July 13, 1965 H. P. STOCK 3,194,899

PUSHBUTTON SWITCH ASSEMBLY

Filed June 15, 1962 2 Sheets-Sheet 1

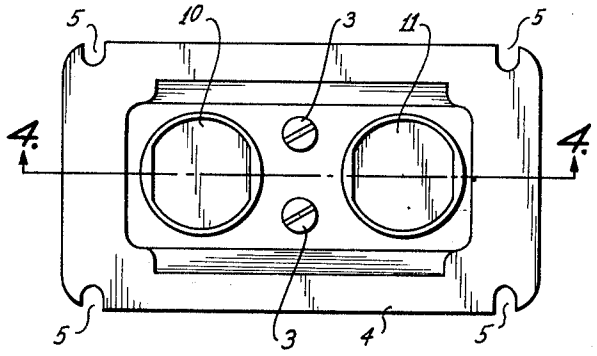


Fig. 1.

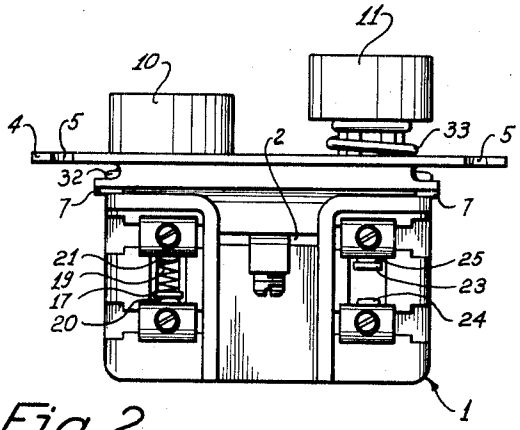


Fig. 2.

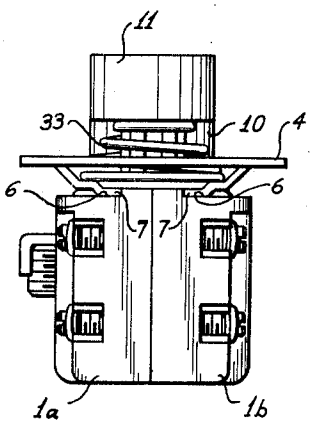


Fig. 3.

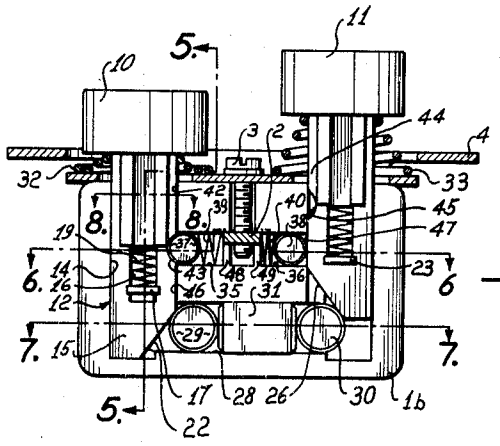


Fig. 4.

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PUSHBUTTON SWITCH ASSEMBLY

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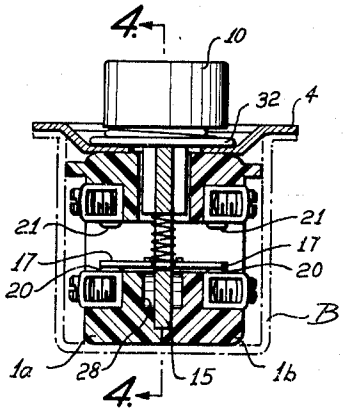


Fig. 5.

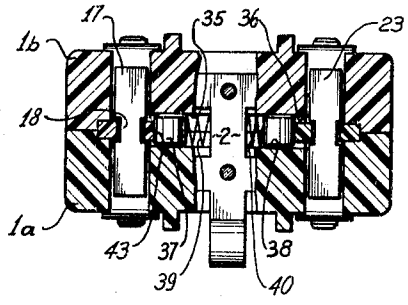


Fig. 6.

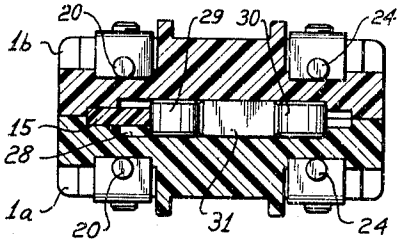


Fig. 7.

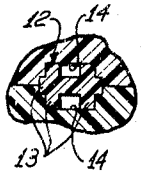


Fig. 8.

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PUSHBUTTON SWITCH ASSEMBLY

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Filed June 15, 1962, Ser. No. 202,791
3 Claims. (Cl. 200—5)

This invention relates to an interlocking pushbutton switch assembly, and particularly to a dual pushbutton switch assembly provided with an interlock for assuring proper movements of the pushbuttons relative to each other at all times, and with yieldable position retainers by which whichever pushbutton is in one of its predetermined operating positions is retained in that position under yieldable restraint, so as to remain in that position until forced out of that position by the interlock upon operation of the other push button.

More specifically, the assemblage is one wherein both pushbuttons are urged outwardly by respective return springs and have portions which carry spring seated contacts, and in which, when one pushbutton is fully inserted in operating position, the interlock prevents the movement of the other pushbutton into the innermost operating position and constrains it to remain in a different position.

Another object is to provide a restraining means, which, when one pushbutton is in an innermost position, cooperates with the pushbutton to hold it in such position against the outward thrust of its return spring and the spring of its contact, but yieldably releases the pushbutton for movement in an outward direction upon predetermined inward movement being exerted on the other pushbutton and transferred by the interlock to the inwardly positioned pushbutton.

Another object is to provide a structure of this character in which the mechanism is included in a hollow body formed of detachable members, at least some of which are readily removable for affording access to the retaining means and the interlock so that each can be removed and replaced readily as required.

Various other objects and advantages will become apparent from the following description, wherein reference is made to the drawings, in which:

FIG. 1 is a top plan view of the switch embodying the principles of the present invention;

FIG. 2 is a front elevation of the switch illustrated in FIG. 1;

FIG. 3 is a right end elevation of the switch illustrated in FIG. 1;

FIG. 4 is a vertical longitudinal sectional view taken on line 4—4 in FIGS. 1 and 5;

FIG. 5 is a vertical cross sectional view taken on the line 5—5 in FIG. 4;

FIGS. 6 and 7 are horizontal sectional views taken on the lines 6—6 and 7—7, respectively, of FIG. 4; and

FIG. 8 is a horizontal sectional view through one of the pushbutton stems and is taken on the line 8—8 of FIG. 4.

Referring to the drawings, the mechanism comprises a body 1 formed of two detachable members, a forward member 1*a* and a rearward member 1*b*. These members preferably are duplicates of each other, and are assembled by being engaged at their open sides along a plane extending through the axes of the two pushbuttons. A forwardly and rearwardly extending H-shape metal tie member 2 extends through the assembled members 1*a* and 1*b* in intersection relation to the plane. Screws 3 extend through a supporting plate 4 and are in threaded engagement with the H-shaped tie member 2 at their inner ends, thus holding the two body members in assembled relation. The plate 4 has notches 5 for receiving screws for mounting the switch in a conventional switch box B. Each body member has external notches 6 which receive ribs 7 on

the plate 4 for assisting in holding the body members firmly together.

Carried by the body 1 are two duplicate pushbuttons 10 and 11. The pushbutton 10 has an elongated stem 12 having a plurality of guide ribs 13 which extend endwise thereof and slidably engage the complementarily contoured inner walls of a passage 14 in the upper portion of the body, so as to slidably support the stem for endwise movement relative to the body while assuring proper guided lineal movement of the pushbutton stem 12.

At its lower end, the pushbutton stem 12 has a flattened portion 15 through which is a rectangular opening 16 which receives a contact 17 having a reduced width central portion 18. The width of the opening is greater than that of the reduced width portion and less than that of the portions of the contact adjacent to the reduced width portion for preventing endwise displacement of the contact. The contact is urged to the bottom of the opening by a suitable spring 19 so that it can be placed in resilient pressure contact with the lower contacts 20 in the body upon inward movement of the pushbutton to a predetermined operating position. However, upon raising the pushbutton, the contact can be placed in contact with upper contacts 21 in the body. On its inner edge near the bottom the flattened portion 15 has a cam surface 22.

The pushbutton 11 corresponds in all details to the pushbutton 10, carrying a contact 23 cooperable, when the pushbutton 11 is moved inwardly to operating position, with contacts 24 in the body. When the pushbutton 11 is raised, the contact 23 engages contacts 25 in the body. The lower end of the stem of the pushbutton 11 has a cam surface 26 identical with the cam surface 22 and facing toward the cam surface 22. These cam surfaces preferably are linear and slope downwardly away from each other at equal angles to the paths of the pushbuttons.

Between the cam surfaces, the body has a transverse guideway 28 so arranged so that the cam surfaces 22 and 26 are exposed in alignment with the opposite ends of the guideway, respectively. Rigid force transmitting elements are disposed in the guideways and engage the cams. In the form illustrated, these elements include two rolling elements 29 and 30 with a sliding element 31 therebetween. The overall length of the two rolling elements and sliding element, when they are in contact with each other endwise of the guideway 28 is such that they are at all times substantially in contact with both of the cam surfaces 22 and 26. Since one pushbutton is to be out while the other is in, they are in contact concurrently with the upper portion of the cam of the pushbutton which is inwardly and the lower portion of the cam of the pushbutton which is outwardly. Since this distance is fixed and these elements are substantially incompressible endwise, it is apparent that when either pushbutton is moved to its inward operating position, the other pushbutton is in an outward operating position. It is impossible to have both pushbuttons in their inner position at the same time.

It is desirable that each pushbutton be urged outwardly by a return spring. For example, the pushbutton 10 is urged outwardly by a spring 32 and the pushbutton 11 by a spring 33. However, it is desirable also that when either pushbutton is in a fully inserted position that it be retained in that position yieldably so as not to be moved outwardly by its spring or by the pressure of the spring of its contact. For example, with pushbutton 10 inwardly, it is to be retained against the force of the spring 32 and the added force of the spring 19. The same is true of the pushbutton 11 and its springs when it is in the inward position. For this purpose, yieldable restraining means are provided. Since they are the same for both pushbuttons, that for the pushbutton 10 only will be

described in detail. The two members or halves 1*a* and 1*b* of the body define, when assembled, two sockets 35 and 36. In the socket 35 is a detent member 37 and in the socket 36 is a detent member 38. Springs 39 and 40, respectively, are provided in the sockets 35 and 36 behind the detents 37 and 38 and yieldably urge the detents outwardly toward the stems of the pushbuttons, respectively. The stem of the pushbutton 10 has on its inner face a channel 42 which, at the bottom, terminates in a latching shoulder 43. Correspondingly, the stem of the pushbutton 11 has a channel 44 which at its bottom terminates in a latching shoulder 45. Also, the stem of the pushbutton 10 has a barrier surface 46 and the stem of the pushbutton 11 has a barrier surface 47. In the outward position of either pushbutton, its barrier surface engages the associated detent 37 or 38, as the case may be, and holds it in depressed condition in its socket. The shoulder 43 is positioned so that when the pushbutton 10 is in its inserted operating position, the shoulder 43 is exposed just to the under side of the detent 37, whereupon the detent 37 is forced outwardly by its spring against the base of the channel 42 in overlying contact with the shoulder 43 and yieldably restrains the stem of the pushbutton 10 from moving outwardly. Correspondingly, the detent 38 engages the shoulder 45 of the stem of the pushbutton 11 when that pushbutton is in its inner operating position.

The strength of the springs 39 and 40 are so related to the other springs that they hold whichever pushbutton is in the inner operating position in that position against the force of the return springs, such as the spring 32 of the pushbutton 10 or the spring 33 of the pushbutton 11, plus the added force of the contact seating springs. However, when the pushbutton 11 is forced downwardly, the cam surface 26 engages the rolling element 30 and applies force through it to the slidable element 31, the rolling element 29, and the cam 22. When this applied force becomes sufficient, it forces the pushbutton 10 outwardly, applying the shoulder 43 to the detent 37 with sufficient force to cam the detent 37 back into its socket against the force of the spring 39. Suitable bridges 48 and 49 in the body provide bottom walls of the sockets 35 and 36.

In assembling the mechanism, it is only necessary to place the stems of the pushbuttons in one body member 1*b* of the body in their proper position therein, insert the rolling elements 29 and 30 and the sliding element 31, insert the detents 37 and 38 and their springs 39 and 40 in the partial sockets 35 and 36 in the member 1*b*, insert the element 2 so that its narrow central portion lies between the bases of the springs 39 and 40, and then place the body member 1*a* in place thereon, pressing the members 1*a* and 1*b* firmly together. The pushbuttons both are depressed slightly and the screws inserted through the members 1*a* and 1*b*, respectively, and screwed firmly into the member 2, whereby the body members are connected together and to the supporting plate 4 and held in position. The contacts 20, 21, 24 and 25, with contact points thereon, are mounted in the body by press fitting them into suitable slots in the body. They are preferably tubular so as to permit wires brought through the walls of the terminal box B at suitable knockout points to be connected to them by conventional screws.

In this condition, after the wires are connected, the entire assemblage can be inserted into the terminal box B.

Having thus described my invention, I claim:

1. An interlocked pushbutton mechanism comprising: a pair of body members, each open at one face, detachably secured together with their open faces juxtaposed and defining a hollow body with a guideway therein to which access can be gained when one of the body members is removed, a pair of pushbuttons, guide means in the body at opposite ends of the body, respectively, supporting each pushbutton for movement independently of

the other in directions inwardly and outwardly of the body and transversely of the guideway, the guide means for each pushbutton including slideways on the inner surfaces of the body members, respectively, each pushbutton having a portion movable thereby and disposed within the body, and each portion having a cam surface thereon, the cam surface of one pushbutton being aligned with one end of the guideway and the cam surface of the other pushbutton being aligned with the other end of the guideway, said cam surfaces being positioned to approach and recede from their associated ends of the guideway upon movement of their associated pushbuttons in said directions, respectively, movable means in the guideway and movable endwise thereof and being substantially incompressible endwise thereof, and said movable means being of such length relative to the space between said cam surfaces that one cam surface must be in receded position when the other is in the approached position, and that the movable means transfers sufficient force from each cam surface, as it approaches its associated end of the guideway, to the other cam surface to cause said other cam surface to recede from the end of the guideway associated with said other cam surface, and complementary contact means including stationary contacts in the body and movable contacts carried by the pushbuttons, respectively, and cooperable with the stationary contacts in the body.

2. The mechanism according to claim 1 wherein said movable means include a pair of rigid rolling elements rollable endwise in the guideway and a rigid member movable endwise of, and disposed therebetween in, the guideway with its opposite ends engaging the rolling elements, respectively.

3. An interlocked pushbutton mechanism comprising: a hollow body, a guideway therein, a pair of pushbuttons, guide means in the body supporting each pushbutton for movement independently of the other in directions inwardly and outwardly of the body, transversely of the guideway at opposite ends of the guideway, respectively, cam means on the pushbuttons, respectively, movable means in the guideway and movable endwise thereof and having additional cam means at its ends, respectively, the additional cam means being cooperable with the cam means on the pushbutton adjacent the associated end of the movable means, respectively, to move each pushbutton outwardly of the body by force transmitted through the cam means and movable means when the other pushbutton is moved inwardly of the body, spring means for the pushbuttons, respectively, each spring means being arranged for continuously urging its associated pushbutton outwardly of the body with predetermined force, spring seated detent means for the pushbuttons, respectively, each spring seated detent means operatively interconnecting the body and its associated pushbutton, when the associated pushbutton is in its inward position, under yielding force sufficient to constrain the associated pushbutton from movement outwardly of the body by its spring means, and to release its associated pushbutton when the force of the associated spring means is augmented by additional force applied to the other pushbutton to move it inwardly and transmitted from the other pushbutton to said associated pushbutton through the cooperation of the cam means and movable means.

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