Chapter 26

VOLTAGE REGULATOR, TYPE 70

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Voltage regulator, Type 70	*Ref. No. 5UC/6014*
Controlled voltage	*28 volts* ± *2½ per cent*
Maximum pile loading	*100 watts*
Actual pile loading	*65 watts*
Pile resistance range	*1·7 to 37 ohms*
Carbon pile	*Ref. No. 5UC/6165*
Operating coil current	*0·82 to 0·88 amp.*
Operating coil resistance	*9·4 ohms*
Equalizing coil resistance	*0·4 ohms*
Trimmer diverter (12 ohms, 20 watts) ...	*Ref. No. 5UC/6174*
Adjustable ballast resistor (1 adjuster) (15 ohms, 10–12 watts)	*Ref. No. 5UC/6173*
Adjustable ballast resistor (2 adjusters) (15 ohms, 10–12 watts)	*Ref. No. 5UC/6173*
Remote trimmer (10 ohms, 7½ watts)	*Ref. No. 5UC/5780*
Stabilizing transformer—	
Ratio	*500 : 240*
Primary winding	*3·3 ohms*
Secondary winding	*1·0 ohms*
Stabilizing transformer series resistor (25 ohms, 20 watts)	*Ref. No. 5UC/6175*
Dimensions	*7·96 in.* × *5·5 in.* × *6·06 in.*
Weight	*8 lb. 5 oz.*

Introduction

1. The voltage regulator, Type 70, is used to control the output of the 1·5 kW d.c. generator, Type 505, at 28 volts $\pm 2\frac{1}{2}$ per cent.

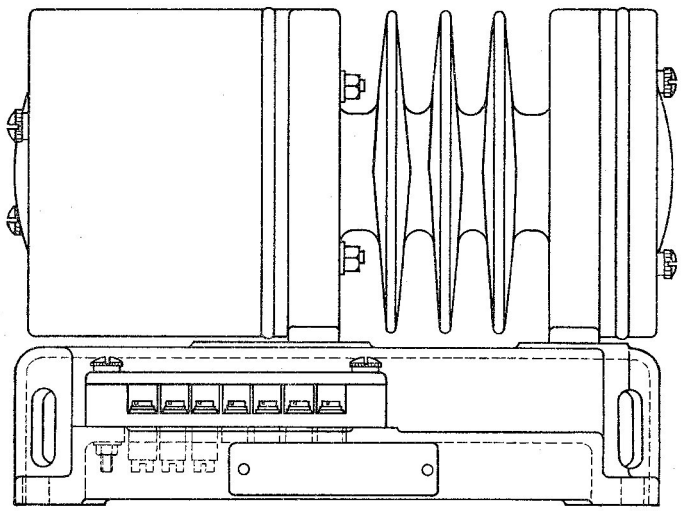

Fig. 1. Voltage regulator, Type 70

DESCRIPTION

2. This regulator (*fig.* 1) is of the single carbon pile type, and in general construction and principle of operation is similar to the standard design as described in A.P.4343, Vol. 1, Sect. 6, Chap. 1. It incorporates the later flat type armature spring, with a bi-metal strip embodied for temperature compensation. The pile consists of fifty 1-mm. washers interleaved with six 3-mm. washers, there being ten 1-mm. washers to each 3-mm. washer, with a 3-mm. washer at each end.

3. The regulator unit is mounted on a base, beneath which are the associated resistors and stabilizing transformer. Provision is made for alternative fitting positions of the magnet case and cooling assembly to suit different aircraft installations. A remote trimmer, (10 ohms, $7\frac{1}{2}$ watts), is connected across terminals 1 and 4, i.e., across the fixed ballast resistor. This ensures that in the event of open-circuiting of one of the trimmer leads, the voltage level is still maintained within safe limits.

4. Two adjustable ballast resistors are fitted, one with one adjuster and the other with two. Part of the latter, that between terminals 1 and 7, is used as a voltage boost resistor, to ensure an adequate differential voltage when bringing a generator on to a bus-bar already being supplied with current. When the generator has been connected, that part of the resistor is automatically short-circuited and so rendered ineffective.

5. An equalizing coil is incorporated, to ensure that the load is shared approximately equally between generators operating in parallel. This coil is such that the application of 0·5 volts across terminals 2 and 6, derived from the voltage drop on the generators series winding during a period of overload, will cause the line voltage to fall to between 23·5 and 24·0 volts.

6. A stabilizing transformer is fitted to maintain the stability of the regulator during sudden speed or load changes and switching of the generator field and is connected as shown in fig. 2, with the primary winding across the generator shunt field and the secondary in series with the operating coil. Under stable conditions, no voltage is induced in the secondary winding, but when the generator speed increases, a voltage will be induced in the secondary winding such as to oppose the compensating effect of the operating coil and so damp any tendency towards oscillation.

SERVICING

7. 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.

Testing of regulator

8. Connect the regulator in the test circuit shown in fig. 3. If a generator, Type 505, is not available, any suitable d.c. generator may be used, but in this case the stabilizing windings should be disconnected, at the point indicated in fig. 3, for all but the stabilizing tests. Terminals 1 and 7 must be connected together for all tests except that in para. 12.

9. The regulator must be adjusted to control the generator output at 28 volts, with

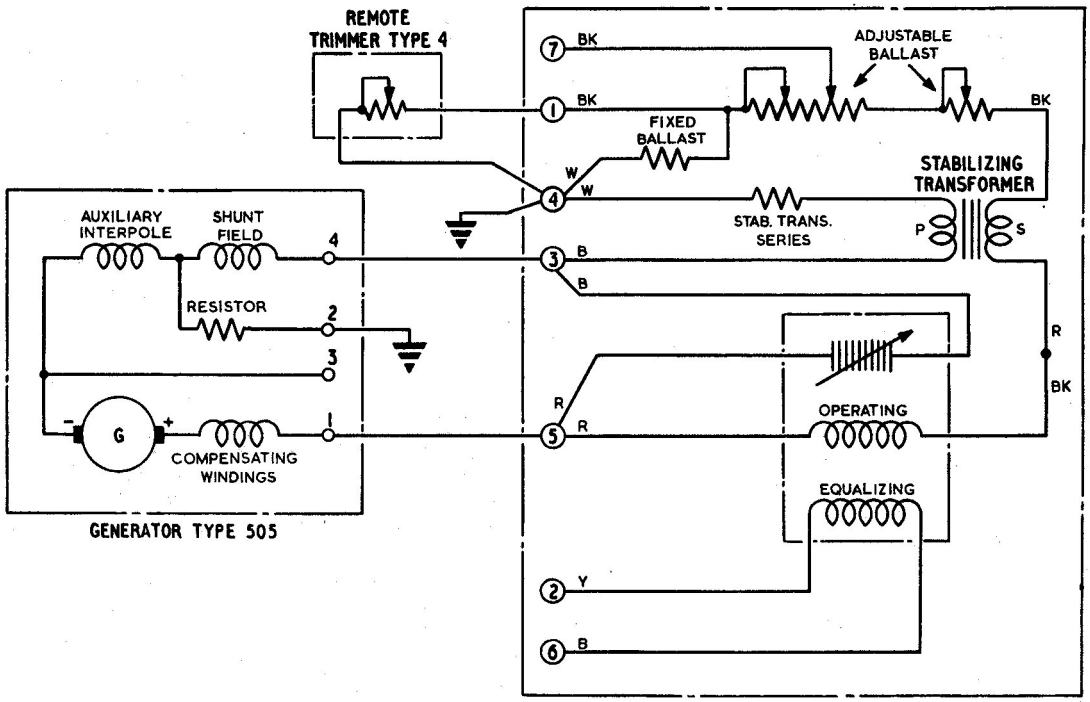

Fig. 2. Circuit diagram

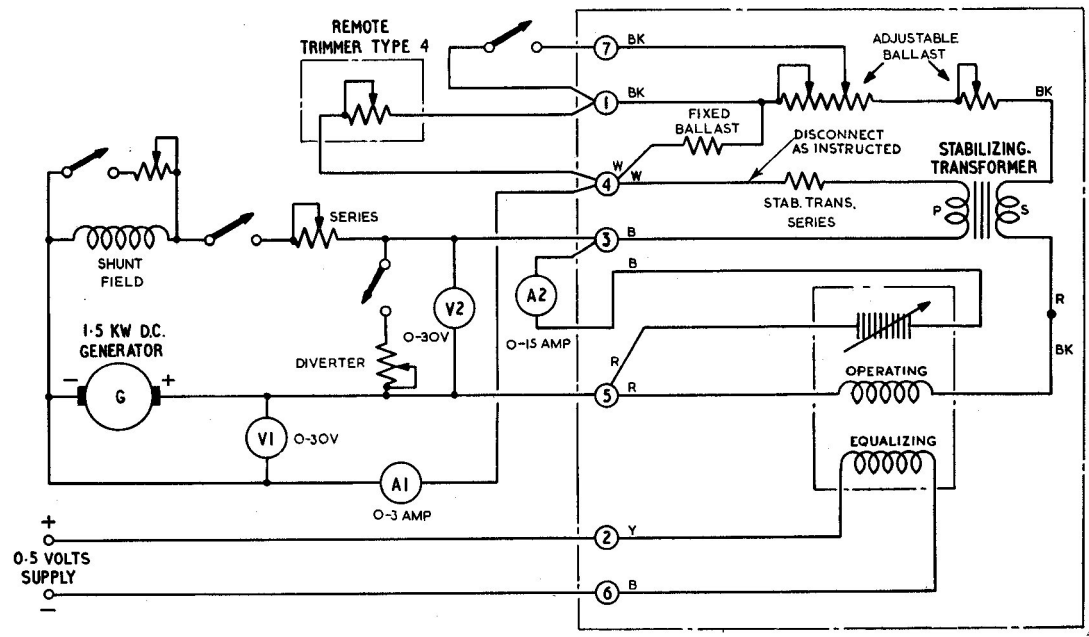

Fig. 3. Test circuit diagram

the coil current shown on A1 adjusted to within the limits of 0·82 and 0·88 amp. cold.

Regulation test

10. 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 1·7 ohms to 37 ohms, and then decrease to 1·7 ohms. Repeat this cycle, and over this cyclic variation of pile resistance, the controlled voltage V1 must be maintained at 28 volts ±0·5 volt.

Note . . .

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

Equalizing test

11. Connect a separate supply of 0·5 volts across the equalizing coil, the positive lead being connected to terminal 2. On the application of this voltage, the line volts V1 must be reduced from 28 volts to between 23·5 to 24·0 volts.

Voltage boost test

12. With terminals 1 and 7 connected together, adjust the control level to 28 volts. When terminals 1 and 7 are open-circuited, the controlled voltage should rise by 1·25 ± 0·25 volts.

Stability test

13. With the stabilizing windings connected in circuit and with the pile resistance adjusted to the maximum value of 37 ohms, the generator field should be switched on and off at least three times. Under this condition the regulator must be critically damped.

14. Following the test in para. 13, slacken the pile compression screw back 0·005 in., and repeat the stability test. At this setting of the pile compression screw, the regulator must respond without tendency to sustained hunting.

Note . . .

On this regulator the pile udjusting bracket is calibrated in thousandths of an inch, indicating the amount of rotation necessary to effect the stated amount of pile movement.

15. Provided the regulator satisfies the test in para. 14, restore the pile compression screw to its original setting, and repeat the regulation test. The controlled voltage must be maintained at 28 volts ±0·75 volts over pile resistance range of 1·7 to 37 ohms.