Chapter 3. Power train

Clutch

The design of the clutch is shown on fig. 3-1. The clutch release fork 11 (fig. 3-1) can be of two types: with a leaf or wire spring.

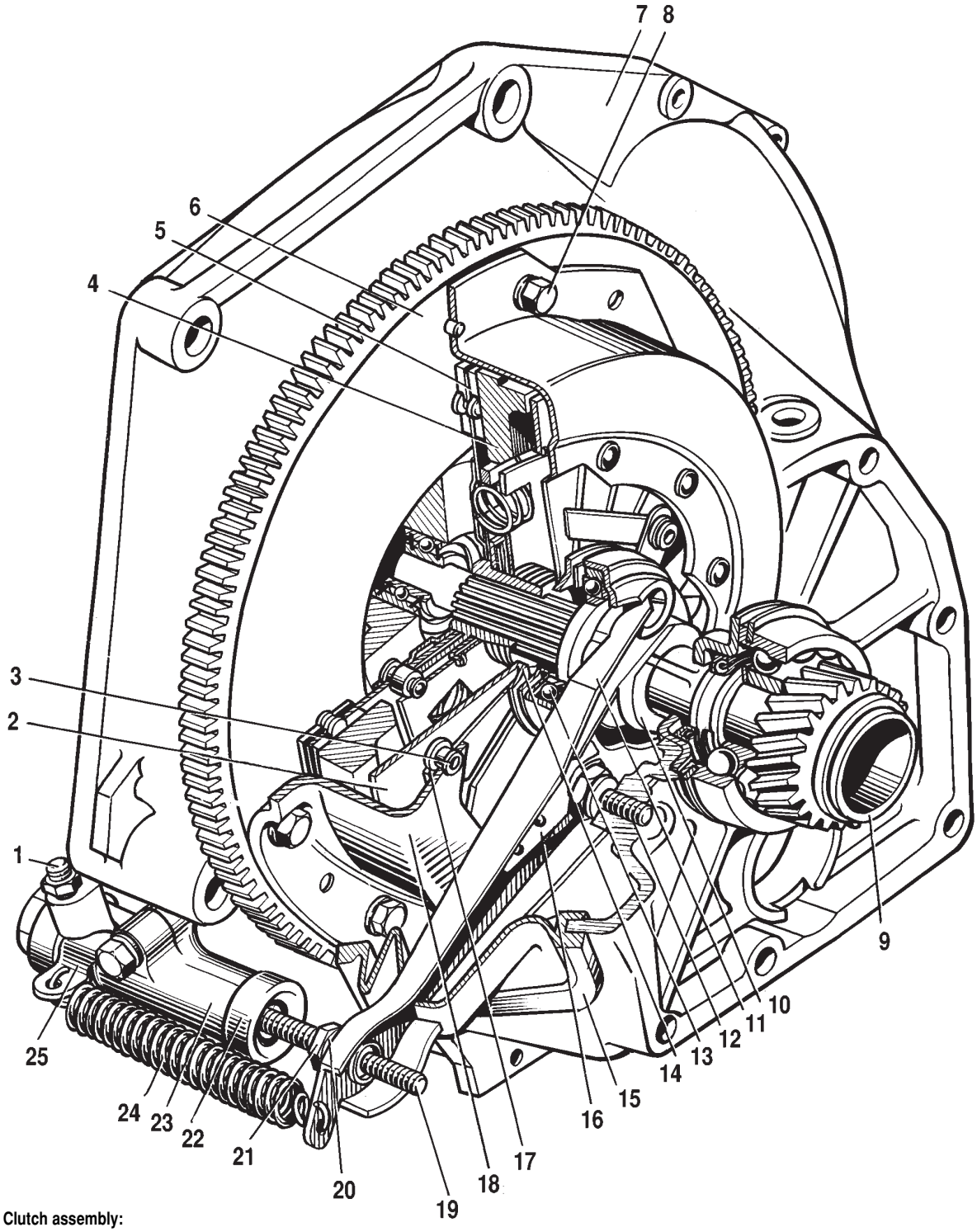

Fig. 3-1. Clutch assembly:

1 - bleeder; 2 - central diaphragm spring; 3 - diaphragm spring rivet; 4 - pressure plate; 5 - clutch disc; 6 - flywheel; 7 - clutch bellhousing; 8 - bellhousing-to-flywheel bolt; 9 - gearbox input shaft; 10 - clutch release bearing assembly; 11 - clutch release fork; 12 - release fork ball socket; 13 - clutch release bearing; 14 - pressure plate thrust flange; 15 - clutch release fork boot; 16 - clutch release fork spring; 17 - pressure plate fulcrum ring; 18 - clutch cover; 19 - clutch release fork pushrod; 20 - adjusting nut; 21 - locknut; 22 - protective cap; 23 - clutch release cylinder (slave cylinder); 24 - fork return spring; 25 - return spring bracket

Fault diagnosis

Diagnosis	Remedy
Incomplete clutch release (clutch spin)	
1. Excessive gaps in clutch release drive	1. Adjust clutch release drive
2. Buckling of clutch disc (camming action more than 0.5 mm)	2. Straighten or replace disc
3. Roughness on clutch disc friction linings	3. Renew linings or clutch disc assembly
4. Jammed rivets or broken clutch disc friction linings	4. Renew linings, check disc runout
5. Jammed clutch disc hub on primary shaft splines	5. Clean splines, apply grease ЛСЦ-15 or Фиол-1, Фиол-2. In case of badly worn splines causing seizure, renew input shaft or clutch disc
6. Broken thrust flange-to-clutch cover connecting plates	6. Renew clutch cover/pressure plate assembly
7. Air in clutch hydraulic drive system	7. Bleed system
8. Liquid leak from hydraulic drive system through connections or damaged pipelines	8. Tighten connections, renew damaged components, bleed system
9. Leaking master cylinder or clutch release cylinder	9. Renew sealing rings, bleed system
10. Plugged opening in reservoir cover, causing underpressure and vacuum leak in cylinder through sealings	10. Clean opening in tank cover, bleed system
11. Vacuum leak due to fouling or wear of front sealing ring in master cylinder	11. Clean sealing ring, replace in case of wear
12. Skew or buckling of pressure plate	12. Renew clutch cover/pressure plate assembly
Incomplete clutch engagement (clutch slips)	
1. No gaps in clutch release drive	1. Adjust clutch release drive
2. Badly worn or burnt clutch disc friction linings	2. Renew linings or clutch disc assembly
3. Excessive oil on clutch disc friction linings, surfaces of flywheel and pressure plate	3. Clean oily surfaces with white-spirit, remedy the situation
4. Plugged compensation port in master cylinder	4. Wash cylinder and clean port
5. Damaged or jammed clutch release drive	5. Rectify malfunctions causing jamming
Clutch judder	
1. Jammed clutch disc hub on primary shaft splines	1. Clean splines, apply grease ЛСЦ-15 or Фиол-1, Фиол-2. In case of badly worn splines causing seizure, renew input shaft or clutch disc
2. Excessive oil on clutch disc friction linings, surfaces of flywheel and pressure plate	2. Clean oily surfaces with white-spirit, remedy the situation
3. Jammed clutch release drive mechanism	3. Replace damaged parts, rectify malfunctions causing jamming
4. Badly worn clutch disc friction linings	4. Renew linings, check for damages on disc surfaces
5. Loose rivets on clutch disc friction linings	5. Renew damaged rivets and linings, if necessary
6. Damaged surface or buckling of pressure plate	6. Renew clutch cover/pressure plate assembly
Excessive noise at clutch release	
1. Worn, damaged or dry clutch release bearing	1. Renew bearing
2. Worn front bearing on gearbox primary shaft	2. Renew bearing
Excessive noise at clutch engagement	
1. Broken or weak damper spring	1. Renew clutch disc assembly
2. Broken, weak or detached clutch release fork return spring	2. Renew spring or secure
3. Broken pressure plate-to-clutch cover connecting plates	3. Renew clutch cover/pressure plate assembly

Clutch release drive adjustment

The following adjustments are carried out in the clutch release drive:

- the 0.1-0.5 mm gap between the pushrod and the piston of the master cylinder (see fig. 3-2) is set. This gap, necessary for complete clutch release, is adjusted by the clutch pedal limiter bolt 5. The clearance is determined by the pedal free travel equal to 0.4-2 mm;

- the free travel of the clutch release fork pushrod, equal to 4-5 mm, is adjusted by bolt 5 (fig. 3-3) and fixed by locknut 6. The distance of the pushrod free travel is controlled by a special pattern.

After carrying out the above described adjustments the clutch pedal free travel should make 25-35 mm.

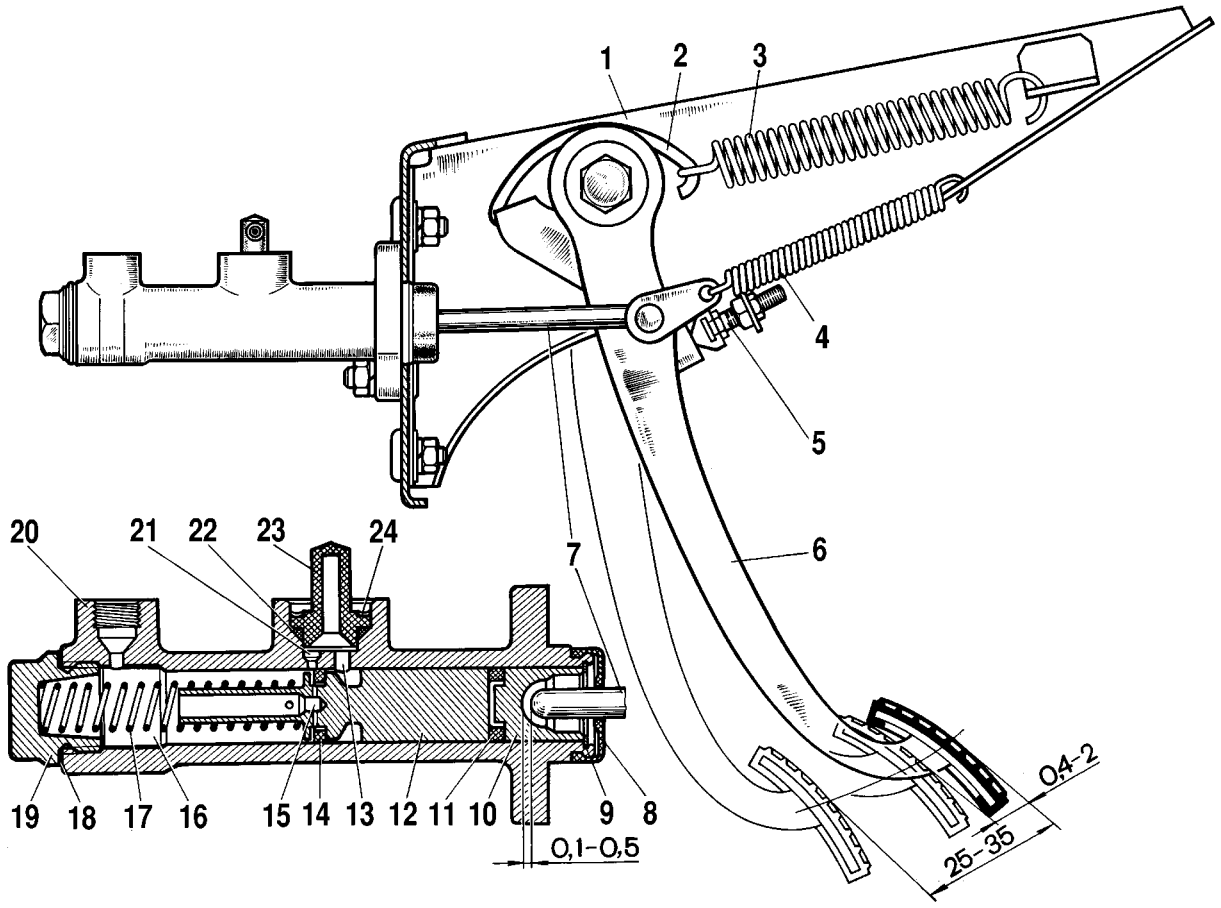

Fig. 3-2. Clutch pedal and master cylinder:
1 - pedal cluster mounting bracket; 2 - clip; 3 - clutch pedal servo spring; 4 - clutch pedal return spring; 5 - clutch pedal limiter bolt; 6 - clutch pedal; 7 - pushrod; 8 - protective cap; 9 - circlip; 10 - pushrod piston; 11 - sealing ring; 12 - master cylinder piston; 13 - inlet port; 14 - sealing ring (ring valve); 15 - piston bypass orifice; 16 - cylinder cavity; 17 - piston return spring; 18 - gasket; 19 - plug; 20 - master cylinder body; 21 - bypass (compensation) port; 22 - gasket; 23 - union; 24 - washer

Bleeding the clutch hydraulic system

Air in the clutch hydraulic system is indicated by incomplete clutch release, and also by "sponginess" and "failure" of clutch pedal.

To expel air from the hydraulic drive:

- clean the tank and the bleeder from dust and dirt;

- check the liquid level in the hydraulic system tank and top up if necessary;

- put a hose on bleeder 9 (see fig. 3-3) of the slave cylinder and place its lower end into a container with hydrodrive liquid (30-50 gr);

- undo bleeder 9 by 1/2-3/4 turn, several times rapidly depress and smoothly release the pedal until there will be no air bubbles coming out from the hose;

- depress the pedal and fully tighten the bleeder. Remove the hose and refit the bleeder cap.

If, despite a continuos bleeding, there are still air bubbles in the hose, check the tightness of connections, find out if there are cracks on tubes or leaks in places of connections. Air inleak is possible through damaged sealing rings of the master or slave cylinders.

During bleeding:

- the liquid level in the reservoir should be higher than the opening of the tube connecting the reservoir with the master cylinder;

- the end of the bleeding hose should be always dipped in liquid;

- after bleeding, top-up liquid in the reservoir to the lower edge of the filler neck.

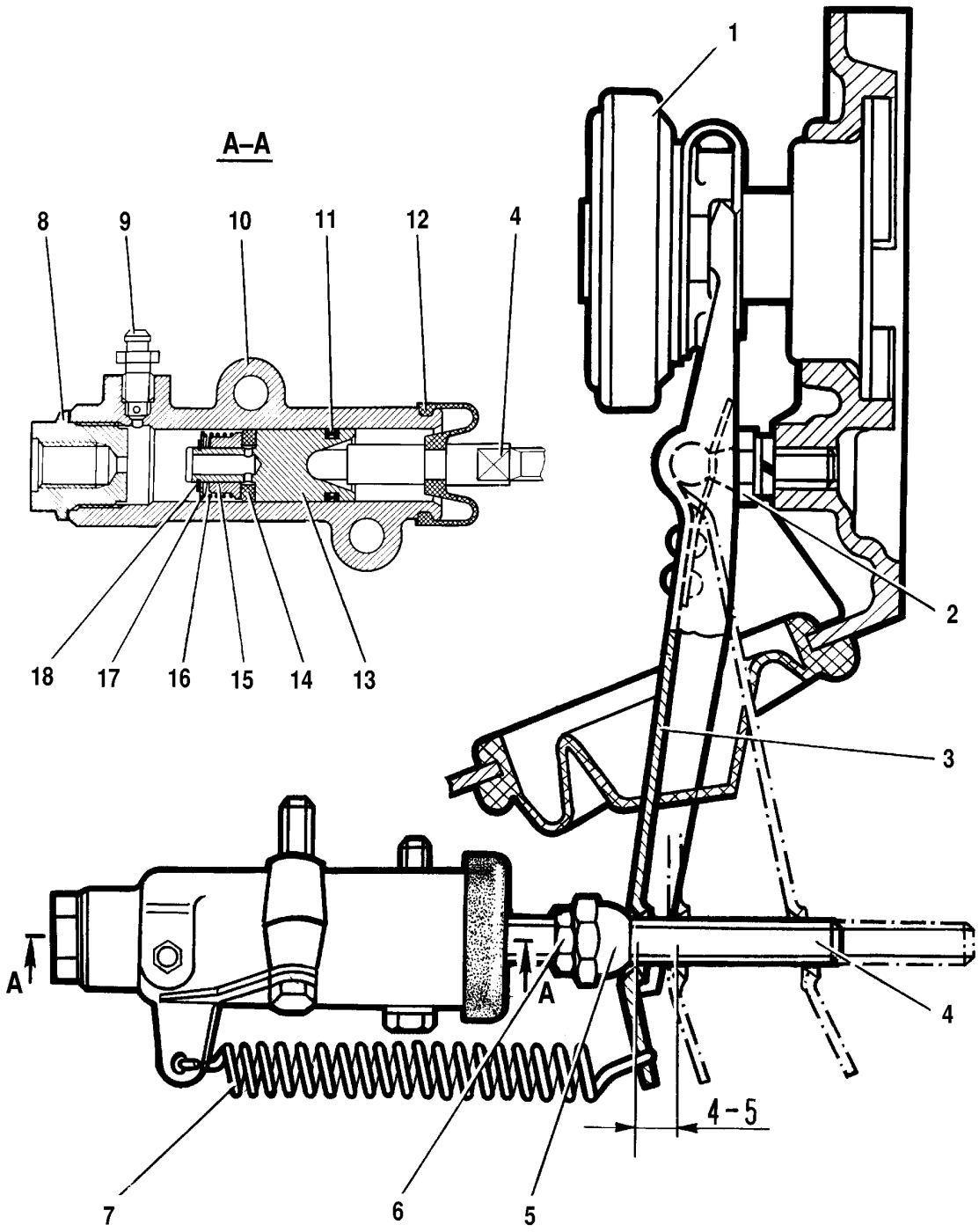

Fig. 3-3. Slave cylinder and clutch release fork:
1 - release bearing; 2 - ball pivot; 3 - clutch release fork; 4 - pushrod; 5 - adjusting bolt; 6 - locknut; 7 - return spring; 8 - plug; 9 - bleeder; 10 - cylinder body; 11 - sealing ring; 12 - protective cap; 13 - piston; 14 - sealing; 15 - sleeve; 16 - spring; 17 - spring disc; 18 -lock ring

Clutch assembly - removal and refitting

Removal. First remove the gearbox (see "Gearbox"). Undo the bolts and remove the clutch cover in assembly with the pressure plate. Do not lift this unit by holding the pressure plate thrust flange.

Refitting is a reversal of removal, providing the following:

- inspect the bearing on the crankshaft end face, if necessary replace the bearing;

- inspect the splines on the clutch disc hub and the gearbox input shaft, clean the splines and grease with a thin layer of greasing ЛСЦ-15 or ФИОЛ-1, ФИОЛ-2;

- refit the clutch disc with the hub protruding part facing the gearbox and centralise the plate against the bearing using tool A.70081, simulating the gearbox input shaft splined end (fig. 3-4).

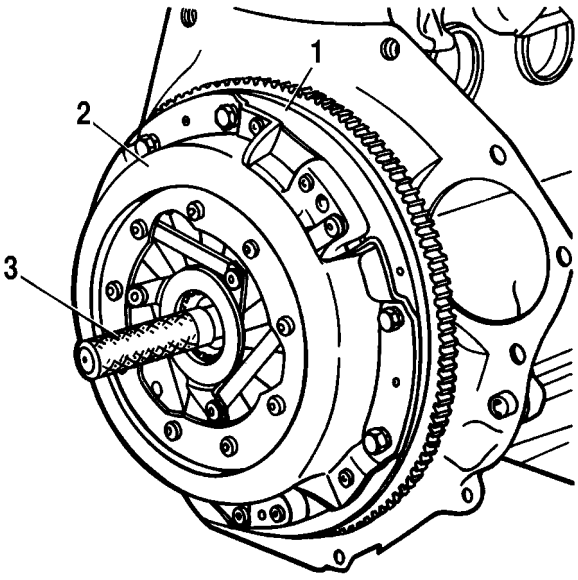

Fig. 3-4. Centering the clutch disc with tool A.70081:
1 - flywheel; 2 - clutch assembly; 3 - tool A.70081

Clutch inspection

The inspection of the clutch is carried out on a bench, which simulates the engine flywheel and has a metal intermediate ring 4 (fig. 3-5) with thickness of 8.2 mm simulating the clutch disc. Having fixed the clutch cover, make four release strokes equal to 8-9 mm. The release stroke of 8 mm should correspond to the travel of the pressure plate within 1.6-1.7 mm (permitted minimum - 1.4 mm).

The distance from the rig base to the working surface of the thrust flange friction washer should be 40-43 mm. During engine operation due to wear of the clutch disc surfaces this size increases. If it will reach 48 mm or the travel of the pressure plate will be less than 1.4 mm, renew the clutch cover in assembly with the pressure plate.

The clutch disc friction linings should be replaced at any signs of cracks, reduction of distance between the rivet and the working surface up to 0.2 mm, and also at one-side scuffings. To repair the clutch disc and replace the friction linings use tool 67.7822.9529 (fig. 3-6).

Flared rivets should have no breaks. The runout of the friction lining working surface should not exceed 0.5 mm. If this value is exceeded, straighten the disc (fig. 3-7) or replace with a new one. Also replace the clutch disc assembly in case of cracks on the clutch disc or the damper springs.

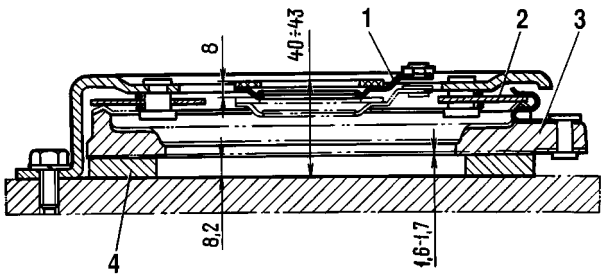

Fig. 3-5. Clutch check:
1 - pressure plate thrust flange; 2 - central diaphragm spring; 3 - clutch disc; 4 - ring

Master and slave cylinders - removal and refitting

First, drain working liquid. To do this, attach one end of the hose to bleeder 9 (see fig. 3-3) on the slave cylinder, and the other end place in a clean reservoir; unscrew bleeder 9 by 1/2-3/4 turn and depress the pedal several times until all liquid will be removed from the hydrosystem, then disconnect the tubes between the master and the slave cylinders, disconnect the return spring 7, remove the pin from the pushrod end, and the slave cylinder, having prior undone two fastening bolts.

To remove the master cylinder undo two nuts, with which it is pinned to the pedal bracket, and disconnect the flexible hose from the reservoir.

To refit the master and slave cylinders the above described operations are executed in reverse order.

After filling with working liquid, bleed the system.

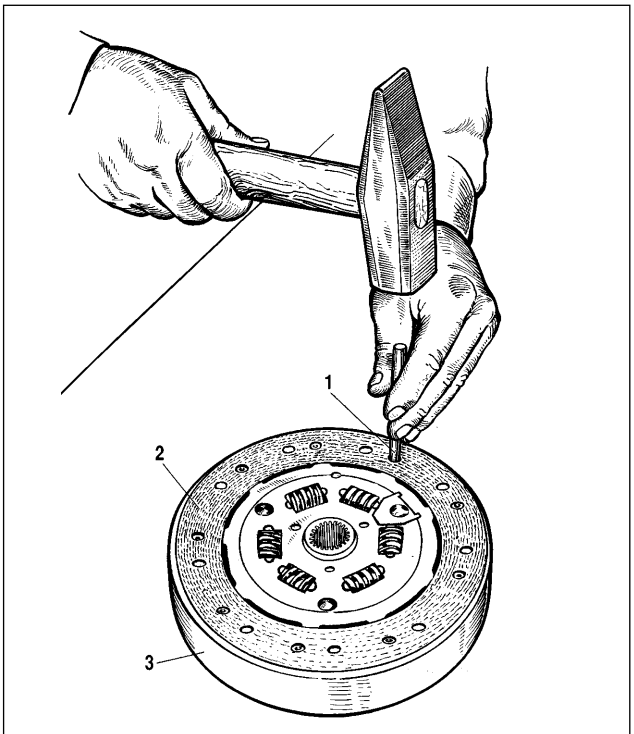

Fig. 3-6.Replacing the clutch disc friction linings:
1 - tool 67.7851.9500; 2 - clutch disc; 3 - fixture 67.7822.9517

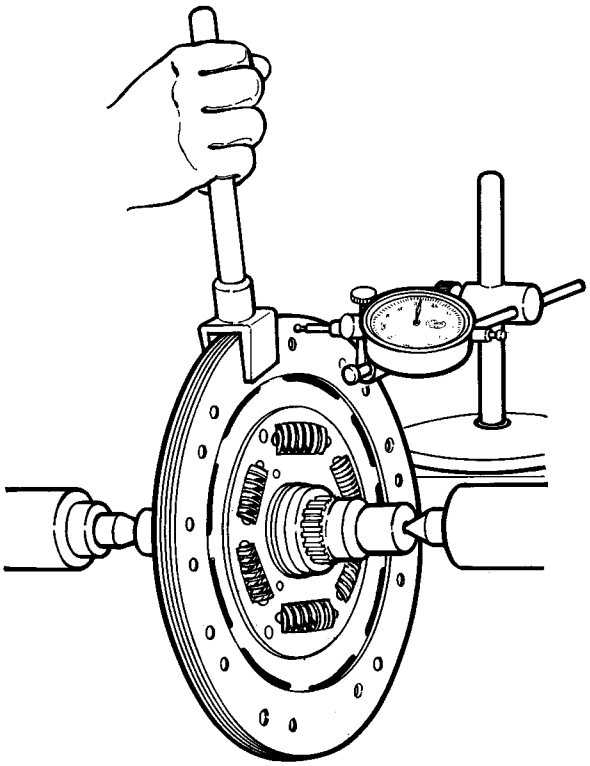

Fig. 3-7. Straightening the clutch disc

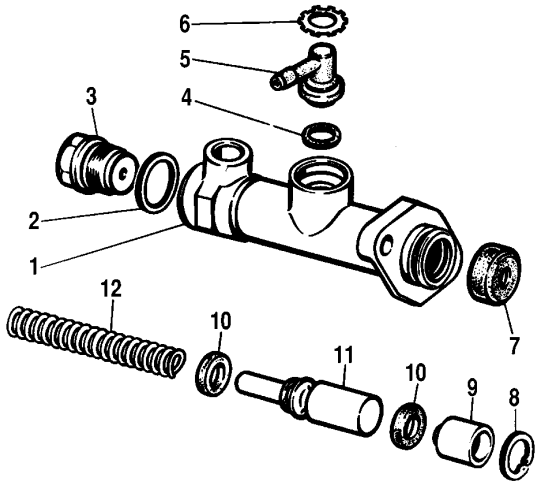

Fig. 3-8. Master cylinder components:
1 - body; 2 - sealing; 3 - plug; 4 - gasket; 5 - union; 6 - retaining washer;7 - cap; 8 - circlip; 9 - pushrod piston; 10 - sealing ring; 11 - master cylinder piston; 12 - spring

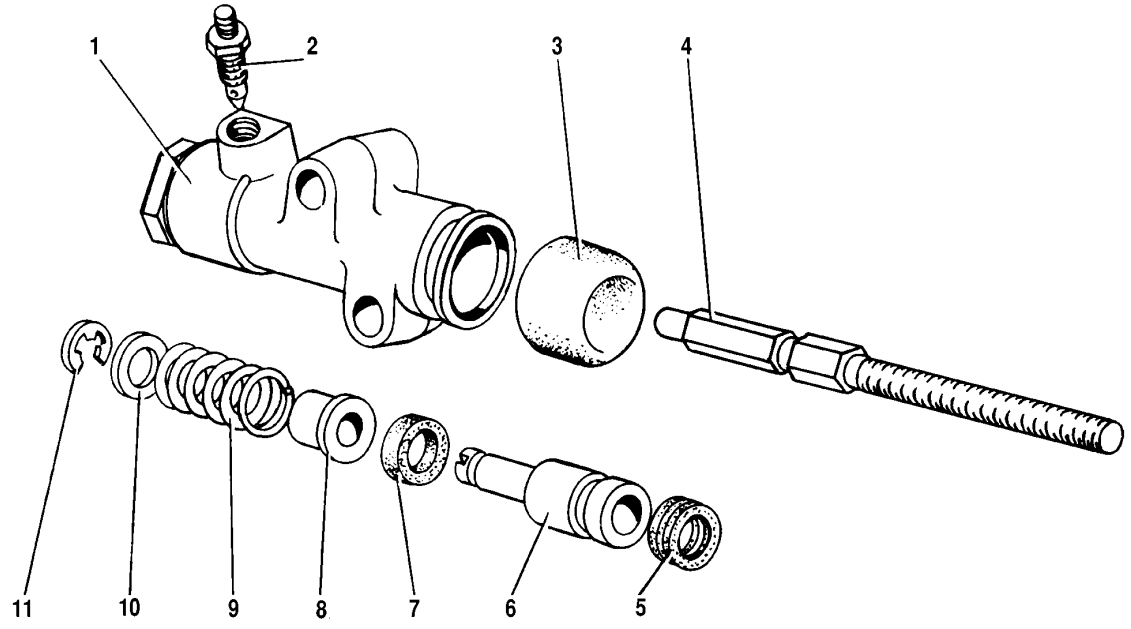

Fig. 3-9. Slave cylinder components:
1 - body; 2 - bleeder; 3 - cap; 4 - pushrod; 5 - sealing ring; 6 - piston; 7 - sealing ring; 8 - sleeve; 9 - spring; 10 - disc; 11 - lock ring

Master and slave cylinders - dismantling, inspection, repair and reassembly

Master cylinder. Turn out plug 3 (fig. 3-8), remove protective rubber cap 7 and circlip 8. This will allow to withdraw from the cylinder body piston 9, sealing ring 10, floating piston 11 with sealing ring and piston return spring 12.

Cylinder mirror and the outer surface of the piston should have no damages or marks. The inner diameter of the cylinder should be within the limits of 19.035-19.075 mm.

Inspect the piston return spring and replace if it has become weak.

Renew sealing rings. Inspect the protective cap on the rear end of the cylinder and renew in case of damage. Before reassembly, accurately clean and wash all parts in brake liquid. Do not let mineral oil, petrol, kerosine or diesel fuel to get in contact with the parts as this may cause swelling of the rubber sealings.

After inspection, reassemble all parts of the master cylinder in reverse order; grease all components with brake liquid or preservation liquid НГ-213.

Slave cylinder. Turn out plug, take off protective rubber cap 3 (fig. 3-9) together with pushrod 4, take out piston and dismantle it, previously having removed lock ring 11.

After dismantle, accurately wash and check all parts, as it is specified for the master cylinder. Do not refit a damaged pushrod.

After inspection, begin to reassemble in reverse order, grease all parts with brake liquid.

Clutch master cylinder - bench-check

Checking the leak-proofness of the rear sealing ring. Place the master cylinder on the test-bench (see fig. 3-10), and ensure good sealing between the cylinder flange and the surface of the test-bench. Connect reservoir 2 with hydraulic liquid to the cylinder. Open the compressed air vent, with the adjusting screw 6 being open, and then slowly close the adjusting screw until all air will be expelled from reservoir 2.

Control air pressure by the pressure gauge, it should be within 0.05-0.08 MPA (0.5-0.8 kgf/cm²). If pressure is less, replace the rear sealing ring.

Checking the leak-proofness of the front sealing ring. Place the master cylinder on the test-bench and connect it to the reservoir with hydro drive liquid, and with manometers (fig. 3-11).

Close manometer vent 3 and, by moving the master cylinder pushrod, provide constant pressure of 0.2 MPA (2 kgf/cm²).

With a fixed pushrod and no liquid leaks pressure should remain constant during 2 minutes.

Close pressure gauge vent 4 and open pressure gauge vent 3. By moving the pushrod provide constant pressure of 10 MPA (100 kgf/cm²).

With a fixed pushrod and no liquid leaks pressure should remain constant for no less than 2 minutes. Otherwise, replace the front sealing ring.

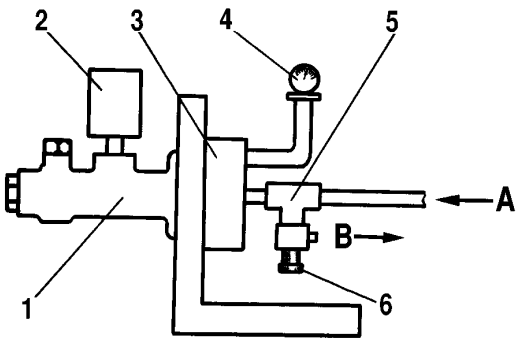

Fig. 3-10. Checking the leak-proofness of the rear sealing ring:
1 - master cylinder; 2 - reservoir; 3 - adapter with sealing; 4 - manometer; 5 - T-connector; 6 - adjusting screw; A - air from compressor; B - air outcome

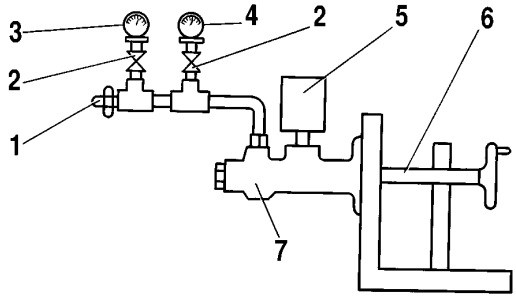

Fig. 3-11. Checking the leak-proofness of the front sealing ring:
1 - bleeding screw; 2 - vent; 3 - manometer with 0.2 MPa (2 kgf/cm²) scale; 4 - manometer with 0.005 MPa (0.05 kgf/cm²) scale; 5 - reservoir; 6 - pushrod; 7 - master cylinder

Gearbox

The design of the gearbox is shown on fig. 3-12, 3-26, 3-34.

Fault diagnosis

Diagnosis	Remedy
Noise in gearbox	
1. Noise in bearings	1. Renew damaged bearings
2. Worn teeth on gears and synchro units	2. Replace worn parts
3. Low oil level in gearbox	3. Top up oil. Rectify cause of oil leak
4. Axial shaft movement	4. Renew bearings or securing components
Difficulty in engaging gears	
1. Incomplete clutch release	1. See. subsec."Clutch"
2. Jammed gearshift lever ball-joint	2. Clean ball contact surfaces
3. Deformed gearshift lever	3. Rectify deformation or renew lever
4. Hard movement of fork rods (burrs, dirty rod sockets, detent seizure)	4. Repair or renew worn components
5. Hard movement of sleeve on hub when splines get dirty	5. Clean components
6. Deformed gearshift forks	6. Straighten forks or renew
Jumps out of gear or incomplete clutch engagement	
1. Worn rod balls and sockets, weak detent spring	1. Renew damaged components
2. Worn synchro unit baulk rings	2. Renew baulk ring
3. Broken synchro unit spring	3. Renew spring
4. Worn teeth on synchro unit sleeve or synchro unit crown	4. Renew sleeve or gear
5. Crushed hub short teeth	5. Renew synchro hub
Oil leak	
1. Worn oil seals on input and output shafts	1. Replace oil seals
2. Loose fitting of gearbox covers, damaged sealings	2. Tighten nuts (see torque in Appendix) or renew seals
3. Loose fitting of clutch housing to transmission casing	3. Tighten nuts

Removal and refitting

Removal. Place the vehicle over an inspection pit or on a lift, put blocks under front wheels and raise the rear axle from one or two sides. Let off the handbrake and place the gearshift lever in neutral. Disconnect the wires from the battery.

Take out the front floor mat and the gaiters from the transfer- and gearbox levers. Remove the aperture covers and sealings. Unscrew the handles from the transfer box levers.

Push downward lever rod 27 (see fig. 3-12) and with the help of a screwdriver or any other pointed tool take out the retaining sleeve 31 from the groove on the lever rod; remove the rod.

Disconnect the brackets that are fixing pipes and mufflers in the rear part of the vehicle, and then the muffler pipe from the front exhaust pipe. Disconnect the exhaust pipe clip and remove the pipe downward.

Undo the lower bolts of the clutch bellhousing cover plate. Disconnect the "ground" wires from the clutch bellhousing and the wires from the tail light switch.

Unhook the return spring 1 (fig. 3-13) from the clutch release fork 5 and take pin 4 out from pushrod 6. Disconnect the slave cylinder 8 from the clutch bellhousing. Thus, cylinder 8 connected to the master cylinder hose, remains on the vehicle, what excludes loosing brake liquid and necessity of the subsequent bleeding of the clutch release hydraulic drive.

Put clip 2 (A.70025) on the flexible coupling 3 (fig. 3-14) and tighten. This will help in subsequent removal and refitting of the flexible coupling. Undo nuts 1 and, by turning the layshaft, remove the bolts that are fastening the flexible coupling 3 to the flange of the gearbox output shaft.

Disconnect the speedometer cable from the speedometer drive unit on the transfer box.

Disconnect the shaft flanges of the front and rear axles drive from the flanges of the transfer box shafts. Lower and move aside the axle drive shafts.

Undo the bolts that are fastening the transfer box brackets to the car body and remove it together with the propeller shaft.

Using a socket spanner 02.7812.9500 undo the bolts fastening the starter motor to the clutch bellhousing and release it. Undo the clutch bellhousing cover plate bolts.

Disconnect the engine rear mounting from the crossmember 4 (fig. 3-14), and then remove the crossmember while supporting the gearbox from below.

Place a jack or other suitable support under the transmission casing. Using a socket spanner A.55035 undo the fastening bolts and remove the gearbox together with the clutch bellhousing by moving it to the rear part of the vehicle so that to take out the gearbox input shaft from the front bearing and from the clutch disc hub.

ATTENTION. So that not to deform the clutch straps, do not rest the end of the input shaft on the clutch diaphragm spring flange when removing or refitting the gearbox.

Refitting the gearbox is a reversal of removal. Before refitting, apply a thin layer of greasing ЛСЦ-15 (ЛИТОЛ-24) on the spline end of the input shaft and centralize the clutch disc using tool A.70081 (see fig. 3-4).

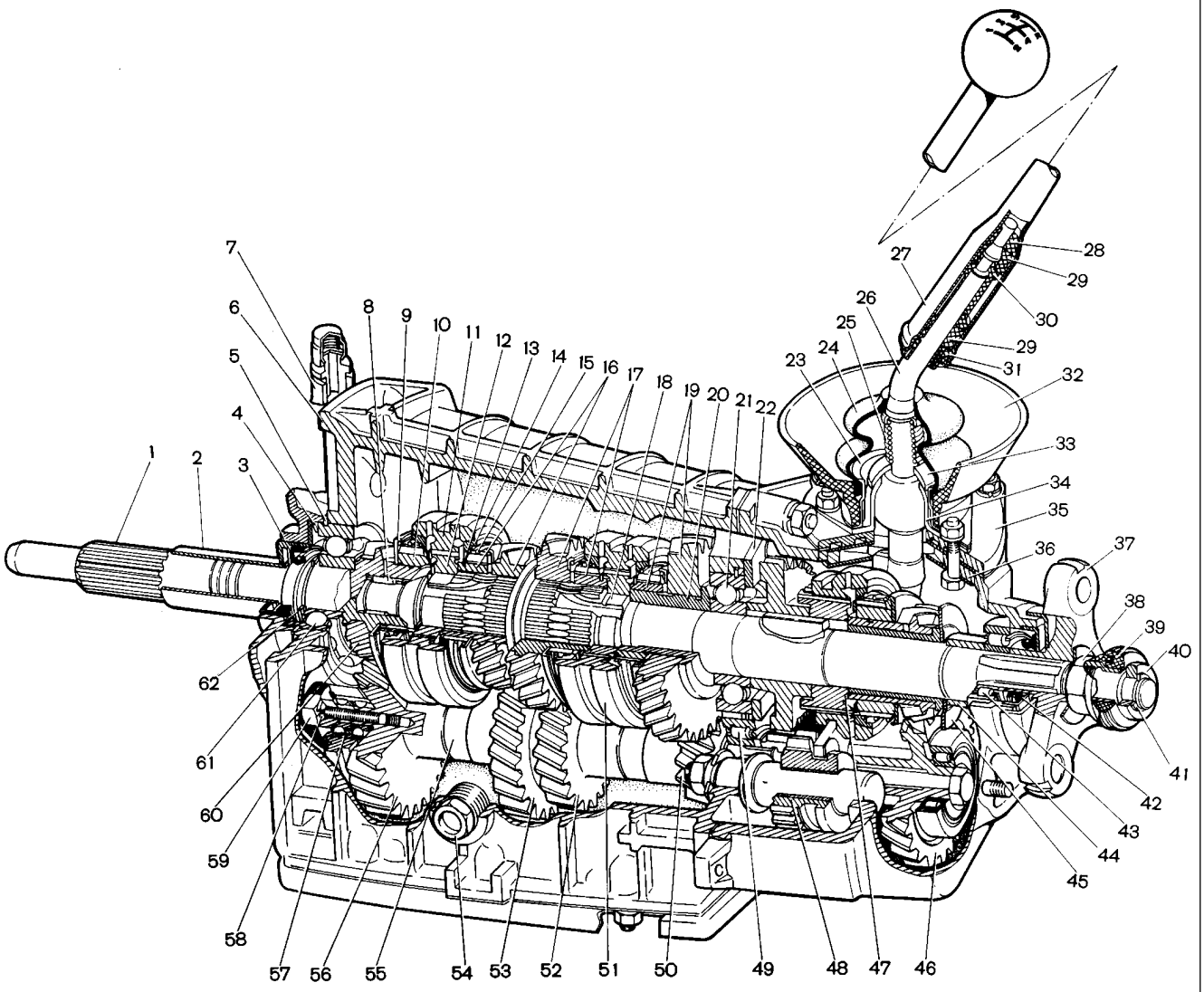

Fig. 3-12. Gearbox:

1 - input shaft; 2 - front cover with guide sleeve; 3 - input shaft oil seal; 4 - spring washer; 5 - bearing set collar; 6 - gearbox housing; 7 - breather; 8 - output shaft needle bearing; 9 - synchro spring thrust washer; 10 - 4th speed synchro unit crown; 11 - 3rd/4th synchro unit sleeve; 12 - 3rd/4th synchro unit hub; 13 - circlip; 14 - baulk ring; 15 - synchro unit spring; 16 - 3rd speed synchro unit crown and gear; 17 - 2nd speed synchro unit crown and gear; 18 - output shaft; 19 - 1st speed synchro unit crown and gear; 20 - 1st gear bush; 21 - output shaft idler bearing; 22 - idler bearing lock plate; 23 - flange; 24 - bellows; 25 - spring; 26 - gear shift lever; 27 - lever rod; 28 - damper rubber pad; 29 -grommet; 30 - distance washer; 31 - retaining sleeve; 32 - collar; 33 - cap washer; 34 - ball socket; 35 - gearshift lever housing; 36 - guide plate; 37 - driveline coupling flange; 38 - nut; 39 - centering ring oil seal; 40 - centering ring; 41 - circlip; 42 - output shaft rear bearing oil seal; 43 - output shaft rear bearing; 44 - distance washer; 45 - oil deflector washer; 46 - 5th/reverse gear unit; 47 - 5th synchro unit hub; 48 - reverse idler gear; 49 - intermediate shaft rear bearing; 50 - intermediate shaft 1st speed gear; 51 - 1st/2nd synchro sleeve; 52 - intermediate shaft 2nd speed gear; 53 - intermediate shaft 3rd speed gear; 54 - filler and check orifice plug; 55 - intermediate shaft; 56 - intermediate shaft constant mesh gear; 57 - intermediate shaft front bearing; 58 - intermediate shaft bearing clamping washer; 59 - clamping washer bolt; 60 - input shaft constant mesh gear; 61 - input shaft rear bearing; 62 - circlip

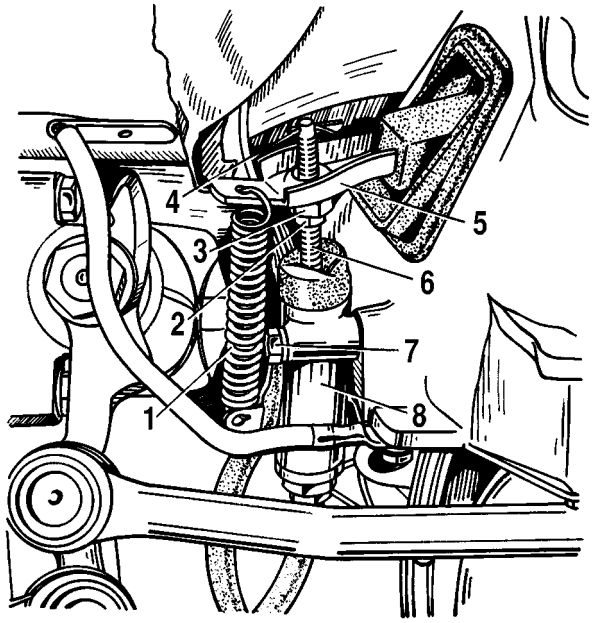

Fig. 3-13. Clutch release drive:
1 - fork return spring; 2 - locknut; 3 - adjusting nut; 4 - cotter pin; 5 - clutch release fork; 6 - pushrod; 7 - slave cylinder fastening bolt; 8 - slave cylinder

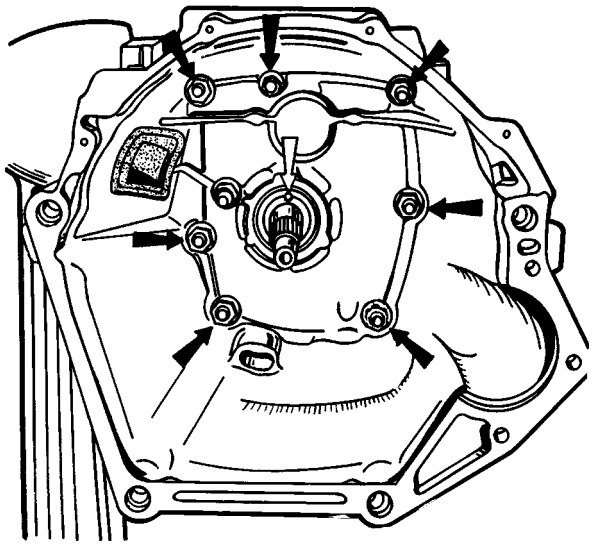

Fig. 3-15. Clutch bellhousing, view from inside.
The black arrows point to the gearbox-to-clutch bellhousing fastening nuts; the white arrow points to the opening in the front cover for oil outflow from the transmission casing to avoid clutch disc contamination.

Dismantling and reassembly

Dismantling. Wash the gearbox and place it on a bench. Drain oil and remove the bottom cover with the lining.

Remove the clutch release fork, and the coupling in assembly with the bearing and the spring from the guide sleeve in the gearbox front cover.

Remove the clutch bellhousing with the lining and the front cover together with the oil seal and spring washer (see fig. 3-15).

Turn out the rear light switch, take care not to deform the housing.

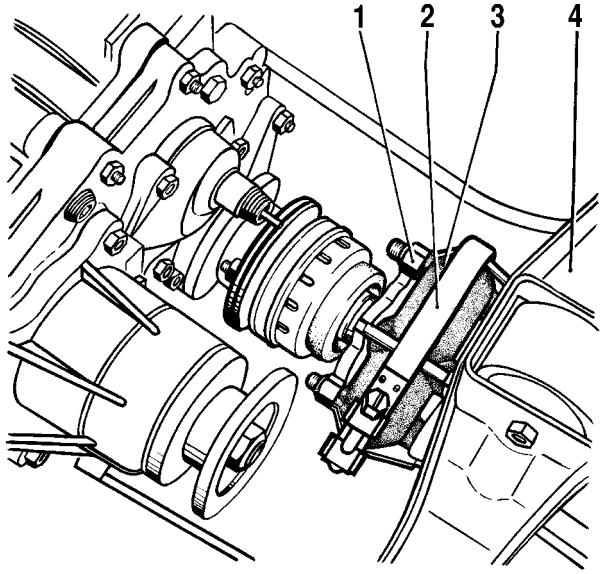

Fig. 3-14. Flexible coupling between the propeller shaft and the gearbox:
1 - propeller shaft flange-to-flexible coupling fastening nuts; 2 - clamp A.70025; 3 - flexible coupling; 4 - rear engine mounting crossmember

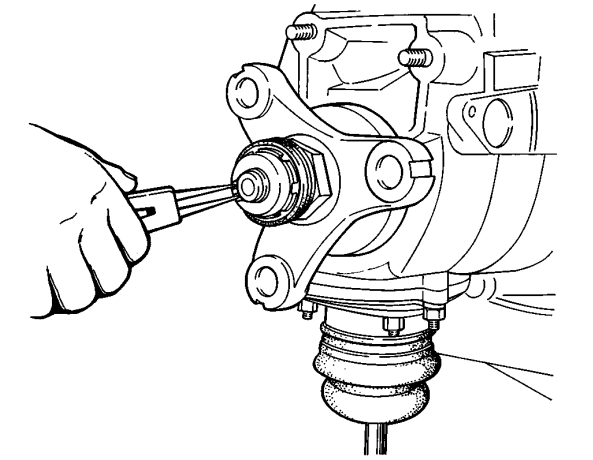

Fig. 3-16. Removing the circlip

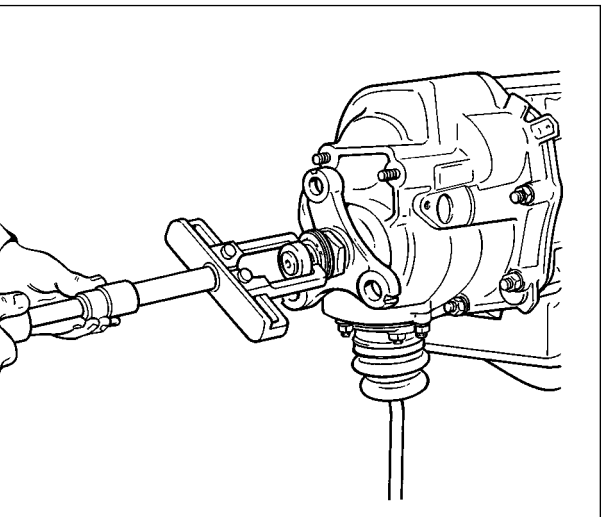

Fig. 3-17. Removing the coupling centering ring from the propeller shaft

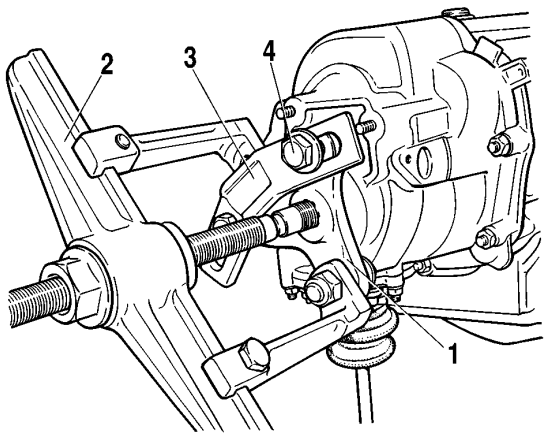

Fig. 3-18. Removing the coupling flange using tool A.40005/3/9B/9C:
1 - flexible coupling flange; 2 - tool A.40005/3; 3 - tool A.40005/3 strap; 4 - tool-to-flange fastening bolts

Turn out the 3rd/4th gearshift fork fastening bolt. Install lock 41.7816. 4068 on the input shaft or simultaneously engage both gears. This will prevent the turning of the input, output and intermediate shafts and will allow to do the subsequent operations on dismantling.

ATTENTION. Since 1997, on the rear end of the gearbox output shaft the design of the following parts was changed:

- instead of a metal centering ring 26 (see fig. 3-31) and circlip 1, a rubber centering bush is installed;

- instead of sealing 25 with spring 24, a sealing without a spring is installed;

- lock washer 22 is replaced with a spring washer;

- nut 23 is sealed with УГ-9 or УГ-10.

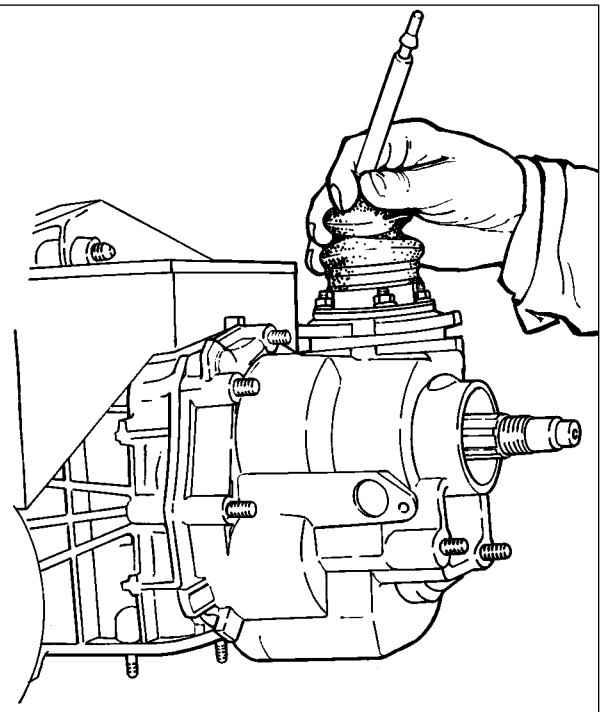

Fig. 3-19. Removing the gear selector mechanism

Remove circlip from the gearbox output shaft end (fig. 3-16).

Unbend the lock washer, undo the nut by several turns to move the coupling centering ring, and again turn in the nut. Using a puller A.40006/1 with tool A.40005/4 remove the flexible coupling centering ring from the output shaft end (fig. 3-17).

Remove the coupling centering ring seal with spring from the output shaft end, undo the nut and using tool A.40005/3/9B/9C remove the flexible coupling flange (fig. 3-18).

Before removing the rear cover, place the gearshift lever in neutral position, undo the gear selector mechanism fastening nuts and remove the gearshift lever (fig. 3-19) in assembly with the selector mechanism. One of the cover fastening nuts is undone from the inside of the transmission casing with the bottom cover being removed. When removing the rear cover it is necessary to move it not only backwards, but also to turn it to exclude hitting the fifth speed/reverse gear unit.

After removing the output shaft rear bearing inner ring 43 (see fig. 3-12) and distance sleeve 44, loosen the cover fastening bolts 5 (fig. 3-20) and undo bolts 2 and 4 that are securing the fifth speed/reverse gear unit. Remove the oil deflector washer 45 (see fig. 3-12), then bush 1 (fig. 3-21) from the fifth speed gear and take out rod 1 (fig. 3-22) from fork 2. Thus, distance bush 3 is removed from the rod. Then remove the gear unit 4 from the intermediate shaft splines.

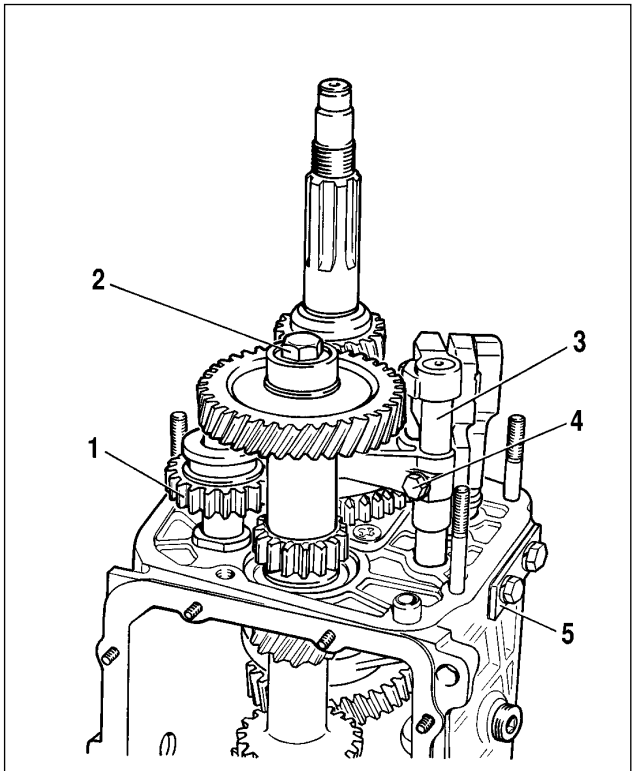

Fig. 3-20. Undoing the fastening bolts of the gear unit and the 5th/reverse fork:
1 - reverse idler gear; 2 - gear unit fastening bolt; 3 - fork rod; 4 - fork fastening bolt; 5 - detent cover

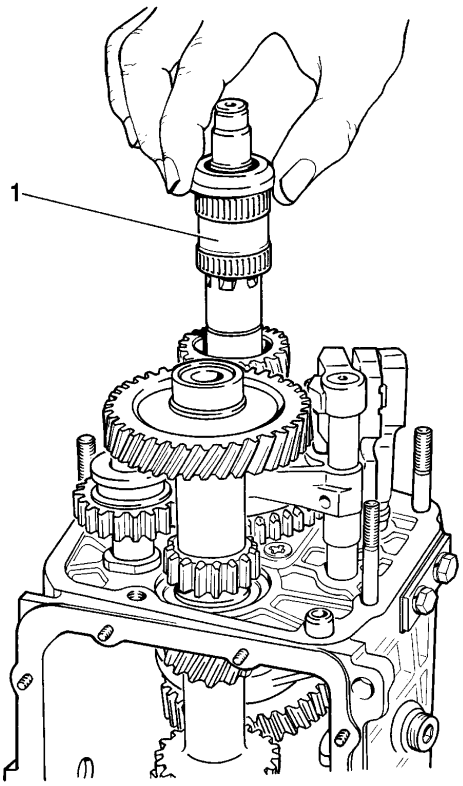

Fig. 3-21. Removing the 5th gear bush:
1 - bush

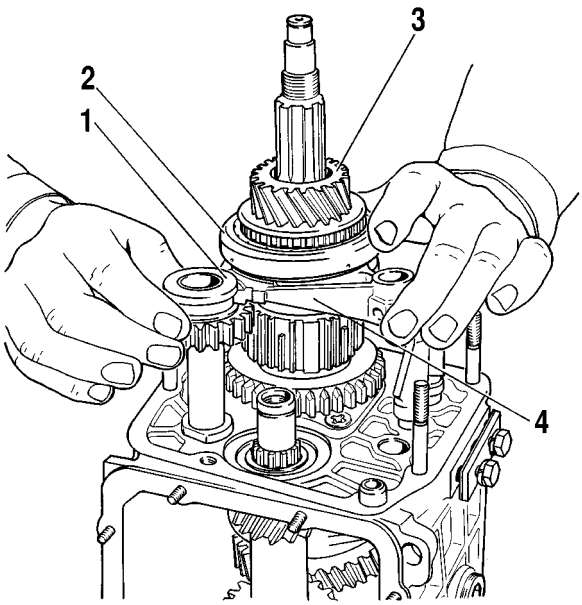

Fig. 3-23. Removing the reverse idler gear, 5th gear/synchro unit and fork assembly:
1 - reverse idler gear; 2 - 5th speed coupling; 3 - 5th speed/reverse gear

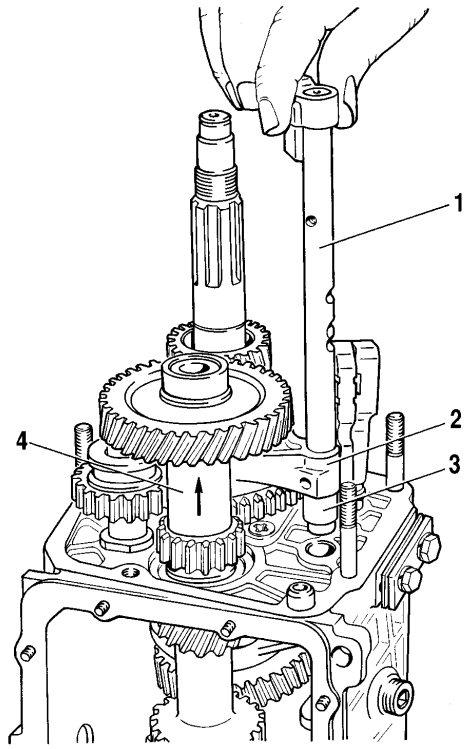

Fig. 3-22. Removing the 5th speed/reverse selector rod:
1 - 5th/reverse selector rod; 2 - 5th/reverse fork; 3 - distance sleeve; 4 - gear unit

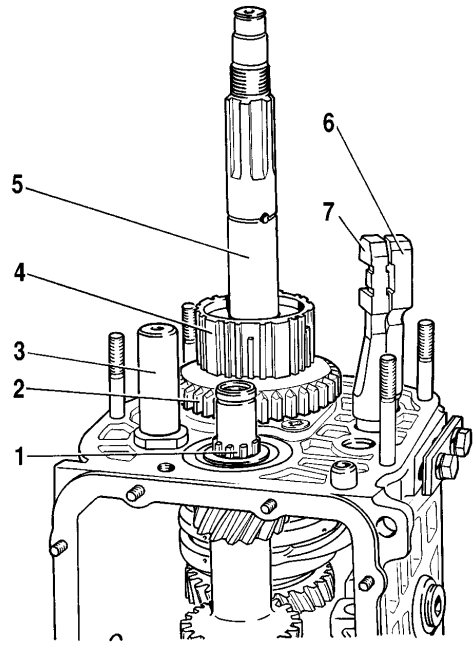

Fig. 3-24. Removing the 5th synchro unit hub/reverse driven gear:
1 - intermediate shaft; 2 - reverse driven gear; 3 - reverse idler gear shaft; 4 - 5th synchro unit hub; 5 - output shaft; 6 - 1st/2nd selector rod; 7 - 3rd/4th selector rod

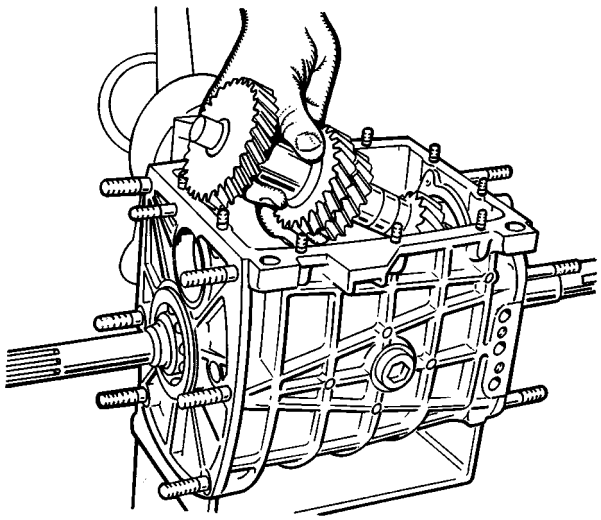

Fig. 3-25. Withdrawing the intermediate shaft from transmission casing

Simultaneously remove the reverse idler gear 1 (fig. 3-23) from the shaft, gear 3 in assembly with the coupling and fork 4 from the output shaft.

With the help of a special mandrel (like a screwdriver) remove the 5th synchro unit hub together with reverse driven gear 2 from key 4 (fig. 3-24).

With the help of a special mandrel (like a screwdriver) and a knock-out tool take out the front and rear bearings of the intermediate shaft from the transmission casing. Make marks on the inner rings of the double-row bearing for further refitting in the bearing outer ring.

Take the intermediate shaft out from the transmission casing, inclining it as shown on fig. 3-25.

Take out from the transmission casing the 1st, 2nd, 3rd and 4th selector rods one by one, previously having undone the securing bolts. Taking out the rods, simultaneously remove three detents 6 (fig. 3-26). Remove the output shaft idler bearing lock plate (fig. 3-27). Undo the fastening nut of the reverse idler gear shaft and remove it.

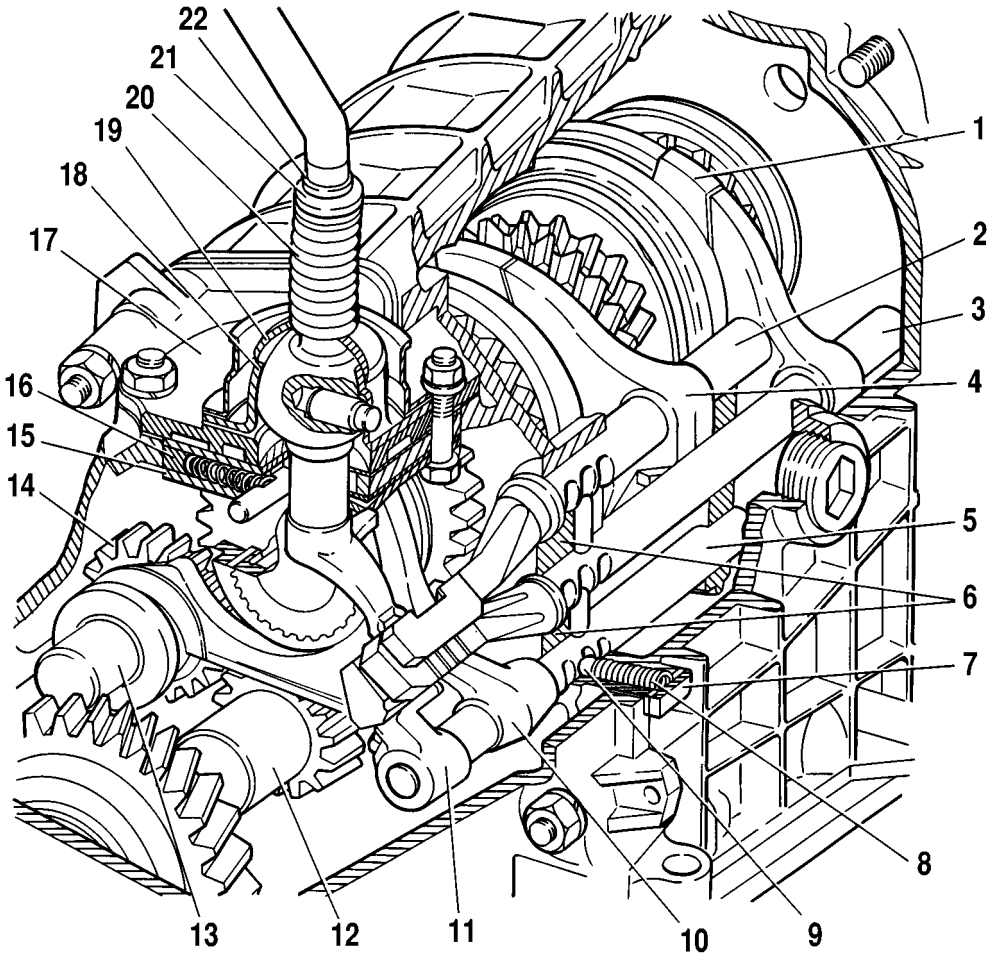

Fig. 3-26. Gear shift mechanism:
1 - 3rd/4th selector fork; 2 - 1st/2nd selector rod; 3 - 3rd/4th selector rod; 4 - 1st/2nd selector fork; 5 - 5th/reverse selector rod; 6 - detents; 7 - detent cover; 8 - detent spring; 9 - detent ball; 10 - 5th/reverse selector fork; 11 - 5th/reverse fork rod head; 12 - 5th/reverse gear unit; 13 - reverse idler gear shaft; 14 - reverse idler gear; 15 - guide plate washer; 16 - guide plate; 17 - gear shift lever housing; 18 - ball socket; 19 - cap; 20 - spring; 21 - thrust washer; 22 - circlip

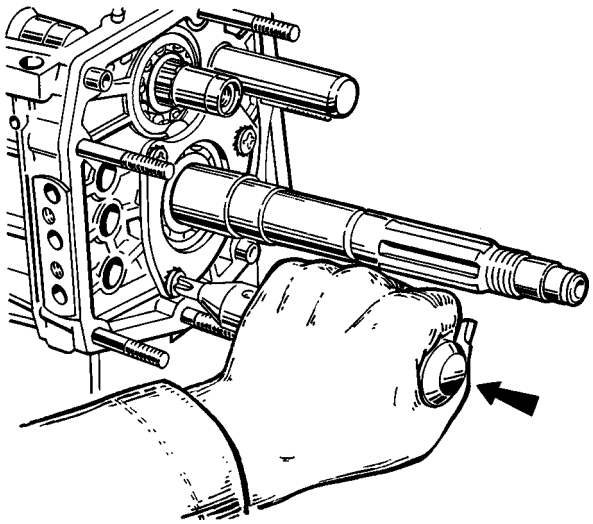

Fig. 3-27. Undoing the fastening bolts of the output shaft idler gear plate with an impact screwdriver.
The arrow shows the direction of the screwdriver thrust stroke when striking with a hammer

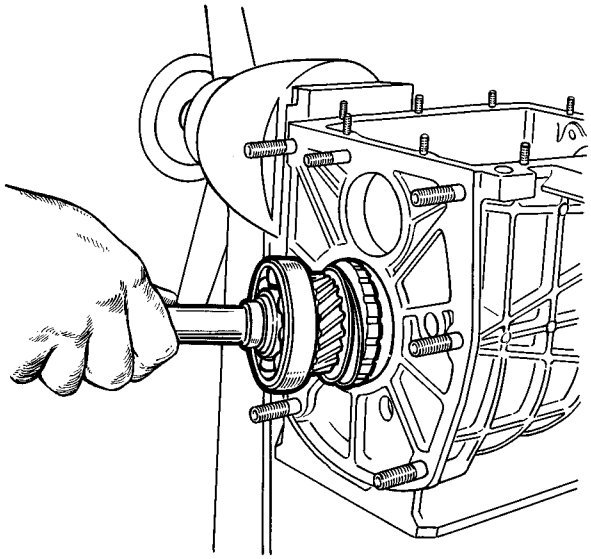

Fig. 3-28. Withdrawing the input shaft from the transmission casing

With the help of a special mandrel (like a screwdriver) take out the input shaft together with the bearing and the synchro unit ring (fig. 3-28) and remove the needle bearing from the front end of the output shaft.

Punch out the output shaft from the idler bearing, take out the idler bearing and, having inclined as shown on fig. 3-29, take out from the crankcase the output shaft in assembly with gears, couplings and synchro unit rings. Remove the 3rd/4th synchro unit sleeve from the shaft.

Dismantle the input shaft (fig. 3-30):

- remove circlip 7, baulk ring 6 and spring 5;

- place the shaft on a press and, having fixed the spring washer 2 with tool 41.7816.4069, remove circlip 1, and then the spring washer and bearing 3.

Dismantle the output shaft (fig. 3-31):

- from the rear end of the shaft remove the 1st synchro gear 11 with bush 12, hub 3 with 1st/2nd synchro sleeve 4, 2nd speed gear 10 together with baulk ring 5;

- place the output shaft with tool 41.7816.4069 on a press (fig. 3-32), place two thrust half-rings 3 under 3rd speed gear and by pressing the spring washer with the mandrel, remove the circlip 2, then spring washer 4, 3rd/4th sleeve hub and 3rd speed gear.

If necessary, dismantle the lever and the gear selector mechanism. Proceed as follows:

- take off rubber boot 10 (fig. 3-33), thrust ring 6 and circlip 7, spring 5 and cap 4 from the gearshift lever;

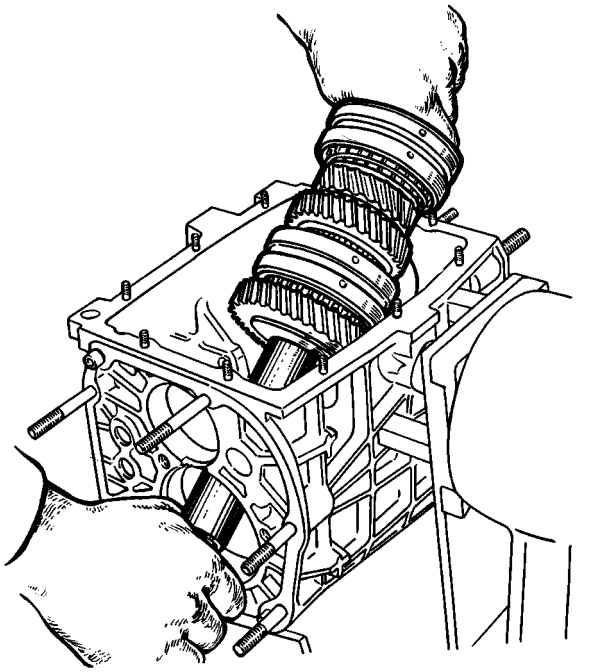

Fig. 3-29. Withdrawing the output shaft from the transmission casing

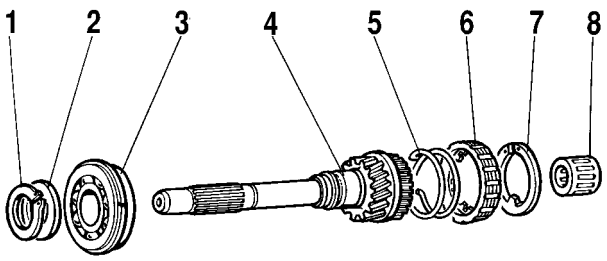

Fig. 3-30. Input shaft components:
1 - circlip; 2 - spring washer; 3 - bearing; 4 - input shaft; 5 - synchro unit spring; 6 - synchro unit baulk ring; 7 - circlip; 8 - bearing

- note visually the location of parts relative to risk A (fig. 3-34), made on the directing plate, so that to reassemble the parts in the same order;

- having undone the nuts from the fastening bolts, separate the parts of the gear selector mechanism and remove lever 9, ball socket 4 and rubber sealing rings 15.

The reassembly of the gearbox is carried out in reverse sequence. Pay attention, that:

- the reverse idler gear shaft is fitted before refitting the shafts in the transmission casing with torque to 78 N•m (7.8 kgf•m);

- before refitting the 5th/reverse fork rod in the crankcase, refit the spacer;

- the inner ring of the bearing is press-fitted on the 5th/ reverse gear unit, and the outer one - in the rear cover socket;

- the output shaft rear bearing is press-fitted on the shaft to facilitate the installation of the rear cover;

- the reverse idler gear 1 (see fig. 3-23), gear 3 and fork 4 are installed simultaneously;

- when reassembling the gear switch lever apply grease ЛСЦ-15 or ЛИТОЛ-24 on the ball or the cap of the ball socket;

- the gear unit fastening bolt is tightened with torque to 78 N•m (7.8 kgf•m);

- when refitting the clutch housing with the transmission casing front cover, the opening in the front cover should be located as shown on fig. 3-15;

- grease the oil seals with ЛИТОЛ-24 before refitting;

- use tools 41.7853.4028, 41.7853.4032, 41.7853.4039 to install the sealings and bearings.

Inspection

Cleaning. Before inspection, carefully clean all gearbox components. Brush or scrape all deposits or residues, clean the bores and splines; then wash down to dissolve and remove all traces of oil.

Blow the parts with compressed air and carefully wipe them. Especially carefully blow the bearings, directing the air jet so, that to exclude fast rotation of rings.

Gearbox casing and covers. There should be no cracks on the casing, and no wear or damage should be evident on the bearing housings.

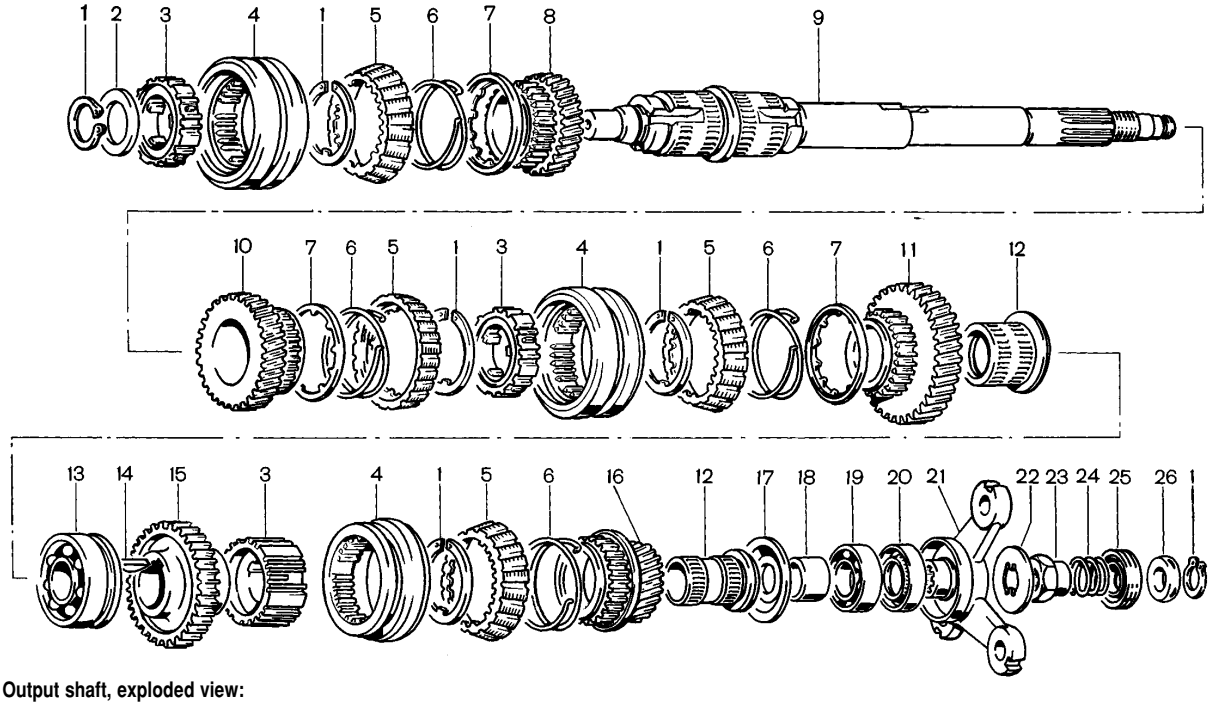

Fig. 3-31. Output shaft, exploded view:
1 - circlip; 2 - spring washer; 3 - synchro unit hub; 4 - synchro unit sleeve; 5 - baulk ring; 6 - spring; 7 - washer; 8 - 3rd speed gear; 9 - output shaft; 10 - 2nd speed gear; 11 - 1st speed gear; 12 - gear bush; 13 - bearing; 14 - key; 15 - reverse gear; 16 - 5th speed gear; 17 - oil deflector washer; 18 - spacer; 19 - output shaft rear bearing; 20 - oil seal; 21 - coupling flange; 22 - lock washer; 23 - nut; 24 - seal spring; 25 - seal; 26 - centering ring

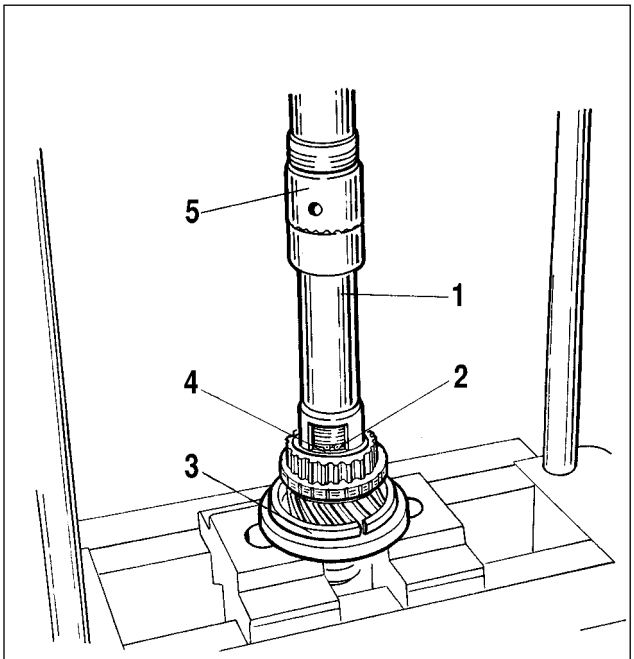

Fig. 3-32. Refitting the circlip on the output shaft:
1 - tool 41.7816.4069; 2 - circlip; 3 - support half-ring; 4 - spring washer; 5 - press rod

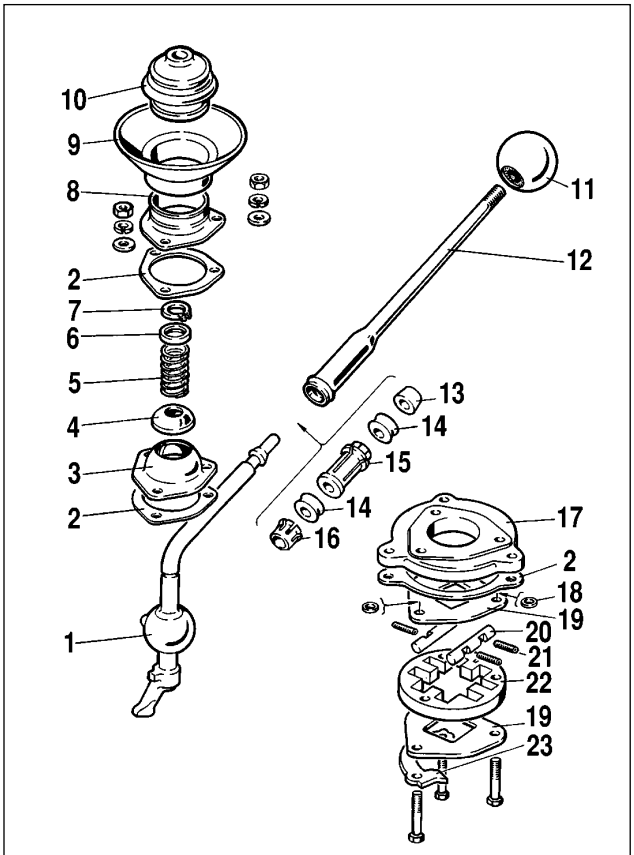

Fig. 3-33. Gear change mechanism and lever:
1 - gear change lever; 2 - gasket; 3 - ball socket; 4 - cap; 5 - spring; 6 - ring; 7 - circlip; 8 - flange; 9 - collar; 10 - rubber boot; 11 - lever knob; 12 - lever extension; 13 - pad; 14 - rubber bush; 15 - spacer; 16 - securing collar;17 - gear change lever housing; 18 - sealing ring; 19 - guide plate washer; 20 - guide bar; 21 - spring; 22 - guide plate; 23 - reverse lock plate

On surfaces mating with the clutch housing, with the rear and bottom covers there should be no damages that may cause oil leak. Insignificant damages should be smoothed with a file. If parts are badly damaged or worn, renew them.

Check the condition of the front cover and ensure that the input shaft does not touch it when rotating. If the shaft and the cover are not aligned against each other, replace the damaged parts. Ensure, that the oil drain aperture is not fouled (shown by an arrow on fig. 3-15). Clean the oil drain plug.

Seals. Inspect the oil seals and ensure there is no damage, severe wear or roughness on the working edges. The permissible amount of wear of seal working edges is no more than 1 mm. In case of any insignificant defect renew the seals.

Shafts. On the working surfaces and on the splines of the output shaft no damages or excessive wear is allowed. There

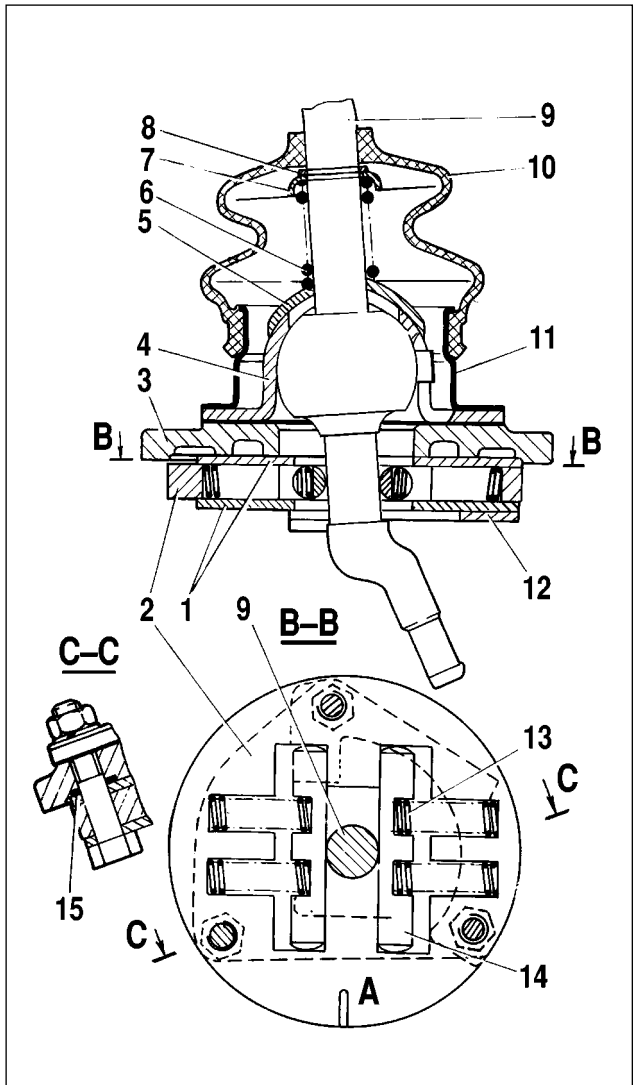

Fig. 3-34. Gear change mechanism:
1 - guide plate washer; 2 - guide plate; 3 - gear change lever housing; 4 - ball socket; 5 - cap; 6 - spring; 7, 8 - circlips; 9 - gear change lever; 10 - bellows; 11 - flange; 12 - reverse locking plate; 13 - spring; 14 - guide bar; 15 - sealing ring; A - mark

should be no roughness or scuffings on the rolling surfaces of the shaft front end.

Check the condition of needle rolling surface in the opening of the primary shaft.

Examine the intermediate shaft, no chipping or excessive wear of teeth is allowed.

The surface of the reverse gear shaft should be absolutely smooth, with no traces of jamming. The mounting gap between the shaft and the bush of the reverse idler gear should be 0.056-0.09 mm, the maximum permissible size is 0.15 mm. The clearance is checked by measuring the shaft diameter and the opening of the gear bush. On new parts the shaft diameter is equal to 19.079-19.094 mm, and the inner diameter of the press-fitted bush is 20.05-20.07 mm.

Insignificant surface roughness can be removed with fine sandpaper. In case of serious damages and deformations renew the shaft.

Gears. There should be no damages or excessive wear of teeth. Special attention should be payed to the condition of the teeth end faces on the synchro unit crown.

The bearing pattern between the gear teeth should cover the complete working area, which should be smooth with no signs of wear. Check the gear mesh clearance, the mounting gap should be 0.10 mm; maximum wear-gap - 0.20 mm.

The mounting gap between the bushes and the 1st/5th gears, and between the output shaft and the 2nd/3rd gears should be 0.05-0.10 mm; maximum wear-gap - 0.15 mm.

If wear exceeds permissible limits, renew the gears.

Bearings. Ball and roller bearings should be in perfect condition. Their radial gap should not exceed 0.05 mm.

Press the inner ring to the outer one with fingers, turn one of them in both directions, the rolling thus should be smooth. On the surface of balls and rollers and the rolling paths of the rings no damage is permissible. Renew damaged bearings. When replacing the input shaft front bearing use pusher A.40006 (see fig. 2-11); it is possible not to remove the flywheel.

Rods and forks. No deformation of gear shift forks is acceptable. The rods should freely slide in the borings without significant gaps.

Check the condition of rod collets, springs and detent balls. Parts having any traces of jamming or wear should be renewed.

Hubs, sleeves and baulk rings. Ensure the hubs have no damage, in particular on the sleeve sliding surface. Draw special attention to the condition of the sleeve spline face.

The synchro rings should show no sign of excessive wear. They should be renewed in case the end face is resting on the synchro unit sleeve. Roughness interfering free sliding, should be removed with a fine-cut file. Badly worn parts should be renewed.

Transfer box

Fault diagnosis

Diagnosis	Remedy
Vibration of the transfer box and body floor (in the area of front seats) when starting and accelerating to 80 km/h	
1. Transfer box not centralised against power unit	1. Centralise transfer box
2. Loose or damaged transfer box mountings, and power unit rear mount	2. Tighten securing nuts and bolts, renew if necessary
3. Hard turning or jamming of front or rear propeller shaft joints	3. Repair U-joints or renew shafts
4. Incomplete handbrake release	4. Adjust handbrake
5. Hard turning of layshaft CV-joint	5. Inspect boot and joint. Renew joint in case of damage
Vibration of the transfer box and body floor (in the area of front seats) at a steady-state movement (most typical at speed of 80-90 km/h)	
1. Propeller shafts out-of-balance	1. Renew or repair propeller shafts
2. Interaxial differential out-of-balance	2. Renew or repair differential
3. Jammed propeller shaft U-joints	3. Repair joints or replace shafts
4. Jammed layshaft CV-joint	4. Inspect boot and joint. Renew joint in case of damage
5. Loose engine mounting nuts and bolts or damaged engine supports	5. Tighten mounting nuts and bolts or renew engine mounts
6. Bended bolts and layshaft flexible coupling flange	6. Renew bolts or layshaft
Noise at cornering or wheel slip	
1. Hard rotation of differential pinions on shaft	1. Renew worn or damaged parts
2. Jammed axle drive gears in differential housing	2. Renew worn or damaged parts
3. Damaged differential pinion working surface	3. Renew worn or damaged parts
4. Large axial clearance of axle drive gears in differential housing	4. Use shims to adjust clearance to 0-0.10 mm
Hard gear switching or differential lock up	
1. Jammed coupling on hub splines or on differential housing splines	1. Rectify burrs, dints, scores, renew bad parts
2. Dents on smaller crown teeth on top or lower gears, on clutch teeth and on splines of front axle drive shaft	2. Rectify burrs, scores, renew bad parts
3. Bended fork or rod	3. Straighten deformed parts
4. Deformed transfer box drive levers	4. Straighten levers, renew if necessary
5. Jammed drive levers on shafts	5. Remove levers, clean shafts and bushes. Renew bad parts

Spontaneous gear or differential lock disengagement

1. Worn teeth on gears and couplings	1. Renew worn parts
2. Weak detent spring or detent component wear	2. Renew springs or worn parts
3. Incomplete gear engagement and differential lock due to drive system component damage or due to dents on gears, clutches or splines	3. Straighten deformed parts or renew, clean burrs and scores, replace bad parts

Oil leak

1. Damaged sealings	1. Renew gaskets
2. Loose nuts and pins fixing covers to casing	2. Tighten nuts and pins in places of leak
3. Worn or damaged shaft seals	3. Renew oil seals
4. Worn transfer drive rod seals	4. Renew sealing ring

Transfer box / car body floor vibration trouble-shooting (in the area of front seats)

First of all note, at what speed does the transfer box vibration occur, then start with the diagnosis.

Test 1. Place the transfer- and gearbox levers in neutral position and start the engine. Set engine speed equal to vehicle speed at which vibration occurs.

If vibration still exists on a parked vehicle, it is necessary to check engine mounting and supports, as they are the reason of vibration.

Test 2. If during test 1 vibration was not diagnosed, place the transfer levers in neutral position, start the engine, engage direct gear and set engine speed equal to vehicle speed at which vibration occurs.

If vibration is observed on a parked vehicle at this engine speed, the reason should be looked for in the layshaft (out-of-balance, bended fastening bolts or flexible coupling flange, jammed CV-joint).

Test 3. If no vibrations was diagnosed during tests 1 and 2, go to test 3. Accelerate the vehicle to the speed, at which vibration occurs, and place the transfer- and gearbox levers in neutral position. If vibration persists, the reason should be looked for in the front or rear propeller shaft (out-of-balance, jammed joints) or interaxial differential is not balanced.

Transfer box - removal, refitting and centering

Removal. Place the vehicle over an inspection pit or on a lift. Release the handbrake and place the gear- and transfer-box levers in neutral position. Undo the fastening screws of the gear lever surround and remove it. Remove the handles and gaiters from the levers. Undo the fastening screws and remove the cover cap and the bellows.

Disconnect the speedometer cable from the transfer box and the wires from the differential lock warning lamp sensor. Turn the driveshafts and disconnect the driveshaft flanges from the transfer box shafts, and the layshaft flange from the gearbox output shaft flange.

Unscrew nuts 3 (fig. 3-37) on the transfer box mounting bracket 1 fastening bolts and remove it together with brackets and shims 5, which are placed under the brackets, in assembly with the layshaft. Mark each shim so that to refit them in the same amount.

Refitting and centering the transfer box is done in the following order:

- ensure proper refitting of engine support pads in brackets (the centering washers of the engine front support pads should fit into the appropriate apertures in the side brackets) and perfect fit of transfer box supports to the car body bottom. If necessary, straighten the floor surface under the supports;

- place the transfer box on the vehicle, but do not tighten completely mounting bracket nuts 4 and 5 (fig. 3-38);

- by moving the transfer box in different directions, find such location, at which the flanges of the transfer box input shaft and the layshaft will be on one level, parallel and with minimum clearances between them; the transfer box shafts should be parallel with the car bottom;

- refit the earlier removed shims under the mounting brackets, fully tighten the fastening nuts;

- reconnect the front and rear propeller shafts to the transfer box shafts; attach the speedometer cable, and the wires to the differential lock warning lamp sensor.

When replacing the transfer box, and also at engine rear mount "settle down", resulting in vibration of the transfer box, renew and match shims 5 (see fig. 3-37) with those of proper thickness.

Matching the shim thickness:

- ensure proper refitting of engine support pads (see subsection. "Engine removal and refitting");

- separate the flanges of the transfer box input shaft and the layshaft;

- slacken the nuts that are fixing the transfer box supports to the car body, remove the shims and, and by moving the transfer box in different directions, find such location, at which the separated flanges will be on one level, parallel and with minimum clearances between them; the transfer box shafts should be parallel with the car body bottom;

- the formed gap between the floor and the support should be filled with a sufficient amount of shims;

- align the flange centering collars without tensioning the supports of the transfer box and the engine, and while keeping the transfer box in this place, tighten the earlier slackened support nuts;

- refit and tighten the flange fastening bolts on the transfer box and the layshaft; if the bolts fit perfectly in the apertures of the flanges, the centering is carried out correctly, otherwise the flanges should be re-aligned.

Dismantle and reassembly

Dismantle. Wash the transfer box and drain oil.

Place the transfer box on a bench for dismantle and slacken the flange fastening nuts on the input shaft and on the front and rear axle shafts.

Undo the fastening nuts and remove the front axle casing 1 (fig. 3-39) in assembly with cover 2, lever, fork, differential lock coupling and the front axle shaft. Remove the speedometer drive unit housing 3 in assembly with the speedometer driven gear.

After removing lock washer 8 (see fig. 3-36) take out lever shaft 10 and remove differential locking lever 11. Then remove cover 7 from the front axle drive and take out the detent spring and ball 19. Undo clamping bolt 3 from the differential lock fork, take out rod 6, fork 1 and locking coupling 2.

Remove rear cover 31 (see fig. 3-35) in assembly with the rear axle drive shaft, taking care not to damage the sealing. Then remove flanges 12 from the input shaft and the drive shafts of the front and rear axles.

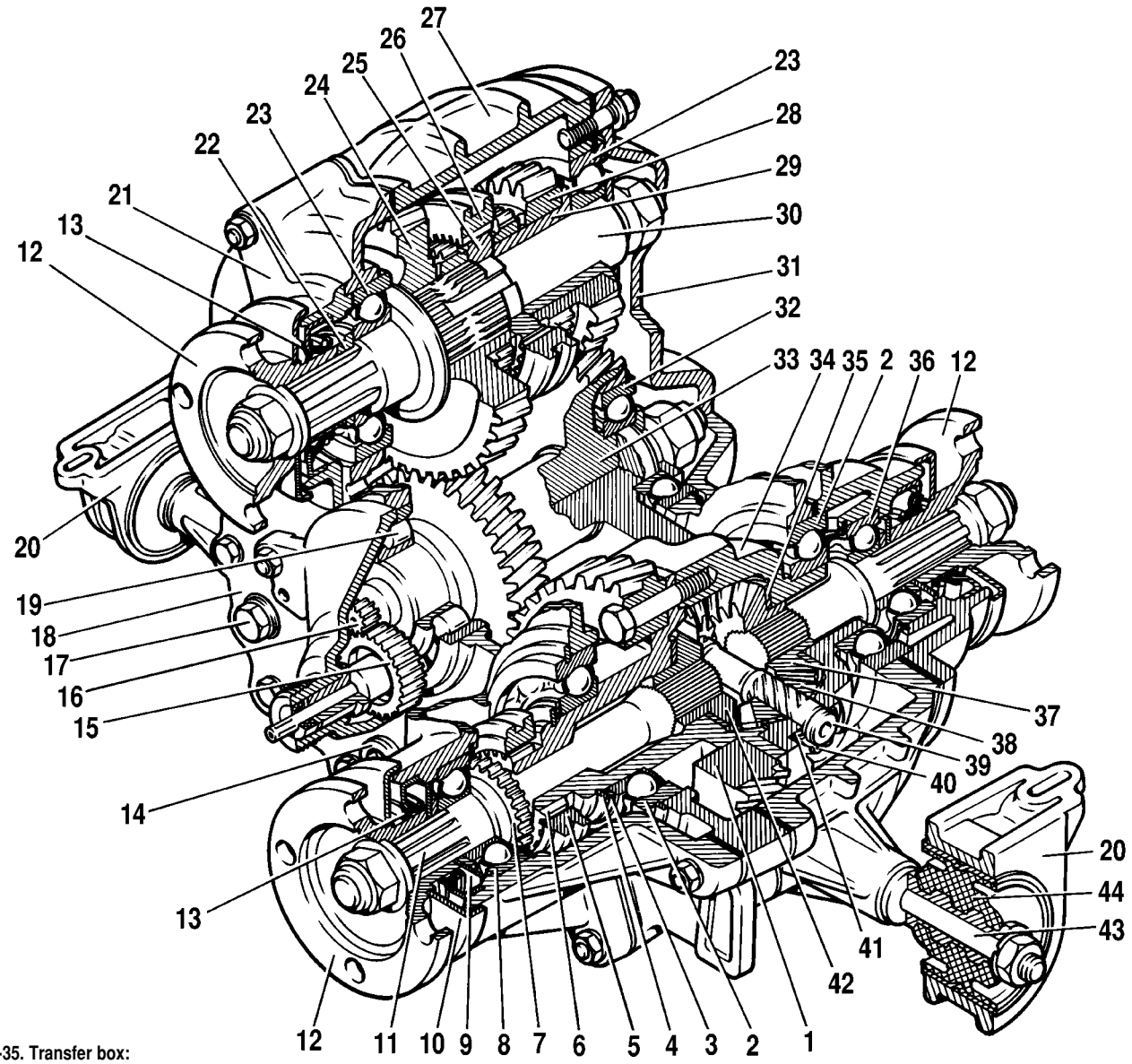

Fig. 3-35. Transfer box:
1 - driven gear; 2 - differential bearing; 3 - spring washer; 4 - circlip; 5 - differential locking coupling; 6 - differential housing crown; 7 - front axle drive shaft crown; 8 - front axle drive shaft bearing; 9 - oil screen; 10 - splash guard; 11 - front axle drive shaft; 12 - flange; 13 - oil seal; 14 - oil drain plug; 15 - speedometer driven gear; 16 - speedometer drive gear; 17 - plug for oil top-up and level check; 18 - transfer box front cover; 19 - layshaft roller bearing; 20 - mounting bracket; 21 - input shaft bearing cover; 22 - bearing thrust ring; 23 - input shaft bearing; 24 - top gear; 25 - gear shift clutch hub; 26 - gear shift clutch; 27 - transfer box casing; 28 - low gear; 29 - low gear bush; 30 - input shaft; 31 - rear cover; 32 - layshaft ball bearing; 33 - layshaft; 34 - differential housing; 35 - rear axle differential gear thrust washer; 36 - rear axle drive shaft bearing; 37 - rear axle differential gear; 38 - pinion; 39 - pinion shaft; 40 - pinion shaft circlip; 41 - spring washer; 42 - front axle differential gear; 43 - transfer box mounting shaft; 44 - mounting bracket rubber pad

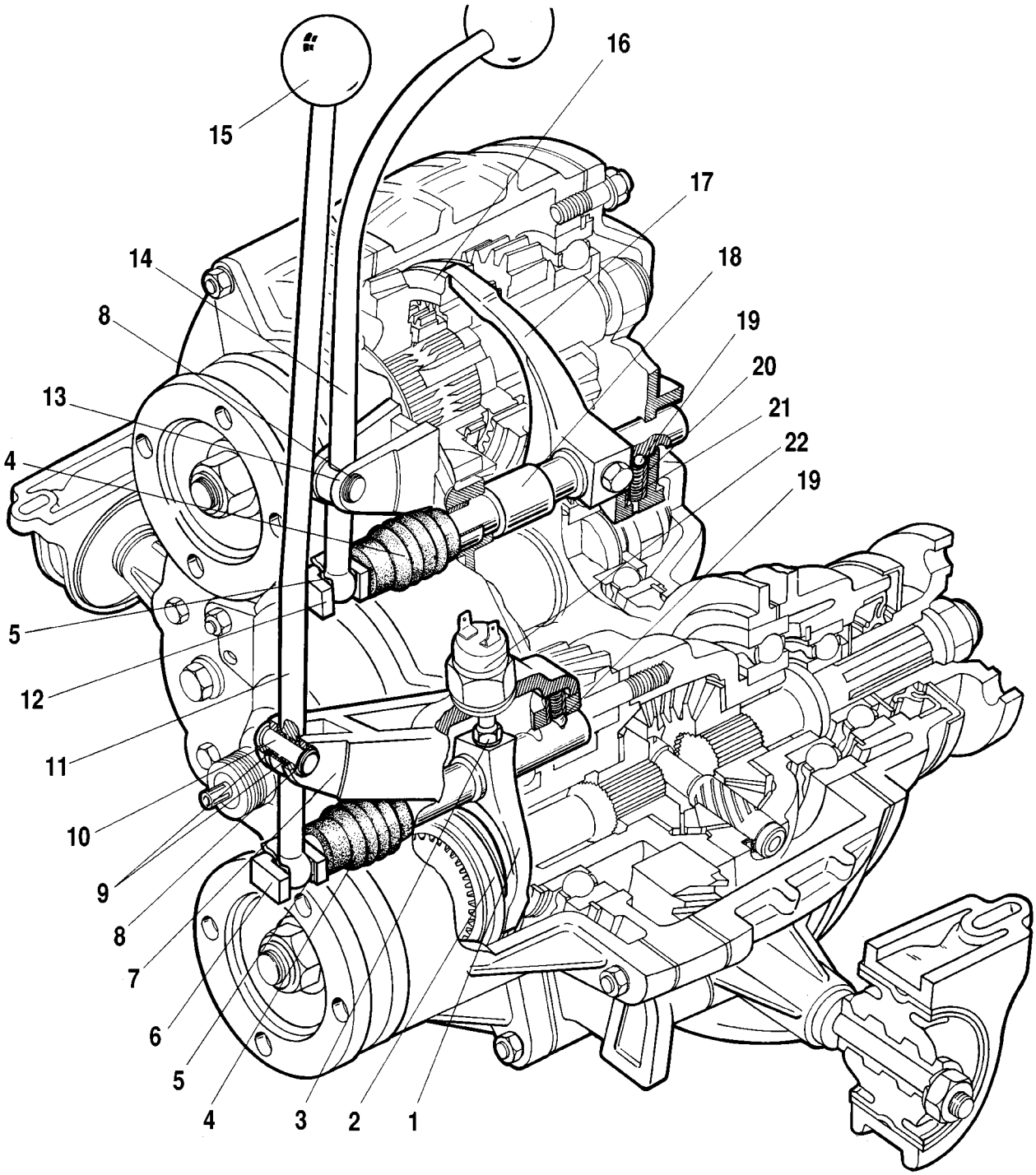

Fig. 3-36. Transfer box operating system:

1 - differential locking clutch yoke; 2 - differential locking clutch; 3 - yoke stop bolt; 4 - boot; 5 - lever spring; 6 - differential locking fork rod; 7 - front axle case cover; 8 - lock washer; 9 - lever shaft bush; 10 - lever shaft; 11 - differential locking lever; 12 - gear shift fork rod; 13 - gearshift lever bracket; 14 - gear shift lever; 15 - knob; 16 - gear shift clutch; 17 - gear shift clutch fork; 18 - distance sleeve; 19 - detent ball; 20 - detent spring bush; 21 - detent spring; 22 - differential lock warning light switch

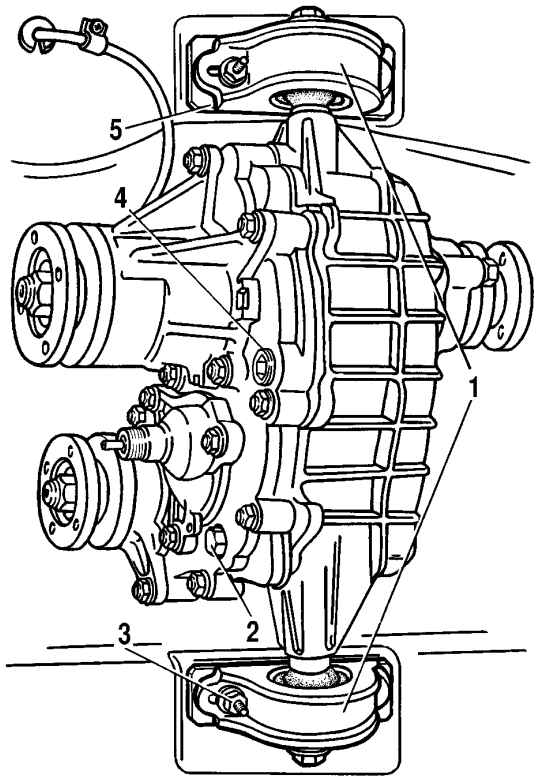

Fig. 3-37. Transfer box mounting on vehicle:
1 - transfer box mounting bracket; 2 - filler plug; 3 - bracket fastening nut; 4 - drain orifice plug; 5 - shims

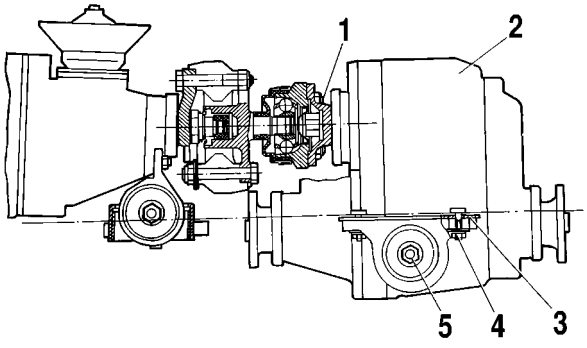

Fig. 3-38. Transfer box installation:
1 - layshaft and drive shaft flange fastening pin; 2 - transfer box; 3 - shims; 4 - transfer box-to-car body fastening nuts; 5 - nuts fastening mounting brackets on shafts

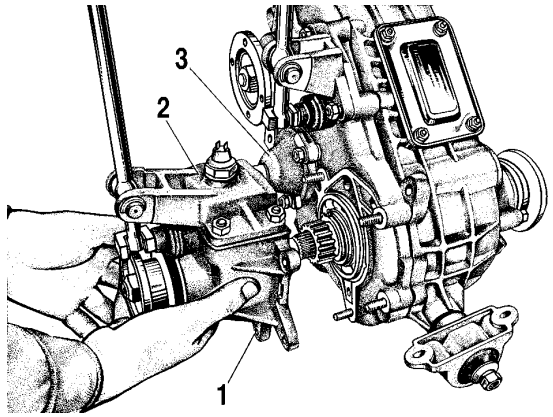

Fig. 3-39. Removing the front axle case:
1 - front axle case; 2 - case cover; 3 - speedometer drive housing

Remove the bearing setting rings from the front and rear drive shafts. Take the front axle drive shaft 11 (see fig. 3-35) out from the casing together with bearing 8, thrust ring and oil deflector 9. Take the rear axle drive shaft out from the rear cover 31 together with bearing 36, thrust ring and oil deflector.

Remove cover 21 from the input shaft front bearing and the inspection hatch cover.

Remove the gear switch lever bracket 13 (see fig. 3-36) in assembly with the lever. After removing the lock washer, take out the shaft and remove lever 14.

Undo the locking bolt of the gear shift fork 17, close the detent socket with a finger and carefully take out rod 12 and the detent components.

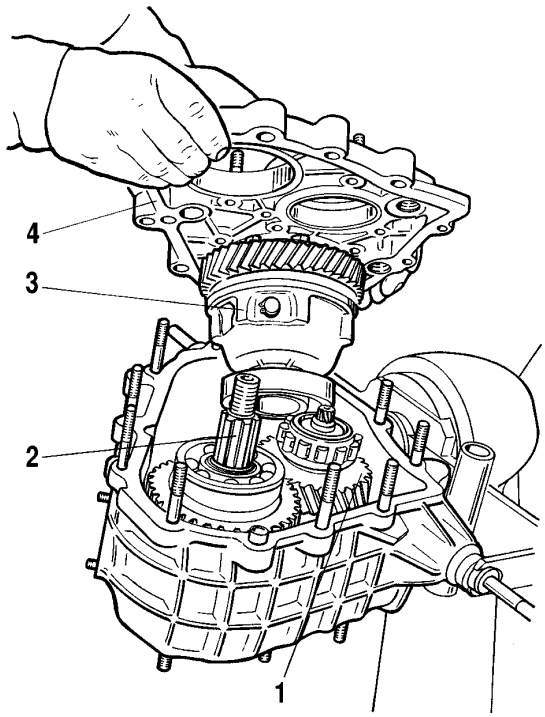

Fig. 3-40. Removing the transfer box front cover:
1 - layshaft; 2 - drive shaft; 3 - differential; 4 - front cover

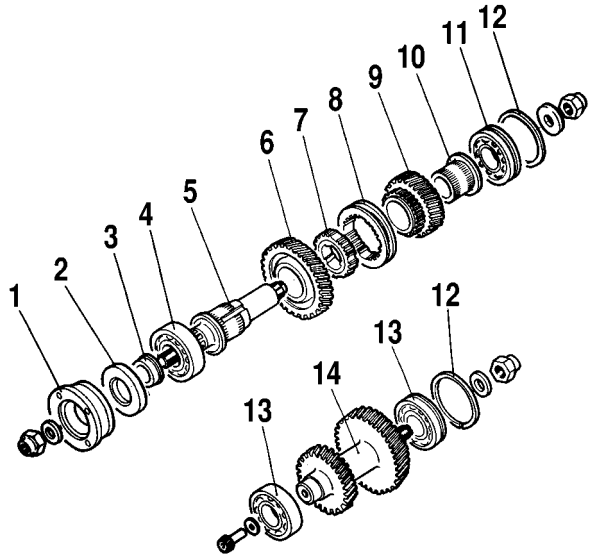

Fig. 3-41. Drive shaft and layshaft components:
1 - flange; 2 - oil seal; 3 - bearing thrust ring; 4 - front bearing; 5 - drive shaft; 6 - top gear; 7 - hub; 8 - coupling; 9 - low gear; 10 - bush; 11 - rear bearing; 12 - bearing set ring; 13 - layshaft bearing; 14 - layshaft

Remove front cover 4 (fig. 3-40) with the differential, fit the differential bearing setting ring and take out the bearing in assembly with the differential from the front cover.

Remove the setting rings from the bearings of the drive- and intermediate shafts and remove both input- and layshafts from the transfer box casing.

Grip the input shaft in vise and use a universal remover tool to remove the thrust ring and rear bearing 11 (fig. 3-41) . Remove low gear 9 together with bush 10, gear engagement clutch 8, clutch hub 7 and top gear 6 from the input shaft.

Dismantle the differential:

- remove circlip 1 (fig. 3-42) and spring washer 2 from the front bearing;

- remove the rear and front bearings from the differential casing (fig. 3-43) using a universal puller and a rest block 67.7853.9559;

- undo the differential driven gear fastening bolts, make risks on the differential casings to mark their location against to each other and dismantle the casing;

- remove the differential driven gear;

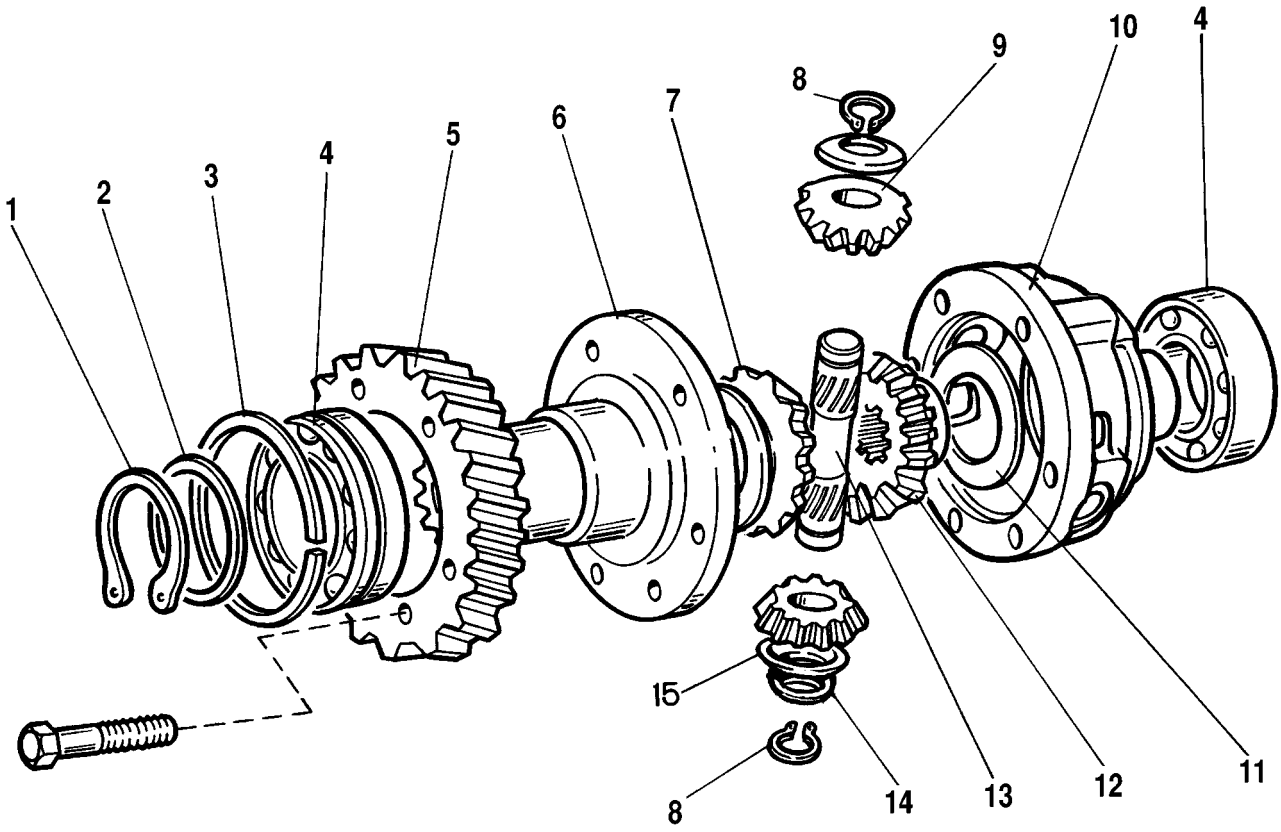

Fig. 3-42. Differential, exploded view:
1 - circlip; 2 - spring washer; 3 - bearing set ring; 4 - differential housing bearing; 5 - driven gear; 6 - differential front housing; 7 - front axle gear; 8 - pinion shaft circlip; 9 - pinion; 10 - differential rear housing; 11 - washer; 12 - rear axle gear; 13 - pinion shaft; 14 - pinion shaft spring washer; 15 - washer

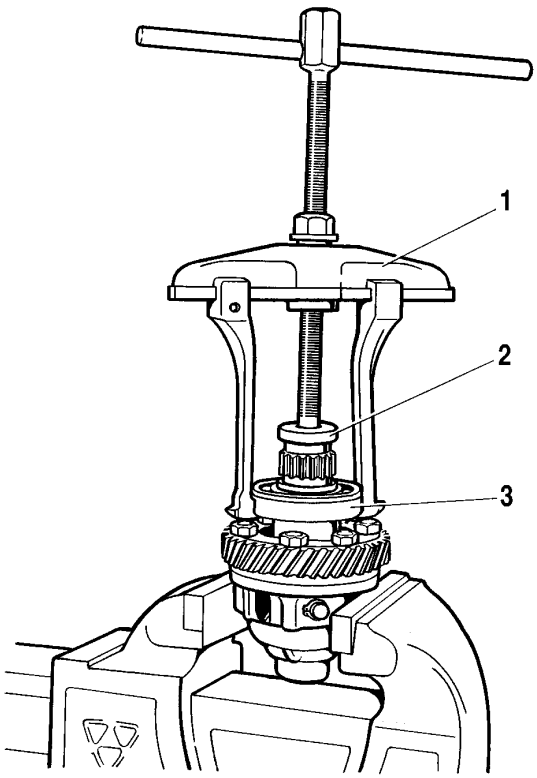

Fig. 3-43. Pressing off the bearing from the differential housing:
1 - puller A.40005/1/6; 2 - rest 67.7853.9559; 3 - bearing

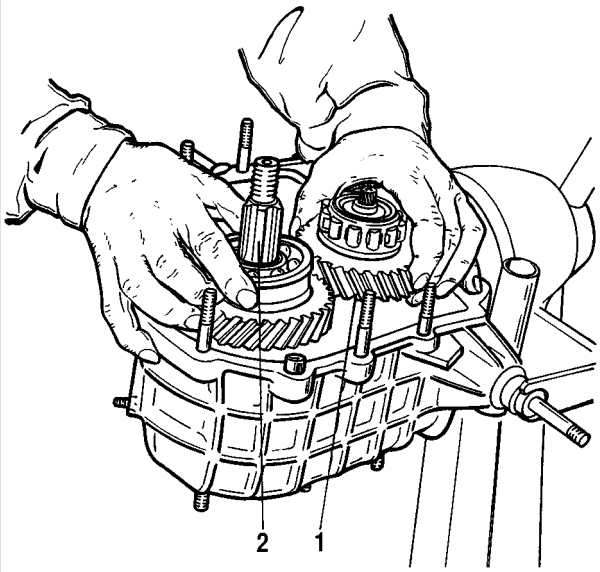

Fig. 3-44. Refitting the drive- and layshafts into the housing:
1 - layshaft; 2 - drive shaft

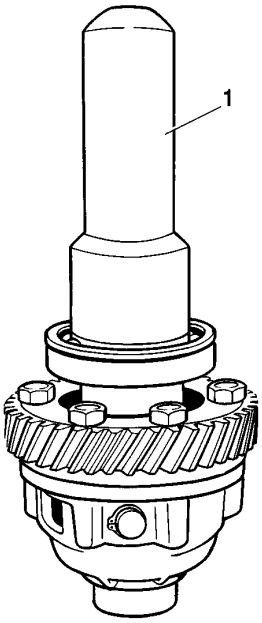

Fig. 3-45. Press-fitting the bearing on the differential housing:
1 - tool 67.7853.9558

- remove circlips 8 (see fig. 3-42) and spring washer 14, then press out the differential pinion shaft and remove the differential pinions and the drive shaft gears with support washers.

Press out worn or damaged oil seals from the front axle case, from the front bearing cover and from the rear cover. Undo the nuts from the axle support pad and remove brackets assembly.

The reassembly of the transfer box is carried out in reverse sequence. Pay attention to the following:

- reassemble the interaxial differential, having matched the marks on its cases so that not to disturb the balance of this unit;

- the spring washer on the differential pinion shaft should be placed from the blind hole side on the shaft end face;

- the axial gap of each axle drive gear should be 0-0.10 mm, and the gear moment of resistance to rotation should not exceed 14.7 N•m (1.5 kgf•m). If the gap is greater, renew the support washers with those having bigger thickness; if this will not help to obtain the specified gap, renew the gears because of their excessive wear;

- drive- and layshafts are installed in the transfer box casing simultaneously (see fig. 3-44);

- bearings are press fitted on the differential casing with tool 67.7853.9558 (see fig. 3-45);

- the working surfaces of oil seals are greased with ЛИТОЛ-24 before their refitting in the covers and casings;

- threaded connections are tightened with torque specified in appendix 1;

- use tool 67.7820.9520 to reduce the transfer box shaft nuts (see fig. 3-46).

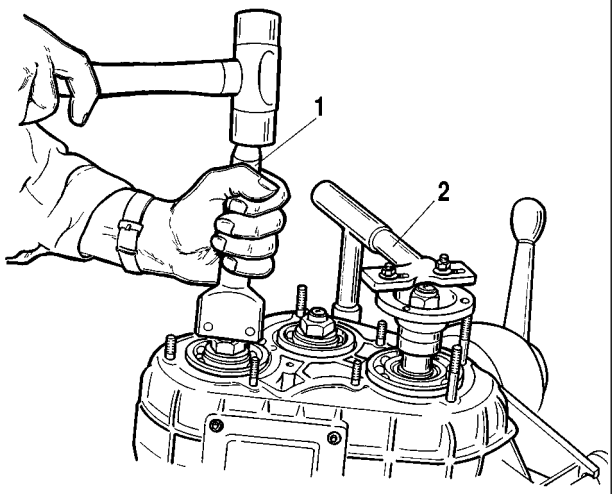

Fig. 3-46. Reducing the rear axle shaft flange nut:
1 - tool 67.7820.9520; 2 - flange retainer

After reassembly, top-up oil in the transfer box to the lower edge of the filler neck.

Inspection

Prior to inspection, all parts of the transfer box should be carefully cleaned with a brush and a scraper, and then washed. Blow the parts with a jet of compressed air. Especially carefully wash and blow the bearings, but do not let them to rotate quickly under the air jet to prevent damage.

Casing and covers. There should be no cracks on the casings and covers, no signs of wear or damage (dents, chipping) is allowed on the surface of bearing housings. Damage on surfaces between casing and covers may result in misalignment of shafts and oil leak. Small damages can be repaired with a file. Renew the parts with significant damage or wear.

Seals. Carefully inspect their condition. Renew in case of even insignificant damages. The wear width of working edges should not exceed 1 mm.

Shafts. On working surfaces, threaded parts and on shaft splines no damages are allowed. To check the runout of the input shaft and the drive shafts of the front and rear axles place them on V-blocks and turn manually. The runout of face ends of bearing thrust shoulders should be no more than 0.01 mm.

When checking the layshaft, pay attention to the condition of the gear unit and the speedometer drive gear. No chipping or excessive wear of teeth is allowed. Renew bad parts.

Gears. When inspecting the gears, check the condition of teeth and landing surfaces. No teeth chipping or excessive wear is allowed. There should be no scuffings or wear on gears landing surfaces that may cause large gaps.

Check the gear mesh clearance; the mounting gap should be 0.10 mm, maximum allowed - 0.20 mm.

The mounting gap between the low gear and bush, and between the input shaft and top gear should be 0.05-0.10 mm, maximum allowed - 0.15 mm. If wear exceeds the limits, renew the gears.

Bearings. Ball and roller bearings should have no damages on races, cages, rollers or balls, and no cracks and choppings on rings. The bearing radial gap should not exceed 0.05 mm.

When turned, a clean dry bearing should not knock. It should run smooth, without jamming. Renew damaged bearings.

Rods, forks. No deformation of forks and jamming of rods in the casing apertures is allowed. In case of jamming, renew the detent components. Weak springs should be replaced. The spring length under load of 99.15-114.85 N (10.2-11.8 kgf) should be 19 mm, when let free - 23.3 mm.

Ensure there are no traces of jamming on the gear shift clutch hub and especially on the clutch sliding surfaces, and also on the differential housing splines. Scuffings and burrs can be smoothed with a file. Special attention should be payed to the clutch teeth end faces; if their damage interferes with the clutch sliding when shifting the gears, renew the clutch.

Differential. Check the differential pinion shaft surface and the apertures in the differential housing; in case of insignificant damages smooth the surfaces with fine sandpaper, and at major damages - renew.

Check the surfaces of axle drive gear journals and their mounting apertures in differential housings, and also the adjusting washer surfaces and mating end face surfaces on the axle drive gears and housings. The detected damages can be removed by fine sandpaper or velvet file; renew the parts in case of major damages or wear.

With spring washer 15 being removed (see fig. 3-42) ensure there is no radial movement of circlip 8 in shaft grooves 14. Replace circlips in case of free play.

Drive line

Design of propeller shafts is shown on fig. 3-47, 3-48, 3-49.

Fault diagnosis

Diagnosis	Remedy
Knock in shafts at pull away, at hard acceleration or gear switching	
1. Loose fastening bolts and nuts on flexible coupling and U-joint flanges	1. Tighten nuts to torque specified in Appendix
2. Excessive backlash in spline joints of front or rear propeller shafts	2. Check gap on spline middle diameter; if it is more than 0.30 mm - renew worn parts
3. Worn U-joints	3. Repair joints and renew worn parts

Noise and vibration of propeller shafts

1. Deformation of front or rear propeller shaft	1. Rectify under press or renew
2. Propeller shafts out-of-balance	2. Check and balance shafts (see "Shaft balancing")
3. Worn or damaged centering bush on layshaft flexible coupling flange	3. Renew coupling flange bush
4. Worn U-joint	4. Repair joints and renew worn parts
5. Loose grease seal retainer on spline joint of front or rear propeller shaft	5. Tighten grease seal and compress retainer, renew oil seal in case of oil leak
6. Insufficient greasing of spline joints	6. Grease spline joints with Фиол-1 or Фиол-2У using oil cups

Lubrication leak

1. Loose grease seal retainer on spline joint of front or rear propeller shaft	1. Tighten grease seal and compress retainer, renew oil seal
2. Damaged layshaft CV-joint boot	2. Dismantle joint, renew greasing and boot. In case of damage - renew joint assembly

Removal and refitting

Place the vehicle on a lift or over an inspection pit, provide free rotation of front and rear wheels from one or both sides of the vehicle.

Reliably anchor the vehicle, release handbrake and place the gearshift lever in neutral.

Remove the front and rear propeller shafts.

Place fixture A.70025 on the layshaft flexible coupling 3 (see fig. 3-14) and, while turning the shaft, undo the bolt nuts that are fastening the flexible coupling to the gearbox output shaft flange. Remove the transfer box (see subsection. "Transfer box") in assembly with the intermediate shaft. Undo the pin nuts that are fastening the intermediate shaft joint to the transfer box input shaft flange and remove the intermediate shaft.

The refitting of propeller shafts is carried out in reverse order. Before refitting the intermediate shaft in assembly with the transfer box, place the flexible coupling centering ring on the gearbox output shaft. When refitting the layshaft, ensure the alignment of the gearbox and the transfer box shafts (see "Refitting the transfer box").

Before refitting the layshaft, grease the inner surface of the flange centering bush with 2-3 gr of ШРУС-4.

Inspection without dismantle

After cleaning and washing the propeller shafts, check the shaft U-joints for smooth and easy rotation and absence of significant axial and radial gaps.

Check the layshaft balance on a balance bench, as follows.

It is not recommended to dismantle the propeller shafts, if the yokes are turning smoothly, there is no jamming, the mis-alignment of the drive axle shafts does not exceed 1.716 N•mm (175 grf•mm), the layshaft - 2.16 N•mm(200 grf•mm) and there is no lubricant leak from the spider bearing seals and the layshaft protective shroud.

Dismantling

Rear and front shafts. Make marks (with paint or punch) to note mutual location of mating parts so that to refit them in the same position and avoid misalignment of shafts.

Place the front (rear) shaft in vice with aluminum jaws. Remove the circlips using round-nose pliers.

Press out the bearing housing from the U-joint yoke. Proceed as follows:

- place the propeller shaft so that one of the yokes will be based on rest 1 (fig. 3-50). Move the other yoke (pos.3) with the help of the press rod through special bush 2 down until it will be pressed against the spider;

- turnover the yoke, repeat the described operations, i.e. move the other end of the yoke down to press against the spider. When performing these operations the opposite spider bearing will partially leave the yoke aperture and in the formed gap between the yoke and spider it will be possible to place bush 1 (fig. 3-51) with a side notch for further complete dismantle;

- place bush 1 (see fig. 3-51) on the spider stud, move the U-joint yoke down to press out the bearing;

- using the above specified procedure, press out the other spider bearings.

Layshaft. Disconnect the flexible coupling from flange 5 (see fig. 3-49). Note the amount and location of the coupling and balance washers 17 on the flange, so that to refit them in place.

In case of damage of the protective cover 6 or shroud 14, when it is required to inspect the joints and the quality of greasing, note the location of the U-joint in relation to the flexible coupling flange, and dismantle the U-joint using the procedure described in subsection "Front wheel drive".

Inspection

Eccentricity check. Place the front (rear) propeller shaft between the centers on a special bench and while turning it, check the runout, which should not exceed:

- 0.5 mm in 50 mm from the end weld seams;

- 0.3 mm in the middle part.

If the runout exceeds the specified values, straighten the shaft under a press or renew.

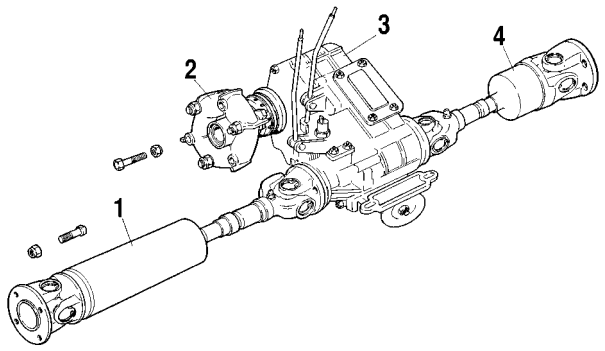

Fig. 3-47. Driveline assembly:
1 - front propeller shaft; 2 - layshaft; 3 - transfer box; 4 - rear propeller shaft

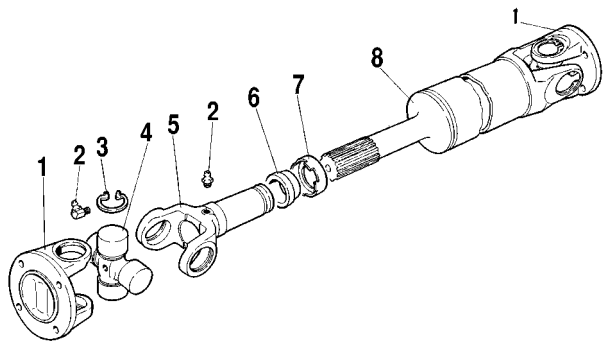

Fig. 3-48. Front propeller shaft, exploded view:
1 - U-joint flange; 2 - grease cup; 3 - circlip; 4 - spider; 5 - sliding yoke; 6 - seal; 7 - seal retainer; 8 - propeller shaft

Spline joint. Check the gap in the spline joint of the sliding yoke of the forward and rear shafts. The maximum allowable backlash on the spline middle diameter is 0.30 mm.

Check for the plug in yoke 5 (fig. 3-48), inspect retainer 7 and seal 6 of the sliding yoke. If necessary, renew the seal, and the retainer if damaged.

U-joint. Inspect the bearing housing, needles and thorns of the spider, seals, end face washers.

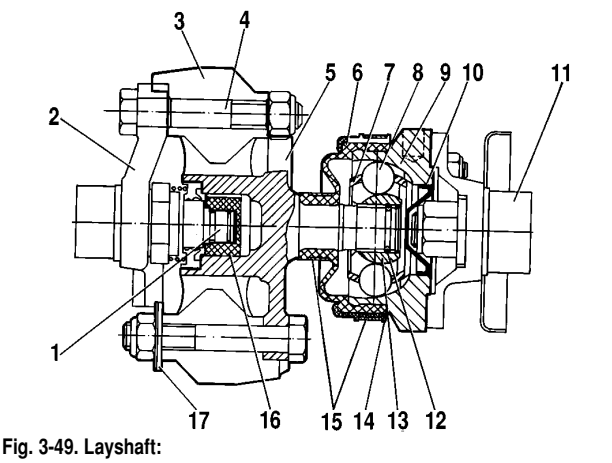

Fig. 3-49. Layshaft:
1 - gear box output shaft; 2 - output shaft flange; 3 - coupling insert; 4 - flange fastening bolt; 5 - coupling flange; 6 - boot; 7 - cage; 8 - ball; 9 - CV-joint housing; 10 - plug; 11 - transfer box input shaft; 12 - circlip; 13 - joint race; 14 - boot cover; 15 - clamp; 16 - centering bush; 17 - balancing washer

If any of the components are damaged, renew the spider in assembly with the bearings.

The diameter of the yoke opening for the needle bearing should not exceed 28.021 mm.

In case of damage or if wear of working surfaces of the layshaft U-joint components exceeds 0.1 mm, renew the U-joint assembly.

Flexible coupling. Inspect the rubber components of the flexible coupling. In case of cracks or peelings of rubber from the metal inserts, renew the flexible coupling.

Flexible coupling flange. Inspect the centering bush on the flexible coupling flange. Renew in case of damage or wear.

Reassembly

The reassembly is a reversal of dismantle, providing the following:

- evenly grease the spline joints with 3-4 gr of ФИОЛ-1 or ФИОЛ-2У;

- match the marks on the dismantled parts;

- after reassembling the spline joint, apply axial load to press the seal by 0.3-0.5 mm and crimp the retainer on the yoke groove.

The reassembly of the U-joint is carried out in the following sequence:

- remove old greasing, lubricate the inner surface of the bearing housing with grease № 158 or ФИОЛ-2У (0.8-1.2 gr on each bearing). Do not grease the spider thorns, to avoid an air plug during reassembly. Mount the spider into fork apertures. Insert a bearing in one of the yoke openings and place circlip1 (fig. 3-52) with thickness of 1.56 mm in the yoke groove. Insert a bearing in the other yoke opening until the opposite bearing will thrust against the circlip end face. The pressing force should not exceed 15000 N (1500 kgf).

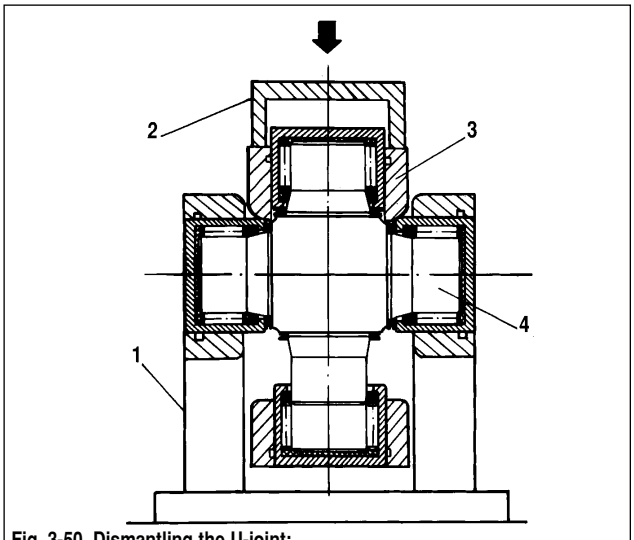

Fig. 3-50. Dismantling the U-joint:
1 - rest; 2 - bush; 3 - joint fork; 4 - spider

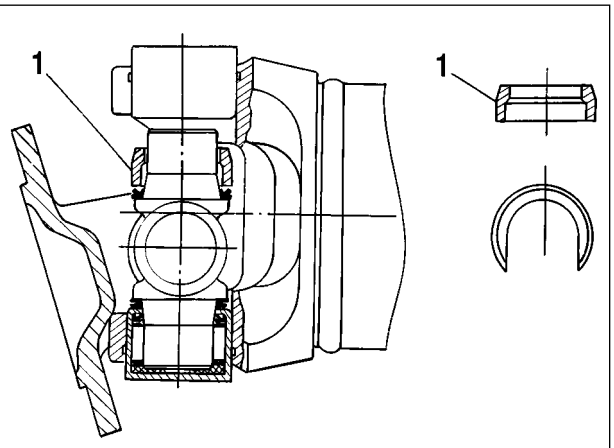

Fig. 3-51. Installing the bush for dismantling the U-joint:
1 - bush

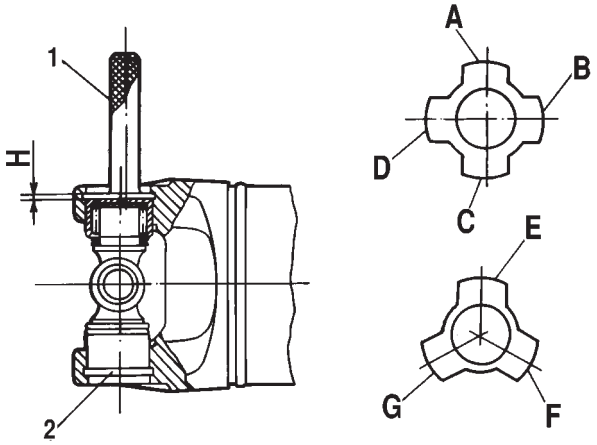

Fig. 3-52. U-joint reassembling:
1 - circlip; 2 - feeler gauge; H - gap; A, B, C, D, E, F, G - feeler gauge blades with thickness in mm: 1.45; 1.48; 1.52; 1.56; 1.60; 1.64; 1.67

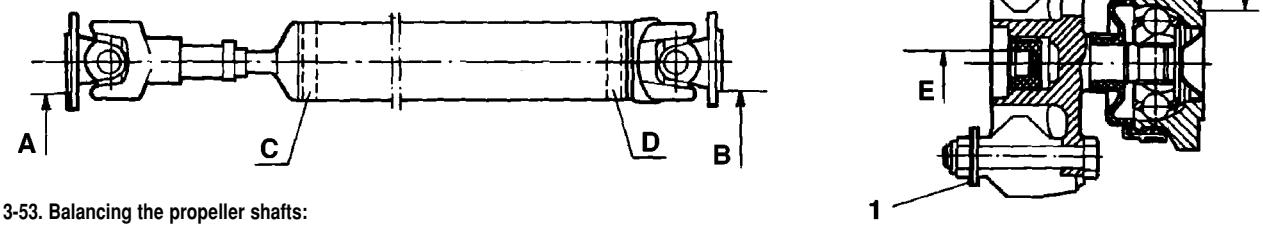

Fig. 3-53. Balancing the propeller shafts:
1 - washers for balancing; A, B, E, F - out-of-balance check points; C, D - shaft rest points on the balancing fixture

Using two feeler gauges 2, with 4 and 3 blades of different thickness accordingly, determine which will tightly fit in the clearance **H** between the base of the bearing and the yoke groove end face, and install a circlip of the same thickness.

Note. *One feeler gauge has blades with thickness of 1.45; 1.48; 1.52; 1.56 mm, the other one - 1.60; 1.64; 1.67 mm.*

If the blade of the smallest thickness (1.45 mm) does not fit into gap **H**, replace circlip 1 with the one having thickness of 1.4 mm and repeat the procedure.

If the blade of the greatest thickness (1.67 mm) loosely fits into backlash H, it is necessary to remove ring 1 and insert in this gap a ring with thickness of 1.67 mm, and repeat all specified operations.

Note. It is recommended to carry out the gap measurement from the side of the pipe. The circlips are provided in eight size sets (according to their thickness), each of them has a certain colour: 1.45 - not painted; 1.48 - yellow; 1.52 - brown; 1.56 - dark blue; 1.60 - black; 1.64; 1.67; 1.40 - colors are not designated and their thickness is determined by measuring.

After inserting the circlips, hit the yoke forks with a hammer with plastic head. After the impact the backlash between the bearing bottom and the circlip will be taken up, and formed between the bearing housing and spider thorn end faces within 0.01-0.04 mm. After reassembly, check for easy rotation of the U-joint yokes and the shaft balance.

To reassemble the layshaft U-joint follow the procedure described in chapter "Front wheel drive". When reassembling, install retainer 7 (see fig. 3-49) with the chamfer facing the transfer box input shaft, and grease the U-joint with 20 cm^3 of Longtern-00 from "Dow corning".

Shaft balance

The front and rear propeller shafts are balanced on special machines by welding metal plates.

At speed of 5500 min^{-1} the shaft misalignment, checked on surfaces A and B (fig. 3-53), should not exceed 1.72 N•mm (175 grf•mm), and at the balance check - 2.16 N•mm (220 grf•mm).

The layshaft balance is checked at speed of 800 min^{-1} on surfaces **E** and **F**. Equilibration is provided by balance washers 1 (see fig. 3-53) and drilling the U-joint housing. The out-of-balance condition should not exceed 1.96 N•mm (200 grf•mm).

ATTENTION. If any of the shaft components were replaced during repair, it is necessary to balance the shafts.

After balancing, lubricate the U-joint bearings with grease N158 or ФИОЛ-2У through oilers. Force in the grease until it will start coming out through the sealings.

Rear axle

The design of the rear axle is shown on fig. 3-54.

Fault diagnosis

Diagnosis	Remedy
Excessive noise from the rear wheels	
1. Loose wheel fastening	1. Tighten wheel securing nuts
2. Worn or failed axle shaft ball bearing	2. Inspect axle shaft and replace bearing
Constant excessive noise at rear axle operation	
1. Deformed rear axle beam, damaged axle shaft bearings	1. Rectify beam and check dimensions, renew axle shaft bearings
2. Damaged axle shafts and intolerable runout	2. Straighten axle shafts. In case of heavy damages - renew
3. Wrong adjustment, damage or wear of gears or reduction gear bearings	3. Isolate problem and repair reduction gear
4. Wear or wrong adjustment of differential bearings	4. Dismantle reduction gear, repair and adjust
Noise at acceleration and engine deceleration	
1. Wrong adjustment of final drive gear mesh during reduction gear repair	1. Adjust gear mesh
2. Damaged axle shaft bearing	2. Renew bearings
3. Insufficient amount of oil	3. Top up oil and check for leaks from seals and rear axle beam
4. Worn gap in final drive gear mesh during reduction gear	4. Adjust clearance
5. Excessive gap in driving gear bearing due to loose flange fastening nut or worn bearing	5. Check moment of resistance to rotation, tighten nut or renew damaged parts
Noise at cornering	
1. Damaged axle shaft bearings	1. Renew bearings
Knock at the beginning of movement	
1. Worn opening in differential box for differential pinion shaft	1. Replace differential box
2. Loose rear suspension arm fastening bolt	2. Tighten bolts
Oil leak	
1. Worn or damaged driving gear seal	1. Renew oil seal
2. Worn axle shaft seal, determined by excessive oil on braking plates, drums and pads	2. Check axle shaft runout, beam sag. Straighten or replace damaged parts
3. Loose fastening bolts on rear axle reduction gear casing, damaged sealings	3. Tighten bolts, replace gaskets

Rear axle - removal and refitting

The removal and refitting of the rear axle beam is described in subsection "Rear suspension". To remove the rear axle it is enough to disconnect the suspension arm and the shock-absorbers only from the rear axle beam. When refitting the rear axle the bar fastening bolts should be tightened according to the regulations in subsection "Rear suspension". After refitting, bleed the brakes and adjust the main and handbrake systems as directed in section "Brakes". Fill the rear axle with transmission oil through oil fillers.

Rear axle - dismantling and reassembly

Dismantling. Disconnect the pipe ends from the brake cylinders and remove the pipeline with the brake system tee from the axle.

Place the axle on a repair-bench and drain oil.

After removing the brake drum and undoing the braking plate fastening nuts with pusher 67.7823.9516 (fig. 3-55), take out the axle shaft in assembly with the oil screen, the bearing fastening plate, the bearing and a stop ring. Remove the braking plate and the sealing ring. If necessary to renew, take out the sealing ring from the axle beam flange.

Do the same on the other end of the beam, then remove the reduction gear.

The reassembly of the rear axle is carried out in reverse sequence:

- grease the threads of the reduction gear fastening bolts with a sealant, previously having degreased them and the threaded connections in the rear axle beam;

- grease the axle shaft bearing seal with ЛИТОЛ-24 before refitting, and use tool A.70157 to refit the seal in the beam flange;

- grease the landing shoulder of the axle shaft and the drum-mating surface of the flange with graphite or ЛСЦ-15.

The brake drums are installed after refitting the rear axle on the vehicle and fastening the cable ends to the handbrake linkage levers.

Rear axle beam - inspection

Carefully inspect the beam, especially on a vehicle after collision. A damaged beam can become the reason of noise in the rear axle and quick wear of tyres.

The deformation of the axle beam is checked both horizontally and vertically.

Attach flange A.70172 to each end of the beam, place the beam with the flanges on identical V-blocks located on a surface plate with length no less than 1600 mm so that the abutment surface between the casing and the beam will be vertical.

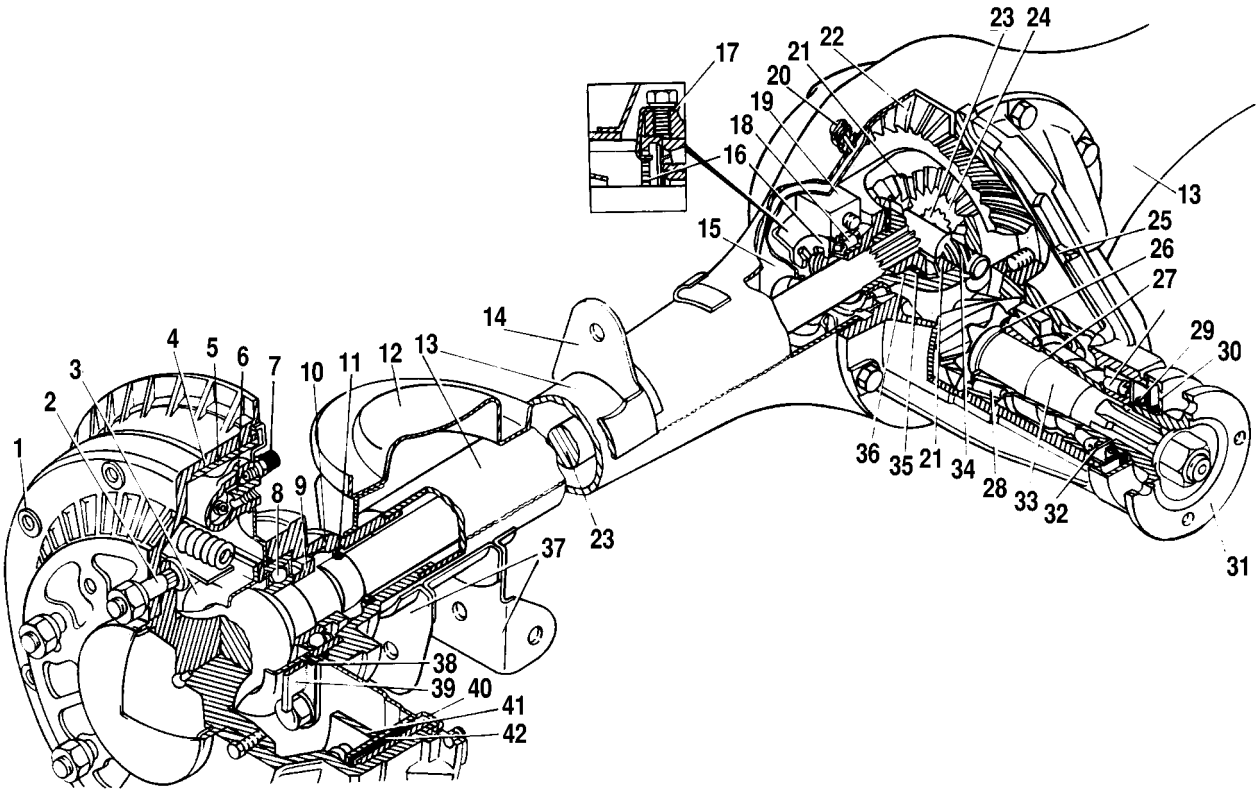

Fig. 3-54. Rear axle:
1 - wheel cap; 2 - brake drum-to-wheel securing bolt; 3 - oil deflector; 4 - brake drum; 5 - brake drum iron ring; 6 - wheel cylinder; 7 - bleeder; 8 - axle shaft bearing; 9 - bearing locking ring; 10 - rear axle beam flange; 11 - oil seal; 12 - suspension spring cup; 13 - rear axle beam; 14 - rear suspension bar mounting bracket; 15 - axle shaft guide; 16 - differential bearing adjusting nut; 17 - nut locking plate; 18 - differential housing bearing; 19 - bearing cover; 20 - breather; 21 - pinion; 22 - driven gear; 23 - axle shaft; 24 - differential side gear; 25 - rear axle reduction gear casing; 26 - shim; 27 - bearing spacer sleeve; 28 - final drive bearing; 29 - grease seal; 30 - splash guard; 31 - flange; 32 - oil screen; 33 - final drive gear; 34 - pinion shaft; 35 - axle shaft gear washer; 36 - differential housing; 37 - suspension mounting bracket; 38 - axle shaft bearing, mounting plate; 39 - plate fastening bolt holder; 40 - rear brake backplate; 41 - rear brake shoe; 42 - shoe pad

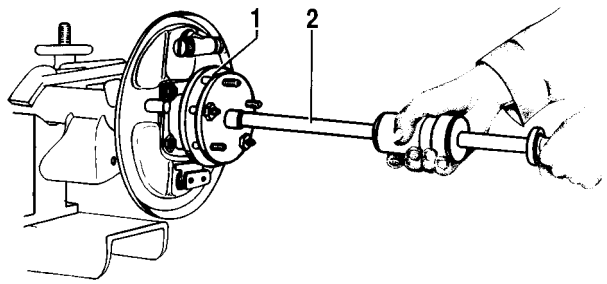

Fig. 3-55. Pressing out the axle shaft:
1 - axle shaft; 2 - knockout tool 67.7823.9516

Check the beam deformation by attaching a try square to the outer (fig. 3-56) and side (fig. 3-57) surfaces of the flange A.70172; if the beam is not deformed, the try square will fit perfectly.

Size of deformation is checked by a probe. If a 0.2 mm gauge passes through on any of the flanges, the beam should be straightened.

Using a try square (fig. 3-58), check the normality of the reduction gear fastening surface vs the seating surface of flange A.70172. The 0.2 mm feeler gauge should not fit.

Make a 90 ° turn of the axle beam and place it on V-blocks. A try square applied to the outer surface of the flange (fig. 3-59) should adjoin with no gaps, otherwise check the size of deformation by a feeler gauge. The 0.2 mm gauge should not fit.

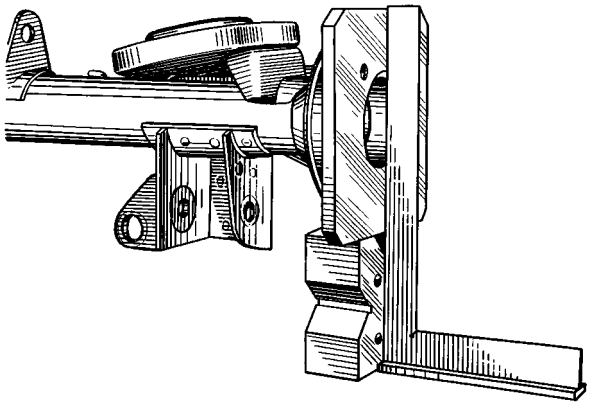

Fig. 3-56. Checking for vertical deformations of the rear axle beam using a try-square on the outside surface of flange A.70172

If deformation exceeds this size, straighten the beam, following the procedure given below.

After straightening, carefully wash the beam, clean the magnetic plug, put it in place and check the following:

- quality of weld seams and leak-proofness of the beam;

- the beam breather and the beam should be clean inside (no burrs, chippings or oil residues).

After that paint the beam to protect from corrosion.

Straightening the rear axle beam

Attach to each end of the beam flanges A.70172 (the set used for straightening and not for checking the beams) and place it on supports of a hydraulic press so that the ends of the clamping crossrail 2 (fig. 3-60) were in the zone of deformation. The most probable location of the zone is in 200-300 mm from the end faces of the beam flange.

Establish rack 7 with the indicator so that the leg of the indicator will rest against the top part of the flange side surface, and

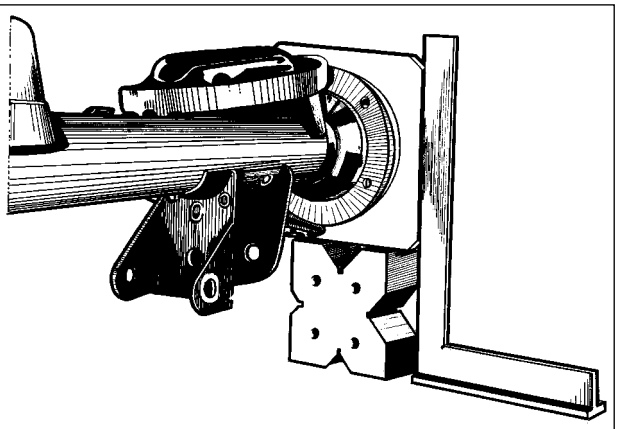

Fig. 3-57. Checking for twisting of the rear axle beam using a try-square on the side surface of flange A.70172

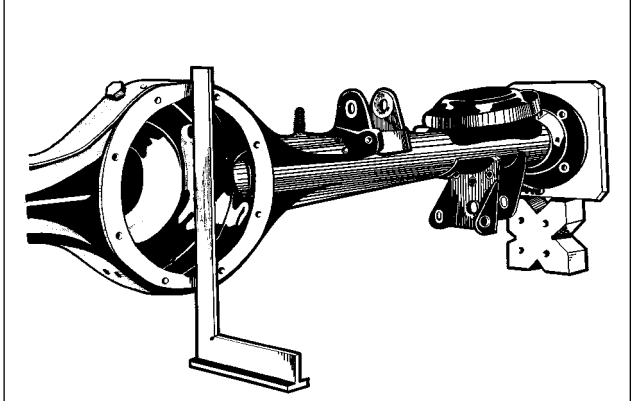

Fig. 3-58. Checking the reduction gear mounting

the arrow of the indicator will point to the division equal to the size of beam deformation measured by a feeler gauge when checking the beam. On the other end of the beam place either a rack with an indicator or a try square 4.

Place rests 6 under the beam (in the zone of deformation), straighten the beam on a hydraulic press first horizontally and then vertically, monitoring the results by an indicator or a feeler gauge with a try square 4.

The maximum pressing force during straightening should not exceed 98 kN (10000 kgf), so that not to affect the housing profile.

Note. *If the height of the rest was experimentally correctly adjusted, the beam can be straightened without monitoring by a try square or an indicator.*

Remove the beam from the press and check as mentioned above, having replaced flanges A.70172 with "test" ones.

In case there is no necessary equipment available, as an exception, it is possible to straighten the rear axle beam first from one side, then from the other, but with an obligatory deformation check from both sides (see "Rear axle beam check").

Axle shafts

Removal and refitting

Remove the wheel and the brake drum.

After unscrewing the nuts fastening the brake backplate to the axle beam, hold the backplate, and using pusher 67.7823.9516 remove the axle shaft together with the oil screen, bearing fastening plate and bearing stop ring.

Take out the seal from the beam flange if necessary to renew.

The axle shaft refitting is a reversal to removal, paying attention not to damage the working edge of the seal. Before refitting the brake drum, grease the landing shoulder of the axle shaft with

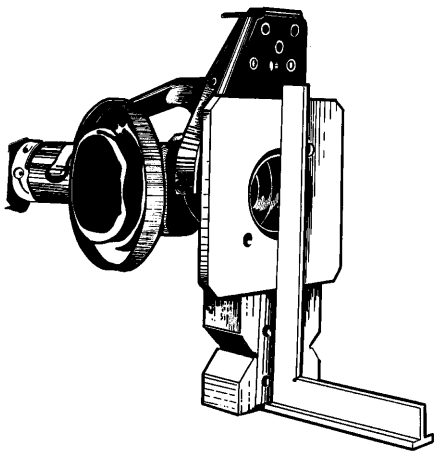

Fig. 3-59. Checking for horizontal deformations of the rear axle beam using a try-square on the outside surface of flange A.70172

graphite greasing or ЛСЦ-15. After refitting, check the operation of axle shafts during an actual road test.

Inspection

Inspect the parts composing a complete set, and make sure that:

- bearing is not worn and is not damaged; if the axial gap exceeds 0.7 mm, renew the bearing;

- stop ring and bearing are not shifted in relation to the initial position; if the bearing inner ring turns against the axle shaft landing shoulder, renew the stop ring;

- bearing fastening plate and oil screen have no damages;

- axle shaft is not deformed and the landing surfaces are not damaged; the axle shafts runout measured in centers, on the seal journal does not exceed 0.08 mm. Before fitting in the centers, carefully clean the centering apertures on the axle shaft from dirt and rust.

In case of wear or damage of parts fitted on the axle shaft, renew them following the below guidelines and using special tools. An insignificant bending of the axle shaft core can be corrected by straightening. After straightening the runout of the

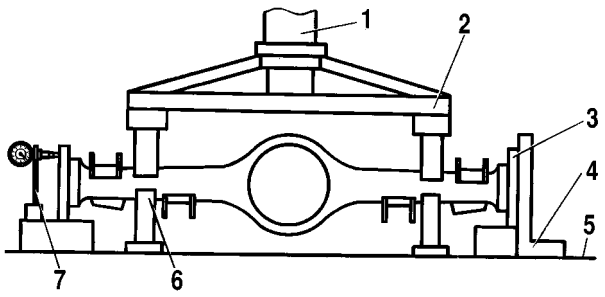

Fig. 3-60. Rear axle beam straightening:
1 - hydraulic cylinder; 2 - clamping bar; 3 - flange A.70172; 4 - try-square; 5 - press table; 6 - rest; 7 - indicator post

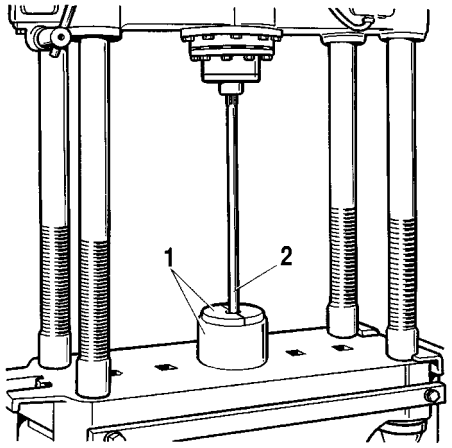

Fig. 3-61. Pressing out the axle shaft bearing stop ring:
1 - fixture; 2 - axle shaft

flange end face measured in the centers, should not exceed 0.05 mm, if the runout is above the specified value, but no more than 0.08 mm, it can be lathed to eliminate runout. The reduction of flange thickness due to turning should be no more than 0.2 mm.

Stop ring removal

The axle shaft bearing stop ring is removed and installed on a hydraulic press.

First, bend out bolt retainers 39 (see fig. 3-54) that are fastening plate 38 with the oil screen and the brake plate, and take out the bolts.

Straddle the bearing with tool 67.7823.9529 and place the axle shaft vertically so that the half-rings are rested on the thrust ring.

Place the axle shaft under the press (fig. 3-61) and apply gradually increasing force to the spline end of the axle shaft until the bearing stop ring will be removed. The bearing stop ring should be renewed.

Ensure that the landing surface of the axle shaft has no marks or damages; renew if necessary.

Axle shaft reassembly

Place the axle shaft vertically and rest the flange on ring 7 (fig. 3-62) of tool 67.7823.9530.

Bolt together the axle shaft bearing oil screen and the bearing fastening plate with a seal, and refit the assembly on the axle shaft; fit the axle shaft ball bearing.

Fit a new stop ring into special retainer 3, place into heater and warm the ring up to approximately 300 °C, so that at the moment of press-fitting its temperature will be 220-240 °C.

The stop ring is press-fitted on the axle shaft with tool 1 on a press with force of 58.8 kN (6000 kgf) so that the bearing inner ring is fixed between the stop ring and the axle shaft collar.

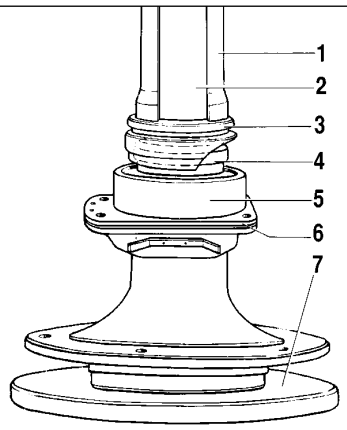

Fig. 3-62. Press-fitting the axle shaft bearing stop ring:
1 - tool; 2 - axle shaft; 3 - race; 4 - stop ring; 5 - bearing; 6 - oil deflector assembly and bearing securing plate; 7 - ring

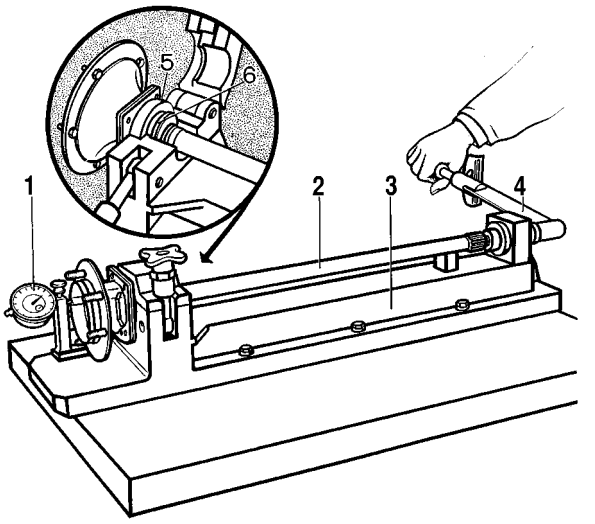

Fig. 3-63. Checking the force of pressing out the axle shaft bearing stop ring:
1 - indicator; 2 - axle shaft; 3 - fixture; 4 - dynamometer; 5 - bearing; 6 - bearing stop ring

After press-fitting, ensure, that the ring does not shift under the axial load of 19.6 kN (2000 kgf). To do this, place the axle shaft assembly on a special fixture (fig. 3-63), and grip the stop ring in special vice.

Attach the leg of indicator 1 with scale interval of 0.01 mm to the axle shaft flange. Set the arrow to "0" and apply the specified axial load, creating with a dynamometer the torque of 78.5-83.3 N•m (8-8.5 kgf•m) on the tool screw. The screw through the ball should be pressed against the axle shaft end face. There should be no, even a slightest, gap between the stop ring and the inner ring of the bearing.

After removing load and when undoing the tool screw, the indicator arrow should return to zero, thus proving there was no shift between the stop ring and the axle shaft. If the indicator arrow does not return to zero, it will mean the stop ring had shifted and the axle shaft assembly should be renewed.

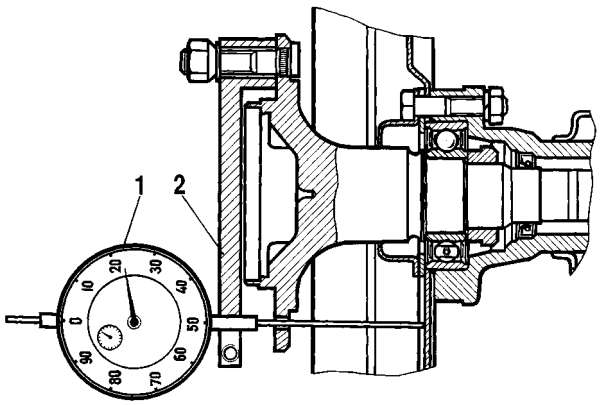

Fig. 3-64. Checking the axle shaft axial play with the wheel and the brake drum removed:
1 - indicator; 2 - fixture

After checking the press fitting of the stop ring, replace the fastening bolts of the plate and oil screen 6 (see fig. 3-62) and fix them in place by bending back the bolt retainers.

On-vehicle measurement of the axle shaft axial play

Slacken the rear wheels fastening nuts. Put blocks under front wheels and raise the rear axle. Release the handbrake and place the gear shift lever in neutral.

Remove wheels and brake drums. Attach tool 02.7834.9504 (fig. 3-64) to the axle shaft, pass through one of the axle shaft openings the indicator 1 leg extension until it will rest against the braking plate or the oil screen and fix the indicator.

Make the measurement with the indicator, applying to the axle shaft flange force of approx. 49 N (5 kgf) in both directions along the rear axle shaft. The free play should not exceed 0.7 mm.

Reduction gear

The rear axle reduction gear assembly is shown on fig. 3-65. It is unified with the reduction gear of VAZ - 2106 and has a label on the housing as figure 6.

Fault diagnosis by noise

Fault diagnosis is carried out in the following sequence.

Test 1. In order to clearly determine the character of noise, drive the vehicle on a highway with speed approximately 20 km/h. Then gradually increase speed up to 90 km/h, listen carefully to various noises and note speed, at which they occur and disappear.

Release the throttle pedal and without applying the brake pedal shift to lower gear.

During deceleration listen how noises change, and note the moment, when noise increases. Usually, noises appear and disappears at same speeds both at acceleration and deceleration.

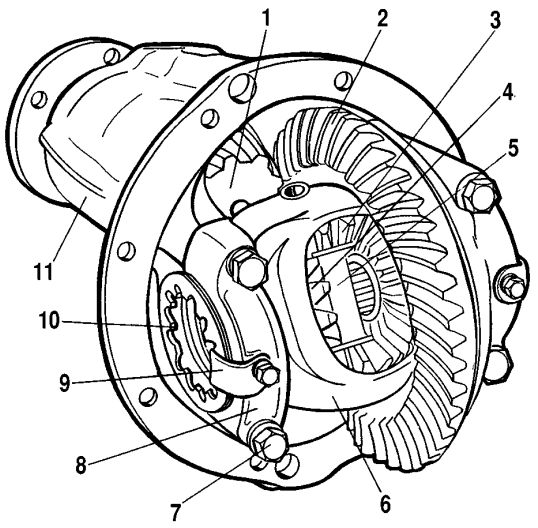

Fig. 3-65. Reduction gear:
1 - drive gear; 2 - driven gear; 3 - pinion; 4 - axle shaft gear; 5 - pinion shaft; 6 - differential housing; 7 - bearing cover securing bolts; 8 - bearing cover; 9 - stop plate; 10 - bearing adjusting nut; 11 - reduction gear housing

Test 2. Accelerate the vehicle approximately up to 100 km/h, place the gear shift lever in neutral, switch off ignition and let the vehicle to roll on to a stop; listen to the noise character at various speeds during deceleration.

ATTENTION. With the ignition switched off, be attentive and careful. Do not turn the key more than it is necessary, as it may activate the anti-theft system.

Noise noticed during this test and corresponding to the one noticed at the first test, does not originate from the final drive drive gears, as they do not make any noise without load.

And on the contrary, noise marked during the first test and which was not repeated at the second one, can proceed from the reduction gears or the driving gear bearing or the differential.

Test 3. On a parked vehicle with the handbrake set, switch on the engine and, by gradually increasing the revolutions, compare the arisen noises with those noticed in the previous tests. Noises similar to those indicated in test 1, do not originate from the reduction gear and are likely to be caused by other units.

Test 4. Noise noticed at the first test and which were not repeated at the subsequent, originate from the reduction gear; for confirmation lift the rear wheels, start the engine and engage the fourth gear. Thus, it is possible to ensure, that noise indeed originates from the reduction gear, and not from the other units, for example, suspension or car body.

Reduction gear - removal

If it is necessary to remove only the reduction gear:

- drain oil from the rear axle beam;

- raise the rear part of the vehicle, place it on supports and remove wheels and brake drums;

- undo nuts fastening the braking plate to the beam and pull out the axle shafts so that they come out from the differential box;

- disconnect the propeller shaft from the reduction gear, put a support under the reduction gear casing, turn out the bolts fastening it to the rear axle beam and take out the reduction gear from the beam, pay attention not to damage the sealing.

Reduction gear - refitting

Before refitting the reduction gear, carefully clean the axle beam from oil. Place a sealing on the mating surface, fit the reduction gear into the beam and fix with bolts. Grease the bolt threads with a sealant. Before greasing the bolts and connections in the beam carefully degrease all surfaces. Connect the propeller shaft to the reduction gear. Install the axle shafts and brake drums.

Install a wheel with a tyre and fasten without tightening the wheel nuts. After refitting both wheels, remove the supports and lower the vehicle; then tighten the wheel nuts with a torque wrench.

Fill the axle beam with oil through the filler, previously having cleaned and screwed in the drain plug.

Reduction gear - dismantle

Fix the reduction gear on a bench. Remove lock plates 9 (see fig. 3-65), turn out bolts 7 and remove covers 8 of the differential box bearings, adjusting nuts 10 and outer rings of the roller bearings. Make marks on covers 8 and bearing outer rings, so that to refit them on former places.

Take out from the reduction gear casing 11 the differential box together with the driven gear 2 and bearing inner rings.

To remove gear 1 and its components:

- turn the reduction gear casing with the filler neck upward (fig. 3-66), hold driving gear flange 3 with tool 1, and undo the flange fastening nut with wrench 2;

- remove the flange and take out the driving gear with the adjusting ring, rear bearing inner ring with distance sleeve;

- take out the seal, the oil screen and the front bearing inner ring from the reduction gear casing;

- using tool A.70198 press out the outer rings from the front and rear bearings;

- remove the distance sleeve from the driving gear and with the help of a universal puller A.40005/1/7 and tool A. 45008 (fig. 3-67) take out the inner ring from the rear roller bearing;

- remove the driving gear adjusting ring.

To dismantle the differential:

- remove inner rings 2 (fig. 3-68) from the differential box 3 roller bearings with the help of a universal puller A.40005/1/6 and rest A.45028;

- undo the driven gear fastening bolts and punch out the differential pinion shafts from the differential box;

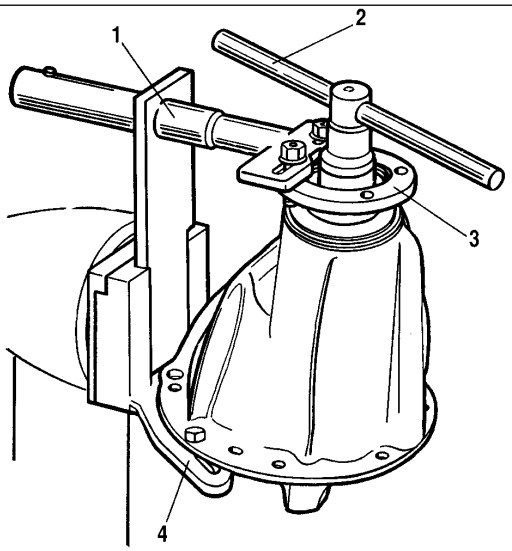

Fig. 3-66. Undoing the drive gear nut:
1 - tool to fix the drive gear flange; 2 - box wrench; 3 - drive gear flange; 4 - bracket

- turn the differential side gears and differential pinions so that the last ones will roll out from the differential openings, then take them out;

- remove the differential side gears with support washers.

Inspection of reduction gear components

Before inspection carefully wash all parts. It will help to locate wear and damages.

Check for damages on the final drive gear teeth and for proper location of the bearing pattern between the teeth. In case of inadmissible wear renew the parts; find the reason for wrong teeth mesh.

Note. *As spare parts the driving and driven gears are delivered in a complete set matched by noise and mesh, therefore both should be replaced in case of damage.*

Inspect the differential pinion apertures and the shafts; insignificant surface damages smooth with fine sandpaper, and renew in case of serious damages.

Inspect the surfaces of the axle shaft gear journals and their bores in the differential box, check the condition of box apertures for differential pinion shafts. The revealed damages should be eliminated as described above, if necessary, replace worn or damaged parts.

Examine the surfaces of the differential side gear support washers, even insignificant damages should be eliminated. When replacing, match the new washers by thickness.

Examine the roller bearings on the drive gear and the differential boxes; they should have smooth working surfaces and no wear. Replace bearings in slightest doubt in their serviceability, as bad condition of bearings can cause noise and teeth jamming.

Check for deformations or cracks on the casing and on the differential box, renew if necessary.

Reduction gear - reassembly

The reliable operation of the reduction gear is provided by strict observance of following guidelines on reassembly and adjustment.

The reduction gear components are shown on fig. 3-69.

Differential reassembly. Grease the differential side gears with support washers and the differential pinions with transmission oil and establish them through the openings in the differential box. Turn differential pinions and differential side gears so that to align the rotation axis with the opening axis in the box, then insert the differential pinion shaft.

Check the axial gap in each differential side gear: it should be 0-0.10 mm, and the moment of resistance to rotation of the differential gears should not exceed 14.7 N•m (1.5 kgf•m).

In case of an excessive gap resulting from wear of differential parts, replace the support washers of the differential side gears by others of greater thickness. If the specified clearance

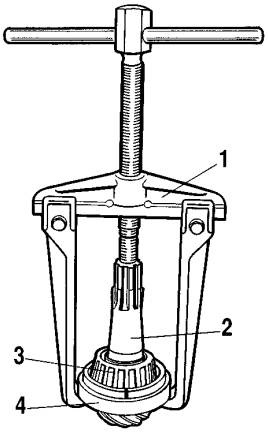

Fig. 3-67. Removing the drive gear rear bearing inner ring using puller A.40005/1/7:
1 - puller; 2 - drive gear; 3 - bearing ring; 4 - fixture A.45008

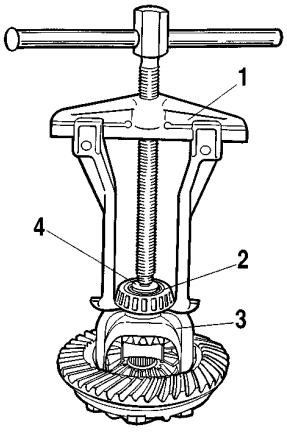

Fig. 3-68. Removing the differential housing bearing inner ring using puller A.40005/1/6:
1 - puller; 2 - bearing inner ring; 3 - differential housing; 4 - rest A.45028

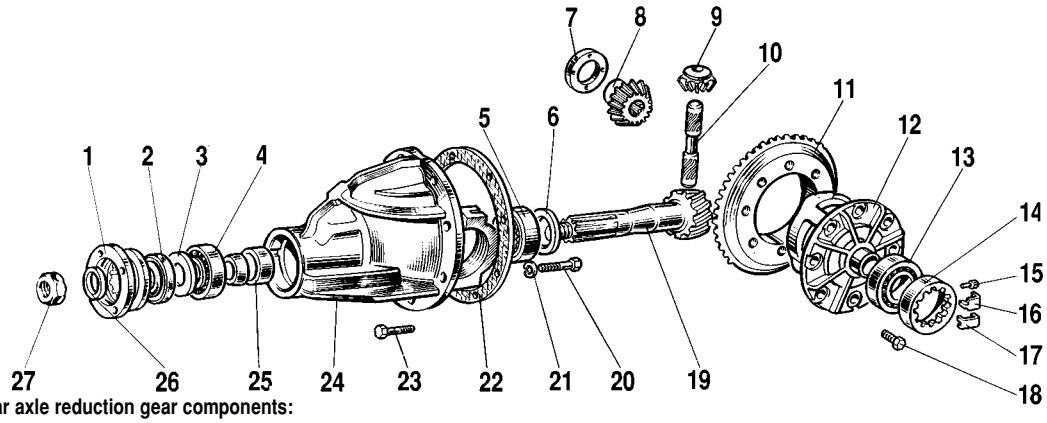

Fig. 3-69. Rear axle reduction gear components:
1 - drive gear flange; 2 - oil seal; 3 - oil deflector; 4 - front bearing; 5 - rear bearing; 6 - drive gear adjusting ring; 7 - axle shaft gear support washer; 8 - axle shaft gear; 9 - pinion; 10 - pinion shaft; 11 - driven gear; 12 - differential housing; 13 - differential housing bearing; 14 - adjusting nut; 15 - stop plate securing nut; 16 - stop plate; 17 - stop plate; 18 - driven gear fastening bolt; 19 - drive gear; 20 - cover securing bolt; 21 - spring washer; 22 - gasket; 23 - reduction gear securing bolt; 24 - reduction gear housing; 25 - distance sleeve; 26 - flat washer; 27 - drive gear flange securing nut

fails to be achieved even by increasing the washer thickness, renew the gears due to their excessive wear.

Fix the gear on the differential box.

Using tool A.70152 press-fit the roller bearing inner rings on the differential box.

Drive gear - refitting and adjustment

The correct location of the drive gear against the driven gear is provided by selecting the thickness of the adjusting ring fitted between the driving gear face and the rear bearing inner ring.

Select the thickness of the adjusting ring with the help of tool A.70184 and tool A.95690 with an indicator. The procedure is carried out in the following sequence.

Fix the reduction gear casing on a bench, use tool A.70185 to press-fit the outer rings of the drive gear front bearing in the casing, and tool A.70171 (fig. 3-70) - for the rear bearing.

On tool A.70184, simulating the driving gear, with the help of tool A.70152, fit the rear bearing inner ring and insert the tool into the reduction gear casing (fig. 3-71).

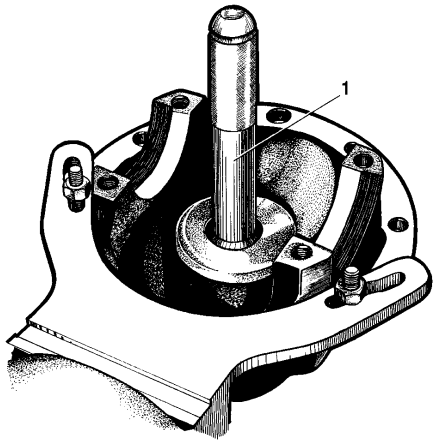

Fig. 3-70. Fitting the driving gear rear bearing outer ring using special tool:
1 - tool A.70171

Fit the front bearing inner ring, the driving gear flange and, while turning the tool to refit the bearing rollers correctly, tighten the nut with torque to 7.85-9.8 N•m (0.8-1 kgf•m).

Fix tool A.95690 on tool face 4 and adjust the indicator with a 0.01 mm scale to zero having established its leg on the same end face of tool A.70184. Then move indicator 1 so that its leg will be on the landing surface of the differential housing bearing.

Turn tool 4 with indicator left and right, and find a position in which the arrow of the indicator will show the minimum reading of "$\mathbf{a_1}$" (fig. 3-72) and record. Repeat this operation on the landing surface of the second bearing and record the reading of "$\mathbf{a_2}$".

Define thickness "**S**" of the driving gear adjusting ring, which is an algebraic difference between **"a"** and **"b":**

S = a - b

Where:

a - average arithmetic distance from the tool 1 face (fig. 3-64) to the differential bearing journals

$\mathbf{a = (a_1 + a_2) : 2}$

b - deviation of the driving gear from the nominal position in terms of mm. The size of deviation is marked on the driving gear (fig. 3-73) in hundredth of a millimeter with a plus or minus sign.

When finding the thickness of the adjusting ring pay attention to the **"b"** sign and unit of measurement.

Example. *We presume, that size "**a**", determined by the indicator, is equal to 2.91 mm (size **"a"** is always positive), and on the driving gear after the serial number the deviation of **"-14"** is shown. To get size **"b"** in millimeters, we multiply the specified size by 0.01 mm.*

b = -14 • 0.01 = -0.14 mm

Determine the thickness of the driving gear adjusting ring in millimeters.

S = a - b = 2.91 - (-0.14) = 2.91 + 0.14 = 3.05 mm

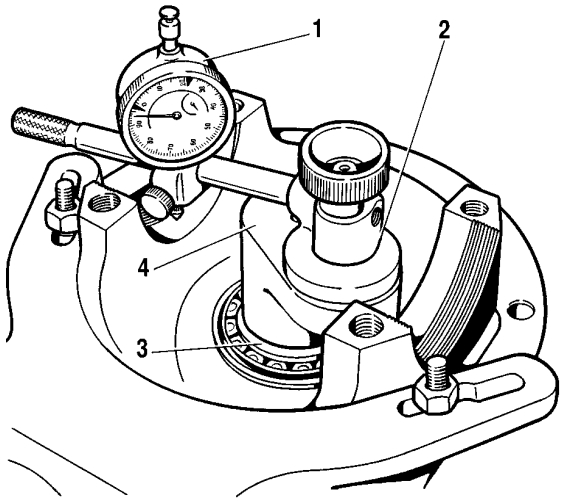

Fig. 3-71. Defining the thickness of the drive gear shim:
1 - indicator; 2 - fixture A.95690; 3 - drive gear rear bearing; 4 - tool A.70184

In this case fit an adjusting ring with thickness of 3.05 mm.

Fit an adjusting ring of the necessary thickness on the driving gear and press fit using tool A.70152 (fig. 3-74) the rear bearing inner ring which was taken from tool A.70184. Fit the distance sleeve.

ATTENTION. When repairing the rear axle reduction gear, install a new distance sleeve, if the reduction gear casing, the final drive gears or the driving gear bearings were replaced. If these parts were not changed, the former distance sleeve can be used.

Fit the driving gear into the reduction gear casing and place on it the front bearing inner ring, the oil deflector, sealing, the driving gear flange and washer. Screw a nut on the gear end and, having locked the driving gear flange, tighten it (tightening torque is specified below).

Adjustment of the driving gear bearings

To restrict the axial shifts of the driving gear under working loads, it is very important to create the bearing preload within the given limits. Tension is monitored by a dynamometer 02.7812.9501 (fig. 3-75), which measures the driving gear moment of resistance to rotation.

The moment of resistance to rotation determines the tightness of the bearing. It should be 157 - 196 N•cm (16 - 20 kgf•cm) for new bearings, and 39.2 - 58.8 N•cm (4 - 6 kgf•cm) - for bearings after mileage of 30 km and more.

The flange nut should be tightened to torque 118 - 255 N•m (12 - 26 kgf•m), periodically checking with the dynamometer the bearing`s moment of resistance to the rotation of the driving gear.

To check the resistance torque, fix the dynamometer on sleeve 3 (fig. 3-76), place the torque limit indicator 2 (fig. 3-75) on the scale division corresponding to 196 N•cm (20 kgf•cm), and

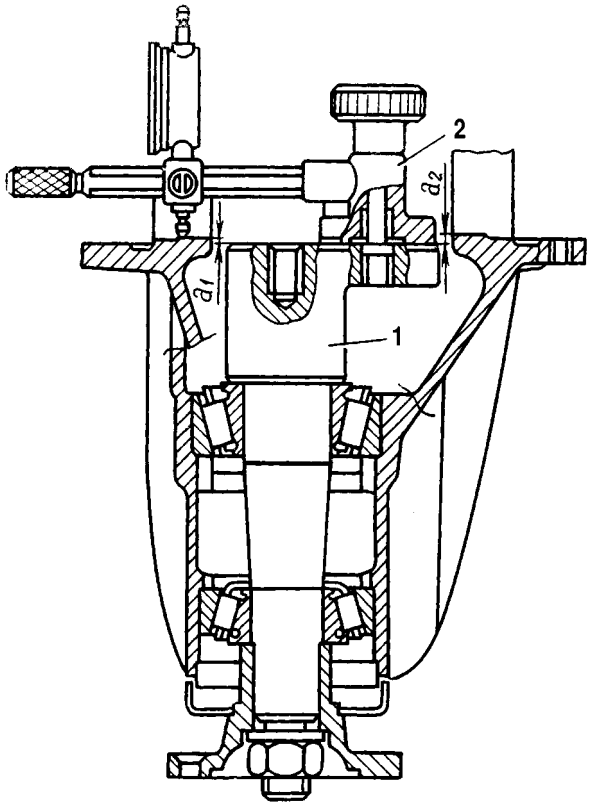

Fig. 3-72. Making the measurements to define the thickness of the drive gear shim:
1 - tool A.70184; 2 - fixture A.95690 with indicator; a_1 and a_2 - distance from tool end face to differential bearing journal

make a few turns clockwise with handle 4. During rotation of the driving gear the movable indicator 1 should not pass indicator 2 and should show no less than 157 N•cm (16 kgf•cm).

If the moment of resistance to rotation is less than 157 N•cm (16 kgf•cm), and for bearings after 30 km - 39.2 N•cm (4 kgf•cm), tighten the driving gear flange nut (but do not exceed the rated tightening torque) and check again the driving gear moment of resistance to rotation.

If the moment of resistance to rotation has appeared to be more than 196 N•cm (20 kgf•cm), and for run-in bearings 58.8 N•cm (6 kgf•cm), this will indicate excessive bearing preload. Renew the deformed distance sleeve. After replacing the distance sleeve, re-assemble the unit with the appropriate adjustments and checks.

Refitting the differential housing

Fit in the casing previously assembled differential housing together with the outer bearing rings.

Place two adjusting nuts 4 (fig. 3-77) so that they adjoin the bearing rings.

Fit the bearing covers and tighten the fastening bolts with a torque wrench.

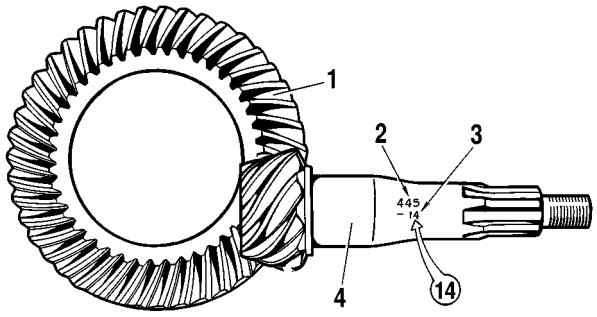

Fig. 3-73. Final drive gears:
1 - driven gear; 2 - serial number; 3 - allowance in hundredth of mm to nominal; 4 - drive gear

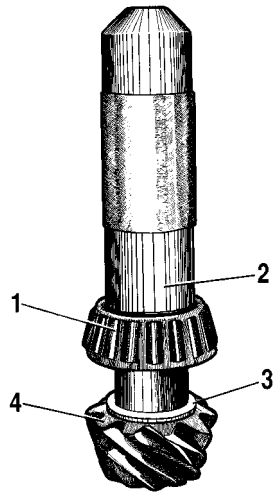

Fig. 3-74. Fitting the rear bearing inner ring on the drive gear:
1 - roller bearing ring; 2 - tool A.70152; 3 - shim; 4 - drive gear

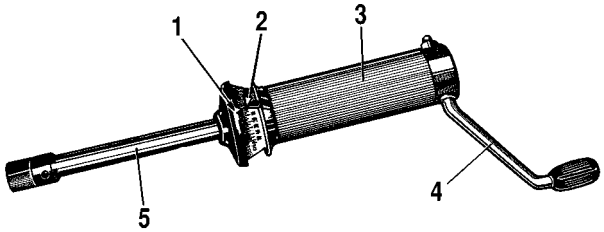

Fig. 3-75. Dynamometer 022.7812.9501:
1 - movable indicator; 2 - torque limit indicator; 3 - body; 4 - handle; 5 - rod with sleeve adapter

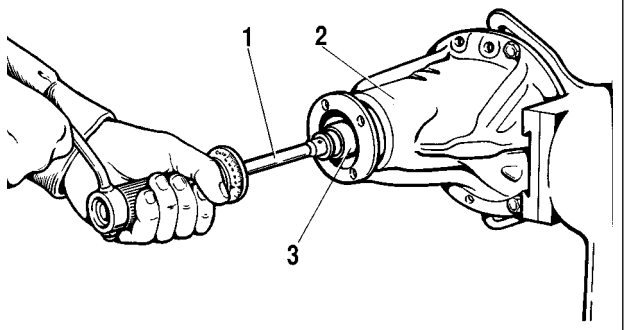

Fig. 3-76. Checking the drive gear bearing preload:
1 - dynamometer 02.7812.9501; 2 - casing; 3 - sleeve

Differential housing bearings preload and adjustment of the side gap in final drive gears mesh

These operations are carried out simultaneously using tool A.95688/R and key A.55085.

Fix the tool on the reduction gear casing (see fig. 3-77) with screws 1 and 6, having screwed them in the bolt apertures for the adjusting nut lock plate.

Move bracket 7 along the tool guide rail until arm 5 will touch the outer side surface of the cover and tighten screw 8.

Loosen screws 1 and 3 (fig. 3-78) and place bracket 4 so that the leg of indicator 2 will be based on the side surface of the driving gear tooth near the tooth edge, then tighten screws 1 and 3.

Turn the adjusting nuts and make the preliminary adjustment of the side gap between the teeth of the driving and driven gears within the limits of 0.08 - 0.13 mm. The gap is check by indicator 2 while rocking gear 6. Bearings should have no preload. The adjusting nuts should be only in contact with bearings, otherwise the accuracy of preload measurement is affected.

Evenly tighten both adjusting nuts of the bearings, the differential bearings covers will go apart and, hence, distance "D" (fig. 3-79) will increase by 0.14 - 0.18 mm.

Having established the exact preload of the differential housing bearings, finally check the side gap in the final drive gears mesh, which should not change.

If the gears mesh gap is more than 0.08 - 0.13 mm, move the driven gear closer to the driving gear or move it away, if the gap is below this value. To maintain the bearings preload, move the driven gear, tightening one of the bearing adjusting nuts and loosen the other one by the same angle.

To fulfill this procedure correctly, watch the indicator 9 (see fig. 3-77), which shows the size of the previously set bearing preload. After tightening one of the nuts the indication will change, as distance "D" (fig. 3-79) between the covers and the bearings preload increase. Therefore, the other nut should be loosened until the indicator arrow will return to the initial position.

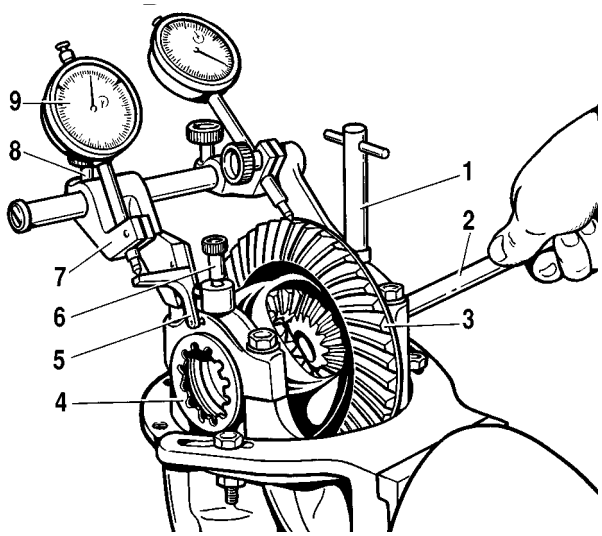

Fig. 3-77. Checking the differential housing bearing preload using fixture A.95688/R:
1 - fixture screw; 2 - key A.55085; 3 - driven gear; 4 - adjusting nut; 5 - intermediate lever; 6 - securing screw; 7 - indicator bracket; 8 - bracket securing screw; 9 - indicator for checking the bearing preload

After moving the driven gear, check the side gap by indicator 2 (see fig. 3-78). Repeat the adjustment if the clearance does not correspond to the rated value.

Remove tool A.95688/R, fit the adjusting nut lock plates and fix them by bolts with spring washers. In spare parts the lock plates are delivered of two types: with one or two tabs depending on the location of the nut slot.

Adjustment and repair of reduction gear components is carried out on a bench, on which it is possible also to test the reduction gear for noise and to check the arrangement and the form of the pattern on teeth working surfaces, as set forth below.

Final drive gear teeth mesh pattern check

To finally check the quality of final drive gear mesh on the test bench:

- after adjustment place the reduction gear on the bench and grease the working surfaces of the driven gear teeth with a thin layer of lead oxide;

- start the bench and decelerate the rotation of the axle shafts, so that under load on the driven gear teeth surfaces there were visible traces of contact with the driving gear teeth;

- change the rotation direction and while decelerating ensure forming the contact patterns on the other side of the driven gear teeth, what will simulate the reverse movement of the vehicle.

The gear mesh is considered to be OK, if on both sides of the

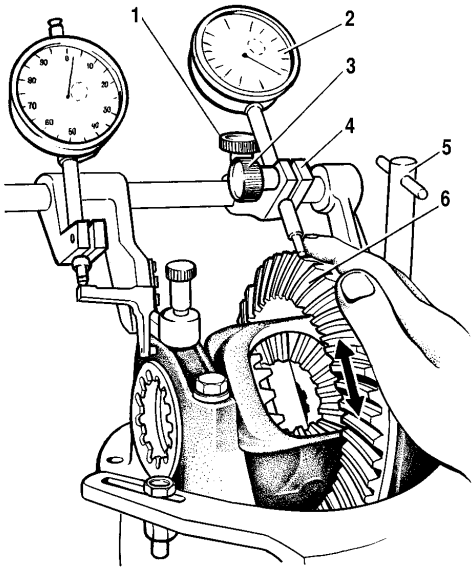

Fig. 3-78. Checking the side gap in final drive gear mesh using tool A.95688/R:
1 - bracket securing screw; 2 - indicator for checking the gear mesh side gap; 3 - indicator rod securing screw; 4 - indicator bracket; 5 - retaining screw; 6 -driven gear

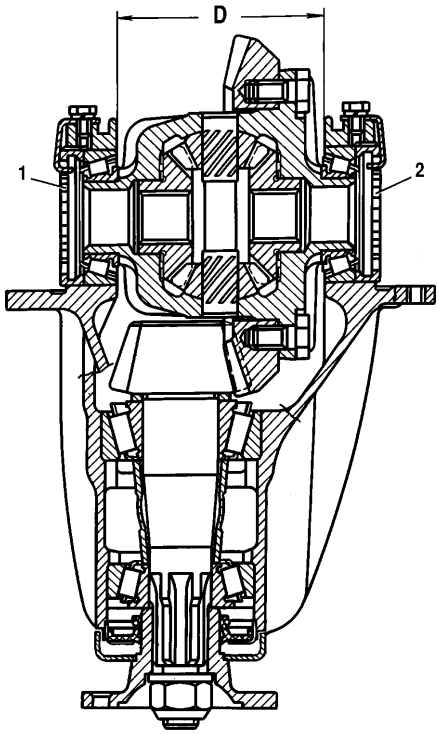

Fig. 3-79. Checking the differential housing bearing preload:
D - distance between two covers of the differential bearings; 1, 2 - shims

driven gear teeth the contact pattern is located in regular intervals closer to the narrow end of the tooth, occupying two thirds of length and without covering the top and the base of the tooth, as shown on fig. 3-80, e.

The examples of wrong location of contact pattern on the tooth working surface are shown on fig. 3-80 (a, b, c, d).

The unit will have to be dismantled to make the adjustments of the driving gear and replace the adjusting ring.

After reassembly, repeat all operations on the driving gear roller bearings preload, check the moment of resistance to rotation, the preload of the differential housing roller bearings and the adjustment of the final drive mesh side gap.

Replacing the driving gear sealing

The necessity of seal replacement is determined by the drop of oil level in the rear axle casing (due to oil leak through the sealing) to the level which might affect normal operation of the reduction gear.

Misting of the casing filler neck and even oil drops, in the amount not exceeding the below norms, do not indicate oil leak.

In case of heavy drop formation inspect the sealing:

- put the vehicle on the lift or over an inspection pit;

- clean the breather from dirt and inspect;

- undo the control plug, check the oil level in the axle casing; top up if necessary;

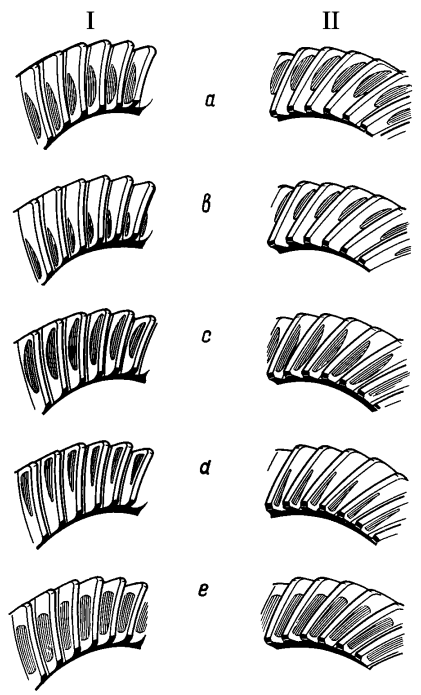

Fig. 3-80. Bearing pattern in final drive gear mesh:
I - front side; II - rear side; «a» and «b» - improper contact in gear mesh: move the drive gear away from the driven gear by reducing the shim thickness; «c» and «d» - improper contact, move the drive gear closer to the driven by increasing the shim thickness; «e» - right contact in gear mesh

- clean the casing filler neck from oil and wipe dry;

- raise the rear axle and put it on supports;

- start the engine, engage the fourth gear and at speed of 90-100 km/h warm oil up to 80-90 °C (approximately during 15 minutes);

-with the fourth gear engaged, at speed of 100 km/h determine the amount of oil leakage during 15 minutes.

Oil leak exceeding 5 drops in 15 minutes will indicate a bad sealing.

Damaged sealing can be replaced without removing the reduction gear from the vehicle, if no replacement of other parts of the reduction gear is required.

The procedure of seal replacement is the following:

- drain oil from the rear axle casing;

- loosen the rear wheels fastening nuts, put blocks under front wheels and raise the rear axle; release the handbrake and place the gear shift lever in neutral;

- take off the wheels and brake drums;

- undo the nuts that are fastening the braking plate to the axle beam and using a pusher remove the axle shafts from the differential box;

- disconnect the propeller shaft from the driving gear flange and move the shaft aside;

- using a dynamometer check the driving gear moment of resistance to rotation and note;

- hold the flange with a special key, undo the driving gear flange fastening nut and remove the flange with the washer;

- remove the driving gear sealing;

- grease the seal working surface with ЛИТОЛ-24 and press fit with a mandrel into the reduction gear casing on depth of 2-0.3 mm between the end face of the reduction gear casing and the sealing outer surface;

- fit the flange with a washer on the driving gear, hold it with a special key and tighten the flange fastening nut, controlling the moment of resistance to rotation by a dynamometer from time to time.

If the initial value of moment of resistance to rotation was 58.8 N•cm (6 kgf•cm) or more, the new one should exceed the initial by 9.8-19.6 N•cm (1-2 kgf•cm). If the initial moment of resistance to rotation was less than 58.8 N•cm (6 kgf•cm), the flange fastening nut should be tightened to 58.8-88.2 N•cm (6-9 kgf•cm).

If the moment of resistance to rotation was exceeded when tightening the nut, dismantle the reduction gear, renew the distance sleeve, then reassemble the reduction gear and adjust as described in chapter "Assembly and adjustment".

The reassembly of the rear axle is carried out in sequence reverse to dismantle.

Front axle

The design of the front axle is shown on fig. 3-81. A number "13" is painted on the reduction gear casing for distinction.

Fault diagnosis

Diagnosis	Remedy
Constant excessive noise at front axle operation	
1. Worn or badly adjusted differential bearings	1. Renew worn components, adjust differential bearings
2. Wrong adjustment, damage or wear of gears or bearings of reduction gear	2. Isolate problem in reduction gear, repair or replace
3. Low oil amount in axle case	3. Top up oil, check for oil leak from front axle casing
4. Worn or destructed inner joint bearing (axle shaft)	4. Replace bearing
Noise at vehicle acceleration and engine braking	
1. Incorrectly adjusted final drive gear mesh at reduction gear repair	1. Adjust gear mesh as described in subsec. "Rear axle"
2. Wrong side gap in final drive gear mesh	2. Adjust clearance as described in subsec. "Rear axle"
3. Excessive gap in driving gear bearing due to loose flange fastening nut or worn bearings	3. Adjust clearance (as described in subsec. "Rear axle"), replace bearing if necessary
Knock at the beginning of movement	
1. Worn differential pinion shaft opening in differential housing	1. Replace differential housing and pinion shaft if necessary
Oil leak	
1. Worn or damaged oil seal	1. Renew oil seal
2. Worn inner joint casing oil seal	2. Renew oil seal
3. Loose inner joint casing bearing cover fastening or casing covers, damaged sealings	3. Tighten nuts and bolts, replace gaskets

Removal and refitting

Place the vehicle on the lift or over an inspection pit and raise the vehicle front part.

Remove the anti-roll bar, the suspension crossmember tie-rods and the crankcase protective cover. Disconnect the shock-absorbers from the lower suspension control arms, and the input propeller shaft from the front axle reduction driving gear flange.

Compress the suspension spring, disconnect the balljoint from the lower arm and take off the spring, having smoothly unloaded it. Disconnect the steering tie-rods from the steering knuckle arms.

Remove the wheel cap and undo the wheel hub bearing nut.

Do the same on the other end of the suspension.

Loosen the muffler-to-front exhaust pipe clip, disconnect the pipes and muffler brackets in the rear part of the vehicle and on the gearbox.

Using key 02.7812.9500 undo the front exhaust pipe-to-exhaust manifold fastening nuts and remove the pipe downward.

Undo the nuts that are fastening the engine front mounting pads to the suspension crossmember brackets.

Support the front axle and undo the bolt fastening the right bracket 22 (see fig. 3-81) to the engine and two fastening nuts of the front axle from the left side.

Raise the engine by 25-30 mm, remove the front axle in assembly with the front wheel drives.

Refitting of the front axle on the vehicle is carried out in a reverse sequence. When refitting the axle, the fastening nuts and bolts should be tightened with torque specified in the appendix.

Fill the front axle casing with transmission oil through the filler neck, the oil level should reach the lower edge of the opening.

Dismantle

Place and fix the front axle on a bench for repair. Turn out plug 5 and drain oil from the casing, then do the following from both ends of the front axle:

- undo the inner joint casing bearing 7 cover 12 fastening nuts and take out the joint, paying attention not to damage the sealing;

- after removing circlip 11 and spring washer 10, press off bearing 7 from the inner joint casing 9 and remove oil seal 8.

Remove the axle casing stamped cover and sealing. It is not recommended to remove bottom cover 2.

Dismantle the front axle reduction gear, using the procedure described in subsection "Rear axle".

Inspection

Parts are inspected according to the procedure given in subsection "Rear axle", and besides ensure that:

- the ball bearing of the inner joint casing is not worn or damaged (renew the bearing if the radial gap exceeds 0.05 mm);

- the inner joint casing is not deformed and the landing places are not damaged;

- there are no scuffings and dents in the grooves of the inner joint casing;

- there is no wear and cracks on the casing landing places.

Renew worn and damaged parts.

Reassembly

Before reassembly, match the ratio marks on the final drive and the rear axle reduction gears.

Reassemble and adjust the front axle reduction gear, follow-

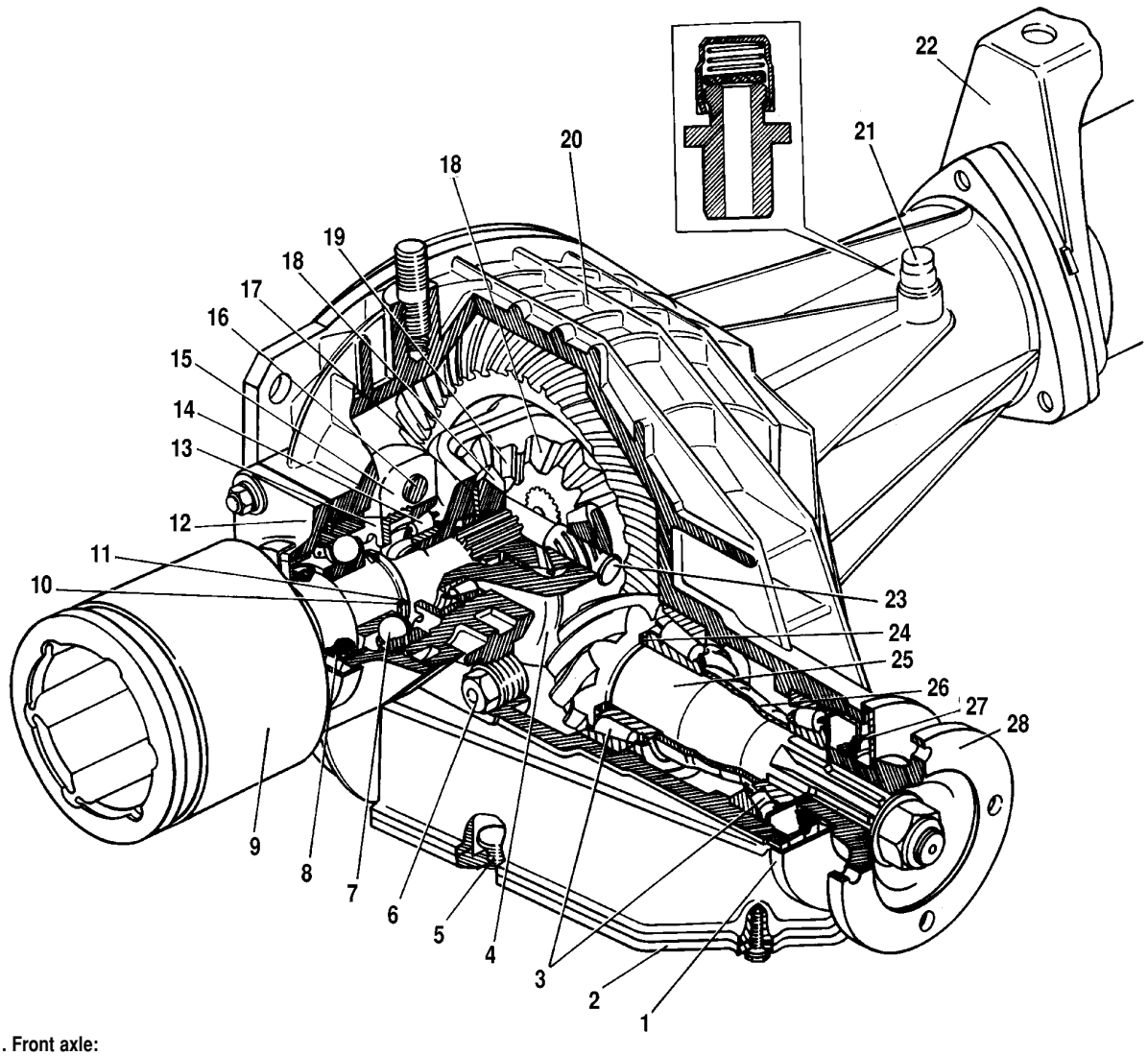

Fig. 3-81. Front axle:
1 - splash guard; 2 - reduction gear casing lower cover; 3 - final drive gear bearing; 4 - differential housing; 5 - drain aperture plug; 6 - check and filler plug; 7 - inner joint housing bearing; 8 - oil seal; 9 - wheel drive inner joint housing; 10 - spring washer; 11 - circlip; 12 - bearing cover; 13 - adjuster nut; 14 - differential housing bearing; 15 - bearing cover; 16 - cover securing bolt; 17 - thrust washer; 18 - axle shaft gear; 19 - pinion; 20 - reduction gear casing; 21 - breather; 22 - front axle mounting bracket; 23 - pinion shaft; 24 - shim; 25 - drive gear; 26 - bearing spacer; 27 - drive gear oil seal; 28 - flange

ing the guidelines given in subsection "Rear axle", distance "D" (see fig. 3-79) should increase by 0.08 - 0.11 mm. For adjustment use bracket 67.8701.9508 with a measuring end piece and key 67.7812.9520.

Place cover 12 with sealing 8 on the inner joint bearing casing 9 (see fig. 3-81), then press fit bearing 7. Refit spring washer 10 and circlip11.

Note. *The left sealing of the inner joint (axle shaft) for distinction has a mark in form of a circular groove on the body*.

Fit the front axle mounting bracket 22 with cover on the inner joint right casing.

Place the inner joint assembly in the casing, previously having fit the sealings on the pins. Tighten the fastening nuts of the joint bearing covers.

Front wheel drive

Torque from the front axle is transferred to the front wheels through the right and left drives, each consisting of shaft 4 (fig. 3-82) and two CV-joints.

The joints are mounted on the ends of shaft 4. The outer joint is connected with the front wheel hub; it is of a rigid type with angular degree of freedom. The inner joint is of universal type, with an angular and axial degree of freedom. It is connected with the front axle shaft gear.

The outer joint consists of case 13, race 11, cage 8 with balls 10, lock ring 12 and thrust ring 7. Race 11 is connected with case 13 through balls, which come into race grooves made on the radius, and in the case grooves. The race is fixed on shaft 4 splines against ring 7 and is secured by circlip 12. In compressed

state this ring should pass free through the spline opening in race 11, what allows to connect and to separate the joint and shaft 4.

The joint is protected by boot 6 from dirt and moisture, which in its turn is protected from mechanical damages by shroud 5. On the shaft 4 and on the joint case the shroud is fixed by clamps 9.

The use of straight grooves differs the design of the inner joint from the outer one. The axial movement of components in the case is limited by circlip 2.

The components of the inner joint and separate sets of the outer joints are sorted according to their sizes into different assembly groups, therefore do not replace only part of the joint during repair. The joint should be replaced in assembly. Only shroud 5 and boot 6, clips 9, clamp 3 and circlip 2 can be replaced separately.

Fault diagnosis

Diagnosis	Remedy
Noise, knock from the front axle at vehicle movement (especially at cornering)	
1. Worn components in outer or inner joints	1. Replace damaged or worn joints
2. Deformed wheel drive shafts	2. Straighten or replace shafts
Oil leak	
1. Damaged or broken protective cover of inner or outer joint	1. Renew greasing in joint and boot. In case of wear or damage, replace joint assembly

Removal and refitting

Removal. Place the vehicle on a lift or over an inspection pit, set the handbrake and do the following from both sides of the vehicle:

- raise the front part of the vehicle and put it on supports;

- disconnect the shock-absorber from the suspension lower arm;

- remove the suspension spring, and disconnect the balljoint from the lower arm;

- remove the wheel hub cap and undo the wheel hub bearing nut, then unscrew the fastening nut of the inner joint housing bearing cover;

- undo the fastening bolt of the front axle suspension right arm;

- remove the outer and inner joints from the wheel hub and from the front axle.

The refitting of the front wheel drive is carried out in reverse sequence. When tightening the wheel hub bearing nuts, adjust the bearing clearance as specified in subsection "Front suspension".

Dismantle and reassembly

Dismantle is needed in case of damage on boot 6 and shroud 5 with the aim to check the joint components and the quality of greasing.

The order of dismantle is the following:

- undo clip 9 (see fig. 3-82), remove it from boot 6 and move the shroud with the boot on the shaft to provide access to joint race 11;

- using a knock-out and a hammer, beat off race 11 from the shaft;

ATTENTION. To exclude jamming circlip 12, pay attention not to skew the race, be careful in choosing the force and direction of impact.

- remove thrust rings 7, boot 6 and shroud 5 from shaft 4;

- move on the shaft the inner joint shroud and boot and, after taking out lock ring 2, take out from case 1 shaft 4 in assembly with race, cage and balls;

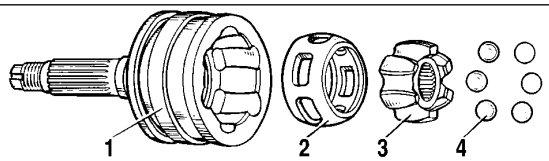

Fig. 3-83. Front wheel drive, outer joint, exploded view:
1 - joint housing; 2 - cage; 3 - race; 4 - ball

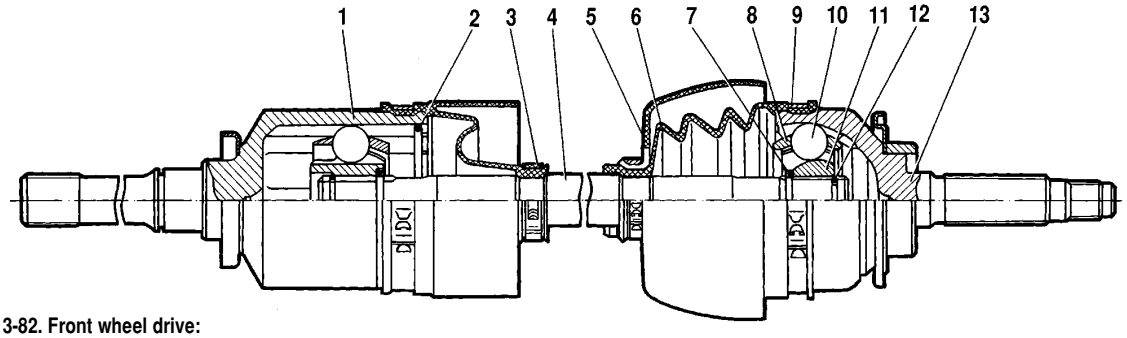

Fig. 3-82. Front wheel drive:
1 - inner joint housing; 2 - circlip; 3 - boot clamp; 4 - wheel drive shaft; 5 - shroud; 6 - boot; 7 - race thrust ring; 8 - cage; 9 - clip; 10 - ball; 11 - outer joint holder; 12 - circlip; 13 - outer joint casing

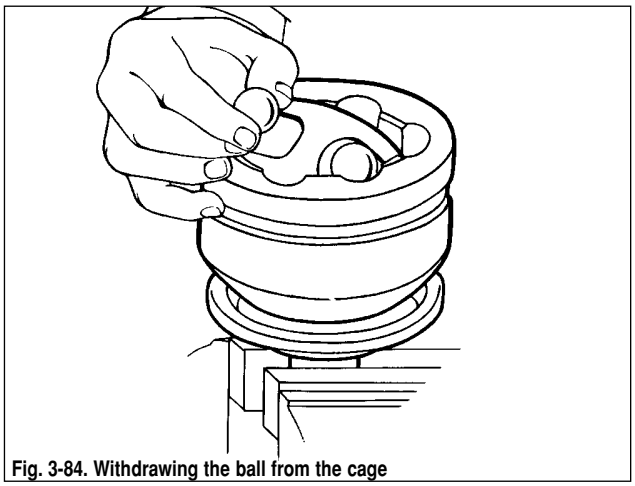

Fig. 3-84. Withdrawing the ball from the cage

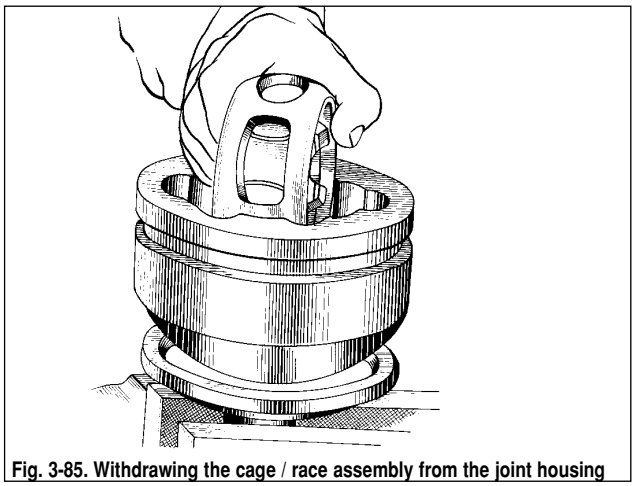

Fig. 3-85. Withdrawing the cage / race assembly from the joint housing

- using a knock-out and a hammer, beat the inner joint race from shaft 4;

- after removing the thrust ring, move the shroud from the shaft;

- wash the inner cavities of the joint housings and other components.

The most difficult and crucial are the operations on dismantling and reassembling the outer joint, the components of which are shown on fig. 3-83. The high quality of dismantling-reassembly works is provided with observance of below instructions.

Mark with paint the mutual arrangement of the race, cage and the joint housing. Fix the outer joint in vice, as shown on fig. 3-84. Incline the race and cage so that one ball will go out from the groove in the case of the joint as far as possible. Using a screwdriver made of soft metal, push the ball out from the cage. Then turn all components so that the next ball will occupy the same position, and take it out from the cage. Using the above procedure, take out other balls. The sequence of removing the balls from the cage can be different - every other ball.

Slight tapping on the cage or race with a tool made of soft material is allowed. No excessive effort when turning the cage is admissible, as the balls may be blocked what will complicate the further dismantle.

Place the cage/race unit so that the elongated apertures of the cage are situated against the ledges of the joint case (see fig. 3-85) and take out the cage in assembly with the race.

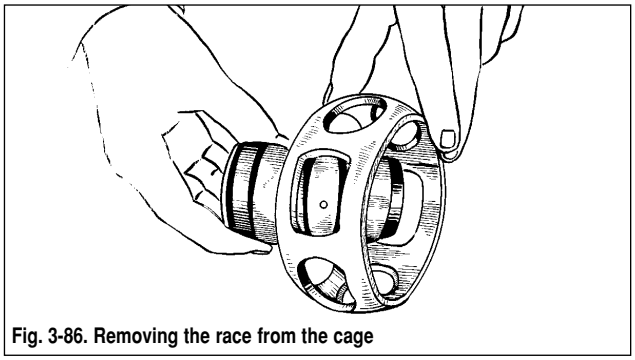

Fig. 3-86. Removing the race from the cage

Take the race out from the cage, to do that, place one of the race ledges in the elongated opening of the cage (see fig. 3-86) and then roll out the race in the direction of the straight edge of the aperture. Wash all components and blow with compressed air.

The reassembly of the outer joint is carried out in reverse sequence, paying attention to the following:

- grease all components with ШРУС-4 before reassembly;

- when refitting the cage/race assembly in the joint casing, ensure the matching of labels made before dismantle, the race should be fitted with the ring groove (for the thrust ring) facing the shaft;

- when refitting the balls in the cage, incline the race approximately by an angle twice bigger, than the cage;

- fill the joint with 60 cm^3 of ШРУС-4;

- before striking the shaft 4 (see fig. 3-82) to connect it with the inner race 11, it is necessary to fit a new circlip 12 strictly in the centre, and then sharply strike downward on the shaft end; the circlip will compress and slip through the race spline opening;

- use tool 67.7853.9533 to press-fit the sealing ring in the joint housing.

After reassembly, the race might be blocking at shaft rolling, when the ball does not rotate. This does not indicate a poor-quality assembly, as such blocking will not appear at the joint rotation during operation.

Using the above mentioned procedure, dismantle completely the inner joint. The race should be taken out in the direction of the larger diameter of the cage.

The reassembly of the inner joint is carried out in reverse sequence. It is necessary to match the labels made before dismantle. The elongated cone part of the cage should be facing shaft 4. When reassembling, fill 150 cm^3 of ШРУС-4 into the joint.

Use tool 67.7853.9537 to refit the joints protective covers.

If there are no knocks and vibrations, the shrouds are in good condition, the dismantle of the front wheels drive is not recommended.

Chapter 4
Wheel suspensions

Fault diagnosis

Diagnosis	Remedy
Noise and knock in suspension at vehicle movement	
1. Faulty shock-absorbers	1. Replace or repair shock absorbers
2. Loose anti-roll bar fastening bolts	2. Tighten securing nuts and bolts; in case of rubber pad wear - replace
3. Worn arm silent blocks	3. Renew silent blocks
4. Loose shock-absorber fastening or worn shock absorber eye rubber bushes	4. Tighten fastening bolts and nuts, renew bushes in shock absorber eyes
5. Worn arm balljoints	5. Renew ball joints
6. Excessive gap in wheel hub bearings	6. Adjust clearance or replace bearings
7. Wheels significantly out of balance	7. Balance wheels
8. Deformed wheel discs	8. Replace discs
9. Set down or broken springs	9. Renew spring
10. Worn rear suspension bar rubber bushes	10. Renew rubber bushes
11. Knock in "stiff" suspension due to damaged buffers	11. Replace damaged buffers
12. Rear suspension "stiffness" due to rear axle overload	12. Unload vehicle rear part
Wheel alignment angles can not be adjusted	
1. Deformed lower arm shaft or suspension arms	1. Replace shaft or arm
Vehicle wandering	
1. Different pressure in tyres	1. Adjust pressure in tyres
2. Misalignment of front wheels	2. Align wheels
3. Wrong gap in front wheel bearings	3. Adjust bearing clearance
4. Deformed suspension arms	4. Replace deformed arms
5. Unequal tension of suspension springs	5. Renew weak spring
6. Incomplete release of wheel brake mechanism	6. Rectify fault
7. Significant difference in tyres wear	7. Replace worn tyres
8. Front wheels significantly out-of-balance	8. Balance wheels
9. Displacement of rear axle due to deformation of rear suspension bar	9. Straighten or replace suspension arms
Shimmy	
1. Insufficient tyres pressure	1. Adjust pressure in tyres
2. Excessive gap in front wheel hub bearings	2. Adjust clearance
3. Shock-absorbers do not work	3. Renew shock absorbers or repair
4. Loose fastening nuts on balljoint pins	4. Tighten nuts
5. Misalignment of front wheels	5. Align wheels
6. Worn arm shaft silent blocks	6. Renew silent blocks
7. Wheels are significantly out of balance	7. Check and balance wheels
8. Worn arm balljoints	8. Replace joints
Often "stiffness" in suspension	
1. Suspension springs set down	1. Renew springs
2. Shock-absorbers do not work	2. Renew shock absorbers or repair
3. Deformed front suspension arms	3. Renew deformed arms
Excessive gap in balljoints	
1. Worn balljoint rubbing surfaces as a result of fouling due to leaks in shroud or its damage	1. Replace ball joint and boot

Diagnosis	Remedy
Un-even tyre tread wear	
1. Excessive speed at cornering	1. Low down speed
2. Excessive wear of suspension joints and bushes	2. Repair suspension
3. Wheels out of balance (stains in regular intervals on tread outer path and on central path when driving with a disbalanced wheel for a long time)	3. Balance wheels
4. Uneven wheel braking	4. Adjust braking system
5. Shock-absorbers do not work	5. Renew shock absorbers or repair
6. Wheel camber misalignment (wear of tread inner path)	6. Align wheel camber
7. Low tyre pressure (large wear on tread edge)	7. Adjust to normal pressure
8. Excessive tyre pressure (large wear in tread middle part)	8. Adjust to normal pressure
9. Low front wheel toe-in (wear of tread inner path)	9. Adjust wheel toe-in
10. Excessive front wheel toe-in (wear of tread outer path)	10. Adjust wheel toe-in
Wheel runout	
1. Wheel out of balance:	1. Do the following:
- uneven tread wear	- balance or replace wheels
- displacement of balance weights and tyres at installation	- balance wheels
- deformed rim	- rectify rim or replace, balance wheels
- damaged tyres	- replace tyre and balance wheels
2. Excessive gap in wheel hub bearings	2. Adjust clearance
Liquid leak from shock-absorber	
1. Wear or destruction of rod sealing	1. Replace oil seal
2. Foreign particles on sealing surfaces	2. Wash shock absorber components, renew or filter liquid
3. Dent, risks, scuffings on rod, complete wear of chrome coating	3. Renew worn or damaged rod and oil seal
4. Loose tank nut	4. Tighten nut
5. Tank damage in zone of sealing ring	5. Renew or repair tank
6. Shrinkage or damage of tank sealing ring	6. Renew ring
7. Excessive amount of liquid in shock-absorber	7. Ensure required amount of liquid
Insufficient shock-absorber resistance at recoil stroke	
1. Leaking recoil valve or bypass valve	1. Renew damaged valve components or repair
2. Piston ring broken or stuck in flute	2. Renew ring or rectify sticking
3. Insufficient amount of liquid due to leak	3. Renew damaged components and top up liquid
4. Scuffings on piston or cylinder	4. Renew damaged components and liquid
5. Worn guide bush opening	5. Replace guide bush
6. Impurities in liquid	6. Wash all parts, renew liquid
7. Recoil spring set down	7. Replace spring
Insufficient shock-absorber resistance at compression stroke	
1. Compression valve leak	1. Renew damaged components or repair
2. Insufficient amount of liquid due to leak	2. Renew damaged components and top up liquid
3. Worn guide bush and rod	3. Renew worn parts
4. Impurities in liquid	4. Wash all parts, renew liquid
5. Worn or damaged compression valve discs	5. Renew damaged components
Shock-absorber knock and squeak	
1. Worn rubber bushes in eyes	1. Renew bushes
2. Impact deformation of boot	2. Renew or repair boot
3. Insufficient amount of liquid due to leak	3. Renew damaged components and top up liquid
4. Loose tank and piston fastening nuts	4. Tighten nuts
5. Jammed rod due to deformation of cylinder, tank or rod	5. Renew damaged components or repair
6. Loose shock-absorber fastening nuts	6. Tighten nuts
7. Damaged components of shock-absorbers	7. Renew damaged components

Diagnosis	Remedy
Excessive wear of tyre tread	
1. High driving speed	1. Choose speed according to road conditions
2. Heavy vehicle acceleration	2. Avoid sharp acceleration
3. Often braking	3. Use brakes correctly
4. Wrong wheel alignment angles	4. Adjust wheel alignment angles
5. Excessive clearance in front wheel hub bearings	5. Adjust clearance
6. Vehicle overload	6. Avoid vehicle overload
7. Recommended rearrangement of wheels was not carried out	7. Rearrange wheels on vehicle according to service manual
Tyres squeal at cornering	
1. Abnormal tyre pressure	1. Ensure normal pressure
2. Wrong wheel alignment angle	2. Adjust wheel alignment angles
3. Deformed suspension arms, crossmember or body front elements	3. Replace deformed parts, rectify body front elements

Front suspension

The design of the front suspension is shown on fig. 4-1.

Suspension components - inspection

At each maintenance and repair, it is necessary to inspect the protective covers of suspension balljoints, paying special attention to any possible mechanical damages. It is necessary to check the suspension components for traces of hitting the road obstacles or car body, for cracks on the suspension components, deformations of lower arm shaft, crossmember or suspension arms and elements of body front, and also to check the condition of balljoints and silent blocks.

The deformations of lower and upper arm shafts is determined by visual check.

The deformation of the front suspension crossmember is determined by measuring the distance between the outer surface of the crossmember bracket in the zone of the upper arm shaft fastening bolt. This distance should be (736±1.5) mm.

If the crossmember is so badly deformed, that it is impossible to adjust the wheel alignment angles with the help of washers, but at satisfactory condition of all suspension components, renew the crossmember.

The condition of the silent blocks is checked in the following order:

- ensure there are no deformations of the suspension arms, the lower arm shaft, the suspension crossmember;

- raise the vehicle front wheels;

- measure the outer bush 2 radial displacement A (fig. 4-2) in relation to the inner bush 6 and distance B between the thrust washer 5 and the outer end face of the outer bush 2.

The silent blocks of the top and lower arms are subject to replacement in case of:

- breaks and one-sided "buckling" of rubber;

- undercutting and wear of rubber on the end faces of joints;

- if the outer bush radial displacement **A** relative to the inner bush exceeds 2.5 mm;

- if size **B** is not within the limits of 3-7.5 mm.

If size **B** exceeds the specified limits, check the press fitting of the silent block in the arm socket.

The gap in the upper balljoints is checked in the following order:

- place the vehicle on an even horizontal platform with hard surface;

- lift the right (left) front part of the vehicle and take off the wheel;

- put a 230 mm wooden pad under the lower arm, which is closer to the ball pin, and lower the vehicle on it;

- ensure, that resin does not come out from the runner channel of the upper ballpin housing, if necessary smooth with a file to avoid errors when measuring;

- fix tool indicator bracket 4 (fig. 4-3) on the top of stub axle;

- place the indicator 2 in centre of the pin balljoint housing 3 sphere with small preliminary preload, and then align the zero division of the scale with the arrow;

- fix a fork lever 5 with length of 0.7 m on the front suspension upper arm;

- using dynamometer 6 create load of 196 N•m (20 kgf•m) (on the fork lever end 294 N) in vertical direction, first to press-in, and then to pull out the ball pin from the joint housing;

- record the maximum deviations of the indicator arrow;

- calculate the meaning of the clearance in the upper balljoint by summing the values of deviations from zero;

- the total indicator readings should not exceed 0.8 mm.

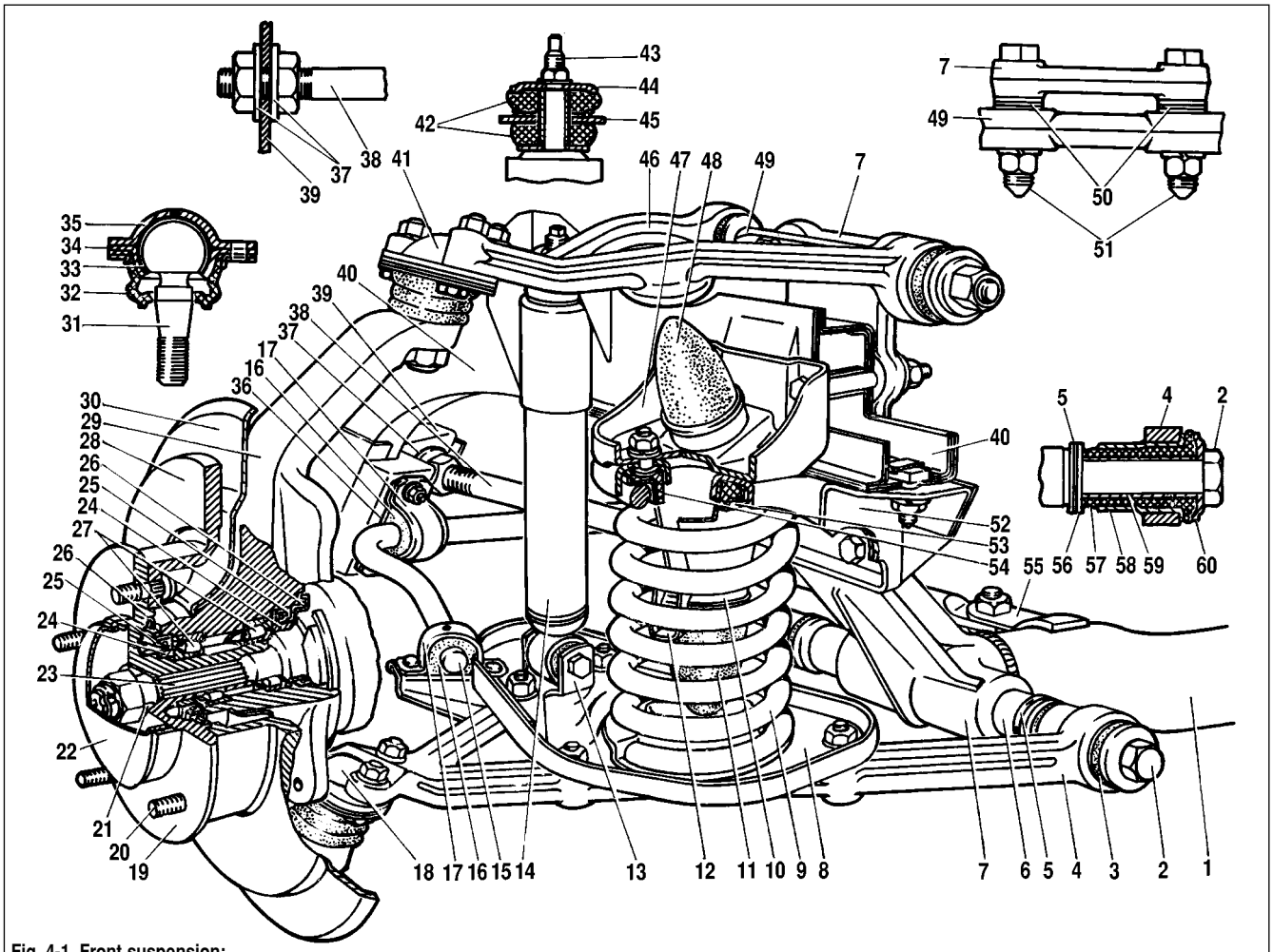

Fig. 4-1. Front suspension:

1 - front suspension crossmember; 2 - lower control arm shaft; 3 - lower arm silent block; 4 - lower control arm; 5 - lower control arm shims; 6 - lower control arm shaft bush; 7 - crossmember bracket; 8 - coil spring lower seat; 9 - coil spring; 10 - compression buffer mounting strut; 11 - compression buffer; 12 - compression restrictor; 13 - shock absorber mounting bracket, lower; 14 - shock absorber; 15 - anti-roll bar; 16 - rubber pad; 17 - anti-roll bar securing clamp; 18 - lower balljoint; 19 - wheel hub; 20 - wheel and brake disc securing bolt; 21 - taper bush; 22 - cap; 23 - outer CV-joint housing tail; 24 - oil seal bush; 25 - oil seal; 26 - splash guard ring; 27 - wheel hub bearings; 28 - wheel disc; 29 - steering knuckle; 30 - front brake splash guard; 31 - ballpin; 32 - boot; 33 - bearing; 34 - ballpin liner race; 35 - ballpin bearing housing; 36 - anti-roll bar securing plate; 37 - washers; 38 - tie-rod; 39 - tie-rod mounting bracket; 40 - body chassis arm; 41 - upper ball joint; 42 - shock absorber rod mounting pad; 43 - shock absorber rod; 44 - washer; 45 - shock absorber mounting bracket; 46 - upper control arm; 47 - recoil buffer bracket; 48 - recoil buffer; 49 - upper arm shaft; 50 - shims; 51 - upper arm shaft securing bolts; 52 - suspension spring mounting, upper; 53 - suspension spring seat, upper; 54 - spring sealing gasket; 55 - crossmember-to-tie-rod securing bracket; 56 - thrust washer; 57 - balljoint rubber bush; 58 - balljoint sleeve, outer; 59 - balljoint sleeve, inner; 60 - balljoint thrust washer

Front wheel alignment angle - checking and adjustment

The check and adjustment of the front wheel alignment angle is carried out on special test-benches according to the instructions.

ATTENTION. It is necessary to check the wheel alignment angle after replacement or repair of suspension components, that could have caused the misalignment of wheel angle.

The check and adjustment of wheel angles is carried out on a vehicle under static load of 3140 N (320 kgf) (four men and 40 kg in boot).

Follow the parameters specified in tab. 4-1 to check and adjust the wheel alignment angles.

Table 4-1

Front wheel alignment angle parameters

Front wheels alignment angle	for vehicle with load 3140 N (320 kgf)	vehicle kurb weight
Camber	0°30' ± 20' (0°30' $^{+40'}_{-30'}$) *	0°20' ± 20' (0°20' $^{+40'}_{-30'}$) *
Caster	3°30' ± 30' (3°30' $^{+60'}_{-90'}$) *	1°30' ± 30' (1°30' $^{+60'}_{-90'}$) *
Toe-in	2... 4 mm (1... 7 mm) *	4.5.... 6.5 mm (3.5... 9.5 mm) *

** permissible front wheel alignment angle for the elastic elements stabilization time before the first maintenance (2000-3000 km).*

Before adjusting the wheel alignment angles check the following:

- pressure in tyres;
- axial gap in front wheel hub bearings;
- serviceability of shock-absorbers (absence of rod jamming);
- radial and axial runout of tyres;
- gap in suspension balljoints;
- free play of steering wheel.

Rectify any detected malfunctions and make necessary adjustments.

After placing the vehicle on a test-bench, immediately prior to inspection, apply 2 or 3 times a downward force of 392-490 N (40-50 kgf) first on the rear bumper and then on the front one.

The wheel alignment angle should be checked and adjusted in the following sequence:

1. Caster angle
2. Camber angle
3. Toe-in

Caster angle. If the check will show that the angle size does not correspond to the above data, it is necessary to change the quantity of adjusting washers 50 (see fig. 4-1) between the upper arm shaft and the crossmember arm (see tab. 4-2).

Table 4-2

Camber and caster angle vs. number of washers in a set

Number of washers added to the set or withdrawn		camber	caster
front bolt	rear bolt		
+1	+1	+ (8' 42")	0
-1	-1	- (8' 42")	0
+1	0	- (7' 30")	+ (20' 24")
-1	0	+ (7' 30")	- (20' 24")
0	+1	+ (15' 18")	- (25' 18")
0	-1	- (15' 18")	+ (25' 18")
-1	+1	+ (27' 30")	- (43' 18")
+1	-1	- (21' 36")	+ (40')

Note. *Data are given for washers with thickness of 0.75 mm. Plus - adding a washer, minus - removing a washer.*

To adjust the caster angle:

- undo the fastening nuts of the front suspension upper arm shaft and replace the washers from one bolt to the other one until a normal reading of the angle will be obtained. The caster angle increases at rearrangement of washers from the rear bolt to the front one and decreases at reverse swapping;
- tighten the nuts with a torque wrench and check the caster angle.

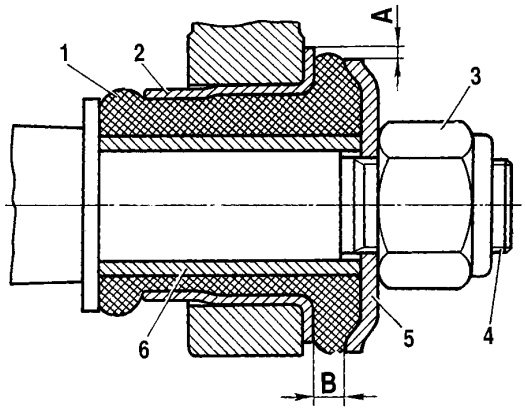

Fig. 4-2. Inspection of the front suspension arm silent block:
1 - rubber bush; 2 - outer bush; 3 - shaft securing nut; 4 - suspension arm shaft; 5 - thrust washer; 6 - inner bush

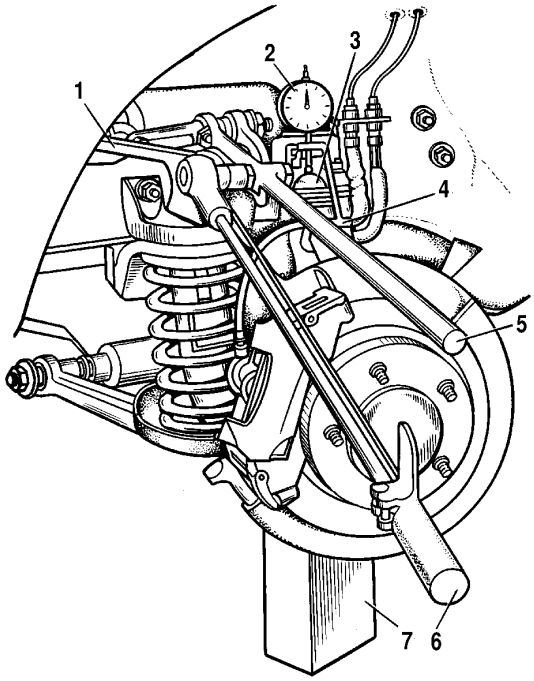

Fig. 4-3. On-vehicle check of the clearance in the suspension upper balljoint:
1 - upper control arm; 2 - indicator; 3 - upper balljoint housing; 4 - indicator fastening bracket; 5 - control arm; 6 - dynamometer; 7 - block

Front wheel camber. If the camber angle differs from normal, it should be adjusted by changing the amount of washers 50 (see fig. 4-1) between the upper arm shaft and crossmember bracket.

To reduce the camber angle remove the same amount of washers from both bolts, and to increase - add.

Front wheel toe-in. If the toe-in differs from normal value, it is necessary to slacken the fastening clamps on the side tie-rods and using tool 67.7813.9504 identically turn both adjuster pins in opposite directions; thus the pins are turned on or off and change the length of side tie-rods.

After adjustment, refit the fastening clamps with the slot facing back with allowable deviation downward by 60° to the horizontal plane of the vehicle. With the nuts tightened the clamp slot edges should not contact.

After toe-in adjustment, ensure that wheels and steering mechanism components do not hit the adjacent components of the suspension and car body. To do this, turn the wheels fully right and left until the steering pitman arm will rest against the steering mechanism housing fastening nuts.

Front wheel hub bearing gap - check and adjustment

To check the gap, remove the cap and slacken the wheel fastening nut, lift the front part of the vehicle, rest it on a support and take off the front wheel.

Remove the front brake caliper with brake pads. Do not allow the caliper to hang on high pressure hoses.

Fix tool 67.7834.9507 with indicator (fig. 4-4) on the steering knuckle so that the indicator leg will rest against the wheel hub as closely as possible to the adjusting nut. Turn the hub in both directions and simultaneously move it with lever 67.7820.9521 along the steering knuckle shaft (forward and backward). Measure the size of shift (gap) by the indicator.

If the gap is more than 0.15 mm, adjust it in the following order:

- undo the adjusting nut from the outer joint housing tail;

- fit a new or used, but on other vehicle, nut and tighten with torque to 19.6 N•m (2 kgf•m), simultaneously turning the hub in both directions 2-3 times for self-setting the roller bearings;

- slacken the adjusting nut and again tighten with torque to 6.86 N•m (0.7 kgf•m);

- make a mark **B** on the washer (fig. 4-5), then undo the nut by 20-25° until the first edge will meet the **A** mark;

- fix the nut in this position by pressing the cups on the journal into the grooves on the outer joint race tail end.

After adjustment the bearing clearance should be within the limits of 0.01-0.07 mm.

Front wheel hub bearing - renewing the greasing

To renew the greasing do the following from both sides of the vehicle:

- raise the front part of the vehicle and take off the wheel;

- unbend the edge of the brake front splash guard, undo the fastening bolt of the brake pad carrier and remove the brake caliper from the brake disc by moving it aside. Do not disconnect the brake hoses, to avoid air penetration in the hydraulic system, and do not leave the caliper to hang on the hoses;

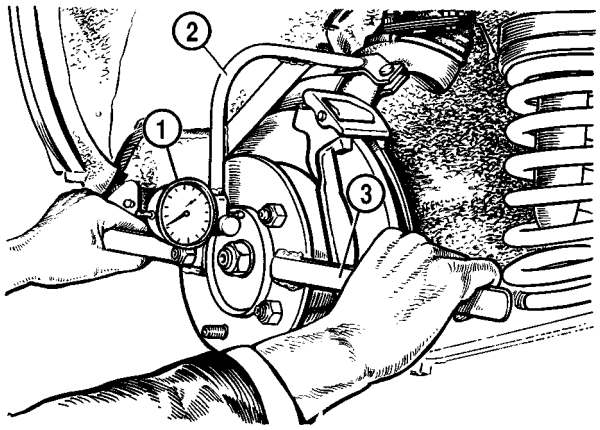

Fig. 4-4. Checking the axial gap in the front wheel hub bearings:
1 - indicator; 2 - fixture 67.7834.9507; 3 - lever 67.7820.9521

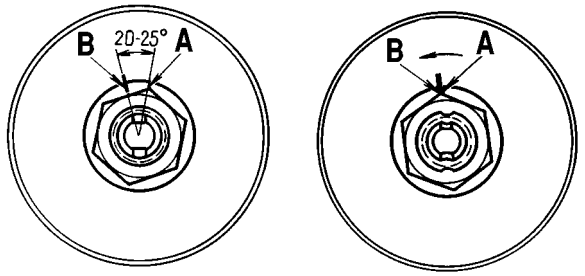

Fig. 4-5. Tightening and adjusting the front wheel hub bearings:
A - nut edge; B - mark on the nut

- use tool 67.7823.9514 to remove the wheel hub cap, undo the adjusting nut and remove bush 21 (see fig. 4-1);

- carefully, so that not to damage sealing 25, remove hub 19 in assembly with the brake disc;

- put a support under the suspension lower arm 4 and slightly lower the front part of the vehicle to compress spring 9;

- disconnect the lower balljoint 18 from the suspension arm;

- disconnect the shock-absorber 14 from the lower arm 4 and steering drive side tie-rod from the steering knuckle shaft 29;

- move the front wheel drive shaft fully forward to the front axle;

- by turning the steering knuckle 29 relatively the upper balljoint 41, remove the knuckle from the joint casing tail 23;

- using tool 67.7853.9535 with washer 67.7853.9540 press out from the cavity of the steering knuckle the inner rings of bearings 27 with dismantling rings and seals 25. The bearing outer rings are pressed off using washer 67.7853.9534, and press-fitted with tool 67.7853.9536. Mark the bearing rings so that to put them on former place when reassembling;

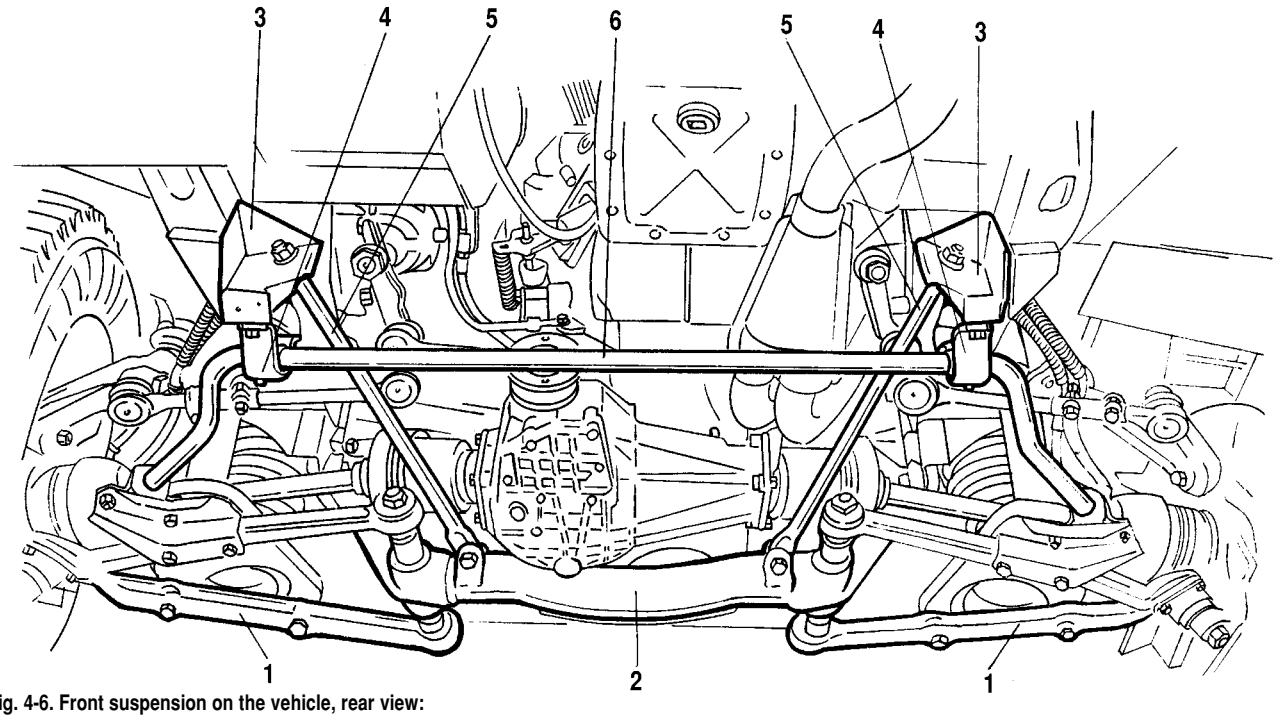

Fig. 4-6. Front suspension on the vehicle, rear view:
1 - lower control arm; 2 - crossmember; 3 - tie-rod fastening bracket; 4 - anti-roll bar-to-body securing bracket; 5 - tie-rod; 6 - anti-roll bar

- remove old greasing and wash with kerosine the inner cavity of the steering knuckle, the outer and inner cavities of the hub, the CV-join case tail and bearings;

- fill 40 gr of fresh ЛИТОЛ-24 in bearing cages, spread evenly in the cavity of the steering knuckle between the bearings, grease the splines of the joint casing tail;

- fit the bearing inner rings, the oil seal bush and press fit the sealings;

- fit the steering knuckle on the joint case tail and connect the balljoint to the lower arm;

- fix the shock-absorber and attach the side tie-rod of the steering mechanism to the steering knuckle arm;

- fit the hub in assembly with brake disc on the joint case tail and establish the taper bush 21;

- turn the new adjusting nut and adjust the gaps in wheel hub bearings;

- using tool 67.7853.9528 fit the wheel hub cap;

- replace the brake caliper and the wheel.

Note. *In all cases, when the nut is unscrewed from the tail of the outer joint case, renew the nut or use one from another vehicle*

Balancing the wheels

The wheels are balanced on special benches according to the instructions attached to the test-bench. The wheel out-of-balance is eliminated by balance weights, which are fastened on the rim with special springs.

Front suspension - removal and refitting

Place the vehicle on the lift or over an inspection pit, set the parking brake, open the hood and take out the spare wheel.

Place supports under rear wheels and take off front wheels.

Using remover 67.7824.9516 (see fig. 5-10) press out pins from the steering knuckle arms and draw aside the steering tie-rods.

Disconnect the anti-roll bar 6 (fig. 4-6) from the suspension lower arms.

Disconnect the tie rods 5 from body brackets and the crossmember.

Disconnect the shock-absorbers from the suspension lower arms.

Remove the engine crankcase protective plate and the splash guard.

Remove from each side the front brake caliper without disconnecting the brake hoses, and suspend it so that the caliper will not hang on hoses.

Compress the suspension spring to completely unload the lower arm.

Disconnect from the lower arm the balljoint and take off the spring, having smoothly unloaded it, repeat the procedure for the other unit of the suspension.

Disconnect the upper arm shaft 49 (see fig. 4-1) from suspension crossmember bracket 7 and remove the upper arm 46 in assembly with the steering knuckle, wheel hub, front brake and the outer joint case.

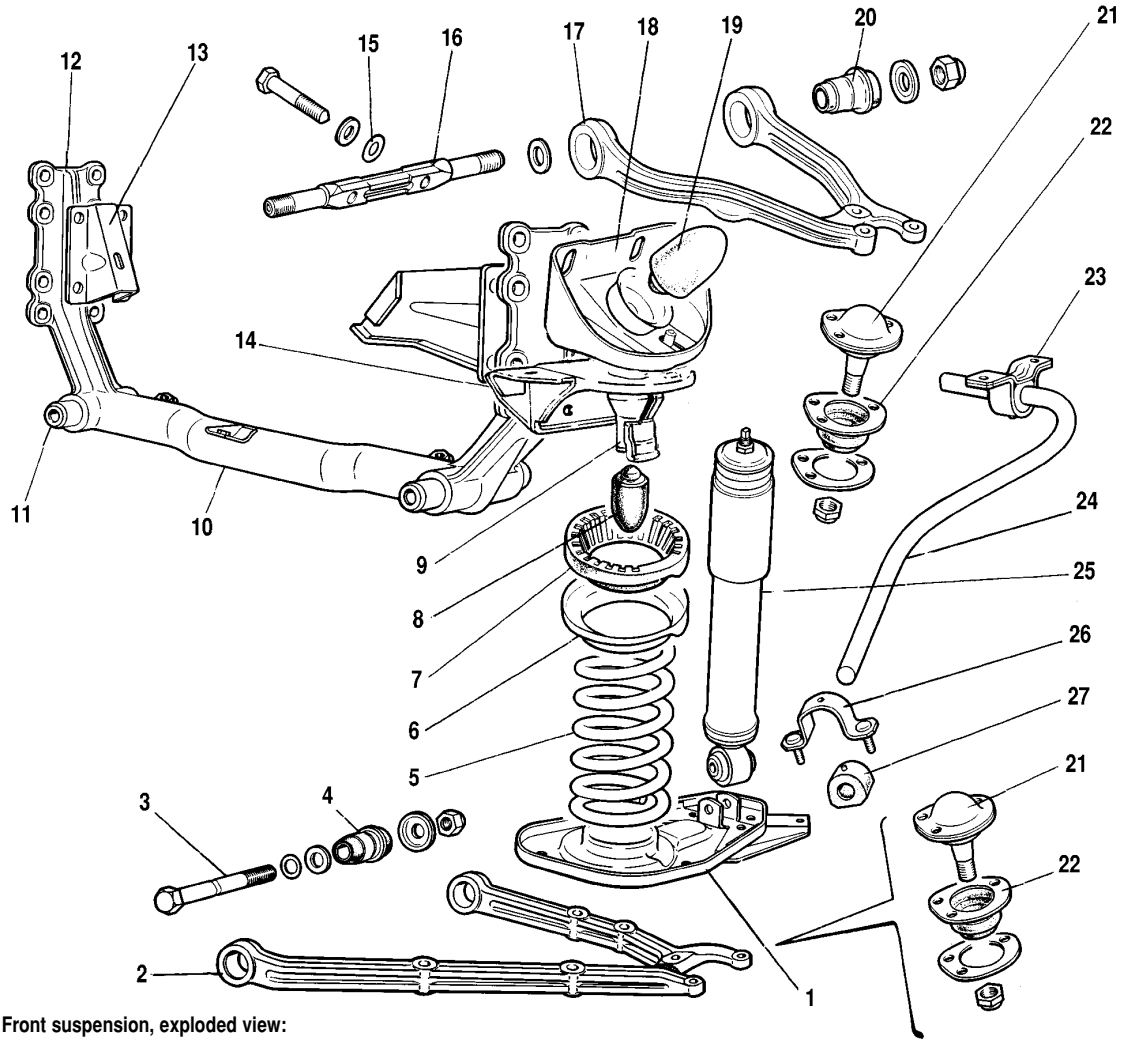

Fig. 4-7. Front suspension, exploded view:
1 - coil spring lower seat; 2 - lower control arm; 3 - lower arm shaft; 4 - lower control arm silent block; 5 - coil spring; 6 - upper seat; 7 - spring insulator gasket; 8 - compression buffer; 9 - compression restrictor; 10 - suspension crossmember; 11 - lower control arm shaft bush; 12 - crossmember bracket; 13 - engine mounting bracket; 14 - spring upper mounting; 15 - shim; 16 - upper control arm shaft; 17 - upper control arm; 18 - recoil buffer bracket; 19 - recoil buffer; 20 - upper control arm silent block; 21 - balljoint; 22 - boot; 23 - body - to - tie-rod mounting bracket; 24 - tie-rod; 25 - shock absorber; 26 - securing clamp; 27 - rubber pad

Note. *When removing the upper arm shaft, note the amount and arrangement of washers between the upper arm shaft and the crossmember, and also the number of shims between the crossmember and car body chassis arm, so that at refitting all washers and shims will be properly replaced.*

Disconnect the engine mounting rubber pads from the crossmember brackets.

Place a hydraulic jack with a fixing tool under the suspension crossmember, support the engine with arm 67.7820.9514 or hoist, disconnect the recoil bumper bracket 47 and the crossmember from the body chassis.

Remove the crossmember 1 in assembly with lower arms 4.

The installation of suspension parts and units is done in reverse order. The springs on the suspension should be installed only of one class (class **A** - not marked or has marks by white paint, class **B** - with black marks on the outer surface of the coils). It is permissible to install springs of A class on the front suspension, if B class springs are fitted on the rear suspension.

After reassembly and suspension refitting, check the wheel alignment angles and toe-in.

Suspension units - dismantle and reassembly

Dismantle. If the suspension repair requires complete dismantle of the units, it is more convenient to begin directly on the vehicle after removing the crankcase protective plate and the splash guard.

Proceed as follows:

- undo the upper balljoint 41 (see fig. 4-1) pin nut and remove the clips from hoses;

- unbend the protective casing blades, turn out the fastening bolt of the caliper carrier and move the whole assembly aside;

ATTENTION. To avoid damaging the hoses do not leave the caliper to hang on hoses.

- using tool 67.7823.9514 remove the hub cap and undo the wheel hub bearing nut;

- remove the front wheel hub in assembly with the brake disc, using pusher 67.7823.9516;

- remove the front brake splash guard;

- remove the front suspension shock-absorber;

- lower the suspension lower arm on a support and compress the suspension spring to fully unload the lower arm;

- disconnect the balljoint housing from the suspension lower and upper control arms and remove the steering knuckle;

- smoothly unload the suspension spring and take it off;

- using pusher 67.7823.9515 knock out the shaft and disconnect the suspension lower arm from the crossmember;

- disconnect the upper arm shaft from the crossmember and remove the shaft in assembly with the control arm;

Note. *Before removing the upper and lower arm shafts count the amount of washers on each end of the lower arm shaft and on the fastening bolts of the upper arm shaft, so that to refit them in former places.*

- remove the recoil bumper bracket and the crossmember, as described above;

- using puller 67.7824.9516, press out the balljoint pins from the steering knuckle.

The front suspension components are shown on fig. 4- 7.

The reassembly of suspension units is carried out in reverse sequence. When reassembling the wheel hub, grease the bearing cages with ЛИТОЛ-24 and put a thin layer in the cavity of the steering knuckle between the bearings in the amount of 40 gr in each knuckle.

When refitting the crossmember tie rods, the inner nut should be tightened until the clearance between the washer and the bracket 3 (see fig. 4-6) will be taken up, and the outer one - with torque specified in the appendix.

To avoid wrong force distribution in silent blocks, the arm shaft nuts should be tightened under vehicle static load of 3140N (320 kgf). Then check and adjust the wheel alignment angles and toe-in.

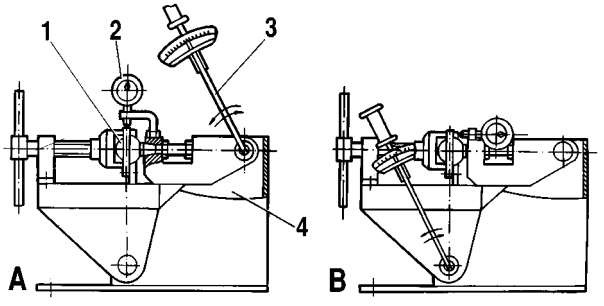

Fig. 4-8. Inspecting the balljoint on fixture 02.8701.9502:
1 - balljoint; 2 - indicator; 3 - dynamometer; 4 - fixture 02.8701.9502; A - method of checking the radial clearance; B - method of checking the axial clearance

Inspection

Balljoint. Ensure the integrity of the balljoint boots; no breaks, cracks, rubber peeling from the metal fixture, traces of grease leaks are permissible.

Check for wear of balljoint working surfaces by manually turning the ballpin. No free play or pin jamming is allowed.

A more profound check of the balljoint radial and axial clearances is carried out on fixture 02.8701.9502. Place the balljoint 1 (fig. 4-8, A) in the fixture bezel and fix with screw. Fit in the fixture bracket indicator 2 so that the indicator leg will rest against the side surface of the balljoint housing, the indicator arrow should point to zero.

Fit the dynamometer 3 in the fixture bezel and apply torque of 196 N•m (20 kgf•m) in both directions, determine by indicator 2 the total radial clearance in the balljoint. If it exceeds 0.7 mm - renew the joint.

Make the similar check of the balljoint axial clearance, previously having changed its fastening in the fixture, as shown on fig. 4-8, B. The axial clearance in the joint should not exceed 0.7 mm.

Suspension springs. Carefully examine the springs. If any deformations affecting the spring efficiency will be found - renew the springs.

To check the spring set down, fully compress it three times. The spring compression is made along the spring axis; the bearing surfaces should meet the vehicle suspension spring seats. Then apply load of 6.276 N (640 kgf). According to the spring length (see fig. 4-9) under the specified load the springs are divided into two classes: class A - length more than 192 mm, and class B - length is equal to or less than 192 mm. The springs of A class can be not marked or have marks with white paint on the external side of coils, spring of B class are marked with black paint.

On the front suspension the springs of the same class, as those on the rear suspension, should be installed. As an exception, when on the rear suspension the springs of B class are installed, and there are no springs of the same class available for

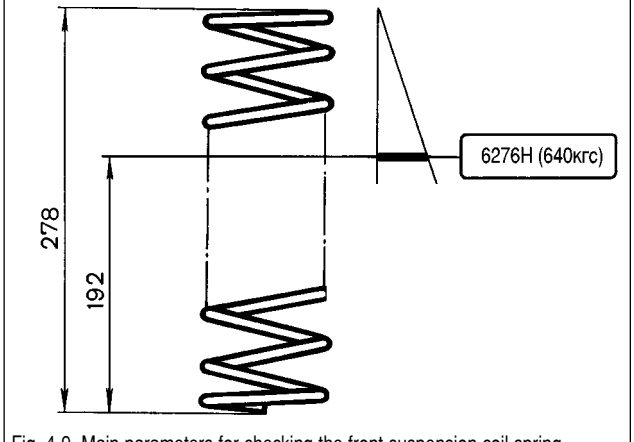

Fig. 4-9. Main parameters for checking the front suspension coil spring

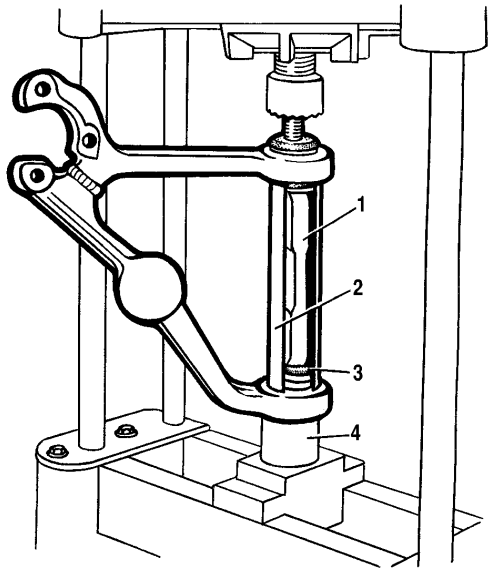

Fig. 4-10. Pressing out the upper control arm balljoint:
1 - control arm shaft; 2 - tool 67.7823.9527; 3 - balljoint; 4 - tool A.47045

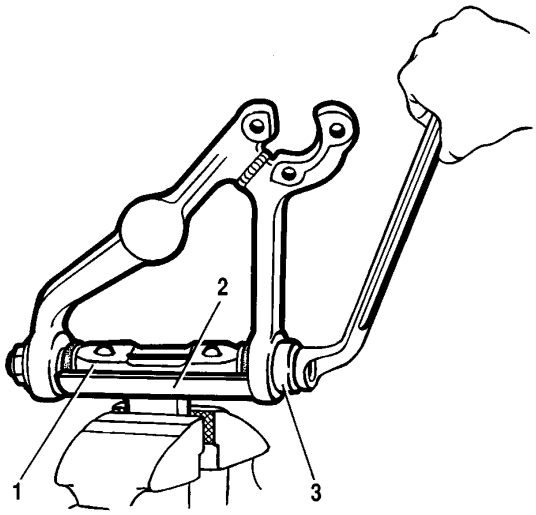

Fig. 4-11. Press-fitting the upper control arm balljoint:
1 - control arm shaft; 2 - tool 67.7853.9519; 3 - fixture A.74177/1

the front suspension, it is permissible to install the A class springs on the front suspension. But you can not install the B class springs on the front suspension, if the A class springs are installed on the rear suspension.

Inspect the gaskets and renew, if they have damages.

Anti-roll bar, suspension arms, steering knuckle. Check the bar for deformations and ensure that the ends lie in one plane; if deformation is insignificant, the bar can be straightened; at significant deformations - renew the bar.

Carefully inspect and ensure that the suspension arms, crossmember and steering knuckles are not deformed and have no cracks. Renew the specified components in case of cracks and deformations.

Suspension crossmember. Use tool 67.8732.9501 to check the geometrical parameters of the crossmember. At significant deformations of the crossmember, when it is impossible to adjust the front wheel alignment angle with washers, and at satisfactory condition of all other elements, renew the crossmember.

Silent blocks. The criteria for renewal are described in chapter "Front suspension - inspection".

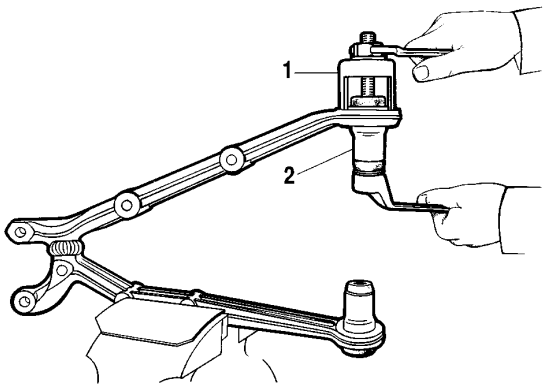

Fig. 4-12. Pressing out the lower control arm balljoint:
1 - tool 67.78223.9517; 2 - balljoint

Replacement of silent blocks

The upper arm. Between the eyes of the arm establish tool 67.7823.9527 on the shaft and place the arm on tool A.47045 (fig. 4-10). Press the arm shaft 1 with the punch to press out joint 3 from the aperture. To press out the second joint turn over the arm and repeat the procedure.

The press fitting of upper arm joints is done with tool 67.7853.9519 (fig. 4-11), fixed in vice. Fix the arm with shaft 1 in fixture 2, place the joint on the shaft and press fit in the arm bezel with tool 3 (A.74177/1). Then repeat the above described operations to press fit the second joint on the other side of the arm.

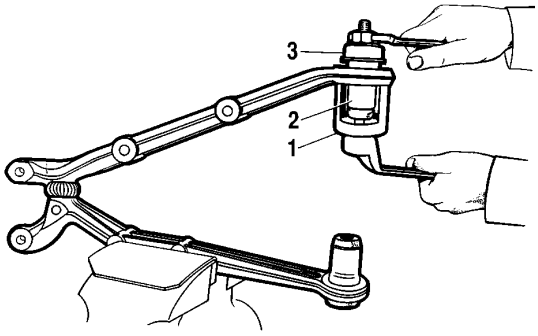

Fig. 4-13. Press-fitting the lower control arm balljoint:
1 - tool; 2 - balljoint; 3 - cap

The lower arm. The pressing-out and press-fitting of the joint can be carried out on a press, using tool 67.7823.9526, and also with tool 67.7823.9517 (fig. 4-12), which is installed on the arm so that the head of the tool screw was directed inside. Tighten the tool screw to press out the joint.

For press fitting, insert the joint into the arm bezel and fit tool 67.7823.9517 (fig. 4-13) complete with cap 3. By tightening the fixture screw, press fit the joint in the arm bezel.

Rear suspension

The design of the rear suspension is shown on fig. 4-14.

Suspension removal and refitting

Removal. Lift the rear part of the vehicle and place it on supports. Take off the rear wheels.

Disconnect the propeller shaft from the final drive gear flange.

Disconnect the hose of the brake hydraulic system from the steel tube on the axle, and make arrangements to prevent liquid leaking from the brake system.

Disconnect the handbrake rear cable brackets from the body, remove the front cable return spring, and after undoing the locknut and the adjusting nut, release the rear cable. Disconnect from the bracket on the axle beam the tie-rod 13 (see fig. 4-14) of the rear brake pressure regulator drive. Disconnect the top ends of shock-absorbers 25.

Put under the rear axle beam a hydraulic jack. Disconnect the longitudinal 3 and 17 and transverse 24 arms from brackets on the body, lower the jack and remove the axle.

Start to dismantle the suspension:

- remove the shock-absorbers from the brackets on the axle beam;

- disconnect the longitudinal and transverse arms from the brackets on the axle beam.

The rear suspension components are shown on fig. 4-15.

The rear suspension refitting is carried out in reverse sequence. On the rear suspension the springs of the same class, as on the front suspension, should be installed. In exceptional cases, if the springs of A class (not marked or with marks by white paint on the external side of coils) are installed on the front suspension, and there are no springs of the same class available

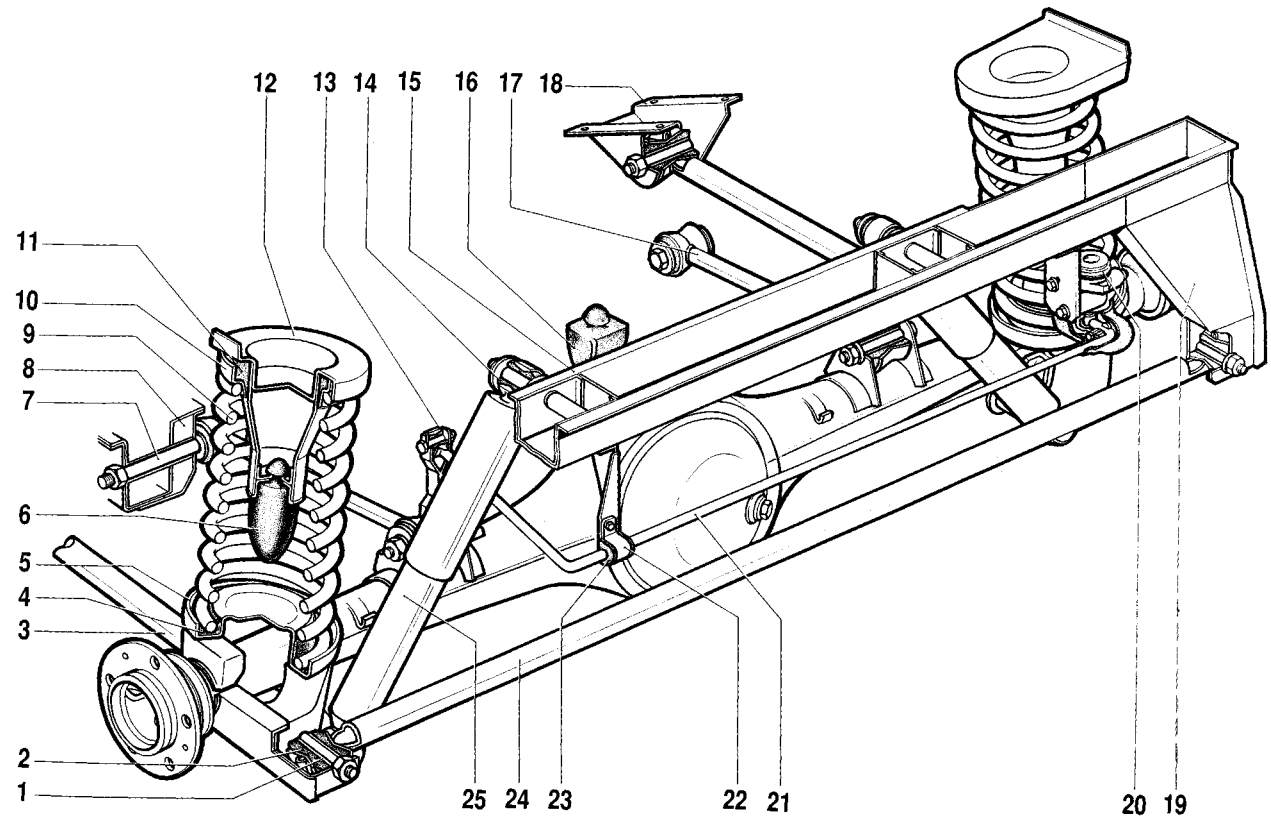

Fig. 4-14. Rear suspension:
1 - spacer sleeve; 2 - rubber bush; 3 - lower longitudinal arm; 4 - spring insulating gasket, lower; 5 - spring seat, lower; 6 - compression buffer; 7 - upper longitudinal arm securing bolt; 8 - upper longitudinal arm mounting bracket; 9 - suspension spring; 10 - upper spring seat; 11 - spring insulating gasket, upper; 12 -spring mounting; 13 - rear brake pressure regulator operating rod link; 14 - shock absorber eye rubber bush; 15 - underbody crossmember; 16 - additional compression buffer; 17 - upper longitudinal arm; 18 - lower longitudinal arm mounting bracket; 19 - transverse arm-to-body mounting bracket; 20 - pressure regulator; 21 - pressure regulator operating rod; 22 - bush clamp; 23 - arm bush; 24 - transverse arm; 25 - shock absorber

for the rear suspension, it is permissible to install the B class springs (with black marking). If on the front suspension the springs of B class are installed, the rear suspension should be fitted with B class springs only.

To avoid damage and excessive tightening of control arm rubber bushes and shock-absorbers:

- load the rear part of the vehicle so that distance **X**, measured from the axle beam to the body chassis arm in 100 mm from the cross bar bracket (fig. 4-16), will make 152 mm; use a dynamometer to tighten the nuts on fastening bolts of the longitudinal and cross bars , and the shock-absorbers fastening pins on the axle beam and car body.

Inspection

Before inspection thoroughly wash all components.

Protect the rubber components, bushes and protective covers from solvents.

Springs. Check the tension characteristic of the spring on control points (fig. 4-17), previously having depressed it to bring the coils in contact.

Note. *According to length under load of 3432 N (350 kgf) the springs are divided into two classes: class A - length more than 278 mm, and class B - length equal to or less than 278 mm. The springs of A class can be not marked or have marks with white paint on the external side of coils, and class B - marked with black paint on the external side of the coils.*

Check for spring deformation. If the spring tension does not correspond to the data on fig. 4-17 or the deformation can affect spring efficiency, renew it.

Inspect the spring rubber gaskets; if necessary - renew.

Arms. Check for:

- arm deformation; straighten if possible;

- cracks on rear axle beam brackets and body; overhaul the brackets in case of cracks;

- the arm joint rubber bushes; if necessary - renew, using a set of fixtures 67.7820.9517.

Shock-absorbers

The design of shock-absorbers of front and rear suspensions is shown on fig. 4-18.

Shock-absorbers bench-test

To test the efficiency of the shock-absorber, make an operating diagram check on a dynamometer bench.

The working diagram is made according to the instruction attached to the test-bench, after no less than 5 working cycles, at the shock-absorber liquid temperature of (20±5) °C, the flywheel

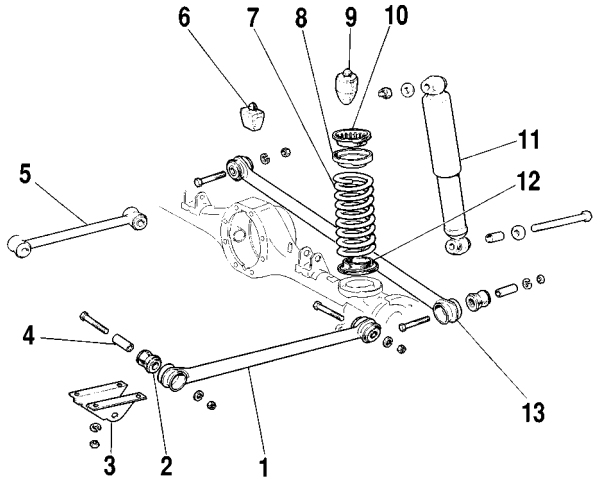

Fig. 4-15. Rear suspension, exploded view:
1 - lower longitudinal arm; 2 - rubber bush; 3 - bracket; 4 - spacer sleeve; 5 - upper longitudinal arm; 6 - additional compression buffer; 7 - spring; 8 - spring seat, upper; 9 - compression buffer; 10 - spring insulating gasket, upper; 11 - shock absorber; 12 - spring insulating gasket, lower; 13 - transverse arm

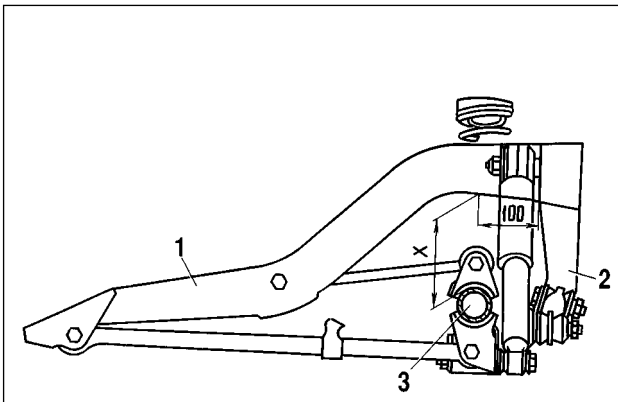

Fig. 4-16. Rear suspension mounting:
1 - chassis arm; 2 - transverse arm bracket; 3 - rear axle beam; X = 152 mm

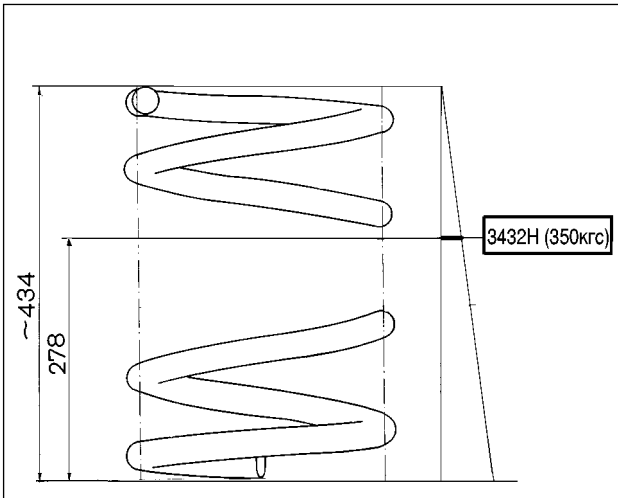

Fig. 4-17. Main parameters for checking the rear suspension spring

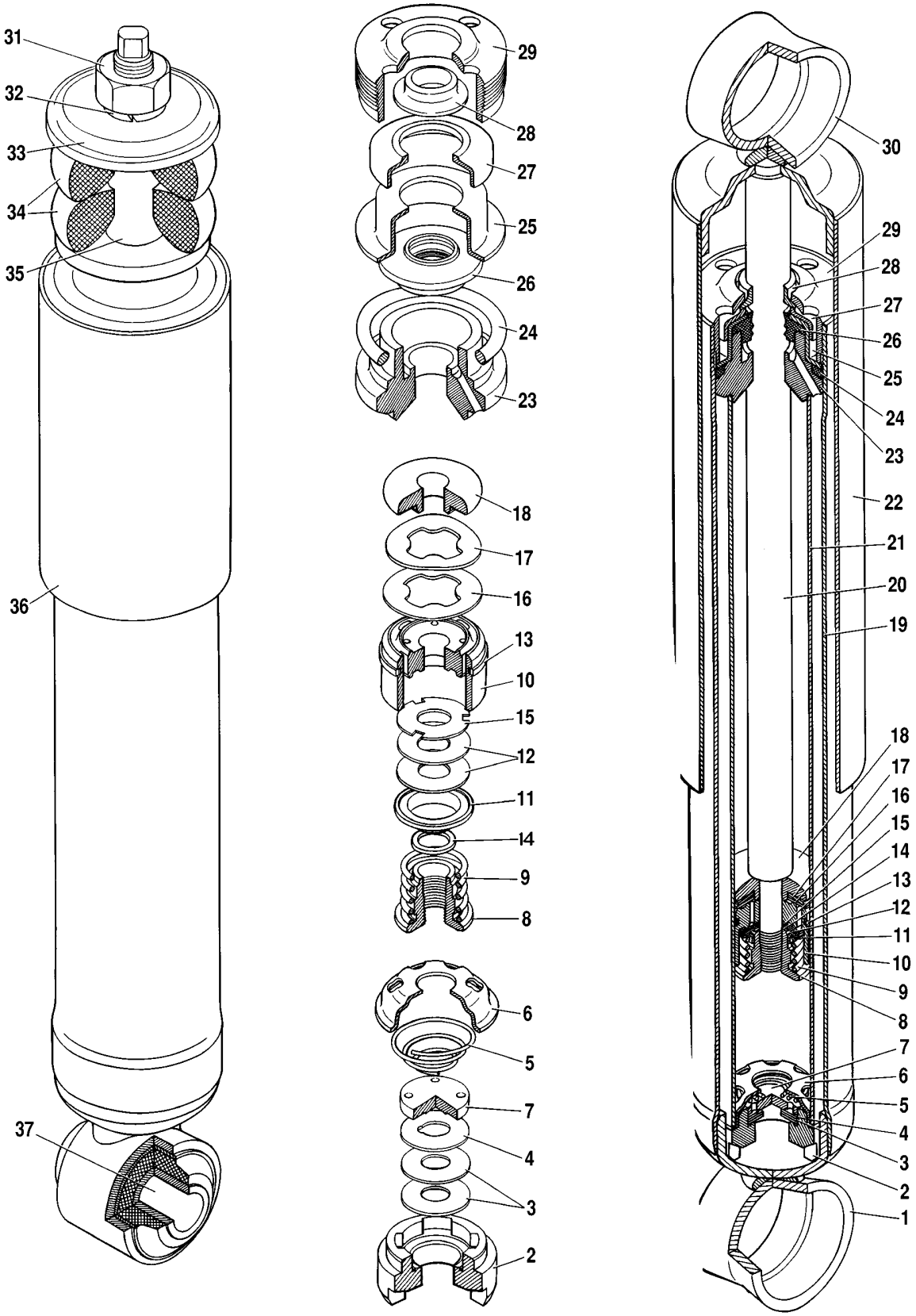

Fig. 4-18. Front and rear suspension shock absorbers:

1 - lower eye; 2 - compression valve body; 3 - compression valve discs; 4 - compression valve throttling disc; 5 - compression valve spring; 6 - compression valve holder; 7 - compression valve cap; 8 - recoil valve nut; 9 - recoil valve spring; 10 - shock absorber piston; 11 - recoil valve cap; 12 - recoil valve discs; 13 - piston ring; 14 - recoil valve nut washer; 15 - recoil valve throttling disc; 16 - by-pass valve cap; 17 - by-pass valve spring; 18 - restricting plate; 19 - tank; 20 - rod; 21 - cylinder; 22 - housing; 23 - rod guide sleeve; 24 - tank sealing ring; 25 - oil seal retainer; 26 - rod oil seal; 27 - gasket; 28 - rod guard ring; 29 - tank nut; 30 - shock absorber eye, upper; 31 - front suspension shock absorber securing nut for top end; 32 - spring washer; 33 -washer; 34 - pad; 35 - distance sleeve; 36 - shock absorber casing; 37 - silent block

Fig. 4-19. Shock absorber operating curve:
I - force at recoil stroke; II - force at compression stroke

speed of 60 min^{-1}, rod stroke length of 80 mm for the front shock-absorber, and 100 mm - for the rear one.

The curve of the diagram (fig. 4-19) should be smooth, and in points of transition (from the recoil stroke to the compression stroke) - without areas parallel to zero line.

Evaluation of diagram results. The resistance of recoil and compression strokes is defined by the peaks of the appropriate diagrams.

The highest point of the recoil stroke curve, with the scale of 1 mm = 47 N (4.8 kgf), should be on the A distance from the zero line, and equal to: 25-32 mm - for front shock-absorbers, 23.5-30.5 mm - for the rear ones.

The highest point of the compression stroke curve, with the same scale, should be on the B distance from the zero line, and equal to 3.5-6.5 mm - for front shock-absorbers, 4.5-7.5 - for the rear ones.

The ordinate control points on the diagrams of front and rear shock-absorbers are given for cold shock-absorbers at shock-absorber liquid temperature (20±5) °C.

After checking, remove the shock-absorber from the test-bench, overhaul or renew the components if necessary.

Repeat the tests to ensure the shock-absorber efficiency.

Shock-absorber - dismantle and reassembly

After washing fix the shock-absorber in vice.

Note. *Special grips 67.7824. 9513-001 are used to fasten the shock-absorber and its components in vice.*

Fully extend the shock-absorber rod, undo tank nut 29 (see fig. 4-18) with key A.57034/R, take out from the tank the slave cylinder 21 in assembly with the rod and compression valve 2. Remove the tank from vice and drain liquid.

Using key 67.7824.9513-005 take out the rod guide bush 23 from the slave cylinder. Take out from the cylinder rod 20 complete with piston 10 and drain the liquid. Carefully, using a special tool, punch out from the cylinder the compression valve 2 housing in assembly with other components.

Place the rod in assembly with the piston in grips, fix in vice and undo the recoil valve nut 8. Remove piston 10 with valves (bypass and recoil), rod guide bush 23, rod sealing 26, sealing race 25 and other components.

Note. *To facilitate the inspection of the rod in the front suspension shock-absorber it might be helpful to press off the cover from the rod.*

To dismantle the compression valve, first remove race 6, and then sequentially take out from case 2 spring 5, plate 7 and valve discs 4 and 3.

The reassembly of the shock-absorber is carried out in reverse sequence, paying attention to the following:

- after the reassembly of the compression valve ensure the free play of plate 7 and valve discs;

- race 6 is press fitted on case 2 with special tool;

- the compression valve is press-fitted in the cylinder using tool 67.7824.9513-004;

- to facilitate the reassembly of components located on the rod, use guide 67.7824.9513-003;

- the throttle disc 15 of the front shock-absorber has two grooves on the outer diameter, and the rear shock-absorber throttle disc - three;

- the recoil valve nut is tightened with torque of 11.76-15.68 N•m (1.2-1.6 kgf•m);

- the tank nut is tightened with key 67.7824.9513-002 to torque 68.6-88.2 N•m (7-9 kgf•m).

Inspection of components

Wash the metal components and dry, wipe the rubber components with clean cloth and wash in warm water.

Carefully inspect the components, paying attention to the following:

- the compression and feedback valve discs, and the bypass valve plate should not be deformed; the nonflatness of the bypass valve plate is allowed no more than 0.05 mm;

- the working surfaces of the piston, the piston ring, the rod guide bush, cylinder and the valve components should have no scuffings and dents that might affect normal operation of the shock-absorber;

- the recoil and compression valve springs should be tense enough and not damaged ;

- the compression valve discs should not be damaged and should have no significant wear;

- it is recommended to renew the sealing at repair.

Replace all damaged components and start to reassemble the shock-absorber.

Chapter 5. Steering

The steering mechanism design is shown on fig. 5-1, 5-2.

Since November, 1998, vehicles are fitted with a telescopic intermediate shaft instead of a cylindrical intermediate shaft 17 (see fig. 5-1) and the steering wheel 19 is fastened by a self-locking nut.

There are two variants of fitting the steering pitman arm roller: on needle or on ball bearing. In the text the figures for both variants are given, thus the sign "*" refers to the first embodiment (pitman arm roller is established on a needle bearing).

Fault diagnosis

Diagnosis	Remedy
Excessive free play in the steering wheel	
1. Loose steering box fastening bolt	1. Tighten nuts
2. Loose tie-rod ballpin nuts	2. Check and tighten nuts
3. Excessive gap in rod balljoints	3. Renew ball joints or tie rods
4. Excessive clearance in front wheel hub bearings	4. Adjust clearance
5. Excessive clearance in roller-to-worm mesh	5. Adjust clearance
6. Too large clearance between slave arm shaft and bushes	6. Replace bushes or bracket assembly
7. Excessive clearance in worm bearings	7. Adjust clearance
8. Loose bolts fastening intermediate shaft to worm shaft or to upper shaft	8. Tighten bolts
Stiff steering wheel	
1. Deformation of steering drive components	1. Renew deformed components
2. Wrong wheel alignment angle	2. Check wheel alignment angle and adjust
3. Wrong roller-to-worm clearance	3. Adjust clearance
4. Excessive torque applied to slave arm shaft adjusting nut	4. Adjust nut tightening
5. Low pressure in front wheel tyres	5. Ensure normal pressure
6. Damaged balljoint components	6. Inspect and renew damaged parts
7. No oil in steering box	7. Check oil lever and top up. Renew oil seal if necessary
8. Damaged upper shaft bearings	8. Renew bearing
Noise (rattle) in the steering mechanism	
1. Excessive clearance in front wheel hub bearings	1. Adjust clearance
2. Loose nuts on tie-rod ballpins	2. Check and tighten nuts
3. Excessive gap between slave arm shaft and bushes	3. Replace bushes or bracket in assembly
4. Slackened slave arm shaft adjusting nut	4. Adjust nut
5. Wrong clearance in roller-to-worm mesh or in worm bearings	5. Adjust clearance
6. Excessive gap in tie-rod balljoint	6. Renew ball joints or tie rods
7. Loose steering box fastening bolts or slave arm shaft bracket	7. Check and tighten bolt nuts
8. Loose knuckle arm fastening nuts	8. Tighten nuts
9. Loose steering shaft fastening bolts	9. Tighten nuts
Shimmy	
1. Improper tyre pressure	1. Check and ensure normal pressure
2. Wrong front wheel alignment angle	2. Check and adjust wheel alignment angle
3. Excessive clearance in front wheel hub bearings	3. Adjust clearance
4. Wheels out-of-balance	4. Balance wheels
5. Loose tie-rod ballpin nuts	5. Check and tighten nuts
6. Loose fastening bolts on steering box or slave arm shaft bracket	6. Check and tighten bolt nuts
7. Wrong roller-to-worm gap	7. Adjust clearance
Vehicle wandering	
1. Unequal pressure in tyres	1. Check and ensure normal pressure
2. Wrong front wheel alignment angle	2. Check wheel alignment angle and adjust
3. Different tension in front suspension springs	3. Replace bad springs
4. Deformed steering knuckles or suspension arms	4. Inspect knuckles and arms, replaces bad parts
5. Incomplete brake release on one or several wheels	5. Check braking system
Vehicle unstable	
1.Wrong front wheel alignment angle	1. Check wheel alignment angle and adjust
2. Excessive clearance in front wheel bearings	2. Adjust clearance
3. Loose tie-rod ballpin nuts	3. Check and tighten nuts
4. Excessive clearance in tie-rod balljoint	4. Renew tie rod balljoints
5. Loose fastening bolts on steering box or slave arm shaft bracket	5. Check and tighten bolt nuts
6. Excessive roller-to-worm gap	6. Adjust gap
7. The steering knuckles or suspension arms are deformed	7. Inspect knuckles and arms, replaces bad parts
Oil leak from the steering box	
1. Worn arm shaft sealing or worm	1. Renew oil seal
2. Loose steering box cover fastening bolts	2. Tighten bolts
3. Damaged sealings	3. Renew sealings

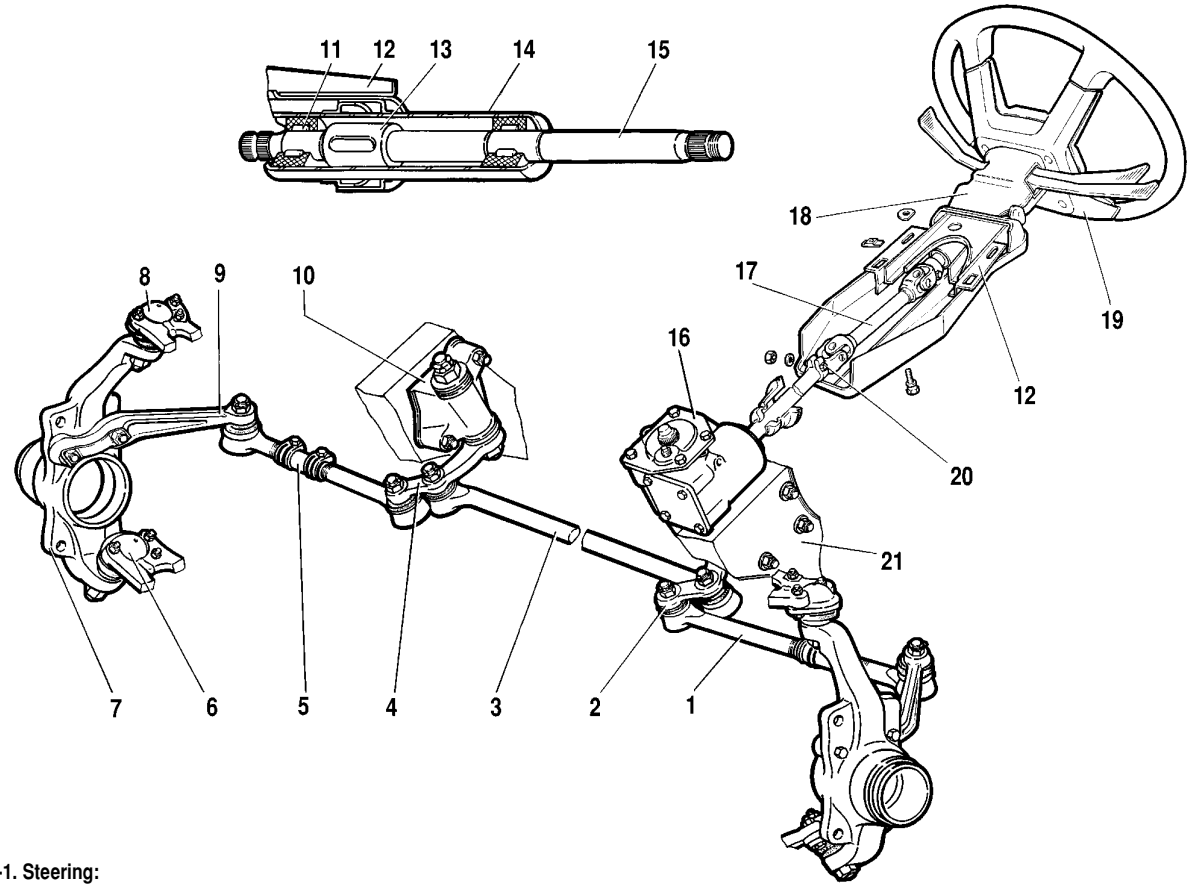

Fig. 5-1. Steering:

1 - track rod; 2 - drop arm; 3 - relay rod; 4 - idler arm; 5 - adjuster pin; 6 - lower balljoint; 7 - right steering knuckle; 8 - upper balljoint; 9 - right steering knuckle arm; 10 - idler bracket; 11 - upper shaft bearing; 12 - steering wheel mounting bracket; 13 - sleeve, ignition switch anti-theft device; 14 - steering wheel mounting bracket pipe; 15 - upper shaft; 16 - steering box; 17 - middle shaft; 18 - column shroud; 19 - steering wheel; 20 - pinch bolt; 21 - underbody chassis arm

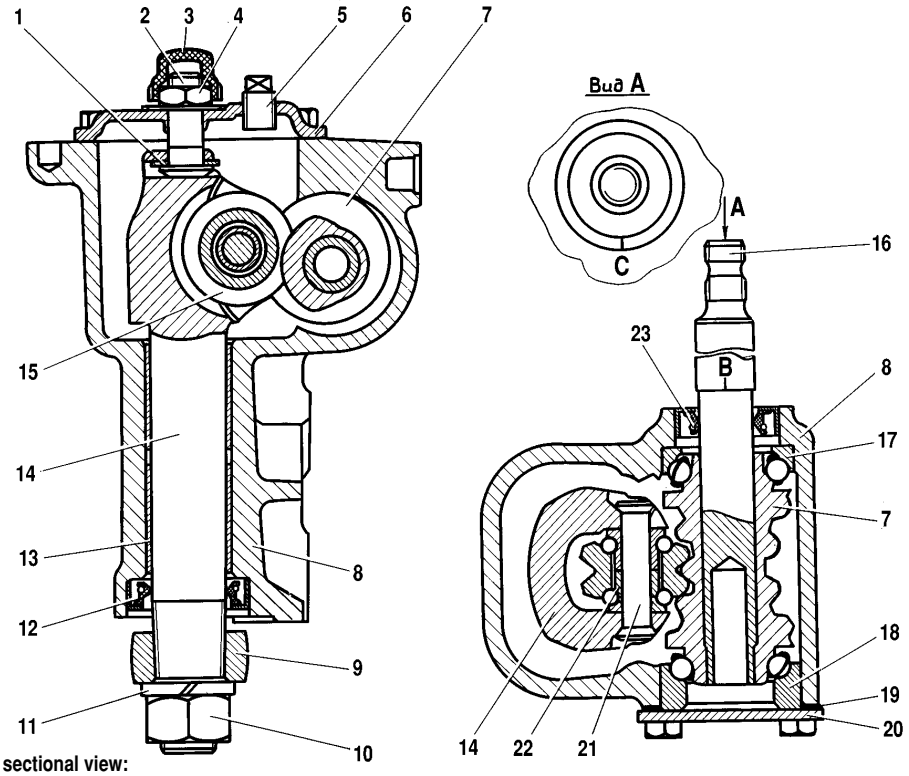

Fig. 5-2. Steering mechanism, sectional view:

1 - adjuster screw plate; 2 - adjuster screw; 3 - cap; 4 - screw nut; 5 - oil filler plug; 6 - cover; 7 - worm; 8 - housing; 9 - drop arm; 10 - securing nut; 11 - spring washer; 12 - oil seal; 13 - bronze bush; 14 - drop arm shaft; 15 - drop arm shaft roller; 16 - worm shaft; 17 - upper ball bearing; 18 - lower ball bearing; 19 - shims; 20 - worm bearing cover, lower; 21 - roller shaft; 22 - ball bearing; 23 - worm shaft oil seal; B, C - marks

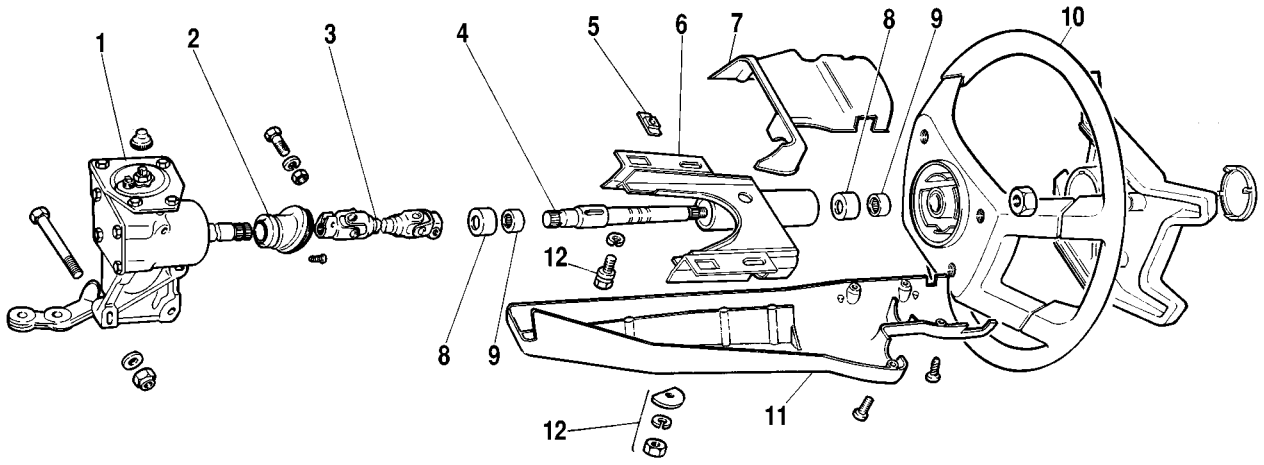

Fig. 5-3. Steering components:
1 - steering box; 2 - shaft seal; 3 - intermediate shaft; 4 - upper shaft; 5 - locking plate, bracket front end; 6 - bracket; 7 - upper shroud; 8 - bearing bush; 9 - needle bearing; 10 - steering wheel; 11 - lower shroud; 12 - steering system mounting bracket components

Steering - inspection, check and adjustment

General inspection

The steering system should be examined at any signs of malfunction (rattle, excessive free play of the steering wheel or, on the contrary, its hard rotation, and so on). The inspection is carried out on the trestles or an inspection pit in the following order.

Clean the components of the steering mechanism and the steering box. Place the wheels in position corresponding to straight movement.

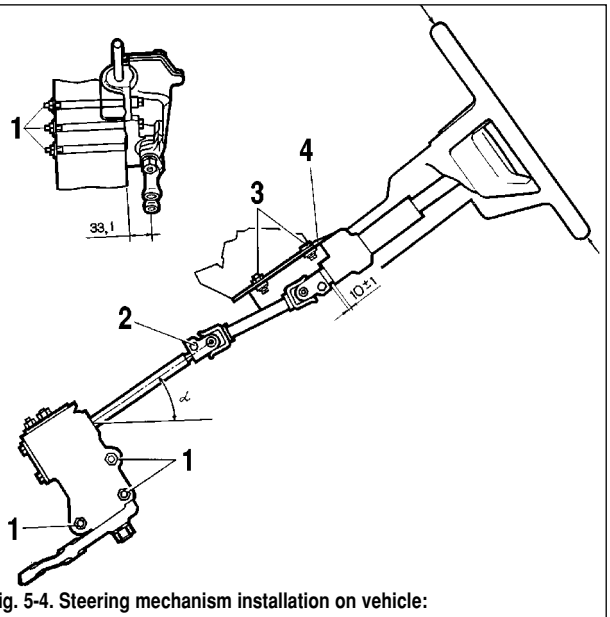

Fig. 5-4. Steering mechanism installation on vehicle:
1 - steering box securing bolts; 2 - pinch bolt, intermediate shaft lower end; 3 - bracket securing bolts; 4 - steering shaft bracket; 33.1 mm- distance from the pitman aperture to the steering box thrust surface at middle position of the pitman

Turn the steering wheel in both directions, and ensure:

- the steering wheel free play does not exceed 5° (when measured on the wheel rim, no more than 18-20 mm). To perform this operation use tool 67.8720.9501;

- there is no rattle in joints, connections and steering mechanism;

- reliable fastening of the steering box and the slave arm bracket (tighten the threaded connections if necessary);

- there is no free play in the tie-rod balljoint and in the slave arm bracket, and there is no axial displacement of the worm shaft;

- the steering wheel turns with the effort (with the front wheels standing on smooth surface) not exceeding 196 N (20 kgf), 245* N (25* kgf).

Check the tie-rod adjuster pins, ensure reliable tightening of the clamps.

Inspect the balljoint and protective caps, as set forth below.

Inspection of the tie-rod balljoint

First, check the movement of the tie-rod ends along the pins. For this purpose, move the end parallel to the pin, using a lever and a support.

The axial movement of the end in relation to the pin should be 1-1.5 mm. This will prove that the pin insert is not jammed in the tie-rod end and it moves together with the pin, depressing the spring. Replace the joint with a jammed insert.

Rotate the steering wheel in both directions, by touch ensure there is no free play in the tie-rod joints. If the free play in the ball is detected, replace the tie-rod ends or tie-rod assembly.

Inspect the tie-rod balljoint protective caps.

If the protective caps are in good condition and provide inside cleanness, their service life is practically unlimited. Moisture, dust and other foreign particles inside the joint will result in premature wear of components.

The cap should be replaced in case of cracks, breaks and in case greasing is squeezing out when the joint is pressed with fingers.

Checking and adjusting the clearance in the steering mechanism worm bearings

Place the front wheels in position corresponding to straight movement, rotate the steering wheel in both directions, and check if the distance between the steering box 8 end face (fig. 5-2) and mark B made on the steering worm shaft will change. This change will indicate a gap in worm bearings.

To adjust the clearance in worm bearings, make 1-1.5 turns of the steering wheel to the left, undo the fastening bolt from the bottom cover 20 and drain oil from the steering box. Remove the bottom cover, remove one shim or replace it with a thinner one.

Note. *Shims are delivered in spare parts with thickness of 0.10 and 0.15 mm.*

Fix the bottom cover, again check for axial shift of worm in bearings. If there is no free play, fill the steering box with 0.215 l. of transmission oil.

Check the effort of turning the steering wheel, having placed the front wheels on smooth metal surface. It should not exceed 196 N (20 kgf), 245* N (25* kgf).

Check and adjustment of the roller-to-worm mesh

Having ensured there is no axial movement of the worm in the bearings, use puller A.47035 to press out the balljoint pins from the apertures in the arm and disconnect the tie-rods from the arm, at the same time keeping the front wheels straight.

Move the arm by the head, check for a gap in the roller-to-worm mesh. Within the 30° turn of the steering wheel in each direction from the neutral position there should be no clearance, that is, no evident free play of the arm.

If the free play of the arm can be felt, remove cap 3 (see fig. 5-2), slacken nut 4 on the adjusting screw and, having raised the washer, tighten the adjusting screw 2 to take up the backlash. Do not tighten the adjusting screw too much. Then, hold the adjusting screw with a screwdriver, and tighten nut 4.

Ensure, that the arm does not move, connect the balljoint pins. Check the effort of turning the steering wheel. If it exceeds 196 N (20 kgf), slacken adjusting screw 2 and refit cap 3.

Steering mechanism

Removal and refitting

Removal. Disconnect the wires from the battery and take off the horn push-pad trim. Undo the steering wheel fastening nut, remove the steering wheel, and both halves of the steering column shroud.

Note. *If it is necessary to remove only the steering box, undo the bolt that is fastening the intermediate shaft lower U-joint fork on the worm shaft and the bolts fastening the steering box to the body chassis arm.*

Remove the instrument cluster and disconnect the connector plugs of the three-lever switch from the harness connectors.

Disconnect the wires from the ignition switch terminals, undo the fastening screws, push down the switch lock and remove the ignition switch. Loosen the fastening clip of the switch housing incorporating the turn lights, headlights and wipers, and remove.

Undo the bolt that is fastening the intermediate shaft lower U-joint fork to the steering worm shaft.

Undo the bracket 6 fastening bolt (fig. 5-3) and remove the steering shaft with the bracket.

Undo the nuts that are fastening the ballpins on the side and middle tie-rods to the arm, and use puller A.47035 to press out the ballpins from the arm apertures.

Remove the steering box, prior having undone the bolts that are fastening it to the body chassis arm. Take out the steering shaft sealing from the opening in the car front.

Refitting. Insert sealing 2 (see fig. 5-3) into the opening in the car front, match the sealing ridges with the grooves in the opening, place the steering box on the chassis arm, but do not tighten completely the nuts on the steering box fastening bolts.

Using a special fixture, situate the steering box so that angle α (fig. 5-4) does not exceed 32°, and the clearance between the shaft and the brake pedal will be no less than 5 mm. Then completely tighten the steering box fastening nuts.

Place the steering pitman arm in middle position. To do this, match the labels on the steering box and on the worm shaft (see fig. 5-2).

Temporarily refit the steering wheel on the shaft so that the spokes are located horizontally and in this position connect the intermediate shaft U-joint with the worm shaft, paying special attention, that the fastening bolts pass through the worm ring groove. Then attach the steering shaft bracket to the body.

Remove the steering wheel and refit the combination switch (turn lights, headlights and wipers) on the column.

Refit the steering wheel on the shaft so that the spokes are located horizontally. The steering wheel should rotate smoothly and easily in both directions, then tighten the steering wheel fas-

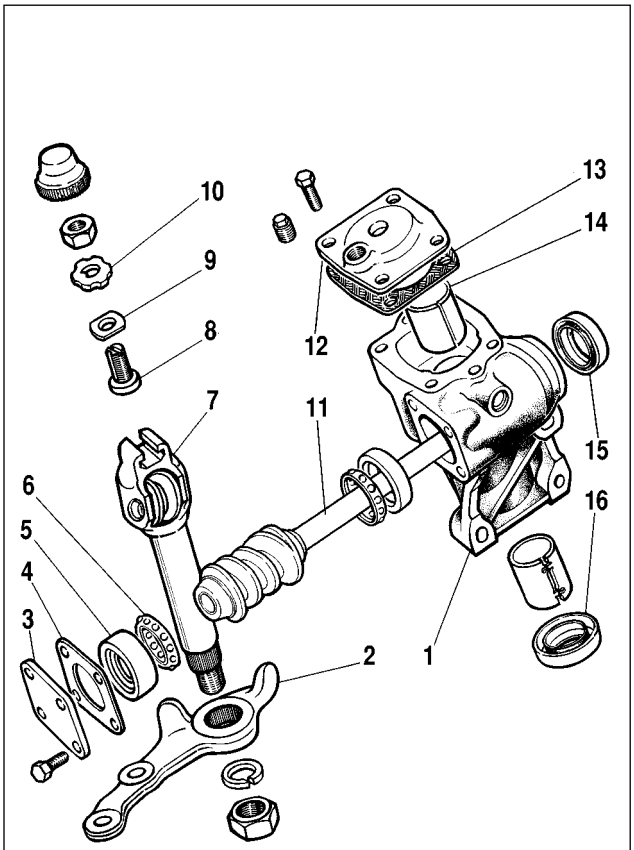

Fig. 5-5. Steering mechanism, exploded view:
1 - steering box; 2 - drop arm; 3 - box cover, lower; 4 - shims; 5 - worm shaft bearing ring, outer; 6 - race with balls; 7 - drop arm shaft; 8 - adjusting screw; 9 - adjusting plate; 10 - lockwasher; 11 - worm shaft; 12 - top cover; 13 - gasket; 14 - pitman shaft bush; 15 - worm shaft oil seal; 16 - pitman shaft oil seal

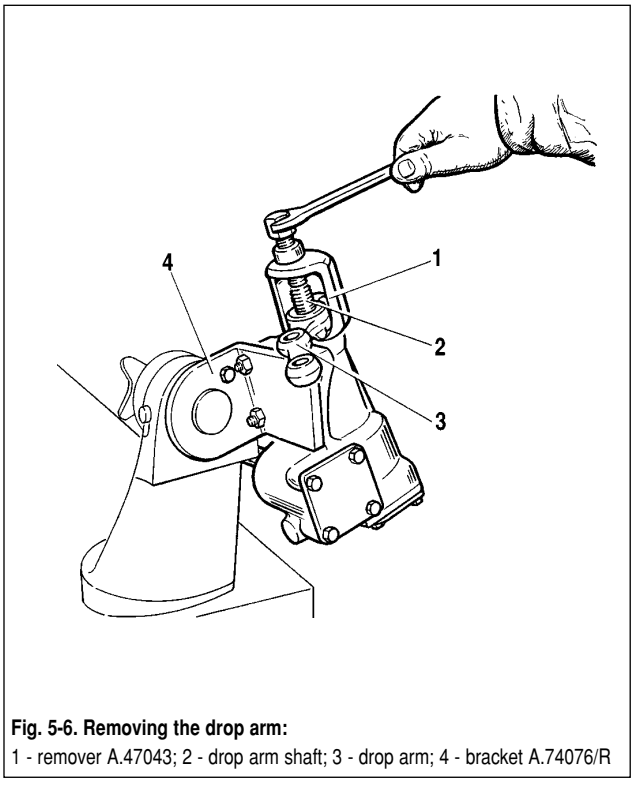

Fig. 5-6. Removing the drop arm:
1 - remover A.47043; 2 - drop arm shaft; 3 - drop arm; 4 - bracket A.74076/R

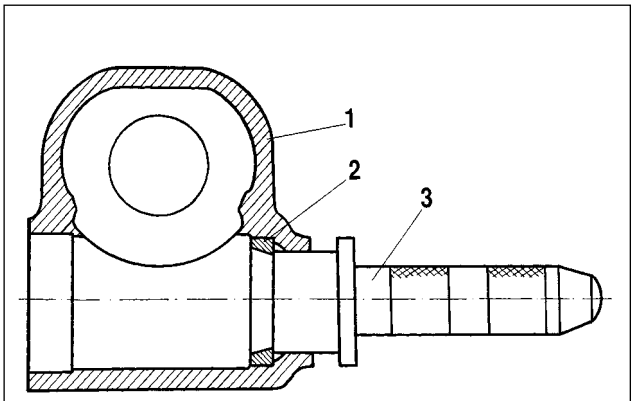

Fig. 5-7. Removing the outer ring of the worm upper bearing using tool 67.7853.9541:
1 - steering box; 2 - worm upper bearing ring, outer; 3 - tool 67.7853.9541

tening nut and fix it in three points. Move the combination switch case fully towards the steering wheel, and tighten the switch fastening clip.

Reconnect the wires of the ignition switch and fix the switch on the steering column bracket with screws.

Reconnect the combination switch plugs to the vehicle harness plugs.

Refit both halves of the shaft shroud and fasten them with screws. Apply a thin layer of greasing on the lower contact ring and refit the horn push-pad trim on the steering wheel.

Refit the ballpins of the middle and left tie-rods on the pitman arm and fix them with nuts.

Adjust the front wheels toe-in and check the effort on the steering wheel, which should not exceed 196 N (20 kgf), 245* N (25* kgf) (measured on the wheel rim) when tested on a smooth metal plate.

Note. *It is possible to assemble the steering column (with the combination switch) separately and then to refit the unit on the vehicle.*

To fix the unit, establish the steering wheel spokes horizontally and connect the worm shaft to the lower end of the intermediate shaft, paying attention, that the lock bolts pass through a ring groove on the worm shaft and the wheel shaft.

Prior to completely fastening the bracket bolts, rotate the steering wheel in both directions several times and only then tighten the bracket fastening bolts.

Steering mechanism - dismantle and reassembly

Dismantle. Drain oil from the steering box. Fix it on bracket A.74076/R with support A.74076/1.

Undo the pitman arm fastening nut 2 (fig. 5-5), take off the spring washer, and using puller A.47043 remove the arm (fig. 5-

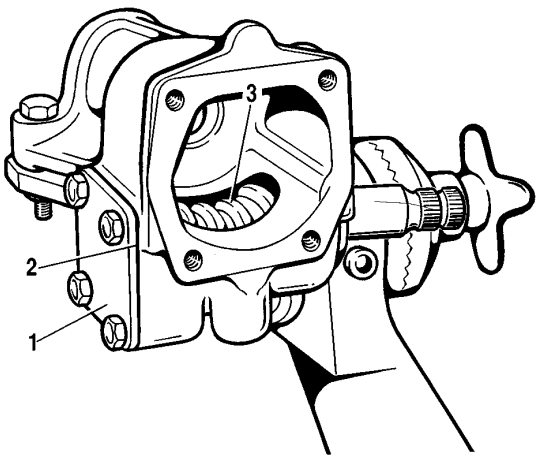

Fig. 5-8. Installing the steering worm
1 - bearing cover; 2 - shim; 3 - worm

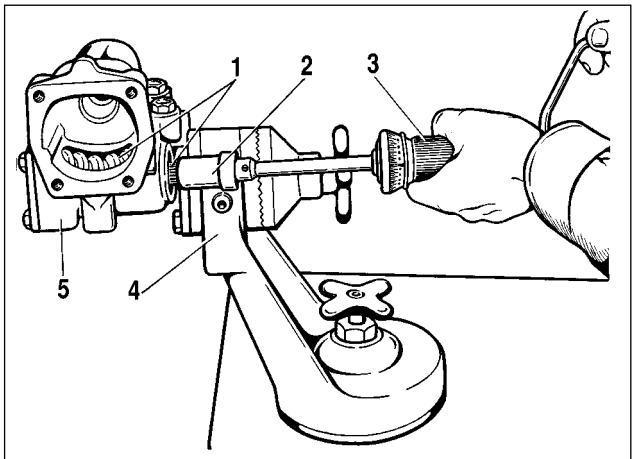

Fig. 5-9. Checking the worm friction moment using a dynamometer:
1 - worm; 2 - head A.95697/5; 3 - dynamometer 02.7812.9501; 4 - test-bench bracket; 5 - steering box

6). Undo the fastening bolt, take off cover 12 (see fig. 5-5) of the steering box together with cap, adjusting screw 8, adjusting plate 9, lock washer 10 and jam nut. Take out from the steering box 1 the pitman arm shaft 7 in assembly with the roller.

Undo the fastening bolt, remove cover 3 from the worm shaft thrust bearings together with shims 4.

With the worm shaft 11 push out from the box the bearing outer ring 5 and take out the shaft together with bearing cage 6. Remove worm shaft sealing 15 and the pitman arm sealing 16.

Using tool 67.7853.9541 take out the top bearing outer ring (fig. 5-7).

Reassembly. The reassembly of the steering mechanism is carried out on bracket A.74076/R in sequence, reverse to dismantle.

The outer ring of the worm upper bearing is press-fitted with tool 67.7853.9541, having rearranged the fixture on the tool handle in reverse order.

Refit the worm in the steering box and fasten the bottom cover (fig. 5-8), use dynamometer 02.7812.9501 and head A.95697/5 (fig. 5-9) to check the worm friction moment; it should be within the limits of 19.6-49 N•cm (2-5 kgf•cm). If the moment will appear less than specified, reduce the thickness of shim 2 (see fig. 5-8), and if more - increase.

After refitting the pitman arm, ensure there is no clearance in the roller-to-worm mesh in position when the worm shaft is turned right and left by 30° from the pitman arm middle position. Take up any possible clearance by adjusting screw 2 (see fig. 5-2) and tighten jam nut 4.

After adjusting the roller-to-worm mesh gap, use a dynamometer to check the worm friction, which should be equal to 68.7-88.3 N•cm (7-9 kgf•cm) when turning the worm shaft by 30° both to the left and to the right from the middle position and should smoothly reduce to 49 N•cm (5 kgf•cm) when turned from the 30° position further to the stop.

After the reassembly, check the angles of pitman rotation from the neutral position, which should make 32°10' ± 1° both to the left and to the right until the pitman arm will get pressed against the bolt head; fill the steering box with 0.215 l of transmission oil.

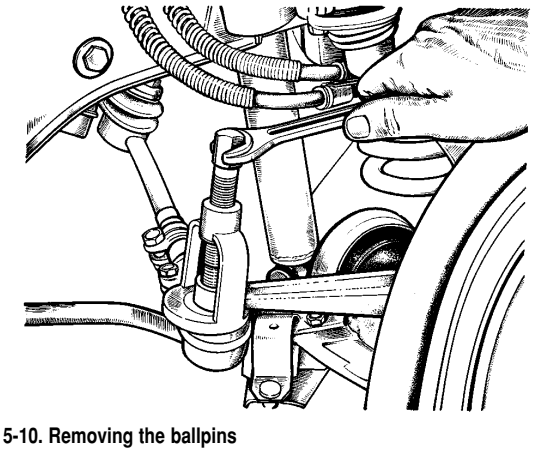

Fig. 5-10. Removing the ballpins

Check and repair

Carefully examine the working surfaces of the roller and the worm for traces of wear, jamming or risks. Renew worn and damaged components.

Check the size of the clearance between the bushes and the pitman arm shaft, which should not exceed 0.10 mm. If the clearance is more than specified, renew the bushes using tool A.74105.

On the inner surfaces of the pitman arm bushes there are spiral flutes, which come out only from one side. When press-fitting, the bushes should be located so that their end faces with the flutes were inside the aperture of the steering box, and the outputs of the flutes were facing each other. The end faces of the bushes should be deep inside the steering box aperture by 1.5 mm.

New bushes should be greased with transmission oil before press-fitting.

After press-fitting in the steering box, finally process the bushes with a reamer A.90336 up to the size of 28.698-28.720 mm. The mounting gap between the pitman arm shaft and the bushes should be within 0.008-0.051 mm.

Check for easy rotation of the pitman arm roller on the ball bearing. The ball bearings on the worm and the roller should rotate freely, without jamming; there should be no signs of wear or damages on the surface of the rings and balls.

Check the axial clearance between the head of the adjusting screw 8 (see fig. 5-5) and the groove in the pitman arm shaft 7. The gap should not exceed 0.05 mm. If more, replace the adjusting plate 9 with a plate of greater thickness.

Note. *In the spare parts the adjusting plates are supplied of eleven sizes, with thickness from 1.95 mm up to 2.20 mm, ; the increase in each size makes 0.025 mm.*

Inspect locking plates 5 (see fig. 5-3). Renew if they are deformed.

Steering shaft - dismantle and reassembly

Dismantle. Undo the U-joint fork fastening bolt and separate the intermediate and upper shafts of the steering mechanism.

If the upper shaft or its bearings are damaged, flare the places of the bracket pipe punching and take out the pipe from the shaft 15 (see fig. 5-1) in assembly with bearings 11.

If the shaft rotates in the bearings without jamming and there is no radial free play in the bearings (the resilient radial movements of the steering shaft are allowed), it is not recommended to dismantle the upper steering shaft.

Renew the shaft and the bearing in case of wear or damage.

The reassembly is carried out in reverse order, paying attention that the U-joint lock bolt passes through the ring groove on the upper shaft. Then punch the bracket pipe in two points from both sides to fix the shaft bearings.

Tie-rods and balljoints

Removal and refitting. Remove the cotter pins and undo the nuts with which the side tie-rod ballpins are fastened to the arms on the steering knuckles.

Using puller 67.7824.9516 (fig. 5-10) take out the ballpins from the cone apertures on the arms.

Remove the cotter pins and undo the nuts fastening the ballpins of the middle and side tie-rods to the pitman arm and to the idler arm. Using puller 67.7824.9516, take out the pins from the corresponding jacks on the arms and remove the tie-rods.

The tie-rods are refitted in reverse order. All ballpin nuts are tightened with a dynamometer with subsequent splinting. If the nut cut does not match the opening for the pin, the nut should be screwed in to an angle, smaller than 60° to provide for subsequent splinting.

After refitting adjust the front wheel toe-in.

Check and repair. Inspect the protective caps 3 (fig. 5-11), as described above (see "Inspection, check and adjustment of steering mechanism"). Renew damaged protective caps.

Inspect the condition of the tie-rod balljoints by their radial and axial clearance. If the free play of pin 1 in case 3 is felt, and also in case of dirt or sand penetration, or corrosion on the ballpin, wear of the support insert - renew the joint with the tie-rod end.

Idler arm bracket

Removal and dismantle. Separate the idler arm from ballpins on the middle and side tie-rods, remove the cotter pins, having previously undone the nuts and taken out the ballpins from the arm using puller 67.7824.9516. Then undo the bolt fastening the bracket to the body chassis arm and remove the bracket.

Fix the bracket in vice, remove the cotter pins and undo nut 4 (fig. 5-12), then remove washers 3 and 6 and the idler arm 1 in assembly with shaft 9, washer 10 and self-locking nut 11, remove sealings 7 and press out bushes 8.

Inspection. Inspect the idler arm shaft bushes; in case of out-of-roundness or inadmissible gap between them and the shaft, renew the bushes. Also renew sealings 7.

Check the shaft for out-of-roundness and damages, renew if necessary. Ensure the idler arm has no deformations, otherwise renew.

Assembly and refitting. Before reassembly grease the bushes of the idler arm shaft and fill the space between them with ЛИТОЛ-24. The reassembly order of the idler arm bracket is a reverse to dismantle.

If shaft 9 was replaced, the bracket self-locking nut 11 should be tightened with a dynamometer.

Washer 6 is installed with the extrusions facing upwards.

After tightening nut 4 the arm in horizontal position should not rotate under its own weight. It should turn under force of 9.8-19.6 N (1-2 kgf) applied to its end.

If nut 4 was tightened too much, undo it, raise washer 6 and tighten again.

Fix the bracket on the chassis arm with self-locking nuts and flat washers, tighten them with dynamometer.

Connect the tie-rod ballpins to the idler arm.

Chapter 6
Braking system

The design of the braking system is shown on fig. 6-1.

Fault diagnosis

Diagnosis	Remedy
Insufficient efficiency of braking	
1. Leak of brake liquid from wheel cylinders of front or rear brakes	1. Renew bad components of wheel cylinder, wash and dry shoes and drums, bleed braking mechanism
2. Air in brake system	2. Expel air from system
3. Damaged rubber sealings in master brake cylinder	3. Renew seals and bleed system
4. Damaged hydraulic system rubber hoses	4. Renew hoses
Spontaneous braking at working engine	
1. Air inleak in servo unit between valve housing and protective cap	1. Replace servo unit
Incomplete brake release on all wheels	
1. No brake pedal free travel due to wrong position of stop-signal switch	1. Adjust switch position
2. Projection of servo unit adjusting bolt in relation to fastening surface of master cylinder exceeds $1.25^{-0.2}$ mm	2. Adjust bolt position (see fig. 6-2)
3. Jammed servo unit valve housing	3. Replace servo unit
4. Plugged compensation aperture in master cylinder	4. Clean aperture and bleed system
5. Swollen master cylinder rubber sealings due to penetration of petrol, mineral oils and etc in liquid.	5. Carefully wash system with brake liquid, renew damaged rubber parts, bleed system
6. Jammed master cylinder piston	6. Check and replace, if necessary, master cylinder, bleed system
Snubbing of one wheel at released brake pedal	
1. Loose or damaged return spring of rare brake shoes	1. Renew spring
2. Jammed piston in wheel cylinder due to corrosion	2. Dismantle cylinder, clean and wash all components, renew damaged parts
3. Swollen wheel cylinder sealing due to penetration of fuels and lubricants in liquid	3. Renew rings, wash system with brake liquid
4. No gap between shoes and drum	4. Adjust parking brake
5. Wrong position of caliper in relation to brake disc due to loose bolts that are fastening carrier to steering knuckle	5. Tighten securing bolts, renew damaged parts if necessary
6. Excessive runout of brake disc (more than 0.15 mm)	6. Grind disc, in case thickness is less than 9 mm - renew
Vehicle wandering or skidding at braking	
1. Leak of brake liquid in one of wheel cylinders	1. Renew seals and bleed system
2. Jammed piston in brake wheel cylinder	2. Check and rectify piston sticking in cylinder, renew damaged components if necessary
3. Clogged tube due to dent or contamination	3. Renew or clean tube, bleed system
4. Different pressure in tyres	4. Adjust pressure
5. Wrong wheel alignment angles	5. Adjust angles
6. Dirty or oily discs, drums and linings	6. Clean braking mechanism components
7. Wrong adjustment of pressure regulator	7. Adjust position
8. Faulty pressure regulator	8. Adjust or renew
Excessive pedal effort at braking	
1. Plugged air filter	1. Renew air filter
2. Jammed servo unit valve housing	2. Renew servo unit
3. Damaged hose between servo unit and engine inlet pipe, or its loose fastening on connectors	3. Renew hose or tighten clips
4. Oxidation of brake pedal metal bushes or dry greasing in pedal bushes	4. Renew worn parts or greasing
Scratch or squeal of brakes	
1. Loose shoe return spring	1. Inspect return spring, replace if necessary
2. Ovality of drums	2. Remachine brake drum
3. Excessive oil on friction linings	3. Clean pads using metal brush with warm water and washing liquid. Eliminate cause of liquid or lubricate ingress
4. Worn linings or trapped detrimental inclusions	4. Renew pads
5. Excessive disc runout or non-uniform wear	5. Grind disc, in case thickness is less than 9 mm - renew

Inspection and adjustment

Pipelines and connections - inspection

To prevent any occasional failure of the braking system carefully inspect all pipelines:

- metal pipelines should have no dents or cracks and should lie far from sharp edges that can damage them;

- brake hoses should have no cracks on the outer surface and should not get in contact with mineral oils and greasings that dissolve rubber; heavily depress the brake pedal and inspect the hoses for bulges that will indicate malfunctions;

- all brake lines should be reliably fastened; loose fastening will result in vibration causing damage;

- liquid leak through pipeline connections is not allowed; if necessary, fully tighten the connections without deforming the pipelines.

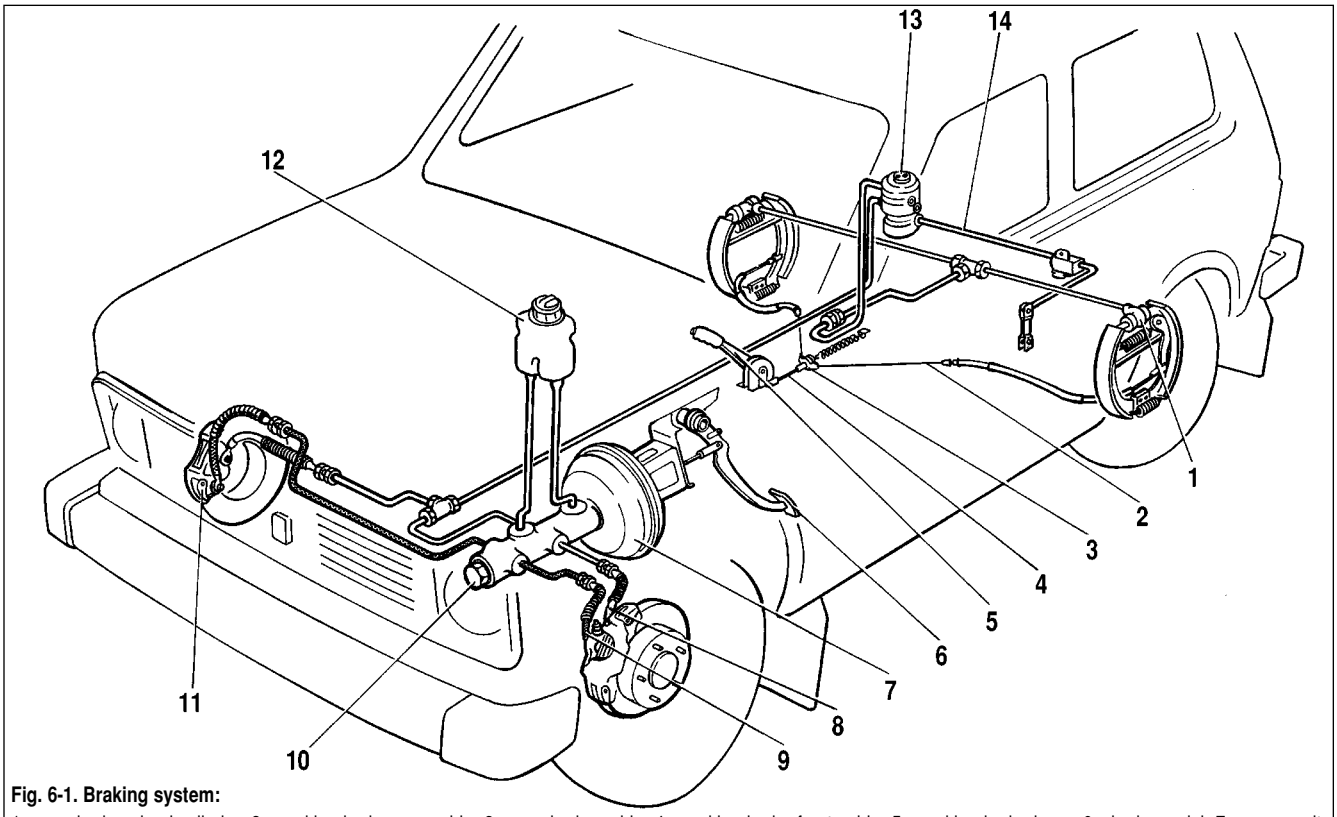

Fig. 6-1. Braking system:
1 - rear brake wheel cylinder; 2 - parking brake rear cable; 3 - rear brake guide; 4 - parking brake front cable; 5 - parking brake lever; 6 - brake pedal; 7 - servo unit; 8 - second circuit pipeline; 9 - primary circuit pipeline; 10 - master cylinder; 11 - wheel cylinder block, front brakes; 12 - master cylinder tank; 13 - pressure regulator; 14 - pressure regulator control arm

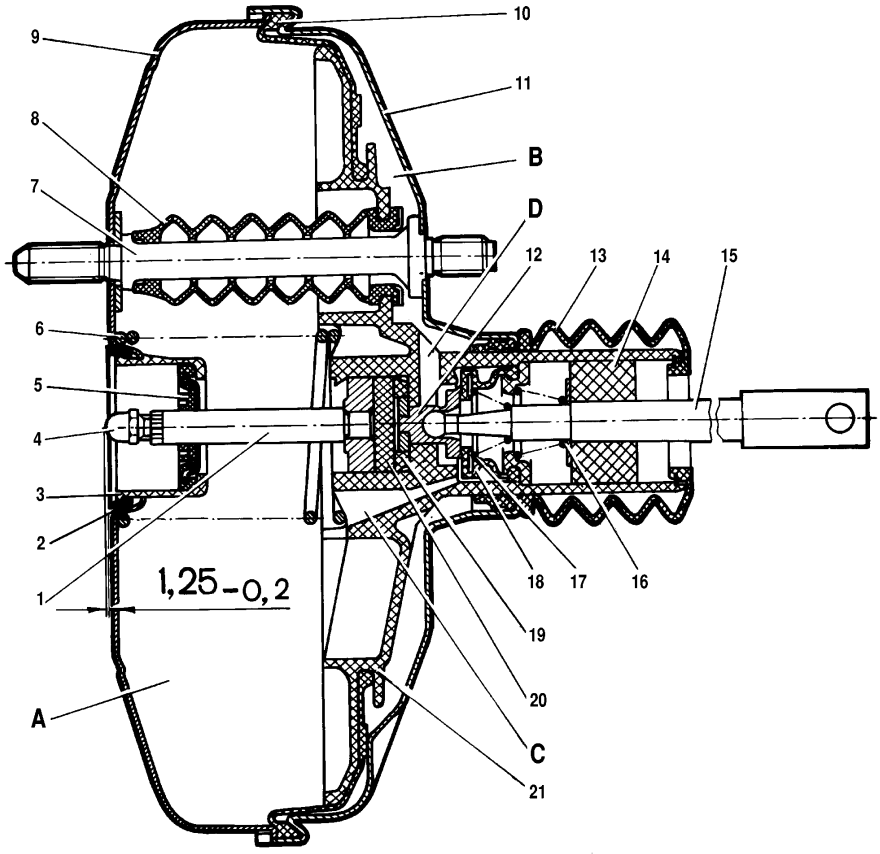

Fig. 6-2. Brake servo unit:
1 - rod; 2 - master cylinder flange sealing ring; 3 - servo housing cup; 4 - adjuster bolt; 5 - rod sealing; 6 - diaphragm return spring; 7 - pin; 8 - sealing boot; 9 - servo unit housing; 10 - diaphragm; 11 - servo unit housing cover; 12 - piston; 13 - valve body boot; 14 - air cleaner; 15 - push rod; 16 - push rod return spring; 17 - valve spring; 18 - valve; 19 - valve body bush; 20 - reaction disc; 21 - valve body; A - vacuum chamber; B - atmospheric chamber; C, D - ports

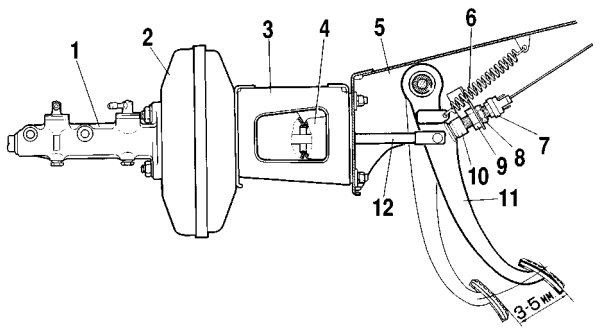

Fig. 6-3. Brake pedal:
1 - master cylinder; 2 - servo unit; 3 - bracket; 4 - sealant cup; 5 - clutch/brake pedal mounting bracket; 6 - brake pedal return spring; 7 - stop light switch; 8, 9 - nuts; 10 - stoplight buffer; 11 - brake pedal; 12 - push rod

Renew the components in the slightest doubt in serviceability.

Flexible hoses, irrespective their condition, should be renewed after 100000 km or after 5 years of vehicle operation to prevent sudden breaks due to aging.

After five years of operation it is recommended to renew the brake liquid.

Servo unit -serviceability check

Press the brake pedal 5-6 times with the engine not working to create in cavities A and B (fig. 6-2) identical pressure close to atmospheric. Simultaneously, by effort applied to the pedal, define, whether the valve housing 21 is jammed.

Stop the brake pedal in the middle of its travel and start the engine. If the servo unit is OK, the brake pedal after engine start should "go forward".

If the pedal does not "go forward", check the fastening of the hose end piece, condition and fastening of the end piece flange in the booster, hose-to-end piece fastening and connection to the engine inlet pipe, because loose fastening or damage will significantly reduce the underpressure in cavity A and performance efficiency of the unit.

In case of vehicle spontaneous braking, check the servo unit for leak-proofness with the engine running , first with a released, and then depressed motionless brake pedal. "Sticking" of the protective cap 13 to the valve housing tail and hissing of inleaking air will indicate insufficient tightness of the servo unit. In these cases the unit should be renewed.

Brake drive adjustment

The free travel of the brake pedal with engine not working should be 3-5 mm. This size is received by adjusting the position of the stoplight switch 7 (fig. 6-3).

If the stoplight switch is too close to the pedal, it does not come back to the initial position, valve 18 (see fig. 6-2), being pressed to housing 21, separates cavities A and B, and it results in incomplete release of wheels when the pedal is let off.

To adjust the stop-light switch position slacken nut 8 and by rotating nut 9 (see fig. 6-3) position the switch so that its buffer will slightly touch the pedal rest, thus the pedal free travel should make 3-5 mm. After adjustment tighten nut 8.

ATTENTION. The brake pedal free travel adjustment is made with the engine not working.

If the adjustment of the stoplight switch fails to remedy the brake mechanism, disconnect the master cylinder from the servo unit and check the protrusion of the adjusting bolt 4 (see fig. 6-2) in relation to the fastening plane of the master cylinder flange (size $1.25^{-0.2}$). This size can be established by holding with a special key the end of rod 3, and with the other key screwing in or undoing bolt 28.

Handbrake adjustment

Note. *In the end of year 1995, the design of the handbrake lever quadrant was changed - the first tooth of the sector became double and thus the order of adjustment, marked below in the text with a "*" sign, has changed.*

If the handbrake does not hold the vehicle on a slope up to 25 % when moving the lever by 4-7 (2-8) * teeth of the quadrant, adjust the handbrake in following order:

- shift the handbrake lever to the lowest position and then lift by 1-2 teeth of quadrant (this operation is carried out only for the gear sector of the "old" design);

- slacken locknut 5 (fig. 6-4) and by turning the adjusting nut 6 take up cable 1;

- check the full travel of the handbrake lever, which should be 4-5 (2-4)* teeth on the quadrant, then tighten locknut 5.

Apply the brake pedal several times to ensure that the lever travel does not change and wheels rotate without jamming at fully lowered lever.

Note. *If the cables were renewed, depress the brake pedal two or three times applying force on the lever of approx. 392 N (40 kgf). Thus the cables will be stretched.*

Pressure regulator serviceability check

Position the vehicle on a lift or over an inspection pit, clean the pressure regulator and protective cover from dirt.

Carefully remove the protective cover from the pressure regulator, remove the remains of greasing and clean the "torsion-to-piston" connection.

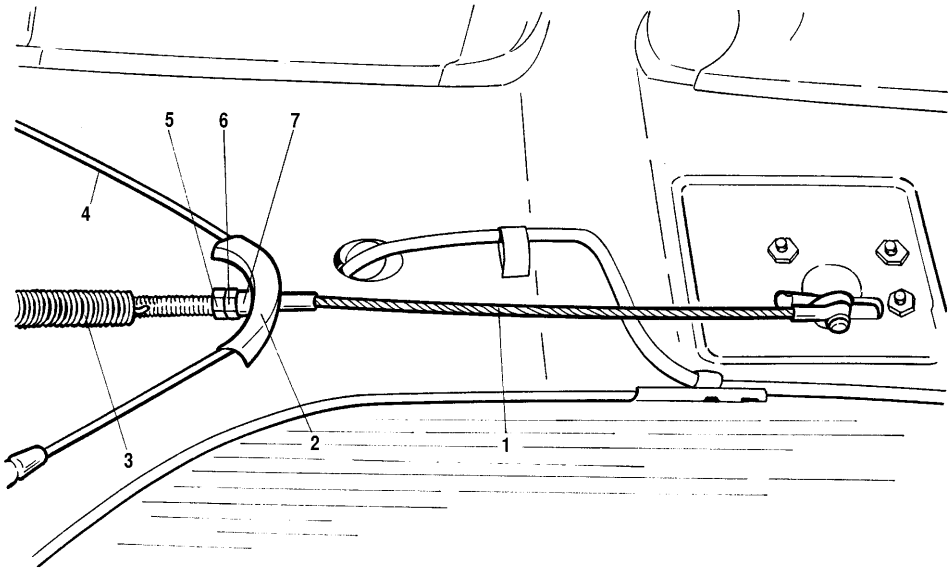

Fig. 6-4. Handbrake linkage:
1 - front cable; 2 - rear cable guide; 3 - front cable return spring; 4 - rear cable; 5 - locknut; 6 - adjusting nut; 7 - spacer

Ask an assistant to press the brake pedal with effort of 686-784 N (70-80 kgf) and simultaneously observe the outcoming part of the pressure regulator piston. If the piston moves by 0.5-0.9 mm in relation to the regulator housing, thus twisting the torsion arm, the pressure regulator is efficient. Repeat the pedal depressing 2-3 times to completely ensure the serviceability of the pressure regulator.

If during pedal depressing the piston remains motionless, this means that the piston became stuck to the housing due to corrosion, and pressure regulator renewal is required.

After ensuring the pressure regulator serviceability and no brake liquid leaks between the piston and the pressure regulator housing, apply a thin layer of ДТ-1 on the shaft and the acting part of the piston, fill 5-6 gr. of this greasing in the rubber boot and refit the cover.

Pressure regulator position adjustment

The pressure regulator position adjustment is required if the fastening bolts became loose. Raise the vehicle rear axle. Disconnect arm 4 (fig. 6-5) from tie-rod 8 and fix on its end tool 67.7820.9519. Direct the core of the tool upwards until it will get pressed against the car floor (fig. 6-6). This will be distance "X" from the arm end to the body chassis arm (see fig. 6-5), equal to (150±5) mm.

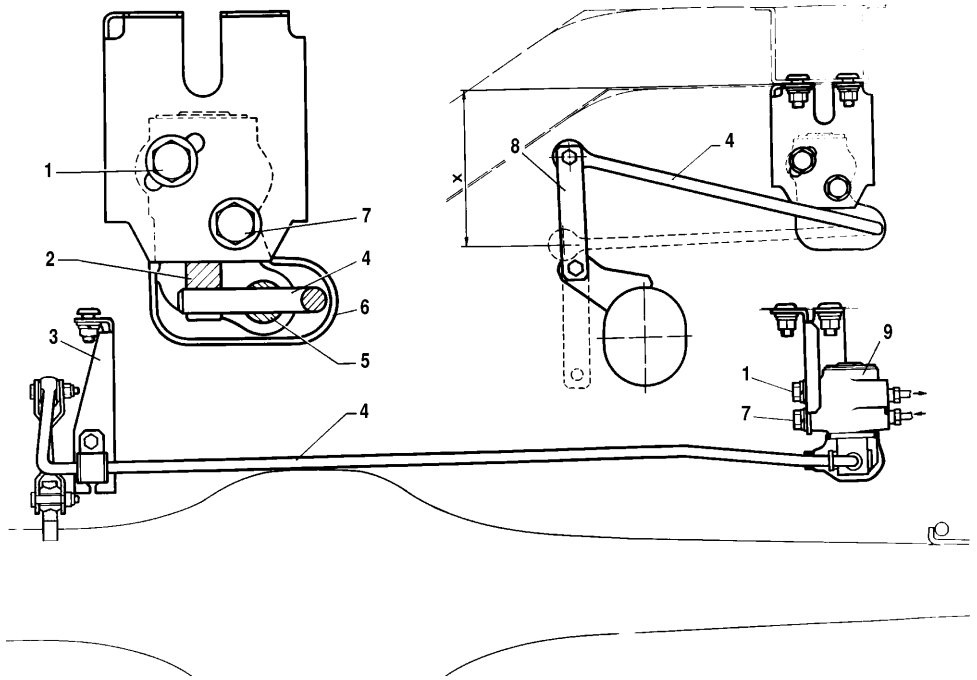

Fig. 6-5. Installation of the rear brake pressure regulator and adjustments:
1, 7 - regulator securing bolts; 2 - piston; 3 - thrust washer bracket; 4 - pressure regulator control arm; 5 - shaft; 6 - cap; 8 - tie rod; 9 - pressure regulator;X = 150 ± 5 mm

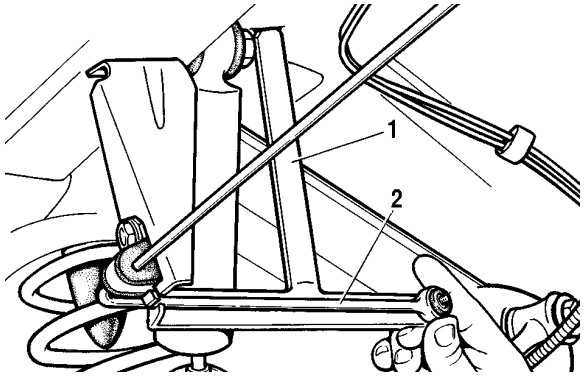

Fig. 6-6. Installing tool 67.7820.9519 to adjust the position of the rear brake pressure regulator:
1 - tool 67.7820.9519; 2 - pressure regulator control arm

Raise the protective rubber cap 6 (see fig. 6-5) and, by turning the pressure regulator on the bolts, get a slight contact between the arm and piston 2.

Keep the regulator in this position, fully tighten bolts 1 and 7, then apply a thin layer of greasing ДТ-1 on shaft 5 and the working part of piston 2. Fill 5-6 gr. of the same greasing in rubber cap 6 and refit.

Remove tool 67.7820.9519 and reconnect the arm end with tie-rod 8.

Hydraulic system bleeding

Air, that got into the brake hydraulic system during replacement of pipelines, hoses, sealing rings or due to system leak, causes increase of brake pedal free travel, its "softness" and considerably reduces braking efficiency.

Before bleeding the brake system ensure the leak-proofness of all system units and their connections, check and if necessary fill the tank with brake liquid up to normal level. Then carefully clean from dirt and dust the bleeding connectors and remove the protective caps.

Fit a rubber hose on the connector (fig. 6-7) for liquid drain, and place its free end in a transparent vessel partially filled with liquid.

Sharply depress the brake pedal 3-5 times, with 2-3 sec. intervals, undo the connector by 1/2-3/4 turn with the pedal depressed. Continue to press the pedal, bleed liquid with air through the hose into the vessel. After the brake pedal will reach the lowest front position and the liquid drain through the hose will be finished, tightly close the bleeding connector. Repeat these operations until all air bubbles will be bleeded from the hose. Then, keeping the brake pedal in depressed position, tightly close the bleeding connector and take off the hose. Wipe dry the connector and refit the protective cap.

All above operations should be carried out through the upper connectors first on the right rear wheel, the most remote from the master cylinder, then further clockwise: the left rear wheel, left and right front wheels. Thus, air from one circuit will be removed. To bleed the other circuit use the lower connectors on the cylinder block of the left and right front brakes. Bleeding can be started from the right or left wheel.

During bleeding maintain normal liquid level in the hydraulic system tank. If there is no air in the system the brake pedal should go no more than 1/2-3/4 of full travel.

To exclude the influence of the servo unit and the pressure regulator on bleeding the hydraulic system, it should be carried out with the engine not working and rear wheels loaded (do not raise the rear part of the vehicle).

If the brake liquid was completely drained from the system, do the following before bleeding air:

- undo the bleeding connector by 1.5-2 turnы on all wheel cylinders;

- sharply depress the brake pedal and smoothly release it, close the connector when liquid will be drained. Then bleed the hydraulic system, as described above.

If, despite continuos bleeding, the air bubbles still come out from the hose into the vessel, it means air penetrates into the system through damaged pipelines, because of insufficient tightness of connections or due to malfunction of the master or wheel cylinders.

When bleeding the vehicle, the braking system of which has worked for a long time, renew the brake liquid.

If the brake liquid is suitable for further use, carefully filter the liquid, and then desilt in a tightly closed vessel.

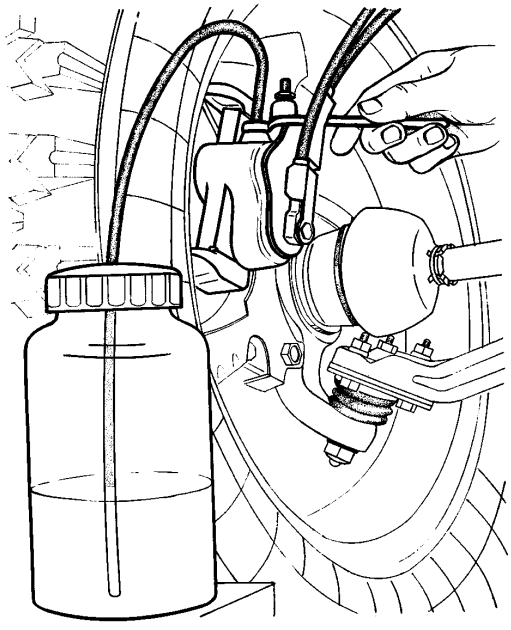

Fig. 6-7. Bleeding the brake hydro system

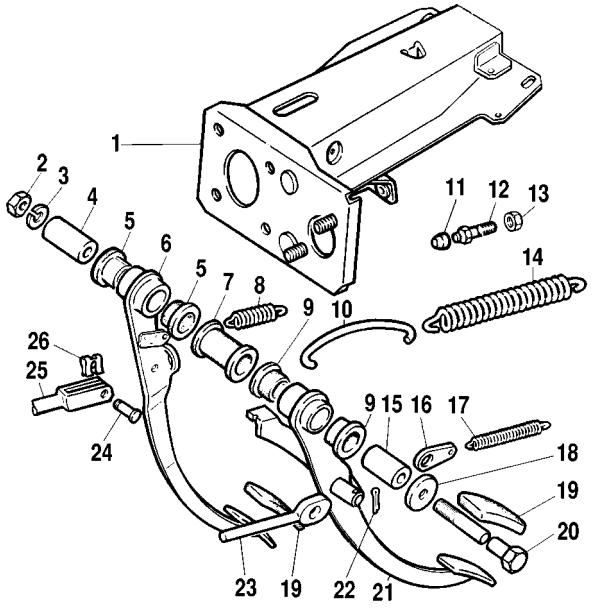

Fig. 6-8. Clutch/brake pedal bracket, exploded view:
1 - bracket; 2 - nut; 3 - spring washer; 4 - brake pedal inner bush; 5 - brake pedal outer bush; 6 - brake pedal; 7 - distance sleeve; 8 - brake pedal return spring; 9 - clutch pedal outer bush; 10 - hook; 11 - cap; 12 - clutch pedal limit screw; 13 - nut; 14 - servo spring; 15 - clutch pedal inner bush; 16 - plate; 17 - clutch pedal return spring; 18 - washer; 19 - pad; 20 - bolt; 21 - clutch pedal; 22 - cotter pin; 23 - clutch pedal push rod; 24 - pin; 25 - push rod; 26 - lock shackle

Clutch and brake pedal bracket

Removal and refitting. To remove the pedal bracket:

- remove the steering shaft bracket, as mentioned in section "Steering";

- disconnect the servo unit push rod from the brake pedal, having removed lock shackle 26 (fig. 6-8) and taken out pin 24;

- disconnect the wires from the stoplight switch;

- undo the nuts that are fixing the brackets of the servo unit and pedals to the body front and remove the bracket in assembly with the servo unit and the master cylinder, and then the clutch and brake pedal bracket.

Refitting is carried out in reverse sequence. Pay attention to correctly refit the push rod in the jack of the clutch master cylinder piston.

Dismantle and reassembly. To dismantle, remove the clutch pedal servo unit spring 14, remove return springs 8 and 17, undo nut 2 of bolt 20, take out the bolt and remove the pedals together with bushes.

To remove and refit the springs use tool A.70017.

Reassembly of the master cylinder is carried out in reverse order. When reassembling, grease with ЛИТОЛ-24 the pedal bushes, spring ends, connection places between the push rods and pedals, and the push rod end adjoining the piston of the clutch master cylinder.

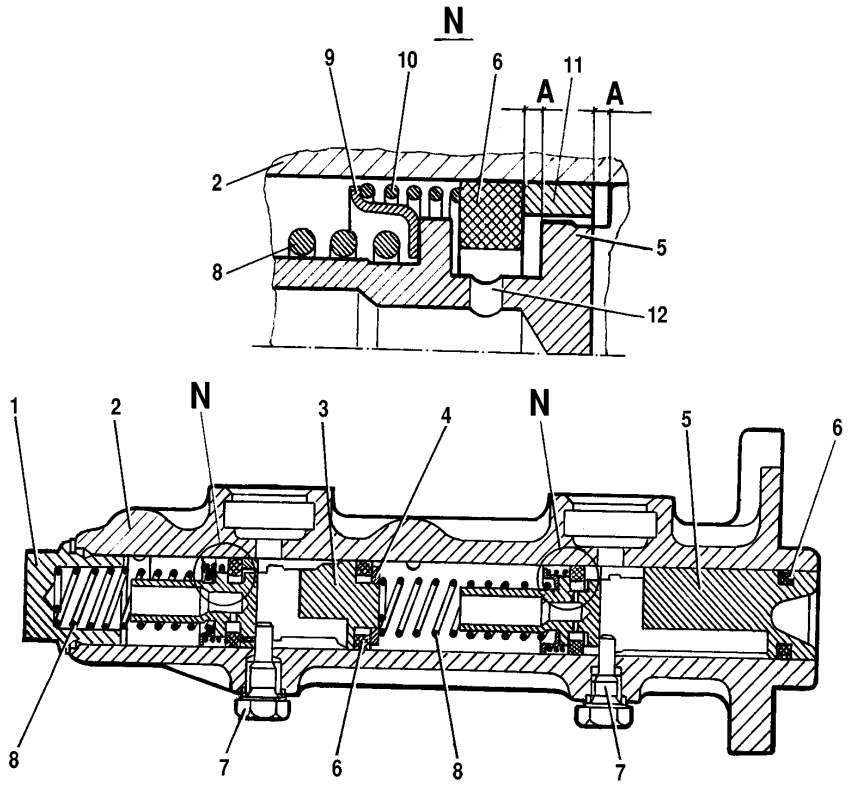

Fig. 6-9. Master cylinder:
1 - plug; 2 - cylinder body; 3 - front brake drive piston; 4 - washer; 5 - rear brake / front additional drive piston; 6 - sealing ring; 7 - stop screws; 8 - piston return springs; 9 - spring cup; 10 - seal holding spring; 11 - spacer ring; 12 - inlet port; A - compensation port (clearances between seal 6, ring 11 and piston 5)

Check and repair. At hard pedal movement examine the working surfaces of pedals, bushes and shaft.

If there will be small risks or traces of oxidation on surfaces of metal parts, grind them slightly with sandpaper; renew worn outer plastic bushes on pedals.

Check the spring tension. The length of the brake pedal spring should be: under load of 12.8±1.96 N (1.3±0.2 kgf) - 80 mm, under load of 117.5±5.88 N (12±0.6 kgf) - 160 mm.

The clutch pedal return spring has the length of 130 mm under load of 36.26-30.38 N (3.7 – 3.1 kgf), and 155 mm under load of 49.49 – 42.63 N (5.05 – 4.35 kgf). Length of the clutch servo unit spring under load of 219.52 – 180.32 N (22.4 – 18.4 kgf) should be 120 mm, and under load of 645.82 – 529.22 N (65.9 – 53.9 kgf) - 152 mm.

Servo unit

Removal and refitting. When removing the servo unit, do not disconnect the brake hydrodrive master cylinder from the hydraulic system to avoid air penetration.

The order of removal:

- disconnect the servo unit push rod from the pedal;

- undo the nuts fastening the master cylinder to the unit, remove it from pins and move aside;

- disconnect the hose from the servo unit;

- undo the nuts fastening the servo unit bracket to the body front and remove the unit in assembly with the bracket.

Refitting of the servo unit is carried out in reverse order.

Master cylinder

The design of the master cylinder is shown on fig. 6-9.

Removal and refitting. Disconnect the flexible hoses from the master cylinder and close the openings of hoses and connectors on the cylinder to prevent liquid leak from reservoir and penetration of dust, dirt or foreign matters.

Undo the tube nuts and disconnect from the master cylinder the steel pipelines that are carrying liquid to wheel cylinders of front and rear brakes.

Remove the cylinder, having undone the nuts that are fastening it to the servo unit.

Refitting of the master cylinder is carried out in reverse sequence. After refitting the cylinder, bleed the hydraulic system to expel air.

Dismantle and reassembly. Remove connectors 2 (fig. 6-10) with connecting bushes 3, turn out lock bolts 5 and take out all components in order specified on fig. 6-10.

The reassembly of the cylinder is carried out in reverse sequence. Grease all components with brake liquid. When reassembling, use tool 67.7853.9543.

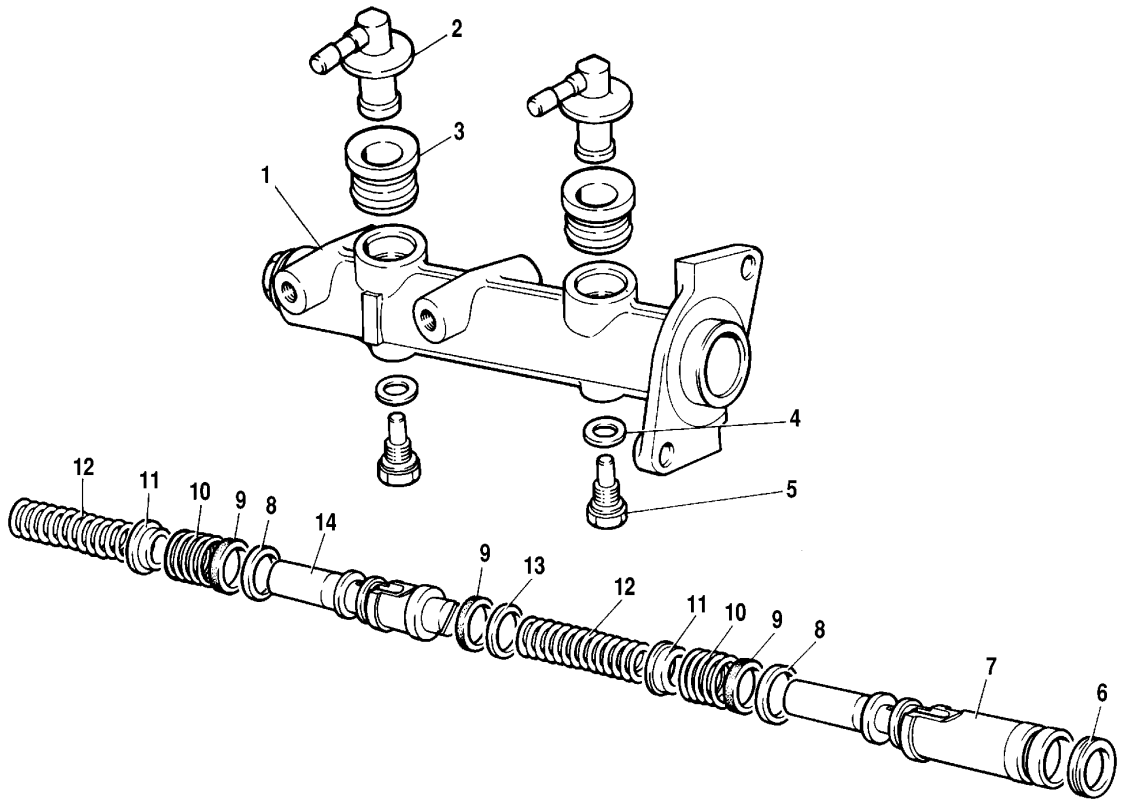

Fig. 6-10. Master cylinder components:
1 - cylinder body; 2 - connector; 3 - connector bush; 4 - sealing washer; 5 - lock bolt; 6, 9 - sealing rings; 7 - rear brake / front additional drive piston; 8 - distance ring; 10 - sealing ring holding spring; 11 - spring cup; 12 - piston return spring; 13 - washer; 14 - front brake drive piston

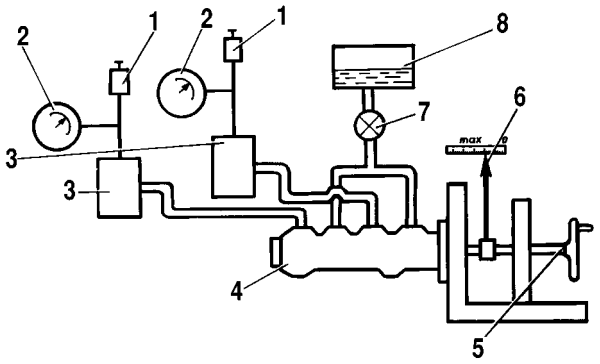

Fig. 6-11. Checking the leak-proofness of the master cylinder:
1 - test-bench bleeding valve; 2 - manometer; 3 - reservoir; 4 - master cylinder; 5 - flywheel; 6 - pushrod shift indicator; 7 - vent; 8 - vessel

Inspection of components. Before reassembly, wash all components with isopropyl alcohol; dry by a jet of compressed air or wipe with a clean cloth, but do not allow their contact with mineral oil, kerosine or diesel fuel, which can damage the sealings.

Note. *Time of washing the sealing rings in isopropyl alcohol is no more than 20 seconds with subsequent drying by compressed air.*

The cylinder mirror and working surfaces of pistons should be completely clean, without rust, marks and other defects. No excessive gap between the cylinder and pistons is allowed.

Every time, when dismantling the cylinder, renew the sealings, even if they are in good condition.

Check the piston spring tension, the length of which should be 41.7 mm under load of 42.18±3.92 N (4.3±0.4 kgf), 21 mm under load of 90.64±8.83 N (9.24±0.9 kgf), in free state - 59.7 mm.

Master cylinder leak-proofness check. Place the master cylinder on a test bench and connect it to the bench elements, as shown on fig. 6-11.

Open the bench bleeding valves 1 and, by moving the master cylinder piston several times by its full stroke, bleed the system. Then close valves 1. Rotate flywheel 5, slowly move the master cylinder pistons until pressure monitored by manometer 2 will reach 12.5 MPA (125 kgf/cm^2). In this position block the master cylinder push rod. Specified pressure should remain constant for no less than 5 seconds.

In case of liquid leaks or drop of established pressure during 5 seconds, renew the cylinder piston sealings.

Front brakes

The design of the front brake is shown on fig. 6-12.

Before repairing the brakes, carefully wash them in warm water with washing liquids and immediately dry with a jet of compressed air.

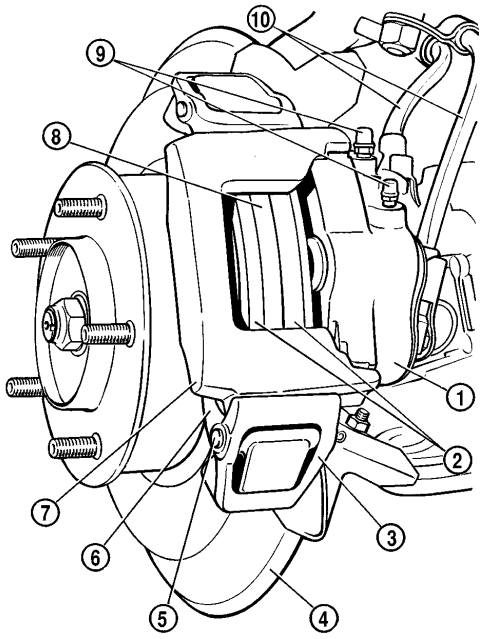

Fig. 6-12. Front wheel brake system:
1 - cylinder block; 2 - brake pads; 3 - caliper clamping lever; 4 - splash guard; 5 - clamping lever shaft; 6 - carrier; 7 - caliper; 8 - brake disc; 9 - bleeders; 10 - brake hoses

ATTENTION. Do not use petrol, diesel fuel, trichloroethylene or any other mineral solvents to clean the brakes, as these materials damage the cylinder sealings.

Removal and refitting

Removal. Lift the front part of the vehicle, place it on supports and remove the wheel.

Remove the hose guide brackets. Undo the bypass bolts, disconnect from the cylinder block hoses 10 (see fig. 6-12), avoid penetration of dirt into the cylinder cavities. Plug the openings of the cylinder block and hoses.

Unbend the edges of the front brake splash guard, undo the bolt fastening the brake to the steering knuckle (fig. 6-13) and remove the brake assembly.

The refitting of the front brake is carried out in sequence reverse to removal.

After refitting, fill the brake liquid in the reservoir and bleed the system to expel air from the hydraulic drive.

Dismantle and reassembly

Take out pins, then shafts 5 (see fig. 6-12), hold the clamping levers 3 so that not to loose the springs. Remove the clamping levers and their springs, and then caliper 7 in assembly with block 1. Remove brake pads 2.

Take out cylinder block 1 from the caliper grooves by moving apart the caliper grooves up to 118.5 mm and pressing on lock 12. Remove the dust caps 3 (fig. 6-14) from cylinders.

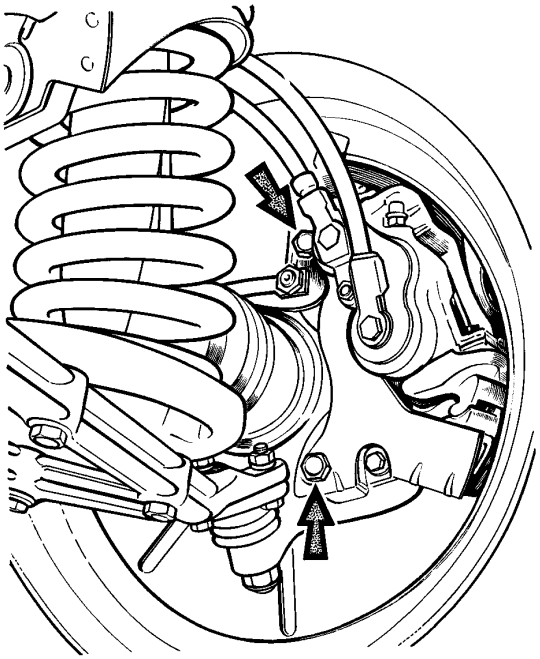

Fig. 6-13. Removing the front brake:
Arrows are pointing to the bolts that should be undone to remove the front brake

Forcing a jet of compressed air through the aperture for brake liquid, push out pistons 14 from the cylinder block and take out sealing rings 4.

The reassembly of the front brake is carried out in sequence reverse to dismantle. When assembling, lubricate the sealing rings, pistons and cylinder mirrors with brake liquid, and grease the protective caps with ДТ-1.

Components inspection

Carefully examine all components, having previously washed them in warm water with washing liquid and dried by a jet of compressed air.

If on pistons and on cylinder mirrors any traces of wear or jamming are found, renew the cylinder block complete with pistons.

Note. *In all cases, when the piston is taken out from the cylinder, it is recommended to renew the dust cap and the sealing rings in the cylinder block flutes to ensure satisfactory operation of the system.*

Brake disc runout check

Check the axial runout of the brake disc without removing it from the vehicle (fig. 6-15). The maximum allowable runout by the indicator is 0.15 mm; if the runout is greater, it is necessary to grind the disc, but the final thickness of the disc after grinding should be no less than 9.5 mm. In case of damage or very deep risks, and also if wear exceeds 1 mm on each side, renew the disc.

Replacement of brake pads

Renew the pads, if the friction lining thickness has decreased to 1.5 mm.

To replace the pads do the following:

- remove the pins from the shaft of the upper clamping lever, take out the shaft and remove the lever; remove the caliper

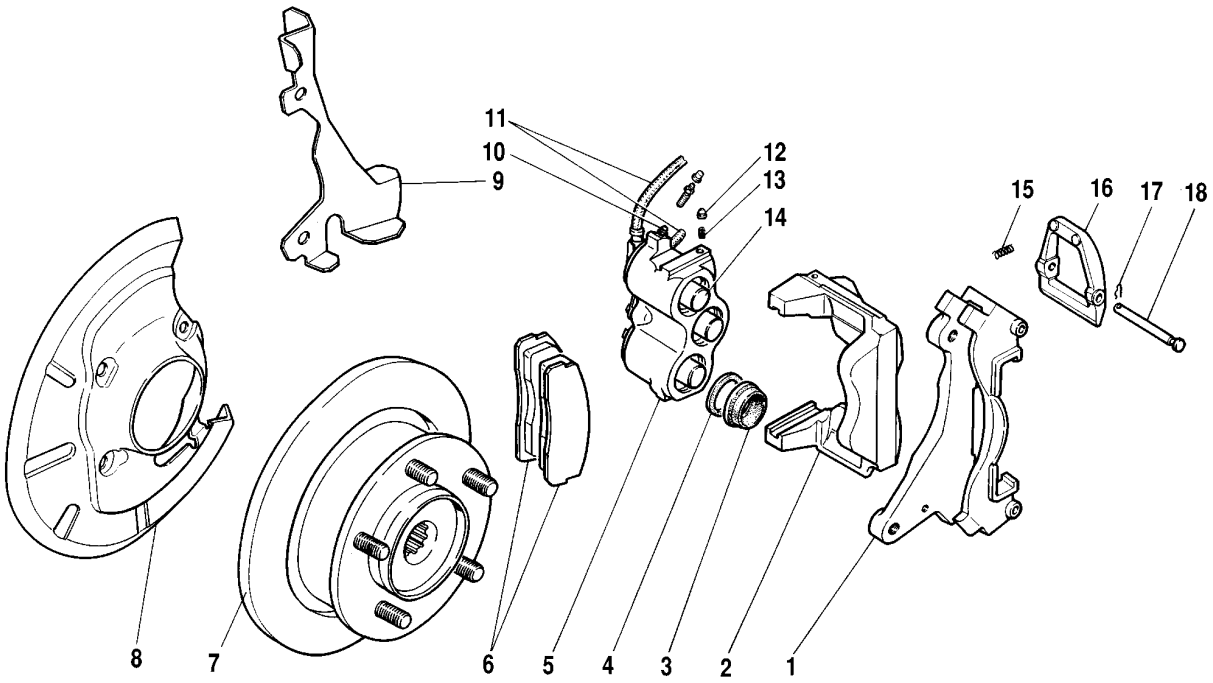

Fig. 6-14. Front brake components:
1 - carrier; 2 - caliper; 3 - piston cap; 4 - sealing ring; 5 - cylinder block; 6 - brake pads; 7 - brake disc; 8 - caliper dust cover; 9 - brake splash guard; 10 - bleeder; 11 - brake hoses; 12 - cylinder block detent; 13 - detent spring; 14 - piston; 15 - clamping lever spring; 16 - clamping lever; 17 - pin; 18 - clamping lever shaft

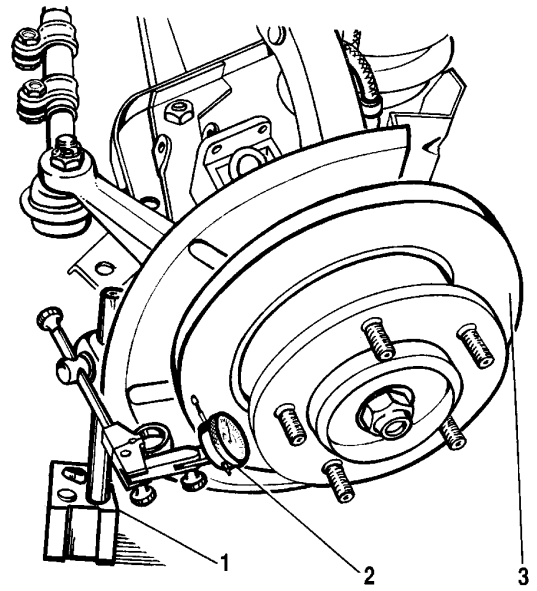

Fig. 6-15. Checking the brake disc runout:
1 - magnetic block; 2 - indicator; 3 - brake disc

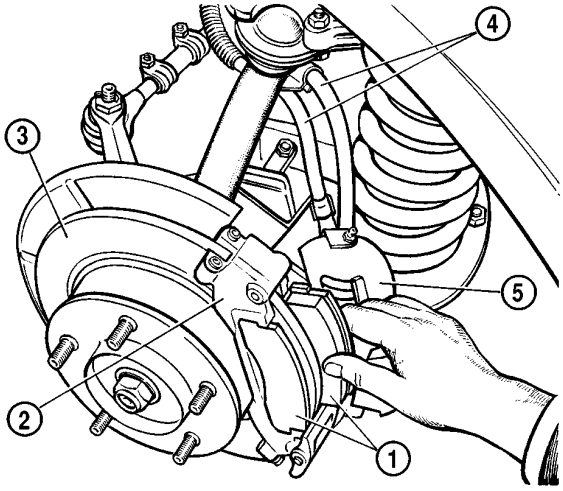

Fig. 6-16. Replacing the brake pads:
1 - brake pads; 2 - carrier; 3 - brake disc; 4 - brake hoses; 5 - cylinder block (complete with caliper)

assembly and take out the worn pads from the carrier grooves (fig. 6-16);

- carefully depress the pistons in cylinders to a stop, paying attention not to splash the liquid from the master cylinder reservoir, and place new brake pads in carrier grooves;

- move the lower directing splay on the caliper under the lower clamping lever, press the caliper to the pads, insert the lever shaft with the head facing the wheel and fix the pins.

The pads should be changed simultaneously on the right and on the left brakes.

Rear brakes

The design of the rare brake is shown on fig. 6-17.

Removal and dismantling

Lift the rear part of the vehicle and take off the wheel. Take care of possible liquid spillage from the tank.

Using puller 67.7823.9519 (fig. 6-18) remove the brake drum. Disconnect the cable end piece from the shoe manual lever 18 (see fig. 6-17), remove the cotter pin, press pin 21 and remove the lever. Using flat-nose pliers disconnect the upper 2 and lower 7 return springs.

Turn the cups of the steady post 17, take them off together with posts, springs and bottom cups; remove shoes 8 and 16 and expander strut 20. Disconnect from the wheel cylinder 1 pipeline and plug the openings of the cylinder and pipeline. Remove the wheel cylinder. To replace the brake backplate 4 remove the axle shaft, as specified in chapter "Rear axle", and disconnect the rear cable 13, having turned out two bolts that are fastening it to the brake plate 4.

Assembly and refitting

Assembly and refitting is carried out as follows.

Fit and fix the wheel cylinder on the brake backplate, attach it to the pipeline and fully tighten the connector nut.

Attach the shoe manual lever 18 (see fig. 6-17) and refit the brake shoes with expander strut 20, then insert posts 17 with springs and bottom cups, put the upper springs and fix them on racks by turning one or other way. Ensure, that the shoe ends have correctly settled down in the support jacks on the wheel cylinder pistons and on the backplate. Attach the rear cable end piece 15 to lever 18.

Fit the brake drum, previously having greased the landing shoulder of the axle shaft with graphite lubricant or greasing ЛСЦ-15 and fully tighten the drum fastening bolts.

Wheel cylinders - dismantle and reassembly

The dismantle and reassembly of the wheel cylinders is carried out as follows.

Remove protective caps 2 (fig. 6-19), then press out from the cylinder body 3 pistons 4 in assembly with the components of the automatic shoe-drum clearance adjuster.

Place the piston in assembly with the automatic adjuster on a special tool so that the ledges of the tool will cover the head of the thrust screw 3 (fig. 6-20). Using a screwdriver and by turning piston 9, turn out thrust screw 3 from the piston. Remove sealing 8 with support cup 7 and retainers 5 from the screw. Separate thrust ring 4 and thrust screw 3.

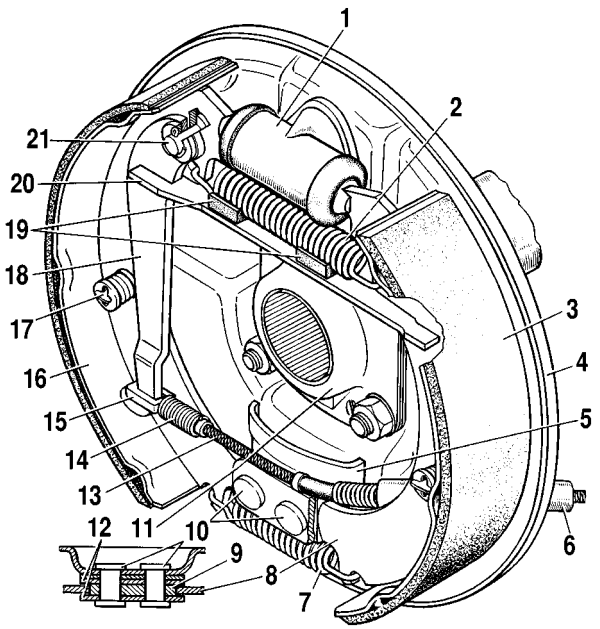

Fig. 6-17. Rear wheel brake mechanism:
1 - wheel cylinder; 2 - upper return spring; 3 - friction lining; 4 - backplate; 5 - inner plate; 6 - rear cable sheath; 7 - lower return spring; 8 - front brake shoe; 9 - thrust plate; 10 - rivet; 11 - oil deflector; 12 - guide plates; 13 - handbrake rear cable; 14 - rear cable spring; 15 - rear cable end; 16 - rear brake shoe; 17 - steady post; 18 - shoe manual control lever; 19 - rubber pads; 20 - expander strut; 21 - shoe manual control lever pin

The reassembly of the automatic adjuster and the wheel cylinder is carried out in reverse sequence, paying attention to the following:

- piston thrust screws are tightened to torque 4-7 N•m (0.4-0.7 kgf•m);

- slot A (see fig. 6-19) on thrust rings should be directed vertically upward; vertical deviation should be no more than 30°. Such position of the slot provides complete air bleeding from the brake mechanism;

- for preliminary compression of thrust rings the pistons are press-fitted in the cylinder body with a special tool having the form of a cylinder with a cone inner aperture;

- the effort of press-fitting the piston in the cylinder should be no less than 350 N (35 kgf); in case effort was less than 350 N (35 kgf) - replace the thrust ring;

- when press-fitting the piston in the cylinder it is necessary to maintain the sizes of 4.5-4.8 mm and 67 mm (maximum) (see fig. 6-19) for free landing of the brake drum;

- before refitting the components in the cylinder body thickly grease them with brake liquid.

After reassembly check the movement of each piston in the cylinder body. They should freely move within the limits of 1.25-1.65 mm. The last established in place is the protective cap 2.

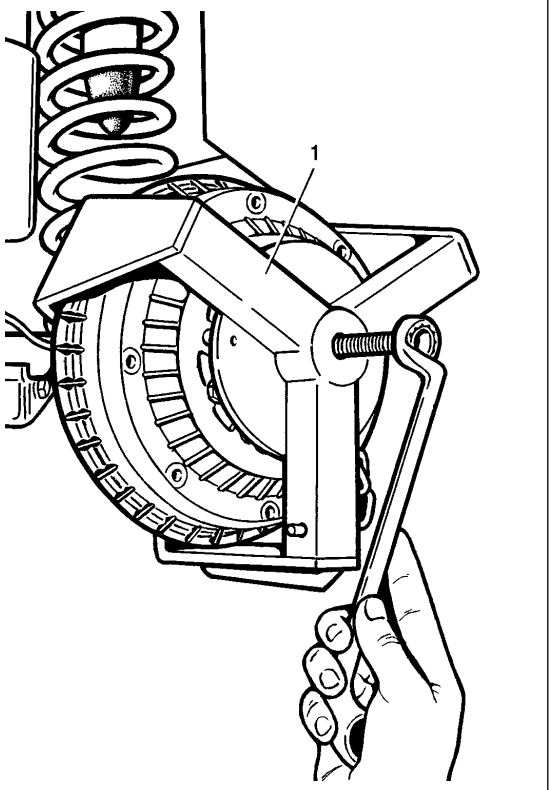

Fig. 6-18. Removing the brake drum:
1 - remover tool 67.7823.9519

Component inspection

Wheel cylinders. Ensure the cleanness of working surfaces of the cylinder, pistons and thrust rings. The surfaces should be absolutely smooth, without roughness, to avoid liquid leak and premature wear of sealings and pistons. The defects on the cylinder mirror can be eliminated by lapping or polishing. However, no increase of the cylinder inner diameter is allowed.

Inspect screw 3 (see fig. 6-20), spring 6, thrust cup 7 and retainers 5. If necessary, renew damaged components.

Renew sealings 8. Inspect protective caps 10 and renew if necessary.

Shoes. Carefully check the shoes for damages or deformations.

Check the tension of the upper and lower return springs; if necessary, renew.

The springs should have no residual deformations when stretched with effort of 350 N (35 kgf) for lower springs and 420 N (42 kgf) - the upper ones.

Check the linings for dirt or traces of greasing, if necessary, carefully clean with metal brush and wash with white-spirit, besides, check for leaks of greasing inside the drum; eliminate malfunctions. Renew shoes, if the friction lining thickness is less than 1.5-2 mm.

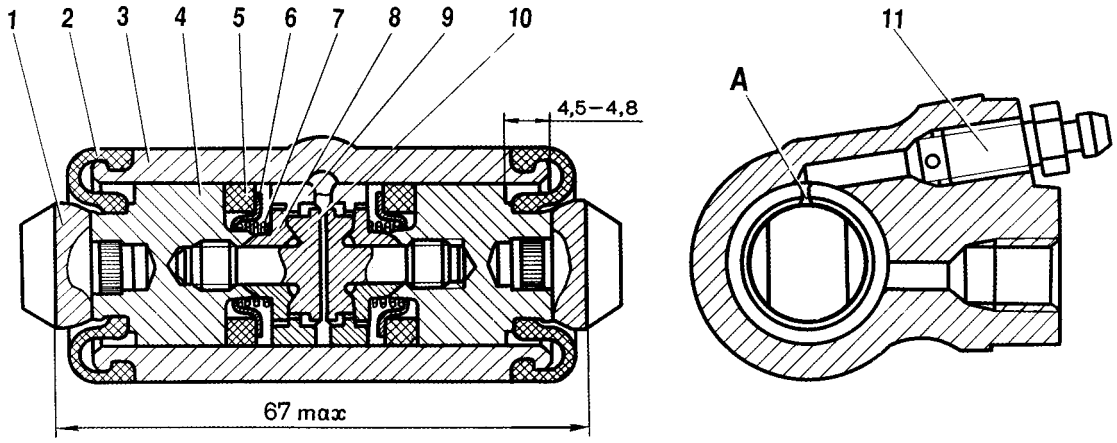

Fig. 6-19. Wheel cylinder:
1 - shoe abutment plate; 2 - cap; 3 - cylinder body; 4 - piston; 5 - seal; 6 - backing cup; 7 - spring; 8 - retainers; 9 - thrust ring; 10 - thrust screw; 11 - bleed screw; A - slot in thrust ring

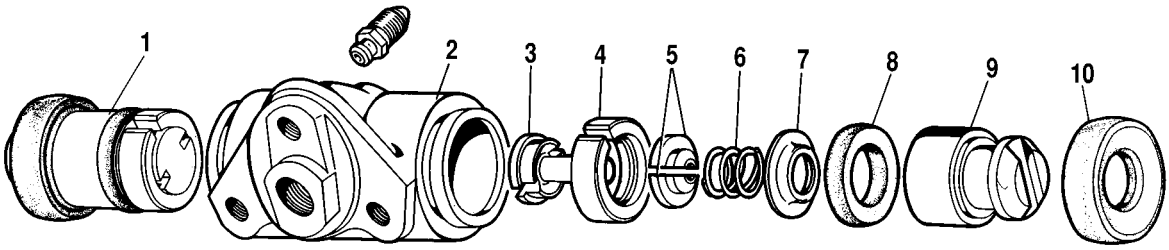

Fig. 6-20. Wheel cylinder components:
1 - piston assembly; 2 - cylinder body; 3 - thrust screw; 4 - thrust ring; 5 - retainers; 6 - spring; 7 - backing cup; 8 - seal; 9 - piston; 10 - cap

Brake drums. Examine the brake drums. If the working surfaces have deep risks or excessive ovality, chisel the drums. Then grind on a machine tool with abrasive fine stones. This will help to increase the lining durability, and improve the uniformity and efficiency of braking.

The maximum allowable increase of drum nominal diameter (250 mm) after turning and polishing is 1 mm. These dimension limits should be strictly observed, otherwise, the durability of the drum, and the efficiency of braking will be decreased due to reduction of drum rigidity.

Rear brake wheel cylinder -test-bench inspection

Position cylinder 2 (fig. 6-21) on the test bench, attach the pipeline from the manometers and bleed the system.

Adjust rests1 so that the wheel cylinder pistons are rested against them.

Check for liquid leak. Connect a low pressure manometer 4. Slowly rotate flywheel 8 to obtain liquid pressure of 0.05 MPA (0.5 kgf/cm^2) as read by the pressure gauge 4.

Ensure that pressure holds steady for 5 minutes. Repeat similar test at liquid pressure of 0.1 - 0.2 - 0.3 - 0.4 - 0.5 MPA (1 - 2 - 3 - 4 - 5 kgf/cm^2).

Reduce pressure and connect a high pressure manometer 5. Ensure that pressure holds steady for 5 minutes, repeat similar test at liquid pressure of 5 - 10 - 15 MPA (50 - 100 - 150 kgf/cm^2).

There should be no pressure decrease due to liquid leak through sealing elements, pipeline connections, bleeding connectors or through casting pores.

An insignificant reduction of pressure (no more than 0.5 MPA (5 kgf/cm^2) during 5 minutes is permissible, especially at high pressure, due to shrinkage of sealings.

Rear brake pressure regulator

Removal and refitting. Disconnect arm 12 (fig. 6-22) from tie-rod 7, and holder 18 from bracket 14 and shackle that is fastening the pipelines going to the pressure regulator.

Disconnect the components of muffler mounting from the body and move the pipeline with the mufflers aside.

Undo the bolts fastening the regulator on the bracket and the bracket on the car body, remove the regulator bracket, and then, having lowered the regulator downward, disconnect the pipelines.

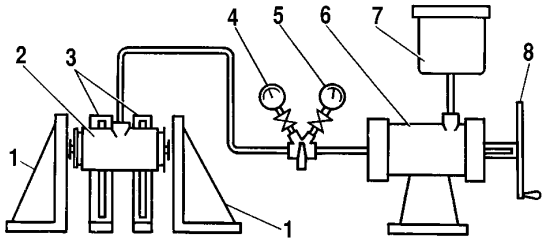

Fig. 6-21. Checking the rear brake wheel cylinders:
1 - piston rests; 2 - cylinder under check; 3 - cylinder bracket; 4 - low pressure manometer; 5 - high pressure manometer; 6 - cylinder for building up pressure; 7 - reservoir; 8 - flywheel

Remove the regulator and disconnect the arm. Plug all openings of the pressure regulator and pipelines.

Refitting of the pressure regulator is carried out in reverse sequence. Before tightening the regulator fastening bolt place tool 67.7820.9519 (see fig. 6-6) on the end of the regulator arm. Direct the tool bar upwards to the car body. Thus, the distance of (150+5) mm (see "Pressure regulator position adjustment") between the end of arm 2 and underframe side member is obtained.

Raise protective cap 3 (see fig. 6-22) and by turning the regulator on the fastening bolts, obtain a slight contact between the arm end and the regulator piston.

Fix the regulator in this position, fully tighten the fastening bolts, then apply a layer of greasing ДТ-1 or "ДИТОР" on shaft 2 and the protruding part of the piston. Refit rubber cap 3 having applied 5-6 gr of the same greasing.

Remove tool 67.7820.9519 and reconnect the arm end to tie-rod 7, previously having covered the bushes of the rod-to-arm connection with greasing ДТ-1 or ДИТОР.

Attach the gas release system pipelines to the car body.

Bleed the brakes to expel air from the rear brakes.

Dismantle and reassembly. Use key A.56124 to turn out the plug, remove lining 5 (fig. 6-23), take out piston 10, distance sleeve 2, sealing 7, plate 8, spring 9 and thrust washer with sealing ring 3.

When reassembling, which is carried out in reverse sequence, grease all components with brake liquid.

ATTENTION. To differentiate the VAZ-2121 and -21213 pressure regulators from others of similar design, there is a groove on the bottom part of the piston.

Wash the components with isopropyl alcohol or brake liquid and inspect. The components surfaces should have no marks and roughness.

Check the spring tension, length in free condition should be 17.8 mm, and under load of 76.44 - 64.68 N (7.8-6.6 kgf) - 9 mm.

Renew damaged components, sealings and sealing rings.

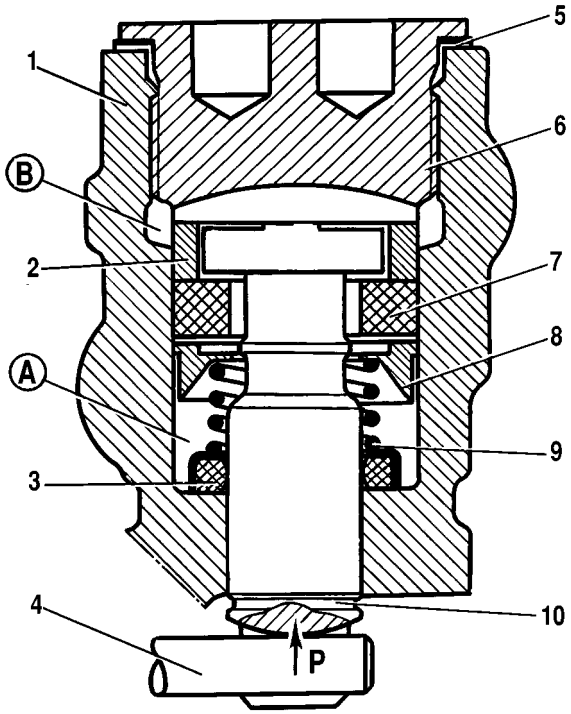

Fig. 6-23. Rear brake pressure regulator, non-operating position:
A - normal pressure chamber; B - adjustable pressure chamber; P - force from arm 4; 1 - regulator housing; 2 - distance sleeve; 3 - sealing ring; 4 - regulator control arm; 5 - gasket; 6 - plug; 7 - seal; 8 - spring cup; 9 - piston spring; 10 - piston

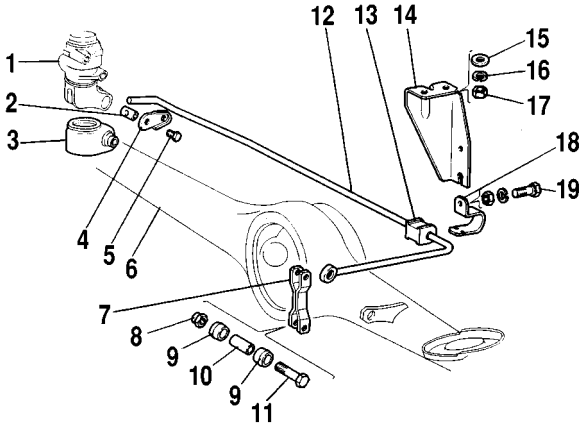

Fig. 6-22. Pressure regulator linkage components:
1 - pressure regulator; 2 - regulator control arm shaft; 3 - cap; 4 - lock plate; 5 - bolt with spring washer; 6 - rear axle beam; 7 - pressure regulator control arm-to-rear axle bracket connecting tie-rod; 8 - bolt washer; 9 - plastic bush; 10 - distance sleeve; 11 - tie-rod securing bolt; 12 - pressure regulator control arm; 13 - arm thrust bush; 14 - bush bracket; 15 - washer; 16 - spring washer; 17 - nut; 18 - bush clamp; 19 - clamp-to-bracket fastening bolt

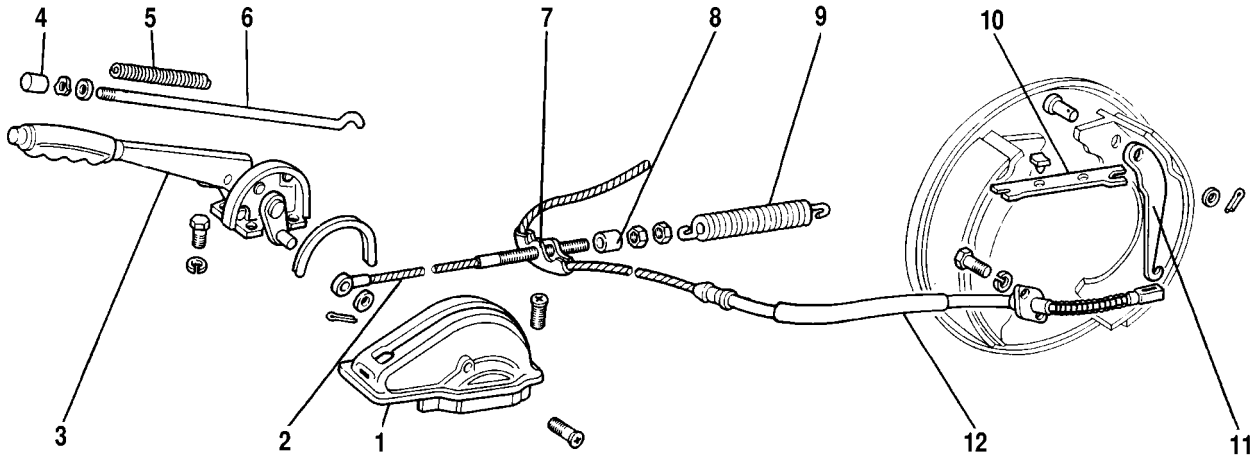

Fig. 6-24. Handbrake linkage components:
1 - cover; 2 - front cable; 3 - lever; 4 - pushbutton; 5 - tie rod spring; 6 - lock tie-rod; 7 - rear cable guide; 8 - distance sleeve; 9 - return spring; 10 - expander strut; 11 - manual shoe operating lever; 12 - rear cable

Handbrake

Removal and refitting. Place the handbrake lever in the lowest position, disconnect the cable ends from the brake shoe levers (see "Rear brake").

Slacken locknut 5 (see fig. 6-4) and adjusting nut 6, remove return spring 9 (fig. 6-24), then completely undo the locknut and nut.

Take out the front end pieces of the rear cable from the brackets on the floor, and the cable sheath from the brackets on the rear axle beam, and remove the rear cable 12.

Remove the lever protective cover and then the lever assembly and the front cable.

Take out the pin and remove the thrust washer, disconnect the front cable from the handbrake linkage lever.

The handbrake is refitted in reverse sequence with subsequent adjustment (see "Handbrake adjustment"). When refitting, grease with ЛИТОЛ-24 or ЛСЦ-15 the rear cable guide, the handbrake lever shaft and the front cable end.

Check and repair. Carefully inspect the components of the handbrake mechanism.

If breakage or wire scuffing is detected, renew the cable.

Make sure, that the quadrant teeth and handle lock are not damaged; worn components should be replaced.

Check the condition of the spring. It should provide the lever return to the released position.

Inspect the rear cable sheath and the fastening of end pieces on the sheath, and ensure, that the cable freely moves inside the sheath. Replace the cable in case of sheath damage and loose end piece fastening.