

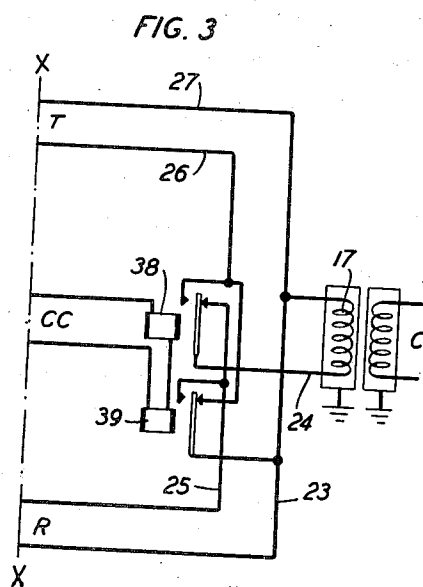
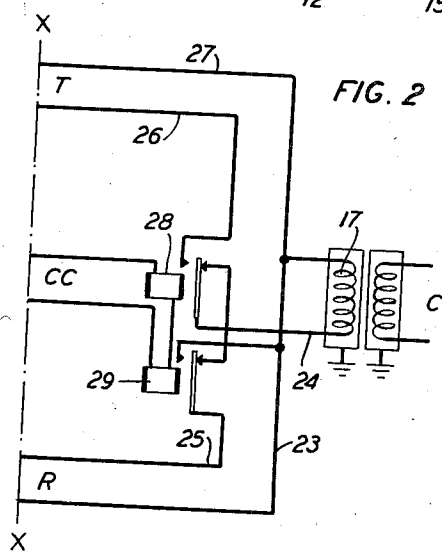
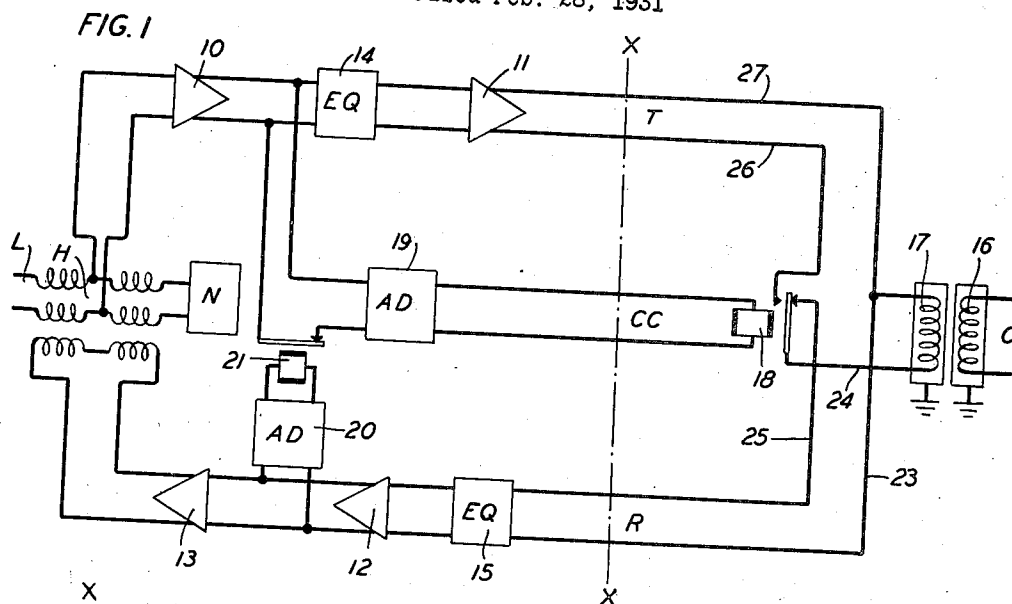
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VOICE OPERATED SWITCHING CIRCUIT

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VOICE OPERATED SWITCHING CIRCUIT

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3 Claims. (Cl. 179—170)

The present invention relates to a telephone or similar system having as its main transmission path a two-way circuit and having a so-called four-wire termination therefor comprising a transmitting branch and a receiving branch. Switching means is provided for alternately connecting the transmitting and receiving branches to the two-way path and disconnecting them therefrom. This switching means is preferably under the control of the signals or speech waves that are being transmitted over the system.

Since in the case of an electrically long transmission system in which the attenuation is high the transmitting energy level is very high in comparison with the receiving energy level it is important to insure that the switching mechanism under no circumstances connects the transmitting branch to the receiving branch so that the high level transmitting energy gets into the receiving branch. It is possible for this to happen in certain prior art systems employing separate switching mechanisms for the transmitting and receiving branches, if either of the switching mechanisms fails to operate, as by the sticking of a relay armature or other cause.

It is a general object of the present invention to provide a transfer mechanism for alternately associating the transmitting and receiving branches with the main circuit, which is rapid and positive in action and insures against the possibility of the two branches at any time being connected with one another.

This object is attained in accordance with the invention in a simple form by providing a switching mechanism with a movable member and cooperating contacts such that the transmitting circuit cannot be closed except when the movable member is in one position and the receiving circuit cannot be closed except when the movable member is in another position.

Referring to the drawing, Fig. 1 is a simplified diagrammatic showing of a two-way terminal circuit for a telephone system such, for example, as a transatlantic cable system incorporating the invention; while Figs. 2 and 3 are detailed modifications thereof.

Referring to Fig. 1 speech is transmitted from the incoming line, L, at the left through the transmitting branch T into the deep sea telephone cable C, shown at the right. Speech received over the cable C is transmitted through the receiving branch R into the telephone line L.

Amplifiers 10 and 11 are provided in the transmitting circuit and amplifiers 12 and 13 are provided in the receiving circuit. There is also shown

in the transmitting circuit T an equalizer 14 for shaping the outgoing speech waves in any desired manner such as to compensate, at least in part, for the unequal attenuation of the cable circuit and enabling the speech better to override noise, etc. An equalizer 15 is also shown in the receiving branch for restoring the speech waves to their original form.

The cable itself may be a twin core cable comprising two cores in a single sheath extending all the way to the distant terminal station or it may be a single core cable with a ground return path. That is, in the latter case there would be but a single core extending to the distant terminal station and the ground return path or circuit would be obtained by extending a second conductor out from the shore a suitable distance and providing it with a suitable ground connection or so-called sea earth. These two conductors are connected to the terminals of the transformer winding 16, the other winding of which is shown at 17.

The land line L is provided with the usual hybrid coil H and balancing network N.

In the circuit of Fig. 1, the receiving branch is shown normally connected to receive speech waves from the cable, while the transmitting branch T is disconnected from the cable at the front contact of relay 18. Relay 18 is adapted to be energized under control of speech waves in the transmitting branch T, these passing in part into the amplifier-detector 19, where they are suitably amplified and rectified so as to render them capable of energizing the relay. A similar amplifier-detector 20 bridged across the receiving branch R actuates a relay 21 when speech waves are being received, this relay opening the input circuit of the amplifier-detector 19 to prevent the relay 18 from being actuated.

The showing of amplifiers 10 to 13, equalizers 14 and 15, and amplifier-detectors 19 and 20 is purely diagrammatic in this figure and in practice it would be preferred to adopt the more elaborate circuit arrangement for these corresponding elements disclosed in my prior application Serial No. 459,663, filed June 7, 1930.

Speech waves incoming from the cable C are repeated into the transformer winding 17 from which they pass into the receiving branch R through conductors 23, 24 and 25, conductors 24 and 25 being now connected together at the back contact and armature of relay 18. These waves pass through the equalizer 15 and are amplified at 12 and 13 and pass out into the line L through hybrid coil H. A portion of these speech waves passes into amplifier-detector 20 and causes op-

eration of relay 21 which opens the input circuit to amplifier-detector 19 so that any of the received speech which may find its way across the hybrid coil H and into the transmitting branch T is prevented from actuating relay 18.

Speech waves received over the line L, in the absence of any speech waves in the circuit R, pass into amplifier 10 and through equalizer 14, and amplifier 11. A portion of the speech wave passes into amplifier-detector 19 and causes relay 18 to attract its armature, thus closing a circuit through the lower conductor 26, armature and front contact of relay 18 and conductor 24 to the lower terminal of winding 17, the other terminal of which is connected through conductor 27 of the transmitting branch. If, for any reason, armature 18 fails to attract its armature no injury is done to the receiving circuit R or any of the apparatus therein since the transmitting energy cannot pass the open contacts of the relay armature. The movement of the armature from its back contact to its front contact under the control of speech insures that the receiving branch R is open whenever the transmitting branch T is closed.

The circuit of Fig. 2 retains the advantages of the circuit of Fig. 1 and provides in addition for the short-circuiting of the receiving branch during the transmitting period. This is desirable in order to prevent noise from passing into the receiving branch and possibly causing false operation of relay 21 or at least passing down into the line L where it might be annoying to the talker. It will be understood that the circuit of Fig. 2 discloses only that portion of the circuit to the right of the dotted line X-X in Fig. 1, the portion to the left of this line being considered to be identical in Fig. 2 with that of Fig. 1.

Two relays, 28 and 29, are shown in Fig. 2 having their windings connected in series with each other in the control circuit CC leading from the amplifier-detector 19. These relays, therefore, move their armatures in unison. In the receiving condition (that shown) speech waves from the cable pass into winding 17 and thence into the receiving branch R through conductors 23, 24 and 25, the connection from conductor 24 to conductor 25 in this case being made through the back contacts of both armatures of relays 28 and 29. When relays 28 and 29 attract their armatures to permit speech to pass out into the cable the armatures close two respective circuits. The armature of relay 28 closes a transmitting circuit from conductor 26 through the armature of relay 28, conductor 24, to the lower terminal of winding 17, the upper terminal of which is connected to wire 27. The armature of relay 29 closes a short circuit across the receiving branch R at the front contacts of this armature as shown. It will be noted that failure of either armature to leave either of its contacts results in no harm to the receiving branch R. For example, if the armature of relay 28 fails to release at the end of the talking period while the armature of relay 29 releases, the transmitting branch is not closed through to the receiving branch but is maintained open at the back contact of the armature of relay 28. If the armature of relay 29 fails to leave its back contact when speech is being transmitted the receiving branch cannot be connected to the transmitting branch on account of the open contact at the back terminal of relay 28.

In the circuit of Fig. 3 a shunt is placed across each of the circuits T and R when the other circuit is connected to the cable. In the receiving

position as shown, speech waves received in winding 17 from the cable pass into the receiving branch R through conductors 23 and 25 as before, the connection between conductors 25 and 24 being in this case made at the normally closed back contact of the armature of relay 38. The armature of relay 39 in this position is maintaining a short circuit across the transmitting branch T, extending from lower conductor 26 of branch T through the back contact of the armature of relay 39. Thus any noise and other voltages in the transmitting circuit are shunted out and effectively prevented from reaching the cable or the receiving circuit.

When relays 38 and 39 attract their armatures in response to speech energy in the transmitting branch T, the transmitting branch is connected to the cable while the receiving branch is disconnected from the cable and short-circuited. The connection of the transmitting branch to the cable is effected by the armature of relay 38, which closes its front contact and connects conductor 26 to conductor 24. When this armature leaves its back contact as in the case of the circuit of Fig. 1 the conductor 25 is disconnected from conductor 24 thus opening the receiving branch. Movement of the armature of relay 39 to its alternate position opens the normal shunt across the transmitting branch and closes a short circuit across the receiving branch at its front contact as in the case of Fig. 2. As was explained in connection with the other figures the failure of either relay armature to operate will not result in the application of transmitter voltage to the receiving branch R.

It will be understood that the invention is not limited to the particular circuit arrangements that have been described but its scope is defined in the appended claims.

What is claimed is:

1. In a telephone system, a first line having a hybrid coil and balancing network to provide two two-wire branches conjugate to each other, one a transmitting branch for transmitting waves received over said line and the other a receiving branch for impressing received waves upon said line, one side of each branch comprising a conductor in common, a second line of such high attenuation that the transmitting energy level is very high in comparison with the receiving energy level connectible to both of said branches for receiving from said transmitting branch and alternatively transmitting to said receiving branch, said second line having one side connected to said common conductor, switching means having a member movable between fixed contacts, said member being connected to the remaining side of said second line, said fixed contacts being respectively connected to the side of each branch not common, a one-way amplifier in each branch, said movable member constituting the sole point of interruption of said branches throughout their operation, and means actuating said switching means under control of waves in one of said branches.

2. A system according to claim 1, in which said switching means includes a second movable member actuated in unison with the first member, said second member in either position short-circuiting the branch opposite to that which includes the other member when in corresponding position.

3. In a telephone system, a two-way speech transmission path, a one-way sending and a one-way receiving circuit associated therewith, switching mechanism having two movable mem-

bers, means to move said two members in unison under control of speech energy, one of said members connecting said two-way path to one of said one-way circuits when in one position and to the other of said one-way circuits when in the other

position, and the other member in one position short-circuiting the second mentioned one-way circuit and in the other position short-circuiting the other one-way circuit.

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