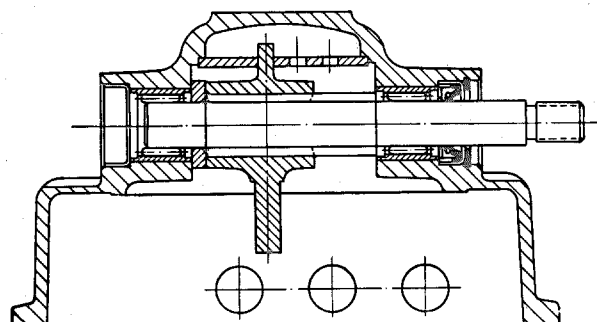


Fig. 26—4/9

20. Install the selector finger in the cover in such a way that it engages in the recess of the shifting finger (Fig. 26—4/10).

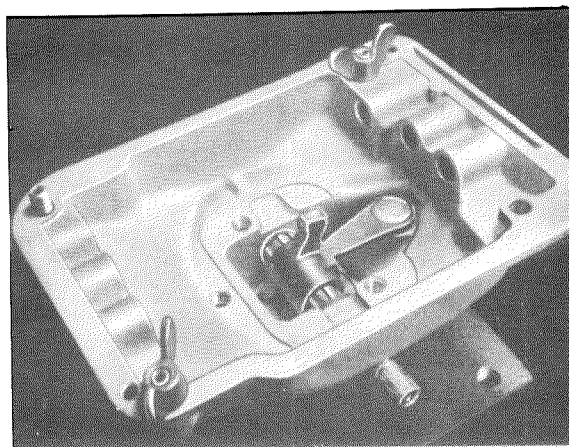


Fig. 26—4/10

21. Slide the selector finger lever (1) onto the selector finger shaft and lock it. Pay attention to the markings made on removal! The lever (1) must be at right angles to the selector finger.

Slide the shifting shaft lever (2) onto the shifting shaft and lock it. Note markings made on removal! In the 1st or 3rd speed position the lever must be perpendicular to the separating surface of the top cover (Fig. 26—4/11).

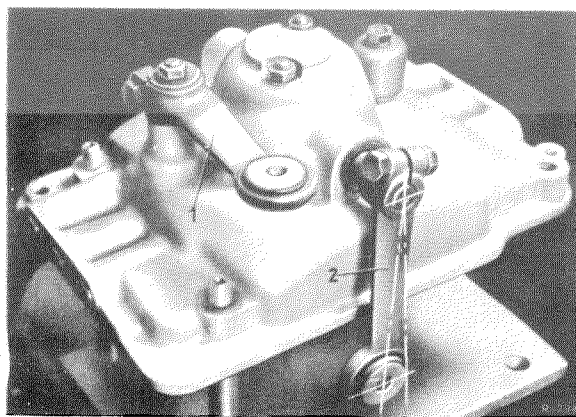


Fig. 26 — 4/11

1 Selector finger lever 2 Shifting shaft lever

22. Install the guide plate. The guide plate must be able to move easily. Use new nuts and washers. The nuts are locked by compressing their collars.
23. Install the bar (3) together with the shim (2) and the pressure spring (5) for the reverse drive gear stop (A) and install the pressure pin (4) (40 mm long) for the reversing light switch in the transmission case top cover and screw in the reversing light switch (6). The shim (2) must be of the appropriate size, i.e. when the 1th or 2nd gear is selected by means of the selector finger lever (9), the stop (A) of the guide plate (8) must rest

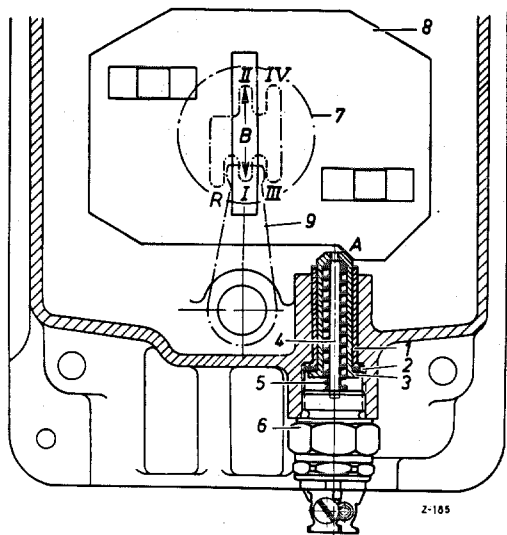


Fig. 26 — 4/12

1 Bushing	4 Pressure pin	7 Stop plate
2 Shim	5 Pressure spring	8 Guide plate
3 Bar	6 Reversing light switch	9 Selector finger

against the bar (3) (Fig. 26 — 4/12). In that position the shifting finger must be easy to move in the slot (B) of the guide plate (8) (Fig. 26 — 4/12).

Note: The shim (2) is supplied in thicknesses of 0.20 and 0.50 mm.

24. Install shift forks and shift rails. To facilitate installation of the springs and steel balls in the shift forks, use Fitting Bolt 136 589 09 61. **Caution:** The spring for the reverse gear shift fork has a larger wire gage (see Spring Testing Table, Job. No. 26 — 5, p. 26 — 5/5). When the gear is engaged, the shift fork must be properly held in the shift rail; the shift fork must not be under side pressure. For this reason the distance between spacer tube or spacer ring and transmission case top cover must be 0.10—0.15 mm when the gear is engaged. To adjust the distance, the spacer rings are available in the following thicknesses: 0.30, 0.50, and 1.00 mm.

Installation:

25. Adjust the shift forks to neutral and coat the separating surface of the transmission case top cover with grease.
26. Put the reverse gear relay lever in its in-operative position and put the sliding sleeves of the synchronizing units in neutral.
27. Coat the separating surface of the transmission case with sealing compound. Install a new gasket on the transmission case, install the transmission case top cover and screw down (Fig. 26 — 4/13).

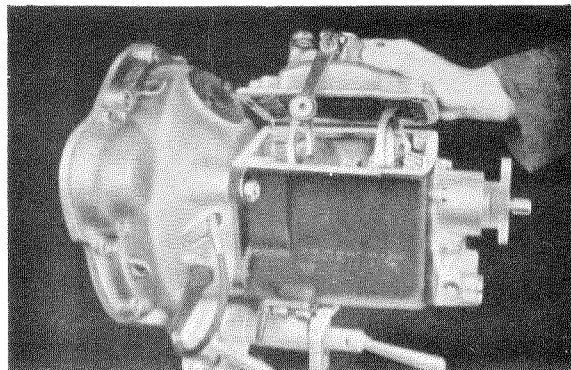


Fig. 26 — 4/13

28. Check reversing light switch.

The selector finger lever (1) and the shifting shaft lever (2) must be in neutral position (see Fig. 26 — 4/11).

Connect the reversing light switch to a battery and connect a testing light to this circuit.

Then press back the selector finger lever (1) approx. 1—1.5 mm (see Fig. 26 — 4/11); be-

ginning from this position the testing light must light up. If it lights up before the lever is in this position, shorten the pressure pin accordingly or replace it by a shorter pin. If the testing light lights up too late or not at all, replace the pressure pin by a longer one.

The pressure pin is available in the following lengths: 40.0 mm, 40.5 mm, and 41.0 mm.

B. Removal and Installation of Clutch Housing

29. Press the bent ends of the two spring clips (4) out of the throw-out fork toward the rear, turn the spring clips sideways and remove them upward (Fig. 26 — 4/14).

Then remove the throw-out unit and bearing (1) and remove the throw-out fork (3) from the ball pin.

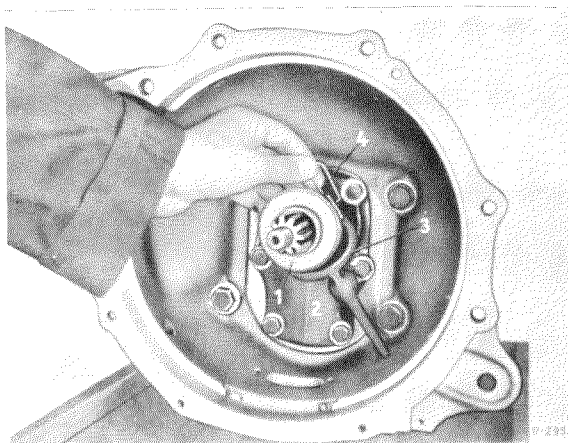


Fig. 26 — 4/14

- | | |
|---------------------------------|------------------|
| 1 Throw-out unit and bearing | 3 Throw-out fork |
| 2 Transmission case front cover | 4 Spring clip |

Caution! Do not wash out the throw-out bearing; it requires no maintenance.

30. Unscrew the four hexagon screws for attaching the clutch housing and remove the clutch housing.

31. Clean and check the separating surfaces of both transmission case and clutch housing.

32. Screw the clutch housing to the transmission case.

Do not omit the fitting sleeves for centering the clutch housing to the transmission case. When the clutch housing is screwed on, these sleeves must be properly seated.

33. Press the throw-out fork onto the ball pin and install the throw-out unit and bearing. Install the spring clips in the throw-out unit, turn them toward the rear and attach the bent ends to the throw-out fork (see Fig. 26 — 4/14).

C. Removal, Installation, and Sealing of Transmission Case Front Cover

Removal:

34. Unscrew and remove the transmission case front cover, paying attention to the shims.
35. Drive the sealing ring out of the front cover.
36. Thoroughly clean the transmission case front cover.

Installation:

37. Coat the circumference of a new sealing ring with sealing compound and press it in, using Installing Arbor 198 589 00 61 (Fig. 26—4/15 and 26—4/16).

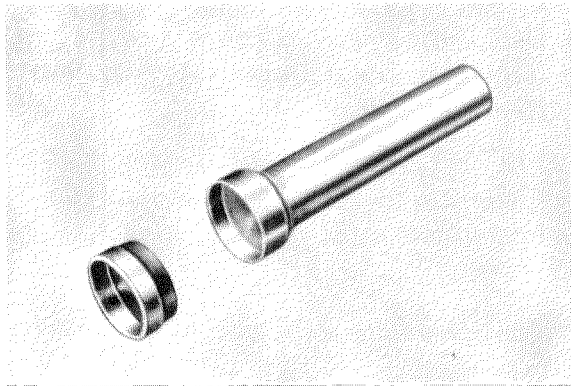


Fig. 26—4/15

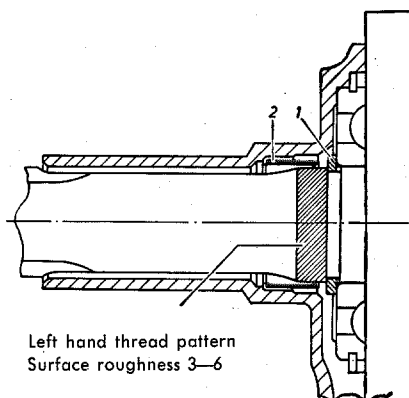


Fig. 26—4/16

- 1 Snap ring
2 Sealing ring

38. Determine the clearance between the transmission case front cover and the annular

grooved bearing. To do this, use a depth gage or a depth micrometer to measure the depth of the recess in the transmission case

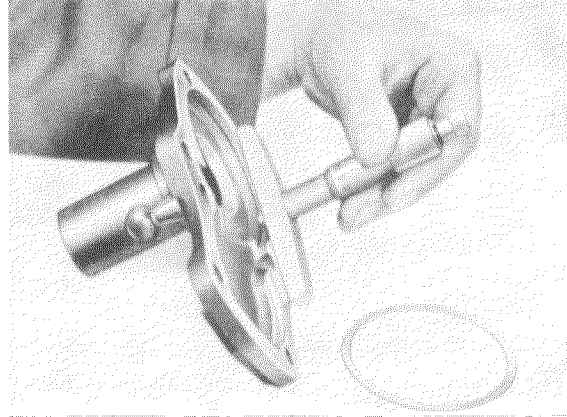


Fig. 26—4/17

front cover (Fig. 26—4/17) and the distance between the transmission case separating surface and the snap ring (Fig. 26—4/18). When these measurements are taken, the snap ring must fit snugly against the separating surface of the transmission case.

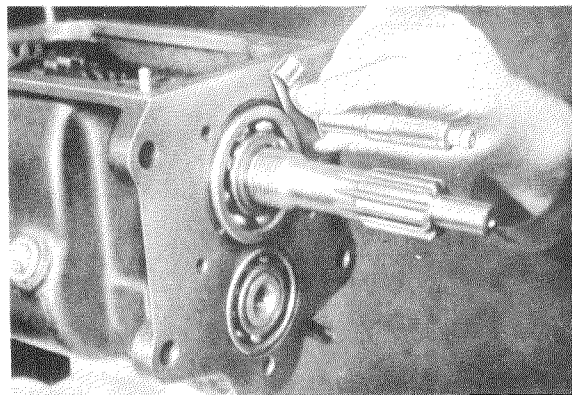


Fig. 26—4/18

The clearance between the annular grooved bearing and the transmission case front cover should be 0.00—0.05 mm; it can be adjusted by installing appropriate shims, which are available in the following thicknesses: 0.1, 0.2, and 0.3 mm.

39. Apply a thin coat of sealing compound to the separating surface of the transmission case front cover.

Slide Installing Sleeve 198 589 00 61 onto the drive shaft and insert the front cover together with the appropriate shim. Screw down the front cover and remove the installing sleeve.

On recent models, locking plates (part No. 180 994 00 15) are used for the fixing screws instead of lock washers.

Note: Before installing the front cover, check the contact surface of the sealing ring on the drive shaft. If the contact surface is badly worn, the drive shaft must be removed and the contact surface refinished. See E. Removal and Installation of Gear Train, including Disassembly and Reassembly, and Job No. 26—5, Checking and Repair of Transmission, Paragraph 6, Drive Shaft.

D. Removal, Installation, and Sealing of Transmission Case Rear Cover

Removal:

40. Perform the operations necessary to remove the transmission case top cover (see Paragraphs 1—3).

Note: The transmission case rear cover must only be removed or sealed with the transmission removed from the vehicle in order to prevent the key on the main shaft from slipping out of the groove in the thrust washer or the stop ring when the grooved nut is removed.

41. Slide Retaining Fixture 136 589 14 61 into the small gear section of the first and second speed gears in such a way that the two gears are pushed toward the synchronizing unit; this is necessary to prevent the key from slipping out of the groove of the stop ring or the thrust washer (see Fig. 26—4/19).

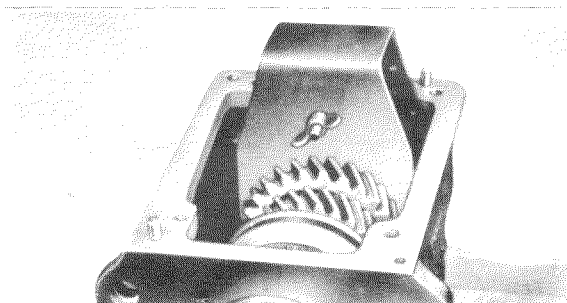


Fig. 26 — 4/19

42. Tap up the locking plate for the three-way flange at the main shaft. Engage reverse and fourth gear in order to block the transmission, or hold the three-way flange steady with Retaining Wrench 187 589 08 07. Then remove the grooved nut with Pin Wrench 186 589 11 07 and pull off the three-way flange by hand or, if necessary, by means of Bell-shaped Puller 136 589 03 33.
43. Unscrew transmission case rear cover and remove, together with speedometer drive gear, paying attention to the shims
44. Drive the sealing ring for the three-way flange out of the rear cover.
45. Use a screw driver to prize out the plug for the speedometer drive gear. Drive out the speedometer drive shaft and drive shaft sealing ring with a suitable drift and remove the small drive gear.
46. Thoroughly clean the transmission case rear cover and check the separating surface for evenness; if necessary, refinish by hand.

Installation

47. Slide the sealing ring onto the speedometer drive shaft. Install the small drive gear in the rear cover. Coat the circumference of the sealing ring with sealing compound and press the shaft, together with the sealing ring, into the transmission case rear cover (shaft and sealing ring must be flush).

48. Coat the outer edge of the plug with sealing compound and press it into the transmission case rear cover. Rear cover and sealing ring must be flush (Fig. 26 — 4/20).

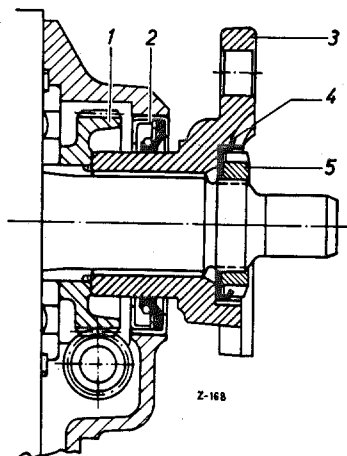


Fig. 26 — 4/20

- 1 Speedometer drive gear
- 2 Sealing ring
- 3 Three-way flange
- 4 Locking plate
- 5 Grooved nut

49. Check the contact surface of the sealing ring at the three-way flange.
See Job No. 26 — 5 "Checking and Repairing Transmission", Paragraph 7 — Three-way Flange.

50. Tap the countershaft forward until the front annular grooved bearing rests against the transmission case rear cover.

Determine the clearance between the countershaft annular grooved bearing and the transmission case rear cover.

To do this, use a depth gage or a depth micrometer to measure the distance between the annular grooved bearing and the separating surface of the transmission case (Fig. 26 — 4/21) and the depth of the recess in the rear transmission case (Fig. 26 — 4/22).

The clearance between the countershaft annular grooved bearing and the transmission case rear cover must be 0.15—0.20 mm.

When measurements are made, the thickness of the gasket between transmission case and rear cover must be taken into account.

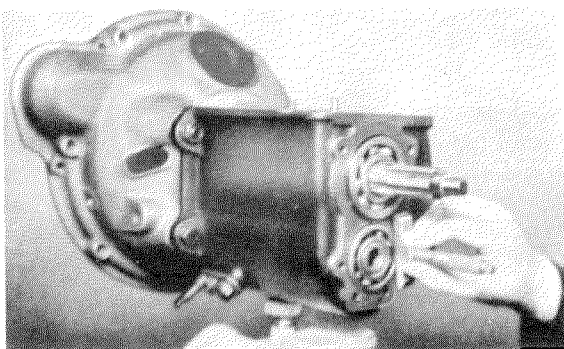


Fig. 26 — 4/21

The clearance should be adjusted by means of appropriate shims. These shims are available in the following thicknesses: 0.1, 0.25, 0.5, and 1.0.

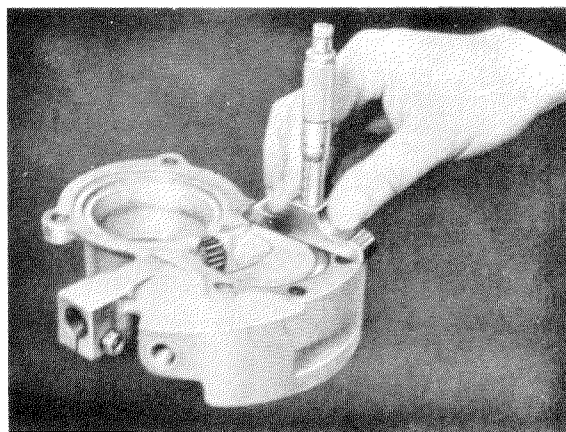


Fig. 26 — 4/22

51. Then check in the same way the clearance between the main shaft annular grooved bearing and the transmission case rear cover and select the appropriate shim. When measurements are made, the snap ring must be seated firmly against the transmission case; the thickness of the gasket must be taken into account. The clearance between the main shaft annular grooved bearing and the transmission case rear cover must be 0.00 to 0.05 mm. The shims are available in the following thicknesses: 0.1, 0.2, and 0.3 mm.
52. Slide the speedometer drive gear, together with spacer ring, onto the main shaft, with

the spacer ring in front. Gear and ring are cast integral of aluminium bronze.

Note: The gear rotates clockwise; do not confuse it with the gear for Model 220 a which rotates anti-clockwise.

53. Coat the separating surface of the transmission case with sealing compound and the separating surface of the transmission case rear cover with grease. Screw the rear cover, together with gasket and the required shims, to the transmission case (Fig. 26 — 4/23).

On recent models, the lock washers for the fixing screws have been replaced by locking plates (Part No. 180 994 00 15).

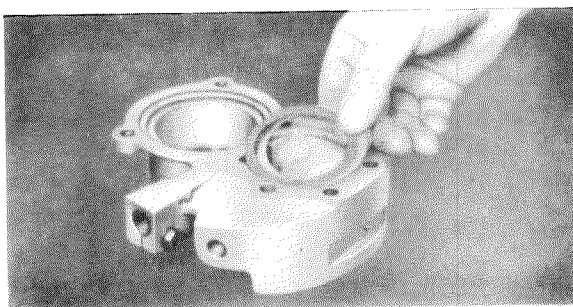


Fig. 26 — 4/23

54. Block the transmission by engaging the reverse and fourth speed. Thoroughly grease the three-way flange at the contact surface for the sealing ring and slide it on. Install the locking plate, screw on the grooved nut and tighten it by means of Pin Wrench 186 589 11 07 to a torque of 14—15 mkg.

55. Check the transmission three-way flange for run-out by means of Tester 136 589 04 21 (Fig. 26 — 4/24).

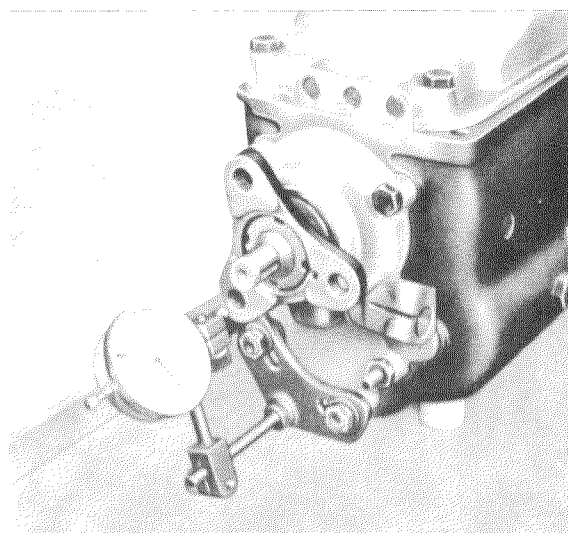


Fig. 26 — 4/24

Measured at the outer diameter, the run-out must not exceed 0.10 mm; if the run-out exceeds this amount, the position of the three-way flange must be changed on the splined journal in order to ensure that any additional eccentricity of the main shaft in relation to the three-way flange can be compensated. If, despite repositioning, the run-out of the three-way flange still exceeds 0.1 mm, the flange can be turned down to a thickness of 8.5 mm. Otherwise the three-way flange must be replaced. Lock the grooved nut by tapping down the locking plate.

E. Removal and Installation of Gear Train, including Disassembly and Reassembly

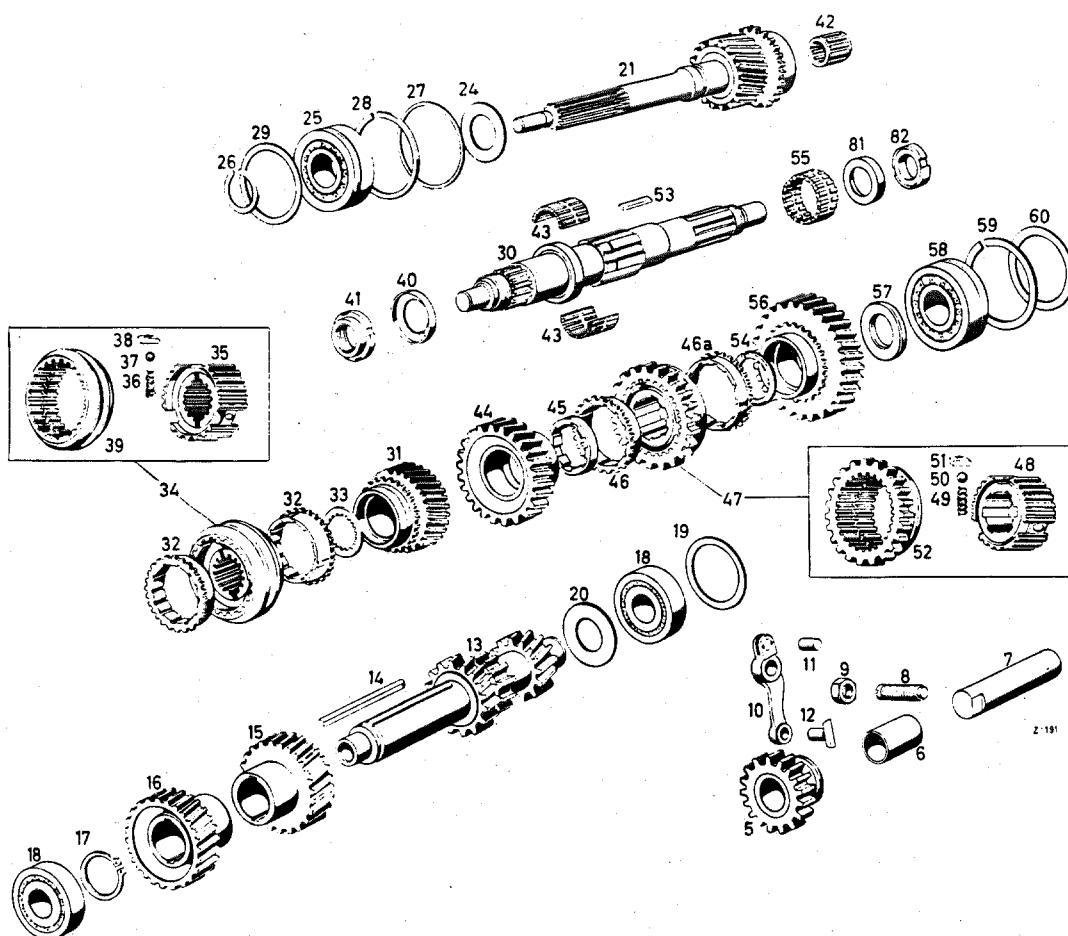


Fig. 26 — 4/25

- | | | |
|----------------------------|---|---|
| 5 Reverse idling gear | 26 Snap ring | 44 Helical gear (2nd speed) |
| 6 Bushing | 27 Spacer ring | 45 Stop ring |
| 7 Reverse idling shaft | 28 Snap ring | 46 Synchronizing ring |
| 8 Threaded pin | 29 Shim | 46a Synchronizing ring |
| 9 Hexagon nut | 30 Main shaft | 47 Synchronizing unit (1st and 2nd speed) |
| 10 Relay lever | 31 Helical gear (3rd speed) | 48 Synchronizing unit |
| 11 Dowel pin | 32 Synchronizing ring | 49 Pressure spring |
| 12 Shifting claw | 33 Thrust washer | 50 Steel ball |
| 13 Countershaft | 34 Synchronizing unit (3rd and 4th speed) | 51 Follower |
| 14 Woodruff key | 35 Synchronizing unit (4th speed) | 52 Sliding sleeve |
| 15 Countergear (3rd speed) | 36 Pressure spring | 53 Key |
| 16 Countershaft drive gear | 37 Steel ball | 54 Thrust washer |
| 17 Snap ring | 38 Follower | 55 Roller cage |
| 18 Annular grooved bearing | 39 Sliding sleeve | 56 Helical gear (1st speed) |
| 19 Shim | 40 Locking plate | 57 Thrust washer |
| 20 Protective washer | 41 Grooved nut | 58 Annular grooved bearing |
| 21 Drive shaft | 42 Roller cage | 59 Snap ring |
| 24 Oil slinger plate | 43 Roller cage, split | 60 Shim |
| 25 Annular grooved bearing | | |

Removal:

56. Perform the operations necessary to remove the transmission case top, front, and rear covers as well as the clutch housing, as outlined in Sections A—E.
57. Remove the small snap ring in front of the annular grooved bearing on the drive shaft by means of Snap Ring Pliers 136 589 00 37 (Fig. 26 — 4/26).

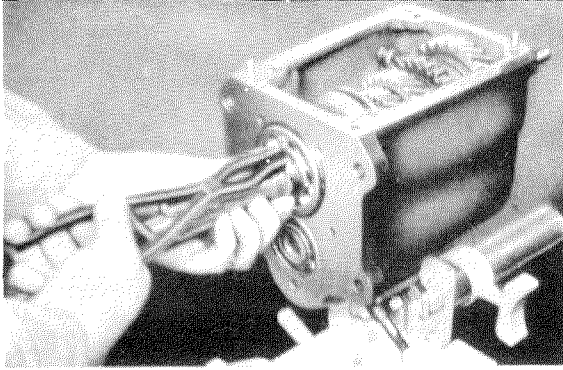


Fig. 26 — 4/26

58. Use a plastic hammer to tap the main shaft toward the front to the point where the annular grooved bearing can be caught by the two removing levers at the large snap ring and can be forced forward (Fig. 26 — 4/27).

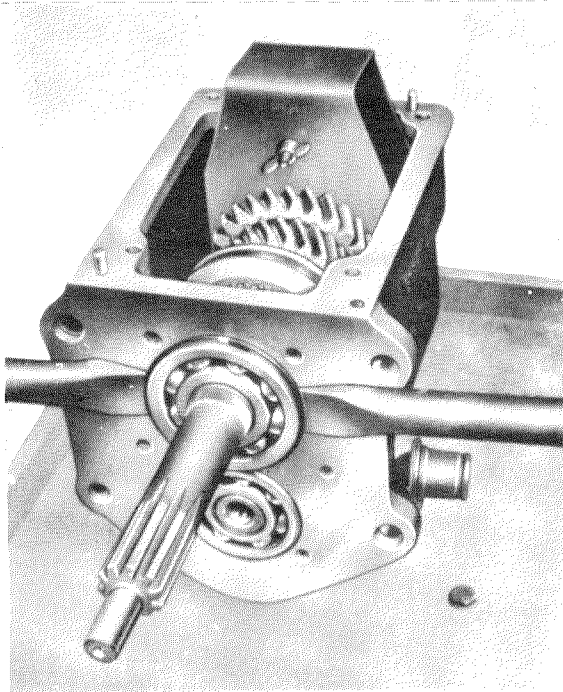


Fig. 26 — 4/27

Pull off the annular grooved bearing by means of Puller 136 589 02 33 (Fig. 26 — 4/28). Pay attention to the spacer ring behind the snap ring!

Alternatively, first tap the drive shaft toward the rear and then tap the main shaft toward the front until the annular grooved bearing can be pulled off by means of the puller.

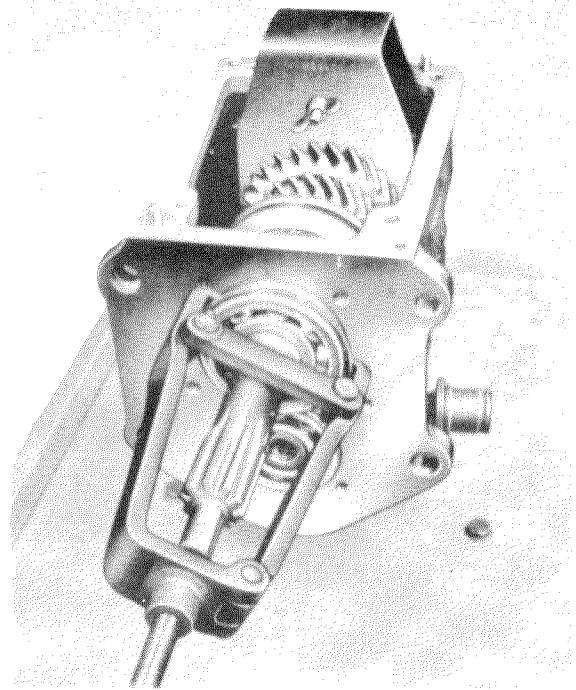


Fig. 26 — 4/28

59. Tap the drive shaft toward the rear by means of a plastic hammer until the snap ring of the rear annular grooved bearing on the main shaft can be caught and then pulled off by means of Puller 136 589 02 33 (Fig. 26 — 4/29).

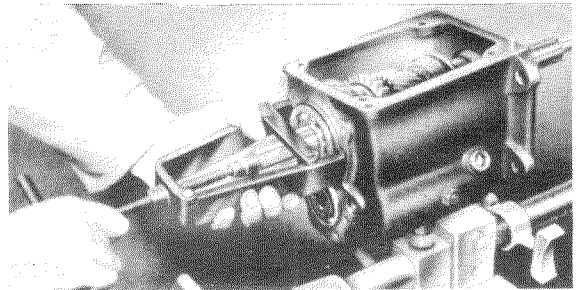


Fig. 26 — 4/29

60. After pulling off the rear annular grooved bearing, slide Fitting Sleeve 198 589 02 61 over the free end of the main shaft and use

the grooved nut to screw the sleeve against the 1st speed gear on the main shaft (Fig. 26 — 4/30).

Note: This is necessary in order to prevent any axial displacement of the 1st speed gear on the main shaft.

Then remove Retaining Clamp 136 589 14 61; its task has now been taken over by Fitting Sleeve 198 589 02 61.

61. Pull the rear annular grooved bearing off the countershaft, using Puller 187 589 06 33 (Fig. 26 — 4/30).

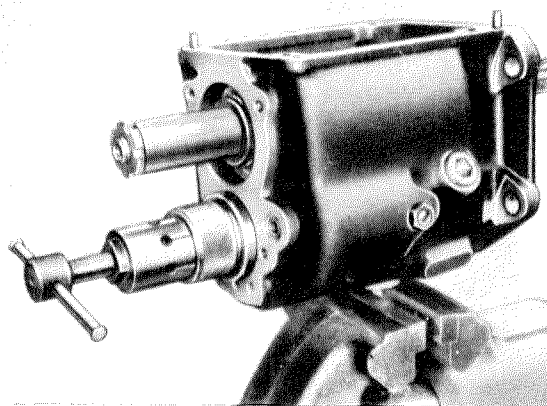


Fig. 26 — 4/30

62. If the puller is not available, lift both drive and main shaft (Fig. 26 — 4/31).

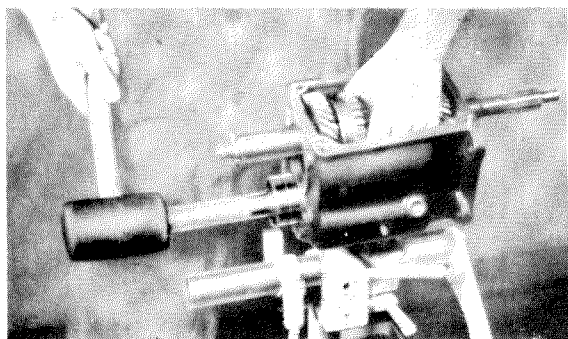


Fig. 26 — 4/31

Then use Drift 136 589 06 39 to drive the countershaft, together with front bearing, toward the rear until the countershaft drops down into the transmission case.

63. Remove the drive shaft toward the front and the main shaft upward at an angle (Fig. 26 — 4/32).

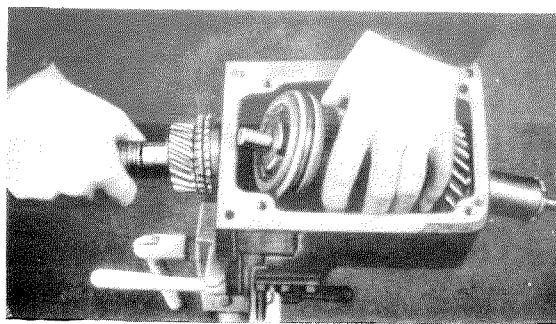


Fig. 26 — 4/32

Remove the roller cage from the rear end of the drive shaft and remove the 4th speed synchronizing ring from the 3rd and 4th speed synchronizing unit.

64. Install Retaining Tool 136 589 11 61 on the countershaft in such a way that the 2nd speed gear is supported against the transmission case wall (Fig. 26 — 4/33).

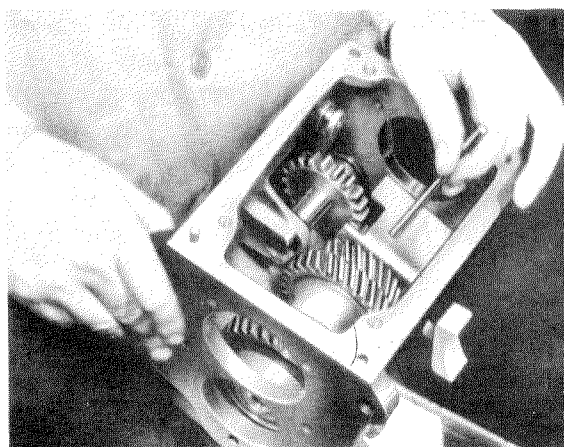


Fig. 26 — 4/33

65. Use the two Removing Levers 136 589 00 35 to press the rear annular grooved bearing off the countershaft (Fig. 26 — 4/34).

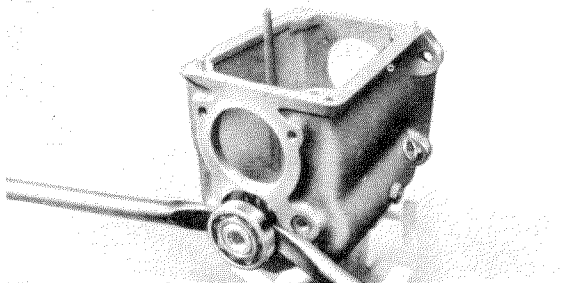


Fig. 26 — 4/34

66. Remove the countershaft from the transmission case upward.
67. Unscrew the threaded pin and hexagon nut for the reverse idling shaft. Then use Puller 136 589 27 33 to pull out the reverse idling shaft toward the rear and remove the reverse idling gear (Fig. 26 — 4/35).

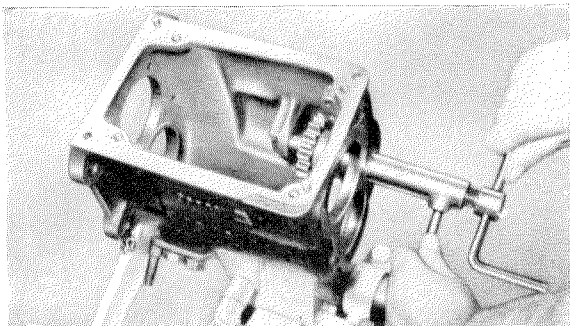


Fig. 26 — 4/35

68. Remove the relay lever and shifting claw for the reverse idling gear.

Disassembly:

Countershaft:

69. Press the front annular grooved bearing off the countershaft, using Removing Levers 136 589 00 35.
70. Remove the snap ring from the countershaft. If necessary, press off the two countergears (drive gear and 3rd speed gear) from the countershaft (Fig. 26 — 4/36).

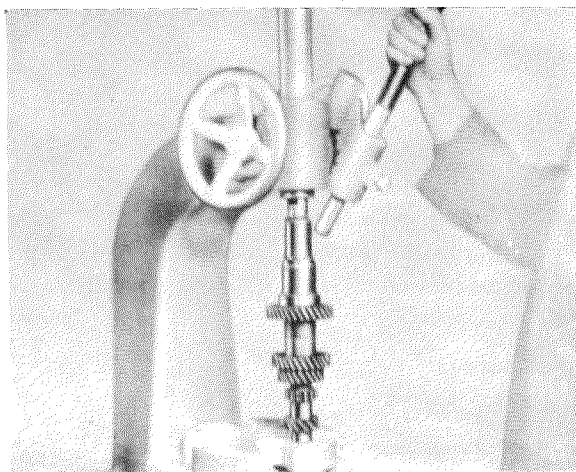


Fig. 26 — 4/36

Main Shaft:

71. Remove Fitting Sleeve 198 589 02 61 after removing the grooved nut. Remove 1st speed gear together with synchronizing ring, roller cage, and thrust washer (Fig. 26 — 4/37).

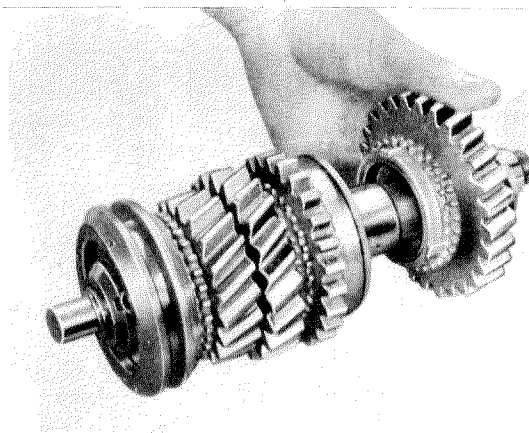


Fig. 26 — 4/37

72. Remove the 1st and 2nd speed synchronizing unit (which is also the reverse idling gear), synchronizing ring, thrust washer, and key (Fig. 26 — 4/38).

Note: When disassembling the gear train, always mark the synchronizing rings in relation to the appropriate side of the speed gears, since the synchronizing cones in the course of time have adapted themselves to one another.

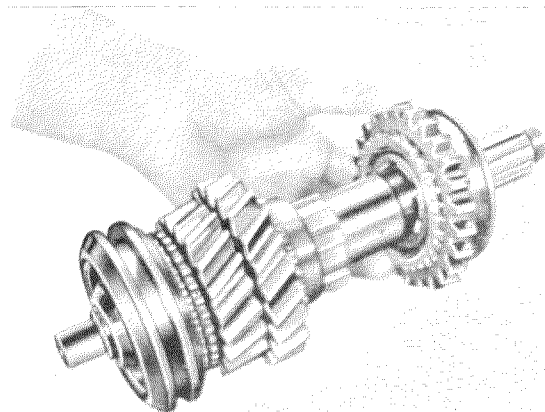


Fig. 26 — 4/38

73. Turn the stop ring for the 2nd speed gear in such a way that the splines on the main shaft and on the stop ring (1) are indexed (Fig. 26 — 4/39).

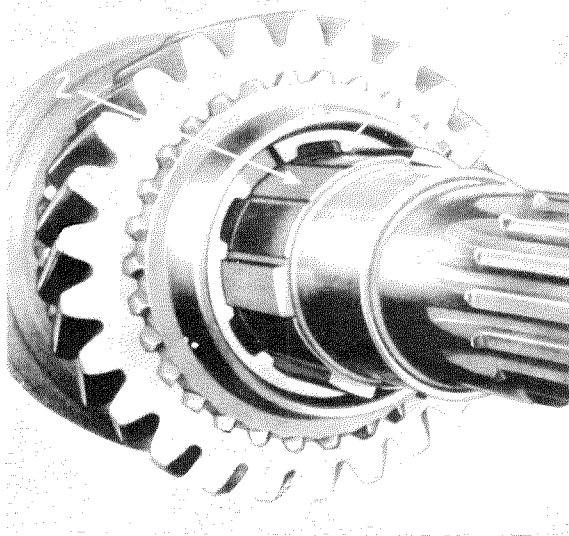


Fig. 26 — 4/39

- 1 Splines on stop ring
- 2 Splineways on main shaft

74. Remove 2nd speed gear, together with stop ring and split roller cage (Fig. 26 — 4/40).

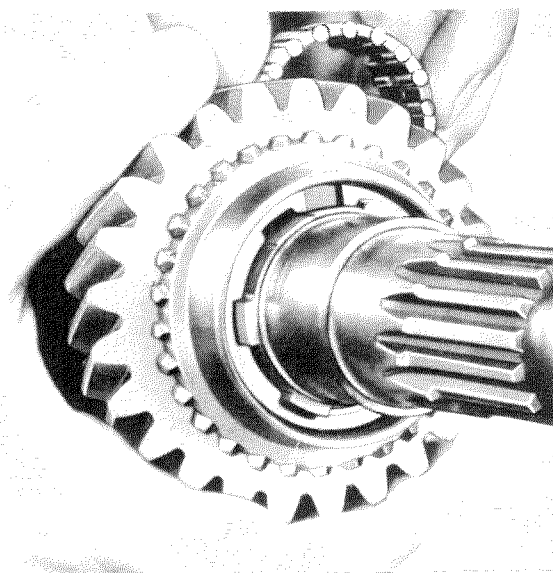


Fig. 26 — 4/40

75. Clamp Retaining Wrench 187 589 00 31 in a vise. Install the three-way flange in the retaining wrench and insert the main shaft in the three-way flange. Remove the locking plate from the main shaft and unscrew the grooved nut, using Pin Wrench 120 589 04 07 (Fig. 26 — 4/41).

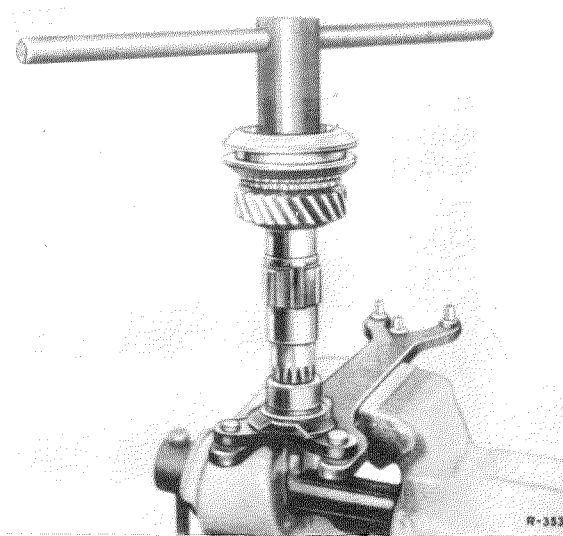


Fig. 26 — 4/41

76. Remove the 3rd and 4th speed synchronizing unit together with synchronizing ring, thrust washer, and 3rd speed gear.

Synchronizing Units

77. In order to disassemble the synchronizing units, insert the synchronizing ring and press the synchronizing unit and followers out of the sliding sleeve with the help of the synchronizing ring (Fig. 26 — 4/42).

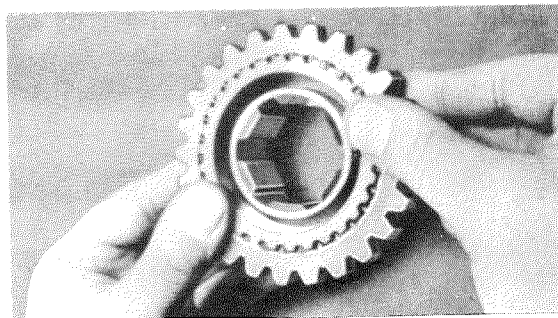


Fig. 26 — 4/42

Note: Since the steel balls drop out in the process, it is advisable to wrap the synchronizing unit in a cloth to catch the steel balls.

Reassembly

Synchronizing Units

78. Install the followers and springs in the synchronizing unit and insert the synchronizing unit in the sliding sleeve (Fig. 26 — 4/43).

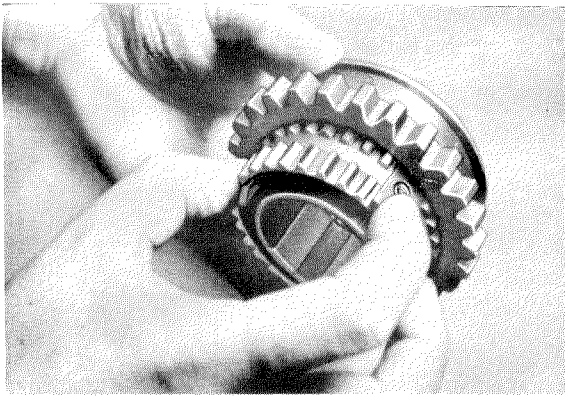


Fig. 26 — 4/43

79. Push followers forward one at a time, insert a ball, and push the follower back again (Fig. 26 — 4/44 and Fig. 26 — 4/45).

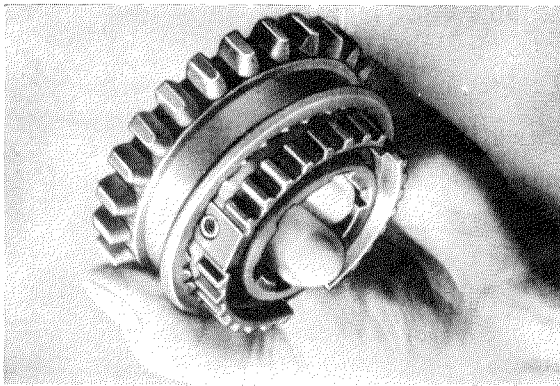


Fig. 26 — 4/44

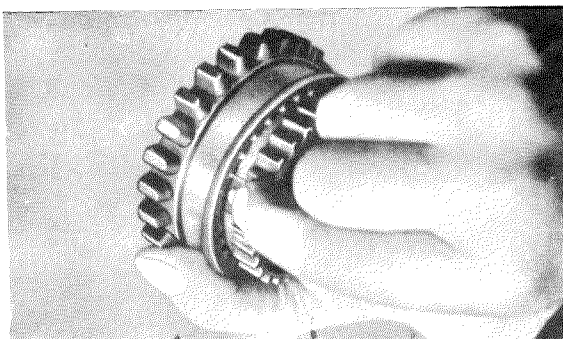


Fig. 26 — 4/45

80. Install the 1st and 2nd speed synchronizing unit in such a way that the long hub side of

the synchronizing unit is opposite the guide groove in the sliding sleeve (Fig. 26 — 4/46).

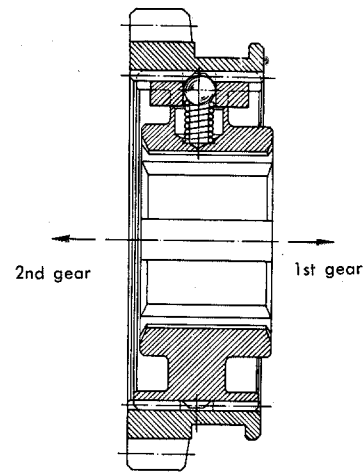


Fig. 26 — 4/46

81. Install the 3rd and 4th speed synchronizing unit in such a way that the broad hub side and the 3 grooves in the sliding sleeve are opposite each other (Fig. 26 — 4/47).

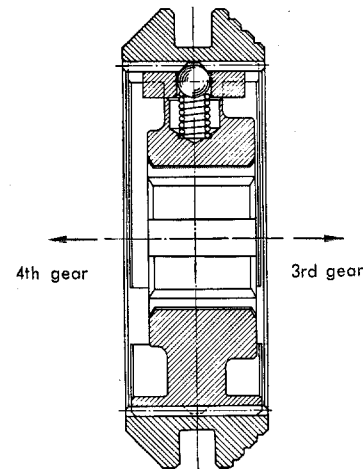


Fig. 26 — 4/47

82. After assembly check whether the sliding sleeve disengages under an axial thrust of 7—11 kg.

Countershaft

83. Fit the key in the countershaft.
84. Press the two countergears (3rd speed gear and drive gear) onto the countershaft with the two high collars facing one another (Fig. 26 — 4/48).

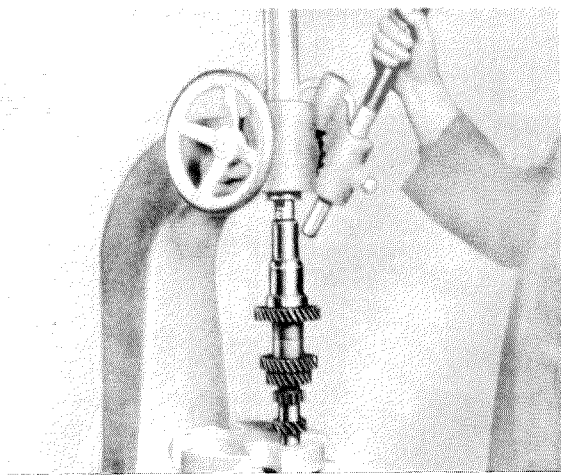


Fig. 26 — 4/48

When pressing on the gears, make sure that no stock is scraped off! Before the 3rd speed countergear comes to rest against the 2nd speed countergear, check whether any stock has been scraped off. If necessary, remove the material and make sure that the faces of the collars are absolutely clean. Then press the countergears on until they rest against one another.

85. Install the snap ring.

Main Shaft

86. Clamp Retaining Wrench 187 589 00 31 in a vise and install the three-way flange in the retaining wrench.
87. Insert the main shaft in the three-way flange.
88. Slide the 3rd speed gear onto the shaft with the synchronizing cone pointing upward and insert the thrust washer.
89. Install the synchronizing ring (8.4 mm nose width) on top of the 3rd speed gear and slide the synchronizing unit onto the shaft with the grooved side down (see Fig. 26 — 4/47). Pay attention to the markings made on removal.
90. Install the locking plate and the grooved nut and firmly tighten the nut using Wrench 120 589 04 07 (Fig. 26 — 4/49). Do not yet lock the grooved nut.

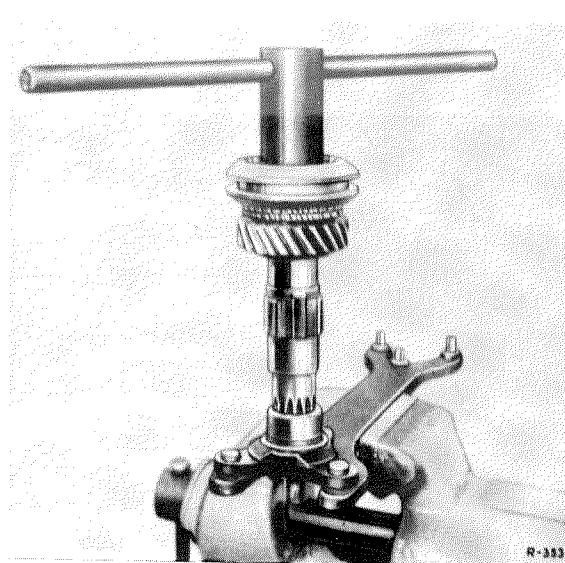


Fig. 26 — 4/49

Note: The 3rd speed gear must still be able to turn easily.

91. Then pull the main shaft out of the three-way flange, turn the main shaft over, with the drive shaft centering journal pointing downward, and either reinstall it in the three-way flange or clamp it in a vise, using copper or lead jaw covers.
92. Measure the end play between the 3rd speed gear and the shaft collar (Fig. 26 — 4/50). Set dial gage to 1 mm beforehand!

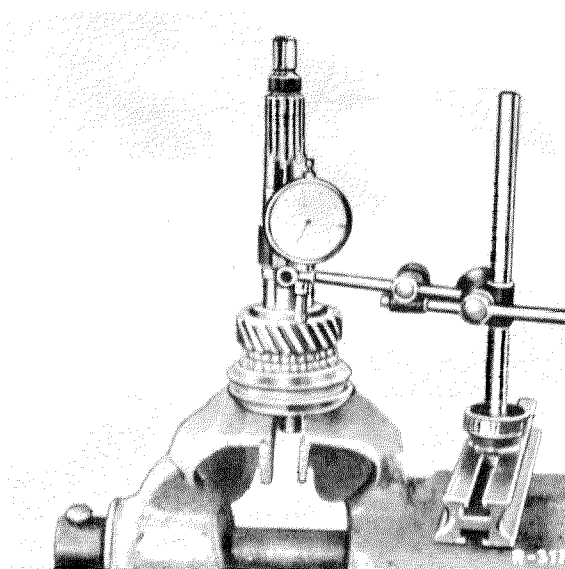


Fig. 26 — 4/50

The end play must be 0.10—0.18 mm. Thrust washers of different thicknesses are not available.

If the end play is less than 0.10 mm, the front of the 3rd speed gear must be ground down. If the end play is more than 0.18 mm, the 3rd speed gear must be replaced.

93. Turn over the main shaft, tighten the grooved nut to a torque of 12 mkg and then tap down the grooved nut locking plate at all four points.

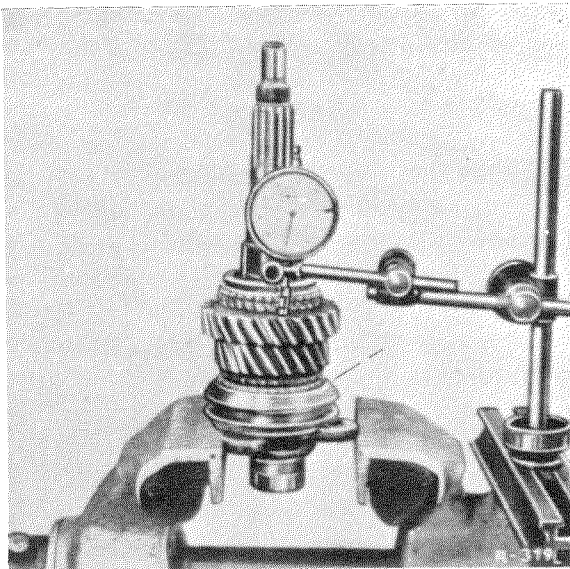


Fig. 26 — 4/51

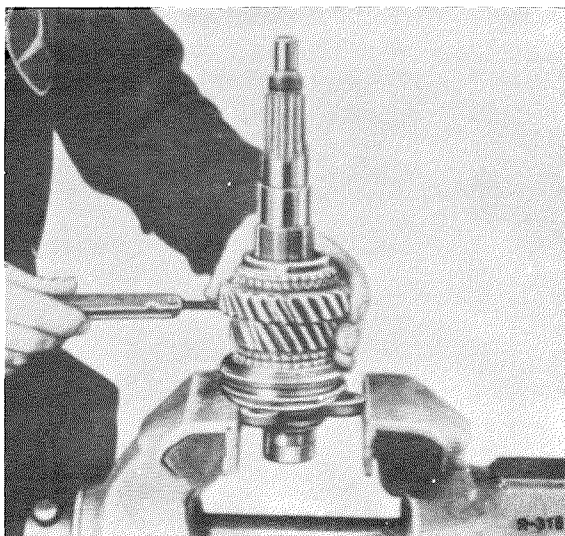


Fig. 26 — 4/51 a

94. Again turn the main shaft over, slide the 2nd speed gear over the shaft and install the stop ring.

95. Measure the end play between the 2nd speed gear and the shaft collar with a dial gage or a feeler gage (Figs. 26 — 4/51 and 26 — 4/51 a).

The end play must be 0.10—0.18 mm and can be adjusted by installing the appropriate stop ring.

Stop rings are available in thicknesses between 7.90 and 8.10 mm at intervals of 0.05 mm.

96. Remove the 2nd speed gear together with stop ring. Install the split roller cage on the shaft, slide the 2nd speed gear over the shaft and the split roller cage and install the stop ring in front of it.

97. Turn the stop ring in such a way that the splines of the stop ring and the splineways (2) of the main shaft index (Fig. 26 — 4/52).

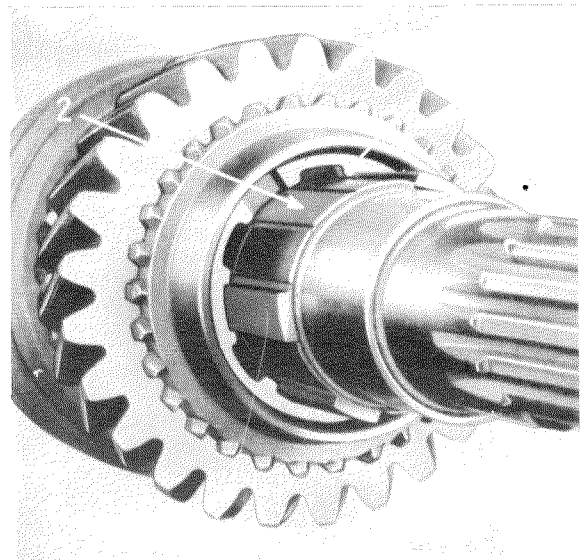


Fig. 26 — 4/52

1 Spline of stop ring
2 Splineway of main shaft

98. Slide the 1st speed gear thrust washer with spline onto the main shaft, spline downward. Then install the 1st speed gear with the synchronizing cone downward. Install the rear thrust washer with the shouldered face upward and measure the end play of the 1st speed gear (Fig. 26 — 4/53).

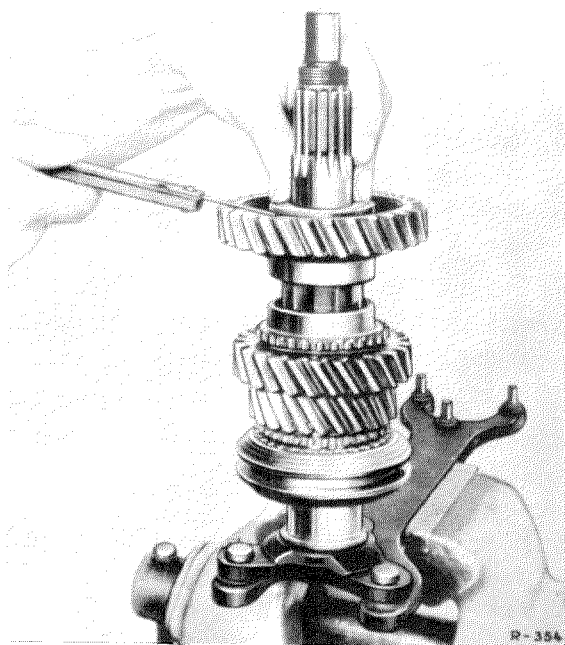


Fig. 26 — 4/53

Note: The prescribed end play of 0.10—0.18 mm is obtained by using an appropriate thrust washer. Only splined washers are replaced. The thrust washers are available in thicknesses from 4.40—4.60 mm at intervals of 0.05 mm.

99. Remove rear thrust washer and 1st speed gear. Insert the key between the two splines of the thrust washer and the stop ring and measure the axial clearance of the key by means of a tolerance feeler band (Fig. 26 — 4/54).

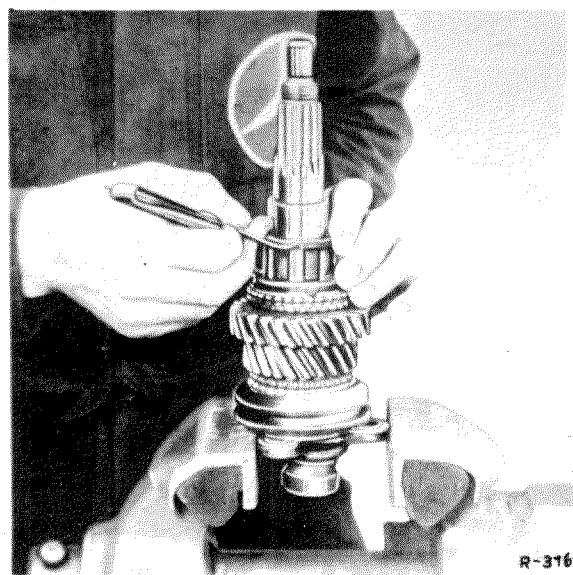


Fig. 26 — 4/54

The minimum axial clearance is 0.1 mm.

Note: When measuring the clearance, the clearance between the 2nd speed gear and the stop ring must be taken into account!

100. Remove the thrust washer and key and fit the key into the synchronizing unit. The key can only be fitted into two opposite splines which are cut slightly deeper.
101. Put the synchronizing ring with a nose width of 8.4 mm on the synchronizing cone of the 2nd speed gear and install the key. Then slide the synchronizing unit, with the guide groove for the shift fork facing upward (see Fig. 26 — 4/46), over the key; remember that only the deep-cut spline will fit over the key.
102. Slide the thrust washer together with the roller cage on the main shaft. Spline and key must index. Put the synchronizing ring with the 10 mm nose width on the synchronizing unit. Install the 1st speed gear and the rear thrust washer, shouldered face upward.
103. Slide Fitting Sleeve 198 589 02 61 or a short pipe length (31 × 40 × 62) over the shaft and screw down with the grooved nut in order to hold the 1st speed gear in position.

Note: If a suitable gage is available, the functioning of the various gears should be checked before reassembly (Fig. 26—4/55).

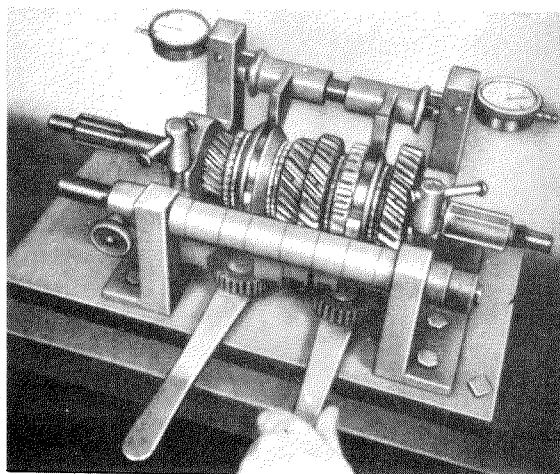


Fig. 26 — 4/55

Until the individual synchronizing units come to rest against the opposite cone of the speed gear, the travel is 0.8—1.3 mm (1st to 4th gear).

Any deviation in the 4th gear can be adjusted by the large thrust washer between the 1st speed gear and the annular grooved bearing. These thrust washers are available in thicknesses from 3.80—4.50 mm at intervals of 0.1 mm.

Supplementary Note Concerning Main Shaft Reassembly

On recent models the 3rd speed gear is provided with roller bearings in the same way as the 1st and 2nd speed gears: For reassembly only the procedure outlined in Paragraph 88 has been modified. First slide the two roller cages onto the main shaft and then install the 3rd speed gear, synchronizing cone upward (Fig. 26—4/55a).

Then install the thrust washer. For the rest, the procedure is the same as outlined above.

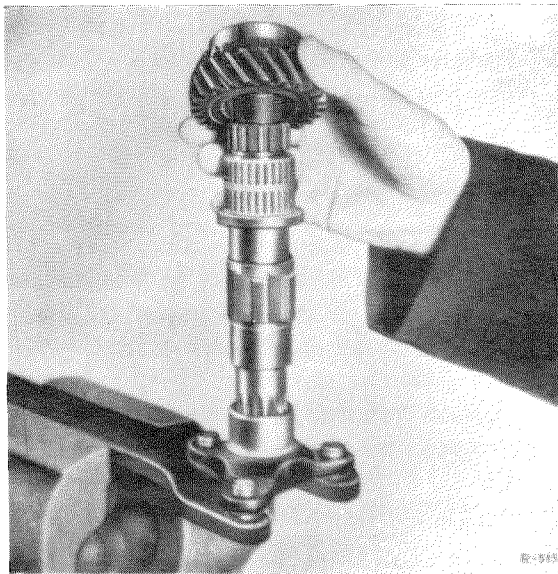


Fig. 26 — 4/55a

Note: The 3rd speed gear with roller bearing can be installed subsequently only if both the main shaft and the 3rd speed gear are replaced, since the dimensions of these two parts have been modified.

Installation:

104. Install the relay lever for the reverse gear in the housing together with shifting claw.
105. Insert the reverse idling shaft in the case, making sure that the reverse idling gear is slid on with the guide groove toward the rear in such a way that the shifting claw of the relay lever engages the guide groove of the reverse idling gear (Fig. 26 — 4/56).

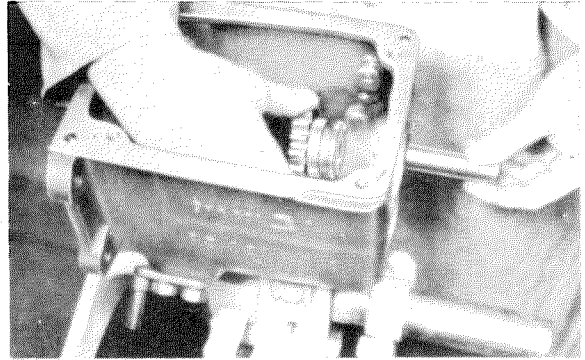


Fig. 26 — 4/56

106. Lock the reverse idling shaft by means of the threaded pin and tighten the hexagon nut of the threaded pin.
107. Press the front annular grooved bearing onto the countershaft and install the countershaft from above in the transmission case.
108. Slide the protective washer onto the rear end of the countershaft.
109. Install the main shaft from above and push the roller cage into the drive shaft bore. Put the synchronizing ring for the 4th speed gear on the drive shaft and insert the drive shaft from the front (Fig. 26 — 4/57).

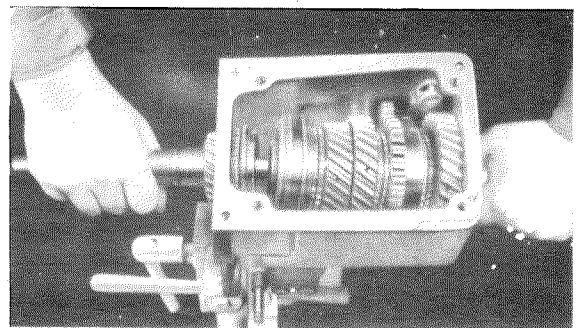


Fig. 26 — 4/57

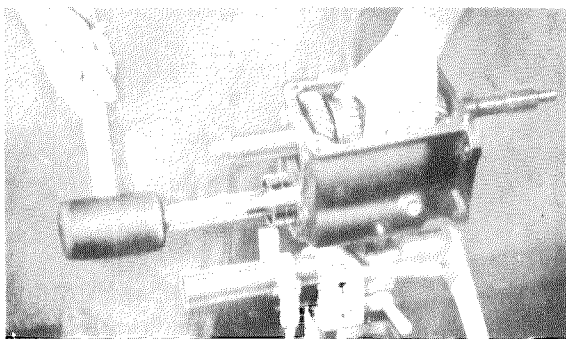


Fig. 26 — 4/58

110. Lift both drive shaft and main shaft and drive the countershaft into the transmission case with Drift 136 589 06 39 (Fig. 26 — 4/58).
111. Slide the oil slinger plate onto the drive shaft; use Installing Arbor 136 589 07 39 to drive the annular grooved bearing together with Cover Plate 6306 ZN DIN 625 (snap ring toward the front), and the spacer ring onto the drive shaft and at the same time into the transmission case.
112. Use Snap Ring Pliers 136 589 00 37 to install the small snap ring in the groove of the drive shaft. The snap ring must be firmly seated on the shaft. Re-shape loose snap rings (Fig. 26 — 4/59), if for some reason a new snap ring should not be available.

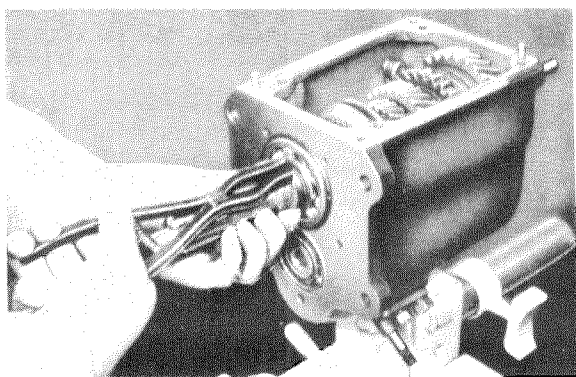


Fig. 26 — 4/59

113. Perform the operations necessary to install the transmission case front cover and the clutch housing as outlined in Sections B and C.
114. Install Retaining Clamp 136 589 14 61 in the short gear section of the 1st and 2nd speed gears in such a way that the speed gears are pushed toward the synchronizing unit in order to prevent the key from slipping out of the groove of the stop ring or the thrust washer (Fig. 26 — 4/60).

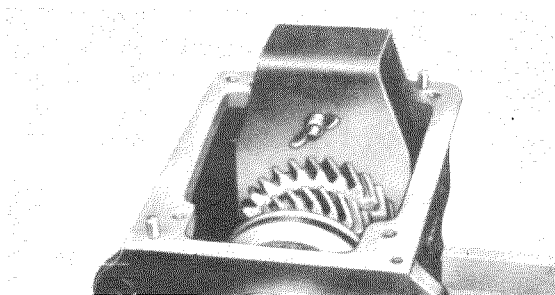


Fig. 26 — 4/60

115. Remove Fitting Sleeve 198 589 02 61, slide on Rear Annular Grooved Bearing 6306 N marked X (see Job No. 26 — 5) and drive it into the transmission case, snap ring toward the rear, using Fixture 136 589 07 39.
116. Perform the operations necessary to install the transmission case rear cover as outlined in Section D, Paragraphs 49 — 54.
117. Fill in 1.4 liters transmission fluid Type A.
Note: For this purpose it is advisable to unscrew the oil level check plug at the transmission case and to fill in transmission oil until it runs out at the check bore.
The previous conical plug at the transmission case for draining the oil has been replaced by a shouldered plug (Part No. 186 997 01 32) together with Sealing Ring A 24 × 30 DIN 7603 AL 99 F 8.
118. Perform the operations necessary to install the transmission case top cover as outlined in Section A.