Nov. 18, 1924. 1,515,632

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AUTOMATIC TELEPHONE SWITCH

Filed Nov. 19, 1921

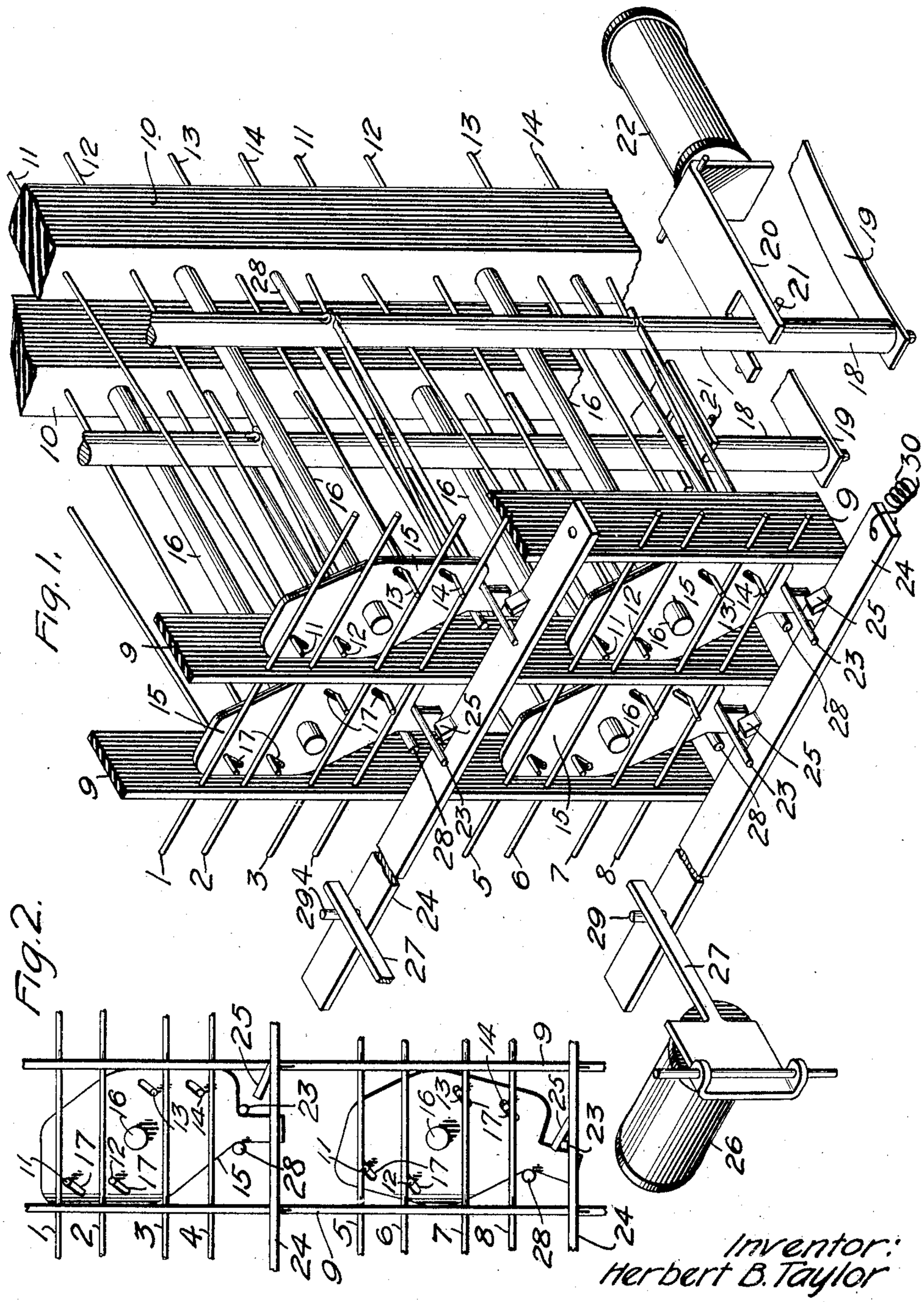

Fig. 1.

Fig. 2.

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Patented Nov. 18, 1924. 1,515,632

UNITED STATES PATENT OFFICE.

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AUTOMATIC TELEPHONE SWITCH.

Application filed November 19, 1921. Serial No. 516,276.

To all whom it may concern:

Be it known that I, HERBERT B. TAYLOR, a citizen of the United States, residing at Westfield, in the county of Union, State of New Jersey, have invented certain new and useful Improvements in Automatic Telephone Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to switching apparatus for use in automatic and semi-automatic telephone systems and is directed more particularly to switches of the cross-bar type whereby incoming lines are automatically connected with idle outgoing lines or trunks.

The object of the present invention is the provision of a simple and compact cross-bar switch structure which is economical to manufacture.

One feature of the invention resides in the combination with movable coordinate bars of pivoted members which are selectively operable by the conjoint operation of said bars to effect electrical connections.

Other features of the invention consist in the novel details of construction as particularly pointed out in the following description and claims.

With reference to the accompanying drawing, Fig. 1 is a fragmentary perspective view of a cross-bar switch illustrating the preferred embodiment of the invention, and Fig. 2 is a front elevation of a portion of the switch.

Wires 1, 2, 3 and 4 comprise in the present instance one of several similar groups and wires 5, 6, 7 and 8 comprise another such group. As many of these groups as desired may be provided. These wires extend over substantially the entire width of the structure and are suitably secured at their ends on supports which are not shown but which may be of any desired form. The aforementioned wires are also supported intermediate their ends by the vertical members 9 which are preferably of insulating material. These wires, together with their immediate supporting structure will be hereinafter referred to as a grid.

The vertical bars of insulating material 10 serve as supports for several sets of wire contact springs, each of which sets comprises in the present instance four springs 11, 12, 13 and 14. These contact springs are preferably embedded in the vertical bars 10 and their free ends extend through the grid, as shown in Fig. 1. All the sets of contact springs in each row may be connected in multiple, that is, all the contact springs 11 in the same vertical row, all the contact springs 12, all the contact springs 13 and all the contact springs 14 would be connected together.

Such arrangement of contact multiples is not, however, essential, as for instance, the present structure is adapted for use in the automatic telephone system described in the British Patent No. 183,438 issued to the Western Electric Company, Limited, accepted September 6, 1923, in which the vertical rows of contact springs, which are assigned to incoming lines, are each divided into a number of groups, each of which comprises a plurality of multiply connected sets of contact springs, each of such groups being associated with a different incoming line.

Associated with each set of contact springs 11, 12, 13 and 14 is a flat member 15, preferably of insulating material. These members are each pivotally mounted on studs 16 which are embedded in bars 10. Elongated apertures 17 are provided in the members 15 through which the contact springs extend. These apertures are so disposed as to normally hold the contact springs out of engagement with their respectively associated grid wires 1, 2, 3, 4, etc. Rotation of members 15 in a clockwise direction, as viewed in Fig. 2, permits their associated contact springs to move under their own tension into engagement with the grid wires. The contact springs are preferably tensioned diagonally with respect to the grid wires so that they will engage therewith with a wiping action, thereby keeping the contact surfaces clean. Resilient wires 28, which are also embedded in the bars 10, are provided for restoring the pivoted members 15, when released to their normal positions, such positions being determined by contact with adjacent insulating strips 9.

Individual to each vertical row of contact springs is a longitudinally movable bar 18, which is mounted in suitable bearings which have been omitted from the drawing for the sake of simplicity. These bars are each

normally held in their upper positions by the flat springs 19, which press against their lower ends and are movable downwardly by the armatures 20 in response to the energization of electromagnets 22 through the engagement of armatures 20 with the pins 21 on the bars 18.

Each bar 18 is provided with a plurality of laterally extending resilient wires 23, there being one such wire provided for each set of contact springs per vertical row. The free ends of the wires 23 extend into juxtaposition with their associated pivoted members 15 and are normally disposed in the position shown at the top portion of Fig. 2. When the bars 18 are moved downwardly in response to the energization of their respective electromagnets 22, the wires 23, mounted thereon, likewise move downwardly into a position where they may be utilized for the rotation of their respective pivoted members 15.

With each group of grid wires 1, 2, 3, 4, etc., there is associated a longitudinally movable horizontal bar 24, each of which is provided with a plurality of diagonally extending lugs 25, one for each vertical row of contact springs. These lugs are adapted to engage any of the wires 23 associated therewith which may be in the downward position when the bar 24 is moved to the left, as viewed in Fig. 2. Such operation of a bar 24, following the operation of one or more bars 18, results in a movement of the free ends of the downwardly positioned wires 23 against the associated pivoted members 15, thereby rotating the latter and permitting their respective contact springs 11, 12, 13, and 14 to engage the grid wires 1, 2, 3, 4, etc. For operating each bar 24, an electromagnet 26 is provided which is operatively associated with the bar 24 through its armature 27 and a pin 29 on the bar. The bars are retained in their normal position by suitable springs such as 30.

As soon as a bar 24 has operated, the previously operated bar or bars 18 may be restored to the normal upper position by the spring or springs 19, the electromagnets 22 being deenergized. The free ends of the engaged wires 23 are prevented from moving upwardly with their respective bars 18 by reason of the fact that the lugs 25 overlie them, as shown in the lower portion of Fig. 2.

When this structure is used in the system described in the aforementioned British Patent No. 183,438 of 1923, certain of the vertical rows of contact springs are assigned to incoming lines, the remaining vertical rows are assigned to outgoing trunks, and the grid wires 1, 2, 3, 4, etc. are utilized as link conductors whereby connections are established between incoming line contacts and outgoing trunk contacts. Each incoming line bar 18 being associated with a plurality of incoming lines may be operated repeatedly to establish co-existing connections between its several associated incoming lines and idle link conductors through which the connections are further extended to idle trunks by the simultaneous operation of bars 18 associated with the rows of contact springs assigned to outgoing trunks.

If, for instance, it be assumed that the vertical row of contact springs at the left of Fig. 1 is assigned to incoming lines, the two sets of contact springs shown in the drawing being connected in multiple to one incoming line, and the vertical row at the right of Fig. 1 assigned to an outgoing trunk (in which case all the sets of contact springs are connected in multiple), a call originating on the aforementioned incoming line would result in the operation of both bars 18, shown in Fig. 1, (assuming the aformentioned trunk to be idle, otherwise another trunk and its associated bar would be selected). The operation of these two bars would draw all the wires 23 thereon into the paths of the associated lugs 25 of all the bars 24. Following the above operation one of the horizontal bars 24 (which may be properly referred to as link bars) associated with the calling line, and which happens to be idle, is operated by its electromagnet 26 and armature 27. Two of the pivoted members 15 are thereby rotated and connections simultaneously established between the incoming line contact springs and link conductors and between outgoing trunk contact springs and link conductors. After the connection is established both of the vertical bars 18 may be released and returned to normal, only the link bar 24 remaining in its operated position.

The link conductors 1, 2, 3, 4, etc. might, if desired, be utilized as line conductors, in which event each of the vertical rows of contact springs would be assigned to an outgoing trunk. The operation in this last mentioned case would consist in operating one vertical bar 18 and one horizontal bar 24 after which the vertical bar could be immediately released.

What is claimed is:

1. In a switch structure, a grid comprising a plurality of substantially parallel wires, said wires being arranged in sets of one or more, a plurality of rows of sets of wire contact springs disposed at right angles to said first mentioned wires, said contact springs each being fixed at one end and having their free ends extending through said grid, each set of contact springs in a row being associated with a different set of said parallel wires and adapted for engagement therewith, a pivoted member for each of said sets of contact springs, said pivoted members each being provided with an elon-

gated aperture for each contact spring in its associated set, each of said contact springs extending through one of said apertures, and means for rotating said pivoted members selectively whereby the selected sets of contact springs are operated, said means including two groups of longitudinally movable bars, the bars of one group being individual to said sets of parallel wires and the bars of the other group being individual to said rows of contact springs, the conjoint operation of a bar of each group being effective to selectively operate one of said pivoted members.

2. A switch structure comprising a contact set, a pivoted member for operating said contact set, a longitudinally movable bar, a resilient member carried by said bar, said resilient member extending into juxtaposition to said pivoted member, and a second longitudinally movable bar provided with a diagonally extending lug, the operation of said first bar being effective to move said resilient member into the path of said lug and the operation of said second bar following the operation of said first bar being effective to engage said resilient member with said lug and further effective to move said resilient member to rotate said pivoted member, said lug being effective to prevent the return to normal of said resilient member during the continued operation of said second bar.

3. A switch structure comprising a grid of passive conductors arranged in sets, coordinate rows of active contacts entering said grid, a rotatable contact moving element associated with the active contacts at each coordinate point, a longitudinally movable bar individual to each row of active contacts having a resilient finger individual to each contact moving element, a longitudinally movable bar individual to each set of grid conductors, and means for moving said bars, the conjoint movement of one bar of each set being effective to bring the resilient finger at the coordinate point of such bars into engagement with its associated contact moving element to effect engagement between the active contacts and the associated grid conductors.

4. In a coordinate switch, a grid of passive contacts, a plurality of combs of active contacts entering said grid, rotatable camming cards at the coordinate points of said switch, and means to selectively rotate said cards to cause the interengagement of the active contacts and the passive contacts.

In witness whereof, I hereunto subscribe my name this 16th day of November, A. D. 1921.

HERBERT B. TAYLOR.