

April 5, 1938.

A. C. MAGRATH

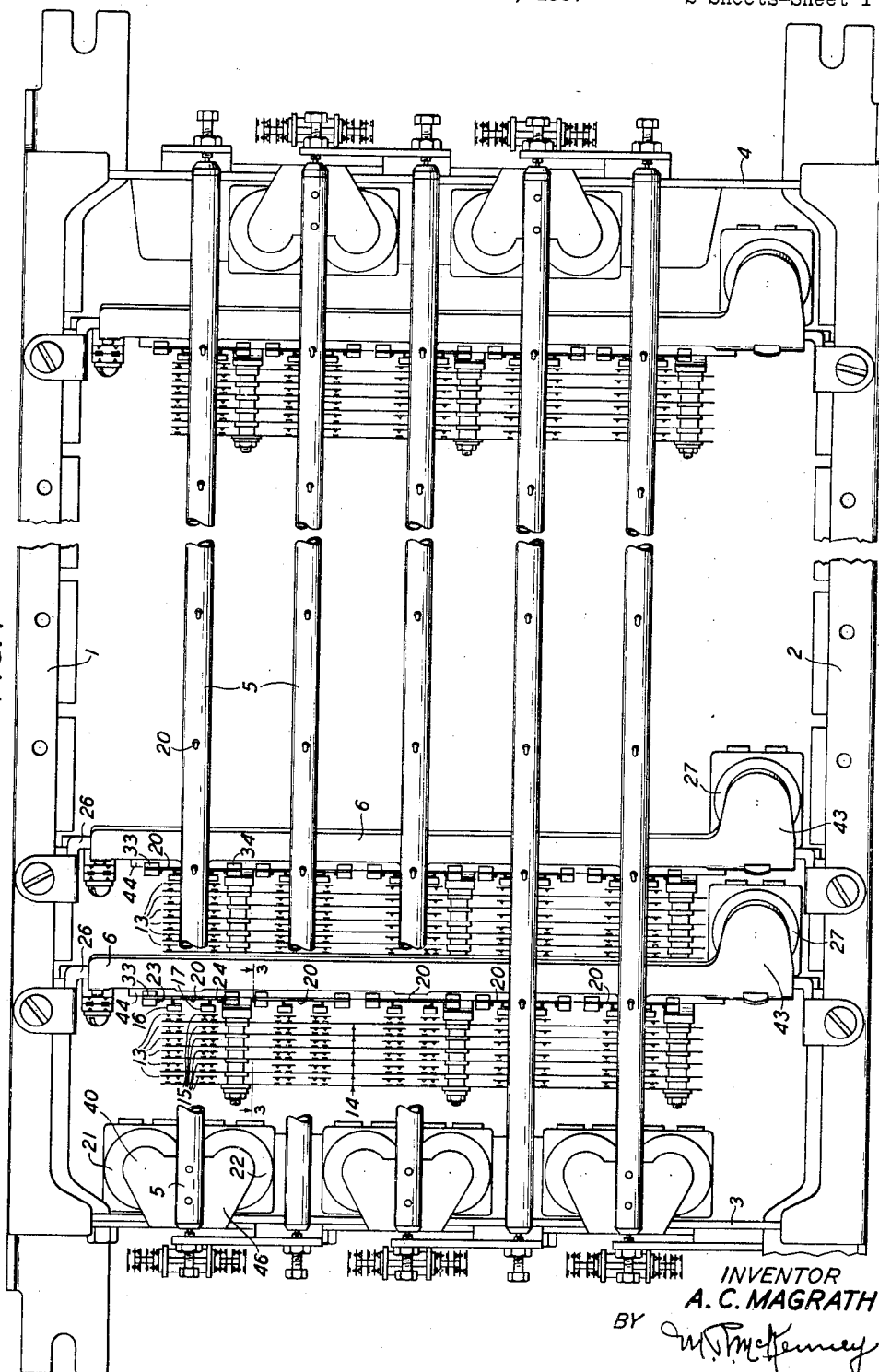
2,113,215

CROSS BAR SWITCH

Filed Feb. 27, 1937

2 Sheets-Sheet 1

FIG. 1



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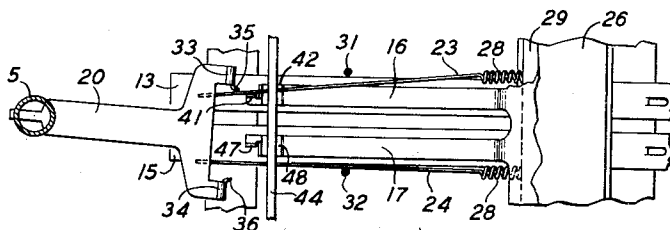
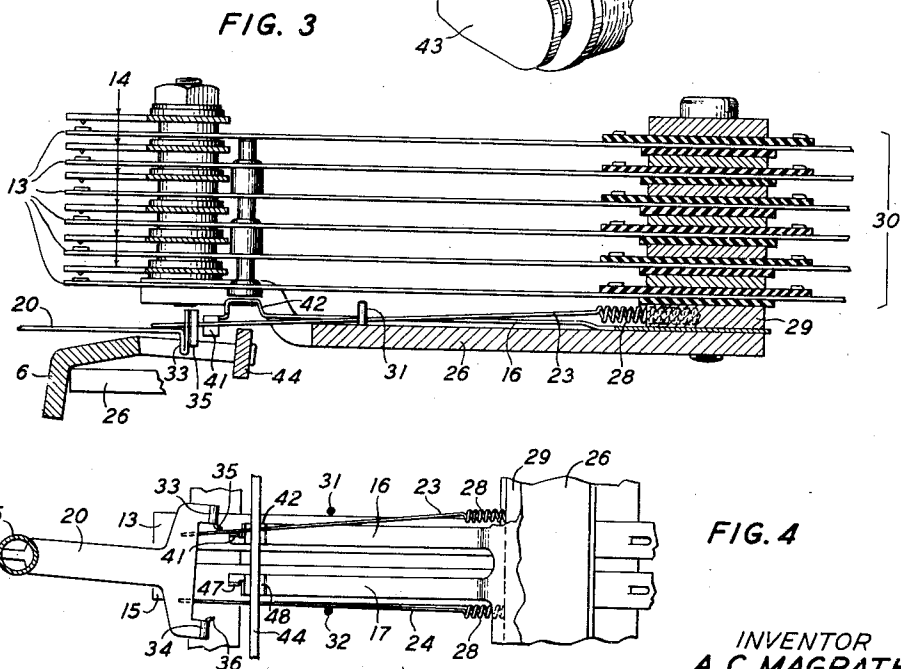
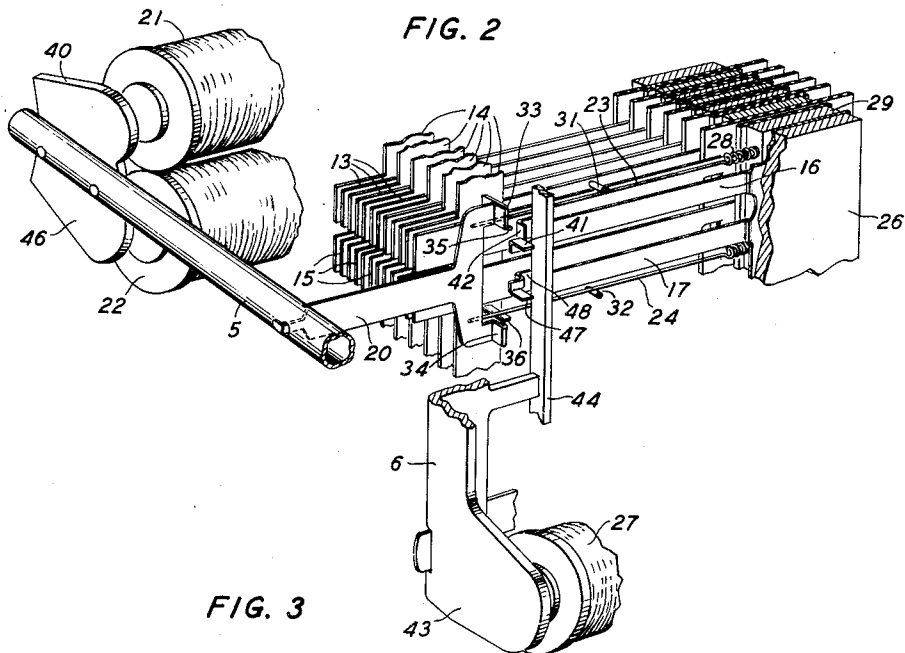


FIG. 4

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CROSS-BAR SWITCH

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6 Claims. (Cl. 179—27.54)

This invention relates to improvements in switching mechanisms and particularly to switches of the cross-bar type for use in establishing electrical connections.

It is an object of this invention to provide in a switch of this kind improvements that will cause its functions to be performed with greater accuracy and reliability.

Cross-bar 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 for the establishing of connections through a contact set at the intersection point of two operated bars. In some types of switches the horizontal bars are rotatable 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. In some switches of this latter type the rotation of the horizontal bar in either direction causes selecting fingers attached thereto to be placed opposite so-called actuating springs to select sets of contacts and when a vertical bar is operated it causes a corresponding finger to be pressed against an associated actuating spring which in turn causes a connection to be established at a contact set at the intersecting point of said operated bars.

It is a feature of the present invention to provide improvements in the selecting finger mechanism for switches of these general types. The selecting finger mechanism at each intersecting point comprises a selecting member attached to the horizontal bar and two selecting fingers each associated with an actuating spring. When the horizontal bar is rotated in one direction the selecting member is adapted to actuate one of said two selecting fingers and when it is rotated in the opposite direction the selecting member actuates the other selecting finger. The actuated selecting finger is thereby placed opposite the associated actuating spring for the selection of a set of contacts for the subsequent operation thereof on the operation of the vertical bar. The selecting member is so constructed that when it actuates one of a pair of selecting fingers, this finger will always move in a direction towards the other finger.

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

Fig. 1 shows a front view of a cross-bar switch

structure with the applicant's invention applied thereto;

Fig. 2 shows a fragmentary perspective view of a horizontal bar, a selecting mechanism in accordance with the applicant's invention, two actuating springs and their associated contact sets and a vertical bar;

Fig. 3 is an enlarged cross-section of the switch taken on the line 3—3 of Fig. 1; and

Fig. 4 is a side view of a selecting mechanism showing a selecting member on a horizontal bar, and two associated selecting fingers and actuating springs with the horizontal rod rotated to a position where the selecting member has placed the upper selecting finger in actuated position.

While the invention is applicable in general to cross-bar switches, it has been illustrated as applied to a switch of the type described in the patent of J. N. Reynolds 2,021,329 of November 19, 1935.

Referring to the drawings, this switch may consist of a frame comprising members 1, 2, 3, and 4, five horizontal bars 5 and a series of ten vertical bars 6, the first, second and last of the latter bars only having been shown in full with their corresponding horizontal and vertical rows of contact sets. The first horizontal row of contact sets is marked 13 and the first vertical row is marked 14, while the second horizontal row is marked 15. The actuating spring for connecting the horizontal contacts 13 to the vertical contacts 14 is shown at 16 and the actuating spring for connecting the horizontal contacts 15 with the vertical contacts 14 is shown at 17. The first or upper horizontal bar 5 may be rotated in one direction to cause the associated selecting members marked 20 to select the upper row of horizontal contacts 13 by the operation of the magnet 21 and to select the second row of horizontal contacts 15 by the operation of magnet 22. A selecting member in the case of the operation of magnet 21 causes the selecting finger 23 to be placed in front of the actuating spring 16 and on the operation of magnet 22 causes the selecting finger 24 to be placed in front of actuating spring 17. The operation of these parts will be described hereinafter more fully. The vertical operating bars 6 may be rotatably mounted on the frame members 26 and may be actuated by magnets 27 to cause them to establish connections as will be hereinafter described. The members 26 are secured to the upper and lower frame members 1 and 2 while the horizontal bars 5 are pivotally supported between the frame members 3 and 4. As will be noted, the selecting fingers 23 and 24 are secured to the

frame member 26 by a coiled portion 28 of the fingers entering a hole in the plate 29 secured to the frame member 26 with the horizontal contact set assembly arrangement as shown in detail at 39 of Fig. 3. The fingers 23 and 24 are prevented from movement away from each other by stops 31 and 32 on the frame member 26 and are tensioned against these stops. The selecting member 20 is secured at one end to the horizontal bar 5 in a slot and riveted thereto. The free end of the selecting member 20 terminates in upper and lower lips 33 and 34 each of which is bent back over itself at right angles to the longitudinal direction of the selecting member to form a T. The lower edge of lip 33 and the upper edge of lip 34 are again bent at right angles to form the projections 35 and 36 for the engagement of the selecting fingers 23 and 24, respectively. While the selecting fingers are tensioned against the stops 31 and 32 they may also rest on or lightly touch the projections 35 and 36 when all parts are in normal position.

The operation of this switch structure will now be given. For example, if the horizontal bar 5 is operated by magnet 21 acting on the armature 40, the selecting member 20 will move, through the medium of the projection 35, the selecting finger 23 into engagement with the projection 41 on the upper actuating spring 16. The selecting finger 23 will come to rest in a position in front of the U-shaped portion 42 practically in the center of spring 16. If now the vertical bar 6 is operated by the magnet 27 acting on armature 43, the angularly projecting operating member 44 which is located in front of the U-shaped portion 42 of spring 16 will press the selecting finger 23 against the spring 16. This spring in turn will press the horizontal contacts 13 into electrical contact respectively with vertical contacts 14. The vertical bar now holds these connections while the selecting bar 5 and member 20 are returned to normal. The selecting finger 23 is thus held between the actuating spring 16 and the member 44 and is prevented from slipping away from this position when the horizontal bar 5 is returned to normal and is not disturbed by subsequent movements of this bar and member 20. Similarly, if the bar 5 is rotated in the opposite direction by having the magnet 22 act on the armature 45, the selecting member 20 will be moved upwardly to cause the projection 36 to move the finger 24 upward to engage the projection 47 on the actuating spring 17. This will place the finger opposite the U-shaped portion 48 of the spring 17. Then when the vertical bar 6 and its member 44 are operated, selecting finger 24 will be pressed against the actuating spring 17 which in turn will act on the second horizontal row of contacts 15 to cause them to engage respectively with the vertical contacts 14. The horizontal bar 5 will then return to normal leaving the selecting finger engaged until the bar 6 is released when the finger 24 is released and spring 17 and contacts 15 are returned to normal. It should be noted that when the selecting member 20 is moved downward, the finger 24 will not be disturbed as the stop 32 will hold it in its normal position. Similarly, when the selecting member 20 is moved upward, the selecting finger 23 will not be disturbed, but will be held in its normal position by the stop 31, nor will a locked selecting finger be disturbed by subsequent movements of the selecting member 20.

What is claimed is:

75 1. The combination in a switch of two sets of

contacts, a rotatable bar, a selecting finger for each set of contacts independently supported in the switch, a selecting member secured to said bar, means for rotating said bar to cause said selecting member to actuate either one of the selecting fingers to its operative position, and means responsive to the movement of a selecting finger for operating the corresponding contact set.

2. In a cross-bar switch having horizontal and vertical bars, two contact groups at each cross-point of said bars, a selecting finger independently supported in the switch for each contact group, a selecting member supported on the horizontal bars at each cross-point, and means for rotating a horizontal bar in either direction and then rotating a vertical bar to cause the selecting member at the cross-point of said bars to operate either one of the associated fingers to select the corresponding contact group and cause the selected contact group to operate through the medium of the operated finger.

3. In a cross-bar switch having horizontal and vertical bars, two contact groups at each cross-point of said bars, a selecting finger independently supported in the switch for each contact group, a selecting member supported on the horizontal bars at each cross-point, and means for rotating a horizontal bar in either direction and then rotating a vertical bar to cause the selecting member at the cross-point of said bars to raise one or lower the other of the corresponding fingers to select a corresponding contact group and cause the moved finger to actuate the corresponding contact group.

4. In a cross-bar switch having horizontal and vertical bars, two contact groups at each cross-point of said bars, a common support for all contact groups at the cross-points forming a vertical row, a selecting finger for each contact group independently connected to said common supports, a selecting member connected to the horizontal bars at each cross-point, and means for moving a horizontal bar and then a vertical bar to cause the selecting member at the cross-point of said bars to operate either one of the associated fingers to select and operate the corresponding contact group.

5. In a cross-bar switch having horizontal and vertical bars, two contact groups at each cross-point of said bars arranged one group above the other, a selecting finger for each contact group, the finger for the upper contact group of a pair being located above said group and the finger for the lower group of a pair being located below said group, selecting members connected to the horizontal bars at each cross-point, means for rotating a horizontal bar in one direction to cause its selecting members to actuate the selecting fingers below the lower contact groups in an upward direction to cause the selection of the corresponding contact groups, means for rotating a horizontal bar in the opposite direction to cause its selecting members to actuate the selecting fingers above the upper contact groups in a downward direction to cause the selection of the corresponding contact groups, and means for operating any one of the selected groups by the operation of a corresponding vertical bar.

6. In a cross-bar switch having horizontal and vertical bars, horizontal and vertical rows of intersecting contact strips at each cross-point of said bars, a supporting member for each group of contact strips forming a vertical row, a selecting member connected to each horizontal bar 75

at each point where said bar is crossed by a vertical bar, a selecting finger associated with the contact strips at each intersecting point connected to the vertical supporting members, means for moving a horizontal bar in one direction to cause the selecting finger associated with one horizontal row of contact strips to be displaced downwardly by the selecting member on said bar, means for moving said horizontal bar in the opposite direction to cause the selecting finger asso-

ciated with another horizontal row of contact strips to be displaced upwardly by the selecting member of said bar, and means operated by the movement of a vertical bar for engaging the finger displaced by the movement of the horizontal bar at the cross-point of said actuated bar to cause connections between the horizontal and vertical strips at said cross-point.

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