Jan. 13, 1942. J. S. THOMPSON 2,269,610

FUSIBLE CIRCUIT INTERRUPTER

Filed Feb. 26, 1940 2 Sheets-Sheet 1

Fig. 1.

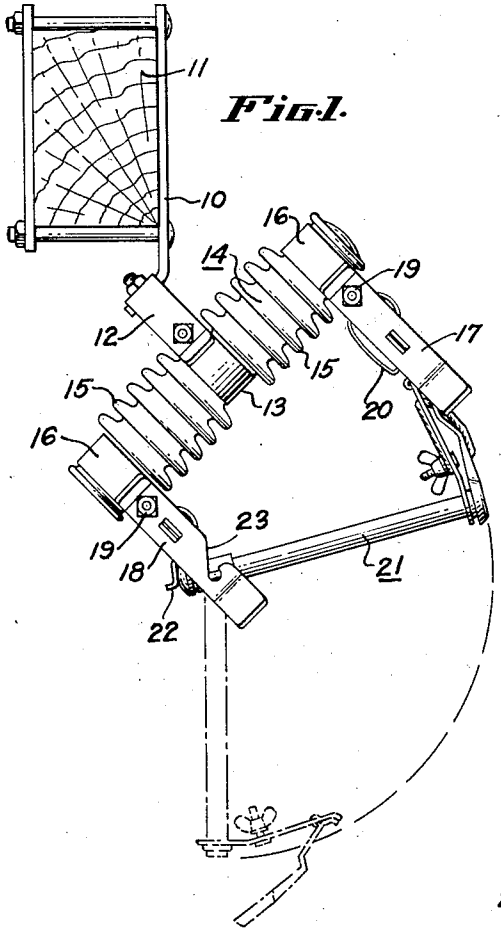


Fig. 3.

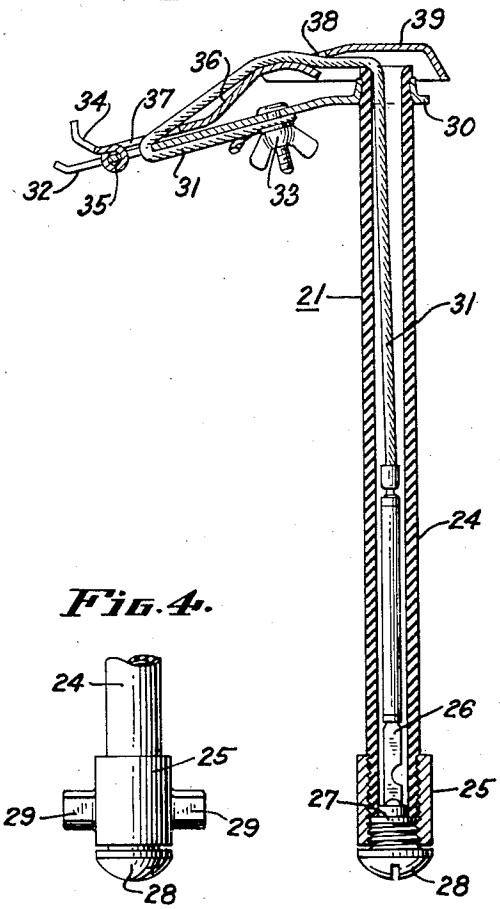


Fig. 4.

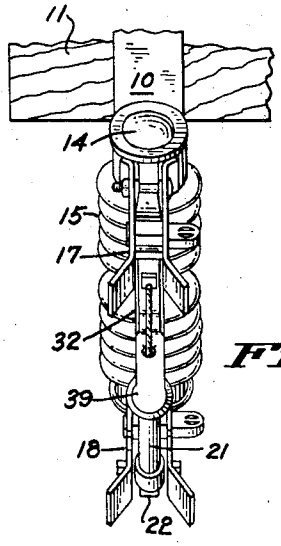
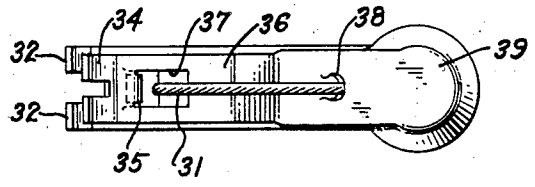


Fig. 2.

Fig. 5.



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Fig. 6.

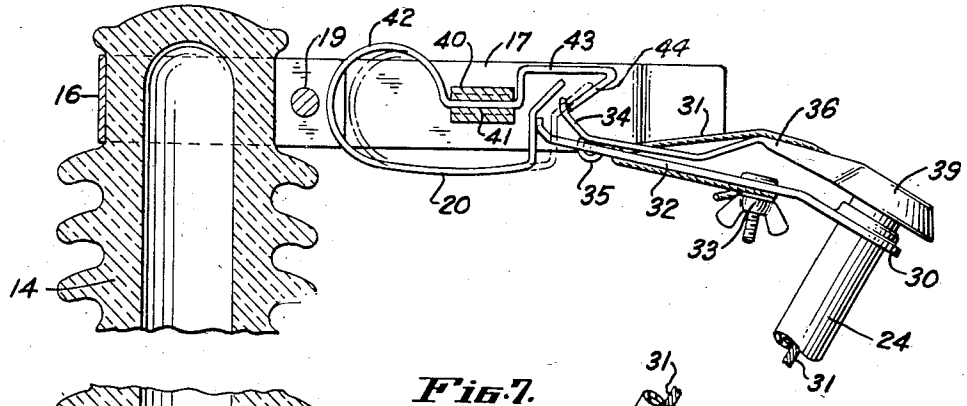


Fig. 7.

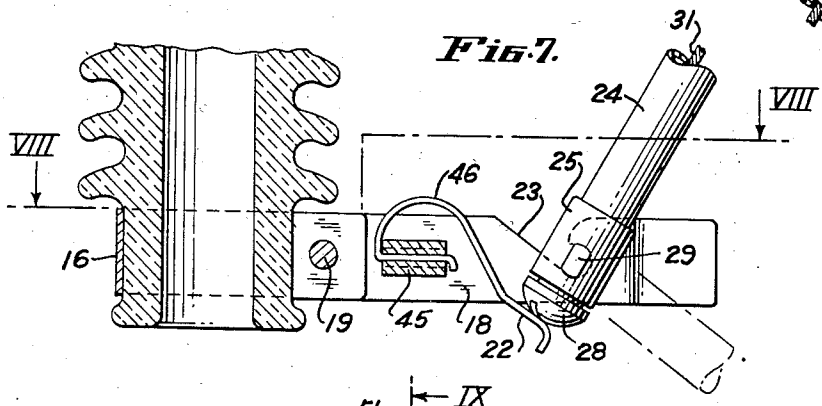


Fig. 8.

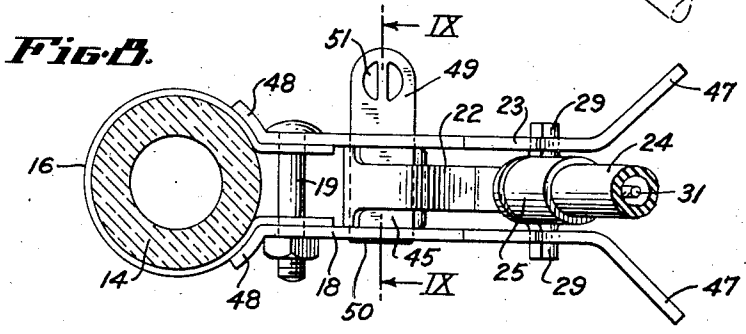


Fig. 9.

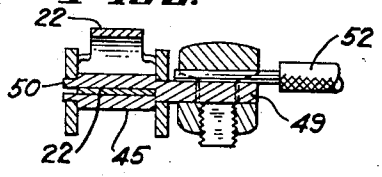
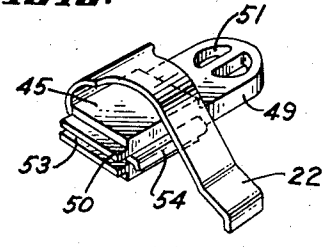


Fig. 10.



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Patented Jan. 13, 1942

2,269,610

UNITED STATES PATENT OFFICE

2,269,610

FUSIBLE CIRCUIT INTERRUPTER

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Application February 26, 1940, Serial No. 320,807

11 Claims. (Cl. 200—116)

My present invention relates generally to fusible circuit interrupters, and more particularly to a circuit interrupter of the drop-out type, wherein a fusible element serves to retain the circuit interrupter in a latched closed circuit position.

An object of the invention is to provide a fusible cut-out and latching means of new, novel and inexpensive construction.

Another object of the invention is to provide a simple and practical latching means for a fusible circuit interrupter of the drop-out type in which the latching means is adapted to be controlled by a fusible conductor.

Another object of the invention is to provide a new and novel form of support for a fusible circuit interrupter of the drop-out type in which the support, a terminal and a contact forming member are held in cooperating relation by a single securing means.

Another object of the invention is to provide a new and novel form of latching means for a circuit interrupter of the expulsion type in which, after release by a fusible retaining means, the latch will be moved into an inoperative position by the gasses produced upon a fusing of the fusible element under abnormal circuit conditions.

Other objects and advantages of the invention will be in part evident to those skilled in the art and in part pointed out hereinafter as the description thereof proceeds.

In the accompanying drawings, wherein there is shown by way of illustration and not of limitation a preferred embodiment of the invention:

Figure 1 is a side elevation of an insulating support with a circuit interrupter of the type contemplated by the present invention mounted thereupon,

Figure 2 is a front view of the circuit interrupter illustrated in Figure 1,

Figure 3 is a sectional view taken through a fusible drop-out unit embodying the present invention,

Figure 4 is a fragmentary view showing a further detail of the fusible drop-out unit illustrated in Figure 3,

Figure 5 is a top view of the fusible drop-out unit shown in Figure 3,

Figure 6 is a vertical sectional view partially in section showing the details of the upper contact and terminal of the fusible drop-out unit shown in Figure 3,

Figure 7 is a view similar to Figure 6 showing the details of the lower contact and terminal of the fusible drop-out unit shown in Figure 3,

Figure 8 is a plan view taken along line VIII—VIII of Figure 7 looking in direction of arrows,

Figure 9 is a sectional view taken along line IX—IX of Figure 8 looking in direction of arrows, and

Figure 10 is a perspective view showing the line terminal and contact assembly contemplated by the invention.

Fusible circuit interrupters of the character contemplated by the present invention are generally used with high voltage power transmission lines and for safety they are customarily mounted at the top of a pole or tower which also serves as a support for the transmission line. As shown in Figures 1 and 2 of the drawings, the circuit interrupter is carried by a bracket 10 which is secured to a cross arm 11, such as is customarily provided at the top of a transmission line supporting pole. In the arrangement shown the bracket 10 carries a clamping member 12 that cooperates with an encircling band 13 which surrounds a centrally arranged cylindrical portion of an insulator 14. The insulator 14 is of conventional design and is provided with spaced skirts 15 that are arranged at opposite sides of the encircling band 13. At its ends, the insulator 14 has other cylindrical portions about which encircling bands 16, together with contact supporting members 17 and 18, are clamped by means of bolts 19, as will hereinafter appear. The support 17 is here shown as carrying a flexible line terminal contact 20 which is adapted to cooperate with a terminal at the upper end of a fuse unit 21 of the drop-out type, and the support 18 is shown as carrying a flexible line terminal contact 22 that is adapted to cooperate with the lower terminal of the fuse unit 21.

In Figure 2 of the drawings, as will more clearly appear hereinafter, the supporting member 17 is composed of a pair of spaced side forming pieces between which the flexible line terminal contact 20 and the upper terminal of the drop-out fuse unit are positioned when the fuse unit 21 is in its circuit closed position. The supporting member 18 is likewise composed of two spaced side pieces between which the flexible line terminal contact 22 and the lower terminal of the drop-out fuse unit 21 are disposed. In addition to supporting the lower line terminal contact 22, the supporting member 18 is also provided with means 23 by which the lower terminal of

the drop-out fuse unit 21 can be pivotally secured thereupon.

Since the nature of the supporting members 17 and 18 and the characteristics of the flexible line terminal contacts 20 and 22 are determined largely by the nature and construction of the fusible drop-out unit, reference will now be made to Figures 3, 4 and 5 of the drawings for a detailed description of the fusible drop-out unit, hereinbefore designated generally by the numeral 21.

As shown particularly in Figure 3 of the drawings, the fusible drop-out unit 21 comprises an elongated tubular member 24 of insulating material upon the lower end of which there is a threaded ferrule 25 that provides a lower terminal for a fuse link 26 which is disposed within the elongated tubular member 24. As shown, the fuse link 26 has an enlarged button-like head 27 that is adapted to be clamped against the end of the elongated tubular member 24 or a shoulder upon the ferrule 25 by means of a threaded screw 28. In this manner the lower end of the fuse link 26 is connected in current conducting relation with the ferrule 25 and the threaded screw 28. As is more clearly shown in Figure 4 of the drawings, the ferrule 25 is also provided with oppositely disposed gudgeons 29 that are adapted to cooperate with the means 23 upon the supporting member 18 so that the fusible drop-out unit 21 may pivot as a whole with a downwardly swinging movement upon the supporting member 18, as will hereinafter appear. At its upper end the elongated tubular member 24 carries a second terminal member 30 to which the upper end of the fuse link 26 is connected by means of a flexible conductor 31. In the present embodiment of the invention, the terminal member 30 is shown as secured about the outside of the elongated tubular member 24 so as not to close the upper end thereof. This provides an arrangement which is commonly referred to as an expulsion type of fuse, as the open upper end of the elongated tubular member 24 will permit the expulsion of any gasses that may be generated within the tubular member 24 upon a fusion of the fuse link 26 and thus prevents any excessive bursting strain upon the tubular member 24. Extending outwardly at a right angle to the centers of the gudgeons 29 upon the ferrule 25, the terminal member 30 carries a flexible portion 32 which is adapted to make contact with the flexible line terminal contact 20 carried by the supporting member 17. At a point removed from its end, the outwardly extending flexible portion 32 is shown as provided with a thumb nut and screw 33 by means of which the end of the flexible conductor 31 may be connected thereto. In addition to the thumb nut and screw 33, the outwardly extending flexible portion 32 also carries an abutment engaging latch 34 that is pivotally mounted at a point 35 closely adjacent its flexible line terminal contact engaging end. The abutment engaging latch 34 is here shown as adapted to be held in a latching position by means of a rearwardly projecting and slightly flexible extension 36 over which the flexible conductor 31 is passed when the parts are assembled. This is made possible by the provision of apertures 37 and 38 in the rearwardly projecting extension 36. At its extreme end, as is more clearly shown in Figure 5 of the drawings, the rearwardly projecting extension 36 is formed with a flared and flanged portion 39 that is disposed over the open end of the elongated tubular member 24 so as to provide a closure which will effectively prevent the entrance of foreign matter into the elongated tubular member 24. The disposition of the flared and flanged portion 39 upon the rearwardly projecting extension 36 over the open end of the elongated tubular member 24 provides an arrangement which will render the abutment engaging latch 34 responsive to the gases that may be expelled from the elongated tubular member 24 upon a fusion of the fuse link 26 and thus further insures that the abutment engaging latch will be operated to release the fuse unit 21 upon the occurrence of an abnormal current condition in the power line.

Reference is now made to the remaining figures of the drawings for a more detailed description of the novel features of the present invention and their mode of operation. As will be seen from an inspection of Figure 6 of the drawings, the flexible line terminal contact 20 is carried by a transversely extending terminal forming block 40 which, as will hereinafter appear, is secured upon the supporting member 17 in a novel manner. The terminal forming block 40 is shown as having a slot extending longitudinally thereof in which a portion 41 of the flexible line terminal contact 20 is positioned. At the left of the terminal forming block 40 the flexible line terminal contact 20 has a looped portion 42 which serves to impart flexibility thereto, and at the other or right-hand side of the terminal forming block 40 the line terminal contact 20 has an outwardly extending portion 43 with a depending end that provides a substantially stationary abutment 44 with which the abutment engaging latch 34 is adapted to cooperate when the fuse unit 21 is in its circuit closed position. Similarly, as is shown in Figure 7 of the drawings, the lower flexible line terminal contact 22 is secured upon its supporting member 18 by means of a terminal forming block 45. In this instance the flexible line terminal contact 22 is extended through a horizontally disposed slot in a terminal forming block 45 and is looped thereover, as at 46 so as to impart flexibility to the fuse terminal engaging end thereof. At this point it will be noted that the gudgeons 29 upon the ferrule 25 have flattened sides which extend parallel to the longitudinal axis of the elongated tubular member 24 so that when they are in engagement with the means 23 upon the supporting member 18, which means 23 is here shown as oppositely disposed hook-like extensions upon the sides of the supporting member 18, the fuse unit 21 cannot be removed therefrom except when it is in a position intermediate its closed and fully opened circuit positions, as illustrated by dot and dash lines in this figure of the drawings.

Upon referring to Figure 8 of the drawings, it will be noted that the supporting member 18 has two outwardly extending sides of similar construction, but which are bent so as to provide what might be termed right and left hand sides. Each of these sides has an outwardly flaring end portion 47 which serves as a guide in directing the fuse terminal 25 into engagement with the lower flexible line terminal contact 22. At their other ends, these sides are also flared outwardly, as at 48, so as to cooperate with the ends of the encircling band 16 to secure the supporting member 18 upon the insulator 14 when the bolt 19 is tightened thereupon. The terminal forming block 45 has an outwardly extending portion of a somewhat reduced cross-section which is projected through a correspondingly dimensioned

slot in one of the sides where it will form a line terminal receiving lug 49. At its other end, the terminal forming block 45 has a similar but shorter projection 50 of reduced cross-section which extends into an elongated slot in the other side of the suporting member 18. As here shown, the outwardly extending lug 49 of the terminal forming block 45 is provided with two semi-circular apertures 51 which are adapted to accommodate the bifurcated ends of a connector of the so-called split-bolt type. This forms a means by which the end of a line conductor 52 may be secured in a simple and convenient manner. As will be clear from an inspection of Figure 10 of the drawings, the extending lug 49 and the reduced end portion 50 upon the terminal forming block 45 provides shoulders against which the sides of the supporting member 18 will be held in properly spaced and clamped relation by the bolt 19. At this point it is to be understood that the terminal forming block 40 is of a configuration similar to that described above for the terminal forming block 45. As shown in this latter figure of the drawings, the terminal forming blocks 40 and 45 each have a transversely extending slot 53 into which a substantially flat portion of its associated flexible terminal forming contact is positioned. The flexible line terminal contact 22 is here shown as bent over at its end 54 so as to prevent a displacement thereof from the terminal forming block 45 when the latter member is clamped in position, as above described.

It is believed that the operation of my improved fusible circuit interrupter will be clear from the above description. However, in order that there may be no misunderstanding as to the manner in which the fuse unit 21 is latched into and released from its operative circuit closed position, it may be stated that after the gudgeons 29 upon the terminal 25 of the fuse unit 21 are placed into pivotal engagement with the supporting member 18, the fuse unit 21 can then be rotated as a whole so as to bring the outwardly extending flexible contact engaging portion 32 of the terminal member 30 into contacting engagement with the flexible line terminal contact 20 where, upon initial engagement, the flexible line terminal contact member 20 will be flexed inwardly from a position corresponding to that shown by dot and dash lines in Figure 6 of the drawings. As this movement of the fuse unit 21 takes place, the outwardly extending flexible contact engaging portion 32 will be flexed downwardly to permit the abutment engaging latch 34 carried thereby to move under and into latched relation with the depending stationary abutment forming portion 44, which has been described as formed upon the opposite end of the flexible line terminal contact 20. When in this position, the latch 34 will serve to hold the fuse unit 21 in its closed circuit position. At the same time, the tendency of the flexible contact engaging portion 32, together with the bias exerted by the flexible terminal contact member 20, will cause the abutment engaging latch 34 to exert a pressure against the stationary abutment forming portion 44. This will cause the rearwardly projecting or lever-like extension 36 of the latch to flex slightly downward and pivot counterclockwise with respect to its pivotal point 35 and thus the flexible conductor 31 of the fuse unit will be placed under a tension which, upon a fusing of the fuse element, will cause the flexible cable to be drawn outwardly and away from the fusible portion of the unit as it is released from the circuit closed portion. Now, upon a fusing of the fuse link 26, which will in turn release the flexible conductor 31, the abutment engaging latch 34 will be free to move downwardly and out of engagement with the stationary abutment 44. Where the fuse unit 21 is of the expulsion type, the gases emanating from the expulsion chamber formed by the elongated tubular member 24 will also exert a further operating force upon the flared and flanged portion 39 and thus further insure a release of the abutment engaging latch 34. At this point it will be noted that due to the character and position of the outwardly extending flexible contact engaging portion 32, the fuse unit 21 will be positioned at such an angle that its weight will further operate to move the abutment engaging latch 34 out of latching relation with the abutment 44 immediately upon a release of the flexible conductor 31 by a fusing of the fuse link 26.

While I have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, I desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A fuse for circuit interrupters of the character described, comprising a tubular member of insulating material having its lower end closed by a terminal forming means which is adapted to be pivotally mounted adjacent a circuit forming contact, a second terminal secured in non-closing relation upon the other end of said tubular member having an outwardly extending flexible portion adapted to engage a second circuit forming contact, a latching means pivotally mounted upon the extending end of the outwardly extending flexible portion of said second terminal having a lever forming extension termination adjacent the open end of said tubular member, an abutment adjacent said second circuit forming contact adapted to cooperate with said latching means and hold the fuse in a circuit closed position with respect to said circuit forming contacts, a fusible element connected between the terminal at the lower end of said tubular member and extending flexible portion of said second terminal, said fusible element being passed over the lever forming extension of said latching means and adapted to normally hold said latching means in an operative position and when fused to release said lever forming extension and permit said latching means to move into an inoperative position, and means carried by said lever forming extension disposed over the open end of said tubular member and in the path of the explosive gases emanating from said tubular member upon a fusing of said fusible element adapted to move said latching means into an inoperative position and permit the fuse to move about its pivotal support and into a circuit opened position.

2. In a fusible drop-out circuit interrupter of the character described, the combination of a tubular cartridge of insulating material having a terminal at its lower end pivotally mounted upon a fixed support in cooperating relation with a

stationary contact, a terminal at the upper end of said cartridge having an outwardly disposed flexible extension adapted to cooperate with a second stationary contact, a fixed latch receiving abutment adjacent said latter contact, an abutment engaging latch pivotally secured at the extending end of said latter terminal adapted to be moved into latching engagement with said abutment by a flexing of the outwardly disposed flexible extension of said terminal, and without pivotal movement relative to the extending end of said latter terminal, and a fusible element connected between the terminals upon said cartridge adapted to normally hold said abutment engaging latch in a fixed position and against pivotal movement upon said flexible portion and when fused to permit a pivotal movement of said abutment engaging latch out of engagement with said abutment without a flexing of said outwardly disposed flexible extension.

3. In a circuit interrupter of the character described, the combination of a fixed support having a latch accommodating abutment thereupon, a fusible cut-out pivotally mounted with respect to said fixed support having an outwardly extending flexible terminal portion, a latch carried by said outwardly extending flexible terminal portion adapted to be moved into cooperating relation with said latch accommodating abutment by a flexing of said outwardly extending flexible terminal portion, and a contact carried by said fixed support having an oppositely extending flexible terminal engaging portion adapted to engage the outwardly extending flexable terminal portion of said fusible cut-out and flex with same when said latch is moved into latching engagement with said latch accommodating abutment.

4. A support and terminal contact for a fusible cut-out, comprising an insulator, an insulator encircling band having spaced extending ends with openings through which a securing bolt may pass, a pair of spaced outwardly extending members having holes coinciding with the openings in the extending ends of said encircling band, a bolt passing through the holes in said members and the openings in the ends of said encircling band, whereby a clamping force may be exerted upon said band, said spaced members having oppositely arranged elongated slots positioned outwardly from said bolt, a terminal forming member having a split portion of enlarged cross-section adapted to be clamped between said spaced members by said bolt and other portions of smaller cross-section extending into the oppositely arranged elongated slots in said spaced members, one of said portions of smaller cross-section being extended through the elongated slots in one of said spaced members to accommodate a line terminal, and a flat contact forming member positioned between said spaced members and secured at one end within the split portion of said terminal forming member and having its other end positioned to flexibly engage the terminal of a fusible cut-out.

5. In a fusible circuit interrupter, the combination of a fuse enclosing member of insulating material having its upper end open and closed at its lower end by a terminal pivotally mounted with respect to a stationary contact, a terminal at the upper end of said fuse enclosing member having an extending flexible portion adapted to engage a second stationary contact, a latch abutment adjacent said stationary contact, a latch pivotally mounted at the outer end of said extending flexible portion adapted to cooperate with said latch abutment, said latch having an extending end that is held in engagement with said latch abutment by a flexing of the flexible portion of said terminal and an oppositely disposed portion that extends over the open end of said fuse enclosing member, a fuse element disposed in said fuse enclosing member and secured at its lower end to said first terminal, and a flexible conductor secured to the other end of said fuse element extending out through the open end of said fuse enclosing member and secured to the oppositely disposed portion of said latch whereby said latch will be held in latching relation with said latch abutment and said fuse will be placed under tension by spring action of the flexible portion of the terminal at the upper end of said fuse enclosing member.

6. In a fusible circuit interrupter, the combination of a fuse enclosing member of insulating material having its upper end open and closed at its lower end by a terminal pivotally mounted with respect to a stationary contact, a terminal at the upper end of said fuse enclosing member having an extending flexible portion adapted to engage a second stationary contact, a latch abutment adjacent said stationary contact, a latch pivotally mounted at the outer end of said flexible portion adapted to cooperate with said latch abutment, said latch having an outwardly extending end that is moved into engagement with said latch abutment by a flexing of the flexible portion of said terminal and a rearwardly extending end forming a closure over the open end of said fuse enclosing member, a fuse element disposed in said fuse enclosing member and secured at its lower end to said first terminal, and a flexible conductor secured to the other end of said fuse element extending out through the open end of said fuse enclosing member and secured to the rearwardly extending end of said latch, whereby said latch will be held in latching relation with said latch abutment by spring action of the flexible portion of said second terminal when said fuse element is intact and moved out of latching relation with said latch abutment by gases expelled from said fuse enclosing member when said fuse operates.

7. In a fusible circuit interrupter, the combination of a fuse enclosing member of insulating material having its upper end open and its lower end closed by a terminal pivotally mounted with respect to a stationary contact, a terminal at the upper end of said fuse enclosing member having a radially extending flexible portion adapted to engage a second stationary contact, an overhanging stationary abutment adjacent said second stationary contact, a latch hingedly secured adjacent the extending end of the flexible portion of the terminal at the upper end of said fuse enclosing member, said latch having an abutment engaging end at one side of its hinged connection with the extending flexible portion of said second terminal and an oppositely extending portion having conductor receiving apertures, a fuse element secured at one end to the terminal at the lower end of said fuse enclosing member, and a flexible conductor secured at the other end of said fuse element and connected to the extending flexible portion of the terminal at the upper end of said fuse enclosing member, said flexible conductor being threaded through the conductor apertures of the oppositely extending portion of said latch before being connected to the extending portion of said terminal and

adapted to hold said latch against an abutment disengaging movement when said fuse element is intact.

8. An improved fuse unit for circuit interrupters of the fusible drop-out type, comprising a fuse enclosing member of insulating material having a contact engaging terminal secured in closing relation at its lower end, said contact engaging terminal having trunnions for pivotally securing same with respect to a stationary contact, a second terminal secured in non-closing relation at the upper end of said fuse enclosing member having an outwardly extending flexible portion with conductor securing means intermediate its ends, a latch member pivotally secured adjacent the end of said outwardly extending flexible portion, said latch member having an outwardly extending end adapted to cooperate with a stationary abutment and also an oppositely disposed portion having apertures through which a conductor may pass to secure said latch member against pivotal movement upon said outwardly extending flexible portion, a fuse unit disposed within said fuse enclosing member and connected at one end to said first terminal, and a conductor connected to and extending from the other end of said fuse unit out the open end of said fuse enclosing member and through the apertures in the oppositely disposed portion of said latch member and secured at its end to the outwardly extending flexible portion by said conductor securing means, whereby the outwardly extending end of said latch member will be held in a fixed latching position upon said outwardly extending flexible portion of said second terminal by said conductor when said fuse unit is intact.

9. An improved fuse unit for circuit interrupters of the fusible drop-out type, comprising a fuse enclosing member of insulating material having a contact engaging terminal secured in closing relation at its lower end, said contact engaging terminal having trunnions for pivotally securing same with respect to a stationary contact, a terminal secured in non-closing relation at the upper end of said fuse enclosing member having an outwardly extending flexible portion with conductor securing means intermediate its ends, a latch member pivotally secured upon a horizontal axis at the end of said outwardly extending flexible portion, said latch member having an outwardly and upwardly extending end adapted by a flexing of said outwardly extending flexible portion to move under a stationary latch abutment and also an oppositely disposed portion having apertures through which a conductor may pass to secure said latch member against pivotal movement upon said outwardly extending flexible portion, a fuse unit disposed within said fuse enclosing member and connected at one end to said first terminal, and a flexible conductor connected to the other end of said fuse unit and extending out the open end of said fuse enclosing member and through the apertures in the oppositely disposed portion of said pivotally mounted latch member and secured to said outwardly extending flexible portion by said conductor securing means, whereby the outwardly and upwardly extending end of said latch member will be held in a fixed latching position upon said outwardly extending flexible portion by said flexible conductor when said fuse unit is intact.

10. In a support and terminal contact for a fusible cut-out, the combination of a pair of spaced fuse terminal guiding members having oppositely disposed slots formed therein, a slotted terminal block having reduced ends adapted to extend through the slots in said spaced fuse terminal guiding members, a contact member of flexible construction disposed edgewise between said spaced fuse terminal guiding members and having a portion extending through the slot in said slotted terminal block, and means for securing said spaced fuse terminal guiding members in clamped relation against said slotted terminal block.

11. In a support and terminal contact for a fusible cut-out, the combination of a pair of spaced fuse terminal guiding members having oppositely disposed slots formed therein, a slotted terminal block having a body portion with shoulders formed by reduced end portions that extend through the slots in said spaced fuse terminal guiding members, one of said reduced end portions having a line conductor securing means thereupon, a ribbon-like contact member of flexible construction disposed edgewise between said spaced fuse terminal guiding members and having a portion disposed in the slot of said slotted terminal block, and means for securing said spaced fuse terminal guiding members in clamped relation against the shoulders formed upon the body portion of said slotted terminal block.

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