United States Patent [19]

Van Benschoten

[11] **3,821,528**

[45] **June 28, 1974**

[54] **PUSHBUTTON SWITCH LATCHING MECHANISM**

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[22] Filed: **Feb. 8, 1973**

[21] Appl. No.: **330,574**

[52] **U.S. Cl.** ..... **200/153 J,** 200/169 PB

[51] **Int. Cl.** **H01h 13/56**

[58] **Field of Search** ..... 200/153 J, 169 PB

[56] **References Cited**

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[57] **ABSTRACT**

An alternate action pushbutton switch includes a plunger which is movable between latch and release positions. The switch associated with the plunger is only operated when the plunger has been committed to a latch position.

11 Claims, 7 Drawing Figures

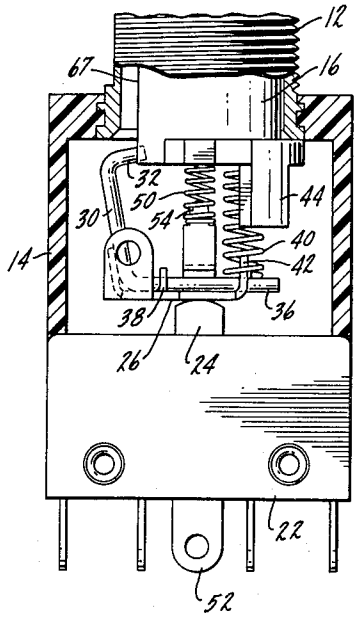


Fig. 1.

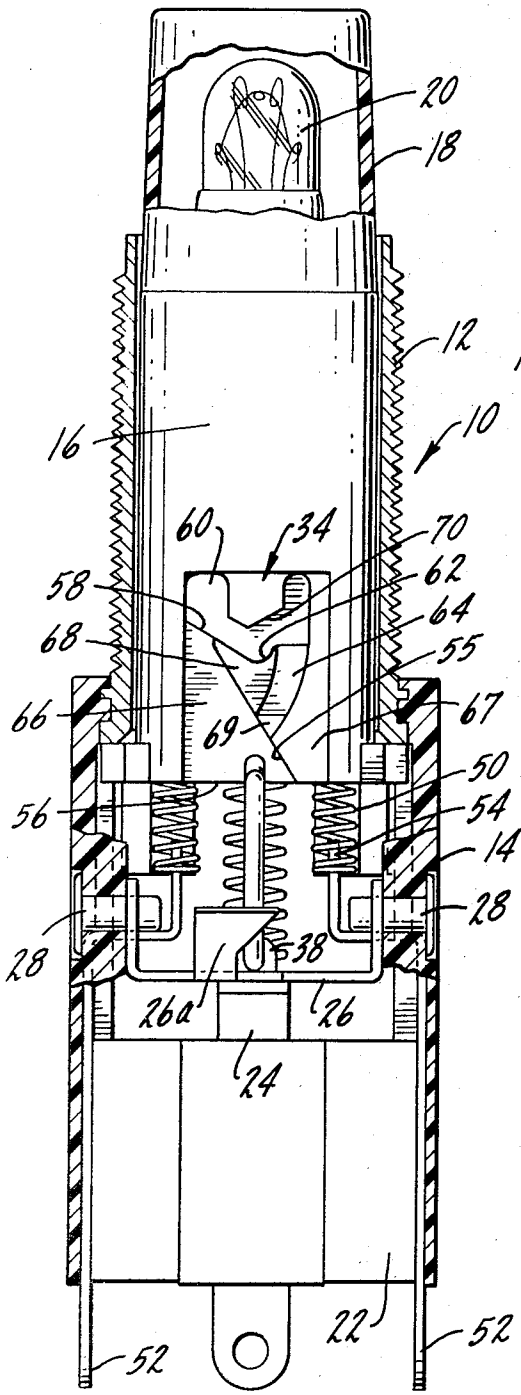
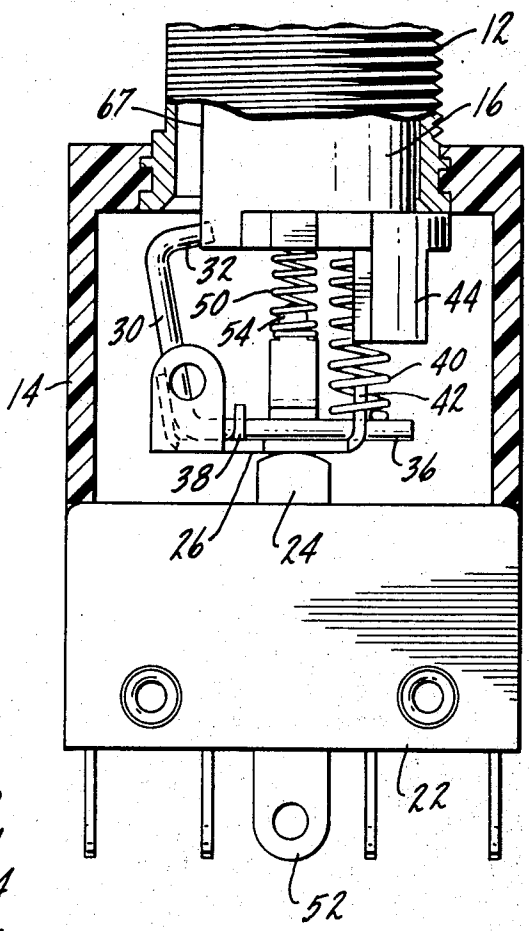


Fig. 2.



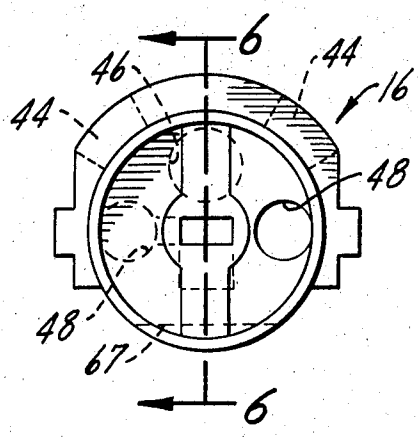


Fig. 5.

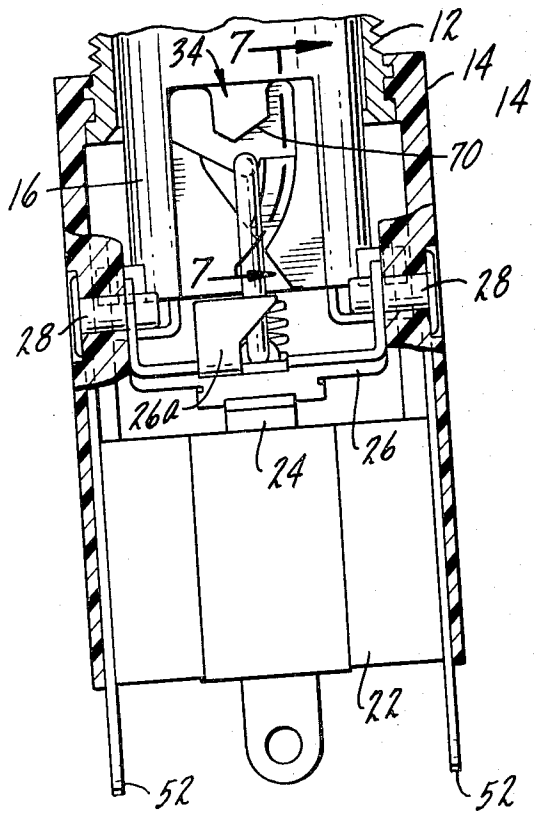


Fig. 3.

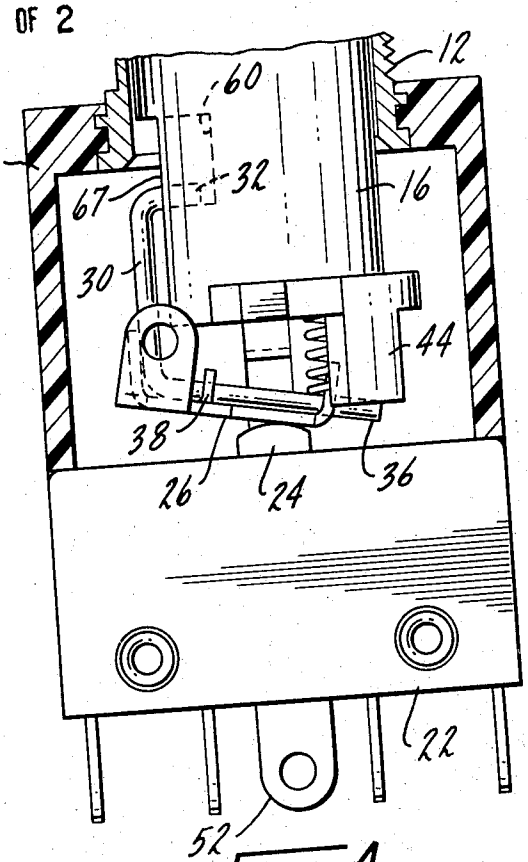


Fig. 4.

Fig. 6.

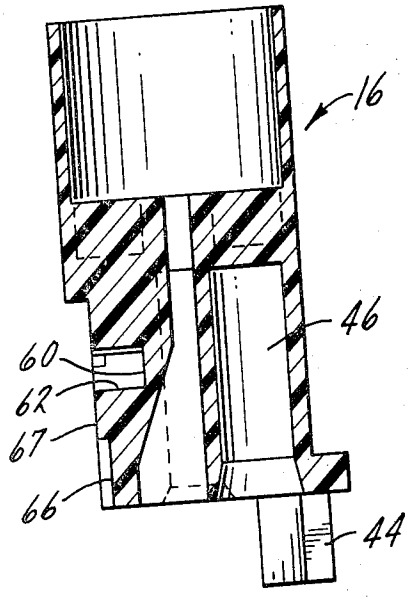
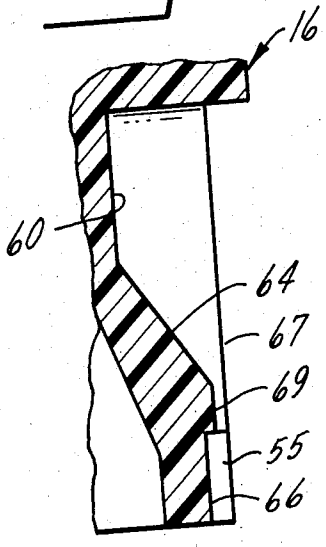


Fig. 7.



PUSHBUTTON SWITCH LATCHING MECHANISM

SUMMARY OF THE INVENTION

The present invention relates to a push to latch and push to release switch arrangement and is particularly directed to such an alternate action type of switch in which switching cannot be accomplished unless the latching operation is performed simultaneously therewith.

A primary purpose of the invention is a switch of the type described in which there can be no operation of the switch without latching of the plunger.

Another purpose is in an alternate action type of switch mechanism using fewer parts than previous mechanisms of the same general type.

Another purpose is in an alternate action type of switch of the type described requiring substantially reduced assembly time over previous constructions.

Another purpose is a push to latch and push to release switch utilizing a pivotal latch member and a pivotal actuator which are in direct contact with each other.

Another purpose is a switching mechanism of the type described in which a common spring provides the force for the actuator to operate the switch and urges the latch member into contact with the plunger cam.

Other purposes will appear in the ensuing specification, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated diagrammatically in the following drawings wherein:

FIG. **1** is a front view with portions in section of the switch mechanism;

FIG. **2** is a partial side view in section of the switch mechanism;

FIG. **3** is a partial front view, similar to FIG. **1**, showing the mechanism in a latched position;

FIG. **4** is a partial side view, similar to FIG. **2**, showing the mechanism in a latched position;

FIG. **5** is a top view of the switch plunger;

FIG. **6** is a section along plane **6—6** of FIG. **5**; and

FIG. **7** is a section along plane **7—7** of FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A popular type of alternate action switch uses a latching mechanism to hold the pushbutton in a depressed position until the button is released by a second operation. This type of switch gives a positive visual indication of the on-off condition due to the differences in pushbutton positions. In the past latching mechanisms have been of a kind where when the pushbutton has been depressed sufficiently, releasing it will cause it to latch. However, when such a mechanism is used in conjunction with switch contacts it is necessary that the contacts be connected substantially before the latch position is reached, to assure the switch is always in the "on" condition whenever the pushbutton is latched down. The major drawback of this type of mechanism is that it is possible to depress the pushbutton to the point where the switch closes but not far enough to cause it to latch when the button is released. When this happens the button will return to the off position and the switch will open. This type of operation can be disconcerting to the operator, particularly where high power levels are involved. Such fast on-off operation can shorten switch life, blow fuses and damage electrical components.

The present invention provides a switching mechanism of the type described in which the electrical switching operation cannot take place until the pushbutton has been committed to move to a latching position.

In the drawings, a housing is indicated generally at **10** and may include an upper housing section **12** and a lower housing section **14.** Mounted within the housing is a plunger **16** which may be reciprocally moved between the latch and release positions indicated in FIGS. **3** and **1** respectively. At the upper end of the plunger **16** is a lens **18** containing a suitable light bulb or the like **20.**

Within the lower housing section **14** is a switch assembly **22** having an operating button **24** extending upwardly therefrom. Positioned above the switch assembly **22** is an actuator **26,** the opposite sides of which are pivotally mounted on rods **28** fixed in opposite side walls of the housing **14.**

A latch member or latch wire is indicated at **30** and has an inwardly directed end **32** which cooperates with a generally heart-shaped cam **34** formed on one side of the plunger **16.** The lower end of the latch wire **30,** indicated at **36** is pivotally mounted to actuator **26** by spaced integral rings **38** and **42** on the actuator. The latch wire is pivotally movable on the actuator and the actuator is pivotally movable relative to the housing section **14.** A latch spring **40** has its lower end mounted on ring **42** of the actuator and has its upper end mounted within the plunger as described hereinafter. The latch spring **40** biases the latch wire end section **32** into frictional contact with the cam **34** and also biases the actuator toward the switch operator **24.**

The plunger **16** has downwardly directed feet **44** which contact the switch assembly **22** when the plunger has been moved to its fully depressed position. The feet **44** accordingly provide an inward stop for plunger movement. The bottom surface of the plunger **16** may have a series of openings. One such opening, indicated at **46,** receives the upper end of the latch spring **40.** Openings **48** generally diametrically spaced within the plunger receive lamp springs **50,** there being a pair of such springs which are effective to normally bias the plunger to the outward or release position shown in FIG. **1.**

A pair of lamp terminals are indicated at **52,** such terminals being positioned within the housing **14** and outside of the switch assembly **22.** The lamp terminals **52** have inwardly and upwardly directed portions **54** which mount the lamp springs **50.** There are connections within the plunger, not shown, which electrically connect the upper end of the lamp springs **50** to suitable contacts for electrically connecting the lamp **20** to the lamp terminals **52** when the plunger is in the latch position.

The cam surface **34** on the plunger **16** includes an upwardly inclined ramp **55,** the lower end of which terminates at the plunger lower surface **56.** The upper end of the ramp **55** terminates in a ledge **58** which extends into the plunger. Above and inside of ledge **58** is a plunger latching area **60.** Integral with the ledge **58** is a depression **62** which is formed to receive the inwardly directed portion **32** of the latch wire when the plunger is in the latched position of FIG. **3.** Adjacent to one side

of the depression **62** is a release ramp **64** which leads from the latching area **60** outwardly to the inclined ramp **64.** The cam **34** has several levels, relative to the latch wire **32.** The inclined ramp **55** and the ledge **58** define a surface **66,** which is inside of the outer surface **67.** Above and inward from the ledge **58** is the latching area **60.** The release ramp **64** connects area **60** and surface **66** through a stop **69** and defines the internal island or heart-shaped area **68.** The stop **69** prevents the latch spring from accidentally passing into ramp **64** when the plunger is depressed from the outward position.

The release position of the switch assembly is shown in FIGS. **1** and **2.** The latch wire **30** holds the actuator in position away from the switch operator **24.** The inwardly directed end **32** of the latch wire **30** is in contact with surface **66** of cam **34** and is held in such frictional contact by the spring **40.** As the plunger is depressed the ramp **55** will cause the end **32** of the latch wire **30** to pivot to the left as shown in FIG. **1.** Continued downward movement of the plunger will eventually cause the latch wire to move to the top of the ramp and as the end **32** of the latch wire passes over the ledge **58,** the latch wire will be snapped inwardly, to the position of FIG. **4.** At this point the plunger is committed to a latching position. Such inward movement of the latch wire **30** permits the compressed spring **40** to pivot the actuator **26** about the rods **28** such that the base of the actuator will cause the switch operator **24** to be depressed to operate the switch assembly **22.** The spring **40** not only provides a bias to insure frictional contact between the latch wire and the cam surface, but also provides the operating force for the actuator **26.** The latch wire **30** holds the actuator away from the switch operator until such time as the latch wire end **32** passes over the ledge **58** to commit the plunger to move to a latching position. Release of the plunger at this point will cause a slight upward movement of the plunger as the latch wire end **32** moves into the depression **62** of the cam **34.**

The next operation of the plunger will effect a release of the switch operator. As the plunger is depressed, surface **70** of the cam will contact the latch wire end **32** causing the latch wire to pivot to the right. Subsequent release of the plunger, permitting it to move upward, causes the latch wire end to travel through the release ramp **64,** returning the latch wire to the position of FIG. **1.** As the latch wire returns to the release position of FIG. **1,** the actuator will also return to its original position as projection **26a** on the actuator is in contact with the latch wire and this interlock causes the actuator to move to the position of FIGS. **1** and **2.**

Of particular advantage is the fact that the actuator cannot effect operation of the switch operator until latch wire **30** commits the plunger to move to the latch position by pivoting inwardly over the ledge **58.** Simultaneously with plunger latching there is insurance that the switch assembly will be operated through the interlock between the latch wire and the actuator. There can be no switch operation unless the plunger is committed to move to a latch position.

It is necessary for the end of the latch wire to be in frictional contact with the heart-shaped cam and such frictional contact is maintained by the spring **40.** This friction prevents excessive freedom in rotation of the latch wire relative to the cam and relative to the actuator. Note that the lower end of the latch spring presses directly against the latch wire, pressing the latch wire against the actuator.

The number of parts and thus the assembly time have been decreased substantially from prior alternate action switches of this general type.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there may be many modifications, substitutions and alterations thereto.

The embodiments of the invention in which an exclusive property or privelege is claimed are defined as follows:

1. A switching mechanism including a housing, a plunger reciprocally movable in said housing, a switch assembly positioned in said housing, an actuator in said housing positioned to effect operation of said switch assembly,

a latch member positioned in said housing and associated cam means on said plunger, yielding means urging said latch member into contact with said cam means, said latch member and cam means being arranged to alternately latch and release said plunger as it is reciprocally moved within the housing, said latch member being movable between latch and release positions by said cam means and plunger,

means interlocking said latch member and actuator, including contact there between to prevent movement of the actuator relative to the switch assembly until said latch member has moved a sufficient distance relative to said cam means to commit said plunger to a latched position, whereby latching of said plunger and actuation of said switch assembly occur simultaneously.

2. The structure of claim **1** further characterized in that said yielding means is in contact with said actuator and is effective to urge said actuator toward a position to effect operation of said switch assembly.

3. The structure of claim **2** further characterized in that said actuator is pivotally movable within said housing.

4. The structure of claim **1** further characterized in that said latch member pivots while moving between the latch and release position.

5. The structure of claim **4** further characterized in that said actuator is pivotally mounted within said housing.

6. The structure of claim **6** further characterized in that said yielding means is in contact with said actuator and is effective to apply a force upon said actuator to effect operation of said switch assembly.

7. The structure of claim **1** further characterized by and including spring means normally urging said plunger to a release position.

8. The structure of claim **1** further characterized in that said cam means includes a ledge, movement of said latch member into said ledge commits said plunger to a latching position.

9. The structure of claim **8** further characterized by an including an inclined surface in said cam means leading toward said ledge, movement of said plunger toward a latching position causes said inclined surface to move said latch member toward said ledge.

10. The structure of claim **1** further characterized in that said actuator and latch member are each pivotally mounted within said housing, said yielding means urging said latch member into contact with said cam means and being effective to apply a force to urge said actuator toward a position to effect operation of said switch assembly.

11. The structure of claim **10** further characterized in that said latch member is pivotally movable on said actuator.

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