United States Patent [19]

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[54] PUSH BUTTON SWITCH UNITS

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[30] **Foreign Application Priority Data**

May 25, 1970 Germany.....P 20 25 504.3

[52] **U.S. Cl.**.....**74/483 PB,** 200/5 E

[51] **Int. Cl.**.....**G05g 13/00**

[58] **Field of Search** .....74/483 PB; 200/5 E

[56] **References Cited**

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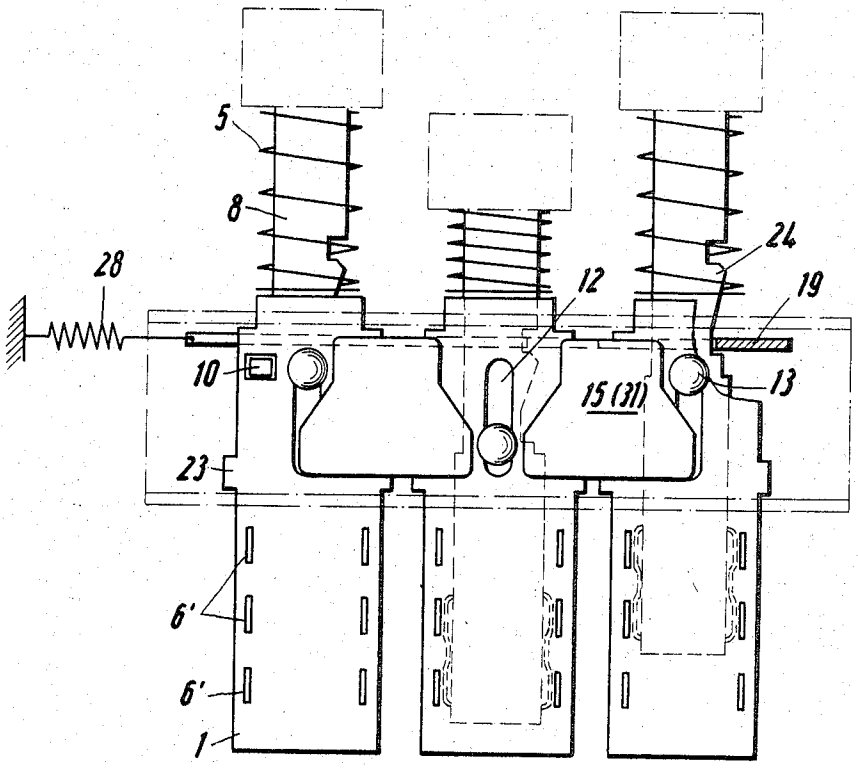
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[57] **ABSTRACT**

A push button switch unit comprises a mounting chassis with push button switches, the chassis having a housing plate adjacent to the push button switches on the chassis plate. Flat locking slides are mounted between the chassis plate and the housing plate so as to be able to move side-ways for coordinating the operation of plungers of the switches. The unit includes for each switch a locking pin extending into a hole in the plunger of the respective switch, the hole being perpendicular to the axis of the plunger. An opening is provided in the chassis plate and a slot, corresponding in length to the stroke of the respective plunger, is provided in the switch unit housing plate. The locking pin is arranged to be inserted through the opening in the chassis plate and the slot in the housing plate. The unit further comprises a locking slide adapted to cooperate with the head of the locking pin.

10 Claims, 10 Drawing Figures



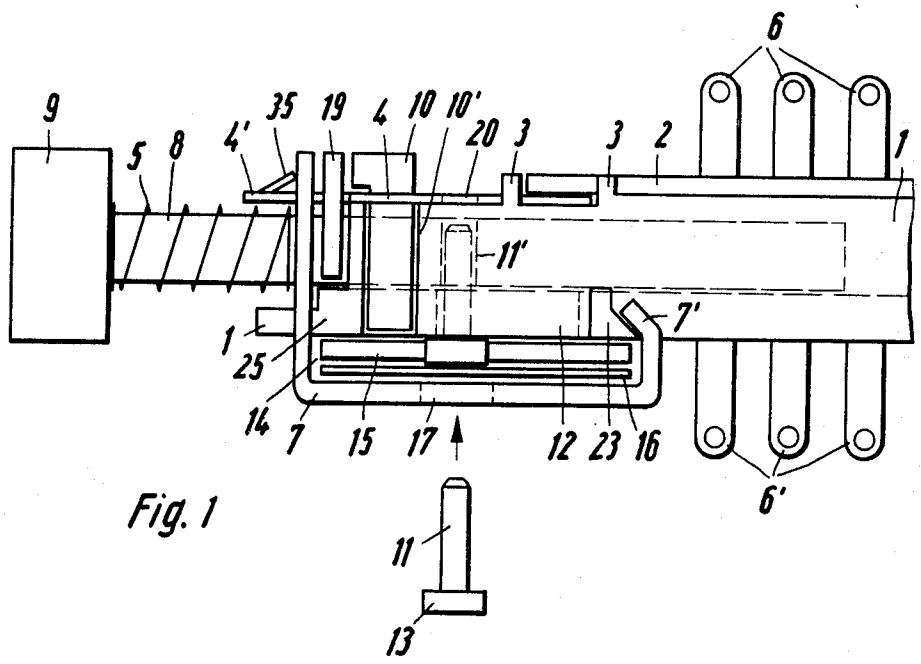


Fig. 1

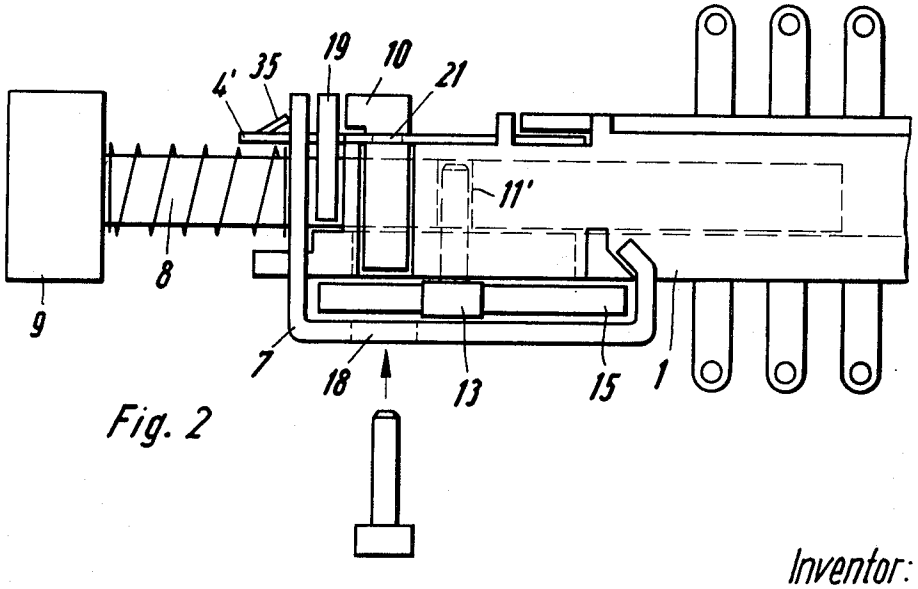


Fig. 2

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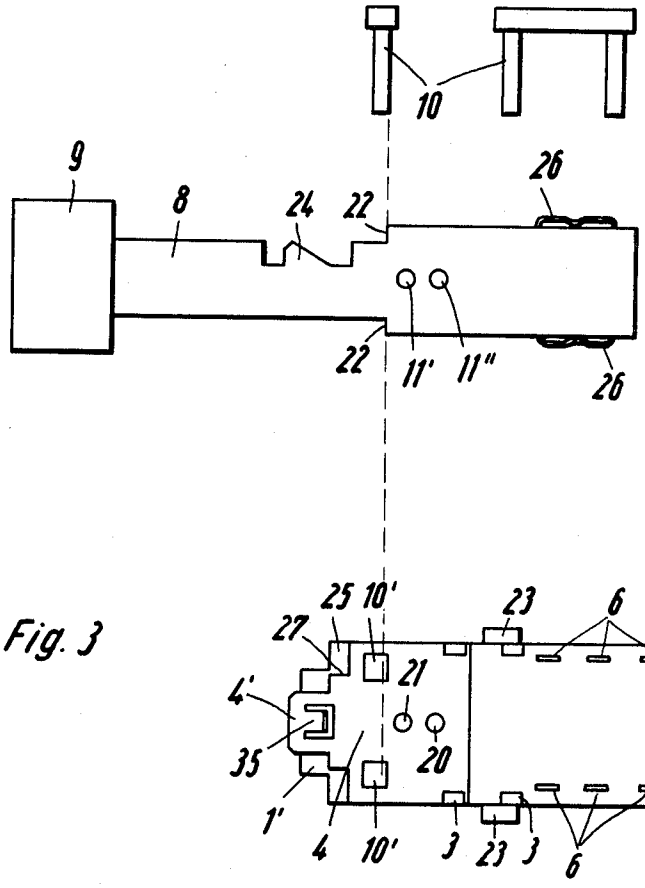


Fig. 3

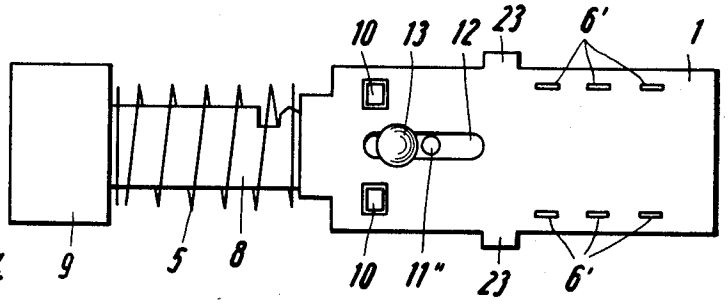


Fig. 4

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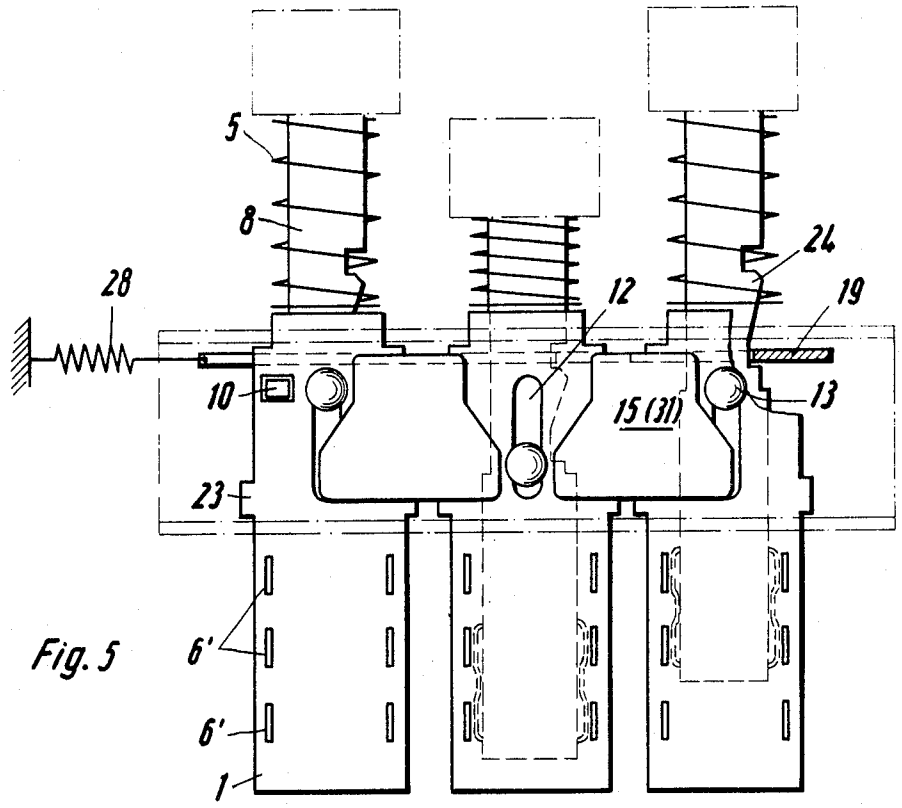


Fig. 5

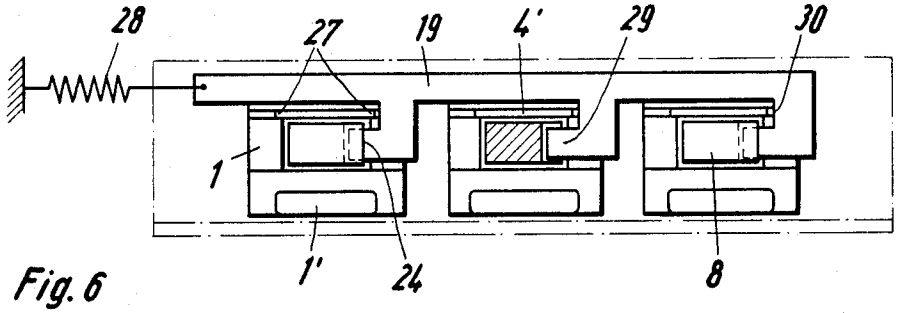


Fig. 6

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Fig. 7

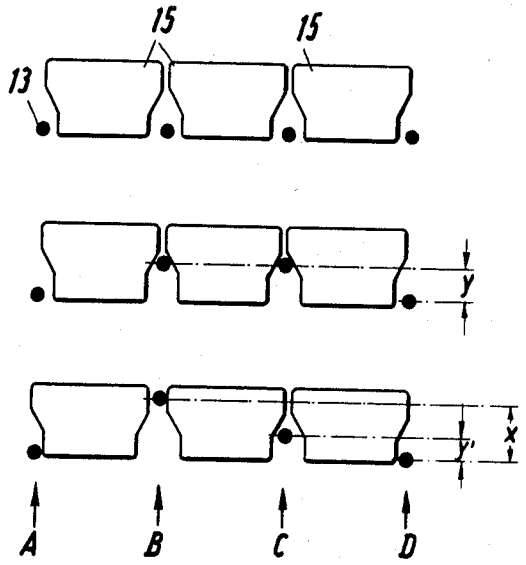


Fig. 8

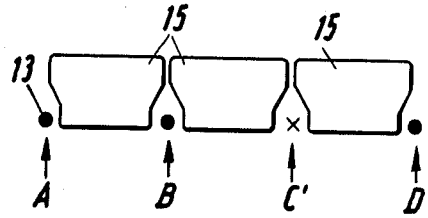


Fig. 9

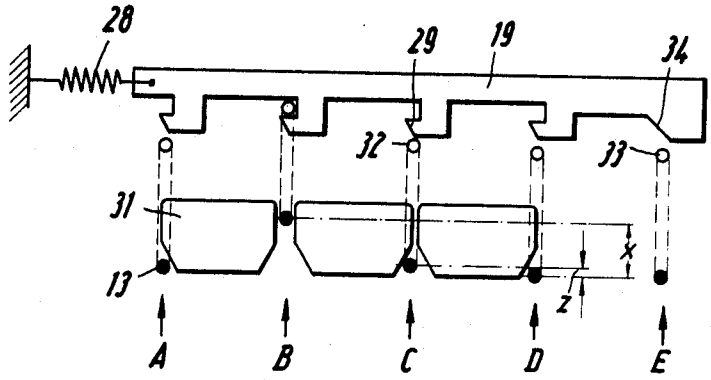
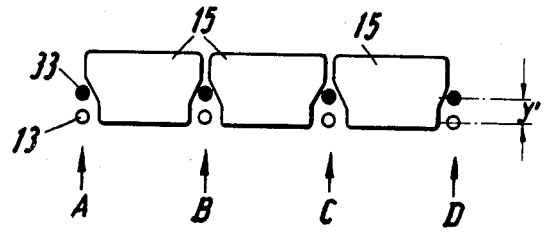


Fig. 10



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PUSH BUTTON SWITCH UNITS

BACKGROUND OF INVENTION

1. Field to which invention relates

The present invention relates to push button switch units, and more particularly to such units comprising inter-changeable detent and locking mechanisms. Such units are made up of push button switches with a common mounting chassis, in which between the housing plate of the individual switches and the chassis plate, locking members or slides are provided which bring about coordination of the push-plungers of the individual switches.

2. The prior art

The necessity of replacing the detent slides or locking elements occurs more particularly in the case of switches with push slides which can be replaced by withdrawing them in a forward direction and quite generally in the case of relatively long series of buttons, whose locking elements require subsequent correction or modification, and also occurs in the case of repairs or modifications so as to include other detent and locking mechanisms.

In the case of prior art push button switch units with pivotally mounted detent lugs there are disadvantages owing to the difficulty in mounting occasioned by the long constructional length. Other known constructions, which make use of detent slides and locking members make it necessary to remove the whole push button module or involve other tedious dismounting operations.

If, in accordance with the known practice locking members are mounted to the rear on the push button switches, all push button units must have the same constructional depth, something which is undesirable since it wastes space, if the contact arrangements of the adjacently placed push buttons does not require this. On the other hand, locking members that can be mounted in the front, to the rear or underneath a unit require a frame which must always be individually adapted to suit the number of push buttons and the distance between the push buttons.

SUMMARY OF INVENTION

One aim of the present invention is to provide for fitting together and dismounting of detent slide and locking elements as far as possible without using tools.

The present invention consists in a push button switch unit comprising a mounting chassis with push button switches. The chassis has a housing plate adjacent to the push button switches on the chassis plate. Flat locking slides are mounted between the chassis plate and the housing plate so as to be able to move sideways for coordinating the operation of plungers of the switches. The improvement is characterized in that the unit comprises, for each switch, a locking pin extending into a hole in the plunger of the respective switch. The hole is perpendicular, i.e. transverse to the axis of the plunger. An opening is provided in the chassis plate and a slot, corresponding in length to the stroke of the respective plunger, is provided in the switch unit housing plate. The locking pin is arranged to be inserted through the opening in the chassis plate and the slot in the housing plate. The unit further comprises a locking slide adapted to cooperate with the head of the locking pin. The detent or locking slide can be made in one or more pieces.

With this construction the locking slides or locking members can easily be interchanged by sliding them laterally on the chassis plate. They can have different shapes in accordance with the purpose and function involved. For example in cooperation with the locking pins, which can also be easily interchanged, they can prevent the simultaneous pushing in of several push buttons of the unit.

The detent mechanism, which cooperates with the locking members or detent slides in the arrangement in accordance with the invention, but nevertheless can be used with other sliding push button switch units, is preferably constructed as a flat detent slide between the front side of the housing and the front wall of the chassis and is provided with detent projections, which cooperate with the detent profiles of the push button plungers. Each detent projection fits in the space between two adjacently placed housing cover plates of the push button switches and at the base of each detent projection there is a slot that opens toward the detent profile of the switch plunger. This slot has a length exceeding the length of the detent slide stroke and extends into the housing plate at the side. The spring force of a detent slide spring ensures that the detent slide does not fall out of position.

LIST OF SEVERAL VIEWS OF DRAWINGS

In what follows the invention is described with reference to the accompanying drawings.

FIG. 1 shows a side view of a switch unit, mounted in a chassis, with locking slides arranged in a shifting manner between the push button housing plate and the chassis plate, and with a detent slide arranged between the front of the housing and the front side the chassis.

FIG. 2 is a side view, corresponding to FIG. 1 with a different construction of the means for ensuring that the locking pin does not fall out.

FIG. 3 is an exploded view of the push plunger abutment bolt and the switch housing of a single push button switch of the unit.

FIG. 4 is a bottom view of a push button unit with the locking pin placed in position.

FIG. 5 is a view from below of a push button switch assembly with the chassis indicated in broken lines.

FIG. 6 is a front view of a push button switch assembly without the push buttons, showing the detent slide and the chassis, the latter being indicated in broken lines.

FIGS. 7*a*, *b* and *c* diagram the locking of the switches. In FIG. 7*a* all push button or keys A, B, C and D are in the rest position. In FIG. 7*b* the keys B and C can only be displaced together along the path *y*. In FIG. 7*c* one key or push button B is pressed in (displacement *x*) while the key C can only be pushed along the path *y'*.

FIG. 8 is a diagram of a locking action, the key or push button C not having any locking pin and the function of the remaining locking pins with the locking members being the same as in FIG. 7.

FIG. 9 shows a diagram of a locking action for a switch assembly with an additional release key or button.

FIG. 10 shows a locking diagram for a key assembly with an additional release key and locking pins in a forward position.

DESCRIPTION OF PREFERRED EMBODIMENTS

As will be gathered in the course of the following description of the figures of the drawing, the construction of the sliding button or key switch in accordance with the invention makes possible the production of combinations of mutual locking of and/or coordination of keys or push buttons of a switch or key unit so that all switching problems occurring in practice can rapidly and simply be dealt with. In this respect the features necessary for a particular switching problem can be realized simply and rapidly without the fitter having to have especially nimble fingers. Settings to deal with particular switching problems are possible both before mounting and also after it. If required, modifications may be carried out to meet all requirements later.

FIG. 1 shows a typical push button or push key switch unit, which carries the fixed contacts 6/6' includes synthetic resin housing 1 and the housing lid 2 together with a further housing cover that is recommended to provide mechanical strength and is in the form of a metal cover plate 4. The parts 1, 2 and 4 enclosing a cavity are held in position by pins 3 extending out from the housing. In the housing a key or push button plunger 8 is guided for longitudinal shifting. It carries indirectly or directly contact bridges for bridging over electrically the fixed contacts 6/6', which can be arranged in any required number and combination. The contact bridges are displaceable to provide two or more defined switching positions. One of the possible key plunger and housing constructions is shown in FIGS. 3 and 4.

Function of the key or push button switch unit as assembled is ensured by a resetting spring 5 and by abutment bolt 10, which extends through openings 10' in the housing 1 and in the cover plate 4 and holds the key plunger 8 by the abutment edges 22 in a defined rest or inactive position beyond which plunger 8 cannot be moved out of the housing.

Several push button switches are assembled, in accordance with the number of keys or buttons required and with the desired spacing, in a mounting chassis 7. A passage opening for the key plunger 8 and openings for centering the switch housing are provided, for example for the housing extension 1' and the cover plate 4' in the front of the chassis. The attachment of chassis 7 and housing 1 is by bending lugs 7' on the rear side of the chassis over projections 23 extending from both sides of the housing. The key or push button plungers have detent profiles of a generally conventional type, as can be seen from the side in FIG. 1. The housings 1 have underneath at the front the shoulder 25, which leaves space for the key slide 19 directly behind the front wall of the chassis.

The key slide consists of a flat strip with detent projections 29 that are spaced away from the strip in a direction perpendicular to the longitudinal direction of the strip. The breadth of the detent projections 29 is selected so that they fit into the spaces between the key switches or the metallic cover plate 4, 27 which is set back at the front. At the base of the detent shoulders slots 30, which are open to-ward the detent profile of the key plungers, are provided. The slots have a length exceeding the detent slide stroke. The metallic cover plates 4, 27 can fit laterally into the slots 30. A laterally acting detent slide spring 28 suitable for ensuring the proper functioning of the detent mechanism, pushes or pulls the detent slide 19 into the guide slots 30, after it has been fitted in place from above, and ensures that the slide 19 does not fall out of position.

The space 14 between the switch housing plates 1 or bottoms and the chassis bottom or plate 7 is intended for accommodating flat locking members 15, 31 or detent slides, which, when the key assembly has been mounted, can be inserted from one or both sides using a suitable number of them. The locking or detent pins 13 required for the proper function of a locking or detent slide are preferably in the form of round pins (though naturally pins with a square or rectangular cross-section can be used) and are mounted in the key plungers. In order to make possible their later placing in position and removal, these pins should be capable of easily being inserted through openings 17 in the chassis plate and through a slot 12, corresponding to the key stroke, of the switch housing, so that the pin extends into a hole 11' of the key plunger. The respective pin 13 is preferably provided for this purpose with a shank, the head 13 being either made so long that it lies against the underpart of the key plunger and the slot 12 in the switch housing is made sufficiently large for the head 13, or a shorter head 13 lies against the switch housing and the longitudinal slot is made so as to have a breadth narrower than the breadth of the shank 11.

In order to ensure that the loosely fitted locking pins cannot drop out in any position of the switch or on operation through the insertion holes 17, either a thin sheet metal strip 16 is inserted between the chassis plate 7 and the locking pin heads 13 (FIG. 1) or an insertion hole 18 is provided in the chassis plate, which hole is offset in a forward direction (FIG. 2). In the latter case, before insertion of the locking pin, the key plunger must be drawn out a short distance from the switch housing before the abutment bolt 10 is inserted. When the bolt 10 is inserted, the locking pin head 13 is then away from the insertion hole 18.

In order to be able to press the locking pin easily out of position when taking the assembly apart, it is best to provide a suitable hole 20 or 21, corresponding to the insertion hole 17 or 18 respectively in its position, in the cover plate 4.

The action of the various forms of locking members in combination with suitable locking pins is now described with reference to FIGS. 7 to 10.

FIG. 7*a* shows the locking pins 13 of four keys which are to be locked so as to ensure that they cannot be simultaneously operated. They are shown in their initial positions in which they are not pushed in. If in accordance with FIG. 7*b* the push buttons or keys B + C are simultaneously pushed in, the locking members 15, if correctly constructed, ensure that the key slides cannot be moved further than the distance or displacement denoted by *y*. FIG. 7*c* shows the key B pressed in, its locking pin pressing apart the locking members; if depressed later a key can only be moved through the distance *y'*, which suffices for releasing the key or push button B from the locking action of a detent slide.

FIG. 8 shows that at any suitable position one or more locking pins 13 can be removed without the locking of the remaining keys becoming impaired.

FIG. 9 shows a further form of the locking members cooperating with a detent slide. In this case the taper of the locking members 31 on the inlet side is so small that if for instance the locking pin of the key B is pressed inwards, pushing later on the key B, for instance, can only cause the key D to move a very short distance z equal substantially to zero. This arrangement leads practically to the locking of all other keys until a release key E releases the detent slide 19 by means of the release pin 33 and oblique edge 34 of the detent slide so that the detent pin 32 of the depressed key B is released.

In accordance with the construction of FIG. 10 the above-described manner of operation can also be achieved if the same locking members 15 of FIGS. 7 and 8 are used but the locking pin is offset by the distance y'. For this purpose in the key plunger 7 a second hole 11'' for receiving the locking pin 11, 13 can be provided.

In accordance with a further development of the invention the covering plate 4 can be made of spring steel sheet, which has a resilient catch 35 cooperating with the extension 4' fitting through the front of the chassis 7. On insertion through the opening in the chassis this catch is compressed and snaps back into its correct position so as to retain the push button switch unit.

I claim:

1. In a push button switch unit comprising a mounting chassis with means for carrying a plurality of push button switches; a plurality of push button switches, with each having a switch plunger; the chassis having a chassis plate and having a housing plate adjacent to the push button switches; locking slides being mounted between the chassis plate and the housing plate so as to be able to move sideways for coordinating the operation of plungers of the switches, the improvement comprising for each switch, a locking pin extending into a hole in the plunger of the respective switch, the hole extending transversely to the axis of the plunger, an opening in the chassis plate and a slot, corresponding in length to the stroke of the respective plunger, in the housing plate, the locking pin being arranged to be inserted through the opening in the chassis plate and the slot in the housing plate, each locking pin having a head, said locking slides being positioned so that at least one slide is contacted by and cooperates with the head of a locking pin when the respective switch plunger is operated; said slide having means to block movement of the respective said pin and of its said plunger when said slide is in one position and said slide being movable to a position where it does not block its pin.

2. A push button switch unit in accordance with claim 1 comprising a flat detent slide between a front side of the housing and a front part of the chassis, detent projections on the detent slide are received by cooperating detent profiles of the switch plungers, each said detent projection fits into the space between two adjacently placed housing cover plates of the switch unit, the base part of each detent projection having a slot which is open towards the detent profile of the respective switch plunger and has a length exceeding the length of the detent slide stroke, the slot laterally including the housing cover plate, and a detent slide spring, which is provided between a detent slide and the chassis and laterally stresses the detent slide.

3. A push button switch unit in accordance with claim 1, in which the locking slides are normally so positioned that the locking pins and the associated push button plungers can be moved to a limited extent in the intermediate space between two adjacent locking slides.

4. A push button switch unit in accordance with claim 3, comprising a piece inserted between the chassis plate and heads of the locking pins for covering pin insertion holes in the chassis plate.

5. A push button switch unit in accordance with claim 3, in which the switch plungers can be removed by moving them forwards, an insertion opening in the chassis for the locking pin being offset to the rear in relation to the inactive position of the respective push button switch towards the push button of the switch.

6. A push button switch unit in accordance with claim 5, in which each switch housing cover plate is provided with an opening in the chassis plate aligned with the opening for the insertion of the respective pin.

7. A push button switch unit in accordance with claim 3, in which the locking slides each have a generally trapezoidal taper narrower toward the forward end of the chassis; the locking slides each have a breadth corresponding to the distance between locking pins and the taper of the locking slides makes possible complete insertion of one push button with its locking pin while a subsequently depressed push button can only be moved a fraction of the full push button switch operating stroke.

8. A push button switch unit in accordance with claim 7, in which the locking slides are flat and arranged in a row and have such a trapezoidal taper that one of the push buttons with its locking pin can be moved through the whole switch operating stroke and the other buttons are blocked by their respective locking pins contacting the shifted locking slides.

9. A push button switch unit in accordance with claim 7, in which a locking pin in an offset hole in the push button plunger enables only one push button slide to carry out the full switch operating stroke owing to the same locking slide shape being present, while a subsequent push button remains locked.

10. The push button switch unit of claim 3 wherein said locking pin extends perpendicularly to the axis of the plunger.

* * * * *