May 27, 1958 W. E. BRACEY 2,836,681

EXPULSION FUSE CONSTRUCTION

Filed Sept. 17, 1956 2 Sheets-Sheet 1

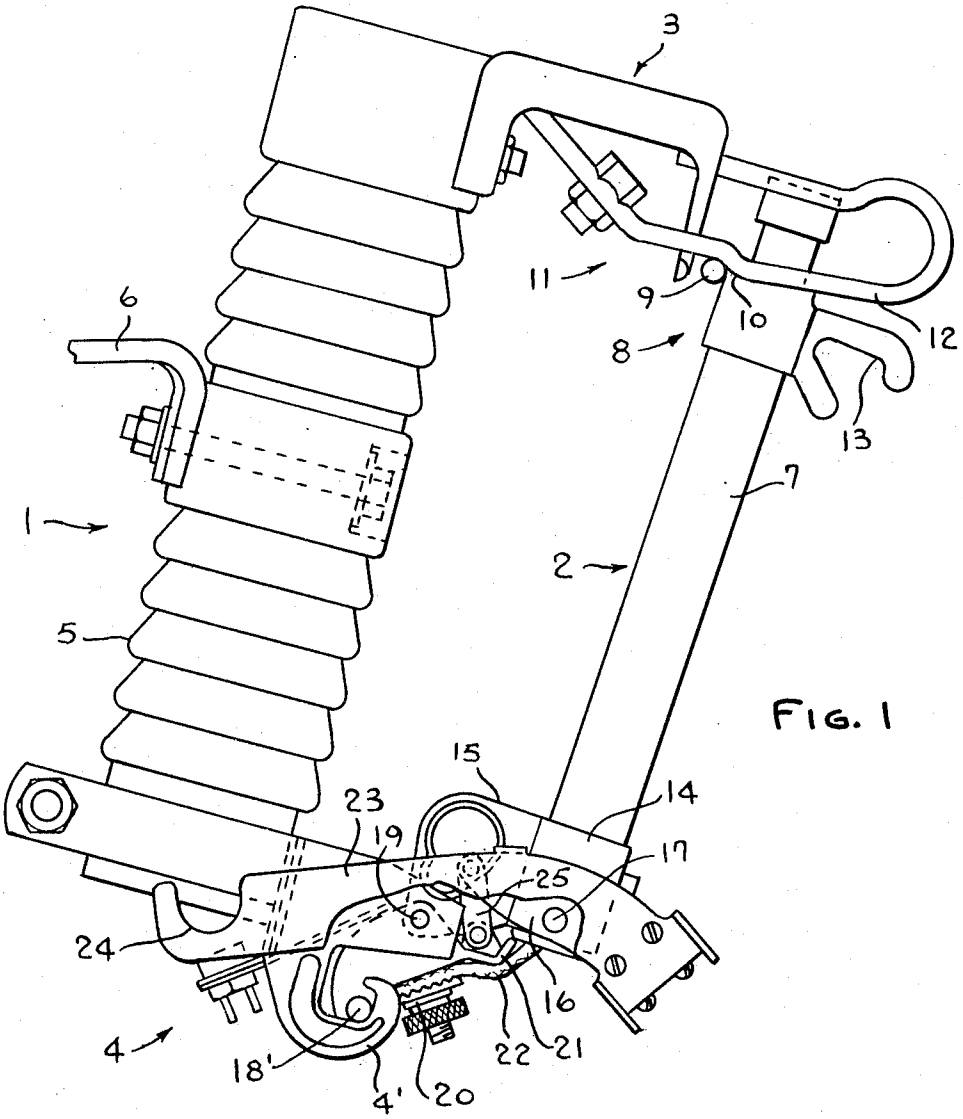


FIG. 1

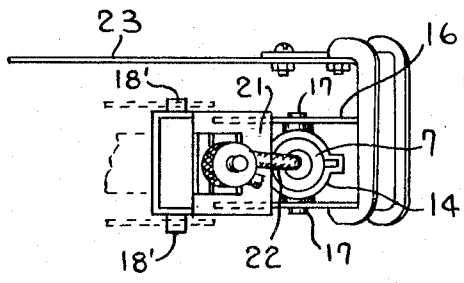


FIG. 3

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EXPULSION FUSE CONSTRUCTION

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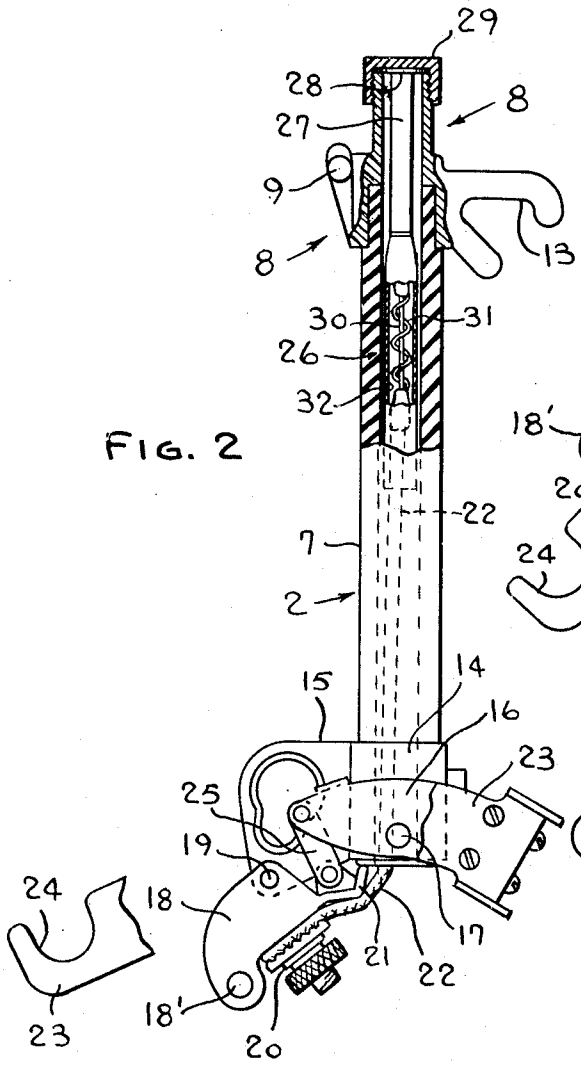
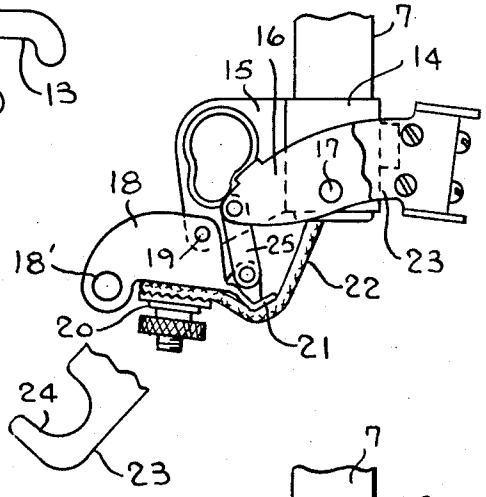


FIG. 2

FIG. 4



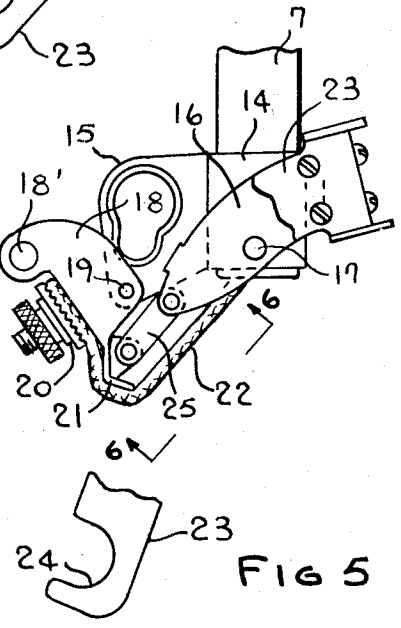


FIG 5

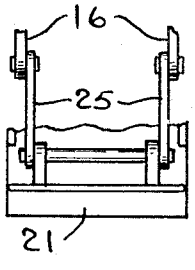


FIG. 6

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2,836,681

Patented May 27, 1958

2,836,681

EXPULSION FUSE CONSTRUCTION

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Application September 17, 1956, Serial No. 610,171

4 Claims. (Cl. 200—114)

This invention relates to a circuit interrupter of the expulsion fuse type.

This invention is an improvement over that disclosed in application of George R. McCloud, Serial Number 490,465, filed February 25, 1955, for Fuse Construction and has in general the same objects as the above noted application among which may be mentioned the provision of means for mechanically or manually separating the fuse link or rupturing the fuse link by means of a switch stick for example, while the circuit is loaded and also to provide means which provides for the rupture of the fuse link on overload on normal conditions of operation independently of the mechanical or manual rupturing so that the fuse construction will operate in its normal capacity on overload and also may be operated manually to open the circuit under normal load conditions through the medium of a switch stick, for instance.

In the above noted invention it was found that it works satisfactorily in the great majority of cases, but that occasionally a peculiar type of fuse link was encountered which had an excessively long stretch before it could be manually broken at the fusible section.

This invention has for its primary object the provision of means, in a fuse construction of the above outlined type, in which an unusual length of travel is given the fuse link extracting lever so that it will insure the mechanical rupture of a fuse link although the fuse link requires an unusual amount of stretch before rupture at the fusible section occurs.

In specific detail objects of this invention are to provide a motion multiplying means between the manually operable lever and the fuse link extracting lever so that the fuse link extracting lever will have the long travel hereinabove discussed when the manually operable lever is operated.

An embodiment of the invention is shown in the accompanying drawings herewith.

Figure 1 is a side elevation of the apparatus partly broken away.

Figure 2 is a view of the fuse tube assembly with parts broken away and parts in section.

Figure 3 is a view looking upwardly from the bottom of Figure 2.

Figure 4 is a view showing the mechanism in partly extended position.

Figure 5 is a view corresponding to Figure 4 showing the mechanism in fully extended position.

Figure 6 is a fragmentary view, partly broken away, taken on line 6—6 of Figure 5.

Referring to the drawings it will be seen that the device comprises a support assembly 1, an expulsion fuse tube indicated generally by the reference character 2, and upper and lower stationary contact assemblies indicated generally by the reference characters 3 and 4. The support 1 includes an insulator 5 to which the stationary upper and lower contact assemblies 3 and 4 are attached. The support assembly 1 may be attached to any suitable support by means of the bracket 6 or in any other suitable way.

The fuse tube is adapted to pivot about its lower end and to rock outwardly when the fuse link blows in the usual manner. The fuse tube is an expulsion fuse tube and is indicated by the reference character 7. It is provided with an upper movable contact assembly 8 which includes outwardly projecting pins 9 adapted to fit behind a shoulder 10 of the resilient portion of the stationary upper contact indicated generally by the reference character 11. The resilient portion of the upper stationary contact is provided with rounded portions 12 which guide the fuse tube so that the fuse tube may be rocked back into service position when the fuse link has been renewed. The fuse tube is rocked back into service position by engaging the upper open eyelet member 13 with a switch stick and pushing the fuse tube back into latched position as shown in Figure 1.

The lower end of the fuse tube 7 is provided with a collar 14 which has an outwardly projecting portion 15 to which an operating lever 16 is pivoted as indicated at 17. The portion 15 also carries a fuse link extracting lever 18 which is pivoted thereon as indicated at 19. This fuse link extracting lever is provided with a fuse link gripping means in the form of a nut and gripping member indicated generally by the reference character 20 and is provided with a lip 21 over which the leader of the fuse link indicated at 22 extends.

The fuse link extracting lever 18 is provided with an outwardly projecting trunnion 18' on opposite sides thereof which removably seat within the hook like arms 4' of the lower stationary contacts as set forth in the above mentioned co-pending application.

The operating lever 16 includes a switch stick receiving arm 23, see Figures 1 and 2. This switch stick receiving arm is provided with a notch 24 adapted to receive the upper hooked end of the switch stick.

The operating lever 16 is in reality a U-shaped member, as shown in Figure 3, and its rearwardly projecting arms are connected to the fuse link extracting lever 18 by means of a pair of links 25.

It is to be noted that in the normal position the links 25 are at an angle outwardly and the lever arm between the links 25 and fuse link extracting member 18 is relatively long, as compared with the lever arm when the device is being operated and passes through its successive positions shown in Figures 4 and 5. In these last positions, it is to be noted that the actual or effective lever arm is relatively small so that as the fuse link extracting lever is moved from its normal position, shown in Figure 2, successively through its positions shown in Figures 4 and 5, it will pass from the position giving it maximum mechanical advantage to its position giving it its minimum mechanical advantage, but also it will pass through the successive stages whereby the motion or distance traveled by the fuse link extracting lever 18 is multiplied or in other words increases for each increase in angular motion of the operating lever 16. This means that when the fuse link is first stretched, the maximum mechanical advantage is obtained, but after the stretching progresses the mechanical advantage decreases but the motion multiplying effect increases and the fuse link extracting lever consequently moves at a greater and greater rate or distance for each succesive angular increase in the position of the fuse line extracting lever. This is of great importance.

The above arrangement of linkage mechanism is highly important, for by means of it the maximum travel of the fuse link extracting lever is obtained so that although the fuse link, indicated generally by the reference character 26 in Figure 2, stretches far beyond the average stretch of the standard fuse link, it nevertheless is ruptured,

However, a very long throw or wide angular motion is imparted to the fuse link extracting lever **18** far greater than that obtained by the fuse link extracting lever of the construction shown in the co-pending application hereinabove mentioned.

Referring to Figure 6, a fuse link indicated generally at **26** is disclosed, and is provided with the leader **22** and with the upper solid portion **27** which latter is provided with a button head **28** adapted to be clamped in place by the clamping cap **29** of the upper movable contact assembly **8** of the fuse tube **2**. Between the two members, namely the member **27** and the leader **22** of the fuse link, a strain wire **30** and a coiled relatively long fusible section **31** are positioned. This portion of the fuse link may be positioned within a small insulating sleeve **32**, in accordance with the standard practice, such sleeve being opened at its lower end and attached at its upper end to the solid portion **27** of the fuse link. This specific construction forms no portion of the invention. It is illustrated and described merely to show a type of fuse link which requires an excessively long or unusually long travel of the leader of the fuse link when it is being manually ruptured. Obviously any other type of fuse link could be employed which requires a long stretch before actual rupture occurs.

This extremely long travel of the fuse link extracting lever, or excessively long rocking motion imparted to such fuse link extracting lever by the operating lever, is obtained by the peculiar lever and linkage mechanism hereinabove described.

It is to be noted that the operating lever and the fuse link extracting lever have the points at which the connecting link joins them located between their respective pivots. This is shown in Figures 1, 4 and 5. From this it is also to be noted that the connecting link normally stands at an angle to a horizontal line, as viewed in Figure 2, and that this angle is increased and becomes more obtuse as the operating lever is pulled downwardly. Also, it is to be noted that the point at which the link is attached to the operating lever approaches closer to the point at which the fuse extracting lever is pivoted and that the actual effective lever arm between the link and the fuse link extracting lever decreases as the operating lever is moved towards fuse link extracting position and as the fuse link extracting lever moves towards the fuse link extracting position. This accounts for the decrease in effective lever arm so far as the fuse link extracting lever is concerned and it therefore accounts for the fact that the fuse link extracting lever has a greater and a greater angle of travel as the fuse link extracting lever moves to its final position as shown in Figure 5. Therefore it is apparent that the linkage mechanism is such as to provide a motion multiplying means so as to secure the great stroke or long stroke for the fuse link extracting lever.

It is to be particularly noted that although a fuse link of excesisvely long stretch may be encountered that nevertheless even this type of fuse link can be readily mechanically or manually broken or ruptured although it has as stated an excessively long stretch before actual rupture of the fuse link occurs.

Although this invention has been described in considerable detail it is to be understood that such description is intended as illustrative and not as limiting as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. An expulsion fuse construction comprising a support assembly having an upper and a lower stationary contact; and a fuse tube assembly having pivot means pivoted on said support assembly for rocking motion of said fuse tube assembly outwardly from said support assembly, said fuse tube assembly including a fuse tube having an open lower end and an upper movable contact normally engaging the upper stationary contact, a fuse link in said fuse tube electrically connecting the upper movable contact with the lower stationary contact, said pivot means including a supporting lever pivoted at spaced pivot points on said fuse tube and on said support assembly and constituting a fuse link extracting lever, an operating lever pivoted at a fixed point on said fuse tube assembly, and a link joining the end portion of said operating lever with the end portion of said fuse link extracting lever, said link being located between the pivot points of said operating lever and said fuse link extracting lever, said link and said operating lever and fuse link extracting lever jointly constituting a motion multiplying means, whereby a large angular travel of said fuse link extracting lever is obtained when said operating lever is rocked through a predetermined angle and whereby a long pull is imparted to said fuse link.

2. An expulsion fuse construction comprising a support assembly having an upper and a lower stationary contact; and a fuse tube assembly having pivot means pivoted on said support assembly for rocking motion of said fuse tube assembly outwardly from said support assembly, said fuse tube assembly including a fuse tube having an open end and an upper movable contact normally engaging the upper stationary contact, a fuse link in said fuse tube having a fusible section and electrically connecting the upper movable contact with the lower stationary contact, said pivot means including a fuse link extracting lever which also acts as a supporting lever pivoted on said fuse tube and on said support assembly at spaced pivot points, a manually operable lever pivoted on said fuse tube assembly, said fuse link extracting lever having an end portion projecting towards the pivot point of said manually operable lever and said operating lever having an end portion projecting towards said fuse link extracting lever, and link means joining the respective end portions of said fuse link extracting lever and said manually operable lever; said link means being located between the pivot points of said fuse link extracting lever and operating lever and being arranged to produce a decreasing effective lever arm when said manually operable lever is manually rocked downwardly to thereby constitute a motion multiplying means between said manually operable lever and said fuse link extracting lever.

3. An expulsion fuse tube construction comprising a fuse tube having an open lower end and an upper contact and a lower contact adjacent open end of said tube, a fuse link connecting the upper and lower contacts of said fuse tube and extending out of the open lower end of said fuse tube, a manually operable lever pivoted at a fixed point on said fuse tube adjacent the lower end thereof, a fuse link extracting lever pivoted on said fuse tube adjacent to the lower end thereof, said levers having end portions projecting towards each other and arranged one above the other with their end portions located in overlapping relation out of contact with each other and with the pivot points of the manually operable lever and the fuse link extracting lever spaced laterally from each other, and link means pivoted to the end portions of said levers, whereby motion multiplying means is provided for increasing the angular travel of said fuse link extracting lever for a given angle of travel of said operating lever.

4. An expulsion fuse construction comprising an expulsion fuse tube having an open lower end and having an upper contact and a lower contact adjacent its upper and lower ends respectively, a fuse link located within said fuse tube and electrically joining said contacts and having a fusible portion located within said fuse tube, said fuse link extending outwardly through the open lower end of said fuse tube, an operating lever pivoted on the lower portion of said fuse tube, a fuse link extracting lever pivoted on said lower portion of said fuse tube with the pivot points located one above the other, said levers having end portions extending towards each other in horizontally

overlapping relation and having pivot points on their end portion so arranged that the pivot point on the end of the upper operating lever extends inwardly of the pivot point on the end of the lower fuse link extracting lever so that the pivot points of the two levers are spaced laterally from each other, and link means joining the pivot points on the end portions of said levers.

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