March 24, 1925. 1,530,998

H. W. GOFF

AUTOMATIC TELEPHONE SWITCH

Filed July 3, 1922

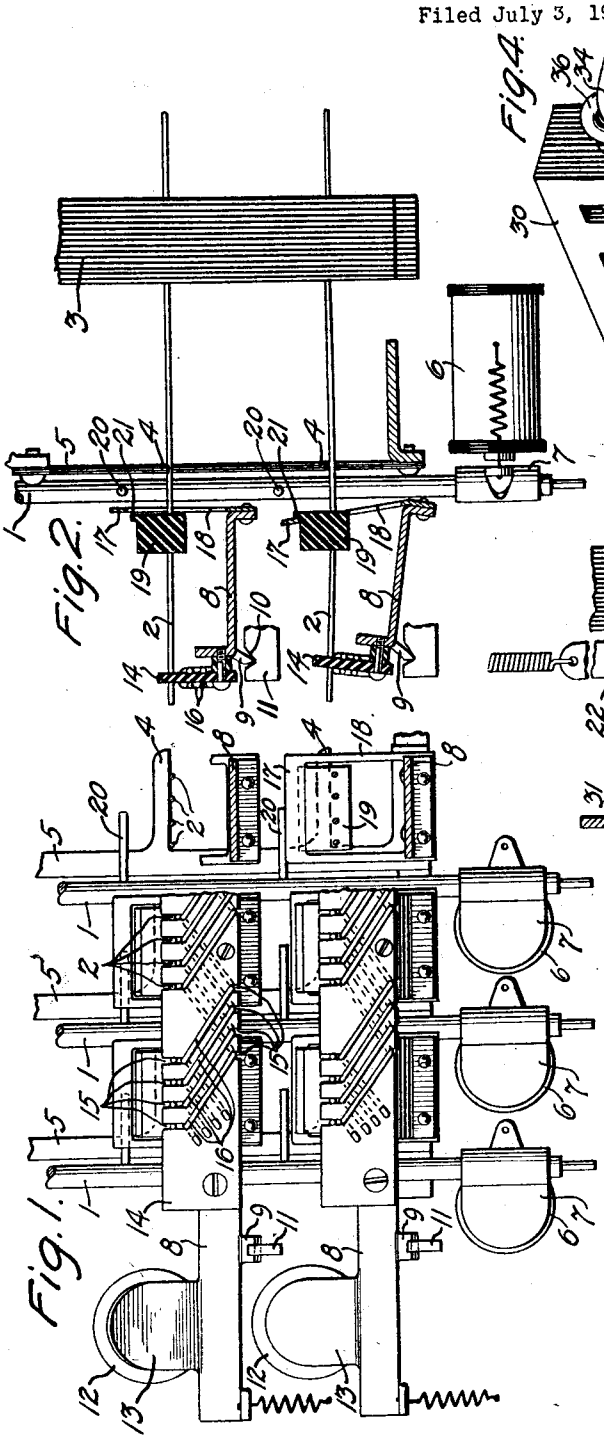


Fig. 1.

Fig. 2.

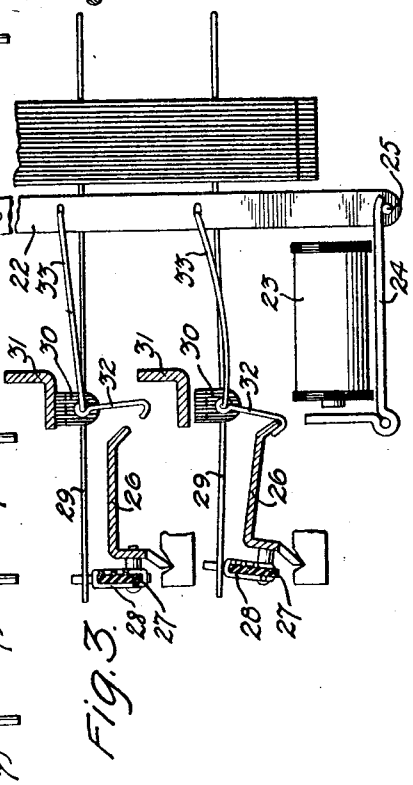


Fig. 3.

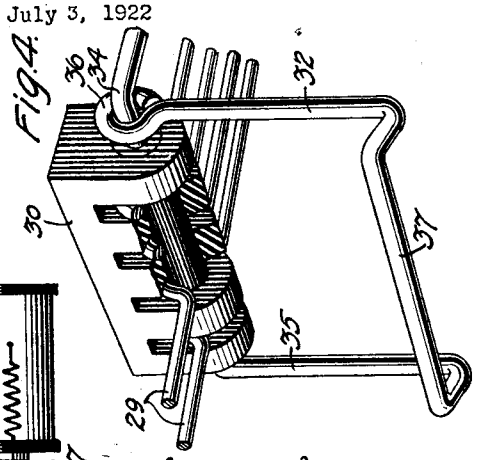


Fig. 4.

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UNITED STATES PATENT OFFICE.

HAROLD W. GOFF, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

AUTOMATIC TELEPHONE SWITCH.

Application filed July 3, 1922. Serial No. 572,482.

To all whom it may concern:

Be it known that I, HAROLD W. GOFF, a citizen of the United States, residing at New York, in the county of New York, State of New York, 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 improvements in switching mechanisms and has particular reference to a switch structure employed in automatic telephone exchange systems.

In the type of switch mechanisms generally referred to in the telephone art as coordinate switches, it has been proposed to produce a wiping engagement between two sets of contacts and to flex one of said sets so that the contacts thereof will remain in engagement with the contacts of another set when operated. This has been accomplished by the cooperation of incoming and outgoing line bars and link bars, certain of the line bars being assigned to groups of incoming lines, each line having a set of line contacts and the link bars being individual to a set of link contacts which are operated to join an incoming line in any particular group to an outgoing trunk. In making such a connection, the active link contacts and intersecting or transversely arranged sets of active line contacts are moved relative to each other to bring them into engagement. Each of the incoming line bars, being associated with a plurality of incoming lines, participates in the establishment of coexisting connections between the lines of the group to which it is assigned and idle outgoing lines or trunks. It is possible that successive operations of said incoming line bars, in establishing coexisting connections, may sometimes tend to disturb said connections by producing noises on the lines and that vibrations of the switching mechanism, due to the establishment of connections, may be imparted to engaged sets of contacts and thereby momentarily interrupt the connections therebetween.

An object of the present invention is to prevent successive operations of the line bars from disturbing existing connections established between active sets of relative movable contacts.

Another object is to maintain two transversely arranged sets of operated contacts in close contacting engagement with each other by exerting a constant pressure on one of said sets.

A further object is to provide an economical and improved form of coordinate switch which will be simple in construction and reliable in operation.

The above and other objects will appear more clearly from the following detailed description when taken in connection with the accompanying drawing which illustrates some of the mechanical expressions of the inventive idea.

In the drawing, Fig. 1 is a fragmentary front elevation of a switch structure partly broken away and shown in section. Fig. 2 is a vertical longitudinal sectional view through the switch structure shown in Fig. 1. Fig. 3 is a view similar to Fig. 2 showing another embodiment of the invention, and Fig. 4 is a perspective view of a latching member and mounting therefor employed in connection with Fig. 3.

Referring to the drawing and more particularly to Figs. 1 and 2, the switch structure is shown as comprising a plurality of vertically arranged line bars 1, some of which may be assigned to groups of incoming subscribers' lines while others may be assigned to outgoing lines or trunks. While only three of the bars 1 are shown, it will be understood that in actual practice a considerable number of these bars will be employed, the number depending upon traffic requirements and other considerations. Each of the line bars assigned to incoming lines serves a group of such lines and after being engaged in the extension of one of said lines to a trunk, may be again employed in the establishment of connections for other lines in the group which the line bar serves.

Each of the incoming lines is respresented by a set of active contacts comprising four flexible wire conductors 2, although it will be understood that the number of these conductors may be varied to meet certain traffic requirements. Each of the sets of contacts or conductors 2 is mounted in an insulating support 3 and extends outwardly therefrom in a horizontal plane at right angles to the line bars 1. The upward movement of the contacts 2 past the normal horizontal

plane is prevented by extensions or stops 4 preferably forming part of the switch frame 5. Each of the line bars is rotated by a magnet 6, the armature 7 of which is secured to an associated line bar.

Arranged in transverse or intersecting relation to the line bars 1 are a plurality of link bars 8 rotatably supported in a horizontal position by downwardly extending lugs 9 disposed adjacent each end of each of said bars and engaged in notches 10 formed in supports 11 which comprise part of the switch frame. The support for only one end of each of the link bars is shown in the drawing, but it will be understood that the other end thereof is supported in the same manner. Each of the link bars is rotated by means of a magnet 12 having its armature 13 secured to or forming a part of the associated link bar.

Secured to each of the link bars is a grid element such as shown and described in my copending application, Serial No. 550,617, filed April 8, 1922, and consisting of an insulated strip 14 having series of transverse notches or slots 15 formed on the opposite longitudinal edges thereof. These notches are arranged in staggered relation and designed to receive the four wire conductors 16 which are helically wound about the insulated strip 14 and which form a set of active link contacts for establishing a connection between a set of incoming line contacts and a set of outgoing line contacts, the latter of which are individual to an outgoing line or trunk. When one of the link bars and its associated set of active contacts are employed in establishing a connection they cannot be again used in making another connection until the first one is released. The rear longitudinal edge of each link bar 8 has secured thereto a flexible latching member 17 associated with each set of active line contacts 2 and provided therein with an opening 18 through which the contacts 2 extend and which is designed to receive a block of insulating material 19, in which said contacts are embedded, when the latching member 17 is flexed in a primary movement by contact with a pin 20 extending laterally from the associated line bar 1.

When a call is initiated on an incoming line in a group served by one of the line bars 1, this bar and another line bar 1 serving an idle outgoing line or trunk are rotated by their respective magnets 6 in a manner which is clearly described in Patent No. 1,515,735 issued to C. L. Goodrum et al, on November 18, 1924. The rotation of each of the line bars 1 causes the pins 20 carried thereby to engage the upper free ends of all latching members 17 which are in their normal positions. The engagement of the pins 20 with latching members 17 flexes or rotates said members in their primary movement so that the opening 18 in said members will receive the insulated block 19 substantially as shown in the lower portion of Fig. 2.

A magnet 12 associated with a link bar is now operated and rotates said bar about its lug 9 as a pivot to the operated position shown in Fig. 2. Being thus actuated, the link bar 8 moves the grid element 14 and its link contacts 16 relative to the associated sets of active line contacts 2. At the same time the downward movement of the rear end of the link bar 8 causes a secondary movement of two of the latching members 17 which have been actuated by two of the line bars 1, to engage the upper ends of said latching members with the insulated blocks 19 so as to exert a constant pressure on said blocks and thus move the active sets of line contacts 2 relative to the set of link contacts 16 until said sets engage each other. The secondary movement of said latching members is in a plane different from the primary movement thereof. The relative movements of said sets are such that when the same come in contact a wiping engagement is produced. At the termination of the rotary movement of the link bar each insulated block 19 has been moved downwardly to such an extent as to flex its set of contacts 2 to effectively maintain the same in engagement with the contacts 16 and this engagement is maintained constant by the pressure exerted upon the block 19 by the latching member 17. After the sets of contacts 2 and 16 have been brought into engagement, the magnet 6 controlling the incoming line bar may be released to permit of the restoration of said bar to normal, whereby the same may be employed in establishing coexisting connections for other lines in the group which it serves. When the line bar is restored to normal the pins 20 are disengaged from the associated latching members 17 which have not been operated in their secondary movements by the actuation of the link bar so that said latching members will restore to their normal positions preparatory to being again actuated by a succeeding operation of the line bar. The latching member 17 which was operated in its secondary movement by the actuation of the link bar 8 remains in its operated position by reason of engagement thereof with a projection 21 formed upon the upper edge of the insulated block 19. When the latching member 17 is operated by link bar 8 said member is moved downwardly to such an extent that the upper edge thereof, which is engaged by a pin 20, is moved out of the path of said pin so that upon a succeeding operation of the line bar the pin associated with the operated latching member will fail to engage the same

and thus be prevented from in any way disturbing the existing engagement between the sets of contacts 2 and 16.

At the termination of the connection which has been established magnet 12 is de-energized thus permitting the link bar 8 to be restored to its normal horizontal position, whereupon latching member 17 is disengaged from the insulated block 19. The active set of contacts 2 is then permitted to restore to its normal position in engagement with the stop 4 and the sets of contacts 2 and 16 are again separated.

Referring now to Figs. 3 and 4 the line bars 22, instead of having a rotary movement as described in connection with Figs. 1 and 2, have a vertical longitudinal movement and each is controlled by a magnet 23 which, when energized, cause its armature 24 to engage a pin 25 and move the line bar in a downward direction. The link bars 26, arranged transversely with respect to the line bars 22, are of substantially the same construction as the link bars 8 and each has secured to its front edge the grid elements including an insulating strip 27 and an active set of link contacts 28 helically wound on said strip. Each link bar is rotated by a magnet (not shown), similar to the magnet 12, so as to move the set of contacts 28 relative to the set of line contacts 29. In the embodiment shown in Fig. 3, each set of line contacts is embedded in an insulated block 30, the upper movement of which is limited by a stop member 31 forming a portion of the switch frame. Pivotally mounted in the block 30 is a latching member 32 preferably formed of a single length of wire having its rear end 33 secured to the line bar 22. The intermediate portion 34 of the wire forming the latching member 32 is bent at substantially right angles to the rear end thereof and passed through the insulated block 30 to form a pivot for the latching member. The remaining portion 35 of the wire is then bent into a substantially rectangular formation and has its free end 36 wound about one end of portion 34 in a manner clearly shown in Fig. 4. The lower end 37 of the portion 35 is bent upwardly as indicated to provide a recess for receiving the rear longitudinal edge of an associated link bar when the latching member and link bar are in their operating positions as indicated in the lower portion of Fig. 3.

When the line bar 22 is moved downwardly by the energization of the magnet 23, latching member 32 is rocked in a primary movement about its pivot portion 34 to substantially the position shown in lower portion of Fig. 3 so that when the link bar 26 is rotated downwardly the rear edge of said link bar is first engaged with the portion 37 of the latching member and then forces the same downwardly in a secondary movement to move the set of contacts 29 toward the set of link contacts 28 which are also moved relative to the line contacts 29 by the rotation of the link bar 26. A wiping engagement is thus effected between the sets of contacts 28 and 29 and continued movement of the link bar 26 then flexes the contacts 29 and maintains a constant pressure thereon through the intermediary of the latching member 32 and insulated block 30 so that said sets of contacts will be maintained in such close engagement as to be unaffected by possible vibrations of the switching mechanism when establishing other connections. After the connection is established, the line bar 22 serving a group of incoming lines is permitted to restore to its normal position in preparation for the establishment of another connection. In thus moving to its normal position all of the latching members 32, except the one which has been engaged by a link bar, are also restored to normal while the rear portion 33 of the latching member which has been given a secondary movement by the actuated link bar, is flexed as indicated in the lower portion of Fig. 3.

When the connection is released, the actuated link bar is restored to normal, thus disengaging the rear longitudinal edge thereof from the portion 37 of the latching member which then restores to normal by reason of the flexed condition of the portion 33 thereof and that of the line contacts 29 which also assume their normal position when the insulated block 30 engages the stop 31. The relative movements between the sets of contacts 28 and 29, when the same are restored to normal, separates these contacts, thus disestablishing the connection therebetween.

What is claimed is:

1. In a switching mechanism, sets of active contacts arranged in transverse relation, rotatable and pivotal operating bars also arranged in transverse relation, a latching member fixedly attached to said pivotal operating bar and operated by said rotatable operating bar to prepare one of said sets of contacts for engagement with the other of said sets of contacts, and means operable to move the said pivotal operating bar, thereby moving both sets of contacts simultaneously to effect an inter-engagement.

2. In a switching mechanism, sets of contacts, an operating bar having a rotary movement, another operating bar having a rocking movement, a resilient latching member securely attached to said rocking bar, means for rotating the first of said operating bars to move the said latching member into an operative position, and other means for rocking the second of said operating bars to further move the said latching mem-

ber, thereby effecting a connection between said contact sets.

3. In a switching mechanism, sets of active contacts, an insulating block in which one of said sets of contacts is embedded, operating bars for each of said sets of contacts, a resilient latching member attached to one of said operating bars and arranged to be flexed by the other of said operating bars into a position in which it prepares one of said contact sets for connection, and means on said insulating block arranged to be engaged by said latching member in an operative position, when the operating bar to which the latching member is attached is operated, thereby moving simultaneously said contact sets into inter-engagement producing a wiping effect therein.

4. In a switching mechanism, sets of active contacts, a rotatable operating bar, a pivotal operating bar, an insulating block in which one of said sets of contacts is embedded, a latching member attached to said pivotal bar and arranged to position itself in operative relation to said insulating block when the rotatable bar is operated, and means to move the pivotal bar in order to lock together the latching member and the insulating block, thereby flexing the said embedded contact set into a wiping engagement with the other of said contact sets, the flexed condition of the contact set restoring the operating bars to normal when the connection is broken.

5. In a switch structure, sets of movable contacts, an insulating block in which one of the said sets of movable contacts is securely embedded, a projection on said insulating block, a rotatable and a pivotal operating bar, a resilient latching member, means operable to flex said latching member into operative relation with said projection, and other means operable to cause an engagement between the latching member and the projection, thereby both effecting a rubbing engagement between the said contact sets, and exerting a constant pressure therebetween during the engagement.

In witness whereof, I hereunto subscribe my name this 30th day of June, A. D., 1922.

HAROLD W. GOFF.