Aug. 7, 1951 F. G. VON HOORN 2,563,566

SPACING DEVICE FOR RENEWABLE FUSE

Filed March 3, 1949

Fig. 1.

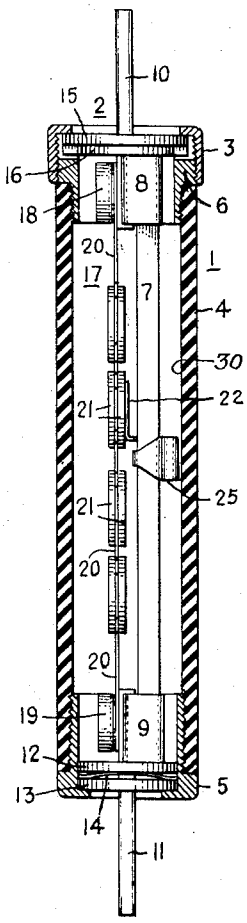


Fig. 2.

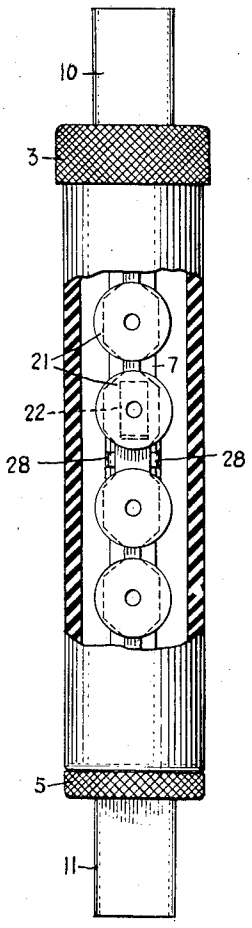


Fig. 3.

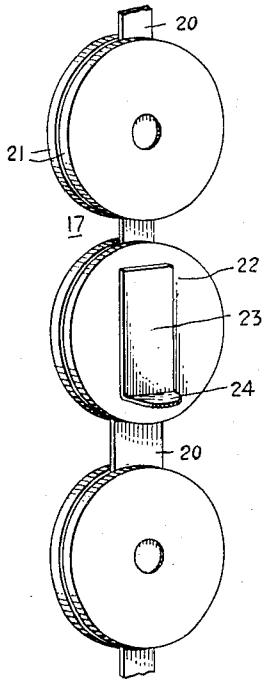


Fig. 6.

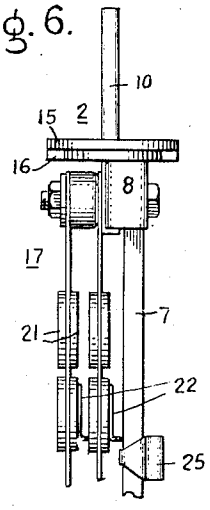


Fig. 5.

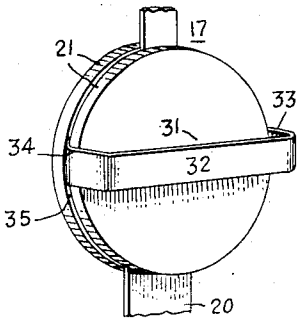
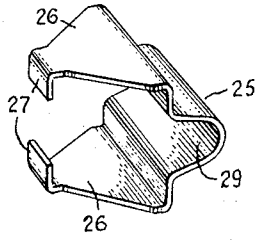


Fig. 4.



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SPACING DEVICE FOR RENEWABLE FUSES

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6 Claims. (Cl. 200—131)

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My invention relates to electric fuses and more particularly to improvements in spacing devices for electric fuses of the renewable fuse link type.

Current flowing in the fusible link member of an electric fuse of the type mentioned causes heating of the link and accompanying expansion thereof. Since the ends of the link are fixed relative to the center portion, buckling of the link tends to occur and physical contact frequently results between the heated link and the fiber bar supporting the fuse terminals and the link. Heat from the link is transmitted into the fiber support, causing heating and charring of the portions of fiber nearest the link. Uneven drying of the fiber bar tends to cause warping thereof which in turn causes the terminals to be distorted from their normal positions, resulting in loss of mechanical strength and poor external contact. Furthermore, abnormal conduction of heat away from the link member disturbs the predetermined thermal characteristics thereof, resulting in defective calibration of the fuse. This is particularly the case when links are used in multiple to increase the normal rating of the fuse, since buckling of the links frequently permits adjacent links to come in contact with each other, thereby greatly disturbing the thermal characteristics of the combination of links.

Accordingly, it is an object of my invention to provide a new and improved spacing device integral with each of the link members of an electric fuse of the renewable type, to restrict buckling action of the link members due to heating by a current flowing therein.

It is a further object of my invention to provide a new and improved spacing device attachable to the supporting bar of a fuse of the type mentioned, to restrict warping action of the supporting bar, resulting from the transmission of heat thereto from the heated link member of the fuse.

With these and other objects in view, attention is now directed to the following description taken in connection with the figures of the accompanying drawing in which the features of my invention believed to be novel are set forth.

Fig. 1 represents a longitudinal sectional side view of an electric fuse of the renewable knife blade contact type, in which an embodiment of my invention comprising a duality of spacing devices is shown.

Fig. 2 is a front view of the fuse device shown in Fig. 1, partially sectionalized to expose a portion of the fusible link member.

Fig. 3 is a perspective view of the fusible link member represented in Fig. 1, showing in detail one embodiment of the link spacing device of my invention.

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Fig. 4 is a perspective view of the support spacing device of my invention, as represented in Fig. 1.

Fig. 5 is a perspective view of a portion of a fusible link member showing another embodiment of a link spacing device.

Fig. 6 is a side view of a portion of the removable inner assembly of a typical fuse having a combination of links, showing the link spacing device represented in Fig. 1 applied to a fuse having multiple links.

Referring now to Fig. 1 of the accompanying drawing, there is represented an electrical fuse of the renewable knife blade contact type comprising principally, a tubular outer casing assembly 1, a removable inner assembly 2, and an internally threaded cap member 3. Outer casing assembly 1 comprises a tubular casing 4 of insulating material such as fiber, a lower metal insert 5, and an upper metal insert 6, inserts 5 and 6 being threadedly connected to casing 4 and securely anchored thereto by rivets or the like. Removable inner assembly 2 comprises principally a supporting bar 7 of insulating material such as fiber, a pair of metal cleats 8 and 9 fixed to the ends of bar 7, a pair of terminals such as knife blades 10 and 11 securely attached to cleats 8 and 9, a pair of lower guiding washers 12 and 13 having a spring washer 14 therebetween, a pair of upper guiding washers 15 and 16, and a renewable fusible link member 17 attached to terminals 10 and 11 by suitable holding devices, such as screws 18 and 19. Link 17 comprises a strip 20 of fusible material having a plurality of "mass members" 21 attached to the opposite sides thereof in pairs. These pairs are located in longitudinal spaced relation along strip 20, forming in effect a series of enlarged portions connected by restricted portions.

The parts of inner assembly 2 thus far enumerated are typical parts such as may be found in a conventional electric fuse of the general type described. In accordance with my invention, I provide, additionally, two spacing devices to accomplish objects as previously explained. In particular, I provide a spacer 22 attached directly to one of the mass members 21 of fusible link 17. The preferred shape and application of spacer 22 are shown most clearly in Fig. 3, wherein it is seen that spacer 22 is a simple folded member, preferably metal, having a pair of legs 23 and 24 disposed at a convenient angle, such as a right angle. Leg 23 is permanently at-

tached, preferably by welding or soldering, to a mass member 21 of link 17, and leg 24 is arranged to project transversely from link 17. Referring again to Fig. 1, it is seen that projecting leg 24 of spacer 20 is arranged to engage supporting bar 7 approximately at the longitudinal center thereof, substantially preventing buckling action of link 17 in the direction of support 7, resulting from heating of link 17 by a current flowing therein.

By the use of spacer 22, therefore, direct contact between link 17 and support 7, under operating conditions, is prevented. Direct transmission of heat from link 17 to support 7 is also thereby minimized. The amount of heat transmitted directly from link 17 through spacer 22 to support 7 is very small because of the fact that spacer 22 is attached to one of the "mass members" 21, which is one of the cooler portions of the link 17, and because of the fact that the spacer 22 itself is of a thin material so that the projecting leg 24 is rapidly and efficiently cooled. However, heat from link 17 tends to be transmitted to support 7 in other ways, as for example, by radiation and circulation of gases within tubular casing 4. A greater amount of heat is transmitted to the side of support 7 adjacent to link 17 by direct radiation from the link to cause a greater heating and drying action for this surface and a resulting warping action to cause support 7 to bow away from link 17, or to the right, in contemplation of Fig. 1. This warping action, if permitted, causes the ends of the inner assembly, including cleats 8 and 9, to be spaced more closely together. This action tends to cause a closer spacing of link 17 to support 7, further aggravating the heating, drying and warping effect. A further undesirable result of the possible warping of support 7 is a twisting of the ends of inner assembly 2, including cleats 8 and 9, and knife blades 10 and 11 to cause knife blade 10 to tilt in a counter-clockwise, and blade 11 in a clockwise, direction, in contemplation of Fig. 1, which results in poor contact between the knife blades and the respective spring contact fuse holder receptacles (not shown). Therefore, I provide a spacer 25 which is attached to and forms a part of supporting bar 7 to prevent the above-described warping and deflection. The configuration of spacer 25 is shown more clearly in Fig. 4, wherein it is seen that spacer 25 is a simple V-shaped folded member, preferably metal, having a pair of arms 26 arranged to engage firmly the periphery of supporting bar 7, arms 26 being provided at one end with bendable fingers 27 arranged to engage a pair of notches 28 located approximately at the longitudinal center of bar 7. Extending from the other ends of arms 26 is a projecting portion 29 arranged to engage inner wall 30 of tubular casing 4. As may be seen in Fig. 1 any tendency of support 7 to warp to the right, away from link 17, is opposed by interference between projecting portion 29 and inner wall 30 of tubular casing 4. It will be seen from the above explanation that spacer 25, by preventing warping deformation of support 7, assists spacer 22 in preventing undesired proximity of link 17 to support 7.

Reference to Fig. 6 indicates the manner in which link spacer 22 shown in Fig. 1 may be applied to a fuse having multiple links. Each of the links 17 is provided with a spacer 22 attached thereto in the manner previously described. It is obvious that if a fuse of the type shown in Fig. 6 has only a single supporting bar, as is generally the case, only a single support spacer 25 need be provided.

In Fig. 5, I have shown another embodiment of a link spacer, comparable in function to spacer 22, but differing therefrom in shape and method of attachment to a link member such as link 17. In particular, spacer 31 shown in Fig. 5 takes the form of a spring clip, preferably metal, having a center portion 32, a pair of arms 33 projecting transversely from the ends of center portion 32, and a pair of fingers 34 projecting transversely and inwardly from the ends of arms 33, forming in effect a C-shaped member.

The distance between fingers 34 is such that a clamping action exists between fusible strip 20 of link 17 and fingers 34, when the latter are slidably positioned in slot 35 between a pair of mass members 21. Such clamping action maintains spacer 31 in the desired position with respect to link 17 after attachment thereto.

A particular advantage of my invention is to be found in the provision of separate spacing devices to perform the dual spacing functions previously described, namely spacing the fusible links away from the supporting bar, and spacing the supporting bar away from the inner wall of the tubular casing. As will be understood by those skilled in the art, in the performance of a current interrupting operation by an electrical fuse device, commonly described as "blowing," an arc is generally formed between the disconnected portions of the fusible link member after melting action thereof has occurred due to excessive current therein. A link spacing device, which of necessity must be located adjacent to a link member, is subjected to the arcing action occurring when the fuse blows and may therefore be partially, if not entirely, destroyed. In a fuse of the renewable type, it is desirable upon renewing a fusible link after blowing of the fuse, that an integral link spacing device be available to perform the link spacing function in connection with the replaced link. In accordance with my invention, I provide a link spacer which is directly attached to the fusible link member, in effect forming a part thereof. With such an arrangement a new and therefore undamaged link spacer is automatically provided with each replacement link. In addition, when links are placed in multiple a link spacing device is automatically provided with each link.

Furthermore, in accordance with my invention, I provide a supporting bar spacer which is located on the opposite side of the supporting bar from the fusible link, thereby placing it in a position where it is least likely to be damaged by an arc between portions of the fusible link. Since the supporting bar is generally considered a permanent part of the fuse device not subject to replacement each time blowing of the fuse occurs, it is obviously advantageous to provide a supporting bar spacer which is likewise a permanent part of the fuse device, and which need not therefore be replaced whenever the fuse blows. Moreover, by providing a spacer which maintains the bar in its proper position in the casing, the link spacing device will always be effective to perform its function of preventing undue bending and elongation of the link.

While I have shown certain preferred embodiments of my invention it should be understood that my invention may well take other forms and I therefore aim in the appended claims to cover all such modifications as are within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent in the United States is:

1. An electric fuse of the renewable type comprising a tubular outer casing, an inner assembly including a supporting bar, a pair of terminals attached to the ends thereof, a fusible link member connected between said terminals, said inner assembly being removable from said casing for renewal of said link, means for preventing buckling of said link and closer spacing of said link to said supporting bar comprising a first spacer integral with said supporting bar extending away from said link to the wall of said casing for preventing warping of said supporting bar and a second spacer integral with and renewable with said link extending toward said supporting bar to maintain a minimum spacing between said link and said bar.

2. An electric fuse of the renewable type comprising a tubular outer casing, an inner assembly including a supporting bar, a pair of terminals attached to the ends thereof, a fusible link member of the type having a plurality of alternately arranged enlarged and restricted portions connecting said terminals, said inner assembly being removable from said casing for renewal of said link, a spacer integral with and renewable with said link comprising an L-shaped member having a long leg fixedly attached to one of said enlarged portions of said link and a short leg extending toward said supporting bar to maintain a minimum spacing between said link and said bar.

3. An electric fuse of the renewable type comprising a tubular outer casing, an inner assembly including a supporting bar, a pair of terminals attached to the ends thereof, a fusible link member of the type having a plurality of alternately arranged enlarged and restricted portions connecting said terminals, said inner assembly being removable from said casing for renewal of said link, a spacer integral with and renewable with said link comprising a metallic spring clip having a center portion, a pair of arms projecting transversely from the ends of said center portion, and a pair of fingers projecting transversely and inwardly from the ends of said arms, said fingers being arranged to be slidably attached to one of the enlarged portions of said link member and to effect clamped engagement therewith, said center portion being arranged to engage said supporting bar and maintain said link in minimum spaced relation with said bar.

4. An electric fuse of the renewable type comprising a tubular outer casing, an inner assembly including a supporting bar having a pair of notches therein, a pair of terminals attached to the ends thereof, a fusible link member connected between said terminals, said inner assembly being removable from said casing for renewal of said link, a spacer integral with said supporting bar for preventing warping of said supporting bar having a pair of arms and a projecting portion, said arms being constructed and

adapted to engage firmly the periphery of said supporting bar, said arms being provided at one end with bendable fingers arranged to engage firmly said pair of notches, said projecting portion extending from the other end of said arms, said projecting portion being arranged to engage said outer casing and maintain said bar in minimum spaced relation with said casing.

5. An electric fuse of the renewable type comprising a tubular outer casing, an inner assembly including a supporting bar having a pair of notches therein, a pair of terminals attached to the ends thereof and each including a knife blade contact, a fusible link member of the type having a plurality of alternately arranged enlarged and restricted portions connecting said terminals, said inner assembly being removable from said casing for renewal of said link, means for preventing buckling of said link and closer spacing of said link to said supporting bar comprising a first spacer and a second spacer, said first spacer being integral with said supporting bar and extending away from said link to the wall of said casing for preventing warping of said supporting bar and having a pair of arms and a projecting portion, said arms being constructed and adapted to engage firmly the periphery of said supporting bar, said arms being provided at one end with bendable fingers arranged to engage firmly said pair of notches, said projecting portion extending from the other ends of said arms, said projecting portion being arranged to engage said outer casing and maintain said bar in minimum spaced relation with said casing; said second spacer being integral with an renewable with said link and comprising an L-shaped member having a long leg fixedly attached to one of said enlarged portions of said link and a short leg extending toward said supporting bar to maintain a minimum spacing between said link and said bar.

6. A fusible link member for use in an electric fuse of the renewable type including an insulating supporting bar, said link having a plurality of alternately arranged enlarged and restricted portions, a spacer integral with and renewable with said link comprising an L-shaped member having a long leg fixedly attached to one of said enlarged portions of said link and a short leg for extending toward said supporting bar to maintain a minimum spacing between said link and said bar.

FRED G. VON HOORN.

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