Feb. 12, 1946. E. F. BOOTHE 2,394,590

FUSE LINK

Filed Sept. 16, 1943

Fig. 1

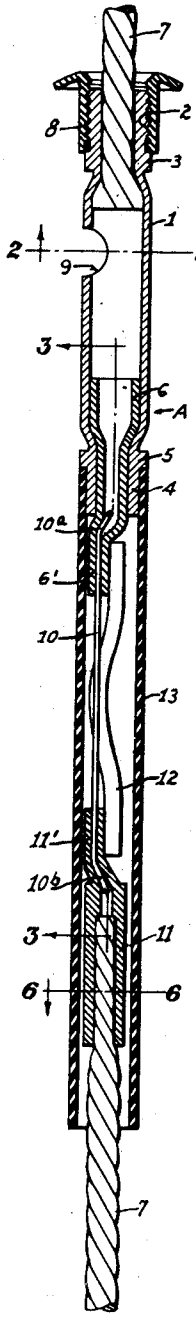


Fig. 2

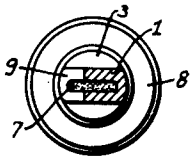


Fig. 3

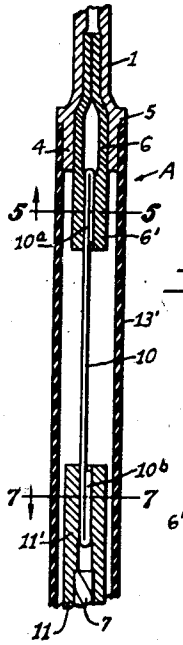


Fig. 4

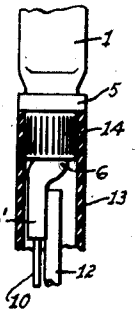


Fig. 5

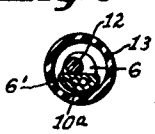


Fig. 6



Fig. 7

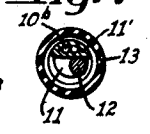


Fig. 8

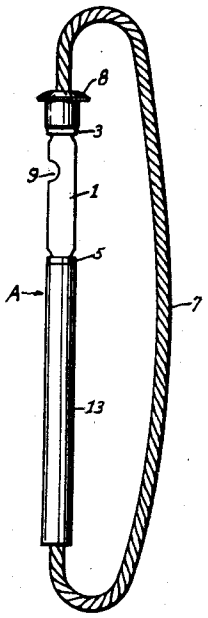


Fig. 9

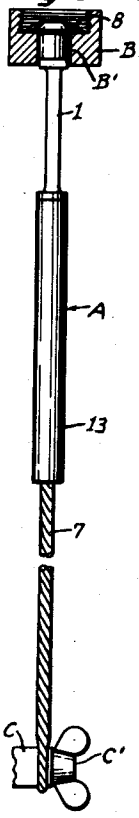


Fig. 10

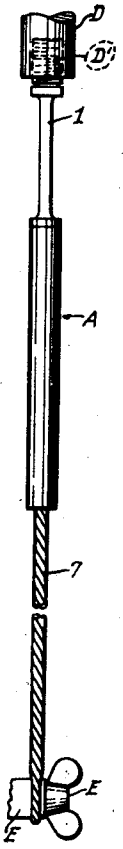


Fig. 11

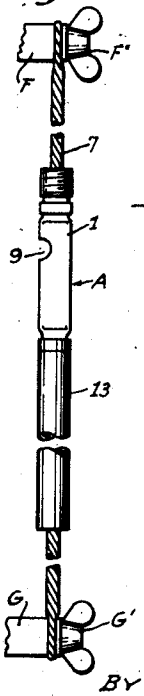


Fig. 12

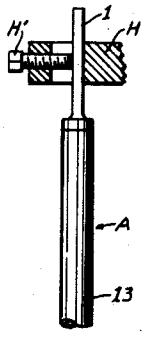
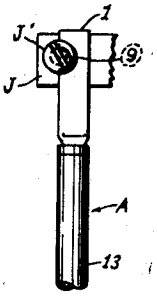


Fig. 13



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FUSE LINK

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Application September 16, 1943, Serial No. 502,550

4 Claims. (Cl. 200—135)

This invention relates generally to fuse links and more specifically to fuse links of the type adapted for use with electrical protective devices, such as, fuse switches and cutouts, the predominant object of the invention being to provide a fuse link of this type which is of such improved construction and arrangement that it is capable of substantially universal use with various types of protective devices now widely employed in electrical distribution systems.

As stated above, a number of electrical protective devices of different types are at present employed in electrical distribution systems for purposes of electrical protection, and because of differences in construction and mode of operation of these various protective devices, it has been necessary that a number of fuse links of different constructions be provided for the various protective devices. This situation is highly undesirable inasmuch as it necessitates the keeping on hand by the operators of electrical distribution systems of substantial stocks of fuse links made up of links of various types, and it causes confusion in connection with the maintenance of the electrical systems due to the fact that the men whose duty it is to keep the protective devices in working condition are required to have available at all times for use a number of fuse links of various types.

The present invention eliminates the disadvantages referred to above by providing a substantially universal fuse link which may be adopted for employment with any one of a number of protective devices of different types, upon the making of simple manipulations and adjustments in the field by a maintenance man. Thus, it is necessary that the operators of electrical systems maintain a stock of fuse links of one type only, and the maintenance man in the field may be sure that the fuse links in his possession are proper for the servicing of any protective devices that may require his attention.

Fig. 1 is a vertical section of the improved fuse link, with the flexible conductor portions at the top and bottom of the fuse link broken away.

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1 and looking in the direction indicated by the arrows.

Fig. 3 is a fragmentary vertical section taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary view partly in elevation and partly in vertical section, illustrating the manner of securing the tubular housing of the fuse link in place.

Fig. 5 is a horizontal section taken on line 5—5 of Fig. 3 and looking in the direction indicated by the arrows.

Fig. 6 is a horizontal section taken on line 6—6 of Fig. 1 and looking in the direction indicated by the arrows.

Fig. 7 is a horizontal section taken on line 7—7 of Fig. 3 and looking in the direction indicated by the arrows.

Fig. 8 is an elevation of the complete fuse link showing same as it appears prior to being put into use.

Figs. 9, 10, 11, 12, and 13 illustrate the improved fuse link in use with various types of protective devices, parts of the fuse link being broken away in said views and only enough of the protective devices being illustrated therein to show the application of the fuse link thereto.

In the drawing, wherein is shown for purposes of illustration, merely, one embodiment of the invention, A designates the improved fuse link generally. The fuse link A includes a head portion 1 which in its original form is tubular throughout its length, said head portion being externally screwthreaded at its upper end, as indicated at 2 in Fig. 1, and being provided with an annular shoulder 3 disposed at the lower end of said externally screwthreaded portion. At its lower end the head portion 1 of the fuse link is provided with a tubular extension 4, an annular shoulder 5 being located at the upper end of said extension 4, as is shown to good advantage in Fig. 1.

Arranged in telescopic relation with respect to the lower portion of the head portion 1 is a member 6 which in its original form is tubular. This member 6 is of such diameter with respect to inner diameter of the lower portion of the head portion 1, that said member 6 may be slipped upwardly into the lower portion of said head portion. Also, an end portion of a flexible conductor 7 is introduced into the upper portion of the head portion 1, as shown in Fig. 1, and the part of the head portion 1 located between the annular shoulders 3 and 5 is flattened by pressure suitably applied thereto so that said part of the head portion assumes the shape shown in Fig. 2. By so flattening the part of the head portion referred to, the upper portion of the member 6 is simultaneously flattened, as shown in Fig. 1, with the result that said member is very securely attached to the head portion. Likewise, the flattening of the part of the head portion 1 causes the extreme lower end portion of the part of the flexible conductor 7 that is extended into the upper portion of said head portion to be secure-

ly gripped within the upper portion of said flattened portion.

The screwthreaded portion 2 at the upper end of the head portion 1 has mounted thereon an internally screwthreaded cap 8 which serves a purpose which will be hereinafter set forth. Likewise, the flattened part of the head portion 1 has formed therein a semicircular cavity 9 which performs a function that will also be referred to later herein.

The portion 6' of the member 6 which projects below the lower end of the head portion 1 is offset slightly, as shown in Fig. 1, and this offset portion receives the upper, doubled-over end portion of a strain element 10 (see Figs. 1 and 3).

When the upper, doubled-over portion of the strain element is introduced into the lower portion of the member 6 said lower portion of said member 6 is in its original tubular form. However, after such introduction of the upper, doubled-over portion of the strain element into the lower portion of the member 6, said lower portion is compressed by pressure suitably applied thereto, as shown in Fig. 5, so that said strain element portion is securely gripped thereby. Due to the fact that the upper portion of the strain element 10 which is disposed within the lower portion of the member 6 is doubled-over, and because of the presence of a bend 10a at the extreme upper end of said doubled-over strain element portion, the likelihood that tension to which the fuse link is subjected in use will cause the upper portion of the strain element to be pulled loose from the member 6 is very greatly reduced.

Disposed in vertical spaced relation with respect to the member 6 is a companion member 11 which in its original form is tubular. The end portion of the flexible conductor 7 opposite to the end portion thereof which is connected to the head portion 1, is introduced into the lower portion of the member 11, after which said lower portion of said member 11 is compressed on the conductor portion disposed therein, by pressure suitably applied thereto, so as to cause said end portion of said conductor to be securely gripped by the member 11 and fixedly attached thereto. The upper, originally tubular portion 11' of the member 11 is slightly offset with respect to the lower portion of said member, and this upper, offset member portion receives the lower portion of the strain element 10, said upper portion of the member 11 being compressed on the lower portion of the strain element, by pressure suitably applied thereto, to cause the lower portion of the strain element to be securely gripped by the compressed member portion and fixedly attached thereto. As in the case of the upper portion of the strain element 10, the lower portion of said strain element that is received by the upper portion 11' of the member 11 is doubled-over and is provided with an angularly extended, extreme lower end portion 10b, whereby the gripping action between the upper portion of the member 11 and the lower portion of the strain element is improved for the reasons previously explained herein.

The improved fuse link A includes a fusible element 12 which is mechanically and electrically connected at its opposite end portions, by means of solder or otherwise, to the portions 6' and 11' of the members 6 and 11. The fusible element 12 is arranged in parallel with the strain element 10, and said strain element serves to relieve the fusible element of strains resulting from tensioning of the fuse link which in the absence of the strain element might alter the dimensions of the fusible element and modify its fusing characteristics.

Arranged in embracing relation with respect to the strain element 10 and the fusible element 12, and parts of the fuse link located adjacent thereto, is a housing member 13, preferably of tubular formation. The housing member 13 is formed from suitable electrical insulating material and its upper portion embraces the extension 4 at the lower end of the head portion 1 of the fuse link in close, frictional engagement therewith. In order to increase the frictional gripping action between the extension 4 of the head portion 1 and the housing 13, the outer surface of said extension is preferably milled, knurled, or otherwise roughened, as indicated at 14 in Fig. 4.

The improved fuse link disclosed herein is received by users thereof in the condition illustrated in Fig. 8; that is to say with the flexible conductor 7 extending continuously, and in an unbroken manner, from the upper portion of the head portion 1 of the fuse link to the lower portion of the member 11 thereof. Assume, now, that it is desired to employ one of the fuse links in the manner illustrated in Fig. 9, where the cap 8 of the fuse link engages an upper member B of an electrical protective device and where a downwardly extended portion of the flexible conductor 7 is attached to a member C of said protective device. In preparing the fuse link for such use the cap 8 is unscrewed from the screwthreaded portion 2 of the head portion 1 of the fuse link and the flexible conductor is severed at the top of said screwthreaded portion 2, the cap then being replaced on the screwthreaded portion 2. The fuse link is then threaded downwardly through the opening B' of the member B until the cap is properly seated with respect to the cap-receiving face of the member B whereupon the lower flexible conductor is attached to the member C by the wing nut C'.

Likewise, when one of the improved fuse links is to be applied to a protective device such as that illustrated in Fig. 10, where an upper portion of the fuse link is screwed into a screwthreaded socket D' formed in a member D, and where a downwardly extended flexible conductor of the fuse link is attached to a member E, the cap 8 is unscrewed from the screwthreaded portion 2 and the flexible conductor is severed at the top of said screwthreaded portion 2, the cap in this case not being used. The screwthreaded portion 2 is then screwed into the screwthreaded socket D' of the member D and the downwardly extended flexible conductor 7 is attached to the member E by the wing nut E'.

In Fig. 11 is illustrated a condition where the fuse link is provided with flexible conductor portions extended upwardly and downwardly at its opposite ends for attachment to members F and G of a protective device. In preparing the improved fuse link disclosed herein for such use the flexible conductor 7 is severed at its approximate longitudinal center and the cap 8 is removed from the fuse link. The upwardly and downwardly extended flexible conductor portions 7 are then connected to the members F and G by the wing nuts F' and G'.

In Fig. 12 is illustrated a condition where the upper portion of a fuse link is secured to a member H of a protective device by a set screw H'. When the fuse link of the present invention is

to be so employed the flexible conductor 7 is severed at the proper point to provide the fuse link with a downwardly extending flexible conductor portion (not shown), and the head portion 1 of the fuse link is severed at the top of the flattened portion thereof by the use of suitable heavy shears with which the maintenance men will be equipped. The upper portion of the head portion of the fuse link will then be introduced into place where it may be engaged by the set screw, as shown in Fig. 12, the downwardly extended flexible conductor portion being then attached to the member (not shown) provided for that purpose.

In the use of the improved fuse link in accordance with the showing of Fig. 13 the flexible conductor and the upper portion of the head portion of the fuse link are severed as explained in connection with the description of Fig. 12. However, the shank of the screw J' of Fig. 13 extends through the semicircular recess 9 of the head portion 1 of the fuse link, and the head of said screw is forced into binding engagement with the portion of said fuse link head portion which is located adjacent to the semicircular recess 9 to secure the upper portion of the fuse link to the member J of the protective device, the downwardly extended, flexible conductor portion of the fuse link of Fig. 13 (not shown) being attached to the member (not shown) of the protective device which is provided to receive it.

I claim:

1. A fuse link comprising a tubular head portion, a flexible conductor portion extended into said tubular head portion at an end thereof and secured thereto by having a portion of said tubular head portion compressed into tight gripping engagement with a part of said conductor portion, a tubular member telescoped within said tubular head portion at the opposite end thereof and secured thereto by compressed and deformed portions of said head portion and said tubular member which are in close frictional engagement with each other, a second tubular member spaced from said first-mentioned tubular member, a strain element having its opposite end portions inserted into the adjacent end portions of said first-mentioned and said second-mentioned tubular members and secured thereto by having portions of said first-mentioned and said second-mentioned tubular members compressed into close frictional engagement with said inserted end portions of said strain element, a fusible element connected to said first-mentioned and said second-mentioned tubular members, and a flexible conductor portion connected to said second-mentioned tubular member.

2. A fuse link comprising a tubular head portion, a flexible conductor portion extended into said tubular head portion at an end thereof and secured thereto by having a portion of said tubular head portion compressed into tight gripping engagement with a part of said conductor portion, a tubular member telescoped within said tubular head portion at the opposite end thereof and secured thereto by compressed and deformed portions of said head portion and said tubular member which are in close frictional engagement with each other, a second tubular member spaced from said first-mentioned tubular member, a strain element having its opposite end portions inserted into the adjacent end portions of said first-mentioned and said second-mentioned tubular members and secured thereto by having portions of said first-mentioned and said second-mentioned tubular members compressed into close frictional engagement with said inserted end portions of said strain element, a fusible element connected to said first-mentioned and said second-mentioned tubular members, and a flexible conductor portion connected to said second-mentioned tubular member by having a part thereof inserted into said second-mentioned tubular member and said second-mentioned tubular member compressed onto said inserted part of the last-mentioned flexible conductor portion.

3. A fuse link comprising a tubular head portion, a button removably mounted on said tubular head portion, a flexible conductor portion extended into said tubular head portion at an end thereof and secured thereto by having a portion of said tubular head portion compressed into tight gripping engagement with a part of said conductor portion, a tubular member telescoped within said tubular head portion at the opposite end thereof and secured thereto by compressed and deformed portions of said head portion and said tubular member which are in close frictional engagement with each other, a second tubular member spaced from said first-mentioned tubular member, a strain element having its opposite end portions inserted into the adjacent end portions of said first-mentioned and said second-mentioned tubular members and secured thereto by having portions of said first-mentioned and said second-mentioned tubular members compressed into close frictional engagement with said inserted end portions of said strain element, a fusible element connected to said first-mentioned and said second-mentioned tubular members, and a flexible conductor portion connected to said second-mentioned tubular member by having a part thereof inserted into said second-mentioned tubular member and said second-mentioned tubular member compressed onto said inserted part of the last-mentioned flexible conductor portion.

4. A fuse link comprising a tubular head portion, a button screwthreadedly mounted on said tubular head portion, a flexible conductor portion extended into said tubular head portion at an end thereof and secured thereto by having a portion of said tubular head portion compressed into tight gripping engagement with a part of said conductor portion, a tubular member telescoped within said tubular head portion at the opposite end thereof and secured thereto by compressed and deformed portions of said head portion and said tubular member which are in close frictional engagement with each other, a second tubular member spaced from said first-mentioned tubular member, a strain element having its opposite end portions inserted into the adjacent end portions of said first-mentioned and second second-mentioned tubular members and secured thereto by having portions of said first-mentioned and said second-mentioned tubular members compressed into close frictional engagement with said inserted end portions of said strain element, a fusible element connected to said first-mentioned and said second-mentioned tubular members, and a flexible conductor portion connected to said second-mentioned tubular member by having a part thereof inserted into said second-mentioned tubular member and said second-mentioned tubular member compressed onto said inserted part of the last-mentioned flexible conductor portion.

EUGENE F. BOOTHE.