Nov. 29, 1949 G. RENSNER 2,489,501

FUSE LINK

Filed May 30, 1945

Fig. 1

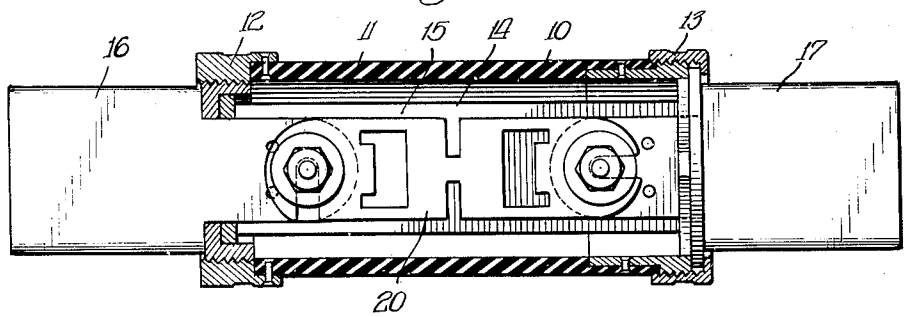


Fig. 2

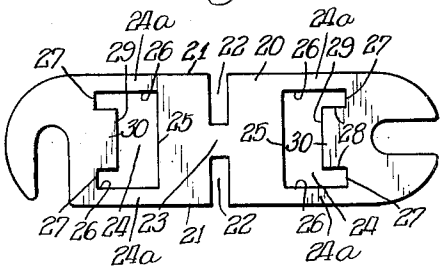


Fig. 3

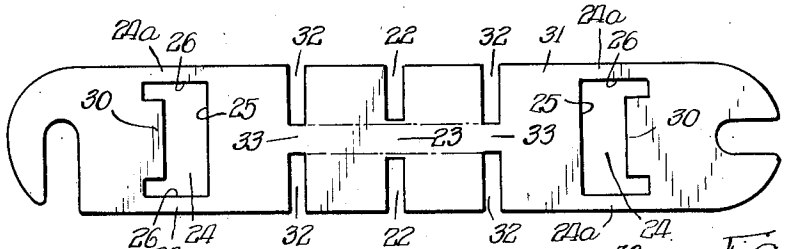


Fig. 4

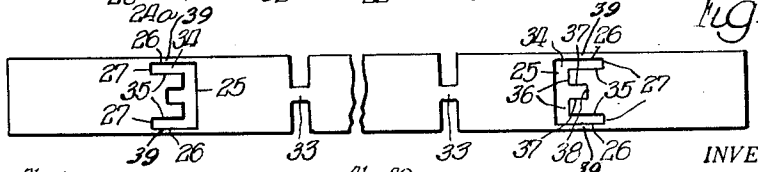
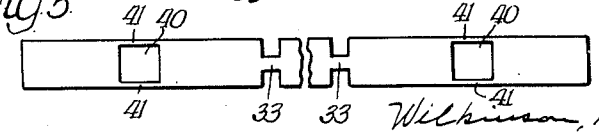


Fig. 5



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FUSE LINK

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8 Claims. (Cl. 200—135)

1

The present invention relates to improvements in fuse links.

A fuse link has the function of protecting the circuit in which it is located against abnormal conditions, among which are those resulting from an abnormal rush of current due, for example, to a short circuit. Another of the conditions against which the fuse link should protect its circuit is a condition of overload. Of course, it is more or less common to overload an electric circuit for a short period of time, as for example when motors are being started and before the counter E. M. F. thereof builds up to limit the rush of starting current. A fuse link, to be practical, should therefore not blow upon a reasonable overload for a short period of time, though it should blow if such an overload should continue for a longer period.

Experience has shown that under short-circuit conditions a fuse will blow at the regions of least conductivity. Under conditions commonly referred to as overload conditions, heat due to abnormal current flow is dissipated to the relatively cool terminals of the fuse, and fusing action usually occurs at a mid point in the fuse even though this mid point is not the region of least conductivity.

Many attempts have been made to provide fuses for adequately protecting an electric circuit under both short-circuit and overload conditions, and the present invention has for one of its objects the provision of a fuse link which will give improved action under short-circuit and/or overload conditions and at the same time provide improved mechanical strength.

A further object is to provide a renewable fuse link which combines relatively sturdy construction with the advantage that under conditions approximating a short circuit an intermediate portion of the fuse will drop out with the production of a minimum of gas.

A further object is to provide an improved fuse link of relatively sturdy construction in which fusing action is delayed under overload conditions for a short period of time, with the advantage that the fuse will blow with the formation of a minimum of gas either under overload conditions or short-circuit conditions.

A further object is to provide an improved fuse link well adapted to meet the needs of ordinary service.

Further objects will appear as the description proceeds.

Referring to the drawings:

Figure 1 is a sectional view illustrating a cartridge fuse including a removable element having a renewable fuse link embodying the principles of the present invention;

Figure 2 is a view of the renewable fuse link of

2

Figure 1 shown separated from the remainder of the structure of Figure 1;

Figure 3 is a plan view of a modified form of the fuse link shown in Figures 1 and 2; and

Figures 4 and 5 illustrate other modifications.

The numeral 10 indicates a cartridge, which is a receptacle closed except for a tortuous passageway for the escape of gases. The particular cartridge chosen for illustration is described and claimed in the application of Messer and Davis Serial No. 596,636, filed May 30, 1945, which application has become abandoned, and need not be described in detail herein. Said cartridge includes the cylindrical member 11, which has secured thereto at one end the closure member 12. Located at the other end of the cylindrical member 11 is the collar member 13, a portion of which is removable to permit the assembly and disassembly of the removable element 14.

Said removable element 14 includes a strut 15 of non-conducting, non-inflammable material, which is adapted to firmly support terminals 16 and 17 of copper or other electrical conducting metal. Extending through said strut and through extensions of said terminals are the binding posts 18 and 19 for releasably securing the fuse link 20.

According to the disclosure in Figure 2, the two extremities of the fuse link 20 will be slotted, whereby an unblown fuse link may be readily secured to the terminals 16 and 17 and whereby the extremities of a blown fuse link may be readily released from said terminals. The end portions of the fuse link should have good electrical and thermal communication with the terminals 16 and 17.

The particular embodiment of the present invention chosen for illustration in Figure 2 comprises the elongated link 20 having side edges 21—21 parallel with each other, which edges, however, are provided with notches 22—22 defining a restricted portion 23 located symmetrically with respect to the length of the link 20 and preferably, though not necessarily, disposed symmetrically with respect to the width of said link. The link will preferably be of uniform thickness throughout its length.

Located in symmetrical relationship with the notches 22—22 are the openings 24—24 providing restricted portions 24a—24a of relatively great length compared to the restricted portion 23. Each of said openings 24—24 may be described as being of U-shape, the base lines 25—25 thereof being disposed preferably in right-angular relationship with the edges 21—21 of the link. The lines 26—26 of the openings 24—24 are preferably disposed in parallel relationship with the edges 21—21 and the lines 27—27 of each opening 24 are preferably in alignment with each other and in parallel relationship with the corresponding

lines 25. The lines 26—26 of each opening are preferably parallel with the lines 26—26 and equally spaced from said lines 26—26. The line 29 of each opening 24 is preferably parallel with the corresponding line 25. The U-shape of each opening 24 provides the projection 30, which constitutes a bulk of metal provided for the purpose of reducing overheating under overload conditions. Though each opening 24 has been described as U-shaped in contour, modifications of this contour may be used provided they include restricted portions of relatively great length, whereby when said sections fuse there is no danger of arcing over, which might otherwise occur under short-circuit conditions.

The construction has the advantage with respect to overload conditions that the bulk of the fusible metal provided by the projections 30—30 expedites the dissipation of heat from the mid portion of the fuse link toward the extremities and to the terminals 16 and 17, whereby overheating is prevented for a reasonable length of time to prevent the blowing of the fuse link under overload conditions of short duration.

Expressed in other language, under short-circuit conditions a fuse link will blow at the regions of least conductivity, to wit—the elongated strips 24*a* bounded by the lines 26—26 of the openings 24—24, there being no sufficient opportunity for the dissipation of heat to the terminals 16 and 17. Accordingly, under short-circuit conditions the mid portion of the fuse link of Figure 2 will drop out with a minimum of gasification. Under overload conditions of short duration, heat will be dissipated to the relatively cool terminals, the projections 30—30 reducing overheating during these conditions, and after a reasonable length of time fusing will occur at the restricted portion 23 midway of the length of the link.

The construction illustrated in Figure 3 embodies the fundamentals discussed in connection with Figure 2 and provides additional restricted portions located symmetrically with respect to the restricted portion 23 disposed midway of the length of the link. The link illustrated in Figure 3 bears the numeral 31. It also has parallel side edges, the notches 22—22, the central restricted portion 23 and the openings 24—24 disposed in symmetrical relationship with the portion 23. Disposed symmetrically with respect to the notches 22—22 are the notches 32—32 defining the restricted portions 33—33, preferably disposed symmetrically with respect to the width of the link 31 and preferably disposed symmetrically with respect to the restricted portion 23 considered longitudinally of the link 31. Said restricted portions 33—33 are preferably narrower than the restricted portion 23 and each has lower electrical conductivity than the restricted portion 23, but preferably has higher electrical conductivity than the pair of strips 24*a* defined by the lines 26—26 of each opening 24.

The construction illustrated in Figure 3 has the advantage that it presents added opportunities for dropping out the mid portion of the link under short-circuit or approximate short-circuit conditions. Not only may the fuse link blow at the restricted portions 24*a*, but in the event of a particularly heavy rush of current the fuse link may blow at the restricted portions 33—33 located closer to the mid point of the fuse link.

Figures 4 and 5 illustrate further modifications of the structure illustrated in Figure 3. Figures 4 and 5 are illustrated with end portions suitable for use in the common form of ferrule fuse. It will be understood, of course, that the structure of the end portions for connection to the terminals of a fuse may be chosen as desired.

Referring to Figure 4, the openings adjacent to the end portions take a shape which may be referred to as a letter E as observed from one side or the other of the fuse link. These openings are indicated by the numerals 34—34. Said openings 34—34 are bounded by the lines 25—25 similarly to the openings 24—24 in the embodiments illustrated in Figures 2 and 3. Said openings are also bounded by the lines 26—26, 27—27, similarly to Figures 2 and 3. Communicating with the inner extremities of the lines 27—27 are the lines 35—35 which extend parallel with the lines 26—26. Said lines 35—35 extend toward the lines 25—25, but terminate at the extremities of the lines 36—36, which extend toward each other parallel with the line 25 terminating in the lines 37—37, which are parallel with each other and with the lines 26—26. Said lines 37—37 terminate at the transverse line 38. As noted in Figure 4, the outline of the opening 34 at the right-hand end of the fuse link, defined by the lines 25, 26, 27, 35, 36, 37 and 38, is in the form of a letter E. As the corresponding opening at the left end of the fuse link is viewed in Figure 4, the outline is in the form of a letter E in reverse, but as viewed from the other side of the link said outline is in the form of a letter E. The lines 26—26 define restricted portions 39—39 of relatively great length compared to the restricted portions 23 and 33. The outline of the opening 34 at each end of the link may be varied within wide limits provided they include the restricted portions of relatively great length.

Figure 5 illustrates another form of opening adjacent to the ends of the link. The openings referred to in the link illustrated in Figure 5 are indicated by the numerals 40. Said openings 40—40 are illustrated as being rectangular and define the restricted portions 41—41 of relatively great length. Though each of the restricted portions 23, 33 in the illustrated embodiments of the present invention has been represented as being formed by a single pair of notches, any one of said restricted portions may be formed by a plurality of notches, if preferred.

In the illustrated embodiments of the present invention mechanical strength is provided in combination with the advantages of certainty of action either under short-circuit conditions or under reasonable overload conditions, the construction having the advantage that a minimum of gas is formed whether the fuse blows under short-circuit conditions or overload conditions.

Though certain preferred embodiments of the present invention have been described in detail, many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is:

1. A fuse link having a restricted portion midway of its length and midway of its width and other restricted portions spaced on either side of said first-mentioned restricted portion, each of said other restricted portions being of less electrical conductivity than said first-mentioned restricted portion and certain of said other restricted portions having a contour defined at least in part by a U-shaped cut-out, the legs of each of said U-shaped cut-outs extending longitudinally of said link, the portions of said link at the ends thereof being flat, whereby said link may be mounted in good electrical and thermal com-

munication with electrical and thermal conducting terminals.

2. A fuse link having a restricted portion midway of its length and midway of its width and other restricted portions spaced on either side of said first-mentioned restricted portion, certain of said other restricted portions being of less electrical conductivity than said first-mentioned restricted portion and certain of said other restricted portions having a contour defined at least in part by a U-shaped cut-out, the legs of each of said U-shaped cut-outs extending longitudinally of said link toward the extremities of said link, the portions of said link at the ends thereof being flat, whereby said link may be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

3. A fuse link having a restricted portion midway of its length and midway of its width and other restricted portions spaced on either side of said first-mentioned restricted portion, certain of said other restricted portions being of less electrical conductivity than said first-mentioned restricted portion and certain of said other restricted portions having a contour defined at least in part by a U-shaped cut-out, the legs of each of said U-shaped cut-outs extending longitudinally of said link toward the extremities of said link, said U-shaped cut-outs being located adjacent to the extremities of said link, the portions of said link at the ends thereof being flat, whereby said link may be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

4. A fuse link having a restricted path midway of its length and midway of its width, said path including a middle restricted portion and other restricted portions spaced on either side of said first-mentioned restricted portion, said other restricted portions being of less conductivity than said first-mentioned restricted portion, said other restricted portions comprising strips defined by openings disposed midway of the width of said link, said link including projections extending into said opening between said strips, the portions of said link at the ends thereof being flat, whereby said link may be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

5. A fuse link having a restricted path midway of its length and midway of its width, said path including a middle restricted portion and other restricted portions spaced on either side of said first-mentioned restricted portion, said other restricted portions being of less conductivity than said first-mentioned restricted portion, said other restricted portions comprising strips defined by openings disposed midway of the width of said link, said link including projections extending into said opening between said strips, said projections being located at the sides of said openings adjacent to the end portions of said link, the portions of said link at the ends thereof being flat, whereby said link may be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

6. An elongated fuse link having end portions adapted to have thermal communication with electrical and heat conducting terminals, said fuse link having midway of its length a restricted path for current flow disposed along the center line of said link and restricted portions spaced on either side of said restricted path, each of said restricted portions being of less electrical conductivity than said restricted path, certain of said restricted portions having a contour defined at least in part by a U-shaped cut-out, the legs of each of said U-shaped cut-outs extending longitudinally of said link, the portions of said link at the ends thereof being adapted to be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

7. An elongated fuse link having end portions adapted to have thermal communication with electrical and heat conducting terminals, said fuse link having midway of its length a restricted path for current flow disposed along the center line of said link and restricted portions spaced on either side of said restricted path, each of said restricted portions being of less electrical conductivity than said restricted path, certain of said restricted portions having a contour defined at least in part by a U-shaped cut-out, the legs of each of said U-shaped cut-outs extending longitudinally of said link toward the extremities of said link, the portions of said link at the ends thereof being adapted to be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

8. An elongated fuse link having end portions adapted to have thermal communication with electrical and heat conducting terminals, said fuse link having midway of its length a restricted path for current flow disposed along the center line of said link and restricted portions spaced on either side of said restricted path, each of said restricted portions being of less electrical conductivity than said restricted path, certain of said restricted portions having a contour defined at least in part by a U-shaped cut-out, the legs of each of said U-shaped cut-outs extending longitudinally of said link toward the extremities of said link, said U-shaped cut-outs being located adjacent to the extremities of said link, the portions of said link at the ends thereof being adapted to be mounted in good electrical and thermal communication with electrical and thermal conducting terminals.

GUSTAV RENSNER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,857,097	Glowacki	May 3, 1932
1,857,098	Glowacki	May 3, 1932
1,974,119	Naher	Sept. 18, 1934
2,017,490	Glowacki	Oct. 15, 1935
2,017,492	Glowacki	Oct. 15, 1935
2,018,556	Hope	Oct. 22, 1935
2,028,720	La Mar	Jan. 21, 1936
2,028,721	La Mar	Jan. 21, 1936
2,181,825	Wood	Nov. 28, 1939
2,287,553	Floten	June 23, 1942

FOREIGN PATENTS

Number	Country	Date
217,625	Great Britain	June 19, 1924