July 25, 1967 J. M. MICHAELSON, JR 3,333,079

SWITCH OPERATOR COMPRISING A ROTATABLE SWITCH ACTUATOR

Filed Oct. 7, 1965 2 Sheets-Sheet 1

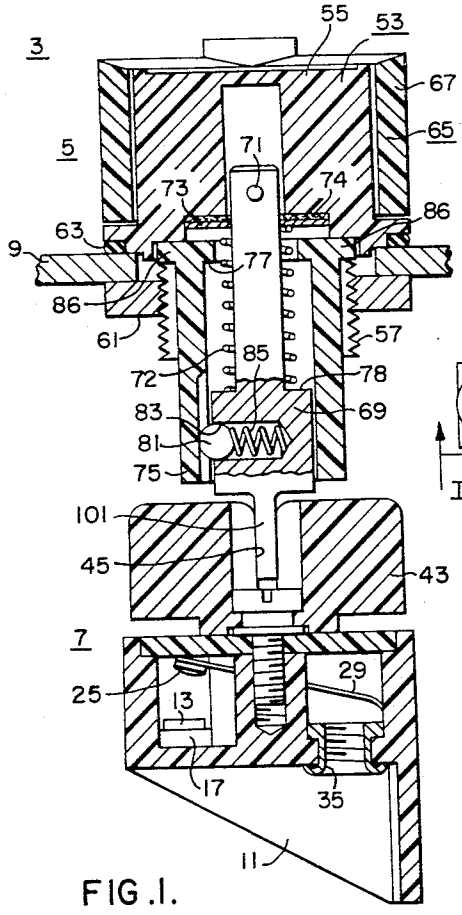


FIG. 1.

FIG. 2.

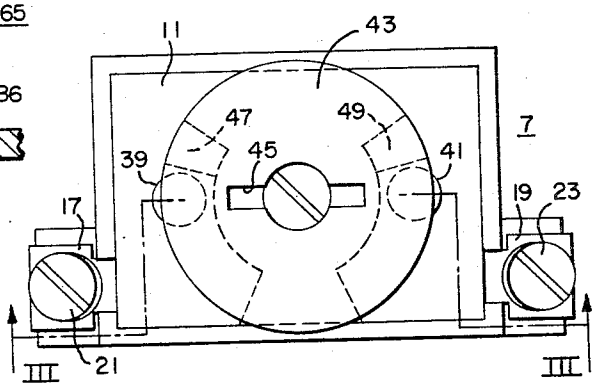
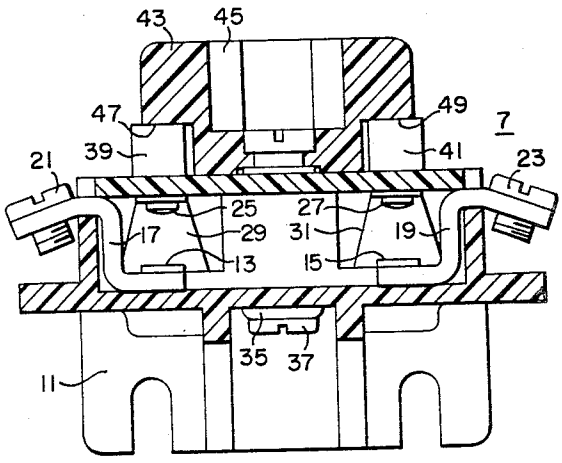


FIG. 3.



WITNESSES

Edwin E. Barnes

James F. Young

INVENTOR

Joseph M. Michaelson, Jr.

BY

William A. Elchik

ATTORNEY

July 25, 1967 J. M. MICHAELSON, JR 3,333,079

SWITCH OPERATOR COMPRISING A ROTATABLE SWITCH ACTUATOR

Filed Oct. 7, 1965 2 Sheets-Sheet 2

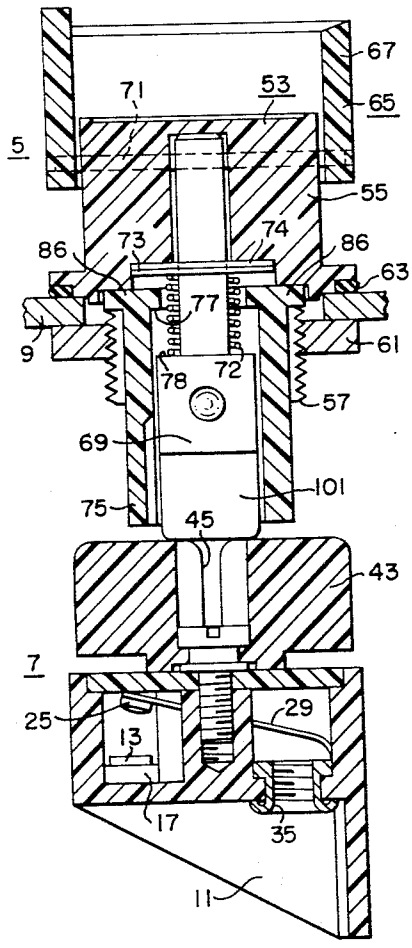


FIG. 4.

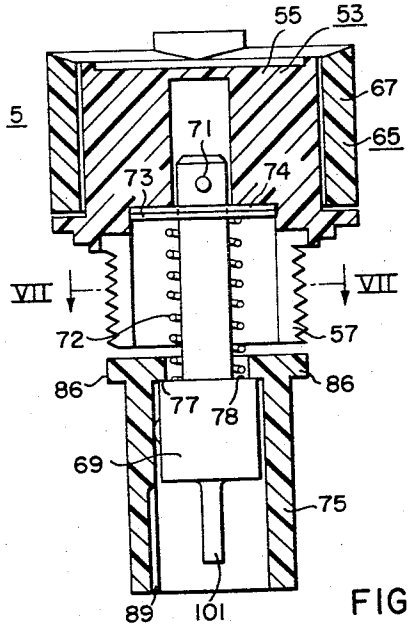


FIG. 5.

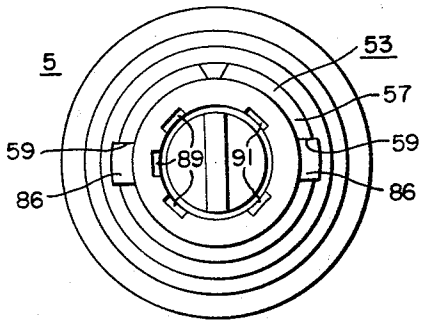


FIG. 6.

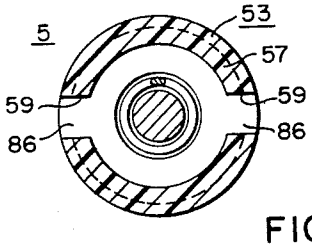


FIG. 7.

United States Patent Office 3,333,079 Patented July 25, 1967

3,333,079

SWITCH OPERATOR COMPRISING A ROTATABLE SWITCH ACTUATOR

Joseph M. Michaelson, Jr., Beaver, Pa., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Oct. 7, 1965, Ser. No. 493,822
10 Claims. (Cl. 200—172)

This invention relates generally to switch operators and more particularly to switch operators of the type comprising a rotatable actuator.

In the switch art, it is often desirable to provide a contact block and switch operator as separate structures. With this arrangement, the contact block can be mounted within an enclosure and the switch operator can be mounted for external operation on the enclosure cover to cooperate with the contact block when the cover is moved into the closed position. In order to eliminate the need for manufacturing and stocking different types of operators, and also to provide a structure with increased utility, it is desirable to provide a switch operator that can be converted to provide different numbers of operating positions. For example, it is desirable, for certain switches, to provide a switch operator that can be converted between two-position and three-position operation.

Accordingly, an object of this invention is to provide an improved switch operator that can be readily converted to provide different numbers of operating positions.

Another object of this invention is to provide an oil-tight convertible switch operator.

Another object of this invention is to provide a switch operator that may be mounted on an enclosure cover which operator is constructed to permit movement of the enclosure cover to the closed position when the operator is misaligned with the enclosed contact block and which operator comprises means providing a visual indication of misalignment when the cover is in the closed position.

The invention, both as to structure and operation, together with additional objects and advantages thereof, will be best understood from the following detailed description when read in conjunction with the accompanying drawings:

In said drawings:

FIGURE 1 is a sectional view, with parts broken away, of a switch structure comprising a contact block and a switch operator mounted on an enclosure cover to cooperate with the contact block;

FIG. 2 is a plan view of the contact block seen in FIG. 1;

FIG. 3 is a sectional view taken generally along the line III—III of FIG. 2;

FIG. 4 is a sectional view similar to FIG. 1 except that the switch operator is in a misaligned position wherein there is no operative driving connection between the switch operator and the contact block;

FIG. 5 is a sectional view of the switch operator with the position indexer positioned such that the indexer can be rotated to change the operating characteristics of the switch operator;

FIG. 6 is a bottom plan view of the switch operator seen in FIG. 5; and

FIG. 7 is a sectional view taken generally along the line VII—VII of FIG. 5.

Referring to the drawings, there is shown in FIGURE 1 a switch structure 3 comprising a switch operator 5 and and a contact block or contact device 7. The contact block 7 may be mounted within an enclosure and the switch operator 5 is adapted to be mounted on the enclosure cover, part of which is disclosed at 9, to cooperate with the contact block 7 when the cover is in the closed position.

The contact block 7 comprises a molded insulating housing 11. Two stationary contacts 13 and 15 are mounted in the housing 11 in a spaced relationship. The stationary contacts 13, 15 are welded or otherwise suitably secured to terminal conductors 17, 19 respectively, which conductors protrude out through suitable openings in the housing. Screw members 21, 23 are secured at the external ends of the conductors 17, 19 to permit connection of the contacts 13, 15 in electric circuits. Separate movable contacts 25, 27 are mounted on the free ends of resilient conducting contact arms 29, 31 respectively to cooperate with the contacts 13, 15. Each of the conducting contact arms 29, 31 is electrically connected to a tapped conductor 35. A screw 37 is provided to cooperate with the tapped conductor 35 to enable connection of the contact arms 29, 31 in electric circuits. Two plungers 39 and 41 are disposed for axial movement in suitable openings in the housing 11 with each plunger resting on a different one of the contact arms 29, 31. As can be seen in FIG. 3, the plungers 39, 41 protrude out from the housing 11 to cooperate with a molded insulating contact operator 43. The contact operator 43 comprises a molded insulating member having a slot 45 therein. The contact operator 43 is rotatably mounted on the housing 11, and the operator is formed with opposite cam surfaces 47 and 49 for operating the plungers 39, 41. When the contact block 7 is mounted for operation, suitable conductors may be connected to the terminal conductors 17, 19, 35 to provide for control of certain circuits.

The contact block 7 is shown in FIG. 3 with the contact operator 43 in a first position wherein both of the plungers 39, 41 are in the upper position and wherein the movable contacts 25, 27 are both in the open position. The cam surfaces 47, 49 are shaped such that upon rotation of the contact operator 43 in a counterclockwise (FIG. 2) direction to a second position the plunger 41 will remain in open position seen in FIG. 3 and the plunger 39 will be forced downward to move the resilient contact arm 29 downward to close the contacts 13, 25. Upon rotation of the contact operator 43 in a clockwise direction back to the center or first position the cam surface 47 will be moved to permit the charged resilient contact arm 29 to spring back to the open position moving the contact 25 and plunger 39 back to the open or first position seen in FIG. 3. Upon rotation of the contact operator 43 in a clockwise (FIG. 2) direction from the first to a third position the plunger 39 will remain in the upper position seen in FIG. 3 and the plunger 41 will be actuated downward to flex the resilient contact arm 31 downward to close the contacts 15, 27. If the contact operator 43 is then rotated in a counterclockwise direction back to the first position, the cam surface 49 will permit the movement of the plunger 41 upward so that the charged resilient contact arm 31 will spring back to the open position moving the plunger 41 and movable contact 27 back to the open or initial position seen in FIG. 3. The cam surfaces 47, 49 are shaped such that the three positions of the operator 43 are stable positions. Thus the operator 43 will remain in the position to which it was last actuated. The contact block can be wired to provide either a single circuit from the terminal 17 to the terminal 35, a single circuit from the terminal 31 to the terminal 35, or two separate circuits one from each of the separate terminals 17, 31 to the common terminal 35.

Referring to FIGS. 1 and 4–7, the switch operator 5 comprises a support 53 comprising an upper part 55 and a lower tubular threaded part 57. The lower tubular threaded part 57 of the support 53 is provided with two oppositely disposed slots 59 (FIGS. 6 and 7). When it is

desired to mount the switch operator 5 on a mounting plate or cover 9, the lower part 57 of the switch operator is passed through a suitable opening in the cover 9 and a nut 61 (FIGS. 1 and 4) is threaded on the terminal lower part 57 to secure the support 53 in the mounted position. An O-ring gasket 63, that is disposed in a suitable slot in the support 53, is compressed between the support 53 and the outer surface of the cover 9.

The switch operator 5 also comprises a rotatable switch actuator 65. The actuator 65 comprises an outer tubular molded insulating part 67 and an inner metallic driving part 69. The driving part 69 is connected to the outer part 67 by means of a pin 71 (FIGS. 1, 4 and 5). A spring member 72 biases the actuator 65 downward to the operating position seen in FIG. 1. The pin 71 is positioned in opposite slots (not shown) in the part 55 of the support 53 which slots are shaped to permit axial and rotating movement of the actuator 65 relative to the support 53. In order to prevent the passage of oil and other foreign matter into the switch through these slots in the support part 55 a washer 73 and washer gasket 74 are positioned between the spring 72 and support part 55. A molded insulating tubular position indexer 75 is disposed over the driving part 69 of the actuator. A ledge 77, on the position indexer 75 engages a shoulder 78 on the driving part 69 to prevent movement of the indexer 75 off of the driving part 69. A ball bearing 81 (FIG. 1) is disposed in a hole 83 in the driving part 69 of the rotatable actuator 67. The bearing 81 is biased outward into engagement with the indexer 75 by means of a compression spring 85.

When the switch operator is assembled, the spring 85 and bearing 81 are positioned in the hole 83 in the driving part 69 of the actuator 65 and the indexer 75 is moved into position over the top part of the driving part 69 to capture the bearing 81 in position. Thereafter, the driving part 69 and position indexer 75 are moved into the position seen in FIG. 1 relative to the support 53 to capture a compression spring 72 between the shoulder 78 and the washer 73. Two oppositely disposed ear projections 86, on the position indexer 75 move within the two slots 59 (FIGS. 6 and 7) in the part 57 of the support during this mounting operation. The outer tubular part 67 of the actuator 65 is then placed in position over the outer part 55 of the support 53 and the pin 71 is mounted through suitable openings in the parts 67 and 69 of the actuator 65, and through the slots (not shown) in the part 55, to secure the parts 67, 69 together. When the switch operator is mounted on the cover plate 9 the nut 61 will engage the projections 86 on the position indexer 75 to limit downward movement of the indexer 75.

Referring to FIG. 6, it is to be noted that the position indexer 75 is provided with three adjacent slots 89 at the inner surface thereof and two adjacent slots 91 opposite the three slots 89. The slots 89 and 91 are provided to receive the ball bearing 81 (FIG. 1) to index the positions of the switch actuator 65. The pin 71 (FIGS. 1 and 4) engages stop portions on the support 53 to limit rotating movement of the actuator 65 relative to the support 53. The actuator 65 is limited to rotation of not more than 180°, with the extremes of the rotation being simultaneous with the extreme opposite indexed positions in a manner that will be hereinafter described. The two ear projections 86 of the position determiner (indexer) 75 fit in the opposite slots 59 of the inner part 57 of the support 53 to prevent rotation of the indexer 75 relative to the support 53. When the position indexer 75 is in a first mounted position the bearing 81 cooperates with the three slots 89 (FIG. 6) of the indexer 75 to index three positions of the actuator 65. Thus, as the actuator 65 is rotated to each of the three actuated positions the bearing 81 will be spring biased to click into the adjacent slot 89 to index the position of the actuator 65. When it is desired to convert the switch operator to two-position operation, the position indexer 75 is first moved downward to the position seen in FIG. 5 wherein the ear projections 86 are clear of the slots 59. The position indexer 75 is then rotated 180° and then moved back up into the mounted position during which mounting movement the projections 86 move into the slots 59 of the support 53. If the position indexer 75 is repositioned when the switch operator 5 is on the cover plate 9, the nut 61 must first be removed to permit downward movement of the projections 86 in the slots 59. This re-positioning of the position indexer 75 positions the two slots 91 (FIG. 6) opposite the bearing 81 so that only two positions of the actuator 65 will be indexed. During the two-position operation, the bearing 81 will click into only the two slots 91 rather than the three slots 89 as was the case for the three-position operation. The switch can be converted back to three-position operation by moving the indexer 75 out to the position seen in FIG. 5 and rotating the indexer 75 180° and then moving the indexer 75 back up into the mounted position thereby positioning the indexer 75 to receive the bearing 81 at the three slots 89 during rotation of the actuator 65.

As was hereinbefore set forth, the O-ring seal 63 is provided between the support 53 and cover 9 to prevent the passage of oil and other foreign matter into the enclosure from outside of the cover 9. The back-up washer 73 and washer gasket 74 are provided between the upper end of the compression spring 72 and the adjacent surface of the support part 55 to prevent the passage of oil and other foreign matter into the enclosure through the slots in the support part 55 which slots receive the pin 71 to permit movement of the actuator 65 relative to the support part 55, and which slots terminate above the washer gasket 74.

When the cover 9, with the switch operator 5 mounted thereon, is moved to the closed position on an enclosure a flat connecting part 101 of the driving part 69 of the switch actuator 65 automatically moves into the slot 45 in the contact actuator 43 of the contact block 7 to provide a driving connection between the rotatable switch actuator 65 of the switch operator 5 and the rotatable contact actuator 43 of the contact block 7. Thus, the contact actuator 43 will be rotated by rotation of the switch actuator 65 to thereby operate the contacts in the same manner hereinbefore described. If the switch actuator 65 is in a misaligned position when the cover 9 is moved to the closed position, the connecting part 101 thereof will engage the outer surface of the contact actuator 43 whereupon the actuator 65 will move upward to the position seen in FIG. 4 against the bias of the compression spring 72 permitting the cover 9 and switch operator 5 to be moved to the closed position without braking or damaging any of the parts of the switch operator 5 or contact block 7. During this closing movement of the cover 9 the part 67 of the switch actuator 65 is moved upward relative to the support 53 to the position seen in FIG. 4 to thereby provide a clear external visual indication that a driving connection has not been made between the switch operator 5 and the contact block 7. A driving connection can be made by merely rotating the actuator 65 to the proper position whereupon the connecting part 101 of the switch actuator 65 will be aligned with the slot 45 in the contact actuator 43 and the compression spring 72 will bias the switch actuator 65 downward and inward to the position seen in FIG. 1 in which position the connecting part 101 is in the slot 45 to provide an operative driving connection between the switch actuator 65 and the contact actuator 43.

From the foregoing, it can be understood that there is provided by this invention an improved switch operator that can be readily converted to provide different numbers of indexed operating positions. The switch operator is oil-tight to prevent the passage of oil and other foreign matter into an enclosure when the operator is mounted for external operation on the enclosure cover. The switch operator also comprises means permitting axial movement

of the switch actuator relative to the support, against the bias of a spring member, whereby the enclosure cover, with the switch operator mounted thereon, can be moved to the closed position without breaking or damaging parts when the switch actuator of the switch operator is not in alignment with the contact actuator of the enclosed contact block. During a cover closing operation when the parts are not in alignment the external part of the switch actuator is moved outward relative to the external support part of the switch to thereby provide a visual indication that the switch actuator is not operatively connected to the contact actuator. In this case, the switch actuator can be rotated to the proper position whereupon the switch actuator will be spring biased into the proper position wherein there is a driving connection between the switch actuator and the contact actuator.

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

I claim as my invention:

1. A switch operator for operating a rotatable contact actuator, said switch operator comprising a support, a rotatable switch actuator rotatably mounted on said support, a position indexer supported on said support in a first stationary position, a first indexing means on said rotatable switch actuator and position indexer cooperating when said position indexed is in said first stationary position to index said rotatable switch actuator for rotatable operation through a first number of positive positions, said position indexer being movable to a second stationary position on said support, and a second indexing means on said rotatable switch actuator and position indexer cooperating when said position indexer is in said second stationary position to index said rotatable switch actuator for rotatable operation through a second number of positive positions different from said first number.

2. A switch operator according to claim 1 wherein said switch operator is adapted to be mounted on a mounting plate in an opening on the mounting plate, said support comprising an external part and an internal part, said internal part comprising an externally threaded tubular-type part for receiving a securing nut on the inner side of said mounting plate to draw said external part toward the outer side of said mounting plate to secure said switch operator on said mounting plate.

3. A switch operator according to claim 2, said rotatable switch actuator comprising a tubular-type external part disposed over the external part of said support and an internal driving part disposed within the internal tubular-type part of said support, said position indexer comprising a tubular-type member disposed within said tubular-type part of said support and over said internal driving part of said rotatable switch actuator, a first notch means and a second notch means on the internal surface of said tubular-type position indexer, and bearing means biased away from said driving part toward said internal surface of said tubular-type position indexer, said first indexing means comprising said first notch means and said bearing means, and said second indexing means comprising said second notch means and said bearing means.

4. A switch operator according to claim 3 wherein said tubular-type part of said support and said position indexer comprise keying means to position said position indexer against rotation when said position indexer is in said first and second stationary positions.

5. The switch operator combination of claim 2, said external part of said support having gasket-receiving notch means therein receiving a gasket between said external part of said support and the outer side of said mounting plate whereby when said nut is tightened said gasket is compressed in said gasket-receiving notch means between said external part of said support and said outer side of said mounting plate to seal said opening in said mounting plate.

6. A switch operator for operating a separate contact structure of the type comprising a rotatable contact actuator, said switch operator comprising a support, a rotatable switch actuator rotatably mounted on said support, said rotatable switch actuator comprising a connecting part at the bottom thereof for operative connection with said rotatable contact actuator when said switch operator is moved toward said separate contact structure with said connecting part aligned with said rotatable contact actuator, said rotatable switch actuator being movable axially on said support, means biasing said rotatable switch actuator axially in a first direction to a normal position on said support whereby when said switch operator is moved toward said separate contact structure with said rotatable switch actuator in a mis-aligned position said connecting part will engage said rotatable contact actuator and said rotatable switch actuator will be moved axially on said support against the bias of said biasing means to prevent breakage of parts and to provide a visual indication of said mis-alignment, a position indexer in a first stationary position on said support to effect indexing of said rotatable switch actuator for rotatable operation through a first number of positive positions, said position indexer being movable to a second stationary position on said support to effect indexing of said rotatable switch actuator for rotatable operation through a second number of positive positions which second member is different from said first number.

7. A switch operator for operating a contact structure of the type comprising a rotatable contact actuator, said switch operator comprising a support, a rotatable switch actuator rotatably mounted on said support, said rotatable switch actuator being movable axially on said support, said rotatable switch actuator comprising a tubular part disposed over said support with said support being visible in front elevation through the opening in said tubular part, means biasing said rotatable switch actuator in a first direction to a normal position on said support whereby when said switch operator is moved toward a contact block with said rotatable switch actuator in a mis-aligned position said rotatable switch actuator will engage said contact structure and be moved axially on said support against the bias of said biasing means to prevent breakage of parts and to provide a visual indication of said mis-alignment.

8. A switch operator according to claim 7, a position indexer in a first position on said support to effect indexing of said rotatable switch actuator for rotatable operation through a first number of positive positions, said position indexer being movable to a second position on said support to effect indexing of said rotatable switch actuator for rotatable operation through a second number of positive positions which second number is different from said first number.

9. A switch operator for operating a rotatable contact actuator of a contact structure, said switch operator being adapted to be mounted on a mounting plate in an opening on the mounting plate, said switch operator comprising a support, said support comprising an external support part and an internal support part, said internal support part comprising externally threaded tubular-type part whereby a nut may be threaded on said threaded tubular-type part to draw said external support part toward the outside of said mounting plate to mount said support on said mounting plate, a rotatable switch actuator mounted for rotation on said support, said rotatable switch actuator comprising an external handle part and an internal driving part, said external handle part comprising a tubular structure disposed over said external support part with said external support part being visible in front elevation through the opening in said tubular structure, said rotatable switch actuator being movable axially on said support,

spring means biasing said rotatable switch actuator inward toward a normal position whereby when said switch operator is moved toward said contact structure with said rotatable switch actuator in a mis-aligned position said rotatable switch actuator will engage said contact structure and be moved axially on said support against the bias of said spring means to prevent damage of parts and to move said handle part axially relative to said external support part to provide an external visual indication of said mis-alignment.

10. A switch operator for operating a rotatable contact actuator of a contact structure, said switch operator being adapted to be mounted on a mounting plate in an opening on the mounting plate, said switch operator comprising a support, said support comprising an external support part and an internal tubular-type part having external threads thereon for receiving a nut whereby when said internal tubular-type part is passed through said opening in said mounting plate a nut may be threaded on said external threads to draw said external support part toward the outside surface of said mounting plate to secure said support on said mounting plate, a rotatable switch actuator rotatably mounted on said support and comprising an external tubular-type handle part disposed over said external support part, said rotatable switch actuator comprising an internal driving part disposed generally within said internal tubular-type part of said support, said external support part having slot means therein, connecting means passing through said slot means in said external support part and connecting said external handle part of said rotatable switch actuator with said internal driving part of said rotatable switch actuator, a tubular-type position indexer supported generally within the internal tubular-type part of said support and keyed against rotation relative to said support, said tubular-type position indexer being positioned over said internal driving part of said rotatable switch actuator to effect indexing of the operating positions of said rotatable switch actuator, said rotatable switch actuator being movable axially on said support, spring means biasing said rotatable switch actuator axially on said support to a normal position, when said switch operator is moved toward said contact structure to engage the rotatable contact actuator in a mis-aligned position said rotatable switch actuator moving axially against the bias of said spring means to prevent damage to parts and to move said handle part of said rotatable switch actuator axially relative to said external support part of said support to provide an external visual indication of said mis-alignment, said position indexer being in a first stationary position on said support to effect indexing of said rotatable switch actuator for operation through a first number of positive positions, said position indexer being movable to a second stationary position on said support to effect indexing of said rotatable switch actuator for operation through a second number of positive positions which second number is different from said first number.

References Cited

UNITED STATES PATENTS

2,927,168	3/1960	Brown	200—167
2,984,726	5/1961	Roeser	200—172

ROBERT K. SCHAEFER, *Primary Examiner.*

H. O. JONES, *Assistant Examiner.*