May 30, 1961 G. R. McCLOUD 2,986,619

FUSE CUTOUTS

Filed Dec. 12, 1958 4 Sheets-Sheet 1

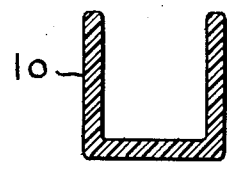

FIG. 2

FIG. 1

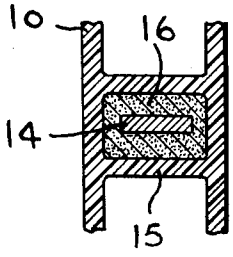

FIG. 3

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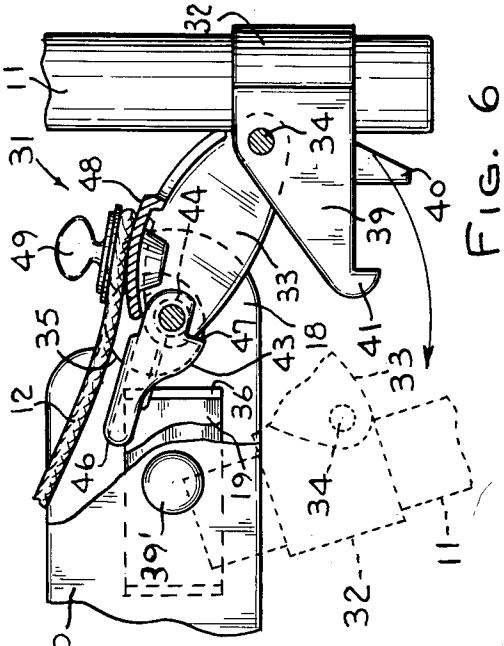

FIG. 6

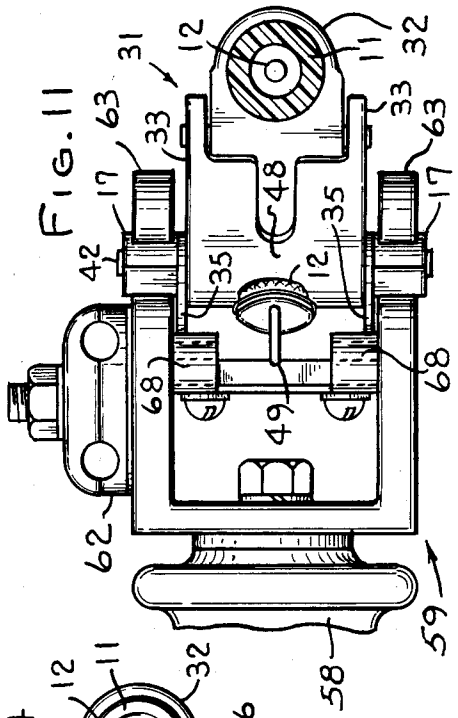

FIG. 11

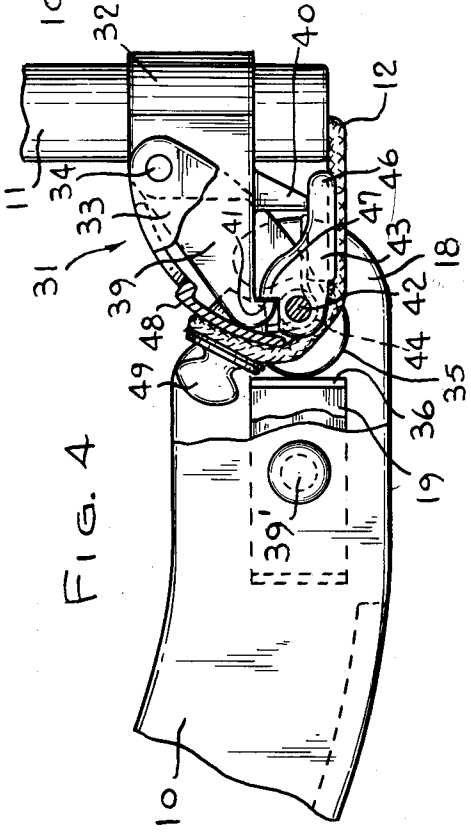

FIG. 4

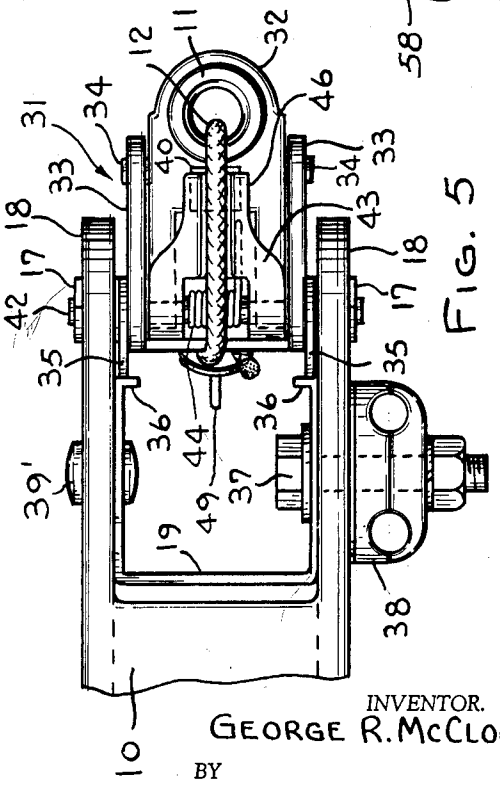

FIG. 5

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FUSE CUTOUTS

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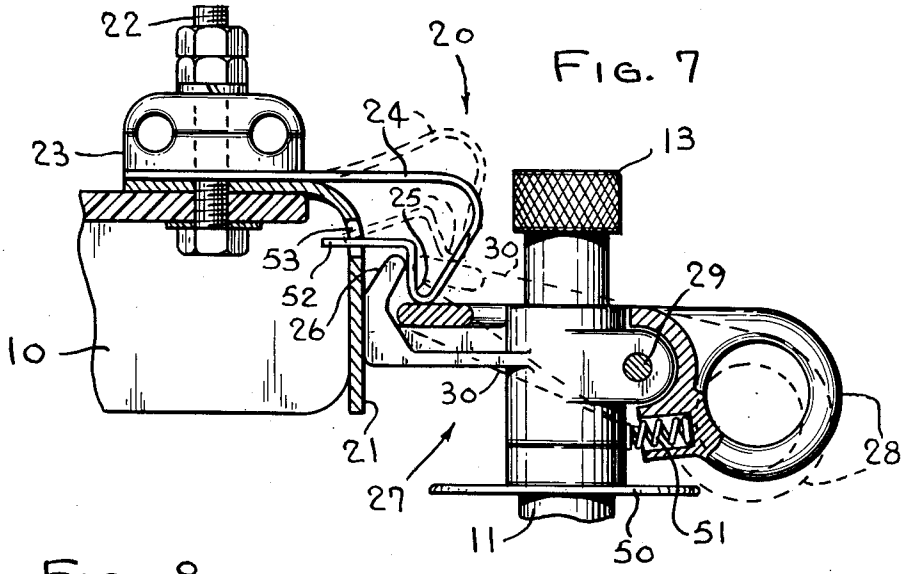
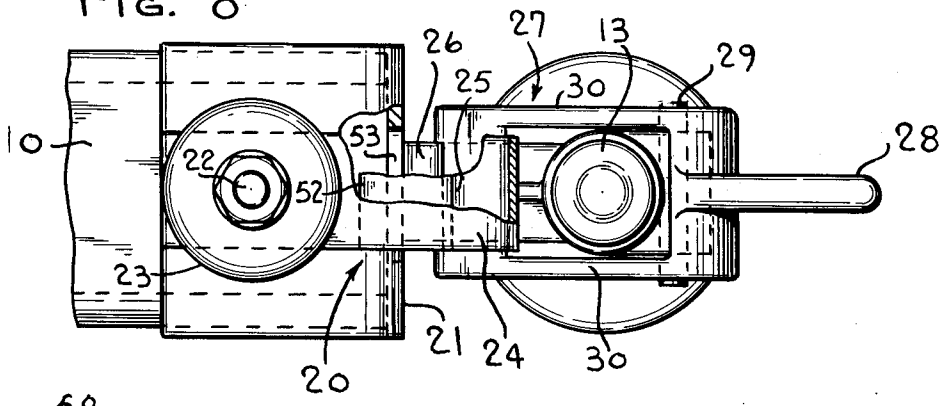


FIG. 7

FIG. 8



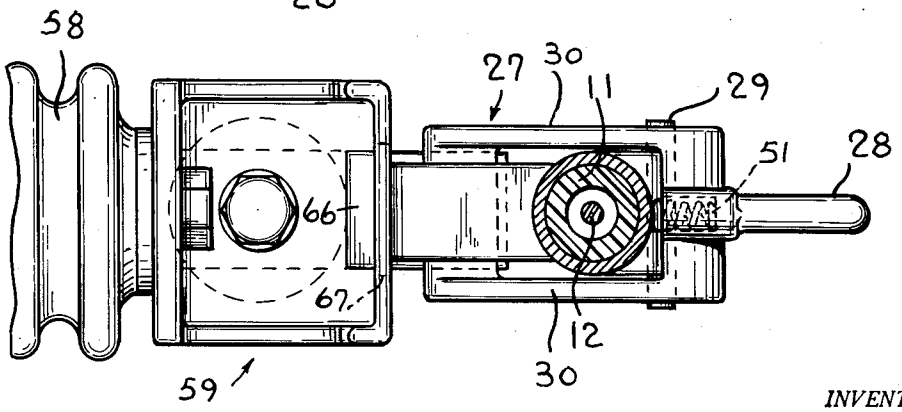


FIG. 12

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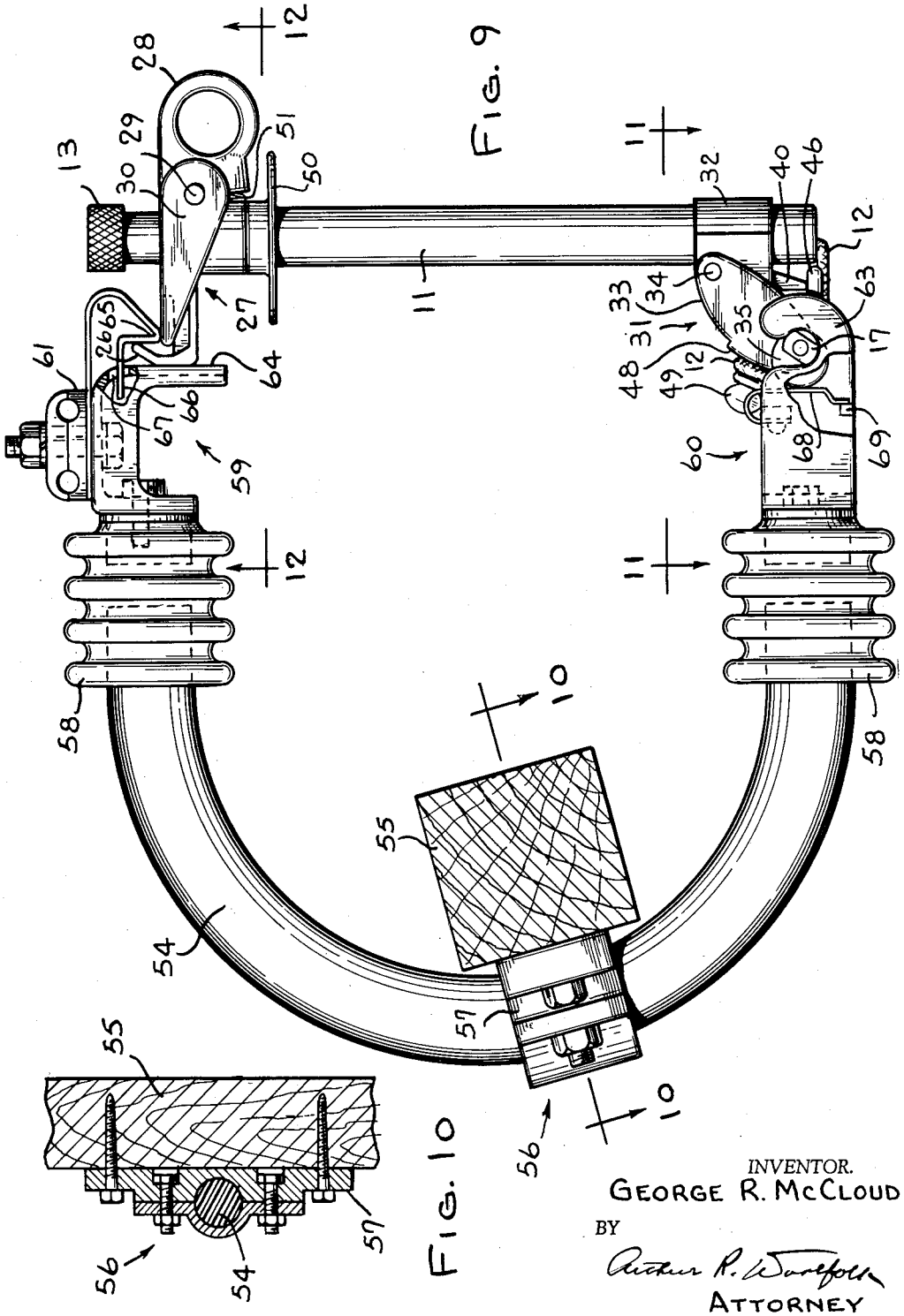

FIG. 9

FIG. 10

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2,986,619

FUSE CUTOUTS

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Filed Dec. 12, 1958, Ser. No. 780,070

11 Claims. (Cl. 200—114)

This invention relates to open type fuse cutouts.

In open type fuse cutouts it has been found that the upper support for the fuse tube is subjected to a terrific force due to the upward thrust from the fuse tube if the fuse tube is open at the lower end, and, the lower portion of the support is subjected to a considerable shock or force due to the rebound of the fuse tube so that both the upper and the lower portions of the support are subject to terrific forces and suddenly applied shocks.

In the prior constructions it is usual practice to provide porcelain or similar supports for the upper and lower contacts of the body portion or supporting structure of the circuit interrupter.

In addition to this, the flashover distance is usually not very great inasmuch as quite often the main support is of metal and the upper and lower stationary contacts are carried by the insulating members such as porcelain as previously described.

This invention is designed to overcome the above noted defects and the primary objects of this invention are to provide a fuse construction of great strentgh particularly for an open type fuse assembly and to prevent breaking due to brittleness or rigidity of the structure, and to provide a construction which has great mechanical strength in itself and also one which has high insulating characteristics or a high insulating factor between the upper and lower contacts.

A further object is to provide a construction which greatly increases the length of the flashover path from either the upper or lower contact to the metal support.

In further detail, this invention relates to an open type fuse construction where the main support is shaped like a C or is semicircular or of other shapes of this general character, which will hereinafter be referred to as C-shape for brevity, and to provide a construction whereby substantially the entire support is formed of fiber glass which has a springy nature and which is very strong mechanically in absorbing shocks, thrusts, or suddenly applied forces, and in which the support itself provdies a high degree of insulation between the upper and lower stationary contacts.

Further objects are to provide a resilient supporting structure for open type fuse cutouts which is of C-shape or similar shape as defined hereinabove which is formed throughout of fiber glass, which may or may not be provided with porcelain end portions.

Further objects are to provide a construction which is mechanically very simple and which will stand thermal shocks due to alternate heating and cooling and which retains its desirable characteristics although subjected to repeated mechanical or thermal shocks.

Embodiments of the invention are shown in the accompanying drawings in which:

Figure 1 is a side elevation of one form of the invention.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

Figure 3 is a sectional view on the line 3—3 of Figure 1.

Figure 4 is a detail view partly broken away of the lower portion of the structure shown in Figure 1.

Figure 5 is a bottom view of the lower portion of Figure 1 looking upwardly.

Figure 6 is a view corresponding to Figure 4 but showing the fuse tube as it drops out of operative position to its final dotted line position.

Figure 7 is a fragmentary view partly broken away and partly in section of the upper portion of Figure 1.

Figure 8 is a top view of the structure shown in Figure 1 looking downwardly with parts broken away and parts in section.

Figure 9 is a side elevation of a second form of the invention, such view corresponding to Figure 1.

Figure 10 is a reduced sectional view on the line 10—10 of Figure 9.

Figure 11 is a sectional view on the line 11—11 of Figure 9.

Figure 12 is a sectional view on the line 12—12 of Figure 9.

Referring to the drawings it is to be noted that both Figures 1 and 9 show the device in elevation. For convenience in drawing, the device has been shown with the fuse tube vertical but in usual practice the structure is mounted at an angle so that the fuse tube leans forward, so to speak. For example, referring to Figure 9, it will be seen that the wooden portion represents the ordinary cross arm of a power line pole and therefore this view will show how the device is usually tilted in actual mounting. Similarly in Figure 1, it is to be noted that the mounting tongue has a bend in it and therefore tilts the tube forwardly in the same manner as that previously described when the device is mounted on the usual support. This feature however can be varied as desired in accordance with the well known practice.

Further it is to be noted that the cross sectional shape of the different forms of the invention can be of any type of structural cross section desired whether channel shaped, hollow, or round, or of any other shape.

In this invention, the main support or main body of the device is a C-shaped, or the equivalent, resilient mounting of insulating material. The best material that I know of at this time for this purpose is bonded fiber glass or fiber glass reinforced plastic such as an epoxy plastic or resin. The term fiber glass therefore is intended to cover any of the high grade fiber glass insulating materials or equivalent materials.

Further, it is to be noted that the support may be of any desired shape such as semicircular shape as shown, or a strictly C-shape or a rectangular open sided shape or a similar shape of this general character.

It is to be understood that the term C-shape will be used throughout, but the invention is not to be limited strictly to this shape but may be of any open shape desired.

Further than this, the main body portion or support may be either formed of poured, molded fiber glass or may be formed from rolled sheets or strips and thereafter fabricated or shaped to the desired cross sectional shape.

It is to be noted that when the device is prepared from rolled or worked stock, that it is somewhat stronger because the orientation of the fibers is longitudinal.

The upper and lower stationary supports may be formed directly from the fiber glass itself as shown in the first form of the invention, Figure 1, or may be formed as separate metal members which are attached to the corresponding ends of the C-shaped body portion or main support.

In the form shown in Figure 1, the lower support for the fuse tube is formed directly in the side walls of the

fiber glass body portion itself. But it is to be understood, as stated, that the lower support may be a separate metal member attached to the lower end of the C-shaped body, if desired. Further it is to be noted that the fiber glass may carry porcelain insulators at the upper and lower ends as shown in the second form of the invention, Figure 9, or may be formed without such porcelain insulators.

Only a few of the many cross sectional shapes have been shown, but it is to be understood that these are merely for the purpose of illustration and are in no way intended to limit the scope of the invention.

Referring to Figure 1, the reference character **10** indicates the main body portion of the device. This body portion is formed of fiber glass. The fuse tube **11** is the expulsion type having an open lower end and the fuse link is indicated by the reference character **12** and the clamping upper cap for the fuse link is indicated by the reference character **13**. This construction is of any of the usual and well known types so far as hereinabove described.

The body portion **10** may be of any desired cross sectional shape, for example open channel shape, as shown in Figure 2, with the open portion directed inwardly as shown in Figure 1.

This body portion is provided with a metal supporting member **14**. As shown in Figure 3, this supporting member **14** has its inner end positioned within the inwardly depressed portion **15** of the fiber glass body portion **1** and is cemented therein as indicated at **16** in Figure 3. The body portion **10** is in reality semicircular but is intended to be included in the generic expression C-shape. The drawing shows the device with the fuse tube mounted vertically but in use it is usually mounted with the fuse tube slanting outwardly as its upper end is approached. This is accomplished by providing a bend as shown for the supporting tongue **14**.

As shown in Figure 1, the lower support for the trunnions **17** of the drop-out fuse tube **11** are carried directly in hook shaped members **18**.

It is to be noted from reference to Figure 1 that the trunnions **17** are free to turn in the hook-shaped supporting portion **18** of the body portion **10** but may not be detached by an upward motion as there is a slight overhang of the tongues **18** with reference to the trunnions **17**. However after the fuse tube has dropped from operative to inoperative position or in other words has dropped out as indicated in dotted lines in Figure 6, the trunnions will be turned to such a position that the fuse tube and associated parts may be lifted directly upwardly as the trunnions **17**, see Figure 1, have flat portions that allow it to clear the overhanging part of the hook-shaped supports **18** when in the dotted line position.

The particular type of mechanism for supporting the lower end of the fuse tube and for locking the upper end thereof may be of any desired type, but the ones chosen for illustration will however be described to show their cooperation with other parts of the apparatus.

The lower stationary contact is indicated by the dotted line **19** in Figure 1, and is shown in considerable detail in Figures 4, 5, 6 and 11. Although the Figure 11 is a sectional view taken on the line **11—11** of Figure 9, it is to be understood that the upper and lower movable contacts are the same type in both the first and second forms of the invention.

The upper stationary contact, indicated generally by the reference character **20** consists of a right angle metal contact member **21** and is clamped in place by means of the bolt **22**, which bolt also carries the line wire attaching portion **23**. This line wire attaching portion or part of the upper stationary contact is provided with upper and lower clamping members as shown and is a well known type.

The upper stationary contact also includes the spring metal member **24** which is looped downwardly and has a downwardly projecting lip **25** normally hooked over the upwardly projecting, slightly outwardly slanting lip **26** of the movable contact indicated generally at **27**.

It is to be noted also that the spring finger member **24** is provided with an inwardly projecting portion **52** which fits loosely within a hole or aperture **53** formed in the portion **21** of the stationary upper contact, see Figure 7. This upper movable contact **27** is carried by the upper end of the fuse tube **11**. The upper movable contact **27** is provided with a switch stick receiving eyelet or manually operable detaching eyelet **28** which is pivoted at **29** and has inwardly projecting fingers **30** positioned below the downwardly projecting spring lip or locking lip **25** of the upper stationary contact. It is obvious that when it is desired to detach the fuse tube assembly before it has blown or, in other words, while it is still in operative position, it is merely necessary to pull downwardly and outwardly on the manually manipulable eyelet **28** which causes the fingers **30** to move upwardly in a clockwise direction and to thus lift the spring locking finger **25** of the upper stationary contact. This frees the hooklike portion **26** of the upper movable contact of the fuse tube **11** so that the fuse tube may be rocked outwardly and downwardly.

The lower movable contact is indicated generally at **31** and includes the sleeve or member **32** which is secured to the lower portion or open end of the fuse tube **11** and pivotally carries the main link **33**. The pivot point is indicated at **34**.

This link **33** is in reality a pair of links which carry a pair of eccentrically mounted portions **35** which are integral with the links **33**, see Figures 1, 4, 5, 6 and 11, and which, when the fuse tube is in operative position as shown in Figure 1, bear against the inwardly turned abutments or lips **36** of the lower stationary contact **19**. This is most clearly shown in the dotted portion of Figure 1, and in Figures 4 and 5.

In Figure 5 it will be seen that the lower stationary contact **19** is an open, horizontally mounted, roughly U-shaped or rectangular member, whose side walls are clamped to the side walls of the insulating fiber glass support or body portion **10** by means of the bolt **37** and rivet **39'**. The bolt **37** etxends outwardly and carries the ground wire clamping member **38**. This clamping member **38** consists of a pair of clamping members of a well known type.

The arms **39** are provided with a downwardly projecting portion **40** and with hooklike parts **41** as shown in Figure 6.

The main supporting lever **33** is pivoted as indicated at **34** to the projecting portions **39** and pivotally carry the flipout lever **43** which flipout lever is pivoted to the inner ends of the linklike part **33** as indicated at **44**. This flipout lever is urged in a clockwise direction by means of the spring **44**, Figure 5, and normally occupies the position shown most clearly in Figure 4. The flipout lever **33** has an outwardly projecting portion **46** which may be slightly channel shaped and which bears directly against the fuse link **12** so that when the fuse link is ruptured, the flipout lever will serve to extract any remaining lower portion of the fuse link and will rock to the position shown in dotted lines in Figure 6.

The downwardly projecting finger **40** normally rests against the upper side of the inwardly projecting tongue **46** of the flipout lever as shown in Figure 4 and serves as a stop to arrest the motion of the flipout lever while the device is being refused. The flipout lever is also provided with a hook or shoulder portion **47** which, as shown in Figure 4, normally engages the hooklike portions **41** of the portion **39**. It will be seen from Figure 4 and from Figure 5 that the eccentric portions **35** of the main lever **33** bear or wedge against the flanges or ears **36** of the stationary contact **19** and thus serve as a direct and secure electrical connection between the main lever **33** and the stationary contact **19**.

The main lever **33** is provided with a rib or bridging

member or portion **48** which carries the thumb nut or clamping bolt **49** which clamps the fuse link **12** directly to the main lever **33** as shown in Figures 4 and 6.

When the fuse link is ruptured, or in other words when the device "blows," the flipout lever **43** immediately rocks to the position shown in Figure 6 and the fuse tube drops downwardly through the position shown in full lines and then rocks to the dotted line position of Figure 6.

If desired the upper movable contact or upper portion of the fuse tube may be provided with a circular shield indicated at **50** in Figure 1.

It is to be understood that any suitable type of mechanism could be employed with the fuse tube, however one of the preferred forms has been shown and described.

When the fuse blows, the upward thrust due to the expulsion action of the fuse tube, is very severe and puts a severe strain on the upper and lower ends of the C-shaped body portion **10**. In the particular form chosen for illustration in Figure 1, the major force or strain happens to be on the lower portion of the supporting structure **10**. This upward thrust is safely resisted by the strong C-shaped fiber glass body portion. In addition to this there are certain additional forces exerted due to the rebound of the fuse tube, so that the end portions of the C-shaped member have to resist all of these forces. The strong and resilient nature of the fiber glass C-shaped main support or body portion, readily takes care of these forces and this is one of the chief advantages due to the use of the fiber glass body portion or main support.

Another important advantage of the fiber glass supporting main body portion, is the fact that it is an excellent insulator itself and also, it materially increases the flashover path from the upper or lower stationary contact to any grounded portion of the structure for instance from either of the stationary contacts to the metal supporting portion **14**, see Figure 1. Other types of metal upper and lower portions of the device corresponding to upper and lower contacts hereinabove described may interlock with either or both of the upper and lower projecting ends of the fiber glass body portion or main support, and the forces may be transmitted to both of the ends of the C-shaped support.

The invention is not limited to the particular type of movable or stationary contacts employed. Whatever types of metal contacts may be used, the advantages enumerated above, are due to the strong, resilient and insulating characteristics of the main C-shaped body portion.

It is to be noted that the hooked member **26** of the upper movable contact bears tightly against the downwardly extending lip **21** of the stationary contact and thus produces a direct electrical connection.

It is to be noted from Figure 7 that the levers **30** and manually manipulable eyelet **28** are urged in a counter clockwise direction by means of the spring **51**, and the downward motion of the fingers is limited.

Referring to Figure 9, which shows the second form of the invention, it will be seen that the C-shaped main body portion is indicated by the reference character **54**. It may be of any desired shape as previously described, but has been shown as semicircular as in the first form of the invention. Also it may be of any desired cross sectional shape. The solid form has been illustrated, and it is clamped to a cross arm or supporting structure **55** by means of the clamp indicated generally at **56** in Figures 9 and 10. This clamp has outwardly projecting tongues **57** which may be bolted to the cross arm or other support **55** as shown.

The porcelain insulators are indicated by the reference characters **58**. They are cemented or secured in any of the usual ways to the end portion **54** of the main fiber glass, C-shaped body portion **54**. They carry the upper and lower stationary contacts indicated generally by the reference characters **59** and **60** respectively.

Referring to Figure 9 it will be seen that the metal lower stationary contact has hooklike portions **63** which overhang the trunnions **17**. The upper metal stationary contact **59** has a downwardly extending tongue **64** which engages the hooklike portion **26** of the movable upper contact.

The hooklike portion **26** is held tightly against the lip **64** of the upper metal contact by means of the spring hook member **65**. This member may be detached by pulling downwardly on the eyelet **28** with a switch stick, as in the first form of the invention. The spring member **65** terminates in a finger **66** which fits loosely within an aperture **67** in the metal upper contact **59**.

The upper metal stationary contact **59** and the lower stationary contact are provided with attaching members **61** and **62** as shown in Figures 9 and 11 respectively.

The lower stationary metal contact **60** is provided with a spring finger **68** attached at its upper end and adapted to bear at its lower end against a stop **69**. This spring finger is adapted to wedge against the eccentrically mounted member **35** of the movable lower contact previously described.

It is to be understood that the porcelain insulators **58** may be omitted or may be used with any form of the invention.

It is to be noted also that a shield **50** may be provided for either or both the first or second forms of the invention if so desired.

The C-shaped body portion may take many other shapes as previously described. Only two have been illustrated but the invention is not to be limited in any manner to these two main cross sectional shapes so far as the broadest aspect of the invention is concerned.

It will be seen that novel forms of main body portions have been provided which are composed throughout in certain forms of the invention of fiber glass, and which are composed substantially throughout in all forms of the invention of fiber glass, which has all of the above detailed desirable characteristics particularly as to mechanical and thermal ability to resist shocks and also as to the resilient springy feature of the device for cushioning mechanical shocks. The body portion itself has a very high insulating factor as described.

Although the 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 construction comprising a C-shaped main body portion formed of resilient fiber glass having upper and lower stationary contacts and having a supporting member intermediate the upper and lower ends of said body portion and spaced substantially the maximum distance from the upper and the lower stationary contacts to minimize flashovers, and an expulsion fuse tube having upper and lower movable contacts normally in engagement with the upper and lower stationary contacts.

2. A fuse construction comprising a C-shaped main body portion formed of resilient fiber glass having upper and lower stationary contacts and having a supporting grounded member intermediate the upper and lower ends of said body portion and spaced substantially the maximum distance from the upper and the lower stationary contacts to minimize flashovers, and an expulsion fuse tube having upper and lower movable contacts normally in engagement with the upper and the lower stationary contacts, said construction providing a cushioning resilient yielding structure for cushioning shocks due to the reaction from said fuse tube upon blowing on overload and due to any bounding that may take place.

3. An open type expulsion fuse construction comprising a C-shaped supporting main body portion formed of resilient fiber glass, said main body portion having an upper and a lower contact, an expulsion fuse having upper and lower contacts engaging said first mentioned up-

per and lower contacts, and a supporting projection extending outwardly intermediate the ends of the main body portion, the resiliency of said fiber glass C-shaped body portion cushioning shocks due to the expulsion action of said fuse tube and due to the rebounding that may take place from said fuse tube and said fiber glass body portion being resistant to thermal shocks.

4. A fuse construction comprising a main body portion formed of resilient fiber glass and having upper and lower outwardly projecting arms, upper and lower stationary contacts carried by said upper and lower arms, and an expulsion fuse assembly comprising an expulsion fuse tube having upper and lower movable contacts normally in engagement with said upper and lower stationary contacts, the major portion of the main body portion being formed solely of fiber glass.

5. A fuse construction comprising a main body portion formed of resilient fiber glass and having upper and lower outwardly projecting arms, upper and lower stationary contacts carried by said upper and lower arms, and a fuse assembly comprising a fuse tube having upper and lower movable contacts normally in engagement with said upper and lower stationary contacts, the major portion of the main body portion being formed solely of fiber glass.

6. A fuse tube construction comprising an open main body portion having upper and lower arms and formed of resilient fiber glass and having a support intermediate the ends thereof and having upper and lower stationary contacts carried by the arms of said main body portion, and a fuse tube having upper and lower movable contacts normally in engagement with upper and lower stationary contacts and having a fuse link, the yielding of said fiber glass body portion providing cushioning means for cushioning any forces upon fusing of said fuse link on overload.

7. A fuse tube construction comprising a C-shaped main body portion formed of resilient fiber glass and having a support intermediate the ends thereof and having upper and lower stationary contacts carried by the arms of said main body portion, and a fuse tube having upper and lower movable contacts normally in engagement with upper and lower stationary contacts and having a fuse link, the yielding of said fiber glass body portion providing cushioning means for cushioning any force upon fusing of said fuse link on overload.

8. A fuse construction comprising a main body portion formed of resilient fiber glass and being solid in cross section, said main body portion having upper and lower outwardly projecting arms and having stationary upper and lower contacts supported from said arms and an expulsion fuse construction having upper and lower movable contacts normally in engagement with said upper and lower stationary contacts.

9. A fuse construction comprising a main body portion formed of fiber glass and being resilient and resistant to thermal shocks and having upper and lower stationary contacts, a support intermediate the ends of said main body portion, an expulsion fuse tube including movable upper and lower contacts normally in engagement with the upper and lower stationary contacts, and ceramic spacing insulators between the upper and lower stationary contacts and the upper and lower ends of said main body portion.

10. A fuse construction comprising a main body portion formed of resilient fiber glass and being hollow in cross section, said main body portion having upper and lower outwardly projecting arms and having stationary upper and lower contacts supported from said arms and an expulsion fuse construction having upper and lower movable contacts normally in engagement with said upper and lower stationary contacts.

11. A fuse construction comprising a main body portion formed of resilient fiber glass and being channel shape in cross section, said main body portion having upper and lower outwardly projecting arms and having stationary upper and lower contacts supported from said arms and an expulsion fuse construction having upper and lower movable contacts normally in engagement with said upper and lower stationary contacts.

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