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SELECTIVE MESSAGE REGISTER SYSTEM

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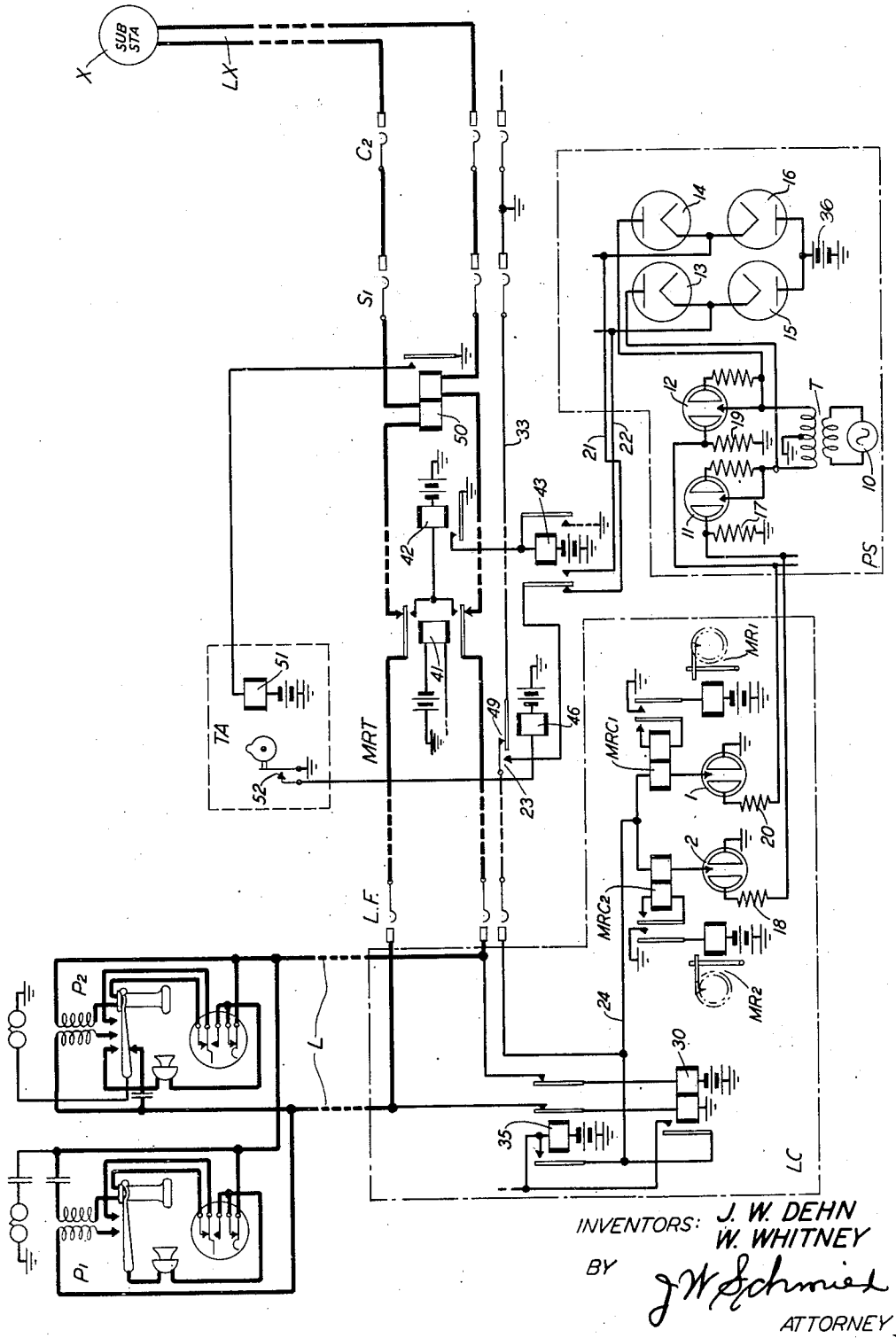

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SELECTIVE MESSAGE REGISTER SYSTEM

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This invention relates to telephone systems and more particularity to systems comprising so-called message rate party lines.

An object of the invention is to automatically operate a counting device or register, individual to a calling station, when a connection is established with the line of the called station and the call is answered.

In exchange areas where message rate service is generally furnished the central office switching equipment is usually equipped with circuit means, responsive to the establishment of a connection with and the response of a called subscriber, to operate a so-called message register individual to the calling station which means usually comprises two or more extra conductors in the exchange wiring in addition to the usual tip, ring and sleeve conductors.

In some isolated central offices, however, most of the lines are what are termed "flat rate lines" that is, no charge is made for local calls, and as no message registers are provided, no extra register conductors are required. It occasionally happens, however, that there are a few message rate and prepayment coin box lines to be served by the same switching equipment and the present invention relates to the provision of call charging facilities whereby selective operation of a message register, or the collect or return of a coin at a pay station, can be controlled over the sleeve conductor of the line without adding extra conductors in the exchange wiring.

A feature of the invention resides in an arrangement for selectively operating either of two message registers or either of the collect and return magnets of a coin box, over the sleeve conductor of the line by selectively connecting to the sleeve conductor, when the called station answers, positive potential direct current impulses derived from either the positive or negative half of an alternating current wave. The two message registers, or the coin box magnets, are connected to the sleeve each in series with a gas-filled discharge tube which tubes are alternately ionized and conditioned for discharge in accordance with the phase changes of the same alternating current wave. One or the other of the registers, or coin box magnets will be operated, depending on which series of impulses are connected to the sleeve at the time registration or coin control is to be effected. If impulses derived from the positive half wave of the supply source are connected to the sleeve the gas tube which is primed during the same half cycle will break down and operate its associated register, and,

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conversely, if impulses derived from the negative half wave of the supply source are applied to the sleeve the other tube which is ionized at the same time will fire and operate the other register.

The arrangement of the invention wherein the foregoing features are incorporated will be understood from the following description, the drawing of which shows a two-party message rate subscriber's line L serving two subscriber's stations P1 and P2. Line L terminates in the bank of a line finder switch LF. A message rate trunk MRT connects the wipers of the line finder LF to the wipers of a selector S1, and a connector switch C2 completes the connection to a called line LX terminating at a subscriber's station X.

Subscriber's stations P1 and P2 connected to the line L differ from each other only in that while the removal of the receiver at station P2 connects both conductors of the line L to ground, through the station ringer, the same operation of the receiver switchhook at station P1 is not effective to establish such a ground connection, which difference enables identification of the calling station on each call initiated over the line L.

Line circuit LC comprises the usual line relay 30, a cutoff relay 35, two message registers MR1 and MR2, one for each of the stations P1 and P2, two message register control relays MRC1 and MRC2 and the two three-element cold cathode gas-filled tubes 1 and 2, each of which when conducting causes operation of either MRC1 or MRC2 to actuate the corresponding register MR1 or MR2.

Message rate trunk MRT includes party identifying means comprising a test control relay 41 and a test relay 42. Relay 41 is operated immediately after the first digit dialed at the calling station, in a manner described in Patent 1,823,688 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 station P1 relay 42 does not operate, due to the fact that no ground is applied to the line L but if the case is initiated at station P2, relay 42 operates in series with the ringer of that station and closes a circuit for relay 43 which thereupon locks thus preparing a circuit to cause actuation of the message register MR2 corresponding to station P2 when the called station answers.

A pulse supply circuit PS common to the exchange is shown at the lower right of the drawing and comprises a source of alternating current, 10, 110-volt 60 cycles for example, connected to the primary winding of a transformer T, two

three-element gas-filled tubes 11 and 12 having their anodes connected to opposite ends of the secondary winding of the transformer, which is connected to ground at its mid-point, and four rectifying tubes 13, 14, 15 and 16, the anodes of tubes 13 and 14 being connected to the anodes of tubes 11 and 12, respectively, the cathodes of tubes 13 and 15 being connected together and to the front contact of relay 43, the cathodes of tubes 14 and 16 also being connected together and to the back or normal contacts of relay 43 and the anodes of tubes 15 and 16 being connected together and to a positive potential grounded source 36 of direct current having a voltage substantially equal to the drop between the anode and cathode of either tube 15 or 16. The cathode of tube 11 is connected to ground through a resistance 17 and to the control anode of the tube 2 in the line circuit LC in series with a current limiting resistance 18, and the cathode of tube 12 in a corresponding manner is connected to ground in series with a resistance 19 and to the control anode of tube 1 in series with resistance 20.

The operation of the circuit of the invention is as follows:

Assuming station P1 calls, line relay 30 in operating causes the line finder LF to come to rest on the line L in a well-known manner. Immediately after the first digit of the called number has been dialed, test control relay 41 operates in the manner disclosed in the before-mentioned Patent 1,823,688 to connect test relay 42 to the conductors of the line, and, as station P1 when calling does not connect ground to the line, relay 42 will not operate. As relay 42 does not operate at this time, relay 43 remains released and its normal or back contacts remain closed.

Succeeding digit pulses of the called number causes selector S1 and connector C2, to extend the call to the desired subscriber's line LX; whereupon, the bell at the called station is rung and when the subscriber removes his receiver from the switchhook, the connector, in accordance with well-known practice, reverses the current through the windings of relay 50 to cause its operation.

Relay 50, when operated, closes a circuit to energize start magnet 51 of a timing mechanism TA which may be individual to trunk MRT or common to a plurality of similar trunks. As soon as the timing mechanism moves out of normal position, in response to operation of relay 50, contacts 52 are closed to operate relay 46. Prior to operation of relay 46, the connection between the calling and called lines has been maintained over sleeve conductor 33 by ground in the connector C2, which holding circuit includes contacts 49 of relay 46.

Alternating current source 10 alternately causes the two ends of the secondary winding of transformer T to assume a positive potential and therefore for one-half cycle of the source, the control anode of tube 12 and the anode of rectifier tube 14 will both be at positive potential and for the other half cycle the control anode of tube 11 and anode of rectifier tube 13 will be positive.

When the control anode of tube 12 is positive, that tube will ionize and discharge current will flow between the corresponding main anode and cathode in series with resistance 19 and when the control anode of tube 11 is positive, a similar discharge current will flow through resistance 17.

The control gap of tube 1 in the line circuit is connected across resistance 19 in the discharge

circuit of tube 12 and the control gap of tube 2 is similarly connected across resistance 17 in the discharge circuit of tube 11. Consequently, when current flows in resistance 19 during the half cycle when the anode of tube 12 is positive, tube 1 in the line circuit will be ionized due to the potential drop in resistance 19 thus "priming" or conditioning tube 1 for operation when its anode becomes positive. Similarly, tube 2 will be ionized in condition for operation when tube 11 fires due to the potential drop in resistance 17.

When the phase of the source 10 is such that tube 12 is discharging, tube 1 in the line circuit is conditioned for operation. It will be noted that rectifier tube 14 is poled in such a direction that a path for a current flow exists from the secondary winding of the transformer T, anode to the cathode of the tube 14 and over conductor 21 to the back contact of relay 43 and when the phase of the supply current is reversed, a similar path exists through tube 13 and over conductor 22 to the front contact of relay 43.

Now when relay 46 is operated during the interval contacts 52 of the timing mechanism are closed if, as assumed, station P1 is calling which does not cause the operation of relay 43, a positive pulse of direct current occurring every other half wave of the supply source is connected to the sleeve conductor of the trunk MRT in a circuit from the secondary winding of the transformer T, rectifier 14, conductor 21, back or normal contact of relay 43, contact 23 of relay 46, sleeve wiper of the line finder, conductor 24, windings of message register control relays 1 and 2 in parallel to the anodes of tubes 1 and 2. During this half cycle of the supply source tube 1 in the line circuit, as previously described, is ionized and conditioned for operation, and it therefore breaks down and discharges to ground thus operating relay MRC1 which in turn causes operation of message register MR1. Relays MRC1 and MRC2 each have a second winding which is short-circuited when the relay operates to give the relay a slow-release characteristic and prevents more than one operation of the register during the interval relay 46 is operated.

If station P2 calls, relay 42 followed by relay 43 are operated, the latter locking itself to ground. When the called subscriber answers, thus operating relay 50, relay 46 connects the sleeve conductor from the line circuit over its contact 23, front contacts of relay 43, and conductor 22 to rectifier 13. If tube 2 of the line circuit is enabled, i. e., ionized, at this time in synchronism with the pulses transmitted by tube 13, message register MR2 is operated once during the interval contact 52 of the timing mechanism is closed.

Due to the opposing connection of rectifier tubes 13, 15, and 14, 16, when either tube 13 or 14 conducts, the respective opposing tube 15 or 16 is not conducting, but conversely when 13 or 14 is in a non-conducting condition, its respective opposing tube conducts. Due to the proper selection of a direct current potential for the source 36, which is substantially equal to the drop through the tube 15 or 16, 20 volts for example, conductors 21 and 22 will be at substantially ground potential during half the cycle of the supply source 10. This ground potential is effective, when contacts 49 of relay 46 are opened, to hold the cut-off relay 35 operated and the connection maintained during the interval between metering pulses. Relay 35 is held operated during application of metering impulses by the difference between the exchange battery potential

(—48 volts) at the relay and the positive voltage supplied by rectifier tube 13 or 14 which introduce a 20-volt drop in the voltage supplied by transformer T.

The present arrangement, shown for message register operation, is also applicable, with only minor circuit modifications, for use in controlling collection or return of coins deposited at coin box pay stations which modification will be obvious and understood by those skilled in the art.

What is claimed is:

1. In a selective message register system, a telephone line, two message registers associated with said line, a pair of gas-filled discharge tubes each having at least two mutually spaced electrodes, one of which electrodes is an anode, each of said tubes individualized to one of the registers associated with said line, a source of alternating current, means for supplying full cycles from said source to other corresponding electrodes of said tubes 180 degrees out of phase with each other, means for deriving two successive positive potential impulses from each complete cycle of said alternating current, switching means for selectively applying one or the other of said two successive impulses to the anodes of said tubes to cause the discharge of the tube of said pair which is properly conditioned for discharge by the simultaneous application to its said other electrode of the half cycle of said source of the proper polarity to cause discharge of said tube, and a different one of said two message registers associated with each of said tubes and operable in response to the discharge thereof.

2. In a selective message register system, a telephone line, two message registers associated with said line, a pair of gas-filled discharge tubes each having at least two mutually spaced electrodes, one of which electrodes is an anode, each of said tubes individualized to one of the registers associated with said line, a source of alternating current, means for supplying full cycles from said source to other corresponding electrodes of said tubes 180 degrees out of phase with each other, means for deriving two successive positive potential half cycles from each complete cycle of said alternating current, switching means for selectively applying one or the other of said two successive half cycles to the anodes of said tubes to cause the discharge of the tube of said pair which is properly conditioned for discharge by the simultaneous application to its said other electrode of the half cycle of said source of the proper polarity to cause discharge of said tube, and a different one of said two message registers associated with each of said tubes and operable in response to the discharge thereof.

3. The combination in a selective system of an impulse conductor, a pair of discharge tubes, a source of alternating current voltage, circuit means for connecting said source to said pair of tubes in such a manner as to cause the discharge of one of said tubes when the wave of said source reaches a definite value in a positive direction and the discharge of the other tube when said wave reaches a definite value in a negative direction, a discharge circuit for each tube including a resistance element through which current flows following the discharge of its associated tube, a pair of current responsive devices to be selectively controlled, a second pair of discharge tubes each having an anode, a cathode and a control electrode, means for connecting each current responsive device, in series with the anode circuit of a different one of said second tubes, to said impulse conductor, circuit means for connecting the cathode and control electrode of each of said second pair of tubes across a different one of said resistances to cause said second pair of tubes to be alternately ionized in accordance with the change in phase of said source, means for deriving a positive potential impulse during each half cycle of said alternating current source, and means for applying positive potential impulses derived from either half cycle to the impulse conductor, to the exclusion of impulses derived from the other half cycle, to cause conductive discharge of the one of said second pair of tubes which is ionized at the time, and the consequent response of the respective serially connected device.

4. In a telephone system, a two-party line, a pair of message register control relays, a sleeve conductor, a first pair of gas-filled discharge tubes each having an anode, a cathode and a control electrode, a connection between each anode and said sleeve conductor, each connection serially including a different one of said control relays, a source of alternating current, a second pair of discharge tubes, circuit means for connecting said alternating current source to said second pair of tubes to cause one tube to discharge when the potential of said source reaches a predetermined positive value and to cause the other tube to discharge when the source potential reaches a predetermined negative value, a resistance in the discharge circuit of each of said second pair of tubes and through which current flows during the discharge of the associated tube, means connecting the control electrode and cathode of one of the first pair of tubes across the resistance in the discharge circuit of one of the second pair of tubes and the control electrode and cathode of the other of the first pair of tubes across the resistance in the discharge circuit of the other of the second pair of tubes whereby the voltage across the resistance associated with the discharging tube of the second pair causes ionization of the associated tube of the first pair, other means for deriving two successive positive potential impulses from each complete cycle of said alternating wave and switching means for selectively connecting one or the other of said two successive impulses to said sleeve conductor to cause discharge of the ionized tube of the first pair and consequent operation of the respective register control relay.

5. In a telephone system, a two-party line, a pair of message register control relays, a sleeve conductor, a first pair of gas-filled discharge tubes each having an anode, a cathode and a control electrode, a connection between each anode and said sleeve conductor, each connection serially including a different one of said control relays, a source of alternating current, a second pair of discharge tubes, circuit means for connecting said alternating current source to said second pair of tubes to cause one tube to discharge when the potential of said source reaches a predetermined positive value and to cause the other tube to discharge when the source potential reaches a predetermined negative value, a resistance in the discharge circuit of each of said second pair of tubes and through which current flows during the discharge of the associated tube, means connecting the control electrode and cathode of one of the first pair of tubes across the resistance in the discharge circuit of one of the second pair of tubes and the control electrode and cathode of the other of the first pair of tubes across the re-

sistance in the discharge circuit of the other of the second pair of tubes whereby the voltage across the resistance associated with the discharging tube of the second pair causes ionization of the associated tube of the first pair, other means for deriving two successive positive potential impulses from each complete cycle of said alternating wave and switching means for selectively connecting one or the other of said two successive impulses to said sleeve conductor to cause discharge of the ionized tube of the first pair and consequent operation of the respective register control relay, a cut-off relay in series with a grounded negative source of direct current connected to said sleeve conductor and maintained operated by ground connected to said conductor during progress of a call over said line, said ground disconnected during the interval registration impulses are applied to said conductor, and other means for maintaining said sleeve conductor at ground potential, to hold said cut-off relay operated, when the registration impulses

applied thereto are below a predetermined potential, said other means comprising a rectifying device, and a positive potential grounded source of direct current, said device being serially connected in a conducting direction between said latter source and said sleeve conductor and said latter source having a potential substantially equal to the fall of potential through said device.

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