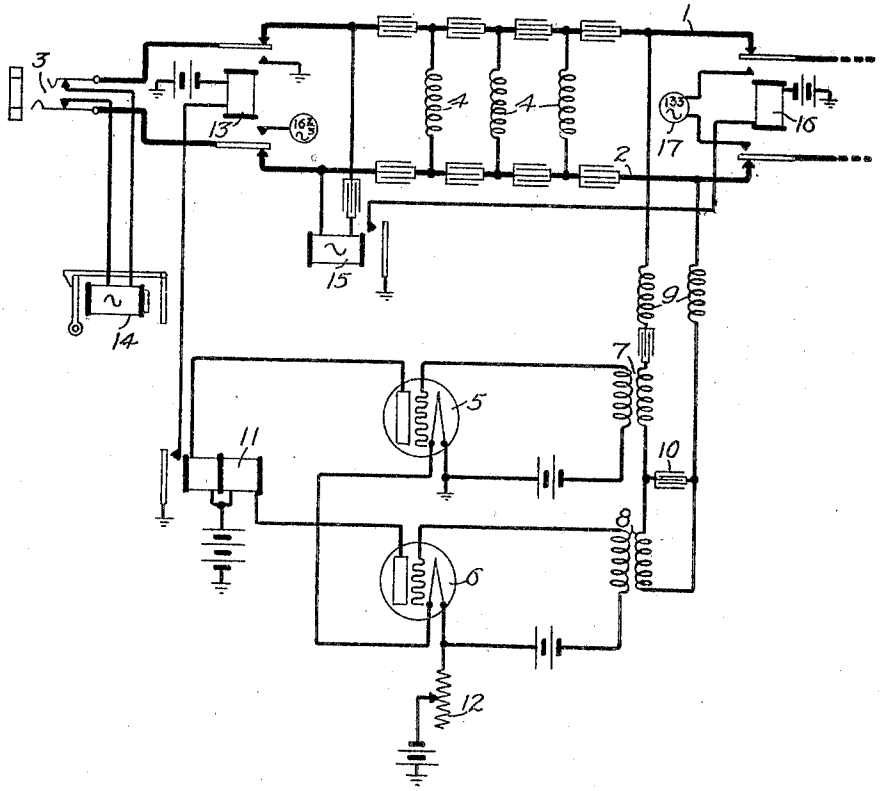
Feb. 12, 1924.

1,483,400

R. S. WILBUR

TELEPHONE SYSTEM

Filed Dec. 31, 1919



Inventor:
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by C. R. Soper Att'y.

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UNITED STATES PATENT OFFICE.

RAY S. WILBUR, OF LYNDHURST, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

Application filed December 31, 1919. Serial No. 348,585.

To all whom it may concern:

Be it known that I, RAY S. WILBUR, a citizen of the United States, residing at Lyndhurst, in the county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to improvements in signaling systems and has particular reference to a composite ringing repeater circuit employed in toll transmission lines.

In the transmission of signaling current in composite repeater circuits, it has been customary to connect relays directly across an incoming line or through amplifiers, which relays are tuned to respond to currents of high and low alternating current frequencies for the purpose of operating signals at the terminating ends of the line. It has been found in practice that the nature of the current flowing through the windings of these relays is such as to cause a constant vibration of the armatures thereof, which tends to decrease the efficiency of operation.

An object of the present invention is to provide an improved means for accomplishing the transmission of signaling current to the terminating end of a repeater circuit, wherein the vibrations, above referred to, are eliminated and the operation thereby rendered more positive.

The drawing illustrates diagrammatically the terminating end of a composite ringing repeater circuit showing a preferred application of the invention thereto.

In the drawing, the numerals 1 and 2 indicate the sides of a toll transmission line, the ends of which terminate in the tip and ring contacts of a jack 3. For the purpose of preventing the passage of 133-cycle alternating current through the terminating ends of the transmission line, filters 4 are bridged across the sides 1 and 2 of the line.

In the present invention, a pair of repeaters or amplifiers 5 and 6 of the well known discharge tube type are connected to the sides 1 and 2 of the transmission line respectively through input coils 7 and 8, and arranged between these input coils of the lines are the retardation coils 9 which exclude low frequency currents from the repeaters. Signaling current of 133 cycles incoming on the line is prevented from passing thereover to the terminating end of the line by the filters 4, and consequently this current will flow through the retardation coils 9 and the input coils 7 and 8 of repeaters 5 and 6. It is proposed to split the phase of the alternating current incoming on the transmission line in order that the alternating current will be alternately induced into the repeaters. For this purpose a condenser 10 is preferably connected in parallel with the primary winding of the input coil 8 and thereby establishes a local oscillating circuit including the primary winding of the input coil 8. In thus splitting the phase of this alternating current it will be apparent that the same will be first induced into the input side of the repeater 5 and then into the input side of repeater 6, thus maintaining a constant flow of current which is alternately amplified by said repeaters.

The constant flow of the current to the repeaters 5 and 6 is utilized to maintain the energization of relay 11 during the application of ringing current to the incoming end of the transmission line. The relay 11 is responsive to direct current which, in one instance, flows from the positive pole of battery, through the left-hand winding of relay 11, the plate of repeater 5, and to ground through the filament of the repeater. In the case of the repeater 6, a circuit for relay 11 extends from battery, through the right-hand winding of said relay, the plate of repeater 6, to the filament of said repeater and the potentiometer 12 to the negative pole of battery. It will thus be apparent that relay 11 will remain constantly energized by direct current flowing through the windings thereof and the output side of the repeaters 5 and 6 when alternating current of 133 cycles is passed through said repeaters. The energization of relay 11 closes a circuit extending from ground, through the contact of said relay and the winding of relay 13, to grounded battery. Relay 13 energizes and at its normal contacts disconnects the sides 1 and 2 of the transmission line from the jack 3 during the application of ringing current to the line. By closing its alternate contacts, relay 13 establishes a circuit extending from

the source of ringing current, preferably of 16⅔ cycles, through the lower alternate contact of relay 13, the ring contact of jack 3, the winding of signaling device 14, the tip contact of jack 3, and the upper alternate contact of relay 13, to ground. Signaling device 14 is responsive to this signaling current and operates to indicate to the operator at the terminating end of the transmission line that a call is being extended thereover, whereupon the operator inserts the plug of a link circuit into jack 3 and thereby disconnects the signaling device 14 from the terminating end of the line. When transmission of signaling current through the repeaters 5 and 6 ceases, relay 11 releases and opens the energizing circuit for relay 13 which again connects the sides 1 and 2 of the transmission line to the terminating ends thereof. Conversation may then proceed over the line.

When ringing out over the sides of the line the insertion of a plug into jack 3 and the operation of the ringing key of the link circuit connected to said jack causes the energization of relay 15, which, in closing its contact, establishes an obvious circuit for relay 16. This relay energizes and at its alternate contact connects the source of signaling current 17, preferably of 133 cycles, to the sides of the line 1 and 2 and the transmission of this signaling current to the other terminating end of the line will be effected in the same manner as described in connection with transmission of signaling current to the end of the line shown in the drawing.

What is claimed is:

1. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, a source of alternating current, means for connecting said source of alternating current to the terminating end of said line, and means responsive to and maintained effective by direct current through said repeaters for operating the last named means during the transmission of alternating current over said line.

2. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, a source of alternating current, means for connecting said source of current to the terminating end of said line, and a relay connected to the output sides of said repeaters and responsive to and maintained effective by direct current therefrom for operating said means during the transmission of alternating current over said line.

3. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, a relay responsive to direct current transmitted from said repeaters during the transmission of alternating current incoming on said line, means on the input side of said repeaters for alternately rendering the same effective to apply direct current to said relay whereby the relay is constantly maintained energized, and means responsive to the energization of said relay for applying alternating current to the terminating end of said line.

4. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, an electromagnetic device responsive to direct current from said repeaters, an input coil for each repeater, means for splitting the phase of the alternating current passing through said coils to said repeaters for constantly maintaining the energization of said electromagnetic device and means responsive to the energization of said device for applying alternating current to the terminating end of said line.

5. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, a relay having windings each of which is connected to the output side of one of said repeaters, an input coil for each repeater, means connected to the coil of one repeater for splitting the phase of alternating current incoming on said line whereby said repeaters are alternately rendered effective to constantly supply direct current to the windings of said relay, and means responsive to the energization of said relay for applying alternating current to the terminating end of said line.

6. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, a local circuit for the input coil of one repeater, a condenser connected to a winding of the input coil of the other repeater for establishing said local circuit, a relay connected to the output sides of said repeaters and maintained constantly energized during the transmission of alternating current through said repeaters by direct current transmitted alternately therefrom, and means responsive to the energization of said relay for applying alternating current to the terminating end of said line.

7. In a signaling system, a transmission line, repeaters connected to said line for amplifying alternating current transmitted thereover, a source of alternating current, means for connecting said source of current to the terminating end of said line, and means responsive only to direct current through said repeaters and maintained effective by said direct current for operating the first-named means during the transmission of alternating current over said line.

8. In a signaling system, a transmission line, repeaters connected to said line for

amplifying alternating current transmitted thereover, a source of alternating current, means for connecting said source to the terminating end of said line, and a switching device connected to the output sides of said repeaters and responsive only to direct current from said repeaters and maintained operated by said direct current for actuating said means during the transmission of alternating current over said line.

In witness whereof, I hereunto subscribe my name this 30th day of December A. D., 1919.

RAY S. WILBUR.