DESCRIPTION

This Service Manual is concerned with the B 16 B engine and should be used as a complement to the Service Manual PV, Part 1, B 16 A Engine.

This book treats the carburetors in detail but also includes a brief description of other differences between the engines in question.

GENERAL

The B 16 B engine is a four-cylinder overhead-valve engine with twin horizontal carburetors. Capacity 1.6 litres (97.6 cu in.), bore 3.125", stroke 3.15", compression ratio 8.2:1.

This engine develops 85 b.h.p. (SAE) 76 b.h.p. (DIN) at 5500 r.p.m. and has a maximum torque of 87 lb. ft. (SAE) at 3500 r.p.m. or 83 lb.ft. (DIN) at 3300 r.p.m.

The engine is shown in figs. 1 and 2. See also the illustration at the end of this book.

CYLINDER HEAD

The cylinder head is of cast-iron. The distance from the contact face with the block to the cylinder head nut level is 3.839".

CRANKSHAFT

The crankshaft is made of drop-forged steel which has been precision ground and surface hardened on the bearing journals. It is statically and dynamically balanced and is carried in three main bearings in the upper part of the crankcase. The main bearings consist of replaceable precision inserts. Undersize bearing shell inserts are also available to ensure the correct bearing clearance after the journals have been ground.

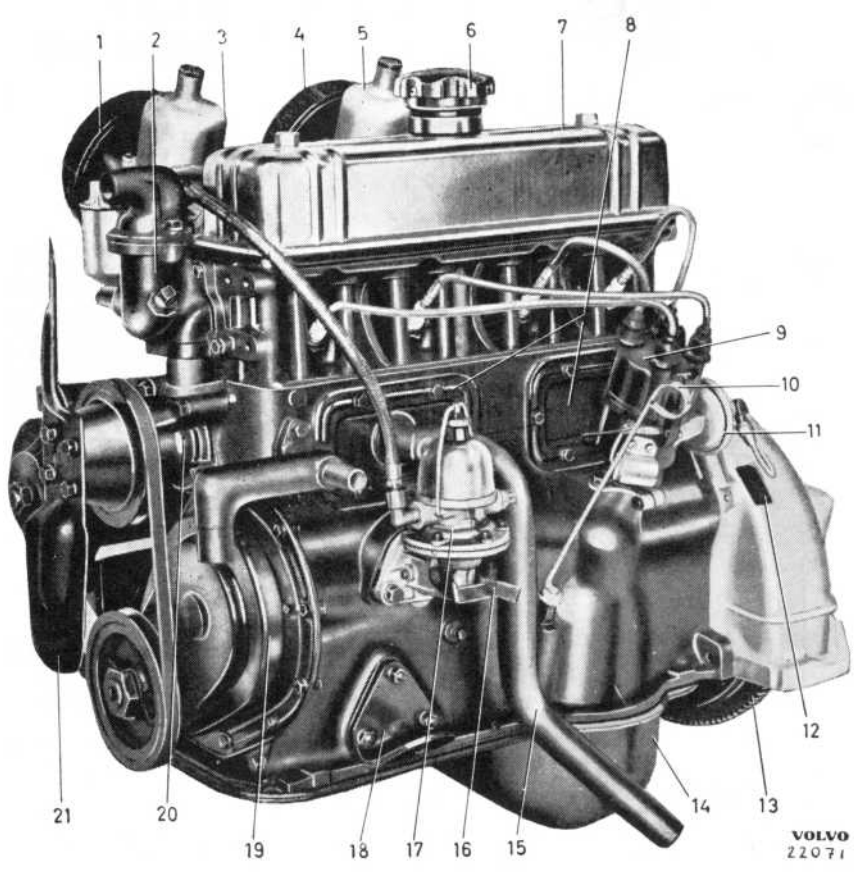


Fig. 1. B 16 B engine (distributor side).

1. Front air cleaner
2. Thermostat housing
3. Front carburetor
4. Rear air cleaner
5. Rear carburetor
6. Oil filler cap
7. Rocker arm cover
8. Inspection cover
9. Distributor
10. Oil dipstick
11. Engine serial number (plate on right-hand side on early production)
12. Inspection hole
13. Flywheel
14. Oil pan
15. Crankcase breather
16. Hand primer pump
17. Fuel pump
18. Engine mounting
19. Timing gear casing
20. Water pump
21. Fan

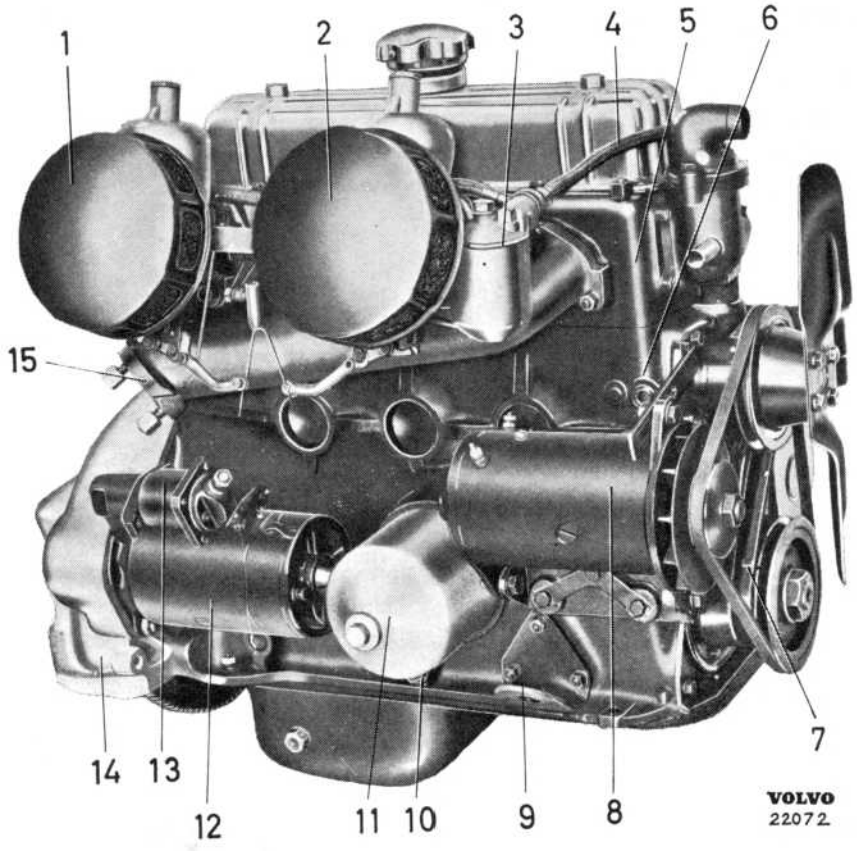


Fig. 2. B 16 B engine (carburetor side).

1. Rear air cleaner
2. Front air cleaner
3. Float chamber
4. Fuel line
5. Cylinder head
6. Cylinder block
7. Ignition setting mark (T.D.C.)
8. Generator
9. Engine mounting
10. Oil pressure relief valve
11. Oil filter
12. Starter motor
13. Solenoid
14. Flywheel housing
15. Exhaust manifold

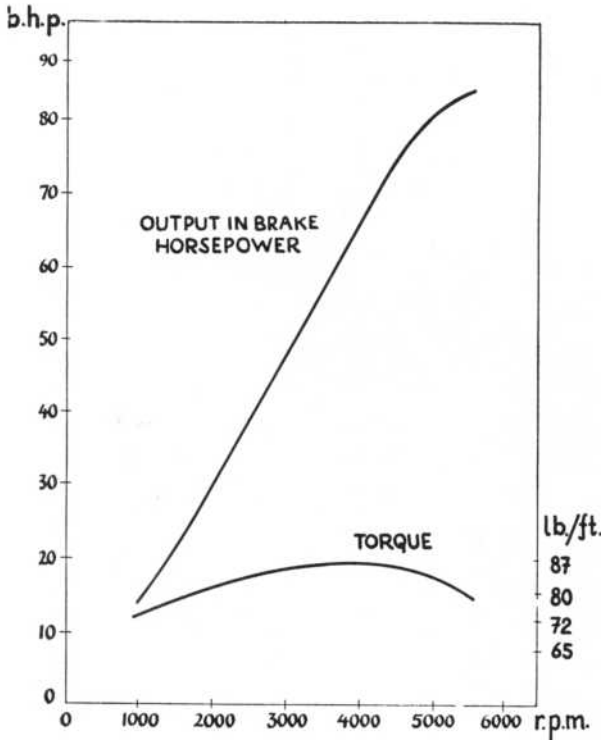


Fig. 3. Output and torque curves.

MAIN AND CONNECTING ROD BEARING SHELLS

The main and connecting rod bearing shells are of the tri-metal type designed for the hardened crankshaft and consist of steel bodies lined with lead-bronze alloy. This alloy is coated with a thin layer of lead-indium.

The crankshaft guide bearing, which has a larger bearing surface than the other main bearings, is covered with bearing metal-babbit.

CAMSHAFT

The camshaft is made of special cast-iron with hardened and ground cams and bearing journals. The cams give a relatively high lift.

FUEL SYSTEM

Carburetors

The engine is fitted with two coupled SU carburetors, see Fig. 4. The carburetors are of the horizontal type so that the fuel-air mixture passes through the carburetors in a horizontal direction.

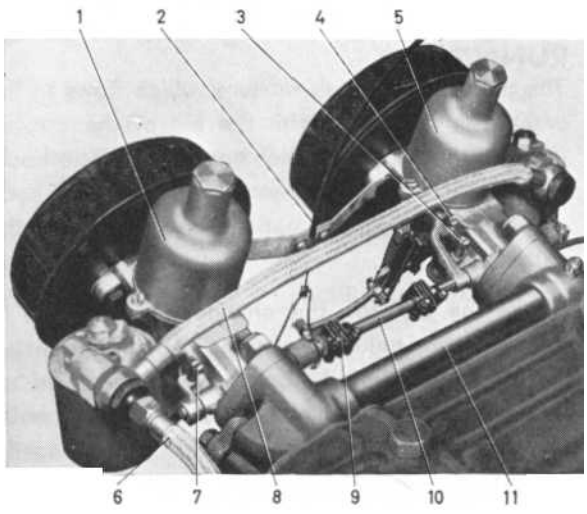


Fig. 4. Carburetors.

1. Forward carburetor
2. Controls
3. Idling adjuster screw
4. Rapid idling adjuster screw
5. Rear carburetor
6. Fuel pipe from pump
7. Idling adjuster screw
8. Fuel pipe between carburetors
9. Couplings
10. Coupling shaft
11. Equalizer tube

In this case the carburetors are, however, fitted at a slight angle to the horizontal.

The rear carburetor is fitted with a rapid idling device. The forward carburetor does not have this device but obtains the same impulse through the shaft which couples the two carburetors.

Between the two inlet manifolds, which are very short, there is a pipe which evens out the pressure variations.

Each carburetor has only one jet. The fuel flow is varied by a tapered needle, which is guided by a plunger in the carburetor, which is impulsed by the vacuum in the carburetor barrel.

There is no choke in the normal sense of the term. Instead there is a cold start device which when engaged gives a richer fuel-air mixture by depressing the jet, whereupon the fuel flow area increases.

The function of the carburetor can be divided into the following groups:

1. Float system
2. Running
3. Cold start
4. Rapid idling
5. Idling

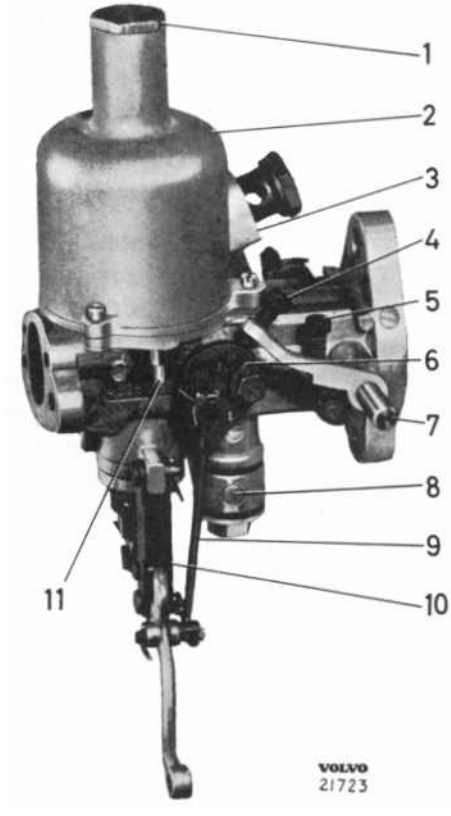


Fig. 5. Rear carburetor from control side.

1. Nut for damping plunger (also for oil filling)
2. Suction chamber
3. Float chamber cover
4. Rapid idling adjuster screw
5. Idling adjuster screw
6. Cam plate
7. Throttle shaft
8. Throttle shaft lever
9. Link rod
10. Link
11. Lift pin for piston

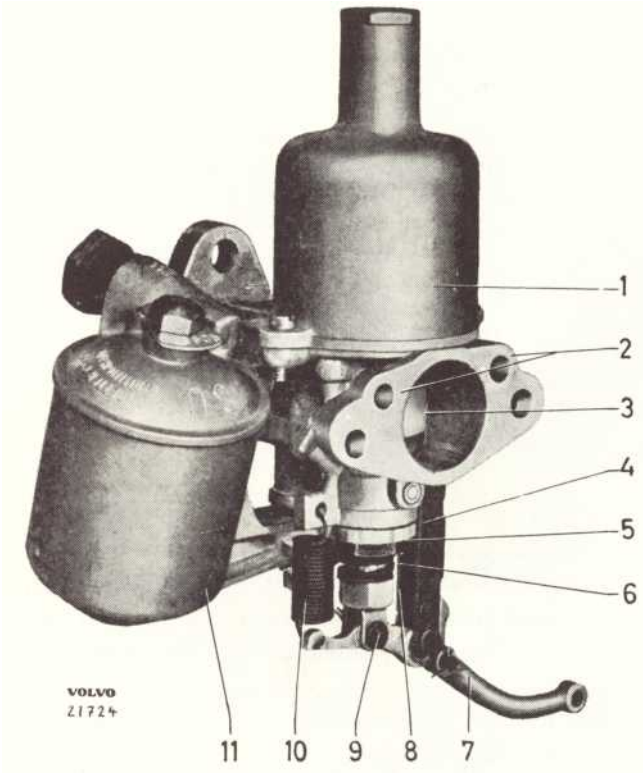


Fig. 6. Rear carburetor from float chamber side.

1. Suction chamber
2. Ventilation channel
3. Piston
4. Seal washer
5. Lock nut
6. Spring
7. Lever
8. Adjuster nut
9. Lower part of jet
10. Spring
11. Float chamber

FLOAT SYSTEM

The fuel flow is controlled by the float system so that the correct fuel level is obtained in the carburetor. The fuel system is composed of a float chamber (6 Fig. 7) which is flexibly bolted to the carburetor housing through the medium of rubber washers, a float (5), cover (1) and the flexibly attached lever (4) as well as the needle valve (3), which is attached to the cover. There is a strainer (2) with a spring in the cover. The float is guided by a centre bolt in the float chamber.

When the fuel is forced forward to the float chamber by the pump, it first passes through the strainer which removes all impurities. When the fuel level rises, the float is lifted upwards and when the fuel level has reached the set height, the needle is pushed up by the lever and the fuel flow is stopped. When the level sinks the valve opens again and more fuel flows in.

RUNNING

The amount of fuel-air mixture, which flows to the engine, is regulated with the aid of the throttle (6 Fig. 8) in the carburetor housing (7). The housing is shaped like a channel and is also a body on which are built the various components of the carburetor.

Above the jet (10), the channel narrows due to the projection called the bridge (22) and the piston (4) which is situated above the bridge. The air flow speed increases when it passes this restriction whereupon the fuel is picked up more easily. On the top of the carburetor, there is a suction chamber (1) with the piston (4). There is a tapered needle (24) attached to the lower section of the piston.

The piston is guided by a central spindle which is mounted with a bushing fitted in the central boss of the suction chamber. The upper section of the piston fits into the suction chamber precisely. The lower section functions as a shutter and restricts the area of the main air passage in the vicinity of the fuel jet as the piston falls. The piston, under the influence of its own weight and in certain cases assisted by the spring, (2) will tend to assume its lowest position. When the

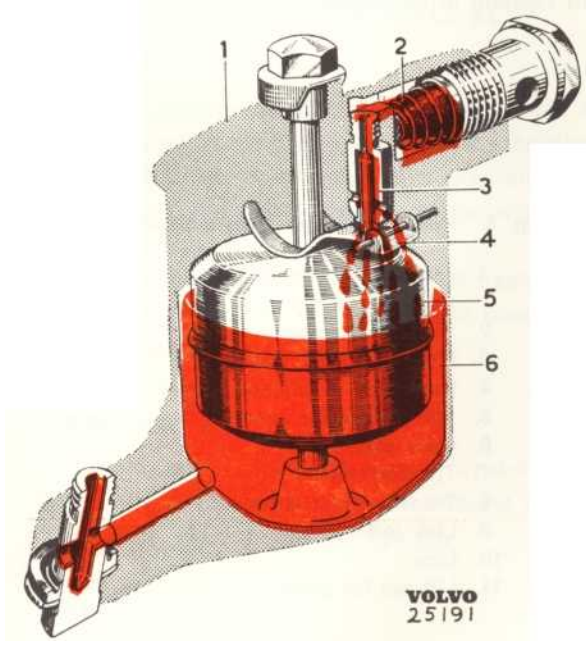
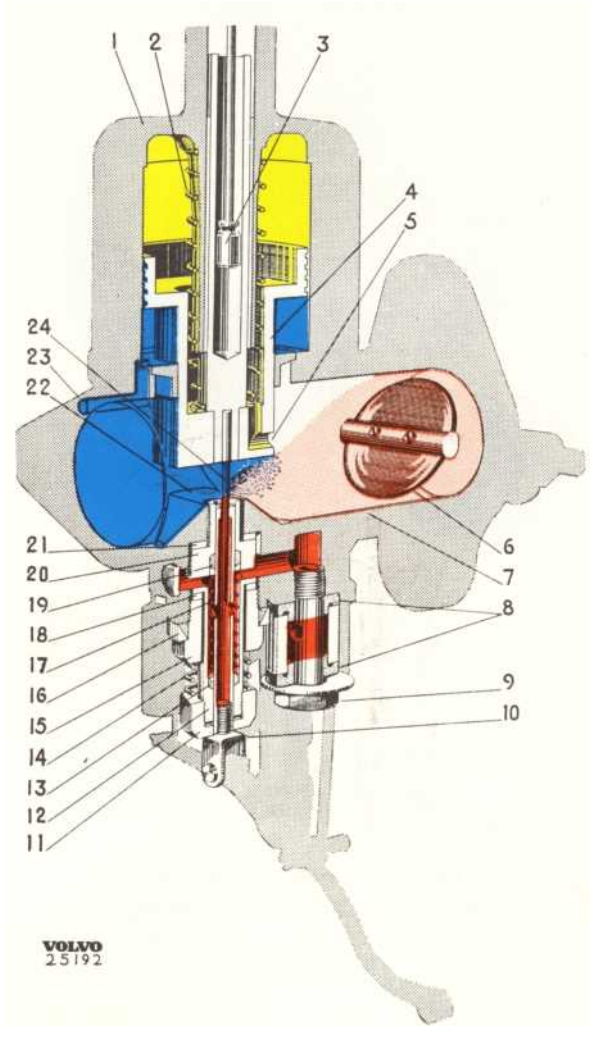


Fig. 7. Float system.

1. Float chamber cover
2. Strainer
3. Needle valve
4. Lever
5. Float
6. Float chamber

Fig. 8. Carburetor, operating position.

1. Suction chamber
2. Spring
3. Damping plunger
4. Piston in suction chamber
5. Channel
6. Throttle
7. Carburetor housing
8. Rubber gasket
9. Bolt for float chamber
10. Jet
11. Adjuster nut
12. Lower jet bearing
13. Seal with washer
14. Spring
15. Lock nut
16. Seal washer and gland
17. Spring
18. Washer
19. Seal ring with washer
20. Upper jet bearing
21. Washer
22. Bridge
23. Channel
24. Fuel needle



piston is in its lowest position it rests against the bridge and a pin attached to it.

When the throttle opening increases, when running, the vacuum in the chamber between the bridge and the throttle increases and then the space above the piston is connected, through the channel (5), with the previously mentioned chamber, so that the piston rises. The area under the upper section of the piston in connected with the outer air by channels (23) and a pin attached to it.

When the piston rises, the carburetor channel cross-section above the jet is enlarged and admits an additional quantity of air. Owing to the fact that the fuel needle is attached to the piston, it rises with the piston and the effective opening between the fuel needle and the jet is enlarged. A quantity of fuel corresponding to the quantity of air is sucked in. The amount of fuel is regulated partly by the piston (fuel needle) position and partly by the air flow speed.

The jet obtains the fuel, from the area in the carburetor housing at the float chamber connection, through holes in the jet walls.

The position of the piston will be stable for any given air flow through the carburetor. The degree of this air flow is determined by the degree of throttle opening and the engine speed and loading. Any tendency on the part of the piston to fall will be accompanied by a reduction of the air flow between the bridge and the lower side of the piston. There will then be an increase in the partial vacuum between the piston and the throttle which will immediately result in an increased partial vacuum in the upper part of the suction chamber. The piston will then rise immediately until balance is once again obtained.

In order to prevent the piston from coming into any pendular motion or moving excessively rapidly, there is a damping device in the recess in the piston spindle. This device consists of a damping plunger (3) attached to the rod. The hollow interior of the spindle contains a quantity of thin engine oil The retarding effect of the damping device on rapid movement of the piston prevents the engine from stalling due to an excessively lean fuel-air mixture when the accelerator pedal is depressed rapidly.

Opposite the throttle (rear carburetor), there is a connection for the pipe line to the vacuum regulator on the distributor.

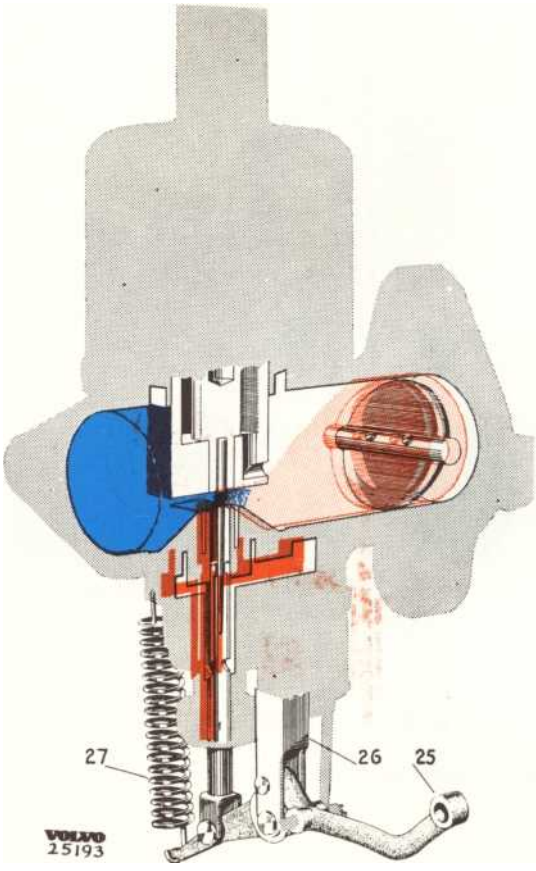


Fig. 9. Carburetor, cold start.

25. Lever
26. Link
27. Spring

Cold starting

In order to richen the fuel-air mixture when starting a cold engine ,there is a device on the carburetor (Fig. 9) by which the jet can be lowered. When the jet is lowered, there will be a wider passage for the fuel since the needle in the jet is tapered. There is no choke shutter on the carburetor.

The jet, the lower part of which is yoke-formed, is not fitted directly into the carburetor housing but is in two bearings (12 and 20, Fig. 8) so that it can be moved up and down. When the lock nut (15) is loosened, the jet can also be moved laterally (for centralizing). The upper jet bearing has a flange which, with the aid of a washer (21), seals against a recess in the carburetor body, and the lower bearing flange seals with the help of a washer (18) against the upper surface of the lock nut. The lock nut seals against the carburetor housing by means of a washer and gland (16).

Inside the bearing there is a spring (17) exerting pressure against two washers with sealing glands (13 and 19) which prevent any leakage of fuel between the jet and the upper jet bearing.

When a cold engine is being started, the outer end of the lever (25, Fig. 9) is pulled upwards by means of a control, whereby the movement is transmitted through the link (26) so that the jet, which is connected to the inner end of the lever, is pulled downwards. This movement is limited by means of a projection on the lever and return to the normal position is taken care of by the return spring (27), when the control is pushed in.

At the same time as this lever is operated, the throttle is opened slightly by means of the rapid idling device described below.

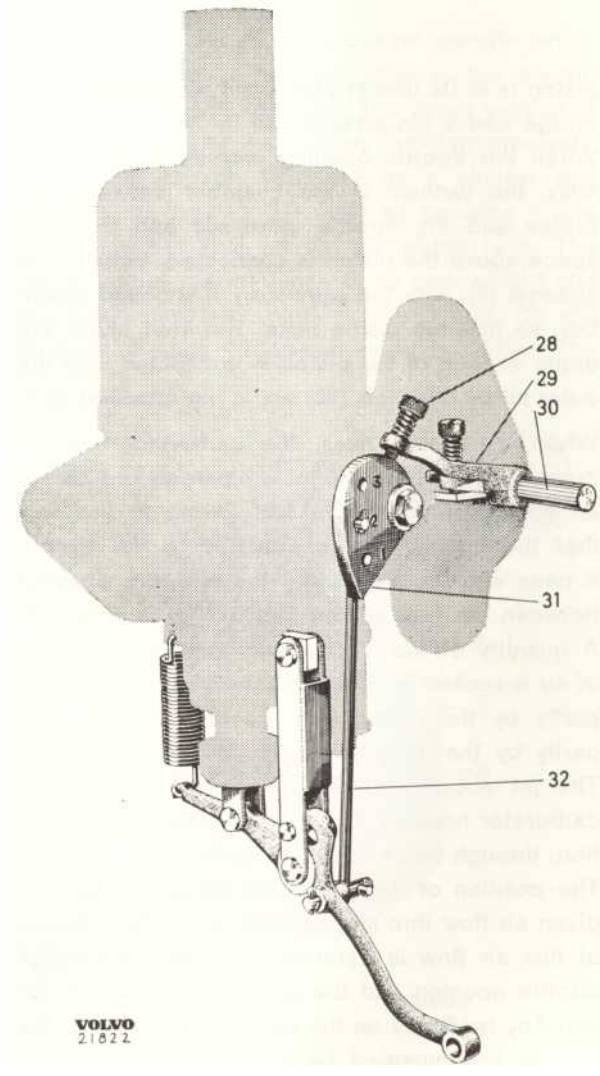


Fig. 10. Carburetor, rapid idling.

28. Adjuster screw
29. Lever
30. Shaft
31. Cam plate
32. Link rod

Rapid idling

When the rapid idling device is operated, a larger throttle opening is obtained then is usual during normal idling and this is used during the engine warming-up period in order to obtain a somewhat higher idling speed. See Fig. 10. When the choke knob on the instrument panel is pulled out, the rapid idling system is influenced first. If the knob is pulled further out, (more than '/2") increased resistance is felt depending on the fact that the jet is being influenced.

The device, which is connected to the cold starting device, consists of a link rod (32) connected to the lower lever, which influences a cam-shaped plate (31) attached to the carburetor housing. There is an adjuster screw which contacts this plate when the rapid idling device is in operation. This screw is attached to the throttle lever (29). When the lower outer end of the lever is lifted, the cam-formed plate is turned, by which the throttle is opened slightly. (The end of the lever can be lifted slightly before the jet is influenced depending upon the large clearance in the lever hole on the link).

The cam-shaped plate has three positions for the link rod. Normally the hole marked 2 is used.

Idling

When the engine is idling, the carburetor piston is in its lowest position and rests on the bridge at the jet on a pin. The small opening which remains between the bridge and the piston allows the required amount of air to pass for idling without there being a sufficiently great partial vacuum to raise the piston.

The amount of fuel required for idling is very small and the tapered needle almost entirely fills the jet opening.

The jet is pressed upwards by the spring (10, Fig. 6) for the lever (7) so that the lower part of the jet is supported against the adjuster nut (8), which is locked in position by means of another spring (6). This nut is used to set the amount of fuel passing through since the fuel needle is tapered.

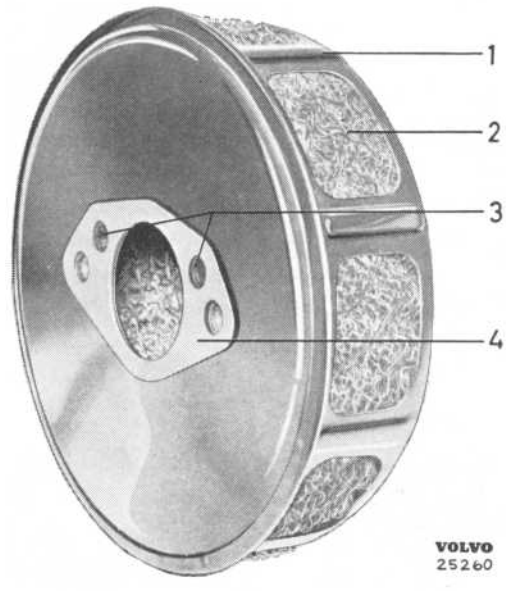


Fig. 11. Air cleaner.

1. Housing
2. Wire filter. Late production units have special paper cartridges
3. Ventilation holes
4. Gasket

If the nut is screwed upwards, a leaner fuel-air mixture is obtained and if the nut is screwed downwards, the mixture will be richer.

The fuel-air ratio is set at idling for the complete speed range.

AIR CLEANERS

There is one air cleaner on each carburetor. These consist of metal housings containing wire filters, see Fig. 11. The air passing into the engine is cleaned when it passes through the oil-soaked filters so that impurities are thus prevented from entering and causing damage to the engine.

Late production air cleaners have special paper cartridges. These air cleaners may not be oiled in or washed.

Ventilation air to the lower part of the carburetor suction chamber passes through the holes (3) in the cleaner so it is important to ensure that the gasket (4) is correctly fitted, otherwise the holes can be blocked.