Feb. 1, 1966 G. H. HORST 3,233,058

PLUNGER-OPERATED SNAP-ACTION SWITCH

Filed Aug. 29, 1963 2 Sheets-Sheet 1

FIG. 1.

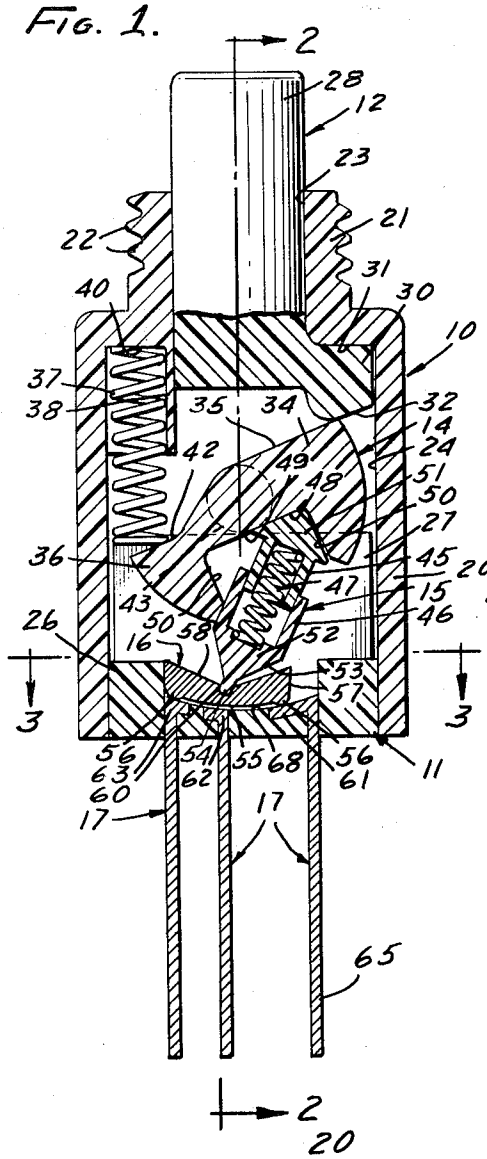


FIG. 2.

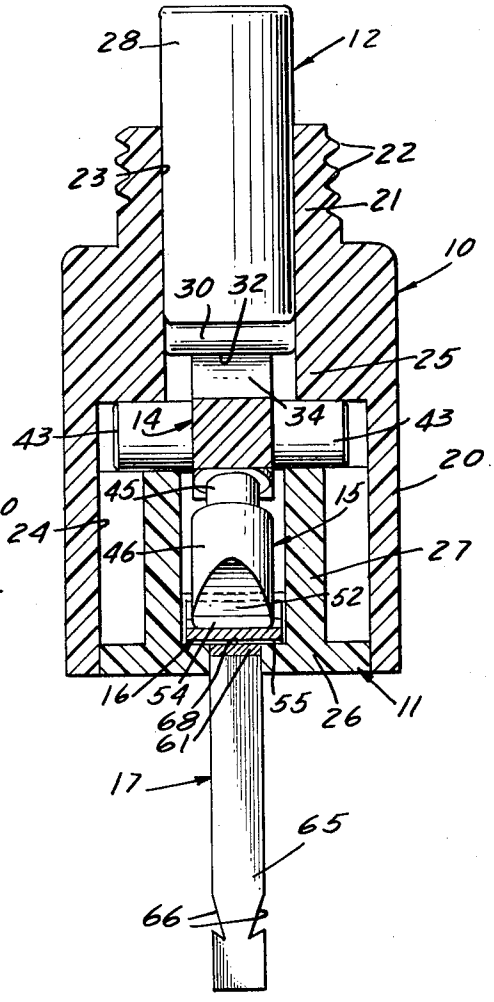
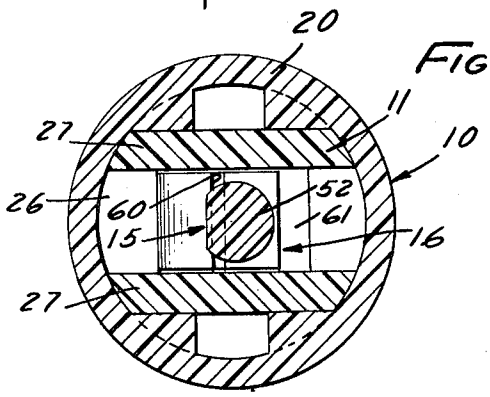


FIG. 3.



Gunter H. Horst
INVENTOR.
WHANN & McMANIGAL
Attorneys for Applicant
by Robert M. McManigal

Feb. 1, 1966 G. H. HORST 3,233,058

PLUNGER-OPERATED SNAP-ACTION SWITCH

Filed Aug. 29, 1963 2 Sheets-Sheet 2

FIG. 4.

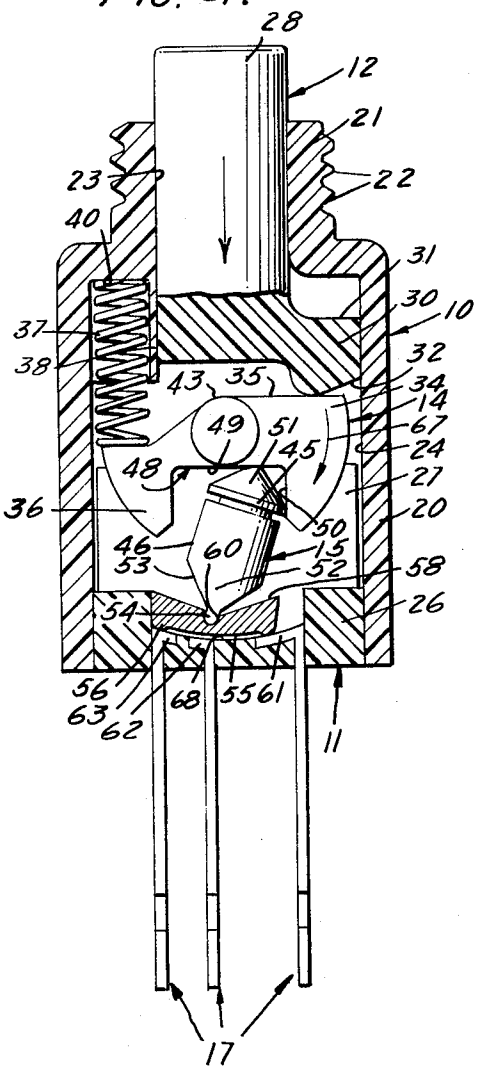
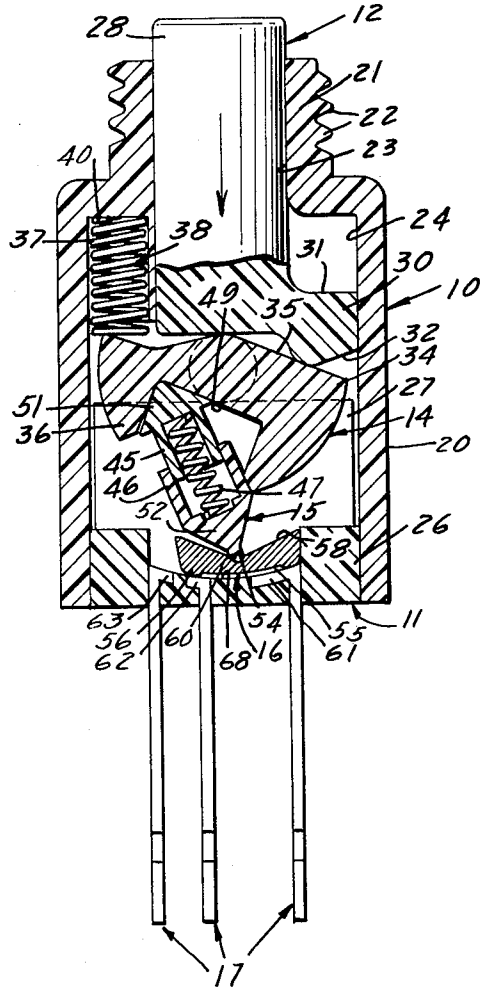


FIG. 5.



Gunter H. Horst
INVENTOR.
WHANN & McMANIGAL
Attorneys for Applicant
by Robert M. McManigal

United States Patent Office 3,233,058 Patented Feb. 1, 1966

3,233,058

PLUNGER-OPERATED SNAP-ACTION SWITCH

Gunter H. Horst, Arcadia, Calif., assignor to Schulz Tool and Manufacturing Co., San Gabriel, Calif., a corporation of California

Filed Aug. 29, 1963, Ser. No. 305,465
9 Claims. (Cl. 200—77)

This invention relates generally to switches and more particularly relates to a push button switch having a fast snap action.

In most switches and particularly in a push button switch, arcing between the contacts presents a severe problem. The arcing depends of course on the voltage applied between the contacts and on the particular design of the switch. However, when arcing occurs, the contact brushes and the movable contact become rapidly pitted and corroded thus shortening the life of the switch. In addition, arcing causes voltage surges between the contacts to be switched which may damage the electric components connected thereto.

It is accordingly an object of the present invention to provide a push-button, or plunger-operated snap-action switch which will minimize arcing.

Another object of the present invention is to provide a push button switch which has a high velocity snap action which in turn reduces arcing to a minimum.

A further object of the present invention is to provide a switch of the character referred to which can be made of small size and which is suitable for testing electric components or circuits.

Still another object of the present invention is to provide a push button switch which is reliable in operation and which consists of relatively few parts most of which can be molded thereby to reduce manufacturing costs to a minimum.

A push button switch in accordance with the present invention is characterized by a high velocity snap action. Thus, it has been found that the switch can be snapped from one position to another in 0.4 millisecond.

To this end, the switch of the invention includes a push button or plunger which is slidably disposed in a housing and movable from an unactuated to a depressed position. There is further provided an actuator which is rockably mounted in the housing. The push button is provided with means for rocking the actuator from one position to another when the push button is depressed. Spring means are further provided for urging the push button into its unactuated position. This is preferably accomplished by mounting a return spring between the housing and one end of the actuator while the push button has a portion engageable with the other end of the actuator. Thus, when the push button is depressed, the actuator is rocked in one direction. The return spring, on the other hand, urges the actuator to rock in the other direction and hence urges the push button into its unactuated position.

Two, three or more spaced-apart contact brushes are fixedly mounted in the housing opposite the push button. There is further provided a contact movable over the contact brushes. The contact has a first position where it contacts the first two or three brushes while in its second position it contacts another two of the brushes.

Finally, spring-urged means are disposed between the actuator and the movable contact for rapidly snapping the contact from one position to the other in response to rocking movement of the actuator when the push button is operated.

The novel features that are considered characteristic of this invention are set forth with particularly in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as

additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a sectional view, partly in elevation, of a snap action switch embodying the invention and shown with the push button in the unactuated position;

FIG. 2 is a longitudinal section taken on line 2—2 of FIG. 1, parts being shown in elevation, of the switch of FIG. 1;

FIG. 3 is a cross sectional view taken on line 3—3 of FIG. 1 and illustrating particularly the switch contact and a portion of the spring capsule which snaps the movable contact from one positon to the other;

FIG. 4 is a sectional view similar to that of FIG. 1, but illustrating the switch with the push button partly depressed and the actuator in a position just before it snaps the contact; and

FIG. 5 is a sectional view similar to that of FIG. 4, but illustrating the switch with the push button completely depressed and the actuator in its second position.

Referring now to the drawings and particularly FIGS. 1 through 3, there is illustrated a fast snap-action switch of the push-button type embodying the present invention. The switch includes essentially a housing **10**, an end cap **11**, a push button or plunger **12**, a rocking actuator **14**, a telescoping spring capsule **15**, a movable switch contact **16** and a plurality of fixed contact brushes **17**. As will be more fully explained hereinafter, with the exception of the movable switch contact **16**, the contact brushes **17**, and a pair of springs, the remainder of the switch of the invention may be made of a suitable insulating plastic material. As a result, most of the parts of which the switch consists may be molded so that the switch may be cheaply manufactured in mass production.

The housing **10** has a lower cylindrical portion **20** which is open toward the bottom and an upper cylindrical neck portion **21** of reduced diameter. The neck portion **21** of the housing **10** may be provided with external threads **22** as shown for securing the switch to a threaded opening in a panel. The neck portion **22** is provided with a cylindrical opening **23** within which the push button **12** is slidably disposed. The main cylindrical portion **20** of the housing **10** is provided with an internal opening **24** open at the bottom. As shown particularly in FIG. 2, the cylindrical housing portion **20** is enlarged at the top as shown at **25** to provide a bearing for the actuator **14** as will be presently explained.

The end cap **11** has a cylindrical lower piece **26** through which the contact brushes **17** extend and which closes the opening **24** in the main housing portion **20**. The end cap portion **26** is also provided with two upwardly extending plate-like extensions **27** which serve to support the actuator **14**. The end cap **11** is preferably cemented to the housing **10** as will be more fully explained hereinafter.

The push button **12** has an upper portion **28** of cylindrical shape which extends through the opening **23** in the housing neck **21**. Disposed within the housing main portion **20**, the push button **12** has a laterally extending or depending portion **30** engageable with the actuator **14**. Thus, the upper surface **31** of the laterally extending push button portion **30** has a shape to correspond to that of the housing neck **21** which serves as a stop. The lower surface **32** of the push button portion **30** has a rounded or curved shape forming substantially a semi-cylinder as illustrated to engage one portion of the actuator **14**.

The actuator **14** has one end portion **34** which engages the depending portion **30** of the push button **12**. Preferably, the actuator portion **34** has a straight surface **35** over which the curved surface **32** of the push button can slide with a minimum of friction. The actuator **14** also has an opposite end portion **36** which cooperates with a

return spring 37. One end of the return spring 37 which is preferably a coil spring engages a flat surface 40 in the housing 10 while the other end bears directly against the curved upper surface 42 of the actuator end portion 36. It might be noted that the axis of the coil spring 37 is parallel to that of the cylindrical push button portion 28. The spring 37 is enclosed by a cylindrical wall 38 forming part of the housing 10. This construction minimizes friction between the actuator 14 and the spring 37 and prevents contact between the spring and the push button 12.

The actuator 14 is provided with a pair of shafts 43 extending laterally therefrom as shown in FIG. 2. The shafts 43 are rockably mounted in a pair of bearings provided by the housing portion 25 and by the upwardly extending plates 27 of the end cap 11. These portions 25 and 27 are preferably inwardly curved to provide a secure bearing for the actuator shafts 43 and to permit the actuator 43 to be inserted from the bottom into the housing main portion 20.

The capsule 15 consists of two hollow telescoping members 45 and 46, which are of generally cylindrical shape. A coil spring 47 is disposed in the hollow space of the two telescoping members 45 and 46 and tends to urge them apart.

The lower portion of the actuator 14 has a substantially rectangular shaped recess 48 therein providing a bottom wall 49, and a pair of opposed side walls 50. The side walls 50 preferably form substantially a right angle with the bottom wall 49 of the recess 48. The upper member 45 of the capsule 15 has a head 51 which is preferably of conical shape and may, for example, have an angle of 80°, or at least an angle less than 90°.

Thus, the head 51 normally rests against the bottom surface 49 of the recess 48 in the actuator 14. Since the angle that the cone of the head 51 forms is less than 90°, the head 51 is spaced from the side wall 50 as clearly shown in FIGS. 1 and 5.

The lower telescoping member 46 is also provided with a head 52. The head 52 has two opposed flat surfaces 53 which merge into a semi-cylindrical portion 54 engageable with the movable switch contact 16. Thus, it will be seen that the spring 47 urges the upper head 51 against the recess 48 of the actuator 14 while the semi-cylindrical portion 54 of the other telescoping member 46 engages the switch contact 16.

The movable contact 16 consists of a suitable metal and has a generally arc-shaped or semi-cylindrical lower surface 55. On either end of the lower arc-shaped surface 55 of the contact 16 there are provided two semi-cylindrical protrusions 56 which will electrically interconnect two of the contact brushes 17 as will be more fully explained hereinafter.

The side walls 57 of the contact 16 form a small angle with the axis of the actuator so that the side walls 57 can engage the vertical walls of the end cap portion 26 in either position of the contact. The top surface 58 of the contact 16 is slanted as shown to provide a clearance for the head 52 of the telescoping member 46. The upper surface 58 is also provided with a semi-cylindrical recess 60 into which the semi-cylindrical extrusion 54 of the head 52 engages.

The three contact brushes 17 have respective contact heads 61, 62 and 63 which are preferably molded into the end cap portion 26. It will be noted that the contact brush head 61 is larger than either the head 62 or 63 for a purpose which will be more fully explained hereinafter. The outer surfaces of the brush heads 61–63 are flush with the inwardly curved cylindrical surface 68 of the end cap portion 26. Each of the contact brushes has an outwardly extending tab 65 which may be provided with suitable cutouts or notches 66 at the edges clearly shown in FIG. 2 for winding a wire about the tab.

The operation of the snap action switch of the invention will now be explained. FIGS. 1 and 2 illustrate the switch in the normal position where the push button is not actuated. The actuator 14 has previously been rocked in a counterclockwise direction so that the capsule 15 has pushed the switch contact 16 toward the left as shown in FIG. 1. It will be noted that the semi-cylindrical extruded portions 56 of the contact interconnect the contact brush heads 61 and 63. Accordingly, an electric circuit connected between the corresponding tabs thereof is now closed. The contact brush head 61 is long enough too so that its extruded portion 56 of the contact remains in contact therewith in either position of the contact.

When the push button 4 is depressed downwardly against the action of spring 37 as shown in FIG. 4, the actuator 14 rotates in a clockwise direction as shown by arrow 67. The conical head 51 of the spring capsule 15 is urged toward the left by the conical surface of the head engaging one of the end walls 50. FIG. 4 illustrates the position of the switch just before it snaps over to its other position. It will be noted that the bottom wall 49 of the actuator recess 48 is now in a horizontal position.

As the push button 12 is further depressed, the actuator 14 continues to rotate in a clockwise direction. Thereupon, the bottom wall 49 of the actuator recess 48 begins to tilt thus allowing the head 51 of the spring capsule 15 to snap toward the left. As the spring capsule 15 reaches and passes dead center, the lower head 52 is urged toward the right to snap the contact 16 into its right-hand position illustrated in FIG. 5. After the actuator has rotated in a clockwise direction to its end position of FIG. 5, the spring capsule 15 now has tilted into the opposite direction from that shown in FIG. 1.

As a result of the extremely fast snap action of the spring capsule 15, where the head 51 moves from the right to the left while the head 52 moves from the left to the right, the switch contact 16 has been moved from the left-hand position of FIG. 4 to the right-hand position of FIG. 5.

It will now be noted that the semi-cylindrical projections 56 of the switch contact 16 interconnect the contact brush heads 61 and 62. Therefore, an electric circuit connected to the corresponding tabs will now be closed. The contact 16 remains in the position of FIG. 5 as long as the push button is held in the actuated or depressed position.

When the push button 12 is released again, the spring 37 urges the actuator portion 36 to rotate in a counterclockwise direction which in turn will return the push button 12 because the other actuator end 34 urges the push button portion 30 upwardly. The previously described snap action is now reversed until the switch contact 16 has snapped from the position shown in FIG. 5 to that shown in FIG. 1.

It will thus be seen that the snap action switch of the present invention has one normal or stable position corresponding to that shown in FIG. 1. The other position illustrated in FIG. 5 is unstable and is only maintained as long as the push button 12 is held in the depressed position. However, it will be appreciated that the principles of the invention may also be applied to a snap action switch having two stable positions, so that the contact 16 is moved into the position of FIG. 1 when the push button is depressed once and is moved to the position of FIG. 5 when the push button is depressed again. In that case the spring 37 is omitted and a return spring provided which directly urges the push button 12 upwardly.

The snap action switch with three or more contact brushes as shown in the drawings may be used for testing electric circuits or for lighting up a test lamp to indicate that a particular circuit is in operating condition. Alternatively, electric components or electronic circuits may be connected to the three tabs 64 for testing the components or circuits. Furthermore, the contact head

62 or the contact head 63 may be omitted to provide either a normally closed or a normally open switch which can be either opened or closed upon depressing the push button.

It may be noted that the spring 37 is considerably stronger than the spring 47. For example, the return spring 37 may exert a pressure of seven pounds while the spring 47 may be designed to exert a pressure of one and three-quarter pounds.

The materials of which the switch of the invention is preferably made will now be described. Thus, the housing 10, the end cap 11, the push button 12, the actuator 14, and the telescoping members 45, 46 as well as the spring button 41, may be made from a plastic insulating material such, for example, as a polycarbonate. A polycarbonate is a polymer derived from biphenol A or 4,4'-dihydroxy diphenyl propane. This compound has the chemical formula

$$C_6H_4—OH—C—CH_3—CH_3—C_6H_4—OH$$

Such a polycarbonate is sold in the trade under the name of Lexan by General Electric Company. This plastic material may readily be molded and can be cheaply made in mass production. It is also characterized by great impact strength.

The two springs 37 and 47 may consist of any suitable spring material such, for example, as piano wire. The switch contact 16 preferably consists of a conducting material which has a flaking action in order to minimize arcing. Thus, the armature may be made of or plated with an alloy known as coin silver which consists of 92% silver and 8% copper. The contact brush heads 61, 62 and 63 may consist of beryllium copper. However, it is also feasible to use stainless steel or molybdenum for either the movable contact or the contact brushes. Preferably, however, the contact brushes consist of stainless steel and the contact of molybdenum. At least one of the contacts and preferably the contact 16 consists of a metal which has a flaking action and both the contact and the contact brushes preferably consist of a metal or metals which minimize arcing.

The end cap 11 may be secured to the housing 10 by a suitable cement, by heat sealing or by any expedient manner. Lexan permits to join the end cap 11 to the housing 10 by applying a solvent to the surfaces to be joined. The two portions may then be put together and are joined when the solvent dries.

It may be noted that experiments have shown that the contact 16 snaps from the position of FIG. 1 to that of FIG. 5 and vice versa within 0.4 millisecond or 400 microseconds. Due to this high velocity snapping action of the switch, it is believed that arcing problems are minimized.

The contact brushes 17 and their heads 61–63 are preferably stamped out of a suitable metal and they are preferably molded thereafter into the end cap portion 26. This will automatically provide the required curved or cylindrical surface so that the armature 16 can slide thereover.

The switch may be assembled in the following manner:

At first, the push button 12 is inserted through the opening at the bottom of the housing 10. The spring 37 is then also inserted into the cylindrical wall 38 of the housing 10. The contact brushes 17 are molded into the end cap 11. Then the contact 16, the capsule 15, and the actuator 14 are assembled within the end cap 11. The resulting assembly then is slid into the housing 10 until the actuator shafts are supported by their bearings. Finally, the end cap 11 is sealed to the housing 10. In order to facilitate the assembly and prevent parts from slipping out of their proper position during assembly, it is feasible to put small quantities of wax, for example, between the head 51 and the recess 48 and the semi-cylindrical extension 52 and the groove 60 in the contact 16. This will assure that the parts do not move while the end cap is inserted into the housing.

There has thus been disclosed a snap action switch of the push button type. The switch of the invention is characterized by a high velocity snap action which minimizes arcing. The switch may readily be manufactured of small size. For example, the diameter of housing 10 may be ⅝" and the length of the housing 20 with the push button 12 in its unactuated position may be 1¼". With the exception of the switch contact, the contact brushes and the two springs, the remaining parts of the switch all consist of plastic material which can be molded. This in turn reduces the manufacturing costs. Also, the switch of the invention consists of relatively few parts thus increasing the reliability of operation and facilitating the assembly.

The invention and its attendant advantages will be understood from the foregoing description. It will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing its material advantages, the arrangement hereinbefore described being merely by way of example. I do not wish to be restricted to the specific form shown or uses mentioned except as defined in the accompanying claims wherein various portions have been separated for clarity of reading and not for emphasis.

I claim:

1. A snap-action, push-button switch comprising:
(a) a housing;
(b) a push button slidably disposed in said housing and movable from an unactuated to a depressed position;
(c) an actuator;
(d) means in said housing rotatably mounting said actuator in said housing;
(e) means on said push button for rotating said actuator from one position to another when said push button is depressed;
(f) spring means including a first spring for urging said actuator against said push button to move said push button into its unactuated position;
(g) two spaced apart contact brushes fixedly mounted in said housing opposite said push button;
(h) a contact movable over said contact brushes and having a first position where said contact contacts both of said brushes to electrically interconnect said brushes and having a second position where said contact is out of contact with at least one of said brushes; and
(i) spring-urged means including a second spring disposed between said actuator and said contact for snapping said contact from one position to the other in response to rotation of said actuator when said push button is operated.

2. A snap-action, push-button switch comprising:
(a) a housing;
(b) a push button slidably disposed in said housing and movable from an unactuated to a depressed position;
(c) an actuator;
(d) means for rockably mounting said actuator in said housing;
(e) means on said push button for rocking said actuator from one position to another when said push button is operated;
(f) a spring mounted on said housing and urging said push button into its unactuated position;
(g) two spaced apart contact brushes fixedly mounted in said housing opposite said push button;
(h) a contact movable over said contact brushes and having a first position where said contact contacts both of said brushes to electrically interconnect said brushes and having a second position where said contact is out of contact with at least one of said brushes;

(i) a telescoping pair of members, and
(j) an action spring urging said members apart, said actuator having a recess therein forming end walls, said recess facing said contact, and one of said members having a head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator.

3. A snap-action, push-button switch comprising:
(a) a housing;
(b) a push button slidably disposed in said housing and movable from an unactuated to a depressed position;
(c) an actuator;
(d) means for rockably mounting said actuator in said housing, said push button having a portion engageable with one end of said actuator for rocking said actuator in one direction when said push button is depressed;
(e) a return spring mounted between said housing and the other end of said actuator and urging said actuator to rock in the other direction, thereby to urge said push button into its unactuated position;
(f) at least two spaced apart contact brushes fixedly mounted in said housing opposite said push button;
(g) a contact movable over said contact brushes and having a first position where said contact contacts both of said brushes to electrically interconnect said brushes and having a second position where said contact is out of contact with at least one of said brushes;
(h) a telescoping capsule; and
(i) an action spring disposed in said capsule, said actuator having a recess therein forming end walls, said recess facing said contact, said capsule having a first head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion engaging a recess in said contact for snapping said contact from one position to the other.

4. A snap-action, push-button switch comprising:
(a) a housing;
(b) a push button slidably disposed in said housing and movable from an unactuated to a depressed position;
(c) an actuator;
(d) means for rockably mounting said actuator in said housing, said push button having a portion engageable with one end of said actuator for rocking said actuator in one direction when said push button is depressed;
(e) a spring for urging said push button into its unactuated position;
(f) three spaced apart contact brushes fixedly mounted in said housing opposite said push button;
(g) a contact movable over said contact brushes and having a first position where said contact contacts a first and a second one of said brushes to electrically interconnect said brushes and having a second position where said contact contacts said first and said third one of said brushes;
(h) a telescoping capsule; and
(i) an action spring disposed in said capsule, said actuator having a recess therein forming end walls, said recess facing said contact, said capsule having a first head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion engaging a recess in said contact for snapping said contact from one position to the other.

5. A snap-action, push button switch comprising:
(a) a housing having an opening extending through one end thereof;
(b) a push button slidably disposed in the opening of said housing and movable from an unactuated to a depressed position;
(c) an actuator having a shaft extending therefrom;
(d) a bearing in said housing for rockably mounting said actuator shaft, said push button having a portion engageable with one end of said actuator for rocking said actuator in one direction when said push button is depressed;
(e) a return spring having one end resting against said housing;
(f) the free end of said return spring resting against the other end of said actuator for urging said actuator to rock in the other direction, thereby to urge said push button into its unactuated position;
(g) two spaced-apart contact brushes fixedly mounted in said housing opposite said push button;
(h) a contact movable over said contact brushes and having a first position where said contact contacts both of said brushes and having a second position where said contact is out of contact with at least one of said brushes;
(i) a telescoping capsule; and
(j) an action spring disposed in said capsule, said actuator having a recess therein forming end walls, said recess facing said contact, said capsule having a first head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion engaging a recess in said contact for snapping said contact from one position to the other.

6. A snap-action, push-button switch comprising:
(a) a housing having an opening extending through one end thereof;
(b) a push button slidably disposed in the opening of said housing and movable from an unactuated to a depressed position;
(c) an actuator;
(d) means in said housing for rockably mounting said actuator therein, said push button having a portion engageable with one end of said actuator for rocking said actuator in one direction when said push button is depressed;
(e) a return coil spring having one end resting against said housing, the other end of said return spring resting against the other end of said actuator for urging said actuator to rock in the other direction, thereby to urge said push button into its unactuated position;
(f) three spaced-apart contact brushes fixedly mounted in said housing opposite said push button;
(g) a contact movable over said contact brushes and having a first position where said contact contacts a first and a second one of said brushes and having a second position where said contact contacts said first and said third one of said brushes;
(h) two telescoping members forming a capsule; and
(i) an action spring disposed in said members and urging said members apart, said actuator having a recess therein forming a bottom wall and two end walls disposed at right angles to said bottom wall, said recess facing said armature, said capsule having a first conical head portion forming an angle less than 90 degrees and disposed in said recess and capable of snapping from one position adajcent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion engaging a recess in said contact for snapping said contact from one position to the other.

7. A snap-action, push-button switch comprising:
(a) a housing having an opening extending through one end thereof;
(b) a push button slidably disposed in the opening of said housing and movable from an unactuated to a depressed position;
(c) an actuator;
(d) means in said housing for rockably mounting said actuator therein, said push button having a portion engageable with one end of said actuator for rocking in one direction when said push button is depressed;
(e) a return coil spring having one end resting against said housing, the other end of said return spring resting against the other end of said actuator for urging said actuator to rock in the other direction, thereby to urge said push button into its unactuated position;
(f) three spaced-apart contact brushes fixedly mounted in said housing opposite said push button;
(g) a contact movable over said contact brushes and having a first position where said contact contacts a first and a second one of said brushes and having a second position where said contact contacts said first and said third one of said brushes;
(h) two telescoping members forming a capsule; and
(i) an action spring disposed in said capsule and urging said members apart, said actuator having a recess therein forming a bottom wall and end walls, said recess facing said armature, said capsule having a first head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion with a semi-cylindrical end portion engaging a semi-cylindrical recess in said contact for snapping said contact from one position to the other.

8. A snap-action, push-button switch comprising:
(a) a housing having an opening extending through one end thereof;
(b) a push button slidably disposed in the opening of said housing and movable from an unactuated to a depressed position;
(c) an actuator having a shaft extending therefrom;
(d) a bearing in said housing for rockably mounting said actuator shaft, said push button having a portion engageable with one end of said actuator for rocking said actuator in one direction when said push button is depressed;
(e) a return coil spring having one end resting against said housing and having an axis extending substantially parallel to that of said push button, the other end of said return spring resting against the other end of said actuator for urging said actuator to rock in the other direction, thereby to urge said push button into its unactuated position;
(f) three spaced-apart contact brushes fixedly mounted in said housing opposite said push button;
(g) a contact movable over said contact brushes and having a first position where said contact contacts a first and a second one of said brushes and having a second position where said contact contacts said first and said third one of said brushes;
(h) a telescoping capsule; and
(i) an action spring disposed in said capsule, said actuator having a recess therein forming end walls, said recess facing said contact, said capsule having a first head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion engaging a recess in said contact for snapping said armature from one position to the other.

9. A snap-action, push-button switch comprising:
(a) a housing having an opening extending through one end thereof;
(b) a push button slidably disposed in the opening of said housing and movable from an unactuated to a depressed position;
(c) an actuator having a shaft extending therefrom;
(d) a bearing in said housing for rockably mounting said actuator shaft, said push button having a portion engageable with one end of said actuator for rocking said actuator in one direction when said push button is depressed;
(e) a return coil spring having one end resting against said housing and having an axis extending substantially parallel to that of said push button, the other end of said return spring resting against the other end of said actuator for urging said actuator to rock in the other direction, thereby to urge said push button into its unactuated position;
(f) three spaced-apart contact brushes fixedly mounted in said housing opposite said push button, said contact brushes having an exposed surface forming a cylindrical surface;
(g) a contact movable over said contact brushes, said contact having two spaced-apart semi-cylindrical projections, and having a first position where said contact projections contact a first and a second one of said brushes and having a second position where said contact projections contact said first and said third one of said brushes;
(h) a telescoping capsule; and
(i) an action spring disposed in said capsule, said actuator having a recess therein forming end walls, said recess facing said contact, said capsule having a first head portion disposed in said recess and capable of snapping from one position adjacent one of said end walls to its other position adjacent the other end wall upon rocking motion of said actuator, and said capsule having another head portion engaging a recess in said contact for snapping said contact from one position to the other.

References Cited by the Examiner

UNITED STATES PATENTS

2,469,337	5/1949	Kohl	200—68
3,046,377	7/1962	Fraser	200—153

KATHLEEN H. CLAFFY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*