Chapter 16

ROTARY INVERTER, TYPE 108 (ROTAX S3301)

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Inverter Type 108 (Rotax S3301) ...	Stores Ref. 5UB/5953
Input voltage	25–28V, d.c.
Output	115V, a.c. Single phase 650 Watts, 0·9 p.f. lag, and 0·95 p.f. lead
Frequency	400 c.p.s.
Rating	Continuous
Speed	8000 r.p.m.
Rotation (viewed on commutator end)	Clockwise
Cooling	Fan to 35,000 ft; blast and fan to 55,000 ft.
Electrical connection	
Input	2 split terminal lugs, cable holes ·413 in. dia.
Output	2 pole miniature Mk. 4 plug
Control panel interconnection ...	12 pole miniature Mk. 4 plug
Brush grade	
d.c.	K.C.E.G.11
a.c.	K.C.E.G.11
Brush spring pressure	
d.c.	20–24 ozs.
a.c.	4–5 ozs.
Minimum brush length	
d.c.	·562 in.
a.c.	·375 in.
Minimum slip ring diameter	·75 in.
Minimum commutator diameter	1·875 in.
Weight	30·5 lb.
Length	16·625 in.
Width	6·375 in.
Height	7·968 in.

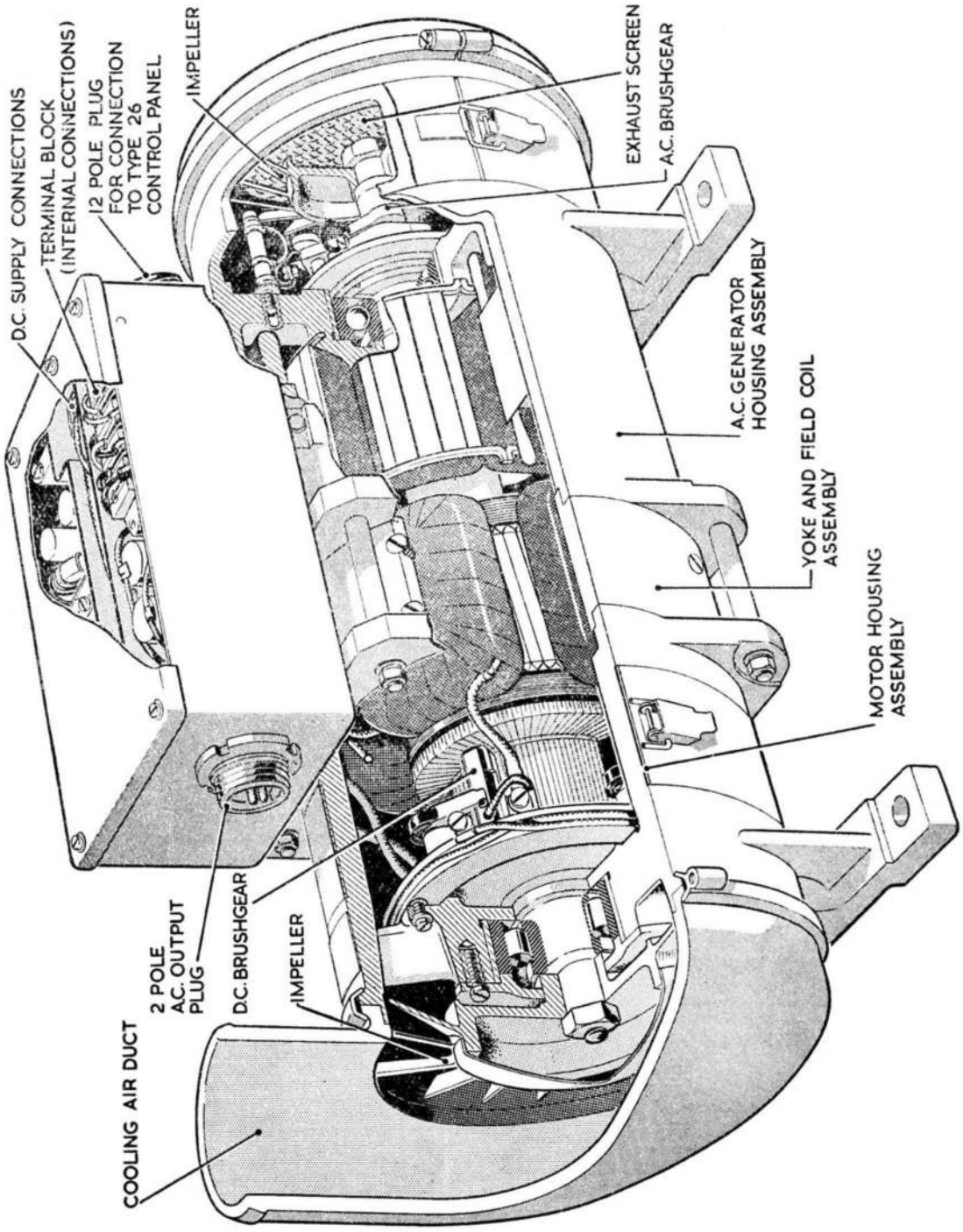

Fig. 1. Sectioned view of inverter

Introduction

1. The rotary inverter Type 108 (*fig. 1*) is designed to give an output of 650 watts at 0·95 p.f. lead, 0·90 p.f. lag, 115V, a.c. single phase 400 c.p.s. with an input of 25–28V, d.c.

2. This machine is designed to operate in conjunction with a control panel Type 26.

DESCRIPTION

3. The inverter consists of a 25–28V, d.c. compound wound, four pole motor, driving

a 115V, a.c., 400 c.p.s., 6 pole generator both mounted on a common shaft. A suppressor unit is mounted on top of the inverter castings, and the 28V, d.c. supply enters it through two cables connected to cable lugs.

4. The main body of the inverter consists of three parts. The a.c. generator housing assembly, the yoke and field coil assembly, and the motor housing assembly. The yoke and field coil assembly is spigoted at both ends, clamped between the a.c. generator and motor housings, and secured by four long bolts passing between lugs on the two housings. The cooling air inlet is spigoted to fit on the motor housing and retained by a strap and clamping bolt. At the a.c. generator end the exhaust cooling air passes out through a screen held in position by an end casting and retained by a strap and clamping bolt.

5. The shaft is supported at the d.c. motor end by a roller bearing housed in the motor housing casting. At the a.c. generator end a ball bearing housed in the a.c. generator housing casting supports it. Each end of the shaft has a keyway and screw thread cut in it for mounting impellers (*para. 9*).

6. The d.c. brush gear is mounted on a moulded ring, which is held on the motor housing by four screws. Brush pressure is maintained by springs, which are coiled round the trigger posts and bear down on the brush triggers. There are four d.c. brushes, located opposite openings in the motor housing so that they are readily accessible. A sheet metal strap with a clip fits round the housing to make the final closure.

7. The a.c. stator is clamped into the a.c. generator housing and held by a bolt passing through the top of the housing. The a.c. rotor is excited from the d.c. supply, which is taken into it on two slip rings. Brush pressure is maintained on the four slip ring brushes by similar springs and triggers to those used at the d.c. end. These brushes are also sited opposite openings in the casting for accessibility and are finally enclosed by a metal strap and clip.

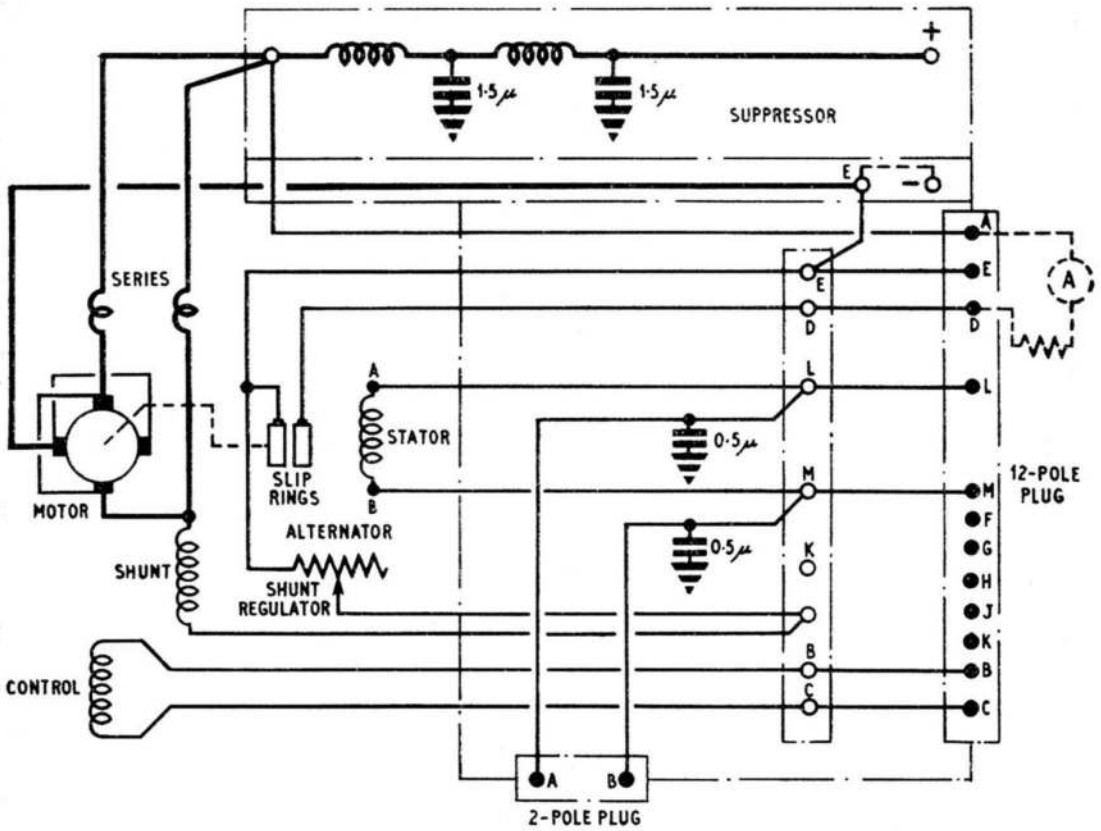

Fig. 2. Circuit diagram

Suppressor unit

8. The suppressor unit contains the capacitors and chokes comprising the suppression circuit (*fig. 2*) and also a terminal block for the internal a.c. and d.c. connections. The main d.c. supply is connected to cable lugs. The a.c. output is taken via a 2-pole miniature plug, whilst the interconnection between the inverter and its control panel is done through a 12-pole plug. Access to the suppressor unit is obtained by removing the top cover.

Cooling

9. For low altitudes, cooling is effected by two impellers, one mounted at the commutator end and the other by the slip rings. Air is drawn in through the inlet at the commutator end, and is expelled through a screen at the a.c. end.

10. For high altitudes blast cooling is employed. By slackening the clamping bolt and strap, the air inlet can be placed in any radial position relative to the main body.

OPERATION

11. Current is supplied at 28V, d.c. (nominal) to the motor, and also the rotor winding via the slip rings. The shaft rotates in a clockwise direction looking at the commutator end. As stated in para. 2 the inverter is normally used with a control panel Type 26. When an increase of load occurs both voltage and frequency tend to fall but the control panel corrects this in the following way. A corrective current is fed to the control winding of the d.c. motor resulting in an increase of speed and thus an increase of frequency. A larger current is also fed to the rotor windings causing a stronger flux and thus increasing output voltage. In the case of a drop in load these two actions are reversed.

12. The output voltage is actually kept between 110V, a.c. and 120V, a.c., and the frequency between 398 c.p.s. and 402 c.p.s.

INSTALLATION

13. There are four mounting feet drilled with 0·312 in. diameter holes. The machine may be mounted in any position, but one in which it is normally horizontal is preferable.

14. Provision for adequate circulation of free air in and around the unit must be made and if blast cooling is to be employed then suitable arrangements must be made for a blast air supply. The blast air requirements for these machines are given in the following table:—

Air Temperature (degrees/c.)	Cooling air requirements (lb./minute)
−30	1·30
−15	1·40
+ 5	1·60
+25	1·84
+45	2·20

15. Interconnection between the inverter and its associated control panel should be made using screened cables between the plugs and sockets. All cable runs should be kept as short as possible.

SERVICING

Brush gear

16. The inverter will require little servicing other than attention to the a.c. and d.c. brush gear. The bearings are packed with grease and should not require any attention.

17. Both sets of brush gear become easily accessible on removing their covering straps. Particular attention must be given to minimum brush length, and if the remaining length is not sufficiently greater than the minimum permissible, then the brushes must be renewed. This will entail removing the inverter from the aircraft in order to bed the brushes in properly. Any carbon dust deposits must be blown away using dry compressed air. The brushes must slide easily in their respective boxes. Brush spring pressures when measured with a spring balance, and with the trigger level with the top of the brush box, must be within the limits as shown in leading particulars. For the d.c. brushes use a spring balance Stores Ref. 1H/59 and for the a.c. brushes a spring balance Stores Ref. 1H/97. All brush gear connections must be tight and free from corrosion.

Commutator and slip rings

18. The commutator and slip rings must be examined for signs of wear. If there is any serious scoring or burning then the complete inverter must be removed for repair.

General

19. The suppressor unit should be examined to make sure that all connections are tight and free from corrosion.

20. A check should be made to see that the blast air supply is not obstructed.

21. Finally the suppressor unit cover must be put on and screwed down, and the brush-gear covering straps clamped in position.

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