Aug. 10, 1926. 1,595,742

H. B. TAYLOR

FUSE MECHANISM

Filed Sept. 12, 1922

Fig. 1.

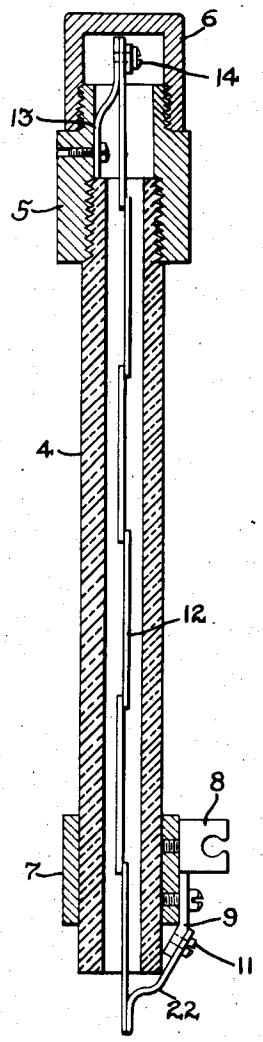


Fig. 2.

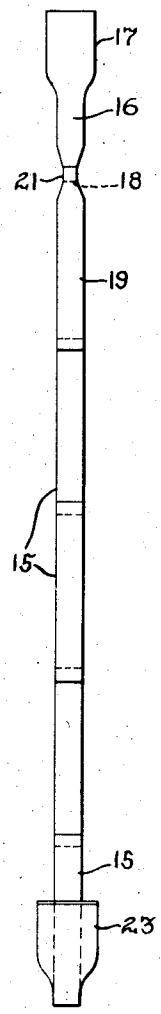
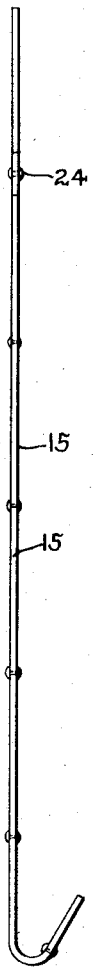


Fig. 3.



WITNESSES:

R. J. Butler

D. H. Tendig

INVENTOR

Harold B. Taylor

BY

Merley & Starr

ATTORNEY

Patented Aug. 10, 1926.

1,595,742

UNITED STATES PATENT OFFICE.

HAROLD B. TAYLOR, OF FOREST HILLS BOROUGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

FUSE MECHANISM.

Application filed September 12, 1922. Serial No. 587,841.

My invention relates to fuse mechanism and particularly to a fuse device of the expulsion type wherein the gases incident to the rupture of the fuse expel the particles of fuse metal from the tube.

One object of my invention is to provide an expulsion fuse for overload and short-circuit protection with a strip having ample current-carrying capacity and a minimum quantity of fusible metal for reducing to a minimum the quantity of metal vapor produced within the casing and the consequent arc when a rupture of the fuse strip occurs, thereby rendering the fuse effective for instantly interrupting a circuit under short-circuit or overload conditions.

Another object of my invention is to provide an expulsion fuse with a fuse strip having relatively great current-carrying capacity and having relatively small cross-sectional area for reducing the normal working temperature and heat radiating surface of the fuse and thereby preventing charring and consequent deterioration of the fuse casing.

Another object of my invention is to provide an expulsion fuse of the open end type with a fuse strip made of a plurality of metal sections having relatively high fusion characteristics joined by means of a small quantity of metal solder fusible at relatively low temperatures, that are adapted to be simultaneously separated by reason of the fusion of the solder under overload or short-circuit conditions and expelled bodily from the fuse casing when rupture occurs.

Another object of my invention is to provide an expulsion fuse with a fuse strip having the above characteristics wherein at least one joint of the strip adjacent the innermost end thereof is of reduced cross-sectional area and current-carrying capacity to insure initial rupture of the fuse strip at a point near the closed end of the casing.

These and other objects, that will be made apparent throughout the further description of my invention, are attained by means of the apparatus hereinafter described, and illustrated in the accompanying drawings, wherein:

Figure 1 is a longitudinal sectional view through an expulsion fuse casing having a fuse strip therein embodying features of my invention;

Fig. 2 is an elevational view of the fuse strip shown in Fig. 1, and

Fig. 3 is a side elevational view of a modified form of fuse strip embodying features of my invention.

Referring to the drawings, the improved fuse strip is shown mounted with an expulsion fuse casing similar to that disclosed in a copending application Serial No. 510,280, filed Oct. 25, 1921 by M. J. Sandin, and assigned to the Westinghouse Electric & Manufacturing Company.

The fuse casing includes an insulating tube 4 made of micarta, or similar insulating material, having a metal contact sleeve 5 threaded thereon. The sleeve 5 is externally threaded, at one end, for receiving a threaded cap 6 for closing the end of the casing. The other end of the casing is provided with a contact sleeve 7 having a clip 8 for connecting the fuse terminal sleeve 7 to a conductor terminal (not shown). The sleeve 7 is also provided with a terminal plate 9 into which a terminal screw 11 is threaded for clamping the exposed end of a fuse strip 12 thereto.

The sleeve 5 is provided with a terminal strap 13 having a threaded terminal screw 14 thereon for clamping the inner end of the fuse strip 12 thereto.

The fuse strip 12 comprises a plurality of metal strips or sections 15 made of copper or other metal having low resistance and relatively high fusion characteristics. The sections are overlapped slightly at their ends and are joined by means of a metal solder fusible at relatively low temperatures.

The section 16, constituting the inner terminal of the fuse strip, is provided with an enlarged portion 17 for providing ample contact surface and a narrow section 18 that is of less cross-sectional area than that of the body of the fuse strip. The section 19, that is soldered to the section 16, is provided with a reduced end 21 that is adapted to overlap the reduced end of the section 16.

The combined cross-sectional area of the reduced portions of the sections 16 and 19 is less than the cross-sectional area of the body of the strip and, consequently, is of reduced current-carrying capacity.

When an overload or short-circuit condition occurs, the solder at the joint connecting the sections 16 and 19 will be fused be-

fore rupture occurs at the other joints of the strip. The gases incident to the rupture of the fuse strip at this point move toward the open end of the casing and heat the remaining sections and cause their separation and subsequent ejection from the fuse strip. This operation causes the arc to be extinguished instantly under either overload or short-circuit conditions by reason of the relatively small quantity of metal vapor produced by the rupture of the fuse.

The outermost section 15 of the fuse strip is provided with a terminal section 22 that is soldered thereto and provided with an enlarged end portion 23 that is adapted to be clamped to the terminal member 9. Arc gases discharged from the open end of the fuse casing cause the lowermost section to be separated immediately from the terminal section 22.

A modified form of fuse strip is shown in Fig. 3 wherein the strips 15 are arranged in end-to-end or abutting relation and soldered together by means of a metal solder fusible at relatively low temperatures. The operation is similar to that of the fuse strip shown in Figs. 1 and 2. The sections adjacent the inner end of the strip are reduced in width similar to the sections 16 and 19 previously described and, consequently, the joint 24 is of reduced current-carrying capacity and will be ruptured before the others.

Fuse strips constructed in the manner above described are particularly adapted for interrupting circuits under overload conditions for the reason that the temperature of the sections constituting the strip rises nearly to the fusing temperature of the solder before the rupture occurs and are easily separated and blown from the tube by a relatively small quantity of heated gas, such as is incident to the rupture of a fuse under overload conditions. The quantity of metal vapor produced by the arc is relatively small and does not assist in sustaining the arc. The strip, however, is equally effective for interrupting short-circuit conditions. The violent explosion incident to rupture under the latter conditions causes immediate fusion of the solder at all points of the tube and the immediate discharge of the strip sections from the fuse tube.

While I have described and illustrated but two embodiments of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of my invention, as set forth in the appended claims.

I claim as my invention:

1. The combination with an expulsion fuse tube having at least one end open, of a fuse element within the tube comprising a plurality of sections of conductive material fusible only at relatively high temperatures joined by a conductive material fusible at relatively low temperatures.

2. The combination with an expulsion fuse tube having at least one end open, of a fuse element within the tube comprising a plurality of metal members fusible only at relatively high temperatures and joined by metal fusible at relatively low temperatures.

3. The combination with an expulsion fuse tube having at least one end open, of a fuse element within the tube comprising a plurality of metal members fusible only at relatively high temperatures and joined at their ends by metal fusible at relatively low temperatures.

4. The combination with an expulsion fuse tube having at least one end open, of a fuse element within the tube comprising a plurality of metal members fusible only at relatively high temperatures and soldered to one another with metal fusible at relatively low temperatures.

5. The combination with an expulsion fuse tube having at least one end open, of a fuse element within the tube comprising a plurality of metal members fusible only at relatively high temperatures and having reduced current-carrying capacity at adjacent ends of the members and soldered to one another at the reduced portions with metal fusible at relatively low temperatures.

6. The combination with an expulsion fuse tube closed at one end and open at the other end, of a fuse element within the tube comprising a plurality of metal members fusible at relatively high temperatures joined at their ends by metal fusible at relatively low temperatures, the members joined nearest the closed end of the tube being provided adjacent to the junction with portions of reduced current-carrying capacity for causing initial separation of the members adjacent to the closed end of the tube in response to abnormal currents in the fuse element.

7. The combination with an expulsion fuse tube closed at one end and open at the other end, of a fuse element within the tube comprising a plurality of metal members fusible at relatively high temperatures joined at their ends by metal fusible at relatively low temperatures, the members joined nearest the closed end of the tube being so proportioned at the point of joinder thereof as to constitute a section of the fuse element having reduced current-carrying capacity whereby the initial separation of the members is made to occur adjacent to the closed end of the tube in response to abnormal currents in the fuse element.

8. The combination with an expulsion fuse tube closed at one end and open at the other end, of a fuse element within the tube com-

prising a plurality of metal members fusible at relatively high temperatures and joined at their ends by metal fusible at relatively low temperatures, the members joined nearest the closed end of the tube being proportioned to cause greater heating effect in response to abnormal currents in the fuse element adjacent to the joint nearest to the closed end of the tube than at the more remote joints for causing initial separation of the said members.

9. A fuse element comprising three or more metal members fusible only at relatively high temperatures and joined at their ends by metal fusible at relatively low temperatures adapted to be fused by an excessive current for separating the members and means for causing excessive heating at a predetermined joint.

10. A fuse element comprising three or more metal members fusible only at relatively high temperatures and soldered together at their ends by metal fusible at relatively low temperatures adapted to be fused by an excessive current for separating the members.

In testimony whereof, I have hereunto subscribed my name this 7th day of September 1922.

HARCLD B. TAYLOR.