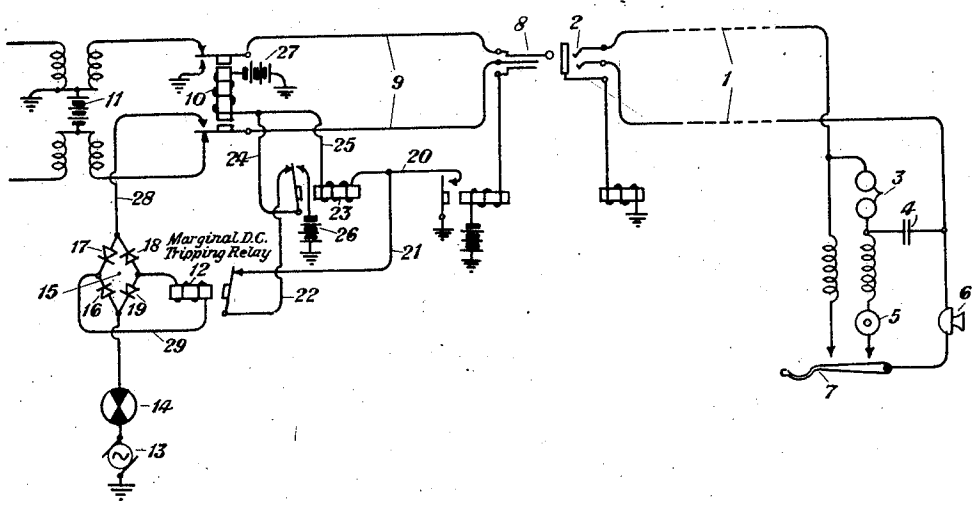
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TELEPHONE SIGNALING CIRCUITS

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TELEPHONE SIGNALING CIRCUITS

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This invention relates to telephone systems and more particularly to improved arrangements for signaling on such systems.

When it is desired to signal a subscriber's station, it is the practice to connect to the subscriber's line at the central office a source of alternating signaling current. When the subscriber answers a relay termed a tripping relay operates to disconnect this ringing source from the line. The tripping relay has usually been connected in series with the source of alternating signaling current and 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 subscriber's station, thereby permitting a larger amount of alternating current to flow through the tripping relay. The tripping relay is adjusted so that it will operate on this amount of current. Obviously, in systems of this type, there is the necessity of marginal adjustment of the tripping relay on alternating current. This limits the ringing range and also requires considerable maintenance.

The primary object of the arrangements of the invention is to increase the range of usefulness of ringing systems utilizing a tripping relay to cut off the ringing current by providing for direct current instead of alternating current operation of the tripping relay at the central office. Other objects and features of the invention 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 the figure of which is shown a circuit diagram embodying a preferred form of the invention.

In the drawing is shown a subscriber's line 1 terminating at a central office in the jack 2. At the subscriber's station is shown the bell 3 in series with the condenser 4 bridged across the subscriber's line. There will also be included at the subscriber's station, the usual receiver 5, transmitter 6 and switchhook apparatus 7. At the central office, a connection may be established with line 1 by means of the plug 8 connected to the circuit 9. The circuit arrangement 9 will include a source of current 11 for talking purposes. It will also include the transfer relay 10, the operation of which applies ringing current to the subscriber's line 1. The ringing current is supplied from a circuit arrangement comprising the alternating current generator 13, the interrupter 14, the rectifier device 15 and the marginal direct current tripping relay 12.

The operation of the arrangements is as follows. When the plug 8 is inserted in jack 2, the following circuit is closed; from ground connected to sleeve of jack 2, winding of the relay connected to sleeve of plug 8, to battery and ground. This will operate the sleeve relay of plug 8 and close the following circuit; from ground and contact of sleeve relay of plug 8, conductors 20 and 21, contact of tripping relay 12, conductor 22, left hand contact of relay 23, conductor 24, winding or relay 10 to battery 27 and ground. This will operate relay 10. It is pointed out that when the above traced circuit is completed, a short circuit is established around the winding of relay 23 and it remains unoperated at this time. The operation of relay 10 will connect ringing current to the tip and ring conductors of circuit 9 and thence over line 1 to the subscriber's set. Ringing current will be applied to the ring conductor of circuit 9 from source 13, through interrupter 14, through the rectifier device 15 and over conductor 28. The rectifier device 15 is a Wheatstone bridge network with the rectifier elements 16, 17, 18 and 19 pole as shown. The individual rectifier elements are preferably of the contact variety, such as copper oxide rectifiers. Bridged across the midpoints of the rectifier network is the tripping relay 12 which may be adjusted to operate on direct current. Current of one polarity from the alternating current source will pass through the rectifier and tripping relay as follows: from source 13, interrupter 14, rectifier 16, conductor 29, winding of relay 12, rectifier 18 and over conductor 28 to the ring conductor

of circuit 9. Current of the opposite polarity from source 13 will travel in the following direction: from the ring conductor of circuit 9, conductor 28, rectifier 17, conductor 29, winding of relay 12, rectifier 19, interrupter 14 to source 13. It will be seen that with this arrangement, the current always passes through the tripping relay 12 in the same direction but retains its alternating current wave form when transmitted over the line for ringing purposes. Accordingly, the tripping relay may be adjusted for direct current operation alone. This permits of more sensitive adjustment and also reduces maintenance. At the same time stronger alternating current may be utilized for ringing purposes and hence signaling may be possible over longer loops than heretofore.

When the subscriber answers in response to the operation of bell 3 and removes the receiver 5 from the switchhook 7, a lower impedance path is presented at the subscriber's station to the ringing current. This will increase the amount of current transmitted over the circuit and this increase in the current will operate the tripping relay 12. The operation of relay 12 will break at its armature and contact the previously traced circuit for relay 10. This will remove the short circuit around relay 23. The circuit will then be completed as follows: from ground and contact of sleeve relay of plug 8, conductor 20, winding of relay 23, conductor 25, winding of relay 10 to battery 27 and ground. This will operate relay 23 and close the following circuit; from ground and battery 26, right hand contact of relay 23, conductor 24, winding of relay 10, to battery 27 and ground. As like poles of both equal batteries 26 and 27 are connected to this circuit, the relay 10 will be deenergized. This will cut off the ringing current for the line and complete the line for talking purposes.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, 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 subscriber's line interconnecting a subscriber's set with a central office, a circuit adapted to be connected to said line at said central office, a source of alternating current, a device for connecting said source to said circuit, a relay connected to said device, said device being so constructed that the current transmitted therethrough from said source to said circuit will retain its alternating current wave form and the current transmitted therethrough from said source to said relay will be rectified, and means controlled by said relay for controlling the connection of said source to said circuit.

2. A subscriber's line interconnecting a subscriber's set with a central office, a circuit adapted to be connected to said line at said central office, a source of alternating current, a Wheatstone bridge network comprising rectifiers in each of the arms of said bridge for connecting said source to said circuit, a relay connected across the midpoints of the arms of said bridge, said relay being marginal and adjusted to operate solely on direct current, and means controlled by said relay for disconnecting said source from said circuit.

3. A subscriber's line interconnecting a subscriber's set with a central office, a circuit adapted to be connected to said line at said central office, a source of alternating current, a Wheatstone bridge network comprising rectifiers in each of the arms of said bridge for connecting said source to said circuit, a marginal direct current relay connected across the midpoints of the arms of said bridge, the recifiers in said bridge network being so poled that the current transmitted therethrough from said source to said circuit will retain its alternating current wave form and the current transmitted therethrough from said source to said relay will be rectified, and means controlled by said relay for disconnecting said source from said circuit.

In testimony whereof, we have signed our names to this specification this 22nd day of September, 1928.

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