

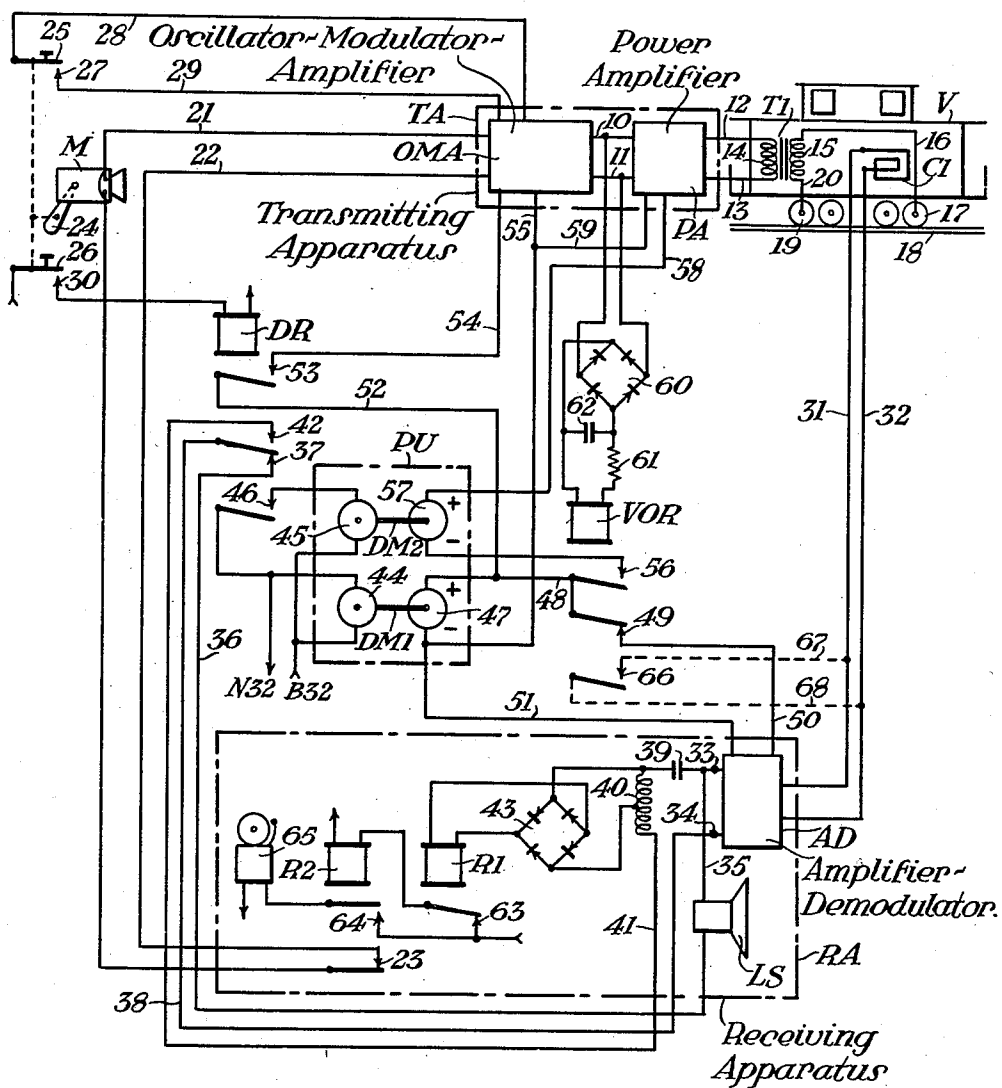
Aug. 10, 1937.

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2,089,824

APPARATUS FOR RAILWAY TRAIN COMMUNICATION SYSTEMS

Filed April 7, 1936



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2,089,824

APPARATUS FOR RAILWAY TRAIN COMMUNICATION SYSTEMS

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Application April 7, 1936, Serial No. 73,135

12 Claims. (Cl. 246—8)

My invention relates to apparatus for railway train communication systems, and particularly to telephone systems for railway trains.

I will describe one form of apparatus embodying my invention, and will then point out the novel features thereof in claims.

A feature of my invention is the provision of novel and improved apparatus for systems of the type here under consideration wherewith an operator at the station receiving a telephone message may break in upon the conversation and signal to the operator talking. Another feature of the invention is the provision of apparatus of the type here involved wherewith receipt of a calling current for a very brief interval during a conversation automatically takes over control of the apparatus, so that as long as the other station continues to send a calling current it is received at the station being broken in upon.

Other features and advantages of my invention will appear as the specification progresses.

In railway train communication systems of the type here contemplated, a carrier current modulated with voice frequencies is used for telephone communication, and a current equal to such carrier modulated by a single predetermined voice frequency is used for calling. A train-carried station in sending out current supplies the current to a communication channel which preferably includes the track rails, the current being supplied to the channel through the medium of a sending circuit effectively coupled with the track rails. Current is received at a train-carried station through the medium of a receiving circuit effectively coupled with the track rails. The receiving apparatus at each station is normally active and in circuit ready to receive a message from the remote station at any time. The transmitting apparatus at each station is normally inactive and is energized and conditioned for supplying current only during periods a current is to be sent out from that station. Switching apparatus is provided for selectively rendering either the transmitting apparatus or the receiving apparatus operative and effectively coupled to the track rails. In systems heretofore proposed, the operator actuates such switching apparatus manually. As will appear hereinafter, I provide a voice operated device or relay which cooperates with the manually operated mechanism in switching the connections between the transmitting and receiving apparatuses. Such voice operated relay automatically switches the receiving apparatus into operation during each pause in a conversation, and cuts out the receiving apparatus on the

first syllable of a group of words. Receipt of an incoming calling current during such pause of the outgoing conversation effectively influences the receiving apparatus and results in a visible or audible signal being displayed or sounded to indicate to the operator talking that the operator at the remote station desires to break in upon his conversation. The receiving apparatus thus influenced also renders the microphone ineffective and the operator at that station can no longer transmit his conversation. In other words, apparatus embodying my invention provides the equivalent of a duplex telephone system for railway trains.

The accompanying drawing is a diagrammatic view of a preferred embodiment of my invention.

The receiving apparatus will preferably include an electron tube amplifier-demodulator, a loudspeaker or telephone receiver, and a call responsive circuit effective when energized to operate a signaling device. The transmitting apparatus will preferably include a source of carrier current such as an electron tube oscillator, a modulator-amplifier capable of suppressing the carrier and selecting a desired side band, a power amplifier such as a pair of power electron tubes connected in the usual push-pull arrangement, and calling means capable of supplying a frequency equivalent to the carrier modulated at a single predetermined voice frequency. The electron tube oscillator, amplifiers, modulator, and demodulator will be described in the present application only in so far as is deemed necessary for full understanding of my invention, since the specific structure of such devices forms no part of my invention. To fix the ideas, I shall assume that a band of voice frequencies extending from 500 to 2500 cycles per second for telephoning is desired, the calling voice frequency is 800 cycles per second, a carrier of 7000 cycles per second is employed, and single side band transmission is contemplated, the upper side band being utilized. It follows that during telephone communication a band of frequencies extending from 7500 to 9500 cycles is transmitted, and for calling the frequency is 7800 cycles. It will be understood, of course, that my invention is not limited to these specific frequencies and other frequencies may be used if found desirable.

A power unit for supplying the proper plate voltages to the various electron tubes is provided. As here shown, the arrangement is such that the power unit is rendered active as needed and the generated voltage is switched to the plate circuits of the transmitting and receiving

tubes according to whether communication current is to be transmitted or is to be received. Consequently, the transmitting apparatus and the receiving apparatus of a location are selectively rendered active and effectively coupled to the track rails by switching plate voltage to the electron tubes of the respective apparatuses.

Referring to the drawing, the reference character V designates a vehicle of a railway train, such as, for example the caboose of a freight train and on which vehicle communication equipment is located. The transmitting apparatus is indicated as a whole by the reference character TA, the receiving apparatus by the reference character RA, and the power unit at PU. The oscillator, modulator and single side band amplifier of the transmitting apparatus is indicated at OMA, and the power amplifier at PA, these devices being shown conventionally for the sake of simplicity since, as stated hereinbefore, their specific structure forms no part of my invention. Device OMA includes an electron tube oscillator capable of supplying a carrier current of 7000 cycles per second, means to modulate such carrier current at voice frequencies and to suppress the carrier and one side band, the remaining side band being supplied to the input of the power amplifier PA where it is amplified to a relatively high energy level. As here shown, the carrier current is modulated by voice frequencies produced in a microphone M connected with the input of the device OMA over wires 21 and 22, a front contact 23 of a relay R2 to be referred to later being interposed in the wire 22. The output of the device OMA is supplied to the input of the power amplifier PA over wires 10 and 11, and the output of the power amplifier PA is, in turn, supplied over wires 12 and 13 to the primary winding 14 of a transformer T1. The secondary winding 15 of transformer T1 is interposed in a sending circuit for the vehicle V and which circuit extends from the top terminal of winding 15 over wire 16 to a truck wheel 17 at the right-hand end of the vehicle V, track rails 18, truck wheel 19 at the left-hand end of vehicle V, and wire 20 to the lower terminal of the secondary winding 15, connection with the wheels 17 and 19 being preferably made through their journal bearings. It follows that voice frequencies produced by speaking into the microphone M are translated to the upper side band of the carrier at the device OMA, further amplified at the amplifier PA, and then supplied to the sending circuit for the vehicle V with the result that such communication current is transmitted along the track rails in both directions from the vehicle in the well known manner.

As here shown, the microphone M is mounted on a handle 24 to facilitate its being brought close to the person speaking. Two push buttons 25 and 26 of the common spring return type are mounted on the handle 24 as indicated by dotted lines. Depressing the push button 25 to close its contact 27 completes a connection between wires 28 and 29 leading to the device OMA, and causes that device to produce a calling current which in this instance is of 7800 cycles per second. Such calling frequency may be effected by changing the capacitance of the associated electron tube oscillator. This calling frequency current when thus produced is passed over wires 10 and 11 to the power amplifier PA and is supplied to the track rails through the sending circuit in the same manner as described for the telephone current. Depressing the push button

26 to close its contact 30 completes a simple circuit for energizing a relay DR as will be readily understood by an inspection of the drawing. The function of relay DR will be referred to later in the description.

An inductor coil C1 is mounted on the vehicle V in inductive relation with the track rails and is connected over wires 31 and 32 with the input of the amplifier-demodulator AD of the receiving apparatus RA. This amplifier-demodulator AD is shown conventionally for the sake of simplicity since, as stated above, its specific structure forms no part of my invention. It follows that communication current flowing in the track rails will induce electromotive force in the inductor C1 which electromotive force will be impressed upon the input of the amplifier-demodulator AD, and the corresponding audio frequencies will appear at the output terminals 33 and 34 of the device AD. These output terminals 33 and 34 are connected with a loud-speaker circuit or with a call responsive circuit. The loud-speaker circuit may be traced from the terminal 33 over wire 35, operating winding of a loud-speaker LS, wire 36, back contact 37 of relay DR, and wire 38 to terminal 34. The call responsive circuit extends from terminal 33 through condenser 39, reactor 40, wire 41, front contact 42 of relay DR, and wire 38 to terminal 34. A portion of reactor 40 is connected across the input terminals of a full wave rectifier 43, the output terminals of which are connected with the winding of a relay R1. This call responsive circuit is so proportioned and adjusted that it is tuned to resonance at the voice frequency of 800 cycles. Thus with relay DR picked up and its front contact 42 closed to complete the call responsive circuit and a calling current is received by the inductor C1, the relay R1 is energized. Under normal conditions, that is, with the apparatus in the position illustrated, the loud-speaker circuit is completed at the back contact 37 of relay DR and the voice frequencies of a telephone current received by the inductor C1 are reproduced at the loud-speaker LS, and a calling current received by the inductor C1 is reproduced by the loud-speaker sounding a corresponding note.

The power unit PU consists of two motor generators or dynamotors DM1 and DM2. The motor generator DM1 is constantly active by virtue of its motor 44 being continuously supplied with current from any convenient source of current such as a battery not shown, the two terminals of such source being indicated at B32 and N32. The motor generator DM2 is normally inactive and is set into operation by current supplied to the motor 45 when relay DR is picked up and its front contact 46 is closed. The generator 47 of motor generator DM1 is connected with the plate circuits for the electron tubes of the amplifier-demodulator AD, the circuit extending from the positive terminal of generator 47 over wire 48, back contact 49 of a relay VOR to be referred to later, wire 50, plate circuits for the device AD, and wire 51 to the negative terminal of generator 47. The generator 47 is connected with the plate circuits for the tubes of the oscillator-modulator-amplifier OMA by a circuit extending from its positive terminal over wires 48 and 52, front contact 53 of relay DR, wire 54, plate circuits of device OMA, and wire 55 to the negative terminal of generator 47. Energization of relay VOR in a manner to shortly appear to close its front contact 56 connects the

two generators 47 and 57 in series with the plate circuits of the tubes of power amplifier PA, the circuit being traced from the positive terminal of generator 47 over wire 48, front contact 55 of relay VOR, generator 57, wire 58, plate circuits for the tubes of the power amplifier PA, and wires 59 and 55 to the negative terminal of generator 47. It is clear, therefore, that with relays DR and VOR both deenergized, the motor generator DM1 only is active and plate voltage is applied to the tubes of the receiving apparatus; with relay DR picked up and relay VOR deenergized, both motor generators are active and plate voltage is applied to the tubes of the device OMA of the transmitting apparatus and also to the tubes of the receiving apparatus; and with both relays DR and VOR picked up, the voltage of the generator 47 is applied to the tubes of the device OMA of the transmitting apparatus and voltage of the two generators 47 and 57 in series is applied to tubes of the power amplifier PA.

The relay VOR is a voice operated relay and is controlled by rectifying a portion of the single side band energy supplied from the device OMA to the input of the power amplifier PA. The input terminals of a full wave rectifier 60 are connected across the wires 10 and 11, and the output terminals of this rectifier are connected with the winding of relay VOR, a resistor 61 being interposed in series with the winding of relay VOR and a condenser 62 being connected in parallel therewith. The relay VOR is of the usual direct current type proportioned and adjusted for relatively quick-acting characteristics. The resistor 61 is used for lessening the release period of the relay, and the condenser 62 is used to increase the release period. By proper choice of condenser 62 and resistor 61, and by proper proportioning of the parts of relay VOR, the speed of operation of relay VOR is readily adjusted as desired. For example, a pause of 0.1 second very frequently occurs in a conversation, and relay VOR is adjusted to release at something less than, say, 0.1 second. The pick-up time of the relay would be, say, 0.02 second. It follows that with the device OMA active and voice frequencies produced by speaking into the microphone M, the relay VOR is picked up during speaking periods, is released to close its back contacts during normal pauses that occur at the end of a phrase in a conversation, and is then again picked up on the first syllable of the next word group.

In describing the operation of the apparatus I shall assume that the apparatus is in the position illustrated in the drawing and the operator on the vehicle V desires to establish telephone communication, and to that end he first depresses the push button 26 to pick up the relay DR to close its front contacts 46 and 53 to thereby start up the second motor generator DM2 and to apply plate voltage to the tubes of the device OMA. The operator would ordinarily first transmit a calling current by depressing push button 25. A portion of the calling current energy delivered by the device OMA to the power amplifier is rectified and energizes the relay VOR with the result that its front contact 55 is closed and plate voltage is applied to the power amplifier PA and the calling current is supplied to the track rails. It is to be noted that with relay DR picked up and its front contact 42 closed, the call responsive circuit is completed but the receiving apparatus RA is inoperative due to plate voltage being removed from the tubes of the receiving

apparatus at the back contact 49 of relay VOR. After a short interval the operator would discontinue the calling current by releasing push button 25, and would initiate his conversation by speaking into the microphone M. A portion of the side band telephone current delivered by the device OMA to the power amplifier PA is rectified and used to energize relay VOR which relay picks up on the first syllable of a spoken word and applies plate voltage to the tubes of the amplifiers PA so that the side band telephone current is supplied to the rails. Ordinarily the operator of vehicle V carries on his conversation with the remote operator by depressing push button 26 when he wishes to speak and releasing the push button when he wishes to listen. The operator by holding the push button 26 depressed may continue his conversation as long as desired. When a pause occurs at the end of a phrase in the conversation of the operator of vehicle V, however, the relay VOR is released and the receiving apparatus is rendered operative and the power amplifier PA is rendered inoperative. If the operator at the remote station desires to break in upon the conversation of the operator of vehicle V, he would close his push buttons 25 and 26 and effect the sending of a calling current from the remote station. Under such circumstances and with relay VOR released at the pause which occurs at the end of the next phrase in the conversation of the operator of vehicle V, the incoming calling current effectively influences the receiving apparatus and energizes the relay R1 since, as explained above, the call responsive circuit is now closed at front contact 42 of relay DR. With relay R1 energized, the circuit for relay R2 is opened at back contact 63 and relay R2 is released and at its back contact 64 completes a circuit for a signaling device 65 which is here shown as an electric bell. Relay R2, upon releasing, also opens the microphone circuit at its front contact 23. Thus, the bell 65 is sounded and further sending of telephone current from vehicle V is prevented as long as the calling current is received to retain relay R1 energized. The operator of the vehicle V upon receiving such signal will know that the other operator at the remote station desires to talk to him at once and will set his equipment in condition to receive a telephone message by releasing the push button 26.

It is to be noted that relay VOR is energized only during periods when either a calling current or a telephone current is being sent from vehicle V, since the carrier current is suppressed within the device OMA and upper side band energy only passed to amplifier PA. Hence, with relay DR picked up and device OMA rendered active, the relay VOR remains deenergized until either the push button 25 is depressed to produce a calling current or the operator speaks into the microphone M.

An alternative method of controlling the receiving apparatus would be to short-circuit the wires 31 and 32 at a front contact 66 of the voice operated relay VOR. Such short-circuit is shown on the drawing by the dotted lines 67 and 68 which connects the front contact 66 of relay VOR across the wires 31 and 32. It may not be necessary to remove the plate voltage from the tubes of the power amplifier PA during pauses in the conversation, but this is done to avoid the danger of feed back causing sustained tones at the loud-speaker or operating the call responsive circuit.

It will be understood, of course, that ripple filters, voltage adjusting resistors and spark suppression condensers would be provided in the usual manner but are not shown on the drawing for the sake of simplicity.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In a railway communication system consisting of train-carried transmitting apparatus capable of supplying a side band carrier telephone current, train-carried receiving apparatus capable of reproducing the audio frequencies of such carrier telephone current and a communication circuit including the track rails the combination with the above instrumentalities comprising; a relay, means to connect a winding of said relay with the output side of the modulator of the transmitting apparatus to energize the relay with a portion of the modulated carrier energy, said relay characterized by being quick acting whereby the relay is released during a pause in a telephone conversation and is picked up on the first syllable of a spoken word, means including a front contact of said relay to effectively couple the transmitting apparatus to the track rails, and means including a back contact of the relay to effectively couple the receiving apparatus to the track rails.

2. In a railway communication system consisting of train-carried transmitting apparatus capable of supplying a side band carrier telephone current, train-carried receiving apparatus capable of reproducing the audio frequencies of such carrier telephone current and a communication circuit including the track rails the combination with the above instrumentalities comprising; a relay, means including a rectifier to connect a winding of said relay with the output side of the modulator of the transmitting apparatus to energize said relay with a portion of the voice modulated carrier energy, means including a resistor and a condenser associated with said relay to provide the relay with quick acting characteristics whereby the relay is released during a pause in a telephone conversation and is picked up on the first syllable of a spoken word, means including a front contact of said relay to effectively couple the transmitting apparatus to the track rails, and means including a back contact of said relay to effectively couple the receiving apparatus with the track rails.

3. In a railway communication system consisting of train-carried transmitting apparatus including an electron tube modulator-amplifier and power amplifier for supplying a carrier telephone current, receiving apparatus including an electron tube amplifier-demodulator for reproducing the telephone message of such carrier telephone current, a power unit to supply plate voltage to the electron tubes and a communication circuit coupled with both the transmitting and receiving apparatus the combination with the above instrumentalities comprising, a relay, means to connect a winding of the relay with the modulator-amplifier to energize the relay with a portion of the voice modulated carrier energy, means to connect the power unit with the power amplifier and including a front con-

tact of said relay, and means to connect the power unit with the amplifier-demodulator and including a back contact of said relay.

4. In a railway communication system consisting of train-carried transmitting apparatus including an electron tube modulator-amplifier and power amplifier for supplying a carrier telephone current, receiving apparatus including an electron tube amplifier-demodulator for reproducing the telephone message of such carrier telephone current, a power unit to supply plate voltage to the electron tubes and a communication circuit coupled with both the transmitting and receiving apparatus the combination with the above instrumentalities comprising, a first and a second relay, means to connect the power unit with the modulator-amplifier and including a front contact of the first relay, means to connect the power unit with the power amplifier and including a front contact of the second relay, means to connect the power unit with the amplifier-demodulator and including a back contact of the second relay, manually controlled circuit means including a current source for energizing the first relay, and other circuit means to connect a winding of the second relay with the modulator-amplifier to energize the relay with a portion of the voice modulated carrier energy.

5. In a railway communication system consisting of train-carried transmitting apparatus capable of supplying a carrier telephone current and a calling current equivalent to the carrier modulated by a single predetermined voice frequency, receiving apparatus capable of demodulating such telephone and calling currents and a communication circuit including the track rails in combination with the above instrumentalities comprising, a relay, means including a rectifier to connect a winding of the relay with the transmitting apparatus to energize the relay with a portion of the modulated carrier energy, means including a front contact of the relay to effectively couple the transmitting apparatus with the track rails, means including a back contact of the relay to effectively couple the receiving apparatus with the track rails, a call responsive circuit connected with the receiving apparatus and selectively responsive to said predetermined voice frequency, and means controlled by said call responsive circuit for rendering the transmitting apparatus ineffective to supply telephone current.

6. In a railway communication system consisting of train-carried transmitting apparatus capable of supplying a carrier telephone current and a calling current equivalent to the carrier modulated by a single predetermined voice frequency, receiving apparatus capable of demodulating such telephone and calling currents and a communication circuit including the track rails in combination with the above instrumentalities comprising, a relay, means including a rectifier to connect a winding of the relay with the transmitting apparatus to energize the relay with a portion of the modulated carrier energy, said relay characterized by being quick acting whereby the relay is released during a pause in a telephone conversation and is picked up on the first syllable of a spoken word, means including a front contact of the relay to effectively couple the transmitting apparatus with the track rails, means including a back contact of the relay to effectively couple the receiving apparatus with the track rails, a call responsive circuit connected with the receiving apparatus and se-

lectively responsive to said predetermined voice frequency, a signaling device controlled by said call responsive current, and other means controlled by said call responsive circuit when energized for rendering the transmitting apparatus ineffective to supply telephone current.

7. A railway communication system comprising, train-carried transmitting apparatus including an oscillator-modulator-amplifier, a circuit including a microphone connected with the oscillator-modulator-amplifier to produce a carrier telephone current, a circuit connection including a manually operated contact connected with the oscillator-modulator-amplifier and effective when closed to produce a calling current equivalent to the carrier modulated with a single predetermined voice frequency, train-carried receiving apparatus including an amplifier-demodulator capable of demodulating such telephone and calling current, means to effectively couple both the transmitting apparatus and the receiving apparatus with the track rails for telephoning communication with a remote station, a call responsive circuit connected to the amplifier-demodulator and selectively responsive to said predetermined voice frequency, a signaling device controlled by said call responsive circuit when energized, and other means controlled by said call responsive circuit when energized for rendering the circuit including the microphone ineffective.

8. A railway communication system comprising, train-carried transmitting apparatus including an oscillator-modulator-amplifier, a circuit including a microphone connected with the oscillator-modulator-amplifier to produce a carrier telephone current, a circuit connection including a manually operated contact connected with the oscillator-modulator-amplifier and effective when closed to produce a calling current equivalent to the carrier modulated with a single predetermined voice frequency, train-carried receiving apparatus including an amplifier-demodulator capable of demodulating such telephone and calling currents, a relay, means to connect a winding of the relay with the transmitting apparatus to energize the relay with a portion of the modulated carrier energy, means including a front contact of the relay to effectively couple the transmitting apparatus with the track rails, means including a back contact of the relay to effectively couple the receiving apparatus with the rails, a call responsive circuit connected with the receiving apparatus and selectively responsive to said predetermined voice frequency, a signaling device controlled by said call responsive circuit, and other means controlled by said call responsive circuit when energized to render the circuit including the microphone ineffective.

9. A railway communication system comprising transmitting apparatus and receiving apparatus mounted on a vehicle of a train, said transmitting apparatus including an oscillator-modulator of the balanced type, coupling means effective at times to couple the output side of the oscillator-modulator with the track rails, said receiving apparatus including an amplifier-demodulator the input side of which is effectively coupled with the track rails, a microphone connected across the input side of said oscillator-modulator to cause a side band carrier telephone current to be supplied to the rails by speaking into the microphone, a loud speaker connected across the output side of said amplifier-demodulator to reproduce the voice frequency of such

carrier telephone current flowing in the rails, an electroresponsive device connected across the output side of said oscillator-modulator and effectively energized by a portion of the telephone current, circuit means including a manually operated contact to render said oscillator-modulator active, means including a contact governed by said device and closed only when the device is deenergized to render said amplifier-demodulator active, and means including a contact governed by said device and closed only when the device is energized to render said coupling means effective.

10. A railway communication system comprising transmitting apparatus and receiving apparatus mounted on a vehicle of a train, said transmitting apparatus including an oscillator-modulator of the balanced type and a power amplifier the output side of which amplifier is coupled with the track rails and the input side of which is connected over a pair of wires with the output of the oscillator-modulator, said receiving apparatus including an amplifier-demodulator the input side of which is coupled with the track rails, a microphone connected across the input side of the oscillator-modulator to cause an amplified side band carrier telephone current to be supplied to the rails by speaking into the microphone, a loud speaker connected across the output side of said amplifier-demodulator to reproduce the voice frequencies of such telephone current flowing in the rails, an electroresponsive device connected across said pair of wires and effectively energized when voice frequency energy is passed to the power amplifier, a first circuit means including a manually operated contact to render the oscillator-modulator active, a second circuit means including a contact governed by said device and closed only when the device is deenergized to render the amplifier-demodulator active, and a third circuit means including a contact governed by said device and closed only when the device is energized to render said power amplifier active.

11. A railway communication system comprising transmitting apparatus and receiving apparatus mounted on a vehicle of a train, said transmitting apparatus including an oscillator-modulator of the balanced type and a power amplifier as well as a connection between the output terminals of the modulator and the input terminals of the power amplifier, said receiving apparatus including an amplifier-demodulator, coupling means for effectively coupling the output side of said power amplifier and the input side of said amplifier-demodulator with the track rails, a microphone connected with the input side of said oscillator-modulator to supply to the rails a side band carrier telephone current, a loud speaker connected across the output side of said amplifier-demodulator to reproduce the voice frequencies of such telephone current flowing in the rails, a quick acting relay, means to effectively connect a winding of said relay across the connection between the oscillator-modulator and the power amplifier to pick up the relay in response to the first syllable of a word spoken into the microphone and to permit the release of the relay during a pause which occurs at the end of a phrase in the conversation, a power unit, means to connect the power unit with the power amplifier and including a front contact of said relay, and means to connect the power unit with said amplifier-demodulator and including a back contact of said relay.

12. A railway communication system comprising transmitting apparatus and receiving apparatus mounted on a vehicle of a train and a communication circuit including the track rails, said
5 transmitting apparatus including an oscillator-modulator of the balanced type, a circuit including a microphone connected with said oscillator-modulator to produce a side band telephone
10 current, a circuit connection including a manually operated contact connected with said oscillator-modulator to produce a calling current equivalent to the carrier modulated with a single
15 predetermined voice frequency, said receiving apparatus including an amplifier-demodulator capable of demodulating such telephone and calling currents, an electroresponsive device, means

to connect said device with the output side of said oscillator-modulator to energize the device with a portion of the telephone or calling current, means controlled by said device when energized
5 to effectively couple the transmitting apparatus with the track rails, means controlled by said device when deenergized to effectively couple the receiving apparatus with track rails, a loud
10 speaker and a call responsive circuit connected with the output side of said amplifier-demodulator, said call responsive circuit selectively responsive to said predetermined voice frequency,
and a signal controlled by said call responsive circuit.

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