July 13, 1943. L. R. WALLER 2,324,341

TELEPHONE SYSTEM

Filed Aug. 30, 1941 2 Sheets-Sheet 1

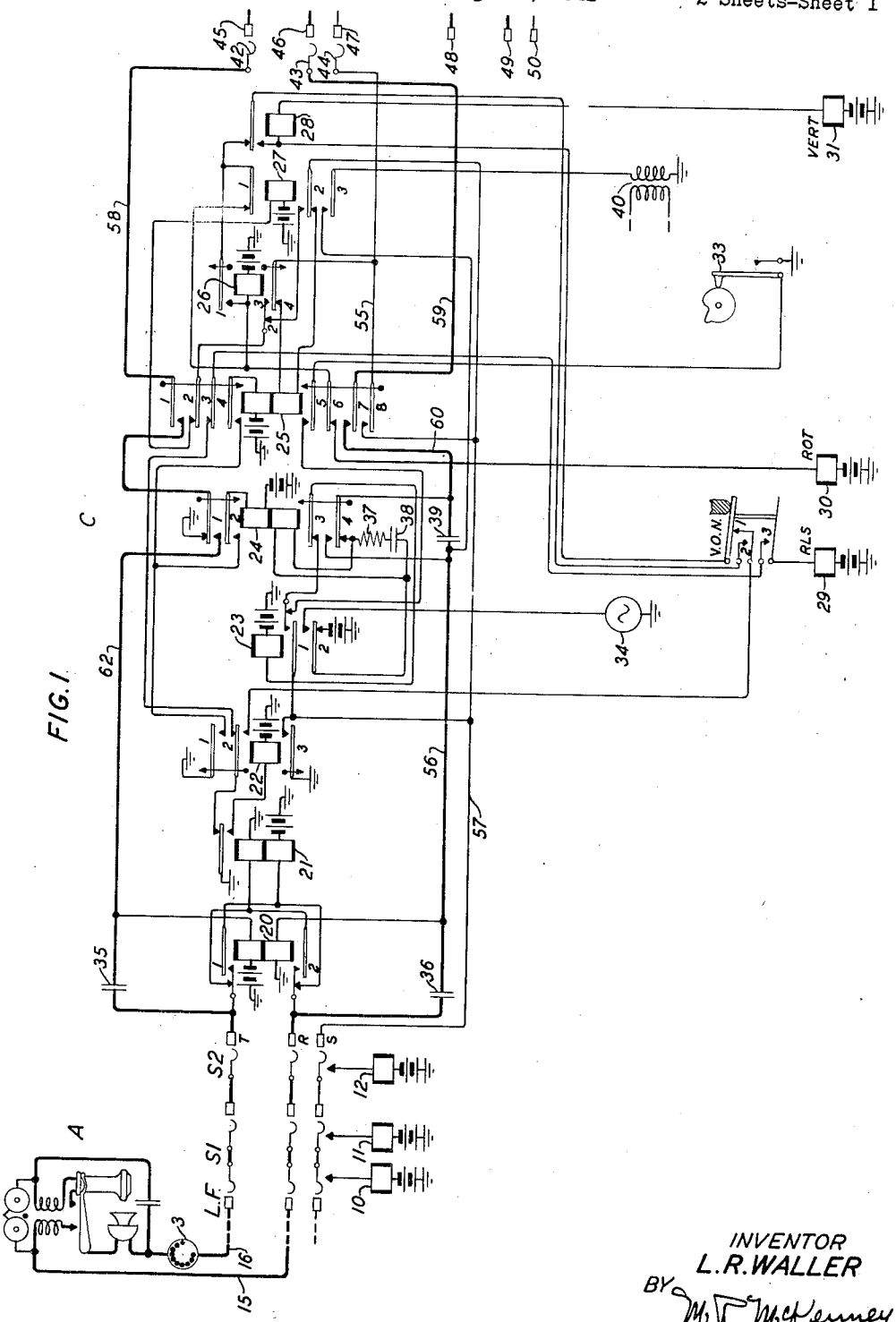


FIG. 1

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Filed Aug. 30, 1941 2 Sheets-Sheet 2

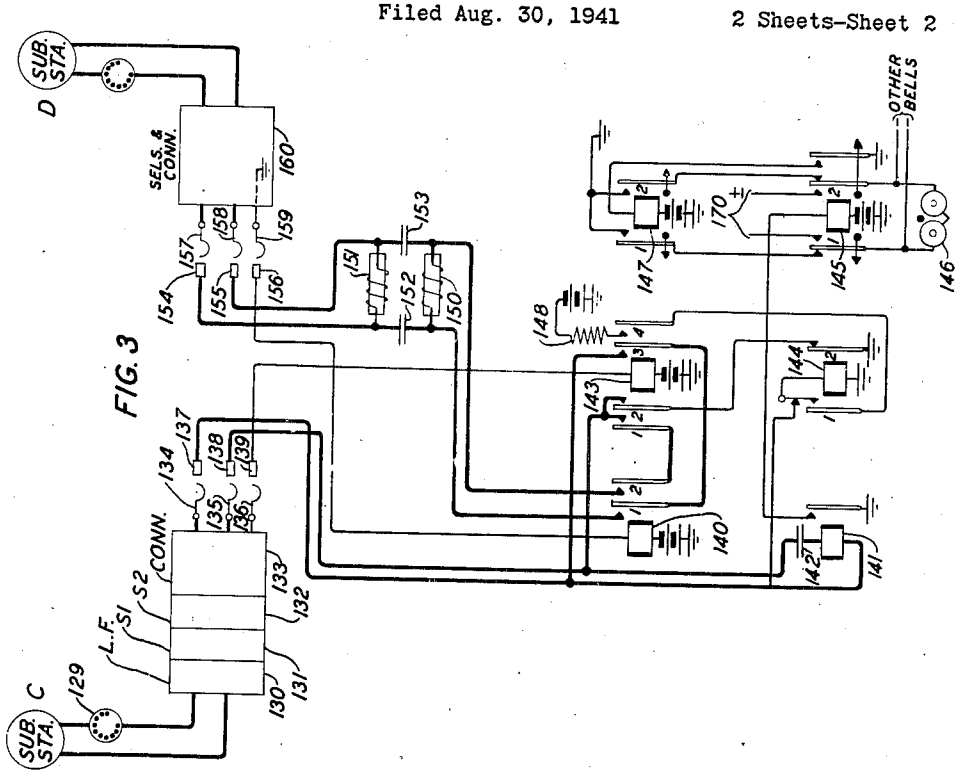


FIG. 3

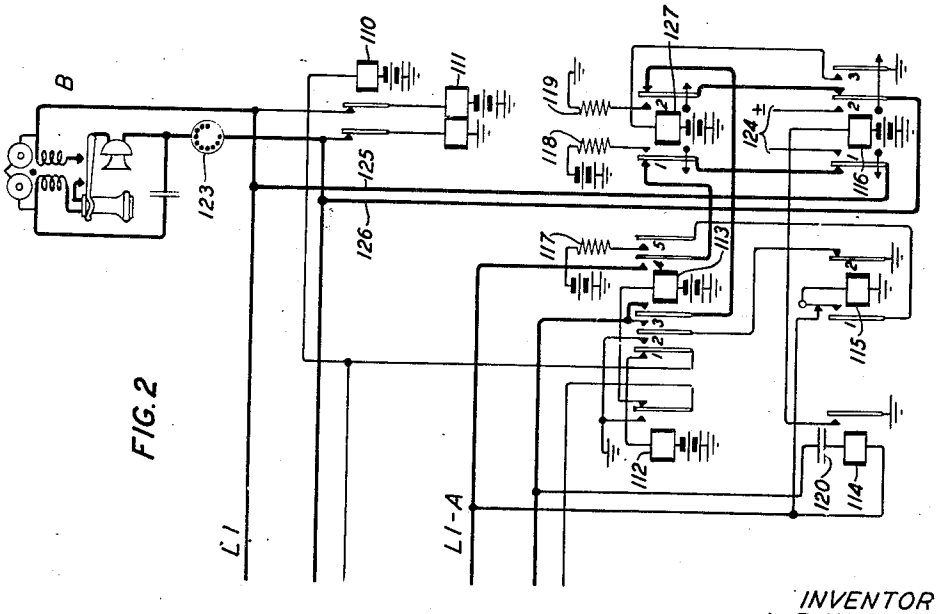


FIG. 2

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UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

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Application August 30, 1941, Serial No. 408,911

9 Claims. (Cl. 179—18)

This invention relates to telephone systems and particularly to those in which connections are established by automobile switches.

The object of the present invention is to simplify and enlarge the scope of signaling arrangements for use in telephone systems.

A feature of the present invention is an improvement in prior code ringing systems which consists in having a device connected to a subscriber's station and selectable by an automatic switch, with means in the switch and the associated device arranged to form a circuit for creating the flow of alternating current responsive to the manipulation of the calling subscriber's dial, for energizing said device to ring the bell in the called subscriber's station connected thereto, thus providing a code ringing circuit which enables the calling subscriber to form any desired ringing code to attract the attention of a particular person within hearing distance of the called station bells.

A second and related feature of the present invention consists in providing two sets of terminals for a subscriber's station in a switch bank, one set being connected directly to the subscriber's station over one line channel and the second set being connected to said code ringing responsive device and thence over a second channel to said line and said subscriber's station, either set of terminals being available for selection by a switch having ringing equipment therein which is automatically responsive to the selection of either set of terminals when the line is idle, which when connected to the terminals leading directly to the subscriber's station causes the bell in said station to be intermittently sounded according to the interruption rate of said automatically responsive ringing equipment in said switching circuit, and which when connected to said second set of terminals is immediately tripped and disconnected therefrom by the action of said device, causing responsive action in the switching circuit and the code ringing device to form a circuit which is responsive to alternating current created by the manipulation of the dial in the calling subscriber's station for ringing the called subscriber's station bell.

The foregoing and other features of the invention will be described more fully in the following detailed specification, which should be taken in conjunction with the accompanying drawings, and the appended claims.

Referring to the drawings, Fig. 1 shows subscriber's station A with dial 3, diagrammatic representations of a line finder LF, a first selector S1, and a second selector S2 of the usual type in step-by-step offices including their release magnets. The switching circuit for connector C is shown in detail arranged for the association of its brushes with switch bank terminals 45, 46 and 47 or 48, 49 and 50.

Subscriber's station B is shown in Fig. 2 connected directly to switchbank terminals 45, 46 and 47 and having the usual line and cut-off relays connected thereto. The subscriber's station B is also shown in this figure connected to code ringing equipment responsive to the association of a connector switch with switch terminals 48, 49 and 50.

Fig. 3 shows a diagrammatic representation of subscriber's station C having dial 129 associated therewith, line finder 130, first selector 131, second selector 132 and connector 133 which may be the same as shown in Fig. 1. Connector bank terminals 137, 138 and 139 connect with code ringing responsive equipment for signaling a particular person. Subscriber's station D is shown associated with a diagrammatic representation of switches for connection with the so-called answering terminals 154, 155 and 156 for connection through a relay in the code ringing equipment with the calling station.

The finder LF and selectors S1 and S2 may be of any suitable type, such as the step-by-step switch, the operation and release of which are well known.

A detailed description of the operation of the system will now be given, first in connection with a call routed from station A to station B, for regular service via terminals 45, 46 and 47, and secondly for a call from station A to station B via terminals 48, 49 and 50 through the code signaling equipment connected to the latter terminals. A description of a code call for a hospital or factory building will also be given which employs the equipment shown in Fig. 3.

Let it be assumed that the subscriber at station A desires to establish a connection with the station B and that the connection has been extended in the usual manner through line finder LF and selectors S1 and S2 to the tip, ring and sleeve terminals of connector C. When this circuit is seized by the selector S2 a circuit is closed through the windings of relay 21 which may be traced from battery through the lower winding of relay 21, normally closed lower contacts of relay 20, ring terminals and brushes of selectors S1, S2, and the line finder LF, thence over line conductor 15 and through subscriber's telephone A and dial 3, over conductor 16 and through tip

terminals and brushes of line finder LF, and selectors S1 and S2, normally closed upper contacts of relay 20 and upper winding of relay 21 to ground. Relay 21 operates which operates relay 22 through a circuit traceable from battery through the winding of relay 22 to ground on the contact of relay 21. Relay 22 in operating connects ground on its contact 3 to the sleeve terminals and brushes of selectors S1, S2 and line finder LF, thereby holding in the operated position the selectors and line finder and guarding connector C from other hunting selector circuits.

On the first break of the contacts of dial 3 for the purpose of dialing the tens digits of the called number, relay 21 releases and closes a circuit from battery through the windings of vertical magnet 31 and relay 28, contact 1 of the vertical off-normal contact assembly 32, contact 2 or relay 22 to ground on the contact of relay 21. Relay 22 is slow to release and does not release during the momentary open periods of the front contact of relay 21, while responding to the pulses of dial 3. Relay 28 and vertical magnet 31 are operated through the circuit hereinbefore retraced. As soon as the shaft of the connector switch is moved from its normal position on its first vertical step, the vertical off-normal springs 32 operate and transfer the operating circuit for relay 28 and vertical magnet 31 from contact 1 to contact 2, thereby placing the windings of relay 28 and vertical magnet 31 in series through the make contact of relay 28, and contact 2 of the vertical off-normal spring combination. This transfer is made without interrupting the circuit, since the upper springs of the vertical off-normal spring combination are of the make-before-break type. After the contacts of dial 3 are closed again after the first break, relay 21 reoperates and again closes the circuit through the winding of relay 22, before this relay has had time to release, as hereinbefore explained. On the next open period of dial 3, relay 21 again releases and transmits a second ground pulse, through the circuit of relay 28 and vertical magnet 31. Relay 28 is slow to release and remains locked up over the open periods of the back contacts of relay 21. The second ground pulse causes the shaft of the switch to take another step upward. This action continues until all required pulses for the tens digits are transmitted by dial 3 and the connector brushes 42, 43 and 44 have reached the level containing the terminals of the line being called.

After the tens digit has been dialed and dial 3 is restored to normal, relay 21 remains operated, relay 28 releases, and the winding of vertical magnet 31 is deenergized. When relay 28 releases, a circuit is closed through rotary magnet 30 for rotary stepping and a circuit is closed for relay 26. These circuits may be traced from battery through the winding of rotary magnet 30, contact 6 of relay 25 and from battery through the winding of relay 26 to a junction point, thence through the upper contact 1 of relay 27, back contact of relay 23, contact 2 of combination 32 to contact 2 of relay 22. On the first break of dial 3 for dialing the units digits of the called number, i. e., for rotary stepping, relay 21 releases and connects a ground impulse to contact 2 of relay 22 and over the rotary stepping circuit just traced. Relay 22 remains operated during dial pulses, as in the case of vertical stepping. In response to said first ground impulse rotary magnet 31 will operate and cause the switch brushes 42, 43 and 44 to rotate one step in a horizontal direction. Relay 26 operates to short-circuit the upper contacts of relay 27 to maintain the above circuit closed if relay 27 momentarily operates. Subsequent dial pulses cause rotary magnet 30 to step the switch around until the channel L1 or L1—A of the called subscriber's line is reached. Let it first be assumed that the pulses caused the connector brushes to be associated with channel L1.

When dial 103 has restored to normal the circuit for relay 26 and the rotary magnet 30 is opened since relay 21 remains operated. Slow relay 26 does not release at once. Before connecting ringing current to this line a test is made to determine whether the line is busy or idle. If busy, ground will be found on the sleeve terminal 47, and will cause the operation of test relay 27 from battery through its winding, contact 2 of relay 25, contact 3 of slow-release relay 26, conductor 55, to ground on sleeve terminal 47 through brush 44. Relay 27 in operating opens the original circuit for rotary magnet 30 and when slow-release relay 26 finally releases the second circuit established for rotary magnet 30 is opened and a holding circuit is established for relay 27. Relay 27 in operating connects the secondary winding of busy tone transformer 40 through its contacts 3, to the ring conductor 56 which indicates to the calling subscriber A that the called line is busy. Relay 27 is locked up through a circuit traced from battery through the winding of relay 27, contact 2 of relay 25, contact 2 of relay 26 is released, contact 2 of relay 27 to ground on sleeve conductor 57. Under this condition the calling subscriber will disconnect, causing the release of relays 21 and 22, thereby closing a circuit from battery through the winding of release magnet 29, contact 3 of VON combination 32, contact 3 of relay 25, contact 2 of relay 22 and contact of relay 21 to ground. Release magnet 29 is energized and causes the restoration of the connector switch to normal, including VON springs 32. Relay 27, which was locked to ground on sleeve conductor 57, releases since ground was removed by the opening of contact 3 of relay 22 when this relay released. The removal of ground from conductor 57 causes in the well-known manner the energization of relay magnets 10, 11 and 12 of the preceding switches and the consequent release of these switches.

Let it be assumed now that the line of the called subscriber station B is found idle when brushes 42, 43 and 44 encounter terminals 45, 46 and 47. Under this condition battery will be found by sleeve brush 44 on the terminal 47 connected through the winding of cut-off relay 110 and auxiliary lines busy relay 112. Under this condition relay 27 will not operate as hereinbefore described when the line L1 was found busy. After relay 26 has released upon the completion of rotary stepping, a circuit is closed for the operation of relay 25, which may be traced from aforesaid battery through the windings of relays 110 and 112, terminal 47, brush 44, through contact 2 of relay 26, lower winding of relay 25, contact 2 of relay 27 to ground on sleeve conductor 57. Relay 25 in operating locks through its upper winding and its contact 4 to ground on contact 1 of relay 22. Relay 25 also connects tip conductor 58, through its contact 1 to ground on contacts 1 of relay 24, opens the circuit of the winding of relay 27, by opening its contact 2,

connects ground from pick-up interrupter 33 through its contact 5, contact 1 of relay 23, contact 3 of relay 24 to battery through the winding of relay 23. Relay 23 operates and locks through its contact 1 to ground on contact 3 of relay 22. Relay 25 in operating also opens the lead to the rotary magnet 30 through its contacts 6, connects ring conductor 59 to ring conductor 60 through its contact 7, and joins sleeve conductor 57 to sleeve conductor 55, thereby grounding said conductor 55 for operating cut-off relay 110 and guard relay 112. Relay 110 opens the circuit to line relay 111 and relay 112 places a busy ground on sleeve terminal 53 to make the code pulsing equipment of this line busy to other calling lines.

When relay 23 operates it closes a circuit for ringing the station B. This circuit is traced from source of ringing current 34, which may comprise an interrupter connected with an alternating current generator and with battery on different segments, through contact 2 of relay 23, lower winding of relay 24, contact 4 of relay 24, over conductor 60, contact 7 of relay 25, conductor 59, through connector brush 43 and associated contact 46, over line L1 of subscriber B, contact 45 and associated brush 42, conductor 58, contact 1 of relay 25, to ground on contact 1 of relay 24. The ringer of station B is now actuated, but relay 24 does not operate until subscriber B answers by removing his receiver from the switchhook, thereby removing the ringer from the ringing current or silent interval battery circuit and connecting a low impedance bridge across the line. Ringing tone is intermittently sent back to the calling subscriber over conductor 56 during the periods when ringing current is connected with station B. The contacts of relay 24 are adjusted so that in operating a locking circuit is closed from battery through its upper winding and contact 2 to ground on contact 1 of relay 22 before the circuit through its lower winding is broken at either of its contacts 1 or 4. The operation of relay 24 disconnects ringing current from subscriber's station B. The locking circuit for relay 23 is also opened causing the release of the latter relay to disconnect the ringing source 34. In some instances the called subscriber such as the subscriber at station B may remove his receiver to make a call after a connector has been connected to his line, but before relay 23 has been operated by pick-up interrupter 33. To guard this condition a circuit is provided to operate relay 24 before ringing current is applied to this called station. This circuit may be traced from battery through contact 2 of relay 23, lower winding of relay 24 and thence over the line conductors as traced through station B to ground on contact 1 of relay 24. Under this condition the locking circuit for relay 24 is established through its upper winding in the same manner as previously described.

The conversational circuit between the calling and called subscribers is completed by relay 24 by closing through the tip conductors on its contact 1, and the ring conductors on its contact 4. Relay 24 in operating also completes the operating circuit for relay 20 through subscriber's station B, which may be traced from battery through the upper winding of relay 20, over the tip conductors of connector C and the line of station B, through station B including dial 123, ring conductors of the line and of connector C to ground through the lower winding of relay 20. Relay 20 in operating reverses the direction of current over the line of calling station A, thereby causing the operation of an associated line message register (not shown) in the well-known manner. After the aforesaid reversal, battery through the lower winding of relay 21 is connected by contact 1 of relay 20 of the tip conductor, and ground through the upper winding of relay 21 by contact 2 of relay 20 to the ring conductor.

At the end of the conversation, when the calling subscriber disconnects, relays 21 and 22 release, removing ground from the upper locking windings of relays 24 and 25, which release. The release of relay 25 closes a circuit for operating release magnet 29, which may be traced from battery through the winding of magnet 29, contact 3 of VON combination 32, contact 3 of relay 25, contact 2 of relay 22, and the contact of relay 21 to ground. The operation of relay magnet 29 restores the connector switch to normal in the well-known manner. Also, the removal of ground from conductor 57 causes the operation of release magnets 10, 11 and 12 and the immediate release of the preceding switches LF, S1 and S2.

The system will now be described for code calling under the control of the calling subscriber who wishes a particular person to answer the call at the called station. For this type of call, the connector C is directed to the second set of terminals 48, 49 and 50 to which the called station B is available over channel L1—A as well as being available over terminals 45, 46 and 47 and channel L1. The connector C is controlled for connection to channel L1—A by pulses in the same manner as for connection to channel L1. If terminals 48, 49 and 50 are on the same horizontal level of the switch as terminals 45, 46 and 47, only the second series of connector switch pulses are different but if these sets of terminals are on different horizontal levels both series of connector switch pulses may be different for connection to channel L1 or L1—A of subscriber's station B.

Referring back to the description of the connector C it will be remembered that a test of the line is made when brushes 42, 43 and 44 are connected to the terminals of this line. If a busy ground is encountered on the sleeve terminal, a busy tone is transmitted to the calling subscriber and if battery is encountered on the sleeve terminal the line is idle and may be seized by the connector. The same action in this respect occurs in the connector circuit when brushes 42, 43 and 44 are connected to terminals 48, 49 and 50 as described when these connector brushes were connected to terminals 45, 46 and 47. Let it be assumed that the line of the called subscriber's station B is found idle when brushes 42, 43 and 44 encounter the code signaling equipment or auxiliary line circuit connected to line terminals 48, 49 and 50 and that circuits have been established in the connector for seizing this line by way of its auxiliary line channel. A circuit is thus established for relay 113 from battery through its winding, back contact of relay 112, sleeve terminal 50, contact 8 of relay 25, operated, to ground on contact 3 of relay 22 which is operated. The operation of relay 113 establishes a circuit for operating cut-off relay 110 from battery through its winding, contact 1 of relay 113 to ground. This also places a busy ground on sleeve line terminal 47.

Relay 23 of the connector circuit operates as previously described to ground on pick-up interrupter 33 and locks to ground on contact 3 of

relay 22. This connects ringing current and battery from different segments of an interrupter 34, through contact 2 of relay 23, lower winding of relay 24, contact 4 of relay 24, conductor 60, contact 7 of relay 25, conductor 59, connector brush 43, contact 49, contact 2 of relay 113 to ground on contact 2 of relay 115. An automatically responsive code ringing device may be substituted for the interrupter 34. Relay 24 operates in the circuit traced and disconnects ringing current which in this type of connection does not actuate the bell in subscriber's station B. Relay 24 locks through its upper winding to ground on contact 1 of relay 22 and opens the locking circuit for relay 23 which releases. The release of relay 23 opens the circuit to ringing current source 34. A circuit is now established for relay 115 to open the ground connection used for tripping the ringing current. This circuit may be traced from ground through the winding of relay 115, tip terminal 48, brush 42, contact 1 of relay 25, contact 1 of relay 24, upper winding of relay 20 to battery. Relay 115 operates in the circuit traced but relay 20 does not operate due to the high resistance of relay 115. Relay 115 locks through its contact 1, contact 5 of relay 113, resistance 117 to battery.

The circuit is now prepared to receive low frequency ringing current formed into any desired code by manipulation of the dial in the calling subscriber's station A. At this time a circuit extends from battery through the lower winding of relay 21, contact 2 of relay 20, thence over the ring side of the line and through the calling subscriber station including dial 3, tip side of the line, contact 1 of relay 20, upper winding of relay 21 to ground. A second circuit extends from battery through the upper winding of relay 20 to the tip conductor 62 where one branch extends through condenser 35 to the tip of the line and to ground, through the upper winding of relay 21 and another branch extends through contacts 1 of relays 24 and 25, brush 42, terminal 48, winding of relay 114, condenser 120, terminal 49, brush 43, contact 7 of relay 25, contact 4 of relay 24, conductor 56, where one branch extends through the lower winding of relay 20 to ground and another branch through condenser 36 to the ring of the calling line and to battery through the lower winding of relay 21. Thus a circuit is formed for creating low frequency alternating current from interruptions of dial 3 corresponding to the speed of the dial. Relay 114 is designed to operate on this alternating current according to any code desired by the calling subscriber.

The operation of relay 114 energizes relay 116 over an obvious circuit and the operation of relay 116 connects the ringing current source 124, through contacts 1 and 2 to leads 125 and 126 connected to the line leading to subscriber's station B for ringing the bell in this station. A code signal may be given to differentiate from the machine ringing transmitted over channel L1 and a code may be formed to call a particular person to the telephone in station B. During each ringing period relay 127 is operated from ground on contact 3 of relay 116. Relay 127 remains operated momentarily after relay 116 has released in order to drain the subscriber's station ringer and line of any charge through resistances 118 and 119 to battery and ground after each code ringing period.

The removal of the receiver in station B completes a circuit for connector relay 20. This circuit may be traced from battery through the upper winding of relay 20, thence over conductors 62 and 53, brush 42, terminal 48, contact 4 of relay 113, contact 1 of relay 127, contact 1 of relay 116, conductor 125, station B including dial 123, conductor 126, contact 2 of relay 116, contact 2 of relay 217, contact 3 of relay 113, terminal 49, brush 43, conductors 59, 60 and 56, lower winding of relay 20 to ground. Relay 20 in operating reverses the direction of current over its contacts and the calling line thereby causing the operation of a message register (not shown) in the well-known manner.

At the end of conversation, when the calling party A disconnects, relays 21 and 22 release, removing ground from the upper locking windings of relays 24 and 25 which release. The release of relay 25 closes a circuit for operating release magnet 29 as previously described causing the release of the connector and the preceding switches LF, S1 and S2.

The code dialing system using the dial in the calling subscriber's station for creating alternating current in a connector circuit and associated responsive circuit just described is also herein applied to a code signaling arrangement for hospitals and factories as shown in Fig. 3. For a description of this let it be assumed that the subscriber in station C has energized the line finder 130, first selector 131, second selector 132 and connector 133 by pulses from dial 129 in the same manner as herein described for the operation of the same switching equipment, Fig. 1. The connector brushes 134, 135 and 136 are thus connected with terminals 137, 138 and 139 on a particular switch level leading to the code responsive equipment for ringing bells in different locations of a hospital or factory building. Let it also be assumed that the person wanted is not available in his office. Since the connector 133 is the same as the connector C shown in Fig. 1, a busy or idle test of the line is made and if the line is idle a circuit is established for relay 143 from battery through its winding, terminal 139, brush 136 to ground on contact 3 of a relay the same as relay 22. This establishes a circuit for tripping off the ringing current in the manner previously described by connecting ground from contact 2 of relay 144 through contact 2 of relay 143, terminal 138, brush 135 to the ring conductor of the connector which operates relay 24 and releases relay 23. The operation of relay 24 establishes a circuit for relay 144 to remove the above ground circuit from the ring conductor. The circuit for relay 144 may be traced from ground through its winding and contact 1, terminal 137, brush 134 to battery through the winding of relay 20. Relay 144 locks through its contact 1, contact 4 of relay 143, resistance 148 to battery. Relay 20 does not operate in the circuit traced because of the high resistance of relay 144.

A code ringing circuit has now been set up including the connector circuit and relay 141 and condenser 142 which is the same as previously described for the operation of relay 114, and by the manipulation of the dial the subscriber at station C may send a prearranged or private code to operate a number of bells the same as bells 146 in different locations of a hospital or factory building. The operation of the dial thus creates low frequency alternating current in the connector circuit and the circuit of relay 141 which actuates the latter relay. This operation of relay 141 establishes an obvious energizing circuit for

relay 145 which connects ringing current source 170 with a number of bells such as 146. Relay 147 is operated by relay 145 to drain the signal bells and line of any charge after each code ringing period.

A person hearing his code on the bells may respond from the nearest subscriber's set by dialing a certain number known as the answering number, with the result that an automatic switch connects with the code signaling equipment at the so-called answering set of terminals as fully described in Patent 1,585,909 to M. L. Nelson, May 25, 1926. This connects brushes 157, 158 and 159 with switchbank terminals 154, 155 and 156 to complete the connection between the calling and the called subscribers' stations. Brush 159 having ground connected thereto establishes a circuit for relay 140 which completes the conversational connection and causes the reversal of the battery connection over the calling line by the operation of relay 20. The circuit for relay 20 constitutes part of the transmission circuit and may be traced from battery and ground through the windings of relay 20 over the tip and ring conductors to brushes 134 and 135, through contacts 1 and 3 of relay 143, contacts 1 and 2 of relay 140 and retardation coil 150. A similar transmission and signaling circuit extends through retardation coil 151.

At the end of conversation, connector 133 is released by restoring the receiver in the calling station as previously described which also restores the first and second selectors 131 and 132 and the line finder 130. The release of the connector 133 releases relay 143 which causes the release of relay 144. Restoring the receiver in the called station likewise restores the switches associated therewith which restores relay 140 and the circuit may again be used for a code ringing signal.

What is claimed is:

1. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, a switching system connected to said lines including connector switches, means including switching and transmission circuits in said connector switches for selecting switchbank line terminals responsive to dial pulses from a calling subscriber station, a code signaling circuit for a subscriber station connected to said switchbank line terminals, means in said connector circuit and said code signaling circuit responsive to the selection of terminals connected to said code signaling circuit to form a circuit in said connector and code signaling circuit for causing the flow of alternating current responsive to further manipulation of the dial in the calling subscriber's station, and means in said code signaling circuit responsive to said flow of alternating current for ringing the bell in the associated subscriber's station in any code created by the operations of said dial.

2. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, a switching system connected to said lines including connector switches, means including switching and transmission circuits in said connector switches for selecting switchbank line terminals responsive to dial pulses from a calling subscriber station, a code signaling circuit for a subscriber station connected to said switchbank line terminals, means in said connector circuit and said code signaling circuit when associated together for forming a circuit in said connector and the selected code signaling circuit for creating low frequency alternating current responsive to further manipulation of the dial, said frequency corresponding to the speed of said dial and means in said code signaling circuit operatively responsive to said low frequency alternating current for connecting a higher frequency alternating current source with said line for ringing the subscriber's station bell.

3. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, a switching system connected to said lines including connector switches having automatic ringing means therein, means in said connector switches for selecting switchbank line terminals responsive to dial pulses from a calling subscriber station, code signaling circuits, a subscriber station having one channel of its line connected directly to one set of switchbank terminals and a second channel of its line connected to a code signaling circuit which is connected to a second set of switchbank terminals, said station being selectable over the direct channel for automatically controlled ringing of the subscriber's station bell and the second channel for code ringing under the control of the calling subscriber, means in a code signaling circuit and a connector switch when associated therewith for forming a circuit to cause the flow of alternating current responsive to further manipulation of the dial in the calling subscriber's station and means in said code signaling circuit responsive to said flow of alternating current for ringing the bell in the associated subscriber's station in a code created by the operations of the dial in the calling subscriber's station.

4. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, a switching system connected to said lines including connector switches, means in said connector switches for selecting switchbank line terminals responsive to dial pulses from a calling subscriber station, code signaling circuits, a subscriber's station having one channel of its line connected directly to one set of switchbank terminals and a second channel of its line connected to a code signaling circuit which is connected to a second set of switchbank terminals, said station being available over either channel, automatic ringing means in said connector circuits for ringing the subscriber's station bell in a predetermined order responsive to the association of said connector with the channel leading directly to said subscriber's station, means in said code signaling circuit responsive to the association of a connector circuit with said second channel for cooperating with said connector circuit to disconnect said automatic ringing and form a circuit for causing the flow of alternating current responsive to further manipulation of the dial in the calling subscriber's station in any code created by said calling subscriber and means in said code signaling circuit responsive to said flow of alternating current for ringing the bell in said subscriber's station in an order as controlled by the operations of the calling subscriber's station dial.

5. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, a switching system connected to said lines including connector switches, means in said connector switches for selecting switchbank line terminals responsive to dial pulses from a calling subscriber station, code signaling circuits, a subscriber's station having one channel of its line connected directly to one

set of switchbank terminals and a second channel of its line connected to a code signaling circuit which is connected to a second set of switchbank terminals, said station being available over either channel, automatic ringing means in said connector circuits for ringing the subscriber's station bell in a predetermined order responsive to the association of a connector switch with the channel leading directly to said subscriber's station, a relay in said code signaling circuit operatively responsive to the association of a connector with said second channel to operate the connector means for disconnecting said automatic ringing, means responsive to the operation of said connector means to alter said code signaling circuit by the operation of a second relay to form with said connector circuit, a circuit for creating alternating current responsive to further manipulation of the dial, said alternating current being of low frequency corresponding to the speed of said dial, and a relay in said code signaling circuit operatively responsive to said low frequency alternating current for connecting a higher frequency alternating current source with said line for ringing the subscriber's station bell in an order as controlled by the operations of said dial.

6. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, a switching system connected to said lines including connector switches having switching and transmission circuits, means in said connector switches for selecting switchbank line terminals responsive to dial pulses from a calling subscriber station, a code signaling circuit connected to said switchbank line terminals and having a plurality of bells connected thereto, means responsive to the selection of said code signaling circuit by a connector for operating both the code signaling circuit and connector circuit to form a circuit in said connector and code signaling circuits for causing the flow of alternating current responsive to further manipulation of the dial in the calling subscriber's station in any code created by said manipulation of said dial, means in said code signaling circuit responsive to the flow of said alternating current for ringing said plurality of bells according to the code created, an answering subscriber station having a dial and switches connected thereto, means responsive to the manipulation of said latter dial for operating said latter switches for effecting connection with said code signaling circuit, and means in said code signaling circuit operatively responsive to said connection for connecting said answering subscriber's station with said calling line through said connector switch.

7. In an automatic switching telephone office, subscriber's stations having dials therein connected by lines to said office, selectors and connector switches having circuits and equipment operably responsive to the manipulation of the dial in a calling subscriber's station for associating the connector switch brushes with connector switch terminals to select a called line, auxiliary equipment individual to lines connected to connector switch terminals, means in said auxiliary equipment responsive to the selection thereof by a connector for operating the connector circuit to associate the calling line with said auxiliary equipment, means in the connector circuit and said auxiliary equipment responsive to said latter action for creating a signaling circuit responsive to further manipulation of the dial for operating said auxiliary line equipment in code of any character as organized by the calling subscriber and means in said auxiliary equipment responsive to said letter operations for signaling the called subscriber's station in an equivalent code.

8. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, selectors and connectors operably responsive to the manipulation of the dial in a calling subscriber's station for associating the connector switch brushes with connector switch terminals of the called line, ringing equipment in said connector automatically operated by the selection of the called station line for associating a ringing current circuit therewith for ringing the bell in said called station, tripping equipment including a relay in said connector to open the ringing current circuit when the resistance of the line is lowered such as by the removal of the receiver from the switchhook, lines having auxiliary equipment therein connected to the connector switch terminals, means in said auxiliary line equipment for operating said relay in the connector to trip off said connector automatic ringing circuit and connect the calling subscriber's station with alternating current responsive means in said auxiliary equipment, which arranges a circuit formation in the connector and the auxiliary equipment, providing means to create alternating current responsive to further manipulation of the dial in the calling subscriber's station for operating said alternating current responsive means and means operated by said alternating current responsive means for signaling the called subscriber's station.

9. In an automatic switching telephone office, subscribers' stations having dials therein connected by lines to said office, selectors and connectors operably responsive to the manipulation of the dial in a calling subscriber's station for connecting said station to a called station by associating the connector switch brushes with switch terminals of the called line, ringing equipment in said connector automatically operated by the selection of the called station line for associating a ringing current circuit therewith for ringing the bell in said call station, tripping equipment including a relay in said connector to open the ringing current circuit when the resistance of the line is lowered such as by the removal of the receiver from the switchhook, lines having auxiliary equipment therein connected to the connector switch terminals, means in said auxiliary line equipment for operating said relay in the connector to trip off said connector automatic ringing circuit and connect the calling subscriber's station with alternating current responsive means in said auxiliary equipment, which arranges a circuit formation in the connector and the auxiliary equipment, providing means to create alternating current responsive to further manipulation of the dial in the calling subscriber's station for operating said alternating current responsive means, means operated by said alternating current responsive means for signaling the called subscriber's station by associating another ringing current source therewith and means in said auxiliary equipment responsive to the removal of the receiver in the called station to trip off said latter ringing current source and connect said called subscriber's station with said calling subscriber's station.

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