July 9, 1935. H. M. BROADWELL 2,007,634

ELECTRIC SWITCH

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Fig. 1.

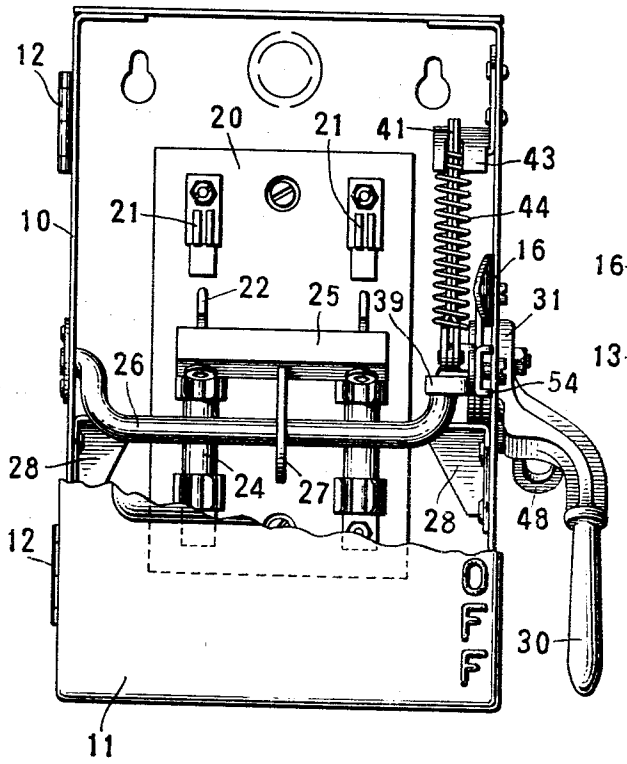


Fig. 2.

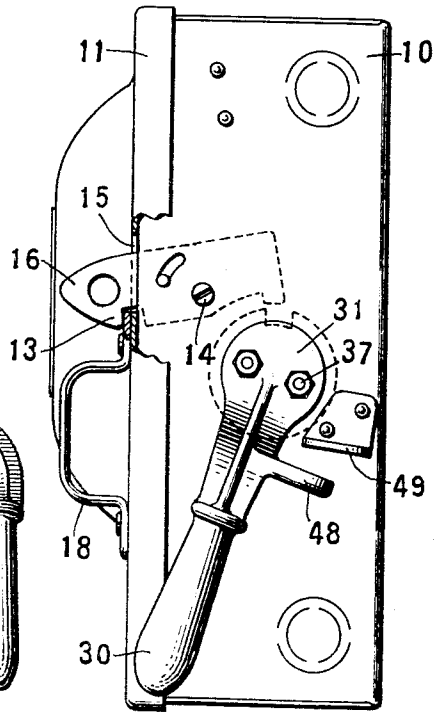


Fig. 3.

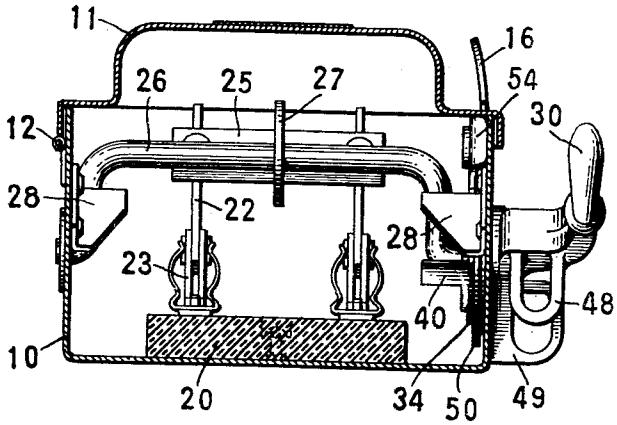
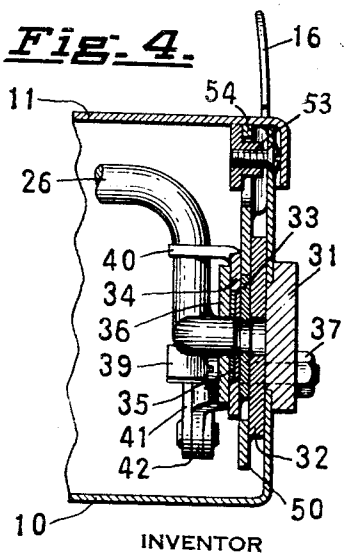


Fig. 4.



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Fig. 5.

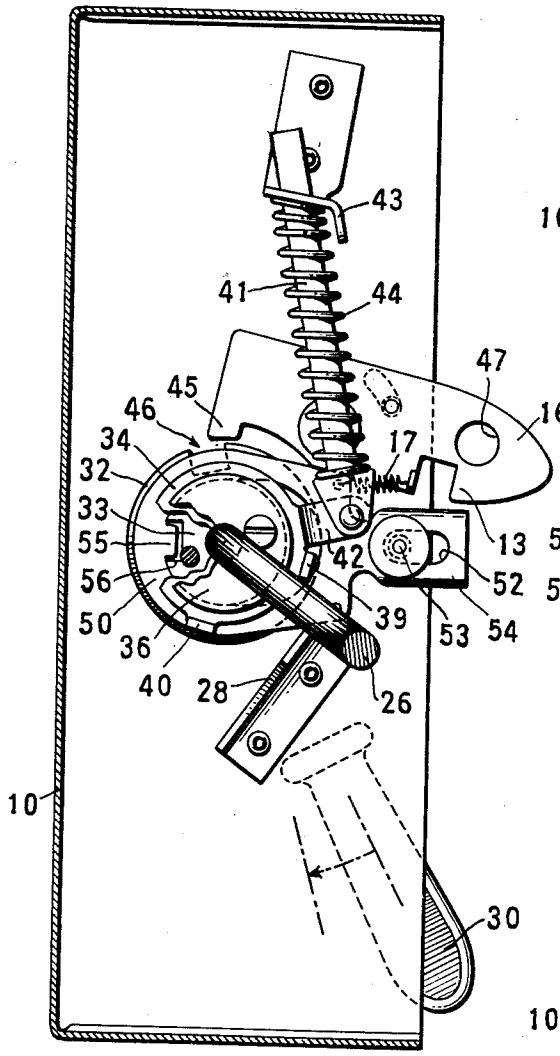


Fig. 6.

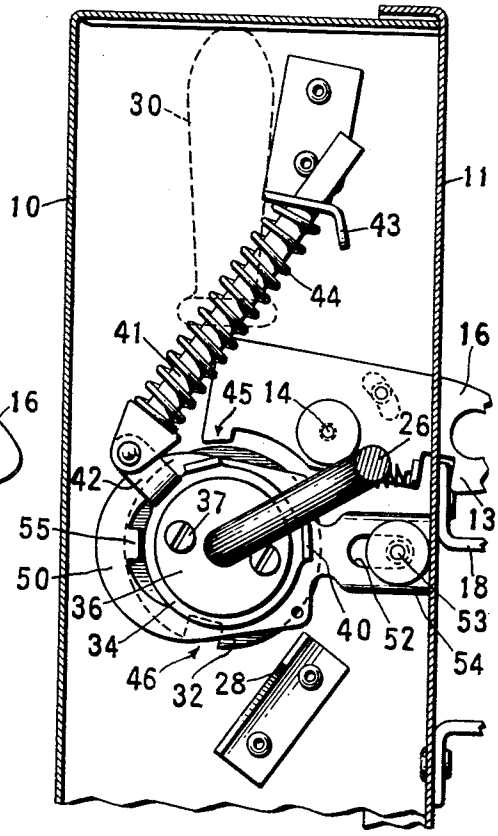


Fig. 7.

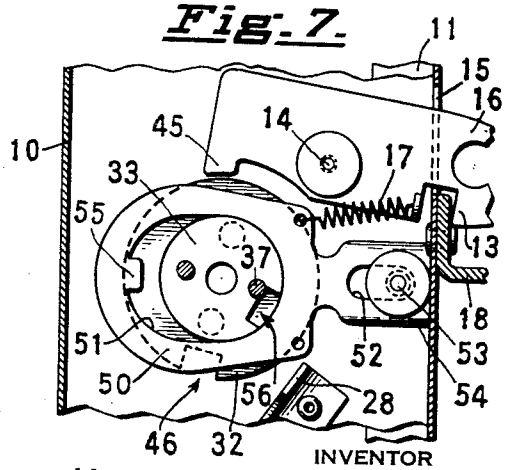
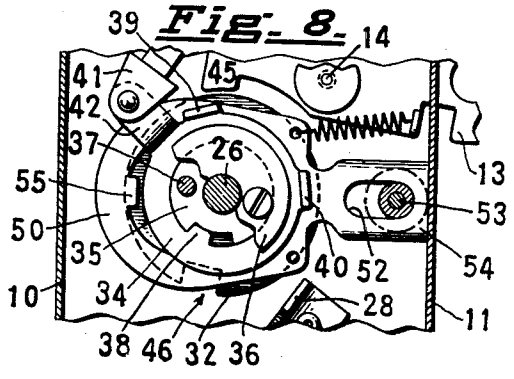


Fig. 8.



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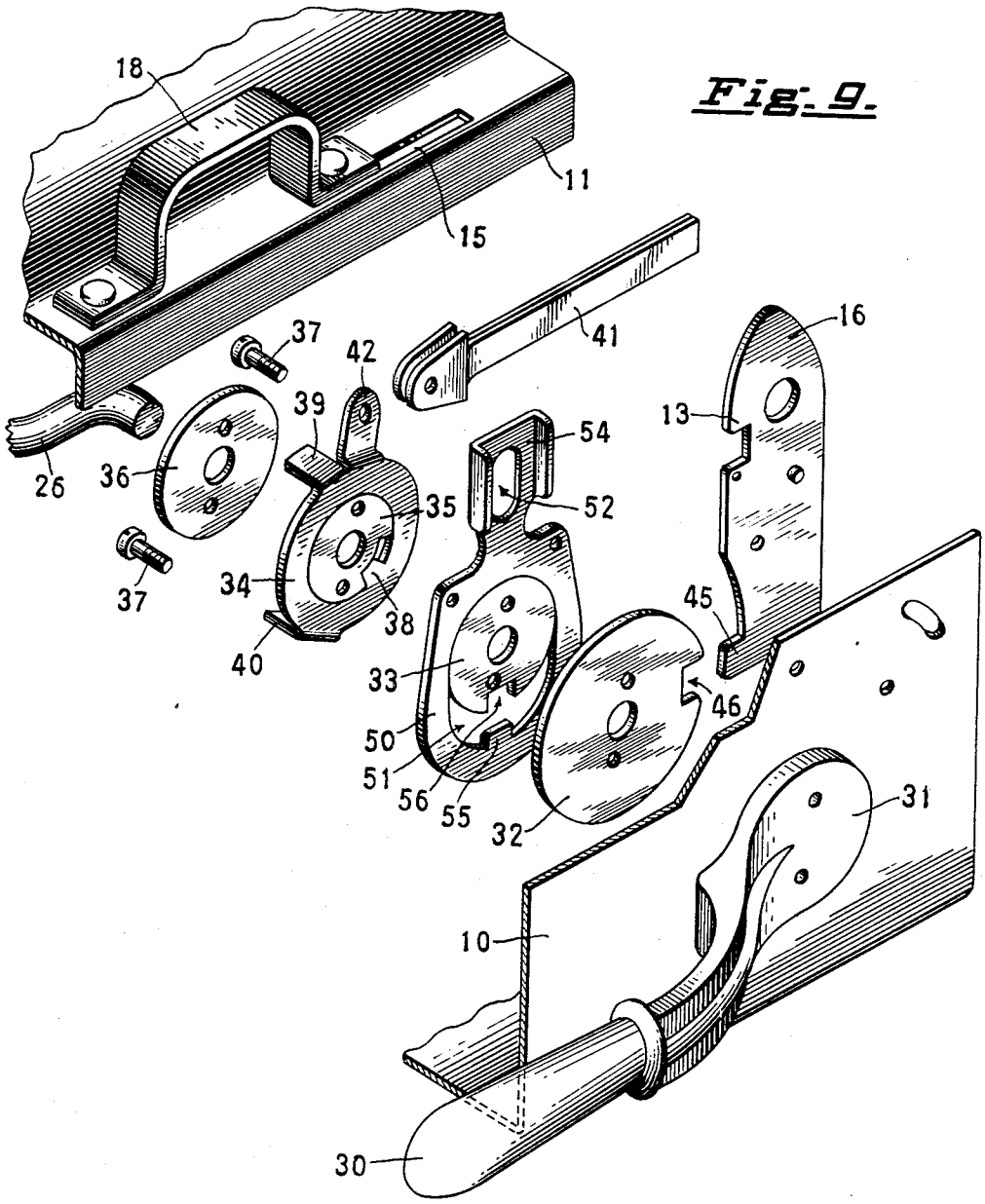
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Fig. 9.



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ELECTRIC SWITCH

Harry M. Broadwell, Plainville, Conn., assignor to The Trumbull Electric Manufacturing Company, Plainville, Conn., a corporation of Connecticut

Application January 6, 1934, Serial No. 705,485

8 Claims. (Cl. 200—50)

My invention relates particularly to switches of the enclosed or safety type in which provision is made to prevent the opening of the cover when the switch is closed and to normally prevent the closing of the circuit when the cover is open.

It is also desirable that provision be made for the testing of the switch when the cover is open.

In some types of switches it is customary to employ a simple form of latch for normally holding the cover closed but which can be retracted manually when it is desired to open the cover.

I have sought to obtain the advantages of simplicity of construction and certainty of action in the various interlocking features. I have especially sought to provide a construction which combines the advantages of manually actuated latches and automatically actuated interlocks.

Another object of my invention is to provide a simple but rugged type of mechanism which is not likely to be injured even by the roughest kind of handling.

Another object is to provide latching and interlocking mechanism, all the parts of which can be readily formed out of sheet metal stampings.

Another object is to provide a construction of the foregoing character which can be readily applied to quick make and break switches.

Another object is to provide a type of construction which will not jam or stick or require adjustment under any circumstances.

In carrying out the invention in its preferred form I provide a latch which is pivoted inside the casing or box and coacts with the hub of the actuating mechanism and with the cover so that it is necessary to completely close and latch the cover before the switch can be closed and so that the cover cannot be closed if the switch has been previously closed. The outer end of this latch projects through a slot in the cover when the cover is closed adjacent a finger grip or handle on the cover. Inside the box I provide a spring pressed slide which coacts with the hub of the actuating handle to prevent the closing of the switch when the cover is open. This slide has one end which tends to project beyond the edge of the box so that it can be actuated manually to release the actuating mechanism even if the cover is open.

This projection on the outer end of the slide stands in the path of movement of the cover so that the slide is retracted from the actuating mechanism automatically by the engagement of the cover when the cover is closed. When the switch is closed and the cover is closed the cover cannot be opened because it is held by the latch and the coaction of the hub of the actuating handle with this latch.

Fig. 1 is a front view of a construction embodying one form of the improvements of my invention, part of the cover being broken away and parts of the switch being shown in the open circuit or off position.

Fig. 2 is a side view of the same showing more of the cover.

Fig. 3 is a transverse sectional view showing the same parts in the open circuit position.

Fig. 4 is an enlarged sectional view of the latch and interlocking parts in the on position of the switch.

Fig. 5 is a longitudinal sectional view of the box showing the latch and interlocking mechanism in the open circuit or off position, the cover being removed.

Fig. 6 is a similar partial section showing the cover in place and the parts of the switch in the closed circuit or on position.

Fig. 7 is a fragmentary sectional view showing the latch and interlocking slide in the position they occupy when the cover is closed. This also shows a member of the actuating hub in the position which it occupies when the circuit is closed.

Fig. 8 is a view similar to Fig. 7 showing parts of the snap action or quick make and break mechanism.

Fig. 9 is an exploded perspective view of the interlocking and latching parts.

The box 10 and cover 11 may be of any suitable construction and in the form shown are connected together by hinges 12, which in the normal position of the switch permit the opening of the cover by swinging about a vertical axis.

The latch 13 is hinged at 14 and its outer end 16 extends through the slot 15 in one edge of the cover. The spring 17 tends to move the latch toward the latching position. A finger piece or handle 18 is secured to the edge of the cover adjacent the tip of the latch to facilitate opening and closing the cover. One end of this grip piece may serve as a part of an abutment for the outer hooked end of the latch as shown in Figs. 6 and 7.

The actual conducting parts of the switch may be of any suitable form and mounted in any suitable manner as for instance upon an insulating base 20 secured in the bottom of the box. Any number of suitable stationary contacts 21 may be employed.

In the form shown the movable switch member 22 is in the form of a blade of conventional type hinged to a post 23. Circuit protective devices

such as a cartridge type fuse 24 may or may not be employed as desired so far as the present invention is concerned although switches of this character usually employ some form of fuse or relay.

In the form shown there are two movable switch blades connected by an insulating cross bar 25 for simultaneous operation.

The switch actuating mechanism may be of any suitable type and in the form shown preferably embodies a crank shaft 26 which is connected to the cross bar 25 by a hook or link 27. When the switch is closed the stationary contacts or associated parts receive the impact of the movable switch members. Stationary abutments 28 may also be provided to receive the impact of the crank shaft 26 in opening the circuit.

A handle 30 of any suitable type is mounted outside of the box and has a hub portion 31 which with the disc-like members 32, 33, 35 and 36 constitutes the hub of the actuating mechanism, the parts of which are held together by one or more bolts or rivets 37. One end of the crank shaft 26 is supported in this hub as shown in Fig. 4. The hub members are secured rigidly together so that they rotate together as the handle 30 is oscillated.

The member 34 is in the form of a ring which lies between the discs 33 and 36 and has a lost motion connection with the member 35 consisting of a lug 38 which projects into an elongated cutout in the periphery of the disc 35 as shown in Fig. 8.

The ring 34 has a lost motion connection with the crank shaft 26 which is provided by the lugs 39 and 40 which project on opposite sides of one arm of the crank shaft.

A rod 41 has one end hinged to the projecting arm 42 of the ring 34 and the other end guided by a forked bracket 43 secured to the inside of the box. A spring 44 on the rod 41 tends to actuate the crank shaft 26 and the connected movable switch members with a quick make and break or snap action in the usual manner when started by the swinging of the actuating handle.

The latch member 13 has a projecting finger 45 which projects close to the periphery of the disc 32 of the hub member, and this disc has a notch 46 at one point in its periphery, so that the latch 13 cannot be actuated except when the notch 46 is in line with the projecting finger 45. This is arranged so that the latch cannot be operated except when the switch is in the open circuit position. In other words the cover can be neither opened nor closed when the switch is in the closed circuit position.

The outer end of the latch member 13 may be provided with an opening 47 to facilitate sealing or padlocking the latch 13 so as to prevent the opening of the box.

Means may be provided for locking the actuating handle 30 in the open circuit position as is frequently done in switches of this character. Such means may consist of a projection 48 on the handle member adapted to be chained or padlocked to the projection 49 on the box.

The interlocking mechanism includes a slide 50 which has an elongated opening 51 to accommodate the washer or disc member 33. The other end of this slide has a slot 52 which is guided on a pin or stub 53 adjacent the open edge of the box. The end 54 stands in line with the inner edge of the cover and is normally projected outwardly by the spring 17 when the cover is open as shown in Fig. 5.

When the cover is closed the inside edge of the cover adjacent its flange strikes the outer end 54 of the slide and forces it inwardly into the position shown in Figs. 6, 7 and 8. This slide 50 is provided with a lug 55 which interlocks with the notch 56 in the disc 33 when the switch is open as shown in Fig. 5. This locks the actuating handle and attached parts and normally prevents the closing of the switch. For testing purposes, however, it is merely necessary to press inwardly with the thumb or finger on the outer end of the part 54 of the slide to release the slide and permit the switch to be actuated.

Similarly the switch is released by the mere closing of the cover. The closing movement of the cover strikes the outer end of the latch 13 and raises it so that it automatically engages the cover to hold it closed. The latch and the hub member 32 are so constructed that the latch will not yield sufficiently to permit the closing of the cover unless the hub of the actuating mechanism has been moved to the fully off or open circuit position.

With the parts in the position shown in Fig. 5 it would be impossible to close the cover or to operate the switch. The cover could not be closed because of the position of the latch member 13 and the latch member cannot move because the edge of the disc 32 stands in the path of movement of the projecting finger 45. By moving the operating handle 30 in the direction of the arrow the disc 32 will be rotated to bring the notch 46 into line with the projecting finger 45 so that when the cover is closed it will tilt the latch 13 about its pivotal axis sufficiently to allow the hook portion 16 to slip through the opening 15.

The interlocking of the finger 45 in the notch 46 then prevents the actuation of the switch until the latch is tilted to the position shown in Fig. 7 which releases the disc 32 and permits the actuation of the handle and switch mechanism.

With the slide 50 in the position shown in Fig. 5 the switch cannot be actuated because of the interlock of the lug 55 in the notch 56. This interlock is released by pressing inwardly on the end 54 of the slide either with the finger or by closing the cover. When the cover is closed the switch can be actuated to open or close the circuit without interference by the interlocking mechanism but when the cover and switch are both closed the cover cannot be opened because the finger 45 of the latch is prevented from movement by the periphery of the disc 32.

The mechanism will thus be seen to be simple in form and capable of embodiment in a rugged construction which can be readily operated in a proper manner and yet cannot be damaged or become jammed in ordinary use.

It will also be readily apparent that the latching of the cover is accomplished in an unusually strong and dependable manner by means of the hook portion of the latch member 13 which projects so as to directly engage a rigid outside portion of the cover 11 and, by reason of its correlation to the disc member 22 of the switch crank hub, is positively secured in locked position when the switch is in the closed position.

It is also obvious that the latch itself is visible and manually operable which is not only structurally important but is a great convenience to the operator.

I claim:

1. A safety switch including a box having a hinged cover, a latch hinged in the box and having a hook portion adapted to engage the outside

of the cover when the cover is closed and having a projecting portion for manual engagement to release the latch, snap action mechanism mounted within the box and including a hub having a disc, a slide mounted on said disc and having a portion projecting toward the cover for engagement thereby when the cover is closed, said slide and said disc having parts adapted to interlock when the cover is open so as to prevent rotation of the hub, spring means for projecting the slide when the cover is opened, said hub including a second disc having means adapted to interlock with the latch to prevent opening the cover when the switch is closed, said slide being manually retractable to permit actuation of the switch when the cover is open.

2. In an enclosed switch construction a box having a hinged cover, a latch hinged inside of the box and having a projecting hook portion for engaging the outer surface of the cover when the cover is closed, and having an external finger tip for manual operation of the latch, switch actuating means including an external handle, manually operable spring pressed means for normally locking the switch and actuating means in the open circuit position when the cover is open, said locking means having a projecting part adapted to be manually engaged for releasing the locking means when the cover is open and means for directly engaging and positively holding said latch in its latched position to hold the cover closed when the switch is in the closed position.

3. A safety switch including a box having a hinged cover with a slot therein, a latch hinged in the box and having a hook portion adapted to project through said slot and engage the outer surface of the cover when the cover is closed, switch actuating means including a hub having a disc, a slide embracing a part of the hub, said slide and hub having parts which interlock to normally prevent movement of the actuating means when the cover is open.

4. A safety switch including a box having a hinged cover with a slot therein, a latch hinged in the box and having a hook portion adapted to project through said slot and engage the outer surface of the cover when the cover is closed, switch actuating means including a hub having a disc, a slide embracing a part of the hub, said slide and hub having parts which interlock to normally prevent movement of the actuating means when the cover is open, the said disc and said latch having interlocking engagement to prevent the cover releasing movement of said latch when the switch is in the closed position.

5. A safety switch including a box having a hinged cover, a movable latch carried by the box and having a hook portion for engaging the cover to hold said cover closed and having a portion projecting through the cover to permit manual release, switch actuating mechanism having means coacting with the latch to prevent opening or closing the cover when the switch is on and a slide coacting with the actuating mechanism to normally prevent actuation of the switch when the cover is open, said slide having a portion extending beyond the edge of the box when the cover is open to permit manual engagement for releasing the slide to permit operation of the switch.

6. A safety switch including a box having a hinged cover, a latch movably mounted on a wall of the box and having a hook portion for engaging the cover to hold said cover closed, switch actuating mechanism in the box and having means coacting with the latch to prevent movement of the latch when the switch is closed, a slide coacting with the actuating mechanism to normally prevent actuation of the switch when the cover is open and a spring connecting the latch and the slide to bias the latch toward a latching position and to bias the slide toward a locking position, said latch having a portion projecting outside of the box when the cover is closed so as to permit manual release of the latch from the cover when the switch is open.

7. A safety switch including a box having a movable cover, an actuating handle having a hub and said hub including three discs, a latch movably mounted in the box and having a hook for holding the cover closed when the switch is closed, one of said discs preventing the release of the latch when the switch is closed, a slide coacting with another of said discs to prevent closing the switch when the cover is open and said cover serving to disengage the slide from its disc when the cover is closed and switch operating means having a lost motion connection with the third disc.

8. A safety switch including a box having a cover, an actuating hub having a notched disc, an external operating handle connected to said hub, a spring pressed latch having one end coacting with said disc to prevent movement of the latch when the switch is closed and the handle is in one position and also to prevent movement of the latch when the switch is off and the handle is in another position, said latch having a hook engaging the cover to keep it closed when the switch is closed and having a projecting finger piece to permit digital release of the latch when the switch is open, said hub having a second disc and a spring pressed slide coacting with said second disc and with the cover so that the slide interlocks with the second disc when the cover is opened and is retracted by the closing of the cover.

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