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2,104,899

FUSE LINK CONSTRUCTION

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Fig. 1

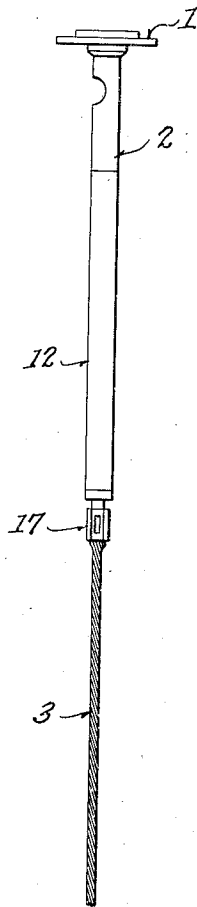


Fig. 2

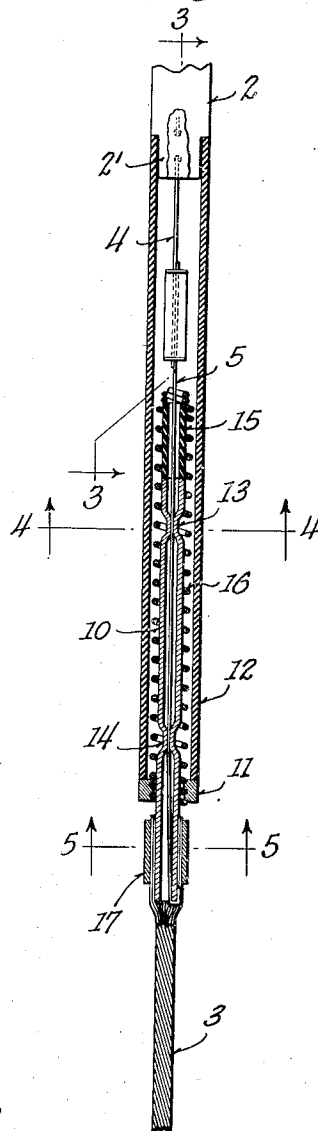


Fig. 3

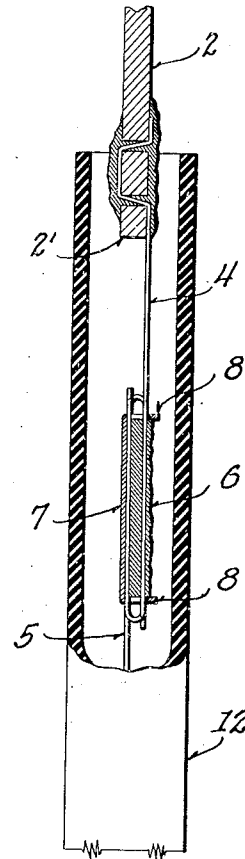


Fig. 5

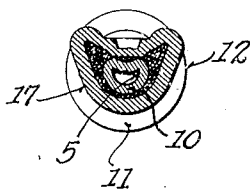


Fig. 4

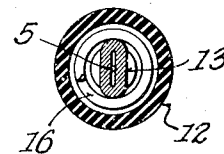
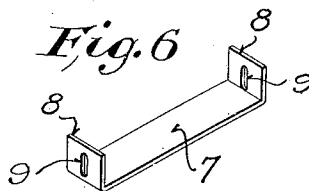


Fig. 6



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FUSE LINK CONSTRUCTION

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18 Claims. (Cl. 200—117)

This invention relates to a fuse link construction.

Objects of this invention are to provide a novel fuse link construction in which the fuse link itself is so made that it mechanically separates the severed parts and provides a wide separation of these parts whether the rupture of the fuse link is produced by a suddenly applied overload or by a slowly applied overload, so that there is a positive and definite mechanical separation of the parts due to the inherent construction of the fuse link itself.

Further objects are to provide a fuse link construction having the features hereinabove enumerated but nevertheless which may be made comparatively short, although it provides an adequate spring action on the one hand and ample separation of the parts on the other.

Further objects are to provide a fuse link construction which is so made that it may be used in various types of service, for instance in drop-out fuses, the construction providing a compact arrangement of parts so that it will not interfere with the normal functioning of a drop-out fuse, for example.

In greater detail, objects of this invention are to provide a fuse link construction in which the fuse link itself has its parts formed of suitable material, such, for example, as Nichrome wire, held together by a low melting point solder but so arranged that they will not tip and thus tear apart due to the pull of a relatively long spring.

The relatively long spring is obtained by a novel construction of connection with the fuse proper without, on the one hand, detracting from the proper heating effect and, on the other hand, without shortening the spring so that a relatively great movement of the parts may be obtained mechanically as soon as the fuse link is severed and yet in which compactness is maintained, the construction securing the effect of a long fusible element enclosed or confined in a relatively small space.

Further objects are to provide a construction of fuse link in which novel means are provided for attaching the leader to the movable portion of the fuse construction and in which means are provided for attaching the fuse link proper at a point remote from the soldered joint so as to insure the proper heating effect and to avoid undesirable rapid cooling of the fuse link proper.

An embodiment of the invention is shown in the accompanying drawing, in which:

Figure 1 is a side view of the fuse link with a part of the leader broken away.

Figure 2 is an enlarged sectional view with parts broken away.

Figure 3 is a sectional view on a still larger scale, such view being taken approximately on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 2.

Figure 5 is a sectional view on the line 5—5 of Figure 2.

Figure 6 is a much enlarged view of the plate which is located at the soldered portions of the fuse link.

Referring to the drawing, it will be seen that the fuse link construction comprises a button head 1 having a downwardly projecting member 2 and a flexible leader 3. The fusible section may consist of a pair of Nichrome or other wires 4 and 5 which are joined together by means of a low melting point solder, as indicated at 6. The wire 4 is joined to the projection 2 extending from the button head and the wire 5 is joined to the flexible leader 3 in a manner hereinafter to appear.

It is preferable to provide a reinforcing plate 7 at the soldered joint and this plate may have outwardly turned ends 8 provided with apertures 9, see Figures 3 and 6, through which the wires 4 and 5 loosely project. If desired, the ends of the wires 4 and 5 may be turned backwardly upon themselves to provide additional surface for the soldered connection, although there is no interlock between the wires 4 and 5 other than that provided by the soldered joint, so that when the solder melts, the wires are free to slide apart.

By having the reinforcing plate with the guiding lugs 8 and 9, it is apparent that tension imposed upon the wires 4 and 5 will not tend to tilt them at the soldered joint and so will not tend to strip one wire from the other.

The wire 5 extends downwardly through a copper or other tube 10, see Figure 2, and this copper tube slidably projects through a washer 11 bearing against one end of a fiber or other tube 12. The other end of the tube 12 receives a reduced portion 2' of the projecting portion 2 of the button head and seats against shoulders formed in such projecting portion 2, as shown in Figure 2. The copper tube 10 is crimped, as indicated at 13 and 14, so as to lock against the wire 5.

A tube 15 of glass, porcelain or other insulating material is supported upon the end of the tube 10, as shown in Figure 2. A helical spring 16 loosely surrounds the tubes 10 and 15 and has its upper end bearing against the upper end of

the insulating tube 15 and its lower end secured to the washer 11, as indicated in Figure 2.

This spring is under tension and tends to pull the tubes 15 and 10 downwardly, such motion being resisted by the wires or fuse link proper 4 and 5. The lower or outer end of the wire 5 projects through the bottom of the tube 10 and is turned upwardly, as shown in the lower portion of Figure 2. The flexible leader 3 is formed of a plurality of twisted strands and these strands are separated and surround the lower portion of the tube 10.

A sleeve 17 is slipped over the separated strands of the leader 3 and is crimped, as indicated in Figure 5, to mechanically lock the strands to the tube 10 and at the same time to lock the end of the wire 5 to the tube 10, thus providing an intimate electrical connection and a strong mechanical connection of the parts.

The operation of the apparatus is as follows: When an overload occurs and the fuse link is severed, it is apparent that the pressure exerted by the spring 16 will force the member 10 and any lower remaining portion of the fuse link downwardly, thereby increasing the gap formed by the rupture of the fuse link. It is obvious that the device may be so made that the spring will always shoot the tube 10 entirely clear of the upper portion of the fuse construction. Also gas pressure generated by the rupture of the fuse link will assist in this action and, as a matter of actual fact, if the fuse link is used in an expulsion type tube, all of the parts including the tube 12 will be driven outwardly and discharged from the enclosing body portion of the fuse in the usual manner.

It is clear that a suddenly applied, heavy overload will fuse perhaps the entire section of the wires 4 and 5 and with a small overload the low melting point fusible solder 6 will melt and the spring will cause the fuse wires to separate as it will project the tube 10 downwardly and thereby draw the lower wire 5 outwardly away from the upper wire 4, thus providing a quick break in the circuit and also insuring wide separation of the parts, even under moderate overload conditions.

It will be seen that the device is simple to make and is compact and can be used in the usual capacity of an ordinary fuse link and in the usual types of fuse constructions.

It will be seen further that a positive separation of the fuse link is insured by this invention.

It is to be noted also that there is not any undesirable or excessive cooling of the wires 4 and 5 as their points of attachment are widely spaced from the fusible soldered joint between the wires.

Another highly desirable feature of this invention is that the elements employed to make up this fuse link construction are inexpensive and are easy to assemble.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A fuse link comprising a tubular insulating member, a pair of end portions, at least one of said end portions being slidable outwardly from within said tubular member, said fuse link having a severable portion joining said end portions, and a spring urging said slidable end portion outwardly with respect to said tubular member,

said spring having its inner end immediately adjacent said severable portion and electrically insulated therefrom.

2. A fuse link comprising a tubular insulating member, a pair of end portions, at least one of said end portions being slidable outwardly from within said tubular member, said fuse link having a severable portion joining said end portions, and a spring urging said slidable end portion outwardly with respect to said tubular member, said spring having its inner end surrounding a portion of said severable portion and electrically insulated therefrom.

3. A fuse link comprising a tubular insulating member, a pair of end portions, at least one of said end portions being slidable outwardly from within said tubular member, the other of said end portions being seated adjacent one end of said tubular member, said fuse link having a severable portion joining said end portions, and a spring urging said slidable end portion outwardly with respect to said tubular member, said spring having its inner end surrounding a portion of said severable portion and electrically insulated therefrom.

4. A fuse link comprising a tubular insulating member, a pair of end portions, at least one of said end portions being slidable outwardly from within said tubular member, the other of said end portions being seated adjacent one end of said tubular member, said fuse link having a severable portion joining said end portions, and a spring urging said slidable end portion outwardly with respect to said tubular member, said spring having its inner end surrounding a portion of said severable portion and electrically insulated therefrom, said tubular member surrounding said severable portion and said spring.

5. A fuse link construction comprising a tubular member formed of insulating material, a pair of end portions one of which is movable, a severable section joining said end portions, said tubular member surrounding said severable section, an annular member located within said first tubular member and surrounding at least a part of said severable section and bearing against the movable end portion, and a spring tensioning said severable section and tending to separate said end portions, said spring transmitting force through said annular member.

6. A fuse link construction comprising a tubular member formed of insulating material, a pair of end portions one of which is movable, a severable section joining said end portions, said tubular member surrounding said severable section, an annular member located within said first tubular member and surrounding at least a part of said severable section and bearing against the movable end portion, and a spring tensioning said severable section and tending to separate said end portions, said spring transmitting force through said second tubular member, said annular member being formed of insulating material.

7. A fuse link comprising a tubular member, a pair of end portions, at least one of said end portions being slidable outwardly with respect to said tubular member, a severable section joining said end portions, a helical spring surrounding at least a part of said severable section and tensioning said severable section, and means including an insulating annular member transmitting the force of said spring to the slidable end portion.

8. A fuse link comprising a tubular member, a pair of end portions, at least one of said end

portions being slidable outwardly with respect to said tubular member, a severable section joining said end portions, a helical spring surrounding at least a part of said severable section and tensioning said severable section, and means including an insulating annular member transmitting the force of said spring to the slidable end portion, one end of said spring engaging one end of said insulating annular member.

9. A fuse link comprising a tubular member, a pair of end portions, at least one of said end portions being slidable outwardly with respect to said tubular member, a severable section joining said end portions, a helical spring surrounding at least a part of said severable section and tensioning said severable section, said spring being spaced from said severable section, and means including an insulating annular member, transmitting the force of said spring to the slidable end portion.

10. A fuse link comprising a tubular member, a pair of end portions, at least one of said end portions being slidable outwardly with respect to said tubular member, a severable section joining said end portions, a helical spring surrounding at least a part of said severable section and tensioning said severable section, said spring being spaced from said severable section, and means including an insulating annular member transmitting the force of said spring to the slidable end portion, one end of said spring engaging one end of said insulating annular member.

11. A fuse link comprising a tubular insulating member, a pair of end portions, one of said end portions being seated against said tubular insulating member the other of said end portions being slidable with respect to said tubular insulating member and being hollow, a severable section within said tubular insulating member joining said end portions and extending into and being attached to the slidable end portion at a point spaced from the inner end of the slidable end portion, and a spring urging the slidable end portion outwardly with respect to said tubular insulating member.

12. A fuse link comprising a tubular insulating member, a pair of end portions, one of said end portions being seated against said tubular insulating member the other of said end portions being slidable with respect to said tubular insulating member and being hollow, a severable section within said tubular insulating member joining said end portions and extending into and being attached to the slidable end portion at a point spaced from the inner end of the slidable end portion, and a helical spring urging the slidable end portion outwardly with respect to said tubular insulating member, said spring surrounding at least a portion of said severable section.

13. A fuse link comprising a tubular insulating member, a pair of end portions, one of said end portions being seated against said tubular insulating member the other of said end portions being slidable with respect to said tubular insulating member and being hollow, a severable section within said tubular insulating member joining said end portions and extending into and being attached to the slidable end portion

at a point spaced from the inner end of the slidable end portion, a spring urging the slidable end portion outwardly with respect to said tubular insulating member, and an insulating tube interposed between the end of said spring and the slidable end portion.

14. A fuse link comprising a tubular insulating member, a pair of end portions, one of said end portions being normally held by said tubular insulating member and the other of said end portions consisting of a metal tube slidable with respect to said tubular insulating member, a severable section joining said end portions and extending through said metal tube and having one end projecting from the outer end of the metal tube and bent backwardly exteriorly of said metal tube, a spring urging said metal tube outwardly with respect to said tubular insulating member, a stranded, flexible leader having its inner end surrounding the outer end of said metal tube, and means securing the inner end of said leader and the projecting end of said severable section to the metal tube.

15. A fuse link comprising a tubular insulating member, a pair of end portions, one of said end portions being normally held by said tubular insulating member and the other of said end portions consisting of a metal tube slidable with respect to said tubular insulating member, a severable section joining said end portions and extending through said metal tube and having one end projecting from the outer end of the metal tube and bent backwardly exteriorly of said metal tube, a spring urging said metal tube outwardly with respect to said tubular insulating member, a stranded, flexible leader having its inner end surrounding the outer end of said metal tube, and a crimped metal band surrounding the outer end of the metal tube and securing the inner end of said leader and the projecting end of said severable section to the metal tube.

16. A fuse link comprising a pair of end portions, a severable section joining said end portions, means tensioning said severable section, said severable section comprising a pair of elongated members held together in overlapping relation by low melting point solder, and a reinforcing member located adjacent the soldered portion and having ends holding the elongated members against tilting adjacent the overlapped portion.

17. A fuse link comprising a pair of end portions, a severable section joining said end portions and including a pair of members having overlapping parts, a stiffener and reinforcing member positioned at said overlapping parts, low melting point solder joining said overlapping parts, and means tensioning said severable section.

18. A fuse link adapted to withstand tension including a severable section comprising a pair of members having overlapping parts, a reinforcing member adjacent said overlapping parts and having apertured end portions through which the said members pass, and low melting point solder joining the overlapping parts and said reinforcing member.

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