

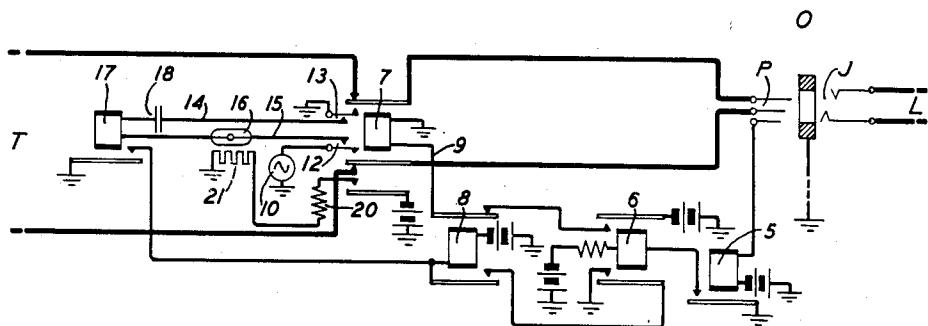
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SIGNALING SYSTEM

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## UNITED STATES PATENT OFFICE

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## SIGNALING SYSTEM

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5 Claims. (Cl. 179—84)

This invention relates generally to signaling systems and more particularly to telephone signaling systems.

It is the object of this invention to provide, in a telephone system, a simple, economical and reliable arrangement for controlling the time duration of an automatically initiated ringing signal.

This object is attained in accordance with a feature of the invention by utilizing a resistor, having a negative temperature coefficient of resistance, which functions in such a manner as to cause the signaling current source to be automatically disconnected from the telephone circuit a predetermined period of time after its connection thereto.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing which illustrates the invention as applied to the plug end of a toll tandem trunk circuit employed in extending telephone connections from one toll office to another toll office.

The toll tandem trunk circuit T is shown terminating in a plug P at an exchange O at which the toll line L terminates in the jack J.

To signal a distant exchange by way of the toll line L, the operator inserts plug P of the toll tandem trunk into jack J of the toll line L whereupon relay 5 operates over an obvious sleeve circuit including the sleeve contacts of plug P and jack J. Relay 5 in attracting its armature establishes an obvious energizing circuit for start relay 6 which relay operates, causing ringing relay 7 to operate in a circuit extending from grounded battery, upper armature and front contact of relay 6, back contact and upper armature of relay 8, conductor 9 to ground through the winding of relay 7.

40 Relay 7 in operating interrupts the continuity of the tip and ring conductors of the toll tandem trunk T and at its lower inner upper armature and front contact connects the ringing current source 10 to the ring contacts of plug P and at its upper armature and front contact connects ground to the tip contacts of plug P. Signaling current from the source 10 is therefore transmitted over the tip and ring conductors of the toll line L to effect the actuation of a signal device at the distant exchange to which the toll line L leads.

45 At contacts 12 and 13 relay 7 connects ground and the ringing current source 10 to the leads 14 and 15 respectively, across which is connected a series circuit including the non-linear

resistance 16, winding of relay 17 and condenser 18. The resistor 16 is one having a negative temperature coefficient of resistance and in its normal or unheated condition presents a high resistance to the flow of current from the source 10 so that relay 17 does not receive sufficient current to operate. The resistor 16 may be boron or silver sulphide or any such substance having similar temperature-resistance characteristics.

At its outer lower armature relay 7 establishes 10 an obvious circuit including resistance 20 and the heater coil 21. Closure of this circuit causes the resistor 16 to become heated gradually under the influence of the heater coil 21 so that its resistance gradually decreases causing the current from source 10 traversing the winding of relay 17 to increase gradually until it reaches a value sufficient to operate relay 17. Relay 17, therefore, operates a predetermined period of time after the operation of relay 7 which initiated 20 the outgoing signal.

Relay 17 operated, causes the operation of relay 8 over an obvious circuit. Relay 8 at its upper armature and back contact opens the energizing circuit for relay 7 which relay thereupon releases disconnecting the signaling current source from the contacts of plug P and therefore from the toll line L as well as from the conductors 14 and 15 and opening the energizing circuit for the heater unit 21. The resistor 16 30 thereupon cools and eventually assumes its normal condition.

When relay 8 operated, it completed a locking circuit for itself to ground on the front contact and lower armature of relay 6. Relay 8 accordingly remains locked up under the control of sleeve relay 5 which relay remains operated as long as the plug P remains in jack J.

Though applicants have illustrated their invention as applied to a toll tandem trunk it will be understood that it is applicable to any system in which a timed signal is required.

What is claimed is:

1. In a telephone system, a telephone exchange, a line circuit terminating thereat, a source of 45 signaling current, means responsive to the seizure of said circuit for connecting said source of signaling current to said line circuit, a relay for controlling the disconnection of said source from said circuit, means including a heat responsive 50 resistor for controlling the operation of said relay and means for heating said resistor.

2. In a telephone system, a telephone exchange, a line circuit terminating thereat, a source of signaling current, means responsive to the seizure 55

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 second relay controlling the operation of said first relay, means including a resistor having a negative temperature coefficient of resistance for adjusting the time of operation of said second relay with respect to the seizure of said circuit whereby said signaling current source is disconnected from said circuit a predetermined period of time after its seizure and means for heating said resistor.

3. In a telephone system, a telephone exchange, a line circuit terminating thereat, a source of signaling current, means responsive 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 second relay controlling the operation of said first relay, means including a heat responsive resistor for adjusting the time of operation of said second relay with respect to the seizure of said circuit whereby said signaling current source is disconnected from said circuit a predetermined period of time after its seizure and means for heating said resistor.

4. In a telephone system, a telephone exchange, a line circuit terminating thereat, a source of signaling current, means responsive to the seizure of said line circuit for connecting said source of signaling current to said line circuit, a relay

for controlling the disconnection of said source from said line circuit, said relay being included in circuit with said source of current and a high resistance element upon the seizure of said line circuit, and means effective also upon the seizure of said line circuit for causing a gradual diminution in the resistance of said resistance element whereby said control relay operates a predetermined period of time after the seizure of said line circuit to effect the disconnection of said source of current from said line circuit.

5. In a telephone system, a telephone exchange, a line circuit terminating thereat, a source of signaling current, a relay responsive to the seizure of said line circuit for connecting said source of current to said line circuit, a second relay, a resistance unit having a negative temperature coefficient of resistance, said first relay operating also to effect a series circuit including said second relay, said resistance unit and said source of signaling current whereupon the resistance of said series circuit gradually decreases to cause the operation of said second relay a predetermined interval of time after the seizure of said line circuit, and means controlled by said second relay for opening the circuit to said first relay whereupon said relay releases and disconnects said source of signaling current from said line circuit and said resistance unit.

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