April 11, 1939. W. H. FRANK ET AL 2,154,236

SWITCH

Original Filed March 7, 1936 2 Sheets-Sheet 1

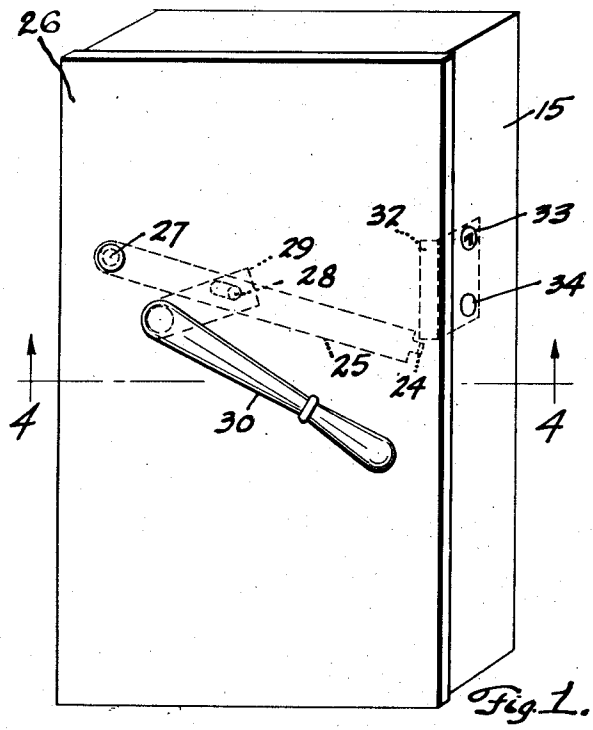


Fig. 1.

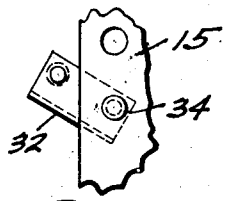


Fig. 5.

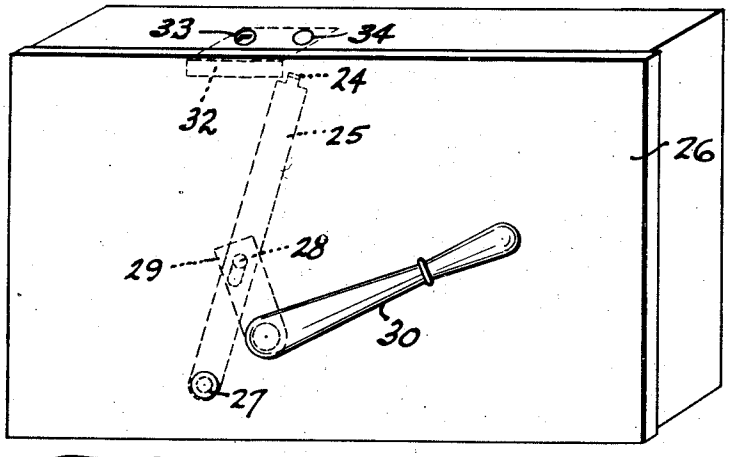


Fig. 6.

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SWITCH

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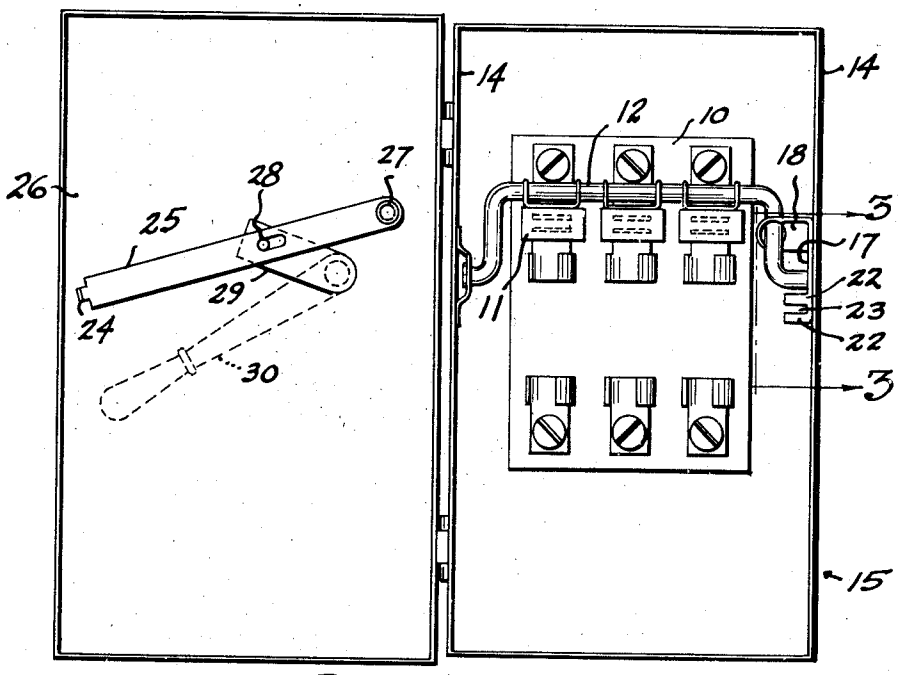


Fig. 2.

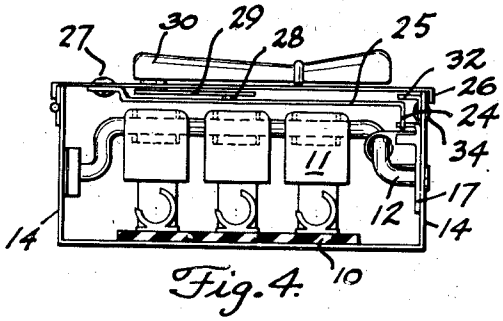


Fig. 4.

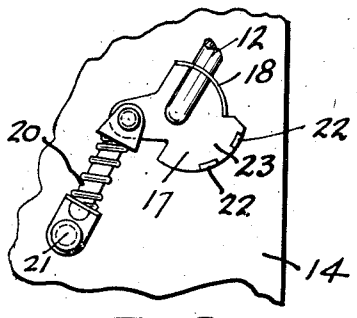


Fig. 3.

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UNITED STATES PATENT OFFICE

2,154,236

SWITCH

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Detroit, Mich.

Application March 7, 1936, Serial No. 67,740
Renewed April 9, 1938

11 Claims. (Cl. 200—50)

This application relates to quick operating switches of the safety type.

In the switch herein disclosed, the switch operating handle is on the front of the switch, and the invention particularly aims to provide a front-operated switch more simple and economical of manufacture than front operated switches heretofore contemplated.

The switch herein disclosed has a mechanism which gives the operating handle a mechanical advantage over the operated parts of the switch, and further has certain desirable interlocks, one of which operates to prevent closing of the switch cover unless the switch handle and operating parts be in proper position, and another of which operates to prevent opening of the switch box when the switch is in "On" position. In addition, a means is provided to disable the last mentioned interlock so that qualified persons may open the switch cover for inspection of the switch under load even though the switch be closed.

Still further objects of the invention will presently be understood upon reference to the appended drawings disclosing the switch. In these drawings,

Fig. 1 is a front view of the switch with the cover closed and with the operating parts carried by the cover shown in full and in dotted lines as proper;

Fig. 2 shows the switch with the cover swung open, and with the switch parts in switch "Off" position;

Figs. 3 and 4 are sections as if on lines 3—3 and 4—4 of Figs. 2 and 1 respectively.

Fig. 5 is a side view of the switch box with an interlocking plate swung out;

Fig. 6 shows a modification.

Referring to the drawings, it will be seen that the switch herein disclosed comprises a stationary contact base 10 towards and away from which may be reciprocated movable contact heads 11 for switch closing and switch opening. The reciprocation of the heads is accomplished by means of a cross bar 12 pivotally mounted at its ends or hubs in sides 14 of the switch box 15. The hub end of the cross bar which journals the cross bar on the box provides a journal for an operating plate 17 which has a slotted lug 18 bent up therefrom and through which passes a portion of the cross bar to provide a positive lost motion connection between the plate and the cross bar. The plate is provided with a snap action over-center compression spring 20 which is pivotally anchored at 21 to the side of the box.

The plate also has lugs 22 bent therefrom to define between them a slot 23 into which is adapted to be projected the end lug 24 of the operating bar 25 pivotally mounted on the cover 26 at 27 and connected by a pin and slot connection 28 to a crank 29 journalled on the cover 26 of the switch and fixedly connected to the handle 30 in front of the cover. The relative length of the handle, the crank, and the operating bar provides the handle with a mechanical advantage over the operating bar.

When the cover 26 is swung shut, the lug is disposed in the slot 23 between the lugs 22 of the plate 17 and movement of the handle 30 about its pivot 27 causes the plate 17 to rotate about the hub of the cross bar 12 and consequently causes the cross bar to swing on its hubs or journals and reciprocate the movable contact heads 11 towards or away from the stationary contact base 10.

In order to insure against closing of the cover except when the end lug 24 carried thereby is in proper position to be received within the slot 23 between the lugs 22 of the operating plate 17, the latter then being in switch open position, there is secured to the side of the box a plate 32 which is disposed in the path of movement of the lug 24 but which terminates short of the extreme end of such path representing the proper position for the lug 24 for cover closing. When the lug 24 of the cover is in proper position for cover closing, the lug will clear the plate 32 carried by the side of the box. On the other hand, if the cover lug 24 is not in proper position, it will engage the plate 32 and prevent cover closing.

The plate 32 also functions to insure the handle 30 against being in improper position when the door 26 is being swung closed, for the position of the handle is controlled by and controls the position of the operating bar 25. The influence of gravity tends to pull the handle down and consequently tends to pull down the operating bar, so that these are in proper position for door closing. If something prevents gravity from keeping parts 30—25 down, and they are up, then there is necessarily a maladjustment of the parts and this is detected by the operator's inability to close the door, due to the interference presented by plate 32. No effort is required to place the handle in operative relation to the cam 17 other than door closing and no operation other than door closing is required to establish the switch in its operative condition.

When the cover is closed and the handle has been moved to close the switch, the end of the handle operating bar 25 disposes itself behind the plate 32 carried by the box side, and the engagement of such bar end with such plate prevents the cover from being opened until the bar 25, and with it, the switch parts, the handle, etc., are moved back to switch open position. This feature provides the interlock which prevents opening of the switch box with the switch in "On" position.

In order to disable such interlock, it is neces-

sary merely to loosen the screw 33 which holds such plate in place and this screw is fashioned to be accessible to the outside of the box and is equipped with a head of special shape so as to be manipulable only by those equipped with wrenches of complementary shape. When such screw is loosened and removed, the plate 32 mounted on the box side may be swung on the rivet 34 which secures it to the box side to permit the cover to be opened even though the switch itself is in closed position, it being observed that on opening of the cover under such circumstances the end of the operating bar 25 of the cover will swing the plate 32 on its rivet 34 towards the open side of the box and cause it to clear the path of the operating bar. Under such circumstances the cover may be swung open and the operating bar 25 free itself of the plate 32 without causing movement of the operating bar 25, the operating plate 17, or consequent switch opening.

In the modification of Fig. 6, the switch handle 30 is shown as connected to the operating bar 25 so that its end is movable in a line parallel to the cross bar 12, rather than across the cross bar 12. If this switch be mounted as is the switch of Fig. 1, the handle 30 will depend from its pivot and be in the nature of a pendulum handle.

Now having described the switch herein disclosed, reference should be had to the claims which follow for a determination of the monoply sought to be covered herein.

We claim:

1. A switch comprising a switch box having a back and an open front, a swing door or cover therefor, a stationary contact on the back of the box and mounted to project forwardly, a movable insulation structure slidably mounted thereon and containing a contact and arranged to slide thereon towards and away from the box back for switching, a transversely extending bail operatively connected to the structure and mounted in the sides of the box, a handle movably mounted on the front of the cover and actuating means on the back of the cover connected to the handle through the cover and arranged to move in a path whose plane is parallel to the front of the box to establish a releasable operative connection between itself and the bail when the box cover is swung shut and the handle moved towards the switch closed position.

2. A switch comprising a switch box having a back and an open front, a swing door or cover therefor, a stationary contact on the back of the box and mounted to project forwardly, a movable insulation structure slidably mounted thereon and containing a contact and arranged to slide thereon towards and away from the box back for switching, a transversely extending bail operatively connected to the structure and mounted in the sides of the box, a handle movably mounted on the front of the cover and actuating means on the back of the cover connected to the handle through the cover and arranged to move in a path whose plane is parallel to the front of the box to establish a releasable operative connection between itself and the bail when the box cover is swung shut and the handle moved towards the switch closed position, the actuating means and handle being so constructed and arranged that the operative connection aforesaid is established automatically by the mere closing of the door and without further adjustment of the parts, provided the handle and the actuating means and the operating means are in proper position for this prior to cover closing, and interlock means for preventing closing of the door unless the handle and the actuating means and the operating means are in such proper position, the handle and the actuating means being so constructed and arranged that their weight tends to cause them to be in such proper position when the door is open.

3. A switch comprising a switch box having a back and an open front, a swing door or cover therefor, a stationary contact on the back of the box and mounted to project forwardly, a movable insulation structure slidably mounted thereon and containing a contact and arranged to slide thereon towards and away from the box back for switching, a transversely extending bail operatively connected to the structure and mounted in the sides of the box, a handle movably mounted on the front of the cover and actuating means on the back of the cover connected to the handle through the cover and arranged to move in a path whose plane is parallel to the front of the box to establish a releasable operative connection between itself and the bail when the box cover is swung shut and the handle moved towards the switch closed position, the actuating means and handle being so constructed and arranged that the operative connection aforesaid is established automatically by the mere closing of the door and without further adjustment of the parts, provided the handle and the actuating means and the operating means are in proper position for this prior to cover closing, and interlock means for preventing closing of the door unless the handle and the actuating means and the operating means are in such proper position.

4. A switch comprising a switch box having a back and an open front, a swing door or cover therefor, a stationary contact on the back of the box and mounted to project forwardly, a movable insulation structure slidably mounted thereon and containing a contact and arranged to slide thereon towards and away from the box back for switching, a transversely extending bail operatively connected to the structure and mounted in the sides of the box, a handle movably mounted on the front of the cover and actuating means on the back of the cover connected to the handle through the cover and arranged to move in a path whose plane is parallel to the front of the box to establish a releasable operative connection between itself and the bail when the box cover is swung shut and the handle moved towards the switch closed position, the actuating means and handle being so constructed and arranged that the operative connection aforesaid is established automatically by the mere closing of the door and without further adjustment of the parts, provided the handle and the actuating means and the operating means are in proper position for this prior to cover closing, and interlock means for preventing opening or closing of the door unless the handle and the actuating means and the operating means are in such proper position, and externally accessible means for disabling the interlock to permit the door to be opened without requiring the operating means to be disturbed.

5. In a switch, a box having a front cover and a side, an element within the box pivotally mounted on a side at a point remote from the front and on an axis parallel to the front cover, to rotate in a path parallel to the side, a handle outside the box on the front cover and mounted

to move in a path parallel to the front cover, and means within the box on the back surface of the front cover movable along the cover and releasably engaging the element and permanently connected to the handle and operatively and releasably connecting the handle and the element and constructed to transform movement of the handle along the cover into rotation of the element on its axis and in a path parallel to the box side.

6. In a switch, a box having a front cover and a side, an element within the box pivotally mounted on a side at a point remote from the front and on an axis parallel to the front cover, to rotate in a path parallel to the side, a handle outside the box on the front cover and mounted to move in a path parallel to the front cover, and means within the box on the back surface of the front cover movable along the cover and releasably engaging the element and permanently connected to the handle and operatively and releasably connecting the handle and the element and constructed to transform movement of the handle along the cover into rotation of the element on its axis and in a path parallel to the box side, and a switch part within the box mounted to move in a straight line path parallel to the box side and operatively connected to the element in such a manner that rotary motion of the element in a path parallel to the box side causes rectilinear motion of the switch part in a path parallel to the box side.

7. In a switch, a box having a side and an open front, a movable front cover therefor, a handle outside the box and on the front surface of the front cover and carried thereby and arranged to move in a path parallel to the front cover, a lug on the side, and means within the box on the back surface of the front cover and carried thereby and movable along the cover with the handle for detachably interlocking with the lug and preventing cover movement.

8. In a switch, a box having a side and an open front, a movable front cover therefor, a handle outside the box and on the front surface of the front cover arranged to move in a path parallel to the front cover and carried thereby and, a lug on the side, and means within the box on the back surface of the front cover and carried thereby and movable along the cover with the handle for detachably interlocking with the lug and preventing cover movement, and an element within the box pivotally mounted on a side at a point remote from the front and on an axis parallel to the front cover to rotate in a path parallel to the side, the means being connected to the handle to move therewith in a position where it releasably engages the element for releasably operatively connecting the handle and the element and constructed to transform movement of the handle along the cover into rotation of the element on its axis and in a path parallel to the box side.

9. In a switch, a box having a side and an open front, a movable front cover therefor, a handle outside the box and on the front surface of the front cover arranged to move in a path parallel to the front cover and carried thereby and, a lug on the side, and means within the box on the back surface of the front cover and carried thereby and movable along the cover with the handle for detachably interlocking with the lug and preventing cover movement, and an element within the box pivotally mounted on a side at a point remote from the front and on an axis parallel to the front cover to rotate in a path parallel to the side, the means being connected to the handle to move therewith in a position where it releasably engages the element for releasably operatively connecting the handle and the element and constructed to transform movement of the handle along the cover into rotation of the element on its axis and in a path parallel to the box side, the element, the lug, and the means being so positioned relatively that when the means has been moved to cause movement of the element to one of its positions, the means itself has been interlocked to the lug to prevent cover opening.

10. In a switch, a box having a side and an open front, a movable front cover therefor, a handle outside the box and on the front surface of the front cover arranged to move in a path parallel to the front cover and carried thereby and, a lug on the side, and means within the box on the back surface of the front cover and carried thereby and movable along the cover with the handle for detachably interlocking with the lug and preventing cover movement, and an element within the box pivotally mounted on a side at a point remote from the front and on an axis parallel to the front cover to rotate in a path parallel to the side, the means being connected to the handle to move therewith in a position where it releasably engages the element for releasably operatively connecting the handle and the element and constructed to transform movement of the handle along the cover into rotation of the element on its axis and in a path parallel to the box side, and a switch part within the box mounted to move in a straight line path parallel to the box side and operatively connected to the element in such a manner that rotary motion of the element in a path parallel to the box side causes rectilinear motion of the switch part in a path parallel to the box side.

11. In a switch, a box having a side and an open front, a movable front cover therefor, a handle outside the box and on the front surface of the front cover arranged to move in a path parallel to the front cover and carried thereby and, a lug on the side, and means within the box on the back surface of the front cover and carried thereby and movable along the cover with the handle for detachably interlocking with the lug and preventing cover movement, and an element within the box pivotally mounted on a side at a point remote from the front and on an axis parallel to the front cover to rotate in a path parallel to the side, the means being connected to the handle to move therewith in a position where it releasably engages the element for releasably operatively connecting the handle and the element and constructed to transform movement of the handle along the cover into rotation of the element on its axis and in a path parallel to the box side, the element, the lug, and the means being so positioned relatively that when the means has been moved to cause movement of the element to one of its positions, the means itself has been interlocked to the lug to prevent cover opening, and a switch part within the box mounted to move in a straight line path parallel to the box side and operatively connected to the element in such a manner that rotary motion of the element in a path parallel to the box side causes rectilinear motion of the switch part in a path parallel to the box side.

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