May 31, 1932. C. MILLER 1,861,400

PUSH BUTTON SWITCH CONSTRUCTION

Filed June 17, 1930

Fig. 1.

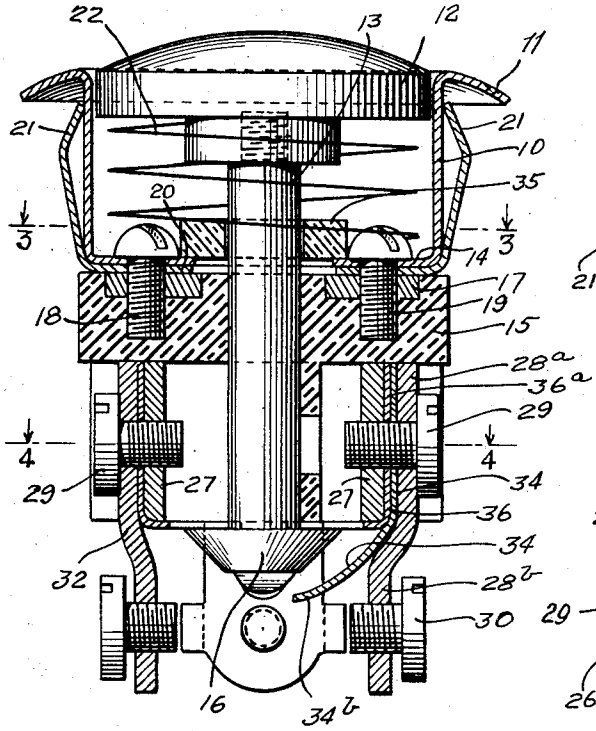
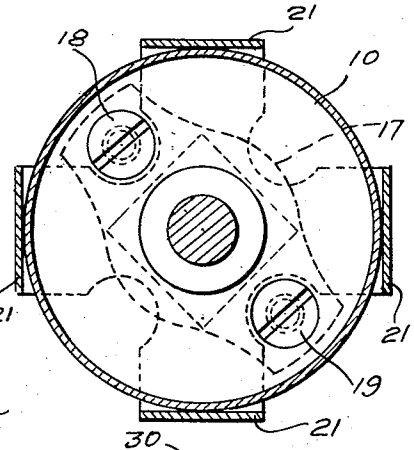


Fig. 3.



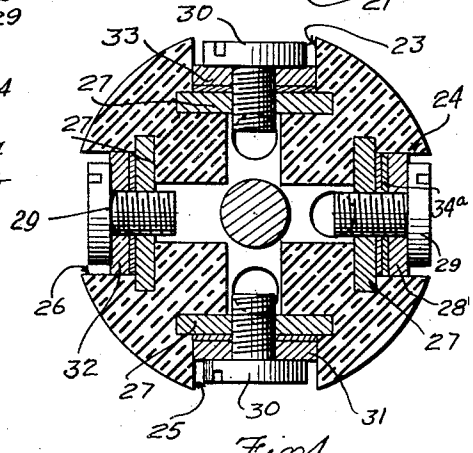


Fig. 4.

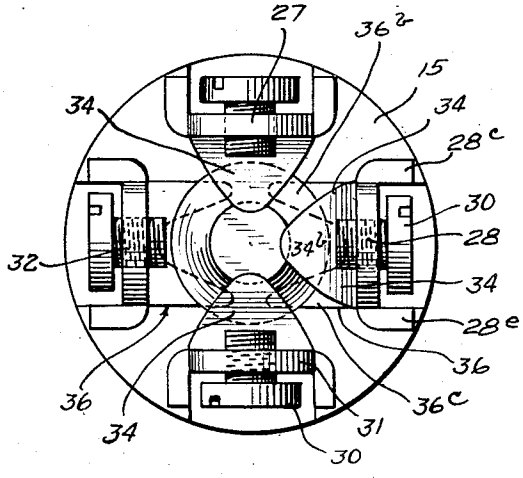


Fig. 2.

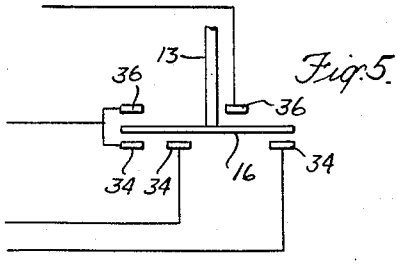


Fig. 5.

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UNITED STATES PATENT OFFICE

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PUSH BUTTON SWITCH CONSTRUCTION

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This invention relates to push button switch construction.

One of the objects of this invention is to provide a simple, practical and durable push button switch construction that will be of dependable action and capable of long-continued use in practice. Another object is to provide a push button switch construction that will be easy and inexpensive to manufacture and capable of rapid assembly. Another object is to provide a push button switch adapted for the control of a plurality of circuits either by making the same upon actuation of the push button, or by breaking the circuits, or by breaking certain circuits and making certain others. Another object is to provide a push button switch of the above-mentioned character having certain of its parts so constructed as will permit of ready and convenient replacement or interchange thereof to meet the varying conditions met with in practice. Another object is to provide a push button switch construction of the above-mentioned character in which dependable circuit-controlling action may be achieved even though a relatively large number of circuits are controlled or affected by a single actuation thereof. Another object is to provide a construction of the above-mentioned character that will be well adapted to meet the widely varying conditions of hard practical use. 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 is shown one of various possible embodiments of my invention,

Figure 1 is a vertical, central, sectional view of an assembled push button switch;

Figure 2 is a view, as seen from the bottom of Figure 1;

Figure 3 is a horizontal sectional view, as seen along the line 3—3 of Figure 1;

Figure 4 is a horizontal sectional view, as seen along the line 4—4 of Figure 1, and

Figure 5 is a diagrammatic view illustrative of one of various conditions of practical use that my invention meets.

Referring now to Figure 1 of the drawing, there is shown at 10 a sheet metal cup-shaped member, preferably of a cylindrical shape, as is clear from Figure 3, so as to fit readily within a round bore hole in a panel, frame, or the like, and flanged as at 11, the latter being adapted to rest against the surface of the panel carrying the push button switch. A push button 12 made of any suitable non-conducting material, such as fiber, bakelite, or the like, is slidably fitted into the upper end of the shell 10 and has suitably secured thereto a downwardly extending rod or plunger 13, the latter being conveniently threaded into the push button 12.

The plunger 13 extends downwardly through a suitable opening in the bottom 14 of the shell 10 and is guided in a suitable axially extending hole in a substantially cylindrical plug-like base member 15 made of a suitable moldable insulating material, such as bakelite, hard rubber, or the like. At its lower end the plunger 13 has secured thereto or has integrally formed therewith a contact bridging member 16 in the shape substantially of an inverted truncated cone, as is clearly shown in Figures 1 and 2. The member 16 is preferably made of a material like brass or phosphor bronze.

Molded into the upper end of the member 15 is a metallic plate-like insert 17 shaped substantially as is shown in Figure 3; this member 17 is threaded to receive the securing screws 18 and 19 (Figs. 1 and 3) which secure the member 15 against the under side of the bottom 14 of the shell 10, a plate-like member 20 having a suitable number of upwardly bent spring arms 21 being interposed between the shell 10 and the base member 15 and securely held in position by the screws 18 and 19. The spring arms 21 act to hold the push button switch construction in the recess or round hole into which the construction is inserted.

As above noted, the member 15 is of a sub-

stantially cylindrical shape and the length of the plunger 13 is so proportioned with respect to the remaining parts that the coiled spring 22, which is interposed between the push button 12 and the bottom 14 of the shell 10, normally holds the push button 12 substantially flush with the upper end of the shell 10 when the contact member 16, which acts substantially as a stop, abuts against the lower or free end of the member.

The member 15 is provided with any suitable number of recesses in its outer surface and along its lower edge and illustratively I have shown these recesses as four in number, namely, at 23, 24, 25 and 26 (Figs. 4 and 2). Viewed from the side, these recesses are of a generally rectangular shape and adjacent the lower or end face of the insulating base 15 these recesses are open. Preferably the recesses are bottomed each by a plate-like metallic member 27, the members 27 being molded into the material of the base plug 15 or secured thereto by pins or the like (not shown).

Each recess is adapted to snugly receive therein a terminal member preferably of the general shape and configuration as is indicated in Figure 1 at 28. The terminal member 28 is made of a suitable sheet metal, such as brass, and has a shank portion 28^a that fits into the recess 24 in which it is held by a screw 29 that passes through the shank 28^a and is threaded into the metal insert 27. The member 28 extends downwardly beyond the end face of the insulating member 15, whence it is bent inwardly toward the axis of the latter and thence extends downwardly as at 28^b, the latter portion being provided with spaced lugs 28^c and 28^e between which there is threaded into the portion 28^b a binding screw 30 for making an electrical connection of a conductor to the terminal member 28, the lugs 28^c and 28^e coacting with the head of the screw 30 to hold the portions of the conductor that are wrapped around the screw in desired position. Associated with the recesses 25, 26 and 23 (Fig. 4) are similar terminal members 31, 32 and 33, each provided with a binding screw 30 and each secured in its respective recess by a screw 29 threaded into a metallic insert 27.

For coaction with the contact bridging member 16 (Fig. 1) I provide a suitable number of contact members of two different types, either of which may be utilized alone or both may be used to coact with the bridging member 16. One of these contact members is indicated in Figures 1 and 2 at 34, and it is preferably made of a sheet spring metal, such as phosphor bronze, and is shaped to provide a shank portion 34^a fitted preferably snugly in the same recess that the shank portion 28^a of the terminal member 28 fits into and, as is clear from Figures 1 and 4, this shank portion 34^a is interposed between the insulating plug 15 and the terminal member 28, being provided with a suitable opening through which the screw 29 passes so that the latter may securely clamp the contact member 34 in position with the terminal member 28. The contact member 34 has a downwardly and inwardly bent portion 34^b (Figs. 1 and 2) which extends underneath but spaced from the contact bridging member 16 when the latter is in its uppermost position, as in Figure 1, so that depression of the button 12 moves the bridging member 16 downwardly into a wiping electrical contact with the yieldable portion 34^b of the contact member 34, a washer 35 made of any suitable material, preferably an insulating material, being interposed between the push button 12 and the bottom 14 of the shell 10 to limit the downward movement of the button 12 and hence of the contact bridging member 16.

The other type of contact member is indicated at 36 and is made of a suitable spring sheet metal, such as phosphor bronze, is provided with a shank portion 36^a that is shaped to be snugly received in the recess of the terminal member with which the contact member 36 is to be associated, and is provided with an opening through which the screw 29 may pass. The contact member 36 will be seen to be interposed between the member 15 and the terminal member 28, and the screw 29 dependably clamps these parts, as well as the contact member 34, in position.

The contact member 36 extends downwardly out of the recess, whence it is bent laterally so as to overlap the lower end face of the insulating member 15; preferably it is shaped to provide two spaced prongs 36^b and 36^c (Fig. 2), each being yieldable and each tending to spring in a downward direction, as viewed in Figure 1, and hence away from the end face of the member 15. These prongs or contact-making portions 36^b or 36^c are of a sufficient extent to be contacted by the bridging member 16 when the latter is held, by the spring 22 (Fig. 1) in its uppermost position, as is shown in Figure 1, the yielding or spring action of the prong portions 36^b and 36^c having a resistance to yielding that may be readily overcome by the tension of the spring 22 so that when the latter moves the parts upwardly, the prong portions 36^b and/or 36^c are forced to yield and achieve a rubbing interengagement with the upper face of the bridging member 16. The recesses, such as recess 24, for example, act to prevent rotation of that terminal member and contact member or members that are seated therein, about the axis of screw 29, and thus these various parts are dependably held in grouped relation about the contact bridging member 16.

The contact members 34 and 36 are interchangeable and either or both may be associated with as many recesses, and hence

terminal members, as may be desired, the securing screw 29 acting to insure good electrical connection between any terminal member and its associated contact member, or members. I may, to meet certain conditions met with in practice, associate two or more contact members of the kind and shape like the contact member 36 with, respectively, a corresponding number of recesses and terminal members, and in Figure 2 I have shown such a contact member 36 related to the terminal member 28 and a like contact member related to the terminal 32, so that the two contacts 36 will be bridged by the bridging member 16 and the circuit in which they are associated will be held closed as long as the push button 12 remains in its uppermost position, but it will be broken as soon as the push button is depressed.

In like manner I may relate as many contact members of the type shown in Figure 1 at 34 with as many terminal members as may be desired, and in Figure 2 I have shown a contact member 34 assembled with respect to the terminal members 27, 28 and 31; thus the circuits in which the contacts 34 are associated will be closed upon depression of the push button and hence of the contact bridging member 16, such depression being accompanied by the breaking of the circuits in which the contact members 36 are included. The circuits of the contacts 34 will remain closed and those of the contact members 36 remain open as long as the push button 12 is held depressed. Release of the push button 12 breaks the circuits of the contacts 34 and closes the circuit or circuits of the contacts 36.

In Figure 5 I have diagrammatically indicated the above-described illustrative arrangement of the contacts.

Should it be necessary to meet the requirements of other circuit arrangements than those diagrammatically shown in Figure 5, I need merely to associate with the respective terminal members either or both of the contacts 34 and 36 and even with only four recesses and a corresponding number of terminal members, it will be seen that I am enabled to achieve a large number of possible combinations of circuit-making and breaking controls or actions.

It will thus be seen that I have provided in this invention a push button switch construction in which the several objects hereinbefore noted, as well as many thoroughly practical advantages, are successfully achieved. It will be seen that the construction is thoroughly practical, is rugged, and capable of dependable action, the various contact-making parts achieving the rubbing action which insures maintaining of the respective surfaces bright and clean. Moreover, it will be seen that a wide range of varying practical conditions may be easily and quickly provided for or met, all without detracting in any way from such advantages as those above noted.

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. In push button switch construction, in combination, a base member made of insulating material and having a plurality of lateral recesses adjacent one end, a plunger extending through said base and having a contact bridging member exposed at said end thereof, a spring-opposed push button for actuating said plunger and adapted to urge said bridging member in a direction toward the end face of said base, a plurality of terminal members each seated in one of said recesses and detachably secured therein, and a plurality of contact members inserted in said recesses and between said base and said terminal members, certain of said contact members extending in line with said bridging member to be contacted by the latter upon depression of said push button and certain of said contact members extending in line to be contacted by said bridging member upon retrograde movement thereof.

2. In push button switch construction, in combination, a base member made of insulating material and having a plurality of lateral recesses adjacent one end, a plunger extending through said base and having a contact bridging member exposed at said end thereof, a spring-opposed push button for actuating said plunger and adapted to urge said bridging member in a direction toward the end face of said base, a plurality of terminal members each seated in one of said recesses and detachably secured therein, and a plurality of contact members inserted in said recesses and between said base and said terminal members, certain of said contact members being substantially L-shaped and having the angular portions thereof resting substantially against the end face of said base so as to be bridged by said bridging member upon retrograde movement thereof under the action of said spring and certain other of said contact members having yielding portions that extend underneath said bridging member and in line to be contacted by the latter upon depression thereof by said push button.

3. In push button switch construction, in combination, a substantially cylindrical base made of insulating material and having a plurality of lateral recesses adjacent one end thereof, each of said recesses having associated therewith a metallic insert molded into said base, a plunger carrying a bridging mem-

ber adjacent said end face of said base and having a push button at its other end, a spring interposed between said base and said push button for moving said bridging member in a direction toward said end face, a plurality of terminal members, each resting within one of said recesses and having extensions thereof beyond said end face, said extensions having means for detachably securing an electrical conductor thereto, means threaded into said metallic inserts for holding said terminal members in place, and a plurality of contact members each interposed between a terminal member and said base and having a portion for coaction with said bridging member.

4. In push button switch construction, in combination, a substantially cylindrical base made of insulating material and having a plurality of lateral recesses adjacent one end thereof, each of said recesses having associated therewith a metallic insert molded into said base, a plunger carrying a bridging member adjacent said end face of said base and having a push button at its other end, a spring interposed between said base and said push button for moving said bridging member in a direction toward said end face, a plurality of terminal members, each resting within one of said recesses and having extensions thereof beyond said end face, said extensions having means for detachably securing an electrical conductor thereto, means threaded into said metallic inserts for holding said terminal members in place, and a plurality of contact means for coaction with said bridging member and secured in place by the same threaded means that holds said terminal members in position, some or all of said contact means having one portion for engagement by said plunger upon movement thereof in a direction away from said end face upon depression of said push button and another portion adapted to be engaged by said bridging member upon retrograde movement thereof in response to the action of said spring.

5. In push button switch construction, in combination, a shell having its upper end closed by a depressible spring-opposed push button and having insulating means at its other end, a contact bridging member actuated by said push button, a plurality of terminal members secured by screws to said insulating means and each adapted to have an electrical conductor secured thereto, and contact means for each of said terminal members and in electrical connection therewith and each held in position by the screw that holds the corresponding terminal member in position, one of said contact means having a portion contacted by said bridging member upon movement thereof in response to depression of said push button and a portion contacted by said bridging member upon retrograde movement thereof.

6. In push button switch construction, in combination, a shell having its upper end closed by a depressible spring-opposed push button and having insulating means at its other end, a contact bridging member actuated by said push button, a plurality of terminal members secured by screws to said insulating means and each adapted to have an electrical conductor secured thereto, and contact means for each of said terminal members and in electrical connection therewith and each held in position by the screw that holds the corresponding terminal member in position, certain of said contact means having a portion contacted by said bridging member upon movement thereof in response to depression of said push button, certain of said contact means having a portion contacted by said bridging member upon retrograde movement thereof, and certain of said contact means having a portion contacted by said bridging member upon depression thereof and a portion contacted thereby upon retrograde movement thereof.

7. In push button switch construction, in combination, a substantially cylindrical base made of insulating material and having a plurality of lateral recesses adjacent one end thereof, each of said recesses having associated therewith a metallic insert molded into said base, a plunger carrying a bridging member adjacent said end face of said base and having a push button at its other end, a spring interposed between said base and said push button for moving said bridging member in a direction toward said end face, a plurality of terminal members, each resting within one of said recesses and having extensions thereof beyond said end face, said extensions having means for detachably securing an electrical conductor thereto, means threaded into said metallic inserts for holding said terminal members in place, and sheet metal contact members extending into said recesses and clamped to said base by said threaded means and having portions for coaction with said bridging member.

8. In push button switch construction, in combination, a shell having its upper end closed by a spring-opposed depressible push button and having a plurality of terminal members each adapted to have an electrical conductor secured thereto, means insulatingly supporting said terminal members from said shell, a contact bridging member actuated by said push button, and a plurality of interchangeable contact members, each in electrical connection with one of said terminal members and some of which are shaped to be engaged by said bridging member upon depression of said push button and some of which are shaped to be engaged by said

bridging member upon release of said push button.

9. In push button switch construction, in combination, a sheet metal shell having a push button movable thereinto, a base member of solid insulating material and having a plurality of metal inserts molded thereinto, means threaded into one of said metal inserts for securing said base to said shell, a contact bridging member actuated by said push button, a plurality of interchangeable contact members, and means threaded into others of said metallic inserts for securing said contact members into position to be engaged by said bridging member.

10. In push button switch construction, in combination, a sheet metal shell having a push button movable thereinto, a base member of solid insulating material and having a plurality of metal inserts molded thereinto, means threaded into one of said metal inserts for securing said base to said shell, a contact bridging member actuated by said push button, a plurality of sheet metal contact members some of which are shaped to be engaged by said bridging member upon movement of the latter in one direction and other of which are shaped to be engaged by said bridging member upon movement of the latter in opposite direction, and means including terminal members together with means threaded into others of said metallic inserts for securing said contact members to said base.

11. In push button switch construction, in combination, supporting means including insulating means, a depressible spring-opposed push button slidably guided by said supporting means, a contact bridging member actuated by said push button, said insulating means being provided with a plurality of recesses, a plurality of apertured sheet metal contact members, each seated in one of said recesses and each having a portion for coaction with said contact bridging member, said insulating means having a plurality of threaded openings and each contact member being positioned not only in a recess but also with its aperture substantially registering with a threaded opening in said insulating means, a plurality of terminal members, each having means for securing thereto an electrical conductor and each positioned over and in engagement with one of said contact members, and a screw for each terminal member, the screw passing through the latter and through the aperture in the contact member underlying the terminal member and threaded into the threaded opening in said insulating means, thereby to clamp the contact member between said insulating means and said terminal member.

12. In push button switch construction, in combination, a sheet metal shell having its upper end closed by a spring-opposed depressible push button and having secured at its lower end a block of insulating material, said push button having a downwardly directed stem extending through said insulating block and a contact bridging member at the lower end of said stem, said insulating block having a plurality of metallic inserts molded thereinto, said inserts having threaded openings accessible from the sides of said insulating block, a plurality of contact members resting laterally against said insulating block, each having an extension at its lower end for coaction with said contact bridging member on said stem, a plurality of terminal members each having means for securing an electrical conductor thereto and each resting against one of said contact members at the side of said insulating block, and a plurality of screws, each passing through a terminal member and threaded into the threaded opening of one of said inserts for securing said terminal members in place and for clamping said contact members between the terminal members and the insulating block.

13. In push button switch construction, in combination, a shell having its upper end closed by a spring-opposed depressible push button, an insulating block carried by said shell and having a plurality of metallic inserts molded thereinto, a contact bridging member actuated by said bush button, a plurality of contact members each having an apertured portion and a portion for coaction with said contact bridging member, a plurality of terminal members each having means for securing thereto an electrical conductor and each overlying a contact member, and a screw for securing each contact member with its overlying terminal member in place, said screw passing through the apertured portion of the contact member and being threaded into a metallic insert.

In testimony whereof, I have signed my name to this specification this 5th day of June, 1930.

CHRISTIAN MILLER.