

United States Patent

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[72] Inventor **William G. Dennison**
Milwaukee, Wis.
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 [73] Assignee **Cutter-Hammer, Inc.**
Milwaukee, Wis.

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Primary Examiner—H. O. Jones
Attorney—Hugh R. Rather

[54] **PUSH-PULL ELECTRIC SWITCH OPERATOR**
6 Claims, 5 Drawing Figs.

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 [51] Int. Cl. H01h 3/12
 [50] Field of Search 200/167,
 168 (C), 172, 153.10

[56] **References Cited**

UNITED STATES PATENTS
 3,215,806 11/1965 Arnold et al. 200/167(A)

ABSTRACT: A single return spring biases a switch operator against movement to either operating position by being compressed against either an internal shoulder formed in the operator housing or against the inner edge of an inserted ring. A pair of projections on the movable operator nest between a pair of switch actuating levers to bear directly downward upon one lever in the push direction and to rock the other lever downward in the pull direction. The levers are designed with a two-to-one mechanical advantage to reduce the stroke length of the operator.

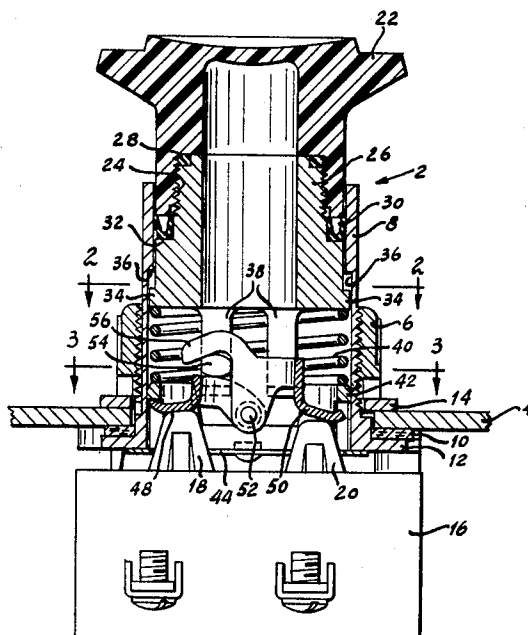


Fig. 1

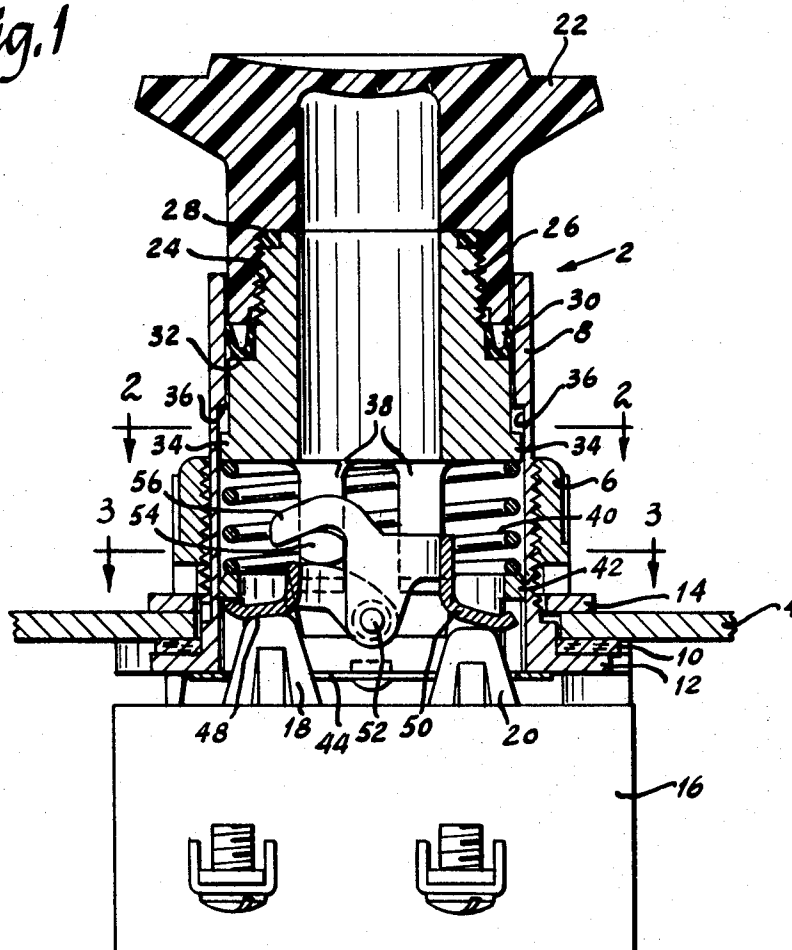


Fig. 2

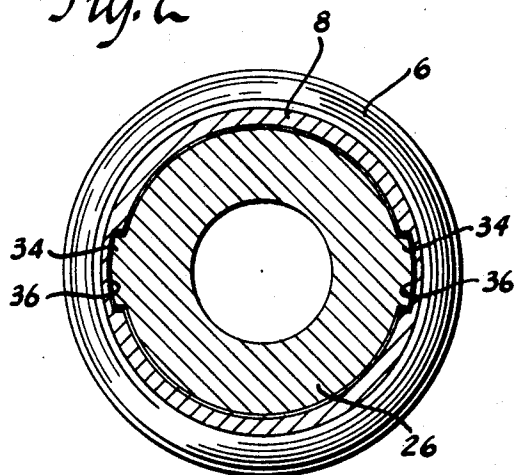


Fig. 3

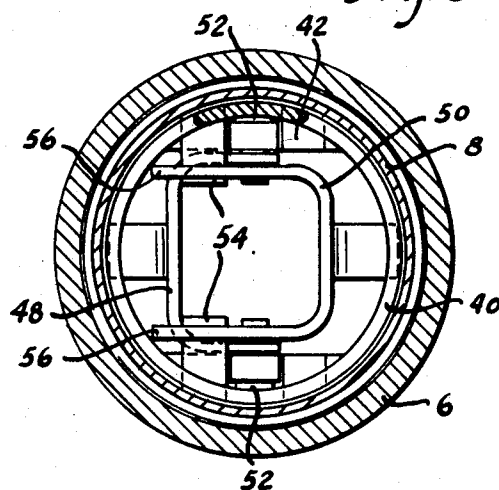
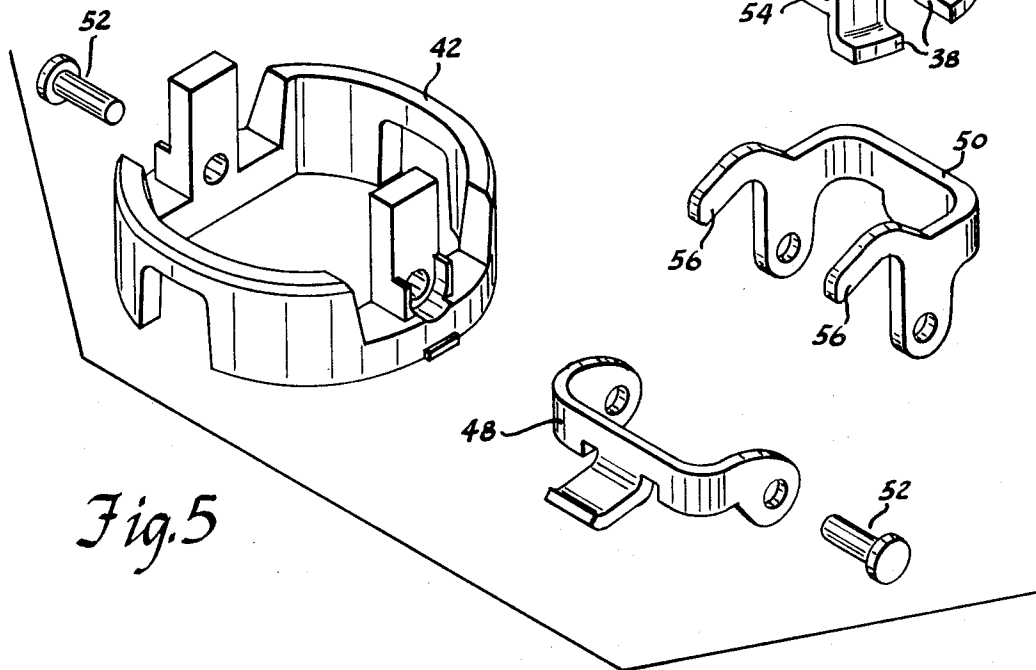
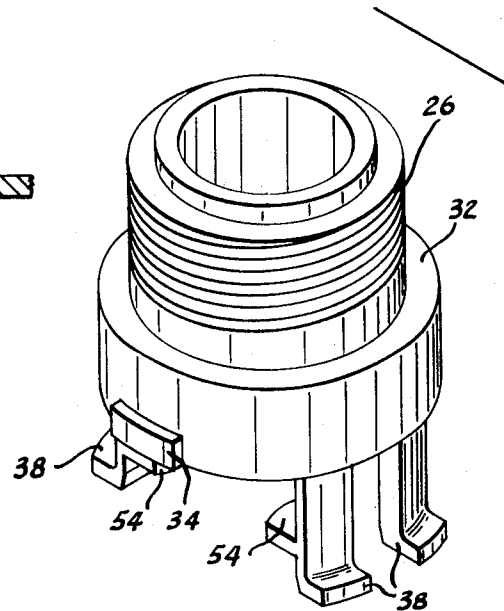
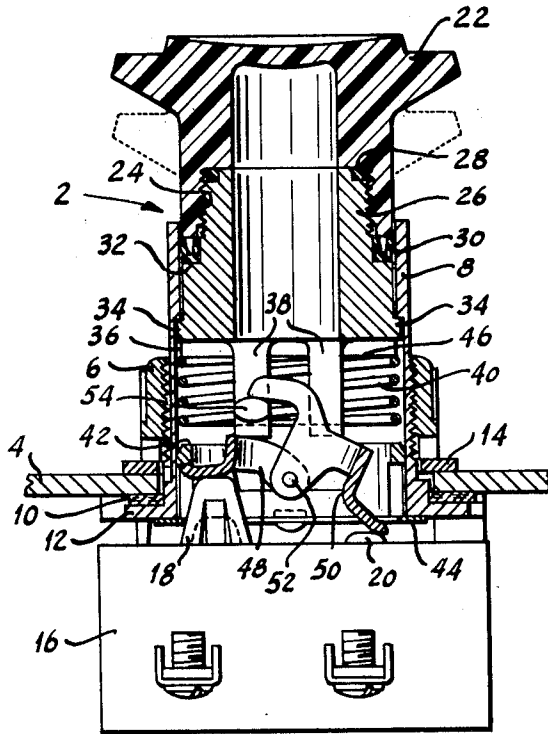


Fig. 4



PUSH-PULL ELECTRIC SWITCH OPERATOR

BACKGROUND OF THE INVENTION

This invention relates to push-pull operators for pushbutton switches, particularly of the oiltight pushbutton type.

Manufacturers of oiltight pushbuttons generally produce a full line of devices therefor which include various operators, switch units, illumination devices and the like. It is important that new components to the line be designed to utilize existing components and to be in design harmony with the remainder of the line.

One consideration in designing the switch operator of this invention was that of spring biasing the operator to a relatively stable original or neutral position irrespective of the number of spring biased pushbutton switch units that may be assembled thereto. The use of full stroke pushbutton switch units reduced this problem significantly. However, the length of the full stroke is generally objectionably long for panel assemblies and a lever system had to be employed which provided a mechanical advantage. In addition to these features, space along the axis of the operator had to be reserved for a lamp assembly if desired.

SUMMARY OF THE INVENTION

It is therefor a primary object of this invention to provide a push-pull operator for a pushbutton electric switch unit in which a lever system multiplies the operator motion to permit the use of full stroke pushbutton units.

It is a further object of this invention to provide a push-pull operator for a pushbutton electric switch unit in which is relatively easy to manufacture and which may be readily incorporated with existing components of the line.

These and other objects and advantages will become more apparent in the following specification and claims when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view taken generally along the centerline of the push-pull operator of this invention;

FIG. 2 is a cross-sectional view taken along the line 2-2 in FIG. 1;

FIG. 3 is a cross-sectional view taken along the line 3-3 in FIG. 1;

FIG. 4 is a view similar to FIG. 1, but drawn to a reduced scale and showing the pulled operating position of the operator; and

FIG. 5 is an exploded isometric view of several of the major components of the operator.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings and particularly FIG. 1 there is shown a push-pull operator assembly 2 extending through an opening in a panel 4 and clamped thereto by a retaining nut 6 threadably secured to a cylindrical housing 8 of the pushbutton assembly. A sealing washer 10 is compressed between a lower flange 12 on housing 8 and the back side of panel 4 to seal the opening in the panel. An indicia ring 14 surrounds the housing 8 and opening in panel 4 at the front surface thereof, the ring 14 being secured by nut 6.

A two circuit pushbutton switch 16 is mounted to the rear of housing 8. The switch 16 and its method of attachment to the housing are described in Nolden et al. U.S. Pat. 2,930,859 issued Mar. 29, 1960 and reference may be had thereto for the details of switch 16. For purposes of this description the switch may be thought of as containing two individual electric switches each controlled by their own pushbutton elements 18 and 20.

A hollow molded plastic button 22 is provided with an internally threaded counterbore 24 at one end to be threadably secured to a movable sleeve member 26. A resilient O-ring seal 28 is entrapped between the upper end of sleeve 26 and the inner shoulder of button 22 formed by the counterbore 24.

A second resilient seal 30 is disposed in an annular groove formed by a shoulder 32 on sleeve 26 and the bottom surface of button 22.

Sleeve 26 is positioned for axial movement within cylindrical housing 8 by a pair of outwardly projecting, oppositely disposed tabs 34 formed on the lower skirt of sleeve 26. The tabs 34 cooperate with diametrically opposed grooves 36 (see FIGS. 2 and 5) in housing 8 to prevent rotational movement of sleeve 26 within housing 8 and to limit the outward movement thereof.

Sleeve 26 is further provided with oppositely disposed pairs of feet 38 depending from the skirt portion thereof. A helical compression spring 40 is disposed around the feed 38 to rest thereon at one end and abut against the underside of tabs 34 at the other end. A retaining ring 42 is inserted from the rear of housing 8 and maintained there by a stop plate 44 riveted to the rear surface of housing 8. The upper edge of ring 42 serves as a seat for the lower end of spring 40 while a shoulder 46 in housing 8, which is coplanar with the bottom of the skirt portion of sleeve 26 in FIG. 1, serves as an upper limit for the spring 40.

A pair of levers 48 and 50 are pivotally mounted to the retaining ring 42 by a pair of headed pins 52 which are received in diametrically opposed holes in ring 42 to extend inwardly toward each other. The pins pass through aligned clearance holes in levers 48 and 50 respectively. An epoxy cement is applied to the head of each pin to retain it assembled to ring 42.

A pair of generally elliptical projections 54 are formed on the inner surfaces of one opposed pair of the feet portions 38 (see FIGS. 3 and 5) to extend inwardly toward each other. The elliptical projections 54 overlie the side arm portions of lever 48 to rest thereacross. Lever 50 is provided with upstanding dogleg portions 56 on the sides thereof which overlie the projections 54. The wide arcuate upper and lower surfaces of projections 54 permit a more positive driving connection with each lever over a greater range of movement than would a cylindrical projection of the same diameter.

The operation of the push-pull switch will be described with particular reference to FIGS. 1 and 4. While not illustrated specifically, the push operation will be described first. The final positions of the button 22 and pushbutton 18 in the push operation are shown in dotted lines in FIG. 4.

To actuate the pushbutton 18 of switch 16, the button 22 is pushed to depress the sleeve 26. The tabs 34 on the skirt of sleeve 26 carry the upper end of spring 40 downward to compress the spring against the upper edge of inserted ring 42. Elliptical projections 54 bear upon the sides of lever 48 to drive it downwardly and depress button 18 against the bias of an internal spring of switch 16. The lever 48, as is lever 50, is designed to provide a mechanical advantage of a 2 to 1 ratio, i.e. the manual depression of button 22 one unit of length results in a depression of pushbutton 18 equal to two units of length.

Button 22 is returned to its original position by spring 40 when the operating force is removed from the button. The upper end of spring 40 stops against the internal shoulder 46 to position the assembly. The internal spring of switch 16 returns the pushbutton 18 to its original position and that button in turn returns lever 48.

To depress switch pushbutton 20 the button 22 is pulled from its original position to that illustrated in FIG. 4. The feet 38 of sleeve 26 carry the lower end of spring 40 upwardly to compress the spring against the shoulder 46. The outward movement of button 22 and sleeve 26 is limited by the engagement of tabs 34 with the upper ends of slots 36. Elliptical projections 54 engage the undersides of dogleg portions 56 on lever 50 to pivot the lever clockwise about pins 52, thereby depressing pushbutton 20. Release of button 22 will cause spring 40 to return the button to its original position while the internal spring of switch 16 will return the pushbutton 20 and lever 50.

Thus there is disclosed a push-pull switch which utilizes a single spring to bias the operator against movement in either direction and to return the operator from movement to either position. A lever system is utilized which permits full stroke switch pushbutton actuation with a substantially shorter forward panel extension stroke. It may also be seen that the axial center of the operator has been left vacant to permit an illumination device to be used therewith along with a translucent lens in place of button 22.

I claim:

1. A push-pull switch comprising, in combination:

a cylindrical housing;

an axially movable member mounted within said housing;

button means secured to said movable member and extending beyond one end of said housing;

electrical switch means attached to the other end of said housing, said switch means comprising a pair of independently movable pushbuttons each having individual electrical switch means operated thereby;

a pair of levers pivotally mounted within said housing adjacent said switch means, each of said levers having a portion thereof in engagement with a respective one of said pushbuttons;

projecting means on said movable member bearing directly upon one of said levers to pivot said lever to depress the respective pushbutton upon inward axial movement of said movable member; and

a portion of the other of said levers overlying said projecting means to pivot the latter lever to depress the respective pushbutton upon axial outward movement of said movable member.

2. The combination according to claim 1 together with;

spring means partially compressed within said housing between an annular shoulder formed in said housing and

the forward edge of a ring inserted within said housing; means on said movable member abutting said spring means adjacent said shoulder to define a normal inward position for said movable member; and

means depending from said movable member through said spring means to engage the opposite end thereof to define a normal outward position for said movable member.

3. The combination according to claim 2 wherein:

inward movement of said movable member compresses said spring means between said means on said movable member and said forward edge of said ring to bias said movable member outwardly of said housing; and

outward movement of said movable member compresses said spring means between said shoulder in said housing and said means depending from said movable member to bias said movable member inwardly of said housing.

4. The combination according to claim 3 wherein said levers are generally U-shaped members, said levers pivotally mounted within said housing on common pivot pin means extending through openings near the outer ends of legs on said levers, the bight portions of said levers disposed at opposite sides of said housing and having portions extending therefrom to be in engagement with respective ones of said pushbuttons.

5. The combination according to claim 4 wherein said pivot pin means are secured in diametrically opposed holes formed in said ring.

6. The combination according to claim 5 wherein said projecting means on said movable member comprise a pair of projections extending inwardly from said depending portions to extend across the legs of one of said levers and to extend under portions of the other of said levers.

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