

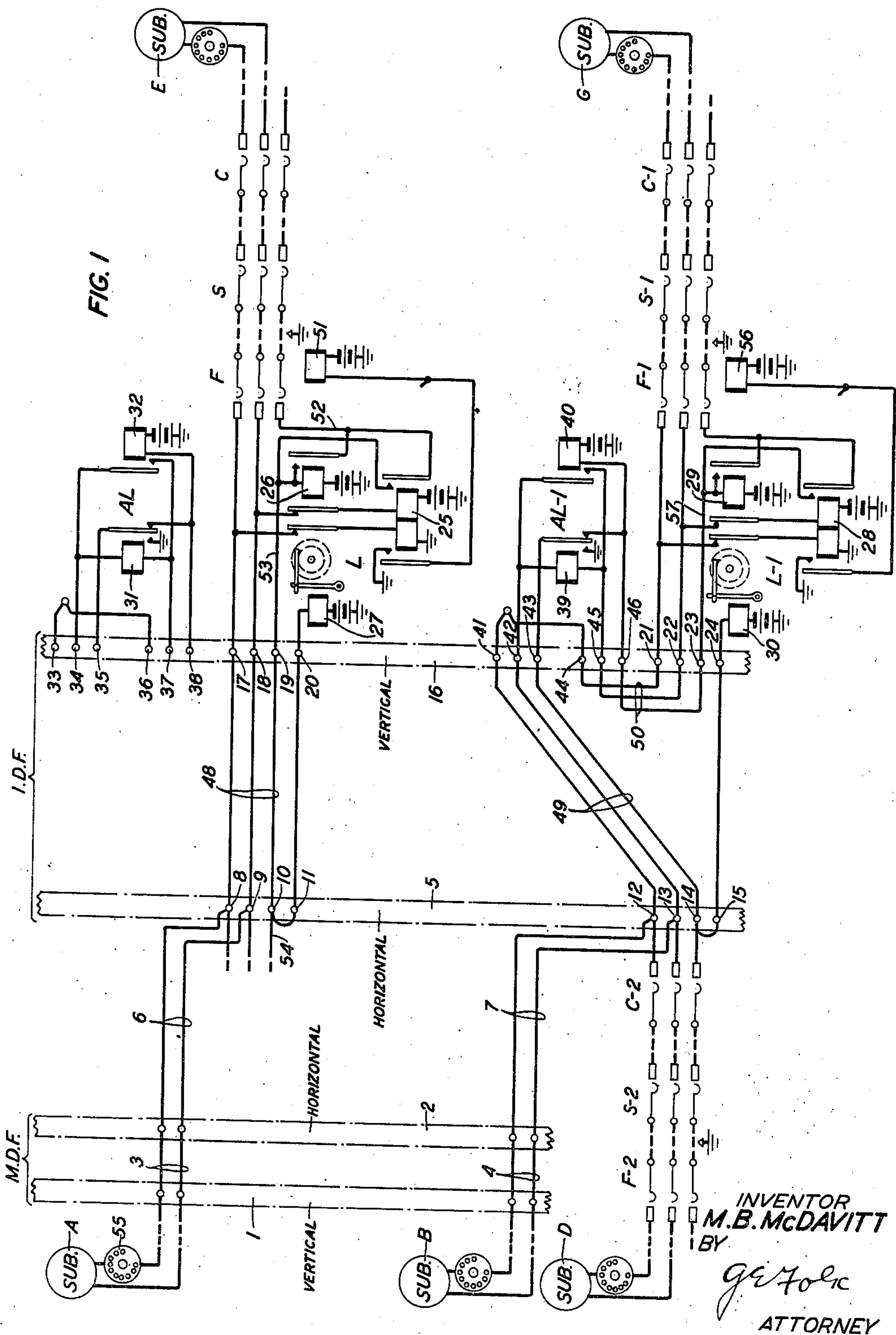
Nov. 29, 1938.

M. B. McDAVITT  
TELEPHONE SYSTEM

2,138,186

Filed Nov. 23, 1935

3 Sheets-Sheet 1





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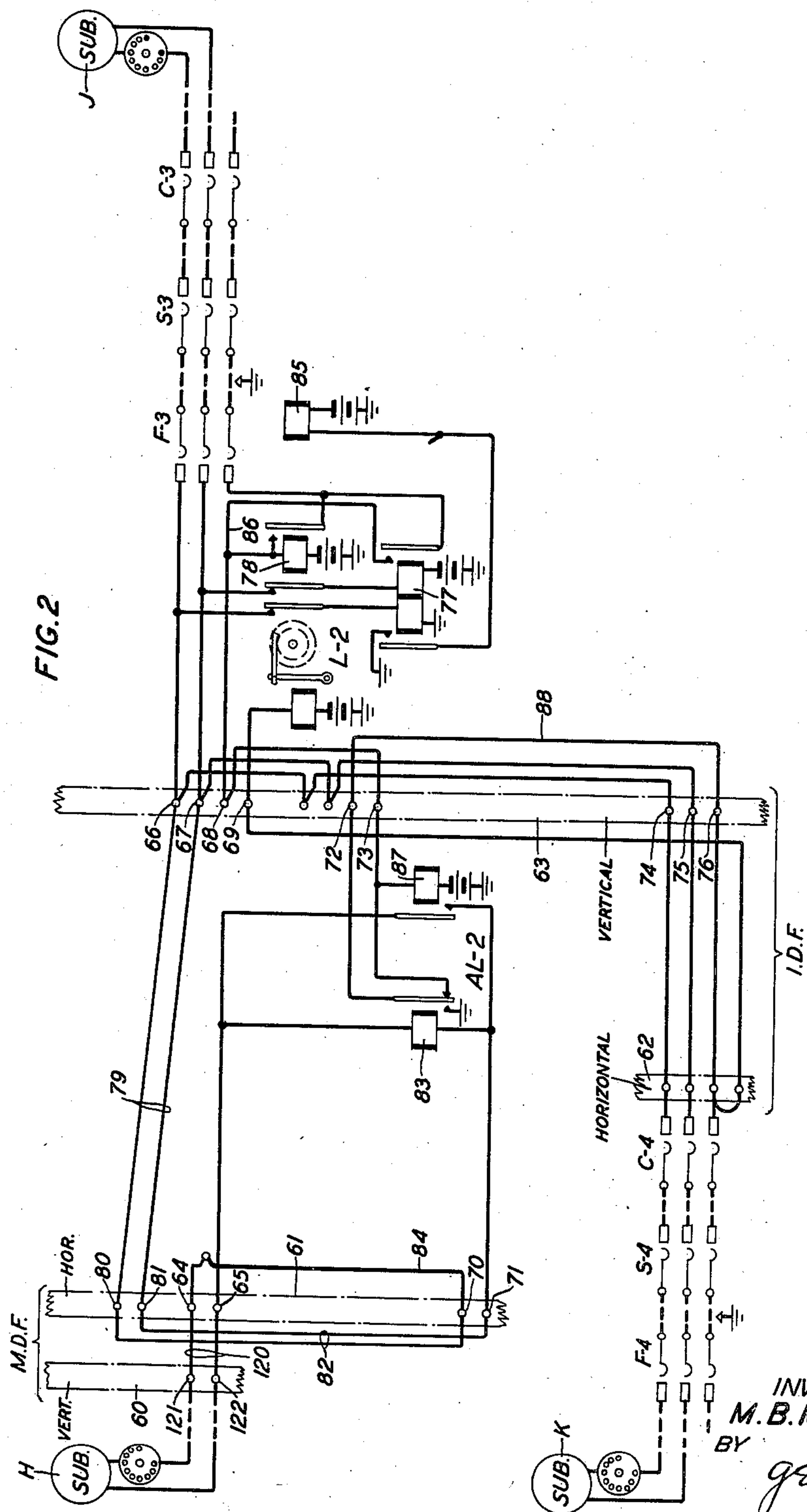
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**2,138,186**

TELEPHONE SYSTEM

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3 Sheets-Sheet 2



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Nov. 29, 1938.

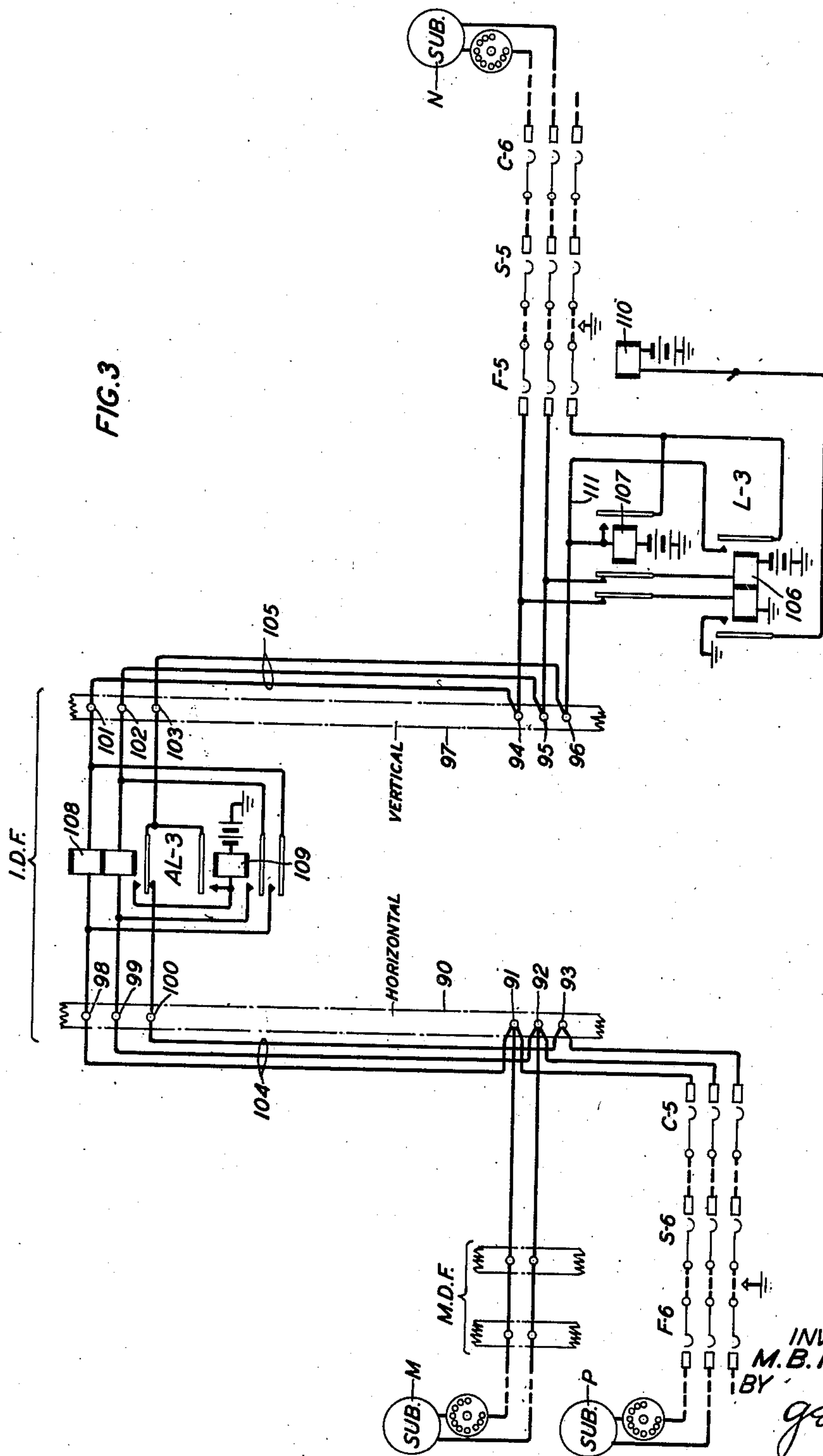
M. B. McDAVITT

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TELEPHONE SYSTEM

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,138,186

## TELEPHONE SYSTEM

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Application November 23, 1935, Serial No. 51,314

6 Claims. (Cl. 179—18)

This invention relates to telephone systems and particularly to systems of the class using automatic switching apparatus for establishing connections.

5 The objects of the invention are to facilitate changes in the operating conditions of subscribers' lines without altering the individual equipment normally provided for such lines; to enable any line to be changed from one operating condition to another by a simple wiring change at the distributing frame; to provide for the guarding of a telephone line against seizure by one switch while another switch, such as a line finder, is seeking the line; and otherwise to improve systems of this character.

10 Systems have been devised heretofore in which a subscriber's line, when in a calling condition, is rendered unselectable to a connector switch during the interval a line finder is seeking the line in response to the calling condition. This has been accomplished by relay connections in the line circuit, thus requiring a different type of individual line circuit for those lines that are to be guarded than that used for other lines in the exchange that do not need the guarding feature. One reason for guarding the line during the interval mentioned is to prevent a calling connector from seizing the line and tripping the ringing current-applying mechanism without notice to the calling party that his call has failed. Also, in case of a private branch exchange group, the call may fail under these conditions although succeeding trunks in the same group are idle.

35 According to a feature of the present invention an auxiliary control circuit is arranged to be connected to the conductors of a subscriber's line without disturbing the regular line circuit individual to the line, and which auxiliary circuit when so connected cooperates with the line circuit to control the operating conditions of the line and central office apparatus. This auxiliary circuit is connected to one side or member of the intermediate distributing frame where it can be included readily, by means of cross-connecting wires, in circuit with the subscriber's line conductors and also in circuit with the line circuit individual to such line. In this way the auxiliary circuits can be permanently connected to the frame, and by a simple change of the cross-connecting wires they may be connected respectively to any of the subscribers' lines that require the additional control features provided by the auxiliary circuits. Moreover, all lines can be installed uniformly with their regular line circuits, and these require no change in case it is found desirable later either to add or to remove one of the auxiliary circuits.

60 Another feature of the invention is an arrangement in which a line control relay is connected

in a subscriber's line between the point where the line enters the exchange from the substation and the regular line and cut-off relays, and this control relay serves to place a guarding potential on the connector terminals of the line while the line finder is hunting for the line in response to a calling condition. After the line finder finds the line and the cut-off relay operates to disconnect the line relay, a circuit is closed for shunting the control relay so as to exclude it from the subscriber's pulsing circuit extending to the selector switches in the exchange and also to exclude it from the talking circuit which will later be completed. In one embodiment of the invention the control relay is also shunted to remove it from the talking circuit when the subscriber's line is engaged as a called line.

The foregoing and other features of the invention will be more fully described in the following specification and will also become more apparent from the appended claims.

The specification should be taken in connection with the accompanying drawings, in which:

Figure 1 shows a number of subscribers' line circuits and auxiliary circuits and illustrates the manner in which these may be connected to the subscribers' lines at the distributing frames;

Fig. 2 shows line and auxiliary circuits similar to those in Fig. 1 but with different cross-connecting arrangements on the distributing frames; and

Fig. 3 shows a modification of the auxiliary circuit and also a modification of the distributing frame arrangement.

In order to achieve the objects and features of this invention, advantage is taken of the distributing frames at the central office. In offices of appreciable size it is customary to provide both a main distributing frame and an intermediate distributing frame. The subscribers' lines entering the office appear first on the main frame. From there they extend to the intermediate frame, and from this latter frame they are connected to the individual line circuits, to the non-numerical switches, such as finders, for outgoing calls, and to the final or connector switches for incoming calls. Each frame comprises two parts, a vertical side and a horizontal side, and the various connections between the two sides of each frame and between frames are made by jumper wires and cables which may be changed from time to time as occasion requires. It is, of course, desirable to avoid as much as possible the necessity of making these jumper changes and to facilitate the work of making such changes when they do become necessary. However, it is also desirable to take full advantage of the relative ease with which jumper connections can be made where this leads



to a saving in the amount of equipment needed in the office.

As explained above, it is desirable to guard some lines, particularly private branch exchange lines, from seizure by a connector switch while they are in a calling condition and before the line finder has completed its hunting operation and guarded the calling line. Yet it would be expensive to provide all line circuits in the office with extra equipment to secure this feature, where some of the lines do not at the time require the service and may never require it in the future, and the more economical way is to equip the office with a sufficient number of auxiliary line circuits which may be associated with any desired subscriber's line in the exchange by making jumper wire connections such as those described above. This makes it possible for any line in the office to be converted by a simple wiring change performed at the distributing frame.

Referring now to the drawings and first to Fig. 1, two subscribers' lines A and B are shown entering the exchange and appearing on the vertical side 1 of the main distributing frame. From the side 1 the lines A and B are connected to the horizontal side 2 by jumpers 3 and 4, respectively; and from the horizontal side of the main distributing frame these lines are connected to the horizontal side 5 of the intermediate distributing frame by means of the cable pairs 6 and 7, respectively. The line A, for example, is represented on the side 5 of the intermediate frame by terminals 8, 9, 10 and 11, and the cable pair 6 is wired to the terminals 8 and 9. Similarly, line B is represented by terminals 12, 13, 14, and 15, and the cable pair 7 is wired to terminals 12 and 13. All other subscribers' lines entering the exchange are wired in a similar manner to the main distributing frame and from there to the horizontal side of the intermediate frame.

At the intermediate frame each subscriber's line is further connected to its own individual line circuit and to a non-numerical switch, such as a line finder, for out-going calls and is also connected to the contact banks of the connector switches for incoming calls. The individual line circuits, such as line circuits L and L—1 for lines A and B, are connected to the vertical side 16 of the intermediate distributing frame. The line circuit L appears in terminals 17, 18, 19 and 20, and line circuit L—1 appears in terminals 21, 22, 23 and 24. These line circuits include the usual relays and equipment; the line circuit L comprises a line relay 25 and a cut-off relay 26, and the line circuit L—1 comprises a line relay 28, and a cut-off relay 29. The message registers 27 and 30 are also individual to lines A and B, respectively.

As explained hereinbefore, the exchange is also equipped with a suitable number of common auxiliary line circuits. Two of these are illustrated, circuits AL and AL—1, and they too are connected to the vertical side of the intermediate frame. The circuit AL includes a line control relay 31 and a relay 32 and appears in terminals 33, 34, 35, 36, 37, and 38 on the frame member 16. In a similar manner the auxiliary line circuit AL—1 comprises relays 39 and 40 and appears in terminals 41, 42, 43, 44, 45 and 46. Any subscriber's lines may be connected directly to its individual line circuit by using one arrangement of jumper wires, or it may be connected to its individual line circuit through one of the

auxiliary line circuits by using a different arrangement of jumper wires. The line A is shown connected directly to its individual line circuit L and to the terminals in the line finder F. In this case a jumper 48 joins the terminals 8, 9, and 10 of the horizontal side 5 with the terminals 17, 18, and 19 on the vertical side 16 of the intermediate frame. The line B is shown connected to its individual line circuit L—1 through the auxiliary line circuit AL—1. In this case a jumper 49 joins the terminals 12, 13 and 14 on the horizontal side 5 and the terminals 41, 42 and 43 on the vertical side 16 and a second jumper 50 interconnects the terminals 44, 45, and 46 and the terminals 21, 22, and 23 on the vertical side 16. The fourth terminal 15 is wired by means of another jumper directly to the fourth terminal 24 the same as though the auxiliary line circuit were not included. Should it become desirable to equip the line A with an auxiliary circuit, this could be done by the simple act of disconnecting the jumper 48 and connecting terminals 8, 9, and 10 to terminals 33, 34, and 35 by one jumper and connecting terminals 36, 37 and 38 to terminals 17, 18 and 19 by a second jumper the same as shown in connection with line B. Likewise any other subscriber's line in the exchange may be changed at any time to include an auxiliary line circuit.

The subscribers' lines are connected to the connector banks at the horizontal side 5 of the intermediate distributing frame. The line B, for example, is shown connected to terminals of connector C—2 by the wires extending to the terminals 12, 13, and 14. Likewise connections or terminals 8, 9, and 10 join the subscriber's line A to the terminals of the connector switches.

The operation of the system shown in Fig. 1 will now be described. While the individual line circuit is already well known in the art, it may be helpful first to describe briefly the operation of the system when so wired as not to include the auxiliary line circuit. Assume, therefore, that the subscriber of line A wishes to converse with the subscriber of line E. When the calling subscriber removes his receiver, the line relay 25 operates over an obvious circuit and energizes the finder start relay 51. The finder switch F starts and searches for the terminals of the calling line, and, upon finding the same, it applies ground potential over conductor 52 through the right contact of the line relay 25 to the sleeve conductor 53. This operates the cut-off relay 26, which locks to the grounded conductor 52 and disconnects the line relay from the tip and ring conductors of the line. The ground potential on conductor 53 is also applied by way of conductor 54 to the test terminals in the connector switches. From this point on the calling subscriber operates his dial 55 in the well known manner to set selector switch S and connector switch C to establish connection with the called subscriber's line E. In case it is necessary to operate the calling subscriber's register 27, registering operating current is applied to the sleeve conductor 53 and flows to register 27 over circuit extending by way of terminals 19, 10, 11 and 20. After conversation the connection is released in the usual manner, the cut-off relay 26 releases, and the equipment is thus restored to its normal condition.

Assume next that the subscriber of line B wishes to communicate with the subscriber of line G. In this case the auxiliary line circuit AL—1 is associated with the calling line B. When the calling subscriber removes his receiver



to initiate the call, a circuit is closed from battery through the right winding of line relay 28, contact of cut-off relay 29, thence over middle jumper wire 50, winding of control relay 39, middle jumper wire 49, thence over the loop of subscriber's line B and returning over the upper jumper wire 49 to terminal 41, thence to terminal 44, right-hand jumper wire 50, terminal 21, contact of cut-off relay 29, left winding of line relay 28 to ground. Relays 28 and 39 operate in this circuit. Relay 39 immediately applies ground potential over the lower jumper wire 49 by way of terminal 14 to the test terminals of the connector switches, such as switch C—2, having access to the calling line B. Thus the calling line is guarded against seizure by a connector switch as soon as the receiver is removed from the switch-hook. Relay 28 operates the start relay 56, and the line finder F—1 searches for and seizes the terminals of the calling line B. As soon as the terminals are seized, ground potential is applied to the sleeve conductor 57 by way of the right-hand contact of relay 28, operating relay 29. This ground potential also results in operation of auxiliary relay 40, the circuit extending from battery through the winding of relay 40, thence over the left-hand jumper wire 50 to the grounded sleeve conductor 57. Relay 40 closes a shunt around the winding of relay 39. The cut-off relay 29 in operating releases the line relay 28, and the tip and ring conductors of the subscriber's line B are now extended through the terminals of the line finder F—1 to battery and ground in the well known manner. The cut-off relay 29 locks through its right front contact and maintains ground potential on the conductor 57 to hold the relay 40 operated. Relay 40 thereby maintains a shunt around the winding of relay 39 to prevent it from operating and to exclude its winding from the circuit including the subscriber's loop. The subscriber's line B is now maintained busy at the terminals of the connector switches by means of a circuit to ground over the sleeve conductor 57 through the left-hand jumper wire 50, back contact of relay 39, thence as above traced to the test terminals of the connector switches. Following this the selector S—1 and connector C—1 are operated in response to the subscriber's dial to complete a connection to the called line G. At the end of conversation the connection is released, and ground potential is removed from the sleeve conductor 57. This restores the cut-off relay 29 and the auxiliary relay 40.

The next assumption to be made is that the subscriber's line B has been engaged in an established connection as a called line. It may be considered that the established connection involves a calling line D, line finder F—2, selector S—2, connector C—2 and the called line B. At the time the connector C—2 set its brushes on the terminals of the subscriber's line B, cut-off relay 29 and auxiliary relay 40 were operated. The circuit for these relays are traced from battery to the winding of relay 29 and from battery to the winding of relay 40, thence in parallel to the back contact of relay 39, lower conductor of jumper 49, thence to ground over the sleeve terminals of the connector switch C—2. Relay 29 disconnects the line relay 28 from the tip and ring conductors and extends the grounded conductor 57 through its front contact to the terminals of the line finder switch F—1. A further assumption to be made is that the release control of this connection between lines D and B is such

that when the calling subscriber hangs up his receiver the entire connection, including connector C—2, is released. If, therefore, following the conversation, the calling subscriber D is the first to replace his receiver, all switches, including the connector switch C—2, release, leaving the called line B in the condition of a calling line. The release of the connector switch C—2 removes the ground potential from the test terminal, causing relays 29 and 40 to restore. The instant relay 29 releases, it connects the line relay 28 across the closed loop of the subscriber's line B. Relay 28 thereupon operates and starts the line finder F—1 to search for the terminals of the line B. As above explained, the relay 39 also operates in circuit with the relay 28, and in so doing it applies ground potential to the test terminals in the connector switches.

Thus a subscriber's line is guarded by the relay 39 in the connector switch bank during the time that his receiver is off the switch-hook and before a line finder has seized his line. Should a connector switch be stepped to the terminals of his line during this interval, it would find a busy potential the same as though the subscriber's line were actually engaged in conversation. Either the busy signal can be returned to the calling subscriber or, in the case of a private branch exchange group, the connector switch may step to a succeeding trunk.

Fig. 2 shows a somewhat different arrangement for accomplishing the same purpose. In this figure the subscriber's line H appears in terminals 121 and 122 on the vertical side 60 of the main distributing frame. The individual line circuit L—2 appears in terminals 66, 67, 68 and 69 on the vertical side 63 of the intermediate distributing frame. The auxiliary line circuit AL—2 appears in terminals 65 and 71 on the horizontal member 61 of the main frame and in terminals 72 and 73 on the vertical member 63 of the intermediate frame. To wire the subscriber's line H in such a way as to include the auxiliary line circuit AL—2 in circuit with the individual equipment L—2, the connections are made as shown in the drawings. In this case the terminals 121 and 122 are connected by means of a jumper 120 to the terminals 64 and 65, respectively. Also the terminals 70 and 71 are connected by a second jumper 82 to the terminals 80 and 81. The terminals 80 and 81 on the horizontal side of the main frame are connected by a cable pair 79 to the terminals 66 and 67, respectively, on the vertical side of the intermediate frame. If, on the other hand, it is desired to connect the subscriber's line H directly to the line circuit L—2, excluding the auxiliary circuit AL—2, the jumper 82 is disconnected from terminals 80 and 81, and the jumper 120 is now connected between terminals 121 and 122 and terminals 80 and 81.

The operation of the circuit shown in Fig. 2 will now be described. Assuming the subscriber's line H initiates a call for the purpose of obtaining connection with the subscriber of line J, the removal of the calling party's receiver from the switch-hook operates the line relay 77. The circuit for this relay may be traced from battery to the right winding thereof, contact of cut-off relay 78, terminal 67, lower conductor of cable pair 79, terminal 81, right-hand conductor of jumper 82, terminal 71 to the winding of auxiliary relay 83, terminal 65, thence over the loop of calling line H and returning to terminal 64, conductor 84, terminal 70, left-hand conductor of jumper 82, terminal 80, upper conductor of cable pair 79,



terminal 66, through the contact of relay 78 and the left-hand winding of relay 77 to ground. The line relay 77 operates the start relay 85 to start the line finder F—3 to search for the terminals of the calling line. Relay 83 operates and applies ground potential over terminal 72, conductor 88, terminal 76, thence over the horizontal side 52 to the test terminals of the connector switches, including connector C—4. This renders the line busy to the connectors. The subscriber's line is now extended through the terminals of the line finder F—3 to battery and ground in the well known manner. Relay 87 in operating shunts the relay 83 and this latter relay releases. The line H is maintained busy at the connector switches by means of a circuit from ground over the sleeve conductor 86, thence over terminal 68, terminal 73, back contact of relay 83, terminal 72 and by way of conductor 88 as above traced to the test terminals of the connector switches. The release of the connection takes place in the usual manner.

When the subscriber's line H is called by the subscriber of another line, such as line K, the connection is established by way of line finder F—4, selector S—4 and connector C—4. As soon as the connector C—4 engages the terminals of the called line H, ground potential is extended from the connector over the conductor 88 through the back contact of relay 83 and thence in parallel through the windings of relay 87 and cut-off relay 78. Relay 87 operates and shunts the relay 83, and relay 78 operates and disconnects the line relay 77. The relay 83, being shunted by relay 87, is effectively excluded from the talking connection between the calling and called lines. The grounded sleeve conductor is also extended by way of the contact of relay 78 to the test terminals of the line finder switches.

Fig. 3 shows a still further modification for attaining somewhat the same results as in Figs. 1 and 2. In this figure a subscriber's line M is connected from the main distributing frame to the horizontal side 90 of the intermediate frame and there appears in terminals 91, 92 and 93. From these terminals the line is connected to the contact banks of the connector switches, such as connector C—5. The individual line circuit L—3 is connected to terminals 94, 95, and 96 on the vertical side 97 of the intermediate frame. The auxiliary line circuit AL—3 is connected to terminals 98, 99 and 100 on frame member 90 and to terminals 101, 102, and 103 on frame member 97. If it is desired to wire the subscriber's line M directly to its individual line circuit L—3, this is accomplished by disconnecting the jumper 104 from terminals 91, 92 and 93 and by disconnecting the jumper 105 from terminals 94, 95 and 96, and further by connecting the terminals 91, 92 and 93 directly to terminals 94, 95 and 96, respectively. If it is desired to include the auxiliary line circuit AL—3, the wiring shown in the drawings is used.

The operation of the circuit shown in Fig. 3 when wired to include the auxiliary line circuit will now be described. Assume that the subscriber of line M wishes to call the subscriber of line N. When the calling subscriber initiates the call, a circuit is closed from battery through the right winding of the line relay 106, contact of cut-off relay 107, terminal 95, middle conductor of jumper 105, terminal 102, lower winding of auxiliary relay 108, terminal 99, the middle conductor of jumper 104, terminal 92, thence over the loop of the calling line and returning to ter-

terminal 91, left-hand conductor of jumper 104, terminal 98, upper winding of relay 108, terminal 101, left-hand conductor of jumper 105, terminal 94, thence through the contact of cut-off relay 107 and the left winding of relay 106 to ground. Relay 108 operates in this circuit and in so doing disconnects the cut-off relay 107 from the test terminal of the connector switches, including the connector switch C—5. Thus battery potential is removed from the test terminals of the connectors, and a connector arriving on the terminals of the line M at this time does not find the line in condition for the application of ringing current thereto. The line relay 106 in operating operates the start relay 110 to start the line finder F—5 in operation to seize the terminals of the calling line M. When the finder finds the line, ground potential is applied over the sleeve conductor through the contact of relay 106 to conductor 111, causing the operation of the cut-off relay 107. Ground on this conductor also results in the operation of relay 109. The operating circuit for the latter relay may be traced from battery through its winding, front contact of relay 108, terminal 103, right-hand conductor of jumper 105 to the grounded conductor 111. The relay 107 disconnects the line relay 106 and locks through its contact to the grounded sleeve conductor. Relay 109 also locks through its upper armature contact to the grounded conductor 111. Relay 109 in operating closes shunt circuits around the windings of relay 108, thus causing the release of relay 108 and the effective removal of its windings from the circuit including the subscriber's loop. When the relay 108 releases, the test terminals of the line M in the connector switches are grounded to render this line non-selective. The circuit for this purpose may be traced from the grounded sleeve conductor in the line finder F—5, thence over conductor 111, terminal 96, thence to terminal 103 through the back contact of relay 108, terminal 100, right-hand conductor of jumper 104, terminal 93 and thence to the multiple test terminals of the connector switches. The subscriber of line M may now operate his dial to set the selector switch S—5 and the connector switch C—6 to the terminals of the called subscriber's line N. At the end of conversation the connection is released in the well known way.

Assume now that the subscriber of line P calls the subscriber of line M. In this event the connection is established by way of line finder F—6, selector S—6 and connector C—5 to the terminals of the called line M. When the connector C—5 reaches the terminals of the called line M, a circuit is closed from ground in the connector switch over the test terminal thereof, thence to terminal 93, terminal 100, back contact of relay 108, terminal 103, terminal 96, to the winding of cut-off relay 107. Relay 107 operates, disconnects the line relay 106, and extends the grounded conductor 111 through to the terminals of the line finder switches, including finder F—5. If at the end of conversation the called party P is the first to hang up his receiver, the entire connection may be released, including the connector switch C—5. When ground potential is removed from the sleeve conductor as the result of the release of connector C—5, cut-off relay 107 releases and reconnects the line relay 106 to the conductors of the subscriber's line M, the receiver of which is still off the hook. Relay 106 operates in series with the closed loop of the line and starts the line finder F—5. Also relay 108 operates and as



above described disconnects battery potential from the test terminals of the connector switches. Should a connector arrive on the terminals of the line M while the line finder F—5 is hunting for the line M, it would find the line neither in a busy nor in an idle condition. Therefore, the connector would wait until the line finder F—5 finds the line M. At this time the cut-off relay 107 operates and disconnects the line relay 106. Also relay 109 operates and shunts the relay 108 allowing it to release. Ground potential from the line finder is now extended over the sleeve circuit through the back contact of relay 108, thence to the test terminal of the connector switch C—5. However, if the waiting connector has already passed its busy test stage, it will not recognize this ground potential as a busy condition and will continue to wait on the terminals of the line M. As soon as the subscriber M replaces his receiver, the line finder F—5 is released, the grounded connection is removed from the sleeve conductor, and relays 107 and 109 are released. Battery potential is now applied through the winding of cut-off relay 107 to the test terminal of the waiting connector switch. This causes the connector switch to function to apply ringing current to the subscriber's line M, thus calling the subscriber back to his telephone.

The finder switches, selector switches, and connector switches disclosed diagrammatically herein may be of any well-known type, such as the Strowger step-by-step switch. The specific circuits of the connector switches which have been referred to in some detail herein are disclosed and described in the patent to Newforth 2,005,844, granted June 25, 1935.

What is claimed is:

1. In a telephone system, a distributing frame having a horizontal terminal member and a vertical terminal member, a plurality of lines connected to said horizontal member, a plurality of line circuits connected to said vertical member, said line circuits being individual respectively to said lines, a plurality of control circuits connected only to said vertical member, and cross-connecting conductors for said horizontal and vertical members for connecting any one of said lines to its individual line circuit either directly or through any one of said control circuits.

2. In a telephone system, a line finder switch, a connector switch, a subscriber's line appearing in terminals of said finder and also in terminals of said connector, a line relay connected to the conductors of said line, a cut-off relay for disconnecting said line relay from said line, means responsive to the closure of the subscriber's line to set said finder in operation to find the line, an auxiliary relay included in the circuit of said line at a point between the substation and said line relay, said auxiliary relay serving to render the line unselectable to said connector switch while said finder is in operation, and means for disabling said auxiliary relay.

3. In a telephone system, a line finder switch, a connector switch, a subscriber's line appearing in terminals in said line finder switch and also in terminals in said connector switch, a line relay connected to the talking conductors of said line, means controlled by said line relay for setting said finder switch in operation to seize said line, a control relay connected in circuit with said

line at a point between the substation of the line and said line relay, said control relay serving to render the line unselectable to said connector switch, a cut-off relay operable when the line finder finds the line to disconnect said line relay from said line, and circuit means controlled by said cut-off relay for shunting said control relay.

4. In a telephone system, a line finder switch, a connector switch, a distributing frame having horizontal and vertical members, a subscriber's line connected to said horizontal member, a line circuit individual to said line including a line relay and a cut-off relay, said line circuit being connected to said vertical member and also appearing in terminals in said finder switch, an auxiliary circuit including a control relay connected to said vertical member, a set of conductors interconnecting said horizontal member and the terminals of said connector switch individual to said line, cross-connecting conductors for connecting said line to said auxiliary circuit and to said line circuit, means effective when said line is in a calling condition for operating said line relay and said control relay, said line relay serving to start said line finder in operation to seize said line, said control relay serving to render the line non-selectable to said connector switch, and means effective when the line finder finds the line for operating said cut-off relay to disable the line relay and for shunting said control relay to cause its release.

5. In a telephone system, a plurality of lines, a switch for seizing said lines, line circuits individual respectively to said lines, each line circuit having a line relay, an auxiliary circuit including a control relay arranged to cooperate with any one of said line circuits, cross-connecting means for connecting said auxiliary circuit individually to any particular one of said lines and to the line circuit of such line, a circuit for energizing simultaneously the line relay of said particular line and the control relay of said auxiliary circuit to cause said switch to seize said particular line and to guard said line until it is seized, and circuit means rendered effective by the line circuit of the seized line to cause the release of said auxiliary circuit relay.

6. In a telephone system, a plurality of lines, trunk circuits, non-numerical switches for interconnecting said lines and trunk circuits, line circuits individual respectively to said lines, each line circuit having a line relay, terminals for said lines and a selector switch for seizing said terminals, an auxiliary circuit including a control relay arranged to cooperate with any one of said line circuits, cross-connecting means for connecting said auxiliary circuit individually to any particular one of said lines and to the line circuit of such line, a circuit for energizing the line relay of said particular line and the control relay of said auxiliary circuit to cause a non-numerical switch to interconnect said line and one of said trunk circuits, circuit means closed by said control relay for placing a busy condition on the terminals of said particular line to guard it until the non-numerical switch has completed its function, and circuit means rendered effective by the line circuit to cause the release of said control relay.

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