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FILAMENT FUSE TUBE

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This invention relates to electric fuses and more particularly to fuses which are especially adapted to interrupt fault currents of substantial magnitude.

In electric cutouts and fuses having a fuse tube in which a fusible element is mounted, it is common practice to provide means for closing one end of the fuse tube for fault currents of a low order of magnitude and to construct such means so that it will yield upon the occurrence of fault currents of a high order of magnitude thereby to open both ends of the tube and release the high pressures generated therein due to the formation of high current arcs. The arc expulsion action for low current fuses is thus rendered effective due to the single vented effect and for high current cuts the device operates as a double vented fuse thereby to facilitate the quick release of high pressures built up within the tube and to aid in the prompt interruption of such high current arcs.

In cutouts and fuses of the aforementioned type there is a tendency for gases formed within the fuse tube during circuit interruption to escape to atmosphere at the closed end of the tube due to the fact that it is difficult to affix the tube hardware to the fuse tube in a gas tight manner. Such gas leakage may cause the tube hardware to be blown off of the fuse tube thereby destroying the fuse and endangering other apparatus and personnel.

A principal object of this invention is to provide an improved electric fuse in which the fuse tube is in effect formed on a part of the tube hardware in a gas tight manner and in which an internal sleeve is arranged so as to bridge the junction between the fuse tube and hardware and thereby to prevent pressure gas from within the tube from gaining access to the junction.

The invention in one form as applied to an electric power fuse comprises a metal sleeve having an irregular external surface on which a filament of insulating material is wound, and an internal tubular lining of fiber or other suitable material which extends through the filament wound tube and the metal sleeve so as effectively to bridge the junction therebetween. Preferably the filament is wound at an acute angle to the tube axis thereby to impart axial strength to the tube.

For a better understanding of the invention reference may be had to the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a side view of a conventional power fuse; FIG. 2 is an enlarged view of a portion of the lower end of the structure shown in FIG. 1; FIG. 3 is an enlarged detailed view of a portion of the upper end of the fuse tube shown in FIG. 1; and in which FIG. 4 is a view similar to FIG. 3 and is cross-sectionally in a metal sleeve on which a filament wound fuse tube is formed and inside of which is a liner is arranged to bridge the junction between the metal sleeve and the fuse tube to form a gas tight connection between the fuse tube and the terminal element.

With reference to FIG. 1, the numeral 1 designates a metallic base on which an insulator stack 2 is mounted by means of bolts 3. Also affixed to the channel base 1 is an insulator stack 4 which is mounted by means of bolts 5. Mounted to the left-hand extremity of the insulator stack 2 is the terminal structure generally designated by the numeral 6. Similarly, terminal structure generally designated by the numeral 7 is mounted on the insulator stack 4. As is well understood the circuit protected by the power fuse is connected to the terminals 6 and 7 respectively.

As is best shown in FIG. 3 the upper terminal 6 comprises a body portion 8 and a terminal portion 9. The terminal 6 is affixed to the insulator stack 2 by bolts 10. Affixed by bolt 11B to the terminal element 6 is a slelt hood 13. Mounted under the slelt hood and forming a part of terminal element 12 is a contact element 14 which is arranged to engage a magnetic loop 8A mounted on the body portion 8. Of course terminal element 12 is mounted atop fuse tube 15 and is held in engagement with loop 8A by latch 8B pivoted at 8C to body portion 8. A ring 16 is engageable by a hook stick to rotate the lever 11A counterclockwise about pivot 11. The right hand end of lever 11A engages the left hand end of latch 8B. Clockwise movement of latch 8B about pivot 8C permits contact 14 to disengage loop 8A. The tube 15 may then swing counterclockwise about the pivot 17 supported by jaws 18. It will be understood that slelt hood 13 is provided with prong like extensions 13A and 13B which are disposed on either side of the terminal element 12.

Mounted atop the fuse 12 and constituting a releasable closure is the internally threaded sleeve 19 and its releasable disc 20. Elements 19 and 20 form no part of the present invention but are disclosed in detail and claimed in Patent Number 2,903,538 issued September 8, 1959, and assigned to the assignee of this invention.

Disposed within the fuse tube 15 is a conventional fuse link 21 having a button head 22 at the upper end thereof.

According to the present invention means are provided for preventing the escape of gas between the fuse tube 15 and the terminal element 12 during a circuit interrupting operation. Such means may comprise a sealing element in the form of a metallic sleeve 23 having an irregular external surface 23A about which the filament formed tube 15 is wound and having its upper portion 23B externally threaded. Since the external surface 23A of metallic sleeve 23 is irregular the filament forms a snug engagement therewith thus providing a gas tight seal. In order to impart axial strength to tube 15 the filament 15A preferably is wound at an angle other than a right angle to the axis of the tube as indicated by X in FIG. 4. Disposed within the tube 15 and sleeve 23 is a liner 24 of gas evolving material which bridges the junction at 25 between the lower end of sleeve 23 and the inner surface of tube 15. Thus high pressure gas generated by the arc formed upon rupture of the fuse link 21 cannot escape at the junction 25.

In practice the method employed to form the above structure comprises first mounting the liner 24 about a rotatable cylindrical mandrel not shown. Thereafter the sleeve 23 is slipped over the liner and the filament 15A is wound by rotating the mandrel. During winding epoxy resin may be applied to the filament in aid in uniting the filament into a unitary structure. The filament preferably is of glass fiber.

While it is preferable to use a filament and a suitable bonding material to form the tube the invention is not limited thereto since the tube could comprise a solid or moulded substance of insulating material.

Terminal element 12 is then slipped over the metallic sleeve 23 and pinned to tube 15 by pins 26 and 27 in known manner. Nut 28 is then screwed down about the sleeve 23 into snug contact with terminal element 12. The fuse link 21 is inserted in a conventional fashion. The internally threaded sleeve 19 is then screwed onto the sleeve 23 until the disc 20 snugly engages the button head 22.

As is best shown in FIG. 2 the lower terminal struc-
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The supporting structure 30 is of conventional arrangement and constitutes a pair of spaced jaws which engage trunnions 17 pivotally mounted on the terminal structure 31 which in turn is secured to the lower end of the fuse tube 15 by pins 32.

For the purpose of arresting counterclockwise swinging movement of tube 15 and terminal structure 12 about trunnions 17 a suitable conventional snubber 33 is mounted on the terminal element 30 and cooperates with one of the trunnions 17.

Although not shown in the drawings the above trunnions 17 are formed on an element which is pivotally connected to terminal element 31 and which is normally held in its normal position by the fuse link 21 to which the pivotally mounted element is connected. Also a contact brush engages the pivotally mounted element and urges such element toward the left as viewed in FIG. 2. Thus when the fuse link 21 ruptures the pivotally mounted element is released and the tube 15 swings counterclockwise and down to its open position. Similar structure to that represented by FIG. 2 is shown in Patent 2,750,470 issued June 12, 1956, and assigned to the assignee of this invention.

While a particular embodiment of the invention has been described, the invention is not limited thereto and it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

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

1. An electric fuse comprising a hollow sleeve of conducting material having an irregularly configured exterior surface portion at one end and a threaded portion at the other, a hollow fuse tube formed of insulating filament wound on said irregularly configured surface portion and having one end coaxially disposed about said irregularly configured exterior surface portion of said sleeve, the irregular configuration of said sleeve in cooperation with said filament forming a secure junction between the fuse tube and sleeve, a separate liner of insulating material disposed within said fuse tube and sleeve and arranged to bridge the junction therebetween, bonding means for securing said filament into a sturdy unitary structure, a fuse link disposed within said tube and having a button head in electrical contact with the outer end of said sleeve, and a terminal element in electrical contact with said sleeve.

4. An electric fuse comprising a hollow tubular fiber liner, a hollow metallic sleeve of conducting material having an irregularly configured exterior surface portion and disposed about said liner, a glass filament wound about said liner and sleeve and forming a structural bond therebetween, epoxy resin intermingled with said filament and forming therewith a mass of substantial mechanical strength, a fusible element disposed inside said fiber liner and having a button head in electrical contact with the outer end of said hollow sleeve, and a terminal element electrically connected with said sleeve.

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