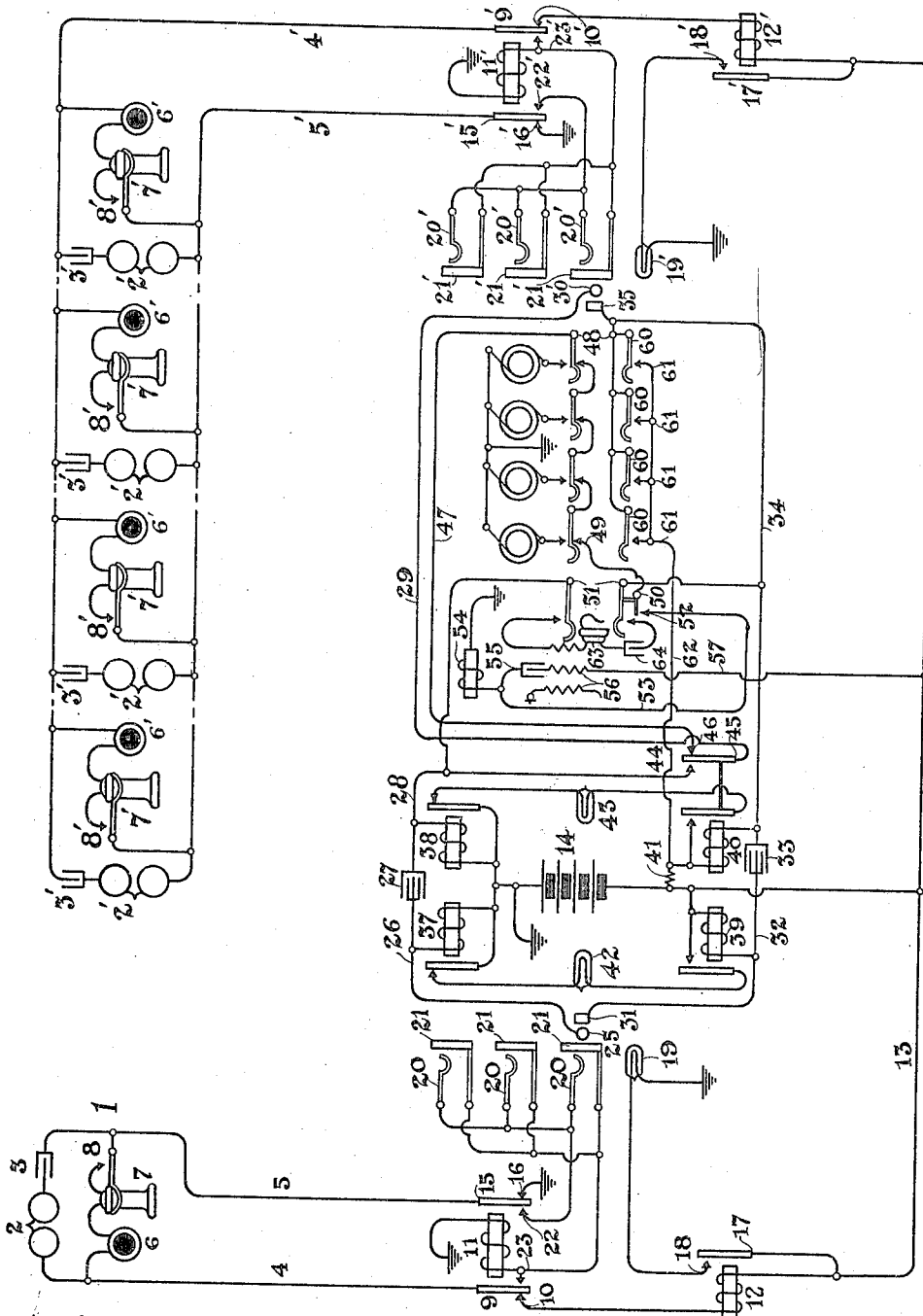


C. C. BRADBURY.
 PARTY LINE RINGING SYSTEM.
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Witnesses
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PARTY-LINE RINGING SYSTEM.

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To all whom it may concern:

Be it known that I, CLIFFORD C. BRADBURY, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Party-Line Ringing Systems, of which the following is a specification.

My invention relates to telephone systems, and particularly to the means of connecting and disconnecting the ringing current with the strands of the cord circuit.

It has been customary in the past to provide party line ringing keys with a plurality of series contacts all normally in the talking circuit, each spring when actuated being adapted to be severed from the portion of the cord circuit to the rear of that spring and to be connected with its particular source of ringing current, the spring itself being connected with one of the contacts of the calling plug.

Series contacts of this character frequently become dirty and greatly increase the resistance of the talking circuit and it is the object of my invention to so connect the ringing key that its contacts are in a portion of the cord circuit which is disconnected during conversation, and thereby to exclude the series contacts of the key from the talking circuit.

My invention is illustrated in the accompanying drawing in which all of the apparatus is shown in its normal or unactuated condition.

The subscriber's station 1 shown at the left of the drawing is equipped with the annunciator 2 and condenser 3 in a permanent bridge between the line conductors 4 and 5, and with the transmitter 6 and receiver 7 in a bridge maintained normally open by contacts of the switch hook 8. At the central office line conductor 4 is connected through the contacts 9 and 10 of cut-off relay 11, the coil of line relay 12 and conductor 13 with the live pole of battery 14. Line conductor 5 is connected with earth through contacts 15 and 16 of cut-off relay 11. The line relay 12 has normally open contacts 17 and 18 controlling the circuit of the line signal 19. The tip and sleeve contacts 20 and 21 of the answering and multiple jacks are connected respectively with the inside contacts 22 and 23 of cut-off relay 11, the

contact 23 being also connected through the coil of relay 11 with earth.

The called subscriber's line shown at the right of the drawing is here provided with four subscribers' stations, each station being equipped with apparatus similar to station 1, the corresponding apparatus associated with this line being designated by like figures with the suffix "'". The cord circuit for connecting these lines for conversation is here illustrated as of the well known four relay type, and is provided with two talking strands, one extending from the tip 25 of the answering plug through conductor 26, condenser 27, and conductors 28 and 29 to the tip 30 of the calling plug, the other extending from the sleeve contact 31 of the answering plug through conductor 32, condenser 33 and conductor 34 to the sleeve contact 35 of the calling plug. The answering and calling tip supervisory relays 37 and 38 have their coils bridged between the ground pole of battery 14 and the tip strand of the cord circuit on the answering and calling sides of the condenser 27, and the answering and calling sleeve supervisory relays 39 and 40 have their coils bridged between the live pole of battery 14 and the sleeve strand of the cord circuit on the answering and calling sides of condenser 33, a non-inductive resistance 41 being included in the circuit of relay 40 between the coil and the battery 14. The answering supervisory relays 37 and 39 control the circuit of the answering supervisory signal 42, and the calling supervisory relays 38 and 40 control the circuit of the calling supervisory signal 43. Relay 40 has additional contacts 44, 45 and 46, the spring contact 45 being permanently connected with the tip of the calling plug, and being normally connected through contact 46, and conductor 47 with the first spring of the operator's ringing key 48.

Ringling key 48 is here illustrated as a four-party ringling key with series tip contacts, the last series contact 49 being connected with the auxiliary contact 50 of the operator's listening key 51, the other auxiliary contact 52 being connected through conductor 53 with one terminal of impedance coil 54 and one terminal of the condenser 55. The other terminal of the impedance coil is connected with earth, and the other

terminal of the condenser is connected through the tertiary winding of the operator's induction coil 56 and conductor 57 with the live pole of battery 14. The sleeve side of the ringing key 48 is provided with springs 60 all connected in multiple and with the normally open contacts 61 also connected in multiple, the spring contacts 60 being connected directly with the sleeve of the calling plug and the contacts 61 being connected through conductor 62 with the inside terminal of supervisory relay 40 at a point outside of the non-inductive resistance 41. The operator's listening key 51 is adapted when actuated to place the operator's receiver 63 in a bridge between the talking conductors, this bridge also including the condenser 64 and the secondary winding of the operator's induction coil 56.

In the operation of this system, the subscriber in charge of substation 1 removes his receiver 7 from the switch hook 8 and thereby completes a circuit from the live pole of battery 14 through conductor 13, the coil of line relay 12, contacts 10 and 9 of cut-off relay 11, line conductor 4, transmitter 6, receiver 7, contacts of the switch hook 8, line conductor 5 and contacts 15 and 16 of cut-off relay 11 to earth. Current in this path actuates line relay 12 closing its contacts 17 and 18 and completing the circuit of the line signal 19, which is thus displayed to indicate to the operator that a connection is desired. The operator therefore inserts her answering plug into the answering jack of the calling line and thereby completes a circuit from the live pole of battery 14 through the coil of relay 39, sleeve contacts 31 and 20 of the answering plug and jack and the coil of cut-off relay 11 to ground. Current in this path actuates relays 39 and 11, the actuation of relay 11 severing the circuit of the line relay 12 and connecting the line conductors 4 and 5 with the contacts 21 and 20 of the jack. Current thus flows from the live pole of battery 14 through the coil of supervisory relay 39, contacts 31 and 21 of the plug and jack, contacts 23 and 9 of cut-off relay 11, line conductor 4, transmitter 6, receiver 7, switch hook 8, line conductor 5, contacts 15 and 22 of the cut-off relay 11, tip contacts 20 and 25 of the jack and plug, tip conductor 26 and the coil of supervisory relay 37 to the ground pole of battery 14. The current in this path also actuates relay 37 which prevents the display of the supervisory signal 42 which would otherwise be displayed by the actuation of relay 39. The operator now actuates her listening key 51 and inquires the number of the desired line. Finding this to be that of subscriber 1', the operator touches the tip 30 of her calling plug to the sleeve or test contact 21' of one of the multiple jacks of the desired line. If the line is busy another cord circuit will be connected with one of the jacks of the line and the sleeve contacts of all of the jacks will be raised to a potential higher than that of earth, in which case current will flow from the test contact of the jack through the tip contact 30 of the calling plug, cord conductor 39, the contacts 45 and 46 of supervisory relay 40, conductor 47, the series contacts of the ringing key 48, auxiliary contacts 50 and 52 of the listening key 51, conductor 53, and the impedance coil 54 to earth. The current in this path would cause a slight discharge of the normally charged condenser 55 which would in turn cause a disturbance in the tertiary winding of the induction coil 56 and in the operator's receiver 63, indicating to the operator that the line is busy. Assuming, however, that no click is heard, the operator inserts her calling plug completely into the jack of the desired line causing its tip and sleeve contacts 30 and 35 to register with contacts 20' and 21' of the jack. A path for current is thereby completed from the live pole of battery 14 through the non-inductive resistance 41, coil of supervisory relay 40, conductor 34, sleeve contacts 35 and 20' of the plug and jack and the coil of cut-off relay 11' to ground. The actuation of relay 11' connects line conductors 4' and 5' with the contacts of the jack. The operator now actuates one of the buttons of her four-party ringing key 48, the button actuated depending upon which of the four parties on the line is desired. The actuation of this button closes contacts 60 and 61 on the sleeve side of the ringing key. This completes a shunt about the coil of supervisory relay 40 and causes it to fall back to its normal position. The actuation of this button also connects ringing current with the tip springs of the key, this current being carried through conductor 47, contacts 46 and 45 of the supervisory relay 40, conductor 29, tip contacts 30 and 20' of the calling plug and jack, contacts 22' and 15' of cut-off relay 11', line conductor 5', annunciators 2', condensers 3', line conductor 4', contacts 9' and 23' of cut-off relay 11', sleeve contacts 21' and 35 of the jack and plug, contacts 60 and 61 of the actuated ringing button, conductor 62, non-inductive resistance 41 and through the battery 14 back to the other pole of the ringing generator. The current sent out from the particular generator to which connection was made, being of a distinctive character, sounds the signal at only one of the substations upon the line. When the ringing key is released the supervisory relay 40 is again actuated over the path formerly described, the shunt now being removed from the coil of that relay. The actuation of this relay closes the circuit of supervisory signal 43, displaying that signal to indicate to the op-

erator that the called subscriber has not yet answered his call. When the called subscriber answers his call a path for direct current is completed from the live pole of battery 14 through non-inductive resistance 41, supervisory relay 40, conductor 34, contacts 35 and 21' of the plug and jack, contacts 23' and 9' of cut-off relay 11', line conductor 4', transmitter 6', receiver 7', hook-switch 8' of the answering subscriber's station, line conductor 5', contacts 15' and 22' of cut-off relay 11', tip contacts 20' and 30 of the jack and plug, conductor 29, the now closed contacts 45 and 44 of supervisory relay 40, conductor 28 and the coil of supervisory relay 38 to ground. This actuates supervisory relay 38 which effaces the signal 43 and indicates to the operator that the called subscriber has answered his call. The calling and called subscribers are now in condition for conversation, the current for the transmitters being supplied through the coils of the supervisory relays in the cord circuit. It is to be understood that the non-inductive resistance 41 will be quite low, its only purpose being to prevent the live pole of battery 14 from being connected directly with the contacts of the ringing key 48 and with the line conductor 4' during ringing, it being considered better practice to have some resistance interposed between the battery and the line so that an excessive current would not flow in case of a grounded line. When the conversation has been terminated the calling and called subscribers replace their receivers upon their respective switch hooks and thereby interrupt the circuits of supervisory relay 37 and 38. When these relays resume their normal positions, the circuits of supervisory signals 42 and 43 are again completed and these signals are displayed to indicate to the operator that the conversation has been terminated. The operator then removes her plugs from their connections which allows all of the apparatus to resume its normal condition.

While my invention has been here shown and described in connection with a specific combination of relays and circuits, it is to be understood that it may be applied to many different systems and that therefore I do not wish to be unduly limited to the details here shown, many changes from which could be made without in any way departing from the spirit or scope of my invention.

I claim:

1. In a telephone system, the combination with a connecting circuit having answering and calling connecting plugs, of a ringing key having contacts connected with contacts of the calling plug, a supervisory relay permanently connected to one of the connecting plugs of the connecting circuit, and means to interrupt the circuit between the answer-

ing and calling plugs at the contacts of said supervisory relay whenever the ringing key is actuated, substantially as described.

2. In a telephone system, the combination with a cord circuit, of a supervisory relay therefor having contacts maintaining a normal break in the tip strand of the cord circuit, a ringing key connected with said strand on one side of said break, said break preventing the flow of ringing current to the answering end of the cord circuit, said relay being adapted to be actuated after ringing to complete the tip strand of the cord circuit for talking purposes, substantially as described.

3. In a telephone system, the combination with a cord circuit having tip and sleeve conductors, of a supervisory relay for the cord circuit actuated over one of said conductors and having contacts serially included in the other conductor, the portion of said latter conductor from the relay contacts to the calling plug being free from series contacts, a ringing key adapted by its actuation to impress ringing current upon the calling end of the interrupted conductor and to place said supervisory relay in condition for interrupting the strand to which the ringing current is connected, substantially as described.

4. In a telephone system, the combination with a cord circuit, of a ringing key therefor, a sleeve supervisory relay responsive to a connection to a called line, said ringing key being connected with a strand of the cord circuit through normal contacts of said supervisory relay, substantially as described.

5. In a telephone system, the combination with a cord circuit, of a supervisory relay for the cord circuit having contacts serially included in the tip strand of said cord circuit, said strand from the contacts of said relay to the calling plug, comprising a permanently continuous conductor, means for connecting ringing current with said conductor, said contacts being adapted to be open during the application of said ringing current, whereby the current will not pass to the answering end of the cord circuit, substantially as described.

6. In a telephone system, the combination with a cord circuit having a normally interrupted talking strand, said strand being permanently continuous from said interruption to the calling plug, a ringing key connected with the calling end of said strand during ringing, and means to complete said interruption after ringing, substantially as described.

7. In a telephone system, the combination with a cord circuit having a normally interrupted talking strand, the portion of said strand from said interruption to the calling plug being permanently continuous, a ringing key connected with the calling end of

said strand during ringing, and means to disconnect said ringing key and complete said interruption after ringing, substantially as described.

- 5 8. In a telephone system, the combination with a cord circuit, of a supervisory relay for the cord circuit having contacts serially included in a strand of the cord circuit, a ringing key adapted to be connected with the
10 calling end of the cord circuit when said contacts are in one condition, said ringing key being adapted to be disconnected and the cord strand completed when said contacts are in the other condition, substantially as
15 described.
9. In a telephone system, the combination with a connecting circuit, of a ringing key normally connected with a talking strand of said connecting circuit, contacts in said
20 strand maintaining a normal separation between the answering and calling ends of said connecting circuit, and means to disconnect the ringing key and complete said normal interruption during conversation, substantially
25 as described.
10. In a telephone system, the combination with a connecting circuit having a normally interrupted tip strand, a ringing key having contacts normally connected with the
30 calling end of said tip strand, a testing device adapted to be connected with the tip of the calling plug through the contacts of the ringing key, and a supervisory relay for the connecting circuit having contacts adapted
35 to complete the tip strand of the cord circuit and adapted to disconnect the ringing key and testing device from the tip strand when the relay is actuated, substantially as described.
- 40 11. In a telephone system, the combination with a cord circuit, of a source of current therefor, a supervisory relay normally connected between a talking strand of the cord circuit and a pole of said source, said
45 relay having contacts maintaining a normal interruption in the tip strand of the cord circuit, a ringing key having series contacts normally connected with the calling end of the tip strand of the cord circuit
50 through the contacts of said relay, a test receiving device adapted to be connected with the last series contact of said ringing key, contacts of said ringing key adapted to place a shunt about the coil of said supervisory relay, whereby the relay is inoperative during ringing, substantially as described.
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12. In a telephone system, the combination with a cord circuit, of a multiple contact ringing key normally connected to the
60 cord circuit and adapted to be connected to the cord circuit during ringing, a supervisory relay for the cord circuit operated over a local circuit when the cord is connected with a line and the ringing key is in

its normal position, said supervisory relay being adapted when actuated to disconnect the ringing key from the cord circuit, substantially as described.

13. In a telephone system, the combination with a cord circuit, of a testing conductor therefor, said conductor including a part of the tip talking strand, contacts of a supervisory relay, contacts of a ringing key, a contact of a listening key and a winding of an induction coil in the order named,
70 substantially as described.

14. In a telephone system, the combination with a connecting circuit, of a ringing key therefor having a plurality of multiple contacts permanently connected with the sleeve of the calling plug, a plurality of series contacts connected during ringing with the tip of the calling plug, a supervisory relay having contacts in the circuit
80 between the series contacts of said ringing key and the tip of the calling plug, said supervisory relay being adapted when actuated to disconnect said series contacts from the tip of the calling plug, the multiple contacts of said ringing key being adapted to complete a shunt about the coil of the supervisory relay, whereby said relay is not actuated during ringing, substantially as described.
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15. In a telephone system, the combination with a cord circuit, of a ringing key therefor, having a plurality of contacts normally in series with a portion of a talking strand of the cord circuit, a sleeve supervisory relay having contacts in the circuit of said key, said relay being actuated during conversation to disconnect said series key contacts from the talking circuit, substantially as described.
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16. In a telephone system, the combination with a cord circuit, of a ringing key therefor having a plurality of series contacts connected with a talking strand of said cord circuit, a supervisory relay having contacts
110 in the circuit between the series contacts of said ringing key and said strand of the talking circuit, said supervisory relay being adapted when actuated to disconnect said series contacts from the talking circuit, said
115 ringing key having contacts adapted to complete a shunt about the coil of said supervisory relay when the key is actuated, whereby said relay is not actuated during ringing, substantially as described.
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17. In a telephone system, the combination with a cord circuit, of a ringing key therefor having a plurality of series contacts connected with a talking strand of said cord circuit, a supervisory relay having contacts
125 in the circuit between the series contacts of said ringing key and said strand of the talking circuit, said supervisory relay being adapted when actuated to disconnect said series contacts from the talking circuit, said
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ringing key having contacts adapted to deprive said relay of actuating current during the operation of the key, whereby said relay is not actuated during ringing, substantially as described.

18. In a telephone system, the combination with a cord circuit, a ringing generator, a supervisory relay normally connected with a strand of said cord circuit, the current from said generator being connected with the calling end of the cord circuit through normally closed contacts of said relay, substantially as described.

19. In a telephone system, the combination with a telephone line, of a cord circuit adapted to connect therewith, a supervisory relay adapted to be actuated when said cord circuit is connected with said line, a ringing key adapted by its actuation to deenergize said supervisory relay, whereby said relay returns to normal position, the ringing contacts of said key being connected with said line through normal contacts of said supervisory relay, substantially as described.

20. In a telephone system, the combination with a link circuit provided with a two-contact terminal, a ringing current generator, a supervisory relay connected to one contact of said terminal, and means for connecting current from said generator to the other contact of said terminal through normally closed contacts of said relay.

21. In a telephone system, the combination with a cord circuit provided with a two-contact terminal, a ringing generator, a supervisory relay connected to one of said contacts, the current from said generator being connected to the other contact of said

terminal through normally closed contacts of said relay.

22. In a telephone system, the combination with a link circuit provided with a two-contact calling terminal, a ringing generator, a sleeve supervisory relay normally connected to a contact of said terminal, and means for connecting current from the said generator to the other contact of said terminal through normally closed contacts of said supervisory relay.

23. In a telephone system, the combination with a cord circuit provided with a two-contact terminal, a supervisory relay permanently connected to one of said contacts, a ringing key for said cord circuit, and means controlled by the actuation of said ringing key for connecting ringing current through normally closed contacts of said supervisory relay to the other contact of said terminal.

24. In a telephone system, the combination with a link circuit provided with a multi-contact terminal, a ringing current generator, a supervisory relay normally connected to a contact of said terminal, and means for connecting current from said generator to another contact of said terminal, through normally closed contacts on said relay.

Signed by me at Chicago, county of Cook, and State of Illinois, in the presence of two witnesses.

CLIFFORD C. BRADBURY.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."