Oct. 28, 1958 E. W. SUGDEN 2,858,396

ELECTRIC FUSES

Filed March 5, 1956

FIG. 1.

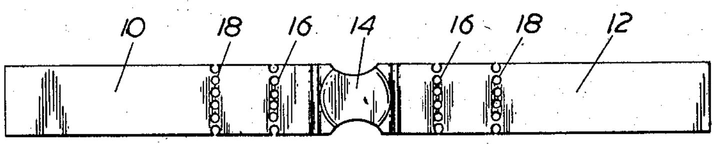
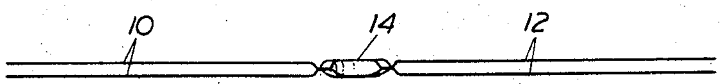


FIG. 2.



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ELECTRIC FUSES

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2 Claims. (Cl. 200—135)

This invention relates to electric fuses, and more specifically to bi-metallic fuse links comprising a pair of high melting point elements in the form of strips arranged end to end and connected together by a low melting point element.

The use of two metals in the link gives protection against two kinds of overload. The low melting point element is designed to fuse on prolonged moderate or small overloads while the high melting point elements are designed to fuse on heavy overloads of short duration.

It has been customary to provide portions of reduced cross-section in the high melting point elements, for example by notching the elements or by punching holes in them. The provision of these portions of reduced cross-section ensures that fusion of the high melting elements on the occurrence of a heavy overload takes place at predetermined points along the elements. Another beneficial effect is that the increased resistance offered to the current flowing through the link increases the amount of heat supplied to the low melting point element, which can thus be made to fuse at a lower overload than it would otherwise do.

We have now found that the low melting point element clears the circuit in which the fuse link is placed more satisfactorily if the high melting point elements have as uniform a temperature distribution as possible and do not therefore, have portions of reduced cross-section. But the advantage gained by using high melting point elements without such portion is, of course, offset by the fact that the high melting point element does not fuse at predetermined points on the occurrence of heavy overloads.

It is therefore an object of the present invention to provide a fuse link having high melting point elements provided with portions of reduced cross-section which, however, do not prevent the low melting point element from clearing the circuit on fusing almost as effectively as if the high melting point elements had no portions of reduced cross-section.

Another object of the invention is to provide the high melting point elements of a bi-metallic fuse link with narrow portions of low cross-sectional area which do not increase unduly the resistance of the link to the current flowing through it.

A further object of the invention is to provide a fuse link wherein the arc which occurs when one or more of the high melting point elements are fused is spread out across the element and is not concentrated on one or two particular points of the element.

Yet another object of the invention is to provide a fuse link which is highly successful when embedded in arc-quenching powder.

According to the invention, the high melting point elements have narrow portions extending across them of reduced cross-section, the width of these portions being dependent on the rating of the fuse link and being substantially only as great as is necessary for an adequate

gap to be formed in the high melting point elements on their being fused.

The portions of reduced cross-section are formed by providing one or more rows of small holes in the elements.

As an example of the actual width of the portions of reduced cross-section, an 100 amp. fuse link operates very effectively if the said portions are formed by providing one or more rows of holes having a diameter of about 1/16 inch.

In order that the invention may be thoroughly understood, a fuse-link in accordance with it will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of one of the fuse links; and

Figure 2 is a side elevation of the fuse link shown in Figure 1.

The fuse link shown in Figures 1 and 2 is rated at 100 amp. and comprises two pairs of parallel strips of high melting point **10, 12** arranged end to end and connected together by an element **14** of low melting point. The high melting point strips **10, 12** are made of tinned copper and the low melting point element **14** is made of a tin-lead alloy.

Each copper strip **10, 12** is provided with two rows of holes **16, 18** extending across it. The width of the strips is about 0.43 inch and the diameter of the holes is about 0.0625 inch. The holes in each row lie very close to each other with only about 0.016 inch of metal separating adjacent holes, so that each row comprises at least four complete holes. The inner row of holes **16** in each strip lies about 0.23 inch from the lead-tin alloy element **14**, while the outer row of holes **18** in each strip lies about 0.60 inch from the said element.

The cross-sectional area of the copper strips **10, 12** measured along the line joining the centres of the holes in any one of the rows of holes **16, 18** is very small compared with the normal cross-sectional area of the strips. At the same time, these portions of reduced cross-section only extend a very small distance (about 0.0625 inch) along the length of the strips. Thus, a low cross-sectional area at these portions is obtained with minimum increase in the resistance of the link to the current flowing through it.

A further advantage provided by the link described above is that the arc which occurs when one or more of the high melting point elements **10, 12** are fused is spread out across the element along the row of holes **16, 18**, and is not concentrated on one or two particular points of the element as is the case in elements having only a single, comparatively large hole punched therein or a single neck formed by notching the edges of the element. This advantage is of particular value if the fuse link is embedded in arc-quenching powder.

It will thus be seen that, in accordance with the invention, the width of the portions of reduced cross-section in the high melting point strips **10, 12** is substantially only as great as is necessary for an adequate gap to be formed on fusion of the strips.

I claim:

1. An electric bi-metallic fuse link comprising a first metallic strip member of high melting point, a second metallic strip member of high melting point arranged end on to said first metallic strip member, said strip members being out of direct contact with each other, a third metallic element of low melting point connecting said first and said second strip members together, at least one straight row of small circular apertures extending across each of said first and second strip members approximately at right angles to the longitudinal axes of said strip members, said apertures each having a diameter not exceeding 0.0625 inch with each of said apertures being

spaced from adjacent apertures by a distance not exceeding 0.016 inch, said rows of apertures being displaced from said third metallic element of low melting point, and each of said rows of apertures having at least four complete apertures.

2. An electric fuse link having a rating not exceeding 100 amps., comprising a first copper strip member having a uniform cross-section for the greater part of its length, a second copper strip member substantially identical to said first copper strip member, a lead-tin alloy plug-shaped member connecting said copper strips together in end-to-end relationship without said strip members being in direct contact with each other, at least one straight row of small circular apertures extending across each of said copper elements approximately at right angles to the longitudinal axes of said copper elements, said apertures each having a diameter not exceeding 0.0625 inch with each of said apertures being spaced from adjacent apertures by a distance not exceeding 0.016 inch, said rows of apertures being displaced from said third metallic element of low melting point, and each of said rows of apertures having at least four complete apertures.

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