March 10, 1925.

H. W. GOFF

1,528,761

AUTOMATIC TELEPHONE SWITCH

Filed May 29, 1922

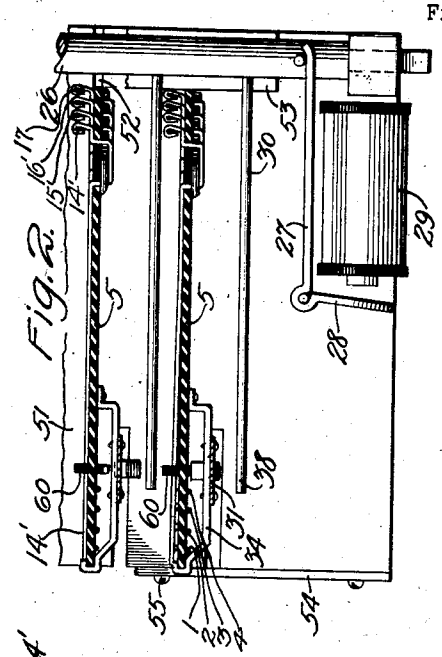


Fig. 2.

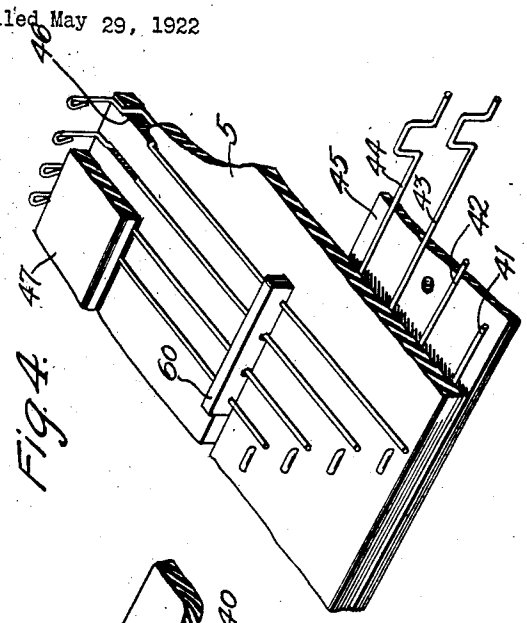


Fig. 4.

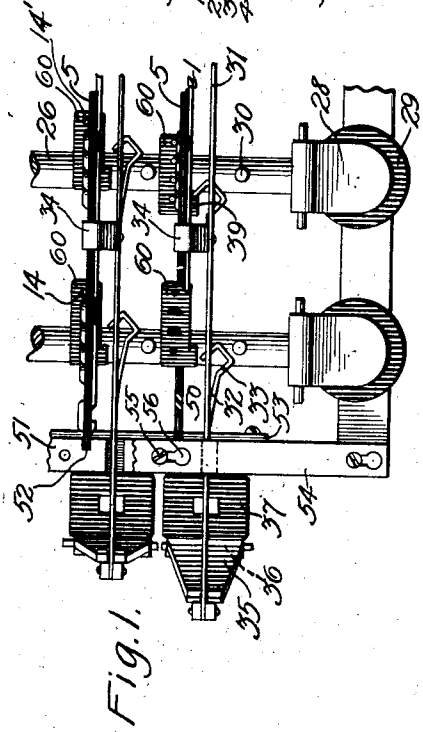


Fig. 1.

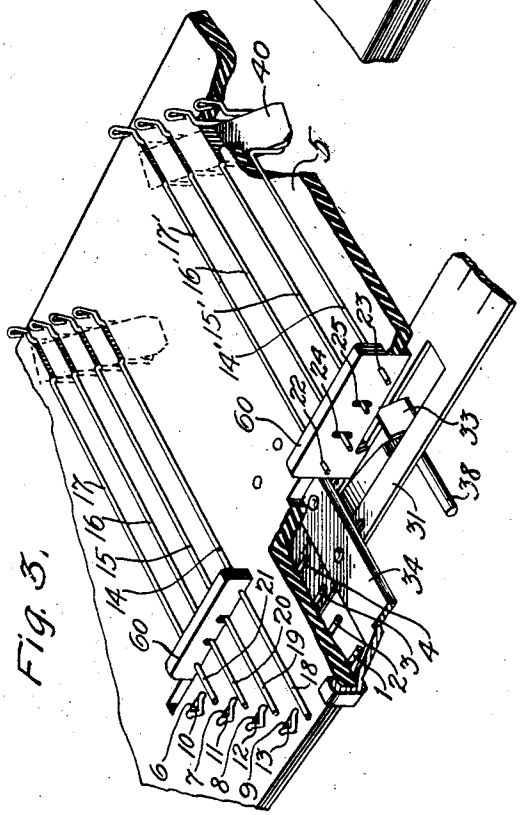


Fig. 5.

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

Patented Mar. 10, 1925.

1,528,761

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 May 29, 1922. Serial No. 564,364.

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 automatic telephone exchange switching apparatus and more particularly to the so-called coordinate switches of the type adapted for establishing connection in an automatic telephone exchange system.

The invention is particularly adaptable to a switching system of the type disclosed in Patent No. 1,515,735 issued November 18, 1924 to Charles L. Goodrum and John N. Reynolds, but it will be apparent to those skilled in the art that this invention may be applied equally well to perform other switching functions.

The object of this invention is to provide an economical and improved form of coordinate switch which will be simple, durable, and reliable in operation.

In accordance with the foregoing object the principal feature of this invention resides in mounting the active and passive conductors on the same supporting element whereby their relative positions are definitely fixed.

Another feature consists in the provision of a contact supporting member from which the active contact wires are individually removable.

Still another feature is the provision of superposed individually removable elements, on which the horizontally extending multiple bank conductors are mounted together with a plurality of sets of active contact wires which cooperate with the bank conductors.

Other features of invention and advantages will appear from the following detailed description and by the claims appended thereto, reference being had to the accompanying drawing in which: Fig. 1 is a partial front assembly view of said switch showing a set of active contacts in operated position; Fig. 2 is a sectional view of Fig. 1; Fig. 3 is a perspective view of a contact supporting member showing its associated operating bar and sets of contacts in normal non-operated position. Fig. 4 is a perspective view of a modified form of a contact supporting member showing a set of active and passive conductors arranged thereon.

The multiple bank conductors comprising the wires 1, 2, 3 and 4 are arranged on a supporting insulating strip 5 having rows of slots 6, 7, 8 and 9 at intervals along one side in which the laterally extending lugs 10, 11, 12 and 13 of bank conductors 1, 2, 3 and 4 protrude and are held thereon by bending the lugs or loops over the insulating strip as shown by Fig. 3. The slots are staggered relatively to one another and their spacing equals the distance between the flexible conductors 14, 15, 16 and 17 which are also arranged on the supporting strips 5 and held securely thereon preferably by means of a latching key 40. This key threads through the lugs or loops of the flexible conductors as a wedge under the insulating strip to lock the flexible conductors in position as shown, and because of its angular position, may be removed from the rear without interference from adjoining sets of conductors.

In the modified from of supporting member shown in Fig. 4 the multiple bank conductors 41, 42, 43 and 44 are arranged between the supporting member 5 and a strip of insulating material 45. Similarly the integrally formed lugs of the flexible conductors forming the active contacts are located in slots such as shown at 46 and held in position by means of an insulating strip 47 which is held securely on said supporting member in any suitable manner.

The sets of flexible conductors are arranged in rows parallel to the bank conductors and the free ends 18, 19, 20, 21 of each of said sets are normally tensioned out of contact with the protruding lugs 10, 11, 12 and 13 of the bank conductors. The support 5 may be of considerable length and may carry any desired number of sets of contact springs 14, 15, 16, 17, 14′, 15′, 16′, 17′, etc., depending upon the switch capacity desired. For simplicity of illustration, however, only two such sets are shown on support 5 in the perspective view of Fig. 3.

The free ends 18, 19, 20, 21 of each set of contact springs 14, 15, 16, 17, extend through apertures in a tie member or card 60. The two outer holes 22 and 23 in each card 60 are approximately the size of the wires while the two inner apertures 24 and

25 are elliptical in shape. This is to permit the four contact wires 14, 15, 16, 17, to act independently in exerting their downward tensions against the lugs of the cross multiple wire conductors.

With each vertical row of active contact sets there is associated a vertical bar 26 which is connected at one end to the arm 27 of an armature 28 arranged to be attracted by an electromagnet 29 whereby the bar 26 is axially moved out of its normal position in response to each energization of said electromagnet. On each vertical bar 26 there is provided a number of rigid arms 30 each individual to a set of contact springs.

With each set of multiple bank conductors 1, 2, 3 and 4, there is associated a bar 31 which carries a plurality of arms 32, having a hook-shaped portion 33.

The said bar is slidably mounted on a number of suitable brackets such as 34, and is connected at one end to the arm 35 of an armature 36 arranged to be attracted by an electromagnet 37 whereby the bar 31 is moved longitudinally out of its normal unoperated position in response to each energization of said electromagnet 37.

The operating cards 60 are each slidably mounted in slots in support 5 and are adapted to be operatively engaged by the hook 33 of arm 32, but it will be noted that normally, arms 32 are free to move in a horizontal path. This is true, however, only while the arm 30 associated with any of the arms 32 is in its normal position as shown at 50 Fig. 1 wherein the arm 32 is shown in its off-normal ineffective position. When the vertical bar 26 is moved out of its normal position by electromagnet 29 the end portion 38 of arm 30 is moved into operable engagement with the arm 32.

The continued movement of bar 31 results in operating the card 60 through the engagement of the hook 33 with the projecting hook 39 of the card 60 so as to move the active contact wires 14, 15, 16 and 17 to engage the lugs of the multiple bank conductors 1, 2, 3 and 4 respectively. The operated bar 31 and arms 32 thereon remain in their off-normal positions throughout the duration of the connection but the vertical bar 26 may be immediately restored to normal. The hook portion 33 in its operated position is entirely clear of its associated arm 30 so that any subsequent movement of said arm is ineffective to disturb the connection already established.

Each of the plates 5, together with the sets of passive conductors 6, 7, 8 and 9, the sets of active conductors 14, 15, 16 and 17, etc., operating cards 60 and card operating bar 31, carried thereby, constitutes a switching unit. A plurality of these units may be assembled in superposed relation in the frame of the switch. Any suitable means for supporting the switching units in the frame may be employed. In Figs. 1 and 2 the plates 5 are disclosed as slidable in grooves 52 formed in the end plates 51 of the switch frame. The plates are positioned at the rear by stop strips 53 and are retained in place by locking strips 54. To remove any unit it is only necessary to disconnect all wiring from the conductors of such unit, slide the locking plates 54 upwardly until the enlarged portions of slots 56 register with the screws 55 when the locking strips may be removed, and to uncouple the bar 31 of such unit from the armature of its operating magnet 37. The plate 5 may then be drawn towards the front of the switch and removed.

What is claimed is:

1. In a switching mechanism, a supporting plate of insulating material, a set of active conductors, a set of passive conductors common to a plurality of sets of active conductors, said sets of conductors being mounted on said plate and extending in a plane parallel thereto, and means for engaging said sets of conductors.

2. In a switching mechanism, a supporting plate of insulating material, sets of active conductors, a set of passive conductors, said sets of conductors being mounted upon said plate and extending in a plane parallel thereto, and means for selectively engaging said sets of active conductors with said set of passive conductors.

3. In a switching mechanism, a support, a set of active conductors, a set of passive conductors common to a plurality of sets of active conductors, said sets of conductors being mounted upon said support in substantially the plane thereof, and mechanism for establishing a connection between said active and passive conductors.

4. In a switching mechanism, a set of passive conductors, sets of active conductors associated therewith, an insulating support, said sets of conductors being mounted upon said support in substantially the plane thereof, an operating card for each set of said active conductors, and means for selectively operating said cards to effect interengagement between said sets of passive and active conductors.

5. In a switching mechanism, a set of active conductors, a set of passive conductors having laterally extending contact lugs, an insulating support for said sets of conductors, said support having slots along one side through which said contact lugs protrude, and a mechanism for operating said active conductors into contact with the lugs of said passive conductors.

6. In a switching mechanism, a supporting plate of insulating material, a set of passive conductors mounted upon one face of said plate and extending at intervals there-

through to form contact lugs, sets of active conductors extending transversely to said set of passive conductors and in a plane parallel to said plate, means for removably supporting said active conductors upon said plate, and means for selectively engaging said sets of active conductors with the contact lugs of said passive conductors.

7. In a switching mechanism, a supporting plate of insulating material having rows of staggered slots adjacent one edge thereof, a set of passive conductors mounted upon one face of said plate and having portions thereof looped through said slots to form contacts, said loop portions being struck over to retain them in said slots, sets of active conductors extending transversely to said sets of passive conductors and normally out of contact with the loop portions thereof, and means for selectively engaging said sets of active conductors with the contact loops of said passive conductors.

8. In a switching mechanism, a support, a stationary contact and a flexible contact mounted thereon, means for removably locking said flexible contact to said support, and means for engaging said contacts.

9. In a switching mechanism, a support, a plate of insulating material, a passive contact mounted thereon, an active contact having a mounting lug extending through said plate, means extending through said lug and cooperating with said plate for removably retaining said active contact upon said plate, and means for engaging said contacts.

10. In a switching mechanism, an insulating support, a set of passive conductors, sets of individually removable active conductors arranged on said support, and a wedge for interlocking said active conductors with said support.

11. In a switching mechanism, passive conductors, sets of individually removable active conductors associated therewith, an integrally formed lug on each of said active conductors, a supporting member for said active and passive conductors, a plurality of slots in said member through which said lugs protrude, and means for interlocking said active conductors on said member.

12. In a switching mechanism, an insulating support having sets of slots disposed in staggered relation therein, sets of individually removable active conductors arranged in said slots, and a wedge for interlocking said conductors with said support.

13. In a switching mechanism, a supporting plate of insulating material, a set of passive conductors carried thereby, a set of active conductors, said sets of conductors extending in a plane parallel to said plate, mounting lugs integral with said active conductors and extending through said plate, means extending through said lugs and cooperating with said plate for removably retaining said active conductors upon said plate, and means for engaging said sets of conductors.

14. In a switching mechanism, a supporting plate of insulating material, a set of passive conductors carried thereby, sets of active conductors, said sets of conductors extending in a plane parallel to said plate, mounting lugs integral with said active conductors and extending through said plate, means extending through said lugs and cooperating with said plate for removably retaining the active conductors of each set upon said plate, and means for selectively engaging said sets of active conductors with said set of passive conductors.

15. In a switching mechanism, a supporting plate of insulating material, a set of passive conductors carried thereby, sets of active conductors extending in a plane parallel to said plate, mounting lugs integral with said active conductors and extending through said plate, a locking wedge for each set of active conductors extending through the lugs thereof and cooperating with said plate for retaining the active conductors of each set upon said plate, said wedges being diagonally disposed relative to the conductors of each set whereby said wedges may be withdrawn without interference, and means for selectively engaging said sets of active conductors with said set of passive conductors.

16. In a switching mechanism, a frame, a plurality of removable switching units carried by said frame, each of said units comprising a support, a set of passive conductors, a plurality of sets of active conductors, said sets of conductors being mounted on said support, and means for selectively engaging said sets of active conductors with said sets of passive conductors.

17. In a switching mechanism, a frame, a plurality of superposed switching units carried by said frame, each of said units comprising a plate of insulating material, a set of passive conductors, a plurality of sets of active conductors, said sets of conductors being mounted on said plate and extending in a plane parallel thereto, and means for selectively engaging said sets of active conductors with said set of passive conductors.

18. In a switching mechanism, an insulating support, a set of passive conductors insulatively arranged thereon and brought through insulation at intervals in staggered position along one side of said support, a plurality of sets of active conductors arranged in rows on said support, said active conductors being associated but normally out of contact with said passive conductors, and a selective mechanism for operating said active conductors into contact with said passive conductors.

19. In a switching mechanism, a set of

passive conductors, an insulating support for said conductors, sets of active conductors on said support disposed in the same plane but at right angles to said passive conductors, an operating card for each set of said active conductors, and means comprising conjointly operating bars for operating said cards to effect contact between said active and passive conductors.

20. In a switching mechanism, a set of passive conductors, a set of active conductors, an insulating support for said sets, an operating card for said set of active conductors, a mechanism for operating said card comprising a pair of coordinately disposed movable bars, a rigid arm extending laterally from one of said bars, and a hook carried by the second bar for operatively engaging said card, the conjoint operation of said bars being effective to operate said card to effect interengagement between said sets of conductors at their intersecting points.

21. In a switching mechanism, a plurality of superposed individually removable supports, each having a set of passive conductors mounted thereon, a plurality of sets of active conductors on each of said supports, said active conductor sets being arranged in rows parallel to said passive conductors but normally out of engagement therewith, an operating card for each set of said active conductors, and means for selectively operating said cards to effect contact between said active and passive conductors.

22. In a switching mechanism, sets of parallel conducting elements, each having sets of contact lugs formed integrally therewith, a plurality of rows of superposed sets of flexible conductors arranged in rows coordinate to said sets of conducting elements, horizontal supports for said sets of conducting elements and flexible conductors, a selecting bar for each vertical row of flexible conductors, a plurality of rigid arms on each of said selecting bars, each of said arms being associated with a set of flexible conductors individually but normally out of operable relation therewith, other bars disposed coordinately to the first-mentioned bars, a plurality of flexible operating arms carried by said other bars, and means operative through the conjoint operation of said other bars and the arms of the first-mentioned bars for selectively establishing connections between said sets of elements and said sets of conductors.

23. In a switching mechanism, a plurality of coordinate rows of sets of active and passive contacts, supporting plates of insulating material for said sets of active and passive contacts, said supporting plates being in superposed relation, an operating bar arranged to be moved longitudinally on each of said supports, a plurality of arms carried by said bars, a hook carried by each of said arms, a tie member for each set of said active contacts, said arms being adapted to be moved into operative relation with said tie member, a selecting bar for each row of superposed sets of active conductors, a plurality of laterally extending arms on each of said selecting bars, and means for moving said selecting and operating bars, the conjoint actuation of one of said selecting bars and one of said operating bars being effective to flex a set of flexible contacts into engagement with its associated set of contact lugs.

24. In a switching mechanism, a supporting plate of insulating material, a set of passive conductors mounted thereon and having laterally extending contact lugs arranged in staggered relation, a set of active conductors of uniform length mounted on said plate with their free ends arranged in staggered relation and adjacent said contact lugs respectively and with their fixed ends in staggered relation to form soldering terminals, and means for engaging said active conductors with said contact lugs.

In witness whereof, I hereunto subscribe my name this 26th day of May A. D., 1922.

HAROLD W. GOFF.