July 20, 1954 L. L. VERKUIL 2,684,411

PUSH-BUTTON SWITCH CONSTRUCTION

Filed April 13, 1951

Fig. 1.

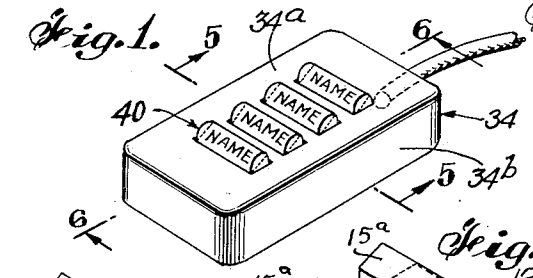


Fig. 2.

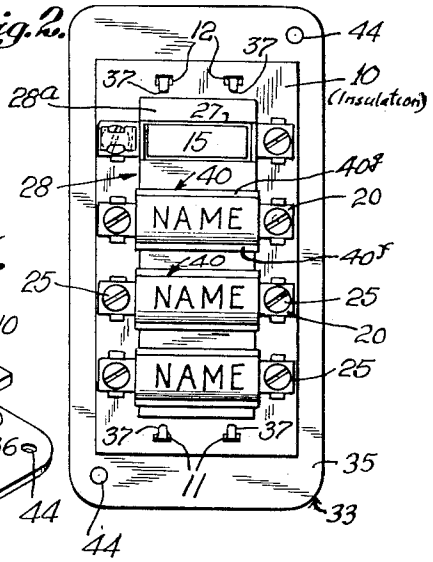


Fig. 3.

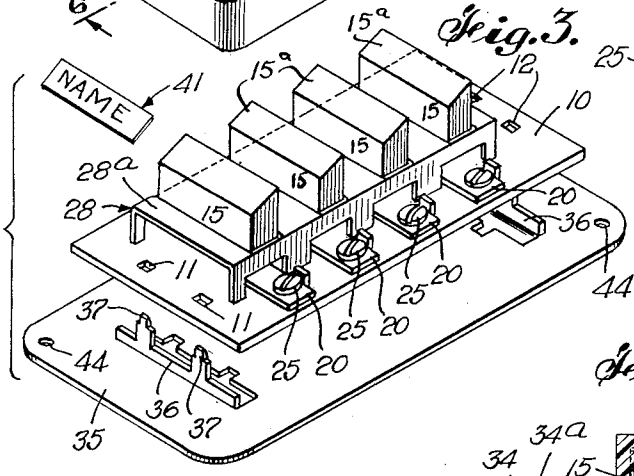


Fig. 5.

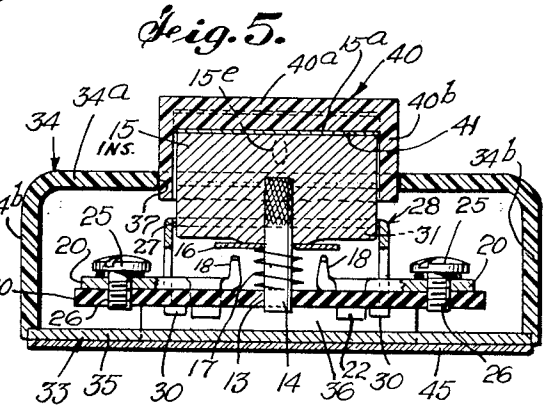


Fig. 4.

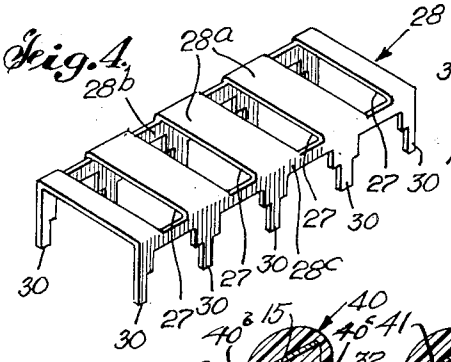
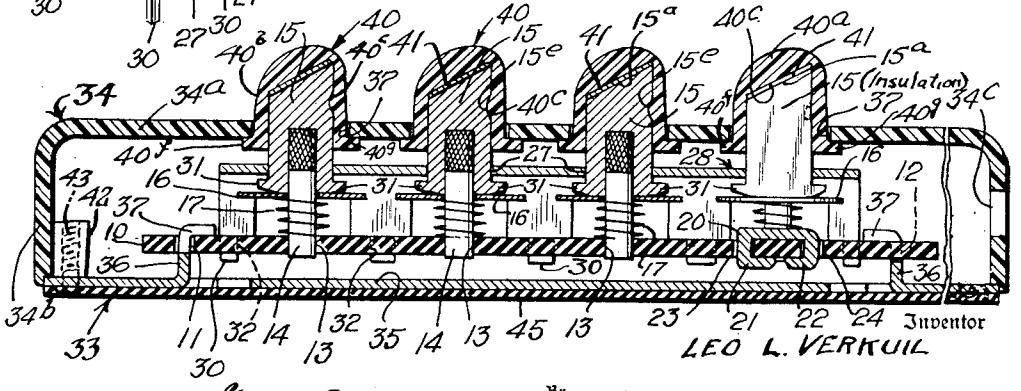


Fig. 6.



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PUSH-BUTTON SWITCH CONSTRUCTION

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6 Claims. (Cl. 200—5)

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This invention relates to push button switch construction.

One of the objects of this invention is to provide a push button switch construction that will be neat in appearance, compact, and convenient in practical use. Another object is to provide a push button switch construction of the multiple push type in which identifying indicia for the different switches or pushes may be easily and conveniently applied or changed. Another object is to provide a construction of the just-mentioned type in which visibility of the identifying indicia is greatly enhanced and their legibility made easier, all in a manner free from impairment of ease and facility of assembly, or even of disassembly for purposes of changing the identifying indicia. Another object is to provide, in a push button switch construction, a simple, practical, and reliable arrangement for protectively holding and displaying identifying indicia, such as a small sheet or tab of paper, cardboard, or like sheet material, bearing the desired legends. Another object is to provide a construction of the just-mentioned nature in which change or rearrangement of the identifying indicia may be easily and speedily effected.

Another object is to provide an improved push button switch construction of the gang or multiple switch type and to facilitate and simplify manufacture and assembly thereof. Another object is to provide a push button switch construction in which the push button or manual actuator which controls the switching device can have applied to it the desired legend or identifying indicia in a manner that is simple and foolproof and does not interfere with the switching mechanism, and yet achieves dependable and reliable switch actuation without being interfered with by the switch mechanism itself. Another object is to carry out this last-mentioned object by means of coacting subassemblies which are individually adapted for simple and efficient manufacture and assembly and which coact in achieving facility and dependability of assembly thereto of the desired legend-bearing tabs, plate, or other sheet material.

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 similar reference characters refer to similar parts throughout the several views—

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Figure 1 is a small-scale perspective view of a multiple push button switch as it appears in use;

Figure 2 is a plan or top elevation as it is seen with the upper or cover part of the casing removed;

Figure 3 is a partially exploded perspective view of the base portion and the multiple switch subassembly ready to be assembled to the former;

Figure 4 is a perspective view of a frame forming part of the subassembly of Figure 3;

Figure 5 is a transverse cross-section as seen along the line 5—5 of Figure 1, and

Figure 6 is a longitudinal vertical sectional view as seen along the line 6—6 of Figure 1.

For purposes of illustration, let it be assumed that four circuits, usually signalling circuits, are to be controlled, each by a manually depressible actuator, usually called a "push" or a "push button," whether or not it is round in shape; it is also desired to identify, by an appropriate legend or other identifying indicia, the push allocated to each of the circuit switches. In the illustration, therefore, four legends are to be applied to the four pushes. Since these legends have to be changed frequently and are oftentimes typewritten on usually not too heavy paper, the resultant small tabs, according to past practices, are difficult to handle or to install or replace, and one of the dominant aims of this invention is to provide a construction in which such objections and difficulties are overcome in a simple and practical way.

I first provide a sheet or plate 10 of suitably rigid insulating material, such as hard fiber, and at its respective ends punch two pairs of transversely spaced holes 11—11 and 12—12 (Figures 3 and 6), and intermediate of these pairs of holes I punch out, for each switch structure and push, a set of holes so that there are virtually as many identical sets of holes punched in the insulating plate 10 as there are switches and pushes. Accordingly, it will suffice to describe one set of such holes, the remaining three sets, where there are four pushes, being the same.

Along the longitudinal axis of plate 10, a round hole 13 (Figures 5 and 6) provides a bearing for slidably guiding the metal stem 14 whose upper end is suitably anchored and secured in a small block 15 of non-conductive material, preferably a molded plastic, which, in the preferred embodiment of the invention, is rectangular in horizontal cross-section, as appears from Figures 3, 5, and 6; the upper end of the round

stem 14 may be knurled and press-fitted into the block member 15, or the material of the latter may be molded about the stem in the process of molding and curing it when made of a suitable curable plastic. Slipped onto the stem 14 is a washer or apertured disc 16 of any suitable springy material and it is held against the under side of the member 15 by a helical spring 17 that extends about the stem 14 and abuts against the insulating plate 10.

The metal disc 16 is a contact bridging element and underneath it are insulatingly supported, by plate 10, two identical spaced upstanding contact points 18, 18 (Figure 5). Each is integral with a small connector plate 20 which rests crosswise of the insulating plate 10 and to one side of the central longitudinal axis, and each plate 20 is stamped to provide two tongues 21 and 22 (Figure 6) which pass through two holes 23 and 24, respectively, punched in the plate 10, against the under side of which they are bent over to hold the connector plate 20 assembled. Each connector plate 20 has a binding screw 25 threaded into it at its outer end and the threaded end portion of the screw can pass into a hole 26 punched in the insulating plate 10 (Figure 5). The circuit to be controlled by any contact bridging disc 16 may thus have its conductors connected to the two binding screws 25, 25 allocated to that particular contact bridging disc and, as is better seen in Figure 2, the binding screws 25, 25 are aligned in two rows, each along one longitudinal edge of the insulating plate 10, where they are thus conveniently accessible.

The block-like member 15 at the upper end of the metal stem 14 is guided for up and down movement, as viewed in Figures 3 and 6, by the walls of a rectangular aperture 27 (see Figure 4) punched out of the top wall 28a of a sheet metal frame, generally indicated by the reference character 28, having depending side walls 28b and 28c which are cut or stamped to provide depending shouldered tongues 30 of which, in the illustration, the endmost pairs of tongues 30 and 30 are shown in Figure 4 to be of about half the width as the intermediate tongues 30, thus to indicate that the frame 28 is cut from a long stamping according to the number of apertures 27 that pass through them in the particular multiple switch structure, four in the illustrative embodiment. When thus cut transversely to the desired length, the cutting proceeds along a plane through the middle of two opposed depending tongues 30, 30, and that accounts for the narrower width of the endmost pairs of tongues 30, 30.

Each block member 15 is provided adjacent its lower end with suitable means to limit its upward sliding movement between the side walls 28b and 28c of the frame 28, and between the opposed guiding walls of the aperture 27 and where the block member 15 is rectangular in horizontal cross-section; this means preferably comprises laterally projecting flanges 31 and 31 (see Figure 6) along the opposed longitudinal sides of the block member 15 which are thus adapted to engage against the under face of the top wall 28a of the frame 28.

With the desired number of block members 15, each with its stem 14 and bridging disc 16 and spring 17, assembled to the frame 28 by projecting each block member 15 through an aperture 27, the resultant assemblage is now secured to the insulating plate 10 which has punched in it suitable holes 32 (Figure 6) dimensioned to receive the tongues 30 up to the transverse shoulders in the latter, the tongue portions that project beyond the under side of the insulating plate 10 being then bent over to clamp the plate 10 against the shoulders.

In the resultant subassembly, the spring 17 presses upwardly, as viewed in Figures 6 and 3, against the bridging disc 16 and block member 15, holding the latter in uppermost position with the side flanges 31 and 31 of the block member 15 engaging against the under side of the top wall 28a, as is shown in Figure 3. The flanges 31, 31, in coaction with the stem 14 in the hole 13 of insulating plate 10, thus neatly align each block member 15 relative to the frame 28 and all of the block members 15 stand projected upwardly, as in Figure 3.

I next provide a housing or casing, preferably of two separable parts, such as a lower part generally indicated in Figure 5 at 33 and an upper casing part generally indicated at 34. The lower casing part 33 is preferably a metal plate 35 in the form of a stamping of sheet metal, and adjacent each of its two narrow ends (Figure 3) there is cut and bent upwardly and out of the plane of the metal plate a flange part 36 of a dimension about equal to the width of the insulating plate 10 (Figure 3), and projecting from the flange part 36 are two spaced tongues 37 and 37. The conformation of these parts, as is best shown in Figure 3, can be easily achieved in a suitable punch and die operation.

The above-described subassembly of the insulating plate 10 and its related parts, shown in exploded perspective in Figure 3, is now secured to the bottom plate 35, the pairs of tongues 37 and 37 at the two ends of the plate 35 are entered into the respective pairs of holes 11—11 and 12—12 of the insulating plate, the free ends of the tongues are then bent over (see Figure 6), and the insulating plate is thus clamped against the horizontal edges of the upstanding flanges 36—36, thus also reinforcing the plate 10, as is better shown in Figures 5 and 6, positioning and supporting it so that the various condutive parts of the switching mechanism, such as the clamping tongues 21, 22 of the connector plates 20, as well as the ends of the screws 25, are all held insulatingly spaced from the metal base plate 35.

The upper casing part 34 casing part 34 comprises a top wall 34a and peripheral side walls 34b which are rabbetted at their bottom edges (Figures 5 and 6) to form a snug seat for the base plate 35 of the switching mechanism subassembly and for thereby aligning each block member 15 with a hole 37 in the top wall 34a; hole 37, in the illustrative embodiment, being shaped to be larger than the cross-section of that portion of the block member 15 that is to project through the hole, in order to provide clearance and a coacting relationship for a push, generally indicated by the reference character 40, in the form of an inverted housing-like element telescopically related to block member 15. Where the block member is of rectangular cross-section, as in the illustrative embodiment, the interior hollow space within the push element 40 is of similar cross-section and hence has a top wall 40a from which depend side walls 40b that outline a rectangle.

The top face 15a of the block member 15 is preferably flat to form a suitable support against which to rest a nameplate 41 (see also Figure 3) which may be of any suitable sheet material and which bears any appropriate identifying legend,

as indicated in the drawings by the word "Name," and the under face 40c of the top wall 40a of the push element 40 is parallel to the face 15a so that, when the parts 15 and 40 are telescopically related to each other with the name tab or plate 41 interposed between them, the name tab 41, even if of relatively light or fragile material like paper, is neatly held flatwise and, as later described, is held under compression between the two parallel faces 40c and 15a.

Moreover, these faces need not be horizontal, but can be at an angle, as is better shown in Figures 3 and 6, thus making for greater ease of legibility. The push element 40 is made of any suitable transparent material, illustratively a transparent thermo-plastic such as methyl methacrylate, a form of which is known as Lucite, so that the legend on the tab 41 can be seen through the top wall 40a. Furthermore, the latter may be given any suitable cross-section to cause it to function as a magnifying lens and, in the illustrative embodiment, with a flat under face 40c, its external surface is externally convex, being generated by a straight line moving along a suitable curve, as in a so-called plano-cylindrical lens. Thus readability is facilitated, and with a substantial degree of magnification the various parts may be constructed in physically very small and diminutive form.

Onto each of the several block members 15 there is telescopically assembled such a transparent push element 40 with an interposed name plate or tab. Preferably suitable means are provided to releasably hold the push element 40 and the block member together, and such a means may comprise a small shallow recess 15e (Figure 6) in a side face of the block member 15 and a small rounded-over projection 40e on the inside of the corresponding side wall of the push element 40; these parts may be easily formed during the molding of the block member 15 and push member 40, and preferably the recess 15e is of greater length vertically (Figure 6) than is the projection 40e, thus to provide appropriate leeway for accommodating different thicknesses of nameplate elements 41 interposed between the two parts. The side wall bearing the projection 40e yields or flexes outwardly as the push element 40 is slid onto or off the block member 15.

The several conductors of the various signalling circuits may now be connected to the several switching devices, by way of the binding screws 25, and the upper casing part 34 may then be put into position over the above-described subassembly, one end wall of the upper casing part 34a having a suitable hole 34c (Figure 6) through which the conductors are first brought. As the casing part 34 is let down over the subassembly, each push element 40 is accommodated in a hole 37 in the top wall of the casing and the bottom plate 35 seats itself in the rabbet of the bottom edges of the casing side walls 34b (Figures 5 and 6); but before this latter seating is completed, lateral projections, in the form of flanges 40f and 40g (Figure 6) on each of the push elements 40, are engaged by the under side of the top wall 34a of the casing 34, each along a longitudinal side of a hole 37, and by this engagement and continuing downward movement of the upper casing 34 to complete the seating of the plate 35 in the wall rabbets, the push elements 40, and the parts housed therein and underneath, are moved downwardly so as to bring the lateral flanges 31 on the block members 15 spaced downwardly from the top wall 28a of the sheet metal frame 28, as is

shown in Figure 6. As a result, the spring 17 about each stem 14 has its amount of compression increased and the force it exerts in upward direction, as viewed in Figures 5 and 6, instead of being taken up by the engagement of flanges 31, 31 of the block member 15 with the frame plate 28a, is taken up by the engagement of the flanges 40f and 40g against the under side of the casing top wall 34a, but the spring 17 exerts its upward force upon the push element 40 through the block element 15, which it tends to press farther and farther into the push element 40 and thereby holds the name tab or nameplate 41 compressed between the two faces 40c and 15a. The name tab is thus in effect always held and compressed flat, and disarrangement or shifting thereof is guarded against.

At diagonally opposite corners the upper casing part 34, which can be a molding of any suitable plastic material, is provided with bosses, of which one is shown in Figure 6 at 42; these are provided with threaded holes to receive screws 43 that pass through suitable holes 44 in the lower casing part 33 to hold the latter with its metal plate part 35 seated in the wall rabbets, as above described. The bottom plate 35 (Figures 5 and 6) may have secured to its bottom surface a sheet 45 of any suitable non-metallic cushioning material, such as leather, rubber, or the like, for cushioning and non-scratching engagement with the surface on which the structure is to rest, such as a desk.

Where the device embodies more than one switch structure, each with its own push element 40, selection of the desired push to depress is made easy by the elements of visibility and magnification of the identifying indicia, as above described. Depression of the selected push brings the contact bridging disc 16 (Figure 5) into engagement with the spaced contact points 18—18 to close the circuit, and by giving the under surface of the block member 15 a rounded or convex shape about the stem 14, the contact disc 16 can freely tilt and even bow or flex to accommodate itself to the applied desired pressure and to the spaced contacts 18—18, and by such an arrangement the need for costly precision of dimensioning, mounting, and spacing of the contact points 18—18 can be avoided. Moreover, the several parts are so proportioned that excessive downward depression is precluded, in that, as better appears in Figure 6, the bottom end edges or faces of the wall of the push element 40 find the top wall 28a of the frame 28 in their path of downward movement; here engagement can take place only after good contact bridging engagement between the disc 16 and the spaced contacts 18—18 has been effected. Where base plate 35 is metallic, these limiting actions are of advantage in preventing metal stem 14 from contacting plate 35.

It will thus be seen that there has been provided in this invention a push button switch construction in which the various objects heretofore noted, together with many thoroughly practical advantages, are successfully achieved. The device has many advantages from the viewpoint of manufacture and assembly, as well as in actual use. For example, it is a simple operation to remove the upper casing part 34 and then, by simply pulling off the push element 40, to remove and replace the name tab 41, and reassembling the parts, in case it is desired to change the identifying indicia.

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 drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A multiple push button switch construction comprising a casing forming a substantially complete enclosure and having separable upper and lower casing parts of which the lower casing part comprises a flat metal base with means for detachably holding them together, said casing having means for the entry into the interior thereof of a multiple-conductor cable, said upper casing part having a plurality of apertures, an internal frame structure comprising spaced upper and lower parts of which the lower is made of non-conductive material, the upper frame part having a plurality of apertures, one for each of the apertures in said upper casing part, said frame structure having a plurality of switches with contact elements and connector elements of which the latter are secured to said insulating lower frame part and thereby insulated from each other and, upon separation of upper and lower casing parts, are accessible for the connection thereto of circuit conductors of said cable, a plurality of actuators, one for each of said switches and each comprising two superimposed interfitting members having identifying indicia interposed therebetween and of which the upper one is transparent, with the lower one slidably coacting with an aperture in said upper part of said frame structure and with the transparent upper one slidably coacting in an aperture in said upper casing part, and means securing said frame structure to said metal base.

2. A multiple push button switch construction according to claim 1 in which said switch contact and connector elements are secured to said lower insulating frame part by conductive means that are exposed on the under side of said lower frame part, said metal base having upstanding spacer means holding said frame structure with said exposed conductive securing means out of contact with said metal base.

3. A multiple push button switch construction according to claim 1 in which each switch actuator is depressible and has a downwardly-extending conductive guiding stem and said lower non-conductive frame part has a plurality of apertures, one for each conductive stem, to coact in guiding during movement of depression, and means holding said frame structure with said non-conductive lower frame part thereof spaced from said metal base and thereby coact to prevent contact of said conductive stems with said metal base.

4. A multiple push button switch construction as claimed in claim 3 in which said metal base is of sheet metal and said last-mentioned means comprises a plurality of spaced flange-like parts of said sheet metal base bent upwardly out of its plane and against which said non-conductive lower frame part engages, said securing means comprising ear-like extensions of said flange-like parts for clamping said lower frame part thereagainst.

5. A multiple push button switch construction comprising a frame structure carrying a plurality of switches and having an apertured frame plate through which project upwardly biased operating members, one for each switch, each switch having means coacting with said frame structure to limit outward movement of its operating member relative to its frame plate aperture, an apertured top plate having a plurality of transparent push members each of which is made of non-conductive material and has integrally formed therewith lateral flanges and each of which has a pocket-like recess open at its under-side and providing an interior bottom face in the recess against which to receive identifying indicia, there being one recessed push member for each operating member and each exposed at an aperture in said top plate with the lateral flange thereof below the top plate, the operating members having parts respectively received into the pocket-like recesses of the non-conductive transparent push members and telescopically interfitting therewith to form connections therebetween whereby each transparent push member is detachable from its operating member upon movement thereof in the direction in which said operating member is spring-biased, identifying indicia received in each pocket-like recess and thereby interposed between each operating member and its transparent push member, and means for detachably securing said front plate to said frame structure.

6. A multiple push button switch construction comprising a casing having a plurality of switches therein and comprising separable upper and lower casing parts with means for detachably securing them together, said upper casing part having a plurality of apertures, one for each switch, each switch having a manual actuator that comprises two parts of which one is an outer transparent member having an upper portion exposed at an aperture in said upper casing part and having depending side walls surrounding and forming a pocket-like recess for receiving therein identifying indicia and of which the other is an inner member, said outer member being made of a molded plastic material and said depending side walls being resiliently yieldable, said inner member having a part received within said pocket-like recess and coacting with said yieldable side walls of the outer transparent member to form a detachable connection therewith, and identifying indicia at the bottom of each recess and interposed between the two members forming the manual actuator and visible through the outer transparent member thereof.

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