CONTACT SUPPORT FOR CROSSBAR SWITCHES

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1. The invention refers to an arrangement for relays and relay selecting mechanisms in automatic telephone systems of the type in which an electromagnetic holding armature acts upon operating spring groups consisting of contact springs insulated from each other, and being mounted on supporting bars.

In such relays and relay selecting mechanism as for instance crossbar switch systems the contact springs are usually arranged in such a way that they are laid upon each other alternately with insulating inserted layers and eventually with distance layers of metal, forming together packages which are clamped together with screws insulated from the springs by insulating tubes or by some other suitable means.

Vertical units used up to now have several drawbacks. On the one hand they need very exact measure for all contact springs, inserted insulating layers used as well as for all distance layers. The dimensions of these details must be kept within very narrow tolerances, otherwise it is difficult to get all springs arranged on an exact allower distance from the frame of the vertical unit. This is true especially when using groups with a relatively great number of contact springs mounted on each other. Another arrangement which has been used frequently before contains eight springs on each other which means not less than 32 separate parts piled up upon each other. Errors in dimensions, existing from the beginning are thereby necessarily added to each other. The deviation of exact measure of each part need not be great to make the allower measure incorrect. Another drawback of this arrangement is that both a great many details and much material are needed. The purpose with an improved vertical unit is that the unit is carried out in such a way that adjustment of the springs after mounting becomes entirely unnecessary.

In order to obtain this purpose a mounting is necessary resulting in an exact position between all those parts through the cooperation of which the contact pressure and the spring pressure is obtained. This can be brought about, if the following conditions are complied with:

1. An exact division between (a) each contact spring at the lifting point; (b) each contact bar (fixed contact points) corresponding to the division of the springs at the lifting point.

2. An exact distance or an exact position between bars and the contact springs i.e. the spring racks; (b) the contact springs and the bridge frame (vertical unit) as well as the holding armature; (c) the contact bars and the bridge frame (vertical unit) and the armature.

An important presumption for an arrangement of a vertical unit is further that the springs have the right shape and the right pretension, e.g. the right contact pressure when inactive. When the above conditions are complied with, the spring will always receive the same motion and bending action. In such a case the contact pressure and spring pressure are dependent only of the quality of material the springs are made of and of the dimensions of the spring.

Arrangements which ensure that part of the above cited 5 conditions can be fulfilled are known before, for instance condition 1(a) and condition 1(b) have been accomplished before. A number of drawbacks however remain since these constructions are only aiming to bring about equal division between the lifting points of the springs respecting contact bars. The problem to get exactly fixed position between the spring racks and the contact bars and of the spring racks and the contact bars in relation to the vertical bridge unit and the holding armature has not been solved with the said arrangements known before. It has moreover been proved impossible in the manufacture of those parts to get the said distances correct from the beginning without special adjustment, although all parts are manufactured as accurate as possible.

Besides the great advantages that all distances between contact bars, contact springs and the vertical unit bridge become exact in relation to each other, the arrangement according to the invention implies that the total material necessary for a complete vertical unit becomes considerably less and the number of parts is very much reduced. For a crossbar switch of older type 34 parts are needed for mounting necessary spring racks and contact bars. According to the present invention only 12 parts are needed on a so called "ten bridge" selecting vertical unit mechanism which corresponds to a reduction of weight of about 10 percent. Screw threading of the holes in the vertical bridge unit is avoided when using an arrangement according to the invention.

The invention is shown and explained more detailed in connection with the drawings, in which a crossbar-switch vertical bridge unit is chosen as one embodiment of the invention. Figure 1 shows a typical vertical unit of a crossbar switch, seen from underneath, Figure 2 is
a cross section of the same switch unit along the section line a of Fig. 1. Figure 3 is a vertical unit frame equipped with supporting members according to the invention, but without contact spring groups being mounted on the unit and Figures 4a, 4b a supporting member according to the invention as connected to a base plate and Fig. 4e a separate supporting member.

In Figures 1 and 2, A means the frame of a vertical bridge unit provided with a number of parallel openings C. Six distance plates B are fixed directly to the frame A for instance by riveting. Sets of operating contact springs E are horizontally fixed to a common bar of insulated material F, forming spring racks, arranged in groups of ten, adjacent to each other. The springs are fixed to the insulating bar F in such a way that some extra space is available for expansion of the bar with regard to the expansion coefficient of the insulating material, used in the bar and safeguarding therewith that the pressure of the contact spring remains substantially unchanged. These bars F are fitted into the openings C of the distance plates B. Since these openings can be at once placed on exact distance from the frame A, the condition according to point 2b is complied with, e.g. the spring racks and thereby all springs E are placed on an exact distance from the bridge, which makes an adjustment unnecessary. M are metal bars riveted to insulating bars fixed to supporting members N. Q is an operating card for the contact spring group consisting of insulated material. X means a number of horizontal or selecting bars, provided with selecting fingers Y, extending underneath the spring groups as best seen in Fig. 2.

The arrangement of the present invention brings about that the other conditions cited before, can be performed at the same time. By shaping the distance plates B with openings which can support the fixed contact bars as well as the spring racks the condition according to point 2(c) is complied with e.g. the position of the spring racks becomes exact in relation to the contact bars. At the same time the condition according to point 2(c) is automatically complied with e.g. the position of the contact bars in relation to the plane of the bridge A becomes exact. The arrangement according to the invention allows also comply in a simple way with the conditions that the springs receive right shape and correct pre-tension. By giving the openings C in the distance plates B an angle V in relation to the base plane of the bridge the springs of the spring racks receive a certain desired pre-tension (Figure 4b).

Each vertical unit of the crossbar switch contains according to Fig. 2 an operating magnet V and 10 sets of contacts in a vertical row. Thus, with 10 vertical rows, a total of 100 sets of contacts is provided in a rectangular field, one set of contacts at each “crosspoint.” These crosspoints are operated independently of each other by a coordinate operation of horizontal and vertical bars X. The horizontal bars are actuated by the 10 horizontal or selecting magnets, while the vertical bars are the armatures of the vertical or holding magnets. Any set of contacts in any vertical row may be operated by operating first the selecting magnet corresponding to the horizontal row in which the set of contacts is located and then operating the holding magnet V associated with the vertical row. Since the contacts are held closed by the holding magnet alone, the selecting magnet is operated but momentarily, and is released as soon as the holding magnet operates. Other connections through the switch may then be made by the operation of the other selecting and holding magnets. Thus, as the switch is normally used, as many as 10 connections can be maintained at any one time through the switch, one for each of the horizontal paths.

Each horizontal or selecting bar X is provided with 10 selecting fingers Y, which are made of flexible wire. These fingers are mounted at right angles to the bar, one at each of the vertical rows of contacts. In making a selection, the proper selecting bar is rotated through a small arc by its magnet Y, and 10 selecting fingers Y move into position under the operating cards Q of that row of crosspoints. The holding armature U is then operated by its associated magnet, engaging the selecting finger at the crosspoint of the two bars and causing the corresponding set of contacts to operate. When the selecting magnet is released the selecting fingers Y are restored to normal, and made available for other selections, but the selected crosspoint contacts will be held closed by the holding armature U until the holding magnet V is released at the end of the connection.

The distance plates B according to the invention are easy to manufacture and the measures become exact in relation to each other, since these parts can be manufactured in one operation by punching, pressing or similar manufacturing processes. The spring racks with the contact springs mounted on it can be fixed to the distance plates in different ways, for instance by bolts S or the like. A further advantage is obtained with the arrangement according to the invention by the fact that the springs E can be fixed to the insulating bar F in any suitable way. In order to improve the manufacturing method it may be desirable to arrange the flaps for fixing the spring groups to the insulating bar instead on the edge of the insulating bars for instance in the centre of the springs, or across to the longitudinal direction of the spring instead of along the spring.

No screw connections are used and the centering of the spring groups at the lifting point of the operating card Q is easily carried out by drilling holes R in the distance plates B, putting small steel pins through these holes on which pins the springs rest when fixing the card Q (Figure 4e).

The invention can be varied in different ways without changing the principle of the new arrangement. The distance plates B can be manufactured entirely or partly of different materials, such as for instance partly of metal and partly of insulated material. The distance plates can further be arranged on a separate intermediate base plate, which in its turn is fixed to the frame of the vertical bridge unit in any suitable manner. The number of springs can vary in any desirable way, depending on the type of crossbar switch. It is not necessary to combine the arrangement according to the invention with the operating cards or contact arrangement with equal division e.g. of the shown embodiment to the fixing of the spring racks only. The arrangement using distance plates can be applied to fix contact bars or both, spring racks and contact bars. The arrangement does not differ in principle when using spring groups of other type as the ones shown in the embodiment.
We claim:

1. An arrangement in electric switching devices comprising a base structure, a plurality of groups of movable contact springs arranged side by side on said base structure, each of said groups comprising a plurality of movable contact springs in juxtaposed relation, means for controlling the movable contact springs of each group to perform a contact closure movement, a plurality of contact bars in juxtaposed relation having stationary counter-contact points thereon for cooperation with said movable contact springs, each contact bar extending substantially perpendicularly to the longitudinal direction of said movable contact springs as well as to the direction of said contact closure movement, counter-contact points on each contact bar cooperating with movable contact springs forming part of different spring groups and situated on substantially the same level relative to the said base structure, a plurality of flat supporting bars in juxtaposed relation having the movable contact springs affixed thereto, each of said supporting bars being common to movable contact springs of one and the same level, a plurality of supporting plates rigidly connected with said base structure and extending transversely to said contact bars and supporting bars and having at one end slots for receiving said contact bars and at the edge opposite thereto slots for receiving said supporting bars.

2. An arrangement in electric switching devices comprising a base structure, a plurality of groups of movable contact springs arranged side by side on said base structure, each of said groups comprising a plurality of movable contact springs in juxtaposed relation, means for controlling the movable contact springs of each group to perform a contact closure movement, a plurality of contact bars in juxtaposed relation having stationary counter-contact points thereon for cooperation with said movable contact springs, each contact bar extending substantially perpendicularly to the longitudinal direction of said movable contact springs as well as to the direction of said contact closure movement, counter-contact points on each contact bar cooperating with movable contact springs forming part of different spring groups and situated on substantially the same level relative to the said base structure, a plurality of flat supporting bars in juxtaposed relation having the movable contact springs affixed thereto, each of said supporting bars being common to movable contact springs of one and the same level, a plurality of supporting plates rigidly connected with said base structure and extending transversely to said contact bars and supporting bars and having at one end slots for receiving said contact bars and at the edge opposite thereto slots for receiving said supporting bars.

3. An arrangement according to claim 2, in which said abutting members consist of insulated back strips forming part of said contact bars.

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