Chapter 4

GENERATOR, TYPE U2

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Generator, Type U2	Stores Ref. 5UA/2617
Output voltage	80V, a.c.
Output current	15 amp.
Excitation voltage	24V, d.c.
Rotation	Clockwise or anti-clock
Field resistance	7·2 ohms
Maximum speed (continuous)	6,000 r.p.m.
Frequency at 3,000 r.p.m.	1,200 c/s
Weight	20 lb.

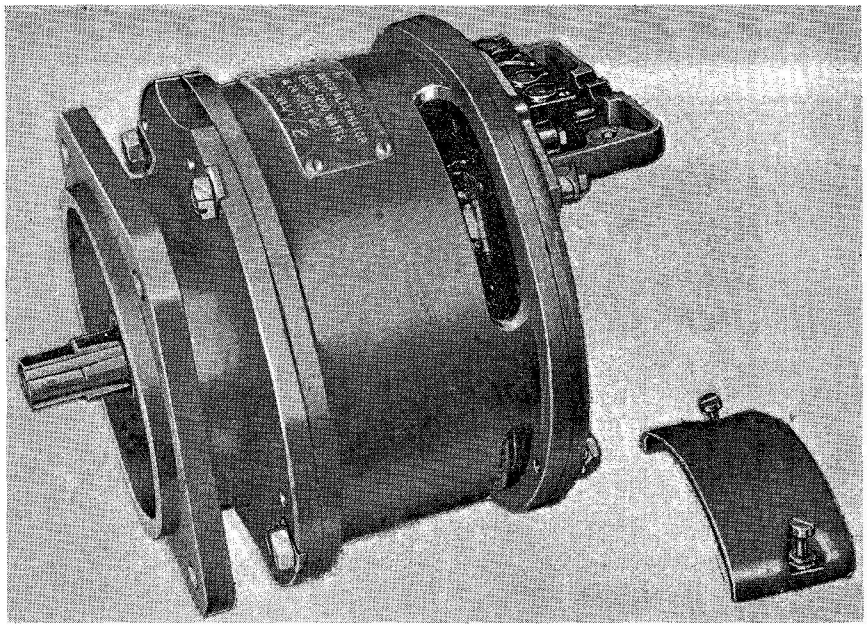

Fig. 1. Generator, Type U2

Introduction

1. The a.c. generator, Type U2 (*fig.* 1) has been designed to give a maximum output of 15 amp. at 80V, a.c. when excited from the aircraft's 24V, d.c. system. Normally the output voltage of this generator is controlled by a control panel Type 5, with which is incorporated a voltage regulator Type EU or the control panel Type 5A, incorporating the voltage regulator Type EU2. A full description of these two control panels is given in A.P.4343B, Vol. 1, Sect. 7, Chaps. 3 and 4 respectively. In order that the full rated output may be obtained over the full speed range, a capacitor of 18μF must be connected in series with the a.c. winding. Allowance is made for this within the control panel.

2. The generator is intended to be engine driven through gearing and is designed to run at available speeds up to 6,000 r.p.m. continuous maximum. For periods not exceeding five minutes its maximum speed may be 7,500 r.p.m. At 3,000 r.p.m. the output frequency is 1,200 c/s.

PRINCIPLE OF OPERATION

3. The generator is of heteropolar type, with four poles, and four exciting coils

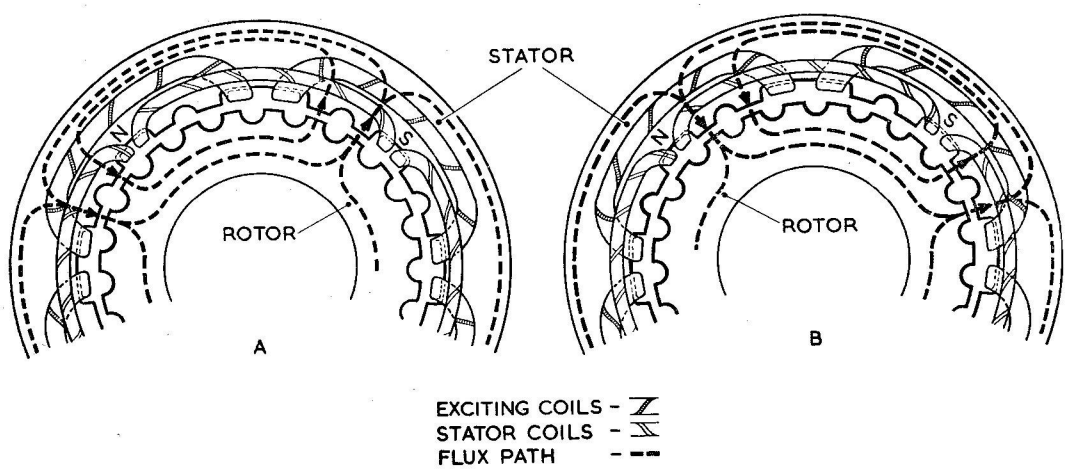

Fig. 2. Principle of generator, Type U2

connected in series. The coils of the a.c. winding are concentrated in single slots in the centre of each pole, each coil spanning one pole pitch. Referring to fig. 2(A) and considering one pair of paths only, it will be seen that with the rotor in the position shown, almost the whole flux will be concentrated along the path indicated by the dotted lines, since the reluctance of the air gap is at a minimum where the teeth of the rotor are opposite to those of the stator. When, however, the rotor is moved one half tooth pitch to the position shown in fig. 2(B), the concentration of flux will now be as indicated by the dotted line in this figure. A further movement of the rotor one half tooth pitch in the same direction of rotation restores the flux conditions to these shown in fig. 2(A). Similar conditions apply at the same instant for the other pair of poles. It will thus be seen that a movement of the rotor through a distance equal to one tooth pitch causes a complete cyclic change of the flux linking with each of the coils of the a.c. windings, and an a.c. voltage is induced in them accordingly. The frequency of the induced voltage thus depends on the number of teeth in the rotor, and the speed of rotation.

DESCRIPTION

4. A sectional view of the generator is given in fig. 3. The driving end frame has two flanges, one for attachment to the yoke and the other to provide a means of attaching the generator to the engine. The non-drive end frame is bolted to the yoke and carries a shrouded terminal block (*fig.* 4). The pole and stator assembly is spot welded to the yoke.

Bearings

5. The rotor runs in ball bearings at both ends. The bearing at the drive end is retained by a special nut whilst that at the non-drive end is held by an externally tapered sleeve pressed on to the shaft.

6. Both bearings are oil lubricated. A felt washer attached to a thin metal disc (to prevent the felt being drawn into the bearing) is fitted at the outer side of both bearings. The felt washer makes light rubbing contact on the shaft sleeve and is also in contact with the main reservoir felt fitted in the bearing cap. Oil is thus transferred from the reservoir to the shaft sleeve by the felt wiping washer, and then passes to the bearing under the action of centrifugal force. A similar wiping washer is fitted on the inner side of the bearing.

Terminal box

7. Within the terminal box (*fig.* 4) the a.c. winding is connected to the two outer terminals (marked with yellow and blue spots respectively) whilst the d.c. exciting

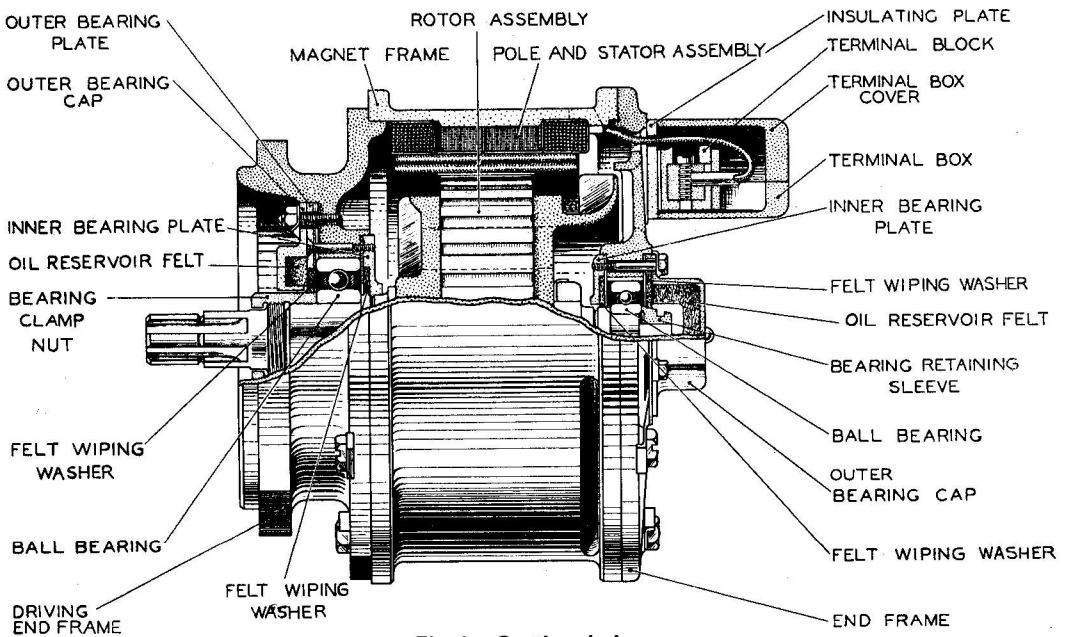

Fig. 3. Sectional view

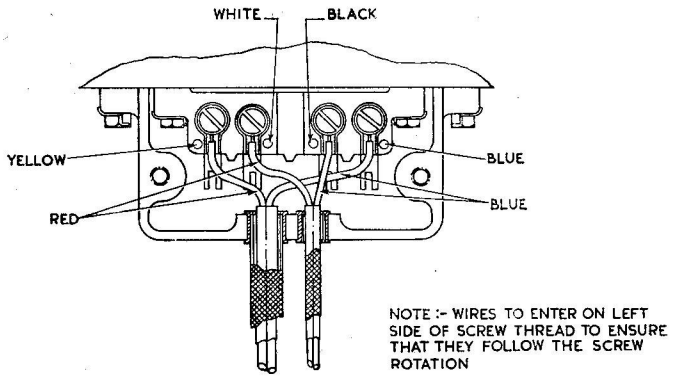

Fig. 4. Terminal connections

winding is connected to the two middle terminals (marked with a white and black spot respectively) (*fig.* 5).

Cooling

8. The generator is semi-enclosed and is cooled by through ventilation, a fan being incorporated in the rotor. Air is taken in through apertures in the non-drive end frame and flows through axial vents in the rotor, then back through the air gap and the spaces between the rotor teeth, and is expelled through peripheral openings in the yoke.

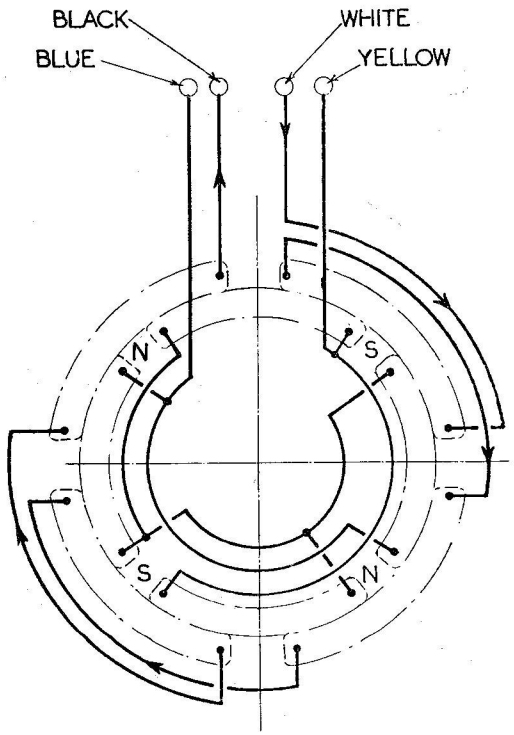

Fig. 5. Internal connections of field windings

INSTALLATION

9. The generator is secured to the engine by four bolts passing through holes in the mounting flange, and should be so arranged that the terminal cover is easily accessible.

SERVICING

10. Very little servicing needs to be done to these generators apart from lubricating the bearings. They should be inspected to see that all electrical connections are tight and free from corrosion, and all mechanical fixings are secure.

Lubrication

11. To lubricate the bearings it is necessary to remove the generator from the aircraft, and proceed as follows. Remove the outer bearing cap and Vellumoid gasket at the driving end by taking off the six nuts. Well soak the felt of the outer bearing cap in lubricating oil (OM170). After soaking and replacing the felt in the bearing cap, lightly depress the felt with the fingers to exude superfluous oil and wipe the metal part free from oil with a soft rag. Refit the outer bearing cap and the Vellumoid gasket to the driving end; replace the nuts securely and lock the tab washers. At the non-driving end take out the screws holding the outer bearing cap and remove the latter. This frees two Vellumoid gaskets and a felt wiping washer and retaining disc. Soak the outer bearing cap and the felt wiping washer in lubricating oil as for the driving end. After soaking shake and wipe off surplus oil from the metal parts. Refit the components in the following order; Vellumoid gasket, felt wiping washer and retaining disc (felt AWAY from the bearing), Vellumoid gasket, and finally the outer bearing cap. Fit and secure the three fixing screws and lock the tab washers. The countersunk screws under the bearing caps at both the driving end and the non-driving end must not be removed.

TESTING

12. A check should be made to see that the rotor revolves freely without excessive noise or end play in the bearings.

13. The generator should be connected to its appropriate control panel, this latter being connected to a suitable source of d.c. supply and to a suitable load. Switchboard, Type K (*Stores Ref.* 5G/214), and loading panel

(*Stores Ref.* 5G/215) are available for this purpose. The generator should then be run at approximately 4,000 r.p.m. with an output current of 15 amp. for a period of 20 minutes.

At the end of this period the insulation resistance of all live parts together to the frame should be not less than 0·05 megohms when measured with a 250V insulation tester.

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