

July 28, 1964

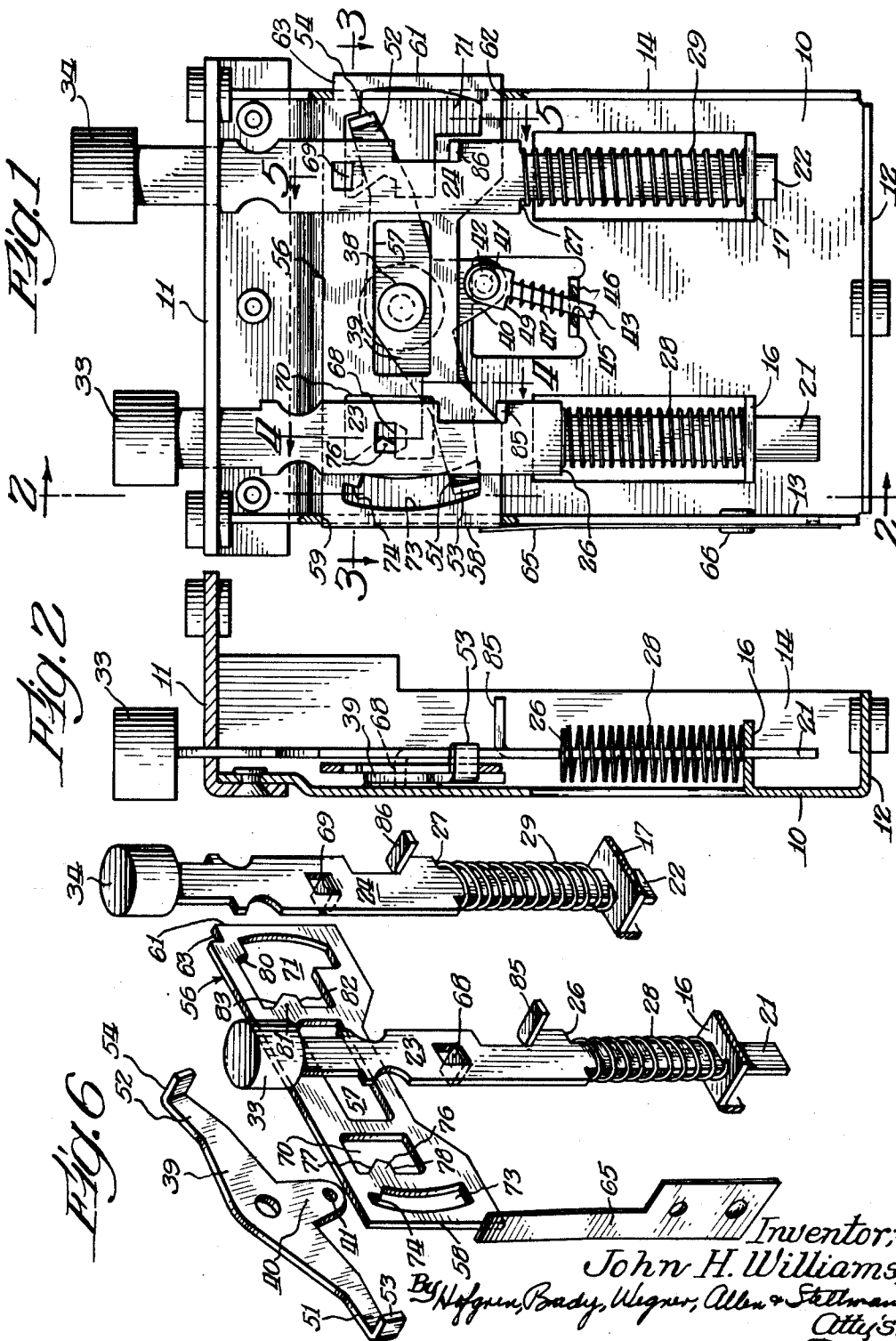
J. H. WILLIAMS

3,142,198

PUSH BUTTON MECHANISM

Filed Aug. 17, 1961

3 Sheets-Sheet 1



July 28, 1964

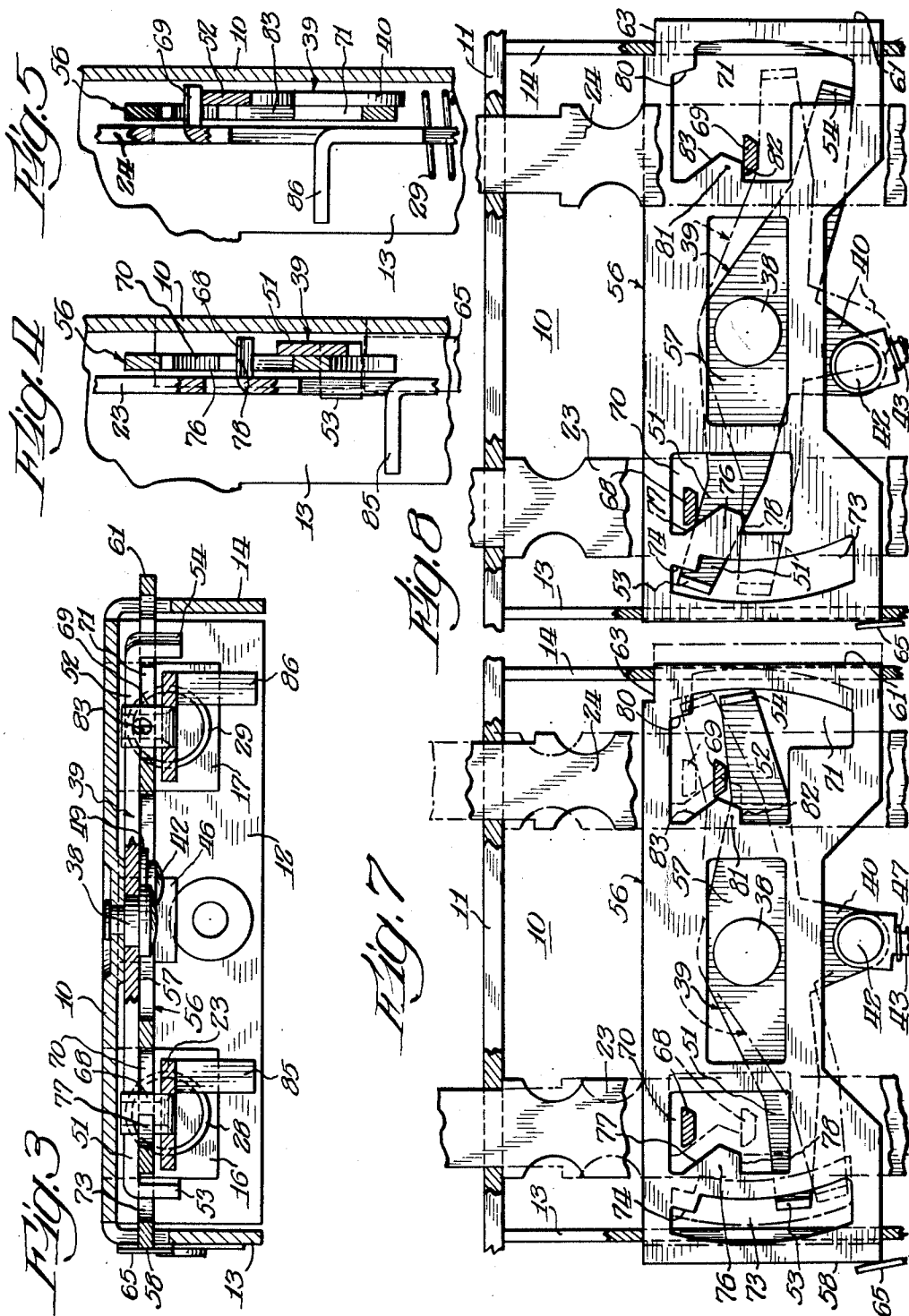
J. H. WILLIAMS

3,142,198

PUSH BUTTON MECHANISM

Filed Aug. 17, 1961

3 Sheets-Sheet 2



July 28, 1964

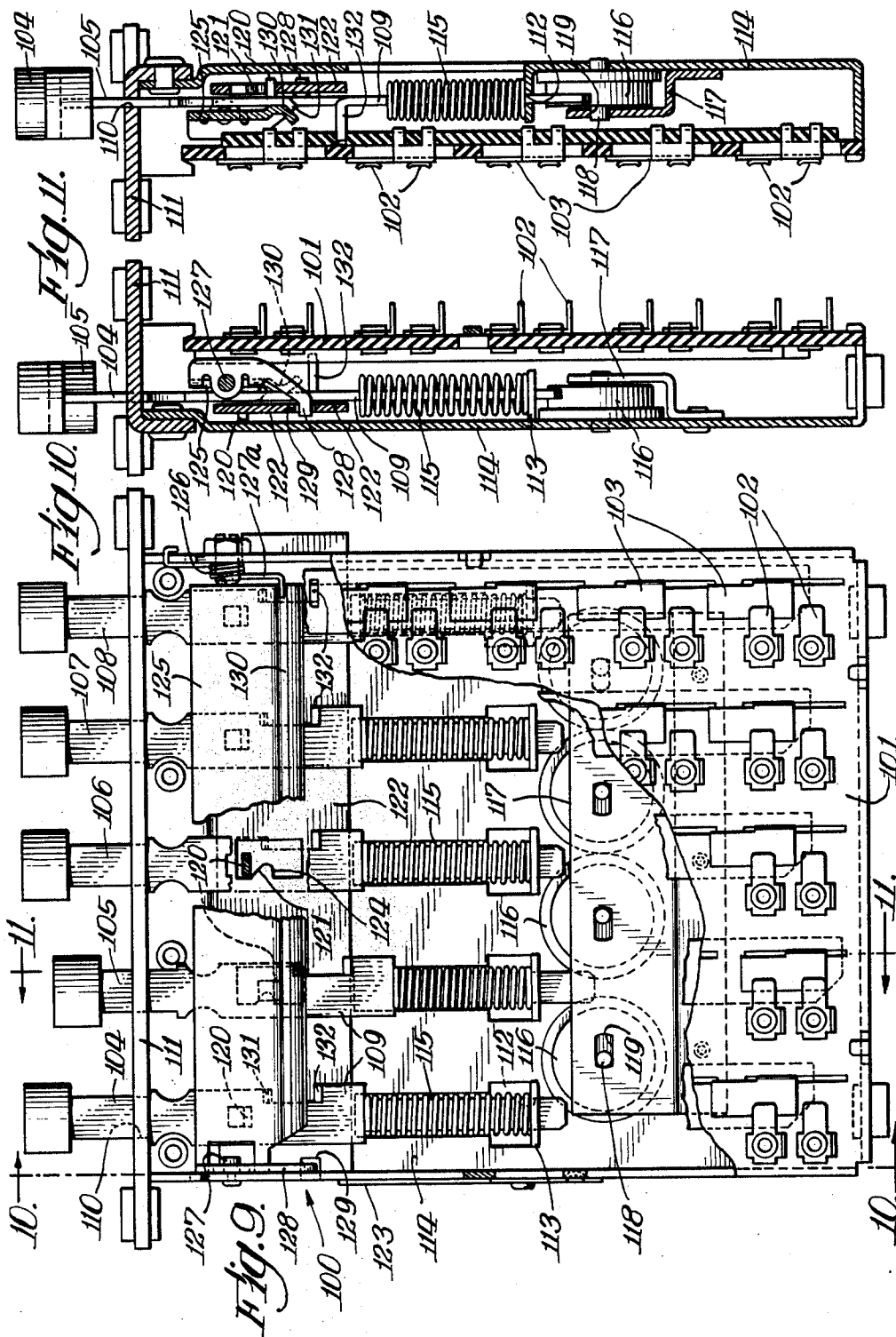
J. H. WILLIAMS

3,142,198

PUSH BUTTON MECHANISM

Filed Aug. 17, 1961

3 Sheets-Sheet 3



1

3,142,198

PUSH BUTTON MECHANISM

John H. Williams, Barrington, Ill., assignor to Oak Manufacturing Co., a corporation of Delaware
Filed Aug. 17, 1961, Ser. No. 132,200
4 Claims. (Cl. 74—483)

This invention relates to a push button mechanism and more particularly to a simple push button mechanism which may be used for controlling low power electric switches and other light loads. For convenience, the application to switches will be considered in connection with a discussion of the construction with the understanding that this is exemplary.

Push button mechanisms having various kinds of mechanical interlocks are well known and are widely used. This invention pertains to a multi-button mechanism wherein interlock means are provided for alternate operation of each button, each button being movable from a normally biased OUT position to a locked IN position. The movement of one OUT button serves to release the previously locked other button with the new button now being locked to an IN position.

Various mechanisms for accomplishing the above are well known. However, such mechanisms suffer from various drawbacks. One drawback is the lack of simple positive locking for the IN button. Thus, such mechanisms when subject to vibration or mechanical shock will unlock and permit the button, which is supposed to be IN and locked, to be released to an OUT position. Where such mechanisms control electric switches, it is possible for circuits to be accidentally opened or closed with possible damage or danger to equipment or personnel.

Where positive locking means for such push button mechanisms are provided, it has usually resulted in mechanical complexity and has interfered with the simple operation of pushing an OUT button to an IN position. This invention provides a construction which is mechanically simple and rugged and yet which will provide positive locking against accidental opening. The simplicity of the new construction is desirable not only for economy in manufacture and low cost of tooling, but is particularly useful under conditions such as obtain in high flying aircraft where cold and other atmospheric conditions may interfere with the operation of complex mechanism.

For a thorough understanding of the invention, reference will now be made to the drawings wherein:

FIGURE 1 is a plan view of a mechanism embodying the present invention;

FIGURE 2 is a section on line 2—2 of FIGURE 1;

FIGURE 3 is a section on line 3—3 of FIGURE 1;

FIGURE 4 is a sectional detail on broken line 4—4 of FIGURE 1;

FIGURE 5 is a sectional detail on broken line 5—5 of FIGURE 1;

FIGURE 6 is an exploded perspective view showing certain parts of the new mechanism;

FIGURES 7 and 8 are enlarged detailed views showing the treadle and latch bar operation;

FIGURE 9 is a view like FIGURE 1 of a modified form of the invention;

FIGURE 10 is a sectional view taken along line 10—10 of FIGURE 9; and

FIGURE 11 is a sectional view taken along line 11—11 of FIGURE 9.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail several embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to

2

the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

The mechanism embodying the present invention is mounted upon base 10 preferably of sheet metal such as sheet steel. Base 10 has attached thereto by rivets front wall portion 11, and base 10 has rear wall portion 12 and side wall portions 13 and 14. Struck up from base 10 are guides 16 and 17 extending perpendicularly from base 10 inside of the region enclosed by the base and wall portions.

Guides 16 and 17 are provided with slots through which push rod portions 21 and 22 project and are movable longitudinally of the push rods. Push rod portions 21 and 22 are parts of push rods generally indicated by 23 and 24, and may be flat stampings. Push rods 23 and 24 have shoulders 26 and 27 which define the ends of push rod portions 21 and 22. The two push rod portions have coil springs 28 and 29 disposed around their respective portions 21 and 22 between guides 16 and 17 on the one hand and shoulders 26 and 27 on the other hand.

Push rods 23 and 24 extend through slots in front wall 11 of the base plate and carry buttons 33 and 34 on their free ends beyond front wall portion 11. Coil springs 28 and 29 normally bias their respective push rods outwardly, away from front wall 11. As indicated in FIGURE 2, push rods 23 and 24 are supported clear of base 10 to leave room for certain operating parts between the push rods and base 10. Pivotaly supported on rivet 38 at base 10 is treadle bar 39. Pivot 38 is disposed midway between the bodies of push rods 23 and 24. Treadle bar 39 has central lug portion 40 extending downwardly from the pivot region of the treadle bar as seen in FIGURE 1. Lug portion 40 is apertured at 41 and has rivet 42 therethrough pivotaly supporting finger 43. Finger 43 extends generally parallel to base 10 and passes through aperture 45 and guide 46 struck up from base 10. Coil spring 47 is disposed between guide 46 and shoulder 49 on finger 43 adjacent pivot 42.

Treadle bar 39 has arms 51 and 52 extending from opposite sides of the pivot region. Arms 51 and 52 have fingers 53 and 54 extending laterally from the arms in the same direction. When the treadle bar is mounted as illustrated in FIGURE 1, fingers 53 and 54 extend away from base 10.

Disposed between push rods 23 and 24 on the one hand and treadle bar 39 on the other hand is latch bar 56. Latch bar 56 has window 57 for clearing rivet 38 so that the latch bar may move lengthwise, this being transversely of the side walls 13 and 14. Latch bar 56 has one end 53 which is adapted to operate in opening 59 in side wall 13. Latch bar 56 has its remaining end 61 operating in opening 62 of side wall 14. The latch bar is long enough so that the two ends of the latch bar are always within the openings in the side walls. End 61 of the latch bar is provided with stepped shoulder corner portion 63. Opening 62 in side wall 14 is just long enough (in the direction between front wall 11 and rear wall 12) so that the shoulder formed by portion 63 of the latch bar will engage side wall 14 to limit the movement of the latch bar to the right, as seen in FIGURE 1.

Latch bar 56 is normally biased to the right, as seen in FIGURE 1, by leaf spring 65 secured at 66 to side wall 13 on the outside thereof and having the free end portion of the spring engage end 58 of the latch bar.

Push rods 23 and 24 are provided with treadle bar engaging fingers 68 and 69, these fingers being pushed out from the bodies of the push rods and extending toward base 10. Fingers 68 and 69 pass through windows 70 and 71 in the latch bar and are disposed above arms 51 and 52 of the treadle bar as seen in FIGURE 1. The location of the parts is such that when a push rod is out, as is the case with rod 24 in FIGURE 1, finger 69 will

3

be disposed close to or at the edge of arm 52 of the treadle bar. Thus when push button 34 is moved in the direction of the arrow, toward rear wall 12, finger 69 can rock the treadle bar so that treadle bar finger 54 moves downwardly as viewed in FIGURE 1. The toggle arrangement involving finger 43 and spring 47 between the two push rods provides a snap action for the treadle bar.

Latch bar 56 is provided adjacent end 58 with slot 73 extending across the end portion of the latch bar. Slot 73 is so shaped and proportioned as to accommodate finger 53 of the treadle bar during the rocking of the treadle bar and the movement of the latch bar. Slot 73 is so shaped as to provide shoulder 74 at the upper portion of the slot as seen in FIGURES 1 and 6. Shoulder 74 can engage finger 53 of the treadle bar when that finger is up, as illustrated in FIGURE 8. Latch bar 56 is also provided with lug 76 in window 70 at the left hand side of the window, as seen in FIGURES 1 and 6. Lug 76 has top cam surface 77 and stop portion 78 at the two opposite parts. Lug 76 is normally adapted to cooperate with finger 68. If push rod 23 is in the IN position as seen in FIGURES 1 and 6, then finger 68 will normally lie against stop shoulder 78. When push rod 23 is in the OUT position, as seen in FIGURE 8 for example, then finger 68 of push rod 23 will be above cam portion 77 of the lug.

Latch 56 has the other portion adjacent end 61 also provided with shoulder 80 located near the upper portion of the window for cooperation with finger 54 of the treadle bar 39. Window 71 is also provided with lug 81 having stop side 82 and cam side 83 similar to lug 76. The arrangement of lug 81 is such that finger 69 of push rod 24 can cooperate with the stop and cam portions of this lug in exactly the same manner as described before in connection with finger 68. Due to the fact that leaf spring 65 always biases the latch bar to the right, as seen in FIGURES 1 and 6, lugs 76 and 81 will be disposed at the left hand sides of their respective windows. Window 71 is large enough to permit finger 54 of the treadle bar to move up and down. Push rods 23 and 24 are provided with actuating fingers 85 and 86 which may be used for operating the movable parts of any suitable mechanism, such as electric switches for example.

The operation of the mechanism is as follows. Assuming that the parts are in the position illustrated as in FIGURE 1, it will be seen that finger 54 of the treadle bar is caught against shoulder portion 80 of window 71 of the latch bar. The treadle bar is biased to either stable position, one being illustrated in FIGURE 1. This bias is obtained by the action of spring 47 on finger 43. At the same time, finger 68 of push rod 23 is caught against stop side 78 of lug 76 in window 70. The engagement of the finger 54 of the treadle bar against the stop 80 of the latch locks the latch bar against movement. Push rod 24 is normally biased to the OUT position, illustrated in FIGURE 1, because of spring 29. Now assume that push button 34 is moved downwardly or inwardly as seen in FIGURE 1. When this occurs, finger 69 of push rod 24 will cooperate with cam side 83 of lug 81 to force latch bar 56 to the left from the position illustrated in FIGURE 1. At the same time that the latch bar is being urged to the left, finger 69 is moving down against arm 52 of the treadle bar to rock it. The result is that the treadle bar is snapped to the position illustrated in FIGURE 8, with push rod 23 being moved out. Finger 53 of the treadle bar moves into position against shoulder 74 of slot 73 in the latch bar locking the latch bar against movement. Push rod 24 is locked to an IN position because of finger 69 engaging stop side 82 of lug 81.

Thus it will be seen that while the latch bar is shiftable for the purpose of retaining either of the push rods in the IN position, inadvertent release of the push rods

4

by an undesired shifting of the latch bar is prevented by reason of the engagement between one or the other of the finger portions of the treadle bar with the stops 74 or 80 on the latch bar. Thus, the treadle bar serves in effect as a lock for locking the latch bar against movement which lock is released only upon inward movement of one of the push rods resulting from a desired actuation of the mechanism. When moving button 33 down, the action is generally similar.

A somewhat modified form of the invention is shown in FIGS. 9, 10, and 11 wherein a multi-button interlock mechanism employing five buttons is shown. As shown in these drawings, the apparatus comprises a casing 100 supporting a contact-carrying insulating member 101 provided with a plurality of contacts 102 and a plurality of shiftable contact-making bars 103 for making and breaking various electrical circuits. The slidable bars are operated by push button mechanisms, five of which, namely, 104, 105, 106, 107 and 108, are shown. The push button mechanisms each include a push rod 109 which, as the constructions are substantially identical, will be described in detail only with reference to the push button mechanism 104. Each push rod 109 is slidably received in a suitable opening 110 in the top plate 111 of the frame 100 and is guided in its travel by a slot 112 in a lug 113 fixed to the rear portion 114 of the casing. Springs 115 urge each push rod outwardly of the casing. To prevent more than one push rod from being depressed at one time, a plurality of nylon rollers 116 is provided, the nylon rollers being shiftable laterally in an enclosing framework 117 and held therein by virtue of the engagement between integral axles 118 provided on each roller with slots 119 provided in the plate 117. Downward movement of a push rod brings it into contact with at least one roller and the lateral shifting movement thereof is such as to move the other rollers thereby prohibiting the complete inward movement of more than one push rod at a time.

Each of the push rods 109 is provided with a downwardly extending outstruck dog 120 engageable with a cam surface 121 provided on a latch bar 122 shiftable mounted in the frame 100. A spring 123 constantly urges the latch bar to the right (as seen in FIG. 9) retaining the dog 120 of a push rod in the IN position beneath the bottom holding surface 124 of each of the lugs on the latch bar. Shifting movement of the latch bar to the left slides the surface 124 out of contact with the dog 120 permitting the spring 115 to return the push rod to the OUT position.

From the portion of the apparatus of FIGS. 9-11 thus far described, it can be seen that upon depressing of a push rod, the dog 120 on each push rod engages the upper surface of the cam 121, thereby shifting the latch bar laterally against the bias of the spring 123. This shifting movement, when sufficiently progressed, releases any other push rod held in the IN position and upon complete depression of the push rod being moved inwardly permits the latch bar to shift to the right, bringing the surface 124 above the dog 120 of the rod being moved inwardly to hold this latter push rod in the IN position.

Even though the latch bar serves to hold the push rods in the IN position, such holding engagement can be broken by a shifting of the latch bar to the left, whether caused by the depression of another push rod or by some external force which could be inadvertently and undesirably applied.

In accordance with the present invention, however, there is provided a lock which serves to prevent inadvertent movement of the latch bar, and which lock is released permitting movement of the latch bar only upon the inward movement of another push rod from its normal OUT position.

Referring again to the drawings, the lock bar is shown at 125 and is in the form of an elongated more or less flat piece overlying the latch bar 122. The lock is pivot-

ally mounted on pivots 126 and 127 so as to be rockable about the axis formed by the pivots with the lock being urged to the position shown by coil spring 127a. Adjacent its left-hand end the lock is provided with a dependent finger 128 receivable in an opening 129 in the latch bar 122 and when the finger is so engaged in the opening in the latch bar, shifting movement of the latter is of course prohibited.

The lock bar 125 is arranged to be rocked to a position withdrawing the finger 128 from the opening 129 upon inward movement of an OUT positioned push rod. For this purpose, the lock bar is provided with a curved end portion 130 adapted to be contacted by a release finger 131 carried by each push rod, such contact serving to lift the free end carrying the curved portion 130 thereby rocking the lock bar. As the finger 131 passes beyond the curved portion 130 the rock bar is free to return to its locking position wherein the finger 128 is again positioned in the opening 129 under the urging of the spring 127a.

Each push rod is also provided with an upstruck actuating finger 132 engageable in a suitable opening provided in the contact-making bars 103. The particular arrangement of the bars 103 and contacts 102 is not material to the present disclosure as it will be clear to those skilled in the art that the multi push button mechanism of the present invention lends itself to many uses.

I claim:

1. A two button interlock mechanism comprising a base, two push rods mounted on said base in spaced parallel laterally offset relation for longitudinal movement, means for biasing said two rods to a normal OUT position, a treadle bar pivotally secured on said base at a point between said rods, said treadle bar having arm portions extending from the pivot region laterally of said rods, snap action means for biasing said treadle bar to either of two stable positions, said treadle bar being rockable in a plane parallel to the two rods, means coupling said rods to the arm portions of the treadle bar whereby the movement of a rod to an IN position drives its corresponding treadle bar arm, alternate movement of the push rods causing treadle bar operation, a latch bar movable in a straight line transversely to the lines of motion of the rods, means for biasing said latch bar to one position, said latch bar having cam and stop portions for each push rod, said coupling means for a rod and treadle bar arm also cooperating with a cam and stop portion on the latch bar, the cam portion being shaped so that movement of its rod from one position to its other position causes the latch bar to be moved against its bias, the stop portion cooperating with the same rod to retain said rod in its other position, the remaining rod when operating serving to release the lock between the stop portion and rod.

2. A two button interlock mechanism comprising a base, two push rods mounted on said base in spaced parallel laterally offset relation for longitudinal movement, means for biasing said two rods to a normal OUT position, a treadle bar pivotally secured on said base at a point between said rods, said treadle bar having arm portions extending from the pivot region laterally of said rods, snap action means for biasing said treadle bar to either of two stable positions, said treadle bar being rockable in a plane parallel to the two rods, a finger on each rod for coupling said rods to the arm portions of the treadle bar whereby the movement of a rod to an IN position drives its corresponding treadle bar, arm, alternate movement

of the push rods causing treadle bar operation, a latch bar movable in a straight line transversely to the lines of motion of the rods, means for biasing said latch bar to one end position, said latch bar having a window with cam and stop portions for each finger of said push rods, said finger for a rod cooperating with the cam and stop portion on the latch bar, the cam portion being shaped so that movement of its rod from an OUT position to IN position causes the latch bar to be moved against its bias, the stop portion cooperating with the same rod to retain said rod in an IN position, the remaining rod when operating serving to release the lock between the stop portion and rod.

3. A two button interlock mechanism comprising a base, two push rods mounted on said base in spaced parallel laterally offset relation for longitudinal movement, means for biasing said two rods to a normal OUT position, a treadle bar pivotally secured on said base at a point between said rods, said treadle bar having arm portions extending from the pivot region laterally of said rods, spring biased toggle means for biasing said treadle bar to either of two stable positions, said treadle bar being rockable in a plane parallel to the two rods, a finger on each rod for coupling said rods to the arm portions of the treadle bar whereby the movement of a rod to an IN position drives its corresponding treadle bar arm, alternate movement of the push rods causing treadle bar operation, a latch bar movable in a straight line transversely to the lines of motion of the rods, a leaf spring on said base for biasing said latch bar to one end position, said latch bar having a window with cam and stop portions for each finger of said push rods, said fingers for a rod cooperating with the cam and stop portion on the latch bar, the cam portion being shaped so that movement of its rod from one position to its other position causes the latch bar to be moved against its bias, the stop portion cooperating with the same rod to retain said rod in its other position, the remaining rod when operating serving to release the lock between the stop portion and rod.

4. A multi-button interlock mechanism comprising a plurality of button-actuated push rods, means biasing the push rods to an OUT position, a latch bar shiftable from a first position latching a depressed push rod in IN position to a second position releasing said IN positioned push rod, a dog on each push rod, a plurality of cam surfaces on the latch bar each associated with one of said dogs for shifting the latch bar with inward movement of a push rod, a lock blocking movement of said latch bar against shifting movement from said first to said second position, said lock being rockable to release said latch bar, and means carried by each push rod and engageable with said lock to rock the same with inward movement of the push rod.

References Cited in the file of this patent

UNITED STATES PATENTS

2,289,513	Mastney	July 14, 1942
2,442,766	Garvin	June 8, 1948
2,451,150	Brian	Oct. 12, 1948
2,508,181	May	May 16, 1950
2,523,786	Soreng	Sept. 26, 1950
2,855,472	Schwarzenbach et al.	Oct. 7, 1958
2,857,781	Williams	Oct. 28, 1958
2,934,613	Stoner et al.	Apr. 26, 1960
2,973,663	Williams	Mar. 7, 1961