Chapter 9

STARTER MOTOR, ROTAX, TYPE C12507
(INCORPORATING MOTOR, TYPE C14202)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Starter motor, Type C12507

Incorporating—	
Motor, Type C14202	**Ref. No. 37F/4509**
Gearbox, Part No. N158230	**Ref. No. 37F/4510**
Operating voltage	28 *volts d.c.*
Current	650 *amp.*
Supply characteristic	1 *volt drop*/270 *amp.*
B.H.P.	17.5
Clutch setting	130-150 *lb. ft.*
Torque	41 *lb. ft.*
Rating	60 *seconds*
Speed	2250 *r.p.m.*
Rotation (viewed from drive end)	*Anti-clockwise*
Resistance of windings at 20° C—	
Armature	0·000685 *ohm*
Series field	0·0016 *ohm*
Shunt field	6·64 *ohms*
Brush spring pressure	40–48 *oz.*
Brush grade	*DM4A*
Brush length—	
New	0·305–0·400 *in.*
Minimum permissible	0·234 *in.*

Commutator diameter—	
New	2·640–2·650 *in.*
Minimum permissible	2·625 *in.*
Jaw travel	0·375 *in.*
Jaw extended (minimum)	1·125 *in. (from flange face)*
Jaw retracted (maximum)	0·750 *in (from flange face)*
Overall dimensions—	
Length of housings	14·062 *in.*
Diameter of housing (under lugs)	7·937 *in.*
Diameter of housing (over lugs)	9·500 *in.*
Height	10·893 *in.*
Weight	48 *lb.*

Introduction

1. The C12507 starter unit has been designed for electrically starting aircraft gas turbine engines, primarily the Tyne; it develops a starting torque of 41 lb. ft. at an approximate speed of 2250 r.p.m. The rotation of the starter jaw is anti-clockwise when viewed from the jaw end of the machine.

DESCRIPTION

2. The starter is of conventional design and comprises two main assemblies, the electric motor and the starter mechanism, which are mated by a spigot joint and secured by associated locking bolts and nuts.

Motor, Type C14202

3. The starter motor is a four-pole compound wound machine with the series coils of the motor connected in series-parallel, and the shunt coils connected to each other in series. The lap wound armature is supported by a ball bearing in the commutator end plate and a roller bearing in the driving end frame. An oil seal is fitted on the armature shaft at the drive end.

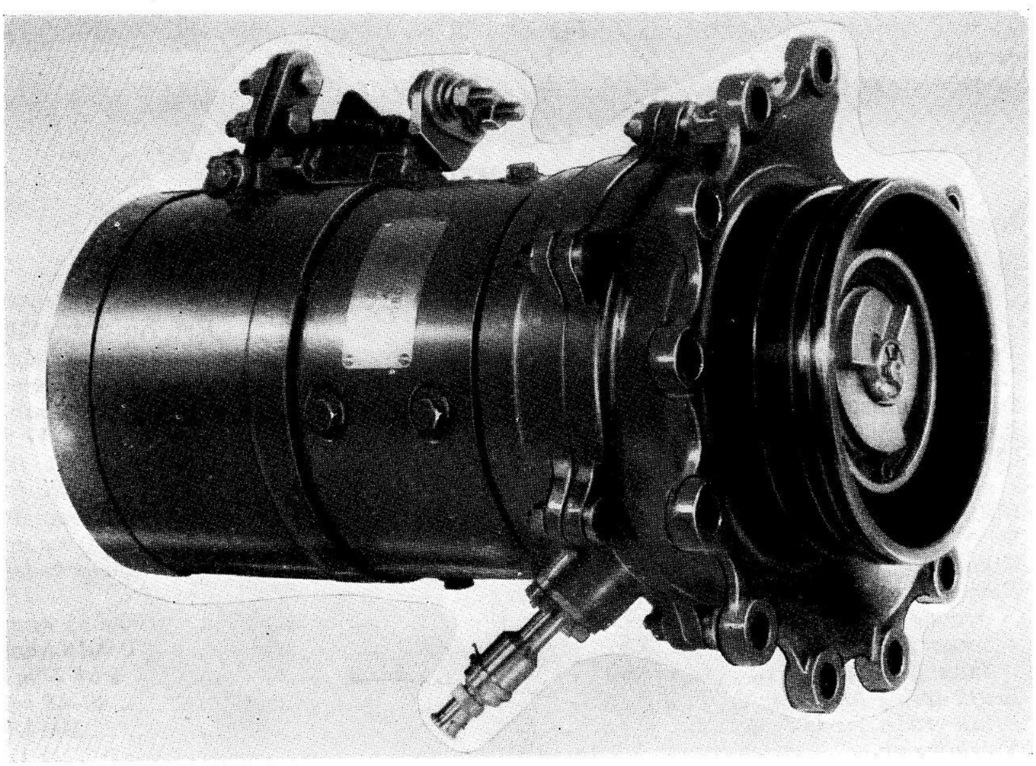

Fig. 1. General view of C12507

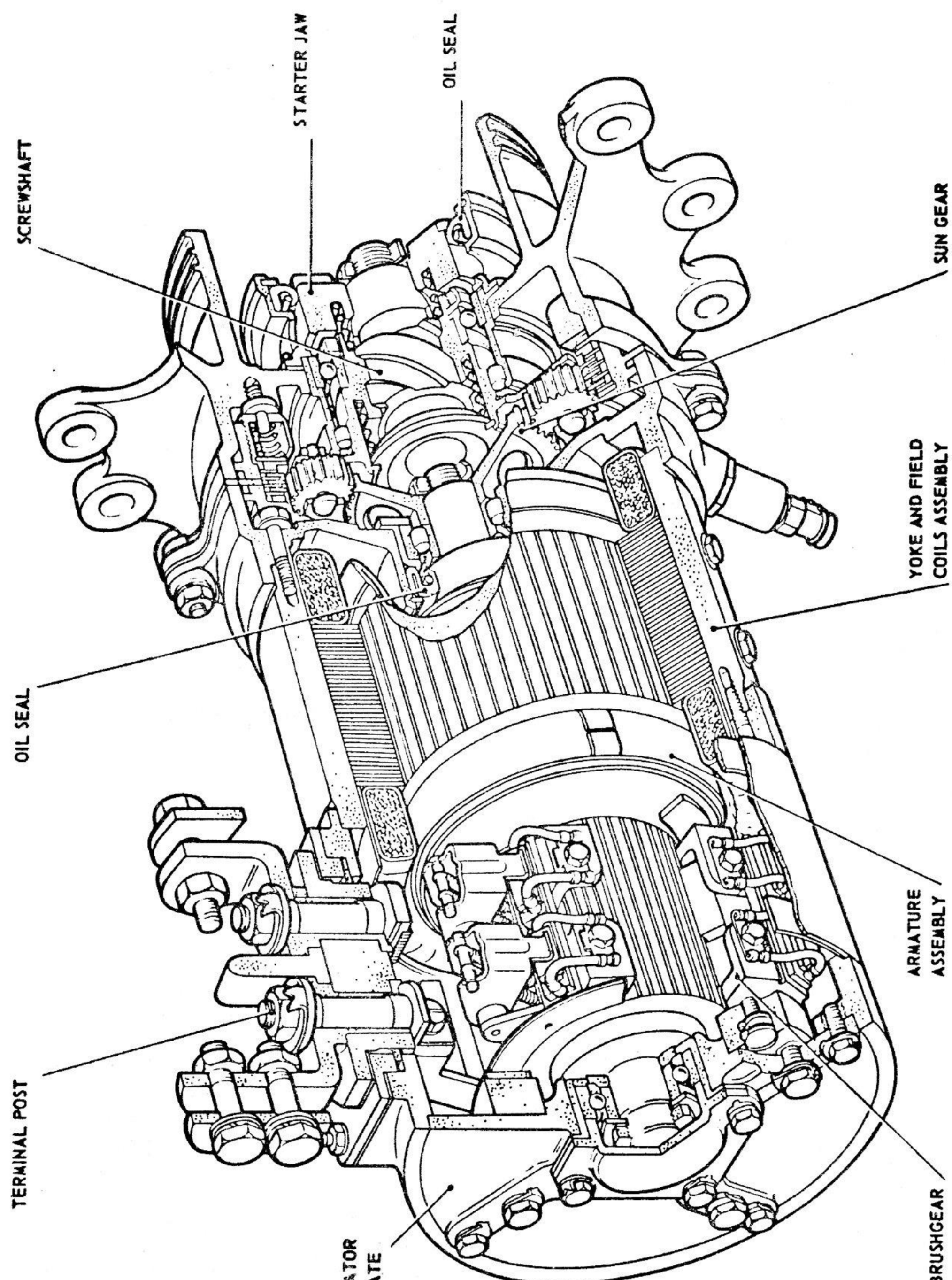

Fig. 2. Sectional view of C12507

4. The brushgear assembly is bolted to the commutator end plate, and the eight brushes are spring loaded through triggers. Diametrically opposite brushes are connected in parallel; one pair is connected to one end of the series and shunt field windings, and the other pair is connected to the remaining end of the shunt windings and the brush terminal post.

5. The series windings are connected to the field terminal post, and both terminal posts are mounted in the terminal block moulding, located on the top of the commutator end frame. The brushes are accessible for inspection through four windows in the commutator end frame covered by a window strap.

Gearbox and starter mechanism

6. The starter mechanism is driven by a sun gear fitted on the drive end of the armature; this meshes with three planet gears in the planet gear carrier. An annulus is formed by the clutch inner plates which alternate in pairs with the clutch outer plates splined to the clutch housing, the clutch plate assembly being loaded by a set of twenty-four clutch springs compressed by the clutch adjusting nut.

7. The planet gear carrier is supported by a ball bearing and a roller bearing and houses the screwshaft. The starter jaw is resiliently mounted on the screwshaft and is spring loaded in the forward direction. An oil seal is fitted to the starter jaw.

Operation

8. When the aircraft starter switch is operated, the motor of the starter unit is energized and armature rotation is transmitted via the starter mechanism to the screwshaft on which the starter jaw is carried.

9. The armature sun gear transmits motion to the planet gears, and the planet gear carrier rotates; the initial motion of the starter jaw is linear because it is restrained, by the friction of the oil seal, from turning.

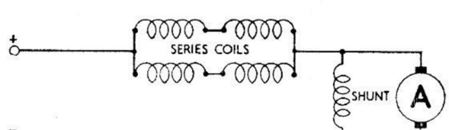

Fig. 3. Circuit diagram

10. When the screwshaft is fully extended, further forward linear travel by the starter jaw is not possible and the jaw rotates. By travelling forward the starter jaw engages the mating jaw on the gas turbine, and when the starter jaw rotates, cranking commences. When the turbine jaw overruns the starter jaw, the trailing bevelled faces of the jaws make contact, and the starter jaw is thrown out of engagement.

Electrical connections

11. The two connections to the aircraft electrical system should be made to the terminals mounted on the commutator end frame.

INSTALLATION

12. Remove the transport cover from the starter and check that the gearbox has been filled with 250 c.c. of oil OX-38 and that the transport plug in the drain plug hole has been removed.

13. Twelve 0·500 in. diameter holes are provided for flange mounting the starter on the engine. To provide a resilient mounting, the 0·500 in. diameter holes should be fitted with tubular rubber bushes, and in addition two rubber O-rings should also be fitted on the oil seal housing which surrounds the starter jaw.

14. Reference should be made to the Aircraft and engine handbooks for detailed information on installation in the type of aircraft concerned.

Caution . . .

Check that the gearbox has been filled with oil.

SERVICING

15. This starter should be serviced in accordance with the general chapter in A.P.4343, Vol. 1, Sect. 15, and the instructions given in the relevant Servicing Schedule.

Brushgear

16. Servicing of the starter is normally restricted to the commutator end of the machine; after removal of the cover band over the brush inspection apertures, brush inspection may be carried out as follows:—

(1) Brush spring loading should be $2\frac{1}{2}$ - 3 lb. (40 - 48 ounces). Check with spring balance (Ref. No. 1H/97).

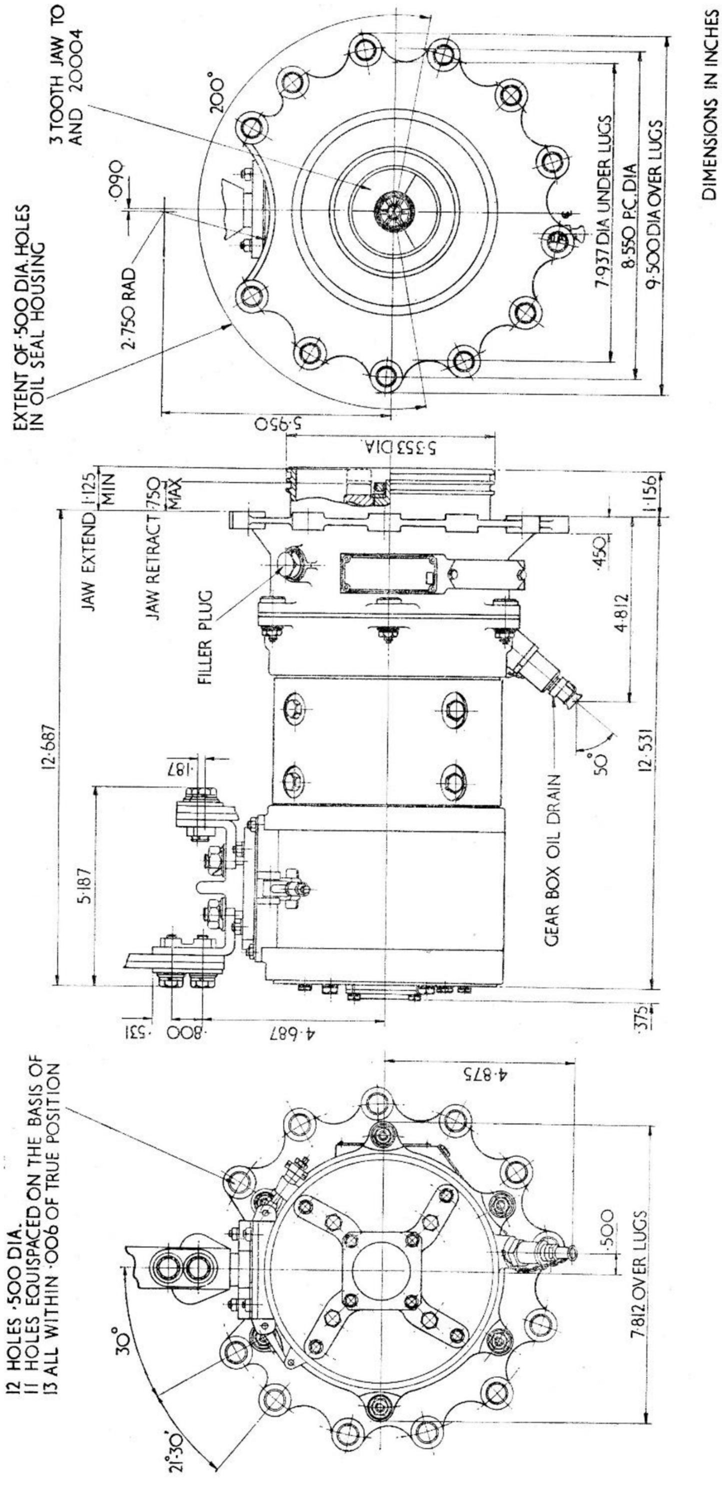

Fig. 4. Installation diagram

(2) Check the length of the brushes to ascertain if they are long enough to function satisfactorily until the next servicing period. The minimum permissible length is 0·234 in. If new brushes require fitting, it will necessitate removal of the unit from the aircraft in order that the new brushes can be properly bedded.

(3) Check that the brushgear is free from carbon deposits and that the brushes slide freely in their boxes without any tendency to bind. If a brush appears to be binding, this may be due to an accumulation of carbon dust in the box. Loose dust may be removed with a jet of dry compressed air.

(4) Badly chipped or cracked brushes should be removed and new ones fitted.

(5) Check the brush spring pressure given in sub-para. (1) and ensure that the spring balance is attached to the tip of the brush spring triggers, and the readings taken level with the top of the brush box.

Lubrication

17. The ball and roller bearings of the motor are grease lubricated during manufacture with grease XG-275 and normally should not require lubrication during servicing periods; The ball and roller bearings in the starter mechanism are lubricated also during manufacture with oil to specification OX-38 and should only need replenishing during the repair and servicing period.

Insulation resistance test

18. The insulation resistance should be measured between all live parts and the frame, using a 250-volt insulation resistance tester; the reading should not be less than 0·05 megohm.