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ELECTRIC CUTOUT

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Fig. 1.

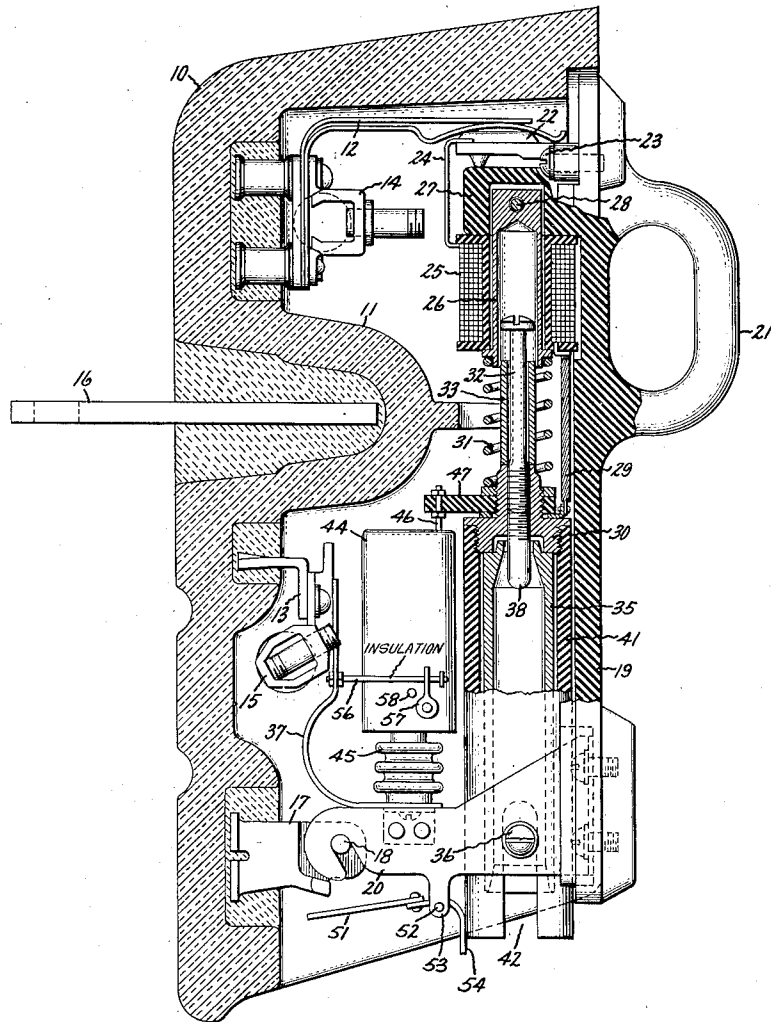
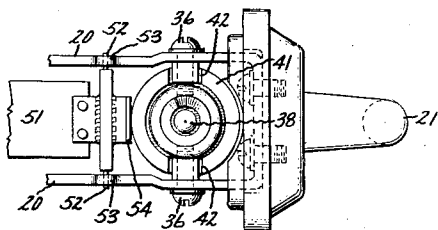


Fig. 2.



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ELECTRIC CUTOUT

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8 Claims. (Cl. 200—29)

The present invention relates to electric circuit breakers and more particularly to such circuit breakers which may be used interchangeably with conventional fuse cutout devices.

Fuse cutout devices are used to a large extent in the protection of high tension electric circuits. Devices of this type in general comprise an insulating housing, usually of porcelain, having a pair of spaced line terminals therein and a fusible element enclosed within a suitable holder mounted on the inside of the housing cover and movable into a circuit completing relation with the line terminals. The fusible element must be replaced each time one is blown by an excess current condition occurring on the circuit protected by the device. Although recent experimentation and research have reduced the cost of the replaceable elements, nevertheless such cost is still appreciable while the servicing charges are relatively high. This is due to the fact that considerable time is consumed by a lineman in reaching the location coupled with the necessity for his having with him just the right fuse link for every individual and different requirement so that the coordination of the protective system might be maintained. It is desirable to provide a fuseless cutout which will automatically interrupt the circuit under abnormal electrical conditions and without necessitating replacement of elements after the protective operation of such cutouts, as in the case of fuse cutouts of the prior art. It is preferred that the electric circuit breaker be of the automatic reclosing type with means provided for locking out the reclosing mechanism in the event of a continuing fault. It is also desirable that such an improved circuit breaker be interchangeable with conventional fuse door assemblies so that the new circuit breaker units can be readily substituted for the old fuse units in existing insulating housings.

It is an object of my invention, therefore, to provide a new and improved circuit breaker of an automatic reclosing type which may be substituted for the conventional fuse type cutout.

Another object of the present invention is to provide a fuseless cutout assembly, preferably of the reclosing type, mounted upon a cover which is adapted to be pivotally attached to an insulating housing.

It is another object of my invention to provide a new and improved fuseless cutout which is simple and compact and which may be readily installed in an existing insulating casing provided for a fuse type of cutout device.

Further objects and advantages of the inven-

tion will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with greater particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention, reference may be had to the accompanying drawing in which Fig. 1 is a view partly in section of my fuseless cutout; and Fig. 2 is a bottom view of Fig. 1 with portions thereof broken away.

The circuit breaker shown in the drawing comprises an insulating housing 10, such as of porcelain, and which is preferably provided with an integrally formed electric creepage and gas barrier 11 disposed between stationary line terminal contacts 12 and 13 secured in the housing. Connectors 14 and 15 are provided for securing to the contacts 12 and 13, respectively, the ends of conductors brought through adjacent openings in the housing side walls. To the rear of the housing 10 is fastened a mounting bar 16 for the attachment of the device to an electric line pole, crossarm structure, or the like. Secured in the lower portion of the housing 10 is a pair of bracket members 17 connected together by a transversely extending pin 18 upon which the circuit breaker unit of the present invention comprising a cover 19 and a circuit breaker mechanism attached thereto is pivotally supported by means of a pair of hook or hinge arms 20.

The cutout housing just described forms no part of the present invention but is a form now commonly used in connection with fuse cutouts and the like devices. A fuse cutout embodying such a housing structure as described above is further described in the Patent No. 2,081,813, issued May 25, 1937, to Mr. Benjamin R. Hermann, and assigned to the General Electric Company, the assignee of the present application.

The circuit breaker mechanism mounted upon the inner surface of the insulating door or cover 19 for the housing is adapted to be moved into and out of operative position relative to the housing contacts 12 and 13 by pivotal movement of the cover about the pin 18 through means of the manual operating handle 21. The circuit breaker mechanism includes an upper terminal 22 which is secured to the upper end of the cover 19 as by screws 23 and which in the closed position of the cover is adapted to engage with the spring fingers of the line contact 12. The terminal 22 is connected by a conductor 24 with a series coil 25 which is secured by the non-magnetic sleeve 26 to an upstanding insulating portion 27 integral with the cover 19 as by a pin 28. The other end

of the series coil 25 is connected by means of a flexible conductor 29 with a movable circuit breaker contact member 30. The contact member 30 is normally biased away from the series coil 25 by a compression spring 31 arranged therebetween and is adapted to be moved upwardly upon the occurrence of a predetermined current condition through the coil 25 by a magnetic armature bolt 32 the upper end of which is slidably arranged within the sleeve 26 and the lower end of which is threaded into the upper portion of the contact member 30. Arranged loosely around the armature bolt 32 is a magnetic hammer sleeve 33 which is somewhat shorter than the bolt 32. Upon a predetermined overcurrent condition the hammer sleeve 33 will be pulled upwardly and will strike against the head at the upper end of the armature bolt 32 and snap the contact member 30 upwardly with a quick action against the force of the biasing spring 31.

The contact member 30 is provided with an annular depending rim which is adapted to cooperatively engage with a similar annular shoulder of a tubular lower stationary contact member 35. The stationary contact member 35 is secured by means of screws 36 to the hook arms 20 and from which the electrical circuit is completed to the lower housing contact 13 by means of the spring finger 37. Centrally threaded in the upper contact member 30 and depending therefrom is a short rod 38 of gas producing material, such as horn fiber, and which is adapted to extend into a cooperating central opening in the lower stationary contact 35. Threaded onto the outer cylindrical surface of the contact member 30 is a tube 41 of a gas producing material, such as horn fiber, which surrounds the lower fixed contact 35 in a spaced relation so as to be freely movable relative thereto. The lower end of the tube 41 is slotted, as indicated at 42, for cooperatively straddling the screws 36 securing the lower contact 35 to the arms 20.

When the contacts 30 and 35 are separated by an overcurrent, an arc will be formed between the arcing tips and, due to the high temperature thereof, gas will be produced from the surfaces of the rod 38 and the tubular member 41. The turbulence of this gas pressure and the expulsion of it through the stationary contact will cause the arc to be forced downwardly through the opening in the upper end of the stationary contact, thus lengthening it and materially aiding in increasing the resistivity of the arc path either prior to or at the current zero. It will be observed that the rod 38 of gas producing material depending from the upper contact 30 substantially closes the upper end of the bore through the stationary contact in the closed position of the contacts and throughout a certain period of the opening operation thereof. Thus following the initial separation of the two contacts and with the vent opening through the upper end of the stationary contact 35 substantially closed, the gas pressure will be increased within the chamber formed between the two contacts. As the upper contact is moved farther away from the stationary contact and the rod 38 withdrawn from the opening of the lower contact, the pent-up gases will be suddenly released to facilitate the interruption of the arc. This action is particularly effective for interrupting arcs of lower current values.

Means are provided for delaying the reclosure of the arcing contacts following the extinguishment of the arc therebetween. A timing mechanism 44, which may be of the escapement or any other well known type, is mounted upon the arms 20 through an insulator 45. A control lever 46 of the timing mechanism is secured to the upper contact member 30 through an insulating arm 47. The lever is freely movable upwardly so as to present no appreciable drag upon the contact connected thereto as it is raised by coil 25. Lowering movement of the contact is delayed by action of the mechanism 44 until it reaches a predetermined position at which time the mechanism releases the lever 46 and the spring and gravity quickly close the contacts. If the fault persists, the contacts will reopen and after a predetermined number of such opening operations will be locked out by the mechanism 44. If, however, the fault is temporary, the reclosing of the contacts will permit the timing mechanism to slowly work back to a reset position, ready for the predetermined number of reclosures for which the device was originally set. While numerous suitable timing mechanisms are available which operate with the characteristics as outlined above, I prefer to use one constructed in accordance with that disclosed in the Patent No. 2,069,082, issued January 26, 1937, to Ludwig S. Walle and assigned to the General Electric Company, the assignee of the present application.

For indicating the opened condition of the circuit breaker, particularly when the contacts have been locked open by the mechanism 44, a flag indicator 51 is pivoted upon a pin 52 extending between the ears 53 depending from the arms 20. An extension 54 of the indicator is adapted to be engaged by the lower end of the insulating tube 41 in the closed position of the circuit breaker contacts to hold the flag indicator 51 in the upper position as shown. Upon the opening of the circuit breaker and upward movement of the tube 41, the indicator will be released for downward movement either by action of gravity or by a small spring suitably arranged on the pivot pin 52.

After the circuit breaker has been locked in the open circuit position by operation of the mechanism 44, the mechanism may be reset following the clearance of the fault by simply opening the door of the cutout and then again reclosing it. The spring finger 37 completing the circuit between the lower circuit breaker contact 35 and the contact 13 in the cutout housing is connected by means of an insulating rod 56 to the reset lever 57 of the timing mechanism 44. Upon opening of the cutout cover the upper end of the spring finger 37 will tend to move away from the timing mechanism 44, and through the connecting rod 56 will exert a pull on the reset lever 57 to rotate it in the counterclockwise direction against the stop 58. Such a movement of the reset lever will release the timer rod 46 and permit movement of the circuit breaker contact 30 to the closed position under the action of the spring 31. By closure of the cover 19 the spring finger 37 will be pushed back toward the timing mechanism 44 and release the reset lever 57 to permit it to return to its initial position.

It will be apparent that the circuit breaker described is a relatively simple structure, comprising few parts arranged in a compact manner. The unit comprising the door and circuit breaker mechanism may be hooked into an insulating housing of a conventional fuse cutout without requiring any alterations of the housing or mounting thereof. The circuit breaker does not require the replacement of any parts following a protective operation and since a high percent-

age of faults are temporary in nature, the service is restored in such instances by automatic reclosure. If the device locks out during a continuing fault, it may be reset readily by any common switch stick and hence the servicing operation, when necessary, is reduced to one of virtually fool proof nature.

Having described the principle of operation of my invention in what I consider to represent a preferred embodiment thereof, I desire to have it understood that the specific arrangement shown is merely illustrative and that the invention may be carried out by other means.

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

1. A circuit interrupter comprising an insulating support having a pair of spaced contacts mounted thereon, an insulating member removably pivoted on said support, an electric circuit breaker unit mounted on said member and having a pair of terminals adapted to engage with said spaced contacts, said circuit breaker unit including a pair of arcing contacts and an electromagnetic coil connected in series between said terminals, means for effecting the reclosure of said arcing contacts following the opening thereof by said coil, means for delaying the reclosure of said arcing contacts and for locking said arcing contacts in a predetermined position after a predetermined number of successive reclosures, and means responsive to movement of said member away from said support for effecting the release of said means for locking said arcing contacts in said predetermined position.

2. In an electric circuit interrupter, an insulating support, a pair of spaced contacts mounted on said support, an electric circuit breaker unit hingedly mounted on said support having terminals movable into engagement with said spaced contacts, said circuit breaker unit including a pair of relatively movable arcing contacts, means normally biasing said arcing contacts to a closed circuit position, means for moving said arcing contacts to an open circuit position, means for locking said arcing contacts in an open circuit position, and means responsive to predetermined movement of said circuit breaker on said support for effecting the release of said locking means.

3. An electric circuit interrupter comprising the combination of an insulating support, a pair of spaced contacts mounted on said support, a reclosing circuit breaker unit pivotally mounted on said support, said circuit breaker unit including a pair of terminals movable into engagement with said spaced contacts, said circuit breaker unit including a pair of arcing contacts normally biased to a closed circuit position and means connected in series with said arcing contacts and said circuit breaker terminals for effecting an opening movement of said arcing contacts, means responsive to a plurality of successive reclosing operations for locking said arcing contacts in the open circuit position, and means responsive to pivotal movement of said circuit breaker on said support for effecting the release of said arcing contacts.

4. A circuit interrupter comprising an insulating support having a pair of spaced contacts mounted thereon, an insulating member removably pivoted on said support, an electric circuit breaker unit mounted on said member and having a pair of terminals adapted to engage with said spaced contacts, said circuit breaker unit including a pair of arcing contacts and an electromagnetic coil connected in series between said

terminals, means for effecting the reclosure of said arcing contacts following the opening thereof by said coil, means for delaying the reclosure of said arcing contacts and for locking said arcing contacts open after a predetermined number of successive reclosures, and means responsive to movement of said member away from said support for effecting the release of the locked open arcing contacts.

5. A circuit breaking device comprising an insulating casing having a pair of spaced contacts mounted therein, an insulating cover for said casing removably pivoted thereon, an electric circuit breaker unit mounted on the inner surface of said cover and having a pair of terminals adapted to engage with said spaced contacts in the closed position of said cover, said circuit breaker unit including a pair of arcing contacts and an electromagnetic coil connected in series between said terminals, means for effecting the reclosure of said arcing contacts following the opening thereof by said coil, means for delaying the reclosure of said arcing contacts and for locking said arcing contacts open after a predetermined number of successive reclosures, and means responsive to the opening of said cover for effecting the release of the locked open arcing contacts.

6. In a reclosing electric circuit breaker unit adapted to be removably supported in an electric cutout casing, the combination comprising a pair of arcing contacts, means for effecting relative separation of said contacts, means biasing said contacts to a closed circuit position, means for delaying the reclosure of said contacts following separation thereof and for locking said contacts open after a predetermined number of reclosures, and means responsive to movement of said unit away from said casing for effecting the resetting of said contacts.

7. In a reclosing circuit breaker unit adapted to be removably supported in an electric cutout casing of substantially the size and type so as to be adapted for use as the housing for a fuse cutout and having a pair of spaced contacts therein, the combination of a cover, a reclosing circuit breaker mechanism mounted on said cover, terminals for said circuit breaker mechanism arranged so as to engage with said contacts in the closed position of said cover, said mechanism including a pair of relatively separable arcing contacts, current responsive means for effecting separation of said arcing contacts, means for effecting the reclosure of said arcing contacts following the separation thereof, means for locking said arcing contacts in the separated position following a predetermined number of successive reclosures, and means responsive to the movement of said cover away from said casing for effecting the resetting of said arcing contacts.

8. In an electric circuit interrupter, an insulating support, a pair of spaced contacts mounted on said support, an electric circuit breaker unit hingedly mounted on said support having terminals movable into engagement with said spaced contacts, said circuit breaker unit including a pair of relatively movable arcing contacts, means normally biasing said arcing contacts to a closed circuit position, means for moving said arcing contacts to an open circuit position, means for locking said arcing contacts in a predetermined position, and means responsive to predetermined movement of said circuit breaker for effecting the release of said locking means.

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