

Feb. 14, 1950

D. P. MOSSMAN

2,497,414

FIVE POSITION LEVER SWITCH

Filed April 28, 1945

3 Sheets-Sheet 1

Fig. 1.

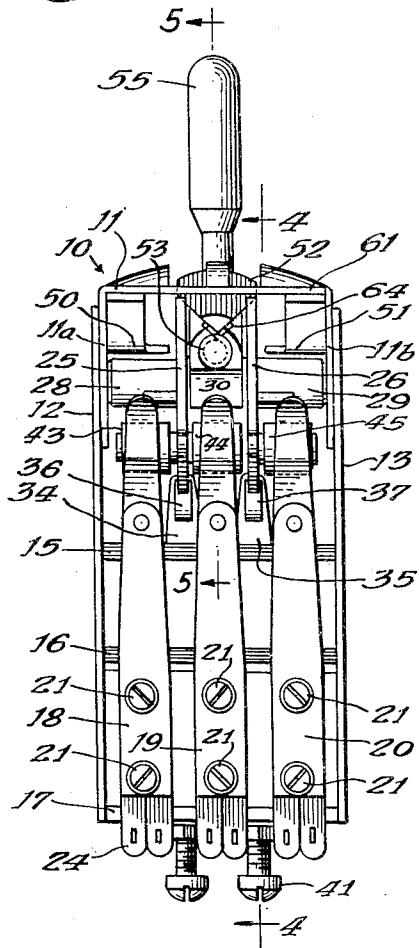


Fig. 2.

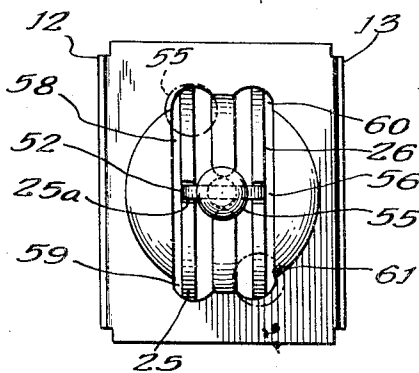
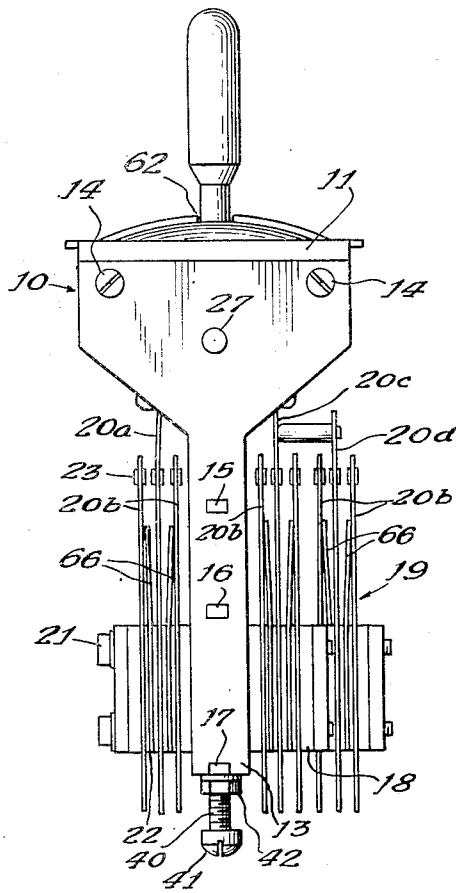


Fig. 3.

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Fig. 4.

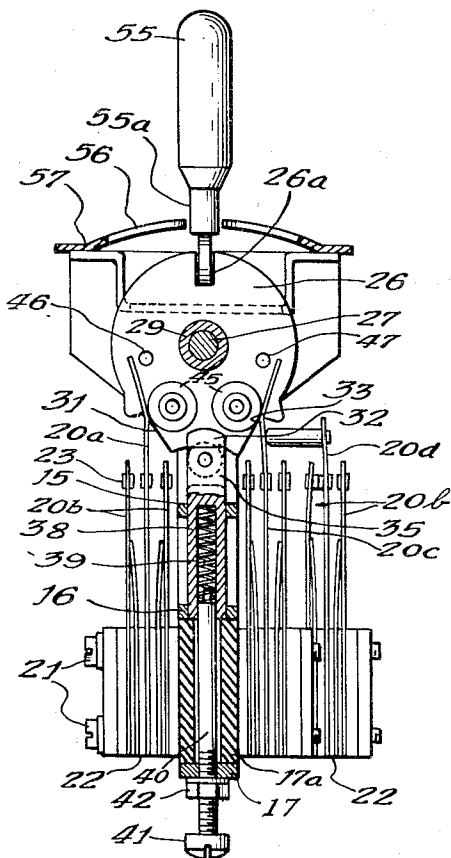


Fig. 5.

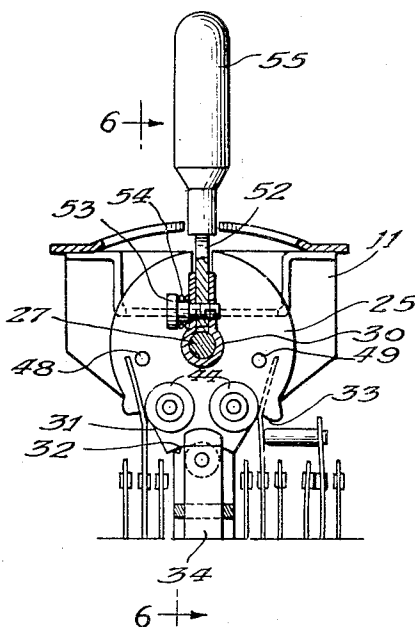


Fig. 6.

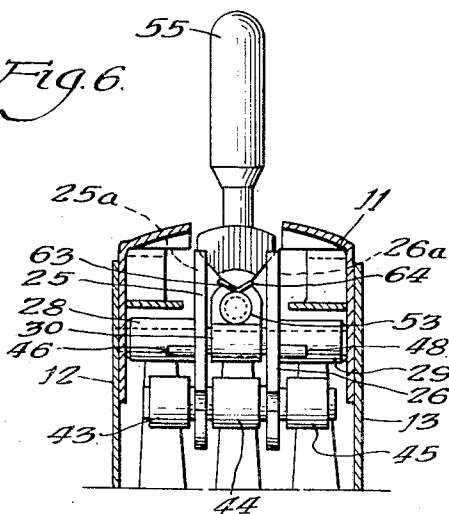
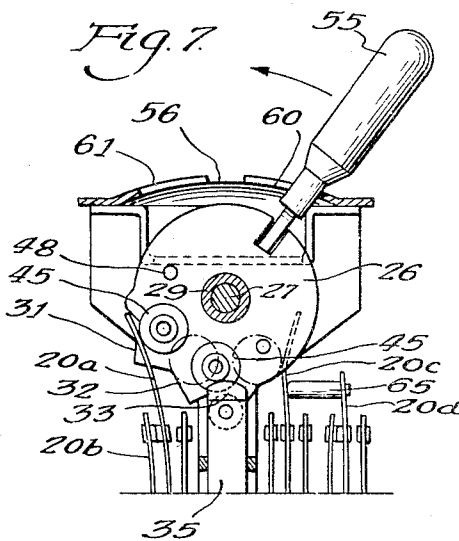


Fig. 7.



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Fig. 8.

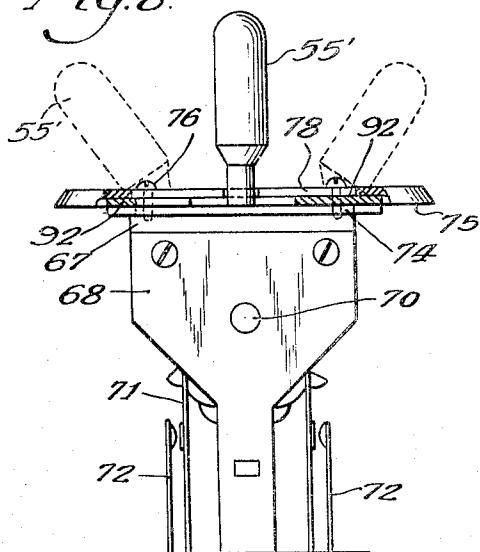


Fig. 9.

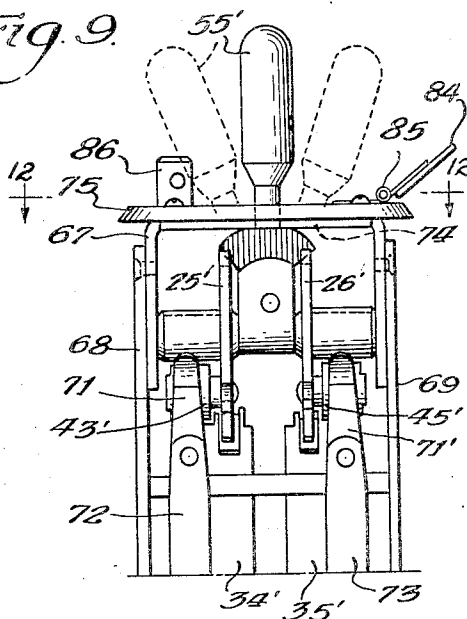


Fig. 10.

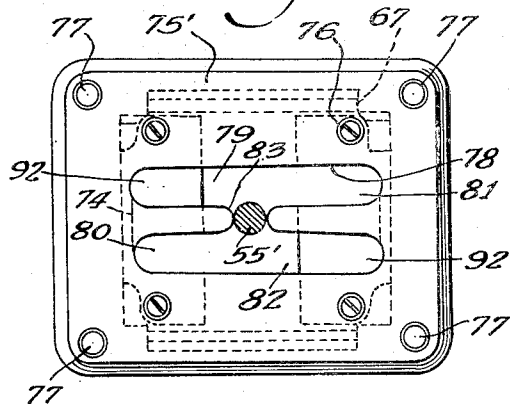


Fig. 11.

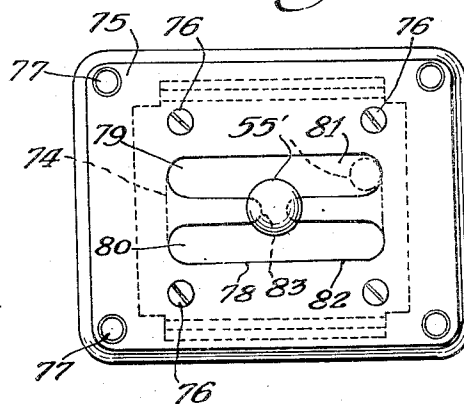
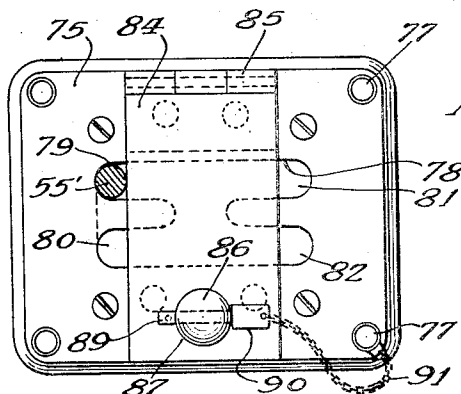


Fig. 12.



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UNITED STATES PATENT OFFICE

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FIVE POSITION LEVER SWITCH

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5 Claims. (Cl. 200—5)

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The present invention relates to switches and particularly to lever type switches wherein a plurality of circuits are controlled by a single switch lever, the switch lever being a multiple position one with locking action in neutral position and locking or non-locking action in other positions of the lever. Primarily the present invention concerns itself with providing a novel means whereby the single lever can be used to actuate different sets of contacts and lock in any one of more than four positions or a lesser number as desired.

It is also a purpose of this invention to provide a novel means for actuating the spring contacts whereby the moving spring contact is pressed against the stationary contact with a higher pressure immediately upon engagement of the contacts than can be obtained by spring mounting the stationary contact. This construction provides also for a more rapid and cleaner break of the moving spring contact from the stationary contact upon movement of the moving spring contact toward open position.

My invention contemplates the provision in a switch of this character a sturdy chassis or frame which supports a plurality of latch plates and spring actuated pistons. Each piston carries a roller for riding over notches provided in the latch plate, and stops are set in the latch plate for engaging the frame and limiting the travel of the plates. I combine an actuating lever with the plates. These plates are positioned on opposite sides of the lever, and the lever is mounted for movement into position to actuate either plate. The frame construction provides means whereby the lever is guided in such directions that only when it is in neutral can the lever be shifted from one plate to the other.

It is also a purpose of my invention to provide a novel cover or mounting plate for a lever switch whereby the lever may be limited in its positions and whereby it may be locked positively against movement out of position. Thus a normal multiple position lever switch can be made into a positive locked switch that requires actuation of a separate locking mechanism before the lever can be moved from a selected position.

The nature and advantages of my invention will appear more fully from the following description and the accompanying drawings wherein a preferred form of the invention is shown. It should be understood however that the drawings and description are illustrative only and

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should not be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Figure 1 is a plan view of a lever switch embodying my invention;

Figure 2 is a view in side elevation of the switch shown in Figure 1;

Figure 3 is an end view of the switch;

Figure 4 is a sectional view taken on the line 4—4 of Figure 1;

Figure 5 is an enlarged fragmentary sectional view taken on the line 5—5 of Figure 1;

Figure 6 is a fragmentary sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a view similar to Figure 4, but showing the parts in changed position;

Figure 8 is a fragmentary view, partly in side elevation and partly in section of a slightly modified form of the invention;

Figure 9 is a fragmentary side view of the switch shown in Figure 8;

Figures 10 and 11 are like views illustrating two different face plates that are employed in connection with the construction shown in Figures 8 and 9; and

Figure 12 is a view taken on the line 12—12 of Figure 9 illustrating a locking device for locking the switch lever in pre-determined position.

Referring now to the drawings and particularly to Figures 1 to 4 of the drawings, my invention is embodied in a multiple circuit lever type switch wherein the frame 10 embodies a U-shape base 11 and two side frames 12 and 13 which are secured to the base 11 by suitable screws 14. The side pieces 12 and 13 are cross-connected by spacer bars 15 and 16 and an end bar 17 to provide a rigid positioning and supporting structure for the operating parts of the switch. The bars 16 and 17 have a block 17a of insulation between them which is secured by screws to provide means for supporting a plurality of banks 18, 19 and 20 of contact springs on each side of the frame 10. The several banks of contacts are held together in the usual manner by screws 21 and are spaced by strips 22 of insulation. These banks of contact springs have their contacts 23 welded or otherwise secured thereto and they also have terminal portions 24 for attaching conductors thereto. Between the frame pieces 12 and 13 and the sides 11a and 11b of the base 11 I mount a pair of plates 25 and 26 for rotation upon a shaft 27 that is supported in the side pieces 12 and 13. The plates 25 and 26 are suitably spaced on the shaft 27 by two spacing sleeves 28 and 29 and by a strap 30 that encircles the

shaft 27 between the plates 25 and 26. The plates 25 and 26 are notched as shown at 31, 32 and 33 to provide stop positions for the plates and in order to hold the plates in the stop positions I provide two pistons 34 and 35 with rollers 36 and 37 mounted in the ends of the pistons. As shown best in Figure 1 the pistons have their ends next to the plates 25 and 26 bifurcated and the rollers are set in these bifurcated ends so that the plates can be received between the bifurcated ends of the pistons where they engage the rollers. The pistons are essentially alike and comprise a tubular portion 38 receiving a spring 39. The tubular portion 38 is guided in the cross bars 15 and 16, and in order to adjust the tension of the spring 39 an adjustable rod 40 is threaded through the end cross piece 17 and extends down into the tubular rod 38. The rod 40 has a screw head 41 thereon so that it can be adjusted. A lock nut 42 is utilized to lock the rod in the desired position.

The plate 25 carries contact spring actuating rollers on both sides of the plate. These rollers are shown at 43 and 44. There are two of the rollers 43 and two of the rollers 44. The plate 26 however, carries only two rollers on one side thereof, these rollers being indicated at 45, there being two rollers 45 spaced apart so as to be properly positioned to engage the movable contact springs. In the main form of the invention there are stop pins 46 and 47 upon the plate 26 and similar pins 48 and 49 on the plate 25. These stop pins are so positioned as to engage depressed portions 50 and 51 of the frame base 11.

The strap 30 preferably is free to rotate on the shaft 27 and it has a flat V-shape bar 52 pivoted to it by means of a pivot pin 53. In order to provide suitable pressure to hold the bar 52 normally centered with respect to the plates 25 and 26 between the opposite ends of the strap 30 a spring 54 is provided. The ends of the spring engage the bar and the spring is wound around the pin 53 between the head thereof and the strap. The pin itself is threaded in the opposite part of the strap as shown in Figure 5. The V-shape bar 52 has a lever 55 fixed thereto and the lever projects through a slot 56 in an escutcheon plate 57 that is mounted on the frame 11. The two plates 25 and 26 are provided with notches 25a and 26a in both of which the bar 52 is normally engaged. However, the bar 52 can be rocked by a lateral movement of the lever 55 so as to connect the lever to either of the plates and effect a rocking motion of that plate while the other end is free from the bar and remains stationary, and thus cause its rollers to actuate the movable contact springs. If the plate 25 is rocked about the shaft 27 it will of course actuate the movable contact springs of both the banks 18 and the banks 19 by means of its rollers 43 and 44. On the other hand, if the plate 26 is actuated, it will operate only the movable springs of the banks 20. It is of course within the scope of this invention to provide more rollers on the plates 25 and 26 and additional banks of contacts on each side of the frame 10 if that is desired. The showing here is primarily to illustrate the basic construction and to demonstrate that the construction may be varied to a substantial degree to accommodate the construction to a specific problem of the user without in any way altering the basic design thereof.

By reference to Figure 3 of the drawings it will be observed that the aperture 56 in the escutcheon plate 57 is so shaped as to provide four branches

58, 59, 60 and 61. The four branches are joined at the center by a narrow neck portion 62 of the opening 56. The lever 55 extends through the opening 56 and has a reduced portion 55a that is small enough to clear the reduced neck 62 between the several branches of the opening 56.

If the operator desires to actuate the plate 25, he swings the lever 55 toward the left as shown in Figure 1 to bring it into alignment with the branches 58 and 59 of the opening 56. This movement likewise brings the bar 52 into the slot 25a of the plate 25. The lever can then be moved up or down to actuate the contact springs by means of the rollers 43 and 44. The extent of the branches 58 and 59 is sufficient to effect movement of the plate 25 far enough to cause the roller 36 to pass from the central notch 32 into one of the notches 31 or 33. This will lock the lever 55 in position against return movement because the force of the spring 39 is sufficient to make it necessary to apply pressure to the lever 55 in order to move the plate 25. By moving the lever to the right as shown in Figure 1 the bar 52 can be engaged with the slot 26a in the plate 26 and the lever is positioned to operate in the branches 60 and 61 of the opening 56. There is a neutral position of the lever 55 when its reduced part 55a is located in the neck 62 of the opening 56. It is preferable to provide a suitable means, such as extensions 63 and 64 on the spring 54 to engage the bar 52 and hold it in the neutral position. In this position the rollers 36 and 37 of the pistons 34 and 35 engage the central notches 32 of the plates 25 and 26 so that all of the contacts are in normal neutral position.

When the lever 55 is moved out of neutral position to right or left, it positions the bar 52 to actuate one of the plates 25 or 26. One actuated position of the plate 26 is shown in Figure 7 of the drawings. In this figure the stop pin 46 is moved up into position to engage the part 51 of the frame. One of the rollers 45 is engaged with a movable contact spring 20a of the associated bank contacts so as to engage the contacts 23 thereon with the contacts of a stationary contact spring 20b of the same bank. By moving the lever 55 in the direction of the arrow shown on Figure 7 of the drawings from the branch 60 of the openings 56 to the branch 61 thereof the plate 26 will be shifted to bring the other roller 45 mounted thereon against the movable contact spring 20c of the bank 20. This movable contact spring 20c is operatively engaged with a second movable contact spring 20d by the usual spacer 65 so that two sets of contacts may be actuated by the one roller engaging one of the contact springs.

In Figures 2 and 4 of the drawings I have shown a novel feature of the contact spring mounting which is particularly advantageous in obtaining proper pressure between contacts immediately when they are brought together and in obtaining a clean break when the contacts are separated. The stationary contact springs are identified throughout by the numeral 20b. Associated with each of these contacts is a back-up spring 66 that is mounted by the same means that mounts the other springs. This back-up spring bears against its associated contact spring 20b so as to place the spring 20b in tension. Now when a movable contact spring, such as 20a, 20c, or 20d is moved into position to engage the contact carried thereby with the contact on the stationary spring, there is an immediate high pressure between the contacts with a very little

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movement of the springs. The back-up spring 66 is relatively stiff when compared with its associated contact carrying spring so that in placing the contact spring in tension the back-up spring is moved very slightly out of its tension free position. This construction makes it possible to use a contact spring that will give the desired pressure initially upon engagement with the moving contact, but which will not overload the moving contact due to the travel necessary for the operation of the detent mechanism in the switch. In breaking of the contact by return of the movable contact spring to normal resting position, the stationary contact spring is stopped more suddenly than would be the case without the back-up spring 66 and a better break of the circuit is obtained.

Referring now to Figures 8 to 12 inclusive, I show a modification of the construction which simplifies the adaptation of the switch to various conditions where the number of positions for the switch may vary over a wide range. For example: it may be desirable to have the switch occupy five positions where it is held in any one of the five positions by virtue of the detent mechanism. Again it may be desirable to have the switch operate one of the plates 26 to two lock positions where the detent mechanism holds the lever in the two positions, and it may be desirable to have the other plate operated by the lever to a pair of hold positions where the detent mechanism will not retain the lever in the operated position, but will return it if it is released, thus making it necessary for the operator to hold the switch lever in actuated position for as long as the operation is to be continued. In certain instances it is also desirable to be able to lock the lever so that it cannot be moved by accident even though a strong force capable of overcoming the detent lock be applied to the lever. The features shown in Figures 8 to 12 take care of the above mentioned conditions.

The modified form of the invention embodies a frame 67 of U-shape to which two side frames 68 and 69 are secured. A shaft 70 is mounted in the frame 67 and extends into the side pieces 68 and 69. The shaft carries two plates 25' and 26', similar in all respects to the plates 25 and 26. The plates 25' and 26' are operated by a bar 52' and a lever 55' in the same manner as in the preferred form of the invention. The plates carry rollers 43' and 45' respectively for engagement with movable contact springs 70 and 71' that cooperate with stationary contact springs 72 and 73 in essentially the same manner as in the preferred form of the invention. The plates 25' and 26' are notched and cooperate with pistons 34' and 35' to lock the plates 25' and 26' in the several positions just as in the main form of the invention.

The frame 67 has a relatively large rectangular opening 74 therein. This opening is covered by a mounting plate 75 which is fastened to the frame 74 by a plurality of screws 76. The plate 75 is also apertured as indicated at 77 beyond the extent of the frame 67 so that the apertures 77 may be utilized as a means for mounting the switch on a panel. In the plate 75 shown in Figure 11 there is provided a lever guiding opening 78 which has four branches 79, 80, 81, and 82. The branches are interconnected by a narrow neck portion 83 in which the reduced part of the lever 55' can rest when the switch is in neutral position. The mounting plate in this case provides the same guiding characteristics

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that are provided in the opening 56 of the first form of the invention. However, in this form of the invention the branches 79 to 82 inclusive function also as the means of stopping or limiting the movement of plates 25'.

When it is desired to limit the positions of either of the plates 25' or 26'; as for example, to a neutral position or one or two non-locked positions, the only change necessary is to place a small blocking plate 92 beneath the mounting plate 75 and fasten it by the same screws to the frame 74. Figure 10 illustrates a pair of the blocking plates 92 in place to shorten the branches 79 and 82. The branches 79 and 82 are shortened so as to stop the lever 55' short of locked position, that is, in a position where the roller on the piston 34' has not passed over the raised point of the plate 25' into the locking notch that would retain the plate in position. Thus if the operator would release the lever 55', it would return to neutral position. It will be evident that various arrangements of the blocking plates 92 may be employed to obtain the desired locking and non-locking features in a switch which is otherwise standard.

In Figures 9 and 12 I show a further modification wherein I provide means in the form of a hinged latch plate 84 on the mounting or escutcheon plate 75. The plate 84 is secured by a hinge 85 to the plate 75 and it extends across the plate 75 in position to cover all but the outer portions of the branches 79, 80, 81 and 82 of the opening 73. A lock or latch device is indicated on Figures 9 and 12. This latch device constitutes a post 86 that is mounted on the plate 75 and that extends through an opening 87 in the hinged plate 84. The post 86 has an opening 88 that receives a pin 89, and the pin 89 has a head 90 thereon which may be fastened by a chain 91 to the plate 75.

From the foregoing description it is believed that the nature and advantages of my invention will be clear to those skilled in the art.

Having thus described my invention, I claim:

1. A switch of the character described comprising a supporting framework, movable and stationary contacts mounted thereon, a pair of members pivoted in said framework and having means thereon operable by pivotal movement of said members to move the movable contacts with respect to the stationary contacts, an actuating lever, means on said lever operatively connected in one position of the lever to both members and locking the members against movement but movable by shifting of the lever to and fro to establish, alternatively, an operative connection with either one of said members to the exclusion of the other, resilient means opposing shifting of said lever from the position where it is connected to both members, said lever being shiftable in another direction when in operative connection with only one of said members to effect turning movement of that member and means on the framework preventing movement of said lever in said other direction while the means on said lever is connected to both of said members.

2. A switch operating mechanism comprising a framework, a pair of spaced contact actuating members pivoted in said framework, each actuating member being movable from a central neutral position in either direction about its pivot to another position for contact actuation, detent means operable to hold each actuating member in any of its three positions, a hand lever, a mounting for said lever in the framework be-

tween the contact actuating members mounting the lever for movement toward either member, and for rotation between the members, spring means opposing movement of said lever toward either member, interengaging means on said lever and members normally connecting the lever to both members but operable to disengage the lever from one member when the lever is moved against the opposition of said spring means toward the other member whereby to move either member by rotation of the lever, and a guide means on said framework preventing rotation of the lever except when it is moved to limiting position toward one or the other of said members, said guide means comprising an H-shaped slot through which the lever extends and a lock plate hinged on said framework and movable over said slot to lock the lever in any one of the four ends of said slot.

3. A switch operating mechanism comprising a framework, a pair of spaced contact actuating members pivoted in said framework, each actuating member being movable from a central neutral position in either direction about its pivot to another position for contact actuation, detent means operable to hold each actuating member in any of its three positions, a hand lever, a mounting for said lever in the framework between the contact actuating members mounting the lever for movement toward either member, and for rotation between the members, interengaging means on said lever and members normally connecting the lever to both members but operable to disengage the lever from one member when the lever is moved toward the other member whereby to move either member by rotation of the lever, and a guide means on said framework preventing rotation of the lever except when it is moved to limiting position toward one or the other of said members, said guide means comprising an H-shaped slot through which the lever extends, one of the leg portions of said slot being shortened to prevent movement of one actuating member by the lever to one of said positions.

4. A switch of the character described comprising a supporting framework, banks of contact springs having contacts thereon including movable and stationary contact springs mounted

on the frame in spaced relation, contact actuating means mounted in the framework operable to force the movable contact springs toward the stationary springs and thereby move both springs in one direction, a stationary spring stop operable to limit the reverse movement of the stationary spring, said stop comprising a relatively stiff bar between the stationary and movable springs and spaced therefrom except at its tip end, the tip end being pressed against the stationary spring whereby to partially tension said stationary spring when it is not engaged by the movable contact.

5. A switch operating mechanism comprising a framework including an U-shaped base, a pivot pin extending across the base, a pair of spaced contact actuating plates pivoted on said pin, each plate being movable from a central neutral position in either direction about its pivot to another position for contact actuation, a detent means cooperating with each plate to hold it in any of its three positions, a hand lever, mounting means for said lever pivotally mounted on said pin between the plates, said lever being pivoted on its mounting means for rocking movement toward either plate, interengaging means on the lever and plates normally connecting the lever to both plates, but adapted upon movement of the lever toward one plate to release the lever from the other plate, and means on the frame preventing rotation of the lever about the pivot pin when it is engaged with both plates.

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