

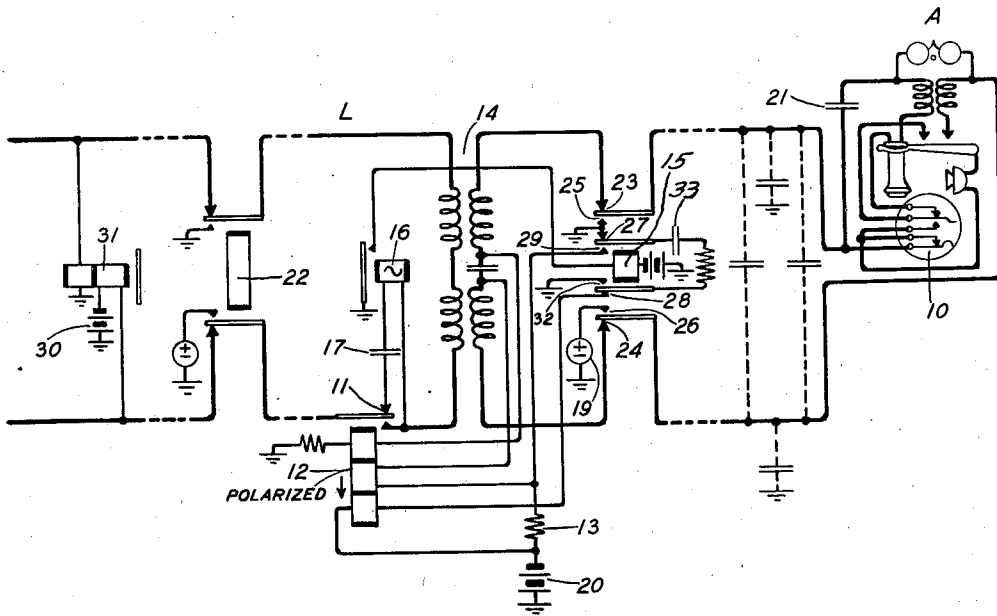
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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3 Claims. (Cl. 179-84)

This invention relates to automatic telephone systems and more particularly to so-called long line circuits therefor wherein a pulsing relay, intermediate the station and exchange, is employed for repeating dial pulses to establish a desired connection, and a ringing relay is also employed for repeating ringing current transmitted from the exchange to call a subscriber. Such an arrangement is shown in U. S. Patent 1,719,499, issued July 2, 1929, to L. J. Bowne.

In arrangements of this character, where the line between the intermediate point and the subscriber's station has a mutual capacity between the conductors, or between the conductors and ground, in excess of a predetermined maximum value, ringing current applied to the line causes a charge to be built up thereon, which, if of the proper polarity, may cause false operation of the pulsing relay when the ringing relay is released and the pulsing relay is reconnected to the line.

An object of the present invention is to prevent false operation of the pulsing relay, in systems of the character described, when a line discharge therethrough occurs at the conclusion of a ringing interval.

A feature of the invention whereby the above object is obtained resides in an arrangement, associated with the ringing and pulsing relays, comprising a condenser which is charged when the ringing relay is operated and discharged through an auxiliary winding on the pulsing relay in a direction to oppose the discharge applied to the line windings of the relay, if in an operating direction, when the ringing relay is released.

A further feature whereby the foregoing opposing effect is maintained for an extended interval consists in causing the condenser to be discharged through the pulsing relay windings in series with an oppositely poled source of direct current whereby the discharging time of the condenser is prolonged.

The invention will be understood from the following description when read in connection with the accompanying drawing which shows a portion of a long line circuit extending from a central office and terminating at a dial subscriber's station, which circuit is arranged to prevent false operation of the pulsing relay in accordance with the above features.

It will first be assumed that the dial subscriber A desires to initiate a call and to do so removes the receiver from the switchhook and actuates the dial 10 in accordance with the number of the station desired.

It will be noted that the upper and middle windings of the pulsing relay 12 are bridged across the pulsing contacts of dial 10 so that for each closure of the dial contacts, relay 12 operates in a circuit extending from grounded battery 20, resistance 13, middle winding of relay 12, lower right-hand winding of repeating coil 14, lowermost back contact of ringing relay 15 through the subscriber's station equipment including the closed pulsing contact dial 10, uppermost back contact of relay 15, upper right-hand winding of repeating coil 14, upper winding of relay 12 to ground. Relay 12 operates in this circuit in accordance with the setting of dial 10, closing and opening the dial circuit to repeat the dial pulses for the central office.

Under normal conditions of the line circuit L, the ringing relay 16, in series with the condenser 17 is bridged across the normally opened pulsing contacts 11 of relay 12. When relay 12 operates in response to actuation of dial 10, the ringing relay 16 is intermittently removed from association with the line. It will be understood that in accordance with general practice, a battery 30 is associated with the line to render the interruption thereof, by the pulsing relay, effective in setting switches at the central office. The battery 30 is shown associated with the windings of a double wound line relay 31 which is a standard arrangement.

The dotted portions of line L indicate the omission of other relay contacts, etc., the disclosure of which is not necessary for an understanding of the invention.

Now assuming the case of a call originating at some distant station and destined for station A, we will assume that the necessary connections to the line L have been effected at the central office and that ringing current has been applied to the line L by operation of the relay 22. Relay 16 responds to this current and in operating establishes an obvious circuit to operate the repeat ringing relay 15.

In attracting the extreme upper and lower armatures relay 15 connects the ringing source 19, and ground, to the ring and tip conductors, respectively, of that portion of the line extending from station A, whereupon the subscriber thereat is signaled in the usual manner. Operation of relay 15 also opens its contacts 23 and 24 thereby disconnecting the line towards the central office during the ringing interval.

Normally, i. e., just prior to operation of relay 15, it will be noted that condenser 33 is charged to the potential of battery 20 in series with the

lower winding of relay 12 and, with the battery 20 connected in the circuit as indicated, the left plate of condenser 33 will be at positive polarity and the right plate negative. When relay 15 is operated, condenser 33 is reversed with respect to battery 20 and recharges in an opposite direction in a circuit from the negative pole of the battery, resistance 13, and contacts 29 of relay 15 to the left plate of condenser 33 and from the right plate to ground and the positive terminal of the battery over contact 32 of relay 15.

Condenser 33 is now charged with its left plate negative and its right plate positive.

At the conclusion of the ringing interval, i. e. when relay 15 releases and contacts 23 and 24 reclose to connect the line through from the central office to the station, contacts 25, 29, 32 and 26 are opened and contacts 27 and 28 are closed thereby again reversing the condenser and connecting it in its original or normal condition whereupon it discharges and recharges in an opposite direction in series with battery 20 and the lower winding of relay 12 which winding is so connected that a discharge and charge there-through in the direction described tends to energize relay 12, which is polarized, in a direction to maintain it in an unoperated condition and therefore if the last ringing impulse applied to the line before relay 15 releases, to reclose its contacts 23 and 24 to connect the upper and middle windings of relay 12 across the line, is of such polarity as to charge the line, and condenser 21 at the subscriber's station, in a direction such that when relay 12 is again connected across the line, the line capacity discharge is in a direction tending to operate relay 12, the simultaneous discharge and subsequent charge of condenser 33 through the lower winding will neutralize that effect and the relay 12 will remain unoperated.

It will be noted that while relay 15 is operated condenser 33 is charged with its right plate positive and its left plate negative and when relay 15 releases this polarity of the condenser charge is opposed by the polarity of battery 20 now in circuit therewith and therefore the discharge of condenser 33 in the circuit including the lower winding of relay 12 is prolonged and the non-operate effect on this relay is correspondingly prolonged sufficiently to permit the line charge to be fully dissipated before condenser 33 recharges in the opposite direction to its full capacity, thus insuring that no false operation of relay 12 results from the cause described.

What is claimed is:

1. In a telephone system, a subscriber's line, a pulsing relay connected to said line, a ringing

relay adapted when operated to disconnect the pulsing relay from, and connect ringing current to, said line, and means comprising a condenser, a source of direct current, and an auxiliary winding on said pulsing relay, controlled by said ringing relay in such a manner as to counteract a line discharge tending to operate said pulsing relay when it is reconnected to the line following release of the ringing relay.

2. In an automatic telephone system, a subscriber's station and line, a pulsing relay in bridge of said line, at an intermediate point therein, responsive to dial impulses originating at said station to repeat said impulses to control an automatic switch, a ringing relay at said intermediate point adapted when operated to disconnect said pulsing relay and connect ringing current to the line, and means for counteracting a line discharge tending to falsely operate said pulsing relay when it is reconnected to the line following the release of the ringing relay, said means comprising an auxiliary winding on said pulsing relay, a condenser, a source of direct current, and contacts on said ringing relay so arranged and connected that when said ringing relay is released said condenser will be connected to said source in series with the auxiliary winding and when the ringing relay is operated, said condenser will be connected to said source alone and in a reverse direction.

3. In a telephone system, an automatic exchange, a dial subscriber's station, a line there-between, a pulsing relay associated with said line at an intermediate point therein and responsive to dial impulses originating at said station for repeating said impulses to control switching equipment at the exchange, a ringing relay at said intermediate point controlled from said exchange for transmitting ringing current to said station, and means for preventing false operation of said pulsing relay, due to a capacity charge on said line, when said ringing relay is released, said means comprising contacts on said ringing relay, an auxiliary winding on said pulsing relay, a condenser and a source of direct current, said contacts on said ringing relay being so arranged that when the relay is operated, said condenser will be charged in a predetermined direction by said direct current and when the relay is released the condenser will be connected in circuit with and discharged through said auxiliary winding to momentarily energize said pulsing relay in a direction to oppose its operation by a capacity discharge through the line winding.

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