Dec. 8, 1942. L. R. WALLER 2,304,220

TELEPHONE SYSTEM

Filed Sept. 10, 1940

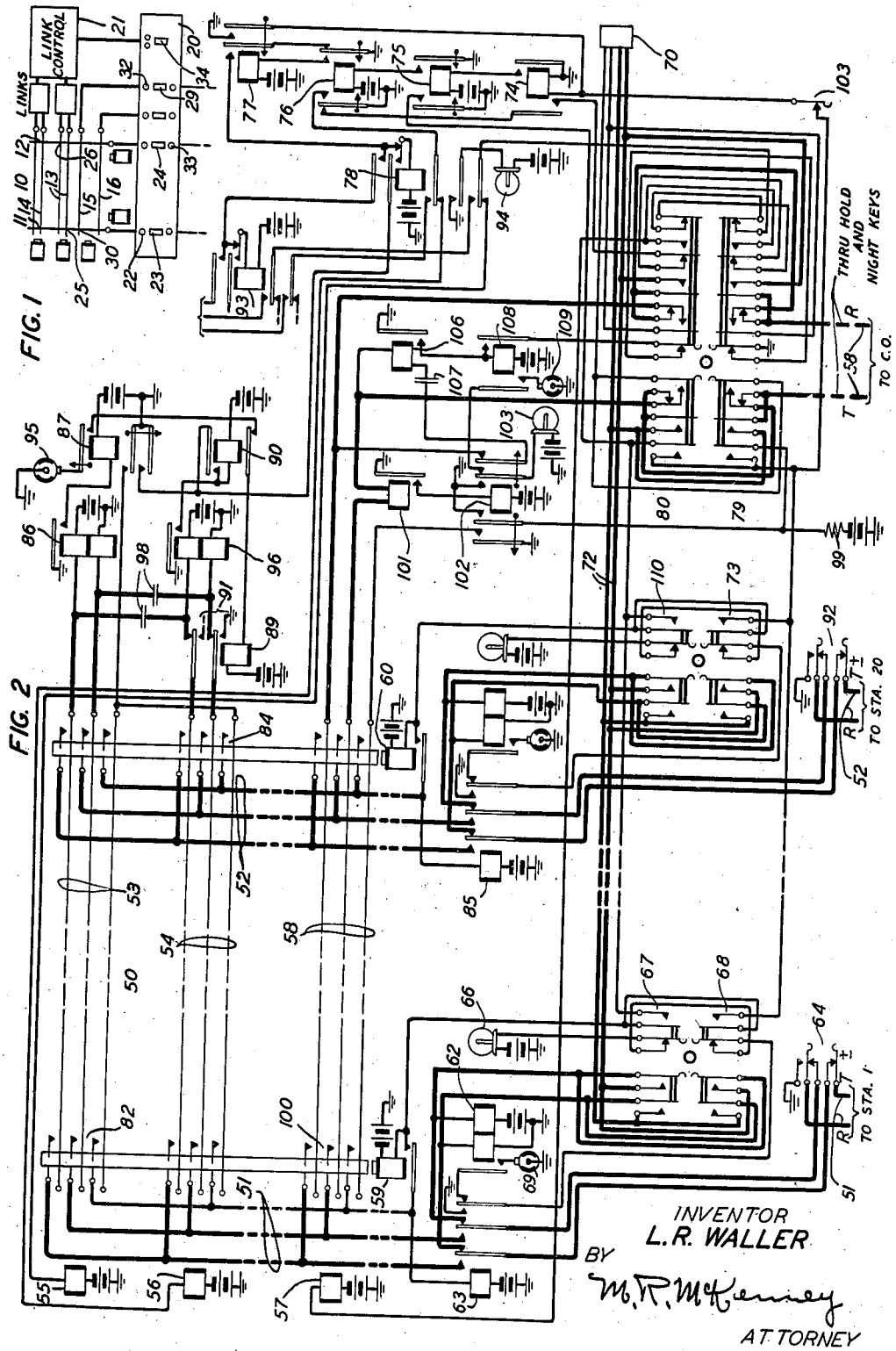

FIG. 1

FIG. 2

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Patented Dec. 8, 1942 2,304,220

UNITED STATES PATENT OFFICE

2,304,220

TELEPHONE SYSTEM

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Application September 10, 1940, Serial No. 356,144

13 Claims. (Cl. 179—27)

This invention relates to telephone systems and particularly to improvements in switching mechanisms and circuits for establishing telephone connections at an exchange.

An object of the invention is to simplify and improve switching mechanisms and circuits employed by an operator at an exchange for establishing connections between subscribers' lines and between subscribers' lines and trunks.

Heretofore systems have been provided for establishing such connections by the aid of cross-bar switches controlled manually by an operator. Cross-bar switches are well known in the art in which connections between two lines are established by the operation of a selecting bar followed by the operation of a holding bar, the connection being established through contacts at the intersecting point of said bars. In such systems connections may be established automatically between a calling subscriber's line and a called subscriber's line by the aid of links or between calling lines or called lines to or from a trunk, or connections may be established between lines by the aid of a link over a cross-bar switch that is manually manipulated by an operator.

It is a feature of the present invention to provide means whereby a cross-bar switch may be operated automatically by the aid of an operator's equipment to establish a connection between a calling subscriber's line and a called subscriber's line over a link, between a trunk and a calling line, between a trunk and a called line and between a calling line and a plurality of called lines over a link in a conference connection.

Another feature is an arrangement of keys and a sequence circuit whereby when a connection between a calling line and a called line is desired, a key for the calling line and a key for the called line are operated in succession by the operator and whereby the connection is then effected by the aid of the sequence circuit when the called line key is operated.

Another feature is an arrangement whereby when a call between a trunk and a called line is desired a key for the trunk and a key of the called line are operated in succession and whereby the connection is effected by the aid of the sequence circuit when the called line key is operated, and when a connection between a calling line and a trunk is desired a key for the calling line and a key for an idle trunk are operated in succession and whereby the connection is effected by the aid of the sequence circuit when the trunk key is operated.

Another feature is an arrangement whereby when a conference connection is desired a special key is operated followed by the operation of the calling line key and the called line keys and the release of the special key in succession and whereby the connection is effected by the aid of the sequence circuit when the special key is released.

The invention has been illustrated in the accompanying drawing in which:

Fig. 1 shows a schematic representation of a system embodying the applicant's invention; and

Fig. 2 shows the detailed circuit of a system in accordance with the plan shown in Fig. 1 for establishing connections in accordance with the applicant's invention.

Referring now to the drawing and particularly to Fig. 1, a cross-bar switch **10** of any well-known type may be employed having selecting bars and holding bars for establishing the connection. The subscriber's lines may terminate in the switch in vertical rows. Two of these lines have been indicated at **11** and **12**, and these lines may be connected to links represented by horizontal lines; two links **13** and **14** have been indicated with their incoming and outgoing branches, and connections between subscribers' lines and trunks may be established by trunks indicated by horizontal lines, two of these trunks being shown and numbered **15** and **16**. An operator's equipment has been indicated at **20** and the link controlling circuits have been indicated at **21** for the links **13** and **14**. In general, the operation of this equipment may be outlined as follows: If the subscriber of line **11** desires a connection to the subscriber of line **12** the calling subscriber will, on seizing his line, operate a line lamp **22** in the operator's equipment. The operator will then actuate a key **23** to an answering position thereby connecting her telephone set to the calling line and receives from the calling subscriber the number of the desired subscriber's line. The operator then operates the key **24** of line **12** to a calling position and thereby causes the link control circuit **21** to operate to establish a connection over an idle link from the calling subscriber's line **11** through the switch at the cross-point **25** of the link **13** if this link is idle to the incoming branch of this link and through the switch at the cross-point **26** to the outgoing branch of this link to the called subscriber's line **12**. The operator then releases the keys **23** and **24** to disconnect her telephone set from the connection, ringing current being transmitted to the called line and when the called subscriber answers the connection is completed over line **13**

between the calling subscriber's line 11 and the called subscriber's line 12. When the calling subscriber hangs up his receiver the connection through the cross-bar switch is released.

In case a connection is desired from a calling subscriber's line to a trunk, a connection is established, for example, from subscriber of line 11, by the operation of key 23 to the answering position and a trunk key, for example 29, of an idle trunk 15 to a calling position and thus a connection is established through the cross-bar switch 10 from the calling line 11 through cross-point 30 over trunk 15 to the distant office. The trunk busy lamp 32 may be lighted to indicate that this trunk is in use and lamp 22 for the calling subscriber is lighted to indicate that this line is engaged. If a connection is desired from a trunk to a line, the trunk busy lamp 32, if the call is incoming over trunk 15, is flashed to indicate that a connection is desired. The operator will then operate the key 29 to an answering position and connect her telephone set to the trunk to receive the desired subscriber's number and she will then operate the key 23 to the calling position if a connection is desired to the subscriber of line 11, and a connection will then be established between the trunk 15 and line 11 at the cross-point 30.

If a conference connection is desired between a calling subscriber and a number of other subscribers, the operator, after she has ascertained this fact from the calling subscriber, will operate the ringing keys, such as for example, 33, of the line 12, and other similar keys to call this line and other subscribers' lines and all of these lines will then be connected simultaneously to the cross-bar switch of the calling line by the operation of the special key 34 and other keys as will be described hereinafter.

Detailed descriptions will now be made of these various types of calls in connection with Fig. 2. In this figure a cross-bar switch 50 has been shown for two subscribers' lines 51 and 52 terminating in vertical rows in the switch, and one link circuit with an incoming branch 53 and an outgoing branch 54, and one trunk circuit 58 terminating in a horizontal row of the switch. The usual select magnet 55 for the incoming branch of the link and the select magnet 56 for the outgoing branch 54 of the link and the select magnet 57 for the trunk 58 have been shown with the holding magnet 59 for line 51 and the holding magnet 60 for line 52. The operation of a select magnet and a holding magnet causes a connection to be established through the switch which may be constructed in any well known manner in which selecting bars and holding bars are used for establishing the connections at the cross-points. If it is assumed that the subscriber of line 51 calls, the removal of the receiver by the subscriber of this line causes a connection to be established for the operation of the line relay 62 from battery and ground through the windings of this relay, contacts of the cut-off relay 63, contacts of the ringing key 64 and the tip and ring conductors through the subscriber's loop. Line relay 62 in operating closes a flashing circuit for the line lamp 66 from battery through this lamp, contacts of the answering key 67 and calling key 68 associated with this subscriber's line, contacts of cut-off relay 63, armature and front contact of line relay 62, interrupter 69 to ground. The operator seeing the flashing of this lamp 66 will now connect her telephone set 70 to the calling line by the operation of the answering key 67, this connection extending over leads 72, contacts of key 67, contacts of cut-off relay 63, contacts of ringing key 64 to the line 51. The operation of the answering key 67 opens the flashing circuit for the line lamp 66. The subscriber of line 51 now informs the operator of the number of the desired subscriber. The operator then operates the calling key 73 of the subscriber's line 52 if the corresponding subscriber is desired. This starts operations to establish a connection between the calling subscriber and the called subscriber by the operation of the link control circuit indicated in Fig. 1 by numeral 21 and consisting of a number of relays as will be described. The first effect will be the operation of the first relay 74 of the series of sequence relays 74, 75, 76 and 77. The circuit for relay 74 extends from battery through the winding of the holding magnet 60 of the called line, contacts of keys 73 and 103, winding of relay 74 to ground. The resistance of the winding of relay 74 is such that the holding magnet 60 will not operate at this time. If now the link shown is idle the select magnet 55 for the incoming branch 53 of this link will be operated from battery through the winding of magnet 55, contacts of link relay 78, contacts of the calling key 79 of the trunk 58 as shown, this connection to key 79, however, extending through corresponding contacts of similar keys for other trunks to open this circuit when any of the trunks is taken for use and from there through the answering key 80 of the trunk shown, contacts of relays 74 and 76 to ground. Relay 74 also closes an obvious circuit for the operation of relay 75 which is slow in operating, to permit the select magnet 55 time to operate before this relay operates. Relay 75 in operating closes a circuit for the holding magnet 59 of the calling subscriber's line from battery through the winding of this magnet, contacts of answering key 67 and contacts of relay 75 to ground, thus establishing a connection at the cross-point 82 between the outgoing branch 53 of the link shown for the calling subscriber's line 51. Magnet 59 in operating closes a circuit from ground over the circuit as traced at contacts of relay 75 through the winding of the cut-off relay 63 to battery causing the operation of this relay to connect the calling line 51 to the cross-point 82 and the incoming branch 53 of the link. Relay 63 in operating opens the circuit for line relay 62 which now releases and disconnects the operator's set 70 from the calling line. Relay 75 also closes a circuit for the operation of relay 76, this relay being slow in operating to permit the operation of the above-mentioned magnet 59 and relay 63. Relay 76 in operating opens the circuit for the select magnet 55 which now releases, and also closes a circuit for the select magnet 56 of the outgoing branch 54 of the link shown, from battery, winding of this magnet, contacts of relays 78 and 76 to ground. Relay 76 also closes an obvious circuit for the operation of relay 77 which is slow in operating to permit the operation of the select magnet 56. When relay 77 operates a circuit to ground is established at the outer right-hand armature and front contact of this relay to shunt relay 74 and to operate the holding magnet 60 of the called line 52 from battery, winding of this magnet, contacts of key 73 to ground at relay 77. Relay 74 is consequently released and causes the release in succession of relays 75, 76 and 77. The operation of the hold-

ing magnet 60 now establishes a connection at the cross-point 84 for the calling line 52 and the outgoing branch 54 of the link shown. The holding magnet 60 in operating closes a circuit for the cut-off relay 85 from battery, winding of this relay, contacts of magnet 60 to ground at relay 77. In the meantime as a result of the operation of the cut-off relay 63 the circuit established from the calling subscriber's line 51 through the cross-point 82 to the incoming branch of the link will operate relay 86 from battery and ground over the loop to the calling subscriber. This relay in turn closes an obvious circuit for relay 87 and this relay in operating closes a locking circuit to ground for the holding magnets 59 and 60 and cut-off relays 83 and 85 over contacts at the cross-point 82 for holding magnet 59 and cut-off relay 63 and over the contacts at cross-point 84 for the holding magnet 60 and the cut-off relay 85. As noted the cut-off relay 85 connects the called line at its contacts through cross-point 84 to contacts of relay 89. Relay 89 will now operate on the operation of relay 87 from battery, winding of relay 89, contacts of relay 90 to ground at the contacts of relay 87. Relay 89 in operating connects the ringing circuit from ground and a ringing source connected at 91 over the tip and ring conductors over the cross-point 84, contacts of relay 85, ringing key 92 of the called line over the tip and ring conductors of this line to the called subscriber to ring his bell. As hereinbefore described, on the release of relay 74 relays 75, 76 and 77 released and on the release of relay 76 prior to the release of relay 77 it will be noted that a circuit will be completed momentarily for the operation of relay 78 from battery through make-before-break contacts of this relay, contacts of relay 77 when operated and contacts of relay 76 when released to ground. Relay 78 in operating closes a locking circuit for itself from battery winding and contacts of relay 87 to ground. Relay 78 transfers the operating leads for the select magnets 55 and 56 to contacts of relay 93 which correspond to relay 78 and is associated with the next link, so that on the next call the next succeeding link will be seized and relay 78 will also close an obvious circuit for the link lamp 94.

When now the called subscriber of line 52 answers the call by removing his receiver a circuit is established over the tip and ring conductors from this line over contacts of relay 85, the connection at cross-point 84, contacts of relay 89 when it releases between ringing impulses as the circuit for this relay is controlled through an interrupter 95, windings of relay 96 to battery and ground. Relay 96 in operating closes an obvious circuit for the operation of relay 90 which opens the circuit for relay 89 which is then permanently released and this relay 90 is locked over its own contacts to ground at relay 87. The conversation between the calling subscriber of line 51 and the called subscriber of line 52 may now take place across the condensers 98, talking battery being supplied for the calling subscriber through the windings of relay 86 and for the called subscriber through the windings of relay 96. The operator may now restore the keys 67 and 73. At the end of the conversation when the calling subscriber of line 51, for example, hangs up, relays 86 and 87 will release causing the release of the holding magnets 59 and 60, cut-off relay 63 and 85, and relay 78 which extinguishes the link-busy lamp 94, returning the switch 50 and the link shown to normal.

If a connection is desired from a subscriber to a trunk such as from the calling subscriber of line 51 and trunk 58 if idle, the connection may be established as hereinbefore described to connect the operator's telephone 70 to the line 51 and when the calling subscriber indicates that a trunk connection is desired, the operator will actuate the calling key 79 of trunk 58 if this trunk is idle. The effect of the operation of key 79 in this case is that the trunk 58 will be connected to the calling line 51 by first causing the operation of the relay 74 from battery at 99, contacts of key 79, key 103, winding of relay 74 to ground. Relay 74 now in operating closes a circuit for the operation of select magnet 57 of the trunk 58 from battery through the winding of this magnet, contacts of key 79, contacts of the key 80, contacts of relays 74 and 76 to ground. Relay 74 now operates relay 75 after an interval and this relay closes a connection for the operation of holding magnet 59 from battery through the winding of this magnet, contacts of key 67 and contacts of relay 75 to ground. Magnet 59 closes the above-mentioned circuit for the cut-off relay 63 which connects the calling line 51 through contacts of this relay over the cross-point 100, tip and ring conductors of the trunk 58 through the winding of relay 101, contacts of keys 80 and 79 to battery and ground (not shown) at the operator's telephone set 70 to cause the operation of relay 101. Relay 101 operates relay 102 over an obvious circuit. This relay closes an obvious circuit for the trunk-busy lamp 103 which indicates that this trunk is now in use. Relay 102 also establishes a connection to ground for shunting the battery 99 so that relay 74 will release. It should, of course, be observed that when relay 76 operates after the operation of relay 75, the circuit for the select magnet 57 is open, while the holding magnet 59 and relay 63 are locked over contacts at cross-point 100 and ground applied at contact of relay 102 to maintain the established connection. The operator may now release the key 79 and connect the trunk 58 through to the calling station through contacts of keys 79 and 80 and as is usual in circuits of this kind battery and ground will be supplied at the distant end of this trunk to maintain relays 101 and 102 operated. The circuits may now be prepared in any well-known manner to permit a connection to be established and usual dial tone will be applied so that the calling subscriber of line 51 may now dial the desired number at the distant station. The operator will also release the key 67 to permit the line lamp 66 to be lighted steadily from ground at contacts of relay 63 to show that this line is engaged, while the trunk-busy lamp 103 indicates that the trunk 58 is busy. If the calling subscriber's line is not provided with dialing equipment the operator may dial over the trunk. In this case the operator will first open the key 103 after she has received the information from the calling subscriber that a trunk connection is desired and dial from her set 70 through contacts of key 79 when she operates this key. The opening of key 103 prevents the connection of the calling line to trunk 58 at the cross-point 100 as described. When the operator has established a connection at the distant end she will release key 103 so that relay 74 may operate and establish the connection as described at the cross-

point 100 and then release keys 67 and 79. Should the calling subscriber of line 51 be a restricted subscriber who is not entitled to outside calls, the operator will, of course, not establish the trunk connection desired. The release of the trunk connection may take place by the subscriber of line 51 replacing the receiver thus releasing relays 101 and 102 to release the holding magnet 59 and extinguish lamp 102 and release relay 63 to extinguish lamp 66.

If a call is incoming over a trunk for a connection to a desired subscriber's line the seizing of the trunk 58 for example at the distant end, causes the operation of the alternating current relay 106 over the tip and ring conductors, contacts of keys 79 and 80 and contacts of relay 102, condenser 107 and winding of relay 106. This relay closes an obvious circuit for the operation of relay 108 which now locks over its contacts over contacts of keys 80 and 79 to ground and closes a circuit from an interrupter 109 over contacts of relay 102, lamp 103 to battery and ground, causing this lamp to flash to indicate that a call is waiting on this trunk. In answering this call the operator actuates the key 80 and connects her telephone set to the trunk over contacts of this key. The subscriber at the distant end of trunk 58 now gives the operator the number of the desired subscriber's line and if line 51 is desired the operator actuates ringing key 64 to ring the subscriber of line 51 by applying ringing current at the contacts of this ringing key. When the operator releases ringing key 64 and the subscriber of line 51 answers relay 62 is operated to cause the line lamp 66 to flash over a circuit as hereinbefore described. When the operator notices the flashing of lamp 66 she will operate the key 68 of line 51 and thus close a circuit for the operation of relay 74 from battery through the winding of holding magnet 59, contacts of key 68, winding of relay 74 to ground. Magnet 59 does not operate in this circuit. Relay 74 in operating closes a circuit for the operation of select magnet 57 from battery through the winding of this magnet, contacts of key 80, contacts of relays 74 and 76 to ground. When relay 75 operates due to the operation of relay 74 a circuit is completed for the operation of holding magnet 59 from battery through the winding of this magnet, contact of keys 68 and 80 and contacts of relay 75 to ground. It should be noted that this circuit to ground on contacts of relay 75 shunts the winding of relay 74 which now releases. Magnet 59 now establishes a connection between the called subscriber's line 51 and the trunk 58 at the cross-point 100 and causes the operation of the cut-off relay 63 which releases line relay 62 and connects the line 51 to the trunk 58 at its contacts. This connection causes the operation of relay 101 over the tip and ring conductors of the subscriber's loop through contacts of key 80 to battery and ground at the operator's telephone set. Relay 101 operates relay 102 which lights the trunk-busy lamp 103 with a steady light to indicate that the trunk is busy. The operator then releases the keys 80 and 68 and the line 51 is connected to the trunk 58 through contacts of keys 80 and 79.

In case a conference connection is desired between a number of subscribers, the answering key, for example 67, of line 51, is operated if the call is incoming over line 51 and the calling subscriber of line 51 will then inform the operator that a conference connection is desired between his line and a number of other lines. The operator then proceeds to ring these other lines by operating their ringing keys, such for example key 92 of line 52. After she has rung the numbers of such subscribers she will operate their calling keys, such as 73 for example of line 52, after first having opened the connection through key 103 to prevent the establishing of any connections until all the calling keys have been operated. After such keys have been operated the operator will restore key 103 and thereby cause the operation of relay 74 to start the operation of the circuits to establish a conference connection. It will be noted that in this case the procedure will be the same as in a line-to-line connection except that as keys, such as 110 of the called subscriber's lines are operated, all holding magnets corresponding to holding magnet 60 for line 32 will be operated through contacts of keys such as 110 of the corresponding lines to ground at relay 75 when this relay operates. Thus it will be seen that when relay 77 operates, holding magnet 59 will be operated to establish a connection between the calling line 51 at the cross-point 82 of link 50 which is the one that was seized and the holding magnets corresponding to holding magnet 60 of all the called lines will be operated as mentioned from battery through the windings of these magnets and their corresponding keys, such as 110 for line 52 and contacts of relay 75 when this relay operates, and thereby cause the connection to be established at cross-points, such as 84, for the outgoing branch of the link as shown, and the calling subscriber's line 51 will therefore be connected to all the other called lines through the link, the calling line being connected at cross-point 82 to the incoming branch and the called lines to the outgoing branch at cross-point 84 and other similar points for the other lines. The operator may then release all the keys actuated and conversation between the conference lines may take place in the same manner as described in connection with line-to-line calls.

What is claimed is:

1. In a telephone system, a switch, lines and links terminated therein, magnets in said switch for actuating it to connect lines in said switch through a link, a key for each line, means controlled by the actuation of the key for a calling line and the key for a called line for actuating magnets in said switch to establish a connection between the calling line and the called line through an idle link over said switch said means being so arranged that the calling line and the called line are connected to said link after the key for the called line is actuated.

2. In a telephone system, a cross-bar switch, lines and links terminating in said switch, magnets in said switch for actuating it to connect lines in said switch through a link, a key for each line, means controlled by the operation of the key for a calling line and the key for a called line for actuating said magnets to first establish a connection between the calling line and an idle link through said switch and then establish a connection between the called line and said link through said switch, said means being operative to actuate said magnets only after the key for the called line has been actuated.

3. In a telephone system, a switch, lines and links terminating in said switch, magnets in said switch for actuating it to connect the lines in said switch through an idle link, a key for each line, a series of relays, circuit means for operating said relays in a certain sequence, means

controlled by the operation of the key for a calling line followed by the operation of the key for a called line for starting the operation of said relays in sequence after the key for the called line has been operated and circuit means controlled by said keys and said relays when operated in sequence for actuating said magnets in a certain sequence to establish a connection between said calling line and said called line through an idle link over said switch.

4. In a telephone system, a cross-bar switch, lines and links terminating in said switch, magnets in said switch for actuating it to connect lines in said switch through a link, a series of relays, a circuit means for operating said relays in a certain sequence, a key for each line, circuit means controlled by the operation of the key of a calling line followed by the operation of the key of a called line for starting the operation of said relays in sequence, and means controlled by said operated keys and said relays for actuating said magnets in a certain sequence to establish a connection between the calling line and the called line through a link over said switch, the starting of the operation of the relays in sequence taking place when the key for the called line is operated.

5. In a telephone system, a cross-bar switch, lines and links terminating in said switch, magnets in said switch for actuating it to connect lines in said switch through a link, a key for each line, a series of relays, circuit means for operating said relays in a certain sequence, means controlled by the operation of the key of a calling line and the key for a called line for starting the operation of said relays in sequence and circuit means controlled by said operated keys and said relays for first operating magnets in said switch for establishing a connection between the calling line and an idle link followed by the operation of magnets in said switch to establish a connection between the called line and said link, operative on the operation of the key for the called line.

6. In a telephone system, a switch, lines, trunks and links terminating in said switch, magnets in said switch for actuating it to connect a line to a link or a line to a trunk, a key for each line, a key for each trunk, means controlled by the operation of the key for a calling line and a key for a called line for actuating said magnets to establish a connection between the calling line and the called line through a link over said switch operative when the key for the called line is actuated, means controlled by the operation of the key for a calling line and a key for a trunk for operating said magnets to establish a connection between said calling line and said trunk and operative when the key for the trunk is actuated.

7. In a telephone system, a cross-bar switch, lines, trunks and links terminating in said switch, magnets in said switch for actuating it to interconnect lines through a link and a line to a trunk, a key for each line, a key for each trunk, means controlled by the operation of the key for a calling line and the key for a called line for actuating said magnets to establish a connection between said calling line and said called line through an idle link over said switch operative when the key for the called line is actuated and means controlled by the operation of the key for a trunk and the key for a calling line for establishing connections from said trunk to said called line over said switch operated when the key of the called line is actuated.

8. In a telephone system, a cross-bar switch, lines, links terminating therein, magnets in said cross-bar switch for actuating the switch to connect lines in said switch through a link, a key for each line, a separate key, means for calling a plurality of said lines, and means controlled by the operation of the separate key, the key of a calling line and the keys of the called lines and the release of the separate key for actuating said magnets to establish a connection over said switch between said calling line and said called lines over a link operative when the separate key is released.

9. In a telephone system, a cross-bar switch, lines, links terminating therein, magnets in said cross-bar switch for actuating the switch to connect lines in said switch through a link, a key for each line, a separate key, means for calling a plurality of said lines, means controlled by the operation of the separate key, the key of a calling line and the keys of the called lines and the release of the separate key for actuating said magnets to establish a connection over said switch between said calling line and said called lines over a link operative when the separate key is released, connections between the calling line and the links preceding the connections between the link and the called lines, said connections between the link and the called lines occurring simultaneously.

10. In a telephone system, a cross-bar switch, lines and links terminating in said switch, magnets in said switch for actuating it to connect lines in said switches through a link, a key for each line, a special key, means controlled by the operation of said special key followed by the operation of the key of a calling line and the operation of the keys of a plurality of called lines and the subsequent release of the special key for actuating magnets of said switch to establish a connection between the calling line and a link and for actuating magnets in said switch to establish connections between the called lines and said link simultaneously, said operation of all of said magnets in said switch being effective on the release of the special key.

11. In a telephone system, a switch, lines and links terminating therein, magnets in said switch for actuating it to connect lines in said switch through said links, a key for each line, means for first actuating certain magnets for connecting a calling line to an idle link and then actuating certain other magnets for connecting said called line to said link, said operating means for said magnets being controlled jointly by the operation of the key for a calling line and the key for a called line to actuate said magnets after the key for the called line has been operated.

12. In a telephone system, a switch, lines and links terminating therein, magnets in said switch for actuating it to connect lines in said switch through a link, an operator's position, a key for each line, means controlled by the actuation of the key for a calling line for connecting said operator's position to said calling line, means controlled by said actuation of the key for the calling line and the actuation of the key for a called line, for actuating said magnets to establish a connection between the calling line and the called line through an idle link and for disconnecting said operator's position from said called line.

13. In a telephone system, a switch, lines and links terminating therein, magnets in said switch for actuating it to connect lines in said switch through a link, an operator's position, a key for each line, means controlled by the actuation of the key for a calling line for connecting said operator's position to said calling line, means controlled by said actuation of the key for the calling line and the actuation of the key for a called line, for actuating said magnets to establish a connection between the calling line and the called line through an idle link and for disconnecting said operator's position from said called line, said means being effective when the key for the called line is actuated.

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