Nov. 1, 1938. J. C. RACH 2,134,986

COVER INTERLOCKING DEVICE FOR SAFETY SWITCHES

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Fig. 1

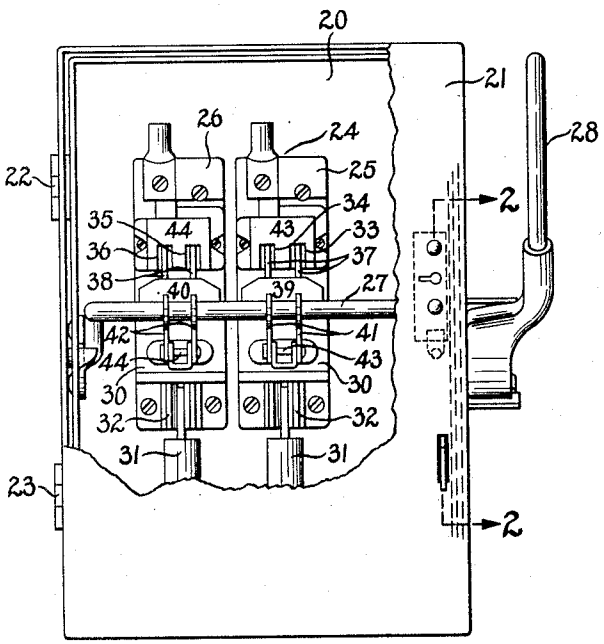


Fig. 2

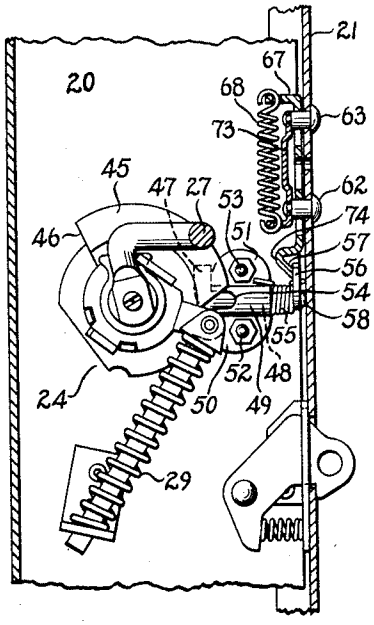


Fig. 3

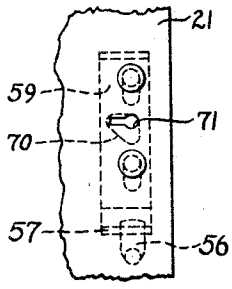


Fig. 4

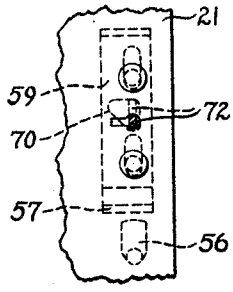


Fig. 5

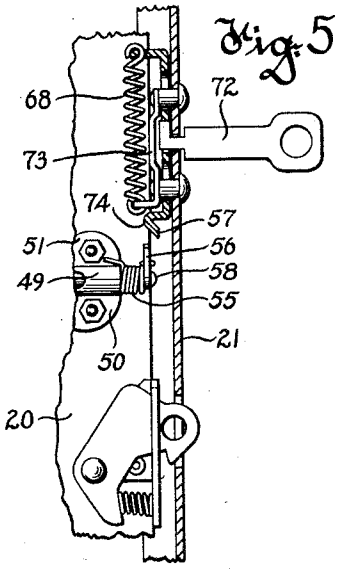
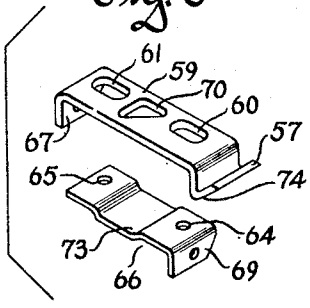


Fig. 6



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Fig. 7

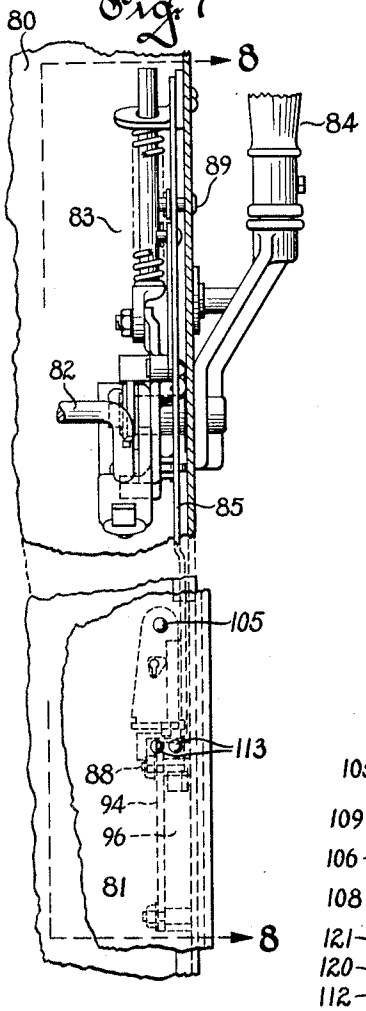


Fig. 8

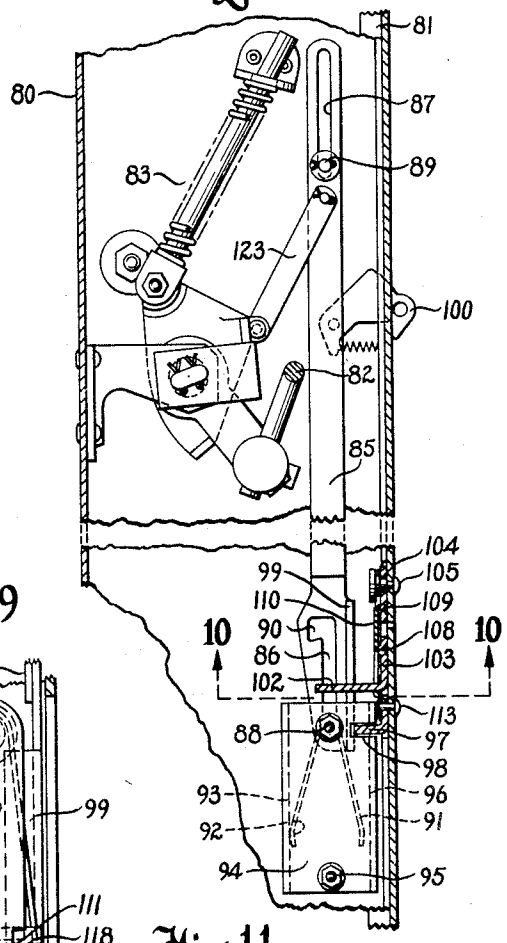


Fig. 9

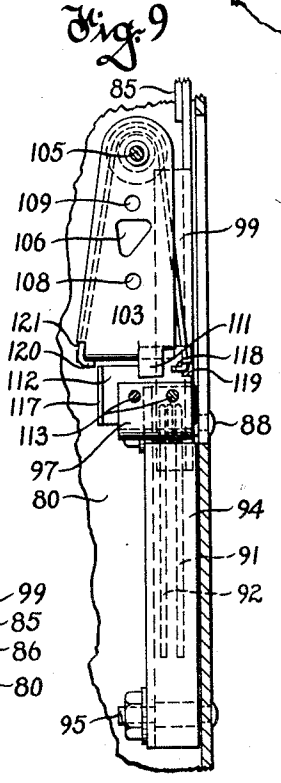


Fig. 10

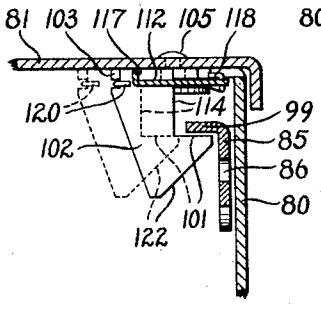
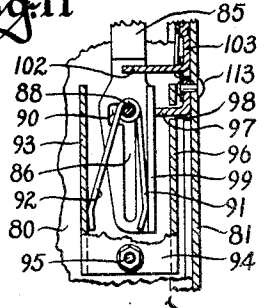


Fig. 11



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Fig. 12

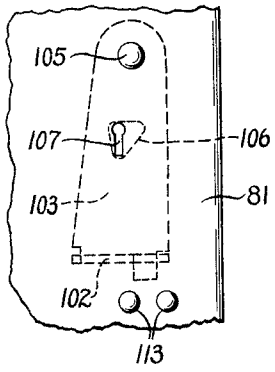


Fig. 13

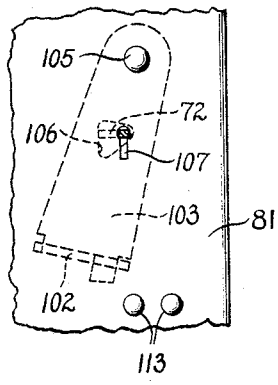
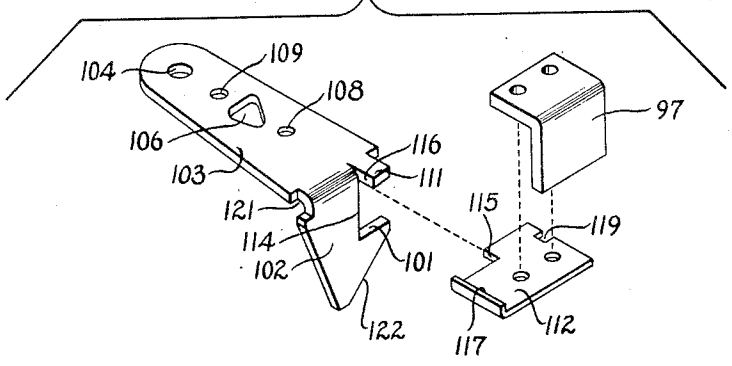


Fig. 14



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UNITED STATES PATENT OFFICE

2,134,986

COVER INTERLOCKING DEVICE FOR SAFETY SWITCHES

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Application January 2, 1937, Serial No. 118,823

15 Claims. (Cl. 200—50)

This invention relates to improvements in cover interlocking devices for safety switches.

The invention relates more particularly to improvements in interlocking devices of the character wherein the casing cover is normally locked in closed position so long as the switch remains closed and wherein closing of the switch is prevented when the cover is open.

An object of the invention is to provide improved and simplified interlocking devices of the aforementioned character whereby an authorized person may, by means of a suitable key, disable the interlock to provide for opening of the casing cover when the switch is in closed position.

Another object is to provide means whereby the cover interlock, when disabled, acts to yieldably retain the key in operated position.

Another object is to provide means for insuring normal positioning of the elements of the interlock upon removal of the key.

Another and more specific object is to so construct and arrange the elements of the interlock as to provide for manual reclosure and automatic locking of the casing cover, independently of the key, in the closed position of the switch, after the cover has been opened.

Another object is to provide novel forms of cover interlock for co-operation with safety switches of the snap-action type.

Another object is to generally improve and simplify the details of construction and arrangement of the elements of the cover interlock.

Another object is to improve the safety characteristics of switches having cover interlocks of the aforementioned character.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that the embodiments illustrated are susceptible of modification in respect of certain details of construction thereof without departing from the scope of the appended claims.

In the drawings, Figure 1 is a top plan view of a safety switch having my improved interlock applied thereto, the casing cover being closed, and the cover being partly broken away to show the switch mechanism in its closed position.

Fig. 2 is a fragmentary sectional view, on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary plan view similar to Fig. 1, showing in dotted lines the relative positions of the cover interlock elements when the cover is closed and the switch is closed, prior to insertion and operation of the key.

Fig. 4 is a fragmentary view similar to Fig. 3, but showing the elements of the interlock and the key in the relative positions assumed thereby after operation of the key, thus disabling and positively restraining the interlock and providing for yieldable restraint or retention of the key.

Fig. 5 is a sectional view, showing the elements of the interlock and the key in the relative positions thereof illustrated in Fig. 4, the usual spring-pressed latch being shown in manually disengaged position, and the casing cover being partly opened.

Fig. 6 is a detail perspective view of the spring-biased slidable catch carried by the casing cover, to be associated therewith in the manner illustrated in Figs. 2 and 5.

Fig. 7 is a fragmentary view, partly in top plan and partly in section, of a modified form of key-releasable interlock between the switch mechanism and the casing cover.

Fig. 8 is a fragmentary sectional view on the line 8—8 of Fig. 7.

Fig. 9 is a fragmentary view, on an enlarged scale, of certain of the interlock elements shown in Fig. 7.

Fig. 10 is a sectional view on the line 10—10 of Fig. 8, and showing in dotted lines the relative position of the catch upon releasing operation of the key.

Fig. 11 is a fragmentary sectional view of certain elements of the interlock shown in Fig. 8, but illustrating the relative positions thereof in the open position of the switch, with the cover closed.

Fig. 12 is a fragmentary top plan view of the casing cover, showing in dotted lines the position of the spring-biased catch (as shown in full lines in Fig. 10), prior to insertion and operation of the key.

Fig. 13 is a fragmentary view similar to Fig. 12, but showing in dotted lines the position of the spring-biased catch (as shown in dotted lines in Fig. 10), after insertion and operation of the key, and

Fig. 14 is a detail perspective view of the spring-biased catch and certain of the relatively fixed parts associated therewith, prior to attachment thereof to the casing cover.

Referring first to Figs. 1 to 6, the numeral 20 designates a metal casing of known form having an opening which is adapted to be closed by a flanged cover 21, which is hinged to one side of the casing, as shown at 22 and 23. Adapted to

be enclosed within casing 20 is a known form of snap-action switch mechanism. Said mechanism as shown may be of the character shown and described in the patent to J. J. Dante, No. 1,795,641, granted March 10, 1931, the same being designated in general herein by the numeral 24 in Fig. 1. Two identical switch units 25 and 26 are shown within casing 20, the same being operable by means of a shaft 27, an externally operable handle 28, and appropriate snap-action means 29 (Fig. 2) for rapidly completing the movement of the shaft 27 in either direction.

Each of said switch units comprises an insulating base 30 secured to the bottom wall of casing 20. Each unit also comprises a smaller insulating base (not shown); the main and auxiliary bases carrying clips for engagement with fuses 31. The fuses 31 are shown as of the knife blade cartridge type, and the clips 32 are correspondingly shaped to accommodate the same. The bases 25 and 26 carry pairs of contact clips 33, 34 and 35, 36 and pivoted U-shaped contactors 37 and 38 respectively cooperable with said pairs of contact clips. Contactors 37 and 38 are secured to insulators 39 and 40, respectively carried by pairs of plates 41, 42, the pairs 41, 42 being pivotally mounted at 43, 44 and having hook portions engaging shaft 27.

Associated with the pairs of contact clips 33, 34 and 35, 36 are arc-diminishing or arc-snuffing blocks 43, 44 which are formed and which function in the manner described in detail in said Patent No. 1,795,641. As will be understood, the form and arrangement of blocks 43, 44 is such as to minimize the amount of oxygen (or air) available to the arc formed by opening the switch blades. Said blocks absorb heat from the arcs so formed, thereby cooling and diminishing the latter; whereas the insulating characteristics of the blocks effectively prevent flash-overs of any arcs formed incident to operation of the switch.

The means affording an interlock between the switch mechanism 24 and the casing cover 21 is in general of the character described and claimed in the patent to J. J. Dante, No. 1,857,711, granted May 10, 1932. Referring more particularly to Fig. 2, it will be understood that, assuming open-circuit positioning of the switch mechanism 24 and opening of the casing cover 21, the switch cam plate 45, which is fixed with respect to shaft 27, has its radial shoulder 46 so positioned as to positively engage with a lug 47 at the lower end of a plunger 48, said plunger being slidably supported by a tubular bracket 49 having side plates 50 and 51 rigidly secured to the interior surface of one side of the casing, as shown at 52 and 53. While I have herein shown bolts and nuts for effecting such securement, it is to be understood that these parts may be riveted, welded or otherwise permanently secured in position.

The bottom of the tubular bracket 49 is cut away to provide a locking slot 54 within which the lug 47 will be held against rotation, so long as the cover remains open, by a helical combined compression and torsion spring 55 surrounding the upper part of said plunger 48. The angularly bent lower end of spring 55 engages the top of bracket 49 while the angularly bent upper end of said spring engages a laterally extending flat tail member or latch 56, which is adapted when rotated to the position shown in Fig. 2 (as an incident to circuit-closing operation of the switch mechanism) to interlock with the movable catch 57 carried by cover member 21, and thus normally prevent the latter from being opened when the switch is closed.

The plunger 48 has a rounded upper end 58 adapted to be engaged by the inner surface of cover 21 for forcing the plunger downwardly against the influence of the spring 55 when the cover is moved to closed position. Upon closing of cover 21 the lug 47 will be positioned below the locking slot 54 and will no longer obstruct the movement of cam plate 45. The switch may then be readily closed by moving the handle 28 to its upper extreme position, as shown in Fig. 1.

To open the switch the handle 28 is moved to its lower extreme position (with reference to Fig. 1), the torsion effect of spring 55 causing the lug 47 to rotate into alinement with the locking slot 54 in tubular bracket 49 so that, when the cover 21 is raised, the lug 47 will move upwardly into said slot for locking the switch mechanism in open position.

The movable catch 57 is spaced a predetermined distance from the inner surface of cover 21, the main body portion 59 of said catch being slidable with respect to said inner surface. Body portion 59 is guided for movement in a straight line, as by means of a pair of slightly elongated slots or openings 60 and 61, which freely accommodate the shanks of headed members or rivets 62 and 63 (Fig. 2), the inner end portions of said shanks being reduced to enter openings 64 and 65 formed in a punched and stamped sheet metal member 66, and said reduced end portions being upset as shown in Fig. 2 to secure the same with respect to cover 21.

Body portion 59 is provided at the end thereof opposite to catch 57 with a lug 67 having a perforation to accommodate one hooked end of a coiled tension spring 68, the member 66 having a lug 69 provided with a perforation to accommodate the other hooked end of spring 68. The spring 68 thus acts to normally bias the catch 57 to the position thereof shown in Fig. 2, for cooperative interlocking engagement by the tail member or latch 56 when the switch mechanism is moved to closed position with the cover 21 closed.

The body portion 59 is provided intermediate the ends thereof with an opening 70 which is preferably of substantially triangular contour arranged as shown. Cover 21 is provided with an opening 71 arranged to register with the upper portion of opening 70 in the normal position of catch 57, as shown in dotted lines in Fig. 3. The key 72 is preferably of the form shown in Fig. 5. Key 72 may be inserted through opening 71 (Fig. 3) and upon turning thereof in a clockwise direction it will engage the upper end wall of opening 70, thus retracting catch 57 to the temporarily disabled position thereof shown in Fig. 4. With the interlock thus disabled the cover 21 may be opened notwithstanding closed positioning of the switch mechanism, as indicated by the position of latch 56 shown in dotted lines in Fig. 4. As is well understood by those skilled in the art, in certain installations it is necessary, or at least desirable, to provide for opening of the casing cover while the switch remains in closed-circuit position, for the purpose of permitting inspection by certain authorized individuals possessing the proper key.

As shown in Figs. 2 and 6, the member 66 is preferably provided with an offset portion 73 to afford clearance for the key while insuring proper engagement thereof with the wall of opening 70. As best illustrated in Figs. 4 and 5, the key 72 when inserted and turned in a clockwise direc-

tion is adapted to positively restrain the catch 57, 59 against movement to its normal position, and as will be understood, the key 72 is itself yieldably restrained against movement out of the position thereof illustrated in Figs. 4 and 5.

When the interlock is disabled by key 72 as shown in Figs. 4 and 5 to permit opening of cover 21 while the switch is closed, the key 72 may be permitted to remain in said position until inspection of the switch is completed and cover 21 is again closed. Of course the key 72 may be removed when cover 21 is in open position, in which event the catch 57, 59 is permitted to move to its normal position (Figs. 2 and 3) under the bias of spring 68. Such removal of key 72 may be necessary, as where a single key is employed to open a number of switch covers with the switches closed. In the event that an authorized person has opened a casing cover with the switch closed, and has then removed the key, either such person or anyone else may manually reclose the casing cover while the switch remains in closed position. This feature is of great importance from the viewpoint of safety, and from the viewpoint of facilitating inspection of the switches. In cover and switch interlocking devices employing a key for release thereof as heretofore proposed it has been necessary to employ the key to effect reclosure of the casing cover in the closed position of the switch. With such devices of the prior art, when an authorized person has used a key to effect opening of the casing cover with the switch closed, and has then neglected to reclose the cover, there is danger of shock to an operator working near the closed switch with the cover open; and it is inconvenient to such operator and dangerous from the viewpoint of fire hazard to require the operator to open the switch while the cover is open or unlocked in order to permit reclosure of the casing cover.

Thus as best illustrated in Figs. 2, 5 and 6 the catch 57 is formed to provide a cam surface 74 which cooperates with latch 56 (see Fig. 2) to automatically retract catch 57 against the bias of spring 68 upon manual reclosure of cover 21 while the switch mechanism remains in closed position. When cover 21 is thus again closed, the catch 57 will snap into engagement with the inner surface of latch 56, whereby use of the key 72 is again required to effect opening of cover 21 so long as the switch remains in closed position. As aforeindicated, of course, the interlock is not effective when the switch is moved to open-circuit position.

The particular switch illustrated in Figs. 1 to 6 has a rated capacity of 60 amps., 250 volts. The switch and casing cover interlock there illustrated is likewise adapted for use with switches having a rating of 100 amps., or even higher. However, for relatively large size switches, such as those rated at 400 amps., 600 amps., or higher, I prefer to employ a switch and cover interlocking mechanism of the character illustrated in Figs. 7 to 14. The particular switch mechanism in these latter figures has a rated capacity of 400 amps., 250 volts, but it is to be understood that the identical interlocking mechanism may be employed for switches of greater current controlling capacity. The interlocking mechanism of Figs. 7 to 14 performs the same functions as the interlocking mechanism of Figs. 1 to 6. That is to say, it normally insures against opening of the casing cover while the switch is closed, and against closing of the switch while the casing cover is open. The movable catch which is spring biased to a given operative position is retractable, or is temporarily disabled, by use of a suitable key. The catch when retracted by the key is positively restrained by the latter, and the latter is yieldably restrained by the former. The catch is formed for cooperation with the latch to provide for manual reclosure of the casing cover, when the switch is closed, without requiring use of the key, with consequent automatic interlocking of the switch and cover.

Thus in Figs. 7 to 14 the numeral 80 designates a metal casing having a flanged cover 81 hinged to one side thereof in the usual manner. The switch mechanism, of which the shaft 82 forms a part, may be of any suitable or well known form, such, for instance, as that shown more in detail in Figs. 1 to 6; it being understood that the current carrying and current controlling parts are increased in relative size to correspond with the higher rating of the switch. The snap-action mechanism of the switch may be of a character similar to that aforedescribed, and the same is designated in general by the numeral 83, the external operating handle being designated by the numeral 84.

Referring more particularly to Fig. 8, which illustrates the relative positions of the parts when the cover is closed and the switch is in closed-circuit position. It will be noted that I provide a punched and stamped sheet metal member 85 which is provided at opposite ends thereof with slots 86 and 87 which respectively accommodate the shanks of bolts 88 and 89, whereby member 85 is guided, throughout the major portion of its range, for movement in a straight line. However, the slot 86 at its inner end is enlarged, or of bayonet formation, as shown at 90, to provide for movement of the lower end of member 85 (Fig. 8) toward the open end of casing 80 under the bias of one arm 91 of a torsion spring the coils of which surround and are positioned by the shank of bolt 88. The other arm 92 of the torsion spring bears against one wall 93 of a channel-shaped bracket 94, which is secured to the inner surface of the side wall of casing 80, as by means of the aforementioned bolt 88 and a second bolt 95.

The other wall 96 of channel member 94 is sufficiently spaced to permit the required degree of outward movement of the lower end of member 85, when the latter is in a position corresponding with open-circuit position of the switch mechanism, as represented by the showing of Fig. 11. As will be noted in Fig. 11, however, such outward movement of member 85 is restrained pending opening of cover 81, the latter having a lug 97 riveted or otherwise rigidly secured thereto which projects inwardly through a suitable opening 98 in channel member 94 when cover 81 is closed. The inner end of lug 97 is adapted to engage the outer surface of a flange or lateral projection 99 formed on member 85 and extending from the lower end of the latter to a point slightly beyond the bayonet end 90 of slot 86.

Thus as will be apparent from Fig. 11, in the open-circuit position of the switch, cover 81 may be opened by merely operating the usual manually releasable latch or latches, one of which is shown at 100 in Fig. 8. When cover 81 is thus opened the arm 91 of the torsion spring throws the lower end of member 85 toward the right, with consequent engagement of bayonet slot 90 with the shank of bolt 88. The result of this is that member 85 is positively locked against

upward movement (Figs. 8 and 11), wherefore the switch mechanism cannot be closed pending reclosure of cover 81.

Also in the open-circuit position of the switch, as indicated in Fig. 11, the flange 99 will have been moved downwardly out of interlocking engagement with the shoulder 101 formed upon the movable catch 102, whereby cover 81 may be opened without requiring use of a key. Catch 102 comprises the angularly bent portion of a sheet metal member the main body portion 103 of which is adapted to bear flatwise against the inner surface of cover 81, as shown in Figs. 8, 10 and 11. Body portion 103 is provided with a circular opening 104 (Figs. 8 and 14) to accommodate the headed shank of a rivet 105 to provide for pivotal movement of said catch.

Body portion 103 is provided intermediate the length thereof with an opening 106 of substantially triangular form which is adapted to normally underlie a key-hole 107 formed in cover 81, as best illustrated in Figs. 12 and 13. As best shown in Figs. 8 and 14, said body portion 103 is extruded at two points 108 and 109 to provide bosses extended beyond the inner surface thereof, and to these bosses (Fig. 6) is welded or otherwise rigidly secured a flat metal plate 110 which acts to limit the degree of insertion of the key, which is identical with the key 72 aforedescribed, and is so indicated in dotted lines in Fig. 13.

The forward end of body portion 103 is provided with a lug or extension 111 located in the plane thereof. Lug 111 is adapted to bear against a metal plate 112 which is secured in spaced relation to the inner surface of cover 81 as by means of the same rivets 113 which are employed to attach the aforementioned lug 97. A shoulder 114 formed on catch 102 (Fig. 14) is adapted to engage a shoulder 115 on plate 112 to limit rotation of the catch in one direction, and the shoulder 116 on extension 111 is adapted to engage a flange or shoulder 117 on plate 112 to limit rotation of the catch in the opposite direction. A substantially U-shaped spring has the bent end 118 of one arm thereof engaged with a notch 119 in plate 112, the bent end 120 of the other arm of said spring being engaged with a notch 121 formed at the bend between catch 102 and body portion 103. The intermediate portion of said spring surrounds the shank of rivet 105 (Fig. 8) and is retained in position by the head of the latter.

As best illustrated in Fig. 9 catch 102 is biased in a counterclockwise direction by said U-shaped spring to the normal position thereof shown in Fig. 9, and as shown in full lines in Fig. 10. In the relative positions of the parts as shown in Fig. 8, and in full lines in Fig. 10, it is obvious that the cover 81 cannot normally be opened pending movement of the switch mechanism to open-circuit position. However, by inserting the key 72 and turning the same in a clockwise direction (Figs. 12 and 13) the catch 102 will be moved to the dotted line position thereof shown in Fig. 10, wherein the shoulder 101 is clear of the projection 99, thus permitting opening of cover 81 in the closed position of the switch.

With the key 72 in the position thereof shown in Fig. 13, it will be noted that catch 102 is positively restrained against relative movement pending counterclockwise rotation of the key to effect removal thereof. Similarly it will be noted from Fig. 13 that the key 72 is yieldably restrained against relative movement. If, after opening cover 81 in the closed position of the switch, the key 72 is removed, the catch 102 will assume that position relative to cover 81 which is shown in Fig. 10. In order to provide for manual reclosure of cover 81 under these conditions, I provide catch 102 with a cam surface 122 leading to the shoulder 101, whereby upon reclosure of the cover in the on position of the switch, cam surface 122 will engage projection 99 to retract catch 102 until the shoulder 101 is again free to snap into interlocking engagement with the under surface of flange 99, as indicated in Fig. 10.

With the cover 81 closed it will be apparent that upon movement of the switch mechanism from the open-circuit position represented by Fig. 11 to the closed-circuit position represented by Fig. 8 the member 85 will be moved automatically to slide the projection 99 thereof into interlocking engagement with shoulder 101 on catch 102. The reciprocating movement is effected by means of a suitable linkage represented in Fig. 8 by the numeral 123.

The switch and cover interlock of Figs. 7 to 14 is so constructed and arranged as to minimize the amount of useful space required therefor within the switch casing. The length of the member 85 and the range of reciprocating movement thereof are reduced to a minimum, without sacrificing any of the features of ruggedness and trustworthiness of the interlock when in use. In other words, the size of the interlock parts is such that the same may be used with a switch of the fused or unfused type, without necessitating any increase in the normal length of the latter. This feature is of importance in respect of minimizing the cost of producing a switch with interlock, and in respect of insuring minimum over-all dimensions of a switch of given relatively high current controlling capacity.

What I claim as new and desire to secure by Letters Patent is:

1. In a safety switch, the combination with a casing having a cover hinged thereto, of switch operating means and interlocking means co-operating with both said switch operating means and cover, whereby normally the switch cannot be closed when the cover is open, and the cover cannot be opened while the switch is closed, said interlocking means comprising a spring-biased catch carried by the cover and a movable latch carried by the casing, said cover having a key-hole to provide for manual insertion and operation of a key for temporarily retracting said catch out of interlocking position, whereby the cover may be opened in the closed position of the switch, said catch being adapted in its retracted position to yieldably retain the key, and said catch being formed to provide for manual reclosure of the cover and automatic interlocking of said catch with said latch independently of the key in the closed position of said switch.

2. In a safety switch, a casing, a cover hinged to one side of said casing and having a movable catch depending from the inner surface thereof, a spring for normally biasing said catch to a given position, a pivoted switch within said casing, a rotatable operating member for moving said switch to open and to closed positions, a bracket secured within said casing and forming a bearing parallel to one side wall of the latter, a member having a portion thereof movable within said bearing, said member last mentioned having a lateral projection formed thereon adjacent the upper end of said casing for interlocking with said catch when said operating member

is moved to close said switch, said cover having a key-hole, and a key insertable within said key-hole and engageable with said catch to provide for retracting the same from interlocking engagement with said lateral projection against the bias of said spring to provide for opening of the cover in the closed circuit position of said switch, said catch being formed to provide for automatic interlocking engagement thereof with said lateral projection upon manual reclosure of said cover independently of said key.

3. In a safety switch, a casing having an opening, a cover hinged to said casing for closing said opening, a catch movably supported by and in spaced relation to the inner surface of said cover, a spring for normally biasing said catch to a given operative position thereof, said cover having a key-hole formed therein, said catch being formed to accommodate a key insertable within said opening to provide for retracting said catch against the action of said spring, a movable switch within said casing, a rotatable operating member for moving said switch to open and closed positions, a handle outside of said casing operatively connected with said member, a latch member associated with said switch and movable, upon closure of the latter, into interlocking engagement with said catch, said catch when retracted by said key being adapted to yieldably retain the latter and to permit opening of said cover in the closed position of said switch, and said catch having a cam surface formed thereon for cooperation with said latch to provide for manual reclosure and automatic interlocking of said cover with said switch independently of the key when said switch is in closed position.

4. In a safety switch, a metal casing, a metal cover hinged to one side of said casing and having a movable catch, a spring engaging said catch to normally bias the same to its operative position, a pivoted switch within said casing, a rotatable operating member for moving said switch to open and to closed positions, a bracket secured within said casing and having a tubular portion arranged parallel to one side wall of the latter, a plunger having a cylindrical portion movable within the tubular portion of said bracket, said plunger having a lateral projection at its upper end for interlocking with said catch in the normal position of the latter when said operating member is moved to close said switch, said cover having a key-hole, said catch being movable against the bias of said spring by means of a key inserted through said key-hole in the cover to cause disengagement of said catch from said projection to thereby permit the cover to be opened when the switch is in closed position, said catch having a cam surface formed thereon to provide for interlocking re-engagement thereof with said lateral projection upon manual reclosure of said cover independently of the key.

5. In an enclosed switch of the safety type, in combination, a sheet metal casing having an opening, a flanged sheet metal cover hinged to said casing for closing said opening, a catch supported by and in spaced relation to the inner surface of said cover and movable with respect thereto, a spring attached to said catch to normally bias the same to a given operative position, a movable switch within said casing, a rotatable operating member for moving said switch to open and closed positions, a handle outside of said casing operatively connected with said member, a tubular bracket secured to the side of said casing and having a locking slot in its lower edge, a rotatable plunger slidable in said tubular bracket and having a lug adapted to fit within said slot, said plunger having a latch on its upper end to interlock with said catch, means on said operating member located in alinement with said lug to prevent rotation of said member, means actuated by the closing of said cover for depressing said plunger to bring said lug out of said locking slot, permitting said operating member to be rotated to close said switch and interlock said catch and latch, said cover having a key-hole formed therein, said catch being formed to accommodate a key insertable within said last mentioned opening to provide for retracting said catch against the action of said spring to permit opening of said cover in the closed position of the switch, and said catch having a cam surface formed thereon for cooperation with said latch to provide for manual reclosure of said cover independently of the key when said switch is in closed position.

6. In a snap-acting safety switch, in combination, a sheet metal casing having an opening, a cover hinged to one side of said casing for closing said opening, a switch within said casing, means including an over-the-center spring for closing and opening said switch with a snap action, a one-piece metal bracket secured to the inner surface of one side wall of said casing, said bracket having an intermediate offset portion to form with said side wall a substantially tubular bearing, a metal plunger having an intermediate cylindrical portion slidable and rotatable within said bearing, said plunger having a lateral projection at the upper end thereof for locking said cover in closed position when said plunger is rotated, said plunger also having a lateral projection at the lower end thereof and lying in the path of said switch-closing means, means including an integral part of said bracket for normally locking said plunger in a given angular position, said cover when closed acting directly upon said plunger to unlock the same from said integral part of the bracket to thereby permit manual actuation of the switch closing means and locking of said cover, said cover locking means including a movable catch carried by said cover and spring-biased to a given operative position, said cover having a key-hole formed therein, a key insertable within said cover opening and co-operable with said catch to provide for manual retraction of the latter whereby said cover may be opened in the closed position of the switch, and said catch being provided with a cam surface to provide for manual reclosure of said cover and interlocking of the latter with said switch independently of the key, whereby insertion and operation of the key is again required to effect opening of the cover when the switch is closed.

7. In an electric snap switch of the safety type having a relatively high current controlling capacity, in combination, a metal casing having an opening, a metal cover member hinged to one side of said casing for closing said opening, switch mechanism located within said casing, operating means for said switch mechanism including an over-the-center spring located within the casing and a handle located exteriorly of the casing for effecting snap movements of said switch mechanism to and from open- and closed-circuit positions, interlocking means located within said housing and respectively associated with said switch operating means and said cover member, said interlocking means comprising a punched and stamped sheet metal member positively guid-

ed at each end thereof throughout the major portion of its range of movement to normally provide for movement thereof in a straight line by said switch operating means when said cover is in closed position, said member being spring biased at one end to provide for movement thereof out of said straight line when said switch mechanism is in open-circuit position with the cover open, whereby said mechanism is positively restrained against movement to closed-circuit position, said member having a flange formed thereon at the last mentioned end thereof for movement in a plane substantially parallel to said cover member when the latter is in closed position, a catch member pivotally supported on the inner surface of said cover member and spring-biased toward a given rotary position, said catch member having a shoulder formed thereon in downwardly offset relation to said inner surface of the cover member, said shoulder being normally engageable with said flange when said switch and cover are in closed position whereby said cover is locked in closed position, said cover having a key-hole formed therein, said catch member being formed to accommodate a key inserted in said key-hole, whereby said catch member may be rotated to effect temporary disengagement of said shoulder from said flange to permit opening of said cover when said switch is in closed position, and said catch member having a cam surface formed integrally therewith and leading to said shoulder, whereby said cover member may be closed and said shoulder and flange interlocked independently of the key when the switch is in closed position.

8. In an electric switch of the safety type, in combination, a metal casing having an opening, a metal cover member hinged to one side of said casing for closing said opening, switch operating means, and interlocking means associated with said switch operating means and with said cover member, said interlocking means comprising a metal member normally movable in opposite directions in a straight line by said switch operating means when said cover is in closed position, spring means associated with said member to bias the same out of said straight line when said switch and said cover member are in open position whereby said switch mechanism is restrained against closing movement when said cover is open, a catch member pivotally supported on the inner surface of said cover member and spring-biased toward a given rotary position, said catch member having a shoulder formed thereon in downwardly offset relation to said inner surface of the cover member, said metal member having a flange to be normally engaged by said shoulder when said switch and said cover are in closed position whereby said cover is locked in closed position, said cover having a key-hole formed therein, said catch member being formed to accommodate a key inserted in said key-hole, whereby said catch member may be rotated to effect temporary disengagement of said shoulder from said flange to permit opening of said cover when said switch is in closed position, and said catch member having a cam surface formed thereon and leading to said shoulder, whereby said cover member may be closed and said shoulder and flange interlocked independently of the key when the switch is in closed position.

9. As an article of manufacture, a metal cover member for electric switches of the safety type, said cover member having a cover interlocking catch pivotally supported upon the inner surface thereof, said catch comprising a punched and stamped sheet metal member the end of which remote from the point of pivotal support is bent downwardly at substantially right angles to said inner surface, a sheet metal stop plate secured to said cover member in spaced relation to the inner surface of the latter, said stop plate being adapted to limit rotary movements of said catch member in each direction and to assist in guiding and supporting the latter, a substantially U-shaped spring respectively engageable with said catch member and said stop plate to bias the former toward one extreme rotary position, said cover member having a key-hole opening formed therein, and said catch member having a recess formed therein to accommodate a key when inserted through said opening, whereby said catch member may be manually operated toward its other extreme rotary position, for the purpose set forth.

10. As an article of manufacture, a metal cover member for electric switches of the safety type, said cover member having a cover interlocking catch pivotally supported upon the inner surface thereof, said catch comprising a punched and stamped sheet metal member the end of which remote from the point of pivotal support is bent downwardly at substantially right angles to said inner surface, a sheet metal stop plate secured to said cover member in spaced relation to the inner surface of the latter, said stop plate being adapted to limit rotary movements of said catch member in each direction and to assist in guiding and supporting the latter, a substantially U-shaped spring respectively engageable with said catch member and said stop plate to bias the former toward one extreme rotary position, said cover member having a key-hole opening formed therein, said catch member having a recess formed therein to accommodate a key when inserted through said opening, whereby said catch member may be manually operated toward its other extreme rotary position, and said downwardly bent portion of said catch member having a shoulder formed thereon in parallel relation to the inner surface of said cover member, said shoulder being adapted for interlocking engagement with a switch operated element under certain conditions when the cover is closed.

11. As an article of manufacture, a metal cover member for electric switches of the safety type, said cover member having a cover interlocking catch pivotally supported upon the inner surface thereof, said catch comprising a punched and stamped sheet metal member the end of which remote from the point of pivotal support is bent downwardly at substantially right angles to said inner surface, a sheet metal stop plate secured to said cover member in spaced relation to the inner surface of the latter, said stop plate being adapted to limit rotary movements of said catch member in each direction and to assist in guiding and supporting the latter, a substantially U-shaped spring respectively engageable with said catch member and said stop plate to bias the former toward one extreme rotary position, said cover member having a key-hole opening formed therein, said catch member having a recess formed therein to accommodate a key when inserted through said opening, whereby said catch member may be manually operated toward its other extreme rotary position, said downwardly bent portion of said catch member having a shoulder formed thereon in parallel relation to the inner surface of said cover member, said

shoulder being adapted for interlocking engagement with a switch operated element under certain conditions when the cover is closed, and said downwardly bent portion having a cam surface formed thereon and leading to said shoulder, for the purpose set forth.

12. In a safety switch, the combination with a metal casing having a cover hinged thereto, of switch operating means and interlocking means co-operating with both said switch operating means and cover, whereby normally the switch cannot be closed when the cover is open, and the cover cannot be opened while the switch is closed, said interlocking means comprising a spring-biased catch carried by the cover and a movable latch carried by the casing, said cover having a key-hole to provide for manual insertion and operation of a key for temporarily retracting said catch out of interlocking position, whereby the cover may be opened in the closed position of the switch, said catch and said key being co-operatively formed to provide for positive restraint of said catch and yieldable restraint of said key against relative movement in the retracted position of said catch, and said catch being also formed and arranged to permit temporary retraction thereof by said latch, whereby said cover may be reclosed independently of the key in the closed position of the switch.

13. In a safety switch, the combination with a metal casing having a cover hinged thereto, of switch operating means and interlocking means co-operating with both said switch operating means and cover, whereby normally the switch cannot be closed when the cover is open, and the cover cannot be opened while the switch is closed, said interlocking means comprising a spring-biased catch carried by the cover and a movable latch carried by the casing, said cover having a key-hole to provide for manual insertion and operation of a key for temporarily retracting said catch out of interlocking position, whereby the cover may be opened in the closed position of the switch, said catch and said key being co-operatively formed to provide for positive restraint of said catch and yieldable restraint of said key against relative movement in the retracted position of said catch, and said catch being formed for co-operation with said latch to provide for manual reclosure of the cover and automatic interlocking of said catch with said latch independently of the key in the closed position of the switch.

14. In a safety switch, a casing, a cover hinged to one side of said casing and having a movable catch depending from the inner surface thereof, a spring for normally biasing said catch to a given position, a switch within said casing, an operating member for moving said switch to open and to closed positions, a bracket secured to the inner surface of one side wall of said casing, a member having a portion thereof movable within said bracket, said last mentioned member having a lateral projection formed thereon adjacent the upper end of said casing for interlocking with said catch when said operating member is moved to close said switch, said cover having a key-hole, and a key insertable within said key-hole and engageable with said catch to provide for retracting the same from interlocking engagement with said lateral projection against the bias of said spring to provide for opening of the cover in the closed circuit position of the switch, said catch being formed to provide for automatic interlocking engagement thereof with said lateral projection upon manual reclosure of said cover independently of said key.

15. As an article of manufacture, a metal cover member for electric switches of the safety type, said cover member having a cover interlocking catch member movably supported upon the inner surface thereof, said catch member comprising a punched and stamped sheet metal member one end of which is formed to provide a shoulder offset downwardly from and substantially parallel to said inner surface of the cover, a sheet metal plate secured to said cover member in spaced relation to the inner surface of the latter, said plate being adapted to assist in guiding and supporting said catch member, a spring member respectively engageable with said plate and said catch member to bias the latter toward one extreme position, said cover member having a key-hole opening formed therein, said catch member being formed to accommodate a key when inserted through said opening, whereby said catch member may be manually operated toward its other extreme position to retract the same from interlocking engagement with a switch operating part to permit opening movement of said cover member, said catch member and said key being co-operatively formed to provide for positive restraint of said catch member by said key upon manual release of the latter and yieldable restraint of said key by said catch member under the bias of said spring member against relative movement in the retracted position of said catch member, and said catch member being formed to permit temporary retraction thereof independently of the key and subsequent interlocking positioning thereof upon reclosing movement of said cover member.

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