Obsolete

Chapter 17

GENERATOR, TYPE 505

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Generator, Type 505	Stores Ref. 5UA/6115
Rotation	Clockwise (Looking on drive end)
Rated output	1·5 kW
Rated voltage	30V, d.c.
Voltage regulator—	
Type 70	Stores Ref. 5UC/6014
Regulated voltage	28V, d.c. (± 2·5 per cent)
Speed range	2,850—10,000 r.p.m.
Recommended speed	8,000 r.p.m.
Brushes—	
Grade	KCEG 11
Minimum length	0·365 in.
Brush spring pressure	12·5—17·5 oz.
Minimum commutator diameter	2·95 in.
Armature resistance	·042 ohm.
Shunt field resistance	2·43 ohm.
Main interpole winding	·0175 ohm.
Compensating winding	·014 ohm.
Equalizing resistance	·0144 ohm.
Weight	29 lb. 9 oz.

Introduction

1. The generator, Type 505, is designed to be engine-driven through a gearbox. When used in conjunction with a voltage regulator Type 70, it will provide a constant voltage supply over a wide speed range.

DESCRIPTION

General

2. The generator (*fig.* 1) is a 6-pole, shunt wound machine with interpoles and compensating windings. The sectional view (*fig.* 2) shows the main construction of the machine which consists essentially of a yoke, armature, and two end plates.

Cooling

3. Blast cooling air is fed into the machine through a duct at the commutator end and leaves by way of a second duct at the drive end. Five alternative radial positions for the inlet and outlet ducts are available.

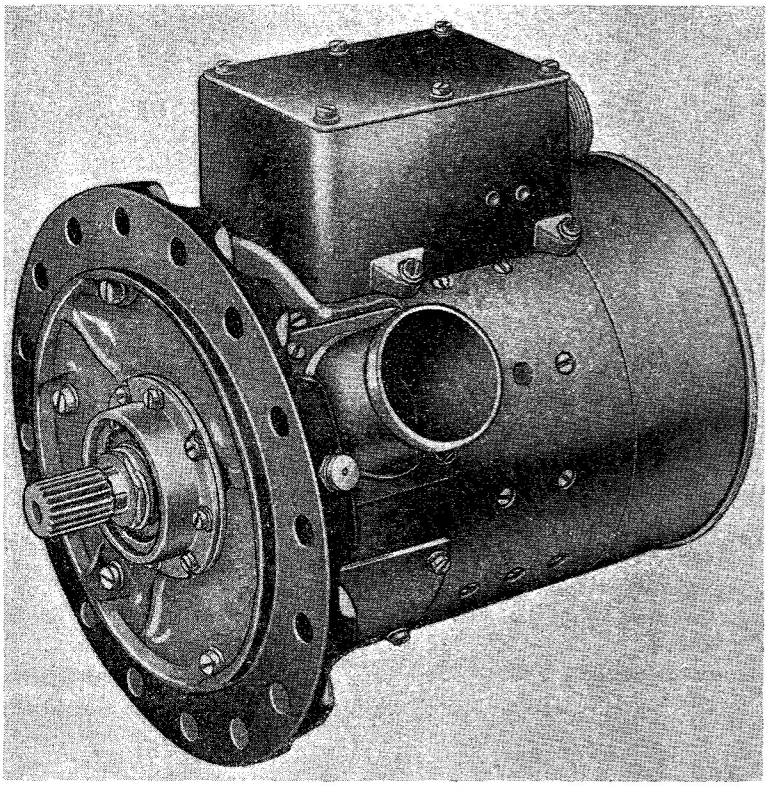

Fig. 1. General view, generator, Type 505

Yoke

4. The cylindrical yoke, housing the armature, carries the field system within its bore. The main pole and interpole pieces are bolted to the yoke, the bolt heads being let into its outer surface and locked.

5. The commutator end plate is held on the yoke by six screws and the drive end plate fits over six studs tapped into the yoke.

6. At the commutator end, six windows are formed in the yoke casting for use as brush inspection windows. They are normally enclosed by a sheet metal band, held by two screws. This band actually carries the inlet duct for the cooling air.

Armature

7. The armature is supported by a roller bearing at the commutator end and a ball bearing at the driving end. The drive end of the shaft is screwed to take a clamping nut for the bearing and the final drive is taken on a spline cut on the shaft. The commutator end is screwed to take a clamping nut for its bearing. The centre portion of the shaft is hollow and radial holes in both ends of it allow cooling air to pass through. It is a wave wound armature and the windings are brought out to an 86 bar commutator.

Commutator end plate

8. This end plate supports the brushgear and houses the roller bearing supporting the armature. It is a light alloy die casting, as is the outer bearing cap. The inner bearing cap is a pressing and between it, the roller bearing and the outer cap are fitted felt washers soaked with oil. Four screws pass through the end plate from the outer bearing cap and are screwed into the inner cap, thus forming a lubrication chamber for the bearing.

9. The outer race of the bearing is a push fit in a sleeved hole in the commutator end plate and the inner race is an interference fit on the armature shaft.

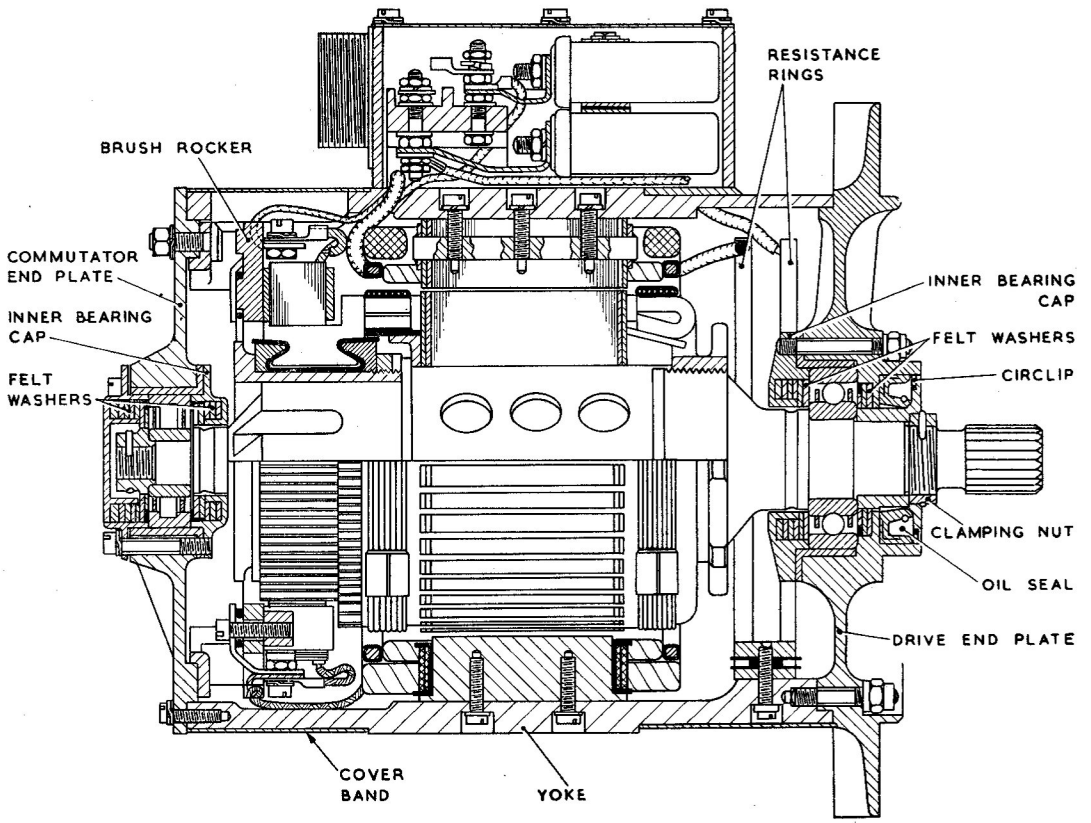

Fig. 2. Sectional view

Brush gear

10. The brush gear consists of six brush boxes mounted on an insulated rocker. The rocker is attached to the commutator end plate by three bolts which pass through slots in the rocker and are held by nuts on the outside. Thus by slackening the nuts the brush gear can be rocked round to obtain the neutral position. Each brush box contains one brush and pressure is maintained on each of them by a clock-type coiled spring. The pressure should be as given in Leading Particulars.

Drive end plate

11. The drive end plate which is also a light alloy casting, houses the ball bearing supporting the drive end of the shaft. The inner bearing cap contains felt lubricated washers and carries four studs. The outer bearing cap, clamped on the studs, also bears down on felt washers in addition to carrying a special oil seal retained by a circlip. This circlip is covered by a flanged bush which also serves to clamp the inner race of the ball bearing. This flanged bush is retained by a nut screwed on the armature shaft (*para.* 7) and locked in position. Thus the ball bearing runs in a chamber and is kept lubricated by the felt washers. The oil seal prevents gear box oil running back into the machine.

12. The ball bearing is a push fit in a flanged bush in the bore of the end plate and an interference fit on the armature shaft.

13. The drive end plate is spigoted to fit on to the gear box and is drilled to take sixteen retaining bolts.

Terminal box

14. The terminal box (*fig.* 3) is mounted on top of the generator and contains six capacitors for radio interference suppression, the two main output terminals, the shunt field

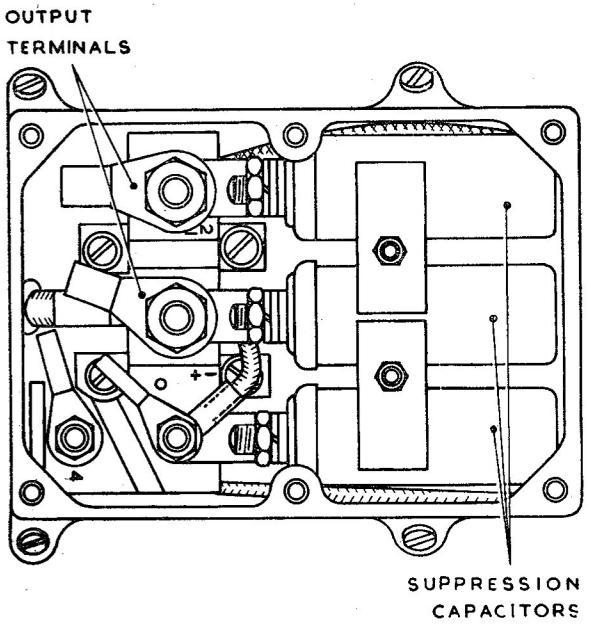

Fig. 3. Terminal box

terminal and a terminal connected to an equalizing connection for use when paralleling the generator with one or more of its type. Terminals No. 1 and No. 2 are the positive and negative generator output terminals respectively, No. 4 is the shunt field connection, and No. 3 is the equalizing connection.

Internal connections

15. The circuit diagram of the generator is shown in fig. 4. The resistor included in the negative input to terminal 2 is composed of two parallel rings of resistance strip. These are secured on insulating mountings within the bore of the yoke, at the driving end. The resistance of these rings ensures that a voltage difference, the value of which depends upon the load current, exists between terminals No. 3 and No. 2.

INSTALLATION

16. Before installing the generator, ensure that the direction of rotation, as marked on the small plate riveted to the frame, is suitable for the engine gear box. Remove the protecting ferrule from the shaft and examine the serrations for damage. Ensure that an oil seal is fitted.

17. Mount the generator on the engine gearbox and secure the bolts. Connect the cables to the terminals and secure the terminal box cover. Attach the air pipes. Reference should be made to A.P.4343, Vol. 1, Sect. 2, Chap. 1 for information on the care of, and anti-corrosive treatment for these pipes.

OPERATION

18. The generator is normally used either singly or in parallel with others of its type, each generator being controlled by a Type 70 voltage regulator. By this means the generator output voltage is maintained at a value of 28 volts ($\pm$ 2·5 per cent) at all loads up to its rated maximum and over the full speed range.

19. To ensure that the total load of the system is shared equally between all the generators an equalizing circuit is employed. The voltage appearing at terminal No. 3 of the generator (*fig.* 4) is proportional to the load, and an equalizing connection is made from this terminal to the voltage regulator. Full details of the system may be obtained from A.P.4343, Vol. 1, Sect. 2, Chap. 5.

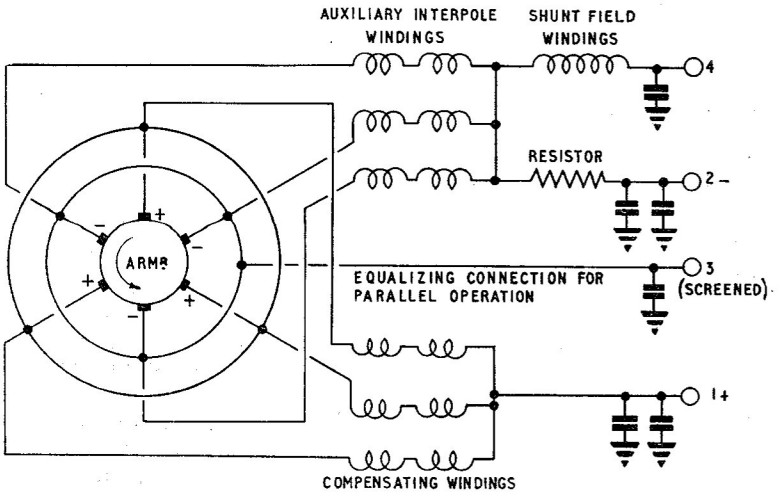

Fig. 4. Circuit diagram

SERVICING

General

20. Information on servicing, common to all D.C. generators, is to be found in A.P.4343, Vol. 1, Sect. 2, Chap. 1. The following paragraphs should be read in conjunction with that chapter and with the relevant servicing schedule.

Note . . .

Particular reference should be made to A.P. 4343, Vol. 1, Sect. 1, Chap. 1 in relation to the servicing of the commutator.

21. To examine the machine, the air pipes should be disconnected and the commutator end cover band removed. The terminal box cover and the blanking-off plates at the driving end of the frame, should also be removed.

22. Clean and examine the frame, commutator and brush gear, ensuring that all nuts, bolts, screws and locking devices are secure. Check the insulation of all connecting leads and straps for damage or deterioration and ensure that the connections are tight. When replacing the cover band examine it for distortion and renew if necessary.

Oil seal

23. If the machine is to be run on a test bench, either for a brush bedding run or on test then the oil seal must be removed. Without the machine being coupled to a gearbox the oil seal is not properly lubricated.

24. Unscrew the retaining nut (*para.* 7 *and* 10) and withdraw the flanged bush (*para.* 7). On removing the circlip the oil seal can be taken out. The flanged bush and retaining nut must now be assembled and tightened on the armature shaft before running the machine.

25. After the run has been completed the flanged bush and retaining nut must again be removed. Before replacing the oil seal examine it carefully and if it shows any signs of defects it must be renewed. Replace it, and finally fit the flanged bush and retaining nut.

Brushes

26. The brushes should be examined to see that they are bedding properly and not likely to wear below their minimum length before the next servicing period. They should work freely in their respective boxes. For all other information on the brushes especially when bedding in new ones reference should be made to A.P.4343, Vol. 1, Sect. 2, Chap. 1.

Note . . .

If new brushes are fitted, then throughout the bedding run the generator must be cooled by an air blower.

Brush spring pressure

27. The pressure of each brush spring when measured in a direction in line with the axis of the brush should be as given in Leading Particulars. If it is not then the spring must be renewed. The pressure can be measured with a spring balance (*Stores Ref.* 1H/86).

Bearings

28. The bearings are adequately greased during assembly and require no further lubrication until the machine is sent for reconditioning.

TESTS

General

29. Before installing a new or reconditioned generator, it should be tested as described in the following paragraphs. If available a generator test bench should be used and before any runs are commenced the oil seal should be removed.

30. The armature should first be turned by hand to ensure that it does not foul any leads or fixed parts of the machine. Rotation should be smooth, and the end play in the bearings should not be excessive. Slight radial play which can just be felt by hand is permissible. The machine should also be observed for any undue vibration during the following running tests.

31. With the generator mounted on the test bench and a voltage regulator Type 70 connected in circuit the generator should be run up to a speed of 2,850 r.p.m., in the direction of rotation as indicated on the machine. If the polarity of the generator is correct, positive readings will be obtained as the voltage should build up without hesitation to between 27 and 29 volts.

32. If positive voltage readings are not obtained, check all connections and ensure that the direction of rotation is correct. Should the polarity prove to be incorrect, or the generator voltage fail to build up, the poles must be re-magnetized.

Re-magnetizing

33. To re-magnetize the poles, disconnect the test circuit and connect a six volt battery in series with a single pole quick-break switch across the generator field terminals. The positive battery lead must be connected to the generator terminal No. 4, and the negative lead to terminal No. 2. Using the switch, make and break the circuit once only to magnetize the poles. Repeat the test as given in para. 30.

Note . . .

Unless an air blower is used the machine must only be run for very short periods.

Insulation resistance

34. Directly after running the machine and whilst it is still warm, the insulation resistance should be taken between the generator terminals and the frame. It should be measured with a 250V insulation resistance tester and should be not less than 0·3 megohm.

35. If the insulation resistance proves to be below the limit, the interference suppression capacitors should be disconnected and checked for breakdown.

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