April 30, 1957 HUNG-TU TSENG ET AL 2,790,858

PUSH BUTTON THREE WAY SWITCH

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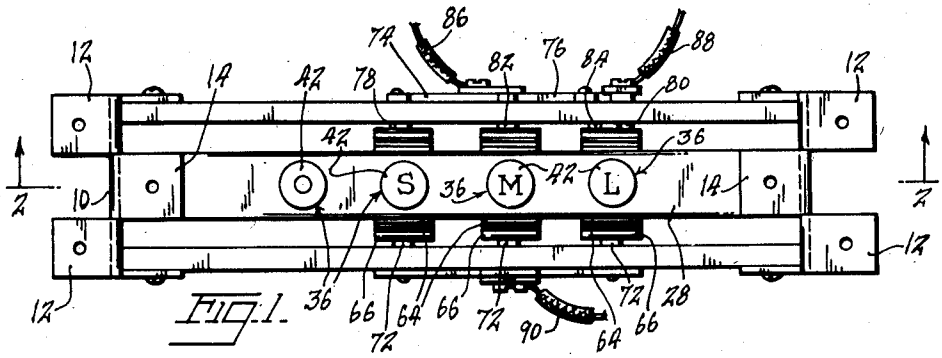


FIG. 1.

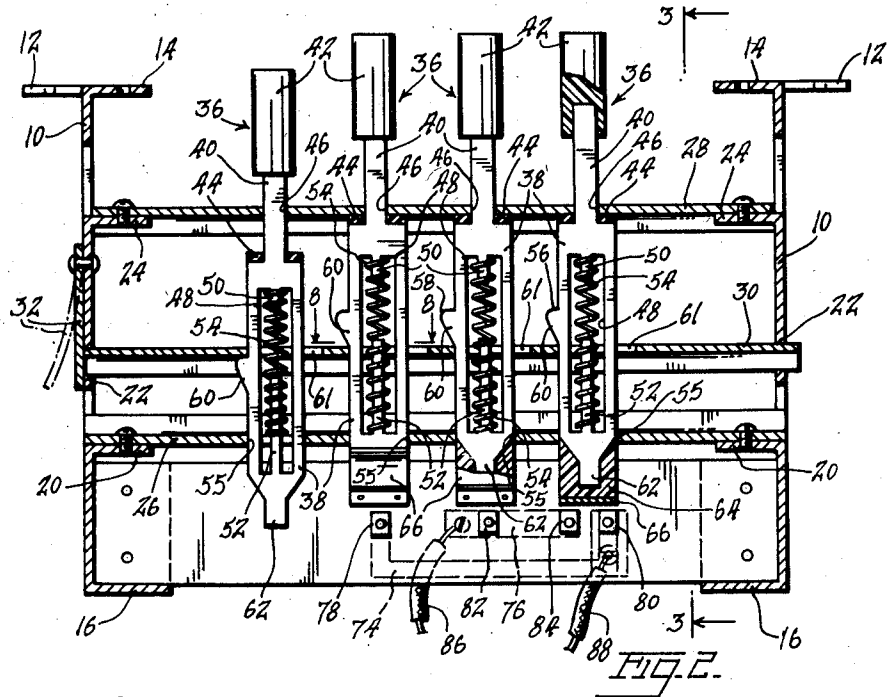


FIG. 2.

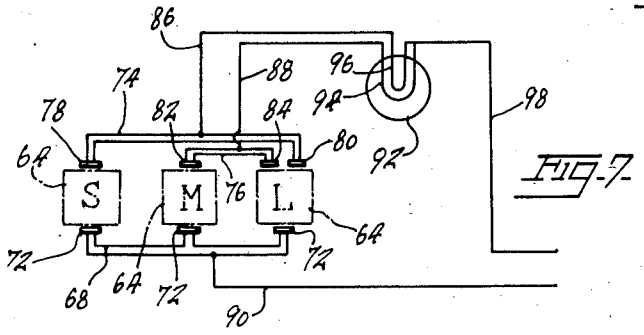


FIG. 7.

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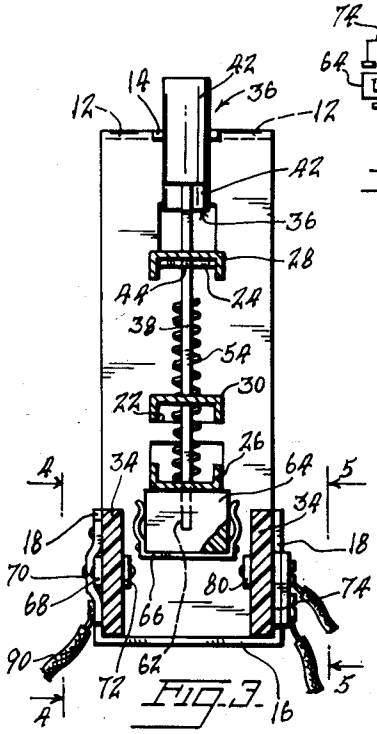


Fig. 3.

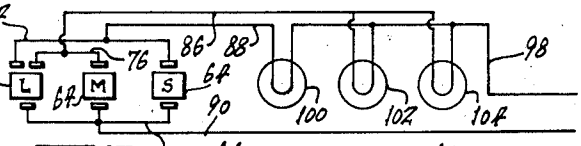


Fig. 10.

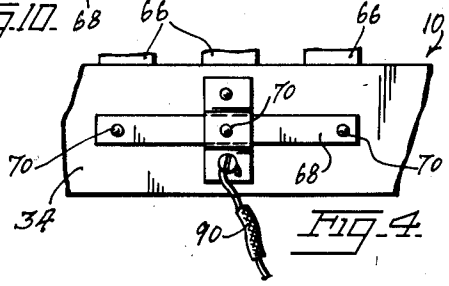


Fig. 4.

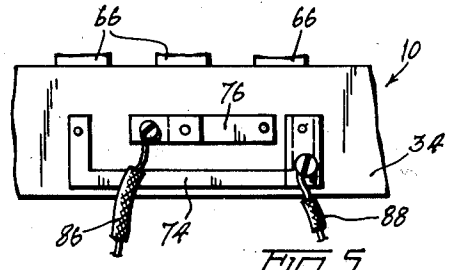


Fig. 5.

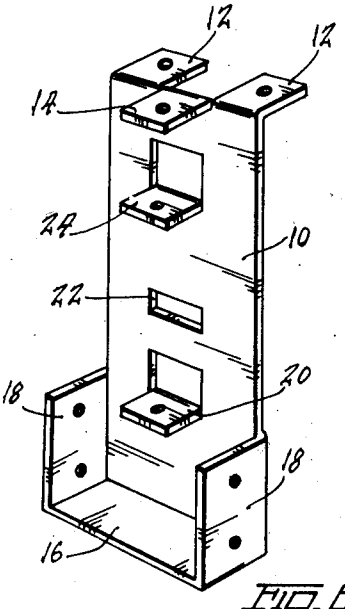


Fig. 6.

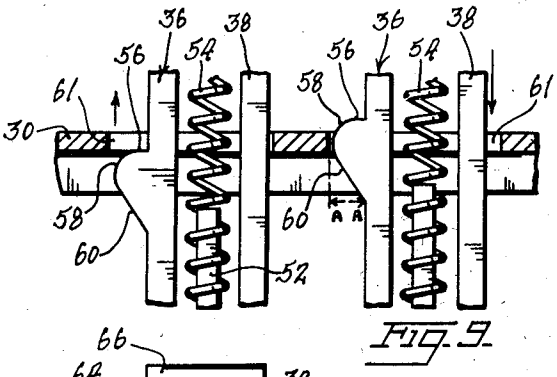


Fig. 9.

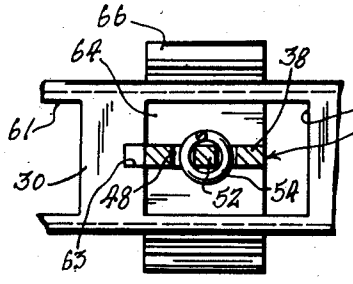


Fig. 8.

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PUSH BUTTON THREE WAY SWITCH

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Application August 16, 1954, Serial No. 450,052

3 Claims. (Cl. 200—5)

This invention relates to a switch device for three-way or multi-pole incandescent lamps. More particularly, the invention has reference to a device of the nature referred to wherein there is embodied a slidably reciprocable latch bar, that is adapted to hold a selected switch button in a depressed position.

The term "multi-pole incandescent lamp," when used herein, will be understood to encompass not only a lamp fixture having a multi-filament bulb, but also one of the type having a plurality of bulbs, any number of which can be turned on to vary the amount of light furnished.

Conventionally, switch devices for three-way or multi-pole incandescent lamps are so designed as to require the user to traverse substantially the full cycle of switch positions, in arriving at a desired position of said switch. Obviously, this is undesirable, since in some instances, to turn off the lamp, it may be necessary to operate the switch through "medium" and "small" positions, from a "large" position. This is one example of how one is required to traverse the cycle of switch operation, when conventionally designed switches are utilized in association with incandescent lamps.

An important object of the present invention is to provide an improved switch device for lamps of the type referred to. More particularly, the invention has reference to a device so designed as to cause depression of any selected push button to be effective to adjust automatically, to an inoperative position, any other push button which was previously depressed. In this way, there is no necessity for one to traverse the entire range of switch positions. Instead, one merely selects the lamp condition desired, and depresses the appropriate push button to obtain said condition.

Another object of importance is to provide a switch device of the nature stated which will be relatively inexpensive considering the benefits to be obtained from the use thereof.

Still another object of importance is to provide a switch device which will be so designed as to be housed in a compact assembly, capable of installation with a minimum of difficulty in a relatively inconspicuous position in a suitable location such as on the wall of a room, to control operation of a lamp located remotely therefrom, as for example on the ceiling.

A further object of importance is to provide a switch device as stated which will be characterized by its ease of operation, the device being so designed as to permit depression of the selected push button with a minimum of difficulty, and without interference from other push buttons of the assembly.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a top plan view of a switch device formed in accordance with the present invention.

Fig. 2 is a longitudinal sectional view through said device taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary side elevational view of the device as seen from the line 4—4 of Fig. 3.

Fig. 5 is a view similar to Fig. 4, the device being seen from the line 5—5 of Fig. 3.

Fig. 6 is a perspective view of one of the end frames.

Fig. 7 is a diagrammatic showing of the circuitry involved in the construction.

Fig. 8 is a detail sectional view taken substantially on line 8—8 of Fig. 2.

Fig. 9 is an enlarged, fragmentary longitudinal sectional view showing two of the push buttons during operation of the switch.

Fig. 10 is a circuit diagram showing the device in use to control three lamp bulbs.

The reference numeral **10** has been applied to an end frame, there being identically but oppositely formed end frames at opposite ends of the switch assembly, as best shown in Figs. 1 and 2. Each end frame is formed as shown in Fig. 6, from a single piece of sheet metal material, the upper end of said piece being formed with transversely spaced, outwardly extended ears **12**, each of which has a screw-receiving aperture, said ears being disposed at opposite sides of an inwardly extended ear **14** also having a screw-receiving aperture. The ears **12**, **14** are respectively provided to adapt the device for mounting in a suitable casing, not shown, said casing being of rectangular formation, and to permit attachment of a cover to the switch device.

Since the casing would merely be adapted to receive the switch assembly shown, it is not believed necessary to illustrate it herein, it being understood that the casing would be as compact as possible.

In any event, each end frame is formed at its lower end with an inwardly extended bottom flange **16** integral at its opposite ends with side flanges **18**. Immediately above the upper ends of the side flanges **18**, the end frame is formed, medially between opposite sides thereof, with a tab **20** which is struck inwardly from the material of the end frame to provide a support ledge. Above the support ledge **20**, and also disposed medially between the opposite sides of the end frame, there is a horizontally extended, slot-like guide opening **22** for a latch bar to be described hereinafter. Above the opening **22**, a second inwardly struck tab **24** is provided, defining an upper support ledge.

The support ledges **20**, **24** are apertured to receive screws, said screws passing through openings formed in the opposite ends of lower and upper guide bars **26**, **28** to secure said guide bars to the respective lower and upper support ledges (Fig. 2).

The guide bars are of inverted channel shape to strengthen the same.

Having its ends slidably engaged in the openings **22** of the end frames is a slidably reciprocable latch bar **30**, also of inverted channel shape as shown in Fig. 3. Latch bar **30**, at one end, is engaged by the free end of a leaf spring **32** anchored to the adjacent end frame. Leaf spring **32** tends to urge the latch bar to the right in Fig. 2, to the full line latch bar position. However, the latch bar is shiftable to the left in Fig. 2 against the opposing action of the spring, to the dotted line position shown in this figure of the drawing.

Extending between the end frames, at the lower ends thereof, are transversely spaced, parallel, contact bar support plates **34**. These are secured by screws or equivalent fastening elements at their ends to the respective flanges

18 of the end frames, the plates 34 being supported upon the bottom flanges 16 of said end frames when so secured.

The switch assembly constituting the present invention includes a bank of reciprocating push button assemblies 36. For use with a three-way or multi-pole incandescent lamp, four push button assemblies are desired, as shown one of said assemblies being designated "O" for the purpose of turning the lamp off. The other assemblies are respectively designated "L," "M," and "S," and are used to turn the lamp on "large," "medium," and "small."

Each of the push button units or assemblies 36 is mounted in the guide bars for reciprocation in a direction normal to the line of reciprocating movement of the latch bar 30. Each unit 36 includes an elongated sheet metal body portion 38 integral at its upper end with a longitudinal extension 40 of reduced width embedded at that end thereof remote from body portion 38 in the inner end of a cylindrical push button 42 the outer end surface of which is provided with a suitable indicium (Fig. 1) designating the lamp condition which will be produced by depression of the particular button. Surrounding the base of the extension 40 and resting on the shoulder defined between body portion 38 and extension 40 is a rubber cushion 44 that will reduce shock when the shoulder engages against the underside of the upper guide bar 28 on movement of the push button unit to an inoperative or extended position, the extension 40 being guided in an opening 46 of the upper guide bar during said movement of the push button unit.

For the major part of its length, body portion 38 is formed with an elongated, longitudinally extending, closed slot 48. Extending longitudinally and centrally of the slot toward one another from the opposite ends of the slot are lugs 50, 52, the lug 52 being of substantial length. A spring 54 extends from end to end of the slot, and is held under compression between the slot ends, the lugs 50, 52 being engaged in the opposite ends of the spring to hold the same assembled with the body portion. The spring, at its lower end, engages against the upper surface of the lower guide bar 26. The lower guide bar has openings 55 in which the lower ends of the body portions 38 are slidably engaged.

Formed upon one longitudinal edge of each body portion 38, medially between the opposite ends of said body portion, is a protuberance or nose having at one end a narrow shoulder 56 lying normally to the line of reciprocation ofthe push button unit. Shoulder 56, at its outer end, merges into an inclined surface 58 inclined obliquely to said line of reciprocating movement of the push button unit. Inclined surface 58 merges in turn into a cam surface 60 substantially greater in length than the inclined surface 58 and also inclined obliquely to the line of reciprocation of the push button unit, though in a direction opposite to that of the surface 58. At the intersection of the surfaces 58, 60, the nose is rounded off.

It is of importance that, as shown in Fig. 9, the outer end of the shoulder 56 terminates more closely to the adjacent longitudinal edge of body portion 38 than does the outer end of the cam surface 60, that is, that end of the cam surface that meets the inclined surface 58. As a result, and as clearly shown in Fig. 9, when an extended or raised push button is depressed, the latch bar 30 will be shifted to the left by the pressure of cam surface 60 in Fig. 9 a distance equal to the distance A—A in Fig. 9. Since this distance is more than the length of shoulder 56, during the movement of the latch bar to the left the shoulder 56 of a push button that has been in depressed position will clear the latch bar. Under the pressure of the spring 54 of said previously depressed push button, the push button will be biased upwardly to extended position, simultaneously with movement of the push button first referred to, to a depressed position. The latch bar, in this connection, has large openings 61 (Fig. 8) widened sufficiently to prevent engagement of the springs 54 by their latch bar, each opening being formed at one end with a small communicating recess 63 receiving the nose of the associated assembly 36. As each push button is moved fully to a depressed position, spring 32 will shift the latch bar to the right in Fig. 2, to engage the left edge of opening 61, that is, the inner end edge of recess 63, over shoulder 56 of the depressed push button, thereby to hold the same depressed.

Each body portion 38 has a reduced inner end portion 62 embedded in a rectangular block 64 of plastic or other non-electrically conductive material. Referring to Fig. 3, embracing each block 64 is a conductive, U-shaped bridge element 66 fixed to the block 64 and having springable, outwardly bowed legs at opposite sides of the block.

Secured fixedly to and extended longitudinally of one plate 34 is a conductive bar 68. Conductive nails or rivets 70 extend through bar 68 and plate 34, at locations spaced along the lines of bar 68, said nails or rivets being adapted to secure to the inner surface of the associated plate 34 spaced contacts 72 engageable by the bridging elements of the "large," "medium," and "small," push button units.

To the outer surface of the other plate 34 there is secured an elongated, U-shaped, electrically conductive contact bar 74 the ends of which are extended upwardly and are secured fixedly to the associated plate 34 by rivets or conductive nails. The conductive nails or rivets extend fully through the plate 34. A shorter, straight bar is embraced by the longer bar 74, and is designated at 76. This, like bar 74, is fixedly secured to plate 34 by conductive nails or rivets passing through said plate 34. The conductive nails or rivets of the bars 74, 76 secure to the inner surface of the associated plate 34 contacts 78, 80, 82, 84. Contacts 78, 80 are electrically connected through their associated nails or rivets to the ends of bar 74, and contacts 82, 84 are similarly connected to the bar 76. Contacts 80, 84 are closely spaced apart, so as to be simultaneously engaged by the bridging element of the "large" push button unit.

Attached by a suitable terminal screw to bar 76 is a lead 86, a lead 88 being similarly attached to bar 74. A lead 90 is attached by a terminal screw to the bar 68 of the other plate 34, and extends to one side of a conventional house supply of electricity.

As shown in Fig. 7, the device is used to control the operation of a three-way or multi-pole incandescent lamp 92 having a high intensity filament 94 and a low intensity filament 96. Filaments 94, 96 at one end have a common pole connected to lead or conductor 98 extending to the other side of the house supply. The other poles of the filaments are respectively connected to the leads 86, 88.

It will be seen that depression of any push button unit, other than the "off" unit, is effective to bridge selected contacts. For example, if the light is to be turned on "small," the "small" push button unit will be depressed. This lowers the bridging element of this unit into engagement with one of the contacts 72, and with the contact 78 disposed directly opposite said contact 72. A circuit is thus closed through lead 90, bar 68, bridged contacts 72, 78, bar 74, lead 86, filament 96, and back to the source of electricity through lead 98.

The lamp would be turned on "medium," of course, by depression of the "M" push button. Depression of this push button, as is true also of depression of any other push button, will automatically move to inoperative position the last previously depressed push button.

If the lamp is to be turned on "large," the "L" push button is depressed, and this will cause the contacts 84, 80 to be engaged by the bridging element of this push button unit, to connect the same electrically to the contact 72 aligned transversely therewith. Both filaments 94, 96 will now be energized.

In Fig. 10, the device is shown in association with a plurality of lamp bulbs 100, 102, 104. Lead 88 is in this

instance connected to bulb **100**, while the two bulbs **102**, **104** are connected to lead **86**.

Depression of push button marked "S" will close a circuit including lead **90**, bar **68**, the "S" bridging element bar **64**, lead **88**, bulb **100**, and lead **98**, thus illuminating one bulb for a relatively small amount of light. Depression of the "M" push button will close a circuit including lead **90**, bridging element marked "M," bar **76**, lead **86**, bulbs **102**, **104**, and lead **98**. Two bulbs are thus lit for a medium light. Depression of "L" button will cause flow through lead **90**, bar **68**, bridging element "L," bar **76**, lead **86**, bulbs **102**, and **104**, and lead **98**. It will further cause flow through lead **90**, bar **68**, element "L," bar **74**, lead **88**, bulb **100**, and lead **98**. Thus all three bulbs are lit for a relatively large amount of light.

While we have illustrated and described the preferred embodiment of our invention, it is to be understood that we do not limit ourselves to the precise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described our invention, what we claim as new, and desire to secure by United States Letters Patent is:

1. A push button switch for multi-pole incandescent lamps, comprising a frame assembly including a pair of end frames, transversely spaced contact support plates extending therebetween, and guide means extending between the end frames, a plurality of individually depressible push button units each mounted for reciprocating movement in said guide means, a latch bar slidably reciprocable in the frame assembly in a direction normal to that of the respective push button units, said latch bar and push button units having interengaging means for releasably holding a selected unit in depressed position, each unit having means to shift the latch bar out of push-button-unit-holding position during depression of a unit, to free for return to extended position the last previously depressed unit, transversely aligned contacts on the plates adapted for connection in circuit with selected poles of a multi-filament lamp, and conductive elements carried by selected push button units for bridging the transversely aligned contacts responsive to depression of a push button unit, each of said end frames being formed from a single piece of sheet metal material adapted at one end for connection to an associated support, and adapted at its other end to receive one end of said plates, said other end of the end frame having a U-shaped flange formation receiving said one end of the plates and means for fastening said one end of the plates to the flange.

2. A push button switch for multi-pole incandescent lamps, comprising a frame assembly including a pair of end frames, transversely spaced contact support plates extending therebetween, and guide means extending between the end frames, a plurality of individually depressible push button units each mounted for reciprocating movement in said guide means, a latch bar slidably reciprocable in the frame assembly in a direction normal to that of the respective push button units, said latch bar and push button units having interengaging means for releasably holding a selected unit in depressed position, each unit having means to shift the latch bar out of push-button-unit-holding position during depression of a unit, to free for return to extended position the last previously depressed unit, transversely aligned contacts on the plates adapted for connection in circuit with selected poles of a multi-filament lamp, and conductive elements carried by selected push button units for bridging the transversely aligned contacts responsive to depression of a push button unit, each push button unit carrying a block of electrically insulative material at one end, each of said bridging elements embracing and being secured fixedly to one of said blocks, each bridging element being formed as a U-shaped spring the legs of which engage said transversely aligned contacts, said legs being normally bowed outwardly from opposite sides of the associated block.

3. A push button switch for multi-pole incandescent lamps, comprising a frame assembly including a pair of end frames, transversely spaced contact support plates extending therebetween, and guide means extending between the end frames, a plurality of individually depressible push button units each mounted for reciprocating movement in said guide means, a latch bar slidably reciprocable in the frame assembly in a direction normal to that of the respective push button units, said latch bar and push button units having interengaging means for releasably holding a selected unit in depressed position, each unit having means to shift the latch bar out of push-button-unit-holding position during depression of a unit, to free for return to extended position the last previously depressed unit, transversely aligned contacts on the plates adapted for connection in circuit with selected poles of a multi-filament lamp, and conductive elements carried by selected push button units for bridging the transversely aligned contacts responsive to depression of a push button unit, each push button unit carrying a block of electrically insulative material at one end, each of said bridging elements embracing and being secured fixedly to one of said blocks, each bridging element being formed as a U-shaped spring the legs of which engage said transversely aligned contacts, said legs being normally bowed outwardly from opposite sides of the associated block, selected contacts of one plate being spaced closely apart for engagement by a single bridging element, for simultaneous energizing of a plurality of filaments of said lamp.

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