H. S. FREEMAN.

ELECTRICAL SWITCH AND INTERLOCKING CASING.

APPLICATION FILED MAY 9, 1918.

1,412,466. Patented Apr. 11, 1922.

2 SHEETS—SHEET 1.

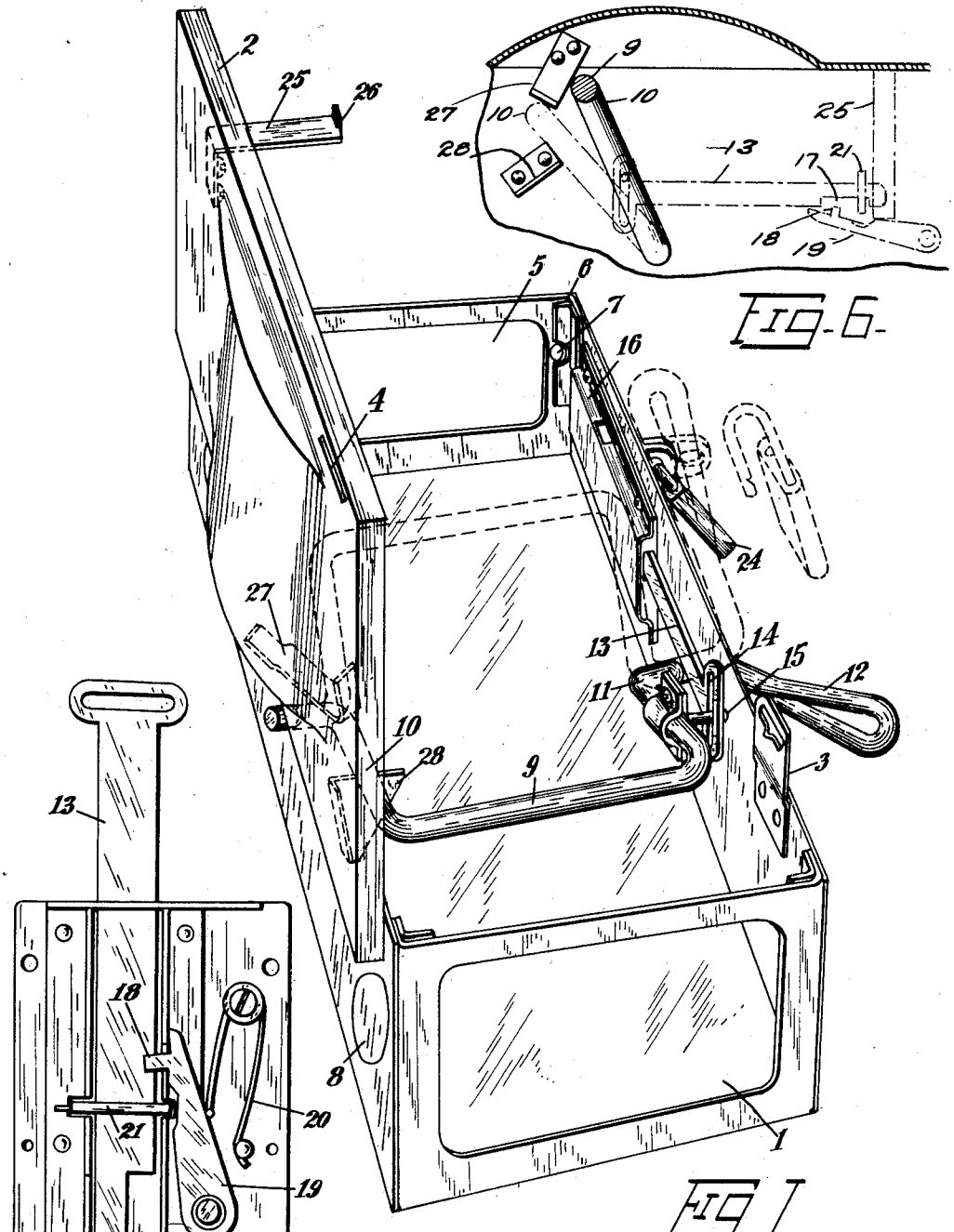


FIG. 6.

FIG. 1

FIG 2

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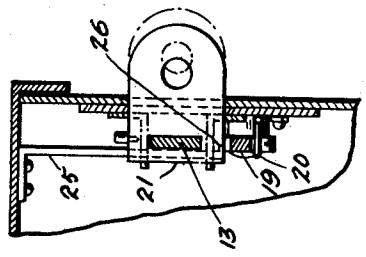


FIG-5-

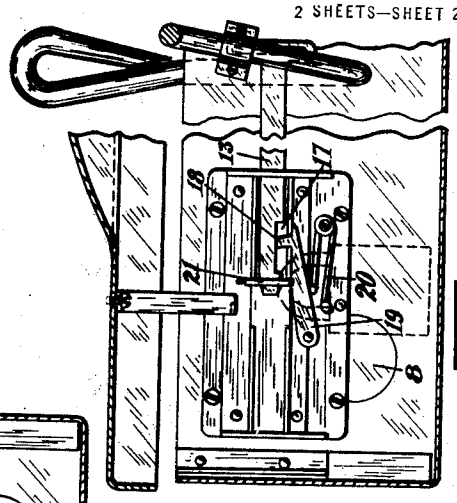


FIG 4

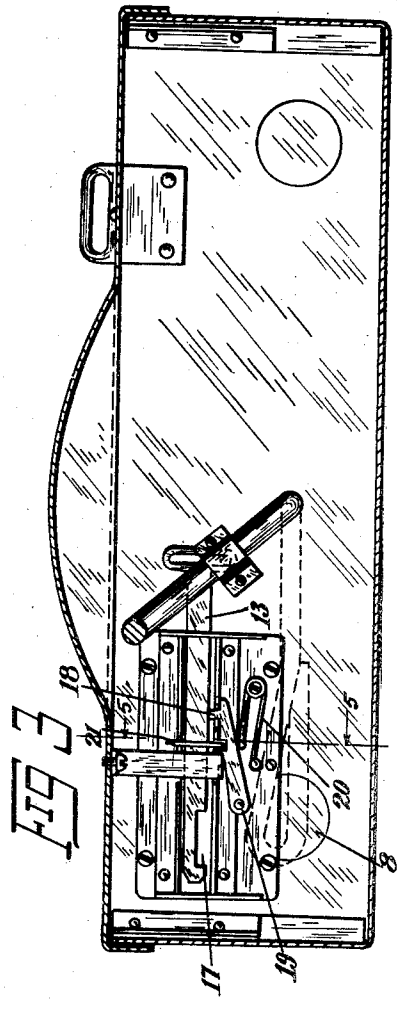


FIG 3

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ELECTRICAL SWITCH AND INTERLOCKING CASING.

1,412,466. Specification of Letters Patent. Patented Apr. 11, 1922.

Application filed May 9, 1918. Serial No. 233,416.

To all whom it may concern:

Be it known that I, HARRY S. FREEMAN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Electrical Switches and Interlocking Casings, of which the following, taken in connection with the accompanying drawings, forms a complete and exact description thereof.

My invention relates to electrical switch of the general type having an enclosing casing of metal or other suitable material properly insulated from the electrical contacts of the switch mechanism generally known as armor-clad switches.

One of the objects of this invention is to provide an enclosed switch with interlocking cover and switch mechanism whereby access cannot normally be had to the interior of the casing until the switch is in open position nor can the switch be closed normally until the cover is first closed. These switches perform the very desirable function of preventing workmen or others from coming into contact with live parts of the switch mechanism as, under normal conditions, the cover is always closed while the switch is closed and can only be opened after the switch is opened. However, it will be readily seen that it would be impossible for the test man or inspector to inspect the switch mechanism without first shutting off the customer's power, inasmuch as the cover cannot be opened normally without first opening the switch.

It is, therefore, a further object of my invention to so design the interlocking mechanism that such mechanism may be temporarily rendered ineffective by an authorized person suitably equipped with a key or similar means whereby access may be had to the interior of the casing while the switch is closed and also whereby the switch may be closed while the cover is open. It will, therefore, be seen that a suitably equipped authorized person may inspect the switch mechanism without interfering with the customer's power, as he may then open the box or casing without first opening the switch.

It is a further object of this invention to so design the interlocking mechanism that at the completion of the inspection or test such interlocking mechanism may be again rendered effective.

It is a further object of this invention to so design the interlocking cover and switch mechanism that the switch may be permanently locked in "off" position, if so desired.

It is a further object of this invention to provide for the operation of such switch by means of an external handle or other suitable means, whereby the workman or others may turn on or off the current without opening such box or casing.

It is a further object of this invention to generally simplify the construction of enclosed or armor-clad switches whereby a very rugged or practically foolproof structure results.

One of the many possible embodiments of the invention is shown in the accompanying drawings wherein similar reference characters designate similar parts.

Fig. 1 is a perspective view of an armor-clad or enclosed switch showing in full lines the switch operating mechanism in open position, and in dotted lines the switch operating mechanism in closed position. Such figure further shows in dotted lines the ineffective position of the disabler for the interlocking means.

Fig. 2 is a detailed side elevation of a portion of the interlocking mechanism in the ineffective position, and with the switch "on," the small cover or shield plate removed, whereby the interior of such mechanism may be seen.

Fig. 3 is a longitudinal sectional view through the casing with the small cover of the interlocking mechanism removed and showing the details of the interlocking mechanism.

Fig. 4 is a longitudinal fragmentary sectional view showing the details of the interlocking mechanism in position with the switch operating means in "off" position and the cover partly raised.

Fig. 5 is a section on line 5—5 of Fig. 3 showing the cover locked closed in full lines, and the interlocking mechanism disabled, in dot and dash lines.

Fig. 6 is a view showing the switch and lockoff as related to the interlocking mechanism.

Referring now in detail to the drawings, it will be noted that the electrical portion of the switch mechanism has not been shown and only the operating means for such

mechanism has been shown, as this operating mechanism is a part of the switch mechanism which cooperates with the interlocking cover and relates directly to this invention. It will be seen from Fig. 1 that the casing comprises a base 1, a cover 2, such cover and base being hingedly connected in the usual manner and adapted to be locked in closed position by means of an apertured member 3 on the body portion of the casing which is adapted to pass through an opening 4 in the top and such apertured member thereafter adapted to receive the hook or bail-shaped portion of a suitable padlock or other means.

This casing, it will be noted, has open ends, as shown at 5, and has adjacent such open ends at the interior corners thereof, angle irons 6. Interchangeable end plates (not shown) of any suitable type are adapted to be slipped between the angle irons 6 and end portions of the casing and are held in position from upward sliding by means of suitable screws or bolts passing through apertures 7 or by means of the top 2 which, when the box is in closed position, suitably holds such interchangeable end plates from displacement. It will be noted that the casing is provided with suitable knock-outs 8 which may, if desired, be removed and thereby accommodate a particular type of wiring.

The switch operating mechanism is shown at 9 and comprises an inverted U-shaped member having downwardly extending arms 10 and 11 such arms terminating in laterally extending portions which are pivotally related to the casing. On one side of the casing is provided an external handle 12 fastened to one of such laterally extending portions or made integral therewith as shown, whereby the switch mechanism may be operated from the exterior of the box without opening the cover. In order to provide for the interlocking relation of the cover and switch mechanism a link or bar 13 is provided which has a slot 14 at its outward end, which slot cooperates with a pin 15 bolted or otherwise fastened upon the arm 11. Upon the movement of the switch operating means such bar 13 is given a reciprocatory motion. The reciprocatory bar or arm extends into the small casing or shield plate 16 which encloses a portion of the interlocking mechanism. This interlocking mechanism is shown in detail in Figs. 2 to 4, inclusive. The forward end of the bar or arm 13 is provided with a recess 17 which is adapted to cooperate in one position with a projection or lug 18 provided upon a latch member or pivoted pawl 19 which is upwardly pressed by means of a spring 20. This reciprocatory arm 13 passes through a guiding member or strap 21 as shown in Fig. 5, which strap has a projecting portion 22 extending through an opening in the casing to the outside of the casing or box. This portion 22 has an opening therein which alines with a similar opening provided in an ear 23 rigidly fastened upon the exterior of the casing. These alining openings are adapted to receive the hook or bail-shaped portion of a padlock 24, or other suitable means, whereby the guiding strap 21 is locked in place to thereby definitely position the reciprocatory bar or arm 13 laterally within the casing and in its lateral relation to the rest of the interlocking mechanism. Rigidly secured to the cover 2 of the casing is a tongue or finger 25 which extends downwardly therefrom and is provided with an outwardly extending shoulder or lip 26.

The operation of this interlocking mechanism will now be described in detail. In normal condition, when the interlocking mechanism is in effective operation, as shown in full lines in Fig. 1, the padlock 24 positions the strap 21 through the medium of the aligning openings in the members 22 and 23 so that the bar 13 is pressed away from the wall of the casing toward the shield plate and into engagement upon its lower side with the lip 26 of the tongue 25. It will thus be seen that it is now impossible to raise the cover with the switch in its closed position. However, when the switch is thrown into its open or "off" position, the bar 13 is withdrawn from engagement with the lip 26, as shown in Fig. 4, and the cover may then be raised. If it is now attempted to close the switch, it will be readily understood that the projection 18 of the pawl 19 engages in the recess 17 of the bar 13 and prevents such bar, and consequently the switch operating mechanism from moving to the "on" position. However, when the cover is closed the shoulder or lip 26 of the finger 25 presses against the pawl 19 and withdraws the projection 18 from engagement with the recess 17 of the bar 13.

It will thus be seen that it is impossible under normal conditions to open the cover of the casing without first opening the switch, and it is also impossible under normal conditions to close the switch without first closing the cover.

In order to provide for rendering this interlocking effect ineffective temporarily, the strap member 21 is operated from the exterior of the box by first removing the padlock 24 and drawing such strap member outwardly towards the outer side of the casing by means of the projecting member 22. From an inspection of Fig. 5, it will thus be seen that the bar 13 is withdrawn from engagement with the lip 26 and the cover may, therefore, be raised while the switch is still in "on" position. It will also be seen from an inspection of Figs. 2 and 5 that when the strap member 21 is pulled

outwardly the projection 18 of the pawl member 19 lies on the inner side of the bar 13 and does not lie in the path of travel of the aperture 17 in such bar, and consequently, does not interfere with the full travel of such bar in either longitudinal direction.

It will be seen from the above that when the interlocking mechanism is rendered ineffective by the means above described the cover and switch operating mechanism are wholly independent and may be operated independently of each other in any manner desired.

It will also be seen from the above description that great flexibility is provided in an armor-clad or enclosed switch of this type, whereby it is possible to have a normally interlocking cover and switch mechanism rendered temporarily independently operative by means of a key or other device carried by a properly authorized person such as an inspector or test man.

As shown in Figs. 1 and 6, the cover carries an L-shaped member 27 which normally acts as a stop to limit the motion of the operating crank 9. When, however, it is desired to lock the switch open so it cannot be closed by the consumer, the cover is opened and the crank 9 moved to its extreme position where it is stopped by the lug or projection 28 carried by the casing. When the cover is again closed, the crank is between the member 27 and the lug 28, as shown in dot and dash in Fig. 6. The insertion of a lock through the aperture in member 3 completes the operation so the switch cannot be closed. The bar 13 will be moved on account of the extra movement of the crank 9, and in order that the projection 18 will not interfere, the slot 17 is elongated.

The arrangement just described provides an interlocking cover and switch mechanism wherein the switch mechanism may be locked in off position if desired, without affecting the interlocking mechanism, that interlocking mechanism being associated with the disabling device.

The above description is specific to the form of invention shown but such description and drawings must be interpreted in an illustrative sense and not in a limiting sense, except as hereinafter defined by the following claims:—

1. In an enclosed switch having a casing provided with a cover, means for operating said switch, means operated by said switch operating means for interlocking said switch and cover, comprising a linearly reciprocatory laterally movable bar co-operating with the cover, whereby normally the cover cannot be opened until the switch is opened.

2. In an enclosed switch having a casing provided with a cover, means for operating said switch, means operated by said switch operating means for interlocking said switch and cover, comprising a linearly reciprocatory laterally movable bar, and means carried by the cover and co-operating therewith, whereby normally the cover cannot be opened until the switch is opened.

3. In an enclosed switch having a casing provided with a cover, means for operating said switch, means operated by said switch operating means for interlocking said switch and cover comprising a linearly reciprocatory laterally movable bar, and a finger fastened to the cover and normally co-operating therewith, whereby the cover cannot be opened until the switch is opened.

4. In an enclosed switch having a casing provided with a cover, means for operating said switch, means operated by said switch operating means for interlocking said switch and cover comprising a linearly reciprocatory laterally movable bar, and a finger fastened to the cover, said finger having a shoulder adapted to engage said bar and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened.

5. In an enclosed switch having a casing provided with a cover, means for operating said switch comprising an interiorly arranged inverted U-shaped member, means operated by one arm of said U-shaped member for interlocking said switch and cover, and comprising a linearly reciprocatory bar, and means operated by the cover and co-operating therewith, whereby normally the cover cannot be opened until the switch is opened, and means for rendering the interlocking means temporarily ineffective, whereby the cover may be opened while the switch is closed.

6. In an enclosed switch having a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising means operated by said switch operating means, a downwardly extending finger controlled by the operation of the cover, whereby normally the cover cannot be opened until the switch is opened, and a removable lock for the last mentioned means for rendering said interlocking means temporarily ineffective, whereby the cover may be opened while the switch is closed.

7. In an enclosed switch having a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising means operated by said switch operating means, a downwardly extending finger carried by the cover, whereby normally the cover cannot be closed until the switch is closed, means for rendering said interlocking means temporarily ineffective, whereby the cover may be opened while the switch is closed and a removable lock for the last mentioned means.

8. In an enclosed switch having a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising means operated by said switch operating means, a downwardly extending finger fastened to the cover, whereby normally the cover cannot be opened until the switch is opened and the cover cannot be closed until the switch is closed and means for rendering said interlocking means temporarily ineffective, whereby the cover and the switch may be independently operated.

9. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a movable member operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, and a latch member cooperating with said movable member and controlled by the cover carried member, whereby normally the switch cannot be closed until the cover is closed.

10. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a movable member operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, and a pivoted pawl cooperating with said movable member and controlled by the cover carried member, whereby normally the switch cannot be closed until the cover is closed.

11. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, and a latch member cooperating with said reciprocatory bar and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed.

12. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, and means for interlocking said switch and cover comprising a reciprocatory bar provided with a recess and operated by said switch operating means, means carried by said cover and cooperating with said reciprocatory bar whereby normally the cover cannot be opened until the switch is opened, and a pivoted pawl cooperating with said recess and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed.

13. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a movable member operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, a latch member cooperating with said movable member and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means temporarily ineffective whereby the cover and switch may be independently operated.

14. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a movable member operated by said switch operating means, means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, and a pivoted pawl cooperating with said movable member and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means temporarily ineffective, whereby the cover and switch may be independently operated.

15. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar operated by said switch operating means, means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, and a pivoted pawl cooperating with said reciprocatory bar and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means temporarily ineffective whereby the cover and switch may be independently operated.

16. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar having a recess and operated by said switch operating means, means carried by said cover and cooperating with said reciprocatory bar whereby normally the cover cannot be opened until the switch is opened, and a pivoted pawl cooperating with said recess and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking

means temporarily ineffective whereby the cover and switch may be independently operated.

17. In an enclosed switch having a casing provided with a cover, means for operating said switch, means operated by said switch operating means for interlocking said switch and cover comprising a reciprocatory bar and means carried by the cover cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, and means for temporarily rendering the interlocking means ineffective comprising a movable strap member surrounding said reciprocatory bar and governing its lateral position relative to the cover operated means, whereby the cover may be opened while the switch is closed.

18. In an enclosed switch having a casing provided with a cover, means for operating said switch, means operated by said switch operating means for interlocking said switch and cover comprising a reciprocatory bar and a finger fastened to the cover and cooperating with said reciprocatory bar, whereby normally the cover cannot be opened until the switch is opened, and means for rendering the interlocking means temporarily ineffective, comprising a movable strap means surrounding said reciprocatory bar and governing its lateral position relative to said finger, whereby the cover may be opened while the switch is closed.

19. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a movable member operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, a latch member cooperating with said movable member and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means and latch member temporarily ineffective, comprising a movable strap member surrounding said movable member and governing its lateral position relative to the cover operated means and said latch member, whereby the cover and switch may be independently operated.

20. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a movable member operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, a pivoted pawl cooperating with said movable member and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means and pivoted pawl temporarily ineffective, comprising a movable strap member surrounding said movable member and governing its lateral position relative to the cover operated means and said pivoted pawl, whereby the cover and switch may be independently operated.

21. In an enclosed switch having a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, a pivoted pawl cooperating with said reciprocatory bar and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means and pivoted pawl temporarily ineffective, comprising a movable strap member surrounding said reciprocatory bar and governing its lateral position relative to cover operated means and said pawl, whereby the cover and switch may be independently operated.

22. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar having a recess and operated by said switch operating means and means carried by said cover and cooperating with said reciprocatory bar, whereby normally the cover cannot be opened until the switch is opened, a pivoted pawl cooperating with said recess and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means and pivoted pawl temporarily ineffective, comprising a movable strap member surrounding said reciprocatory bar and governing its lateral position relative to the cover operated means and said pawl, whereby the cover and switch may be independently operated.

23. In an enclosed switch having a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar operated by said switch operating means and means carried by said cover and cooperating therewith, whereby normally the cover cannot be opened until the switch is opened, a pivoted pawl cooperating with said reciprocatory bar and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, means for rendering the interlocking means and pivoted pawl temporarily ineffective, comprising a movable strap member surrounding said reciprocatory bar and govern-

ing its lateral position relative to said cover operated means and said pawl, whereby the cover and switch may be independently operated, and means for locking said strap member in one position.

24. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar having a recess and operated by said switch operating means and means carried by said cover and cooperating with said reciprocatory bar, whereby normally the cover cannot be opened until the switch is opened, a pivoted pawl cooperating with said recess and controlled by the cover carried means, whereby normally the switch cannot be closed until the cover is closed, means for rendering the interlocking means and pivoted pawl temporarily ineffective, comprising a movable strap member surrounding said reciprocatory bar and governing its lateral position relative to the cover operated means and said pawl, whereby the cover and switch may be independently operated, and means for locking said strap member in one position.

25. In an enclosed switch, comprising a casing provided with a cover, means for operating said switch, means for interlocking said switch and cover comprising a reciprocatory bar having a recess and operated by said switch operating means and a finger fastened to the cover and provided with a shoulder and cooperating with said reciprocatory bar, whereby normally the cover cannot be opened until the switch is opened, a pivoted pawl cooperating with said recess and controlled by said shoulder, whereby normally the switch cannot be closed until the cover is closed, and means for rendering the interlocking means and pivoted pawl temporarily ineffective, comprising a movable strap member surrounding said reciprocatory bar and governing its lateral position relative to the said shoulder and said pawl, whereby the cover and switch may be independently operated, and means for locking said strap member in one position.

26. In combination, a switch, a protective enclosure for such switch provided with a cover removable to afford access to the switch, means external of the enclosure for operating the switch, an interlock between the switch and cover preventing opening of the cover while the switch is closed, and an inside lockoff carried by the enclosure whereby the switch may be locked open.

27. In combination, a switch, a protective enclosure for such switch provided with a cover removable to afford access to the switch, means external of the enclosure for operating the switch, an interlock between the switch and cover preventing closing of the cover while the switch is open, and an inside lockoff carried by the enclosure whereby the switch may be locked open.

28. In combination, a switch, a protective enclosure for such switch provided with a cover removable to afford access to the switch, means external of the enclosure for operating the switch, an inside stop and lockoff whereby the switch operating means has normally a limited movement in the open position and whereby the switch operating means may be locked off when moved to extreme open position, and an interlocking mechanism between the switch operating means and the cover whereby operation of the cover and switch in pre-arranged sequence is insured, such interlocking mechanism having provision for movement of the switch operating means to both positions.

29. In combination, a switch, a casing having sides and provided with a cover hinged on one edge and removable to afford access to the switch, a U shaped switch operating crank pivotally mounted in the sides of the casing, one edge of the cover and one of the sides of the casing carrying means co-operating with one side of the U-shaped crank to stop and to lock off the crank, the other edge of the cover and side of the casing carrying an interlocking device co-operating with the other side of the U-shaped crank to insure pre-arranged sequence of operation of the cover and crank respectively, and means for normally retaining the cover closed.

30. In combination, a switch, a casing having sides and provided with a cover hinged on one edge and removable to afford access to the switch, a U-shaped switch operating crank pivotally mounted in the sides of the casing, one edge of the cover and one of the sides of the casing carrying means co-operating with one side of the U-shaped crank to stop and to lock off the crank, the other edge of the cover and one side of the casing carrying an inter-locking device co-operating with the other side of the U-shaped crank to insure pre-arranged sequence of operation of the cover and crank respectively, and means for normally retaining the cover closed, said interlocking device being on the edge remote from the hinge.

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