

Feb. 15, 1966

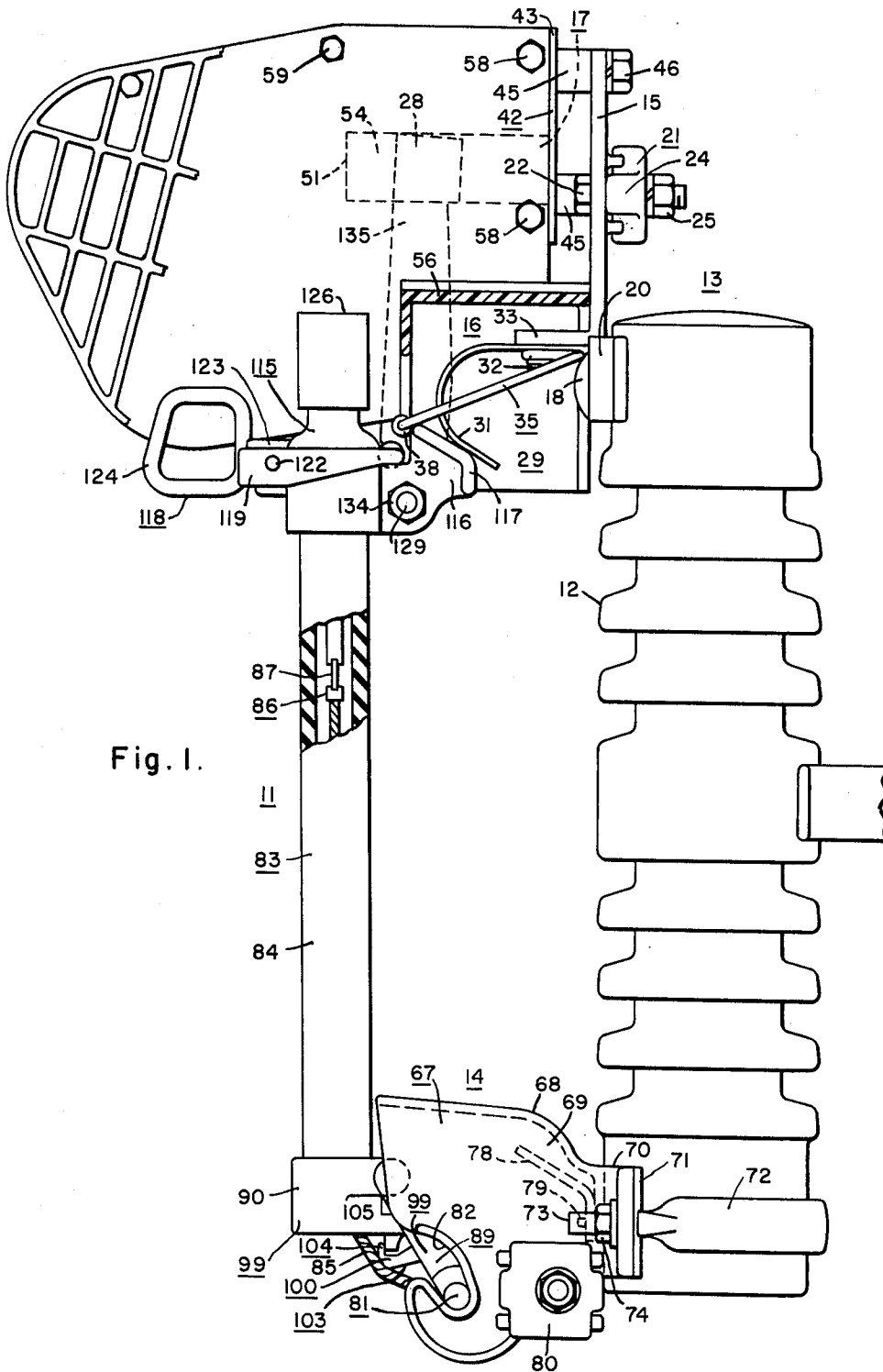
A. J. FINK ETAL

3,235,688

OPEN-TYPE FUSE CUTOFF WITH TOGGLE MEANS HAVING
A LOAD BREAK EXTENSION DEVICE

Filed April 3, 1961

4 Sheets-Sheet 1

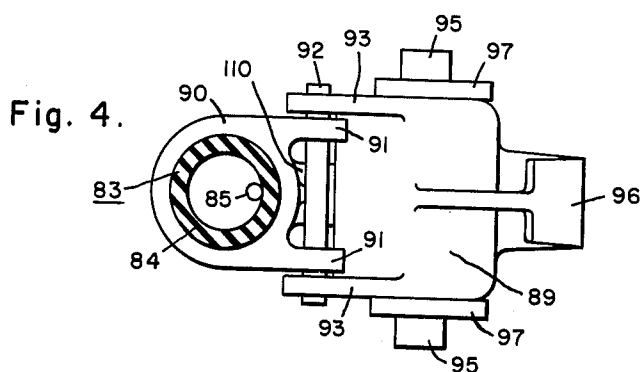
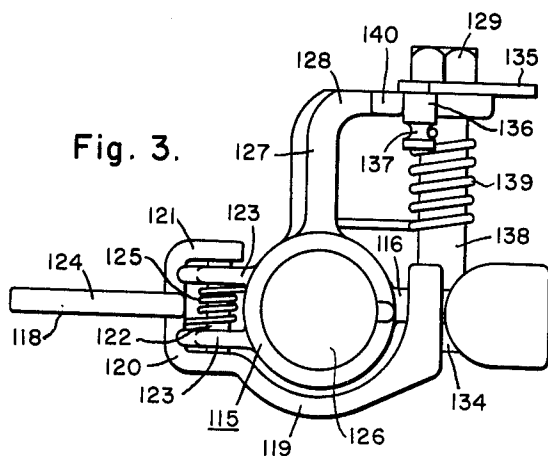
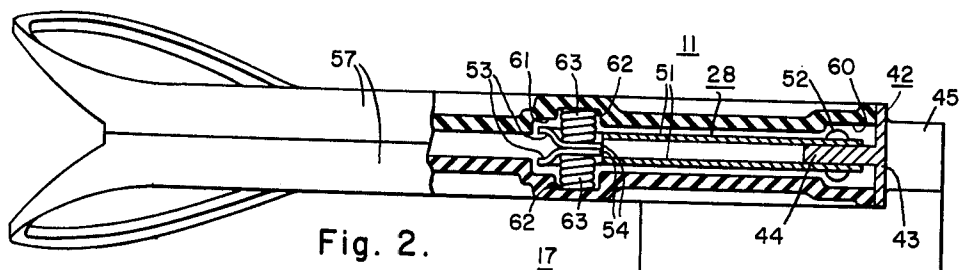


Feb. 15, 1966

A. J. FINK ETAL
OPEN-TYPE FUSE CUTOUT WITH TOGGLE MEANS HAVING
A LOAD BREAK EXTENSION DEVICE

3,235,688

4 Sheets-Sheet 2



Feb. 15, 1966

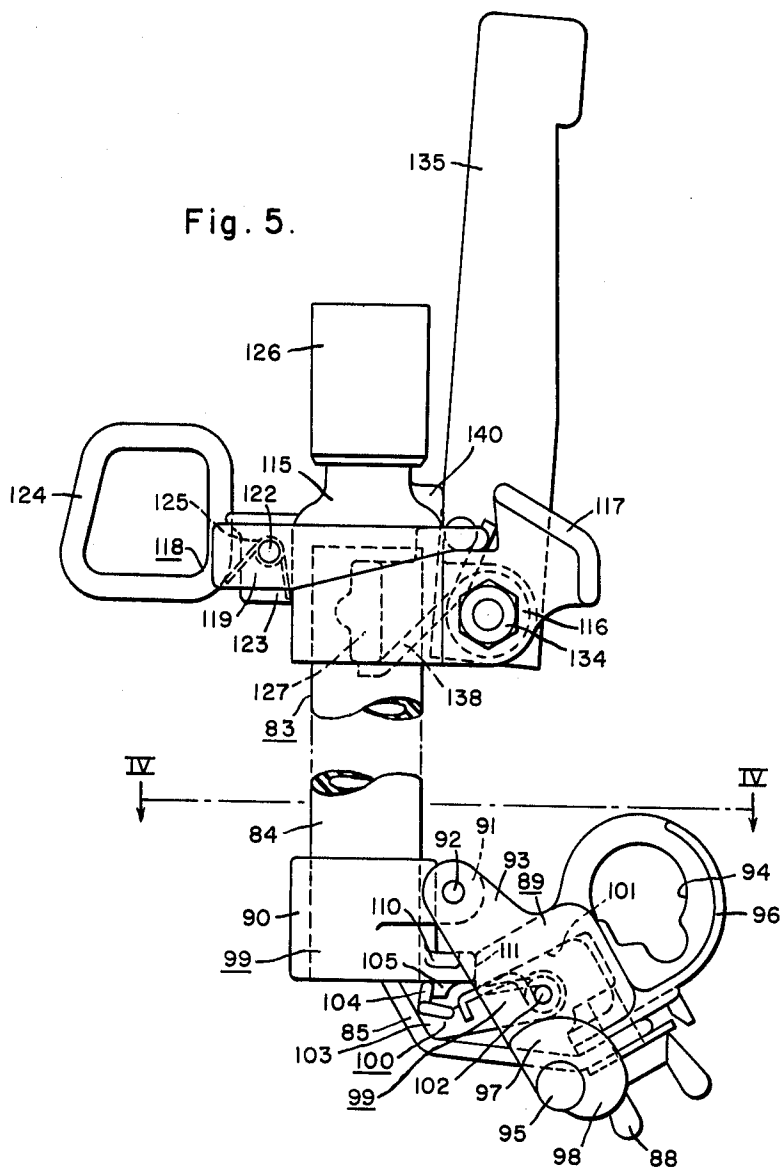
A. J. FINK ETAL
OPEN-TYPE FUSE CUTOUT WITH TOGGLE MEANS HAVING
A LOAD BREAK EXTENSION DEVICE

3,235,688

Filed April 3, 1961

4 Sheets-Sheet 3

Fig. 5.



Feb. 15, 1966

A. J. FINK ETAL
OPEN-TYPE FUSE CUTOUT WITH TOGGLE MEANS HAVING
A LOAD BREAK EXTENSION DEVICE

3,235,688

Filed April 3, 1961

4 Sheets-Sheet 4

Fig. 6.

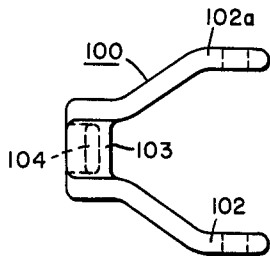


Fig. 7.

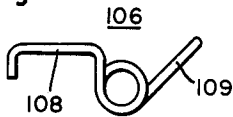


Fig. 8.

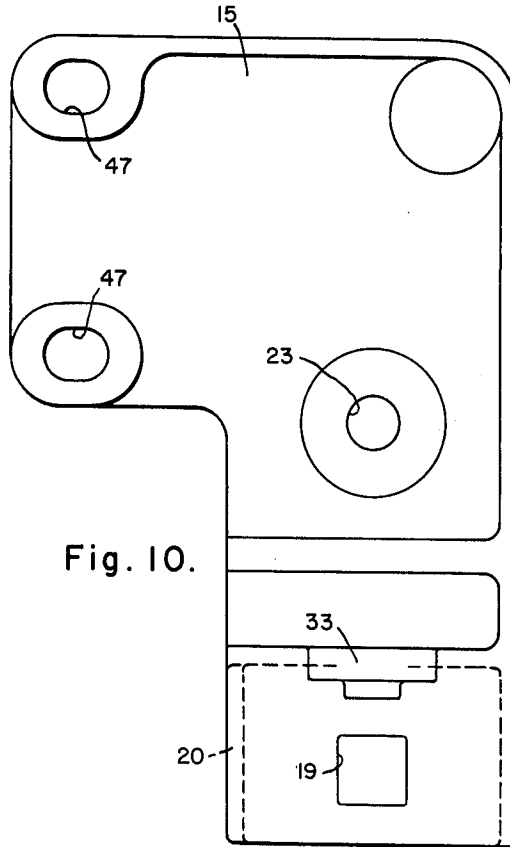
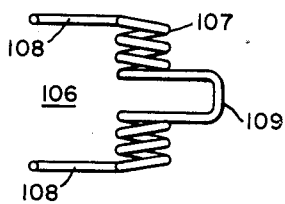
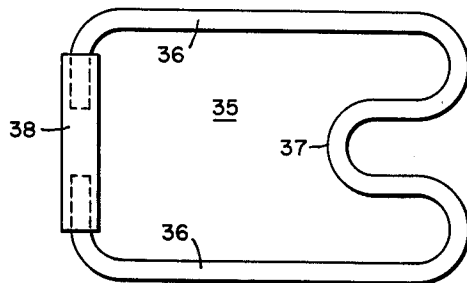


Fig. 9.



1

3,235,688

OPEN-TYPE FUSE CUTOUT WITH TOGGLE MEANS HAVING A LOAD BREAK EXTENSION DEVICE

Austin J. Fink, Bloomington, Robert J. Lawrence, Ellettsville, and Gene L. Miller, Bloomington, Ind., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Filed Apr. 3, 1961, Ser. No. 101,621

13 Claims. (Cl. 200-114)

This invention relates to circuit interrupters in general, and, more particularly, to load-break drop-out-type fuse cutouts.

At certain locations on distribution systems, it is desirable to have a load-break fuse cutout for providing inexpensive switching and at the same time provide fault-current protection.

Heretofore, load-break operation of fuse cutouts has been provided either by a special tool carried on a hook stick, or by a variety of mechanical devices directed primarily toward stressing the fuse link to effect breakage of the link at its fusible section with the resultant arc being interrupted in the fuse tube, as for example, in Patent No. 2,829,218, patented April 1, 1958 by J. E. Harder. The tools are uneconomical because of the initial cost and maintenance. These link-break devices are effective in providing load-break operation, but are inconvenient and expensive in that each interruption wears the fuse tube and, after interruption has been achieved, it is necessary that the fuse link be replaced in order that the circuit may be restored.

It is a general object of this invention to provide in a dropout-type fuse cutout a mechanical device for facilitating load-break operation of the cutout without requiring destruction of the fusible device in the cutout.

More specifically, it is an object of this invention to provide in a dropout type fuse cutout an auxiliary interrupter for effecting safe operation of the cutout as a load-break device without excessive arcing and without destruction of the fusible device in the cutout.

Another object of the invention is to provide an improved dropout-type fuse cutout having a delayed-acting loadbreak means associated therewith, in which the dropout action, occurring during fault-current interruption, effects release of a latching device for the delayed-acting loadbreak means, and thereby assures free rotation of the fuse-holder assembly to an open indicating observable position.

It is another object of this invention to provide in an outdoor switch an arc interrupting material resistant to weather.

These and other objects of this invention will become more apparent upon consideration of the following specification of a preferred embodiment thereof, taken in conjunction with the attached drawings, in which:

FIG. 1 is a side elevational view of a load-break dropout fuse cutout embodying this invention, and shown in the closed circuit condition;

FIG. 2 is a top plan view of the auxiliary interrupter with a portion being sectionalized to show the auxiliary contacts;

FIG. 3 is a top plan view of the fuse holder;

FIG. 4 is a sectional view of the fuse holder taken substantially along the line IV-IV of FIG. 5;

FIG. 5 is a side elevational view of the fuse holder;

FIG. 6 is a bottom plan view of the fuse link flipper;

FIGS. 7 and 8 are a side elevational view and a top plan, respectively, of the flipper spring;

FIG. 9 is a top plan view of the latch for the main contact; and,

2

FIG. 10 is a front elevational view of the top casting.

Referring to the drawings, and more particularly to FIG. 1 thereof, there is illustrated a circuit interrupting device 11 of the dropout fuse cutout type, which is shown in the closed circuit position. As shown, the circuit interrupter is mounted upon an insulator support 12. Although in this particular instance being illustrated as mounted upon a single insulator support 12, it is to be clearly understood that the interrupter 11 may be clamped to a pair of insulators, if desired. Any suitable mounting, of course, may be employed, and that shown is merely by way of illustration.

utting laterally outwardly from the upper end of the insulator support 12 is an upper stationary contact assembly 13. Also, associated with the lower end of the insulator, and extending laterally therefrom, is a lower stationary contact assembly 14.

Referring more particularly to the upper end of the interrupter 11, it will be observed that the upper contact assembly 13 includes a top casting 15 supporting the main contact assembly, generally indicated at 16, and a secondary or auxiliary contact assembly, generally indicated at 17. The top casting is comprised of suitable conducting material, such as aluminum bronze, and is secured to the insulator 12 by any suitable means, such as a bolt 18 extending through an aperture 19 (FIG. 10) in the casting and an aperture extending through the insulator 12. A nut, not shown, secures the bolt 18 to the insulator and is accessible through the aperture from the rear of the insulator 12. The casting 15 includes a curved rearwardly extending portion 20 to mate with the curvature of the insulator 12, thus providing a snug fit.

A line terminal clamp, generally indicated at 21, is associated with the conducting casting 15 and has a terminal bolt 22 extending through aperture 23 in the casting 15. A clamp 24 is secured to casting 15 by means of nut 25.

The main contact assembly 16 includes a leaf contact member 31 curved in a basically U-shaped configuration and having a notch or other opening, not shown, at one end for attachment by means of a bolt 32 to an apertured contact mount 33 integral with and protruding from the top casting 15. The contact 31 may be comprised of any suitable conducting material, such as Phosphor bronze.

A first contact latching device 35 is associated with the main contact 31 and is comprised of a basically U-shaped wire having leg portions 36, 36 (FIG. 9) connected by a bight portion 37. The bight portion 37 is recurved to fit around the shank of bolt 32 for anchoring the first latching device 35 to the contact mount 33 as shown in FIG. 1. The outer ends of legs 36, 36 are bent toward each other and are received in the ends of a tube 38, which tube serves as a contact engaging member, as hereinafter described.

The auxiliary contact assembly 17 shown in FIGS. 1 and 2 comprises a support member 42, having a flat base 43 for attachment to the casting 15 and an integral rib 44 on the base 43 for supporting an auxiliary contact assembly and an arc chute. The support member 42 includes a pair of outwardly extending studs 45, 45 for fixing the base member to the top casting 15 by means of a pair of bolts 46 (only one being shown) extending through apertures 47, 47 in the top casting 15 and into the studs 45, 45.

A pair of auxiliary contact strips 51, 51 are mounted at opposite sides of the rib 44, by means of a rivet 52 extending through the rib 44 and the inner ends of the contacts 51, 51. The outer ends of the contacts are flared outwardly with respect to each other as at 53 to serve as a guide for the incoming auxiliary blade to be hereinafter described. Each contact 51 includes an integral tabular

indentation 54 immediately adjacent the outer end 53, each indentation extending inwardly toward the other substantially half the thickness of the rib 44 so that the indentations normally touch, thus comprising a second latching device or stop for the auxiliary blade, as hereinafter described. The contacts 51, 51 may be constructed from any desirable conducting material, such as Phosphor bronze.

The arc chute is comprised of a pair of opposing arcing plates 57, 57 fixedly mounted to the rib 44 by any suitable means, such as bolts 58, and attached to each other at various points around their perimeters by a suitable means such as bolts 59. The arcing plates 57 have the outer edge flared, as in FIG. 2, to provide a converging entrance to the slot between the plates. The inner sides of the plates, are spaced from each other, except at the top and rear where they are joined, to provide access for the auxiliary blade. The plates are slotted as at 60 and 61 to provide space for the contacts 51. Indentations 62, 62 are provided in the interface of each plate 57 to serve as a seat for compression springs 63, 63, each compressed between one of the indentations 62 and the indentation formed by the previously described tabular stop 54, 54 on the contacts 51, 51. It is seen that the tabular portion 54 on each blade serves a dual purpose in providing stop means for the auxiliary blade and a spring seat for the biasing springs. One of the plates 57 includes an integral hood 56 comprising a bottomless box extending over the main contact assembly 16 and having cutout front and rear portions. Generally, the arc plates 57, 57 are comprised of a material which is capable of evolving an arc extinguishing gas when in the proximity of an electric arc. However, the present loadbreak fuse cutout is of the open or non-enclosed type intended for outdoor usage, and when so applied, the arc plates 57, 57 must be comprised of suitable material having acceptable arc quenching and weather resistant abilities.

Heretofore, a suitable material for the arc chute for outdoor applications has not been available. The first indoor devices employed fiber type inserts in the arc chutes, and, later, these were replaced by other types of material that gave off de-ionizing gases. All these materials were suitable for indoor application, but were not suitable for outdoor applications because of their poor weathering properties.

The material used in the present invention for outdoor arc chute construction is a synthetic resinous composition comprising highly polymerized formaldehyde, as disclosed in Patent No. 2,768,994. This material is ideal for this purpose because of its outstanding electrical and weather resistant properties. Some of the properties of this material contributing to its success in this usage are its temperature resistance, high fatigue endurance, solvent resistance, form stability and moisture resistance, and high impact strength.

The volume resistivity of the present material is high and does not change appreciably due to moisture absorption. As a result, it maintains its good electrical properties under high humidity exposure, even after complete immersion in water.

Another outstanding ability of the present material is its non-tracking characteristic. Erosion of the surface is not noticeable even after 200 arc interruption operations at full interruption rating of the present apparatus. Loss of material is not noticeable and only a slight blacking of the surface is apparent.

The overall strength of the material, excellent insulating and tracking characteristics, and resistance to moisture and temperature make the material ideal for electrical products subjected to severe weather conditions. Finally, the material produces gas under arcing conditions making it suitable for de-ionizing power arcs.

The use of highly polymerized formaldehyde as an arc interrupter, is broadly disclosed and claimed in a co-pending application Serial No. 838,332, filed by Gordon

C. Gainer and Albert P. Strom on September 4, 1959, now United States Patent 3,059,081 issued October 16, 1962, and assigned to the same assignee as the present application. However, the present application is particularly directed toward the use of highly polymerized formaldehyde in an outdoor, open switch apparatus.

The lower stationary contact assembly 14 comprises a suitably configured hood plate 67 having a top wall portion 68, side wall portions 69 and a rear wall portion 70. The rear wall 70 is curved to mate with the outer periphery of the insulator 12 and includes laterally extending apertured ear portions 71, 71 (only one shown) for connection to a bracket 72 surrounding the insulator 12 and having studs 73 (only one shown) extending through the apertured ears 71 and secured thereto by nuts 74, 74.

A flexible contact plate 78 is secured to the inside of the rear wall by a suitable means such as a rivet 79. The plate 67 may be comprised of any suitable conducting material, such as aluminum bronze.

A line terminal clamp 80, similar to previously described line terminal clamp 24 is attached to the plate 67.

The hood 67 has provided on its side walls 69 means providing a hinge pivot 81 for a fuse element to be hereinafter described. More specifically, trunnion guide slots 82 are provided in the side walls 69 of the hood 67 and have offset trunnion bearings or seats associated therewith.

The fuse element, or fuse-holder assembly 83 comprises a fuse tube 84, at least the inner wall thereof being formed of a gas evolving material, so that arc extinction will be facilitated. Extending out of the lower open end of the fuse tube is a fuse link cable 85. This cable extension is a portion of the fuse link, generally designated by the reference numeral 86, and enclosed within the fuse tube 84, having at the upper end thereof a fusible portion 87, as well understood by those skilled in the art.

The end of the fuse link cable extension is secured by a wing bolt 88 to a toggle link hinge member 89 shown in detail in FIGS. 4 and 5 of the drawing. Disposed adjacent the lower end of the fuse tube 84 is a bottom casting 90, shown in more detail in FIGS. 4 and 5. The casting receives the fuse tube 84 therein and is affixed thereto in any suitable manner, as by cement. A pair of spaced integral leg portions 91 are provided on casting 90. The legs are apertured at the outer ends to receive therethrough a shaft 92, which shaft is also received in suitably apertured integral leg members 93 on toggle link 89, thereby pivotally hinging the casting 90 to toggle member 89 which together constitute a unitary toggle assembly designated by the reference numeral 99.

The toggle member 89 is provided with an eyelet 94 enabling the prong of a switch stick to be inserted therein so that the fuse-holder assembly 83 may be bodily lifted out of the trunnion bearings 82 following fuse operation and dropout action for a re-fusing operation. Also, the toggle link hinge member 89 is provided with trunnions or stub shafts 95 which cooperate with the trunnion bearings 82 of the lower hood 67. The base of each stub shaft 95 is provided with a cam 97 having a narrow end 98. The cam provides maximum clearance for removal and replacement of the fuse holder, and, by cam action reduces the side play of the fuse holder 83 in the slots 82 as the cutout nears the closed position assuring that the main contact and auxiliary blade will always be aligned for proper closing regardless of the angle of the closing force. A contact portion 96 on the toggle member 89 cooperates with the flexible contact 78 to engage therewith when the loadbreak fuse cutout is in the closed position, as illustrated in FIG. 1.

A fuse link flipper 100 is mounted within a cavity 101 to the toggle link 89 between the trunnions 95 by means of a shaft 102 extending through the side walls of the toggle member 89. The flipper 100 includes a pair of offset leg members 102a having apertures at their ends surrounding the shaft 102, and having a bight portion

103 connecting the legs 102a. The bight portion carries an integral latch 104 normally bearing against integral catch 105 on the bottom of hinge casting 90. The latch 104 is normally held in engagement with the catch by the tension of fuse cable 85 against the bight 103, thus preventing dropout operation of the cutout and reducing the strain on the fuse link that would otherwise be exerted by the downward pressure of the top contacts when latched. An integral spacer 110 on casting 90 abuts an integral stop portion 111 to hold casting 90 and toggle link 89 in under-toggle relationship. Thus, the top leaf contact member 31 and the bottom flexible contact plate 78 collectively constitute a toggle-link biasing means 29 acting to break the underset toggle linkage 99.

A flipper spring 106, shown in detail in FIGS. 7 and 8 includes winding 107 encircling shaft 102, hooked leg members 108 bearing against offset legs 102a of flipper 100, and a central portion 109 bearing against the top of cavity 101, thus constantly urging the flipper 100 in a counterclockwise direction around pivot shaft 102. The flipper 100 also aids the fuse contact in clearing faults by flipping the cable 85 out of the fuse tube 84 during a fuse operation.

Disposed at the upper end of the fuse tube 84 is a metallic terminal ferrule 115 which has integrally formed therewith a contact arm portion 116 having an integral contact portion 117 which latches under the tube 38 on previously described latch member 35, as shown in FIG. 1. The ferrule may be attached to the fuse tube by any suitable means, such as cement. It will be observed in FIG. 1 that when the contact 117 is latched under the latch tube 38, the contact 117 engages the previously described leaf contact 31 in the upper contact assembly 16.

A manually operable unlatching mechanism assembly, generally indicated at 118, is carried by the ferrule 115 for unlatching the latch 35 to effect loadbreak operation of the fuse cutout. The unlatching assembly 118 comprises an unlatching arm 119 having one end curved back in spaced relationship with itself forming a pair of pivot arms 120, 121 apertured to receive a pivot shaft 122. The shaft 122 extends through a pair of spaced integral arms 123, 123, thus pivotally relating the unlatching device 118 with the ferrule 115. The free end of the unlatching arm extends around the ferrule on top of contact arm 116 to normally rest beneath the latch tube 38 on latch 35, as seen in FIG. 1, when the switch is in the closed position. Integrally formed with the unlatching arm between the arms 120, 121 is an operating ring 124 to render the unlatching device 118 suitable for operation by a hook stick device. A hook eye spring 125 encircles the shaft 122 and has its end bearing against the arm 119 and the ferrule 115 to bias the unlatching device clockwise about pivot 122 in the normally unlatched position as shown in FIG. 1. It is seen that the unlatching mechanism 118 and the latch 35 or first latching device, comprise a positive latching assembly which prevents accidental opening due to vibration or shock. The lineman must pull down on eyelet 124 effecting thereby rotation of the rotating arm 119 to release the latch.

Threaded into the upper end of the terminal ferrule 115 is an internally threaded cap 126, which secures the upper end of the fuse link 86 into place, as well understood by those skilled in the art.

The metallic ferrule 115 also serves as a carrier for an auxiliary blade support and an auxiliary blade, and for this purpose includes a laterally extending integral auxiliary support arm 127 having an apertured outer end portion 128 paralleling previously described contact arm 116 and in spaced relationship therewith. A bolt 129 extends through the aperture in arm 128 and an aperture in arm 116, and is secured therein by means of a nut 134 fixed to the bolt as by a cotter pin (not shown). An auxiliary contact arm 135 is pivotally mounted at one end on the bolt shaft between the bolt head and the outer side of arm 128 for rotational movement about the bolt shaft. A pin

136, having a circumscribing groove 137 around the outer end thereof, is fixed to the blade 135 in any suitable manner near the pivoted end of the blade 135. A spacer 138 is sleeved on the bolt 129 between the arms 116 and 128. A spring 139 encircles the spacer 138 and includes an end portion bearing against the underside of arm 127 and having the other end bearing against the groove 137 in pin 136, thus biasing the contact arm counterclockwise about bolt 129 into engagement with an integral stop member 140 on arm 128 so that normally the contact arm 135 extends upwardly substantially parallel to the axis of the fuse tube 84 and forwardly of the ferrule 115 and laterally of the contact arm 116 on ferrule 115.

As shown in FIG. 1, the loadbreak fuse cutout is in its normal closed position with the main contact 117 latched into engagement with the line contact 31 by the first latching device 35. At the same time the auxiliary blade 135 is received between the contact strips 51 inwardly of the stop means or second latching device, 54. At the lower end of the fuse holder 83, the casting 90 and toggle hinge 89 are held in under-toggle relationship by the fuse link cable 85 bearing upwardly against flipper 100.

The loadbreak fuse cutout may operate either as a fuse cutout or a loadbreak switch as will now be described.

In the operation of the loadbreak fuse cutout as a fuse cutout, an overload or fault current passing through the device will fuse the fusible section 87 whereupon the cable extension 85 will become slack and will enable the flipper 100 to urge the cable 85 downwardly out of the tube 84 as the flipper rotates counterclockwise under the urging of spring 106. Operation of the flipper releases latch 104 on flipper 100 from engagement with catch 105 on casting 90, thereby permitting the fuse holder assembly 83 to drop downwardly and outwardly about the hinge pivot 81 to the fully open disconnected position. The downward movement of the fuse holder 83 lowers contact 117 away from the first latching device 35, thus effecting release of the main contact 117 with respect to the contact 31. At the same time the blade 135 is carried downwardly between contacts 51, 51 and out of engagement therewith during the initial downward movement of the fuse holder 83 so that the fuse holder is thereafter allowed to freely move outwardly around pivot 81 as previously described.

The thickness of the blade 135 is slightly smaller than the spacing between the contacts 51, 51 to allow the blade 135 to easily drop out of the auxiliary contact assembly 17 during the above described cutout operation, and also to minimize the contact between the blade 135 and contacts 51 when the cutout is closed whereby the major share of the current is carried through the main contact assembly 16 and main contact 117.

In the operation of the loadbreak fuse cutout as a loadbreak switch, the operating member 124 of the ferrule 115 is moved downwardly and outwardly, the downward movement pivoting the unlatching arm 119 upwardly to engage the latch tube 38 and release the first latching device 35 from engagement with contact 117, and the outward motion effecting rotation of fuse holder 83 about the pivot 81 effecting disengagement between contacts 117 and contact 31. During the initial outward movement of contact 117 away from contact 31, the auxiliary blade 135 is prevented from disengaging from contacts 51, 51 by stop means or second latching device, 54, 54 on contacts 51 engaging blade 135. As the contact 117 moves further outwardly, the blade 135 rotates about pivot bolt 129 on the ferrule 115, remaining for a time in engagement with contact stop or latching means 54, 54 and carrying the full line current to prevent arcing between contacts 117 and 31 as they separate. This relative movement between fuse holder 83 and blade 135 will act to stress spring 139. As the ferrule 115 moves further outwardly, blade 135 slides downwardly over stop or latching means 54, 54 and, when the main contacts have separated a sufficient distance to prevent flashover, is completely withdrawn

from between the contacts 51, 51 in the downward direction whereupon spring 139 quickly moves the blade 135 outwardly from the contacts 51, 51 and arc plate means 57, 57 with a snap action out through the slot in the plates 57, 57 until the blade is again substantially parallel with the fuse holder 83 and in engagement with stop means 140 on arm 128. The movement of the blade 135 through the arc chute will extinguish the arc formed when the blade 135 disengages from contacts 51, 51. As is generally known, the arc is extinguished by attenuation and confinement between the plates 57, 57 and the gas blast produced by the gas evolving material as hereinbefore described.

To close the loadbreak fuse cutout, the operating device 124 is moved inwardly, rotating the fuse holder 83 about bearing 81, effecting engagement of the auxiliary contact blade 135 with contacts 51 before the main contact 117 engages contact 31. The stop means 140 on arm 128 bears against blade 135 during the closing operation effecting engagement with the contacts 51, 51 before the main contacts engage and forcing the blade 135 inwardly between guide members 53, 53 and beyond stop means 54, 54 to its normally closed position, as shown in FIG. 1.

From the foregoing description it is seen that there has been provided an open dropout fuse cutout having an auxiliary interrupter or delayed-acting loadbreak means 28, for adapting the fuse cutout for operation as an outdoor loadbreak switch without destruction of the fuse link within the fuse holder.

Although there is shown and described a specific loadbreak fuse cutout structure, it is to be clearly understood that the same is merely for the purpose of illustration, and that changes in modification may readily be made therein by those skilled in the art without departing from the spirit and scope of the invention.

We claim as our invention:

1. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

2. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, a first latching device (35) for latching said main movable contact to said other line contact assembly means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-

acting loadbreak means having separable contacts and including a second latching device (54) electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of both said first and second latching devices, whereby during fault current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

3. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said toggle linkage including a toggle-link hinge member (89), said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, said last-mentioned means including a fuse-link flipper having a latching portion (104) to make latching engagement with said toggle-link hinge member (89), means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

4. The combination set forth in claim 3, wherein spring means biases the fuse-link flipper to a link-withdrawing position, and the fuse link engages a portion of said flipper to maintain the same in a latching position.

5. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, said loadbreak means including an arc chute structure comprising highly-polymerized formaldehyde to assist in extinguishing the arc drawn between said separable contacts, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the fuse-holder assem-

bly may freely rotate about said one line contact assembly to an open indicating observable position.

6. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, said loadbreak means including a narrow-slot arc chute disposed generally laterally of said other line contact assembly, one of said separable contacts being generally blade shaped and movable within said narrow-slot arc chute, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

7. The combination according to claim 6, wherein the arc chute has a shielding portion extending generally laterally to shield said other line contact assembly from the weather.

8. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means including an arc chute having a pair of stationary finger contacts disposed therein and a co-acting movable blade contact carried by said fuse-holder assembly for electrically paralleling said main movable contact and said other line contact assembly, the interengagement between said movable blade contact and said stationary finger contacts constituting a latching device associated with said loadbreak means, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

9. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining

said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position, and the separable loadbreak contacts closing during the closing operation of the cutout prior to the closing engagement between said main movable contact with said other line contact assembly.

10. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, one of said separable loadbreak contacts being movably mounted to said other end of the fuse-holder assembly, so as to make relative motion therewith during a manual loadbreaking operation, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

11. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, one of said separable loadbreak contacts being pivotally mounted to said other end of the fuse-holder assembly and biased in the opening direction of the fuse-holder assembly against a stop member carried by the fuse-holder assembly, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the

11

fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

12. The dropout-type of fuse cutout according to claim 10, wherein said one separable loadbreak contact forms a general extension of the fuse-holder assembly.

13. An open-type dropout fuse cutout adaptable for loadbreak operation comprising, in combination, means defining a pair of spaced line contact assemblies, a fuse-holder assembly including a toggle linkage and a fuse tube pivotally supported adjacent one end thereof to one of said line contact assemblies, said fuse-holder assembly carrying a metallic terminal ferrule (115) having a main movable contact adjacent the other end thereof to make main contacting engagement with the other line contact assembly, means including a fuse link extending through said fuse tube for maintaining said toggle linkage in an underset condition, means biasing said toggle linkage to a collapsed condition, delayed-acting loadbreak means having separable contacts and including a latching device electrically paralleling said main movable contact and said other line contact assembly, whereby manual separation of said main movable contact from said other line contact assembly will nevertheless cause continued latched contacting engagement of said delayed-acting loadbreak means for a predetermined time, said terminal ferrule (115) having a laterally extending arm (127) pivotally carrying one of said separable loadbreak con-

12

tacts, spring means biasing said one separable loadbreak contact (135) in the opening direction of the fuse-holder assembly for snap opening action, and said loadbreak means being responsive to a collapse of said toggle linkage during fault-current interruption to effect release of said latching device, whereby during fault-current interruption the fuse-holder assembly may freely rotate about said one line contact assembly to an open indicating observable position.

References Cited by the Examiner

UNITED STATES PATENTS

2,249,662	7/1941	Matthews	200—114
2,308,026	1/1943	Rawlins	200—62
2,314,693	3/1943	Dickinson	200—114
2,571,864	10/1951	Graybill	200—146
2,734,966	2/1956	Schneider	200—114
2,787,683	4/1957	Kratoville	200—114
2,808,489	10/1957	Maass	200—146
2,816,984	12/1957	Lindell	200—114
2,840,671	6/1958	Gieffers	200—62

BERNARD A. GILHEANY, *Primary Examiner.*

WALTER STOLWEIN, ROBERT K. SCHAEFER,
Examiners.

S. B. SMITH, JR., H. A. LEWITTER,
Assistant Examiners.