

[54] **ROTARY HANDLE OPERATOR WITH REVERSIBLE COVER LATCH**

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[51] Int. Cl. **H01h 3/10**

[58] Field of Search **200/168 G, 172 A, 50 A**

[56] **References Cited**

UNITED STATES PATENTS

3,192,334 6/1965 Dimond et al.200/50 A

3,141,934 7/1964 Beaudoin et al. ...200/172 A X
3,324,259 6/1967 Chamberlin, Jr. et al.200/50 A

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[57] **ABSTRACT**

A handle mechanism for operating a molded case circuit breaker secured to the rear wall of an enclosure is mounted separate from the enclosure cover and extends through a cover opening to be operable from outside the enclosure when the cover is closed. The mechanism is constructed so as to be readily adapted for use with enclosure covers that are hinged at either side of the enclosure.

10 Claims, 12 Drawing Figures

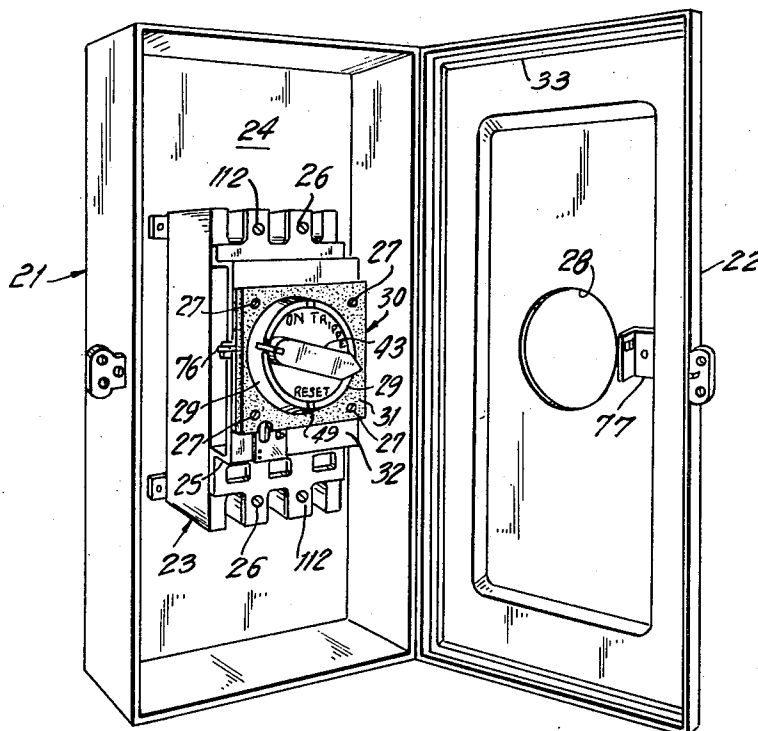


FIG. 1.

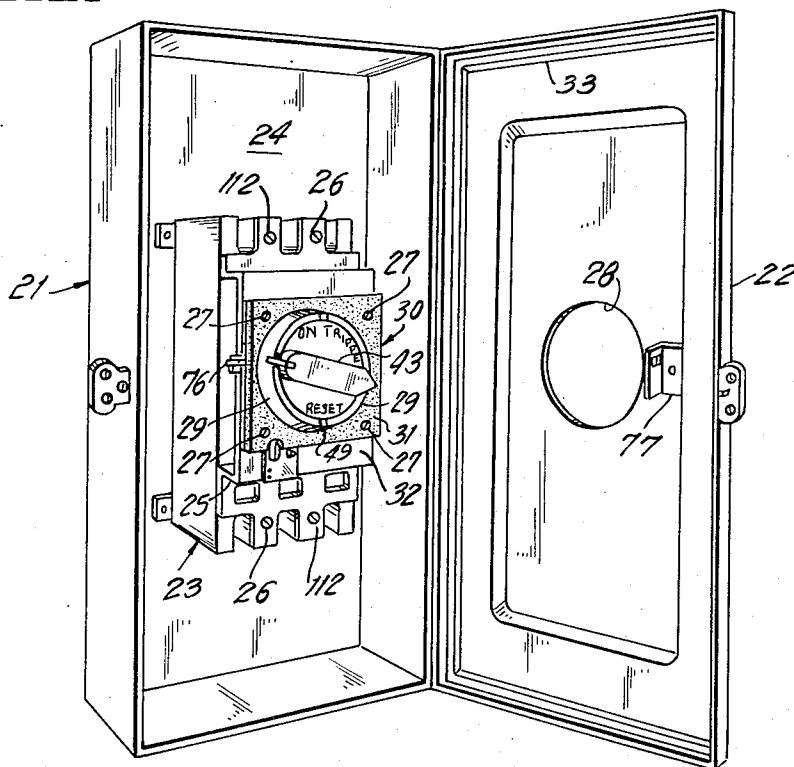
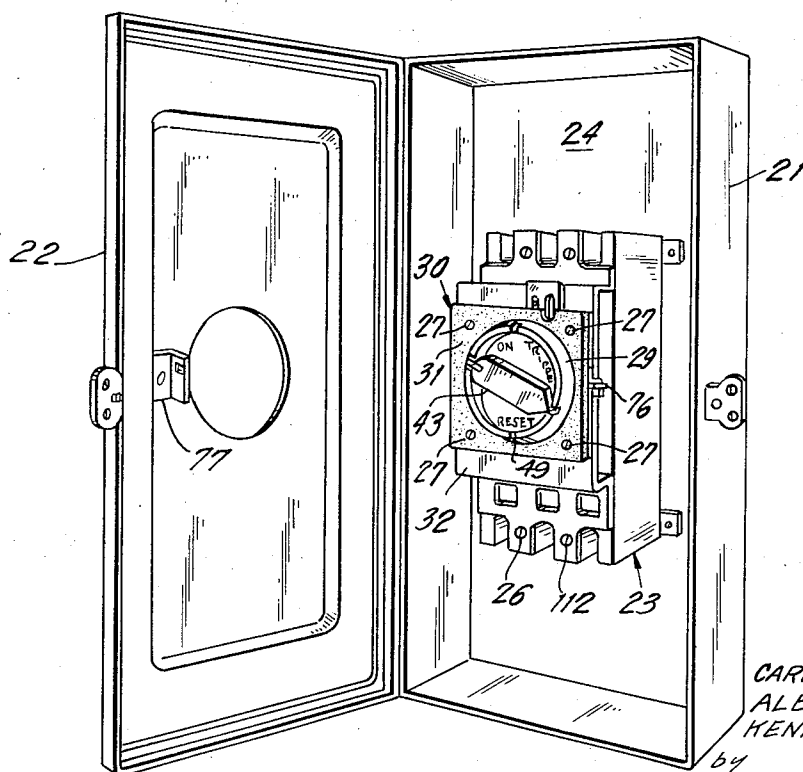
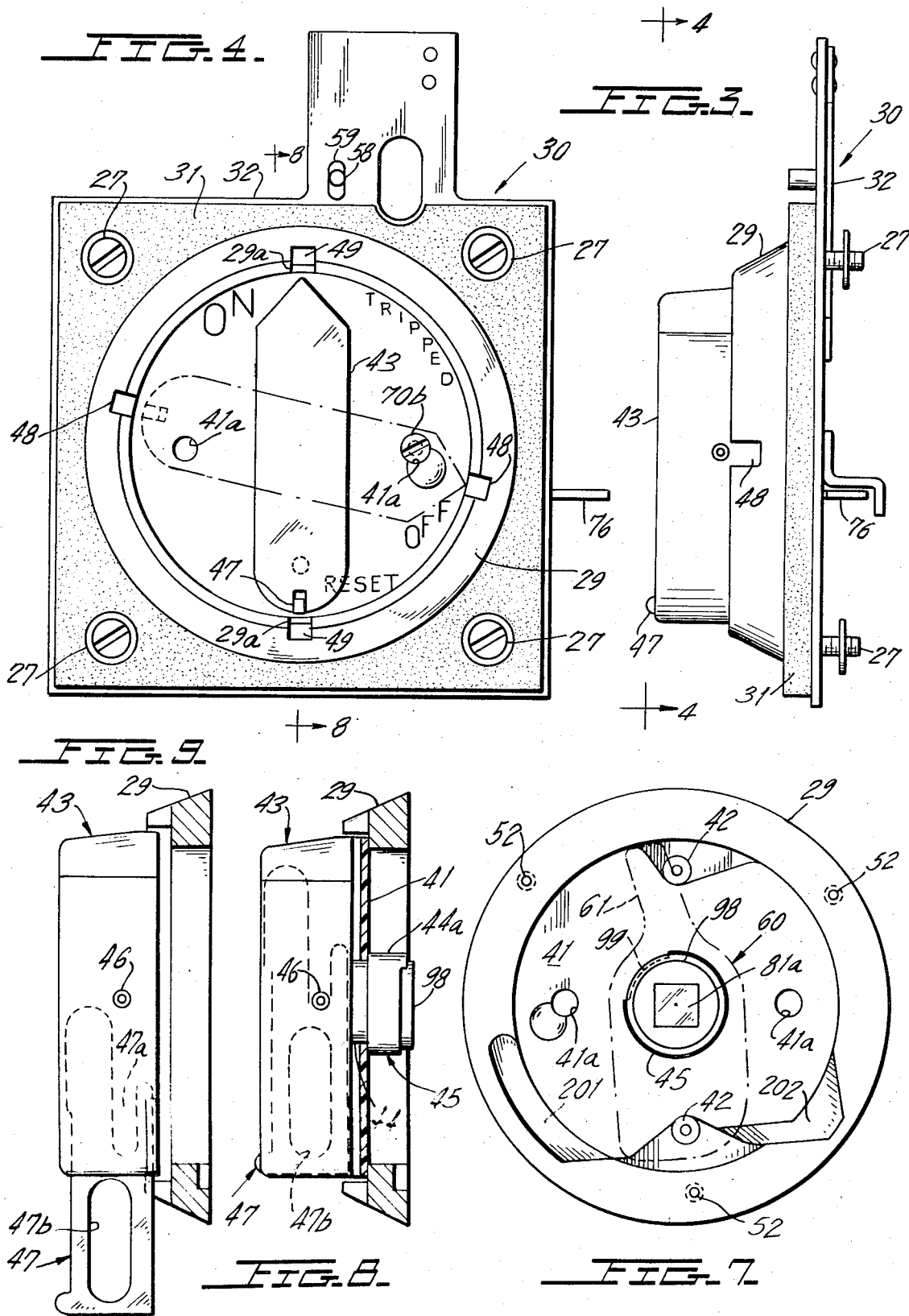


FIG. 2.



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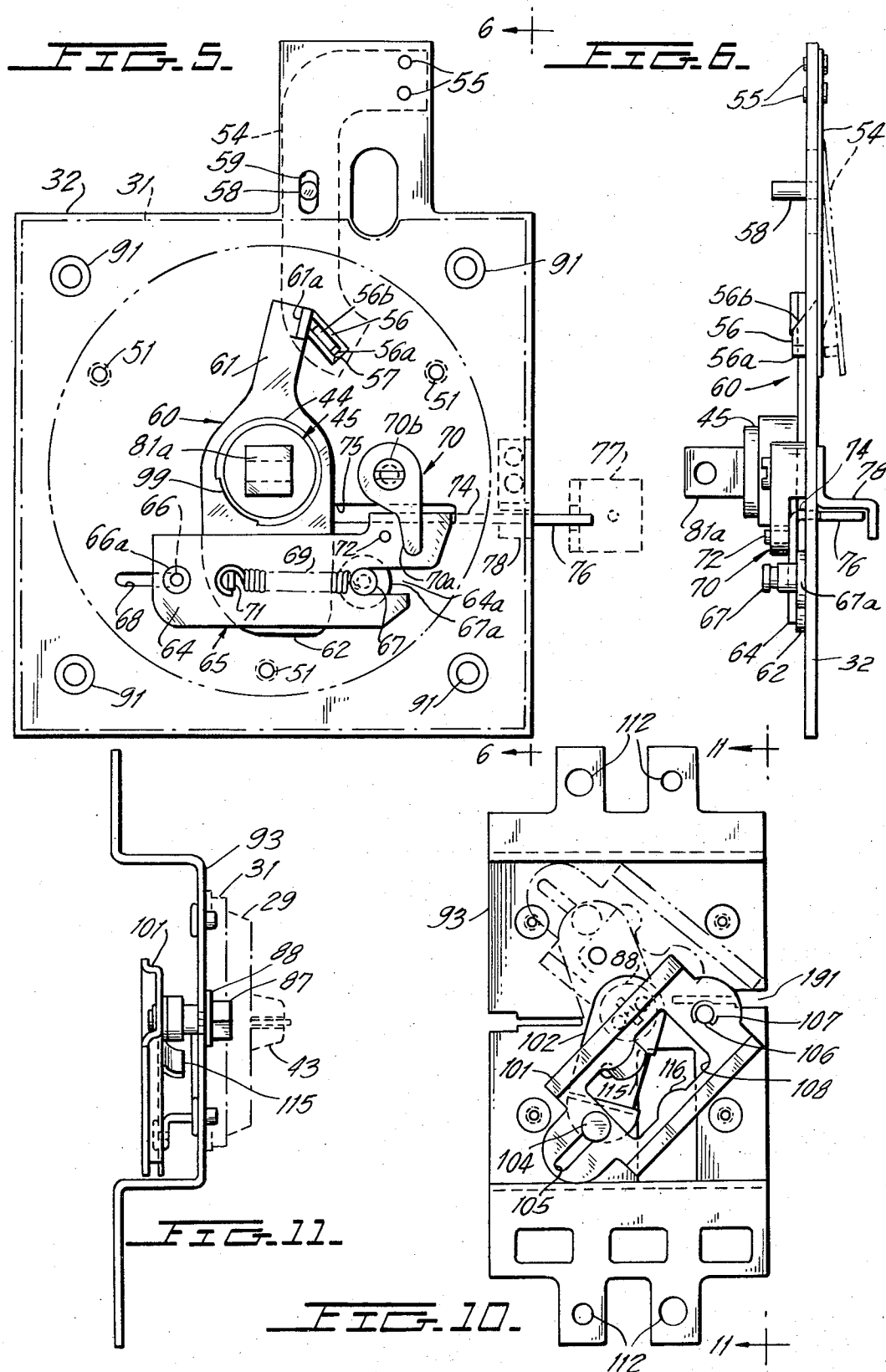
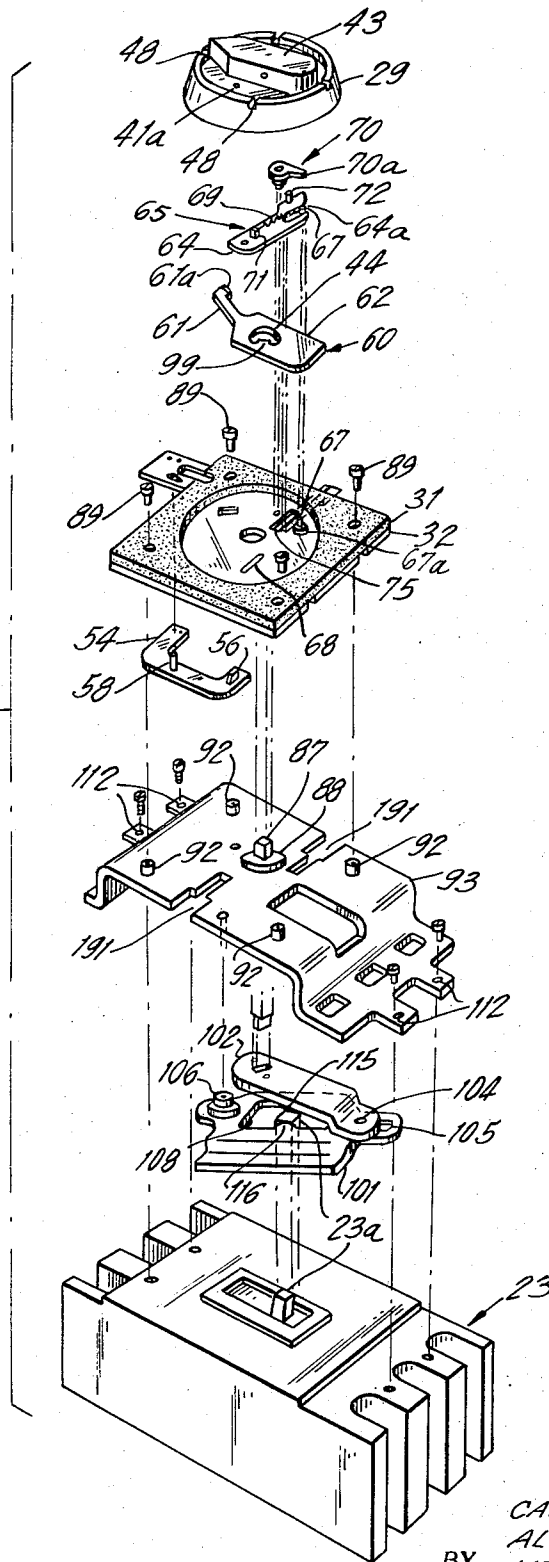


FIG. 12.



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ROTARY HANDLE OPERATOR WITH REVERSIBLE COVER LATCH

This invention relates to handle mechanisms for operation of circuit interrupters enclosed in housings with the handle mechanisms being operable from outside the enclosure, and more particularly relates to handle mechanisms of this type that are readily converted for use with covers hinged at opposite sides of the enclosure.

U.S. Pat. No. 2,890,302 issued June 9, 1959, entitled **OPERATING MECHANISM FOR VARIABLE DEPTH ENCLOSURE**, with W. DeBenedictis as inventor, illustrates a rotary handle mechanism, mounted upon the openable cover of an enclosure, for operating a circuit breaker within the enclosure and mounted to the enclosure wall remote from the cover. With such a device in the cover open position, the handle mechanism is completely disconnected from the circuit breaker and because of this the position of the handle mechanism cannot be relied upon as being indicative of whether the circuit breaker is opened or closed. Further, because the cover mounted handle mechanism may, when the cover is open, assume a different position than the circuit breaker handle it is necessary to provide a costly resilient slam proof means to cushion closing of the cover.

In order to eliminate these undesirable and/or costly features U.S. Pat. No. 3,313,896 issued Apr. 11, 1967 to D. T. Gray for **ROTARY HANDLE OPERATOR FOR CIRCUIT BREAKER** etc., discloses a construction in which the handle mechanism consists of front and rear sections that are constructed to accept an intermediate connecting section which adapts such mechanism for enclosures differing in depth. The rear section is mounted directly to a front surface of the circuit interrupter which is mounted within the enclosure on the rear wall thereof. The front section includes a rotary handle which extends through an opening in the enclosure cover when the cover is in its closed position so that the handle is operable from outside the enclosure. A defeatable cover interlock is provided to prevent unauthorized persons from opening the enclosure cover when the circuit interrupter is closed. A defeatable switch interlock is provided to prevent accidental closing of the circuit interrupter when the enclosure cover is opened and a handle locking means is provided to prevent unauthorized handle operation. The cover and switch interlocks include a common cam operated by the mechanism handle.

The instant invention is directed to modifications of the rotary handle mechanism of the aforesaid U.S. Pat. No. 3,313,896 which enables that type of mechanism to be utilized with a cover that is hinged along either the left or right edge thereof, yet permit closing of the circuit interrupter by conventional clockwise handle rotation for either left or right side hinged covers.

Accordingly, a primary object of the instant invention is to provide a novel construction for a rotary handle mechanism used to operate a circuit interrupter mounted within an enclosure having an openable cover, with this handle mechanism extending outside of the cover.

Another object is to provide a rotary handle mechanism of this type that is provided with a novel reversible latch for ready conversion to operation with enclosures having both left and right hand side hinged covers.

These objects as well as other objects will become readily apparent after reading the following description of the accompanying drawings in which:

FIGS. 1 and 2 are perspectives each showing a circuit interrupter mounted in an enclosure having an openable cover, with a rotary handle mechanism for interrupter operation, constructed in accordance with the teachings of the instant invention. In FIG. 1 the cover is hinged along its right edge, and in FIG. 2 the cover is hinged along its left edge.

FIG. 3 is an elevation of the front section of the handle mechanism.

FIG. 4 is a plan view of the front section of the handle mechanism looking in the direction of arrows 4—4 of FIG. 3.

FIG. 5 is a plan view of the front section with the ring assembly, handle and gasket removed to more clearly reveal the elements of the cover and switch interlocks.

FIG. 6 is an elevation looking in the direction of arrows 6—6 of FIG. 5.

FIG. 7 is a rear view of the handle ring assembly.

FIGS. 8 and 9 are elevations of the rotary handle and related elements taken through line 8—8 of FIG. 4 looking in the direction of arrows 8—8. In FIG. 8 the handle locking mechanism is inactive while in FIG. 9 this mechanism is extended to locking position.

FIG. 10 is a plan view looking at the rear of the rear section.

FIG. 11 is an elevation looking in the direction of arrows 11—11 of FIG. 10.

FIG. 12 is an exploded perspective of the rotary handle mechanism including an intermediate connection section.

Now referring to the figures. The device of the instant invention is used in connection with rectangular sheet metal enclosure 21 having openable front cover 22. Circuit interrupter 23 mounted to the rear wall 24 of enclosure 21 is a multi-pole molded case circuit breaker of a type described in U.S. Pat. No. 3,155,802 issued Nov. 3, 1964 entitled **U-SHAPED CRADLE FOR CIRCUIT BREAKER** with E. Wortman as inventor.

In FIG. 1 enclosure 21 is turned so that the hinge connection to cover 22 is at the right. Conversely, in FIG. 2 enclosure 21 is turned so that the hinge connection to cover 22 is at the left. However, in both FIGS. 1 and 2 circuit interrupter 23 is oriented the same so, as will be hereinafter seen, the rotary handle mechanism rotates in the same direction to bring about ON and OFF operation in the devices of both FIGS. 1 and 2. The essential difference between the devices of FIGS. 1 and 2 is that in FIG. 1 cover latching tip 76 extends to the left, as described in detail in the aforesaid U.S. Pat. No. 3,313,896, and in FIG. 2 latching tip 76 extends to the right.

The rotary handle mechanism includes rear mechanism 25 mounted to the front of circuit interrupter 23 by two screws 26, and front mechanism 30 mounted to the front of rear mechanism 25 by four other screws 27. Cover 22 is provided with circular aperture 28 which receives handle ring 29 of front section 30 when cover 22 is closed. Cover 22 in the closed position thereof engages and slightly compresses gasket 31 mounted on the forward surface of plate 32. Rectangular gasket strip 33 mounted on the inside of cover 22 engages the free edges of the enclosure side walls when

cover 22 is closed. It should now be apparent that gaskets 31 and 33 constitute means for dust proofing enclosure 21.

The depth of enclosure 21 in FIGS. 1 and 2 is such that by merely mounting front section 30 directly to rear section 25, when cover 22 is closed it engages gasket 31 of front section 30. However, for the case of a deeper enclosure (not shown) and a circuit interrupter no larger than circuit breaker 23 it is necessary to provide a connecting section (not shown) joining front and rear sections 30, 25 together and positioning gasket 31 for engagement by the enclosure cover.

Now referring more particularly to FIGS. 3 through 8, front section 30 of the rotary handle mechanism also includes indicator plate 41 mounted by rivets 42 to the front of an interior ledge of ring 29. Elongated handle 43, having one end formed as a pointer, is positioned in front of plate 41 and is fixedly secured to the square front section 44 of bushing 45 by means of roll pin 46. Square section 44 extends through a central aperture in plate 41 while the larger diameter rear section 44a of bushing 45 is disposed to the rear of plate 41.

Locking slide 47 is mounted to handle 43 and is guided for movement along the longitudinal axis thereof by a narrow slot in section 44 of bushing 45. Pin 46 and open end slot 47a cooperate to provide additional guidance for slide 47. In FIG. 8 slide 47 is shown in retracted position where it is ineffectual to perform a locking function. In FIG. 9 slide 47 is shown extended from the end of handle 43 remote from the pointed end thereof. In order to extend slide 47 it must be aligned with ring notch 48, or ring notch 49 when the frangible section 29a of ring 29 is broken away. With slide 47 extended the shackles of one or more padlocks (not shown) may be inserted into the elongated slot 47b of slide 47 to prevent slide 47 from being moved to its retracted position of FIG. 8. With slide 47 extended ring 29 blocks rotation of handle 43 and, as will hereinafter become apparent, prevents operation of circuit breaker 23.

Screws extending through clearance apertures 51 (FIG. 5) in plate 32 are received by threaded apertures 52 in the rear of ring 29 to secure ring 29 and the elements mounted to plate 32. L-shaped sheet-like member 54 constructed of spring metal is mounted to the rear surface of plate 32 by rivets 55. The end of member 54 remote from rivets 55 carries blocking projection 56 which extends through aperture 57 in plate 32. Pin 58 extends from spring member 54 at a point intermediate the ends thereof through aperture 59 in plate 32, projecting perpendicular to the plane of member 54. For a reason to be hereinafter explained, when enclosure cover 22 is closed it engages and thereby depresses pin 58 deflecting spring 54 inwardly which in turn moves projection 56 to the rear providing clearance for counterclockwise movement of cam 60.

Cam 60 is keyed to bushing 45 at the rear of enlarged section 44a so that cam 60 is movable by handle 43. However, there is a certain amount of lost motion in the connection between handle 43 and cam 60 in that the inward radial keying extension 99 of cam 60 is not as long angularly as its cooperating keying notch 98 in bushing 45 (See FIG. 7).

Cam 60 includes narrow radial extension 61 which cooperates with blocking projection 56, in a manner to

be hereinafter explained, in order to prevent closing of circuit breaker 23 when cover 22 is opened. Cam 60 also includes wide radial projection 62 disposed almost 180° from narrow projection 61. Projection 62 extends behind the main section 64 of cover interlock member 65 and is positioned between guide pin 66 and post 67. Pin 66 extends rearwardly from main section 64 and is disposed within elongated slot 68 in plate 32. Post 67 extends forwardly from plate 32 and is provided with an enlarged standoff section 67a adjacent to the forward surface of plate 32 with the narrow portion of post 67 being disposed within open ended slot 64a of latch member 65. It is noted that the portion 66a of pin 66 positioned immediately to the rear of latch member section 64 is of a diameter which is larger than the width of slot 68. Thus, pin portion 66a and post section 67a act to mount interlock member 65 in spaced relation with respect to the forward surface of plate 32 so as to provide clearance for the movement of cam member 60.

Coiled tension spring 69 is secured at one of its ends to the forwardly extending ear 71 of latch member 65 and at its other end is secured to post 67 so as to bias interlock member 65 the right end of slot 75, with respect to FIG. 5, to a latching position. Member 65 may be operated to unlatching position to the left of that shown in FIG. 5 by rotating cam member 60 in a clockwise direction with respect to FIG. 5 so that wide projection 62 engages pin portion 66a. Latch member 65 may also be moved to the left with respect to FIG. 5 by rotating the defeater member 70 in a clockwise direction so that extension 70a thereof engages pin 72 extending forwardly from latch member section 64. Defeater member 70 includes, at its axis of rotation, slotted portion 70b accessible for engagement by a screw driver or the like insertable through aperture 41a in indicator plate 41. It is noted that aperture 41a is accessible when handle 43 is in the circuit breaker ON position.

Interlock member 65 also includes another section 74 disposed at right angles to section 64 and extending through slot 75. Section 74 also extends between the arms of U-shaped bracket 78 secured to the rear surface of plate 32 and cooperates therewith to stabilize and guide movement of latch member 65. The end of section 74 remote from section 64 is sloped and constitutes latching tip 76 which cooperates with bracket 77 carried on the inside of cover 22 to permit closing and latching of cover 22 even when handle 43 is in the circuit breaker ON position.

Assuming for the moment that the position of handle 43 always corresponds with the position of circuit breaker handle 23a, it is seen that with circuit breaker 23 ON, cam 60 is in the position shown in FIG. 5 and latch tip 76 cooperates with cover bracket 77 to maintain enclosure cover 22 in closed position. Movement of handle 43 in a clockwise direction serves to rotate cam 60 in a clockwise direction into engagement with rearwardly extending pin portion 66a thereby moving latching member 65 to the left with respect to FIG. 5 to its unlatching position wherein latching tip 76 is clear of bracket 77 thereby permitting cover 22 to be opened.

With handle 43 in circuit breaker OFF position, cam extension 61 is positioned to the right of projection 56 as viewed in FIG. 5. Since the right end 56a of projec-

tion 56 extends substantially at right angles to the path of movement of cam 60, when cover 22 is opened, surface 56a is in the path of movement of cam extension 61 thereby blocking movement of cam 60 in a counterclockwise direction and in so doing preventing the closing of circuit breaker 23.

Projection 56 may be moved from this blocking position by depressing pin 58 either manually or by the closing of cover 22. When projection 56 is moved to the rear, or releasing position shown in phantom in FIG. 6, projection 56 is no longer in the path of cam extension 61 so that cam 60 is free to operate in a counterclockwise direction thereby permitting handle 43 to close circuit breaker 23. It is noted that the sloping surface 56b of projection 56 and the resilient nature of member 54 permits the operation of circuit breaker 23 from ON position to OFF position when cover 22 is open in that clockwise movement of cam 60 from its position shown in FIG. 5 causes the rounded edge portion 61a of cam extension 61 to engage sloping surface 56b thereby camming projection 56 to the rear.

Four screws 89 received in interiorly threaded nipples 92 extending forwardly from the sheet metal frame 93 of rear section 25 fixedly secure front section plate 32 to frame 93 of connecting section 35. It is noted that nipples 92 are positioned in what will be termed a square arrangement about bushing 88 as a center, to permit the angular orientation or indexing of plate 32 to be readily changed with respect to rear section 25 by 180°, for a reason which will hereinafter be seen.

Rear section 25 also includes a linkage comprising main crank 101 and intermediate crank 102 both mounted between the arms of U-shaped frame 93. Main crank 101 is an elongated shallow-channel member while intermediate crank 102 is an elongated sheet member having a rearward step at one end thereof. One end of intermediate crank 102 is keyed at 103 to the rear end of bushing 88. The other or rearwardly stepped end of crank 102 is connected by pin 104 to one end of main crank 101 at slot 105 in crank 101. The cooperation of pin 104 and slot 105 provides a lost motion connection between cranks 101 and 102. The other end of main crank 101 is connected to post 106 fixed to frame 93 and extending parallel to bushing 88 and spaced therefrom. Spring clip 107 retains crank 101 mounted to post 106. Square projection 87 extending forwardly from bushing 88 is received by a complementary aperture 81a (FIG. 7) at the rear of bushing 45. Thus, it is seen that rotation of handle 43 is transmitted through forward bushing 45 to rear bushing 88.

As explained in the J. C. Brumfield abandoned application Ser. No. 314,226, filed Oct. 7, 1963, entitled ROTARY HANDLE OPERATOR and assigned to the assignee of the instant invention, rotation of rear bushing 88 in a clockwise direction with respect to FIG. 10 rotates pin 104 in a clockwise direction carrying along the free end of main crank 101. Thus, crank 101 moves in a clockwise direction about post 106 as a stationary pivot.

The portion of main crank 101 between post 106 and slide 105 is provided with aperture 108 which receives the operating handle 23a of circuit breaker 23. Screws 26 extending through frame apertures 112 fixedly mount rear section 25 to the front surface of circuit breaker 23 in operative position such that handle 23a is engaged by tang 116 for closing of circuit breaker 23.

It is noted that circuit breaker handle 23a is mounted for pivotal movement about an axis extending normal to the axis provided by post 106 for main crank 101. Even though handle 23a is actually pivoted about an axis parallel to the forward surface of frame 93, the angular motion of handle 23a is so limited that those skilled in the art consider motion of handle 23a to be linear. Rear section 25 converts the rotary motion of operating handle 43 into the so-called linear motion required to operate circuit breaker handle 23a. In order to obtain the best mechanical advantage the surface of ear 115 which engages handle 23a is convex being curved about an axis which is oblique with respect to the plane of motion of main crank 101 so as to extend over handle receiving aperture 108 and towards handle 23a. This construction of ear 115 eliminates sharp corners in contact with handle 23a to minimize friction therebetween for ease of circuit breaker operation and also to engage the extreme forward end of circuit breaker handle 23a to obtain the greatest mechanical advantage.

It is noted that frame 93 is provided with two appropriately shaped and positioned cutouts 191, 191 (FIG. 12) to provide clearance for operation of cover latch 65 depending upon the angular orientation of front section 30 relative to rear section 25. The height of nipples 92 spaces plate 32 from frame 93 to provide clearance for deflection of circuit breaker interlock spring 54. It is also noted that the rear of locking ring 29 is notched at 201 to provide clearance for operation of cover latch defeater 70 and is notched at 202 to provide clearance for operation of cover latch slide 65.

The differences between the rotary handle mechanisms of FIGS. 1 and 2 will be pointed out in the following discussion. In both FIGS. 1 and 2 rear section 25 is in the same position mounted to circuit breaker 23. However, in FIG. 1 front section mounting plate 32 is pivoted 180° about bushing 88 as a center from the position of FIG. 2 so that cover latching tip carried by plate 32 extends to the left in FIG. 1 and to the right in FIG. 2. All other elements on plate 32 are similarly pivoted 180° except for operating handle 43 and disk 41 bearing indicia indicating the position of circuit breaker handle 23a. That is, disk 41 is riveted to locking ring 29 after pivoting of disk 41 by 180° in the plane thereof, and handle 43 is pivoted 180° relative to square bushing extension 87 so that elements 41 and 43 are in the same positions in both FIGS. 1 and 2.

Thus, it is seen that the instant invention provides a novel construction for a rotary handle mechanism used to operate a circuit breaker mounted within an enclosure having an openable cover with the handle mechanism being operable from outside the enclosure. The handle mechanism is so constructed that it is readily convertible for latching covers that are hinged along either the left or right edges thereof.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited not by the specific disclosure herein, but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. In combination, an enclosure having a first side normally closed by an openable front cover, a circuit interrupter within said enclosure and having a handle disposed entirely within said enclosure; a mechanism separate from said cover for manually operating said circuit interrupter from a point outside of said enclosure and in front of said cover; said mechanism including a rear section connected to said handle and a front section operatively engaged with said rear section whereby manual operating forces applied at said front section are transmitted through said rear section to operate said handle; said front section including an operating handle received by an aperture in said cover as the latter moves from its open to its closed position, means rotatably mounting said operating handle for movement about a pivot axis and in a plane generally parallel to said cover in its closed position, a first element biased to cover latching position for maintaining said cover closed, a second element biased to blocking position, cam means operable by said operating handle to move said first element to cover releasing position, said cam means and said second element in said blocking position cooperating to prevent operation of said operating handle to close said circuit interrupter when front cover is open, interlock means operable by said cover upon closing thereof to move said second element from said blocking position to a retracted position wherein said operating handle may be operated to close said circuit interrupter, defeater means for moving said first element to said cover releasing position when said circuit interrupter is closed, an indicia carrying plate behind said operating handle and cooperating therewith to indicate the position of said handle, a support means to which said first element, said second element, said interlock means and said defeater means are mounted and movable with as a unit; said unit being selectively connectable in a first and second position relative to said rear section for use of said mechanism when said cover is pivotally mounted along respective first and second opposite edges thereof; said indicia carrying plate remaining in the same position relative to said rear section for both said first and second positions of said unit; said indicia carrying plate having a first hole through which said defeater means is accessible for operation outside of said enclosure when said unit is in its said first position; said indicia carrying plate having a second hole through which said defeater means is accessible for operation outside of said enclosure when said unit is in said second position.

2. The combination as set forth in claim 1 in which said unit is pivoted 180° about said axis in moving from said first to said second position.

3. The combination as set forth in claim 1 in which the rear section includes a motion translating linkage drivingly connected to said handle and said operating handle, and another supporting means which carries said linkage; said another supporting means having first

and second notches along opposed edges thereof to provide clearances for said first element when said unit is in its respective first and second positions.

4. The combination as set forth in claim 1 in which the front section includes a raised ring extending through said aperture in said cover and surrounding said operating handle; said ring having first and second locking notches 180° apart at the front thereof to receive a locking bar extendable from said operating handle when the latter is in circuit interrupter OFF position; said ring being moved 180° in the plane thereof when said unit is repositioned whereby said first locking notch receives said locking bar when said unit is in said first position and said second locking notch receives said locking bar when said unit is in said second position.

5. The combination as set forth in claim 4 in which the ring is notched at the rear thereof to provide clearance for operation of the defeater means.

6. The combination as set forth in claim 5 in which the ring has first and second front knockouts 180° apart which when removed provide locking notches to receive the locking bar when the operating handle is in circuit interrupter ON position.

7. The combination as set forth in claim 3 in which said unit is pivoted 180° about said axis in moving from said first to said second position.

8. The combination as set forth in claim 7 in which the front section includes a raised ring extending through said aperture in said cover and surrounding said operating handle; said ring having first and second locking notches 180° apart at the front thereof to receive a locking bar extendable from said operating handle when the latter is in circuit interrupter OFF position; said ring being moved 180° in the plane thereof when said unit is repositioned whereby said first locking notch receives said locking bar when said unit is in said first position and said second locking notch receives said locking bar when said unit is in said second position; said ring being notched at the rear thereof to provide clearance for operation of the defeater means.

9. The combination of claim 2 in which the mechanism includes a gasket mounted to the support means on its front surface; said gasket means being positioned to be engaged and thereby compressed by portions of said cover bounding the aperture therein when said cover is closed.

10. The combination as set forth in claim 1 in which the means rotatably mounting the operating handle is a bearing member having said cam means mounted thereto; said bearing member including a formation drivingly connected to another bearing member of said rear section; said rear section also including a linkage in driving engagement with said another bearing member and said handle.

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