

Dec. 8, 1925.

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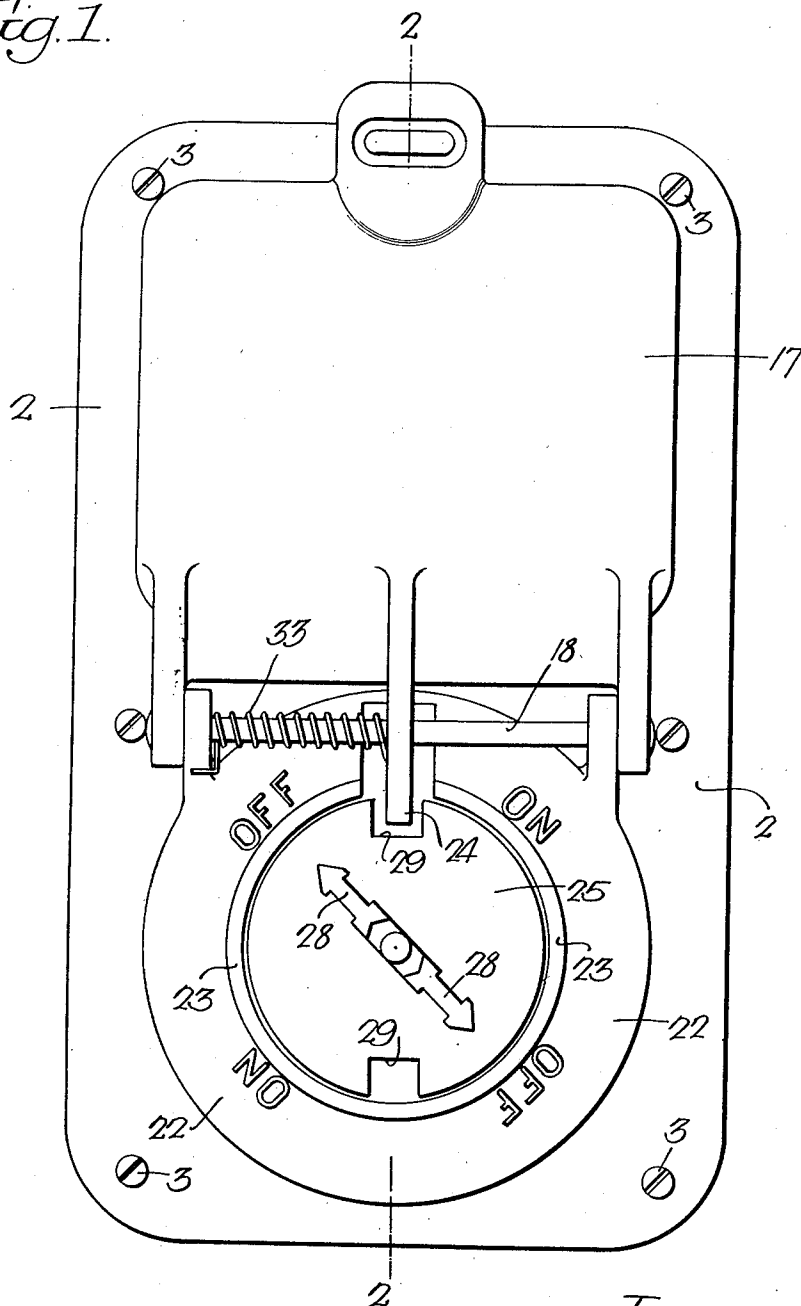
J. F. BURNS

SAFETY SWITCH

Filed June 27, 1922

4 Sheets-Sheet 1

*Fig. 1.*



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Dec. 8, 1925.

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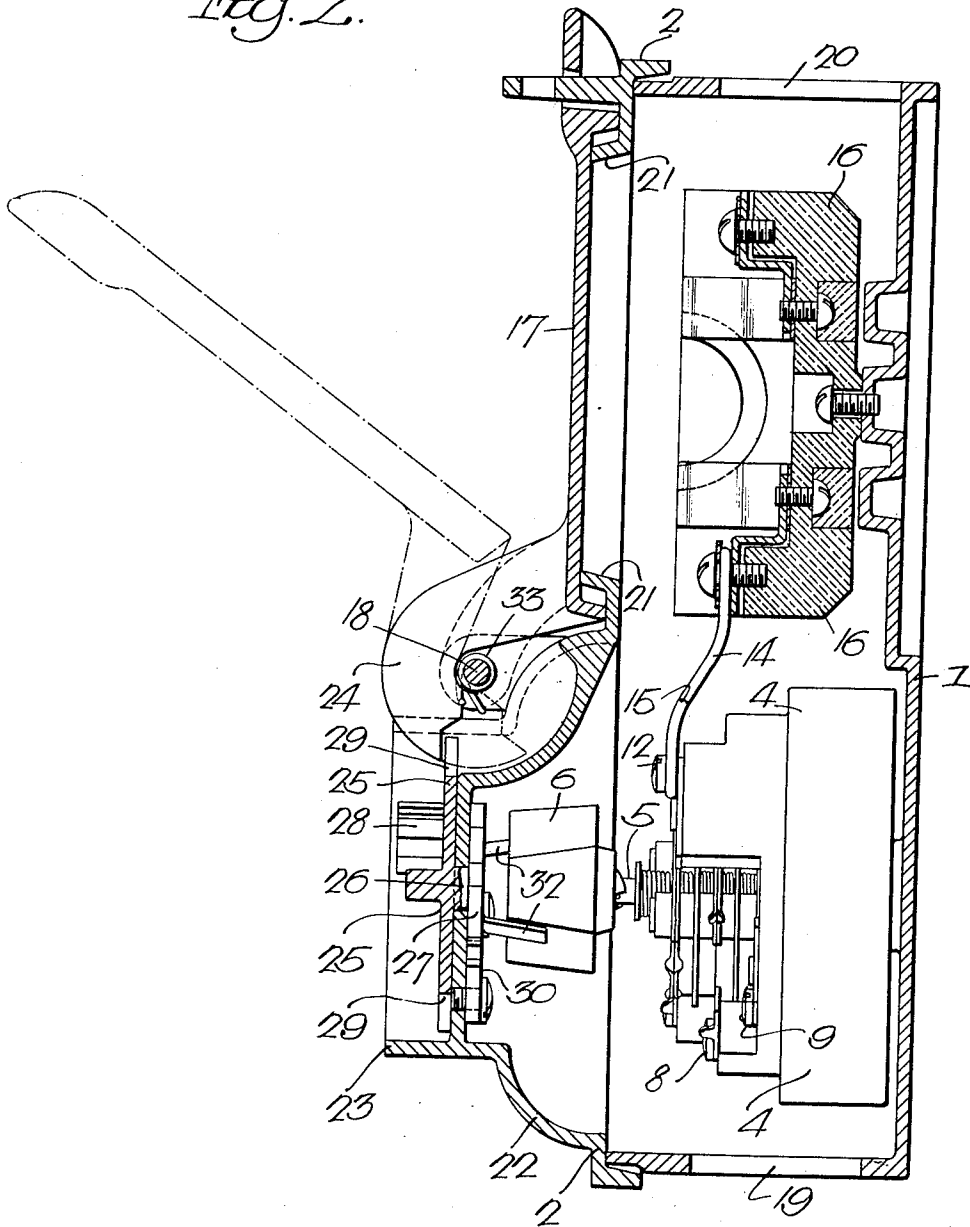
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*Fig. 2.*



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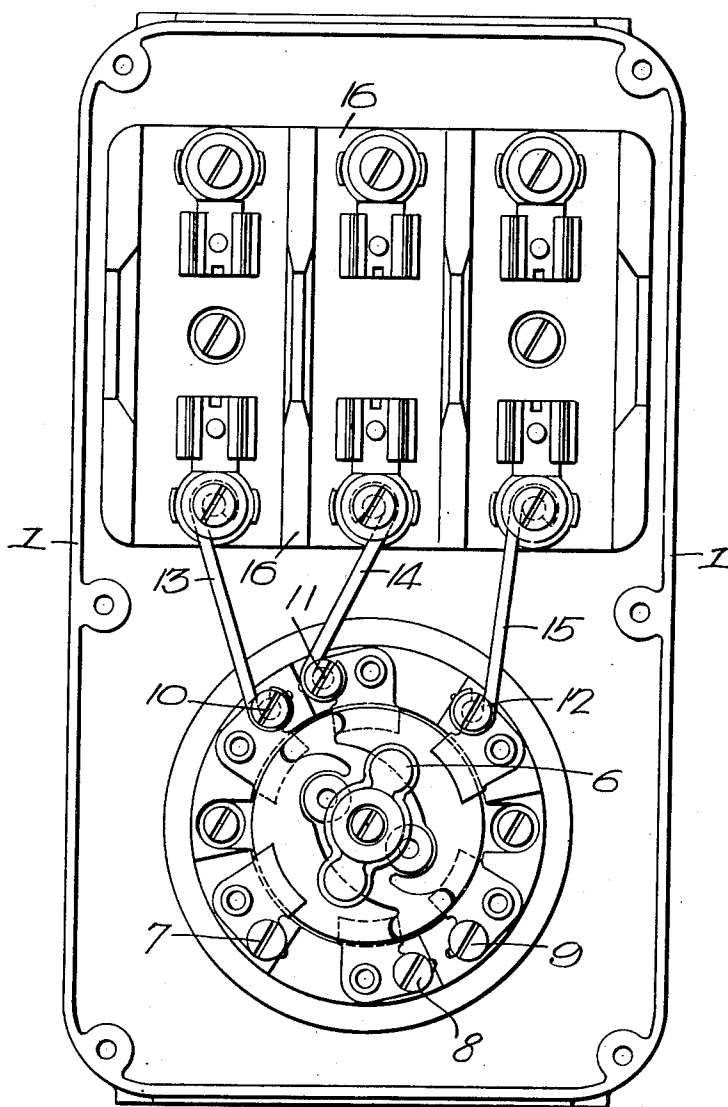
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SAFETY SWITCH

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*Fig. 3.*



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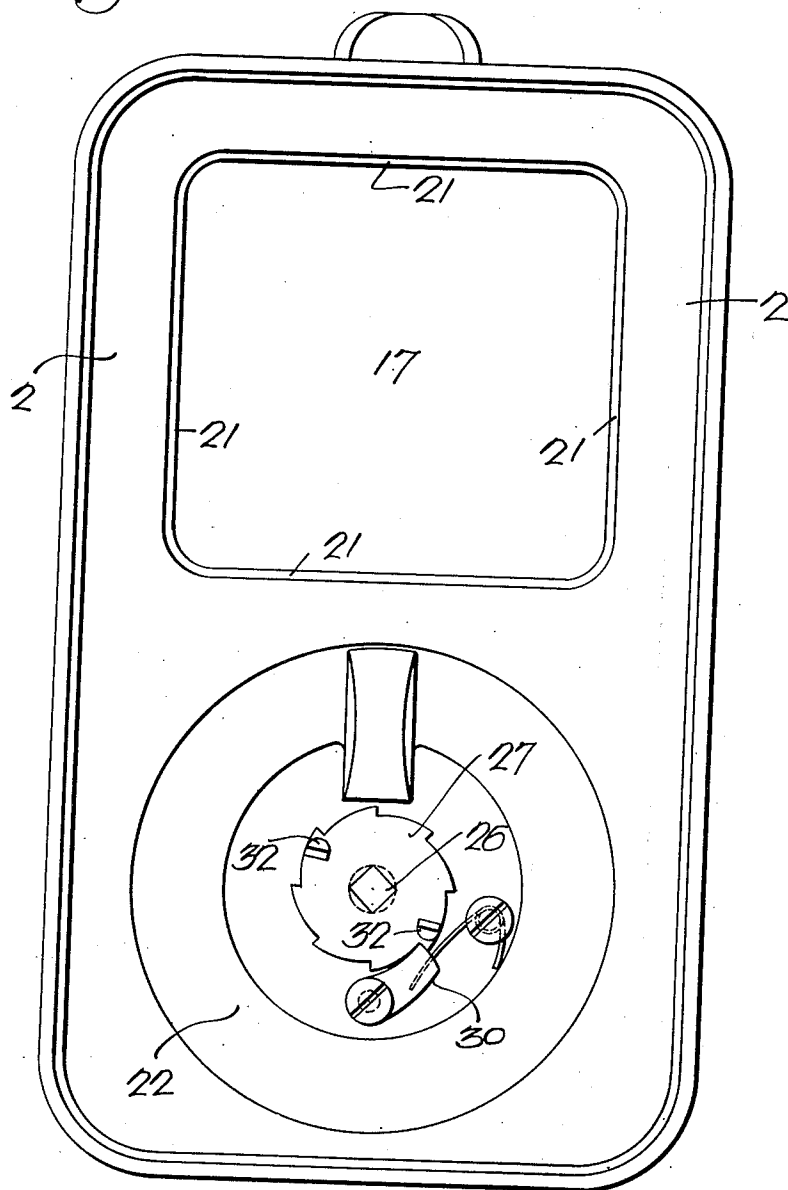
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SAFETY SWITCH

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4 Sheets-Sheet 4

*Fig. 4.*



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## UNITED STATES PATENT OFFICE.

JAMES F. BURNS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO V. V. FITTINGS COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## SAFETY SWITCH.

Application filed June 27, 1922. Serial No. 571,129.

*To all whom it may concern:*

Be it known that I, JAMES F. BURNS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented a Safety Switch, of which the following is a specification.

One object of this invention is to provide a relatively simple, substantial, compact and reliable mechanism for actuating the movable element of a rotary snap switch, the invention contemplating an enclosing casing for said switch and a member operative from outside said casing for intermittently turning the movable element of the switch to operate the same.

It is further desired to provide a device including a casing having a movable cover or door in combination with a rotary snap switch and one or more fuses in the casing accessible through the doorway, together with novel means for operating the switch from outside the casing, designed to lock the door or cover in its closed position except when the switch is open and to prevent closing of the switch until after the door has been closed.

Another object of the invention is to provide novel means for actuating the rotary snap switch, which shall be capable of movement in but one direction and which shall include mechanism for preventing it being manipulated to allow the door being unlocked without first opening the switch.

I also desire to provide novel means for enclosing a switch so that it shall be dust- and weather-proof, together with novel means for visually indicating the position of the movable element of the switch.

These objects and other advantageous ends I attain as hereinafter set forth, reference being had to the accompanying drawings, in which,

Fig. 1 is a plan of a switch casing having my invention applied thereto;

Fig. 2 is a vertical section on the line 2-2, Fig. 1;

Fig. 3 is a plan of the casing with the cover and switch operating mechanism removed, showing the switch and fuse block; and

Fig. 4 is an inverted plan of the cover and switch operating means.

In the above drawings, 1 represents a metallic or other box shown in the present

instance as substantially rectangular in cross section, formed with a flat flanged cover 2 held to it by screws or bolts 3 or the like. Within the box or casing is mounted an electric switch 4 of the rotary snap type having its movable element or elements mounted on but insulated from a spindle 5 on whose outer or free end is mounted a head or handle 6 of insulating material. By means forming no part of the present invention, this head is so connected to the spindle as to be capable of turning the same when rotated in a clockwise direction but is released from said spindle when turned in a counter-clockwise direction.

The switch employed is preferably of the quick break or snap type and is of such design that after the handle 6 has been turned through a predetermined angle, the structure carrying the movable contact or contacts controlled by the spindle suddenly snaps or turns at a high speed from a position in which said contact or contacts engage the fixed contact or contacts, to one in which they are disengaged from said contacts, or from their disengaged position to a position in which they complete the circuit through said fixed contacts.

In the case illustrated the electric switch shown is of the three-pole type, having three terminals 7, 8 and 9 for connection to three other terminals 10, 11, and 12 of a supply circuit, which through conductors 13, 14 and 15 are connected to three terminals of a fuse block 16 so positioned that its clips or fuse holders are accessible through a doorway normally closed by a door 17 hinged by a pin 18 to suitable lugs projecting from the cover 2. An opening 19 in one end of the box 1 is provided for conductors passing to the switch terminals 7, 8 and 9 and a second opening 20 at the opposite end of the box is designed for the passage of the conductors from the second set of terminals of the fuse block to the motor or lighting circuit to be supplied with current. The opening or doorway giving access to the fuse block has a peripheral flange 21 and the door 17 is likewise flanged to fit over and enclose the flange of the doorway so that access of water or dust is effectually prevented.

The cover 2 over or adjacent the switch 4 is given an outward spherical bulge or

curvature as indicated at 22 and on the top of this extension is formed an outwardly projecting collar 23 forming an open enclosure on the outer face of the cover, completely cut off from the inside of the same. The door 17 adjacent the cover extension 22 has a projecting lug or arm 24 of such length as to extend over and beyond the hinge pin or spindle 18 and through a suitably positioned opening in the wall of the collar 23 so that it projects in the space defined by the latter.

Rotatably mounted in this space is a locking plate 25, in the present instance fixed integrally to a spindle 26 journaled in the cover centrally of the projection 22 and having similarly fixed to its inner end a ratchet wheel 27. The locking plate 25 is generally circular in outline and has fixed on or integral with its outer face a pair of pointers or indicating arrows 28 shown as extending in the same straight line but pointing in opposite directions. The plate 25 is so positioned that when the door 17 is closed, the lug 24 thereof extends over and immediately adjacent its outer face, thus effectually preventing opening of said door except when the plate is so turned that either of its oppositely placed notches 29 is brought under said lug.

In the present case the switch 4 is of such design that for each full revolution of its operating handle or head 6, it has two opposite positions in which the electric circuit or circuits in which it is connected are closed and two other opposite positions in which said circuits are open.

Coacting with the ratchet wheel 27 is a spring-actuated pawl 30 pivotally mounted on the under side of the cover 2 and so arranged as to be always pressed toward said wheel. As a result the latter with the locking plate 25 can be turned in but one direction, i. e.,—clockwise, and the teeth of the ratchet wheel are so positioned or bear such relation to the notches 29 of the indicating plate that said pawl will hold the plate immovable in either of its two positions in which the notches 29 are under the lug 24 as well as in certain other intermediate positions. The advantage of said intermediate positions is that the locking plate 25 is prevented from being returned to its original position should the switch 4 snap from one position to the other prior to the engagement of the pawl 30 and the desired locking ratchet tooth, as will be readily understood by those skilled in the art.

Projecting from the under or inner face of the ratchet wheel 27 are a pair of more or less elongated, oppositely placed fingers 32 designed to engage the handle or cross head 6 of the rotary snap switch so as to transmit rotary motion thereto from the locking plate 25, whose indicating pointers or arrows 28 project above the surface thereof such a

distance as to permit of their being readily engaged by the fingers when it is desired to rotate the plate 25 to operate the switch 4. The fingers 32 are so positioned on the ratchet (which in the present case has eight teeth) that as the locking plate 25 is turned in a clockwise direction, they engage and turn the head or handle 6, causing the circuit or circuits through the switch to be alternately opened and closed. Moreover the parts are so assembled that at such time as the circuit through the switch is closed, the circular edge of the locking plate lies under the projecting end of the lug 24 and the indicating arrows are in a diametrical line of the enclosure formed by the collar 23, having adjacent its ends the word "On" cast in the cover extension 22.

Thereafter as the locking plate is turned, torsional stress is applied by the fingers 32 to the handle 6, but before this moves sufficiently to cause actuation of the movable switch contacts, the pawl 30 falls behind one of the teeth of the ratchet wheel 27. This tooth may be called a "safety tooth" inasmuch as it prevents the return of locking plate 25 to its original position should the switch 4 snap from the present closed position to the open position. The circuit through the switch is thus still closed but it is not possible to open the door 17 since the locking plate 25 still extends under the end of the lug 24 and cannot be moved backward. Further movement of the locking plate in a clockwise direction causes such further turning of the handle 6 as to cause the movable contact of the switch to disengage the fixed contacts and open the circuits through said switch and just as the locking plate is moved sufficiently far to bring one of its notches 29 under the lug 24, the pawl 30 falls behind another tooth of the ratchet wheel 27, thus preventing said locking plate moving back out of its given position.

The door 17 may now be swung on its hinge pin 18 to an open position, although it tends to close under the action of a spring 33 coiled on said spindle as shown in Fig. 1. The fuses may now be inspected, removed or replaced as desired and it is not possible, as long as the door 17 remains open, to so turn the locking plate as to close the circuits of the switch and supply current to the fuses or their terminals. This is due to the fact that in any other position except when the door is fully closed, the lug 24 will extend into one of the notches 29 to a greater or less extent, thus effectually locking the plate 25 and the switch element actuated therefrom from all movement. The indicating arrow then lies in a line having at its ends the words "Off" cast in the metal of the extension 22.

When the door 17 is closed the end of the

lug 24 is swung out of the notch 29 and it is then possible to again turn the locking plate in a clockwise direction. As said turning is continued, the pawl 30 falls behind one of the teeth of the ratchet 27 before the switch handle 6 is turned far enough to cause closing of the switch circuits, so that the door is effectually locked shut even though the switch is still open and the fuse terminals are still dead. Further turning of the locking plate now causes the switch handle 6 to move the rotary contact thereof to its "on" position, so that current is supplied to the fuses and whatever circuit may be connected thereto, while the door 17 is locked shut owing to the edge of the locking plate 25 being introduced under the lug 24. The continued rotation of the locking plate will thereafter cause opening of the switch before one of the notches 29 can be brought under said lug.

From the above description it will be appreciated that not only is it a practical impossibility for an operator to have access to the fuses until after the current is cut off from them by the opening of the switch, but in addition the door of the cover effectually prevents operation of the switch and throwing of the current on the fuses until said cover has been fully closed. Moreover, owing to the fact that the controlling switch handle cannot be turned backward or moved in but one direction, and since the switch itself is of the quick break type, it is not possible for said switch to be moved to any but a full on or a full off position, in the former of which the door giving access to the fuses cannot be opened.

I claim:

1. The combination of a casing having a door; a rotary snap switch and a fuse in said casing; a rotary member mounted on the casing and operatively connected with the movable element of the switch; means cooperating with said member to lock the door closed when the switch is in one position and to permit said door being opened when the switch is in another position; a pawl and ratchet to prevent retrograde movement of said rotary element of the switch, the number of teeth of the ratchet being a multiple of the number of positions which may be assumed by said rotary switch element.

2. The combination of a casing having a door; a rotary snap switch and a fuse in said casing; a rotary member mounted on the casing and operatively connected with the movable element of the switch; means cooperating with said member to lock the door closed when the switch is in one position and to permit said door being opened when the switch is in another position; and a pawl and ratchet preventing said rotary

member from turning in one direction, the number of teeth of the ratchet being double the number of positions which may be assumed by the movable switch element.

3. The combination of a casing, a rotary snap switch mounted therein, a cover plate for the casing, a switch operating member carried thereby and operatively connected to the movable member of the switch, a door carried by the cover plate, cooperative means carried by the door and switch operating member for locking and unlocking the door according as the switch is closed or open, means to lock the switch operating member against retrograde movement at the "on" positions of the switch, and means to prevent retrograde movement of the operating member in case the switch closes before the operating member has reached said "on" position.

4. The combination of a casing, a snap switch positioned therein, said switch including a rotary operating shaft, an apertured cover plate for the casing, a hinged closure for the aperture, a switch operating member carried by the cover plate, cooperative means carried by the operating member and cover plate for indicating "on" and "off" positions of the switch, cooperative means carried by the operating member and hinged closure for locking and unlocking the closure according as the operating member is in "on" or "off" positions, means for locking the operating member against retrograde movement when indicating positions, and means for similarly locking the operating member at points intermediate its indicating positions, whereby upon premature closing of the switch, opening of the closure by retrograde movement of the operating member, is precluded.

5. The combination with a casing and a rotary snap switch mounted therein, of an apertured cover plate for the casing, a swinging closure of the aperture of the cover plate, an operating member carried by the cover plate and operatively connected with the movable member of the switch, cooperative means associated with the operating member and swinging closure for locking and unlocking the closure according as the switch is in "on" or "off" positions, pawl and ratchet mechanism carried by the cover plate for locking the operating member against retrograde movement at "on" and "off" positions of the switch, said ratchet being provided with safety teeth for limiting the retrograde movement of the operating member between "on" and "off" positions of the switch whereby to preclude the possibility of opening the swinging closure in the event of premature closing of the switch.

JAMES F. BURNS.