Revision: model 114/115 is provided with transmission W 4 B 025.

## Installation Survey

| Unit designation | Transmission Type | Installed in vehicle model | | | | Unit version |
|---|---|---|---|---|---|---|
| K 4 A 040 | – | 107.023 [1] | 107.043 [1] | | | 1 |
| | | 108.057 | 108.058 | | | |
| | | 109.056 | 111.026 | 111.027 | | |
| W 3 A 040<br>W 3 B 050 | 722.0 | 107.023 [2] | 107.024 | 107.043 [2] | 107.044 | 2 |
| | | 108.067 | 108.068 | 109.057 | | |
| | | 116.028 | 116.029 | 116.032 | 116.033 | |
| K 4 C 025<br>reinforced | 722.2 | 114.062 [4] | 114.072 [4] | | | |
| W 4 B 025 | 722.1 | 114.011 [3] | 114.015 [3] | 114.023 [3] | 114.060 [3] | 3 |
| | | 114.062 [3] | 114.072 [3] | 114.073 [3] | 115.015 [3] | |
| | | 115.017 [3] | 115.110 [3] | 115.115 [3] | 115.117 [3] | |
| | | 116.020 | 116.024 | 116.025 | | |

1) Transmission K 4 A 040 installed up to June 1972
2) Transmission W 3 A 040 installed as from June 1972
3) Transmission W 4 B 025 installed as from August 1973
4) Transmission K 4 C 025 installed up to July 1973

| | Job No. |
|---|---|
| **Maintenance Jobs** | |
| Oil Level Checkup | 010 |
| Oil Change, Filter Change | 020 |
| **Adjusting Jobs** | |
| Adjustment of Control Pressure Rod and Selector Rod | 110 |
| Adjustment of Starter Locking Switch and Kickdown Switch | 140 |
| **Transmission Checkup** | |
| Checkups during Test Drive | 320 |
| Measuring Instruments and their Connections | 330 |
| Measuring the Nominal Pressures | 340 |
| **Shift Valve Housing** | |
| Removal and Installation of Shift Valve Housing | 400 |
| Disassembly and Reassembly of Shift Valve Housing | 420 |
| A. 1st Version up to Use of New Controls (February 1971) | /1 |
| B. 2nd Version as from Use of New Controls (February 1971) | /5 |
| **Rear Transmission Housing** | |
| Removal and Installation of Rear Transmission Housing | 500 |
| Removal and Installation of Centrifugal Governor | 520 |
| Removal and Installation of Parking Lock | 540 |
| Disassembly and Reassembly of Rear Transmission Housing | 560 |
| Disassembly and Assembly of Centrifugal Governor | 570 |
| Removal and Installation of Starter Lock and Backup Light Switch | 580 |
| **Transmission** | |
| Removal and Installation of Transmission | 600 |
| Disassembly and Reassembly of Front Transmission Cover with Primary Pump | R 620 |
| Disassembly and Assembly of Transmission | R 640 |
| Disassembly, Reassembly and Measuring of Gear Assembly | R 660 |
| Disassembly, Reassembly and Measuring of Clutch K 1 | R 680 |
| Disassembly, Reassembly and Measuring of Clutch K 2 | R 690 |

## Oil Type

| | |
|---|---|
| Automatic transmission fluid (ATF) approved oil types | Type B, Dexron B<br>refer to pertinent specifications page 236.4 |

## Special Tools

| | |
|---|---|
| Filling funnel | 111 589 04 63 00 |
| Syringe | 112 589 00 72 00 |

## Oil Level Checkup

Complete oil level checkup with the engine running, the parking brake pulled, and the selector lever in position "P", with the **vehicle resting on level ground in unloaded condition** and the **transmission at operating temperature** (approx. 80° C cooling water temperature). Prior to the inspection, run engine for approx. 1–2 minutes at idling speed so that the torque converter can fill up.

**C a u t i o n ! At an oil temperature of 20° to 30° C the max. oil level is in fact approx. 25 mm below the lower dipstick mark. This information is provided as an aid during an oil change, which is generally made at this oil temperature.**

Wipe oil dipstick (6) with a lintfree cloth (leather is best), immerse fully for measuring, pull out again and read oil level (Fig. 1).

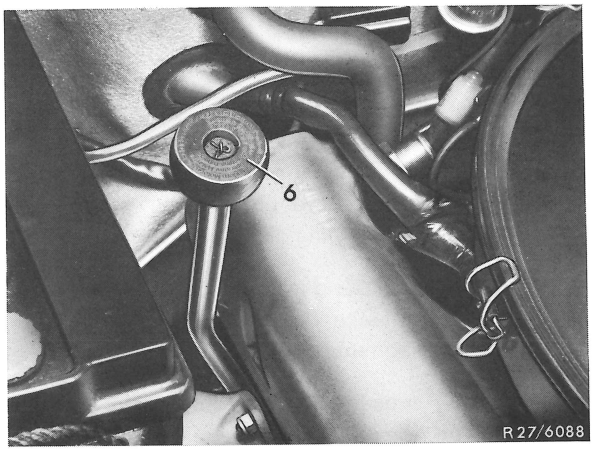



Fig. 1
6 Oil dipstick

## Notes

A fully **cooled down transmission** will show an **oil level below the bottom dipstick mark** even whn correctly filled with oil.

Add required oil through a funnel with a finemeshed strainer **into pipe for oil dipstick** with the engine running. (Funnel 111 589 04 63 00 is recommended). A reference value is as follows: The distance between the upper and the lower dipstick mark corresponds to approx. 0.3 lits. of transmission fluid.

If the **oil level is too low,** the oil pump will **suck up air** which can be clearly heard. The **oil will foam** and provide **wrong results** during oil level checkup. Wait until the oil foam is down (for approx. 2 minutes), add oil and check oil level.

**Excessive transmission fluid must be drained** or drawn off, since otherwise the transmission gears would be splashing in oil. The temperature will increase unnecessarily until the foaming oil is ejected through breather. **Continuous operation** under such circumstances **will lead to transmission damage.** The syringe 112 589 00 72 00 for rinsing the oil cooler can be provided with a hose and can then be used for drawing off excess transmission fluid.

Actuate service brake when the upper dipstick mark is attained after adding oil. Leave selector lever in position R–N–D–N–R – in each position for several seconds – and move back to position "P", so that the working pistons of the servo members are charged with oil Then check oil level once again and make corrections, if required.

# 27.1 Oil Change, Filter Change

K 4 A 040

| Oil Capacity in Liters | Flat oil pan | Deep oil pan | Oil Type |
|---|---|---|---|
| Initial capacity | 6.4 | 6.8 | Use specified ATF Type B, Dexron B only, refer to pertinent specifications on page 236.4 |
| During oil change | 5.4 | 5.8 | |

| Oil Change Intervals | |
|---|---|
| Oil change, filter change | every 45,000 km[1]) (27,000 miles) |

1) For vehicles which are running under aggravated conditions (such as taxis, vehicles operating predominantly in cities or mountainous regions, or towing trailers) an additional oil change is required (without renewing filter).

| Tightening Torque | Nm | (kpm) |
|---|---|---|
| Fastening bolts of oil pan | 7 | (0.7) |

## Draining the Oil and Changing the Filter

The following conditions must be observed during an oil change: Vehicle on level ground, transmission at operating temperature, engine shutoff.

Unscrew oil filler pipe (2) and let oil run out (Fig. 1).

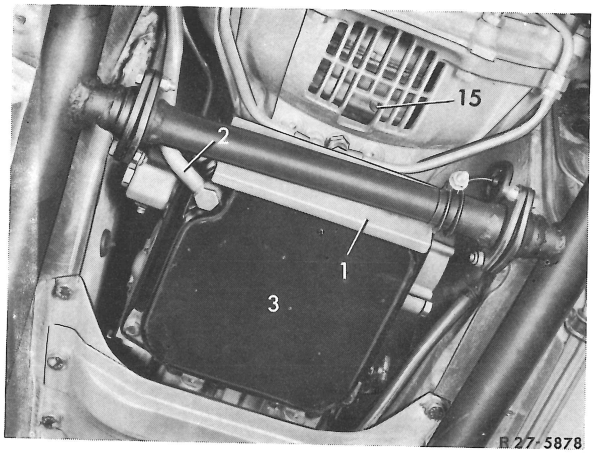



Fig. 1

1 Shielding plate
2 Oil filler pipe
3 Oil pan
15 Oil drain plug

Rotate crankshaft until the oil drain plug (15) shows up and can be screwed out (Fig. 1).

When no more oil runs out of transmission and clutch, remove transmission oil pan and replace oil filter (4).

Mount oil pan and tighten fastening bolts to 7 Nm (0.7 kpm). Attach oil filler pipe.

Screw oil drain plug (15) into hydraulic coupling using a new sealing ring.

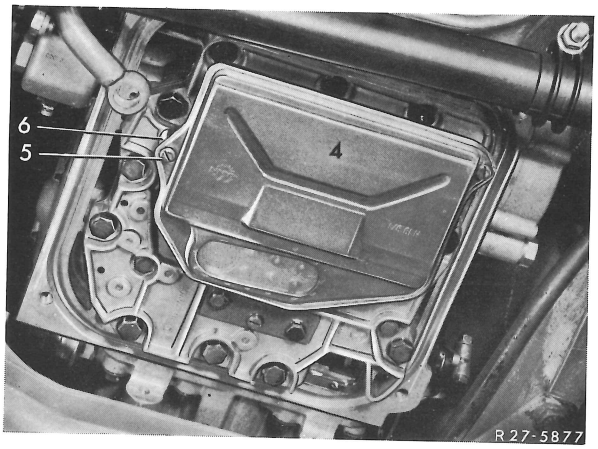



Fig. 2

4 Oil filter
5 Fastening bolt
6 Spacer sleeve

## Filling-In Oil

First fill-in a major quantity (approx. 4 lits.) of an approved automatic transmission fluid through the hole for the oil dipstick with the engine stopped. Start engine in selector lever position "P" and run at idling speed, add remaining oil immediately.

Actuate service brake and leave selector lever in each position for several seconds, then check oil level with the oil at operating temperature.

**Caution! Immediately after filling-in the correct quantity of oil, the oil level is approx. 25 mm below lower dipstick mark. With the oil at operating temperature, this corresponds to a level up to top dipstick mark.**

**Caution!** All the adjusting jobs described below should be made only with the vehicle standing on its wheels.

### Adjustment of Control Pressure Rod

Remove air filter and disconnect control pressure linkage (1).

Push intermediate lever (2) against idling speed stop (4) on drag lever (3) and throttle valve lever (6) on idling speed stop (5) on venturi control unit.

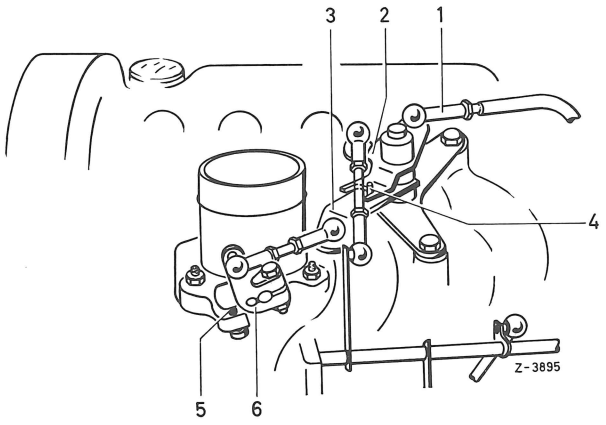



Fig. 1

1 Control pressure linkage
2 Intermediate lever
3 Drag lever
4 Idling speed stop drag lever
5 Idling speed stop venturi control unit
6 Throttle valve lever

Push control pressure linkage (1) completely toward the rear against stop and check or adjust length free of stress in relation to ball head.

**Note:** When checking the control pressure linkage for length, hold ball socket adjacent to ball head and not above, due to the circular movement of the linkage.

### Adjustment of Selector Rod

Disconnect selector rod (5) on range selector lever (6). Set range selector lever (6) and selector lever (1) to "N", making sure that approx. 1 mm play is available between the selector lever (1) and the "N"-stop on the gate plate. Adjust length of selector rod (5) in such a manner that it can be attached free of stress; then tighten counternut (4) again (Fig. 2).

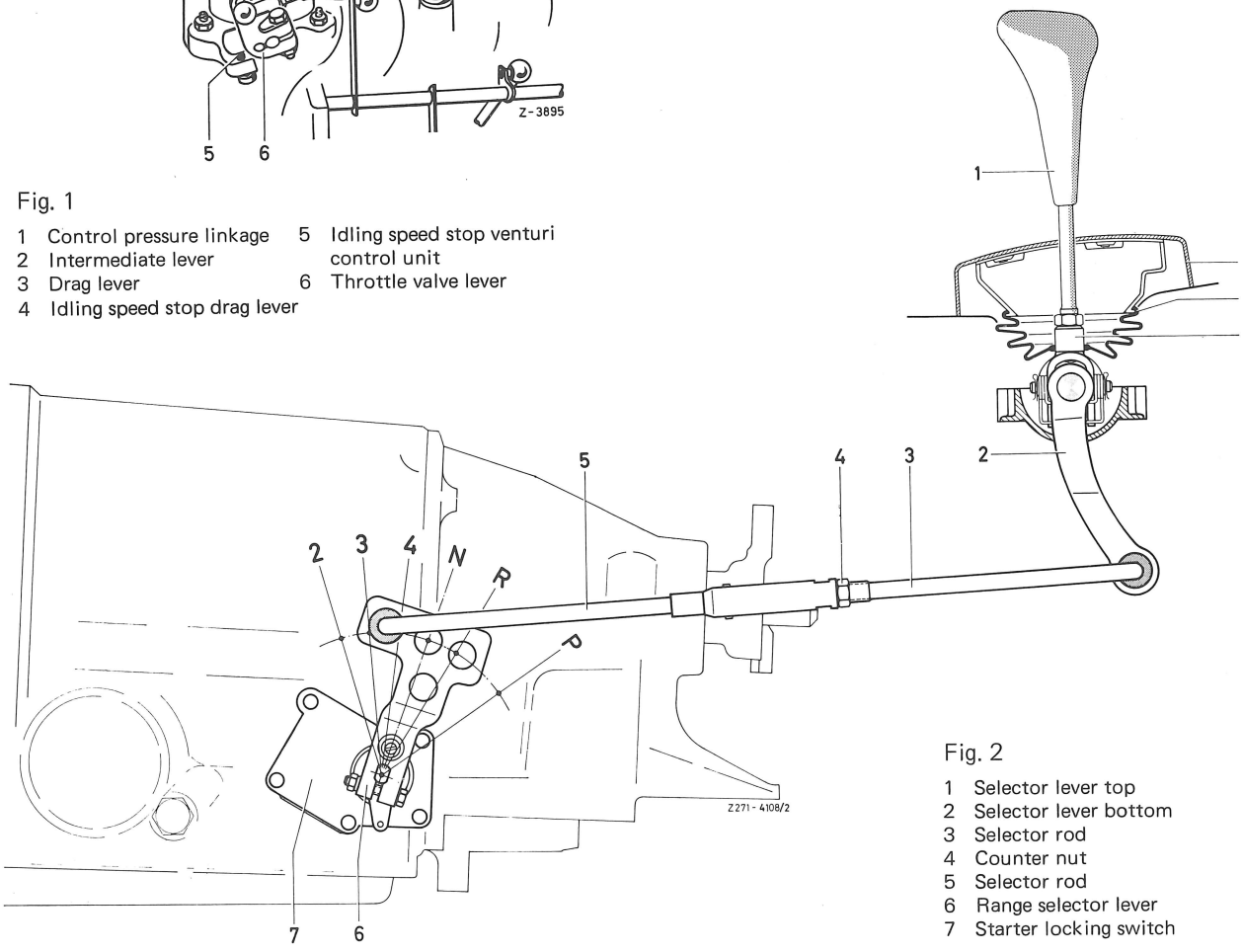



Fig. 2

1 Selector lever top
2 Selector lever bottom
3 Selector rod
4 Counter nut
5 Selector rod
6 Range selector lever
7 Starter locking switch

# 27.1 Adjustment of Starter Locking and Backup Light Switch and Kickdown Switch

K 4 A 040

**Special Tool**

| | |
|---|---|
| Locating pin | 115 589 18 63 00 |

## Adjustment of Starter Locking and Backup Light Switch

Disconnect selector rod and move range selector lever (1) on transmission into position "N". Tighten clamping bolt (6) prior to making adjustments (Fig.1).

Loosen adjusting screw (3) and insert locating pin (5) through carrier into locating hole in gear shift housing.

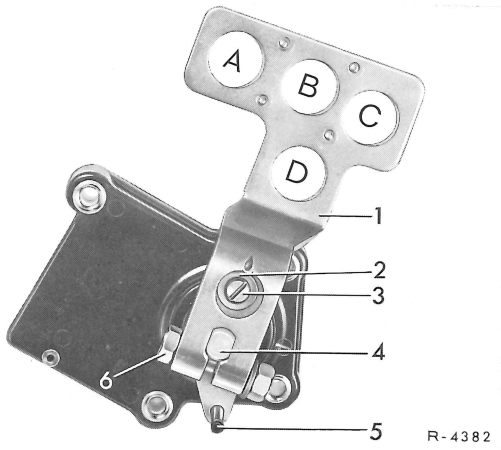



Fig. 1

1 Range selector lever
2 Washer
3 Adjusting screw
4 Shaft
5 Locating pin
6 Clamping bolt

Tighten adjusting screw (3) and remove locating pin (5).

Place selector lever of steering column or floor-mounted gear shift in position "N" and attach selector rod free of tension. Then check whether the engine can be started in selector lever position "N" or "P".

## Adjustment of Kickdown Switch

The kickdown position of the magnetic valve is controlled by the accelerator pedal via the kickdown switch.

Depress accelerator pedal (9) from inside vehicle against kickdown end position (Fig. 2). In this position the throttle valve lever should rest against the full load stop of venturi control unit.

Adjustments are made by loosening the clamping bolt on the retracting lever (11) of the accelerator pedal shaft and turning of accelerator pedal. Then tighten clamping bolt again.

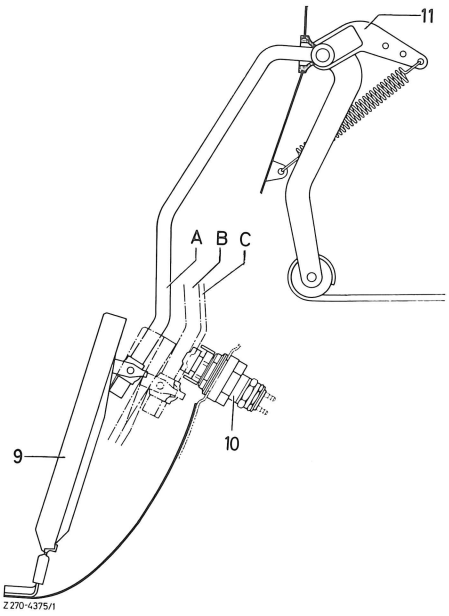



Fig. 2

9 Accelerator pedal
10 Kickdown switch
11 Retracting lever
A Idle throttle position
B Full throttle position
C Kickdown position

K 4 A 040

## Notes

The test methods described below are used to check the normal functions of the automatic transmission. Judging the operation and troubles, if any, of transmission obviously requires experience in handling automatic transmissions. Without such experience it will be of advantage to use another automatic transmission in good order and of the same design for making comparisons. If the test shows irregular functions, reference to a system of **"Programmed Repairs"** will assist in finding the causes of such faults.

Prior to starting, be sure to check the oil level (27.1–010), the idling speed of the engine (07.4.1–417), adjustment of selector rod (27.1–110) of regulating linkage (07.4.1–443) and of kickdown switch (27.1–140).

An example for checking the shifting sequence, partially while influencing the accelerator pedal and the selector lever, with the assistance of a pertinent program follows.

## Shifting Down with Kickdown

In selector lever position"4" accelerate vehicle while maintaining accelerator pedal position up to 60 km/h, then apply kickdown; transmission will shift back to 3rd speed.

## Shifting Up with Full Throttle

Return accelerator pedal to "full throttle" and accelerate. Shifting up from 3rd to 4th speed occurs at 125 km/h.

## Deceleration Shifts

Accelerator pedal in idling speed position

Decelerate vehicle to approx. 80 km/h and move selector lever into position "3" (shifting down to 3rd speed. Time up to begin of shift: approx. 1 sec max.). Following a deceleration to approx. 50 km/h, raise selector lever slightly and move into position "2" (shifting down to 2nd speed, time up to begin of shift: approx. 1 sec max.). Shifting down is effected under increased engine speed and a clearly shown decelerating effect on vehicle.

## Accelerations with Kickdown

At a driving speed of approx. 25 km/h move selector lever again to position "4"; the transmission shifts to 3rd speed. Apply kickdown and hold pedal in kickdown position; the transmission will shift back to 2nd speed for acceleration, shifting up to 3rd speed occurs at 56 km/h.

## Checkup of Parking Locks and Reverse Speed Lock

Above approx. 10 km/h no shifting to selector lever positions "P" and "R" should be possible.

## Starting at Full Throttle and Accelerating

Apply full throttle in selector lever position "4" and maintain full throttle position. Vehicle will start from stop in 1st speed and will shift to 2nd speed at approx. 25 km/h. Keep accelerator pedal in full throttle position and wait for the up-shift from 2nd to 3rd speed at 56 km/h. Decelerate vehicle up to stop.

## Starting in Selector Lever Position "2"

Engage selector lever position "2" and start at part throttle. Vehicle will start from stop in 1st speed and will shift to 2nd at approx. 40 km/h. Decelerate to approx. 8 km/h. During acceleration, the transmission should shift down to 1st speed. Wait for shifting up to 2nd speed, then decelerate vehicle up to stop; transmission remains in 2nd speed.

## Shifting Down at Part to Full Throttle

Decelerate vehicle in selector lever position "4" to approx. 40 km/h, then apply full throttle; transmission will shift down to 3rd speed for acceleration. Move selector lever to position "3" and decelerate vehicle to approx. 32 km/h, then apply full throttle; transmission will shift down to 2nd speed for acceleration.

Move selector lever to position "2" and decelerate vehicle to approx. 12 km/h, then apply full throttle; transmission will shift down to 1st gear for acceleration.

**Shifting up** at **part throttle** should be noticed only when listening carefully. At **full throttle** and **kickdown** the gear changes are clearly heard, but the new

gear speed should obtain a smooth hold and the impression of an energetically pulling engine should remain. Sudden revving up of the engine when shifting up indicates the slipping of a servo member (brake band for clutch) and should be checked.

Automatic **downshifts without applying the throttle** occur at very low speeds and will be heard only when listening very carefully (speed increase of engine). On the other hand, **downshifts under kick-down** are coupled with a clearly felt shifting impulse in addition to an increase in engine speed. At certain speed ranges a downshift under part to full throttle is possible.

**Downshifts with the selector lever** are either downshifts while applying the throttle (for example uphill) or decelerating shifts without applying throttle (for example downhill or when decelerating). Downshifts while applying the throttle only a few fractions of a second for changing gears, while decelerating shifts without application of the throttle require from 1 to 2 seconds.

During the checkup make sure that the transmission, particularly under load, is not constantly shifting. During the shifting, the servo members develop considerable heat and pertinent dispersal requires some time. A **reference value** is: **Repeat a gear shift under load only max. once within 15 seconds.**

### Driving in Reverse

Check transmission while driving in reverse. Move selector lever to position "R", accelerate vehicle quickly while backing up and decelerate again.

| Gas pedal position | Shift | ▲ km/h | ▼ km/h |
|---|---|---|---|
| **Selector Lever Position 4** | | | |
| Idle throttle | 1-2-1 | 10 | 7 |
| | 2-3-2 | 30 | 22 |
| | 3-4-3 | 50 | 36 |
| Full throttle | 1-2-1 | 29 | 7 |
| | 2-3-2 | 61 | 22 |
| | 3-4-3 | 138 | 60 |
| Kickdown | 1-2-1 | 34 | 20 |
| | 2-3-2 | 61 | 50 |
| | 3-4-3 | 138 | 120 |
| **Selector Lever Position 3** | | | |
| Idle throttle | 1-2-1 | 10 | 7 |
| | 2-3-2 | 38 | 32 |
| Full throttle | 1-2-1 | 29 | 7 |
| | 2-3-2 | 82 | 39 |
| Kickdown | 1-2-1 | 34 | 20 |
| | 2-3-2 | 82 | 71 |
| **Selector Lever Position 2** | | | |
| Idle throttle | 1-2-1 | 42 | 7 |
| Full throttle | 1-2-1 | 42 | 21 |
| Kickdown | 1-2-1 | 42 | 35 |

**Note:** All speed values are approximate and refer to a rear axle ratio of 3.46:1.

**Explanation of symbols:**

▲ Shifting up ▼ Shifting down

**Special Tool**

| | |
|---|---|
| Tester | 116 589 15 21 00 |

**Note**

The automatic transmission carries three test connections, so that with the assistance of the tester, the three most important oil pressures (modulating pressure, working pressure, regulating pressure) can be measured.

The pressure gauge is suitably connected in such a manner that it can be read from the front passenger seat during the test drive. The working pressure test requires a pressure gauge permitting a scale reading up to 25 bar overpressure (25 atü).

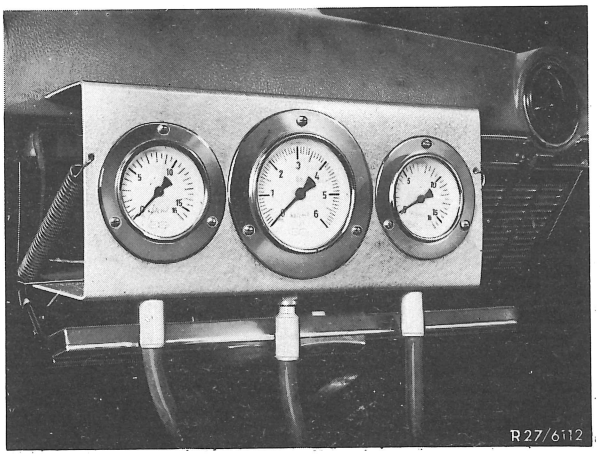



Fig. 1

**Connection of Tester**

The tester is attached to the instrument panel of the vehicle. The pressure gauges are connected to their measuring points as usual by means of pressure hoses guided through the window of the righthand driver's door. The pressure hoses are held in position by the window. Make sure that the hoses are neither too slack nor resting against exhaust pipe.

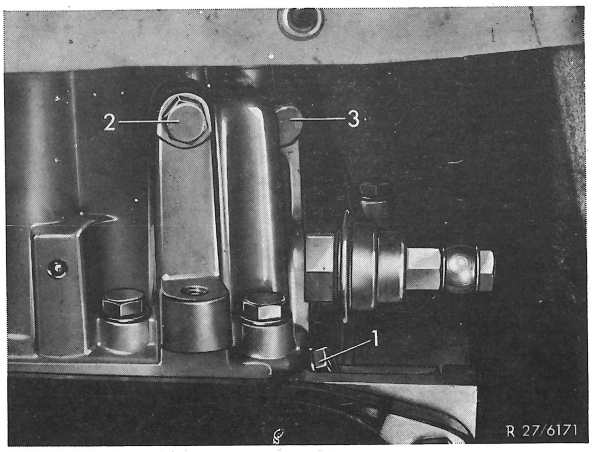



Fig. 2

1 Modulating pressure
2 Working pressure
3 Regulating pressure

## Hydraulic Pressures in kp/cm$^2$

| | | | |
|---|---|---|---|
| Working pressure | 1st and reverse speed | Basic pressure | 7,9 ± 0.4 |
| | | Max. pressure | 16,4 ± 0.4 |
| | 2nd speed pos. "2" | Basic pressure | 7.0 ± 0.4 |
| | 2nd to 4th speed | Basic pressure | 3.4 ± 0.2 |
| | | Max. pressure | 7.1 ± 0.2 |
| Modulating pressure | | Max. pressure | 3.8 |
| Regulating pressure | | 20 km/h | 0.7 + 0.1 |
| | | 40 km/h | 1.4 + 0.1 |
| | | 60 km/h | 2.1 + 0.2 |
| | | 90 km/h | 3.0 + 0.2 |
| | | 120 km/h | 4.1 + 0.3 |

**Special Tool**

| | |
|---|---|
| Tester | 112 589 09 21 00 |

### Modulating Pressure

Prior to testing all the pressures, measure the modulating pressure with the engine running, the hand brake pulled and the selector lever in position "P" and adjust, if required. Use an accurately indicating oil pressure gauge (up to exactly 0.05 kp/cm$^2$ scale value), 6 kp/cm$^2$, or tester 112 589 09 21 00. If the modulating pressure is accurately adjusted, the wor-working pressure will result by itself.

### Measuring and Adjusting

Disconnect vacuum line and make sure that a **counter-hold is applied to the hexagon (SW 14)** on diaphragm. Attach pressure gauge to connection provided. Run engine.

Slightly depressing the accelerator pedal will provide the max. pressure. This pressure can be adjusted by applying a 4 mm socket spanner (2) to the adjusting screw of the vacuum box (1) (Fig. 1).

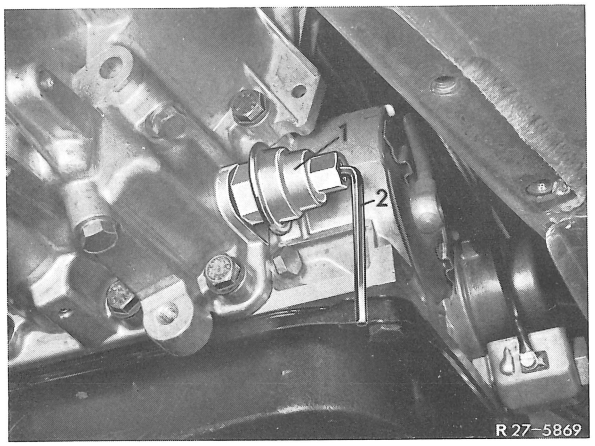



Fig. 1
1 Vacuum box 2 Socket spanner

In the event of complaints about shifting jerks, measure modulating pressure with vacuum line connected while driving following adjustment.

### Measuring while Driving

Apply full throttle in 4th speed at approx. 60 km/h. Hold speed by means of service brake. The modulating pressure should be 3.6 kp/cm$^2$.

# 27.1 Measuring the Nominal Pressures

### Working Pressure

The working pressure is not adjustable and is automatically set during the respective operating condition.

### Regulating Pressure

The regulating pressure is a partial pressure of the working pressure and is set to the required value by the centrifugal regulator attached to the output shaft. The regulating pressure can never exceed the working pressure and for this reason the upper pressure values can be measured only while driving at full throttle.

If no regulating pressure shows up or if the values are deviating, disassemble, clean and make regulator operable upon removal of rear transmission housing cover.

The automatic up and down shifts are determined by the regulating pressure, that is, the increase of the regulating pressure at little partial throttle is connected with shifting up into the next higher speed and shifting down from kickdown upon reaching a given level of the regulating pressure is no longer possible.

### Control Pressure

The control pressure is a partial pressure of the modulating pressure. It is mechanically controlled in dependence of the position of the accelerator pedal. If the linkage is correctly adjusted (for adjustments refer to Job No. 27.1—110), the control pressure will be arrived at automatically.

# Removal and Installation of Shift Valve Housing 27.1

K 4 A 040

**Tightening Torques in mkp**

| | |
|---|---|
| Hex. bolts for oil pan on transmission housing | 0.7 |
| Fastening bolts for oil filter on shift valve housing | 0.4 |
| Hex. bolts for shift valve housing on transmission housing | 1.3 |

**Special Tools**

| | |
|---|---|
| 1 Locating pin | self-made |
| 2 Stud | self-made |

## Removal

**1** Unscrew shielding plate (1) on connecting pipe of exhaust system (Fig. 1).

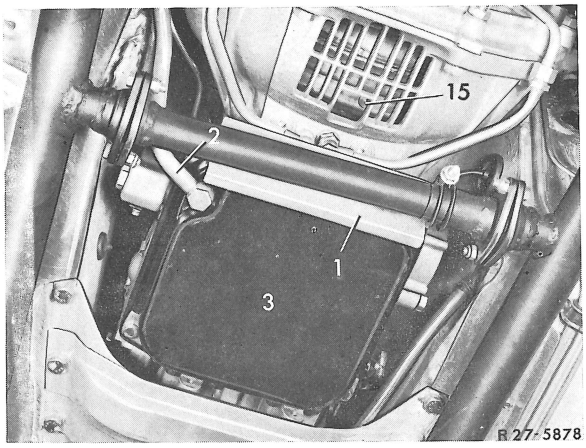



Fig. 1

1 Shielding plate
2 Oil filler pipe
3 Oil pan
15 Oil drain plug

**2** Drain transmission fluid, loosening oil filler pipe (2) from oil pan.

**3** Unscrew four hex. bolts on oil pan and remove oil pan together with seal.

**Caution!** If the transmission fluid smells burned and if the oil pan holds abrasive matter, sludge or an abnormally large number of chips, it is not enough to replace the shift valve housing alone, but the entire transmission must be exchanged. The hydraulic coupling together with the oil lines and the oil cooler must be flushed clean and well.

**4** Remove oil filter (Fig. 2).

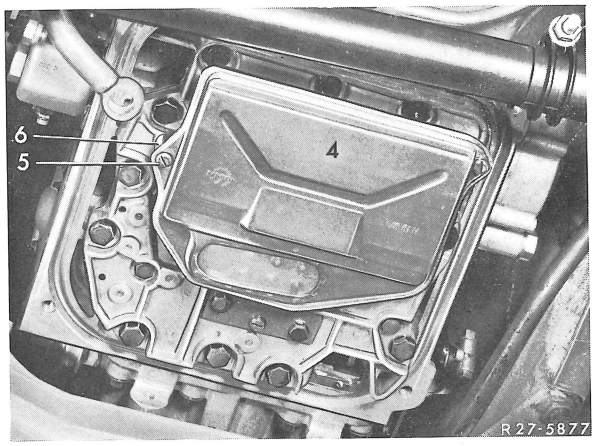



Fig.2

4 Oil filter
5 Fastening bolts
6 Spacer sleeves

# 27.1 Removal and Installation of Shift Valve Housing

**5** Move selector lever in position "P". Unscrew fastening bolts (25) of shift valve housing (26) and remove shift valve housing (Fig. 3).

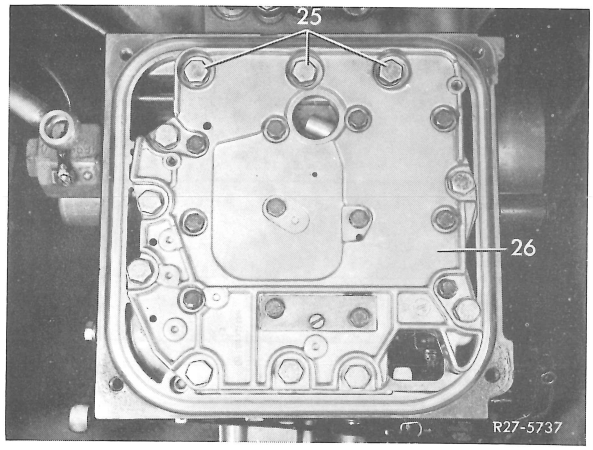



Fig. 3
25 Fastening bolts
26 Shift valve housing

**6** Remove plug pipes with sealing bushings and pull sealing bushings (27) from plug pipes (Fig. 4).

## Installation

**7** Provide plug pipes on both sides with new sealing bushings (27) and insert in transmission. Screw two studs (30) into transmission housing (Fig. 4).

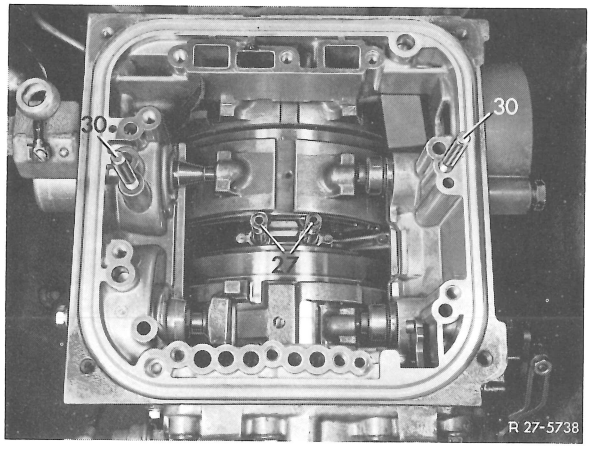



Fig. 4
27 Sealing bushings
30 Studs

**8** Insert locating pin (12) for control pressure valve (13) into shift valve housing (Fig. 5).

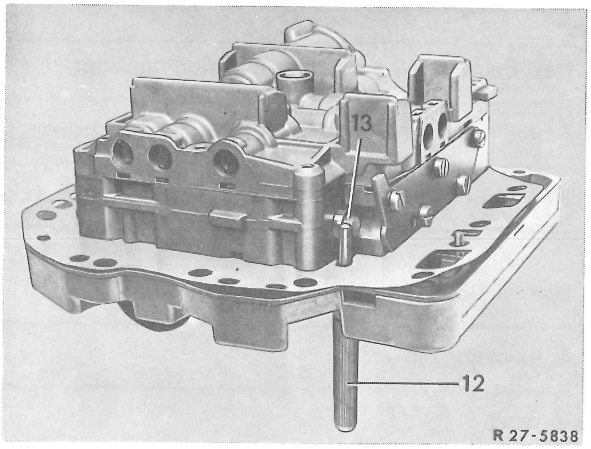



Fig. 5
12 Locating pin
13 Control pressure valve

**9** Carefully introduce shift valve housing (26) into transmission. Make particularly sure that the range selector valve (28) enters correctly into the detent plate (29) (Fig. 6).

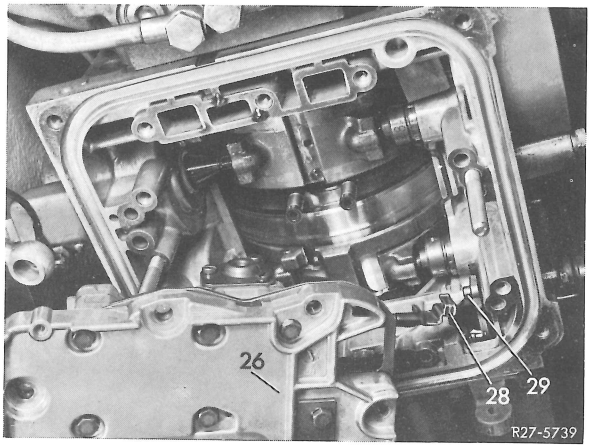



Fig. 6
26 Shift valve housing
28 Range selector valve
29 Detent plate

**10** Screw-in fastening bolts (25) with spring washers and tighten to 1.3 kpm (Fig. 3).

**Caution!** The fastening bolts of the shift valve housing are of different length.

**11** Remove locating pin (12) (Fig. 5).

**12** Install oil filter (Fig. 2).

**13** Mount oil pan with new seal and tighten fastening bolts to 0.7 kpm (Fig. 1).

**14** Screw oil filler pipe to oil pan (Fig. 1).

**15** Fill up with transmission fluid as specified.

**16** Test shift program during test drive.

**17** Check oil level at operating temperature.

**18** Retighten bolts on oil pan to 0.7 kpm.

# Disassembly and Reassembly of Shift Valve Housing 27.1

| Tightening Torque | Nm | (kpm) |
|---|---|---|
| Hex. bolts shift valve housing top and bottom | 8 | (0.8) |

| Special Tools | |
|---|---|
| Assembly fixture | 112 589 09 59 00 |

## A. 1st Version up to Use of New Controls (February 1971)

### General Notes

Observe particular cleanliness when working on shift valve housing. The work should be done as much as possible on a plastic surface. Do not use fuzzy cloth; leather would be best. Upon disassembly, wash all parts and blow-out with compressed air.

### Disassembly

**Caution!** The shift valve housing has 11 ball valves, 9 of 5.5 mm dia. and 2 of 7 mm dia. Be sure that the balls are not rolling off during disassembly.

**1** Loosen hex. bolt (22) from bottom and screw-out except for two opposite bolts (Fig. 1).

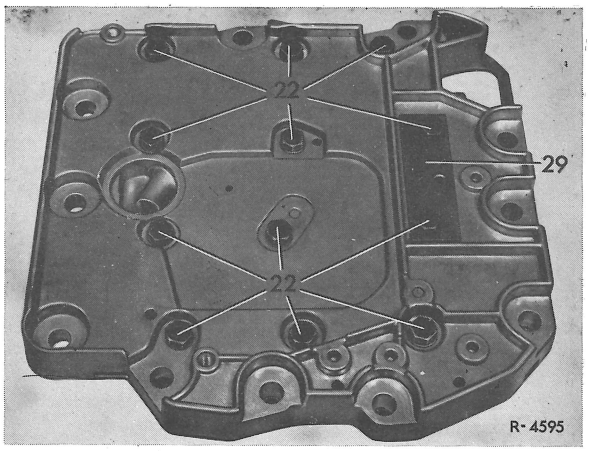



Fig. 1
22 Hex. bolts 29 Cover plate

**2** Place shift valve housing on assembly fixture (23) (Fig. 2).

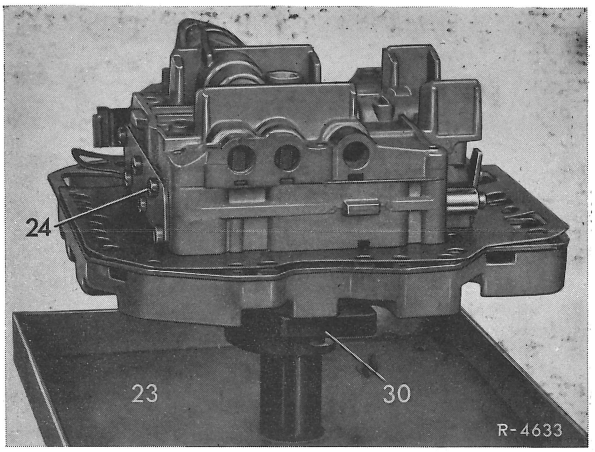



Fig. 2
23 Assembly fixture
24 Cheesehead bolts 30 Top

**3** Unscrew the two remaining hex. bolts from bottom and lift off top (1) together with intermediate plate (2) (Fig. 3).

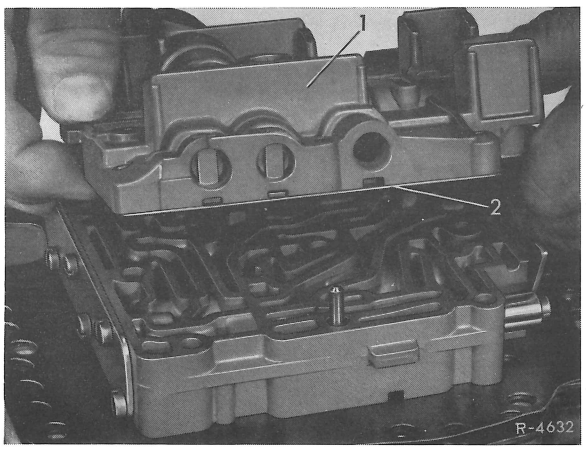



Fig. 3
1 Top 2 Intermediate plate

# 27.1 Disassembly and Reassembly of Shift Valve Housing

**4** Remove two balls of 7 mm dia. (7, 8) and one ball of 5.5 mm dia. (9) including spring (10) from excess pressure valve modulating pressure from top (1) (Fig. 4).

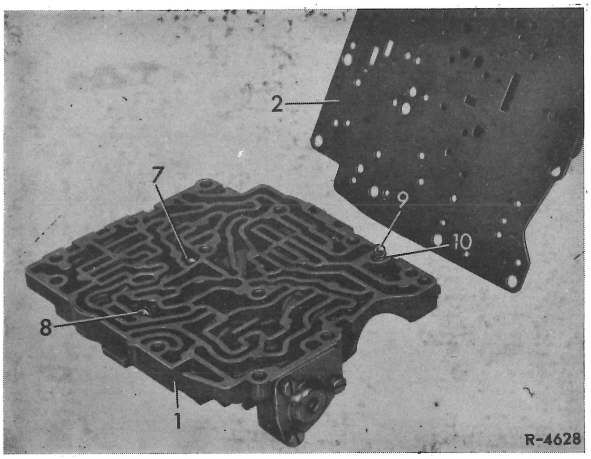



Fig. 4

1 Top
2 Intermediate plate
7 Ball one-way throttle valve K 1
8 Ball one-way throttle valve K 2
9 Ball excess pressure valve modulating pressure
10 Spring

**5** Lift bottom part from assembly fixture and remove the four balls of 5.5 mm dia. (11, 12, 13 and 14) by tilting (Fig. 5).

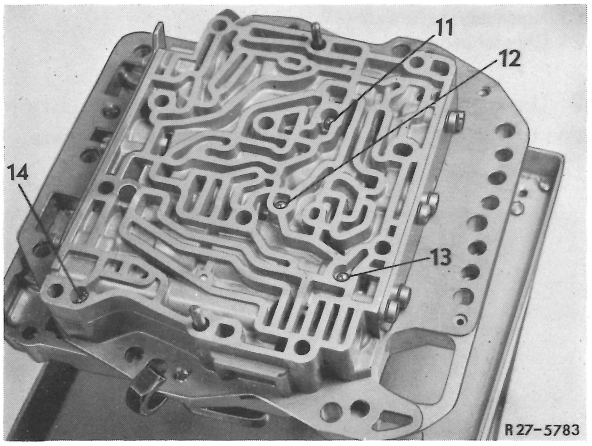



Fig. 5

11, 12, 13 and 14 Balls of 5.5 mm dia.

**6** Remove two balls of 5.5 mm dia. (15, 16) with piston brake shift (13) and check valve primary pump (18) including spring (19) (Fig. 6).

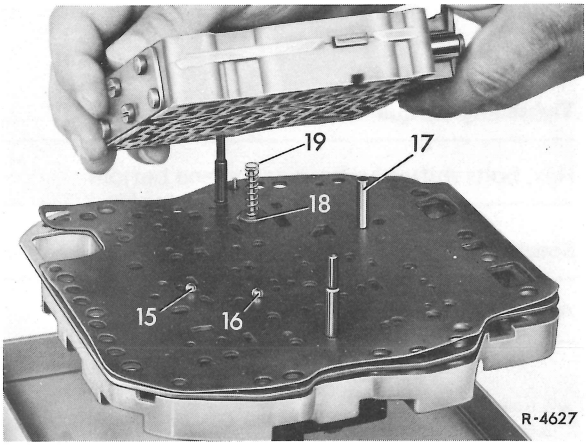



Fig. 6

13 Piston brake shift
15 Ball valve
16 Ball valve
18 Check valve primary pump
19 Spring check valve

**7** Remove gasket (4) and intermediate plate (5) (Fig. 8).

**8** Remove lube pressure valve (27), one-way throttle valve B 3 (26) and one-way throttle valve releasing end B 2 (25) from oil distributing plate (6) (Fig. 7).

**9** Take oil distributing plate from assembly fixture and remove the two balls of 5.5 mm dia. (20, 21) by tilting (Fig. 7).

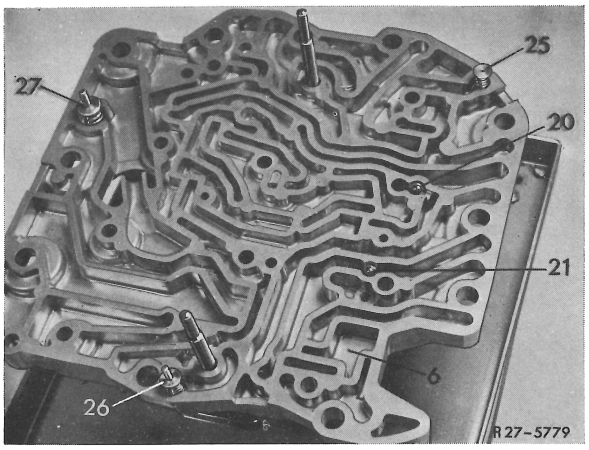



Fig. 7

6 Oil distributing plate
20 Ball 5.5 mm dia.
21 Ball 5.5 mm dia.
25 One-way throttle valve B 2
26 One-way throttle valve B 3
27 Lube pressure valve

## Assembly

**10** Place oil distributing plate (6) on assembly fixture (Fig. 7).

**11** Insert lube pressure valve (27), one-way throttle valve B 3 (26) and one-way throttle valve releasing end B 2 (25) in their seat in oil distributing plate (Fig. 7).

**12** Insert two balls of 5.5 mm dia. (20 and 21) into their countersunk seats (Fig. 7).

**13** Place intermediate plate (5) with gasket (4) on oil distributing plate (6) and clamp down with holding clips (28) (Fig. 8).

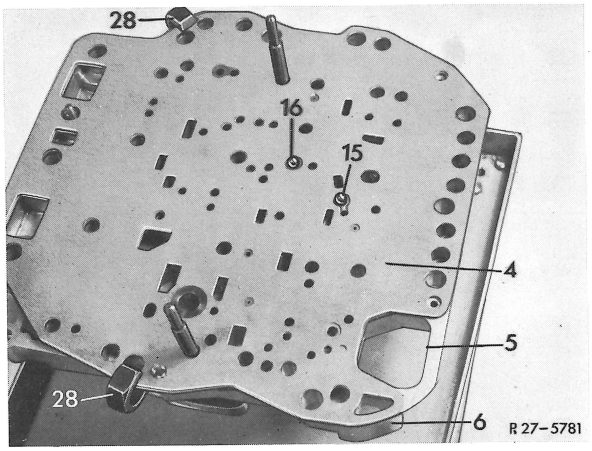



Fig. 8

4 Gasket
5 Intermediate plate
6 Oil distributing plate
15 Ball of 5.5 mm dia.
16 Ball of 5.5 mm dia.
28 Holding clips

**Caution!** After clamping the gasket and the intermediate plate down, check the spring-loaded valves for easy operation by pushing down on valve. The valve retainers should not be squeezed-in between the oil distributing plate and the intermediate plate.

**14** Place two balls of 5.5 mm dia. (15 and 16) on intermediate plate (5) (Fig. 8).

**15** Introduce check valve primary pump (18) with spring (19) from below into shift valve housing bottom (3), then cant projecting valve stem from above by pushing laterally against shaft (Fig. 6 and 9).

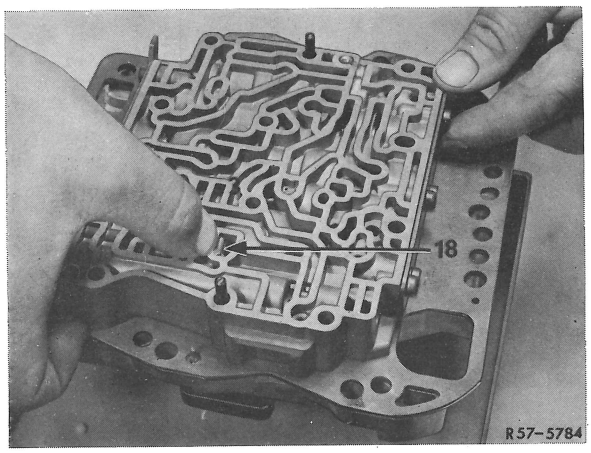



Fig. 9

3 Bottom
16 Check valve primary pump

**16** Place bottom (3) on oil distributing plate and release valve stem; the valve should audibly knock against intermediate plate (Fig. 9).

**17** Insert four balls of 5.5 mm dia. (11, 12, 13 and 14) into countersunk seats (Fig. 10).

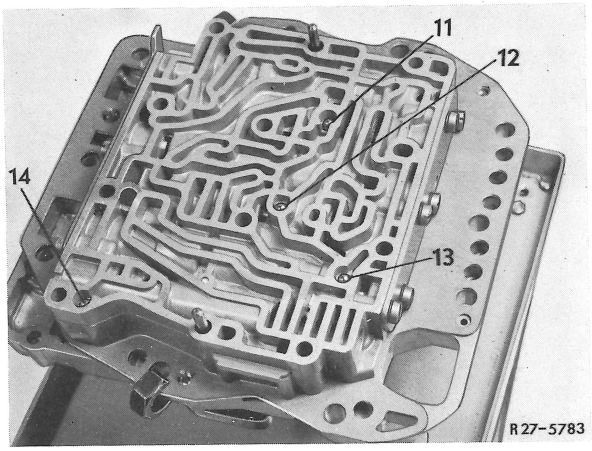



Fig. 10

11, 12, 13 and 14 Balls with 5.5 mm dia.

**18** Insert piston brake shift 4–3 (17) into shift valve housing bottom (Fig. 11).

# 27.1 Disassembly and Reassembly of Shift Valve Housing

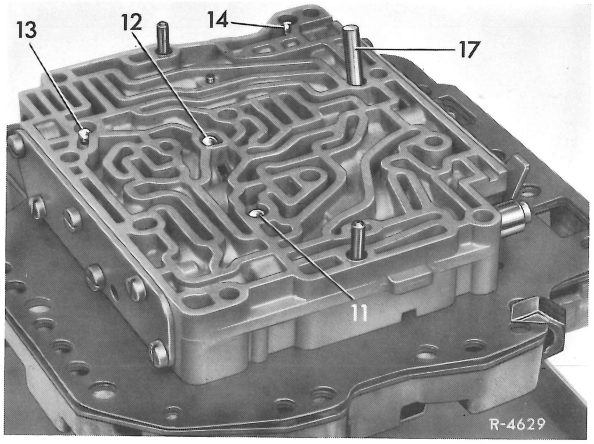



Fig. 11

11, 12, 13 and 14 Balls of 5.5 mm dia.
17 Piston brake shift 4–3

## Top

**19** Insert ball of 7 mm dia. (7) of one-way throttle valve K 1, ball of 7 mm dia. (8) of one-way throttle valve K 2 and spring (10) including ball of 5.5 mm dia. (9) into shift valve housing top (1) (Fig. 12).

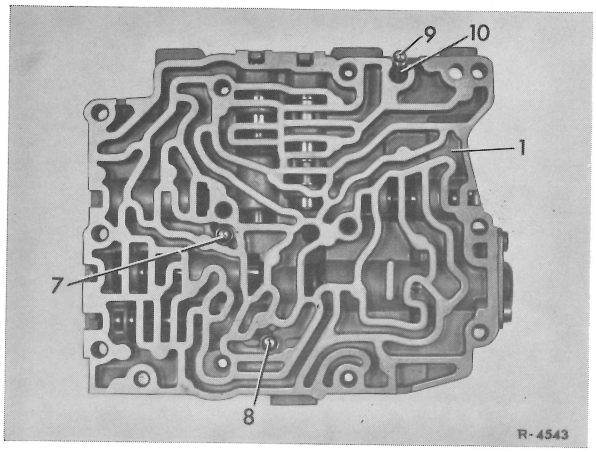



Fig. 12

1 Top
7 Ball valve K 1
8 Ball valve K 2
9 Ball valve modulating pressure

**20** Place intermediate plate (2) on top (1), watching out for correct seat of spring-loaded ball (Fig. 12 and 13).

**21** Hold intermediate plate (2) and top (1) tightly together, turn around and place on bottom. (Fig. 13).

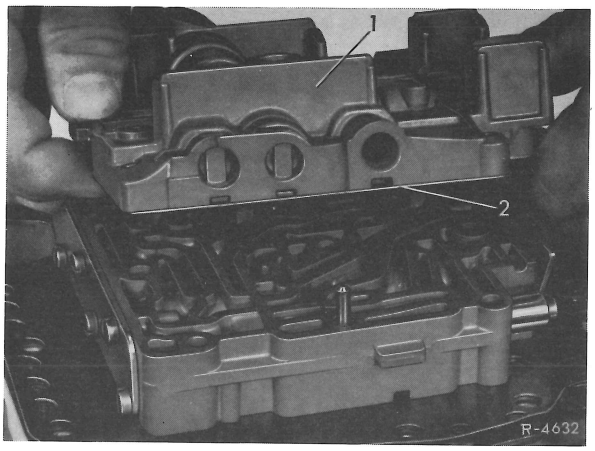



Fig. 13

1 Top
2 Intermediate plate

**22** Insert two opposite bolts and tighten slightly.

**23** Remove shift valve housing from assembly fixture, insert remaining bolts and tighten to 8 Nm (0.8 kpm) from inside out.

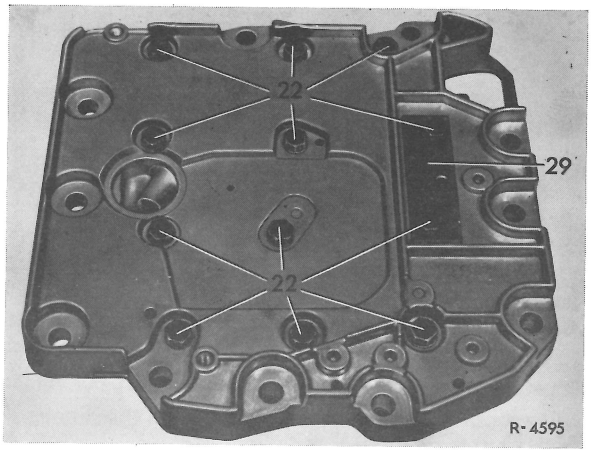



Fig. 14

22 Hex. bolts
29 Cover plate

**Caution!** Two hex. bolts are longer; they are used to screw cover plate (29) down.

## B. 2nd Version as from Use of New Controls (February 1971)

**Refer to general notes page 420/1.**

### Disassembly

**Caution!** The shift valve housing has ten ball valves, 8 of 5.5 mm dia. and 2 of 7 mm dia. Be sure that the balls are not rolling off during disassembly.

**1** Loosen hex. bolts from bottom and screw out except for two opposite bolts (Fig. 15).

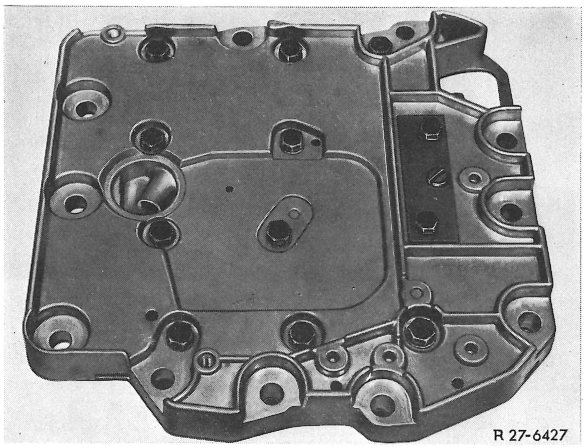



Fig. 15

**2** Place shift valve housing on assembly fixture (Fig. 16).

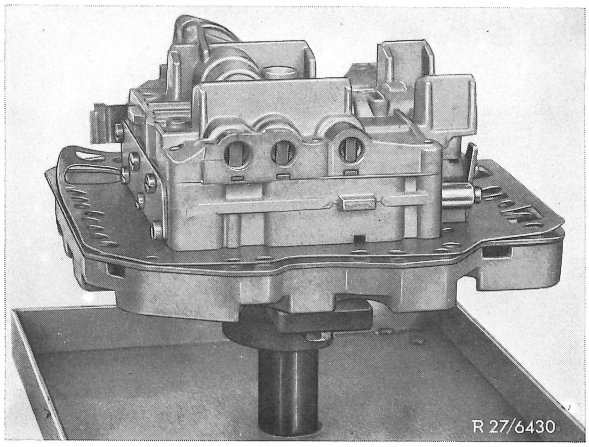



Fig. 16

**3** Unscrew the two remaining hex. bolts from bottom and lift off top (B) together with intermediate plate (E) (Fig. 17).

**4** Remove intermediate plate (E) from top and take out strainer filter (50) together with spring (Fig. 18).

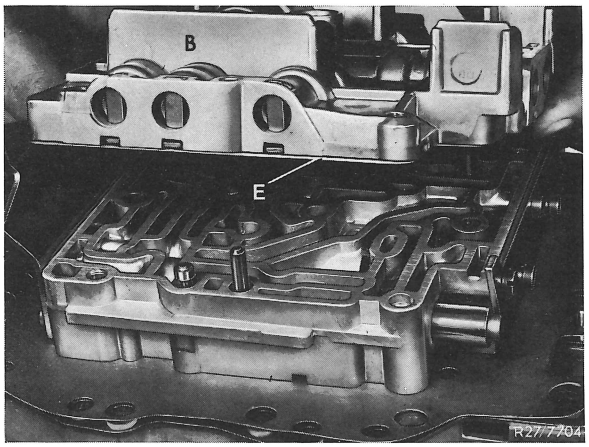



Fig. 17

B Top E Intermediate plate

**5** Remove two balls of 7 mm dia. (27 and 31) and one ball of 5.5 mm dia. (34) including spring from excess pressure valve modulating pressure from top (Fig. 18).

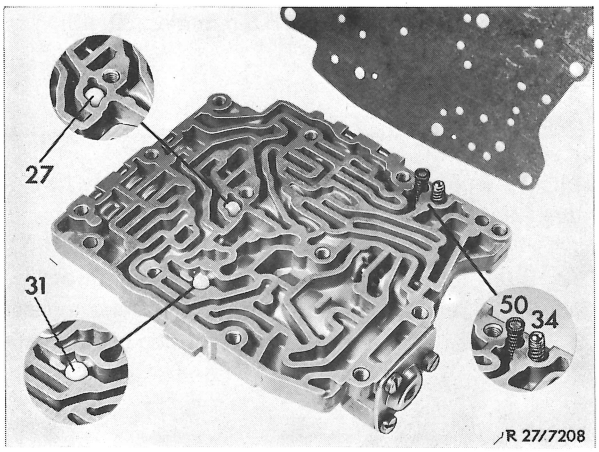



Fig. 18

27 Ball one-way throttle valve K 1
31 Ball one-way throttle valve K 2
34 Ball excess pressure valve modulating pressure with spring
50 Strainer filter with spring

**6** Lift bottom from assembly fixture and remove the four balls of 5.5 mm dia. (10, 17, 22 and 26) (Fig. 25).

**7** Remove ball of 5.5 mm dia. (16), piston brake shift (15) and check valve primary pump (24) including spring. Remove detent valve K 2 (26a) and shift valve releasing end B 2 (11) together with springs (Fig. 19).

**8** Remove gasket (D) and intermediate plate (F) (Fig. 21).

# 27.1 Disassembly and Reassembly of Shift Valve Housing

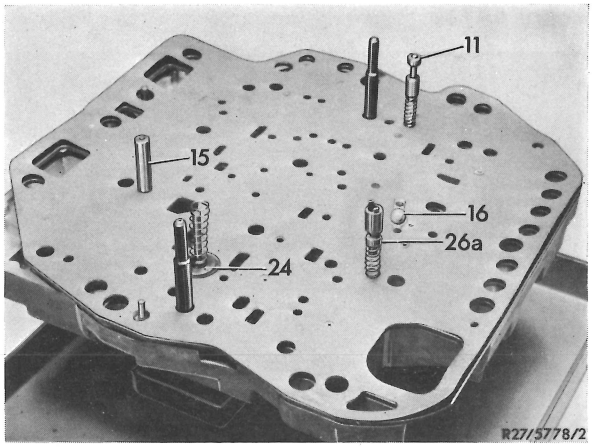



Fig. 19

11 Shift valve releasing end B 2
15 Piston brake shift
16 Ball 5.5 mm dia.
24 Check valve primary pump
26a Detent valve K 2

**9** Remove lube pressure valve (37), one-way throttle valve B 3 (38) and one-way throttle valve releasing end B 2 (41) from oil distributing plate (C) (Fig. 20).

**10** Take oil distributing plate from assembly fixture and remove the two balls of 5.5 mm dia. (39, 40) (Fig. 20).

## Assembly

**11** Place oil distributing plate (C) on assembly fixture (Fig. 20).

**12** Insert lube pressure valve (37), one-way throttle valve B 3 (39) and one-way throttle valve releasing end B 2 (41) into their seats in oil distributing plate (Fig. 20).

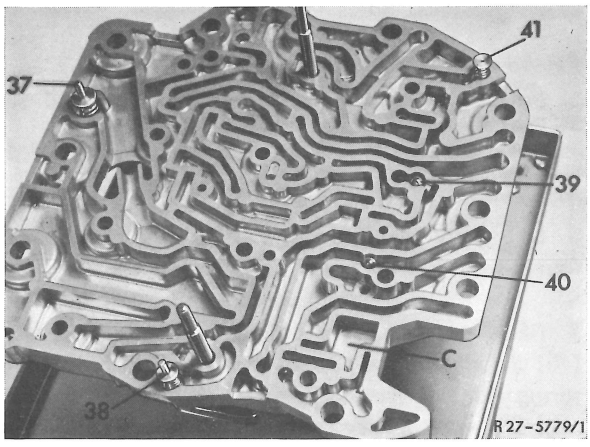



Fig. 20

C Oil distributing plate
37 Lube pressure valve
38 One-way throttle valve B 3
39 Ball 5.5 mm dia.
40 Ball 5.5 mm dia.
41 One-way throttle valve B 2

**13** Place ball of 5.5 mm dia. (39) and ball of 5.5 mm dia. (40) into their countersunk seats (Fig. 20).

**14** Place intermediate plate (F) with gasket (D) on oil distributing plate and clamp down with holding clips (Fig. 21).

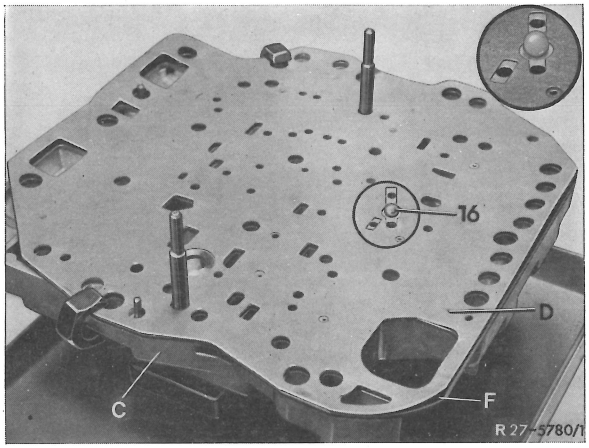



Fig. 21

C Oil distributing plate
F Gasket
F Intermediate plate
16 Ball 5.5 mm dia.

**Caution!** After clamping the gasket and the intermediate plate down, check the spring-loaded valves for easy operation by pushing down on valves. The valve retainers should not be squeezed-in between the oil distributing plate and the intermediate plate.

**15** Place ball of 5.5 mm dia. (16) on intermediate plate (F) (Fig. 21).

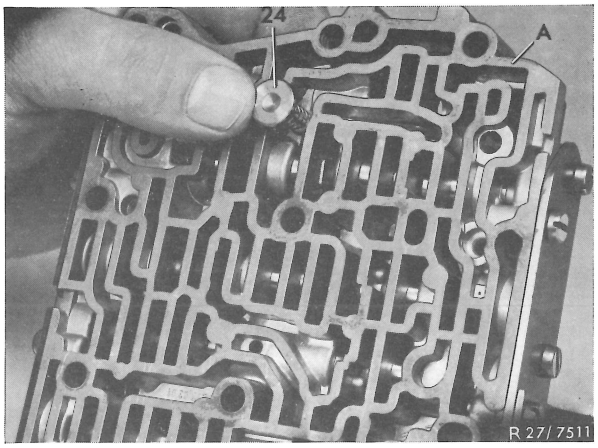



Fig. 22

A Bottom
24 Check valve primary pump

**16** Insert check valve primary pump (24) with spring into shift valve housing bottom (A) from below (Fig. 22).

Cant valve stem projecting from above by pushing laterally against stem (Fig. 23).

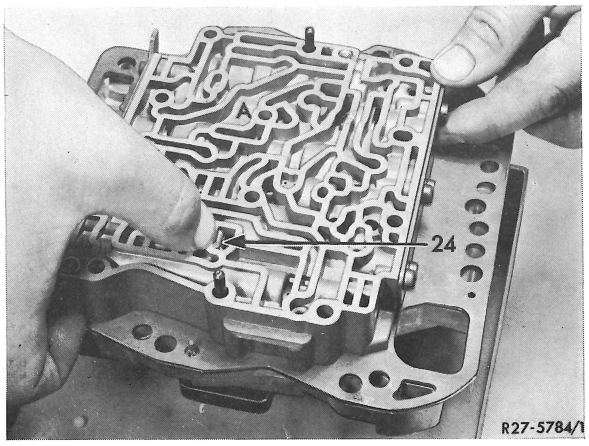



Fig. 23
A Bottom
24 Check valve primary pump

**17** Place bottom (A) on oil distributing plate and release valve stem; valve should audibly knock against intermediate plate.

**18** Insert piston brake shift 4–3 (15) as well as detent valve (26a) and shift valve releasing end B 2 (11) together with spring (Fig. 24).

**19** Insert four balls of 5.5 mm dia. (10, 17, 22 and 26) into countersunk seats (Fig. 25).

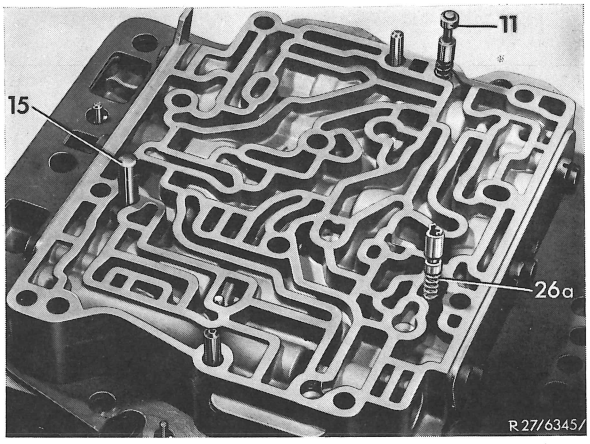



Fig. 24
11 Shift sleeve releasing end B 2
15 Piston brake shift 4–3
26a Detent valve K 2

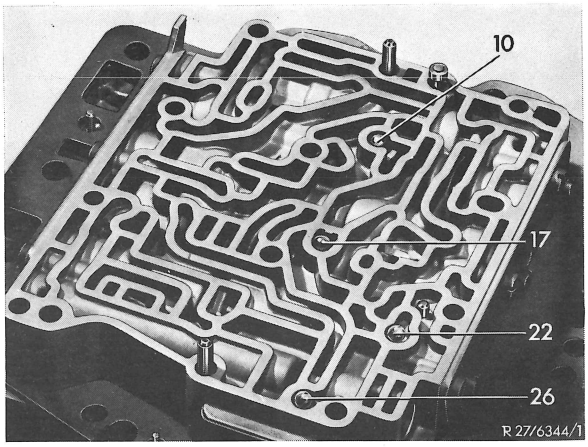



Fig. 25
10 Ball 5.5 mm dia.
17 Ball 5.5 mm dia.
22 Ball 5.5 mm dia.
26 Ball 5.5 mm dia.

**Caution!** The three compression springs of releasing valve B 2 (11), detent valve K 2 (26a) and strainer filter (50) are the same. The compression spring of modulating pressure valve (34) deviates in pressure.

Spring Table

| Item | Wire dia. | Unloaded length |
|---|---|---|
| 11 | 0.45 | 15.3 |
| 26a | 0.45 | 15.3 |
| 34 | 0.6 | 13.5 |
| 50 | 0.45 | 15.3 |

**Top**

**20** Insert ball of 7 mm dia. (27) of one-way throttle valve K 1, ball of 7 mm dia. (31) of one-way throttle valve K 2, ball of 5.5 mm dia. (34) with spring, as well as strainer filter (50) together with spring into top (B) (Fig. 26).

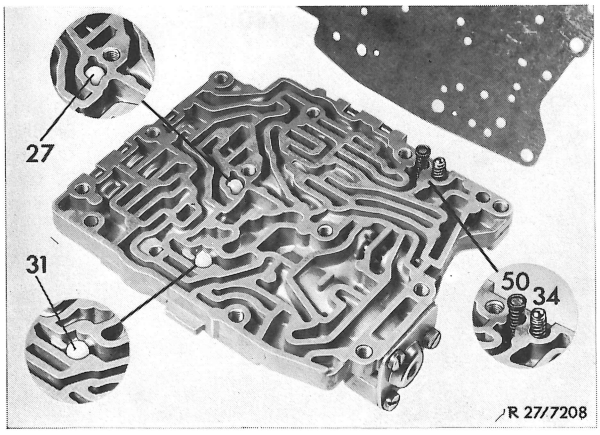
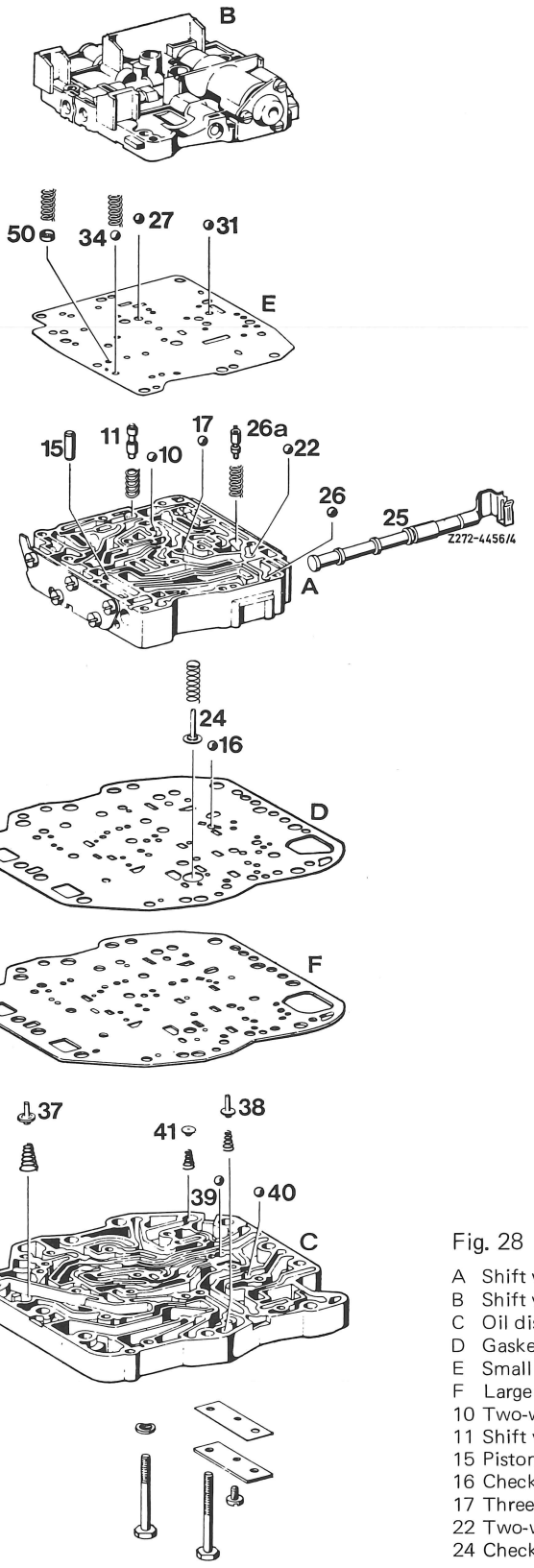



Fig. 26
27 Ball valve K 1
31 Ball valve K 2
34 Ball valve modulating pressure with spring
50 Strainer filter with spring

# 27.1 Disassembly and Reassembly of Shift Valve Housing




**21** Place intermediate plate (E) on top (B), watching out for correct seat of spring-loaded ball (34) and strainer filter (50) (Fig. 26).

**22** Hold intermediate plate (E) and top (B) tightly together, turn around and place on bottom (Fig. 27).

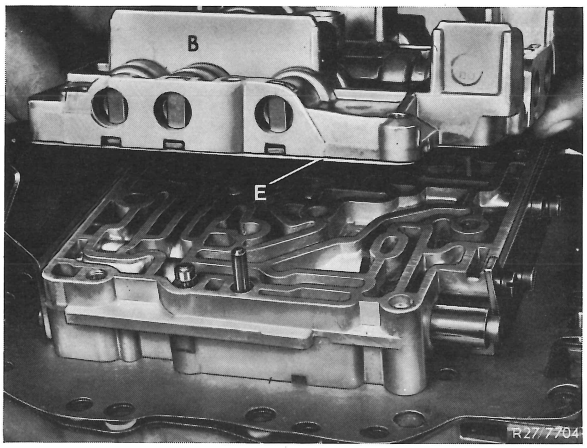



Fig. 27
B Top E Intermediate plate

**23** Insert two opposite bolts and tighten slightly.

**24** Remove shift valve housing from assembly fixture, insert remaining bolts and tighten to 8 Nm (0.8 kpm) from inside out (Fig. 15).

**Caution!** Two hex. bolts are longer; they are used to screw cover plate down.

Fig. 28

A Shift valve housing bottom
B Shift valve housing top
C Oil distributing plate
D Gasket
E Small intermediate plate
F Large intermediate plate
10 Two-way ball valve
11 Shift valve releasing end B 2
15 Piston brake shift 4–3
16 Check-ball valve
17 Three-throttle ball valve
22 Two-way ball valve
24 Check valve-primary pump
25 Range selector valve
26 Two-way ball valve
26a Detent valve K 2
27 One-way throttle valve K 1
31 One-way throttle valve K 2
34 Excess pressure valve modulating pressure
37 Lube pressure valve
38 One-way throttle valve B 3
39 Two-way ball valve
40 Two-way ball valve
41 One-way throttle valve B 2
50 Strainer filter

| Tightening Torques | Nm | (kpm) |
|---|---|---|
| Universal shaft clamping nut | 30 | (3.0) |
| Hex. bolts of universal shaft intermediate bearing | 20 | (2.0) |
| Slot nut on three-legged flange | 120 | (12.0) |
| Hex. bolts for rear transmission housing | 13 | (1.3) |
| Hex. bolts for modulating pressure housing on transmission housing | 7 | (0.7) |

| Special Tool | |
|---|---|
| Screw driver for slotted plugs of secondary pump | 116 589 00 11 00 |

## Removal

**1** Drain transmission fluid while loosening oil filler pipe on oil pan.

**2** Slightly raise engine transmission unit with top for pit lift, unscrew both fastening bolts (19) for rear engine mount, loosen tunnel closing plate (17) attached with 12 bolts and remove (Fig. 1).

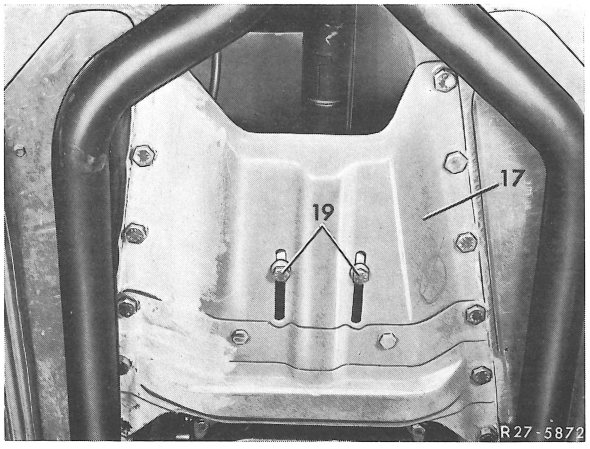



Fig. 1
17 Tunnel closing plate
19 Fastening bolts

**3** Loosen tachometer shaft (16) on rear transmission cover and pull-off (Fig. 2).

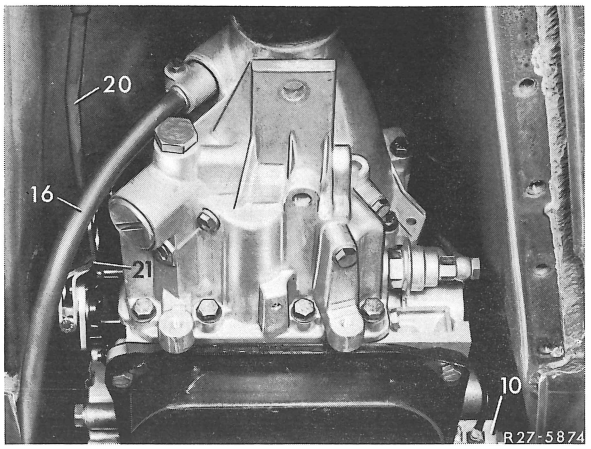



Fig. 2
10 Kickdown solenoid valve
16 Tachometer shaft
20 Selector rod
21 Range selector lever

**4** Disconnect selector rod (20) on range selector lever (21) and move range selector lever to position „P" (Fig. 2).

**5** Loosen both fastening bolts of universal shaft intermediate bearing, but do not screw out.

**6** Loosen universal shaft clamping nut.

**7** Unscrew universal shaft on transmission, but leave universal plate on universal shaft.

# 27.1 Removal and Installation of Rear Transmission Housing

**8** Slide universal shaft to the rear to the extent the center bearing and the clamping piece permit.

**9** Place suitable piece of wood under universal shaft front in tunnel in such a manner that the shaft is completely pushed up.

**10** Unlock slotted nut on three-legged flange and screw-off, remove three-legged flange.

**11** Disconnect vacuum line (22) on vacuum box (23) while counterholding against hexagon (SW 14) on vacuum box.

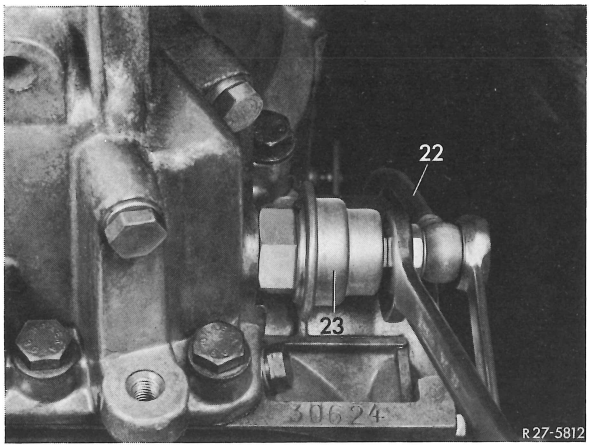



Fig. 3
22 Vacuum line
23 Vacuum box

**12** Unscrew vacuum box (23).

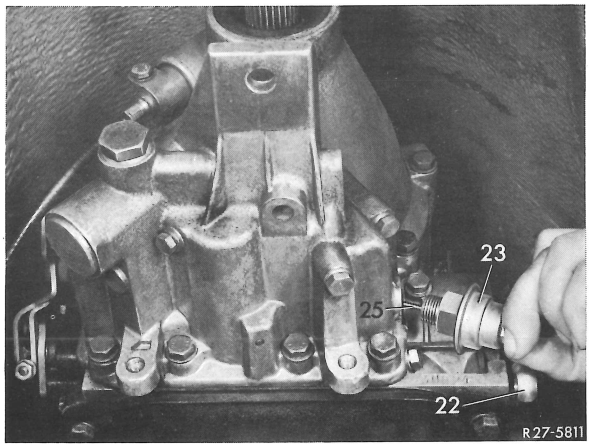



Fig. 4
22 Vacuum line
23 Vacuum box
25 Thrust pin

**13** Unscrew plug for secondary pump (5) and remove compression spring (11).

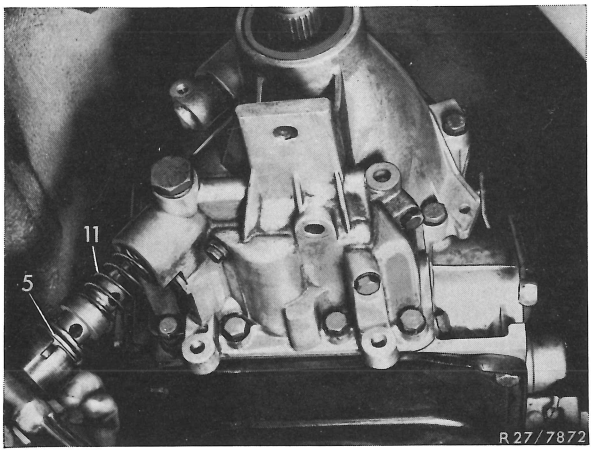



Fig. 5
5 Plug for secondary pump
11 Compression spring

**14** Lower transmission to the extent possible and unscrew fastening bolts for rear transmission housing.

**15** Loosen rear transmission housing by light blows with plastic hammer and remove. The centrifugal governor should remain on output shaft, that is, when pulling-off the housing, also pull governor from guide of rear transmission housing at the same time.

**16** Remove modulating pressure housing (9) and gasket (Fig. 6).

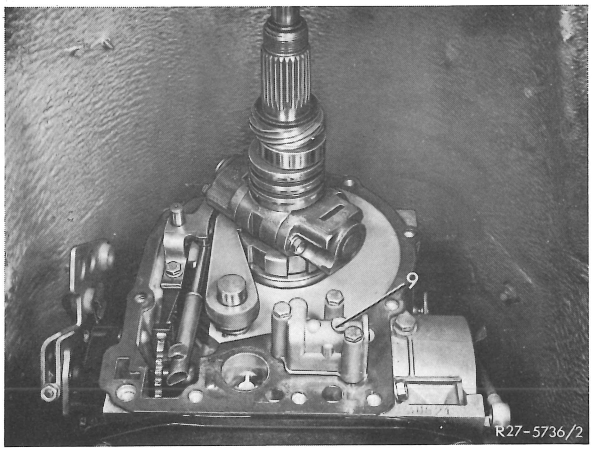



Fig. 6
9 Modulating pressure housing

**Installation**

**17** Install modulating pressure housing (9) with new gasket for rear transmission housing (Fig. 6). Center gasket on sealing surface of transmission housing by means of two set pins.

**18** Mount rear transmission housing while moving tachometer drive with a screw driver until in mesh with worm gear.

**19** Screw-in fastening bolts of rear transmission housing and tighten to 13 Nm (1.3 kpm).

**20** Screw-in plug for secondary pump (5) together with compression spring (11) (Fig. 5).

**21** Coat vacuum box (23) on threads with sealing compound and screw into rear transmission housing (Fig. 4).

**22** Connect vacuum line (22) to vacuum box (13) while counterholding on hexagon (SW 14) on vacuum box (Fig. 3).

**23** Place range selector lever in position "P".

**24** Place three-legged flange on output shaft and tighten slotted nut to 120 Nm (12.0 kpm), secure slotted nut.

**25** Attach shift rod to range selector lever.

**26** Connect tachometer shaft to transmission.

**27** Lift engine transmission unit with top for pit lift as required. Remove wooden support under universal shaft and screw the latter to transmission.

**28** Check rear rubber mount and screw to transmission.

**29** Screw-on rear half to tunnel closing plate (17) (Fig. 1).

**30** Screw-in both fastening bolts (19) for rubber mount on end plate and tighten (Fig. 1). Lower pit lift.

**31** Move vehicle back and forth and tighten universal shaft clamping nut to 30 Nm (3.0 kpm).

**32** Tighten fastening bolts on universal shaft intermediate bearing to 20 Nm (2.0 kpm).

**33** Fill-up with transmission fluid.

**34** Shift through gears and correct oil level acc. to Job No. 27.1–010.

**35** Check modulating pressure and adjust, if required (refer to Job No. 27.1–340).

**36** Screw-on front end of tunnel closing plate.

# Removal and Installation of Centrifugal Governor 27.1

K 4 A 040

## Removal

**1** Remove rear transmission housing (27.1–500).

**2** Remove plate spring (85), worm gear of speedometer drive (15), eccentric ring for secondary pump (16) and centrifugal governor (17) from output shaft (Fig. 1).

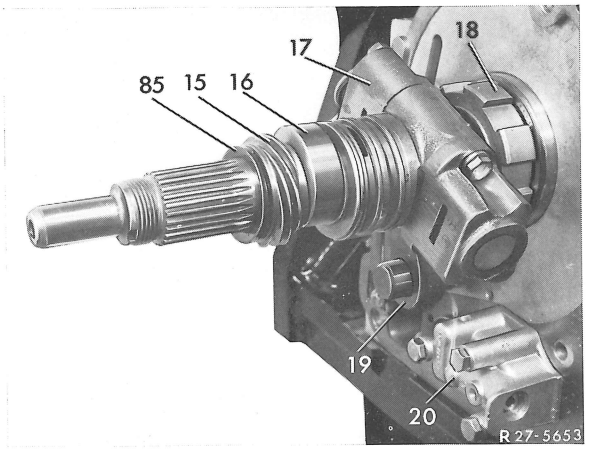



Fig. 1

15 Worm gear of speedometer drive
16 Eccentric ring for secondary pump
17 Centrifugal governor
85 Plate spring

## Installation

**3** Attach centrifugal governor (17), eccentric ring for secondary pump (16), worm gear of speedometer drive (15) and plate spring (85) to output shaft (Fig. 1). The flange of the worm gear (15) should face the centrifugal governor and the curvature of the plate spring (85) should face the worm gear (15) (Fig. 2).

**4** Install rear transmission housing (27.1–500).

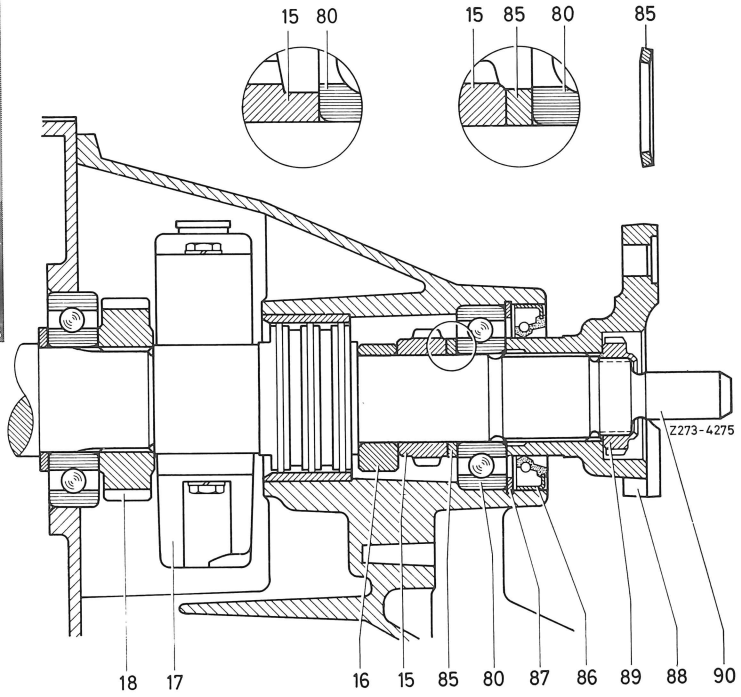



Fig. 2

15 Worm gear speedometer drive
80 Ball bearing
85 Plate spring
89 Slotted nut

# 27.1 Removal and Installation of Parking Lock

K 4 A 040

**Tightening Torque in kpm**

| | |
|---|---|
| Hex. bolt for leaf spring of detent plate | 1.0 |

## Removal

**1** Remove rear transmission housing (27.1–500).

**2** Remove centrifugal governor (27.1–520).

**3** Screw fastening bolt from holder (14) and remove holder together with leaf spring (13) (Fig. 1)

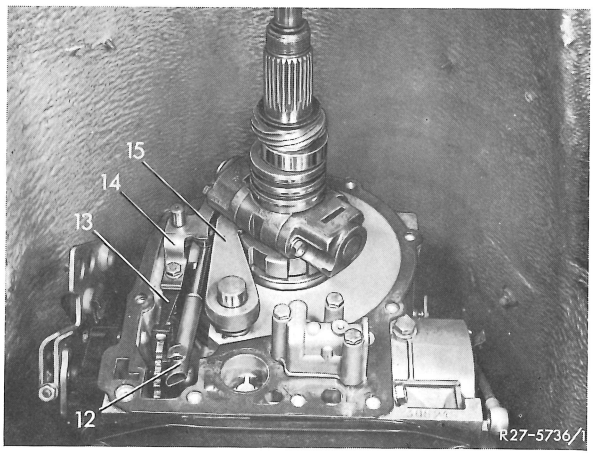



Fig. 1

12 Resilient linkage
13 Leaf spring
14 Holder
15 Parking lock pawl

**4** Remove resilient linkage (12).

**5** Remove parking lock pawl (15) together with clamping spring.

**6** Pull parking lock gear (21) from output shaft (Fig. 2).

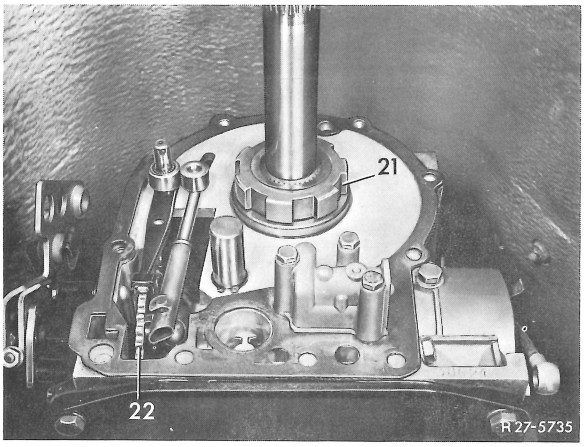



Fig. 2

21 Parking lock gear
22 Detent plate

## Installation

**7** Attach parking lock gear (21) to output shaft (Fig. 2) and slide parking lock pawl (15) with clamping spring on bearing pin (Fig. 1).

**8** Install resilient linkage (12) (Fig. 1).

**9** Install leaf spring (13), needle bearing supported roller and holder (14) and tighten fastening bolt to 1.0 kpm.

**10** Place range selector lever in position "P" by checking whether the parking lock engages correctly.

**11** Install centrifugal governor (27.1–520).

**12** Install rear transmission housing (27.1–500).

**Tightening Torques in kpm**

| | |
|---|---|
| Fastening bolt for speedometer drive and secondary pump | 0.8 |
| Phillips head screw for holding plate on locking piston | 0.4 |

**Special Tool**

| | |
|---|---|
| Assembly mandrel | 108 589 02 43 00 |

## Disassembly

**1** Remove rear transmission housing (27.1–500).

**2** Unscrew fastening bolt from cover plate of locking piston and remove locking piston (81) together with spring (Fig. 1).

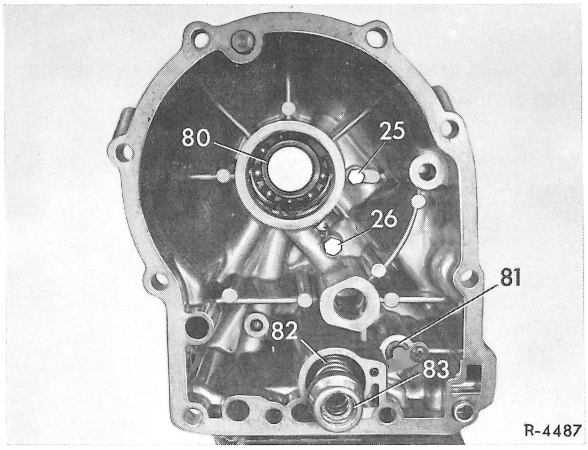



Fig. 1

25 Fastening bolt for speedometer drive
26 Fastening bolt for secondary pump
80 Ball bearing
81 Locking piston
82 Pressure receiving springs
83 Spring plate

**3** Remove spring plate (83) with two springs (82) and pressure receiving piston from rear transmission housing cover.

**4** Unscrew fastening bolt for speedometer drive (25).

**5** Pull speedometer drive (31 to 33) from rear transmission housing, remove speedometer pinion (31) from bearing body (33) (Fig. 2).

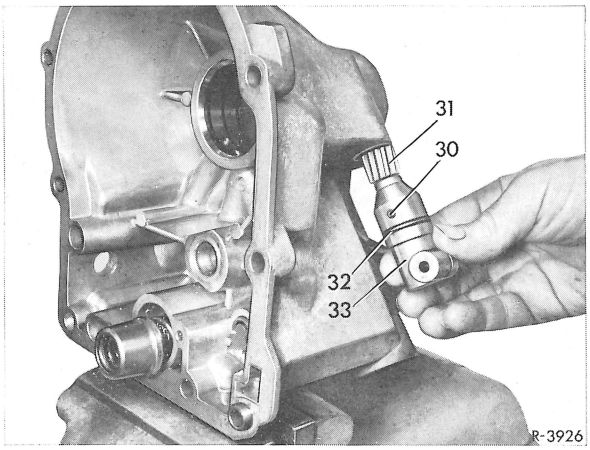



Fig. 2

30 Fastening hole
31 Speedometer pinion
32 O-ring
33 Bearing body

**6** Unscrew fastening bolt for secondary pump (26) (Fig. 1).

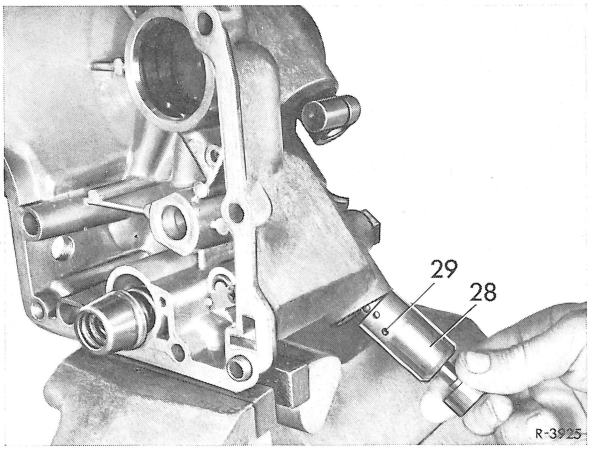



Fig. 3

28 Secondary pump
29 Fastening hole

# 27.1 Disassembly and Reassembly of Rear Transmission Housing

**7** Remove secondary ~~pump~~ (28) from rear transmission housing (Fig. 3).

**8** Remove sealing ring from rear transmission housing.

**9** Remove locking ring (79) and press out ball bearing (80).

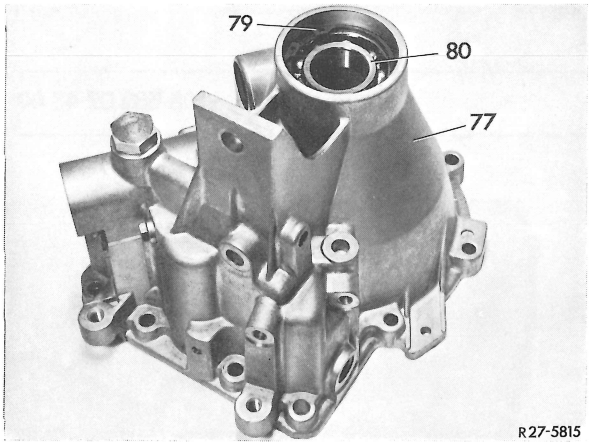



Fig. 4
77 Rear transmission housing 80 Ball bearing
79 Locking ring

**10** Unscrew all measuring screw connections and closing plugs with ball valves.

## Assembly

**11** Press in ball bearing (80) (Fig. 4) with assembly mandrel (78) (Fig. 5).

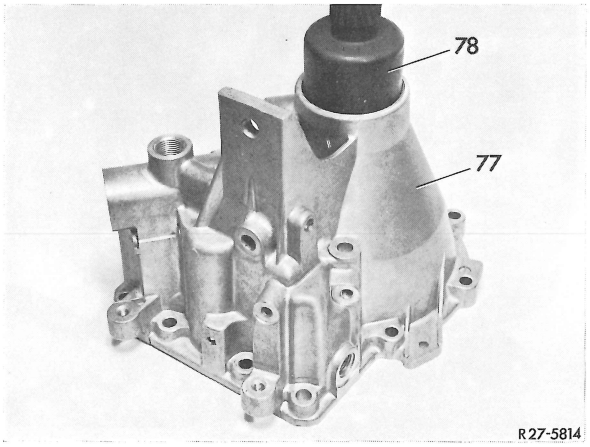



Fig. 5
77 Rear transmission housing
78 Assembly mandrel 108 589 02 43 00

**12** Insert locking ring (79) and press in sealing ring (Fig. 4).

**13** Insert locking piston (81) with spring and screw on holding plate at 0.4 kpm (Fig. 1).

**14** Introduce secondary pump (28) into rear transmission housing until the fastening bore (29) is in alignment with the bore in the transmission housing (Fig. 3).

**15** Tighten fastening bolt (26) of secondary pump to 0.8 kpm (Fig. 1).

**16** Insert speedometer pinion (31) into bearing body (33), introduce speedometer drive into rear transmission housing until the fastening hole (30) is in alignment with the hole in the transmission housing (Fig. 2).

**17** Tighten fastening bolt (25) of speedometer drive to 0.8 kpm (Fig. 1).

**18** Screw-in all measuring screw connections and closing plugs with ball valves.

**19** Insert pressure receiving piston with two springs (82) and spring plate (83) (Fig. 1).

**20** Install rear transmission housing (Job No. 27.1–500).

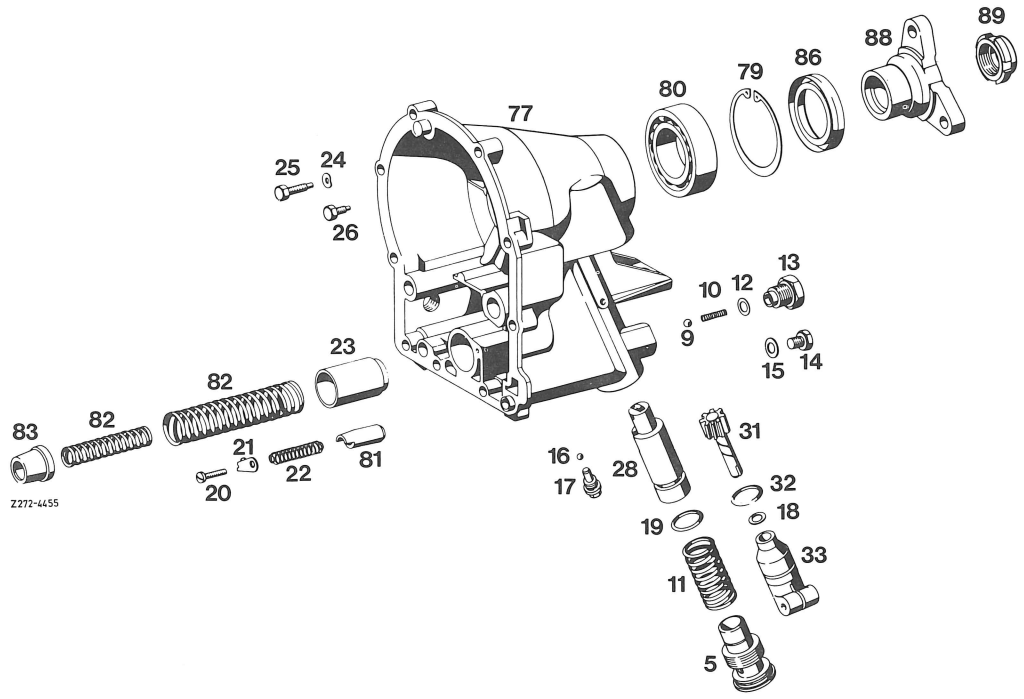



Fig. 6

5 Plug with inlet valve for secondary pump
9 Ball
10 Compression spring
11 Compression spring
12 Sealing ring
13 Closing plug
14 Closing plug
15 Sealing ring
16 Ball
17 Closing plug
18 Sealing ring
19 O-ring
20 Oval head screw
21 Holder
22 Compression spring
23 Pressure receiving piston
24 Spring plate
25 Fastening bolt for speedometer drive
26 Fastening bolt for secondary pump
28 Secondary pump
31 Speedometer pinion
32 O-ring
33 Bearing body
77 Rear transmission housing
79 Locking ring
80 Ball bearing
81 Locking piston
82 Pressure receiving springs
83 Spring plate
86 Radial sealing ring
88 Three-legged flange
89 Slotted nut

**Tightening Torques in kpm**

| | |
|---|---|
| Hex. bolts for shift housing and governor housing on centrifugal governor | 0.8 |

## Disassembly

**1** Replace oil sealing rings (5) as required, by disconnecting and removing oil sealing rings (Fig. 1).

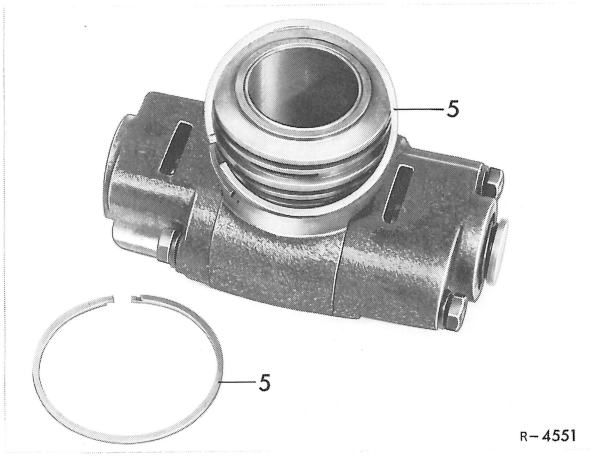



Fig. 1
5 Oil sealing rings

**2** Unscrew hex. bolts (4) (Fig. 2).

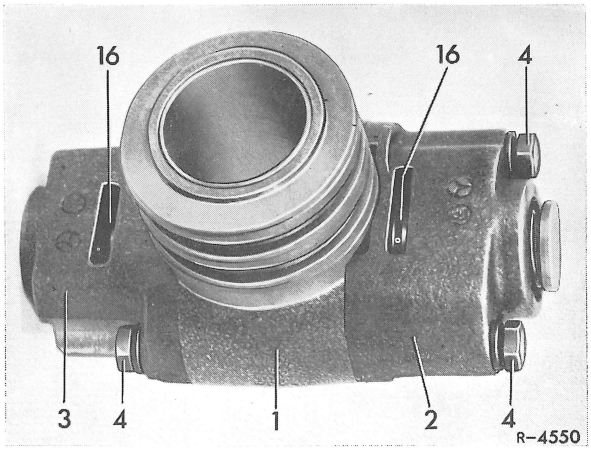



Fig. 2
1 Flange
2 Governor housing
3 Shift housing
4 Hex. bolts
16 Oil outlet slots

**3** Remove shift housing (3) and governor housing (2) from flange (1).

**4** Remove lock washer (6), compression spring (7) and shift valve (8) (Fig. 3).

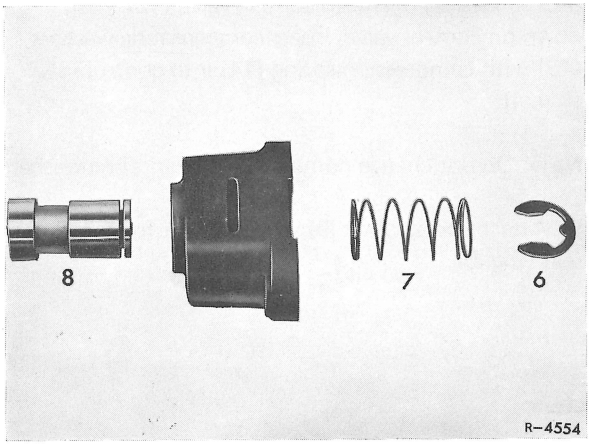



Fig. 3
6 Lock washer
7 Compression spring
8 Shift valve

**5** Remove spring plate (9), remove centrifugal weight (10) and weak compression spring (11) in upward direction (Fig. 4).

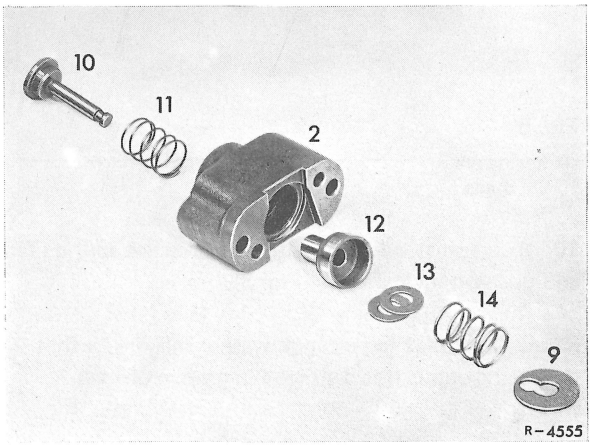



Fig. 4
2 Governor housing
9 Spring plate
10 Centrifugal weight
11 Compression spring
12 Control valve
13 Compensating washers
14 Compression spring

**6** Remove compression spring (14) with compensating washers (13) and control valve (12) in downward direction.

## Assembly

**Caution!** Clean all parts well in dry cleaning gasoline. Check shift valve (8) (Fig. 3) and control valve (12) (Fig. 4) for damage and easy sliding in their bores.

**7** Insert control valve (12) into governor housing (2).

**8** Introduce centrifugal weight (10) with weak compression spring (11) into control valve (12). Push down on control valve, insert compensating washers (13) with compression spring (14) into control valve (Fig. 4).

**Note:** Do not change number of compensating washers.

**9** Attach spring plate (9) watching out for correct seat (Fig. 5).

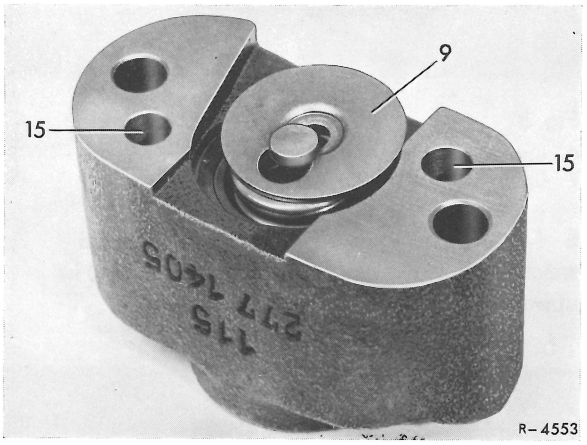



Fig. 5
9 Spring plate
15 Oil ducts

**10** Insert shift valve (8) with compression spring (7) and push on lock washer (Fig. 3).

**Note:** When pushing on lock washer make sure that the spring end is not distorted in groove of lock washer.

**11** Position shift housing (3) on flange (1) in such a manner that the oil outlet slots (16) are facing the oil sealing rings (Fig. 2) and the oil ducts (15) are in alignment (Fig. 6).

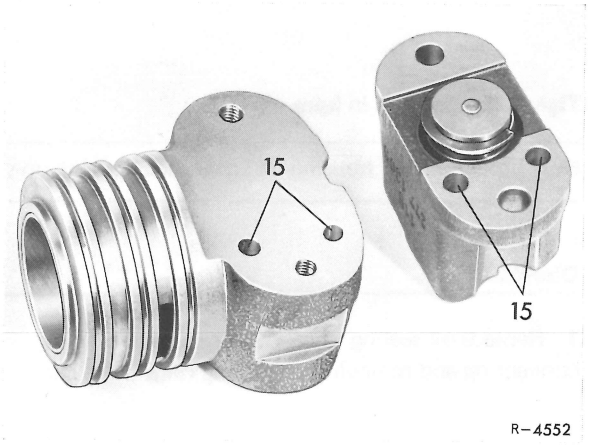



Fig. 6
15 Oil ducts

**12** Insert strainer (17) into seat provided in oil duct (Fig. 7) and mount governor housing (2) with the oil outlet slots (16) facing the oil sealing rings (Fig. 2).

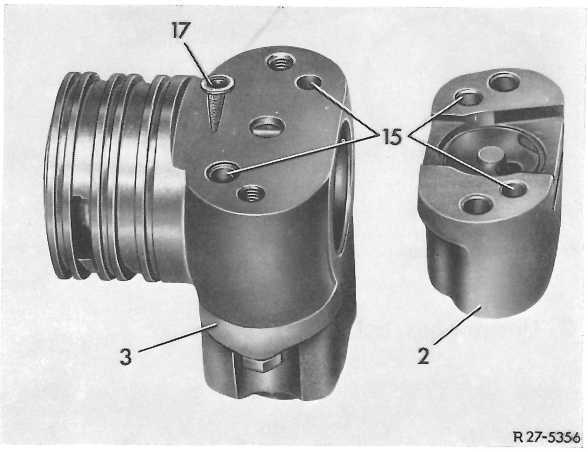



Fig. 7
2 Governor housing
3 Shift housing
15 Oil ducts
17 Strainer

**13** Tighten hex. bolts (4) to 0.8 kpm (Fig. 2).

**14** Replace oil sealing rings (5), if removed, by inserting into grooves and attaching as required (Fig. 1).

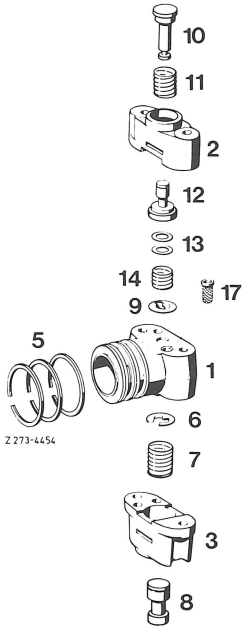



Fig. 8

1 Flange
2 Governor housing
3 Shift housing
5 Oil sealing rings
6 Lock washer
7 Compression spring
8 Shift valve
9 Spring plate
10 Centrifugal weight
11 Compression spring
12 Control valve
13 Compensating washers
14 Compression spring
17 Strainer

# 27.1 Removal and Installation of Starter Lock and Back-up Light Switch

K 4 A 040

**Tightening Torques in kpm**

| | |
|---|---|
| Adjusting screw for starter lock and back-up light switch | 0.2 |
| Cheesehead screws for starter lock and back-up light switch | 0.5 |

**Special Tool**

| | |
|---|---|
| 1 Locating pin | 115 589 18 63 00 |

## Removal

**1** Disconnect selector rod on range selector lever.

**2** Remove range selector lever (1) from shaft by loosening clamping screw (6) (Fig. 2).

**3** Unscrew fastening screws of starter locking switch (7) (Fig. 1).

**4** Remove starter locking switch (7) from shaft (4) (Fig. 1).

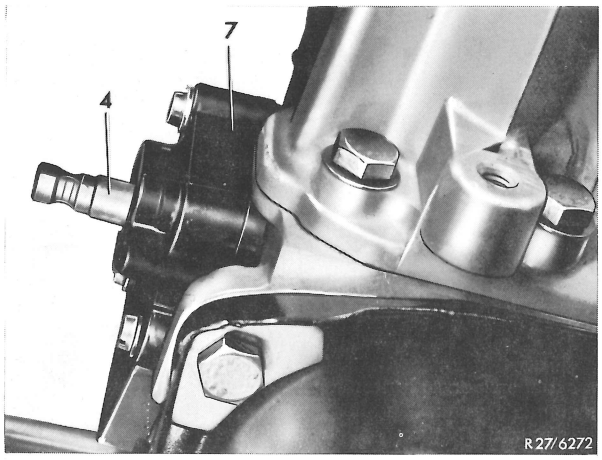



Fig. 1
4 Shaft
7 Starter locking switch

## Installation

**5** Screw starter locking switch (7) to transmission housing. Tighten fastening screws to 0.5 kpm.

**6** Place range selector lever (1) on shaft and tighten with clamping screw (6).

**7** Move range selector lever (1) into position "N" and loosen adjusting screw (3). Insert locating pin (5) through carrier sleeve into locating hole on switch housing, then carefully tighten adjusting screw (3) (tightening torque 0.2 kpm) and pull out locating pin (Fig. 2).

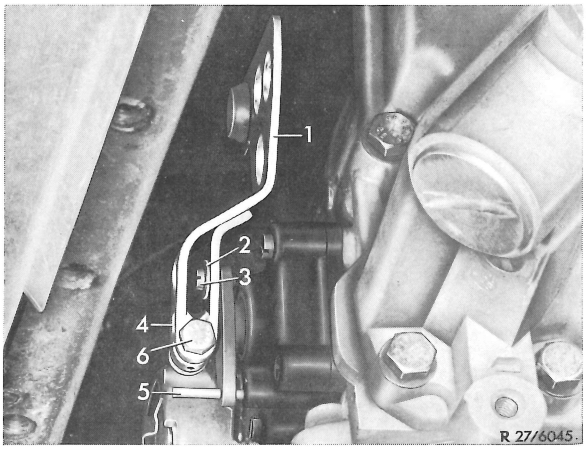



Fig. 2
1 Range selector lever
2 Washer
3 Adjusting screw
4 Shaft
5 Locating pin
6 Clamping screw

**8** Attach selector rod to range selector lever and secure.

| Tightening Torques | Nm | (kpm) |
|---|---|---|
| Universal shaft clamping nut | 30 | (3.0) |
| Hex. bolts of universal shaft intermediate bearing | 20 | (2.0) |
| Hex. bolts for hydraulic clutch on driven plate | 42 | (4.2) |

| Special Tools | |
|---|---|
| Top for pit lift | EE 11 857 |
| Torque wrench | 001 589 44 21 00 |
| Open end wrench | 000 589 13 01 00 |
| Flushing mandrel | 115 589 24 63 00 |
| Syringe | 112 589 00 72 00 |

## Removal

**1** Disconnect minus cable from battery.

**2** Unscrew compensating connection (4) between exhaust pipes including shielding plate (1) (Fig. 1).

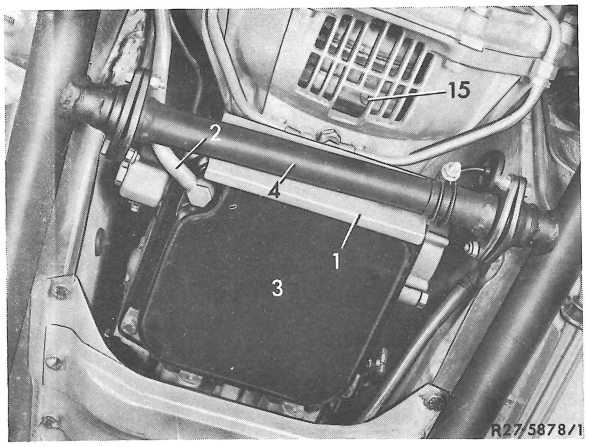



Fig. 1

1 Shielding plate
2 Oil filler pipe
3 Oil pan
4 Compensating connection
15 Drain plug

**3** Drain transmission fluid. For this purpose, unscrew oil filler pipe (2) on oil pan (3) of transmission and oil drain plug (15) on hydraulic clutch (Fig. 1). Use clean vessel only.

**4** Place vehicle on supporting stand.

**5** Separate feed line (5) and return line (6) for oil cooler from connecting lines (Fig. 2).

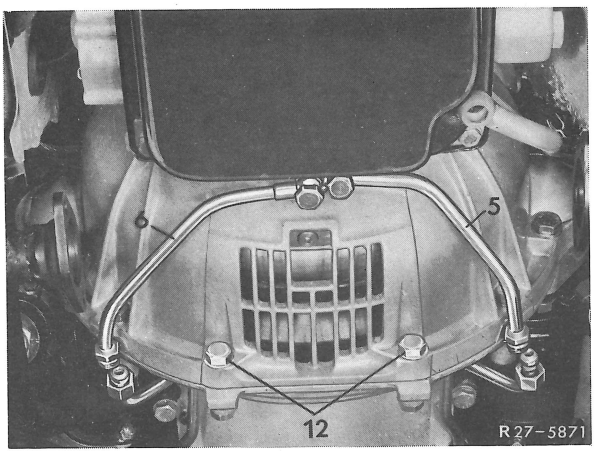



Fig. 2

5 Feed line
6 Return line
12 Fastening bolts

**6** Remove rear exhaust section with initial and main muffler. Loosen front righthand exhaust pipe on exhaust manifold and swivel to the right (Fig. 11).

# 27.1 Removal and Installation of Transmission

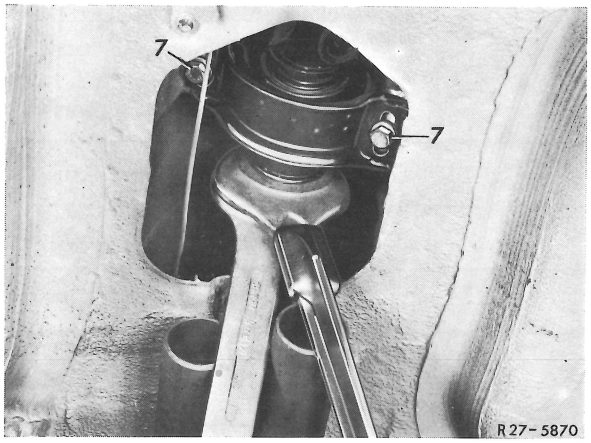



Fig. 3
7 Fastening bolts

**7** Loosen both fastening bolts (7) of universal shaft intermediate bearing, but do not yet screw out (Fig. 3).

**8** Loosen universal shaft clamping nut with torque wrench 001 589 44 21 00 and open end wrench 000 589 13 01 00 (Fig. 3).

**9** Unscrew both fastening bolts (19) from engine mount (Fig. 4).

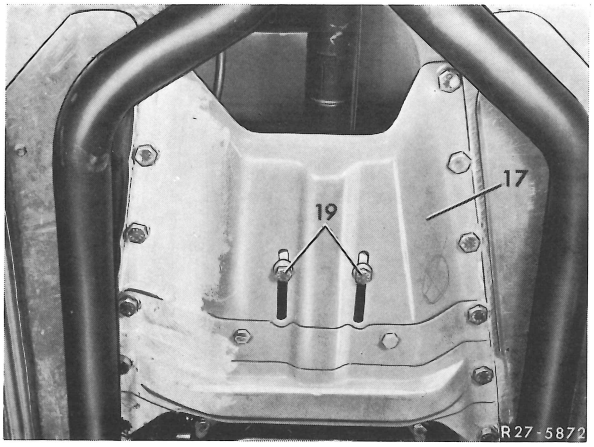



Fig. 4
17 Tunnel closing plate
19 Fastening bolts for engine mount

**10** Loosen and remove tunnel closing plate (17) attached with 12 bolts.

**11** Unscrew rear engine mount (18) on transmission (Fig. 5).

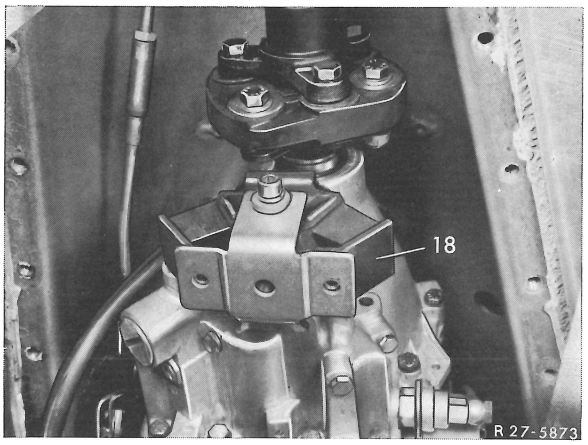



Fig. 5
18 Rear engine mount

**12** Unscrew universal shaft on transmission while leaving universal plate on universal shaft.

**13** Slide universal shaft toward the rear as far as the center bearing and the clamping piece permit.

**14** Place suitable piece of wood underneath universal shaft front in tunnel in such a manner that the shaft is pushed completely upwards (Fig. 11).

**15** Pull out plug for starter lock and backup light switch (8) (Fig. 6).

**16** Unscrew clamping screw from lever for control pressure (9) and pull lever from shaft (Fig. 6).

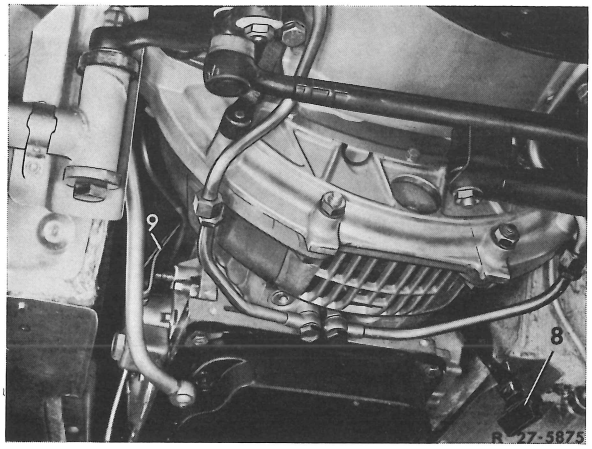



Fig. 6
8 Plug for starter lock and backup light switch
9 Lever for control pressure

**17** Unscrew cable from kickdown solenoid valve (10) (Fig. 7).

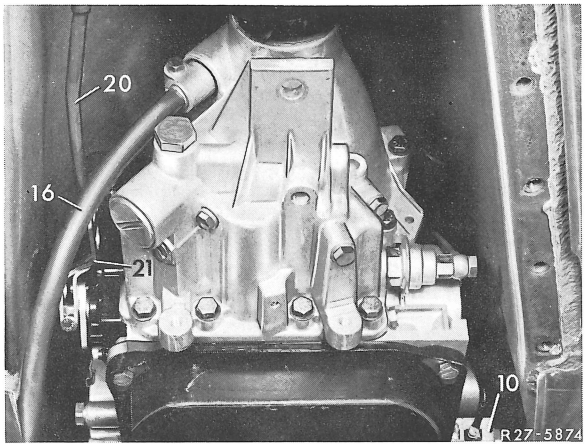



Fig. 7
10 Kickdown solenoid valve
16 Speedometer shaft
20 Shift rod
21 Range selector lever

**18** Disconnect shift rod (20) on range selector lever (21) and set range selector lever to position "P".

**19** Disconnect speedometer shaft (16) on transmission.

**20** Unscrew vacuum line (22) from vacuum box (23) while counterholding at hexagon SW 14 on diaphragm (Fig. 8).

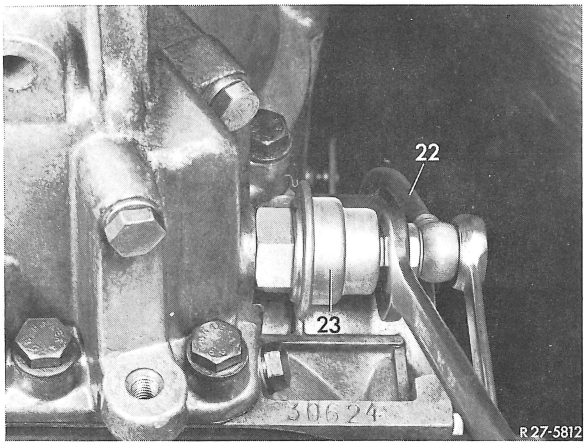



Fig. 8
22 Vacuum line
23 Vacuum box

**21** Pull covering plug from intermediate flange. Separate hydraulic clutch from driven plate by unscrewing 6 hex. bolts (11) (Fig. 9).

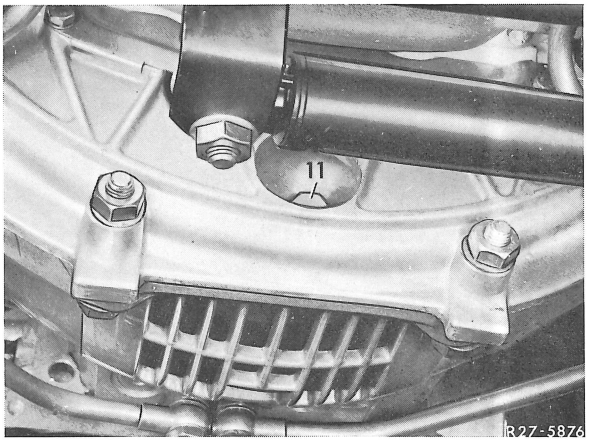



Fig. 9
11 Hex. bolts

**22** Slightly raise engine transmission unit with top for pit lift BE 11 857 (Fig. 10).

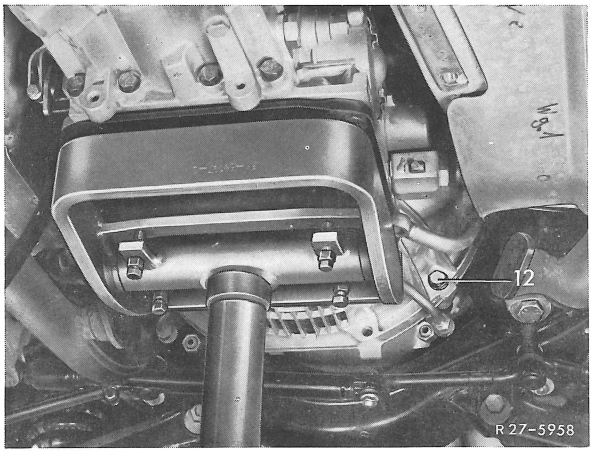



Fig. 10
12 Fastening bolt

**23** Loosen all bolts for attaching transmission to intermediate flange and screw out. The two lateral screws (12) should be removed last (Fig. 10).

**24** Push transmission with hydraulic clutch in direction of rear axle until the bearing journal of the hydraulic clutch can no longer touch the intermediate flange.

**25** Carefully lower transmission with hydraulic clutch and then pull out in forward direction (Fig. 11).

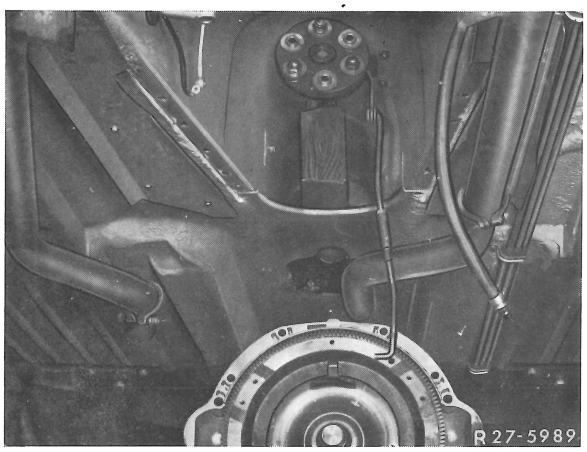



Fig. 11

**26** Place transmission in vertical position. Screw two M 8 bolts into clutch and pull clutch out in upward direction. Sight-check hydraulic clutch and clean inside with flushing mandrel 115 589 24 63 00. If no flushing mandrel is available, replace hydraulic clutch.

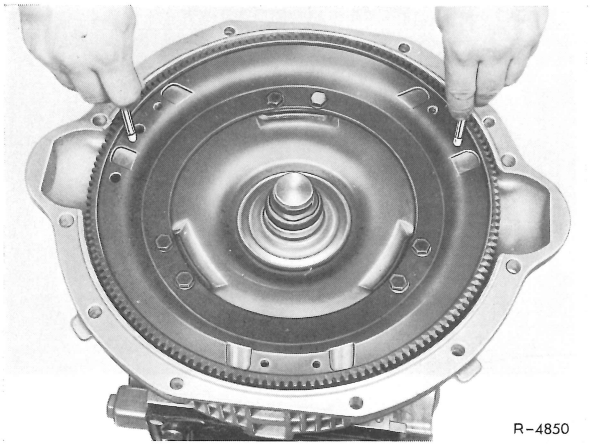



Fig. 12

## Installation

**27** Prior to installing the transmission, thoroughly flush transmission oil cooler in lower water header including feed lines with syringe 112 589 00 72 00 and dry cleaning gasoline and blow out. Also thoroughly clean and blow out all pipelines.

**28** Place transmission in vertical position. Screw two M 8 bolts into hydraulic clutch. Move claws of hollow shaft (1) in engaging direction opposite pump wheel (Fig. 13).




Fig. 13
1 Drive flange

Carefully install clutch while turning lightly back and forth (Fig. 12).

Grease centering pins of hydraulic clutch slightly with Molykote.

**Caution!** On a correctly installed clutch the dimension "K" should be approx. 4 mm (Fig. 14).

Also make sure that when introducing the clutch the sealing lip of the radial sealing ring in the primary pump housing is not damaged. With the transmission installed the clutch is pulled with fastening bolts against the driven plate and cannot wipe against clutch housing.

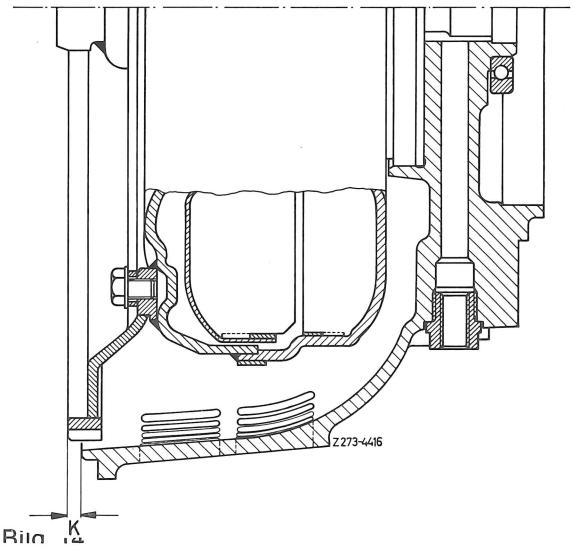



Fig. 14

With the transmission installed, the clutch is pulled with fastening bolts against the driven plate and cannot wipe against clutch housing.

**29** Place transmission on vehicle jack or pit lift. Turn clutch in such a manner that two fastening bores are at bottom.

**30** Rotate crankshaft until two bores (13) in driven plate (14) for fastening bolts of clutch are at bottom (Fig. 15).

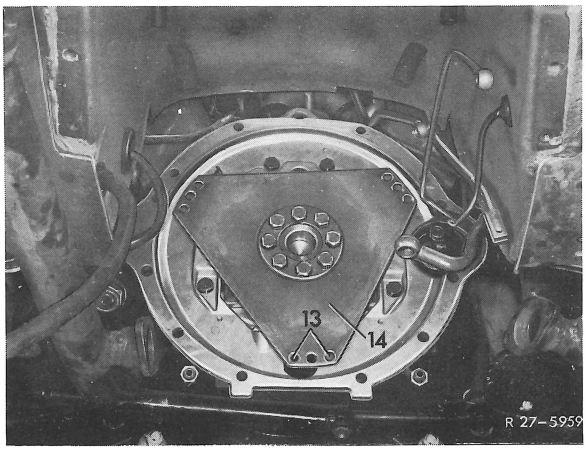



Fig. 15
13 Fastening bores
14 Driven plate

**31** Introduce transmission and lift until the lower bolt holes of the clutch housing are in alignment with the bores in intermediate flange. Push transmission forward until clutch housing is well-seated. Do not use force.

**32** Screw transmission with fastening bolts (12) to engine flange (Fig. 2).

**33** Screw six hex. bolts 12 K (M 8 x 14) into hydraulic clutch and tighten to 42 Nm (4.2 kpm) (item 11 in Fig. 9).

**34** Connect vacuum line (22) to vacuum box (23) while counterholding at hexagon (SW 14) on vacuum box (Fig. 8).

**35** Connect tachometer shaft (16) to transmission (Fig. 7).

**36** Attach selector rod (20) to range selector lever (21) (Fig. 7).

**37** Connect cable to kickdown solenoid valve (Fig. 7).

**38** Slide control pressure lever (9) on shaft and attach with clamping screw (Fig. 6).

**39** Attach plug (8) for starter lock and backup light switch (Fig. 6).

**40** Remove wooden support from under universal shaft and screw universal shaft to transmission.

**41** Check rear engine mount (18) and screw to transmission (Fig. 5).

**42** Mount tunnel closing plate (17) while uniformly tightening the 12 fastening bolts (Fig. 4).

**43** Screw both fastening bolts (19) into rear engine mount and tighten (Fig. 4).

**44** Remove vehicle from supporting stands, move slightly back and forth, then tighten universal shaft clamping nut with torque wrench 001 589 44 21 00 and open end wrench 000 589 13 01 00 to 30 Nm (3.0 kpm) (Fig. 3).

**45** Tighten fastening bolts (7) of universal shaft intermediate bearing (Fig. 3).

**46** Move righthand front exhaust pipe into correct position and insert compensating connection (4) between the exhaust pipes including the shielding plate (1) and screw-on.

**47** Tighten righthand front exhaust pipe on exhaust manifold.

**48** Install rear exhaust section with initial and main muffler.

**49** Screw feed line (5) and return line (6) for oil cooler to connecting lines (Fig. 2).

**50** Screw oil filler pipe (2) to oil pan (3) of transmission and screw oil drain plug (15) into hydraulic clutch (Fig. 11).

**51** Connect minus cable to battery.

**52** Fill up with transmission fluid (27.1–010).

# Disassembly and Reassembly of Front Transmission Cover with Primary Pump



| Tightening Torque | Nm | (kpm) |
|---|---|---|
| Hex. bolts for primary pump | 20 | (2.0) |

| Special Tools | |
|---|---|
| Assembly mandrel for ball bearing in front transmission cover | 115 589 02 35 02 |
| Pulling fixture for ball bearing in front transmission cover | 116 589 07 33 00 |
| Removing fixture for radial sealing ring of primary pump | 116 589 08 33 00 |

## Disassembly

**1** Pull ball bearing (5) from front transmission cover (7) with pulling fixture (Fig. 1).

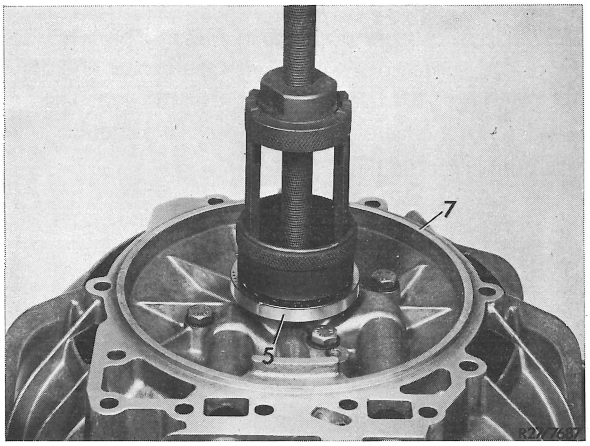



Fig. 1
5 Ball bearing
7 Transmission cover

**2** Unscrew fastening bolts (4) (Fig. 2).

**3** Screw-in two hex. bolts (8) approx. 50 mm long in opposite location (Fig. 3).

**4** Loosen primary pump from transmission cover (7) by means of light blows against the two hex. bolts (8) (Fig. 3).

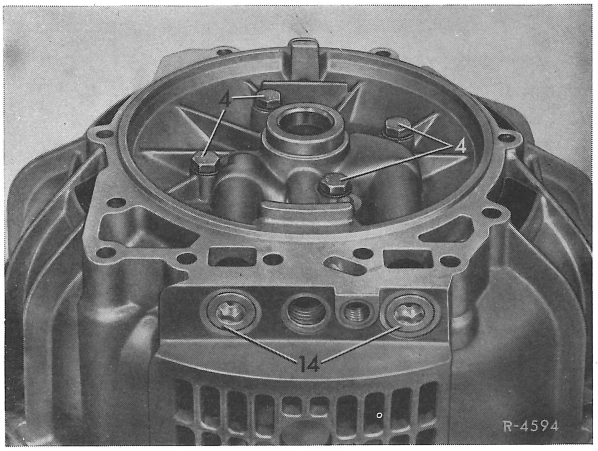



Fig. 2
4 Fastening bolts
14 Closing plugs

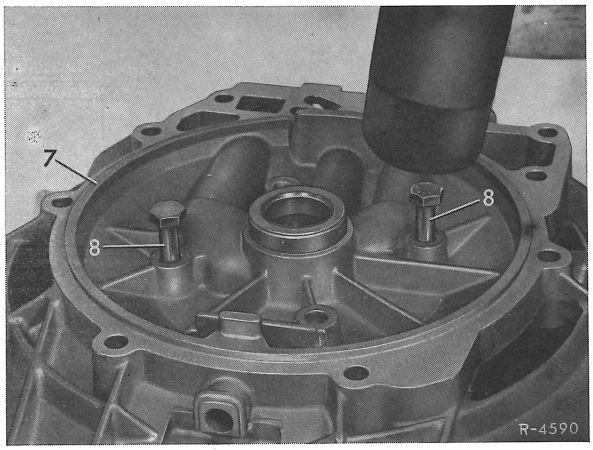



Fig. 3
7 Transmission cover
8 Hex. bolts

# 27.1 Disassembly and Reassembly of Front Transmission Cover with Primary Pump

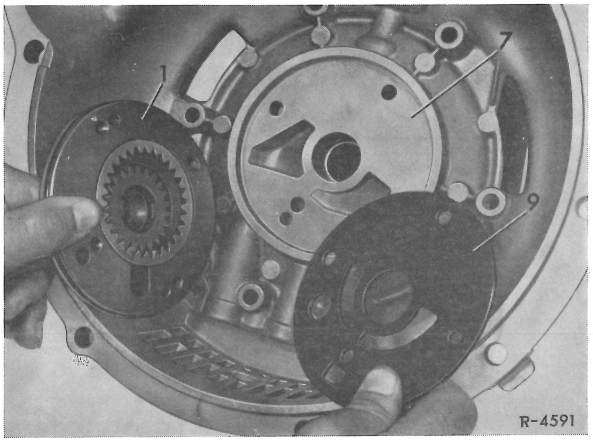



Fig. 4

1 Primary pump
7 Transmission cover
9 Intermediate plate

**5** Then remove primary pump (1) with intermediate plate (9) from front transmission cover (7) (Fig. 4).

**6** Remove primary pump gears (10 and 11) from pump housing (1) (Fig. 5).

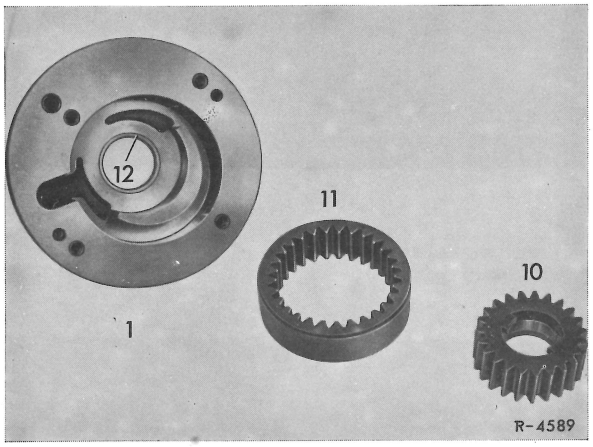



Fig. 5

1 Pump housing
10 Drive gear
11 Ring gear
12 Bronze bushing

**7** Remove O-ring (3) and radial sealing ring (2) (Fig. 7).

**Note:** The removing fixture shown in Fig. (6) can also be used with sleeve on mounted transmission.

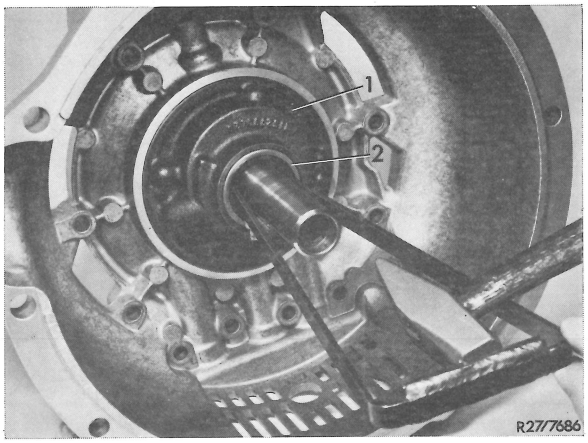



Fig. 6

1 Pump housing
2 Radial sealing ring

## Assembly

**8** Install new O-ring (3) and radial sealing ring (2) into pump housing (1) (Fig. 7).

**9** Lubricate primary pump gears (10 and 11) and insert into pump housing (1), with the carrier end of the drive gear (10) facing the transmission end. The bevelled outer edge of the pump gear (11) should face bronze bushing (12) (Fig. 5).

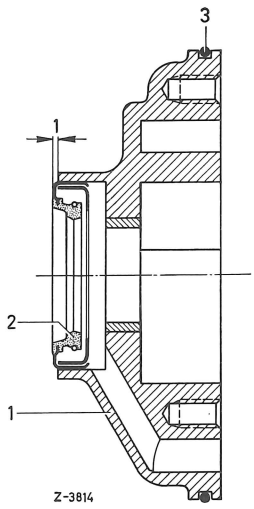



Fig. 7

1 Pump housing
2 Radial sealing ring
3 O-ring

**10** Insert intermediate plate (9) and primary pump (1) into transmission cover (7) (Fig. 4).

**11** Tighten fastening bolts (4) to 20 Nm (2.0 kpm) (Fig. 2).

**12** Press ball bearing (5) on transmission cover (7) with assembly mandrel (Fig. 8).

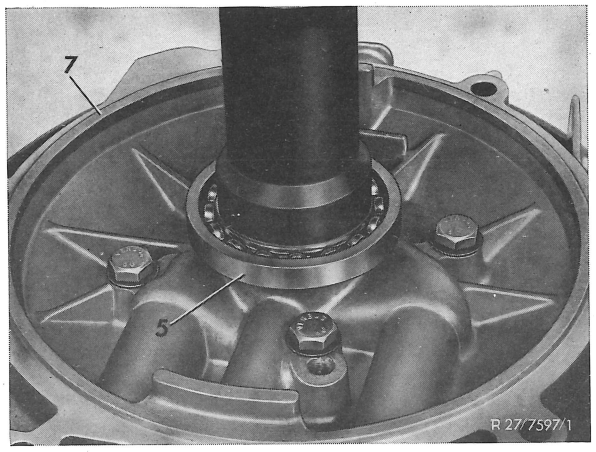



Fig. 8
5 Ball bearing
7 Transmission cover

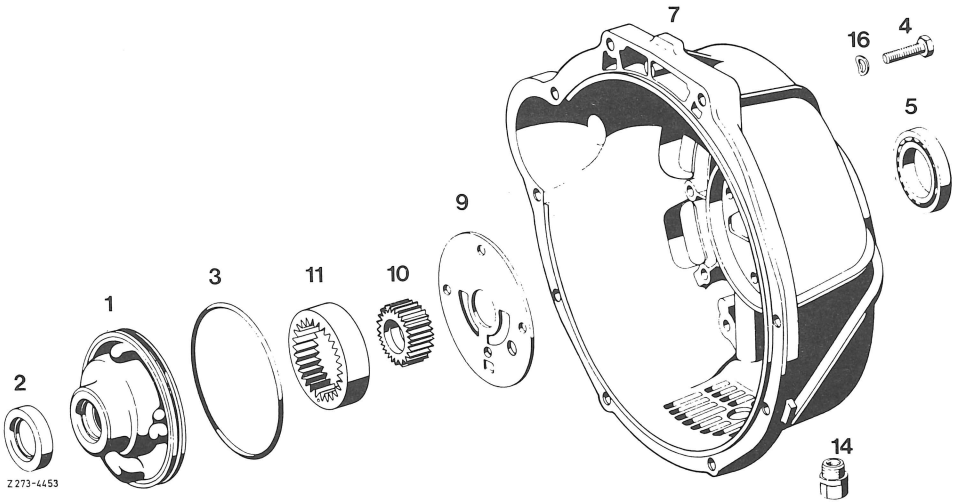



Fig. 9
1 Primary pump housing
2 Radial sealing ring
3 O-ring
4 Fastening bolt
5 Ball bearing
6 Transmission cover
9 Intermediate plate
10 Drive gear
11 Ring gear
14 Threaded plug
16 Spring washer

**Adjusting Data**

| | | |
|---|---|---|
| End play of front transmission housing cover or of gear assembly | | 0.4 + 0.1 |
| Idle travel of brake band pistons B 1 and B 2 | | 3.0 – 4.0 |
| Adjusting screw brake band B 3 | | Tighten adjusting screw to 0.5 kpm, then loosen by 1 3/4 turns and tighten counter nut |
| Thickness of compensating washers for radial ball bearing front transmission housing cover | | 0.1 – 0.2 – 0.5 |
| Lengths of thrust pins | for brake band B 1 and B 2 | 22 –23 – 24 – 25 – 26 – 27 – 28 |
| | for brake band B 3 | 45 |
| | for modulating pressure transmitter bright<br>yellow<br>black | 39.65<br>40.15<br>40.65 |

| **Tightening Torques** | Nm | (kpm) |
|---|---|---|
| Fastening bolts for oil pan on transmission housing | 7 | (0.7) |
| Fastening bolts for oil filter | 4 | (0.4) |
| Hex. bolts for shift valve housing on transmission housing | 13 | (1.3) |
| Slotted nut on three-legged flange | 120 | (12.0) |
| Hex. bolts for rear transmission housing | 13 | (1.3) |
| Hex. bolts for front transmission housing | 13 | (1.3) |
| Kickdown magnetic valve | 30 | (3.0) |
| Hex. bolts for modulating pressure on transmission housing | 7 | (0.7) |
| Hex. bolts for leaf spring of detent plate | 10 | (1.0) |
| Hexagon socket bolt for detent plate on shaft of range selector lever | 10 | (1.0) |
| Cheesehead bolts for starter lock and backup light switch | 5 | (0.5) |
| Adjusting screw B 3 | 5 | (0.5) |

# 27.1 Disassembly and Assembly of Transmission

**Special Tools**

| | |
|---|---|
| Assembly stand for automatic transmission | 116 589 06 59 00 |
| Screw driver for slotted plugs | 116 589 00 11 00 |
| Pin spanner for slotted nut | 115 589 08 07 00 |
| Assembly fixture for brake band piston B 1 | 115 589 04 59 00 |
| Measuring device for thrust pin modulating pressure | 115 589 11 21 00 |
| Measuring bridge | 116 589 00 21 00 |
| Introducing ring brake band piston B 2 | 115 589 18 61 00 |
| Locating pin for shift valve housing | self-made |
| 2 Studs for shift valve housing | self-made |
| Locating pin for starter lock and backup light switch | 115 589 18 63 00 |
| Introducing ring for double piston B 1 | 116 589 05 61 00 |

**Notes**

Special attention must be paid to absolute cleanliness during all assembly jobs. Perfect function of the transmission depends on the fact that there is no dirt on transmission members, on control valves and in oil circuit. Therefore, wash all parts carefully upon disassembly, flush oil ducts and dry. **Do not use washing gasoline for rubber seals,** since this type of gasoline will attack the rubber.

Use spirit of alcohol for cleaning rubber parts. Also note that the parts are not touched with woolen rags, since even the most minor contamination (for example by fuzz) may result in trouble.

When assembling transmission members, provide bearing points and sliding parts with specified automatic transmission fluid (ATF).

**Disassembly**

**1** Position transmission with oil pan up.

Remove oil pan after loosening the four fastening bolts (2) including gasket and shim (3) (Fig. 1).

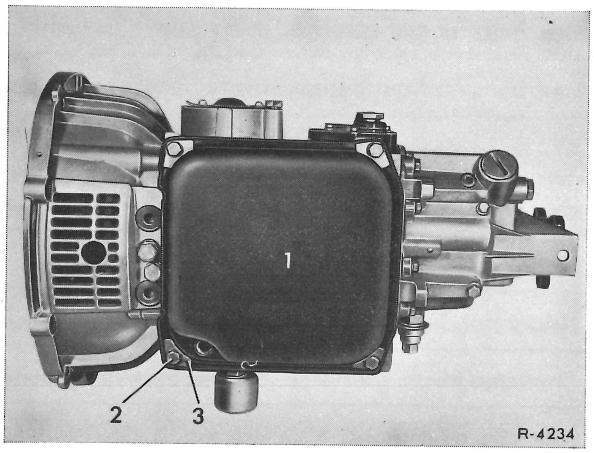



Fig. 1

1 Oil pan
2 Fastening bolt
3 3 Shim

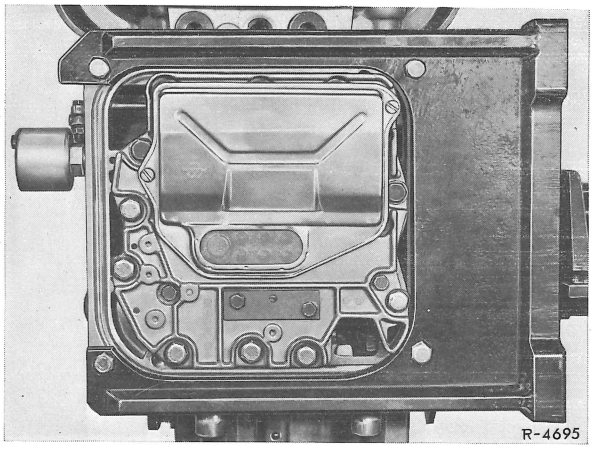



Fig. 2

**2** Screw transmission to assembly stand (Fig. 2).

**3** Remove oil filter (4) (Fig. 3). Unscrew fastening bolts (6) of shift valve housing (7). Move range selector lever between position "P" and "R" and remove shift valve housing (Fig. 4).

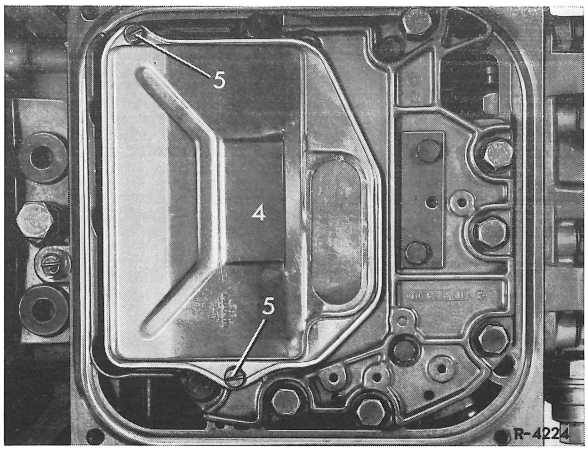



Fig. 3
4 Oil filter
5 Fastening bolts

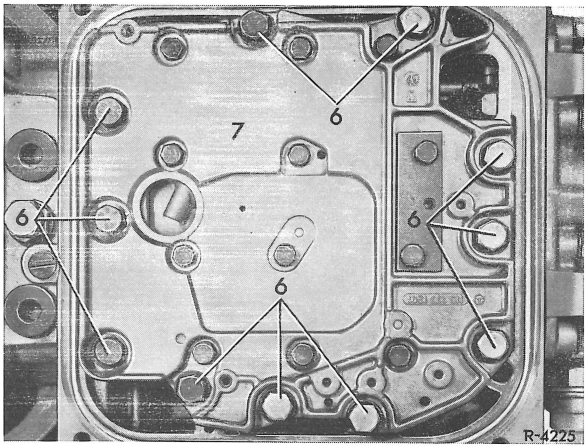



Fig. 4
6 Fastening bolts
7 Shift valve housing

**4** Remove plug pipes (8) and pull sealing caps (9) from plug pipes (Fig. 5).

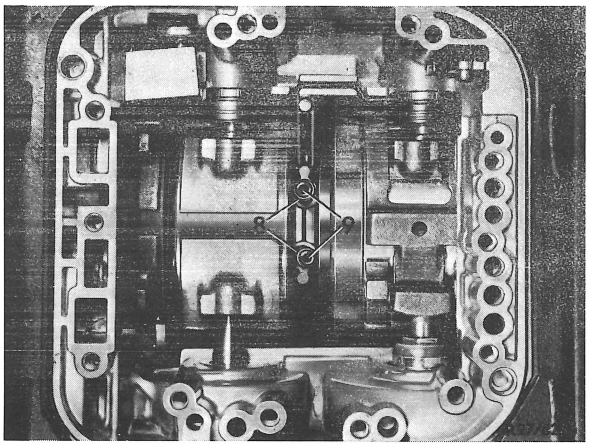


Fig. 5
8 Plug pipes
9 Sealing caps

**5** Swivel transmission on assembly fixture in such a manner that the rear transmission housing faces upwards. Unscrew vacuum box (10) together with thrust pin (12) (Fig. 6).

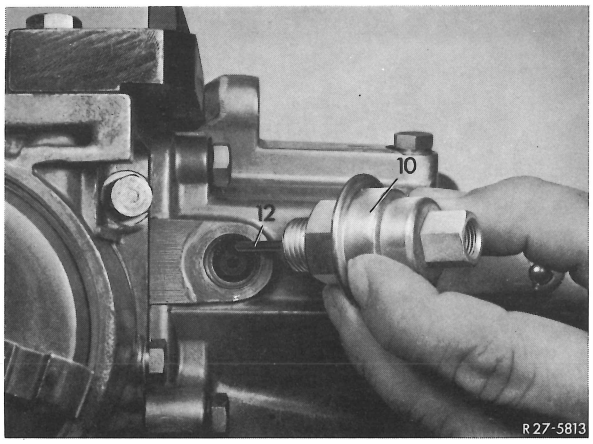



Fig. 6
10 Vacuum box
12 Thrust pin

**6** Unscrew plug for secondary pump (13) with screw driver for slotted plugs and remove compression spring (14) (Fig. 7).

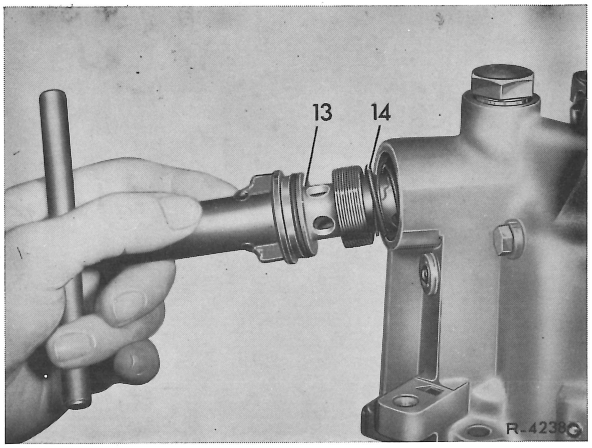



Fig. 7
13 Plug for secondary pump
14 Compression spring

**7** Unlock slotted nut on three-legged flange and unscrew by means of pin spanner. Pull three-legged flange from output shaft.

**8** Loosen fastening bolts for rear transmission housing. Remove rear transmission housing with pulling fixture (Fig. 8).

Disassembly of rear transmission housing (27.1–500).

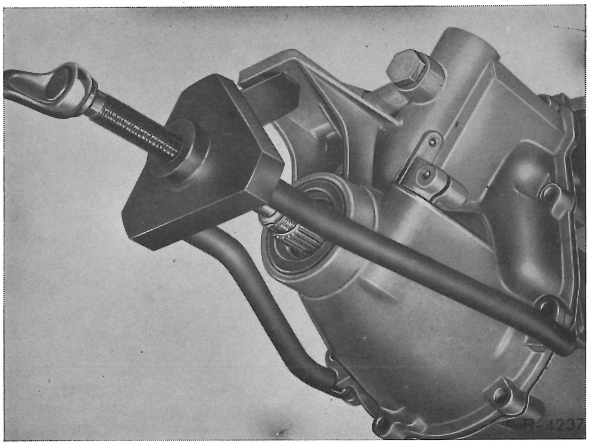



Fig. 8

**9** Remove plate spring (85) with worm gear of tachometer drive (15), eccentric ring for secondary pump (16) and centrifugal governor (17) from drive shaft (Fig. 9).

**10** Remove parking lock pawl (19) and spreading spring. Pull parking lock gear (18) from output shaft (Fig. 9).

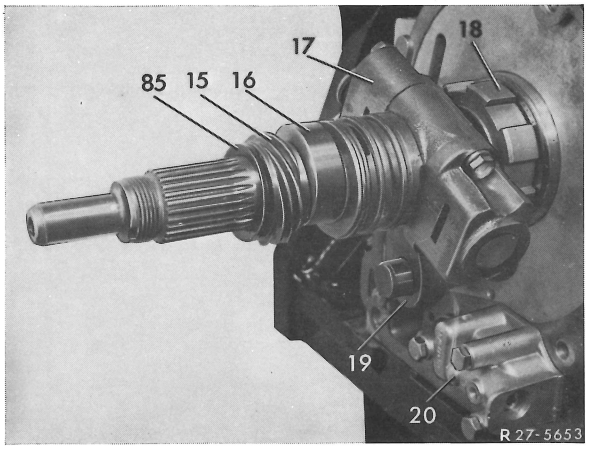



Fig. 9
15 Worm gear tachometer drive
16 Eccentric ring secondary pump
17 Centrifugal governor
18 Parking lock gear
19 Parking lock pawl
20 Modulating pressure housing
85 Plate spring

**11** Swivel transmission on assembly stand so that the front transmission housing faces upwards. Unscrew fastening bolts (21) for front transmission housing (22) (Fig. 10).

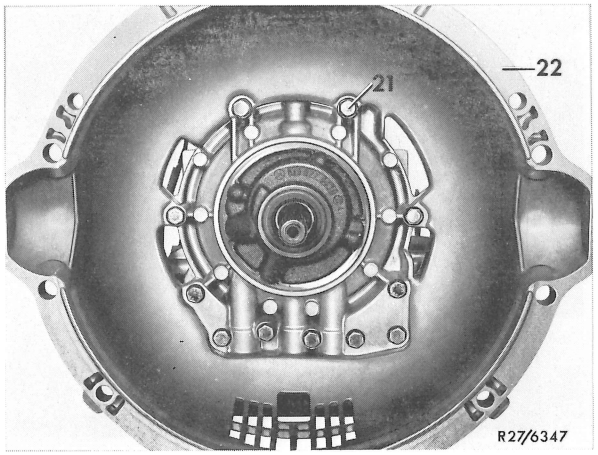



Fig. 10
21 Fastening bolts
22 Front transmission housing

**12** Loosen front transmission housing by means of light blows with plastic hammer and remove.

**13** Swivel transmission on assembly stand into horizontal position.

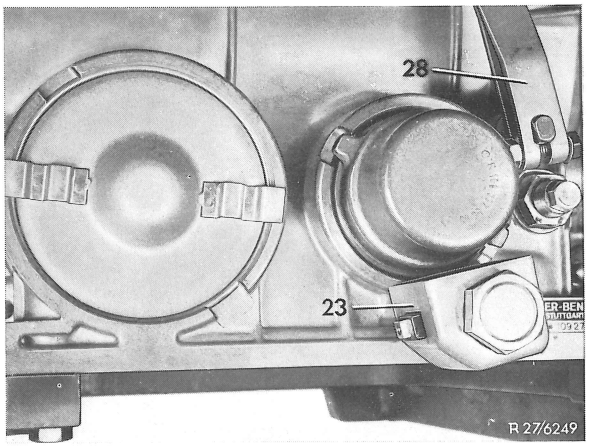



Fig. 11
23 Magnetic valve
28 Control pressure lever

**14** Unscrew magnetic valve (23) and control pressure lever (28) (Fig. 11).

**15** Remove circlip (24) from brake band piston cover B 2 (65) and pull out brake band piston cover with pulling handle 115 589 05 33 00 (Fig. 12).

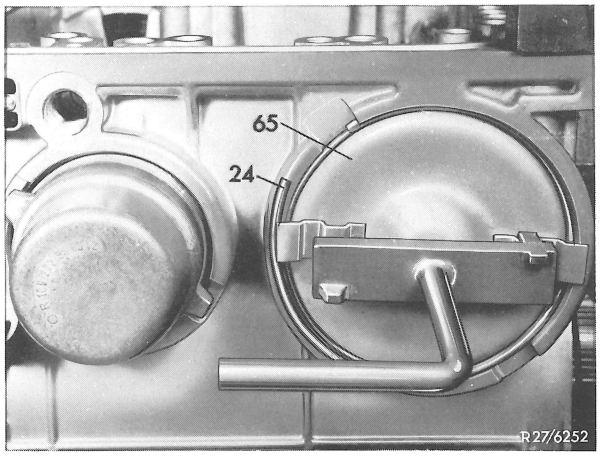



Fig. 12
24 Circlip
65 Brake band piston cover B 2

**16** Insert introducing ring 115 589 18 61 00 for brake band piston B 2 and pull out brake band piston B 2 through introducing ring. Remove thrust fork from brake band B 2.

**17** Position assembly fixture (11) for brake band piston cover B 1. Tension assembly fixture (11) and remove circlip (27). (Fig. 13).

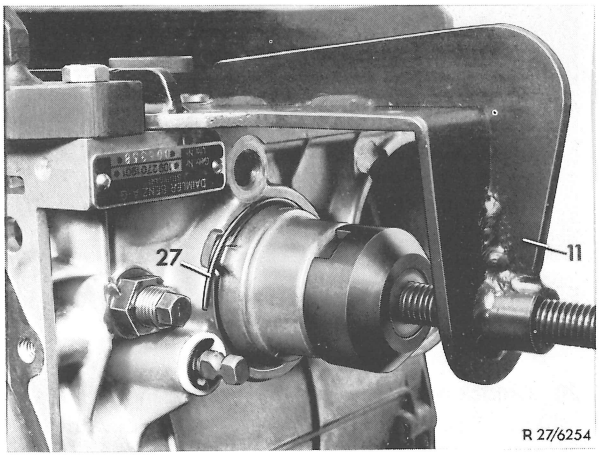



Fig. 13
11 Assembly fixture 115 589 04 59 00
27 Circlip

**18** Relieve assembly fixture and screw out fastening bolts. Remove assembly fixture with brake band piston cover (29), brake band piston B 1 (30) and both compression springs (31) (Fig. 14).

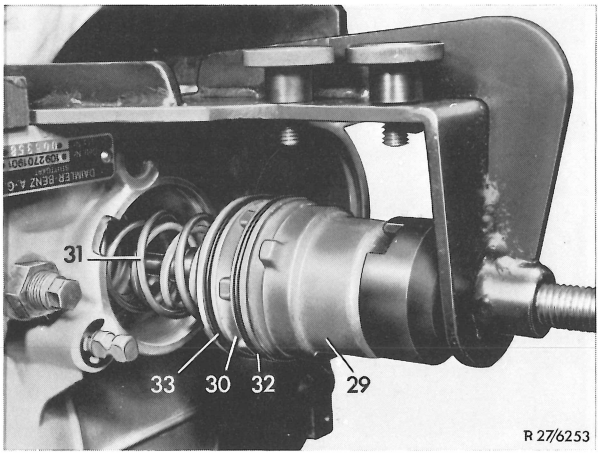



Fig. 14

29 Brake band piston cover B 1
30 Brake band piston B 1
31 Compression springs
32 O-ring
33 Lip sealing ring

**19** Remove thrust pins (34) for B 1 and B 2 (Fig. 15).

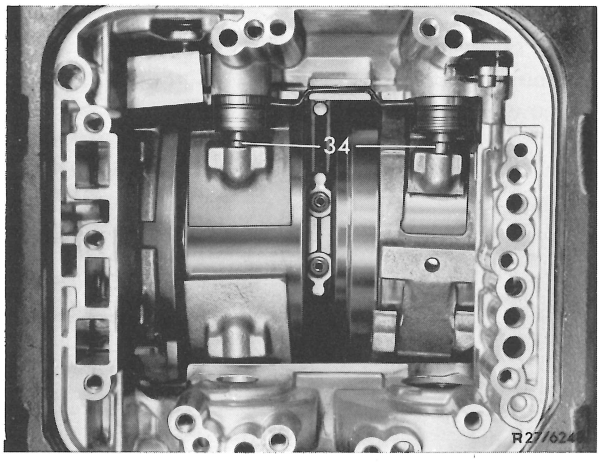



Fig. 15

34 Thrust pins

**20** Unlock adjusting screw for brake band B 3 (35) by loosening counter nut (36) and screw out. Remove both thrust pins (37) (Fig. 16).

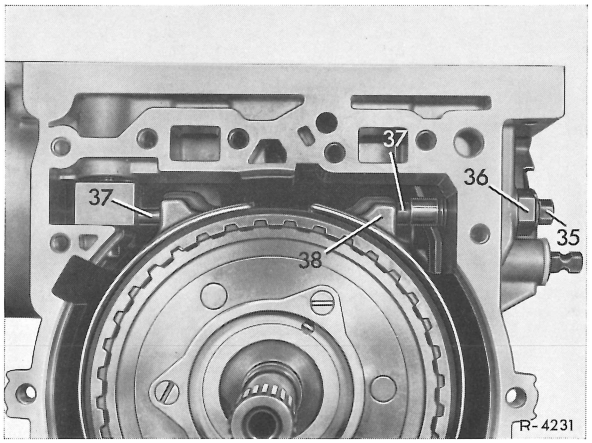



Fig. 16

35 Adjusting screw B 3
36 Counter nut
37 Thrust pins
38 Brake band B 3

**21** Remove brake band B 3 (38) in forward direction (Fig. 17).

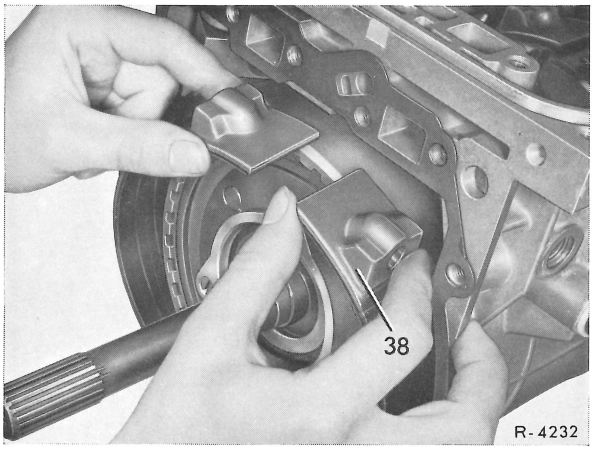



Fig. 17

38 Brake band B 3

**22** Clamp brake band 1 (39) to drum with a circlip for brake band piston cover B 2 and remove gear assembly (40) from transmission housing. Brake band B 2 will remain in transmission housing (Fig. 18).

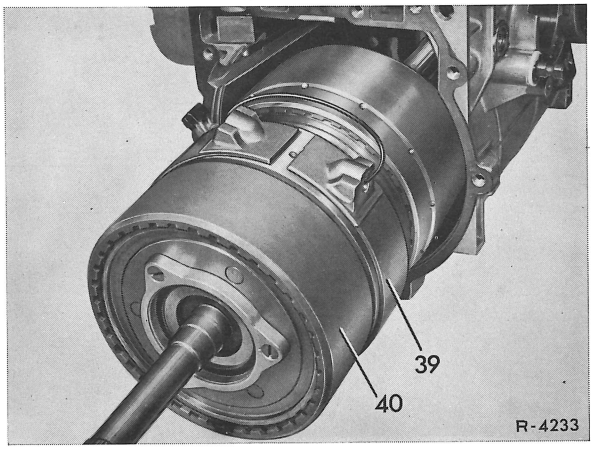



Fig. 18
39 Brake band B 1
40 Gear assembly

**23** Remove brake band B 2 from transmission housing (Fig. 26).

**24** Remove modulating pressure valve housing (20) after loosening the three fastening bolts including gasket (42) for rear transmission housing (Fig. 19).

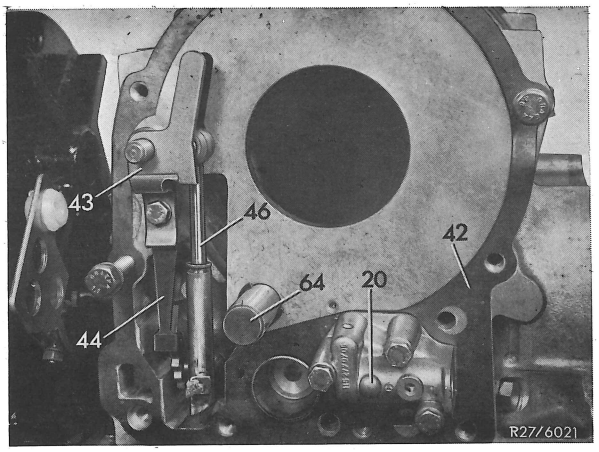



Fig. 19
20 Modulating pressure valve housing
42 Gasket
43 Holder for parking lock
44 Leaf spring
46 Resilient linkage
64 Bearing pin for parking lock pawl

**25** Remove holder (43) and leaf spring (44).

**26** Unscrew clamping screw (45) on detent plate (Fig. 20).

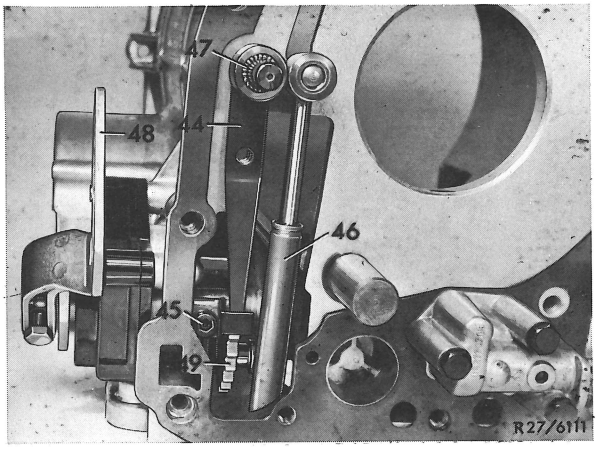



Fig. 20
44 Leaf spring
45 Clamping screw
46 Resilient linkage
47 Needle bearing
48 Range selector lever
49 Detent plate

**27** Pull-out range selector lever (48) and take detent plate (49) with resilient linkage (46) out of transmission housing. Remove needle bearing (47) (Fig. 20).

**28** Remove starter lock and backup light switch (50) after loosening fastening bolts (Fig. 21).

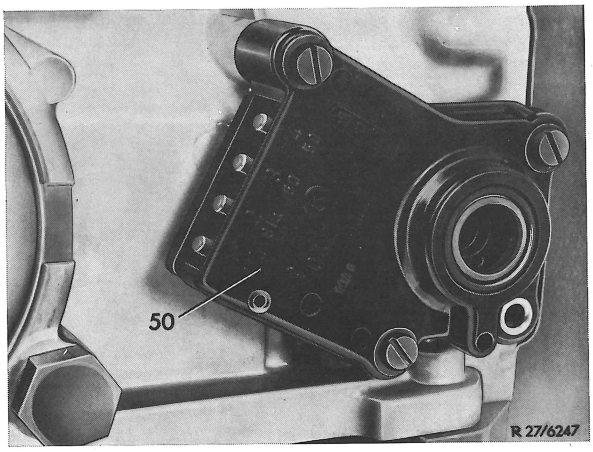



Fig. 21
50 Starter lock and backup light switch

**29** Remove transmission housing from assembly stand.

**30** Unlock brake band piston cover B 3 , remove locking ring (51) and pull out cover (52) (Fig. 22).

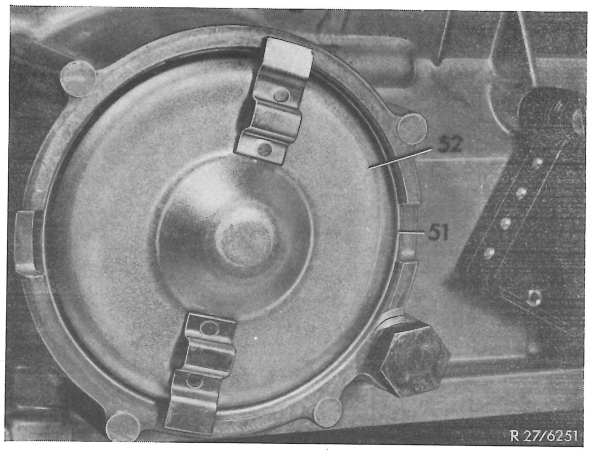



Fig. 22
51 Locking ring
52 Cover brake band piston B 3

**31** Remove brake band piston B 3 (53) and truncated cone spring (54) (Fig. 23).

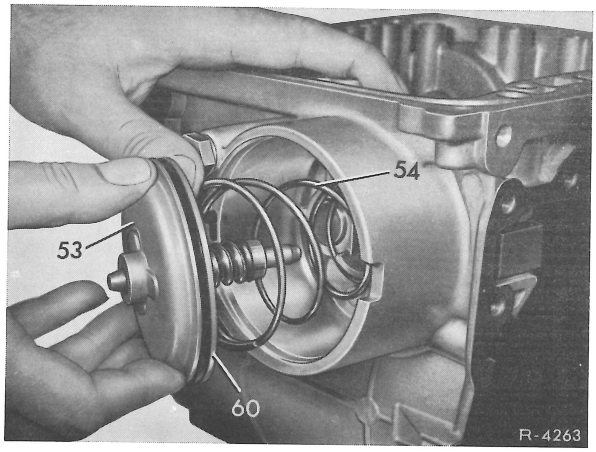



Fig. 23
53 Brake band piston B 3
54 Compression spring
60 Lip sealing ring

**32** Pull out circlip (55) for bearing pin from brake band lever B 3 and knock-out bearing pin (57) in downward direction (Fig. 24).

**33** Remove brake band lever B 3 (56) from transmission housing.

**34** Remove locking clip (58) for thrust body B 1 and B 2 and remove both thrust bodies (59 and 61) (Fig. 25).

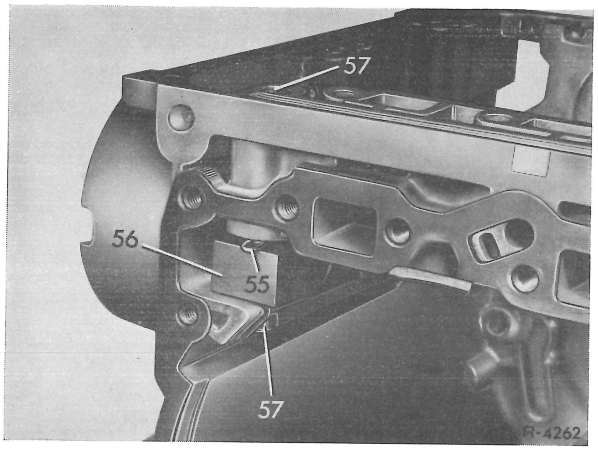



Fig. 24
55 Circlip
56 Brake band lever B 3
57 Bearing pin

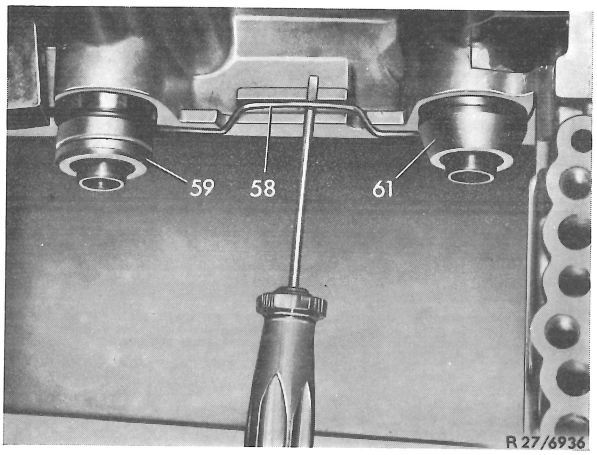



Fig. 25
58 Locking clip
59 Thrust body B 1
61 Thrust body B 2

## Assembly

**Caution!** Replace brake band B 2 with thrust fork by reinforced brake band with welded-on plate. Together with reinforced brake band, install a thrust body with bevelled valve cap, as well as a brake band piston with dome-shaped thrust pin (Fig. 26).

Brake band piston is machined at the rear (refer to arrow Fig. 27) and may be installed only in combination with brake band piston cover (94) with stop plate (95) (Fig. 27).

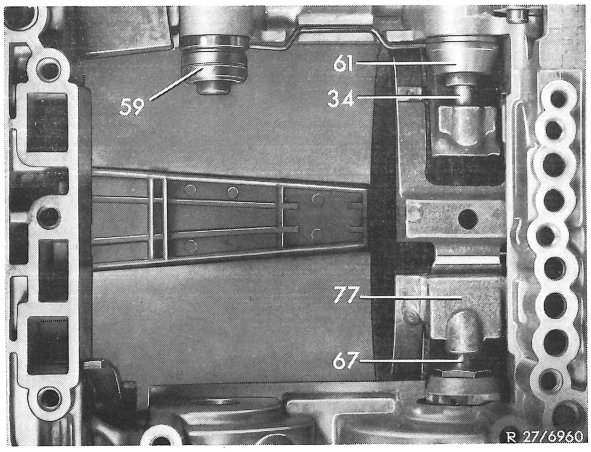



Fig. 26

34 Thrust pin
59 Thrust body B 1
61 Thrust body B 2
67 Brake band piston B 2
77 Brake band B 2

Do not confuse thrust body B 1, up to use of new controls (February 1971) thrust body has been characterized by two grooves (round), and as from use of new controls by one groove (sharp-edged).

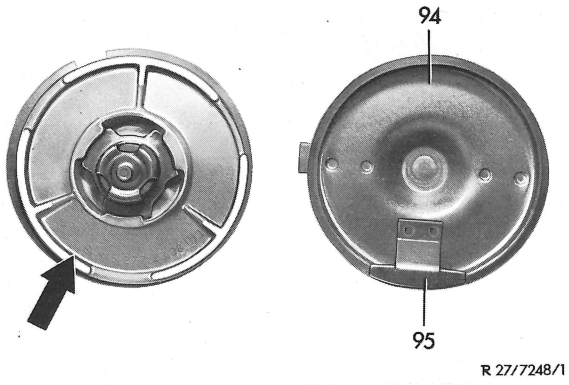



Fig. 27

94 Brake band piston cover
95 Stop plate

**35** Renew O-rings depending on version in transmission housing (arrows Fig. 28) or on thrust bodies.

**36** Insert thrust body B 1 (59) and thrust body B 2 (61) with bevelled valve cap into transmission housing and secure with locking clip (58) (Fig. 25).

**37** Insert brake band lever B 3 (56) into transmission housing. Introduce bearing pin (57) from above and secure with circlip (55) (Fig. 24).

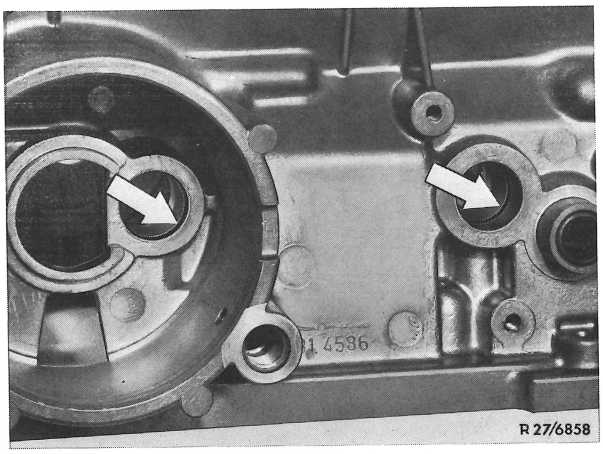



Fig. 28

**38** Insert brake band piston B 3 (53) with a new lip sealing ring (60) and compression spring (54) into transmission housing (Fig. 23).

**39** Mount brake band piston cover B 3 with a new O-ring and secure with locking ring (51) (Fig. 22).

**40** Mount starter lock and backup light switch (50) and tighten fastening bolts to 5 Nm (0.5 kpm) (Fig. 21).

**41** Insert detent plate (49) into transmission housing. Introduce range selector lever (48) into toothing of detent plate (49) and tighten clamping screw (45) to 10 Nm (1.0 kpm) (Fig. 20).

**42** Loosen adjusting screw (95), introduce locating pin (97) through driver into locating hole in switch housing (Fig. 29).

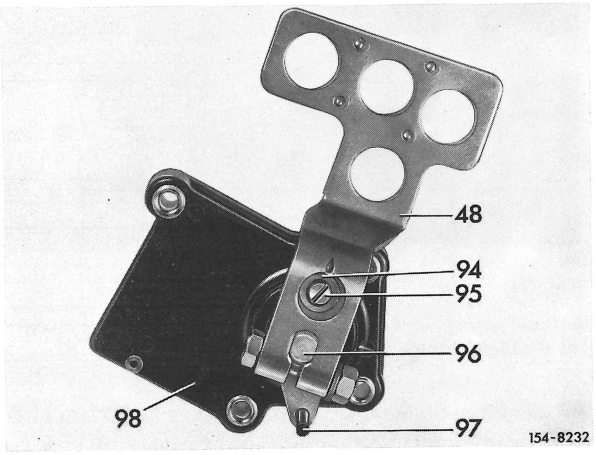



Fig. 29

48 Range selector lever
49 Washer
95 Adjusting screw
96 Shaft
97 Locating pin
98 Clamping screw

**43** Tighten adjusting screw (95) and remove locating pin (97) (Fig. 29).

**44** Clamp transmission housing on assembly fixture.

**45** Insert resilient linkage (46) with washer (11) and roller (26) (Fig. 30).

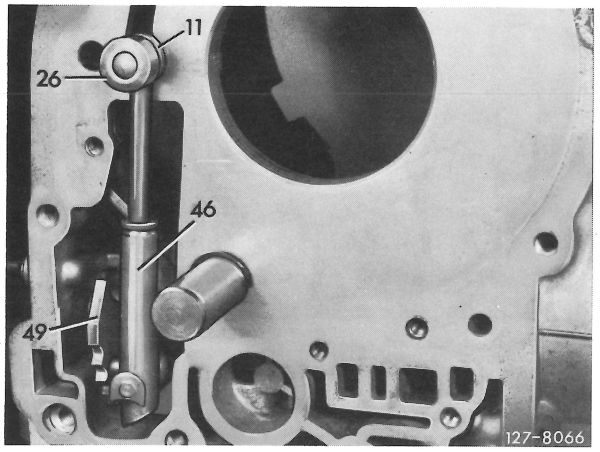



Fig. 30

11 Washer
26 Roller
46 Resilient linkage
49 Detent plate

**46** Attach leaf springs (44) and roller (47) mounted on needle bearings (Fig. 31).

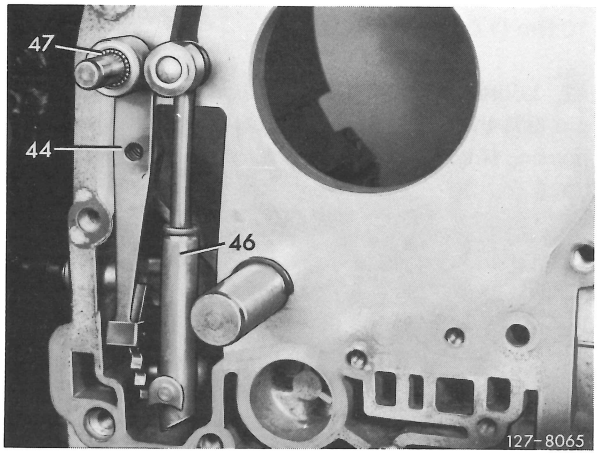



Fig. 31

44 Leaf spring
46 Resilient linkage
47 Roller mounted in needle bearings

**47** Tighten holder (43) with hex. bolt to 10 Nm (1.0 kpm) and mount bearing pins (64) for parking lock pawl (Fig. 19).

**48** Mount modulating pressure valve housing (20) with a new gasket (42) for rear transmission housing. Tighten fastening bolts to 7 Nm (0.7 kpm) (Fig. 19).

**Note:** Prior to tightening modulating pressure valve housing, center gasket on bores for set pin.

Check valve for easy operation after tightening.

**49** Insert upper brake band guide into groove in transmission housing (Fig. 32).

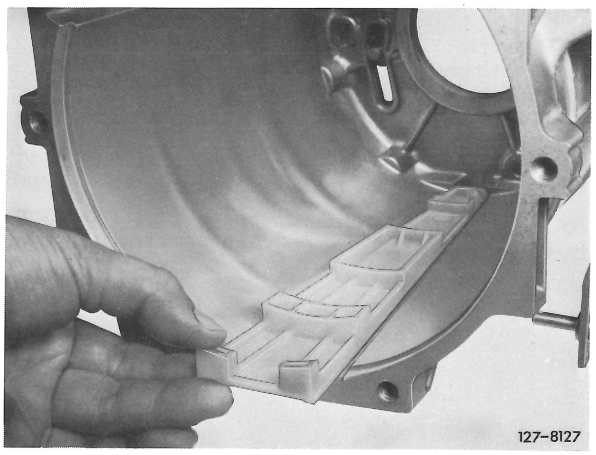



Fig. 32

**50** Insert output shaft (76) with radial ball bearing into transmission housing and knock in with plastic hammer (Fig. 33).

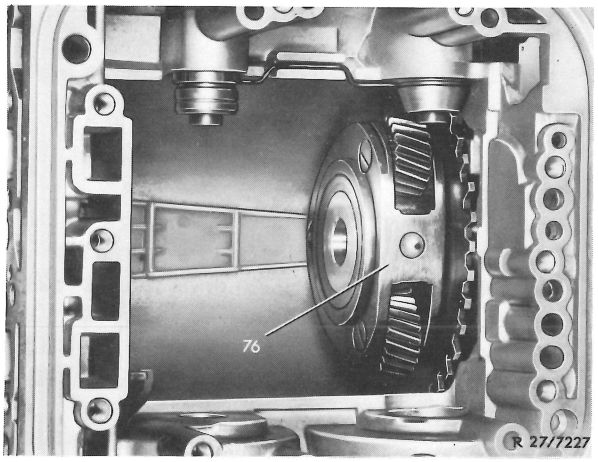



Fig. 33

76 Output shaft

**51** Insert brake band B 2 (77) (double looped steel band) into transmission housing, welded-on plate should face brake band piston end (arrow Fig. 34).

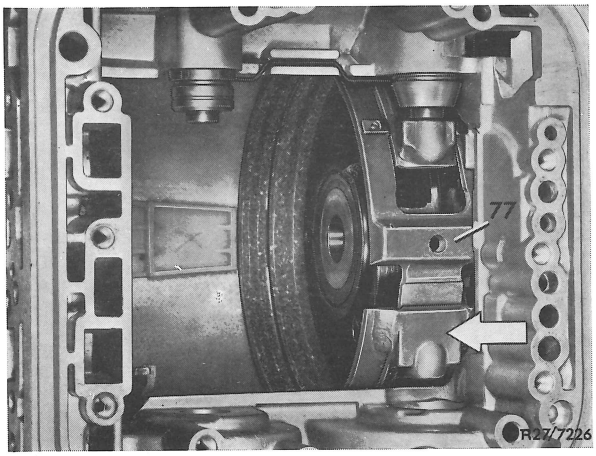



Fig. 34
77 Brake band B 2

**52** Insert axial bearing (78) and radial bearing (79) coated with grease into gear assembly (Fig. 35).

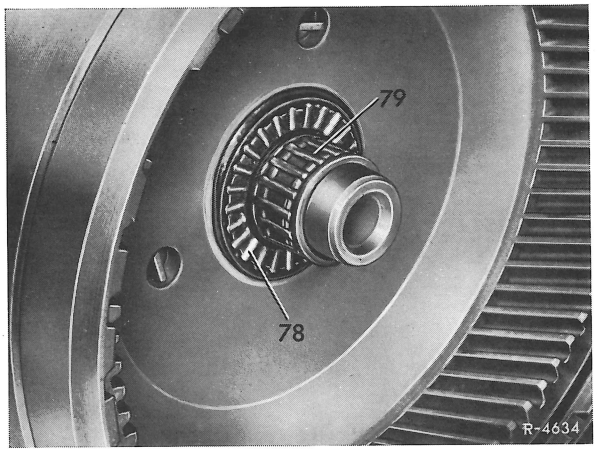



Fig. 35
78 Axial bearing
79 Radial bearing

**53** Clamp brake band B 1 (39) (smooth lining) with circlip for brake band piston cover B 2 to brake band drum (Fig. 36).

**54** Insert gear assembly (40) with brake band B 1 (39), while introducing supporting lever for oil guide sleeve into groove in transmission housing (Fig. 36).

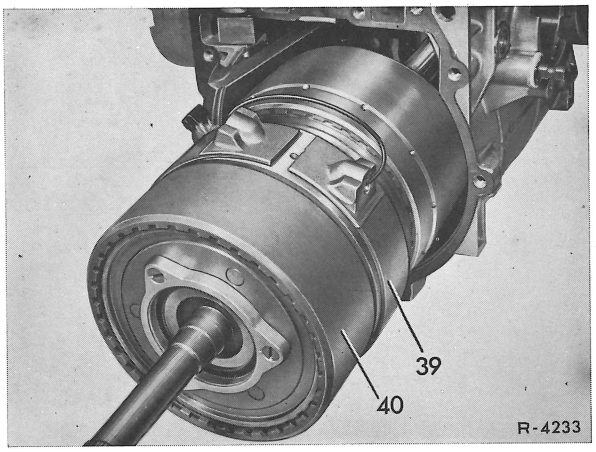



Fig. 36
39 Brake band B 1
40 Gear assembly

**Note:** When introducing gear assembly into transmission housing, make sure that the segment teeth of the sun gear on output shaft are correctly engaging in brake drum B 2.

**55** Insert brake band B 3 with radial groove lining (heavy steel band) (38) from the front into transmission housing, insert both thrust pins (37) into brake band B 3 (38) and screw adjusting screw (35) coated with sealing compound into transmission housing until brake band is held (Fig. 37).

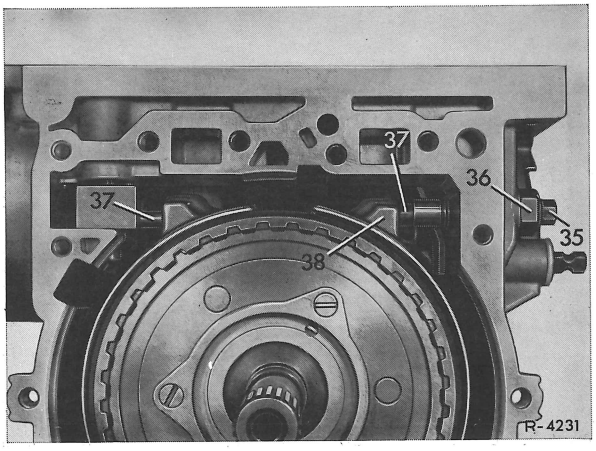



Fig. 37
35 Adjusting screw B 3
36 Counter nut
37 Thrust pins
38 Brake band B 3

**56** Turn transmission with assembly fixture in such a manner that **input shaft** faces upwards.

**57** Support gear assembly at front with assembly flange (61) of assembly stand (Fig. 38).

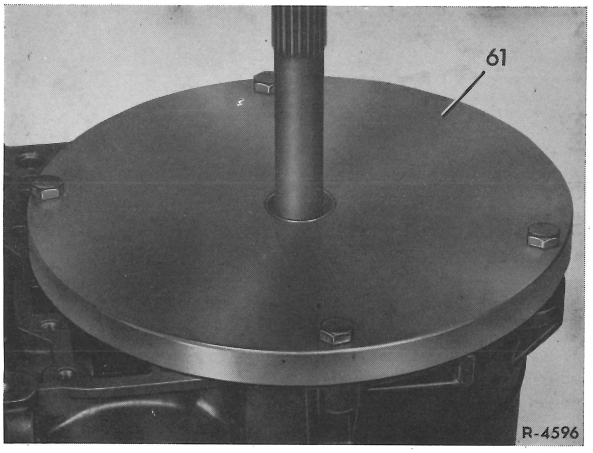



Fig. 38
61 Assembly flange

**58** Rotate transmission with assembly fixture in such a manner that **output shaft** faces upwards.

**59** Place parking lock gear (18) (Fig. 40) in output shaft. Place spreading spring (63) on bearing pin (64), attach to housing (arrow) and tension (Fig. 39).

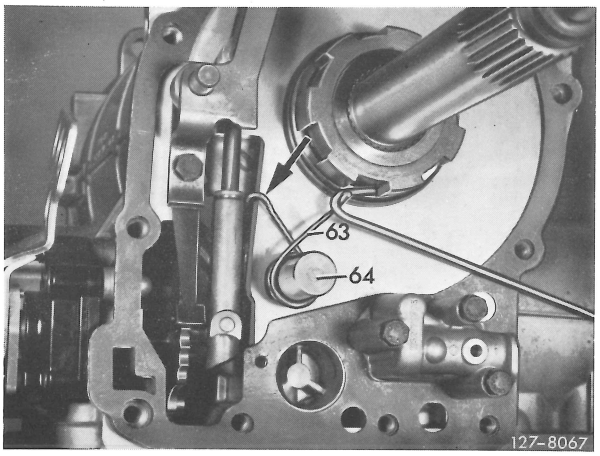



Fig. 39
63 Spreading spring
64 Bearing pin

**60** Attach parking lock pawl (19), centrifugal governor (17), eccentric ring for secondary pump (16), worm gear for tachometer drive (15) and plate spring (85) on output shaft (Fig. 40).

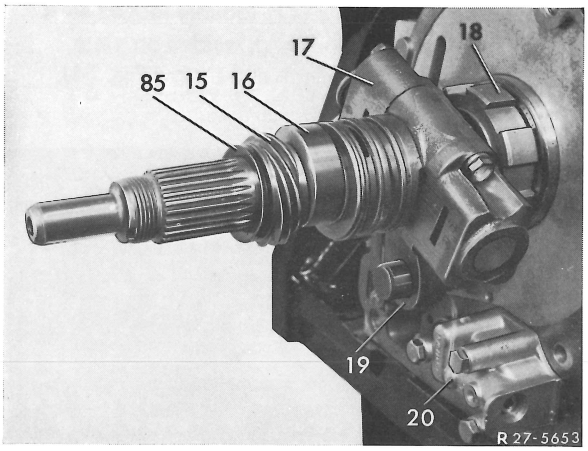



Fig. 40
15 Worm gear tachometer drive
16 Eccentric ring secondary pump
17 Centrifugal governor
18 Parking lock gear
19 Parking lock pawl
20 Modulating pressure housing
85 Plate spring

**61** Assembly of rear transmission housing (27.1–560).

**62** Check function of parking lock.

**63** Insert pressure receiving piston (23) with two springs (82) and spring cup (83) into rear transmission housing (Fig. 41).

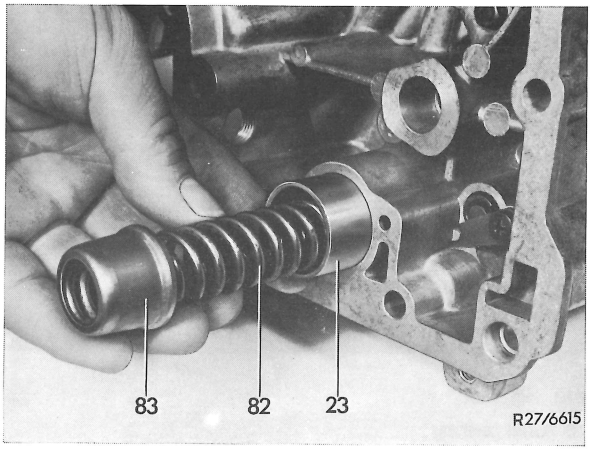



Fig. 41
23 Pressure receiving piston
82 Pressure receiving springs
83 Spring cup

**64** Push delivery piston for secondary pump outwards and mount transmission housing.

**65** Screw-in fastening bolts of rear transmission housing and tighten to 13 Nm (1.3 kpm).

**66** Screw-in plug for secondary pump (13) and compression spring (14) (Fig. 42).

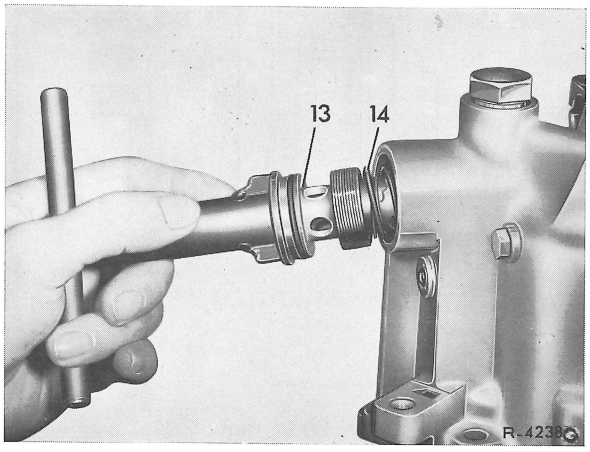



Fig. 42

13 Plug secondary pump
14 Compression spring

**67** Screw measuring device (62) into housing and tighten slightly. Insert thrust pin (12) and push in up to stop (Fig. 43). Thrust pin should be flush with face of measuring device. For this reason, thrust pins of three different lengths are available and color-coded.

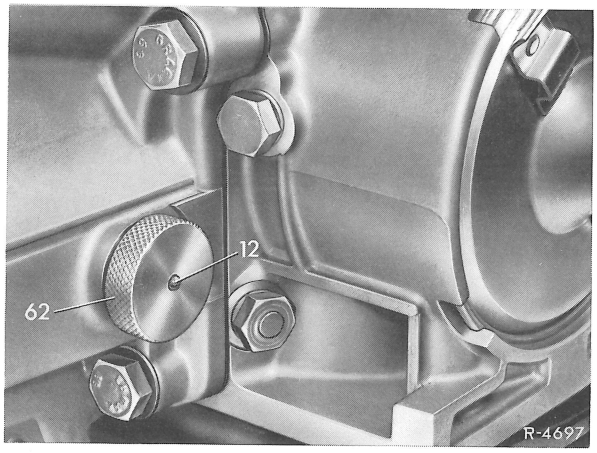



Fig. 43

12 Thrust pin
62 Measuring device

**68** Glue thrust pin determined by measuring into vacuum box using Omnifit-Rapid Red M.

Coat vacuum box (10) on threads with sealing compound and screw into rear transmission housing (Fig. 44).

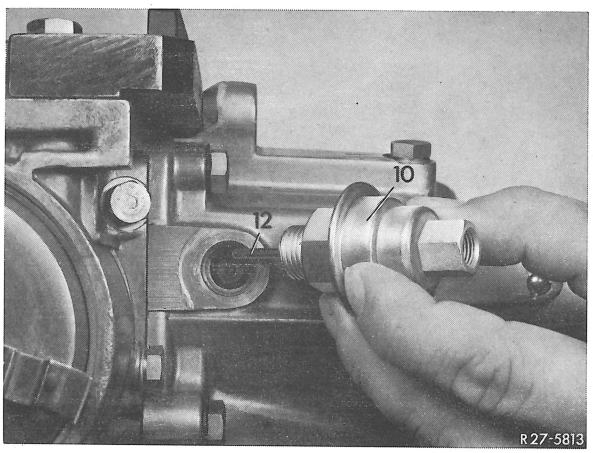



Fig. 44

10 Vacuum box
12 Thrust pin

**69** Place three-legged flange on output shaft and tighten slotted nut to 120 Nm (12.0 kpm), secure slotted nut.

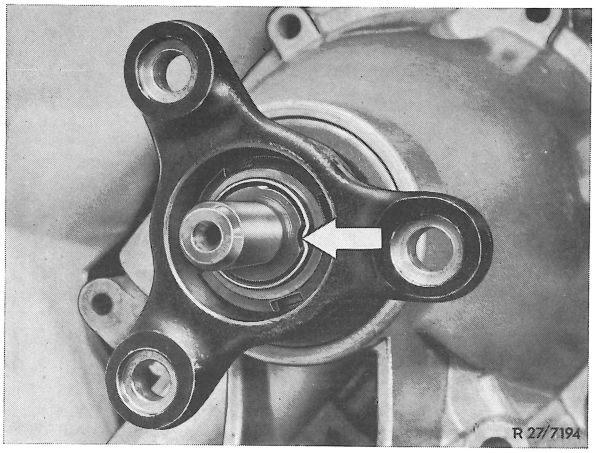



Fig. 45

**70** Turn transmission on assembly fixture in such a manner that the input shaft is facing upwards, remove assembly flange.

**71** Measure end play of gear assembly by placing measuring bridge on transmission housing and determining dimension "A" with depth gauge (Fig. 46).

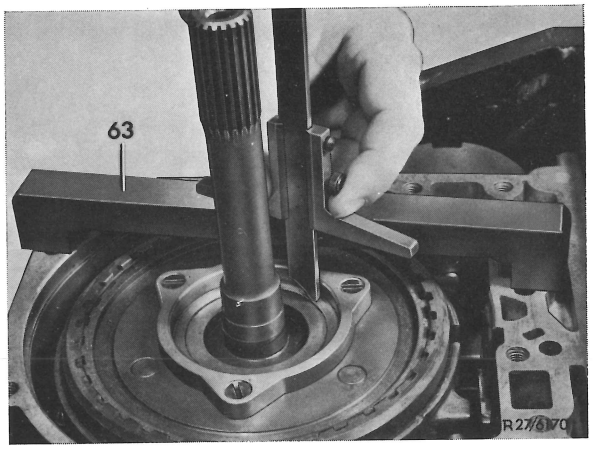



Fig. 46

**72** Place new gasket on front transmission housing and determine dimension "B" (Fig. 47).

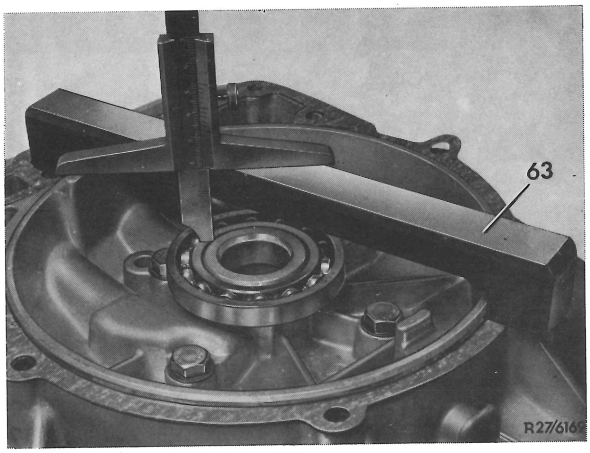



Fig. 47

The difference of dimensions A and B provides play "C" of gear assembly (Fig. 48).

Starting point for computations is the thickness of 30 mm of the measuring bridge.

End play dimension "C" results from the following computation:

1. 30 mm minus determined dimension "A".
2. Determined dimension "B" minus 30 mm.
3. The difference between the values determined according to item 1 and 2 provides dimension "C".

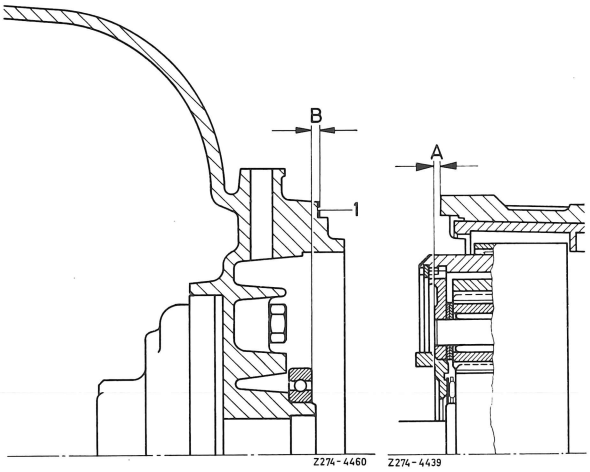



Fig. 48
1 Gasket

**Example:**

| | | | |
|---|---|---|---|
| Measuring bridge | = | 30.0 | mm |
| Dimension "A" | = | 27.6 | mm |
| | | 2.4 | mm |

| | | | |
|---|---|---|---|
| Dimension "B" | = | 32.9 | mm |
| Measuring bridge | = | 30.0 | mm |
| | | 2.9 | mm |

Dimension "C" = 2.9 – 2.4 = 0.5 mm

**73** Adjust dimension "C" to its value of 0.4 + 0.1 mm by adding compensating washers to supporting flange (Fig. 48).

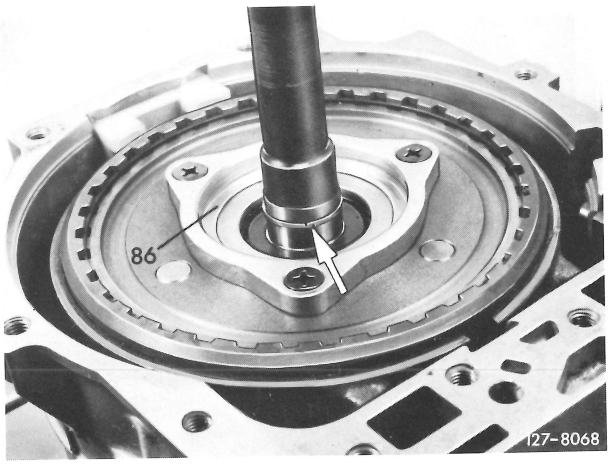



Fig. 48
86 Compensating washer

**74** Center gasket when mounting front transmission cover. Align piston ring on input shaft in such a manner that the joint is in alignment with groove (arrow Fig. 48).

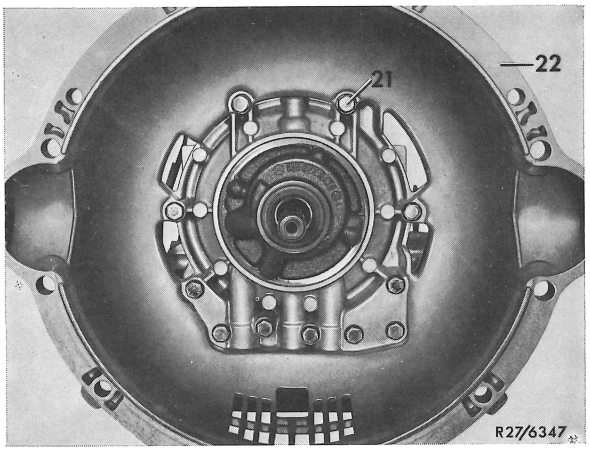



Fig. 49
21 Fastening bolts
22 Front transmission housing

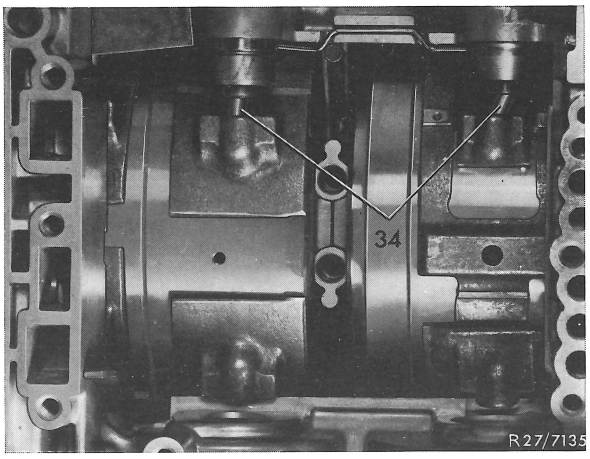



Fig. 50
34 Thrust pins

**75** Mount front transmission housing (22) using new gasket. Screw-in fastening bolts and tighten to 13 Nm (1.3 kpm) (Fig. 49).

**Note:** Coat threads of lower seven bolts lightly with sealing compound.

**76** Insert the two thrust pins (34) on opposite end of brake band piston (Fig. 50).

**77** Check oil sealing ring and bypass valve for brake band piston B 2 by sight for wear.

**Caution!** Install brake band piston covers identified with letters "Front" (refer to arrow Fig. 51) in such a manner that the safety clips (96) are accurately horizontal and the letters are facing the front transmission cover (Fig. 51).

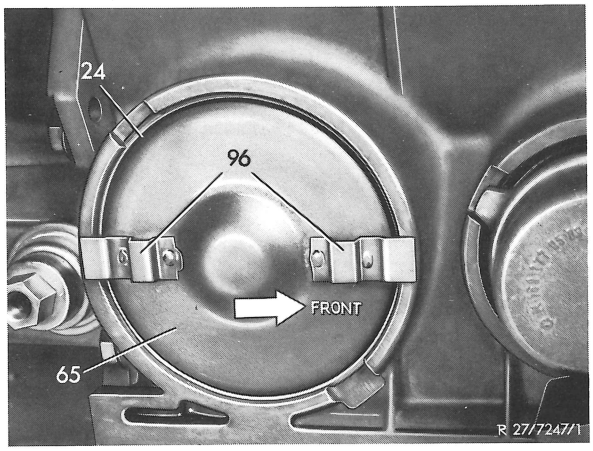



Fig. 51
24 Circlip
96 Locking clips
65 Brake band piston cover B 2

**78** Introduce brake band piston B 2 (67) with introducing ring (66) into transmission housing and watch out for correct seat of thrust pin in bore of brake band B 2 (Fig. 52).

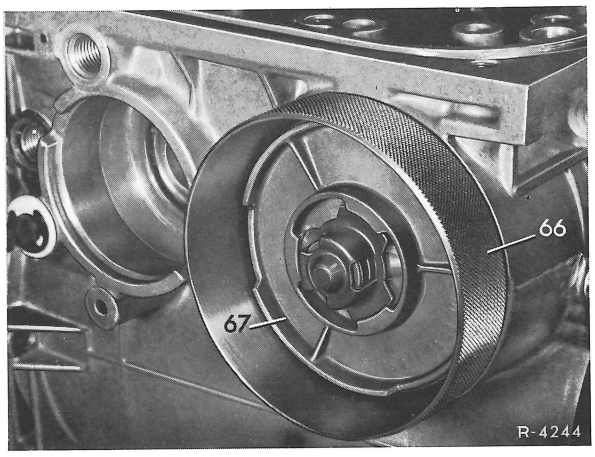



Fig. 52
66 Introducing ring
67 Brake band piston B 2

**79** Insert brake band piston cover B 2 (65) with a new O-ring and secure with circlip (24) (Fig. 51).

**80** Replace O-ring (87) and lip sealing ring (88) of supplementary piston B 1 (89) and insert with introducing ring into brake band piston cover B 1 (29). Replace lip sealing ring (90) and O-ring (91) of cover (92). Place cover on supplementary piston and secure with locking ring (93).

Replace O-ring (32) of brake band piston cover B 1 (Fig. 53).

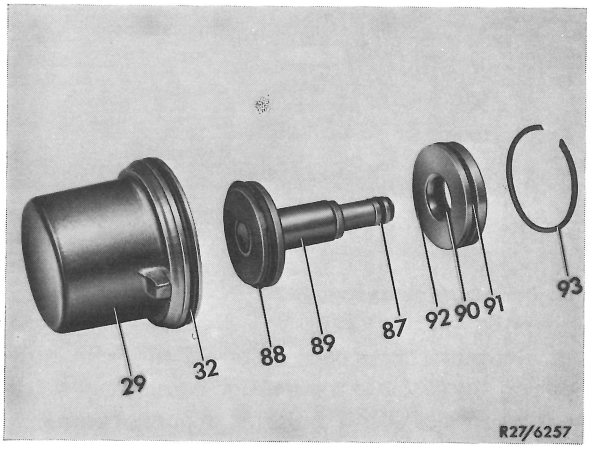



Fig. 53

29 Brake band piston cover B 1
32 O-ring
87 O-ring
88 Lip sealing ring
89 Supplementary piston B 1
90 Lip sealing ring
91 O-ring
92 Cover
93 Locking ring

**81** Replace lip sealing ring (33) of brake band piston B 1 (30). Attach supplementary piston and brake band piston B 1 to each other. Slide compression springs (31) on brake band piston (Fig. 54).

**82** Position assembly fixture with brake band piston B 1 and screw down. Introduce brake band piston cover B 1 (29) with assembly fixture and secure with locking ring (27) (Fig. 54).

**83** Remove assembly fixture for brake band piston B 1.

**84** Measure idle travel of brake band pistons B 1 and B 2, bymoving brake band piston B 2 with compressed air over bore for lifting pressure (69) into lifting position and determine dimension „b". Then move brake band piston with compressed air over bore for shifting pressure B 2 (70) into shifting position and determine again dimension „b". The difference of the two measurements provides idle travel „L".

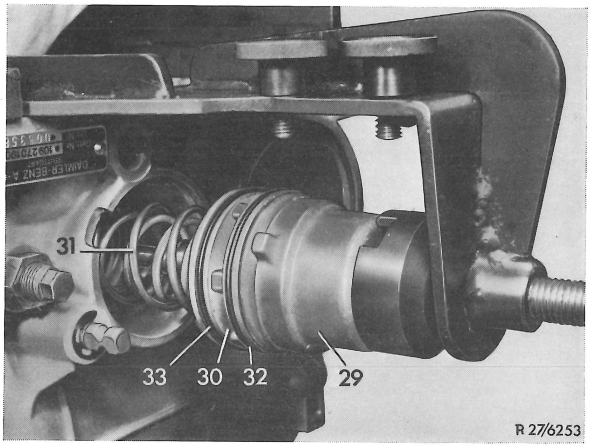



Fig. 54

29 Brake band piston cover B 1
30 Brake band piston B 1
31 Compression springs
32 O-ring
33 Lip sealing ring

The compression spring keeps the brake band piston B 1 in lifting position. Determine dimension „a" in this position. Then move brake band piston with compressed air via the bore for shift pressure B 1 (71) into shifting position (Fig. 54), while again determining dimension „a". The difference of the two measurements provides the idle travel „L".

The idle travel „L" of brake band pistons B 1 and B 2 should be 3.0—4.0 mm. The thrust pins have different lengths of 22, 23, 24, 25, 26, 27, 28 mm.

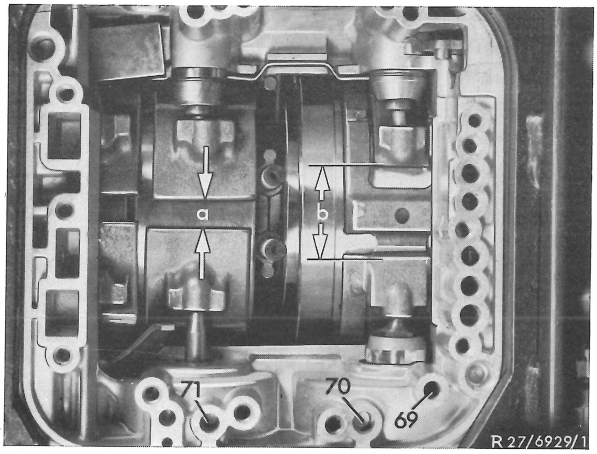



Fig. 55

69 Lifting pressure B 2
70 Shift pressure B 2
71 Shift pressure B 1

When the idle travel „L" is too large, install a longer thrust pin (34), when „L" is toosmall, install a shorter thrust pin.

**85** Tighten adjusting screw (35) for brake band B 3 to 5 Nm (0.5 kpm) and then loosen by 1 3/4 turns. Secure adjusting screw with counternut (36) (Fig. 56).

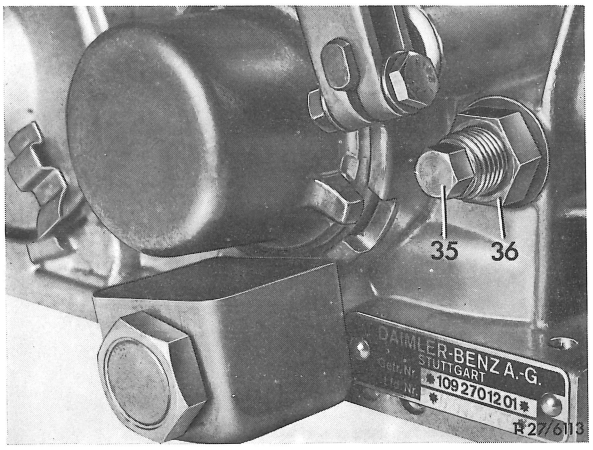



Fig. 56
35 Adjusting screw
36 Counter nut

**86** Insert both plug pipes (8) with new sealing bushings (9) (Fig. 57).

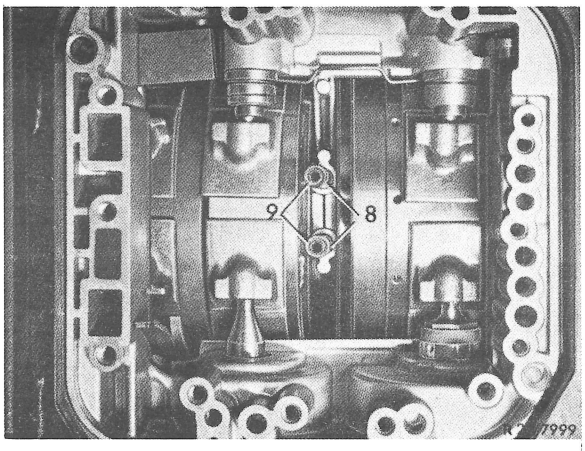



Fig. 57
8 Plug pipe
9 Sealing bushings

**87** Move range selector lever between position „P" and „R". Insert locating pin for control pressure valve (72) into shift valve housing and screw guide pin (73) into transmission housing (Fig. 58).

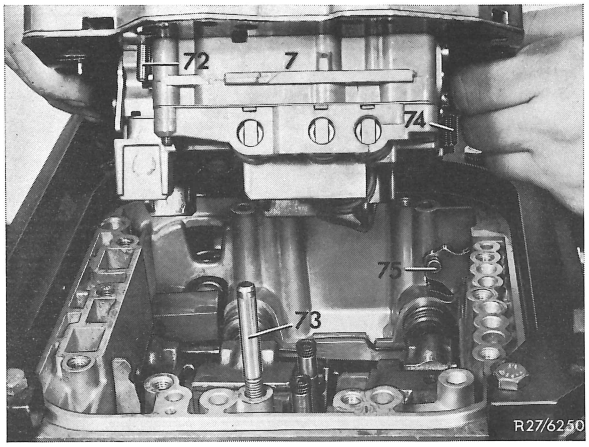



Fig. 58
7 Shift valve housing
72 Locating pin control pressure
73 Guide pin
74 Range selector valve
75 Range selector lever

**88** Introduce shift valve housing carefully into transmission housing, making particularly sure that the range selector valve (74) enters the range selector lever (75) (Fig. 58).

**89** Unscrew guide pin (73). Screw-in fastening bolts (6) with spring washers and tighten to 13 Nm (1.3 kpm) (Fig. 59).

**Caution!** Watch out for varying length of fastening bolts.

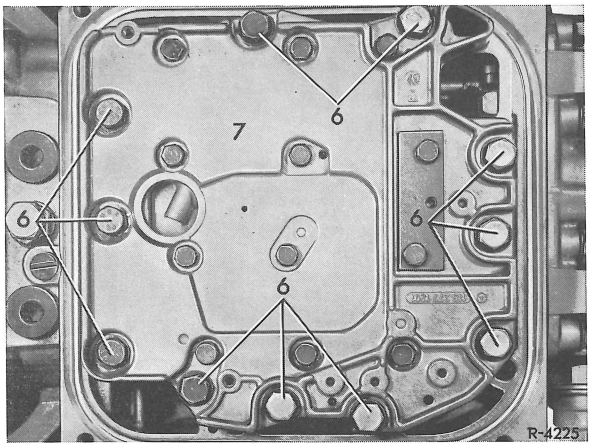



Fig. 59
6 Fastening bolts
7 Shift valve housing

**90** Pull out locating pin (72) for control pressure valve.

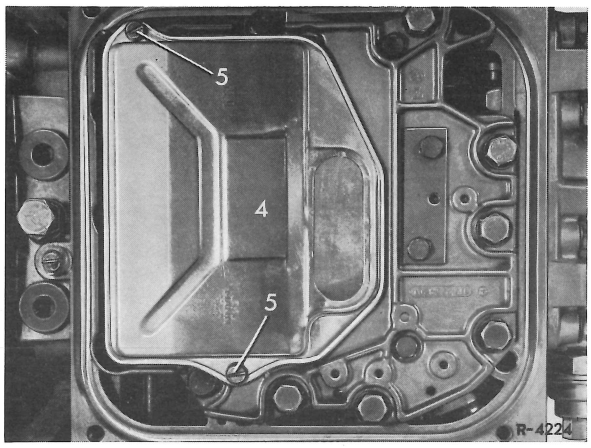



Fig. 60
4 Oil filter
5 Fastening bolts

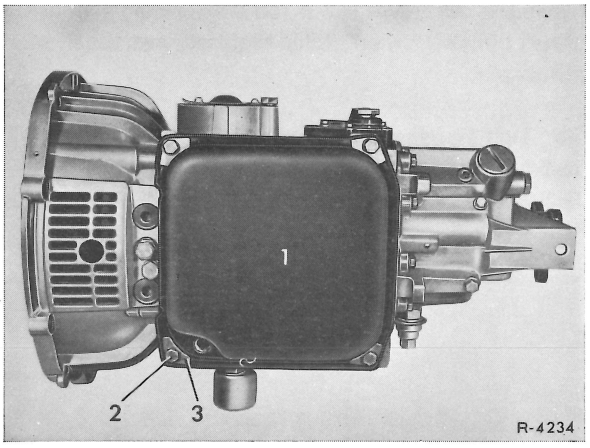



Fig. 61
1 Oil pan
2 Fastening bolts
3 Shims

**91** Mount oil filter (4), screw-in fastening bolts (5) and tighten to 4 Nm (0.4 kpm) (Fig. 60).

**92** Remove transmission from assembly stand.

**93** Attach oil pan (1) with new gasket, screw-in fastening bolts (2) with shims (3) and tighten to 7 Nm (0.7 kpm) (Fig. 61).

**94** Screw-on control pressure lever.

**95** Screw-in solenoid valve with new O-ring and sealing ring and tighten to 30 Nm (3.0 kpm).

K 4 A 040

**Adjusting Data**

| | |
|---|---|
| End play of sun gear, rear planetary gear set | 0.25 + 0.1 |
| End play of ring gear | 0.2 + 0.1 |
| End play of sun gear, center planetary gear set | 0.2 + 0.1 |
| **Tightening Torque in kpm** | |
| Countersunk screws on supporting flange gear assembly | 0.7 |
| **Special Tools** | |
| Assembly fixture | 112 589 07 59 00 |
| Pulling fixture for ball bearing | 000 589 98 33 00 |
| Assembly mandrel | 198 589 03 39 00 |

## Disassembly

**1** Remove output shaft (18) together with rear planetary gear carrier (Fig. 1).

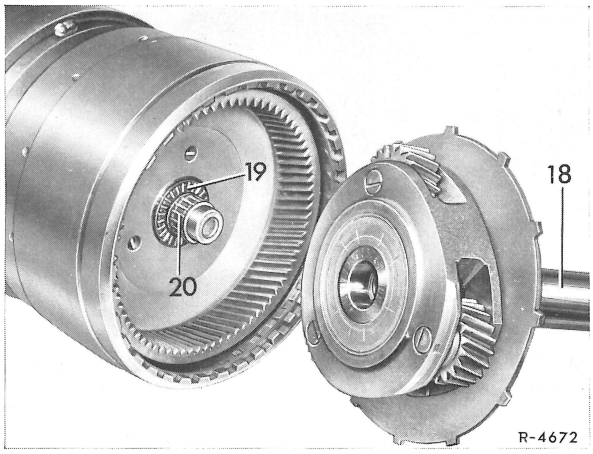



Fig. 1

18 Output shaft
19 Axial bearing
20 Radial bearing

**2** Remove radial bearing (20) and axial bearing (19).

**3** Place gear assembly with input shaft (3) in upward position on assembly fixture 112 589 07 59 00 (Fig. 2).

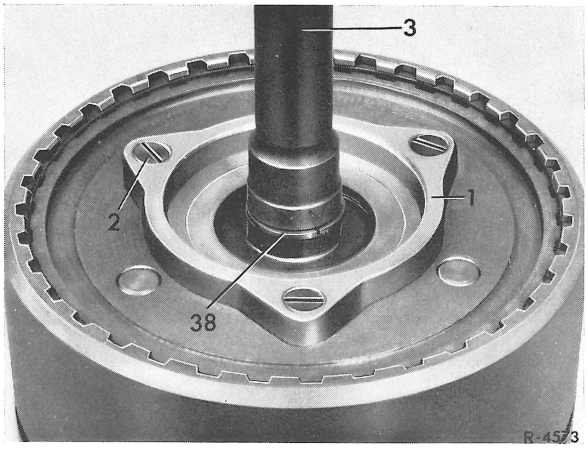



Fig. 2

1 Supporting flange
2 Countersunk screw
3 Input shaft
38 Lube pressure ring

**4** Remove supporting flange (1) after loosening the three countersunk screws (2) (Fig. 2).

**5** Pull out input shaft (3) with sun gear (4) of front planetary gear set (Fig. 3).

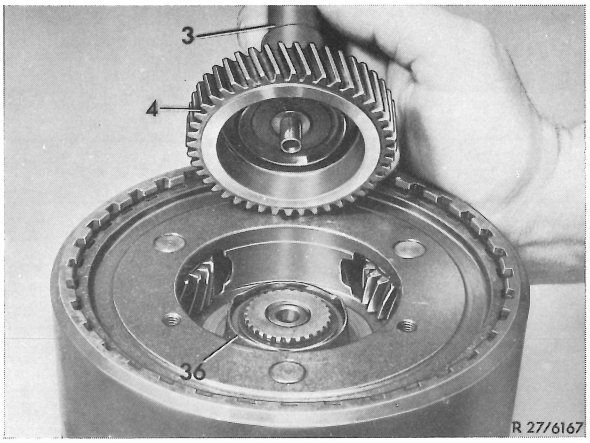



Fig. 3

3 Input shaft
4 Planetary gear
36 Thrust washer

**6** Remove locking ring intermediate shaft (5) and circlip gear assembly (6) (Fig. 4).

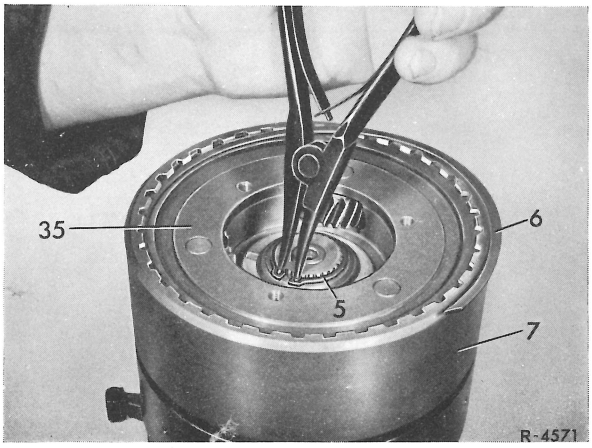



Fig. 4

5 Locking ring intermediate shaft
6 Circlip gear assembly
7 Brake band drum B 3
35 Planetary gear carrier front planetary gear seat

**7** Lift off brake band drum B 3 (7) together with front and center planetary gear set (Fig. 5).

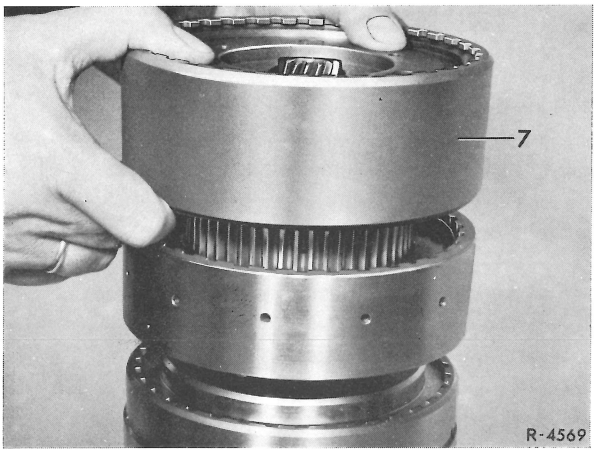



Fig. 5

7 Brake band drum B 3

**8** Remove brake band drum B 3 from gear sets (Fig. 6).

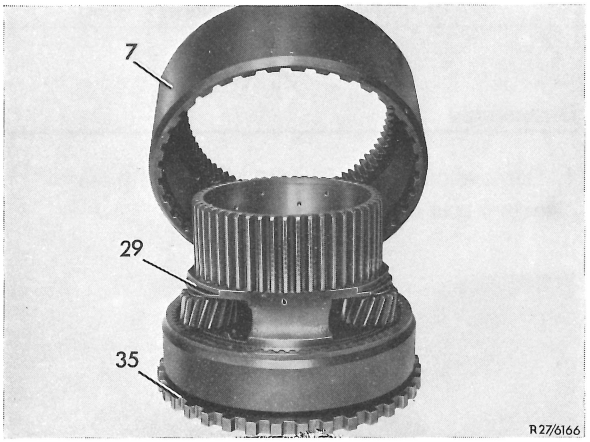



Fig. 6

7 Brake band drum B 3
29 Planetary gear carrier center planetary gear seat
35 Planetary gear carrier front planetary gear set

**9** Lift off planetary gear for center planetary gear set (8) and brake band drum B 1 (9) (Fig. 7).

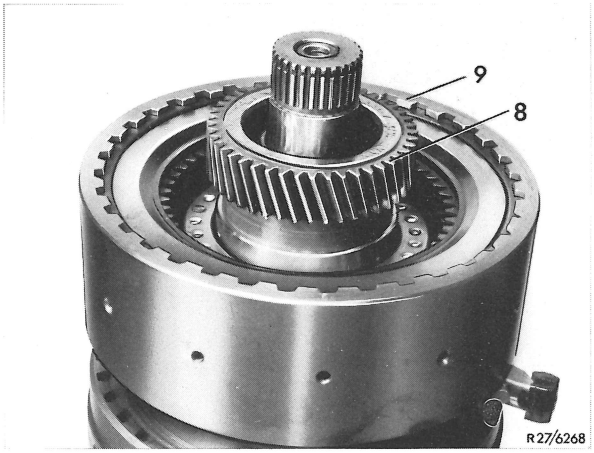



Fig. 7

8 Sun gear of center gear seat
9 Brake band drum B 1

**10** Pull off spacer bushing (50) together with oil feed sleeve (11). Remove brake band drum B 2 (12) together with plate clutch K 2 (Fig. 8).

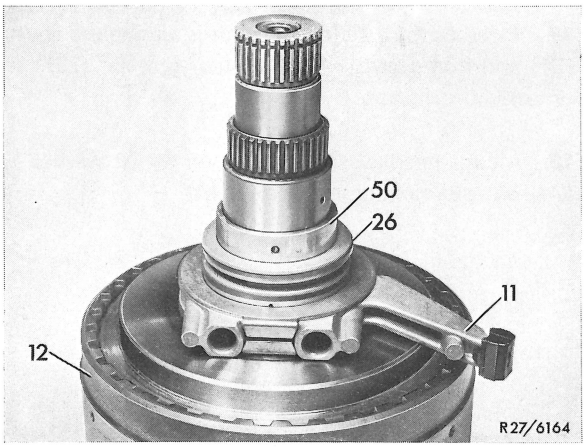



Fig. 8

11 Oil feed sleeve
12 Brake band drum B 2
26 Oil sealing rings
50 Spacer

**11** Remove hollow shaft (13) with inner plate carrier K 2 (14) and free-rolling clutch (15) from intermediate shaft (21) (Fig. 9).

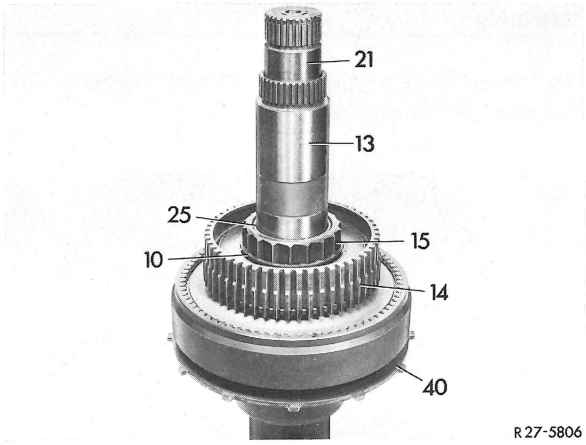



Fig. 9

10 Circlip
13 Hollow shaft
14 Inner plate carrier K 2
15 Free-rolling clutch
21 Intermediate shaft
25 Needle bearing
40 Sun gear rear gear assembly

**12** Pull radial ball bearing (16) with puller (17) from output shaft (18) (Fig. 10).

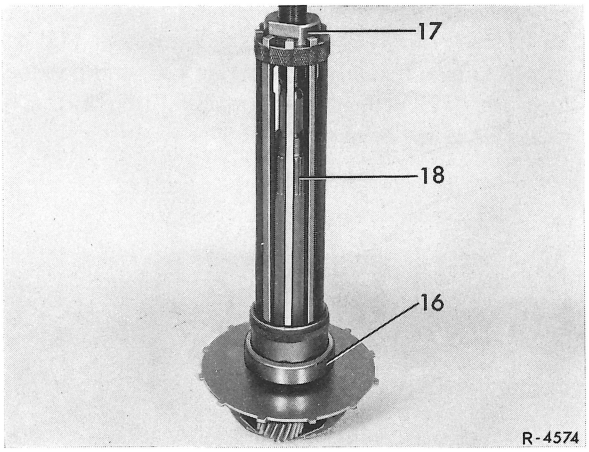



Fig. 10

16 Radial ball bearing
17 Puller 000 589 98 33 00
18 Output shaft

**13** Remove sun gear and needle bearing.

# 27.1 Disassembly, Reassembly and Measuring of Gear Assembly

## Assembly

**14** Insert axial bearing (46) and split needle bearing (39) with grease (Fig. 11).

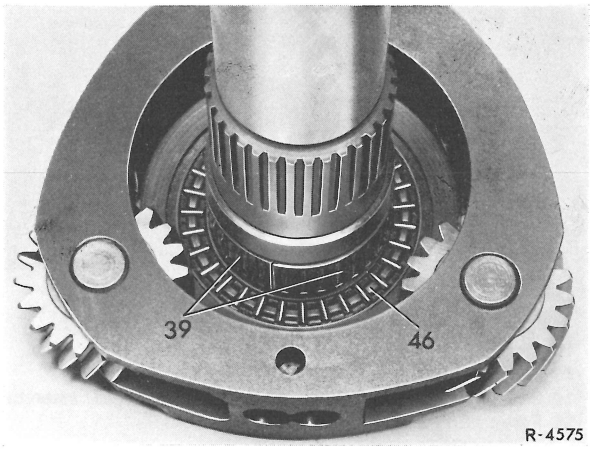



Fig. 11

39 Needle bearing
46 Axial bearing

**15** Insert sun gear (40) with thrust washer (41) as shown, press on radial ball bearing (16) and parking lock gear (42) with assembly mandrel (Fig. 12). (The clearance is self-adjusting).

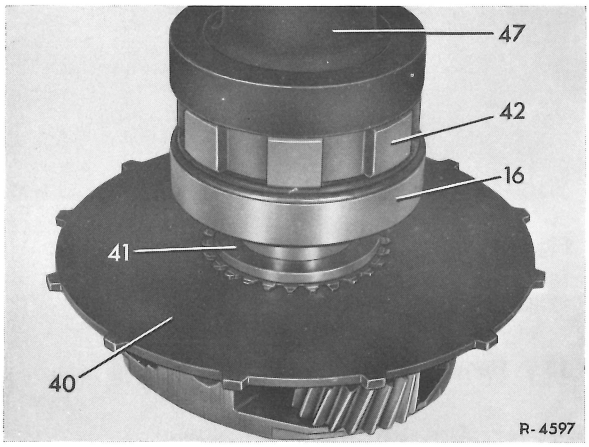



Fig. 12

16 Radial ball bearing
40 Sun gear behind gear assembly
41 Thrust washer
42 Parking lock gear
47 Assembly mandrel 198 589 03 39

**16** Set axial (19) and radial bearing (20) with some grease into intermediate shaft and attach output shaft (18) (Fig. 13).

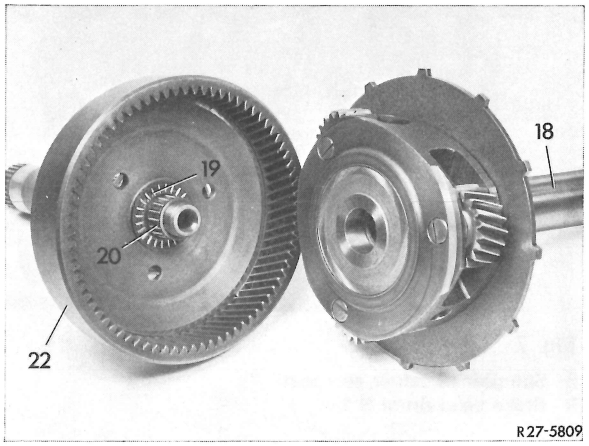



Fig. 13

18 Output shaft
19 Axial bearing
20 Radial bearing
22 Ring gear of rear planetary gear carrier

**17** Place output shaft (18) with intermediate shaft (21) and ring gear of rear planetary gear set (22) on assembly fixture (Fig. 14).

**18** Mount needle bearing (23) and thrust washer (24) on intermediate shaft (Fig. 14).

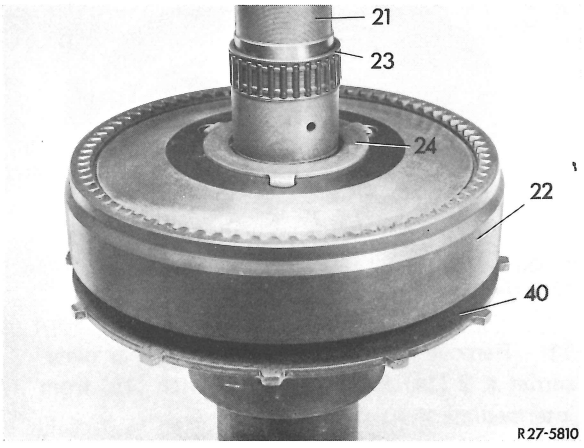



Fig. 14

21 Intermediate shaft
22 Ring gear of rear gear assembly
23 Needle bearing
24 Thrust washer
40 Sun gear of rear gear assembly

**19** Introduce hollow shaft (13) with free rolling clutch into brake band B 2 (12) watching out for correct engagement of clutch plates (Fig. 15).

**20** Place hollow shaft with brake band drum B 2 on intermediate shaft and introduce needle bearing (25) into free-rolling clutch (Fig. 15).

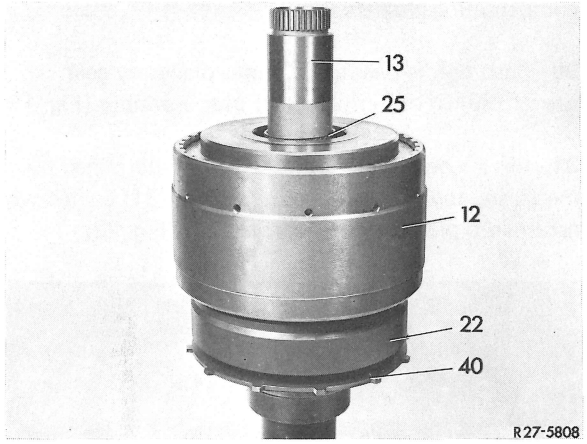



Fig. 15

12 Brake band drum B 2
13 Hollow shaft
22 Ring gear of rear gear assembly
25 Needle bearing
40 Sun gear of rear gear assembly

**21** Check oil sealing rings (26) on oil feed sleeve.

**22** Insert oil feed sleeve (11) into brake band drum B 2(12). Push oil feed sleeve completely down, so that both oil sealing rings will enter the supporting flange K 2, then attach spacer bushing (50) (Fig. 16).

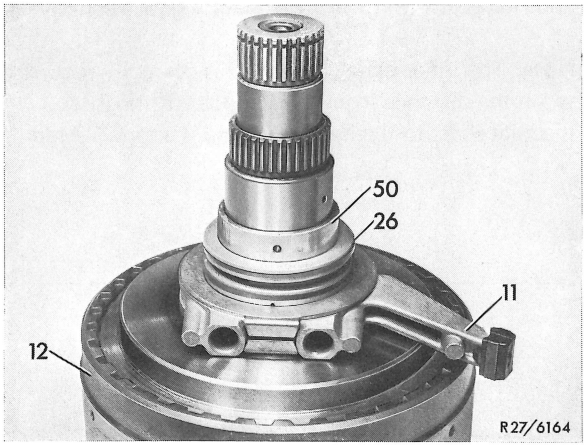



Fig. 16

11 Oil feed bushing
12 Brake band drum B 2
26 Oil sealing rings
50 Spacer bushing

**23** Position brake band drum B 1 (9) with plate clutch K 1.

**24** Attach needle bearing (27) to hollow shaft (13). Insert sun gear of center gear assembly into teeth of brake band drum B 1 (Fig. 17).

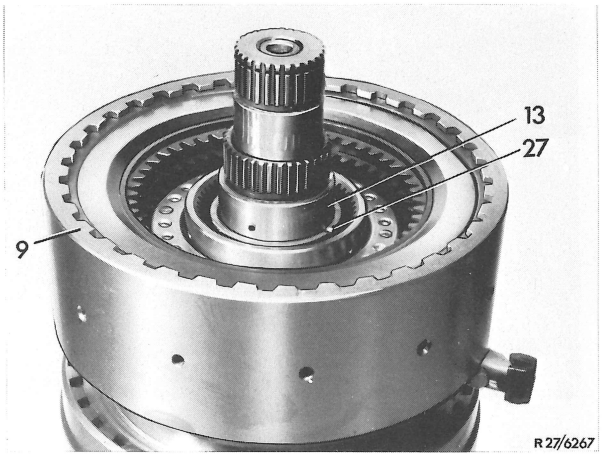



Fig. 17

9 Brake band drum B 1
13 Hollow shaft
27 Needle bearing

**25** Determine dimension "a" from inner plate carrier K 1 (32) to thrust washer (31) by means of depth gauge (Fig. 18).

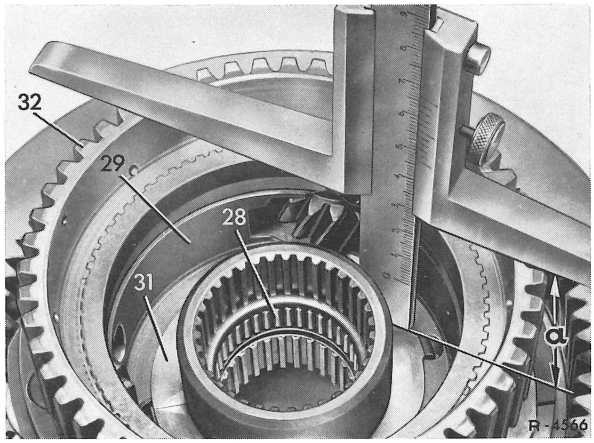



Fig. 18

28 Needle bearing
29 Planetary gear carrier of center planetary gear assembly
31 Thrust washer
32 Inner plate carrier K 1

**26** Determine dimension "b" from inner plate carrier K 1 (32) to recess (44) with depth gauge (Fig. 19).

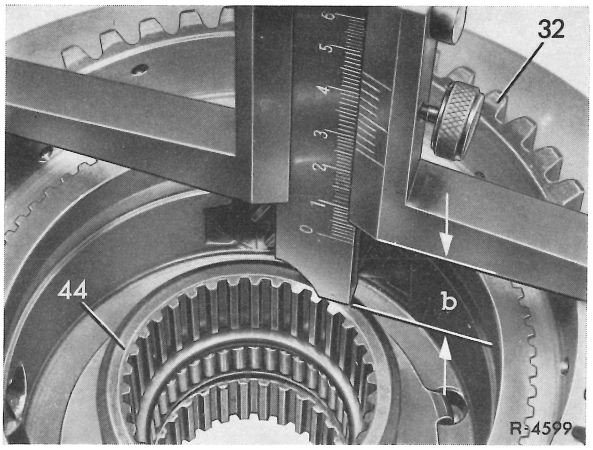



Fig. 19
32 Inner plate carrier K 1
44 Shoulder

**27** Determine dimension "d" from thrust surface of sun gear to shoulder of hollow shaft (43) with depth gauge (Fig. 20 and 21).

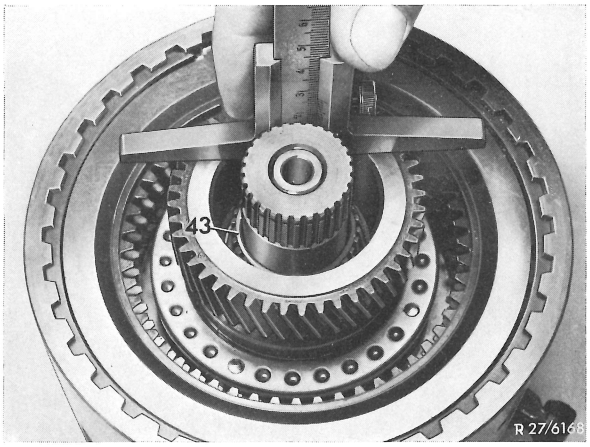



Fig. 20
43 Shoulder of hollow shaft

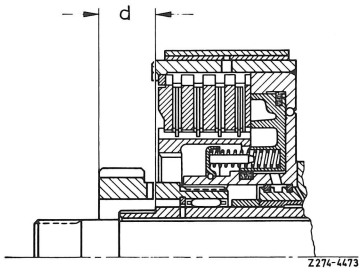



Fig. 21

**28** The play results from the dimensions a—b = "c" and c—d = "S".

**29** The play is adjusted to 0.2—0.3 mm by adding compensating washers.

**30** Push needle bearing (28) into planetary gear carrier (29) of center planetary gear assembly (Fig. 18).

**31** Insert compensating washer (30) determined by measuring together with thrust washer (31) coated with grease into planetary gear carrier (29) (Fig. 22).

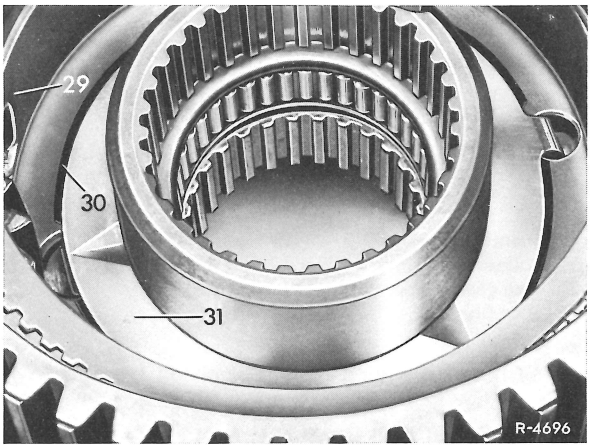



Fig. 22
29 Planetary gear carrier of center planetary gear assembly
30 Compensating washer
31 Thrust washer

**32** Insert planetary gear carrier of center planetary gear assembly (29) with inner plate carrier K 1 (32) and ring gear (45) of front planetary gear assembly.

**Note:** The inner plate carrier K 1 is correctly mounted when the distance from the shoulder of the intermediate shaft to the needle bearing is approx. 2 mm.

**33** Determine dimension "a" with depth gauge (Fig. 23). (From top edge of intermediate shaft to shoulder of intermediate shaft).

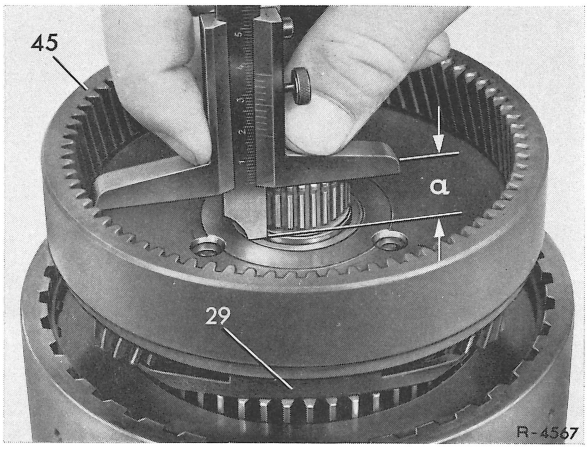



Fig. 23

29 Planetary gear carrier of center planetary gear
45 Ring gear of front planetary gear assembly

**34** Determine dimension "b" with depth gauge (Fig. 24). (From top edge of intermediate shaft to thrust washer).

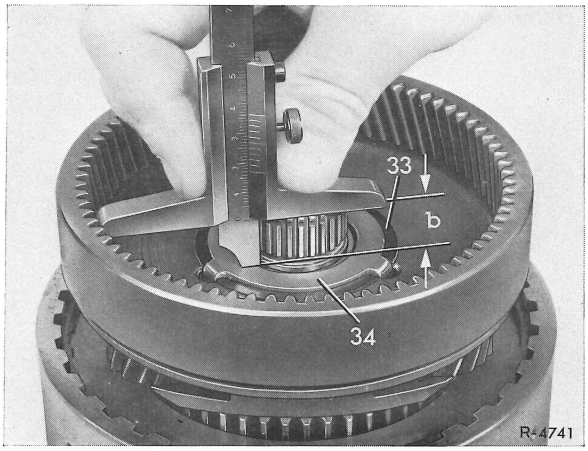



Fig. 24

33 Compensating washer
34 Thrust washer

**35** The play results from the dimension b—a = "S".

**36** Adjust play to its value of 0.2 to 0.3 mm by adding compensating washers.

**37** Insert measured compensating washers (33) and thrust washer (34) coated with grease (Fig. 24).

**38** Lift off planetary gear carrier of center gear assembly (29), put back brake band drum B 3 (7) with planetary gear carrier of center gear assembly (29).

**39** Introduce planetary gear carrier (35) of front planetary gear assembly and secure intermediate shaft (5) with locking ring (Fig. 25).

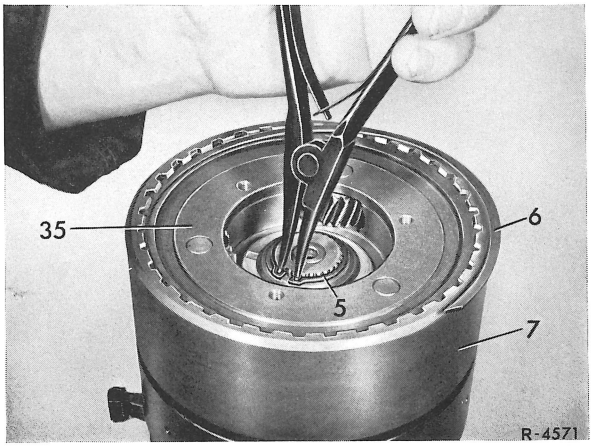



Fig. 25

5 Circlip
6 Circlip for gear assembly
7 Brake band drum B 3
35 Planetary gear carrier of front planetary gear assembly

**40** Push brake band drum B 3 (7) in upward direction and secure gear assembly (6)with circlip (Fig. 25).

**41** Insert thrust washer (36) and input shaft (3) together with sun gear (Fig. 26). (The play is self-adjusting).

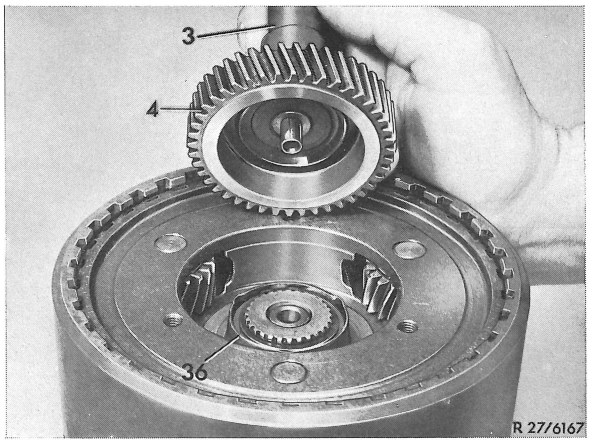



Fig. 26

3 Input shaft
4 Sun gear
36 Thrust washer

**42** Place needle bearing (51) on sun gear of front planetary gear set (Fig. 27).

**43** Position supporting flange (1) and thrust washer (37) (Fig. 27) and coat the 3 fastening bolts (2) at the three front threads with Loctite hydraulic sealer and tighten to 0.7 kpm (Fig. 28).

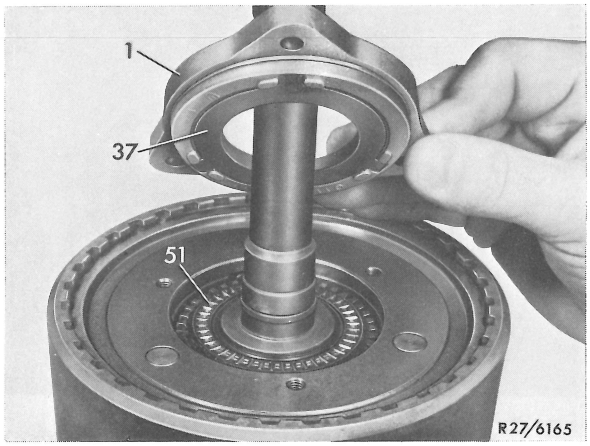



Fig. 27

1 Supporting flange
37 Thrust washer
51 Needle bearing

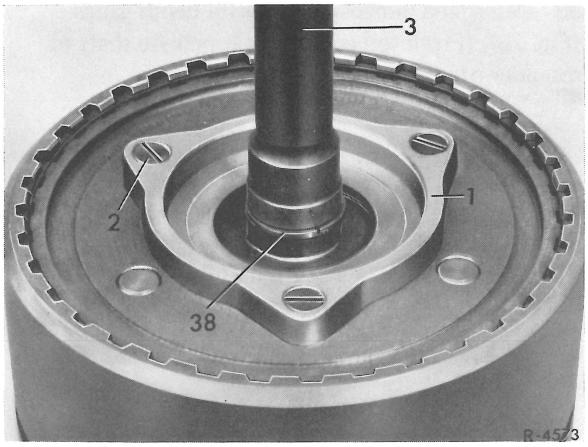



Fig. 28

1 Supporting flange
2 Fastening bolts
3 Input shaft
28 Lube pressure ring

**44** Insert lube pressure ring (38) into groove and attach (Fig. 28).

**45** Remove gear assembly from assembly fixture.

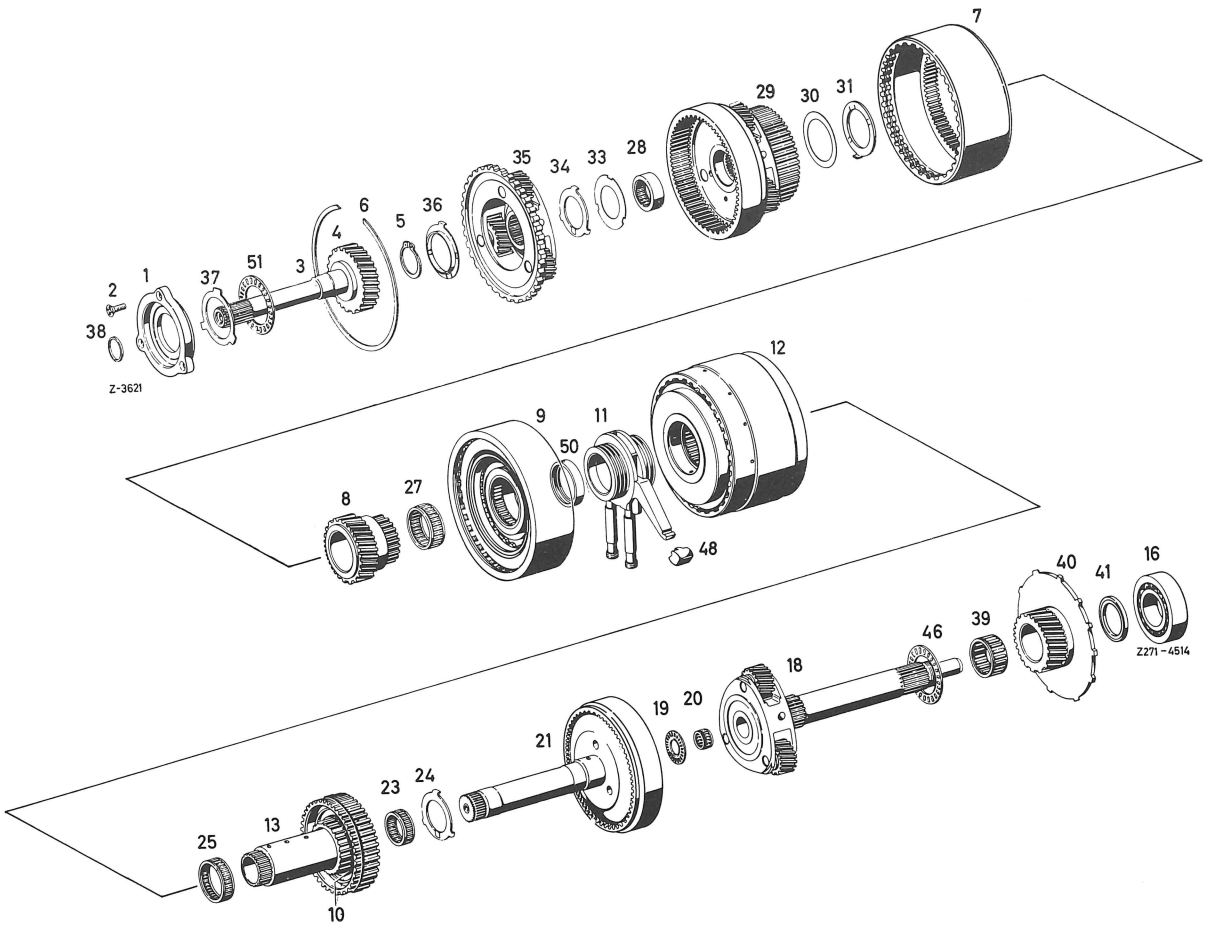



Fig. 29

1 Supporting flange
2 Countersunk screws
3 Input shaft
4 Sun gear
5 Circlip intermediate shaft
6 Circlip gear assembly
7 Brake band drum B 3
8 Sun gear center gear assembly
9 Brake band drum B 1 with K 1
10 Circlip free-rolling clutch
11 Oil feed sleeve
12 Brake band drum B 2 with K 2
13 Hollow shaft
16 Radial ball bearing
18 Output shaft
19 Axial bearing
20 Radial bearing
21 Intermediate shaft
23 Needle bearing intermediate shaft
24 Thrust washer
25 Needle bearing intermediate shaft
27 Needle bearing sun gear
28 Needle bearing planetary gear carrier
29 Planetary gear carrier center gear assembly
30 Compensating washer
31 Thrust washer
33 Compensating washer
34 Thrust washer
35 Planetary gear carrier of front gear assembly
36 Thrust washer
37 Thrust washer
38 Lube pressure ring
39 Split needle bearing
40 Sun gear rear gear assembly
41 Thrust washer
46 Axial bearing
48 Rubber cap
50 Spacer bushing
51 Axial bearing