

Sept. 8, 1942.

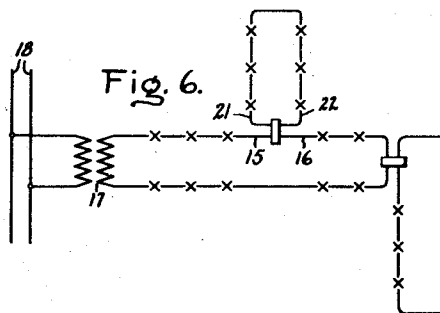
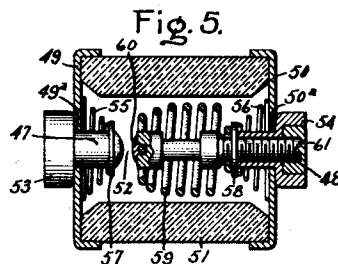
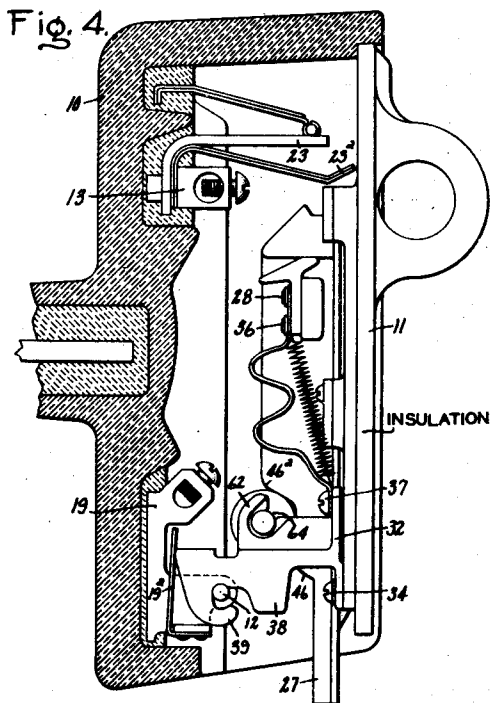
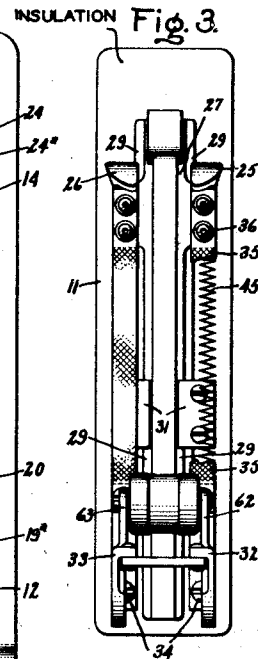
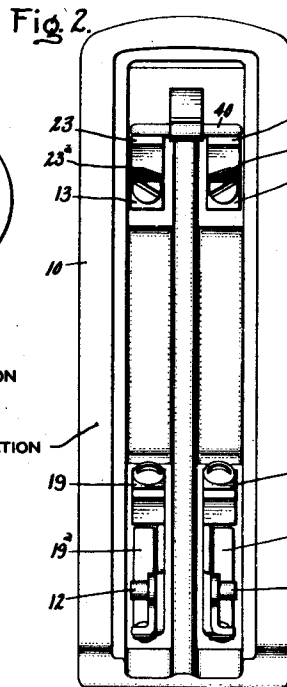
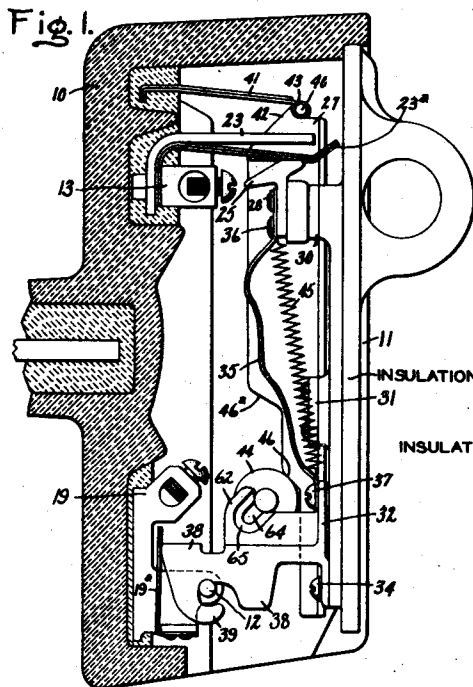
R. S. BENNETT

2,295,328

PROTECTIVE DEVICE

Filed June 25, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 7.

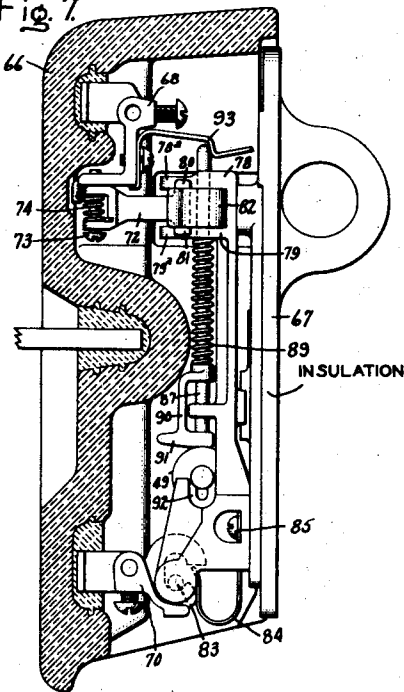


Fig. 8.

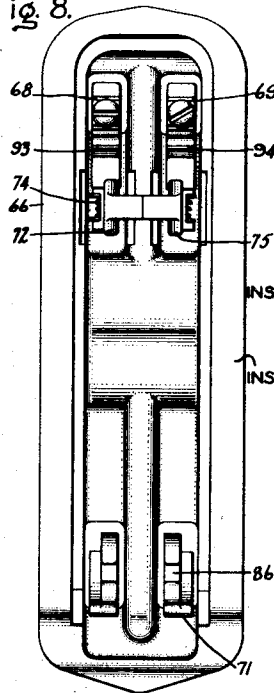


Fig. 9.

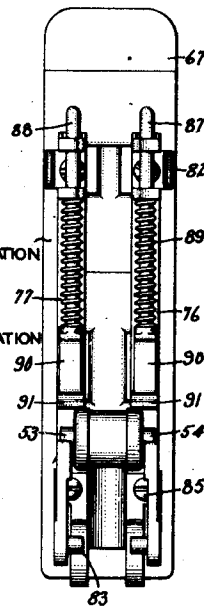


Fig. 10.

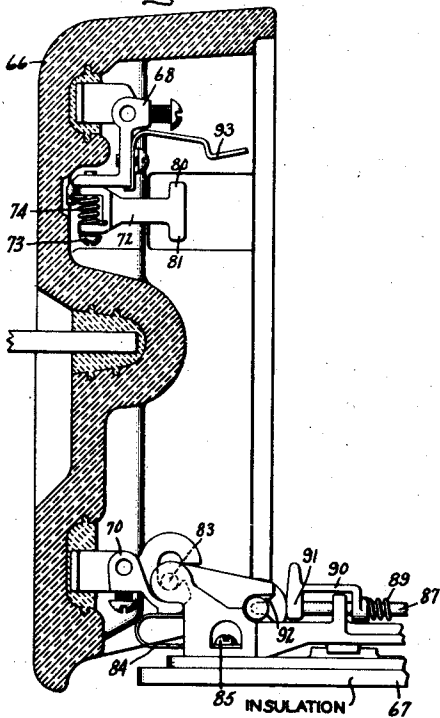
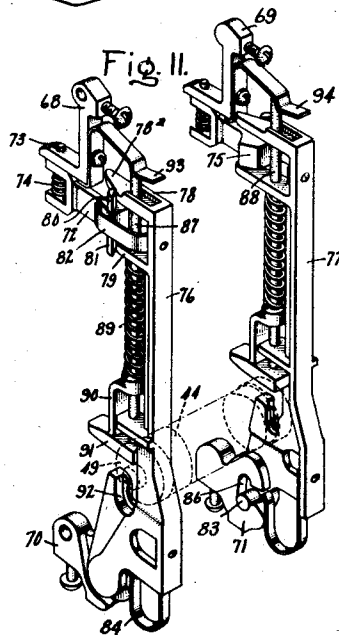


Fig. 11.



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UNITED STATES PATENT OFFICE

2,295,328

PROTECTIVE DEVICE

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Application June 25, 1940, Serial No. 342,247

24 Claims. (Cl. 200—118)

My invention relates to protective devices, that is, to electrical cutouts and switches, such as of the type described in a copending application S. N. 342,259, Lincks, filed concurrently herewith, and which is assigned to the same assignee as this present invention. My invention also relates to a voltage responsive device for use with my protective device and, although not limited thereto, my protective device has features which make it particularly adapted for use as a loop sectionalizing cutout for constant current street-lighting circuits.

It is therefore an object of my invention to provide an improved protective device of the above-mentioned type and also to provide an improved voltage responsive device for use with a protective device.

Another object of my invention is to provide an improved loop sectionalizing cutout with an improved arrangement for controlling the operation thereof so that, when an overvoltage appears in the loop circuit to which the cutout is connected, that circuit will be positively isolated from the line feeder circuit.

Further objects and advantages of my invention will become apparent from the following description referring to the accompanying drawings, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawings, Fig. 1 is a sectional side elevation of a sectionalizing cutout provided with an embodiment of my invention and which may operate without movement of its door; Fig. 2 is a front view of the cutout illustrated in Fig. 1, the door having been removed; Fig. 3 is a front view of the inside of the door of the cutout illustrated in Fig. 1; Fig. 4 is a sectional side elevation of the cutout illustrated in Fig. 1, the slide and latching mechanism having moved to an unlatching position; Fig. 5 is a sectional side elevation of the voltage responsive device which is employed with the cutout illustrated in Fig. 1; Fig. 6 diagrammatically illustrates a constant current street-lighting circuit to which my improved cutout arrangement finds a ready application; Fig. 7 is a sectional side elevation of a cutout which operates with movement of its door and which is provided with a modification of my invention; Fig. 8 is a front view of the cutout illustrated in Fig. 7, the door having been removed; Fig. 9 is a front view of the inside of the door of the cutout illustrated in Fig. 7; Fig. 10 is a sectional side elevation of the cutout illustrated in Fig. 7, the door

and latching mechanism having moved to an unlatching position; and Fig. 11 is a skeleton view of the conducting members of the cutout illustrated in Figs. 7 to 10.

In the illustrated embodiments of my invention I provide my protective device with an improved switch mechanism so that when it is applied between a loop and a constant current line, this switching arrangement when in one position isolates the loop from the line and at the same time short circuits the terminals in the device, 13—14 in Fig. 2 and 68—69 in Fig. 8, which are connected to constant current lines 15—16 in Fig. 6, so that these lines may continue to feed other loops which have not been damaged; while, when the switching arrangement is in a second position, it connects the loop, indicated by lines 21—22 in Fig. 6, with the constant current line. The switching arrangement is held in this second position by my improved voltage responsive device, illustrated in Fig. 5, through a movable part, such as a slide, 27 in Fig. 1, or door, 67 in Fig. 7, the switching arrangement being allowed to move to its first position when the slide or door moves to a corresponding first or unlatching position. In addition to causing a switching operation the movable part performs the function of providing an indication that the switching operation has taken place. When the movable part is the door, my improved voltage responsive device may control the operation thereof through an operative connection such as a latching arrangement including slides 87, 88 and hooks 93, 94, see Figs. 7 to 11, and, when the movable part is the slide, it may be held in its second position by direct contact with the voltage responsive device. The movable part is moved from a second to a first position in any suitable way, such as through the force of biasing springs, 45 in Fig. 1 and 89 in Fig. 7, and the device which holds the part in its second position is an electric discharge device having electrodes 47 and 48 disposed to define a gap 52 and an arrangement which moves in response to a predetermined arcing across the gap. This movement which allows the holding device to release the movable part may be accomplished in any suitable manner, such as by mounting the electrodes for relative movement. The electrodes are normally disposed to define a gap, however, so that, when an overvoltage is impressed across the electrodes arcing will appear across the gap causing the relatively movable electrodes to be actuated, thereby removing the restraining force of the operating device from the slide or latching mechanism which, therefore,

moves under the force of the biasing arrangement so that the switching arrangement may move from its second to its first-mentioned position. The latching arrangement, which may include the slide mounted on the door of the cutout and a hook mounted on the housing, may be therefore employed with the voltage responsive device where it is desired to control the operation of a switching arrangement from its second to its first position by movement of the door which is pivoted on the housing, while only the slide need be employed with the control device where it is desired to effect operation of the switching arrangement without movement of the door, that is, through movement of the slide.

Proceeding now with a more detailed description of my invention and referring to Figs. 1 to 4, I have illustrated a loop sectionalizing cutout being provided with an embodiment of my invention which may be efficiently applied in a constant current street-lighting circuit. However, it is to be understood that my invention may be applied to any other suitable electric protective device, and it is also to be understood that my improved cutout structure may be applied in any other circuit where it is desired to positively disconnect a burden circuit from a source of potential upon the occurrence of an overvoltage. The cutout includes a housing 10 and a door 11 which is pivoted to the housing at 12. The housing is provided with terminals 13 and 14 which may be connected to the feeder lines 15 and 16, respectively. These feeder lines, which are diagrammatically illustrated in Fig. 6, may be connected to a constant current source 17 which is in turn connected to constant potential lines 18. The housing also carries, at the opposite end from the terminals 13 and 14, terminals 19 and 20 which may be connected to lines 21 and 22 of the loop. In order that the line terminals 13 and 14 may be connected with a switching arrangement, I provide contacts 23 and 24 which are rigidly connected to the line terminals 13 and 14, respectively. These contacts 23 and 24 are also provided with resilient parts 23a and 24a, respectively, whose function will become obvious as the description proceeds. Adapted to cooperate with the contacts 23 and 24, I provide contacts 25 and 26, which are in turn mounted on a movable part, such as a slide member 27, by bolts 28, the slide member 27 being mounted for sliding movement on any suitable part of the cutout, such as the door 11. This slidable support is provided by tongue members 29 which extend from the slide member 27 and which in turn slide in cooperating slot members 30 and 31. The slide is mounted on the door since this provides a convenient way of removing the slide from the cutout by merely removing the door from the housing. The slide could, of course, be mounted on the housing if desired. The contacts 25 and 26 are electrically connected to bus bars 32 and 33 which are supported at the base of the door by bolts 34. This electrical connection between the contact 25 and bus bar 32 is made through a pigtail 35 which is electrically connected to the former through a bolt 36 and to the latter through a bolt 37. The contact 26 and bus bar 33 are similarly electrically connected in order that the line terminal 14 may be connected to the loop terminal 20 through the contact 26 and bus bar 33. In order that the bus bar 32 may make contact with the terminal 19, I provide the bus bar 32 with an angularly extending portion 38. This extending portion 38 is

provided with a hook portion 39 which cooperates with the pivot 12 which is integrally connected with the terminal 19. The terminal 19 is also provided with a resilient portion 19a which cooperates with the outwardly extending portion 38 of the member 32. Thus, the bus bar 32 makes electrical contact with the terminal 19 through its extension 38 and the spring contact 19a and pivot member 12. The terminal 20 and the bus bar 33 have similar cooperating portions for electrically and pivotally connecting the terminal 20 and bus bar 33 together. It will be seen, therefore, that, when the parts of the cutout are in the second position as illustrated in Fig. 1, the electrical circuit is made from the line terminal 13 through the contacts 23 and 23a to the contact 25. The circuit may then be traced through the pigtail 35 to the bus bar 32 which is electrically connected through its angularly extending portion 38 to the loop terminal 19. The electrical circuit may then be traced around the loop through the lines 22, 21, as shown in Fig. 6, back to the opposite loop terminal 20, and from the terminal 20 the electrical circuit may be traced to the bus bar 33 and the pigtail connection to the contact 26, the latter, when in a position as shown in Fig. 1, being electrically connected to the contacts 24 and 24a. The contact 24 is, of course, rigidly connected to the other line terminal 14.

When such a cutout as described above is connected between a feeder line and a loop as illustrated in Fig. 6, it is important, if a fault occurs in the loop, to be able to isolate the loop and, at the same time, short circuit the terminals 13 and 14, so that the remaining loops will not be kept out of circuit with the source. I have already described the contact arrangement whereby the loop is electrically connected to the feeder lines, and I shall describe below the voltage responsive device or holding mechanism for the cutout and the structure by which the cutout isolates the loop when it becomes faulty and, at the same time, short circuits the terminals 13 and 14.

In order to provide a suitable arrangement for short circuiting the terminals 13 and 14, I provide a bus bar 40 which is carried by a spring member 41. The spring member 41 is biased by its inherent resiliency to force the bus bar 40 towards the contacts 23 and 24, as will be seen in Fig. 2. It will be seen, therefore, that it is necessary to provide an arrangement for holding the bus bar 40 away from the contacts 23 and 24 when it is desired that the loop should be electrically connected with the feeder lines. This is accomplished through the slide member 27 and the voltage responsive device which will be described later. Since the switching arrangement may move from its second to its first position through the sliding action of the slide, movement of the door is not necessary for the operation of the cutout illustrated in Figs. 1 to 4. However, since I have found it desirable to mount the slide on the door, an arrangement must be provided for holding the door in its closed position during the time the switching arrangement is in its second position. In order to accomplish this, I provide the slide member 27 with an inclined portion 42 which catches behind a hook portion 43 of the spring member 41, the inclined portion 42 of the slide 27 and the hook portion 43 of the spring member 41 providing a latching arrangement for holding the door in its closed position when the switching arrangement is in its second position. It is to be understood, however, that

any other suitable arrangement may be employed for holding the door in its closed position.

In order to hold the slide member 27 in the position as illustrated in Fig. 1, which I call its "second or latching position", I provide an improved voltage responsive device 44 for releasably holding the movable part in such a position. The slide member 27 is normally biased to its first or unlatching position by spring members 45 so that the contacts 25 and 26 tend to move away from the contacts 23 and 24. These spring members are connected at one end to the slide member through the bolts 36 and, at the other end, the spring members are connected to the relatively stationary door portion through the bolts 37. The slide member 27 is held in its upward or second position against the force of the biasing springs 45 by the device 44 by direct contact therewith through an inclined portion 46 on the slide. The device 44 is in turn held in the position illustrated in Fig. 1 by a supporting arrangement which includes the bus bars 32 and 33.

The structure of my improved voltage responsive or control device, whereby a suitable movable part, such as the slide or latching means is allowed to move to its first or unlatching position when a fault occurs on the loop, will now be described. Referring to Fig. 5, my improved device includes an electric discharge device having a mechanism movable in response to an overvoltage, such as relatively movable electrodes 47 and 48. These electrodes are slidably supported on a supporting arrangement which includes plate members 49 and 50. The plate member 49 has a hole 49a through which the electrode 47 passes, and the plate member 50 has a similar hole 50a through which the electrode 48 passes. The plate members 49 and 50 are in turn supported by a tubular member 51. This tubular member may be of any suitable type, such as a nonlinear resistance material, such as described in Patent No. 1,971,194, McEachron et al., or it may be an insulating material, such as porcelain, as described in a copending application Serial Number 342,282, Allen, both being assigned to the same assignee as the present invention. The electrodes 47 and 48 are normally disposed to define a gap 52 between their inwardly extending ends and their opposite ends are provided with head portions 53 and 54, respectively. The function of the heads 53 and 54 will become apparent when I describe below the operation of my improved operating device as applied to the cutout which has already been described. The relatively movable electrodes 47 and 48 are positioned or biased toward each other so as to define a gap 52 by an arrangement which includes spring members 55 and 56. The spring member 55 is disposed between the supporting member 49 and a shoulder 57 which is near the inner end of the electrode 47. The spring member 56 is also disposed between the supporting member 50 and a shoulder 58 of the electrode 48. Thus the spring members 55 and 56 cause the electrodes 47 and 48 to move toward each other until the heads 53 and 54 abut against the outside surfaces of the supporting arrangement 49 and 50. In order to provide an arrangement for causing the electrodes 47 and 48 to move outwardly when an overvoltage occurs, I provide a spring member 59 which is releasably held between the collar member 58 and a heat responsive means. The spring member 59 is held, therefore, in compression since the end of the spring adjacent the gap is restrained from moving toward the electrode 47 by the heat-respon-

sive arrangement, such as a meltable member 60 which is disposed over the end of the spring which is adjacent the gap 52.

The operation of my improved voltage responsive device which is illustrated in Fig. 5 is as follows: The gap 52 may be designed to arc over when an overvoltage within a predetermined range or of a particular value is impressed across the electrodes 47 and 48. In order to be able to variably distance the electrodes 47 and 48, I provide an adjusting arrangement which includes a threaded member 61 which cooperates with a threaded portion of the head member 54. Thus, when the overvoltage is reached at which the gap is designed to arc over, sufficient heat will be developed by the arc to cause the member 60 to melt. Instead of employing a member which will melt upon the application of heat due to arcing across the electrodes, any other suitable arrangement which may be designed to perform the same function as the meltable member 60 may be employed. Thus the force of the spring 59 will cause the end of the spring adjacent the gap member to move toward the electrode 47 when the heat-responsive arrangement overheats. The spring member 59 is designed so as to have a greater force than the combined effect of the springs 55 and 56 so that, when the end of the spring 59 contacts the shoulder member 57, it will push the electrode 47 outwardly against the force of the spring member 55. The spring member 59 will also push against the shoulder member 58 and push the electrode 48 outwardly. Thus, the heads 53 and 54 will move away from the plate members 49 and 50, respectively, and portions of the electrodes 47 and 48 of relatively smaller diameters will extend through the holes 49a and 50a respectively. If desired, the electrodes could be relatively stationary and any other suitable arrangement employed which will allow relative movement between the housing and device. I may, therefore, make use of this movement of the electrodes to effect any desired control operation, and, when my improved device is applied in connection with the cutout described above, the outward movement of the heads 53 and 54 will cause my device 44 to tend to move away from the slide member 27, thus allowing the latter to move with the device 44 to a first or unlatching position under the influence of the biasing springs 45.

My improved operating device is supported in an efficient manner by the cutout device so as to make use of the movement of the electrodes. This supporting arrangement includes portions 62 and 63 which are integral with the bus bars 32 and 33, respectively. The portion 62 has a slot 64 which is of slightly larger width than the diameter of that portion of the electrode 47 which is immediately adjacent its head member 53. The extending portion 63 of the bus bar 33 is similarly provided with a slot. The extensions 62 and 63 are so situated that, when the heads 53 and 54 of my operating device are against the plates 49 and 50, the heads 53 and 54 will be supported by the outer edges of the slots as shown in Fig. 1. Thus, the device 44 is suspended by the head members 53 and 54 between the supporting members 62 and 63. When the meltable member, however, melts so that the electrodes will move to their outward position, portions of the electrodes will extend outside the plates 49 and 50 which portions are of smaller diameter than that of the heads. Since the diameter of these portions of the electrodes are less

than the width of the slot member 64 and since the electrodes move outwardly a distance greater than the thickness of the portion 62 around the slot 64, the portions of the electrodes adjacent the heads will move into the slots until they rest on the curved portions at the bottom of the slots as shown in Fig. 4. Grooved portions 65 are provided around the slots so as to accommodate the heads 53 and 54. It will be seen, therefore, that as the body of the operating device 44 tends to move away from the slide member, the slide member will move with it away from the hook member 43 under the force of the biasing springs 45. The slide member will move downwardly until its inclined portion 46a strikes the body portion 51 of the device. This downward movement of the slide or latch mechanism will cause my switching arrangement, which includes the contacts 25, 26 and cooperating contacts 23, 24 and short-circuiting bar 40, to move downwardly or to their first position to which they are biased. The contacts 25 and 26 will move until they no longer contact the spring portions 23a and 24a of their cooperating contacts and, in which time, the short-circuiting bar 40 will have already contacted the contacts 23 and 24 to short circuit them.

In view of the foregoing, it will be seen, therefore, that I have provided an improved cutout with a movable part such as a slide which, when in its second or latching position, will hold the switching arrangement in position such that the loop is connected in series with the line. However, upon operation of my improved voltage responsive device, my slide moves to its first or unlatching position so that the switching arrangement will isolate the loop and short circuit the terminals of the line. It may be noted from an inspection of Fig. 4, that the slide when in its first position performs the additional function of giving an indication that a predetermined voltage has appeared across the gap, since the end protrudes from the housing. It will be further noted that the above operation is accomplished without requiring the door 11 to drop out. Thus, if for any reason the door 11 is held closed, such as by sleet, my improved cutout will still operate. Thus, movement of the door is unnecessary in the above described cutout to cause operation thereof. If, however, it is desired to have a structure wherein the door must drop out before the switching arrangement operates, my improved sectionalizing cutout as illustrated in Figs. 7 through 11 may be employed.

Referring to Figs. 7 through 11, I have illustrated a drop out sectionalizing cutout which employs a latching arrangement for controlling the movement of the switching arrangement and voltage responsive device for initiating the movement of the latching arrangement toward its unlatching position, the device for controlling the operation being similar to that shown in Fig. 5.

The cutout includes a housing 66, a movable part, such as a dropout door 67, and terminals 68 and 69 which are mounted near the top of the housing 66 and which may be connected with the feeder line. The housing also contains terminals 70 and 71 which are mounted at the bottom of the housing and which may be connected to the lines of the loop. The terminal 68 is pivotally connected to a contact 72 and, as will be seen in Fig. 8, this contact 72 is biased to move to the right when looking inside the housing 66 with the cover removed. This contact is mounted on the terminal 68 through a bolt 73, and a

spring member 74 surrounds the bolt 73 to cause the contact 72 to be biased as described above. Terminal 69 has a contact 75 similar to the contact 72, the contact 75 being supported by the terminal 69 similar to the supporting arrangement for the contact 72, but biased to move to the left when viewing the inside of the housing with the cover off. Thus, the contacts 72 and 75 tend to abut against each other as illustrated in Fig. 8 and, since these contacts are electrically connected to the terminals 68 and 69, respectively, when the contacts 72 and 75 are allowed to move toward each other under the force of their biasing springs, a short-circuiting path is provided between the terminals 68 and 69. Such a condition, of course, is desired when a fault occurs in the loop. The cover 67 is provided with bus bars 76 and 77 so as to provide an arrangement for making contact between the terminals 68 and 70, and 69 and 71, respectively. The bus bar 76 is provided at its upper end with prongs 78 and 79 which have inclined surfaces 78a and 79a which are adapted to cooperate with outwardly extending portions 80 and 81, respectively, on the contact 72. Thus, when the cover is moved to its closed position as shown in Fig. 7, the prongs 78 and 79 will abut against the outwardly extending portions 80 and 81 of the contact 72 and rotate it to the left, against the force of its biasing spring. The bus bar 76 is also provided with a resilient guiding member 82 which surrounds the opposite side of the contact 72 from that contacted by the prongs 78 and 79. These details may be clearly seen in Fig. 11. Thus, the contact 72 upon closing of the cover 67 is rotated to the left and tightly held between the prongs 78 and 79 and the resilient contact piece 82. The bus bar 77 is similarly provided with prongs and a resilient guiding piece so as to move the contact 75 to the right and to make contact therewith. Therefore, when the cover is in the closed position as illustrated in Fig. 7, contact 72 is moved away from the contact 75 and, in addition, contact 72 makes electrical contact with the bus bar 76 through the prongs 78 and 79 and resilient member 82. Similarly, the bus bar 77 moves the contact 75 away from the contact 72 and makes contact therewith. At the bottom of the bus bar 76, there is provided an extending pivot 83 and a resilient contact member 84. The contact 84 is supported by and electrically connected to the bus bar 76 by a bolt 85. A slot 86 is provided in the terminal 70 into which the pivot 83 may be placed when the cover 67 is attached to the housing 66. Contact is, therefore, provided between the bus bar 76 and the terminal 70 through the sides of the slot 86, pivot 83, and resilient contact 84, which abuts against the outside edge of the terminal 70. The bus bar 77 is also provided with a pivot 83 and resilient contact 84, and terminal 71 is also provided with a slot 86, so that the bus bar 77 may make electrical connection with the terminal 71 when the cover is attached to the housing.

In order to provide a latching arrangement for holding the cover in the position illustrated in Fig. 7, I provide two slide or bar members 87 and 88 which are slidably mounted on the bus bars 76 and 77, respectively, through suitable holes in portions thereof. The slide 87 is biased downwardly by the force of a spring member 89 which abuts at the top on the relatively stationary prong 79 of the bus bar 76 and at the bottom the spring member 89 abuts against a bracket member 90 which is integral with the bottom of

the slide member 87. A bottom portion 91 of the bracket member 90 in turn abuts against the plate member 49 of my device 44. The slide member 88 of the bus bar 77 is similarly provided with a biasing spring and a bracket member. The device 44 is supported by a supporting arrangement which includes grooves 92 which are placed at the base of the bus bars 76 and 77. Thus, the operating device 44 is supported in grooves by the bus bars 76 and 77, as was the device 44 by the edges of the grooves in the cutout illustrated in Fig. 1. It will be noted that the voltage appearing across the terminals of the cutout also appears across the terminals of the gap of the device 44.

The operation of the cutout illustrated in Figs. 7 through 11 is as follows: When the heads 53 and 54 move outwardly due to some fault causing an overvoltage in the loop, the portions of the electrodes of lesser diameter adjacent the heads will pass into the grooves 92. This operation is the same as that which was described in connection with Figs. 1 through 4. This will cause the device 44 to move downwardly in the grooves and allow the slide members 87 and 88 to move downwardly or to an unlatching or first position under the force of their biasing springs 89. The top ends of the slides 87 and 88 which are normally held behind hook members 93 and 94, respectively, move downwardly out of the range of the hook members 93 and 94. Since the center of gravity of the door is to the right of the pivot 83 and, further, since the forces of the spring members 74 normally tend to push the prong members 78 and 79 outwardly, the door will drop open when the latch which includes the slides 87 and 88 and hooks 93 and 94 move out of operative engagement or to their unlatching position. Upon this movement, the circuit will be broken between contact 72 and the prongs 78, 79. Similarly, the prongs of bus bar 77 will move out of engagement with contact 75, thus causing the loop to be isolated from the line terminals 68 and 69. Furthermore, in order not to have the remaining serially connected loops remain unconnected with the line, the contacts 72 and 75 under the force of their biasing springs will move toward each other until they short circuit the terminals 68 and 69. It may be noted from an inspection of Fig. 10, that the movable door gives an indication that a predetermined voltage has appeared across the gap.

Thus, in the cutout illustrated in Figs. 7 through 11, I have provided a cutout of the drop-out type wherein, upon actuation through my improved voltage responsive device, the latching arrangement will move to its unlatching position so that the door will drop open. Thus, the loop will be isolated and the line contacts short circuited as the switching mechanism moves from one position, where the loop and line terminals are connected together, to a second position.

In view of the foregoing, it will be seen that I have provided an improved voltage responsive device which provides for relative movement of its electrodes upon an overvoltage being impressed across its gap. This movement of the electrodes may be used in any suitable manner and, in the cutouts described above, this movement has been efficiently employed to operate a slide or latching arrangement from a second to a first or unlatching position so that the switching arrangement may effect the desired circuit opening and closing operations.

Modifications of the particular arrangements

which I have disclosed embodying my invention will occur to those skilled in the art, so that I do not desire my invention to be limited to the particular arrangements set forth and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A voltage responsive device including relatively movable electrodes, resilient means positioning said electrodes to define a gap, actuating means mounted on one of said electrodes for causing relative movement thereof and heat-responsive means for restraining said actuating means, said heat-responsive means being so constructed and arranged to release said actuating means upon becoming overheated, said gap being so positioned to allow arcing thereacross upon an over-voltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so that said actuating means will overcome said positioning means and cause relative movement between said electrodes.

2. A voltage responsive device including relatively movable electrodes, resilient means positioning said electrodes to define a gap, second resilient means for causing relative movement of said electrodes, and means including heat-responsive means for restraining said second resilient means, said heat-responsive means being so constructed and arranged to release said second resilient means upon becoming overheated, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so that said second resilient means will overcome said first resilient means and cause relative movement of said electrodes.

3. A voltage responsive device including relatively movable electrodes, supporting means for said electrodes, a collar on one of said electrodes, resilient means disposed between said supporting means and said collar for positioning said electrode so that it will define a gap with said other electrode, second resilient means for causing relative movement of said electrodes, and heat-responsive means for restraining said second resilient means, said heat-responsive means being so constructed and arranged to release said actuating means upon becoming overheated, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so that said second resilient means will overcome said first resilient means and cause relative movement of said electrodes.

4. A voltage responsive device including relatively movable electrodes, supporting means for said electrodes, collar members on each of said electrodes, spring means between said collar and said support of each of said electrodes for positioning said electrodes to define a gap, second resilient means for causing relative movement of said electrodes, and heat-responsive means for restraining said second resilient means, said heat-responsive means being so constructed and arranged to release said actuating means upon becoming overheated, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so that said second resilient means will

overcome said first resilient means and cause relative movement of said electrodes.

5. A voltage responsive device including relatively movable electrodes, tubular supporting means for slidably supporting at least one of said electrodes, resilient means within said tubular supporting means for positioning said electrodes to define a gap, heat-responsive means, spring means for actuating said relatively movable electrodes, means including said heat-responsive means for restraining said spring means, said heat-responsive means being so constructed and arranged to release said actuating means upon becoming overheated, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so that said spring may actuate said relatively movable electrodes.

6. A device for controlling the operation of an electric protective device including relatively movable electrodes, means positioning said electrodes to define a gap, one of said electrodes having a heat responsive means and an abutment, spring means for actuating said relatively movable electrodes, said spring means being releasably held between said heat responsive means and said abutment, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an over-voltage appearing across said electrodes, said arcing causing said heat responsive means to overheat so that said spring may be released so as to cause relative movement between said electrodes.

7. A voltage responsive device for a switch including relatively movable electrodes, supporting means for said electrodes, collar members on each of said electrodes, spring means between said support and said collar of each of said electrodes, means including said spring means for positioning said electrodes to define a gap, a meltable member, second spring means for actuating said relatively movable electrodes, said second spring means being held in compression between said meltable member and said collar of one of said electrodes, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said member to melt so that said second spring may cause relative movement between said electrodes.

8. A voltage responsive device for a cutout including relatively movable electrodes, supporting means for said electrodes, collar members on each of said electrodes, spring means between said support and said collar of each of said electrodes, means including said spring means for positioning said electrodes to define a gap, a meltable member carried by one of said electrodes adjacent said gap, second spring means for actuating said relatively movable electrodes, said second spring means being held in compression between said meltable member and said collar of one of said electrodes, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said member to melt so that

said second spring may cause relative movement between said electrodes.

9. A voltage responsive device for a cutout including electrodes, one of said electrodes having a collar and an enlarged head, supporting means for said electrodes, said one of said electrodes being movably supported between said collar and said head, spring means between said support and said collar for holding said head of said one of said electrodes against said support and for positioning said one of said electrode to define a gap with said other electrode, actuating means for said relatively movable electrodes, and heat-responsive means for releasably restraining said actuating means between said means and said collar, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so that said actuating means may be released so as to cause movement of said one of said electrodes.

10. A voltage responsive device for a cutout including movable electrodes, said electrodes each having a collar and an enlarged head, a supporting means for said electrodes, said electrodes being movably supported between said collar and said head, spring members between said support and said collar of each of said electrodes for holding said heads of each of said electrodes against said support and for positioning said electrodes to define a gap, meltable member, spring means for actuating said relatively movable electrodes, said spring means being held in compression between said meltable member and said collar of one of said electrodes, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing said member to melt so that said spring means may cause movement of said electrodes.

11. In a control device for a switch, a switch-actuating means, a supporting means releasably supporting said switch-actuating means, electrodes movably supported in said supporting means and having ends passing therethrough, means including said supporting means positioning said electrodes to define a gap, and means responsive to arcing across said electrodes to allow said ends which pass through said support to move thereby permitting movement of said supporting means and releasing said switch means to cause actuation of the switch.

12. A switch including a housing, a door pivoted to said housing, means movably mounted on said door, a voltage responsive device having relatively movable electrodes normally disposed to define a gap, means for biasing said movable means in one position, means including said device for releasably holding said movable means in a second position, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing relative movement of said electrodes so that said means can move to said one position under the influence of its biasing means.

13. A cutout including terminals adapted to be connected to feeder lines, a switch mechanism biased to one position, a slide for holding said switch mechanism in a second position, said switch mechanism providing a short-circuiting path between said terminals when in said one

position and when in said second position providing a conducting path between said feeder lines and a loop circuit, a device having movable electrodes being normally disposed to define a gap, means including said device for restraining said slide member so that it will hold said switch mechanism in its second position, said restraining force being removable upon movement of said electrodes so that said switch mechanism may move to said first position.

14. A cutout including a housing, a door pivoted to said housing, a slide member, a hook member, said slide and hook members being mounted on said door and housing respectively and being cooperable to provide latching members, said members being biased for relative movement to an unlatching position, a device having electrodes disposed to define a gap and relatively movable in response to predetermined arcing across said gap, and means including said device for restraining said latching members in their latching position, said restraining means being removable upon relative movement of said electrodes so as to allow relative movement of said latching members under the influence of their biasing means to said unlatching position.

15. A cutout including a switch mechanism, a slide member, a hook member, said slide and hook members being cooperable to provide latching members, means biasing said members for relative movement to an unlatching position, a device having movable electrodes normally disposed to define a gap, means including said device for restraining said latching members in their latching position, said switch mechanism being operable upon movement of said slide member, said restraining means being removable upon movement of said electrodes so as to allow relative movement of said latching members under the influence of their biasing means whereby said switch mechanism is allowed to operate.

16. A cutout including terminals, said terminals being adapted to make electrical connection with feeder lines, a switch mechanism biased to one position, means including a movable part for holding said switch mechanism in a second position, said switch mechanism providing a short-circuiting path between said terminals when in said one position, voltage responsive device having movable electrodes being normally disposed to define a gap, means including said device for restraining said part so that said switch mechanism is held in its second position, said restraining means being removable upon movement of said electrodes whereby said switch mechanism may move to said first position.

17. In an electric protective device, a part movable from one position to another position for accomplishment of a predetermined function, mechanism operatively connected with said part for releasably holding said part in one of said positions, said mechanism including an electric discharge device having electrodes disposed to define a gap, means movable to extend from said discharge device, a slot adjacent said extendible means, and heat-responsive means adjacent said gap for releasably restraining said extendible means against movement into said slot, said heat-responsive means being operative to release said extendible means so that it may move into said slot in response to predetermined arcing across said gap so that said mechanism may release said part in order that said part may move to said other of said positions.

18. A cutout including a movable part, a device

having electrodes disposed to define a gap, a support for said device, means biasing said part in one position, said device being positioned on said support and operatively connected with said part to restrain it in a second position, and means movable to extend from said device upon predetermined arcing appearing across said gap, said support having means cooperable with said extendible means upon its movement so as to allow relative movement between said support and said device, said relative movement between said device and support allowing the restraining effect of said device to be removed so that said part may move to said first position.

19. A cutout including a part movable from a non-indicating to an indicating position, a device having relatively movable electrodes normally disposed to define a gap and heat-responsive means adjacent said gap, means including said heat-responsive means for causing said electrodes to maintain said gap defining position, a support for said device, said support being so constructed and arranged to allow relative movement between said device and said support upon relative movement of said electrodes, said device and said support providing a means for releasably holding said part in said non-indicating position, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an over-voltage appearing across said electrodes, said arcing causing said heat-responsive means to overheat so as to allow relative movement of said electrodes whereby said device may move relative to said support so that said part may move to said indicating position.

20. A circuit breaker including a movable member, a device having electrodes disposed to define a gap, a support for said device having a slot, means movably supported by said device and arranged to move into said slot, means for biasing said movable member to one position, said device being positioned on said support and operatively connected with said movable member to restrain it in a second position, said movably supported means being movable into said slot upon predetermined arcing appearing across said gap so that the restraining action of said device is removed thereby allowing said movable member to move under the influence of its biasing means to said one position.

21. A cutout including a latch means, a device having relatively movable electrodes normally disposed to define a gap, a support for said device having a slot, means extendible from said device and arranged to move into said slot upon movement of said relatively movable electrodes, means for biasing said latch means to an unlatching position, said device being positioned on said support and operatively connected with said latch means to restrain it in its latching position, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing relative movement of said electrodes so that said extendible means may move into said slot so that the restraining action of said device is removed thereby allowing said latch means to move under the influence of its biasing means to its unlatching position.

22. A cutout including a slide member, a hook member, said slide and hook members being cooperable to provide latching members, means for biasing said members for relative movement to an

unlatching position, a device having relatively movable electrodes normally disposed to define a gap, a support for said device having slots, means movably supported on said device and arranged to move into said slots upon movement of said relatively movable electrodes, means for biasing said latch means to an unlatching position, said device being positioned on said support and operatively connected with said slide to restrain said latch members in their latching position, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing relative movement of said electrodes so that said movably supported means may move into said slots so that the restraining action of said device is removed thereby allowing said latch means to move under the influence of its biasing means to its unlatching position.

23. A cutout including a switch mechanism biased in one position, a slide for holding said switch mechanism in a second position, a hook member, said slide and hook members being co-operable to provide latching members, means for biasing said members for relative movement to an unlatching position, a device having relatively movable electrodes normally disposed to define a gap, a support for said device having slots, portions of said electrodes extendible from said device and arranged when extended to move into said slots upon relative movement of said electrodes, means for biasing said latch means to an unlatching position, said device being positioned

on said support and operatively connected with said slide to restrain said latch members in their latching position, and means for connecting said electrodes across a source of potential having a normal voltage value, said gap being so positioned to allow arcing thereacross upon an overvoltage appearing across said electrodes, said arcing causing relative movement of said electrodes so that said extendible portions may move into said slots so that the restraining action of said device is removed thereby allowing said latch means to move under the influence of its biasing means to its unlatching position so that said switch mechanism may move to its first position.

24. A cutout including a part movable from one position to another to accomplish a predetermined function, a device having electrodes so disposed that adjacent ends define a gap, a support for said device having slots, said ends of said electrodes remote from said gap having portions of a diameter slightly less than the width of said slots and head portions of a diameter slightly larger than the width of said slots, said heads of said device being so positioned on the edges of said slots and said device being operatively connected with said movable part so that said device may releasably restrain said part in said one position, said heads being movable away from said slots upon predetermined arcing appearing across said gap so that said portions of said electrodes of relatively lesser diameter may be movable into said slots so that the restraining action of said device is removed thereby allowing said part to move to said other position.

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