Aug. 2, 1960 S. A. WOODWARD 2,947,825

KEY OPERATED MULTIPLE SWITCH

Filed Jan. 27, 1959

FIG. 1.

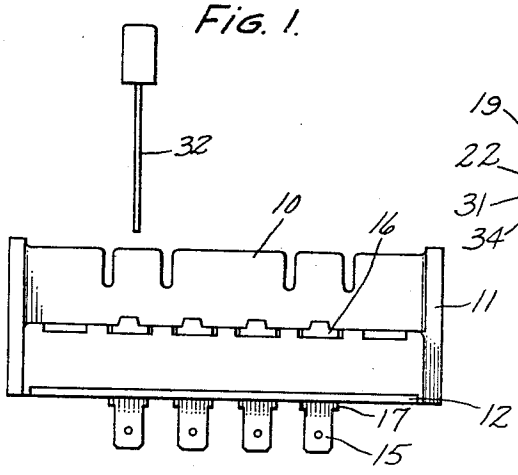


FIG. 2.

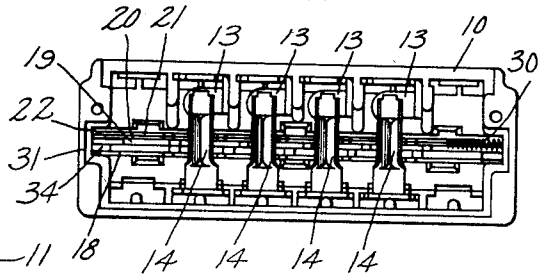
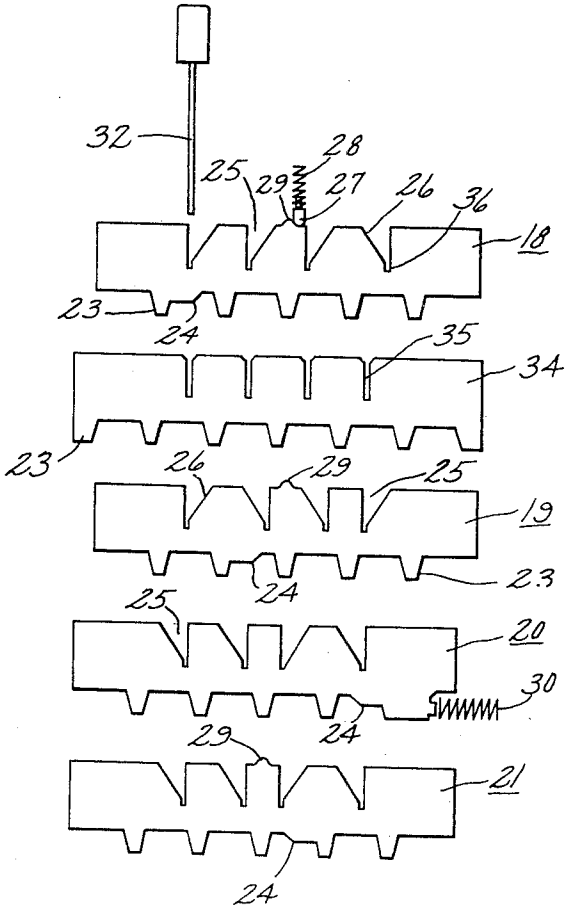


FIG. 3.



Inventor:
Stewart A. Woodward
by Richard L Caslin
His Attorney

United States Patent Office

2,947,825

Patented Aug. 2, 1960

2,947,825

KEY OPERATED MULTIPLE SWITCH

Stewart A. Woodward, Stratford, Conn., assignor to General Electric Company, a corporation of New York

Filed Jan. 27, 1959, Ser. No. 789,315

4 Claims. (Cl. 200—5)

The present invention relates to electrical switches and particularly to a multiple switch that is operated by a single removable key for preventing the unauthorized operation of the switch. Such a switch has many applications but is especially suited for controlling commercial air conditioning equipment in public places as supermarkets, theaters, and auditoriums. The switch would also be useful in home workshop power equipment and as an outdoor control for garage door openers.

This switch is an outgrowth of the multiple push button switch designs which were pioneered by the Andrews Patent No. 2,431,904 that is assigned to the same assignee as is the present invention. Key operated toggle switches have been used for many years but, to our knowledge, these are usually single switches that may be ganged together in a single box. The present invention relates to a single switch for controlling multiple circuits where each circuit is arranged by the insertion of a key in one of a plurality of openings in one wall of the housing.

The principal object of this invention is to provide a multiple electric switch for controlling a plurality of circuits where the switch actuator is a removable key to render the switch tamperproof.

A further object of the present invention is to provide a multiple electric switch with a restricting feature that will only accept a special key member.

A still further object of this invention is to provide a novel guiding means for a removable key that operates a multiple electric switch.

A preferred embodiment of the present invention has a plurality of fixed contacts and movable contact blades supported in a switch housing. The blades are generally parallel to each other and are operated by a plurality of movable sliders that are arranged transversely of the blades. One edge of each slider has a cam surface that cooperates with at least one of the contact blades so that movement of the sliders will control the opening and closing of the circuits of the switch. The sliders also incorporate inclined portions which are formed by notching the opposite edge of the sliders. These inclined portions are engaged by a switch actuator for shifting the sliders in a predetermined manner. One wall of the housing has a series of narrow openings for the insertion of a removable key that represents the switch actuator. The housing includes a guide plate with a matching series of narrow slots that are aligned with the openings in the housing. Accordingly, as the key is inserted through an opening, it will extend into a cooperating slot in the guide plate so that the key is confined to movement in a straight line direction. The before-mentioned sliders are arranged to the side of the guide plate so that the key will engage the inclined portions thereof and shift the sliders for rearranging the circuits of the switch.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

Figure 1 is a front view of a multiple electric switch embodying my invention showing the removable key posed over one of the openings in the top wall of the switch housing.

Figure 2 is a bottom plan view of the switch of Figure 1 with the cover plate removed to show the internal arrangement of the switch.

Figure 3 is a diagrammatic view showing the various movable sliders of the switch and the details thereof, as well as the novel guide plate that cooperates with the removable key.

Referring in detail to the drawing and in particular to Figures 1 and 2, there is shown a switch housing **10** formed by a recessed base **11** and a bottom cover plate **12**. With the back cover plate removed, it is possible to look into the vase and identify the various elements of the switch, as is the case in Figure 2. The switch has a plurality of fixed contacts **13** and a plurality of complementary movable contact blades **14** of spring material. All of these contacts have tab-type terminals **15** which are fastened to the base as at **16** and extend through close-fitting apertures in the cover plate **12**. The cover plate is held to the base by deforming or staking the opposite sides of the terminals as at **17**.

The movable contact blades **14** are normally biased into engagement with the fixed contacts. These blades **14** are acted upon by a plurality of movable sliders **18, 19, 20** and **21**. These sliders are stamped from thin sheet insulating material and are usually of dissimilar shapes to perform the various functions of the switch mechanism. The sliders are accommodated in a relatively deep channel **22** that is centrally disposed in the base **11** and extends longitudinally thereof. The side walls of this channel **22** confine the sliders to a stacked or side-by-side relationship and serve to limit the movement of the sliders to an endwise travel that is transverse of the movable contact blades **14**.

The sliders are supported on the back cover plate **12**. A series of supporting feet **23** are spaced longitudinally along one edge of each slider for engaging the cover plate **12** without interfering with the contact blades **14** as the sliders move within the base. Cam surfaces **24** are provided between some of the supporting feet **23** of the sliders for making engagement with a contact blade to force it to move away from the fixed contact and break the circuit. The opposite edge of each slider has a series of notches **25** with inclined portions **26** that are to be engaged by the switch actuator.

Certain sliders, namely, sliders **18, 19** and **21** are provided with a detent action. This is accomplished by a plunger **27** that is backed by a coil spring **28**. Both the plunger and spring are seated within the channel **22** of the base. The plunger is in frictional engagement with the notched edge of the sliders and cooperates with a curved abutment **29** on each of the three sliders **18, 19** and **21**. Accordingly, the detent spring **28** must be compressed to allow the abutment **29** to slip under the plunger **27** before any one of these three sliders can be shifted.

The slider **20** is provided with a momentary contact action by incorporating a compression spring **30** at one end of the channel **22** between the end wall of the base and the end of the slider **20**. Hence, the normal position of the slider **20** will be against the left-hand end wall **31** of the base as seen in Figure 2.

The actuator for this switch is represented by a removable key **32** of thin metal strip. The strip is wide enough to be able to engage all of the sliders at one time. In other words, the width of the key is equal to or greater than the thickness of the stack of sliders. The top wall of the base **11** is provided with a series of narrow openings (not shown) so that the removable key **32** may be inserted into any one of them. Means are pro-

vided to limit the type of key that may be used to operate this switch. Also, it is expedient to guide the movement of the key within the base as well as brace the key against forces exerted by the sliders that might bend the key.

I have chosen to satisfy these requirements by providing a guide plate 34 that is stamped from sheet insulating material and has the general appearance of a slider. However, this guide plate 34 differs from a slider in that it extends the complete length of the channel 22 and is incapable of moving lengthwise of the base. This guide plate also has supporting feet 23 as do the sliders, so that the cover plate 12 will hold it in place and the guide plate will not interfere with the contact blades 14. A series of narrow slots 35 are cut in the top edge of the guide plate to be in alignment with the narrow openings (not shown) in the top wall of the base. These slots 35 are slightly narrower in width than the openings in the base to restrict the type of key, instrument or tool which may be inserted into the switch housing by an unauthorized person attempting to circumvent the tamperproof protection that is built into this switch. A screwdriver could not be used to actuate the switch because the blade of the screwdriver would either be too large for both the opening in the base and the slot in the guide plate or the blade would be too narrow to engage all of the sliders. The same is true of a nail. A knife blade could not be used because it has a pointed tip that could not engage all of the sliders simultaneously. A hairpin would probably be too weak to overcome the resistance of the detent spring 28 and in some cases the additional force of the momentary contact spring 30. The design of this switch almost requires an exact duplicate key to key 32 in order to operate the switch.

Attention is drawn to the contour of the notches 25 in the sliders and especially the innermost ends of the notches which are identified as 36. These innermost ends 36 conform very closely to the configuration of the innermost ends of the slots 35 of the guide plate, and the accurate positioning of the sliders is the result.

Having described above my invention of a novel multiple switch having a removable key actuator, it should be readily recognized by those skilled in this art that I have produced a simple design that is most practical and economical to manufacture, assemble and operate. Also, I have provided against most of the common instrumentalities that might be at hand to accomplish the unauthorized use of the switch. Another modification would be to install an OFF button in the switch so that it could not be removed. This would always render it possible to turn off the switch in the event that the removable key 32 were lost or unavailable at the opportune moment. Moreover, it is conceivable that different types of keys and mating slots in the guide plate may be used in place of the simple arrangement disclosed heretofore. Understandably, the guide plate could be an integral part of the housing rather than a separable plate member.

Modifications of this invention will occur to those skilled in this art and it is to be understood, therefore, that this invention is not limited to the particular embodiments discolsed but that it is intended to cover all modifications which are within the true spirit and scope of this invention as claimed.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A multiple electrical switch comprising a housing, a plurality of fixed contacts and movable contact blades supported in the housing, each blade being engageable with at least one of the fixed contacts for closing a circuit therethrough, a plurality of movable sliders arranged in the housing transversely of the contact blades, one edge of the sliders having cam surfaces that cooperate with the contact blades so that movement of the sliders will control the opening and closing of the circuits through the switch, the sliders also having inclined portions which are engaged by a switch actuator for shifting the sliders in a predetermined manner; the invention comprising a fixed guide plate within the housing, the plate having a series of narrow slots in one edge, one wall of the housing having a matching series of narrow openings in alignment with the slots, the switch actuator being represented by a removable key that may be inserted into any one of the openings for engaging the inclined portions of the sliders, the slots of the guide plate serving to receive only the proper key and to seal the switch from unauthorized operation.

2. A multiple electrical switch as recited in claim 1 wherein the inclined portions of the sliders are formed by notching the edge of each slider that is remote from the cam surfaces, the innermost ends of the notches being slotted to conform to the narrow width of the slots in the guide plate for accurately positioning the sliders within the housing.

3. A multiple switch as recited in claim 1 wherein the removable key has a thin shank of uniform thickness which conforms very closely to the width of the openings in the housing and the width of the slots in the guide plate.

4. A multiple electrical switch comprising a housing, a plurality of fixed contacts and movable contact blades supported in the housing, each blade being engageable with at least one of the fixed contacts for closing a circuit therethrough, a plurality of movable sliders arranged in the housing, one edge of the sliders having cam surfaces that cooperate with the contact blades so that movement of the sliders will control the opening and closing of the circuits through the switch, the sliders also having inclined portions which are engaged by a switch actuator for shifting the sliders in a predetermined manner; the invention comprising a series of fixed guiding slots within the housing, the switch actuator being represented by a removable key, one wall of the housing having a series of openings so that the key may be inserted into any one of the openings for engaging the inclined portions of the sliders, the guiding slots serving to block any instrumentality but the proper key from engaging and shifting the sliders, thereby sealing the switch from unauthorized operation, the guiding slots also serving to brace the innermost end of the key that extends into the housing for accurately positioning the sliders with respect to the contact blades.

References Cited in the file of this patent

UNITED STATES PATENTS

840,699	Kaisling	Jan. 8, 1907
2,057,301	Golokow	Oct. 13, 1936
2,376,846	Field	May 22, 1945
2,819,356	Hutt	Jan. 7, 1958
2,879,345	Mossman	Mar. 24, 1959