F. H. MILLER AND J. H. PROCTER.

FUSE.

APPLICATION FILED NOV. 16, 1918.

1,438,607. Patented Dec. 12, 1922.

Fig. 1.

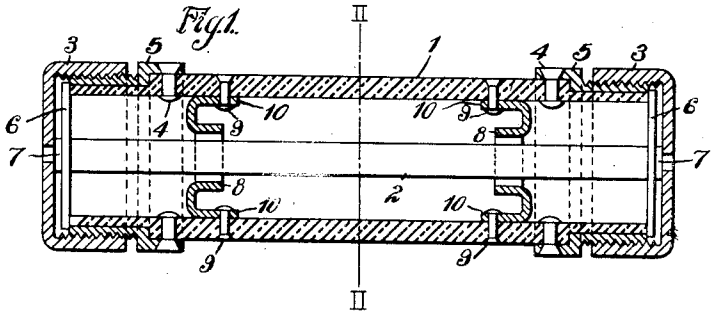


Fig. 2.

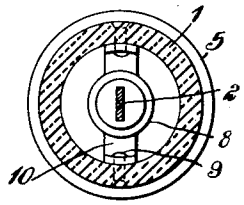


Fig. 3.

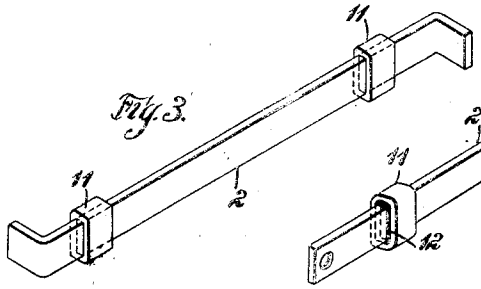


Fig. 4.

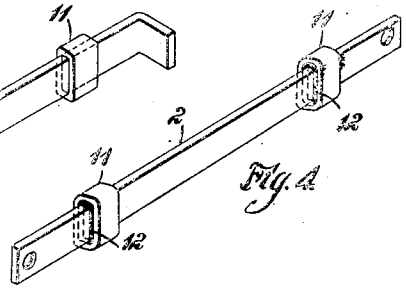
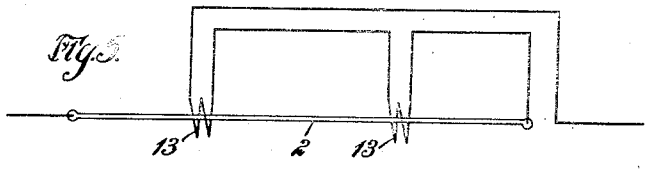


Fig. 5.



WITNESSES:

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UNITED STATES PATENT OFFICE.

FREDERICK H. MILLER AND JOSEPH H. PROCTER, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

FUSE.

Application filed November 16, 1918. Serial No. 262,904.

To all whom it may concern:

Be it known that we, FREDERICK H. MILLER, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, and JOSEPH H. PROCTER, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fuses, of which the following is a specification.

Our invention relates to fuses and particularly to means for causing the rupture of fusible elements at predetermined portions thereof.

One object of our invention is to provide means for transmitting heat, other than the natural inherent heat of a fusible element, to a predetermined portion of the element to cause rupture at said portion when the element is traversed by a current that exceeds a predetermined value.

Another object of our invention is to provide means for localizing the place of rupture of an ordinary fusible conductor without alteration in its form or substance.

A further object of our invention is to provide a fuse device in which means for localizing the place of rupture of a fusible element shall be so associated with a support or container for the element that the latter may consist of any usual form of fusible element or uniform fusible conductor and be replaced without interfering with said means.

Heretofore, it has been usual, in certain fusible elements, to form the same to special contours, as by cutting notches or holes therein, to cause the elements to fuse at predetermined portions thereof, while in other elements, special coatings or other means to prevent the fusing of the elements at certain portions thereof, have been employed. In nearly all of these elements, so far as we are aware, the inherent heat of the elements, caused by the passage of current therethrough, has been the only heat utilized to rupture the elements.

In practicing our invention, we provide means for so additionally heating a predetermined portion of a fusible element as to cause the element to fuse at said portion.

Figure 1 of the accompanying drawings is a longitudinal sectional view of a refillable fuse cartridge embodying one adaption of our invention; Fig. 2 is a view taken along the line II—II of Fig. 1; Figs. 3 and 4 are detail views of fusible elements illustrating modified forms of our invention; and Fig. 5 is a diagrammatic view showing one adaptation of our invention to a direct-current system.

In Figs. 1 and 2, a cartridge fuse device comprising a tubular insulating container 1 encloses a fusible element 2 that extends longitudinally through the container 1 and engages interiorly-threaded terminal ferrules 3 at the ends of the container. Rivets 4 secure exteriorly-threaded sleeves 5 around the ends of the container for the reception of the ferrules 3, and slotted washers 6 receive the ends 7 of the element 2, in a usual and well known manner, the ends 7 being bent laterally against the outer faces of the washers 6. The washers 6 may be placed in relatively close engagement with the ends of the sleeves 5 and the ends 7 be pressed against the washers 6 by advancing the ferrules 3 on the sleeves 5.

Sleeves 8 of iron or other magnetic material are secured to the container 1 and positioned in longitudinal spaced relation with respect to each other and to the ends of the element 2 by rivets 9 that extend through the walls of the container 1 and apertured lugs 10 on the sleeves 8. As shown, the sleeves 8 are disposed inside the container 1 and around the element 2 in spaced relation to the latter to permit the ready insertion and withdrawal of the element 2 from the container 1.

When used in an alternating-current circuit, eddy currents are induced in the sleeves 8 to heat the latter which, in turn, heat the element 2 to a greater degree at the portions of the element adjacent the sleeves 8 than at the remaining portions thereof. In conjunction with the inherent heat of the element, caused by the current passing therethrough, this additional heat from the sleeves 8 causes the element 2 to rupture at the portions thereof that are adjacent the sleeves 8, thereby causing the mid-portion of the element, between the sleeves 8, to drop to the bottom of the container and preventing a sustained arc.

While it is essential, in thus creating heat by magnetic induction, to have the mag-

netizable members relatively close to the element 2 it is not essential to have the particular structure shown and other readily-suggested means may be employed.

In Fig. 3 magnetizable bands 11 are pressed upon, or otherwise connected directly to, the element 2 that may, in this form, be used as an exposed fuse or placed in any suitable container.

In Fig. 4 the bands 11 are separated from the element by layers of insulating material 12, such as asbestos.

Being dependent upon change in current values for effective operation, it is evident that fuses constructed in accordance with the above description, will operate more positively when used in alternating-current circuits, however, the eddy-current effect will not be entirely lost in direct-current circuits where pulsating or change of current values occurs.

Since the primary object of this invention is to supplementally heat the fusible element at a local portion thereof, this may be effectively accomplished, in a direct-current circuit, by an arrangement such as is indicated in Fig. 5. Here the element 2 is surrounded by two heating coils 13 connected in series relation with the element and disposed with respect to the latter and to each other in the same relation as are the sleeves 8 and the bands 11 in the devices above described.

While we have shown and described particular forms of our invention, many changes may be effected therein without departing from the spirit and scope thereof, as set forth in the appended claims.

We claim as our invention:

1. A circuit-interrupting device comprising a thermal-responsive device, and inductive heating means responsive to the current traversing the circuit and having a single flux-linkage relation to said thermal-responsive device.

2. A circuit-interrupting device comprising a thermal-responsive device, and inductive means for heating the same at a single local position thereon.

3. A circuit-interrupting device comprising a thermal-responsive device, and inductively heated means for heating the same at a plurality of independent local positions thereon.

4. A refillable cartridge fuse device comprising a container, a fusible element removably disposed therein and inductive heating means attached to the container for causing the rupture of the element at a definite predetermined local position thereon.

5. A circuit-interrupting device comprising a uniform fusible element and inductive means for so heating the element at a plurality of spaced portions thereof that, when a current of predetermined value traverses the element, the latter will fuse at said spaced portions and permit an unfused portion intermediate said portions to be separated from the ends of the element.

6. A circuit-interrupting device comprising a current-carrying thermal-responsive member and a metal member mounted at a predetermined position thereon to effect a local heat zone therefor.

7. A circuit-interrupting device comprising a current-carrying thermal-responsive member and a magnetizable member disposed adjacent to a definite predetermined local position thereof for heating the same at said position.

8. A circuit-interrupting device comprising a recessed magnetizable member and a thermal-responsive conducting device extending once therethrough.

In testimony whereof, we have hereunto subscribed our names this 30th day of Oct., 1918.

FREDERICK H. MILLER.
JOSEPH H. PROCTER.