

March 3, 1970

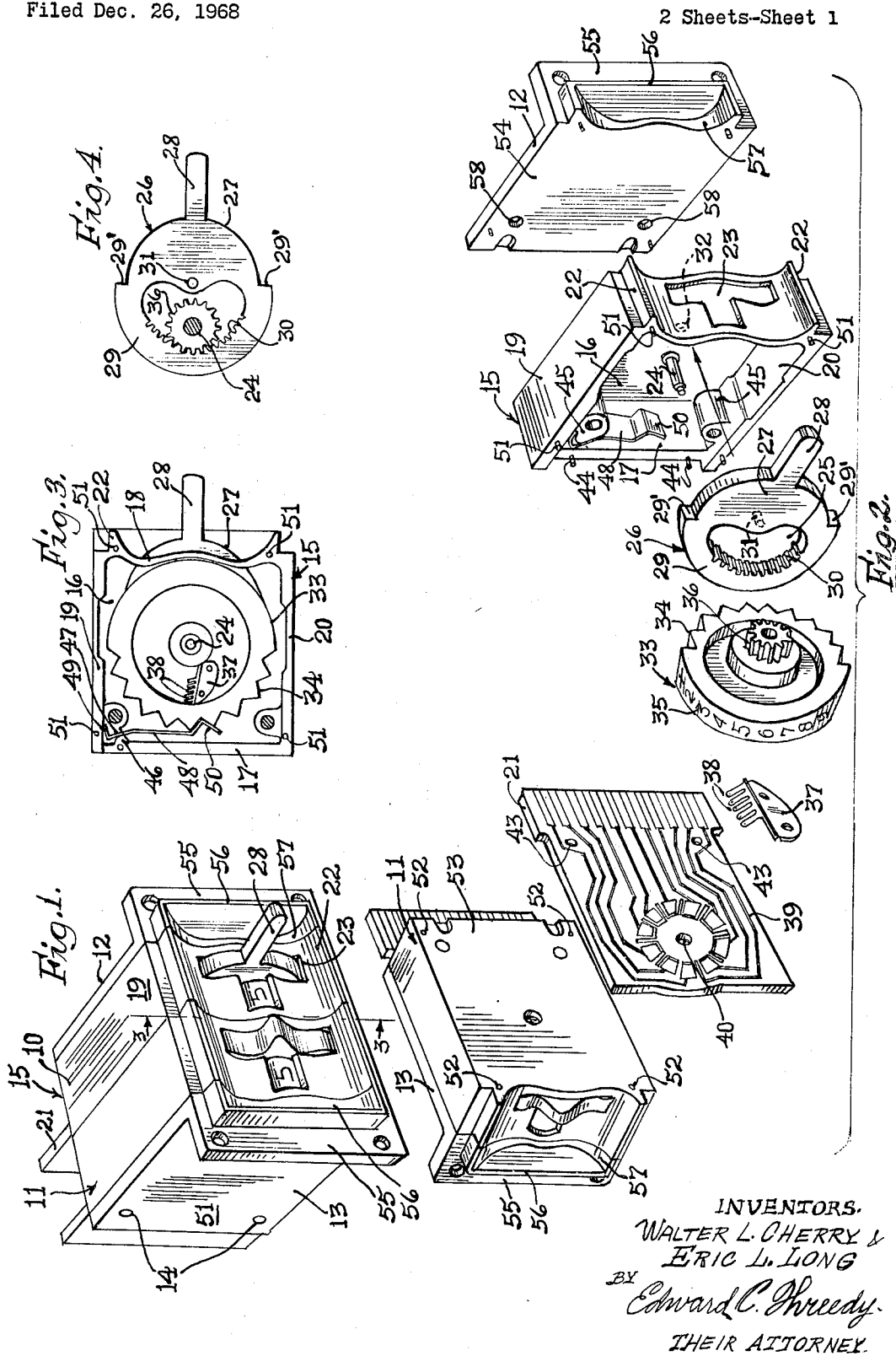
W. L. CHERRY ET AL

3,499,127

THUMBWHEEL TYPE SWITCH

Filed Dec. 26, 1968

2 Sheets--Sheet 1



INVENTORS.
WALTER L. CHERRY &
ERIC L. LONG
BY
Edward C. Phreedy.
THEIR ATTORNEY.

March 3, 1970

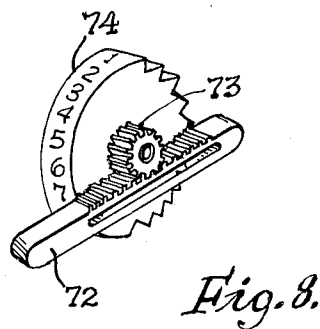
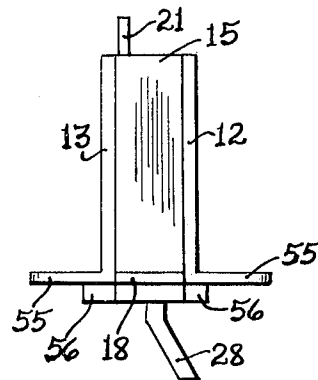
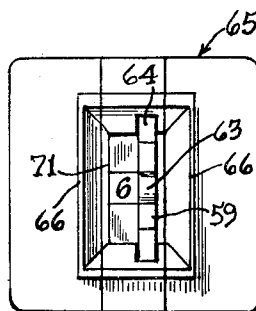
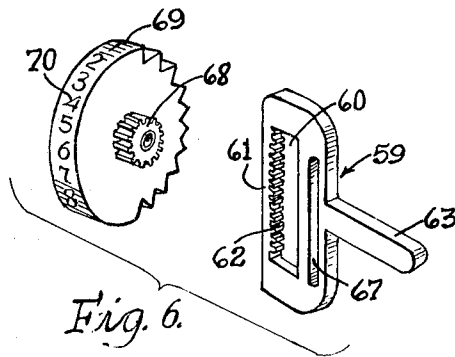
W. L. CHERRY ET AL

3,499,127

THUMBWHEEL TYPE SWITCH

Filed Dec. 26, 1968

2 Sheets-Sheet 2



INVENTORS.
WALTER L. CHERRY &
ERIC L. LONG
BY *Edward C. O'Reedy*
THEIR ATTORNEY.

1

2

3,499,127

THUMBWHEEL TYPE SWITCH

Walter L. Cherry and Eric L. Long, Highland Park, Ill.,
assignors to Cherry Electrical Products Corporation,
Highland Park, Ill., a corporation of Illinois

Filed Dec. 26, 1968, Ser. No. 813,409

Int. Cl. H01h 3/00; F16h 53/00

U.S. Cl. 200—17

9 Claims

ABSTRACT OF THE DISCLOSURE

A thumbwheel type switch having a sectioned casing providing an interior cavity housing the switch components including a printed circuit board, a rotatable drum having a switch wiper blade affixed thereto and rotatable therewith, an actuator having rotating means comprising a geared arrangement between the actuator and the rotatable drum for selectively rotating the drum and its wiper blade over said circuit board and into selected circuit making positions when said actuator is moved through a prescribed path.

SUMMARY OF THE INVENTION

A thumbwheel type switch and actuator therefor comprising a housing for a printed circuit board and a rotatable switch blade carrying drum. An actuator for rotating the drum, including an actuating lever extending externally of the housing and a rotating means operable between the actuator, as it is moved through a prescribed path, and the drum for selectively rotating the switch blade carried thereby in either direction so as to move the same over the circuit board through individually designated circuit making positions.

GENERAL DESCRIPTION

The invention will be best understood by reference to the accompanying drawings in which there is shown the switch structure embodied in the invention and in which:

FIG. 1 is a perspective view of a dual type thumbwheel switch, including the switch unit of this invention;

FIG. 2 is a perspective view of the components of the switch unit of this invention in an exploded relationship;

FIG. 3 is a detailed sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a side elevational view of the switch actuator as embodied in this invention;

FIG. 5 is a top plan view of a modified switch unit embodying the switch components of this invention;

FIG. 6 is a perspective view of a modification of certain of the switch components as can be employed in the present invention;

FIG. 7 is a front elevational view of a switch housing, including the modified structure shown in FIG. 6; and

FIG. 8 is a perspective view of still another modification of certain switch components as may be employed in this invention.

As illustrated in FIG. 1 two switch units 10 and 11 are shown assembled in a side-by-side relation. Each end of the assembled unit includes cooperating end plates 12 and 13, respectively, which are retained in assembled relation by removable connecting means 14 journaled therethrough.

The present invention is directed to the specific switch components that are operatively contained in unit 10, which may be assembled as illustrated in FIG. 1 or arranged as a single switch unit as is illustrated in FIGS. 5 and 7. In FIG. 5 the end plates 12 and 13 are positioned on either side of a modular switch casing 15 forming a complete single switch unit.

The modular switch casing 15 as shown in FIGS. 2 and 5 comprises a rectangularly shaped open sided hollow receptacle including a side wall 16, a rear wall 17, a front wall 18 and a top and bottom wall 19 and 20. The rear wall 17 is of a width less than the width of the top and bottom walls 19 and 20, and provides a recessed space between the top and bottom walls 19 and 20 for the reception of the rearwardly extending portion of a printed circuit board 21. The printed circuit board 21 when in an assembled relation as hereinafter more fully described normally closes the open side of the switch casing receptacle 15.

As shown in FIG. 1 the circuit board 21 has its exposed side wall covered by the switch unit 15, or as in the structure shown in FIG. 5 covered by the end plate 13.

The front wall 18 of the receptacle 15 provides adjacent its top and bottom edges a forwardly extending lip 22 with the wall therebetween preformed into a smooth curvature in which is formed an opening 23.

Carried by the side wall 16 and projecting inwardly of the center cavity of the receptacle 15 is a shaft 24. This shaft 24 extends through an interior opening 25 formed in the circular body portion of a switch actuator 26.

The actuator 26 comprises a solid arcuated body portion 27 which includes an elongated radially extending actuating arm 28. The remaining body portion of the actuator 26 comprises an arcuated ring 29, the internal periphery of which is provided with gear teeth 30. As seen in FIGS. 2 and 4, the ring portion 29 of the actuator 26 has a diameter greater than that of the arcuated body portion 27 so as to provide at the line of junction therebetween stop shoulders 29'. The body portion 27 carries a perpendicularly extending stud shaft 31 which is adapted to be projected into an opening 32 formed in the side wall 16 to one side of and in horizontal alignment with the shaft 24.

In assembling the switch components the actuator 26 is placed within the receptacle 16 with the radially extending actuating arm 28 projected out of the opening 23 formed in the front wall 18. The stud shaft 31 is projected into the opening 32 formed in the side wall 16 in such a manner as to pivotally position the actuator 26 relative to the front wall 18 so that its arm 28 and part of the body portion 27 projects out of the opening 23, as seen in FIG. 3.

Adapted to be mounted on the shaft 24 is a drum 33. The peripheral edge of the drum 33 through a sector thereof is provided with a series of index teeth 34. The remaining sector of the peripheral edge of the drum 33 contains switch position indicia 35 which are adapted to be exposed through the window 23 formed in the front wall 18 of the receptacle 15 when the drum 33 is mounted on the shaft 24.

Extending axially about the center of the drum 33 is an externally geared hub 36. The geared hub 36, when positioned with the drum 33 on the shaft 24, will project through the center opening 25 formed in the actuator 26 and mesh with the gear teeth 30 carried by the arcuated ring portion 29 of the actuator 26. Thus by pivotal movement of the actuator 26 the drum 33, by the geared connection between its hub 36 and the arcuated internally geared ring 29 of the actuator 26, will be rotated to a limited degree in either direction about the shaft 24.

The actuator 26 as hereinbefore described is operatively connected to the switching drum 33 by having the gear ratio between its gear teeth 30 and the geared hub 36 such that arcuated movement of the actuator 26 about its pivot stud 31 from one extremity of its travel to the other will rotate the drum through ten digital switching positions.

Mounted on the opposite side face of the drum 33 and concentrically about the center opening formed there-through is a switch blade 37, including a plurality of radially extending contact fingers 38 having their free ends lying out of the normal plane of the face of the drum 33 so as to be moved over the printed circuits 39 contained on the confronting face of the printed circuit board 21.

To correctly position the printed circuit board 21 relative to the rotatable switch blade 37, the board 21 is provided with an opening 40 adapted to be freely journaled on the shaft 24. The board 21 is also provided with apertures 43 which are adapted to receive locating pins 44 which project laterally out of the confronting edge surface of the rear wall 17. Thus when the actuator 26 is pivotally positioned within the receptacle 15 and the drum 33 is rotatably carried on the shaft 24, the printed circuit board 21 will be placed within the confines of the front wall 18 and the top and bottom walls 19 and 20 with the shaft 24 projected into the opening 40 and the pins 44 projected into the apertures 43 formed in the board 21.

Adjacent each of the rear corners of the receptacle 15 are formed circular bosses 45 having formed therein an opening through which the connecting means 14 are adapted to be projected. The upper corner boss 45 cooperates with a nipple 46 formed on the adjacent surface of the rear wall 17 to provide a restricted passage 47 through which projects a flat indexing spring 48. One end of the spring 48 is bent to form a lateral flange 49 which is captured in the corner defined by the rear wall 17 and its junction with the top wall 19. The opposite end of the spring 48 is V-notched as at 50 so as to be yieldably received between corresponding index teeth 34 formed in the one sector of the peripheral edge of the drum 33. By this arrangement the spring 48 will index the rotatable movement of the drum 33.

In assembling the switch unit 10 between the end plates 12 and 13 as shown in FIG. 5 or between the end plate 12 and the modular switch unit 11 as shown in FIG. 1 there is provided means by which each structural component is aligned for proper relationship. As seen in FIG. 2 the exposed edge surface of the top wall 19 and the bottom wall 20 adjacent their junction with the rear wall 17, as well as the front wall 18 adjacent the lip 22 provided thereby, carries laterally extending locating pins 51. These pins 51 are insertable into correspondingly aligned openings 52 provided by the outer wall surface 53 of the modular switch unit 11 as shown in FIG. 2, or into aligned openings formed in the confronting wall surface of the end plate 13 (not shown) when the unit is assembled as shown in FIG. 5.

Regarding the end plates 12 and 13 each of which is similar in construction except for obvious configurations, it should be noted that each end plate comprises a solid substantially flush wall 54 that terminates at its forward end into a laterally extending flange 55. Each of the flanges 55 of each end plate 12 and 13 is provided with a wall abutment 56 that defines the curved front wall area 57 which corresponds to the front wall 18 of either of the switch units 10 and 11 as shown in FIG. 1.

Adjacent the rear edge of each of the walls 54 of each end plate 12 and 13 are formed openings 58 which are adapted to be in alignment with the openings formed in the corner circular bosses 45 provided by the switch receptacle 15. Through these openings may be projected the connecting means 14 by which each modular switch unit is assembled.

A slightly modified switch actuator is shown in FIG. 5, and the modification consists of angularly displacing the radially projecting actuating arm 28 to one side of and out of the line of sight of the opening 23 formed in the front wall 18 of the receptacle 15.

A further modification of an actuator is disclosed in FIGS. 6 and 7 wherein the actuator 59 of such construction comprises a substantially rectangularly-shaped body

portion having an enlarged central opening 60, the rear wall 61 of which is provided with a series of gear teeth 62. An actuating arm 63 extends laterally from a mid-point of the actuator 59, and is adapted to project through an elongated slot 64 formed in the front wall of the switch housing 65 within the area defined by the protruding flanges 66 such as is shown in FIG. 7.

The forward wall portion of the actuator 59 is provided with a slotted guide 67 which will receive a corresponding guide lug (not shown) provided by one wall of the casing when the geared hub 68 of the rotatable drum 69 is freely journaled on a shaft, and is positioned in the central opening 60 formed in the actuator. Thus the actuator 59 is operatively connected to the rotatable drum 69 and restricted in its movement through a guided vertical plane such that the gear teeth 62 will engage the geared hub 68 and rotate the drum 69 to expose different indicia 70 through a window portion 71 formed in the front wall of the switch unit 65.

With a slight modification which comprises placing a guide stud in a spaced vertical relation with respect to the shaft 24 an actuator in the form of a rack 72 can be associated with a pinion 73 carried at the center of a rotatable switching drum 74 as shown in FIG. 8. The rack actuator 72 would then move horizontally through an opening formed in the front wall of the switch housing in such a manner to rotate the switch drum 74.

While we have illustrated and described the preferred form of construction for carrying out 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. A digital switch including a casing having an opening formed in its front wall and providing therein an interior cavity in which there is positioned a printed circuit plate, wherein the improvement comprises:

- (a) an actuator rotatably mounted within the cavity of the switch casing,
- (b) means providing an axis about which said actuator is rotatably mounted within the cavity of the switch casing,
- (c) a position indicator for circuit-making contacts mounted within the cavity and movable about an axis spaced from and parallel to said means providing an axis for said actuator, with said position indicator having a peripheral portion exposed through the opening formed in the front wall of the casing,
- (d) circuit-making contacts within the cavity and movable over the printed circuit plate by rotatable movement of said actuator and said position indicator about their axes,
- (e) cooperating means provided by said actuator and said position indicator for rotating the same in either direction about their respective axes for rotating said circuit-making contacts over the printed circuit plate,
- (f) means provided by said actuator extending out of a portion of the opening formed in the front wall of the casing and movable therethrough for rotating said actuator and said position indicator in either direction, and said circuit-making contacts over the printed circuit plate of the digital switch.

2. A digital switch as defined by claim 1 including an indexing means selectively positioning said position indicator in the opening formed in the front wall of the casing as the same is rotated in either direction by said actuator.

3. A digital switch as defined by claim 1 wherein said position indicator comprises a drum having a partially uninterrupted indicia-bearing circumferential edge, a portion of which is exposed through the opening formed in the front wall of the casing, and with the remaining por-

5

tion of its circumferential edge notched for cooperation with an indexing means to selectively locate said position indicator in the opening formed in the front wall of the casing.

4. A digital switch as defined by claim 2 wherein said indexing means comprises a spring within the cavity of the casing and engageable with the notched circumferential edge of said position indicator to yieldably retain said indicator in the opening formed in the front wall of the casing.

5. A digital switch as defined by claim 1 wherein said cooperating means provided by said position indicator comprises an externally geared hub, the teeth of which mesh with gear teeth provided by said actuator with the gear ratio therebetween being such that by movement of said actuator different portions of said position indicator are exposed in the opening formed in the front wall of the casing and said circuit-making contacts are moved into a predetermined position upon the printed circuit plate.

6. A digital switch as defined by claim 1 wherein said means provided by said actuator extending out of a portion of the opening formed in the front wall of the casing and movable therethrough comprises an elongated lever extending in a plane transversely to the axis of said actuator and said position indicator, and adapted to be moved in either direction through the entire length of said portion of the opening formed in the front wall of the casing.

7. A digital switch as defined by claim 6 wherein said elongated lever has a portion of its length angularly disposed to one side of a portion of the opening formed in the front wall of the casing and out of the line of sight of the position indicator exposed therethrough.

8. A digital switch as defined by claim 5 wherein said means provided by said actuator extending out of a portion of the opening formed in the front wall of the casing and movable therethrough comprises an elongated lever

6

extending in a plane transversely to the axis of said actuator and said position indicator, and adapted to be moved in either direction through the entire length of said portion of the opening formed in the front wall of the casing.

9. A digital switch as defined by claim 8 wherein said elongated lever has a portion of its length angularly disposed to one side of a portion of the opening formed in the front wall of the casing and out of the line of sight of the position indicator exposed therethrough.

References Cited

UNITED STATES PATENTS

1,028,350	6/1912	Guett	200—71
1,157,310	10/1915	Klein	200—69
1,434,972	11/1922	Tizley	200—156
1,587,640	6/1926	Getchell	200—67
1,697,980	1/1929	Krone	200—11
2,144,665	1/1939	Rasmussen	200—17
2,368,083	1/1945	Adam	200—18
2,393,184	1/1946	Passow	179—1
2,432,782	12/1947	McClain	335—190
2,541,917	2/1951	De Mers	336—136
2,853,564	9/1958	Gahagan	200—11
2,896,033	7/1959	Hartz	200—11
3,072,756	1/1963	Koci	200—11
3,089,923	5/1963	Wright	200—5
3,090,249	5/1963	Martin	74—568
3,164,690	1/1965	Heide	200—11
3,409,747	11/1968	Mincone	200—11

ROBERT K. SCHAEFER, Primary Examiner

J. R. SCOTT, Assistant Examiner

U.S. Cl. X.R.

74—568; 200—11, 153