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D. R. LOCKE ET AL

3,283,105

DETENT MEANS FOR A POSITIONABLE SWITCH ACTUATOR

Filed July 30, 1964

2 Sheets-Sheet 1

FIG. 1

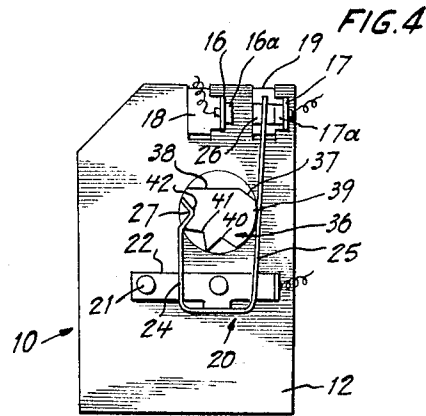
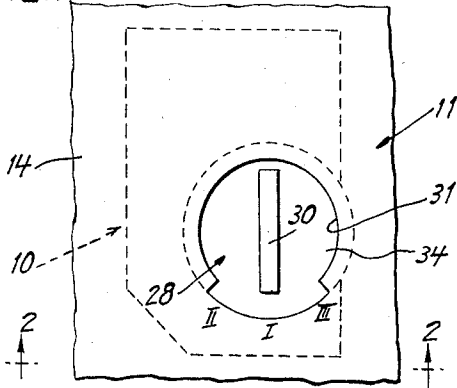


FIG. 2

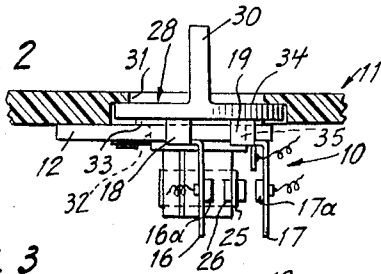


FIG. 3

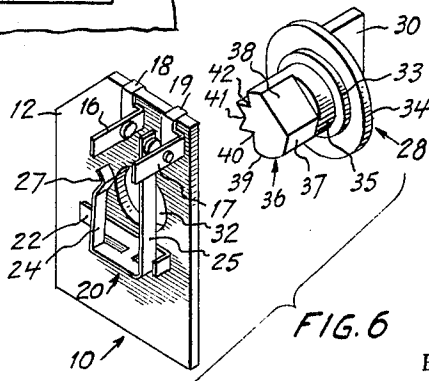
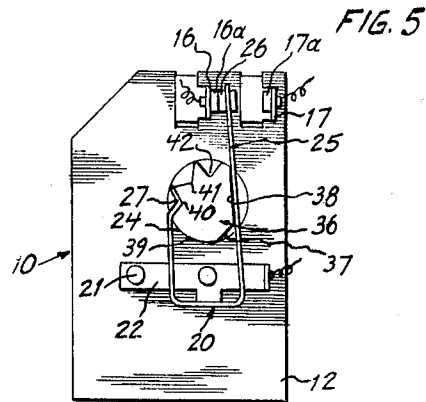
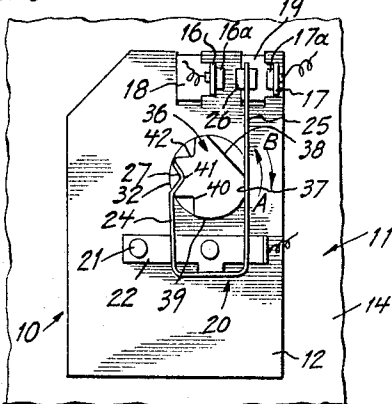


FIG. 6

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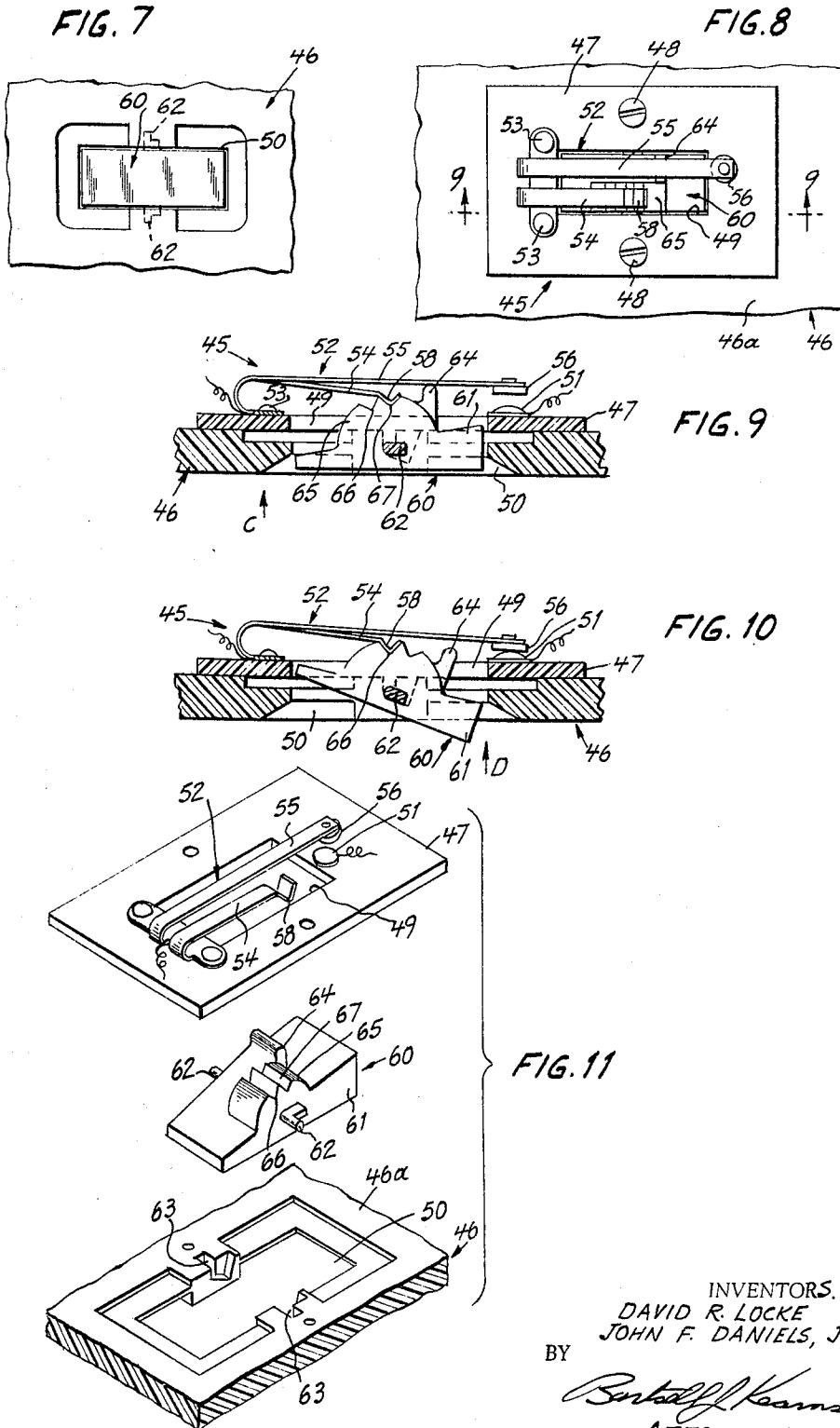
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DETENT MEANS FOR A POSITIONABLE SWITCH ACTUATOR

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The present invention relates to new and useful improvements in electric switches.

In electrical portable appliances, manually operable electric switches are used to accomplish a variety of functions. In some electric appliances, as for example in certain electric dry shavers, manually operable electric switches are used to selectively open and close a motor operating circuit. In other electric dry shavers, multi-positional electric switches are utilized to selectively control a plurality of modes of operation, such as selecting a particular voltage level of operation or selecting a particular source of electric power for operating the motor. One type of manually operable electric switch constructed to accomplish these various functions includes movable contact means and stationary contact means mounted on a support member within the appliance casing. A positionable switch actuator, which is manually operable from without the casing, is provided with cam means in engagement with the movable contact means. The actuator is movable to a plurality of positions whereby the movable contact means are moved by the cam means alternately into engagement or disengagement with the stationary contact means. These known arrangements present various disadvantages in that among others, additional structure is required to latch the switch actuator in a selected position against ready movement thereof to another selected position.

It is the object of the present invention to provide a novel electric switch.

Another object is to provide novel means for latching a positionable switch actuator in any of a plurality of moved positions.

Another object is to provide novel means for effecting a positive snap action to a switch actuator to insure positive engagement and disengagement of circuit establishing contact means.

A still further object is to provide a low cost electric switch of simple design and which electric switch is comprised of relatively few parts to facilitate the assembly thereof.

The present invention contemplates a novel electric switch and which electric switch includes novel means for maintaining a positionable switch actuator in a moved position against accidental movement thereof away from the latter position. According to the present invention the electric switch includes stationary contact means mounted on a support member with movable contact means also provided on the support member adapted for selective engagement and disengagement with the stationary contact means. The actuator is provided with cam means for controlling movement of the movable contact means into and out of engagement with the stationary contact means. The movable contact means is provided with a first spring arm adapted to engage the stationary contact means and with a second spring arm provided with resilient latch means on one end thereof. Detent means are formed on the actuator to receive the latch means of the second arm in any moved position of the actuator to restrain undesired movement of the actuator away from the selected moved position.

The present and other objects and advantages of the present invention will appear more fully hereinafter from

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a consideration of the detailed description which follows, taken together with the accompanying drawings wherein two embodiments of the invention are illustrated.

In the drawings:

FIG. 1 is a front elevational view of a portion of a casing of an electrically energized device which incorporates an electric switch of the present invention;

FIG. 2 is a sectional view taken on the line of 2-2 of FIG. 1;

FIG. 3 is a bottom view of the electric switch viewed from within the casing, and illustrates the movable contact means in a center position;

FIGS. 4 and 5 are views similar to FIG. 3 and show the movable contact means and actuator cam means in different moved positions;

FIG. 6 is an exploded perspective view of the parts of the electric switch of FIG. 1 through 5;

FIG. 7 is a front elevational view of a portion of a casing of an electrically energized device in which is incorporated another embodiment of an electric switch constructed according to the present invention;

FIG. 8 is a rear view of the electric switch of FIG. 7 as viewed from within the casing;

FIG. 9 is a sectional view taken on the line 9-9 of FIG. 8, and shows the switch contacts in open condition;

FIG. 10 is a view similar to FIG. 9 and shows the switch contacts in closed condition;

FIG. 11 is an exploded perspective view of the parts of the electric switch of FIGS. 7 through 10.

Referring now to the drawings for a more detailed description of the present invention and more particularly to FIGS. 1 to 3 inclusive, wherein one preferred embodiment of the present invention is clearly illustrated, a switch mechanism is generally indicated by the reference numeral 10. Switch mechanism 10 is mounted on a wall portion 11 (partially shown) of an electrically energized device as for example, an electric dry shaver. It is to be understood that the novel electric switch which is to be hereinafter fully described is not limited to such an electrically energized device and as will be seen is readily adapted for use with a wide variety of electrically powered devices to be selectively connected to one or more electric circuits. The drawings have been simplified so as to show only conventional structure as being necessary for a clear understanding of the present device.

Switch 10, as illustrated, is of the type usually referred to as a single pole-double throw switch and includes a support member 12 of nonconductive material and which support member 12 has one face secured to the rear surface 14 of casing wall 11 (FIG. 3) by any suitable means (not shown). A pair of spaced stationary contact members 16 and 17 are arranged on support member 12 with each contact member 16 and 17 provided with a clamp portion 18 and 19 respectively (FIGS. 3 and 6) secured to an edge marginal portion of support member 12. Contact buttons 16a and 17a (FIGS. 2 and 3) are provided on the opposing faces of stationary contacts 16 and 17 respectively.

Movable contact means are provided for selectively engaging either stationary contact 16 or 17 and which means include a movable contact member 20 (FIG. 3) of generally U-shaped configuration. Contact member 20 is attached to support member 12 by means of rivets 21 secured to a base portion 22 of contact member 20 and support member 12. A pair of spaced leaf spring arms 24 and 25 extend from base portion 22 and by their construction are biased toward each other. Arms 24 and 25 are of different lengths with the longer spring arm 25 provided with a contact button 26 on the free end thereof and which contact button 26 is disposed between stationary contact buttons 16a and 17a. The free end of the shorter

spring arm 24 is provided with a latch hook portion 27 for purposes to be hereinafter fully described.

Actuating means are provided for selectively moving contact arm 25 into and out of engagement with stationary contacts 16 and 17 and which actuating means include a positionable actuator 28 (FIGS. 1, 2, and 6) formed of molded nonconductive material. Actuator 28 includes a finger piece 30 which extends through an aperture 31 (FIG. 2) in casing wall 11 to the exterior of the casing to provide means for manually rotating actuator member 28 to a plurality of positions as indicated by the numerals I, II and III on the outer surface of casing wall 11 in FIG. 1. A circular aperture 32 (FIGS. 2, 3, and 6) is provided in support member 12 and through which aperture 32 extends a stub shaft 35 of actuator 28. Spaced rims 33 and 34 are provided on actuator 28 and as seen FIG. 2 are respectively disposed between support member 12 and casing wall 11 to maintain actuator 28 within the casing.

A cam portion 36 is provided on the end of stub shaft 35 and which cam portion extends between spring arms 24 and 25 of contact member 20. Cam portion 36 is provided with a flat corner portion 37 and which corner portion 37 merges at one side edge with an elongated flat surface 38 and at the opposite side edge with an arcuate camming surface 39. Detent means are provided on the side of cam portion 36 (FIG. 3) connecting flat surface 38 with arcuate surface 39, and which detent means includes triangular shaped recesses 40, 41 and 42 respectively. In the center position of contact arm 25 (FIGS. 1 to 3) corner portion 37 of cam portion 36 engages arm 25 and latch hook 27 on contact arm 24 is seated in recess 41 to maintain actuator 28 against arm 25. Contact button 26 is maintained out of engagement with stationary contact buttons 16a and 17a and actuator 28 is held in position against accidental movement by the engagement of hook 27 in recess 41.

If it is elected to move contact arm 25 into engagement with stationary contact 17 to the position shown in FIG. 4, and assuming contact arm 25 is in the center position (FIG. 3) as disclosed, finger piece 30 and actuator 28 are rotated from position I to position II (FIG. 1). As finger piece 30 is rotated, cam portion 36 is moved in the direction designated by arrow A in FIG. 3 to flex contact arm 25 to the right (FIG. 3). Cam corner portion 37 moves out of contact with arm 25 and arcuate camming surface 39 is brought into engagement with contact arm 25 to move contact arm 25 whereby contact button 26 is brought into engagement with contact button 17a of stationary contact 17, as shown in FIG. 4. As actuator 28 is rotated, arm 24 of contact member 20 flexes to the left (FIG. 3) to move latch hook 27 out of recess 41. As contact 25 engages contact 17 latch hook 27 snaps into detent recess 42 restraining further movement of actuator 28 and maintaining contacts 25 and 17 in firm engagement.

Let it be further assumed that with movable contact 25 at center position (FIG. 3), a person elects to move contact arm 25 into engagement with stationary contact 16. Finger piece 30 is rotated to position III (FIG. 1) to thereby rotate actuator cam portion 36 in the direction designated by the arrow B in FIG. 3. Corner portion 37 releases movable contact arm 25 allowing arm 25 to move to the left (FIG. 3) to bring contact button 26 into engagement with contact button 16a of stationary contact 16 as shown in FIG. 5. Simultaneously, elongated surface 38 of cam portion 36 engages arm 25 and latch hook 27 is moved out of recess 41 to snap into detent recess 40 to restrain further movement of actuator 28 in the direction of arrow B.

In FIGS. 7 to 11, inclusive, another embodiment of the present invention is disclosed in which an electric switch 45 is provided for attachment to the rear surface 46a of a casing wall 46 (partially shown in FIGS. 7 to 10) of an electrically energized device. Switch 45 is of

a single pole-single throw type and includes a support member 47 of non-conductive material and which support 47 is secured to surface 46a of casing wall 46 by screw threaded fastenings 48 (FIG. 8). As seen in FIG. 9, a rectangular shaped opening 49 is provided in support member 47 and which opening registers with a corresponding opening 50 in wall 46.

A stationary contact comprising a contact button 51 (FIG. 11) is secured to support member 47 adjacent one edge of opening 49. A substantially U-shaped movable contact member 52 has one end secured to support member 47 adjacent the opposite edge of opening 49 by means of rivets 53. Movable contact member 52 includes a pair of spaced and parallel resilient arms 54 and 55 of different lengths. Arms 54 and 55 both extend over opening 49 and by their construction are both biased toward support member 47. The free end of the longer arm 55 is provided with a contact button 56 adapted to engage stationary contact 51 and shorter arm 54 of contact member 52 is provided with a latch hook projection 58.

Switch 45 includes means for controlling movement of movable contact member 52 and which means comprise an actuator 60. Actuator 60 includes a moulded wedge-shaped main body portion 61 formed of a suitable non-conductive material such as for example nylon. A pair of pintles 62 are formed on the opposite side walls of body portion 61 and which pintles 62 (FIG. 11) are disposed in slots 63 in the spaced side walls of opening 50 in casing wall 46 mounting actuator 60 for pivotal movement therein. An outwardly extending cam projection 64 is formed on body portion 61 and is adapted to engage movable contact arm 55 of switch 45.

Means to detent actuator 60 are provided on body portion 61 and include an arcuate shaped bulge portion 65. A pair of triangular shaped recesses 66 and 67 are provided in the periphery of bulge 65 and are adapted to receive latch hook 58 of spring arm 54. In the position shown in FIG. 9, contact arm 55 is maintained out of engagement with stationary contact 51 by projection 64 and latch hook 58 is seated in detent recess 67 over the axis of rotation of actuator 60 to restrain movement of actuator 60.

Assuming switch 45 is in the position described with contacts 51 and 56 open (FIG. 9) and it is desired to close contacts 51 and 56 as shown in FIG. 10. Actuator 60 is pressed in the direction designated by arrow C in FIG. 9. Actuator 60 pivots on pintles 62 displacing projection 64 from contact arm 55. Contact arm 55 upon release moves and engages stationary contact 51. Simultaneously, latch hook 58 is cammed out of engagement with recess 67 and snaps into seated position in recess 66 to restrain actuator 60 from further movement in the direction of arrow C.

If it is then elected to open contacts 51 and 56 the portion of actuator exposed outwardly of opening 50 (to the right in FIG. 10) is pressed in the direction designated by arrow D in FIG. 10 into substantially flush relationship with the outer surface of casing wall 46. Projection 64 is moved into engagement with arm 55 to separate contacts 51 and 56. Latch hook 58 is simultaneously moved out of recess 66 and snapped into recess 67 in bulge 65 to restrain further movement of actuator 60 in the direction of arrow D.

It will be apparent from the foregoing description that the novel electric switch has many advantages in use. One advantage among others is that economical means are provided for detenting a switch actuator in a plurality of positions. Further the latch means is formed integrally with the contact member and the detent means integral with the actuator requiring relatively few and economical parts that require only a relatively small area of operation within a device.

It is to be expressly understood that the present invention is not limited to the two embodiments illustrated and described. Various changes can be made in the design and arrangement of parts without departing from the

spirit and scope of the invention as the same will now be understood by those skilled in the art.

What is claimed is:

1. An electric switch of the class described, comprising
 - (a) a support member of nonconductive material, 5
 - (b) a pair of spaced stationary contact members secured to said support member,
 - (c) spring contact means mounted on said support member and including a spring contact arm extending between said pair of spaced stationary contacts, 10
 - (d) a rotatable actuator member on said support member and having an axis of rotation extending normal to said support member,
 - (e) cam means carried by said actuator member and in engagement with said movable spring contact arm, 15
 - (f) said actuator member having a first position wherein said cam means is operable to maintain said contact arm out of engagement with said stationary contacts,
 - (g) said actuator having a second position wherein said cam means is operable to move said contact arm into engagement with one of said stationary contacts, 20
 - (h) said actuator having a third position wherein said cam means is operable to move said movable contact arm into engagement with the other of said stationary contacts, 25
 - (i) detent means on said actuator including a plurality of recesses in the surface of said actuator equal in number to the number of positions of said actuator member, 30
 - (j) said spring contact means including a second resilient arm spaced from said first arm and biased in the direction of said first arm, and
 - (k) a latch hook provided on the free end of said second spring arm adapted to engage in said detent recess according to the selected position of said actuator to prevent ready movement of the said actuator to the remaining positions, 35
 - (l) said second spring arm being yieldable upon movement of said actuator to release said latch hook from said selected detent recess to allow said actuator to be manually rotated to one of said other two positions whereat said latch hook is adapted to engage in another of said detent recesses in said actuator member. 40
2. An electric switch of the class described, comprising
 - (a) a support member of nonconductive material, 45
 - (b) a pair of spaced stationary contact members secured to said support member,
 - (c) a U-shaped contact member mounted on said support member and having a pair of convergently biased spring arms, 50
 - (d) a first arm of said U-shaped contact member extending between said pair of spaced stationary contacts, 55
 - (e) the second arm of said contact member provided with a latch hook on the free end thereof,
 - (f) a rotatable actuator member on said support member and having an axis of rotation extending normal to said support member, 60
 - (g) cam means carried by said actuator member and in engagement with said movable contact arm,
 - (h) said actuator member having a first position wherein said cam means is operable to maintain said first contact arm out of engagement with said stationary contacts, 65
 - (i) said actuator member having a second position wherein said cam means is operable to move said first contact arm into engagement with one of said stationary contacts, 70
 - (j) said actuator member having a third position wherein said cam means is operable to move said first contact arm into engagement with the other of said stationary contacts, 75

- (k) detent means on said actuator including a plurality of recesses in the surface of said actuator equal in number to the number of positions of said actuator member, and
- (l) a latch member on said second arm adapted to engage in a selected one of said recesses according to the selected position of said actuator to prevent ready movement of said actuator to one of the remaining two positions,
- (m) said latch member being yieldable upon movement of said actuator to release from said selected detent recess to allow said actuator to be rotated to a selected one of said other two positions whereat said latch member is adapted to engage in another of said detent recesses in said actuator member.
3. An electric switch of the class described, comprising
 - (a) a support member of nonconductive material,
 - (b) a stationary contact secured to said support member,
 - (c) a second contact member mounted on said support member and having first and second parallel and movable spring arms,
 - (d) said first spring arm having the free end thereby biased to a closed position with said stationary contact,
 - (e) latch means formed on the free end of said second arm,
 - (f) a pivotal actuator member arranged spaced and parallel to said arms of said second contact member and movable between first and second positions,
 - (g) cam means on said actuator adapted to engage said first arm to maintain said first arm out of engagement with said stationary contact when said actuator is in said first position,
 - (h) said cam means adapted to disengage from said first arm when said actuator is moved to said second position to permit said arm to engage said stationary contact, and
 - (i) detent means on said actuator in engagement with said latch means on said second arm in either of said two positions of said actuator member to restrain ready movement of said actuator.
4. An electric switch of the class described, comprising
 - (a) a support member of nonconductive material,
 - (b) a stationary contact secured to said support member,
 - (c) a second contact member mounted on said support member and having first and second parallel spring arms,
 - (d) said first spring arm having the free end thereof biased toward a closed position with said stationary contact,
 - (e) a latch hook formed on the free end of said second spring arm,
 - (f) a pivotal actuator member disposed to one side of said spring arms and arranged in a first position wherein said actuator lies in a plane spaced from and parallel to said spring arms,
 - (g) said actuator member being movable to a second position whereat said actuator is inclined towards said arms,
 - (h) a cam projection on said actuator in engagement with said first spring arm to maintain said first spring arm out of engagement with said stationary contact in said first position of said actuator,
 - (i) said cam projection moved out of engagement with said first arm when said actuator is in said second position to allow said arm to engage said stationary contact, and
 - (j) detent means on said actuator adapted to engage said resilient latch hook on said actuator in either of said two positions to restrain undesired movement of said actuator.
5. The electric switch of claim 4 wherein said actuator member comprises a wedge-shaped body portion having said contact engaging projection extending outwardly from

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said body portion and said detent means comprising a bulge projection on said body portion having at least two recesses provided therein with each of said recesses adapted to receive and detent said latch hook in a selected position of said actuator to restrain ready movement of said actuator to the other position.

6. An electric switch of the class described, comprising

(a) a support member of non-conductive material,
(b) a stationary contact carried by said support member,

(c) first and second spring arms mounted on said support member and disposed spaced and parallel to each other,

(d) said first spring arm having contact means thereon and adapted for movement into and out of engagement with said stationary contact,

(e) latch means formed on said second spring arm,

(f) an actuator member spaced from said spring arms and mounted for pivotal movement between first and second positions relative to said support member,

(g) cam means on said actuator member adapted for engagement with said first spring arm to control said movement of said first spring arm respectively into and out of engagement with said stationary contact in accordance with said positions of said actuator member, and

(h) detent means on said actuator member in engagement with said latch means on said second spring arm in either of said positions of said actuator member to restrain ready pivotal movement of said actuator between said positions.

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7. The electric switch of claim 6 wherein said actuator member comprises a wedge-shaped body portion having a pair of pintles extending from spaced sidewalls thereof to support the body portion for pivotal movement relative to the support member, said cam means extending outwardly from the body portion, said detent means comprising a bulge projection on said body portion disposed adjacent said cam means and having at least two recesses provided therein, and said combination further including said latch means comprising a hook on the free end of said second spring arm adapted to selectively engage in said recesses in accordance with the position of the actuator member to restrain ready movement of said actuator member between said positions.

8. The electric switch of claim 6 wherein said actuator member is arranged to lie in a first plane substantially parallel to said spring arms in the first position and in a second plane inclined towards said arms in the second position.

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