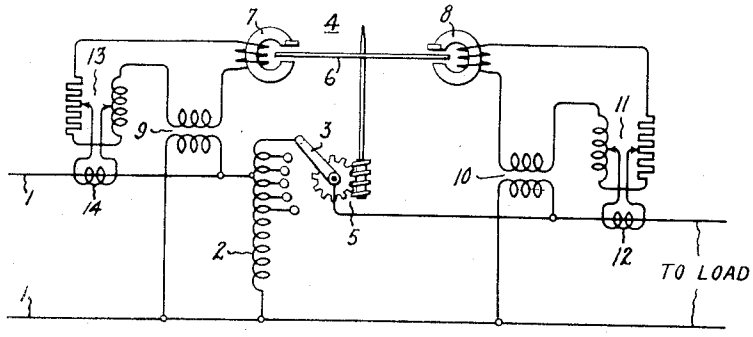
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REGULATOR SYSTEM

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REGULATOR SYSTEM

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5 Claims. (Cl. 171—119)

This invention relates to regulator systems and more particularly to improvements in voltage regulating means for systems of electrical transmission and distribution.

The present invention is an improvement on that disclosed and claimed in my co-pending joint application with Louis F. Blume, Serial No. 202,892, filed April 19, 1938, and assigned to the assignee of the present application. In that application, a novel regulator system employs as its principal element a novel line drop responsive control device for a regulator. In accordance with the present invention I provide another form of line drop responsive regulator control means.

It is an object of this invention to provide a new and improved regulator system.

It is another object of this invention to provide a new and improved line drop responsive regulator control arrangement.

The invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring now to the single figure of the accompanying drawing, which is a diagrammatic illustration of an embodiment of the invention, there is shown therein a main alternating current power circuit 1 in which is inserted a regulating transformer 2 provided with a tap changing switch 3 for changing the transformer ratio and thus inserting various values of regulating voltage in the main circuit. This switch is operated by a control device 4 and it may either be operated directly thereby through suitable reduction gearing 5 or it may be operated indirectly thereby through control contacts and a separate operating motor, as will be well understood by those skilled in the art.

Device 4 comprises an induction disk 6 provided with a pair of opposed operating elements 7 and 8 energized, respectively, in accordance with the voltage on the supply side of transformer 2, preferably through a potential transformer 9, and on the load side of the regulating transformer 2, preferably through another potential transformer 10. In the energizing circuit of the element 8 there is inserted a line drop compensator 11 which is energized in accordance with the load current by means of a current transformer 12.

The operation of the illustrated embodiment of the invention is as follows. When the line drop compensator 11 is adjusted to produce a voltage which bears the same relation to the output voltage of the potential transformer 10 as exists between the output voltage of the regulating transformer 2 and the actual line drop between the regulator and the load, the control device 4 will only balance or be at rest when the load voltage is equal to the voltage on the input side of the regulator. Under all other conditions a net torque tends to rotate device 4 in one direction or the other. These directions of rotation are so correlated to the switch 3 that they cause the switch 3 to move in the proper direction to produce a balanced condition in the control device 4. Thus, it will be seen that mere fluctuations in the voltage level of circuit 1 will have no substantial effect upon the control device 4, whereas changes in load will cause the control device to operate the regulator so as to produce a regulating effect which exactly compensates for the line drop caused by the load current.

The above described arrangement holds constant voltage at a point on the load side of the regulator only if the voltage is maintained constant at the input terminals of the regulator. This may not always be the case as sometimes it is more convenient to maintain constant voltage at some other point on the circuit further back toward the generator end. In such cases a line drop compensator 13 is provided for element 7. As shown, this compensator is energized by a current transformer 14. It is adjusted so as to compensate element 7 for the line drop between the constant voltage point and the input terminals of the regulator. Under normal conditions its voltage will usually add to the voltage of potential transformer 9 whereas under the same conditions the voltage of compensator 11 will usually subtract from the voltage of potential transformer 10. The result is that the amount of voltage inserted in the circuit by the regulator is increased enough to compensate for the voltage drop between the constant voltage point and the regulator. The load voltage is therefore independent of changes in current.

It will also be noted that the speed of the control device 4 will be roughly proportional to the net difference in voltage of the two motor elements. This gives a rate of voltage correction proportional to the degree of correction necessary.

While the invention has been shown in connection with a step type regulator, it will be understood that it may equally well be applied to operating any other suitable type of regulator,

such, for example, as an induction voltage regulator.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention and, therefore, it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a regulator system, power transmitting and distributing apparatus having a variable quantity to be regulated, a regulator therefor having an input side and an output side, a primary device for controlling the operation of said regulator, said device having means for urging it in one direction in accordance with the value of said quantity on the input side of the regulator and having means for urging it in the opposite direction in accordance with the difference between the value of said quantity on the output side of said regulator and the drop in value of said quantity resulting from the transmission and distribution of power over a given distance from said regulator.

2. In combination, an electric circuit, means for regulating the voltage of said circuit and control means for said regulating means, said control means including a pair of opposed normally balanced operating windings connected respectively to respond to said circuit voltage on opposite sides of said regulating means, and means for inserting a voltage in series with one of said windings which is proportional to the voltage drop in a predetermined length of said circuit.

3. In combination, an alternating current circuit, a variable ratio regulating transformer connected in said circuit, a reversible control motor connected for direct mechanical operation of said regulating transformer, said motor having means responsive to the voltage on the input side of said transformer for urging it in a direction to cause said regulating transformer to raise the voltage of said circuit, said control motor having a second means energized in accordance with the voltage on the load side of said regulating transformer for urging it in a direction to cause said regulating transformer to lower the voltage of said circuit, and means for reducing the voltage on said last mentioned operating means in accordance with the line drop in a predetermined amount of said circuit.

4. In a regulating system, an electric circuit which transmits power from a first point thereon to a second point thereon, said circuit having a substantial current carrying impedance between said points, and voltage regulating means including a normally balanced device having opposed elements responsive respectively to the voltages at said points for holding the voltage at the second point at a predetermined percentage of the voltage at the first point.

5. In a regulating system, an electric circuit which transmits power from a first point thereon to a second point thereon, said circuit having a substantial current carrying impedance between said points, a voltage regulator inserted in said circuit between said points and non-adjacent thereto, means including a normally balanced device having opposed elements connected respectively across said circuit on both sides of said regulator and adjacent thereto for controlling said regulator, a line drop compensator for compensating one of said elements for the line drop between the first point and said regulator, and a second line drop compensator for compensating the other element for the line drop between said regulator and the second point.

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