Dec. 31, 1940. H. A. TRIPLETT 2,226,838

FUSE CONSTRUCTION

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Fig. 1.

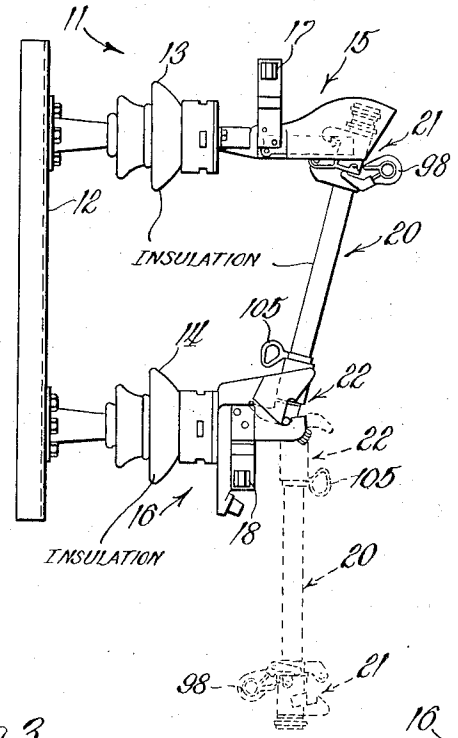


Fig. 2.

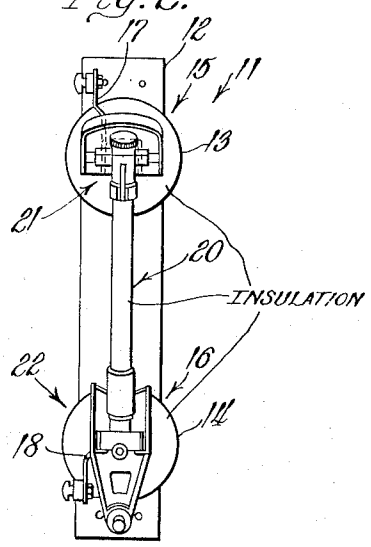


Fig. 3.

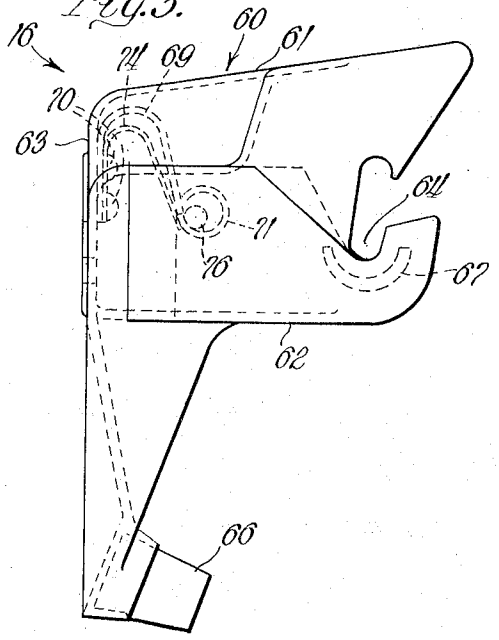
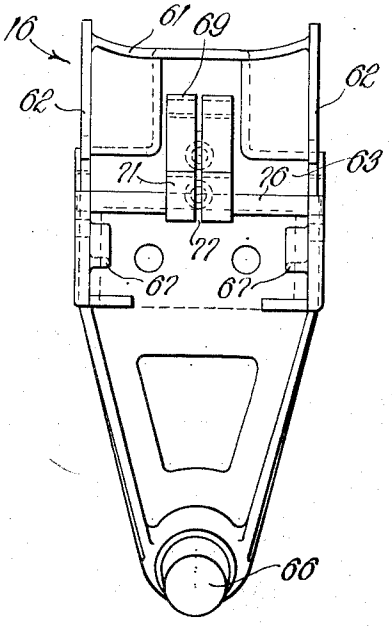


Fig. 4.



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Fig. 5.

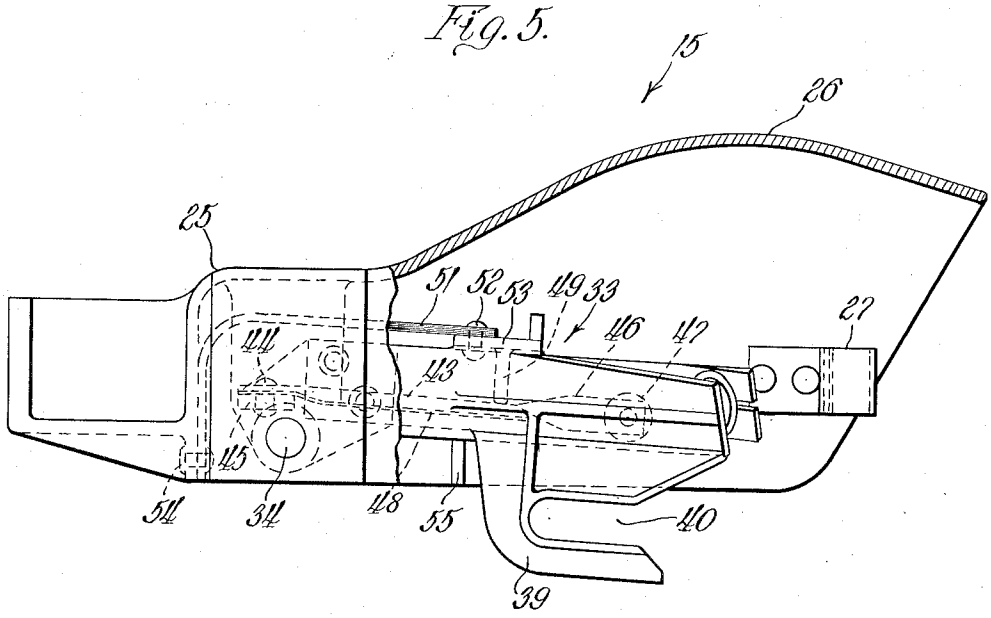
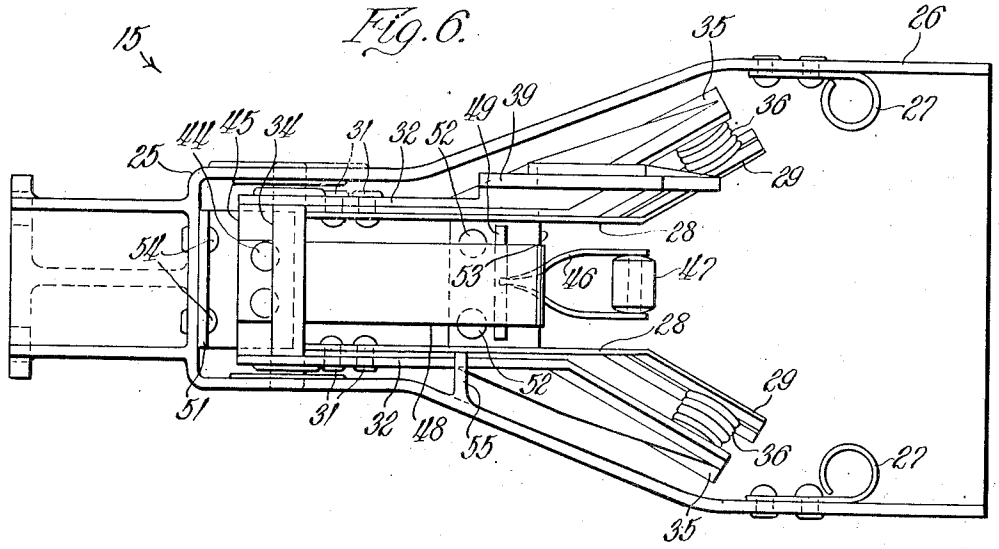


Fig. 6.



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FUSE CONSTRUCTION

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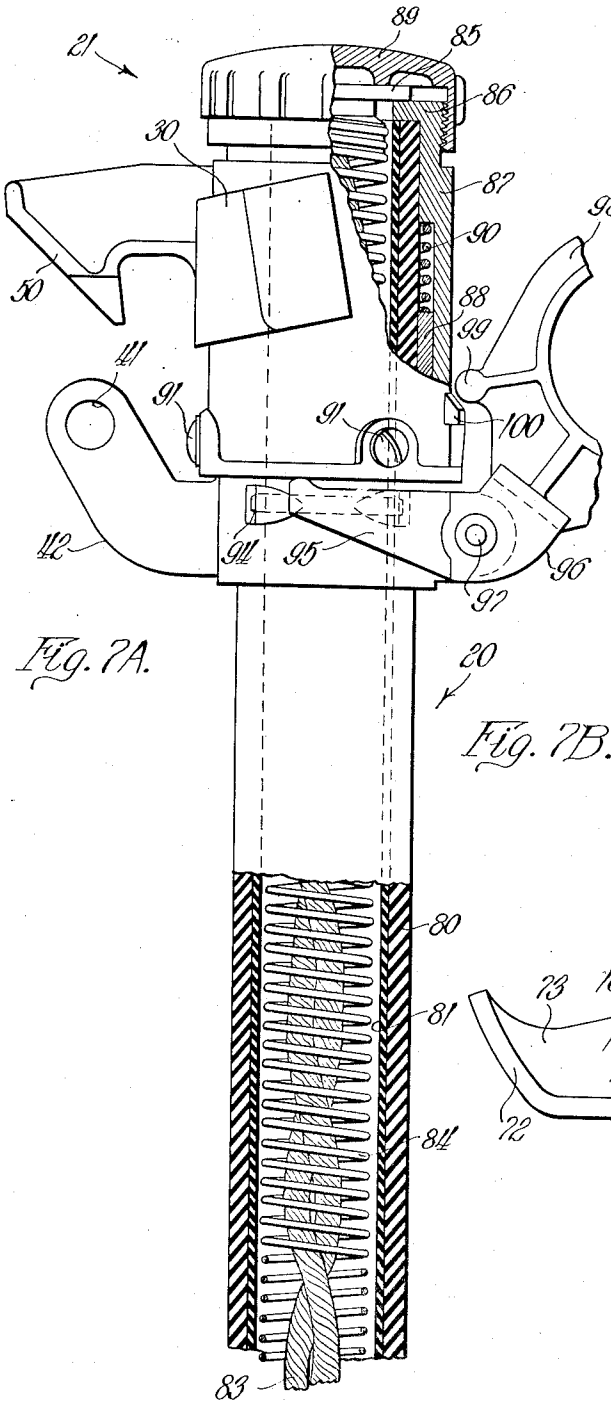


Fig. 7A.

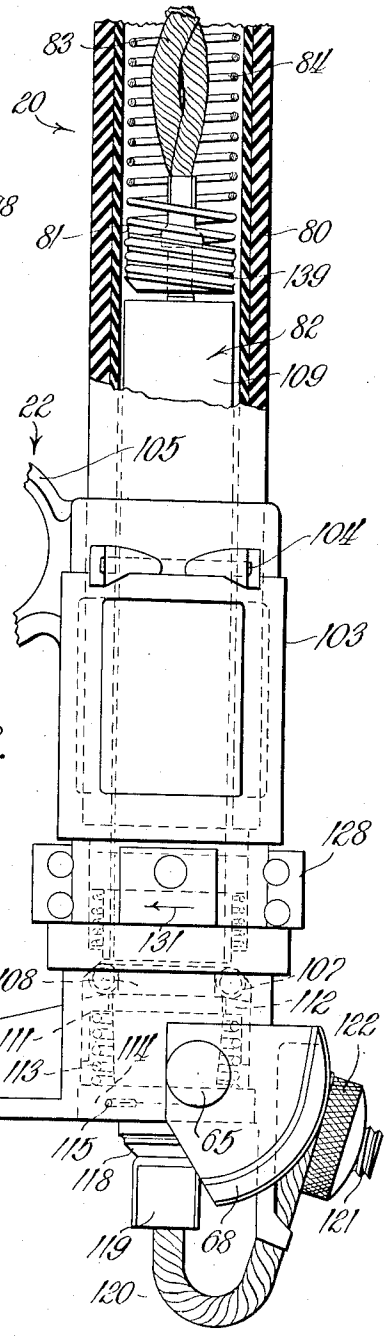


Fig. 7B.

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FUSE CONSTRUCTION

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Fig. 9.

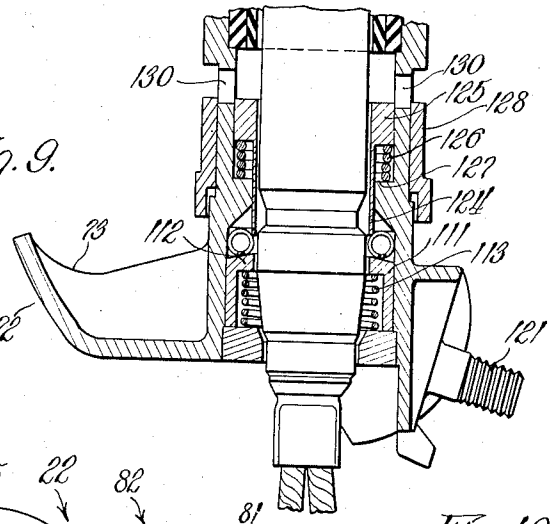


Fig. 8.

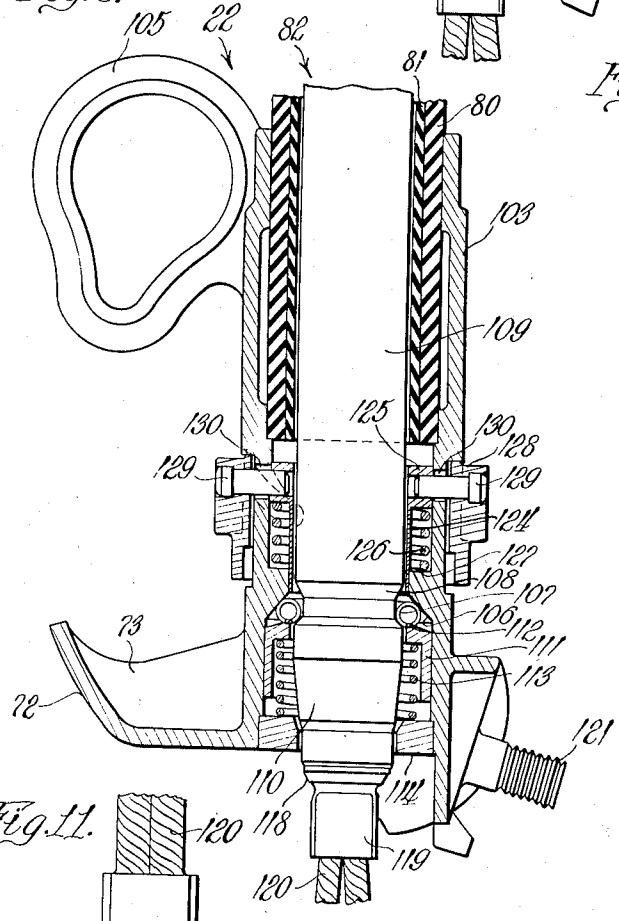
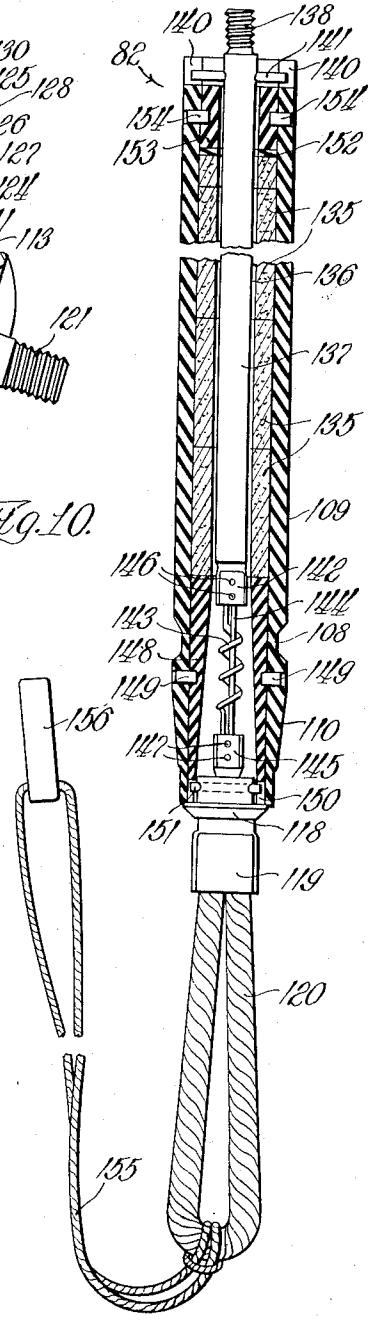


Fig. 11.

Fig. 10.



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2,226,838

UNITED STATES PATENT OFFICE

2,226,838

FUSE CONSTRUCTION

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Application August 5, 1938, Serial No. 223,175

39 Claims. (Cl. 200—117)

My invention relates, generally, to circuit interrupters and it has particular relation to expulsion fuse devices of the dropout type.

The present invention constitutes an improvement over the dropout fuse construction shown in the copending application of Allan Ramsey, Serial No. 740,057, filed August 16, 1934, and assigned to the assignee of this application. It also provides a fuse construction that has a greater range of current interrupting capacity and is adapted for use on higher system voltages, i. e., up to 46,000 volts. However, this figure is not intended to represent the limit of system voltage to which the invention may be applied but is merely illustrative of its range of application.

In this copending application of Ramsey a fuse tube is provided that is hinged on a lower stationary terminal and is latched at the top to another stationary terminal. The stationary terminals, are, of course, connected to the circuit to be protected. The fuse tube is of the expulsion type and has positioned therein a fuse link containing a fusible element that blows under predetermined conditions of overload on the circuit. As long as the fuse link remains intact, the fuse tube is held in position because of the latch at the upper end. On blowing of the fuse link, the latch is released and the tube is permitted to rotate about its lower end to an open circuit position, thereby placing an air gap in the circuit in addition to that formed by blowing of the fusible element. The upper terminal assembly is provided with a pair of contact fingers that are rigidly secured to the upper stationary terminal and are flared outwardly and upwardly at their outer ends for contact engagement with opposite sides of the upper terminal of the fuse tube. This construction requires that there be fairly close alignment between the fuse tube or its lower support and the upper contact assembly. One of the objects of my invention is to provide for receiving the upper terminal of the fuse tube of a hinged type of dropout in order to accommodate a fairly wide range of misalignment between the upper contact assembly and the fuse tube support.

The lower contact assembly shown in said copending application is provided with a contact finger that is backed up by a spring and is arranged to engage a contact arm carried by the lower terminal of the fuse tube. The arrangement is such that this contact finger may be bent out of shape or otherwise distorted by accidental engagement by a switch stick or the like. It is an object of my invention to protect the movable contact engaging portions of the lower contact assembly of a hinged type of fuse dropout and at the same time provide a relatively high degree of contact pressure between it and the lower terminal of the fuse tube.

The fuse link shown in said copending application is provided with a fiber tube that is secured to a terminal which, in turn, is connected to a tension spring in the fuse tube. When the fusible element in the fuse link blows, the terminal and the fiber sleeve of the fuse link are drawn into the fuse tube by the spring. In some cases the arc is first formed within the sleeve of the fuse link and then is drawn into the bore of the fuse tube which is of considerably larger diameter. Under certain operating conditions difficulties may be encountered in quickly extinguishing the arc. It is an object of my invention to hold the sleeve of a fuse link or fuse cartridge with its lining of arc extinguishing material stationary relative to the fuse tube when the fusible element blows. It is also an object of my invention to open a circuit by drawing an arc in a bore of substantially uniform diameter in a filling of arc extinguishing material to extinguish the same and subsequently automatically providing an air gap in the circuit in addition to that formed as a result of extinguishing the arc.

The fuse link in said copending application is provided with a flexible lead that extends outside of the fuse tube and is arranged to be secured to the lower terminal of the fuse tube. In refusing the fuse tube, the flexible lead is drawn to a predetermined position where its wedge terminal can be inserted in a pair of jaws. An object of my invention is to automatically latch a fuse cartridge or fuse link in place in a dropout type of fuse tube on its being drawn to a predetermined position therein. Still another object of my invention is to latch the fuse cartridge or fuse link having a flexible lead in a fuse tube in such manner that there is no tension stress applied to the flexible lead. A still further object of my invention is to provide for manually releasing the latch so as to permit removal of the fuse cartridge or fuse link either before or after it has blown.

Other objects of my invention will, in part, be obvious and in part appear hereinafter.

Accordingly, my invention is disclosed in the embodiment thereof shown in the accompanying drawings and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope

of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of my invention, reference may be had to the following detailed description, taken in connection with the accompanying drawings in which:

Figure 1 is a view, in side elevation, of a dropout fuse device of the expulsion type constructed in accordance with my invention;

Figure 2 is a view, in front elevation, of the fuse device shown in Figure 1;

Figure 3 is a view, in side elevation, of the lower contact assembly for the fuse device shown in Figure 1;

Figure 4 is a view, in front elevation, of the contact assembly shown in Figure 3;

Figure 5 is a view, partly in side elevation and partly in section, of the upper contact assembly for the fuse device shown in Figure 1;

Figure 6 is a view, in bottom plan, of the contact assembly shown in Figure 5;

Figures 7A and 7B, taken together, show the construction of the dropout fuse tube and associated parts, certain portions being broken away in order to more clearly illustrate the details of construction;

Figure 8 is a detail sectional view of the lower end of the fuse tube shown in Figures 7A and 7B in order to illustrate more clearly the construction of the clamping mechanism for the fuse cartridge shown in Figure 10, the fuse cartridge being shown in the latched position;

Figure 9 is a view similar to Figure 8 but showing the fuse cartridge in the unlatched position;

Figure 10 is a longitudinal sectional view of a replaceable fuse cartridge or fuse link that is employed in the fuse tube shown in Figures 7A and 7B; and

Figure 11 is a view showing an alternate form of terminal construction for the fuse cartridge shown in Figure 10.

Referring now particularly to Figures 1 and 2 of the drawings, it will be observed that the reference character **11** designates, generally, a dropout expulsion type fuse having a channel base **12** on which are mounted insulators **13** and **14**. Upper and lower contact assemblies **15** and **16** are mounted on the insulators **13** and **14** and they are provided, respectively, with circuit terminal members **17** and **18** to permit clamping thereto of the line conductors. A fuse tube, shown generally at **20**, is provided with upper and lower terminal assemblies **21** and **22**. The upper terminal assembly **21** is arranged to have contact engagement with the upper stationary contact assembly **15** while the lower terminal assembly **22** is arranged not only to have contact engagement with the lower contact assembly **16** but is also hingedly mounted thereon. When a fuse link or fuse cartridge within the fuse tube **20** blows, as will be described hereinafter, the upper terminal assembly **21** is no longer held in the position shown in Figures 1 and 2 of the drawings but is released therefrom to permit the fuse **20** to rotate to the alternate position shown by the broken lines. This provides an air gap between the circuit terminals formed by the contact assemblies **15** and **16** in addition to that which is provided by blowing of the fuse link or fuse cartridge itself.

In Figures 5 and 6 of the drawings the details of construction of the upper contact assembly **15** are more clearly shown. The upper contact assembly **15** is provided with a frame member **25** that is arranged to be suitably mounted on the insulator **13**. It has integrally formed therewith a sleet hood **26** which serves to protect the mechanism underneath including the upper terminal assembly **21** of the fuse tube **20** from the elements. Guide clips **27** are secured, as illustrated, to the opposite side walls of the sleet hood **26** for guiding the fuse tube **20** to the circuit closed position.

Flexible and resilient contact fingers **28** are provided with out and upwardly turned end portions **29** for contact engagement with the spaced apart contact surfaces on contact bosses **30**, Figure 7A, forming a part of the upper terminal of the fuse tube **20**. As will hereinafter appear, a portion of this upper terminal assembly **21** moves upwardly when the device is called upon to interrupt the circuit and, therefore, the outer ends **29** of the contact fingers **28** and the contact surfaces of the contact bosses **30** are shaped as described to facilitate this movement. At their inner ends the contact fingers **28** are secured, as by rivets, **31**, to the depending sides **32** of a backing member, shown generally at **33**. A hinge pin **34** extending through the depending sides **32** of the backing member **33** and into the depending side walls of the sleet hood **26** serves to rockably mount the backing member **33** and the parts carried thereby. A limited degree of freedom of vertical movement in the contact fingers **28** is thereby provided which is not present in the construction referred to hereinbefore in the copending application of Ramsey in which the contact fingers are secured directly to the depending walls of the sleet hood. It will be observed that the outer end portions **35** of the sides **32** of the backing member **33** are turned outwardly and upwardly to correspond to the outer end portions **29** of the contact fingers **28**. Coil compression springs **36** are provided therebetween for biasing the end portions **29** into contact engagement with the contact surfaces of the contact bosses **30**, Figure 7A, of the upper terminal assembly **21**.

It will now be apparent that the contact fingers **28** have two degrees of freedom. Because of their being rockably mounted on the pin **34**, they are movable in a vertical plane. The inherent resiliency of the contact fingers **28** and the springs **36** permit movement in a horizontal plane. As a result close alignment is not required to be maintained between the fuse tube **20** or its mounting in the lower contact assembly **16** and the upper contact assembly **15**. This is of considerable advantage not only from a manufacturing but also from an operating standpoint. It is not necessary to provide for mounting the lower terminal assembly **22** of the fuse tube **20** in the lower contact assembly **16** with close tolerances. In the field it is unnecessary to hold the insulators **13** and **14** within close limits of tolerance nor must a great deal of care be exercised in operating the fuse tube **20** to the circuit closed position. When it is recalled that fuse devices of the type disclosed herein are mounted overhead and are intended to be operated by means of switch hooks from a considerable distance, the advantages of these features will be readily apparent.

It is desirable to automatically align the contact fingers **28** with the contact bosses **30**, Figure 7A. For this purpose a centering arm **39** is integrally formed with one of the sides **32** of the backing member **33** and is provided with a

slotted opening 40, the outer ends of which are flared outwardly, as illustrated in Figure 5, for receiving a guide pin 41, Figure 7A, that is carried by a guide arm 42 forming a part of the upper terminal assembly 21 of the fuse tube 20. When the fuse tube 20 is operated toward the closed circuit position, the guide pin 41 first enters the flared out end portion of the slot 40 and then enters the slot 40 itself to lift the backing member 33 to the extent that may possibly be required. Since there is a definite relationship between the positions of the guide pin 41 and the contact bosses 30 and also between the slot 40 and the contact fingers 28, it will be readily apparent that proper contact engagement will be made between the outer end portions 29 of the contact fingers 28 and the contact surfaces of the contact bosses 30 despite the fact that they might otherwise be considerably out of alignment.

With a view to holding the fuse tube 20 in the circuit closed position, a latch arm 43 is provided, Figure 5, that is secured at its rear end by rivets 44 to a bridging member 45 between the sides 32 of the backing member 33. The forward end of the latch arm 43 is split and the two portions thereof are turned at right angles to the remainder of the latch arm 43 as indicated at 46 for receiving therebetween a roller 47. A spring strip 48, secured in position by the rivets 44 which also hold the latch arm 43, serves to bias the roller 47 upwardly, its upward movement being limited by a stop 49 formed by a depending flange of the backing member 33. It will be understood that the roller 47 is adapted to be engaged by a latch hook 50, Figure 7A, forming a part of the upper terminal assembly 21 of the fuse tube 20. Since the latch arm 43 and the roller 47 carried thereby move with the backing member 33, the roller 47 is automatically centered with the latch hook 50 when the guide pin 41 enters the slot 40 in the centering arm 39.

In order to provide a good electrical connection between the backing member 33 and the frame 25 a flexible shunt 51 is provided comprising several layers of flexible copper strips. The flexible shunt 51 is secured at one end by rivets 52 to a bridging member 53 between the sides 32 of the backing member 33. At its other end it is secured to the frame 25 by rivets 54.

The downward movement of the backing member 33 and the parts carried thereby about the hinge pin 34 is limited by a stop 55. It will be noted that the stop 55 is provided by a lug that may be cast integrally with one of the side walls of the sleet hood 26.

In Figures 3 and 4 of the drawings the details of construction of the lower contact and hinge assembly 16 are illustrated. The assembly comprises a housing 60 that is open at the front and has a wall 61 closing the top and side walls 62 depending therefrom. A rear wall 63 joins the walls 60 and 62, as shown. The assembly 16 serves not only to rockably mount the fuse tube 20 but also to conduct current to the lower terminal assembly 22.

In order to rockably mount the fuse tube 20, the side walls 62 are provided with slotted openings 64 for receiving therein trunnions, one of which is shown at 65 in Figure 7B of the drawings as forming a part of the lower terminal assembly 22. When the fuse link or cartridge within the fuse tube 20 blows, the fuse tube 20 is unlatched at its upper end, as previously described, and rotates downwardly with the trunnions 65 turning in the bottoms of the slots 64. A rubber bumper 66 is provided for cushioning the inward swing of the fuse tube 20. Disengagement between the fuse tube 20 and the hinge and contact assembly 16 is prevented by interfitting flanges 67 and 68. The flanges 67 are formed integrally with the side walls 62 and project inwardly therefrom while the flanges 68, one of which is shown in Figure 7B, are integrally formed with the lower terminal assembly 22. It will be understood that, when the fuse tube 20 is in the circuit-closed position, the flanges 67 and 68 overlap, thereby preventing the recoil resulting from the blowing of the fuse link or cartridge causing the fuse tube 20 to move upwardly and possibly carry the trunnions 65 out of the slots 64. It is only when the fuse tube 20 has rotated to the broken line position shown in Figure 1 that it is possible to lift it out of the slots 64. Likewise, it can only be inserted therein by being initially placed substantially in this position.

Contact engagement with the lower terminal assembly 22 is provided by an inverted U-shaped contact finger 69 that may be secured by rivets 70 to the rear wall 63 of the housing 60, which pass through one leg thereof. As shown, the outer end of the other leg of the U-shaped contact finger 69 is turned back on itself as indicated at 71 to provide a curved surface for contact engagement with a contact shoe 72, Figure 7B, that is part of a contact arm 73 which extends from the lower terminal assembly 22 into the housing 60 when the fuse tube 20 is in the circuit closed position. An inverted U-shaped spring strip 74, conforming generally to the shape of the contact finger 69 and having one leg commonly secured to the rear wall 63 therewith by the rivets 70, is provided for biasing the other leg of the contact finger 69 outwardly into contact engagement with the contact shoe 72. While the contact finger 69 itself is resilient, the added resiliency of the spring strip 74 serves to bias the portion 71 into high pressure contact engagement with the contact shoe 72.

While it is desirable to bias the contact finger 69 into high pressure contact engagement with the contact shoe 72, it is desirable that there be little movement of the turned back portion 71 required for effecting this high pressure contact engagement. Therefore, a pin 76 is provided through the turned back portion 71, its ends being secured in the side walls 62. The contact finger 69 and the spring strip 74 are then held in a prestressed condition when the contact shoe 72 is out of engagement therewith. In order to obtain the full biasing effect of the contact finger 69 and of the spring strip 74, it is only necessary for the contact shoe 72 to move the turned back portion 71 out of engagement with the pin 76. Despite the fact that only a slight movement of the contact finger 69 takes place, yet, as soon as it is moved away from the pin 76, the full biasing force of the contact finger 69 and of the spring strip 74 is available for providing the desired high pressure contact engagement. With a view to increasing the flexibility of the contact finger 69 and of the spring strip 74 they are split as indicated at 77 in Figure 4 of the drawings.

In Figures 7A and 7B of the drawings the details of construction of the fuse tube 20 are shown. It will be observed that it comprises an outer sleeve 80 and a lining or inner sleeve 81. Preferably, the outer sleeve 80 is formed of a weather

resisting material, such as phenolic condensation product, while the liner or inner sleeve 81 is formed of fiber for reasons now well known to those skilled in the art. If desired, the liner or inner sleeve 81 may be omitted and the outer sleeve 80 alone used. A replaceable fuse cartridge, shown generally at 82, and described in detail hereinafter, is provided at the lower end of the fuse tube 20 and connection thereto is provided by a flexible cable 83. A coil tension spring 84 is provided for tensioning the fuse cartridge 82 and withdrawing a terminal therefrom as will presently appear.

At their upper ends the flexible cable 83 and the spring 84 are secured to a cable and spring fastener having a flanged head 85, the under surface of which engages a flange 86 of a sleeve 87 that is slidably mounted on a ferrule 88. A cap 89 is threaded on the sleeve, as shown, for clamping the flanged head 85 to the sleeve 87 for securing good electrical contact engagement therebetween. A spring 90, around the upper end of the fuse tube 20 and interposed between the sleeve 87 and the ferrule 88 serves to bias the former upwardly.

It will be noted that the contact bosses 30 and the latch hook 50 are formed integrally with the sleeve 87. As long as the fuse cartridge 82 remains intact, the sleeve 87 is prevented from moving upwardly under the influence of the coil spring 90. However, as soon as the fuse cartridge 82 blows, the sleeve 87 is no longer restrained but moves upwardly carrying with it the latch hook 50. As previously described, when it moves out of engagement with the roller 47, Figure 6, the fuse tube 20 is then free to swing downwardly to the circuit open position. The upward movement of the sleeve 87 relative to the ferrule 88 is limited by screws 91 which project into suitable slots, not shown, in the ferrule 88. The ferrule 88 is fastened on to the upper end of the fuse tube 20 so that it is rigid therewith. For this purpose transverse pins, one of which is shown at 94, are provided on opposite sides. Thus the guide arm 42, which is integrally formed with the ferrule 88, and the guide pin 41 are rigid with the fuse tube 20.

In order to lift the latch hook 50 from engagement with the roller 47 for the purpose of manually removing the fuse tube 20, a pair of arms are provided, one of which is shown at 95, on opposite sides of the ferrule 88 as a part of an operating lever 96 which is pivoted on a pin 97 that extends through a portion of the ferrule 88, as shown. An eye 98 is formed integrally with the operating arm 96 and is adapted to be engaged by the prong of a switch hook, as will be readily understood. A stop 99, forming a part of the eye 98, on engaging a flange 100 extending from the sleeve 87, serves to prevent upward movement of the latter when the fuse tube 20 is moved to the closed circuit position.

In Figures 7B and 8 the details of construction of the lower terminal assembly 22 are more clearly illustrated. This terminal assembly includes a ferrule 103 that is fixedly secured to the lower end of the fuse tube 20 by transversely extending pins, such as the pin 104 located near the top and on opposite sides. An eye 105 is integrally formed with the ferrule 103 to receive the prong of a switch hook for placing the fuse 20 in position with the trunnions 65 in the slots 64. It will be understood that the fuse tube is first positioned as shown by the broken lines in Figure 1. The prong of the switch stick is then removed from the eye 105, and placed in the eye 98. The fuse tube 20 is then swung upwardly to the circuit closed position.

In my copending application, Serial No. 304,035, filed November 13, 1939, as a continuation in part of this application, the details of construction of the foregoing described contact structures are claimed.

The lower end of the ferrule 103 is provided with an inclined surface 106 intermediate its ends against which a garter spring 107 reacts for interlocking with or interfitting with a peripheral groove 108 in the sleeve 109 of the fuse cartridge 82. As illustrated in Figure 10, the sleeve 109 is of substantial thickness and the peripheral groove 108 is formed adjacent its lower end. Preferably the sleeve 109 is formed of a phenolic condensation product. If desired, the sleeve 109 may be provided with a fiber lining. Its lower end 110 is tapered in order to facilitate insertion through the garter spring 107. When the fuse cartridge 82 is positioned in the fuse tube 20, as shown in Figure 8 of the drawings, it is latched in position by the garter spring 107 interfitting in the peripheral groove 108 and reacting against the inclined surface 106.

With a view to returning the garter spring 107 in operative position when the cartridge 82 is not in position and at the same time permitting expansion of the garter spring 107 to receive the fuse cartridge 82, a sleeve 111 is slidably mounted in the lower enlarged opening in the ferrule 103 below the inclined surface 106. The sleeve 111, as shown, is provided with an inwardly extending flange 112 that bears against the underside of the garter spring 107.

A coil spring 113 reacting between the underside of the flange 112 and the upper surface of a closure ring 114 serves to bias the sleeve 111 upwardly. Radially extending pins 115, Figure 7B, serve to hold the closure ring 114 in position in the lower end of the ferrule 103.

When the fuse cartridge 82 is drawn through the ferrule 103, the tapered end portion 110 first engages the garter spring 107 and causes it to expand radially. Because of the inclined surface 106, it moves downwardly at the same time and carries with it the sleeve 111, at the same time compressing the spring 113. Since the convolutions of the garter spring 107 are spaced substantially uniformly about the sleeve 109 of the fuse cartridge 82 and further since they bear uniformly against the upper surface of the flange 112, there is no likelihood of the latching mechanism binding at any point and preventing proper operation. It will be understood that the fuse cartridge 82 is drawn through the ferrule 103 until it reaches a position where the garter spring 107 can snap into the peripheral groove 108 in the sleeve 109. This it does by virtue of its own resiliency and also under the biasing influence of the coil spring 113 which tends to move the garter spring 107 upwardly, this upward movement having a radial complement because of the inclined surface 106.

At its lower end the fuse cartridge 82 is provided with a relatively infusible metal terminal 118 that has an initially tubular shaped lower end portion 119 which is collapsed, as shown, on to the two ends of a length of flexible cable 120. After the fuse cartridge 82 has been latched in position, as shown in Figure 8, the looped end of the flexible cable 120 is positioned over the threaded stud 121 extending from the ferrule 103 and is clamped in position by the knurled nut 122. Since the sleeve

109 of the fuse cartridge 82 is latched in position by the garter spring 107, as previously described, the coil tension spring 84 does not apply any tension stress to the flexible cable 120. This simplifies the installation of the fuse cartridge 82 since it is unnecessary to hold the flexible cable 120 against the tension force of the spring 84 and at the same time clamp it in position. Further, since the flexible cable 120 is comparatively slack in the installed position, the terminal 118 does not have applied to it any oblique stresses. It then remains centered with respect to the sleeve 109 of the fuse cartridge 82. At the same time the connection to the flexible cable 120 is positioned entirely away from the lower end of the sleeve 109 and out of the path of the products of the arc that are formed when the fusible element blows.

In order to remove the fuse cartridge 82 from its latched position in the lower ferrule 103, a release ring 124 is slidably and rotatably mounted in the ferrule 103, as illustrated. The release ring 124 is provided with a flanged head 125 and is biased upwardly by means of a coil compression spring 126 that reacts between the undersurface of the flanged head 125 and the upper surface 127 of a shoulder formed in the sleeve 103. The lower end of the release ring 124 is arranged to engage the garter spring 107, as will presently appear, and is normally held out of engagement therewith by the spring 126. A release operating ring 128 is provided externally of the lower ferrule 103 and is adapted to be grasped by the hand of the lineman. The release operating ring 128 is both slidably and rotatably mounted exteriorly of the lower ferrule 103. Radial pins 129, extending through helical slots 130 in the wall of the ferrule 103 serve to mechanically interconnect the release ring 124 with the release operating ring 128. On rotation of the release operating ring 128 in the direction indicated by the arrow 131, Figure 7B, it will be understood that the relase ring 124 is rotated therewith. At the same time, because of the interaction between the pins 129 and the helical slots 130, both of these rings are moved downwardly, compressing the spring 126. The lower end of the release ring 124 engages the garter spring 107 and moves it out of the peripheral groove 108 as is illustrated more clearly in Figure 9 of the drawings. The fuse cartridge 82 is then withdrawn by the spring 84, if the fuse cartridge is still intact, or, if it has blown, it will drop out of position when the fuse tube 20 is inverted. On release of the release operating ring 128 by the operator, it snaps back into the position shown in Figure 8 of the drawings.

If desired, one end of the spring 126 may be fastened to the under surface of the flanged head 125 and the other end may be fastened into the shoulder against whose surface 127 it reacts. This arrangement not only serves to bias the rings 125 and 128 upwardly but also biases them for rotation back to the normal position.

In Figure 10 of the drawings the details of construction of the refill unit or fuse cartridge 82 are more clearly shown. As previously described, the cartridge 82 is provided with a sleeve 109 having the peripheral groove 108 for interfitting with the garter spring 107. The sleeve 109 has a lining 135 formed by a filling of arc extinguishing material, such as boric acid. The filling 135 of arc extinguishing material may either be continuous or in sections, as illustrated. The filling of arc extinguishing material 135 is provided with a central bore 136 of uniform diameter through which a rod-like terminal 137 may be withdrawn. At its upper end the rod-like terminal 137 is threaded, as indicated at 138, for engagement with a spring and cable fastener 139, Figure 7B, to which the lower ends of the flexible cable 83 and the tension spring 84 are also connected. The upper end of the sleeve 109 is transversely slotted, as shown at 140, for receiving the ends of a transverse pin 141 that extends through the rod-like terminal 137. This arrangement prevents rotation of the terminal rod 137 relative to the sleeve 109.

Initially the lower end of the terminal rod 137 is provided with an axially extending recess that is collapsed, as shown at 142, on to the ends of fusible and strain elements 143 and 144, respectively. The other ends of the fusible and strain elements have collapsed thereon the end portion 145 of the terminal 118. As indicated at 146 and 147, the terminal end portions 142 and 145 are provided with prick punch marks for further deforming the metal thereof about the ends of the fusible and strain elements 143 and 144.

A fiber retaining ring 148 is provided at the lower end of the sleeve 109 and is secured thereto by transverse pins 149, as shown. The retaining ring 148 is flared outwardly to form an ring 148 is preferably formed of fiber in order arcing chamber. As indicated, the retaining ring 148 is preferably formed of fiber in order to withstand the heat that may be radiated from the fusible element 143 under normal operating conditions.

The lower end of the retaining ring 148 is slotted as indicated at 150 for receiving the ends of a pin 151 that extends transversely through the terminal 118. The terminal 118 is, therefore, prevented from rotating relative to the sleeve 109. It is then possible to grasp the fuse cartridge 82 at the terminal 118 and thread it into the spring and cable holder 139, Figure 7B, without twisting the fusible or strain elements 143 and 144. This is important, as will be readily understood, since such twisting action might injure or even break one or both of these elements or might alter the time-current characteristics thereof.

The sleeve 109 is filled with as many sections of the arc extinguishing material 135 as is desired. One or more spacers 152 are then inserted at the upper end to fill the remaining space underneath a retaining ring 153 which is held in position by transverse pins 154, as shown.

For installation purposes, a pull-up cord 155 is looped about the flexible cable 120 and is provided at its end with a suitable weight 156. It will be understood that the pull-up cord 155 is removed once the fuse cartridge 82 has been installed.

Under predetermined overload conditions the fusible and strain elements 143 and 144 will be fused and an arc will be formed between the terminal 118 and the rod-like terminal 137. Since the rod-like terminal 137 is no longer restrained, it will move upwardly through the bore 136 in the filling of arc extinguishing material 135 under the influence of the tension spring 84. The heat of the arc will cause water vapor to be evolved from the wall of the bore 136 which forms a highly efficient arc extinguishing medium. The terminal 118 will be blown out of the lower end of the fuse cartridge 82 but is prevented from falling by the flexible cable 120. The lower end of the sleeve 109 and the retaining ring 148 is open, however, to permit free egress of the products of the arc. Since the sleeve 109 is held

latched to the lower ferrule 103 by the garter spring 107, the filling of arc extinguishing material 135 is held stationary while the rod-like terminal 137 is moved upwardly therethrough. The length of the rod-like terminal 137 is such that it is not withdrawn from the bore 136 when the tension spring 84 is fully collapsed.

As previously described, when the fuse cartridge 82 blows, the sleeve 87 of the upper terminal assembly 21 is no longer restrained. It then moves upwardly under the influence of the spring 90 to lift the latch hook 50 off of the roller 47 to permit the fuse tube 20 to swing downwardly to the broken line position shown in Figure 1 of the drawings. The movement of the fuse tube 20 to the open circuit position not only provides an air gap in the circuit in addition to that provided by the blowing of the fusible and strain elements 143 and 144 but it also serves to indicate that the circuit has been interrupted and that the cartridge 82 should be replaced by a new one.

Accordingly, the lineman inserts the prong of his hook stick in the eye 105 and removes the fuse tube 20 from the lower contact assembly 16, Figure 1. He then removes the cap 89, Figure 7A, and withdraws the spring and cable assembly including the flexible cable 83 and the spring 84, also carrying with it the rod-like terminal 137. He then inverts the fuse tube 20 and rotates the release operating ring 128 in the direction indicated by the arrow 131, Figure 7B, and the remaining portions of the fuse cartridge 82 drop out. The knurled nut 122 is then loosened and the flexible cable 120 is removed.

After unscrewing the rod-like terminal 137 from the spring and cable fastener 139, a new fuse cartridge 82 is screwed into place. The pull-up cord 155 with the weight 156 are then attached to the flexible cable loop 120 and the entire assembly is dropped through the fuse tube 20 from the upper end and the cap 89 is replaced. The weight 156 carries the pull-up cord 155 out of the lower end of the fuse tube 20 where it can be grasped by the hand of the lineman. He then pulls it through the fuse tube 20 until the cartridge 82 is moved to such position that the garter spring engages the peripheral groove 108 to latch the same in position. He then removes the pull-up cord 155 and clamps the end of the flexible cable loop 120 in position by the knurled nut 122. The fuse tube 20 is now ready to be connected in the circuit, as previously described.

As shown in Figure 11 of the drawings, the flexible lead 120 may be provided with a lug or terminal 160 to facilitate attachment to the lower ferrule 103 on being placed over the stud 121 and clamped in position by the nut 122. The lug or terminal 160 may comprise a metal sleeve flattened onto the looped lower end of the flexible lead 120.

In the copending application of Ramsey, referred to hereinbefore, three fuse tubes are provided which are arranged to be repeatedly connected into the circuit. That is, on the blowing of the fuse tube that is connected in the circuit, it drops out, as described, and in so doing closes a transfer switch which connects the next fuse tube into the circuit.

When the second fuse blows, it drops out and operates a transfer switch to connect the last fuse tube into the circuit. When the last fuse tube drops out, the circuit is not again reclosed. It will be understood that the present invention may be employed in connection with a repeating fuse structure, as disclosed in this copending application of Ramsey, merely by the provision of two or more units with transfer switches arranged as required for completing the circuit through the next fuse when the preceding fuse blows.

Since certain further changes may be made in the foregoing construction and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter shown in the accompanying drawings or described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, a replaceable circuit interrupting device insertable through one end of said housing and including a fuse cartridge attached to a spring having means at its free end cooperating with said one end of said housing for holding the same thereat, means at the other end of said housing automatically interfitting with said fuse cartridge when it is drawn to a predetermined position through said housing for latching the same thereat, and manually operable means shiftable through a relatively short arc for releasing said automatic interlocking means.

2. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, a replaceable circuit interrupting device insertable through one end of said housing, means automatically interlocking with said replaceable circuit interrupting device at the other end of said housing on its being moved to a predetermined position in said housing for holding the same thereat, and means located at said other end of said housing and manually shiftable through a relatively short arc for releasing the automatic interlocking means to permit removal of said replaceable circuit interrupting device.

3. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, a replaceable circuit interrupting device insertable through one end of said housing and including a fuse cartridge attached to a spring having means at its free end cooperating with said one end of said housing for holding the same thereat, means at the other end of said housing automatically interfitting with said fuse cartridge when it is drawn to a predetermined position through said housing for latching the same thereat, and means adapted to be manually shifted through a relatively short arc for releasing the automatic latching means to permit removal of said fuse cartridge from said housing.

4. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, tubular terminals at the ends of said housing, a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge attached to a tension spring having means at its free end cooperating with said one terminal for holding it thereat, and means carried by the other tubular terminal on the portion thereof adjacent said housing for automatically interlocking with said fuse cartridge when it is drawn therepast to hold the same in a predetermined position in said housing.

5. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, tubular terminals at the ends of said housing, a replaceable circuit interrupting device insertable

through one of said tubular terminals including a fuse cartridge attached to a tension spring having means at its free end cooperating with said one terminal for holding it thereat, means carried by the other tubular terminal for automatically interlocking with said fuse cartridge when it is drawn therepast to hold the same in a predetermined position in said housing, and manually operable rotatable means disposed externally of said other tubular terminal on the end thereof adjacent said housing for releasing the automatic interlocking means to permit removal of said fuse cartridge from said housing.

6. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, a replaceable circuit interrupting device insertable through one end of said housing, means automatically interlocking with said replaceable circuit interrupting device at the other end of said housing on its being moved to a predetermined position in said housing for holding the same thereat, and a flexible lead forming part of said replaceable circuit interrupting device and extending outside of said other end of said housing to permit external connection thereto.

7. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, a replaceable circuit interrupting device insertable through one end of said housing and including a fuse cartridge attached to a spring having means at its free end cooperating with said one end of said housing for holding the same thereat, means at the other end of said housing automatically interfitting with said fuse cartridge when it is drawn to a predetermined position through said housing for latching the same thereat, means adapted to be manually operated for releasing the automatic latching means to permit removal of said fuse cartridge from said housing, and a flexible lead connected to said fuse cartridge and extending outside of said other end of said housing to permit external connection thereto, said flexible lead being unstressed by said spring when said fuse cartridge is latched in operative position.

8. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, tubular terminals at the ends of said housing, a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge attached to a tension spring having means at its free end cooperating with said one terminal for holding it thereat, means carried by the other tubular terminal for automatically interlocking with said fuse cartridge when it is drawn therepast to hold the same in a predetermined position in said housing, and a flexible lead interconnecting said fuse cartridge and said other tubular terminal, said flexible lead being unstressed by said tension spring when said fuse cartridge is latched in operative position.

9. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, tubular terminals at the ends of said housing, a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge attached to a tension spring having means at its free end cooperating with said one terminal for holding it thereat, means carried by the other tubular terminal for automatically interlocking with said fuse cartridge when it is drawn therepast to hold the same in a predetermined position in said housing, manually operable means disposed externally of said other tubular terminal for releasing the automatic interlocking means to permit removal of said fuse cartridge from said housing, clamp means carried by said other tubular terminal, and a flexible lead extending from said fuse cartridge and secured to said other tubular terminal by said clamp means, said flexible lead being unstressed by said tension spring when said fuse cartridge is latched in operative position.

10. A renewable circuit interrupter comprising, in combination; a tubular insulating housing; tubular terminals at the ends of said housing; a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge, a sleeve of insulating material for said fuse cartridge, a tension spring connected to said fuse cartridge at one end of said sleeve, and means at the free end of said spring cooperating with said one tubular terminal for holding it thereat, and means carried by the other tubular terminal for automatically interlocking with said sleeve of insulating material when said fuse cartridge is drawn to a predetermined position in said housing.

11. A renewable circuit interrupter comprising, in combination; a tubular insulating housing; tubular terminals at the ends of said housing; a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge, a sleeve of insulating material for said fuse cartridge, a tension spring connected to said fuse cartridge at one end of said sleeve, means at the free end of said spring cooperating with said one tubular terminal for holding it thereat, and a flexible lead connected to said fuse cartridge and extending from the other end of said sleeve, means carried by the other tubular terminal for automatically interlocking with said sleeve of insulating material when said fuse cartridge is drawn to a predetermined position in said housing; and means carried by said other tubular terminal for receiving said flexible lead for connection thereto, said flexible lead being unstressed by said tension spring.

12. A renewable circuit interrupter comprising, in combination; a tubular insulating housing; tubular terminals at the ends of said housing; a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge, a sleeve of insulating material for said fuse cartridge, a tension spring connected to said fuse cartridge at one end of said sleeve, and means at the free end of said spring cooperating with said one tubular terminal for holding it thereat; means carried by the other tubular terminal for automatically interlocking with said sleeve of insulating material when said fuse cartridge is drawn to a predetermined position in said housing; and manually operable means operatively interconnecting said other tubular terminal and said automatic interlocking means for releasing the latter from said sleeve by rotation of the manual means relative to the other tubular terminal.

13. A renewable circuit interrupter comprising, in combination; a tubular insulating housing; tubular terminals at the ends of said housing, a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge, a sleeve of insulating material for said fuse cartridge, a tension spring connected to said fuse cartridge at one end of said sleeve, means at the free end of said spring cooperating with said one tubular terminal for

holding it thereat, and a flexible lead connected to said fuse cartridge and extending from the other end of said sleeve; means carried by the other tubular terminal for automatically interlocking with said sleeve of insulating material when said fuse cartridge is drawn to a predetermined position in said housing; and manually operable means operatively interconnecting said other tubular terminal and said automatic interlocking means for releasing the latter from said sleeve by rotation of the manual means relative to the other tubular terminal.

14. A renewable circuit interrupter comprising, in combination; a tubular insulating housing; tubular terminals at the ends of said housing; a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge, a sleeve of insulating material for said fuse cartridge having an external peripheral groove adjacent one end, a tension spring connected to said fuse cartridge at the other end of said sleeve, means at the free end of said spring cooperating with said one tubular terminal for holding it thereat, and a flexible lead connected to said fuse cartridge and extending from said one end of said sleeve; means interacting between said other tubular terminal and said peripheral groove in said sleeve for automatically latching said fuse cartridge in a predetermined position in said housing when it is drawn thereto; and means carried by said other tubular terminal for receiving said flexible lead for connection thereto, said flexible lead being unstressed by said tension spring.

15. A renewable circuit interrupter comprising, in combination; a tubular insulating housing; tubular terminals at the ends of said housing; a replaceable circuit interrupting device insertable through one of said tubular terminals including a fuse cartridge, a sleeve of insulating material for said fuse cartridge having an external peripheral groove adjacent one end, a tension spring connected to said fuse cartridge at the other end of said sleeve, means at the free end of said spring cooperating with said one tubular terminal for holding it thereat, and a flexible lead connected to said fuse cartridge and extending from said one end of said sleeve; means interacting between said other tubular terminal and said peripheral groove in said sleeve for automatically latching said fuse cartridge in a predetermined position in said housing when it is drawn thereto; means carried by said other tubular terminal for receiving said flexible lead for connection thereto, said flexible lead being unstressed by said tension spring; and manually operable means operatively interconnecting said other tubular terminal and said automatic interlocking means for releasing the latter from the groove in said sleeve by rotation of the manual means relative to the other tubular terminal.

16. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove, of means for securing the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing, and resilient means disposed internally of said tubular terminal and adapted to interfit with said peripheral groove in said fuse cartridge.

17. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove, of means for securing the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing, resilient means disposed internally of said tubular terminal and adapted to interfit with said peripheral groove in said fuse cartridge, and externally operable manual release means carried by said tubular terminal for moving said resilient means out of said peripheral groove to permit removal of said fuse cartridge from said housing.

18. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove, of means for securing the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing, a garter spring inside said tubular terminal for interfitting with said peripheral groove in said fuse cartridge, and resilient means biasing said garter spring into operative position, said resilient means being arranged and adapted to permit said garter spring to be expanded on insertion of said fuse cartridge into said tubular terminal.

19. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove, of means for securing the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing, a garter spring inside said tubular terminal for interfitting with said peripheral groove in said fuse cartridge, resilient means biasing said garter spring into operative position, said resilient means being arranged and adapted to permit said garter spring to be expanded on insertion of said fuse cartridge into said tubular terminal, and externally operable manual release means carried by said tubular terminal for moving said garter spring out of said peripheral groove to permit removal of said fuse cartridge from said housing.

20. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove adjacent one end, of latch means for latching the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing having an inclined shoulder portion intermediate its ends, a garter spring interfitting between said peripheral groove and said inclined shoulder portion, and lost motion means cooperating with said garter spring for holding the same in operative position and permitting expansion thereof on insertion of said fuse cartridge.

21. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove adjacent one end, of latch means for latching the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing having an inclined shoulder portion intermediate its ends, a garter spring interfitting between said peripheral groove and said inclined shoulder portion, a sleeve member slidable in said tubular terminal and having a shoulder portion engaging said garter spring, and spring means biasing said sleeve member toward said garter spring for holding the same in operative position and permitting expansion thereof on insertion of said fuse cartridge.

22. The combination, with a tubular insulat-

ing housing and a renewable fuse cartridge therefor having an external peripheral groove adjacent one end, of latch means for latching the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing having an inclined shoulder portion intermediate its ends, a garter spring interfitting between said peripheral groove and said inclined shoulder portion, lost motion means cooperating with said garter spring for holding the same in operative position and permitting expansion thereof on insertion of said fuse cartridge, a release ring slidable and rotatable in said tubular terminal for operatively engaging said garter spring, spring means biasing said release ring away from said garter spring, a release operating ring manually rotatable externally of and slidable with respect to said tubular terminal, said tubular terminal having helical grooves coextensive with said release operating ring, and pin means operatively interconnecting said release and operating rings through said helical grooves in such manner that rotation of said operating ring causes said release ring to engage said garter spring and move the same out of said peripheral groove to permit removal of said fuse cartridge from said housing.

23. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external peripheral groove adjacent one end, of latch means for latching the fuse cartridge in a predetermined position in said housing comprising, a tubular terminal at one end of said housing having an inclined shoulder portion intermediate its ends, a garter spring interfitting between said peripheral groove and said inclined shoulder portion, a sleeve member slidable in said tubular terminal and having a shoulder portion engaging said garter spring, spring means biasing said sleeve member toward said garter spring for holding the same in operative position and permitting expansion thereof on insertion of said fuse cartridge, a release ring slidable and rotatable in said tubular terminal for operatively engaging said garter spring, spring means biasing said release ring away from said garter spring, a release operating ring manually rotatable externally of and slidable with respect to said tubular terminal, said tubular terminal having helical grooves coextensive with said release operating ring, and pin means operatively interconnecting said release and operating rings through said helical grooves in such manner that rotation of said operating ring causes said release ring to engage said garter spring and move the same out of said peripheral groove to permit removal of said fuse cartridge from said housing.

24. A renewable cartridge comprising, in combination, a tubular insulating member, a filling of solid arc extinguishing material in said tubular member having a bore extending longitudinally therethrough, a rod-like terminal substantially filling said bore and adapted to be withdrawn through one end thereof, a relatively infusible terminal at the other end of said bore, fusible means interconnecting said terminals, flexible lead means connected to the last named terminal to permit external connection thereto, and means carried by said cartridge for cooperating with latching means carried by a fuse tube for holding the cartridge in a predetermined position with respect to said fuse tube independently of said flexible lead means.

25. A renewable cartridge comprising, in combination, a tubular insulating member, a filling of solid arc extinguishing material in said tubular member having a bore extending longitudinally therethrough, a rod-like terminal substantially filling said bore and adapted to be withdrawn through one end thereof, a relatively infusible terminal at the other end of said bore, fusible means interconnecting said terminals, flexible lead means connected to the last-named terminal to permit external connection thereto, and means preventing rotation of both said terminals relative to said tubular insulating member.

26. A renewable cartridge comprising, in combination, a tubular insulating member having a peripheral groove adjacent one end for cooperating with automatic latching means in an expulsion fuse tube, a filling of solid arc extinguishing material in said tubular member having a bore extending longitudinally therethrough, a rod-like terminal substantially filling said bore and adapted to be withdrawn through one end thereof, a relatively infusible terminal at the other end of said bore, fusible means interconnecting said terminals, and flexible lead means connected to the last-named terminal to permit external connection thereto.

27. A high tension circuit interrupter for completing a circuit between a pair of circuit terminals comprising, in combination; a tubular fuse housing; a fuse tube terminal at the upper end of said fuse housing for contact engagement with one of said circuit terminals; means within said fuse housing for connecting said fuse tube terminal to the other of said circuit terminals including fusible means, a filling of solid arc extinguishing material having a longitudinal bore of substantially uniform diameter and a rod-like terminal adapted to draw the arc formed on blowing of said fusible means within said bore for extinguishing the same; and means for releasing said fuse tube terminal from its circuit terminal on blowing of said fusible means to interpose an air gap between said circuit terminals in addition to the gap formed by blowing of said fusible means.

28. A high tension circuit interrupter for completing a circuit between a pair of circuit terminals comprising, in combination; a tubular fuse housing; a fuse tube terminal at the upper end of said fuse housing for contact engagement with one of said circuit terminals; means within said fuse housing for connecting said fuse tube terminal to the other of said circuit terminals including fusible means, a filling of solid arc extinguishing material having a longitudinal bore of substantially uniform diameter and a rod-like terminal adapted to draw the arc formed on blowing of said fusible means within said bore for extinguishing the same; a flexible lead interconnecting said fusible means and the other circuit terminal; and means for releasing said fuse tube terminal from its circuit terminal on blowing of said fusible means by movement of said fuse housing to an alternate position to interpose an air gap between said circuit terminals in addition to the gap formed by blowing of said fusible means.

29. A renewable circuit interrupter comprising, in combination, a tubular insulating housing, a replaceable circuit interrupting device insertable through one end of said housing, means automatically interlocking with said device at the other end of said housing on its being moved to a

predetermined position therein for holding the same thereat, and externally manually operable release means at said other end of said housing adapted to be moved through a relatively short distance and to cooperate with said automatic interlocking means for releasing said device.

30. A renewable cartridge for an expulsion type fuse comprising, in combination, a tubular insulating member of uniform external diameter having a peripheral groove adjacent one end for cooperating with automatic latching means in a fuse tube, a filling of solid arc extinguishing material in said tubular member having a bore extending longitudinally therethrough, a rod-like terminal substantially filling said bore and adapted to be withdrawn through one end thereof, a relatively infusible terminal at the other end of said bore, and fusible means interconnecting said terminals.

31. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having an external circumferential groove, of means for securing the fuse cartridge in a predetermined position in the housing comprising, a tubular terminal at one end of said housing, and spring biased means within said tubular terminal adapted to interfit with said groove of said fuse cartridge.

32. The combination, with a tubular insulating housing and a renewable fuse cartridge therefor having a circumferential groove, of means for securing the fuse cartridge in a predetermined position in the housing comprising, a tubular terminal at one end of said housing, spring biased means within said tubular terminal adapted to interfit with said groove of said fuse cartridge, and externally operable manual release means cooperating with said spring biased means for releasing the same from engagement with said fuse cartridge.

33. A circuit interrupter comprising, in combination, a pair of line terminals and means for mounting the same in insulated spaced relation, a fuse tube having terminals at its ends for engaging said line terminals and open at one end, latching means for releasably holding said fuse tube in operative position, a mass of solid arc extinguishing material adjacent said one end of said fuse tube having a bore extending longitudinally therethrough, and conductor means extending through said longitudinal bore for interconnecting said terminals on said fuse tube and controlling said latching means; said conductor means including a relatively infusible terminal connected to the fuse tube terminal at said one end of said fuse tube, a rod-like terminal substantially filling said longitudinal bore and connected to the other fuse tube terminal, and fusible means interconnecting said infusible and rod-like terminals, said latching means being released on blowing of said fusible means whereupon said fuse tube moves from said operative position and an air gap is provided between at least one of said line terminals and its associated fuse tube terminal.

34. A circuit interrupter comprising, in combination, a pair of line terminals and means for mounting the same in insulated spaced relation, a fuse tube having terminals at its ends for engaging said line terminals and open at one end, latching means for releasably holding said fuse tube in operative position, a mass of solid arc extinguishing material adjacent said one end of said fuse tube having a bore extending longitudinally therethrough, conductor means extending through said longitudinal bore for interconnecting said terminals on said fuse tube and controlling said latching means; said conductor means including a relatively infusible terminal connected to the fuse tube terminal at said one end of said fues tube, a rod-like terminal substantially filling said longitudinal bore and connected to the other fuse tube terminal, and fusible means interconnecting said infusible and rod-like terminals, said latching means being released on blowing of said fusible means whereupon said fuse tube moves from said operative position and an air gap is provided between at least one of said line terminals and its associated fuse tube terminal, and spring means restrained by said fusible means and released on blowing thereof for effecting relative movement between said rod-like terminal and said longitudinal bore and operating said latching means to unlatching position.

35. Circuit interrupting apparatus comprising, in combination, solid arc extinguishing material having a bore from the inner wall of which a relatively large quantity of water vapor is evolved due to the heat of an arc, terminals adapted to be moved relatively apart and to draw an arc therebetween within said bore, one of said terminals being rod-like in character and disposed within said bore and movable relative thereto, and disconnecting means operable as a result of relative movement apart of said terminals for providing an air gap in the circuit in addition to the gap provided therein between said terminals after the arc is extinguished.

36. Circuit interrupting apparatus comprising, in combination, solid arc extinguishing material having a bore from the inner wall of which a relatively large quantity of water vapor is evolved due to the heat of an arc, terminals adapted to be moved relatively apart and to draw an arc therebetween within said bore, one of said terminals being rod-like in character and disposed within said bore and movable relative thereto, and means operable as a result of relative movement apart of said terminals for bodily moving said solid arc extinguishing material to an alternate position to provide an air gap in the circuit in addition to the gap provided therein between said terminals after the arc is extinguished.

37. Circuit interrupting apparatus comprising, in combination, solid arc extinguishing material having a bore from the inner wall of which a relatively large quantity of water vapor is evolved due to the heat of an arc, terminals adapted to be moved relatively apart and to draw an arc therebetween within said bore, one of said terminals being rod-like in character and disposed within said bore and movable relative thereto, spring means acting to bias said terminals apart, fusible means interconnecting said terminals and restraining movement thereof apart, and disconnecting means operable as a result of relative movement apart of said terminals for providing an air gap in the circuit in addition to the gap provided therein between said terminals after the arc is extinguished.

38. In a circuit interrupter, in combination, a fuse tube, a mass of solid arc extinguishing material adjacent one end of said fuse tube having a bore extending longitudinally therethrough, a relatively infusible terminal at said one end of said fuse tube, a rod-like terminal substantially filling said longitudinal bore, means biasing said

rod-like terminal for movement relative to said bore, fusible means interconnecting said terminals and restraining said rod-like terminal from movement under the influence of said biasing means, and a member connected to said rod-like terminal and movable endwise of said fuse tube externally thereof as a result of blowing of said fusible means.

39. A high tension circuit interrupter for completing a circuit between upper and lower circuit terminals comprising, in combination; a tubular fuse housing and means pivotally mounting the same relative to said lower circuit terminal, a fuse tube terminal at the upper end of said fuse housing for contact engagement with said upper circuit terminal; means within said fuse housing for connecting said fuse tube terminal to said lower line terminal including fusible means, a filling of solid arc extinguishing material having a longitudinal bore of substantially uniform diameter and a rod-like terminal adapted to draw the arc formed on blowing of said fusible means within said bore for extinguishing the same; latching means for maintaining said contact engagement between said fuse tube terminal and said upper circuit terminal and holding said fuse housing in operative position; and means for releasing said latching means on blowing of said fusible means whereby said fuse housing is permitting to swing to an inoperative position and an air gap is interposed between said fuse tube terminal and said upper circuit terminal.

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