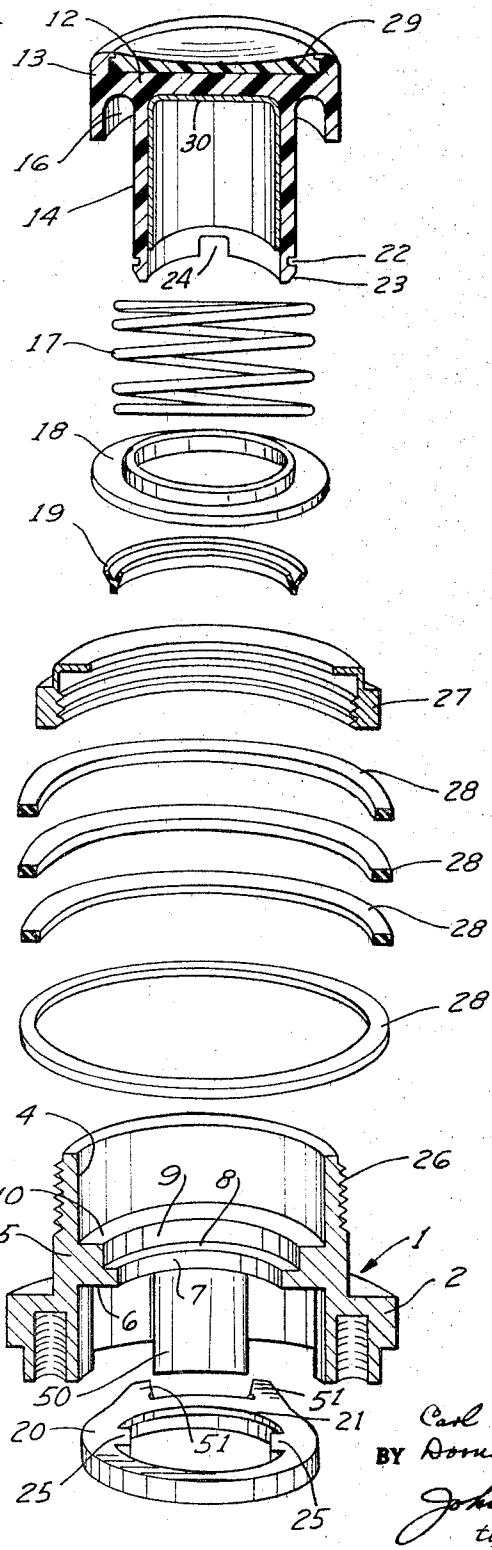
Feb. 21, 1967 C. B. SOHNS ETAL 3,305,660

PUSH BUTTON OPERATOR

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Fig. 1.



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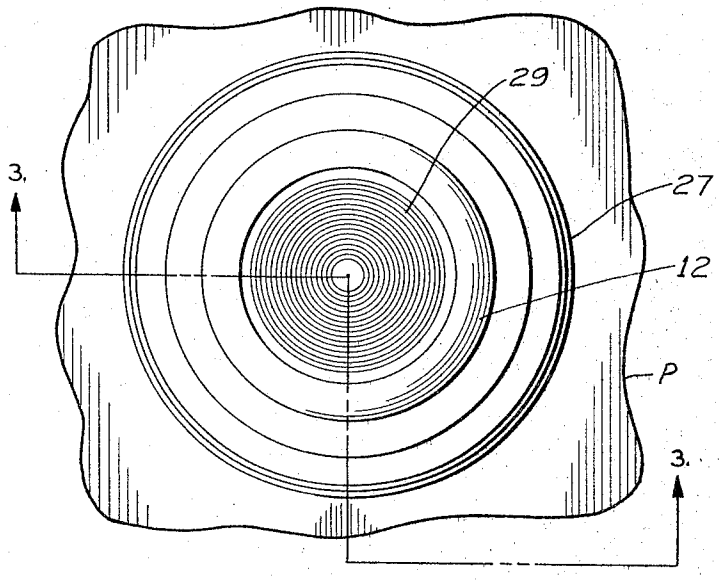


Fig. 2.

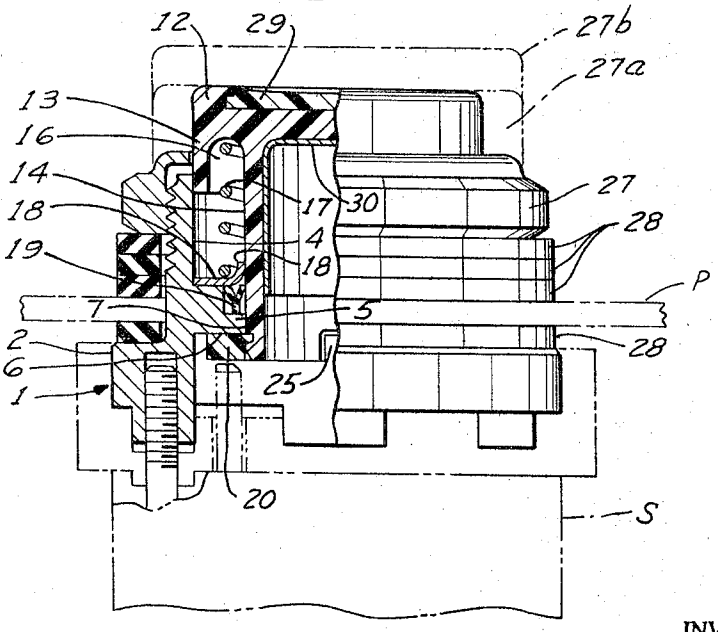


Fig. 3.

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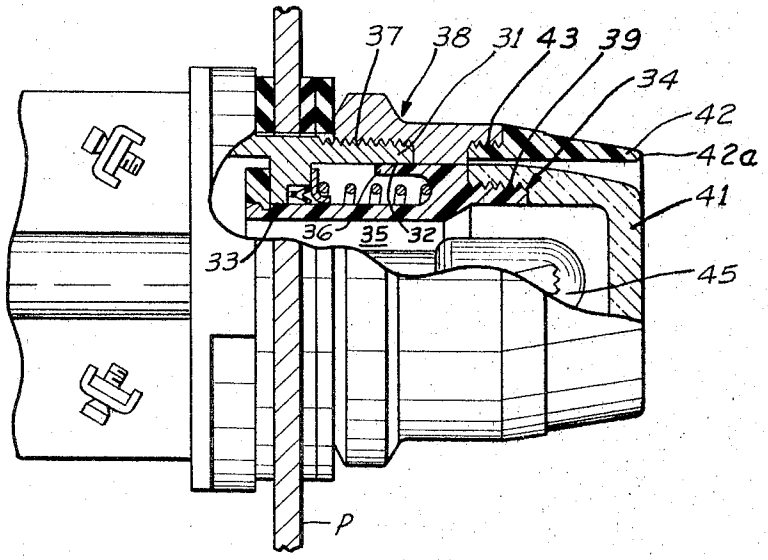


Fig. 4.

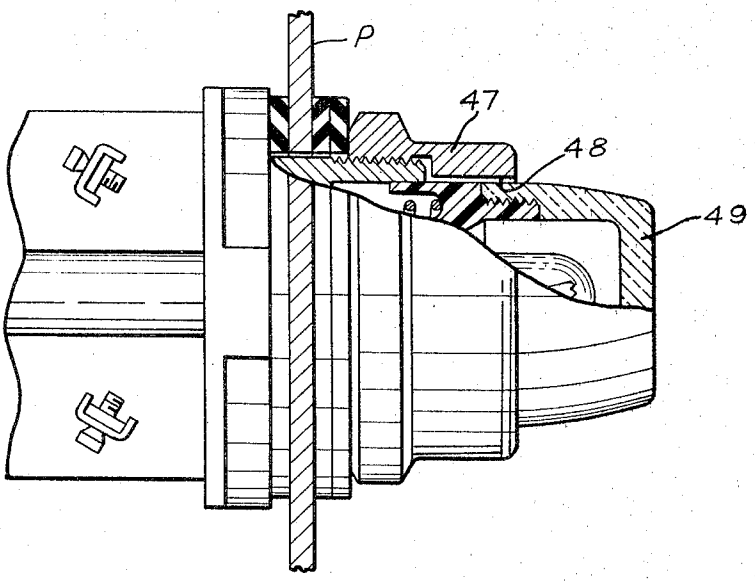


Fig. 5.

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3,305,660

PUSH BUTTON OPERATOR

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Filed Oct. 23, 1965, Ser. No. 502,926
11 Claims. (Cl. 200—172)

This invention relates to push button operators for operating push button switches, including push button operators of the unilluminated and illuminated types.

An important feature of the invention resides in the combination of an operator push button and a supporting base which is adapted for connection to a panel or the like and which has effective guide bearing surfaces disposed adjacent the opposite ends of the operator push button, respectively, and particularly at the forward end and near the rear end of the base, and in guiding relation to the operator push button for assuring effective guiding of the operator push button.

Specifically the invention relates to a push button operator which is so designed that a large number of its parts can be used either in an unilluminated or an illuminated type of push button operator, whereby a smaller inventory of parts is sufficient for meeting the needs of customers.

Another feature is to provide an operator of the character described wherein the push button is guided for axial movement at spaced opposite end portions of the button stem, and an oil seal is provided in a space in the base between the opposite end portions for assuring sealing around the stem, the seal being retained effectively in position without danger of pinching, disalignment, and the like.

A very specific object resides in the connection of the operator button within the base by means of a snap-in nylon retainer in snap fastening engagement with the stem of the operator push button.

Another specific object is to provide the operator button with a hollow stem which is adapted to accommodate a light for the illumination of the head of the push button.

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

FIG. 1 is an exploded view of the parts of an unilluminated type of push button operator embodying the invention, the parts being arranged in axial alignment, portions thereof being shown in section for clearness in illustration;

FIG. 2 is a top plan view showing the parts illustrated in FIG. 1 in their assembled relation;

FIG. 3 is a front elevation of the structure illustrated in FIG. 2, a part thereof being shown in section, as indicated by the line 3—3 in FIG. 2;

FIG. 4 is a view similar to FIG. 3 showing an illuminated operator wherein the lens is guarded so as to be visible substantially only from the front of the operator; and

FIG. 5 is a view similar to FIG. 3 showing an illuminated operator embodying the principles of the present invention.

Referring first to FIGS. 1 through 3, the operator comprises a base, indicated generally at 1, in the form of an open end sleeve having a radially extending flange 2 at one end. The flange 2 is provided with a plurality of tapped bores which are adapted to receive screws for securing the base and the body of a push button switch S together. The base 1 has an axial passage formed by an internal annular guide wall 4 at the forward end of the base and adapted to surround and guide the head of a

push button of the operator for endwise sliding movement axially of the passage, as will later be described. Between the ends of the passage, the sleeve is provided with an internal annular rib 5 having a stop shoulder 6 facing rearwardly of the sleeve passage of the sleeve. The rib has an annular internal guide wall 7 of smaller diameter than the guide wall 4 and which is adapted to engage and guide the stem of the operator push button, as will later be described. The rib 5 is also provided with a forwardly facing radial shoulder 8 extending from the forward edge of the wall 7 radially outward a short distance to a wall portion 9 which is spaced radially outwardly from the wall 7. The shoulder 8, wall 9 and push button stem provide an annular space for accommodating an oil seal.

The push button of the operator comprises a head 12, having an external rearwardly extending annular flange 13 which extends from the forward face of the head 12 rearwardly, part way toward the opposite end of the push button. The push button also has a hollow cylindrical stem 14 in the form of a cylindrical shell, less diameter than the flange 13 and coaxial therewith.

The outer peripheral surface of the flange 13 engages and is guided for axial movement by the guide wall 4 of the base while the external peripheral surface of the stem 14 engages and is guided by the guide wall 7.

The flange 13 is spaced radially outwardly from the stem 14 so as to provide an annular channel 16 in which one end of a coil return spring 17 is disposed so that its one end engages the inner face of the head 12 and urges the push button forwardly. An annular spring support 18 is juxtaposed against the shoulder 10 of the rib 5. It is engaged by the opposite end of the spring 17 and it is held firmly in face to face juxtaposition with the shoulder 10 thereby.

The annular support 18 extends radially inwardly beyond the shoulder 10 and overhangs the shoulder 8 in axially spaced relation. The support 18 fits the stem 14 with operating clearance, thus providing a forwardly facing channel in which is disposed an oil seal 19 which provides an effective seal between the radial wall 9 and the adjacent external peripheral wall of the stem 14.

In order to limit the forward movement of the stem relative to the base, a retainer 20 is connected to the inner end of the stem. The retainer 20 is aligned with the stop shoulder 6 and arranged to engage that shoulder and to constrain the operator push button from undue movement forwardly, thus assuring proper guiding relation with the walls 4 and 7 at all times.

The retainer 20 is shown as annular. At its forward end, it has an internal annular bead or shoulder 21 extending radially inwardly from its inner periphery and terminating axially in spaced relation to the rear end of the retainer. The rear end of the stem 14 is provided with a radially open annular groove 22 and a tapered guiding nose portion 23 at its rear end. The stem 14 has two axially extending notches 24 extending through its peripheral wall. The retainer 20 is provided with radially extending tongues 25 which are receivable in the notches 24 with circumferential clearance. The notches impart a certain flexibility to the extreme rear end of the stem 14. The stem and the retainer are made of relatively stiff, but slightly resilient, self-restoring material. The stem and retainer can be assembled by pressing the retainer forward end foremost over the tapered guiding nose portion 23 of the stem, thus contracting the rear end of the stem radially and expanding the retainer until the rib 21 passes into alignment, radially of the stem, with the groove 22. Thereupon the retainer 20 and the stem 14 approach fully restored condition, seating the rib 21 firmly in the groove. The tongues 25 fit the notches 24 with very limited circumferential clearance when the stem is un-

contracted. Hence, when the retainer is snapped into place, the notches in the rear end of the stem **14** firmly engage the tongues **25** and assure that, when the retainer **20** is self-restored to its original condition, it is constrained from rotation relative to the stem **14** and also limits the forward movement of the push button by the spring **17**.

The retainer may be made of nylon, a synthetic plastic well known in the plastic art.

The base **1** is externally threaded, as indicated at **26**, at its forward end for receiving an internally threaded ring nut **27**. The base can readily be inserted through a hole in the panel when the nut **27** is removed, and oil seal washers **28** may be disposed between the rear face of the panel P and a shoulder on the base **1**.

If desired, a colored indicating disk **29** may be snap-fitted into a suitable cavity in the forward end of the push button head **12**, and a metal or plastic thimble **30** may be press fitted in the interior of the stem **14**.

In some cases it is desirable to have the front face of the push button forwardly from the forward end of the nut **27**, as in the form illustrated in FIG. 3. On the other hand, sometimes it is desirable to have the forward face of the head flush with the forward end of the nut, in which case a nut **27***a*, as indicated by the dot and dash lines in FIG. 3 may be provided, this nut being the same in all respects as the nut **27** except for a greater length axially. Again, it is sometimes desirable that the forward face of the push button head **12** be rearwardly from the forward end of the nut, in which case a nut **27***b* may be provided, this nut being sufficiently long so that while it is seated and holding the base firmly in position on a panel, its forward end is forwardly from the forward face of the push button **12**.

Referring next to FIG. 4, a similar structure is illustrated. It employs a base **31** similar to the base **1**. The base **31** has an internal annular guide wall **32** at its forward end, and an internal annular wall **33** near its rear end. An operator push button **34** is provided and, as illustrated in FIG. 4, is essentially the same as the push button heretofore described, except that its axial passage **35** extends entirely through the push button and is open at both ends. The push button **34** has an external annular flange **36** guided by the wall **32**, and the external surface of the stem is guided by the wall **33**. The base **31** is provided with external threads **37** on which is threaded a ring nut **38** for fastening the base and the parts carried thereby to a panel. The push button head is provided with external threads **39** for cooperation of internal threads of a concavo-convex lens **41**, disposed with its convex face forwardly in alignment the passage **35**, thus providing connecting means detachably connecting the lens to the head.

A suitable annular guard **42** is externally threaded for engagement with internal threads **43** at the forward end of the ring nut **38**. The guard has an annular portion **42***a* which extends forwardly from the threaded portion into surrounding relation to the side walls of the lens **41**, thus blocking the passage of light laterally of the lens. A suitable electric bulb **45**, with the usual fittings and socket, may be mounted in the passage **35** for providing the desired illumination.

In some cases it is desirable to have the lens unshielded from the side, in which case the structure illustrated at FIG. 5 may be used. In this structure, a ring nut **47** is substituted for the ring nut **38**, and is provided with an internal annular shoulder **48** which is disposed in surrounding relationship to the rear end of a lens **49**. No guard, such as the guard **42**, is provided, thus leaving the lens unshielded laterally.

In all forms of the invention it may be desirable to constrain the operator push button from rotation about its axis. This is particularly true in the case of illuminated push buttons so as to prevent rotation of the push button by the lens when the lens, such as the lens **41** in FIG. 4 or lens **49** in FIG. 5, are being unscrewed to replace the bulb, and by the bulb when it is rotated for connection and disconnection.

For this purpose, the base **1** is provided with an internal rib **50** which extends endwise of the base. The retainer **20** is provided with fingers **51** which engage circumferentially opposite sides of the rib **50** with operating clearance, and cooperate therewith to constrain the stem **14** from rotation about its axis relative to the base **1**.

It is apparent that with the structure described, with merely a substitution of different ring nuts, an unilluminated push button operator can be provided in which the button is normally exposed forwardly and laterally, or is exposed forwardly only with its forward face flush with the operator, or is exposed with its forward face disposed rearwardly from the forward end of the operator.

Again, by substituting a modified form of ring nut and a different type of push button, an operator can be provided which is readily adaptable for illumination, the other parts remaining the same as for the unilluminated operator. In the latter case, the substituted push button has a head which accommodates a lens detachably, and the new ring nut carries a guard such that the lens is exposed only forwardly. Substitution of still another ring nut permits the omission of the guard so that the lens is exposed laterally also as well as forwardly.

In all cases, the push button is well guided near the forward end of the base and near the rear of the base, and is non-rotatively accommodated in the base. The oil seal is disposed therebetween. The retainer springs and other portions and the base may be the same in all instances.

Having thus described our invention, we claim:

1. A push button operator comprising a base having a forward end and a rear end, and having a passage extending forwardly and rearwardly therethrough, said base having a forward internal annular guidewall at the forward end of the passage and coaxial therewith, and having a rearward internal annular guidewall coaxial with, and spaced axially rearwardly from, the forward guidewall, a push button comprising a head and a stem, said head disposed in said passage and guided at its outer periphery by said forward guidewall for movement axially forwardly and rearwardly of the passage, said stem having an external peripheral wall disposed in said passage and guided by said rearward guidewall for movement axially forwardly and rearwardly, said base having an internal stop shoulder in said passage disposed rearwardly from said rear guidewall and facing rearwardly of the passage, and retainer means on the stem rearwardly from said shoulder and aligned therewith in position to engage the shoulder and limit the forward movement of the push button, thereby constraining said head and stem from moving forwardly out of guided relation to said forward and rearward guidewalls, respectively.

2. A structure according to claim **1** wherein an internal annular rib is disposed in the passage of the base and extends radially inwardly into the passage, and the rear guidewall is on the inner periphery of the rib, and said stop shoulder is on the rear of the rib.

3. A structure according to claim **2** wherein said rib has a forwardly facing annular shoulder of greater outer diameter than the rear guidewall, an annular spring support is juxtaposed on the forwardly facing shoulder in surrounding relation to the stem, a spring is interposed between the head and said spring support, and said rib has an auxiliary forwardly facing shoulder disposed between the forward shoulder and the stop shoulder and of greater outer diameter than the rear guidewall and of lesser diameter than the forwardly facing shoulder, whereby a channel is provided in surrounding relation to the stem between the forwardly facing shoulders, and an oil seal is disposed in the channel and is in sealing relation with said stem and with an inwardly facing annular wall of the rib.

4. A structure according to claim **3** wherein the push button head has a rearwardly extending peripheral flange

of larger diameter than the stem, and the spring at its forward end engages the rear face of the head portion between the flange and the stem portion.

5. A structure according to claim 2 wherein the retainer means is an annular member, and complementary snap-fastening means are provided on the inner end of the stem and on the member for securing the member in fixed position axially of the stem.

6. A structure according to claim 5 wherein the rear end portion of the stem is relatively stiff, resilient and contractible radially and self-restoring, said member is relatively stiff and resilient and expansible radially and self-restoring, a complementary snap-fastening means include interfitting annular means on the rear end portion of the stem and on the member.

7. A structure according to claim 6 wherein the member is composed of NYLON.

8. A structure according to claim 1 wherein said stem is hollow.

9. A structure according to claim 1 wherein the push button stem is hollow in the form of a cylindrical sleeve

which is open at both ends, the head has a passage extending entirely therethrough axially of the stem and joining the forward end of the passage in the stem, a concavo-convex lens is disposed on the head with its convex face forward, and said lens extends forwardly from, and is in alignment with, said passage in the head; and connecting means detachably connect the lens to the head.

10. A structure according to claim 9 wherein a ring nut and an annular guard are provided, said ring nut is in threaded engagement with the base; and the annular guard is detachably supported by the ring nut in radially spaced relation to, and in surrounding relation to, the lens.

11. A structure according to claim 1 wherein oil-sealing means are disposed in the passage forwardly from, but close to, said stop shoulder.

No references cited.

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