Oct. 22, 1968 R. B. GABER 3,406,589

PUSH-PUSH SWITCH STRUCTURES

Filed Oct. 18, 1967 2 Sheets-Sheet 1

FIG. 3

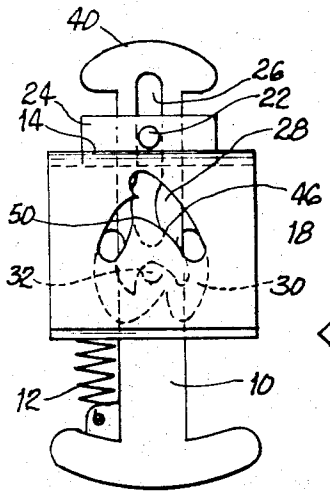


FIG. 1

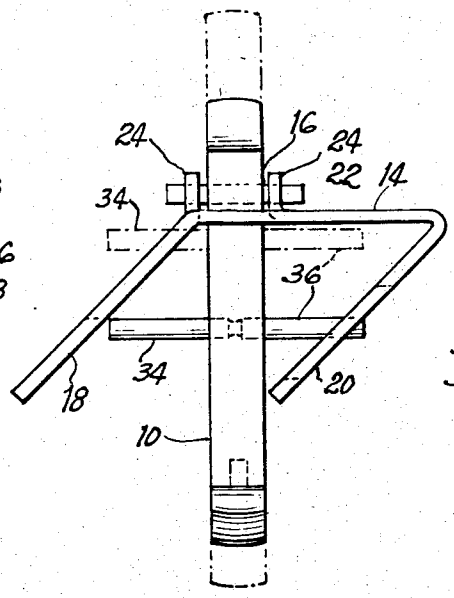


FIG. 2

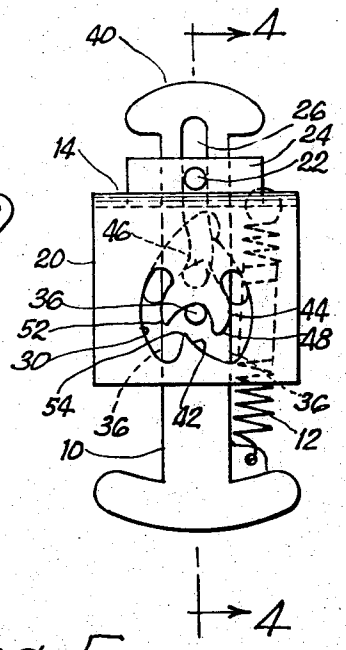


FIG. 4

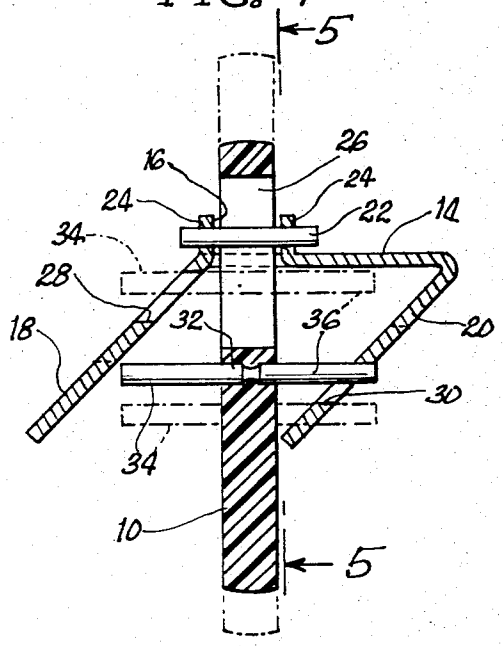
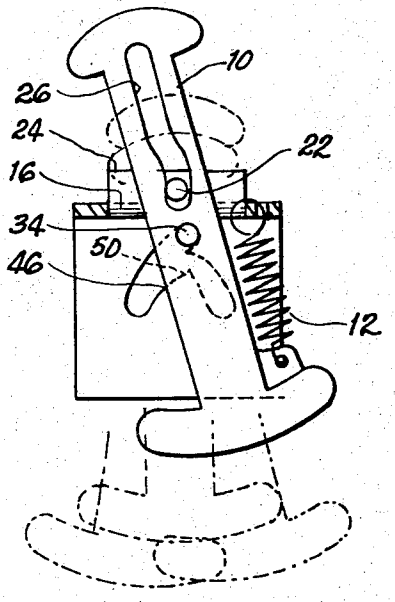


FIG. 5



INVENTOR
Richard B. Gaber
by McDougall, Hersh, Scott
and Ladd
Attys

Oct. 22, 1968 R. B. GABER 3,406,589

PUSH-PUSH SWITCH STRUCTURES

Filed Oct. 18, 1967 2 Sheets-Sheet 2

FIG. 6

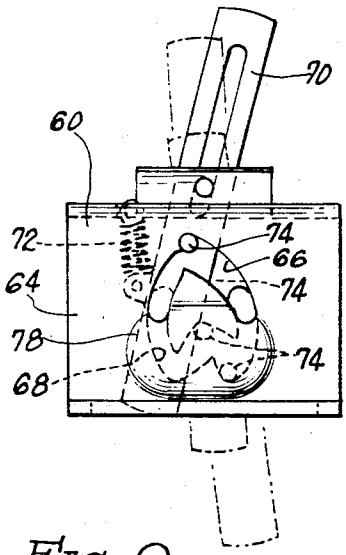


FIG. 7

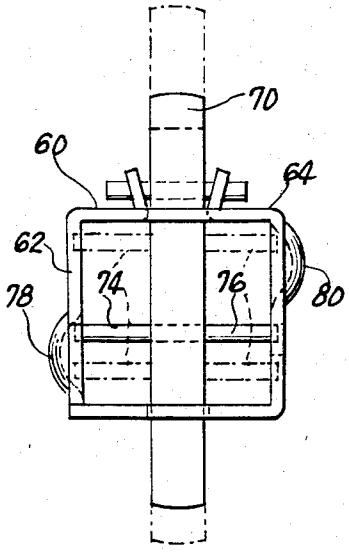


FIG. 8

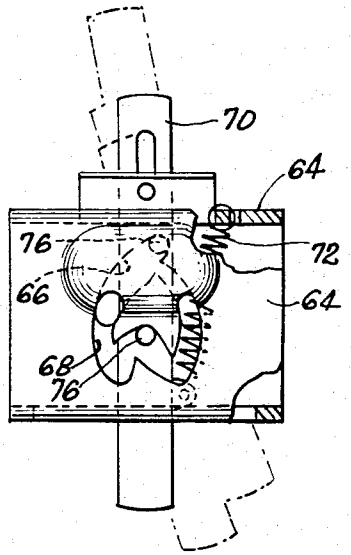


FIG. 9

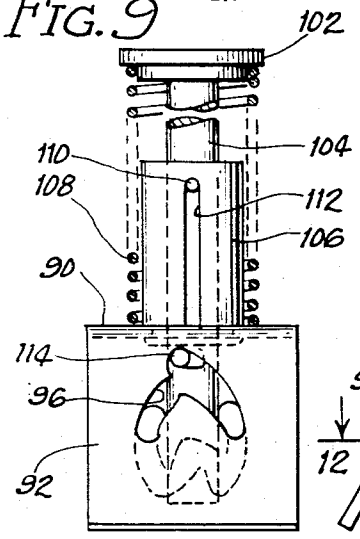


FIG. 10

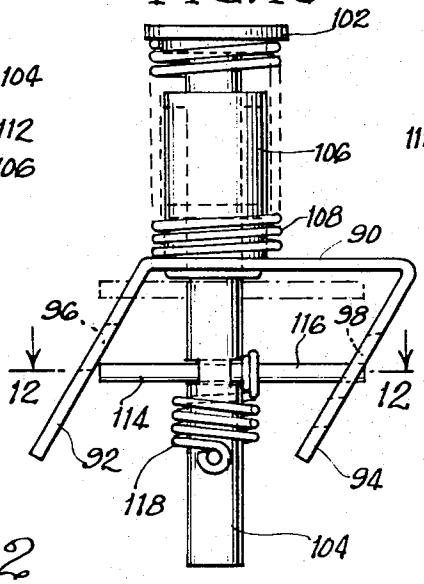


FIG. 11

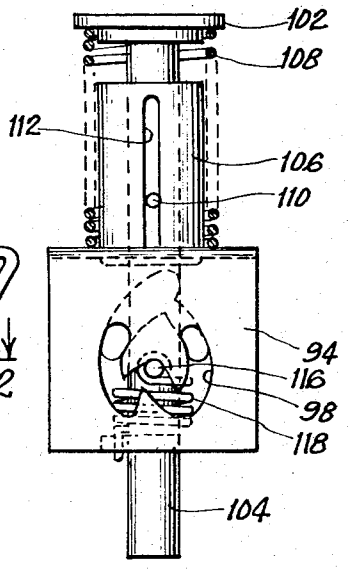
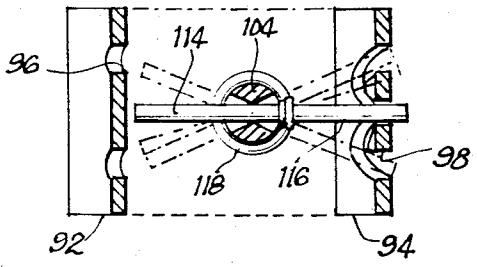


FIG. 12



United States Patent Office 3,406,589 Patented Oct. 22, 1968

3,406,589

PUSH-PUSH SWITCH STRUCTURES

Richard B. Gaber, Crystal Lake, Ill., assignor to F&F Enterprises, Inc., Chicago, Ill., a corporation of Illinois

Filed Oct. 18, 1967, Ser. No. 676,298
11 Claims. (Cl. 74—503)

ABSTRACT OF THE DISCLOSURE

A push-push switch structure which includes an actuator member situated between cam surfaces. Arms extend outwardly from the actuator member for engagement with one or the other of the cam surfaces, depending upon whether the switch is in the latched or unlatched position. Pushing of the actuator in the latched position results in camming of an arm and corresponding pivotal movement to the extent that release of the actuator will cause the actuator to spring to an unlatched position. Pushing of the actuator when in the unlatched position results in a similar camming action by the other cam surface whereby release will cause the actuator to spring to a latched position.

Specification

This invention relates to a push-push switch construction. In the operation of a switch construction of this type, pushing on an actuator for the switch will result in a reversal of the switch positon. Thus, when a switch is in the latched position, pushing of the actuator will result in unlatching. When in the unlatched position, the same pushing action will result in shifting to a latched position.

Push-push switch structures are well known; however, there is a constant demand for improvements in such switches whereby miniaturization can be achieved. Reliability in the switch operation is also of critical importance, and the provision of switches which have a consistent operation is also of concern. Finally, simplified parts are highly desirable, particularly since miniature switch parts can create extremely difficult fabricating problems.

The primary object of this invention is the provision of a switch construction which is particularly suited for reliable push-push operation.

A more specific object of this invention involves the provision of a switch construction which can be produced in miniature, and which is characterized by a relatively few and simple operating parts whereby highly reliable operation can be achieved and whereby efficient manufacturing techniques can be employed.

These and other objects of this invention will appear hereinafter and for purposes of illustration but not of limitation, specific embodiments of the invention are shown in the accompanying drawings in which:

FIGURE 1 is an elevational view of a switch construction characterized by the features of this invention;

FIGURE 2 is a side elevation of the switch construction shown in FIGURE 1;

FIGURE 3 is an elevational view of the opposite side of the switch construction shown in FIGURE 1;

FIGURE 4 is a vertical sectional view taken about the line 4—4 of FIGURE 2;

FIGURE 5 is a cross-sectional view taken about the line 5—5 of FIGURE 4;

FIGURE 6 is a side elevation of an alternative switch construction;

FIGURE 7 is a front elevation of the construction shown in FIGURE 6;

FIGURE 8 is an elevational view of the opposite side of the switch construction of FIGURE 6;

FIGURE 9 is a side elevation of a still further switch design embodying the features of this invention;

FIGURE 10 is a front elevation of the construction shown in FIGURE 9;

FIGURE 11 is an elevational view illustrating the opposite side of the construction of FIGURE 9; and

FIGURE 12 is a cross-sectional view taken about the line 12—12 of FIGURE 10.

The switch construction of this invention generally comprises an actuator mounted for reciprocal movement. An exposed end of the actuator construction may be, or may have attached thereto, a pushbutton whereby the actuator may be moved either manually or by some other mechanism.

Opposed cam surfaces are located at the sides of the actuator. Arms extend outwardly from the actuator for engagement with these cam surfaces. In a latched position, one of the arms will engage a cam surface on one side of the actuator. Pushing of the actuator will cause this arm to ride along the cam surface to a position such that upon release of the pushing force, the arm will move clear of the cam surface. At this time the other arm will come into engagement with the other cam surface. Depressing of the pushbutton will result in coaction between this other arm and cam surface whereby release of the arm from the cam surface will take place along with engagement of the first arm with the first cam surface.

FIGURES 1 through 5 illustrate one form of the invention. This construction includes a reciprocally mounted actuator **10** connected by means of a spring **12** to bracket **14**. The bracket includes a central portion defining an opening **16** which received the actuator **10**. Angularly disposed walls **18** and **20** extend outwardly from this central portion.

A pin **22** secured between upturned portions **24** formed in the central portion of the bracket. The actuator defines a vertical slot **26** and the pin **22** is confined within this slot whereby the actuator is adapted to pivot relative to the bracket **14**.

The walls **18** and **20** define cam slots **28** and **30**, respectively. A pin **32** is attached to the actuator **10**, and the outwardly extending arms **34** and **36** of this pin are adapted to be received in the slots **28** and **30**. The arms **34** and **36** thus act as cams moving in engagement with the edges defining the slots.

The configuration of the slots **28** and **30** is such that the latching and unlatching action described can be achieved. Referring to FIGURE 4, it will be noted that the arm **36** is located at the center of the slot **30**. This represents the latched position of the switch, the spring **12** operating to maintain this position.

When the pushbutton end **40** of the actuator **10** is depressed downwardly, the arm **36** will ride along the cam edge **42** until it stops at the bottom of the slot. The pivotal mounting of the actuator **10** permits this movement of the arm **36**.

When the pushing force is released, the spring **12** will pull the actuator upwardly whereby the arm **36** will ride along cam edge **44**. When the arm **36** moves upwardly, it will move completely out of contact with the wall **20**. At this time, the arm **34** will move into the slot **28**. It will be noted that the upper portions of the slot **30** are coextensive with the lower portions of the slot **28**.

The arm **34** is positioned at the upper end of the slot **28** at the end of its movement. In this condition, the switch is in the unlatched position. The application of pushing force on the actuator will result in downward movement of the arm **34** at which time, the arm will engage the cam edge **46** of the slot **28**. Continued movement will permit the arm **34** to clear the slot **28** completely at which time, the arm **36** enters the slot **30**. The

arm **36** continues to the bottom of the slot **30** after which release of the pushing force will cause the arm to resume the latched position.

The points defined by slots **28** and **30** are positioned to achieve the operation described. When considering the latch position of FIGURE 2, it will be noted that the arm **36** moves from one side to the other of the point **48**. Accordingly, when the pushing force is released, the arm **36** will move upwardly to the right of this point rather than returning to its original position.

The same type of action occurs when the arm **34** is moved downwardly from the position shown in FIGURE 5. The point **50** is positioned so that the arm must move to the left of this point along the cam surface **46**.

To complete the cycle, the points **52** and **54** are located so that the arm **36** will return to the position shown in FIGURE 2 upon completion of the cycle.

FIGURES 6 through 8 illustrate an alternative arrangement including a bracket **60** provided with side walls **62** and **64**. Slots **66** and **68** are defined by the respective side walls. An actuator **70** is mounted for reciprocal movement with a spring **72** normally urging the actuator upwardly.

Arms **74** and **76** extend outwardly from the actuator for cooperation with the slots **66** and **68**. The side walls **62** and **64** are provided with embossed portions **78** and **80**. When the switch is in the latched position shown, the arm **76** is engaged within the slot **68** while the arm **74** is out of engagement due to the space provided by the embossed portion **78**. The unlatching movement corresponds with the movement previously described. This will result in the arm **74** being received within the slot **66** while the arm **76** will be unconfined due to the embossed portion **80**.

A further alternative arrangement is shown in FIGURES 9 through 12. This construction includes a bracket **90** having angularly disposed side walls **92** and **94**. Slots **96** and **98** are defined by the respective side walls.

The actuator comprises a head **102** which may serve as a pushbutton. The shaft **104** of the actuator is reciprocally received within a cylinder **106**. A spring **108** is located between the bracket and the shoulder defined by the head **102** whereby the actuator is normally urged upwardly away from the bracket. A pin **110** secured to the shaft **104** is received within a slot **112** to confine the movement of the actuator.

Arms **114** and **116** extend outwardly from the shaft **104** for cooperation with the slots **96** and **98**, respectively. As best shown in FIGURES 10 and 12, these arms comprise extensions of a pin which is secured to the shaft **104** by means of spring **118**. The pin has a point suspension within the shaft **104** so that the pin can pivot back and forth as indicated by the dotted lines in FIGURE 12.

The movement of the arms **114** and **116** within the respective slots is essentially the same as that described with respect to FIGURES 1 through 5. It will be noted, however, that in this instance, the actuator shaft **104** undergoes a straight reciprocal movement while the arms **114** and **116** are free to pivot. This, of course, distinguishes from the preceding embodiments wherein the arms were tied to the actuator with the actuator pivoting in response to the camming action.

The switch structures of this invention provide many distinct advantages. It will be appreciated that the camming action for any particular switch can be adjusted by adjusting the bracket pins, particularly the angle of these pins. A simple means is, thus, provided to insure precise switch operation which can be extremely important in highly complex systems.

It will be understood that various changes and modifications may be made in the structure described which provide the characteristics of this invention without departing from the spirit thereof particularly as defined in the following claims.

That which is claimed is:

1. In a switch construction wherein an actuator is mounted for reciprocal movement between forward and rearward positions, the improvement comprising means for latching and unlatching said actuator whereby the actuator will be set in one of said positions, said latching and unlatching means comprising means defining cam tracks located on opposite sides of said actuator, outwardly extending first and second arms attached to said actuator, said arms extending toward said cam tracks for contact therewith, one of said cam tracks including a set position for holding the first arm to thereby latch said actuator, a track portion leading away from said position for guiding the first arm during an unlatching operation, and a track portion leading toward said position for guiding the first arm during a latching operation, and wherein the other of said tracks includes a set position for holding the second arm when the actuator is in an unlatched position, a track portion leading away from said position for guiding the second arm during a latching operation, and a track portion leading toward said position for guiding the second arm during an unlatching operation.

2. A construction in accordance with claim **1** wherein said arms move free of their respective cam tracks when leaving the track portions leading away from said set positions.

3. A construction in accordance with claim **2** wherein the means defining said cam tracks comprise opposed walls with said actuator extending between said walls, and wherein said walls are angularly positioned with respect to said actuator with the walls being substantially parallel to each other.

4. A construction in accordance with claim **2** wherein the means defining said cam tracks comprise opposed walls with said actuator extending between said walls, and wherein said walls are substantially parallel to each other and to said actuator.

5. A construction in accordance with claim **2** wherein said arms extend perpendicular to the plane of movement of said actuator.

6. A construction in accordance with claim **3** wherein the cam track on one of said walls is disposed near the outer end of one of said walls while the other cam track is disposed near the inner end of the other of said walls.

7. A construction in accordance with claim **4** wherein the cam track on one of said walls is disposed near the outer end of one of said walls while the other cam track is disposed near the inner end of the other of said walls.

8. A construction in accordance with claim **7** including embossed portions formed in said walls in opposed relationship with the cam track in an opposite wall, said embossed portions providing a free space for movement of said arms.

9. A construction in accordance with claim **1** wherein said actuator moves in and out between latching and unlatching positions in a plane extending between said cam tracks, and including means pivotally mounting said actuator, movement of said arms along the cam tracks resulting in swinging of the actuator about its pivotal mounting within the confines of said plane.

10. A construction in accordance with claim **1** wherein said actuator is confined for movement in and out along a line corresponding to the longitudinal axis of the actuator, said arms being pivotally connected to said actuator whereby movement of the arms along said cam tracks results in pivotal movement of the arms.

11. A construction in accordance with claim **1** including spring means normally urging said actuator to an outward position, depressing of the actuator taking place in opposition to said spring means during latching and unlatching operations.

(References on following page)

5

References Cited

UNITED STATES PATENTS

2,647,180	7/1953	Tregoning	200—153.9 XR
2,671,354	3/1954	Goos	74—503
2,741,930	4/1956	Montooth et al.	
2,946,237	7/1960	Hebert	74—503 XR
2,956,446	10/1960	Ensign et al.	200—153.9 XR

6

3,100,403	8/1963	Dottlinger	74—503
3,251,240	5/1966	Frederick	74—527
3,359,397	12/1967	Clark	74—503 XR

ROBERT K. SCHAEFER, *Primary Examiner.*

H. BURKS, *Assistant Examiner.*