Sept. 23, 1941. R. N. ROWE 2,256,910

ENCLOSED SWITCH

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Fig. 1.

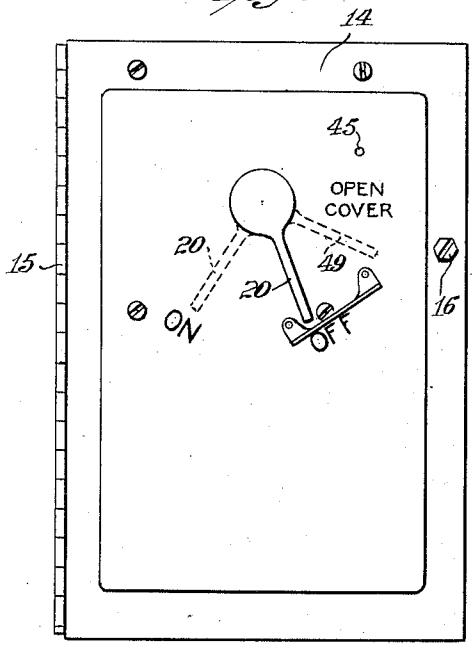


Fig. 3.

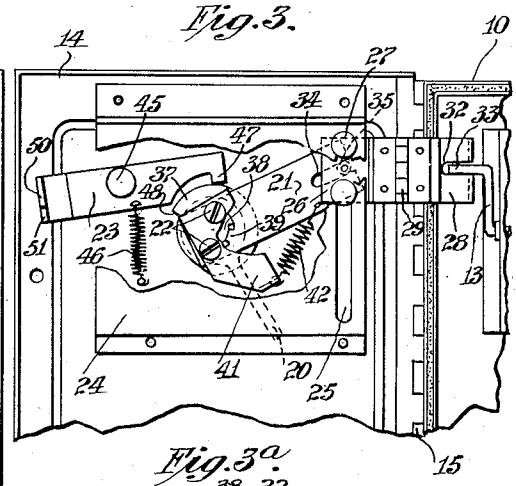


Fig. 3a.

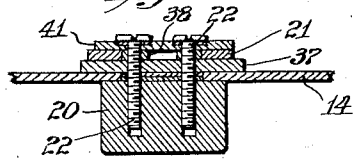


Fig. 2.

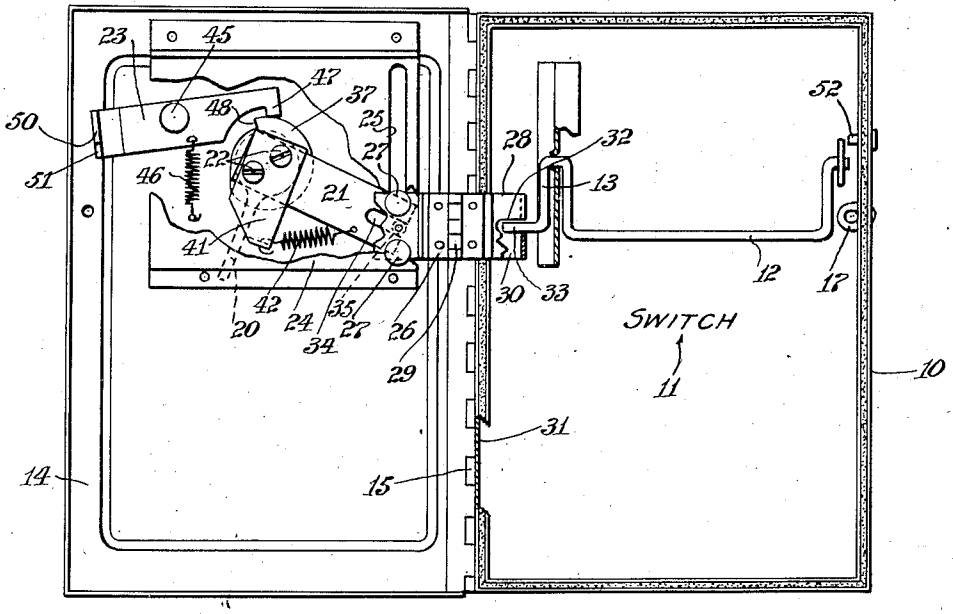


Fig. 3b.

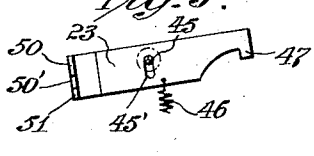


Fig. 3c.



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Fig. 4.

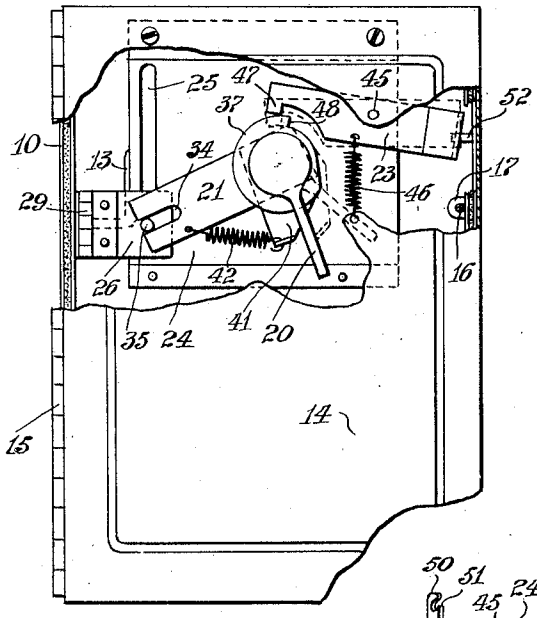


Fig. 5.

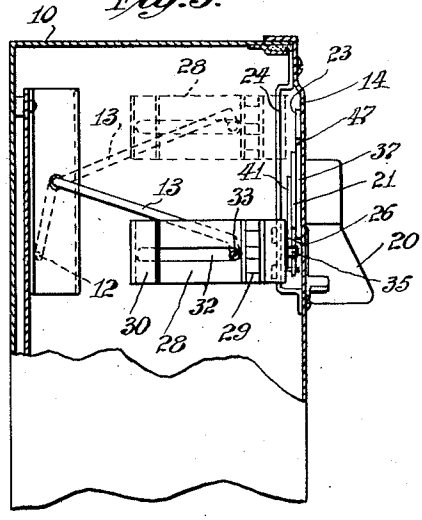


Fig. 7.

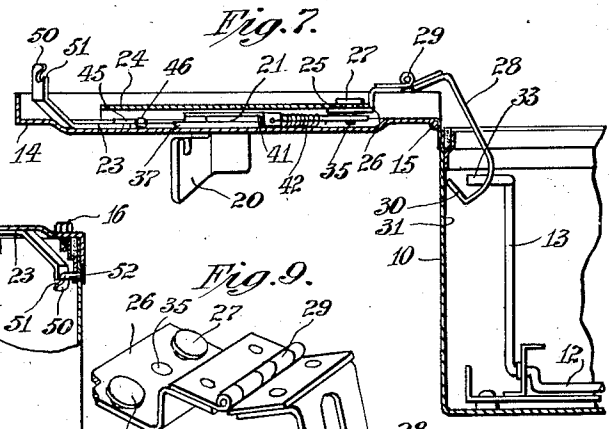


Fig. 6.

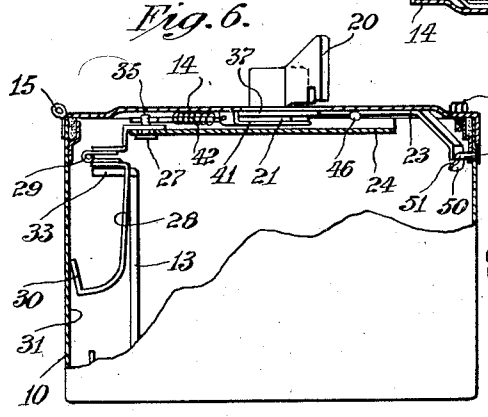


Fig. 9.

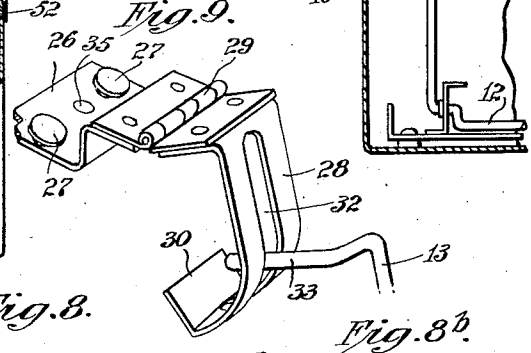


Fig. 8.

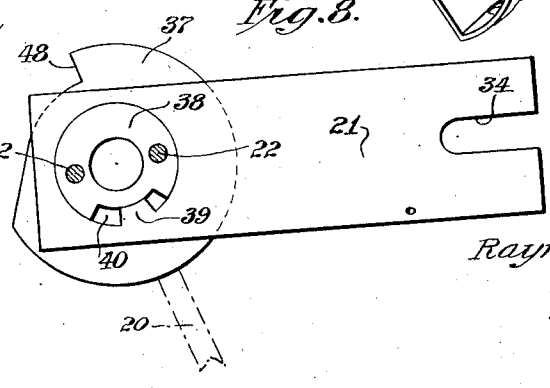


Fig. 8a.

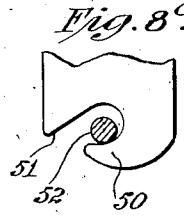
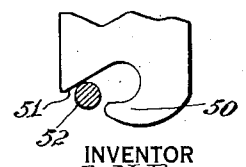


Fig. 8b.



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Fig. 10.

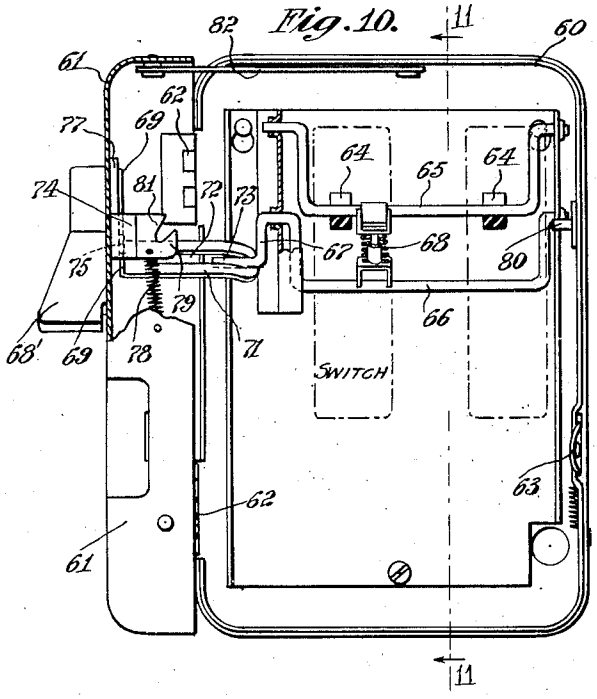


Fig. 11.

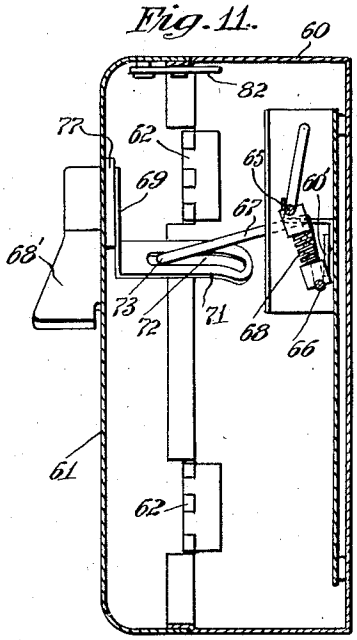


Fig. 12.

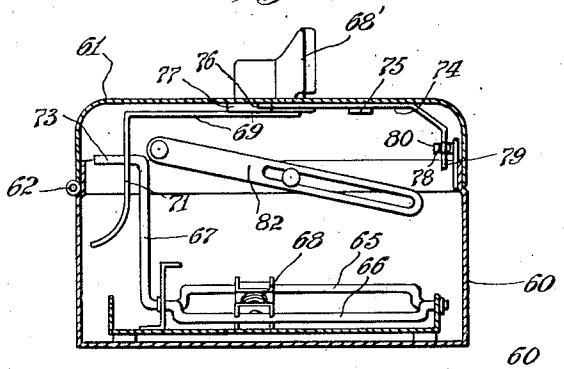


Fig. 14.

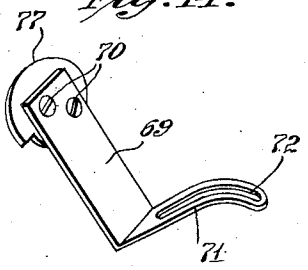
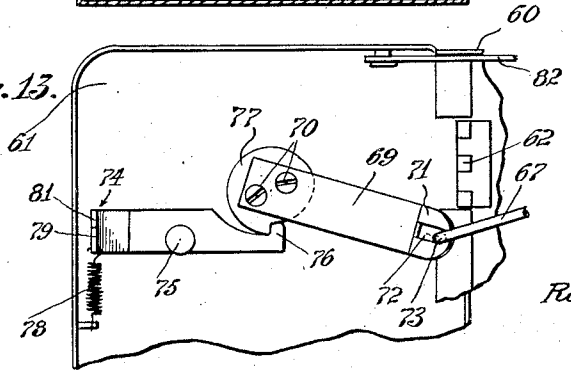


Fig. 13.



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Patented Sept. 23, 1941 2,256,910

UNITED STATES PATENT OFFICE

2,256,910

ENCLOSED SWITCH

Raymond N. Rowe, Plainville, Conn., assignor to The Trumbull Electric Manufacturing Company, Plainville, Conn., a corporation of Connecticut

Application August 2, 1940, Serial No. 349,907

15 Claims. (Cl. 200—50)

My invention relates to what are commonly termed enclosed switches of the front operated type.

One object is to provide actuating mechanism which can be applied to substantially any construction of circuit making and breaking devices.

Another object is to provide mechanism by which the switch may be actuated when the cover is open as well as when the cover is closed.

Another object is to provide interlocking safety features for a switch of this type.

Another object is to provide a front type actuated switch having means for latching the cover when closed in such a way as to permit release of the latching means by a special movement of the actuating handle.

Another object is to provide quick make and break mechanism applicable to the switch of the character described.

In my former application, Serial Number 217,262 filed July 2, 1938, I have shown certain forms of mechanisms having some of the advantages herein set forth.

The present form of my invention contemplates the provision of any suitable type of circuit making and breaking mechanism mounted in a suitable type of box having a hinged cover. The actuating handle is hinged or pivoted to the cover of the box in a manner so that the handle swings in a plane parallel with the main plane of the cover.

On the inside of the box are provided pivoted and sliding means actuating the actuating handle with a lever for operating a circuit making and breaking device. The cover also carries a latch which coacts to lock the handle in a certain position. This latch interlocks under certain conditions with a projection in the body of the box so as to hold the cover closed. In this particular form of the invention, the cover can be opened only when the handle is moved to unlatching position. The mechanism is such that when the cover is opened the switch can be actuated unless the handle is held by the latch. The latch however may then be retracted manually so as to permit operation of the switch.

A simplified form of the invention employs a curved slotted arm which directly engages the switch lever so as to permit actuating of the switch or circuit breaker when the cover is open as well as when it is closed.

Fig. 1 is a front view of a switch box embodying the improvements of my invention, the actuating handle being shown in full lines in the open circuit or off position and in dotted lines in the on position and also in dotted lines in the unlatching position.

Fig. 2 is a view of the inside of the box and the cover, with the cover open, and showing parts in the off position and the interlock released. As the invention is applicable to any suitable type of circuit making and breaking mechanism, I have not shown this in detail. Reference to one form of such mechanism may be found in Patent No. 1,970,520 dated August 14, 1934.

Fig. 3 is a fragmentary view similar to Fig. 2 showing the parts in the on or closed circuit position.

Fig. 3*a* is a sectional view of the handle and associated parts.

Fig. 3*b* is a detail view showing a modified latch construction to permit the cover to be closed while the handle is in either the on or off position.

Fig. 3*c* is a detail view of the tip of the latch of Fig. 3*b*.

Fig. 4 is a front view of one form of construction involving my invention, the cover being closed and parts being broken away to show the interior, parts being in the off position. This also shows in dotted lines the handle and latch in the unlatching position.

Fig. 5 is a side view of this form of construction, part of the box being broken away to disclose the interior.

Fig. 6 is a transverse sectional view of the construction, the cover of the box being closed.

Fig. 7 is a similar section with the cover open.

Fig. 8 is a detail view showing a part of the actuating mechanism which is carried by the cover.

Figs. 8*a* and 8*b* are detail views showing the relation of the latch on the cover to the interlocking pin in the box in the latched and unlatched positions, respectively.

Fig. 9 is a perspective view of the actuating slide or bracket.

Fig. 10 is a front view showing a modified form of construction, the cover of the box being open and shown in section.

Fig. 11 is a longitudinal sectional and side view on line 11—11 of Fig. 10, showing the actuating mechanism, with the cover closed.

Fig. 12 is a transverse sectional view showing the cover closed.

Fig. 13 is an inside view of part of the cover showing the parts of the actuating mechanism carried thereby.

Fig. 14 is a perspective view of the operating lever.

The box body 10 may be of any suitable construction in which is mounted any suitable form of switch mechanism 11 preferably of the quick make and break type, for which an operating crank 12 pivoted in the box is provided. This crank has an operating lever 13.

The cover 14 of the box is hinged along the side edge 15 and may be held in the closed position by a bolt or other locking device 16 which passes through the cover and engages in a seat 17 in one edge of the box body.

The operating handle 20 is provided with a hub which has a bearing in the cover so that the handle can swing in a direction parallel to the plane of the cover. On the inside of the cover is an arm 21 which is loosely secured to the hub of the handle by screws 22 and other parts described below. This arm 21 and the latch 23 which will be later described are normally covered by a plate 24 secured to the cover. This plate has an elongated slot 25 extending parallel with the axis of the hinge 15. In this slot is mounted a slide 26, a part of which extends behind the plate 24 and carries headed studs 27 which serve to guide the slide with respect to the plate and the hinge 15. The arm 28 is connected to the slide 26 by means of a hinge 29, and the inner end of the arm 28 is provided with an offset or foot 30 which rests against the inner wall 31 of the box. This arm 28 is provided with a slot 32 into which projects the offset end 33 of the actuating crank lever 13 previously mentioned.

From the foregoing, it will be seen that when the handle 20 is moved from the full line position of Fig. 1 to the dotted on position of Fig. 1 or vice versa, the arm 21 will be oscillated. This arm 21 has a slot 34 into which a pin 35 on the slide 26 projects. When the arm 21 moves up or down it will accordingly move the slide 26 correspondingly, and the slide 26 of course will move with it the arm 28 and the lever of the operating crank of the switch. This construction is so arranged that this action can take place whether the cover is open or closed.

To allow for the cover latching action, a special form of connection is provided between the arm 21 and the handle 20. Between the arm 21 and the inside of the cover is mounted a disc 37 which is secured to the handle 20 by the screws 22. A washer 38 is mounted so as to have a limited relative rotation in the end of the arm 21, the arm having a lug 39 which projects into an elongated slot 40 in the washer 38. The screws 22 pass through the washer 38 so that the disc 37 and the washer 38 rotate always with the handle. An abutment member 41 is also secured by the screws 22 and is connected by spring 42 to the arm 21. This spring 42 holds the handle 20 and the arm 21 in fixed relation to each other in the normal off and on positions of the switch. The latch 23 is hinged at 45 to the inside of the cover and is biased by the spring 46 so that the inner end 47 presses against the edge of the disc 37. This disc has a hooked portion 48 which is adapted to interlock with the tip 47 of the latch when the handle 20 has been rotated from the full line position of Fig. 1 to the position designated by the number 49 so that when the handle is in this position the latch 23 prevents it from turning. The latch 23 however may be manually retracted when the cover is opened so as to permit the operation of the handle and switch. The outer end of the latch 23 is provided with a hook 50 and an incline 51 which when the cover is closed are adapted to coact with pin 52 projecting inwardly from the side of the box.

In order to open the cover it is necessary to move the handle 20 to the open cover position 49 shown in Fig. 1 as described above. In its simplest form the parts of the present switch must be in this same position in order to close the cover. When the cover is closed, the inclined portion 51 above the hook opening engages with the pin 52 and pressure on the cover will force the pin 52 into engagement with the hook 50, thereby raising the tip 47 of the latch 23 from behind the hook 48 of the disc 37. As soon as this disengagement takes place the spring 42 will move the handle, the disc 37, and the abutment piece 41 to the normal position that they occupy during the off cycle of the switch. The cover is then latched and the handle 20 may be moved to the on position or left in the off position as desired, and in both of these positions the hook 50 of the latch will engage beneath the pin 52 and prevent the opening of the cover.

In case the latch 23 is omitted, it will be obvious that the switch may be operated by moving the handle from the usual on to the off position or vice versa. It is also possible to modify the tip of the latch so as to permit the cover to be closed with the operating handle in the normal off or on position. This is accomplished by putting an incline 50' on the tip of the hook 50 and by making a slotted pivot hole 45' for the pivot 45 of latch 23. The slot allows the hooked end to move freely with respect to the pin 52 against the bias of the spring 46 even though the tip 47 may be disengaged from the hook 48 of disc 37. The locking action takes place because the spring 46 still moves the hooked end 50 no matter what the position of end 47.

In the form shown on sheet 3, the box body 60 has a cover 61 hinged at 62, a spring pressed latch 63 serving to hold the cover in the closed circuit position.

The switch mechanism proper includes one or more movable contact member 64 which are directly actuated by crank shafts 65 suitably supported in the bottom of the box.

A secondary crank shaft 66 is also pivoted in the box and has an extended lever 67 adjacent the hinged edge of the cover. A spring pressed member 68 is interposed between the two cranks 65 and 66 to cause a quick break and make action of the crank 65 when the lever 67 is moved back and forth. An abutment member 60' may be mounted beneath the member 68 to provide a positive "kick" for the crank 65.

The operating handle 68' is rotatably supported in the front of the cover so that it can be swung from right to left. In the form shown, when swung to the right, the parts are in the off or open circuit position and when the handle is swung to the left, the parts are in the closed or on position.

The arm 69 inside the cover is secured to the handle 68' by a number of screws or other fastening devices 70 so that the arm 69 swings back and forth with the handle 68'. This arm 69 has an extension 71 which is curved or bent toward its end and provided with a slot 72 into which extends the end 73 of the lever 67. This arm and lever are so constructed that they have a sliding connection which remains effective when the cover is closed and when it is open.

The result is that when the cover is closed the operating lever 67 may be swung back and forth to open and close the circuit by moving the operating handle from one side to the other. The same action takes place when the cover is open. It is thus possible for the inspector to fully test the switch when the cover is open.

To prevent opening the cover when the circuit is closed and to prevent unintentional closing of the circuit when the cover is open, I provide a latch member 74 which is hinged at 75 in the cover and has a hook-like tip 76 at its inner end adapted to interlock with a camlike disc 77 connected to the handle by screws 70. This latch 74 is under tension of spring 73 tending to move the latch to a position to interlock with the disc 77. The outer end of the latch has a hook portion 79 adapted to interlock with a pin 80 projecting from the edge of the box opposite the hinge 62. This end also has an inclined portion 81 adapted to engage the pin 80 when the cover is closed so as to retract the hook 79 from the pin 80 and allow the cover to be opened after the circuit is closed. The hook 79 prevents the opening of the cover after the circuit is open.

A strap or other device 82 may be provided to limit the opening of the cover.

In comparing the forms shown in Figs. 1 through 8b and in Figs. 10 through 14, it will be noted that the handle 20 corresponds with the handle 68', the disc 37 with the disc 77, the latching piece 74 with the latching piece 23, the arm 21 with its associated mechanism up to the yoke serves substantially the same purpose as the arm 69, and the yoke 12 corresponds generally to the yoke 65. The particular arrangement allowing for the 3-position handle action in the first form could be applied to the mechanism of the second form as is obvious.

The double yoke 66, 65 with the spring 68 could also be applied to the mechanism of the first form if desired.

I claim:

1. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including an actuator with a portion extending toward said hinged edge, operating mechanism having a movably mounted handle on the outside of the cover, a movable arm mounted inside of the cover and connected to the handle for movement therewith, an end of said arm extending toward the hinged edge of the cover, and means establishing slidable and rotatable connection between the said end of said arm and the extended portion of said actuator for maintaining operable connection between said arm and said actuator in all positions of said cover with respect to said box body.

2. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including an actuator with a portion extending toward said hinged edge, operating mechanism having a rotatably mounted handle on the outside of the cover, an arm rotatably mounted at one end inside of the cover and connected to the handle for rotation therewith in a plane parallel and close to the inside of the cover, the free end of said arm extending toward the hinged edge of the cover, and means establishing slidable and rotatable connection between the free end of said arm and the extended portion of said actuator for maintaining operable connection between said arm and said actuator in all positions of said cover with respect to said box body.

3. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including a swinging actuator rod with an end extending toward and close to said hinged edge, operating mechanism having a handle pivotally mounted on the outside of the cover for movement in a plane parallel to the cover, an arm pivotally mounted at one end inside of the cover and connected to the handle for pivoting therewith, the free end of said arm extending toward the hinged edge of the cover, and a pin and slot connection between the free end of said arm and the extended end of said actuator rod for maintaining operable connection between said arm and said actuator in all positions of said cover with respect to said box body.

4. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including a pivoted actuator with a portion extending toward said hinged edge for movement in a plane generally parallel and close to the hinge axis, operating mechanism having a rotatable handle on the outside of the cover, an arm rotatably mounted at one end inside of the cover and connected to the handle for rotation therewith, the free end of said arm extending toward the hinged edge of the cover and close to the cover, and an extensible connection at all times effective between the free end of said arm and the extended portion of said actuator for maintaining operable connection between said arm and said actuator in all positions of said cover with respect to said box body.

5. An enclosed switch having a box body with a cover hinged along one side edge, a switch operating lever pivoted in the body of the box and a handle on the outside of the cover hinged to swing parallel with the surface of the cover, an arm connected to said handle inside of said cover and a hinge member having one part always operatively connected to said lever and another part always operatively connected to said arm so that the switch can be actuated by said handle when the cover is closed and also when the cover is open.

6. An enclosed switch having a box body with a cover hinged along one side edge, a switch operating lever pivoted in the body of the box and a handle on the outside of the cover hinged to swing parallel with the surface of the cover, an arm connected to said handle inside of said cover and a jointed member always operatively connected to said lever and to said arm so that the switch can be actuated by said handle when the cover is closed and also when the cover is open, and a latch carried by the cover and coacting with said handle to prevent its operation when the cover is open, said latch being manually retractable and means for retracting the latch when the cover is closed.

7. An enclosed switch including a box body, a cover hinged along one edge thereof, snap switch mechanism in the box body, means for actuating said switch mechanism including a handle on the outside of the cover and mechanism for latching said cover on the box body upon closing movement of the cover and means actuated by movement of the handle in a direction toward and beyond the normal off circuit

position for releasing said latching means when the cover is closed.

8. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including an actuator with a portion extending toward said hinged edge, operating mechanism having a movably mounted handle on the outside of the cover, a movable arm mounted inside of the cover and connected to the handle for movement therewith, an end of said arm extending toward the hinged edge of the cover, means establishing slidable and rotatable connection between the said end of said arm and the extended portion of said actuator for maintaining operable connection between said arm and said actuator in all positions of said cover with respect to said box body and means for guiding the sliding movement of the end of said arm.

9. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including an actuator with a portion extending toward said hinged edge, operating mechanism having a movably mounted handle on the outside of the cover, a movable arm mounted inside of the cover and connected to the handle for movement, therewith, an end of said arm extending toward the hinged edge of the cover, means establishing slidable and rotatable connection between the said end of said arm and the extended portion of said actuator for maintaining operable connection between said arm and said actuator in all positions of said cover with respect to said box body and means for guiding the sliding movement of the end of said arm including a plate on the inside of the cover spaced from said arm and having a slot and studs carried by said arm coacting with the edges of said slot.

10. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including a pivoted actuator with a portion extending toward said hinged edge for movement in a plane generally parallel and close to the hinge axis, operating mechanism having a rotatable handle on the outside of the cover, an arm rotatably mounted at one end inside of the cover and connected to the handle for rotation therewith, the free end of said arm extending toward the hinged edge of the cover and close to the cover, and another arm hingedly connected to the first named arm and extending into the box body and formed with a slot for receiving the extended portion of said actuator for maintaining operable connection between said last named arm and said actuator in all positions of said cover and said box body.

11. An enclosed switch including a box body having a cover hinged thereto adjacent one edge, a circuit breaker mounted in the box body including a pivoted actuator with a portion extending toward said hinged edge for movement in a plane generally parallel and close to the hinge axis, operating mechanism having a rotatable handle on the outside of the cover, an arm rotatably mounted at one end inside of the cover and connected to the handle for rotation therewith and an integral extension formed on said arm and curved toward its free end, said curved extension having an elongated slot for receiving the extended portion of the actuator whereby an operable connection is maintained between said arm and said actuator in all positions of said cover with respect to said box body.

12. In an enclosed switch, a box including a cover hinged thereto, a circuit breaker mounted in the box and having an actuating lever, an arm movably supported in the box and engaging said actuating lever of the circuit breaker and operating means having a handle carried by the cover for moving the arm and means of maintaining operable connection between said actuating lever and said arm in all positions of said cover with respect to said box.

13. An enclosed switch including a box having a cover hinged thereto and a rear wall, a switch mounted in the box on the rear wall and having a projecting operating lever, a handle movably mounted on the outside of the cover, an arm on the inside of the cover and movable by the handle, and a slidable and rotatable connection means for operably connecting said arm to said operating lever in all positions of said cover with respect to said box.

14. In a switch of the character described, a box having a cover hinged to one edge of the body, a circuit breaker mounted in the box body and having an actuating lever extending toward the cover adjacent the hinged edge thereof, an operating handle having a bearing in the front of the cover and hinged to swing parallel with the face of the cover and means carried by the cover and operatively connected with the handle and including a slotted arm connected with said lever in all operative positions of the cover for actuating the circuit breaker.

15. An enclosed switch construction including a box having a cover hinged at one edge and having circuit making and breaking mechanism in the box and having an operating handle pivoted in the front of the cover, said handle having an on position, an off position and a third position, means of connection between the handle on the cover and the circuit making and breaking mechanism in the box operable when the cover is open or closed, latching means operable when the cover is closed to prevent opening the cover except when the handle is in the said third position and means permitting said cover to be closed when the handle is in either the on or off position.

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