

Oct. 11, 1955

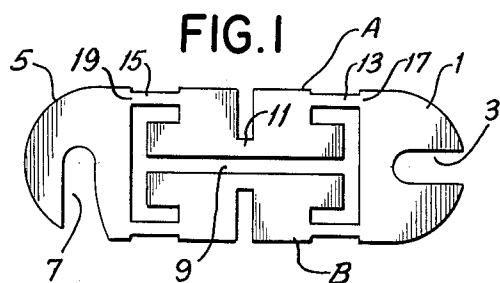
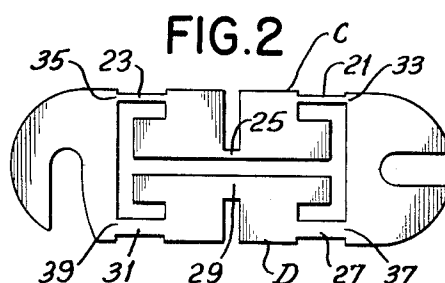
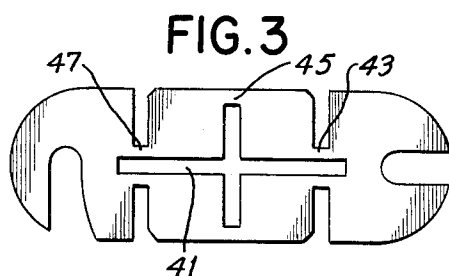
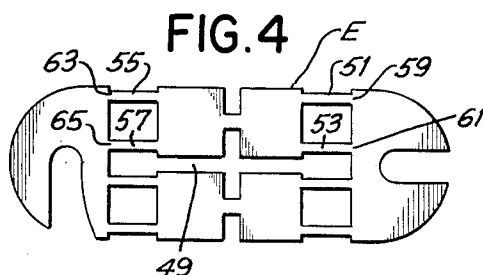
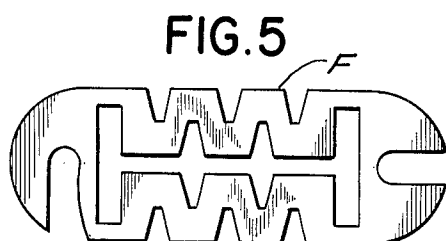
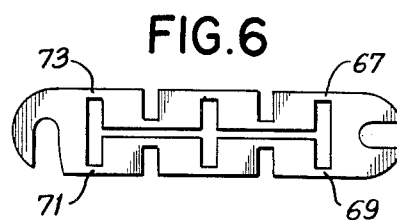
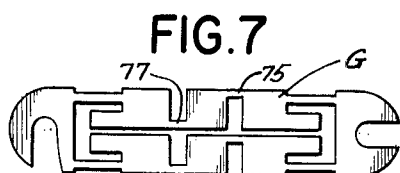
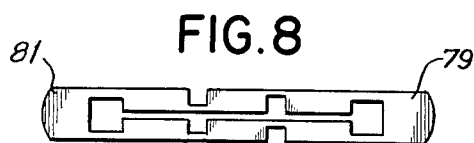
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**2,720,567**

## CARTRIDGE FUSE FUSIBLE ELEMENT

Filed May 15, 1953

2 Sheets-Sheet 1



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CARTRIDGE FUSE FUSIBLE ELEMENT

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2 Sheets-Sheet 2

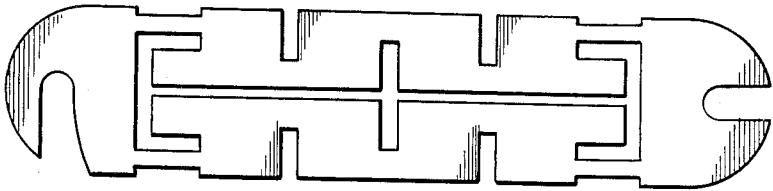


FIG. 9

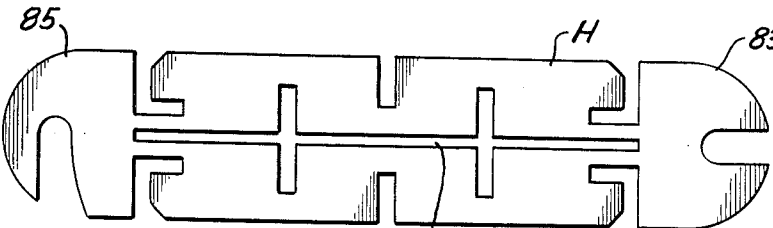


FIG. 10

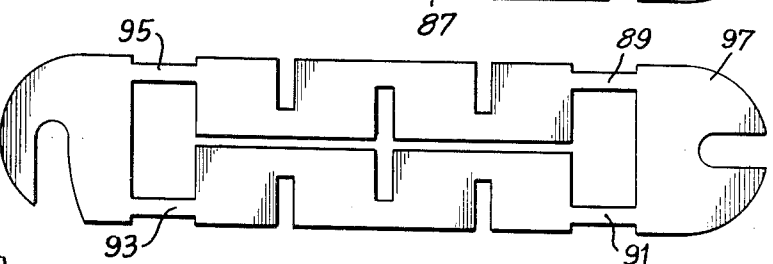


FIG. 11

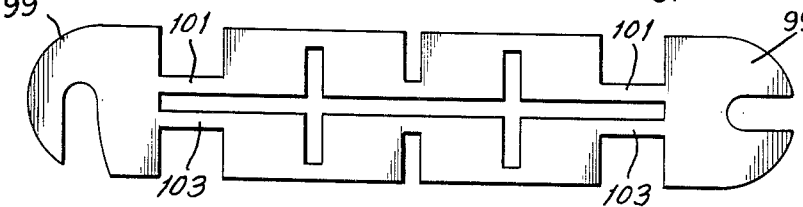


FIG. 12

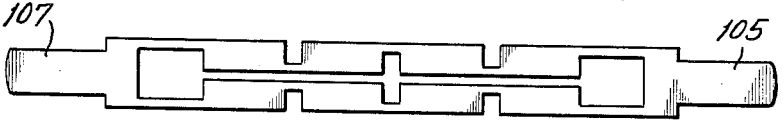


FIG. 13

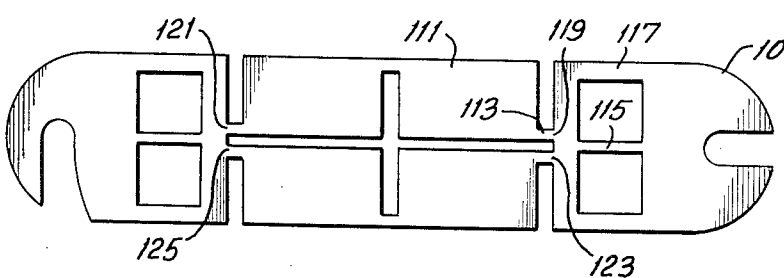


FIG. 14

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2,720,567

## CARTRIDGE FUSE FUSIBLE ELEMENT

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2 Claims. (Cl. 200—135)

This invention relates to electric circuit breakers, particularly thermal current breakers, and more especially to the fusible elements such as are used in the well known renewable cartridge type fuses.

Those acquainted with well known cartridge type electric fuses are well aware of the difficulty which is experienced in large manufacturing plants in always having available a fusible element or link of the desired carrying capacity. In order to be certain to always have a link of the desired carrying capacity, it is necessary to carry in stock one of each of a very large number of different links.

A principal object of this invention is to provide fusible links of such construction that each link may serve as a link of three different carrying capacities. By the use of such links, the number of links which must be carried in stock will not be greater than one-third the number now required to be carried in stock.

Another object of the invention is to provide a fusible link of the type specified that, in addition, will more effectively dispose of the heat generated in normal operation of the fuse in which it is inserted.

Other objects and advantages will appear as the description of the particular physical embodiment selected to illustrate the invention progresses and the novel features will be particularly pointed out in the appended claims.

In describing the invention in detail and the particular physical embodiment selected to illustrate the invention, reference will be had to the accompanying drawings and the several views thereon, in which like characters of reference designate like parts throughout the several views, and in which:

Figures 1 to 14 inclusive are plan views of fusible elements or links embodying my invention. Figs. 8 and 13 illustrate ferrule type cartridge fuse links, whereas the other views illustrate knife blade cartridge fusible links.

Fig. 1 illustrates a relatively thin sheet like piece of metal, preferably zinc, forming a fusible element suitable for insertion in a knife blade cartridge type fuse.

The device of Fig. 1 has an end 1 which is provided with a slot 3 for insertion under the usual bolt head for attaching the fusible link to the tang end of a knife blade. The end 5 is also provided with a slot 7 which is for the purpose of inserting the end 5 under the usual bolt head for attaching the fusible link to the tang end of a knife blade.

The material of the fusible element or link between the ends 1 and 5 is provided with a suitable longitudinal central slot 9.

On each side of the longitudinal central slot 9 the material of the link is formed into heat absorbing and heat disruptable sections. On one side of the longitudinal slot 9 is a reduced section or blowing section 11 and the material on one side of the longitudinal central slot is attached to the ends 1 and 5 by the reduced sections 13 and 15.

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From an inspection of Fig. 1, it will be seen that if the current flows from end 1 to end 5 it will flow a tortuous path, that is, through reduced section 13 and then through reduced section 11 and then through reduced section 15 to end 5. This tortuous path brings into play the utmost in heat absorbing efficiency of the material. It also brings at least one of the hottest points of the fusible element to the center, adjacent the longitudinal slot and removed from the surrounding cartridge in which it would be used so that, to that extent, the heat does not operate directly upon the material of the cartridge which is generally horn fibre and which will become carbonized by continuous exposure to a very high temperature.

The material of the link embodying the blowing sections 11, 13 and 15 on one side of the longitudinal central slot 9, may be considered as a sub-link designated A. On the other side of the central longitudinal slot 9 is another sub-link B. These sub-links are both shown as identical in Fig. 1 and are so constructed as to be of equal carrying capacity. If the fusible element or link, as a whole, has a continuous carrying capacity of 100 amperes then sub-link A could have a continuous carrying capacity of 50 amperes and sub-link B could have a continuous carrying capacity also of 50 amperes. With the fusible element so constructed, when used as a whole, it will have one carrying capacity, but if the material on one side of the longitudinal central slot is disposed of by cutting as at 17 and 19, there would be left only the sub-link B and the fusible element as a whole would only have one-half the carrying capacity than it had, before sub-link A was severed, so that one link, as illustrated by Fig. 1, may serve for cartridge fuses of two different capacities.

Fig. 2 illustrates a fusible link identical with the fusible link illustrated by Fig. 1 except that the carrying capacity of sub-link C is different from the carrying capacity of sub-link D. The link of Fig. 2 has the reduced portions 21 and 23 connecting the ends of the intermediate material of the link and these reduced sections together with reduced section 25 is less carrying capacity than that of reduced sections 27, 29 and 31 of sub-link D.

The link, such as Fig. 2, may be made with the carrying capacities of the sub-links quite widely different, for instance, the whole link might have a carrying capacity of 200 amperes of which 75 amperes would be carried by sub-link C and 125 amperes by sub-link D.

If one has a fuse link like that shown by Fig. 2, and of the carrying capacity specified, then one could use it as a 200 ampere link, or by severing the sub-link C at the lines 33 and 35 it could function as a 125 ampere link, whereas by severing it at the lines 37 and 39 it could function as a 75 ampere link. A link such as that shown in Fig. 2 could be carried in stock and used as a whole to refill a cartridge fuse in which a 200 ampere link had been destroyed or to refill a cartridge fuse in which a 75 ampere link had been destroyed, so that, by having one link in stock, it would be possible to replace any one of three particular specific fusible links.

The device illustrated by Figs. 1 to 8 inclusive are intended to illustrate 250 volts renewable links. Each of these links embodies characteristics which enable them to be used either as a single definite carrying capacity link, or a link made up of two sub-links each of which has the same carrying capacity, or a fuse made up of two sub-links each having a different carrying capacity. That is, the blowing or melting point of the several fuse links on one side of a longitudinal center line may be the same as the blowing or melting point of the sub-links on the other side of the longitudinal central slot, or may be different.

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The construction of Fig. 3 is readily apparent from the drawing. It, like all of the views, Figs. 1 to 7 inclusive, is constructed for attachment to the tangs of knife blade and is provided with the characteristic longitudinal central slot 41 and the blowing points as 43, 45 and 47 are arranged so that the current must travel a tortuous path.

The fusible link as shown in Fig. 4 has the intermediate section of the material of the link on one side of the longitudinal central slot 49 connected with the ends by two reduced sections at each end, as 51, 53 at one end, and 55 and 57 at the other end. In severing the material of one sub-link as E from the ends it will be necessary to cut along two lines at each end as along lines 59 and 61 and 63 and 65. It is also to be observed that the sub-link E may be severed not only along the lines as 59 and 61 and 63 and 65 so that the entire sub-link E may be detached, but severance may be had at 59 and 63 only so that if the sub-link on one side of the longitudinal slot is of different carrying capacity than the sub-link on the other side of the longitudinal slot, four different carrying capacities of the link may be obtained.

Fig. 5 illustrates a fuse link in which the tortuous path of the current is accentuated by making the material of the sub-link F between the ends tortuous.

The fusible link as shown by Fig. 6 is quite similar to that as shown by Fig. 3, except that the reduced sections connecting the intermediate portions of the link to the end are at the other edge as 67, 69, 71 and 73 instead of adjacent the longitudinal central slot 41 as in Fig. 3.

Fig. 7 is very similar in construction to that shown in Fig. 1, but in Fig. 7 each sub-link as G has two intermediate blowing points as 75 and 77 instead of one, such as 11, in Fig. 1.

Fig. 8 illustrates the principle of my invention as applied to a fusible link for a ferrule type cartridge fuse. In this form, the ends 79 and 81 are plain as they are adapted, as is well understood, to pass through slots in washers at the ends of the fuse and then be bent over against the washer and be held in place by the well known end cap or ferrule.

The forms shown in Figs. 9 to 14 inclusive are especially designed for 600 volt cartridge type fuses. The form shown in Fig. 9 corresponds to the type shown in Fig. 7.

Fig. 10 illustrates a form of fusible link in which the diminished cross section blowing point connecting the intermediate portions of the fusible link, that is the sub-link H with the ends 83 and 85 are adjacent the longitudinal central slot 87 and are longer than the corresponding reduced section, as 43, as shown in Fig. 3.

Fig. 11 illustrates a fusible link in which the blowing point or portions of diminished cross section 89 and 91, 93 and 95 are adjacent the outer edge of the end portions 97.

Fig. 12 illustrates a form somewhat similar to Fig. 10, but omits any material between the intermediate portion of the fusible element and the ends 99, except the reduced sections 101 and 103.

Fig. 13 illustrates a fusible link suitable for a ferrule type cartridge fuse so that it has plain ends 105 and 107.

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Fig. 14 illustrates another form of fusible element in which, between an end as 109 and an intermediate section as 111, there are really three blowing points as 113 and 115 and 117, but when the fuse is to be converted from a maximum carrying capacity to a lower carrying capacity a sub-link is detached along the lines 119 and 121 or along the lines 123 and 125. This link shown by Fig. 14 by various cuttings may be made to serve as a link of very much varied carrying capacity because not only may the severing be along the lines 119 and 123, but 117 may be severed or 115 may be severed, and a combination of cuts may be made including 115 and 117 and 119 and 123 all at one end of the link and by making comparable severings at the other end of the link a very large number of carrying capacities may be produced.

From the hereinbefore given description it will now be understood that each of the fusible links illustrated is so constructed that the electric conducting path there-through is a tortuous path and that each of the links embodies a central longitudinal slot upon both sides of which there is a sub-link and that these sub-links may be the same or different carrying capacities and that either one or the other may be detached so that each link has a potential triple carrying capacity.

Although I have particularly described a preferred physical embodiment of my invention and modified forms thereof, nevertheless, I desire to have it understood that the forms selected are merely illustrative, but do not exhaust the possible physical embodiments of the idea of means underlying my invention.

What I claim as new and desire to secure by Letters Patent is:

1. A fusible link in sheet form formed with ends for mounting in a cartridge type fuse, the portion between the ends formed with a longitudinal central slot, the material of the link on each side of the slot formed with longitudinally spaced portions of reduced section arranged in a tortuous path, each end on each side of the longitudinal central slot being connected to the intermediate material by a reduced section, the reduced sections on opposite sides of the longitudinal central slot being of different cross sections.

2. A fusible link in sheet form formed with ends for mounting in a cartridge type fuse, the portion between the ends formed with a longitudinal central slot, the material of the link on each side of the slot formed with longitudinally spaced portions of reduced section, each end on each side of the longitudinal central slot being connected to the intermediate material by a reduced section, the reduced sections on opposite sides of the longitudinal central slot being of different cross sections.

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