April 28, 1942. J. W. SAMZELIUS 2,281,052

SAFETY SWITCH

Filed Oct. 30, 1940 3 Sheets-Sheet 1

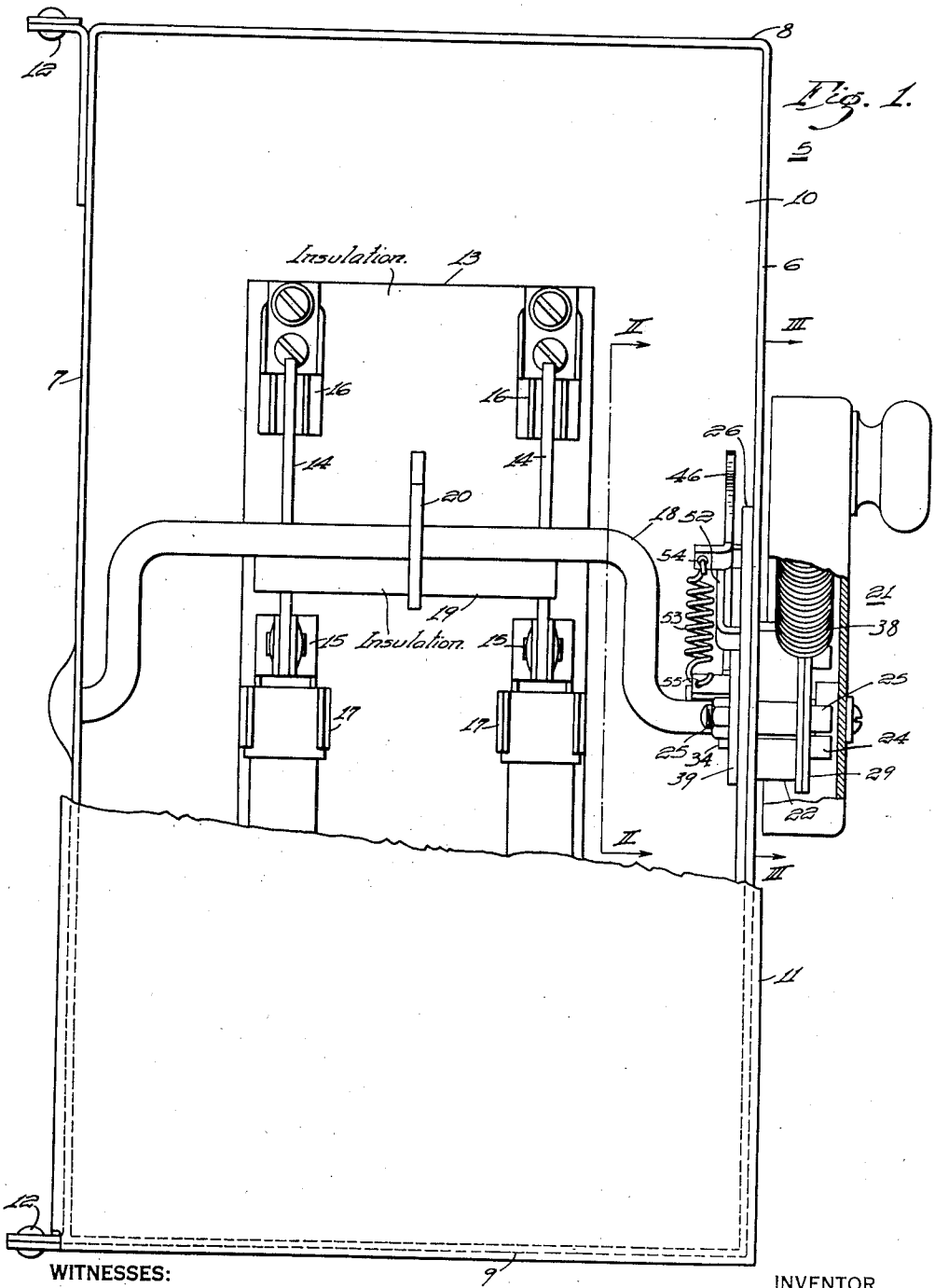


Fig. 1.

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SAFETY SWITCH

Filed Oct. 30, 1940 3 Sheets-Sheet 2

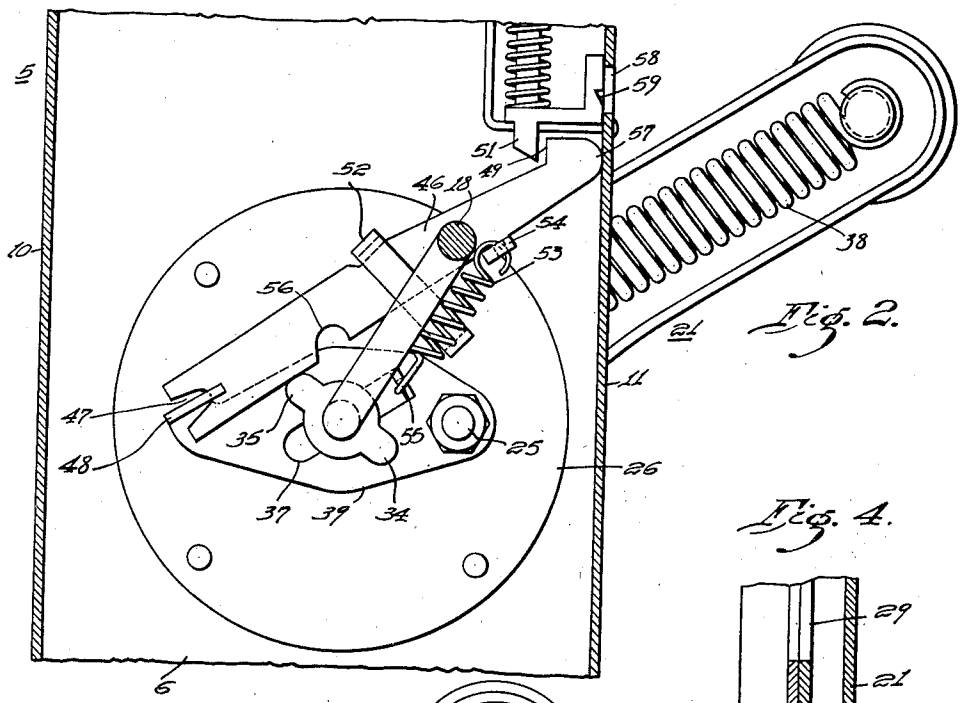


Fig. 2.

Fig. 4.

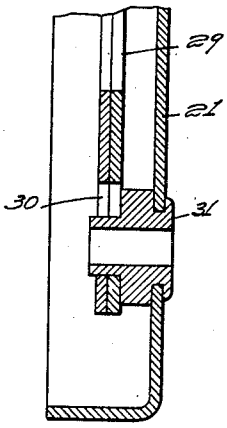
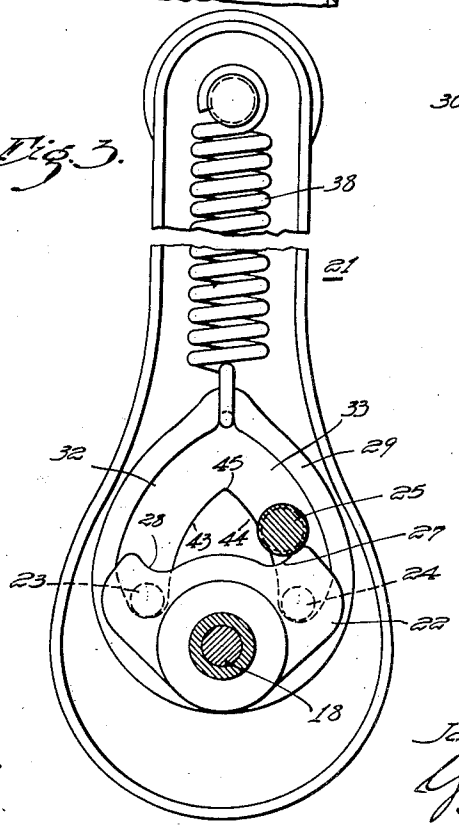


Fig. 3.



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SAFETY SWITCH

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Fig. 5.

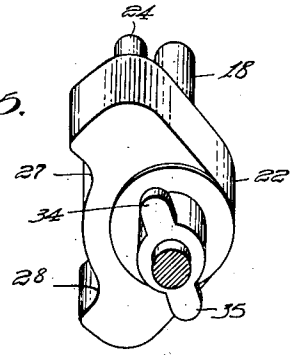


Fig. 6.

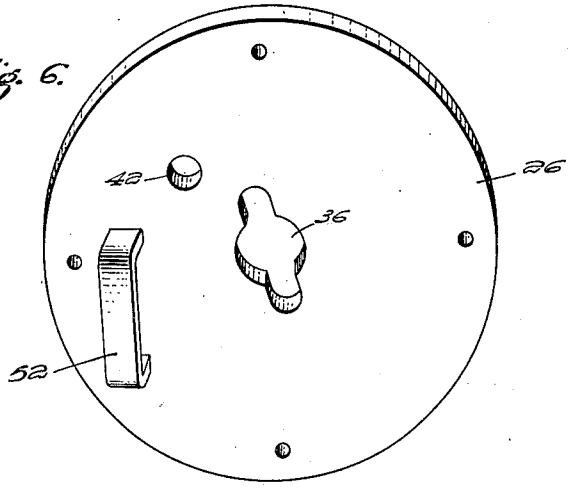
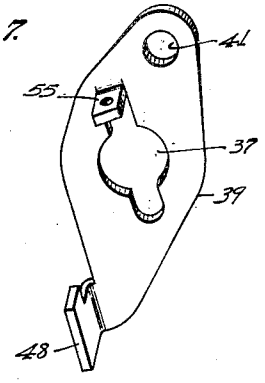


Fig. 7.



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Patented Apr. 28, 1942 2,281,052

UNITED STATES PATENT OFFICE

2,281,052

SAFETY SWITCH

John W. Samzelius, Forest Hills, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application October 30, 1940, Serial No. 363,419

9 Claims. (Cl. 200—50)

My invention relates, generally, to electric switches and, more particularly, to operating mechanisms for electric switches of the enclosed type commonly known as safety switches.

An object of my invention, generally stated, is to improve and simplify the structure of the switch operating mechanism described in Patent No. 1,606,801, issued November 16, 1926, to H. K. Krantz, and assigned to the Westinghouse Electric & Manufacturing Company.

A more specific object of my invention is to simplify the structure of the operating handle and associated parts of the aforesaid switch operating mechanism.

Another object of my invention is to provide an improved means for retaining the parts of the operating mechanism assembled in the switch housing.

A further object of my invention is to provide an interlocking device for the cover and operating mechanism of an enclosed switch.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with the present invention the cam plate of the operating mechanism described in the aforementioned patent is made smaller and the operating handle is of a simpler shape which may be manufactured at a lower cost. A lever for interlocking the housing cover and the switch mechanism is operated by a projecting lug on the crank actuating plate which also functions to retain the crank in the housing after assembly.

For a fuller understanding of the nature and objects of my invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view, in front elevation, of an enclosed switch mechanism embodying my invention, a portion of the housing cover being removed for clearness;

Fig. 2 is a view, in section, taken along the line II—II of Fig. 1 showing the interlocking device and a portion of the operating mechanism;

Fig. 3 is another view, in section, taken along the line III—III of Fig. 1 showing the portion of the operating mechanism disposed within the handle;

Fig. 4 is a longitudinal section through a portion of the operating handle showing details of the apparatus contained therein; and

Figs. 5, 6 and 7 are views, in perspective, of parts of the operating mechanism.

Referring to the drawings, the apparatus includes a metal housing 5 having side walls 6 and 7, end walls 8 and 9, a bottom wall 10, and a cover 11 that is pivoted to the housing by means of hinges 12. The housing contains an insulating switch panel 13 that is secured to the bottom 10 of the housing. A double pole switch, that is mounted upon the panel 13, comprises a pair of switch blades 14 which are hinged to pivot jaw members 15 and which are movable into engagement with switch jaw members 16. Fuse clips 17 are mounted on the panel for receiving standard cartridge fuses. The knife switch is of standard construction and is operated by a bent crank rod 18 that is pivotally mounted for oscillation in the side walls 6 and 7 of the housing which constitute a bearing support for the crank rod 18. The crank rod is connected in a well known manner to the switch blades 14 by an insulating cross member 19 which joins the two switch blades and a clip 20 which connects the crank 18 to the cross member 19.

The switch box and switch devices herein shown are of standard construction, and it will be understood that any preferred switch mechanism or housing may be employed in connection with the switch operating mechanism described herein. The switch crank rod 18 is provided with an exteriorly extending portion upon which a hollow operating handle 21 is mounted for relative rotary movement therewith. As shown in Fig. 3, a crank plate or yoke 22 is fixed upon the exterior portion of the crank rod 18 and is provided with crank pins 23 and 24. Rotary movement of the yoke 22 is limited by a stop pin 25 that is detachably secured to a closure or bearing plate 26 that is secured to the side wall 6 of the housing. Movement of the crank rod 18 in either direction is limited by reason of the engagement of the plate 22 with the pin 25 at the depressions 27 and 28 in the plate 22.

A floating member 29, hereinafter referred to as a cam plate, that is provided with an opening 30 as shown in Fig. 4, is mounted upon the crank rod 18 and is held against longitudinal movement thereon by the crank plate 22 and a hub 31 which may be formed integral with the handle 21 or may be a bushing secured in the handle by riveting in the manner shown in Fig. 4 of the drawings. The cam plate 29 may, however, be moved laterally with respect to the crank rod 18 since the opening 30 is of a greater dimension than the diameter of the neck of the bushing 31 on which the cam plate 29 is mounted.

In order to reduce the size of the cam plate 29 and to simplify the shape of the handle 21, as

compared with the structure shown in the aforesaid Patent No. 1,606,801, the initial tension in the operating spring 38 is maintained by the hub 31, over which the cam plate 29 is inserted when assembling the mechanism, instead of by projecting shoulders on the cam plate 29 which engage cooperating projections on the handle 21, as described in the aforesaid patent. Thus, both the cam plate 29 and the handle 21 may be reduced in size and simplified in shape which makes it possible to produce a handle cheaply by pressing it from sheet steel. In order to facilitate punching the cam plate 29, it may be composed of laminations of relatively thin sheets of metal.

The cam plate 29 is provided with a pair of angularly disposed arcuate slots 32 and 33 through which the stop pin 25 and the crank pins 23 and 24 extend. The inner edges of the slots 32 and 33 constitute arcuate cam surfaces 43 and 44, respectively, the purpose of which will hereinafter appear.

In order to retain the crank 18 in the housing after assembly, without drilling a hole in the crank and inserting a cotter key therein as in the structure described in the aforesaid patent, thereby weakening the crank, the crank plate 22 is provided with a pair of lugs 34 and 35 which are inserted through openings 36 and 37 in the bearing plate 26 and a locking plate 39. The locking plate 39 is secured to the inside of the bearing plate 26 by means of the stop pin 25 which is inserted through openings 41 and 42 in the locking plate 39 and bearing plate 26, respectively.

It will be understood that during the assembly of the operating mechanism, the openings 36 and 37 may be turned to register with the projecting lugs 34 and 35 on the plate 22, thereby permitting the lugs to be inserted through these openings. The locking plate is then secured to the bearing plate by the stop pin 25 with the openings 36 and 37 in such a position that the lugs 34 and 35 cannot pass through these openings at any time during the operation of the switch mechanism. In this manner, axial movement of the crank is prevented.

As shown in Fig. 2, one of the projecting lugs or ears 35 is utilized for controlling the operation of an interlocking lever 46 which is disposed on the inside of the housing and functions to prevent opening of the cover 11 while the switch is in the closed position. As shown, one end of the lever 46 is provided with a notch 47 which engages a tail piece 48 on the locking plate 39. The other end of the lever 46 is provided with a hook 49 disposed to engage a latch 51 on the cover 11.

A strap 52 of a U-shape is secured to the bearing plate 26 at a point about midway of the length of the lever 46 to retain the lever 46 in its proper position. A spring 53 having one end connected to the lever 46 at 54 and the other end connected to the locking plate 39 at 55 is disposed to bias the lever 46 against the lug 35 on the cam plate 22.

The lever 46 is provided with a notch 56 which registers with the lug 35 when the crank 18 is actuated to a position which opens the switch blades 14. Therefore, the hook 49 of the lever 46 will move to a position which clears the latch 51 when the cover is raised, provided the switch is in the open position. If an attempt is made to open the cover while the switch is in the closed position, the lug 35 prevents the lever 46 from disengaging the latch 51, since the notch 56 does not register with the lug 35.

Furthermore, the notch 56 prevents closing the switch blades while the cover is open by engaging the lug 35 to prevent rotation of the crank 18 unless the lever 46 is pressed downwardly to disengage the lug 35. Thus, it will be seen that the closing of the cover 11 automatically releases the lug 35 from the notch 56 since the cover engages the rounded end 57 of the lever 46 as it is being closed.

The sliding latch 51 may be of the type fully described and claimed in my copending application, Serial No. 346,528, filed July 20, 1940. In order to permit inspection of the switch by an authorized person, an opening 58 is provided in the cover 11 through which a screw driver or similar tool may be inserted into a notch 59 in the sliding latch 51 to move the latch away from the interlocking lever 46 to permit the cover to be opened even though the switch is in the "on" position. The sliding latch 51 is so made that the opening 58 is always entirely closed on the inside of the cover, thereby excluding dirt and moisture from the interior of the casing.

The operation of the switch blades by the operating mechanism is as follows: Assuming that the parts of the operating mechanism are in the relative positions shown, and that the handle 21 is moved in a clockwise direction, as viewed in Fig. 3, to open the switch contacts, the movement of the operating handle causes the side of the handle to engage the cam plate 29 opposite the arcuate slot 32. The natural tendency of the plate 29 would then be to rotate about the crank rod 18 as an axis of rotation, but such movement is prevented by reason of the engagement of the pin 25 with the cam surface 44. The cam surfaces 43 and 44, the opening 30, and the side walls of the handle are so designed that the cam plate 29 is caused to rotate about the pin 23 as an axis of rotation without exerting any effort thereon tending to move the pin 23 or the attached crank rod 18. The cam surfaces 44 and 43 are concentric to the crank pins 23 and 24, respectively, and consequently further rotation of the operating handle will cause the cam plate 29 to continue to rotate about the crank pin 23 as an axis until the point of intersection 45 has passed the center of the stop pin 25.

When the clearance point 45 of the cam surfaces 43 and 44 has passed the center of the pin 25, the spring 38 which has been extended during the opening movement of the operating handle will suddenly contract and the bottom of the slot 32 will engage the pin 23 and cause opening movement of the switch with a snap action.

When the operating handle is moved from the open position to the closed position, the mechanism functions in a similar manner to close the switch with a corresponding snap action.

From the foregoing description, it is apparent that I have provided a simplified and improved operating mechanism for electric switches of the enclosed type. Furthermore, I have provided an improved means for retaining the parts of the operating mechanism assembled in the switch housing, and I have also provided a simple and efficient device for interlocking the cover of the switch housing with the operating mechanism.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the

foregoing description or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a switch mechanism, in combination, a switch member, an operating shaft therefor, an operating handle rotatably mounted on said shaft and having a hub portion surrounding the shaft, a yielding member, and a floating member having a lost-motion connection to the operating shaft for actuating the switch member, said floating member engaging the hub portion of said handle to establish a predetermined tension on said yielding member, said floating member having an opening therein of a greater diameter than said hub portion, said hub portion having a shoulder thereon engaging one side of said floating member.

2. In a switch mechanism, in combination, a switch member, an operating shaft therefor, an operating handle rotatably mounted on said shaft and having a hub portion surrounding the shaft, a yielding member, and a floating member having a lost-motion connection to the operating shaft for actuating the switch member, said floating member engaging the hub portion of said handle to establish a predetermined tension on said yielding member, said floating member having an opening therein for receiving the hub portion of said handle, said opening being of a greater diameter than said hub portion, said hub portion having a shoulder thereon engaging one side of said floating member.

3. In an enclosed switch, in combination, an enclosing casing, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, an operating member for the shaft secured thereto exteriorly of the casing and having laterally projecting lugs disposed inside the casing for limiting longitudinal movement of the shaft, said casing having an opening therein for receiving said lugs during assembly of the switch, said lugs being out of alinement with said opening during operation of the switch.

4. In an enclosed switch, in combination, an enclosing casing, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, an operating member for the shaft secured thereto exteriorly of the casing and having integrally formed laterally extending lugs disposed inside the casing and cooperating therewith to limit longitudinal movement of the shaft, said casing having an opening therein for receiving said lugs during assembly of the switch, said lugs being out of alinement with said opening during operation of the switch.

5. In an enclosed switch, in combination, an enclosing casing, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, a bearing plate for said shaft secured to said casing, an operating member for the shaft secured thereto exteriorly of the bearing plate and having a laterally projecting lug disposed inside the casing, and a locking plate disposed inside the casing and cooperating with said lug to limit longitudinal movement of the shaft, said locking plate having an opening therein disposed in alignment with said lug during assembly of the switch and out of alignment with the lug during operation of the switch.

6. In an enclosed switch, in combination, an enclosing casing, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, a bearing plate for said shaft secured to said casing, an operating member for the shaft secured thereto exteriorly of the bearing plate and having laterally projecting lugs disposed inside the casing, and a locking plate disposed inside the casing and cooperating with said lugs to limit longitudinal movement of the shaft, said bearing plate and said locking plate having openings therein disposed in alignment with said lugs during assembly of the switch and out of alinement with the lugs during operation of the switch.

7. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, an operating member for the shaft secured thereto exteriorly of the casing and having a laterally projecting lug disposed inside the casing for limiting longitudinal movement of the shaft, and an interlocking lever actuated by said lug to retain said cover closed when the switch is closed.

8. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, an operating member for the shaft secured thereto exteriorly of the casing and having a laterally projecting lug disposed inside the casing for limiting longitudinal movement of the shaft, and an interlocking lever actuated by said lug to retain said cover closed when the switch is closed, said interlocking lever being disposed to engage said lug when the cover is open to prevent actuating the switch to the closed position.

9. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch member in said casing, an operating shaft for the switch member rotatably mounted in the casing, an operating member for the shaft secured thereto exteriorly of the casing and having a laterally projecting lug disposed inside the casing for limiting longitudinal movement of the shaft, an interlocking lever actuated by said lug to retain said cover closed when the switch is closed, said interlocking lever being disposed to engage said lug when the cover is open to prevent actuating the switch to the closed position, and spring means for biasing said interlocking lever against said lug.

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