July 2, 1963 H. V. ALEXANDERSSON ET AL 3,096,422

MULTI-CONTACT SWITCHING DEVICE

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Fig. 1

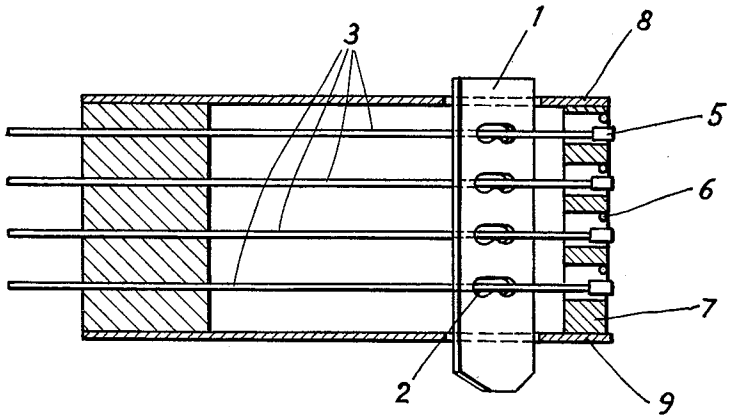

Fig. 2

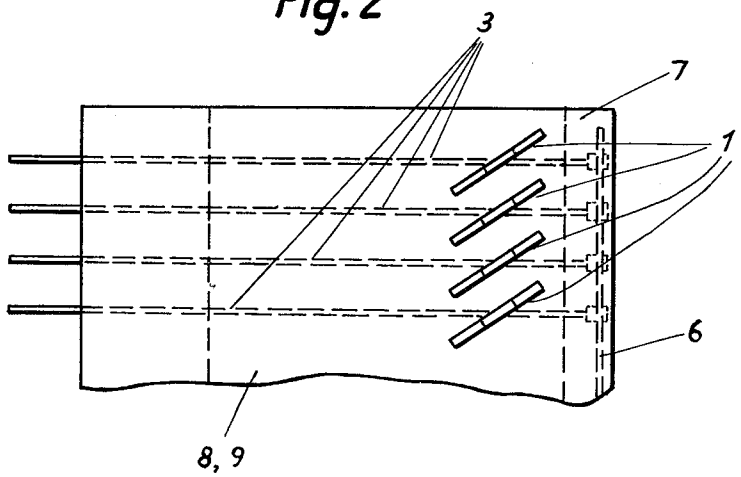

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Fig. 3

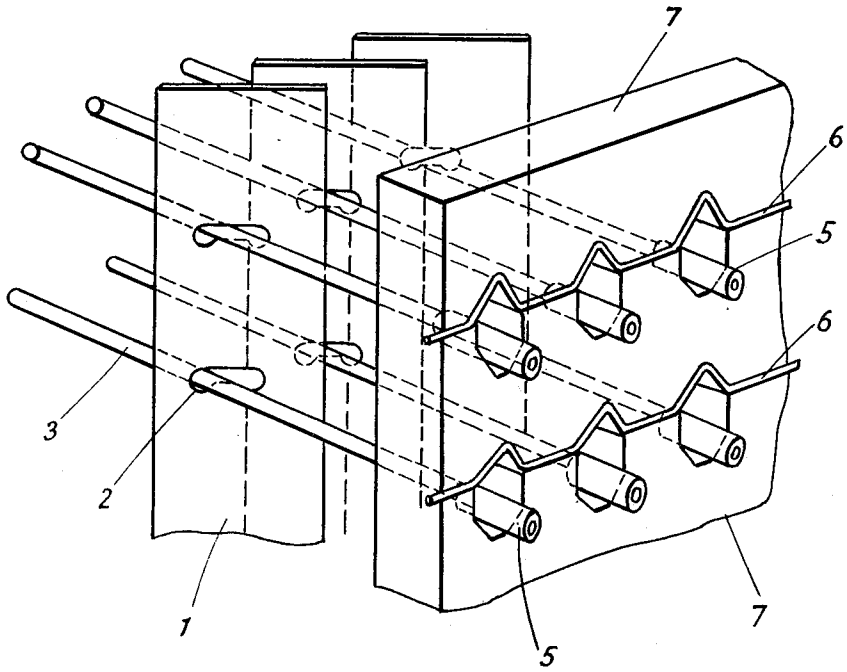
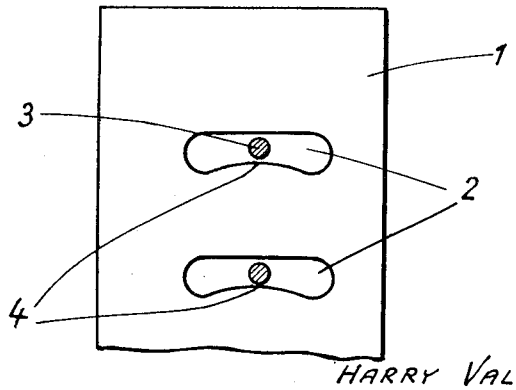


Fig. 4



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United States Patent Office

3,096,422

Patented July 2, 1963

3,096,422

MULTI-CONTACT SWITCHING DEVICE

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Filed Jan. 29, 1960, Ser. No. 5,442
Claims priority, application Sweden Feb. 10, 1959
5 Claims. (Cl. 200—166)

In contact spring multiples built of plate springs in several parallel piles or groups of springs lying above each other a lifting rib is normally used as an actuating member for the springs in a group, said lifting rib is in most cases cut out from a plate of paper laminate. The lifting rib is generally placed inside and right through the springs, which are actuated by teeth in one edge of the lifting rib. If wire springs or similar springs are used the lifting rib must, of course, lie mainly outside the contact springs. In the case a contact spring multiple constructed of wires is wanted, for example for cross bar switches, and it is desirable to have small dimensions sideways of the wire in order to construct a very compact multiple, the problem arises that the lifting ribs take too much space if they are constructed in traditional manner. While it is possible to arrange the lifting ribs in two or more rows displaced in relation to each other, when this arrangement is used the working point on the contact springs will be placed differently, the bending will be different and the contact pressures will differ too much from each other. Lifting ribs provided with teeth on their broad side are also a possibility. However, in such case the production becomes expensive, as ordinary cutting out of the rib is not possible.

A practical and cheap solution of the problem is obtained if the present invention is used. This invention is mainly characterized in that the lifting ribs have a breadth which is bigger than the distance sideways between the contact wires. Thus, the cross direction of the lifting ribs forms an angle less than 90° with respect to the longitudinal direction of the contact wires.

The invention will be further described with reference to the accompanying drawings. FIG. 1 shows a side view of a wire spring set. FIG. 2 shows four groups of a multiple seen from above. FIG. 3 shows in perspective and in large scale three groups in a multiple seen from in front. FIG. 4 is an enlarged picture of a lifting rib.

In the drawing only the details of a multiple necessary for explaining the invention are included, and this multiple comprises a number of parallel lying spring sets of the kind shown in FIG. 1. Each group includes a number of wire springs **3** lying above each other and fastened in a normal way at their rear left ends. The front right ends of the wires are lifted upwards from the position of rest shown in the drawing by a lifting rib or bar **1** for each group, said lifting rib being actuated in a known way which is not shown.

The lifting rib **1** is provided with a number of oval holes **2** for the contact wires **3**. The holes are provided with a convex edge **4** upon which the contact wires rest. The holes are suitably formed, at least on one side, with a greater width than the remainder of the holes to enable the lifting rib to be threaded on the contact wires. The contact wires are provided with applied tubes **5** or sleeves of contact material at their front end. When the contact wires are actuated by the lifting ribs, these tubes make contact with wires **6**, which are disposed in a stand **7** of insulating material and extend transverse of the contact wires **3**. The distance sideways between the contact wires **3** in the different groups is smaller than the width of conventional lifting ribs, so that the ribs can not be placed in a row with their cross direction perpendicular to the

longitudinal direction of the contact wires. According to the invention the lifting ribs are placed so that their cross direction forms an angle less than 90° with the longitudinal direction of the contact wires **3**. The ribs are guided in their position by diagonal holes in an upper and a lower guiding plate **8** respectively **9**. The holes **2** in the ribs are dimensioined so that the contact wires obtain a relatively good side guiding. When the ribs are lifted, the ribs are turned upon contact of the wires with the lower limiting edges of the holes **2** owing to the inclined position of the ribs towards the contact wires. This turning moment is unfavorable, since extra friction can appear owing to this. However, these frictions can be kept down at safe values, by forming the holes in the lifting ribs with the said convex form. It would, of course, be possible to provide the lifting ribs with teeth instead of holes in one edge, but then the mechanical stability will be smaller.

With the spring sets of the described wire spring type there is a need to center the wire springs **3** in their rest position. The wire springs cannot be directed so precisely that all the wires in a group get into exactly the same position below each other. This is especially true when they are actuated by diagonal ribs. The holes in the ribs are dimensioned so that relatively good side guiding is obtained as previously mentioned, but still derivations in guiding appear at the front ends of the contact wires. As shown in embodiment of FIG. 3 it is necessary that the contact sleeves **5** are positioned in relation to the surrounding insulating material of the stand **7** so that no wear and tear appears when the contact wires move upwards and downwards. If a wire spring is free in its inactive rest position, i.e. when it lies against the lower part of the slots for the contact wires in the stand **7**, it will take a position so that the contact sleeve **5** at its movement upwards will drag along the vertical side edges of the slots in the insulating material. This causes debris of insulating- and contact material to remain both on the contact sleeves and on the limiting surfaces of the slots in the stand **7** at such places where it may adversely affect the contact make and break qualities. This inconvenience can be prevented if the side edges of the slots are drawn closer to each other downwards in such a manner that the wires are centered in predetermined rest positions. If a wire should have a side pressure, it is taken up by the vertical limiting surfaces, until the wire again is brought upwards by the lifting rib.

We claim:

1. A multi-contact switching device comprising a plurality of substantially straight contact springs fixedly mounted at one end and grouped spaced apart in vertical and transverse rows, a plurality of stationary contacts each engageable with one of said contact springs at the free end thereof, and a lengthwise displaceable vertically disposed insulation lifting bar for each vertical row of contact springs, said bars being aligned in a row transverse of said contact springs, each of said bars contacting with all the contact springs in the respective vertical row to move said springs into and out of engagement with the respective stationary contacts by lengthwise displacement of the bars, said bars having a width greater than the transverse spacing between two adjacent vertical rows of springs and being positioned to define an angle of less than 90° with said contact springs whereby upon displacement of the bars into the contact-making position, a uniform contact pressure is exerted at all the stationary contacts in the respective vertical row.

2. A switching device according to claim 1 wherein each of said lifting bars has several vertically spaced holes therethrough one for each contact spring in the respective vertical row, the transverse width of said holes permitting passages of the springs during assembly of the

device and placement of the bars at a slant in reference to the length of the springs.

3. A switching device according to claim 2 wherein a contact sleeve is secured upon the free end of each contact spring, each of said holes in the bars having a portion widened to permit passage of the respective contact sleeve.

4. A switching device according to claim 2 wherein the lower edge of each hole is convexly curved in reference to the respective contact spring extending through the hole, the apex of the convexly curved edge supporting the respective spring to guide the same during movement within the hole.

5. A switching device according to claim 2 wherein said holes are formed with end portions that are substantially wider in vertical direction than the central portion

of the holes, said end portions guiding said springs in said holes when the springs are moved into the contact-making positions by said lifting bars.

References Cited in the file of this patent

UNITED STATES PATENTS

1,647,792	Gent	Nov. 1, 1927
2,638,514	Martin	May 12, 1953
2,846,547	Pettet	Aug. 5, 1958
2,902,549	Bernstein	Sept. 1, 1959

FOREIGN PATENTS

58,924	Denmark	July 28, 1941
62,914	Norway	Oct. 7, 1940
526,371	Belgium	Feb. 27, 1954
1,025,046	Germany	Feb. 27, 1958