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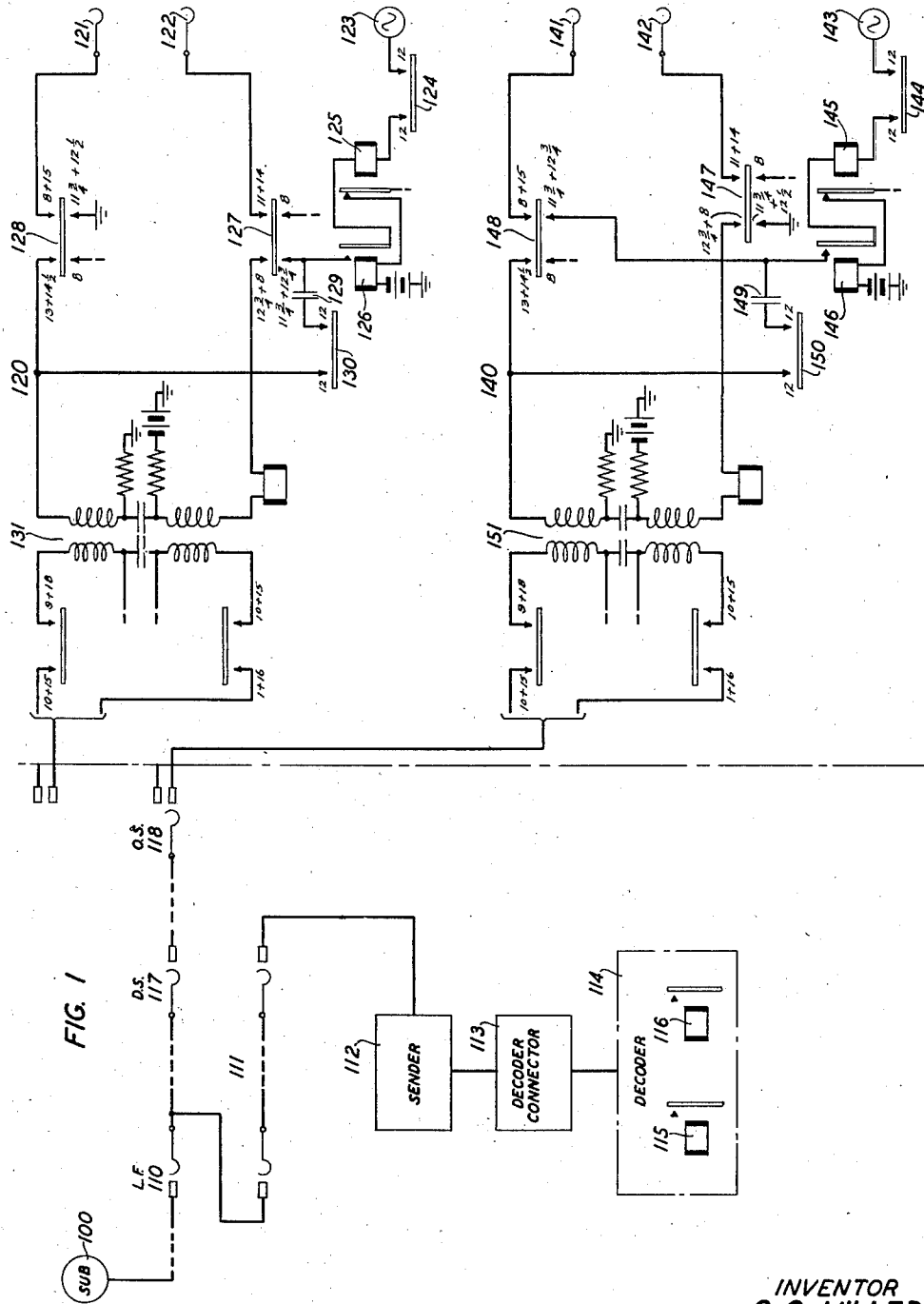
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SELECTIVE RINGING TELEPHONE SYSTEM

Filed Jan. 11, 1945

3 Sheets-Sheet 1



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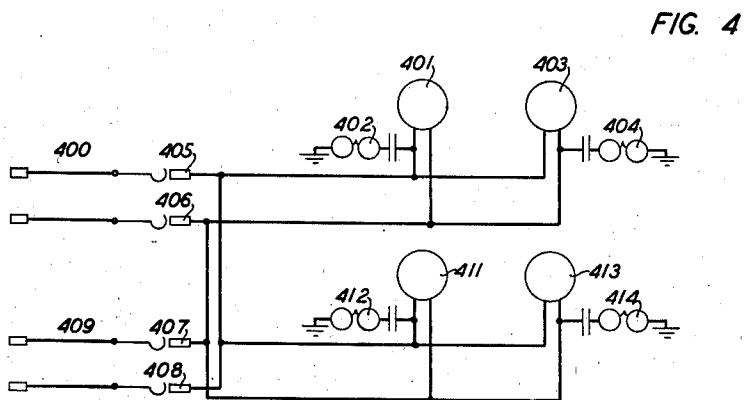
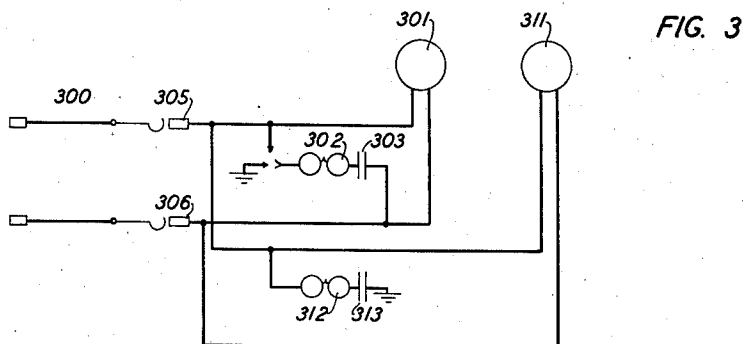
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UNITED STATES PATENT OFFICE

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SELECTIVE RINGING TELEPHONE SYSTEM

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3 Claims. (Cl. 179-17)

This invention relates to telephone systems and has for its object to increase the capacity of existing dial telephone exchanges with the minimum of labor and expense.

War time restrictions prevent the manufacture and installation of new dial telephone exchanges to meet the greatly increased demand for telephone service. Therefore some means is desirable for increasing the number of subscribers who may be served by the dial telephone exchange equipment already in use.

In accordance with the present invention, the capacity of existing dial exchanges of the panel type to serve residential subscribers may be nearly doubled. To this end, a second residential subscriber's line is connected to the terminals of the final selectors, in parallel with the line already connected thereto. The second lines thus added are arranged to be called by a different ringing signal from that employed in calling the original line and are assigned the same numerical designation but a different office name than that used by the first line, the office codes being used to control the ringing selection.

In the panel dial system the ringing equipment is associated with the incoming selectors, which have access through the final selectors with all of the called lines of the particular office. The selection of a wanted office is performed by district and office selectors under the control of a register sender. When a subscriber dials the code of the office at which a wanted line is located the code is registered in the sender and then is transferred to a decoder, where a route relay is operated individual to the route to be employed in reaching the wanted office. Under the control of the route relay, registrations are set up in the sender which serve to control the selections to be made by the district and office selectors.

In practicing the present invention in any office, certain of the incoming selectors are arranged to provide the proper ringing current for signaling the added second lines which are identified by the special office code. In those offices having access thereto, the route relay corresponding to this special code is cross-connected so that only the modified incoming selectors will be selected.

A clearer understanding of the invention will be obtained from a consideration of the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 shows schematically the switches and control equipment for connecting a calling line

with an incoming selector, and two skeletonized incoming selectors serving individual lines;

Fig. 2 shows two skeletonized incoming selectors serving two-party lines;

Fig. 3 shows a final selector and two individual lines; and

Fig. 4 shows two final selectors and two two-party lines.

Reference may be made to the following patents for more complete disclosures of the circuits and equipment employed in the present specification: Patent 1,862,549 to Raymond and Scully, June 14, 1932, for the circuits at the originating office, including the decoder and route relays; and Patent 1,658,829 to C. H. Berry, February 14, 1928, for the circuits of a complete incoming selector and final selector.

Referring first to Fig. 3, the subscriber's substation 301 represents the line originally connected to the terminals 305 and 306 of the final selector 300 while substation 311 represents the second line connected in parallel with line 301. Originally, the ringer 302 and condenser 303 were connected between the tip and ring conductors of the subscriber's line 301. When line 311 is connected in parallel with line 301, the ringer 302 is disconnected from the tip conductor and connected to ground instead. The new line 311 has its ringer 312 and condenser 313 connected between the tip conductor and ground.

Assuming that the subscriber at substation 100 wishes to call line 301 prior to the addition of line 311, the initiation of the call will cause an idle line finder 110 to hunt for and seize the calling line 100, and an idle sender link 111 to connect the line finder 110 with an idle sender 112. The subscriber then operates the substation dial to set up a registration in the sender 112 of the designation of the wanted line 301. As soon as the office code has been registered, the sender operates decoder connector 113 to seize an idle decoder 114 and transfers the office code to the decoder. The decoder then translates this code and operates a route relay, for example, relay 115, individual to the route to be employed in reaching the wanted office. It then sets up in the sender registrations by which the sender controls brush and group selections by the district selector 117 and brush and group selections by the office selector 118, to select an idle trunk terminating in an incoming selector at the wanted office. Since incoming selector 120 shows the original arrangement, it may be assumed that selector 120 has been chosen.

The sender 112 now employs the registered nu-

merical designation of the line 301 to control selections by the incoming selector 120 and the final selector 300 by which the connection is extended to line 301.

After the line has been tested and found idle, the control sequence switch of incoming selector 120 is advanced to position 12, in which position, with relay 126 held operated by means not shown, the ringing circuit is established from ringing source 123, contacts of sequence switch cam 124, winding of ringing relay 125, front contact of relay 126, contacts of cam 127, ring brush 122, ring conductor and brush of final selector 300, over terminal 306 to the ring side of line 301, through condenser 303 and ringer 302 to the tip side of line 301, terminal 305, tip brush and conductor of final selector 300, brush 121 and right contacts of cam 128 to ground. At the same time a branch of this circuit extends through condenser 129 and over cam 130 to the upper right winding of the repeating coil 131 to transmit a ringing tone to the calling line. Relay 125 cannot operate in response to ringing current, but when the subscriber at substation 301 answers, relay 125 operates, releasing relay 126, cutting off the ringing current and advancing the sequence switch to position 14 in which conversation may take place.

When it is desired to increase the capacity of the office by adding the extra lines such as line 311, a part of the incoming selectors are modified as shown in selector 140 by reversing the connections of the ringing source and ground with the tip and ring brushes of the incoming selector. At the same time, the ringers on the individual lines are disconnected from the tip conductors of the lines and connected to ground, while the added lines are equipped with ringers connected between the tip conductor of the line and ground. In the offices having access to the office in which the added lines are located, an additional route relay, for example relay 116 is wired in each decoder to correspond to the new office name applied to the added lines, the cross-connections being such that the sender will only select the modified incoming selectors in response to the registration of the new office code. Where only a few trunks terminating in incoming selectors connect a particular originating office with the modified terminatnig office the route relays might be arranged to mark busy those trunks extending to incoming selectors having the undesired ringing arrangement.

When, after these rearrangements are made, the subscriber at substation 100 calls the subscriber at substation 301, the call proceeds as above described, except that the ringing circuit extends to ground at the ringer instead of to ground at cam 128. Since the open switchhook contacts in line 311 intervene between the ring conductor and ringer 312 the subscriber on line 311 will not be disturbed.

On the other hand if the subscriber at substation 100 calls the subscriber at substation 311, the dialing of the other office code will cause the operation of route relay 116 which in turn will cause the office selector 118 to pick one of the modified incoming selectors, for example selector 140. The operation of incoming selector 140 and the final selector 300 will be the same as for the call to line 301 since the numerical designation is the same. When the line terminals have been tested and found idle and the sequence switch is advanced to position 12, the ringing circuit is closed from source 143, contacts of cam 144, winding of relay 145, contact of relay 146, right contacts of cam 148, tip brush 141, tip conductor

and brush of final selector 300 to tip terminal 305, ringer 312, condenser 313 to ground, signaling the subscriber of line 311, while the subscriber on line 301 is unaware of the call on the other line.

It is apparent that by the means described the capacity of a dial telephone exchange may be largely increased with only a minimum of labor and substantially no outlay for materials.

Where party lines are employed in panel type offices, each party has an individual number and therefore the line has two or four appearances before final selectors, each appearance being used to signal the corresponding party. The numbers assigned to the stations on one line differ in the hundreds or hundreds and thousands digits and the incoming selector in making the corresponding group selection picks a final selector having access to the corresponding appearance of the party line.

As at present used, a two-party line arranged for semi-selective ringing has the two ringers connected across the line and appears in multiple before two sets of final selectors which appear in separate groups before incoming selectors. The incoming selectors used with such lines are similar to those shown in Fig. 2, but conductor 238, connected to the lower left contact of cam 224 normally extends to a group contact on the commutator carried by the selector, which contact is grounded when the incoming selector is positioned in accordance with the designations of subscribers requiring a two-ring signal and is ungrounded when the incoming selector is positioned in accordance with the designations of individual lines or of the one-ring party on party lines.

In order to apply the present invention to such lines, they would be rearranged as shown in Fig. 4. The tip and ring conductors would be reversed at the terminals in the second final selector group and the ringers 402 and 404 would be connected between the tip and ground and the ring and ground respectively, thereby giving the original party line full selective ringing in place of semi-selective ringing. The second two-party line, to be connected in parallel with the original line would be similarly arranged.

At the incoming selectors, conductor 238 would be disconnected from the group commutator contact. On a certain number of selectors, proportioned to the number of second lines to be served, this conductor would be connected to a permanent ground as shown at the lower left contact of cam 254. With this arrangement, when a party on the original line, for example substation 401, is called, an incoming selector such as selector 220 is used. When the sequence switch reaches ringing position 12, ringing current from the one-ring source is connected over conductor 232, back contacts of relays 236 and 237, upper contacts of cam 224, winding of ringing relay 225, front contact of relay 226, right contacts of cam 227 to brush 222, over the ring conductor and brush of final selector 409 to ground through ringers 402 and 412. Since the one-ring signal identifies substation 401, only the subscriber at that station will answer. Response at substation 401 operates relay 225, releasing relay 226, cutting off the ringing current and advancing the sequence switch to talking position. To call substation 403, incoming selector 220 would select a final selector like selector 400 which directs the ringing current to ringers 404 and 414.

If a party on the second line is called, for ex-

ample substation 413, the special office code will cause the selection of one of the group of special incoming selectors, for example selector 240. After the final selections have been completed, which take place with the incoming selector sequence switch in position 8, that sequence switch is advanced to position 12. In positions 9 to 11 a circuit is closed from ground over the lower contacts of cam 254, left winding of relay 256 to battery. Relay 256 operates and locks in a circuit from battery through its right winding and its inner right contact, contacts of cam 258, front contact of relay 246 to ground over contacts of cam 259. Relay 256 remains operated in this circuit after its operating circuit is opened at cam 254. With relay 256 operated and the sequence switch in position 12, as soon as the pick-up conductor 253 is grounded, which takes place in the interval between the two-ring signals, relay 257 is operated over the contact of relay 256, contacts of cam 254 and ground on conductor 253. Relay 257 locks in parallel with relay 256 and completes the ringing circuit from the two-ring source, over conductor 255, front contact of relay 257, upper contacts of cam 244, winding of relay 245, front contact of relay 246, right contacts of cam 247, brush 242, ring conductor and brush of final selector 400, terminal 406 to ground through ringers 404 and 414. Since a two-ring signal identifies substation 413, only the subscriber at that substation will respond. As in the previous case, the subscriber's answer operates relay 245, releasing relay 246 which in turn releases relays 256 and 257.

To call substation 411, incoming selector 240 would select a final selector such as selector 409 which directs the ringing current to ringers 402 and 412, the two-ring signal identifying line 411 as called.

It is therefore apparent that in the case of offices employing semi-selective ringing, the addition of second lines in parallel with previously installed two-party lines may be effected with the use of comparatively little labor and materials. The only change required in the incoming selector is the disconnection of a single conductor in each selector and the connection of that conductor to ground in a portion of them. Likewise, when conditions permit the added lines to be transferred to a new office, the equipment may be restored to its normal condition with equally little labor.

To apply the invention to four-party lines would be entirely possible, but since it would require more material and labor than for the one and two-party lines, might not prove advisable.

What is claimed is:

1. In a telephone system, a final selector, sets of terminals for said final selector, called lines,

a plurality of said called lines connected to certain of said sets of terminals, each of the called lines connected to one set of terminals being identified by the same numerical designation and by a different office code, a plurality of groups of incoming selectors having access to said final selector, each group of incoming selectors arranged to signal a different line of the plurality connected to one set of terminals, and means operated in accordance with a called office code for selecting an incoming selector in a group arranged to signal the line identified by that code.

2. In a telephone system, final selectors, sets of terminals for said final selectors, called lines each having a plurality of substations, a plurality of said called lines connected in parallel to certain of said sets of terminals the called lines connected to one set of terminals being identified by different office codes, the corresponding substations on said lines being identified by the same numerical designations, each substation requiring a different ringing signal, a plurality of groups of incoming selectors having access to said final selectors, each group of incoming selectors equipped with different arrangements of ringing current, means operated in accordance with the office code of the called substation for selecting one of said groups of incoming selectors to determine which line is to be signalled and means operated in accordance with the numerical designation of the called substation to operate the selected incoming selector to determine which substation on the line is to be signalled.

3. In a telephone system, final selectors, sets of terminals for said final selectors, called lines each having a plurality of substations, a plurality of said called lines connected in parallel to certain of said sets of terminals in a plurality of groups of final selectors, the called lines connected to one set of terminals being identified by different office codes, the corresponding substations on said lines being identified by the same numerical designations, each substation requiring a different ringing signal, a plurality of groups of incoming selectors having access to said final selectors, each group of incoming selectors equipped with different arrangements of ringing current, means operated in accordance with the office code of the called substation for selecting one of said groups of incoming selectors to determine which line is to be signalled and means operated in accordance with the numerical designation of the called substation to operate the selected incoming selector to select a final selector in one of said groups to determine which substation on the line is to be signalled.

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