



# SERVICE MANUAL

TRUCKS

**L 385**

*Export Service Department*

AKTIEBOLAGET

**VOLVO**

GÖTEBORG . SWEDEN

Then press on the camshaft gear with press tool SVO 1356, tighten the nut and secure it with a lock washer.

The idler gear is then fitted on its journal, due attention being paid to the markings, and is tightened by means of two bolts which are then secured with lock washers.

Finally the fuel injection pump drive gear is fitted with the help of press tool SVO 1356 care being taken to ensure that the markings on the gear are in their correct positions.

The tooth flank clearance is then checked and this should be 0.03-0.07 mm (0.0018"-0.0027"). This clearance is measured either with a feeler gauge or a dial indicator as shown in Fig. 1-80.

When carrying out measurements with a dial indicator, first measure the clearance between the crankshaft gear and the idler gear. Then lock the idler gear and measure the clearance on the other gears. On early production engines when measuring tooth flank clearance for the fuel injection pump and vacuum pump drive gears, a special fixture must be used which follows the contours of the auxiliary drive gear casing and has been precision ground. This fixture is bolted into position on the intermediary plate to prevent any movement on this.

## VALVES AND VALVE MECHANISM

### Inspection

#### Valves and Valve Seats .....

The valve disks may not be burned or distorted and there should be no deep pitting in the contact surface towards the valve seat. The valve stem should be absolutely straight and wear should not exceed 0.02 mm (0.0008"). After grinding the edge on the valve disk should not be less than 1 mm wide (0.04") since otherwise heat conduction will not be sufficient. Valves which do not come up to this specification should be discarded.

The valve seats should be checked for cracks, the condition of the contact surface and looseness. Loose or cracked valve seats should be replaced. Burned valve seats can be adjusted by using a valve seat cutter or a Vibro-Centric grinder.

#### Valve Guides .....

Excessive looseness between the inlet valve stems and their guides causes oil losses. If the valve stems and guides are worn, the vacuum caused by the induction stroke of the piston will carry an excessive amount of oil and air to the combustion chamber. Oil which has passed through the inlet valve guides can easily be detected since there will be a thick deposit of carbon on the underside of the valve disks. Clearance between the valve stem and guide is measured by using a dial indicator. Fit a new valve. See Fig. 1-81. Since the diameter of the inlet and exhaust valves are not the same, care must be

taken to ensure that exhaust valves are used in exhaust valve guides and inlet valves in inlet valve guides. When new valves are fitted the clearance may not exceed 0.15 mm (0.0060") for inlet valves and 0.17 mm (0.0067") for exhaust valves.

The exhaust valve relief gap can be cleaned by using reamer SVO 1727. See Fig. 1-82.

#### Valve Springs .....

Valve springs should be checked for straightness, length and tension. This test is carried out in a spring tester. The valve springs must come up to the specifications shown. Springs which do not satisfy this specification should be replaced.

#### Push Rods .....

The push rods should be absolutely straight and there should be no damage on the ends. The end plugs should not be loose or the tube deformed in any way. Damaged or twisted push rods should be replaced.

The push rods should be straight within 0.4 mm (0.016") over their entire length.

#### Valve Lifters .....

The spherical contact surfaces towards the cams should be neither worn or cracked. The radial clearance of the valve lifter should not exceed 0.1 mm (0.004").

Valve lifters with excessive looseness or damaged spherical surfaces should be replaced. Replacement should also be carried out in cases where there is obvious pitting on the spherical contact surfaces.

#### Rocker Arms and Shafts .....

There are three points on the rocker arm which are subject to wear and these points should be carefully examined. They are the rocker arm bushings, the rocker arm contact surface with the valve and the set screws.

Looseness in the bushings may not exceed 0.1 mm (0.004"). The rocker arm contact surface should be an even and scratch-free curve against which the valve stem glides without jumping. The threads of the adjuster screws should be in good condition as well as the hex on the lock nut. Make sure that the ball is not deformed in any way and that the spherical surface contacting the push rod is in good condition. The nuts on the adjuster screws are usually replaced each time the engine is reconditioned since these become more or less deformed.

Damaged adjuster screws and rocker arms should be replaced. Replace also worn rocker arm bushings. There should be no scoring or signs of wear on the rocker arm bearing points. Since the rocker arm shaft serves as an oil distributor to the rocker arms and bearing brackets, it

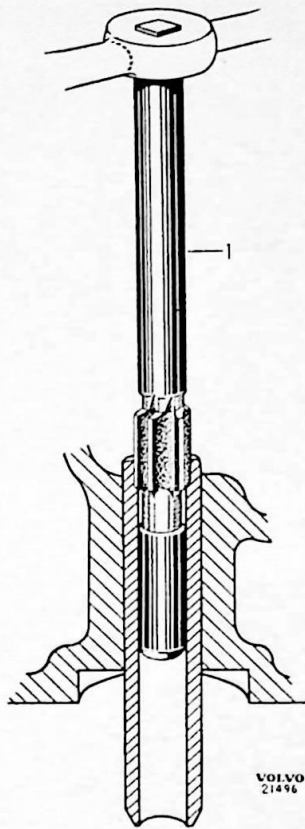


Fig. 1—82.  
1. Reamer SVO 1727

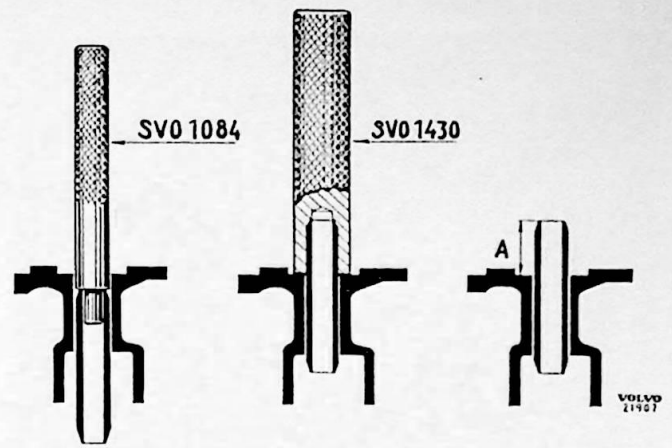


Fig. 1—84. Fitting valve guide.

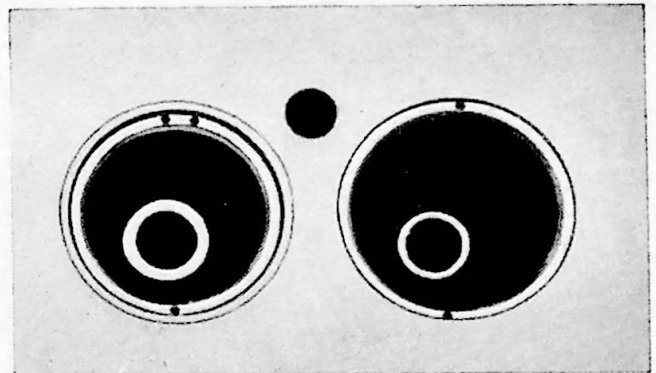


Fig. 1—85. Valve seat replacement.

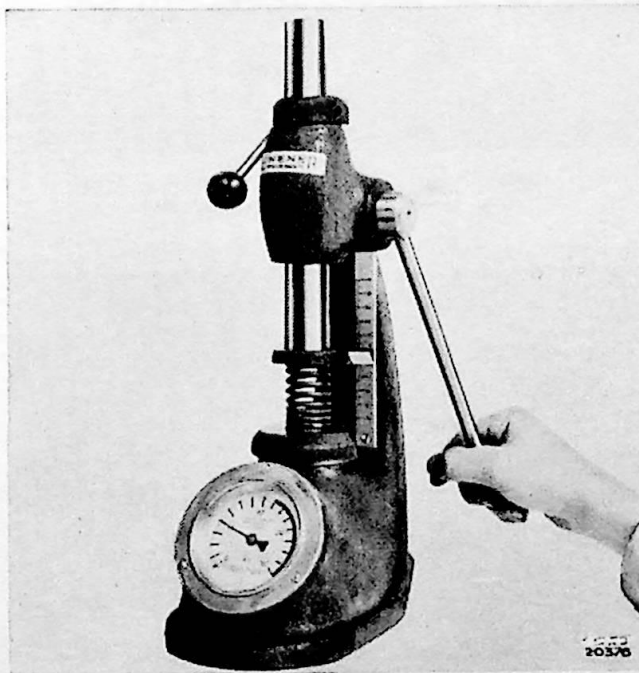


Fig. 1—83. Testing spring.

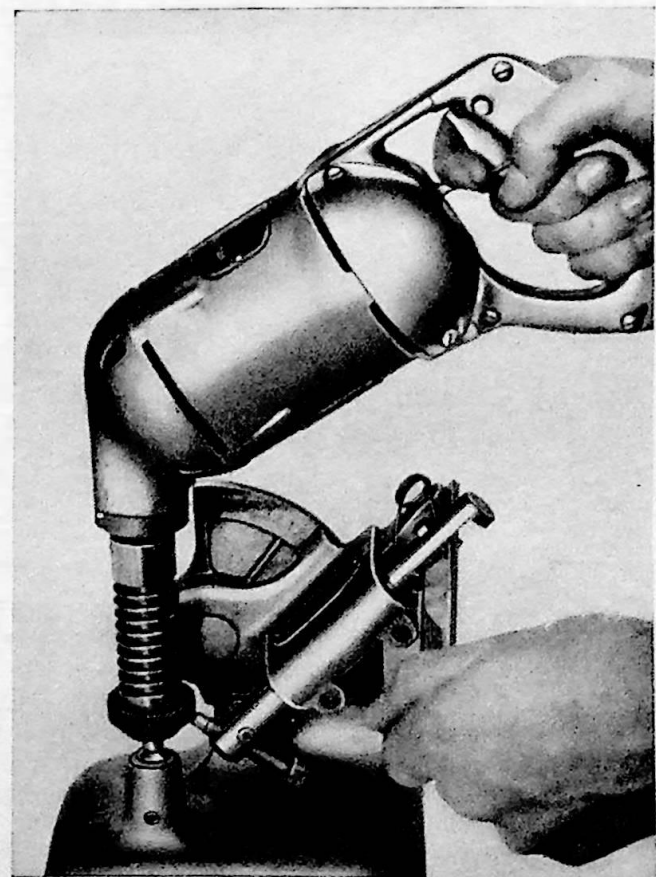
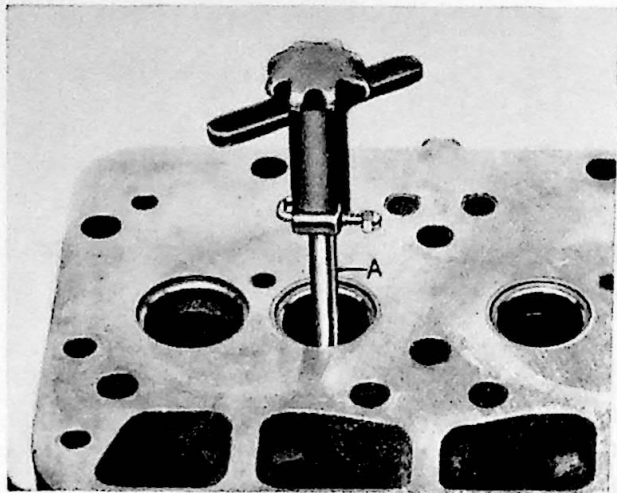
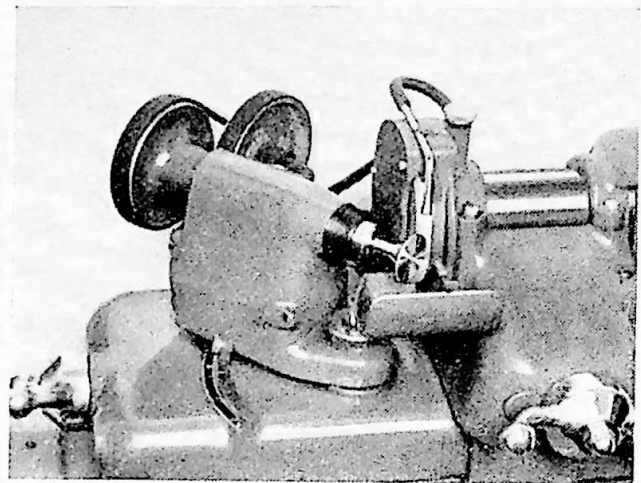


Fig. 1—86. Dressing grinding stone.



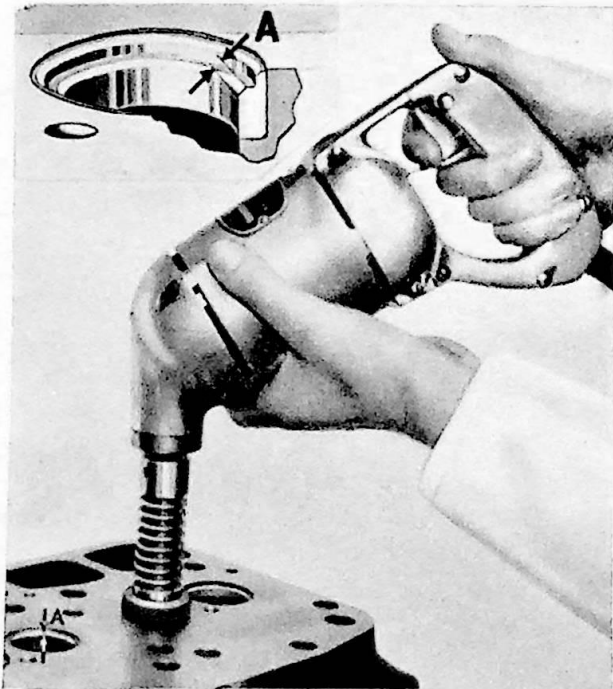
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Fig. 1-87. Fitting guide.



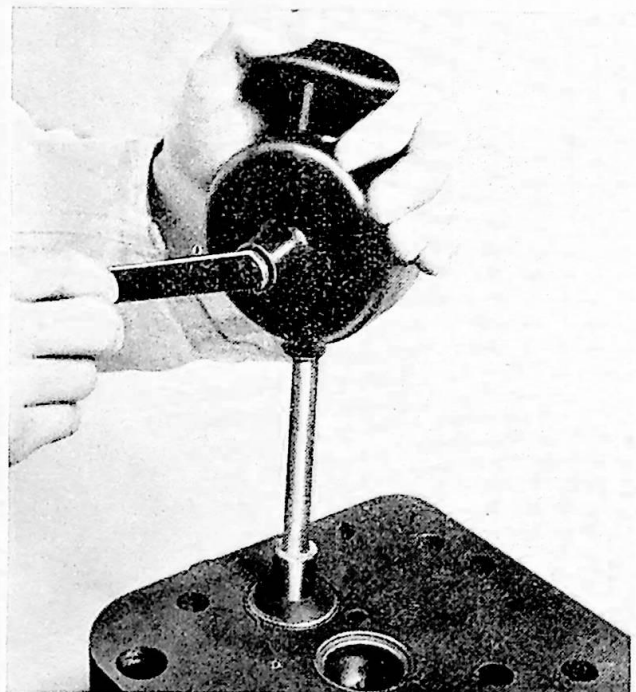
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Fig. 1-90. Refacing valve.



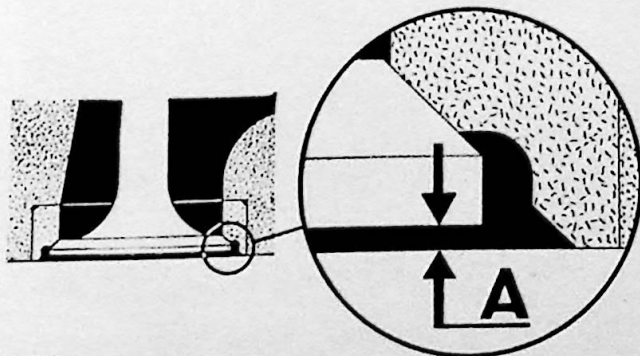
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Fig. 1-88. Grinding seat.



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Fig. 1-91. Lapping-in valve.



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Fig. 1-89. Valve position in cylinder head.

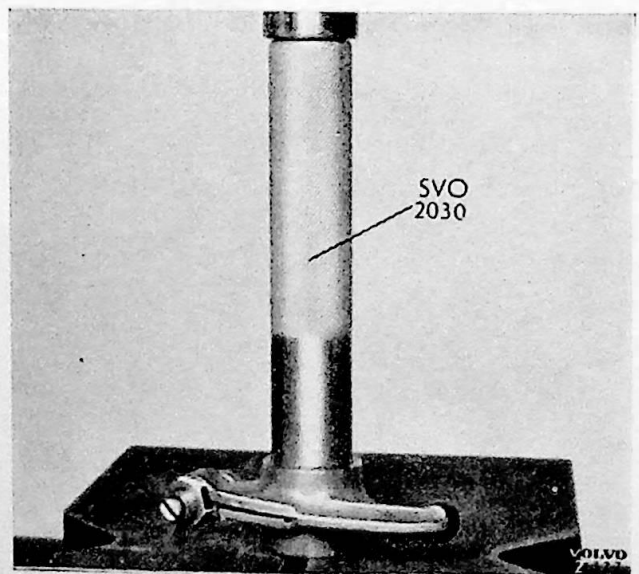


Fig. 1-92. Removing and fitting rocker arm bushing.

should be carefully cleaned internally. Remove the sealing washers and then brush and flush it clean. Fit new end washers when reassembling.

#### Replacement of Valve Guides

1. Press out the guide (see Fig. 1-84) with tool SVO 1084.
2. Press in a new guide (see Fig. 1-84) with tool SVO 1430 which ensures that the correct height above the cylinder head surfaces is obtained. After the guide has been pressed in the distance "A" (Fig. 84) should be 31 mm (1.7/32").
3. Ream the valve guide if necessary. See the specifications for the clearance between the valve and the guide.

#### Replacement of Valve Seats

1. Remove the old valve seats by drilling two diametrically opposed raiser holes. Be careful to ensure that the cylinder head is not damaged when this is done.
2. Crack the seats by using a sharp chisel and then remove the pieces.
3. Clean the valve seat location thoroughly and check to ensure that there are no cracks in the cylinder head around the seat location.
4. Measure the diameter of the valve seat location. Use these measurements to determine the possibilities of fitting a standard size valve seat or whether an oversize needs to be fitted. See the specifications concerning oversizes.
5. If necessary, a cutter must be used to widen the valve seat location to enable an oversize valve seat to be fitted.
6. Cool the new valve seat in dry ice (carbon dioxide snow) at a temperature of minus  $65^{\circ}$  - minus  $70^{\circ}$  C (minus  $76^{\circ}$  - minus  $94^{\circ}$  F) and heat up the cylinder head by using warm water or other suitable methods.
7. Press the seat into position with a suitable tool.
8. Machine the seats into the correct angle and width.

#### Valve Seat Grinding

Replace and ream the valve guides before commencing valve seat grinding. A Vibro-Centric machine and grinding stones are used for this purpose. The machine is located by means of a pilot which is fitted in the valve guides. Since the valve guide centralizes the pilot the whole time, the work is always carried out in a satisfactory manner relative to the center line of the valve guides. If the best possible results are to be obtained, the grinding stones should be very carefully dressed to ensure that the right angle is obtained. This angle should

be  $45^{\circ}$  for both the inlet valve and exhaust valve seats. Another fact which must not be overlooked is the correct tightening of the pilot. This must be firmly in position if the grinding stone is to be maintained in a position which is absolutely at right angles to the longitudinal axis of the valves.

Be careful to see that an excessive amount of material is not removed and make sure that a good contact surface with the right profile is obtained by removing the smallest possible amount of material. As a result of grinding, the width of the contact surface is increased. This must now be reduced so that the width of the contact surface is 1.5-2 mm (0.060" -0.080") and this is done by grinding down the upper edge with the grinding stone at an angle of  $20^{\circ}$ .

A new valve seat must be ground so that the difference between the upper surface of the cylinder head and the upper surface of the valve is 0.5-0.8 mm (0.020"-0.032"). See Fig. 1-89.

A valve seat may not be ground an unlimited number of times. When an excessive amount of grinding has been carried out, this causes flow losses at the same time as it weakens the seat considerably. Valve seats should therefore be replaced when the distance between the upper surface of the valve disk and the cylinder head surface when measured with a new valve exceeds 2 mm (0.080").

### Valve Grinding

Valves which have become burned or deformed in other ways are refaced in a machine for this purpose so that the seating face and the valve stem assume the correct angle.

The seating face of the valve should be ground down as little as possible, that is to say until it is "clean". If the valve mechanism is to work as noiselessly as possible, the valve stem butt should be even. This operation is carried out by pressing the valve with the stem in a carrier on the refacing machine and grinding the butt until it is absolutely smooth.

When the valve disk is being ground to obtain a "clean" surface and it is found that the width of the valve seating face is less than 1 mm (0.040"), the valve should be discarded. Valves with twisted stems should also be discarded. After the valve disk has been refaced and the stem butt has been ground, the valve should be lapped-in to the valve seat and this is done in the following way:

Smear a little fine lapping compound on the contact surface and then insert the valve into the guide. A coil spring about 35 mm (1.3/8") long should be inserted under the valve disk.

A suitable machine is used to force the valve against its seat and then twist it backwards and forwards. While this lapping is being carried out the valve should be lifted from its

seat now and then to ensure that the grinding action is being distributed around the complete contact surface. Make sure that there is always lapping compound on the valve.

Lapping should be continued until a good contact surface is obtained around the complete circumference of the valve. Check the contact then by coating the valve with a thin layer of marking paint, inserting the valve in position and giving it half a turn. If the contact is correct, the marking paint should be evenly distributed around the complete contact surface. If this should not be the case, continue lapping until a satisfactory result is obtained. Then clean off the valve, the seat and the surrounding portion of the cylinder head very thoroughly.

#### Replacement of Rocker Arm Bushing

1. Press out the old bushing using tool SVO 2030 (Fig. 1-92).
2. Press in the new bushing with tool SVO 2030 in such a way that the oil hole in the bushing indexes with the hole in the rocker arm.
3. Ream the bushing to an accurate running fit.

#### Valve Adjustment

After the cylinder head has been refitted on the cylinder block, the valve should be adjusted before the engine is started. A rough adjustment is first carried out with a cold engine. The engine is turned to the compression stroke on the first cylinder, that is to say with number one piston in its top dead center position after which the clearance should be measured on the rocker arms 1, 2, 4, 5, 7 and 9. The crankshaft is then given one complete revolution and the clearance is then measured on rocker arms 3, 6, 8, 10, 11 and 12. This procedure is possible due to the cam positions (turned downwards).

Valve clearance should be 0.40 mm (0.160") for inlet valves and 0.45 mm (0.0180") for exhaust valve. After this rough adjustment has been carried out the engine should be started and run until normal operation temperature is reached after which it is stopped and a final adjustment is carried out. Since the combustion chambers are in the form of toroidal chambers in the piston crowns, the pistons travel upwards so close to the valves that valve adjustment may never be carried out with engine running since the valves could then strike against the piston and serious damage results.

Valve clearance is adjusted by loosening the lock nut and turning the adjuster screw before retightening the lock nut (see Fig. 1-93). The location of the inlet and exhaust valves is shown in Fig. 1-94.

#### AIR CLEANER

The air cleaner must be cleaned at regular intervals. It is usually sufficient if this cleaning

is carried out after every 10,000 km (6,000 miles). If the vehicle is being run on dusty roads, however, cleaning must be carried out more often.

First remove the complete air cleaner and then unscrew the butterfly nut. When this is being done, the cover is removed and the filter element taken out. Empty out the oil and remove sludge by rinsing with gasoline or kerosene. The filter is then washed in gasoline which should be allowed to run off. Then refill up to the "Level" mark with oil of the same type being used in the engine.

## LUBRICATING SYSTEM

### Oil Pan

#### Inspection .....

The oil pan should be checked for cracks and dents. If the plating is buckled at the bolt holes it must be flattened out so that the contact surface against the cylinder block is absolutely level. Check that the threads on the drain plug and the hole in the oil pan are undamaged. The drain plug is fitted with a magnet.

Check that the magnetic affect on this is unchanged.

#### Fitting .....

New gaskets should always be used when the oil pan is fitted. Make sure that the contact surfaces are free from dirt. Tighten the bolts carefully a little at the time.

The cork gaskets should be smeared on one side with sealing compound so that they fasten on one of the sealing surfaces. The other side of the gasket should be smeared with grease which facilitates removal the next time this is carried out.

### Oil Strainer

The oil strainer which is attached to the oil pump can be reached after removing the cover in the bottom of the oil pan.

On early production engines with the floating oil strainer, the cotter pin in the pump cover suction channel is removed and then the strainer can be taken out.

On late production engines the strainer is fixed and consists of a strainer housing which is bolted to the pump cover as well as a strainer net which is retained in the housing by a circlip.

To clean this strainer, remove the circlip and then take out the strainer net. The best way of cleaning the net is in a degreasing bath and then rinsing it with warm water and blowing it dry with compressed air. After cleaning, check that the strainer net is in good condition.