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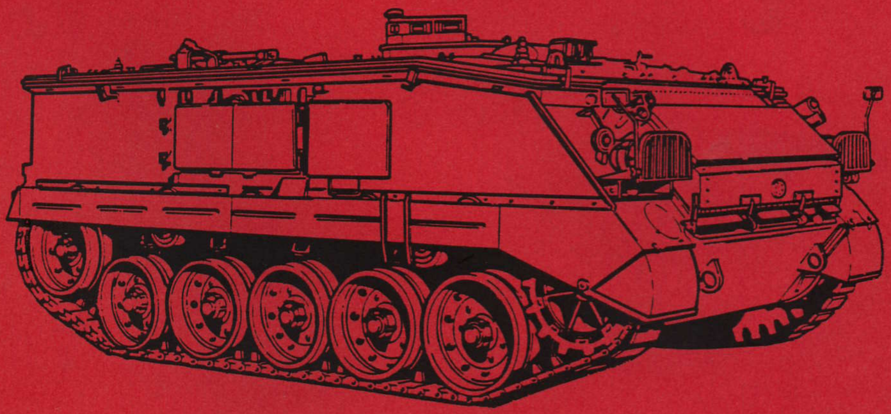
FV 430 SERIES



SEME REF NO: V2/18

CHAPTER 2

Power Pack

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LIST OF ILLUSTRATIONS

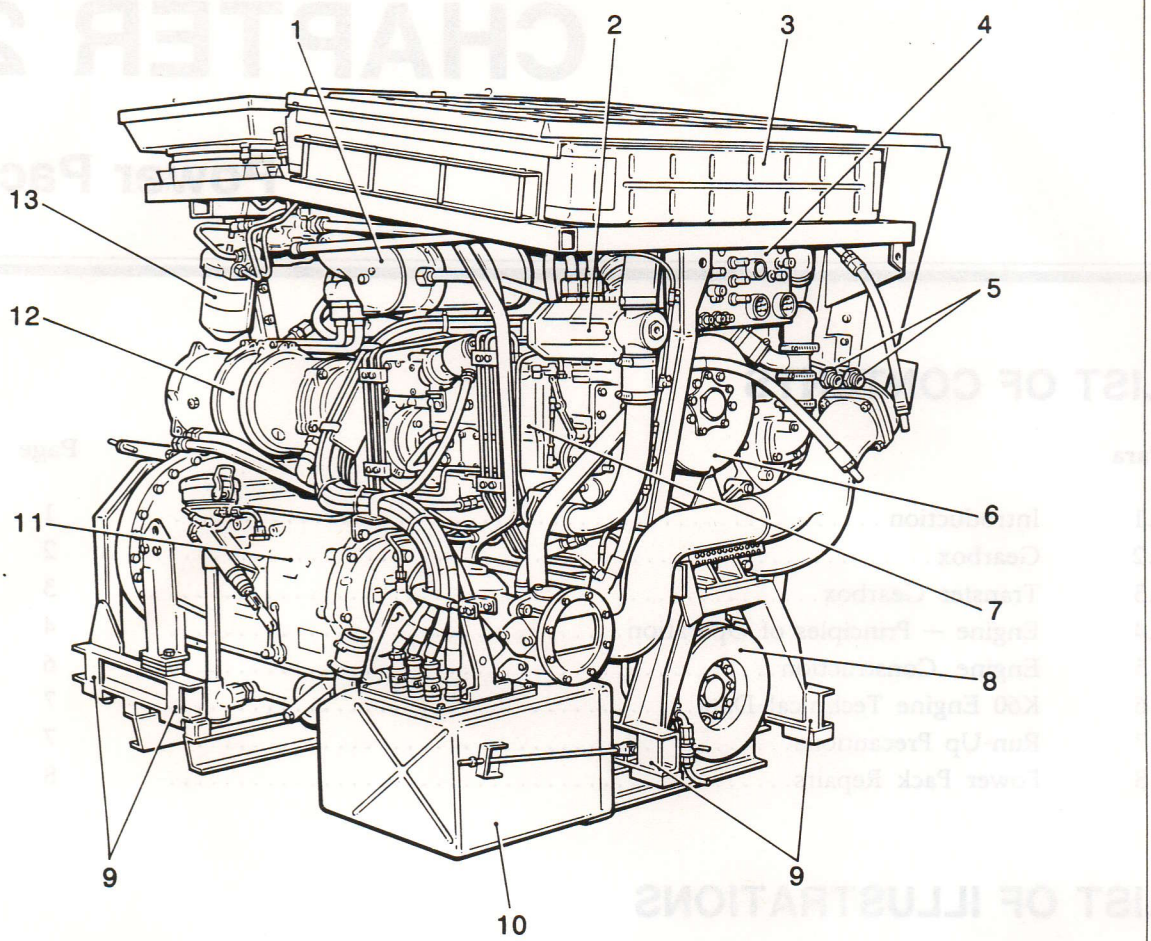
2.1 INTRODUCTION

See Figs 2.1 and 2.2.

The power pack is a composite unit containing all the assemblies required to supply power, both electrical and mechanical, to the vehicle with a gearbox incorporated to give a mechanical variation in torque and direction.

The power pack is a self contained unit which can be removed from, or installed in, the vehicle as a single assembly. It comprises an engine with its attendant oil tank, heat exchanger, radiator, hydraulic fan assembly and air cleaner; with a semi-automatic gearbox and a transfer gearbox.

The connections for the electrical circuits, fuel and fire warning system are made at the front of the power pack on the power pack junction (PPJ).



1. Heat Exchanger
2. Fan Controller
3. Radiator (two pass)
4. Power Pack Junction
5. Steering unit oil connections to heat exchanger
6. Air Crankshaft Damper
7. Fuel Injection Pump and Governor
8. Exhaust Crankshaft Damper
9. Mounting Bolt Locations
10. Engine Oil Tank
11. Gearbox
12. Alternators
13. Fuel Filter

Fig 2.1 Power Pack, front right side, Mk 2 and 2/1 Vehicles

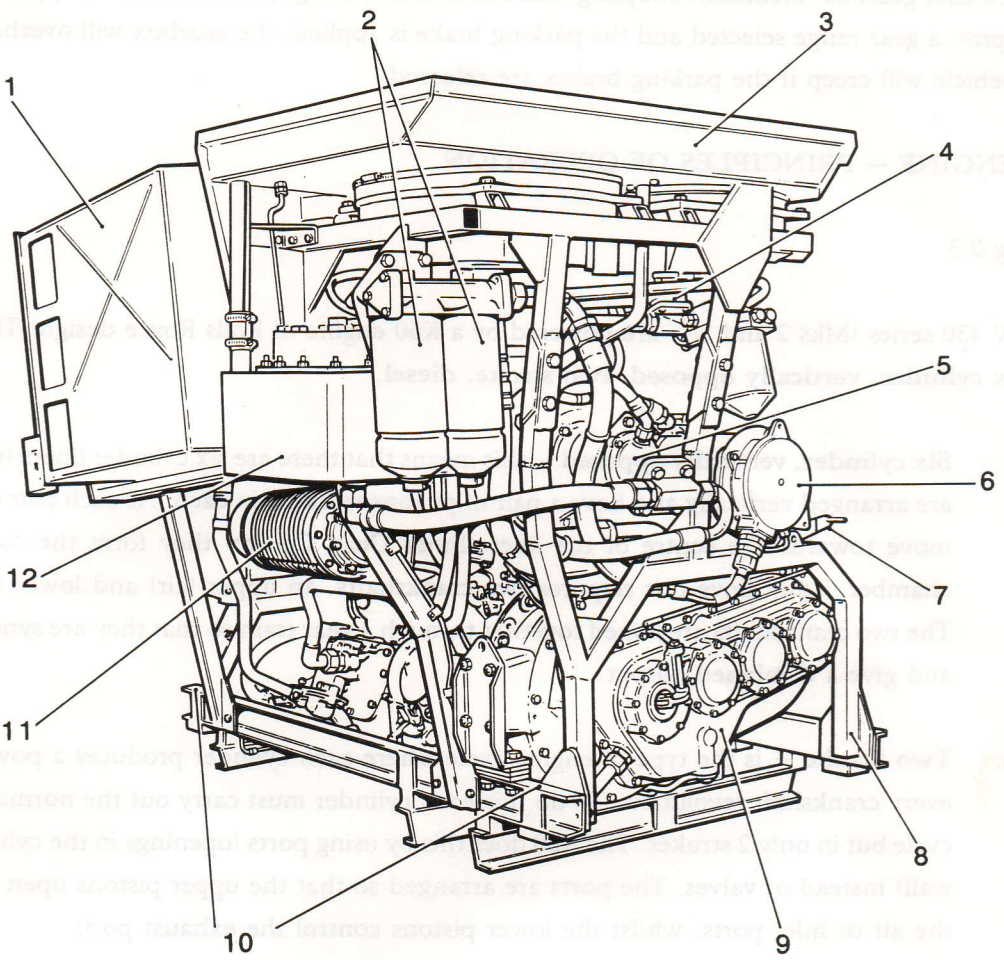
2.2 GEARBOX

See Figs 2.1 and 2.2.

The FV 430 series all use an Allison, hydraulically operated, semi-automatic gearbox. It comprises a 3 element torque converter, with an automatic lock-up clutch, epicyclic gearing and speed range clutches.

Four forward speed ranges and one reverse range are manually selected, automatic gear changes take place in each forward speed range.

The torque converter is a hydraulic coupling used to replace a conventional clutch. It provides an infinite variation in drive, from full slip to 1:1 drive, with the advantage of torque multiplication when turbine speed is less than 0·8 times speed of pump.



1. **Air Cleaner**
2. **Engine Oil Filter**
3. **Fan Cowl**
4. **Cooling Fan Motor**
5. **Hydraulic Fan Pump**
6. **Alternator**
7. **Engine Disconnector Operating Handle**
8. **Mounting Bolt Locations**
9. **Transfer Gearbox**
10. **Mounting Bolt Locations**
11. **Blower**
12. **Hydraulic Fans Oil Tank**

Fig 2.2 Power Pack, rear left side, Mk 2 and 2/1 Vehicles

2.3 TRANSFER GEARBOX

See Figs 2.1 and 2.2.

Transfers the output of the engine across the rear of the pack to the input of the gearbox. It provides, through a dog clutch, a simple means of disconnecting the engine from the transmission to make starting easier in cold weather, and provides a power take off if required (eg crane hydraulic pump on FV 434).

NOTES:

1. Maximum engine running time with transfer gearbox disconnected, due to a build up of oil within the T/Box, is 3 minutes.

2. If the engine idling speed is allowed to fall below its lower limit (780 rpm) then damage to the transfer gearbox (metalastic coupling) will occur. If the idling speed is above its upper limit (800 rpm), a gear range selected and the parking brake is applied, the gearbox will overheat or the vehicle will creep if the parking brakes are released.

2.4 ENGINE — PRINCIPLES OF OPERATION

See Fig 2.3.

The FV 430 series (Mks 2 and 2/1) are powered by a K60 engine of Rolls Royce design. The engine is a **six cylinder, vertically opposed, two stroke, diesel.**

a. **Six cylinder, vertically opposed** — this means that there are six cylinder liners (wet), they are arranged vertically and have a pair of pistons working in each. As each pair of pistons move towards the centre of the liner (Inner Dead Centre) they form the combustion chamber. To achieve this requires two crankshafts, an upper (air) and lower (exhaust). The two crankshafts are joined together through a gear train so that they are synchronised and give a combined output.

b. **Two Stroke** — is the type of engine cycle where each cylinder produces a power stroke every crankshaft revolution. To do this each cylinder must carry out the normal 4 stroke cycle but in only 2 strokes. The K60 does this by using ports (openings in the cylinder liner wall) instead of valves. The ports are arranged so that the upper pistons open and close the air or inlet ports, whilst the lower pistons control the exhaust ports.

c. **Diesel (Compression Ignition).** At the start of the compression stroke the cylinder contains only air. As the pistons compress the air, its temperature is raised, to the point that when the fuel is injected self-ignition takes place.

The K60 is pressure charged using a Rootes blower. This overcomes the need for transfer ports and raises the pressure in the cylinder at the start of the compression stroke.

d. **Port Timing.** To allow the exhaust ports to open before the air ports, and both sets of ports to close at the same time, the exhaust ports are closer to IDC than the air ports by the equivalent of 11° of crankshaft rotation and the exhaust crankshaft is in advance of the air crankshaft by 11°.

On the outward stroke the exhaust ports open 22° before the air ports to exhaust the spent gases. When the air port opens it allows a charge of cool air to fully scavenge the exhaust gases from the cylinder. On the inward stroke the exhaust and air ports then close together and the compression stroke starts.

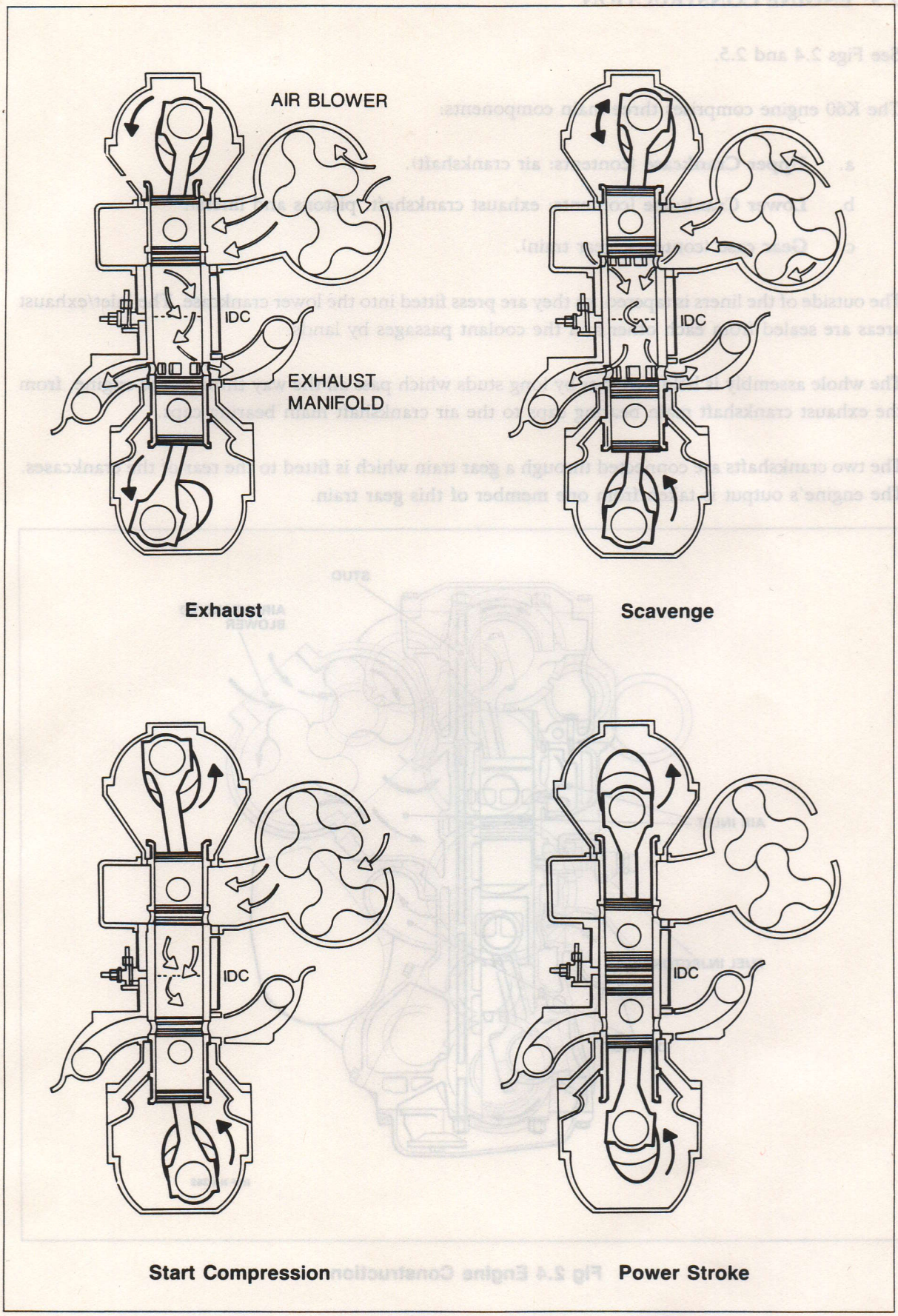


Fig 2.3 Engine — Principles of Operation

2.5 ENGINE CONSTRUCTION

See Figs 2.4 and 2.5.

The K60 engine comprises three main components:

a. **Upper Crankcase** (contents: air crankshaft).

b. **Lower Crankcase** (contents: exhaust crankshaft, pistons and liners).

c. **Gear case** (contents: gear train).

The outside of the liners is tapered, so they are press fitted into the lower crankcase. The inlet/exhaust areas are sealed from each other and the coolant passages by lands.

The whole assembly is held together by long studs which pass all the way through the engine, from the exhaust crankshaft main bearing caps to the air crankshaft main bearing caps.

The two crankshafts are connected through a gear train which is fitted to the rear of the crankcases. The engine's output is taken from one member of this gear train.

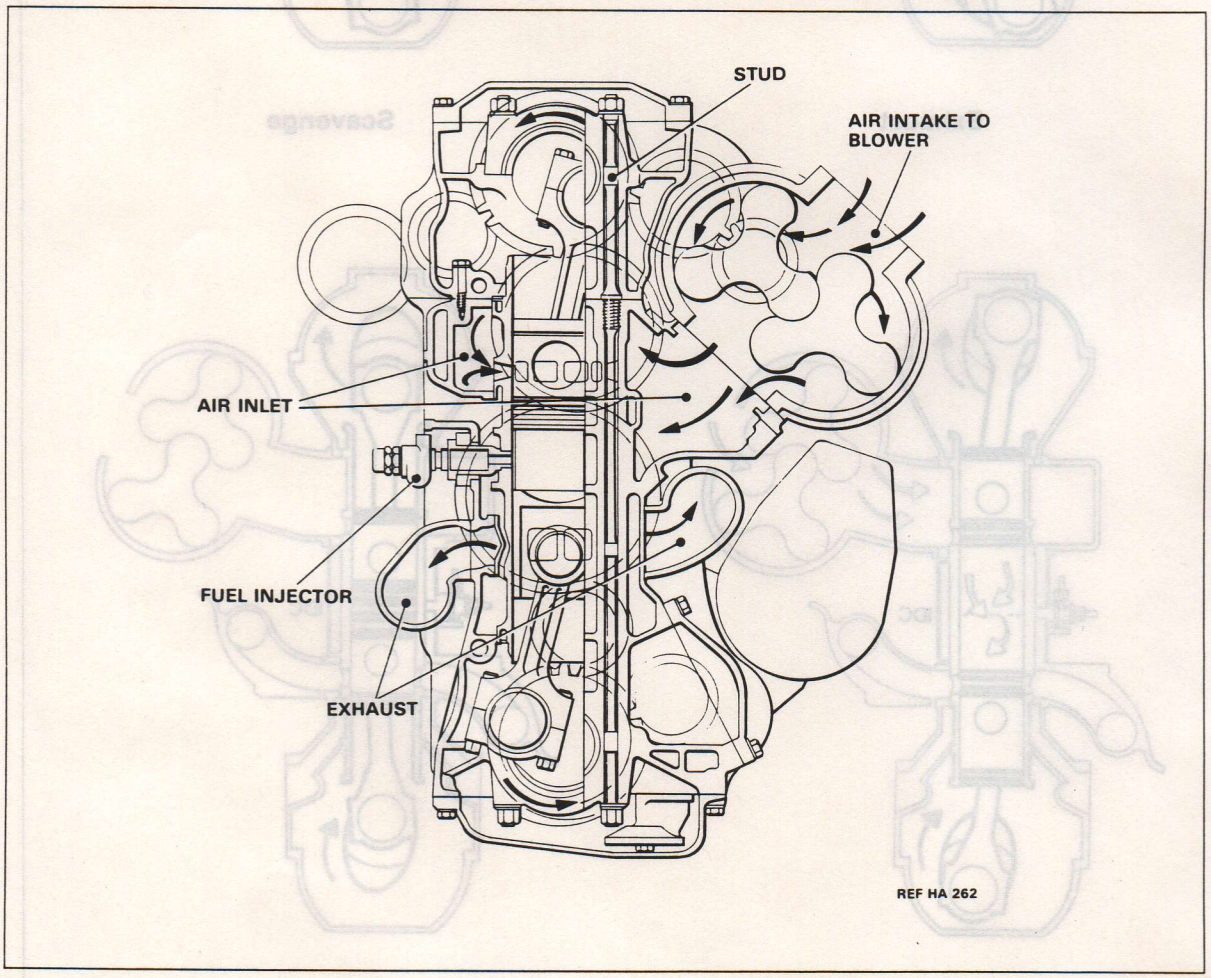


Fig 2.4 Engine Construction

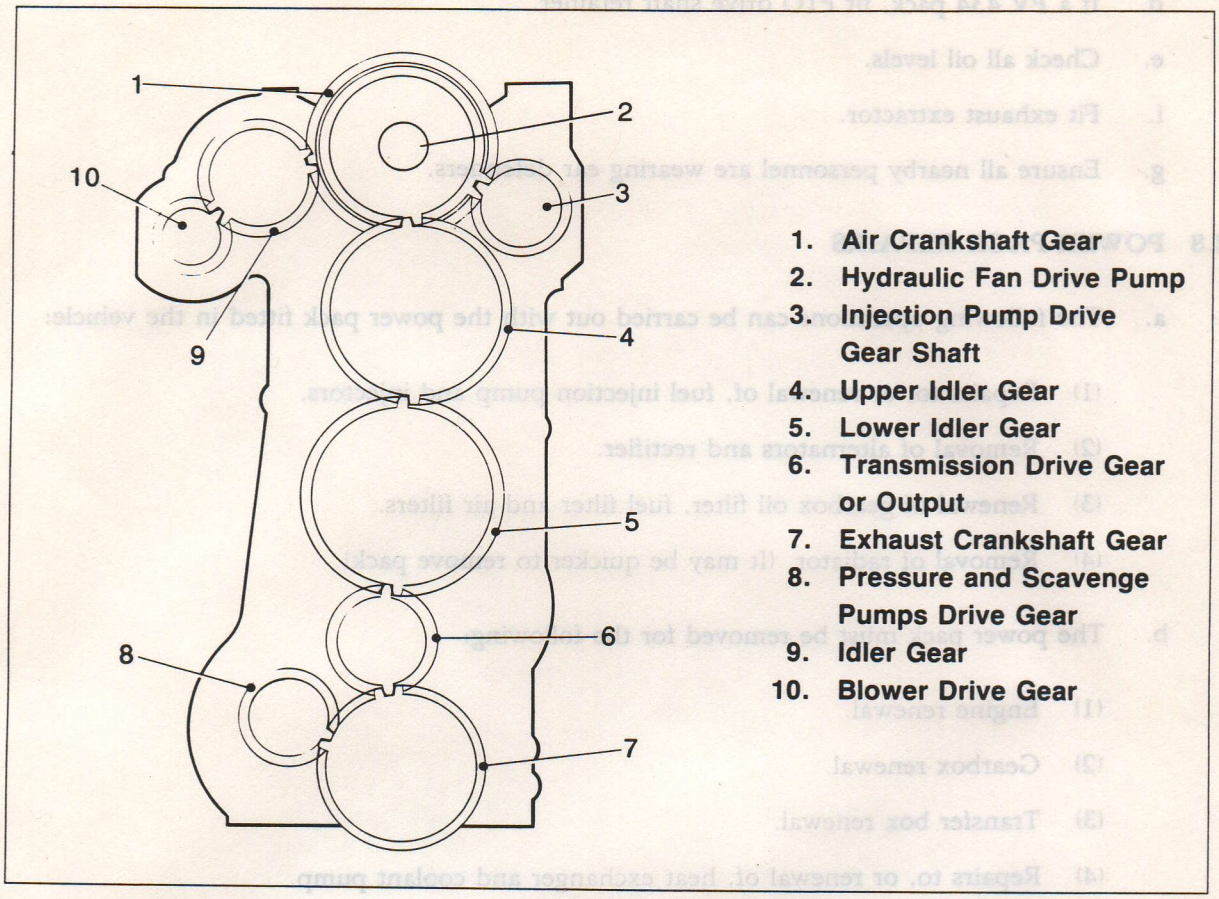


Fig 2.5 Gear Train

2.6 K60 ENGINE TECHNICAL DATA

Capacity		6·9 litres
BHP		240 @ 3750 rpm *
Maximum speed:	Crankshaft	2400 rpm
	Output Shaft	3750 rpm *
Idling speed		780—800 rpm *
Firing order		1—5—3—4—2—6

* The rev counter shows output speed.

2.7 RUN—UP PRECAUTIONS

After removing, but before running-up, a power pack carry out the following:

a. Connect all fuel lines and electrical cables.

b. Remove the propshaft.

c. Check that transfer box disconnector is in the engaged position.

d. If a **FV 434** pack, fit PTO drive shaft retainer.

e. Check all oil levels.

f. Fit exhaust extractor.

g. Ensure all nearby personnel are wearing ear defenders.

2.8 POWER PACK REPAIRS

a. The following operations can be carried out with the power pack fitted in the vehicle:

(1) Repairs to, or renewal of, fuel injection pump and injectors.

(2) Removal of alternators and rectifier.

(3) Renewal of gearbox oil filter, fuel filter and air filters.

(4) Removal of radiator. (It may be quicker to remove pack).

b. The power pack must be removed for the following:

(1) Engine renewal.

(2) Gearbox renewal.

(3) Transfer box renewal.

(4) Repairs to, or renewal of, heat exchanger and coolant pump.

(5) Repairs to, or renewal of, starter motor.

(6) Repairs to, or renewal of, fan drive pump or motors.

(7) Servicing of engine oil filters.