

April 12, 1949.

H. J. HAMMERLY
ENCLOSED SAFETY SWITCH

2,467,307

Filed Oct. 30, 1946

3 Sheets-Sheet 1

Fig. 1

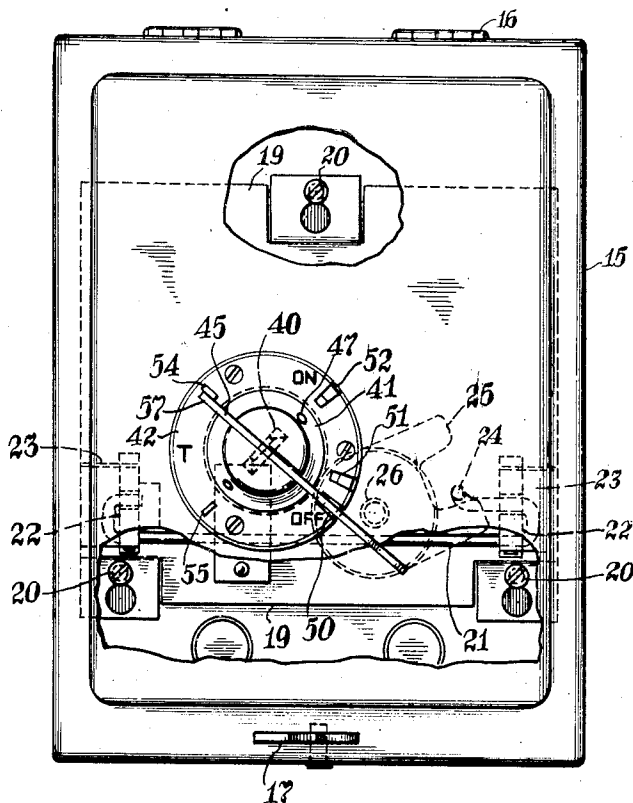
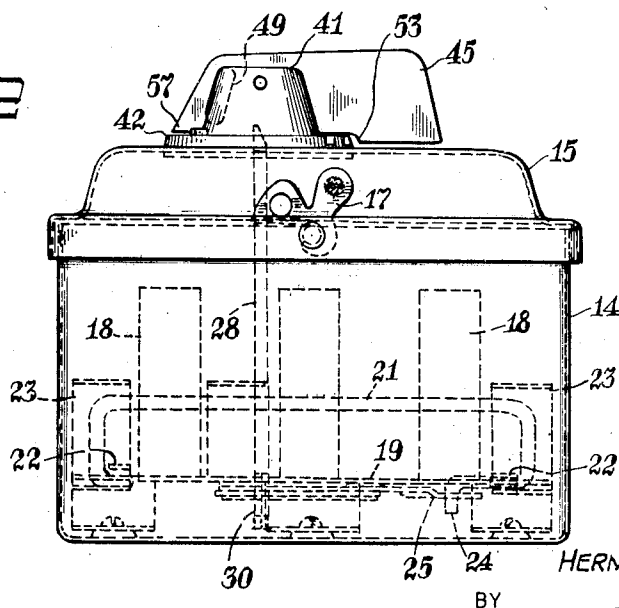


Fig. 2



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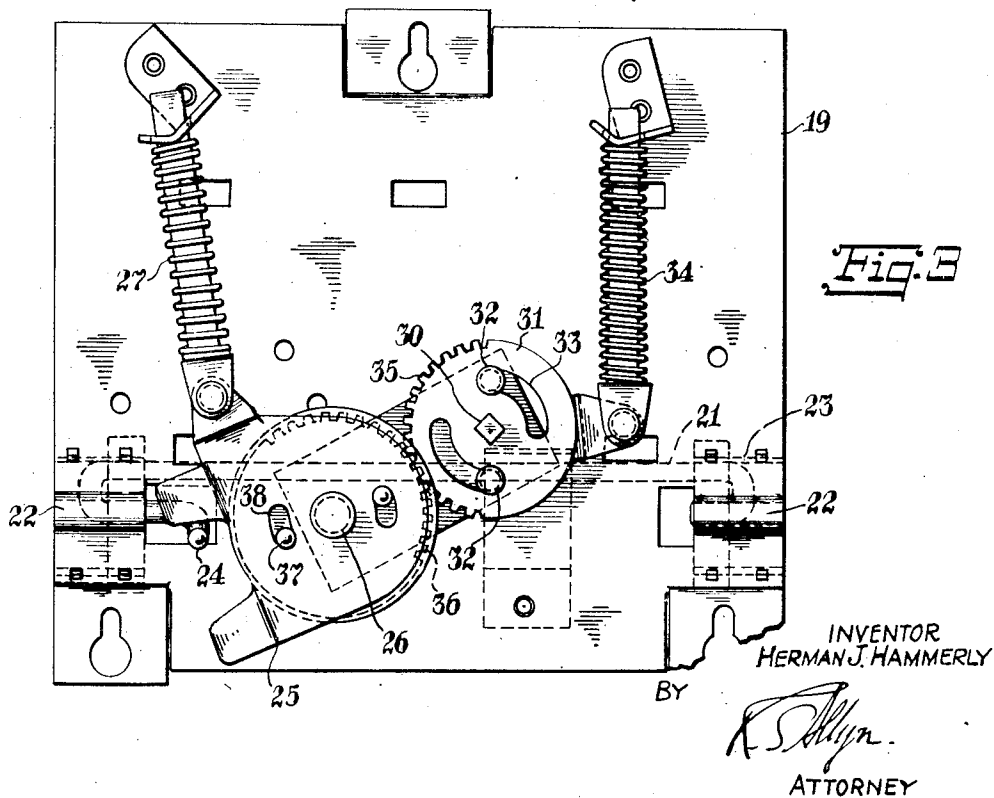
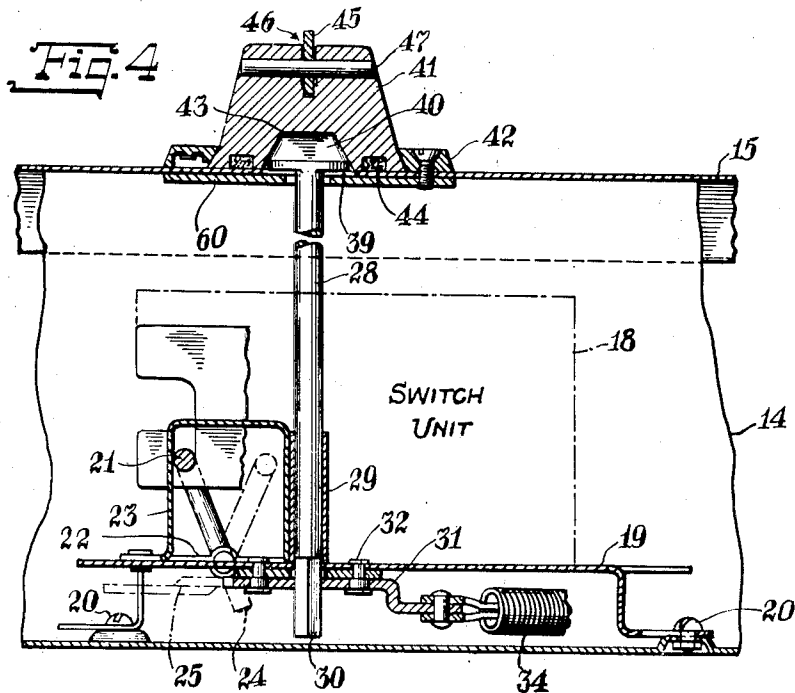
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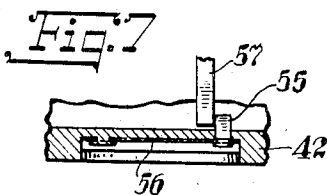
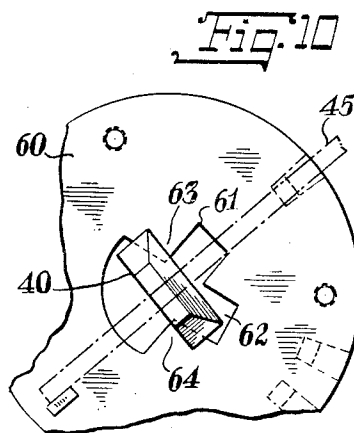
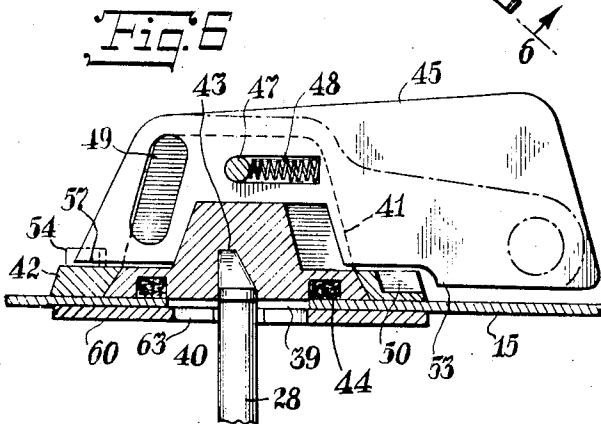
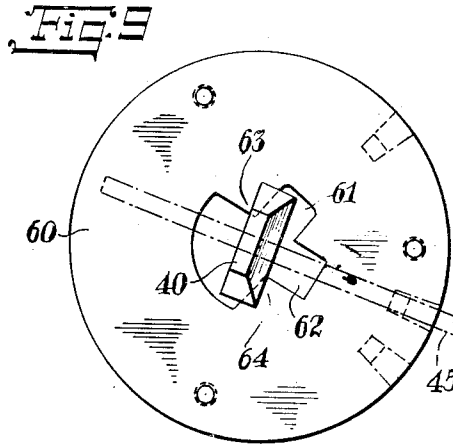
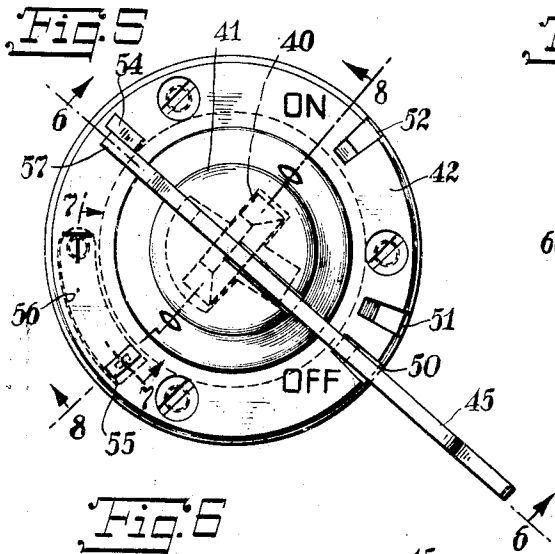
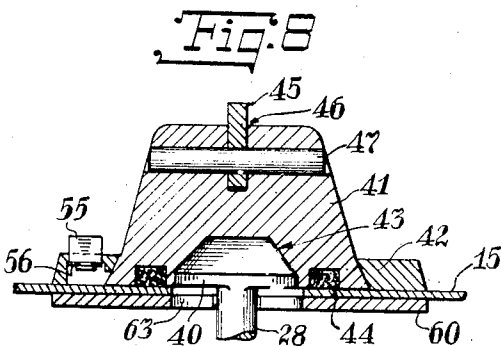
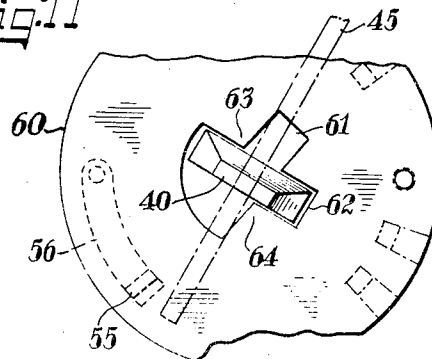


Fig. 11



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2,467,307

ENCLOSED SAFETY SWITCH

Herman John Hammerly, Plainville, Conn., assignor to The Trumbull Electric Manufacturing Company, Plainville, Conn., a corporation of Connecticut

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10 Claims. (Cl. 200—50)

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My invention relates particularly to what are called front operated enclosed switches provided with means for locking the switch mechanism per se either in the open circuit position or in the closed circuit position. It is also desirable to lock the cover in the open or closed circuit position.

One object of my invention is not only to lock the switch make and break mechanism in the closed circuit position and to lock the cover of the switch box when the circuit is closed but to enable an authorized inspector or other person to open the box while the circuit is either closed or open.

I also propose to provide for locking the switch mechanism in the open circuit position and to lock the cover by the use of the same handle member.

Furthermore I have sought to provide a front operated switch of the enclosed type having all the desirable locking and interlocking features of the switch parts and of the cover so as to provide a maximum of safety and simplicity of operation with facility of inspection and repair or replacement.

Another object is to provide a construction in which the switch per se and the cover itself can be locked by the same device such as a padlock or seal.

In carrying out the purposes of my invention, I take advantage of the fact that most switches especially of the snap action or quick make and break type have or may have some lost motion in the connection between the operating handle and the switching mechanism so that the actuating member of the switch in the box can be turned through a small angle without actuating the make and break mechanism.

Accordingly I provide the cover of the box with a rotatable handle on the outside and a locking member inside with which the actuating member of the switch in the box may be interlocked when the cover is closed so as to prevent opening the cover until the actuating member has been turned by the handle through a predetermined angle sufficiently to disengage the actuating member from the interlocking member. The outside of the cover is provided with a stop and means for locking the handle member in different positions, so that the switch may be locked either "on" or "off" and the cover may be locked or released by any one having the proper authority.

The accompanying drawings show one form of switch mechanism with the safety features involving one form of my invention.

Fig. 1 is a front view of an enclosed switch

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construction embodying my invention, parts being broken away to show the interior and parts shown dotted.

Fig. 2 is an end elevation of the same construction, showing interior parts in dotted outline.

Fig. 3 is a rear view of the make and break mechanism of the switch of Figs. 1 and 2.

Fig. 4 is a cross sectional view showing the interlock between the cover and the switch actuator.

Fig. 5 is a plan view showing the switch handle in the normal "off" position, the cover being free to open.

Fig. 6 is a vertical sectional view showing the switch handle and its mounting on the cover and the connection of the closed cover and the handle with the switch actuator, the section being taken on the plane of line 6—6 of Fig. 5.

Fig. 7 is a fragmentary sectional view showing the releasable stop, the section being taken on the plane of the line 7—7 of Fig. 5.

Fig. 8 is a sectional view similar to Fig. 6 but in which the section is taken on the plane of the line 8—8 of Fig. 5.

Figs. 9 and 10 and 11 are fragmentary views showing the way the actuator is interlocked with the cover member in the locked "off", the locked "on" and the unlocked "on" positions, respectively.

I have illustrated the invention as applied to a switch box 14 having a cover 15 hinged at 16 and a finger type catch 17. The type of switch unit 18 having stationary and movable contacts is immaterial to the invention. So also the specific form of make-and-break mechanism is immaterial. In the form shown, the switch units are carried by a base plate 19 which is secured by screws 20 to the bottom of the box. To move the movable members of the switch I have shown a crank shaft 21 having bearings 22 at the base plate 19 and provided with yokes 23 serving as limiting abutments for the crank shaft. The lower arm 24 of the crank shaft lies between the fork of the throwing member 25 pivoted at 26. A spring member 27 serves to turn the forked member 25 and the crank shaft from the positions shown in Fig. 1 to that of Fig. 3 and vice versa.

The actuating shaft 28 has a bearing in the sleeve 29 and an angular sectional lower end 30 which slides freely through the base plate 19 and is fitted to the lower actuator member 31. This latter member is guided and limited in its rotation by the stationary studs 32 which project into the arcuate slots 33 which extend around

approximately 90°. A spring member 34 presses the member 31 toward the position of Fig. 3 or in the opposite direction when the shaft member 30 is turned counter-clockwise as viewed in Fig. 3. The gear teeth 35 on member 31 mesh with the teeth of gear member 36 which is mounted on the same pivot as the throwing member 25 and has studs 37 which project into the arcuate slots 38 in member 25. Thus the spring member 34 augments the action of spring member 27 in turning the crank shaft 21 so as to open and close the circuit of the switch. The construction in which the make and break switch units 18, 18 are detachably mounted on the upper face of the raised base plate 19 and the snap action mechanism is mounted on the lower face of the base plate as shown in Figs. 3 and 4 is shown and claimed in my application Serial Number 663,685, filed April 20, 1946. The details of the switch mechanism per se however are immaterial to the instant invention which will now be described.

The actuator shaft 28 projects toward the cover of the box which has a passage 39 through which the T-shaped head 40 of the actuator shaft projects when the cover is closed. The head 40 is preferably tapered. The hub 41 of the operating handle is mounted on the cover of the box over the passage 39 and is rotatable within the ring 42 which is fixed to the cover. This hub has a socket 43 shaped to fit over the tapered head of the actuator when the cover is closed. The tapered shape of the head of the actuator and the corresponding tapered socket in the hub facilitate closing the cover. A packing ring 44 may be provided in the under side of the hub if desired. The arm 45 of the handle member is slidably mounted in a slot 46 in the hub and guided by a transverse pin 47 and preferably under pressure of a spring 48 tending to hold the arms in the position of Fig. 6. The end of the arm has an opening 49 to receive a padlock or sealing device when the arm is extended. Normally this opening is substantially closed by the wall of the hub, but I provide notches 50, 51 and 52 in the rim of the ring 42 into any one of which the shoulder or lug 53 of the arm may be inserted when it is desired to prevent rotation of the switch handle.

Stops 54 and 55 are provided which project upwardly from the ring 42 to limit the rotation of the handle arm. Stop 55 is mounted on the end of a spring 56 so that it may be depressed and moved out of the path of movement of the tip 57 of the handle arm when required.

On the inside of the cover is fixed a locking device 60 having slots 61 and 62 large enough to clear the head 40 of the actuator when in the positions of Figs. 5 and 11 respectively. Between these slots are lugs or shoulders 63 and 64 which serve to underlie the ends of the head of the actuator when the cover is closed and the actuator is turned to the positions of Figs. 9 and 10 respectively so as to prevent the opening of the cover.

From the foregoing it will be seen that when the cover is closed the switch is actuated by simply rotating the hub 41 by means of the handle arm 45 with the parts in the position of Fig. 5, the switch is "off" and the cover is free to be opened. This may be considered a neutral position. By sliding the handle arm 45 toward the left, the lug 53 will enter the notch 50 and a padlock or seal may be inserted into the opening 49 to lock the handle against turning. If it is desired to lock the cover closed it is merely neces-

sary to turn the handle anti-clockwise from a neutral position through a small angle and slide it across the hub until the lug 53 enters notch 51. This brings the head of the actuator into the position of Fig. 9 where it overlies the shoulders 63 and 64 of the locking member so that the cover cannot be opened. To hold the handle in this position, it must be padlocked or sealed as usual. It will be understood of course that there is sufficient play or lost motion in the parts to permit the rotation of the actuator through the angle mentioned without actuating the switch contact member.

To close the circuit the handle and hub are rotated anti-clockwise from the neutral position to the "on" position in the usual manner. This brings the head 40 of the actuator into the position of Fig. 10 where it overlies the lugs 63 and 64 of the locking member 60 and prevents opening the cover. In this position, the cover is locked closed even before the padlock or seal is applied. The handle arm may then be slid across the hub until the lug 53 enters notch 52, and a padlock or seal applied to prevent actuation of the switch.

To permit opening the cover while the switch is "on," it is merely necessary to unlock and release the handle arm 45, depress the stop 55 to clear the tip 57 and turn the handle and actuator so as to bring the head 40 into the position of Fig. 11 where the head is disengaged from the locking device. This required turning of the handle and actuator is so slight that it does not effect the switch contact parts. It should be understood that those over travel movements of the actuator in order to defeat the cover locking action may be arranged in any suitable manner as for instance by lost motion devices with or without springs such as herein shown or in any other manner.

I claim:

1. In an electric switch having a box with a cover and having switch mechanism with an actuating member in the box, an operating hub rotatably carried by the cover and having a rotatable connection with said actuating member when the cover is closed, a locking device carried by the cover and interlocked with the switch actuating member when the cover is closed and the operating hub has been rotated and has turned the actuating member to a closed circuit position, said actuating member being released from said locking device by rotating said hub from one closed circuit position without opening the circuit.

2. In a front operated electric switch having a box with a cover and having switch mechanism with an actuating member in the box, an operating hub rotatably carried by the cover and having a rotatable connection with said actuating member when the cover is closed, a locking device carried by the cover and interlocked with the switch actuating member when the cover is closed and the operating hub has been rotated and has turned the actuating member to a closed circuit position, a retractable latch for limiting the rotation of the hub, said actuating member being released from said locking device by rotating said hub from one closed circuit position when the latch is retracted and without opening the circuit.

3. A cover construction for an enclosed switch of the front operated type, having a switch actuating member, said construction comprising a cover for attachment to the box body of the switch, a hub rotatably mounted on the outer

face of the cover and having a socket adapted to receive a part of the switch actuating member when the cover is fitted to the box body, a handle movably mounted in said hub by which the hub may be rotated, means for locking the hub and handle against rotation and means carried by the inside of the cover for interlocking with the actuating member to prevent opening the cover.

4. A cover construction for an enclosed switch having a switch actuating member, said construction comprising a cover for attachment to the box body of the switch, a hub rotatably mounted on the outer face of the cover and having a socket adapted to receive a part of the switch actuating member when the cover is fitted to the box body, a handle movably mounted in said hub by which the hub may be rotated, means for locking the hub and handle against rotation, means carried by the inside of the cover for interlocking with the actuating member to prevent opening the cover and a stop for limiting the rotation of the handle and hub, said stop being retractable to permit a partial over-throw of the switch hub and handle.

5. The combination of a box having a cover and containing switch mechanism having an actuating member, a handle member rotatably carried by the cover and coupled with the actuating member when the cover is closed, a locking member carried by the cover interlocked with the actuating member to prevent opening the cover when the handle has been turned to close the circuit through the switch, means for locking the handle member against rotation when the switch is in the closed circuit position, and a retractable stop for the handle member to permit the actuating member to be disengaged from the locking member carried by the cover when the means for locking the handle member has been released.

6. A cover for an enclosed switch which has an actuator projecting toward the cover, said cover having a passage through which the actuator projects when the cover is closed, a locking device carried by the inside of the cover adjacent said passage with which the actuator interlocks in certain positions of the actuator when the cover is closed, a bearing ring fixed to the outside of the cover, a handle hub rotatably mounted on said ring on the outer face of the cover, said hub having a socket to receive the end of the actuator and an arm slidably mounted in the hub and means for locking the arm and hub against rotation in various positions of the switch.

7. A cover for an enclosed switch which has an actuator, with a head projecting toward the cover, said cover having a passage through which the actuator head projects when the cover is closed, a locking device carried by the inside of the cover adjacent said passage with which the actuator head interlocks in certain positions of the actuator when the cover is closed, a handle member rotatably carried by the outer face of the cover and consisting of a hub having a socket to receive the head of the actuator and an arm movably mounted in the hub and means for locking the handle member against rotation in positions corresponding with "off" and "on" positions of the switch.

8. A cover for an enclosed switch which has an actuator with a tapered head projecting toward the cover, said cover having a passage

through which the actuator head projects when the cover is closed, a locking device carried by the inside of the cover adjacent said passage with which the actuator head interlocks in a certain position of the actuator when the cover is closed, a handle member rotatably carried by the outer face of the cover and consisting of a hub having a tapered socket to receive the head of the actuator and an arm movably mounted in the hub and means for locking the handle member against rotation in a position corresponding with an "on" position of the switch.

9. An enclosed switch comprising a box body having a cover, circuit making and breaking mechanism mounted in the box and having an actuating shaft extending toward the cover when the cover is closed, said shaft having a head extending transversely of the axis of the shaft, a rotatable handle having a hub carried by the cover and having a socket extending transversely of the axis of said shaft and adapted to fit over the head of said shaft when the cover is closed, a locking member at the underside of the cover having an opening shaped to allow the head of the shaft to pass through when the handle is in one position, said opening having an eccentric shoulder which interlocks with the head of said shaft to prevent opening the cover when the switch handle has been turned to another position and a ring carried by the outside of the cover, said handle having a movable arm adapted to be interlocked with said ring to prevent rotation of said handle.

10. An enclosed switch comprising a box body having a cover, circuit making and breaking mechanism mounted in the box and having an actuating shaft extending toward the cover when the cover is closed, said shaft having a head extending transversely of the axis of the shaft, a rotatable handle having a hub carried by the cover and having a socket extending transversely of the axis of said shaft and adapted to fit over the head of said shaft when the cover is closed, a locking member at the underside of the cover having an opening shaped to allow the head of the shaft to pass through when the handle is in one position, said opening having an eccentric shoulder which interlocks with the head of said shaft to prevent opening the cover when the switch handle has been turned to another position, said handle having a bolt member movable transversely of the axis of the shaft and said cover having two spaced locking abutments for receiving said bolt, one of said abutments preventing rotation of the handle from one position and the other abutment for coacting with said bolt to prevent said handle from being rotated when the head of the shaft is interlocked with said eccentric shoulder to prevent opening the cover.

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