

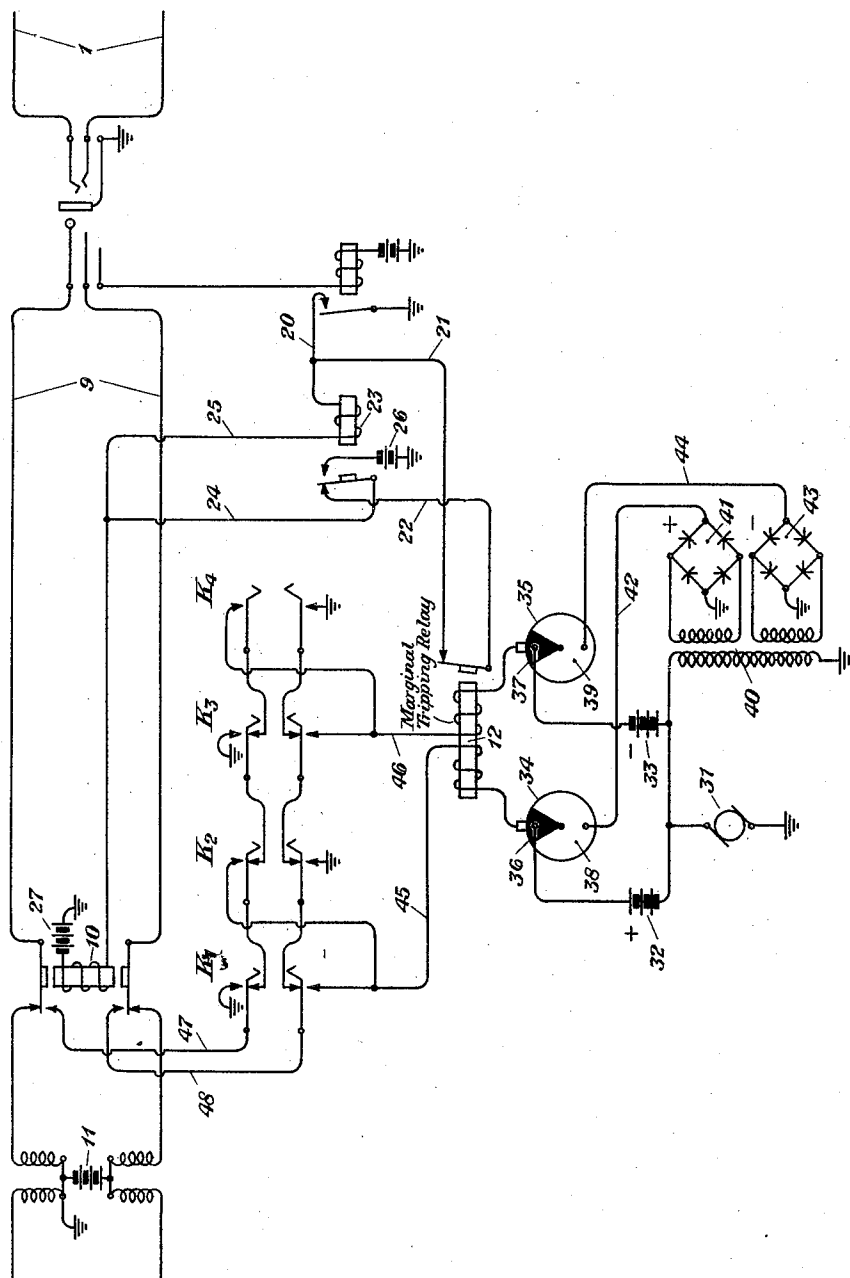
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SIGNALING CIRCUIT

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SIGNALING CIRCUIT

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This invention relates to telephone systems, and more particularly to improvements in circuits utilized for signaling purposes on such systems.

5 When it is desired to signal or ring a telephone subscriber the subscriber's line is connected at the central office with a circuit including a source of signaling current and a tripping relay. When the subscriber answers
10 the tripping relay will operate and disconnect the ringing or signaling source from the line. The tripping relay is usually in series with the ringing source, and the ringing current will pass through the tripping relay but will
15 not operate it as it is adjusted so that it will not operate on this current. When the subscriber answers and takes his receiver off the hook a lower impedance is presented to the ringing current at the station, thereby
20 permitting a larger amount of current to flow through the tripping relay. This increase in current will operate the tripping relay and thereby disconnect the ringing apparatus from the line.

25 When the ringing service is adapted for use on a party line to which a number of subscribers' stations might be connected, it is the practice to connect positive and negative direct current in series with the alternating
30 ringing source and to provide switching means whereby these currents of opposite polarity may be connected to various sides of the line. It is also the practice to apply ringing current to the line intermittently so that
35 there will be a ringing interval and a silent interval. If the subscriber should remove his receiver from the hook during the silent interval no current would be on the line and the tripping relay would not be operated.
40 Accordingly, it is the practice to apply to the line direct current during this silent interval so that no matter whether the subscriber removes his receiver from the hook during the ringing interval or the silent
45 interval the tripping relay will be operated.

It has been the practice to supply the silent interval tripping battery from banks of dry cells at the central office. It has not been feasible to supply this current from
50 the regular 48-volt storage batteries in the

office, as is done with other types of service, because a different potential such, for example, as in the neighborhood of 70 volts is required, and furthermore, batteries with both positive and negative polarity are
55 needed to avoid false signals on the party line.

In the arrangements of this invention the segments of the interrupter which supply the silent interval tripping battery receive their
60 direct current supply from two wave rectifiers connected to secondaries of a transformer operating from the alternating ringing current source. With the arrangements
65 of the invention certain advantages will arise in economies from elimination of expense for dry cells, with the considerable amount of testing and other maintenance which they require, together with the saving in floor
70 space which is now occupied by the dry cell cabinets. Furthermore, the arrangements of the invention will prove more reliable, causing less chance of service troubles than former arrangements utilizing dry cells. A
75 suitable type of rectifying device for use in the arrangements of the invention might be a contact rectifier of the electronic variety such, for example, as a copper oxide rectifier. Other objects and features of the invention
80 will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing, in
85 the figure of which is a circuit diagram illustrating a preferred form of the invention.

In the drawing is shown a subscriber's line 1 terminating in a jack at the central office. For purposes of illustration it may be assumed that such line is a party line
90 with four subscribers' stations connected thereto. By means of a plug connection may be established with a cord circuit 9. The cord circuit 9 will receive ringing current from a source of alternating current 31.
95 The positive battery 32 and the negative battery 33 may be superimposed on the alternating current from this source and selectively applied by means of the switches K_1 , K_2 , K_3 and K_4 to either the tip or ring of the cord 100

circuit 9 for selectively ringing the subscribers' stations. In series with this source of ringing current is the marginal tripping relay 12. Connection from the source 31 to the cord circuit is established through the interrupters 34 and 35. These interrupters will have segments 36 and 37 during which alternating ringing current will be applied to the line. These interrupters will have segments 38 and 39 which provide for a silent interval in which no ringing current is applied to the line. In order to provide tripping current for relay 12 during the silent interval, connections are established from the silent interval segments 38 and 39 through the full wave rectifier devices 41 and 43 and the transformer 40 connected to the alternating ringing source 31.

A more detailed description of the operation of the arrangements is as follows: When a connection is established between cord circuit 9 and line 1 by means of the plug and jack, the relay connected to the sleeve of the plug will be operated. This will close the following circuit: from ground, contact of the sleeve relay, conductors 20 and 21, contact of relay 12, conductor 22, contact of relay 23, conductor 24, winding of relay 10, battery 27, to ground. This will operate the relay 10. It is pointed out that when the above traced circuit is completed, a short circuit is established about the winding of relay 23 and it remains unoperated at this time. The operation of relay 10 will prepare for the connection of ringing current to the cord circuit 9. This ringing current will be connected thereto upon the operation of one of the keys such, for example, as the key K_1 . If the key K_1 is operated, ground will be connected over conductor 47 to the tip conductor of the cord 9. The ring conductor of the cord 9 will be connected to the following circuit: conductor 48, contact of key K_1 , conductor 45, winding of relay 12, brush of interrupter 34, and thence either over segment 36, battery 32 to source 31 or over segment 38, conductor 42, rectifier 41, winding of transformer 40, to the source 31. If the brush of interrupter 34 is in contact with segment 36 alternating ringing current with direct current superimposed thereon will be applied to the ring conductor of the cord circuit 9. If the brush of interrupter 34 is in contact with the silent interval segment 38, only direct current of positive polarity will be applied through the tripping relay 12 to the ring conductor of the line. Accordingly, at no matter what time the subscriber takes his receiver off the hook the tripping relay will be operated, due to the increased current therethrough. The operation of the tripping relay will open the previously traced short circuit around the winding of relay 23. Accordingly, the relay 23 will be operated over conductor 25 leading to bat-

tery 27. The operation of relay 23 will move its armature to its right hand contact, thereby connecting battery 26 in circuit with the battery 27. As these are common batteries the relay 10 will be released and the ringing apparatus will be disconnected from the line.

While the methods and arrangements of this invention for supplying battery to the silent interval segment of the interrupter have been illustrated in connection with the ringing apparatus of a cord circuit, it is pointed out that they might equally well be adapted to supply positive and negative current to a cord circuit designed to operate prepayment coin box apparatus. Furthermore, while the arrangements of the invention have been shown as applied to a four-party ringing system, they might equally well be utilized with other types of ringing systems. While the invention disclosed is embodied in certain specific forms it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A cord circuit having associated therewith a source of alternating ringing current, a tripping relay connected with said source, an interrupter in said last mentioned connection, and rectifying means connected to said source said interrupter having one segment directly connected to said source and another segment connected to said rectifying means.

2. A cord circuit including a tripping relay, an interrupter connected to said tripping relay, said interrupter having a ringing segment and a silent interval segment, a source of alternating current connected to said ringing segment, a transformer, a rectifier connected to said source through said transformer, and a connection from said rectifier to said silent interval segment.

3. A cord circuit having associated therewith a source of alternating ringing current, a tripping relay having two windings connected in parallel from said source, interrupters in each of said last mentioned connections, each of said interrupters having a segment directly connected to said source, two rectifiers of opposite polarity connected to said source, one of said interrupters having a segment connected to said source through one of said rectifiers, and the other of said interrupters having a segment connected to said source through the other of said rectifiers.

In testimony whereof, I have signed my name to this specification this 22nd day of March, 1929.

ELIOT W. NILES.