Dec. 29, 1925. 1,567,532

H. MARBURG

TELEPHONE SWITCH

Filed July 3, 1924

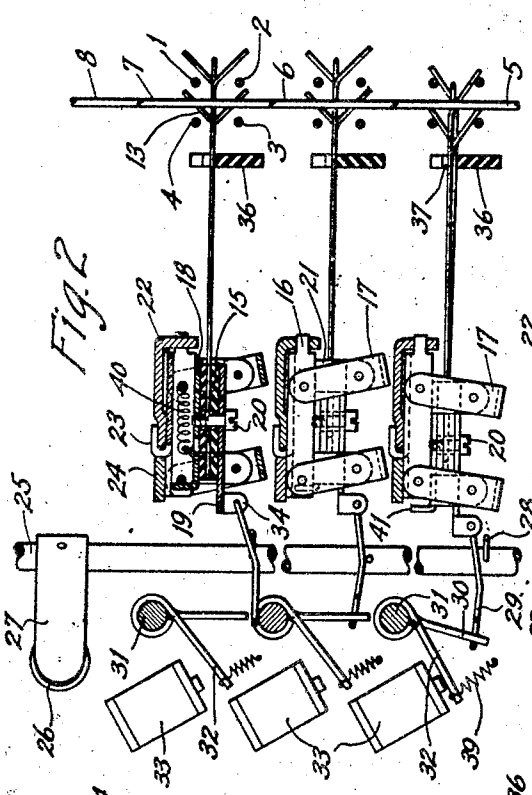


Fig. 2

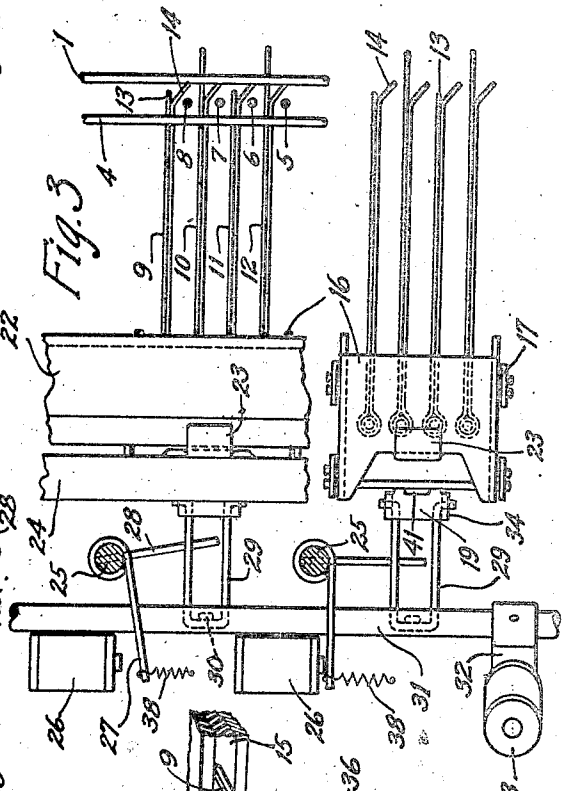


Fig. 3

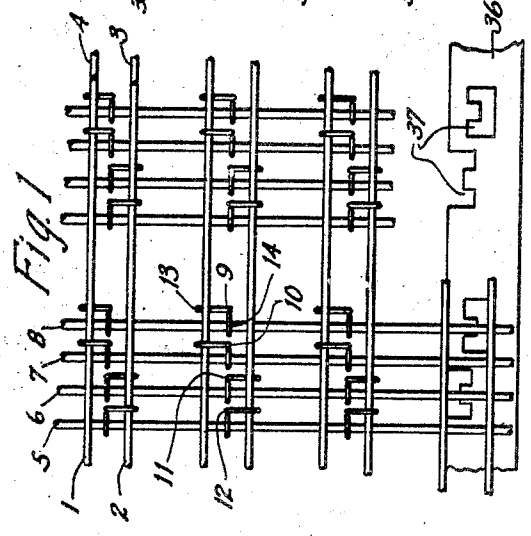


Fig. 1

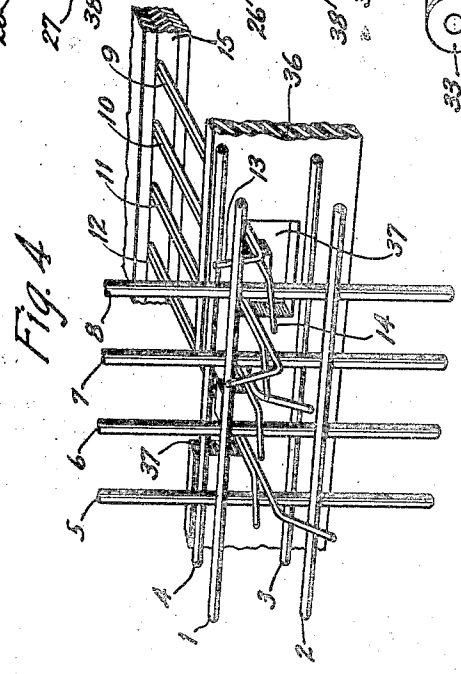


Fig. 4

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UNITED STATES PATENT OFFICE.

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TELEPHONE SWITCH.

Application filed July 3, 1924. Serial No. 723,882.

To all whom it may concern:

Be it known that I, HANS MARBURG, a citizen of Germany, residing at Halensee, Germany, 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, in general, to telephone switches and specifically to a coordinate switch structure adapted for establishing connections in an automatic or semi-automatic telephone system.

The invention is particularly adaptable to a switch structure in which the vertical conductors are assigned to trunk lines and the horizontal conductors to incoming and outgoing lines. This invention is an improvement on the switches of the type shown in Patent No. 1,515,735, granted to Charles L. Goodrum et al on November 18, 1924, in which case, the horizontal conductors may be used as links and the vertical conductors assigned to incoming lines and outgoing or trunk lines.

The object of this invention is to provide a switching device of the type referred to above in which the electrical connection of a plurality of conductors is simple and positive in manner, being effected with a wiping action, and to also provide a switching device in which the operating parts are reliable, cheap to manufacture and readily accessible for repairs and replacement.

The principal feature of the invention consists in the arrangement of coupling elements or members adjacent to coordinately disposed conductors between which a connection may be desired.

Another feature is the arrangement of a stationary insulated bar in which there are notched apertures provided for the purpose of limiting the movement of the coupling members.

Another feature is the arrangement of the horizontal conductors in a plurality of vertical planes thereby providing a greater capacity than the coordinate switch structures heretofore disclosed.

Other features of the invention will be clear from the detailed description and the appended claims which follow.

With reference to the accompanying drawing, Fig. 1 is a partial front assembly view showing the coordinately disposed conductors with their associated coupling members. Fig. 2 is a cross-sectional elevation view showing the actuating mechanism for the coupling members. Fig. 3 is a plan view of Fig. 2. Fig. 4 is a fragmentary perspective view of the switch structure.

The structure shown consists, in general, of bare wire conductors arranged in sets coordinately disposed to each other. The conductors 1, 2, 3 and 4 of one set extend horizontally and parallel to one another and are arranged in two vertical planes, one behind the other. The conductors 5, 6, 7 and 8 of another set extend vertically and are arranged adjacent to each other and this set is located in a third vertical plane midistant between the other two planes and parallel thereto. The means for establishing an electrical connection between the two conductor sets comprises a set of movable coupling members 9, 10, 11 and 12, the free ends of which members are bifurcated and bent out in planes at right angles to each other, the distance between the points of bending being equal to the distance between adjacent planes of the conductors. When the coupling members are operated the bent-out ends of each engage a pair of coordinately disposed conductors establishing a connection therebetween.

A more detailed description of the invention and its method of operation are as follows:

The sets of horizontal conductors comprising the wires 1, 2, 3 and 4 and the sets of vertical conductors comprising the wires 5, 6, 7 and 8 are securely fastened at their ends to fixed members, not shown, of the switch structure. The coupling members 9, 10, 11 and 12 consist also of bare wires and these are detachably and insulatively mounted in a laminated support 15 and are arranged adjacent to one another in a horizontal plane, their free ends protruding through the three vertical planes of conductors. Each coupling member is bent in bifilar formation, the sides of which may be welded together to obtain the desired resiliency and the free ends are bent out as described above so as to effect contacts with both coordinate conductors of the pair with which it is associated, when the operating mechanism is actuated.

The operating mechanism comprises a sup-

port 15, upper plate 18 and a lower plate 19, the entire embodiment being clamped together by the machine screws 20 which also serve the purpose of securely fastening the coupling members to the support. The support is pendulously mounted to a stationary holding piece 16 by means of stirrups 17 which are pivotally connected to both sides of the holding piece and the support. The connections of the stirrups to the support are made to the lobes 21 which are integral parts of the plate 18. The holding piece is detachably suspended from a rail 22 which extends the full length of the switch structure and which is securely fastened at its ends to fixed members, (not shown), the means of suspension consisting of a hook-shaped projection 23 which is formed integrally with the holding piece. The projection 23 is securely locked to the rail by a strap 24 which, like the rail, extends the full length of the structure and is fastened at its ends to fixed members.

The vertical rotatable bar 25, which may be arranged for preselection, is operated by means of a magnet 26 being energized and its associated armature 27 being attracted. Fixedly attached to said bar is a row of positioning pins 28 which are individual to the horizontal links or subscribers' lines depending upon the type of system to which this switch structure is adapted. On plates 19 are integrally formed inverted channel-shaped lugs 34 to which are pivotally attached U-shaped links 29 and each of these links is so arranged as to normally rest upon one of the pins 28. When the pins 28 on the bar 25 are rotated, all the links associated with said pins are forced upwards and are positioned in operable relation to other pins 30. The second mentioned pins are fixedly attached to other rotatable bars 31 which are assigned individually to each of the link circuits or subscribers' lines, as the case may be, and arranged parallel thereto.

For the sake of explaining the further operation of the switch, it is assumed that the horizontal rotatable bars are assigned individually to subscribers' lines. When a subscriber removes his receiver from the hook a magnet 33, which is associated with the rotatable bar 31, assigned to that particular line, is energized and by means of the armature 32, the bar 31 is rotated and the operating pins 30, attached thereto, are also rotated. One of these operating pins is in operable relation with an operated link 29 as stated above and this pin, in its rotation, engages said operated link thereby moving the operating mechanism to an off-normal position against the tension of spring 40. This operation will pull the coupling members 9, 10, 11 and 12 rearward in the direction of their length to effect contacts with the conductors 4 and 8, 1 and 7, 3 and 6 and 2 and 5, respectively, establishing thereby an electrical connection between the subscriber's line and a preselected trunk.

As soon as the connection between the conductor sets is established, the magnet 26 is deenergized, the armature 27 released and the rotatable bar 26 is restored to normal by the tensioned condition of spring 38 to be ready for a subsequent call.

In order to release the connection the associated magnet 33 is deenergized thereby releasing its armature 32, and the rotatable bar 31 is restored to normal by the operated condition of spring 39. The return of pin 30 to normal releases the link 29 which now drops clear of the pin, and the stressed condition of retractile spring 40 draws the operating mechanism back to its normal position thereby breaking the connection between the coupling members and the conductors.

The return of the operating mechanism to its normal position is controlled by the stop 41 which consists of a bent projection formed integrally with plate 18. This stop is provided in order to prevent the operating mechanism in its return movement from going beyond its normal position and causing the coupling members to be thrust against the conductors.

At a fixed distance back of the inner row of conductors is located an insulative bar 36 in which are provided notches through which the coupling members are extended in order to make contact with the conductors. These notches are so arranged as to limit the movement of the coupling members when a contac is broken or when the switch structure or apparatus is shaken, consequently preventing any detrimental vibrations in these members.

In Fig. 2, the switch operating mechanism is shown in three positions, namely, the upper position representing it in its normal condition, the middle position showing it still in its normal condition but with its associated link 29 positioned by an operating pin 28, and the lower position showing it in its off-normal condition with its operated link in engagement with a second operating pin 30 and clear of its positioning pin 28 which pin is now shown restored to normal indicating that the rotatable bar 25, to which it is attached is ready for a subsequent call.

By first operating two of the vertical bars 25 and then one of the horizontal bars 31 two sets of conductors 5, 6, 7, 8 may be connected together through the medium of a set of conductors 1, 2, 3, 4.

What is claimed is:

1. In a selective switch, a plurality of sets of conductors arranged in intersecting relation, wire coupling members having their free ends projecting into proximity to the conductors of said sets, and cooperating bars

for drawing said coupling members longitudinally to engage each a conductor in each of said sets to establish an electrical connection therebetween.

2. In a coordinate switch structure, a set of horizontal conductors arranged in the form of a quadrilateral beam, a set of vertical conductors arranged to bisect said set of horizontal conductors, a set of coupling members arranged to intersect said sets of horizontal and vertical conductors, and an operating mechanism pivotally supported and arranged to move said set of coupling members into engagement with said conductor sets.

3. In a coordinate switch structure, sets of conductors coordinately disposed, a set of coupling members coordinately disposed to said sets of conductors, an insulating embodiment, pivotally suspended in which said set of coupling members is detachably mounted, a link pivotally connected to said embodiment, a rotatable operating bar, a positioning pin on said operating bar, a second rotatable operating bar, an operating pin on said second bar, means for operating the first mentioned bar to rotate the said positioning pin thereby positioning the said link in operative relation to the said operating pin, and means for operating the said second bar to rotate the said operating pin thereby engaging said link to swing the said embodiment to effect a connection between said set of coupling members and said sets of coordinately disposed conductors.

4. In a coordinate switch structure, coordinately disposed rotatable bars, sets of conductors, an operating mechanism pendulously supported, a set of coupling members, and means for rotating said rotatable bars to swing said operating mechanism to effect an engagement between said set of coupling members and said sets of conductors.

5. In a coordinate switch structure, a horizontal operating bar, a vertical operating bar, a set of horizontal conductors, a set of vertical conductors, an operating mechanism pendulously supported, a set of coupling members supported by said operating mechanism, a bifurcated end on each of said coupling members, and means for actuating the vertical operating bar primarily and the horizontal operating bar secondarily to swing said operating mechanism to effect engagements between said bifurcated end and a conductor in each of said horizontal and vertical sets.

6. In a coordinate switch structure, sets of rotatable bars, sets of conductors, a set of coupling members, means for rotating said rotatable bars in sequential order to effect engagement between said set of coupling members and said sets of conductors, and an insulative bar common to a plurality of sets of coupling members and having a notch for each coupling member of said sets to prevent vibrations of the coupling member.

7. In a coordinate switch structure, a horizontal rotatable bar, a vertical rotatable bar, a set of horizontal conductors, a set of vertical conductors, an operating mechanism pendulously supported, a set of coupling members fixedly attached to said operating mechanism, means for rotating the vertical operating bar primarily and the horizontal operating bar secondarily to swing said operating mechanism to effect connection between said set of coupling members and said conductor sets, and an insulative bar having notched apertures for the said set of coupling members to prevent detrimental vibrations of the said set of coupling members when the said connection is broken or when the switch structure is shaken.

8. In a coordinate switch structure, operating bars coordinately disposed, a set of horizontal conductors arranged in the form of a quadrilateral beam, a set of vertical conductors arranged to bisect said set of horizontal conductors a set of coupling members arranged to intersect said sets of horizontal and vertical conductors and an operating mechanism pivotally supported and arranged under the conjoint operation of said operating bars to swing said set of coupling members into engagement with said conductor sets.

In witness whereof, I hereunto subscribe my name this 24th day of May A. D., 1924.

HANS MARBURG.