Section 5

BRAKES

CONTENTS

GROUP 50

GENERAL

TOOLS

Remarks

Brake calipers of make ATE are supplied for certain markets. Where the instructions for these differ from the other brake caliper make (Girling), the letters ATE will follow. The ATE brake caliper is installed at the factory as follows:

145: For all markets except USA.

142 and 144: VENV, i.e., vehicles by Volvo Europa Naamloze Vennootschap, Belgium.

The following special tools are used for repair work on the brake system. The special tools are marked 999 or SVO (e.g., 999 2742 or SVO 2742).

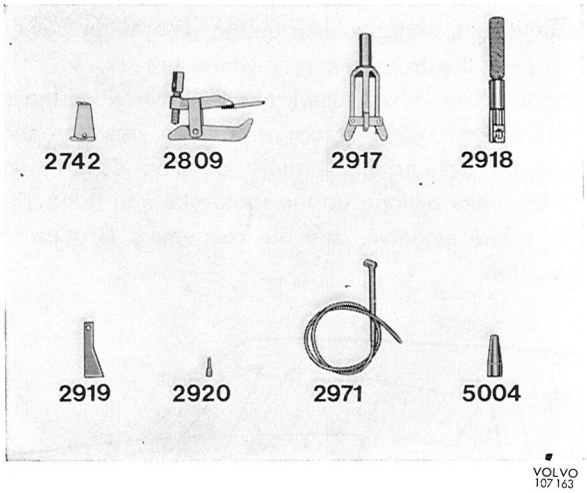

Fig. 5-1. Special tools

999 (SVO)
2742 Holder for cable spring
2809 Tool for pressing in piston
2917 Extractor for brake pads
2918 Tool for turning piston ATE
2919 Template for piston, ATE
2920 Nipple for testing, ATE
2971 Bleeder wrench
5004 Drift for piston seal, master cylinder

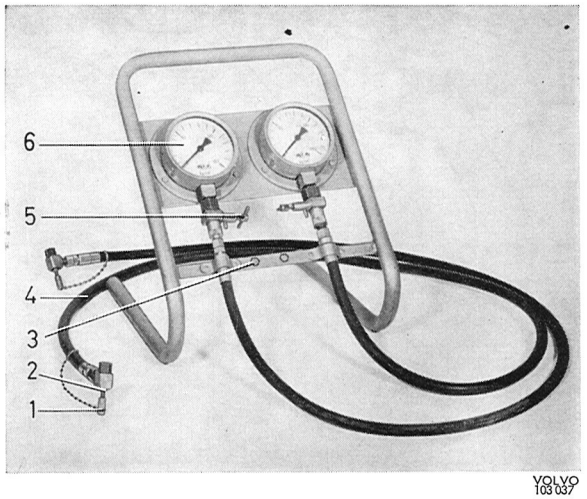

Fig. 5-2. Tester 2741

1. Protection cover
2. Connection nipple
3. Enlarging nipple
4. Hose
5. Bleeder tap
6. Pressure gauge

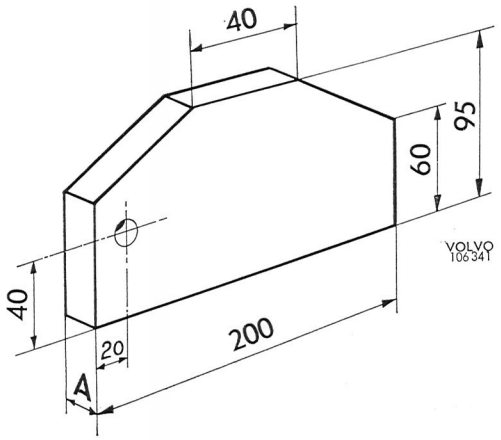

Fig. 5-3. Wooden insert for brake calipers

AA= 15.5 mm (5/8") for front brake calipers
13 mm (1/2") for rear brake calipers

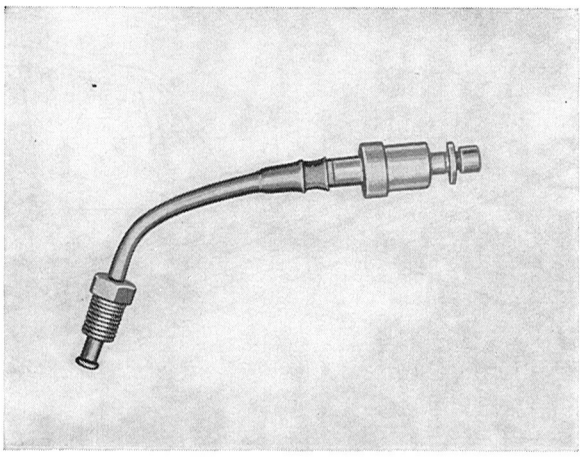

Fig. 5-4. Connections

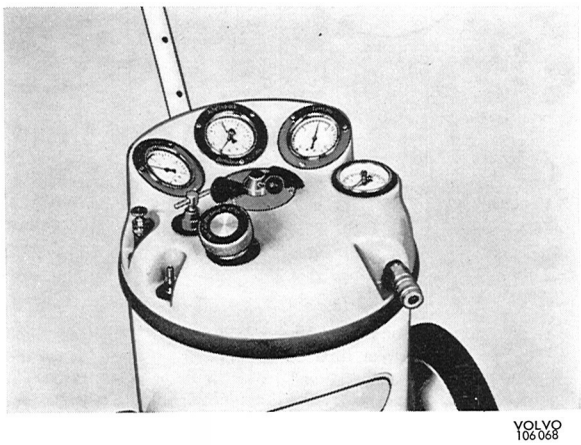

Fig. 5-5. Type of bleeder unit

The tester 2741 (Fig. 5-2) is used, for example, to diagnose faults in the brake system.

Removal of the pistons in the brake calipers is made easier with the help of wooden inserts according to Figs 5-3 and 5-4.

A hose connection (see 2, Fig. 5-4) is required for removing the pistons in the calipers.

A bleeder unit, of the type shown in Fig. 5-5, is required for maintaining the hydraulic system under constant pressure. Also needed is a connection cover for the brake fluid container, see Fig. 5-60.

GENERAL INFORMATION

The 140 is equipped with two brake systems which are independent of each other. One of these, the footbrake system, is controlled by a brake pedal and operates on all four wheels through a hydraulic system. The other brake system, the parking brake, functions by means of a brake lever and operates both the rear wheels mechanically.

Fig. 5-6 shows the arrangement of the footbrake system which has disc brakes all round.

The hydraulic part has two separate circuits, this due to the fact that the master cylinder (1) is of the tandem-type and that each front brake caliper (13) has two pairs of cylinders which are entirely separated from each other. One of the circuits serves the lower cylinders of the front wheel brake units and the right rear wheel, while the other circuit takes care of the upper cylinders of the front wheel brake units and the left rear wheel. With such an arrangement, braking effect is ensured, should one of the brake lines fail.

The servo cylinder (5) is directly actuated by the brake pedal and the help of vacuum from the engine induction manifold results in less pedal pressure being required for braking. The function of the brake valves (10 and 11) is to assist in providing a suitable distribution of braking power between the front and rear wheel brakes.

The warning valve (16) warns the driver when there is an abnormal pressure difference between the circuits. Concerning a more detailed description of the units making up the footbrake and the parking brake systems, see the respective Groups in question.

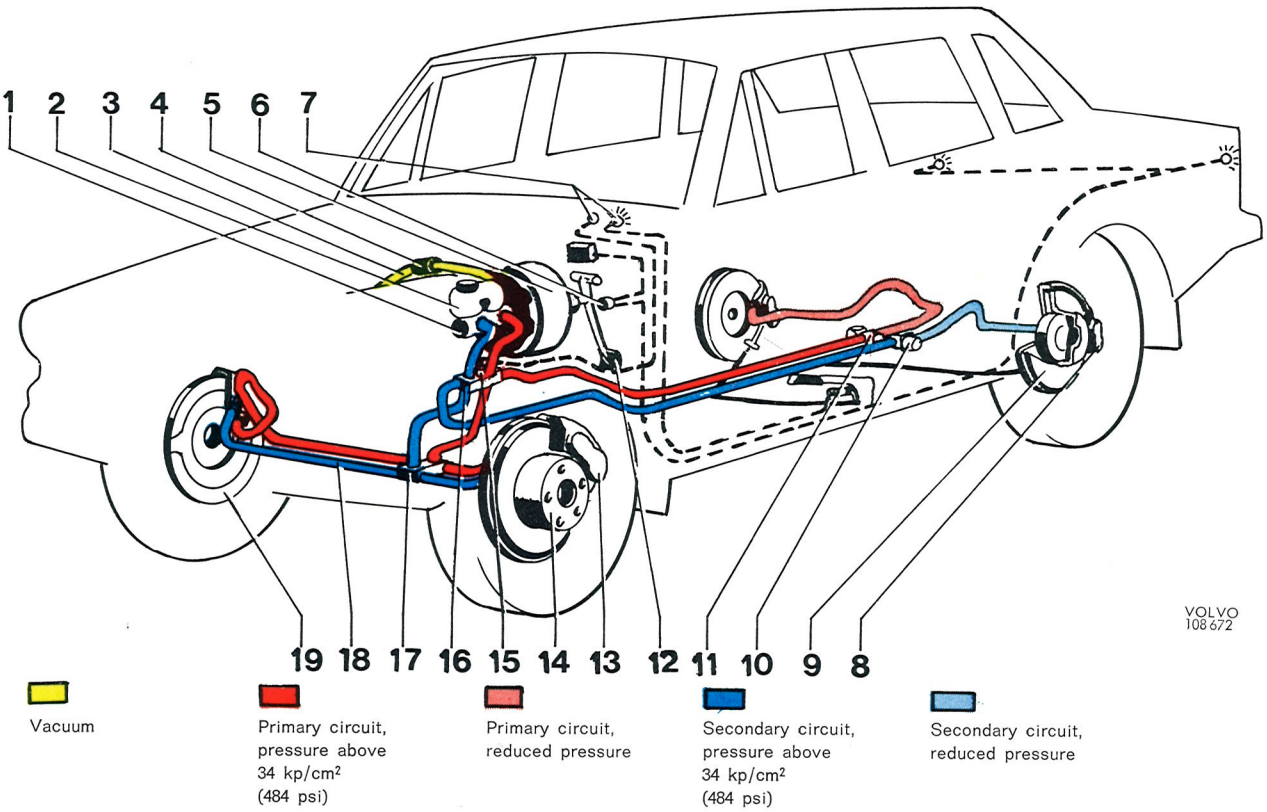

Fig. 5-6. Brake system

1. Tandem master cylinder
2. Brake fluid container
3. Vacuum line
4. Check valve
5. Power cylinder
6. Brake switch
7. Warning lamps
8. Rear brake caliper
9. Brake disc with drum
10. Brake valve, secondary circuit
11. Brake valve, primary circuit
12. Brake pedal
13. Front brake caliper
14. Brake disc
15. Warning switch
16. Warning valve
17. 6-branch union, (double 3-branch union)
18. Brake pipe
19. Cover plate

SERVICE PROCEDURES

CLEANING

The components of the hydraulic brake system should be cleaned in clean brake fluid or denatured alcohol, which does not contain benzene (benzol).
Of the existing kinds of denatured alcohol being sold in general, only methylated spirit is free from benzene. Brake fluid is an excellent but expensive cleaning agent. From most viewpoints, **methylated spirit** is therefore the most suitable.
Do NOT use petrol, kerosene, trichloroethylene or alcohol with benzene for cleaning as, like the slightest trace of mineral oil, they attack the rubber seals and cause them to swell out. For this reason, hands should be washed with soap and water before the internal parts are touched. The mechanic working with the hydraulic components should preferably be provided with rubber gloves. Final rinsing should take place in a cleaning agent free from impurities after which the parts can be dried in the open air. To precipitate the drying and complete the cleaning process, filtered, compressed air free from moisture can be used. It is of the utmost importance that no alcoholic residue is left in the system when filled with brake fluid. Traces of alcohol in the brake fluid reduces its boiling point and can result in the formation of vapor which can affect brake functioning.
After being cleaned and dried, the parts should be moistened with brake fluid, assembled and then the complete unit filled with brake fluid as soon as possible in order to prevent corrosion attacks from moisture in the air. This applies to parts which should be installed immediately in the vehicle. To counteract corrosion on brake parts which are stored, or for any other reason are not covered by brake fluid, the plungers, cylinders and seals should be coated with a thin layer of lubricant called brake paste intended for this purpose. Under no condition whatsoever must other types of grease or rustproofing oil be used.

BRAKE FLUID

Only first-class brake fluid, which is guaranteed by a well-known manufacturer to fulfil the requirements according to the standard SAE J 1703, should be used for the brake system. Brake fluid with the designation DOT 3 or DOT 4 can also be used. Fluids which only fulfil the requirements according to SAE 70 R 1, for example HD-quality and FS-VV-H 910 A, should not be used. Avoid mixing different brands of brake fluid.

When the container of the master cylinder is being filled, likewise with all work concerning connections, etc. the greatest cleanliness should be observed in order to prevent dirt from getting into the system. Only clean, unused brake fluid should be filled. Brake fluid which is expelled during, for example, bleeding, may not be put back into the system.
After use over a long period, it is normal that even first-class brake fluid gradually deteriorates through the absorption of moisture and small impurities. Deteriorated brake fluid can be recognized by the fact that, compared with new brake fluid, it is darker or has changed its color, is relatively odorless and watery, i.e., when felt between the fingers it lacks the normal feeling of a light lubricating film. Such brake fluid should be replaced by new fluid, and this should also be done when the master cylinder and wheel brake units are being overhauled, as well as after periodic intervals, see "Maintenance".

SERVICE DIAGNOSIS

The following service diagnosis can be used, for example, after the discovery, from some kind of brake testing, that the capacity of the footbrake system is not what it should be. The diagnosis can also be used to prevent faults.

1. Check that the level of the brake fluid reaches up to the "Max" mark on the container. Top up, if necessary. See under the heading "Brake Fluid".
2. Remove both the inside bleeder nipples at one of the front brake calipers and connect tester 2741 shown in Fig. 5-2. Nipple 2920 is also used for the ATE.
3. Depress the brake pedal several times to even out any partial vacuum in the servo cylinder and in this way disconnect it. When free, the pedal is about level with the clutch pedal.
4. Apply and release the footbrake while reading the pressure gauges of the tester. The pressure in both the circuits should be observed. At 100 kp/cm^2 (1420 psi), the pressure must not differ more than 3 kp/cm^2 (43 psi).
5. Apply the footbrake with the help of a pedal jack to a hydraulic brake pressure of about 100 kp/cm^2 (1420 psi). Check pipes and parts for damage and leakage. The pressure should remain unchanged for at least 15 seconds.
6. Remove the pedal jack. Depress the brake pedal and maintain this pressure. Start the

engine. Here a considerable lowering of the pedal should be felt when the servo cylinder starts to operate.

7. Stop the engine after it has run for at least 1 minute. Use a pedal jack to apply a hydraulic pressure of 25 kp/cm² (355 psi).
   Wait a couple of minutes. The hydraulic pressure should not drop more than 5 kp/cm² (70 psi).
8. Check the warning valve (Fig. 5-37). Connect a hose to one of the bleeder nipples of the testing device and open the device. Switch on the ignition switch and check that the warning lamp lights when the parking brake is applied. Release the parking brake. Apply the footbrake slowly with a pedal jack. When the warning lamp lights, check the pressure on the pressure gauge. The lamp should light at a pressure difference of 5—15 kp/cm² (70—210 psi) between the circuits.
   After the test, shut off the bleeder nipple and remove the pedal jack. Disconnect the electrical wire and screw out the warning valve switch so that the warning valve returns to its normal position. Screw in the warning switch to a tightening torque of 1.4—2.0 Nm (10—14 lb ft). Connect the electrical wires.
9. Check the brake valve of one circuit. Connect the tester to the bleeder nipple on the left rear wheel brake unit and to the upper nipple on one of the front wheel brake units. Apply the footbrake with the pedal jack to the incoming pressure according to the table in the adjacent column. Read the incoming pressure on the pressure gauge for the front wheel brake unit. Read the outgoing pressure on the gauge which is connected to the rear wheel brake unit. From the point of view of leakage, the brake valve is not defective if the pressure remains unaltered for at least 15 seconds.

Model	Incoming pressure kp/cm² (psi)	Outgoing pressure kp/cm² (psi)
142—144	30 (427)	30 (427)
	50 (711)	36—42 (512—597)
	100 (1422)	50—59 (711—839)
145	45 (640)	45 (640)
	65 (924)	52—57 (739—810)
	100 (1422)	62—69 (882—981)

10. Check the other brake valve in the same way by connecting it to the right rear wheel brake unit and the inner, lower nipple of the front wheel brake unit.
11. Jack up the vehicle so that the wheels rotate freely. Apply and release the brake, during which check to see if the wheels can be rotated. The wheels should be free half a second after the pedal has been released. The test should be made with and without a partical vacuum in the servo brake cylinder.

Test operation	Condition	Cause	Correction
3	Pedal too low or too high	Incorrect adjustment	Adjust, see page 5:27
4	Fading pressure	Damaged brake line	Replace the damaged line
		Blocked hose	Replace hose
	Difference between circuits greater than 3 kp/cm² (42.7 psi)	Blockage in one of the circuits	See point 5
		Defective adjustment	Recondition master cylinder
5	Pressure drops	External leakage	Tighten connections and replace line or recondition leaking part
		Leaking brake valve	Replace brake valve
		Leaking seal in wheel unit cylinder	Recondition wheel unit cylinder
		Leaking seal in master cylinder	Recondition master cylinder

Test operation	Condition	Cause	Correction
6	The pedal does not go down	Leaking vacuum line	Replace vacuum line
		Blocked air filter or leaking seal for front pressure plunger in servo cylinder	Replace filter or seal
		Defective power cylinder	Replace power cylinder completely
7	The pressure drops more than 5 kp/cm² (71 psi)	Leaking check valve	Remove and blow clean the valve and replace the seal ring. If insufficient, replace check valve.
		Leaking seal for outgoing thrust rod in power cylinder	Remove master cylinder and replace seal
		Internal fault in power cylinder	Replace power cylinder complete
	Pressure increases	Leaking rear sealing ring in power cylinder	Replace rear sealing ring
8	The parking brake warning lamp does not light	Wrongly adjusted switch Defective electrical parts	Adjust the switch Replace defective parts
	Footbrake warning lamp does not light	Defective switch	Replace switch
	Warning lamp does not go out when pistons have returned to normal position	Pistons seize	Replace warning valve
	Warning when pressure difference is other than 5—15 kp/cm² (71—213 psi)	Defective warning valve	Replace valve
9—10	Incorrect outgoing pressure	Defective valve	Replace brake valve
11	All wheel brakes fade	Incorrectly adjusted front pressure plunger in power cylinder	Adjust the pressure plunger
	A circuit fades	Blocked equalizing hole in master cylinder	Recondition the master cylinder
	The rear wheel brakes fade	Parking brake cable chafes	Replace the cable
		Incorrectly adjusted parking brake	Adjust the parking brake
		Defective brake valve	Replace brake valve
	A wheel brake fades	Damaged brake line	Replace line
		Blocked hose	Replace hose
		Worn sealing ring	Recondition wheel brake unit

The condition of the brakes is an extremely important traffic safety factor. It is of importance, therefore, that any work on the system should be done by qualified mechanics with the greatest care, likewise that a regular check is made according to the instructions given below.

CHECKING BRAKE FLUID LEVEL

When filling the fuel tank, check that the fluel level in the master cylinder container is not below the "Min" mark. This can be done without removing the cap. Every 10 000 km (6 000 miles) top up, if necessary, to the "Max" container mark.

A first-class brake fluid which meets the requirements according to SAE J 1703 should be used for topping-up. Brake fluid with the designation DOT 3 or DOT 4 can also be used. Before removal, clean the cap of the container and observe maximum cleanliness when filling fluid. Avoid spilling the brake fluid onto the paintwork as this can damage it. Check to make sure that the vent-hole in the cap is not blocked.

CHECKING BRAKE PADS

Every 10 000 km (6 000 miles) check the wear on the linings. The brake pads should be replaced when the linings are worn down to a thickness of about 3 mm (1/8"). Under no circumstances must the linings be worn down below 1.5 mm (1/16"). For replacement of the pads, see page 5:10.

FUNCTION CHECK

In addition to the regular check on the brakes by the driver as result of the driving done, the brakes should be checked every 10 000 km (6 000 miles) by a workshop mechanic. The footbrake should also be checked then to make sure that it functions satisfactorily; if necessary, check with the help of proper testing equipment (see "Service Diagnosis"). A check should also be made that there is no leakage and that the brake lines are not exposed to such damage that resulting leakage can be expected. The parking brake should provide full braking power at the 3rd—4th ratchet segment. If not, adjust the parking brake according to the instructions on page 5:35.

OVERHAUL

Every third year or 80 000 km (48 000 miles) brake system seals and air filter for the servo cylinder should be replaced. Where driving conditions are mostly dusty replace the air filter more often.

At the same time replace the brake system fluid completely. At continous hard driving, alp driving or similar, where the brakes are used extensively, the fluid should be changed annually. Extremely humid climates warrant the same recommendation.

GROUP 51

WHEEL BRAKE UNITS

GENERAL INFORMATION

The figures in the following description show the Girling type brake caliper. For the 145 (except USA) and VENV-built vehicles in the 140-series, the brake caliper is of make ATE, see Fig. 5-29.

CONSTRUCTION OF FRONT WHEEL BRAKE UNITS

Fig. 5-7 shows how the brake components are located at the front wheels. The disc (3) is of cast iron and is attached to the wheel hub with which it rotates. The cover plate (4) protects the disc from dirt. Mounted on the stub axle is the front wheel brake caliper (2) which houses the wheel unit cylinders and brake pads.

The front wheel brake caliper consists of a housing in two halves (6 and 14, Fig. 5—8) bolted together and located on either side of the brake disc. Each half contains two cylinders and pistons. The upper cylinder is completely separated from the lower one, but both upper and lower cylinder are each connected through channels to the corresponding cylinder in the other half. The function of the seal (1) is partly to prevent brake fluid from oozing out and partly to return the piston to the rest position after braking. Rubber dust covers (3) prevent dirt from entering. Each seal has a square section and presses against the piston from the slightly oblique groove in the housing. The brake pads (10) are provided with bonded facings and are held in position by retaining pins (13).

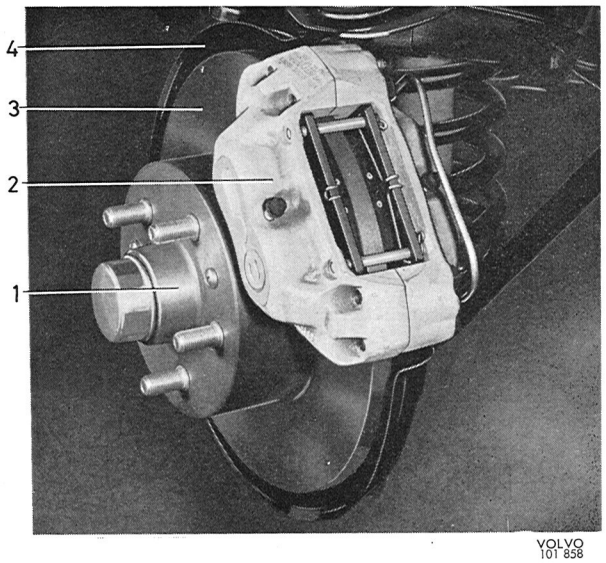

Fig. 5-7. Brake components, front wheel

1. Hub
2. Front brake caliper
3. Brake disc
4. Cover plate

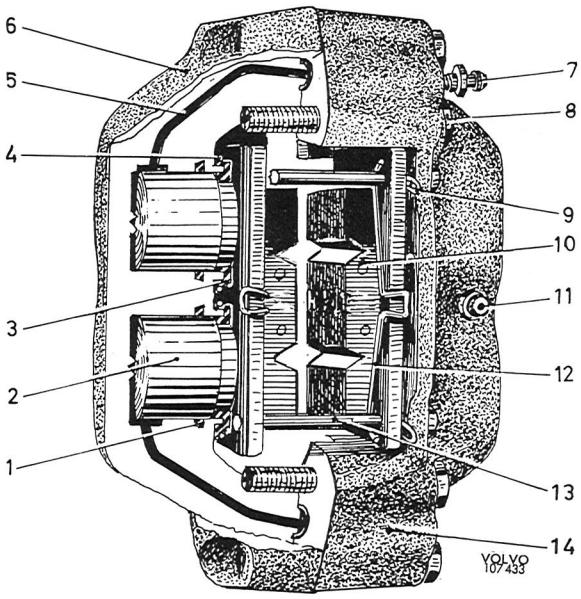

Fig. 5-8. Front wheel brake caliper

1. Seal
2. Piston
3. Rubber dust cover
4. Retaining ring
5. Channel
6. Outer half
7. Upper bleeder nipple
8. Bolt
10. Brake pad
11. Lower bleeder nipple
12. Damping spring
13. Retaining pin
14. Inner half

CONSTRUCTION OF REAR WHEEL UNITS (FOOTBRAKE COMPONENT)

Fig. 5-9 shows the location of the brake components on the rear wheels. The brake disc (2) is of cast iron and is fixed to the drive shaft with which it rotates. The cover plate (3) prevents dirt from reaching the disc.

The rear wheel brake caliper is mounted to the rear axle housing with a retainer. It houses the wheel unit cylinders and brake pads. It consists of a housing divided in two halves (6 and 11, Fig. 5-10) bolted together and located on either side of the brake disc. Each half contains a piston and a cylinder linked by a channel in the housing.

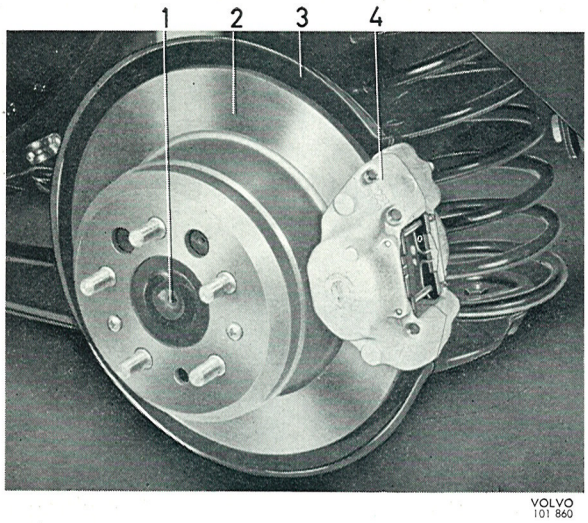

Fig. 5-9. Brake components, rear wheel

1. Drive shaft
2. Brake disc
3. Cover plate
4. Rear brake caliper

The seal (1) has a square section and presses against the piston from the slightly oblique groove in the housing. The function of the seal is partly to prevent brake fluid from oozing out and partly to return the pistons to the rest position after braking. The rubber dust covers (3) prevent dirt from entering. The brake pads (10) are provided with bonded facings and are held in position by retaining pins (13).

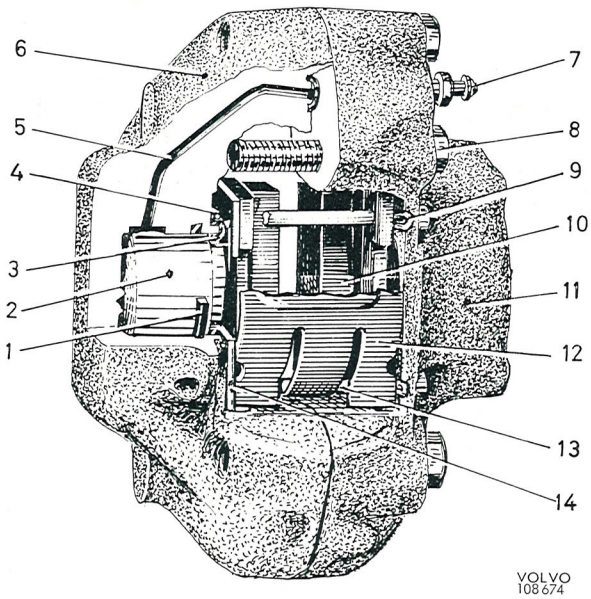

Fig. 5-10. Rear brake caliper

1. Seal
2. Piston
3. Rubber dust cover
4. Retaining ring
5. Channel
6. Outer half
7. Bleeder nipple
8. Bolt
9. Retaining clip
10. Brake pad
11. Inner half
12. Damping spring (alt. 1)
13. Retaining pin
14. Washer

FUNCTION

HYDRAULIC

The lower cylinders of the front wheel brake units and the right rear wheel brake unit are connected through brake lines to the primary chamber of the master cylinder. In the same way, the upper cylinders of the front wheel brake units and the left rear wheel brake unit are connected to the master cylinder through the secondary chamber. Fig. 5-11 shows the general arrangement of the connections for a car with left-hand drive. Also installed are brake valves and a warning valve. For a car with right-hand drive, the connections to the master cylinder are reversed but are otherwise the same in principle.

When the pressure in the master cylinder rises as a result of brake application, the pistons in the brake calipers are displaced and press the pads with brake linings from both sides against the rotating friction surface of the brake disc, see Fig. 5-12. The pressure applied, and thus the braking effect, vary in proportion to the foot effort applied to the pedal. When the piston is displaced, the seal is tensioned laterally. It remains in this state as long as the footbrake is applied.

Should leakage occur in one of these circuits, full

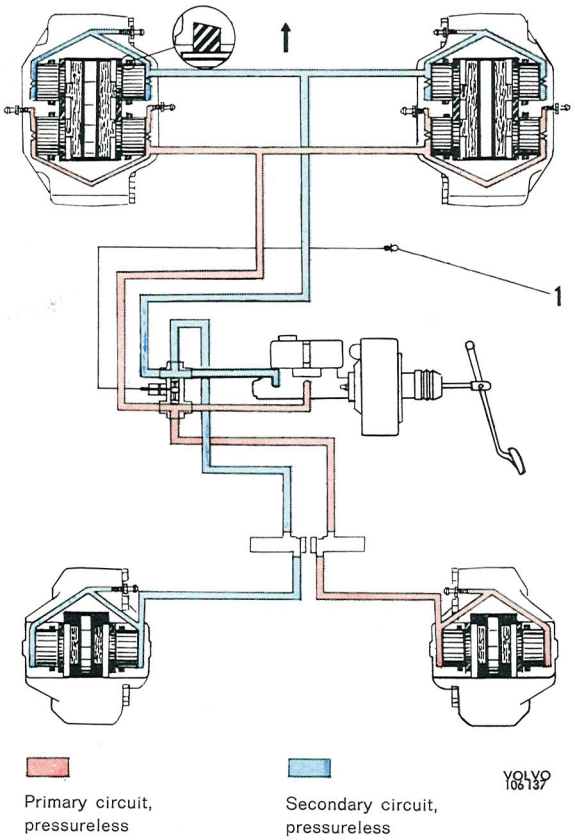

Fig. 5-11. Rest position

1. Warning lamp

braking effect is still obtained on both the front wheels and one rear wheel if pedal pressure is increased. When there is a pressure difference in the brake circuits (about 10 kp/cm^2 = 142 psi), the piston of the warning valve is pressed over to one side where the pressure is less and the warning lamp lights. The warning lamp remains lighted until the leakage in the circuit concerned has been corrected and the warning switch returned to normal.

When the brake pedal is released, the hydraulic pressure on the piston ceases. Since with this system there is no residual hydraulic overpressure in the lines, the tension in the seals is sufficient to move the pistons back to a certain extent, see Fig. 5-11. This results in a clearance being formed between the brake linings and the brake disc. With such an arrangement, the linings will always be in the rest position at a certain distance from the brake disc, irrespective of the wear. For this reason, the brakes are self-adjusting.

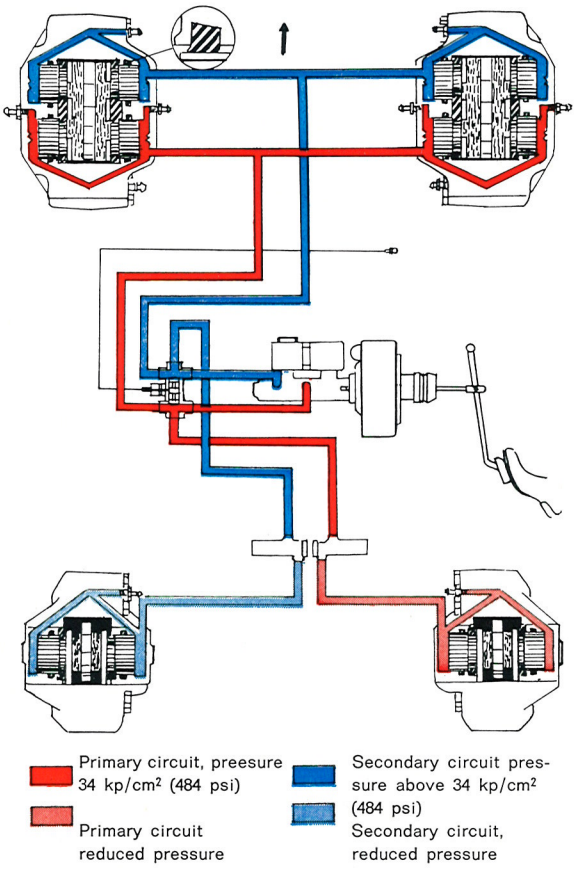

Fig. 5-12. Brake application

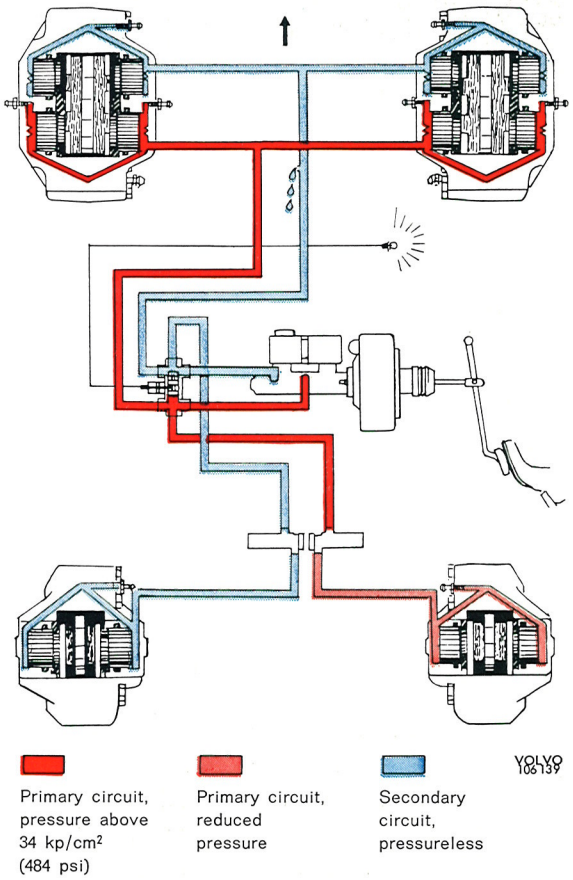

Fig. 5-13. Brake application, leakage in secondary circuit

BRAKE PAD REPLACEMENT

Volvo Standard Times Op. No. 51712:
pad replacement on all four wheels

The brake pads should be replaced when approx. 3 mm (1/8″) of the lining thickness remains. On no account may the linings be worn down to below 1.5 mm (1/16″).

1. Remove the hub caps and slacken the wheel nuts slightly.
2. Jack up the vehicle and put stands under the rear axle and front jack attachments. Remove the wheel nuts and lift off the wheels.

3a. Girling: Remove the hairpin-shaped locking clips for the guide pins. Pull out one of the lock pins while holding the damper springs in place. Remove the springs and the other lock pin.

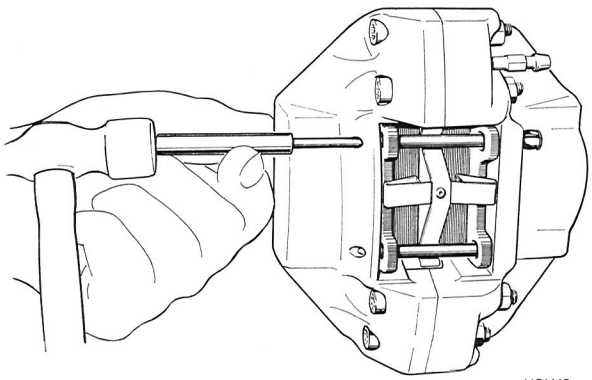

Fig. 5-14. Removing guide pin, ATE

3b. ATE: Tap out the upper guide pin wits a drift with diameter 2.5 mm (9/64″), see Fig. 5-14. Take out the tensioning spring. Tap out the lower guide pin.

4. Pull out the pads with tool 2917, see Fig. 5-15. If the used pads are to be re-installed, mark them to ensure they are restored to their original position.

5. Carefully clean out the cavity in which the pads are located. Replace any dust covers that are damaged. If dirt has penetrated into the cylinder due to a damaged cover, recondition the brake unit. Check the friction area of the brake disc. Grind off rust, the brake pads should not be used for such removal.

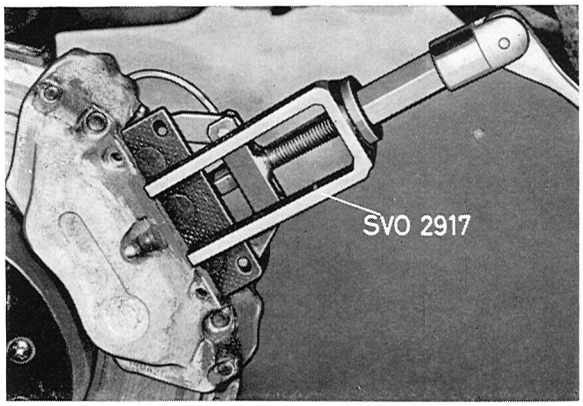

Fig. 5-15. Removing brake pads

6. To provide room for the new brake pads, press the pistons into the cylinders. The pistons can be pressed in evenly and without risk with tool 2809 according to Fig. 5-16. If done properly, the pistons can be pressed in perhaps more rapidly with another tool in the same way but, for example, if a screwdriver is used and wrongly applied, the pad, rubber seal and piston may be damaged. Note that when pressing in the pistons, the fluid brake level in the container rises so that the brake fluid can spurt out.

7. Rear wheel brakes ATE: Check to make sure the pistons are in the proper position to avoid brake squeal. The piston recess should incline 20° in relation to the lower guide area on the caliper. Check the position with template 2919, see Fig. 5-27. The tolerance is ±2°, that is, when the template is placed against the one recess, the distance to the other (meas. A) may be max. 1 mm (.039″).
   If necessary, adjust the location of the piston with tool 2918. To do this, move the tool into position, see Fig. 5-28, press it against the piston and force out the shoes by screwing in the handle. Turn the piston, release the tool and re-measure with the template.

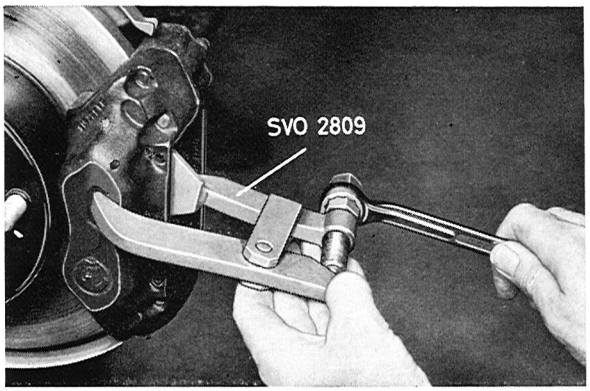

Fig. 5-16. Pushing in piston

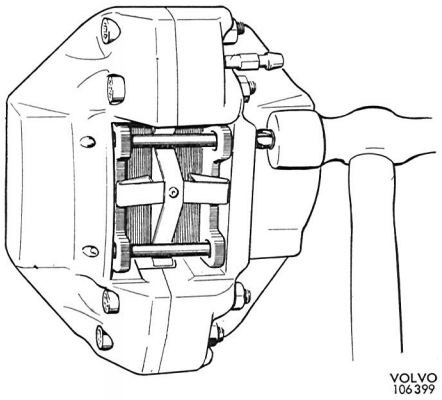

Fig. 5-18. Installation of guide pin, ATE

8a. Girling: Install the new pads. If the caliper previously has been equipped with intermediate plates between pad and caliper, they should be re-installed.

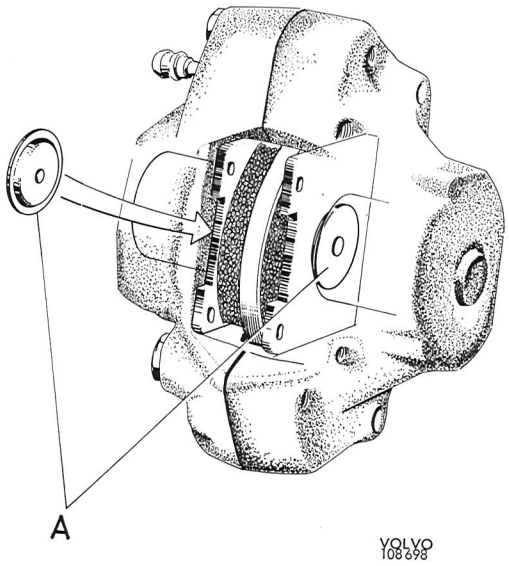

Fig. 5-17. Rear brake caliper
A. Damper washers

If, on the other hand, round damper washers previously have been installed, they should be re-installed, the smaller contact face towards the pad. Use a feeler gauge for the installation, never grease or glue.

Intermediate plates must not be installed in calipers equipped with round damper washers. Place one of the lock pins in position and install the damper springs and the other lock pin. Fix the pins with new locking clips. Check that the pads are movable.

8b. ATE: Install the new pads. Place one of the guide pins in position and tap it in with a hammer without help from a tool, see Fig. 5-18. NOTE: The guide pin must not be knocked in with a drift which has a smaller diameter than the pin since the tensioning sleeve can then shear off the pin flange. Install a new tensioning spring for the pads. Install the other guide pin while pushing in the tensioning spring. Check that the pads can move.

9. After replacing the necessary brake pads, depress the brake pedal several times to check that the movement is normal. Generally, the system does not require bleeding after replacing the brake pads.

10. Re-install the wheels after cleaning the contact surfaces and brake disc of sand, dirt, etc. Tighten the nuts sufficiently so that the wheels are securely held. Lower the vehicle and tighten finally the wheel nuts. Tighten each other nut a little at a time until all are finally tightened to a torque of 100—140 Nm (70—100 lb ft). Install the hub caps.

N.B. The function and lifetime of the linings wil benefit if lengthy and hefty braking is avoided in the beginning.

RECONDITIONING WHEEL BRAKE UNITS

When working with the hydraulic system, observe the instructions given under "Cleaning" and "Brake Fluid", Group 50.

Front brake calipers

REMOVAL

Replace = Volvo Standard Times Op. No. 52349

1. Remove the hub caps and slacken the wheel nuts slightly. Temporarily block the vent-hole in the brake fluid container cover to reduce leakage.

2. Jack up the front end and put stands under the front jack attachments. The control arms should be off-loaded so that the brake hoses can be installed in the correct position. Remove the wheel nuts and lift off the wheels.

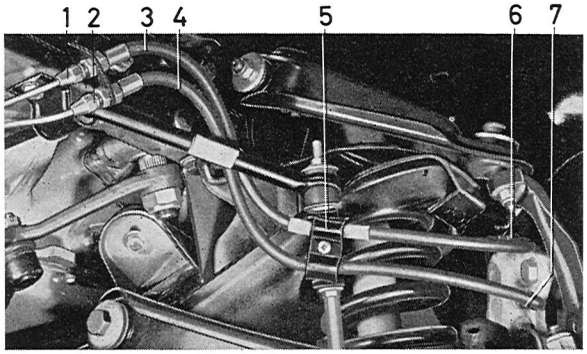

Fig. 5-19. Front brake hoses

1. Connection for the primary circuit
2. Connection for the secondary circuit
3. Upper brake hose
4. Lower brake hose
5. Clip
6. Connection for lower wheel unit cylinder
7. Connection for upper wheel unit cylinder

3. Remove the clip (5, Fig. 5-19). Disconnect the connection (2) and the lower hose (4) from the bracket. Place some kind of protective casing on the brake lines to prevent unnecessary leakage. Disconnect the connection (6) for the upper hose from the brake.
4. Remove the attaching bolts (5 and 7, Fig. 5-20) and the brake caliper.

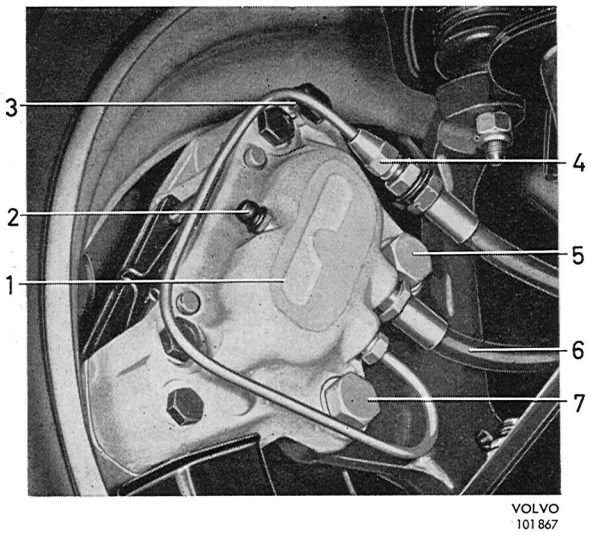

Fig. 5-20. Front wheel brake unit fitted

1. Front wheel brake caliper
2. Lower bleeder nipple
3. Upper bleeder nipple
4. Connection for lower wheel unit cylinder
5. Attaching bolt
6. Connection for upper wheel unit cylinder
7. Attaching bolt

DISASSEMBLY

1. Remove the brake pads, see ops. 3a and 3b under "Replacing brake pads".
2. Remove the retaining rings and the rubber dust covers. Place a wooden disc. see Fig. 5-3, between the pistons and press them out towards the disc with the help of an air line, see Fig. 5-21.

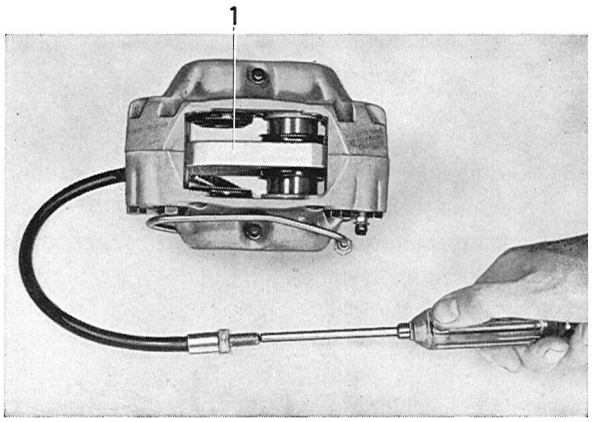

Fig. 5-21. Removing pistons

1. Wooden disc

The pistons can then be easily removed. If a piston feels stiff to remove so that more pressure is required, use air pressure, see Fig. 5-26. Lever off the rubber covers.

3. Remove the seals with a blunt tool. Be careful not to damage the edges of the grooves. Screw out the bleeder nipple and brake lines.

The brake caliper halves should not be separated. The reason for this is that subsequent assembly would require test pressure equipment and special fluid for the bolts.

INSPECTION

Before inspection, clean all the parts according to the instructions given under "Cleaning", Group 50. Make sure that the channels are clean.

The seals and rubber dust covers should be replaced whenever reconditioning takes place. If any of the cylinders are scored or scratched, or damaged in any way, the complete cylinder housing should be replaced. Inspect the other parts and replace any that are damaged or worn.

Check also the brake disc, see under "Brake Disc".

ASSEMBLY

1. Coat the working surfaces of the pistons and cylinders with brake fluid.
2. Install the seals in the cylinders.
3. Install the pistons with the large diameter end facing inwards. Make sure that the pistons are installed straight and are not scratched.
4. Install the rubber cover on the piston and housing. Install the lock rings, see Fig. 5-22.

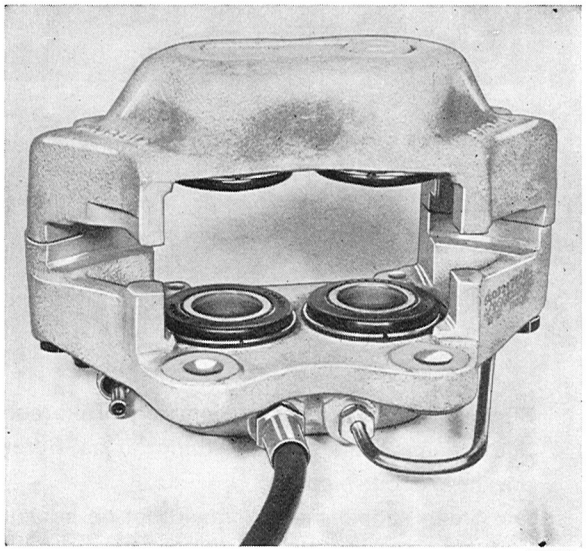

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Fig. 5-22. Front brake caliper assembled

5. Install the brake pads, see ops. 8a and 8b under "Replacing brake pads".
6. Install the bleeder nipples and also the brake lines.

INSTALLATION

1. Position the calipers. Check that the contact surfaces of the retainer are clean and not damaged. Check the location of the brake caliper in relation to the brake disc. Axial deviation is checked by measuring with a feeler gauge on both sides of the disc the distance between disc and caliper support nib. The difference in measurement is max. .55 mm (.010″). The caliper should be parallel with the disc. This is checked by measuring the distance to the upper and lower support nibs in the caliper. The location of the brake caliper can be adjusted with shims, which are available in thicknesses of .2 and .4 mm (.008 and .016″). Install the attaching bolts after they have been coated with a couple of drops of Loctite, type AV. Check that the brake disc can rotate easily in the brake pads.
2. Install the hoses and their connections as well as the guide clip, see Fig. 5-19. It is important that the hoses are installed correctly, thas is, without being tensioned and with the control arms off-loaded. Remove the plug for the vent-hole in the brake fluid container cover.
3. Install the wheel after the contact surfaces have been cleaned of dirt, etc., and then tighten the nuts sufficiently so that the wheel cannot be displaced on the hub. Lower the vehicle and tighten the wheel nuts. Tighten every other nut a little at a time until all are finally tightened to a torque of 100—140 Nm (70—100 lb ft). Install the hub cap.
4. Bleed the brake system, see Group 52.

Rear brake calipers

Replace = Volvo Standard Times Op. No. 52353

REMOVAL

1. Remove the hub caps and slacken the wheel nuts sligthly. Tempararily plug the vent-hole in the brake fluid container cap to reduce leakage.
2. Jack up the rear end and put stands under the rear axle. Remove the wheel nuts and the wheel. Release the parking brake.

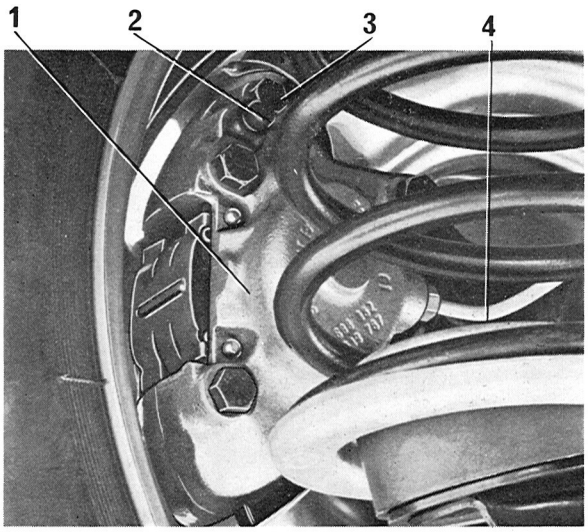

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Fig. 5-23. Rear wheel brake unit fitted

1. Rear wheel brake caliper
2. Bleeder nipple
3. Attaching bolt
4. Brake line

3. Disconnect the brake line connection (2, Fig. 5-23) and install the protective cover. Remove the attaching bolts (1 and 3). Lift off the brake caliper, see Fig. 5-24.

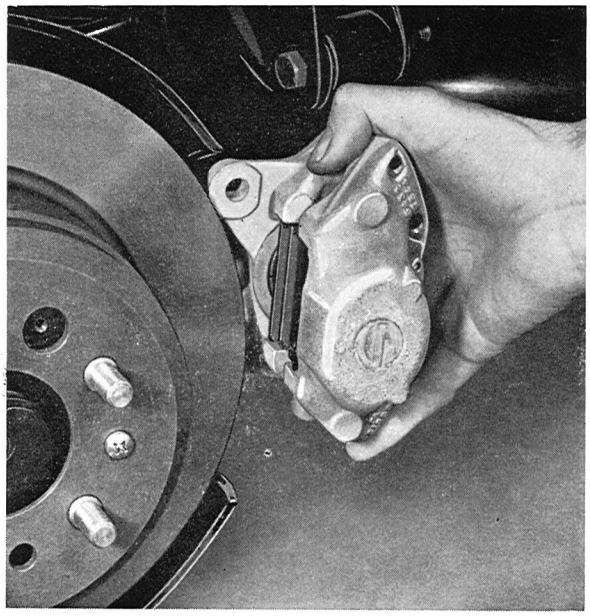

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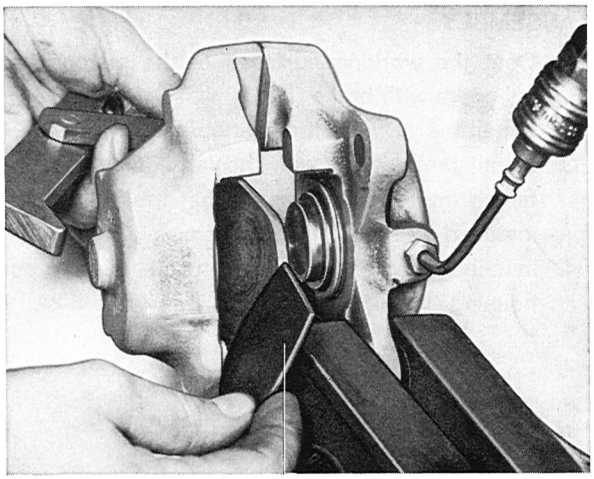
Fig. 5-24. Removing rear brake caliper



A

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Fig. 5-26. Removing piston
A=rubber dust cover

DISASSEMBLY

1. Remove the brake pads, see 3a and 3b under "Replacing the brake pads".
2. Remove the retaining ring and the rubber dust covers. Place a wooden disc, see Fig. 5-3, between the pistons and press them out towards the disc, using air pressure, see Fig. 5-25. The pistons can then be easily removed. Lever off the rubber covers.

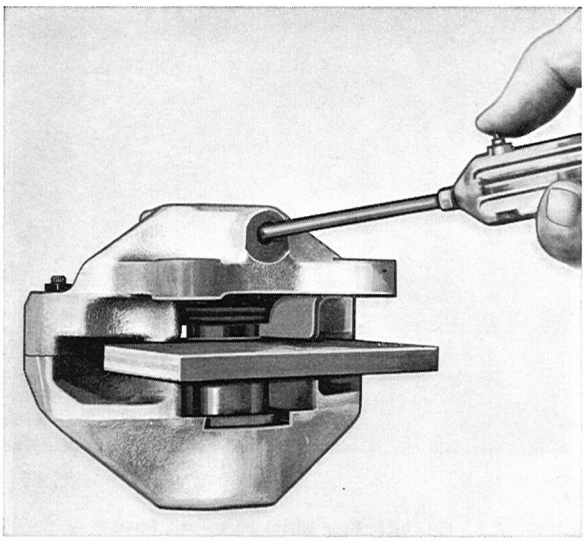

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Fig. 5-25. Removing piston

3. If a piston feels stiff to remove, use air pressure, see Fig. 5-26. If one of the pistons is removed, the cylinder can be sealed by means of a rubber washer and 2809 (see Fig. 5-26).
4. Remove the seals with a blunt tool. Take care not to damage the edges of the grooves. Screw out the bleeder nipple.
   The brake caliper halves should not be separated. The reason for this is that subsequent assembling would require test pressure equipment and special fluid for the bolts.

INSPECTION

Before inspecting clean all the parts according to the instructions given under "Cleaning", Group 50. Make sure that the channels are clean.
Seals and rubber dust covers are replaced after each reconditioning. If any of the cylinders is scored, scratched, etc., the entire cylinder housing must be replaced complete. Inspect the other parts and replace any that are damaged or worn.
Also check the brake disc, see under "Brake Disc".

ASSEMBLY

1. Coat the working surfaces of the pistons and cylinders with brake fluid.
2. Install new seals in the cylinders.

3a. Girling: Install one of the pistons in the caliper. Make sure that the piston is installed straight and is not scratched.

3b. ATE: Check to make sure the pistons are in the proper position to avoid brake squeal. The piston recess should incline 20° in relation to the lower guide area on the caliper. Check the location with template 2919, see Fig. 5-27. The tolerance is ±2°, that is, when the template is placed against the one recess, the distance to the other (meas. A) may be max. 1 mm (.039″).

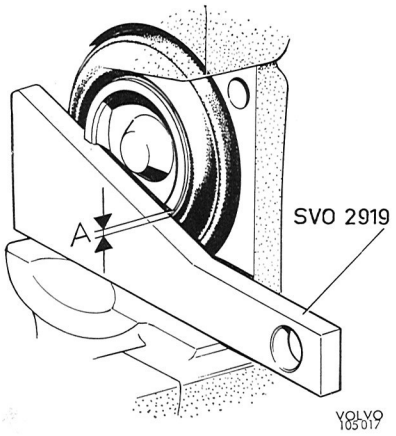

Fig. 5-27. Checking location

If necessary, adjust the location of the piston with tool 2918. To do this, move the tool into position see Fig. 5-28, press it against the piston and force out the shoes by screwing in the handle. Turn the piston, release the tool and re-measure with the template.

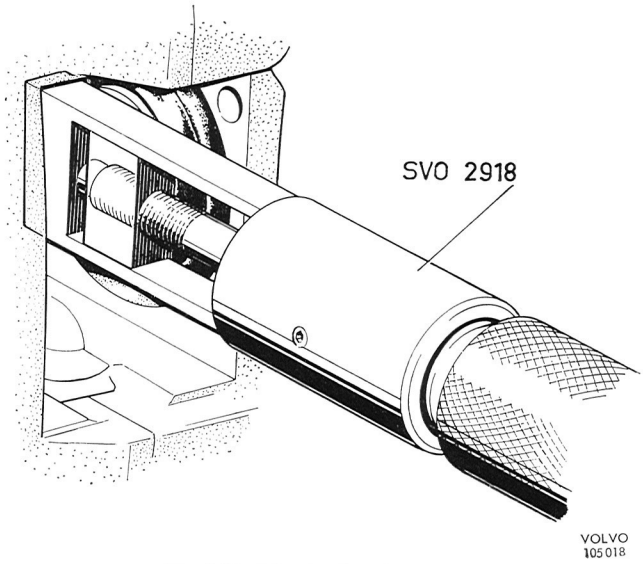

Fig. 5-28. Adjusting location

4. Install and test the other piston in the same way as above. Place the new rubber dust covers on the piston and housing. Install the new retaining rings.
5. Install the brake pads, see 8a and 8b under "Replacing brake pads".
6. Screw in the bleeder nipple.

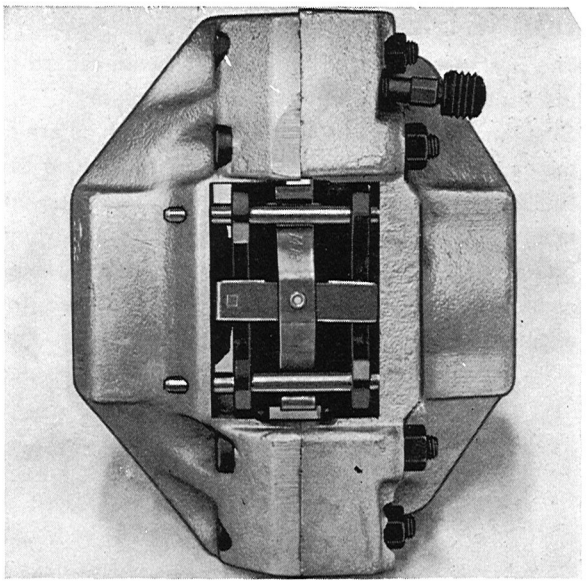

Fig. 5-29. Rear brake caliper assembled

INSTALLATION

1. Position the caliper. Check that the contact surfaces of the retainer are clean and not damaged. Check the location of the brake caliper in relation to the brake disc when the drive shaft is at the outer position within the clearance limits. Axial deviation is checked by measuring with a feeler gauge on both sides of the disc the distance between disc and caliper support nib. The difference in measurement is .25 mm (.010″). The caliper should be parallel with the disc. This is checked by measuring the distance to the upper and lower support nibs on the caliper. The brake caliper location can be adjusted with shims, which are available in thicknesses between .6 and 1.8 mm (.024 and .072″). Coat the attaching bolts with a couple of drops of Loctite, type AV, and then install them.
2. Connect the brake line, see Fig. 5-23. Remove the plug for the vent-hole in the brake fluid container cover.
3. Clean the wheel contact surfaces and disc before installation of the wheel. Tighten the wheel nuts so much that the wheel cannot be moved. Lower the vehicle and tighten the wheel nuts finally. Tighten each other nut a little at a time until all are finally tightened to a torque of 100—140 Nm (70—100 lb ft). Install the hub cap.
4. Bleed the brake caliper, see Group 52.

BRAKE DISC

The brake disc should be examined with regard to the friction surface, run-out and thickness.

Small marks on the friction surface or linings are of minor importance, but radial scratches reduce the braking effect and increase pad wear. The run-out must not exceed .1 mm (.004″) for the front wheel brakes and .15 (.006″) for the rear wheel brakes at the outer edge of the disc and is measured, for example, according to Fig. 5-30. Check first that the wheel bearings are correctly adjusted and that the disc fits securely on the hub. The thickness is measured with, for example, a micrometer. It should not vary more than .03 mm (.0012″) when the disc is rotated one turn, since this can cause a vibrating brake pedal.

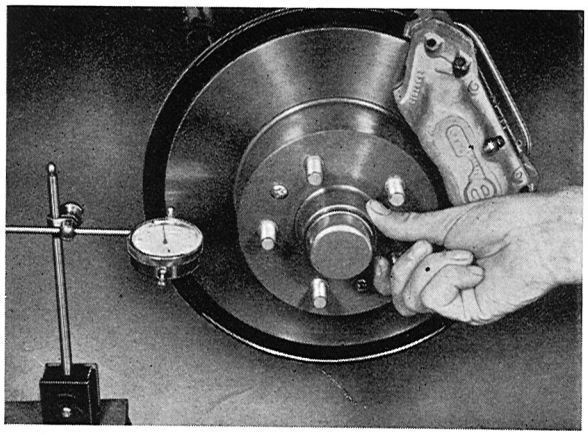

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Fig. 5-30. Checking run-out

If a fault is discovered during the above-mentioned inspection, the brake disc should be replaced. When doing this, the brake caliper should first be removed. Then remove the lock bolts and lift off the brake disc, see Figs. 5-31 and 5-85. Tap on the inside of the disc with several light blows from a plastic hammer or similar tool.

If for some reason a new brake disc is not available, the old one can be reconditioned by fine-polishing or fine-turning. Accurate disc aligning is required and the turning should be equal on both sides.

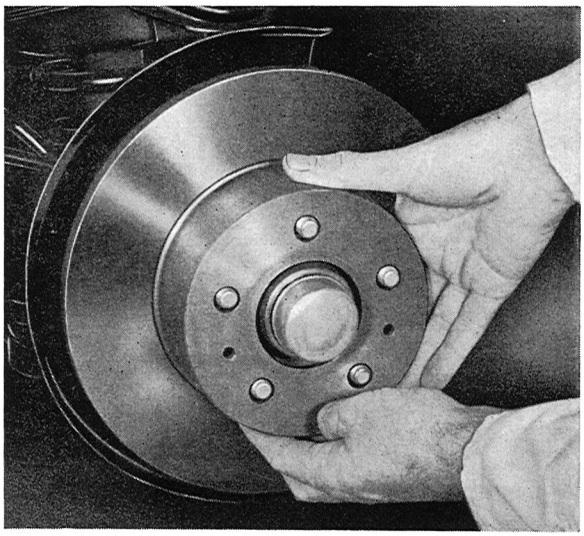

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Fig. 5-31. Removing brake disc

After the turning, the disc thickness may not be 1.2 mm (.48″) less than the original thickness, see "Specifications". The surface finish should be max. 3 μ measured on an arbitrary diameter and max. 5 μ measured radially. After the reconditioning, the disc throw may not exceed .1 mm (.004″) and its thickness may not vary more than .03 mm (.0012″).

GROUP 52

HYDRAULIC FOOTBRAKE SYSTEM

GENERAL INFORMATION

MASTER CYLINDER

The master cylinder is of the tandem type and its construction is shown in Fig. 5-32. Its function is the following:

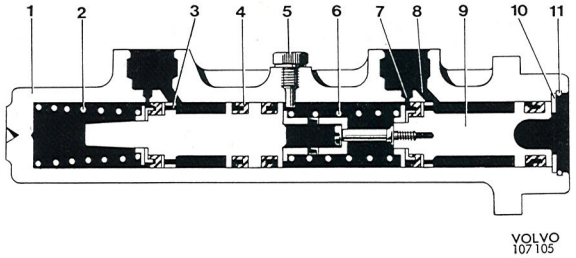


Fig. 5-32. Master cylinder

1. Cylinder
2. Return spring for secondary piston
3. Secondary piston
4. Piston seal
5. Stop screw
6. Return spring for primary piston
7. Equalizing hole
8. Overflow hole
9. Primary piston
10. Thrust washer
11. Circlip

When the system is at rest (Fig. 5-33), the pistons are kept pressed back by the force of the springs. When the pistons are in this position, the connections between the fluid brake container and wheel brake units are open. At the moment braking takes place, the primary piston (to the right) is pressed in by the piston rod. This closes the connection to the container and the pressure in front of the piston rises. This pressure influences the secondary piston so that it is also moved to the left. The same overpressure arises in front of both pistons (Fig. 5-34),

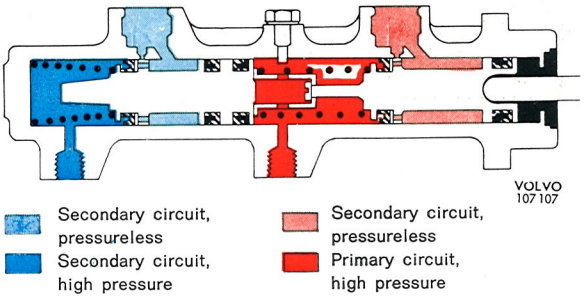


Fig. 5-34. Normal brake application

the brake fluid is forced out into the respective brake line and the wheel brakes are applied, providing the system is functioning properly.

If a leakage has occurred in the secondary circuit, no hydraulic counterpressure builds up in front of the secondary piston. Instead, this piston is moved inwards when the brakes are applied until it is stopped by the end of the cylinder (Fig. 5-35).

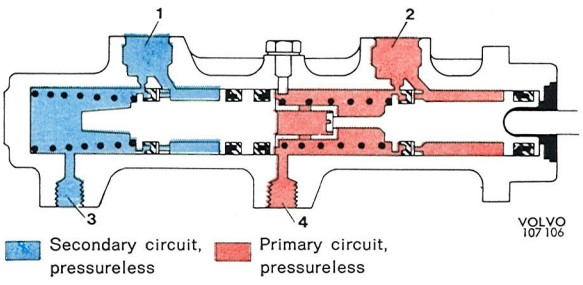


Fig. 5-33. Rest position

1. and 2. Connections for brake fluid container
3. Connection for primary circuit
4. Connection for secondary circuit

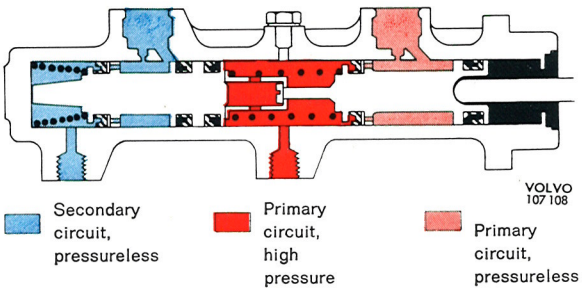


Fig. 5-35. Brake application with leakage in secondary circuit

The hydraulic pressure between the pistons can then rise and apply the brakes in the primary circuit. If leakage occurs in the primary circuit, the primary piston is moved and the brakes are applied until the primary piston makes contact with the secondary piston. Both pistons are then pressed inwards, the pressure in front of the secondary plunger rises and the brakes in the secondary circuit are applied (Fig. 5-36).

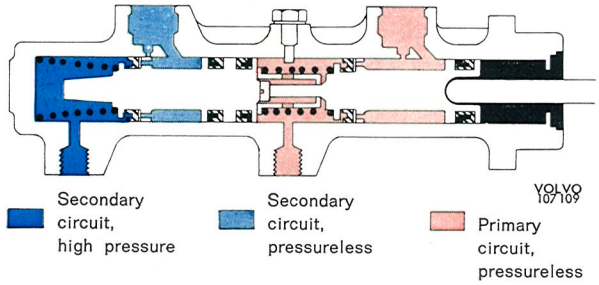


Fig. 5-36. Brake application with leakage in primary circuit

WARNING VALVE

The footbrake system is equipped with a warning valve. The construction is shown in Fig. 5-37. Its function is to warn the driver when the pressure difference between the two brake circuits exceeds about 10 kp/cm² (142 psi). The valve operates as follows:

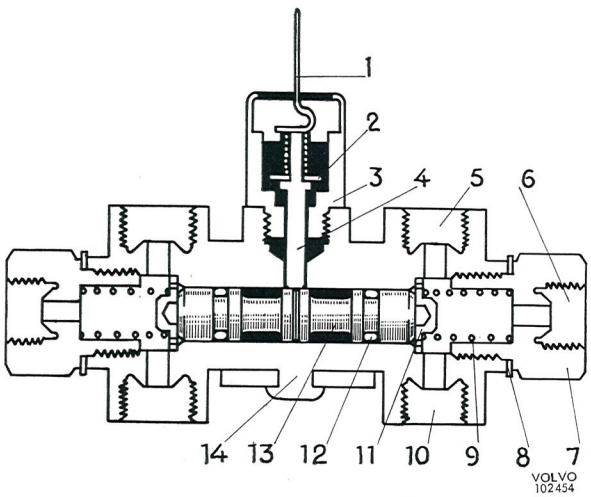


Fig. 5-37. Warning valve

1. Electrical connection
2. Switch washer
3. Switch housing
4. Guide pin
5. Connection, rear wheel brakes
6. Connection, master cylinder
7. End piece
8. Sealing washer
9. Spring
10. Connection, front wheel brakes
11. Thrust washer
12. O-ring
13. Piston
14. Housing

If there is no fault in the circuits and the brakes are applied, the hydraulic pressure on the pistons is largely the same on both sides (Fig. 5-38). But should, for example, the pressure in the secondary circuit be somewhat higher than in the primary circuit, this will try to displace the pistons to the right in the figure. This lifts the thrust washer (11) and the pressure of the spring (9) counteracts the displacement.

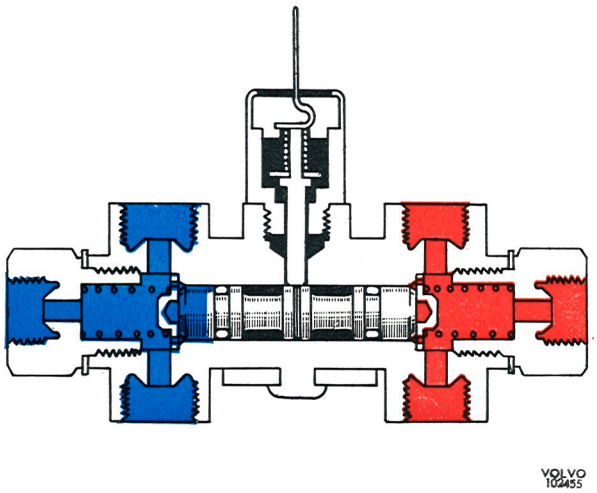


Fig. 5-38. Normal position

It is only when the pressure in the secondary circuit first exceeds that in the primary circuit by about 10 kp/cm² (142 psi) that the pistons are pushed so far to the right that the guide pin (4) can be pressed downwards. When this happens, the switch washer (2) reaches the housing (3) and current is cut in (Fig. 5-39). If the circuits are made pressureless, the guide pin is prevented from returning to its normal position. This can happen by screwing out the warning switch (3).

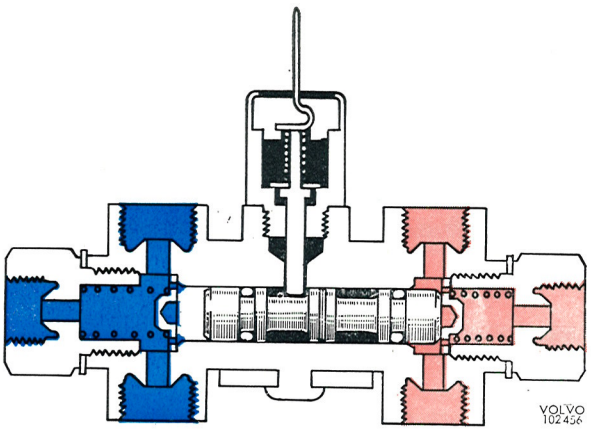


Fig. 5-39. Warning position

BRAKE (REDUCER) VALVE

A brake valve is connected to each of the rear wheel brake lines, see Fig. 5-6. When the ingoing brake pressure exceeds 34 kp/cm²=485 psi (145, 50 kp/cm²=710 psi) a reduction takes place in the valve. The more powerful the pedal pressure, the greater the reduction and thereby the larger the difference between the hydraulic pressure in the front wheel and rear wheel cylinders. This results in a suitable distribution of braking force between both pairs of wheels. The construction of the brake valve is shown in Fig. 5-40 and its function is the following:

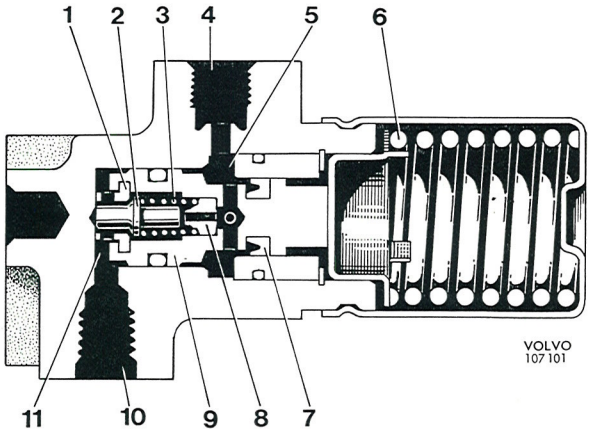


Fig. 5-40. Brake valve, construction

1. Valve seat
2. Valve
3. Valve spring
4. Connection to master cylinder
5. Cylinder
6. Spring
7. Piston seal
8. Equalizing valve
9. Piston
10. Connection to rear wheel brake cylinders
11. Cylinder

When the footbrakes are applied, the pressure from the master cylinder is transmitted via the connection (4, Fig. 5-40). The pressure then proceeds through the cylinder (5), the counterbore, past the valves (8) and (2) to cylinder (11) and then on through connection (10) to the rear wheel cylinders, see Fig. 5-41. The hydraulic pressure per unit surface is equal on the different parts of the piston (9), but since its pressure surface is larger in cylinder (11) than in cylinder (5), the force developed will move the piston to the right of the figure. However, this is counteracted by the pressure from the spring (6).

When the hydraulic pressure approaches 34 kp/cm² =485 psi (145, 50 kp/cm²=710 psi) the spring pressure is overcome and the piston (9) is moved to the right. By means of pressure from the smaller spring (3), the valve (2) shuts off the connection between the two cylinders and forms two separate systems, one for the front wheels and one for a rear wheel.

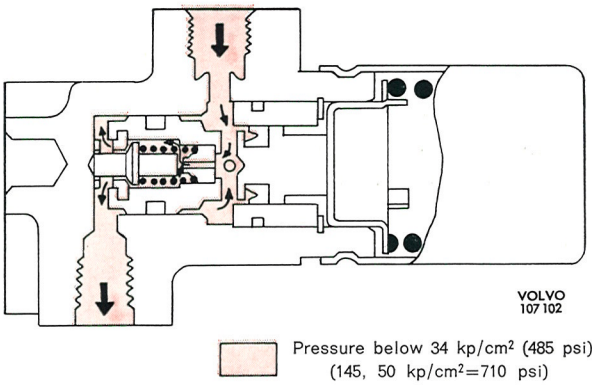


Fig. 5-41. Brake application

With continued increase in pressure in the master cylinder and front wheel cylinders, the hydraulic pressure in cylinder (5) moves the piston to the left so that the valve rod comes up against its stop and opens the valve, this causing the pressure in cylinder (11) to increase. Due to the larger pressure surface in this cylinder, the plunger is moved to the right again and the valve closes. In this way, the piston assumes a position of balances and the outgoing pressure from the brake valve will be lower than the incoming pressure, see Fig. 5-42. The difference in these pressures is determined by the different areas and spring tension.

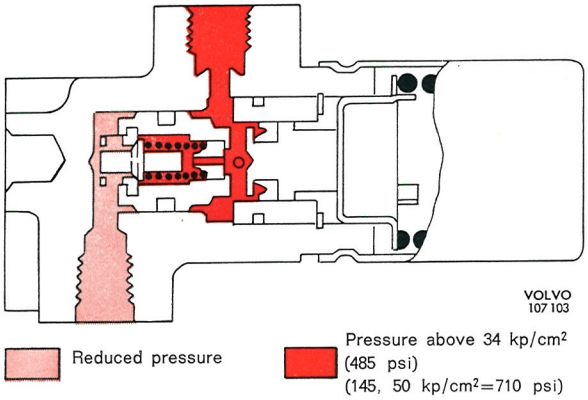


Fig. 5-42. Reducing action

When the brake pedal is released, the pressure in the line (4) falls. The piston (9) is moved to the right by the spring (6). When the pressure on the right-hand side of the valve (2) falls so much that the hydraulic pressure on the left-hand side enables the valves to be actuated, the connection between both the cylinders is opened again. As the pressure falls, the spring (6) presses the left piston back to its original position where the valve is held in the open position by mechanical means, see Fig. 5-41. The equalizing valve (8) is provided with control channels which ensure an even flow of pressure through the valve.

MASTER CYLINDER

Replace master cylinder = Volvo Standard
Times Op. No. 52114

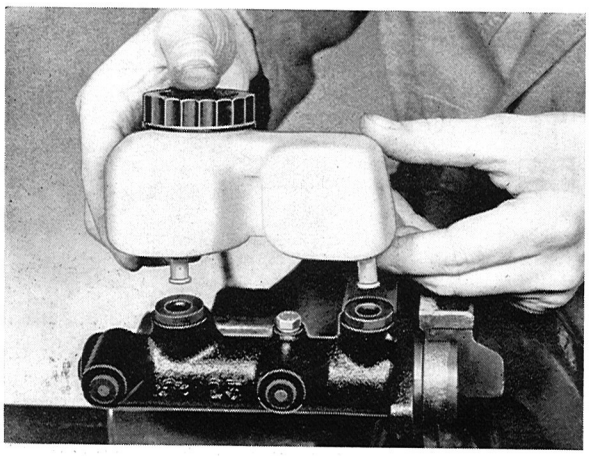
With regard to repair work on the hydraulic system, the instructions given under "Cleaning" and "Brake Fluid", Group 50, should be observed. When the master cylinder is removed, the brake pedal should not be depressed because the resulting abnormal position for the parts of the servo cylinder can cause damage.

REMOVAL

1. Place a cover over the mud guard and rags under the master cylinder in order to avoid possible damage to the paintwork should the brake spill over.
2. Remove the lines from the master cylinder and plastic plugs.
3. Remove the two attaching nuts for the master cylinder and lift the cylinder forwards.
   Remove the brake fluid.

DISASSEMBLY

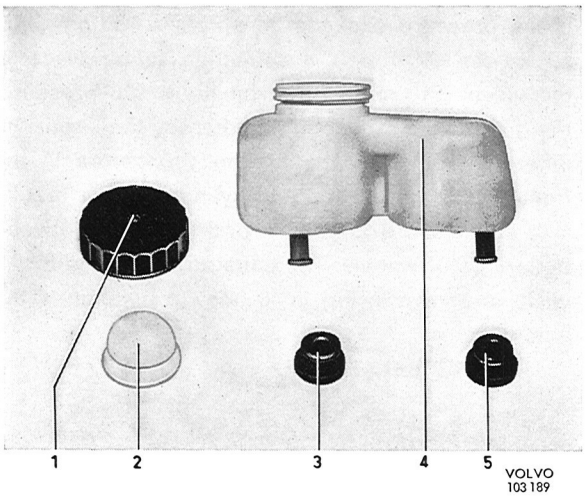
1. Fix the flange of the master cylinder firmly in a vise.
2. Place both hands under the container and pull it up from the rubber seals, see Fig. 5-43.



VOLVO 103188

Fig. 5-43. Removing container

   Remove the filler cap and strainer from the container and also the rubber seals from the cylinder see Fig. 5-44.
3. Remove the stop screw. Remove the circlip from the primary piston with the help of circlip pliers. Remove the pistons. If it is not possible to shake out the secondary piston, it can be removed by blowing air in the hole for the brake switch.
4. Remove the seals from the secondary piston. Be careful not to damage the surface of the plunger.



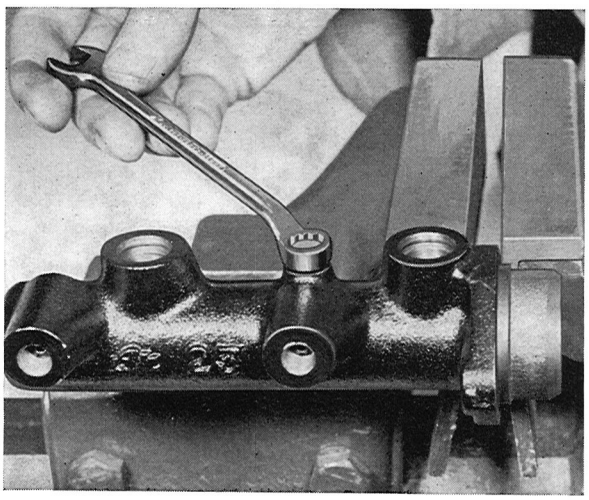
VOLVO 103189

Fig. 5-44. Container parts

1. Filler cap
2. Strainer
3. Rubber seal
4. Container
5. Rubber seal

INSPECTION

Before inspecting, all the parts should be cleaned according to the instructions given under "Cleaning", Group 50.



VOLVO 103190

Fig. 5-45. Removing stop screw

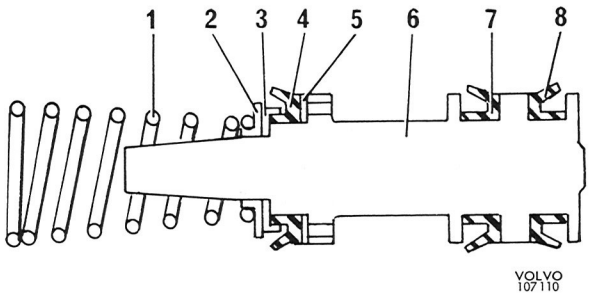


Fig. 5-46. Secondary piston

1. Spring
2. Spring plate
3. Back-up ring
4. Piston seal
5. Washer
6. Piston
7. Piston seal
8. Piston seal

Examine the inside of the cylinder carefully. If scored or scratched, the cylinder should be replaced. Rust and similar damage can as a rule be eliminated by honing the cylinder. The procedure for this varies with different brands of tools so that no general description can be given. Follow, therefore, the instructions of the manufacturer. Clean the cylinder carefully after honing and check that the holes are clear.

If wear on the cylinder or secondary piston is suspected, the diameter should be measured with a micrometer or indicator. The cylinder diameter may not exceed 22.40 mm (.881″), while the diameter of the piston must not be less than 22.05 mm (.870″). With each reconditioning, the piston parts in the repair kit replace the used ones. Also replaced is the stop screw, its washer and lock ring. The rubber seals and washers for the container should also be changed.

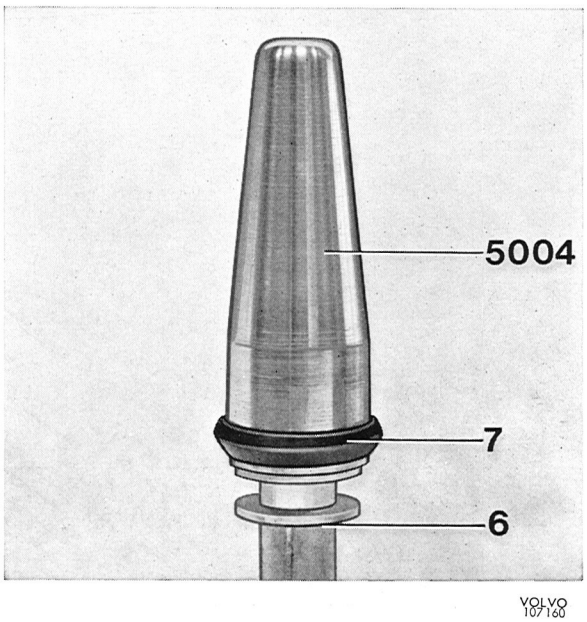


Fig. 5-47. Installation of piston seal

6. Piston
7. Piston seal

ASSEMBLY

1. Install the parts on the secondary piston, see Figs. 5-46 and 5-47. Make sure that the piston seals are turned correctly.
   Use tool 5004 to install seals 7 and 8. Apply brake fluid to the sleeve and seal and press the seal onto the sleeve. Then place the tool on the piston, see Fig. 5-47, and push on the seal. With the tool adjusting screw, adjust to a suitable position when inner and outer seals are installed.
2. Coat the cylinder with brake fluid and dip the piston and seals in brake fluid before installation. Slide the spring onto the secondary piston and install the piston.
   Be careful when inserting the seals in the cylinder.

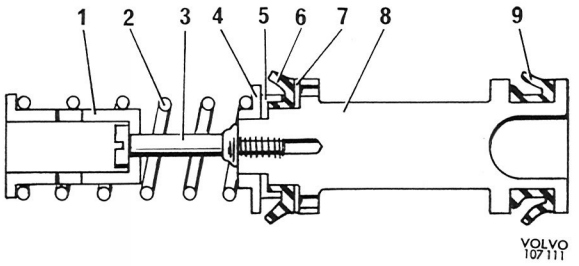


Fig. 5-48. Primary piston

1. Sleeve
2. Spring
3. Screw
4. Thrust washer
5. Back-up ring
6. Piston seal
7. Washer
8. Piston
9. Piston seal

3. Assemble the new primary piston according to Fig. 5-48 and install it as shown in Fig. 5-49. Press in the piston and install washer (10, Fig. 5-32 and circlip (11).

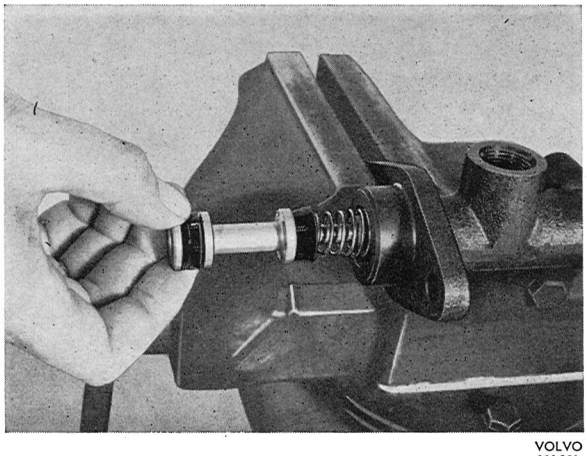


Fig. 5-49. Installation of primary piston

4. Check that the hole for the stop screw is clear and install screw (5) and sealing washer. The tightening torque should be 10—12 Nm (7—9 lb ft).
5. Check the movement of the pistons and make sure that the through-flow holes are clear. The equalizing hole is checked by inserting a soft copper wire with diameter .5 mm (25 s.w.g.) through the hole, see Fig. 5-50. If the equalizing hole is not clear, then the master cylinder is generally wrongly assembled.

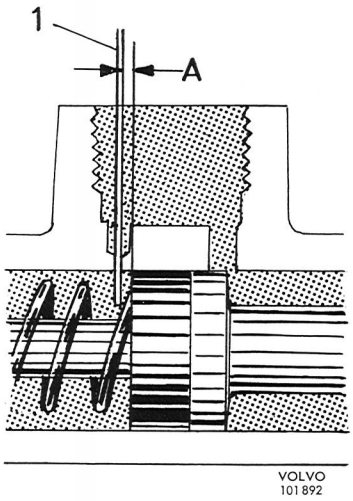


Fig. 5-50. Checking equalizing hole
.5 mm (25 s.w.g.) soft copper wire
A=approx. .5 mm (.020")

6. Install rubber seals (3 and 5, Fig. 5-44). Check that the vent-hole (2, Fig. 5-58) in the cap is clear and install the strainer (2) and filler cap in position. Install container, compare Fig. 5-43.

INSTALLING

1. Install master cylinder in position and then the washers and attaching nuts.
2. Connect the pipes, see Fig. 5-51.
3. Bleed the entire brake system.

WARNING VALVE

NORMALIZING PISTONS

1. Disconnect the electrical wire and screw out the warning switch (Fig. 5-52) so that the pistons return to normal position.
2. Repair and bleed the faulty hydraulic circuit.
3. Screw in the warning switch to a torque af 14—20 Nm (10—15 lb ft). Connect the electrical wire.

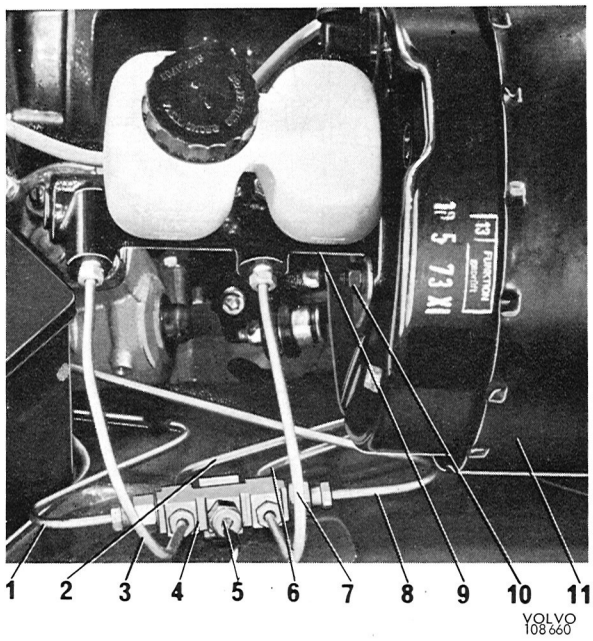


Fig. 5-51. The master cylinder installed

1. To 6-branch union, lower
2. To left brake valve
3. From secondary circuit (master cylinder)
4. Warning valve
5. Warning switch
6. To right brake valve
7. From primary circuit (master cylinder)
8. To 6-branch union, upper
9. Master cylinder
10. Attaching nut
11. Power cylinder

REPLACING WARNING VALVE

Disconnect all connections. Remove the attaching nut and then the valve. Install in reverse order to removal.

Fig. 5-51 shows the different connections. Bleed the brake system.

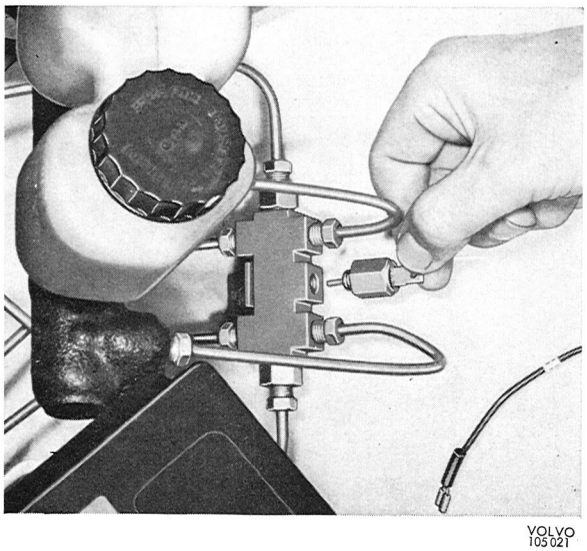


Fig. 5-52. Removing warning switch

BRAKE (REDUCER) VALVES

Replace brake reducer valve, one side, excl. bleed = Volvo Standard Times Op. No. 52431

CHECKS

For checking the brake valve with tester 2741, see page 5:4, Pos. 9. The valve cannot be repaired if defective and must be replaced.

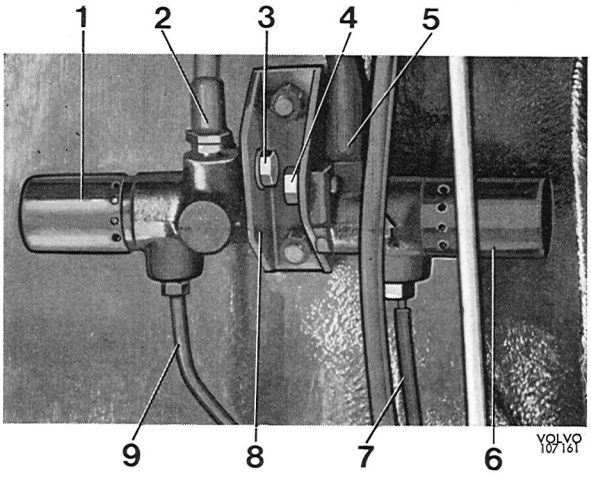


Fig. 5-53. The brake valves installed

1. Left brake valve
2. Brake hose to left rear wheel
3. Attaching screw
4. Attaching screw
5. Brake hose to right rear wheel
6. Right brake valve
7. From the master cylinder
8. Bracket
9. From the master cylinder secondary circuit

REPLACEMENT

1. Unscrew and plug the connection (9, Fig. 5-53) of the brake pipe. Loosen the brake hose (5) a maximum 1/4 turn at the valve. Remove the attaching screw and the valve from the brake hose, see Fig. 5-54.

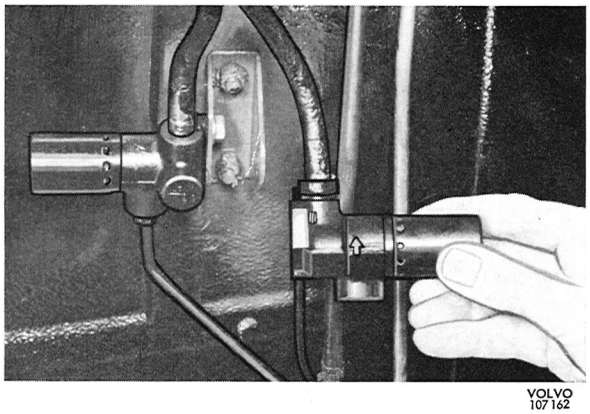


Fig. 5-54. Removing brake valve

2. Screw the new brake valve onto the brake hose with new seal, compare Fig. 5-54. Position the valve and check that there is no tension in the hose. Install the attaching screw and connect the brake pipe. Tighten the connection. Bleed the brake system.

BRAKE LINES

CLEANING

The brake lines can be cleaned by flushing them with brake fluid or alcohol and then by blowing them clean with moisture-free, filtered, compressed air. The purpose of this is to remove all brake fluid and dirt particles and should be made in connection with the complete reconditioning of the hydraulic system and a new fitting.

When complete reconditioning is being made the brake service unit (see Group 50) can suitably be connected to the master cylinder and then the system emptied through the bleeder nipple. The system should therefore be flushed with alcohol, after which it should be blown clean with compressed air. When such a reconditioning has been made the components of the hydraulic system should be taken out and checked to ensure that any dirt and flushing fluid have been effectively removed.

NOTE: See the general instructions in Group 50 for requirements concerning the cleaning agent. Do not top up with brake fluid which has been drained from the system.

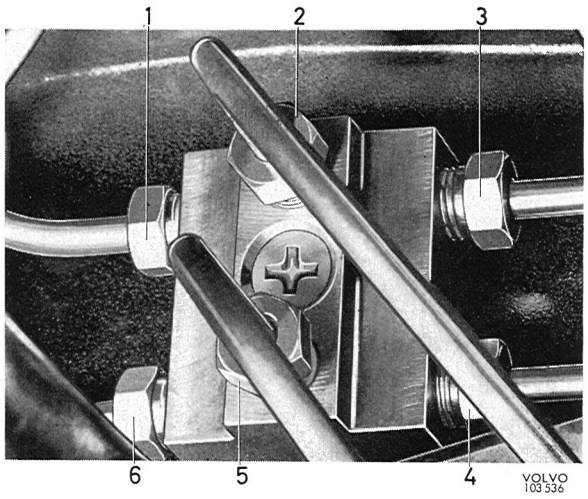


Fig. 5-55. 6-branch union connections

1. Primary circuit of the master cylinder
2. Left, lower wheel unit cylinder
3. Right, lower wheel unit cylinder
4. Right, upper wheel unit cylinder
5. Left, upper wheel unit cylinder
6. Secondary circuit of the master cylinder

REPLACING BRAKE LINES

If leakage occurs or if the brake lines have been exposed to such external damage that leakage or blockage can result, the damaged lines should be replaced according to the instructions given below. If the replacement concerns the front brake hoses, it should be made with no load on the front wheels.

1. To prevent unnecessary spilling of brake fluid, the existing filter cap on the master cylinder container should be temporarily replaced with one without a vent-hole.
2. Clean round the connections and remove the damaged brake line.
3. Take a completely new brake line, blow it clean internally with moisture-free, filtered, compressed air and fit it. Make sure that the brake line lies in such a position that it does not chafe against anything during driving. Particularly important points are where the pipes pass the steering rod, where they must not come nearer than 10 mm (3/8″). If the pipe is not bent correctly, it should be adjusted manually before being installed. Bending a pipe which is already connected often results in deformation at the connections. The front brake hoses may only be installed according to Fig. 5-19 and always with the linkage arms unloaded. Do not forget the clips.
4. Bleed the brake system according to the instructions below. Then re-install the filler cap with the vent-hole on the container.

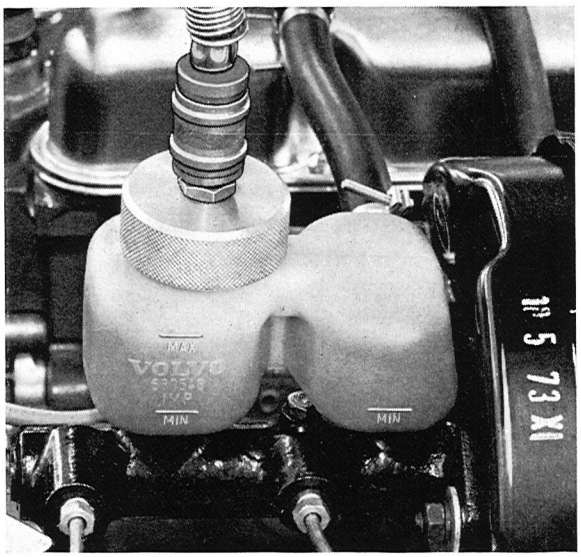


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Fig. 5-56. Connecting bleeder unit

When filling oil, the following should be observed: The brake fluid must fulfil the requirements according to DOT 3 or DOT 4. Brake fluid with the designation SAE J 1703 can also be used. Brake fluid which has been bled from the system must under no circumstances be returned to the bleeder unit or the brake fluid container. Bleeding of the eintire brake system is as follows:

BLEEDING HYDRAULIC SYSTEM

Bleed all four wheel brakes = Volvo Standard Times Op. No. 52037

A sign that there is air in the system is that the brake pedal can be depressed without any appreciable resistance, or it feels spongy.

As soon as any part of the system has been removed, bleeding must be made. Air can also enter the system if there is too small a quantity of brake fluid in the container. If only one rear brake caliper has been removed and little brake fluid runs out, it is generally only necessary to bleed the brake caliper. Otherwise, bleed the entire system. When bleeding or other similar work is being made, no brake fluid must be permitted to come into contact with the friction surfaces or linings. Avoid spilling any fluid on the paintwork as this can damage it.

Should the car be placed on stands during the bleeding, the rear end ought to be raised higher than the front end.

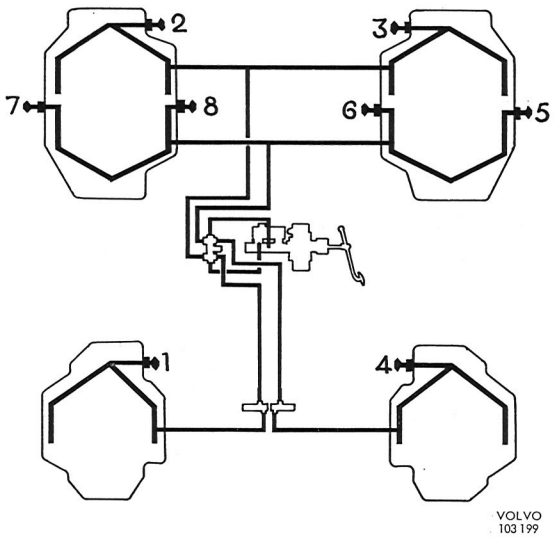

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Fig. 5-57. Bleeding sequence

1. Left rear wheel
2. Left front wheel, upper, inner
3. Right front whel, upper, inner
4. Right rear wheel
5. Right front wheel, outer
6. Right front wheel, lower, inner
7. Left front wheel, outer
8. Left front wheel, lower, inner

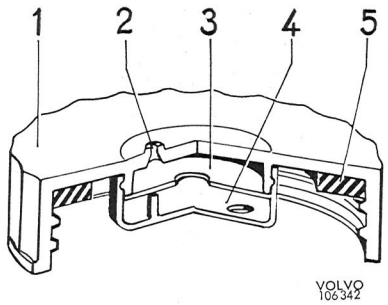


Fig. 5-58. Cover

1. Cover
2. Vent-hole
3. Washer
4. Casing
5. Gasket

BLEEDING WITH BLEEDER UNIT

1. Check to make sure there is full return on the brake pedal and that not mats or similar prevent full travel (about 140 mm=5 1/2″) from being utilized during the bleeding. Depress the brake pedal several times to even out any underpressure in the servo cylinder and in this way disconnect it.
2. Clean round the cap on the brake fluid container, also round the contact on the warning valve. Remove the warning switch,. see Fig. 5-52 Fill if necessary with brake fluid to the "Max" mark on the container.
3. Use a special container cap when bleeding, see Fig. 5-56. This cap can be obtained fram AB Volvo Service Department. Connect the bleeder unit according to the instructions of the manufacturer. The working pressure is 2 kp/cm² (28.4 psi). The type of bleeder unit which may be used is shown in Fig. 5-56.
4. Bleeding should be made in the order shown in Fig. 5-57.
   When bleeding, remove the protective cap and use the bleeder 2971, see Figs. 5-59 and 5-60.

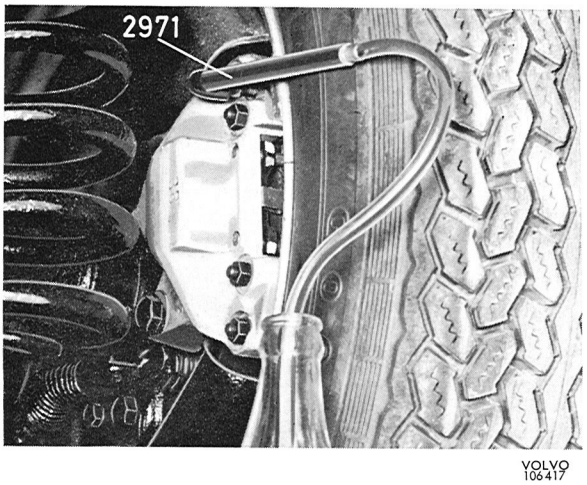


Fig. 5-59. Bleeding caliper

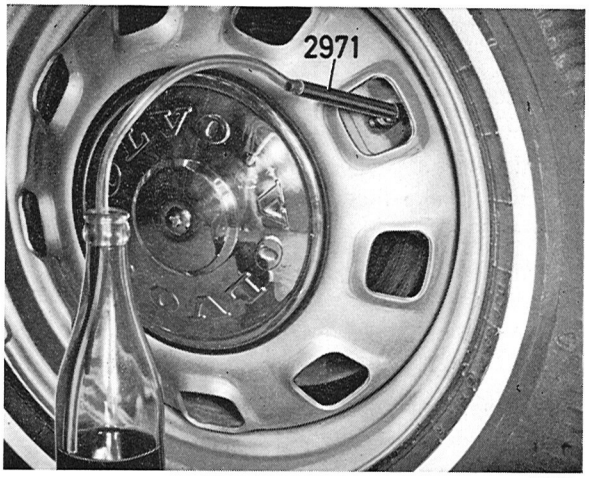


Fig. 5-60. Bleeding front wheel brake unit

   Allow the other end of the hose to hang down into a collecting vessel. Open the bleeder nipple maximum 1/2 turn. Close the nipple when brake fluid free from air bubbles flows out. Make sure that there is no leakage between the nipple and tool, as this could give misleading reults. Re-install the protective caps on the nipples.
5. Generally, it is only necessary to bleed each circuit once. If the brake pedal can still be depressed without any resistance worth mentioning or if it feels spongy, repeat the bleeding.
6. After bleeding has been completed, disconnect the bleeder unit. This will make the unit hose pressureless and the cap can be screwed off. Blow clean the vent-hole in the standard cap and re-install this on the container.
7. Install the warning switch and tighten it to a torque of 14—20 Nm (10—15 lb ft). Connect the electric wire. Check to make sure that the warning lamp lights when the parking brake is on.

MECHANICAL BLEEDING

1. Check to make sure there is full return on the brake pedal and that mats or similar do not prevent full travel (approx. 140 mm=5 1/2″) from being utilized during the bleeding. Depress the brake pedal several times in order to even out any underpressure in the power cylinder and in this way disconnect it.
2. Clean round the cap on the brake fluid container as well as round the scwith on the warning valve. Remove the warning switch, see Fig. 5-52. If necessary, fill the container with brake fluid up to the "Max." mark. Blow the vent-hole of the cap clean.

3. Required for the bleeding is a plastic hose which can be pressed onto and sealed round the bleeder nipple. The lower end of the hose should be extended by a glass or plastic tube. Also required is a glass bottle filled with so much brake fluid that the opening of the pipe can be kept under the surface in order to prevent air being sucked in. To turn the nipple use a 5/16″ box end wrench. New brake fluid must be available so that the container can be gradually filled. The level must not go below the "Min" mark since this would allow air to penetrate into the system via the container.
4. Bleeding should be made in the order shown in Fig. 5-57 and as follows:
   Remove the masking cap and install the box end wrench and plastic hose on the bleeder nipple. Allow the opening of the pipe to hang down below the surface of the fluid in the glass bottle, see Fig. 5-60. Open the bleeder nipple at the most 1/2 turn. Slowly press the brake pedal down to the bottom. When the pedal reaches the bottom, pause a little and then quickly release the pedal. Repeat this procedure until brake fluid free from air bubbles flows out. Then press the pedal to the bottom and close the bleeder nipple. Re-install the masking caps on the nipples.
5. Generally, it is only necessary to bleed each circuit once. If the brake pedal can still be depressed without any resistance worth mentioning or if it feels spongy, repeat the bleeding.
6. Fill the brake fluid container with brake fluid to the "Max" mark.
7. Install the warning switch and tighten it to a torque of 14—20 Nm (10—15 lb ft). Connect the electric wire. Check that the warning lamp lights only when the parking brake is applied.

BRAKE PEDAL

ADJUSTING PEDAL POSITION

The brake pedal should travel approx. 140 mm = 5 1/2″ (dimension A, Fig. 5-61) before the pistons in the master cylinder are pressed to the bottom without the assistance of hydraulic pressure.

The travel can be measured only by bleeding both circuits simultaneously. At the bottom position the pedal should be about 10 mm (3/8″) from the floor (dimension B).

When the brake pedal is released, it should take up the same position as the clutch pedal provided, of course, that the clutch pedal is correctly adjusted. When the master cylinder is removed, do not depress the brake pedal, otherwise the subsequent abnormal position of the parts of the power brake cylinder can cause damage.

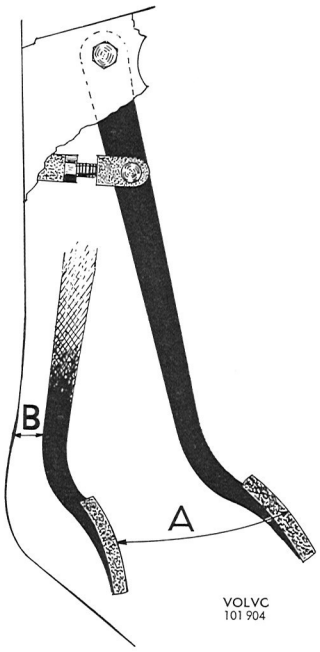


Fig. 5-61. Pedal travel
A=approx. 140 mm (5½″)
B=approx. 10 mm (⅜″)

The position of the pedal is adjusted by loosening the lock nut (8, Fig. 5-63) and removing the cotter pin bolt (10) and then turning the fork (9). Do not forget after adjusting to tighten the lock nut and install the cotter pin.

ADJUSTING BRAKE SWITCH

On adjusting the switch, measure the distance between the brake pedal released and the threated brass hub on the switch (dimension A, Fig. 5-62). This distance should be 4±2 mm (.16±.08″). If this is not the case, slacken the attaching screws for the bracket and move the bracket until the correct distance is obtained. Secure the attaching screws.

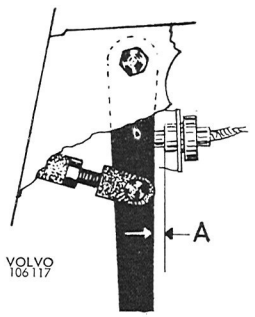


Fig. 5-62. Adjustment measurement, brake warning light switch

REPLACING PEDAL OR BUSHING

1. Remove the cotter pin bolt (10, Fig. 5-63). Lever off the return spring (6). Remove the nut (4) and pull out the screw (2). Lift the pedal (11) forwards.
2. Press out the bearing sleeve (1) and the bushing (3).
3. Clean the parts. If the bearing sleeve is worn, replace it.
4. Press the new bushing (3) in position in the pedal and lubricate them with a thin layer of ball bearing grease. Install the bearing sleeve (1) and the return spring (6).
5. Place the pedal in position and install the screw (2) and the nut (4). Install the return spring. Install the cotter pin bolt (10) and the cotter pin.

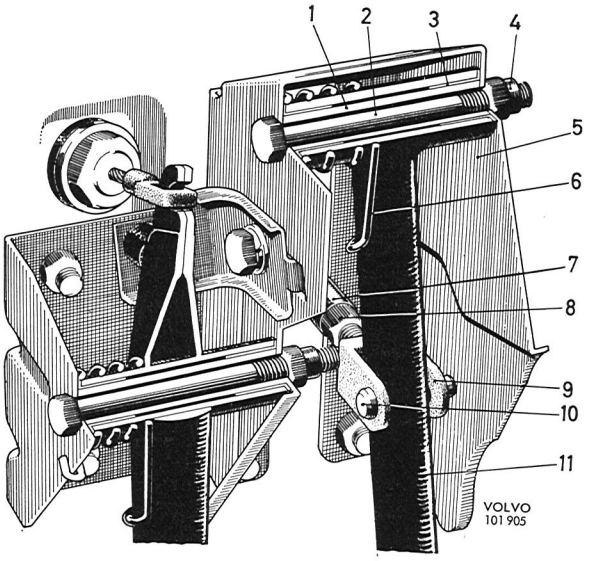


Fig. 5-63. Pedal suspension components

1. Bearing sleeve
2. Screw
3. Nylon bushing
4. Nut
5. Bracket
6. Return spring
7. Thrust rod
8. Lock nut
9. Fork
10. Cotter pin bolt
11. Brake pedal

GROUP 54

AUXILIARY BRAKE SYSTEM

GENERAL INFORMATION

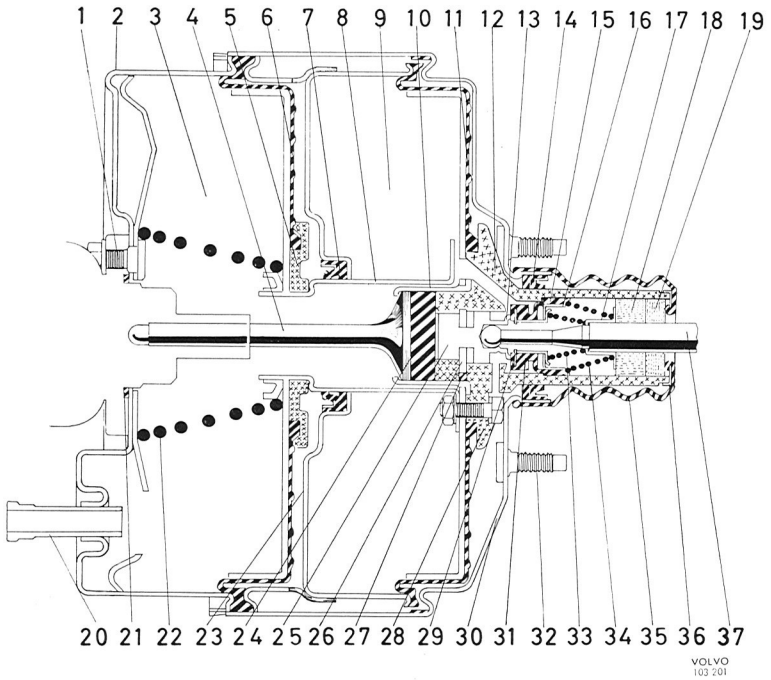


Fig. 5-64. Power cylinder

1. Attaching bolt for master cylinder
2. Cylinder
3. Front vacuum chamber
4. Frcnt thrust rod
5. Retainer
6. Diaphragm
7. Sealing ring
8. Guide sleeve
9. Rear vacuum chamber
10. Retainer
11. Diaphragm
12. Guide housing
13. Valve piston seat
14. Sealing ring
15. Seal
16. Guide
17. Retainer
18. Filter
19. Silencer
20. Vacuum inlet
21. Sealing ring
22. Return spring
23. End
24. Reaction disc
25. Valve piston
26. Stop washer
27. Washer
28. Guide housing
29. Valve guide
30. End
31. Valve plate
32. Attaching screw
33. Valve spring
34. Return spring
35. Rubber cover
36. Washer
37. Rear thrust rod

POWER CYLINDER

This is a mechanical tandem-type vacuum booster located between the brake pedal and the master cylinder, see Fig. 5-6. Due to the power cylinder, which is assisted by vacuum from the engine induction manifold, less pedal pressure is required when braking. There are two types of power cylinders. Type 2, (Fig. 5-68) is designated "9 Single" and is installed in VENV-made vehicles equipped with carburetor engines. Type 1 is designated "8 Tandem" and is installed in all other vehicles.

TYPE 1

The construstion as well as the design and location of the parts are shown in Fig. 5-64. The power cylinder functions as follows.

When the system is at rest, the parts of the power cylinder are in the position shown in Fig. 5-65. The thrust rod spring holds the thrust rod and the valve piston flexibly connected to it pressed to the right. Movement is limited by the stop plate. In this position, the valve plunger keeps the valve lifted from the seat in the guide housing, and this closes the

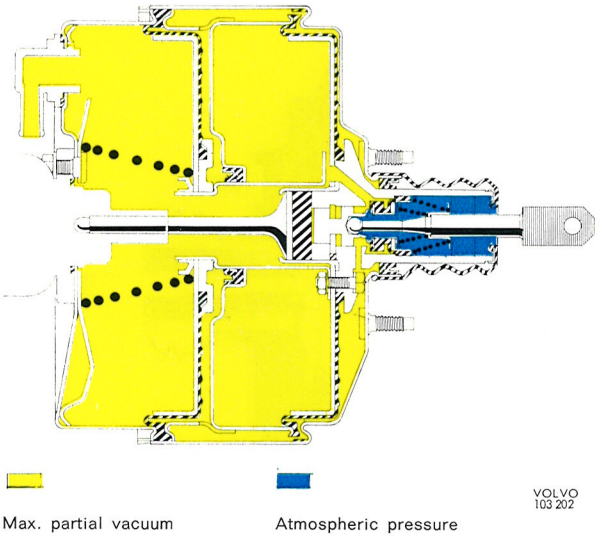


Fig. 5-65. Rest position

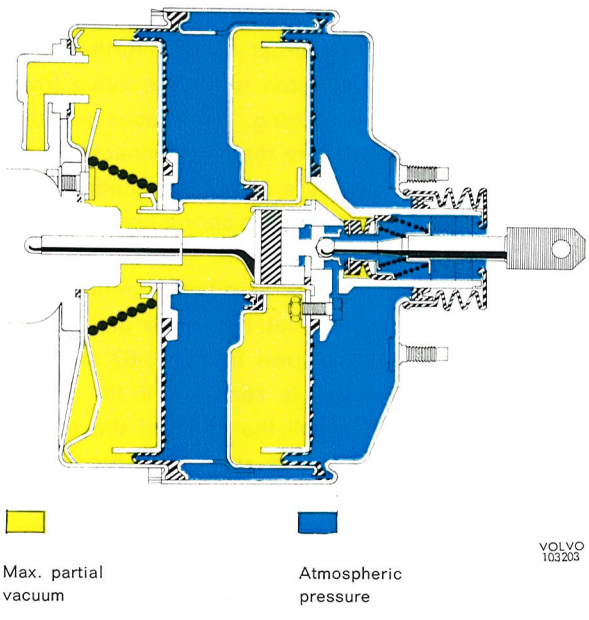


Fig. 5-66. Full brake application

air channel and opens the vacuum channel. Thus an equivalent vacuum exists on both sides of the diaphragm which, together with the guide housing, is held pressed to the right end position of the diaphragm spring.

When the brake pedal is depressed, the rear thrust rod and valve piston are moved to the left (forwards). The valve spring causes the valve plate to move also until it reaches the seat in the guide housing. This closes the connection between the front and rear side af the diaphragm. When the piston continues moving, its movements are transferred via the reaction disc and front thrust rod to the master cylinder. When the seat of the valve piston leaves the plate, the connection between the rear side and the center of the valve section is opened. Air from atmospheric pressure can then flow in behind the diaphragm. When there is partial vacuum on the front side of the diaphragm, it is moved, and also the guide housing, forwards. In this way, the force applied to the front thrust rod is increased. The parts of the power cylinder are in the position shown in Fig. 5-66 when the pedal pressure provides maximum power effect.

If the pedal pressure is less than that mentioned above, the same procedure takes place in the beginning. During brake application, the hydraulic pressure in the master cylinder increases and also the counterpressure on the front thrust rod. The pressure of the guide housing is transmitted to the thrust rod through the outer part of the reaction disc. Because the disc is made of rubber, its periphery contracts while its center tends to expand, see Fig. 5-67. This causes the guide housing to be moved further forwards than the valve piston and results in the seat of the piston reaching the valve shutting off the air supply. The pressure behind the diaphragm remains constant and is thus unable to overcome the hydraulic counterpressure in the master cylinder. The movable parts of the power cylinder, therefore, remain in this position, and constant braking is obtained as long as the same pressure is maintained on the brake pedal.

If pressure on the pedal is increased, the pressure of the valve piston on the reaction disc center will be greater, this causing a certain displacement forwards of the piston. When this happens, the valve leaves the seat of the piston, more air can flow in and greater brake application is obtained until the new equalizing position is attained.

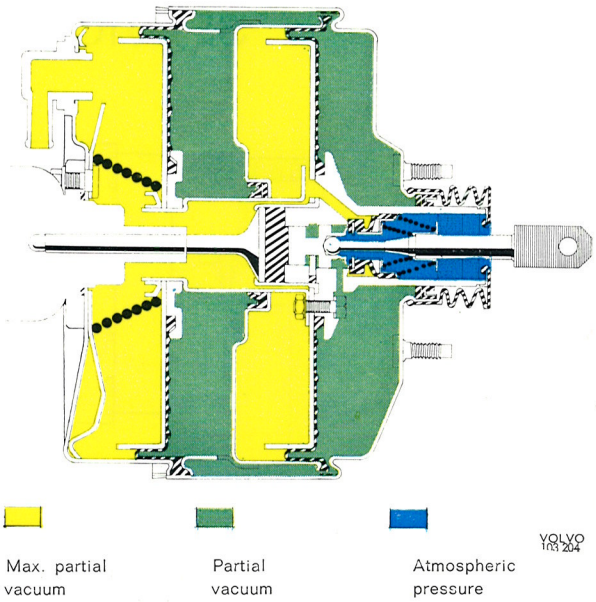


Fig. 5-67. Partial brake application

If the pressure on the pedal is reduced, the reaction disc cener can be thrust out still further, and this causes the valve piston to lift the valve from the seat in the guide housing. The spaces on both sides of the diaphragm are thereby connected with each other, equal pressure arises, the guide housing is moved backwards by the spring pressure and there is a reduction in the brake application. This procedure also reduces the contraction of the reaction disc periphery, so that the valve piston can return to the position shown in Fig. 5-67 and the new equalizing position is reached. If the brake pedal is released fully, all the parts of the power cylinder are returned to the rest position and the brakes are released.

Should any fault occur with the vacuum supply, brake application can still take place due to the fact that the power cylinder functions as an extended thrust rod. As no power effect is then obtained, greater pressure on the pedal is of course required.

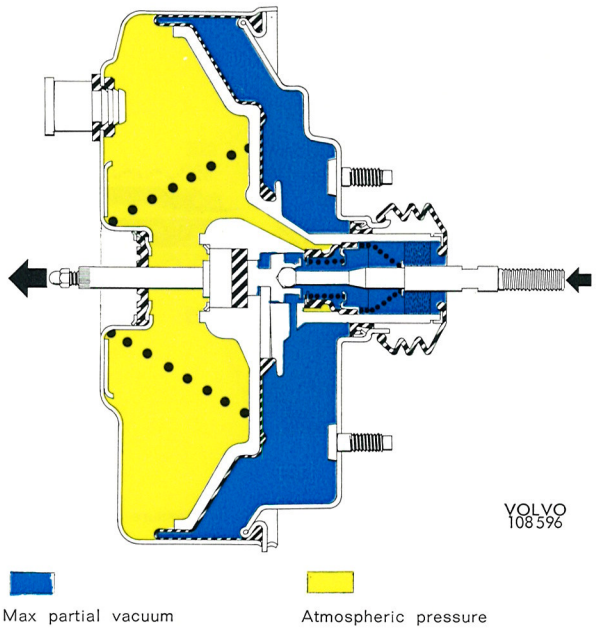


Fig. 5-68. Full brake application (Type 2)

TYPE 2

This type has one piston and one diaphragm. It functions the same way as Type 1.

CHECK VALVE

The check valve (Fig. 5-69) is placed on the line between the engine intake manifold and the power brake cylinder. Its purpose is to prevent air from flowing back to the power brake clyinder. The valve only opens when there is a larger degree of vacuum at connection 1 than at connection 2.

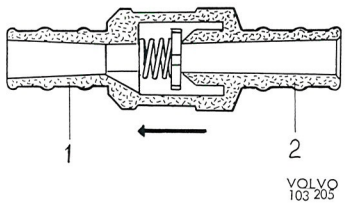


Fig. 5-69. Check valve

1. Connection for intake manifold
2. Connection for power cylinder

SERVICE PROCEDURES

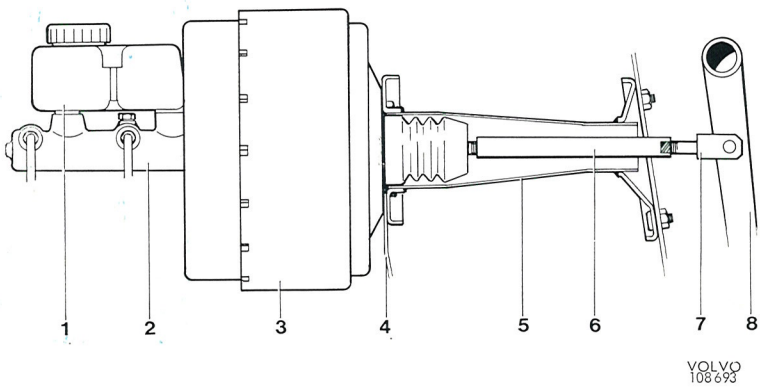


Fig. 5-70. Brake parts

1. Brake fluid container
2. Master cylinder
3. Power cylinder
4. Bracket
5. Bracket
6. Thrust rod
7. Yoke
8. Brake pedal

POWER CYLINDER

The power cylinder cannot be repaired. The filter, however, can be changed. If the power cylinder is defective, it must be replaced complete.

POWER CYLINDER REMOVAL

Replace Power Cylinder = Volvo Standard Times Op. No. 51424

1. Remove the lower dash panel.
2. Pull out the brake pedal pivot shaft so far that the pedal can be turned sideways and the cotter pin bolt removed.
3. Remove the lower retaining nuts for the power cylinder.
4. Remove the washer container. Remove the vacuum hose at the power cylinder.
5. Remove the master cylinder.
6. Disconnect the battery cable at the power cylinder.
7. Remove the power cylinder from firewall and wheel housing.
8. If a new power cylinder is to be installed, transfer brackets and thrust rod with yoke.

INSTALLATION

1. Install the lock nut and the thrust rod. Screw it on as far as possible and lock it.
2. Attack the brackets loosely to the power cylinder.
3. Install the rubber bellow. Install the yoke on the thrust rod and lock it. The distance between the hole center and the thrust rod end (measurement A) should be approx. 45 mm. (1.8″).
4. Attach the power cylinder loosely to the firewall by the two upper firewall nuts. Attach loosely the bolt for the bracket on the wheel housing.
5. Install the retaining nuts for the pedal. Install cotter pin bolt and pivot shaft.
6. Tighten nut and all bolts for the power cylinder in the engine compartment.
7. Install master cylinder (not lines) and battery cable.
8. Check, and adjust if necessary pedal position and brake switch. Install the lower dash panel.
9. Re-connect brake lines and vacuum hose. Install the washer container.
10. Bleed the system.

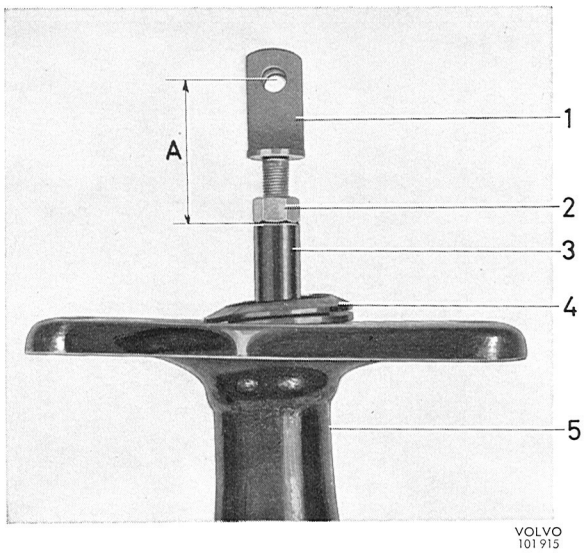


Fig. 5-71. Fitting the fork

1. Fork
2. Lock nut
3. Thrust rod
4. Rubber cover
5. Bracket

A = approx. 45 mm = 1.8″

REPLACING FILTER (TYPE 1)

The filter can be replaced with the power cylinder installed but this concerns vehicles with right-hand drive. For vehicles with left-hand drive, the power cylinder must first be removed.

1. Lever off the rubber cover. Remove the washer switch screwdriver. Pull out the silencer and filter, see Fig. 5-72.
2. Fit the new filter and damper on the thrust rod. The slots should face 180° from each other, see Fig. 5-72.
3. Position the parts. Make sure that the rubber cover is fitted properly on the cylinder and washer.

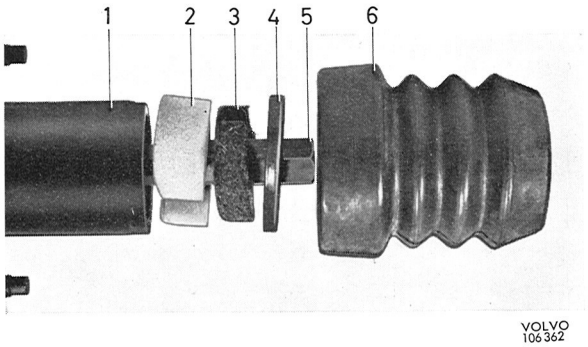


Fig. 5-72. Filter parts

1. Guide housing
2. Filter
3. Damper
4. Washer
5. Rear thrust rod
6. Rubber cover

REPLACING CHECK VALVE (TYPE 1)

Remove the check valve (2, Fig. 5-73) from the vacuum hose. Ensure that the new check valve functions properly. Install the valve so that the arrows on the valve housing point away from the servo cylinder. The vacuum hose connection should face downwards.

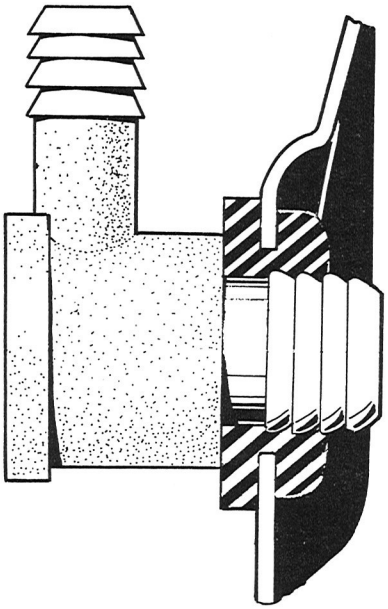
VOLVO 108663

Fig. 5-73. Check valve installed

REPLACING CHECK VALVE (TYPE 2)

Remove the vacuum hose from the check valve. Bend out the valve with two screwdrivers. Then remove the gasket.

Install a new gasket and check that its flange fits properly into position in the cylinder, see Fig. 5-74. Coat the inside of the gasket with the special grease in the repair set and carefully press in the check valve. Make sure that the gasket remains in the proper position. Connect the vacuum hose so that its highest point is at the attachment to the check valve.



VOLVO 108678

Fig. 5-74. Check valve

GROUP 55

PARKING BRAKE

GENERAL INFORMATION

The construction of the parking brake is shown in Fig. 5-75. The parking brake lever (28) is mounted on the floor on the outside of the driver's seat. The movement of the lever is transmitted via the shaft (4), lever and pull rod (5) to the block (6). From here the movement is transmitted through cable (7) to the rear wheel brake units. At each wheel, the movements of the cable influence the lever (16), which is carried in a movable rod (17) on the brake shoes. The lower ends of the brake shoes are held pressed against the anchor bolt (18) by the lower spring. The upper ends are joined through the adjusting device (15) to which they are held pressed by the spring (14), which also locks the small serrated wheel of the adjusting screw. Due to this type of suspension, the brake shoes are self-centering and both the shoes are partly self-applying (Duo-Servo). The brake drum is fitted on the drive shaft and so designed that it also serves as a brake disc for the footbrake.

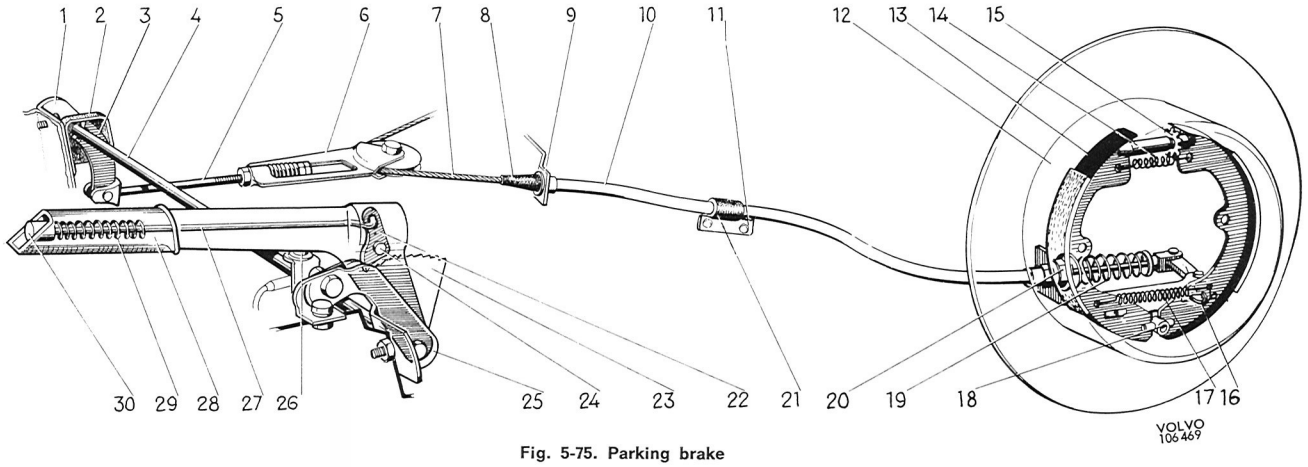


Fig. 5-75. Parking brake

1. Inside support attachment
2. Rubber cover
3. Lever
4. Shaft
5. Pull rod
6. Block
7. Cable
8. Rubber cover
9. Front attachment
10. Cable sleeve
11. Attachment
12. Brake drum
13. Brake shoe (secondary shoe)
14. Return spring
15. Adjusting device
16. Lever
17. Movable rod
18. Anchor bolt
19. Return spring
20. Rear attachment
21. Rubber cable guide
22. Pawl
23. Ratchet segment
24. Rivet
25. Outside support attachment
26. Warning valve switch
27. Push rod
28. Parking brake lever
29. Spring
30. Push button

When the parking brake is applied, the lever and rod press the shoes against the brake drum. When the wheels or drive shaft attempt to turn the drum, the shoes accompany the rotation because of the friction between lining and drum. Due to the "floating" suspension of the shoes, the primary shoe is thus pressed upwards and the secondary shoe downwards until the latter's lower end moves towards the anchor bolt, see Fig. 5-76. Due to the fact that the turning center of the secondary shoe lies in the anchor bolt and that of the primary shoe in the adjusting device, the friction between the drum and the linings will assist in brake application. Also contributing to this is the retarding effect on the secandary shoe because of the primary shoe's endeavour to accompany the direction of rotation of the drum.

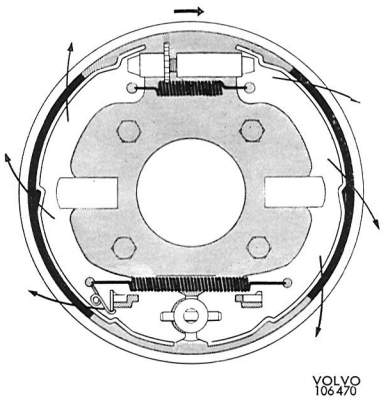


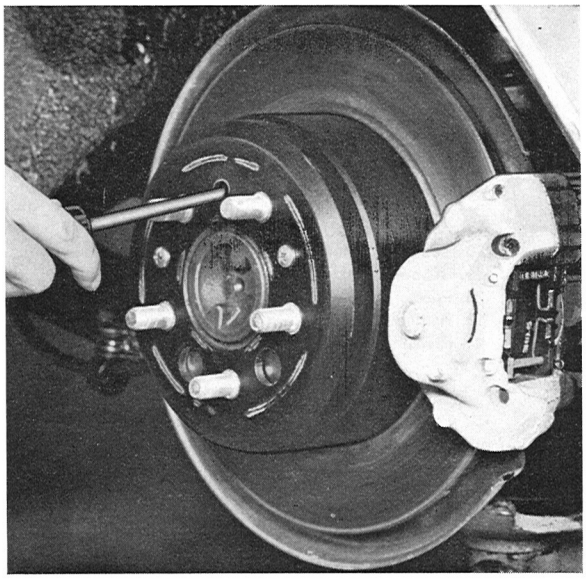
Fig. 5-76. Duo-servo principle

ADJUSTING PARKING BRAKE

Volvo Standard Times Op. No. 55102

The parking brake should give full effect at the third-fourth notch. If it does not do so, adjustment should be made. Here the wheel brake units are first adjusted and, if necessary, the cable.

1. Apply the parking brake, remove the hub caps of the rear wheels and loosen the wheel nuts.
2. Jack up the rear end, put stands under the rear axle, remove the nuts and take off the wheels. Release the parking brake.
3. Check that the brake pads are not stuck to the brake disc. To prevent the lever when adjusting from influencing the shoes and thus give misleading results, the spring tension acting on the lever should be reduced. This can be done by installing holder 2742 (Fig. 5-79) or by disconnecting the cable from the lever.
4. Set the drum so that its hole coincides with the serrations on the adjusting screw and apply the shoes by moving the screwdriver handle upwards, see Fig. 5-77. When the drum cannot be rotated easily, discontinue applying the shoes. Then turn the adjusting screw back 4—5 serrations. Check that the shoes do not "drag" by rotating the drum in its normal direction of rotation. Very little dragging may be permitted. If, however, the dragging is more pronounced, the adjusting screw should be released a further 2—3 serrations. Connect the cable to the lever and remove the holder 2742.



VOLVO 103213

Fig. 5-77. Adjusting parking brake, rear wheel

5. Repeat the adjusting procedure with the other rear wheel.
6. Apply the parking brake lever and check that full braking effect is obtained on the 3rd—4th notch. If the parking brake can be applied past these notches, the cable should be tensioned. This is done by loosening the lock nuts and screwing in the block (7, Fig. 5-78) on the pull rod. After adjusting, tighten the lock nuts. Check that there is approximately the same braking effect on both rear wheels.

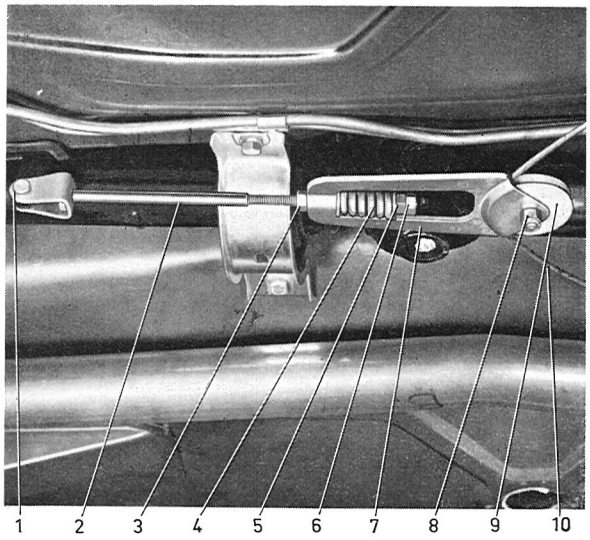


Fig. 5-78. Brake components

1. Split pin bolt
2. Pull rod
3. Stop nut
4. Spring
5. Adjusting nut
6. Lock nut
7. Block
8. Nut
9. Pulley
10. Cable

7. Mount the wheels after having cleaned any dirt from the contact surfaces and tighten the wheel nut sufficiently so that the wheel cannot be moved. Lower the vehicle and tighten the nuts. Tighten every other nut a little at a time until all are tightened to a torque of 100—140 Nm (70—100 lb ft). Install the hub caps.

REPLACING CABLE

Volvo Standard Times Op. No. 55116

REMOVAL

1. Apply the parking brake, remove the rear wheel hub caps and loosen the wheel nuts.
2. Jack up the rear end, place blocks under the rear axle, remove the nuts and take off the wheels. Release the parking brake.

3. Remove the nut (8, Fig. 5-78) and take off the pulley (9) from the block (7).
4. Remove the rubber cover (8, Fig. 5-75) from the cable sleeve front attachment and remove the nut. Remove the attachment of the rubber suspension in the frame member. Remove the cable from the other side's attachment in the same way.

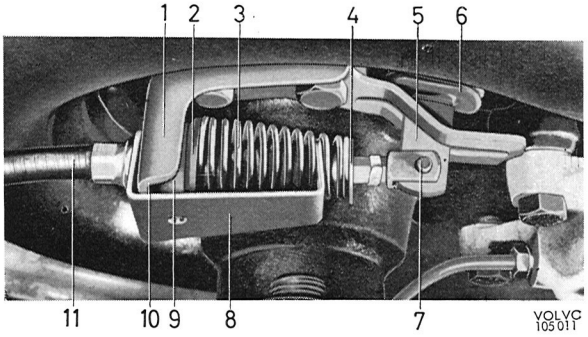


Fig. 5-79. Installing spring tool

1. Cable attachment
2. Washer
3. Return spring
4. Washer
5. Lever
6. Rubber cover
7. Lock pin
8. Holder 2742
9. Nut
10. Lock washer
11. Cable sleeve

5. Place holder 2742 so that the return spring is held in position according to Fig. 5-79. Bend up the lock and remove the lock pin so that the cable releases from the lever.
6. Remove the return spring with washers. Loosen the nut for the rear attachment of the cable sleeve. Lift the cable forwards after having loosened both sides of the attachments.

INSTALLATION

1. Adjust the brake shoes of the rear wheels. Check here that the brake pads do not stick to the brake disc and adjust the drum so that its hole coincides with the serrations of the adjusting screw. Place a screwdriver between the serrations of the adjusting screw and apply the shoes by moving the screwdriver handle upwards, see Fig. 5-77. When the drum can be turned easily, discontinue applying the shoes. Then turn the adjusting screw 4—5 serrations back.
2. Install new rubber cable guides for the cable suspension. Place the cable in position in the rear attachment and tighten the nut. Install the washers and return spring. Compress the spring with the holder tool, see Fig. 5-79. Oil the lock pin and install it together with the cable on the lever. Install the attachment and rubber cable guide an the frame member.
3. Install the cable in the same way as above on the other side of the vehicle.
4. Place the cable sleeve in position in the front attachments and fit the lock washers.
5. Lubricate the bolt and install the block on the pull rod. Adjust so that the parking brake gives full effect at the 3rd—4th notch.
6. Install the wheels, see operation 7 under the heading "Adjusting parking brake".

REPLACING PARKING BRAKE LEVER OR RATCHET PARTS

1. Jack up the rear end and put stands under the rear axle.
2. Remove the cotter pin and stretch the cable so that the pull rod (5, Fig. 5-75) can be removed from the lever.
3. Loosen the three attachments for the frame of the seat slide rails and lift the whole seat forwards.
4. Remove the rubber covers, the ratchet segment and the bearing. Pull the parking brake lever with shaft and lever forwards.

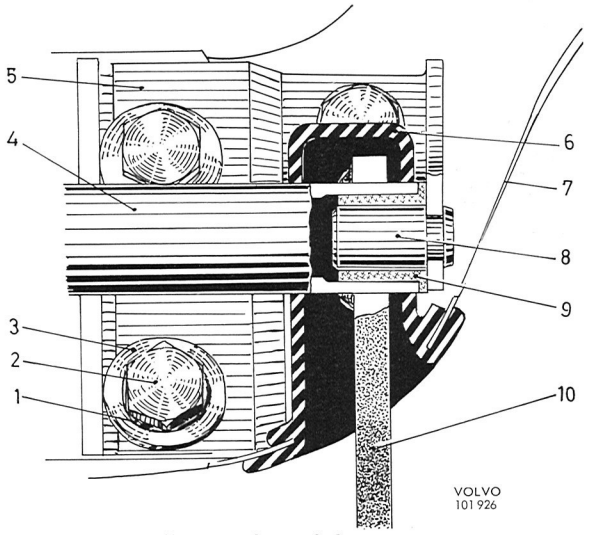


Fig. 5-80. Inner shaft support

1. Spring
2. Attachment bolt
3. Flat washer
4. Shaft
5. Inner support attachment
6. Rubber cover
7. Floor
8. Support pin
9. Bushing
10. Lever

5. Remove the button (30, Fig. 5-75) and the spring (29) from the parking brake lever. Remove the rivet (24) and take out the push rod (27) and the pawl (22).
6. Install the new parts in the reverse order, see Fig. 5-75. Make sure that the rivet is firmly fixed but does not obstruct the movement of the pawl. Lubricate the bushings with a thin coat of ball bearing grease. Do not forget to lock the pull rod and make sure that the rubber covers seal well.

REAR WHEEL BRAKE UNIT (PARKING BRAKE COMPONENT)

Replace all brake shoes = Volvo Standard Times Op. No. 55204

1. Apply the parking brake, remove the hub caps of the rear wheels and loosen the wheel nuts.
2. Jack up the rear end, put stands under the rear axle, remove the nuts and take off the wheels, release the parking brake.
3. Remove the brake line (4, Fig. 5-22) from the rear brake caliper and plug the connection. Brake fluid must not spill onto the disc or brake pads. Remove the attaching bolts (2 and 5, Fig. 5-23). Lift out the caliper.
4. Remove the attaching bolts for the brake drum and lift off the drum, see Fig. 5-81.

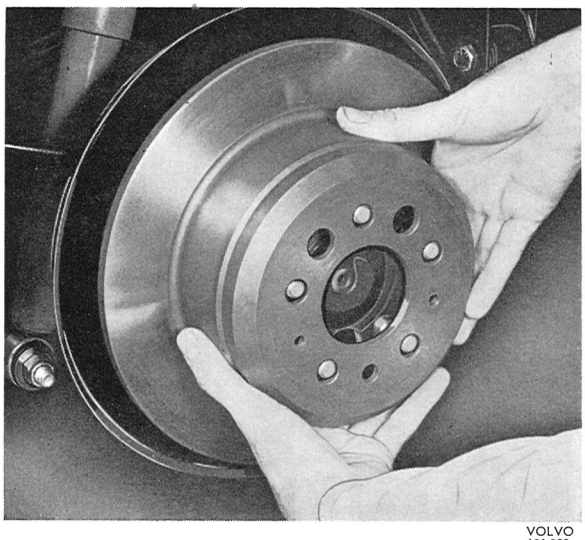


Fig. 5-81. Removing brake drum

5. Remove both the return springs and the adjusting device. Lift forward the shoes, see Fig. 5-82. Manipulating the links will facilitate removal.

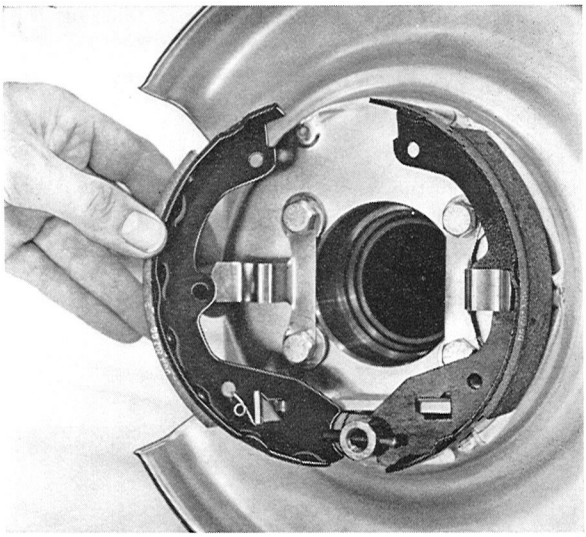


Fig. 5-82. Installing brake shoes

INSPECTION

First check that there is no oil leakage. If there is oil leakage, replace the seal, see Group 46. Clean all the parts except the brake linings. Check that the lever joint does not chafe and replace parts which are damaged or worn.

If the brake linings are oily or worn down to the rivets, replace the shoes completely. The brake drum should be replaced if its friction surface is concave, or if its out-of-round exceeds .2 mm (.008″). Rust spots can, however, be polished off. Wipe the contact surfaces on the backing plate.

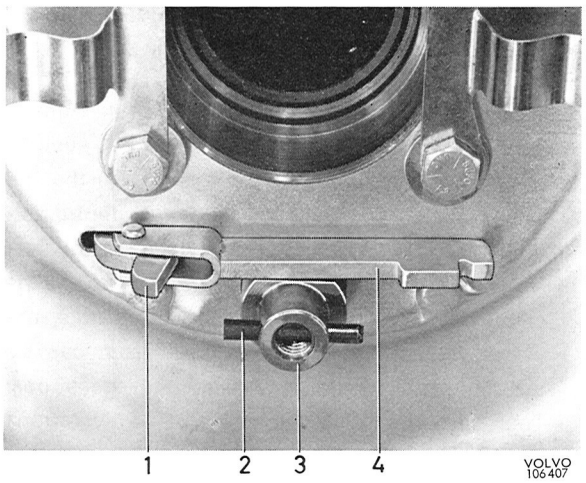


Fig. 5-83. Brake parts

1. Lever
2. Guide pin
3. Anchor bolt
4. Link

ASSEMBLING

1. If linings or drums are replaced, slacken the lock nut (6, Fig. 5-78) to remove tension in the cable.
2. Coat the 6 guide lips on the backing plate as well as the lever joint and adjusting screw with heat-resistant graphite grease intended for this purpose. Check that the lever and anchor bolt parts are correctly installed, see Fig. 5-83. Check that the washer (8, Fig. 5-84) and the spring (9) are in position on the primary shoes.
3. Install the brake shoes, see Fig. 5-82. The shorter sleeve on the adjusting device should be turned forwards on the right-hand side and backwards on the left-hand side, see Fig. 5-84.
4. Hook on the return spring.
5. Install brake drum with attaching bolts.
6. Place the brake caliper in position. Install the attaching bolts (1 and 3, Fig. 5-23) after smearing the bolts woth a couple of drops of Loc-Tite type AV.
7. Check that the brake pads move freely from the brake disc and adjust the parking brake, see operations 4—6 under "Adjusting parking brake".
8. Bleed the brake caliper, see Group 52.
9. Install the wheel, see operation 7 under "Adjusting parking brake".

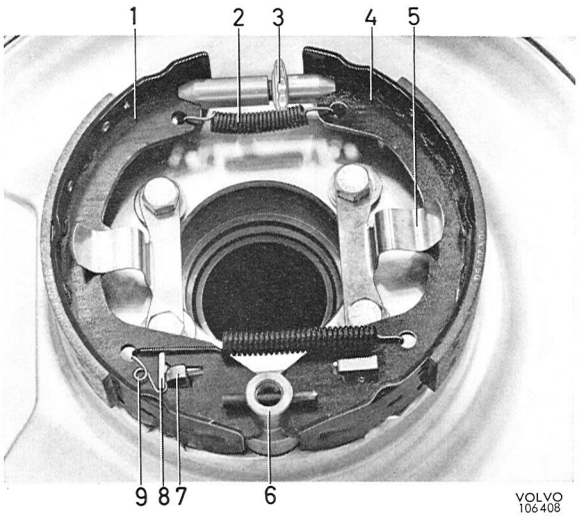


Fig. 5-84. Parking brake

1. Rear brake shoe (primary shoe)
2. Upper return spring
3. Adjusting device
4. Front brake shoe (secondary shoe)
5. Retainer for brake shoe
6. Anchor bolt
7. Lever
8. Washer
9. Spring