AIR PUMP MODEL AP1F

1. DESCRIPTION

This belt-driven pump introduces air into the exhaust manifold while the engine is running to assist in reducing the toxic content of the exhaust gas of petrol-engined vehicles. It is designed for engines of 1000 cc to 4000 cc capacity.

(a) Construction

The main parts of the air pump comprise the pump body, the port-end cover, the rotor and vane assembly and the relief valve. Its construction is shown in Figs. 2 & 3.

The rotor is supported by a ball bearing at the driving end and a needle roller bearing at the port end.

The rotor drive-end bearing is circlip-retained in the pump body while the port end bearing is carried on a journal which forms part of the port end cover. The eccentrically-positioned fixed vane shaft forms an extension to the inner face of the journal.

Two slots in which vanes slide are positioned at opposite sides of the hollow rotor. Spring-loaded carbon vane seals bear on the vanes to prevent air leaking to the inside of the rotor. A spring is positioned behind one of each pair of vane seals. The vanes

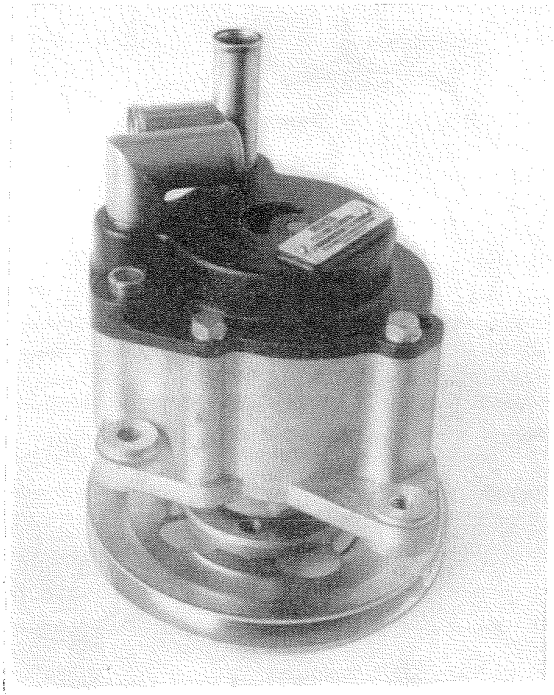
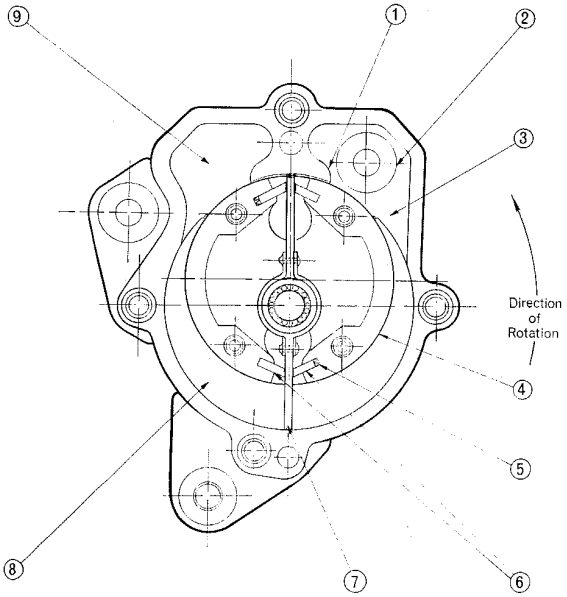
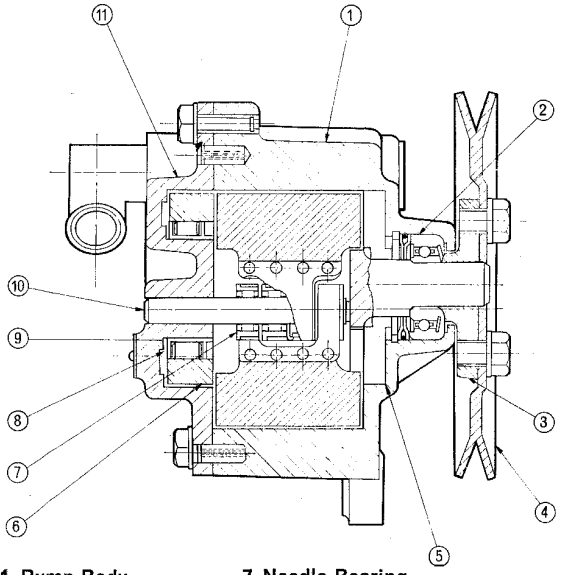


Fig. 1



1 Stripper Land
2 Relief Valve
3 Exhaust Chamber
4 Rotor
5 Vane Spring
6 Vane Seal
7 Vane
8 Pump Chamber
9 Intake Chamber

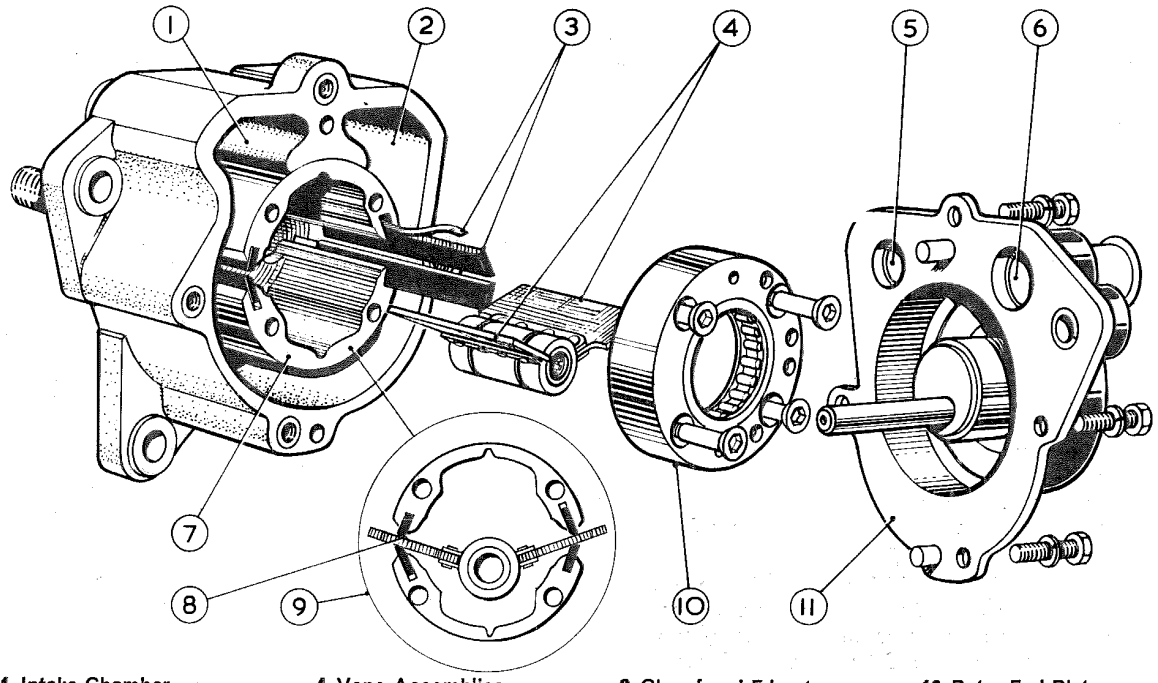
Fig. 2 Sectioned end view of air pump



1 Pump Body
2 Ball Bearing
3 Drive Hub
4 Pulley
5 End Plate
6 Rotor End Plate
7 Needle Bearing (Pump Vanes)
8 Needle Bearing (Rotor Shaft)
9 Inner Race
10 Vane Shaft
11 Port-End Cover

Fig. 3 Sectioned side view of air pump

Air Pump Model AP1F



1 Intake Chamber
2 Exhaust Chamber
3 Vane Seal & Spring Assembly
4 Vane Assemblies
5 Exhaust Port
6 Intake Port
7 Rotor
8 Chamfered Edge to Inside
9 Arrangement of Vanes & Vane Seals
10 Rotor End Plate
11 Port-End Cover

Fig. 4 Air Pump Model AP1F dismantled

are independently mounted and rotate freely on the needle roller bearings carried by the vane shaft.

Initially, the tips of the vanes may slightly foul the pump body, but the vanes quickly 'bed' and thereafter run with minimum clearance.

(b) Operation

Air, drawn through the air cleaner and inlet pipe to the intake chamber, is trapped between the two vanes and the inner surface of the pump body. The vanes (rotating clockwise when viewed from the drive end) transfer the air into the exhaust chamber and so, via an external non-return valve, to the exhaust manifold.

Minimal clearance between the rotor and stripper land effectively prevents air leaking from the exhaust to the intake chamber.

The relief valve is fitted to the exhaust chamber to safeguard the pump from over-pressurisation at any time.

The air pump runs with little noise. If abnormal pump noise cannot be traced to belt slip or any other obvious cause the pump must be removed from the engine and dismantled for detailed inspection.

2. ROUTINE MAINTENANCE

Periodically check the tension of the pump driving belt. If belt adjustment is required, slacken the pump fixing bolts and move the pump body by hand only until there is a total deflection of $\frac{1}{2}$ in (13 mm) at the mid-point of the longest span of the belt.

DO NOT APPLY PRESSURE TO THE PUMP BODY WITH A LEVER.

The pump will normally require servicing only at 50,000 mile (80,000 km) intervals and no maintenance is required between these periods.

3. TECHNICAL DATA

Model:	AP1F
Construction:	positive displacement system semi-articulated type
Number of vanes:	2
O/D of inlet pipe:	19 mm
O/D of inlet pipe:	16 mm
Theoretical delivery volume:	140 cc/rev.
Max. speed:	8000 rev/min.

4. SERVICING

(a) Dismantling

Dismantle the pump in the following manner.

Withdraw the four pulley-fixing bolts. Mount the pump on a housing bracket made from angle iron and mount the whole in a vice as shown in Figure 5.

WARNING: Do not grip the aluminium pump body or the drive hub in the vice jaws or damage may occur.

Withdraw the four port-end cover fixing screws.

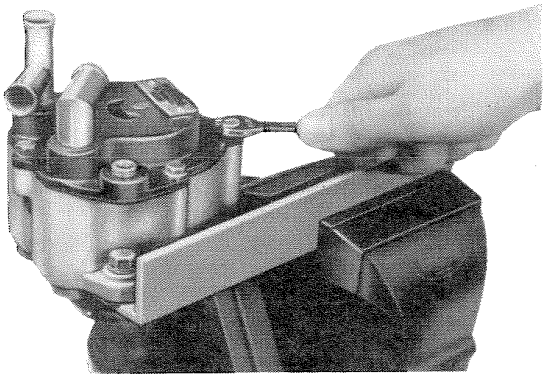


Fig. 5 Removing the port-end fixing screws

Withdraw the port-end cover from the pump body. If there is difficulty in separating the two, carefully tap the cover vertically using a plastic-faced or wooden mallet.

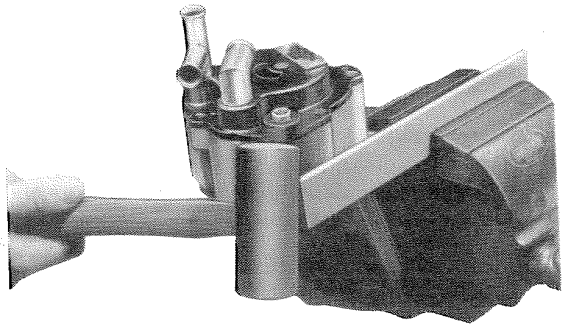


Fig. 6 Withdrawing the port-end cover

Remove the four socket-headed screws which secure the rotor end plate to the rotor. The threaded holes are unequally spaced to ensure that the rotor end plate is re-assembled into its original position.

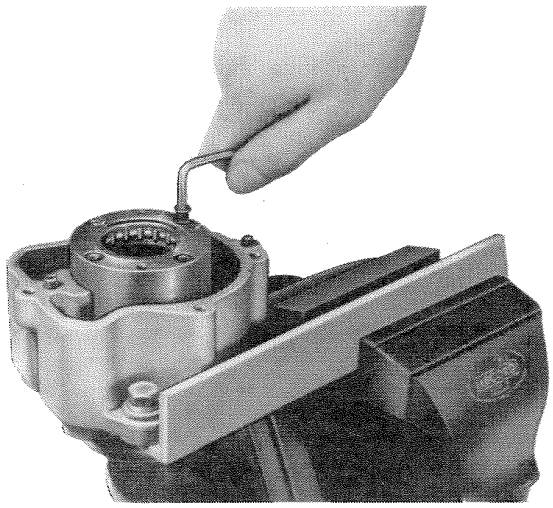


Fig. 7 Removing the rotor end plate

Lift the vane assemblies clear of the rotor. Wash the needle roller bearings in clean paraffin (kerosene) and dry them with a dry air blast.

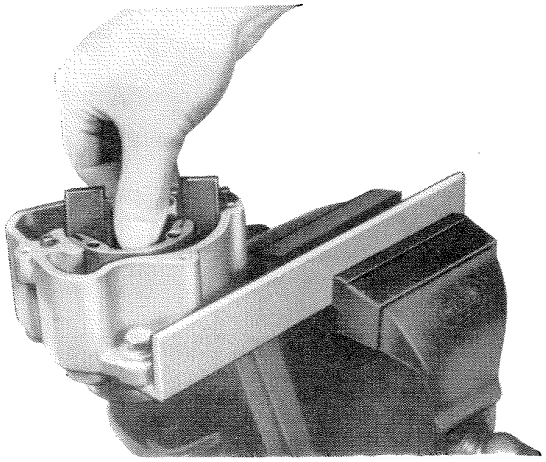


Fig. 8 Removal of the vane assemblies from the rotor

Check the vane needle bearings for wear by inserting a 0.375 in (9.525 mm) dia. shaft into the vane bearings. If satisfactory, repack the bearings with ESSO 'Andok' 260 lubricant. Renew the vane assemblies if the bearings are worn or if there is evidence of excessive grooving of the vanes by the vane seals.

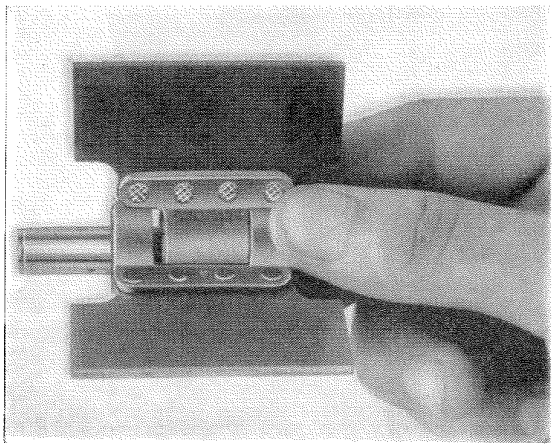


Fig. 9 Checking the vane bearings for wear

Remove the vane seals and springs from the rotor.

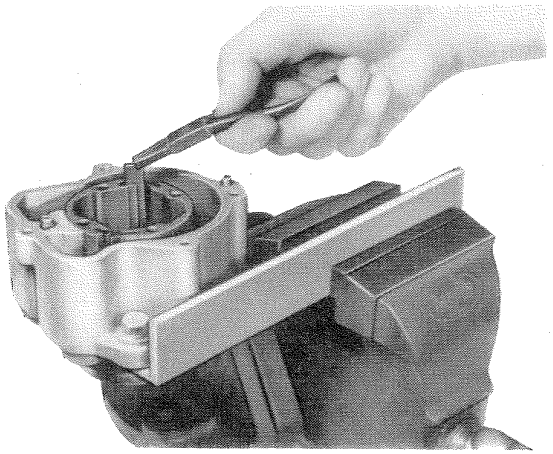


Fig. 10 Removal of the vane seals and springs

Wash the rotor end plate in clean paraffin (kerosene). If the bearing does not rotate smoothly It must be replaced with a new one in the following manner:—

Push the bearing out from the port-end cover side of the rotor end plate. Care must be taken not to deform the rotor end plate by supporting it with a suitable ring.

Using a press, insert the new bearing into the housing from the port-end cover side. Keep the lettered side of the bearing outer ring facing the port-end cover. Insert the bearing until it is $\frac{1}{32}$ in (0.8 mm) below the face of the rotor end plate. Do not attempt to drive the bearing into position using a hand tool.

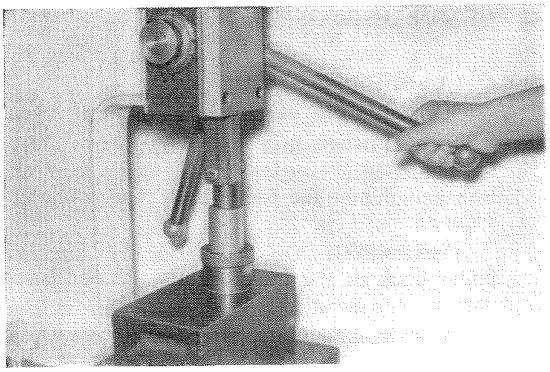


Fig. 11 Renewing the rotor port-end bearing

The relief valve is a press fit into the pump body and can be pressed out with a $\frac{1}{2}$ in (12.6 mm) dia. soft metal drift. The illustration shows this being carried out with the pump assembled, the drift being inserted through the outlet pipe to contact the relief valve.

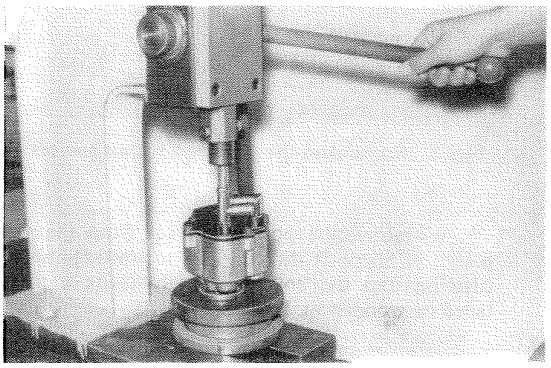


Fig. 12 Removal of the relief valve

Use a concave-faced tool for inserting the new valve so that it bears only on the periphery of the valve.

The illustration shows a suitably-dimensioned tool.

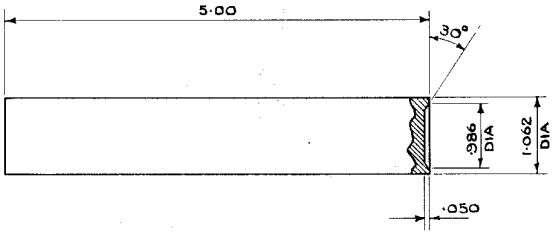


Fig. 13 Details of the relief valve fitting tool