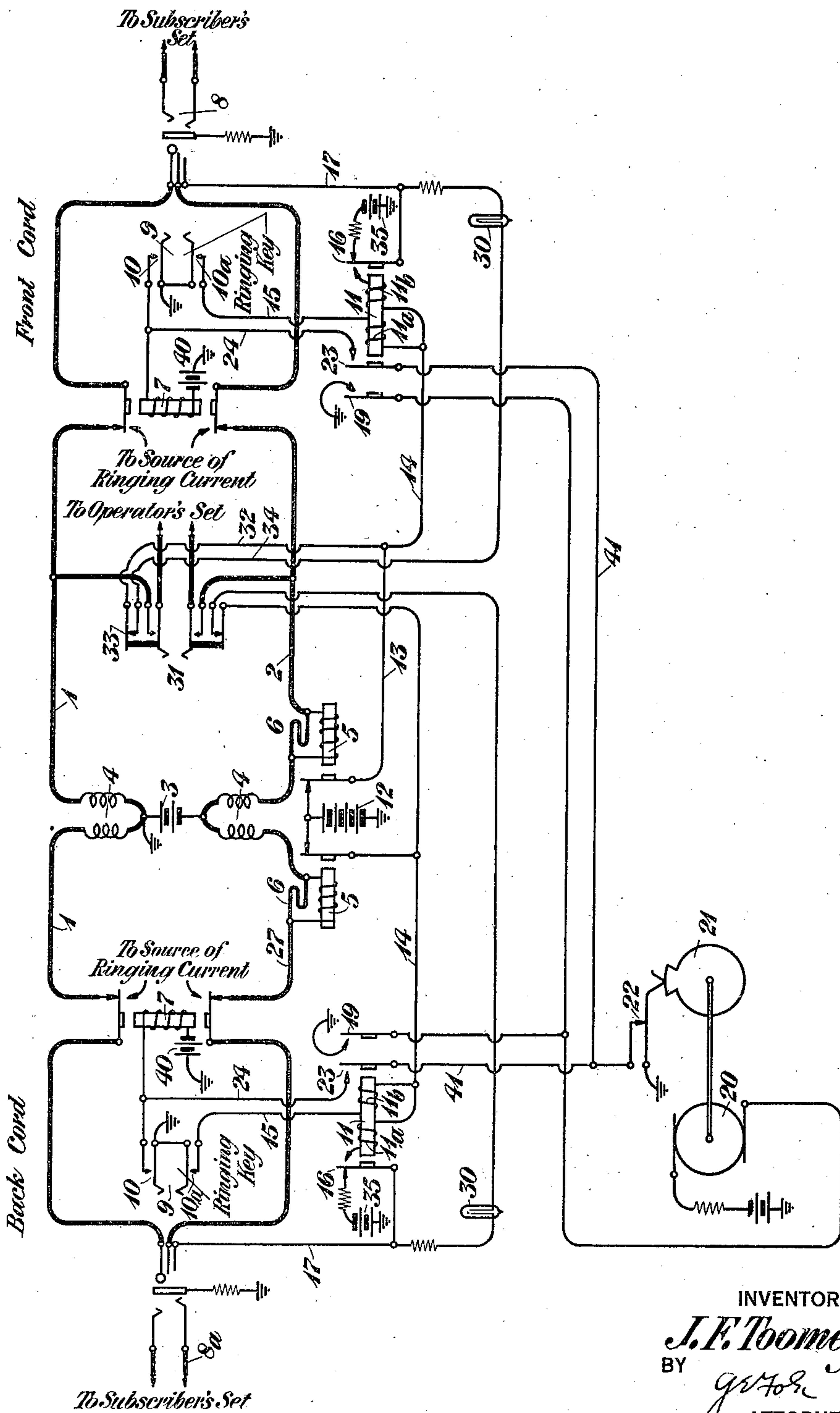


J. F. TOOMEY.
 AUTOMATIC RINGING CIRCUITS.
 APPLICATION FILED JUNE 5, 1919.

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AUTOMATIC RINGING CIRCUITS.

Application filed June 5, 1919. Serial No. 301,927.

To all whom it may concern:

Be it known that I, JOHN F. TOOMEY, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Automatic Ringing Circuits, of which the following is a specification.

This invention relates to automatic ringing circuits.

The object of the invention is to provide a simple and inexpensive arrangement of circuits and apparatus for automatic ringing, particularly adapted for use on small switchboards such as private branch exchange boards.

In the preferred form of embodiment of the invention, the apparatus and circuits are so arranged that the operation of the ringing key causes the energization of a locking relay which, in turn, causes the application of intermittent ringing current to the jack of the subscriber with which the operator's cord is associated. The locking circuit of this relay is controlled by two contacts, one of which is opened by the supervisory relay when the subscriber answers, and the other of which is opened when the operator takes down the cord in case the subscriber fails to answer. The opening of either of these contact stops the flow of ringing current and causes the circuits to be restored to normal conditions.

The above and other features of this invention will be readily understood from the following description when considered in connection with the accompanying drawing showing a diagrammatic view of one form and arrangement of apparatus and circuits embodying this invention.

In this drawing reference characters 1 and 2 designate the switchboard conductors of an operator's cord circuit, which conductors are supplied with current by a battery 3 connected in series with the usual transformer or repeating coil 4. Relays 7 normally associate the switchboard conductors with the front and back cords of the cord circuit. A number of subscriber's and central station jacks are provided on the switchboard with which jacks the operator may associate the plugs of the cord circuit in setting up connections in the usual manner, but for the sake of simplicity only two of these jacks, 8 and 8^a, are shown on the drawing.

To ring the subscriber associated with jack 8 the operator inserts the plug of the front cord into the jack and depresses the ringing key 9. Contact 10 of the key connects ground to the winding of relay 7 and causes the same to close its front contacts and associate a source of ringing current with the subscriber's set. This current continues to flow until the operator releases the ringing key. In the meantime, however, a locking relay 11 has become energized by reason of the closure of contact 10^a of the key, the energizing circuit of the relay extending from a battery 12 through the contact of a supervisory relay 5, the conductors 13 and 14, winding 11^a, conductor 15 and contact 10^a of key 9 to ground. After relay 11 has closed its front contacts it is maintained energized by current in its locking circuit, which extends from battery 12 through the contact of the supervisory relay 5, conductors 13 and 14, winding 11^b, contact 16, wire 17, and through the sleeve contact of the jack 8 to ground. The locking circuit is independent of the contacts of the ringing key, being controlled only by the supervisory relay 5 and the sleeve contact of the jack, and relay 11 consequently remains energized when the operator releases the ringing key.

Relay 11 controls a device for applying intermittent ringing current to the subscriber's set, this device comprising a motor 20 which is mechanically connected to a cam 21 provided with an abutment for operating a contact 22. Contact 19 of relay 11 controls the circuit of the motor and when the relay is energized by the depression of the ringing key, the motor rotates the cam and causes thus an intermittent operation of contact 22. Relay 7 is controlled by contact 22 by means of a circuit extending from battery 40 through the winding of relay 7, wire 24, contact 23 of relay 11, wire 41 and contact 22 to ground. This circuit causes an intermittent energization of relay 7 and consequently an intermittent flow of ringing current through the subscriber's set.

When the subscriber answers, he closes, in taking the receiver off the hook, a path for the direct current from battery 3. This current flows over the switchboard conductors and energizes the supervisory relay 5, which is associated with conductor 2 across the terminals of a shunt 6 having low im-

pedance to the alternating voice currents. Relay 5 breaks the holding circuit of relay 11, causing the same to open contacts 19 and 23 and stop the flow of ringing current to the subscriber's set. In case the subscriber fails to answer, the locking circuit of relay 11 is broken at the sleeve of jack 8 when the operator removes the plug from the jack.

The supervisory lamp 30 is controlled in the usual manner by the supervisory relay 5 and by the contacts of the listening key 31, the circuit of the lamp extending from ground through battery 12, through the contact of supervisory relay 5, conductor 13 and 32, contact 33 of key 31, wire 34, lamp 30, wire 17 and sleeve contact of jack 8 to ground. A battery 35 is provided for furnishing current to the sleeve contact of the jack when relay 11 is deenergized, this current being necessary for the operation of certain instrumentalities associated with the sleeve contact of central station jacks, which instrumentalities however, do not relate to this invention and have, therefore, not been shown in the drawing.

The apparatus associated with the back cord is similar to that of the front cord and the above description applies equally well thereto, like parts being designated by like characters of reference.

Although only one form of embodiment of this invention is shown and described herein, it is readily understood that various changes and modifications may be made therein within the scope of the following claims without departing from the spirit and scope of this invention.

What is claimed is:

1. In combination, a cord circuit comprising voice conductors, a supervisory relay serially connected in the talking circuit, a ringing key, a locking relay, an energizing circuit therefor controlled by said key, and a locking circuit therefor controlled by said supervisory relay, a source of ringing current and a single coil relay, responsive to either said locking relay or said ringing key for associating said source with said cord circuit.

2. In combination, a cord circuit, a jack for receiving the plug of said cord circuit, a contact associated with said plug and jack, a supervisory relay associated with said cord circuit, a ringing key, a locking relay, an energizing circuit therefor controlled by said key and said supervisory relay, but independent of said plug and jack contact, and a locking circuit therefor controlled by said supervisory relay and by said plug and jack contact, a source of ringing current, and a relay controlled by said locking relay for associating said source with said cord circuit.

3. In combination, a cord circuit comprising voice conductors, a supervisory relay in series with the voice conductors, a ringing

key, a locking relay, an energizing circuit therefor controlled by said key and a locking circuit therefor controlled by said supervisory relay, a source of ringing current, a relay for associating said source with said cord circuit, means operated by said ringing key for causing a response of said relay while said key is in operated position, and an intermittent contact controlled by said locking relay for causing an intermittent association of said ringing source when said key has returned to normal position.

4. In combination, a cord circuit, a jack for receiving the plug of said cord circuit, a contact associated with said plug and jack, a supervisory relay associated with said cord circuit, a ringing key, a locking relay, an energizing circuit therefor controlled by said key but independent of said plug and jack contact, and a locking circuit therefor controlled by said supervisory relay and by said plug and jack contact, an intermittent contact device controlled by said locking relay, a source of ringing current, a relay for associating said source with said cord circuit, a circuit for said relay governed by said key and independent of said supervisory relay, and another circuit therefor controlled by said intermittent contact and said locking relay.

5. In combination, a cord circuit comprising voice conductors, a source of talking current associated therewith, a supervisory relay serially connected in the talking circuit, a source of ringing current, a relay for intermittently associating said source of ringing current with said circuit and intermittently disrupting the continuity of the voice conductors of the said circuit and a contact for preventing the operation of said relay, said contact being controlled by the series supervisory relay.

6. In combination, a cord circuit comprising voice conductors, a source of ringing current, a first relay for interrupting said voice conductors and for associating said source with said voice conductors, a key for causing initial operation of said relay, a second relay, an energizing circuit therefor governed by said key, a jack, a locking circuit for said second relay governed by said jack, a supervisory relay serially connected in the talking circuit for governing said energizing and locking circuits, an intermittent contact and a circuit governed thereby and by said second relay for causing an intermittent operation of said first relay.

7. In combination, a cord circuit comprising switchboard and cord conductors, a source of ringing current, a first relay for dissociating said switchboard and cord conductors and for associating said source with said cord conductors, a key for causing an initial operation of said relay, a second re-

lay, an energizing circuit therefor governed by said key, a jack, a locking circuit for said second relay governed by said jack, a supervisory relay for governing said energizing and locking circuits, a motor governed by said second relay, a cam operated by said motor, a contact intermittently operated by said cam and a circuit for said first relay governed by said second relay and by said intermittent contact for causing an intermittent operation of said first relay subsequently to said initial operation thereof.

8. In combination, a symmetrical cord circuit, having associated in one side thereof a supervisory relay, a ringing key, a locking relay, an energizing circuit therefor controlled by said key and a locking circuit therefor controlled by said supervisory relay, a similar set of elements associated in the other side of said cord circuit, a source of ringing current and a relay on each side of said cord circuit, each of said relays being responsive respectively either to its locking relay or its ringing key for associating said ringing source with the corresponding side of said cord circuit.

9. In combination, a pair of switchboard conductors, a battery bridged across said conductors, a cord, a source of ringing current, a ringing relay, means for causing said relay to connect said source for said switchboard conductors in series with said cord ac-

ording to its operated or non-operated position, a jack for receiving the plug of said cord, a contact associated with said plug and jack, a ringing key, a locking relay, an energizing circuit therefor responsive to an actuation of said ringing key but independent of said plug and jack contact, a locking circuit therefor governed by said plug and jack contact, a supervisory relay in series with said switchboard conductors and responsive to flow of battery current in said cord conductors, and comprising a contact responsive to an energization of said supervisory relay for opening both said energizing and locking circuits of said locking relay, an intermittent contact device, means for controlling the operation of said device by said locking relay, a first circuit for said ringing relay governed by said ringing key but independent of said locking relay for causing an immediate response of said first relay to an actuation of the ringing key, and a second circuit for said ringing relay governed by said locking relay and said intermittent contact but independent of said ringing key for causing subsequently an intermittent actuation of the ringing relay.

In testimony whereof, I have signed my name to this specification this 3rd day of June, 1919.

JOHN F. TOOMEY.