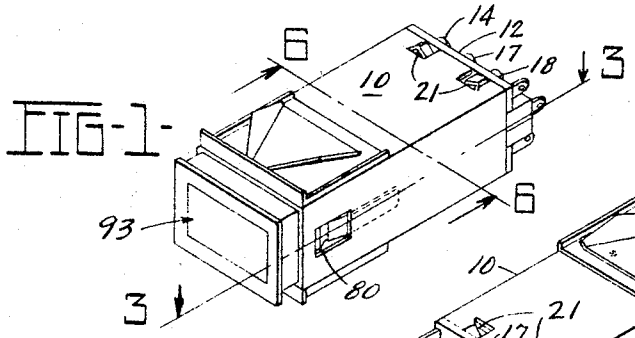
Sept. 20, 1966 C. R. STEVENS 3,274,354

SWITCH MECHANISM

Filed July 15, 1964 2 Sheets-Sheet 1

FIG-1-



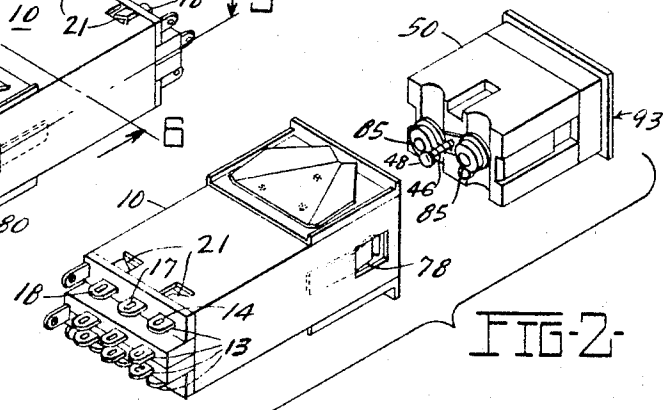
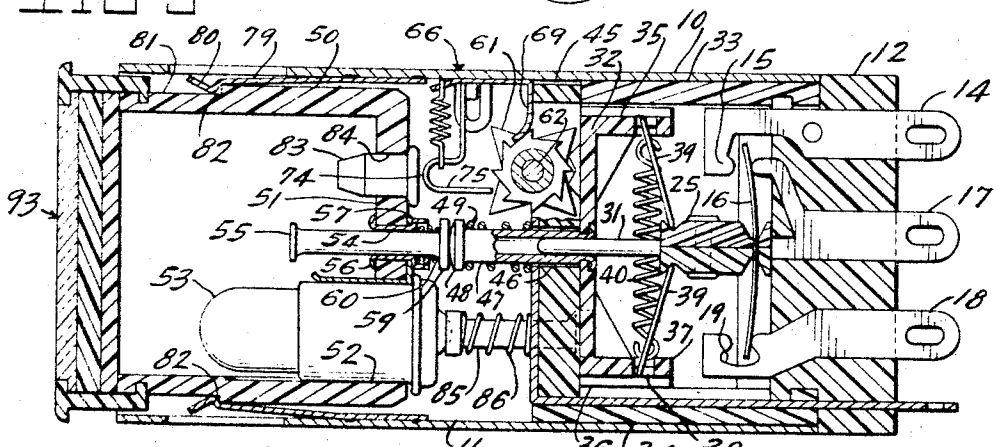


FIG-2-

FIG-3-



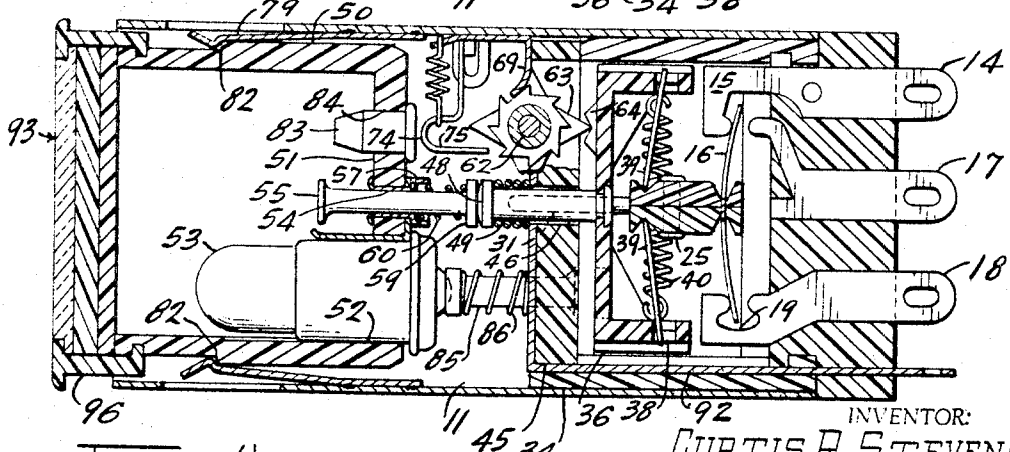


FIG-4-

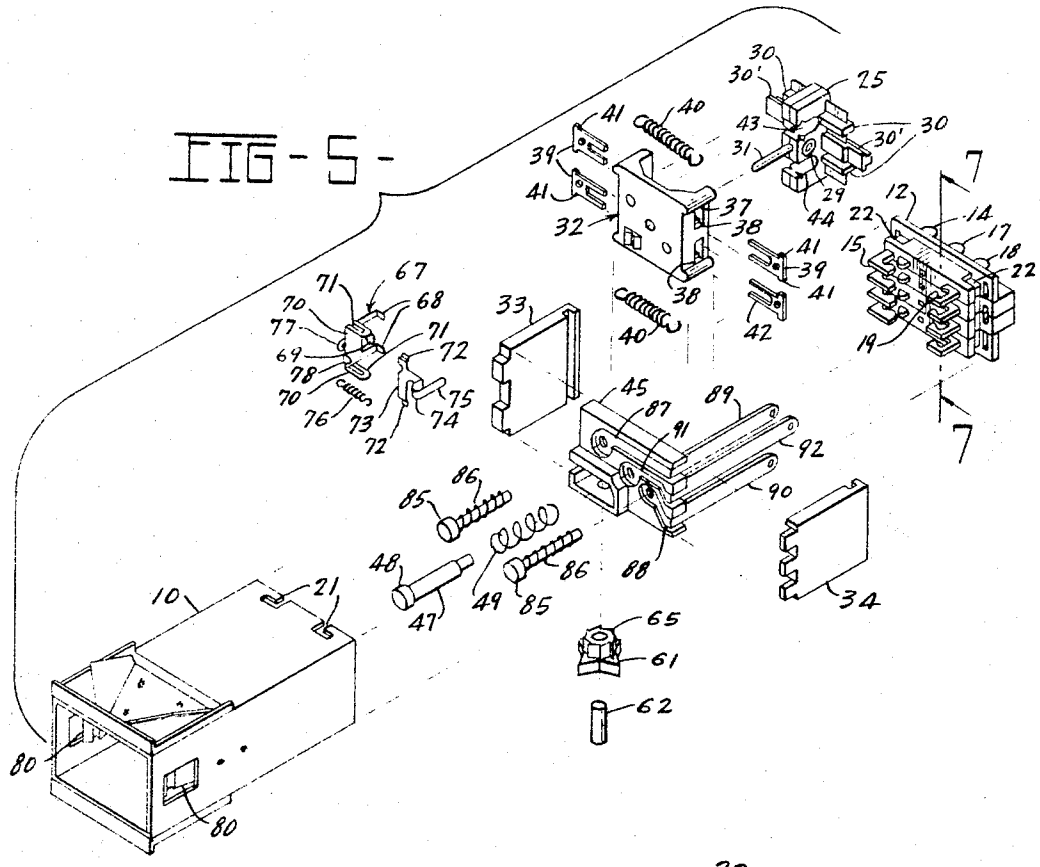
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Sept. 20, 1966 C. R. STEVENS 3,274,354

SWITCH MECHANISM

Filed July 15, 1964 2 Sheets-Sheet 1

FIG-5-



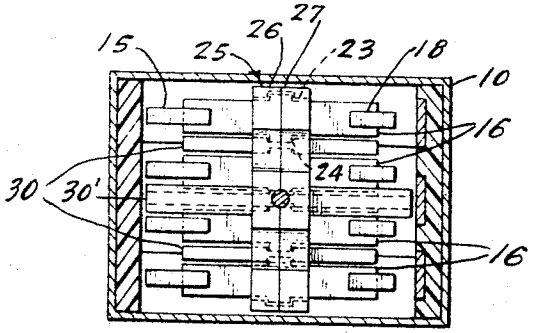


FIG-6-

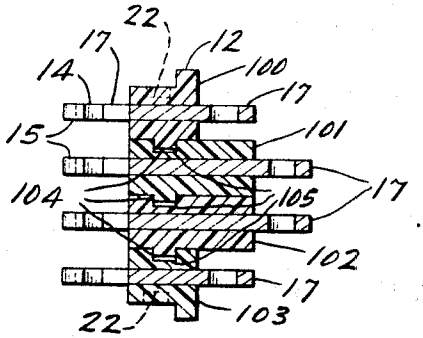


FIG-7-

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United States Patent Office 3,274,35
Patented Sept. 20, 196

3,274,354

SWITCH MECHANISM

Curtis Ray Stevens, La Mirada, Calif., assignor to Master Specialties Company, Gardena, Calif., a corporation of California

Filed July 15, 1964, Ser. No. 382,912
15 Claims. (Cl. 200—76)

The present invention relates to snap acting push button switches; and more particularly to alternate action snap acting push button switches.

An object of the present invention is the provision of a switch having new and improved constructional features which include a novel manner of securing multiple contacts to a wall of a switch housing.

Another object of the invention is the provision of a switch having two pairs of contacts positioned in a rectangular pattern, and a new and improved inexpensive switch blade and switch blade holder assembly reciprocable by a snap action between front and rear contacting positions, and so constructed as to assure a good contact for all switch blades in both positions.

Another object of the invention is the provision of a new and improved overcenter snap acting device for a switch blade holder which, at the completion of its movement from one position to another, is divorced in its action from the actuator by which the movement was initiated.

Another object of the invention is the provision of a new and improved and inexpensive pawl for actuating the ratchet wheel of an alternate action switch mechanism.

A further object of the invention is the provision of a new and improved alternate action switch which can be quickly and easily converted to a direct acting or momentary switch and vice versa.

The invention resides in certain constructions and combinations and arrangements of parts, and further objects and advantages will become apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification and in which:

FIG. 1 is an isometric view of an assembled switch structure embodying the present invention;

FIG. 2 is an isometric view of the switch structure shown in FIG. 1 but turned around so that the rear end of the switch can be clearly seen; the view also showing the lamp housing of the switch removed endwise of the switch housing;

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 1, and showing the switch structure in one of its actuated positions;

FIG. 4 is a view similar to FIG. 3 but showing the switch in the other of its actuated positions;

FIG. 5 is an exploded view showing those parts which go to make up the switch, exclusive of the lamp housing;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 1; and

FIG. 7 is a sectional view taken along the line 7—7 of FIG. 5.

The switch structure shown in the drawings, embodies a preferred form of the invention and comprises a sheet metal housing **10** forming an internal chamber **11** of rectangular cross section. The rear of the housing is closed off by a plastic wall **12** having one or more rows **13** of three contacts, and the switch shown is provided with four rows, or tiers, of terminals. One of the terminals **14** of each tier **13** is generally L-shaped, the lateral contact portion **15** of which is adapted to be abutted on its backside by a switch blade **16**. The center terminal **17** of each tier has a contact portion positioned behind the lateral portion **15**, and is adapted to be abutted by the

switch blade **16** when moved to its rear position. T other terminal **18** of each tier **13** has a generally ' shaped notch **19** in its side facing terminals **14** and **1** and into which the other end of the switch blade **16** pr jects so that the switch blade will engage the front a rear contacts of the terminal **18** in either of its front rear positions. This arrangement avoids the hinge stru ture usually used in three-terminal switches. Hinge stru tures usually have only small current carrying capaci and the arrangement of contacts shown provides a thre terminal switch with a current carrying capacity of four-terminal switch. Each of the rows **13** is identic and only one will be described in detail. The portion and front face of terminal **17** form one pair of contacts each tier, while the front and rear sides of the notch form another pair of contacts of each tier. The plas wall is held in position in the housing by a flange which abuts the end of the housing **10** and four inward deformed tabs **21** (only two of which are shown) whi are received in slots **22** (see FIG. 5) in the plastic e wall **12**.

There are four identical, wide, but thin and flexib switch blades **16** of large current carrying capacity, o for each row **13** of contacts, and each blade **16** has t and bottom center projections **23** and **24**, shown by dott lines in FIG. 6. The switch blades **16** are supported b a switch blade holder **25** that is formed in two sectio **26** and **27** which abut along vertical mating surface Four sets of vertically aligned switch blade receiving slo **28** are formed through each section **26** and **27**, and t portions of each slot **28** adjacent the mating surfaces a enlarged to receive one-half of the projections **23** and **2** The half sections **26** and **27** are slipped endwise ov opposite ends of the four blades **16** and are held togeth by a rivet **29**. The sections **26** and **27** have lateral pr jections **30** made of an insulating material between ea set of blades **16**. The switch blade holder **25** also carri projecting pin **31** which extends therefrom for guidi purposes. The switch blades **16** abut contacts of term nals **17** and **18** when the holder **25** is in the rear pos tion (see FIG. 3) and abut the contacts of terminals **1** and **18** when in the forward position (see FIG. 4).

It will be seen that all of the switch blades are he and actuated by a single solid piece, and that each bla is flexible so that abutment of one blade against its co tacts will not prevent good contact between the oth blades and the contacts associated therewith.

The switch blade holder **25** is adapted to be snappe between its forward and rear positions, as shown in FIG 3 and 4, by a single overcenter structure actuated by rectangularly-shaped actuating slide or switch actuat **32**. By causing all of the switch blades to be actuated b a single overcenter device, simultaneous actuation of a of the switch blades is assured. Plastic insulator plat **33** and **34** extend along opposite sides of the housin and the actuating slide **32** has rearwardly extending pr jections **35** and **36** which slide along the insulator plat **33** and **34**. The projections **35** and **36** have two pairs aligned slotted openings **37** therethrough, each of whic is enlarged vertically at its outer ends to provide top an bottom shoulders **38**. A U-shaped pin **39** is inserted int each opening **37**. A coil spring **40** is fastened betwee opposite U-shaped pins **39**. The coil spring **40** so tightl holds the spaced-apart legs of the U-shaped pins **3** against the switch blade holder **25** that the weight of th holder **25** is supported from the pins which, in turn, ar supported by the sidewalls of the openings **37** in the slid **32** and the inner ends of the legs **42** of the pins **39** projec into indentations **43** in the side of the switch blade holde **25**. The switch blade holder **25** has openings **44** there through between indentations **43** through which the spring

40 pass to permit snap actuation of the pins 39 and switch blade holder 25. It will, therefore, be seen that the switch blade holder 25 has no rigid connection to and is free from its actuating mechanism. Tests indicate that the overcenter structure has no "dead point."

The forward position of the actuating slide 32 is limited by abutment with a plastic partition 45 seated in the housing 10. The partition 45 has a central opening 46 therethrough, through which a headed pin 47 extends with its head portion 48 positioned forwardly of the partition 45 and its rear portion riveted to the actuating slide 32. The rear end of the pin 47 is hollow to receive and guide the pin 31 of the switch blade holder 25, and the actuating slide 32 is biased to its front position against the back of the partition 45 by a coil spring 49 positioned around the pin 47 between the head 48 and the partition 45.

In the form shown in the drawings, the actuating slide 32 is adapted to be moved from its front position, shown in FIG. 3, to a position slightly to the rear of the position shown in FIG. 4, by a movable lamp housing or lighted push button 50 which is slidably received in the front end of the housing 10. The lamp housing 50 has a rear end wall 51 with two lamp openings 52, only one of which is shown, through which lamps 53 extend. The rear end wall 51 also has a central opening 54 therethrough which aligns with the headed pin 47. A headed contact pin 55 projects forwardly through the opening 54 of a headed, hollow rivet 56 which extends through the wall 51. The head 57 of the rivet 56 is cup-shaped and a coil spring 58 is positioned between the head 59 of the pin 55 and the bottom of the cup-shaped head 57. A ground contact 60 is positioned between the back of the lamp housing and the head 57 of the rivet 56, and has portions that extend forwardly in the openings 52 to engage the metal bases of the lamps. Upon rearward movement of the lamp housing 50, the rear end of the cup-shaped head 57 abuts the head 48 of the pin 47 to move the actuating slide 32 rearwardly.

The actuating slide 32 is normally biased to its front position, shown in FIG. 3, by coil spring 49 to cause the switch blade holder 25 to hold blades 16 across contacts 17 and 18. When the device is used as an alternate action switch, the actuating slide 32 is caused to be held in the rear position shown in FIG. 4 by a star wheel 61 having four points and which is rotatably mounted around a vertical pin 62 received in the partition 45. When one of the points 63 projects rearwardly, it engages in a V-shaped abutment 64 on the front of the actuating slide 32 to hold the slide in its rear position. When the star wheel 61 is rotated 45°, so that the space between points 63 is presented to the slide 32, the slide is free to move to its front position, shown in FIG. 3.

The star wheel 61 is rotated 45° each time the lamp housing 50 is pressed, by an eight-toothed ratchet wheel 65 fixed to the star wheel 61. A ratchet actuating mechanism, designated generally at 66, is positioned between the ratchet wheel 65 and the lamp housing 50.

The ratchet actuating mechanism 66 comprises a bracket 67 (see FIG. 5), which may be wedged between the housing and one side of the partition 45. The bracket 67 has two legs 68 which engage the back of the partition 45 and a leg 69 which engages the front of the partition. The inner end of the leg 69 is bent forwardly to engage a side of a tooth of the ratchet wheel 65 to prevent clockwise rotation, as seen in FIG. 3. The bracket 67 includes two inwardly extending, parallel legs 70 positioned forwardly of the leg 69, which legs 70 contain slots 71 for receiving vertical ears 72 on the top and bottom of the outer end of a pawl 73. The inner portion of the pawl 73 is bent forwardly to provide a U-shaped actuating abutment 74 and the inner end 75 of the pawl extends rearwardly to engage a tooth of the ratchet wheel 65 on the side of the pin 62 opposite the slots 71. A coil spring 76 connects the U-shaped portion 74 and a projection 77, which extends forwardly of the legs 70, to simultaneously bias the pawl 73 against the outer side of the bracket 67 and pull the pawl 73 forwardly until it abuts an inwardly bent stop 78. Only one spring is necessary to perform both movements.

The lamp housing 50 is slidably retained in the front of the housing 10 in any suitable manner, as by a pair of fingers 79, the rear ends of which are spot-welded to the inside of the housing, and the front ends of which have inwardly bent V-shaped projections 80 which ride in longitudinal grooves 81.

The lamp housing 50 is biased forwardly by spring 58, and the normal forward position of the lamp housing 50 occurs when the V-shaped projections 80 of the fingers 79 engage the shoulders 82 at the rear end of the grooves 81. By pulling the lamp housing 50 forwardly, the V-shaped projections 80 can be caused to snap out of the grooves and the lamp housing 50 can be removed. The rear end of the lamp housing 50 has a removable abutment means or plug 83 therein positioned opposite the U-shaped abutment 74 on the pawl 73 to actuate the pawl and provide alternate action for the switch mechanism. By removing the plug 83, the U-shaped abutment 74 is allowed to enter the hole 84 upon depressing the lamp housing 50, so that the alternate action mechanism comprising the star wheel 61 is disabled and the switch converted by the user to act as a momentary switch, if desired.

A lamp 53, not shown, is positioned above the plug 83, shown in FIGS. 3 and 4. Electrical connections with the center terminal of the lamps 53 are provided by identical, headed contact pins 85 which are biased forwardly against the lamps by springs 86 (see FIG. 5). The rear ends of the springs 86 bear against the lateral legs 87 and 88 of L-shaped terminals 89 and 90, which lateral legs are recessed into the front face of the partition 45 for the top and bottom lamps 53, respectively. The ground electrode spring 49 bears against the lateral leg 91 of an L-shaped terminal 92, which leg is also recessed into the partition 45 between the legs 87 and 88. The rearwardly extending legs of the terminals 89, 90 and 92 are received in recesses in the plastic insulating plate 34 and project out of the rear end wall 12. The front of the lamp housing 50 is closed off by a conventional lens assembly 93.

Assuming that the plug 83 is in position in the lamp housing 50 and the switch is to be used as an alternate action switch, the operation of the switch will be generally as follows: With the switch in the condition shown in FIG. 3, manual pressing of the lens assembly 93 inwardly causes the lamp housing 50 to move rearwardly and, in turn, cause the end of the head 57 of the rivet 56 to abut the head 48 of the pin 47. During rearward movement of the lamp housing 50, the plug 83 abuts the abutment 74 of the pawl 73, and the pin 47 that is attached to the actuating slide 32 is caused to move rearwardly before the inner leg 75 of the pawl 73 engages a tooth of the ratchet wheel 65. Rearward movement of the slide 32 causes the U-shaped pins 39 to pivot about the indentations 43 in the switch blade holder 25, and causes the spring 40 to move towards a position which is in line with the pins 39. During rearward movement of the slide 32, the end 75 of the pawl 73 engages a tooth of the ratchet wheel 65 and turns the star wheel 61, 45° in a counterclockwise direction, as seen in FIG. 3, so that a point of the star wheel projects directly rearwardly at a time just prior to the time that the coil spring 40 is in line with the pins 39. Thereafter, continued rearward movement of the slide 32 causes the coil springs to move overcenter with respect to the pins 39, and the switch blade holder 25 is caused to snap forwardly to bring the V-shaped abutment 64 of the slide 32 against a point 63 of the star wheel 61. During the snap actuation which occurs as the coil spring 40 moves overcenter with respect to the pins 39, the switch blades 16 are moved rapidly out of contact with the rear of the notch 19 in

the terminal **18** and the front face of the terminal **17**, and are caused to snap into engagement with the front end of the V-shaped notch **19** of the terminal **18** and the back end of the projection **15** of the terminal **14**.

During the previously described rearward movement of the lamp housing **50**, the end **75** of the pawl **73** engages a tooth of the ratchet to engage a tooth of the ratchet wheel **65** on the opposite side of the center of the pin **62** from the slots **71**, and thereafter the end **75** of the pawl must travel inwardly and rearwardly in an arc, during which time the coil spring **76** is elongated and the ears **72** of the pawl **73** slide inwardly within the slots **71**.

During the above-described rearward movement of the lamp housing **50**, the coil spring **49** maintains a contact between the ground terminal **92** and the contact pin **55**, and the coil springs **86** cause the headed contact pins **85** to remain in abutment with the center electrodes of the lamps **53**.

Upon release of pressure upon the lens assembly **93** the combined forces of the several springs **86** and coil spring **58** force the lamp housing **50** to return to its front position wherein the V-shaped projection **80** engages the shoulders **82** of the slots **81**. In this position, the coil spring **76** of the ratchet actuating mechanism **66** pulls the pawl **73** forwardly and laterally to cause its ears **72** to pivot about the slots **71** and move into engagement with the stop **78**.

If it is desired to move the switch structure from the position shown in FIG. 4 wherein an electrical connection is established between the terminals **14** and **18**, to the position shown in FIG. 3 wherein an electrical connection is established between the terminals **17** and **18**, rearward force is again applied to the lens assembly **93**. This moves the lamp housing **50** rearwardly to again cause the abutment plug **83** to engage the pawl **73** and move it rearwardly towards the ratchet wheel **65**. Just prior to the time that the leg **75** engages the ratchet wheel **65**, the cup-shaped head **57** abuts the head **48** of pin **47** to cause the actuating slide **32** to start to move rearwardly. The end **75** of the pawl **73** rotates the ratchet wheel **65** counterclockwise to swing the point **63** out of the V-shaped abutment **64** after the V-shaped abutment **64** has been moved clear of the point **63**. The point **63** is rotated 45° and the overcenter spring **40** moves slightly rearwardly from the position shown in FIG. 4. Thereafter, release of pressure on the lens assembly **93** allows the coil spring **49** to follow the forward movement of the contact pin **55** until the overcenter spring **40** moves slightly past center with respect to the pins **39**. Tension of the spring **40** thereafter snaps the switch blade holder **25** rearwardly from the position shown in FIG. 4 to the position shown in FIG. 3, wherein the switch blade **16** engages the rear of the notch **19** in the terminal **18** and the front of the terminal **17**.

Any time that it is desired to relamp the switch, the plastic retainer **96** can be grasped and pulled forwardly to cause the V-shaped projections **80** to spring outwardly over the shoulders **82** and the lamp housing **50** to be removed. Thereafter, the lamps **53** can be withdrawn from the rear of the lamp housing **50** and new ones installed.

If it should be desired to make the switch a momentary switch instead of an alternate action one, the abutment plug **83** can be removed when the star wheel **61** is in the position shown in FIG. 3, and thereafter, electrical contact will be established between the terminals **17** and **18** when the lamp housing **50** is in its outer position, and the blades **16** will be snap actuated to establish contact between the terminals **14** and **18** whenever the housing **50** is pressed inwardly.

Although the plastic wall **12** can be made as a single piece, in the preferred embodiment shown, it is made from four molded plastic blocks **100**, **101**, **102** and **103**. The terminals **14**, **17** and **18** are cast into each block, and adjacent blocks are provided with abutting keying surfaces. While any keying arrangement can be used, each of the blocks **100**, **101**, and **102** is shown with a dependi projection **104** of rectangular cross section running acro the bottom surfaces of the blocks, and each of the bloc **101**, **102**, and **103** has a rectangularly-shaped groove 1(running across the top surface of an overlying block in which a projection **104** extends. The top surface of t block **100** and the bottom surface of the block **103** a molded with slots **22** therein into which tabs **21** are be to lock the assembly of the blocks into the housing **10**.

While the invention has been described in considerab detail, it is not desired to be limited to the particular en bodiment shown and described and it is intended to cov hereby all novel adaptations, modifications and arrang ments thereof which come within the practice of tho skilled in the art to which the invention relates.

What I claim is:

1. A switch comprising: a housing having a forwardl and rearwardly extending chamber, two pairs of facin contacts, said contacts lying generally in a forwardly an rearwardly extending plane with one contact of each pa being positioned generally forwardly of the other conta of each pair, a laterally extensive one-piece switch blad having opposite ends positioned between the facing cor tacts of respective pairs of contacts, a switch blade holde loosely supporting the center of said switch blade, an an overcenter device actuating said switch blade holde to snap said blade between a position wherein said swit blade engages the forward members of each pair of cor tacts to a position wherein said switch blade engages th rear members of each pair of contacts, the contacts of on pair of facing contacts being formed by a generally U shaped notch in a single contact member.

2. A switch comprising: a housing having a forwardl and rearwardly extending chamber, two pairs of facin contacts, said contacts lying generally in a forwardly an rearwardly extending plane, with one contact of each pai being positioned generally forwardly of the other conta of each pair, a laterally extensive switch blade having op posite ends positioned between the facing contacts of re spective pairs of contacts, a switch blade holder, sai switch blade holder being movable between a front posi tion wherein said switch blade engages the forward mem bers of each pair of contacts to a rear position wherei said switch blade engages the rear members of each pai of contacts, the contacts of one pair of facing contact being formed by a generally U-shaped notch in a singl contact member, a switch actuator movable between fron and rear positions in said housing, an overcenter devic operatively connecting said switch actuator and said switcl blade holder for causing said switch blade holder to b snapped into its front position when said switch actuato is moved from said front position to said rear position and said switch blade holder being snapped to said rea position when said switch actuator is moved from sai rear position to said front position, means normally bias ing said switch actuator to said front position, a push but ton positioned forwardly of said switch actuator, said pusl button being movable between front and rear positions first abutment means operatively positioned between sai push button and said switch actuator causing movemen of said push button from said front position to said rea position to move said switch actuator from said fron position to said rear position, an alternate action mech anism having an actuating forwardly extending abutmen projecting towards said push button, said actuating abut ment being biased to a normal forward position fron which it is moved to a rear position to actuate said mech anism and said mechanism being operative to hold sai switch actuator in said rear position upon alternate rear ward movements of said actuating abutment from said nor mal forward position, said push button having an opening for receiving said actuating abutment during movemen of said push button between said front and rear positions and removable abutment means in said opening in said push button for engagement with said actuating abutment

to move said actuating abutment from said forward position to said rear position during movement of said push button from said front position to said rear position.

3. A switch comprising: a housing, a switch actuator movable between front and rear positions in said housing, a push button positioned forwardly of said switch actuator, said push button being movable between front and rear positions, first abutment means operatively positioned between said push button and said switch actuator and constructed and arranged so that movement of said push button from said front position to said rear position moves said switch actuator from said front position to said rear position, an alternate action mechanism having an actuating forwardly extending abutment projecting toward said push button, said actuating abutment being biased to a normal forward position from which it is moved to a rear position to actuate said mechanism and said mechanism being constructed and arranged to hold said switch actuator in said rear position upon alternate rearward movements of said actuating abutment from said normal forward position, said push button having an opening for receiving said actuating abutment during movement of said push button between said front and rear positions, and a removable plug pressed into said opening non-pivotally retained by said push button for engagement with said actuating abutment to move said actuating abutment from said forward position to said rear position during movement of said push button from said front position to said rear position.

4. A multiple switch comprising: a housing having a forwardly and rearwardly extending chamber, at least two tiers of electrical contacts each tier of which comprises two pairs of facing contacts arranged in a generally forwardly and rearwardly extending plane with one contact of each pair positioned generaly forwardly of the other contact of each pair, flexible laterally extensive one-piece switch blades respective ones of which have opposite ends positioned between the front and rear facing contacts of respective pairs of facing contacts of a respective tier, a switch blade holder supporting the center of said flexible one-piece switch blades of each tier, and an overcenter device actuating said switch blade holder to snap the one-piece switch blades between positions abutting the front contacts of respective pairs of contacts to positions abutting the rear contacts of respective pairs of contacts, said blades being sufficiently flexible to bend by an amount equal to inaccuracies of location of said contacts, and whereby abutment of one blade with contacts associated therewith does not prevent abutment of the other blade with contacts associated therewith.

5. A multiple switch comprising: a housing having a forwardly and rearwardly extending chamber, at least two tiers of electrical contacts, each tier of which comprises two pairs of facing contacts arranged in a generally forwardly and rearwardly extending plane with one contact of each pair positioned generally forwardly of the other contact of each pair, flexible laterally extensive one-piece switch blades respective ones of which have opposite ends positioned between the front and rear facing contacts of respective pairs of facing contacts of a respective tier, a switch blade holder movable between a front position wherein said switch blades engage the front contacts of respective pairs of facing contacts of respective tiers to a rear position wherein respective blades engage the rear contacts of respective pairs of contacts of respective tiers, a switch blade actuator movable between front and rear positions in said housing, means biasing said switch actuator to said front position, an overcenter device which snaps said switch blade holder to said front position when said switch actuator is moved from said front position to said rear position and which moves said switch blade holder to said rear position when said switch actuator is moved from said rear position to said front position, said one-piece switch blades being sufficiently flexible to bend by an amount equal to inaccuracies in location of said contacts and whereby abutment of one switch blade with contacts associated therewith does not prevent abutment of another switch blade with contacts associated therewith, a push button positioned forwardly of said switch actuator, said push button being movable between front and rear positions, first abutment means operatively positioned between said push button and said switch actuator causing movement of said push button from said front position to said rear position to move said switch actuator from said front position to said rear position, an alternate action mechanism having an actuating forwardly extending abutment projecting toward said push button, said actuating abutment being biased to a normal forward position from which it is moved to a rear position to actuate said mechanism and said mechanism being constructed and arranged to hold said switch actuator in said rear position upon alternate rearward movements of said actuating abutment from said normal forward position, said push button having an opening for receiving said actuating abutment during movement of said push button between said front and said rear positions, and a plug in said opening in said push button for engagement with said actuating abutment to move said actuating abutment from said forward position to said rear position during movement of said push button from said front position to said rear position.

6. A switch comprising: a housing having a forwardly and rearwardly extending chamber, two pairs of facing contacts, said contacts lying generally in a forwardly and rearwardly extending plane with one contact of each pair being positioned generally forwardly of and facing the other contact of each pair, a laterally extensive one-piece switch blade having opposite ends positioned between the facing contacts of respective pairs of contacts, a switch blade holder supporting the center of said switch blade, an actuator positioned generally forwardly of said switch blade holder with rearwardly extending projections on opposite sides of said switch blade holder, said projections having openings therein, a pair of U-shaped pins, said pins having the ends of the legs of said pins positioned against opposite sides of said switch blade holder with the closed portion of said pins positioned in respective openings of said projections of said actuator, and a tension spring biasing said pins toward each other against said switch blade holder to act as an overcenter device and support said switch blade holder from said actuator.

7. A multiple switch comprising: a housing having a forwardly and rearwardly extending chamber, at least two tiers of electrical contacts each tier of which comprises two pairs of facing contacts arranged in a generally forwardly and rearwardly extending plane with one contact of each pair positioned generally forwardly of and facing the other contact of each pair, flexible laterally extensive one-piece switch blades respective ones of which have opposite ends positioned between the front and rear facing contacts of respective pairs of facing contacts of a respective tier, a switch blade holder supporting the center of said flexible one-piece switch blades of each tier, an actuator positioned generally forwardly of said switch blade holder with rearwardly extending projections on opposite sides of said switch blade holder, said projections having openings therein, a pair of U-shaped pins, said pins having the ends of the legs of said pins positioned against opposite sides of said switch blade holder with the closed portion of said pins positioned in respective openings of said projections of said actuator, and a tension spring biasing said springs toward each other against said switch blade holder to act as an overcenter device and support said switch blade holder from said actuator.

8. A switch comprising: a housing having a forwardly and rearwardly extending chamber, two pairs of facing contacts, said contacts lying generally in a forwardly

and rearwardly extending plane with one contact of each pair being positioned generally forwardly of and facing the other contact of each pair, a laterally extensive switch blade having opposite ends positioned between the contacts and respective pairs of contacts, a switch blade holder supporting the center of said switch blade, said switch blade holder being movable from a forward position wherein said switch blade abuts said front contacts of respective pairs to a back position wherein said switch blade abuts said rear contacts of respective pairs, a switch actuator positioned forwardly of said switch blade holder, said switch actuator having rearwardly extending side projections which lie generally laterally of and parallel to the forward end of said switch blade holder and which are guided for movement between front and rear positions, at least one pair of toggle pins the adjacent ends of which are positioned laterally against opposite sides of said switch blade holder and the outer ends of which are loosely retained by said side projections of said switch actuator, spring means biasing said toggle bars toward each other whereby said switch blade holder is snapped to said forward position when said switch actuator is moved to said rear position and said switch blade holder is moved to said back position when said switch actuator is moved to its front position, a support positioned forwardly of said switch actuator, means biasing said switch actuator towards said support, a star wheel rotatably carried by said support about an axis generally normal to the movement of said switch actuator such that the points of said star wheel rotate rearwardly for engagement by said switch actuator, said star wheel being arranged such that said switch actuator is held in said rear position when a point of said start wheel projects normal to and is engaged by said switch actuator, and said switch actuator is in its front position when a space between points of said star wheel is normal to said switch actuator, said star wheel including a ratchet, a push button positioned forwardly of said support for movement between front and rear positions, abutment means for moving said switch actuator from said front position to said rear position when said push button is moved from its front to its rear position, means having a pair of laterally extending slots spaced apart in a manner generally parallel to said axis of said star wheel and positioned generally laterally of said axis, a pawl having one end with projections pivotally engaged in said slots and with the other end of said pawl bent rearwardly to engage a tooth of said ratchet on the opposite side from said slots, a spring biasing said pawl forwardly and laterally toward the end of said slots spaced away from said axis of said ratchet, and said pawl being arranged to be engaged by said push button when moved from said front to said rear position to rotate said star wheel between positions wherein a point extends rearwardly of a position where a space between points faces rearwardly.

9. A multiple switch comprising: a housing having a forwardly and rearwardly extending chamber, at least two tiers of electrical contacts each tier of which comprises two pairs of facing contacts arranged in a generally forwardly and rearwardly extending plane with one contact of each pair positioned generally forwardly of the other contact of each pair, flexible laterally extensive switch blades respective ones of which have opposite ends positioned between the front and rear facing contacts of respective pairs of facing contacts of a respective tier, a switch blade holder supporting the center of said switch blades, said switch blade holder being movable from a forward position wherein said switch blades abut said front contacts of said respective pairs of contacts to a back position wherein said switch blades abut said rear contacts of said respective pairs of contacts, a switch actuator positioned forwardly of said switch blade holder, said switch actautor having rearwardly extending side projections which lie generally laterally of an parallel to the forward end of said switch blade holder and which are guided for movement between front an rear positions, at least one pair of U-shaped toggle pir the ends of the legs of which are positioned laterall against opposite sides of said switch blade holder and th outer ends of which are loosely retained by said side pr jections of said switch actuator, a spring biasing th upper ends of said U-shaped toggle pins toward eac other with said spring extending between said legs of sai pins and through said switch blade holder whereby sai switch blade holder is snapped to said forward positio when said switch actuator is moved to said rear positio and said switch blade holder is moved to said back pos tion when said switch actuator is moved to its front pos tion, a support positioned forwardly of said switch act ator, means biasing said switch actuator towards sai support, a star wheel rotatably carried by said suppo about an axis generally normal to the movement of sai switch actuator, such that the points of said star whe rotate rearwardly for engagement by said switch actu tor, said star wheel being arranged such that said switc actuator is held in said rear position when a point of sai star wheel projects normaly to and is engaged by sai switch actuator, and said switch actuator is in its fror position when a space between points of said star whe is normal to said switch actuator, said star wheel ir cluding a ratchet, a push button positioned forwardly c said support for movement between said front and rea positions, abutment means operative to move said switc actuator from said front position to said rear positio when said push button is moved from its front to its rea position, means in said housing having a pair of laterall extending slots spaced apart in a manner generally para lel to said axis of said star wheel and laterally of sai axis, a pawl having one end with projections pivotall engaged in said slots and with the other end of said paw bent rearwardly to engage a tooth of said ratchet on th opposite side of said axis from said slots, a spring biasin said pawl forwardly and laterally towards the end of sai slots spaced away from said axis of said ratchet, and sai pawl being arranged to be engaged by said push butto when moved from said front to said rear position to ro tate said star wheel between positions wherein a poin extends rearwardly to a position where a space betwee points faces rearwardly.

10. A multiple switch comprising: a housing havin a forwardly and rearwardly extending chamber, at leas two tiers of electrical contacts each tier of which com prises two pairs of facing contacts arranged in a gen erally forwardly and rearwardly extending plane witl one contact of each pair positioned generally forwardl of the other contact of each pair, flexible laterally ex tensive switch blades respective ones of which have op posite ends positioned between the front and rear facin contacts of respective pairs of facing contacts of a re spective tier, a switch blade holder supporting the cente of said switch blades, said switch blade holder being mov able from a forward position wherein said switch blade abut said front contacts of said respective pairs of con tacts to a back position wherein said switch blades abu said rear contacts of said respective pairs of contacts, switch actuator positioned forwardly of said switch blad holder, said switch actuator having rearwardly extend ing side projections which lie generaly laterally of an parallel to the forward end of said switch blade holde and which are guided for movement between front an rear positions, at least one pair of U-shaped toggle pin the ends of the legs of which are positioned laterall against opposite sides of said switch blade holder an the outer ends of which are loosely retained by said side projections of said switch actuator, a spring biasing the upper ends of said U-shaped toggle pins towards each other with said spring extending between said legs of said pins and through said switch blade holder whereby said switch blade holder is snapped to said forward position when said switch actuator is moved to said rear

position and said switch blade holder is moved to said back position when said switch actuator is moved to its front position, a support positioned forwardly of said switch actuator, means biasing said switch actuator towards said support, a star wheel rotatably carried by said support about and axis generally normal to the movement of said switch actuator, such that the points of said star wheel rotate rearwardly for engagement by said switch actuator, said star wheel being arranged such that said switch actuator is held in said rear position when a point of said star wheel projects normal to and is engaged by said switch actuator, and said switch actuator is in its front position when a space between points of said star wheel is normal to said switch actuator, said star wheel including a ratchet, a push button positioned forwardly of said support for movement between said front and rear positions, abutment means operative to move said switch actuator from said front position to said rear position when said push button is moved from its front to its rear position, means in said housing having a pair of laterally extending slots spaced apart in a manner generally parallel to said axis of said star wheel and laterally of said axis, a pawl having one end with projections pivotally engaged in said slots with a center section extending forwardly towards said push button by a distance at least equal to the distance between front and rear positions of said switch actuator and with the other end of said pawl bent rearwardly to engage a tooth of said ratchet on the opposite side of said axis from said slots, a spring biasing said pawl forwardly and laterally towards the end of said slots spaced away from said axis of said ratchet, said push button having an opening therein of a size to receive said forwardly extending section of said pawl, and a removable plug in said opening in said push button for engaging and moving said pawl to rotate said star wheel between positions wherein a point extends rearwardly to a position where a space between points faces rearwardly as said push button moves said switch actuator between said front and rear positions.

11. A switch comprising: a housing having a chamber therein, a switch blade holder movable between a forward position in said housing and a back position in said housing, a switch actuator positioned forwardly of said switch blade holder, said switch actuator having rearwardly extending side projections which lie generally laterally of and parallel to the forward end of said switch blade holder and which move between front and rear positions, at least one pair of U-shaped toggle pins the ends of the legs of which are positioned laterally against opposite sides of said switch blade holder and the outer ends of which are loosely retained by said side projections of said switch actuator, a spring biasing the outer ends of said U-shaped toggle pins towards each other with said spring extending between said legs of said pins and through said switch blade holder whereby said switch blade holder is snapped to said forward position when said switch actuator is moved to said rear position and said switch blade holder is moved to said back position when said switch actuator is moved to its forward position.

12. A switch comprising: a housing having sidewalls which form a chamber therein, a fixed support extending laterally between sidewalls of said housing, a switch actuator positioned rearwardly of said support, means biasing said switch actuator towards said support, a star wheel rotatably carried by said support about an axis positioned in such manner that the points of said star wheel rotate rearwardly for engagement by said switch actuator, said star wheel being arranged such that said switch actuator is held in a rear position when a point of said star wheel projects normal to and is engaged by said switch actuator, and said switch actuator being biased to a forward position when a space between points of said star wheel is normal to said switch actuator, said star wheel including a ratchet, a push button positioned forwardly of said support for movement between front and rear positions, abutment means for moving said switch actuator from said front position to said rear position when said push button is moved from its front to its rear position independently of said star wheel during the time that a point of said star wheel is being rotated rearwardly, a pawl for engaging a tooth of said ratchet to rotate said ratchet, said pawl being arranged to be engaged by said push button when moved from said front to said rear position to rotate said star wheel between positions wherein a point extends rearwardly to a position where a space between points faces rearwardly.

13. A switch comprising: a housing having sidewalls which form a chamber therein, a support extending laterally between sidewalls of said housing, a switch actuator positioned rearwardly of said support, means biasing said switch actuator towards said support, a star wheel rotatably carried by said support about an axis positioned in such manner that the points of said star wheel rotate rearwardly for engagement by said switch actuator, said star wheel being arranged such that said switch actuator is held in a rear position when a point of said star wheel projects normal to and is engaged by said switch actuator, and said switch actuator being biased to a forward position when a space between points of said star wheel is normal to said switch actuator, said star wheel including a ratchet, a push button positioned forwardly of said support for movement between front and rear positions, abutment means for moving said switch actuator from said front position to said rear position when said push button is moved from its front to its rear position independently of said star wheel during the time that a point of said star wheel is being rotated rearwardly, a pawl for engaging a tooth of said ratchet to rotate said ratchet said push button having an opening therein of a size to receive the forwardly extending section of said pawl to provide clearance therewith when said push button is moved between said front and rear positions, and a removable plug in said opening in said push button for engaging and moving said pawl to rotate said star wheel between positions wherein a point extends rearwardly to a position where a space between points faces rearwardly as said push button moves said switch actuator between said front and rear positions.

14. In a switch comprising a housing, a ratchet wheel carried by said housing for rotation about an axis of said ratchet wheel for movement between front and rear positions, means in said housing spaced apart in a manner generally parallel to said axis of said ratchet wheel and positioned generally laterally of said axis and having slots extending generally laterally toward and away from said axis, a pawl having one end with projections pivotally engaged in said slots and with the other end of said pawl bent rearwardly to engage a tooth of said ratchet on the opposite side of said axis from said slots, a spring biasing said pawl forwardly and laterally towards the end of said slots spaced away from said axis of said ratchet wheel, and said pawl being arranged to be engaged by said push button when moved from said front to said rear position, and whereby said other end of said pawl follows the arcuate movement of said ratchet wheel as it turns said ratchet wheel while extending said spring and said spring returns the pawl forwardly and laterally upon forward movement of said push button.

15. A multiple switch in accordance with claim 4 in which said housing is generally rectangularly-shaped sheet metal housing, at least three plastic insulator blocks each having a tier of terminals molded therein with contacts projecting from the one face thereof and lugs having soldering surfaces projecting from the opposite end face, said plurality of plastic insulator blocks being stacked across and filling one end of said housing with said contacts projecting inwardly and with the plastic of the center blocks extending outwardly of said soldering surfaces of the lugs of the outer tiers, said insulator blocks hav-

ing mating surfaces which key together in said stacked position, the sides of the outer blocks of said stack which are generally parallel to said keying surfaces engaging sides of said sheet metal housing and having depressions therein, and said housing having tabs bent into said depressions to lock said stack of insulator blocks to said housing.

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