

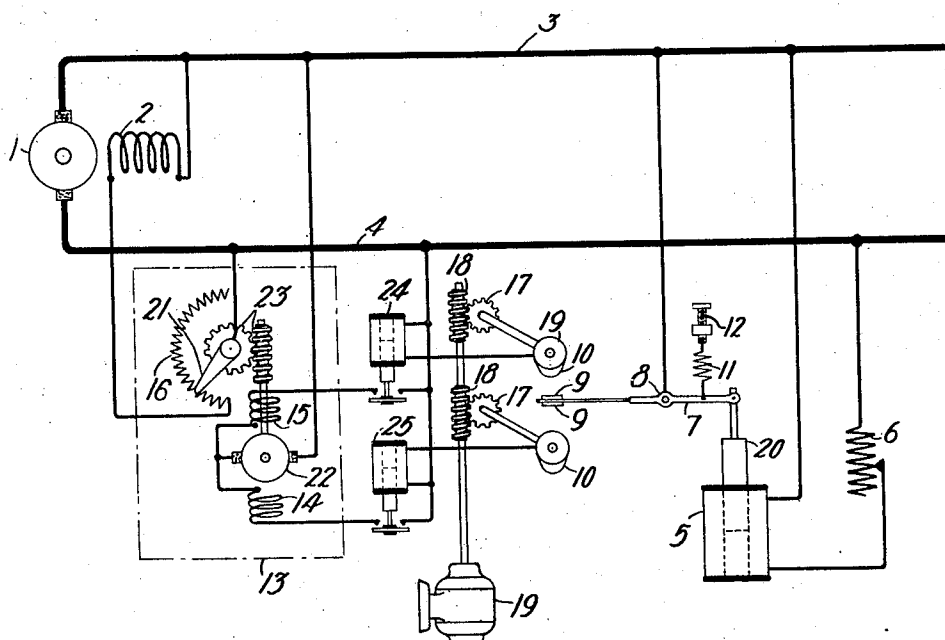
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P. A. NEWMAN

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REGULATOR

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UNITED STATES PATENT OFFICE.

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REGULATOR.

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This invention relates to regulators, and more particularly to such regulators which respond to an abnormal condition of the system with which they are associated to restore this system to a predetermined condition with the least possible disturbance to the system.

An object of the invention is to prevent hunting or overthrow of regulation in a regulator, preferably for voltage, for use with a dynamo having a high time constant. This object is accomplished by regulating, at the source, the voltage generated in such a manner that when it is abnormal in either sense, the regulation is intermittently applied to prevent hunting.

The drawing illustrates the preferred embodiment of the regulator showing it applied to an electrical distribution system.

Referring to the drawings in detail, a generator 1, having a shunt field 2, supplies current to a distribution circuit the leads of which are represented by 3 and 4. A voltage responsive solenoid 5 is bridged across the generator leads and has in series with its winding a variable resistance 6 which permits its manual adjustment. A plunger 20 cooperates with solenoid 5 and has pivotally secured thereto an arm 7 which swings on a fixed pivot 8. The free end of the arm 7 is reduced in thickness to provide flexibility and carries contacting surfaces 9 which engage the improved variable contacting surfaces 10, hereinafter described. A spring 11 and an adjusting screw 12 permit manual adjustment of the mechanical movement of the arm 7.

An automatic rheostat 13 is provided with a motor having two field windings 14 and 15 which make it possible to reverse the direction of rotation of its armature 22. A resistance varying arm 21 is actuated by the armature 22 of the motor through worm gearing 23, and is rotated thereby in response to the energization of either one of the two field windings 14 and 15, thereby varying the effective resistance 16, which is in series with the shunt field 2 of the generator circuit. The fields 14 and 15 are separately energized as the arm 7 of the solenoid 5 engages either its lower or its upper contact, causing the energization of either of the motor contactors 24 or 25 which control the two field windings 14 and 15 respectively.

The contacting cams 10 are offset from one another so as to present different portions of their peripheries to the contacts 9 at any particular moment. They are rotated at a constant speed by means of the gears 17 and the worms 18 which are driven at a uniform rate by a constant speed motor 19.

The operation of the system is as follows: Solenoid 5 will respond to any departure of the system from its desired predetermined condition thereby causing a deflection of the arm 7 bringing one of its contacts 9 into engagement with one of the cams 10. The degree of deflection of the arm 7 will determine the length of time during which such contact 9 is in engagement with its cam 10, the regulator being so constructed that the arm 7 will not remain in constant engagement with a cam 10 during its complete revolution.

The interruption in the regulation brought about by the breaking of contact between such contact 9 and the associated cam 10, and the reestablishing of this contact as often as necessary to effect the desired regulation, gives solenoid 5 ample time to respond to the corrected condition in the distribution circuit, and to vary the deflection of its arm 7 in accordance therewith. This method permits any departure in the system to be corrected by constantly decreasing increments of regulation and prevents hunting and its accompanying inaccuracies.

This invention is particularly applicable to systems employing a generator having a high time constant in which several seconds have been found to elapse after the operation of the regulator before the regulation becomes effective. It may be employed, however, to compensate for the lag in systems employing generators having low time constants, by revolving the contacting cams at a higher rate of speed. The invention may, therefore, be adapted for use in various systems by simply modifying the speed at which the cams rotate.

What is claimed is:—

1. A system comprising a generator, a distribution circuit connected to said generator, a normally inoperative device associated with said circuit intermittently responsive at definite intervals to an abnormal condition in said circuit, means controlled by said device for effecting changes in said

generator to compensate for said condition, and means for varying the extent of response of said device during each of said definite intervals.

2. A system having a source of energy, means for maintaining a predetermined condition therein comprising an element responsive to an abnormal condition in said system, an arm actuated thereby, and a rotating member intermittently engaging said arm to effect variations in said source by increments.

3. A system having a source of energy, means for maintaining a predetermined condition therein comprising a solenoid responsive to a deviation from said predetermined condition, an arm actuated thereby, a member intermittently engaging said arm, and means controlled by said solenoid and said member for effecting changes in said source by increments.

4. A source of energy and a regulator therefor comprising a solenoid responsive to energy from said source, an arm controlled thereby, and rotating members, one of said members arranged to intermittently engage said arm during the deflection thereof in one direction when the solenoid responds to energy below a certain value, and the other member arranged to intermittently engage said arm during the deflection thereof in the opposite direction when the solenoid responds to energy above said certain value.

5. A source of energy and a regulator therefor comprising a device responsive to energy from said source, a plunger controlled thereby, an arm actuated by said plunger, and rotating members, one of said members arranged to intermittently engage said arm at decreasing intervals during the deflection thereof in one direction when the device responds to energy increasing to a certain value, and the other member arranged to intermittently engage said arm at decreasing intervals during the deflection thereof in the opposite direction when the device responds to energy decreasing to said certain value.

6. A source of energy and a regulator therefor comprising a solenoid responsive to energy from said source, an arm controlled thereby, rotating members, one of said members arranged to intermittently en-

gage said arm during the deflection thereof in one direction, and the other member arranged to intermittently engage said arm during the deflection thereof in the opposite direction, and means responsive to the intermittent engagement of one arm for increasing by degrees the energy from said source to a certain value and responsive to the intermittent engagement of the other arm for decreasing by degrees the energy from said source to said certain value.

7. A source of energy and a regulator therefor for including a solenoid responsive to energy from said source, an arm controlled thereby, a pair of rotating members for intermittently engaging said arm, a resistance, and a pair of electromagnetic devices for controlling said resistance, one of said devices controlled by one of said members and the other of said devices controlled by the other of said members.

8. A source of energy and a regulator therefor including a solenoid responsive to energy from said source, an arm controlled thereby, a pair of rotating members for intermittently engaging said arm, a resistance, a motor for controlling said resistance, and a pair of electromagnetic devices for controlling said motor, one of said devices controlled by one of said members and the other of said devices controlled by the other of said members.

9. In combination, a generator, a distribution circuit connected to said generator, and a regulator for controlling the potential impressed on said circuit by said generator, said regulator comprising a solenoid connected across said distribution circuit proportionately responsive to the potential of said distribution circuit, said solenoid controlling a contact arm, a constant speed motor driving two shafts, each having thereon a cam-shaped contact cooperating with said contact arm, each of said cam-shaped contacts being connected to a relay device, said relay devices controlling a motor driven rheostat whereby said regulator is intermittently responsive at definite intervals varying in extent to an abnormal condition in said distributing circuit.

In witness whereof, I hereunto subscribe my name this 17th day of May, A. D., 1922.

PAUL A. NEWMAN.