

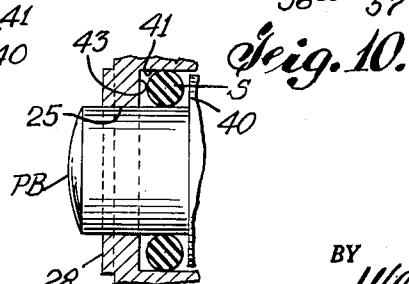
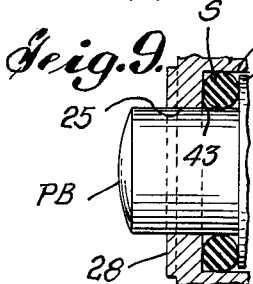
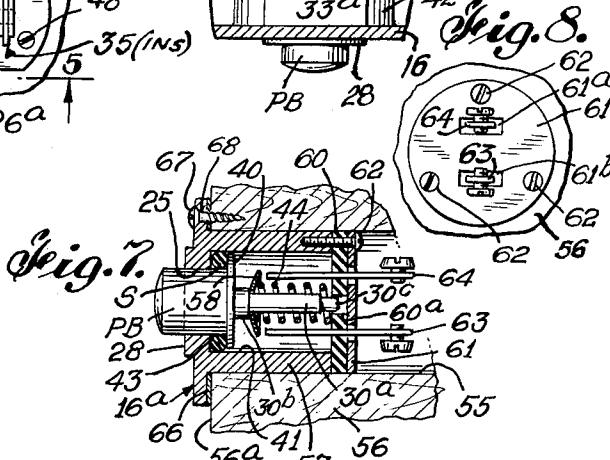
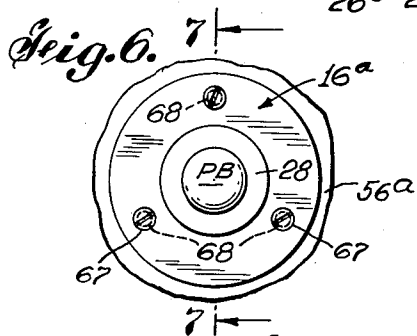
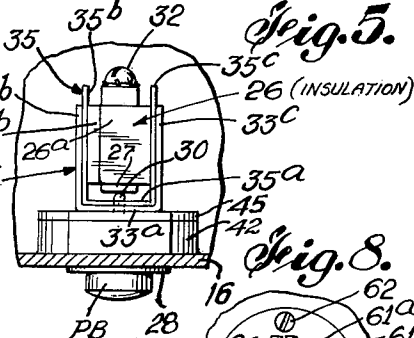
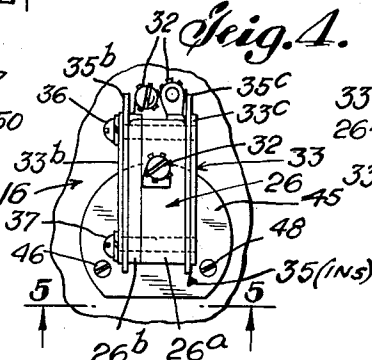
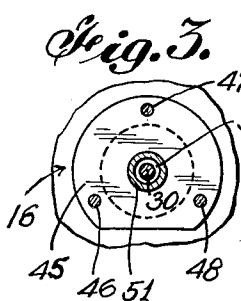
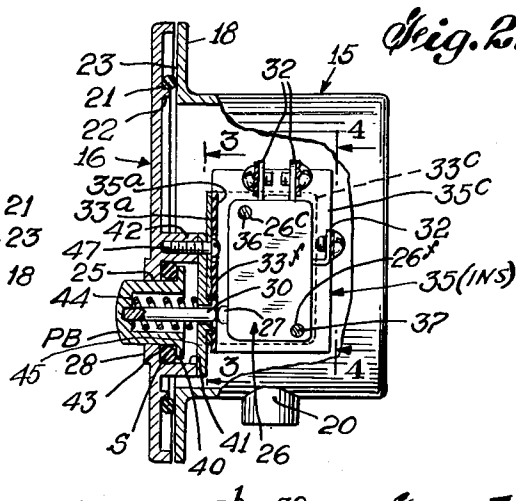
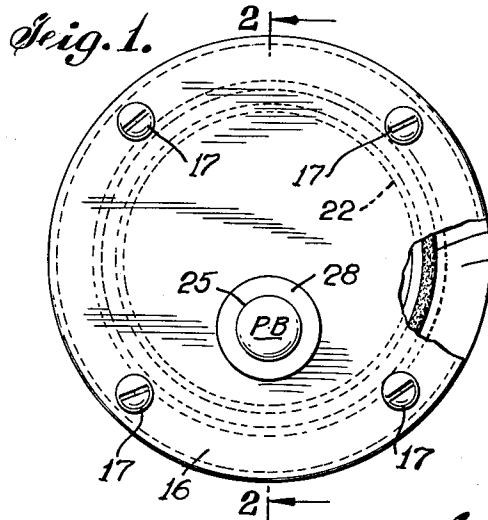
Nov. 8, 1955

L. L. VERKUIL

2,723,328

PUSH BUTTON SWITCH CONSTRUCTION

Filed March 29, 1952



INVENTOR.
LEO L. VERKUIL

BY
William T. Kriesner
ATTORNEY

1

2,723,328

PUSH BUTTON SWITCH CONSTRUCTION

Leo L. Verkuil, Norwalk, Conn., assignor to Edwards Company, Inc., Norwalk, Conn., a corporation of New York

Application March 29, 1952, Serial No. 279,316

10 Claims. (Cl. 200—168)

This invention relates to push button switches.

One of the objects of this invention is to provide a sealed push button switch that will be compact in construction, simple and easy to assemble and install, and of effective and reliable sealing action against access of moisture, water, vapors, and the like. Another object is to provide a push button switch construction in which the working parts may be dependably enclosed and sealed off, particularly at the movable operator thereof, usually a push button. Another object is to provide an efficiently-acting and long-lasting seal for push button switches. Another object is to provide a push button switch with dependable and inexpensive protective means against the entry of moisture, water, or the like and which will have a substantial range of adaptability to meet widely varying conditions or requirements of practical use.

Another object is to provide a push button switch construction of improved and more dependable switching action under the control of the movable operator or push button; another object is to provide such an improved push button switch in which sealing action at the operator may be achieved in a compact, inexpensive, and durable form. Another object is to provide a push button switch construction that will be compact yet strong and durable, and well adapted for reliability and precision of switching action or circuit control. Another object is to provide a push button switch construction of the above-mentioned character in which individual parts are capable of inexpensive fabrication and of simplicity and facility of assembly and in which installation of the push button switch may also be readily and easily effected.

Another object is in general to provide improved push button switch constructions and installations; other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which several embodiments of the invention are shown by way of illustration and in which similar reference characters refer to similar parts throughout the several views,

Figure 1 is a front elevation of an installed sealed push button switch construction;

Figure 2 is a vertical sectional view thereof as seen along the line 2—2 of Figure 1, certain parts being shown in elevation;

Figure 3 is a fragmentary vertical sectional view as seen along the line 3—3 of Figure 2, showing in particular certain features of a mounting plate;

Figure 4 is a fragmentary elevation as seen along the line 4—4 of Figure 2, certain parts being broken away or omitted;

Figure 5 is a bottom end elevation as seen along the line 5—5 of Figure 4, certain parts being omitted or broken away;

2

Figure 6 is a front elevation illustrating a modified embodiment of the invention;

Figure 7 is a vertical sectional view as seen along the line 7—7 of Figure 6;

Figure 8 is an end elevation as seen from the right in Figure 7;

Figures 9 and 10 are fragmentary sectional views on a larger scale with the push button shown in elevation showing, in the same vertical sections as Figure 2 and Figure 7, certain successive sealing coactions of certain of the parts.

The embodiment shown in Figures 1 to 5 comprises a sealed enclosure preferably made up of separable parts, such as a cylindrically-walled casing 15 (Figures 1 and 2) and a disc-like cover plate 16 detachably secured to the casing or box 15 as by a suitable number of screws 17 (Figure 1) that pass through the plate 16 and are threaded into an annular flange 18 of the casing 15. The latter may be provided with any suitable means, such as a round hole in a wall thereof provided with an internally-threaded pipe connector 20 at which a conduit or pipe line carrying conductors may be connected in sealed rotation to bring the circuit conductors into the interior of the casing 15 for connection to the switch structure. The closure plate 16, though detachable, is in sealed connection with the casing 15, illustratively and preferably by means of a gasket 21 (Figures 1 and 2) interposed therebetween and held under compression by the screws 17. The gasket 21, made of any suitable gasket material such as natural or synthetic rubber or other elastomers, may be in the form of a ring of round cross-section coacting with a ring-shaped flange 22 on the cover plate 16 to center it and with the adjacent face 23 of the casing flange 18.

At a suitable point in the cover plate 16 there is provided a round hole 25 to the rear of which and preferably carried by the plate 16 is a switch unit generally indicated by the reference character 26 and provided with a spring-biased actuator 27 projecting therefrom and coaxially with and toward the round hole 25 in the plate 16; slidable in the hole 25 is a push button PB and for the purpose of giving the latter better bearing support for reciprocating movement, the plate 16, which may be die-cast or a turned casting, is of increased thickness about the hole 25, as by an external annular boss 28 integrally formed therewith. Projecting rearwardly (to the right in Figure 2) from the push button PB and press-fitted therein or otherwise secured coaxially therewith is a stem 30 which coacts with the actuator 27 of the switch unit 26.

The details of internal construction of the switch unit 26 may take any suitable form; illustratively the internal mechanism may comprise any suitable snap-action type of switching mechanism responsive to the usually small range of reciprocating movement of the spring-biased projecting actuator 27 (Fig. 2). This movement may be as small as $\frac{1}{16}$ of an inch. In the illustrative embodiment the actuator 27, which is made of insulating material, is normally biased outwardly of the switch unit 26 (to the left in Figure 2), occupying what may be termed its "at rest" position; to effect a change in the switching action, the actuator is depressible (to the right in Figure 2), usually by the small amount above indicated.

The switch unit 26 comprises a box-like or casing structure of molded plastic or other insulating material, having two parts 26^a and 26^b, the part 26^b being in effect a closure or plate-like cover for the hollow or box-like part 26^a, the two being secured together in any suitable manner as by eyelets, after the active switch parts have been assembled and inserted therein, and with the spring-biased actuator 27 slidably projecting through a slot or hole in a wall of the box-like part 26^a; the latter also has suitable slots or openings through which conductor-connecting elements project which illustratively and usually take the form of heavy sheet-metal lugs with threaded holes for the

reception of conductor-clamping screws. Any suitable number of such connectors may be provided, depending upon the kind of switching action desired, and in the illustration the switch unit 26 is provided with three such conductor-connector devices, indicated at 32, projecting from the end walls of the unit as distinguished from the parallel external side walls of the cover part 26^b and the box-like part 26^a, all as is better shown in Figures 2 and 4.

The switch unit 26 is compact and relatively small and conveniently is in the shape of a right-angled parallelepiped. In diagonally opposite corners (Figure 2) it is provided with holes 26^c and 26^f by which the unit may be mounted in place, as by screws or bolts.

To mount the switch unit 26 I provide a U-shaped support 33 which may conveniently be in the form of a sheet-metal stamping, having a bottom wall 33^a and two parallel spaced side walls 33^b and 33^c (Figure 5), the latter being of an expanse somewhat greater than the expanse of the switch unit 26 (see Figure 2) and being spaced apart by an amount somewhat greater than the thickness of the switch unit 26 (see Figures 4 and 5) so as to accommodate therebetween a U-shaped liner 35 of sheet insulating material such as fiber, hard rubber, or the like which is bent up to provide a bottom part 35^a that can rest against the bottom 33^a of the support 33 and two side parts 35^b and 35^c which are of materially greater expanse (see Figure 2) than the side walls of the support 33 so that they project peripherally from the latter and when the switch unit 26 is mounted in place, they also project at the sides of the connector elements 32 and coact in insulatingly protecting these connector elements.

After the U-shaped support 33 is mounted in position as is illustratively described, the U-shaped insulating plate 35 and the switch unit 26 are inserted in between the arms 33^b and 33^c of the support 33 and the switch unit is secured thereto by screws 36 and 37 which pass through suitable holes in the side wall 33^b (Figure 4) and in the insulating plates 35^b and 35^c and through the holes 26^c and 26^f of the switch unit itself, and then are threaded into threaded holes in the opposite arm 33^c of the U-shaped support 33, thereby clamping the parts together and fixing the position of the switch unit relative to the support 33 and locating the plunger-like actuator 27 of the switch unit in juxtaposition to a relatively large round hole 33^f (Figure 2) in the bottom part 33^a of the U-shaped support 33. As shown in Figure 2, the bottom part 35^a of the insulating plate structure 35 also has an aperture concentric with the just mentioned hole 33^f.

The push button PB has a laterally projecting annular flange 40 at its inner end to coact with a ring-shaped sealing member S of preferably circular cross-section and made of any suitable yielding and preferably resilient material such as suitably compounded natural rubber or synthetic rubber or other elastomer. The ring S, being thus torus-shaped, has a thickness somewhat greater than the difference between the radius of the cylindrical face 41 of an internal casing-like wall 42 and the radius of the push button PB itself. Part 42 may be in the form of an annular boss projecting inwardly (to the right in Figure 2) from the cover plate 16 and is coaxial with the hole 25 through which the push button PB projects. The sealing ring S is thus somewhat compressed between the externally cylindrical face of the push button PB and the internal cylindrical face 41 of the internal casing part or annular boss 42 so that the ring is in good frictional engagement with both of these surfaces and is made to roll relative to both surfaces when the push button PB is axially displaced relative to its guiding hole 25 and relative to the cylindrical bearing surface 41; during such relative rolling engagement the compression of the ring between the two cylindrical surfaces relative to which it rolls is maintained, as is also the sealing action. The cylindrical casing part 42 may be closed off at its inner end as later described.

The button PB with its stem 30, in assembly, is inserted into the bearing hole 25 from the inner end of internal casing 42, with the sealing ring S suitably related; for example, the ring S may first be slipped onto the push button PB and the two then inserted, care being taken to ease the sealing ring S into the inside of the annular housing 42, or the ring S may first be inserted and brought to rest against the annular shoulder or end wall 43 which surrounds the hole 25 on the inside of the cover plate 16, whereupon the button PB is eased through the thus-seated sealing ring S and into the hole 25. A relatively strong spring is provided to bias and hold the push button PB in outermost position and also to compress the sealing ring S in axial direction between the shoulder 43 and the annular flange 40 of the button PB as is shown in Figure 2 and on a larger scale also in Figure 9, thus to provide four sealing areas where the cross-section of the ring S engages (1) push button PB, (2) shoulder 43, (3) cylindrical surface 41 of the boss 42, and (4) push button flange 40. In normal or at-rest position shown in Figures 2 and 9, two of these seals or sealing areas are provided by the radial compression of the sealing ring S between the parts or surfaces 41 and button PB, and the other two are provided by axial compression of the seal between the shoulder 43 and the push button flange 40. In Figures 9 and 10, while the cross-sections of the sealing ring S appear as substantially tangential to the surfaces which they engage, it will be understood that, due to the factors of compression above described, the ring S actually makes surface contacts and is actually slightly flattened out at its circular areas of engagement with the opposed surfaces.

In the embodiment shown in Figures 1-5 the spring for achieving axial at-rest compression of the sealing ring S is shown at 44 in Figure 2 and surrounds the push button stem 30 which may be integrally joined with the push button PB, the latter being hollowed out about the stem 30 to provide space for the spring 44 internally of the push button PB. The latter and the stem 30 may be made of any suitable material, illustratively of metal.

Spring 44 is held under compression so as to hold the sealing parts in the above-described at-rest position shown in Figures 2 and 9, by a relatively heavy disc-like plate 45 (Figures 3 and 2) which rests against the inner end of the annular boss 42 to substantially close off the interior of the latter, being secured thereto by three screws 46, 47, and 48 which are threaded into the boss 42; plate 45, in line with the push button stem 30, is provided with a hole 50 (Figures 2 and 3) through which the stem 30 freely projects. The inner end of spring 44 (Figure 2) rests against the inside or left-hand face of plate 45, about the hole 50, and on its outer or right-hand face the plate 45 has projecting therefrom and arranged coaxially with the hole 50 an annular boss 51 (Figures 2 and 3) which is of an axial dimension about the same as the thickness of the bottom part 33^a of the U-shaped sheet-metal support 33 and has an external diameter matching the hole 33^f in the bottom part 33^a so that the latter can rest flatwise against the plate 45 with the boss 51 entered into the hole 33^f. With the push button stem 30 coaxial with the hole 50 in plate 45 and with the switch actuator or plunger 27 of the switch unit 26 coaxially aligned with the hole 33^f in the U-shaped support 33, the interfitting of the boss 51 with the hole 33^f assures that the stem 30 and plunger 27 are coaxially aligned so that the stem 30 can effectively control the position and actuation of the switch plunger 27.

The sub-assembly comprising the U-shaped support 33 and switch unit 26 is secured in position preferably by one of the screws 46, 47, 48 by which the back plate 45 is secured to the annular boss 42. The holes for these screws may be arranged at the apexes of, for example, an equi-lateral triangle as shown in Figure 3 with one of them, such as the hole for screw 47, located on the central vertical axis through the boss 51. With such an arrangement, as is better shown in Figure 4, the two lower screws

5

46 and 48 fall to either side of the U-shaped support 33 the bottom part 33^a of which thus overlying the hole for the screw 47, being itself provided with a hole as shown in Figure 2 so that screw 47 serves also to clamp the bottom part 33^a flatwise against the rear face of the back plate 45. The bottom part 33^a of the insulating shield 35 is cut away (Figure 2) to accommodate the head of the screw 47. Back plate 25 thus closes off the internal casing 42 and takes part in supporting and aligning the switch mechanism for coaction with the push button PB and its stem 30.

In this manner a single screw can suffice to hold the sub-assembly of U-shaped support 33 and switch unit 26 in assembled relation to the rest of the apparatus, pivoting movement about the axis of the screw 47 being prevented by the interfitting of the boss 51 with the hole 33^t in the support 33.

Having so secured the U-shaped support 33 at the back of the back plate 45, the U-shaped insulating shield 35 and the switch unit 26 are snugly interfitted inbetween the side plates 33^b and 33^c and secured to the latter by the screws 36 and 37 as above described. Also, boss 51 may be swaged over part 33^a if desired.

As better appears from Figure 2, the parts are so proportioned that in at-rest position the spring 44 holds the push button PB retracted (to the left), the relatively strong spring 44 exerting substantial compressive force through the push button flange 40 (Figures 2 and 9), upon the sealing ring S, in an axial direction, to give good sealing between the sealing ring S and shoulder 43 and flange 40, that action having the effect of expanding the cross-section of the sealing ring in radial direction and thus improving the sealing contact between the ring S and the cylindrical wall 41 and the cylindrical surface of the button PB. There is thus achieved not only good and multiple sealing action, but also the sealing ring S is held conditioned for dependably initiating its rolling action (compare Figure 10 with Figure 9) upon subsequent depression (to the right) of the push button PB against the action of spring 44. During such rolling action dependable sealing continues to be maintained by the sealing ring S throughout the cylindrical areas of contact between it and the cylindrical surface 41 and the cylindrical surface of the push button PB as shown in Figure 10. Upon release, spring 44 retracts the button PB to its at-rest position, the relative rolling action now being reversed to restore the four-seated seal above described and as is shown in Figure 9. The torus-shaped seal S, in this rolling action, thus partakes of bodily motion of translation, in axial direction.

The switch plunger 27 (Figure 2) may have a relatively short stroke of movement; as will now be clear, the several coacting parts are proportioned and dimensioned so that with the button PB and its stem 30 held in retracted position, the spring-biased switch actuator 27 which, by its internal spring, follows up the retracting movement of stem 30, is given adequate range of movement to restore the internal switch parts to their at-rest position which, for example, may correspond to an open circuit position. The push button flange 40 and the relatively heavy back plate 45 coact to limit inward (to the right) movement of stem 30 but not more than the movement required for switch plunger 27 to actuate the internal switch mechanism to its other position which, for example, may be a closed circuit position, and in that manner the internal switch mechanism and plunger 27 are protected against over-stressing.

In the embodiment shown in Figures 6, 7, and 8 there is illustrated a modified form of moisture-proof and water-proof switch construction adapted to be set into a bored or round hole 55 of a wall 56, the construction comprising a front plate 16^a, illustratively circular (Figure 6), provided with a central hole 25 surrounded externally by the boss 28, in which the push button PB is slidably guided as in the form of Figure 2. Projecting 75

6

rearwardly from the front plate 16^a (Figure 7) and integrally formed therewith is a cylindrical casing 57 of a diameter to snugly enter the hole 55 and being provided with an internal cylindrical surface 41 that corresponds to the cylindrical surface 41 of the annular boss 42 of Figure 2. The push button PB is again flanged, as at 40, and between the flange 40 and the internal annular shoulder 43 is the sealing ring S to coact with these parts and with the cylindrical surface of push button PB and the cylindrical surface 41, all as above described in connection with Figures 1-5 and particularly in connection with Figures 9 and 10, to achieve multiple sealing action as earlier described.

Push button PB has a stem 30^a projecting coaxially therefrom; these two parts may be integrally formed.

Push button PB controls a switching mechanism and in the illustrative form such mechanism is operated in response to movement of the push button stem 30^a and may be operated directly by the stem. For example and as shown in Figure 7, the stem 30^a may have a shoulder 30^b adjacent its junction with the push button PB and resting against the shoulder 30^b is a switch member or contactor 58 which may be in the form of a dished washer of springy sheet-metal such as brass or phosphor-bronze and which during assembly is slipped onto the stem and up against the shoulder 30^b against which it is held by one end of a coiled spring 44 which surrounds stem 30^a and which also serves to bias and normally hold the stem and push button in at-rest position as shown, with the push button PB projected outwardly (to the left). Circuit controlling or switch member 58 coacts with contact members as about to be described, and, as shown in Figure 7, the inner or right-hand end of stem 36^a is stepped or shouldered as at 30^c.

The inner or right-hand end of the cylindrical casing 57 is preferably closed off as by a disc-like member 60 of insulating material and by an outer disc-like and preferably metallic member 61, secured to the end of the casing 57 as by screws 62. Non-conductive member 60 insulatingly supports contact elements for coaction with the contactor 58; thus it has extending therethrough and in sealed connection therewith two stationary contact members 63 and 64 which extend parallel to each other, being radially spaced from the spring 44, and their inner ends terminate just short of the at-rest position of the contactor disc 58, a position in which, as above noted, it is held by spring 44 the other end of which abuts against the non-conductive member 60. The latter has a central hole 60^a into which the reduced end 30^c of stem 30^a enters to coact in slidably guiding the motion of push button PB coaxial with the internal cylindrical casing wall 41, and thus coact in achieving uniform rolling action of the sealing ring S in response to movement of the push button PB. The shoulder at the junction between stem 30^a and its reduced end 30^c can serve as a stop to limit the movement of depression of the push button PB and thus also protect the contactor 58 and its rigid contact elements 63 and 64 against being overstrained when the former is brought into bridging relation to the latter. With a switch mechanism as just described, it is preferred that the push button PB be made of any suitable insulating material and in such case the stem 30^a may be of similar material and integrally formed therewith or may be metallic and suitably anchored coaxially in the material of the push button PB.

The endmost disc member 61, which may be metallic, is provided with suitable holes 61^a, 61^b (Figure 8) to clear the outer ends of contact elements 63, 64; to the outer ends, conductors are connected in any suitable way, such as binding screws as shown. Member 61 overlies the hole 60^a in the insulating closure 60 and when clamped in position closes over the hole 60^a.

The front plate 16^a overlies the front face 56^a of the wall or other support 56 in which the hole 55 is provided and underlying the front plate 16^a is a washer 66 of any suitable gasket material which is clamped in sealing rela-

tion between the two by screws 67 that pass through suitable holes 68 (Figure 6) in the front plate 16^a and are threaded into the part 56, thus also securing the switch structure in installed position.

In the form shown in Figure 7 the spring 44 is relatively strong to dependably coact to achieve the sealing actions of the sealing ring S as well as the rolling of the sealing ring S, as was earlier above described in connection with Figures 9 and 10. In both forms, the inner end of the push button stem can coact to guide the button coaxially of the surface 41 and thus aid in nicety of this rolling action.

It will thus be seen that there has been provided in this invention a push button switch construction in which the several objects herein above set forth, together with many thoroughly practical advantages, are successfully achieved. It will be seen that the constructions are capable of ease of fabrication and assembly and are dependable in action under the varying conditions of practical use. Thus, where the construction is exposed to moisture and wet as for example in an outdoor installation, sealing action at the push button, as indicated in Figure 9, is manifold or multiple in the at-rest position of the push button, which is usually the position it occupies most of the time; when the push button is actuated, as into and out of the position shown in Figure 10, dependable multiple sealing action is maintained by the rolling of the torus-shaped sealing ring along the companion cylindrical surfaces, the rolling action also tending to make for relative nicety and dependability of motion of the push button. Moreover, when the push button PB returns to its at-rest position as in Figure 9, the coactions of the flange 40 and the wall 43, under the force exerted by spring 44, insure that the ring S becomes and is aligned properly in relation to the coaxial cylindrical surfaces along which it rolls when the push button is actuated and thus the rolling action, upon subsequent actuation, is always nicely and uniformly started; in the at-rest position of Figure 9, these parts and their coactions always correct any possible tilting or like misalignment of the ring S as might arise during actuation and accordingly the construction and actions are self-correcting should need for correction arise.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiments above set forth, it is to be understood that all matter hereinabove set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A water-proof push button switch construction comprising a sealed box having therein a switch unit that has a reciprocable actuator projecting therefrom, said box having a detachable front closure plate with peripheral sealing means therefor and said plate having a round aperture for slidably receiving a push button, a push button slidable in said aperture and having an external cylindrical surface terminating at its inner end in a coaxial flange that moves toward and away from the inside face of said closure plate upon back and forth movement of the push button, said plate having on the inside face thereof and projecting inwardly of the box means forming an annular wall which is of small diameter and length compared to the inside dimension of the box and which is in sealed connection with the plate and terminates in an annular supporting seat, said wall having an internal cylindrical surface coaxial with said aperture and of a diameter not less than that of said push button flange, said push button having an inwardly extending stem, an internal closure plate seated and secured against said annular seat and having a hole therein for slidably receiving and guiding said stem and a cylindrical boss about the hole projecting inwardly of said sealed box, said switch unit having means securing it to said internal closure plate and having a round coaxial recess about its said reciprocable actuator into

which said cylindrical boss is received to coaxially align said actuator with said stem, said stem having thereabout a spring that biases said push button outwardly of said aperture and thereby biases said push button flange toward said inside face of said first closure plate, and a non-rubbing rolling sealing ring of yielding material of round cross-section in rolling engagement with said internal cylindrical surface of said annular wall and the cylindrical surface of the push button, said spring having a strength relative to the characteristics of said yielding material to move the push-button outwardly and roll said ring relative to said two cylindrical surfaces and into compression against the inside face of said front closure plate.

2. A push button switch construction comprising a switch box having a detachable front closure plate provided with a small round aperture for slidably receiving a push button, a push button slidable in said aperture and having an external cylindrical surface terminating at its inner end in a coaxial flange that moves toward and away from the inside face of said closure plate upon back and forth movement of the push button, said closure plate having on the inside face thereof and about said push button aperture an annular wall which is of small diameter and length compared to the inside dimensions of the box and which terminates in an annular supporting seat, said wall having an internal cylindrical surface coaxial with said aperture and of a diameter not less than that of said push button flange, said push button being hollow and open at its inner end and having a coaxial stem that projects axially therefrom beyond said flange, a spring about said stem and extending into the hollow of the push button, an internal relatively small plate seated and secured against said annular seat and having a hole therein for slidably receiving and guiding said stem, said internal plate forming an abutment for the inner end of said spring, a non-rubbing rolling sealing ring of yielding material of round cross-section in rolling engagement with said internal cylindrical surface of said annular wall and the cylindrical surface of the push button, said spring having a strength relative to the characteristics of said yielding material to move the push button outwardly and roll said ring relative to said two cylindrical surfaces and into compression against the inside face of said front closure plate, a switch unit within said switch box and having a reciprocable actuator projecting from a side thereof, and means for securing said switch unit against the rear face of said internal closure plate with its reciprocable actuator juxtaposed endwise to said hole in said internal plate and thereby juxtaposed endwise to the end of said push button stem for actuation by the latter.

3. A push button switch construction as claimed in claim 2 in which said last-mentioned means comprises a U-shaped frame with its base resting and secured against the rear face of said internal closure plate, said switch unit being received between the arms of said U-shaped frame with its actuator juxtaposed as aforesaid to said hole in said internal plate, and means securing said switch unit to said U-shaped frame.

4. A push button switch construction as claimed in claim 3 in which said last-mentioned securing means comprises elements that releasably secure the switch unit between the sides of said U-shaped frame whereby, upon removal of the front closure plate from the switch box, said switch unit may be replaced.

5. A push button switch construction comprising a closure plate for a switch box or the like, said plate having a small round aperture with a push button protruding therefrom at the front of the plate, means forming a relatively shallow well at the rear side of said plate and about said aperture for receiving and slidably guiding said push button and having secured thereto, across the bottom end thereof, the base portion of a U-shaped frame, a switch unit having a reciprocable actuator pro-

jecting from a face thereof and being received between the arms of said U-shaped frame with said face thereof adjacent the base part of the frame, means securing said switching unit to the arms of said frame with the reciprocable actuator thereof substantially aligned with the axis of said push button, said well having therein a spring that biases the push button outwardly of said round aperture, said push button having means coaxing to limit outward movement thereof under the action of said spring and having a coaxial member at its inner end and juxtaposed to said switch unit actuator to depress the latter upon inward movement of the push button in opposition to said spring, and means limiting inward movement of said push button to an amount sufficient to move said actuator for switching actuation of said switch unit.

6. A push button switch construction comprising a front plate having a round aperture for slidably receiving a push button, a push button slidable in said aperture and having an external cylindrical surface terminating at its inner end in a coaxial flange that moves toward and away from the inside face of said front plate upon back and forth movement of the push button, said front plate having on the inside face thereof an annular wall that has an internal cylindrical surface coaxial with said aperture and of a diameter not less than that of said push button flange, switching means associated with and carried by said annular wall and including a part actuated in response to inward movement of said push button for switch actuation in one direction, a non-rubbing rolling sealing ring of yielding material of round cross-section in rolling engagement with said internal cylindrical surface of said annular wall and the cylindrical surface of the push button, and a spring opposing inward movement of the push button and having a strength relative to the characteristics of said yielding material to move the push button outwardly and roll said ring relative to said two cylindrical surfaces and into compression against the inside face of said front plate.

7. In construction of the character described, in combination, a closure plate for a switch box having a relatively small round aperture, said plate having integral therewith on the inside face thereof and about said aperture a relatively shallow wall within which is received a reciprocable push button that protrudes from said aperture and that has a spring for biasing it in protruding direction, said push button and said spring being held against disassembly from said apertured front plate and internal wall by an internal plate member secured across said internal wall, said internal closure plate having a hole therein substantially coaxial with said reciprocable push button, a switch unit having a reciprocable actuator, and means for mounting said switch unit in position to align said reciprocable actuator coaxially with said hole in said internal closure plate comprising interfitting round elements, one associated with said internal plate and coaxial with said hole and the other associated with said mounting means and coaxial with said reciprocable actuator of the switch unit, and means securing said mounting means to said internal wall and thereby hold said switch unit against rotational displacement about the axis of said interfitting coaxial round elements.

8. A push button switch construction comprising a mounting plate attachable to the front of a switch box or the like, said plate having a small round aperture with a push button protruding therefrom at the front of the plate, said push button being flanged at its inner end whereby it is insertable into said aperture from the rear side of the plate, an annular wall on the rear side of the plate and integral therewith, said wall being coaxial

with said aperture and extending about said push button flange and being of relatively small extent, a helical spring having one end acting upon said push button and having the other end extending rearwardly of said mounting plate and toward the inner open end of said annular wall, and means bridged across and secured at the open end of said annular wall to hold said push button and said spring against removal and to form an abutment for the inner end of the spring, said means having two spaced parallel bracket-like arms having secured therebetween a switch unit with terminal connectors and with a movable actuator positioned substantially in line with the axis of the push button, said push button having a coaxial part that projects rearwardly from abutting engagement with said actuator.

9. A push button switch construction comprising a mounting plate attachable to the front of a switch box or the like, said plate having a small round aperture with a push button protruding therefrom at the front of the plate, said push button being flanged at its inner end whereby it is insertable into said aperture from the rear side of the plate, an annular wall on the rear side of the plate and integral therewith, said wall being coaxial with said aperture and extending about said push button flange and being of relatively small axial extent, a helical spring having one end acting upon said push button and having the other end extending rearwardly of said mounting plate and toward the inner open end of said annular wall, a disk-like closure plate bridged across the inner end of said annular wall to close in said push button and said spring and having a plurality of peripherally distributed securing means including at least one screw for securing it to said annular wall, said closure plate having a substantially coaxial opening and said push button having a coaxial rearwardly extending part terminating substantially at said aperture, a U-shaped frame having its base portion resting flatwise against said closure plate and secured thereto by said screw whereby said frame may be attached to or removed from said closure plate without disturbing the mounting of the latter to said annular wall, a switch unit having projecting therefrom a movable actuator, and means securing said switch unit between the arms of said U-shaped frame with its actuator substantially juxtaposed to said opening in the closure plate for abutting engagement thereof by said coaxial part of said push button, whereby said switch unit may be mounted in position or removed without having to remove said U-shaped frame or said closure plate.

10. A push button switch construction as claimed in claim 9 in which said base portion of said U-shaped frame is of less width than the diameter of said closure plate and extends along a line on which falls that radius of said disk-like closure plate that intersects said opening and said screw, said base portion being apertured for passage of the screw to clamp it against said closure plate and having a round aperture in line with said switch unit actuator, said closure plate having about its opening a ring-shaped flange that enters said aperture in the base portion of the U-shaped frame for coaxially aligning the switch unit actuator and for holding the U-shaped frame against rotational displacement about the axis of said screw.

References Cited in the file of this patent

UNITED STATES PATENTS

80,066	Gibson	July 21, 1868
2,577,960	Ginard	Dec. 11, 1951
2,583,291	Beem	Jan. 22, 1952
2,605,373	Jeffrey	July 29, 1952
2,606,263	Woodward	Aug. 5, 1952