

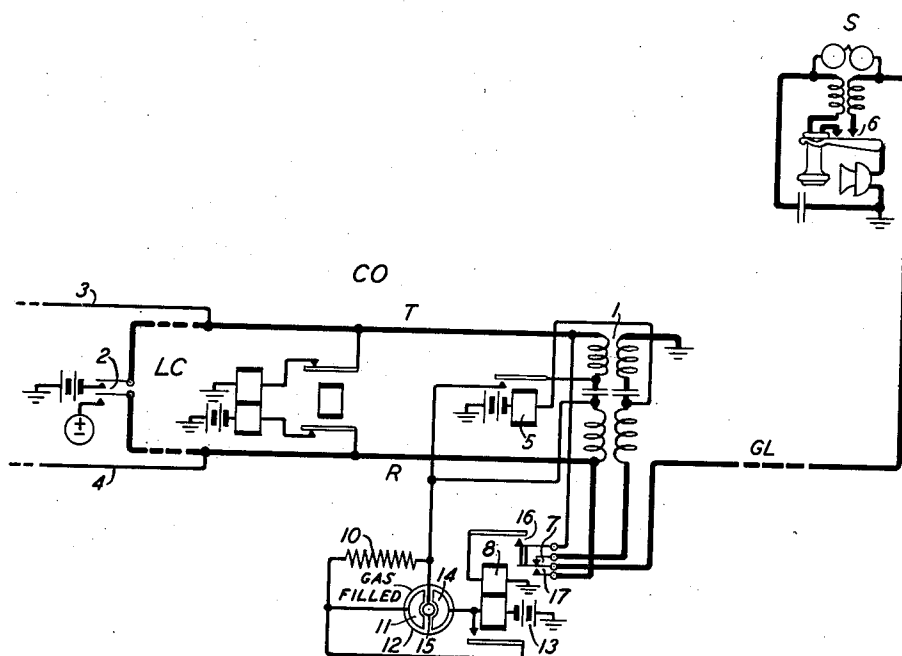
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RINGING SYSTEM.

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RINGING SYSTEM

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3 Claims. (Cl. 179—84)

This invention relates to telephone systems and more particularly to line circuit arrangements for terminating single conductor ground return lines in a telephone exchange, which arrangement comprises a repeating coil or transformer which provides an inductive path for speech current but under normal conditions conductively insulates the ground return lines from the terminal apparatus at the exchange.

An object of the invention is to establish a path for ringing current around the repeating coil to the ground return line when ringing current is applied to the line circuit at the exchange.

A feature of the invention resides in employing a gas-filled discharge device responsive to the application of ringing current to the line circuit to control relay means for effecting a conductive connection between the ground return line and the exchange line circuit.

The invention will be understood from the following description when read in connection with the accompanying drawing which shows a portion of an exchange line circuit LC at a central office CO connected by means of a repeating coil or transformer 1 to a so-called grounded or single wire subscriber's line GL.

The switching circuits of the central office are not shown other than contacts 2 which are adapted to be closed when the subscriber's set is to be rung. Conductors 3 and 4 extending to the left terminate in switching devices and other apparatus of the central office, whereby connection is established with the line GL in response to calls in either direction. A description of the operation of the circuit arrangement will now be given.

Assuming a call from the station S, removal of the subscriber's receiver completes a circuit to operate relay 5 which should be traced from ground through the subscriber's transmitter, contact 6 of his switchhook, right-hand winding of the induction coil, line GL, contacts 7 of relay 8, lower right winding of repeating coil 1 and the winding of relay 5 to battery and ground. Relay 5, in operating, closes a bridge across the line circuit LC at the center of the left half of the repeating coil 1 thereby causing operation of the usual line relay at the central office and the customary succeeding operation well known in the art, further description of which is unnecessary here.

Next let us assume that a call is to be extended to station S and that the line circuit LC has been seized in a well-known manner at the central office, as for example by an automatic switch,

and the connection is ready for the start of ringing. When the circuits are in readiness for ringing, in a system in which this invention is to be used, contacts 2 are closed thereby connecting grounded battery to the tip of the line circuit and a grounded source of alternating ringing current to the ring conductor.

Ringing current on the lower or ring conductor flows through the lower left winding of repeating coil 1 and resistance 10 to the control electrode 11 of the three electrode gas-filled tube 12 whose characteristics are such that the potential of the ringing current in series with battery 13 and the lower winding of relay 8, will cause ionization of the tube. As soon as ionization occurs a glow discharge will take place between the anode 15 and cathode 14 and sufficient current will flow in the lower winding of relay 8 to cause its operation. Operation of relay 8 performs four distinct functions as follows:

1. Closure of contacts 16 connects the tip conductor of the line circuit through the upper winding of relay 8 to ground whereupon the relay is held operated from battery at contact 2 as long as these contacts are held closed.

2. Closure of the bottom contacts of relay 8 places a short circuit around the control electrode and cathode so that when the direction of the ringing current changes, on the next half cycle, the anode-cathode discharge will cease and the tube deionize, not to ionize again during the ringing period.

3. Operation of relay 8 also opens its contact 17 thereby disconnecting the line GL from the right-hand winding of the repeating coil.

4. Closure of contacts 17 connects the ring conductor of the line circuit LC direct to the subscriber's line GL to the exclusion of the repeating coil. Ringing current supplied to the ring conductor of the line circuit at contact 2 now passes direct to the subscriber's line without any appreciable loss through the lower winding of relay 8 to ground due to the fact that resistance 10 is of a relatively high value of the order of 100,000 ohms.

What is claimed is:

1. In a telephone system, a central office, a single conductor ground return subscriber's line terminating thereat in a subscriber's line circuit, transformer means conductively insulating said line circuit from said grounded line, a source of ringing current at said central office, and means including a gas-filled discharge device responsive to the connection of said ringing current source

to said line circuit to conductively connect said line circuit to said grounded line.

2. In a telephone system, a central office, a single conductor ground return subscriber's line terminating thereat in a two-conductor subscriber's line circuit, transformer means conductively insulating said line circuit from said grounded line, a source of alternating ringing current and a source of direct current at said central office, means for simultaneously connecting said ringing current to a first side of the line circuit and said direct current source to the other side of the line circuit, and means including a gas-filled discharge tube and a relay responsive to the simultaneous connection of said ringing and direct current to conductively connect and lock said first side of the line circuit to said grounded line and thereafter disable said discharge tube during the further application of said ringing and direct current to the line circuit.

3. In a ringing system, a line, a grounded source

of alternating ringing current connected to a first side of the line and a grounded source of direct current connected to the other side of the line, a two-winding relay and a three-element gas-filled discharge device comprising an anode, a cathode and a control electrode, said anode and control electrode being connected together and to the first side of the line and said cathode connected to ground through one winding of said relay whereby ionization will occur between said control electrode and cathode to permit said ringing current in one direction, to flow between said anode and cathode to operate said relay, said relay being so arranged that when operated the second winding will be connected in a circuit between ground and the other side of said line circuit to hold said relay operated and further arranged so that when operated, said cathode and control electrode will be short-circuited to prevent further ionization of the tube.

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