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1,934,244

FUSE LINK

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Fig. 1

Fig. 2

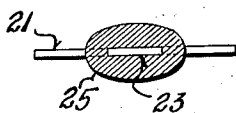
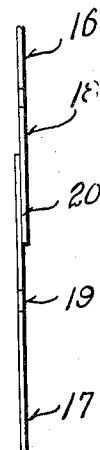
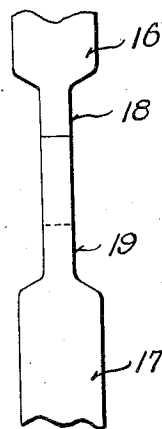
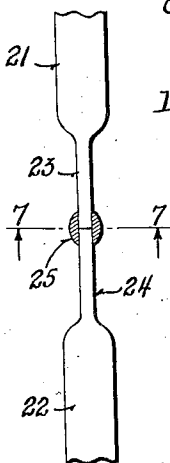
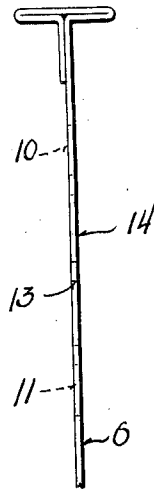
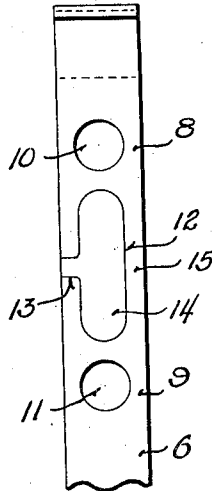
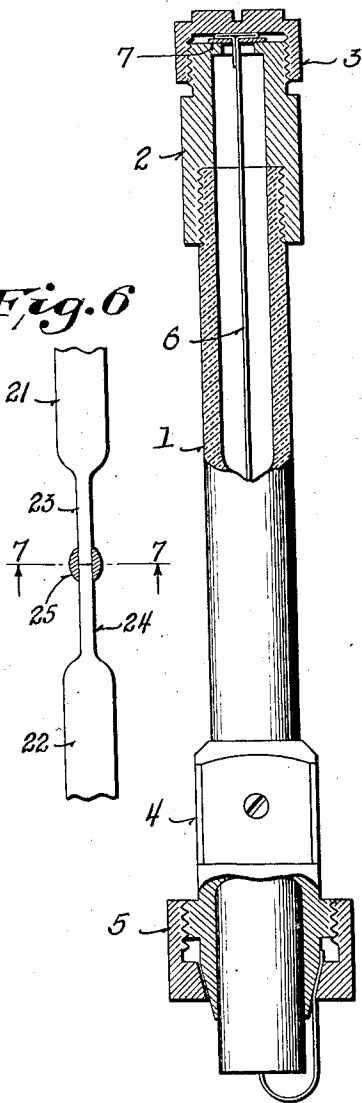
Fig. 3

Fig. 6

Fig. 4

Fig. 5

Fig. 7



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FUSE LINK

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4 Claims. (Cl. 200—135)

This invention relates to fuse links and is particularly directed to a fuse link for expulsion fuses.

Objects of this invention are to provide a fuse link which is responsive to short circuit or heavy overload, and which also is responsive to a small overload, in neither case causing excessive heating of the fuse tube.

In greater detail objects of this invention are to provide a novel type of expulsion fuse link which is so made that it will readily rupture for short circuit or heavy overload, and for small overloads will alter its condition and thereafter suddenly rupture without heating the fuse cartridge, thereby adapting one and the same type of fuse to both of these widely differing load conditions.

Further objects are to provide a fuse link a major portion of which is composed of a relatively high melting point material, and a minor portion of which is composed of a low melting point material, the low melting point material responding to low overloads and the high melting point material being of reduced section at spaced points so that it will respond to short circuit or heavy overload conditions.

Further objects are to provide a fuse link which is not fragile but which may be as easily handled as any other type of fuse link, which, although possessing the characteristics enumerated above, is nevertheless of simple construction and lends itself readily to quantity production.

A further object of this invention is to provide a fuse link construction in which only a small amount of readily fusible alloy or solder is used. The result of this is that there is a minimum amount of gas formed due to volatilization of the metal on the blowing of the link. It is a well known fact that the reduction of the amount of gas formed at the time the fuse blows increases the effectiveness of the fuse and prevents the prolongation of the arc.

Embodiments of the invention are shown in the accompanying drawing, in which:—

Figure 1 is a view, partly in section, showing the link in position in an expulsion fuse.

Figure 2 is a side elevation of the upper portion of the fuse link, such view being drawn to an enlarged scale.

Figure 3 is an edge view of the structure shown in Figure 2.

Figure 4 is a view of the upper portion of a modified form of fuse link.

Figure 5 is an edge view of the structure shown in Figure 4.

Figure 6 is a view, partly in section, showing a further modified form of fuse link.

Figure 7 is an enlarged sectional view on the line 7—7 of Figure 6.

Referring to Figure 1, it will be seen that the usual type of expulsion fuse has been shown as consisting of the fuse tube 1 of insulating material, an upper contact 2 provided with a clamping cap 3, and a lower contact 4 provided with a clamping ferrule or ring nut 5. The actual structure of the expulsion fuse is not the subject matter of this invention, as this invention is directed to the fuse link per se.

Referring to Figures 1, 2 and 3, it will be seen that the fuse link 6 is preferably threaded through an upper metal clip 7 and clamped in place by the clamping cap 3. It extends through the tube 1, loops around its lower end and is clamped to the contact 4 by means of the ring nut or ferrule 5.

Referring to Figures 2 and 3, it will be seen that the fuse link consists of some high melting point material, such as aluminum or copper. This material is preferably employed in the form of a ribbon and is provided with reduced upper and lower sections 8 and 9, each located adjacent the upper portion of the fuse link and preferably formed by producing apertures 10 and 11 in the fuse link.

Between the reduced sections 8 and 9 an aperture 12 is formed, and in the form chosen for illustration may be of oval shape. This aperture opens outwardly to the outer edge of one side of the fuse link, as indicated at 13. The aperture 12 and the continuation 13 thereof are filled with a low melting point alloy or other low melting point material, as indicated by the reference character 14. It is preferable to tin the fuse link at the edges of the aperture 12 and its continuation 13 to insure the sticking of the low melting point alloy to the body of the fuse link.

The principle of operation of this link is that at a predetermined value the heating due to the resistance of the link material, together with the reduced sections 8 and 9, will cause the flowing of the low melting point alloy 14. This operation takes place during relatively low overloads. When the low melting point material 14 flows, the remaining section of the link, indicated by the reference character 15, will quickly rupture as it is insufficient to carry the current.

This rupturing occurs very quickly and does not transmit an appreciable amount of heat to the walls of the fuse tube. Also any heat that is generated in the low melting point alloy prior

to its actual melting is not conducted to the main body of the fuse link, as the reduced sections 8 and 9 are themselves at a higher temperature than the main body of the fuse link, and prevent the cooling of the alloy material due to the conduction of heat away from such material.

From all of the causes enumerated above it is readily appreciated that the fuse link can be accurately gauged for any specific value of overload at which it will respond, and that the operation of the link is certain and reliable. Further, it is clear that undue heating of the fuse tube does not occur with this type of link.

Under severe overload conditions, as for instance short circuit conditions, the fuse link will rupture at the reduced portions 8 and 9.

With this form of link it is clear, therefore, that a wholly novel action is provided, as one portion of the link will rupture for small overloads, and as another portion or portions of the link will rupture for heavy overloads or instantaneous short circuit conditions.

Further, this link may be readily produced by quantity production methods, it is of simple construction, it is cheap to make, and may be as easily handled as any other type of expulsion fuse link.

A further form of the invention is shown in Figure 4 and 5 which is similar to the invention previously described. The fuse link is formed of upper and lower portions 16 and 17 of copper or aluminum, or other high melting point material as previously described, and these upper and lower portions are provided with upper and lower reduced sections 18 and 19 which are overlapped and are soldered together by a low melting point solder or alloy, as indicated at 20 in Figure 5, the adjacent face being previously preferably tinned. The reduced sections 18 and 19, it will be noted, are continuations of the upper and lower sections of the fuse ribbon. This fuse operates in a manner quite similar to that previously described.

Under short circuit conditions as only a small portion of the reduced sections 18 and 19 would have to rupture, it is clear that the action of the fuse would be very rapid. Under small overload conditions, it is clear that the heating of the reduced sections and of the soldered joint 20 would result in the melting of this solder. Consequently, the heat at the instant of melting of the reduced sections adjacent to or at this overlapped portion, and the fuse would consequently quickly rupture after previously melting the soldered joint.

Referring to Figures 6 and 7, it will be seen that the fuse link comprises upper and lower members preferably of ribbon like construction indicated by the reference characters 21 and 22. These members have reduced portions 23 and 24 arranged in abutting relation and joined by a small globule of solder or other fusible alloy or readily fusible material indicated by the reference character 25.

It will be seen that a simple type of expulsion

fuse link has been provided which has the very desirable characteristic of operating quickly and effectively both for small overloads and for violent overloads, such as those existing under short circuit conditions. Further, it will be seen that the action of the fuse during the time rupturing occurs is extremely rapid, and that the walls of the fuse tube are not unduly heated. Consequently the fuse tube is not injured when this type of fuse link is employed.

It is to be noted that the several fuse links forming the subject matter of this invention are so made that a very small amount of alloy or readily fusible material is employed. Consequently there is a minimum amount of gas due to the volatilization of the low melting point alloy at the time the fuse blows. The fuse consequently is very effective in its operation and the tendency for the arc to persist is greatly reduced.

It will be seen further that a fuse link constructed in accordance with this invention is easy to produce, is cheap to make, and is wholly reliable in operation.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A fuse link comprising an elongated ribbon like body portion of relatively high melting point material having upper and lower reduced sections, and having an intermediate cut out section, and a relatively low melting point material filling said cut out section, said reduced sections being located adjacent said intermediate section.

2. A fuse link comprising an elongated ribbon like body portion formed of relatively high melting point material having upper and lower reduced sections, and having an intermediate section provided with an aperture extending to one side edge of said fuse link, and relatively low melting point material filling the aperture in said intermediate section.

3. A fuse link comprising an elongated ribbon like body portion formed of relatively high melting point material and having an upper and a lower aperture formed therein thereby producing an upper and a lower reduced section, said fuse link having an intermediate aperture located between said upper and lower apertures, and a relatively low melting point material filling said intermediate aperture.

4. A fuse link comprising an elongated ribbon like body portion formed of relatively high melting point material and having an upper and a lower aperture formed therein thereby producing an upper and a lower reduced section, said fuse link having an intermediate aperture located between said upper and lower apertures, and a relatively low melting point material filling said intermediate aperture, said intermediate aperture extending to one side edge of said fuse link.

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