May 24, 1949. F. G. VON HOORN 2,471,176

TIME LAG FUSE LINK

Filed Oct. 28, 1947

Fig. 1.

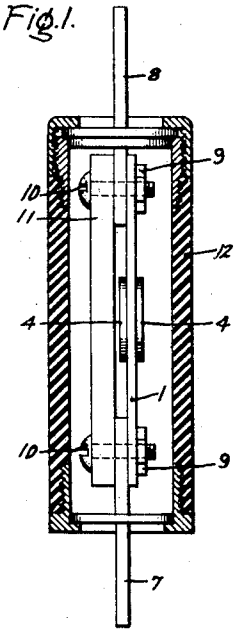


Fig. 2.

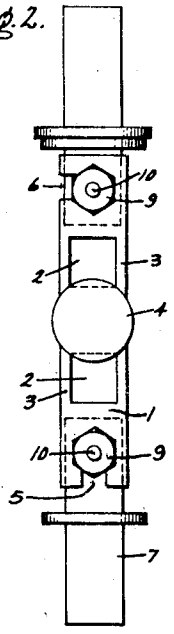


Fig. 3.

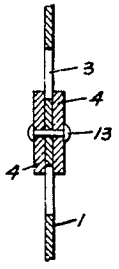


Fig. 4.

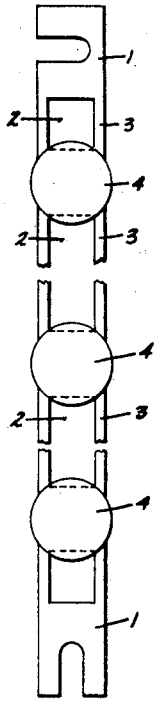


Fig. 5.

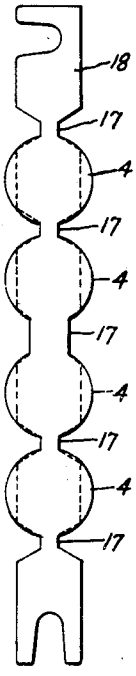


Fig. 6.

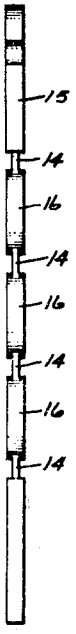
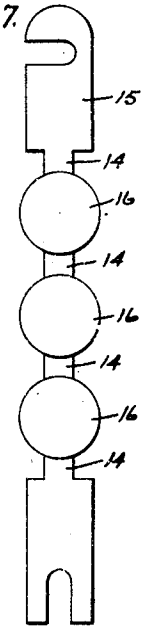


Fig. 7.



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TIME LAG FUSE LINK

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5 Claims. (Cl. 200—135)

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The present invention relates to electric fuse links, particularly fuse links of the time lag type. Still more particularly, the present invention relates to fuse links for enclosed cartridge type fuses.

It is an object of the present invention to provide an improved time lag fuse link having a plurality of fusible portions joined by portions of relatively large heat storage capacity. Such portions of large heat storage capacity tend, when the fuse is blown by large overload or short-circuit currents, to drop out of the link and to fall toward the bottom of the fuse cartridge. It is a further object of my invention so to shape such "drop-out" portions that they cannot become oriented within the fuse cartridge in such a manner as to shorten the arc path or to reestablish a current path between the fuse terminals after the fuse has once blown. It is a still further object of my invention so to shape the "drop-out" portions of the fuse link as to eliminate all corners on which an arc can "hang" and also to provide a blow-out action tending to extinguish any arc which may form when the fuse is blown. A still further object of my invention is to provide a fuse link having time lag features which makes an economical use of materials and labor and which can, therefore, be produced at a low cost.

The above and other objects of my invention will best be understood from the following description taken in connection with the accompanying drawing in which Fig. 1 is an elevation of my fuse link assembled in a renewable fuse cartridge structure, elements of the latter being shown in section; Fig. 2 is a plan view of my fuse link shown assembled in a fuse link supporting structure adapted to be inserted in a cartridge; Fig. 3 is a sectional view of a modification showing a different method of attaching heat storage members to the basic fuse link; Fig. 4 is a plan view of a modification of my fuse link having a plurality of heat storage members; Fig. 5 is a plan view of a further modification; Fig. 6 is an elevation of another modified form of link; and Fig. 7 is a plan view of the modification shown in Fig. 6.

Referring now to Figures 1 and 2, my improved fuse link comprises a basic link 1 preferably formed of a single strip of suitable fusible material having a uniform width and thickness throughout. The basic link has a plurality of perforations 2 punched in it, forming portions 3 of reduced cross section. Since these portions 3 heat up more rapidly, and therefore are the first to melt, they may also be designated as the fusible portions of the link. The perforations are preferably rectangular in shape with sides parallel to the edge of the strip. The portions of the link between the perforations may be termed connecting portions and have attached

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thereto centrally disposed disks 4 of greater surface area than the connecting portions which, by supplementing the heat storage capacity of the basic link, increase its time lag so that small overloads which do not last too long a time will not cause blowing of the fuse. The use of mass members between restricted portions of the link also insures the blowing of the link on short circuit in the restricted portions.

The use of heat storage members to supplement the heat storage capacity of a fuse link and thereby to increase its time lag is known in the art. According to the present invention, however, the heat storage elements 4 are made circular in shape. These supplementary heat storage elements, therefore, require only the simplest tools for their manufacture and furthermore require no particular orientation for assembly to the basic fuse link. In my preferred construction, moreover, no change need be made in the basic fuse link regardless of the size of the circular heat storage elements 4. When such disks 4 are assembled to a basic fuse link formed of a simple strip of uniform width and cross section, a fuse link most economical in manufacture is obtained.

My improved fuse link is adaptable for use in any type of fuse cartridge and is illustrated in the drawing as applied to a renewable fuse. For this purpose the ends of the fuse link are slotted at 5 and 6, whereby the link is readily clamped to the inwardly extending portions of terminal blades 7 and 8 by means of nuts 9 threaded onto bolts 10. The latter are not only secured to the inwardly extending portions of the blade terminals 7 and 8, but may also be used to fasten the latter to a bridge 11 of insulating material, whereby the fuse element may be assembled as a unit prior to being inserted in the cartridge 12. No special form of fuse link support or cartridge need be used with my improved link, but it should be observed that I prefer to make the width of my basic fuse link 1 the minimum width which is required to secure adequate bolted contact to the fuse terminals.

The heat storage disks 4 are preferably welded to the basic link 1. They may, however, if desired, be secured to the basic link in any other desired manner as, for example, by means of a rivet 13 shown in Fig. 3.

Instead of a single pair of fusible portions 3 and of disks 4 attached to the connecting portions as shown in Figs. 1 and 2, my improved fuse link may contain a larger number of fusible portions 3 and a large number of heat storage elements 4 as indicated, for example, in Figs. 4 to 7. The link of Fig. 4 is identical to that shown in Figs. 1 and 2, except for the provision of additional fusible portions 3 and additional connecting portions with attached heat storage

disks 4. The link in Fig. 4 is shown broken to indicate that any additional number of fusible portions and heat storage disks may be used as may be required for the current carrying capacity and time lag desired in the fuse.

Figure 5 shows a modification of my fuse link. In this case a basic link 18 is formed from a strip of fusible material of uniform width and cross section by cutting away portions from its sides to provide fusible portions. As shown, the strip 18 has notches 17 cut into its sides at spaced intervals. Discs 4 are attached to the link portions between the fusible portions as in the previous figures. The fusible portions may be of uniform width or may increase in width toward the center of the link as shown in the figure.

The fuse link in Figs. 6 and 7 is a modification in which the entire link is made of a single piece of material with fusible portions 14 formed by decreasing the cross sectional area of the basic link material 15 at a plurality of places. The terminal portions of the link are left of the original material thickness, as are the intermediate portions between the fusible portions 14. The intermediate portions 16 are, however, shaped into disks with their axes perpendicular to the plane of the link. The disk-shaped elements 16 accordingly act in the same manner as the disks 4 of Figs. 1 to 5.

My disk-shaped heat storage members have additional advantages over other forms of heat storage members heretofore used in the art. Since the disk-shaped members are located between fusible portions of the fuse link, such as the portions 3, 17 or 14, they will tend to drop out of the link and fall to the bottom of the fuse cartridge when the fuse is blown. By virtue of the circular shape of these drop out elements, their longest dimension is already included in the current path through the original fuse link. Therefore, no matter how the circular drop out elements may turn during their fall to the bottom of the fuse cartridge, it is impossible for the arc path to be shortened or the metallic path between the fuse terminals to be reestablished by the turning of the disk members after blowing of the fusible sections. This characteristic not only tends to reduce the burden on the enclosing cartridge and thereby to lengthen its life, but also increases the over all factor of safety of the fuse. Moreover, since the drop out elements are of circular shape, they are not likely to catch one upon the other and have no corners to prevent turning or to cause jamming in the fuse cartridge, but on the contrary, they are free to fall away rapidly and positively and to roll or slide to the bottom of the cartridge with the maximum speed.

A further feature of my improved fuse is that arcs formed between adjacent disks have no corners on which to hang and in consequence the arcs are free to move out along the periphery of the disk in response to magnetic and thermal influences always present when currents of high magnitude are interrupted in fuse enclosures. This feature effects a blow-out action not unlike that developed in the curved arcing horns of air circuit breakers. The result is to produce a faster interruption of the circuit than is otherwise possible.

While I have shown and described particular

embodiments of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from my invention in its broader aspects and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

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

1. A fuse link comprising a basic fuse link element having a plurality of fusible portions in series joined by connecting portions, each of said connecting portions having attached thereto one or more circular disks of metal large enough to cover said connecting portions.

2. A fuse link comprising a basic fuse link member formed of a straight sided strip of fusible material of uniform width and cross section and having some material excised therefrom at a plurality of spaced points, the portions of the strip remaining at the excisions forming fusible portions and the portions of the strip between the excisions forming connecting portions joining said fusible portions, and at least two adjacent connecting portions having attached thereto for providing additional heat storage capacity one or more metallic circular disks of at least as great a face area as the area of the connecting portion to which the disks are attached.

3. A fuse link having between its ends a plurality of fusible portions joined by metallic connecting members, at least two adjacent connecting members being circular in their largest surface dimensions and being joined to the fusible portion between them at a curved periphery, said members further having greater thickness and greater heat storage capacity than the fusible portion between them.

4. A fuse link including at least two heat storage members shaped as circular disks and joined edgewise by a fusible portion of the link, said portion having a restricted length and cross-section and being of lesser thickness than said members, whereby the opposed circularly curved edges of said members act as arc extinguishing gaps when said fusible portion fuses.

5. A fuse link comprising a basic fuse link member formed of a strip of fusible material and having a plurality of fusible portions of reduced cross section joined by connecting portions, at least two adjacent connecting portions having attached thereto for providing additional heat storage capacity, one or more circular disks having an electrically conductive periphery and having a diameter larger than the width of the connecting portion of the basic fuse link member to which it is attached.

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Certificate of Correction

Patent No. 2,471,176. May 24, 1949.

FRED G. VON HOORN

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 28, for the words "face area" read *surface area;*

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent office.

Signed and sealed this 22nd day of November, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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