

Aug. 14, 1945.

H. PERRET

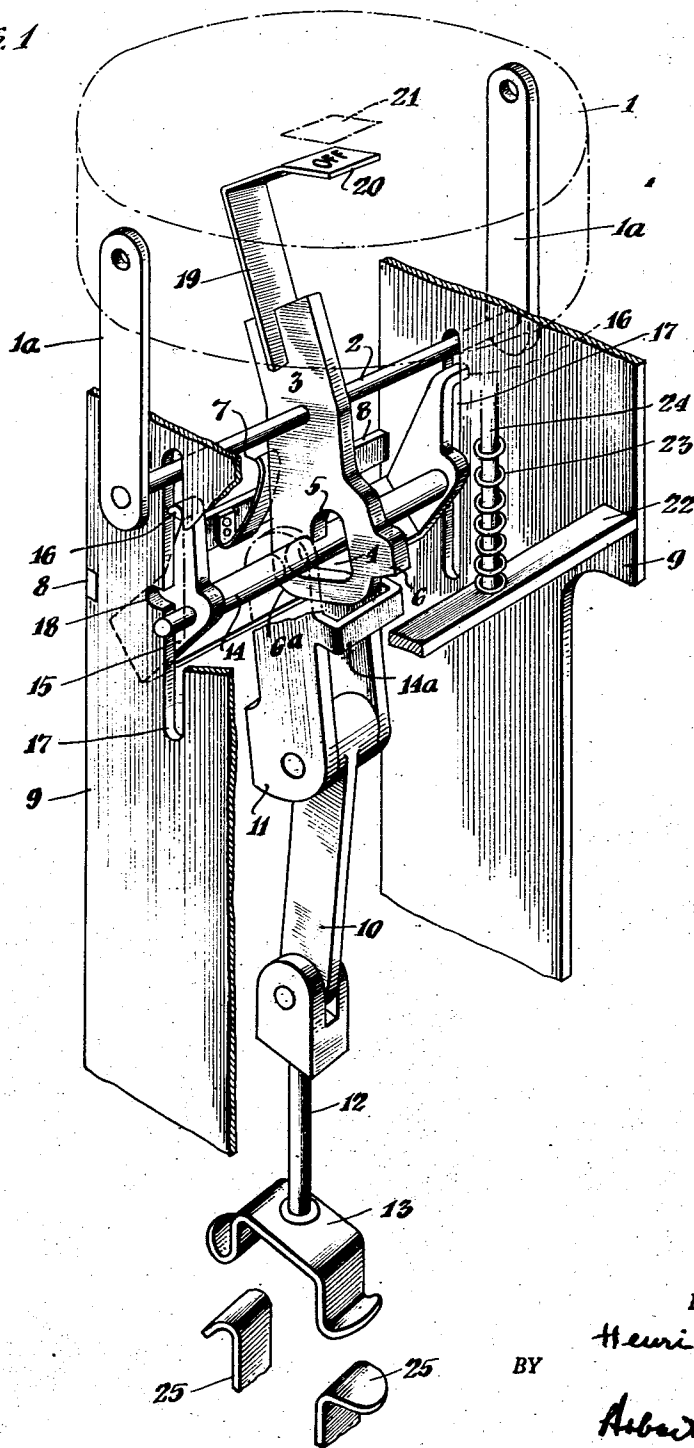
2,382,022

ELECTRIC SWITCH

Filed Oct. 1, 1942

2 Sheets-Sheet 1

*Fig. 1*



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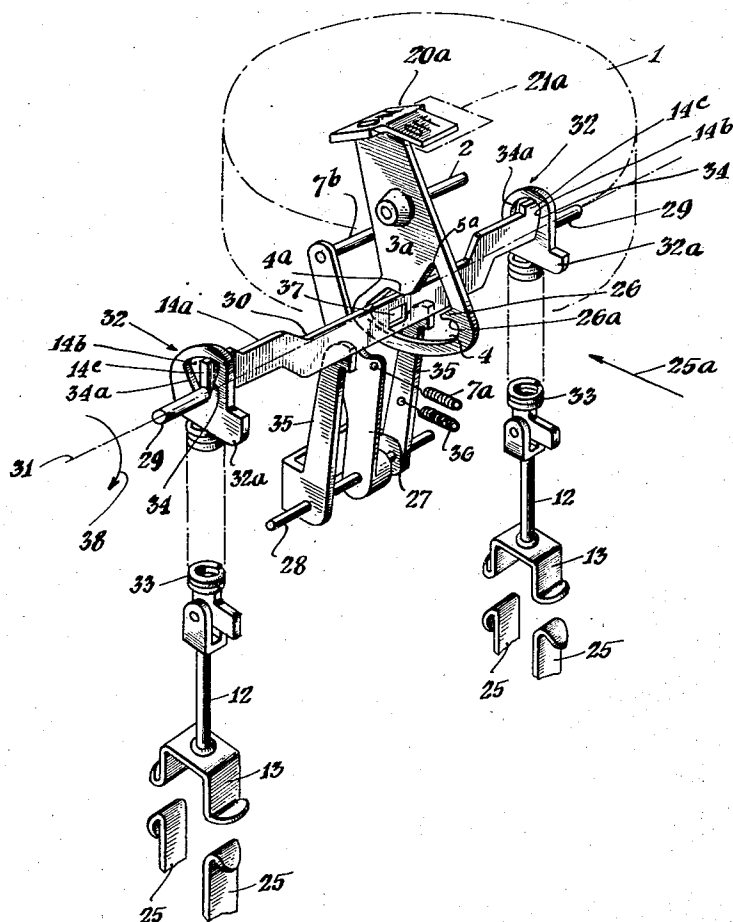
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2 Sheets-Sheet 2

*Fig. 2*



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## UNITED STATES PATENT OFFICE

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## ELECTRIC SWITCH

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8 Claims. (Cl. 200—160)

Electric switches, such as are employed, for example, in house and workshop installations, should desirably be constructed so as to be as simple and take up as little space as possible, while at the same time being rapid in operation. It is also advantageous to provide means to indicate the condition of the switch from time to time, i. e., whether it is in its closed or in its open position.

One object of the present invention is to provide a switch which is simple of construction, takes up a comparatively small amount of space, and is rapid in operation.

Another object of the invention is to provide a switch which may be closed and locked in closed position by preliminary sliding and tilting movements of actuating means and released for return to normal position by secondary or final sliding and tilting movements of the actuating means, the sliding, actuating and releasing movements being in the same direction, whereby such actions may be readily attained by successive depressions of a switch button or the like.

Still another object of the invention is to provide simple and effective means for at all times indicating the positions of the switch.

The accompanying drawings show, by way of example, two constructional forms of embodiment of the invention, wherein there is only shown what is necessary for the understanding of the invention and wherein likewise, with the object of more easily understanding the same, certain variations have been made from the actual construction.

Fig. 1 is a perspective view, illustrating the first embodiment, and

Fig. 2 is a perspective view, illustrating the second embodiment.

The switch shown is a push-button switch, wherein 1 is the push-button inclosing parts of the switching means. To this push-button 1 there is connected, as by connecting members 1<sup>a</sup>, one of which is shown in Fig. 1, a shaft 2, on which is mounted a sliding and tilting switch actuating element in the form of a two-armed lever 3. This lever 3 is vertically disposed and provided in its lower arm with a slot of angular form which has a horizontal part 4 and an upwardly extending vertical part 5; it also has a front lug or projection 6 and a rear heel portion 6<sup>a</sup>, and against its rear longitudinal edge above the heel portion there bears a spring 7, which is fixed to a transverse member 8 forming part of a stationary frame or casing 9.

In the construction shown, the means employed

for directly transmitting motion to the switch comprises a toggle lever device formed of two links 10, 11 pivotally connected together. The link 10 is connected through a push-rod 12 to the reciprocable switch member 13, whilst the link 11 is pivotally mounted for swinging movements on a vertically slidable and laterally shiftable shaft 14 and has a bridge piece 14<sup>a</sup>. The shaft 14 extends through the slot 4, 5 in the lever 3, and a vertically slidable and tiltable locking element in the form of a bail 15 is mounted on the shaft to slide therewith and to tilt thereon. The arms of this bail 15, which pivotally support it from the shaft 14, are provided with guiding and locking pins or lugs 16 which engage guide slots or guideways 17 in the frame 9.

In the guide slots or guideways 17 are also fitted and guided the ends of the shafts 2 and 14. A locking notch or recess 18 is provided in each of the guideways 17, which notches are adapted when the parts 3, 14 and 15 are moved downward on a switch closing motion to receive the lugs 16 as hereinafter described, whereby the switch will be locked in closed position. The movements of the parts 3, 14 and 15 and the arrangement of the notches 18 are, however, such that the shafts 2 and 14 always remain in the guideways, and out of engagement with the notches 18.

Normally, as shown, the arms of the bail 15 are arranged vertically, while the body portion of the bail extends at an angle to the vertical in rear of the heel portion 6<sup>a</sup> of the lever 3, whereby when the lugs 16 on the bail 15 are brought, by downward movement of the shaft, into register with the notches 18, the bail body swings forward by gravity to move the lugs into locking engagement with the recesses.

On the lever 3 there is provided an indicator arm 19 which extends into the push-button 1 and is provided with an angular portion 20 which is visible through an inspection aperture 21 in the front side or top of the push-button. This angular portion 20 is provided with legends, such as "On" and "Off," which show respectively through the aperture in such positions of the switch. These words can be printed in different colors, in order that one may be clearly distinguished from the other.

On the bridge piece 22 forming part of the frame 9 there rests a cylindrical spiral spring 23, which is guided on a rod 24 fixed in the push-button 1 and sliding in an opening in the bridge piece 22. The upper end of the spring acts on the push-button 1 to normally force the same upwardly and hold the switch in its open position.

In the open position of the above described switch shown in Fig. 1 of the drawings, the spring 7 engages the rear edge of the lever 3 below the level of the shaft 2 and the upper wall of the horizontal part 4 of the angular slot in the lever rests on the shaft 14. In this position of the switch also the bail 15 is arranged at a rearward angle with its lugs 16 disposed at the upper ends of the guideways 17 and with its body portion disposed in rear of the heel 6<sup>a</sup> of the lever 3, the links 10 and 11 are disposed in an elevated or retracted position, and the legend "Off" is visible through the inspection aperture 21.

The push-button operated actuating element 3 has a preliminary downward sliding traverse and tilting motion to effect the closing of the switch and the locking of the switch in closed position, and it has a final downward traverse in the same direction to effect the release of the locking means, i. e., the bail arms and lugs 16, and to permit the springs 23 and 7 to open the switch and return the parts to the normal position shown in Fig. 1. When it is desired to close the open switch the switch button 1 is depressed to transmit downward motion to the shaft 2 and lever 3, and through the latter to the shaft 14 and bail 15, until the lugs 16 come into register with the locking recesses 18. This movement of the aforesaid parts also transmits through shaft 14, forming with the bail 15 a motion transmitting and locking means, to extend the toggle levers 10 and 11 and move the switch 13 to closed position. At the moment the lugs 16 in this action register with the recesses 18, the body of the bail 15 swings forwardly so as to swing its arms rearwardly and project the lugs 16 into engagement with the recesses 18, thus locking the switch in closed position. At the same time, as the downward movement of the shaft 2 and lever 3 brings the spring 7 to bear on the upper arm of lever 3 above the shaft 2, said spring operates to tilt the lever 3 to swing its upper arm forwardly and its lower slotted arm rearwardly, thus bringing the slot portion 5 above the shaft 14 and the projection 6 above and in rear of the bridge piece 14<sup>a</sup>, and thereby setting the lever 3 for its second or final downward traverse to effect the release of the switch and the return of the parts to normal position when so desired.

With the parts in the above-described switch closing position, if it should be desired to open the switch, the button 1 is again depressed to transmit the final downward sliding movement to lever 3, allowed by its slot portion 5, in which action the projection 6 is moved downward in rear of the bridge piece 14<sup>a</sup> of the link 11, and said projection and the heel portion 6<sup>a</sup> of the lever 3 come between and respectively bear on the bridge piece 14<sup>a</sup> and body of the bail 15 to spread the same and to produce a forward-pull on shaft 14 and rear tilting of the body of bail 15. By this means the projections 16 will be withdrawn from locking engagement with the recesses, whereupon spring 23 will act to slide the parts 2, 3, and 14 upwardly and spring 7 will act to tilt lever 3 back to normal position.

In the example of embodiment according to Fig. 2 the slotted part 4 of the actuating lever 3 has a shoulder 4<sup>a</sup>, a nose projection 26 and a cam projection 26<sup>a</sup> extending into the slot 4. At the top of the lever 3 is an indicator strip 20<sup>a</sup> having two faces bearing the inscriptions "On" and "Off" for display through the inspection aperture 21<sup>a</sup>. Against the rear longitudinal edge of the lever 3 a pin 7<sup>b</sup> carried by a lever 27 bears under the

action of a contractile spring 7<sup>a</sup>, the lever 27 being pivotally mounted on a stationary shaft 28.

The locking and releasing element in this construction comprises a flat metallic strip 14<sup>a</sup> having cranked end portions and a dropped central body portion, thus forming the journals and working surfaces 29, 30, respectively, whose axis lines coincide as shown along the line 31. The journals 29 in practice slide in slots, similar to slots 18, in the walls of a casing (not shown).

At the ends of the strip 14<sup>a</sup> are bearing pieces or plates 32 having triangular slots 14<sup>b</sup> receiving the ends of the strip and beyond which the journals 29 project. Coiled springs 33 are engaged at their upper ends with the bearing pieces 32, said springs representing the toggle lever arrangement and being connected via push-rods 12 with the movable contacts 13 of the switch. The bearing pieces 32 have at opposite sides of their slots 14<sup>b</sup> stop faces 34, 34<sup>a</sup>, between which the ends of the flat strip 14<sup>a</sup> lie, said ends of the strip being provided with upwardly extending lever portions 14<sup>c</sup> movable between said strip surface and which permit tilting motion of the element 14<sup>a</sup> in either direction from a mid position.

The working surface 30 of the strip 14<sup>a</sup> offers a bearing support for the shoulder 4<sup>a</sup> and a surface for the engagement therewith of the hooked ends of the arms of a bail-shaped locking member 35. The shaft 28 serves also as a support for this member 35. The hook member 35 is biased by a spring 36 which tends to keep its hooked end in bearing contact with the rear face of the strip 14<sup>a</sup>. The nose 26 serves as a detent and is arranged for engagement with a locking opening 37 in the strip 14<sup>a</sup>.

In the off position, shown in Fig. 2, the pin 7<sup>b</sup> bears beneath the axis 2 against lever 3<sup>a</sup>, the latter being supported by its shoulder 4<sup>a</sup> on working surface 30, and the legend "Out" being visible through the observation aperture 21<sup>a</sup>. The nose 26 is disengaged from the opening 37 and the hooks of the member 35 bear against the rear surface of the strip 14<sup>a</sup>. The latter is assumed to be guided by its journals in slots similar to slots 18 in the switch frame so that the tipping effect which the pressure member 35 exerts on the strip 14<sup>a</sup> is neutralized. The spiral springs 33 are extended and the movable contacts 13 disengaged from the stationary contacts 23, and the lever portions 14<sup>c</sup> of the strip 14<sup>a</sup> are disposed between the stop faces 34, 34<sup>a</sup>.

If now, in order to close the switch, the button 1 is depressed, whereby the force of a spring (not shown, but which may be similar to spring 23) is overcome, the lever 3<sup>a</sup> is moved downward on its first traverse and pushes with its shoulder 4<sup>a</sup> on the strip 14<sup>a</sup>, thus pressing the movable contacts 13 into engagement with the stationary contacts 25. The bail 35 is thereupon operated to cause its hooked ends to engage over the working surface 30, thereby locking the switch in the on-position, and in this action the longitudinal edge of lever 3 slides along the pin 7<sup>b</sup>, so that the latter now comes to bear against the lever 3<sup>a</sup> above the axis 2. If the push-button be now released, it moves upwards under the action of its retracting spring (not shown), thus setting the working surface 30 free from the shoulder 4<sup>a</sup>, allowing the lever to be tilted by the spring 7<sup>a</sup> to bring part 5<sup>a</sup> of slot 4 above the strip 14<sup>a</sup>. As a result of this movement the word "On" is displayed at aperture 21, the nose 26 engages the opening 37 and prevents movement of the push-button 1 upward towards its rest position.

When, in order to switch off manually, the button 1 is further depressed, the lever 3<sup>a</sup> is moved downward on its final traverse and the cam projection 26<sup>a</sup> is pressed against the lower wall of the opening 37, whereby the strip 14<sup>a</sup> is tilted about the axis line 31 in the direction indicated by arrow 38. The lever portions 14<sup>c</sup> are thus brought into engagement with the stop faces 34 of the bearing pieces 32, causing the latter to swing, so that the spring coils 33 flex and the movable contacts are instantaneously withdrawn from engagement with the stationary contacts 25 and the push-button retracting spring returns all the parts to normal position.

If automatic means of suitable character be employed to release the switch in the event of an overcurrent or short-circuit, the force of such means may be employed to either act on a lateral arm 32<sup>a</sup> of one of the bearing pieces 32 or, as indicated by the arrow lines 25<sup>a</sup>, against a spring coil 33. Then the stop face 34<sup>a</sup> of this bearing piece 32 will engage the associated lever portion 14<sup>c</sup> and oscillate the strip 14<sup>a</sup>, and the latter will transmit this switch-off movement to the other bearing piece, causing the associated lever portion 14<sup>c</sup> to engage the coacting stop face 34 and tip the associated spring 33.

In Fig. 2 a duplex switch is illustrated, but the switch may embody one, two or more movable switch members, as desired.

Instead of a press-button a lever arrangement may be employed for actuating the switch.

The construction of the switch with a sliding and tilting actuating lever, which is spring biased for locking actions in each of its movements, permits of a simple construction of switch and at the same time allows ready use of indicating means showing the condition of the switch at any time.

The use of the strip 14<sup>a</sup> as a motion transmitting and locking element allows for a compact assembly of parts and disposition of a number of parts on the interior of the push-button, if desired, by which space is saved especially with regard to the height of the switch.

I claim:

1. A switch operating device including in combination a reciprocable switch member, a sliding and tilting actuating element having a preliminary sliding traverse and a continued final sliding traverse at the end of its preliminary traverse and in the same direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit movement in switch closing direction to the reciprocable switch member, means for tilting the actuating element at the end of its preliminary traverse to set it for its final sliding traverse and to effect tilting motion in one direction of the motion transmitting and locking element to dispose it in position to be locked, means operative on such tilting motion of the motion transmitting and locking element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element beyond the end of its preliminary traverse to release the parts and return them to normal position and in such action to cause the motion transmitting element to impart movement in switch opening direction to the reciprocable switch member.

2. A switch operating device including in combination a switch member, a sliding and tilting

actuating element having preliminary sliding traverse and a final sliding traverse in one direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit closing movement to the switch member, toggle mechanism actuable by the motion transmitting and locking element for closing and opening the switch, means for tilting the actuating element at the end of its preliminary traverse to set it for its final sliding traverse and to effect tilting motion in one direction of the motion transmitting and locking element to dispose it in position to be locked, means operative on such tilting motion of the motion transmitting and locking element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element to release the parts and return them to normal position and move the switch member to open position.

3. A switch operating device including in combination a reciprocable switch member, a sliding and tilting actuating element formed with an angular slot and having a preliminary sliding traverse and a continued final sliding traverse at the end of its preliminary traverse and in the same direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit movement in switch closing direction to the switch member, said motion transmitting element normally occupying a portion of the slot in the actuating element and being held thereby against tilting motion, means for tilting the actuating element at the end of its preliminary traverse to bring the motion transmitting and locking element into another portion of the slot in the actuating element so as to release said motion transmitting element for tilting motion and so as to release and dispose the actuating element in position for its final traverse, means operative on such tilting motion of the motion transmitting element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element beyond the end of its preliminary traverse to release the parts and return them to normal position and move the reciprocable switch member back to open position.

4. A switch operating device including in combination a switch member, a sliding and tilting actuating element formed with an angular slot and having a preliminary sliding traverse and a final sliding traverse in one direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit closing movement to the switch member, said motion transmitting element normally occupying a portion of the slot in the actuating element and being held thereby against tilting motion, toggle mechanism actuable by the motion transmitting and locking element for closing and opening the switch, means for tilting the actuating element at the end of its preliminary traverse to bring the motion transmitting and locking element into another portion of the slot in the actuating element so as to release said motion transmitting element for tilting motion and so as to release and dispose the actuating element in position

for its final traverse, means operative on such tilting motion of the motion transmitting element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element to release the parts and return them to normal position and move the switch member to open position.

5. A switch operating device including in combination a reciprocable switch member, a sliding and tilting actuating element having a preliminary sliding traverse and a continued final sliding traverse at the end of its preliminary traverse and in the same direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit closing movement to the switch member, spring means for normally holding the actuating element in normal position and tilting the said actuating element at the end of its preliminary traverse to set it for its final sliding traverse and to effect tilting motion in one direction of the motion transmitting and locking element to dispose it in position to be locked, means operative on such tilting motion of the motion transmitting and locking element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element to release the parts and return them to normal position and move the reciprocable switch member back to open position.

6. A switch operating device including in combination a switch member, a sliding and tilting actuating element having a preliminary sliding traverse and a final sliding traverse in one direction for switch closing and opening actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit closing movement to the switch member, toggle mechanism actuable by the motion transmitting and locking element for closing and opening the switch spring means for normally holding the actuating element in normal position and tilting said actuating element at the end of its preliminary traverse to set it for its final sliding traverse and to effect tilting motion in one direction of the motion transmitting and locking element to dispose it in position to be locked, means operative on such tilting motion of the motion transmitting and locking element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element to release the parts and return them to normal position and move the switch member to open position.

7. A switch operating device including in combination a reciprocable switch member, a sliding and tilting actuating element formed with an an-

gular slot and having a preliminary sliding traverse and a continued final sliding traverse at the end of its preliminary traverse and in the same direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit closing movement to the switch member, said motion transmitting element normally occupying a portion of the slot in the actuating element and being held thereby against tilting motion, spring means for normally holding the actuating element in normal position and tilting said actuating element at the end of its preliminary traverse to bring the motion transmitting and locking element into another portion of the slot in the actuating element so as to release said motion transmitting element for tilting motion and so as to release and dispose the actuating element in position for the final traverse, means operative on such tilting motion of the motion transmitting element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element beyond the end of its preliminary traverse to release the parts and return them to normal position and move the reciprocable switch member back to open position.

8. A switch operating device including in combination a reciprocable switch member, a sliding and tilting actuating element formed with an angular slot and having a preliminary sliding traverse and a continued final sliding traverse at the end of its preliminary traverse and in the same direction for switch closing and releasing actions, a sliding and tilting motion transmitting and locking element slidable by and on the preliminary sliding movement of the actuating element to transmit closing movement to the switch member, said motion transmitting element normally occupying a portion of the slot in the actuating element and being held thereby against tilting motion, spring means for normally holding the actuating element in normal position and tilting said actuating element at the end of its preliminary traverse to bring the motion transmitting and locking element into another portion of the slot in the actuating element so as to release said motion transmitting element for tilting motion and so as to release and dispose the actuating element in position for its final traverse, toggle mechanism actuable by the motion transmitting and locking element for closing and opening the switch, means operative on such tilting motion of the motion transmitting element to lock the same and the actuating element in switch closing position, and means operative on the final sliding traverse of the actuating element beyond the end of its preliminary traverse to release the parts and return them to normal position and move the reciprocable switch member back to open position.

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