TURBO-BLOWER

The turbo-blower consists of a centrifugal compressor and a single stage axial-flow turbine housed in casings and mounted on a sandwich piece at the free end of the triangle. The blower is of the 'geared in' type, the unit being driven by torsionally flexible drive shafts positioned in the two top crankcases.

Compressor

The compressor forms a sub-unit of the turbo-blower and comprises, two light-alloy casings containing the rotating assembly, and a speed increasing gear train housed between the drive end casing and a gear carrier plate.

The rotating assembly consists of a double-sided light-alloy impeller mounted on a steel shaft splined at each end and supported on a ball bearing at the free end and a roller bearing at the drive end of the shaft. The impeller is centralised on the shaft by cones. An impeller drive pinion is secured on splines at the drive end of the impeller shaft while an impeller gear, which engages with a coupling secured to the turbine coupling gear, is secured to the free end. Lubricating oil supplied to the two shaft bearings is prevented from being drawn into the impeller by labyrinth seals mounted on the impeller shaft.

The torsionally flexible drive shafts in the 'AB' and 'BC' crankcases carry driving gears secured at their free ends. The driving gears mesh with idler gears of the speed increasing gear train. Twin gear trains drive the impeller pinion and shaft at a ratio of 8.266:1 crankshaft speed. Each gear of the speed increasing train is supported by roller bearings housed in the drive end casing and gear carrier plate. Lubrication of the gears and bearings is provided by spray jets. The first idler gear in the gear train on 'C' side provides a drive for an oil metering pump which supplies lubricating oil to the bearings of the impeller shaft.

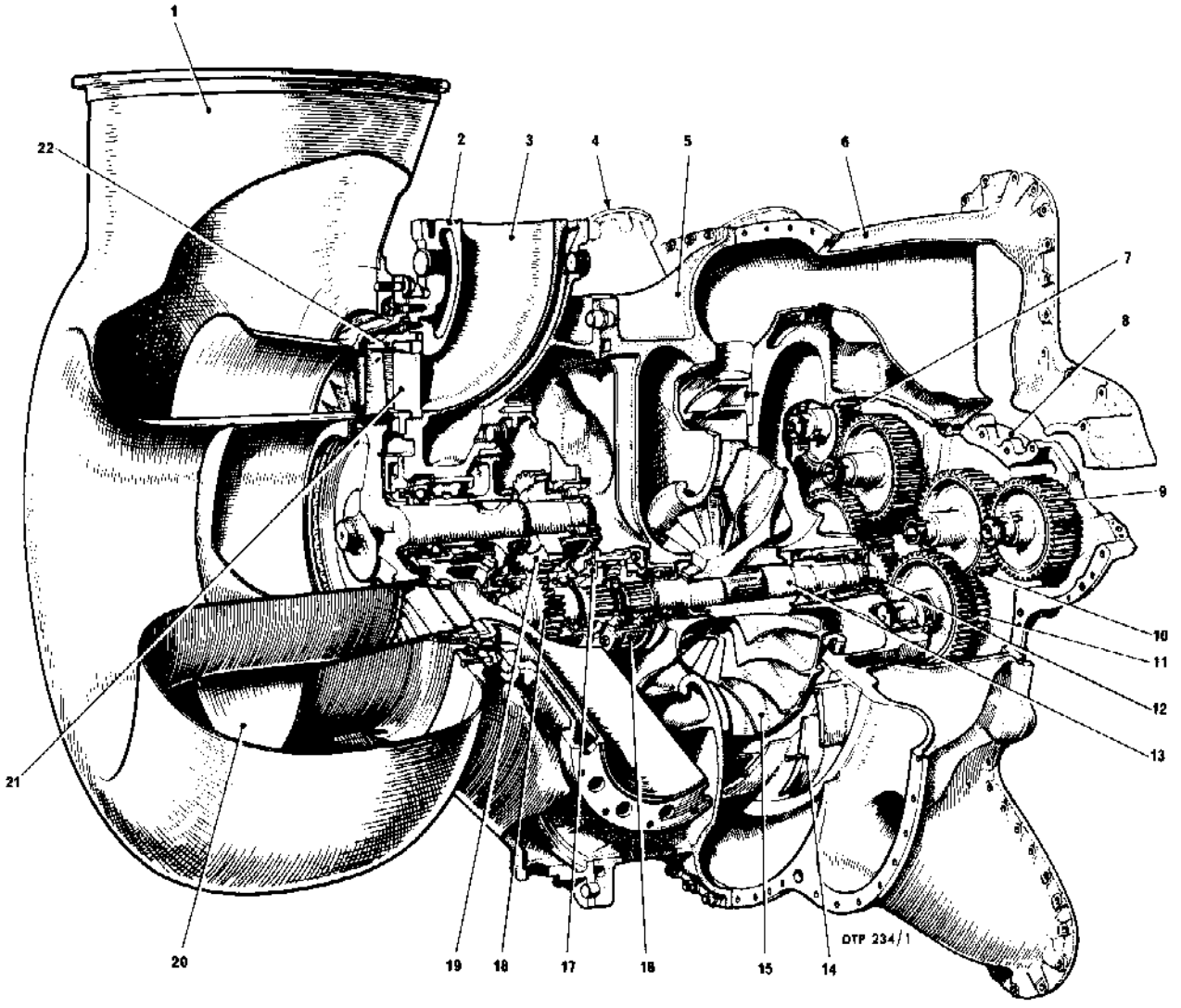
A diffuser ring sandwiched between the free end and drive end casings, reduces the velocity of the air leaving the tip of the impeller and increases the pressure.

Turbine

The turbine assembly forms the second sub-unit of the turbo-blower, comprising a steel exhaust outlet casing and an aluminium-alloy inlet casing housing the rotor assembly and driving gear.

The turbine exhaust outlet casing is a steel fabrication comprising an outlet casing and diffuser, a turbine blade shroud ring and a nozzle ring assembly. The nozzle ring assembly consists of a ring of static nozzle blades of heat-resisting steel which direct the exhaust gases on to the turbine blades.

The aluminium alloy turbine inlet casing is cooled by the passage of the engine coolant through jackets formed in the casing.



1. Exhaust outlet casing
2. Turbine inlet casing
3. Exhaust gas inlet to turbine
4. Air inlet to compressor
5. Compressor free-end casing
6. Compressor drive-end casing
7. 1st idler gear, 'AB' train
8. Gear Carrier plate
9. 1st idler gear, 'BC' train
10. 2nd idler gear, 'BC' train
11. Layshaft gear
12. Impeller drive pinion
13. Impeller shaft
14. Diffuser
15. Impeller
16. Compressor/turbine coupling
17. Turbine coupling gear
18. Turbine reduction gear
19. Turbine gear
20. Exhaust outlet diffuser
21. Nozzle blade ring
22. Turbine blade shroud ring

TURBO-BLOWER

Integral exhaust inlets have machined faces to which are secured exhaust elbows connecting the three exhaust manifolds on the cylinder blocks with the turbine.

The rotating assembly consists of a one-piece turbine-disc shaft supported on ball and roller bearings. The turbine disc has separate turbine blades of heat-resisting steel, secured by 'fir-tree' roots to the turbine disc and retained by locking tabs. A heat-resisting steel lacing wire passes through each turbine blade to dampen blade flutter. Labyrinth seals are positioned on the shaft acting in the capacity of oilseals and air seals. A balance piston, having a labyrinth seal formed on its outer diameter, is keyed to the turbine-disc shaft at its drive end. Pressure air from the compressor is ducted into a chamber formed in the casing and acts against the balance piston to offset the load imposed on the turbine-disc shaft by the passage of the exhaust gases through the turbine. Pressurized air is also fed to the labyrinth seals of the turbine shaft to prevent oil leakage. The turbine gear is secured on splines at the drive end of the shaft and is meshed with the turbine reduction gear which carries the coupling that engages with the impeller gear. There is a reduction ratio of 1.322:1 between the impeller shaft and the turbine shaft.

Air Flows

Air from the tips of the compressor impeller is passed through a diffuser sandwiched between the free end and drive end casings and through three volutes formed in the casings to the outlets which connect with the air inlet manifolds of the three cylinder blocks. Drillings in the compressor free end casing and in the turbine inlet casing, duct pressurized air from downstream of the compressor diffuser to the labyrinth oil seals and the balance piston chamber of the turbine.