Nov. 25, 1941. G. CURRIE 2,263,760

ENCLOSED CIRCUIT BREAKER

Original Filed June 10, 1938 3 Sheets-Sheet 1

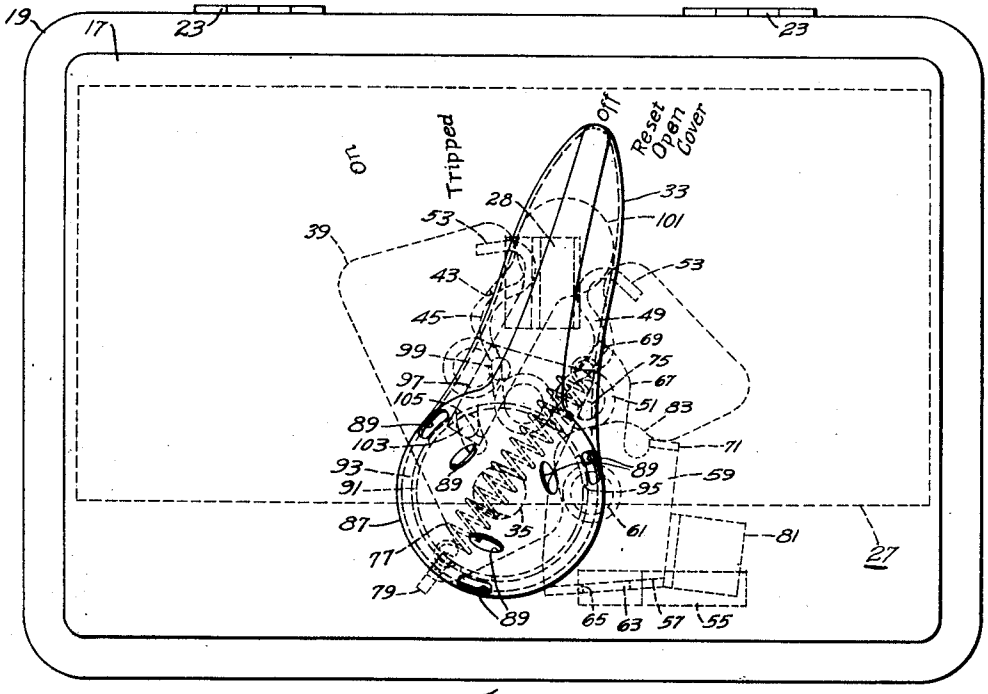


Fig. 1.

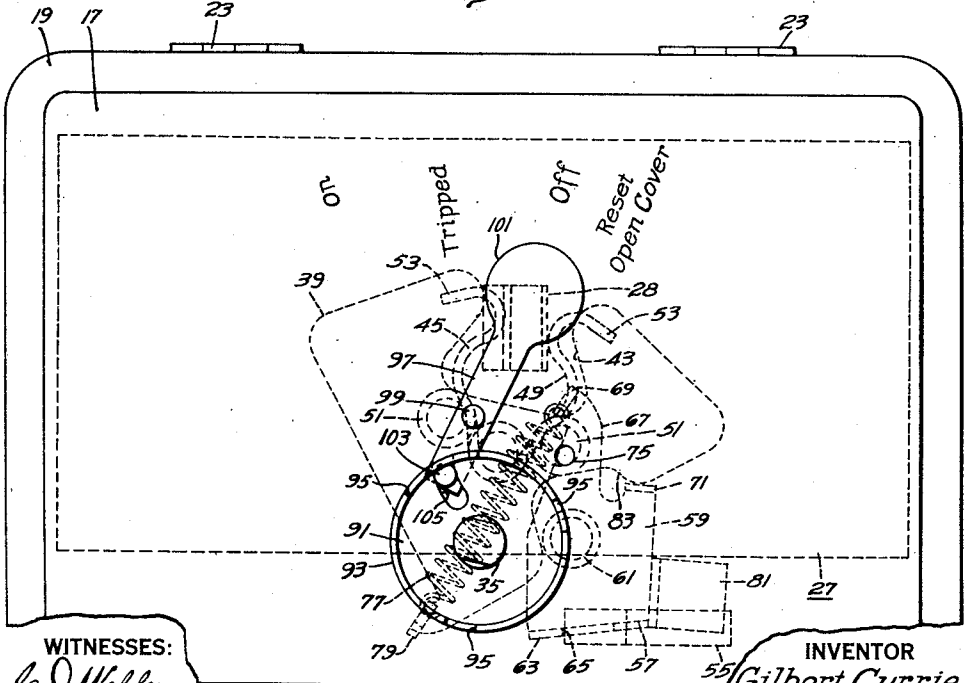


Fig. 2.

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ENCLOSED CIRCUIT BREAKER

Original Filed June 10, 1938 3 Sheets-Sheet 2

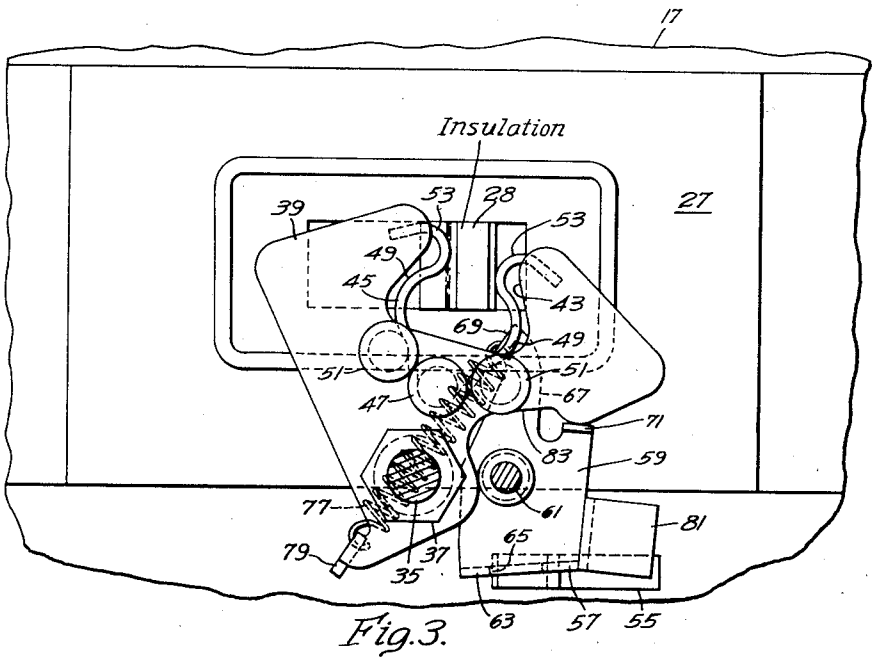


Fig. 3.

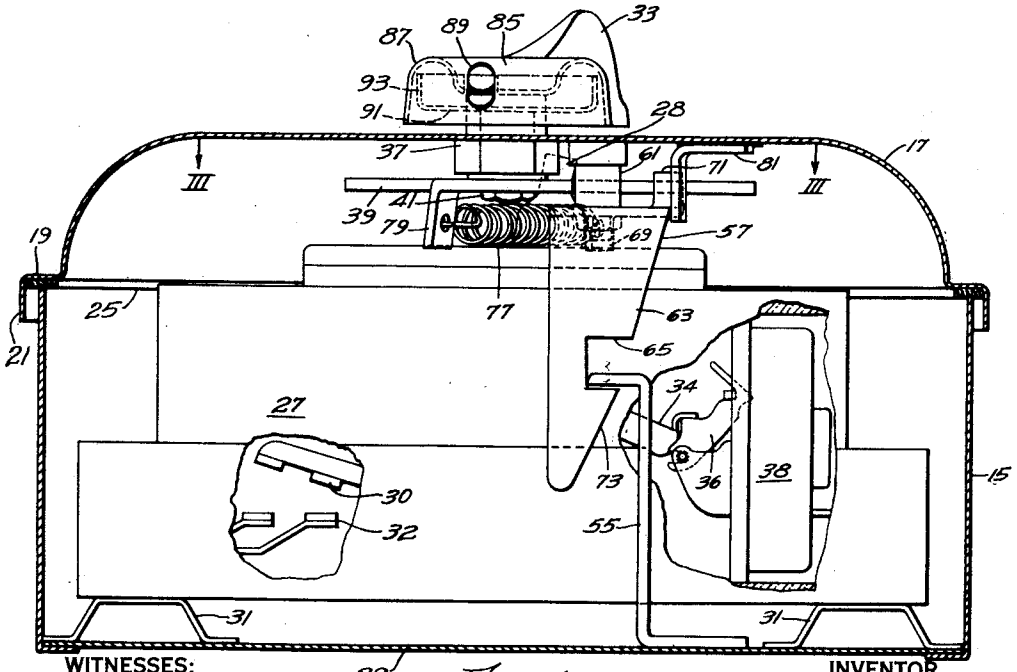


Fig. 4.

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ENCLOSED CIRCUIT BREAKER

Original Filed June 10, 1938 3 Sheets-Sheet 3

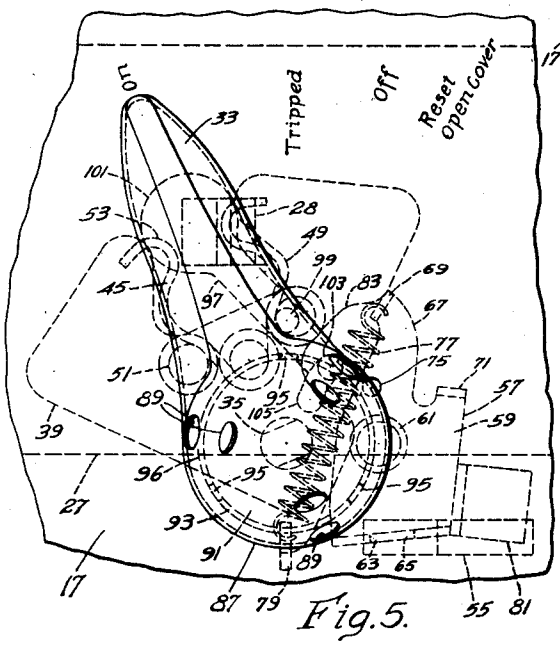


Fig. 5.

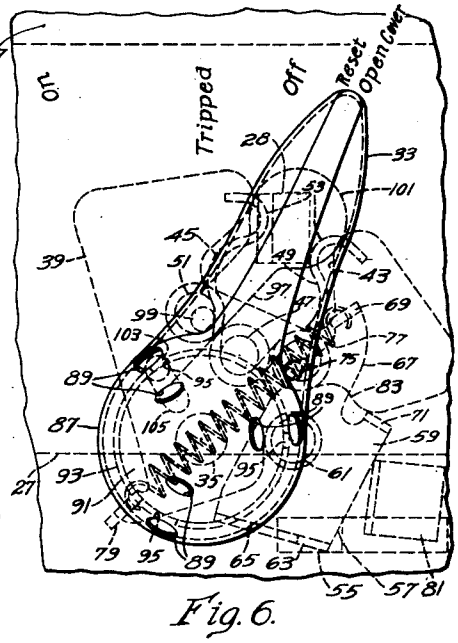


Fig. 6.

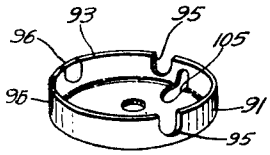


Fig. 7.



Fig. 8.

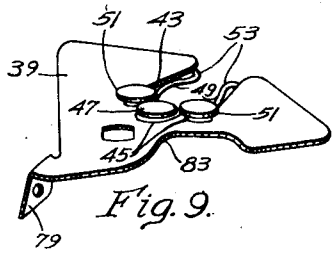


Fig. 9.

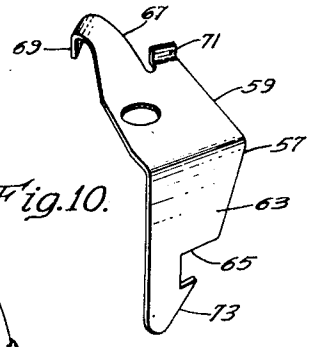


Fig. 10.

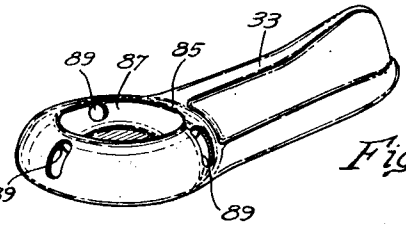


Fig. 11.

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Patented Nov. 25, 1941 2,263,760

UNITED STATES PATENT OFFICE

2,263,760

ENCLOSED CIRCUIT BREAKER

Gilbert Currie, Forest Hills, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application June 10, 1938, Serial No. 212,874
Renewed July 17, 1940

33 Claims. (Cl. 200—50)

The invention relates to electrical switches or circuit breakers having enclosing cabinets, and more particularly to devices for operating and locking circuit breakers which are enclosed in housings or cabinets.

An object of the invention is the provision of a circuit breaker enclosing cabinet having an openable cover, and a means within the cabinet for positively preventing opening of the cover except when the circuit breaker is in the full "off" position.

Another object of the invention is the provision of a circuit breaker enclosing cabinet having an openable cover and an operating handle carried by the cover for operating the circuit breaker, in which the operating handle must be moved to an "open cover" position beyond the "off" position to effect release of the cover interlocking means inside of the cabinet.

Another object of the invention is the provision of a cover interlocking means for a circuit breaker cabinet which is effective to lock the cover in all positions of the operating handle except when the handle is moved to a special "open cover" position.

Another object of the invention is the provision of an improved locking arrangement for a circuit breaker and enclosing cabinet, in which a single padlock is effective to lock the cover in closed position and also to lock the circuit breaker in the "off" position.

Another object of the invention is the provision of means for locking a circuit breaker and enclosing cabinet by means of a plurality of padlocks so that the circuit breaker cannot be moved from the "off" position, nor the cover of the cabinet opened until all of the padlocks have been removed.

Another object of the invention is the provision of a locking means as previously described in which none of the padlocks can be hung until the operating handle is brought to the full "off" position and the circuit breaker is open.

Another object of the invention is the provision of an enclosed circuit breaker or switch embodying a locking means having provision for receiving one or more padlocks to both lock the operating handle in "off" position and the cover of the enclosing housing c losed, and arranged so that it is impossible to hang a padlock anywhere on the enclosing housing without effecting locking of the handle "off" and the cover closed.

Another object of the invention is the provision of a circuit breaker enclosing cabinet having a removable cover carrying an exterior operating handle for engaging the circuit breaker handle within the casing to operate a circuit breaker, in which means is provided for biasing the operating handle to a position of alignment with the breaker handle to prevent breaking of the breaker handle due to accidental misalignment of said handles when the cover is slammed shut.

The novel features that are considered characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to structure and operation, together with additional objects and advantages thereof will be best understood from the following detailed description of several embodiments thereof when read in conjunction with the accompanying drawings, in which

Figure 1 is a plan view of a circuit breaker enclosing cabinet and operating device constructed in accordance with the invention, the operating handle being shown in the "off" position,

Fig. 2 is a plan view similar to Fig. 1 with the operating handle removed to show a portion of the handle locking means,

Fig. 3 is a fragmentary sectional view taken along the line III—III of Fig. 4 to show the operating plate and the cover locking means,

Fig. 4 is a longitudinal sectional view of the cabinet showing the breaker casing in elevation,

Fig. 5 is a fragmentary plan view of a portion of the cabinet showing the operating handle in the "on" position,

Fig. 6 is a view similar to Fig. 5 showing the operating handle in the "reset-open cover" position,

Fig. 7 is a perspective view of the handle locking element,

Fig. 8 is a perspective view of the lever for moving the locking element,

Fig. 9 is a perspective view of the operating plate,

Fig. 10 is a perspective view of the movable latch for locking the cover, and

Fig. 11 is a perspective view of the operating handle.

The present invention constitutes a further development and improvement of the invention described and claimed in the copending application of Delbert Ellis, Serial No. 212,437, filed June 8, 1938, and assigned to the assignee of this invention.

Referring to the drawings, the cabinet shown in Figs. 1, 2 and 4 comprises a rectangular box-

like metal casing 15 and a cooperating metal cover or door 17. The cover 17 is provided with a rim 19 which seats against the edges of the side and end walls of the casing, and has a downwardly extending edge 21 which overlaps the edges of the casing 15. The cover 17 is secured to one of the side walls of the casing 15 by means of a pair of hinges 23 which permit the cover to be swung to open and to closed position. A felt pad 25 (Fig. 4) is interposed between the rim 19 and the edges of the casing 15 to exclude dust and dirt from the interior of the cabinet which is designed to house and protect electrical switches and circuit breakers for industrial applications where the air may contain large amounts of dust and dirt.

In the embodiment of the invention illustrated, a circuit breaker unit 27 having an oscillatable operating handle 28 for operating the breaker mechanism is enclosed by the cabinet and mounted on the back wall 29 of the casing 15 by means of a pair of brackets 31. The circuit breaker unit 27 is preferably of the type fully described in Patent No. 2,047,739, issued to H. J. Lingal on July 14, 1936 and assigned to the assignee of the present invention.

The circuit breaker 27 which is fully described in the above-mentioned patent, has at least one pair of separable contacts 30 and 32, and an operating mechanism (not shown) for opening and closing the contacts by movement of the handle 28 to "off" and "on" positions. The breaker mechanism has a releasable cradle member 34 which when released causes the mechanism to effect automatic opening of the contacts and also causes movement of the breaker handle 28 to a "tripped" position intermediate the "on" and "off" positions. A latch 36 normally restrains the cradle 34 in operative or "set" position as shown in Fig. 4. A current responsive trip device indicated generally at 38 is operable in response to predetermined overload conditions to effect release of the latch 36 and cradle 34 to effect automatic opening of the breaker. In order to reclose the contacts following an automatic tripping operation by the current responsive trip means, it is necessary to reset the mechanism by moving the handle 28 to a "reset" position slightly beyond the "off" position. This movement of the handle to the "reset" position returns the cradle 34 to latched position where it is reengaged and held by the latch 36. The breaker mechanism and trip device are fully described in the above-mentioned patent to which reference may be had for details of construction and operation of the circuit breaker. While a particular type of circuit breaker has been briefly described and referred to, any suitable circuit breaker or switch unit having an oscillatable operating handle may be mounted in the cabinet.

An operating handle 33 is rotatably mounted on the exterior surface of the cover 17 and is secured to a stub shaft 35 which extends through a bushing 37 provided in the cover 17. An operating plate 39 of triangular shape is rigidly secured to the shaft 35 inside of the cover 17 by means of a nut 41 on the end of the shaft. The operating plate 39 is provided with an irregular shaped slotted opening 43 (Fig. 3) for receiving the handle 28 of the circuit breaker 27. The rotation of the operating handle 33 causes the operating plate 39, which moves with the handle, to actuate the breaker handle 28 to various operating positions, thereby operating the circuit breaker.

A clevis spring 45, secured to the operating plate 41, adjacent the slotted opening 43, is provided to prevent heavy impacts or large forces applied to the operating handle 33 from breaking or damaging the breaker handle. The clevis spring 45 is secured to the top of the operating plate 39 by means of a rivet 47 and its arms 49 extend along the edges of the slotted opening 43 in slightly spaced relation thereto. A pair of rivets 51 mounted on the plate 39 serve to maintain the arms 49 of the clevis spring in proper position relative to the edges of the slotted opening 43. The ends of the clevis spring 45 are bent inwardly and then back on themselves as indicated at 53 in Fig. 3, and are also bent downwardly so as to engage under the edges of the operating plate 39. The inwardy bent portions 53 of the clevis spring 45 are adapted to resiliently engage the opposite sides of the breaker handle 28 to move the handle when the operating handle 33 is moved. The resiliency of the arms 49 of the clevis spring prevents the application of large forces to the operating handle from breaking or causing damage to the breaker handle 28. Because of the width of the operating plate 39, it is impossible to close the cover 17 without the breaker handle 28 being in the slot 43 of the operating plate, thereby insuring that the breaker may be properly operated after the cover is closed.

The exterior surface of the cover 17 is marked with suitable indicia such as "on," "tripped," "off," "reset," and "open cover," to indicate the various operating positions of the handle of the circuit breaker. The circuit breaker is closed by moving the operating handle 33 to the "on" position and opened by movement of the operating handle in the opposite direction to the "off" position. The mechanism of the circuit breaker unit may be reset following an automatic tripping operation by moving the operating handle 33 to the "reset" position. This movement of the operating handle to the "open cover" position effects release of a cover interlocking means to permit opening of the cover 17, as will be described hereinafter.

An interlocking means is provided for normally locking the cover 17 to prevent opening thereof in all positions of the operating handle 33 except when the handle is moved to the "open cover" position. The interlocking means comprises a stationary locking element 55 carried by the casing 15 and a cooperating movable interlocking element 57 carried by the cover 17. The stationary locking element 55 is in the form of a Z-shaped bracket and is secured to the bottom wall 29 of the casing at the side of the circuit breaker unit 29. The movable locking element 57 (Fig. 10) has a horizontal portion 59 which is rotatably mounted on a stub shaft 61 extending from the inner surface of the cover 17 and a latch hook portion 63 of triangular shape which extends downwardly along the side of the circuit breaker unit 27 in spaced relation thereto. The latch hook portion 63 is provided with a notch 65 for receiving the laterally extending upper end of the latch element 55 to lock the cover 17 in closed position, as shown in Fig. 4. The horizontal portion 59 of the movable latch element 57 has an arm 67 provided at its end with a downwardly extending projection 69 for supporting one end of a spring to be hereinafter described, which spring serves

to bias the movable locking element 57 to locking position. The horizontal portion 59 of the movable locking element 57 also has an upwardly extending projection 71 which projects into the path of movement of one of the side edges of the operating plate 39 in a position to be engaged by the edge of the operating plate when the operating handle 33 and plate 39 are in the "off" position, as shown in Figs. 1, 2 and 3. The movable locking element 57 is maintained in locking position to normally lock the cover in all positions of the operating handle 33 except the "open cover" position. To open the cover 17 it is necessary to move the operating handle 33 beyond the "off" position to the "open cover" position. When the operating handle is thus moved to the "open cover" position, the edge of the operating plate 39 engages and moves the movable locking element 57 in a clockwise direction to a released position, as shown in Fig. 6, in which its latch hook portion 63 is clear of the laterally extending end of the stationary locking element 55. The cover 17 is now released and may be swung to open position. When the cover is closed, the slanting edge 73 of the movable locking element 57 allows that element to be cammed in a clockwise direction to clear the laterally projecting upper end of the stationary locking element 55. As soon as the cover reaches closed position, the movable locking element 57 is restored to locking position by means of the spring which is connected to the arm 67 thereof.

In order that the cover interlocking means may be released by an authorized person to permit opening of the cover 17 when the circuit breaker is in the "on" position, an opening 75 (Fig. 2) is formed in the cover 17 in a position such that the authorized person may insert a screw driver or other tool therein and move the movable locking element 57 to released position. The opening 75 is covered by the operating handle 33 when the handle is in the "off" or "reset" position.

It is important that the operating handle 33 and the slot 43 in the operating plate be in a position of alignment with the breaker handle 28 when the cover is closed, otherwise slamming of the cover may cause breakage of the breaker handle 28, which is formed of molded insulating material. In order to prevent accidental displacement of the operating handle 33, and slot 43 relative to the breaker handle 28 when the cover is open, a spring means is provided for resiliently restraining the operating handle 33 in whichever position it occupies when the plate 39 separates from the breaker handle 28 during opening of the cover. The spring means comprises a tension spring 77 which has one end connected to the depending projection 69 of the movable locking element 57 and its other end connected to a downwardly extending projection 79 formed on the tail piece of the operating plate 39. The spring 77 is disposed below the end of the stub shaft 35 and is movable back and forth across the axis of the stub shaft as the operating handle is moved between the "on" and "off" positions. When the operating handle 33 is in the "off" position, the line of action of the spring 77 is disposed slightly to the left of the pivot axis of the operating handle 33 (see Figs. 1, 2 and 3) so that it releasably restrains the operating handle in the "off" position. Similarly, when the operating handle is in the "on" position, the line of action of the spring 77 is disposed to the right of the pivot axis of the operating handle 33 (see Fig. 5) so that the handle is releasably restrained in the "on" position. The spring 77 also serves to bias the movable locking element 57 in a counter-clockwise direction about its pivot axis to its latching position.

An angle bracket 81 secured to the underside of the cover 17 serves as a stop to prevent movement of the movable locking element 57 beyond locking position. The downwardly extending projection 79 of the tail piece of the operating plate 39 is adapted to engage the edge of the movable locking element 57 to limit counter-clockwise or closing movement of the operating handle 33. The right hand edge of the operating plate 39 is cut away as indicated at 83 to accommodate the pivot stud 61 which supports the movable locking element 57. The edge of the cut away portion 83 of the plate 39 is adapted to engage the pivot stud 61 to limit clockwise or opening movement of the operating handle 33.

The operating handle 33 is channel shaped in section and is provided with a hub portion 85 (Fig. 11). The central portion of the hub is depressed to provide a rim 87 of inverted U-section which forms a downwardly facing circular channel. The hub 85 and rim 87 of the operating handle 33 form a part of a locking means for locking the operating handle in the "off" position. For this purpose, the rim 87 of the operating handle 33 is provided with a plurality of spaced apertures 89 for receiving a plurality of padlocks, the apertures on the inner side of the rim 87 being disposed in alignment with the cooperating apertures on the outer side of the rim.

A cup-shaped locking element 91 is rotatably mounted on the stub shaft 35 beneath the hub portion 85 of the operating handle 33. The locking element 91, which is shown in perspective in Fig. 7, has an upwardly extending circular flange 93 which extends into the circular channel formed by the rim 87 of the operating handle 33. The flange 93 of the locking element 91 is provided with a plurality of apertures or notches 95 which are adapted to align with the apertures 89 in the rim of the operating handle when the handle is in the "off" position for receiving a plurality of padlocks. A lever 97 (Fig. 2) is pivotally mounted on a pin 99 projecting from the exterior surface of the cover 17, and this lever has an enlarged rounded end 101 which is engaged between the side edges of the operating handle 33. The opposite end of the lever 97 carries a pin 103 which engages an arcuate slot 105 formed in the base and flange of the locking element 91.

When an attendant desires to lock the breaker position, the apertures 95 in the circular flange of the locking element 91 register with the apertures 89 formed in the hub of the operating handle 33 so that a plurality of padlocks, three in the embodiment shown, may be inserted or hung in the apertures. The insertion of even a single padlock in a pair of the apertures 89 and 95 is effective to lock the circuit breaker handle in the "off" position so as to prevent movement thereof in either direction away from the "off" position.

When the attendant desires to lock the breaker in the "off" position, he inserts a padlock in one pair of the apertures 89 and 95. Should a repair man desire to further lock the breaker in the "off" position, he will insert a padlock in another pair of the apertures 89 and 95, and should an inspector or other person desire to further lock the device in the "off" position, a padlock can be inserted in the third pair of apertures 89

and 95. It will be seen that when the operating handle is so locked in the "off" position, it cannot be moved away from that position until all of the padlocks are removed.

When the operating handle 33 is moved away from the "off" position, it carries with it the large end 101 of the lever 97 to cause the cup-shaped locking element 91 to be rotated in an opposite direction from that of the operating handle 33 so that a very small movement of the operating handle away from the "off" position will effect closing of the apertures through which the padlocks are inserted, thus making it impossible to insert the padlocks in any other position of the operating handle 33 except the "off" position. The locking means of the present invention thus insures that the breaker handle is in the full "off" position before any of the locks can be inserted .

A small knockout 96 (Fig. 7) may be provided in the flange 93 of the cup-shaped locking element 91 in a position to line up with one pair of the apertures 89 in the operating handle 33 when the operating handle is in the "on" position. By removing this knockout, it is possible to lock the breaker in the "on" position, in which instance the cover 17 is also locked in closed position.

The end of the lever 97 which carries the pin 103 engages the side edges of the operating handle 33 to limit rotation of the operating handle in either direction as shown in Figs. 5 and 6.

The previously described locking means, in addition to performing the function of locking the operating handle 33 in a predetermined position to lock the breaker, also cooperates with the cover interlocking means comprising the locking elements 55 and 57 to lock the cover in closed position. Since the cover interlocking means is effective to lock the cover 17 in all positions of the operating handle 33 except the "open cover" position, locking of the operating handle 33 in either the "off" or "on" position also prevents opening of the cover, thus a single padlock is effective to lock the operating handle 33 in a predetermined position and also lock the cover in closed position.

The device is absolutely safe because it is impossible to hang a padlock anywhere on the cabinet without effecting locking of the operating handle in the "off" position and the cover closed.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details thereof may be made without departing from the spirit of the invention.

I claim as my invention:

1. In combination with a circuit interrupter unit having a movable handle, a casing in which said interrupter unit is mounted, an openable cover for said casing having an operating handle thereon movable to an "on" and to an "off" position for moving the interrupter handle to operate the interrupter, said operating handle also being movable to an "open cover" position beyond the "off" position, interlocking means enclosed by said casing and cover for locking said cover to prevent opening thereof comprising an interlocking element mounted for movement independently of said operating handle and movable by said operating handle for releasing said interlocking means to permit opening of said cover when said operating handle is moved to the "open cover" position, said interlocking means being effective to lock said cover in all other positions of said operating handle, and means on the outside of said cover for locking said operating handle in the "off" position.

2. In an enclosing cabinet for a circuit interrupter unit having a movable handle, a casing in which the circuit interrupter unit is mounted, an openable cover for said casing having an operating handle for moving the interrupter handle to operate the interrupter, said operating handle being movable to an "on" position, to an "off" position and to a position beyond the "off" position, interlocking means in said cabinet normally effective to lock said cover closed comprising an interlocking element mounted for movement independently of said operating handle, said operating handle being operable only when moved to the position beyond the "off" position to move said interlocking element and release said interlocking means to permit opening of said cover, and means for locking said handle in the "off" position with the cover closed to prevent movement of said handle away from said "off" position.

3. In an enclosing cabinet for a circuit interrupter unit having a movable handle, a casing in which the circuit interrupter unit is mounted, an openable cover for said casing having an operating handle movable to an "on" position, to an "off" position and to an "open cover" position beyond the "off" position for moving the interrupter handle to operate the interrupter, interlocking means in said cabinet for locking said cover to prevent opening thereof in all positions of said operating handle except the "open cover" position comprising an interlocking element mounted for movement independently of said operating handle, said interlocking element being movable by said operating handle for releasing said locking means to permit opening of said cover only when said operating handle is moved to the "open cover" position, and means having provision for receiving a lock for locking said operating handle in the "off" position with the cover closed to prevent movement of said handle away from the "off" position.

4. In combination, a circuit interrupter unit having contact means, an operating mechanism for said contact means including a handle movable between "on" and "off" positions for opening and closing said contact means, current responsive means for tripping the interrupter and causing said contact means to open the circuit, said operating mechanism requiring movement of said interrupter handle to a "reset" position after tripping before return of said contact means to closed position, a casing in which said interrupter unit is mounted, an openable cover for said casing having an operating handle for moving said interrupter handle to "on," "off" and "reset" positions, interlocking means enclosed by said casing and cover for locking said cover to prevent opening thereof comprising an interlocking element mounted for movement independently of said handle and movable by said operating handle for releasing said interlocking means to permit opening of said cover only when said operating handle is moved to a position beyond the "reset" position.

5. In an enclosing cabinet for a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, a

cover for the casing having an operating handle movable to an "on" and to an "off" position for moving the interrupter handle to operate the interrupter, said operating handle having one or more apertures formed therein for receiving one or more locks, a cooperating movable locking element mounted on said cover and having one or more apertures therein for receiving one or more of said locks, and means interconnecting said operating handle and locking element to cause said locking element to move in the opposite direction from said operating handle and cause said apertures to register for receiving one or more of said locks only when said operating handle is in the full "off" position to lock said operating handle in the "off" position.

6. In combination with a circuit interrupter unit having a movable handle, an enclosure in which the interrupter unit is mounted having an operating handle movably mounted thereon for moving said interrupter handle to various positions to operate the interrupter, said operating handle having a portion of inverted U section providing a channel, a locking element connected to the enclosure having a flange projecting into the channel of said operating handle, said portion of inverted U section and said flange being provided with cooperating lock receiving apertures which register when the breaker handle has been moved to a predetermined position.

7. In combination with a circuit interrupter unit having a movable handle, an enclosure in which the interrupter unit is mounted having an operating handle rotatably mounted thereon for moving said interrupter handle to various positions to operate the interrupter, said operating handle having a hub portion provided with a rim extending inwardly toward the enclosure, a locking element on said enclosure having a flange projecting outwardly within said rim on the hub of the operating handle, said rim and said flange being provided with cooperating padlock receiving apertures which register when the interrupter handle has been moved to "off" position.

8. In an enclosing cabinet for a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, a cover for the casing having an operating handle rotatably mounted thereon for moving the interrupter handle to various positions to operate the interrupter, said handle having a hub portion provided with a rim of inverted U section forming a channel, a locking element rotatably mounted on the same axis as said operating handle and having a flange projecting into the channel of said operating handle, said rim and said flange being provided with a plurality of padlock receiving apertures, and means connecting said operating handle and said locking element to cause said locking element to rotate in the opposite direction from said operating handle when said handle is moved and cause said apertures to register only in a single predetermined position of said operating handle.

9. In combination with a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, an openable cover for said casing, an operating handle mounted on the exterior of said cover and having a shaft extending through said cover, an operating member secured to said shaft inside said cover having arms for engaging the opposite sides of the interrupter handle to move the interrupter handle when said operating handle is moved, and means for biasing said operating handle substantially to the position it occupies when said operating member separates from said interrupter handle during opening of said cover to prevent accidental misalignment of said operating member relative to said interrupter handle when the cover is open.

10. In combination with a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, an openable cover for said casing, an operating handle rotatably mounted on the exterior of said cover and having a shaft extending through the cover, an operating plate secured to the shaft inside the cover, said plate having a slot for receiving the interrupter handle to operate the interrupter by means of the operating handle on the exterior of the cover, and means for resiliently restraining said operating handle and plate in the position which they occupy when said plate separates from said interrupter handle during opening of the cover to prevent accidental misalignment of the operating handle and plate relative to the interrupter handle when the cover is open.

11. In combination with a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, an openable cover for said casing, an operating handle rotatably mounted on the exterior of said cover having a shaft extending through said cover, an operating member secured to said shaft inside said cover and having arms for engaging the opposite sides of the interrupter handle for moving said handle when said operating handle is moved, said operating handle being movable to an "on" position, to an "off" position and to an "open cover" position beyond said "off" position to operate the interrupter, interlocking means for locking said cover to prevent opening thereof comprising a stationary latch element carried by said casing and a cooperating movable latch element carried by said cover for normally engaging the stationary latch to lock the cover, said operating member being operable to engage and move said movable latch element to a released position to permit opening of said cover only when said operating handle is moved to the "open cover" position, and spring means connecting said handle and said movable latch element for resiliently restraining said operating handle and operating member substantially in the position they occupy when said operating member separates from said interrupter handle during opening of the cover to prevent accidental displacement of said operating member relative to said interrupter handle when the cover is open, and for also biasing said movable latch element to latching position.

12. In combination with a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, an openable cover for said casing, an operating handle rotatably mounted on the exterior of said cover and having a shaft extending through the cover, an operating plate secured to the shaft inside the cover, said plate having a slot for receiving the interrupter handle to operate the interrupter by means of the operating handle on the exterior of the cover, a spring connected to said operating plate on one side of said shaft and to a relatively fixed support on the opposite side of said shaft, said spring being disposed below the end of said shaft and movable across the axis of said shaft as said operating handle is moved

from an "on" to an "off" position or vice versa, to resiliently restrain said operating handle and plate in whichever position they occupy when said plate separates from said interrupter handle during opening of the cover.

13. In an enclosing cabinet for a circuit interrupter, a casing in which the interrupter is mounted, an openable cover for said casing, an operating handle on said cabinet movable to an "on" and to an "off" position to actuate the interrupter, interlocking means in said cabinet for locking said cover closed to prevent opening thereof at least when said handle is in the "on" and in the "off" positions, and means accessible from outside said cabinet when the handle is in the "on" position for releasing said interlocking means to permit opening of the cover, said means being inaccessible when said handle is in the "off" position.

14. In an enclosing cabinet for a circuit interrupter, a casing in which the circuit interrupter is mounted, an openable cover for said casing, an operating handle on said cabinet movable to an "on" and to an "off" position to actuate the interrupter, said handle also being movable to an "open cover" position beyond the "off" position, interlocking means in said cabinet for normally locking said cover closed to prevent opening thereof, said handle being operable only when moved to said "open cover" position to release said interlocking means to permit opening of the cover, said cabinet having an opening for receiving a tool to release said interlocking means and permit opening of said cover, said opening being covered by said handle when said handle is in the "off" position, and exposed when said handle is in the "on" position, and means for locking said handle in the "off" position.

15. In an enclosed circuit interrupter, a casing having an openable cover, a circuit interrupter unit in said casing, an operating handle on said casing movable to "on" and "off" positions to operate the interrupter, locking means inside said casing normally effective to lock said cover closed, said operating handle being operable only when moved to a position different from said "on" and "off" positions to effect release of said locking means to permit opening of said cover, and locking means on the outside of said casing for locking said operating handle in "off" position, the locking of said operating handle in the "off" position also effecting locking of said cover closed.

16. In combination, a circuit breaker unit having an actuating mechanism automatically operable to open the circuit and having an actuating handle movable to "off" and "on" positions to manually open and close the circuit and movable to a "reset" position beyond the "off" position to reset the actuating mechanism after an automatic operation, a casing in which said circuit breaker unit is mounted, an openable cover for said casing, an operating handle on said cover movable to "on," "off" and "reset" positions for moving said interrupter handle to corresponding positions to operate the interrupter from outside said casing, releasable locking means inside said casing normally effective to lock said cover closed comprising a locking element mounted for movement independently of said operating handle, said operating handle being operable only when moved to an "open cover" position beyond the "reset" position to move said locking element and release said locking means to permit opening of said cover, said locking element being biased to locking position and being effective to lock said cover closed in all positions of said operating handle except said "open cover" position.

17. In an enclosed circuit interrupter, a casing in which the interrupter is mounted, said casing having an openable cover, an operating handle on said casing movable to "on" and "off" positions for operating said interrupter from outside said casing, said handle having a shaft extending through a bushing in said casing, means for locking said operating handle in "off" position and at the same time effecting locking of said cover closed, said locking means being effective through said shaft and bushing and requiring no additional openings in said casing.

18. In combination with a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, an openable cover for said casing, an operating handle rotatably mounted on the exterior of said cover having a shaft extending through said cover, an operating member secured to said shaft inside said cover and having arms for engaging the opposite sides of the interrupter handle for moving said handle when said operating handle is moved, said operating handle being movable to an "on" position, to an "off" position, and to an "open cover" position beyond said "off" position to operate the interrupter, locking means for locking said cover to prevent opening thereof comprising a stationary latch element carried by said casing and a cooperating movable latch element carried by said cover for normally engaging the stationary latch to lock the cover, said operating member being operable to engage and move said movable latch element to a released position to permit opening of said cover only when said operating handle is moved to the "open cover" position, and spring means for resiliently restraining said operating handle and operating member substantially in whichever position they are moved to, said spring means preventing accidental displacement of said operating member relative to the interrupter handle when the cover is open.

19. An enclosed circuit interrupter comprising a casing having an openable cover, a circuit interrupter in said casing, an operating handle on said cover having a portion extending through an opening provided in said cover for actuating said circuit interrupter by said handle, interlocking means in said casing including an element movable by said handle which is effective to prevent opening of said cover when said handle is in closed position and also when said handle is in one open position, said handle effecting release of said interlocking means when in another open position, and means for locking said operating handle in said one open position in which said interlocking means prevents opening of said cover whereby said locking means also locks said cover closed.

20. In combination, a circuit interrupter mechanism, an enclosing housing for the circuit interrupter, said housing having an openable cover, an operating handle on said cover movable to "on" and "off" positions to operate the interrupter, said handle including a portion extending through said cover and having a separable connection with said circuit interrupter mechanism, locking means having provision for receiving one padlock in a position such that said padlock is engageable by said handle to lock said handle in the "off" position, said padlock also

being effective through said locking means to prevent opening of said cover.

21. In combination, a circuit interrupter having relatively movable contacts, an enclosing casing in which the circuit interrupter is mounted, said casing having an openable cover, an operating handle on said cover movable to "on" and "off" positions to operate the interrupter, interlocking means in said casing effective to prevent opening of said cover in all positions of said operating handle except when said handle is moved to a position different from the "on" and "off" positions, and locking means having provision for receiving a lock to lock said operating handle in the "off" position, the locking of said handle in "off" position by said lock being effective to also lock said cover closed through said interlocking means.

22. In combination, a circuit interrupter having relatively movable contacts, an enclosing casing in which the interrupter is mounted, said casing having an openable cover, an operating handle on said cover movable to "on" and "off" positions to operate the interrupter and also movable to a position beyond the "off" position, interlocking means in said casing for preventing opening of said cover, means movable by said handle for releasing said interlocking means to permit opening of said cover only when said handle is moved to said position beyond the "off" position, and locking means having provision for receiving several padlocks to lock said handle in the "off" position, the locking of said handle in "off" position by one or more of said padlocks being effective to also lock said cover closed through said interlocking means.

23. In combination, a circuit interrupter having relatively movable contacts, an enclosing casing in which the interrupter is mounted, said casing having an openable cover, an operating handle on said casing movable to "on" and "off" positions to operate the interrupter and also movable to a position beyond the "off" position, interlocking means in said casing effective to prevent opening of said cover in all positions of said operating handle except when said handle is moved to the position beyond the "off" position, and locking means having provision for receiving at least one padlock to lock said operating handle in the "off" position, the locking of said handle in "off" position by said padlock being effective to also lock said cover closed through said interlocking means.

24. In combination, a circuit interrupter having relatively movable contacts, an enclosing casing in which the interrupter is mounted, said casing having an openable cover, an operating handle on said casing movable to "on" and "off" positions to operate the interrupter, locking means having apertures for receiving at least one padlock to both lock said handle in "off" position and said cover closed, any of the apertures when a padlock is inserted therein and locked effecting locking of the handle "off" and the cover closed.

25. In combination, a circuit interrupter having relatively movable contacts, an enclosing casing in which the interrupter is mounted, said casing having an openable cover, an operating handle on said casing movable to "on" and "off" positions to operate the interrupter, locking means having means for receiving at least one padlock which when locked is effective to both lock said handle in "off" position and said cover closed, said means for receiving the padlock constituting the only means on said casing in which a padlock can be inserted and being disposed so that it is impossible to insert a padlock without effecting locking of said handle in the "off" position and the cover closed.

26. In combination, a circuit interrupter having relatively movable contacts, an enclosing casing in which the interrupter is mounted, said casing having an openable cover, an operating handle on said casing movable to "on" and "off" positions to operate the interrupter, locking means having aperture means for receiving several padlocks which when locked by any one of said padlocks is effective to both lock said handle in the "off" position and said cover closed, said aperture means constituting the only aperture means on said casing and cover in which a padlock can be inserted and being disposed so that it is impossible to insert a padlock therein without effecting locking of said handle in the "off" position and the cover closed.

27. An enclosed circuit interrupter comprising an enclosing housing, circuit interrupter mechanism mounted in said housing, an operating handle on said housing movable to "on" and "off" positions for operating said interrupter, and handle locking means comprising a locking means on said housing and a cooperating locking means movable with said handle having provision for receiving several locks to lock said handle in "off" position and disposed so that a lock can be inserted only when said handle is in "off" position.

28. In combination, a circuit interrupter, an enclosing housing in which the circuit interrupter is mounted, a rotatable operating handle on said housing movable to "on" and "off" positions to operate the circuit interrupter, said operating handle having a hub provided with a flange, a locking element on said housing having a flange disposed in nesting relation with the flange of said handle, said flanges being provided with cooperating apertures for receiving one or more locks to lock said operating handle in "off" position, said apertures being disposed to line up for receiving a lock only when the handle is in "off" position so that it is impossible to insert a lock in any of said apertures except when the handle is in "off" position.

29. In combination, a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, said casing having an openable cover, an operating handle on said cover movable to operate the interrupter "on" and "off" and having a portion extending through said cover, an operating member mounted on the inside of said cover movable by said operating handle, said operating member having a portion for engaging the interrupter handle to move the interrupter handle when the operating handle is moved, interlocking means operable to prevent opening of the cover when the operating handle is in "on" position, and permitting opening of said cover when the operating handle is in an "off" position, and means acting to maintain said operating handle substantially in "off" position when the handle is in an "off" position at the time the cover is opened to thereby maintain the operating member in a position of alignment relative to said interrupter handle when the cover is open.

30. In combination, a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, said casing having an openable cover, an operating handle mounted on said cover having a portion extending through

said cover, said operating handle being movable to "on" and "off" positions to operate the interrupter, an operating member mounted on the inside of said cover and movable by said operating handle, said operating member having a portion for engaging said interrupter handle to move the interrupter handle when said operating handle is moved, and means acting to maintain said operating handle in "off" position when the operating handle is in "off" position at the time the cover is opened to maintain said operating member in a position of alignment relative to the interrupter handle when the cover is open.

31. In combination, a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, said casing having an openable cover, an operating handle mounted on said cover and having a shaft extending through said cover, an operating member on the inside of said cover movable by said handle, said operating member having portions for engaging the opposite sides of the interrupter handle to move the interrupter handle when said operating handle is moved, and means acting to maintain said operating handle substantially in the position it occupies when said operating member separates from said interrupter handle during opening of the cover to maintain alignment of said operating member relative to said interrupter handle when the cover is open.

32. In combination, a circuit interrupter unit having a movable handle, a casing in which the interrupter unit is mounted, said casing having an openable cover, an operating handle mounted on said cover and having a portion extending through said cover, means inside said cover for engaging the interrupter handle to move the interrupter handle when said operating handle is moved, and means acting to maintain said operating handle substantially in the position it occupies when said interrupter handle engaging means separates from said interrupter handle during opening of said cover to prevent accidental misalignment of said interrupter handle engaging means relative to said interrupter handle when the cover is open.

33. In combination, a circuit interrupter unit having a movable handle, an enclosing casing in which the interrupter unit is mounted, said casing having an openable cover, an operating handle rotatably mounted on said cover movable to "on" and "off" positions to operate the interrupter, said operating handle having a shaft extending through said cover, an operating member mounted on the inside of said cover and movable by said operating handle, said operating member having means for engaging the interrupter handle to move the interrupter handle when the operating handle is moved, said operating handle having a hub provided with a flanged rim, a cup-shaped locking element on said cover having a flanged rim disposed in nesting relation with the flange of said handle hub and having a central opening through which the handle shaft extends, the flanged rim of said handle and the flanged rim of said locking element having cooperating apertures which line up only when the operating handle is in "off" position for receiving a plurality of padlocks to lock said handle in the "off" position.

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