SERVICE MANUAL

TRUCKS

L 385

Export Service Department

AKTIEBOLAGET
VOLVO
GÖTEBORG . SWEDEN

PART 7

BRAKES

DESCRIPTION

The L 385 is fitted with two brake systems which are independent of each other. One of these - the foot brake system - is operated by means of a brake pedal and influences the brakes on all wheels. The other brake system - the handbrake - is operated by means of the handbrake lever and operates on the propeller shaft.

FOOT BRAKES

The L 385 is fitted with either a vacuum-hydraulic or compressed air-hydraulic system.

Both these systems have one point in common and that is that the pressure from the brake pedal is transferred to the brake units at the wheels hydraulically. A servo-brake cylinder ensures that only comparatively light pressure on the brake pedal is required. Since there are two brake cylinders on each wheel brake unit, the brake shoes are self-adjusting to a certain extent since when the brakes are applied there is a tendency for them to be pulled in the direction of rotation of the brake drum. The brake shoes are also self-centering since they can slide in grooves in the brake unit cylinders.

THE VACUUM - HYDRAULIC BRAKE SYSTEM

This brake system is designed as shown in Fig. 7-1 to 7-4. It functions in the following way.

When the system is at rest (Fig. 7-5) the air valve is kept closed by spring pressure. Another spring pushes the diaphragm with the seat and plunger to the left so that the vacuum valve is open. The spacer to the right of the vacuum plunger is thus connected to the space to the left of the plunger through the control valve and the pipe line. The same degree of partial vacuum prevails on both sides of the vacuum plunger which is held to the left by the return spring. The pressure cylinder relief valve (Fig. 7-8) is kept open by the yoke and if there should be some fault in the vacuum system, the truck can be braked by the use of the hydraulic system alone. The return valve ensures a low residual pressure in the brake lines and wheel cylinders which is necessary if the brakes are to operate properly.

When the brake pedal is depressed, the pressure in the master cylinder increases and this pressure increase is transferred through the brake line to the Hydrovac. In this, the hydraulic inlet pressure influences the control valve plunger (Fig. 7-6) and pushes both this and the diaphragm to the right. The vacuum valve closes and the air valve on the

same shaft opens. Air from the outer atmosphere now streams past the air valve, through the pipe line and into the space to the left of the vacuum plunger. Since there is a partial vacuum to the right of the plunger, it is pressed to the right and the plunger rod pushes in the pressure cylinder plunger. The relief valve yoke is thus released from the stop washer (Fig. 7-9), the valve closes and the hydraulic pressure in the cylinder increases. This pressure is transferred through the brake line to the wheel cylinders and the brakes are applied.

In the control valve, the pressure on the right side of the diaphragm increases as more air comes in. If the pressure applied to the brake pedal and the consequent hydraulic pressure on the control valve plunger remain unchanged, it is finally exceeded and the diaphragm is pressed to the left (Fig. 7-7). The air valve then closes, the pressure to the left of the vacuum plunger remains constant and cannot exceed the hydraulic resistance in the pressure cylinder. The moving parts of the Hydrovac thus remain in this position and a constant degree of brake application is obtained as long as the same pressure is applied to the brake pedal.

When the brake pedal is released, the inlet pressure on the control valve plunger decreases, the diaphragm is pressed to the left and the vacuum valve is exposed. In this way the spaces on both sides of the vacuum plunger become connected, pressure is equalized and the plunger is moved over to the left. In the pressure cylinder, the plunger is pressed back, the return valve lifts from its seat, the yoke opens the relief valve, the brakes are released and all parts in the system return to the rest position.

Vacuum Pump

The degree of partial vacuum in the servo-brake cylinder on the L 385 is obtained by means of a vacuum pump. This is driven from the crankshaft by means of drive belt.

Each of the gears (7, Fig. 7-10) in the vacuum pump has nine teeth. The gears are pressed onto shafts (3, 11), which are carried in cast-iron bushings (9). These bushings are retained in the pump housing by means of the end units (1,5).

The pump is lubricated from the engine lubricating system. The oil has a double function in this case. Apart from acting as lubricant it also serves as a sealing agent for air. Excess oil is carried with the air stream through the pressure line back to the engine crankcase.

COMPRESSED AIR-HYDRAULIC BRAKE SYSTEM

The design of this brake system is shown in Fig. 7-11 to 7-22. It operates in principle in the same way as the vacuum-hydraulic system. The greatest difference is the fact that compressed air is supplied to the servo-brake cylinder instead of a partial vacuum and naturally on the opposite side of the plunger. The component parts in the compressed air

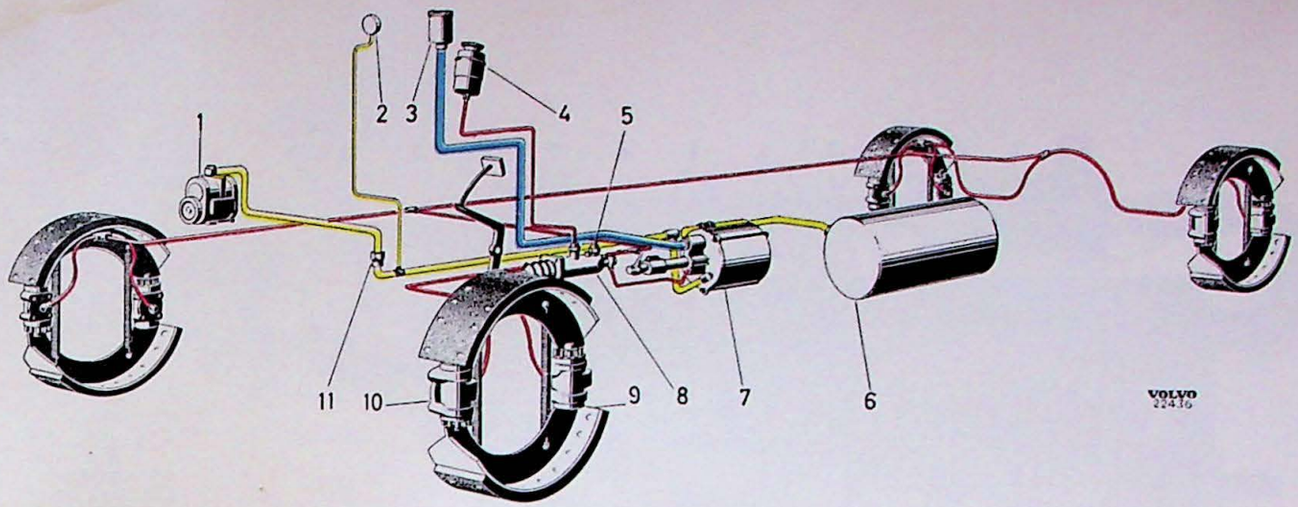


Fig. 7—1. Vacuum-hydraulic brake system.

1. Vacuum pump
2. Air cleaner
3. Brake fluid container
4. Stoplight switch
5. Vacuum tank
6. Hydrovac
7. Master cylinder
8. Brake shoe
9. Wheel unit cylinder
10. Check valve

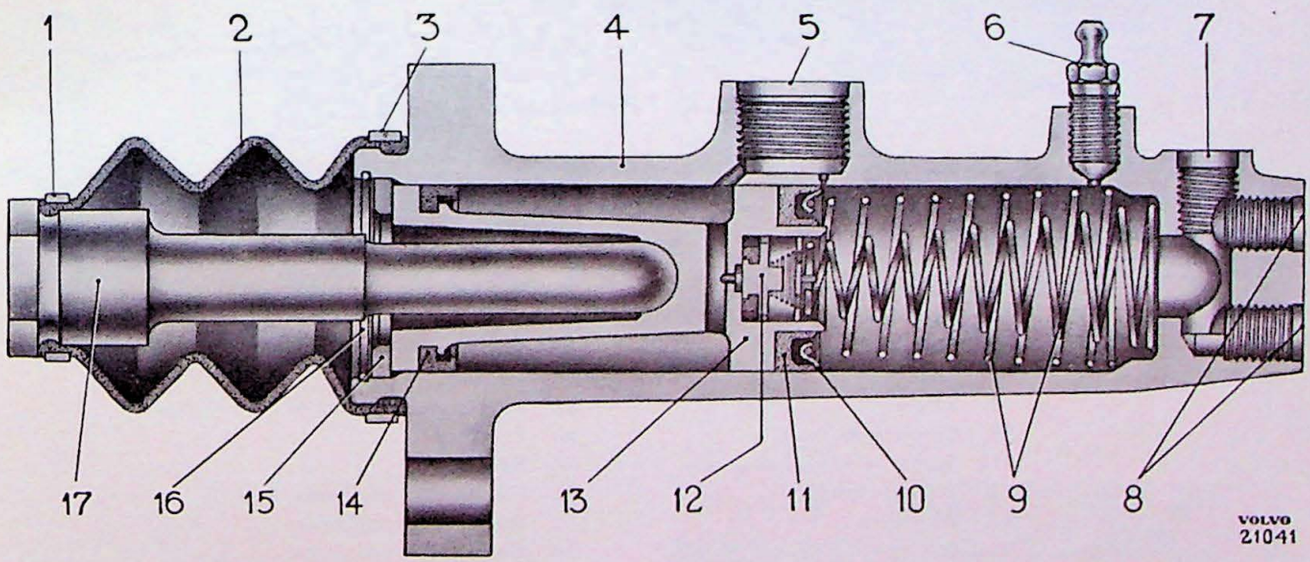


Fig. 7—2. Master cylinder.

1. Lock ring
2. Dust cover
3. Lock ring
4. Master cylinder housing
5. Connection for brake fluid container
6. Air-venting nipple
7. Connection for stoplight switch
8. Connections for brake lines
9. Return springs
10. Washer
11. Inner plunger packing
12. Check valve
13. Plunger
14. Outer plunger packing
15. Stop washer
16. Lock ring
17. Push rod

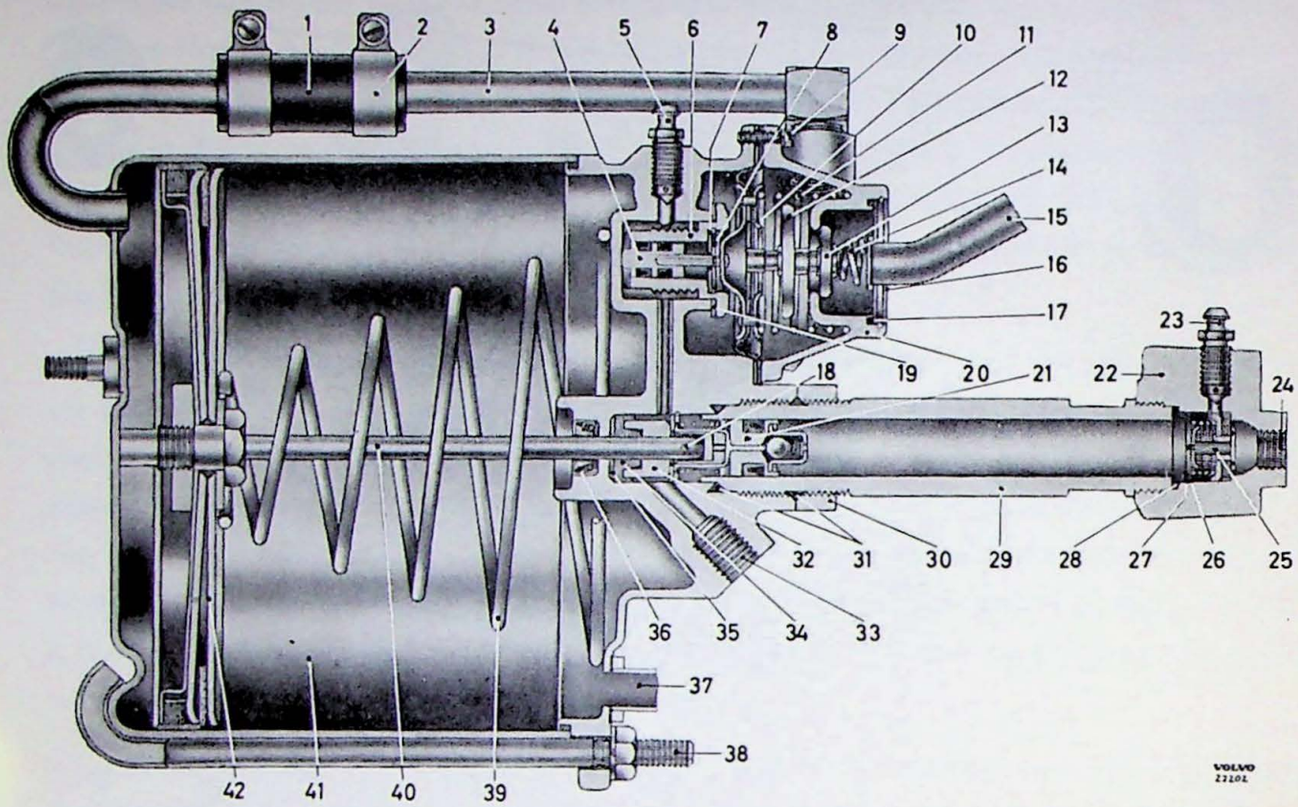


Fig. 7—3. Hydrovac.

1. Rubber hose
2. Hose clamp
3. Pipe
4. Plunger
5. Air-venting nipple
6. Cylinder
7. Stop washer
8. Lock ring
9. Screw
10. Diaphragm
11. Spring
12. Vacuum valve
13. Air valve
14. Spring
15. Air intake
16. Lock ring
17. Packing
18. Lock pin
19. Packing
20. Cover for control valve
21. Plunger
22. End section
23. Air-venting nipple
24. Connection for brake line to wheel unit cylinders
25. Return valve
26. Washer
27. Lock ring
28. Washer
29. Pressure cylinder
30. Lock nut
31. Packings
32. Retainer
33. Connection for brake line from master cylinder
34. Packing
35. Washer
36. Seal
37. Vacuum intake
38. Stay
39. Spring
40. Plunger rod
41. Vacuum cylinder
42. Vacuum plunger

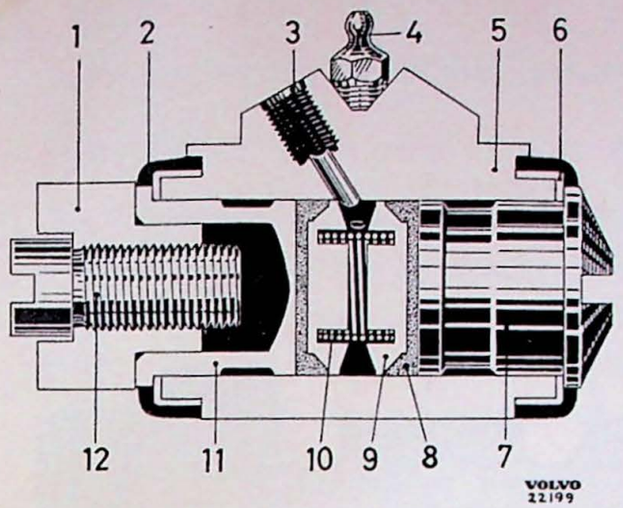


Fig. 7—4. Wheel unit cylinder.

1. Adjuster nut
2. Rubber protector
3. Connection for brake line
4. Air-venting nipple
5. Wheel cylinder housing
6. Cover plate
7. Plunger
8. Plunger packing
9. Guide washer
10. Spring
11. Plunger
12. Adjuster screw

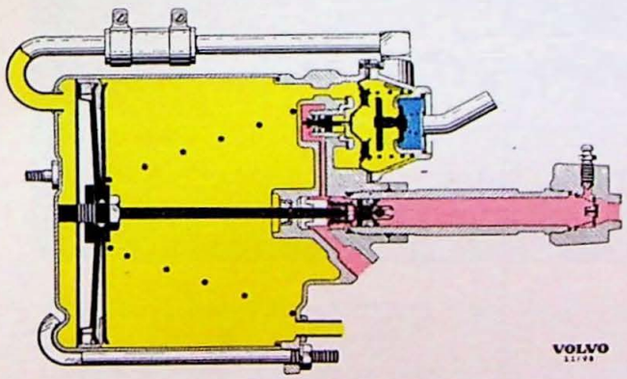


Fig. 7—5. Rest position.

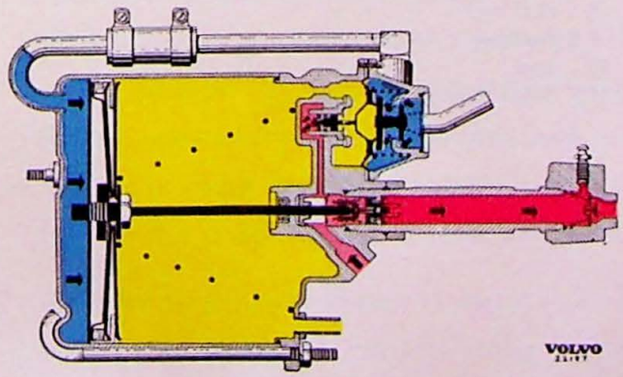


Fig. 7—6. Brakes applied.

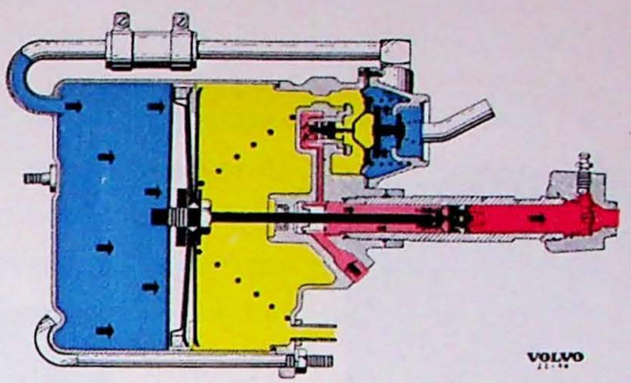


Fig. 7—7. Constant braking.

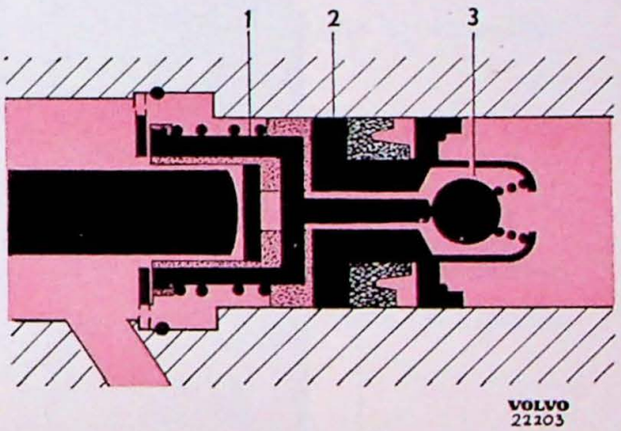


Fig. 7—8. Relief valve, open.

1. Yoke 2. Plunger 3. Valve

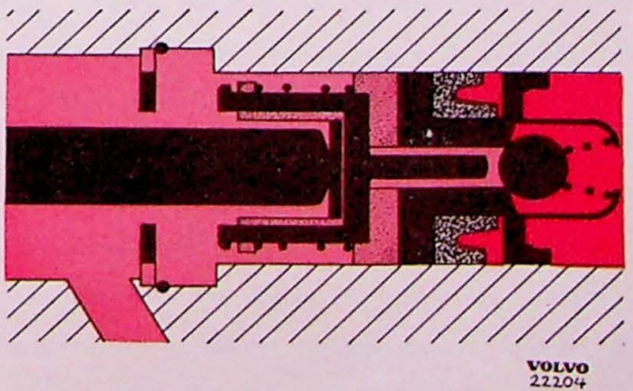


Fig. 7—9. Relief valve, closed.

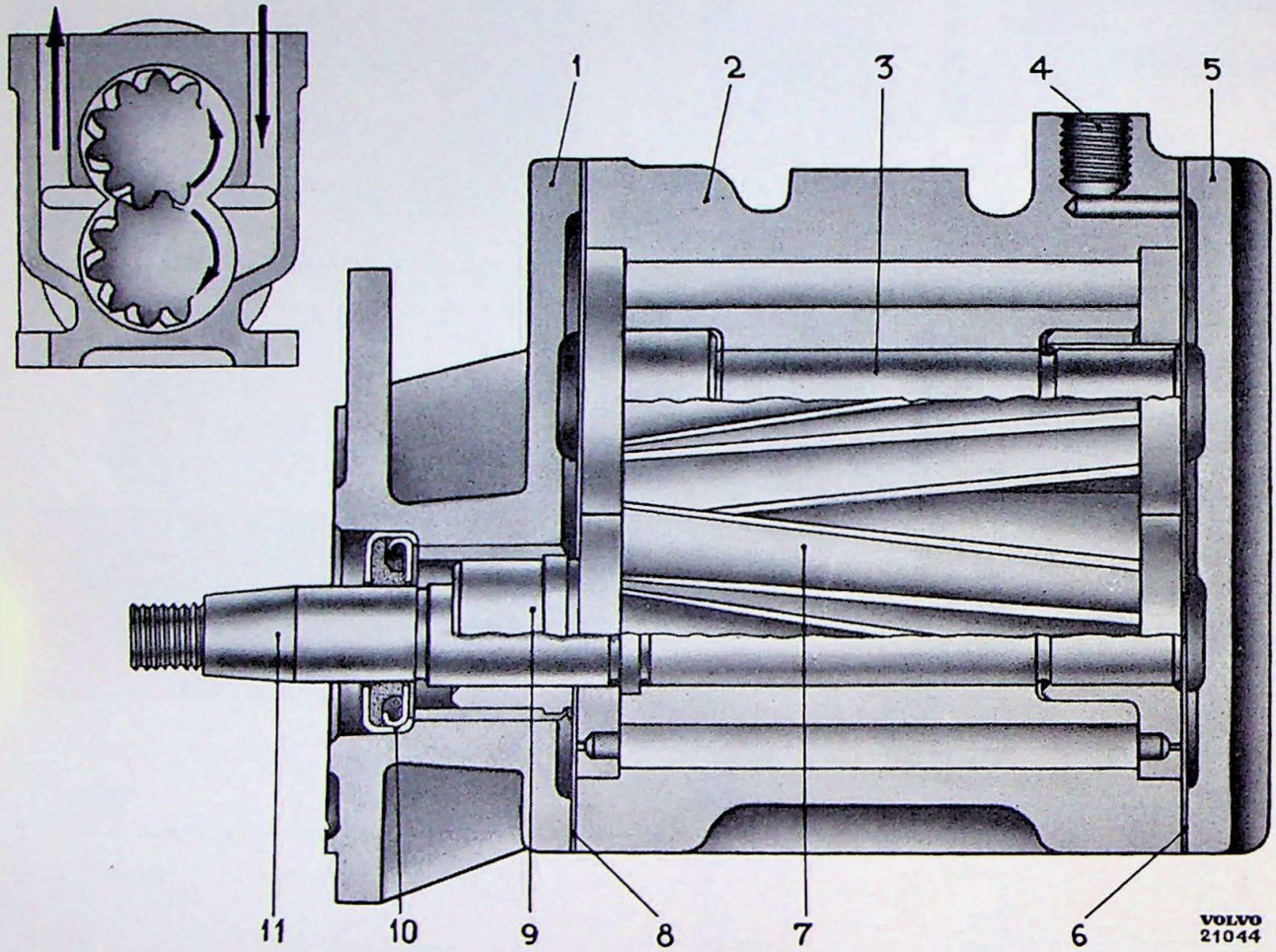


Fig. 7—10. Vacuum pump.

1. Forward end
2. Housing
3. Shaft for driven gear
4. Connection for pressure oil line
5. Rear end
6. Packing
7. Gear
8. Packing
9. Bushing
10. Seal
11. Drive shaft

system are described under their respective headings.

Compressor

The compressor (Fig. 7-13) is a two-cylinder piston compressor and is driven from the engine by means of two drive belts. It is lubricated by splash lubrication from the lower part of the crankcase. Lubricating oil is obtained from the engine pressure lubricating system. In order to prevent excessive lubrication, the compressor is fitted with an oil valve (Fig. 7-14). The oil level is maintained as it should be by means of a level pipe which leads excess oil back to the engine oil pan.

Filter and Tire Inflation Device

This is fitted in front of the pressure regulator and has three functions:

1. To trap any oil in the compressed air which may follow with the air from the compressor.
2. To remove any impurities that may have passed through the air cleaner.
3. To serve as a cock for inflating tires.

The filter (10, Fig. 7-15) traps oil and impurities in the compressed air. Under the lower part of the container there is a cock for tire inflation. The valve (5) remains closed as long as the air pressure is below 7.5 kg/cm^2 (106 p.s.i.).

Pressure Regulator

The design and function of the pressure regulator are shown in Fig. 7-16 to 7-18.

When the compressor is supplying air to the air reservoir tanks, the air passes through the regulator in the direction of the arrows (Fig. 7-18, upper). The check valve (12, Fig. 7-16) is held open by the pressure of the air. When the pressure in the air reservoir tanks reaches 5.3 kg/cm^2 (75 p.s.i.), the control valve (20) opens since the air pressure then exceeds the pressure exerted by the spring. The space above the idling valve plunger (2) is then connected with the compressed air. Under the influence of this, the plunger is pressed downwards and the idling valve (16) opens. The compressor will then idle since the compressed air line is connected with the outer air, see Fig. 7-18, lower. Air pressure in the reservoir tanks is maintained constant by the check valve (12).

In order to prevent the compressor from overheating it must idle a certain time. This is taken care of by the control valve. When the control valve opens, the force holding it open increases since the pressure surface is also increased. If these forces are to be less than the force exerted by the spring, the pressure in the reservoir tanks must be reduced. When the pressure in the tanks sinks to about 4.8 kg/cm^2 (68 p.s.i.) the control valve

closes due to the force exerted by the spring. The compressed air above the pilot valve plunger passes out through the control screw (17, Fig. 7-16). The idling valve closes and the compressor then starts to charge up the pressure in the reservoir tanks again.

Anti-freeze Pump

The anti-freeze pump (Fig. 7-19) provides the simple way of introducing anti-freeze into the compressed air system and preventing the formation of ice from the condensation water which forms. A suitable anti-freeze agent is a mixture of equal parts of ethylene glycol and water. The capacity of the container on the pump is 1/4 of a liter (1/2 U.S. pint). Each stroke of the pump injects about 2 cm^3 (1/15 fl.oz.) into the system.

Compressed Air Reservoir Tanks

The system includes two compressed air reservoir tanks which are connected together through a relief valve. The reservoir tanks are fitted with cocks to drain off condensation water.

Relief valve

The design of this is shown in Fig. 7-20. The valve is adjusted so that it does not open until the pressure in the reservoir tank 1 reaches 4.2-4.5 kg/cm^2 (60-64 p.s.i.). When the pressure in reservoir tank 2 reaches this value both reservoir tanks are charged at the same time. The check valve (11) permits the air pressure to pass to a reservoir tank when the pressure in this goes down for example when the brakes are applied.

Double Pressure Gauge

The pressure gauge has two pointers and two connections. One of the connections goes to the compressed air reservoir tank 1 and the other to the servo-brake cylinder. The black pointer shows the pressure available and the red pointer shows the pressure which is actually being used during braking. When the brakes are fully applied, both the pointers should indicate the same value.

Hand Control

A trailer can be braked separately by means of the hand control. When the handle (1, Fig. 7-21) is turned, the plunger (3) is pressed downwards. When the plunger reaches the valve (4) the connection between the housing and the outer air is closed off. When the handle is turned even further, the valve (4) is pressed down and opens a connection between the compressed air line and the trailer line whereby the trailer brakes are applied. When the handle is turned back again, the compressed air line is first closed and then the trailer brake line is again connected with the outer air.

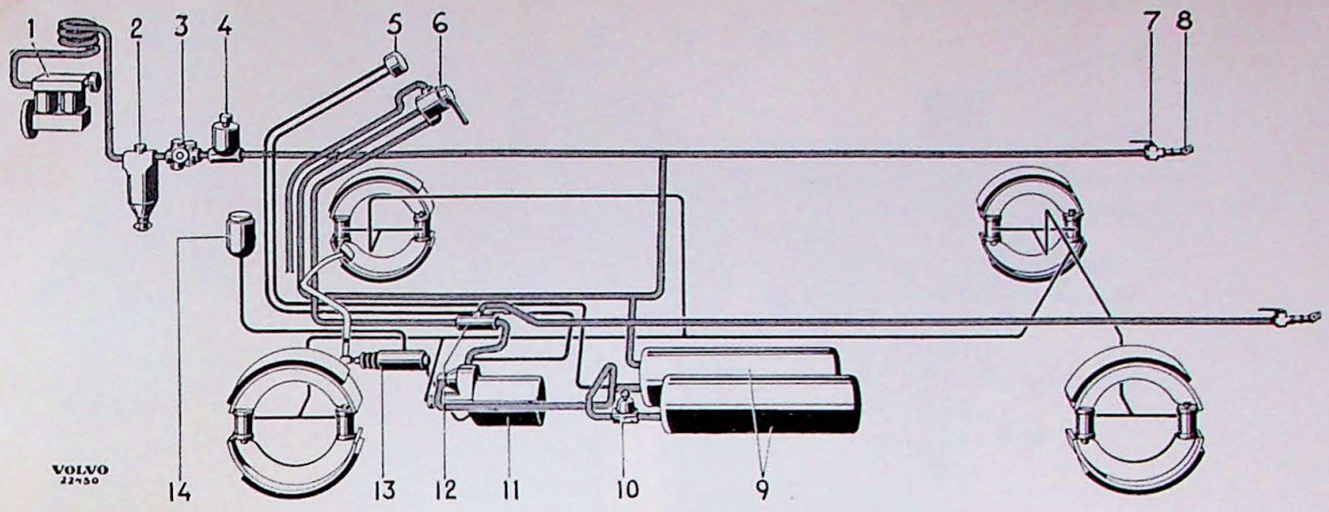


Fig. 7—11. Compressed air-hydraulic brake system.

1. Compressor
2. Filter and tire inflation device
3. Pressure regulator
4. Anti-freeze pump
5. Double pressure gauge
6. Hand control
7. Cut-off cock
8. Connector head
9. Compressed air reservoir tank
10. Relief valve
11. Airpak
12. Control valve
13. Master cylinder
14. Brake fluid container

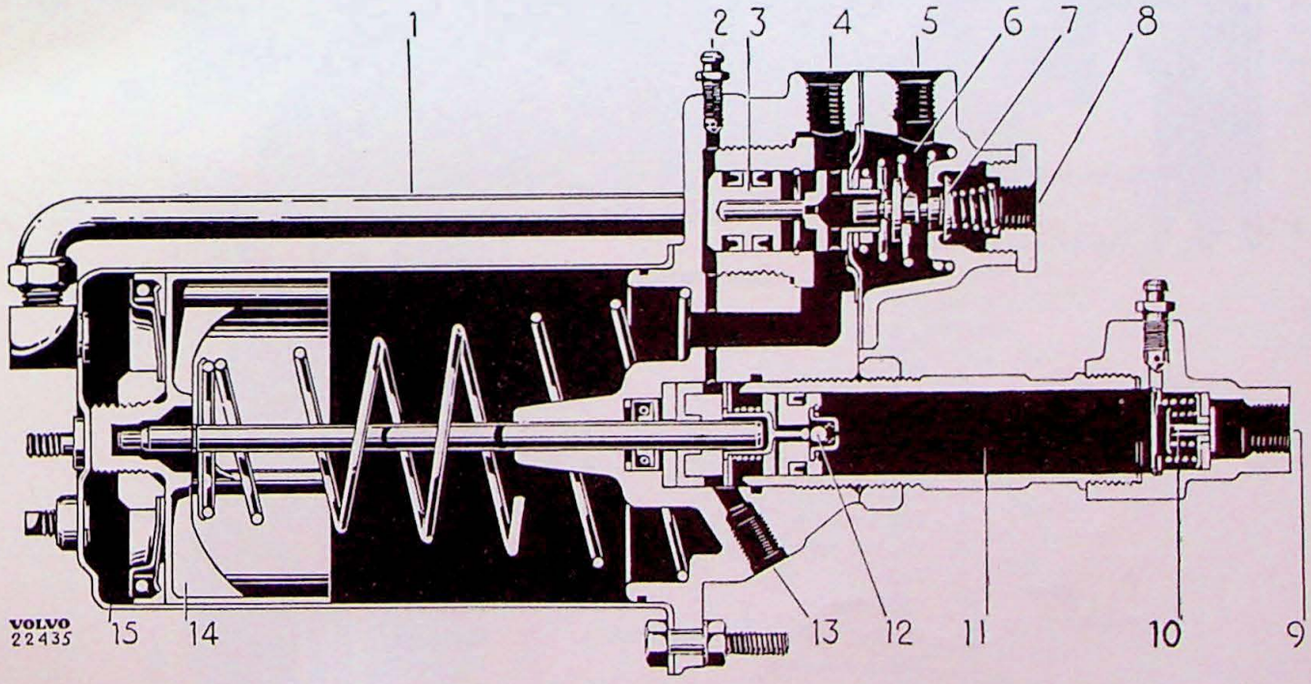


Fig. 7—12. Airpak.

1. Pipe from control valve
2. Air-venting nipple
3. Plunger
4. Outlet
5. Connection for trailer brakes
6. Control valve housing
7. Air valve
8. Connection for compressed air
9. Connection for brake line
10. Return valve
11. Hydraulic pressure cylinder
12. Relief valve
13. Connection for master cylinder
14. Compressed air plunger
15. Compressed air cylinder

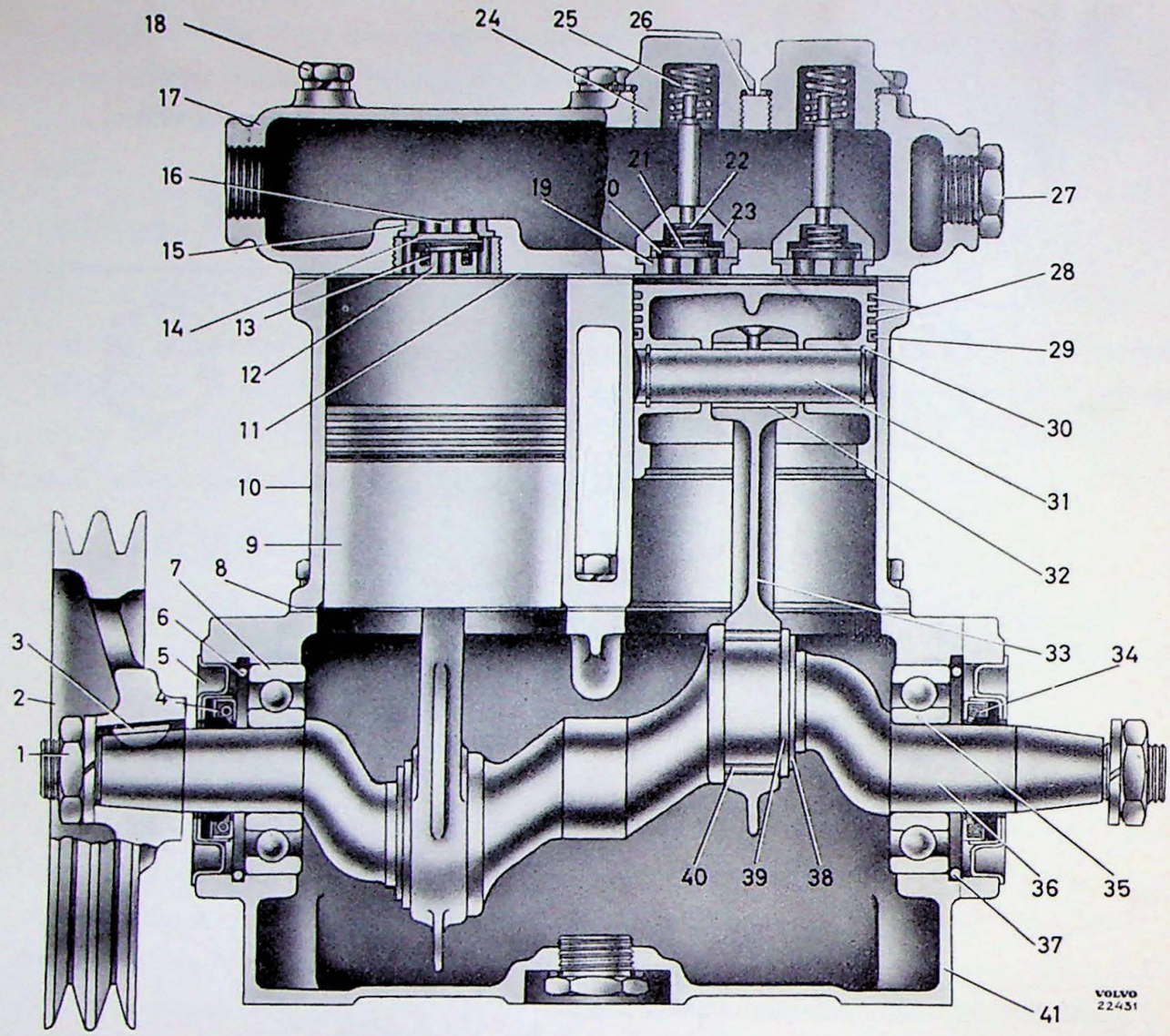
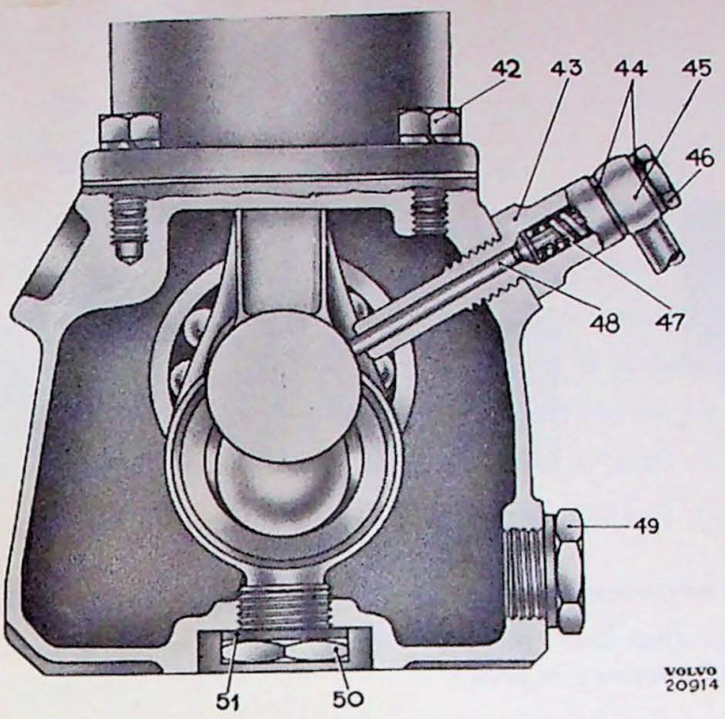


Fig. 7—13. Compressor, longitudinal section.

1. Nut
2. Pulley
3. Key
4. Seal
5. Forward cover
6. Lock ring
7. Ball bearing
8. Gasket, cylinder-crankcase
9. Piston
10. Cylinder
11. Gasket, cylinder head-block
12. Valve housing
13. Spring
14. Valve disk
15. Valve seat
16. Inlet valve
17. Cylinder head
18. Bolt with spring washer
19. Valve seat
20. Outlet valve
21. Valve disk
22. Spring
23. Valve housing
24. Screw union
25. Spring, upper
26. Washer
27. Plug
28. Compression rings
29. Oil control ring
30. Lock ring
31. Piston pin
32. Bushing
33. Connecting rod
34. Seal
35. Ball bearing
36. Crankshaft
37. Lock ring
38. Lock ring
39. Spacer washer
40. Needle bearing
41. Crankcase



42. Bolt and spring washer
43. Valve holder bolt for oil valve
44. Washer
45. Pipe connection
46. Hollow bolt
47. Spring
48. Valve
49. Plug with washer
50. Plug
51. Washer

Fig. 7—14. Compressor, transverse section.

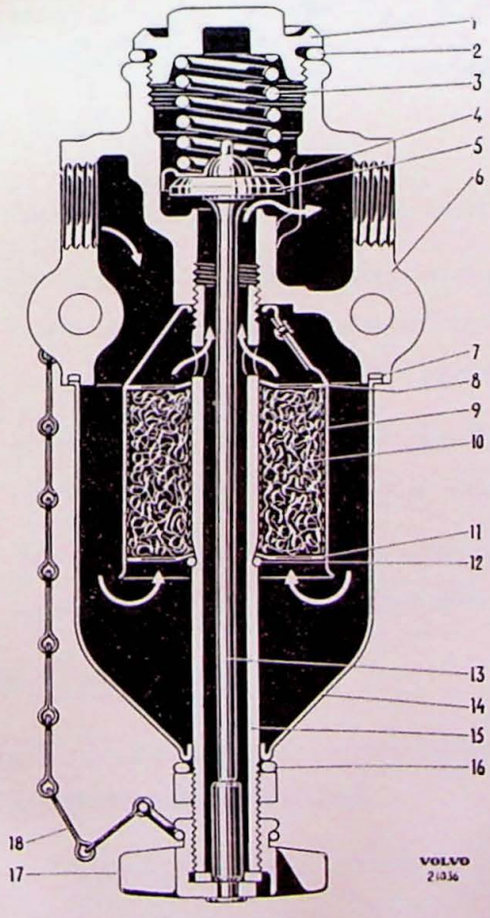


Fig. 7—15. Filter and tire inflation device.

1. Screw connection
2. Washer
3. Spring
4. Washer
5. Valve disk
6. Valve housing
7. Washer
8. Strainer
9. Inner filter housing
10. Filter element
11. Strainer
12. Lock ring
13. Valve retainer
14. Outer filter housing
15. Support pipe
16. Washer
17. Butterfly nut
18. Chain

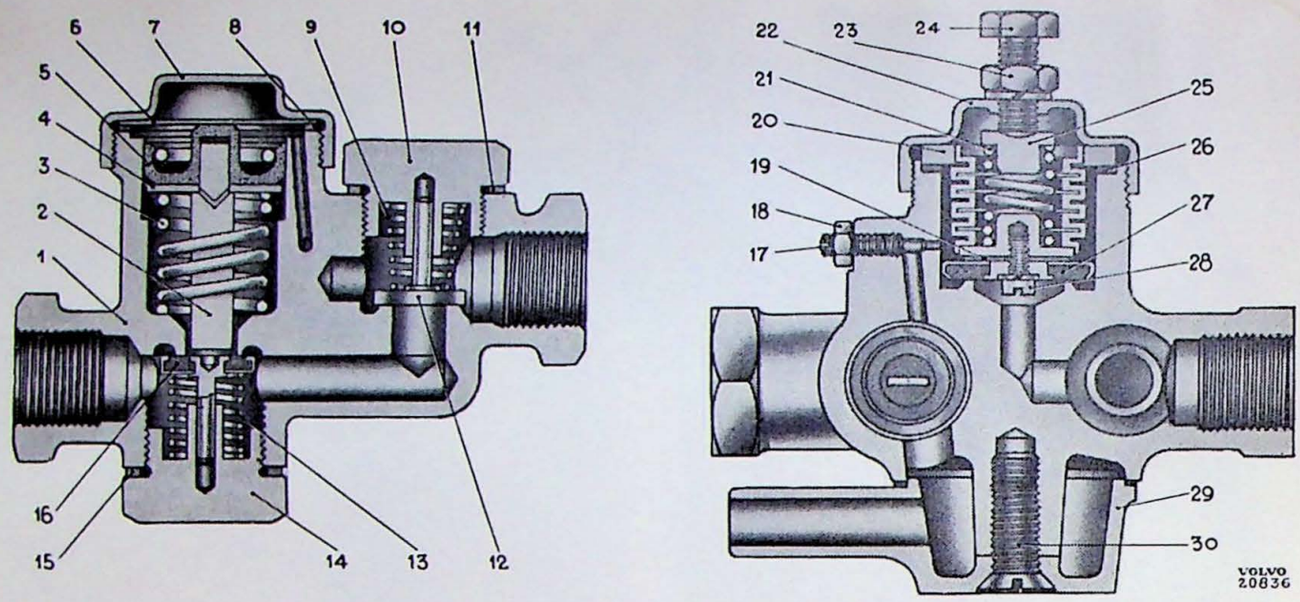
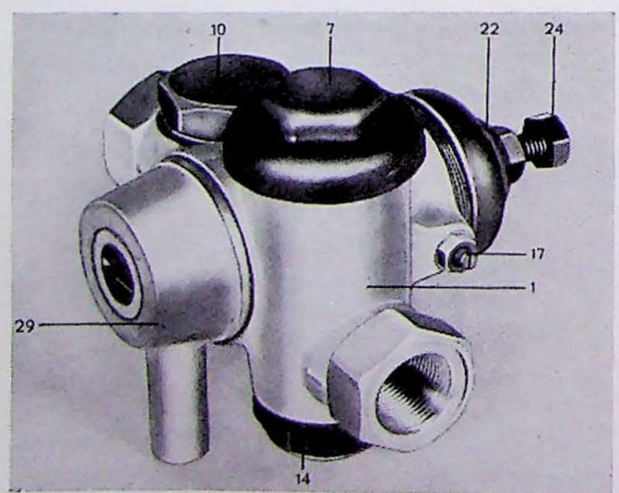


Fig. 7—16. Pressure regulator.

1. Regulator housing
2. Plunger
3. Spring for plunger
4. Support washer
5. Gasket
6. Plate
7. Screw cover for plunger
8. Washer
9. Spring for check valve
10. Plug for check valve
11. Washer
12. Check valve
13. Spring for idler valve
14. Plug for idler valve
15. Washer
16. Idler valve
17. Set screw
18. Lock nut
19. Washer
20. Control valve with bellows
21. Spring for control valve
22. Screw cover for control valve
23. Lock nut with spring washer
24. Adjuster screw
25. Bushing
26. Washer
27. Valve disk
28. Bolt with spring washer
29. Flange support
30. Bolt



7—17. Pressure regulator.

Control Valve

When the trailer is braked with the hand control, compressed air passes through the control valve connection (1, Fig. 7-22) into the trailer brake line (3). When the truck unit is braked with the foot brake, compressed air passes from the Airpak control valve to the connection (5). The plunger (4) is pushed over to the left and closes the line from the hand control (1) at the same time as the trailer line (3) is exposed and the trailer is braked at the same time as the truck unit.

HANDBRAKE

The handbrake (Fig. 7-23) is of the transmission shaft type with internally expanding brake shoes. It is operated from the handbrake lever through a system of levers and pull rods.

REPAIR INSTRUCTIONS

FOOT BRAKE

Hydraulic System

Removing Wheel Brakes

1. Remove the front wheel hub (see Part 6) or the rear wheel hub (see Part 5).
2. Fit a clamp or lash locking wire on the wheel cylinder unit so that the component parts do not separate and fall out when the brake shoes are removed. Remove the brake shoes by lifting them upwards and outwards.
3. If the wheel unit cylinders are to be removed from the brake backing plate, brake lines and the attaching bolts must be disconnected.
4. Remove the clamp or lock wire used from the wheel cylinder unit and separate the component parts. Remember that the cylinder is filled with brake fluid.

Fitting Wheel Brakes

Fitting is carried out in a reverse order to that used when removing. The brake shoes should be fitted in the following way.

1. Fit one of the return springs in its position on the inside of the brake backing plate.
2. Fit the lower brake shoe in its position and the upper as shown in Fig. 7-24. Fit the other spring. Then lift the upper shoe upwards until it is in position.