

Feb. 8, 1944.

J. C. FIELD

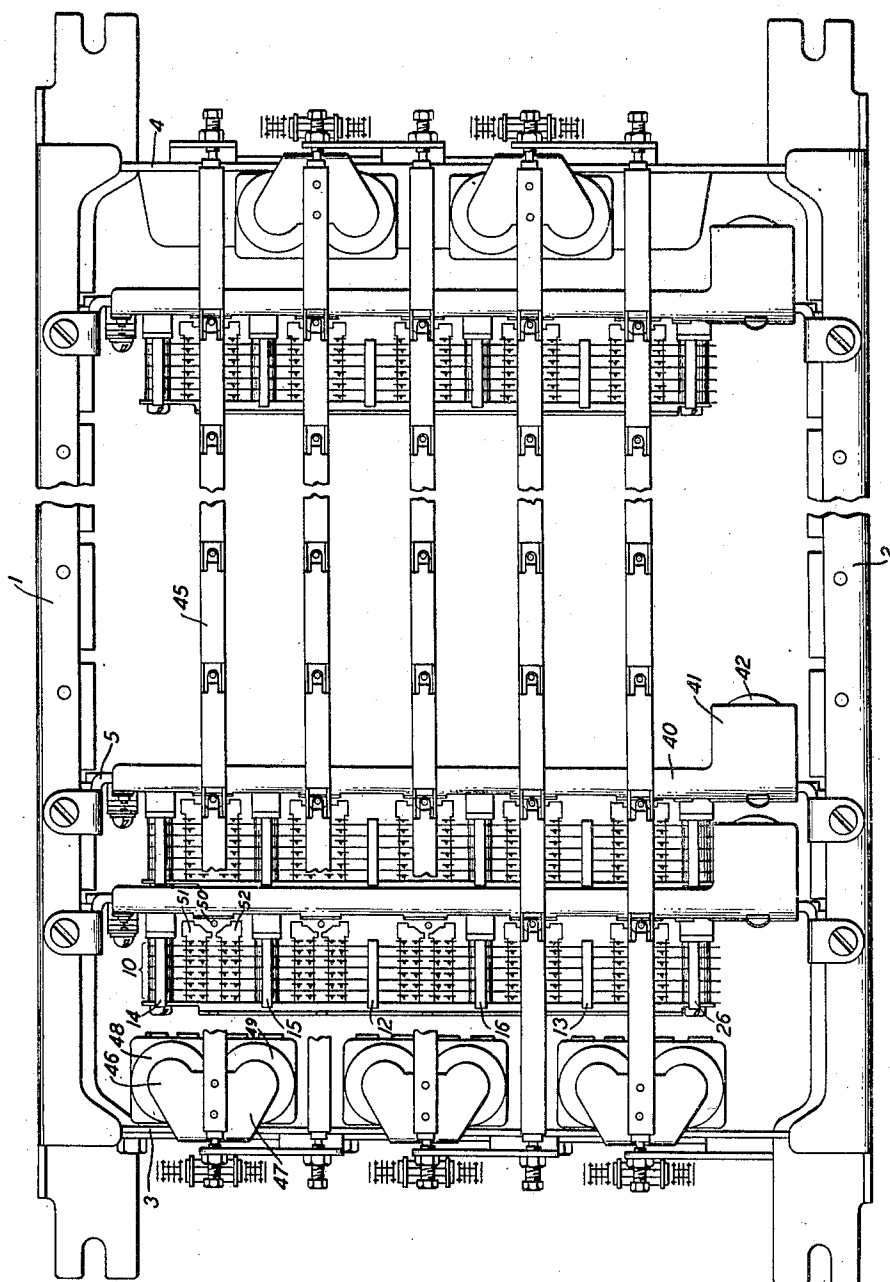
2,341,029

SWITCHING MECHANISM

Filed July 1, 1942

3 Sheets-Sheet 1

FIG. 1



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FIG. 5

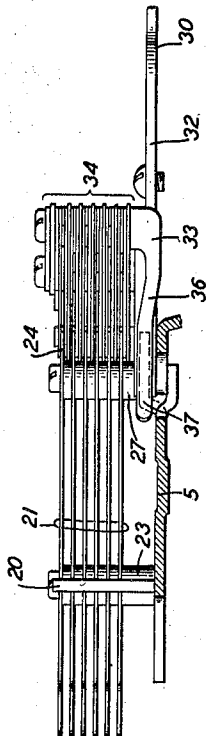


FIG. 6

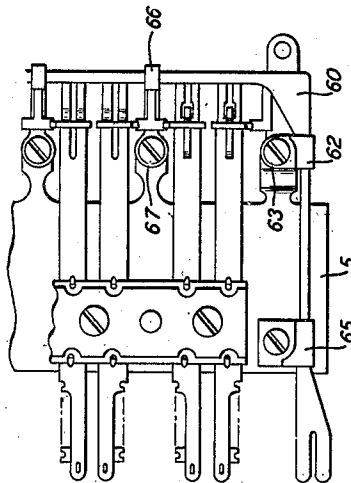


FIG. 4

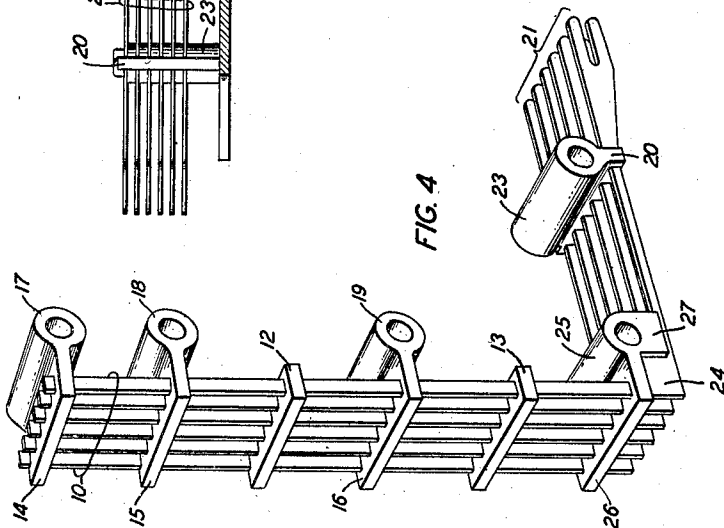


FIG. 7

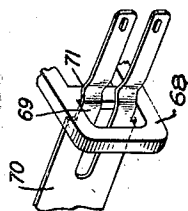
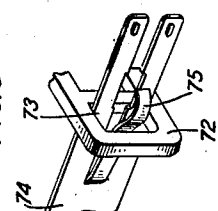


FIG. 8



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## UNITED STATES PATENT OFFICE

2,341,029

## SWITCHING MECHANISM

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Application July 1, 1942, Serial No. 449,262

7 Claims. (Cl. 179—27.54)

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

It is an object of the invention to improve and simplify switching mechanism of this kind by providing simplified contacting and connecting structures of low cost and conveniently arranged for testing.

Crossbar switches of the general type to which the present invention may be applied are well known in the art. Such switches may consist of rows of contact springs located in one coordinate direction and rows of contact strips located in the other coordinate direction. Each row of contact strips are associated with one group of contact springs from each row of contact springs. Means are also provided including one group of operating members intersecting another group of such members and magnets for controlling them. Connections may be established between the contact springs and contact strips at any intersecting point by the operation of a corresponding intersecting operating member of each group.

A switch of the type to which the applicant's invention may be applied is disclosed in the Patent 2,021,329 of November 19, 1935, to John N. Reynolds. This patent discloses a switch structure in which each row of vertical contact strips and the associated contact springs from the different horizontal rows of contact springs are mounted on individual vertical unit mounting plates with their associated vertical operating members and control magnets. The vertical contact strips are mounted on this mounting plate by means of studs and suitable insulation plates located at convenient intervals while the associated contact springs of the horizontal rows are mounted in the rear of the structure on this mounting plate between insulation strips and suitable spacers. To bring the connections from the vertical contact strips towards the rear of the vertical unit where they may be suitably connected to the outgoing wires or conductors, terminal strips are mounted with the horizontal contact springs and connected respectively to the vertical contact strips by soldering or in any other convenient manner.

It is in connection with this latter type of switch that the present invention has been disclosed, although it should be understood that the improvements forming the subject-matter of this invention are applicable to other types of

crossbar switches without departing from the spirit of the invention.

A feature of the present invention relates to the construction of the vertical contact strips and the associated terminals therefor. Each individual vertical contact strip and the associated terminal are stamped out from a single piece of metal with the terminal extending back towards the rear of the unit and near the terminals of the associated horizontal contact springs mounted on the vertical unit plate. These contact strips and terminals for each unit are held together by means of blocks molded around them at convenient intervals. Some of these blocks are provided with extensions whereby each group of strips and terminals may be secured to a vertical unit mounting plate.

Another feature is to have a single block molded around the strips and terminals near the junction points thereof and so shaped as to expose portions of the strips at these junction points and having a test jack arranged with springs for insertion over the strips and terminals at this exposed portion to establish test connections to the switches over said strips.

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

Fig. 1 shows a front view of a crossbar switch embodying the features of this invention;

Fig. 2 is a side view of one of the vertical units of this switch;

Fig. 3 is a fragmentary perspective showing portions of a horizontal operating bar and its operating magnet and a portion of a vertical bar and its operating magnet and the horizontal contact springs and vertical contact strips at the crosspoint of these two bars, and other details such as the operating finger for selecting connections at the crosspoint of these bars;

Fig. 4 is a perspective of a group of vertical contact strips and terminals with their associated molded blocks;

Fig. 5 is a cross section of a vertical unit taken on line 5—5 of Fig. 2 to show how a test jack may be connected to the vertical strips and terminals;

Fig. 6 shows a modified form of the arrangement of the vertical strips and terminals in a vertical unit; and

Figs. 7 and 8 show various forms of the operating cards for controlling the movable horizontal contact springs.

Referring now to the drawings and particularly to Figs. 1 and 2, the structure shown may consist of upper and lower frame members 1 and 2

and left-hand and right-hand frame members 3 and 4 between and on which the vertical units and operating bars are mounted. Each vertical unit consists of the mounting plate 5 secured by means of screws to the upper and lower frame members 1 and 2. At the rear of this plate 5 is mounted a series of ten sets of horizontal contact springs generally identified by the numeral 6. These springs are insulated from each other by suitable insulation plates such as 7 and are held together by means of screws 8 and spacers and a cover plate such as 9. These contact springs extend toward the front of the structure and between them are mounted the corresponding vertical contact strips as shown particularly in Figs. 1, 2, 3 and 4 and are marked in general by the numeral 10. It should be noted that six of these vertical contact strips are provided, each one being arranged to contact with a corresponding horizontal contact spring to establish six different connections at each crosspoint. At various places along these strips are placed molded sections to hold them together and space them accurately apart. As shown in Fig. 4 in particular, there are two of these molded sections 12 and 13 that are merely formed around the strips, while there are three other similar molded sections 14, 15 and 16 that are provided with extensions 17, 18 and 19, respectively. These extensions are provided with holes through which screws may be passed to secure the strips to a mounting plate 5. A similar section 20 is provided for the terminals 21 which extend at right angles from the contact strips 10 towards the rear of the structure. This section 20 is also provided with an extension 23 which is provided with an aperture through which a screw may be passed to connect this section to the mounting plate 5. It should now be noted that at the junction point 24 between the terminals and the contact strips, a special molded section 25 is provided which has one portion 26 surrounding the contact strips at a short distance from the junction point 24 and another portion 27 which surrounds the terminals a short distance from the junction point 24, thus leaving a portion of the strips and terminals bare at the junction point 24. This portion is employed as will be described hereinafter as a connecting point for a test jack. The section 25 is also provided with an aperture through which a screw may be passed to connect this section to the plate 5. The terminals 21 extend as shown in Fig. 2 toward the rear of the structure in line with the terminals of the horizontal contact strips so that all connections to conductors may conveniently be made from the rear of the structure for the vertical contact strips as well as the multiple connection for the horizontal rows of contact strips through their terminals as shown.

If reference is now made to Figs. 1, 2 and 5 in particular, it will be noted that in these figures the test jack 30 has been shown inserted at the junction point 24 between the terminals 21 and the vertical contact strips 10. This test jack may be of any well-known type comprising a handle 32 and a bracket 33 on which the test jack springs 34 are mounted. These springs 34 extend forward and connect with the portions at the point 24 of the vertical contact strips 10 and terminals 21. To hold this jack in its engaged position, a projection 36 on the bracket 33 is hollowed out at its end so that a projecting member 37 on the frame 5 may enter into this projection 36.

On each vertical mounting plate 5 is also mounted the vertical bar 40 having an armature 41 controlled by magnet 42 to rotate the bar 40 and opposite each two rows of horizontal contact strips and associated vertical strips is mounted a horizontal bar such as 45 on suitable connecting bearings on the frame members 3 and 4. Bar 45 is provided with two armatures 46 and 47, controlled by magnets 48 and 49, respectively, to rotate the bar in one direction or the other. Each horizontal bar is provided with an operating finger 50 opposite or between the two operating cards 51 and 52 that are associated respectively with their horizontal contact springs in upper and lower rows which are to be controlled by the movement of the horizontal bar 45 and an associated vertical bar. The cards 51 and 52 may be of the type disclosed in the Patent 2,301,472 of Nov. 10, 1942 to S. J. Stockfleth.

If reference is made to Figs. 1 and 3 it should be observed that if an upper set of contact springs, for example 53, are to be selected to connect with the associated group of vertical contact strips 10, the corresponding horizontal bar 45 is rotated by the magnet 49, attracting the armature 47 so that the operating finger 50 will be lifted and be located between an extension 55 on the vertical bar 40 and the associated card 51 and if then the magnet 42 is operated to attract the armature 41 to rotate the bar 40, the associated extension 55 will press the finger 50 against card 51 and thus cause this card to move the horizontal contact springs 53 to engage respectively with the vertical contact strips 10. This arrangement for establishing a connection at any crosspoint of vertical strips and horizontal contact springs is similar to that disclosed in the above-mentioned patent to S. J. Stockfleth.

In Fig. 6 has been shown a portion of a vertical unit similar to that disclosed in Fig. 2 except that the molded connecting blocks for the vertical strips are arranged somewhat differently as far as the arrangement at the junction point between the terminals 21 and strips 10 are concerned. That is, this junction point as shown at 60 is somewhat enlarged and instead of the block 25, a single block 62 is provided some distance from the portion 60 to hold the terminals together. This block 62 is provided with an extension 63 through which a screw is passed to hold the terminals to the mounting plates 5. The terminals are provided with a block 65 similar to block 20 for holding the ends of the terminals connected to the plate 5. In this case the first connecting block upwardly from the point 60 as shown at 66 for the vertical strips may be one that is provided with an extension 67 to secure the block and the strips to the frame. In this arrangement, therefore, a wider space is provided at the junction point 60 than at the junction point 24 for the mounting of the test jack.

In Figs. 7 and 8 are shown two different types of cards that are somewhat different from the cards 51 and 52, shown in the Fig. 1. In Fig. 7 this card 68 is provided with slots such as 69, one for each spring, as for example, spring 70 which is held in place by a bent portion 71 in front of the card and it is to be noted that the spring 70 is wider towards the rear to form a shoulder against which the card 68 may rest and prevent it from moving towards the rear. Thus the card 68 is held between the bent portions 71 and the shoulder on spring 70. In Fig. 8 the card 72 is also provided with an opening 73 for each spring but the spring 74 is provided with a

lip or extension 75 over which the card may be slipped and held against the shoulder on the spring 74 similar to the shoulders on spring 70.

What is claimed is:

1. In a crossbar switch, parallel horizontal rows of contact springs having their contact ends terminating in one vertical plane and their terminating ends in another vertical plane, each of said rows divided into groups of springs, parallel vertical rows of contact strips with each row of strips associated with one group of springs from each row of springs at the contacting ends thereof, means for establishing connections between any group of contact springs and their associated row of contact strips, a right angle integral terminal extension from each contact strip terminating in the same vertical plane as the terminating ends of the contact springs and insulation blocks moulded around each row of contact strips and their associated terminal extensions at intervals to hold said strips and extensions together.

2. In a crossbar switch, parallel horizontal rows of contact springs having their contact ends terminating in one vertical plane and their terminating ends in another vertical plane, each of said rows divided into groups of springs, parallel vertical rows of contact strips with each row of strips associated with one group of springs from each row of springs at the contacting ends thereof, means for establishing connections between any group of contact springs and their associated row of contact strips, a right angle integral terminal extension from each contact strip terminating in the same vertical plane as the terminating ends of the contact springs and insulation blocks moulded around each row of contact strips and their associated terminal extensions at intervals to hold said strips and extensions together, a frame structure for supporting the contact springs at their terminal ends and for supporting the terminal strips and their extensions through the medium of some of said insulation blocks.

3. In a crossbar switch, parallel horizontal rows of contact springs having their contact ends terminating in one vertical plane and their terminating ends in another vertical plane, each of said rows divided into groups of springs, parallel vertical rows of contact strips with each row of strips associated with one group of springs from each row of springs at the contacting ends thereof, means for establishing connections between any group of contact springs and their associated row of contact strips, a right angle integral terminal extension from the lower end of each contact strip, all of said extensions located in the same horizontal plane and terminating in the same vertical plane as the terminating ends of the contact springs, insulation blocks moulded around each row of contact strips and their associated terminal extensions at intervals to hold said strips and extensions together.

4. In a crossbar switch, parallel horizontal rows of contact springs having their contact ends terminating in one vertical plane and their terminating ends in another vertical plane, each of said rows divided into groups of springs, parallel vertical rows of contact strips with each row of strips associated with one group of springs from each row of springs at the contacting ends thereof, means for establishing connections between any group of contact springs and their associated row of contact strips, a right angle integral terminal extension from each contact strip terminating

in the same vertical plane as the terminating ends of the contact springs, a series of insulation connecting blocks moulded at intervals around each row of contact strips to hold them together and insulation connecting blocks moulded around each row of contact strips and their associated terminal extensions near the connecting points of said strips and terminal extensions so as to leave said parts exposed at said connecting points, an insulation block moulded around the terminal extensions of each row of contact strips near the terminating ends thereof, supporting means for said contact springs at the terminating ends thereof and supporting means for the contact strips and the associated extensions secured to some of the first-mentioned insulation blocks and to the second and third-mentioned insulation blocks.

5. In a crossbar switch, a main frame, a plurality of vertical contact assemblies, each comprising a vertical frame member, attached to said main frame, groups of horizontal contact springs attached to each of said vertical frame members, a row of vertical contact strips, each strip connectable to a corresponding horizontal contact spring in each of said horizontal groups, connecting insulation blocks molded around said rows of vertical contact strips at intervals to hold said strips together, extensions on some of said blocks having apertures therein, a screw member inserted in each aperture and screwed into said vertical frame member to keep said strips in place in relation to the associated horizontal contact springs, horizontal extensions on said contact strips, connecting insulation blocks molded around said extensions at intervals to hold them together and having apertures therein, a screw inserted in each aperture and screwed into said vertical frame member to secure said extensions to said frame member, an operating card on each group of horizontal contact springs, and means for selecting any particular card in any contact assembly and operating it to move the associated group of contact springs into electrical contact with the associated vertical strips.

6. In a crossbar switch, parallel rows of contact springs, each row divided in groups of springs, said rows being located in one coordinated direction, parallel rows of contact strips located in the other coordinate direction, each row of strips associated with one group of springs from each row of contact springs, means for establishing connections between any group of contact springs and the associated row of contact strips, a terminal integral with each contact strip, said terminals of each row of contact strips extending in a group at right angles from one end of said contact strips, insulation connecting blocks molded around each row of contact strips at intervals, an insulation block molded around each row of contact strips and their associated terminals located so that said block surrounds the contact strips and the terminals near the connecting point of said strips of terminals, leaving a portion of the contact strips and terminals exposed at said connecting point, insulation blocks molded around each row of terminals at intervals, and a test jack connectable to each row of contact strips and having contact springs arranged to fit over and engage individual contact strips and terminals at said exposed portions.

7. In a crossbar switch, parallel rows of contact springs, each row divided in groups of springs, said rows being located in one coordinate direction, parallel rows of contact strips located in the

other coordinate direction, each row of strips associated with one group of springs from each row of contact springs, means for establishing connections between any group of contact springs and the associated row of contact strips, a terminal forming an integral part of each contact strip, the terminals of each row extending in a group from one end of the strips in said row at right angles to said strip with a portion at the connecting point of each terminal and strip 10

slightly enlarged, an insulation block molded around these strips and terminals of each row at intervals with one block surrounding both the strips and terminals near the connecting points thereof so as to expose a part of said enlarged portions, and a test jack having spring contacts suitable for connection to said exposed enlarged portions of any row of strips and associated terminals. 5

JOSEPH C. FIELD.