# United States Patent [19]

**Venzke et al.**

[11] **3,911,235**

[45] **Oct. 7, 1975**


[54] **FLANGE MOUNTED OPERATOR FOR AN ENCLOSED ELECTRIC CIRCUIT BREAKER**


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[73] Assignee: **Square D Company,** Park Ridge, Ill.



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[21] Appl. No.: **465,214**

[52] **U.S. Cl.** ..... **200/50 A;** 200/153 R

[51] **Int. Cl.²** ..... **H01H 9/20;** H01H 33/46

[58] **Field of Search** ..... 200/50 A, 153 R



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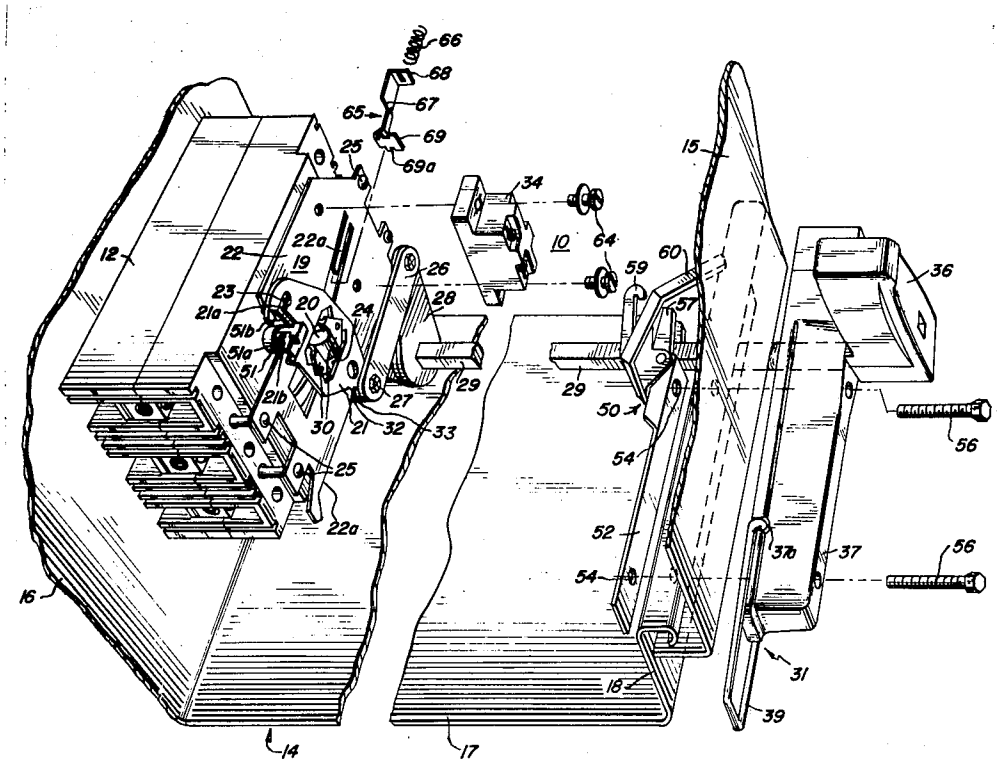
*Attorney, Agent, or Firm*—Harold J. Rathbun; Ernest S. Kettelson



[57] **ABSTRACT**

A handle of the operator is mounted on an external surface of a flange portion of a wall of an enclosure for a molded case circuit breaker and is drivingly connected to an operating handle of the circuit breaker. Interlock means prevent the operating handle of the circuit breaker from being turned to its ON position with a cover of the enclosure open, and the handle of the operator is normally positioned to mechanically interfere and thereby prevent the opening of the cover when the operating handle of the circuit breaker is in its ON position. The handle of the operator is pivotally mounted for limited movement relative to a drive shaft of the operator and can be locked in a single position to lock the circuit breaker handle in either its ON or OFF position. A true position indicator shows the position of the circuit breaker handle regardless of the position of the operator handle.


**7 Claims, 11 Drawing Figures**



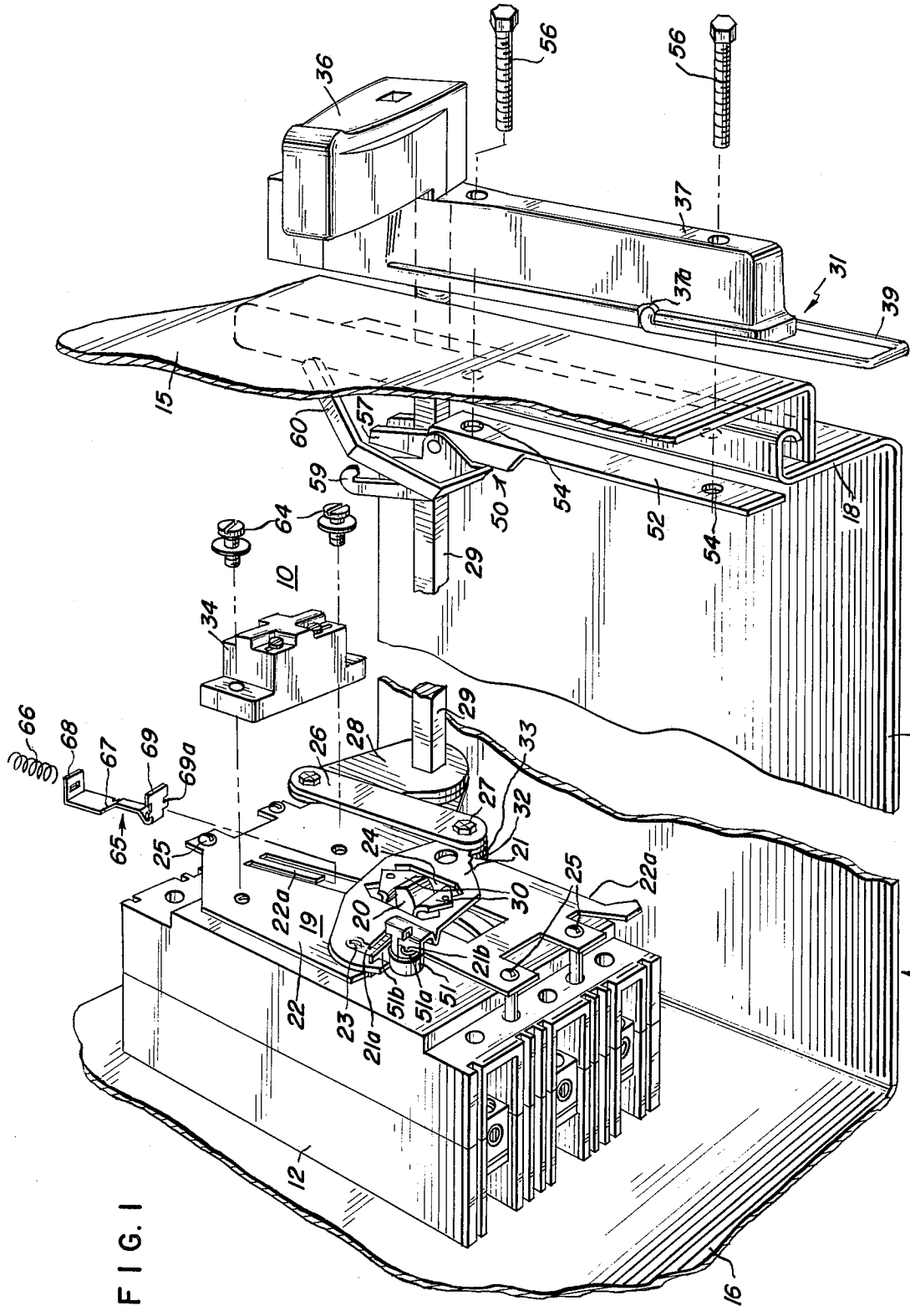

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FIG. 1

FIG. 2

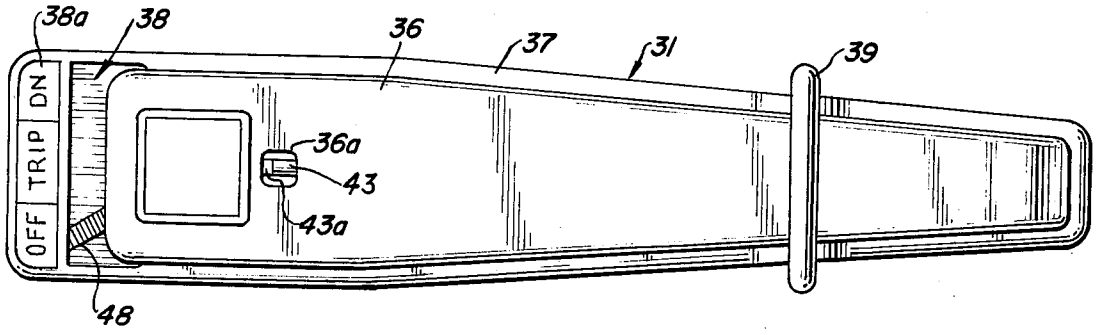


FIG. 3

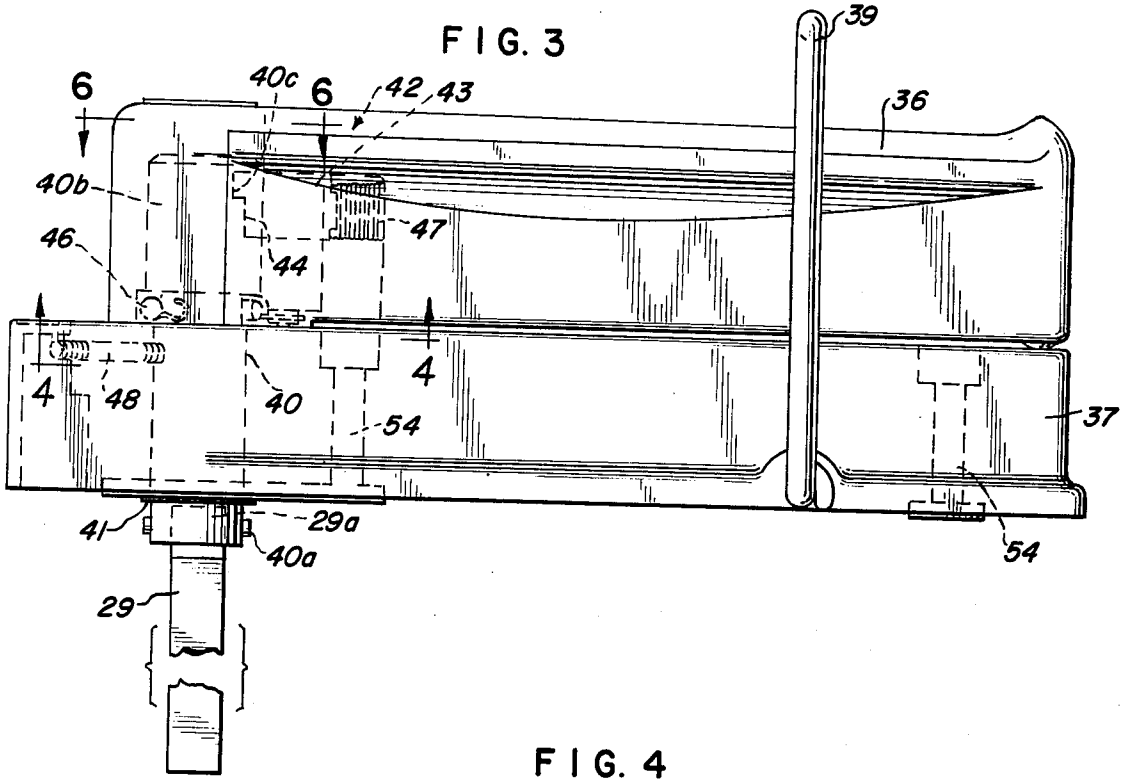


FIG. 4

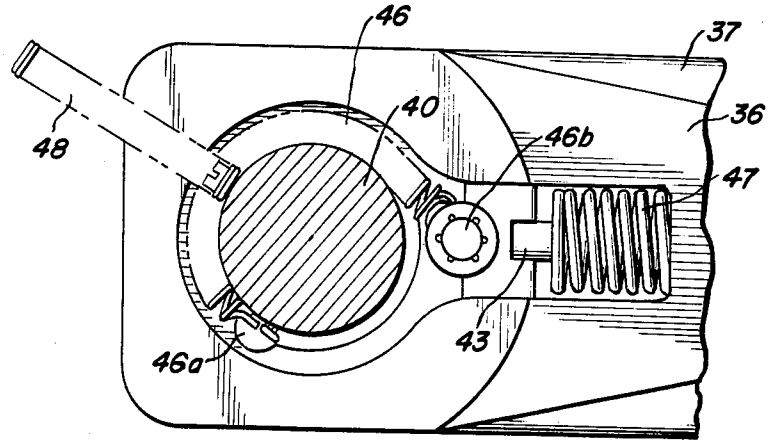

FIG. 6

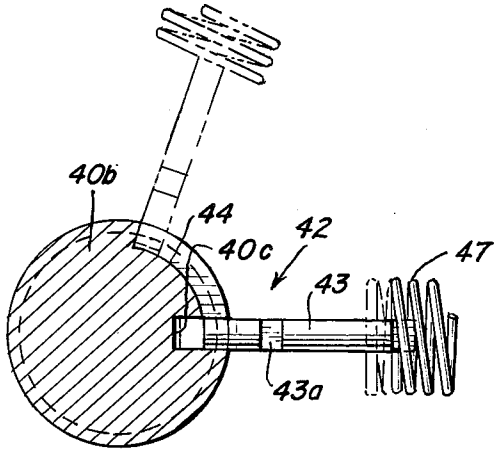


FIG. 11

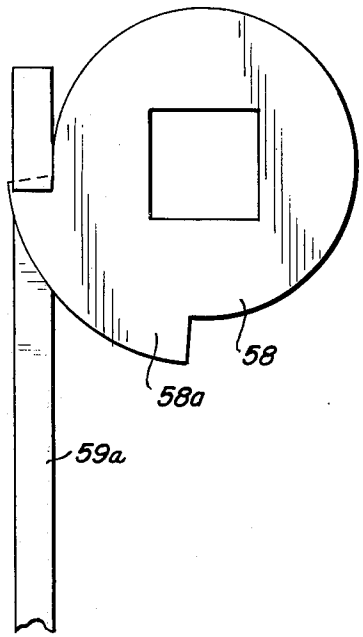


FIG. 7

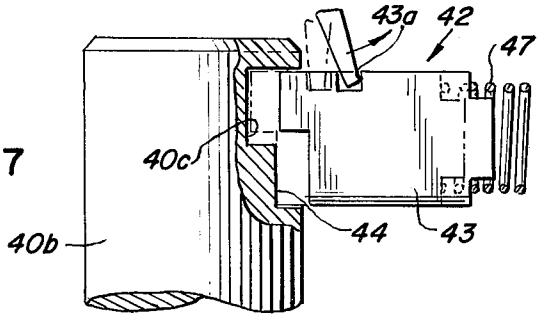


FIG. 5

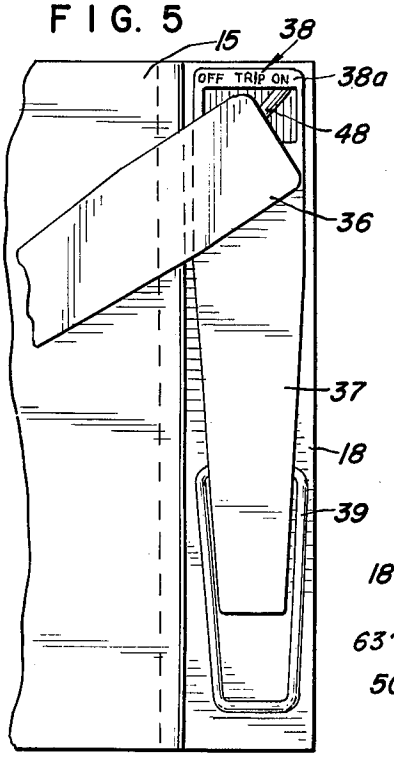


FIG. 10

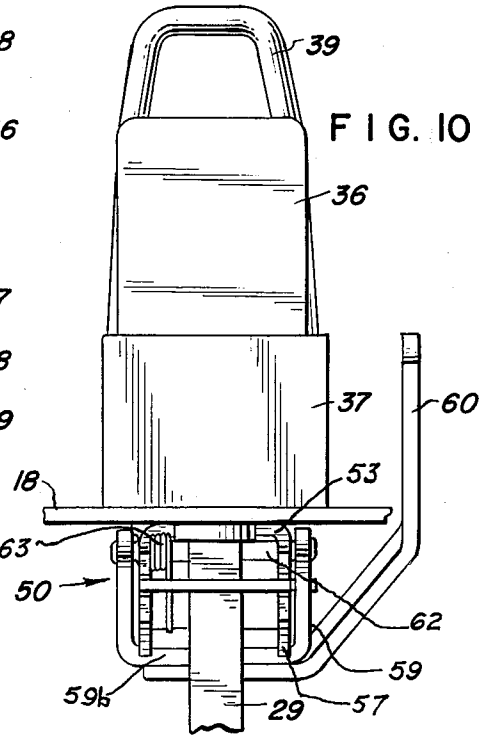

FIG. 8

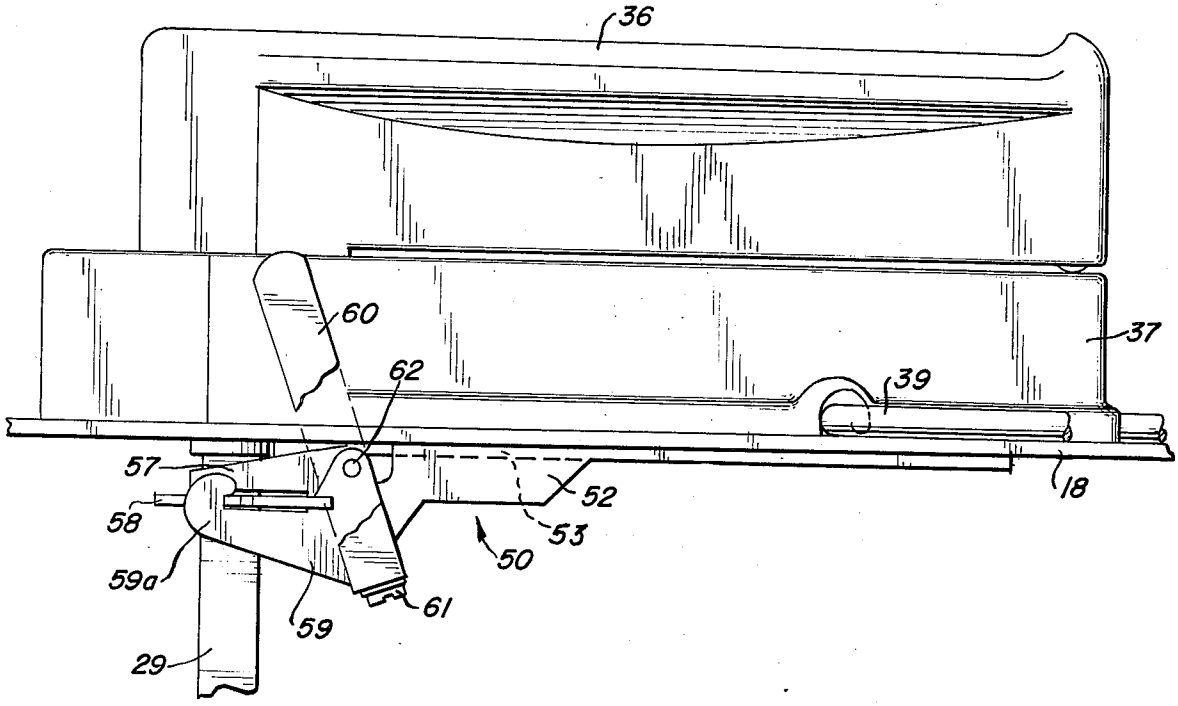
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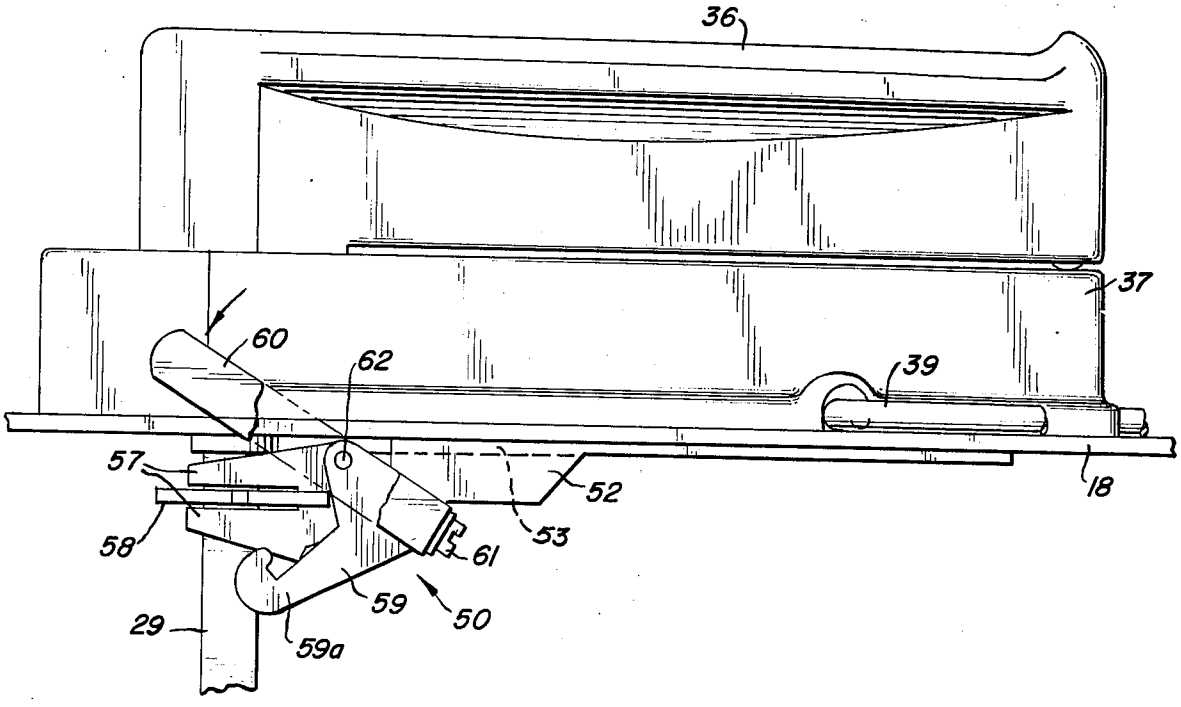
FIG. 9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# FLANGE MOUNTED OPERATOR FOR AN ENCLOSED ELECTRIC CIRCUIT BREAKER

This invention relates generally to operating mechanisms for enclosed circuit breakers, and more particularly to a flange mounted operator including interlock means comprising an external operating handle which is normally positioned to mechanically interfere and thereby prevent the opening of the cover of the enclosure when the circuit breaker is ON and an additional interlock which prevents turning the circuit breaker ON when the cover is open.

In such operating mechanisms, it is desirable to be able to disengage the handle of the operator from the operating mechanism thereby to provide access to the circuit breaker within the enclosure when the circuit breaker is in the ON position. Further, it is desirable that there is an indication of the true position of the circuit breaker handle regardless of the position of the handle of the operating mechanism.

Accordingly, it is an object of the present invention to provide an improved external operator for an enclosed circuit breaker which includes an interlock for preventing opening of a cover of the enclosure when the circuit breaker is ON and for preventing turning the circuit breaker ON when the cover of the enclosure is open.

It is a further object to provide an improved circuit breaker operator having a handle movable to a fixed position and lockable in such position to maintain a settable operating handle of the circuit breaker in either its ON or OFF position against manual movement thereof.

Another object is to provide an improved means for indicating the position of a handle of an enclosed circuit breaker regardless of the position of an external handle of an operator for the circuit breaker.

Other objects and advantages of the invention will appear when the following specification is considered together with the accompanying drawings, in which:

FIG. 1 is a partially exploded perspective view of a flange mounted operator in accordance with this invention for a molded-case electric circuit breaker contained within an enclosure, portions of the enclosure being removed for clarity;

FIG. 2 is a front view of a handle assembly of the operator shown in FIG. 1, the handle being in the OFF position and a locking hasp being in an operative position;

FIG. 3 is a side view of the handle assembly of FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view taken along the line 4—4 of FIG. 3;

FIG. 5 is a fragmentary front view of the handle operator and enclosure with the handle of the operator positioned in interfering relation with a cover of the enclosure;

FIG. 6 is an enlarged fragmentary sectional view taken along the line 6—6 of FIG. 3 showing rotated positions of a key of the operating handle;

FIG. 7 is a fragmentary view, partially in section, of a defeater mechanism shown in broken lines in FIG. 3;

FIG. 8 is a side view of the handle assembly of the operator with a handle interlock in its latched position;

FIG. 9 is a view similar to FIG. 8 except that the handle interlock is in its unlatched position;

FIG. 10 is a top view of the handle assembly showing the interlock mechansim; and



FIG. 11 is a fragmentary view showing a latch plate of the interlock mechanism in engagement with a handle latch member of the interlock mechanism.

Referring principally to FIG. 1, an operator 10 constructed in accordance with this invention is shown as associated with a molded case circuit breaker 12 within an enclosure or box 14. The circuit breaker 12, for example, may be one such as disclosed in U.S. Pat. No. 3,345,591 of James H. Leonard et al. which issued Oct. 3, 1967.

Such a circuit breaker includes a settable operating handle which is rockable between ON and OFF positions. Snap-action lost motion means, including over-center springs, connect the settable operating handle to a movable contact carrier so that when the settable handle is moved manually a predetermined distance partway toward either ON or OFF positions, selectively, the movable contacts are moved with a snap motion to the final position towards which the handle is being moved or rocked.

The settable operating handle can be rocked a considerable distance in either selected direction before the over-center springs of the circuit breaker become effective to drive the movable contact carrier. Until the handle reaches the position at which the over-center springs drive the carrier, it is biased by the springs to return to the position opposite to that in which it is being moved manually. When the springs do operate, the settable handle is moved to, and yieldably held in, the final position toward which it was being moved manually.

The circuit breaker 12 is mounted on a back wall 16 of the enclosure 14. The enclosure 14 has a side wall 17 which is provided with a flange 18 forming a marginal front wall, and has the usual other side walls (not shown). An open front of the enclosure 14 is closed by a cover 15 hinged along a front edge of a side wall (not shown) opposite the side wall 17.

The operator 10 includes a linkage assembly 19 mounted on a front surface of the circuit breaker 12 in driving relation with a settable operating handle 20 of the circuit breaker 12. The assembly 19 is held in place by screws 25, which also serve to hold the circuit breaker 12 on the back wall 16, and comprises a four bar linkage with the handle 20 passing through an opening 24 in an operating link 21 at approximately the mid-point thereof. The linkage assembly 19 includes a fixed link or base plate 22 held in place on the front surface of the circuit breaker 12 by the mounting screws 25, the operating link 21 being pivotably connected adjacent one of its ends to the base plate 22 by a fixed pivot pin 23 received in a slot 21*a* in the link 21 and adjacent the other of its ends being pivotally connected to one end portion of a connecting link 26 by a pin 27. Pivotably connected to the link 26 at its other end portion is an end portion of a driving link 28. Connected to the linkage assembly 19 is a drive shaft 29 which is secured in and preferably passes through a complementary opening in the link 28 adjacent the other end portion thereof. The drive shaft 29, which most conveniently may be of square cross-section throughout most of its length, is operatively connected at its outer end portion to a handle assembly 31 of the operator 10.

Pivotally mounted guard members 30 are provided in the opening 24 in the link 21 to smoothly engage the operating handle 20. An enlarged head portion 32 of

the pin **27** extends rearwardly of the assembly **19** and has a circumferential groove **33** slideably engaging a longitudinal edge **22***a* of the base plate **22** for maintaining the links **21, 26,** and **28** of the assembly **19** in mutual alignment during operation of the handle assembly **10.**

An electric interlock in the form of a snap switch **34** is mounted on the mounting plate **22** for a purpose to be described.

The handle assembly **31** is mounted on the front surface of the flange **18** of the enclosure **14** and comprises an operating handle **36** and a base **37.** The base **37** has indicia **38***a* of an indicating means **38** (FIG. **2**) printed or formed thereon at an upper portion thereof (as viewed in FIG. **1**), and a locking hasp **39** is pivotally mounted at a lower portion of the base **37** by having end portions of the hasp **39** trapped in a recess between the base **37** and the surface of the flange **18** defined by a transverse slot **37***a* in the base.

As shown best in FIG. **3,** an outer end portion **29***a* of the drive shaft **29** is cylindrical and is received in a complementary socket formed in an inner end portion of a cylindrical shaft **40** of the handle assembly **31** and is secured to the shaft **40** by a suitable pin **40***a*. The shaft **40** is rotatably mounted within the upper portion (as viewed in FIG. **1**) of the base **37** and a retaining ring **41** suitably received in a groove in the shaft **40** prevents outward or forward movement of the shaft **40** with respect to the base **37.**

The operating handle **36** of the handle assembly **31** is mounted for limited pivotable movement on an enlarged outer end portion **40***b* of the shaft **40** as will be described, the outer end portion **40***b* of the shaft **40** being received in a complementary socket in the handle **36.** The handle **36** is retained on the shaft **40** by a spring loaded key **43** mounted in the handle **36.**

The defeater mechanism **42** of the operator **10** is enclosed by the handle **36** and includes the spring loaded key **43** (FIG. **6** and **7**) slidably received in a recess in the handle **36** and having an end portion normally received in a slot **40***c* in the shaft **40** and held therein by a compression spring **47.** The key **43** thus normally rigidly couples the handle **36** to the rotatable shaft **40.** Because the shaft **40** is rigidly coupled to the drive shaft **29** by the pin **40***a*, the handle **36** directly transmits torque applied to the handle **36** through the shafts **40** and **29** to the linkage assembly **19** thereby to operate the settable handle **20** of the circuit breaker **12.**

In the OFF position of the handle assembly **31,** the settable handle **20** of the circuit breaker **12** is in the OFF position, and the handle **36** is aligned with and overlies the base **37** as shown in FIG. **2** and **3.** To move the circuit breaker **12** to its ON position, the handle **36** is moved to a position which is diagonal with respect to the base **37** and lies in interfering relation across the face of the cover **15** as shown in FIG. **5.** Thus, when the settable handle **20** of the circuit breaker **12** is in the ON position and the cover **15** is closed the handle **36** prevents opening of the cover.

It is sometimes desirable for certain maintenance purposes to be able to open the cover **15** when the circuit breaker is ON. For this purpose the defeater mechanism **42** including the key **43** is provided. An opening **36***a* extending inwardly from the front surface of the handle **36** provides access to the key **43** and is aligned with a slot **43***a* in the key **43** as best shown in FIG. **2.** By means of a screwdriver or similar tool engaging the slot **43***a* as shown in FIG. **7,** the key **43** may be disengaged from the slot **40***c* to permit limited movement of the key along a circumferential groove **44** in the shaft **40** to the position shown in phantom in FIG. **6** to permit movement of the handle **36** from the ON position of FIG. **5** to the OFF position of FIG. **2** without turning the shafts **29** and **40,** thus leaving the circuit breaker handle **20** in the ON position. The handle **36** now overlies the base **37** even though the settable handle **20** is in the ON position. The handle **36** must be physically retained in that position either manually or by the locking hasp **39** when the circuit breaker **12** is ON because the handle **36** is normally biased by a handle return spring **46** (FIG. **4**) toward the position on the shaft **40** where the key **43** would be forced into the slot **40***c* by the compression spring **47.** The handle return spring **46** curves around the shaft **40** as seen in FIG. **4** and is held at one end on a pin **46***a* secured to the shaft **40** and at the other end on an integral pin **46***b* formed on the underside of the handle **36.**

The locking hasp **39** may be rotated upwardly to overlie the operator handle **36** at a lower end portion thereof to maintain the handle **36** in the OFF position. One or more padlocks (not shown) may be secured to the locking hasp **39** to prevent rotation thereof and lock the handle **36** in the OFF position. Due to the defeater mechanism **42,** the circuit breaker handle **20** may be in the ON or OFF position when the operator handle **36** is locked in the OFF position. Although the circuit breaker handle **20** may be locked externally in the ON position, the contacts (not shown) of the breaker **12** will open if the breaker is tripped by a push-to-trip button or an electrical fault and the handle **20** will be moved to a TRIP position by the internal structural mechanism of the breaker.

In addition to the indicia **38***a*, the indicating means **38** includes a pointer **48** rigidly secured to the shaft **40** so as to indicate the position of the handle **20.** Since the pointer **48** is rigidly secured to the shaft **40,** rotation of the handle **36** with respect to the shaft **40** does not affect the position of the pointer **48** and the true position of the handle **20** is always shown by the position of the pointer **48.**

A lost motion connection is provided between the operating link **21** and the base plate **22** at the pivot pin **23.** As mentioned, the pin **23** is received in the slot **21***a* in the link **21.** A torsion spring **51** having a coiled end portion **51***a* and a yieldable end portion **51***b* is secured to a down-turned ear **21***b* of the link **21** at the coiled end portion **51***a*. The yieldable end portion **51***b* engages the pin **23** at the open side of the slot **21***a* to limit the load applied to the circuit breaker handle **20.** If excessive force is applied to the operator handle **36,** the spring **51** yields and allows the link **21** to pivot about the circuit breaker handle **20** until the pin **27** strikes a stop at the lower end of the edge **22***a*.

Normally the cover of the enclosure **14** cannot be opened when the circuit breaker **12** is ON because the handle **36** is positioned across the face of the cover **15** (see FIG. **5**) when the circuit breaker **12** is ON. However, it is desirable to have additional interlock means to prevent moving the handle **36** from the OFF position of FIG. **2** to the ON position of FIG. **5** when the cover is open.

Referring now to FIGS. **1** and **8–11,** a latch assembly or interlock mechanism **50** for this purpose comprises a handle latch bracket **52** on the innerside of the flange

18 having tapped holes 54 which are aligned with openings in the operator base 37 and corresponding openings in the flange 18, the aligned openings receiving screws 56 which secure the handle latch bracket 52 to the inner side of the flange 18 and the base 37 to the outer side of the flange 18. The bracket 52 has a bight portion 53 and jaws or jaw portions 57 which extend outwardly and forwardly from opposite sides of the bight portion 53 to lap the shaft 29. A rounded latch plate 58 having a square opening at its center is slideably mounted on the shaft 29. The plate 58 is retained between upper and lower portions of the jaws 57. A generally U-shaped latching member 59 engages a shoulder defined by a radially enlarged portion 58*a* (FIG. 11) of the plate 58 to prevent rotation of the plate 58 and the shaft 29. The generally U-shaped latching member 59 has a bight portion 59*b* (FIG. 10) and latch-type leg portions 59*a* which overlap the jaw portions 57 and are suitably attached to the bracket 52 at an inner end portion of the jaws 57 by a pin 62 as shown in FIGS. 8–10. An L-shaped actuating lever 60 has a base portion attached to the bight portion 59*b* of the latching member 59 by screws 61 and a leg portion extending above the frontal plane of the enclosure 14 when the cover 15 is open. The latching member 59 is biased by a torsion spring 63 (FIG. 10) which wraps around the pin 62 and has one end portion engaging an upper wall of the latch bracket 52 and a second end portion engaging the bight portion 59*b* of the latching member 59. The latching member 59 is biased to engage the latch plate 58 when the cover is open to prevent movement of the operator handle 36 and the circuit breaker handle 20 to the ON position. When the lever 60 is moved downwardly, as by the closing of the cover 15 of the enclosure 14, the latching member 59 is disengaged from the latch plate 58 and moved to the position shown in FIG. 9, permitting rotation of the shaft 29 and the operator handle 36 and movement of the circuit breaker handle 20 to the ON position.

An electrical interlock which permits switching of control circuits in sequence with the circuit breaker 12 includes the snap switch 34 (FIG. 1) which is secured to the linkage mounting plate 22 by mounting screws 64 and is activated by a slider 65 mounted on a post 22*a* associated with the plate 22 and is biased toward the link 21 by a spring 66. The slider 65 is a generally U-shaped member having upturned leg portions 68 and 69 and a ramp 67 in the bight portion thereof. The leg portion 68 has an opening therein which receives the post 22*a*, the spring 66 having ends which abut the leg portion 68 at one end and the edges at the base of the post 22*a* at the other end. Slots 69*a* on opposite sides of the leg portion 69 receive edges of the plate 22 to maintain the movement of the slider 65 in a plane parallel to the plate 22. The ramp 67 on the slider 65 operates the snap switch 34, which is seated on the plate 22 between leg portions 68 and 69, through the movement of the circuit breaker handle 20. When the operator 10 moves the circuit breaker handle toward the ON position, the link 21 pushes the leg portion 69 on the slider 65 to operate the snap switch 34 before the circuit breaker 12 is turned ON. When the operating link 21 moves the handle 20 toward the OFF position, the spring 66 engages the leg portion 68 to bias the slider 65 toward the link 21. The body of the switch 34 restricts movement of the slider 65 by engagement with the leg portion 68. The slider 65 operates the snap switch 34 before the circuit breaker 12 is turned OFF to turn off control circuit devices before the breaker contacts open, thus permitting the breaker to open under no-load conditions.

We claim:

1. An enclosed circuit breaker and external operating mechanism therefor comprising an enclosure having a rear wall opposite a front access opening, a hinged cover for the access opening closeable against a front wall flange defining an edge of the access opening, a molded case circuit breaker mounted on the rear wall and having a front-facing settable operating handle pivotable about an axis between ON and OFF positions, a driving member passing through an opening in the flange and extending inwardly of the enclosure toward the circuit breaker, connecting means associated with the inner end portion of the driving member for movement in a first plane between first and second positions upon rotation of said driving member in opposite directions and connected to the handle of the circuit breaker to move said handle in a plane transverse to said first plane between said ON position when said connecting member is moved to said first position and said OFF position when said connecting member is moved to said second position, an exterior operating handle mounted on the driving member for rotating the operating member and being pivotable between ON and OFF positions corresponding respectively to the ON and OFF positions of the circuit breaker handle, and releasable means interconnecting the pivotally mounted handle and the driving member, said releasable means being movable between an engaged and disengaged position, whereby in said disengaged position the handle may be freely rotated relative to the driving member between said ON and OFF positions, and in said engaged position said handle and said driving member are connected to rotate together between said ON and OFF positions.

2. An enclosed circuit breaker and external operating mechanism as claimed in claim 1 wherein the releasable means comprises a key slot in the driving member, an arcuate peripheral groove coextensive with the key slot, a spring-biased key in the external handle received in the key slot, and a handle return spring peripherally mounted on the driving member which biases the key of the external handle toward the key slot of the driving member.

3. An enclosed circuit breaker and external operating assembly as claimed in claim 1 wherein the external handle assembly has indicating means thereon for indicating the position of the operating handle of the enclosed circuit breaker.

4. An enclosed circuit breaker and external operating mechanism as claimed in claim 2 wherein the indicating means includes a scale mounted on the handle assembly and a pointer rigidly mounted on the driving member, said pointer being rigidly mounted on the driving member to indicate the true position of the operating handle of the circuit breaker.

5. An enclosed circuit breaker and external operating mechanism as claimed in claim 1 wherein the external handle has indicating means for indicating the true position of the operating handle of the circuit breaker, said indicating means including a scale on the external handle and a pointer rigidly mounted on the driving member of the handle assembly, said pointer so mounted that disengagement of the external handle

from the keyed slot for limited pivotal movement along the peripheral groove of the driving member will not cause corresponding movement of the pointer, whereby the true position of the operating handle of the enclosed circuit breaker is indicated regardless of the position of the external handle.

**6.** An enclosed circuit breaker and external operating mechanism as claimed in claim **1** wherein the operating mechanism has interlock means for preventing operation of the external handle when the cover is open.

**7.** An enclosed circuit breaker and external operating mechanism as claimed in claim **6** wherein the interlock means comprises a latch assembly secured on an inner surface of the enclosure opposite the external handle, the latch assembly being operatively connected to the driving member of the handle operating mechanism and including a latch bracket suitably secured to the underside of the front flange of the enclosure, the latch bracket having upper jaw-like portions, the jaw portions of the latch bracket retaining a latch plate, the latch plate having an opening therein which receives the driving member of the operating mechanism and operates in cooperation therewith, a latching member suitably secured to the jaw portion of the latch bracket, the latching member biased to engage the latch plate and thereby prevent movement of the driving member of the operator mechanism, an actuating lever rigidly secured to the latching member and extending above the frontal plane of the enclosure, the latching member being disengageable from the latch plate when the actuating lever is engaged by the cover and moved toward the frontal plane of the enclosure thereby.

* * * * *