May 9, 1950 R. A. BECWAR 2,506,987

PUSH BUTTON SWITCH

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FIG. 1

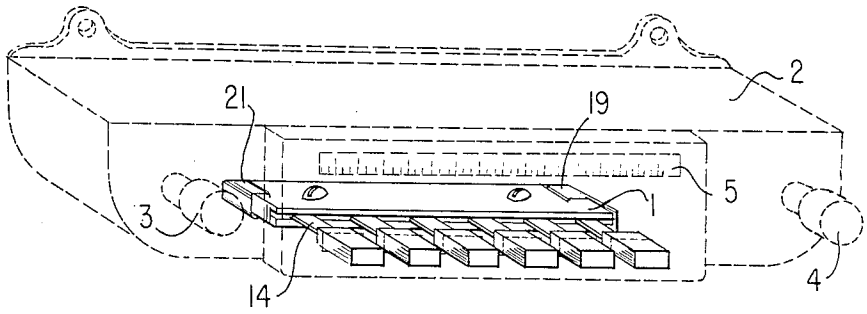


FIG. 2

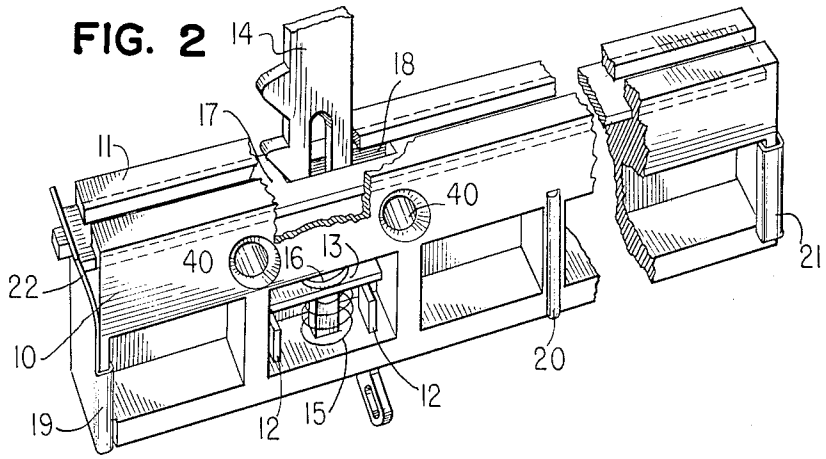
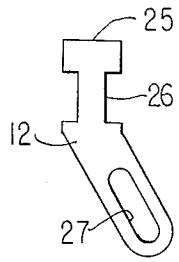


FIG. 6



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FIG. 3

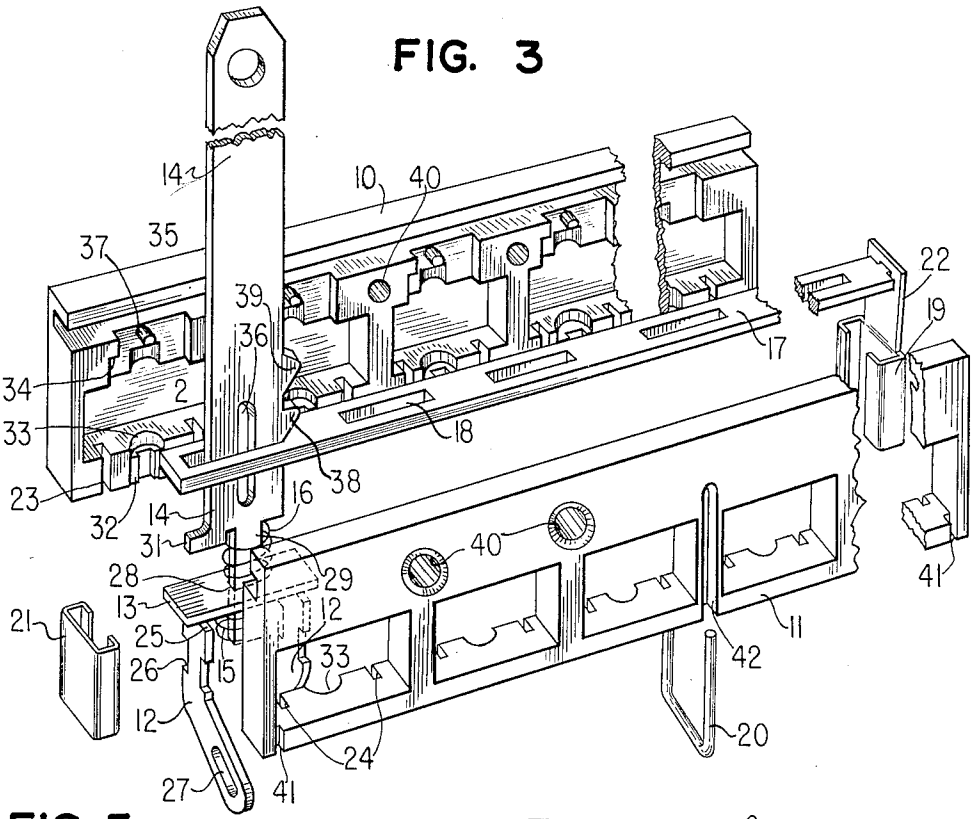


FIG. 5

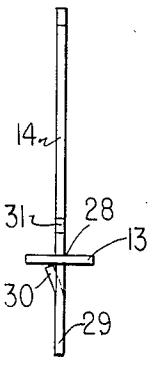
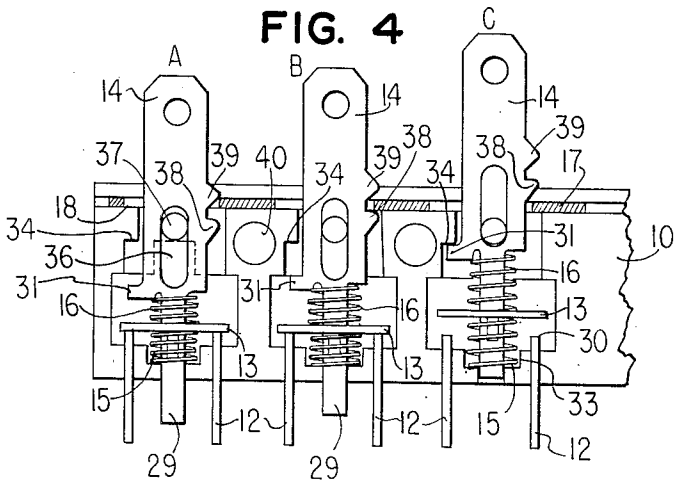


FIG. 4



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PUSH-BUTTON SWITCH

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5 Claims. (Cl. 200—5)

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This invention relates generally to switches and in particular to a self locking push button switch of compact construction.

In the prior art push button switches have been used for many applications as, for example, in selecting mechanisms such as are used on radio receiver sets for selecting predetermined radio stations. Such push button switches have generally been of complicated construction and required a considerable amount of space in the control panel or wherever installed. Also such switches have been subject to faulty operation due to critical adjustment of the components and have required frequent servicing to keep the switch assembly in proper operating condition.

It is an object of this invention, therefore, to provide an improved self locking push button switch of simple and rugged construction and of small dimensions.

It is a further object of this invention to provide a simple and improved push button switch assembly having means for locking a push button which has been depressed and for releasing all other push buttons when one button is being depressed.

It is a still further object of this invention to provide a self locking push button switch assembly entirely made up of components which can be constructed and assembled by production line methods.

It is an additional object of this invention to provide a push button switch assembly in which the components are rugged and securely positioned so that they will remain in operation over long periods of use without requiring servicing thereof.

A feature of this invention is the provision of a self locking push button switch assembly made entirely of molded members and stamped metal members which can be constructed and assembled in a fast and economical manner.

A further feature of this invention is the provision of a self locking push button switch assembly including two molded insulating members having recesses and projections thereon for retaining the components of the switch assembly in position therebetween without other securing means and means for clamping the insulating members together to form a rugged switch assembly.

An additional feature of this invention is the provision of a push button switch assembly having locking means for retaining a push button switch which has been actuated in said actuated position, including means responsive to operation of

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said push buttons for releasing said locking means and causing said switches to be returned to their normal position.

A still further feature of this invention is the provision of a self locking push button switch assembly which is compact and requires very little space for installation. The dimensions of a specific embodiment of the switch assembly including six switch units are approximately ¾ of an inch wide, ¼ inch thick, and 4 inches long.

Further objects, features and advantages of this invention will be apparent from a consideration of the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a view showing the switch installed in a control panel;

Fig. 2 is a perspective view of portions of the switch assembly in accordance with this invention;

Fig. 3 is an exploded view of the switch assembly showing the components of the switch units;

Fig. 4 is a fragmentary cross sectional view showing the operation of the switch;

Fig. 5 is an end view of one of the actuating members of the switch assembly showing the contact bridging member supported thereon; and

Fig. 6 is a detail view of one of the terminals.

In practicing my invention, I provide an insulating housing formed of two parts having recesses and projections thereon forming a plurality of cavities in which a plurality of switch units are positioned. The switch units include two contacts and a bridging member therefor which is controlled by an actuating member having a portion extending outside the housing. Locking means are included for cooperating with the actuating members to lock the actuating members which have been depressed, the locking means being disengaged when a member is being depressed to thereby release other members which are locked. The locking means is also released when a locked actuating member is further depressed thereby releasing any other members which are also locked but not disturbing the bridging member of the switch unit which is further depressed and not releasing this switch. All of the components of the switch units and the locking means are held in assembled relation and in operative position in the housing solely by engagement with the recesses and projections of the parts of the housing.

Referring now to the drawings, in Fig. 1 the push button switch assembly 1 is shown installed in a control panel 2 for use with an automobile radio receiver. The control panel also includes

a volume control 8, a manual tuning control 4 and an indicating mechanism 5 for readily indicating the position of the manual tuning control.

In Figs. 2 and 3 are shown the details of the push button switch assembly consisting of an insulating housing formed of molded members 10 and 11 which are arranged to be fastened together forming cavities therebetween for the components of the switch mechanism. The switch assembly includes a plurality of switch units, each of which includes two contacts 12, a bridging member 13, an actuating member 14 and springs 15 and 16 positioned on either side of the bridging member. A locking bar 17 for cooperating with said actuating members is mounted for sliding movement between the molded members. The locking bar has slots 18 therein through which the actuating members 14 extend. Clamps 19, 20 and 21 are provided for securing the insulating members together with the switch component therebetween forming a rugged and compact assembly. The clamp 19 has an extension 22 thereon which acts as a spring to hold the locking bar 17 in locked position as will be hereafter described. Except for the spring 22 on the clamp 19, clamps 19 and 21 are of identical construction and are adapted to engage the ends of the molded members, slots 41 being provided therein for the clamps. Slots 42 are provided for clamp 20 which holds the center portions of the molded members together.

The contacts 12 are held in the assembly in slots 23 and 24 in the molded members 10 and 11 respectively (Figs. 3 and 6) and include contacting surface 25, recesses 26 for fitting in the slots and terminal portions 27. The terminal portions in adjacent slots are turned in opposite directions to provide more space for making connection thereto. That is, the two contacts of each switch unit are turned in opposite directions and the contacts of adjacent switch units are disposed in opposite directions . The bridging members 13 have openings 28 therein in which fingers 29 of the actuating members 14 are positioned. A punched-out portion 30 of the finger 29 (Fig. 5) limits the movement of the bridging member 13 along the finger, but permits movement of the bridging member 13 between the projection 30 and the stop 31 of the actuating member under the control of the spring 15. A recess 32 is formed in the insulating member 10 for the finger 29 and a similar recess, not shown, is provided in insulating member 11. Recesses 33 are provided for the spring 15 which tends to hold the bridge member 13 away from the contacts and the actuating member in a normal position with the stop 31 in contact with the shoulder 34 on the molded member 10. The body portion of the actuating member 14 fits in slots 35 in member 10 and 11 and has an opening 36 therein fitting over a projection 37 on the member 10 to maintain the actuating member in proper position between the insulating member and permit longitudinal movement of the member therebetween. The actuating member 14 has projections 38 and 39 thereon which cooperate with locking bar 17 to retain the actuating member in actuated position and release the actuating member as will be explained later.

The operation of the structure will be described in connection with Fig. 4. In this figure three switching units are shown but, as is apparent, any number of switching units may be provided in the push button switch assembly according to this invention. The three switching units shown

in Fig. 2 are designated A, B and C for ease in referring to these units. As is previously stated, the actuating members 14 are positioned between the insulating members and are free to move in a vertical direction as illustrated in Fig. 4. In this figure the switching unit C is in the normal position in which the spring 15, positioned between the bottom of the recess 33 and the bridging member 13, holds the bridging member away from the contacts 12. The spring 16, positioned between the bridging member 13 and the body portion of the actuating member 14, holds the actuating member in a normal position. The spring 16 is designed to exert a greater force on the bridging member 13 than the spring 15 and, for example, in a particular structure the spring 15 exerts a pressure of approximately 2 ounces and the spring 16 a pressure of approximately 5 ounces. However, in the normal position, the projection 30 on the finger 29 of the actuating member prevents the bridging member 13 from being moved into engagement with the contacts 12 by the spring 16.

The switch unit B is illustrated in actuated position; that is, the actuating member 14 has been depressed compressing the spring 15, and the bridging member 13 is held in engagement with the contacts 12 by spring 16. It is noted that when the member 14 is actuated the projection 30 is below the bridging member 13 and the bridging member is not held thereby but is held firmly against the contacts 12 by spring 16. As the actuating member 14 is depressed the projection 38 engages the locking bar 17 and the slanting lower surface of the projection causes the locking bar to move to the right against the action of the spring clip 22 illustrated in Fig. 1. After the projection 38 has passed through the slot of the locking member 17, the pressure of the spring 22 will cause the locking member to slide to the left and engage the upper flat portion of the projection 38 holding the actuating member in actuated position. When one or more of the switches are in actuated position and the actuating members locked in such position by the locking bar 17, by depressing an additional actuating member, the locking bar is moved to the right by engagement of the projection 38 of the member being depressed and the actuating members are released and returned to their normal position by the action of the springs 15 and 16.

For the purpose of releasing the locking bar when more than one of the actuating members are locked in actuated position, an additional projection 39 is provided on the actuating member 14 above the projection 38. This projection is operative to release the locking bar 17 by depressing an actuating member from the actuated position to a final position. The switch unit A (Fig. 2) is shown being depressed to this position with the projection 39 engaging the locking bar 17 and moving the bar to the right. It can be seen that when the member 14 is depressed slightly more, the locking bar will be moved to the right by the action of a projection 39 to such extent that the projection 38 of switch unit B will be clear of the locking bar and this switch will be released. The provision of the projection 39 provides two distinct advantages in the operation of the structure. The first is that in the event that all of the actuating members are depressed it will be possible by moving any one of the actuating members to the final position to release all of the other actuating members. The second advantage is that

in the event that two or more switches are inadvertently pressed simultaneously, it is possible to release all except the desired switch by depressing this switch to the final position thereby releasing the other switches that have been depressed with the desired switch remaining locked in the actuated position after being released from the final position. It is to be noted that when an actuating member is moved from the actuated to the final position the bridging member is not moved and remains in engagement with the contacts.

As has been previously stated, the switch assembly according to the invention may be provided with any number of switch units desired. In a specific example of the push button switch in a selective mechanism for radio receivers, six switch units are provided. If a larger number of switch units are used, additional clamping members 20 should be provided so that a rugged assembly will be maintained. Openings 40 are shown in the insulating members to provide means for securing the switch assembly to a control panel or for mounting the switch in any other desired location. The arms of the actuating members may be long or short and may be of any desired configuration to permit the use of various types of actuating push buttons as may be required in a particular application. Fig. 1 illustrates the manner in which the switch may be used in the control panel of an automobile radio receiver. It is apparent that the switch is easily adaptable to any installation desired and that it requires a very small amount of space.

It is apparent from the foregoing description that a very simple compact self locking push button switch assembly is provided. All of the components of the assembly may be fabricated in an easy manner, that is, molded from plastic insulating material or pressed from thin metal sheets. The components are held in assembled relation solely by the recesses and projections on the insulating members making additional securing means unnecessary. This makes for ease in assembly of the unit and for a very low cost structure. The switch units themselves are designed so that the bridging members are held in engagement with the contact 12 by the relatively strong pressure of the spring 16 assuring a firm and effective electrical contact. The construction of the locking mechanism is also simple and the action thereof very effective to retain the desired switches in actuated position and to release any switches which are not to be actuated.

Although the invention has been described in connection with the preferred embodiment thereof it is apparent that various modifications and changes can be made to the strucuture without departing from the intended scope of the invention as defined by the appended claims.

I claim:

1. A self locking push button switch assembly comprising an insulating housing having a plurality of cavities molded therein, a switch unit positioned in each of said cavities and locking means positioned on said housing cooperating with said switch units, each of said switch units including a pair of contacts fixedly supported by said housing, a bridging member for engaging said contacts, an actuating member for said bridging members having a normal position and an actuated position, first spring means tending to hold said actuated means in said normal position with said bridging member away from said contact, second spring means tending to hold said bridging member in engagement with said contacts, and means on said actuating member to limit movement of said second spring means to thereby prevent movement of said bridging member into engagement with said contacts when said actuating member is in said normal position, said second spring means exerting greater force than said first spring means to cause said bridging member to firmly engage said contacts when said actuating member is in said actuated position.

2. In a push button switch assembly, a switch unit comprising a pair of fixed contacts, a bridging member for engaging said contacts, an actuating member for said bridging member having a normal position and an actuated position, first spring means tending to hold said bridging member away from said contacts, second spring means tending to hold said bridging member in engagement with said contacts, and means on said actuating member to limit movement of said second spring means to thereby prevent movement of said bridging member into engagement with said contacts when said actuating member is in said normal position, said second spring means exerting greater force on said bridging member than said first spring means to move said bridging member into firm engagement with said contacts when said actuating member is in said actuated position.

3. In a push button switch assembly, a switch unit comprising a pair of contacts, a bridging member for engaging said contacts, an actuating member for said bridging member having a normal position and an actuated position, said bridging member having an opening therein, said actuating member having a finger portion extending in said opening in said bridging member and having a projection thereon limiting the movement of said bridging member on said finger, first spring means engaging said bridging member on one side thereof tending to hold said bridging member away from said contacts, second spring means engaging said bridging member on the other side thereof tending to move said bridging member in engagement with said contact, said projection on said actuating member limiting movement of said second spring means to thereby prevent movement of said bridging member into engagement with said contacts when said actuating movement member is in said normal position, said second spring means exerting greater force on said bridging member than said first spring means to cause said bridging member to move into engagement with said contact when said actuating member is in said actuated position.

4. A self-locking push button switch assembly comprising an insulating housing including two mating parts, a plurality of switch units including actuating members positioned side by side in said housing and having the components thereof retained in position by said mating parts, a locking bar slidably mounted in said housing and cooperating with said actuating members, said bar having a locking position and a non-locking position, and clamp means for holding said mating parts in assembled relation, said clamp means also cooperating with said locking bar to bias said locking bar to its locking position.

5. A self locking push button switch assembly comprising an insulating housing having a plu-

rality of cavities molded therein, a switch unit positioned in each of said cavities and a locking member positioned on said housing cooperating with said switch units, each of said switch units including a pair of contacts fixedly supported by said housing, a bridging member for engaging said contacts, an actuating member for said bridging members having a normal position and an actuated position, first spring means tending to hold said actuated means in said normal position with said bridging member away from said contact, second spring means tending to hold said bridging member in engagement with said contacts, and means on said actuating member to limit movement of said second spring means to thereby prevent movement of said bridging member into engagement with said contacts when said actuating member is in said normal position, said second spring means exerting greater force than said first spring means to cause said bridging member to firmly engage said contacts when said actuating member is in said actuated position, said locking member cooperating with said actuating members for holding an actuating member which has been depressed in such depressed condition and effective when one actuating member is being depressed to release all other actuating members which are depressed, the maximum dimension of each switch unit transverse of its actuating member being substantially equal to the width of said locking member, and the outside dimension of said housing transverse of said actuating members is substantially equal to the width of said locking member and the thickness of said housing adjacent said locking member.

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