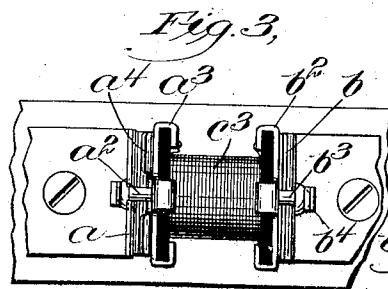
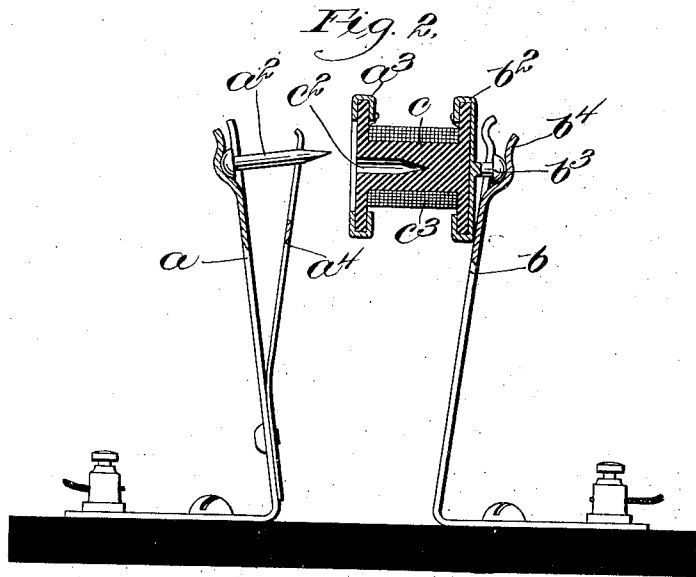
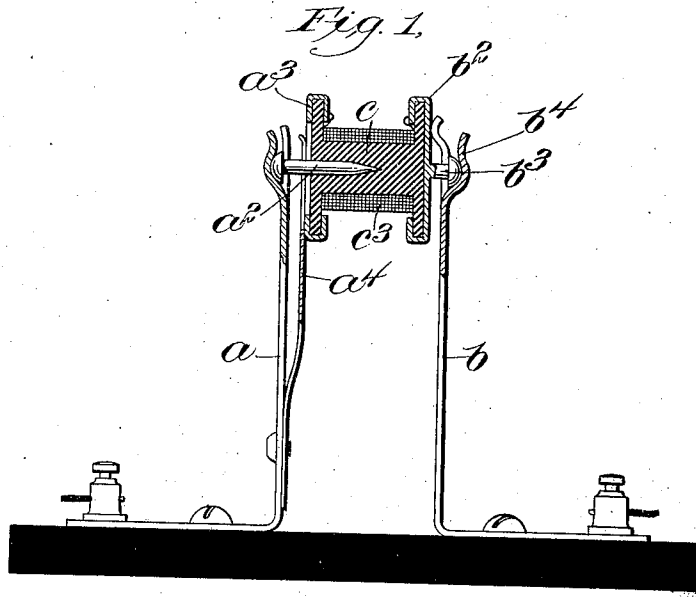


N. H. HOLLAND.
AUTOMATIC CIRCUIT BREAKER.

APPLICATION FILED OCT. 22, 1904. RENEWED MAR. 18, 1909.

937,242.

Patented Oct. 19, 1909.



Witnesses:
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UNITED STATES PATENT OFFICE.

NEWMAN H. HOLLAND, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

AUTOMATIC CIRCUIT-BREAKER.

937,242.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, NEWMAN H. HOLLAND, a citizen of the United States, residing in Brookline, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Automatic Circuit-Breakers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to an automatic circuit breaker, the purpose of which is to cause an electric circuit to be automatically opened in case an excessive current passes over the line, so as to prevent the burning out of the working circuits, electro magnets, &c., in the system.

In accordance with the invention, the circuit is provided with terminals which are under a tension, as that of a weight or spring, normally tending to separate them and break the circuit, these terminals being connected together when in use by an intermediate conductor of such capacity as to become heated when an abnormal current passes over the line. This conductor is arranged in proximity to a device which serves as a frictional holding member to maintain the two terminals in electrical engagement with the conductor so as to complete the circuit, this frictional holding device being so arranged with relation to the conductor as to be heated and expanded thereby if an abnormal current is flowing, the expansion serving to cause the release of the terminal frictionally engaged with said member, thus permitting the two terminals to separate and break the circuit. The two members which are frictionally engaged may have different coefficients of expansion, or may be arranged so that the heating action of the current may be imparted to one, without being substantially imparted to the other, or both of these characteristics may be, and preferably are, taken advantage of.

By this invention a simple and efficient protective device for electrical circuits, commonly known as a "heat coil" may be provided.

It is also evident that this invention contemplates the holding together by frictional engagement of any two opposing members under the stress tending to separate them, the frictional engagement being overcome by such application of heat to the parts as to

cause an unequal expansion of the engaging members.

Figure 1 is a vertical section, partly in elevation, of a device embodying the invention with the parts in normal position; Fig. 2 is a similar view with the circuit broken; and Fig. 3 is a partial top plan view.

In the construction chosen to illustrate the invention, the terminals *a* and *b* are in the form of springs having a tendency to spring apart at their free ends, being held together, in the position shown in Fig. 1, by means of a projection *a*² connected with the terminal *a*, and fitting closely in an intermediate member *c* which, in turn, is connected with the member *b*. In accordance with the invention, this intermediate member *c* is arranged to be directly influenced by the heat of an excessive current flowing over the circuit, and, preferably, is of a material having a higher coefficient of expansion than that of the projection or pin *a*², so that it will expand with relation to the said pin when heated, thus relieving the frictional hold upon the pin and permitting the terminals *a* and *b* to spring apart.

As herein shown, the member *c* consists of a spool of insulating material such, for example, as hard rubber, having a longitudinal bore *c*² in which the projection or pin *a*² fits tightly, the said spool in turn being connected with the conductor *b* so that, when the pin *a*² connected with the conductor *a* is pushed into the socket *c*², the parts will be connected together as shown (Fig. 1). To complete the circuit, the spool *c* is provided with a winding *c*³ of fine wire capable of carrying the normal current, but of such resistance as to become heated at once when an abnormal current passes over the line. As herein shown, one end of the wire coil *c*³ is connected with a metallic member *b*² clamped upon the end of the spool *c* and provided with a headed pin *b*³ which is held in place by a spring member or clip *b*⁴ connected with the member *b* and thereby establishing electrical contact between the said member *b* and the coil *c*³. The other end of said coil *c*³ is connected with a disk *a*³ supported upon the opposite end of the spool and in electrical contact with a spring member *a*⁴ which is connected with the member *a* so as to close the circuit between the two terminals so long as the members *a* and *b* are prevented from springing apart. The two members are nor-

5 mally held together wholly by the frictional fit of the pin a^2 in the bore c^2 in the spool, and as soon as an abnormal current comes on the line causing the said spool c to become heated, and to expand, the pin a^2 will be released, and the two members will fly apart breaking the circuit and protecting the instruments which might otherwise be burned out.

10 As is apparent, after operation the protective device may be placed in condition for further use merely by returning the pin a^2 to the opening c^2 as soon as the spool c has sufficiently cooled off to frictionally engage said pin.

15 It is not intended to limit the invention to the specific construction and arrangement shown and described, since modifications may be made without departing from the said invention.

What I claim is:

1. The combination with two frictionally engaging members, of means tending to cause relative movement of the same, and means for applying heat to said members to cause 25 unequal expansion thereof; whereby the frictional engagement of said members is overcome and their relative movement effected.

2. A protector for electrical circuits comprising a heat coil having an opening therein and a pin frictionally secured in said opening; whereby an abnormal current in the circuit expands said heat coil and permits a relative movement of said heat coil and pin, 30 thereby opening the circuit.

3. In a protector for an electric circuit, the combination with a spool having an opening therein, of a heat producing coil wound on said spool, said coil forming part 40 of said electric circuit, a pin extending from said opening and frictionally secured therein, said frictional engagement of the pin being adapted to be overcome by expansion of said spool due to an abnormal current in said coil.

4. In a protector for an electric circuit, the combination with a terminal provided with a spool, of a heat producing coil for said spool, said coil forming part of said electric circuit, a second terminal provided 50 with means for frictionally engaging said spool; whereby an abnormal current in the circuit produces an expansion of said spool and overcomes the frictional engagement of the parts, thereby opening the circuit.

5. In an automatic circuit breaker, a pair of terminals; means tending to separate said terminals to break the circuit; a conductor in the circuit; a device carried by one terminal and adapted to be heated by heat developed in said conductor due to an abnormal current; and a device carried by the other terminal frictionally held by said first 60 named device and released by the expansion thereof.

6. In an automatic circuit breaker, a pair of terminals spring pressed away from each other; an intermediate member connected with one of said terminals and provided with an opening adapted to receive and frictionally hold a projection from the other terminal; and a high resistance conductor wound on said intermediate member and connected at its opposite ends with said terminals, whereby the heating of said high 75 resistance conductor will produce sufficient expansion of said intermediate member to release the frictionally held projection, and permit the separation of the spring terminals, substantially as described.

7. The combination with spring terminals; of a spool or core provided with a winding, the ends of which are adapted to be connected with said terminals, respectively; means for detachably securing the said spool 85 to one of said terminals; and a frictional engaging member affording means for attaching said spool to the other of said terminals, said member being adapted to be released by the expansion of the spool due 90 to an abnormal current, substantially as described.

8. In apparatus of the class specified, the combination of a device expansible by heat, means for generating heat to expand 95 said device, on the passage of an unduly strong current, means for frictionally engaging said device when unexpanded, the device being adapted to become relieved of its frictional engagement on expanding, and 100 circuit controlling means normally tending to operate but held in restraint by the frictional engagement of said device and released by the expansion and disengagement of said device, substantially as described. 105

9. In apparatus of the class specified, the combination of a device expansible by heat, means for generating heat to expand said device on the passage of an unduly strong current, means for frictionally engaging 110 said device when unexpanded, the device being adapted to become relieved of its frictional engagement on expanding, and circuit opening means normally held in restraint by said device but released when said device 115 is expanded and relieved of its frictional engagement, substantially as described.

10. The combination of an expansible sleeve, an inclosure within the sleeve normally making frictional engagement with 120 the sleeve, a heat concentrating device associated with the sleeve, and circuit controlling means governed by said sleeve, substantially as described.

11. The combination of a pair of frictional elements adapted to normally engage 125 each other frictionally, said elements having different coefficients of expansion, and means for varying the temperature in accordance with variations in the circuit con- 130

ditions to cause frictional engagement and disengagement of said elements with one another, substantially as described.

12. An electrical circuit controller, comprising thermally operable means for controlling the circuit, and having a frictionally secured slidable member releasable to control the circuit, on a change in circuit conditions.

13. An electrical circuit controller, comprising thermally operable means for controlling the circuit, and having a slidable member releasable by expansion to control the circuit.

14. An electrical circuit protector, comprising thermally operable means for protecting the circuit, and having a frictionally secured slidable member releasable on the passage of an unduly strong current.

15. An electrical circuit protector, comprising thermally operable means for protecting the circuit, and having a slidable member releasable by expansion on the passage of an unduly strong current.

16. An electrical circuit protector, comprising a plug, an expansible and contractible collar arranged thereon, a heating device for expanding said collar on the pas-

sage of an unduly strong current, and circuit-controlling devices operable on the movement of said collar.

17. An electrical circuit protector, comprising a plug, an expansible and contractible collar arranged thereon, a heat coil carried by said collar, the collar being frictionally engageable upon the plug, spring means for actuating the collar when released, and circuit-controlling devices operable by the movement of the collar.

18. An electrical circuit protector, comprising a plug, an expansible collar arranged thereon, a heat coil carried by said collar, the collar being frictionally engageable upon the plug and releasable on expansion by the passage of an unduly strong current through said heat coil, spring means tending to slide the collar along the plug, and contacts arranged to open the circuit on the actuation of the collar.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

NEWMAN H. HOLLAND.

Witnesses:

HENRY J. LIVERMORE,
MARGARET E. COVENEY.