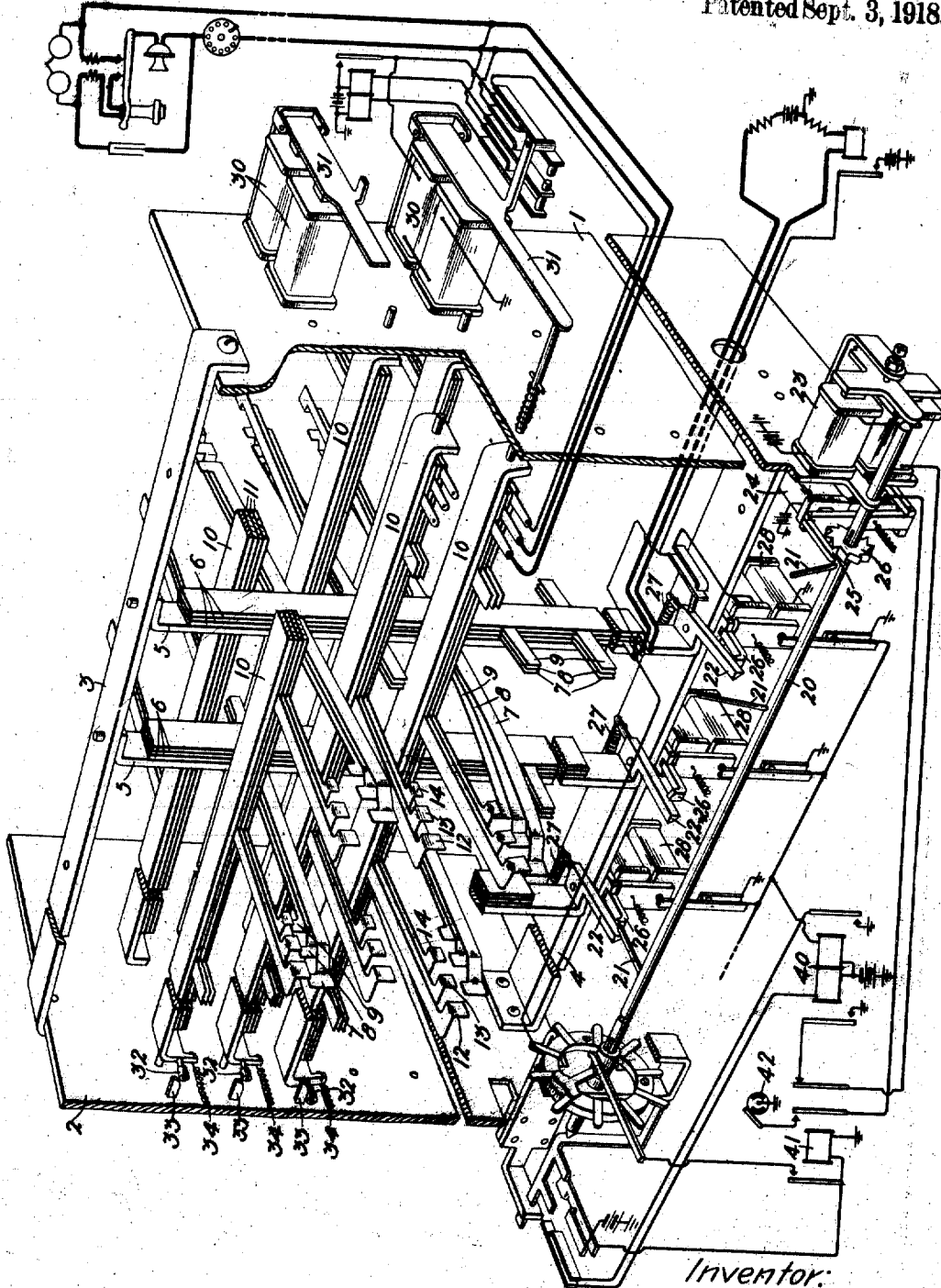


J. N. REYNOLDS.
TELEPHONE SWITCH.
APPLICATION FILED MAY 20, 1916.

1,277,478.

Patented Sept. 3, 1918.



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UNITED STATES PATENT OFFICE.

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TELEPHONE-SWITCH.

1,277,478.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN NEWBERRY REYNOLDS, a citizen of the United States, residing at Greenwich, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Telephone-Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone switching devices, and more particularly to switching devices of the cross-bar type such as disclosed in the Patent No. 1,131,734 of March 16, 1915, in which connection between two sets of conductors is effected by means of sets of relatively movable cross bars in which the two sets of conductors terminate.

The object of this invention in general is to improve the structure disclosed in the Patent No. 1,131,734 by reducing the size of the structure without change in size or efficiency of the operating parts of the device.

In accordance with the general features of this invention, the trunk bars are provided with terminal extensions on each side thereof, and the bars carrying the line terminals are mounted upon opposite sides of said trunk bars. The displacement of any trunk bar in the process of making a call will cause a displacement of the terminals on each side thereof into position to be engaged by the terminals of the line bar in which the calling line terminates. The motor mechanisms for controlling the movement of the line bars are mounted upon opposite ends of the structure; those for controlling the movement of the line bars upon one side of the trunk bars being mounted upon one end of the structure, while those for controlling the movement of the line bars on the opposite side of the trunk bars are mounted upon the opposite end of the structure.

The drawing is a perspective view of the switch with parts broken away and a circuit diagram such as might be employed in the operation of the device.

Referring to the drawing, 1 and 2 designate end plates to which are secured top and bottom members 3 and 4. Pivottally mounted between the top and bottom members 3 and 4 are bars 5, 5, each carrying, rigidly attached thereto, insulated strips 6, 6, 6. Formed integrally with these contact strips 6, 6, 6 and extending in opposite directions

therefrom are terminal contact strips 7, 8 and 9, these terminal contact strips being arranged at equal distances along the length of the bars 5, 5, which will be hereinafter referred to as the trunk bars. Pivottally supported in the end plates 1 and 2 and extending at right angles to the trunk bars 5, 5 are line bars 10, 10 constructed in a manner similar to the trunk bars, with insulated strips 11, 11, 11 and sets of contact terminals 12, 13 and 14 adapted in the operation of the apparatus to engage corresponding contact terminals 7, 8 and 9 of the trunk bars. There will be one of the line bars 10 for each level of contact terminals 7, 8 and 9 of the trunk bars, and each line bar will carry as many sets of contact terminals 12, 13 and 14 as there are trunk bars. In the general operation of the apparatus, one of the trunk bars 5 will normally be displaced through a slight angle, and the line bar 11, upon which the calling line terminates, will be moved longitudinally and laterally to cause a set of its terminals 12, 13 and 14 to engage corresponding terminals 7, 8 and 9 of the displaced trunk bars; whereupon the trunk bar will be released from its displaced position to return to normal, which will cause a pressure to be put upon the engaged contact terminals to hold them firmly in engagement.

The trunk bars 5, 5 are normally placed in set position by means of a setting mechanism comprising generally a rotatable set rod 20 provided with a plurality of spirally arranged pins or projections 21, 21 so arranged that only one at a time may be rotated into engagement with a lever 22 extending from the lower end of a trunk bar 5. The rod 20 is adapted to be moved longitudinally of the structure by means of a magnet 23, and rotated by means of a magnet 24 through a pawl 25 and ratchet 26. The rotary movement of the set shaft 20 brings one of the pins or projections 21 into a position where, upon the longitudinal movement of the shaft 20, the pin or projection 21 will engage a lever 22 on its corresponding trunk bar 5 to swing this bar to the left against the tension of a spring 27, where the lever 21 will be brought into engagement with a latch member 26 controlled by a trip magnet 28. The movement of each

of the line bars 10 is controlled by means of an electromagnet 30, the energization of which moves an armature 31 inwardly. The armature 31 is in engagement with a pivotal extension of a line bar 10, and as it is moved inwardly, moves the associated line bar 10 longitudinally, and a roller 32 mounted on the side of said bar at the opposite end thereof engages a cam projection 33 mounted on the inner face of the end plate opposite to that carrying the magnet controlling a particular bar. The engagement of this roller 32 with its corresponding cam surface 33 causes an angular displacement of the bar 10 against the tension of a spring 34. When one of the bars 10 is thus displaced, a set of the contacts 12, 13 and 14 will be brought into engagement with a corresponding set of contacts 7, 8 and 9 on the displaced trunk bar. The trunk bar with its terminals thus engaged will be released from its displaced position and rotate to the right to carry its unengaged terminals out of position to be engaged by contacts of another line bar, which may be subsequently operated while a circuit is connected through terminals of that particular bar.

The cycle of operation for the device of this invention is practically the same as that described in the Patent No. 1,131,734 and, without tracing in detail the circuit conditions, is briefly as follows. At all times one of the trunk bars 5 will be in a displaced position. Now upon the initiation of a call one of the line bars 10 will be displaced longitudinally and angularly by the magnet 30 to bring a set of contacts thereon into engagement with a set of contacts on the displaced trunk bar 5. The longitudinal movement of the bar 11 is sufficient to carry the unengaged terminals thereon beyond a position where they can be engaged by the terminals of subsequently displaced trunk bars while the particular line bar is in use. The engagement of the terminals 12, 13 and 14 of the line bar 11 with the terminals 7, 8 and 9 of the trunk bar operates to effect a completion of the circuit for the trip magnet 28 individual to the trunk bar, whereby the bar is released and returned to normal position where its unengaged terminals are out of a position to be engaged by terminals of others of the line bars 5 which may be subsequently operated. The operation of the trip magnet 28 completes a circuit for a relay 10 which completes a circuit through the set magnet 23, to cause the longitudinal movement of the shaft 20 to set another trunk bar 5. As the shaft 20 returns to normal position, a circuit is completed for a relay 11 which controls an interrupter mechanism 12 in circuit with the magnet 24. This causes magnet 24 to operate and rotate the shaft 20 to bring a pin or projection 21 thereon into position to

engage the lever 22 of an idle trunk bar 5 upon the next longitudinal movement of the set shaft 20.

The terminal contacts 7, 8 and 9 upon one side of the trunk bars 5 will be displaced in opposite directions upon the displacement of the trunk bar, and the line bars upon opposite sides of the trunk bars will be moved in opposite directions—those upon the front, as shown in the drawing, being moved to the left, while those upon the back are moved to the right. Magnets for moving those shown in the back will be mounted upon the end plate 2 in the same manner as those upon the end plate 1.

By reason of the construction whereby the trunk bars are provided with terminals on each side, the same number of trunk terminals can be provided on a bar half the length formerly used, and by mounting the line bars upon both sides of these trunk bars and locating controlling mechanism therefor upon each end of the apparatus, a structure of the same line and trunk capacity can be obtained with a much smaller and more compact structure than could be obtained with that disclosed in the Patent No. 1,131,734.

What is claimed is:

1. In a switching mechanism, a movable switching member, sets of contact terminals located upon a plurality of sides of said switching member, and a plurality of movable switching members adapted to cooperate with the several sets of terminals on said first mentioned switching member.
2. In a switching mechanism, a movable switching member, a plurality of sets of terminals extending in opposite directions from said member, and a plurality of movable terminal carrying members located on opposite sides of said switching member and adapted to cooperate with the terminals on said switching member.
3. In a switching mechanism, a switching member, terminals extending in opposite directions therefrom, means for displacing said switching member angularly to prepare the terminals for connection, movable terminal-carrying members located upon opposite sides of said switching member, and means for controlling the engagement of the terminals of the terminal carrying member on either side of said switching member with the corresponding terminals on said switching member.
4. In a switching mechanism, a plurality of switching members, a plurality of sets of terminals extending in opposite directions therefrom, means for selectively displacing said switching members to place the terminals thereon in receptive condition, a plurality of movable bars located upon opposite sides of said switching members and extending at right angles thereto, a plurality of sets of terminals on each of said bars adapted

to cooperate with a corresponding level of terminals on said switching members, and means for moving the bars upon opposite sides of said switching members in opposite directions to cooperate with the corresponding sets of terminals on said switching members.

5 5. In a switching mechanism, a supporting frame including end members and a top and bottom member, switching members pivotally supported between said top and bottom members, a plurality of sets of terminals extending in opposite directions from said switching members, a plurality of
10 switch bars pivotally supported in said end members upon opposite sides of said switching members and electromagnets mounted upon said end members for moving said switch bars into cooperative relation with
15 the terminals on said switching members, the magnets for controlling the movement of

the bars on one side of the switching members being mounted upon one end member and those for controlling the movement of the bars upon the opposite side of said switching members being mounted upon the
25 opposite end member.

6. In a switching mechanism, a switching member having terminals projecting from opposite sides thereof, switching bars having terminals arranged to cooperate with the
30 terminals on both sides of said switching member, means for rotating said switching member to place the terminals on both sides thereof in position for engagement by the terminals on said switching bars, and means
35 for rotating a switching bar to engage its terminals with the positioned terminals on said switching member.

In witness whereof, I hereunto subscribe my name this 18th day of May, A. D., 1916.
40 JOHN NEWBERRY REYNOLDS.