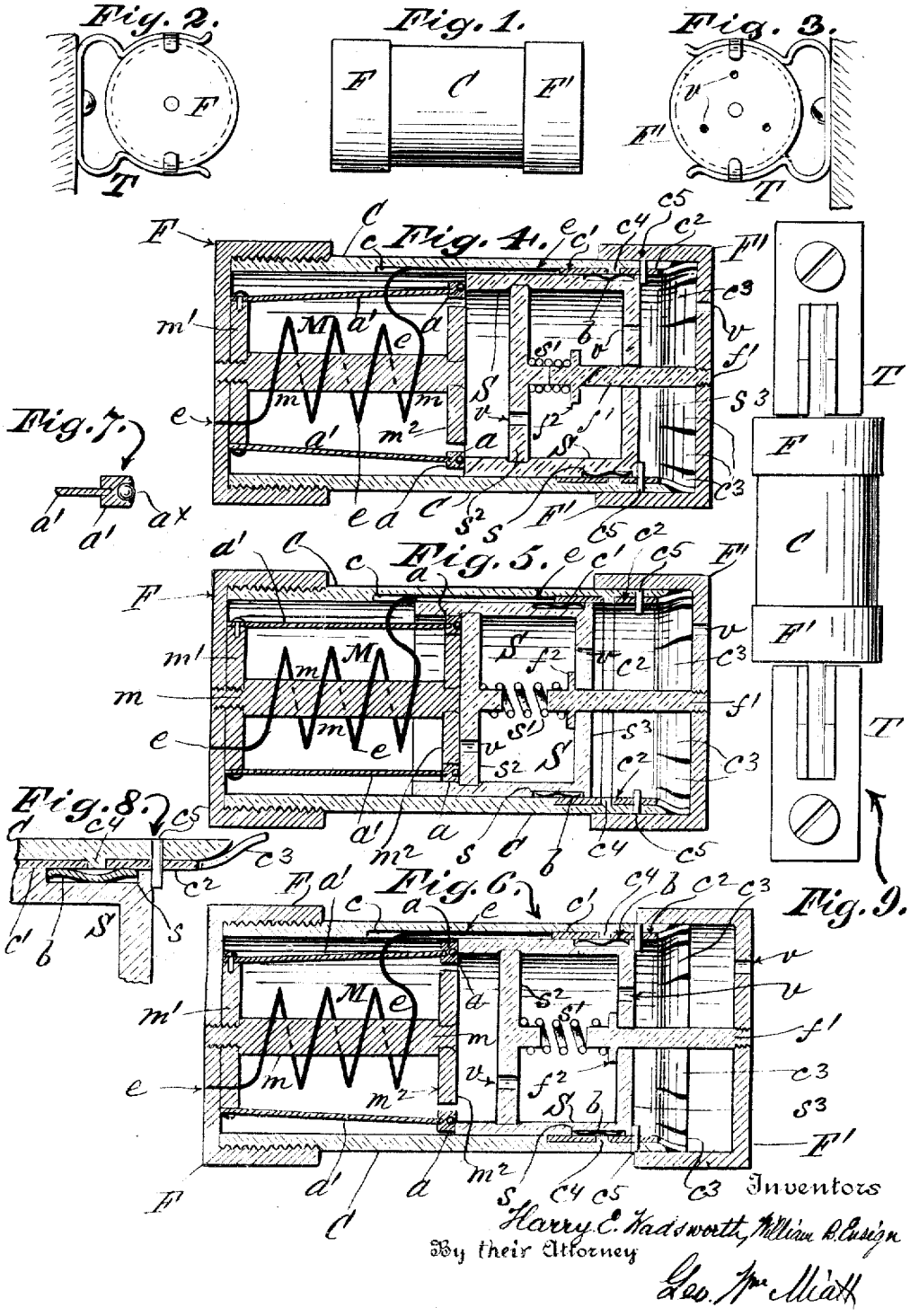
H. E. WADSWORTH AND W. B. ENSIGN.

AUTOMATIC ELECTRICAL CIRCUIT BREAKER.

APPLICATION FILED JULY 31, 1919.

1,352,707. Patented Sept. 14, 1920.



UNITED STATES PATENT OFFICE.

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AUTOMATIC ELECTRICAL-CIRCUIT BREAKER.

1,352,707. Specification of Letters Patent. Patented Sept. 14, 1920.

Application filed July 31, 1919. Serial No. 314,552.

To all whom it may concern:

Be it known that we, HARRY E. WADSWORTH, a citizen of the United States, and a resident of the borough of Bronx, county of Bronx, city and State of New York, and WILLIAM B. ENSIGN, a citizen of the United States, and a resident of White Plains, county of Westchester, and State of New York, have invented certain new and useful improvements in Automatic Electrical-Circuit Breakers, of which the following is a specification.

Our improvements relate to means for automatically breaking and opening an electric circuit when a predetermined excess of current occurs; the object of our invention being primarily to dispense with cut out fuses by providing a substitute therefor to be positioned in like manner between the usual spring clip terminals; to effectually protect the operative parts and prevent tampering therewith; and to attain other practical advantages hereafter set forth,—a distinctive feature of our invention being the use of an inclosed electromagnetic switch latch or automatic circuit opener, together with means, also isolated and inclosed in a casing common to all the operative parts, whereby said electro-magnetic switch latch may be re-set, (when our device is removed from between the terminal clips) without opening the casing, and by the simple expedient of reciprocating a portion thereof, substantially in the manner described and claimed herein.

Our present application involves a practical embodiment of the essential features of our invention in simple form, and with a minimum of operative parts; and we herein seek to cover broadly the principle involved,—other concurrent applications being for specific combinations and arrangements of parts in which the same principle is utilized.

In the accompanying drawings,—

Figure 1, is an elevation of our improved circuit breaker, viewed externally;

Fig. 2, is an elevation of one end thereof, showing the connection with one form of spring clip circuit terminal;

Fig. 3, is an elevation of the other end thereof, also showing its connection with a like spring clip circuit terminal;

Fig. 4, is a central longitudinal sectional elevation upon a larger scale, showing the parts as set for use;

Fig. 5, is a like view, showing the relative position of the parts when the electric circuit is broken;

Fig. 6, is a like view illustrating the resetting operation;

Fig. 7, is a sectional detail of one of the trip armatures;

Fig. 8, in an enlarged sectional detail showing the terminal contacts more clearly;

Fig. 9, is an elevation showing our device supported by and between spring clip terminals of the knife blade type.

In the present instance the operative parts of our automatic circuit breaker are inclosed in a rigid cylindrical casing C, of insulating material of suitable character, the ends of such housing being closed each by means of a metallic ferrule cap adapted for contactual engagement with the spring clip circuit terminals usually provided for cut out fuses in a manner well known in the art. Thus, in the first six figures of the drawings the ferrule caps are adapted to fit peripherally into bifurcated spring clips as shown in Figs. 2 and 3, while Fig. 9 shows the ferrule caps formed each with a knife blade for insertion between parallel spring contact clips.

The ferrule caps F, F′, are formed of a metal of suitable conductivity, and one, F, is a fixture upon its end of the casing C, being rigidly attached thereto by any suitable mechanical expedient,—while the other ferrule cap F′, is movable within certain prescribed limits on its end of said casing for the purpose of re-setting the operative parts as hereinafter set forth, after a "break" in the circuit.

The fixed ferrule cap F, forms the support upon which the electro-magnet M, (the wire wind of which is represented diagrammatically in Figs. 4, 5 and 6) is mounted axially in alinement with the central longitudinal axis of the casing C. The construction of the electro-magnet shown in the drawings is by way of exemplification only, as we do not restrict our invention in this respect, the essential feature in this connection being the use of electro-magnetic means whereby a suitable switch latch may be tripped to release an automatic cut out slide for the purpose of opening an electric circuit. In the construction shown in the accompanying drawings one extremity of the core m, of the magnet M, is shouldered and screw threaded for engagement with the base plate m', of

the magnet, and the ferrule cap F, both of which are correspondingly female screw threaded for the purpose. The other or inner end of the core m, is also shouldered, and has rigidly secured to it the lateral pole extension m^2, provided for the purpose of bringing the field of magnetic influence within operative distance of the trip armatures a, a. The latter constitute automatic switch latches, being each spring mounted in such manner that they tend constantly to dog the cut out slide S, when said slide is in normal retracted position as in Figs. 4 and 6. To this end the trip armatures a, a, are shown as mounted on the free ends of spring arms a', a', the other extremities of which are rigidly secured to the base plate m', of the magnet M,—it being understood of course that the core m, its base m', and lateral extension m^2 are paramagnetic as well as the trip armatures a, a. Obviously also, these spring mounted trip armatures a, a, may be supported upon any stationary part, as on the casing C, if preferred, with like result in so far as their function and operation is concerned. Each of the trip armatures a, is preferably provided with an anti-friction roller a^x, as shown more particularly in Fig. 7, to facilitate contactual engagement with, or disengagement from, the inner edge of the cut out slide S.

The metallic wire coil e, surrounding the core m, is in electrical connection with the ferrule cap F, and (through the longitudinal groove c) with an annular metallic contact plate c', which is embedded in the inner face of the casing C. Another annular metallic contact plate c^2, is also countersunk in part in the inner face of the cylindrical casing C, and is formed with elastic resilient tongues c^3, which project beyond the end of the casing C, and contact positively in an electrical sense with the ferrule cap F'. Between the adjacent edges of these two annular contact plates c', c^2, is interposed an annular shoulder c^4, of insulating material, preferably consisting of a part of the inner side of the casing C, itself. The studs c^5, or equivalent mechanical expedients used for the purpose of securing the resilient tongued contact plate c^2, in position at the end of the casing C, may be also utilized to limit the retractile movement of the cut out slide S, as shown in Figs. 4, 6 and 8.

The said cut out slide S, is provided with an annular contact bridge plate b, positioned in a peripheral groove s, formed for it adjacent to the rear edge of the slide. When the cut out slide S, is in normal, retracted position, as in Figs. 4, 6 and 8, this annular contact bridge plate b, engages with both the aforesaid annular contact plates c', c^2, on the casing C, but straddles the intervening annular shoulder c^4, of insulating material, as also shown in Figs. 4, 6 and 8. In Figs. 4, 5 and 6, this contact bridge plate b, is indicated symbolically for convenience of illustration, but in Fig. 8, it is shown on an enlarged scale and cross sectioned. It consists of an annular plate of elastic resilient metal permanently bent and set transversely so that its medial portion will rest against the floor of the groove in which it is positioned on the cut out slide S, while its edges press outward, thus insuring positive contact with the surfaces to which they are opposed. Thus, as before intimated, when the cut out slide S, is in retracted normal position as in Figs. 4, 6 and 8, the contact bridge plate b, straddles the gap c^4, and establishes electrical connection between the contact plates c', and c^2, and hence, through the resilient tongues c^3, of the latter, with the movable or re-set ferrule cap F'.

Normally the cut out slide S, is held in its retracted position by the trip armatures a, a, against the resistance of a breaker spring s', which tends constantly to thrust the cut out slide S, toward the electro-magnet M. This breaker spring s', is interposed between a cross member s^2, of the cut out slide S, and a post f', of non-conducting material secured rigidly and axially to the movable ferrule cap F', and projecting through the end member s^3, of the said slide S, which is also of course (excepting the contact bridge plate b) made of non-conducting material. A shoulder f^2, on the ferrule cap post f', affords means whereby the cut out slide S, may be retracted to normal position after it has been advanced into the position shown in Fig. 5.

Vent holes v, v, v, are formed in the cross members s^2, s^3, of the cut out slide S, and in the end plate of the ferrule cap F', to ventilate the interior of the device and to facilitate the movement of the said cut out slide S, in either direction, and of the ferrule cap F', in re-setting.

The slidable ferrule cap F', is held in its normal position against the pressure of the breaker spring s', by the frictional contact of the elastic resilient tongues c^3.

The operation of our automatic circuit breaker is as follows.

The parts being set as in Fig. 4, and the device mounted between the clip terminals T, T, of an electric circuit as before intimated, an excess of load to which the coil e, may be subjected will energize the magnet M, sufficiently to cause it to pull the trip armatures a, a, against the resistance of their spring supports a', a', from contact with the inner edge of the cut out slide S, when the breaker spring s', will instantly thrust said slide S, toward the magnet M, until the rear cross member s^3, of the slide rests against the shoulder f^2, of the post f'. In other words, the parts assuming the position shown in Fig. 5. At the very incep-

tion of this forward thrust of the cut out slide S, however its contact bridge plate b, leaves the ferrule contact plate c^2, and passes over the annular gap shoulder c^4, of insulation, thereby breaking the electric circuit instantaneously to all practical intents and purposes, and thus immediately obviating danger.

To re-set the device, it is removed from between the circuit clip terminals T, T, and the movable ferrule cap F′, is drawn outward into the position shown in Fig. 6, thereby causing the post f', to retract the cut out slide S, to its original position at rest against the studs c^5, c^5, when their spring supports a' a', cause the latch armatures a, a, to spring into position to again dog the advance of the slide S, with its contact bridge plate b, again closing the electric circuit by its bearing against both of the contact plates c', and c^2. The return of the re-set ferrule cap F′, to its normal position again compresses the breaker spring s', as in Fig. 4, and the device is again ready for use.

It will be seen that all the operative parts of our automatic circuit breaker are inclosed, isolated and protected from contact with extraneous objects, and that they cannot to be tampered with nor improperly manipulated while the incasement remains intact. It is an effectual substitute for the "blow out" fuse, with the great advantage that it can be re-set and used indefinitely; and the act of re-setting simply involves its removal from between the circuit terminal clips and the reciprocal movement of the ferrule cap F′, after which it is ready for replacement in operative position.

What we claim as our invention and desire to secure by Letters Patent is,

1. An automatic electric circuit breaker of the character designated, comprising a casing of insulating material, metallic ferrule caps formed externally for contactual engagement with electric circuit terminal spring clips, fixed electric contacts connected one with each of said ferrule caps, movable means for electrically connecting said fixed electric contacts, means which tend constantly to open the circuit, switch latch mechanism controlled by an electro-magnet, said electro-magnet having its coil interposed in the electric circuit when the latter is closed, and ferrule-cap-connected means for re-setting the parts after a break.

2. An automatic electric circuit breaker of the character designated, comprising a casing of insulating material, metallic ferrule caps inclosing the otherwise open ends thereof and formed externally for contactual engagement with electric circuit terminal spring clips, an electro-magnet one end of the coil of which is electrically connected with a fixed ferrule cap and the other with a fixed contact in the casing, another fixed contact in the said casing electrically connected with the other ferrule cap which is reciprocally movable, a movable bridge contact adapted to engage with and electrically connect both of said fixed contacts, means which tend constantly to break this electric connection, switch latch mechanism controlled by the magnet, and means for re-setting the parts after a break by the reciprocation of said movable ferrule cap, for the purpose described.

3. An automatic electric circuit breaker of the character designated, comprising a casing of insulating material, metallic ferrule caps inclosing the otherwise open ends thereof and formed externally for contactual engagement with electric circuit terminal spring clips, an electro-magnet one end of the coil of which is electrically connected with a fixed ferrule cap and the other with a fixed contact in the casing, another fixed contact in the said casing electrically connected with the other ferrule cap which is reciprocally movable, a cut out slide having a bridge contact plate adapted to engage with and electrically connect both of said fixed contacts, means which tend constantly to thrust said slide and its bridge contact plate out of operative connection with said fixed contacts, switch latch mechanism controlled by the magnet, and means for re-setting the parts after a break by the reciprocation of the movable ferrule cap, for the purpose described.

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Witnesses:
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DOROTHY MIATT.