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SIGNALING SYSTEM FOR VOICE AND TELEGRAPH OPERATION

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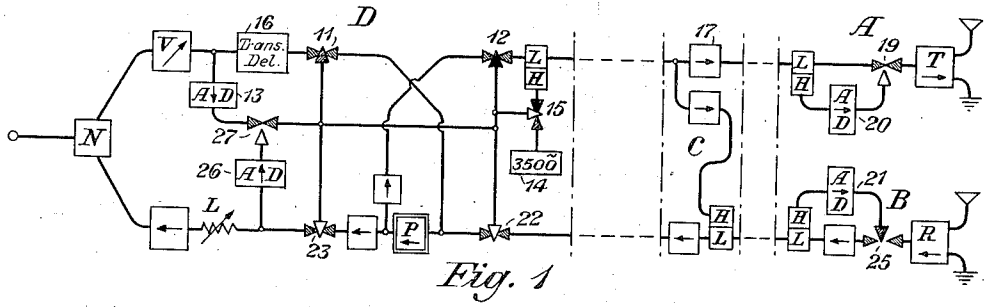

Fig. 1

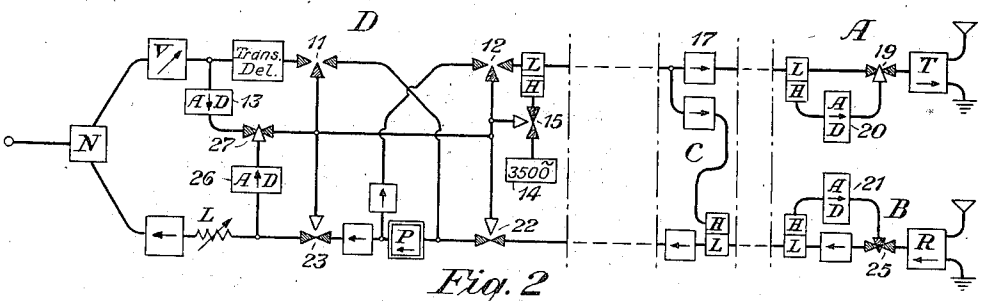

Fig. 2

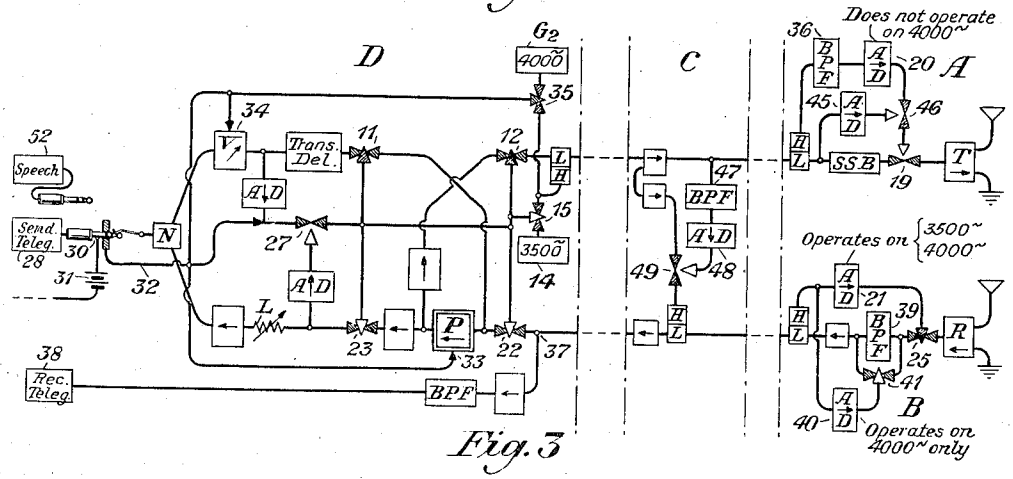

Fig. 3

Legend

Echo Suppressor, released.		A↓D	Amplifier-Detector.
" "	operated.	→	Repeater.
Singing "	released.	P	Privacy Device
" "	operated.		

Fig. 4

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SIGNALING SYSTEM FOR VOICE AND TELEGRAPH OPERATION

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12 Claims. (Cl. 179—4)

This invention relates to a signaling system for voice and for telegraph operation and, more especially, to a long "two-wire channel" such as a radio or a cable link with a long four-wire transmission link. In particular, it relates to improvements in a radio signaling system, such as a transatlantic link, connected to a four-wire circuit from remote points to the radio stations and includes equipment by which the system as a whole may be used in high quality speech signaling or may be adapted for another form of communication such as telegraphy.

Its object is to devise circuit arrangements in such a system which will permit ready changeover from speech or voice signaling to telegraph signaling and, in particular, to high frequency printing telegraphy, or the reverse. A further object is to provide circuit arrangements which will be of high quality for voice comprising special devices for such purpose and yet providing for the elimination or locking of these devices so far as they are not essential to telegraphic operation.

Further purposes and a clearer understanding of the invention will appear from the following specification and accompanying drawing in which Figure 1 is a circuit diagram of one end of such a system as mentioned above and set up for transmitting voice signals, that is, set up for outgoing speech. In this, as in other figures, many parts are shown in conventionalized form. Fig. 2 is the same circuit as Fig. 1 but in condition for receiving voice signals, that is, set up for incoming speech. Fig. 3 is the same circuit but with additions necessary or desirable to adapt the system for alternative use for voice or telegraphic signaling and Fig. 4 gives a list of legends to assist in the reading of the circuits.

In connection with the legends of Fig. 4 it will be of assistance in the reading of the drawing to point out that when the echo suppressors are in the "released" position (as at **22** and **23** of Fig. 2) a conductive connection through the suppressor is established and when in "operated" position (as at **22** and **23** of Fig. 1) this conductive connection is broken, as by opening relay contacts or the electrical equivalent. Also as concerns the singing suppressors when they are in "released" position (as at **11** and **12** of Fig. 2) the circuit connection is opened but when in "operated" position a conductive closure is made, as by closing relay contacts or the electrical equivalent.

Referring to Fig. 1, there is shown a radio transmitting station A and a radio receiving station B, these, in general, being quite widely separated. At the station A there is shown a box T indicating that at this transmitting station there is included the usual and appropriate equipment for generating high frequency oscillations, for receiving the message to be transmitted and for modulating the high frequency with this message and all such other equipment as would be appropriate at a radio transmitting station. Similarly, the box R at station B represents the receiving equipment comprising amplifiers, detectors and all other apparatus appropriate to the reception of radio signals.

It is desired to connect these radio stations with some remote point D which may be some hundreds or thousands of miles away and, in any case, of such a distance as to require special precautions in connection with the transmission system between D and the radio stations. For this purpose, we desire to use a so-called four-wire circuit, that is, a system in which the outgoing message shall be on one circuit and the incoming signal on another circuit. Connection from the two-wire loop of the subscriber's set is made to the four-wire circuit at D through a terminating set N which would, in general, include the common so-called hybrid set. The well known connection from the terminating set N to the subscriber's station is indicated more fully in Fig. 3. The four-wire circuit at station D includes various devices for maintaining transmission on a high quality and a high efficiency basis, this involving the use of special forms of amplifiers, attenuating devices, echo suppressors, etc. as will be described in further detail below. From station D, the long-distance line would finally reach the station C, not very remote from the radio stations, and from this point the two circuits of the four-wire circuit would separate, one going to station A and the other to station B.

The circuit of Fig. 1 is set up on the basis of outgoing speech and will now be described in that connection. Outgoing speech coming from the terminating set N passes into a vogad V which is an amplifier of such gain characteristic that it delivers speech of constant volume although the incoming speech from the terminating set may be of widely different "loudness" or volume. Such a device, now well known in the art, is described in the patent to Hogg and Doba, No. 1,853,974, April 12, 1932. The transmission side of this four-wire circuit is normally disabled; in this case, the disablement being shown as consisting of two singing suppressors **11** and **12** which when released open the main

transmission circuit. The line, however, is enabled or established for transmission by means of speech, for speech at the output of the vogad V enters the amplifier-detector system **13** and the output thereof operates or closes the suppressors **11** and **12**, thus enabling or establishing the circuit during the period and only during the period when speech is to be transmitted. At station D, there is an oscillation-generator **14**, here shown for illustrative purposes as being of a frequency of 3500 cycles and, in general, being of a frequency which is near but outside and, preferably, above the frequency of the speech message to be transmitted. Normally, this generator is sending 3500 cycles out over the line to the stations A and B to disable the transmission path and enable the receiving path in a manner to be hereinafter described. A portion of the output of the amplifier-detector **13**, however, disconnects the oscillator **14** by means of the echo suppressor **15** during actual transmission of speech. In order to allow time for the enablement of the transmission path, a transmission delay device **16** is introduced, as shown. Also, in the event that secrecy is to be introduced by such a means as the shifting of frequency bands then the transmission path from **11** passes through the secrecy or privacy equipment P to the point **12**, whereupon it is impressed on the transmission line going to the station C. This transmission path from D to C may be many hundreds of miles long and it is to be understood, therefore, that suitable stations for repeaters, equalizers and similar equipment will be provided.

At the station C, the speech message is shown as passing through a repeater **17** from whence it may go another considerable distance to the station A. At the station A, it will find the echo suppressor **19** released to permit passage of the message to the transmitting equipment T. During this period, the receiving line is shown as interrupted at two points **22** and **23** by echo suppressors which are operated from the amplifier-detector **13** whenever the outgoing speech is present. The receiving line is also interrupted at the receiver R by the singing suppressor **25** in a manner to be now described.

Normally, and when there is no outgoing speech, the oscillation-generator **14** is connected to the line through the suppressor **15** and the high-pass filter H. At the station C, this 3500-cycle current divides; a portion of it goes to the station A and passing through the high-pass filter to the amplifier-detector **20** operates the echo suppressor **19**, thus keeping the transmission path disabled as long as 3500-cycle current is present. A portion of the 3500-cycle current also passes across to the receiving path at the station C and is transmitted through suitable high-pass filters to the station B where it is impressed on the amplifier-detector **21** to maintain the singing suppressor **25** in operated condition, thus enabling the receiving path at this point as long as 3500-cycle current is present. It will thus be seen that when the outgoing speech disconnects the generator **14**, the suppressors **19** and **25** are both released, thus enabling the transmission path and disabling the receiving path.

In Fig. 2, the same circuit is shown but set up for the condition of incoming speech. In this case, the 3500-cycle generator **14** is connected to the line and thereby operates the suppressor **19** in the transmission path and operates the suppressor **25**, thus enabling the receiving path. The incoming message will then pass through suitable repeaters and filters to the station C and on to the station D where it will find the suppressors **22** and **23** released. If the message has been subjected to privacy band shifting, it will then pass through the privacy system P to restore the message to normal condition. The message will also act through the amplifier-detector **26** to operate the echo suppressor **27**, thus preventing the amplifier-detector **13** from exercising the control described heretofore. The message will also pass through a variable loss device L which is set automatically or by hand to introduce a loss which, in general, would be increased as the gain of the vogad V increases and by such an amount as to prevent operation of amplifier detector **13** by echoes of waves which were too weak to operate amplifier-detector **26**. From this point, the received message passes through appropriate amplifiers and out to the subscriber set.

At times, it is desirable to transmit over this circuit another type of message such as printing telegraph, the circuit requirements for which are substantially different than that for voice signals. Accordingly, we provide for the rearrangement of the circuit of Figs. 1 and 2 as shown in Fig. 3, in order to enable ready transfer from the one form of signaling to the other. The sending telegraph source **28** may be of a variety of forms. It may, for example, be of a form which sends out groups of oscillations of any suitable frequency such as 2,000. Upon plugging in the sending telegraph circuit at the terminating set N a suitable contact may be made, as through the sleeve connection **30**, whereby current of suitable form, such as a d. c. current from battery **31**, will be transmitted out to various points at the station D to perform certain functions. Thus, as shown in the figure, current passes directly over conductor **32** to the suppressors **11** and **12** to keep them operated, thus enabling the transmission circuit as long as the sleeve circuit is closed and also to operate suppressors **22** and **23** thus disabling transmission at these points. This sleeve current also operates the echo suppressor **15**, thus disconnecting the 3500-cycle generator. The sleeve circuit also operates on the privacy system P to short-circuit it or to replace it by some passive network of a loss equivalent to that introduced by the privacy system, as indicated at the point **33**. In addition, the sleeve circuit operates on the vogad as shown at **34** to lock this device at a fixed and appropriate gain; for it will obviously not, in general, be necessary, in the case of telegraph signals, to have variable gain as is the case for speech signaling. Finally, the sleeve circuit operates suppressor **35** to connect in place of the 3500-cycle generator a generator G_2 of some other frequency such as 4000 cycles. This 4000-cycle passes to the station C and thence to the stations A and B. At the station A, it performs no function on the amplifier-detector **20** because of the introduction of a band-pass filter **36**. Thus, the 4000-cycle current cannot disable the transmission path at the point **19**. At the station B, however, the amplifier-detector **21** operates on both 3500 cycles and 4000 cycles and thus keeps the receiving line closed at the point **25**. Under these circumstances, it will be seen that the circuit is in condition for transmission of the telegraph message as long as the sending telegraph equipment is plugged in at the terminating set N.

Also, the receiving side of the circuit is in condition for reception of similar telegraph message at all times so that transmission and recep-

tion may be carried on simultaneously. For the purpose of this invention, the receiving telegraph circuit, as shown in Fig. 3, derives from the main transmission channel at the station D at the point 37 before it reaches echo suppressor 22 and other equipment particularly appropriate for the voice message. For this reason, it is desirable, as shown in Fig. 3, that the sleeve circuit 32 shall operate the echo suppressors 22 and 23 to open the transmission paths at these points. From point 37, the received telegraph message may proceed to any appropriate receiving set 38. It will, of course be understood that the transmission of telegraph message from the far end of the radio link will be on a modulating frequency such as 1,000, sufficiently different from that used for transmission from the station D to facilitate discrimination between the two by means of filters. Thus, for example, in order to make such discrimination more effective there is shown at the station B a band-pass filter 39 which passes the incoming telegraph frequency of, say, 1000 cycles. During the time of voice signaling, this band-pass filter should be eliminated and to this end an amplifier-detector 40 is provided which passes 4000 cycles only and, upon establishment of condition for telegraphy introduces the band-pass filter 39 and upon the establishment of condition for voice signaling, the band-pass filter is shorted at the point 41.

When it is desired to change from telegraphic to voice signaling, the sending telegraph equipment 30 is disconnected, whereupon the sleeve contact is also broken. The source of speech message 52 may then be plugged in whereupon the circuit is prepared for voice signaling.

It will be noted that during voice signaling the oscillation generator of 3500 cycles performs a very important function. It sometimes occurs that, in the event of strong speech, there may be generated harmonics of certain of the speech frequencies which lie at or very close to the frequency of 3500 cycles and may, therefore, occasionally operate the suppressor, thus disabling the transmission path, and may also operate the suppressor 25, thus enabling the receiving path at a time when it should remain disabled. To avoid this difficulty, we may provide an additional suppressor 46 which is operated by speech to disable at the point 46, the circuit leading from the amplifier-detector 20. Also at the station C, a circuit derived from the transmission side through the band-pass filter 47 and amplifier-detector 48 operates on speech alone to disable at the point 49 the circuit leading from the transmission to the receiving side, thus preventing false operation of the suppressor 25 by outgoing speech.

It is apparent that the description given above is quite specific for the purpose of making the invention more clear but it is equally apparent that many variations may be made without departing from the spirit of our invention.

What is claimed is:

1. In a carrier frequency signaling system adapted for speech signaling operation and telegraph signaling operation with different circuit connections, a transmitting channel and a receiving channel, means whereby during the speech operation one channel is always disabled and the other channel enabled, means at one point for disconnecting the speech source and connecting a source of telegraph signals, and a contact at the same point controlled thereby to rearrange the circuit for telegraph operation.

2. The combination of claim 1 characterized by the fact that when the circuit is rearranged for telegraph operation, both transmitting and receiving channels are enabled.

3. In a carrier frequency signaling system adapted for speech signaling operation and telegraph signaling operation with different circuit connections, a transmitting channel and a receiving channel, an oscillation generator and means whereby during speech operation it normally maintains the transmission channel disabled and the receiving channel enabled, means for substituting a source of telegraph signals for the speech source, and a contact controlled thereby to rearrange the circuit for telegraph operation.

4. The combination of claim 3 characterized by the fact that when the circuit is rearranged for telegraph operation, both transmitting and receiving channels are maintained in an enabled condition.

5. In a carrier frequency signaling system adapted for voice signaling operation and telegraph signaling operation with different circuit connections, a transmitting and a receiving channel, means which during voice operation normally maintains the transmitting channel disabled and the receiving channel enabled and which on transmission of voice permits enablement of the transmitting channel and disablement of the receiving channel, means at one point for disconnecting the speech source and connecting a source of telegraph signals, and a contact at the same point controlled thereby to rearrange the circuit for telegraph operation.

6. The combination of claim 5 characterized by the fact that when the circuit is rearranged for telegraph operation, both transmitting and receiving channels are enabled.

7. In a carrier frequency signaling system adapted for voice signaling operation and telegraph signaling operation with different circuit connections, a transmitting channel and receiving channel, an oscillation generator and means whereby during voice operation it normally maintains the transmitting channel disabled and the receiving channel enabled, a second oscillation generator of different frequency which, on telegraph operation, replaces the first oscillation generator to maintain the telegraph circuit connections.

8. In a radio signaling system adapted for speech transmission and telegraph transmission requiring different circuit arrangements, a radio transmitting station and a radio receiving station, a long-line wire communication circuit from a remote point to said stations with a transmitting channel to the radio transmitting station and a receiving channel from the receiving station, a speech signaling source and a telegraph signaling source, circuit enabling and disabling devices in each wire channel at the remote point and in each channel at the radio stations, means at the remote point and inserted in the two channels to establish high efficiency transmission for speech signaling, means at the remote point for substituting the source of telegraph signals for the speech source and for locking or voiding the high efficiency means not required for telegraphy during telegraph operation.

9. The combination of claim 8 characterized by the fact that the means inserted in the channels to establish high efficiency transmission comprises echo suppressors, amplifiers and a vogad.

10. The combination of claim 8 characterized by the fact that when the circuit is rearranged

for telegraphic operation, both transmitting and receiving channels are maintained in an enabled condition.

11. The combination of claim 8 characterized by the fact that there is an oscillation generator which during speech transmission maintains the transmitting channel disabled and the receiving channel enabled at the radio stations and during telegraph operation this is replaced by an oscillation generator of a different frequency whereby both channels at the radio stations are enabled.

12. The combination of claim 8 characterized by the fact that a sleeve circuit connection at the point of substitution of the telegraph source for the speech source sets in motion the train of circuit changes to transfer from speech connection to telegraph connection.

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