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Chapter 11

GENERATOR, ECLIPSE-PIONEER, TYPE 30E16-11-C

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Generator, Type 30E16-11-C	*Ref. No. 5UA/7206*
Rated output	*3 kW*
Rated voltage	*30V d.c.*
Current	*100A*
Rotation	*counter-clockwise*
Speed range	*2500-4500 r.p.m.*
Min. speed for regulation	*2500 r.p.m.*
Max. speed for regulation	*5500 r.p.m.*
Rating	*continuous*
Brush spring pressure	*28-32 oz.*
Commutator min. diameter	*2·764 in.*
Commutator undercut depth	*0·21-0·36 in.*
Commutator undercut width	*0·025 in.*
Commutator concentricity with bearings	*0·0005 in.*
Shunt field resistance	*1·935-2·365 ohms*
Interference suppression capacitor	*4 μfd, 150V*
Cooling air requirement	*75 c.f.m. at 6 in. water*
Weight	*39½ lb.*
Voltage regulator	*Type 1589-1-D*
Regulated voltage	*28V ± 0·7V*

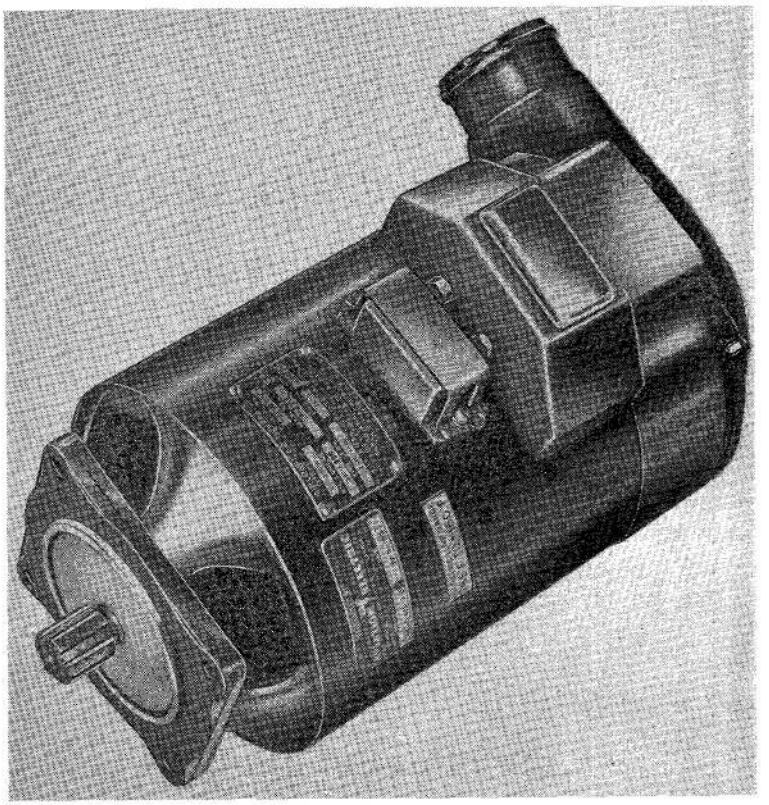

Fig. 1. Generator, Type 30E16-11-C

Introduction

1. The Type 30E16-11-C, 3 kW d.c. generator (*fig.* 1) is designed for use as an engine-driven source of d.c. power, and is nominally rated at 30V, 100A continuous over a speed range of 2500-4500 r.p.m.

DESCRIPTION

General

2. The generator is a 4-pole compound wound machine, interpole and compensating windings are provided in the negative circuit to prevent field distortion and provide favourable commutation conditions. The armature which is statically and dynamically balanced is supported on enclosed type ball bearings located in the drive-end head and the commutator-end head assemblies. A standard type square flange is used for mounting and a 6-tooth spline drive connects the drive shaft to the engine gearbox. An exploded view of the machine is shown in fig. 3.

Cooling

3. Blast cooling by air from the aircraft slipstream is employed, the air enters through the air inlet spout at the commutator end of the machine. The cooling air passes over the brushgear, commutator, armature and field windings, and is expelled at the drive end through radial holes in the frame. The inlet air spout is adjustable and may be moved around in 30° increments to suit the position of the airpipe in a particular aircraft installation.

Frame

4. The frame houses the armature and carries the main poles and interpolates within the central yoke of its bore. The drive-end head and commutator-end head assemblies are attached to the ends of the frame, and the terminal box and interference suppressor are mounted on its surface.

Commutator-end head assembly

5. This assembly is secured to the frame by eight screws. It houses and provides a mounting for the four brush boxes, each brush box is attached by two screws and nuts, and insulated from the head through insulating brushes and washers. The ball bearing is a transition fit within the bearing liner which is assembled into the end face of the head.

Drive-end head assembly

6. The drive-end head, which is attached to frame by four screws, provides a housing for the drive-end ball bearing. The bearing is a transition fit within a lined recess in the head.

Armature

7. The hollow armature shaft is internally splined at the commutator end to mate with the drive shaft assembly, which is passed through the armature shaft and secured at the commutator end by a self-locking nut. The drive-end and commutator-end bearings are interference fits on the armature shaft, and are retained by a lock ring at the drive end and a bearing nut at the commutator end. Connections to the commutator segments are brazed.

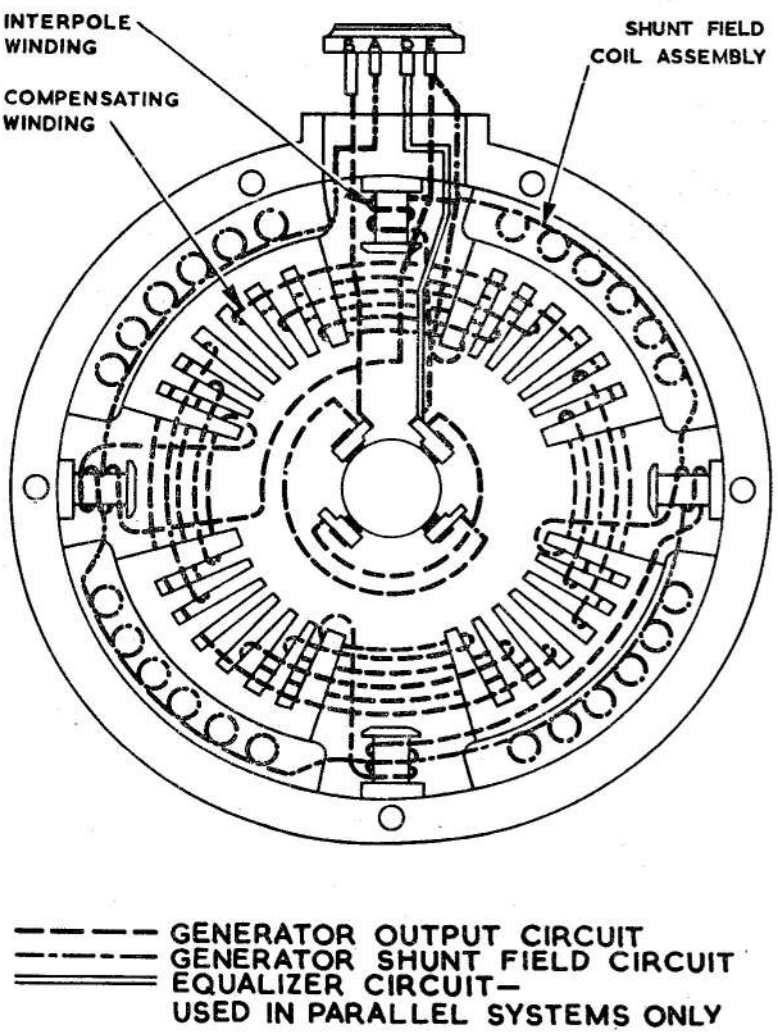

Fig. 2. Diagram of internal connections

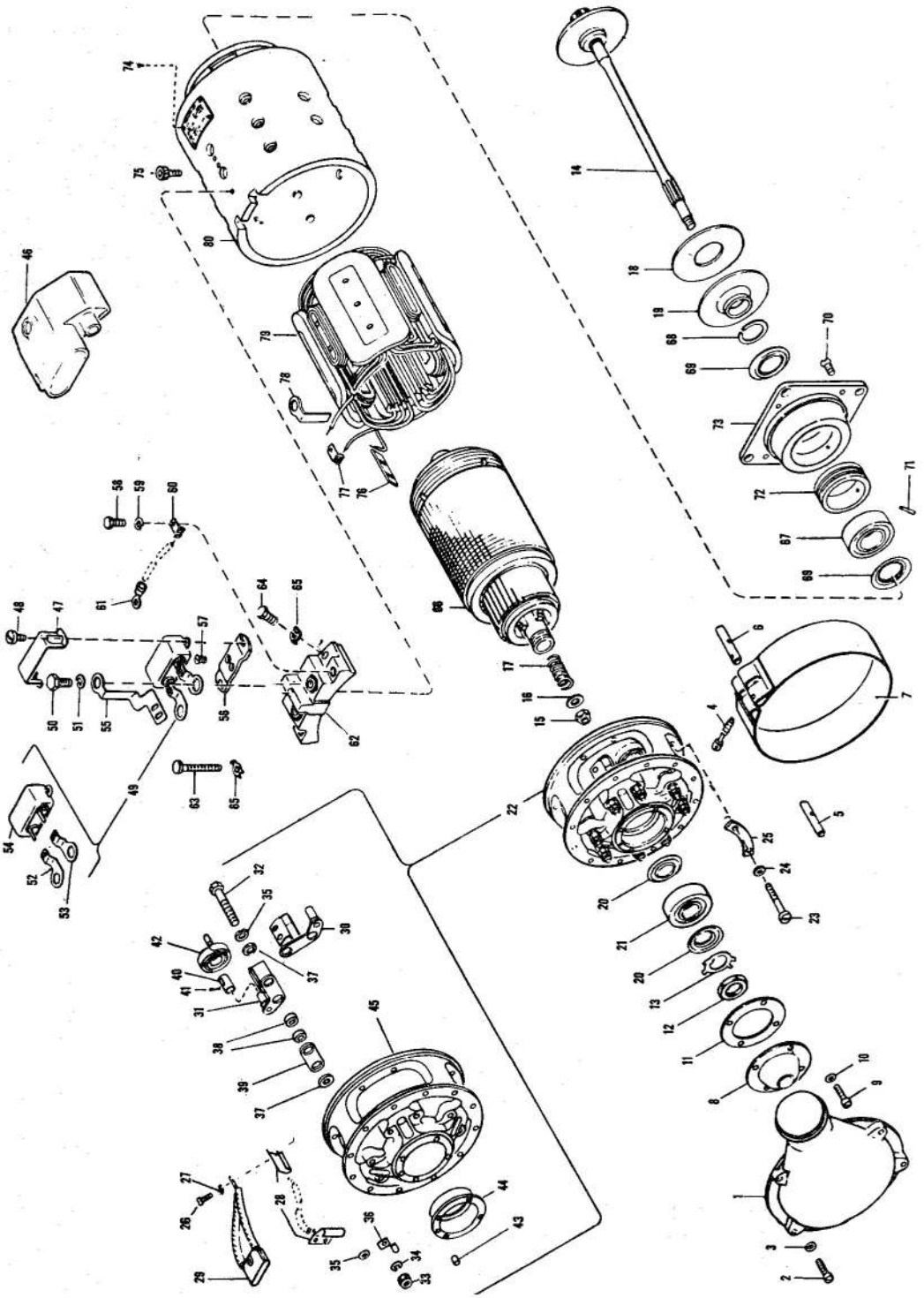

Fig. 3. Exploded view

Key to Fig. 3

1 AIR INLET SPOUT
2 SCREW
3 WASHER
4 SCREW
5 PIN
6 PIN
7 WINDOW STRAP
8 BEARING CAP
9 SCREW
10 WASHER
11 BEARING RETAINER
12 BEARING NUT
13 LOCK WASHER
14 DRIVE SHAFT ASSEMBLY
15 NUT
16 WASHER
17 SPRING
18 LINING
19 FRONT PLATE
20 SLINGER
21 COMMUTATOR-END BEARING
22 COMMUTATOR-END HEAD ASSEMBLY
23 SCREW
24 LOCK WASHER
25 PLATE
26 SCREW
27 LOCK WASHER
28 TERMINAL LUG
29 BRUSH ASSEMBLY
30 BRUSH BOX AND POST ASSEMBLY (RH)
31 BRUSH BOX AND POST ASSEMBLY (LH)
32 BOLT
33 NUT
34 LOCK WASHER
35 WASHER
36 CLAMP
37 BRUSH BOX INSULATOR
38 BUSHES
39 PLATE
40 SPRING ADJUSTING SLEEVE
41 SPLIT-PIN
42 BRUSH SPRING
43 PIN
44 LINER
45 COMMUTATOR-END HEAD
46 TERMINAL BLOCK COVER
47 CLAMP
48 SCREW
49 CAPACITOR ASSEMBLY
50 BOLT
51 LOCK WASHER
52 TERMINAL LUG
53 TERMINAL LUG
54 CAPACITOR
55 TERMINAL POST CONNECTOR
56 BRACKET
57 SCREW
58 BOLT
59 LOCK WASHER
60 TERMINAL
61 TERMINAL
62 TERMINAL BLOCK
63 BOLT
64 BOLT
65 LOCK WASHER
66 ARMATURE ASSEMBLY
67 DRIVE-END BEARING
68 LOCK RING
69 SLINGER
70 SCREW
71 PIN
72 LINER
73 DRIVE-END HEAD
74 SCREW
75 SCREW
76 TERMINAL
77 TERMINAL
78 TERMINAL POST CONNECTOR
79 FIELD COIL AND POLE ASSEMBLY
80 FRAME

SERVICING

General

8. The generator should be removed for servicing at the periods specified in the appropriate Servicing Schedule. Information on the servicing of d.c. generators is to be found in A.P.4343, Vol. 1, Sect. 2, Chap. 1. The following paras. should be read in conjunction with that chapter and with the relevant Servicing Schedule.

9. Clean and examine the frame, commutator and brush gear, ensuring that all nuts, screws and locking devices are secure. Check the insulation of all connecting leads for damage and deterioration, and ensure all connections are tight.

Brushes

10. Brushes should be renewed in accordance with the Bay Servicing Schedule, and at any examination when the state of wear indicates that the minimum length will be reached before the next servicing. If the brushes are removed from their boxes care should be taken to ensure they are replaced in the same position from which they were removed.

Bedding

11. When new brushes are fitted, they must be bedded on the commutator for their full thickness, and for 80 per cent of their axial width. The procedure for bedding is given in the following paragraphs. During the bedding run the brush seats should be examined at 15 min. intervals.

(1) Mount the generator on the test bench and connect to the test circuit as shown in fig. 4. A suitable air blast cooling blower must be connected to the generator and used throughout the bedding run.

(2) Run the generator at 2500 rev/min. and adjust the regulated voltage to 30V. Close the load switch and adjust the load resistor to apply a load of 50A. Run the generator under this condition for 30 min.

(3) Increase the applied load to 100A, and continue running at this load until each brush is satisfactorily seated.

Spring pressure

12. Measure the brush spring pressure using a suitable spring balance. The tension should be between 28 oz. and 32 oz. when the spring is lifted so that its end surface which normally rests on the top of the brush box is $\frac{7}{32}$ in. above the top of the brush box.

Adjustment

13. If the spring tension is outside the limits quoted in the previous paragraph, refer to fig. 2 and adjust as follows:—

(1) Prevent the spring adjusting sleeve from turning, and remove the cotter pin.

(2) Adjust the position of the sleeve until the specified spring tension is obtained, and replace the cotter pin.

Lubrication

14. The bearings are of the enclosed type and no lubrication is possible. They should be changed at the periods specified in the Servicing Schedule. The splines of the drive shaft assembly, the armature assembly shaft end taper and the vibration damper front plate taper, should be lubricated with grease XG-277, Specification D.T.D.878A (*Ref. No.* 34*B*/9100514).

Dismantling

15. Dismantling of the generator should not be attempted unless the special tools required or their equivalents are available. An exploded view of the generator completely dismantled is shown in fig. 2, the numerical sequence of the key to fig. 2 gives a guide to the order in which the dismantling operations may be performed.

TESTING

General

16. A new or reconditioned generator should be tested as described in the following paragraphs before installation. The generator should be driven by a variable speed test bench, and connected to the test circuit as shown in fig. 4 using a Type 1589-1-D voltage regulator of proven serviceability. A suitable air blast cooling blower should be connected and used for all tests except that in para. 22. The armature should first be turned by hand to ensure that it does not foul any leads or fixed parts of the machine.

Preliminary running test

17. The generator should be checked for undue vibration, excessive sparking at the brushes and the build up of voltage, without hesitation, in the correct polarity; the shunt field current as read on the field ammeter should not exceed 8A.

18. Close the pile shorting switch to the X position which will connect the generator for automatic voltage regulation. Run the generator at a speed of 2500 rev/min, and adjust the regulated voltage to 30V. Apply a load of 10A, and if satisfactory operation is obtained, gradually increase the load to 100A.

19. If the voltage fails to build up, or if the polarity is incorrect, the poles should be remagnetized. If excessive sparking is observed, the brush seatings should be examined and, if necessary, the brush bedding procedure, para. 11, repeated. If undue vibration

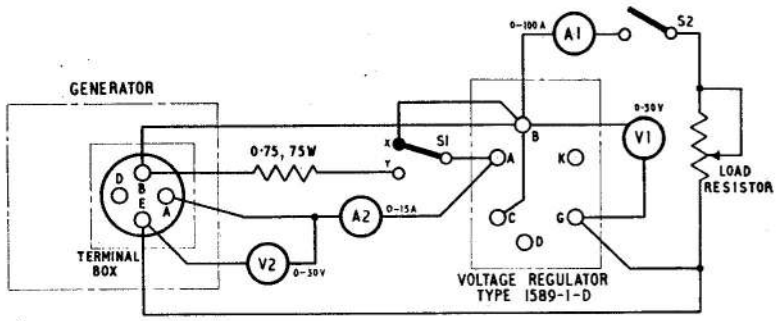

Fig. 4. Test circuit diagram

is apparent the machine should be dismantled for examination of the bearings and drive shaft assembly.

Remagnetizing

20. Disconnect the generator from the test circuit. Connect a 12V battery in series with a quick-break switch across the generator field terminals. The positive battery lead must be connected to the generator terminal "A", and the negative lead to the "E" generator terminal post. Close the switch several times, for approximately five seconds each time. Repeat the test in para. 18 to ensure that the machine is correctly magnetized.

Minimum speed test

21. Close the pile shorting switch to the Y position, this ensures that the carbon pile regulator is switched out of circuit and is replaced by a 0·75 ohm fixed resistor in series with the generator shunt field. Close the load switch and adjust for the full rated load of 100A. Run the generator and gradually increase the speed until the line voltmeter reads 30V. The driven speed at this point should not exceed 2300 rev/min.

Commutation check

22. Remove the window strap assembly from the commutator end in order to expose the brushes for observation during this test. Run the generator with full load applied at speeds of 2500, 3500 and 4500 rev/min. Check the commutation at each speed, pin point sparking with occasional streamers is permissible at speeds above 3500 rev/min.

Note . . .

The generator is deprived of its normal flow of cooling air during the commutation check, it is important therefore to ensure that the duration of the run is not longer than is necessary to perform the test.

Insulation test

23. The insulation resistance measured between the generator terminals and the frame, while the machine is still hot from the preceding tests, should not be less than 50 000 ohms when measured with a 250V insulation resistance tester. If a lower reading is obtained, the interference suppression capacitor should be disconnected and checked for serviceability.

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