

Nov. 9, 1926.

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J. S. GARVIN
CIRCUIT CONTROLLING DEVICE

Filed May 9, 1923

Fig. 1.

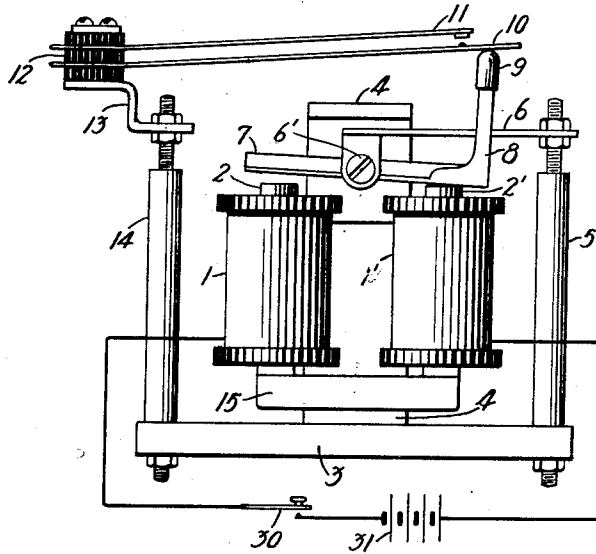


Fig. 2.

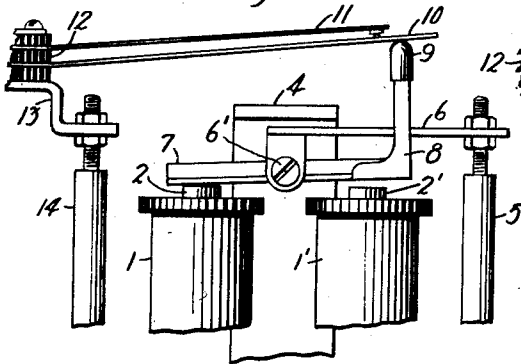
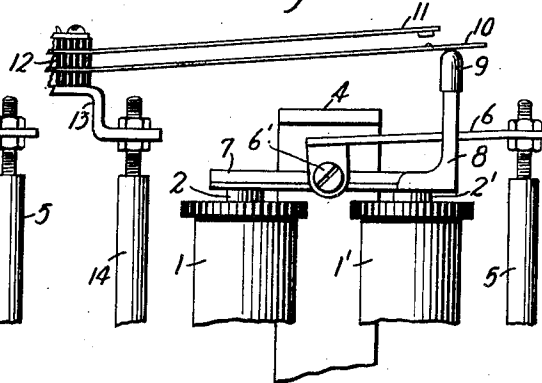


Fig. 3.



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CIRCUIT-CONTROLLING DEVICE.

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This invention relates to circuit controlling devices and more particularly to circuit controlling devices of the electromagnetic type.

5 It has been found difficult in practice to design a circuit controlling device, the electrical constants of which are such as to accurately confine its operation to a predetermined definite current value, and it is a
10 well known fact that many relays said to have a normal operating current value will operate at any value of current within certain limits of its operating value, and in
15 many instances will respond to a current much greater than the normal operating value. In most cases and particularly in telephone and power control systems, it is desirable that certain circuits be completed
20 only upon the application of a predetermined definite value of current to the windings of a circuit controlling device, and that they be opened when this value exceeds the normal operating value.

It is, therefore, an object of this invention
25 to provide a circuit controlling device that is effective in establishing an external circuit only upon the application of a predetermined definite value of current to its windings.

30 This object is obtained in accordance with the features of the invention by the provision of a relay wherein a permanent magnetic field is superposed upon the ordinary field effected by the windings of the relay,
35 in such a manner that under a predetermined value of current in the relay windings, the two fields cooperate to cause the attraction of a resiliently mounted armature and a closure of the external circuit. When
40 the current in the relay windings is greater than the normal operating value the effect of the permanent magnetic field is overcome and the armature is attracted in such a manner as to open the external circuit.

45 The invention will be readily understood when taken in connection with the accompanying drawings, in which Fig. 1 shows a relay according to this invention in its normal condition. Fig. 2 shows the same relay
50 in an operated condition when operated by current of normal operating value, and Fig. 3 shows the relay actuated by current which exceeds the normal operating value.

Referring to Fig. 1 of the drawings, a
55 member 3 is shown having removably fixed

to its ends, posts such as 14 and 5. Between the posts a permanent magnet 4 is fixed in any desirable manner to the member 3. A magnetic member 15 is suitably fixed to the lower end of the magnet 4. Cores 2 and 2' 60 of soft iron or other suitable material are fastened to the magnetic member 15 and carry spools 1 and 1'. The post 5 supports at its upper end a stiff resilient member 6 at the end of which is pivoted as at 6' an
65 armature 7. An arm 8 having an insulating knob 9 is carried by this armature and it is adapted to engage a contact spring 10 when the armature is moved in a certain direction, causing the spring 10 to engage a second
70 contact spring 11. These two contact springs 10 and 11, insulated from each other by the insulating block 12, are mounted by means of the bracket 13 on the post 14.

Fig. 2 of the drawings is a partial view 75 of the arrangement shown in Fig. 1, only sufficient portions thereof being shown to illustrate the position of the parts of the device when it is operated by current of
80 normal operating value.

Fig. 3 is a partial view of the arrangement shown in Fig. 1, only sufficient parts thereof being shown to illustrate the position of the various parts of the device when
85 it is operated by a current greater than the normal operating value.

For the purpose of describing the operation of the device, it will be assumed that the upper end of the permanent magnet is of a north polarity, and that the lower end 90 is of a south polarity. The upper ends of the cores 2 and 2' will, therefore, be of a south polarity. The armature 7 will be magnetized since it is in the path of the flux passing from the north pole to the cores. 95 As shown in the drawings, the right-hand end of the armature is resting on or in the near vicinity of the right hand core 2'. In the device shown in the drawing, the spring 10 serves in effect to normally bias the
100 device. It is to be understood, however, that the invention is not limited to this form of bias, since the armature may be biased in the opposite direction or it may be magnetically rather than mechanically biased. 105

A switch such as a key 30 is provided for closing a circuit for the passage of current from the source 31 through the windings of the circuit controlling device. With the arrangement shown in Fig. 1 of the drawings, 110

this passage of current causes lines of force to flow through the right-hand core 2', the armature 7; the air gap at the left-hand core 2, and thence to the left-hand core 2. Due to the current flowing through the windings of the device the lines of force at the core 2' will oppose the lines of force due to the permanent magnet and the lines of force at the other core 2 will aid the lines of force due to the permanent magnet. When sufficient current flows to create lines of flux so that the pull at the left-hand core 2 is greater than that of the right hand core 2', the armature will be actuated and it will assume the position shown in Fig. 2 of the drawings. With the armature actuated as shown in this figure, the knob 9 will move the spring 10 into engagement with the spring 11 thereby closing any work circuit which may be connected to the springs.

If while the armature is in this position current through the windings of the relay is increased to a value greater than the normal operating value, the lines of force produced at the right hand core will exceed the lines of force thereat due to the permanent magnet, by such a value as to cause a pull on the right-hand armature of the device of sufficient strength to overcome the tension of the spring 6 and to flex the spring 6 to cause the right hand end of the armature to be attracted to the right hand core 2' in the manner shown in Fig. 3 of the drawings. The contacts of the springs 10 and 11 are thereupon opened. The device will remain in this position until the current through its windings is interrupted.

From the foregoing description it will be obvious that if, while the device is in its normal operating position, current of a value greater than the normal operating current is passed through its windings, the lines of force at the right hand core will exceed

the lines of force due to the permanent magnet by such a value as to maintain the right hand end of the armature attracted and the lines of force at the left-hand core 2 will be of sufficient strength to overcome the tension of the spring 6 and to cause the left hand end of the armature 7 to be attracted to the core 2. It will therefore be seen that if, when the device is in its normal position, current of a value greater than the normal operating value is passed through its windings, the external circuit will not be effected.

What is claimed is:

1. An electromagnetic switch comprising a magnet, a set of contact springs, an armature and a resilient mounting for said armature constructed and arranged so that upon a weak energization of said magnet, said contact springs will be actuated, and so that upon a strong energization of said magnet said contact springs will be released.

2. An electromagnetic switch, comprising a bipolar electromagnet, a permanent magnet, a set of contact springs, an armature and a resilient mounting for said armature constructed and arranged so that upon a strong energization of said electromagnet in either direction said armature will respond by approaching both poles of said electromagnet and said contact springs will remain unoperated, upon a weak energization of said electromagnet in one direction said armature will approach one pole of said electromagnet and operate said contact springs, and upon a weak energization of said electromagnet in the other direction said armature will approach the other of said poles of said electromagnet without operating said contact springs.

In witness whereof, I hereunto subscribe my name this 7th day of May, A. D. 1923.

JOHN S. GARVIN.