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C. E. MOSLEY ET AL

2,067,577

FUSE LINK

Filed March 23, 1936

FIG. 1.

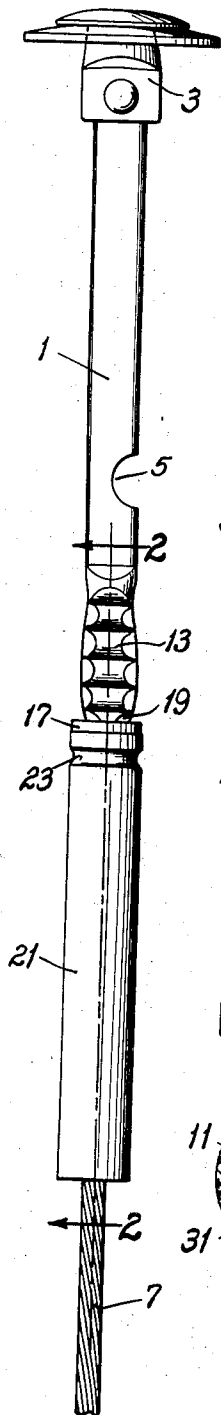


FIG. 2. FIG. 4.

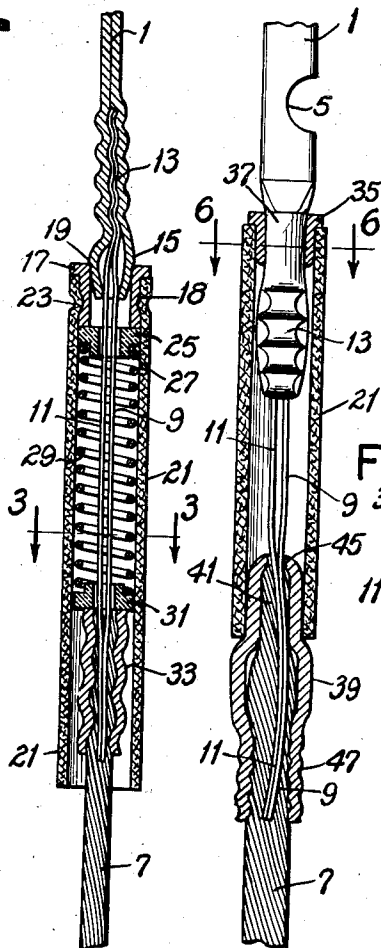


FIG. 7.

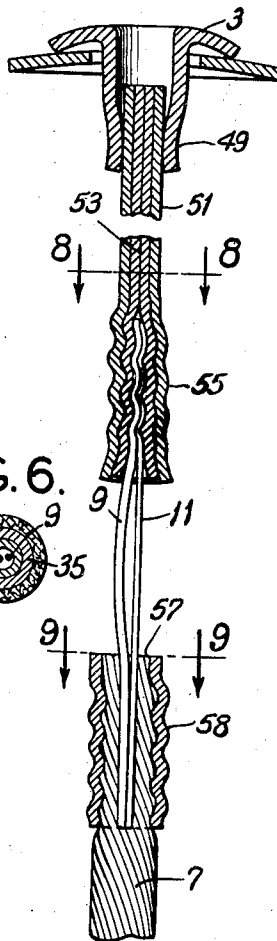


FIG. 6.

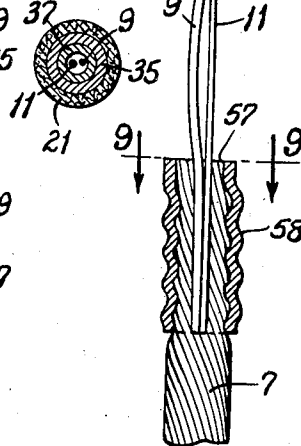


FIG. 3.

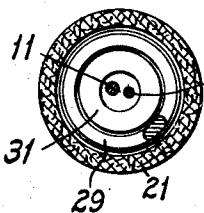


FIG. 5.

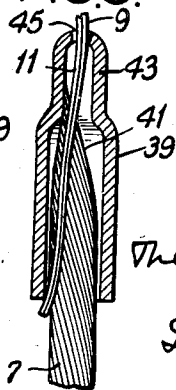
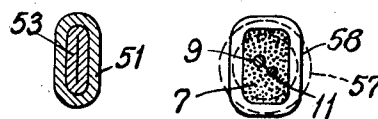


FIG. 8. FIG. 9.



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FUSE LINK

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14 Claims. (Cl. 200—135)

This invention relates to fuse links, and with regard to certain more specific features, to tensioned fuse links having fusible inserts between conducting sections.

Among the several objects of the invention may be noted the provision of fuse links which have fusing inserts between conducting sections and which may be more accurately and consistently calibrated than heretofore; the provision of fuse links of the class described which are adapted to retain said accuracy in service; the provision of a link of this class which is of higher strength against mechanical tension, which is simple in form and which is simple to assemble. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which are illustrated three of various possible embodiments of the invention,

Fig. 1 is a side elevation of one form of fuse link;

Fig. 2 is a vertical section taken on line 2—2 of Fig. 1;

Fig. 3 is a horizontal section taken on line 3—3 of Fig. 2;

Fig. 4 is a vertical section showing a modified form of the invention;

Fig. 5 is a fragmentary view of the lower end of Fig. 4 illustrating an assembly operation;

Fig. 6 is a cross section taken on line 6—6 of Fig. 4;

Fig. 7 is a view similar to Fig. 2 showing another form of the invention;

Fig. 8 is a horizontal section taken on line 8—8 of Fig. 7; and

Fig. 9 is a horizontal section taken on line 9—9 of Fig. 7.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

Heretofore, it has been the practice to make up fusible links by soldering the fusible elements between conducting elements. This has resulted in difficulty in providing a number of links of equally calibrated capacities. Furthermore, the inserts have been subjected to considerable strain caused by the longitudinal stresses arising from the use of the links in locations where they have been mechanically tensioned, as for instance, in

fuse devices of the class shown in the United States Patent 2,000,876 of Lester Pierce Boll and Theodore Birkenmaier, patented May 7, 1935.

For instance, when fuse devices of the class shown in said patent are closed, the terminal-engaging elements of the fuse unit in passing into the line terminals, are subjected to considerable endwise compression which is transmitted by the linkage shown into a tension in the fuse link. It is desirable that the link be prevented from stretching during this period of excessive stress, so that after the terminal-engaging elements are seated in the line terminals, the links will react with the proper tension. Another undesirable feature of former fuse links has been the large amount of gaseous products formed by fusing. The present invention overcomes the above disadvantages by providing in parallel with a steel, piano wire tension-resisting device, a copper fusible element which fuses to a bead.

Referring now more particularly to Fig. 1, there is shown at numeral 1 a conductor which, initially, was a tube of a soft conducting material such as copper, and which has been flattened out. To this is riveted a head 3 for attachment to the terminal-engaging element. A notch 5 is employed for alternative attaching means which may be used if the head 3 be cut off.

The lower end of the link comprises a length of flexible, conducting material 7, such as braided copper wire or the like.

Between the conductors 1 and 7 is located a length of copper wire 9 and, electrically in parallel, a length of stainless steel piano wire 11. These lengths are preferably of round cross section. The purpose of the stainless steel piano wire is to properly resist excessive endwise stresses to prevent application of any substantial stress to the weaker copper fusible element 9. Heretofore the fusible element, though it was strong enough for ordinary spring tension of the spring element associated with the link per se, was not strong enough to resist the greater tension due to seating the fuse cartridge contacts in the spring line terminals.

According to the known practice, it might be possible to solder the elements 9 and 11 to the conducting sections 1 and 7. As above stated, the disadvantage of this procedure is that it is impossible to make a number of soldered joints of equal electrical characteristics. This problem is solved according to the present invention by directing the inserts 9 and 11 into the end of the tube 1 in its initial round condition and then crimping said tube at the lower end as

indicated at numeral 13. The crimp 13 is spaced at some distance from the end of the tube 1 to provide a short uncrimped portion 15, which forms a seat for a small brass ferrule 17. This ferrule is limited in its application by the bulge 19 of the crimped portion. The ferrule 17 is peripherally grooved at 18.

Over the ferrule 17 is slipped a fibre tube 21 which is rolled as at 23 into the groove in the ferrule 17, thereby holding the sleeve 21 in position. In actual assembly the sleeve is applied last.

Inside of the sleeve 21 and abutting the ferrule 17 is a porcelain or other insulating bushing 25 which has a peripheral groove 27 for seating a compression spring 29. The spring, if it were not for the tube 21, would, under compression, tend to assume a sinuous form and contact the section 9 and/or 11, and thereby carry some of the current. The tube 21, according to the present invention, maintains the spring in alignment even under compression and thus prevents it from contacting said sections 9 and/or 11. Thus a spring under compression may be employed without its losing temper because it never carries current, inadvertently or otherwise. Accurate electrical characteristics of the section 9 are thus also maintained.

At the other end of the spring 29 is another similar insulating bushing 31. Below this abuts a crimped sleeve 33 which crimps the conducting element 7 in with the lower end of the inserts 9 and 11. As shown, the sleeve 21 extends downwardly to form a skirt about the crimped element 33.

It is to be understood that the crimp 33 is in such a position with respect to the elements 9 and 11 that the bushings 25 and 31 between them compress the spring 29, the latter being held in alignment under compression by the tube 21 which, as stated, may be applied last to the ferrule 17.

In Fig. 4 is shown a springless type of the invention in which like numerals designate like parts. In this form a ferrule 35 is located on a round portion 37 of the conductor. The crimped portion 13 lies beyond the round portion 37 and said crimped portion is covered by the insulating tube 21.

At the lower end, a ferrule 39 is used which, as shown in Fig. 5, is initially round and bullet-shaped and hollow. It is adapted to receive, not a right-angled end of the conductor 7, but an end which is cut on a bias to form a scarfed end 41. The lower end of the ferrule 39 initially is of a diameter adapted to slidably receive the conductor 7, the scarfed end of said conductor reaches into a small diametered end 43 of the ferrule. The small diametered end 43 of the ferrule slips snugly into said insulating tube 21 and has an opening therein for receiving the inserts 9 and 11. By means of this construction it is possible to insert the conductor 7 so that the scarfed end is adjacent to the opening 45, thus positively predetermining the conducting length of the inserts 9 and 11 which pass in through said opening 45. Thus, when the conductor 7 and insert ends are suitably positioned as shown in Fig. 4, the lower end of the ferrule 39 is crimped as shown at 47.

In Fig. 7 is shown another form of the invention in which like numerals designate like parts. The head 3, instead of being riveted to the upper conductor 1, is crimped thereto as shown at numeral 49.

The upper conductor, instead of being composed of a single flat tube, is composed of a plurality of tubes 51 and 53, flattened as indicated in Fig. 8. Thus the current-carrying capacity of this conductor is increased without substantially reducing deformability.

The inserts 9 and 11 are fed into the initially cylindric inner tube and then both tubes are crimped as indicated at numeral 55 to hold the inserts therein.

At the lower ends the inserts 9 and 11 are placed adjacent to the conductor 7 within a ferrule 57 and crimped as shown at 58.

A common feature of the three embodiments of the invention is the fact that the lower conductor 7 is fed entirely through a ferrule and arranged to end at a predetermined point at the other end of said ferrule. Then, because said other end of the ferrule has its position predetermined on the inserts 9 and 11, there is assured a definite calibration of lengths of parts composed of insert material 9 and 11. This results in the ability to attain a number of links having substantially accurately the same rating.

Another common feature is the strong, stainless steel piano wire, which when subjected to the excessive stresses of placing the entire fuse in a circuit, will not stretch so as to cause subsequent change in the characteristics of the link. In other words, the fusible element 9 is substantially protected against mechanical endwise strains.

The crimp method of holding the fusible portion is adapted to resist powerful endwise stresses met with in using fuse links as above described. Thus full advantage may be taken of the great strength of the piano steel wire and greater endwise tension tolerated.

The fact that the fusible element 9 is made of copper is an advantage, because copper, when it fuses, tends to cause a bead on one or both of the burned fuse ends, rather than excessively gasifying. Reduction of gasification of the fusible material is an advantage for known reasons. It is to be understood that when the fusible element 9 blows, that the heat engendered when the current is then sent through the steel piano wire 11, causes separation in the latter.

In the form of the invention shown in Fig. 2, it is to be understood that the bushing 31 is slidable in the tube 21, so that when the fuse blows, the spring 29 may react to aid in downwardly projecting the lower portion of the link.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A ferrule for fuse links, comprising a cup-shaped portion having an inlet opening of one size for receiving a relatively large conducting element, said ferrule having a relatively small opening at the other end for receiving at least one fusible element, whereby the end of the conducting element and the end of the ferrule are in substantially the same position with respect to the fusible element, the conducting element

and the fusible element being permanently held together by a crimp in the ferrule.

2. A ferrule for fuse links, comprising a relatively large cup-shaped portion having inlet opening of one size for receiving a relatively large conducting element, said conducting element having a tapered end, said ferrule having a relatively small cup-shaped portion and a small opening at the other end for receiving at least one fusible element, whereby the relationship between the end of the conducting element and the end of the ferrule is the same with respect to the fusible element, the conducting element and the fusible element being permanently held together by a crimp in the ferrule around the conducting element and the fusible element.

3. A ferrule for fuse links, comprising a relatively large cup-shaped portion having inlet opening of one size for receiving a relatively large conducting element, said conducting element having a tapered end, said ferrule having a relatively small cup-shaped portion and a small opening at the other end for receiving at least one fusible element, whereby the relationship between the end of the conducting element and the end of the ferrule is the same with respect to the fusible element, the conducting element and the fusible element being permanently held together by a crimp in the ferrule around the conducting element and the fusible element, said crimp being restricted to said relatively large cup-shaped portion.

4. A fuse link comprising a conductor, a fusible element crimped in the end of said conductor, a ferrule about said conductor behind the crimp, a second ferrule comprising a relatively large, cup-shaped portion having an inlet opening of one size for receiving a conducting element having a tapered end, and having a relatively small cup-shaped portion and opening at the other end for receiving said fusible element, the last-named conducting element and fusible element being crimped together, and an insulating sleeve surrounding the fusible element and surrounding at one end the ferrule and at the other end surrounding said small cup-shaped portion.

5. A fuse link comprising an upper conducting element, a fusible element, said fusible element being inserted into said conducting element and crimped therein, a ferrule around the fusible element and located adjacent to the crimped portion of said conducting element, an insulating bushing below the ferrule, a sleeve surrounding said bushing and the ferrule, a spring within the sleeve, an insulating bushing at the lower end of said spring, a lower conducting element, means fastening said lower conducting element and the fusible element located so as to compress said spring, said insulating tube maintaining said spring in alignment to prevent contact thereof with said fusible element.

6. A fuse link comprising an upper conducting element, a fusible element, said fusible element being inserted into said conducting element and crimped therein, a ferrule around the fusible element and located adjacent to the crimped portion of said conducting element, an insulating bushing below the ferrule, a sleeve surrounding said bushing and the ferrule, a spring within the sleeve, an insulating bushing at the lower end of said spring, a lower conducting element, means fastening said lower conducting element and the fusible element located so as to compress said spring, said insulating tube maintaining said spring in alignment to prevent contact

thereof with said fusible element, said sleeve also forming a skirt around the fastening means and said lower bushing being slidable therein.

7. A fuse link comprising an upper conducting element, a lower conducting element, a fusible portion between said elements, a spring surrounding the fusible portion, insulating means between said spring and said conducting elements and fusible element, said insulating means being held in position to compress the spring, and an insulating tube surrounding the spring to maintain the same in alignment and to prevent contact with said fusible element.

8. A fuse link comprising an upper conducting element, a lower conducting element, a fusible portion between said elements, a spring surrounding the fusible portion, insulating means between said spring and said conducting elements and fusible element, said insulating means being held in position to compress the spring, and an insulating tube surrounding the spring to maintain the same in alignment and to prevent contact with said fusible element, said tube surrounding said insulating means and a ferrule beyond one of said insulating elements adapted to support the tube.

9. A fuse link comprising an upper conducting element, a lower conducting element, a fusible portion between said elements and joined thereto, a spring surrounding the fusible portion, and insulating means between said spring and said conducting elements and the fusible element.

10. A fuse link comprising spaced conducting elements, a ferrule connected with one of said elements, an insulating tube supported at least in part by said ferrule, and a fusible element joining said conducting elements located within said tube.

11. A fuse link comprising spaced conducting elements, a ferrule connected with one of said elements, an insulating tube supported at least in part by said ferrule, a fusible element joining said conducting elements and located within said tube, means supporting the other end of the tube comprising a ferrule, one conducting element and the fusible element being coextensive, said ferrule being crimped about said coextensive parts.

12. A fuse link comprising spaced conducting elements, a ferrule connected with one of said elements, an insulating tube supported at least in part by said ferrule, a fusible element joining said conducting elements located within said tube, and crimping means between one conducting element and the fusible element and located within the tube.

13. A fuse link comprising conducting elements, a fusible element joining said conducting elements, an insulating sleeve surrounding the fusible element, a spring within the sleeve, means to hold said spring compressed, said insulating sleeve maintaining said spring in alignment to prevent contact thereof with said fusible element.

14. A fuse link comprising conducting elements, a fusible element joining said conducting elements, a sleeve surrounding the fusible element, a spring within the sleeve, means to hold said spring compressed, said sleeve maintaining said spring in alignment to prevent contact thereof with said fusible element, and means for positively completely insulating the spring from current passing through the fuse.

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