A. K. SUTHERLAND.

PUSH BUTTON SWITCH.

APPLICATION FILED FEB. 23, 1915.

1,292,140. Patented Jan. 21, 1919.

Fig. 1.

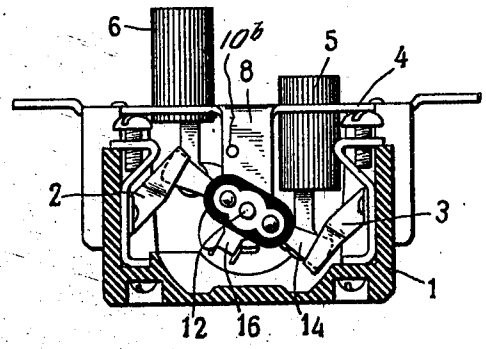


Fig. 2

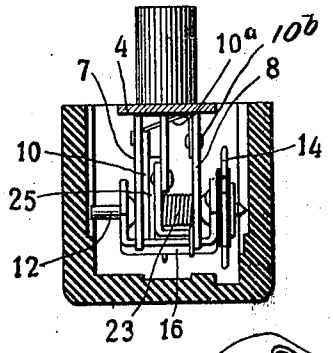
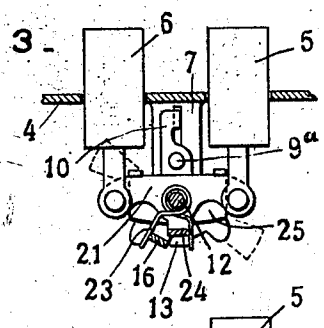


Fig. 3.



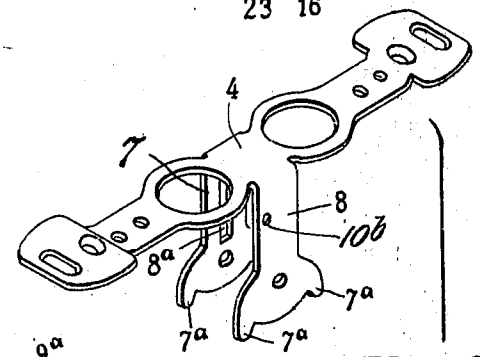


Fig. 6.

Fig. 4.

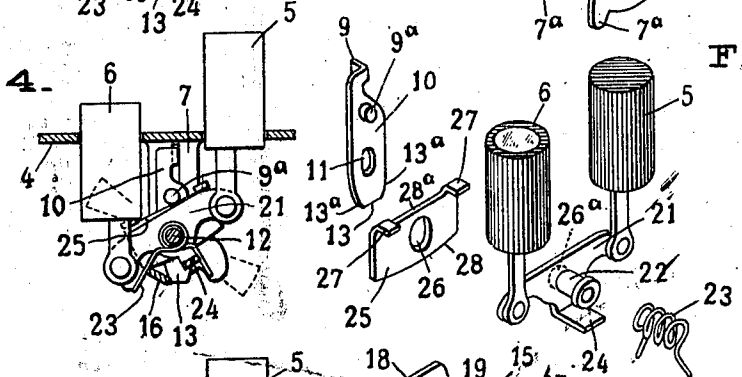
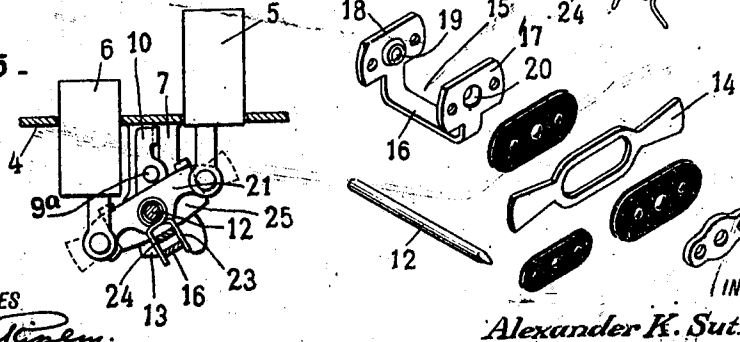


Fig. 5.



WITNESSES

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PUSH-BUTTON SWITCH.

1,292,140. Specification of Letters Patent. Patented Jan. 21, 1919.

Application filed February 23, 1915. Serial No. 9,793.

To all whom it may concern:

Be it known that I, ALEXANDER K. SUTHERLAND, a citizen of the United States, and a resident of Plainville, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Push-Button Switches, of which the following is a full, clear, and exact description, whereby any one skilled in the art may make and use the same.

The invention relates to push button switches or to any switch in which there is a lock element which must be periodically released by a moving element in order to provide a free flying quick movement of the moving element.

The object of the invention is to provide a simple positive mechanism in which during the nominal movement of an actuator a multiplied movement may be imparted to effect the release of the locking elements and permit re-locking of the elements.

A still further object is to provide a main actuator bar and a supplemental actuator moved by the bar to actuate the releasing mechanism with a minimum of friction and with a substantially direct thrust upon the release.

Referring to the drawings:

Figure 1 is a sectional view through a receptacle and parts of the push button switch showing the contacts in engagement.

Fig. 2 is a cross sectional view substantially at right angles to the parts as illustrated in Fig. 1.

Fig. 3 illustrates the parts with one of the push buttons descending in the operation of throwing the switch blade.

Fig. 4 is a view of the parts simliar to that of Fig. 3 with the release mechanism about to disconnect.

Fig. 5 shows the parts immediately after the release of the locking mechanism has taken place.

Fig. 6 is a view illustrative of the various parts of the mechanism in their general position of assembly, said parts being shown in perspective.

It is not new in the art to provide a frame member, an oscillatory switch blade, an actuator bar and means such as switch buttons for moving the actuator bar nor is it new in the art to provide a locking member for the oscillatory switch blade which will hold said blade in a fixed position, pending a tensioning of the spring member for quickly moving the oscillating switch blade.

It has become an all important feature of switch constructions in the art to provide against lost motion and to insure permanency and regularity of action in the movement of the oscillatory switch blade. It is also most desirable to provide a mechanism in which the movements of the actuating parts shall be reduced to a minimum in order to permit the construction of a device of comparatively small though with fully accurate action within a reasonable condensed space.

The present invention has to deal with the features of advantage demanded in this art and proposes a simple and unique structure in which with a nominal movement of the actuating members, a perfect release of the tensioned oscillating switch blade may be secured and a positive locking of the parts may be insured. Much of the detail of the mechanism is well known in the art and needs no detail description.

Referring to the drawings, the numeral 1 denotes a porcelain receptacle or other suitable insulator within which are suitably arranged the stationary contacts 2, 3, which may be of any desired preferred form. Suitably fitting the upper edge of the receptacle 1, there is a metallic supporting frame 4 having suitable perforations through which the push buttons 5, 6 extend and having dependent arms 7, 8 at or near the lower end of which is supported and borne the main mechanism of the switch. The dependent arm 7 has a slot 8^a which has projecting through it the lug 9 of a detent plate 10. This plate is provided with an elongated perforation 11 which encircles the main pivot 12 upon which the oscillating parts move. The lug 9 projecting through the guide slot 8^a insures a reciprocating motion of the plate 10 in a definite line. Its lower end 13 forms a locking member for the oscillatory switch blade 14. This blade is connected through suitable insulators well known in the art with a yoke member 15 which has a bar 16 connecting the two yoke plates 17, 18 which straddle the down-turned dependent frame members 7 and 8 and which are provided with pivot openings 19, 20, through which the main

pivot 12 passes. The insulators and the oscillatory switch blade 14 are provided with a similar central pivotal opening through which the pivot 12 may pass.

The lower end of the detent plate 10 is of a form suitable to impinge against either side of the yoke bar 16 and prevent oscillatory movement of the yoke and the switch blade 14 until it is withdrawn.

For actuating the yoke member and the switch bar 14, an actuator bar 21 is provided which has a hub 22 extending between the dependent members 7 and 8 and upon which hub is arranged a two-armed spring 23. At the lower end of the actuator bar 21, there is a lug 24 which rests between the two arms of the spring 23. This spring is so positioned that its arms also extend on opposite sides of the bar 16 and the hub 22 is pivotally mounted upon the pivot 12.

It is apparent that a movement of the actuator bar 21 through the push buttons 5, 6 would ordinarily carry with it the yoke 15 inasmuch as the bar 16 of the yoke is straddled by the arms of the spring 23. Motion of the yoke-bar 16 is prevented by its engagement with the lower end 13 of the detent plate 10 and said detent plate is normally depressed and held in locking engagement by a spring 10^a secured to the dependent frame member 8, as at 10^b, and can only release the yoke member 16 when it is raised out of engagement therewith.

Upon the side of the detent plate 10, there is a stud 9^a, which forms an abutment by which the detent plate 10 may be raised or moved so that its lower end 13 will be moved out of obstructing position with reference to the yoke bar 16.

Normally resting upon the actuator bar 21 is a cam-plate 25 having an enlarged central perforation 26 which gives it some freedom of movement with reference to the main pivot 12. This cam plate 25 is provided with lugs 27 which overlie the upper edge of the actuator bar 21 and the lower edge of the plate is curved as at 28 to correspond with its general radial line of movement as regards the main pivot 12. This perforation 26 encircles a bearing nipple 26^a projecting from the actuator bar 21 and which in reality is the inner end of the sleeve or barrel 22.

The cam plate 25 at its lower edge 28 does not correspond to the form of the lower edge of the actuator bar 21 but is of such a form that as the actuator bar 21 is depressed the lower edge of the cam plate 25 will impinge against the edges of the yoke bar 16. As the actuator bar is depressed, this impingement of the lower side 28 of the cam plate owing to its perforation 26 will cause it to rise sufficiently at its opposite end to give practically a direct thrust upon the stud 9^a. Thereupon, the detent plate 10 will be released, while under full tension of the spring 23. This operation of the parts is illustrated in Figs. 3 and 4, where it is clearly shown that there is a relative movement between the cam plate 25 and the actuator bar 21 during an oscillation of said actuator bar.

In other words it would be impossible to raise the detent plate 10 by direct contact of the oscillating actuator bar 21 as of necessity the release of the actuator bar must only be effected after the substantially full depression of one of the actuator or push buttons. The actuator bar neither has a proper movement nor a sufficient movement to give an effective release without the addition of the excess movement effected by the cam plate 25 upon the detent plate 10.

The lower edge 28 of the cam plate 25 is carried with the actuator bar 21 owing to the impinging lugs 27 until its lower edge 28 is brought into engagement and rides upon the edge of the yoke bar 16. Thereupon its further oscillatory movement is retarded and it is forced upward so that its upper edge 28^a engages the lug 9^a and presses the detent plate 10 upward until its lower end 13 releases the yoke bar 16. This yoke bar being now under full tension of the spring 23 flies forward for its full movement.

The movement of the yoke bar 16 is limited by stops 7^a formed at the lower ends of the dependent members 7 and 8. As soon as the cam plate 25 has released the yoke bar 16 by impinging against the lug 9^a and raising the detent plate 10, it assumes a position with its lugs 27 overlying the upper edge of the actuator bar 21 and the yoke bar 16 passes over the lower curved end 13 of the detent plate 10. The sides of the lower end of the detent plate 10 are beveled as at 13^a and firmly hold the yoke bar 16 against the stops 7^a under the tension of the spring 10^a. It will be seen from the above description that the cam plate 25 has a nominal oscillatory movement with the actuator bar 21 but as soon as its lower curved edge 28 rides against the bar 16, it has substantially a direct longitudinal movement so that there is a direct upward thrust against the stud 9^a without undue cam friction or wiping movements. With this arrangement of parts, every movement of the actuating buttons 5, 6 may be transmitted effectively to provide a locking and releasing action of the detent plate 10 without loss of motion and without undue friction.

The advantages of the structure are at once apparent. A full oscillatory movement may be given to the actuator bar 21 without placing undue duty upon it and as it is oscillated, it carries the plate 25 on a long leverage through its lugs 27 until the

lower edge 28 of the plate rides easily upon the yoke bar 16. This leverage gives an easy and direct upward thrust of the plate 25 which impinging against the stud 9^a carries the detent plate 10 easily out of engagement with this yoke bar 16.

There is practically no lost motion. The switch buttons may be depressed without suddenly running away from the finger and all of the parts are perfectly locked in position at the end of each throw of the oscillatory switch blade.

The device is simple in construction and cheap in its manufacture as all of the elements may be formed from stamped up metal. The parts may also be assembled with great facility as a single stud 12 serves as a rotative center for all oscillatory and reciprocating movements.

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

1. In a device of the character described, a supporting frame, an oscillating switch blade, a yoke bearing said blade, an actuator bar, a reciprocating sliding detent plate provided at its lower end with means for locking the switch blade yoke, a cam plate loosely mounted upon and movable with the actuator bar and having a free movement with reference thereto, and arranged to impinge against said yoke upon a predetermined movement of the actuator bar and cam plate, and be thereby tilted with reference to said actuator bar, said cam plate being arranged upon being tilted, to move the detent plate, thereby releasing the switch blade yoke.

2. In a snap switch, a supporting frame, an oscillating switch blade, a switch blade yoke for moving said blade, an oscillating actuator bar spring-connected with the switch blade yoke, a reciprocating detent, the lower end of which engages said yoke for locking the same, a cam plate for operating the detent, having a free movement with reference to, and an oscillating movement with, the actuator bar, and having an oscillating movement independent of its movement with said bar, said plate impinging upon the yoke near the end of each oscillation thereof, whereby it is tilted to raise the detent, and means for oscillating the actuator bar.

3. In a snap switch, a supporting frame having a dependent member having spaced stops at the end thereof, a pivoted yoke having a yoke bar arranged to impinge against said stops, a switch blade carried by the yoke, an oscillating actuator bar pivoted concentrically with reference to the yoke, a spring connection between the actuator bar and yoke, a reciprocating detent, the lower end of which holds the yoke bar against one or the other of the stops, and a cam plate loosely mounted upon and oscillating with the actuator bar and having an exaggerated movement independent of its movement with the bar, said plate being arranged to impinge upon the yoke bar and to be thereby given the said exaggerated movement, which movement operates the detent to release the yoke bar.

4. In a snap switch, a supporting frame, a yoke pivoted in the frame, a switch blade carried by the yoke, a pivoted actuator bar, a reciprocating detent for locking the yoke, formed with an opening surrounding the yoke pivot and constituting a guide for the detent, an oscillating cam plate movable with the actuator bar but free to have a limited movement with reference thereto, the cam plate having interengagement with the actuator bar to cause them to move together, and a cam surface arranged to impinge upon the yoke as it is moved and cause the movement of the cam plate independent of the actuator bar as the latter approaches its extreme limit of movement, the cam plate being arranged to move the detent to release the yoke as it is thus moved relative to the actuator bar.

5. In a snap switch, a supporting frame having dependent members, one of said members having a guide slot, a detent having a lug extending into said slot, an oscillating actuator bar, a switch bar having a yoke, said yoke and actuator bar mounted upon a common pivot, a spring connecting the actuator bar and yoke, a cam plate losely mounted upon the pivot of the actuator bar and yoke and provided with lugs adapted to normally engage the upper edge of said bar above its pivot whereby the actuator bar and cam plate oscillate together, and having a surface arranged to impinge upon the yoke as the actuator bar approaches its limit of movement, whereby the cam plate is caused to move relative to the actuator bar, the lug on the detent being adapted to be engaged by the cam plate upon an oscillation of the actuator bar as said cam plate impinges against the yoke, whereby a release of the yoke is effected at substantially the completion of the movement of the actuator bar.

6. In a snap switch, a supporting frame, a detent, an oscillating switch blade yoke and switch blade, an oscillating actuator bar, said bar and switch blade yoke having spring interconnections, a cam plate mounted for oscillation with, and having a free movement with reference to, the oscillating movement of the actuator bar the lower edge of the cam plate being arranged to impinge against the yoke as the actuator bar approaches the limit of its movement in either direction, thereby causing the free movement of the cam plate relative thereto, interengaging lugs between the actuator bar and cam plate, said lugs engaging the bar

to tilt the plate as said plate impinges at its lower edge against the yoke, said engagement and impingement causing an amplified movement of the cam plate and a release of the detent.

7. In a snap switch, a supporting frame, an oscillating switch blade, a yoke therefor, an oscillating actuator bar, a detent plate mounted for sliding reciprocation in the supporting frame and adapted through its lower end to lock the yoke, a cam plate having lugs engaging the upper edge of the actuator bar at two points on opposite sides of the pivotal center of said bar and with the lower edge of said plate adapted to impinge upon the yoke, whereby an amplified releasing movement of the cam plate is effected during oscillation of the actuator bar, and a lug upon the detent plate adapted to be engaged by the cam plate, whereby the detent plate is moved at the completion of the oscillating movements of the actuator bar.

8. In a device of the character described, an oscillating actuator bar, a switch bar, a yoke therefor, a detent plate, the lower end of which holds said yoke at opposite limits of its throw against fixed stops, a floating cam plate loosely connected with the actuator bar and movable therewith but having an amplified movement with respect thereto, said cam plate adapted to impinge against the yoke and also to impinge upon the switch bar upon opposite sides of its center of oscillation, whereby an amplified movement of the cam plate is effected in the line of movement of the detent plate, and a lug on said detent plate engaged by the cam plate.

9. In a device of the character described, a supporting frame having dependent frame members, a switch blade, a switch blade yoke, said parts pivotally mounted in the dependent frame members, a detent plate having a portion that is slidably mounted in one of the dependent frame members and having a slot elongated in the direction of the sliding movement of the detent plate and encircling the pivot of the pivoted members and carrying at its lower end a locking and releasing means for the switch blade yoke, stops against which the switch blade yoke is locked by the lower end of the detent plate at opposite limits of the throw of said yoke, a cam plate having a floating and moving engagement with the actuator bar whereby it moves therewith and is also free to move relative thereto as the actuator bar reaches a definite position in its movement, said plate adapted to impinge upon the switch blade yoke during its movement by the actuator bar whereby it is moved relative to the actuator bar, and an abutment upon the detent plate adapted to be engaged by the cam plate as it is moved relative to the actuator bar.

10. In combination in a snap switch having an oscillatory switch blade, a reciprocating detent for locking said switch blade having locking and releasing actions with respect to said switch blade, a pivot upon which said switch blade is mounted, of an oscillatory actuator bar spring-connected with the switch blade and having an angular movement with reference to the pivot thereof within fixed limits, a cam plate having a free movement with reference to and oscillating with the actuator bar during the angular movement of the latter and having an angular displacement with reference to the supporting pivot greater than the angular movement of the actuator bar, and interconnecting means between the cam plate and reciprocating detent whereby the amplified angular movement of the plate moves the detent and releases the switch blade during the angular movement of the actuator bar.

11. In combination in a snap switch, an oscillating switch blade, a movable detent for locking said switch blade at opposite limits of its throw, a pivot upon which said switch blade is mounted, an oscillating actuator bar spring-connected with the switch blade and having an angular movement with reference to the pivot of the switch blade, a floating cam plate having an engagement with the actuator bar and having an angular movement with reference to the pivot amplified through movement of the actuator bar, and means of engagement between the cam plate and detent, whereby the amplified angular movement of the cam plate is transmitted to the detent and releases the switch blade during the angular movement of the actuator bar.

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Witnesses:
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