

C. D. EHRET.  
ALTERNATING CURRENT CIRCUIT CONTROLLER.

APPLICATION FILED APR. 5, 1902.

NO MODEL.

Fig I

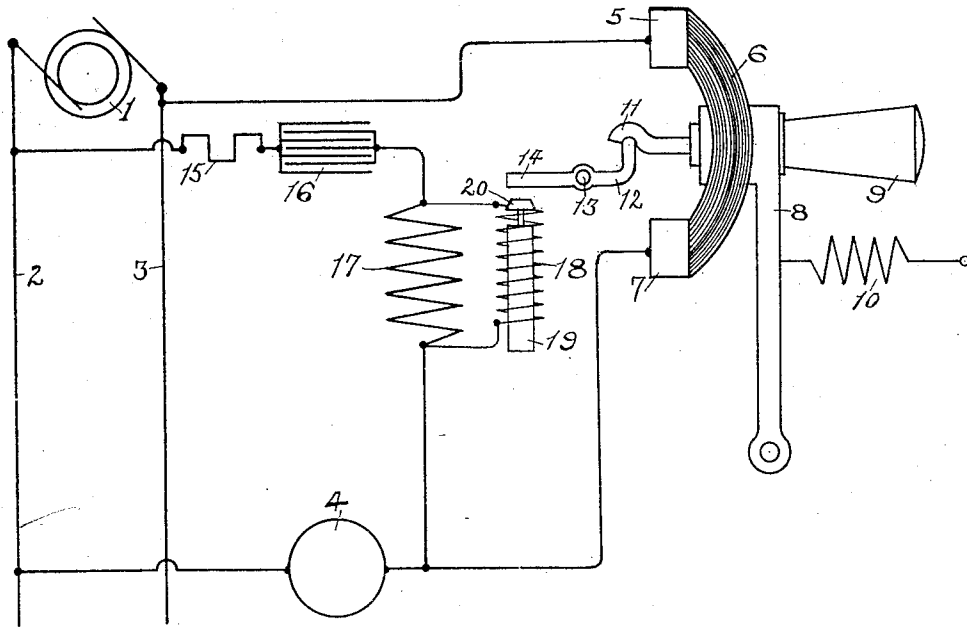
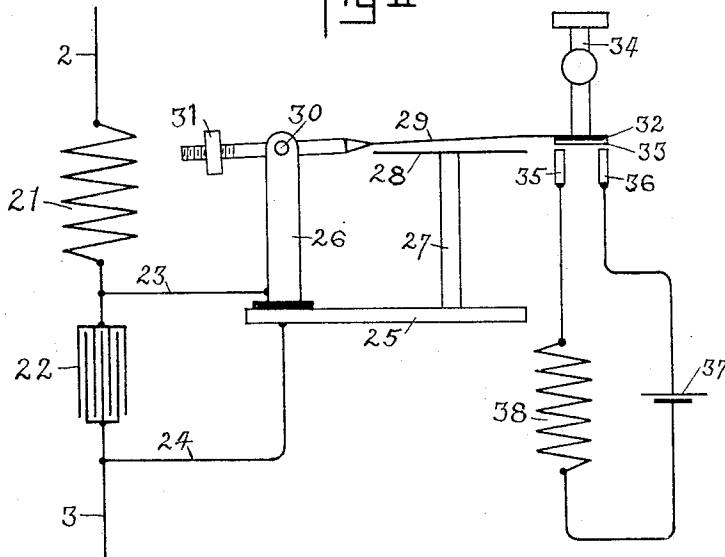


Fig II



Witnesses

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## ALTERNATING-CURRENT-CIRCUIT CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 742,976, dated November 3, 1903.

Application filed April 5, 1902. Serial No. 101,529. (No model.)

*To all whom it may concern:*

Be it known that I, CORNELIUS D. EHRET, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Alternating-Current-Circuit Controller, of which the following is a specification.

My invention has for its object the control or variation in condition of an electric circuit conveying alternating currents upon a change in the frequency or periodicity of the current.

It comprises apparatus which is controlled by electric circuits having capacity, inductance, and resistance so proportioned with respect to each other that upon variations of the frequency of the current-supply abnormal changes in potential will occur in the control-circuits.

It comprises control-circuits and apparatus controlled thereby, such circuits being so adjusted as to their electrical constants that a change in frequency of the electrical energy flowing in them will cause either a rise or fall in the potential in the control-circuit, such variation of the potential being utilized to control the main circuit or an auxiliary circuit or apparatus.

It comprises, further, a circuit-breaker which is responsive to frequency changes of the circuit embracing it, such frequency changes resulting in an abnormal change of potential at the terminals of the elements of a resonant circuit.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view showing the circuit-controller as being operated in consequence of an abnormal rise of potential at the terminals of one element of a resonant circuit. Fig. 2 is a diagrammatic view of a circuit-controller operating upon an abnormal rise in pressure across the terminals of an element of a resonant circuit, such rise in potential causing an attraction between metallic vanes.

At 1 is shown a source of alternating currents from which extend the distributing leads 2 and 3.

4 is a translating device, which is connected in series between the mains 2 and 3 through

the contacts 5 and 7, which are bridged by the laminated member 6, which is supported upon an arm 8 and which is supplied with a handle 9. The arm 8 is retracted by spring 10 and locked by latch 11 to a member 12, which is an extension from the lever 14, pivoted at 13.

In a circuit extending from the conductor 2 is a non-inductive resistance 15 and a condenser 16 and an inductance 17, this circuit being practically in shunt to the mains 2 and 3. In shunt to the inductance 17 is the winding 18 of a solenoid, whose core 19 (shown in the unattracted position) carries at its upper end a mushroom head 20, which upon the attraction of the core 19 engages the lever 14, which then rotates upwardly about its pivot 13 and forces latch 11 from the detent 12, permitting the opening of the main circuit at 5 and 7. Supposing the generator 1 to be delivering alternating currents at a periodicity  $n$  normally and that due to change of speed of the prime mover or due to some other cause the periodicity changes to  $n'$ , it may be desirable upon such change to open the circuit of the translating device 4. Condenser 16 and inductance 17 are so chosen with relation to each other that at this new frequency  $n'$  they form what is well known as a "resonant" circuit. In this case there is an abnormal rise of potential at the terminals of the condenser 16 and also at the terminals of the inductance 17. These high potentials are dephased with respect to each other, but when combined by the process of well-known vector quantities give a potential equal to the potential across the condenser and inductance taken together.

I have shown the non-inductive resistance 15 in circuit with 16 and 17 simply as a current-restraining device, so that under normal operation very little or no energy would be wasted in the local circuit 15, 16, and 17. It is to be understood, however, that resistance 15 may be omitted.

It has formerly been suggested to make the inductance 17 serve also as the electromagnet for operating a controller, in which case the operation of the controller was due to a rise of current in a resonant circuit, such current being at its maximum only as great as a current due to the pressure of a circuit

operating through a non-inductive resistance. By my system, however, I am enabled to get an abnormally high potential difference at the terminals of either the condenser or the inductance, and it is this which I use in controlling a circuit. Upon a critical frequency obtaining there is an abnormal rise of potential at the terminals of 16 and 17. Coil 18 is energized in virtue of the extremely high potential existing across the terminals of inductance 17, resulting in the attraction of core 19 and the consequent opening of the circuit-breaker. It will be noticed that with the core 19 in its unattracted position the inductance of the coil 18 is much smaller than when the core is in its attracted position, and by proper proportionment the inductance of coil 18 may be so slight as to not materially influence the total inductance of the circuit with condenser 16. As the core 19 is attracted upward the inductance of coil 18 increases and to some extent destroys the resonant condition of circuit 16 and 17; but should the arrangement be such that 16 and 17 were resonant to a lower frequency than that normally employed to supply energy to translating device 4 it is seen that a fall in the frequency of the generator 1 would result in an opening of the circuit, because after falling to a value  $n'$ , as mentioned above, the core 19 would begin to be attracted. As it ascends the total inductance of circuit 15, 16, and 17 increases, and the circuit is then resonant to a still lower frequency than  $n'$ ; but this lower frequency may, in fact, exist, inasmuch as generator 1 may still be slowing down. In consequence the rise of the core 19 could be made to compensate in a way the adjustment of 16 and 17 to the drop of frequency of the generator 1; but even in the absence of this refinement there is a distinct advantage in operating the coil 18 due to the abnormal rise of potential, as described.

In Fig. 2 I have shown the inductance 21 in series with the condenser 22 and so adjusted that when a certain frequency current passes therethrough there will be an abnormal or resonant rise of potential at the terminals of either the inductance 21 or a condenser 22. In this instance I have shown the conductors 23 and 24 connected in shunt to the condenser 22 and connected, respectively, to the post 26 and plate 25, 26 being insulated from 25. At the upper end of post 26 is pivoted at 30 a movable vane 29, with an adjustable counterpoise 31 extending to the left. At the right-hand end of the vane 29 is a block of insulation 32, which carries the bridge-piece 33. Adjusting-screw 34 determines the vertical position of the vane 29 with respect to the stationary vane 28, mounted upon the post 27 and in electrical communication with base 25. Upon an abnormal rise of potential, due to a certain frequency current passing through 21 and 22, vanes 28 and 29 attract each other, resulting in the bridge 33 closing the circuit between 35 and

36, which controls a circuit embracing source of energy 37 and a coil 38, which may be the tripping-coil of a circuit-breaker or a coil for any other purpose. It is to be noticed in connection with the controller shown in Fig. 2 that it could be applied to the terminals of the condenser 16 (shown in Fig. 1) and that the coil 38 could then cooperate with the coil 18 or that coil 18 could be omitted and supplanted by coil 38.

It is to be understood that I do not limit myself to the precise arrangement of circuits shown, but that numerous changes may be made therein without departing from the spirit and scope of my invention and that in place of a circuit-breaker, which I have shown, may be used a circuit-controller for altering the conditions of a circuit without actually rupturing it or in place of the controller or circuit-breaker may be used any other suitable device.

What I claim is—

1. A resonant electric circuit and means controlled by the resonant rise of potential at the terminals of an element of said resonant circuit for tripping a circuit-breaker.
2. A system of distribution comprising a source of energy, a translating device supplied thereby, a controller in the circuit of said translating device, a resonant circuit, and means responsive to a resonant rise of potential operating said controller.
3. A system of distribution, a source of energy, a translating device supplied thereby, a controller in the circuit of said translating device, a resonant circuit, and means responsive to the resonant rise of potential at the terminals of an element of said resonant circuit for operating said controller.
4. In a system of distribution, a source of energy, a resonant circuit associated therewith, means responsive to a resonant rise of potential at the terminals of an element of said resonant circuit, and a local circuit controlled by said means.
5. In a system of distribution, a source of energy, a resonant circuit associated with said source, and means responsive to a resonant rise of potential across the terminals of an element of said resonant circuit for tripping a circuit-breaker.
6. In a system of distribution, a source of alternating current, a resonant circuit associated with said source, means subjected to the excessive potential difference at the terminals of an element of said resonant circuit, and circuit-controlling means controlled by said means.
7. In a system of distribution, a source of alternating current, a resonant circuit associated with said source, and an electrostatic circuit-controlling device subjected to the resonant rise of potential at the terminals of an element of said resonant circuit.
8. In combination, a resonant circuit, and an electrostatic circuit-controller subjected to the resonant rise of potential at the ter-

minals of the capacity element in said resonant circuit.

9. In a system of distribution, a source of alternating current of normally definite frequency, a circuit associated with said source and adjusted to resonance for a frequency other than the normal frequency of said source, and a circuit-controller responsive to the excessive rise of potential at the terminals of an element of said resonant circuit.

10. In a system of distribution, a source of alternating current of normally definite frequency, a circuit associated with said source and adjusted to resonance for a frequency other than the normally definite frequency of said source, and an automatic circuit-con-

troller responsive to the resonant rise of potential at the terminals of an element of said resonant circuit.

11. In combination with a resonant circuit, separated conductors connected with the terminals of the capacity element of said resonant circuit, and means actuated by the relative movement of said conductors with respect to each other in virtue of the resonant rise of potential at the terminals of said capacity element.

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Witnesses:

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