

June 1, 1943.

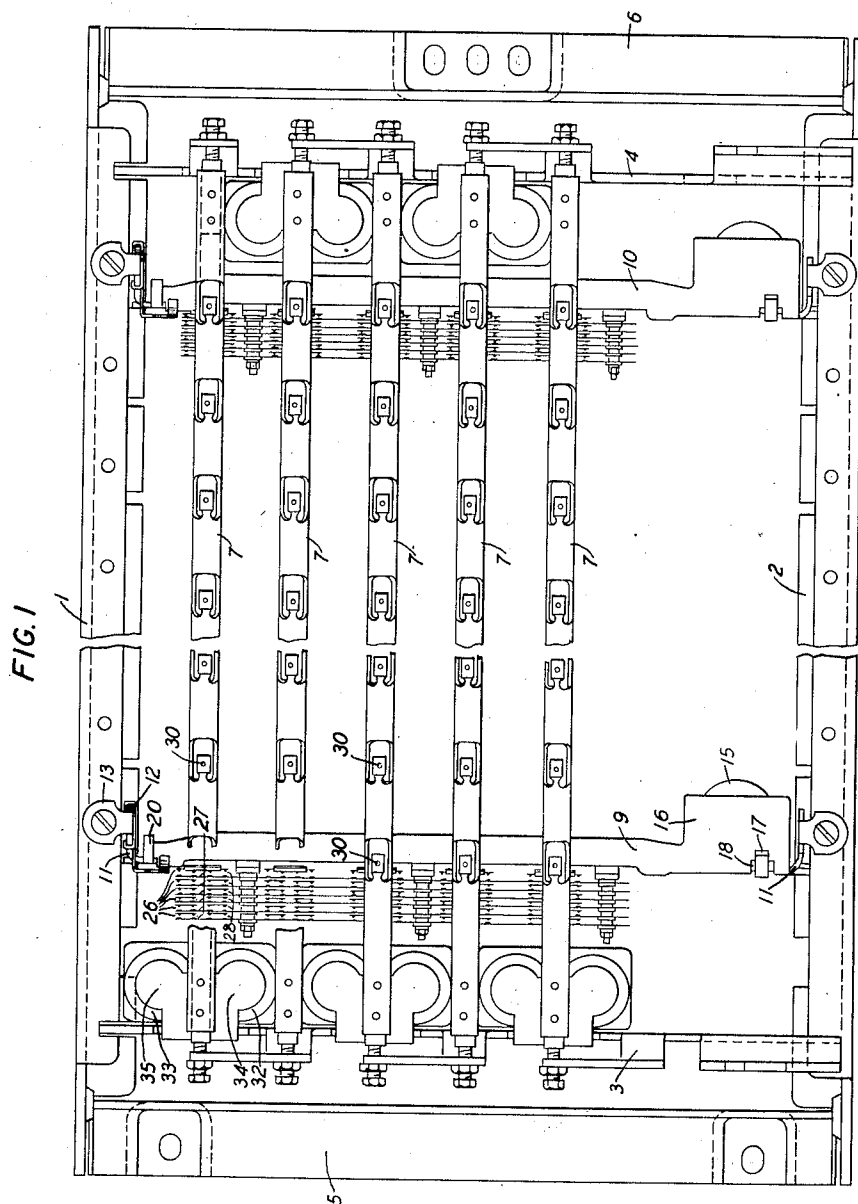
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2,320,734

SWITCHING MECHANISM

Filed May 9, 1941

2 Sheets-Sheet 1



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FIG. 2

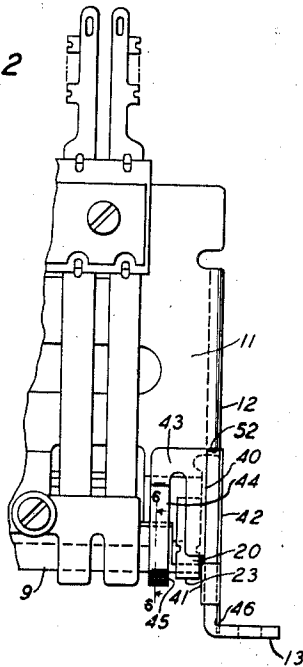


FIG. 3

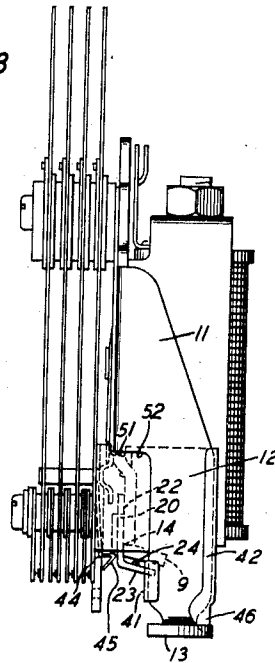


FIG. 4

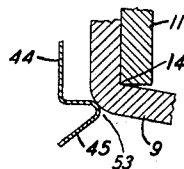
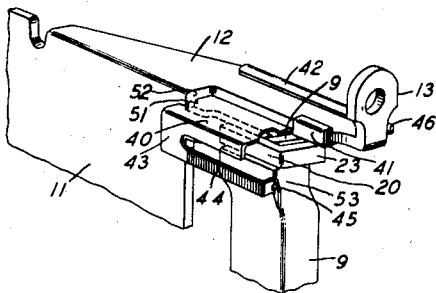
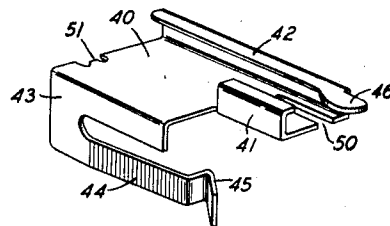


FIG. 6

FIG. 5



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## UNITED STATES PATENT OFFICE

2,320,734

## SWITCHING MECHANISM

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Application May 9, 1941, Serial No. 392,658

6 Claims. (Cl. 179—27.54)

This invention relates to improvements in switching mechanisms and particularly to switches of the relay or crossbar type for use in establishing electrical connections.

It is an object of the invention to improve switches of this type to cause them to perform their functions with greater accuracy and reliability.

Crossbar switches to which the present invention may be applied are well known in the art and consist essentially of contact sets arranged in horizontal and vertical rows and means including a group of horizontal operating bars intersecting a group of vertical operating bars controlled by magnets. In some types of switches the horizontal operating members are rotated in two directions so that connections may be established at either of two sets of contacts at an intersecting point by the rotation of a horizontal bar in one direction or the other and the rotation of a vertical bar in one direction. A crossbar switch of this latter type is disclosed in the patent to J. N. Reynolds 2,021,329 of November 19, 1935.

The present invention has been disclosed in connection with a crossbar switch of this latter type. In such switches the contact sets are assembled on vertical frame units on which two vertical rows of contact sets are mounted with their corresponding sets of horizontal rows of contact sets. Each of these vertical frame units is provided with knife edges, at the upper and lower ends thereof, on which the corresponding vertical bar is rotatably mounted. The lower end of the vertical bar is held in place on its knife edge by a flexible spring engaging the bar and the upper end of the vertical bar is held in place on its knife edge by means of an L-shaped member overlapping the bar on the outside thereof. With this mounting arrangement of the vertical bars it may happen during the operation of these bars that they will be slightly shifted out of their proper adjustment on the knife edges, particularly in regard to the upper ends of the bars.

It is a feature of the present invention to provide a means for preventing these bars from being displaced in this manner. This means consists of a clip having a body member which is shaped to slip over a horizontal projection on the vertical frame member and a flexible spring extending from this body member that engages the vertical bar on the outside thereof in position to hold the bar against the corresponding

knife edge but which permits the free rotation of the bar on the knife edges and at the same time prevents it from being dislocated.

The invention has been illustrated in the accompanying drawings in which:

Fig. 1 shows a front view of a crossbar switch construction of the type disclosed in the above-mentioned patent and to which applicants' invention has been applied;

Fig. 2 is a fragmentary side view of a vertical frame unit;

Fig. 3 is a top view of a vertical frame unit;

Fig. 4 is a fragmentary perspective of the vertical frame unit with the applicants' invention applied thereto;

Fig. 5 is a perspective of the clip member of the applicants' invention; and

Fig. 6 is a cross section taken approximately on the line 6—6 of Fig. 2.

Referring now to the drawings, and particularly to Figs. 1, 2 and 3, the switch structure, to which the applicants' invention has been applied, may consist of a frame comprising the members 1, 2, 3 and 4. This frame is mounted in any suitable manner on vertical upright members 5 and 6. In this frame are mounted five horizontal bars 7 and a series of ten vertical bars. The first and the last only of the vertical bars have been shown mounted on their respective vertical frame units. These vertical bars have been indicated with numerals 9 and 10, respectively, and are mounted at the upper and lower ends on knife edges on the associated frame members. The frame member for the bar 9 is marked 11. Referring to this member 11, it is shown that it is provided at the top with an extension 12 bent at right angles to the vertical portion of the member, and is fastened to the horizontal member 1 by means of a vertical lug 13 and a screw. A similar arrangement is provided at the bottom of the frame member 11 to secure it to the horizontal frame member 2. The vertical bar 9, for example, as shown in Figs. 3 and 6 in particular, is L-shaped and at the inner edge of this L the bar is mounted on the knife edge 14 so that the bar may swing freely on this knife edge at the upper end and on a similar knife edge at the lower end by the operation of a magnet 15 acting on an armature 16 which is integral with the bar 9. The bar 9 is held in place at the lever end on the corresponding knife edge by a spring member 17 engaged in a slot 18 in the bar, and is held at the upper end on its knife edge by an L-shaped member 20 which is welded or otherwise secured to

the frame member 11 at 22 and extends over the bar by an extension 23 as shown in Fig. 3. This L-shaped member 20 on the inside of the extension 23 is provided with a projection 24 which normally engages the front side of the member 9 to hold it in place in its normal position. Horizontal and vertical rows of contact strips mounted on the vertical units have also been shown in Figs. 1 to 3. The first set of movable contacts in the first horizontal row has been marked 26 and the first vertical row of stationary contacts has been marked 27, while the first set of movable contacts of the second horizontal row has been marked 28. The horizontal rows of contacts at each crosspoint are adjacent to flexible spring fingers 30 that may be lifted or lowered by operations of the horizontal bars 7 by magnet 32 or 33 through the armature 34 or 35 attached to the bars 7. The lifting of a finger 30, by the rotation of a horizontal bar 7, will place the fingers in the position in front of, for example, the contacts 26 and 27 and through the medium of an operating card (not shown) and the rotation of the vertical bar 9 cause connections to be established between contacts 27 and 26. Similarly, the finger 30 may be lowered by rotation of the bar 7 in the opposite direction to cause connections to be established between the contacts 28 and 27. A more complete description of the operation of the switch in this manner to select and operate contacts at crosspoints of the horizontal and vertical bars may be had by referring to the above-mentioned patent.

Normally the vertical bar 9 will rotate on its knife edges in the usual manner, but occasionally due to vibration or for other reasons the upper end of the bar 9 may be slightly dislocated from the knife edge 14 and thereby cause inaccurate operation of the switch. To prevent this from occurring, the applicants' clip member shown in perspective in Fig. 5 has been provided. It consists of a flat body portion 40 provided with two hooked or U-shaped extensions 41 and 42. The body portion 40 is also provided with a right angle extension 43 from which is cut a spring portion 44 having a hooked end 45. As shown in Fig. 4, this clip member may be slipped over the extension 12 of the frame member 11 so that the U-shaped portions 41 and 42 will engage the sides of this member 12 when the clip is in place. It should be noted that the U-shaped member 42 is slightly enlarged at 46 so that when the clip is slipped over the member 12, this enlarged portion 46 will engage the inner side of the bent-up extension 13 on the horizontal member 12 to securely lock the clip in place. To facilitate this mounting of the clip, the body portion 40 is slotted as shown at 50 to make it slightly flexible. The body portion 40 is provided with a slot 51 that will fit on the edge 52 of the member 11 to further steady the clip. When the clip is mounted in this manner as shown in Figs. 4 and 6, the hooked end 45 of the spring 44 will engage the outside corner or rounded edge of the bar 9 as shown at 53. This point of contact at 53 is diagonally opposite the knife edge 14 on the frame member 11 and will, therefore, hold the bar securely against the knife edge with the minimum amount of friction during the rotation of the bar 9 on the knife edge.

Although the invention is illustrated herein as applied to switches of the crossbar type, it is also applicable to other types of switches, such as relays. In particular it may be used in multi-

contact relays where the armature or operating bar is pivoted on knife edges and serves to actuate a multiplicity of contact springs.

What is claimed is:

1. In a crossbar switch, horizontal and vertical intersecting contact making strips, horizontal and vertical intersecting operating bars, means for rotating said bars, a frame member for each vertical bar having knife edges on which the associated vertical bar is mounted for rotation, means responsive to the rotation of a horizontal bar and a vertical bar for actuating sets of contact strips at the intersecting point, an extension on each frame, a member for each vertical bar having a flat portion and two opposite clip members extending therefrom arranged to slip over the extension of an associated frame and provided with a flexible spring projection extending from said flat portion to engage the associated vertical bar and press it against the knife edges on the frame.

2. In a crossbar switch, horizontal and vertical intersecting bars, an armature on each bar, a magnet for each armature for operating said armature so as to rotate the associated bar, a frame member for each vertical bar having knife edges on which the associated bar is mounted for rotation, a set of contact making strips at each intersecting point of said bars, means responsive to the rotation of a horizontal bar and a vertical bar for actuating sets of contact making strips at the intersecting point, a right angle extension on each frame member, a clip mounted on each extension and having a flexible lock member for locking the clip on the associated extension, said clip also having a spring member extending therefrom for normally pressing the associated vertical bar against the knife edges on the associated frame member to hold the bar in place.

3. In a crossbar switch, horizontal and vertical intersecting contact making springs, horizontal and vertical intersecting operating bars, means for rotating said bars, and a frame member for each vertical bar, each vertical bar having an L-shaped mounting portion and each frame member having a knife edge portion arranged so that each vertical bar engages at the inner corner of its L-shaped portion the knife edge portion of the associated frame for rotation of said bar on said knife edge, means responsive to the rotation of a horizontal bar and a vertical bar for actuating sets of contact springs at the intersecting point and a resilient clip member frictionally mounted on each frame and yieldingly engaging the associated bar at the outside corner of the L-shaped portion thereof to press it against the associated knife edge on the frame to keep said bar in place to permit said bar to rotate freely on said knife edge.

4. A switching device including a frame member having knife edges, an operating bar mounted for rotation on said knife edges, contact operating mechanisms controlled by said bar, an extension on said frame, a holding member for retaining said bar on the knife edges, said holding member having a flat portion and two opposite clip members extending therefrom arranged to slip over said extension and lock the holding member in place on said extension and having a flexible spring projection extending from the flat portion and engaging the bar to press it against the knife edges.

5. A switching device including a frame having a knife edge, an operating bar mounted for

rotation on said knife edge, contact operating mechanisms controlled by said bar, a member attached to said frame for retaining said bar on said knife edge when the bar is in normal position, a rectangular extension on said frame having an angular projection and a clip member for mounting on said rectangular extension having a flat portion and two opposite U-shaped members extending therefrom, arranged to fit over said rectangular extension and a projection on one of said U-shaped members arranged to engage said angular projection to lock the clip member on said rectangular extension, said clip member having a resilient spring projection extending from the flat portion to engage said bar to press it against the knife edge on said frame when the bar is moved from its normal position to its actuated position.

6. A switching device including a frame having a knife edge, an operating bar mounted for rotation on said knife edge, contact-operating mechanisms controlled by said bar when moved from the normal position to an operated position, a member secured to said frame for holding said bar against said knife edge only when said bar is in normal position, an extension on said frame, a clip mounted on said extension and having locking projections engaging said extension so as to retain said clip in a fixed position on said extension and having a flexible projection engaging said bar to hold it engaged with the knife edge when the bar is moved from its normal position to its actuated position.

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