

Sept. 17, 1963

J. C. KOCI ETAL

3,104,299

ACTUATING MECHANISM FOR A THUMB WHEEL TYPE SWITCH

Filed Feb. 8, 1962

2 Sheets-Sheet 1

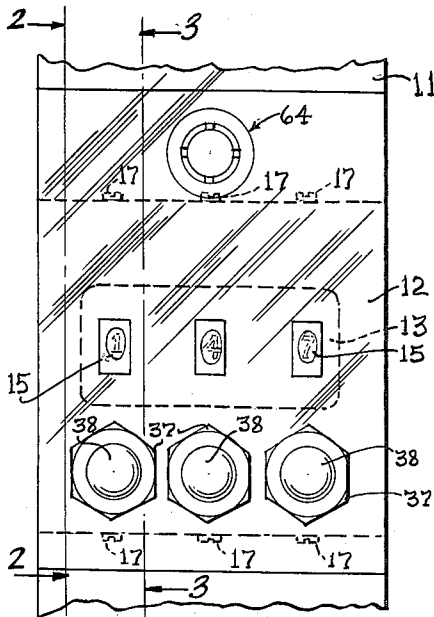


Fig. 1.

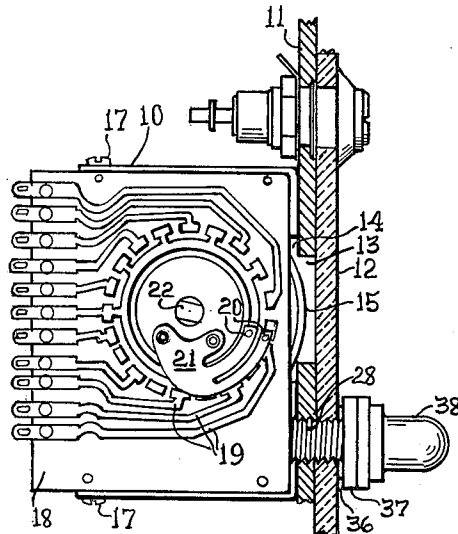


Fig. 2.

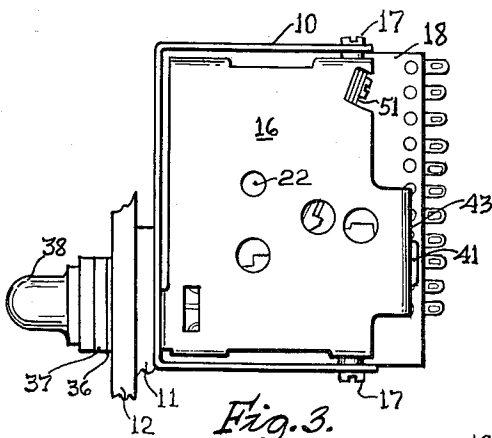


Fig. 3.

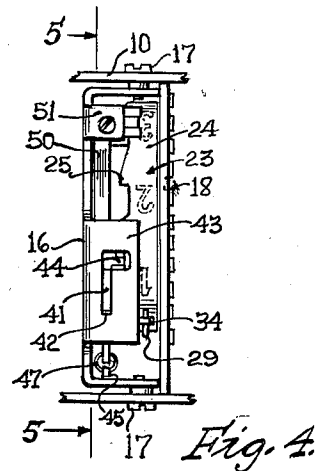


Fig. 4.

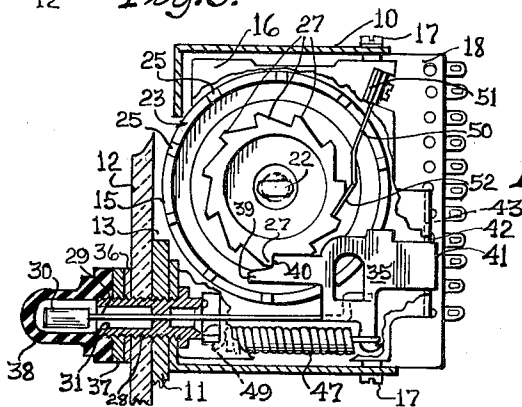


Fig. 5.

INVENTORS.  
JERRY C. KOCI &  
ALFRED HOLZ  
BY  
Hendy & Hendy  
THEIR ATTORNEYS.

Sept. 17, 1963

J. C. KOCI ETAL

3,104,299

ACTUATING MECHANISM FOR A THUMB WHEEL TYPE SWITCH

Filed Feb. 8, 1962

2 Sheets-Sheet 2

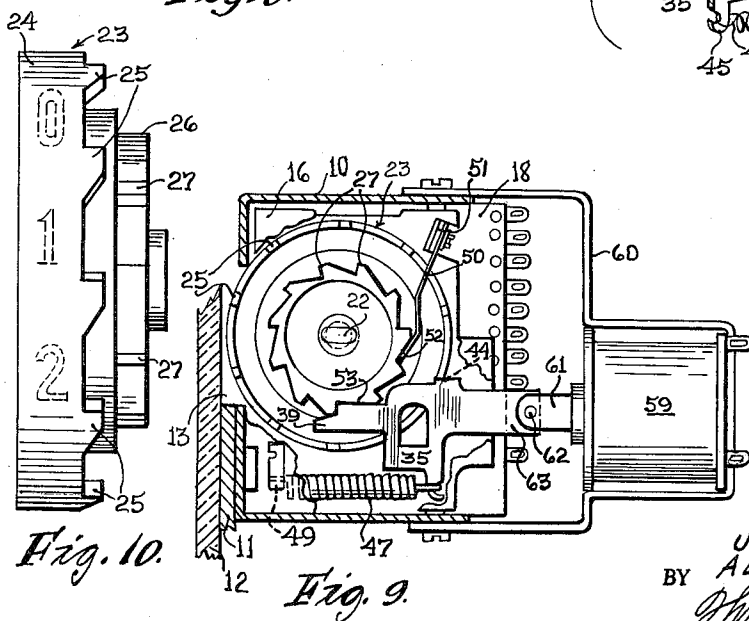
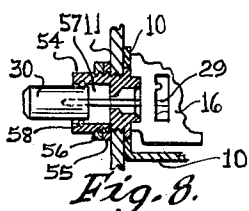
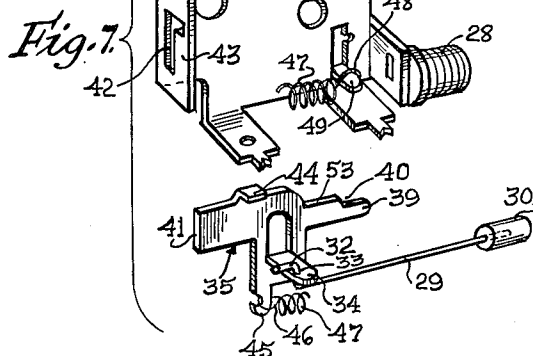
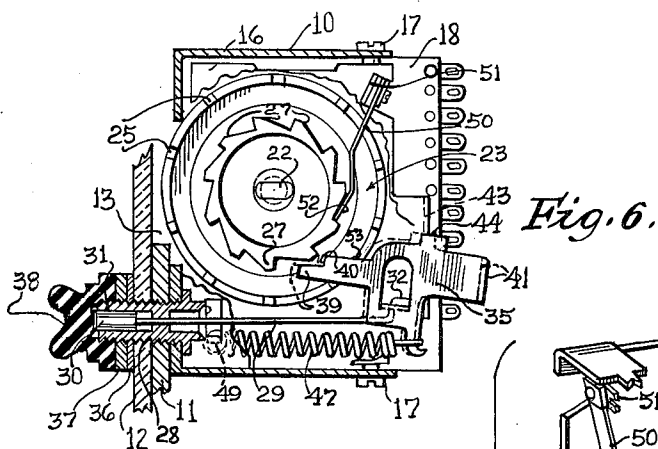


Fig. 10.

Fig. 9.

INVENTORS.  
JERRY C. KOCI &  
ALFRED HOLZ  
BY *Shredy & Shredy*  
THEIR ATTORNEYS.

1

3,104,299

## ACTUATING MECHANISM FOR A THUMB WHEEL TYPE SWITCH

Jerry C. Koci, Barrington, and Alfred Holz, Chicago, Ill., assignors to Chicago Dynamic Industries, Inc., Chicago, Ill., a corporation of Illinois

Filed Feb. 8, 1962, Ser. No. 171,870

8 Claims. (Cl. 200-156)

Our invention relates to a new and useful improvement in an actuating mechanism for a thumb wheel type switch and more particularly to a push button actuator for a thumb wheel type electrical switch.

A particular object of our invention is in the provision in a device of this character of a means whereby a thumb wheel type switch may be caused to be rotatably actuated by an external push button for selectively completing a plurality of electrical circuit connections.

Another object of our invention is in the provision in a mechanism of this character of an efficient means of sealing the thumb wheel switch and its actuator against moisture, dirt, and like foreign matter that would impair its operation.

A further object of our invention is in the provision in a mechanism of this character of an arrangement of parts by which the rotatable actuation of the thumb wheel switch is positively controlled so that the same may not be accidentally actuated. The arrangement of parts of the actuator is shock resistant and will permit rotatable actuation of the thumb wheel switch in a single direction.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which—

FIG. 1 is a fragmentary front elevational view of a series of installed thumb wheel type switches and their push button actuators.

FIG. 2 is a fragmentary detailed side sectional view of our invention.

FIG. 3 is a fragmentary side elevational view opposite to that of FIG. 2.

FIG. 4 is a rear elevational view of our invention.

FIG. 5 is a fragmentary side detailed sectional view taken on line 5—5 of FIG. 4.

FIG. 6 is a fragmentary detailed side view similar to FIG. 5 and showing a portion of the actuating mechanism in its operative position.

FIG. 7 is an exploded perspective view of certain parts of our switch actuating mechanism.

FIG. 8 is a fragmentary detailed sectional view of a modified form of a portion of our switch actuating mechanism.

FIG. 9 is a side sectional detailed view showing a modified electric mechanical switch actuating mechanism, and

FIG. 10 is a front elevational view of the switch thumb wheel as incorporated in our invention.

Our invention relates to an improvement in a switch actuating mechanism for a thumb wheel switch of the type shown and described in co-pending patent application of Jerry C. Koci et al., Serial No. 125,615, filed May 31, 1961.

The thumb wheel type switch is adapted to be mounted to a U-shaped frame member 10 which is in turn associated with a mounting panel 11 fragmentarily shown in FIG. 1. A transparent plate 12 is adapted to lie in confronting relation to the bracket 11 and thus provides a cover for window openings 13 and 14 formed in the mounting bracket 11 and frame 10 respectively. Through

2

the windows 13 and 14 a segment 15 of the periphery of the thumb wheel 23 may be viewed.

A mounting plate 16 is adapted to be removably connected by means of screws 17 to the spaced apart arms of the frame 10 as shown in FIG. 4. This mounting plate 16 carries a switch wafer blank 18. As shown in FIG. 2, the switch wafer blank 18 has printed thereon a plurality of electrical circuits 19 which are adapted to be engaged selectively by a plurality of arms 20 of a switch rotary blade 21. The switch rotary blade 21 is in turn rotatably connected to a shaft 22 which in turn fixedly supports the switch wheel 23. This shaft is rotatably journaled in a suitable bearing provided by the mounting plate 16. The switch wheel 23 is adapted to be rotatably positioned between the mounting plate 16 and the switch wafer blank 18 as seen in FIG. 4.

Referring to FIG. 10, it is shown that the switch wheel 23 is provided with a wide band periphery 24 upon which is carried switch-position indicia which, as seen in FIG. 1, may be viewed through the windows 13 and 14.

One edge of the band 24 of the switch wheel 23 is provided with laterally extending spaced apart stepped teeth 25. The switch wheel 23 is provided with a reduced hub 26 which has formed in its periphery stepped ratchet teeth 27. These latter teeth 27 are shown in FIGS. 5, 6, 9 and 10.

Carried by the frame 10 is a panel stud 28. This panel stud 28 is adapted to project through the mounting bracket 11 and transparent panel 12 as shown in FIGS. 2, 5, 6, and 8. This panel stud 28 slidably carries an actuating rod 29. The free end of the rod 29 terminates into an enlarged head 30 adapted to be slidably received within an enlarged internal bore 31 formed in the stud 28.

The opposite end 32 of the rod 29 is Z bent and has a portion projected through an opening 33 formed in a connecting finger 34 carried by an actuating pawl 35.

Exteriorly of the transparent panel 12 there is threaded upon the panel stud 28 a sealing washer 36. Threaded over the sealing washer 36 is a panel seal nut 37. Threaded outwardly on the panel stud 28 is a rubberized boot 38 which covers the enlarged head 30 of the actuating rod 29 as viewed in FIGS. 5 and 6. By this arrangement that portion of the actuating mechanism which extends exteriorly of the mounting bracket 11 and transparent panel 12 is effectively sealed against moisture, dirt, and like foreign matter which may impair the operation of those parts.

As before described, the inner end 32 of the actuating rod 29 is projected through an opening 33 formed in a finger 34 of an actuating pawl 35. This pawl 35 provides an actuating arm 39 which has a notched out portion 40 adapted to engage the flat side of the stepped teeth 27 carried by the reduced hub 26 of the switch wheel 23. The actuating pawl 35 provides a tail 41 which is slidably projected through an opening 42 formed in a partial back wall 43 of the mounting plate 16. The actuating pawl 35 also provides a stop stud 44 which, as viewed in FIG. 5, is normally engaged with the flat surface of one of the stepped teeth 25 carried by one edge of the wide band 24 of the switch wheel 23. This stop stud 44 prevents the switch wheel 23 from being rotated in a clockwise direction as seen in FIG. 5 when the actuating mechanism is not operated or in its normal position as seen in such figure.

The actuating pawl 35 provides a depending hook 45 to which one end 46 of a spring 47 is connected. The opposite end 48 of the spring 47 is connected to a lug 49 struck inwardly from the mounting plate 16 as viewed in FIG. 7. This spring 47 resiliently retains the actuating pawl 35 in its normal position as viewed in FIG. 5.

A stop pawl 50 is carried by a lug 51 struck from the

mounting plate 16. This stop pawl 50 has its free end 52 in engagement with a flat side of one of the stepped teeth 27 of the switch wheel 23, as seen in FIGS. 5 and 6. This stop pawl 50 prevents rotation of the switch wheel 23 in an anti-clockwise direction as viewed in FIGS. 5 and 6 when the actuating pawl 35 is being operated as viewed in FIG. 6.

When it is desired to effect a change in the circuit connection between the printed circuits 19 and the arms 20 of the rotary blade 21, the switch wheel 23 is caused to rotate in a clockwise direction as seen in FIGS. 5 and 6. To accomplish the clockwise rotation of the switch wheel 23, the actuating rod 29 is caused to move inwardly of the frame 10 or in a direction from left to right as viewed in FIGS. 5 and 6. The movement of the actuating rod 29 is achieved by compressing of the rubberized boot 38 against the enlarged head 30 of the rod 29 causing the same to move in the internal bore 31 formed in the stud 28. The movement of the actuating rod 29 is against the coiled tension of the spring 47. The actuating pawl 35 will be caused to move into the position shown in FIG. 6 by such movement of the rod 29. This movement of the pawl 35 is guided by reason of the tail 41 thereof passing through the opening 42 formed in the back wall 43 of the mounting plate 16.

When the flat portion 53 of the actuating arm 39 is pushed off the corresponding elongated flat side of the stepped teeth 27, the pawl 35 by reason of the tension of the spring 47 will pivot upwardly as viewed in FIG. 6 until the notched out portion 40 of the actuating arm 39 engages the flat surface of the next stepped tooth 27 of the switch wheel 23. Corresponding movement of the switch wheel 23 during this period of movement of the actuating pawl 35 is arrested by reason of the stop pawl 50. When the actuating pressure is removed from the boot 38, the spring 47 will cause the pawl 35 to return to its normal position as seen in FIG. 5, and by this return movement the switch wheel 23 is caused to rotate in a clockwise direction a distance equal to the length of the stepped teeth 27 carried thereby.

The switch wheel 23 is prevented from rotating in either direction without a corresponding actuation of the pawl 35 through the presence of the hereinbefore described stop pawl 50 and the stop stud 44 on the pawl 35 which as shown in FIG. 5 normally engages the flat side of one of the stepped teeth 25.

Referring to FIG. 8, we show a modified form of an exterior actuator which includes a panel stud 65 carried by the frame member 10. Threaded upon the panel stud 54 is a sealing washer 55 and a stud nut 56. The latter stud nut fixedly connects the stud 54 of the mounting panel 11. The enlarged head 30 of the actuating rod 29 is adapted to move inwardly of the enlarged circular bore 57 of the stud 54 when the mechanism is actuated.

An O ring seal 58 is carried internally within the enlarged bore 57 and seals the same as shown in FIG. 7.

Referring to FIG. 9, we show a thumb wheel switch that is adapted to be actuated through the energization of an electromagnetic solenoid 59. This solenoid 59 is connected by a bracket 60 to the frame member 10. The free end of the movable plunger 61 of the solenoid 59 is pivotally attached as at 62 to an elongated tail portion 63 of the actuating pawl 35. This modified form does not include a push button on its connecting operating rod, or the connection for the rod to the actuating pawl. The remaining components of this modified thumb wheel switch are the same as previously described and will not be herein repeated. The same is true with respect to the function and cooperation of such components.

Referring to FIGS. 1 and 2, we show a common lighting assembly 64 carried by the mounting panel 11 and transparent plate 12. This lighting assembly affords a simplified lighting system for illuminating the switch position indicia carried by each of the switch wheels as illustrated in FIG. 1.

From the foregoing it is apparent that we have devised a switch actuating mechanism for a thumb wheel type switch which is positive in its operation, shock proof, and sealed against moisture, dirt, and like foreign matter.

While we have illustrated and described the preferred form of construction for carrying our invention into effect, this is capable of variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to protect by Letters Patent, is:

1. In combination a rotatable thumb wheel type electrical switch including a switch position indicating wheel providing a plurality of ratchet teeth on its periphery.
  - (a) a housing for said switch providing a covered aperture through which a portion of said wheel is visible,
  - (b) an actuating means carried exteriorly of said housing for effecting rotation in one direction of said switch wheel within said housing,
  - (c) a switch rotating pawl within said housing and having a portion thereof normally in engagement with one of said ratchet teeth provided by said wheel,
  - (d) means connecting said actuating means to said pawl for moving the same through a longitudinal plane tangentially with respect to said wheel and out of engagement with said one of said ratchet teeth,
  - (e) a single means within said housing and connected thereto and to said pawl for pivoting said pawl into engagement with another of said ratchet teeth provided by said wheel and for moving said pawl in a direction opposite to the movement of said actuating means so as to rotate said wheel in said one direction within said housing,
  - (f) means carried by said pawl and engageable with a peripheral flange provided by said wheel for preventing rotation of said wheel when said actuating means is not operated, and
  - (g) means for sealing said actuating means and said connecting means between said pawl and said actuating means against moisture, dirt and like foreign matter.
2. The device as defined by claim 1 in which the means for sealing said actuating means includes a yieldable boot threadably positioned in sealing relation over said exteriorly carried actuating means.
3. The device as defined by claim 1 in which said actuating means includes a push button carried exteriorly of said housing and movable longitudinally with respect thereto for effecting rotation of said switch carried therein.
4. The device of claim 1 wherein the means for operatively connecting said actuating means to said switch rotating pawl comprises an elongated actuating rod one end of which is projected exteriorly of said housing and connected to said actuating means, and with its opposite end positioned within said housing and connected to said switch rotating pawl.
5. In combination a rotatable thumb wheel type electrical switch including a switch position indicating wheel providing a plurality of ratchet teeth on its periphery,
  - (a) a housing for said switch providing a covered aperture through which a portion of said wheel is visible,
  - (b) an actuating means carried exteriorly of said housing for effecting rotation in one direction of said switch wheel within said housing,
  - (c) a switch rotating pawl within said housing and having a portion thereof normally in engagement with one of said ratchet teeth provided by said wheel,
  - (d) means connecting said actuating means to said pawl for moving the same through a longitudinal

5

- plane tangentially with respect to said wheel and out of engagement with said one of said ratchet teeth,
- (e) a coil spring within said housing and having one end connected thereto and its opposite end connected to said pawl for pivoting said pawl into engagement with another of said ratchet teeth provided by said wheel and for moving said pawl in a direction opposite to the movement of said actuating means so as to rotate said wheel in said one direction within said housing,
- (f) means carried by said pawl and engageable with a peripheral flange provided by said wheel for preventing rotation of said wheel when said actuating means is not operated,
- (g) means for sealing said actuating means and said connecting means between said pawl and said actuating means against moisture, dirt and like foreign matter, and
- (h) a stop member carried by said housing and engageable with one of said ratchet teeth for preventing retrograde rotation of said wheel when said switch rotating pawl is moved through a longitudinal plane tangentially with respect to said wheel by said actuating means.
6. The device as defined by claim 5 in which the means for sealing said actuating means includes a yieldable boot

6

threadably positioned in sealing relation over said exteriorly carried actuating means.

7. The device as defined by claim 5 in which said actuating means includes a push button carried exteriorly of said housing and movable longitudinally with respect thereto for effecting rotation of said switch carried therein.

8. The device of claim 5 wherein the means for operatively connecting said actuating means to said switch rotating pawl comprises an elongated actuating rod one end of which is projected exteriorly of said housing and connected to said actuating means, and with its opposite end positioned within said housing and connected to said switch rotating pawl.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |          |                |
|-----------|----------|----------------|
| 450,292   | Johnson  | Apr. 14, 1891  |
| 691,557   | Leve     | Jan. 21, 1902  |
| 775,055   | Waterman | Nov. 15, 1904  |
| 2,260,592 | Winning  | Oct. 28, 1941  |
| 2,853,564 | Gahagan  | Sept. 23, 1958 |

##### FOREIGN PATENTS

|         |               |               |
|---------|---------------|---------------|
| 837,934 | Great Britain | June 15, 1960 |
|---------|---------------|---------------|