

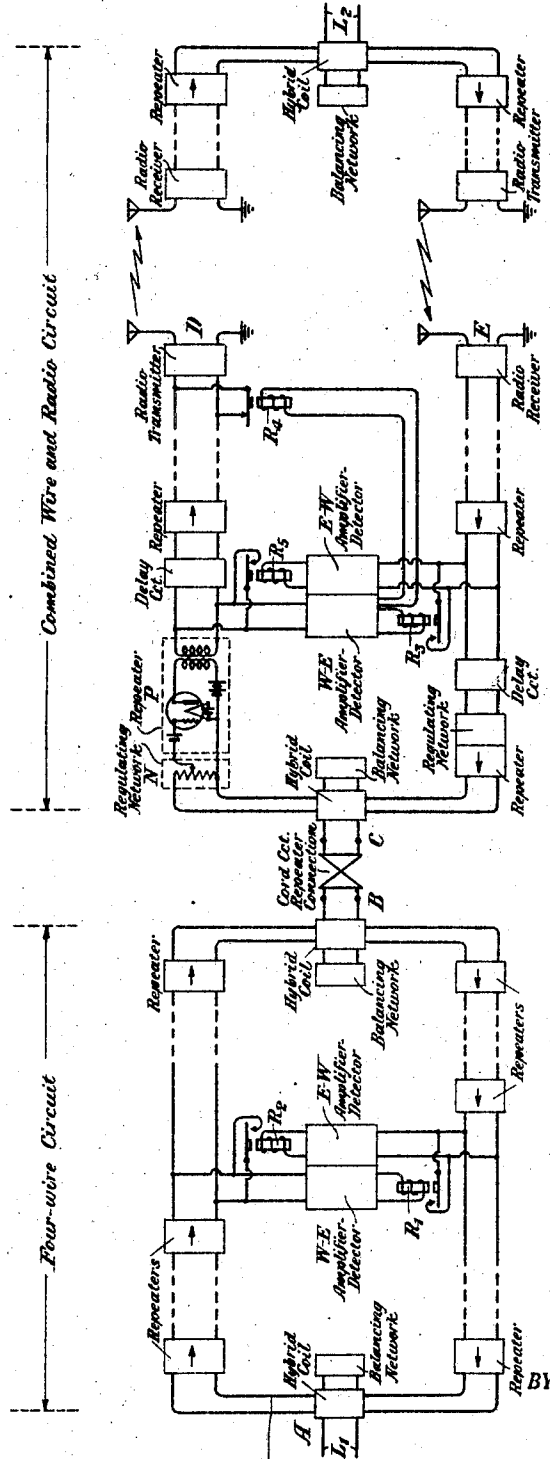
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TWO-WAY TELEPHONE TRANSMISSION

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TWO-WAY TELEPHONE TRANSMISSION.

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This invention relates to two-way telephone systems, and more particularly to two-way telephone systems including a four-wire circuit having paths adapted for transmission in opposite directions and a combined wire and radio circuit having outgoing and incoming wire paths connected to the four-wire circuit.

The object of the invention is the minimization of the false operation of echo suppressors in the circuits by noise or static entering the wire sections of the system from the radio link.

This object is attained by providing for the disabling of the incoming wire path of the combined wire and radio circuit in response to currents of a given value or a greater value in the corresponding outgoing wire path, and regulating the currents flowing over the outgoing path so that they will always have a value sufficient to effect the disabling of the incoming path.

My invention will be more clearly understood when the following description and discussion are read with reference to the accompanying drawing, which shows in diagrammatic form a telephone system to which the invention is applicable.

At the left of the drawing there is shown an ordinary four-wire circuit equipped with one-way repeaters or amplifiers. This four-wire circuit is connected at A to the two-wire line L_1 with the usual hybrid coil and balancing network. This four-wire circuit, furthermore, is equipped with the ordinary echo suppressor apparatus. The W—E amplifier-detector, operated by outgoing currents, controls the incoming transmission path through the operation of the relay R_1 . Similarly, the E—W amplifier-detector, operated by currents in the incoming path, controls the transmission over the upper path by the operation of the relay R_2 .

Between the four-wire circuit and the distant two-wire line L_2 there is shown a combined wire and radio circuit. The two-wire sections of this circuit are joined by the radio link, as shown. The left-hand wire section of the combined circuit, which will be given closer consideration, is connected at C to B of the four-wire circuit by a cord circuit repeater connection or by other suitable connection, the usual hybrid coils and balancing networks being included. The outgoing connection to the radio link is through the

radio transmitting apparatus at D, and the incoming radio waves are received at E. The distant wire link shown at the right of the drawing has corresponding radio receiving and transmitting apparatus and the usual one-way repeaters or amplifiers, and is connected to the two-wire line L_2 through the usual hybrid coil and with the usual balancing network. The amplifier-detectors of the four-wire circuit, shown at the left of the drawing, are usually adjusted so that full operation will not be obtained at all times, since the volume of transmission which may be applied to the two terminals of the four-wire circuit varies over a considerable range. Hence at times—for instance, if a weak talker is talking through A over the outgoing transmission path—the W—E amplifier-detector will fail to operate. This condition is practically satisfactory provided that the noise interference is no greater than that ordinarily received from wire lines.

If, however, the four-wire circuit is connected to a combined circuit including a radio link, the interference from noises or static may be great, sufficient to upset the proper operation of the echo suppressor devices. More specifically, the E—W amplifier-detector may be operated by the interfering currents at a time when a weak talker through A has not control of the circuit due to the fact that the voice currents are too weak to operate the W—E amplifier-detector. In such a case it is obvious that the outgoing transmission from A is seriously interfered with.

The section of the combined wire and radio circuit between C and D and E is shown equipped with echo suppressor and singing suppressor apparatus. The W—E amplifier-detector of this section of the circuit is operated by outgoing currents in the upper wire path. The outgoing transmission path is normally blocked in front of the radio transmitter at D, being short circuited. When the W—E amplifier-detector operates, it clears the outgoing transmission path, the operation of the relay R_4 removing the short circuit; it also disables the incoming transmission path through the operation of the relay R_3 , which places a short circuit on the incoming path. The E—W amplifier-detector of this section of the circuit operates on currents in the incoming path to place a

short circuit on the outgoing path through the operation of the relay R_5 .

It is obvious, upon an examination of the circuit, that clipping will result unless the W—E amplifier-detector of the combined circuit functions without fail; that is, there must be full operation on the outgoing transmission path. It is also obvious that an irregular operation of the corresponding E—W amplifier-detector, such as might be caused by noise or static coming in at E, will prevent the clearing of the outgoing transmission path unless control of that path is assured by the certain functioning of the W—E amplifier-detector. To take a specific case, a weak talker through A must be able to control the transmission path through D in spite of the interfering noise or static received at E.

The problem outlined above is solved by adjusting the W—E amplifier-detector of the combined circuit so that it will operate at a given value of the outgoing currents in the wire section or at a greater value, and the value of these outgoing currents is regulated so that it will always be sufficient to cause the full operation of the amplifier-detector. A suitable means for attaining the desired result is a regulating network N which should be placed in the outgoing path before the one-way repeater or amplifier P.

By the method described above, even a weak talker through A is enabled to control the outgoing transmission path. His voice may not be strong enough to operate the echo suppressor on the four-wire circuit, but the voice currents in the outgoing wire path of the combined wire and radio circuit will be regulated so that full operation of the W—E amplifier-detector of the combined circuit will be obtained. Thus the outgoing path is cleared, and static or noise entering at E is prevented from hindering the clearing of the outgoing path or blocking that path through the operation of the relay R_5 . Also,

of course, currents due to noise or static entering the path EC, are prevented from being passed on to the incoming path BA of the four-wire circuit and falsely operating the E—W amplifier-detector of that circuit.

What is claimed is:

1. In a two-way telephone system including a four-wire circuit having two paths adapted for transmission in opposite directions and a combined wire and radio circuit having outgoing and incoming wire paths connected to said four-wire circuit, the method of preventing the application of static and noise to the four-wire circuit which consists in disabling said incoming path of the combined wire and radio circuit in response to currents of a predetermined value in said outgoing path, and regulating the currents entering said outgoing path so that they will have the predetermined value whatever may be the strength of the voice currents applied to said path from the four-wire circuit.

2. In a two-way telephone system including a four-wire circuit having two paths adapted for transmission in opposite directions, a combined wire and radio circuit having outgoing and incoming wire paths connected to said four-wire circuit, and voice operated means in said outgoing path for disabling the opposite incoming path, the method of preventing the application of static and noise to the four-wire circuit which consists in disabling said incoming path of the combined wire and radio circuit when the currents in said outgoing path reach a predetermined value, and regulating the currents entering said outgoing path so that they will have the predetermined value whatever may be the strength of the voice currents applied to said path from the four-wire circuit.

In testimony whereof, I have signed my name to this specification this 23rd day of November 1926.

HAROLD S. HAMILTON.