

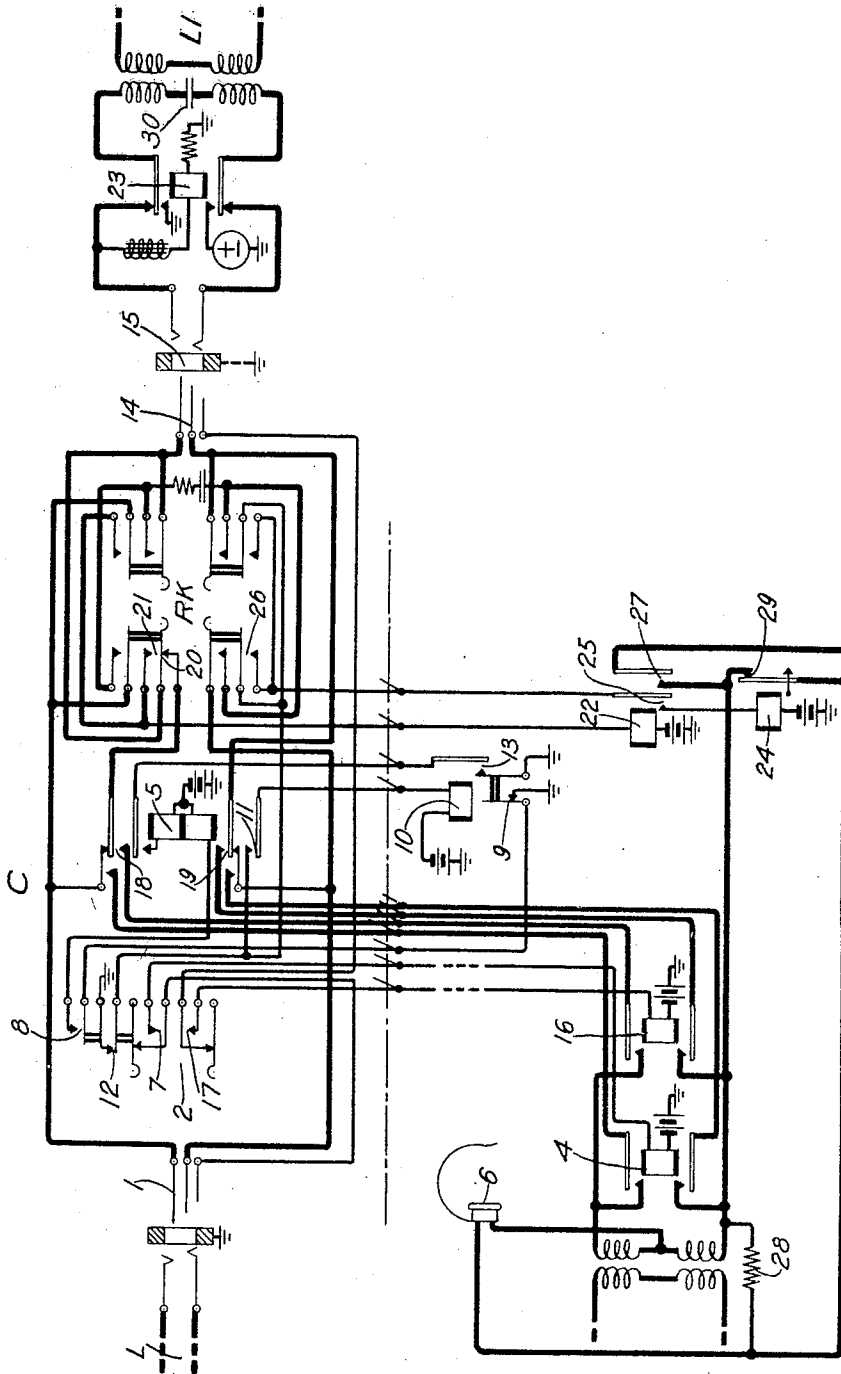
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L. F. PORTER

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TELEPHONE EXCHANGE SYSTEM

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INVENTOR

L. F. PORTER

BY

John Attall
ATTORNEY

UNITED STATES PATENT OFFICE

LESLIE F. PORTER, OF PASSAIC, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

TELEPHONE EXCHANGE SYSTEM

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This invention relates to telephone systems and more particularly to switchboard operator telephone circuits.

The object of the invention is to prevent objectionable clicks in the operator's receiver, when the ringing key is released.

These clicks are caused by an oscillatory discharge from the line, which is charged during the ringing interval. Such discharges are more pronounced in the case of lines having lumped capacity and inductance in bridge thereto, as for example, a repeating coil winding having a condenser connected in series at its mid-point.

A feature of the invention resides in the provision of means whereby a suitable resistance is automatically connected, for a momentary interval, in series or bridge with the operator's receiver upon release of the ringing key, which absorbs a large portion of the following discharge. In other words, the efficiency of the receiver circuit is decreased to such a point that the discharge oscillations are not troublesome to the operator.

The invention will be understood from the following description, when read in connection with the accompanying drawing. The drawing represents an operator's cord circuit arranged to prevent objectionable clicks in the operator's receiver when the operator releases the ringing key following the application of ringing current to a toll line shown at the right which is similar to the toll line shown in Fig. 3 of U. S. Patent 1,608,524. The cord circuit of this application is otherwise very similar to the cord circuit also shown in the above noted Patent, No. 1,608,524.

It will be assumed that the operator has answered a call incoming over the line L1 by inserting the plug 1 of her cord circuit C into the calling line jack and operating the talking and listening key 2 which causes the operation of relays 4 and 5, thereby connecting the operator's telephone set, including receiver 6, to the tip and ring conductors of the calling line.

The circuit for operating relay 4 may be traced from grounded battery, winding of

relay 4, contacts 7 of key 2 and the sleeve conductors of the plug 1 and the calling line L1 to ground. The operating circuit for relay 5 may be traced from battery, lower winding of relay 5, contacts 8 of key 2, and contacts 9 of relay 10 to ground. The operation of relay 5 closes at its contacts 11 a circuit for operating relay 10 which may be traced from grounded battery, winding of relay 10, contacts 11 of relay 5 and contacts 12 of key 2 to ground. Relay 10 in operating closes its make-before-break contacts 13, thereby completing a locking circuit for relay 5 through its upper winding. Immediately thereafter the original energizing circuit for relay 5 is broken by the opening of contacts 9 of relay 10. The operation of relay 10 which is common to a plurality of cord circuits C at the position prevents other cord circuit relays corresponding to relay 5 from operating. This feature, however, has no relation to the present invention and will not be discussed further.

It is further assumed that the calling line is to be extended over outgoing toll line L1 and the operator, therefore, inserts plug 14 of her cord circuit C into jack 15 of the line L1, thereby completing a circuit for operating relay 16 in the operator's position circuit, provided the talking key 2 is still operated, which may be traced from grounded battery, winding of relay 16, contacts 17 of key 2 and the sleeve conductors of the cord and jack 15 to ground. The operation of relay 16 connects the operator's telephone to the called line L1 over a circuit including the contacts of relay 16, contacts 18 and 19 of relay 5, and normal contacts 20 of the ringing key RK to the tip and ring conductors of the line L1.

The operator may now ring on the line L1 by operating the ringing key RK to the left, which opens the tip conductor of the cord at contacts 20 of RK, thereby disconnecting the operator's telephone, and at contacts 21 connects direct current in series with relay 22 to the tip conductor of the cord and line to operate relay 23 in the toll line. Relay 23 operates and connects ringing current to the line. Relay 22 operates in series with relay 23 and, at its contacts 27, completes a short cir-

cuit around resistance 28 in the operator's receiver circuit in parallel with the path completed by contacts 29 of relay 24. Relay 22 in operating also completes at its contacts 25 an energizing circuit for relay 24, provided the listening key 2 is still operated, which may be traced from grounded battery, winding of relay 24, contacts 25 of relay 22, contacts 26 of RK and contacts 12 of key 2 to ground. Relay 24 in operating opens its contacts 29 but the short circuit around resistance 28 is maintained, at this time, over contacts 27 of relay 22. When the ringing key RK is released, relays 22 and 23 release. Relay 22 which is a normally fast releasing relay immediately opens its contacts 27 thereby removing the short circuit from resistance 28 in order that when relay 23 releases to reconnect the tip and ring of the cord to the line, the discharge of condenser 30 in the line will be partially absorbed in the resistance 18, thereby preventing an objectionable click in the operator's receiver. Release of relay 22 opens the circuit of relay 24 which starts to release, but this relay, which is of a sluggish character, releases slowly and there is an appreciable time interval, before relay 24 completes its contacts 29, that resistance 28 is in series with the receiver 6. This time interval, during which the efficiency of the operator's receiver is greatly reduced by the resistance 18, is sufficient to tide over the oscillatory discharge from the line. When relay 24 finally releases and completes its contacts 29, a short circuit is again completed around resistance 28, and the receiver again restored to its normal efficiency.

What is claimed is:

1. In a telephone system, an operator's link circuit, an operator's receiver circuit connected thereto, a key associated with said link circuit adapted, when operated, to connect ringing current to the calling end of said link, and means responsive to the release of said key to momentarily decrease the efficiency of said receiver circuit.

2. In a telephone system, an operator's link circuit, an operator's receiver circuit connected thereto, a ringing key associated with said link circuit, and means automatically responsive to the actuation of said key and its subsequent release to momentarily decrease the efficiency of said receiver circuit.

3. In a telephone system, an operator's link circuit, an operator's receiver circuit connected thereto, a ringing key associated with said link circuit, and means responsive to the actuation of said key and its subsequent release to momentarily increase the resistance of said receiver circuit.

4. In a telephone system, an operator's link circuit, an operator's receiver circuit connected thereto, a ringing key associated with said link circuit, and means responsive to the actuation of said key and its subse-

quent release to momentarily shunt the receiver with a high resistance of the order of 50 ohms.

5. In a telephone system, an operator's position, cord circuits at said position, an operator's receiver circuit common to said cord circuits at said positions, a ringing key circuit associated with each of said cord circuits, and means jointly responsive to the connection of said operator's receiver circuit to one of said cord circuits, and the actuation of the respective ringing key and its subsequent release to momentarily reduce the efficiency of said receiver circuit.

6. In a telephone system, an operator's cord circuit, an operator's receiver circuit connected thereto, a source of ringing current, means for connecting said ringing current to said cord circuit, and means effective upon the disconnection of said ringing current to momentarily decrease the efficiency of said receiver circuit.

7. In a telephone system, a called line, an operator's cord circuit having a calling end connected to said called line, an operator's receiver circuit connected to said cord circuit, a ringing key associated with said cord circuit and adapted, when operated, to cause ringing current to be applied to the called line, means associated with said receiver for decreasing the efficiency thereof, said means being normally disabled, and means responsive to the operation of said ringing key and its subsequent release to momentarily remove said disabled condition from the first means.

8. In a telephone system, an operator's cord circuit having a calling end, an operator's receiver circuit connected thereto, a ringing key associated with said cord circuit, a high resistance in circuit with said receiver, a normally effective short circuit around said high resistance, and means responsive to the operation of said ringing key and its subsequent release to momentarily remove said short circuit from around said high resistance.

9. In a telephone system a called line, an operator's link circuit having a calling end connected to said called line, an operator's receiver circuit connected to said link circuit, a ringing key associated with said link circuit adapted, when operated, to cause ringing current to be applied to said called line, a high resistance in series with said receiver circuit, a short circuit path around said resistance, and means responsive to the operation and subsequent release of said ringing key to momentarily open said short circuit path.

In witness whereof, I hereunto subscribe my name this 20th day of March, 1930.

LESLIE F. PORTER.