July 12, 1966 YUICHIRO YAMAUCHI ETAL 3,260,802

TWO-STEP PUSHBUTTON SWITCH

Filed March 23, 1964 4 Sheets-Sheet 1

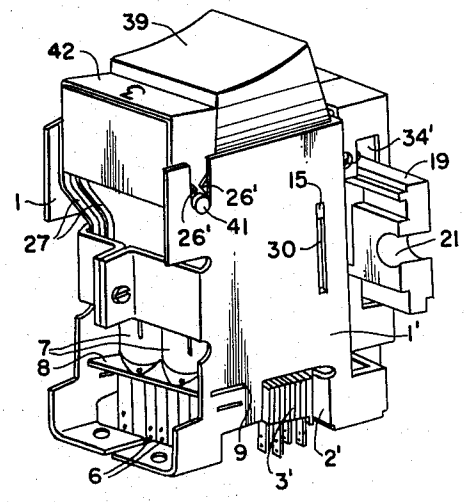

FIG. 1

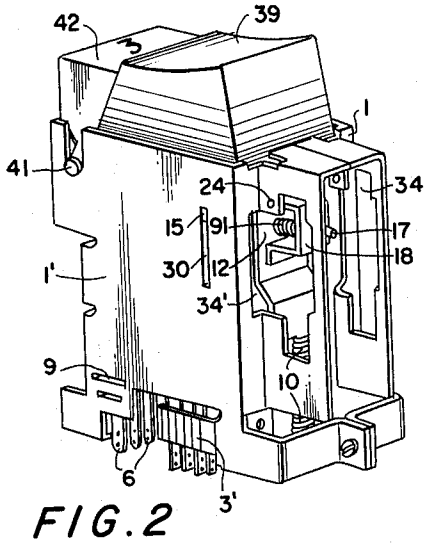

FIG. 2

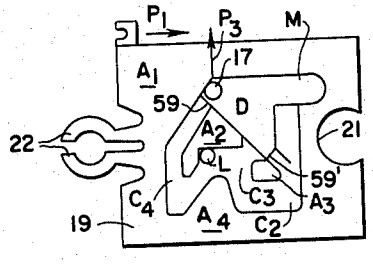

FIG. 5

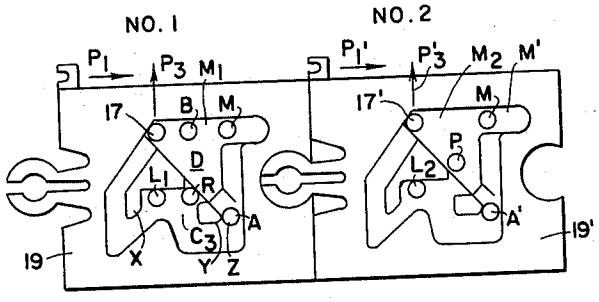

FIG. 6

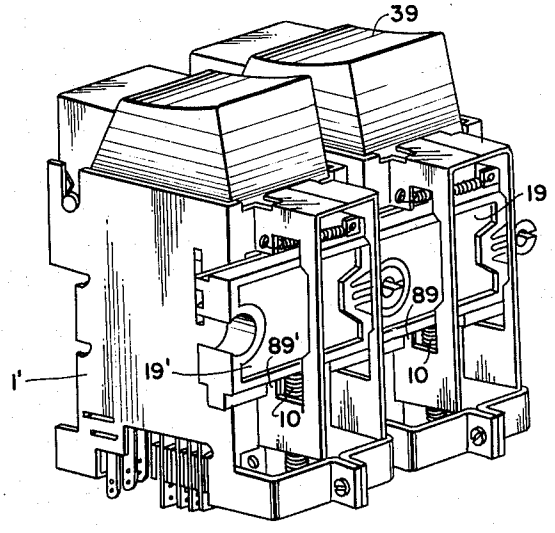

FIG. 7

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FIG. 3a

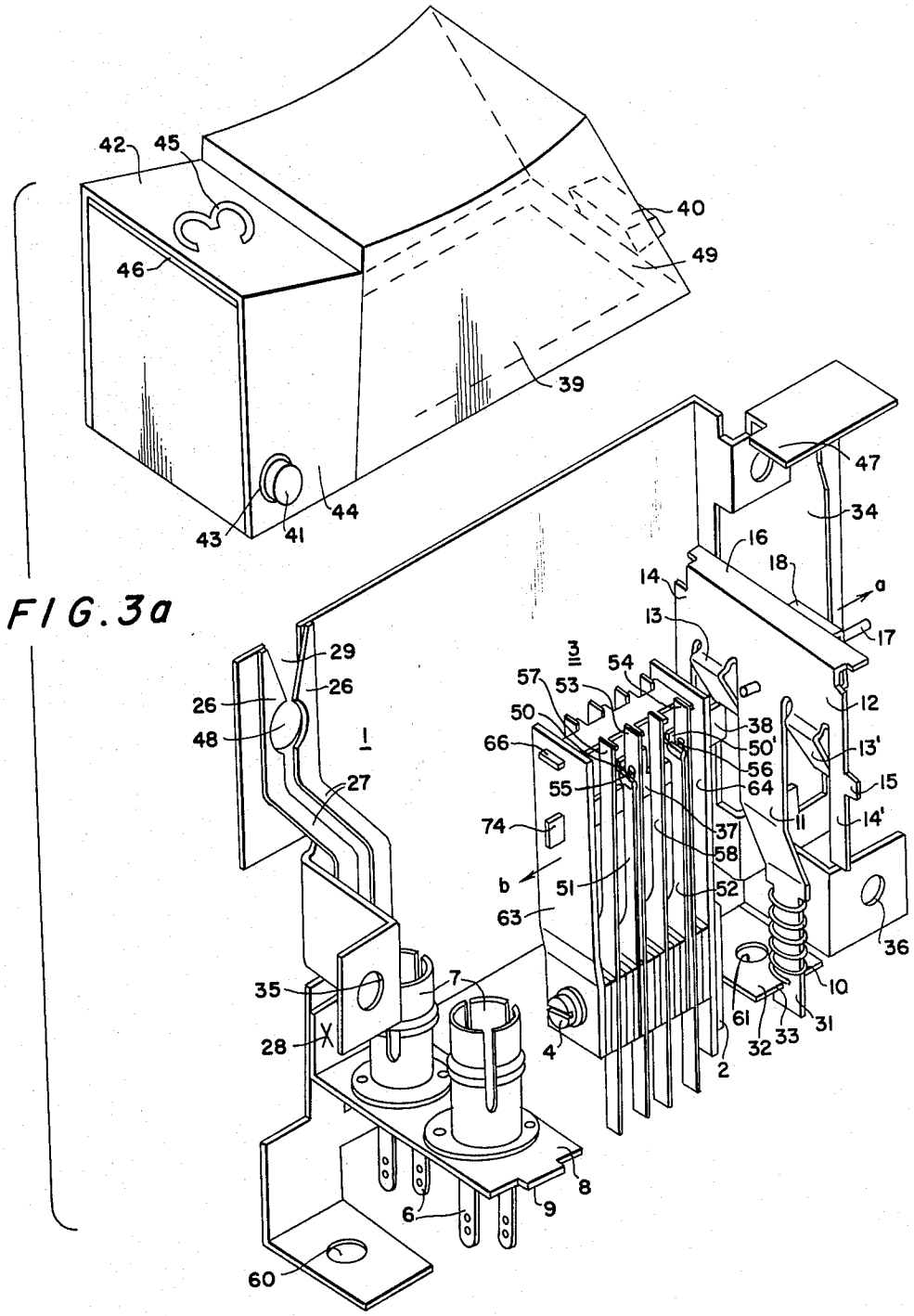

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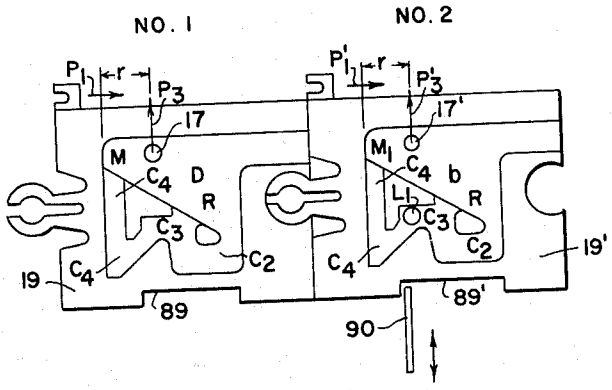
FIG. 8



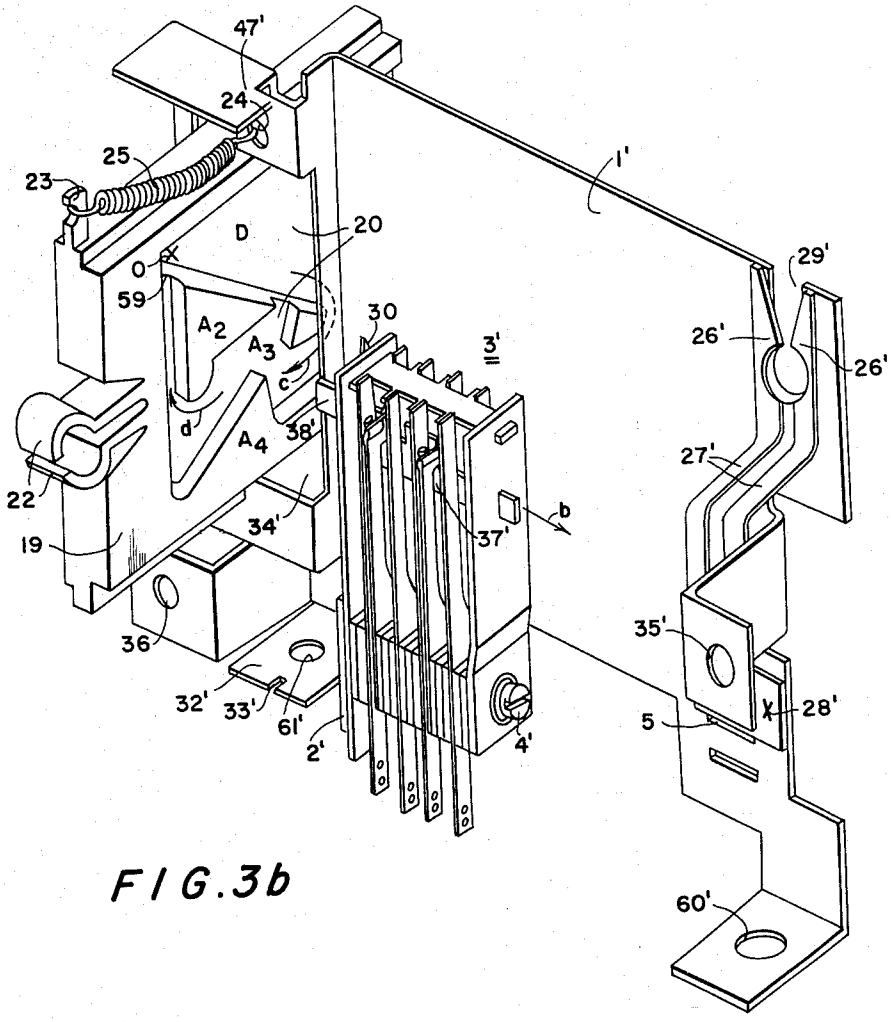


FIG. 3b

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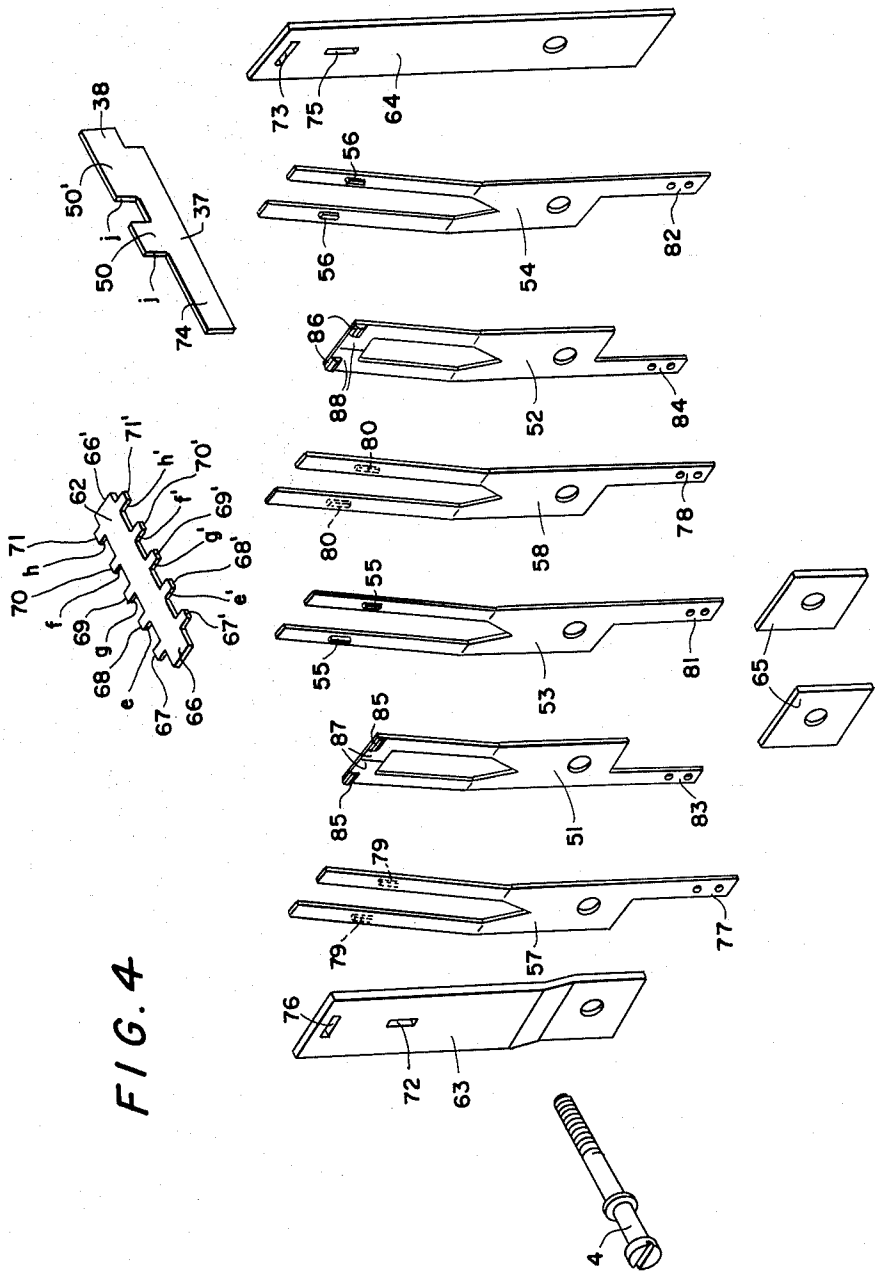

FIG. 4

United States Patent Office 3,260,802 Patented July 12, 1966

3,260,802

TWO-STEP PUSHBUTTON SWITCH

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Filed Mar. 23, 1964, Ser. No. 354,171
Claims priority, application Japan, Mar. 23, 1963, 38/15,190; Dec. 28, 1963, 38/97,966
8 Claims. (Cl. 200—5)

Our invention relates to two-step pushbutton switches in which the pushbutton is locked in its depressed position to keep the switch contacts in deflected or actuated condition, and in which the pushbutton must be depressed a second time to release it for return to the original position and thereby resetting the switch contacts.

It is an object of our invention to provide a two-step pushbutton switch that readily lends itself for selective use as an individual switching unit or in any desired number of mechanically assembled and operatively interlocked units.

More specifically, it is an object of the invention to devise a pushbutton switch which can be used as a unit of a group to permit being actuated by means of its own pushbutton and to be released by actuation of any pushbutton appertaining to the entire group.

Another object of the invention is to selectively permit providing for an interlock of such kind that, once a switch of a group is actuated by means of its pushbutton, it can be released for resetting of its contacts only by actuation of a different pushbutton switch in the group.

Still another object of our invention, subsidiary to those mentioned above, is to make the switch units, particularly the appertaining interlocking components, largely independent from observance of strict manufacturing tolerances so that an accurate performance with respect to mutual interlocking and release within a group of such switches is reliably secured even if the interlocking components of the respective switches differ from each other with respect to accuracy of dimensions.

Another object, akin to the one just mentioned, is to devise a two-step pushbutton switch that permits being assembled to a group of mutually interlocked and mutually releasable units in virtually any desired large number, for example more than 30 or up to about 50, without encountering difficulties beyond ordinary routine.

According to the invention, we provide the pushbutton-actuated shank or slider of a two-step switch with a transverse latch pin which engages a guiding groove in a preferably plate-shaped latch member that is displaceable under the action of the latch pin and the opposing action of a biasing spring to move transversely of the depressing direction of the pushbutton slider. As the pushbutton is being depressed, the latch pin will thus cause the plate member to shift to the left or right until a stop shoulder formed by the guiding groove locks the latch pin in the depressed position of the pushbutton slider in which the switch contacts remain set to the active positions. Furthermore, each latch member or plate is provided with respective coupling means on opposite lateral sides for coupling the latch member with that of an adjacent pushbutton switch in cases where a plurality of such switches are combined to a set of juxtaposed units. When in such a group any pushbutton is being depressed, the latch members of all switch units in the group will shift simultaneously with the result that the first-operated switch can be thereafter released and reset to normal position by actuating any other pushbutton in the group.

The invention will be described more in detail with reference to an embodiment illustrated by way of example in the accompanying drawings, in which:

FIGS. 1 and 2 are perspective views of a pushbutton switch according to the invention seen from different directions respectively.

FIG. 3, comprising FIGS. 3*a* and 3*b*, is a perspective and exploded view of the same switch on larger scale.

FIG. 4 is an exploded view of one of two sets of contact springs which form part of the same switch.

FIG. 5 is a front view of a modified latch plate member applicable in a switch otherwise as shown in FIGS. 1 to 4.

FIG. 6 shows similarly two latch plate members according to FIG. 5 joined together for operation as a single unit.

FIG. 7 is a perspective view of two pushbutton switches joined side by side and having their respective latch members intercoupled according to FIG. 6; and

FIG. 8 is a front view of two intercoupled latch plate members of a design substantially corresponding to that shown in FIG. 3.

The switch illustrated in FIGS. 1 to 5 comprises a frame structure of sheet metal which forms two lateral plates **1** and **1'** punched and bent to symmetrical shape and provided with laterally bent lug portions **2**, **2'** on which two sets **3** and **3'** of contact springs are mounted by means of respective fastening screws **4** and **4'** (FIG. 3) The frame plates **1** and **1'** have respective slots **5** (FIG. 3) engaged by respective projections **9** of an insulating carrier plate **8** on which two sockets **7** (FIGS. 1, 3) for pilot lamps are mounted. The sockets are provided with appertaining terminal strips **6** for soldering respective conductor wires thereto. The displaceable shank for a pushbutton is formed by a slider piece **12** (FIGS. 2, 3) with a downwardly extending middle portion **11** carrying a helical return spring **10**. The slider **12** has sloping cam pieces **13** and **13'** located at opposite sides of the middle portion **11** and bent away from the plane of the slider. Two lateral arms **14** and **14'** of slider **12** have respective guiding noses **15**. Each cam piece **13**, **13'** is thus located between the middle portion **11** and one of the two arms **14**, **14'**, thus being reliably prevented from unduly yielding during displacing movement of the slider **12** imparted thereto by the pushbutton still to be described. The upper marginal portion of the slider **12** is bent laterally to form a top ledge **16**.

Attached to the slider **12** is a latch pin **17** so as to participate in the upward and downward motion of the slider **12**. The latch pin **17** is axially displaceable relative to the slider **12** and is biased by a helical spring **91** (FIG. 2) which is seated on the latch pin **17** between the legs of a mounting stirrup **18** welded to the slider **12**. The spring **91** tends to move the latch pin **17** in the direction indicated by an arrow "*a*" in FIG. 3 toward and into a groove **20** formed in a displaceable latch plate member **19** (FIGS. 1, 3, 5) of molded plastic material, which in FIG. 3 is shown turned about 90° away from its normal position for the purpose of exposing the interior parts of the switch. One of the positions in which the latch pin **17** may engage the groove **20** in latch plate member **19** is apparent from FIG. 5 more fully described below. The latch member **19**, in coaction with the latch pin **17**, serves to lock the pushbutton slider **12** in its depressed, active position.

Provided on one side of the latch member **19** are two semicircular projections **22** which jointly form an elastically compressible plug. On the opposite side of the latch slider there is provided an arcuate, concave recess **21** (FIG. 5) which extends over more than 180° and matches the external shape of the generally circular plug formed by the projections **22** so as to be capable of matingly receiving and retaining the plug projections (**22**) of an adjacent slider, as will more fully appear from the description given below in conjunction with FIG. 6. A helical pull spring **25** (FIG. 3) has one end hung into

an eye 24 in the upper part of frame plate 1', the other end of the spring being attached to a hook 23 formed in the upper portion of the latch plate member 19 at the side of the projections 22.

Mounted on the inner side of each frame plate 1 and 1' and located opposite each other are respective bearing members 27 and 27' of sheet metal whose thickness is smaller than that of the frame plates. The upper portion of each bearing member forms two tapering projections 26, 26'. The lower ends 28 and 28' are welded to the respective frame plates 1 and 1'. The tapering projections 26, 26' of each member overlap a recess in the adjacent frame plate and form a circular journal opening 48 merging with an upwardly widening gap 29, 29' of V-shape which is open toward the top edge of the frame plate.

The parts so far described are assembled as follows. The projections 9 of the insulating carrier plate 8 are inserted into the slots 5 of frame plates 1, 1' and the guiding noses 15 of the slider 12 are inserted into corresponding guiding grooves 30 (FIG. 2) of the frame plates. The lower end 31 of the pushbutton stem 11 is inserted into respective slots 33 and 33' in laterally bent lugs 32 and 32' formed by the respective frame plates 1 and 1'. The latch member 19 is inserted through a guide window 34, 34' (FIG. 3) formed by the frame plates 1 and 1' respectively. Then the assembly is tightened and fastened together by means of two small screws (not shown) passing through holes 35, 35' and 36, 36' (FIG. 3). As will be more fully described below, the cam pieces 13 and 13' of the slider 12 are now positioned at the ends 38 and 38' of respective follower bars 37 and 37' which form part of two previously attached sets 3, 3' of contact springs; and the latch pin 17 is positioned at the deepest spot O (FIG. 3) of the groove 20 in the latch plate 19.

The pushbutton 39 (FIGS. 1, 2, 3) of the switch is molded of plastic material and has generally the shape of a box with a projection 40 at its lower rear end and two coaxial journal pins 41 located laterally near the opposite end. The projection 40 and the pins 41 form an integral part of the molded pushbutton body. A thin plate 42 of transparent material is placed on top of the front portion and has lateral legs 44 and 44' (not seen because of the views of FIGS. 1, 2 and 3) with respective openings 43 snapped over the pins 41. An identifying card or slip 46 exhibiting, for example, an identifying numeral or other character 45, is thus held on the pushbutton, remaining visible through the transparent cover plate.

As shown in FIG. 1, the pushbutton body 39 is located at the top of the frame plates 1 and 1'. It is attached by inserting the projection 40 beneath two mutually adjoining stop plates 47, 47' bent laterally away from the respective frame plates 1 and 1', and then pushing the respective pins 41 through the V-gaps 29, 29' into the journal openings 48 and 48' of bearing members 27 and 27' (FIG. 3). When the pushbutton, thus seated, is being depressed, it turns downwardly about the pivot axis of its journal pins 41. Then the lower part 49 of the pushbutton, near the projection 40, is located on top of ledge 16 (FIG. 3) on slider 12, thus forcing the slider 12 downward in opposition to the force of return spring 10.

When the slider 12, by actuation of the pushbutton 39, is being depressed from the off position, the cam pieces 13 and 13' move downwardly and push against the ends 38, 38' of the follower bars 37, 37' thus shifting them in the direction of the arrow "*b*" (FIG. 3). As a result, the teeth 50 and 50' (FIGS. 3, 4) of the follower bar 37 separate movable contact springs 51 and 52 from the contact points 55, 56 of fixed contact springs 53, 54 and switch the movable contact springs into contact with the corresponding contact points of fixed contact springs 57 and 58 in set 3. The contact springs in the second set 3' are operated by the follower bar 37' in exactly the same manner.

In the operating condition thus reached, the latch pin 17 is locked to point P (FIG. 6) in the guiding groove 20 of latch plate member 19, having shifted along the groove in the direction indicated in FIG. 3 by an arrow "*c*." Consequently, the contact springs are kept in the actuated condition, and the pushbutton 39 with slider 12 remains arrested in a depressed position.

When thereafter the pushbutton is again depressed and released, the latch pin 17 moves along the path indicated by an arrow "*d*" in FIG. 3 until it drops from the shallowest portion of the groove at step 59 into the latching position at the deepest point O of the groove. Now the contact springs have returned to the original position of rest and the latch pin 17 remains locked in the position O. To obtain this latching operation, the guiding groove 20 in latch slider 19, being deepest at the position O, becomes progressively shallower along the path denoted by the arrows "*c*" and "*d*" until the shallowest point is reached at step 59.

Circular holes 60, 60' and 61, 61' in the frame structure of the switch (FIG. 3) permit mounting the switch on a panel or support.

As shown in FIG. 4, the set 3 of contact springs comprises an insulating flat spacer piece 62, the abovementioned follower bar 37, a mounting screw 4, two rigid end plates 63 and 64 of sheet metal, the contact springs 57, 58, 53, 54 and a number of intermediate insulating inserts 65 of which only two are shown.

The spacer piece 62 has a forward and rear projection 66, 66' and has on both longitudinal sides a number of spacing projections 67, 67', 68, 68', 69, 69', 70, 70', 71, 71'. The projection 66 is inserted into a slot 76 of the end plate 63, and the projection 66' into a corresponding slot 73 of the end plate 64.

The follower bar 37 has teeth 50, 50'. One end 38 of bar 37 passes through a slot 75 in end plate 64. The other end 74 of bar 37 is inserted through a slot 72 of the opposite end plate 63.

The fixed contact springs 57 and 58 are of identical construction. Their upper part is bifurcated. Their lower part forms a terminal strip 77, 78. Elongated and vertically extending contact members 79 and 80 are provided on the rear side of respective contact springs 57 and 58. The upper ends of fixed contact spring 57 rest elastically against sides *e*, *e'* of the respective projections 68 and 68' formed by the spacer piece 62. The upper ends of fixed contact spring 58 rest against the sides *f* and *f'* of respective projections 70 and 70'.

The fixed contact springs 53 and 54 are of the same construction as the above-mentioned contact springs 57 and 58 and have respective terminal strips 81 and 82. Mounted on each leg of the bifurcated upper portion is an elongated and vertically extending contact member 55, 56. The two legs of contact spring 53 rest against the sides *g* and *g'* of respective projections 69 and 69', and contact spring 54 has its legs resting against the sides *h* and *h'* of projections 71 and 71' on the spacer piece 62.

The moving contact springs 51 and 52 are of the same shape, each having a terminal strip 83, 84 at the lower end and having the upper portion separated into two parts. Each of the upper parts is provided with elongated, horizontal contact members 85, 86 on the front and rear sides. Since the fixed contact springs have vertically extending contact members while the moving contact springs have horizontally extending contact members, a firm point contact or *x*-type contact is always made between each two mutually engaging springs. The inward projections 87 of spring 51 rest against the end face *j* on tooth 50 of follower bar 37, and the inward projection 88 of spring 52 rests against the corresponding end face of tooth 50'. In the condition of rest, the moving contact 85 is in elastic engagement with the fixed contact 55, and the moving contact 86 engages the fixed contact 56. Each fixed and moving contact spring is slightly bent at the bifurcated upper part to provide for satisfactory elasticity.

The contact-spring set 3 (FIG. 4) is assembled as follows. The spacer piece 62, follower bar 37, end plates 63, 64 and contact springs 57, 58, 53, 54, 51 and 52 are placed in proper position relative to one another. Then

an insulating insert **65** is placed between each end plate and the adjacent contact spring, and also between each two adjacent contact springs. The assembly is then attached to the lug **2** of the frame plate **1** by the screw bolt **4** passing through all of the corresponding holes in the individual components then registering with each other as is apparent from FIG. 4. Thereafter the follower bar is properly positioned upon the separated parts of each spring as described in the foregoing.

If the cam piece **13** (FIG. 3) is being depressed by means of the pushbutton, the follower bar **37** moves toward the left as indicated by the arrow "b," and the end faces *j* of teeth **50** and **50'** (FIG. 4) press the projection **87** of moving contact spring **51** in the same direction, thus shifting the contact members **85** into engagement with the fixed contact members **79**, and the moving contact members **86** into engagement with the fixed contact members **80**.

The set of contact springs **3'** is assembled and operative in the same manner as described above with reference to the set **3**.

Referring now to FIGS. 5, 6 and 7, the design of the molded latch member **19** will be more fully described. The plate-shaped member **19** has on its illustrated front side a recess which forms the above-mentioned guiding groove **20** of varying depth. The groove **20** is generally triangular with a point at the top and its base at the bottom, and an extension of the groove extends horizontally from the top point toward the right (FIG. 5). The member **19** is further provided with a concave coupling recess **21** at one side and two semi-circular projections **22** at the opposite side. The projections **22** jointly form a compressible plug mating the coupling recess **21**. By virtue of the socket recess and the plug projections, any desired number of such latch members can be coupled together to form a single mechanical unit such as the one apparent from FIGS. 6 and 7 or the modified pair of intercoupled latch plate members shown in FIG. 8.

The depth of the guiding groove **20** in the latch slider **19** shown in FIG. 5 has its depth graduated as follows. The surface portions denoted by **C2**, **C3** and **C4** are deeper than the surface areas denoted by **A1**, **A2**, **A3** and **A4**; and the area **D** is deeper than the areas **C2** to **C4**. The area **D** slopes upwardly toward the area **C2** and forms a top ridge at **59'**. As mentioned, a step **59** is formed between the groove bottom constituted by area **C4** and the adjacent deeper area **D**. The tip of the latch pin **17** glides in the groove and over the ridge and step thus formed, being pressed against the latch plate by the above-mentioned spring **91** (FIG. 2) which causes the pin to always engage the bottom of the recessed surfaces. Simultaneously the latch plate member **19** is biased by the pull spring **25** (FIG. 3) so as to be subjected to a force indicated by an arrow **P1** in FIG. 5. The latch pin **17** is further subjected to a force in the upward direction as indicated by an arrow **P3**, this force being exerted by the return spring **10** (FIG. 3).

In the static condition of rest, the latch pin **17** is positioned at point M (FIG. 5). When the latch pin **17** is being moved downwardly by depression of the pushbutton, it travels against the force **P3** along the sloping edge of area **D**, passes over the top of ridge **59'** and then downwardly to the groove area **C2**. The further downward motion of the latch pin **17** and consequently of the pushbutton slider **12** (FIG. 3) is stopped when the latch pin **17** abuts against the bottom edge of groove area **C2**. On this travel, as the latch pin **17** reaches the crest of ridge **59'** between areas **D** and **C2**, it shifts the latch pin **17** up to the level of area **C2** against the biasing force of the spring **91** (FIG. 2), and when the latch pin passes downwardly beyond the raised surface area **A3** it will snap against the stop wall formed by the raised surface portion **A4** adjacent to the groove portion **C2**, due to the force **P1**. Thereafter no further movement of the latch pin **17** and consequently of pushbutton **39** and slider **12** will take place. The contact-spring sets are now placed in the active position.

When thereafter the pushbutton is released, the slider **12** with latch pin **17** moves up under the biasing force **P3**, and the latch pin **17** strikes against the stop shoulder formed by the raised area **A2**. Now the pin **17** is held locked in the position L (FIG. 5) by the joint action of the biasing forces **P3** and **P1**. Consequently, the slider **12** cannot move to the inactive position, and the cam pieces **13** and **13'** (FIG. 3) maintain the contact-spring sets **3**, **3'** in the actuated condition by continuing to press against the ends **38**, **38'** of the followers **37** and **37'**.

Since the pushbutton **39** is located at respectively different heights when the switch is in ON and OFF positions, the different heights can be used for an indication of the switch conditions. However, such indication can also be obtained by means of the above-mentioned pilot lamps.

When the pushbutton is depressed a second time, the latch pin **17** is moved downwardly from the position L (FIG. 5) to the lower end of groove area **C4** adjacent to the raised surface portion **A4**. When then the pushbutton is released, the latch pin **17** glides in the groove **C4** upwardly under the action of force **P3** until it drops at step **59** to the deeper area **D** where it resumes the original static condition of rest. Now the spring sets are returned to the original operating condition, and the switch is ready for another operating cycle.

When two pushbutton switches according to the invention are joined together as shown in FIGS. 6 and 7, the operation is as described presently, it being understood that the same description applies to any larger number of such juxtaposed and interconnected switches.

In the static condition of rest, the respective latch pins **17** and **17'** of the two switches are in the positions **M1** and **M2** shown in FIG. 6. Assume that the pushbutton of switch No. **1** is being depressed, the pushbutton of switch No. **2** remaining in the original position. Then only the latch pin **17** of switch No. **1** will travel along the recessed portion of the latch plate member **19** substantially, but not entirely, in the manner described above with reference to FIG. 5, whereas the latch pin **17'** of switch No. **2** will not perform any downward motion so that relative to this pin only the appertaining latch plate member **19'** will shift.

When the latch pin **17** of switch No. **1** has travelled downwardly along the slope of area **D** and has reached the point A, the latch pin **17'** of switch No. **2** has remained at the same height and consequently has reached the position M' relative to plate member **19'**. When thereafter the latch pin **17** of switch No. **1** reaches the stop position by virtue of the functions explained above with reference to FIG. 5, it cannot abut against the shoulder formed by the raised area **A2** and hence cannot reach the position L shown in FIG. 1 but will remain in the position **L1** shown in FIG. 6. This is due to the fact that the latch pin **17'** of switch No. **2** is now again in the original position **M2** and prevents a further motion of both latch plate members toward the right, despite the continued biasing force **P1**, **P1'**.

Now, the contact springs of only switch No. **1** are in actuated position, whereas switch No. **2** (or any additional switches joined therewith) remains inactive.

When thereafter the pushbutton of switch No. **2** is being depressed, it will place the spring contacts of switch No. **2** to active position in the same manner as described above. At the same time, switch No. **2** will release switch No. **1** and reset it to the inactive position of rest. This takes place as follows.

As the pushbutton of switch No. **2** is being depressed, the latch pin **17'** moves downwardly, whereas the latch pin **17** of switch No. **1** remains at the lowered height previously occupied. When the latch pin **17'** thus reaches the point P (FIG. 6), the latch pin **17** is in the position

R relative to the latch member 19. Thereafter the latch pin 17 drops from the groove area C3 to the deeper area D under the biasing force of spring 91 (FIG. 2) and thereafter snaps up to point B under the force P3. After the latch pin 17' has reached point A', the latch pin 17 moves from point B to point M. The latch pin 17 returns to point M1, thus assuming the original position of rest, whereas the latch pin 17' is kept locked at point L2. Consequently, now switch No. 2 is set to active position, and switch No. 1 is reset to inactive position.

The above-described performance of intercoupled switches according to the invention is not predicated upon observance of close tolerances with respect to dimensions and slope conditions in the latch plate members or latch pins. The dimensions as well as the pitch of the slopes in the latch members 19 and 19' may considerably differ from precise values, and the dimensions of the latch members particularly at the localities identified by *x*, *y* and *z* in FIG. 6 may be made rather large without impairing the proper operation.

Consequently, a group of switches according to the invention will operate satisfactorily even if there are considerable differences with respect to sloping pitch or in the event of minor manufacturing defects. With the conventional type of switches, such a perforance can be obtained only with great difficulty and it has been virtually infeasible to connect any desired number of switching units even when all available economical precautionary expedients are observed. Heretofore, as a rule, it has been necessary to assemble only a given limited number of pushbutton switches within a single frame for interlocking cooperation.

In contrast thereto, a pushbutton switch according to the invention can readily be made in such a manner that no defective operation is encountered with any desired number of units, for example about 50 units, connected mechanically in series as described, without imposing any particularly exacting requirements upon tolerances with respect to precise dimensions.

For some applications, the latch slider 19 or 19' can be removed from one or more of switches assembled in the manner shown in FIG. 7, if the assembly is to comprise individually operable units. Due to the snap movement of the latch slider, it is further possible to use it for the purposes of a snap-action switch to be operated by a pushbutton.

In view of the versatility of application to which a switch according to the invention lends itself, the manufacturing costs, such as those involved in producing the necessary molding equipment, are considerably reduced in comparison with those needed with the corresponding variety of different designs heretofore employed to suit the same diversity of purposes.

The latch members shown in FIG. 8 (and FIG. 3) are basically similar to those according to FIG. 6, except that a space *r* is provided between the initial position M of the latch pin 17 when in the locked condition illustrated. Accordingly, when the pushbutton of switch No. 2 is being depressed, the appertaining latch pin 17 becomes locked in the position L' as in the embodiment of FIG. 6. However, during the travel of the latch pin, it will move along the groove areas C3 and C4 because of the presence of the space *r*; and if the pushbutton is released by the operator's hand, the latch pin will move back upwardly through the groove C4. Likewise, if a pushbutton other than that of switch No. 2 is being depressed, the latch pin previously locked in position L1 will be released for upward movement through the groove C4.

FIG. 8 further shows a modification which, while permitting a pushbutton switch to be depressed from inactive to active position, prevents resetting of this same switch to the inactive position by renewed depression of its own pushbutton, so that this particular switch can be reset only by depressing the pushbutton of a different switch

in the intercoupled group. This kind of interlock is achieved by providing the latch members with a marginal recess 89, 89' at one side thereof and having this recess engaged by a stop 90 fixed to the frame structure of the switch. As shown in FIG. 8, the stop 90 is so mounted that it engages the left end of the recess 89' in latch member 19'. Accordingly, the stop 90 prevents displacement of the latch assembly toward the right. The stop 90 can be provided for any one or more of the intercoupled latch members.

Since the stop 90 prevents the latch member 19' from sliding to the right, the member cannot be shifted in the direction required to release the locked latch pin from the active position L1. Consequently, when the switch No. 2 is once depressed and locked in the active condition of its contact springs, it cannot be reset by means of its own pushbutton but requires actuation of a different pushbutton switch in the same group. For example, if the pushbutton of switch No. 1 is being depressed, the intercoupled latch members 19 and 19' will move to the left and then the latch pin 17' will move from the locked position L1 through the groove C3 into the area R, whereafter the pin can move upward under the biasing force P3' to reset the switch No. 2.

When no stop 90 is provided, any one of the intercoupled switches can be placed into active or inactive position by operation of its own pushbutton.

In FIG. 7 the interlocking action produced by the above-mentioned stop 90 is secured by the particular shape of the groove in the latch plate member 19. For example, when the latch pin 17 of switch No. 1 is locked in position L1, the movement of the latch pin 17' to the right is prevented because the latch pin 17' of switch No. 2 then abuts against the left-hand end of the deep area D in the groove. Consequently, the switch No. 1 can be reset only by depressing the pushbutton of switch No. 2.

To those skilled in the art, it will be obvious upon a study of this disclosure, that our invention permits of various modifications and can be given embodiments other than particularly illustrated and described herein, without departing from the essential features of the invention and within the scope of the claims annexed hereto.

We claim:

1. A two-step pushbutton switch, comprising contacts movable between two switching positions, a pushbutton slider displaceable from a normal to a depressed position, a return spring biasing said slider to normal position, means on said slider for moving said contacts from one to the other of said switching positions by depressing movement of said slider, a latch pin mounted on said slider for movement therewith, a latch plate member, means movably mounting said latch plate member for movement transversely of the displacement direction of said slider, said latch plate member having a groove engaged by said latch pin, said groove having a closed-loop shape in a plane parallel to said displacement direction and forming a stop shoulder for latching said pin in depressed position of said slider, spring means biasing said latch plate member to a given start position of said groove relative to said pin, said latch plate member having opposite said shoulder a sloping groove wall guidingly engageable by said pin upon repeated depression of said slider to then release said pin for return of said slider to normal position, and said latch plate member having respective mating coupling means on opposite lateral sides to permit joining said latch plate member with the corresponding member of an adjacent switch.

2. In a pushbutton switch according to claim 1, said latch pin being axially displaceable on said pushbutton slider, and another spring engaging said pin to bias it toward the bottom of said groove in said latch plate member.

3. In a pushbutton switch according to claim 1, said coupling means on one side of said latch plate member forming a plug projecting from said side, and said cou-

pling means on the other side being formed by a socket recess in said latch plate member having a shape mating the plug.

4. In a pushbutton switch according to claim 1, said coupling means comprising two coupling members, one of said coupling members being positioned on one side of said latch plate member and consisting of two arcuate projections spaced and curving away from each other and being elastically compressible toward each other, said projections forming an integral part of said plate member, said plate member consisting of insulating plastic material and having a concave recess which forms the other of said coupling members.

5. In a pushbutton switch according to claim 1, said groove of said latch plate member being generally triangular, with a point at the top and the base at the bottom and having an additional portion extending laterally away from said point in substantially parallel relation to said base, said groove having at said base an upwardly projecting stop wall for limiting the spring-biased lateral movement of said member when said pushbutton slider is being held depressed, said stop shoulder extending downwardly above and near the peak of said stop wall for catching said latch pin when said slider is being released to move upwardly under the bias of said return spring.

6. In combination, a group of juxtaposed and operationally interlocked pushbutton switches, each switch comprising contacts movable between two switching positions, a pushbutton slider displaceable from a normal to a depressed position, a return spring biasing said slider to normal position, means on said slider for moving said contacts from one to the other of said switching positions by depressing movement of said slider, a latch pin mounted on said slider for movement therewith, a latch plate member, means movably mounting said latch plate member for movement transversely of the displacement direction of said slider, said latch plate member having a groove engaged by said latch pin, said groove having a closed-loop shape in a plane parallel to said displacement direction, spring means biasing said latch plate member to a given start position of said groove relative to said pin, said groove forming a stop shoulder for latching said pin in depressed position of said slider, said latch plate member having opposite said shoulder a sloping groove wall guidingly engageable by said pin upon repeated depression of said slider to then release said pin for return of said slider to normal position, and said latch plate member having respective mating coupling means on opposite lateral sides respectively; the coupling means of mutually adjacent ones of said switches in said group being coupled with each other so that movement of each latch plate member causes simultaneous movement of each other latch plate member, whereby each of said switches actuated by depression of its pushbutton slider can be reset to normal position by actuation of any other switch in said group.

7. In a group of mutually interlocked pushbutton switches according to claim 6, said latch plate members comprising travel limit means for preventing said latch plate members from moving away from the latching position of said latch pin in the direction opposed to the biasing direction of the spring means biasing said latch plate members, whereby each of said switches actuated by depression of its pushbutton slider can be reset to normal position only by actuating another switch in said group.

8. In a group of mutually interlocked pushbutton switches according to claim 6, each of said latch plate members having a marginal stop shoulder on a lateral side, and a fixed stop engageable with said latter shoulder for preventing said latch plate members from moving away from the latching position of said pin in the direction opposed to the biasing force of the spring means biasing said latch plate members.

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