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INTERLOCKING COVER AND SWITCH MECHANISM

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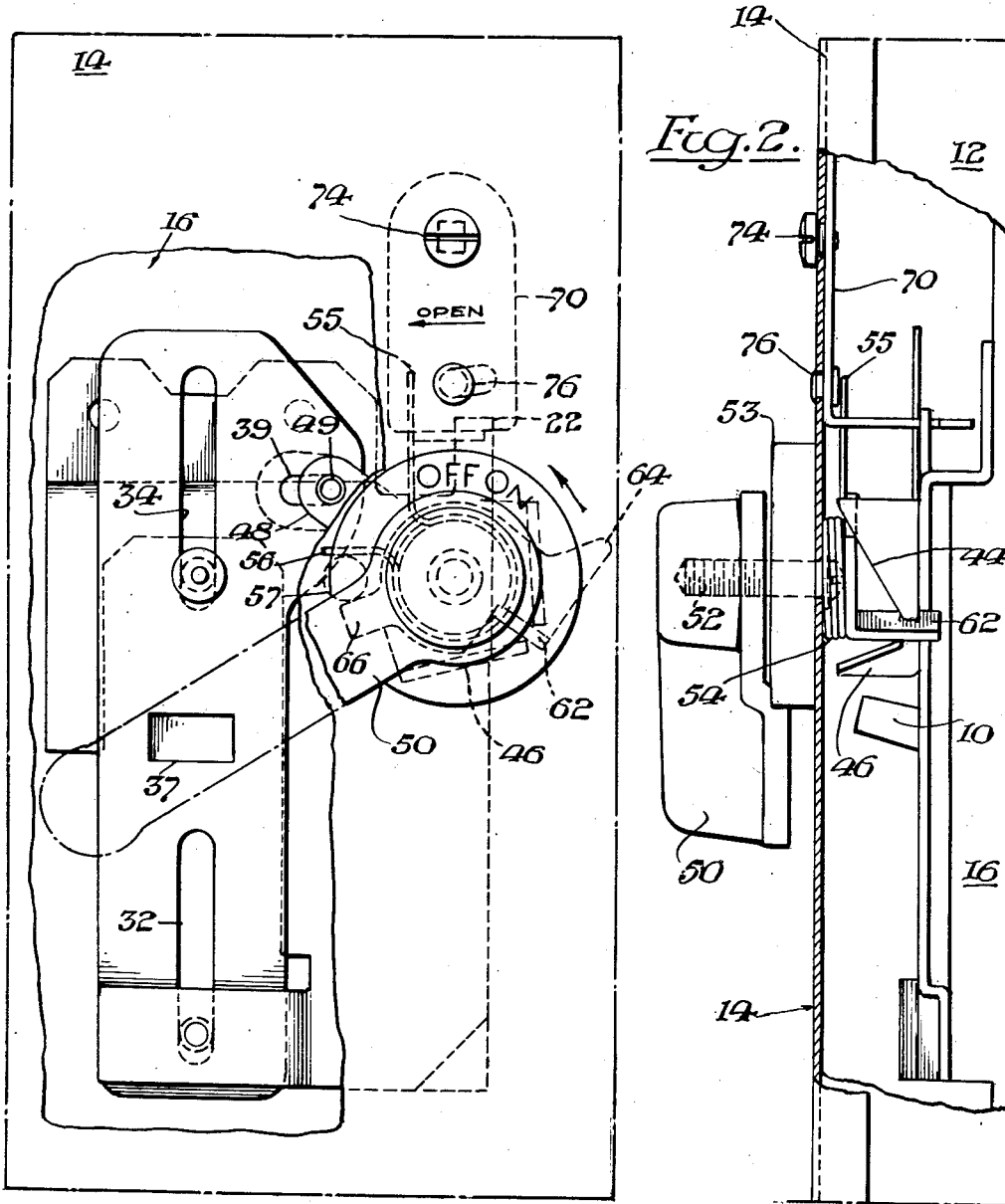


Fig. 1.

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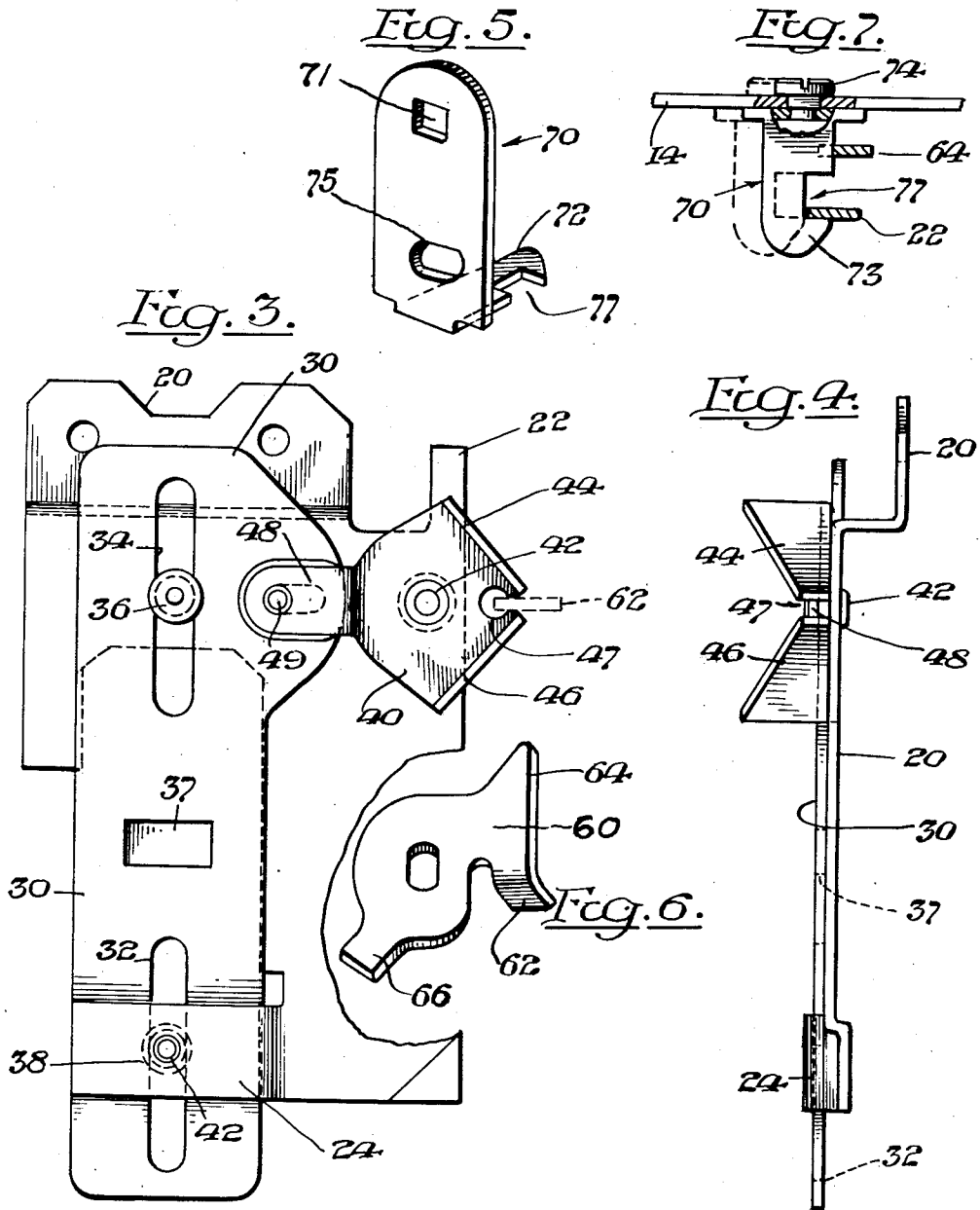
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INTERLOCKING COVER AND SWITCH MECHANISM

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16 Claims. (Cl. 200—50)

This invention relates to interlocking mechanisms and more particularly to an interlocking mechanism between an electric switch contained in a box and an operating handle carried by the box cover.

It is an object of this invention to provide an improved and simplified interlocking arrangement, not only to prevent opening of the cover when the switch is closed but to prevent opening of the cover when the switch is in open position, and to permit opening of the cover only when the handle is moved to an unlocking position which may sometimes be a "reset" position.

Another object is to provide an improved interlocking mechanism for holding the cover of the switch box closed when the switch is either in open or closed position, but which will permit opening of the cover when the switch handle is moved to a separate unlocking position and having additional provision for causing movement automatically of the handle to a position corresponding to the position occupied by the switch, upon closing of the cover, if the handle and switch positions do not correspond.

Another object of the invention is to provide in an interlocking mechanism of the foregoing type, means to cause the cover to automatically become latched closed as the cover is moved into closed position regardless whether the position of the switch is "open" or "closed" at that time.

Other objects and advantages of the invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:

Fig. 1 is a fragmentary plan view, partly broken away of a switch cover and box to which the invention has been applied.

Fig. 2 is a side elevation view partly broken away of the mechanism illustrated in Fig. 1.

Fig. 3 is a plan view showing in detail those portions of the interlocking mechanism which are normally mounted upon the switch within the box.

Fig. 4 is a side elevation view of the parts illustrated in Fig. 3.

Fig. 5 is a perspective view of the latching member.

Fig. 6 is a perspective view of the control member.

Fig. 7 is a fragmentary detail view of the latch member mounted upon the cover.

Referring to the drawings, the invention is applied to a conventional electric switch structure in which the switch itself is operated by a lever 10 which is rockable back and forth to actuate the switch contacts. The switch may be mounted within a conventional switch box 12 having a cover 14 hinged thereon. Since the box and cover are conventional parts to which the invention is applied, the whole of the box and the hinge mounting of the cover thereon need not be illustrated. It will be understood, however, from what follows, that the cover may be swung away from the box upon its hinges in conventional fashion and during that movement, the operating

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parts of the interlocking mechanism which are mounted upon the cover may separate from the remainder of the interlocking parts mounted upon the switch.

As stated, the electric switch mechanism may be of conventional or of any suitable construction having a switch base 16 secured within the switch box 12 and a handle 10 extending forwardly toward the cover of the box.

Mounted upon the switch base 16 or secured to the switch box 12 in any suitable fashion so as to lie in a position parallel and near to, but spaced from, the cover 14 when the latter is closed is a stamped sheet metal base plate 20. One corner (the upper righthand corner as viewed in Fig. 3) of the base plate 20 may be cut away partially to provide an extension 22 acting as a keeper for a latch member as hereinafter will be more particularly described. The opposite side of the base plate is cut away to provide a sidewise extending arm or guide 24 which is offset or pressed out of the plane of the base plate in position to overlie a slide member 30.

The slide member 30 may be stamped from sheet metal into the form of a wide thin bar. In it, at opposite ends longitudinally extending separated aligned slots 32 and 34 are formed. Mounting pins 36 and 38 pass through the slots 32 and 34 and are fixedly mounted in the base plate 20. The pin 36 passes downwardly through the slot 34 into the upper face of the base plate while the pin 38 passes upwardly through the slot 32 from the bottom side of the slide and is threaded or otherwise affixed to the guide arm 24. The pins 36 and 38 each have enlarged heads overlying the edges of the slots. In that way the slide is guided for rectilinear movement over the surface of the base plate 20. In the central portion of the slide 30 is a square aperture 37 which receives the operating lever 10 of the switch so that as the slide is slid to and fro, the switch lever is caused to reciprocate and thus to operate the switch.

In order to reciprocate the slide 30, a leg 48 of a stamped sheet metal slide-operating member 40 is connected thereto by a pin and slot connection. The slide-operating member is pivotally mounted upon a pin 42 which is mounted upon the base plate 20 in the upper righthand corner. The slide-operating member may be stamped into substantially Y-shape. The arms of the Y are bent up in the same direction at right angles to the main body of the member and cut or beveled so as to incline inwardly toward the plane of said main body, thus providing converging cam surfaces for a purpose as hereinafter described. A notch 47 is formed between the cams 44 and 46 to receive the foot of an operating or control member hereinafter described. The leg 48 of the slide-operating member may be offset slightly from the plane of the main body of the lever and may be pivotally connected to the side by a pin 49 mounted in the end of the leg and entering a transversely extending slots 39 in the slide 30.

All of the parts of the interlocking mechanism thus far described are mounted upon the base plate 20 which in turn is mounted upon the switch or supported from the box. Therefore the base plate and associated parts are fixedly located, although some can move.

In order to latch the cover shut, a pivoted latch member 70 is mounted upon the inside surface of the cover by means of a stud 74. The stud 74 has portions of three different diameters, the head portion being the largest and adapted to lie against the outside surface of the cover 14. The intermediate portion is adapted to rotate within a circular hole in the cover 14 while the smallest reduced end portion is of square section and fits within a square aperture 71 in the latch member and is peaned over to hold the latch member and stud in as-

sembled condition on the cover rotatively. If desired, the head of the stud 74 may be slotted so as to permit insertion of the screwdriver to operate a latch from the exterior part when desired.

To limit the motion of the latch, a slot 75 is provided therein through which passes a pin 76 mounted in the cover. From the end of the latch member opposite the pivotal mounting thereof, an arm 72 extends and is bent at right angles to the main portion of the latch member away from the cover. The end of the arm 72 is rounded forming a nose 73. Between the nose 73 and the body of the latch, there is formed in the arm a mouth or slot 77 which is adapted to receive the keeper 22 on the base plate 20. The latch member 70 is so placed that upon closing movement of the cover, the nose 73 will engage the edge of the keeper and the latch member will be cammed to one side. The pressure of a spring 54 will force the slot 77 into cooperative embracing engagement with the keeper 72 when the cover becomes fully closed. In that way the cover will become latched.

The cover 14 carries a lever type handle 50 which is mounted upon a handle shaft 52 extending through an indicating plate 53 secured to the cover by screws or in any suitable fashion. The shaft 52 is adapted to rotate in the cover and carries upon its inner end a stamped sheet metal driving and control member 60. As will presently appear, this member 60 controls the opening of the cover by disengaging the latch; it also drives the slide-operating member 40 and slide 30 which operate the switch. The driving member 60 has a central aperture of non-circular form which fits with a non-circular end portion on the handle shaft 52 so that the member 60 will rotate with the handle and shaft.

The axis of the handle shaft is located in the cover so as to be coaxial (when the cover is closed) with the axis of the pivot pin 42 upon which the slide-operating lever is mounted.

Between the control member and the inside of the cover is a coiled compression spring which is wound coaxially around the shaft 52 and has one end 55 extending outwardly therefrom to engage one side of the latch arm 72. The other end of the spring has an arm 56 which presses against an anchor pin 57 mounted in the cover.

The control member 60 has a foot 62 bent down from the plane thereof in position to lie within the notch 47 of the slide-operating lever 40. Thus, when the cover is shut, turning of the handle and its shaft rotate the control member and cause the slide-operating member 40 also to rotate.

Extending radially from the control member 60 is a finger 64 which is adapted when the switch is in open position to engage the side of the latch arm 72 opposite that which the spring end 55 engages. Such engagement however is insufficient to cause rotation of the latch member from the position into which it is normally biased by the end 55 of the spring 54.

From the foregoing it will be apparent that when the switch is in either the "on" positions shown in Fig. 1 or the "on" position of Fig. 3, the cover will remain latched closed because the slot 77 of the latch member will be engaged with the keeper 22. Upon pivotal movement of the manual operating lever 50 counterclockwise from the position in Fig. 1, the control member 60 will be rotated counter-clockwise also causing concomitant counter-clockwise rotation of the slide-operating lever 40 which in turn will cause rectilinear movement of the switch-operating slide 30 and movement of the switch to the "off" position. If the switch is of the resetting type and has been tripped, additional counter-clockwise movement of the handle 50, control member 60 and slide-operating member 40 from Fig. 3 will cause additional movement of the switch-operating slide 30 and switch lever 10 and will cause resetting of the switch,

This same counter-clockwise movement will cause the finger 64 to push the arm 72 of the latch clockwise to disengage the keeper 22. While the handle is held in that position with the latch disengaged from the keeper, the cover may be opened. Opening of the cover is otherwise unimpeded because the foot 62 of the control member may readily move out from the notch 47 of the slide-operating lever 40 by movement in a direction substantially perpendicular to the base plate 20. There is no other connection between the interlocking mechanism parts which are mounted on the cover and those parts of the mechanism mounted in the box.

In the event that the switch may have been moved to the closed-circuit position of Fig. 1 while the box was opened and the handle has remained in the open-circuit position (not shown), movement of the cover toward the box will cause the foot 62 of the control lever to strike against the cam surface 44 of that lever and will move the control member shaft and handle into position to correspond to the position of the switch, slide and control member. Such movement is independent of operation of the latch member to automatically latch the cover shut as it reaches fully closed position. Except for the unusual and emergency use of the screwdriver to operate the latch member 70, the cover may not now be opened until the operating lever has been moved to switch-open position and then beyond that position to the unlatching position or "cover-open" position, such additional movement in the "cover-open" position being necessary to cause the control finger 64 to move the latch 70 to cause disengagement of the jaw 77 from the keeper 22.

From the foregoing it will be observed that I have provided a new and simple form of interlocking mechanism for an electric switch box and its cover and operating mechanism. Many modifications within the scope of the invention will become apparent to those skilled in the art. Therefore, the invention is not limited to the specific form and embodiment herein illustrated and described.

What is claimed is:

1. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in said box movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover separate from said manual switch-operating means and biased to hold the cover closed in normal switch-operating positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position.

2. The combination as claimed in claim 1 having means to move the manual switch-operating means on the cover automatically into position corresponding to the position of the switch, as said cover is moved closed.

3. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising a supporting member fixedly positioned in said box, means on said supporting member movable to actuate said switch-operating member, an intermediate member supported in said box engaging with and moving said actuating means, manual switch-operating means carried by the cover engaging and disengaging said intermediate member when the cover is closed and opened respectively, latch means on the cover holding said cover closed, and means moving with said manual switch-operating means to cause said latch means to free the cover when moved into a certain position.

4. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch hav-

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ing an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in said box movable to actuate said switch-operating member, an intermediate member supported in said box engaging with and moving said actuating means, manual switch operating means carried by the cover engaging and disengaging said intermediate member when the cover is closed and opened respectively, latch means on the cover holding said cover closed, and means moving with said manual switch-operating means to cause said latch means to free the cover when moved into a certain position.

5. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in said box movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover, biasing means to move the latch means into latching engagement as the cover is closed whether the switch is open or closed, said biasing means and latch holding said cover closed in normal switch-operating positions of said manual switch-operating means but being freed by movement of said manual switch-operating means to a cover-releasing position.

6. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising a supporting member fixedly positioned in said box, means fixedly located in the box including a slidable member on said supporting member movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover biased to hold the cover closed in normal switch-operating positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position.

7. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in the box including a slidable member and a pivoted member connected therewith movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover biased to hold the cover closed in normal switch-operating positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position.

8. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in the box including a slidable member and a rotary member connected therewith movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said rotary member when said cover is closed and opened respectively, and latch means on the cover biased to hold the cover closed in normal switch-operating positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position.

9. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism

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nism interlocking said cover and switch comprising means fixedly located in the box including a slidable member and a rotary member connected therewith movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said rotary member when said cover is closed and opened respectively, and latch means on the cover biased toward cover-latching position, but freed by operation of said manually operable means into cover-unlocking position.

10. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in said box movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover biased to hold the cover closed in certain positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position, and means on said actuating means cooperating with said manually operable switch-operating means to cause the latter to move automatically as the cover is closed into position corresponding to the switch position.

11. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in said box movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover biased to hold the cover closed in certain positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position, and cam-means on said actuating means engageable by said manually operable switch-operating means to cause the latter to move automatically as the cover is closed into position corresponding to the switch position.

12. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising means fixedly located in said box movable to actuate said switch-operating member, manually operable switch-operating means carried by the cover engaging and disengaging said actuating means in the box when said cover is closed and opened respectively, and latch means on the cover biased to automatically latch the cover as it is shut in normal switch-operating positions of said manual switch-operating means but freed by movement of said manual switch-operating means to a cover-releasing position, said latch means being separate from said actuating means.

13. In combination with a box having a cover hinged thereon and a switch mounted therein, said switch having an operating member extending therefrom, mechanism interlocking said cover and switch comprising a mounting member affixed in the box, a member slidable on said mounting member and engaging with said switch-operating member to move the latter, a pivoted member on said mounting member and connected with said slidable member, a control member carried by the cover and engageable with and disengageable from said pivoted member when the cover is closed and opened respectively, a switch-operating handle carried by the cover for moving said pivoted member, latch means on the cover for holding it shut, said latch means being movable by said control member to unlatching position.

14. A device as claimed in claim 13 having cam means

on said pivoted member engageable with said control member to move it and the handle automatically into position corresponding to the switch position as the cover is closed.

15. A device as claimed in claim 14 having biasing means causing the cover to become latched automatically as it moves closed when the switch is in any normal switching position.

16. A device as claimed in claim 13 having biasing means causing the cover to become latched automatically as it moves closed when the switch is in any normal switching position.

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