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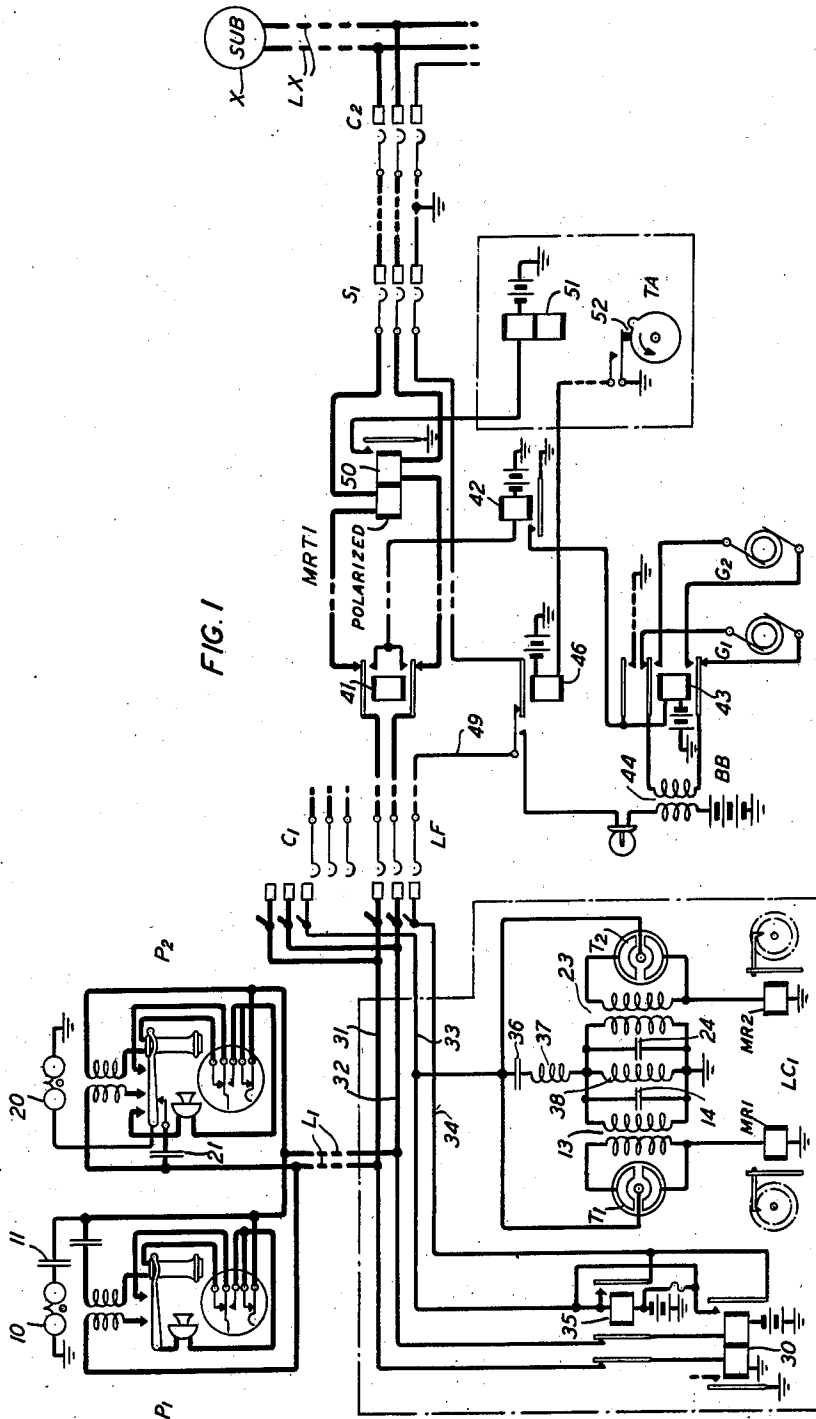
E. VROOM

2,322,330

TELEPHONE SYSTEM

Filed Sept. 28, 1940

3 Sheets-Sheet 1



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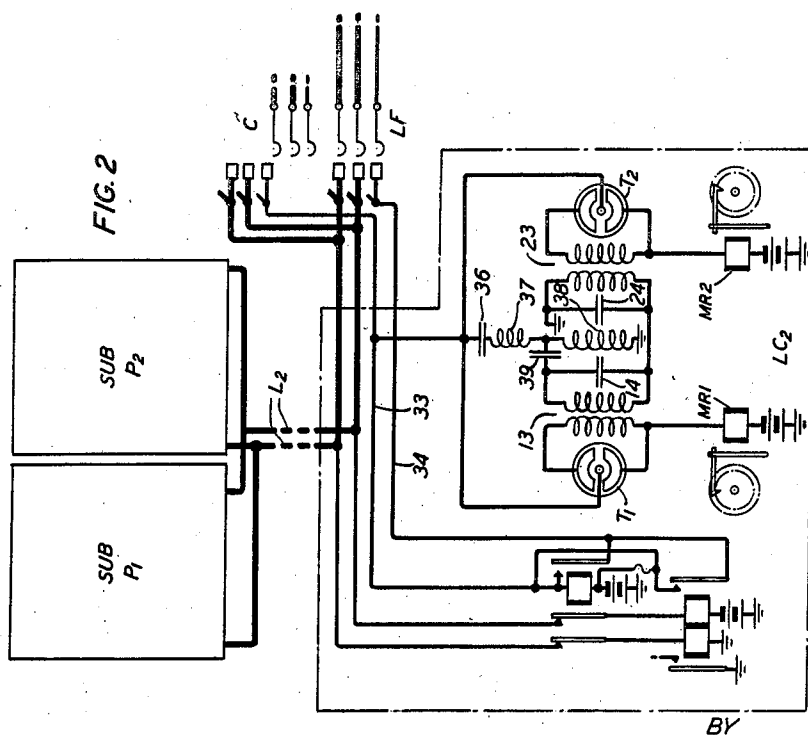
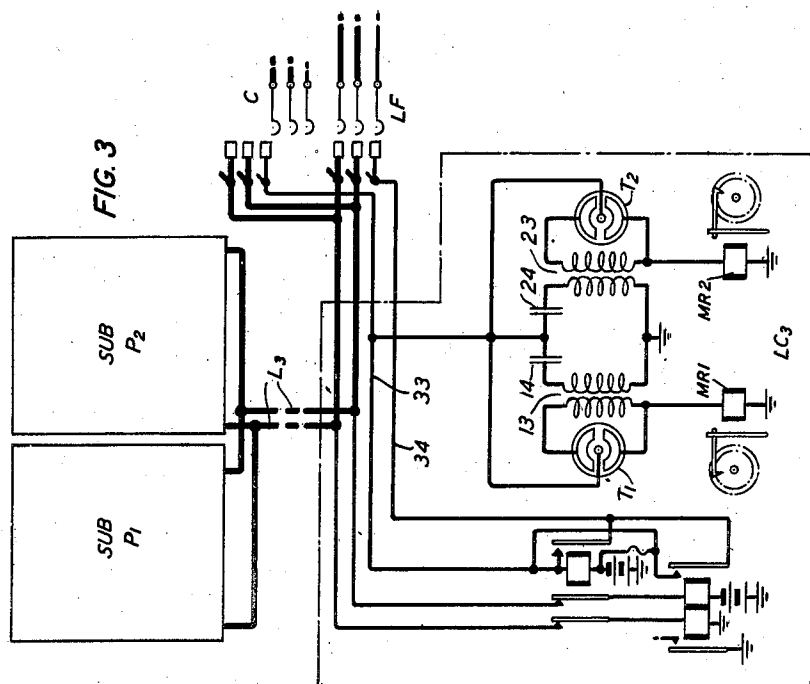
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3 Sheets-Sheet 2



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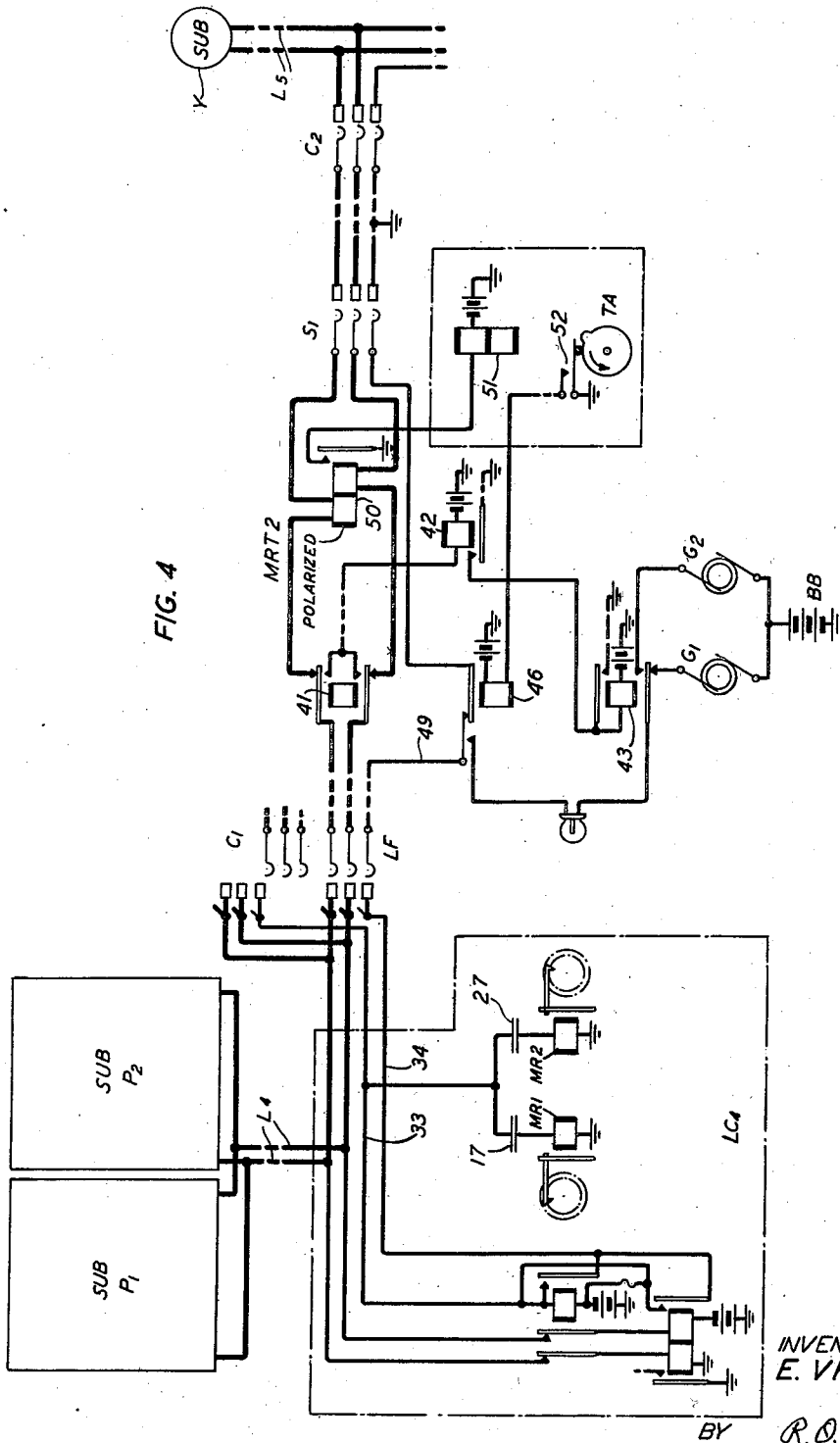
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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,322,330

## TELEPHONE SYSTEM

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Application September 28, 1940, Serial No. 358,820

10 Claims. (Cl. 179—8.5)

This invention relates to telephone systems and particularly to systems comprising message-rate, party line subscribers' stations.

It is the object of the invention to enable the automatic selective operation of the calling subscriber's message register on calls originating at party line subscribers' stations when the call is answered and to enable the reoperation of the message register periodically during the time the talking connection is maintained.

According to this invention, means are provided in a telephone system for selectively operating either of the message registers of a two-party line, one of the registers being connected to the line conductor to which the winding of the line cut-off relay is connected, for operation by alternating current of one frequency and the other register being connected to the same conductor of the line for operation by alternating current of a different frequency. The one or the other of two alternating current generators is automatically connected in series with a booster battery to this conductor of the calling line when the call is answered and periodically thereafter, to operate the calling subscriber's register, the booster battery being effective to hold the line cut-off relay while the register is being operated.

A feature of the invention is a telephone system in which means are provided for automatically, selectively and periodically operating either of the message registers of a two-party line, each of the registers being connected by a three-element gas-filled tube to the line conductor to which the winding of the line cut-off relay is connected. Means are provided for connecting a booster battery potential to this conductor to hold the line cut-off relay operated, and for superimposing on the booster battery potential an alternating potential of one frequency or an alternating potential of another frequency, the alternating potential of one frequency being effective to cause breakdown of one tube and the alternating potential of the other frequency being effective to cause breakdown of the other tube, the booster battery potential being effective in either case to maintain the energization of the energized tube and operatively energize the associated message register.

According to another feature of the invention means are provided in a telephone system for automatically, selectively and periodically operating either of the message registers of a two-party line, each of the registers being connected by a three-element gas-filled tube to the line conductor to which the line cut-off relay is con-

nected. This conductor is also connected to a harmonic generator which is effective, in response to the application of an alternating potential of one frequency to the conductor, to generate a harmonic which is applied through a tuned circuit to break down one of the tubes; and, in response to the application of alternating potential of another frequency to the conductor, to generate a harmonic which is applied through another tuned circuit to break down the other tube; booster battery being connected to the conductor in either case to hold the line cut-off relay, to maintain the energization of the energized tube, and to operate the associated message register.

The drawings, which form a part of this specification, show schematically systems and circuit arrangements in which the invention and its various features are embodied. The invention is, however, not limited in its application to the systems and circuit arrangements shown, but is generally applicable to any message rate, party line, communication system.

Referring to the drawings:

Fig. 1 shows an automatic telephone system comprising subscribers' stations P1 and P2 connected by a line L1 to a line circuit LC1 and to terminals in the banks of a line-finder switch LF and a connector switch C1, a message rate trunk circuit MRT1 connecting the line finder LF to a first selector switch S1, another connector switch C2 connected to terminals in the bank of selector S1, and a line Lx connecting the station X to terminals in the bank of the connector C2;

Fig. 2 shows two subscribers' stations P1 and P2 connected by a line L2 to a line circuit LC2 and to terminals in the banks of a line-finder switch LF and a connector switch C, the line circuit LC2 being an alternative to the line circuit LC1 in Fig. 1;

Fig. 3 shows two subscribers' stations P1 and P2 connected by a line L3 to a line circuit LC3 and to terminals in the banks of a line-finder switch LF and a connector switch C, the line circuit LC3 being another alternative to the line circuit LC1 in Fig. 1; and

Fig. 4 shows an automatic telephone system comprising two subscribers' stations P1 and P2 connected by a line L4 to a line circuit LC4 and to terminals in the banks of a line-finder switch LF and a connector switch C1, a message rate trunk circuit MRT2 connecting the line finder LF to a first selector S1, another connector switch C2 connected to terminals in the bank of selector S1, and a line L5 connecting the station Y to terminals in the bank of connector C2.

The subscribers' stations P1 and P2 in each of the figures of the drawings, the station X in Fig. 1 and the station Y in Fig. 4 are each of the common battery type which includes a dial or other impulse sender for controlling the operation of selector and connector switches through which connections with called subscribers' stations are established. Each of the stations P1 differs from the station P2 connected to the same line in that there is no connection of ground potential to the conductors of the associated line upon removal of the receiver at station P1; whereas removal of the receiver at each of the stations P2 connects both conductors of the associated line to ground through the ringer 20, as shown in Fig. 1. This difference enables identification of the calling station on each call initiated over each of the party lines L1, L2, L3 and L4, as hereinafter explained.

The line-finder switches LF, selector switches S1, and connector switches C1 and C2 are of the well-known two-motion step-by-step type. Reference may be had to "Automatic Telephony," 2nd edition, by Smith and Campbell, pages 53 to 65, for a description of the structure of such switches and their operation when used as selectors and connectors. Reference may be had to the patent to R. L. Stokely No. 1,799,654 of April 7, 1931, for a description of the operation of a two-motion step-by-step line finder.

The line circuit LC1 comprises a line relay 30, a line cut-off relay 35, two message registers MR1 and MR2, one for each of stations P1 and P2, and two three-element gas-filled tubes T1 and T2, each of which, when energized, operatively connects the associated one of the registers to the conductor 33. Operation of the line relay 30, upon initiation of a call at either one of stations P1 and P2, is effective as described in the aforementioned patent to R. L. Stokely to start an idle line finder, the cut-off relay 35 being operated as soon as the calling line is connected by a line finder to an associated message rate trunk and first selector. Relay 35 locks in usual manner to holding ground potential connected, through the test brush of the line finder, to conductor 34. Relay 35 also connects conductor 34 to the anode elements of tubes T1 and T2 and through a harmonic generator comprising condenser 36, inductance 37 and inductive winding 38, to ground. The harmonic generator is of the type shown in Fig. 1 of Patent No. 2,117,752 granted to L. R. Wrathall May 17, 1938, and is adapted to generate odd harmonics of each of two frequencies, for instance, 60 cycles and 120 cycles, upon application of alternating potentials of these frequencies to conductor 34, as hereinafter explained. Condenser 14 and the primary winding of transformer 13 constitute a circuit tuned to an odd harmonic of one of the two frequencies for applying a breakdown potential across the control elements of tube T1 in response to the application of an alternating potential of the one frequency to conductor 33, as hereinafter described. Condenser 24 and the primary winding of transformer 23 constitute a circuit tuned to an odd harmonic of the other of the two frequencies for applying a breakdown potential across the control elements of tube T2 in response to the application of an alternating potential of the other of the two frequencies to conductor 33, as hereinafter described. While any odd harmonic might be used for breaking down the tubes T1 and T2, a higher harmonic, for instance, the thirteenth, permits the use of smaller and more economical elements in the

tuned circuits through which the breakdown potentials are applied to the tubes. The breakdown of tube T1 operatively connects register MR1 to conductor 33 and the breakdown of tube T2 operatively connects register MR2 to conductor 33.

The line circuit LC2 is similar to the line circuit LC1 except that the tuned circuits for generating harmonics of the two frequencies are connected in series instead of in parallel with each other.

The line circuit LC3 is similar to the line circuit LC1 except that the harmonic generator is omitted, the condenser 14 and transformer 13 being effective to apply a breakdown potential of a first frequency, for instance 750 cycles, to tube T1, and the condenser 24 and transformer 23 being effective to apply a breakdown potential of a second frequency, for instance 1500 cycles, to tube T2.

The line circuit LC4 is similar to line circuit LC1 in that it includes a line relay and line cut-off relay and two message registers MR1 and MR2. The register MR1 is designed for operation by alternating current of one frequency, for instance 20 cycles; and the register MR2 is designed for operation by alternating current of another frequency, for instance, 60 cycles. There are no gas-filled tubes controlling the operative connection of the registers to conductor 33 as in line circuits LC1, LC2 and LC3, the registers being directly and operatively connected through condensers 17 and 27 to this conductor.

Each of the message rate trunks MRT1 and MRT2 includes party identifying means comprising a test control relay 41, a test relay 42, and a relay 43 for controlling the frequency of the alternating potential applied to the sleeve conductor of a connected line to effect selective operation of the calling subscriber's register. Relay 41 is operated, immediately after the first digit is dialed at the calling station, in the manner described in Patent No. 1,823,688 granted to H. Hovland, September 15, 1931, to connect test relay 42 to the conductors of the calling line. In the case of a call initiated at a station P1, relay 42 does not operate; but in the case of a call initiated at a station P2, relay 42 is operated in series with the ringer 20, thereby closing a circuit for operating relay 43. Relay 43 locks and remains operated until the connection is released at the calling station. Each of trunks MRT1 and MRT2 further includes a booster battery BB and two sources of alternating potential G1 and G2 of different low frequencies. For use with line circuits LC1 and LC2 of Figs. 1 and 2, the frequencies may be 60 cycles for effecting breakdown of tube T1, and 120 cycles for effecting breakdown of tube T2; for use with line circuit LC3 in Fig. 3, the frequencies may be 750 cycles and 1500 cycles; and for use with line circuit LC4 in Fig. 4, the frequencies may be 20 cycles and 60 cycles. In trunk circuit MRT2, generators G1 and G2 are connected directly in series with booster battery BB; while in trunk circuit MRT1, a transformer 44 is provided for superimposing an alternating potential of the desired frequency on the booster battery.

The selector S1, associated with a line finder LF in each of the arrangements, is operatively controlled by the impulses created by the dialing of the first digit of a called subscriber's number to select a corresponding group of terminals and to select an unguarded set of terminals therein leading to a succeeding switch through which the desired conversation may be established. Suc-

ceeding digits dialed by the calling subscriber effect the operation of intermediate selectors, if any, and a connector C2 to complete the connection with the called line. The connection is maintained under the control of the calling station by the connection of ground potential in the connector C2 to the sleeve terminal in the bank of selector S1, the selector S1, line finder LF1, and cut-off relay 35 all being held operated by this ground potential in usual manner. The connector C2 is arranged to ring the called station; and when the call is answered, the connector reverses the current through the windings of the polarized supervisory relay 50 to effect its operation. Relay 50 closes a circuit for operating the start magnet 51 of timing mechanism TA, which mechanism may be individual to a trunk MRT1 or MRT2, or common to a plurality of trunks. As soon as the timing mechanism moves out of normal position to start the timing of an interval for which one operation of the calling subscriber's message register is required, contacts 52 close a circuit for operating relay 46. In trunk circuit MRT1 the operation of relay 46 disconnects the holding ground potential from conductor 49 and connects the booster battery BB, in series with the left winding of transformer 44 through conductors 49 and 34, and a front contact of relay 35 to conductor 33, thereby impressing both the booster battery BB and an alternating potential of the desired frequency on conductor 33. In trunk circuit MRT2 the operation of relay 46 disconnects the holding ground potential from conductor 49 and connects the booster battery BB in series with the one or the other of generators G1 and G2, through conductors 49 and 34, to conductor 33.

Referring now to the line circuit LC1 and trunk circuit MRT1, the current through condenser 36, inductance 37 and winding 38 upon application of an alternating potential of a first frequency from generator G1 through transformer 44 to conductor 49 and thence to conductor 33, generates odd harmonics in coil 38, a desired one of the harmonics being applied, by the tuned circuit comprising condenser 14 and the primary winding of transformer 13 to cause breakdown of tube T1; the simultaneous application of booster battery potential to conductor 33 being effective to maintain the operation of cut-off relay 35, to maintain the energization of tube T1 and to effect the operation of register MR1. When relay 46 releases, ground potential is reconnected to conductor 49 to hold relay 35. In similar manner the application of an alternating potential of a second frequency from generator G2, through transformer 44, to conductor 49 and thence to conductor 33, generates odd harmonics in coil 38, a desired one of the harmonics being applied, by the tuned circuit comprising condenser 24 and the primary winding of transformer 23, to cause breakdown of tube T2; the simultaneous application of booster battery potential to conductor 33 being effective to maintain the operation of cut-off relay 35, to maintain the energization of tube T2, and to effect the operation of register MR2. Each succeeding closure of timing contact 52, while the talking circuit is maintained, effects a reoperation of relay 46 and a reoperation of the calling subscriber's message register.

Referring now to the line circuit LC4 and trunk circuit MRT2, the operation of relay 46 connects the one or the other of generators G1 and G2 in series with booster battery BB through conductor 49, conductor 34, front contact of relay

35, conductor 33, thence through condenser 17 and register MR1 in parallel with condenser 27 and register MR2. If the call is from station P1 and relay 43 is normal, the generator G1 is so connected, resulting in the operation of register MR1; but if the call is from station P2 and relay 43 is operated, the generator G2 is so connected, resulting in the operation of register MR2. In either case, the connection of booster battery potential to conductor 34 maintains the energization of cut-off relay 35. When relay 46 releases, the meter operating generator and booster battery are disconnected from conductor 49, ground potential being reconnected thereto to hold cut-off relay 35. Each succeeding operation of relay 46, due to the periodic closure of timing contact 52 while the talking connection is maintained effects a reoperation of the calling subscriber's register.

Referring now to line circuit LC2, the application of an alternating potential of a first frequency, for instance, 60 cycles, to conductor 33 causes the generation of odd harmonics in coil 38, a desired one of the harmonics being applied, by the tuned circuit comprising condenser 14 and the primary winding of transformer 13, to cause breakdown of tube T1; and the simultaneous application of booster battery potential to conductor 33 is effective to maintain the energization of tube T1, to operate register MR1 and to hold the line cut-off relay 35. In like manner, the application of an alternating potential of a second frequency, for instance, 120 cycles, to conductor 33 causes the generation of odd harmonics in the coil 38, a desired one of the harmonics being applied, by the tuned circuit comprising condenser 24 and the primary winding of transformer 23, to cause breakdown of tube T2; and the simultaneous application of booster battery potential to conductor 33 is effective to maintain the energization of tube T2, to operate register MR2, and to hold the line cut-off relay 35.

Referring now to line circuit LC3, the application of an alternating potential of a first frequency, for instance 750 cycles, to conductor 33 causes a large enough current through condenser 14 and the primary winding of transformer 13 to induce a voltage across the secondary winding of this transformer to break down tube T1, the current through condenser 24 and transformer 23 being insufficient to cause breakdown of tube T2; and the simultaneous application of booster battery potential to conductor 33 is effective to maintain the energization of tube T1, operate register MR1, and hold relay 35. In like manner the application of an alternating potential of a second frequency, for instance, 1500 cycles, to conductor 33 causes a large enough current through condenser 24 and the primary winding of transformer 23 to induce a voltage across the secondary winding of this transformer to break down tube T2, the current through condenser 14 and transformer 13 being insufficient to cause breakdown of tube T1; and the simultaneous application of booster battery potential to conductor 33 is effective to maintain the energization of tube T2, operate register MR2, and hold relay 35.

It is, of course, apparent that application of breakdown and meter operating potentials to conductor 33 of each of line circuits LC1, LC2, LC3 and LC4 may be effected in the manner provided in trunk circuit MRT1 or in the manner provided in trunk circuit MRT2. Other changes may be made in either the line circuit or the message rate trunk circuit within the scope of this invention.

While the arrangements shown in the drawings contemplate a single operation of a calling subscriber's register for each message unit, the message rate trunks may be arranged to effect one or a plurality of operations of the register for each message unit, the number of operations depending on the relative locations of the calling and called stations.

What is claimed is:

1. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two three-element gas-filled tubes, the anode element of each tube being connected to said conductor, means responsive to an impressed potential of one frequency on said conductor for breaking down one of said tubes, means responsive to an impressed potential of another frequency on said conductor for breaking down the other of said tubes, and two message registers, one register connected in the anode-cathode circuit of one of said tubes and the other register connected in the anode-cathode circuit of the other of said tubes, means for applying ground potential to said conductor to operate said relay, and means for applying booster battery potential in place of ground potential to said conductor and for simultaneously applying to said conductor an alternating potential of the one or the other of said frequencies to selectively effect breakdown of a desired one of said tubes, said booster battery potential being effective to maintain the energization of said relay and the operated one of said tubes and to operate the associated register.

2. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to said conductor, the cathode of one tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer connected across the control elements of the other tube, a harmonic generator connected to said conductor, said generator adapted to generate harmonics of the one or the other of two frequencies upon application of an alternating potential of the one or the other of said frequencies to said conductor, a tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying to the control elements of one tube a desired one of the generated harmonics of one of said frequencies to effect breakdown of said one tube, and a tuned circuit comprising a capacitor and the primary winding of the other transformer for applying to the control elements of the other tube a desired one of the generated harmonics of the other of said frequencies to effect breakdown of said other tube.

3. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to said conductor, the cathode of one tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer con-

nected across the control elements of the other tube, a harmonic generator connected to said conductor, said generator adapted to generate harmonics of the one or the other of two frequencies upon application of an alternating potential of the one or the other of said frequencies to said conductor, and two tuned circuits in parallel, one tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying a desired one of the generated harmonics of one of said frequencies to the control elements of one tube to effect breakdown of said one tube in response to application of an alternating potential of said first frequency to said conductor, the other tuned circuit comprising another capacitor and the primary winding of the other of said transformers for applying a desired one of the generated harmonics of the other of said frequencies to the control elements of the other tube to effect breakdown of said other tube in response to application of an alternating potential of said second frequency to said conductor.

4. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to said conductor, the cathode of one tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer connected across the control elements of the other tube, a harmonic generator comprising an inductor connected to said conductor, said generator adapted to generate harmonics of either one or the other of two frequencies upon application of an alternating potential of the one or the other of said frequencies to said conductor, and two tuned circuits in series connected in parallel with said inductor, one tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying a desired one of the generated harmonics of one of said frequencies to the control elements of one tube to effect breakdown of said one of said tubes in response to application of an alternating potential of said one of said frequencies to said conductor, and the other tuned circuit comprising a capacitor and the primary winding of the other of said transformers for applying a desired one of the generated harmonics of the other of said frequencies to the control elements of the other tube to effect breakdown of the other tube in response to application of an alternating potential of said other frequency to said conductor.

5. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to said conductor, the cathode of one tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer connected across the control elements of the other tube, a harmonic generator comprising an inductor connected to said conductor, said generator adapted to generate harmonics of the one or the other of two frequencies upon application

of an alternating potential of the one or the other of said frequencies to said conductor, a tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying a desired one of the generated harmonics of one of said frequencies to the control elements of one tube to effect breakdown of said one tube upon application of an alternating potential of said one frequency to said conductor, and a tuned circuit comprising another capacitor and the primary winding of the other of said transformers for applying a desired one of the generated harmonics of the other of said frequencies to the control elements of the other tube to effect breakdown of said other tube upon application of an alternating potential of said other frequency to said conductor, and means for selectively applying to said conductor an alternating potential of either of said frequencies to said conductor to energize said generator.

6. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to said conductor, the cathode of one tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer connected across the control elements of the other tube, a harmonic generator connected to said conductor, said generator adapted to generate harmonics of the one or the other of two frequencies upon application of an alternating potential of the one or the other of said frequencies to said conductor, a tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying a desired one of the generated harmonics of one of said frequencies to the control elements of one tube to effect breakdown of said one tube upon application of an alternating potential of said one frequency to said conductor, and a tuned circuit comprising another capacitor and the primary winding of the other of said transformers for applying a desired one of the generated harmonics of the other frequency to the control elements of the other tube to effect breakdown of said other tube upon application of an alternating potential of said other frequency to said conductor, means applying ground potential to said conductor to operate and hold said relay, and means for selectively applying in place of said ground potential an alternating potential of the one or the other of said frequencies to energize said generator.

7. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to said conductor, the cathode of one tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer connected across the control elements of the other tube, a harmonic generator connected to said conductor, said generator adapted to generate harmonics of the one or the other of two frequencies upon application of an alternating po-

tential of the one or the other of said frequencies to said conductor, a tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying a desired one of the generated harmonics of one of said frequencies to the control elements of one tube to effect breakdown of said one tube upon application of an alternating potential of said one frequency to said conductor, and a tuned circuit comprising another capacitor and the primary winding of the other transformer for applying a desired one of the generated harmonics of the other of said frequencies to the control elements of the other tube to effect breakdown of said other tube upon application of an alternating potential of said other frequency to said conductor, means applying ground potential to said conductor to operate and hold said relay, means for selectively applying in place of said ground potential an alternating potential of the one or the other of said frequencies to energize said generator, and means for superimposing on the alternating potential applied to said conductor a booster battery potential for holding said relay operated.

8. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, two three-element gas-filled tubes, the anode of each tube being connected to one of the registers and the cathode of the other tube being connected to the other of the registers, two transformers, the secondary winding of one transformer connected across the control elements of one tube and the secondary winding of the other transformer connected across the control elements of the other tube, a harmonic generator connected to said conductor, said generator adapted to generate harmonics of the one or the other of two frequencies upon application of an alternating potential of the one or the other of said frequencies to said conductor, a tuned circuit comprising a capacitor and the primary winding of one of said transformers for applying a desired one of the generated harmonics of one of said frequencies to the control elements of one tube to effect breakdown of said one tube upon application of an alternating potential of said one frequency to said conductor, and a tuned circuit comprising another capacitor and the primary winding of the other transformer for applying a desired one of the generated harmonics of the other of said frequencies to the control elements of the other tube to effect breakdown of said other tube upon application of an alternating potential of said other frequency to said conductor, means for applying a potential to said conductor to energize said relay, means for selectively applying to said conductor to energize said generator an alternating potential of either of said frequencies in place of ground potential, and means for simultaneously applying to said conductor a potential effective to hold said relay operated and operate the register associated with the energized tube.

9. In a telephone system, a line circuit comprising a control conductor, a line cut-off relay and two message registers, means connecting said relay to said conductor, means comprising a contact of said relay and a condenser connecting one of the registers to said conductor, and means comprising said contact and another condenser connecting the other of the registers to said conductor, one of the registers and the associated condenser being tuned to render said register operatively responsive only to the application of an alternating potential of a first frequency to said



conductor, the other of the registers and associated condenser being tuned to render this register operatively responsive only to the application of an alternating potential of a second frequency to said conductor.

10. In a telephone system, a first line, two subscribers' stations connected thereto, a line circuit for said line comprising a control conductor, a line cut-off relay, means connecting said relay to said conductor, two message registers, one for each of said stations, means including a contact of said relay operatively connecting one of said registers to said conductor, and means including said contact operatively connecting the other of said registers to said conductor, a second line and a station connected thereto, means comprising a message rate trunk circuit connecting said lines for conversation between a calling one of said two stations and a station on said second line, means connecting ground potential to said conductor to

operate and hold said relay, said trunk circuit comprising means responsive to answer of the call at the called station for measuring off intervals of time during which the talking connection is maintained, each of said intervals constituting a unit for which one operation of the calling subscriber's register is required, a booster battery, a generator of a first frequency, a generator of a second frequency, and means in said trunk circuit effective at the beginning of a measured interval for selectively connecting to said conductor a potential derived from the one or the other of said generators to operate the one or the other of said registers as desired and for simultaneously connecting booster battery to said conductor in place of ground potential, the booster battery potential being effective to hold the relay operated while the register is being operated.

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