

TRIPLE BREECH TURBO STARTER.

The triple breech turbo starter is a self-contained unit housed in an accessible position on the front of the engine. The main advantages, over the battery or external power unit methods of starting, are:-

1. It eliminates bulky ground equipment and is independent of aerodrome services.
2. It is a self-contained unit, housing three cartridges and further fresh charges can be carried in the aircraft.
3. It has no trailing cables.
4. If the engine fails to start, another cartridge is immediately available.
5. The starter can be re-engaged before the engine has stopped rotating.

Construction.Breech assemblies.

The breech assemblies are grouped at the front of the starter, in a clover leaf arrangement. Three breech caps carry the cartridges, holding them in contact with a firing pin by two pawls. A central plunger on the breech cap is depressed to release the cap. A pair of pawls lock the cartridge in the cap. Each breech base embodies two gas discharge nozzles, and a relief valve to limit the gas pressure to 1200 p.s.i.

Turbine assembly.

The turbine assembly consists of 50 blades welded to a disc on which is bolted a helical sun wheel. The turbine assembly is supported in three bearings two roller and one ball thrust race. A triple spring assembly holds the turbine away from the nozzles in the breech.

Reduction gear.

This consists of a helical sun wheel on the turbine shaft in mesh with three planet wheels, rotating inside a bell gear. The bell gear has a sun wheel splined on to its shaft. This sun wheel is an engine part and must be changed to each new starter. The starter reduction gear ratio is 4.5:1, but a second gear train housed in the engine intake casing gives a total reduction of 27:1. It consists of three planet wheels in mesh with a fixed annulus. A cage attached to the planet wheels drives the outer member of a ratchet mechanism, and spring loaded internal pawls transmit the drive to the engine.

Lubrication.

A trough in the engine front bearing housing collects splash oil and fills a plunger with 6 cc. of oil. When the engine rotates, main engine oil pressure forces the plunger down and ejects the oil into the starter gear assembly. The surplus oil drains via a stand pipe back into the front bearing housing.

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Operation.

The cartridge is ignited electrically by the automatic starter panel, and the gas pressure in the breech rises to a pressure determined by one of the relief valves. The turbine wheel is held rearwards by the spring assembly in a position which produces a small amount of energy, to reduce shock on initial engagement of the pawls.

The turbine torque causes the helical sun wheel to move towards the nozzles and thus repositions the turbine wheel so as to extract the maximum energy from the gas stream.

The engine R.P.M. will now increase, reducing the turbine torque, until the spring assembly returns the sun-wheel and turbine rearwards to the initial engagement position of low power output. The engine driven pawls are disengaged from the starter ratchet by their centrifugal loading, and are held in this position during all engine running.

It is therefore impossible to overspeed the starter if a second cartridge is fired while the engine is running, as with the pawls disengaged the turbine cannot produce sufficient torque to cause it to move forward into the full power position.

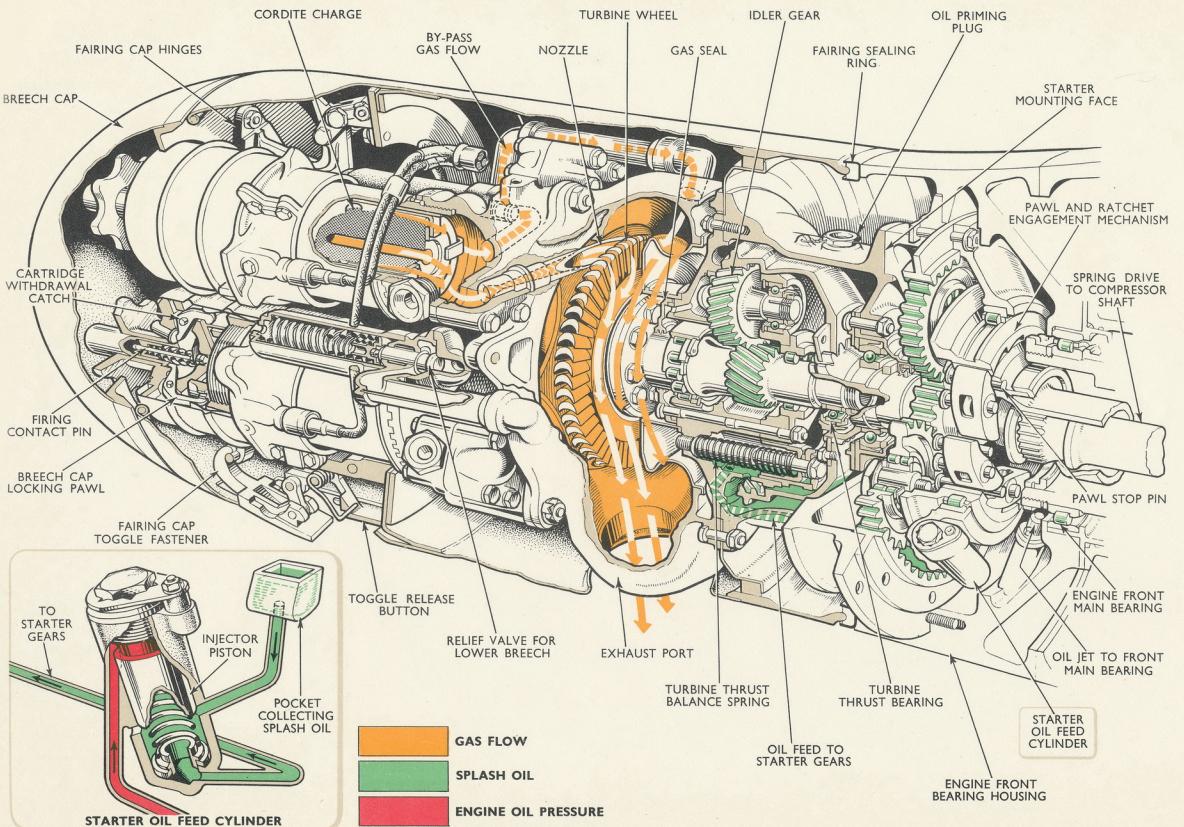
Servicing.

No servicing is normally permitted on the starter, and the starter assembly is changed as a unit in the case of any defect.

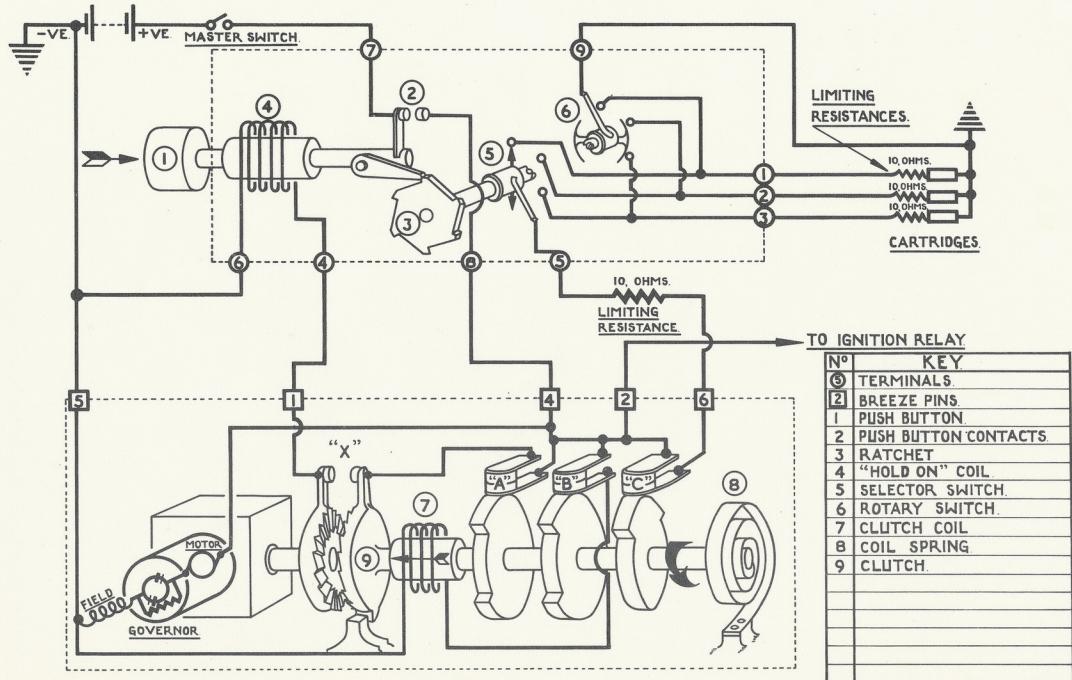
Removal of a defect/starter first entails removal of the starter fairing. The electrical leads should then be disconnected and the retaining setscrews removed from the starter flange. Leave the top setscrew till last, then support the weight of the starter, remove the last setscrew and lift the starter clear.

The starter drive pinion is an engine part, and must be removed from the unserviceable starter and fitted to the replacement unit.

When refitting the new unit, ensure that the oil hole in the joint washer lines up with the hole in the flange. Before replacing the starter fairing, prime the starter gears with about 200 cc. of clean engine oil through the priming orifice on the top of the drive casing.



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