Nov. 23, 1948. L. L. VERKUIL 2,454,295

PUSH BUTTON SWITCH CONSTRUCTION

Filed June 5, 1946

Fig. 1.

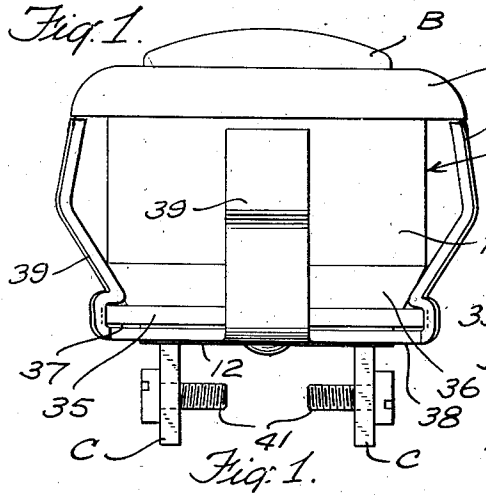


Fig. 1.

Fig. 3.

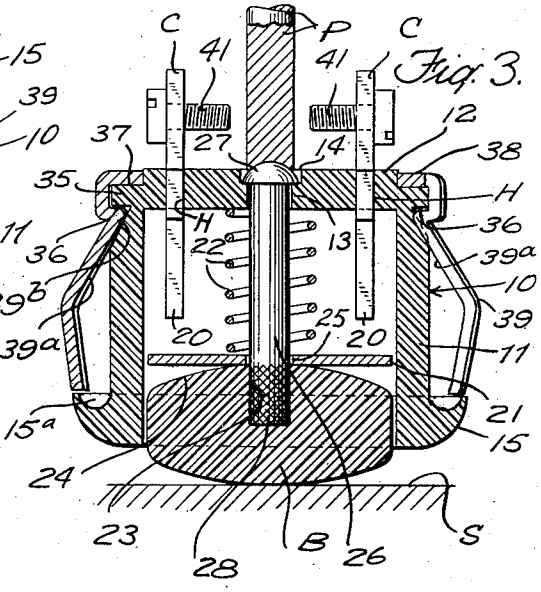


Fig. 2.

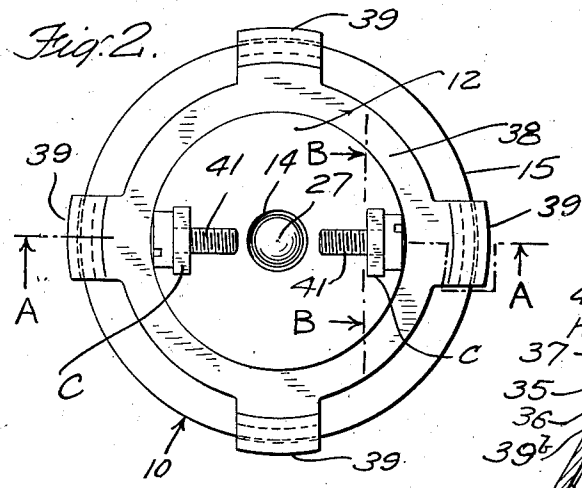
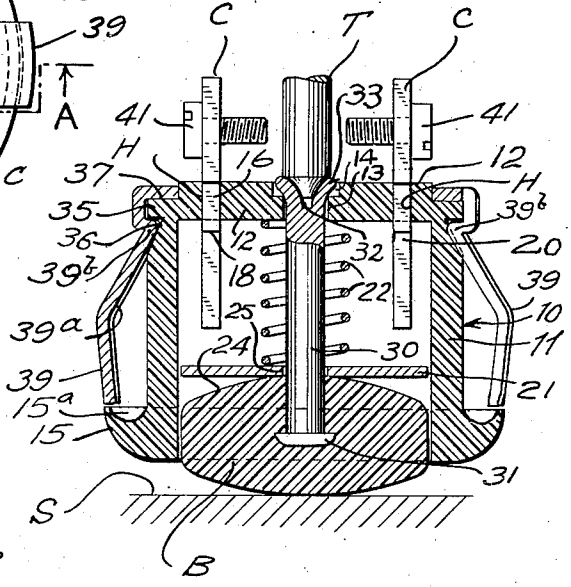


Fig. 4.



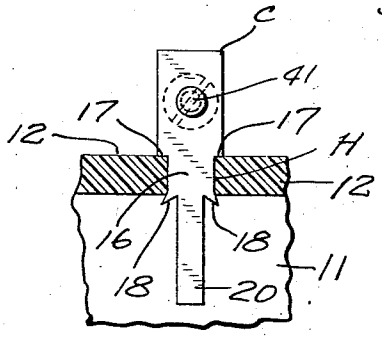


Fig. 5.

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Patented Nov. 23, 1948

2,454,295

UNITED STATES PATENT OFFICE

2,454,295

PUSH-BUTTON SWITCH CONSTRUCTION

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Application June 5, 1946, Serial No. 674,449

7 Claims. (Cl. 200—159)

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This invention relates to push button switch construction.

One of the objects of this invention is to provide a simple, strong and inexpensive push button switch construction that will be well adapted for facility of manufacture and assembly, as well as for installation.

Another object is to provide a push button switch construction in which dependable and reliable use can be made of moldable materials such as so-called "plastics" for certain of the parts of the construction, without detrimentally affecting compactness and durability of construction or dependability of operation.

Another object is to provide a push button switch construction of the so-called "flush" type, with simple and dependable means for securing it in mounted position, as in a hole bored in a wall or door-frame.

Another object is to carry out this last-mentioned object in a manner to simplify and facilitate assembly of the securing means and the related parts and also to insure maintenance of such assembly as well as of the fastening.

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 drawing, in which are shown by way of illustration several possible embodiments of my invention,

Figure 1 is a side elevation of an assembled push button switch structure;

Figure 2 is a bottom plan view as seen from the bottom in Figure 1;

Figure 3 is a central vertical sectional view as seen along the line A—A of Figure 2, and showing also tools or adjuncts usable in course of assembly;

Figure 4 is a central vertical sectional view as seen along the line A—A of Figure 2, illustrating a possible modified form, and showing also certain other tools or adjuncts that may be used in course of assembly; and

Figure 5 is a fragmentary detached vertical sectional view as seen along the line B—B of Figure 2.

Similar reference characters refer to similar parts throughout the several views of the drawing.

The construction comprises a shell 10 which,

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in so far as certain features of the invention are concerned, is preferably made of a moldable material such as any suitable "plastic" of which "Bakelite" is an illustration. The shell 10 has a cylindrical side wall 11 closed at its bottom end by a bottom wall 12 which is provided at its center with a hole 13 whose walls are preferably stepped as is better shown in Figure 3 to provide an annular recess 14 at the extreme face of the bottom 12. At the other end of the side wall 11 the shell 10 has a laterally projecting annular flange 15 which, in known manner, is to engage the face of a wall or door-frame or other part and thereby limit the extent to which the structure is received into a hole that is bored in the wall or door-frame. The latter hole is drilled to a diameter smaller than that of the flange 15 and larger than the external diameter of the side wall 11, for a purpose later described.

The bottom wall 12 is molded or otherwise provided with suitable holes or apertures corresponding to the number of contacts with which it is desired to provide the structure, illustratively 2, and they are appropriately grouped about the axis of the shell 10 and hence about the axis of the hole 13. When two in number they are preferably diametrically opposed. In the illustrative embodiment the two holes are indicated at H and each has extending through it a combined contact and connecter element C of metal such as brass.

The contact elements may be in the form of stampings, conveniently of rectangular section, and may be shaped as is better shown in Figure 5, to provide a stepped or shouldered outline with an intermediate portion 16 snugly fitted into the rectangular hole H to the extent permitted by the shoulders 17, the portion 16 terminating in shoulders 18 that are adjacent the inside face of the bottom 12 so that these shoulders can be, by the use of any suitable tool, swedged or forced outwardly and away from each other and thereby lock and hold the contact connecters C in position.

Thereby also the inner ends 20 (see Figure 3) of the conductive parts C are positioned in a plane parallel to the bottom wall 12 and intermediate of the ends of the shell 10, for coaction with a conductive bridging element which is preferably in the form of a relatively thin metal disc 21 preferably made of a springy metal such as any suitable copper alloy. The disc member 21 is to be actuated by a button B in opposition to a spring 22. In the form shown in Figure 3 the button B is preferably of a molded non-metallic

material such as a plastic and is molded to provide a hole 23 that opens into the inner face 24 of the button, the inner face being preferably curved in cross-section as shown in Figure 3 where it is desired to achieve a flexing of the metal disc 21, as is later described. Disc 21 has a central hole 25 which can be a little larger than the hole 23 in the button B, the latter having a diameter to freely slide along the inside face of the cylindrical side wall 11.

To achieve assembly, the button B is laid down on a suitable support S and then the disc 21 superimposed upon it and thereafter, with the helical spring 22 inserted into the shell 10, the latter and the spring are inverted over the button and disc, thereby axially aligning the holes 23, 25 and 13. Then a pin 26, provided with a head 27 at one end and with its surface at the other end knurled as at 28, is inserted into the hole 13, passing through the hole 25 in the disc 21 and thus substantially aligned with the hole 23 in the button B. The diameters of hole 23 and the knurled end portion 28 are so proportioned that the latter enters the former with a tightness to form a press-fit; and accordingly a plunger P, provided with a concave end face to receive and center the convex head 27 is brought down on to the pin 26 and the latter pressed home into the button hole 23.

The length of the pin 26 is such that, when pressed home in the button B, the head 27 cannot carry the shell 10, pressed upwardly by the spring 22, downwardly to a sufficient extent to cause the flange 15 to engage the support S, and hence there is no danger of stressing the shell 10 or of fracturing it.

In the form shown in Figure 4 the button B has a metal pin 30 molded into it during the molding process, and if desired the submerged end of the pin can be provided with knurling or other projections or even a head, as indicated at 31, to insure dependable interlock between the two parts. The other end of the pin 30 is hollow as indicated at 32. To accomplish assembly, the button B with the pin 30 is rested on a suitable support S, the metal disc 21 and the spring 22 are sleeved on to the pin 30 and then the inverted shell 10 telescoped downwardly over these parts to bring the hollow end of the pin 30 up through the hole 13 and the bottom 12. Then a suitable tool T, preferably provided with a tapered end to enter and center the upper end of the pin 30, is brought down upon the latter and suitably operated to laterally expand or spin the hollow end of the pin, as is indicated in Figure 4. This operation is preferably carried on with the shell 10 manually or otherwise pressed downwardly against the support S, against the action of the spring 22, thus to freely expose the upper end of the pin 30 to the action of the tool T and thereby to avoid risk of jamming the expanding stem parts in the hole 13.

The annular recess 14 about the hole 13 is of appropriate axial dimension to accommodate the head 27 in Figure 3 or the head-like laterally expanded formation 33 of Figure 4.

The external part of the shell 10 adjacent the bottom 12 is shaped to provide a laterally projecting flange 35 which need not be of a diameter in excess of that of the side wall 11. It may be formed by providing an external annular groove 36 which preferably is formed by two surfaces of revolution which make an acute angle to each other in cross-section, as seen in Figures 3 and 4, and at least one of which is preferably in a plane transverse to the axis of the shell. Such a groove 36 is easily molded where the shell is made of plastic. Preferably also there is provided an annular recess 37 on that side of the flange 35 remote from the just described recess 36.

Into the annular recess 37 is received the ring part 38 of a stamping of springy sheet metal having upstanding therefrom and at suitably spaced intervals a suitable number, illustratively 4, of arms 39 which are of a length to extend toward the shell flange 15 which has, in its under face as seen in Figure 1 and as shown in cross-section in Figures 3 and 4, an annular groove or recess 15a with which the arms 39 coact as later described. These arms 39 are bent at right angles to the plane of the flat ring part 38 to by-pass the shell flange 35 (see Figures 3 and 4) whence they are bent inwardly and then outwardly at angularities that approximate the acute angle formed by the faces of the annular groove 36.

The stamped and shaped entity 38—39 may, in assembly, be simply slid downwardly as viewed in Figures 3 and 4, so that the ring part 38 by-passes the projecting ends of the connecter devices C, the downwardly and outwardly inclined portions 39a first engaging the flange 35 and thereby camming the arms 39 outwardly against their spring action so that the knee portions 39b spring or snap downwardly past the flange 35 and snap into the annular recess 36 with which, because of the relative shapes of the parts, the knee portions co-act somewhat in the nature of a pawl and ratchet, dependably resisting movement in relative directions tending to separate the structure 38—39 from the shell 10. The ring part 38, neatly fitting into the annular groove 37, acts thereby to center the two assembled structures and thus tends to insure uniformity of holding or ratchet action by all of the knee parts 39b relative to the groove walls 36.

The conformation of the arms 39 is such that they normally, aided by the spring action of the metal, assume positions somewhat as indicated in Figures 1, 3 and 4, with their free ends spaced away from the shell wall 11, and hence the knee portions 39b need not completely bottom in the groove 36. However, when the assemblage is mounted in the above described hole in the wall or door-frame, the spring arms 39, which may be somewhat arched if desired, relative to the side wall 11, yield and are pressed inwardly toward the shell wall 11, holding the push button switch tightly in the hole. This action may be aided by the engagement of the free ends of the arms 39 with the shell wall 11 just underneath the flange 15 or with the inner curved surface of the annular groove 15a into which the arms 39 can enter as they become elongated when they yield, particularly at the bends or convex curvatures intermediate of their lengths, so that the holding action against the walls of the hole is intensified by the resistance of the arms 39 to flatten out the arch-like shape. In either or both cases, the knee portions 39b of the arms 39 are moved further inwardly into the annular groove 36, thus more securely to envelop the flange 35 and also to bring greater areas of the knee portions 39b into overlapping relation to the flange 35. The very action that contributes toward the secure fastening of the structure in the wall hole is thus made to increase the fastening or security of assemblage of the device 38—39, and the shell 10.

The contact connector devices C may be externally provided with any suitable means for connecting electrical conductors thereto, such as

screws 41. The spring 22 normally holds the bridging disc 21 and the button B outermost of the shell 10, to an extent permitted by the head 27 of the pin 26 or the part 33 of the pin 30. Upon depressing the button B against the action of spring 22 the spring metal disc 22 engages the contact ends 20—20 of the parts C, the pressure of contact being equally distributed therebetween, and the curved face 24 permitting the disc 21 to flex under the applied pressure, thus to give a rubbing self-cleaning circuit-making engagement with the contact parts 20.

There are instances where it is desired to mount the switch structure in a round hole in a sheet metal plate against which the flange 15 can abut; the relationships and coactions between the spring or bendable arms 39 and the flange groove 15a are such that, by entering the free ends of the arms 39 more or less into the groove 15a, the free ends of the arms 39 may be positively precluded from snapping through the hole in the thin sheet metal plate and from then springing radially outwardly, in which case it would be difficult, if not impossible, subsequently to remove the structure from the plate. Moreover, the inclination (downward and inward, in Figures 3 and 4) of the free ends of the arms 39 is, by the freedom of entry of the arms into the flange groove 15a, increased so that the reaction of the arms against the walls of the hole can thereafter tend to cam or press the flange 15 and the thin plate together and thus maintain a tight and flush assembly.

It will thus be seen that there has been provided in this invention a push button switch construction in which the several objects above noted, together with many thoroughly practical advantages of manufacture, assembly, installation, and operation are successfully achieved.

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

I claim:

1. A push button switch construction adapted to be set into a hole in a wall or the like and comprising a shell having a spring-opposed button and contactor means reciprocable within the shell and having connector-contact means carried by the shell for co-action with said contactor means, said shell having laterally exposed groove means, said groove means being adjacent the bottom end of said shell, a frame ring adapted to rest against the bottom end of the shell and having a plurality of spring-like arms extending externally along the side of the shell and toward the front end, at least certain of said spring arms having inwardly projecting means engageable into said groove means to effect assembly thereof and of said frame ring to said shell.

2. A push button switch construction as claimed in claim 1 in which said inwardly projecting means has a cam-like conformation engageable, during assembly, with the peripheral bottom edge of the shell to cam the spring-like arm outwardly to tension said spring arm and to guide said inwardly projecting means over said peripheral bottom edge and to a position overlying said groove means for spring-like entry into said groove means.

3. A push button construction as claimed in claim 1 in which said projecting means has a

shape like a ratchet tooth to cam the spring-like arm outwardly over the peripheral bottom edge of said shell during assembly to tension said spring arm and to guide said inwardly projecting means into said groove means and thereafter oppose retrograde movement of the frame ring and spring-like arms.

4. A push button switch construction adapted to be set into a hole in a wall or the like and comprising a shell having a spring-opposed button and contacter means reciprocable within the shell and having connector-contact means carried by the shell for co-action with said contactor means, said shell having an annular substantially peripheral recess at its bottom end and having recess means in its side wall, a frame ring adapted to seat in said annular recess and having a plurality of yieldable arms extending therefrom and along the sides of the shell for engagement with the walls of the hole into which the construction is to be set, said arms having inwardly extending portions engageable in said recess means.

5. A push button switch construction adapted to be set into a hole in a wall or the like and comprising a shell having a spring-opposed button and contactor means reciprocable within the shell and having connector-contact means carried by the shell for co-action with said contactor means, said shell having laterally exposed shoulder means, and a holding device comprising a frame held against a bottom end portion of the shell and having a plurality of yieldable arms extending therefrom and along the sides of the shell for engagement with the walls of the hole into which the construction is to be set, said arms having inwardly directed knee bends spaced from said frame and in co-acting holding relation to said shoulder means holding said frame against said bottom end portion of the shell.

6. A push button switch construction adapted to be set into a hole in a wall, plate, or the like, and comprising a shell having a spring-opposed button and contactor means reciprocable within the shell and having connector-contact means carried by the shell for coaction with said contactor means, said shell having a peripheral flange to limit entry of the shell into said hole and said flange having recess means underneath it, said shell having recess means in its side wall spaced from said flange, and a frame having a plurality of yieldable arms extending along the sides of the shell and toward said first recess means, said arms having outward bulging intermediate portions to engage with the walls of said hole whereby they yield inwardly toward the sides of the shell and, upon movement of the arms inwardly toward said shell as said intermediate bulging portions engage the walls of said hole, substantially enter their ends into said first recess means, said arms having means interengaging with said second recess means and into which they are entered in response to movement of said arms inwardly toward said shell.

7. A push button switch construction adapted to be set in a hole in a wall or the like and comprising a cup-like shell, a button reciprocable within the mouth thereof, spring means urging said button outwardly and retaining means limiting the outward travel thereof, contactor means within said shell operated by said button, the side walls of said cup being recessed, a frame ring externally resting against the bottom of said cup and having a plurality of spring arms ex-

tending along said side walls toward the mouth of said cup, at least certain of said spring arms having inwardly projecting means thereon extending into the recessed part of said side walls, at least part of said arms being biased away from said side walls to resiliently engage the walls of the hole in which said switch is set.

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