

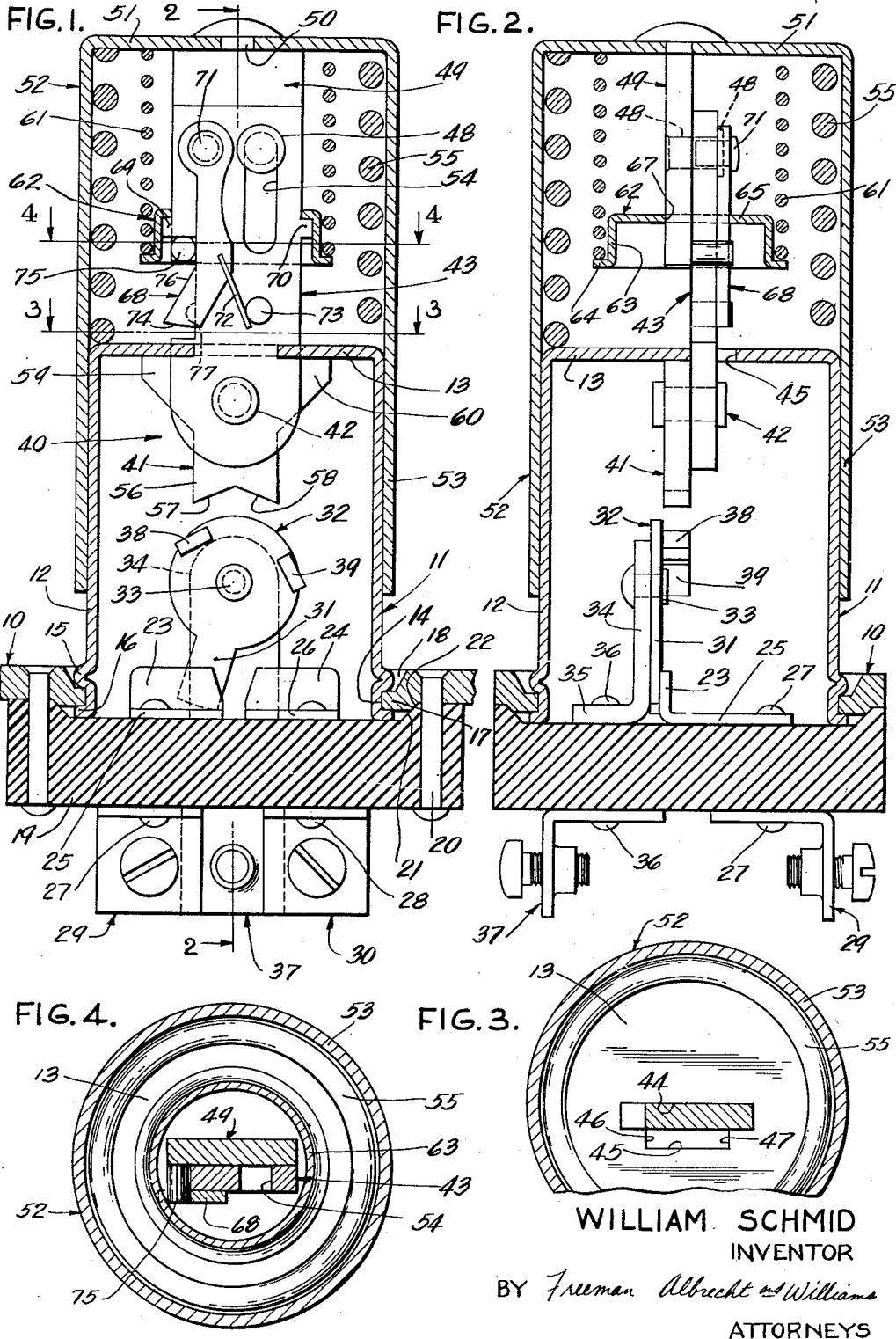
Nov. 14, 1950

W. SCHMID
ELECTRIC SWITCH

2,529,970

Filed July 17, 1945

2 Sheets-Sheet 1



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FIG. 5.

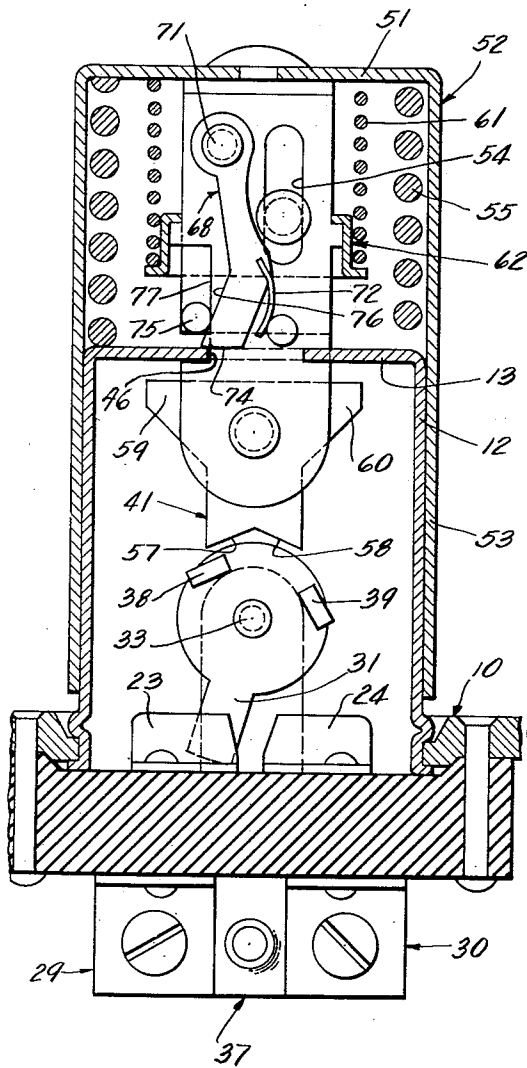
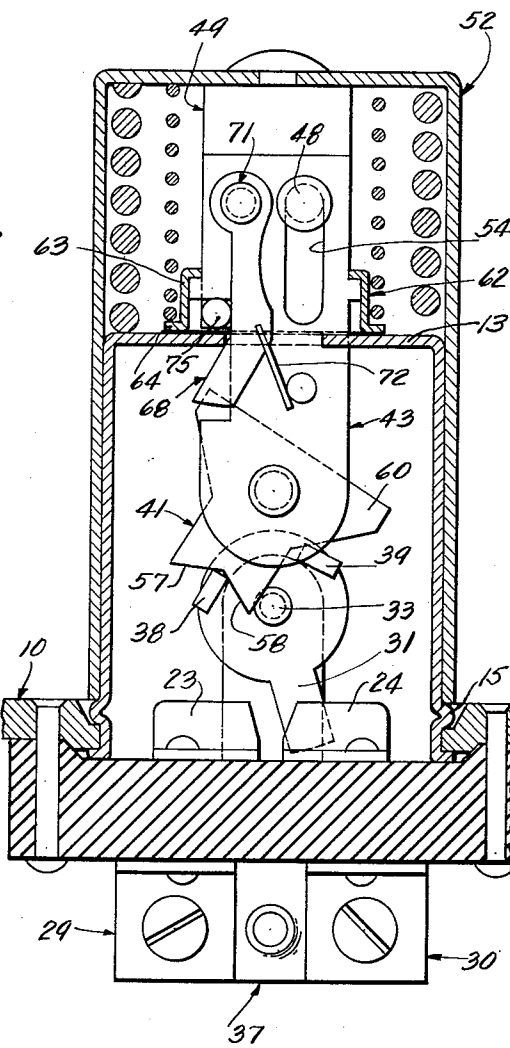


FIG. 6.



UNITED STATES PATENT OFFICE

2,529,970

ELECTRIC SWITCH

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8 Claims. (Cl. 200—70)

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This invention relates to electric switches, and is particularly adapted for embodiment in foot-operated switches such as are used for controlling the headlights of an automotive vehicle. The invention relates also to electric switches, whether foot-operated or not, in which the relatively movable contact means is actuated with a snap action. The principal object of the invention is the provision of new and improved electric switches of these types.

In the drawing accompanying this specification and forming a part of this application, there is shown, for purposes of illustration, one embodiment of the invention, and in this drawing:

Figure 1 shows a foot-operated switch embodying the invention, the casing and certain other parts being in longitudinal section, to show the switch proper and its operating mechanism in front elevation substantially entirely;

Figure 2 is a section taken generally on the line 2—2 of Figure 1, looking in the direction of the arrows, the switch proper and its operating mechanism being, however, in side elevation substantially entirely;

Figure 3 is a section taken on the line 3—3 of Figure 1, looking in the direction of the arrows;

Figure 4 is a section taken on the line 4—4 of Figure 1, looking in the direction of the arrows;

Figure 5 is a view similar to Figure 1, but with the parts in the position they assume just before the snap action takes place; and

Figure 6 is a view similar to Figure 1, but with the parts in the position they assume just after the snap action has taken place.

The switch may comprise a metal plate or bracket 10, fragmentarily shown, which may be fastened to the foot board of an automotive vehicle, or other support.

The switch proper is contained in a casing or housing 11 here shown as a metal cup-like element having a cylindrical wall 12 and a transverse end wall 13. The lower end of the cylindrical wall 12 fits in and extends through an aperture 14 in the plate 10, and for the purpose of fastening the housing 11 to and rigidly supporting it from the plate 10, the cylindrical wall 12 has a circumferential bead 15 which abuts the margin of the aperture 14 at the upper side of the plate 10, and a flange 16 at its free or open end, spun or otherwise forced against the margin of the aperture 14 at the lower side of the plate 10. The joint made between the housing 11 and

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the plate 10 is preferably so constructed and arranged that it is water and dirt proof.

Desirably, the portion 17 of the plate 10 which margins the aperture 14 is offset from the general plane of the plate 10, leaving a recess 18 in which the bead 15 is disposed.

Disposed over and closing the open lower end of the housing 11 is a base 19, which may be of "Bakelite" or other suitable insulating material. The base 19 is large enough so that rivets 20 may be disposed through holes therein and through registering holes in the plate 10. The rivets 20, or other suitable fastening means, serve to hold the base 19 tightly against the plate 10, and, if desired, against the flange 16, so that, in either case, the housing 11 is sealed against water and dirt which might enter from below. The base 19 is here shown as having a recess with a beveled side wall 21 to accommodate a similar surface 22 formed at the under side of the plate 10 and margining the offset portion 17.

The base 19 further serves to carry relatively stationary contact means having plane contact portions 23, 24 in the same general plane, upstanding from respectively integral bracket portions 25, 26 held against the base 19 by, in this instance, rivets 27, 28 extending respectively through the base 19 to connector terminals 29, 30 of any desired kind, to which electrical conductors of the headlight control system (not shown) may be connected.

Cooperable with the relatively stationary contact means 23, 24 is a relatively movable contact means 31 here shown as forming part of a rotor member 32 carried by and swingable on a pivot pin 33. The pivot pin 33 is here shown as carried by an upstanding support 34 having an integral bracket portion 35 held against the base 19 by one or more rivets 36 extending through the base 19 to a connector terminal 37, of any desired kind, to which another electrical conductor of the control system may be connected.

The rotor member 32 is here shown as provided with two projections 38, 39 extending laterally therefrom in the general direction of the axis of the pivot pin 33. The projections 38, 39 serve as means for applying force for causing swinging of the rotor member 32 from a position in which the relatively movable contact 31 is in engagement with the relatively stationary contact 23 to a position in which the contact 31 is in engagement with the relatively stationary contact 24, and vice versa. The construction and arrangement is such that in the illustrated em-

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bodiment, the contact 31 is frictionally held in the aforesaid positions, either by selection of the distance between the contacts 23, 24 and the support 34 to give frictional engagement of the mutually engaging surfaces, or by friction between the rotor member 32 and the support 34, or both. Other suitable ways may of course be adopted for holding the relatively movable contact 31 in its aforesaid operative positions.

For swinging the rotor member 32 from one of its positions to the other, actuating means 40 is provided. The actuating means 40 comprises an actuator member 41 here shown as swingable about a pivot pin 42 carried by an actuating plate or rod 43. The actuating rod 43 is reciprocable and is slidably disposed through a slot 44 in the end wall 13 of the housing 11. One side wall of the slot has a lateral recess 45 having ends 46, 47 spaced from the ends of the slot 44. The purpose of the recess 45 will appear hereinafter.

The upper end of the actuating rod 43 is guided by a pin 48 rigidly carried by operating means including a plunger plate or rod 49. The pin 48 also has the function of returning the actuating means 40 to the position shown in Figure 1, as will appear. The plunger rod 49 has its upper end of reduced width to form a projection 50 extending through an opening in the end wall 51 of a plunger cap 52. The end of the projection 50 is riveted over to securely fasten the plunger rod 49 to the end wall 51 of the plunger cap 52. The plunger cap 52 has a cylindrical wall 53 slidably fitting the outside of the cylindrical wall 12 of the housing 11.

The shank of the pin 48 is of a size to fit slidably in a longitudinal slot 54 in the actuating rod 43. The pin 48 has a head slightly larger than the slot, so that the actuating rod 43 and the plunger rod 49 will be maintained in engagement, but relatively slidable longitudinally.

The plunger cap 52 is biased to the normal position shown in Figure 1 by a helical main or second spring 55 one end of which engages the upper side of the end wall 13 of the housing 11 and the other end of which engages the under side of the end wall 51 of the plunger cap 52.

The actuator member 41 is here shown as in the form of a pawl portion 56 extending vertically downward with the parts shown in the position of Figure 1. The pawl portion 56 has a V-shaped notch providing cam surfaces 57, 58. The actuator member 41 is shown as having a rectilinear top margin formed in part by a pair of wings 59, 60, the construction being such that the upper margin of the actuator member 41 is longer than the slot 44 and hence upward movement of the actuator member from the position shown in Figure 1 is stopped by engagement of the wings 59, 60 with the under side of the end wall 13 of the housing 11. This is the position which the actuator member 41 assumes when the plunger cap 52 is in the position shown in Figure 1, inasmuch as the construction and arrangement is such that when the plunger cap 52 is moved to its uppermost position by the main spring 55, the pin 48 is in engagement with the upper end of the slot 54 and the resultant pull on the actuating rod 43 centers the actuator member 41 in its intermediate position as shown in Figure 1.

The actuating means 40 is biasable downwardly by a helical auxiliary or second spring 61 the upper end of which engages the under side of the end wall 51 of the plunger cap 52 and the lower end of which engages a washer 62 (shown

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in section). The washer 62 is here shown as having a cylindrical portion 63 with an annular outwardly extending flange 64 at its lower end, and a transverse end wall 65 at its upper end. In the embodiment shown the lower end of the auxiliary spring 61 surrounds the cylindrical portion 63 and engages the flange 64. The end wall 65 of the washer 62 has an aperture 67 constructed and arranged slidably to accommodate the plunger rod 49 and the actuating rod 43 and a stop member 68. The actuating rod 43 has a pair of projections 69, 70 extending laterally therefrom at opposite sides, and these projections are adapted to be engaged by the under side of the end wall 65 of the washer 62.

The stop member 68 is swingable about a pivot pin 71 rigidly carried by the actuating rod 43, and, as shown in Figure 1, is biased to the position there shown by a leaf spring 72 suitably fastened at one end to the stop member 68 and bearing at its other end against a pin 73 carried by the actuating rod 43. The construction and arrangement is such that upon downward movement of the actuating rod 43, the lower end 74 of the stop member 68 will abut that part of the upper side of the housing wall 13 which is adjacent to the left hand end, 46, of the recess 45, as viewed in Figure 3. The construction and arrangement is further such that if the stop member 68 is swung counter-clockwise about the pivot 71 the stop member can pass through the aperture provided by the recess 45.

The plunger rod 49 carries near its lower end a releasing pin 75 for releasing the stop member 68, the releasing pin being adapted to engage a cam surface 76 on the stop member 68 extending diagonally across the path of the pin 75 as the plunger rod is moved downwardly. To avoid excessive friction between the end 74 and the top of the wall 13 as the pin 75 cams the stop member 68 counter-clockwise, the end 74 desirably defines an arc having the axis of the pivot pin 71 as its center. To accommodate the pin 75, so that it may extend from the plunger rod 49 across the cam surface 76, the actuator rod 43 is here shown as provided with a longitudinally extending recess 77.

It will be evident that the auxiliary spring 61 biases the actuating means 40 downwardly, assuming that the spring 61 is already under compression in the position of the parts shown in Figure 1, but the main spring 55 is stronger than the auxiliary spring 61 and hence the return pin 48 forces the actuating means upwardly, regardless of whether or not the auxiliary spring 61 is initially under compression. Desirably the auxiliary spring 61 is under at least some initial compression with the parts shown in Figure 1.

The operation of the switch is as follows: Assuming the parts to be in the circuit closing position shown in Figure 1; when the plunger cap 52 is moved downwardly, as, for example, by the foot of an operator, this downward movement compresses the main spring 55. At the same time the under side of the end wall 51 of the plunger cap 52 acts downwardly on the auxiliary spring 61, and the lower end of that spring, acting against the washer 62, moves the actuating rod 43 downwardly until the end 74 of the stop member 68 engages the end wall 13 of the housing 11.

Further downward movement of the plunger cap 52 results in substantial compression of the auxiliary spring 61 since at this time the washer 62 is held stationary while the end wall 51 is

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moving downwardly. As the downward motion of the plunger cap 52 continues, the releasing pin 75, by engagement with and movement along the cam surface 76, causes the stop member 68 to swing counter-clockwise about the pivot 71, as shown in Figure 5, and as the downward motion of the plunger cap continues still further, the left hand edge of the end surface 74 of the stop member 68 will slip off of the end 46 of the recess 45. Thus the stop member 68 will no longer hold the actuating means 40 stationary, and the stored energy in the auxiliary spring 61 is suddenly released and causes the actuating means 40 to move downwardly with a snap action.

During this snap action the lost motion between the actuator member 41 and the projection 38 is taken up, engagement of the projection 38 with the cam surface 57 causing the actuator member 41 to swing clockwise until the projection 38 is seated in the notch formed by the surfaces 57, 58, whereupon the actuator member 41 acts as a pawl on the projection 38 to turn the rotor member 32 in a counter-clockwise direction. Figure 6 shows the position of the parts just after the snap action has taken place. The snap movement will have been completed when the projection 39 and wing portion 60 come into engagement with each other. Then the relatively movable contact 31 will be, as shown in Figure 6, in an angular position similar to that shown in Figure 1 but at the other side of the vertical center line, that is, instead of being in contact with the relatively stationary contact 23 it will be in contact with the relatively stationary contact 24 to close another circuit.

It will be noted that, as herein shown, the downward movement of the plunger cap 52 is limited by engagement of its lower end with the bead 15, as appears in Figure 6, and that in the position of the parts there shown, the flange 64 and the pin 75 are just out of contact with the upper surface of the end wall 13, and the pin 43 is in contact with the upper end of the slot 54.

When the plunger cap 52 is released, the main spring 55 will return the operating rod 49 and the actuating means 40 to the position shown in Figure 1, the movable contact 31 however remaining in contact with the relatively stationary contact 24 by reason of the frictional engagement hereinbefore referred to. Upward movement of the operating rod 49, and hence of the return pin 48, causes the return pin 48, by reason of engagement with the upper end of the slot 54, to move the actuating rod 43 upwardly, returning the actuating means 40 to the position shown in Figure 1.

It will be obvious that if now the plunger cap 52 is again moved downwardly the previously described operations will be repeated except that then the projection 39 will be engaged by the cam surface 58, and the actuating means 40 will cause the rotor member 32 to execute a snap movement in a clockwise direction, to bring the relatively movable contact 31 back into contact with the relatively stationary contact 23.

From the foregoing it will be apparent to those skilled in the art that the illustrated embodiment of the invention accomplishes the principal object of the invention. On the other hand, it also will be obvious to those skilled in the art that the illustrated embodiment of the invention may be variously changed and modified, or features thereof, singly or collectively, embodied in other combinations than those illustrated, without departing from the spirit of the invention, or sacrificing

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all of the advantages thereof, and that accordingly, the disclosure herein is illustrative only, and the invention is not limited thereto.

I claim:

1. An electric switch, comprising: a casing having an end wall, relatively stationary contact means disposed in said casing; cooperating oscillatable contact means disposed in said casing and constructed and arranged for movement from a first circuit closing position to a second circuit closing position; actuating means for said relatively movable contact means; a first stop and a catch pivotally connected to said actuating means for movement relative to the stop, a first spring carried by the catch and normally engaging the stop to maintain the catch in a position for engagement with the end wall of the casing, a housing, operating means in the housing and constructed and arranged for movement relative to said actuating means, an abutment on said operating means; means including a second spring, constructed and arranged to bias said actuating means from an inactive position into an actuating position; means, including a third spring, constructed and arranged to bias said operating means into a normal position and said actuating means into an inactive position; and means so constructed and arranged that movement of said operating means relative to said actuating means will cause the catch to engage the end wall of the casing to permit gradual compression of said second spring and also cause said abutment to pivot the catch and compress the first spring against said stop until the catch becomes disengaged from the end wall whereupon said actuating means will execute a snap movement to move said relatively movable contact means from said first position to said second position.

2. An electric switch, comprising: a casing having an end wall, relatively stationary contact means disposed in said casing; cooperating relatively movable contact means constructed and arranged for movement from a first circuit closing position to a second circuit closing position; actuating means for said relatively movable contact means, said actuating means and said relatively movable contact means being relatively so constructed and arranged that there is lost motion between said actuating means in an inactive position and said relatively movable contact means in said first position; a fixed stop and a catch pivotally connected to said actuating means, a first spring carried by the catch and normally engaging the stop to maintain the catch in a position for engagement with the end wall, operating means constructed and arranged for movement relative to said actuating means; an abutment on the operating means, means, including a second spring, constructed and arranged to bias said actuating means from an inactive position into an actuating position; means, including a third spring, constructed and arranged to bias said operating means into a normal position and said actuating means into an inactive position; and means associated with said operating means so constructed and arranged that movement of said operating means relatively to said actuating means will cause the catch to engage the end wall of the casing to permit gradual compression of said second spring and also cause said abutment to pivot the catch and compress the first spring against the stop until the catch becomes disengaged from the end wall whereupon said actuating means will take up said lost motion and execute a snap movement

to move said relatively movable contact means from said first position to said second position.

3. An electric switch, comprising: a casing having an end wall, relatively stationary contact means disposed in said casing; cooperating relatively movable contact means constructed and arranged for movement from a first circuit closing position to a second circuit closing position; actuating means, including an actuating member for said relatively movable contact means, so constructed and arranged that said actuating member has an intermediate position between two actuating positions and successive movements of said actuating member from said intermediate position into said actuating positions respectively causes said relatively movable contact means successively to move from one of its positions to the other; a fixed stop and a catch pivotally connected to said actuating means for movement relative to the stop, a first spring carried by the catch and normally engaging the stop to maintain the catch for engagement with the end wall, operating means constructed and arranged for movement relatively to said actuating means from a normal position into an operating position; an abutment on the operating means, means, including a second spring, constructed and arranged to bias said actuating means from an inactive position into an actuating position; means, including a third spring, constructed and arranged to bias said operating means into said normal position and said actuating means into an inactive position and said actuating member into said intermediate position; and means associated with said operating means and said actuating means so constructed and arranged that successive movements of said operating means from said normal position into operating position will cause the catch to engage the end wall to permit gradual compression of the second spring and also cause said abutment to pivot the catch and compress the first spring against the stop until the catch becomes disengaged from the end wall whereupon said actuating means will execute a snap movement to move said relatively movable contact means from one of its positions to the other.

4. An electric switch, comprising: a casing having an end wall, relatively stationary contact means in said casing; cooperating relatively movable contact means constructed and arranged for movement from a first circuit closing position to a second circuit closing position; actuating means for said relatively movable contact means, said actuating means including an actuating member cooperable with said relatively movable contact means; operating means constructed and arranged for movement relatively to said actuating means; and means, including a stop on the actuating means, a catch pivotally connected to the actuating means, a spring on the catch engaging the stop to maintain the catch in a position for engagement with the end wall, and an abutment on the operating means for releasing said catch, so constructed and arranged that upon initial movement of said operating means relatively to said actuating means said catch will engage the end wall and prevent movement of said actuating means and further predetermined movement of said operating means causes said abutment to pivot the catch so that when it becomes disengaged from the end wall, said actuating means will execute a snap movement to move said relatively movable con-

tact means from said first position to said second position.

5. An electric switch, comprising: a casing having an end wall, relatively stationary contact means in said casing; cooperating relatively movable contact means constructed and arranged for movement from a first circuit closing position to a second circuit closing position; actuating means for said relatively movable contact means; operating means constructed and arranged for movement relatively to said actuating means; means, including a first spring, constructed and arranged to bias said actuating means from an inactive position into an actuating position; means, including a second spring, constructed and arranged to bias said operating means into a normal position and said actuating means into an inactive position; and means, including a stop on the actuating means, a catch pivotally connected to the actuating means, a third spring acting on the catch and stop to maintain the catch in a position for engagement with the end wall, and an abutment on the operating means for releasing said catch, so constructed and arranged that upon initial movement of said operating means relatively to said actuating means said catch will engage the end wall and prevent movement of said actuating means, and further movement of said operating means stores energy in said first spring and then cause said abutment to pivot the catch so that when it becomes disengaged from the end wall, said actuating means will execute a snap movement to move said relatively movable contact means from said first position to said second position.

6. An electric switch, comprising: a casing having an end wall, relatively stationary contact means in said casing; cooperating relatively movable contact means constructed and arranged for movement from a first circuit closing position to a second circuit closing position; actuating means for said relatively movable contact means, said actuating means including an actuating member so constructed and arranged that it has an intermediate position between two actuating positions; said actuating member and said relatively movable contact means being relatively so constructed and arranged that successive movements of said actuating member from said intermediate position into said actuating positions respectively causes said relatively movable contact means successively to move from one of its positions to the other; operating means constructed and arranged for movement relatively to said actuating means; and means, including a stop on the actuating means, a catch pivotally connected to the actuating means, a spring acting on the catch and stop to maintain the catch in a position for engagement with the end wall, and an abutment on the operating means for releasing said catch, so constructed and arranged that upon successive movements of said operating means relatively to said actuating means said catch initially prevents movement of said actuating means and further predetermined movement of said operating means causes said abutment to pivot the catch so that when it becomes disengaged from the end wall, said actuating means will execute a snap movement to move said relatively movable contact means from one of its positions to the other for each successive movement of said operating means.

7. An electric switch, comprising: a casing having an end wall, relatively stationary contact means in said casing; cooperating relatively mov-

able contact means movable from a first circuit closing position to a second circuit closing position; means for actuating said relatively movable contact means, including an actuating member constructed to actuate said relatively movable contact means and movable to either side of a central position; detent means constructed to detain said actuating means against actuating movement; said detent means comprising a spring pressed catch on the actuating means and a stop on the actuating means for maintaining the catch in a position for engagement with the end wall, operating means constructed to impart actuating movement to said actuating means and including means constructed to transmit such movement to said actuating means; an abutment on the operating means, said transmitting means being constructed to permit movement of said operating means relative to said actuating means while said actuating means is detained by the catch, and thereupon to become stressed, and when the catch is pivoted by the abutment to disengage the end wall a snap movement will be imparted to said actuating means; and said relatively movable contact means and said actuating means being so constructed and arranged that upon successive actuating movements of said actuating means said actuating member moves alternately to one side or the other of said central position and correspondingly snaps said relatively movable contact means alternately into and out of contact with said relatively stationary contact means.

8. An electric switch comprising a casing having an end wall and an open end, said casing adjacent said open end having an outwardly extending abutment, a mounting plate for the switch provided with an aperture receiving the casing so that the mounting plate will engage the abutment, a flange on the casing engaging the mounting plate for permanently securing the plate to the casing, an insulator engaging the flange and the plate for closing the open end of the casing, means extending through the plate and the insulator for permanently securing the insulator in place, a standard carried by the insulator and extending longitudinally into the casing, a pair of spaced yieldable contacts closely related to said standard, a bridge pivotally connected to the standard and having a portion arranged between the standard and the yieldable contacts, a pair of lugs provided on the bridge; actuating means for said bridge including an

actuating member cooperable with said lugs; operating means constructed and arranged for movement relatively to said actuating means; and means, including a stop on the actuating means, a catch pivotally connected to the actuating means, a spring on the catch engaging the stop to maintain the catch in a position for engagement with the end wall, and an abutment on the operative means for releasing said catch, so constructed and arranged that upon initial movement of said operating means relatively to said actuating means said catch will engage the end wall and prevent movement of said actuating means and further predetermined movement of said operating means causes said abutment to pivot the catch so that when it becomes disengaged from the end wall said actuating means will execute a snap movement to alternately engage the lugs to move the said portion of the bridge alternately into engagement with the yieldable contacts, the relationship between the standard, yieldable contacts and said bridge portion being such that when a yieldable contact is engaged by said bridge portion the yieldable contact will press said bridge portion against the standard for resiliently holding the bridge against accidental displacement.

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