April 4, 1961 E. A. JONES 2,978,555

ELECTRIC SWITCH

Filed Jan. 12, 1959 2 Sheets-Sheet 1

Fig. 1.

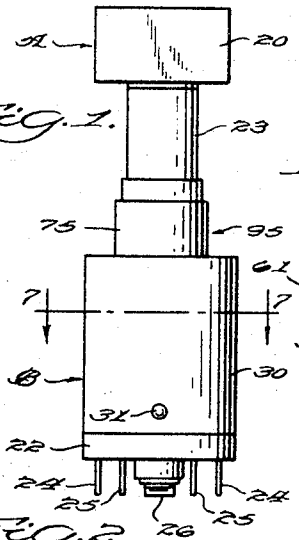


Fig. 5.

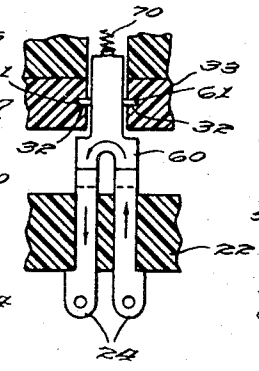


Fig. 4.

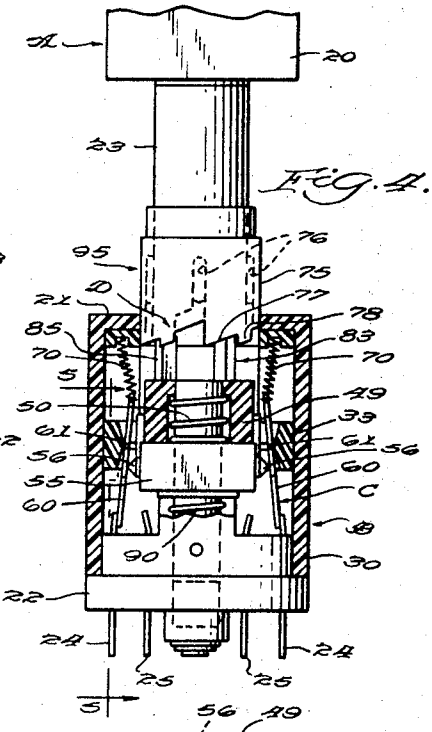


Fig. 2.

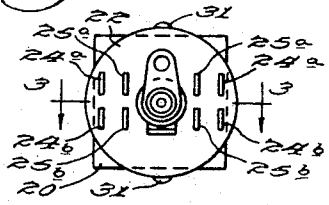


Fig. 6.

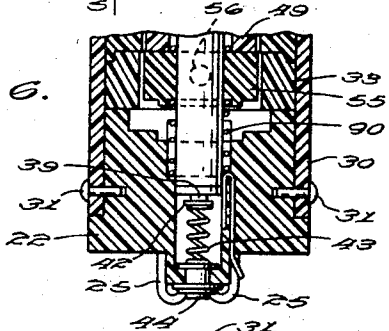


Fig. 3.

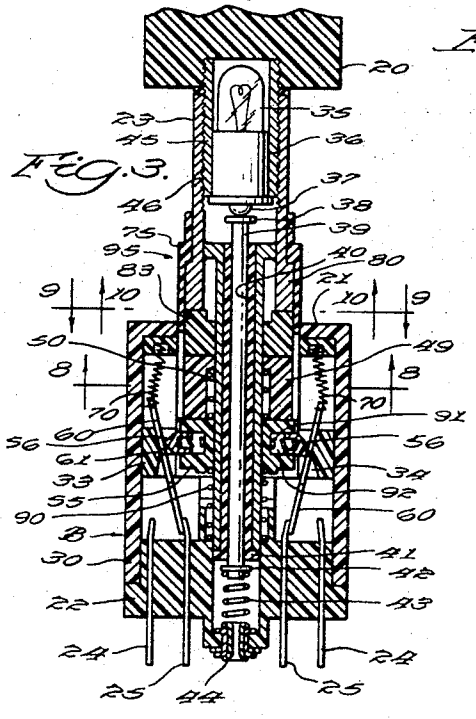
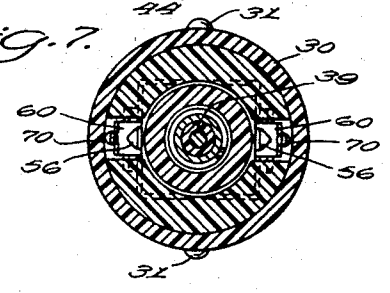


Fig. 7.



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April 4, 1961 E. A. JONES 2,978,555

ELECTRIC SWITCH

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Fig. 8.

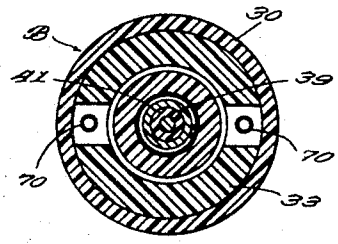


Fig. 9.

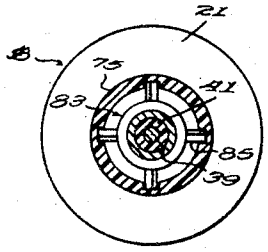


Fig. 10.

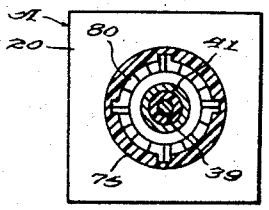


Fig. 11.

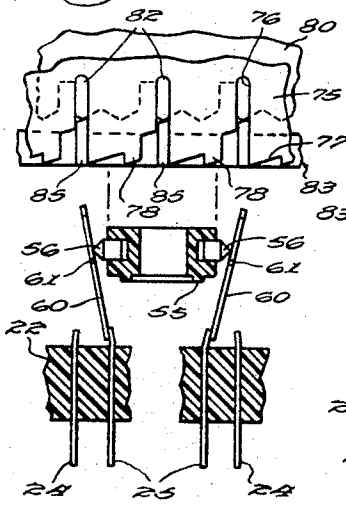


Fig. 12.

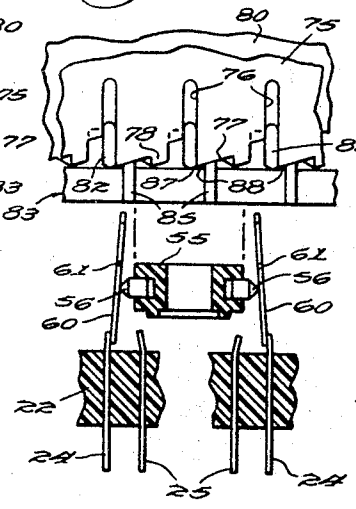


Fig. 13.

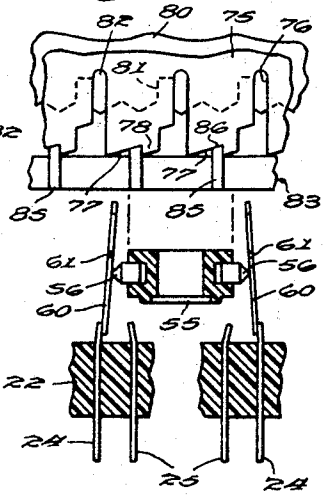


Fig. 14.

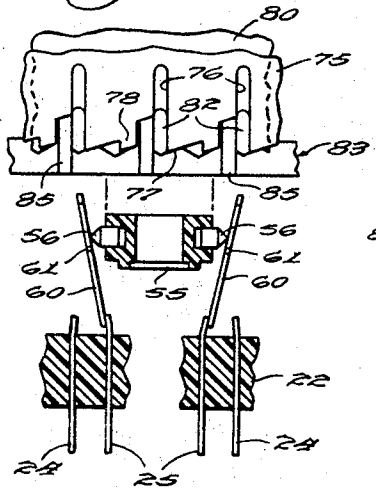


Fig. 15.

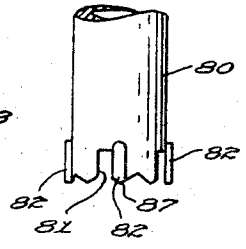
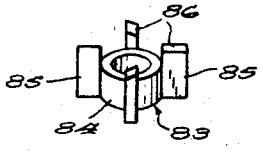


Fig. 16.



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2,978,555

ELECTRIC SWITCH

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Filed Jan. 12, 1959, Ser. No. 786,194

4 Claims. (Cl. 200—67)

This invention relates to electric switches and more particularly to an electric switch of the push-button type.

The switch of the present invention is a positive action switch which alternately transfers from an "on" to an "off" position or from a first electrical circuit position to a second electrical circuit position by a successive depression of a button extending from the top thereof. Means are also provided for illuminating the top of the switch when the switch is in the "on" position.

The switch of the present invention employs a cam action for providing a positive transfer of the contacts from the on position to the off position. A movable contact arm is pivoted about a fixed fulcrum by selectively applying a force which is on either side of the fulcrum thus transferring the angular position of the contact arm from the on to the off contact.

It is an object of the present invention to provide an electric switch of the push-button type which is simple in construction and which provides a positive action.

Another object of the present invention is to provide a push-button electric switch which transfers from the on to the off position by a cam action.

Yet another object of the present invention is to provide a push-button switch which will automatically transfer from a first position to a second position by successive depressions of a button associated therewith.

Yet another object of the present invention is to provide an improved push-button electric switch which will give a visual means of indicating when the switch is in the on position.

The novel features which are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages thereof, will be better understood from the following description considered in connection with the accompanying drawings in which a presently preferred embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention.

In the drawings:

Figure 1 is a front elevation showing an electric switch constructed in accordance with the presently preferred embodiment of the present invention;

Figure 2 is a plan view of the bottom of the switch of Figure 1;

Figure 3 is a view taken along line 3—3 of Figure 2;

Figure 4 is an enlarged view partly in section of the switch of Figure 1 showing the cam mechanism;

Figure 5 is an enlarged sectional view taken along line 5—5 of Figure 4;

Figure 6 is a partial sectional view of the lower part of the switch of Figure 1;

Figure 7 is an enlarged sectional view taken along line 7—7 of Figure 1;

Figure 8 is a sectional view taken along line 8—8 of Figure 3;

Figure 9 is a view taken along line 9—9 of Figure 3;

Figure 10 is a view taken along line 10—10 of Figure 3;

Figure 11 is a view partly in section showing the relative position of the cam mechanism and the contact mechanism of the switch of Figure 1 when it is in the off position.

Figure 12 is a view partly in section showing the relative position of the cam mechanism and the contact mechanism of the switch of Figure 1 when it is in an intermediate position while being switched from the off to the on position;

Figure 13 is a view partly in section showing the relative position of the cam mechanism and the contact mechanism of the switch of Figure 1 when it is released and locked in the on position;

Figure 14 is a view partly in section showing the relative position of the cam mechanism and the contact mechanism of the switch of Figure 1 when it is in an intermediate position while being depressed from the on to the off position;

Figure 15 is an enlarged view of one part of the cam mechanism forming part of the switch of Figure 1; and

Figure 16 is an enlarged view in perspective of another part of the cam mechanism forming part of the switch of Figure 1.

Referring now to the drawings and more particularly to Figure 1, therein is shown a presently preferred embodiment of the switch constructed in accordance with the present invention, which includes the actuating section A which is depressed in order to perform the switching function, the main body of the switch B, the on-off contact mechanism C and a cam mechanism D. The actuating section A includes an actuating button **20** which is depressed to operate the switch and a central extending rod **23** connected thereto which is movable into and out of the main body B. Two sets of contacts **24** and **25** for connecting the switch into the appropriate circuitry which it is to operate extend from the bottom of the switch at opposite sides of a centrally located bulb connecting element **26** for energizing a light bulb **35** which lights the button **20** when the switch is in the on position as described hereinafter. The main body portion B includes an outer housing **30** which may be made of plastic and which encloses the mechanism in the body section. A lower end plate **22** for closing the body portion is fastened thereto by means of a set of pins **31** which extend through a hole within the housing **30** and into the end plate **22**. In the embodiment shown the housing **30** defines an upper end plate **21** as an integral part thereof. The housing **30** and end plates define a generally cylindrical interior and although a cylindrical exterior configuration is shown the body portion may take other forms dependent upon its use.

In Figure 3 there is shown a cross-sectional view taken along line 3—3 of Figure 2 to better expose the operating mechanism of the switch. An incandescent lamp **35** is shown to be affixed within a mounting **36** which includes an extending bottom contact **37** which impinges against a head **38** located at the top of a bulb conductor rod **39**. The bulb conductor rod **39** extends longitudinally through a central hole **40** defined by a bearing rod **41**. The bearing rod **41** is symmetrical with respect to the longitudinal centerline of the switch and is affixed to the stem **23** for movement therewith. The rod **39** has an extending shoulder portion **42** at the bottom thereof. A biasing spring **43** is affixed intermediate a central metal bushing **44** and the shoulder portion **42** thus urging the rod in contact with the contact **37** associated with the bulb mounting.

The bulb mounting is affixed within a threaded element **45** which is screwed within a threaded portion **46** in the top of the shaft **23**.

Referring now to Figures 2, 3 and 5 the manner in which the switch moves to the on and off position with respect to the circuit connectors or contacts **24** and **25** is shown. It is to be understood, however, that although on-off switch operation is described throughout this disclosure the switch is a two position switch which can operate circuitry other than in an on-off manner. That is, the contacts **24** can define one pair of electrical paths while the contacts **25** can define a second pair of electrical paths with the switch being operable to open and close the circuits through these paths alternately. For clarity and simplicity of discussion, however, it will be assumed that both pairs of contacts **24** must be electrically joined to complete an "on" circuit while both pairs of contacts **25** must be joined to complete an "off" circuit. Thus, as shown, each electrical contact **25** comprises a first and second electrical conductor **25***a* and **25***b* which are arranged in side by side relation extending through the end plate **22** of the body portion B but which are electrically insulated one from the other. A pair of pivotal electrical connectors **60** are pivotally mounted within the housing **30** for movement between the contacts **24** and **25**. As shown in Figure 5, each pivotal connector **60** is so constructed that when moved into contact with a contact **24** or **25** it completes an electrical path between the conductor **24***a* and **24***b* or **25***a* and **25***b*. Accordingly, in the presently preferred embodiment the on-off contact mechanism C includes the contacts **24** and **25** and the pivotal connectors **60**. The connectors **60** are mounted within the housing **30** for pivotal movement by affixing to the connector **60** at each side thereof a transverse fulcrum pin **61**. The pin **61** is in turn rotatably mounted in bearings **32** defined by a center mounting section **33**. The mounting section **33** in this embodiment is formed, as shown in Figures 3 and 7, by affixing to the internal wall of the housing **30** a circular cylindrical block of material, such as plastic, which defines indentations **34** within which the connectors **60** are mounted upon the pins **61**. The indentations are so formed that the pins **61** are pivotal to contact with either the contact **24** or **25**. The mounting section **33** extends longitudinally a sufficient distance to form an adequate support for the connectors **60** and defines a central opening in which a connector actuating block **55** is longitudinally movable. That is, the connectors **60** are pivoted to the desired contact **24** or **25** by exerting a radial force below or above the pivot point **61** of the connector respectively. Accordingly, means are provided within the body portion B to exert a force longitudinally to either side of the pivot pins **61**. In the presently preferred embodiment such force is obtained py positioning a connector actuating block **55** which is square in cross-sectional configuration within the body for longitudinal movement to either side of the connector pins **61**. The connector actuating block **55** is a block of plastic slidably movable longitudinally within the central opening through the connector mounting section **33**. The actuating block **55** defines a longitudinal opening therethrough mateable with the central rod **41** such that it is longitudinally movable with respect thereto. Downward movement of the connector actuating block **55** is obtained by actuation of the switch through the cam mechanism as described hereinafter, while upward movement is obtained by means of a compression spring **90** mounted and retained between the lower end plate **22** and the lower surface of the actuating block **55**. A pair of opposed fulcrum pins **56** are carried by the actuating block **55** such that they exert a radial force against the connectors **60** at the proper position. Thus, a fulcrum pin **56** which is forced radially outward by a compression spring **91** is mounted for sliding movement radially from an opening **92** with which it is mateable in the sidewall of the actuating block. The fulcrum pin **56** is positioned substantially at the longitudinal centerline of the respective connector **60** and is movable outward beyond the pivot pin **61** a sufficient distance to cause the required pivotal movement of the connector. Thus, the block **55** and pin **56** are movable from the upper position shown in Figure 3 at which the connector is forced into contact with the contact **25** to the lower position at which the connector is forced into contact with the contact **24** as shown in Figure 4. A pair of springs 70 are provided and connected in tension from the top of each connector **60** to the top of the housing **30** to insure a more positive action when the switching action is taking place.

To obtain movement of the connector actuating block to the upper or lower position as required a cam mechanism operating between the actuating block **55** and the actuating button **20** is utilized. In Figure 4 there is a view shown of the switch mechanism together with a partial exposition of the cam action which permits the successive depression of the actuating section to positively change the position of the movable connector arm **60** from either the on to the off position or the on to the off position depending upon the state of the prior depression of the actuating button **20**. As shown in Figure 4, the switch mechanism is in a state as it would appear in the on position. The cam mechanism consists mainly of three parts. One part is stationary with respect to the body portion B and housing **30** of the switch and is defined by the female cam housing **95** extending upwardly from the upper end plate **21** of the housing **30** to form part of the case or housing for the switch as shown in Figures 4, 11, 12, 13 and 14. The female cam member **75** defines a plurality of generally vertically disposed slots **76** which are cut into the member **75** at fixed predetermined intervals about the periphery thereof. Further, element **75** is so shaped as to have each of the slots **76** communicate one with the other by an inclined section **77** which further includes an intermediate projection **78**. Thus, the female cam member **75** can be formed as a cylinder positioned within the cylindrical cam housing **95** and affixed thereto, or the slots **76** and inclines can be formed into the internal wall of the cam housing **95** itself. A second element forming part of the cam mechanism is shown in Figure 15 and is a longitudinally reciprocative cam section designated therein by numeral **80**. Cam section **80** may be integral with the central rod or member **23** forming part of the switch as shown in Figure 1 and described hereinbefore. The shape of element **80** defining a plurality of curved cam surfaces **81** as the lower end thereof and a plurality of adjoining generally longitudinally extending radial protrusions **82** contributes principally to the cam action as will be hereinafter explained. Element **80** will typically be made of metal such as brass and is preferably formed as the lower end portion of the central stem **23**. The protrusions **82** are of such width as to be slidably mateable with the slots **76** in the female cam **75** and are of predetermined length as described hereinafter. The outside diameter of the cylindrical portion of element **80** is substantially equal to but less than the inside diameter of the female cam **75**. Thus, the cam section **80** is slidably mateable with the female cam for longitudinal movement with respect thereto. The lower end of each of the protrusions **82** is rounded or finished on a bias for reasons which will become more apparent in connection with the description of the operation of the apparatus. The third element forming part of the cam mechanism is the cam follower **83** which is shown in perspective in Figure 16. Cam follower **83** may be made of a plastic material such as polyethylene or nylon. Cam follower **83** consists of a central cylinder **84** and a plurality of generally longitudinally disposed radially extending fin members **85** which are positioned at quadrants of the cylinder **84** and extend from one end thereof to a predetermined length. The outside diameters of

the fin members 85, the protrusions 82 and the slots 76 of the female cam 75 are all substantially equal. The fin members 85 have a radial thickness substantially extending from the inside diameter of the cam element 80 to the outside diameter of the female cam element 75. The width of the fin members 85 is substantially equal to but less than the width of the slots 76 in the female cam 75 such that they are slidably mateable therewith. The upper end of each fin is cut on an angle or bias in one direction for reasons described more fully hereinafter in connection with the operation of the apparatus. The longitudinal length of the slots 76, the protrusions 82 and the fin members 85 are interdependent and determined by the longitudinal distance through which the connector actuating block 55 must travel as discussed hereinafter. The cam follower cylinder 84 defines a central opening therethrough which is mateable with the bearing rod 41 such that the cam follower is longitudinally movable and rotatable with respect to the bearing rod. The bearing rod 41 is in turn affixed to the stem 23 for movement with the actuating section of the switch.

Positioned between the cam follower 83 and the connector actuating block 55 is a bearing block 49 for transmitting longitudinal movement of the cam follower to the actuating block. The bearing block 49 is not essential in that the cam follower can bear directly against the block 55, however, in this embodiment a cylindrical bearing having a central opening to allow movement with respect to the bearing rod is used. A spring 50 in compression is mounted between the bearing block and the actuating block 55 to insure the close engagement of the longitudinally arranged components of the switch.

Thus, referring to Figures 3 and 4, the switch as assembled comprises a housing 30, lower end plate 22, upper end plate 21, and female cam housing 95, the interior surface of which defines the female cam 75 all of which are stationary. The stem 23 which includes the longitudinally movable cam section 80 is movable into and out of the female cam housing 95 and the bearing rod 41 extends through the housing 30 into the central opening of the lower end plate 22 and is longitudinally movable with the stem 23 and cam section 80. The cam follower element 83 is mounted about the bearing rod 41 for rotation and longitudinal movement. The bearing block 49 and connector actuating block 55 are then positioned successively beneath the cam follower 83 and both are mounted about the bearing rod 41 for longitudinal movement with respect thereto.

The configuration of the cam surfaces 81 on the cam element 80 and the manner of operation of the cam mechanism is shown by reference to Figures 11, 12, 13, and 14 which illustrate the various positions of the cam elements. As discussed hereinbefore the cam elements in this embodiment are formed at quadrants. That is, there are four slots 76, four protrusions 82 and four fin members 85. A greater or lesser number of engaging parts could, of course, be utilized. As shown in Figures 11 through 14, however the cam elements have been partially unfolded to show three of the four slots 76, protrusions 82 and fin members 85.

In Figure 11 the cam elements 75, 80 and 83 are shown as they are oriented relative to one another when the switch is locked in the "off" position. That is, the actuating block 55 is in the upward position where the fulcrum pins 56 exert an outward force on the connectors 60 above the pivot point 61 to force the connector into contact with the "off" contacts 25. The actuator button 20 and stem 23 have been previously depressed and at the position of Figure 11 are returned and at rest in their upward position. At this "locked off" position of the switch the protrusions 82 of the longitudinally movable cam 80 and the fin members 85 of the cam follower 83 are aligned and are forced upward into the respective slots 76 of the stationary female cam 75. Thus, the longitudinally movable cam element 80 and the cam follower 83 as well as the bearing block 49 and actuating block 55 are in their uppermost position. All of the parts are maintained in the upper position by the upward spring biasing of springs 50 and 51.

Referring now to Figure 12, to actuate the switch to the on position the actuating button 20 is depressed by the operator. The stem 23 carrying the cam element 80 is moved downward causing the protrusions 82 carried thereby to move longitudinally downward in the slots 76. Depression of the switch continues until the protrusions 82 have been moved downward until the lower end 87 thereof is coincident with or below the lowermost adjacent point 88 of the stationary incline cam section 77. Thus, as the protrusions 82 are moved downward by depression of the actuating button 20 the fin members 85 and accordingly the cam follower element 83 are moved downward until the fin members are no longer in the slots 76. Movement of the cam follower element 83 through this distance also forces the bearing block 49 and connector actuating block 55 downward through an equal distance. The distance through which the actuating block 55 is moved downward is such that, as shown in Figure 12, the fulcrum pins are in the lowermost position and force the connectors 60 outward beneath the pivot point 60 to move the connectors into contact with the on contact 24. As discussed hereinbefore, the lower end 87 of the protrusions 82 are rounded or formed at an angle which becomes coincident with the cam surface 81 at one side of the protrusion. In addition, the upper end 86 of the fin members 85 are formed at a peripheral angle as shown in Figure 16 with the high point to the same side of the protrusion 82 as the coincident cam surface 81. Accordingly, since the cam follower 83 is spring biased toward the protrusions the fin members 85 are urged out of alignment with the protrusions. That is, except when retained in alignment by the slots 76 the cam follower tends to rotate to the right in the figures. Thus, when the protrusions 82 force the fin members out of the slots 76 the fin members slip out of alignment and off of the protrusions to the right. The upper end of the fin member will then be in contact with the cam surface 81 or the incline section 77 whichever is lower, since the cam surface 81 and incline section 77 are concentric and the fin member is sufficient in radius to span both. Both the incline surface 77 and the cam surface 81 immediately adjacent the protrusion are inclined upward and to the right to insure rotation of the cam follower 83 to the right when the fin members are forced from the slots 76. Thus, as the actuating button 20 is depressed from the "locked-off" position of Figure 11 to the "on" position of Figure 12, the longitudinally movable cam element 80, cam follower 83 and connector actuating block 55 are moved to their lowermost positions.

Referring now to Figure 13, as the switch is released from the on position of Figure 12, the elements assume the "locked-on" position of Figure 13. As the actuating button 20 is released by the operator the spring 51 urges the cam follower upward while the spring 43 urges the stem 23 and cam element 80 upward. As the stem 23 and cam element 80 move upward the cam surface moves out of contact with the upper end 86 of the fin member 85 and leaves the fin members in contact with the inclined cam surface 77 of the female cam 75 which is stationary. Due to the incline upward and to the right of the surface 77 the upward force on the fin members causes them to move to the right until they are stopped by the downward protrusions 78 on the incline surface. Although the cam follower and accordingly the connector actuating block 55, have moved upward slightly the upward movement still leaves the fulcrum pins 56 well below the pivot point 61 and the switch is in the locked-on position where it will remain until the actuating button 20 is again depressed.

Referring now to Figure 14, as the switch is depressed

from the locked-on position of Figure 13 the elements assume the off position of Figure 14. When the actuating button **20** is depressed by the operator and cam element **80** moves downward causing the protrusions **82** to move down to the position at or below the lowermost point **88** of the inclined surface **77**. The cam surface **81** in moving downward depresses the fin members **85** to a position beneath the downwardly extending protrusions **78** of the inclined surface **77**. That is, a node **93** of the cam surface **81** is longitudinally aligned with the protrusion **78** of the inclined surface **77** such that when the cam surface **81** moves downward with the fin member resting against the protrusion **78** as shown in Figure 13, the cam surface forces the fin member beneath the protrusion. At this position the cam surface **81** is also inclined upwardly and to the right which causes the fin member to pass to the right beyond the protrusion, after which it is again forced by spring pressure back to the inclined surface **77** since the cam surface **81** at the position to the right of the protrusion extends above the inclined surface. The fin members **85** thus assume the position shown in Figure 14 at which they have been moved upward a sufficient distance to move the fulcrum pins above the pivot point **61** to force the connector **60** into the off position in contact with the contacts **24**. Thus, the switch is now in the off position. When the actuator button **20** is released it is forced upward by the spring bias which carries the protrusions **82** back to the position shown in Figure 11 and allows the fin members **85** to move into the slots **76** to the locked-off position shown in Figure 11 and described hereinbefore.

Thus, the present invention provides an improved push-button switch which automatically moves from a first position to a second position by depression of the button. The switch is simple in construction and provides a positive action.

What is claimed is:

1. An improved push-button actuated electric switch comprising: a switch housing; an electric connector mounted within said switch housing, said connector being mounted for pivotal movement about a pivot point from a first position in electrical contact with a first contact member to a second position in electrical contact with a second contact member; means for exerting a pivoting force against said connector; cam means for moving said force exerting means from a first position at one side of said pivot point to a second position at the opposite side of said pivot point; and push-button means for actuating said cam means, said push-button means being operable from a first to a second position, said cam means comprising a female cam housing and a reciprocative cam section and a cam follower, said female cam housing being of cylindrical tubular shape and having a first end and a second end, said female cam housing being affixed to said switch housing with its first end within said switch housing and with its second end projecting from said switch housing, said female cam housing defining in the internal wall thereof at said first end a plurality of longitudinally extending circumferentially spaced slots, adjacent slots being joined by an inclined surface having a longitudinal projection thereon intermediate said slots, said reciprocative cam section being generally of cylindrical tubular shape and having a first and a second end, the outside diameter of said reciprocative cam section being substantially equal to the inside diameter of said female cam housing, said reciprocative cam section defining a plurality of longitudinally extending radial protrusions at said first end thereof, said radial protrusions being of predetermined length and of a width substantially equal to the width of said slots in said female cam housing, said reciprocative cam section being slidably mounted within said female cam housing with the radial protrusions at the first end of said reciprocative cam section being slidably mateable with said longitudinal slots at said first end of said female cam housing, said first end of said reciprocative cam section defining a plurality of cam surfaces, said second end of said reciprocative cam section protruding from the second end of said female cam housing and being affixed to said push-button means, said reciprocative cam section having an elongate cylindrical element axially projecting from said first end a predetermined distance and adapted to limit the movement of said reciprocative cam section within said switch housing and to normally urge said push button to said first position, said cam follower comprising a cylindrical tubular member having a plurality of longitudinally disposed radially extending fins affixed thereto in predetermined circumferential spacing to provide alignment with said slots in said female cam housing, said cylindrical cam follower surrounding said elongate cylindrical element axially projecting the first end of said reciprocative cam section and slidable and rotatable with respect thereto, the length of said slots and fins and protrusions being interdependent with said fins being slidably mateable with said slots, said protrusions and fins being aligned and mateable with said slots at said off position of said switch, said fins being rotated out of alignment with said slots and into engagement with said longitudinal projections intermediate said slots at said on position of said switch, said fins being rotated by said inclined surfaces of said female cam housing by successive operations of said push-button means from said first to said second position, said cylindrical cam follower being in operative contact with said force exerting means to thereby cause said connector to be pivoted successively from said first contact member to said second contact member upon successive depressions of said push-button means.

2. An improved push-button actuated electric on-off switch which is pushed to "on" and pushed "off" comprising: a relatively vertically oriented housing having a base and a top; and "on" contact and an "off" contact mounted within said housing, said on and off contacts being spaced apart and extending through the base of said housing; an electrical connector pivotally mounted within said housing, said connector being generally vertically extending and pivotally mounted for movement about a pivot point from a first position in electrical contact with said off contact to a second position in electrical contact with said on contact; means for exerting a radially outward pivoting force against said connector, said force exerting means being vertically movable within said housing from a first position above said pivot point to a second position below said pivot point; cam means for moving said force exerting means from said first position above said pivot point to said second position below said pivot point; and a push button for actuating said cam means, said push button being movable with respect to said housing from a first to a second position, said cam means comprising a female cam housing and a reciprocative cam section and a cam follower, said female cam housing being of cylindrical tubular shape and having its uppermost longitudinal portion extending vertically upward from said switch housing, said female cam housing defining in the internal wall thereof at its lowermost portion a plurality of longitudinally extending circumferentially spaced slots, adjacent slots being joined by an inclined surface having a downward projection thereon intermediate said slots, said reciprocative cam section being generally of cylindrical tubular shape with an outside diameter substantially equal to the inside diameter of said female cam housing, said reciprocative cam section defining a plurality of longitudinally extending radial protrusions at one end thereof, said radial protrusions being of a predetermined length and of a width substantially equal to the width of said slot in said female cam housing, said reciprocative cam section being slidably mounted within said female cam housing with the radial protrusions at said one end of said reciprocative cam section being lowermost and slidably mateable

with said longitudinal slots in said female cam housing, the lowermost ends of said reciprocative cam section defining a plurality of cam surfaces, the uppermost end of said reciprocative cam section protruding from the uppermost end of said female cam housing and being affixed to said push button, said reciprocative cam section having an elongate cylindrical element axially projecting from its lowermost end a predetermined distance and adapted to limit the movement of said reciprocative cam section within said switch housing and to normally urge said push button to said first position, said cam follower comprising a cylindrical tubular member having a plurality of longitudinally disposed radially extending fins affixed thereto in predetermined circumferential spacing to provide alignment with said slots in said female cam housing, said cylindrical cam follower surrounding said elongate cylindrical element axially projecting downward from the lowermost end of said reciprocative cam section and slidable and rotatable with respect thereto, the lengths of said slots and fins and protrusions being interdependent with said fins being slidably mateable with said slot, said protrusions and fins being aligned and mateable with said slots at said off position of said switch, said fins being rotated out of alignment with said slots and into engagement with said projections on the inclined surfaces intermediate said slots at said on position of said switch, said fins being rotated by said inclined surfaces of said female cam housing upon successive operations of said push button from said first to said second position, said cylindrical cam follower being in operative contact with said force exerting means to thereby cause said connector to be pivoted successively from said off contact to said on contact upon successive depressions of said push button.

3. An improved push-button actuated electric on-off switch which is pushed to "on" and pushed to "off" comprising: a relatively vertically oriented housing having a base and a top; an "on" contact and an "off" contact mounted within said housing, said on and off contacts being spaced apart and extending through the base of said housing at one side of the longitudinal axis of said housing; an electrical conductor pivotally mounted within said housing to said one side of said longitudinal axis, said connector being generally vertically extending and pivotally mounted for movement about a pivot point from a first position in electrical contact with said off contact to a second position in electrical contact with said on contact; means for exerting a radially outward pivoting force against said connector, said force exerting means being vertically movable within said housing along said longitudinal axis thereof from a first position above said pivot point to a second position below said pivot point; cam means for moving said force exerting means from said first position above said pivot point to said second position below said pivot point; and a push button for actuating said cam means, said push button being movable with respect to said housing from a first to a second position, said cam means comprising a female cam housing and a reciprocative cam section and a cam follower, said female cam housing being of cylindrical tubular shape and having its uppermost longitudinal portion extending vertically upward from said switch housing, said female cam housing defining in the internal wall thereof at its lowermost portion a plurality of longitudinally extending circumferentially spaced slots, adjacent slots being joined by an inclined surface having a downward projection thereon intermediate said slots, said reciprocative cam section being generally of cylindrical tubular shape with an outside diameter substantially equal to the inside diameter of said female cam housing, said reciprocative cam section defining a plurality of longitudinally extending radial protrusions at one end thereof, said radial protrusions being of a predetermined length and of a width substantially equal to the width of said slot in said female cam housing, said reciprocative cam section being slidably mounted within said female cam housing with the radial protrusion at said one end of said reciprocative cam section being lowermost and slidably mateable with said longitudinal slots in said female cam housing, the lowermost ends of said reciprocative cam section defining a plurality of cam surfaces, the uppermost end of said reciprocative cam section protruding from the uppermost end of said female cam housing and being affixed to said push button, said reciprocative cam section having an elongate cylindrical element axially projecting from its lowermost end a predetermined distance and adapted to limit the movement of said reciprocative cam section within said switch housing and to normally urge said push button to said first position, said cam follower comprising a cylindrical tubular member having a plurality of longitudinally disposed radially extending fins affixed thereto in predetermined circumferential spacing to provide alignment with said slots in said female cam housing, said cylinder cam follower surrounding said elongate cylindrical element axially projecting downward from the lowermost end of said reciprocative cam section and slidable and rotatable with respect thereto, the lengths of said slots and fins and protrusions being interdependent with said fins being slidably mateable with said slot, said protrusions and fins being aligned and mateable with said slots at said off position of said switch, said fins being rotated out of alignment with said slots and into engagement with said projections on the inclined surfaces intermediate said slots at said on position of said switch, said fins being rotated by said inclined surfaces of said female cam housing upon successive operations of said push button from said first to said second position, said cylindrical cam follower being in operative contact with said force exerting means to thereby cause said connector to be pivoted successively from said off contact to said on contact upon successive depressions of said push button.

4. An improved push-button actuated electric on-off switch which is sucessively pushed to "on" and pushed "off" comprising: a relatively vertically oriented switch housing having a base and a top; an "on" contact and an "off" contact mounted within said housing, said on and off contacts being spaced apart and extending through the base of said housing at one side of the longitudinal access of said housing; an electrical connector pivotally mounted within said housing and extending downward to a position between said on and off contacts, said connector being pivotally mounted for movement about a horizontal pivot point from a first position in contact with said off contact to a second position in contact with said on contact; means for exerting a radially directed outward force against said connector, said force exerting means being vertically movable within said housing along said longitudinal axis thereof from a first position above said pivot point to a second position below said pivot point; spring means urging said force exerting means to said first position above said pivot point; cam means for moving said force exerting from said first position above said pivot point to said second position below said pivot point; and a push button for actuating said cam means, said push button being movable with respect to said switch housing a first to a second position, said cam means comprising a female cam housing and a reciprocative cam section and a cam follower, said female cam housing being of cylindrical tubular shape and having its uppermost longitudinal portion extending vertically upward from said switch housing, said female cam housing defining in the internal wall thereof at its lowermost portion a plurality of longitudinally extending circumferentially spaced slots, adjacent slots being joined by an inclined surface having a downward projection thereon intermediate said slots, said reciprocative cam section being generally of cylindrical tubular shape with an outside diameter substantially equal to the inside diameter of said female cam housing, said

reciprocative cam section defining a plurality of longitudinally extending radial protrusions at one end thereof, said radial protrusions being of a predetermined length and of a width substantially equal to the width of said slot in said female cam housing, said reciprocative cam section being slidably mounted within said female cam housing with the radial protrusions at said one end of said reciprocative cam section being lowermost and slidably mateable with said longitudinal slots in said female cam housing, the lowermost ends of said reciprocative cam section defining a plurality of cam surfaces, the uppermost end of said reciprocative cam section protruding from the uppermost end of said female cam housing and being affixed to said push button, said reciprocative cam section having an elongate cylindrical element axially projecting from its lowermost end a predetermined distance and adapted to limit the movement of said reciprocative cam section within said switch housing and to normally urge said push button to said first position, said cam follower comprising a cylindrical tubular member having a plurality of longitudinally disposed radially extending fins affixed thereto in predetermined circumferential spacing to provide alignment with said slots in said female cam housing, said cylindrical cam follower surrounding said elongate cylindrical element axially projecting downward

from the lowermost end of said reciprocative cam section and slidable and rotatable with respect thereto, the lengths of said slots and fins and protrusions being interdependent with said fins being slidably mateable with said slots, said protrusions and fins being aligned and mateable with said slots at said off position of said switch, said fins being rotated out of alignment with said slots and into engagement with said projections on the inclined surfaces intermediate said slots at said on position of said switch, said fins being rotated by said inclined surfaces of said female cam housing upon successive operations of said push button from said first to said second position, said cylindrical cam follower being in operative contact with said force exerting means to thereby cause said connector to be pivoted successively from said off contact to said on contact upon successive depressions of said push button.

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