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OPERATING MECHANISM FOR ENCLOSED CIRCUIT INTERRUPTER

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This invention relates, generally, to circuit interrupters and, more particularly, to operating mechanisms for circuit interrupters which are mounted inside enclosing cabinets having an operating handle mounted on the outside of the cabinet.

As explained in my copending application, Serial No. 797,131, filed March 4, 1959, now Patent No. 3,054,886, operating conditions in certain modern industrial plants make it desirable to provide safety features on enclosed circuit interrupters in addition to the safety features previously considered necessary. The operating mechanism and safety features described in the aforesaid application are suitable for utilization with cabinets which are relatively long and narrow with the external operating handle located at the top of the cabinet. However, when such cabinets are installed in certain switchboard structures, the operating handle is above the maximum permissible height.

An object of this invention is to provide an enclosed circuit interrupter having an external operating handle located at the side of the enclosing cabinet, but extending in front of the cabinet.

Another object of the invention is to provide an enclosed circuit interrupter having an external operating handle mechanically connected to the operating member of the interrupter at all times regardless of the position of the cabinet cover.

A further object of the invention is to provide for locking the interrupter in the "off" position with the cover either open or closed.

Still another object of the invention is to provide a voidable interlock for normally preventing the closing of the interrupter while the cover is open.

A still further object of the invention is to provide an operating mechanism which can be utilized with cabinets of different depths for enclosing a circuit interrupter.

Yet another object of the invention is to provide a cover latching mechanism which prevents the cover from being left in a partly closed position.

A further object of the invention is to provide a cover latching mechanism which requires a separate tool in addition to the latching handle in order to open the cover.

Other objects of the invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of the invention, the external operating handle for an enclosed circuit interrupter is mounted on a fixed portion of the cabinet at one side of the front of the cabinet and is connected to the interrupter regardless of the position of the cover. Mechanical interlocking prevents the closing of the interrupter unless the cover is fully closed by a cover latching mechanism, except that the interlock can be deliberately voided. A separate tool is required to open the cover, which can be locked in the closed position. The interrupter can be locked "off" regardless of the position of the cover.

For a better understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a view, partly in front elevation and partly in section, of a portion of a cabinet and a mechanism for operating a circuit interrupter mounted inside the cabinet;

FIG. 2 is a view, partly in side elevation and partly in section, of the structure shown in FIG. 1;

FIG. 3 is a view, in section, of the cover latching mechanism, taken along the line III—III in FIG. 2; and,

FIG. 4 is an enlarged view, in section, of the interlocking mechanism.

Referring to the drawings, and particularly to FIGS. 1 and 2, the structure shown therein comprises a portion of a sheet metal cabinet 11 of dust tight or liquid tight construction inside of which a circuit interrupter 12, an operating mechanism 13 and a cover latching mechanism 14 are mounted. It will be understood that additional control apparatus, such as a motor starter, may be mounted in the cabinet 11 if desired.

As shown, the front wall of the cabinet 11 comprises a fixed portion 16 and an openable cover 17. The fixed portion 16 of the front wall may be formed as an integral part of the cabinet 11 and it extends along one side of the front of the cabinet at a lower level than it would extend if it were disposed at the top of the front (i.e. the uppermost part as viewed in the plane of the paper in FIG. 1) of the cabinet. The cover or door 17 may be hinged to the cabinet by means of a plurality of hinges (not shown). The cabinet 11 may be mounted on a vertical panel or other supporting member in any suitable manner. A gasket 18 is provided between the cover 17 and the walls of the cabinet 11 to exclude dust and other foreign matter from the inside of the cabinet.

An external operating handle 21 is pivotally mounted on the fixed portion 16 at one side of the cabinet. The handle 21 is supported by a pin 22 disposed in a frame 23 mounted on top of the fixed portion 16 of the cabinet 11. The handle 21 has two oppositely extending arms 24 and 25 which engage push rods 26 and 27 respectively, which extend inside the cabinet 11 through bushing portions 28 formed in the base of the frame 23. The frame 23 may be molded from a suitable insulating material. An indexing pin 29 may be provided in the handle 21 to identify more clearly the "on," "off," etc. positions of the handle.

A generally U-shaped operating lever 31 is pivotally mounted inside the cabinet 11. The legs of the U-shaped lever 31 may be attached to the side walls of the cabinet 11 by pins 32. As shown most clearly in FIG. 2, a cross arm 33 is secured to one leg of the lever 31. One end of the cross arm 33 is connected to the push rod 26 by a connecting link 34. The other end of the arm 33 is connected to the push rod 27 by another link 34. The links 34 are threaded onto the push rods, thereby permitting the effective length of the push rods to be properly adjusted.

The circuit interrupter 12 may be a manually operable switch of the type described in Patent 2,849,572, issued August 26, 1958 to A. R. Cellerini et al. As described in the aforesaid patent, contact members of the switch are opened and closed by a toggle mechanism which is actuated by an oscillating operating member 35. If desired, the circuit interrupter 12 may be a circuit breaker of the type described in Patent 2,047,739, issued July 14, 1936 to H. J. Lingal. The contact members of the circuit breaker may be manually opened or closed by oscillatory movement of an operating member similar to the member 35. The circuit breaker may be provided with a tripping mechanism which is operable in response to predetermined overload currents to effect automatic opening of the contact members.

As shown in FIG. 1, the operating member 35 of the interrupter 12 extends through an opening in the lever 31. As explained hereinbefore, the arms of the operating handle 21 engage the push rods 26 and 27

which are connected to the cross arm 33 of the operating lever 31. Thus, the operating handle 21 is continuously connected to the operating member 35 of the interrupter 12, so that it is impossible to move the interrupter operating member if the external operating handle 21 is locked. This is true even though the door of the cabinet may be opened. The operating handle 21 may be locked in the "off" position by inserting the hasp of a padlock in an opening 36 in the arm 25 of the handle 21. The hasp of the padlock will engage sides 37 of the frame 23 to retain the handle 21 in the "off" position.

The latching mechanism 14 is provided to force the door or cover 17 to the fully closed and sealed position. An interlocking mechanism 41 cooperates with the latching mechanism to insure that the interrupter can normally be operated only when the cover is in the fully closed position. As shown most clearly in FIGS. 2 and 3, the latching mechanism 14 comprises a cover closing handle 42 and a spring biased lever 43. The handle 42 is pivotally mounted on a pin 44 which extends through sides 45 of the frame 23. The lever 43 is pivotally mounted on a pin 46 which extends through spaced arms of a generally U-shaped bracket 47 attached to a side wall of the cabinet 11.

As shown in FIG. 3, the lever 43 has a cam shaped hook portion 48 which engages a bracket 44 attached to the cover 17 to draw or force the cover 17 to its fully closed position to compress the gasket 18. The lever 43 is biased in a direction to release the cover 17 by a spring 51. The lever 43 is actuated in a direction to close the cover 17 by means of the handle 42 which has a cam shaped portion 52 engaging a push rod 53. The rod 53 engages an arm 54 of the lever 43 to actuate the lever about its pivot point 46 to engage the bracket 44 on the cover 17.

If it is desired to open the cover 17, the handle 42 must be moved counterclockwise as shown in FIG. 2. However, before the handle 42 can be moved counterclockwise, it is necessary to release the interlocking mechanism 41. The interlocking mechanism 41 comprises two spring biased interlocking members 55 and 56 which are slidably disposed in the frame 23. The member 55 is biased towards the left as shown in FIG. 2 by a spring 57. The member 56 is biased towards the right by a spring 58. The spring 57 is stronger than the spring 58 and a pin 59 carried by the member 55 engages the member 56 to move it toward the left whereupon a projection 61 on the member 55 is disposed in a notch 62 in the cam shaped portion 52 of the handle 42. When the member 56 is in its furthestmost position toward the left, a projection 63 on the member 56 will clear the end of the arm 24 on the operating handle 21. Thus, the circuit interrupter 12 can be opened and closed by means of the handle 21 when the cover 17 is in its fully closed position.

In order to open the cover 17, a screwdriver, or other tool, must be inserted through an opening in the frame 23 into a recess 64 in the interlocking member 55 and the member 55 moved towards the right to disengage the projection 61 from the cam 52 of the handle 42. The handle 42 is then moved counterclockwise, thereby permitting the spring 51 to disengage the lever 43 from the cover 17.

The cam 52 will retain the member 55 in its right hand position while the cover 17 is open. When the member 55 is in its right hand position, the member 56 is actuated towards the right by the spring 58, thereby causing the projection 63 to interfere with the arm 24 on the handle 21 to prevent the closing of the circuit interrupter while the cover is opened. However, the interlock can be voided or defeated by moving the member 56 towards the left by means of the handle portion 65. The upper surface of the projection 63 and the lower surface of the arm 24 are so sloped that the interrupter can be thrown "off" when the cover is open without

utilizing a tool to release the interlock. The sloping surfaces produce a camming action to move the member 56 towards the left.

The cover 17 can be locked in the closed position by inserting the hasp of a padlock into an opening 66 in the handle 42 and sides 45 of the frame 23. The hasp of the padlock will engage the sides 45 of the frame 23 to prevent movement of the handle 42 in a direction to release the cover 17.

From the foregoing description, it is apparent that the improved operating and the interlocking mechanisms occupy a relatively small amount of space at one side of the front of the cabinet on a fixed front portion of the cabinet. Thus, the handle can be positioned within easy reach of an individual of average height when the cabinet is installed in a switchboard structure. Since the operating handle moves in a plane that is generally normal to the plane defined by the front of the closed cover, adequate leverage is provided without having the handle extend past the front-elevation-view dimensions of the enclosure while the widthwise dimension of the fixed front stationary part of the enclosure can be kept relatively small so that the opening provided in the enclosure can be relatively large. Furthermore, the operating mechanism can be utilized with cabinets of different depths by providing push rods of different lengths. Thus, the mechanism can be utilized with different enclosures and still provide the safety features required by certain industries.

Since numerous changes may be made in the above-described construction, and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In combination, an enclosure comprising a cabinet the front of which is defined as having a top a bottom and two sides, a fixed front portion at one side of the front of said cabinet, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed front portion, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism comprising manually operable cam means operable from outside of said enclosure and being operable from an unlatching position to a latching position to cam said cover to a fully closed latched position, interlocking means operating to prevent closing of said circuit interrupter when said circuit interrupter is open and said manually operable cam means is moved from said latching position to said unlatching position to permit opening of said cover, said interlocking means engaging said manually operable cam means to prevent opening of said cover when said cover is in said fully closed latched position and said manually operable cam means is in said latching position, means operable from outside of said enclosure when said manually operable cam means is in said latching position and said cover is in said fully closed position to defeat said interlocking means to permit opening of said cover.

2. In combination, an enclosure comprising a cabinet the front of which comprises a top a bottom and two sides, said cabinet having a fixed front portion at one side of the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed front portion and being movable in a plane that is generally normal to

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the plane defined by the front of said cover when said cover is in a fully closed position, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism comprising manually operable cam means operable from outside of said enclosure from a first position to a second position to cam said cover to the fully closed position, interlocking means, said manually operable cam means being movable from said second position to said first position to permit opening of said cover during which movement said interlocking means is operated to prevent a closing operation of said external operating handle, and means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle.

3. In combination, an enclosure comprising a cabinet having a fixed portion at the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed portion and being movable in a plane generally normal to the plane defined by the front of said cover when said cover is in a fully closed position, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism comprising manually operable cam means operable from outside of said enclosure from a first position to a second position to cam said cover to the fully closed position, interlocking means, said manually operable cam means being movable from said second position to said first position to permit opening of said cover during which movement said interlocking means is operated to prevent a closing operation of said external operating handle, means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle, and said interlocking means automatically moving to a position to permit a closing operation of said operating handle when said manually operable cam means is moved from said first position to said second position to cam said cover to said fully closed position.

4. In combination, an enclosure comprising a cabinet the front of which is defined as having a top a bottom and two sides, said cabinet having a fixed portion at one side of the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed front portion, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cover latching mechanism comprising manually operable cam means operable from outside of said enclosure, said manually operable cam means being movable from an unlatching position to a latching position to force said cover to a fully closed latched position in which fully closed latched position said gasket is compressed between said cover and said cabinet, interlocking means operating automatically to prevent closing of said circuit interrupter when said manually operable cam means is moved from said latching position to said unlatching position to permit opening of said cover, said interlocking means automatically engaging said manually operable cam means to prevent opening of said cover when said cover is in said fully closed position and said manually operable cam means is in said latching position, and means operable from outside of said enclosure when said manually operable cam means is in said latch-

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ing position and said cover is in said fully closed position to defeat said interlocking means to permit opening of said cover.

5. In combination, an enclosure comprising a cabinet the front of which is defined as having a top a bottom and two sides, said cabinet having a fixed portion at one side of the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed front portion and being movable in a plane that is generally normal to the plane defined by the plane of the front of said cover when said cover is in a fully closed position, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cover latching mechanism comprising manually operable cam means being operable from outside of said enclosure, said manually operable cam means being operable from a first position to a second position to force said cover to the fully closed position in which fully closed position said gasket is compressed between said cover and said cabinet, interlocking means, said manually operable cam means being operable from said second position to said first position to release said cover from said fully closed position during which movement said interlocking means is operated to prevent a closing operation of said external operating handle, and means operable when said manually operable cam means is operated to said first position to defeat said interlocking means to permit a closing operation of said operating handle.

6. In combination, an enclosure comprising a cabinet having a fixed portion at the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed portion and being movable in a plane generally normal to the plane defined by the front of said cover when said cover is in a fully closed position, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cover latching mechanism comprising manually operable cam means operable from outside of said enclosure, said manually operable cam means being movable from a first position to a second position to force said cover to the fully closed position in which fully closed position said gasket is compressed between said cover and said cabinet, interlocking means, said manually operable cam means being movable from said second position to said first position to permit opening of said cover during which movement said interlocking means is operated to prevent a closing operation of said external operating handle, means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle, and said interlocking means automatically moving to a position to permit a closing operation of said operating handle when said manually operable cam means is moved from said first position to said second position to move said cover to said fully closed position.

7. In combination, an enclosure comprising a cabinet the front of which is defined as having a top a bottom and two sides, said cabinet having a fixed portion at one side of the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external

operating handle extending from said fixed front portion to move in a plane generally normal to the plane defined by the front of said cover when said cover is in a fully closed position, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cover latching mechanism comprising manually operable cam means operable from outside of said enclosure, said manually operable cam means being movable from a first position to a second position to cam said cover to the fully closed position in which fully closed position said gasket is compressed between said cover and said cabinet, interlocking means, said manually operable cam means being movable from said second position to said first position to release said cover from said fully closed position during which movement said interlocking means is operated to prevent a closing operation of said external operating handle, means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle, and said interlocking means automatically moving to a position to permit a closing operation of said operating handle when said manually operable cam means is moved from said first position to said second position to cam said cover to said fully closed position.

8. In combination, an enclosure comprising a cabinet the front of which is defined as having a top, a bottom and two sides, said cabinet having a fixed portion at one side of the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed portion, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cabinet having a portion extending generally normal to the plane of said cover, said cover latching mechanism comprising manually operable cam means operable from outside of said enclosure, said manually operable cam means being operable from a first position to a second position to force said cover to a fully closed position in which fully closed position said gasket is compressed between said generally normal portion of said cabinet and said cover, interlocking means, said manually operable cam means being operable from said second position to said first position to release said cover from said fully closed position during which operation said interlocking means is operated to prevent a closing operation of said external operating handle, means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle, and said interlocking means automatically moving to a position to permit a closing operation of said operating handle when said manually operable cam means is moved from said first position to said second position to move said cover to said fully closed position.

9. In combination, an enclosure comprising a cabinet having a fixed portion at the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed portion to move in a plane generally normal to the plane defined by the front of said cover when said cover is in a fully closed position, means comprising re-

ciprocable push rods operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cover latching mechanism comprising manually operable cam means movable from outside of said enclosure from a first position to a second position to cam said cover to the fully closed position in which fully closed position said gasket is compressed between said cover and said cabinet, interlocking means, said manually operable cam means being movable from said second position to said first position to release said cover from said fully closed position during which movement said interlocking means is automatically operated to prevent a closing operation of said external operating handle, and means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle.

10. In combination, an enclosure comprising a cabinet the front of which is defined as having a top a bottom and two sides, said cabinet having a fixed portion at one side of the front thereof, an openable cover positioned at the front of said cabinet, a circuit interrupter mounted inside of said enclosure and having an operating member operable to open and close said interrupter, an external operating handle extending from said fixed front portion and being movable in a plane that is generally normal to the plane defined by the front of said cover when said cover is in a fully closed position, means operatively connecting said external operating handle to said operating member in such a manner that said operative connection is maintained regardless of the position of said cover, a cover latching mechanism, a gasket, said cabinet having a portion extending generally normal to the plane defined by the front of said cover when said cover is in the fully closed position, manually operable cam means operable from outside of said enclosure, said manually operable cam means being operable from a first position to a second position to cam said cover to the fully closed position in which fully closed position said gasket is compressed between said generally normal portion of said cabinet and said cover, interlocking means, said manually operable cam means being operable from said second position to said first position to release said cover from said fully closed position during which operation said interlocking means is automatically positioned to prevent a closing operation of said external operating handle, means operable when said manually operable cam means is in said first position to defeat said interlocking means to permit a closing operation of said operating handle, and said interlocking means automatically moving to a position to permit a closing operation of said operating handle when said manually operable cam means is moved from said first position to said second position to cam said cover to said fully closed position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,411,086	Guett	Mar. 28, 1922
1,420,111	Krantz	June 20, 1922
2,143,697	Jackson	Jan. 10, 1937
2,163,230	Rowe	June 20, 1939
2,213,124	Hammerly	Aug. 27, 1940
2,412,494	Cole	Dec. 10, 1946
2,536,522	Wilson	Jan. 2, 1951
2,759,054	Goudy et al.	Aug. 14, 1956
2,946,865	Thomas	July 26, 1960