Sept. 23, 1952 D. P. MOSSMAN, SR 2,611,835

LEVER SWITCH

Filed June 6, 1947 2 SHEETS—SHEET 1

Fig. 1.

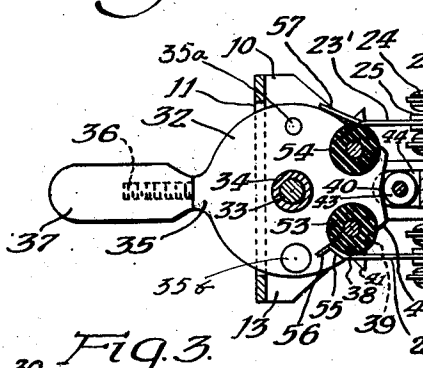


Fig. 2.

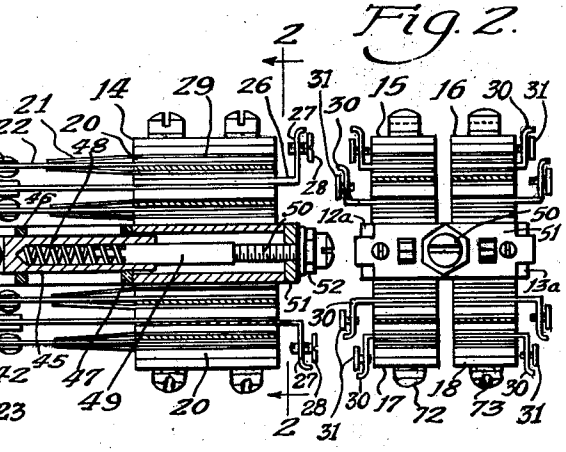


Fig. 3.

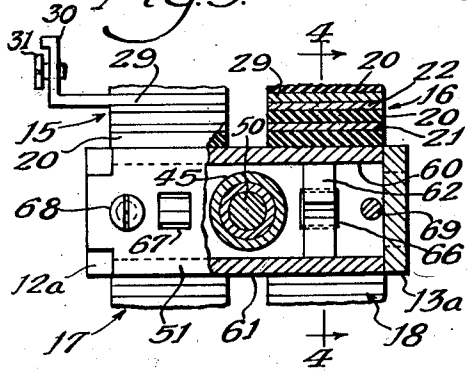


Fig. 4.

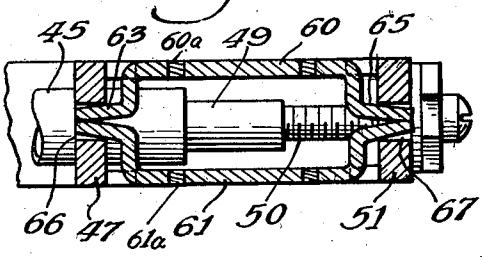
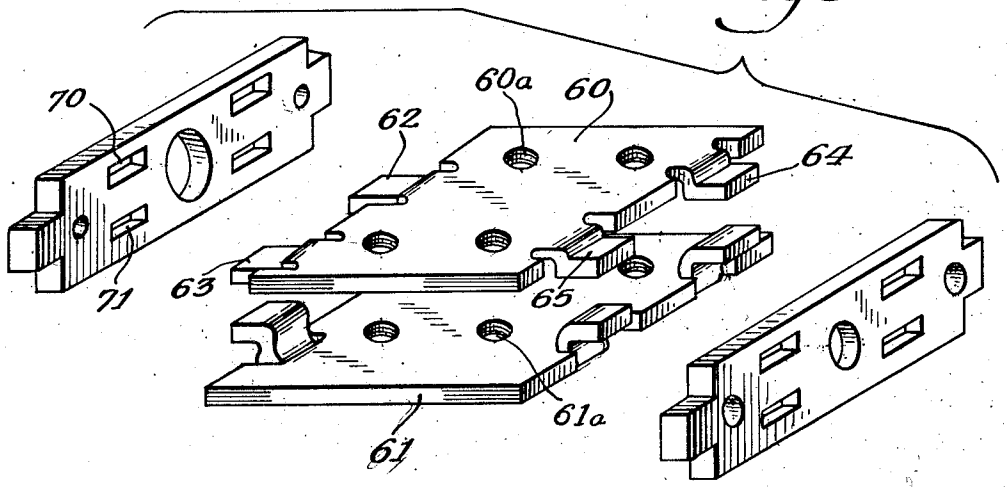


Fig. 5.



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Fig. 6.

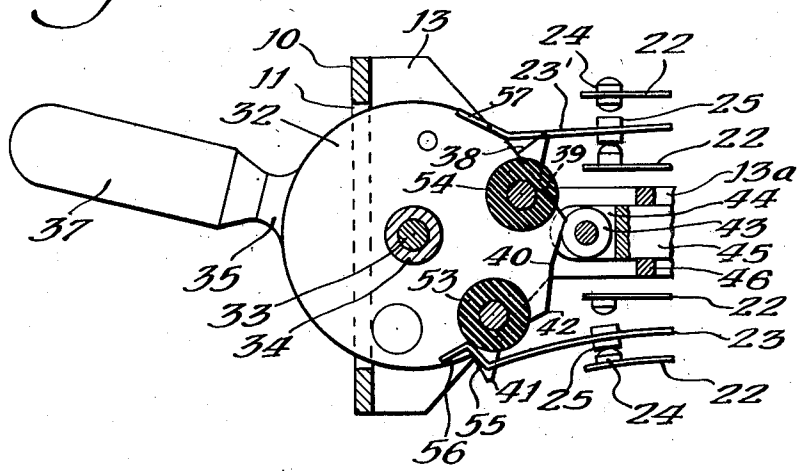
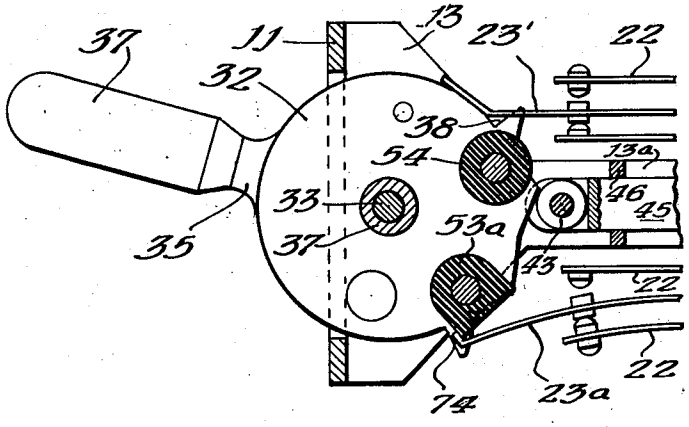


Fig. 7.



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Patented Sept. 23, 1952 2,611,835

UNITED STATES PATENT OFFICE

2,611,835

LEVER SWITCH

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Application June 6, 1947, Serial No. 752,936

3 Claims. (Cl. 200—1)

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The present invention relates to lever switches. It is particularly concerned with a switch wherein a plurality of groups of springs are arranged to be operated by a rocking lever to make and break contact between the contact points on the springs. Switches of this character are usually provided with a main frame and oppositely disposed groups or pile-ups of contact springs, certain of which springs extend beyond the others and are adapted to be engaged by rollers or cams that are mounted on a pivoted lever. It is customary also to associate with the lever a spring pressed detent which engages a notched camming surface that is part of the lever. The detent is adapted to hold the lever yieldingly against movement in a neutral position and one or more operating positions when the lever is turned in either direction from neutral position.

In many instances it is desirable to have the lever operable to make or break certain of the spring contacts without passing the spring detent over one of the holding notches of the camming plate. Such a position is usually termed a non-lock position, and is reached with a relatively small motion of the lever. It is difficult to obtain proper movement of the spring contacts with such a small throw of the lever and still have the requisite movement of the spring contact for locking position that is arrived at by a much larger angular movement of the lever.

It is a purpose of my invention to provide in a switch of this character, a novel combination of parts whereby the desirable full movement of the movable contact spring is obtained over a wide range of movement of the lever so that, for example, a small movement of the lever from neutral position in one direction will give full movement of the contact springs actuated while much greater movement of the lever may be used to move other contact springs or the same springs without excessive bending of the springs and without the necessity of any change in the lever, and general switch construction.

It is also a purpose of my invention to provide certain improvements in a switch of this character whereby the vibration of the contact springs is overcome so as to enable the switch to withstand very severe shocks without the contacts being made or broken due to the shock.

It is a further purpose of my invention to provide in a switch of this character, a frame construction which readily adapts itself to the application of screw terminals for wiring the several pile-ups of switch contacts.

It is another purpose of my invention to provide in a switch of this character, an improved mounting for the spring pile-ups whereby the parts are more rigidly secured together and the construction is simplified from the assembly standpoint.

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The nature and advantages of the invention will appear more fully from the following description and 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 should not be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Figure 1 is a longitudinal sectional view through a switch embodying my invention;

Figure 2 is a sectonali view taken substantially on the line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary end view looking at the switch from the right hand end of Figure 1, certain parts being broken away to better illustrate the construction;

Figure 4 is an enlarged sectional view through the mounting plates for the spring contacts, the view being taken substantially on the line 4—4 of Figure 3;

Figure 5 is an exploded view illustrating the mounting plates in perspective and separated from each other;

Figure 6 is an enlarged fragmentary view illustrating a changed position of the lever; and

Figure 7 is a view similar to Figure 6 but showing the modified construction for obtaining adequate movement of the contact springs with a small throw of the operating lever.

Referring now to the drawings in Figure 1, I have illustrated a switch embodying my invention wherein a main frame 10 has a U-shaped lever mounting portion similar to that shown in my prior application, Serial Number 590,909, now Patent No. 2,497,414 dated February 14, 1950. This lever mounting portion includes an apertured back plate 11 and two sides one of which is shown at 13. These sides have reduced portions 12a and 13a which extend parallel to each other and serve to mount a spring contact assembly 14 which is in the form of a plurality of groups 15, 16, 17 and 18, of contact springs, and associated insulators or spacers 20, and vibration dampening springs 21. The operating parts of the pile-up assembly comprise stationary contact springs 22 and movable contact springs 23 and 23' both of which carry contact points indicated generally by the numeral 24 on the stationary springs and by the numeral 25 on the movable springs.

In connection with each of the springs 23 and 23', wiring terminal plates 26 are provided, these terminal plates being laid in engagement with the springs. Each terminal plate has a portion 27 extending end wise beyond the pile-up, and provided with a screw 28 for fastening a lead thereto. Each of the stationary springs 22 has a terminal wiring plate 29 engaged therewith. The terminal wiring plates 29 extend laterally from the pile-ups and have wiring terminal por-

tions 30 thereon provided with lead attaching screws 31. This arrangement of wiring terminal plates makes it possible as shown in Figure 2 to have each of the wiring terminals spaced from any other plate so that it is readily accessible for connecting the desired leads to it. As illustrated by Figure 2, the plates closest to the frame members 12a and 13a are extended outwardly farther than those more remote from the frame members so that they are readily accessible even though the spacing between plates is no more than the length of the attached screw carrying portion of the terminal plate itself.

The actuation of the spring members 23 and 23' is by means of a cam lever 32 which is pivoted between the side portions of the frame 10 by means of a shaft 33 and suitable spacing sleeves 34. This lever 32 extends through the slot 11 in the base of the frame 10, and has a reduced neck portion 35 provided with an extension 36 on which a handle 37 is mounted. The neck portion 35 is of substantial thickness in the plane of movement of the lever 32, so as to form a shoulder against which the handle 37 engages and to give adequate strength to the lever at this critical point. The lever itself is in the nature of a plate substantially circular throughout most of its circumference except for the neck 35, and notches 38, 39 and 40, and projections 41 and 42. These notches and projections are adapted to engage a spring pressed roller 43 which is mounted in the bifurcated end 44 of a rod 45. The bifurcated end 44 of the rod 45 overlaps the lever 32 on both sides thereof so as to guide the roller with respect to the notches and projections just described. Mounted on the lever plate 35 are also such stop pins 35a and 35b as are necessary to effect a position of locking or non-locking when these pins impinge against the frame 10 on either or both sides of slot 11. The pin 35b effecting the non-lock stopping action has a large head on it so as to limit the throw of the lever to a point when the latching roller 43 does not ride over the tip of projection 42, thus allowing the lever to reverse itself automatically and return to the neutral or center position.

The rod 45 is slidably mounted in two cross frame members 46 and 47 which extend between the side frame portions 12a and 13a. The rod is hollow to receive a spring 48 which is backed up by an adjustable stop pin 49. The stop pin 49 is adjusted by means of a screw 50 which threads into the stop pin and which is mounted for rotation in a cross bar 51 at the rear ends of the frame members 12a and 13a. As usual in devices of this character a lock nut 52 is provided on the screw 50. Thus the tension on the roller 43 pressing it into the notches of the lever 32 can be varied to provide the desired resistance to movement of the lever itself.

An important feature of my invention is embodied in the engagement between the spring contact engaging rollers 53 and 54 that are mounted on the lever 32, and the movable contact springs 23 and 23'. It will be noted that the lower spring 23 in Figure 1 has its forward end bent toward the roller 53 at 55, and then outwardly again at 56, while the upper spring 23' has its forward end 57 bent outwardly at the same angle as the portion 56. In normal use of the switch illustrated, the upper spring 23' is adapted to be used in so-called lock position only. In other words, if the lever 32 is rotated in a counterclockwise direction it will move the upper spring 23' outwardly to engage its contact

25 with the contacts 24 on the associated spring 22 above it with the roller 43 resting on the notch 39. This so-called lock position will then be maintained so that it is necessary to exert substantial pressure on the handle 37 to return the lever to neutral position. It is often desirable to have a hold or non-lock position where the operator of the switch must hold the lever while contact is made, and the lever will return to neutral position immediately upon release of the handle 37. Heretofore it has been difficult to obtain the proper amount of movement of the spring 23 without modifying the switch construction substantially. In order to give the proper throw to the lower spring 23 for a hold or non lock position this spring is provided with the bent tip as illustrated by the portions 55 and 56. Now when the lever is initially moved, the portion 55 engages the roller 53 and causes the spring 23 to move outwardly quite rapidly in the initial movement of the lever thus making contact with the lower spring 22 before the detent roller 43 moves over the upper projection 42 as the lever is rotated in the clockwise direction. This is the so-called hold position when the stationary spring 22 and the actuating spring 23 offer resistance to and the stop 35b prevents further movement of the lever to a lock position. As soon as the operator releases the handle 37 this spring force returns the lever to neutral position breaking the contacts between the lower spring 23 and the lower stationary spring 22. Thus it is possible to adapt the switch to one having a non lock position when the lever is moved in one direction, and a locked position when the lever is moved in the other direction merely by the utilization of a contact spring 23 on the non-lock side which has the bent ends 55 and 56. This makes it unnecessary to change in any way the general mechanism of the switch for adapting it to different installations requiring in some cases a lock and a non-lock position, and in other cases two locked positions, or two non-locked positions.

Referring now to Figures 3, 4, and 5, the frame construction for mounting the pile-ups is shown more in detail. The side frame members 12a and 13a and the cross bars 47 and 51 serve to secure two duplicate mounting plates 60 and 61. These mounting plates are generally rectangular in form, but are provided with offset fingers 62, 63, 64 and 65. The fingers are the same on both plates 60 and 61 and are offset inwardly toward the opposite plate. In Figures 3 and 4, this offset is sufficient so that the fingers come together and enter aperture 66 provided in the cross bar 47 and aperture 67 provided in the cross bar 51. The fingers as shown in Figure 4 are not exactly parallel so that their tips engage and they wedge in the openings 66 and 67. The plates are tightly secured by suitable screws 68 and 69 which pass through the bar 51 and are threaded into the cross bar 47. In Figure 5 the construction is slightly modified in that two apertures 70 and 71 are provided in the cross bars for each pair of fingers such as 62 and 63. Otherwise the construction is just the same as in Figures 3 and 4, but the offset of the fingers is reduced accordingly to align them with the apertures 70 and 71. The plates 60 and 61 are suitably apertured to receive mounting screws 72 and 73 for the pile-ups.

This construction makes it possible to use the same mounting screws for mounting both groups such as 15 and 17 of the contact spring assembly or pile-ups on the opposite sides of the frame. This insures accurate alignment of the pile-ups

and proper spacing thereof with respect to the lever 32, and because of the fact that the screws such as 72 and 73 extend all the way through the pile-ups on opposite sides of the frame the switch is quite rigid and therefore capable of withstanding rougher usage than is the case where individual pile-up mounting is employed. It also provides a means of making separate pile-ups such as 15 and 16 in the upper position and 17 and 18 in the lower position, each pair mounted separately on an individual plate 60 and 61 respectively when that plate has tapped holes as at 60*a* and 61*a*. This method is desirable and much more economical for mounting pile-ups than when the mounting screws go through the plates, and when it is not necessary to provide the additional support of screws which go through the plates as is required in some cases of unusually large pile-ups.

In certain usages of heavy duty switches such as this, the switch is subjected to rather severe shocks, and such shocks tend to cause vibration of the free ends of the stationary springs 22 so as to cause them sometimes to make or break momentary contact with the movable springs. According to my invention, I provide each of the stationary springs 22 with back up springs 21 on both sides. The back up springs are bent from the ends of the spacers 20 toward the stationary contact springs to engage them at a distance about two-thirds of the way from the spacers to the ends of the springs. The inner back up spring 21 thus opposes vibration toward the movable contact while the outer back up spring dampens the vibration in the opposite direction. These back up springs are somewhat lighter than the stationary contact springs so as to avoid the possibility of setting up resonant vibration between the springs.

The construction shown in Figure 7 of the drawings illustrates a slightly modified manner of accomplishing the same results as is obtained by the portions 55 and 56 of the lower movable spring 23. In this construction the roller 53 is replaced with a cam type of spring engaging member 53*a* which is so constructed as to effect a much greater throw of a contact spring 23*a*, than would be effected by a roller 53. The contact spring 23*a* has its tip portion 74 bent over the corner of the member 53*a* to cause it to rock when the lever is turned. It is believed that this operation is sufficiently clear from the drawings that it need not be further described. The form shown in Figure 1 is much preferable both from an operational and a manufacturing standpoint since it combines all of the changes necessary to get non-lock operation to a single spring.

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

Having thus described my invention, I claim:

1. A switch of the character described comprising a supporting frame, a plurality of contact carrying springs mounted thereon in spaced relation, an operating member pivoted in said frame for movement transversely of said springs, and having a handle, at least one of said springs having its free end extended beyond other springs alongside the path of movement of said operating member, a spring engaging member pivoted on said operating member, and said extended spring having a portion thereof in the path of movement of said spring engaging member bent

to extend toward the pivotal axis of said operating member and positioned to hook partially over the spring engaging member and cause greater movement of the spring end as the operating member moves the spring engaging member toward the spring than the movement of the spring engaging member, and back up springs mounted on opposite sides of the non-extended springs, said back up springs being spaced from the non-extended springs at their mounting points and having their free ends in engagement with the non-extended springs at a distance from their mounting.

2. A switch of the character described, comprising a substantially U-shaped supporting frame, the base of said frame being widened and slotted to receive an operating lever, an operating lever extending through the slotted base, pivot means for the lever in said frame adjacent to the base, spring pile up actuating rollers on opposite sides of said lever, and spring pile up mounting means supported on the legs of said frame, said mounting means comprising spaced cross bars connecting the legs, pairs of mounting plates between the cross bars and legs, interlocking lugs and sockets on the plates and cross bars, means to draw the cross bars toward each other to clamp the lugs in the sockets, and a pair of spring pile ups mounted on each plate.

3. A switch of the character described, comprising a substantially U-shaped supporting frame, the base of said frame being widened and slotted to receive an operating lever, an operating lever extending through the slotted base, pivot means for the lever in said frame adjacent to the base, spring pile up actuating rollers on opposite sides of said lever, and spring pile up mounting means supported on the legs of said frame, said mounting means comprising spaced cross bars connecting the legs, pairs of mounting plates between the cross bars and legs, interlocking lugs and sockets on the plates and cross bars, means to draw the cross bars toward each other to clamp the lugs in the sockets, and a pair of spring pile ups mounted on each plate, said spring pile ups including wiring terminal plates having ears turned up at right angles to the plates and provided with terminal screws, the ears on certain terminal plates being at the sides of the pile ups and the ears on other terminal plates being at the ends of the pile ups.

DONALD P. MOSSMAN, SR.

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