Now 113D-07165-1

Chapter 29

VOLTAGE REGULATOR, TYPE 92

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Voltage regulator, Type 92	Ref. No. 5UC/5721
Control voltage	28 ± 0·75 volts
Maximum pile loading	
Natural cooling	250 watts
Blast cooling	340 watts
Pile resistance	0·4—1·8 ohms
Carbon pile	Ref. No. 5UC/6151
Operating coil current	2·0—2·1 amp.
Operating coil resistance (cold)	4·0 ohms
Shunt stabilizing coil resistance	105 ohms
Ballast resistor (7·5 ohms, 40 watts)	Ref. No. 5UC/6094
Trimmer diverter (7 ohms, 20 watts)	Ref. No. 5UC/6095
Remote trimmer (5 ohms, 7½ watts)	Ref. No. 5UC/6159
Overall dimensions	
Length	8⅞ in.
Width	7 in.
Height	7¾ in.
Weight	14 lb.

Introduction

1. The voltage regulator, Type 92, is used in conjunction with the transformer-rectifier unit, Type 2, to control the output voltage of the alternator, Type 155.

2. The 208-volt, 400c/s, 3-phase output of the alternator is stepped down and rectified in the transformer-rectifier unit (described in Sect. 18, Chap. 3, of this publication) to supply the operating coil of the voltage regulator at the 28-volt level. The carbon pile of the voltage regulator is in series with the 28-volt d.c. field winding of the alternator.

DESCRIPTION

3. The voltage regulator (*fig.* 1) is of the multi-pile type, provided with four piles of carbon washers connected in series-parallel. Except for the modified construction to accommodate the four piles, the voltage regulator is similar to the single pile type described in A.P.4343, Vol. 1, Sect. 6, Chap. 1.

4. To mount the four piles, a stub shaft projects from the armature clamp plate (*fig.* 2). A gimbal arm, pinned to this stub axle, carries two pressure arms which are pinned to spindles projecting from the ends

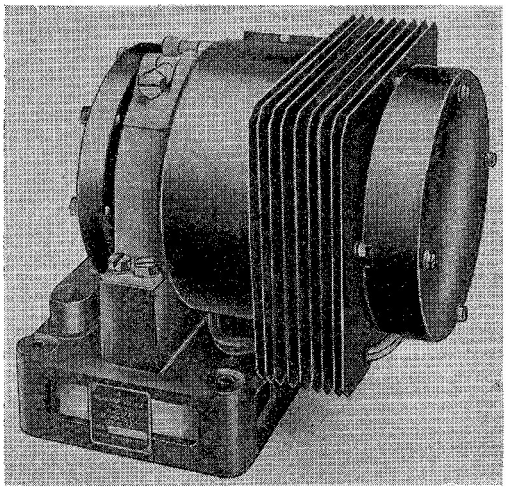


Fig. 1. Voltage regulator, Type 92

of the gimbal arm. At the ends of the pressure arms are fitted brass ferrules which are insulated from the arms by mica. The ferrules house carbon terminal plugs which contact the piles. A strap connector links the pair of ferrules on each pressure arm.

5. At the other end of the unit, each pile bracket is screwed to the end plate and is insulated from it by mica washers. Each pile is fitted with its own terminal plug, adjustable ferrule, compression and locking screws, and lead connecting screw. The assembly is protected by a cover which is attached to the end plate by four screws.

6. The four ceramic tubes, housing the pile stacks, are enclosed within a finned cooler which dissipates the heat generated by the stacks. ◀ Each pile is 2·5 in. long, and consists of 21 3-mm. washers. ▶

7. The regulator unit and a moulded terminal block are mounted on the top plate of a rectangular chassis provided with four fixing holes. The regulator unit is secured in a horizontal position by a strap attached to trunnions projecting from the chassis casting. Beneath the chassis top plate are fixed two tubular wire-wound resistors.

Windings and connections

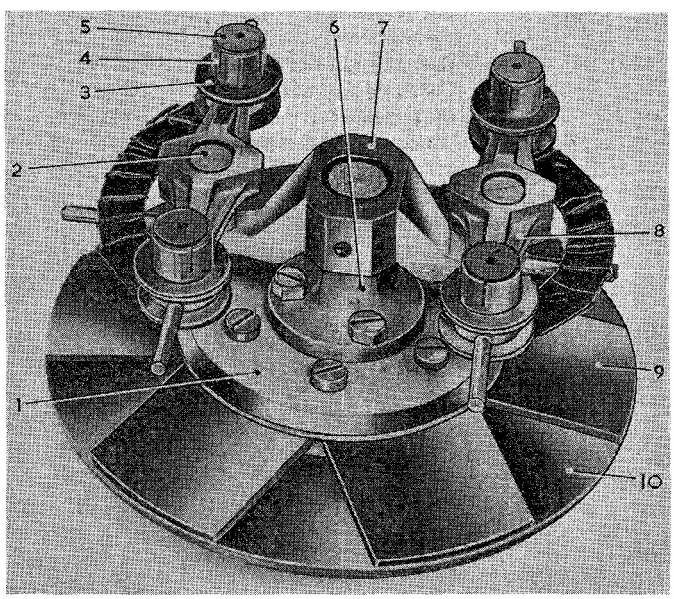
8. The regulator unit is wound with three coils, connected as shown in the circuit diagram (*fig.* 3). In addition to the main operating coil of 600 turns, a shunt coil of 1100 turns and a series coil of 4 turns are fitted to ensure stability of the regulator under transient conditions caused by speed or load fluctuations in the alternator, or by switching of the alternator field.

9. An adjustable 7·5-ohm ballast resistor and an externally connected trimmer resistor are in series with the main coil. The maximum resistance of the trimmer is 5·0 ohms, and it is shunted by a fixed 7·0-ohm diverter resistor. This resistor is fitted to ensure that the voltage level will be maintained within safe limits in the event of the open-circuiting of one of the leads to the external trimmer.

INSTALLATION AND OPERATION

10. The voltage regulator should be installed according to the relevant Aircraft Handbook. The two main requirements which must be met are that the pile stacks must be horizontal, and that the siting ensures a free flow of cooling air around the equipment.

11. The diagram of connection (*fig.* 4) shows the connections to be made to the transformer-rectifier unit and the alternator. With



1 ARMATURE CLAMP PLATE
2 SPINDLE
3 MICA INSULATION
4 BRASS FERRULE
5 CARBON TERMINAL PLUG
6 STUB SHAFT
7 GIMBAL ARM
8 PRESSURE ARM
9 ARMATURE SPRING
10 BI-METAL RING

Fig. 2. Armature assembly

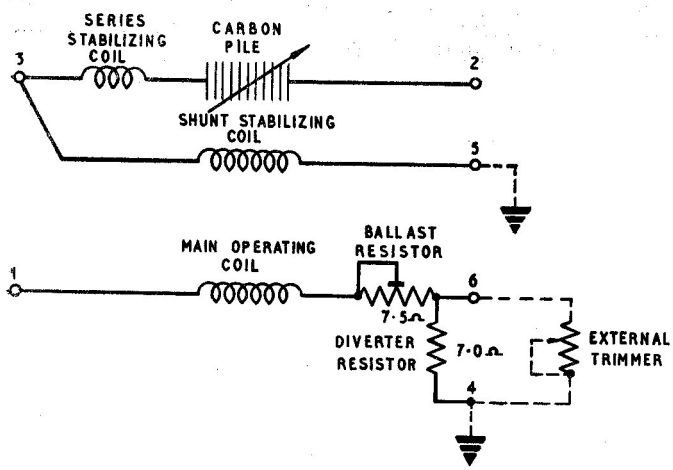


Fig. 3. Circuit diagram

the regulator correctly adjusted, the range of the external trimmer resistor should be sufficient to set the alternator output voltage so that it is maintained at 208 ± 0·75 volts under all conditions of speed and load.

SERVICING

12. General servicing instructions for this type of regulator are given in A.P.4343, Vol. 1, Sect. 6, Chap. 1. That chapter describes the fitting of a new pile stack, and the preliminary mechanical adjustment for a regulator which is completely out of order. When any adjustment is made, the regulator must afterwards be subjected to full test.

Insulation resistance

13. The insulation resistance between the six terminals and the frame should be measured with a standard 250-volt insulation resistance tester. The reading obtained should be not less than 5 megohms.

Testing of regulator

14. ◄ It is preferable that the regulator should be tested in conjunction with the a.c. generator, Type 155 and transformer-rectifier unit, Type 2. If these are not available, however, a test may be carried out using a d.c. generator of suitable characteristics, such as Type P3, U0, 501, 515 or 517, connected as shown in the circuit diagram in fig. 5. ►

15. Disconnect and insulate the green lead from the pile end bracket, and substitute the test lead connected to an external switch (*fig.* 5). With the stabilizing windings disconnected by switching over to the test lead, the regulator must be adjusted to control the generator output at 28 volts, with the coil current shown on A1 adjusted to within the limits of 2·0 and 2·1 amp. cold.

Regulation test

16. Run the generator at constant speed, and by variation of the series and diverter resistors, increase the pile resistance as measured by V2/A2 smoothly from 0·4 ohms to 1·8 ohms, and then decrease to 0·5 ohms. Repeat this cycle, and over this cyclic variation of pile resistance, the controlled voltage V1 must be maintained at 28 volts ± 0·75 volts.

Note . . .

It is important that the diverter resistor should always be switched in or out at its maximum value.

Stability tests

17. With the stabilizing windings connected in circuit, and with the pile resistance adjusted to the maximum value of 1·8 ohms, switch the generator field on and off at least three times. Under this condition the regulator must be critically damped.

18. Following the test in para. 17, slacken each pile compression screw ¼ turn, i.e., equivalent to 0·009 in. pile movement, and

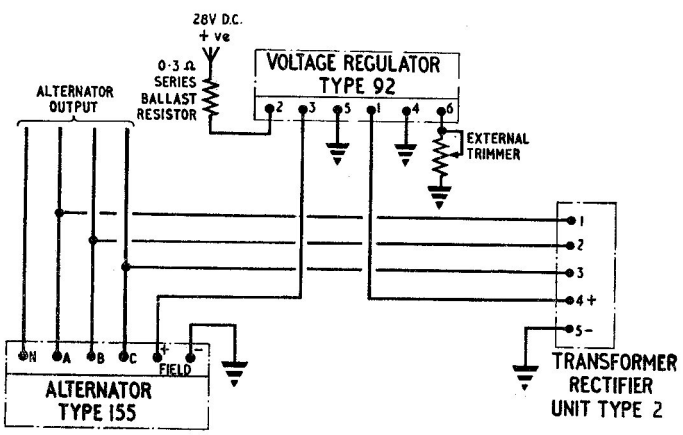


Fig. 4. Diagram of connections

repeat the stability test. At this setting of the pile compression screws, the regulator must respond without any tendency to sustained hunting.

19. Provided the regulator satisfies the test in para. 18, restore each pile compression screw to its original setting, and repeat the regulation test.

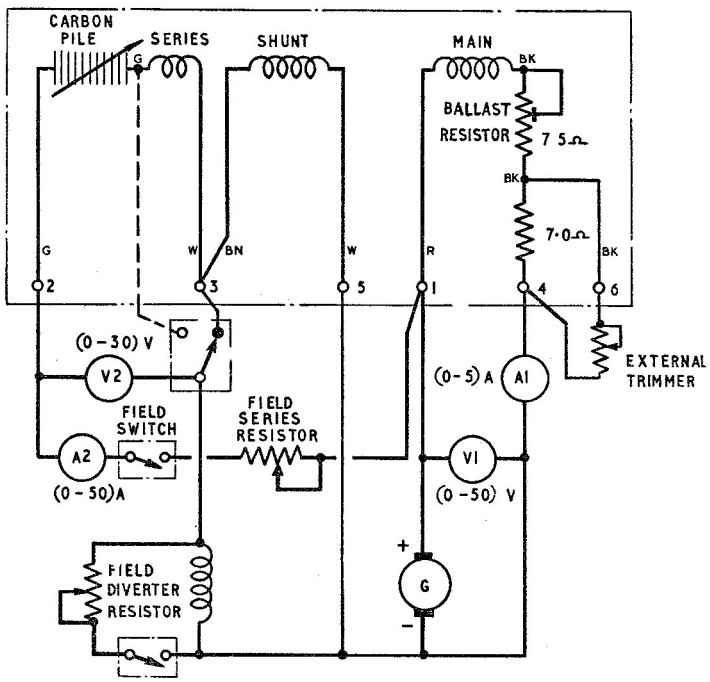


Fig. 5. Test circuit diagram