March 7, 1961 J. H. WILLIAMS 2,973,663

PUSH ROD MECHANISM

Filed Jan. 2, 1959 2 Sheets-Sheet 1

Fig. 1.

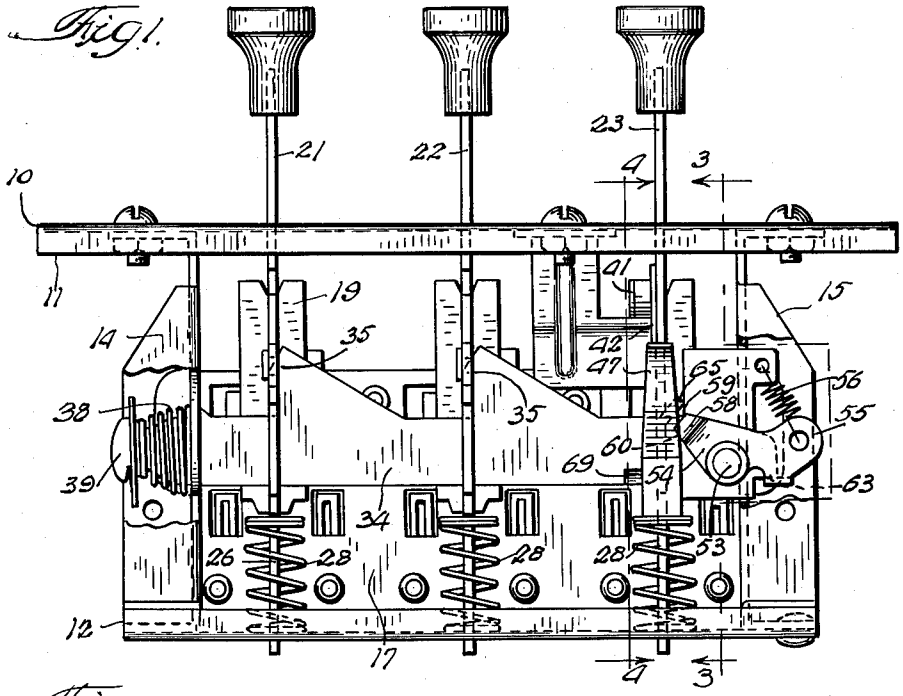


Fig. 2.

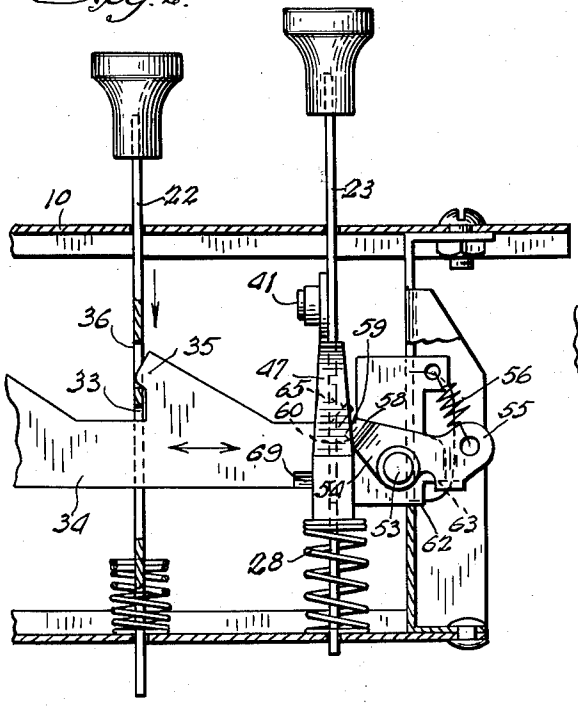
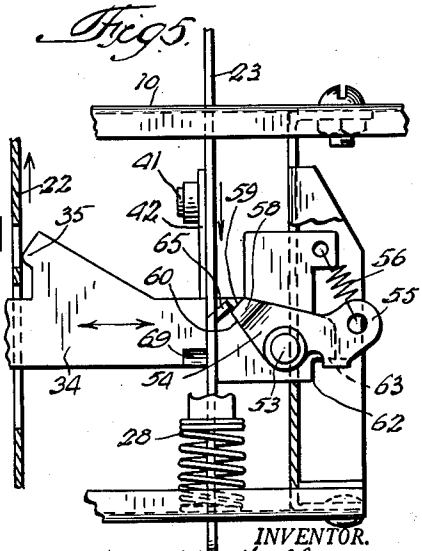


Fig. 5.



INVENTOR.
John H. Williams.
BY
Robert L. Kahn.
Attty.

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Fig. 3.

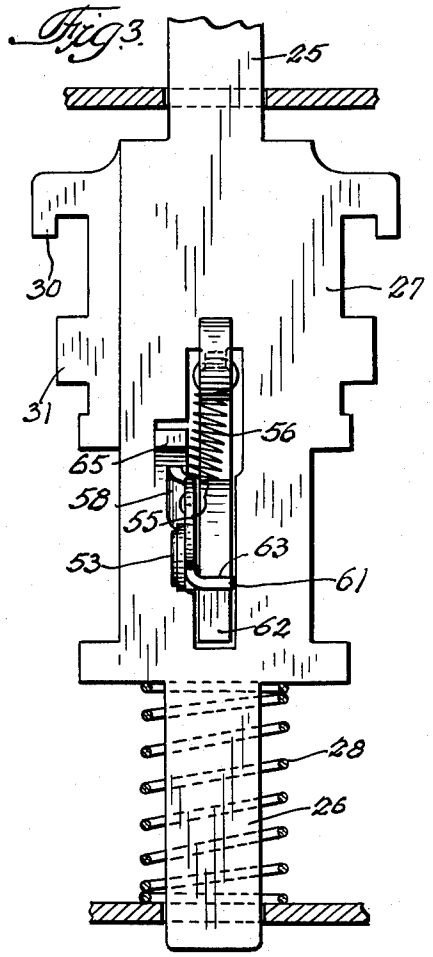


Fig. 4.

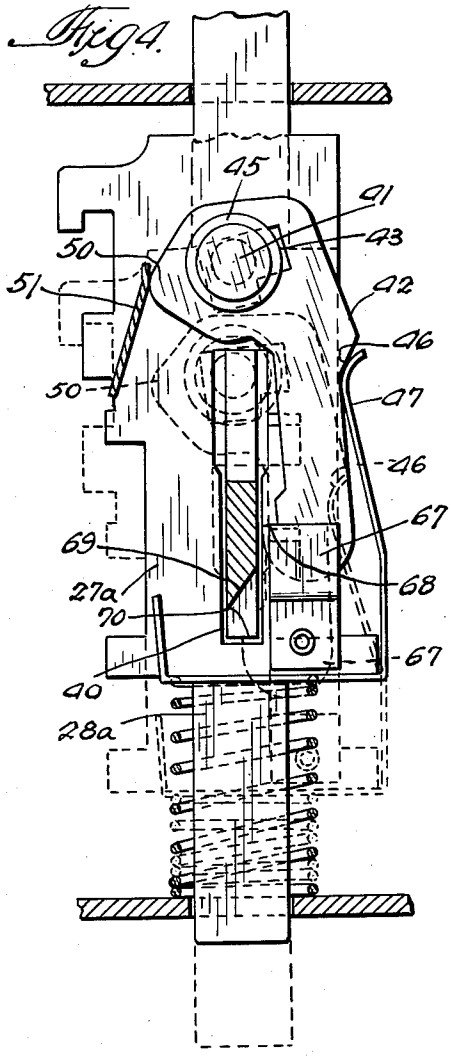
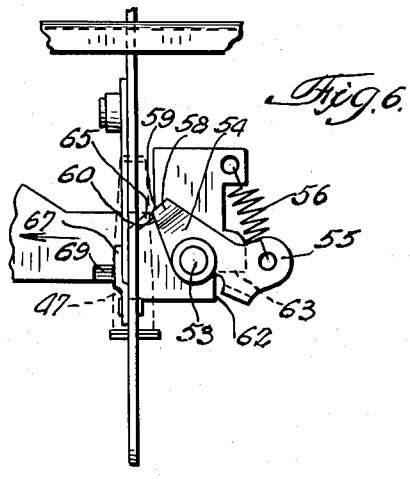


Fig. 6.



INVENTOR.
John H. Williams.
BY.
Robert L. Kahn.
Atty.

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2,973,663

PUSH ROD MECHANISM

John H. Williams, Barrington, Ill., assignor to Oak Manufacturing Co., a corporation of Delaware

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3 Claims. (Cl. 74—483)

This invention relates to a push rod mechanism and more particularly to a push rod mechanism wherein a novel push rod release means is provided.

Push rod mechanisms for use in connection with electric switches and the like are well known. As an example, a push rod mechanism to which the present invention may be readily applied is disclosed in United States Patent No. 2,213,845 issued on September 3, 1940. In the mechanism described therein, a number of push rods are arranged in laterally offset spaced parallel relation. A latch bar is provided for locking a push rod to an "in" position and releasing a previously locked different push rod. It is sometimes desirable to provide a special push rod for releasing any one or more locked push rods and capable of being released itself by operation of this same push rod. In the push rod mechanism illustrated in the patent, a locked push rod can only be released by operation of a different push rod.

This invention provides means whereby a push rod may be operated not only to release other push rods from a locked position but also to release itself without reliance on any other push rod.

For an understanding of the invention, reference will be made to the drawing wherein

Figure 1 is a side view with certain parts broken away of a push rod mechanism embodying the present invention.

Figure 2 is a detail of the mechanism illustrated in Figure 1 to show one of the push rods in a locked position.

Figure 3 is a sectional detail on line 3—3 of Figure 1.

Figure 4 is a sectional detail on line 4—4 of Figure 1.

Figure 5 is a detail illustrating the new release mechanism in one position.

Figure 6 is a detail showing the new release mechanism in a different position.

The push button mechanism generally includes front or top support strip 10 having flanges 11 bent down along each side thereof. Spaced from and parallel to strip 10 is bottom or rear support strip 12 of generally similar construction. End members 14 and 15 extend between the top and bottom strips and are rigidly attached thereto to provide a rigid structure. End members 14 and 15 support insulating sheet 17 carrying a number of electrical contacts. Insulating sheet 17 also supports a number of movable insulating strips, such as 19, carrying movable contacts. Slidably mounted in plates 10 and 12 are a number of push rods 21 to 23 inclusive. Three push rods are here illustrated for convenience but as is well known, as many push rods may be provided as are necessary. The push rods are disposed in laterally offset spaced parallel relation.

Referring specifically to push rod 21, this has rod portions 25 and 26 at the top and bottom portions of the rod and between these rod portions there is body portion 27. Rod portion 25 operates in a slot in plate 10 while rod portion 26 operates in a slot in plate 12. The

push rod is biased to an up or out position as illustrated in Figure 1 by spring 28 disposed around rod portion 26 and extending between bottom plate 12 and body 27 of the push rod.

Body portion 27 is provided with a number of fingers 30 and 31 for engaging a movable insulating strip, in this case strip 19, supporting the movable contacts. Body portion 27 is also provided with slot or window 33 for accommodating latch bar 34. Latch bar 34 has tooth 35 for cooperation with the push rod.

In order to lock push rod 21 to an "in" position, body 27 on the push rod is provided with locking slot 36 disposed above, as seen in Figures 1 and 2, latch bar slot 33. Latch bar 34 is biased toward the left as seen in Figures 1 and 2 by coil spring 38 disposed around a portion of the latch bar projecting beyond end plate 14. Coil spring 38 is kept in position by head 39 of the latch bar.

The structure so far described is generally conventional and is disclosed for example, in the patent above identified. In this particular construction, if push rod 21 is moved down, it will release other push rods and at the same time will itself stay locked in a down position. In order to release push rod 21, push rod 22 can be moved downwardly whereupon rod 22 will be locked in a down position.

Push rod 23 is provided with suitable means to be described whereby push rod 23 may be moved downwardly once to release any other push rod, such as 21 or 22 for example, and lock push rod 23 to an "in" position. A second inward movement of push rod 23 will function to release push rod 23 to an "out" position.

Referring now to push rod 23, body 27*a* thereof is provided with slot 40 for accommodating the latch bar. Latch bar 34 does not have any tooth similar to tooth 35 for the other push rods. Body 27*a* near top plate 10 is provided with pivot pin 41 upon which is disposed rocker arm 42 having slot 43 through which pin 41 passes. Slot 43 has the shape of an L so that rocker arm 42 may not only pivot with respect to pin 41 but may also move transversely of the pin. Washer 45 carried by the end of pin 41 locks rocker arm 42 on the pin. Rocker arm 42 has a cam surface 46 against which spring arm 47 presses. Spring arm 47 extends toward the bottom of body portion 27*a* and around rod portion 28*a* to be locked to the push rod.

Rocker arm 42 also has cam portion 50 which is adapted to cooperate with cam plate 51 rigidly supported from plate 10. Latch bar 34 has pivotally supported thereon at 53 dog 54. Dog 54 has one end 55 apertured for accommodating the end of bias spring 56, the other end of the bias spring being secured to a part of the latch bar. Bias spring 56 tends to pull dog portion 55 up as seen in Figures 1, 2, 5 and 6. Dog 54 has tooth 58 provided with edges 59 and 60. Edges 59 and 60 are at an angle to each other and meet at the very tip of tooth 58. Tooth 58 is rockable over a limited range, this being determined by bent portion 61 of dog 54 operating between edge portions 62 and 63 of the latch bar. Cooperating with edge portion 59 of dog 54 is finger 65 bent from the push rod material toward the dog.

As dog 54 is biased to its normal position as illustrated in Figures 1, 2, 5 and 6, finger 65 of the body of push rod 23 will tend to be forced against edge 59 of the dog when push rod 23 is moved downwardly. Thus, when push rod 23 is moved from a normal "out" position, as seen in Figures 1 and 2, for example, downwardly, dog 54 will be engaged by finger 65 of the push rod to move the latch bar to the right, as seen in Figures 1 and 2. The movement of the latch bar to the right will release any other push rod which happens to be down, such as,

for example, push rod 22 in Figure 2. Once finger 65 is past the tip of dog 54, the latch bar can return to normal position. If no means are provided for retaining push rod 23 to an "in" position, it is clear that push rod 23 will return to its top position, as seen in Figure 1, since finger 65 on the way up can pass tip 58 of the dog. However, rocker 42 is adapted to retain the push rod in a down position, not necessarily the furthest position down, by means provided therefor.

Referring specifically to Figure 4, rocker 42 has bottom portion 67 provided with shoulders 68. Shoulder 68 upon downward movement of rocker 42 with push rod 23 will slide along the surface of the latch bar until edge 70 is reached, permitting rocker 42 to turn clockwise, as seen in Figure 4, so that shoulder 68 can engage bottom edge 70 of the latch bar. This rocking will be due to a combination of actions by spring 47 and cam plate 51. L-shaped slot 43 aids in permitting rocker 42 to move to a locking position. When push rod 23 is moved downwardly from its locked position, this downward movement being enough to cause spring 47 to ride on cam surface 46 of rocker 42 and force the rocker to the left, as seen in Figure 4. This leftward movement of the rocker with reference to pin 41 is permissible due to shape of slot 43. This general rocker construction and push-push action is more fully disclosed and claimed in my previous United States Patent No. 2,857,781, issued October 28, 1958. In the present application, this push-push action is combined with latch bar operating means shown in detail in Figure 6 for providing a novel combination. Instead of the push-push latching means disclosed here and in the patent referred to above, any other push-push latching means may be used.

In general, any suitable latch bar mechanism for cooperating with push rods may be used where the locking and unlocking of a push rod is controlled by the longitudinal movement of a latch bar. Added to such a construction is at least one additional push rod having the special push-push action described.

Instead of having a pivoted dog on the latch bar, it is possible to use any other detent means for providing engagement between the latch bar and additional push rod upon inward movement of said additional push rod from an "out" position while permitting said additional push rod to move freely insofar as the latch bar is concerned in an outward direction.

As is clearly evident, the additional push rod here is normally biased to an "out" position and is movable manually from said "out" position toward an "innermost" position. The normal "in" position of the additional push rod is between the "out" position of the additional push rod and the "innermost" position thereof. A push-push mechanism clearly requires a stable "in" position between a stable "out" position and some "innermost" position. Obviously the "innermost" position of the adlitional push rod is not a stable position. Hence, the one way means for coupling the additional push rod to the latch bar should only act when the additional push rod moves from its "out" position to its "in" position.

The additional push rod must continue beyond the "in" position to some "innermost" position and then returns to a stable "in" position. From this stable "in" position the additional push rod is again movable inwardly for a distance after which it is free to return to its normal "out" position in response to its bias.

What is claimed is:

1. In a multi-push rod mechanism of the type having a plurality of spaced laterally offset push rods and latch bar mechanism including a latch bar whereby a push rod when moved from a normally biased "out" position to "in" position will move said latch bar to unlock any previously locked push rods and lock said last operated push rod to an "in" position, the improvement which consists of an additional push rod movable longitudinally between an "out" and "in" position, means interconnecting said additional push rod and said latch bar for moving said latch bar to a push rod unlocking position upon movement of said additional push rod from an "out" to an "in" position, said interconnecting means permitting said additional push rod to move from an "in" position to an "out" position without affecting said latch bar and means cooperating with said additional push rod for locking said additional push rod to an "in" position after it is moved from an "out" to an "innermost" position, and for unlocking said additional push rod when said additional push rod is again moved from its locked "in" posito its "innermost" position, said interconnecting means comprising a pivoted dog having a tooth portion for cooperation with said additional push rod, said dog being movable to clear said push rod upon outward movement thereof and to engage upon inward movement of said additional push rod.

2. The construction according to claim 1 wherein said means for locking said additional push rod to an "in" position includes a rocker mounted for limited rocking and translational movement with respect to said additional push rod, said rocker having a shouldered portion for engaging said latch bar, said rocker having spring means and cam surfaces cooperating therewith to move said rocker respectively to a locking or unlocking position after successive movements inwardly of said additional push rod.

3. In a multi-push rod mechanism, the combination of a plurality of spaced, laterally offset, longitudinally movable push rods, means for biasing said push rods to a normal "out" position from which position said push rods are manually operable to an "in" position, latch bar means disposed transversely of said push rods, said latch bar means providing a tooth on said latch bar for cooperation with a push rod, each push rod having its own latch bar tooth, each push rod and latch bar tooth cooperating so that when a push rod is moved inwardly the latch bar is first moved longitudinally from a normal locking position to a temporary unlocking position and then moved back to its normal locking position whereby said latch bar will lock a push rod to an "in" position and will unlock any previously locked push rods, an additional push rod normally biased to an "out" position and movable through an intermediate "in" position to an extreme "innermost" position, spring biased means operatively connecting said latch bar and said additional push rod only when said additional push rod moves from its "out" position to its "in" position for moving said latch bar to an unlocking position, and means for locking said additional push rod to an "in" position after it is first moved from its "out" position to its "innermost" position and then goes out to the "in" position for unlocking said additional push rod when moved from its locked "in" position to its "innermost" position whereby said additional push rod can respond to its bias and return to its normal "out" position, said spring biased means comprising a dog pivotally secured to said latch bar and having a part movable in a direction generally parallel to the direction of movement of said additional push rod, said dog and additional push rod having cooperating cam surfaces so that said dog will not yield when the latch bar and additional push rod are to be engaged.

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