Chapter 43

VOLTAGE REGULATOR, TYPE 70/60907

(Completely revised)

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LEADING PARTICULARS

Voltage regulator, Type 70/60907	*5UC/6715*
Controlled voltage	28 *volts* ± 2½%
Maximum pile loading	85 *watts*
Pile resistance range	1·27 *to* 17·4 *ohms*
Operating coil current	1 *to* 1·1 *amp*
Operating coil resistance	3·2 *ohms*
Equalising coil resistance	0·78 *ohm*
Adjustable ballast resistor	25 *ohms* 30 *watts*
Adjustable ballast resistor (voltage boost)	1·4 *ohms*
Fixed ballast resistor (trimmer diverter)	5 *ohms* 20 *watts*
Remote trimmer	10 *ohms* 7½ *watts*
Stabilizing transformer	
Ratio	1250/500
Primary winding	25 *ohms*
Secondary winding	3·5 *ohms*
Dimensions	8 × 6 × 6¾ *in.*
Weight	8½ *lb.*

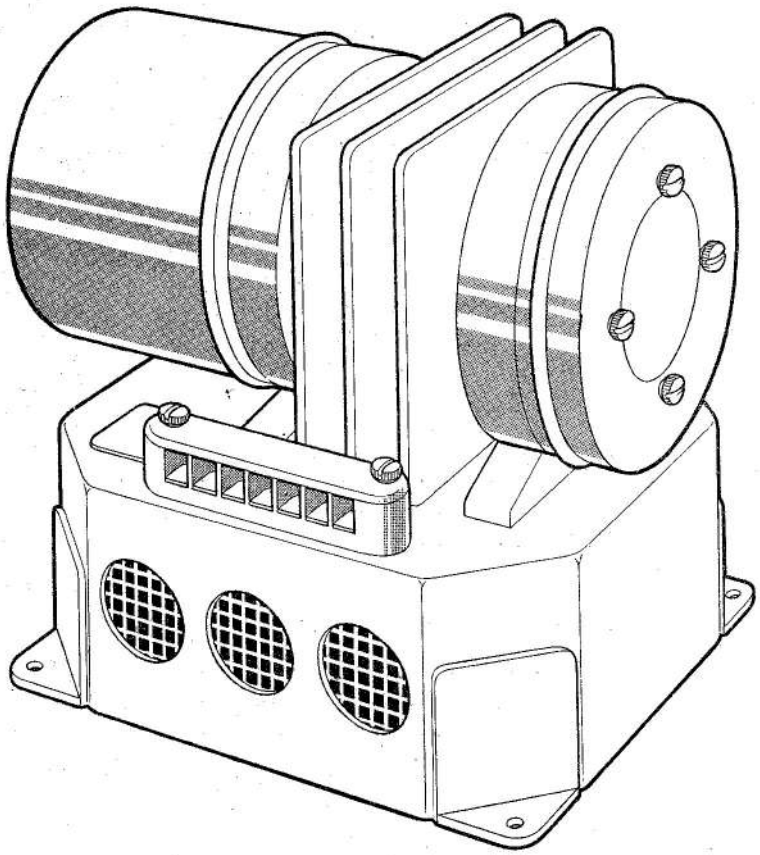

Fig. 1. Voltage regulator, Type 70/60907

Introduction

1. The voltage regulator Type 70/60907 is used to control the output of the 9kW generator, Rotax B.3500 series at 28 volts $\pm 2\frac{1}{2}\%$.

DESCRIPTION

2. The 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.113D-0003—16 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1). It incorporates the flat-type armature spring with a bi-metallic strip embodied for temperature compensation. The pile is 68 mm. in length and consists of not less than sixty-eight 1 mm. washers.

3. The regulator unit is mounted on a base, beneath which are housed the adjustable and fixed ballast resistors and the stabilizing transformer (fig. 2). A remote trimmer (10 ohms, $7\frac{1}{2}$ watts) is connected across terminals 3 and 6, i.e. across the fixed ballast (trimmer diverter) resistance. This ensures that, in the event of an open circuit in the external wiring to the trimmer, the voltage level is still maintained within safe limits.

4. Two adjustable ballast resistors are fitted, one is connected across terminals 3 and 4, and its function is that of a voltage boost resistor. It ensures that an adequate differential voltage is obtained to bring a second generator on to the bus-bar. When the generator has been brought on line, the resistor is automatically short-circuited, and so rendered ineffective, by contacts on an external control unit.

5. An equalising coil is incorporated to ensure that the load is shared approximately equally between generators operating in parallel. The coil is such that with 1 volt

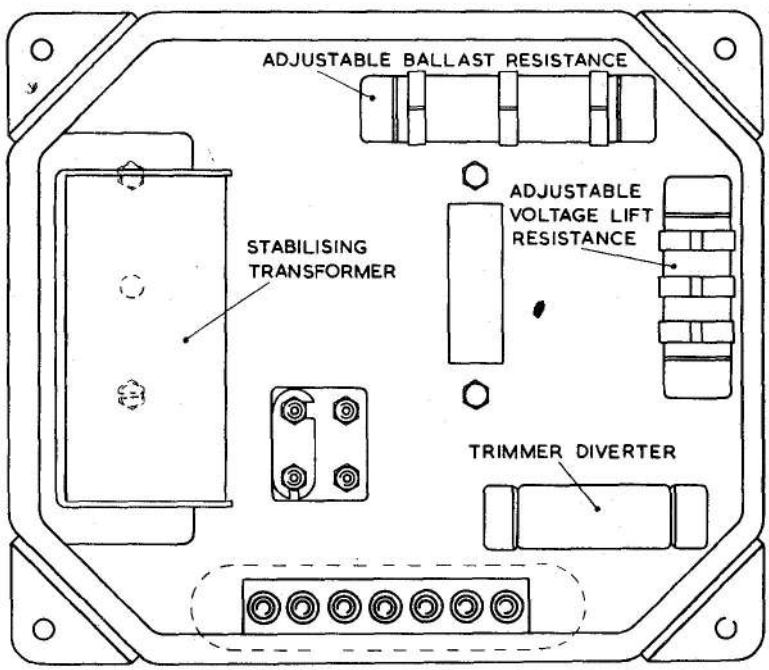

Fig. 2. Underside of regulator

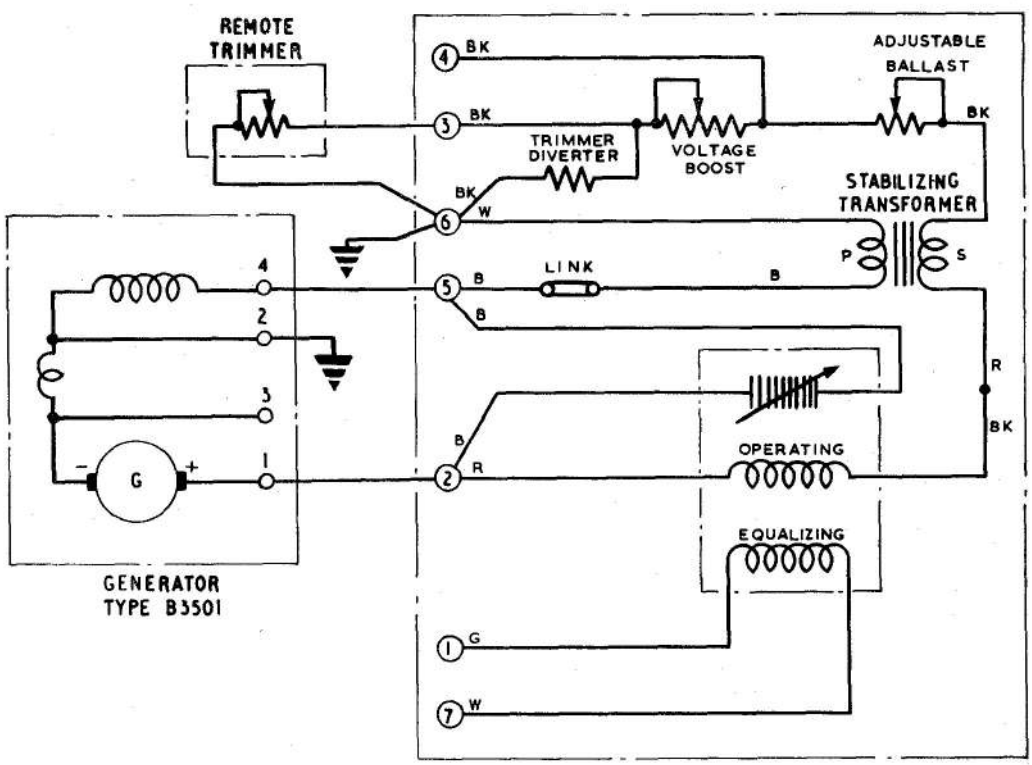

Fig. 3. Circuit diagram

applied in the correct direction across terminals 1 and 7, the controlled voltage level will be reduced from 28 volts to between 21·5V and 19·5V.

6. A stabilizing transformer is fitted to maintain the stability of the generator during sudden changes of speed or load. It is connected as shown in fig. 3 with the primary winding across the generator shunt field, and the secondary winding 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 so as to oppose the compensating effect of the operating coil, and so damp out any tendency towards oscillation.

SERVICING

7. General servicing instructions for this type of regulator are given in A.P.113D-0003—16 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1). That publication describes the fitting of a new pile stack and the preliminary mechanical adjustment and final setting up procedure for a regulator which is completely out of order. The latter part of this publication gives general information on Repair and Reconditioning on this type of regulator. When any adjustment is made, the regulator must afterwards be subjected to a full test.

Note . . .

The correct setting for the pile compression screw on this regulator is in the dip position.

Appendix A

STANDARD SERVICEABILITY TEST
for
VOLTAGE REGULATOR, TYPE 70/60907

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LIST OF ILLUSTRATIONS

Introduction

1. The following tests should be applied to the regulator whenever it is necessary to determine its serviceability.

Test equipment

2. The following items of test equipment will be required when testing the regulator:

(1) Generator Type B3501.

(2) Remote trimmer.

(3) Multimeter Type 12889 (V1), Ref. No. 5QP/17447.

(4) Voltmeter 0-40V (V2), Ref. No. 5Q/234.

(5) Ammeter 0-3A (A1), Ref. No. 5Q/3093.

(6) Ammeter 0-20A (A2), Ref. No. 5Q/25093.

(7) Switch S.P.3A (S1), Ref. No. 5CW/4787.

(8) Switch S.P.20A (S2), Ref. No. 5CW/6518.

(9) Switch S.P.20A (S3), Ref. No. 5CW/6518.

(10) Variable resistor 15 ohms (R1), Ref. No. 10W/9846.

(11) Variable resistor 46·25 ohms (R2), Ref. No. 10W/1167.

(12) Insulation resistance tester Type C.

TEST PROCEDURE

General

3. With the regulator Type 70/60907 and test equipment connected as shown in the circuit diagram, fig. 1. This diagram shows a regulator connected to a generator of the Rotax Type B3500 series, but if this generator is not available any generator which is used with this regulator may be substituted. The link in the stabilizing transformer primary circuit should be removed for all tests except stability tests, para. 8.

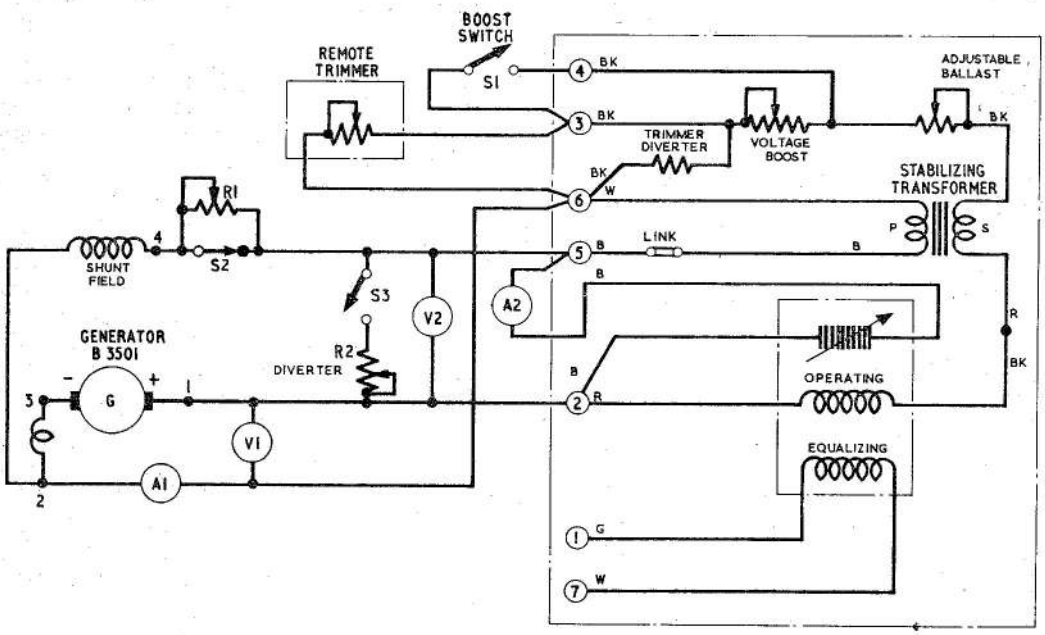

Fig. 1. Test circuit diagram

4. Switch S3 should be open and switch S1 and S2 closed. With the regulator cold, run the generator at 5000 rev/min. Set the remote trimmer in the electrical mid-position. The output voltage at V1 should be 28V and the main coil current A1 within the limits of 1A and 1·1A. If this voltage and current is not obtained refer to A.P. 113D-0003—16, para. 40 to 45 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1, para. 40 to 45).

Note . . .

The correct setting for the pile compression screw on this regulator is in the dip position.

Regulation test

5. Run the generator at a constant speed of 5000 rev/min and, by variation of the series and diverter resistances, increase the pile resistance as measured by the ratio V2/A2 smoothly from 2 to 17·4 to 2 ohms. Repeat this cycle and observe that the controlled voltage is maintained within the limits of 27·5V and 28·75V.

Note . . .

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

Equalizing test

6. Connect a separate supply of 1 volt across the equalizing coil, the positive lead being connected to terminal 7 and the negative to terminal 1. When the voltage is applied the line voltage should be reduced from 28V to between the limits of 21·5V and 19·5V.

Voltage boost test

7. With terminals 3 and 4 short circuited by switch S1, observe that the controlled voltage is 28V. When switch S1 is open circuited the controlled voltage should rise to between the limits of 29V and 29·25V.

Stability test

8. The link previously removed from the stabilizing transformer primary winding should now be replaced. Run the generator at a constant speed of 5000 rev/min, and by variation of the pile diverter resistance increase the pile resistance to a maximum value of 17·4 ohms measured by the ratio V2/A2. Open the generator field switch S2 and adjust the series resistor R1 so that the pile resistance is at its minimum value of 2 ohms, close switch S2. Switch S2 should then be switched off and on at least three

times. Under these conditions the regulator should be critically damped.

9. Provided the regulator satisfies the test in para. 8, screw the pile compression screw counter-clockwise 0·0045 in., and repeat the stability test, para. 8.

Note . . .

On this regulator the pile adjusting bracket is calibrated in thousandths of an inch.

10. Provided the regulator satisfies the test in para. 9, restore the pile compression screw to its original setting and repeat the regulation test, para. 5.

Insulation resistance test

11. Using the insulation resistance tester Type C, measure the insulation between all connecting leads and the frame, the reading should be not less than 5 megohms.

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