

Sept. 8, 1959

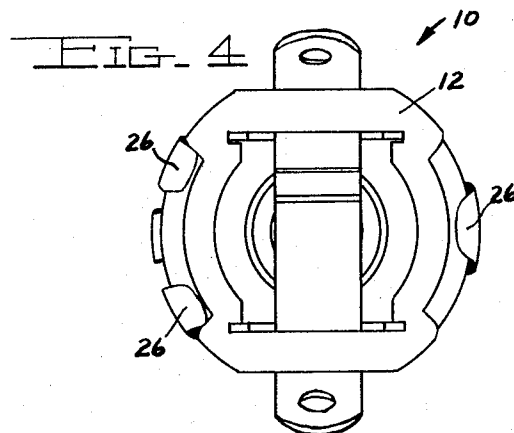
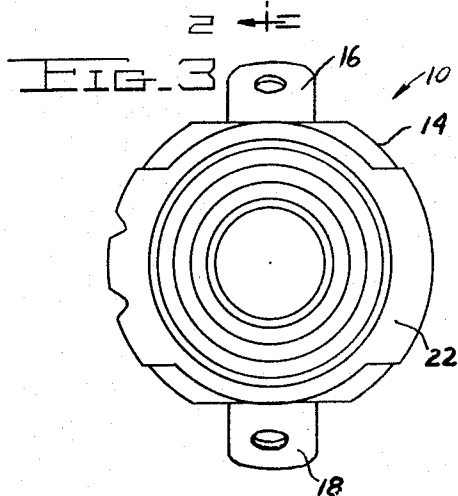
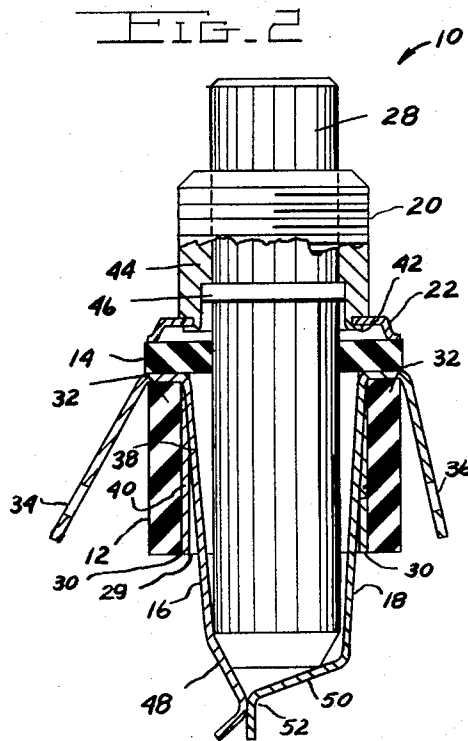
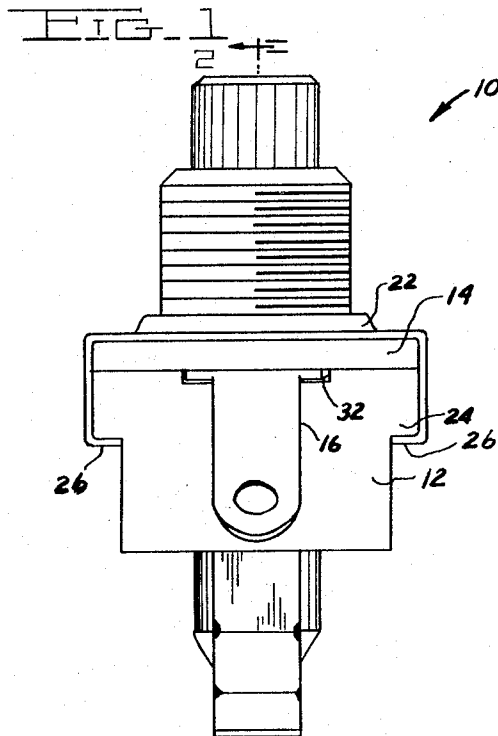
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2,903,540

PUSH BUTTON SWITCH

Filed March 12, 1958

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 5

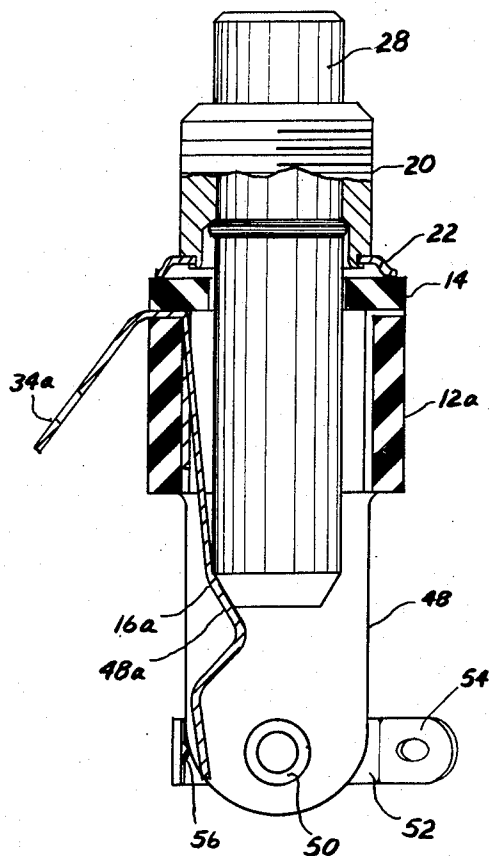
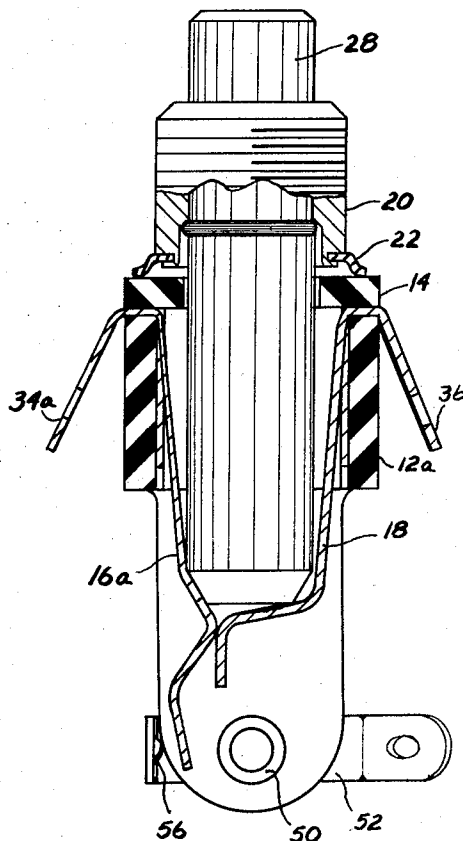


FIG. 6



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2,903,540

PUSH BUTTON SWITCH

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Application March 12, 1958, Serial No. 720,898

10 Claims. (Cl. 200—159)

The present application relates to push button switches, and particularly to such push button switches which employ standard parts for a multiplicity of different electrical arrangements, and which allow advanced manufacturing and assembly techniques to be employed. This is a continuation-in-part of prior application Ser. No. 682,332, filed September 6, 1957.

In the aforesaid application, various modifications of electrical jacks, all coming within the scope of the invention therein disclosed, are illustrated and described. These jacks were developed to overcome various difficulties encountered with prior art devices with respect to their manufacture, use and cost. In particular, the jacks disclosed in the aforesaid application lend themselves very readily to semi-automatic or automatic assembly operations, thereby reducing their costs. These jacks are also characterized by their simplicity and the relatively few parts that are involved, as well as the interchangeability of most of the parts between different modifications.

The present invention has been developed so that the same benefits may be derived in the field of push button switches as was previously derived in the electrical jack field by virtue of the invention taught in the aforesaid application.

It is an object of the present invention to provide a new and improved push button switch which is constructed and arranged so that various elements are secured or locked in place in a most effective manner for assembling the same and from which optimum results of the push button switch can be obtained when in use.

It is still another object of the present invention to provide an improved push button switch of the foregoing character wherein the resilient properties of the spring contact elements are used to return the push button element to its normal position when pressure thereon is released, thereby eliminating the need for installing and using other spring elements.

It is still another object of the present invention to provide an improved push button switch of the foregoing character wherein a dielectric molded plastic body is employed for mounting the various spring contacting elements in a predetermined spaced relation, said body being constructed and arranged to assure that such elements will remain in their mounted positions when in use.

It is still another object of the present invention to provide an improved push button switch of the foregoing character which has a single dielectric member for retaining the spring contact elements in their mounted positions and a sleeve into which a push button element can be retained for limited axial movement, said sleeve having clamping means for holding the sleeve, the dielectric body and the single dielectric member together to form a simple, sturdy and unitary body.

It is still another object of the present invention to provide a push button switch of the foregoing character wherein the molded plastic body is adapted to receive spring contact elements of a plurality of shapes and sizes, thereby providing greater application and standard-

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ization of parts resulting in a lower cost of production.

It is still another object of the present invention to provide a push button switch that is characterized by the relative few parts that are required to assemble it and in which hand adjustment is entirely eliminated.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

Figure 1 is a front elevation of a push button switch embodying one form of the present invention;

Figure 2 is a section taken on the line 2—2 of Figure 1;

Figure 3 is a top plan view of the embodiment of Figure 1;

Figure 4 is a bottom plan view of the embodiment of Figure 1;

Figure 5 is a section similar to that of Figure 2 of another embodiment of the present invention; and

Figure 6 is another section similar to that of Figure 2 of still another embodiment of the present invention.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring now to the drawings, and first to Figures 1 to 4, inclusive, the first embodiment of the invention will be described. The push button switch 10 is formed from seven parts comprising the dielectric body member 12, an annular shaped insulating element 14, a U-shaped spring contact element 16, a second U-shaped spring contact element 18, an externally threaded sleeve 20, a terminal clamp 22 that is integrally connected to sleeve 20 and is clamped over the shoulders 24 of insulator 12, as at 26, and a push button element 28 that extends axially through the insulator 12, the annular insulating element 14 and the sleeve 20. As will be explained with respect to other embodiments, illustrated in other figures of the drawing and described hereafter, the insulator may be modified for the purpose of adding other stationary terminals and the shapes and numbers of spring contact elements 16 may vary.

In the embodiment of Figures 1 to 4, inclusive, the insulator 12 is a molded phenolic having a central aperture 29, with slots 30 formed in the walls of such aperture. The upper end of the insulator 12 has two notches 32 extending transversely between the aperture 24 and the outer surface. The notches are of sufficient width and depth to receive spring contact elements such as the elements 16 and 18. It will be observed that when the spring contact elements 16 and 18 are positioned in the notches 32, their upper surfaces are substantially flush with the end surface of the insulator 12.

The spring contact elements 16 and 18 are inverted U-shaped members which straddle the end wall of the insulator 12 with the intermediate or mid-portion of each contact element 16 and 18 fitting into the notches 32. One side of each element 16 and 18 extends externally of the insulator 12, and these elements have apertured ends 34 and 36 respectively to which electric conductors can be connected. The other sides respectively of elements 16 and 18 extend into the central aperture 29 and converge toward the axis of such aperture so that they will be in the path of axial movement of the push button element 28 in a manner to be more fully described hereafter.

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Referring to Figure 1, it will be observed that the intermediate portion of spring contact element 16 widens so as to be substantially as wide as the notch 32. This assures that the element 16 will not shift laterally. Also, this wide portion extends on into the aperture 29 until substantially to the bottom of the insulator 12. The wide portion is split longitudinally into three longitudinal segments. The center one, identified by the reference number 38, forms the spring contact arm that is engaged by the push button element 28. The side segments 40 fit into the slots 30 in the inner wall of insulator 12. This position is obtained by sliding the segments down into slots 30 from the top of insulator 12. When fully inserted only the free end of spring contact arm 38 can be moved and the contact element 16 is retained in a very stable position. The contact element 18 is similarly retained in position in the opposite slot 30 of the insulator 12.

The spring contact elements 16 and 18 are held in position by the insulating element 14 which seats on the top wall of insulator 12 and blocks the open upper side of the notches 32 in which the spring contact elements 16 and 18 are fitted.

Positioned above the insulating element 14 is the sleeve 20 which has the clamp terminal 22 integrally attached as at 42. A more detailed description of this clamp terminal can be found in the aforesaid prior application Serial No. 682,332. The clamp terminal 22 has clamping portions 26 which are folded under the shoulders 24 to lock the sleeve 20, the insulating element 14 and the insulator 12 together.

The inner wall of sleeve 20 has an enlarged bore at its lower end to form a shoulder 44. Extending axially through the sleeve 20 and seated against the under side of the shoulder 24 by means of an enlarged ring 46 is the push button element 28. The upper end of the push button element 28 serves as the push button for pressing the push button element downwardly into the push button switch. The opposite end of the push button element 28 has a chamfered or beveled edge which is in engagement with the inclined surface 48 of the contact element 16. It is similarly in engagement with the inclined surface 50 of the contact element 18. It will be observed that the contact elements 16 and 18 when in their normal positions are in engagement at 52 to provide a closed electrical connection between the two contact elements. When it is desired to break this electrical connection it is only necessary to depress the push button element 28 by pressing on the upper end thereof. The lower end of the push button element 28 will then be moved downwardly on the inclined surfaces 48 and 50 of the contact elements 16 and 18. The extent of downward movement of the push button element 28 is limited by engagement of the enlarged ring 46 with the insulating element 14. Other suitable limit means may also be employed.

The present embodiment of the push button switch 10 will allow the contact elements 16 and 18 to remain separated only so long as pressure is exerted on the upper end of the push button element 28. As soon as the pressure is released, the resilient properties of the spring contact elements 16 and 18 will tend to urge them together and the axial component of force acting from the inclined surfaces 48 and 50 on the bottom of the push button element 28 will tend to urge the latter upward, thereby permitting the contact elements 16 and 18 to reengage. Thus, no spring means other than the resilient spring contact elements 16 and 18 are required to return the push button element 28 to its original position.

The principles of the present invention may be utilized in other types of push button switches. Another embodiment of the present invention will now be described with particular reference to Figure 5. In this embodiment several of the parts described in the embodiment of Figures 1 to 4, inclusive, are used, and common reference numbers are applied. Thus, the same push button ele-

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ment 28, sleeve 20 and terminal clamp 22 may be employed. Also, the same insulating element 14 may be used. The upper portion of the insulator 12a may be identically the same as insulator 12 except that the modified insulator 12a has an integral extension or leg portion 48 on which is secured, by rivet 50, the electrical terminal 52. The electrical terminal 52 has an apertured end 54 to which an electrical conductor can be connected, and its other end extends at right angles to the plane of the leg portion 48 and has a stationary electrical contact 56 which is in the path of movement of the spring contact element 16a.

The embodiment in Figure 5 is a normally open push button switch which can be closed by pressing down the push button element 28 so that the terminal end of contact element 16a engages the stationary electrical contact 56. In this position a closed connection will extend from the one end 54 of the terminal 52 to the other end 34a of the spring contact element 16a. This push button element 28 functions substantially the same as in the previously described embodiment in returning to its normally raised position when pressure is released from its upper end. Thus, when the pressure is released the resilient properties of the spring contact element 16a will urge the inclined portion 48a to move laterally inwardly and this in turn will cause the push button element 28 to be moved upwardly.

Still another embodiment of the present invention is illustrated in Figure 6. This form of the invention includes features of the two previously described embodiments. It will be observed that the embodiment of Figure 6 includes all of the elements of Figure 5 and in addition includes the spring contact element 18 illustrated in the embodiment of Figures 1 to 4, inclusive. These various elements will not be described again, but common reference numbers are applied to each of them. The embodiment of Figure 6 is in effect both a normally open and a normally closed push button switch. In its normal position an electrical connection is closed between the outer ends 34a and 36 of the contact elements 16a and 18. When the push button element 28 is depressed this connection will be broken and a connection will be closed between the outer ends of contact element 16a and the electrical terminal 52. As in the other embodiments, when the pressure is released on push button element 28, the spring contact elements 16a and 18 will function to urge the push button element 28 upward and the various elements will be returned to their normal position illustrated in Figure 6.

From the foregoing it will be observed that a relatively simple push button type switch has been developed which can be readily adapted to be used as normally open, normally closed, normally open and closed switches and the like. The major portion of the elements are common to each of the modifications, thereby obtaining maximum economic benefits from the use of standard parts. Furthermore, these push button switches can be readily assembled by semi-automatic or automatic means eliminating the need of manually assembling and staking the various elements. Furthermore, maximum utility is made of all the component elements of the push button switch so that the minimum number of parts are used.

Having thus described our invention, we claim:

1. A push button switch comprising an insulator having a central opening and a notch at one end adjacent said opening, a contact element with its mid-portion in said notch and one end extending into said central opening, the other end being external of said insulator for attachment to an electrical conductor, an apertured insulating element seated on the notched end of said insulator in registry with said central opening for retaining said contact element in place, a sleeve aligned axially with said insulating element and clamped together with said insulating element and said insulator, and a push button element extending axially through said sleeve

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with its one end engaging said one end of said contact element, said contact element having spring properties and being inclined at the region of engagement with said push button element for urging the latter in the direction of said sleeve and for causing lateral movement of said one end of the contact element on axial movement of said push button element.

2. A push button switch comprising an insulator having a central opening, a resilient U-shaped contact element fitting over one end of said insulator with one side of said contact element extending into said opening, the other side being external of said insulator for attachment to an electrical conductor, said other side having a portion inclined inwardly toward the axis of said central opening, an insulating element seated on said one end of said insulator over said U-shaped contact element, a sleeve in alignment with said central opening and clamped together with said insulating element and said insulator, a push button element extending through said sleeve and carried therein for limited axial movement, the axially inner end of said push button element engaging the inwardly inclined portion of said contact element for moving the latter laterally on axial movement of said push button element, the resilient properties of the contact element acting to urge the push button element axially outwardly.

3. A push button switch as defined in claim 2 wherein a second U-shaped contact element is retained over one end of said insulator opposite from the first-named contact element, said second contact element having a portion in engagement with the first-named contact element and adapted to be separated therefrom on axial inward movement of said push button element.

4. A push button switch as defined in claim 2 wherein a stationary contact is carried on said insulator in the path of lateral movement of said contact element, and a second U-shaped contact element is retained over one end of said insulator opposite from the first-named contact element, said second contact element having a portion in engagement with the first-named contact element and adapted to be separated therefrom on axial inward movement of said push button element.

5. A push button switch as defined in claim 2 wherein a stationary contact is carried on said insulator in the path of lateral movement of said contact element.

6. A push button switch comprising an insulator having a central opening, a resilient U-shaped contact element fitting over one end of said insulator with one side of said contact element extending into said opening, the other side being external of said insulator for attachment to an electrical conductor, said other side having a portion inclined inwardly toward the axis of said central opening, an insulating element seated on said one end of said insulator over said U-shaped contact element, a sleeve in alignment with said central opening and carrying a clamp fastened to said insulator for securing the sleeve, the insulating element and the insulator together, said sleeve having an axially inwardly facing shoulder, a push button element extending through said sleeve and having an axially outwardly facing shoulder seated on said inwardly facing shoulder, the axially inner end of said push button element engaging the inwardly inclined portion of said contact element for moving the latter laterally on axial movement of said push button element, the resilient properties of the contact element acting to urge the push button element axially outwardly, onto the seat on said inwardly facing shoulder.

7. A push button switch as defined in claim 6 wherein the axially inner end of said push button element has a chamfered edge for normally seating on said inwardly inclined portion of said contact element.

8. A push button switch comprising an insulator having a central axial opening with at least one slot extending lengthwise in the inner wall of said opening, a contact element having an intermediate portion overlying

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ing one end of said insulator with one end of the contact element external of the insulator for attachment to an electrical conductor and the other end extending into said opening, said other end being split lengthwise so that at least one lengthwise segment thereof fits into said slot and another segment is deflected toward the axis of said opening and thereafter is deflected away from the axis terminating in a generally axially extending portion, a stationary contact mounted on said insulator radially outward of the terminal portion of the last-named segment so as to be engaged by said terminal portion on outward lateral movement of said last-named segment, an apertured insulating element seated on said one end of said insulator in registry with said opening and overlying the intermediate portion of the contact element, a sleeve clamped together with said insulating element and said insulator and being in alignment with said central opening, and a push button element carried in said sleeve for limited axial movement with one end projecting therefrom to serve as a push button and the other end engaging the portion of said last-named segment which is deflected away from said axis so that pressure on said push button will move said push button element inwardly thereby deflecting said last-named segment into engagement with said stationary contact and on releasing said pressure said last-named segment will return to its original position urging the push button axially outwardly to its original position.

9. A push button switch comprising an insulator having a central axial opening with a plurality of slots extending lengthwise in the inner wall of said opening, a plurality of contact elements having intermediate portions overlying one end of said insulator in spaced relation to one another with one end of each contact element being external of the insulator for attachment to an electrical conductor and the other end extending into said opening, each of said other ends being split lengthwise so that at least one lengthwise segment thereof fits into one of said slots and another lengthwise segment is deflected toward the axis of said opening with two of the deflected segments being in electrical contact with one another, the end of one of said segments being deflected away from said axis and then terminating in a contact movable laterally in a path toward and away from said axis, a stationary electrical contact mounted on said insulator in the path of the laterally movable contact, an apertured insulating element seated on one end of said insulator in registry with said opening and overlying said intermediate portions of the contact elements, a sleeve in alignment with said central opening and clamped together with said insulating element, and a push button element carried in said sleeve for limited axial movement with one end projecting therefrom to serve as a push button and the other end engaging said inward deflected portions so that when pressure is exerted on said push button the push button element will be moved inwardly thereby moving said inward deflected portions laterally apart with the one engaging said stationary contact and when the pressure is released the inward deflected portions will return to their engaged positions urging the push button element to its original position.

10. A push button switch comprising an insulator having a central axial opening with a plurality of slots extending lengthwise in the inner wall of said opening, a plurality of contact elements having intermediate portions overlying one end of said insulator in spaced relation to one another with one end of each contact element being external of the insulator for attachment to an electrical conductor and the other end extending into said opening, each of said other ends being split lengthwise so that at least one lengthwise segment thereof fits into one of said slots and another lengthwise segment is deflected toward the axis of said opening, an apertured insulating element seated on one end of said insulator in registry with said opening and overlying said intermediate por-

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tions of the contact elements, a sleeve in alignment with said central opening and clamped together with said insulating element, and a push button element carried in said sleeve for limited axial movement with one end projecting therefrom to serve as a push button and the other end engaging said inward deflected portions so that when pressure is exerted on said push button the push button element will be moved inwardly thereby moving said inward deflected portions laterally apart and when the pressure is released the inward portions will return to their engaged positions urging the push button element to its original position.

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