March 6, 1934. J. F. TRITLE 1,950,199

FUSE

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Fig. 1.

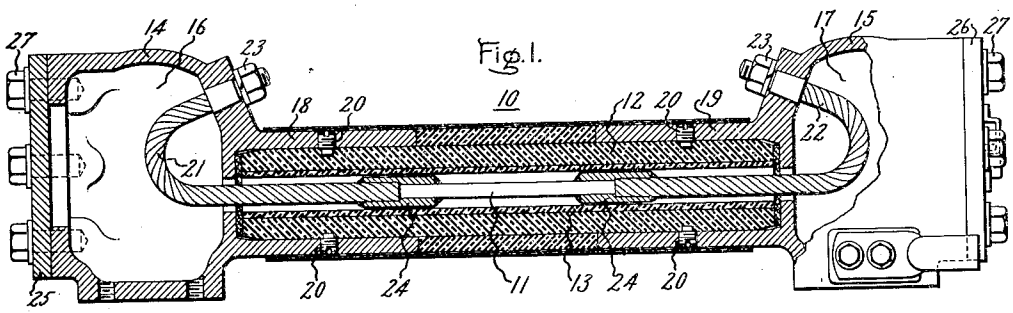
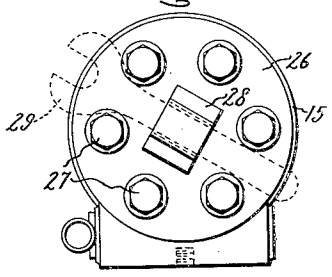


Fig. 2.



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FUSE

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6 Claims. (Cl. 200—127)

My invention relates to protective devices for electrical apparatus and more particularly to a fuse of the totally enclosed type.

Fuses of the expulsion type utilizing explosive forces generated on the volatilization of a fusible element are commonly used to protect high voltage circuits where it is desirable to open the circuit quickly upon a heavy overload so that there will be no unnecessary surge placed upon the electrical apparatus connected to the circuit. In the operation of expulsion fuses, a considerable noise is produced and the portion of the fusible element released by the blowing of the fuse is expelled from the fuse chamber with the accompaniment of a flame. The noise and flame produced with the expulsion of the fusible element are objectionable.

The object of my invention is to provide a fuse of a totally enclosed type which will utilize explosive forces generated on the volatilization of a fusible element to open a circuit protected thereby quickly and positively without undue noise or the production of a flame. This is accomplished by reducing to a minimum the volume of gas generated on the volatilization of the fusible element and providing chambers at each end of the fuse chamber to receive the blown parts of the fusible element and also permit the high pressure gases generated to expand without producing destructive forces. In addition the action of the gas generated in blowing the severed portions of the fusible element out of the fuse chamber is supplemented by magnetic forces.

What I consider to be novel and my invention will be better understood by reference to the following specification and appended claims when considered in connection with the accompanying drawing.

Fig. 1 is a side elevation partly in section and Fig. 2 is an end view of my improved fuse.

In Fig. 1 the fuse is indicated generally by the numeral 10. A fusible element 11 is shown which may consist of any of the well known fusible materials. The fusible element 11 is made relatively short to reduce to a minimum the amount of material which may be volatilized and also reduce the heat generated. Fusible element 11 is located in a fuse chamber consisting of tube 12 of insulating material with a liner 13 of insulating material, such as vulcanized fiber, having a high arc-resisting quality. The central bore of the fuse chamber is relatively small providing a very small clearance between the fusible element 11 and liner 13. The combination of the short fusible element 11 and the small bore of the fuse chamber reduces to a minimum the volume of gas generated by the volatilization of the fusible element. Two metallic supporting members or terminal casings 14 and 15 are provided connected to each end of the tube 12. Supporting members 14 and 15 have large central chambers 16 and 17 which communicate with the central bore of the tube 12 and are sufficiently large to permit the gas generated in the fuse chamber on the blowing of the fuse to expand and reduce the gas pressure to a safe value. Supporting members 14 and 15 are provided with cylindrical extensions 18 and 19 surrounding the ends of tube 12 to reinforce the tube and are secured to tube 12 by means of screws 20 inserted in threaded openings in extensions 18 and 19. Screws 20 have reduced extensions which enter holes provided in tube 12. Terminal wires 21 and 22 are connected to the opposite ends of the fusible element 11 and also to the supporting members 14 and 15. Thus supporting members 14 and 15 serve as the fuse terminals. Terminal wires 21 and 22 have tapered terminals which fit tapered openings in the supporting members 14 and 15 and are secured therein by means of nuts 23. Terminal wires 21 and 22 are looped within the chambers 16 and 17 to produce a magnetic field upon the occurrence of an overload in the circuit protected by the fuse to assist in the withdrawal of the terminal elements 21 and 22 and expulsion of the fusible element 11 from the fuse chamber. These looped ends also permit the portion of the terminal wires normally located in the central bore of tube 12 to withdraw into the chambers 16 and 17 without interference from the ends secured to supporting members 14 and 15.

To connect the two ends of the fusible element 11 to the terminal wires 21 and 22, connectors 24 are provided. Connectors 24 are substantially the same in outside diameter as the inside diameter of lining 13. Connectors 24 may be connected to the fusible element 11 and terminal wires 21 and 22 by soldering after the ends of the terminal wires and fusible element have been inserted into central openings therein. Upon the blowing of the fusible element 11 the gas generated is confined to a small area between the two connectors 24 which causes the production of a high pressure. Thus the connectors 24 in addition to serving to connect the fusible element 11 to terminal wires 21 and 22 act as baffles to enclose the space in tube 12 around fusible element 11. The two connectors 24 react to the generation of the gas as pistons being forced out of the tube 12 carrying

with them the terminal wires 21 and 22 into the chambers 16 and 17. Obviously connectors 24 are not necessary to make the connection between fusible element 11 and the terminal wires 21 and 22. Instead terminal wires 21 and 22 may be directly connected to the opposite ends of fusible element 11 as by soldering them thereto. To obtain the baffling action also performed by connectors 24 tubes or disks of insulating material or metal may be used and connected to the ends of fusible element 11. When the connectors 24 have been ejected into the chambers 16 and 17, the gas generated on the blowing of the fusible element 11 is permitted to expand into the large chambers 16 and 17. This permits the gas generated to expand sufficiently so that the pressure is reduced without the production of destructive forces. Also the chambers 16 and 17 cool the generated gases and prevent the establishment of an arc between the terminals in the supporting chambers. Connectors 24 also serve to reduce the amount of oxygen readily available at the point of severing of the fusible element so that the oxygen is quickly burned out increasing the difficulty of maintaining an arc which may be drawn as the severed portions of the fusible element separate. The supporting members 14 and 15 are made sufficiently strong to withstand the pressure that may be generated on the operation of the fuse. Because of the large volume of chambers 16 and 17 permitting the gas generated to expand, it is unnecessary to provide vents therein as has been generally found necessary heretofore. To permit of the replacing of the fuse, supporting members 14 and 15 are provided with plates 25 and 26 respectively which are secured thereto by bolts 27. Plate 26 is provided with a strap 28 in which an open end wrench 29 may be conveniently inserted for the ready removal of the plates 25 and 26.

From the foregoing it may be seen than a fuse is provided which utilizes the explosive forces generated on the volatilization of a fusible element to produce a quick acting positive fuse without an accompanying noise and flame. In addition the pressure produced by the generated gases is supplemented by magnetic forces produced by loops in the terminals connected to the fusible element which increases the rapidity of action of the fuse.

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

1. In combination, a fusible element, a tube of insulating material of small internal bore surrounding the fusible element and extending substantially beyond the ends of the fusible element, members forming enclosed chambers of substantial volume at each end of the tube communicating with the central bore of the tube, and means to connect the fusible element to electrical terminals.

2. In combination, a fusible element, a tube of insulating material of small internal bore surrounding the fusible element, supporting members forming enclosed chambers of substantial volume at each end of the tube, and terminal members connecting the fusible element to the supporting members whereby upon the blowing of the fusible element the gases generated in the tube may expand into the chambers without producing a destructive force.

3. A fuse comprising a fusible element, a tube of small internal bore surrounding said fusible element, supporting members forming enclosed chambers communicating with the central bore of said tube and having cylindrical extensions surrounding a portion of said tube, and terminal wires connected to the supporting members at one end and to the fusible element at the other end.

4. A fuse comprising a fusible element, a tube of insulating material of small internal bore surrounding said fusible element and extending a substantial distance beyond each end of the fusible element, supporting members forming enclosed chambers at each end of the tube communicating with the central bore of the tube and having cylindrical extensions surrounding and reinforcing the ends of the tube, and terminal wires connected at one end to the supporting members adjacent the point at which they are secured to the tube and connected at the other end to the fusible element.

5. In a fuse, a tube of insulating material relatively long as compared with its internal diameter, a fusible element located within the central bore of the tube and extending a short portion of the length of the tube, supporting members secured to each end of the tube and forming enclosed chambers communicating with the central bore of the tube and having cylindrical extensions surrounding and reinforcing the major portion of the tube, terminal wires connected at one end to the supporting members adjacent their point of connection to the tube, extending within the central bore of the tube and connected at the other end to the fusible element, and connectors surrounding the connection of the fusible element to the terminal wires and substantially filling the central bore of the tube.

6. In a fuse, a fusible element, a tube of insulating material of small internal bore and relatively large external diameter, supporting members secured to each end of the tube and having chambers communicating with the central bore of the tube and cylindrical extensions surrounding a major portion of the length of the tube, terminal wires connected at one end to the supporting members extending within the central bore of the tube and connected at the other end to the fusible element, and removable plates secured to the outer ends of the supporting members.

JOHN F. TRITLE.