May 9, 1944. R. F. MALLINA 2,348,353

SWITCHING MECHANISM

Filed May 5, 1943 2 Sheets-Sheet 1

FIG. 1

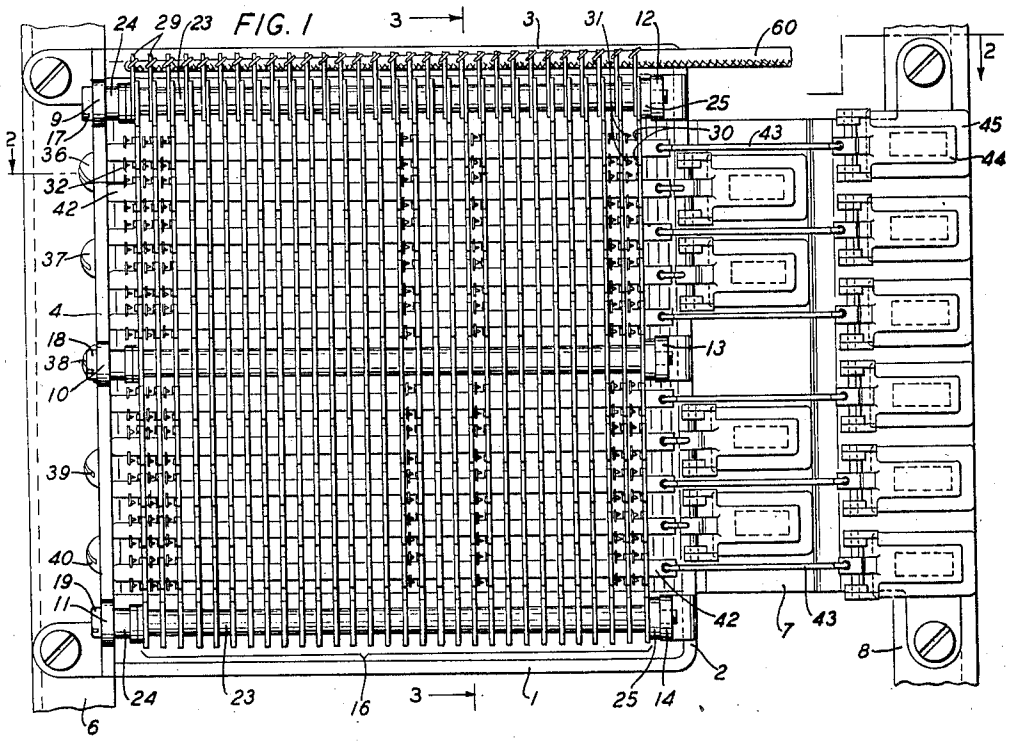
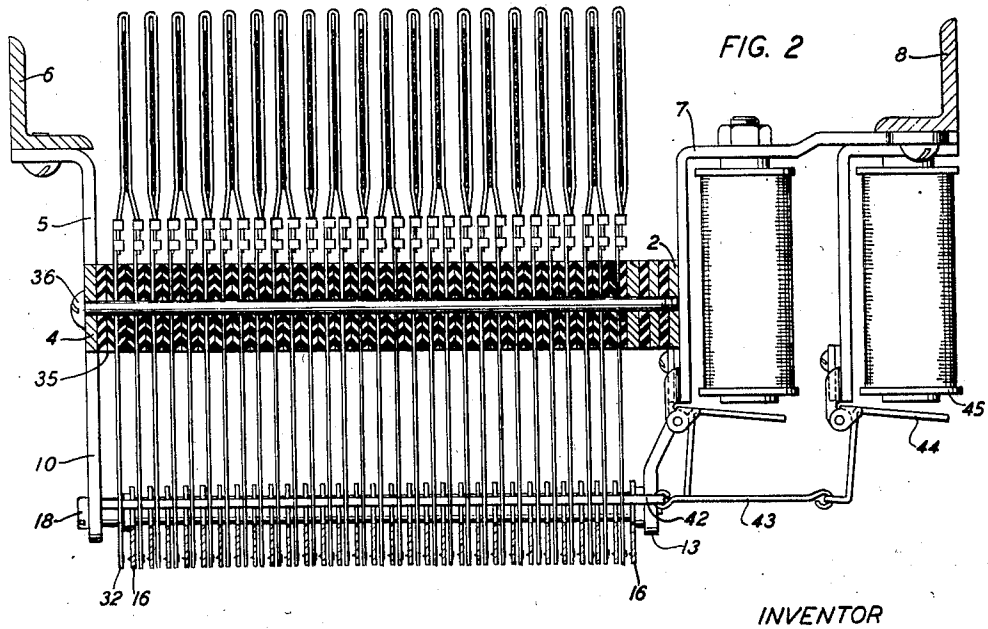


FIG. 2



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SWITCHING MECHANISM

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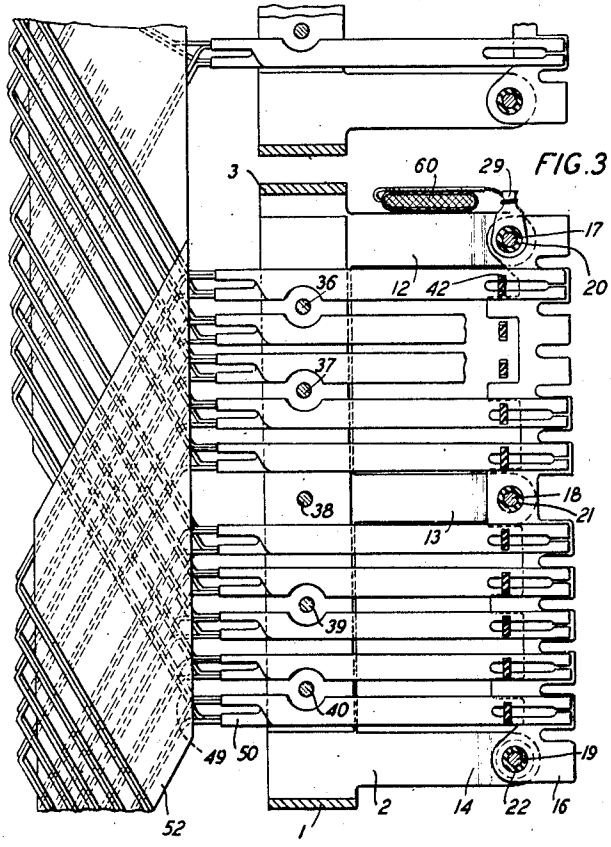


FIG. 3

FIG. 5

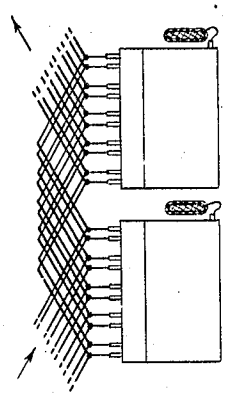


FIG. 6

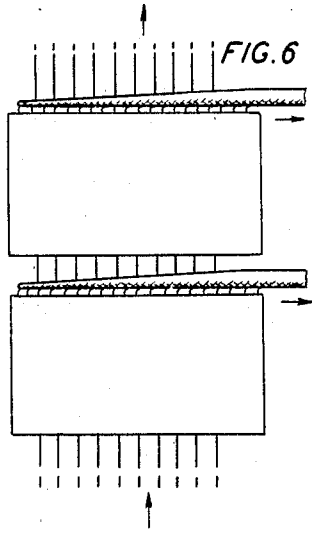
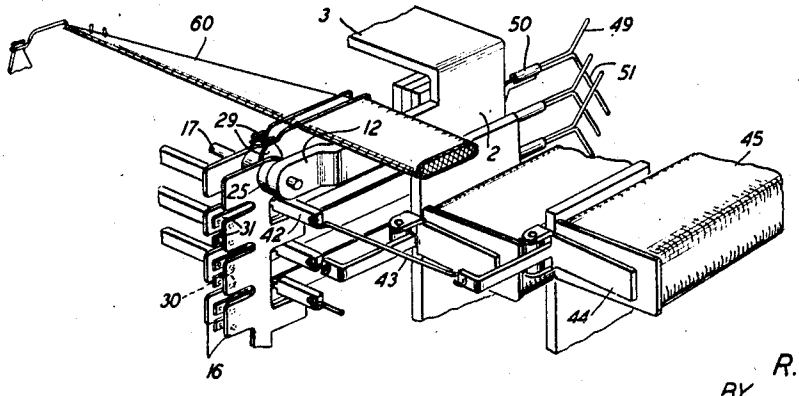


FIG. 4



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Patented May 9, 1944 2,348,353

UNITED STATES PATENT OFFICE

2,348,353

SWITCHING MECHANISM

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Application May 5, 1943, Serial No. 485,738

4 Claims. (Cl. 179—27.54)

This invention relates to switching mechanisms and particularly to multicontact mechanisms in which a large group of connections is established simultaneously by the operation of magnets.

An object is to improve and simplify the construction of such mechanisms and to simplify the multiple connections between a plurality of such mechanisms.

Heretofore multiple contact mechanisms have been provided in which one set of contact strips is connected to a plurality of special contact springs and in which each contact spring set is operated by an individual card and all of said cards are operated by a common armature controlled by a magnet or as in the case of the invention disclosed in the Patent 2,169,551 to C. I. Baker, of August 15, 1939, where two magnets operate on individual armatures tied together and in which each armature in turn operates on a card to control sets of springs to establish connections with the corresponding set of contact strips.

The present invention relates to a switching mechanism along these lines and a feature thereof is an arrangement whereby contact strips are mounted side by side in one large group in one coordinate direction in a frame and sets of contact springs are arranged in the other coordinate direction in rows with a draw bar or card controlling each row of contact strips to connect with the associated contact strips under control of an individual magnet. By this arrangement any one or a plurality of such magnets when actuated will connect their associated contact springs with the corresponding common contact strips.

Another feature is the arrangement of these contact springs, draw bars and magnets in a frame with the magnets arranged on one side in the frame in staggered relation so that the draw bars and rows of contact springs may be placed as close together as is required only by the width of the springs.

Another feature is the arrangement of multiple cabling for a plurality of these switching units consisting of flat prefabricated ribbon cables located side by side in the rear of the frames parallel to the contact strips and containing conductors connecting corresponding contact springs in corresponding rows in all of said frames together and a flat prefabricated ribbon cable located across one end of the contact strips in each frame and containing conductors each connected to a separate contact strip in said frame. By these features of the applicant's invention the set of contact strips in any frame or frames may be connected to the associated multiple contact springs.

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

Fig. 1 shows a switching mechanism in accordance with the applicant's invention;

Fig. 2 shows a cross-section taken on line 2—2 of Fig. 1;

Fig. 3 shows a cross-section taken approximately on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section of a corner of the switch structure shown in Fig. 1;

Figs. 5 and 6 show arrangements of the multiple cables for a plurality of switching units such as shown in Fig. 1. The cabling arrangement of switching units in these two figures is shown in diagrammatic form only.

Referring now to the drawings, the mechanism consists of an outer frame comprising a lower member 1, a right-hand side member 2, an upper member 3 and a left-hand member 4 in which the greater part of the mechanism is enclosed. Frame member 4 is provided with an angular projection 5 towards the rear of the unit which is connected to an upright rack member 6. Attached to the right-hand member 2 is an angular frame member 7 which is attached to the upright rack member 8. The frame member 4 is also provided with three forwardly extending arms 9, 10 and 11 and the right-hand frame member is provided with similar forwardly extending members 12, 13 and 14. Between frame members 9 and 12, 10 and 13, and 11 and 14 is secured a series of vertical contact strips marked in general by the numeral 15. These strips are mounted on rods 17, 18 and 19 which are surrounded by insulation bushings such as 20, 21, 22, see Fig. 3, and washers 23 between the vertical contact strips and washers 24 and 25 on the outside of the outer vertical contact strips and between the associated members 9 and 12, 10 and 13, and 11 and 14, as shown in Figs. 1 and 3. At the upper end of each vertical contact strip and mounted adjacent to each strip on the rod 17 are terminal extensions such as 29, extending upwardly above the rod 17. In the drawings the contact strips 15 are provided with contacts in pairs at ten succeeding points throughout their lengths, for example, as shown at 30 for the first strip at one point and similar contacts at the other nine points throughout the length of this strip. Between the strips 15 and adjacent to each set of contacts 30 on these strips is a bifurcated contact spring, such as spring 31, opposite the contacts 30 on the first strip 15, and

such as for example spring 32 in Fig. 2, opposite the last strip 16.

These contact springs are therefore arranged in vertical and horizontal rows with the springs in each vertical row connectable to one vertical contact strip and with the springs in each horizontal row connected to the corresponding vertical contact strips. In the switch shown there are, therefore, thirty vertical strips and three hundred contact springs or thirty contact springs in each of ten horizontal rows. The contact springs extend towards the rear of the unit and are insulatedly connected or anchored between the frame members 2 and 4 by intermediate insulation strips such as 35 and held in place by means of bolts such as 36, 37, 38, 39 and 40 having a round head on the left-hand end and screw thread on the right-hand end where the bolts are screwed into the plate 2. The contact springs extend beyond this mounting means to form terminals for connection to the cables as will be described presently.

Connected to each horizontal row of contact springs is a draw bar or card member 42 for moving the springs in contact with their respective vertical contact strips 16. As shown, each card is connected through a link 43 to an individual armature 44 controlled by an individual magnet 45. In the mechanism shown there is therefore provided ten cards, links, armatures and magnets. It should be noted that six of these magnets are mounted on the extreme right of the member 7 and the other four magnets are mounted intermediate but to the left of the six magnets on the member 7. Thus, by these arrangements the cards 42 may be placed quite close together, the distance between them determined primarily by the width of the contact springs and the width of the magnets in the vertical direction. Thus, a very compact switch structure is produced by the applicant's arrangement of the component parts.

Referring now particularly to Fig. 4, to establish a connection between the vertical contact strips and the contact springs of a horizontal row, a magnet 45 may be operated to attract its armatures 44 which pulls through link 43, the card 42 towards the left. This movement of the card causes the thirty contact springs in the associated horizontal row to be connected with the thirty contact strips. It is, of course, possible to have all the magnets operate to connect associated contact springs with the thirty contact strips, if desired. As noted particularly in Figs. 2 and 3, the contact springs in pairs of adjacent vertical rows are connected to a series of individual conductors formed into flat vertical cables, while the contact springs in the rows intermediate of said pairs are formed in corresponding vertical cables. Consequently, with this arrangement there will be a total of twenty vertical cables. These cables may be arranged as shown in Fig. 3 so that each conductor, such as 49, loops in diagonally from above and connects to a terminal, such as 50, and then loops diagonally downwardly. All of the conductors are then folded back over themselves and intermediate the folds are inserted rhomboidal sections of fabric, such as shown at 52, to stiffen the cable and hold it together in a flat ribbon. It should be noted that if Figs. 3, 5 and 6 are considered, these ribbon cables extend from one switching unit to another in a vertical direction, these cables being mounted between the upright rack members 6 and 8 on which the switching units are mounted one above the other. Thus, the corresponding contact springs in succeeding units are connected together by a common conductor. The vertical contact strips in each switching unit may be connected at their upper terminals 29 to individual conductors in a prefabricated cable, such as 60. This cable may be located immediately above the terminals in a horizontal position and extended outwardly toward the right, looking at Fig. 1, for establishing an outside connection to the strips.

By this arrangement of switches and cabling, connections may be made from any number of these cables 60 through the connected vertical contact strips in various units to associated horizontal rows of contact springs on the operation of the corresponding magnets in these units.

What is claimed is:

1. In a multicontact relay, a box-shaped frame, mounting members extending forward from the vertical sides of said frame, a series of vertical contact strips insulatedly mounted to and between said members, vertical series of contact springs, each series having its contact ends in position to make contact with an individual contact strip and having its base ends located at the rear of the frame, all of the base ends of said springs being insulatedly mounted in a single unit between the vertical side members of said frame and provided with terminals extending back beyond the frame, said vertical series of contact springs being so located that corresponding springs in each series form a horizontal row, an operating card for each horizontal row of contact springs secured to the individual contact springs of said row, so that the longitudinal movement of said card moves the attached springs sideways to contact with their respective adjacent contact strips, a magnet for actuating each card longitudinally, a series of flat ribbon cables lying vertically side by side beyond the terminals, each cable having a conductor connected to each terminal of a separate vertical row of springs, and a cable having a conductor connected to each vertical strip at the top ends thereof and lying horizontally above and across the mounting members of said frame.

2. In a multicontact relay, a frame, a series of vertical contact plates supported by said frame on the front side thereof, a plurality of horizontally extending springs arranged in vertical rows supported by said frame at the rear thereof and having the free contact ends of each vertical row of said springs adjacent a separate vertical contact plate, a plurality of multiple cables, each comprising a conductor connected to each contact spring in a corresponding separate vertical row, each of said cables being located at the rear of the frame in a flat ribbon formation in the same plane as the row of springs to which it is connected, with the individual conductors folded back on themselves to form loops secured to individual springs in the corresponding row and extending above and below the frame for connection to other springs, a cable running in the horizontal direction for the vertical contact strips and mounted on the top of said frame, each conductor in said second cable being extended in a transverse half loop and connected to a separate vertical contact strip at the upper end thereof, an operating card for each horizontal row of contact

springs and a magnet for each card, an armature for each magnet connected to the corresponding card so that on the energization of a magnet the associated card is moved by the armature to shift the connected contact springs to make connection with the associated horizontal plates.

3. In a multicontact relay arrangement, a plurality of individual multicontact relay units located one on top of another, each unit comprising a frame, a horizontal row of vertical contact strips, forwardly extending projections on said frame on which said vertical strips are insulatedly mounted side by side, vertical rows of contact springs arranged also to form horizontal rows each comprising a spring from each vertical row, said springs extending from the front of the frame to the rear thereof, the base ends of said rows of springs being insulatedly mounted in a single assembly to the frame at the rear thereof and the contact ends of each vertical row of springs being located adjacent an individual vertical strip for the establishing of connections therewith, an operating card for each horizontal row of springs and secured to all of the springs in said horizontal row, a magnet for each card secured to said frame, and means controlled by said magnet when energized for actuating the corresponding card in a horizontal direction to move the associated vertical row of springs in contact with the adjacent vertical strips, a cable for each unit, each cable having its conductors connected individually to the vertical strips in the corresponding units, each of said cables running horizontally along the top of the corresponding frame and secured thereto, a plurality of multiple cables, each in a form of a flat ribbon and located side by side at the rear of the frame and running in a vertical direction, each such flat cable being associated with an individual vertical row of springs in all of said units, and having conductors equal to the number of springs in each vertical row, each conductor connected to a corresponding spring in a corresponding vertical row in each unit.

4. In a multicontact relay, a frame, a series of vertical contact plates supported by said frame, a plurality of horizontally extending contact springs arranged in vertical rows supported by said frame, each of the contact springs having its free contact end bifurcated and each vertical row of said contact springs being so located that their free contact ends make contact with an individual vertical contact plate, said vertical rows of contact springs being further so located that a corresponding contact spring in each vertical row forms a horizontal row, an operating card for each horizontal row of contact springs secured to the individual contact springs in said row in between the bifurcated free ends thereof so that a longitudinal movement of said card moves the attached contact springs sideways to contact with a corresponding vertical contact plate, a plurality of magnets, each having an operating armature, each armature connected to a corresponding card for the movement thereof in said longitudinal direction when the associated magnet is energized, said magnets being located on one side of said vertical plates and secured to said frame in two separate vertical rows, the magnets in each row being located one above the other and as close together as is permissible by the vertical width of the magnets.

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