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TELEPHONE SYSTEM

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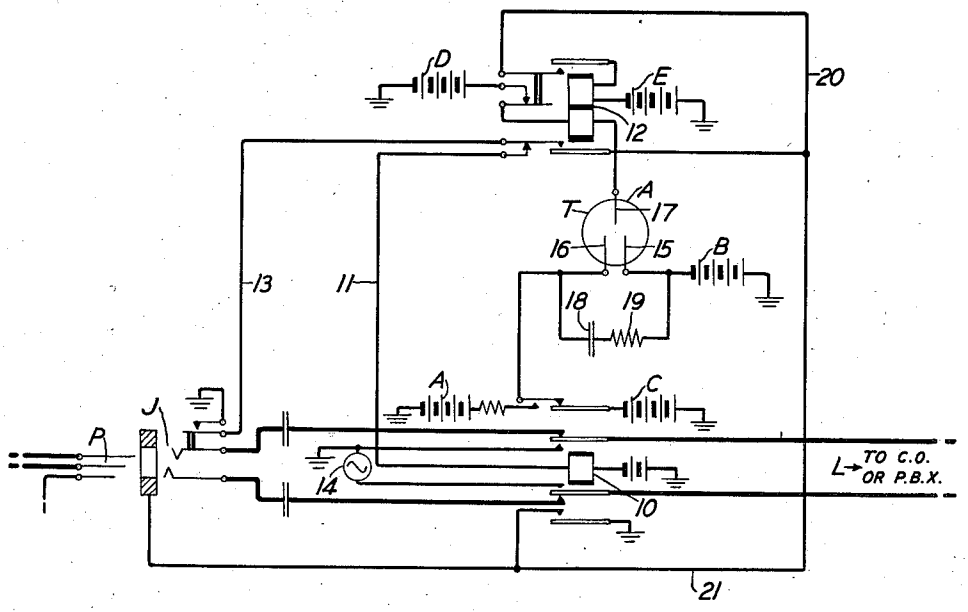

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TELEPHONE SYSTEM

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5 Claims. (Cl. 179—84)

This invention relates to telephone systems and particularly to means for controlling the duration of the application of ringing current to a circuit interconnecting two telephone exchanges.

It is the object of this invention to provide a simple, economical and reliable arrangement for automatically disconnecting a signaling current source from a telephone circuit after the lapse of a predetermined period of time following its connection thereto.

This object is attained in accordance with a feature of the invention by utilizing a gaseous conductor tube for controlling the disconnection of the signaling current source from the telephone circuit.

Another feature of the invention resides in the use of timing means for introducing a time lag in the operation of the gaseous conductor tube whereby the disconnection of the signaling current source from the telephone circuit is delayed for a predetermined period of time.

These and other features of the invention will be readily understood from the following detailed description made with reference to the accompanying drawing which discloses a ring-down trunk circuit or tie line interconnecting two telephone exchanges, such as two central offices, two private branch exchanges or one central office and a private branch exchange, and its associated equipment for controlling the time duration of a signal transmitted from one exchange to the other.

The tie line or trunk circuit L is shown terminating in a jack J at one exchange and extending therefrom to another exchange. To signal the distant exchange by way of the circuit L, an operator having access to jack J inserts therein the plug P associated with one of her cord circuits. This act causes relay 10 to operate in a circuit extending from grounded battery, winding of relay 10, conductor 11, normally closed lower contacts and armature of relay 12, conductor 13 to ground on the auxiliary jack contacts of jack J. Though the relay 10 is shown to be operated from ground on the auxiliary jack contacts, it is to be understood that a sleeve relay, operating in response to the seizure of line L, may be used for the same purpose without departing from the spirit of the invention.

Relay 10, in operating its two inner armatures, opens the forward end of the circuit L and connects to the other end thereof the signaling current source 14. Current from this source energizes signaling equipment at the distant exchange in a manner well known in the art.

The gaseous conductor tube T is shown comprising two cathodes 15 and 16 and an anode 17. The batteries, A, B, C and D constitute the tube batteries and are of the same voltage, approximately 45 volts. It will be noted that prior to the seizure of the circuit L, cathode 16 is connected to the negative side of battery C by way of the upper normally closed contact and outermost armature of relay 10, and that cathode 15 is directly connected to the negative terminal of battery B. Under this condition, there is no difference of potential across the cathodes 15 and 16 which are bridged by the condenser 18 and resistance 19 so that the tube does not become ionized.

However, when relay 10 operates and attracts its upper outer armature, the positive terminal of battery A is substituted for the negative terminal of battery C. Since negative 45 volts is connected to cathode 15 and positive 45 volts is now connected to cathode 16, there will be effectively 90 volts across the two cathodes which are shunted by the condenser 18 and resistance 19. In the present case, the breakdown voltage of the tube is 90 volts. However, due to the shunt condenser and resistance, this breakdown potential across the cathodes is not reached immediately but is realized only when the condenser 18 becomes fully charged; that is, the condenser must be charged to the ionizing potential of the tube before ionization takes place. The capacity of the condenser 18, therefore, in conjunction with the series resistance will determine the time which elapses between the time when 90 volts is connected across the cathodes and condenser in multiple and when ionization occurs. It is evident, therefore, that by adjusting the capacity of condenser 18 and the resistance 19 the time lag which is introduced may be regulated.

When ionization occurs between the cathodes 15 and 16, the cathode-anode path of the tube T will break down because of the difference of potential between them and sufficient current will be passed in the anode circuit to battery D to cause relay 12 to operate. Relay 12, in operating, establishes a locking circuit for itself which may be traced from grounded battery E, upper armature and front contact of relay 12, conductor 20, conductor 21 to ground (not shown) on the sleeve of plug P. At its upper continuity contacts relay 12 disconnects battery D from the anode 17 of tube T thereby terminating the anode-cathode discharge, and at its lower armature and back contact opens the operating circuit for relay 10 which restores to normal, disconnecting the signal current source 14 from the outgoing end of line L

and substituting the negative terminal of battery C for the positive terminal of battery A. The substitution of battery C for battery A extinguishes the tube T and short-circuits the condenser 18 which, accordingly, discharges. This discharge of the condenser 18 insures that the cathode-to-cathode discharge delay resulting from the charging time of condenser 18 will not be affected by a previous charge.

The release of relay 10 restores the continuity of the talking conductors of line L and the system is restored to normal.

What is claimed is:

1. In a telephone system, a first and a second exchange, a circuit interconnecting said exchanges, a source of signaling current, means responsive to the seizure of said circuit at one of said exchanges for connecting said source of signaling current to said circuit, a relay for controlling the disconnection of said source from said circuit, and means including a gaseous conductor for controlling the operation of said relay.

2. In a telephone system, a first and a second exchange, a circuit interconnecting said exchanges, a source of signaling current, means operating in response to the seizure of said circuit for connecting said signaling current source to said circuit, a relay for releasing said means to effect the disconnection of said signaling current source from said circuit, a gas-filled tube controlling the operation of said relay, and means for adjusting the time of operation of said tube with respect to the seizure of said line whereby said signaling current source is disconnected from said circuit a predetermined period of time after its seizure.

3. In a telephone system, a first and a second exchange, a circuit interconnecting said exchanges, a source of signaling current, a gas-filled tube including two cathodes and an anode, both said cathodes being normally maintained at the same negative potential, means responsive to the seizure of said circuit for connecting said source of signaling current to said line and reversing the polarity of one of said cathodes, means bridging said cathodes for delaying the breakdown of said tube across the cathodes thereof for a predetermined period of time after the reversal of polarity on one of the cathodes, and means connected in the anode circuit of said tube and operating when said tube breaks down for effecting the disconnection of said signaling current source from said circuit.

4. In a telephone system, a first and a second exchange, a circuit interconnecting said exchanges, a source of signaling current, a gas-filled tube including two cathodes and an anode, both said cathodes being normally maintained at the same negative potential, means responsive to the seizure of said circuit for connecting said source of signaling current to said line and reversing the polarity of one of said cathodes, means bridging said cathodes for delaying the ionization of said tube for a predetermined period of time after the reversal of polarity on one of the cathodes, and means connected in the anode circuit of said tube and operating when said tube becomes ionized for effecting the disconnection of said signaling current source from said circuit and the deionization of said tube.

5. In a telephone system, a first and a second exchange, a circuit interconnecting said exchanges, a source of signaling current, a gas-filled tube including two cathodes and an anode, both said cathodes being normally maintained at the same negative potential, means responsive to the seizure of said circuit for connecting said source of signaling current to said line and reversing the polarity of one of said cathodes, means bridging said cathodes for delaying the ionization of said tube for a predetermined period of time after the reversal of polarity on one of the cathodes, and a relay connected in the anode circuit of said tube and operating when said tube becomes ionized for effecting the disconnection of said signaling current source from said circuit and the deionization of said tube, and for establishing a locking circuit for itself independent of the anode circuit of said tube.

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