

July 26, 1960

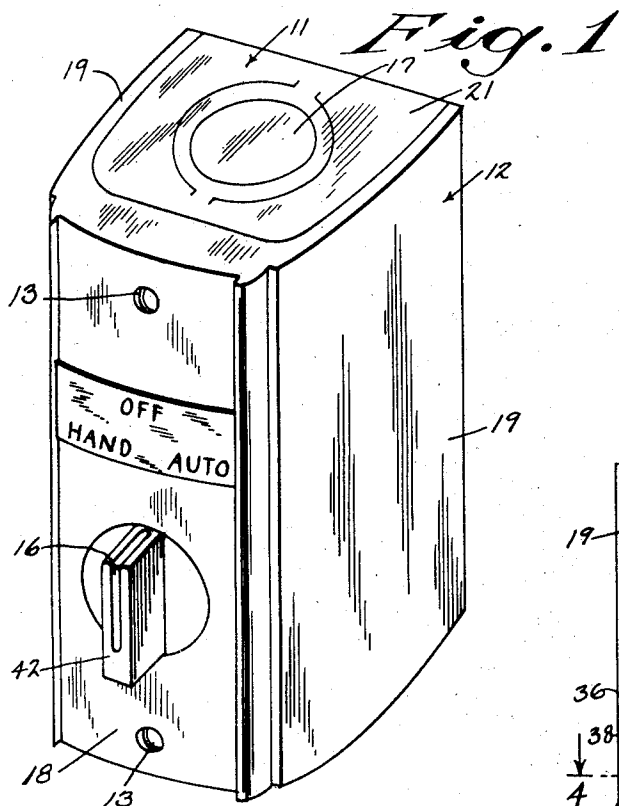
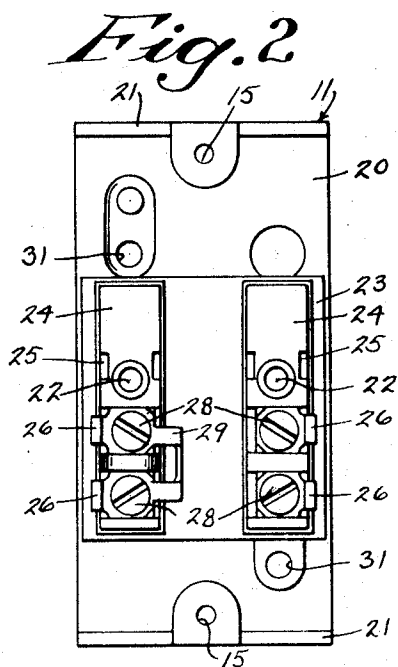
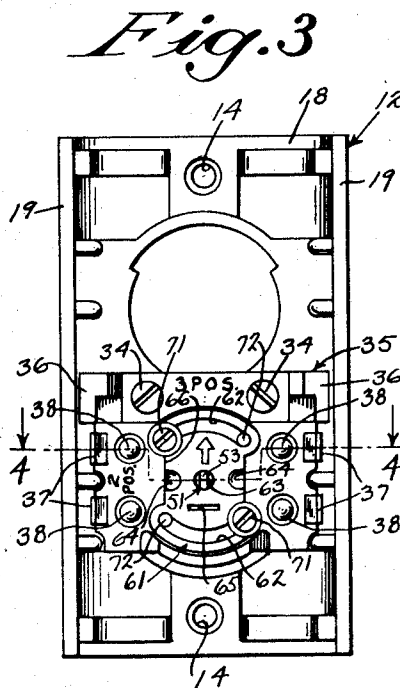
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2,946,871

MULTIPOSITION SWITCH

Filed Dec. 12, 1957

4 Sheets-Sheet 1



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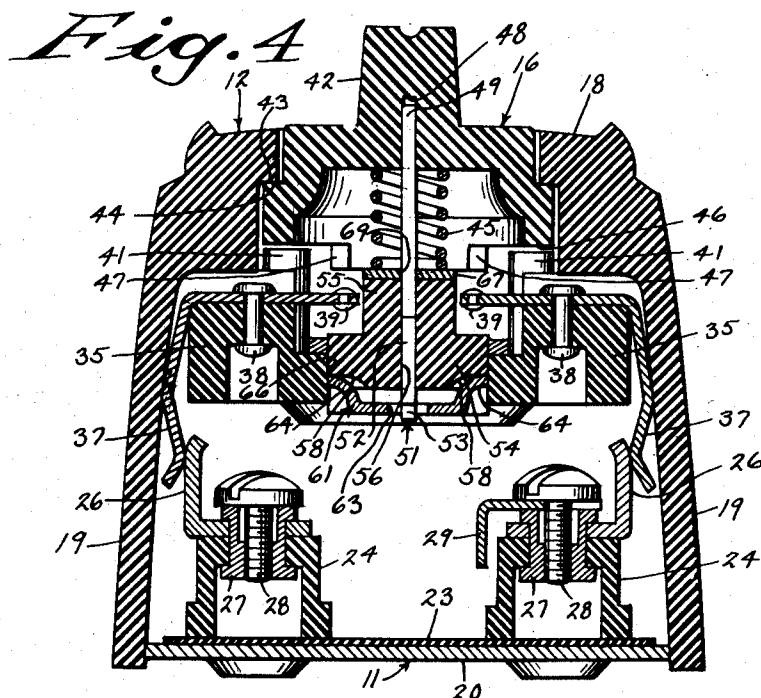


Fig. 5 Fig. 6 Fig. 7

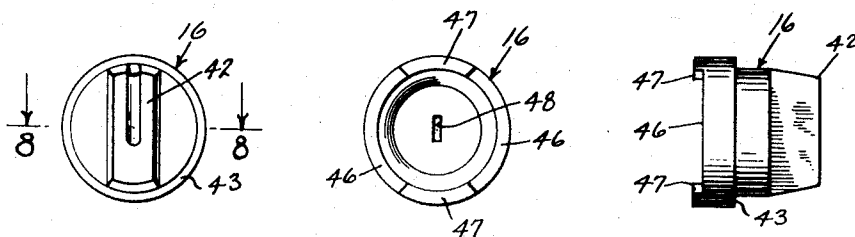
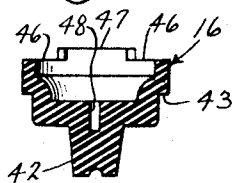


Fig. 8



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Fig. 9

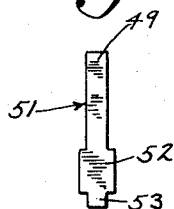


Fig. 10

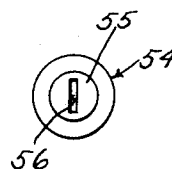


Fig. 11

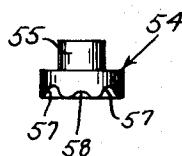


Fig. 12

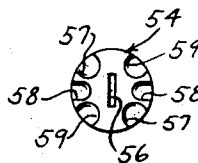


Fig. 13

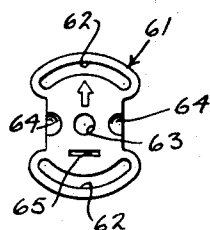


Fig. 14

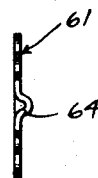
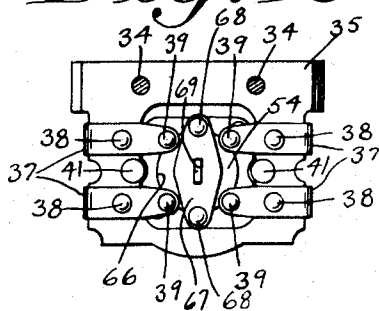


Fig. 15



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Fig. 16

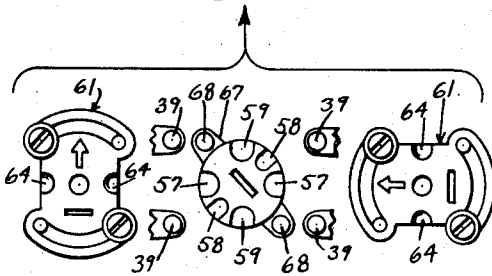


Fig. 17

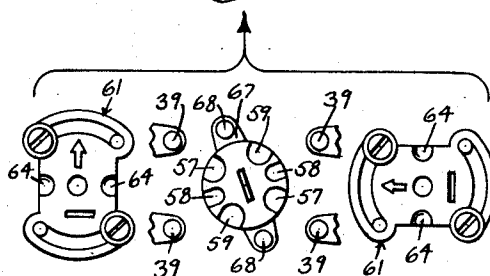


Fig. 18

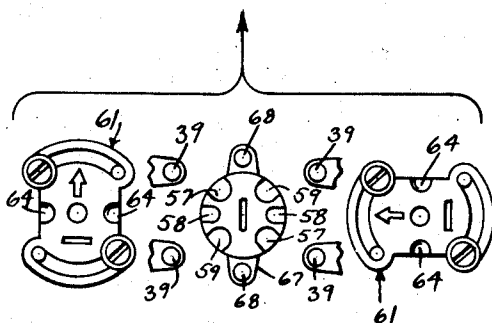


Fig. 19

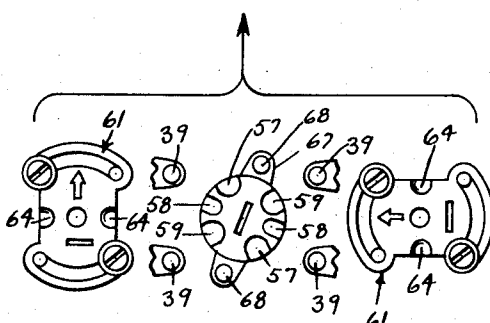
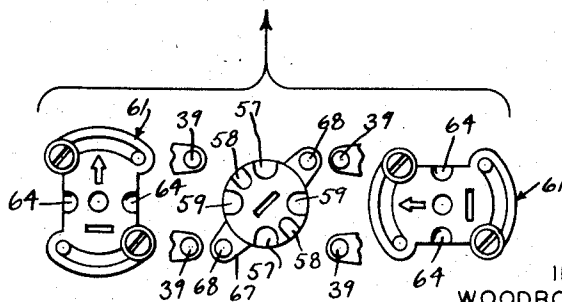


Fig. 20



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MULTIPOSITION SWITCH

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Filed Dec. 12, 1957, Ser. No. 702,470

4 Claims. (Cl. 200—65)

This invention relates to control-stations, primarily manual; and more particularly to an electrical switch comprising: a base and a cooperating readily removable cover, which together form a boxlike enclosure for the mechanism; wherein the base carries within the enclosure a plurality of first assembly contacts and a plurality of terminals, each terminal being conductively connected with certain of said first contacts; and wherein the cover carries within the enclosure a plurality of cooperating assembly contacts, to conductively engage respectively said first contacts when the cover is in place on the base; switching mechanism, carried within the enclosure by the cover, for conductively connecting certain of the cooperating contacts together at will; and means for actuating the switch, usually by manual operation from outside the box. But except as specifically limited in the claims, the invention is not limited to such a switch.

Reference is made to the copending application of the present two inventors, and a third joint inventor, Fred F. Loock, filed November 12, 1957, Serial No. 695,599 for "Control Station," for a listing of the advantages possessed by switches of the above recited general type, of which the present switch is another example.

In addition to applying, to a selector switch or the like, certain of the inventive features generically covered by the above identified patent application, and shown therein as applied to a push-button switch, the present invention exemplifies certain features particularly applicable to a selector switch.

Accordingly it is the principal object of the present invention to construct an improved selector switch wherein, by a simple adjustment, readily accessible, a switch having a given number of indexed positions, can be converted into a switch having a different number of indexed positions.

Other objects and advantages of the invention will appear in the description which follows.

The present invention is intended for use as a control-station, either on the machine to be controlled, or at a distance. Although the embodiment herein shown and described is manually operated, it will become evident as the description progresses that the present invention is equally applicable to switches otherwise operated.

In the description, reference is made to the accompanying drawings, forming a part hereof, in which there is shown by way of illustration and not of limitation one certain specific form in which the article of manufacture of the present invention may be embodied.

In the drawings:

Fig. 1 is an isometric perspective view of the switch of the present invention.

Fig. 2 is a front elevation of the base and the mechanism carried thereby.

Fig. 3 is a rear elevation of the cover and the mechanism carried thereby.

Fig. 4 is a horizontal section of cover and base assembled, as seen from above as through cut along the line

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4—4 of Fig. 3. Fig. 4 is to double the scale of all the other figures.

Fig. 5 is a front elevation of the turn-button.

Fig. 6 is a rear elevation of the turn-button.

Fig. 7 is a side elevation of the turn-button.

Fig. 8 is a section of the turn-button, seen as though cut along the line 8—8 of Fig. 5.

Fig. 9 is a side elevation of the shaft.

Fig. 10 is a front elevation of the cam.

Fig. 11 is a side elevation of the cam.

Fig. 12 is a rear elevation of the cam.

Fig. 13 is a rear elevation of the index plate.

Fig. 14 is a side elevation of the index plate.

Fig. 15 is a front elevation of the switch-mounting block and associated mechanism, removed from the cover and with the turn-button and spring taken off.

Fig. 16 is a diagrammatic exploded showing (from the rear, in one of the two extreme positions of the turn-button and associated movable mechanism) of the four stationary contacts, the movable contact, and the cam, with the index plate in each of its two alternative settings. The object of this figure and the following four figures is to contrast how the cam engages the index plate in each of the latter's two alternative settings.

Fig. 17 is the same as Fig. 16, but with the turn-button, etc., rotated 25 degrees clockwise.

Fig. 18 is the same as Fig. 17, but with the turn-button, etc., rotated 20 degrees further clockwise.

Fig. 19 is the same as Fig. 18, but with the turn-button, etc., rotated 20 degrees still further clockwise.

Fig. 20 is the same as Fig. 19, but with the turn-button, etc., rotated 25 degrees still further clockwise, into the other one of its two extreme positions.

Throughout the description, the same reference numeral is applied to the same member or similar members.

Turning to Fig. 1, with some reference to Figs. 2 and 3, it will be seen that Fig. 1 shows, in closed condition, the box-like enclosure of the present invention, consisting of base 11 and cover 12. The base may conveniently be of bent sheet-metal, whereas the cover is preferably of molded dielectric material. The means to secure the cover to the base consist of screws 13, which pass through holes 14 in the cover, and screw into threaded holes 15 in the base.

Turn-button 16 serves to actuate the switching mechanism from outside the enclosure, as will be described later herein.

Cover 12 constitutes the front 18 and sides 19 of the enclosure. Base 11 constitutes the back 20 and ends 21 of the enclosure. Knock-out plug 17, and/or a similar one in the other end of the base, can be removed to afford an entrance for wires.

Turning to Fig. 2, it will be seen that, secured in the base in any convenient manner, as by rivets 22 and keying (not shown), is a terminal-mounting plate 23 and two terminal blocks 24, at least the latter being made of dielectric material. Each block has a keyway 25, and carries two first assembly contacts 26. Other mechanism carried thereby will be referred to hereinafter.

Referring to Fig. 4 in connection with Fig. 2, it will be seen that each first assembly contact 26 is secured to one of the terminal blocks 24 by means of internally-threaded tubular rivet 27. This end of assembly contact, plus screw 28 (whose threads engage the threads of rivet 27) thus constitutes a terminal, for the attachment of wires. 29 is a connector, to conductively connect two of the terminals, if desired. The switch may be mounted by screws (not shown) driven through holes 31 in back 20.

Turning to Fig. 3, and referring to Fig. 4 in connection therewith, it will be seen that, secured to cover 12

in any convenient manner, as by screws 34, is switch-mounting block 35, which in turn carries the switching mechanism which will be described in more detail later herein. This switch-mounting block includes two keys 36, and carries four cooperative assembly contacts 37. These contacts, as well as all other contacts, movable and stationary, are preferably of silver composition or silver plated.

Keys 36 cannot engage keyways 25 unless the cover is properly oriented with respect to the base.

When assembled, each of the first assembly contacts 26 conductively engages one of the cooperative assembly contacts 37.

Each cooperative assembly contact 37 is secured to switch-mounting block 35 by rivet 38, and extends beyond that rivet to constitute a fixed arm, holding fixed switch-contact 39. Upstanding from block 35 are two stop members 41.

Certain elements which coact to perform the principal object of the present invention, will now be described individually. These mechanisms are carried by the cover 12, which thus may be considered broadly as a support for the switching mechanism.

Figs. 5, 6, 7, and 8, are respectively a front, rear, and side elevation, and a section of turn-button 16. 42 is its handle. The turn-button rotates normally with its shoulder 43 sliding on cooperating shoulder 44 of cover 12, being forced into contact therewith by spring 45. But pressure by the operator on the turn-button, in opposition to spring 45, may close the slight gap between surface 46 and the end of stop 41, so that surface 46 slides on stop 41.

The rotation of turn-button 16 in either direction is limited by stops 47 of the button engaging stop-members 41.

Slot 48 is to engage the end 49 of shaft 51, a flat thin piece, which may conveniently be of metal, shown edgewise in Fig. 4, and flatwise in Fig. 9. It has a broadened portion 52, and a narrowed inner end 53.

Figs. 10, 11, and 12 are respectively a front, side, and rear elevation of an indexing cam 54. The cam has a narrowed portion 55 (to clear the fixed switch contacts 39, as seen in Fig. 4), and a lengthwise slot 56 (to engage the broadened portion 52 of shaft 51). Its inner surface has peripheral recesses 57, 58, 59, with ridges in between, for indexing purposes as will be later explained.

Figs. 13 and 14 are respectively rear and side (edge-wise) elevations of an index plate 61. This index plate has two adjusting slots 62, a central hole 63 (to journal the end 53 of the shaft), two projections 64 (which centeringly engage the recesses of the cam, and also center the plate 61 in hole 66 in switch-mounting block 35), and a slot 65 (for the insertion of the end of a screw-driver, to rotate the plate to adjust it, as will be explained hereinafter). Index plate 61 and cam 54 together serve as mutually cooperating cam indexing means.

Hole 66, in switch-mounting block 35, also serves as a bearing for the rotation of cam 54.

Finally, as seen in Fig. 15, there is movable contact arm 67, which carries movable contacts 68, and has a slot 69 for the insertion of end 49 of shaft 51.

Turn-button 16, spring 45, movable contact arm 67, and cam 54, are assembled on shaft 51 in the order shown in Fig. 4. Spring 45 not only holds turn-button 16 against cover 12, as explained earlier herein, but also holds movable contact arm 67 against cam 54.

The greater depth of recesses 57 and 59 in cam 54 permits movable contacts 68 to settle onto fixed contacts 39 when centered over them; whereas the lesser depth of recesses 58, serves merely for indexing purposes between contactings.

Reverting now to Fig. 3, it will be seen that switch mounting block 35 is inscribed with two notations, namely: "3 POS" and "2 POS," and that index plate 61 bears an arrow. As shown, the arrow is pointing to-

ward "3 POS," indicating that the index plate is set so that, during the cycle through which cam 54 is free to rotate, the switching mechanism will index in three positions, as will be explained later. The index plate is locked in this setting by screws 71, which pass through slots 62 into block 35; and is steadied by pins 72 which project from block 35 barely into slots 62.

The setting can be changed, by loosening screws 71, lifting index plate off of pins 72, and rotating it counter-clockwise by a screw-driver inserted in slot 65 until the arrow points to "2 POS." Each screw 71 will now engage the other end of its slot 62, and each steadying pin 72 will now be in the other of slots 62 than before. Compare the two alternative settings of plate 61 as shown in Fig. 17. Throughout making a setting-change, the turn-button should be maintained in one of its extreme positions, to prevent the movable contact arm from becoming snarled-up with the fixed contacts.

It is to be noted that the adjusting mechanism is exposed to ready access when the cover 12 is removed from the base 11, and that this exposure to ready access is facilitated by the way in which the cover and the base combine to form the enclosure, and respectively carry the switching mechanism and the terminals.

Fig. 16 is a diagrammatic exploded showing (from the rear, in one of the two extreme positions of the turn-button and associated movable mechanism) of the four stationary contacts, the movable contact, and the cam, with the index plate in each of its two alternative settings. The object of this figure and the following four figures is to contrast how the cam engages the index plate in each of the latter's two alternative settings.

The movable contacts 68 connect two diagonally opposite stationary contacts 39.

With index plate 61 set as indicated at the left of the figure, projections 64 engage recesses 57. With the index plate set as indicated at the right of the figure, the projections engage recesses 59. The effect is the same with both settings: the switch is in one of its closed positions and is indexed.

Fig. 17 shows the switching mechanism diagrammatically with the movable parts rotated 25 degrees clockwise. With the left-hand setting, the projections lie between recesses 57 and 58. With the right-hand setting, the projections lie between recesses 59 and 57. The effect is the same with both settings: the switch is open and unindexed.

Fig. 18 shows the results of 20 degrees further rotation. With the left-hand setting, the projections engage recesses 58. With the right-hand setting the projections still lie between recesses 59 and 57. The effect is different, dependent on setting: although the switch is still open, yet with the one setting the switch is indexed, yet with the other it is not.

Fig. 19 shows the result of 20 degrees still further rotation. With the left-hand setting, the projections lie between recesses 58 and 59. With the right-hand setting, the projections still lie between recesses 59 and 57. The effect is the same with both settings: the switch is open and unindexed.

Fig. 20 shows the results of rotation to a final position 25 degrees still further. The movable contacts 68 now connect the other two diagonally opposite stationary contacts 39. With the left-hand setting of the index plate, the projections thereof engage recesses 59. With the right-hand setting, the projections engage recesses 57. The effect is the same with both settings: the switch is in the second of its closed positions, and is indexed.

Thus we see that with the one setting of the index plate the cycle involves three indexed positions, whereas with the other setting of the index plate the cycle involves only two indexed positions.

The two alternative cycles of the present invention could differ in other or further respects without departing from the spirit of the invention; and similarly provision

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could be made for more than two alternative settings of the index plate.

It will be readily evident from the foregoing description that the present invention affords a novel and useful selector switch, which combines the various advantages and accomplishes the various objectives listed earlier herein.

Now that one embodiment of the invention has been shown and described, and several departures therefrom have been suggested, it is to be understood that the invention is not to be limited to the specific forms or arrangements of parts herein shown and described.

To avoid verbosity in describing the switching mechanism in the claims, elements will be recited as "fixed," to indicate that they do not move with respect to the cover or support, during the switching cycle; and "rotatable" or "movable," to indicate that they rotate or move with respect to the cover or support during the switching cycle.

What is claimed is:

1. In a selector switch, the combination of: a support; and a switching mechanism supported thereby comprising: a turn-button; fixed stop means, and cooperating stop means, rotatable with the turn-button to limit the turning of the turn-button in each direction; switch contact means, actuable by the turning of the turn-button, to selectively assume a plurality of closed and open switching positions; indexing cam means, rotatable by the turn-button, and cooperating therewith fixed indexing cam means, exposed for ready adjustment, and adjustable by rotating the fixed indexing cam means as a whole from one fixed position to another fixed position to cause the turning of the turn-button to selectively perform different indexing switching cycles.

2. In a selector switch, the combination of: mounting means and switching mechanism mounted thereon comprising: a turn-button; fixed stop means, and cooperating stop means, rotatable with the turn-button to limit the turning of the turn-button in each direction; a plurality of fixed contacts; cam means, rotatable by the turn-button, and shiftable axially with respect thereto; movable contacts, rotatable and shiftable axially with said cam means; and cooperating fixed cam means; the cooperating surfaces of the two cam means being such that in some relative rotational positions thereof the movable contacts are moved onto and maintained in contact with certain fixed contacts, and that said relative positions are indexed; the fixed cam means being adjustable by rotating the fixed indexing cam means as a whole from one fixed position to another fixed position, to cause the turning of the turn-button to selectively perform different indexing cycles, in at least one of which cycles at least one of the non-contact positions is indexed, and in at least another of which cycles at least one of the non-contact positions is not indexed.

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3. In a selector switch, the combination of: mounting means; and switching mechanism mounted thereon comprising: a turn-button; fixed stop means, and cooperating stop means, rotatable with the turn-button to limit the turning of the turn-button in each direction; a plurality of fixed contacts; cam means, rotatable by the turn-button, and shiftable axially with respect thereto; movable contacts, rotatable and shiftable axially with said cam means; and cooperating fixed cam means; the cooperating surfaces of the two cam means being such that in some relative rotational positions thereof the movable contacts are moved onto and maintained in contact with certain fixed contacts, and that some relative positions are indexed; the fixed cam means being adjustable by rotating it from one fixed position to another fixed position to cause the turning of the turn-button to perform two different indexing cycles; wherein there are two closed switch positions, ninety degrees apart and one open switch position lying between the two; and wherein one cam means has, circularly disposed, two pairs of diametrically opposite recesses, ninety degrees apart, each pair corresponding to a closed switch position, and one pair of diametrically opposite recesses, between the two pairs; and wherein other cam means has two diametrically opposite projections, adapted to fit into every pair of recesses; and wherein there is resilient means tending to force the two cam means toward each other; and wherein the stop means limit the turning to ninety degrees; whereby, when the fixed cam means is adjusted in its first adjustment, the switch will index in each of its closed positions and in its intermediate open position; and whereby, when the fixed cam means is adjusted ninety degrees from its first adjustment, the switch will index in each of its closed positions, but will not index in its intermediate open position.

4. A selector switch according to claim 3, wherein the one pair of recesses are of lesser depth than the two pairs of recesses.

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