

Aug. 30, 1932.

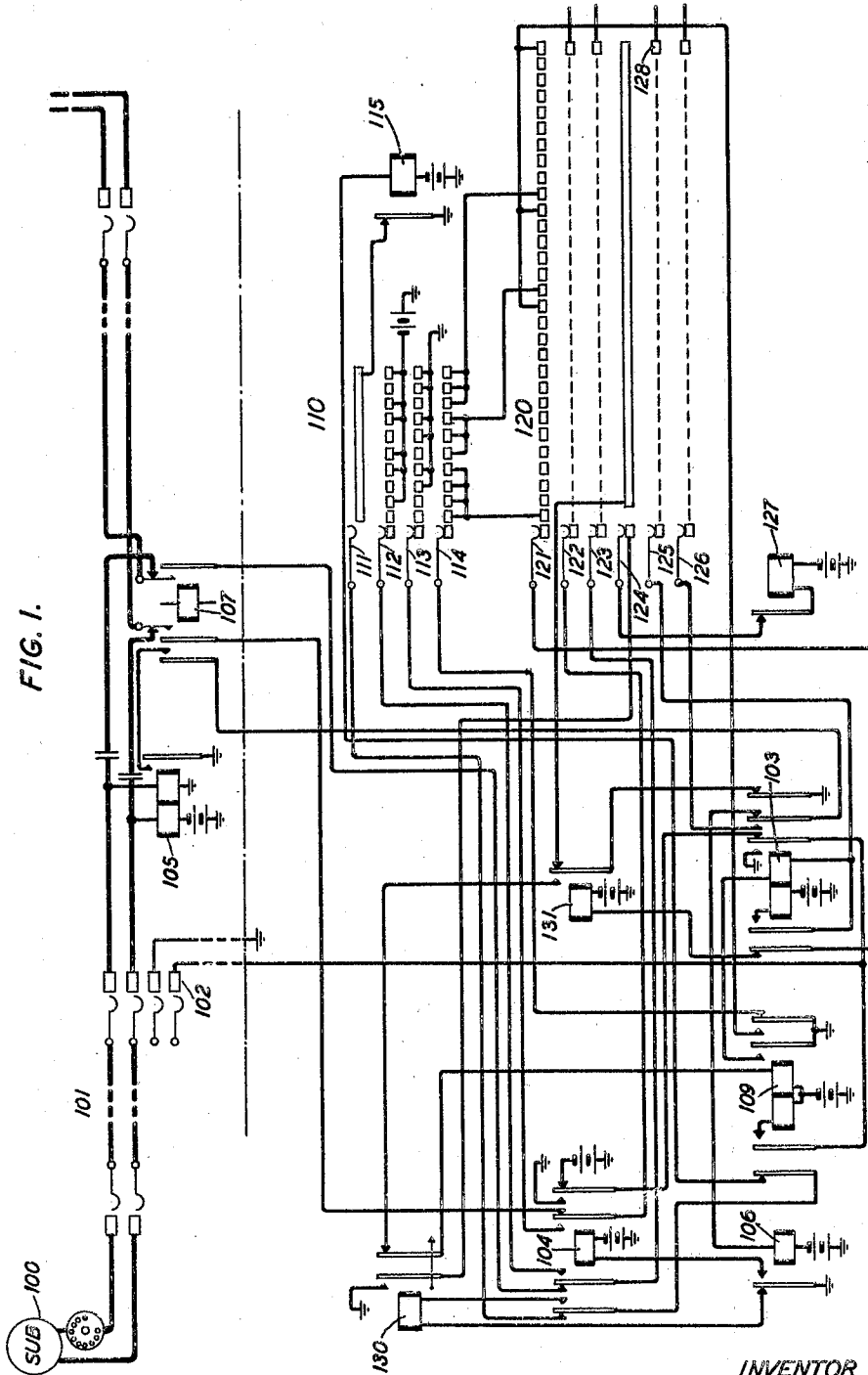
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1,874,684

TELEPHONE SYSTEM

Filed Nov. 12, 1930

2 Sheets-Sheet 1



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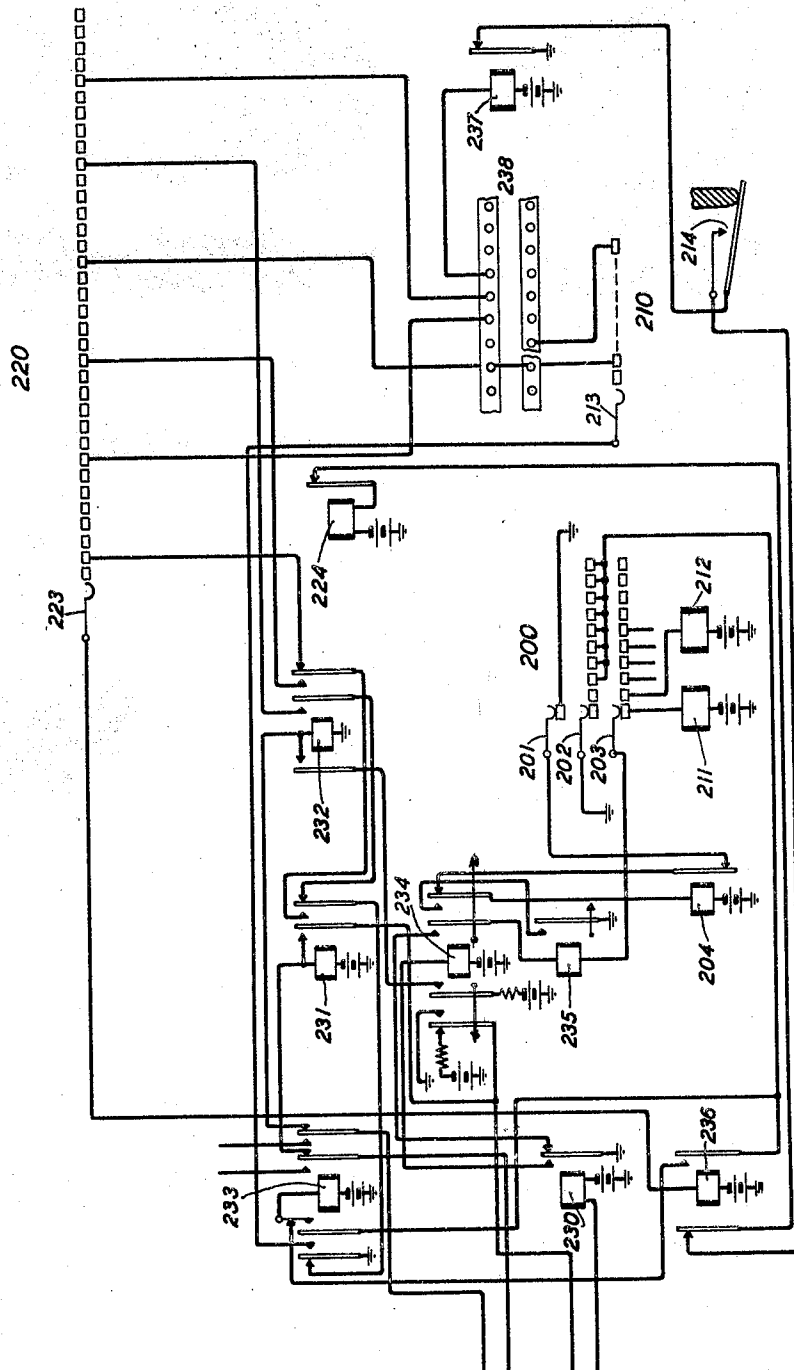
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FIG. 2



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TELEPHONE SYSTEM

Application filed November 12, 1930, Serial No. 495,061, and in Great Britain December 5, 1929.

This invention relates to telephone systems employing register senders in the establishment of connections and has for its object to combine speed of operation with economy of equipment in such a system.

In telephone areas employing a number of code digits, such as three, it has hitherto been the practice either (1) to employ an "A" digit selector which in response to the first code digit selects one of a group of register senders which stores the next two digits and effects the translation by virtue of the group and the combination of second and third digits; or, (2) to use three digit register senders including separate code registers which are positioned in response to three digits and subsequently control the setting of selector switches in accordance with a translation effected by the registered digits.

The objection to the former method is that the register senders which are particularly expensive are divided up into eight groups and searched in groups of ten by the "A" digit selector common thereto. The quantity required for this arrangement is approximately 50% greater than the number which would be necessary if all the register translators could be maintained in one group.

On the other hand there is some disadvantage which arises in the use of three digit register senders because their holding time is increased not only for the receipt of an extra digit but for the period of time which must elapse between the commencement of dialing tone and the dialing of the first digit.

Again the three digit register senders are open to the criticism that all the exchange names must appear on the code switch or translator and consequently if the capacity of the code switch is smaller than the largest possible combination of exchange names, it is necessary to provide an arrangement which will be sufficiently flexible to permit new exchanges to be added from time to time without difficulty.

The object of the present invention is to combine the use of "A" digit selectors with register senders chosen in large groups. This arrangement is made possible in the embodiment to be described by the use of a single

motion switch for the "A" digit selector. In the said embodiment instead of dividing the bank of the "A" digit selector into nine groups, it is divided into three groups and therefore each group is capable of having 33 choices instead of 11 choices. This increase of accessibility enables the quantity of register senders to be considerably reduced. If one of the groups of register senders has to carry considerably more traffic than the others, the number of outlets on the bank of the "A" digit switch for that group would be increased at the expense of the other groups.

According to the main feature of the invention, the register senders are grouped on a non-decimal basis. In the preferred arrangement each group of register senders will be accessible in response to three "A" digits and the "A" digit selector will be adapted to send one of three signals to the register sender. Further features of the invention will be apparent from the following description of the preferred embodiment and will be set out in the appended claims.

In the accompanying drawings, Fig. 1 illustrates the fundamental portions of an "A" digit selector using single motion switches. Fig. 2 shows that portion of a register sender in which the registration is made and the translation effected.

The "A" digit selectors may be selected by means of a link circuit over a trunk circuit in a manner similar to the selection of a sender in Patent 1,757,446, granted to E. P. G. Wright, et al., May 6, 1930 or in the manner described in British Patent 194,580, accepted March 15, 1923. Assuming that a link circuit is used, the link circuit will extend the subscriber's line 100 to a trunk circuit terminating in a first code selector with which is associated an idle "A" digit selector as indicated by battery connected to terminal 102 over the inner right back contact of relay 103 and the outer right back contact of relay 104. When the trunk circuit is found, relay 107 is operated to render the digit selector individual to the trunk. Relay 107 also prepares the circuit by which the first code selector and subsequent switches are controlled. Relay

105 in the trunk circuit is operated over the subscriber's line and in turn closes a circuit from ground over the outer left front contact of relay 107, middle right back contact of relay 103, for operating relay 106. The operation of relay 106 closes an obvious circuit for relay 104. Relay 104 opens at its outer right back contact the testing circuit and prepares at its outer left front contact the circuit for the impulsing magnet 115. When the first series of impulses arrives the magnet 115 is stepped through the left back contact of relay 109, outer left front contact of relay 104, winding of relay 130, back contact of relay 106 to ground. Relay 130 is of the slow releasing type and does not release during the train of impulses. The operation of relay 130 closes a circuit for the magnet 127 which operates through its interrupter springs, wiper 124, in its home position and front contact of relay 130 to ground. The bank terminals swept over by the wiper 114 of the switch 110 are cross-connected to the bank terminals swept over by the wiper 121 of the switch 120 in such a way that while the wiper 114 is in position 1, 2, 3 or 4 a ground potential connected to the wiper over the right back contact of relay 109, is extended to position 1 of the switch 120, whereas the terminals 5, 6 and 7 are multiplied to the first terminal connected to the second group of register senders and terminals 8, 9 and 10 are multiplied to the first terminal connected to the third group of register senders. As already explained the magnet 127 takes one step when the relay 130 operates, but in position 1 a circuit will be closed for relay 131 through the left back contact of relay 103, wiper 121, the wiper 114, right back contact of relay 109 to ground. If the digit dialed is greater than 4 the circuit for relay 131 will be opened when switch 110 moves from position 4 to position 5. A circuit will be completed for magnet 127 through its interrupter springs, wiper 124, back contact of relay 131, outer back contact of relay 103, to ground. The switch 120 will, therefore, continue stepping until relay 131 reoperates at the commencement of the second group. A circuit is prepared for the relay 109 which is dependent upon the back contact of relay 130, front contact of relay 131, outer back contact of relay 103. The back contact of relay 103 will be closed when the relay 130 releases at the end of the train of impulses and the front contact of relay 131 will be closed only when the wiper 121 is standing on a bank terminal corresponding to that upon which the wiper 114 is standing. Hence, the relay 109 will operate only when the switch 120 is standing at the commencement of the group indicated by the digit dialed. Relay 109 locks over its left winding and its left front contact to ground on the test wire over terminal 102. Relay 109 at its left back contact opens the circuit of the magnet 115, at its inner right front contact closes a circuit for the testing relay 103 and at its right back contact opens the circuit of relay 131 and places ground potential on the last terminals of the groups in the bank of switch 120 to which wiper 121 has access so that if all the senders in the groups are engaged, relay 131 will operate when the switch 127 reaches the last set of terminals. A free register sender is characterized by a battery potential on the test terminal 128 which will cause the operation of relay 103 which locks through its windings and left front contact to ground at the inner right contact of relay 109. At its middle right back contact relay 103 opens the circuit of relay 106 in the "A" digit selector and extends the pulse circuit controlled by relay 105 to relay 230 in the register sender. At its outer right back contact relay 103 opens the driving circuit of the magnet 127 and prevents it from taking any further steps. Relay 230 operates in the pulse circuit in turn operating relay 234 which substitutes ground for battery on terminal 128 holding relay 103 locked through its left winding. The bank terminals swept over by the wipers 112 and 113 are connected to battery and earth respectively in various positions so that if the digit 2, 5, or 8 is dialed, battery will be found by wiper 112 alone, whereas if the digits 3, 6 or 9 be dialed ground will be connected to wiper 113 alone and if the digits 4, 7 or 0 be dialed, the wiper 112 will be connected to battery and the wiper 113 to ground. These signals will be passed over the inner right and left front contacts of relay 104 and wipers 122 and 123 to the relays 231 and 232 in the register translator through the inner and outer right back contacts respectively of relay 233. Relay 231 if operated will lock up through its right front contact and the outer left front contact of relay 234 to ground, and relay 232 will lock over the left front contact of relay 232 to battery at the inner left front contact of relay 234. Relay 230 in the register sender in response to the first series of impulses operates the vertical magnet 211 through the normal bank terminal and wiper 203 of the digit distributing switch 200, winding of relay 235, inner right front contact of relay 234, back contact of relay 230 to ground causing the switch represented by brush 213 to lift its wipers a number of steps corresponding to the number of impulses dialed. Relays 234 and 235 are of the slow to release type and remain operated during the train of impulses. A circuit is closed for the magnet 204 of the digit distributor through the outer right front contact of relay 234 and the front contact of relay 235, causing the magnet to take one step when the relay 235 releases. The second set of impulses is repeated to the rotary mag-

net 212 through the first bank terminal and wiper 203 of digit distributor 200 thereby rotating switch 210 to a position corresponding to the second digit and at the conclusion of this train of impulses the switch 200 advances to position 2. In the same way the thousands, hundreds, tens and units digits are stored by means of registers (not shown), the switch 200 advancing one step for each set of impulses. When the vertical magnet 211 operated switch 210 one step the off normal springs 214 were closed, thus completing a circuit for the magnet 224 of the code switch or translator 220 through its interrupter springs, left back contact of relay 236, off-normal springs 214, back contact of relay 237 to ground. The translator switch 220 continues stepping until a circuit is completed for relay 236 through wiper 223, contacts of relays 231 or 232 to ground at the outer left back contact of relay 233. In this way the code switch or translator 220 is positioned at the commencement of the group indicated by the relays 231 and 232; the first terminal of one group is marked when the relay 231 is up alone, the first terminal of the second group is marked when both relays 231 and 232 are operated, and the first terminal of the third group is marked when the relay 232 alone is operated. The operation of the relay 236 opens the circuit of the magnet 224.

When the digit distributor switch 200 reaches position 2 indicating that the switch 210 has been positioned, a circuit is closed for relay 233 through its left normal contacts, right front contact of relay 236, bank terminals and wiper 202 to ground. Relay 233 opens the circuit of relay 236 at its outer left back contact but provides a locking circuit for itself at its inner left contact to ground over wiper 202. Relay 236, therefore, releases and recloses the circuit for the magnet 224 which steps forward until the wiper 223 reaches the bank terminal which is jumpered via the cross-connecting field 238 to the bank terminal on which wiper 213 is positioned. Relay 236 then reoperates from battery, winding of relay 236 by way of wiper 223, cross-connecting field 238, wiper 213, to ground at the outer left front contact of relay 233. The cross connecting field is provided so that the terminals of the code switch may be cross-connected at will to the terminals of the wiper 213. Should the code digits dialed not correspond to any office, a jumper will be arranged on the cross-connecting field to introduce the relay 237 which will open the stepping circuit of the magnet 224 at its back contact.

It should be understood that the sending from the register sender may be performed in any of a number of ways well known to those skilled in the art. The translated code digits will be obtained over other wipers of the switch 220 and other apparatus which is

not shown. The remaining digits are obtained from the numerical registers.

What is claimed is:

1. In a dial telephone system, a plurality of register senders arranged in groups on a non-decimal basis, means to select one of said senders and means to operate said selecting means in response to the first code digit of a telephone designation.
2. In a dial telephone system, a plurality of register senders arranged in groups on a non-decimal basis, means to select one of said senders, means to operate said selecting means in response to the first code digit of a telephone designation, means to record the remaining code digits in said sender and means in said sender for making a translation based on all of said code digits.
3. In a dial telephone system, a plurality of register senders arranged in groups on a non-decimal basis, means to select one of said senders, means to operate said selecting means in response to the first code digit of a telephone designation, and means in said selecting means to transmit a discriminating signal to said sender.
4. In a dial telephone system, a plurality of register senders arranged in groups on a non-decimal basis, means comprising a single motion-selector switch for selecting an idle sender in one of said groups, and means to operate said selector in accordance with the first code digit of a telephone designation.
5. In a dial telephone system, a plurality of register senders divided into groups, selecting means responsive to the first digit dialed for selecting an idle sender in one of said groups, said selecting means being so arranged that the number of senders in one group can be increased at the expense of another group or groups.
6. In a dial telephone system, a plurality of register senders arranged in groups on a non-decimal basis, means to select one of said senders, means to operate said selecting means in response to the first code digit of a telephone designation, means in said selecting means to transmit a discriminating signal to said sender, means to record the remaining code digits in said sender, and means in said sender for making a translation based on said discriminating signals in combination with said remaining code digits.
7. In a dial telephone system, a plurality of register senders arranged in groups on a non-decimal basis, means to select one of said senders and means to cause said selecting means to hunt over the same group of senders in response to the reception of a plurality of different first code digits of telephone designations.
8. In a dial telephone system, a plurality of register senders arranged in three groups

corresponding to three groups of first code digits, means to select one of said groups of senders and means to operate said selecting means responsive to the reception of any one of the digits in one of said three groups of digits to select an idle sender in the corresponding group of senders.

9. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, means responsive to the reception of any one of the digits in one of said three groups to mark the corresponding group of senders, selecting means and means to cause said selecting means to select an idle sender in the marked group.

10. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch, means responsive to the reception of any one of the digits in one of said three groups to cause said marking switch to mark the corresponding group of senders, a selecting switch, and means to cause said selecting switch to select an idle sender in the marked group.

11. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch, means responsive to the reception of any one of the digits in one of said three groups to cause said marking switch to mark the corresponding group of senders, a selecting switch, and means to cause said selecting switch to select an idle sender in the marked group, and means in said marking switch to transmit a discriminating signal to said sender.

12. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch, means responsive to the reception of any one of the digits in one of said three groups to cause said marking switch to mark the corresponding group of senders, a selecting switch, means to cause said selecting switch to select an idle sender in the marked group, conductors connecting said marking switch with said register senders and means in said marking switch to connect a characteristic potential to one or more of a plurality of said conductors to operate discriminating means in said sender.

13. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch, means responsive to the reception of any one of the digits in one of said three groups to cause said marking switch to mark the corresponding group of senders, a selecting switch, means to cause said selecting switch to select an idle sender in the marked group, conductors connecting said marking switch with said register send-

ers, means in said marking switch to connect a characteristic potential to one or more of a plurality of said conductors and a group of relays in said sender responsive to said characteristic potential.

14. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch, means to operate said marking switch in response to a first code digit, means in said marking switch responsive to the reception of any one of the digits in one of said three groups to mark the corresponding group of senders, a selecting switch, means to cause said selecting switch to select an idle sender in the marked group and a group of relays in said sender selectively operable in accordance with the individual position of said marking switch.

15. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch having a plurality of wipers, a selecting switch having a plurality of wipers, means responsive to the reception of any one of the digits in one of said three groups to mark the corresponding group of senders, means to cause said selecting switch to select an idle sender in the marked group, a pair of relays in said sender and means in said marking switch to connect a characteristic potential to one or the other or both of a pair of the wipers of said marking switch and said selecting switch to operate one or the other or both of said relays.

16. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch having a plurality of wipers, a selecting switch having a plurality of wipers, means responsive to the reception of any one of the digits in one of said three groups to mark the corresponding group of senders, means to cause said selecting switch to select an idle sender in the marked group, a pair of relays in said sender, means in said marking switch to connect a characteristic potential to one or the other or both of a pair of the wipers of said marking switch and said selecting switch to operate one or the other or both of said relays, a translator switch and means under the control of said relays to control the setting of said translator switch.

17. In a dial telephone system, a plurality of register senders arranged in three groups corresponding to three groups of first code digits, a marking switch having a plurality of wipers, a selecting switch having a plurality of wipers, means responsive to the reception of any one of the digits in one of said three groups to mark the corresponding group of senders, means to cause said selecting switch to select an idle sender in the marked group, a pair of relays in said sender, means in said marking switch to connect a characteristic po-

tential to one or the other or both of a pair of the wipers of said marking switch and said selecting switch to operate one or the other or both of said relays, a translator switch and means to give said translator switch a preliminary setting in accordance with the operation of said relays.

18. In a telephone system, an A digit selector comprising a selecting switch and a marking switch, three sets of multiplied contacts in a level of the marking switch, marking conductors from said sets to three groups of terminals in the bank of the selecting switch, three groups of register senders accessible from the said selecting switch, B and C digit registering means in each register sender, discriminating means in each register sender adapted to be variably operated in accordance with the setting of said marking switch within any one of said sets of multiplied contacts and translating means in each register sender adapted to be set in accordance with the setting of the B and C digit registering means and the said discriminating means.

19. In a telephone system, a plurality of register senders divided into groups, means responsive to a digit of the wanted designation to select an idle register sender, said selecting means being effective to select an idle register sender in a particular group in response to digits of two or more values and means to subsequently transmit to said selected register sender a discriminating signal indicative of the value of the particular digit dialed.

In witness whereof, I hereunto subscribe my name this 21st day of October, 1930.

ESMOND PHILIP GOODWIN WRIGHT.