

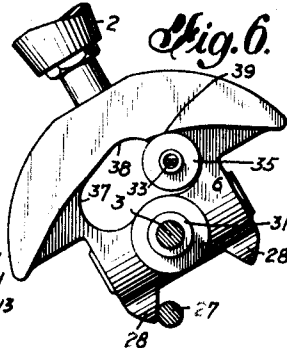
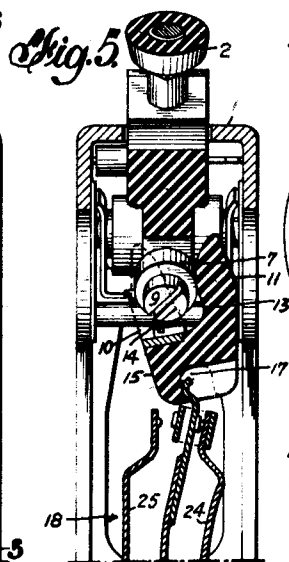
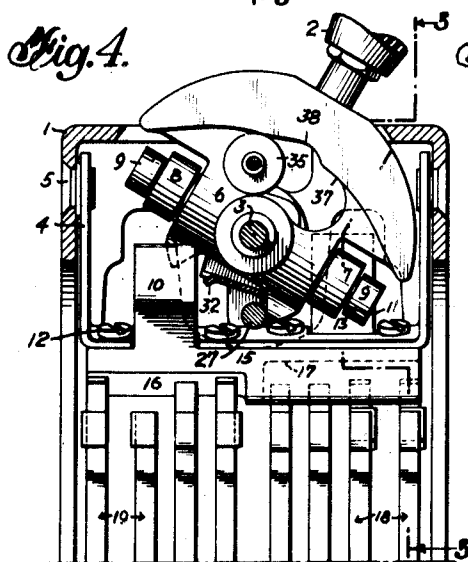
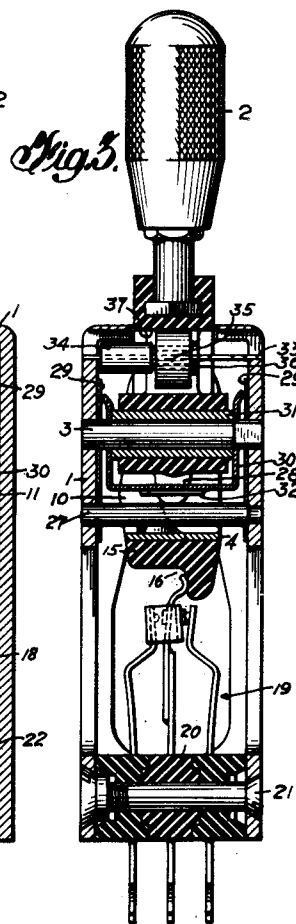
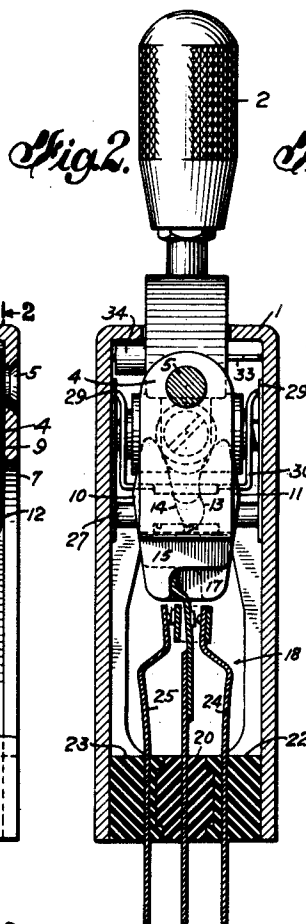
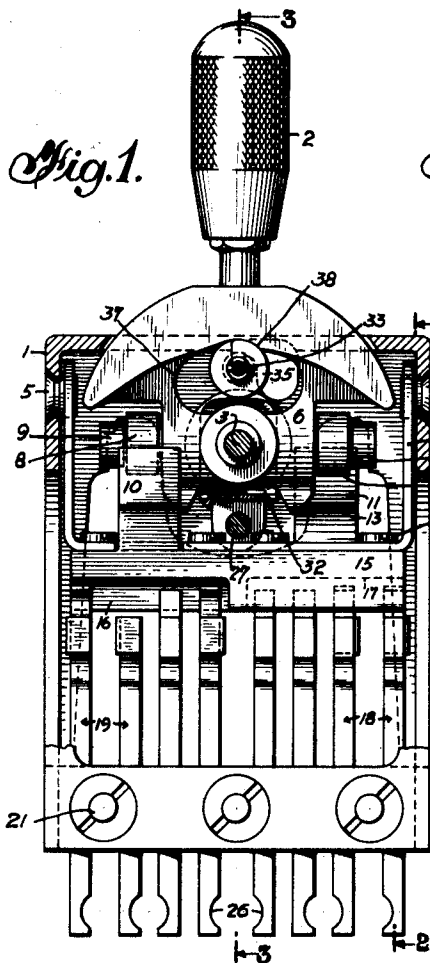
July 22, 1952

W. S. BABCOCK

2,604,553

SWITCHING KEY

Filed July 28, 1949



INVENTOR
WILLIAM S. BABCOCK, Jr.
BY *J. P. Morris*
ATTORNEY

UNITED STATES PATENT OFFICE

2,604,553

SWITCHING KEY

William S. Babcock, Jr., Orange, N. J., assignor to
Federal Telephone and Radio Corporation,
New York, N. Y., a corporation of Delaware

Application July 28, 1949, Serial No. 107,325

6 Claims. (Cl. 200—1)

1

This invention relates to a multiple contact switch of the key actuated type commonly used in the telephone industry.

It is desirable in the telephone communications industry to manufacture electrical switches of the key operated type which are as small in size as possible yet rugged enough to insure trouble free operation for a long period of time. It is also highly desirable to manufacture the switches at the lowest cost possible so that the equipment utilizing the switch may be sold on the competitive market.

The known switches of the prior art have attempted to achieve these objects by a slight reduction in the number of small component parts necessary and by attempting to reduce the overall size of the switch units.

It is the main objects of this invention to greatly reduce the cost of manufacturing a switch of the key actuated type and to reduce the size of such a switch with a corresponding reduction in space requirements on telephone equipment utilizing lever type switches. This is accomplished by eliminating all the usual small parts required as well as reducing the overall size of the switch unit by means of a novel exchange of motion within the switch which allows the use of a much smaller switch frame. By eliminating the small parts found in most key switches of the prior art, it may be seen that in addition to the great reduction in manufacturing cost due to material and labor savings, I also eliminate to a large extent many of the possible sources of failure in such switches.

Another object of this invention is to increase the efficiency of the switch by decreasing the number of contact spring moldings to a minimum.

A still further object of my invention is to provide removable spring contacts easily replaced and cheaply manufactured in the form of group units, allowing a wide variety of switching actions.

It is also an object of this invention to provide a switch of the type described having novel means which may be arranged when manufactured for automatically returning the switch from an operated to a non-operated position, or for retaining the switch in an operated position or for providing the former action in one position of operation and the latter action in a second position of operation.

The switch of my invention comprises a frame, a lever which is pivotally mounted on the frame for movement in a first plane, and a cradle-like

2

structure carrying contact actuating surfaces which is pivotally mounted in the path of the lever and is movable in a plane of motion at right angles to the lever motion. A plurality of contact spring units are disposed in the path of the actuating surfaces on the cradle-like structure and are adapted to be moved by these surfaces into contact with additional spring members mounted adjacent to the movable springs.

The above mentioned and other features and objects of this invention and the means of attaining them will become more apparent, and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings of which:

Figure 1 is a front view of the switch partly in section showing the mechanism in the non-operated or rest position;

Figure 2 is a sectional side view of the switch taken along the line 2—2 of Figure 1;

Figure 3 is a sectional side view of the switch taken on the line 3—3 of Figure 1;

Figure 4 is a partial front view of the switch showing the mechanism in one position of operation;

Figure 5 is a sectional side view of the switch in an operated position taken along the line 5—5 of Figure 4; and

Figure 6 is a front view of a portion of the switch shown to illustrate a second position of operation.

Referring now more specifically to the drawings, and in particular to Figures 1 to 3, the switch of the invention is shown as comprising a metal frame 1 of a substantially box like, rectangular shape having cut out portions to lighten the structure and openings to receive the lever 2 and other components to be described later. The lever 2 is pivotally mounted within the frame by means of the shaft 3, which extends between opposite faces of the frame and is secured in holes therein substantially centrally thereof as shown in Figure 3. A cradle-like structure 4 is pivotally mounted on the frame on pivot pins 5 secured in opposite sides of the frame between the shaft 3 and the end of the frame. The cradle-like structure 4 is formed as a substantially U-shaped member and is adapted to be snapped into place over the pivot pins 5 and held there by the resiliency of the metal. This type of mounting provides for ease of assemblage as no tools are required to insert the cradle-like member. Thus the structure 4 is pivotally movable at right angles to the motion of the lever

2. The lever 2 is provided with a hub portion through which the shaft 3 passes and with extended portions 6 on either side of the hub. Roller members 7 and 8 are pivotally fixed to these portions by means of the bolts 9 and are in substantial axial alignment. The cradle structure 4 has a pair of opposing cam pieces 10 and 11 mounted thereon at opposite ends of the cradle by means of the screws 12 which extend through the resilient metal member of the carriage described above, or by plastic molding such parts onto the resilient metal member. Cam piece 10 is adapted to receive roller 8 of the lever 2 when the lever is moved to the left as shown in Figure 1 and cam piece 11 is adapted to receive roller 7 when the lever is moved to the right.

With reference to Figures 4 and 5, where the lever 2 is shown in the right hand position of operation, it is seen that when the roller 7 is moved into engagement with the cam surface 13 of cam piece 11, the cradle-structure 4 is displaced about the pivots 5 into a first position by a transfer of motion at right angles to the motion of the lever 2. In like manner movement of the lever to the left hand position in Figure 5 would cause the roller 8 to be moved into engagement with the cam surface 14 of cam piece 10 and consequently the cradle structure 4 would be displaced in an opposite direction again at a right angle to the motion of the lever 2.

It will be seen by reference to Figures 2 and 5 that the cam surface 13 of cam 11 is provided with a recessed portion at the lowest point of engagement with the roller 7. The roller falling into this portion of the cam surface will be retained in an operated position until manually returned by the operator. This type of lock provides a great deal of flexibility in the manufacture of the switch for various applications, as it is merely necessary to vary the type of cam carried by the carriage to provide a locking or non-locking switch action. Although not shown in the embodiment illustrated in the drawings, the cam surface 14 of cam 10 could be adapted for holding the key in an operated position similar to cam 11, or both cams could be of the non-locking type similar to cam 10. In addition to this novel locking arrangement I have also provided for an alternate type of retaining means which will hereinafter be described.

The cam pieces 10 and 11 are provided with an extension 15 preferably of insulating material which extends in the opposite direction from the cam pieces 10 and 11 and is indented on opposing sides to form the channels 16 and 17. Disposed in the path of channel 17 as shown in Figures 1 and 2 are the spring contact members 18 which are moulded in a block member 20 and secured in the other end of the frame 1 by means of the bolts 21 or in any desired manner. Channel 16 is associated with the group of contact springs 19 which are also contained in the block member 20. Block members 22 and 23 carry spring contact members 24 and 25 respectively which are mounted on either side of block member 20 by means of the bolts 21. Adjacent surfaces of the blocks 20, 22 and 23 may be formed to nest with each other, as shown in Figures 2 and 3. The bolts 21 extend between the springs carried by the respective blocks and are insulated therefrom in any desired manner, the springs may be partially cut away if necessary to provide clearance for the bolts.

The cooperation between channel 17 and the

spring contact units 18 is shown in Figures 4 and 5 wherein movement of the lever 2 to the right brings the channel 17 into engagement with the elongated spring members 18 and displaces these springs against the spring members 24 thereby performing a plurality of predetermined switching actions depending upon the type of spring members carried by the blocks 20 and 22. Movement of the switch lever 2 in Figure 4 to the left would bring the channel member 16 into engagement with spring members 19 carried by block 20 and this in turn would displace members 18 against the spring members 25 carried by block 23.

It may readily be seen that this type of spring block assembly allows for a wide variety of switching actions as it is merely necessary to interchange additional moulded block members to obtain any combination of switching actions desired. The blocks are easily removed and inserted in the mounting frame 1 because all contact springs of any one block are rigidly carried by the block and are positively aligned with opposing contact springs when mounted in the frame. The contact springs themselves are provided with apertures or with semi-circular cutouts 26 to allow for easy attachment and non-interference of lead wires.

In order to prevent possible overthrow of the lever 2 with resulting damage to the spring contact members 18 and 19 the lever 2 is provided with stop extensions 28 extending from the portion 6, which with reference to Figures 3 to 5, are adapted to engage a pin member 27 at the end of travel in either two positions of operation and thereby positively arrest the motion of the lever. The pin member 27 is mounted in the frame similarly to the shaft 3 and is parallel to and spaced from the shaft. Provision is made for readily adding an extra similar stop pin on either side of the central stop pin to lock out one side thereby producing a single throw key.

In known switches it is often found that an operator, when returning the key from an operated position to the neutral position, will accidentally ride through the neutral position and make temporary contact in the second position of operation. To prevent this possibility in the switch of my invention I provide a frictional drag on the lever which becomes effective a short distance on either side of the neutral position.

There is mounted on either side of the lever 2 adjacent to the walls of the frame and held within the frame by the shaft 3 and pin 27, a pair of friction plates 29. The shaft 3 has pivotally mounted thereon a U-shaped friction spring member 30 having outwardly flared ends which are resiliently maintained in contact with the friction plates 29 on each side of the switch as shown in Figure 5. Plates 29 are provided to protect the frame 1 from excessive wear, as the frame may be made from a soft material such as aluminum. Extending from friction plate to friction plate there is a bushing 31 which at all points of travel maintains the lever member 2 in a fixed position with respect to the sides of the frame and prevents any sideward motion which might eventually lead to false operation of the switch. The central portion of the U-shaped friction spring member 30 is provided with rounded lipped portions 32 adapted to be engaged by a portion of the extensions 28 as shown in Figure 4. With reference to Figure 4 it may be seen that when returning the lever 2 to the neutral position the left hand extended portion

5

of the lever 28 will contact the lipped portion 32 of the friction spring member 30. This member will then be moved with the lever the rest of the way into the neutral position and through the frictional drag of the contacting portions of the member 30 on the plates 29, the momentum of the lever and hence the tendency to ride through the neutral position will be greatly reduced. The operation would be the same when returning the key from the other operated position.

It has been shown in the above discussion that in the particular embodiment of my switch illustrated in the drawings, I have provided a switch which is adapted to be automatically returned from a first position of operation when released by an operator and which will be maintained in its second position of operation until manually returned by the operator. This was accomplished by the various arrangements of the cam surfaces 13 and 14. In an alternate arrangement this same type of action is provided for in a slightly different manner. The method of accomplishing this will be best understood with reference to Figures 1 and 3, wherein a resilient pin member 33, which may preferably be flat, is mounted in the frame substantially parallel to the shaft 3 and spaced on the opposite side of the shaft from the pin 27 and extends through an opening in the lever 2. The member 33 is provided with a spacer sleeve 34 loosely mounted thereon. A roller 35 is centrally mounted on the pin on a bearing 36 and is adapted to be engaged by a cam surface 37 provided in the opening in lever member 2. In the neutral position of the switch as shown in Figure 1, the roller 35 is held in contact with the indented portion 38 of the cam surface 37. Upon movement of the lever to either of its two positions of operation the cam surface 37 acting on the roller 35 causes the pin member 33 to be bent and consequently the pin member exerts a restoring force on the cam surface. In the right hand position of operation as shown in Figure 4 this restoring force will tend to snap the lever back to the indented portion 38 when released by the operator.

In Figure 6 I have shown the lever key in the left hand operated position wherein the cam surface 37 is provided with a recessed portion 39 which is adapted to maintain the lever in an operated position until returned under control of the operator.

It will of course be realized that both sides of the cam surface 37 can be made to automatically return the lever, or can be made according to the embodiment shown in Figure 6. This would depend entirely on the proposed usage of the switch.

It will become apparent to one skilled in the art that the switch of my invention is so constructed that it may be assembled very rapidly without the use of any complicated jigs, fixtures or tools. The lever 2, carriage structure 4, pin member 33, the friction spring member 30, the stop pin 27 and the contact spring molding blocks 20, 22 and 23 constitute all the removable parts of the switch and it has been shown that these parts are all adapted to be inserted within the frame member 1 by various means designed to facilitate rapid assembly without the use of skilled labor or complicated fixtures.

It must be understood that this particular structure has merely been described as one illustration of my invention but could be modified in

6

various ways without departing from the scope of my invention. For instance the resilient pin member 33 may be mounted on the lever and the cam surface embedded in the frame, or additional side-by-side arrangements of contacts could be added by altering the actuating surface of the cradle.

What is claimed is:

1. A key actuated switch comprising, a frame, a lever pivotally mounted on said frame for movement in a first plane, a cradle-like contact actuating member pivotally mounted on said frame, means mounted on said contact actuating member for engaging said lever and transmitting the motion thereof, to said actuating member for pivotal movement in a second plane at right angles to the plane of motion of said lever and contact springs mounted in insulating blocks removably fixed to said frame and being controlled by the movement of said actuating member.

2. A switch comprising a frame, a lever mounted upon said frame for movement in a first plane, a contact actuating member pivotally mounted on said frame for movement in a second plane at right angles to the movement of said lever, said lever having abutments for engaging said contact actuating member and moving said member to at least one position in said second plane and contact springs mounted in said frame operable through the movement of said actuating member to make and break a predetermined combination of contacts.

3. A key actuated switch comprising a frame, a lever mounted upon said frame and pivotally movable in a first plane, a cradle-like structure pivotally mounted on said frame and movable in a second plane at right angles to said first plane, rollers mounted on said lever, means on said cradle-like structure for engaging said rollers to transmit the motion of said lever to said cradle-like structure, first contact springs mounted on said frame and disposed in the path of motion of said cradle like structure, second contact springs mounted on said frame, said cradle-like structure being operative to move a predetermined combination of said first contact springs into contact with said second contact springs.

4. A key actuated switch as claimed in claim 3 and further comprising a resilient pin mounted on said frame, a roller mounted around said pin and being positioned centrally thereon, said lever having a slotted cam track for slidably engaging said roller, said cam track and resilient pin being operative to automatically return said lever to a neutral position when released and to prevent overthrow of said lever when moved to an operated position.

5. A key actuated switch as claimed in claim 3 and further comprising a resilient pin member mounted on said frame, a roller mounted around said pin and being positioned centrally thereon, said lever having a slotted cam track for slidably engaging said roller, said lever being adapted to be rolled from a normal position into two positions of operation, said cam track and resilient pin being operative to retain said lever in a first position of operation and to automatically return said lever to said normal position from a second position of operation.

6. A switch of the lever actuated type comprising a frame, a lever pivotally mounted on said frame for movement in a first plane, a cradle-like structure pivotally mounted on said frame for movement in a second plane at right angles to

7

said first plane, said lever having rollers mounted thereon for contacting said cradle-like structure and transmitting the motion of said lever to said structure, elongated contact springs mounted on the frame in the path of motion of said cradle-like structure, additional contact springs mounted on said frame, ridges in said cradle-like structure being operative to move said elongated contact springs into contact with said additional contact springs, a resilient pin mounted on said frame, a roller mounted on said pin, said lever having a cam track for engaging said roller and being

8

operative to hold said lever in an operated position.

WILLIAM S. BABCOCK, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,912,623	Douglas	June 6, 1933
2,397,978	Paulus	Apr. 9, 1946