March 8, 1966 D. L. PETTIT 3,239,641

MUSHROOM TYPE PUSHBUTTON OPERATOR

Filed Sept. 27, 1963

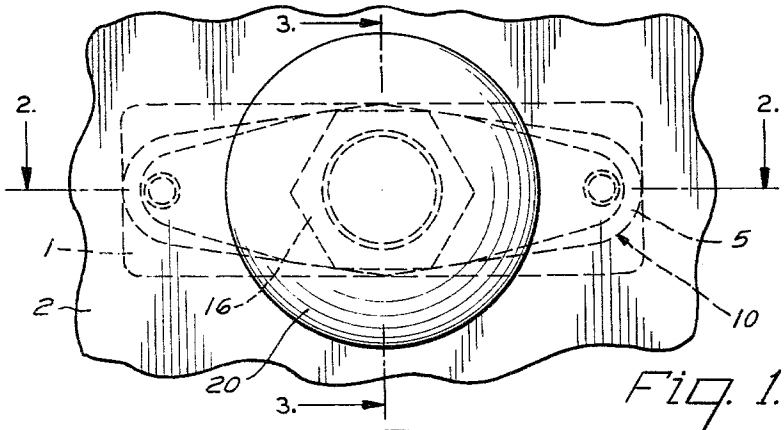


Fig. 1.

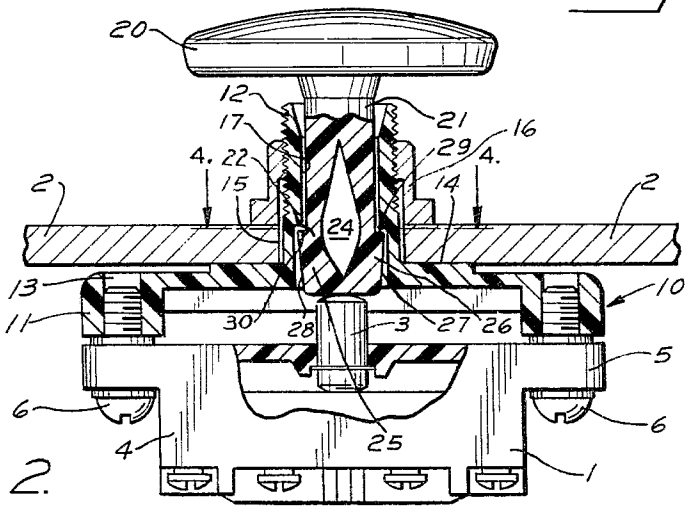


Fig. 2.

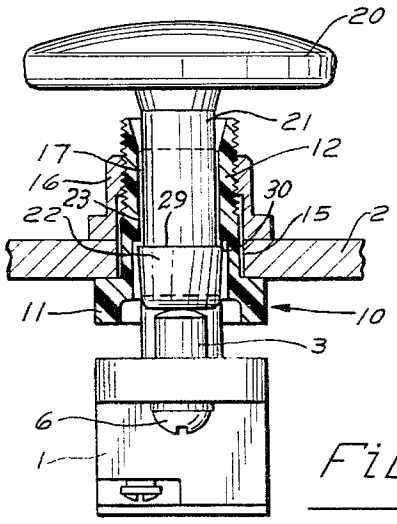


Fig. 3.

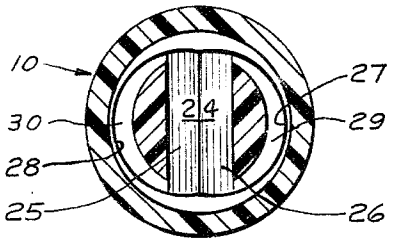


Fig. 4.

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MUSHROOM TYPE PUSHBUTTON OPERATOR

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This invention relates to a mushroom type pushbutton operator for use with pushbutton snap switches and the like, and particularly to a pushbutton operator comprising a housing which may be connected readily to such a switch and then, in turn, connected to a panel so as to support the switch in proper position for operation through an aperture in the panel, the pushbutton of the operator being installable in the housing from the forward face of the panel after the housing, with the switch connected, is mounted on the panel, whereby a large mushroom type of button can be used, yet requires only a relatively small aperture in the panel.

The operator is made of such material and the parts are so arranged that it dampens vibrations to which the switch would otherwise normally be subjected.

Various objects and advantages will become apparent from the following description wherein reference is made to the drawings, in which

FIG. 1 is a front elevational view of a mushroom pushbutton operator of the present invention, showing it mounted on an upright panel;

FIG. 2 is a horizontal sectional view of the operator and is taken on the line 2—2 of FIG. 1, part thereof being shown in section for clearness of illustration;

FIG. 3 is a vertical cross-sectional view of the operator illustrated in FIG. 1, part thereof being shown in elevation for clearness of illustration; and

FIG. 4 is a fragmentary vertical sectional view taken on the line 4—4 of FIG. 2.

Referring to the drawings, for purposes of illustration the pushbutton operator is shown in combination with the pushbutton switch 1 and is mounted on an upright panel 2 of conventional form. The switch 1 may be one such as described in U.S. Letters Patent No. 3,017,471, of Walter C. Karch, issued January 16, 1962, and entitled Electric Switch, the use of the operator with other switches being apparent from the illustrative example.

As therein more fully described, switch 1 is of the self-restoring type having a pushbutton 3. The switch mechanism is enclosed in a housing 4 having a forward wall with integral supporting ears 5 having apertures adapted to receive screws 6 for securing the switch to a supporting structure. In the present instance, the switch is supported by the pushbutton operator which, in turn, is supported on the panel 2.

Referring specifically to the pushbutton operator of the present invention, the operator comprises a body 10 having a relatively flat portion 11 and a neck portion 12 extending at right angles to the plane of the portion 11. The body portion 11 has a rear face shaped so that it can be disposed against the front of the switch housing 4 and secured thereto by the screws 6 passing through apertures 13 in the body portion 11. The body portion 11 has forwardly exposed flat faced portions 14 which, in installed position of the body 10 on the panel 2, are juxtaposed against the rear face of the panel 2.

The panel 2 is provided with an aperture 15 through which neck portion 12 extends. The neck portion 12 extends forwardly beyond the forward face of the panel 2 and is externally threaded, as indicated, for receiving a clamping nut 16. The nut 16 is operable to draw the portions 14 tightly against the rear face of the panel, thus supporting the body 10. The aperture 15 is much smaller in diameter than the mushroom pushbutton which is to

be employed on the operator, hence the pushbutton of the operator must be capable of being installed from the front of the panel after the body 10 and switch 1 are mounted on the panel.

For mounting the operator pushbutton, the passage 17 is arranged in part in the neck portion 12 and is positioned so as to be aligned with the pushbutton 3 of the switch 1 when the switch 2 is secured to the housing.

It is apparent that with the structure described the switch 1 may be mounted on the body 10 and the body 10 mounted in operating position on the panel 2, before the operator pushbutton is installed.

In order to operate the switch 1, a mushroom type pushbutton 20 is provided. The pushbutton 20 is mounted on the outer end of the stem 21 which is insertable, inner end foremost, into and through the passage 17. Near its inner end, the stem is provided with resilient shoulder means 22 which are resiliently expansible and contractible transversely of the stem and self restoring. They are adapted, when in their self restored condition to cooperate with a complementary retaining shoulder means 23 on the housing.

In the form illustrated, the complementary retaining shoulder means 23 are in the neck portion 12 of the body, although they may be in some other portion. The retaining shoulder means 23 are positioned so that when the shoulder means 22 are in operating position in the body 10 and in self-restored condition, the shoulder means 23 can engage the shoulder means 22 to prevent withdrawal of the stem 21 from the passage 17 in a direction forwardly of the panel 2. The pushbutton stem 21 can be inserted readily into the passage 17 after the body has been mounted on the panel.

The pushbutton 20, stem 21, and the resilient shoulder means, are integral with each other and formed of suitable set resilient, self-restoring plastic.

To provide the desired resiliency in the shoulder means 22, an opening 24 is provided in the stem and divides the stem into two portions 25 and 26, which are spaced apart laterally of the stem from each other and can be moved resiliently toward and away from each other. The portions 25 and 26 have outer side walls 27 and 28 which are divergent from the inner end of the stem 21 in a direction toward pushbutton 20, and extend from the inner end of the stem to coplanar shoulders 29 and 30. The inner end of the stem is small enough to be entered readily into the outer end of the passage 17. The outer over-all dimension of the stem portions 25 and 26 transversely of the stem is greater than the corresponding dimension of the passage 17 so that the stem cannot enter thereinto except by being forced sufficiently hard so that the wall of the passage 17 engages the outer side walls 27 and 28 of the portions 25 and 26 and forces them, and thereby the shoulders 29 and 30, toward each other as the stem moves to fully inserted position. As the shoulders 29 and 30 pass the inner end of the wall of the passage 17, the portions 25 and 26 are released, whereupon they become self-restored so as to dispose the shoulders 29 and 30 in alignment with the shoulder means 23 of the body, thus preventing withdrawal of the stem 21 forwardly from the passage 17.

The length of the stem between the rear face of the button 20 and the shoulders 29 and 30 is such that the stem 21 can be moved outwardly sufficiently by the switch pushbutton 3 to permit the pushbutton 3 to reach fully extended position. Once installed, the pushbutton stem cannot be removed except by a special tool or by removing the switch 1 and thereby gaining access to the inner end of the stem.

The body 10, and the integral pushbutton 20 and stem 21, preferably are composed of delrin or natural acetal

resin, or like material. This material is desirable inasmuch as it tends to dampen vibrations and shocks and thus protects the switch.

If desired, an additional spring, not shown, can be interposed between the switch **1** and the stem **21** to prevent transmission of vibration and shocks from the stem **21** to the pushbutton **3** while damping shocks and vibration. However, due to the resiliency of the stem **21** and the type of support of the switch the shocks and vibrations are absorbed.

The pushbutton **20** and its stem **21** may be composed of synthetic organic plastic material.

Having thus described my invention, I claim:

1. In combination, a pushbutton switch, a pushbutton operator comprising a body having a forwardly exposed face portion adapted to be juxtaposed against the rear face of a panel and an integral externally threaded neck portion extending forwardly from said face portion and adapted to extend through an aperture in the panel when said face portion is so juxtaposed, a clamp nut in threaded engagement with the neck portion and adapted for engagement with the front face of the panel for drawing said face portion firmly against the rear face of the panel, means securing the switch to the body at the rear face of the body with the pushbutton of the switch facing forwardly of the body, said body having a passage therethrough opening through the front of the neck and aligned with the pushbutton, a mushroom pushbutton, a stem connected at its outer end thereto and receivable with the inner end foremost in the passage from the front of the neck portion and slidably accommodated in the passage for movement endwise of the pushbutton, and complementary snap fastening means on the stem and body and rendered operative upon the stem being moved a predetermined distance endwise of the passage from the front end of the neck, to interengage and prevent withdrawal of the stem from the passage.

2. The structure according to claim **1** wherein the body and the stem are resilient, self-supporting, self-restoring set plastic material.

3. A pushbutton device comprising a body having a passage therethrough, a pushbutton, a pushbutton stem extending through said passage and connected at one end to the pushbutton, resilient shoulder means on the stem spaced toward the other end of the stem from the pushbutton and being resiliently contractible and self-restoring transversely of the stem, retaining shoulder means on the body, said passage having a wall engaging the stem between the resilient shoulder means and pushbutton and supporting the stem for endwise sliding movement, said passage being of less dimension transversely of the stem than said resilient shoulder means when the resilient shoulder means are in their normal self-restored condition, said resilient shoulder means being engageable and contractible by the passage wall, when the stem is forced through the passage in a direction other end foremost, and being self-restoring when they are moved in said direction beyond the passage wall and said retaining shoulder means, and, when self-restored, being in alignment, endwise of the stem, with the retaining shoulder means so as to move into engagement with the retaining shoulder means consequent upon movement of the stem a predetermined distance in the opposite direction, thereby to constrain the stem from withdrawal through the passage.

4. A device according to claim **3** wherein the body has a body portion adapted for connection to a pushbutton switch for supporting the switch with its pushbutton in alignment with said other end of the stem so as to be engageable and operable by said stem upon endwise movement of the stem, said body having an externally threaded neck portion receivable through an aperture in a panel, a nut in threaded engagement with the neck portion for clamping the panel, about said aperture, between the body portion and nut for mounting the body and switch on the panel, and said passage extending through said neck portion endwise of the neck portion, whereby the stem can be installed after the body and switch are mounted on the panel.

5. A device according to claim **3** wherein the stem is composed of resilient set synthetic organic plastic and has a transverse opening at a location spaced from the pushbutton and dividing the stem at said location into two portions spaced from each other transversely of the stem and resiliently movable toward and away from each other, said spaced portions having shoulders, respectively, between their ends and having outer side walls, respectively, divergent away from said other end of the stem and part way of their length and terminating, in the direction of divergence, adjacent the shoulders, said spaced portions, shoulders, and divergent side walls providing the resilient shoulder means.

6. A pushbutton type operator comprising a body member having a passage therethrough with an inner end and an outer end, and adapted for connection to a pushbutton switch for supporting the switch with the switch pushbutton in alignment with the inner end of the passage, an operator pushbutton, a stem member thereon and accommodated in, and movable endwise of, the passage with one end of the stem extending inwardly beyond said inner end of the passage and disposed in cooperating engagement with the pushbutton of the switch, cooperable self-restoring expansible and contractible snap-fastening means on the stem member, said snap-fastening means being, when unconfined, of greater diameter than the passage and being disposed endwise of the stem so as to lie inwardly, endwise of the stem, from the inner end of the passage, and said snap-fastening means being capable, by an insertion of the stem member endwise a predetermined distance into said passage from the outer end of the passage, of contracting so as to pass through the passage, and being capable, upon further movement of the stem member into said passage to a predetermined location, wherein the snap-fastening means are disposed inwardly from said inner end of the passage and are released, of self-restoring to greater diameter than the passage, and said snap-fastening means being disposed inwardly from said inner end of the passage and being self-restored.

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