

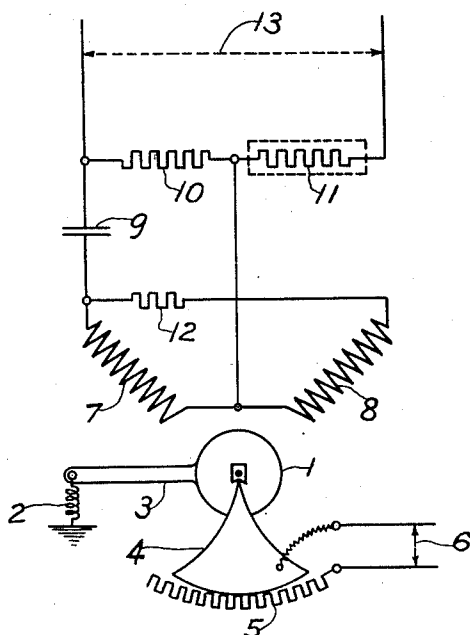
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FREQUENCY DEPENDENT REGULATOR

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# UNITED STATES PATENT OFFICE

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## FREQUENCY DEPENDENT REGULATOR

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This invention relates to improvements in electric regulators and, particularly, to equipment for regulating the frequency of an electric circuit.

5 The usual quick acting regulator operates on voltage, current, load or power factor so that it is impossible to secure regulation of a circuit in dependence on the frequency therein without the aid of special auxiliary means. Heretofore, frequency regulation was obtained by use of a constantly excited tachometerdynamo which was coupled either directly or through a synchronous transmitting device to the machine to be regulated. The voltage of the machine to be regulated gave a value for the frequency so that the voltage, operating on a quick acting voltage regulator, was used to control the frequency.

It is, therefore, among the objects of the present invention to provide a frequency regulator acting directly on the machine to be regulated.

Another object of the invention is to provide a frequency regulator which is operated by changes in the impedance of a coil circuit therein.

Objects and advantages, other than those above set forth, will be apparent from the description and the drawing which shows a diagrammatic view of an embodiment of the invention.

Referring to the drawing by characters of reference, the reference numeral 1 indicates a portion of a rotating system which is counter-balanced by a tension spring 2 attached, at one end, to an arm 3 extending from the rotating system 1 and secured, at the other end, to a stationary support, for the purpose of returning the member 1 to the zero position. A movable contact 4, in the form of a segment of a circle, is secured to the rotating system 1 in such manner that it may contact with a resistance 5, arranged in an arc. One conductor of an electric circuit 6 is attached to the contact 4 and another conductor of the circuit 6 is attached to the resistance 5. Movement of the contact 4 over the resistance 5 adds or subtracts resistance in the circuit 6 thereby influencing the current therein.

Two coils 7 and 8 are arranged adjacent

the rotating system 1 for the purpose of producing a rotating field acting thereon to insert or remove as much of the resistance 5 from circuit 6 as may be necessary to produce the desired effect. The coils 7 and 8 are connected through a condenser 9 to a potential dividing resistance 10 to which is connected an iron resistance 11 for maintaining constant current and voltage at the terminals of resistance 10.

The regulator excitation circuit comprising coils 7 and 8, resistance 12 and condenser 9 always receives a constant voltage. But the current is practically proportional to the frequency when the capacitive resistance of the condenser 9 is greater than the impedance of the coils 7 and 8, i. e. when the current in the circuit leads the voltage at the terminals of the resistance 10. The resistance 12 is connected, in series, between coils 7 and 8 for the purpose of producing changes in the electrical characteristics of coil 8 to obtain the required torque in the field of coils 7 and 8.

When the frequency changes in line 13, the impedance and the current in the coils 7 and 8 will vary thereby changing the torque on rotating system 1. Change of the torque on system 1 moves contact 4 over resistance 5 to add or subtract resistance in circuit 6 which thereby increases or decreases the speed of the electric machine controlled by circuit 6 until the frequency of line 13 is restored. After the frequency of line 13 is restored, the rotating field of the coils 7 and 8 is reduced to the normal value and spring 2 returns contact 4 to its normal position.

It will be apparent that the present invention is particularly useful for remote control because it need not be connected by special conductors. For use in an alternating circuit the regulator may be so arranged that the frequency may be varied with the loading.

Although but one embodiment has been illustrated and described, it will be understood that various other embodiments are possible, and that various changes may be made without departing from the spirit of the invention or the scope of the claims.

The invention claimed is:

1. In a frequency regulator, a rotatable

member, a movable contact actuated by said rotatable member, a resistance variable by action of said movable contact, means for producing a torque on said rotatable member, means for supplying a constant voltage to said torque producing means, and a capacitive reactance connected between said voltage supply means and said torque producing means.

2. In a frequency regulator, a rotatable member, a movable contact attached to said rotatable member for movement thereby, coils arranged to produce a torque on said rotatable member, means for supplying said coils at a constant potential, a capacitive reactance connected between said potential supply means and said coils and means for supplying one of said coils with current in excess of that supplied to another of said coils.

3. In a frequency regulator, a rotatable member, a movable contact, a resistance to be varied by said movable contact for controlling an electric circuit to be regulated, coils arranged adjacent said rotating member, a resistance in series with one of said coils to produce a rotating field about said rotating member, means for maintaining a constant voltage supply to said coils, and a capacitive reactance connected between said voltage supply means and said coils.

4. In a frequency regulator, a rotatable member, a movable contact actuated by said rotatable member, a resistance to be varied by said movable contact for controlling an electric circuit to be regulated, a plurality of coils for producing a rotating field about said rotatable member, means for supplying a constant potential to said coils, and a capacity having greater resistance than the impedance of said coils and connected between said potential supply means and said coils.

5. In a frequency regulator, a movable member, a circuit comprising two coils arranged for producing a torque on said member, means comprising an iron resistance for supplying a constant voltage to said circuit, and a condenser connected in said circuit between said voltage supply means and said coils, the capacity of said condenser being such that the current in said circuit leads the voltage therein.

In testimony whereof I have hereunto subscribed my name this 12th day of January A. D. 1929.

GEORG BOLL.