

June 14, 1932.

H. J. HAMMERLY

1,863,523

INCLOSED SWITCH

Filed Nov. 14, 1930

2 Sheets-Sheet 1

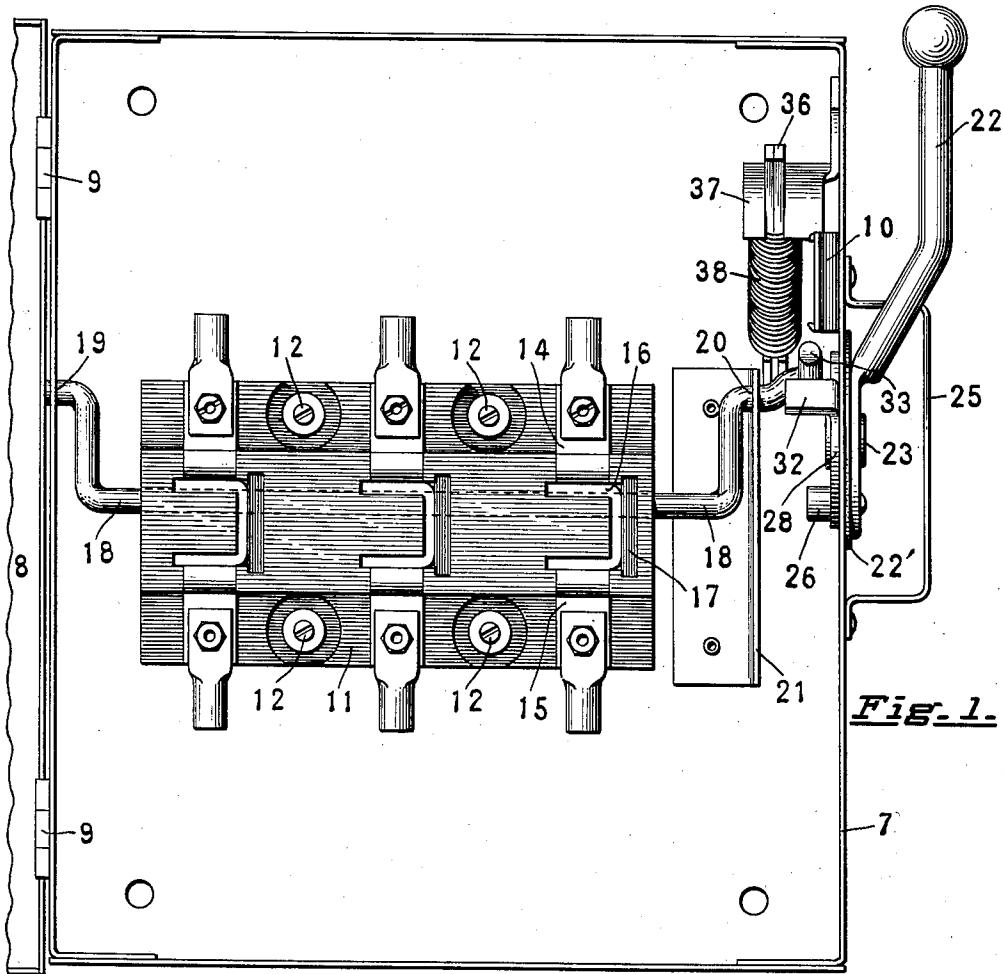


Fig. 1.

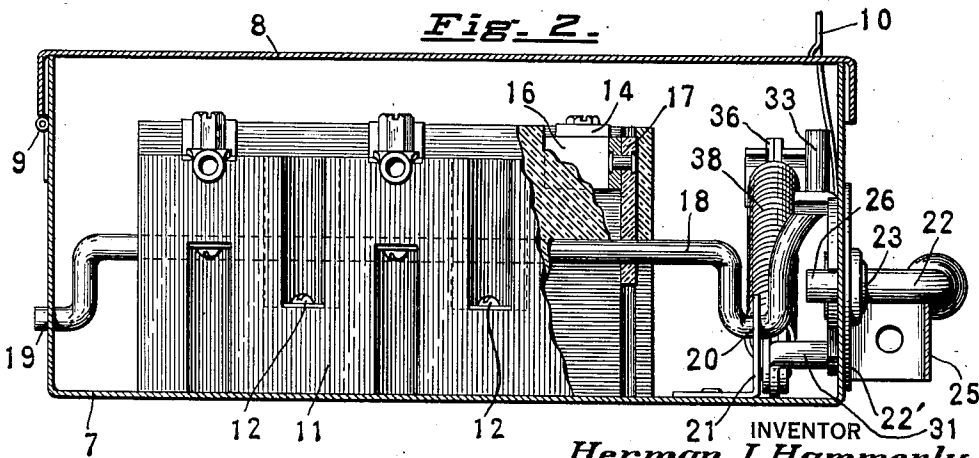


Fig. 2.

INVENTOR
Herman J. Hammerly,

BY *Robert T. Munro*
ATTORNEY

June 14, 1932.

H. J. HAMMERLY

1,863,523

INCLOSED SWITCH

Filed Nov. 14, 1930

2 Sheets-Sheet 2

Fig. 3.

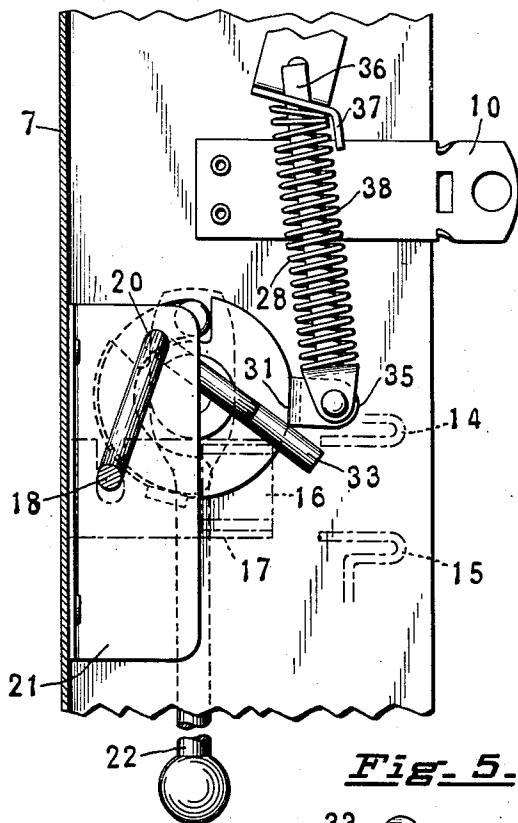


Fig. 4.

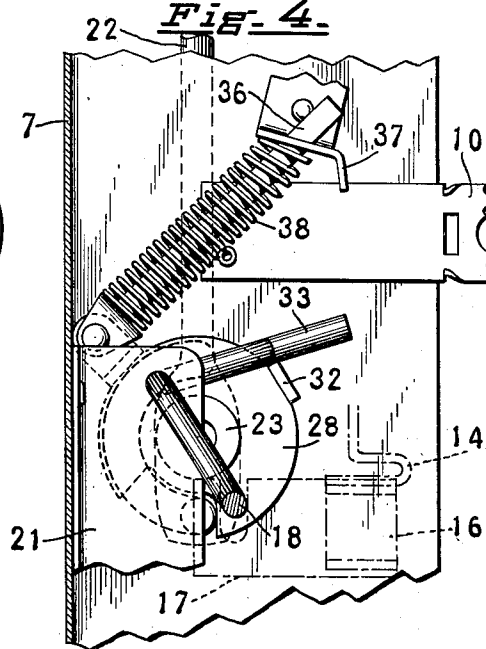
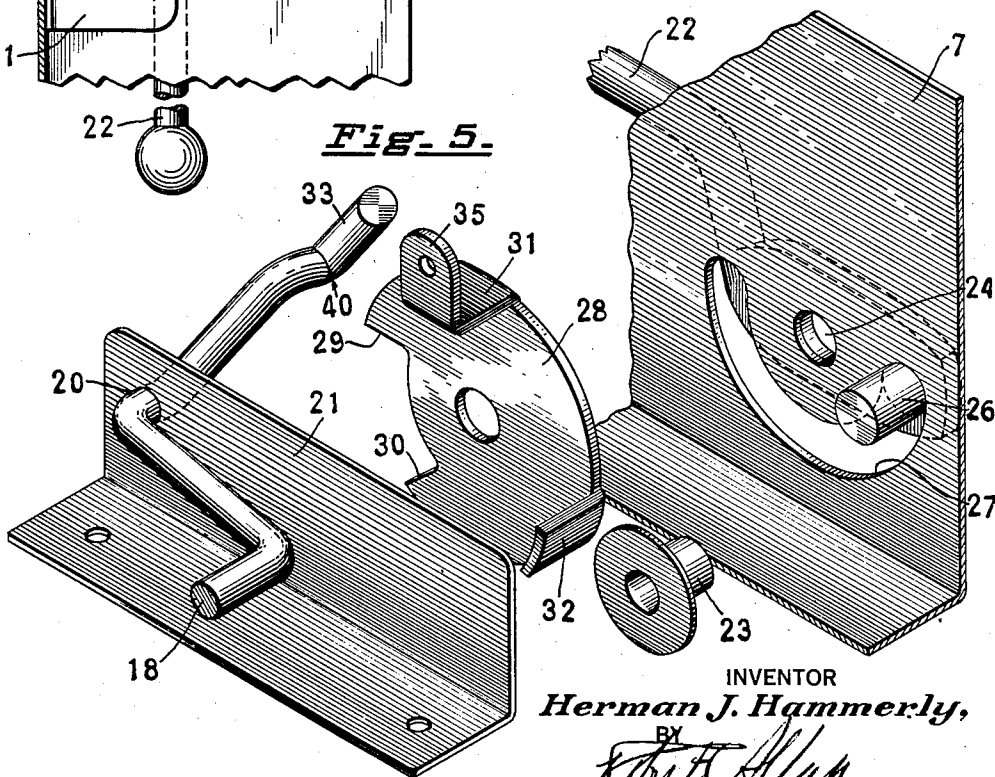


Fig. 5.



INVENTOR
Herman J. Hammerly,
BY
Robert H. Allen
ATTORNEY

UNITED STATES PATENT OFFICE

HERMAN J. HAMMERLY, OF WALLINGFORD, CONNECTICUT, ASSIGNOR TO THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, OF PLAINVILLE, CONNECTICUT, A CORPORATION OF CONNECTICUT

INCLOSED SWITCH

Application filed November 14, 1930. Serial No. 495,600.

My invention relates to inclosed switches of the quick-make and quick-break type and particularly to the class of switches in which the contact blades are of the double-break type and are caused to move in a relatively perpendicular direction with respect to the plane of the enclosing box.

In switches of this class, the blades are usually mounted on, and movable with some kind of a guiding slide, or an equivalent of a slide, and the necessary length of such slides, plus the operating movement of the slides, plus the necessary separation of the respective contacts when in the off position, ordinarily necessitates a relatively deep box or enclosure for the switch.

Applicant's co-pending application Ser. No. 335,250, filed January 26, 1929, now Patent No. 1,838,020 shows a form of switch in which pivoted knife switch blades are employed and in which the operating crank is pivoted in the opposite side walls of the box with an intermediate operating member and an external operating handle mounted concentrically with one end of the crank.

In the form shown in this co-pending application, the pivot centers of the co-related operating members are spaced in the side wall of the box at a point high enough from the bottom of the box to provide for ample mounting and operating space for sturdy and well proportioned operating parts.

Applicant's present invention involves the problem that the switch blade movement is straight in and straight out rather than in the arcuate direction of a hinged or pivoted blade and in meeting the requirement of a shallow box, it will readily be seen that, in one of its positions, the bail portion of the operating crank will stop at a point so very close to the bottom of the box and the crank must be pivoted at a point so low in the box that it would be a very difficult problem to provide co-operating means for engaging the crank in the usual manner or to mount the co-operating means on the same pivot center line as the crank member.

Applicant has solved the problem by providing a special crank which has one of its ends pivoted in one side wall of the box and

its other end pivoted in a special angle plate secured to the bottom of the box and has an angularly bent end extending through the angle plate for engagement with the projecting lugs of an intermediate member which, in turn, is engaged by the external handle with a lost motion connection.

Applicant's intermediate member and the external handle are co-axially mounted on the side wall of the box, with their axial centers positioned at a point a considerable distance away from the axial center of the crank mounting.

It will be noted that the axial centers of the intermediate member and of the external handle are spaced so far away from the axial center of the crank member that ample space is provided on the inner wall of the box, for making the intermediate member of very substantial proportions and this eccentric arrangement of mounting the respective co-related operating members provides open space for ample operating range of movement for the switch throwing spring.

By reason of the crank and the intermediate member being pivoted at different axial centers, the lugs on the intermediate member will engage the projecting end of the crank with a sliding or cam-like movement which exerts a very easy but powerful force against the crank in its initial movement towards the position where the spring will force it rapidly away from the lugs of the intermediate member to the fully open or fully closed position.

Some of these features altho especially adapted to the actuation of the sliding type of contact will be found useful for other types.

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

Fig. 2 is a transverse sectional view of the same construction, the cover of the box being closed and some of the parts being shown in elevation.

Fig. 3 is a side view and partial section showing the actuating mechanism with the

parts in the positions they occupy in the open circuit condition.

Fig. 4 is a similar view showing the parts in the closed circuit position.

Fig. 5 is an exploded perspective view showing parts of the actuating mechanism.

The box 7 has a cover hinged at 8 and provided with a latch 10 in the customary manner.

The conducting parts of the switch are carried by an insulating block 11 suitably secured in the box, for instance, by screws 12.

The invention is applicable to the control of a circuit having any reasonable number of poles and I have illustrated it as applied to a switch for a three wire system. All of the switch units being the same it is only necessary to note that each unit has contacts 14 and 15 with circuit terminals of a suitable character and a movable switch contact member 16 mounted to slide in the base or block 11. In this form the movable switch contact is U-shaped and supported by a sliding carrier 17 as is more fully set forth in my co-pending application Ser. No. 469,152, filed July 19, 1930, now Patent No. 1,824,137.

The operating crank shaft 18 is pivoted at 19 in one side of the box and pivoted at 20 in an angle plate 21 which is secured to the bottom of the box. The crank shaft is loosely connected with the sliding carrier 17 in any suitable manner so that as the crank shaft is swung on its pivoted ends 19 and 20 the carrier 17 is made to slide and bring the switch member 16 into contact with and out of contact from the stationary switch contacts.

The handle 22 is mounted on a sleeve or bushing 23 which extends through the opening 24 in the side of the box. A bracket 25 secured to the outside of the box serves as a stop and has convenient means for locking the handle in the open or closed circuit position by means of a padlock or sealing wire (not shown) of the usual character.

This handle 22 carries a stud or pin 26 which projects through a curved slot 27 in the side of the box.

Inside the box a connector disc or intermediate member 28 is mounted on the sleeve 23 and provided with a cut-out portion bounded by shoulders 29 and 30 with which the pin or stud 26 is adapted to coact. A disc 22' is also preferably provided on the sleeve 23 between the handle and the side of the box to close the slot 27. The connector 28 is also provided with lugs 31 and 32 which project inwardly from the side of the box on opposite sides of the crank arm 33.

In order to insure a quick break or snap action, I provide the connector 28 with a projecting arm 35 to which is pivoted or hinged one end of the bar 36 the other end of which is guided in a bracket 37 secured to the inner wall of the box. A spring 38 is mounted on

this rod 36 and tends to move the disc 28 to the one or the other of the two positions shown in Figures 3 and 4, as is customary in actions of this character.

To operate the switch from the open to the closed circuit position, the handle 22 is raised until the pin 26 engages the shoulder 30 on the connector disc. Continued movement of the handle upwardly rotates the disc 28 about the sleeve 23 and thus compresses the spring 38 until its connection with the rod 36 passes the center line between the axis of the bearing sleeve 23 and the bracket 37. In the meantime the lug 32 has picked up the crank arm 33 so that the spring throws the connector and the crank arm into the position shown in Fig. 4.

This movement of the crank arm and shaft throws the movable switch member to the closed circuit position. To open the circuit the handle 22 is returned to its original position during which movement the pin 26 engages the shoulder 29 on the connector 28 and the connector is rotated until the lug 31 engages the crank arm 33 and forcibly starts to move the crank shaft and movable switch member toward the open circuit position which action is completed with a quick break by the pressure of the spring 38. It will be seen that on account of the fact that the crank shaft bearing 20 is considerably eccentric with respect to the connector disc 28, that the lug 31 first engages the crank arm 33 near the point 40 and then slides along the crank arm outwardly toward the end producing an effective snap action.

It will be noted that the box is so constructed and arranged that they can be assembled and tested in units before complete assembly. For instance, the insulating block carries the stationary as well as the movable contacts, the box carries the handle and quick make and break or snap action mechanism and the crank shaft is supported in the box and in the angle plate 21 independently of the snap action mechanism.

The advantages of my construction will be apparent from an inspection of Figs. 2, 3, 4 and 5 of the drawings.

It will be noted that the intermediate disc or operating member 28 is of very substantial proportions. This is made possible by the fact that the axial center of the disc is positioned at a considerable distance from the axial center of the crank shaft, in other words the axial center of the disc is considerably higher from the bottom of the box than the axis of the crank shaft and is offset in tangential relation to the axial center of the crank shaft.

In some structures it has been the general practice to co-axially mount the switch crank and its co-related operating means but, in order to mount applicant's disc 28 co-axially with the crank shaft, the disc would have to

be made very much smaller in order to clear the bottom of the box or the depth of the box would have to be increased considerably and the height of the switch base would have to be increased accordingly in order to obtain the proper relation of the respective parts.

From Fig. 4 it will be clear that the lugs 31 and 30 of the disc 28 engage the projecting end 33 of the crank 18 with a wiping or cam action which adds materially to the smooth operation of the switch.

It will also be apparent from the drawings that, in order to obtain a desirable correlation of the quick break mechanism members, it was found desirable to form one end of the crank shaft with a special projecting end 33 and to provide a special bearing for that end of the crank inside of the box as shown in the drawings of members 21.

As the support for the crank shaft member is independent of the side plate which supports the handle and snap action device it is obvious that considerable bending or displacement of the side plate might occur without crippling the switch mechanism—in fact the side plate and attached parts might be removed without disturbing the switch contacts and operating crank.

I claim:

1. In a switch a box, a switch member slidably supported in said box, a crank shaft pivotally supported in the box for moving said switch member and having a projecting arm inside of the box, an operating handle pivoted to one side of the box, a connector pivoted inside of said box and having a lost motion connection with said handle and with said crank arm, said connector being mounted eccentric to the axis of the crank shaft and said connector having projecting lugs for a sliding engagement with the said projecting arm of the crank shaft.

2. In an electric switch, a stationary contact, a movable switch member, a pivoted crank shaft for actuating said movable switch member and having an arm, a pivoted operating handle and an oscillating lost motion connector mounted to oscillate about an axis, which is substantially eccentric to the axis of said crank shaft, said connector being actuated by said handle and being provided with projecting arms adapted for a sliding engagement with the arm of said crank shaft to actuate said movable switch member.

3. In a switch, a stationary contact, a slidable switch member coacting therewith, a pivoted crank shaft for actuating said switch member, and having a projecting arm, an oscillating connector disc having lugs spaced apart from each other and having a sliding engagement with the projecting arm of said crank shaft on opposite sides of said crank arm, an operating handle having a lost motion connection with said connector disc and a spring device coacting with one of said

members for actuating said switch member with a snap action. The said oscillating disc being pivotally mounted with its axial center spaced away from the axial center of said crank shaft for the purpose set forth.

4. In an electric switch, a stationary contact, a movable switch member having a contact to coact therewith, a pivoted crank shaft for actuating said movable switch member, a pivoted operating handle and an oscillating connector mounted to oscillate about an axis substantially eccentric to the axis of said crank shaft, said connector being actuated by said handle and in turn serving to engage a portion of said crank shaft with a cam action and actuate said crank shaft, and a spring device for actuating said switch member with a snap action.

5. In an electric switch, a box, an insulating base mounted therein, stationary and movable contacts carried by said base, a plate secured in the box between the base and one side of the box, an operating crank shaft having one of its ends pivoted in one side of the box and its other end pivoted in said plate and having a projecting crank arm, an oscillating disc pivoted in one side of the box and having a sliding lost motion connection with said crank arm, a throwing spring for said disc and an operating handle pivoted in one side of the box and having a lost motion connection with said disc.

6. In an electric switch, a box, an insulating base mounted therein, stationary and movable contacts carried by said base, a plate secured in the box between the base and one side of the box, an operating crank shaft having one of its ends pivoted in one side of the box and its other end pivoted in said plate and having a projecting crank arm, an oscillating disc pivoted in one side of the box and having a sliding lost motion connection with said crank arm and an operating handle pivoted in an adjacent side of the box and having a lost motion connection with said disc and a throwing spring for said oscillating disc, the axis of the disc being substantially eccentric with respect to the axis of said crank shaft.

7. An electric switch including a box, an insulating base within the box, stationary and movable contacts supported by said base, a crank pivotally mounted within said box, an external operating handle, an intermediate member having a lost motion connection with said external handle and a sliding engagement with a portion of said crank and a spring for accelerating the operating movement of said intermediate member, the said intermediate member being pivotally mounted with its axial center spaced definitely away from the axial center of said crank for the purpose specified.

8. An electric switch including a box, an insulating base in said box, stationary con-

tacts on said base, a movable switch member slidably supported by said base, a crank shaft pivotally supported in said box for operating said movable switch member and having a projecting arm, an external operating handle pivoted to said box, an operating connector in said box and having a lost motion connection with said external handle and a sliding lost motion engagement with the projecting arm of the said crank and a spring for rapidly throwing said crank, the said connector being pivotally mounted in the side of the box at a point relatively remote from the axial center of said crank.

9. An electric switch including a box, a base within the box, stationary and movable contacts supported by said base, a crank pivotally mounted in said box and having operable connection with said movable contacts, an external operating handle, an intermediate member having a coaxial lost motion connection with said external handle and an eccentric lost motion sliding engagement with said crank, a quick motion spring having operable connection with said intermediate member the said intermediate member being pivotally mounted in said box with its axial center spaced away from the axial center of the crank shaft in the manner specified.

10. In an electric switch, a box, an insulating base mounted therein, stationary and movable contacts carried by said base, a plate secured in the box between the base and one side of the box, an operating crank shaft pivoted in the opposite side of the box and in said plate and having a projecting arm inside of said box, an oscillating disc pivoted in an adjacent side of the box and having a sliding lost motion connection with the projecting arm of said crank and an operating handle pivoted in an adjacent side of the box and having a lost motion connection with said disc and a throwing member connecting said disc to said box.

HERMAN J. HAMMERLY.

50

55

60