

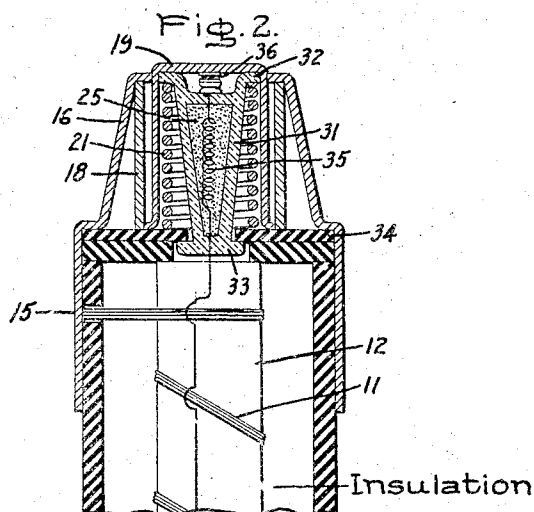
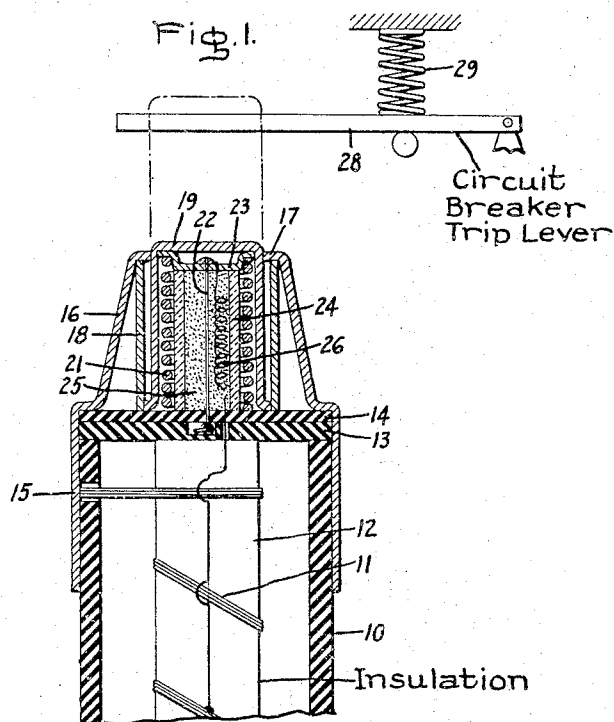
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J. BIERMANN'S ET AL

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ELECTRIC CIRCUIT INTERRUPTING DEVICE

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Inventors:
Josef Biermanns,
Kuno Bauerschmidt,
Willy Mutschke,
Harry E. Dunham
by Their Attorney.

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ELECTRIC CIRCUIT INTERRUPTING DEVICE

Josef Biermanns, Berlin-Friedrichshagen, Kuno Bauerschmidt, Berlin-Karlshorst, and Willy Mutschke, Fredersdorf, near Berlin, Germany, assignors to General Electric Company, a corporation of New York

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9 Claims. (Cl. 200—121)

The present invention relates to electric circuit interrupting devices, and more particularly to high voltage circuit interrupting devices embodying an interrupting element having a long fusible section and means for indicating the condition of the device which means may be also used for actuating other devices mounted adjacent thereto. A fuse device of such type may be used, for example, in connection with circuit breaker arrangements whereby all of the lines of a polyphase system may be disconnected upon the rupture of such a fuse device arranged in one of the phase lines.

Fusible circuit interrupting devices of this general type are known, one common form of which includes a fuse wire which is normally tensioned by spring means which is sufficiently powerful to assure tripping of an adjacent circuit breaker when the fuse wire blows. In such devices, however, a mechanically strong fuse wire must be used in order to hold the spring under tension but in high voltage fuse devices, in which the fuse wires are relatively fragile, such an arrangement cannot be practically employed.

Fuse devices are also known which embody a cartridge containing an explosive which is fired by the fuse wire upon the blowing thereof. The disadvantage of such an arrangement, however, is that accurate measuring of the explosive is required so as to prevent the generation of such powerful forces that parts of the fuse will be thrown in various directions which, under certain conditions may cause short circuits or damage in other adjacent parts of the installation.

It is therefore an object of the present invention to provide a new and improved electric circuit interrupting device comprising a fusible element of the high voltage type and having means for indicating the condition of the device and which means may be also utilized for operating adjacent apparatus.

It is a further object of the invention to provide a new and improved high voltage electric circuit interrupting device comprising a fusible electric circuit interrupting element and having a combined indicator and actuator means so constructed and arranged that it quickly and safely is released for operation concurrently with the rupture of the fusible element.

In accordance with one form of the invention an electric circuit interrupting device including a fusible element is provided with an indicating means which is movable outwardly from the device by a spring associated therewith in such a manner as to be capable of operating a circuit

breaker or other apparatus. The spring is normally held in an inoperative condition by a restraining means which is adapted to be destroyed by heat generated concurrently with the rupture of the main fusible element. The heat for effecting the release of the spring may be generated by a heating element connected in parallel with a portion of the main fusible element or by a small quantity of heating powder which is ignited upon operation of the fusible element or by a combination of both such means.

For a consideration of what we believe to be novel and our invention, attention is directed to the following description taken in connection with the accompanying drawing while the features of novelty which characterize our invention will be pointed out with greater particularity in the appended claims.

In the drawing, Fig. 1 is a cross-sectional view through one end of an electric circuit interrupting device constructed in accordance with one modification of the invention, and Fig. 2 is a similar view illustrating a second modification of the invention.

Referring to Fig. 1, the circuit interrupting device as shown comprises a longitudinal tubular insulating casing 10 which is filled with a suitable arc-extinguishing substance and contains the fuse wire 11 wound upon a suitable insulating support 12. Arranged over the end of the casing 10 is a pair of insulating disks 13 and 14. One end of the fuse wire 11 is connected to the terminal or ferrule 15 arranged on the end of the casing 10. The ferrule 15 includes a conical extension 16 the end of which is crimped over forming a flange 17 for retaining a cylinder 18 against the upper insulating disk 14 in substantially axial alignment with the casing 10. An inverted cup-shaped piston or plunger 19 is arranged within the cylinder 18 and contains a spring 21 which is normally held inoperative under compression by a mechanically strong but relatively low melting point tie wire 22 fastened at the upper end to a metal disk 23 arranged over the upper end of the spring and at the lower end to the disk 14. The wire 22 is enclosed within a tube 24 of glass, Celluloid, or any other suitable material and which tube is filled with a heating powder 25, for example, aluminum powder. The tube 24 also contains a fuse 26 which is so dimensioned and arranged that it ignites the powder 25 upon the melting of the main electric circuit interrupting element 11. For this purpose the fuse 26 may be connected at a suitable point to the fusible element 11 as indicated.

When the fusible element 11 blows under an excess current condition, the powder 25 is ignited by the fuse wire 26 with the result that the tie wire 22 is rapidly melted. The compressed spring 21 is thereby released which actuates the piston 19 outwardly to the position indicated by the dotted line. In so doing the piston 19 strikes the lever 28 forcing it against the action of the spring 29. The lever 28 may be the trip lever of a circuit breaker (not shown) or it may be connected thereto by any suitable linkage mechanism. It is obvious that the lever 28 represents any apparatus which is to be operated upon the blowing of the fuse.

The modification illustrated in Fig. 2 differs from that of Fig. 1 in the means provided for holding the actuating spring 21 in the compressed condition. In this modification, the spring 21 is held under compression by a closed body or capsule 31 which may be made of glass or any other suitable brittle insulating material. The capsule is provided at its upper end with an outwardly extending flange 32 fitting over the upper end of spring 21 and at the other end with a button head 33 which extends through an opening in the insulating disk 34 and engages with the opposite edges thereof. The capsule 31 is filled with a suitable heating powder and contains a fuse wire 35 the ends of which extend through the opposite ends of the capsule 31. Electrical connection is made between the upper end of the wire 35 and the metal piston 19 by means of a small spring 36, while the lower end of the wire 35 is connected to a suitable point of the main electric circuit interrupting element 11. The capsule may be sealed so that an air tight enclosure is provided for the heating powder enclosed therein.

Upon the occurrence of an excess current condition which causes the rupture of the main fusible element 11 the fuse wire 35 will cause the ignition of the powder enclosed within the capsule 31. The capsule 31 will thereupon be destroyed either by melting or bursting, resulting in the same sequence of operation as described above.

It will be obvious that the heating powder embodied in the fuse devices described may be replaced by any suitable explosive which, when the main fuse blows, effects the release of the piston actuating spring 21. It is also obviously not necessary in the embodiment of Fig. 1 to surround the tie wire 22 over its full length with heating powder 25 since only so much heating powder need be used as will cause the melting of the tie wire at a single point.

Having described the principle of operation of our invention in what we consider to represent preferred embodiments thereof, we desire to have it understood that the specific details shown are merely illustrative and that the invention may be carried out by other means.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An electric circuit interrupting device comprising an insulating casing, a terminal ferrule on an end thereof, a longitudinal insulating support in said casing, a circuit interrupting element wound on said support and connected at one end to said ferrule, said ferrule including a cylindrical extension from the end of said casing, a piston arranged in said cylindrical extension, spring means arranged in said piston for forcing said piston outwardly of said cylinder, means for restraining said spring means in a stressed

condition, and means operable upon rupture of said interrupting element for causing release of said restraining means.

2. An electric circuit interrupting device comprising a tubular insulating casing, a terminal ferrule on an end of said casing, a longitudinal insulating support in said casing, a circuit interrupting element wound on said support and connected at one end to said ferrule, means defining an axial cylindrical extension from the end of said casing, a piston arranged in said cylindrical extension, spring means arranged in said cylindrical extension for actuating said piston outwardly of said extension, means for restraining said spring means in a stressed condition, and means operable upon rupture of said interrupting element for causing release of said restraining means.

3. An electric circuit interrupting device comprising a tubular insulating casing, terminal means on an end of said casing, a fusible circuit interrupting element arranged in said casing and connected at one end to said terminal means, means defining an axial cylindrical extension from the end of said casing, a piston arranged in said cylindrical extension, spring means arranged in said cylindrical extension for forcing said piston outwardly of said cylinder, means for holding said spring means in a stressed condition, and means operable upon fusing of said element for effecting a release of said spring means.

4. An electric circuit interrupting device comprising a tubular insulating casing, terminal means arranged on an end of said casing, a fusible circuit interrupting element arranged in said casing and connected at one end to said terminal means, said terminal means including means defining an axial tubular extension from an end of said casing, a plunger slidably arranged in said extension, spring means arranged in said extension for forcing said plunger outwardly of said extension, means normally restraining said spring means in a stressed condition, and means responsive to the fusing of said element for effecting release of said restraining means.

5. An electric circuit interrupting device comprising an insulating casing, terminal means arranged on one end of said casing, a fusible circuit interrupting element arranged in said casing and connected at one end to said terminal means, an indicator device mounted on an end of said casing and movable outwardly with respect thereto, actuating means for said indicator, means for restraining said actuating means in an inoperative condition, and means responsive to an excess current flow through said fusible element for effecting release of said actuating means.

6. In a high voltage circuit interrupter having an interrupting element with a fusible section, an indicating device, a spring actuator for said device, means including a capsule containing an inflammable powder for holding said spring actuator in an energized condition, said capsule also containing means responsive to fusing of said section for igniting said powder to destroy said capsule and effect the release of said spring actuator.

7. In a high voltage circuit interrupter having an interrupting element with a fusible section, an indicating and tripping device, a spring actuator for said device, a thermal locking means for holding said spring actuator in an energized condition, a quantity of inflammable powder associated with said locking means, and means for igniting said powder upon fusing of said section

and thereby effecting release of said locking means.

8. In a high voltage circuit interrupter having an interrupting element with a fusible section, an indicating and tripping device, a spring actuator for said device, a thermal locking means for holding said spring actuator in an energized condition, and means responsive to fusing of said section for effecting release of said locking means.

9. In a high voltage circuit interrupting device 10

having an interrupting element with a fusible section, a plunger, actuating means for said plunger and means operatively connected to said fusible section for causing said actuating means to move said plunger upon the fusing of said section.

JOSEF BIERMANN'S.
KUNO BAUERSCHMIDT.
WILLY MUTSCHKE.

DISCLAIMER

2,306,153.—*Josef Biermanns*, Berlin-Friedrichshagen, *Kuno Bauerschmidt*, Berlin-Karlshorst, and *Willy Mutschke*, Fredersdorf, near Berlin, Germany. ELECTRIC CIRCUIT INTERRUPTING DEVICE. Patent dated December 22, 1942. Disclaimer filed April 21, 1944, by the assignee, *General Electric Company*.

Hereby enters this disclaimer to claim 9 of said patent.

[*Official Gazette May 16, 1944.*]

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