

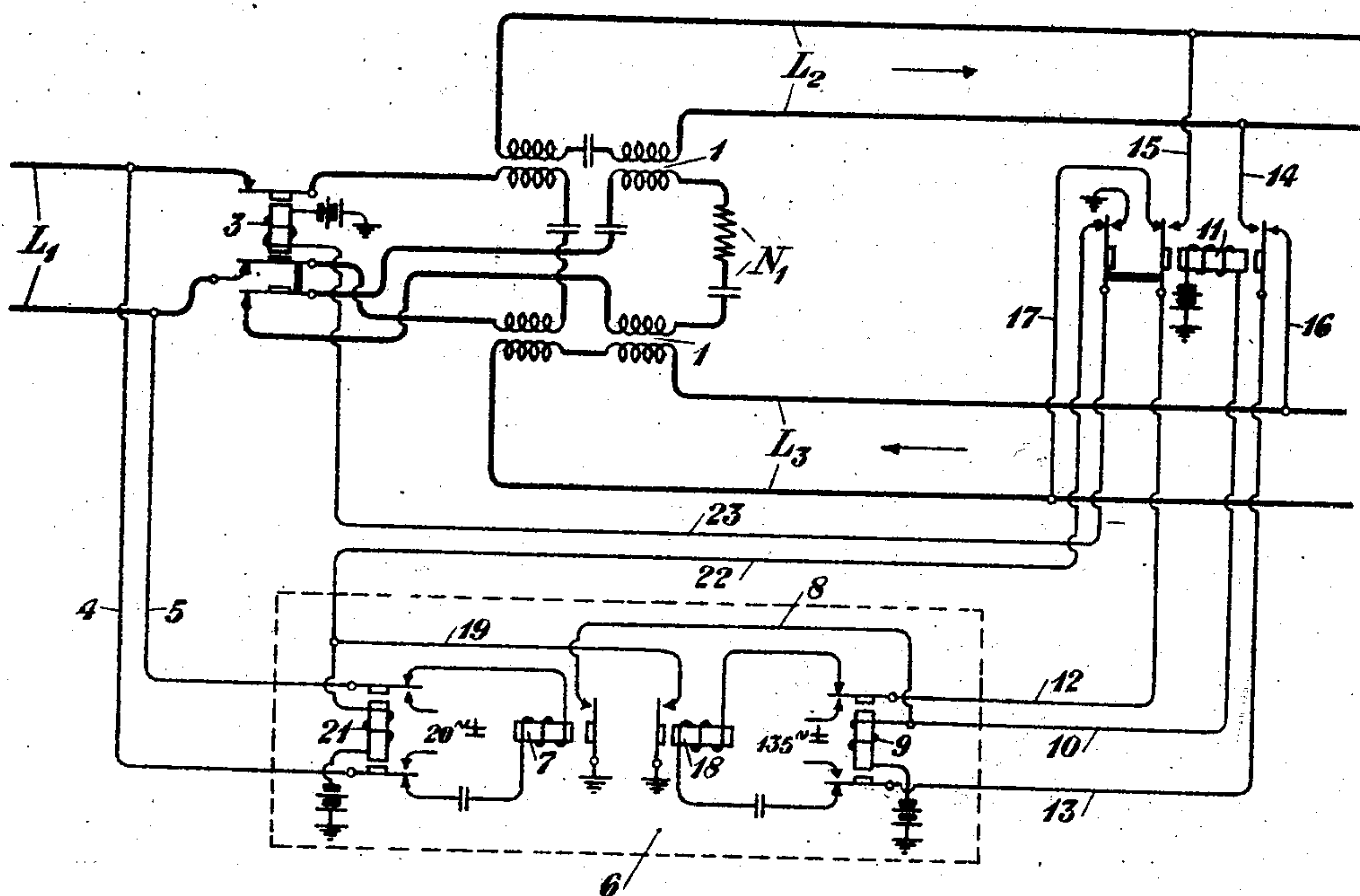
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SIGNALING ARRANGEMENT FOR FOUR-WIRE CIRCUITS

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UNITED STATES PATENT OFFICE.

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SIGNALING ARRANGEMENT FOR FOUR-WIRE CIRCUITS.

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To all whom it may concern:

Be it known that I, CHARLES S. DEMAREST, a citizen of the United States, residing at Ridgewood, in the county of Bergen and State of New Jersey, have invented certain Improvements in Signaling Arrangements for Four-Wire Circuits, of which the following is a specification.

This invention relates to transmission lines and more particularly to signaling arrangements for transmission lines of the well known four-wire type.

The signaling apparatus at a switchboard at which a transmission line terminates is usually designed to operate at a relatively low frequency, such, for purposes of illustration, as a frequency of the order of 20 cycles, while the frequency utilized for transmission over the line itself is usually of a relatively higher order, such, for purposes of illustration, as 135 cycles. Accordingly, at the terminal of a transmission line a device well known in the art and termed a composite ringer may be employed. Such a device comprises means responsive to the relatively high frequency signaling currents coming in over the line for controlling a device to apply relatively low frequency signaling currents to the switchboard apparatus, and vice versa. It is the purpose of the invention to provide improved arrangements for associating composite ringer apparatus with a four-wire type of transmission line. As is well known, the four-wire type of transmission line comprises two one-way line sections for transmission in opposite directions connected at a station through a hybrid coil, or three-winding transformer, to a terminal two-way line. It has been found in practice to be undesirable to associate the composite ringer apparatus entirely with the terminal two-way line, as the signaling currents would have to be transmitted through the hybrid coil in such instance, and the hybrid coil is generally not designed to be efficient at the signaling frequencies utilized. In accordance with the arrangements of this invention, the low frequency side of the composite ringer is associated with the terminal two-way line, and switching arrangements are associated with the one-way lines of the four-wire circuit whereby the high frequency side of the composite ringer may be associated with the incoming one-way line for receiving incom-

ing signals or may be connected with the outgoing one-way line for transmitting signals. With such an arrangement the transmission of signaling currents through the hybrid coil may be avoided, and the standard type of composite set may be utilized with a four-wire type of transmission line. Further features and objects of the invention will appear more fully from the detailed description hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the figure of which is illustrated a circuit diagram of the arrangements of the invention.

The drawing illustrates a portion of a four-wire transmission system comprising the outgoing one-way two-wire line section L_2 , and the incoming one-way two-wire line section L_3 . These lines are connected by the three-winding transformer, or hybrid coil, 1 to the terminal two-wire two-way line L_1 . The line L_1 is connected inductively with and terminates in the balancing network N_1 . The cut-off relay 3 is associated with the line L_1 and the artificial line or network N_1 . The composite ringer apparatus 6 is shown enclosed in dotted lines and is well known in the art. The low frequency branch of the ringer is connected to the terminal two-wire line L_1 by conductors 4 and 5. The high frequency branch of the composite ringer is associated with lines L_2 or L_3 by means of conductors 12 and 13 and the switching arrangements controlled by relay 11.

The invention may be more fully understood from the following description of its operation.

The signaling currents coming in over the four-wire system would be transmitted over the one-way line L_3 and, as has been formerly pointed out, might be of a frequency of the order of 135 cycles. These signaling currents would be transmitted over conductors 16 and 17 and the break contacts of relay 11 and over conductors 12 and 13, break contacts of relay 9 and through the winding of relay 18 thereby actuating relay 18. The actuation of relay 18 will close the following circuit:

From ground, armature and contact of relay 18, conductor 19, winding of relay 21 to battery and ground. This will operate

the relay 21 which will connect to the conductors 4 and 5 a source of signaling current suitable for operating the apparatus at the switchboard which might, in practice, be of a frequency of the order of 20 cycles. This 20 cycle current will be transmitted over conductor 4 and 5 and thence over the line L_1 to the switchboard apparatus. The operation of relay 18 would also close a circuit from ground, armature and contact of relay 18, conductor 19, conductor 22, outer left-hand break contact and armature of relay 11, conductor 23, winding of cut-off relay 3 to battery and ground. This will operate the cut-off relay 3 which will open both the line L_1 and the artificial line N_1 so that the low frequency signaling currents will not be transmitted back over the line L_2 . The signaling currents transmitted from the switchboard apparatus, which, as has been pointed out might have a frequency of the order of 20 cycles, would be transmitted over line L_1 and thence over conductors 4 and 5, armatures and break contacts of relay 21 through the winding of relay 7 thereby actuating relay 7. The operation of relay 7 will close the following circuit:

From ground and armature and contact of relay 7, conductor 8, winding of relay 9 to battery and ground and also close a circuit from conductor 8, over conductor 10, winding of relay 11 to battery and ground. This will actuate both relays 9 and 11. The operation of relay 9 will connect to conductors 12 and 13 a source of signaling current suitable for transmission out over the four-wire system which might be of the order of 135 cycles. Upon the actuation of relays 9 and 11, signaling currents of these frequencies will be transmitted over conductors 12 and

13, make contacts of relay 11 and thence over conductors 14 and 15 and out over the line L_2 . The operation of relay 11 will also close a circuit from ground, outer left-hand make contact of relay 11, conductor 23, winding of cut-off relay 3 to battery and ground thereby operating the cut-off relay to prevent any of these signaling currents from being transmitted over the line L_2 to the line L_1 .

While the invention has been disclosed in certain specific arrangements which are deemed advisable, it is understood that it is capable of embodiment in many other and widely varied forms without departing from the spirit of the invention as defined in the following claim.

What is claimed is:

A transmission system comprising a terminal two-way line, a hybrid coil and an artificial line associated with said line, a cut-off relay for opening said line and said artificial line, two one-way lines for transmission in opposite directions associated with said terminal line by said hybrid coil, a composite ringer, means for connecting one branch of said ringer with said terminal two-way line, switching means associated with said two one-way lines for connecting the other section of said ringer with either of said one-way lines means controlled by said ringer for operating said switching means, and means controlled by said switching means and by said ringer for operating said cut-off relay.

In testimony whereof, I have signed my name to this specification this 16th day of January, 1924.

CHARLES S. DEMAREST.