May 26, 1942. A. LESTI 2,284,329

TELEPHONE SYSTEM

Filed July 31, 1940 2 Sheets-Sheet 1

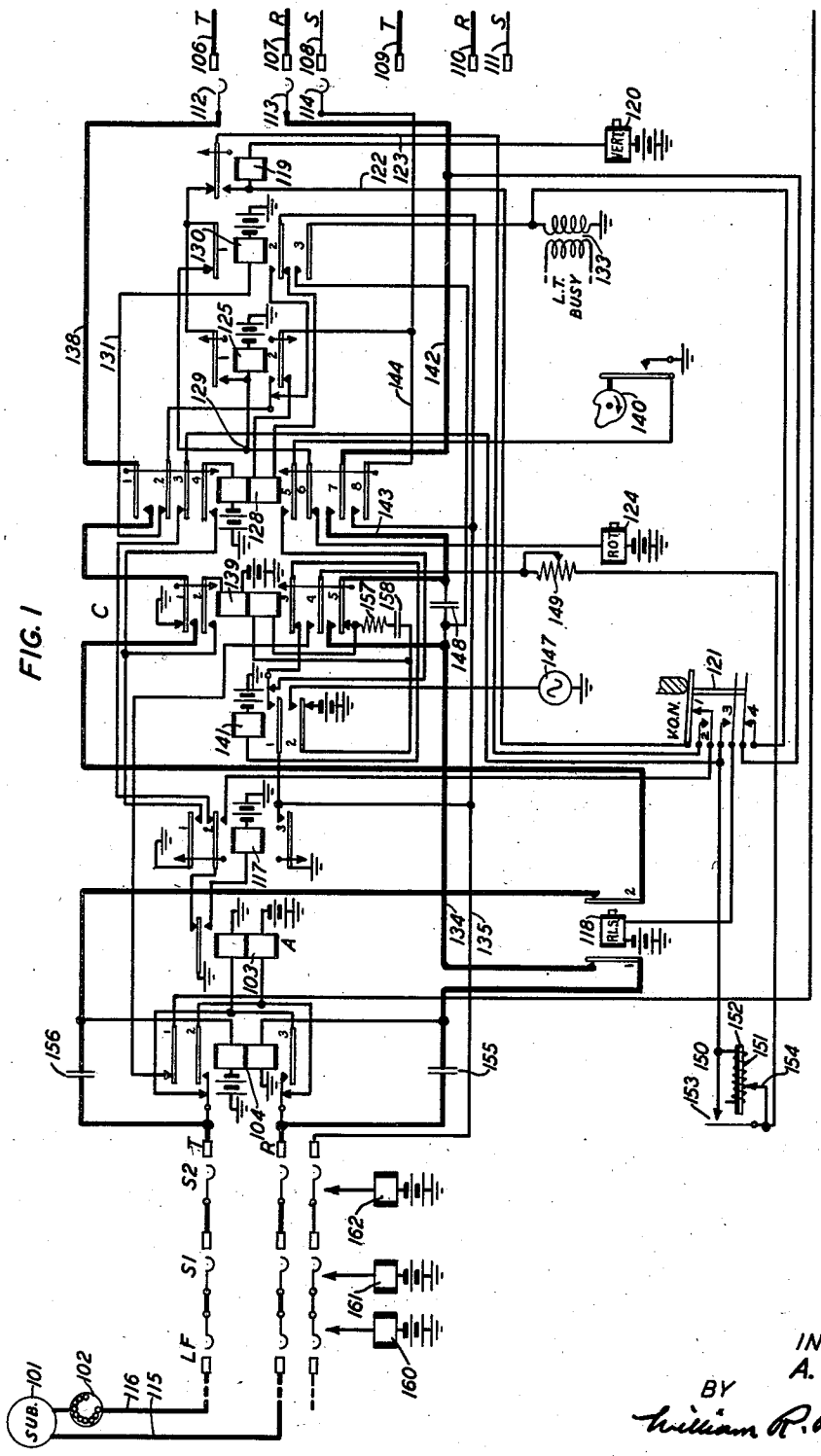


FIG. 1

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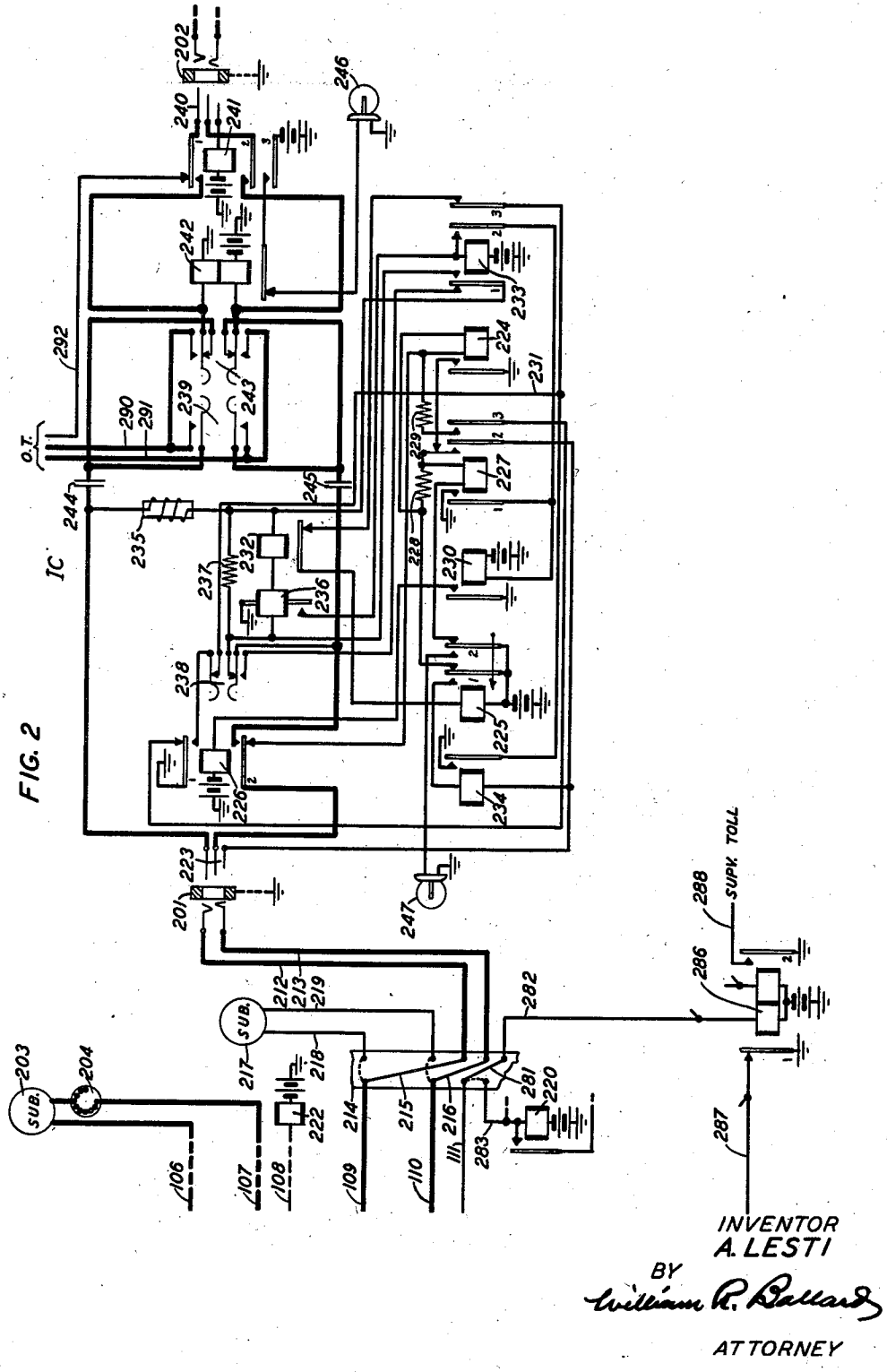


FIG. 2

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UNITED STATES PATENT OFFICE

2,284,329

TELEPHONE SYSTEM

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Application July 31, 1940, Serial No. 348,645

10 Claims. (Cl. 179—27)

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

The objects are to simplify and improve the releasing operations of established connections; to prevent the release of one connection from interfering with other connections; and otherwise to improve such systems.

Systems have been devised heretofore in which the immediate release of all switches of the connection takes place when the calling subscriber replaces his receiver and in which release of the final or connector switch is effected at the end of a measured interval following the replacement of the called subscriber's receiver provided the calling party is slow in hanging up his receiver. Moreover, it is common practice to employ the relay of the connector that responds to the called subscriber's switchhook not only for the purpose of controlling the release circuits but also to effect a reversal in the direction of current flow in the established connection for supervision or for message register operation.

A feature of the present invention is an improvement in these prior systems which consists in including a thermostat in a connector switch having an element heated by electric current in a circuit established following the replacement of the called subscriber's receiver when the calling subscriber's receiver has not been replaced, causing the thermostat to close a contact after a regulated time interval for releasing the connector switch.

Another and related feature consists in the use of a device common to a plurality of connectors cooperatively associated with the thermostatic releasing unit to prevent interference between the operation of connectors used for intercepting calls and the operation and release of connectors associated with called subscribers' stations.

Another and related feature consists in associating a distinctive signal with the calling subscriber's line to signal the calling subscriber to replace the receiver after the automatic release of a connector by the called subscriber.

Another and related feature consists in opening the conductors of a connector leading to the subscriber line terminals during the release of a connector, to prevent the association of a current source with these terminals if the calling subscriber has not replaced his receiver.

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 also in the appended claims.

Referring to the drawings, Fig. 1 shows abbreviated diagrammatic representations of a subscriber's telephone 101 and dial 102, a line finder LF, and first and second selectors, S1 and S2, all of the usual type in step-by-step offices including a diagrammatic showing of the usual release magnets. There is also shown in detail a connector switch C including an auxiliary releasing circuit the function of which is to effect the release of connector C. At the right of Fig. 1 are shown connector terminals associated with conductors 106, 107, 108, 109, 110 and 111 leading to Fig. 2. To these terminals connector brushes 112, 113 and 114 have access.

In Fig. 2 there are shown two subscribers' stations 203 and 217, an intercepting operator's cord circuit IC, which is adapted to answer intercepted calls and to complete these calls when required, and also a part of a cross-connecting frame 214.

Assume that it is desired to discontinue service on the line of station 217, and that it is necessary that incoming calls for this station be directed to an intercepting operator. For normal service the conductors 218, 219 and 283 for line 217 are connected at frame 214 to conductors 109, 110 and 111, which lead to the terminals of connector C. The line is changed to intercept service by cross-connecting conductors 109, 110 and 111 to conductors 212, 213 and 282 by means of jumpers 215, 216 and 281, respectively, at the same time opening jumper connections with conductors 218, 219 and 283 shown by dotted lines. At the left of Fig. 2 is shown another subscriber's station 203, with dial 204, which is associated with line conductors 106, 107 and 108 and the connector switch terminals of Fig. 1. For descriptive purposes it is assumed that the subscriber's line to station 203 is connected for regular, non-intercepted service. Its frame connections and line circuit are of the usual type found in step-by-step dial offices and are omitted here, the omissions being indicated by the dotted lines.

The finder LF and selectors S1 and S2 may be of any suitable type, such as the Strowger 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 to station 203, for regular non-intercepted service, and secondly for a call to

the intercepting operator who answers with the intercepting cord IC.

Let it be assumed that the subscriber of line 101 desires to establish a connection with the station 203 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 103 which may be traced from battery through the lower winding of relay 103, normally closed contacts 3 of relay 104, ring terminals and brushes of selectors S1, S2, and the line finder LF, thence over line conductor 115 and through subscriber's telephone 101 and dial 102, over conductor 116 and through tip terminals and brushes of line finder LF, and selectors S1 and S2, normally closed contacts 2 of relay 104 and upper winding of relay 103 to ground. Relay 103 operates which operates relay 117 through a circuit traceable from battery through the winding of relay 117 to ground on the contact of relay 103. Relay 117 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 102 for the purpose of dialing the tens digits of the called number, relay 103 releases and closes a circuit from battery through the windings of vertical magnet 120 and relay 119, lead 122, contact 1 of the vertical off-normal contact assembly 121, contact 2 of relay 117 to ground on the contacts of relay 103. Relay 117 is slow to release and does not release during the momentary open periods of the front contact of relay 103, while responding to the pulses of dial 102. Relay 119 and vertical magnet 120 are operated through the circuit hereinbefore traced. 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 121 operate and transfer the operating circuit for relay 119 and vertical magnet 120 from conductor 122, to conductor 123, thereby placing the windings of relay 119 and vertical magnet 120 in series through the make contact of relay 119, and contact 2 of the vertical off-normal spring combination 121. This transfer from conductor 122 to 123 is made without interrupting the circuit, since the three upper springs of combination 121 are of the make-before-break type. After the contacts of dial 102 are closed again after the first break, relay 103 reoperates and again closes the circuit through the winding of relay 117, before this relay has had time to release, as hereinbefore explained. On the next open period of dial 102, relay 103 again releases and transmits a second ground pulse, through the circuit of relay 119 and vertical magnet 120. Relay 119 is slow to release and remains locked up over the open periods of the back contacts of relay 103. The second ground pulse aforesaid 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 102 and the connector brushes 112, 113 and 114 have reached the level containing the terminals of the line being called.

After the tens digit has been dialed and dial 102 is restored to normal, relay 103 remains operated, relay 119 releases, and the winding of vertical magnet 120 is deenergized. When relay 119 releases, a circuit is closed through rotary magnet 124 for rotary stepping and a circuit is closed for relay 125. These circuits may be traced from battery through the winding of rotary magnet 124, contact 6 of relay 128 to junction point 129, and from battery through the winding of relay 125 to said junction point 129, thence through the upper contact 1 of relay 130, back contact of relay 119, over conductor 123, contact 2 of combination 121 to contact 2 of relay 117. On the first break of dial 102 for dialing the units digits of the called number, i. e., for rotary stepping, relay 103 releases and connects a ground impulse to contact 2 of relay 117 and over the rotary stepping circuit just traced. Relay 117 remains operated during dial pulses, as in the case of vertical stepping. In response to said first ground impulse rotary magnet 124 will operate and cause the switch brushes 112, 113 and 114 to rotate one step in a horizontal direction. Relay 125 operates to short-circuit the upper contacts of relay 130 to maintain the above circuit closed if relay 130 momentarily operates. Subsequent dial pulses cause rotary magnet 124 to step the switch around until the line 203 of the called subscriber is reached.

When dial 102 has restored to normal the circuit for relay 125 and the rotary magnet 124 is opened since relay 103 remains operated. Slow relay 125 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 connected to conductor 108, and will cause the operation of test relay 130 from battery through its winding, contact 2 of relay 128, contact 2 of slow release relay 125, conductor 144, to ground on sleeve conductor 108 through brush 114. Relay 130 in operating opens the original circuit for rotary magnet 124 and when slow-release relay 125 finally releases the second circuit established for rotary magnet 124 is opened and a holding circuit is established for relay 130. Relay 130 in operating connects the secondary winding of busy tone transformer 133 through its contacts 3, to the ring conductor 134 which indicates to the calling subscriber 101 that the called line is busy. Relay 130 is locked up through a circuit traced from battery through the winding of relay 130, contact 2 of relay 128, contact 2 of relay 125 released, contact 2 of relay 130 to ground on sleeve conductor 135. Under this condition the calling subscriber will disconnect, causing the release of relays 103 and 117, thereby closing a circuit from battery through the winding of release magnet 118, contact 3 of VON combination 121, contact 3 of relay 128, contact 2 of relay 117 and contact of relay 103 to ground. Release magnet 118 is energized and causes the restoration of the connector switch to normal, including VON springs 121. Relay 130, which was locked to ground on sleeve conductor 135, releases since ground was removed by the opening of contact 3 of relay 117 when this relay released. The removal of ground from conductor 135 causes in the well-known manner the energization of release magnets 160, 161 and 162 of the preceding switches and the consequent release of these switches.

Let it be assumed now that the line 203 of the called subscriber is found idle. Under this condition battery will be found by sleeve brush 114 on the terminal connected to sleeve conductor 108 through the winding of cut-off relay 222. Under this condition relay 130 will not operate

as hereinbefore described when the line 203 was found busy. After relay 125 has released upon the completion of rotary stepping, a circuit is closed for the operation of relay 128, which may be traced from aforesaid battery connection on brush 114, through contact 2 of relay 125, lower winding of relay 128, contact 2 of relay 130, to ground on sleeve conductor 135. Relay 128 in operating locks through its upper winding and its contact 4 to ground on contact 1 of relay 117. In operating relay 128 also connects tip conductor 138, through its contact 1 to ground on contacts 1 of relay 139; opens the circuit of the winding of relay 130, by opening its contact 2; connects ground from pick-up interrupter 140 through its contact 5, contact 1 of relay 141, contact 3 of relay 139 to battery through the winding of relay 141. Relay 141 operates and locks through its contact 1 to ground on contact 3 of relay 117. Relay 128 in operating also opens the lead to the rotary magnet 124 through its contacts 6; connects ring conductor 142 to ring conductor 143 through its contact 7, and joins sleeve conductor 135 to sleeve conductor 144, thereby grounding said conductor 144 for operating cut-off relay 222, and guarding the terminals of the line of subscriber 203 from seizure by another connector.

When relay 141 operates it closes a circuit for ringing the station 203. This circuit is traced from source of ringing current 147, which may comprise an interrupter connected with an alternating-current generator and with battery on different segments, through contact 2 of relay 141, lower winding of relay 139, contact 5 of relay 139, over conductor 143, contact 7 of relay 128, conductor 142, through connector brush 113 and associated contact, over line of subscriber 203, connector brush 112 and associated contact, conductor 138, contact 1 of relay 128, to ground on contact 1 of relay 139. The ringer (not shown) of station 203 is now actuated, but relay 139 does not operate until subscriber 203 answers by removing his receiver from the switchhook, thereby removing the ringer from the circuit and connecting a low impedance bridge across the line. Ringing tone is sent back to the calling subscriber over conductor 134 during the periods when ringing current is connected with station 203. The contacts of relay 139 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 117 before the circuit through its lower winding is broken at either of its contacts 1 or 5. The operation of relay 139 disconnects ringing current from subscriber's station 203. The locking circuit for relay 141 is also opened causing the release of the latter relay to disconnect the ringing source 147. In some instances the called subscriber such as the subscriber at station 203 may remove his receiver to make a call after a connector has been connected to his line, but before relay 141 has been operated by pick-up interrupter 140. To guard this condition a circuit is provided to operate relay 139 before ringing current is applied to this called station. This circuit may be traced from battery through contact 2 of relay 141, lower winding of relay 139 and thence over the line conductors as traced through station 203 to ground on contact 1 of relay 139. Under this condition the locking circuit for relay 139 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 139 by closing through the tip conductors on its contact 1, and the ring conductors on its contact 5. Relay 139 in operating also completes the operating circuit for relay 104, which may be traced from battery through the upper winding of relay 104, over the tip conductors of connector C and the line of station 203, through station 203 including dial 204, ring conductors of the line and of connector C to ground through the lower winding of relay 104. Relay 104 in operating reverses the direction of current over the line of calling station 101, 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 103 is connected by contact 2 of relay 104 to the tip conductor, and ground through the upper winding of relay 103 by contact 3 of relay 104 to the ring conductor.

At the end of the conversation, when the calling subscriber disconnects, relays 103 and 117 release, removing ground from the upper locking windings of relays 139 and 128, which release. The release of relay 128 closes a circuit for operating release magnet 118, which may be traced from battery through the winding of magnet 118, contact 3 of VON combination 121, contact 3 of relay 128, contact 2 of relay 117, and the contact of relay 103 to ground. The operation of release magnet 118 restores the connector switch to normal in the well-known manner. Also, the removal of ground from conductor 135 causes the operation of release magnets 160, 161 and 162 and the immediate release of the preceding switches LF, S1 and S2.

A description will now be given of that feature of the system whereby the called subscriber by hanging up his receiver is enabled to effect a release of the connector C when the calling subscriber fails to disconnect and thus free his line for other calls. When the called subscriber at station 203 disconnects, relay 104 releases, but the calling party by keeping his receiver off the switchhook maintains the operative circuit for relay 103 and therefore relays 117, 139 and 128 remain operated. With these relays operated and relay 104 released an auxiliary release circuit is closed from battery through the winding of release magnet 118, contact 3 of VON combination 121, heating coil 151 of thermostat 150, variable resistance 149, contact 4 of relay 139, contact 1 of relay 104 to ground on contact 1 of intercepting trunk relay 286. The current flowing in the circuit above traced through the winding of release magnet 118 and heating coil 151 is insufficient to operate the release magnet but is sufficient to heat the coil 151 associated with the bi-metal element 152 of the thermostat 150. The time period for heating the element 151 may be regulated by a movable contact 154 associated with the heating coil 151 or by a movable contact on variable resistance 149. After this regulated time period has elapsed, the alignment of the bimetal element 152 is altered in such manner as to close contact 153. This eliminates the resistance of the heating coil 151 from the circuit traced through release magnet 118, which latter magnet now operates to restore the connector to normal. The operation of the release magnet opens its contacts 1 and 2 to prevent battery and ground clicks as the brushes 112 and 113 pass over line terminals while releasing. This battery and ground is associated with brushes 112 and 113 through the

windings of relay 104 and contacts of relays 139 and 128 since at this time neither relay 139 nor 128 have released. It will be remembered that the latter relays are locked to ground on contact 1 of relay 117 through contact 2 and the upper winding of relay 139 to battery and through contact 4 and the upper winding of relay 128 to battery. When the connector has completely restored to normal, the vertical off-normal contact combination 121 restores to normal which establishes a tone circuit for announcing to the calling subscriber that his receiver should be returned to the switchhook. This tone circuit may be traced through the secondary winding of tone coil 133, contact 4 of the vertical off-normal combination 121 to conductor 142, contact 7 of relay 128, contact 5 of relay 129 and thence over the ring conductor to the subscriber station 101. The subscriber, hearing this tone simulating a busy connection, replaces his receiver upon the switchhook. This action restores relay 103 to normal which opens the operating circuit for relay 117 which is slow to release, and restores to normal after a short duration of time. The release of relay 117 opens the locking circuit for relays 139 and 128 which release, placing the connector in a normally restored condition. The preceding switches LF, S1 and S2 are released as previously described. It should be noted that the emergency tone circuit is only established when the switch is in its normal position since whenever the switch is active or associated with other terminals, contact 4 of the contact combination 121 is opened.

The thermostat 150 is individual to each connector and consequently a connector which is released under the control of this thermostat will not interfere with the normal release circuit of other connectors in a connector group. As will be remembered, the normal releasing circuit for connectors of this group does not extend to the common ground on contact 1 of relay 286 but is energized over a circuit extending through normal contact 3 of relay 128, normal contact 2 of relay 117 to ground on the normal contact of relay 103. As previously stated, the only occasion for the energization of the emergency or auxiliary releasing device is when the calling party does not replace the receiver on the switchhook for a time period after the called party replaces his receiver which gives the element 151 time to be heated and close the associated contact 153 for energizing the release magnet.

A group of connectors such as connector C, Fig. 1, may have a number of lines which were associated with switch terminals, but which, through change of address of the subscriber or for other reasons, have been disconnected. The switch terminals for all lines are carried to cross-connecting frames where jumpers are used for flexibility in connecting and disconnecting subscribers' lines. Very often a line which is not in service is called by persons familiar with the line number but unaware that the line is no longer in use. Such calls are automatically routed to an intercepting operator who gives the calling party information regarding the change. Calls of this character are not registered against the calling party and consequently there is a difference in the operation of a connector associated with a trunk to an intercepting operator's position such as 1C and a connector associated with a called subscriber such as 203 who in answering the call operates the connector in the manner previously described. It is ordinarily possible to use one intercepting operator's trunk for a plurality of disconnected lines which formerly were reached through the connectors of a group and therefore the intercepting operator's trunk, comprising conductors 212, 213 and 282, jack 201 and relay 286, may be connected to all of the disconnected line terminals associated with the connector group having connector C, Fig. 1, therein and a plurality of other like connectors. When there is more than one intercepting trunk for a connector group relay 286 may be made common to these trunks and the connectors of the connector group or a plurality of relays may be made common to the connector group by the use of a chain circuit through the contacts 1 of relays such as 286 to a ground on one relay armature.

The operation of the system has been described for a regular, non-intercepted call between subscribers. The system will now be described in its operation for an intercepted call. Assume for this purpose that the calling subscriber at station 101 wishes to be connected to subscriber's line 217, whose telephone, as hereinbefore stated, has been removed from service by disconnecting conductors 109 and 110 on frame 214 from line conductors 218, and 219, and by cross-connecting said conductors 109 and 110 by jumpers 215 and 216 to conductors 212 and 213 leading to jack 201 at an intercepting operator's position. Also the line relay is disconnected, and the sleeve conductor 111 is disconnected from cut-off relay 220 and connected by jumper 281 to sleeve conductor 282 of the intercepting trunk 212—213. Let it be further assumed that a connection has been made in the usual manner by connector brushes 112, 113, 114, with terminals connected to conductors 109, 110 and 111 of line 217 which is now connected to an intercepting trunk. The description of the operation for establishing the connection with conductors 106, 107 and 108 is sufficient to explain the connection with conductors 109, 110 and 111. When the connector switch engages the terminals of line 109, 110, 111, relay 128 operates in the manner already described, the current for operating the relay being furnished in this instance from battery through the left winding of relay 286 and thence over conductors 282, 281 and 111 through the lower winding of relay 128 as previously traced. Intercepting trunk relay 286 is operated in the circuit traced which removes ground from the auxiliary connector release circuit operated by thermostat 150 for reasons which will be apparent in the following description.

Ringing current transmitted over conductors 212 and 213 through the lower winding of relay 139 in the manner previously described causes the operation of a line signal (not shown) associated with jack 201. The intercepting operator in response inserts plug 223 into jack 201, thereby closing a circuit for operating relay 224, over a circuit that may be traced from battery on contact 1 of relay 225, through the winding of relay 224, lower back contacts of relay 226, ring conductors of plug 223, and jack 201, to a ground (not shown) on the ring conductor of trunk 212—213. Relay 224 in operating, operates relay 227 through a circuit from ground on the contact of relay 224 through contact 2 of relay 227, resistance 228 to battery on contact 1 of relay 225. Relay 227 in operating, connects a ground to the ring conductor through resistance 229, thereby operating relay 139 of the connector circuit

through its lower winding to trip the ringing current in the manner described hereinbefore in connection with the call to station 203. The circuit for operating relay 139 may be traced from ground on contact 1 of relay 226, contact 3 of relay 227, resistance 229, contact 2 of relay 226, ring conductors of plug 223 and jack 201, conductor 213, jumper 216, conductor 110, brush 113, conductors 142 and 143 and associated operated contact 7 of relay 128, contact 5 and winding of relay 139, contact 2 of relay 141 to the source of ringing current 147. Relay 227 in operating locks to ground on the sleeve of jack 201, through its contact 2 and operates relay 230 through an obvious circuit. Relay 230 in operating, operates through an obvious circuit relay 226, which disconnects ground from its contact 1 and the winding of relay 224 from its contact 2. Relay 224 releases. Relay 226 in operating establishes a conversational circuit over the ring conductors of cord circuit IC, connects ground to conductor 231 through the upper contacts of key 238 and connects a high impedance and high resistance bridge across the tip and ring conductors of cord circuit IC and the tip and ring conductors of the associated connector, said bridge including retardation coil 235, and relays 232 and 236 all in series. In multiple with the series connection of the windings of relays 232 and 236 is a resistance 236. The windings of relay 104 of the connector are thus placed in series with the above bridge circuit. Relay 232 operates from battery and ground in series with the windings of relay 104 over the tip and ring conductors of cord circuit IC, through the operated contacts of relay 226, thence over tip and ring conductors of the connector C, which are closed through by operated contacts on relays 128 and 139. Because of the high resistance in the bridge circuit traced, connector relay 104 does not operate. Accordingly there is no reversal of current over the tip and ring conductors extending towards the station of calling subscriber 101, thereby avoiding the operation of the line register which, of course, should not operate on this call to an intercepting operator. Relay 232 in operating, disconnects the windings of relay 225 from contacts 3 of relay 233. Consequently relay 225 does not operate when ground is connected to conductor 231 by the aforesaid operation of relay 226. Polarized relay 236 does not operate in series with relay 232 for this type of call as the current flow through its winding is in the direction opposing operation. The intercepting operator now operates the listening key 239 and thereby connects the operator's telephone (not shown) over conductors 290 and 291 to the tip and ring conductors of the cord circuit IC. The operator converses with the calling subscriber 101 and if desired the connection may be extended over another line (not shown) which terminates on jack 202.

Consideration may now be given to a number of requirements in the operating conditions of a plurality of connectors simultaneously functioning in different manners in the same connector group. For example, a number of connectors may be connected to subscriber stations such as 203 and released therefrom in the normal manner by the disconnection of the calling subscriber and the energization of the normal release circuit as traced. Another connector in this group may be held by the calling subscriber after the called subscriber has disconnected, and thus the called line is made free by the release of relay 104 and the energization of the auxiliary release circuit through the thermostat heating coil 151 to ground on the intercepting trunk relay 286 common to the connectors of the group. Also at times which are usually infrequent a connector of this group is associated with an intercepting operator's position over an intercepting trunk. It was noted in the description of a call to an intercepting operator that relay 104 in the connector is not operated, which prevents operation of the calling line message register. The connector relays when functioning on an intercepted call are therefore in the same condition in so far as operated and released positions are concerned as they are after a call has been made to a subscriber such as 203 and this subscriber has disconnected but the calling subscriber has not disconnected. In order to provide the advantages of freeing the called subscriber's line when held by the calling subscriber, with a minimum amount of equipment added to connectors of the well-known and standard type, and prevent interference between functions of the connectors of a group, the intercepting trunk, when seized, has been arranged to disconnect the ground from the auxiliary release circuits of all connectors in the connector group. This prevents the energization of the auxiliary release circuit in the connector associated with the intercepting operator's position. At such times the auxiliary release circuit in other connectors of the group is not operative but is again operative upon the disconnection of the intercepting trunk circuit. The time consumed in answering an intercepted call is of short duration, and therefore if one connector is connected with an intercepting trunk when the auxiliary release circuit is closed in another connector, the time consumed by the intercepted call, is negligible when added to the time consumed in heating the thermostat element 151 for energizing the auxiliary releasing circuit in another connector circuit after relay 286 has released.

What is claimed is:

1. In an automatic switching telephone system, subscribers' lines, a connector switch for completing connections between calling and called subscribers' lines under the control of the calling subscriber, a device for releasing said connector switch, a thermostat individual to said connector having a heating coil and a contact operable in a regulated time period, a releasing circuit for energizing said device to release said connector established by the closing of said thermostat contact, and means only under the joint control of the calling subscriber and the called subscriber for heating said coil to close said thermostat contact.

2. In an automatic switching telephone system, subscribers' lines, a connector switch for completing connections between calling and called subscribers' lines under the control of the calling subscriber, a relay operated and released under the control of the calling subscriber, a relay operated and released under the control of the called subscriber, a device for releasing said connector switch, a thermostat individual to said connector having a heating coil and a contact operable in a regulated time period by electrical current, a releasing circuit for energizing said device to release said connector established by the closing of said thermostat contact, and means effective on said first relay operated and said second relay released for heating said coil to close said thermostat contact.

3. In an automatic switching telephone system, subscribers' stations, a connector switch for

completing connections between calling and called subscribers' stations under the control of the calling subscriber, a relay operated and released under the control of the calling subscriber, a second relay operated and released under the control of the called subscriber, a connector switch releasing device, a releasing circuit for energizing said device, means under the control of said first relay released for establishing said releasing circuit, an auxiliary releasing circuit for energizing said device including a thermostat having a heating coil and a contact operable in a regulated time period, means under the control of said first relay operated and said second relay released for establishing said auxiliary release circuit for heating said element to cause the closure of said contact for operating said release device, and means responsive to establishing either of said releasing circuits for disconnecting said connector switch from the called subscriber's station.

4. In an automatic switching telephone system, subscribers' stations, a connector switch for completing connections between calling and called subscribers' stations under the control of the calling subscriber, talking conductors established by the operation of said connector switch, a relay operated and released under the control of the calling subscriber, a second relay operated and released under the control of the called subscriber, a connector switch releasing magnet, a thermostat having a heating coil and a contact operated in a regulated time period, a releasing circuit for energizing said magnet established by the closing of said thermostat contact, means under the control of said first relay operated and said second relay released for establishing said releasing circuit, means responsive to the establishing of said releasing circuit for disconnecting said connector switch from the called subscriber's station, and means operated by said release magnet for opening the connector talking conductors before said switch and conductors are disconnected from the called station.

5. In an automatic switching telephone system, subscribers' lines, a connector switch for completing connections betwen calling and called subscribers' lines under the control of the calling subscriber, a relay operated and released under the control of the calling subscriber, a relay operated and released under the control of the called subscriber, a releasing device for said connector switch, a thermostat having a heating coil and a contact operable in a regulated time period by electrical current, a releasing circuit for energizing said device established by the closing of said thermostat contact, means effective on said first relay operated and said second relay released for heating said coil to close said thermostat contact, and means responsive to the release of said connector switch for connecting a distinctive signal to said calling subscriber's line.

6. In an automatic switching telephone system, subscribers' lines, intercepting trunks, a plurality of connector switches for completing connections between calling and called subscribers' lines and between calling subscribers' lines and intercepting trunks, each connector including a thermostat having a heating coil and a contact operable by electrical current in a regulated time period, a relay operated and released under the control of the calling subscriber, a second relay operated and released under the control of the called subscriber, a switch releasing device, a releasing circuit for energizing said device established by the closing of said thermostat contact, means effective on said first relay operated and said second relay released for establishing said releasing circuit to close said contact, means responsive to the operation of said magnet for disconnecting said connector switch from a called subscriber's line, and means in said intercepting trunk circuit operable when seized by one of said connectors for cooperating with said plurality of connector switches for disabling said releasing circuit.

7. In an automatic switching telephone system, a plurality of connector switches, subscribers' lines incoming to said connector switches, subscribers' lines outgoing from said connector switch terminal banks, intercepting trunks associated with certain terminals of said terminal banks common to said plurality of connector switches, a thermostat having a heating coil and a contact operated in a regulated time period individual to each connector switch, a releasing device for said connector switch, a relay operated and released under the control of the calling subscriber, a second relay operated and released under the control of the called subscriber, a releasing circuit for energizing said device established by the closing of said thermostat contact, means effective on said first relay operated and said second relay released for heating said coil to close said thermostat contact, means responsive to the operation of said device for disconnecting one of said connector switches from a called subscriber's line, and a relay in said common intercepting trunk circuit operable in response to the seizure of said trunk by a connector for cooperating with said plurality of connector switches to disable said releasing circuit.

8. In an automatic switching telephone system, subscribers' lines, a connector switch for completing connections between calling and called subscriber lines under the control of the calling subscriber, a device having an electrically operable magnet for releasing said switch, a thermostat having a bimetal element, a heating coil and a contact operable in a regulated time period, a releasing circuit extending in series through said heating coil and said release magnet for heating said coil to alter the alignment of said bimetal element which closes said contact to shunt the heating coil and cause an increase of current through said magnet for energizing said magnet, and means under the joint control of the calling subscriber and the called subscriber for establishing said releasing circuit to operate said device and release said connector switch.

9. In an automatic switching telephone system, subscribers' lines, a connector switch for completing connections between calling and called subscribers' lines under the control of the calling subscriber, a relay operated and released under the control of the calling subscriber, a relay operated and released under the control of the called subscriber, a magnet for releasing said connector switch, an electrically operable device having a winding and a contact individual to said connector switch, an electrical circuit extending through said device winding and said magnet for energizing said device to close its contact for shunting said winding to operate said magnet for releasing said connector switch and means effective on said first relay operated and said second relay released for establishing said circuit.

10. In an automatic switching telephone sys-

tem, subscribers' lines, a connector switch for completing connections between calling and called subscribers' lines under the control of the calling subscriber, a relay operated and released under the control of the calling subscriber, a relay operated and released under the control of the called subscriber, a device for releasing said connector switch, a thermostat having a heating coil and a contact operable by electrical current, a releasing circuit for energizing said device established by the closing of said thermostat contact to release said connector switch and means effective on said first relay operated and said second relay released for heating said coil to close said thermostat contact for establishing said releasing circuit.

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