Cancelled.

Chapter 7

VOLTAGE REGULATOR, TYPE 120

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Voltage regulator, Type 120	*Ref. No.* 5UC/6882
Controlled voltage	112*V d.c.* ± 1·25%
Maximum pile loading	... ... 250*W*
Pile resistance range	10 *to* 180 *ohms*
Main coil current	0·6 *to* 0·66*A*
Main coil resistance	42·5 *to* 47·5 *ohms*
Auxiliary coil current	... ... 40*mA*
Auxiliary coil resistance	215 *to* 240 *ohms*
Semi-adjustable ballast resistor (2 *off*)	80 *ohms*, 40*W*
Remote trimmer	... 40 *ohms*, 7½ *W*
Weight	... 18 *lb* (*approx.*)

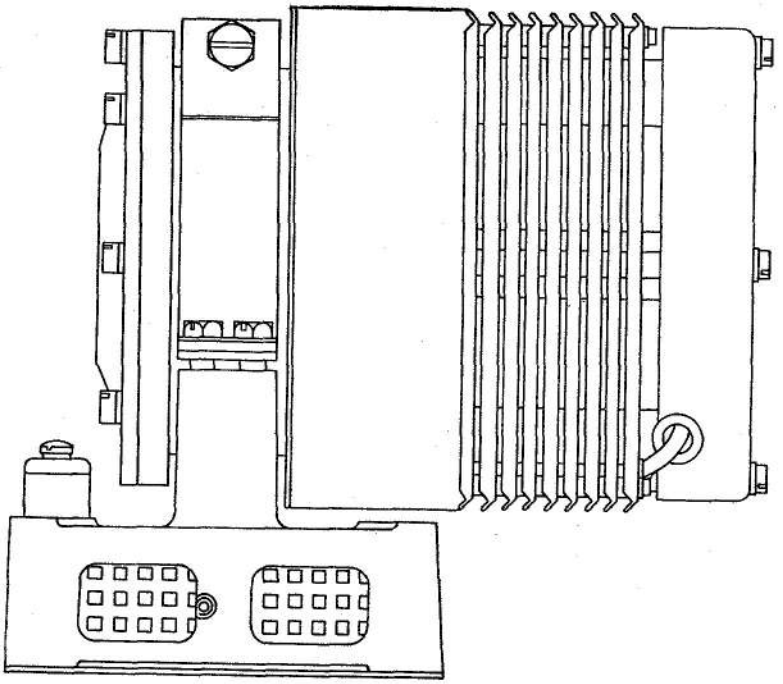

Fig. 1. Voltage regulator, Type 120

Introduction

1. The voltage regulator, Type 120 is used in conjunction with the regulator amplifier unit, Type U6101, to control the output of the generator Type 551 at 112V d.c. ± 1·25%. It differs from the voltage regulator, Type 91 which it supersedes for certain applications, in that the stabilizing and equalizing coils are removed and replaced by a single auxiliary coil fed from the output of the regulator amplifier unit.

DESCRIPTION

2. The regulator is of the multi-pile type. The principle of operation is identical with that of a single-pile type described in A.P. 4343, Vol. 1, Sect. 6, Chap. 1, but the construction is slightly modified to accommodate the additional piles.

3. The four ceramic cubes housing the carbon piles are enclosed within the finned cooler. Each carbon pile consists of a minimum of one hundred and thirty 0·5 mm. washers and is 2·5 in. long. A stub shaft projects from the armature clamp plate, and a gimbal arm pinned to this stub shaft carries two pressure arms which are pinned to spindles projecting from the ends of the gimbal arm. The brass ferrules housing the carbon terminal plugs which contact the carbon piles, are fitted to the ends of the pressure arms and insulated from the arms by mica insulation. A strap connector links the pair of ferrules on each pressure arm.

4. Contact with each carbon pile at the other end is made by a terminal plug housed in an adjustable ferrule which is screwed into the end bracket. The four end brackets are each screwed to the end plate and insulated from it by mica washers. The assembly is protected by a cover which is attached to the end plate by four screws. The regulator unit and a moulded terminal block are mounted on the top plate of a rectangular base plate under which are housed the two adjustable ballast resistors.

5. A remote trimmer is connected between terminals 2 and 7, that is, across part of one of the 80 ohm ballast resistors. This method of connection ensures that in the event of an open circuit in the trimmer or its associated wiring the voltage is still maintained within safe limits.

6. An auxiliary coil is incorporated with the main coil and is connected to the regulator amplifier unit. The regulator amplifier unit is

designed to reduce errors in the controlled generator voltage by providing an adjustment in the ampere-turns of the regulator. This unit is described in Sect. 2, Chap. 6 of this plublication.

7. At the normal system voltage there is no current flowing in the auxiliary coil and regulation is effected by the main coil only. An increase in generator line volts is sensed by the regulator amplifier unit and current proportional to this increase is fed back to the auxiliary coil so as to increase the ampere-turns of the operating coils, thus reducing the generator output. A decrease in generator line volts results in a decrease in ampere-turns and a rise in generator output. Stability and equalizing is controlled in a similar manner from the signals obtained from the generator shunt and series fields.

SERVICING

8. The regulator should be serviced in accordance with the Bay Servicing Schedule and with the general servicing instructions for voltage regulators given in A.P.4343, Vol. 1, Sect. 6, Chap. 1. The procedure for adjusting the regulator after servicing is given in para. 9.

9. (1) Slacken the magnet core locking screw and adjust the core until two threads are protruding from the base.

(2) Screw in the pile compression screw until the armature springs are in contact with the bi-metal ring over three quarters of its width.

(3) Ensure that the pressure arms are parallel with the armature by measuring the distance between the insulating bush at the base of each pile stack and the armature clamp plate, using inside callipers. Adjust each compression screw intil the four distances are equal.

TESTING

10. The test circuit shown in fig. 3 tests the main operating coil regulation, the operation

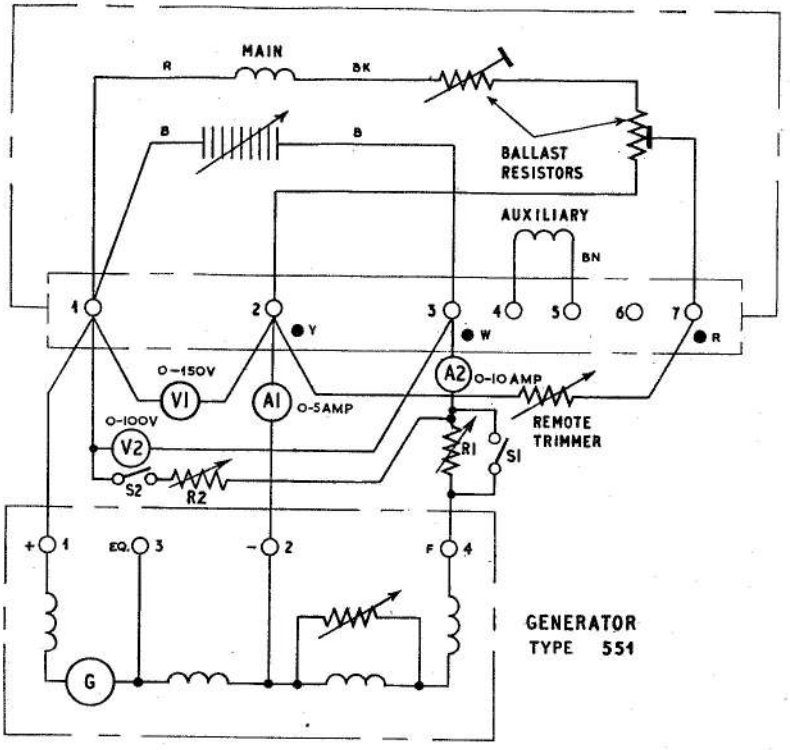

Fig. 2. Test circuit diagram

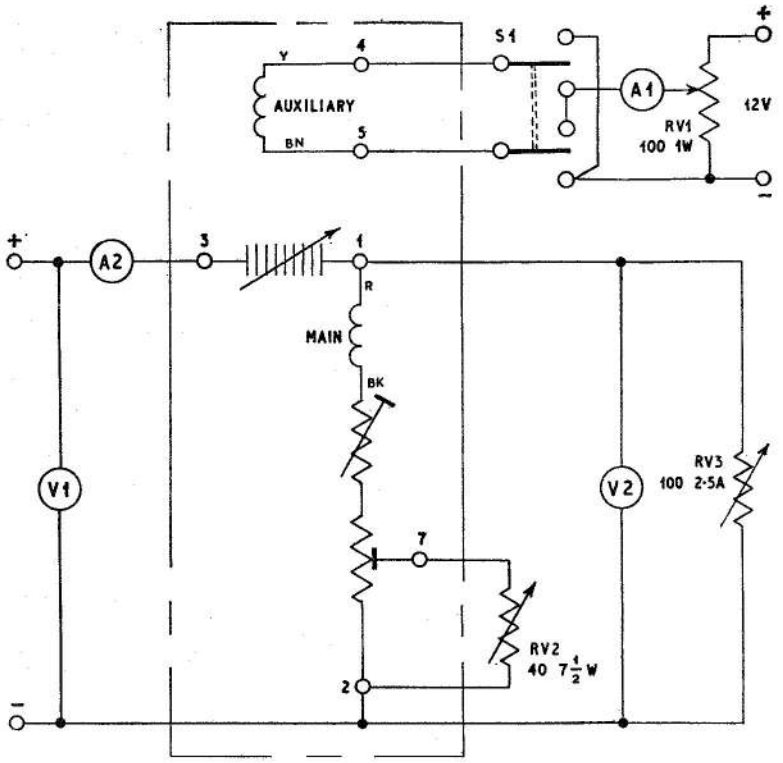

Fig. 3. Auxiliary coil test circuit

of the auxiliary coil should be checked with the circuit connected as shown in fig. 4.

11. With a remote trimmer connected between terminals 2 and 7, connect a 112V d.c. supply to terminals 1 and 2, and check that the coil current is within the limits of 0·6 to 0·66A. Adjust if necessary by means of the adjustable ballast resistor.

12. Connect the regulator to the test circuit as shown in fig. 3, with switch S2 open and switch S1 closed, run the generator at 5000 rev/min. Measure the voltage drop across each carbon pile, that is, between the pile compression screw and the nut holding the brass ferrule. The voltage readings obtained should be within ± 1V. Adjust if necessary by means of the pile compression screws. Check that the generator output voltage as indicated by V1 is 112V, and adjust if necessary by means of the magnet core.

Regulation test

13. Run the generator at normal speed, and by variation of the pile diverter R2 and the pile series resistor R1, increase the pile resistance as measured by V2/A2 smoothly from 15-180-15 ohms. Repeat this cycle and check that the controlled voltage is within the limits of 112V ± 2½%.

Stability test

14. Close switches S1 and S2, run the generator at normal speed and by variation of the pile diverter resistor R2 increase the pile resistance to a maximum value of 180 ohms. Open the generator field switch S1, and adjust the series resistor so that the pile resistance is decreased to a minimum value of 15 ohms, close the field switch. The generator field switch should then be switched on and off at least three times, and under these conditions the regulator should be critically damped.

15. Following the test in para. 14, turn the pile compression screws counter-clockwise by $\frac{1}{16}$ turn and repeat the stability test. At this setting of the pile compression screws the regulator should respond without tendency to sustained hunting. Provided the regulator satisfies this test, restore the pile compression screws to the original settings, and repeat the regulation test.

Auxiliary coil performance test

16. With the generator connected to the test circuit as shown in fig. 4, and variable resistor RV3 set to maximum, adjust the input voltage to 145V as indicated by voltmeter V1. Adjust RV3 so that the pile current as measured by A2 is 2A. Check that the regulated voltage, indicated by V2 is 112V, adjust if necessary by means of variable resistor RV2. Close switch S2 and adjust variable resistor RV1 so that the current in the auxiliary coil, indicated by A1 is 40mA. With terminal 4 positive, the regulated voltage, indicated by V2 should decrease to within the limits of 104·3 to 106V. With terminal 5 positive, the regulated voltage should increase to within the limits of 118 to 119·7V. The test should be performed with the regulator cold.