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H. W. GOFF

SWITCHING MECHANISM

Filed Dec. 30, 1922

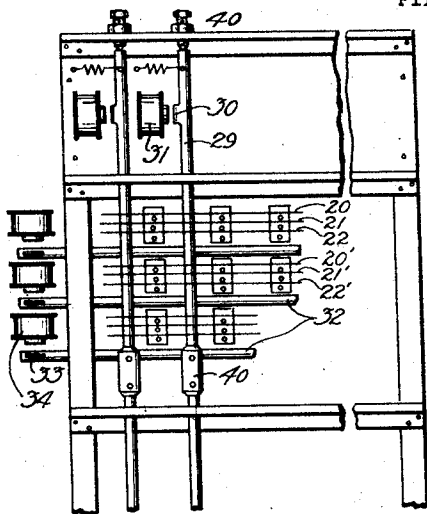


Fig. 1.

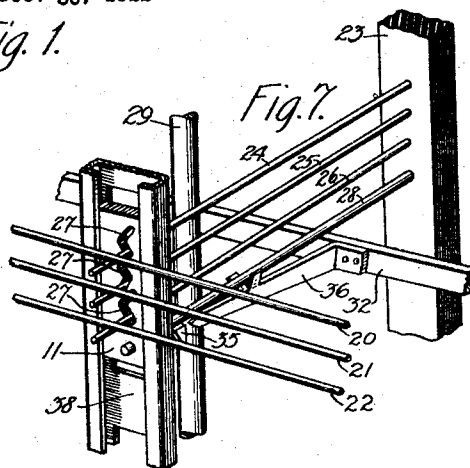


Fig. 7.

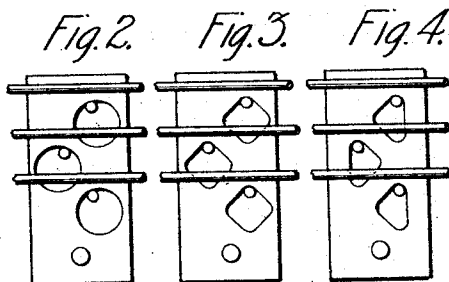


Fig. 2.

Fig. 3.

Fig. 4.

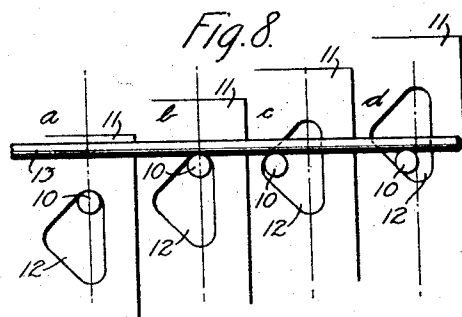


Fig. 8.

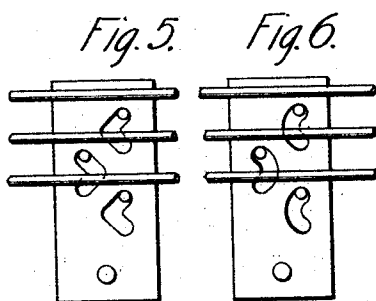


Fig. 5.

Fig. 6.

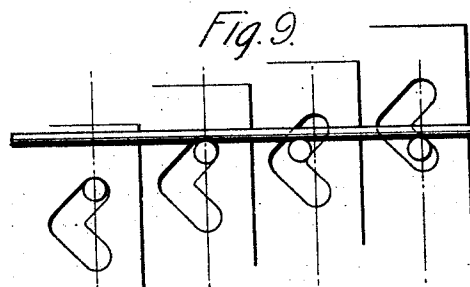


Fig. 9.

Inventor:  
Harold W. Goff,  
by W. E. Beatty, Atty.

## 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.

## SWITCHING MECHANISM.

Application filed December 30, 1922. Serial No. 609,999.

*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 Switching Mechanisms, of which the following is a full, clear, concise, and exact description.

This invention relates to switching apparatus and more particularly to the so-called coordinate switch of the type employed in automatic telephone exchanges.

Switches of the above mentioned type, and as generally disclosed in the British patent to Western Electric Company, Ltd., No. 183,436 of 1923, are characterized by the provision of the coordinately disposed operating bars which are adapted to be jointly operated to selectively actuate an operating card and effect a connection between coordinately disposed sets of active and passive contacts.

In the above mentioned patent and in the British patent to Western Electric Company, Ltd., No. 182,486 of 1923, the switches are provided with operating cards having a plurality of obliquely disposed apertures, by virtue of which the active contacts slide along the passive contacts when their respective cards are actuated. In this manner chattering of the active contacts is prevented and perfect electrical contact is insured, the sliding of the active contacts tending to clean the contacting surface on the passive contacts.

It is an object of this invention to improve the cleaning effect between active and passive contacts in a coordinate switch by wiping across, and then moving part way back over the surface first wiped.

This object is obtained by the provision of operating cards having apertures of a certain configuration which effect a reciprocating or double wiping engagement between active and passive contacts.

The invention will be readily understood from the following detailed description, and by reference to the accompanying drawing in which Fig. 1 shows a fragmentary view of a coordinate switch to which this invention is particularly applicable. Figs. 2, 3, 4, 5 and 6 show alternative arrangements for the apertures in the operating cards whereby the object of this invention is ob-

tained, and respectively disclose circular, diamond, half diamond, V-shaped and semi-elliptical apertures. Fig. 7 shows a section of a coordinate switch and clearly discloses the relative positions of the various parts thereof, such as the active and passive contacts, the vertical and horizontal operating members with their respective camming members and operating finger members, and the operating card. Figs. 8 and 9 point out the manner in which the double wiping effect between active and passive contacts is accomplished by two specific types of apertures.

The following description is directed particularly to Fig. 8 and points out the manner in which the double wiping effect is produced and how the active contact resumes a position in its normal vertical plane after a complete operation of its associated card. This description, however, with slight obvious variations, is equally accurate when applied to Figs. 2, 3, 4, 5, 6 and 9.

In the position "A" the active contact 10 and its associated card 11 are shown in their normal positions, with the contact 10 in the extreme upper corner of the half diamond shaped aperture 12. In position "B" the card 11 has been moved vertically until the contact 10 engages the passive contact 13. The contact 10 it will be noted is in the same vertical plane as in position "A." The contact 10 having been initially tensioned to the right tends to hug the left-hand guiding surface of the aperture 12 so that further vertical movement of the card 11 as shown in position "C" results in the movement of the contact 10 along the contact 13 in a left-hand direction. In passing from position "C" to position "D," during which interval the card 11 has been moved further vertically, the contact 10, still hugging the left-hand guiding surface of the aperture 12, is forced to slide in a right-hand direction along the contact 13. Position "D" shows the card 11 just prior to reaching its highest position. It is apparent that when the card 11 has reached its highest position the contact 10 will have assumed a position substantially in the same vertical plane as when in its normal condition, in position "A." From the foregoing description it is apparent that by using half diamond shaped

apertures a double wiping engagement is produced between the active and passive contacts thereby increasing the cleaning effect on the contacting surface of the passive contacts.

Particular reference will now be made to Figs. 1 and 7 in order to describe the operation of a coordinate switch embodying the features of this invention.

Sets of grid conductors comprising the wires 20, 21 and 22 and 20', 21' and 22' are securely fastened at their ends to fixed members (not shown) and are preferably woven in and out between insulating strips as shown in the above mentioned British Patents Nos. 183,436 and 182,486 of 1923. The support 23 is of insulating material and is disposed at right angles to the direction of the length of the grid conductors and on it are mounted the flexible wire contacts 24, 25 and 26. The support 23 may be of considerable length and may carry any desired number of sets of contact springs 24, 25 and 26 dependent upon the switch capacity desired. The free ends of each set of contact springs 24, 25 and 26 extend through V-shaped apertures 27 in an operating member or card 11. The operating card 11 is mounted on a flexible finger member 28 which is fixed at one end to the support 23. The free end of the finger member 28 normally engages a circular aperture located at the bottom of the operating card 11. The flexible spring member 28 is adjusted normally to hold the card 11 in a predetermined position to prevent the contact springs from normally engaging the grid conductors.

Individually associated with each of the supports 23 (in practice the number of these bars depend upon the switch capacity desired) is a bar 29 which is journaled at its ends in suitable bearings 40. Securely attached to each bar 29 is an armature 30 which is arranged to be attracted by an electromagnet 31 whereby the bar 29 is rotated through a small angle.

Coordinately disposed to the operating bars 29 are a plurality of horizontally operating members 32, each of which is individual to a set of passive contacts or link conductors such as 20, 21 and 22.

Securely attached to each horizontal operating member 32 is an armature 33 which is arranged to be attracted by its associated electromagnet 34 whereby the bar 32 is rotated through a small angle.

The active contacts in all modifications shown are tensioned downwards. In addition, the active contacts in Figs. 2, 3, 4 and 8 only are tensioned laterally against the cam surface which operates them to effect the double wipe.

When a subscriber initiates a call, magnet 31, for example, individual thereto will be energized and by attracting its armature 30

will rotate the line bar 29. Permanently mounted on each line bar are a plurality of camming members 35 there being one of such members for each group of active contacts 24, 25 and 26. Individual to each group of active contacts there is also a flexible finger securely mounted on the horizontal link bar 32. When the line magnet 31 is energized the associated line bar 29 is rotated through a small angle thereby positioning the camming members 35 in operable relation with their respective flexible finger members 36. Subsequent to the operation of a line bar 29, a link magnet 34 is energized and in attracting its armature 33 rotates a corresponding link bar 32 through a small angle. The rotation of the link bar 32 causes the free end of the flexible finger member 36 to slide along the camming surface of its associated camming member 35 whereby the finger member 36 is forced upwardly and engages the spring member 28. The flexible finger member 36 is provided with staggered projections which cooperate with each other in forming a crotch whereby the spring member 28 is held in engagement with the finger member 36 during the energized condition of the magnet 34. The upward movement of the finger member 36 is transmitted to the operating card 11 which thereupon moves vertically in a guide 38. The upward movement of the card 11 causes the active contacts 24, 25 and 26 associated therewith to move into engagement with the passive contacts or link conductors 20, 21 and 22, respectively. By virtue of the particular design of the apertures in the card 11 the active contacts 24, 25 and 26 move to and fro along the passive contacts 20, 21 and 22, respectively, until the card 11 has been completely operated, that is, has reached its highest position in the guide 38.

Considering the switch disclosed in Fig. 1 as a line switch, the active contacts 24, 25, 26 are the terminals of a trunk line, while each set of horizontal wires 20, 21 and 22 may be considered as the terminals of a set of subscribers' line conductors.

It is to be noted that the connection just established is maintained irrespective of the energized condition of the line magnet 31 so that this magnet, which may be accessible to other subscribers, becomes deenergized subsequent to the energization of a corresponding link magnet 34, so that it may be free to cooperate in the establishment of other connections. The maintenance of the connection depends only upon the energized condition of the horizontal link magnet 34.

The vertical line bars 29 are shown sectionalized, each section thereof being individual to a group of sets of passive contacts or link conductors, and rigidly connected to the next succeeding section by a coupling 40.

The method of coupling the sections of

vertical line bars 29 is described in Patent 1,523,407, issued to Henry F. Dobbin on January 20, 1925.

What is claimed is:

5 1. In a switching mechanism, a set of active contacts, a set of passive contacts, an operating member for said active contacts, and means for actuating said operating member, said operating member being apertured  
10 in such a manner as to cause said active contacts to move with a double sheering action into engagement with said passive contacts.

2. In a switching mechanism, coordinate-  
15 ly disposed sets of active and passive contacts, an operating member for said active contacts, and means for actuating said operating member, said operating member being apertured in such a manner as to cause said active contacts to move with a double sheering  
20 action into engagement with said passive contacts.

3. In a switching mechanism, a set of active contacts, an operating member therefor, a set of passive contacts, a second operating  
25 member, an operating card for said active contacts, and means for jointly operating said operating members, whereby said card is actuated causing said active contacts to move with a double sheering action into en-  
30 gagement with said passive contacts.

4. In a switching mechanism, a set of active contacts, an operating member therefor, a set of passive contacts, a second operating  
35 member, an operating card for said active contacts, and means for jointly operating said operating members whereby said card is actuated, said card being apertured in such a manner as to cause said active con-  
40 tacts to move with a double sheering action into engagement with said passive contacts.

5. In a switching device, a grid unit com-

prising a plurality of parallel conductors, a plurality of other conductors fixed at one end and substantially perpendicular to said grid, and having their free ends extending  
45 between the conductors thereof, and means for moving said other conductors into engagement with the conductors of said grid with a reciprocating wiping action.

6. In a switching device, a grid unit com-  
50 prising a plurality of bare wires, a plurality of conducting springs having their free ends extending between adjacent wires of said grid, a camming card adapted to permit the said conducting springs to move simultane-  
55 ously and with a reciprocating wiping action into engagement with the wires of the grid, and means for causing the operation of said camming card.

7. In a switching mechanism, active and  
60 passive contacts, an operating member for said contacts, and means for actuating said operating member, said member being provided with a triangularly shaped aperture, whereby said active contact is caused to  
65 move with a double sheering action into engagement with said passive contact.

8. In a switching mechanism, a set of active contacts, an operating member therefor, a set of passive contacts, a selecting member,  
70 an operating card for said active contacts, and electromagnetic means for jointly operating said selecting and operating members to move said card, said card being so aper-  
75 tured as to effect, when actuated, a to-and-fro rubbing action along said passive contacts in establishing a connection therewith.

In witness whereof, I hereunto subscribe my name this 28th day of December A. D., 1922.

HAROLD W. GOFF.