Oct. 20, 1953 H. H. FAHNOE 2,656,435

HIGH-VOLTAGE FUSE

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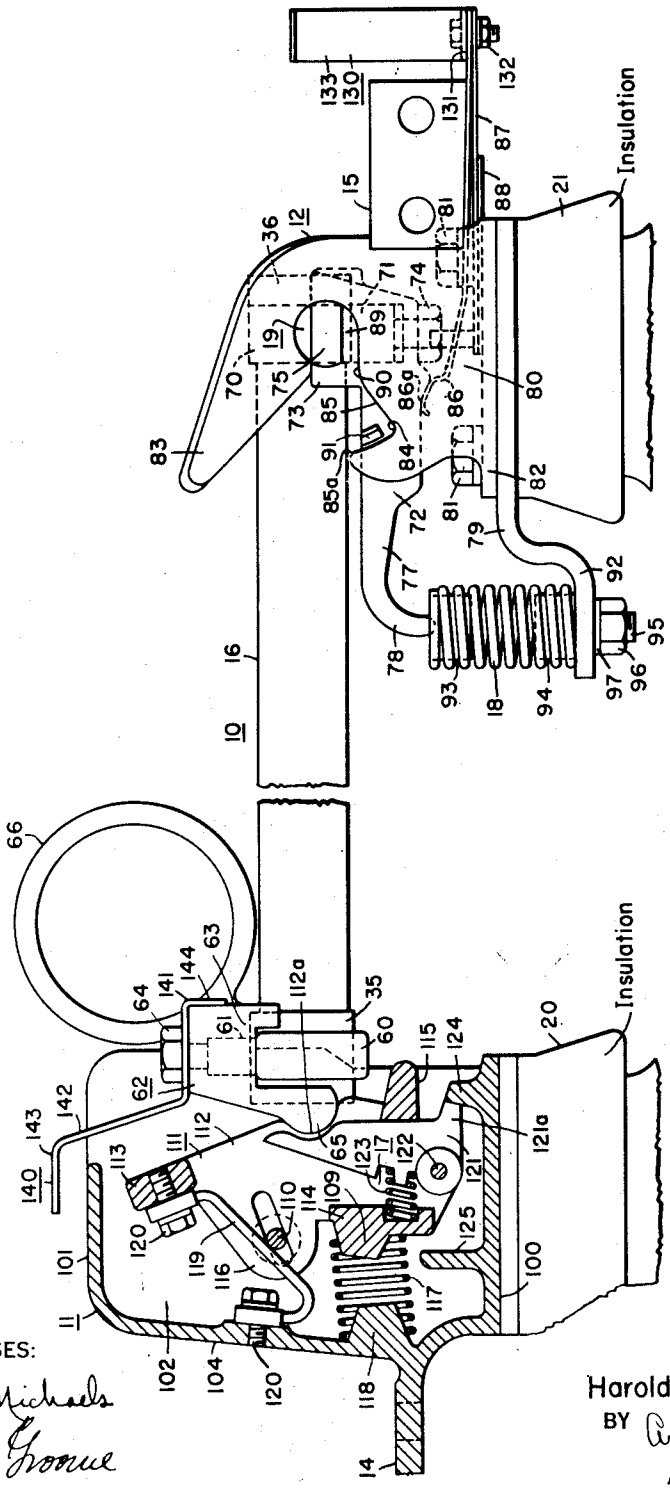


Fig. 1.

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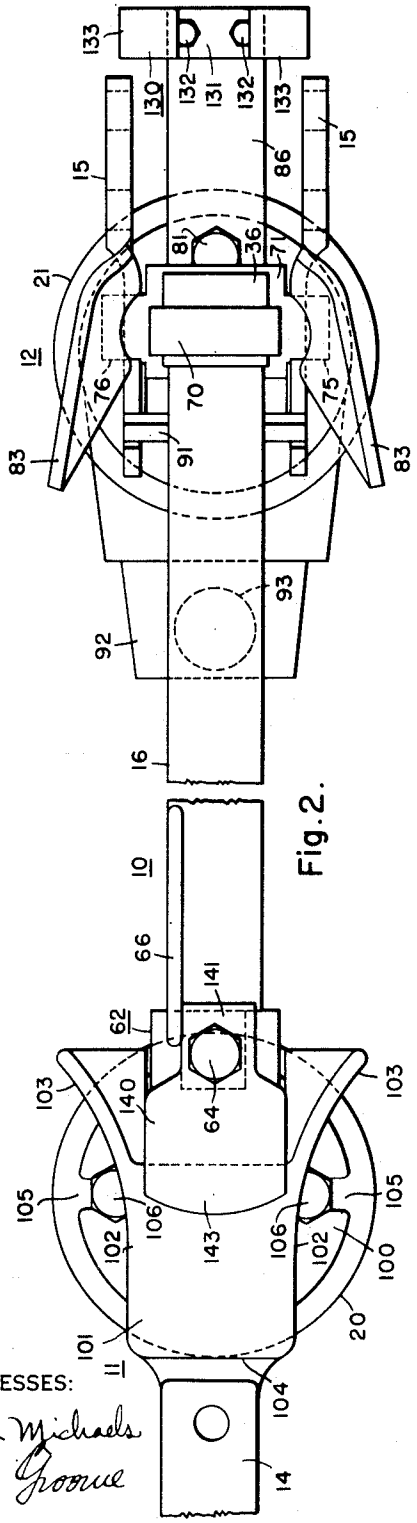


Fig. 2.

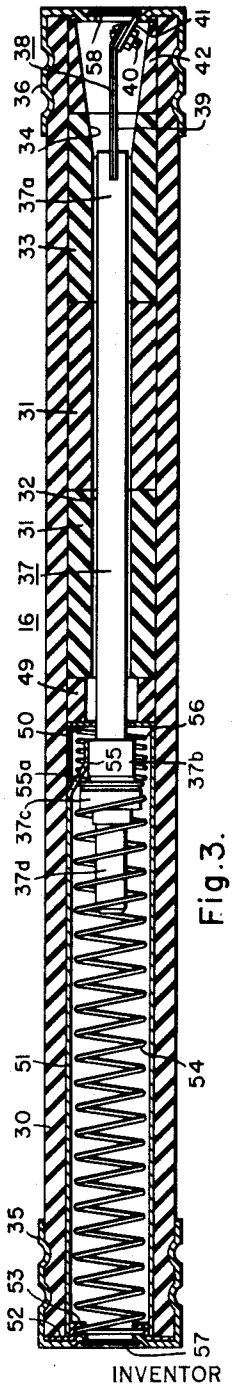


Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE

2,656,435

HIGH-VOLTAGE FUSE

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Application May 8, 1950, Serial No. 160,650

4 Claims. (Cl. 200—114)

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This invention relates generally to circuit interrupters, and more particularly to high voltage fuses. An object of the present invention is the provision of a kick-out fuse for effectively and reliably maintaining a fuse holder in circuit closing operation under normal conditions of circuit operation, and for powerfully throwing out the holder upon being subjected to overload current and blowing.

Another object of this invention is the provision of a kick-out fuse having a fuse holder easily manipulated into and out of circuit closing position, and which fuse releasably maintains the holder in the closed circuit position and operates, in response to blowing of the fuse, for releasing and powerfully throwing out the holder.

A further object of this invention is to provide a kick-out fuse which maintains a pivotally mounted fuse holder in circuit closing position during normal circuit operation, and highly effectively imposes bias on the fuse holder for powerfully throwing the same about the pivot as the result of overcurrent conditions in the protected circuit.

A still further object of this invention is the provision of an outdoor fuse in which releasable means for triggering by the blowing operation of the fuse, is shielded against the effects of weather during normal closed circuit operation of the fuse.

Another object of this invention is that of providing a kick-out fuse, having a fuse holder which is powerfully ejected from the circuit closing position upon circuit conditions blowing the fuse, and which fuse reliably stops rebound of the thrown holder.

Another object of the present invention is to provide a kick-out fuse which is well suited for keeping a fuse holder in substantially horizontal circuit closing position, yet is highly effective for throwing the holder a safe distance out of the circuit upon the fuse blowing on overload.

A further object of this invention is the provision of a kick-out fuse for supporting a fuse holder in substantially horizontal position for closed circuit operation, and which, upon blowing on overload, is capable of throwing the holder upwardly and away from proximity to the closed circuit position.

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

Figure 1 is a side elevational view of a kick-out

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fuse constructed in accordance with this invention;

Figure 2 is a plan view of the fuse represented in Figure 1; and

Figure 3 is an enlarged longitudinal sectional view through the fuse holder of the kick-out fuse shown in Figures 1 and 2.

Referring now more particularly to the structure of fuse 10 represented in Figures 1 and 2 of the drawings, it will be observed that it is substantially identical with the construction described and claimed in H. L. Rawlins et al. Patent No. 2,403,121, issued July 2, 1946, to the same assignee of this invention. The fuse of the Rawlins et al. patent is especially adapted for substantially vertical mounting and is arranged to automatically drop out of the circuit when the fuse blows. As will become apparent as this description proceeds, this invention comprehends the addition of certain structure to the Rawlins et al. fuse having features of cooperation with that fuse for adapting it to a substantially horizontal mounting wherein the fuse will be automatically kicked open when the fuse blows. Accordingly, for a detailed description of many of the parts of the fuse disclosed herein, reference may be made to the aforesaid Rawlins et al. patent.

The kick-out fuse disclosed here includes line terminal fixtures 11 and 12 for connection into a high voltage power line at 14 and 15. These terminals support a fuse holder 16, the latter affording an electrically conductive path completing the line circuit across the terminals during normal operating conditions of the power circuit. The fuse holder, however, includes a fusible portion suited to melt, or blow, when overload conditions in the circuit are encountered. In blowing, the fusible material in the holder prompts operation of releasable means such as the mechanism 17 on terminal 11, which operation releases the holder for being positively thrown to a safe distance away from circuit terminal 14 by biasing action, as of a spring 18 in the vicinity of pivot 19. Considering that the holder 16 is rotatably supported on terminal 12, at pivot 19, it will be seen that utilizing the spring 18, or other biasing means, for applying force to the fuse holder in this vicinity, gives positive drive of the fuse holder.

The releasable means, such as mechanism 17, preferably is adapted to introduce force aiding the bias and throwing action exerted by spring 18. It will be seen, however, that only short distances of expansion of the spring 18, or the

like, are necessary for applying force in the vicinity of pivot 19 to achieve force application in terms of a relatively large arcuate travel of the free end of the holder 16.

Among uses for certain embodiments of the present invention is that of mounting the fuse in a substantially horizontal direction. Thus, the fuse 10 illustratively is mounted on horizontally spaced insulators 20 and 21, such as of porcelain, so as to keep the fuse holder 16 in a substantially horizontal position for normal circuit operation. In the horizontal disposition of the fuse, spring 18 alone, or together with any aiding bias, affords force to throw the holder 16 upward, this occurring upon the fusible means in the latter being blown by an overload current. The throwing action involves rotation of the fuse holder 16 about the pivot 19.

As further illustrative of the practice of this invention, fuse holder 16 (Fig. 3) includes a fuse tube 30 of insulating material, such as fiber, synthetic resin, or the like, and opposite ends of the fuse tube are adapted to be closed by end terminal caps 35 and 36. The right hand end of tube 30, as viewed in Figure 3, is provided interiorly with a plurality of blocks 31, of an insulating material which is capable of evolving an arc extinguishing gas when in proximity to an electric arc. The insulating material, of which the blocks are made, is preferably boric acid, but any other insulating material having the properties set forth above may be employed, such, for example, as fiber or a synthetic resin.

The insulating blocks 31 are each provided with a central bore 32, so that the alignment of the bores 32, when the blocks are mounted in the tube, forms an elongated arc passage of restricted cross-section. The outer end of the arc passage, formed by the bores 32, is flared outwardly, as shown at 34, and an end block 42 is provided, which acts to separate the blocks 31 from the end cap 36. The end block 42 is preferably of fiber, a synthetic resin or other gas evolving material having a greater mechanical strength than boric acid. An arcing contact rod 37 in normal position is within the arc passage formed by the bores 32, and the outer end 37*a* of this rod has electrical connection with terminal cap 36 by a fusible strip 38 paralleled by a strain member 39, secured in any suitable manner to the rod and to the terminal cap 36. As shown, fusible strip 38 and strain member 39 have one of their ends inserted in a slot in the end of rod 37 and secured thereto, as by soldering or riveting, and the opposite ends of the fuse strip 38 and strain member 39 are bolted, or otherwise connected, as at 40, to an inwardly bent tongue 41 formed integrally with the terminal cap 36. The fusible strip 38, illustratively, is of silver, zinc, tin, or of an alloy thereof. Strain member 39, paralleling the fusible strip 38, is preferably of an electrically conductive material having greater tensile strength and of higher electrical resistance than the material of the fusible strip 38.

For supporting a conducting washer 50 in the fuse tube 30, at the far end of the insulating blocks 31 from the terminal cap 36, an insulating spacer block 49 is preferably employed. A tube 51 of good electrically conducting material, such, for example, as copper or the like, extends between the conducting washer 50 and a washer 52, also of good conducting material, which is clamped between the terminal cap 35 and the adjacent outer end of fuse tube 30.

The end terminal caps 35 and 36 may be secured in position in any suitable manner, but in the preferred manner, represented in Figure 3, the caps are indented into the cylindrical end surfaces of the fuse tube 30, such as by a pressing operation forming indentations in and around the end cap flanges and engaging the material of the tube. The conducting washer 52 has a central aperture, from the rim of which extend integral locking tongues 53 for a purpose to be hereinafter described. Adjacent to the conducting washer 50, and on the side thereof nearest the terminal cap 35, arcing contact rod 37 has an enlarged portion 37*b* having a tapered surface 37*c* thereon at an end thereof remote from tongues 53 of the conducting washer 52. This tapered surface 37*c* seats a reduced end coil of a coiled tension spring 54, the opposite end coil of which is held by tongues 53, so that the arcing contact rod is biased outwardly toward end terminal cap 35, and strain member 39 is normally maintained under tension.

To afford a good electrical connection between arcing contact rod 37 and terminal cap 35, tube 51 has integral contact tongues 55 for engagement with enlarged portion 37*b* of rod 37. Contact tongues 55 are joined with tube 51 by inclined parts 55*a* adapted to be engaged by one end of a coil compression spring 56, which reacts against washer 50 to bias contact tongues 55 into engagement with enlarged portion 37*b* of rod 37. By making the conducting tube 51 long enough to project a slight amount beyond the outer end of insulating tube 30, for example, spring 54 conveniently is availed upon to urge conducting washer 52 into firm contact with tube 51, and the latter into firm abutment against the conducting washer 50. This force also, for example, is transmitted by the conducting washer 50 to the insulating spacers 49, 31, 33 and 42, onto the cap 36, thereby keeping the several parts closely together.

It will be noted that arcing contact rod 37 has an integral extension 37*d* from the enlarged portion 37*b*, and that the end terminal caps 35 and 36 are each provided with a central aperture, normally closed by displaceable closure disks 57 and 58, respectively, which are releasably maintained in position, such, for example, as by cementing.

Under normal operating conditions of the power line, in which the replaceable fuse element 16 is used, an electrically conductive path through the fuse element 16 may be traced from terminal cap 35 through conducting washer 52, conducting tube 51, contact portions 55, contact arcing rod 37 and fusible strips 38, 39 to terminal cap 36. When an overload is imposed in the circuit, in which the replaceable fuse element 16 is connected, fusible strip 38 will melt, and strain member 39 will be vaporized shortly thereafter, thus releasing the arcing contact rod 37 and permitting spring 54 to move the latter toward terminal cap 35.

When the fusible strip 38 and strain member 39 are melted, the pressure created in the flared passage 34, augmented by gas evolved from material surrounding the bores 32, will be sufficient to displace closure disk 58, thereby allowing the gases to escape to the atmosphere. Spring 54 meanwhile moves the contact arcing rod 37 until extension 37*d* of this rod displaces the closure disk 57. The extension 37*d* thus passes through the aperture in terminal cap 35 to the outside of fuse element 16 until, for example, the action of

spring 54 is stopped by the abutment of the enlarged portion 37b of the contact arcing rod against tongues 53 on the conducting washer 52.

During circuit interruption, an arc is drawn between the end portion 37a of arcing contact rod 37 and arcing tongue 41 on end cap 36, and since enlarged portion 37b of the contact rod disengages contact portions 55, the current supporting the arc will be carried by spring 54. Inasmuch as the arcing time is very short, it is found that the spring will be undamaged by the passage of current therethrough for such short periods of time. If desired, however, a supplemental electrical connection, such as a flexible shunt (not shown) may be introduced between the terminal cap 35 and the arcing contact rod 37 to protect the spring 54 during circuit interruption. Likewise, if desired, the extension 37d of the arcing contact rod 37 may be of such size as to introduce a close fit against tongues 53 on the conducting washer 52, and thus be locked by the same against returning into the tube 30, once having projected through the aperture in terminal cap 35.

Referring now more particularly to Figures 1 and 2 of the drawings, it will be seen that the fuse holder 16 is suited at opposite ends thereof for mounting in the line terminal fixtures 11 and 12. Receiving the terminal cap 35 of the fuse holder 16 is a clamp, as for example including a substantially circular holding and mounting ring 60 having a radial protuberance 61 therefrom. Covering this protuberance is a hook-eye and latch fixture 62, more particularly having a substantially channel-shaped base 63 over the protuberance and facing the side of terminal cap 35. A screw 64, passing through an aperture in the base 63, threadedly engages internal threads in the protuberance 61 to hold the fixture 62 to the terminal cap 35. Extending outwardly beyond terminal cap 35, fixture 62 is provided with integral latch engaging extensions 65 on each side of the terminal cap 35, for a purpose to be described hereinafter. A hook-eye portion 66 is also formed integrally with the latch fixture and depends from the channel-shaped base 63 so as to occupy a forward position in the fuse assembly 10 and permit manual manipulation thereof about pivot 19.

At terminal cap 36, there is likewise provided a clamp, this for example including a substantially circular holding and mounting ring 70 for the fuse holder 16. This ring receives the terminal cap 36 therein, and has a radial protuberance 71, internally threaded for accommodating a screw 74. A fixture 72, for supporting and applying force for rotating the replaceable fuse element 16 from normal operating position of this fuse element, illustratively has a substantially channel-shaped base 73 affording a clamp receiving the protuberance 71 and the adjacent side of terminal cap 36. The screw 74 conveniently passes through an aperture in base 73 and threads into the protuberance 71 for holding the several parts assembled to the terminal cap 36. Extending in opposite directions from base 73 of the fixture 72 are stub-shafts 75 and 76, each for example having a transverse cross-section presenting opposite flat sides, and opposite arcuate sides interconnecting the flat sides, and affording bearing surfaces for rotation under circumstances which will be more fully described. Toward the back of fuse assembly 10, and behind the fuse holder 16, is a lever portion or projection 77 of the fixture 72. This lever portion extends from the back of base 73 for a distance substantially parallel to the replaceable fuse element 16 and then curves downwardly from the latter, terminating in a curved force receiving portion 78, a substantial distance away from stub shafts 75 and 76.

For supporting the fuse holder 16 to insulators 20 and 21, the insulator 21 preferably is provided with a generally U-shaped pivot contact 80 secured thereto, as, for example, by machine screws 81 extending through a base portion 82 of the contact. Legs 83 of the pivot contact have notches 84 therein, terminating in a keyhole guide edge 85 provided at one side of the notch 84 in each leg and with a retaining edge 85a at the other side. Each leg is also provided with an integral terminal leg portion 15 for connection into the power line. Intermediate the legs 83 of the pivot contact, a leaf spring member 86 of a resilient conducting material, together with backing leaf spring members 87 and 88 are secured to the base 82 of the contact, as by one of the contact mounting screws 81. With reference to Figure 1, it will be observed that when the fuse holder 16 is mounted with trunnions 75 and 76 received in the keyhole portions 89 of slots 90 in the legs of the contact, thus forming the pivot 19, withdrawal of these trunnions is prevented by engagement of guide arms 91 beneath retaining edges 85a of notches 84. These guide arms 91 are lateral extensions of lever portion 77 of the fixture 72. With the parts in the position just mentioned, it will be observed that the left-hand end 86a of the conducting spring 86 presses against the contact fixture 72. Upon pivotal movement of the fuse holder 16 in a clockwise direction (in Figure 1) on trunnions 75 and 76 in the pivot 19, the guide arms 91 will first be moved clear of the guide edges 85a on the pivot contact arms 83, and at this time trunnions 75 and 76 will have their widest dimension presented to the opening 90 in keyhole slot 89, so that for removing the fuse holder from the pivot contact, further rotation thereof in a clockwise direction becomes necessary, as to a position approximately 180° open from the position represented in Figure 1. In the open position, just mentioned, the fuse holder 16 may be removed from the pivot 19 by properly directed manual force.

Disposed between the back of pivot contact 80 and the insulator 21, and conveniently having apertures for admitting passage of the screws 81 for securement thereof, is a supporting bracket 79 for the helical spring or first biasing means 18. The outer end of this bracket has an offset portion 92 substantially confronting the adjacent curved outer end 78 of the force receiving lever of the fixture 72. The helical spring 18, illustratively, has spaced core plugs 93 and 94 inside the opposite ends thereof, and suitably held in place, as by welding to the adjacent last coil of the corresponding end of the spring. Core plug 94 has a threaded shank 95, or the like, extending axially therefrom and through an aperture in the end portion 92 of supporting bracket 79. A washer 97 and nut 96 conveniently serve to hold the spring and cores to the supporting bracket.

The line-terminal contact fixture 11 preferably includes a generally rectangularly-shaped contact supporting and inclosing hood, having a back wall 100, a partial front wall 101, opposite side walls 102 flared outwardly adjacent the free corners thereof, as at 103, and a side wall 104 joining the other walls just named. Back wall 100 is substantially circular in form, as shown in

Figure 2, and has diametrically opposed notches 105 formed in portions thereof beyond side walls 102 for receiving mounting screws 106, the latter securing the rear wall 100 of the contact fixture 11 to supporting insulator 20. Terminal portion 14, for connecting a line conductor to the fuse, conveniently assumes the form of a lug integral with the hood side wall 104. Interiorly of the contact housing is provided a supporting pin 110 extending transversely of, and mounted in, the side walls 102, and supporting a floating contact and latch member 111 for movement within the housing. The floating contact and latch member 111, illustratively, is in the form of a casting, and, as shown, is substantially rectangular in form including opposite side members 112 secured together by an integral front connecting member 113 and rear connecting members 114 and 115. The side legs 112 of the floating contact are provided with integral extensions 116 having slots therein for receiving supporting pin 110. A coil compression spring or second biasing means 117 engages between a supporting lug 118 on the side wall 104 of the housing and a similar supporting lug 109, formed integrally with the transverse connecting member 114 of the floating contact 111, to bias this contact in a counterclockwise direction around pin 110, as viewed in Figure 1. Foating contact 111 is electrically connected with side wall 104 of the housing, as by a flexible shunt 119, secured to this side wall and to cross-member 113 of the contact, for example by machine screws 120.

Along the edges of side legs 112 of the floating contact and latch member 111 are notches 112*a* adapted to receive latch engaging projections 65 of the fixture 62. A releasable supporting lever 121 is pivotally mounted between side legs 112 of the floating contact 111 by means of a pivot pin 122, and this lever 121 is biased for movement in a clockwise direction about pivot pin 122 into engagement with cross-member 115 of the contact 111 by a small compression spring 123, engaging between lever 121 and cross-member 114 of the contact. A supporting lug 121*a* is formed integrally with lever 121 for cooperation with an integral supporting lug 124 formed on the rear wall of the contact housing 11. A stop lug 125 is also formed integrally with the rear wall 100 of the contact housing 11, for engagement with cross-member 114 of the floating contact 111 to limit movement thereof toward the housing wall 104.

It will be observed that, for example, by making the hood or housing 11 with a partial front wall and that by extending the resulting opening to opposite the side wall 104, free entrance and exit of the adjacent end of the fuse holder 16, is possible during rotation of the fuse holder about pivot 19. The fuse 10, however, preferably includes means for shielding this opening in the housing, and consequently the means inside the housing for releasing the fuse holder 16, against the effects of weather. This shield, such as the shield 140, preferably covers the front opening in the housing 11 and part of the adjacent side opening and is displaceable as an incident to the outward movement of the fuse holder 16. Shield 140 is conveniently made of relatively thin flat sheet metal, or the like, having a degree of flexibility and resiliency, such as a Phosphor bronze alloy and is substantially Z-shaped, including an end leg 141 secured to the outside surface of fixture 62, to ring 60 and accordingly to the fuse holder 16, by the screw 64. An intermediate body portion 142 of the shield 140 extends outwardly at an angle (see Figure 1) covering the housing opening and terminates in an end 143 which overlaps the partial opening in front wall 101 of the housing 11. Leg 141 preferably has an extension 144 abutting and overlapping the fixture 62 to prevent substantial rotation of the shield 140 about screw 62 and thus to keep the shield in the covering position relative to the housing opening.

The operation of the floating contact 111 and releasable supporting lever 121 described above, upon being initiated from the normal circuit closing position of the fuse assembly 10, as represented in Figure 1, illustratively begins with a triggering action prompted by blowing of the fusible strips 38, 39 in the holder 16 on overload. Vaporization of the fusible strips 38, 39 releases the arcing contact rod 37 for operation by the spring 54, which serves to project the rod, and more particularly extension 37*d* thereof, through end terminal cap 35, rupturing or displacing the disk 57. In moving outwardly through the end terminal cap 35, the outer end of extension 37*d* of the holder 16 passes between latch engaging portions 65 of the fixture 62 and strikes the adjacent end of lever 121, this serving to rotate the latter counterclockwise (in Figure 1) about the pin 122 and against the bias of spring 123. This rotation of lever 121 moves lug 121*a* off and clear of abutment against the fixed lug 124, thus freeing the floating contact member 111 for counterclockwise rotation about pin 110 under the driving force of spring 117. The force of the latter is applied by arms 112 at the notches 112*a* to latch engaging portions 65 of the fixture 62. Also, it will be observed that the driving force of spring 117 aids spring 18, the latter applying force to lever extension 77 of the fixture 72. Both springs 18 and 117 accordingly are active for initially rotating the fuse holder 16, this rotation, of course, being centered at pivot 19, formed by pivot contact arms 83 and trunnions 75 and 76, and the action being that of powerfully throwing the fuse holder 16, and shield 140 attached thereto, upwardly in Figure 1 to produce rotation of at least 180° away from the position indicated to a vertical position; and its momentum, aided by the force of gravity, will then cause continued rotation of the fuse holder 16.

It will be observed that normally the latch mechanism and contact parts in terminal 11 are protected from the weather by shield 140 which extends over the top opening in terminal 11, and is inclined downwardly and outwardly, over at least the top part of the side opening between walls 102. In the event ice or other foreign substances should build up at the outer end 143 of the shield and/or in the space between it and front wall 101, the flexible nature of the shield will permit it to bend when the fuse is released to exert leverage on such substance to facilitate breaking away of the shield. The resilience of the shield causes breaking stresses to be applied to the ice at a plurality of points, so that the ice is shattered and falls away. Of course, after such an operation the resilient nature of the shield returns it to its normal position relative to the fuse, and illustrated on the drawings. It will be apparent that somewhat the same result would be obtained if the shield 140 were of rigid construction but pivotally mounted on the fuse and spring-biased to the normal position illustrated.

The fuse assembly 10 preferably includes

means for stopping opening movement and preventing rebound of the thrown fuse 16, such, for example, as a resilient substantially U-shaped clip 130, having a base 131 bolted, or otherwise secured, as at 132, to the outer end of spring 86 and the backing strip 87. Legs 133 of the clip 130 extend outwardly on respective sides of the path of rotation of the fuse holder 16, being rounded to receive and retain fuse holder 16 and having their outer ends flared outwardly so as to be spread apart upon being struck by the fuse holder and to resiliently grip and frictionally retain the fuse holder to prevent rebound thereof. Since clip 130 is mounted on springs 86 and 87 these act to absorb the shock entailed in the stopping of the opening movement of fuse holder 16.

Holder 16, together with fixture 62, shield 140 and fixture 72 attached to the end caps 35 and 36 thereof, may be inserted in the fuse assembly 10 in the open position of the fuse 10, such as at approximately the position, hereinbefore referred to as being about 180° removed from the position represented in Figure 1, by manipulating the trunnions 75 and 76 within the openings in the keyhole slot 89 with the aid of hook-eye 66. This insertion conveniently is achieved with the holder 16 out of engagement with the U-shaped clip 130. Following such insertion, the fuse holder 16 and the attached fixtures are rotated in a counterclockwise direction, as viewed in Figure 1, about the pivot 19. This rotation eventually confronts the flat sides of trunnions 75 and 76 to the openings 90 in the keyhole slots 89 and subsequently brings guide arms 91 beneath the guide edges 85*a* of notches 84, all to prevent escape of the trunnions from the keyhole slot. The counterclockwise rotation, referred to, eventually brings the curved end portion 78 of the force receiving lever arm 77 to abutment against the adjacent face of core plug 93 in the spring 18, this abutment for example being initially achieved with the fuse holder 16 still displaced about 60° from the position represented in Figure 1. Continued movement of the fuse holder 16 in the direction indicated compresses the spring 18, and finally brings the latch portions 65 of the contact fixture 62 to bear against the mechanism 17. If latch lug 121*a* has been released from lug 124, the floating contact 111 is moved, by closing movement of the fuse, in a generally clockwise direction about its supporting pin 110, and lug 121*a* of lever 121 engages fixed lug 124 on the contact housing 11 and passes over this fixed lug by compression of biasing spring 123. Spring 117 is also compressed, and the mechanism thus resumes the Figure 1 position. It will be seen that the contact mechanism 17 is susceptible to release by manual force applied to the hook-eye 66, as by means of a fuse hook stick. A substantial pull exerted on the hook-eye 66, tending to rotate the fuse holder clockwise in Figure 1 about the pivot 19, causes the latch portions 65 to exert a camming action on the floating contact and latching member 111, rotating the latter counterclockwise on lug 124 while compressing spring 117. The fuse holder 16, accordingly, is freed for clockwise rotation by further manual manipulation. Also, when the latch lug 121*a* is in engagement with lug 124 force may be applied to the hook-eye 66, driving the fuse in a counterclockwise direction, as viewed in Figure 1, from an open position to bring the latch portions 65 to bear against the floating contact member 111, driving the latter counterclockwise about lug 124 for engaging portions 65 in notches 112*a*.

Thus it will be seen that in this invention there is provided a high voltage kick-out fuse in which the various objects, hereinbefore noted, together with many thoroughly practical advantages are successfully achieved. It will be seen that the kick-out fuse is especially adapted for substantially horizontal mounting of the fuse, and readily operates for maintaining the circuit closed during the existence of non-overload conditions, and automatically operates, after blowing upon overload in the closed circuit position, to assume a safe position, assuring thereby an open circuit condition.

Having described a preferred embodiment of this invention in accordance with the Patent Statutes, it should be understood that the invention is not to be limited to the particular embodiment disclosed herein, inasmuch as it will be obvious, particularly to persons skilled in the art, that many changes and modifications may be made in this particular structure, without departing from the broad spirit and scope of the invention. Accordingly, this invention should be interpreted as broadly as possible and limited only as required by the prior art.

I claim as my invention:

1. In a kick-out fuse, an elongated fuse holder having fusible means therein connected between spaced terminals on said holder, a line terminal, said line terminal including a housing having top and side openings for accommodating swinging movement of one terminal of said holder, means mounting said holder in a substantially horizontal position with said one terminal thereof in engagement with said line terminal for pivotal movement of said one terminal thereof through an opening in said housing and upwardly away from said line terminal, means biasing said holder in favor of said movement of the holder, a shield mounted on said holder at a position to cover at least the top opening in said housing in spaced relation therefrom when said one holder terminal is in engagement with said line terminal, and movable means inside said housing for normally restraining said one holder terminal against the effect of said biasing means and being releasable in response to fusion of said fusible means.

2. In a kick-out fuse, an elongated fuse holder having fusible means therein connected between spaced terminals on said holder, a line terminal, said line terminal including a housing having top and side openings for accommodating swinging movement of one terminal of said holder, means mounting said holder in a substantially horizontal position with said one terminal thereof in engagement with said line terminal for pivotal movement of said one terminal thereof through the opening in said housing and upwardly away from said line terminal, means biasing said holder in favor of said movement of the holder, a shield mounted on said holder at a position to cover at least the top opening in said housing in spaced relation therefrom when said one holder terminal is in engagement with said line terminal, at least the outer end of said shield being resiliently movable relative to said holder, and movable means inside the housing for normally restraining said one holder terminal, against the effect of said biasing means and being releasable in response to fusion of said fusible means.

3. In an outdoor kick-out fuse, an elongated

fuse holder having fusible means therein connected between spaced terminals on said holder, a line terminal, said line terminal including a housing having top and side openings for accommodating swinging movement of one terminal of said holder, means mounting said holder in a substantially horizontal position with said one terminal thereof in engagement with said line terminal for pivotal movement of said one terminal thereof through the opening in said housing and upwardly away from said line terminal, and a shield mounted on said holder and movable therewith at a position to cover at least the top opening in said housing in spaced relation therefrom when said one holder terminal is in engagement with said line terminal.

4. In an outdoor kick-out fuse, an elongated fuse holder having fusible means therein connected between spaced terminals on said holder, a line terminal, said line terminal including a housing having top and side openings for accommodating swinging movement of one terminal of said holder, means mounting said holder in a substantially horizontal position with said one terminal thereof in engagement with said line terminal for pivotal movement of said one terminal thereof through the opening in said housing and upwardly away from said line terminal, a shield mounted on said holder and movable therewith at a position to cover at least the top opening in said housing in spaced relation therefrom when said one holder terminal is in engagement with said line terminal, and at least the outer end of said shield being resiliently movable relative to the holder.

HAROLD H. FAHNOE.

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