Aug. 13, 1957 P. HUTT 2,802,915

SNAP ACTION PUSH BUTTON SWITCH

Filed Dec. 1, 1955

Fig. 1.

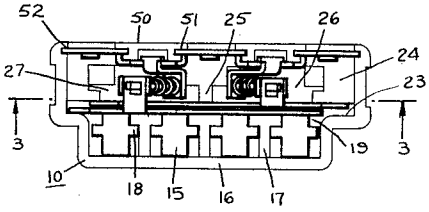


Fig. 2.

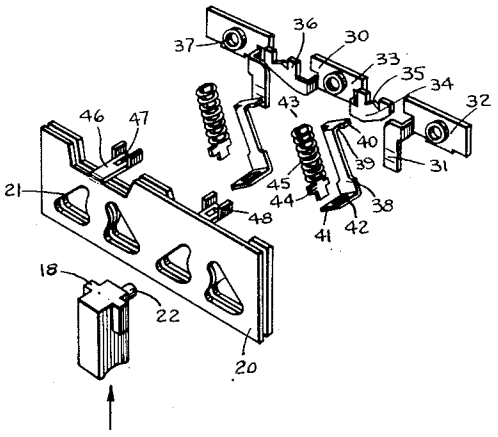


Fig. 3.

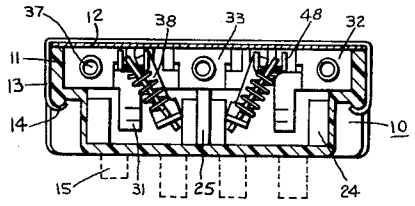


Fig. 4.

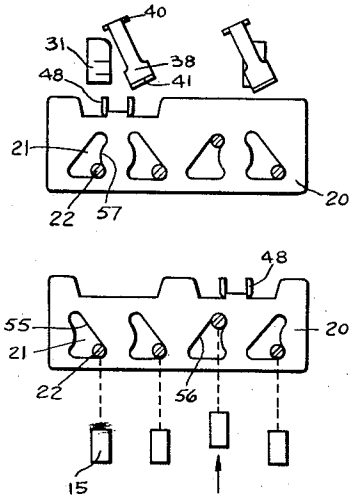
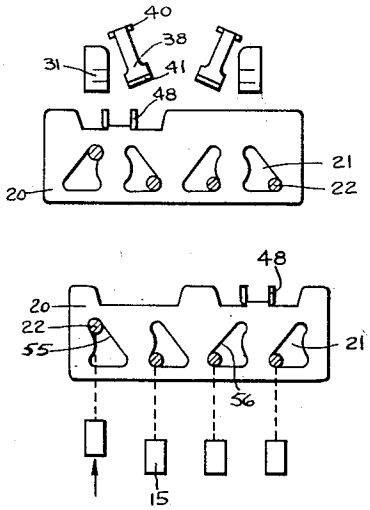


Fig. 5.



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2,802,915

SNAP ACTION PUSH BUTTON SWITCH

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Application December 1, 1955, Serial No. 550,253

7 Claims. (Cl. 200—67)

The present invention relates to a multiple push button switch comprising a plurality of push buttons in cooperation with a pair of slides to effect the opening and closing of a series of pre-selected electric circuits upon the actuation of the buttons.

This invention is an improvement in the push button switch of the basic type exemplified by the Andrews Patent No. 2,431,904 which is assigned to the same assignee as is the present invention. The Andrews switch was designed for alternating current use only, and it has been widely accepted and extensively used for many years for controlling the heating elements of electric ranges.

I have now developed a push button switch having movable slides with an over-center snap acting mechanism so that the switch may be used on both direct and alternating currents. The switch illustrated in the drawing has been developed particularly for use with portable lamps for the control of a two filament, three-way lamp. However, it should be readily understood that this invention is not limited to the particular embodiment disclosed nor to the exact use indicated. My invention is preferably encased in a hollow switch housing comprising a recessed base and an insulating cover plate. A plurality of push buttons extend through openings in the bottom wall of the base while a pair of slides are arranged alongside the buttons to be controlled thereby. Each slide contains a series of cam surfaces which cooperate with a cam follower on each button to move the slides in endwise directions in a manner similar to that of the Andrews patent. In addition, a common terminal bar is mounted in an opening in the side wall of the base opposite from the buttons. A pair of fixed contacts are also mounted in the housing, each with its terminal portion mounted in an opening in the said side wall, one on each side of the terminal bar. A pair of movable contacts of generally Z-shape are hung from spaced points on the terminal bars so that they may oscillate into and out of contact with the fixed contacts. In order to effect the quick opening and closing of the contacts, an over-center spring is supported at the lower end of each movable contact while it bears against an overhanging arm extending from one of the slides. Thus, when a button is depressed, one or more of the slides moves in an endwise direction thereby displacing the overhanging arm to compress the over-center spring until the movable contact is shifted to its opposite position.

An important advantage of my invention is that the over-center spring exerts a force that is offset from the pivotal support point for the movable contact so that the force supporting the movable contact and the force exerted by the over-center spring constitute a couple and tend to hold the swinging end of the movable contact toward the adjacent side wall of the base. This tends to give a strong wiping action between the movable contacts and fixed contacts thereby cleaning any carbon

deposits, oxides or dirt formations from the contacts that might increase the resistance of the circuit and cause excessive operating temperatures.

Accordingly, it is the principal object of this invention to provide a multiple push button switch with a snap acting mechanism so that the switch may be used in both direct and alternating current circuits.

A further object of this invention is to provide a multiple push button switch with movable slides that are connected with the movable contacts of the switch through an over-center spring mechanism for effecting a snap action.

A still further object of this invention is to provide a push button switch with a snap acting mechanism which exerts a strong force to wipe the movable contact across the fixed contact for more reliable switch operation.

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.

In the drawing:

Figure 1 is a plan view of a switch embodying my invention with the cover plate removed.

Figure 2 is an exploded view showing the spatial relationship between the movable parts of the switch.

Figure 3 is a cross-sectional elevational view taken on the lines 3—3 of Figure 1.

Figure 4 is a diagrammatic view showing the positions of the buttons, slides and movable and fixed contacts when the third button from the left is depressed.

Figure 5 is a view similar to that of Figure 4 except the extreme left-hand button has been depressed.

Referring in detail to the drawing, **10** represents a hollow switch housing of insulating material. This housing is formed by the deep recessed base **11** and the flat cover plate **12** which are held together by means of the metal strap **13**. The ends **14** of the strap are bent under into depressions at the ends of the base to hold the strap in place. Looking at the plan view of the base of Figure 1, four push buttons **15** are arranged along the side wall **16** of the base. T-shaped partitions **17** are formed between each button and are in cooperation with the side wings **18** of the buttons to limit the movement of the buttons to a reciprocating movement. These wings **18** do not extend the full length of the buttons as seen in Figure 2 for they are totally enclosed within the base to serve as stop means to prevent the removal of the buttons through the bottom wall of the base. Abutments **19** extending from the end walls of the base cooperate with the side wings **18** of the two end buttons to complete the guiding means for the buttons in the base.

Looking at Figure 2 of the drawing there is shown a pair of metal slides **20** arranged side by side and each having a series of four cam surfaces **21** in a longitudinally spaced relationship. Each push button **15** is shown with a pin-like cam follower **22** which cooperates with the cam surfaces **21** of the slides to effect the endwise movement of the slides in a well-known manner as will be explained hereinafter. In Figure 1 the slides **20** are shown positioned in the grooves **23** at the ends of the base formed by the opposite partitions **19** and **24**. The slides are further supported in the base by means of the central transverse partition **25** that also separates the remainder of the base into two switching chambers **26** and **27**.

Illustrated in Figure 2 is a common terminal bar **30** and fixed contacts **31** that have a terminal plate or portion **32** adapted to be supported in the base. The terminal plate or bar **30** is provided with a central portion **33** to be mounted in the base and a pair of side arms **34** that include a knife edge **35** separating a pair of upstanding fingers **36**. Each terminal portion is provided

with a tapped opening 37 for receiving a binding screw (not shown) therein. The movable contacts 38 are formed of thin strip material which is bent transversely into a generally Z-shape. The upper arm 39 of each movable contact is adapted to pivot on the knife edge 35 of the terminal bar 30. Side extensions 40 are likewise included as part of the upper arm 39 of the contact to engage behind the fingers 36 of the terminal bar to hold the movable contact from slipping out of position. The lower arm or distal end 41 of the contact 38 serves as a spring seat having an oversized aperture 42 into which a spring guide rod 43 may be loosely inserted. A stop means 44 is arranged near the bottom of the guide rod 43 to prevent the rod from slipping completely through the aperture 42 while serving as a rocking knife edge support for the lower end of a coil spring 45 that is assembled over the rod. Of course it will be understood that the guide rod 43 could also be assembled with the stop means 44 reversed in position at the top of the switch. In some applications this would be preferred.

An overhanging arm 46 is formed adjacent the top edge of each slide 20 to be longitudinally spaced from each other. An oversized aperture 47 is formed in each arm to receive the upper end of the guide rod 43 so that each spring 45 is confined between the lower arm 41 of one movable contact and the related overhanging arm 46 of the slides. The sides of the free end of the overhanging arm 46 are formed upwardly as at 48 to lie in the same horizontal plane as the top edges of the slides 20 so that the cover plate 12 serves to hold the slides firmly down in the base against the resistance of the coiled springs 45.

Turning again to a consideration of Figure 1, it should be appreciated that openings are formed in the top edge of the side wall 50 of the base opposite the side 16 for accommodating the terminal bar 30 and terminal portions 32 of the fixed contacts 31. For example, the central portion 33 of the terminal bar 30 is shown supported in the side wall by means of opposed grooves 51 while the terminal portions 32 of the fixed contacts are held in opposed grooves 52 in a well-known manner. Hence, it will be appreciated that as the slides 20 move backward and forward from end to end of the base the upper spring seat 46 will shift to first compress the spring until the upper spring seat passes beyond the longitudinal center line of the movable contact whereby the spring will tend to expand and force the movable contact into its opposite position.

Looking now at Figure 4 of the drawing, the slide 20 that is arranged nearest the buttons 15 is shown for illustration purposes at the top with the other slide 20 arranged directly underneath. A cam follower 22 of each button is shown in cooperation with the cam surfaces 21 of the slides, while both of the movable contacts 38 extend in a parallel relationship, there being a closed circuit between the right-hand movable contact and its related fixed contact 31.

In Figure 5 the switch elements have shifted as a result of the actuation of the left-hand button 15. This can be better understood by referring first to Figure 4 where it is seen that the cam follower 22 of the left-hand button is associated with the inclined surface 55 so that as that button is depressed, the cam follower will act against surface 55 to shift the lower slide to the right. Likewise, there is a reversely inclined surface 56 in cooperation with the cam follower of the third button from the left. Thus, when the lower slide moves to the right, the third button which had been previously depressed would be forced outwardly as shown in its final position in Figure 5. In the upper slide of Figure 4. the cam surface 21 related to the left-hand button has a vertically extending concave surface 57. This surface 57 does shift the upper slide a slight amount but the force of the compression spring 45 is enough to return the slide to its original position as seen in Figure 5.

The downward force exerted on each movable contact 38 by the coiled spring 45 and the upward force at the knife edge 35 of the terminal bar 30 form a couple tending to rotate the movable contact in a plane perpendicular to the side wall 50 of the base. This rotation is resisted by a counter couple comprising a force exerted by the spaced fingers 36 resisting the side extensions 40 of the upper arm 39 of the contact and an additional force exerted against the lower portion of the contact where there is a wiping engagement with the fixed contact. In other words, the lower engaging surface of the movable contact 38 bears strongly against the fixed contact 31 or the adjacent inner walls of the side wall 50. This arrangement provides a very important feature that dirt, carbon deposits, and oxidation which naturally form on the contacts will be wiped clean by this rubbing action to result in a more dependable switch.

Having described my invention above it will be readily appreciated by those skilled in this art that I have devised a novel snap acting mechanism in cooperation with a multiple push button switch to effect the quick opening and closing of the contacts. I have arranged the switch elements so that they all may be assembled in the base, making it a simple matter to install the cover plate and the mounting strap for holding the parts together. The parts are few in number and either of molded or stamped construction so that they may be made by mass production methods and quickly assembled with unerring accuracy.

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

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

1. A push button switch comprising a hollow housing, a plurality of push buttons extending through one wall of the housing, a pair of slides in parallel engagement, each slide having a series of cam surfaces, and a cam follower on each push button cooperating with aligned cam surfaces in each slide so that the depression of a push button effects the endwise movements of one or more slides, fixed contacts mounted on a side wall of the housing that is parallel with the said slides, and movable contacts each pivotally hung by one end from a terminal plate on said side wall, and a compression spring held between an overhanging arm of each slide and the distal end of its related movable contact to serve as an over-center snap acting mechanism.

2. A push button switch comprising a recessed base and a cover plate, a plurality of push buttons extending through openings in the bottom wall thereof, a pair of metal slides arranged alongside the buttons, and a series of cam surfaces in each slide in cooperation with a cam follower on each button for effecting the endwise movements of the slides in a predetermined manner, a common terminal bar mounted in an opening in the side wall of the base opposite the buttons, and a pair of movable contacts of generally Z-shape each hung by one end for pivotal movement at spaced points on the terminal bar, a pair of fixed contacts disposed at opposite sides of the terminal bar with their terminal portions mounted in openings in said side wall of the base, an overhanging arm at the top edge of each slide, and a compression spring supported between each arm and the distal end of the adjacent movable contact to serve as an over-center snap acting mechanism between the slides and the movable contacts.

3. A multiple push button switch comprising a hollow

housing with a pair of slides arranged for endwise movements and controlled by the operation of the buttons in a predetermined manner, a pair of fixed contacts mounted on a side wall of the housing that is parallel with the said slides, and a pair of swinging contacts each hung by one end from a terminal bar that is fixed on the same side wall of the housing, an over-center snap acting mechanism for each swinging contact supported between a transversely extending arm of a slide and the opposite end of its related swinging contact to cause the quick opening and closing of the contacts.

4. A multiple push button switch comprising a hollow housing with at least one slide arranged for endwise movement and controlled by the operation of the buttons in a predetermined manner, a fixed contact mounted in the housing, and an oscillating contact pivotally suspended at one end on a terminal bar and movable into and out of engagement with the fixed contact, and an over-center spring mechanism comprising a coil spring and a guide rod supported between the swinging distal end of the movable contact and an arm at the top edge of the slide to effect the quick opening and closing of the contacts.

5. A push button switch as recited in claim 4 wherein the pivotal support for the movable contact is off-set from the longitudinal axis of the spring to force the distal end of the movable contacts into rubbing engagement with the fixed contact.

6. A push button switch as recited in claim 5 wherein the movable contact is of thin strip material that is folded transversely into a generally Z-shape having an upper and a lower arm, the upper arm of which rests on a knife edge on the terminal bar for rocking movement, the outermost extremity of the upper arm having side extensions which cooperate with upwardly extending fingers on the terminal bar at opposite sides of the knife edge to prevent their accidental disengagement.

7. A push button switch as recited in claim 6 wherein the lower arm of the movable contact has an enlarged opening for receiving the lower end of the spring guide rod, said rod having a stop means adjacent said end to serve as a rocking seat between the lower end of the spring and the lower arm of the movable contact, the upper end of the guide rod extending through an enlarged opening in the said arm at the top edge of the slide.

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