

United States Patent [19]

New et al.

[11] 3,769,482

[45] Oct. 30, 1973

[54] PUSH BUTTON SWITCH WITH INDICATOR

[75] Inventors: William Ernest New, Chichester; Alan David Parmenter, Burgess Hill, both of England

[73] Assignee: Rendar Instruments Limited

[22] Filed: June 29, 1972

[21] Appl. No.: 267,416

[30] Foreign Application Priority Data

July 1, 1971 Great Britain 30,792/71

[52] U.S. Cl. ... 200/167 R, 116/DIG. 28, 116/124 L

[51] Int. Cl. H01h 9/16

[58] Field of Search 200/167 R, 156; 116/124 R, 124 L, DIG. 3, DIG. 28

[56] References Cited

UNITED STATES PATENTS

3,683,145 8/1972 Berenbaum 200/167 R

3,576,175 4/1971 Gammill 200/167 R X
2,382,022 8/1945 Perret 200/167 R

Primary Examiner—Robert K. Schaefer

Assistant Examiner—William J. Smith

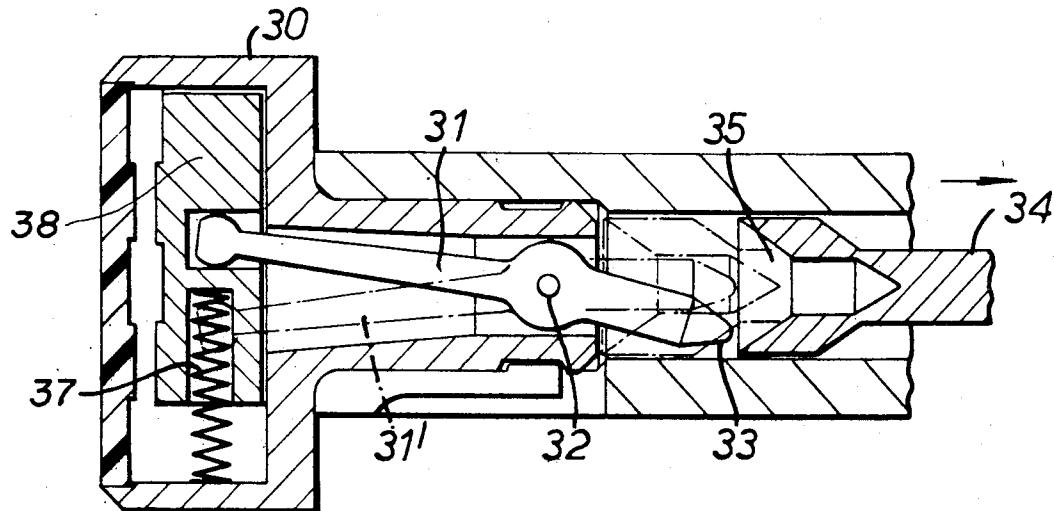
Attorney—Lawrence E. Laubscher et al.

[57]

ABSTRACT

In order to provide better visual indication of the position of an actuating means such as a push button switch there is provided a means for translating the longitudinal movement thereof into the movement perpendicular thereto of an indicating member. Said member, or a device coupled thereto can be more readily observed than the actuating means.

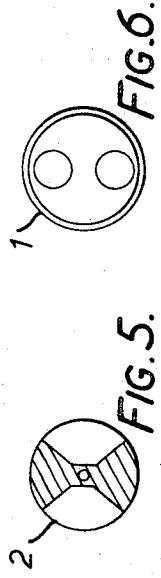
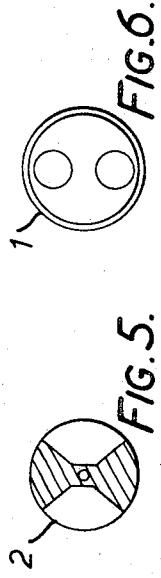
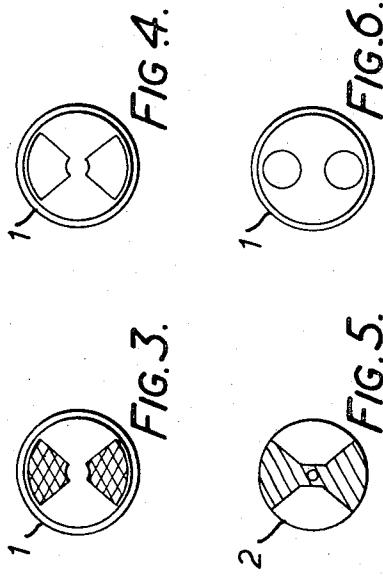
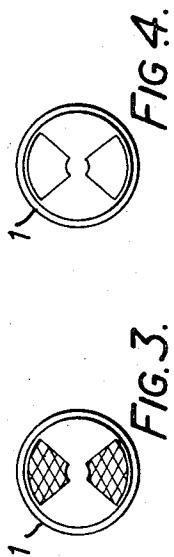
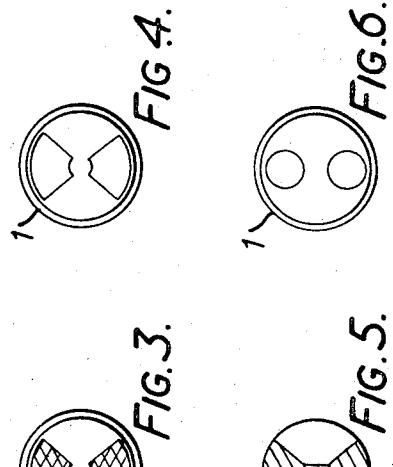
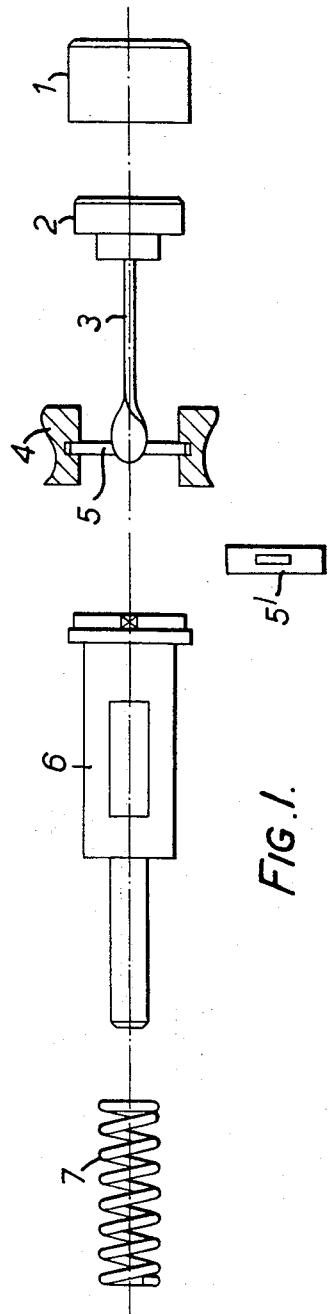
1 Claim, 15 Drawing Figures



PATENTED OCT 30 1973

3,769,482

SHEET 1 OF 3



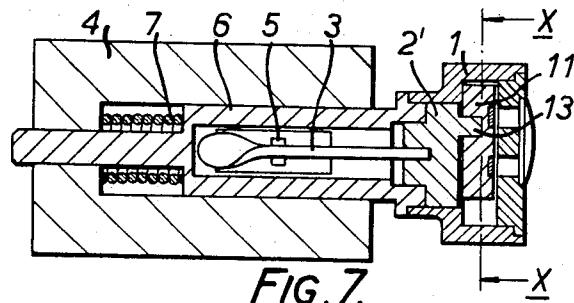


FIG. 7.

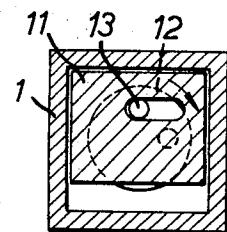


FIG. 8.

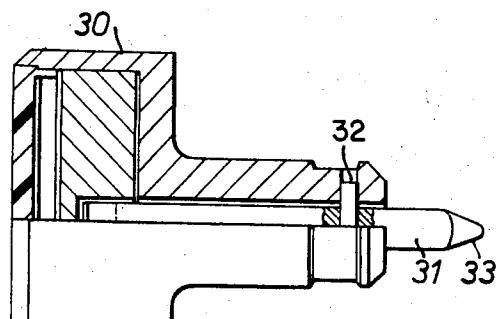


FIG. 13.

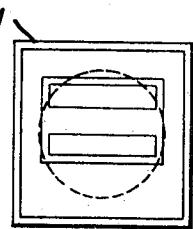


FIG. 9.

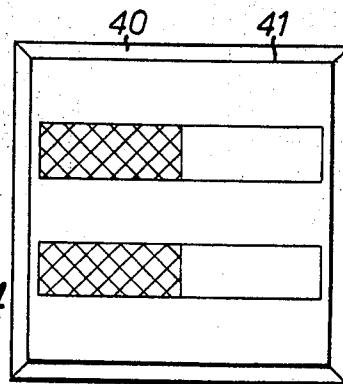


FIG. 14.

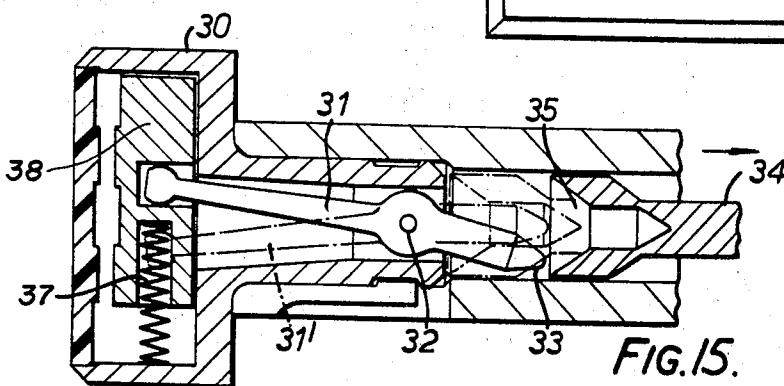


FIG. 15.

PATENTED OCT 30 1973

3,769,482

SHEET 3 OF 3

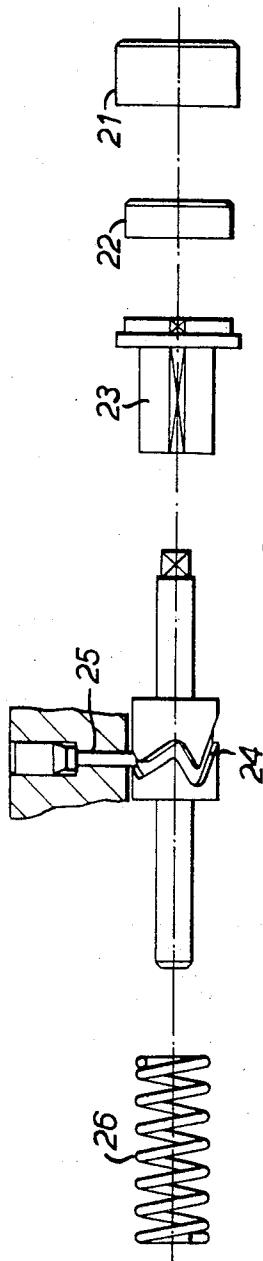


FIG. 10.

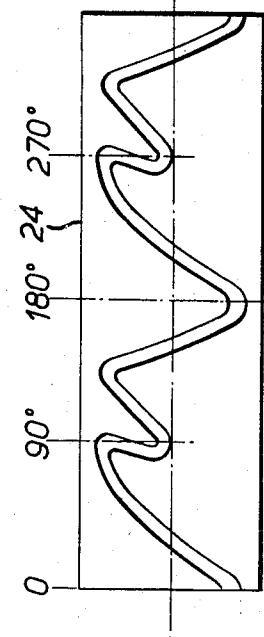


FIG. 12.

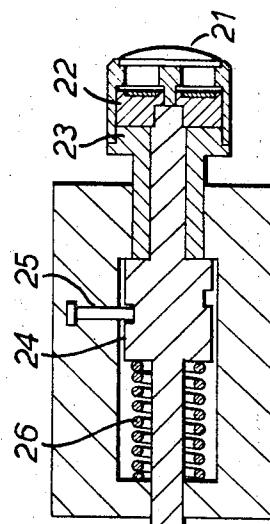


FIG. 11.

PUSH BUTTON SWITCH WITH INDICATOR

This invention relates to actuating means for operation of a device by linear movement of a control means. Such actuating means are utilized, for example, in switches which, operated by manual action, employ successive operation to change from one to another condition, or are arranged in groups so that the operation of one releases any others in an operated condition.

When key board type buttons or knobs are employed the problem is liable to arise that it is difficult or impossible readily to determine visually which switches are operated unless auxiliary means are used. Such auxiliary means may rely on positional discrimination wherein operated keys or buttons are held in a different position when operated, or illuminated lamps either mounted separately or within the operating button are controlled from electrical contacts of the switch. The former method does not provide good visual discrimination, particularly when viewed from certain angles, and the lamp method is complicated and may be costly and unreliable.

It is an object of the present invention to provide an improved method for indicating the condition of an actuating means.

The invention comprises an actuating means for operation of a device by linear movement of a control means, comprising an indicating member capable of movement in a plane substantially perpendicular to the direction of movement of said control means and arranged to occupy a position in dependence on the position of said control means.

Preferred features and advantages of the invention will become apparent from a study of the following description of examples thereof, taken in conjunction with the accompanying drawings, in which:

FIG. 1 shows an exploded view of the operating part of a push-button switch;

FIG. 2 shows a section of the switch part shown in FIG. 1 when assembled;

FIGS. 3 and 4 is an end view looking in a direction from the right hand side of FIGS. 1 and 2 showing the cap when the switch is in its "on" position and its "off" position respectively;

FIG. 5 shows an end view of the rotor shown in FIG. 1;

FIG. 6 shows an end view of an alternative cap for use in the arrangement shown in FIGS. 1 and 2;

FIG. 7 shows a section of the operating part of another push-button switch;

FIG. 8 shows a view of the rotor assembly utilized in the switch part shown in FIG. 7 along the line x—x;

FIG. 9 shows the display produced by the switch part shown in FIG. 7;

FIG. 10 shows an exploded view of the operating part of yet another push-button switch;

FIG. 11 shows a section of the switch part shown in FIG. 10 when assembled;

FIG. 12 shows in detail a cam utilized in the switch part shown in FIG. 10;

FIG. 13 shows a section of a switch part of still yet another push-button switch;

FIG. 14 is a front view of the switch shown in FIG. 13, and

FIG. 15 is a section showing the complete push-button switch, the portion of which is shown in FIG. 13.

Referring now to the exploded sectional view shown in FIG. 1, the operating part of the push-button switch includes an end cap 1 and a display rotor 2 fixed to a twist bar 3. The twist bar 3 is a strip of metal which, as may be seen in the Figure, is twisted through a right angle towards its extremity. A twist washer 5 is mounted fixedly in the casing 4 of the switch of which only a fragment is shown in FIG. 1. The twist washer 5, an axial view of which is shown at 5' is slotted and the twist bar slides in the slot. The plunger of the switch is shown at 6 and the return spring at 7. The cap 1 is fixed to the plunger 6 so that it does not move radially when the plunger is depressed. The cap 1 has two segmental apertures as may be seen in the end view of FIG. 3 which may be closed by transparent windows to exclude dust and dirt. In the alternative cap 1 shown in FIG. 6 the apertures may be circular. The rotor 2 has painted or moulded into its end a contrasting colour area which is indicated by the shaded area shown in the view of FIG. 5. In practice the cap 1 could be black with the non-shaded area of the rotor 2 also black. The shaded area of rotor 2 could conveniently be coloured red. Alternatively, the shaded area could be in a luminous or fluorescent material providing a glow in dark conditions:

In the "off" position of the switch the non-shaded area of the rotor shows through the transparent apertures of the cap 1. When the switch is operated by depressing the cap, the plunger moves and the rotor 2 is carried linearly with the plunger. However the twist bar 3 is caused to move through the twist washer 5, and since the washer is fixed to the body 4 so that it cannot move either in a linear or radial direction, the twist bar is rotated through an angle of 90°. This causes the rotor 2 to move through a similar angle and hence expose the contrasting shaded area through the windows of the cap 1.

It will be appreciated that only the portions of the switch necessary to the understanding of the present invention are shown in the Figures, and in practice the plunger would be held in the operated position by, say, a latch until a release condition is applied. When the manual action is removed the rotor remains stationary thus providing a visual indication of the "off" condition. In the preferred arrangement the twist bar causes the rotor to rotate through 90° to the operated position, but it will be clearly understood that other angles may be convenient in certain applications.

In applications where the plunger returns to its normal linear position after the operating "on" condition, alternative means can be provided whereby the rotor moves through 90° during manual actuation, but the rotor slips relative to the twist bar during the subsequent spring return motion. A second operation of the cap would cause a further 90° movement and similar slip on release. Consequently successive operations of the switch will show the "on" and "off" indications as before.

The assembled operating mechanism of the push-button switch is shown in FIG. 2, the respective parts carrying the same reference numeral as shown in FIG. 1.

In the embodiment of push-button switch shown in FIG. 7 the parts 3, 4, 5, 6 and 7 are similar to the corresponding parts shown in FIGS. 1 and 2. However the rotor 2' differs slightly in construction and an alternative cap 1 of square or oblong shape is provided to

gether with a slide indicator 11 an axial view of which is shown in FIG. 8.

The slide indicator 11 has a slot 12 in the rear part which is coupled loosely to an offset pin 13 in the rotor. This alternative cap and indication method may be easily substituted for the rotary indicator of the switch shown in FIGS. 1 and 2.

With this arrangement a 90° rotation of the twist bar and rotor is translated into linear motion of the slide indicator 11. The indicator has strips of contrasting colours and hence a bar indication is revealed in place of the iris or circular indication of the embodiment shown in FIGS. 1 and 2. The indication which is displayed is illustrated in FIG. 9.

In the push-button switch arrangement which is illustrated in FIGS. 10, 11 and 12 the indicator is combined with a latching arrangement. Referring to the Figures, the arrangement includes a cap 21 having apertures similar to the cap 1 shown in FIG. 1, a rotor 22 having similar contrasting sections to the rotor 2 shown in FIG. 1, a plunger 23, a rotor cam 24, a stop 25, and a return spring 26. The plunger 23 is free to move linearly but is prevented from rotational movement by webs. The rotor 22 is fixed to the rotor cam 24 and can move linearly and also rotationally, both movements being restrained by the stop 25.

In operation, manual depression of the cap 21 causes the plunger 23 to move linearly. At the same time the rotor cam 24 will move in both linear and rotary motions, guided by the cam 24 and the stop 25 to the upper limit through an angle of approximately 90°. The profile of the cam is shown in greater detail in FIG. 12 where the cam is shown as it would appear if it could be opened into a flat plane. Removal of the manual actuation will cause the rotor cam 24, plunger 23 and cap 21 to move under the return spring 26 to the latched cam position with little or no rotary movement of the rotor cam. The end of the rotor cam can be used to operate a convenient switch unit.

A second manual depression of the cap will cause further linear and rotary movement of the rotary cam. Removal of the manual actuation causes the rotary cam plunger and cap to return under spring action to the unlatched or released linear position and rotary motion of 180° is completed.

The following two manual operations cause similar action to first the 270° rotary and latched position and secondly to the 360° or zero linear and rotary positions.

The push-button operating arrangement is shown in its assembled form in FIG. 11.

In the push-button switch arrangement which is illustrated in FIGS. 13, 14 and 15 the display is similar to that shown in FIG. 9. The left-hand portion 40 of FIG. 14 shows the display when the switch is in the "on" or operated condition and the right-hand half 41 of FIG. 14 shows the display when the switch is in the "off" or unoperated position. The cap of the switch is shown at 30 in FIGS. 13 and 14 and the essential portion for operating the display is the lever 31 which is pivoted at 32 and has a slightly pointed interior end 33. It is retained in the position shown at 31 in FIG. 15 by a return spring 37. A stationary member 34 is provided with a conical

hole 35 at the end facing the pointed end 33 of lever 31. The end of lever 31 remote from the pointed end 33 engages in a slot in a sliding element 38 which carries on its front surface coloured portions which show through apertures or widow means in the front plate of the button.

When the button is pressed the lever 31 is carried inwards by means of the pivot pin 32, which may be integral with the lever 31. When the pointed end 33 engages with the side of the hole 35 it is forced into the central position shown in dotted lines at 31 thereby causing the sliding member 38 to move into the other position where the indication shown at 40 is displayed.

What is claimed is:

1. Indicator means for indicating the operating condition of a push-button switch, comprising
 - a. a stationary member (34);
 - b. switch means including a push-button member (30) that is axially displaceable between depressed and released positions adjacent and remote from said stationary member, respectively, thereby to switch said switch means from one operating condition to the other, the end of said push-button member adjacent said stationary member containing a longitudinal bore that terminates in a chamber adjacent the end of said push-button member that is remote from said stationary member;
 - c. means for indicating the position of said push-button member relative to said stationary member and, consequently, the condition of said switch means, said indicating means comprising
 1. an indicator member (38) mounted in said chamber for radial sliding movement between first and second indicating positions relative to the axis of said push-button member, the remote end portion of said push-button member containing an opening affording a visible indication of the position of said indicator member;
 2. a lever member (31) arranged longitudinally within the bore of, and pivotally connected intermediate its ends with, said push-button member, said lever member being pivotable about an axis normal to the plane that contains both the axis of said push-button member and the axis of sliding movement of said indicator member, said lever member being adapted at one end to slidably operate said indicator member and having at its other end a pointed extremity (33) that projects outwardly from said push-button member; and
 3. spring means (37) biasing said indicator member toward one of its indicating positions when said push-button member is in the released position, said stationary member containing a recess (35) having a conically convergent orifice so arranged relative to the pointed extremity of said lever member that when said push-button member is displaced toward the depressed position, the lever member is pivoted by the orifice walls to displace the indicator member toward the other indicating position.

* * * * *