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RECEIVING APPARATUS FOR TRAIN COMMUNICATION SYSTEMS

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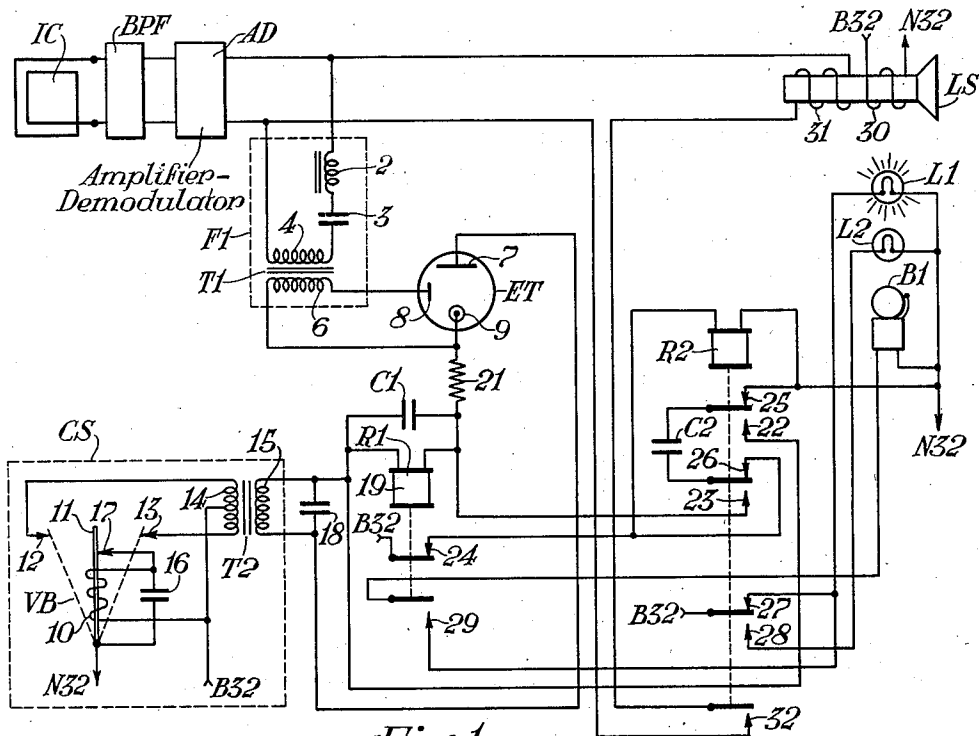


Fig. 1.

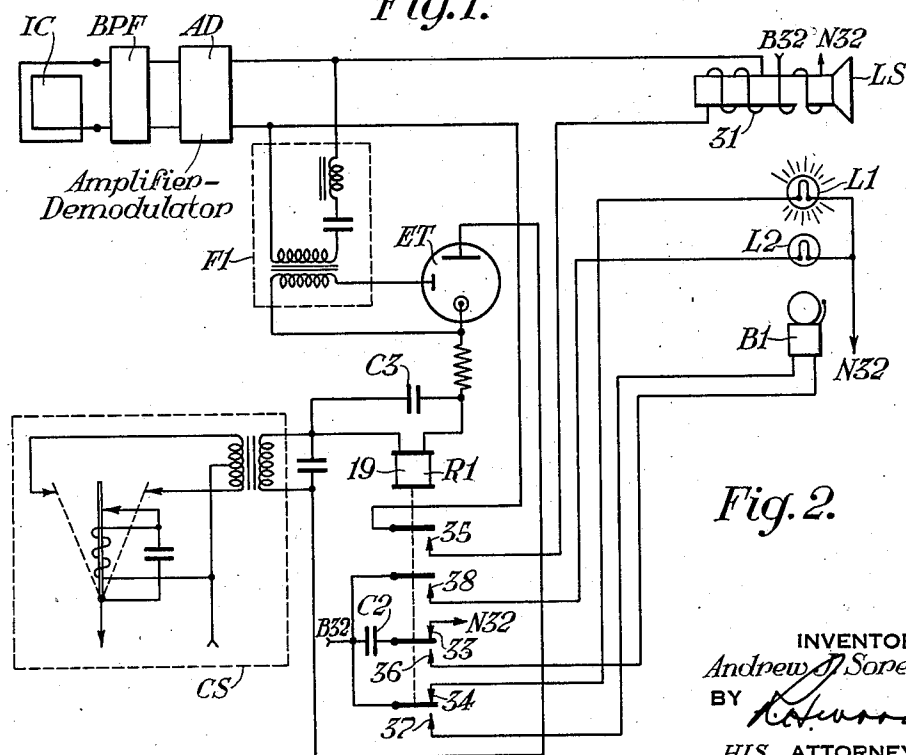


Fig. 2.

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RECEIVING APPARATUS FOR TRAIN COMMUNICATION SYSTEMS

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11 Claims. (Cl. 179—82)

My invention relates to receiving apparatus for train communication systems.

Railway train communication systems ordinarily use a carrier current. For telephone communication a carrier current of a preselected frequency is modulated by the voice frequency produced by speaking into a telephone transmitter and a preselected side band of such modulated current is transmitted, the carrier and the other side band being suppressed. In such a system, a calling or signaling current equivalent to the carrier modulated by a preselected frequency within the voice frequency range is employed. The receiving apparatus includes a demodulator operable to demodulate and pass only the voice frequency energy to a telephone receiver or loud speaker in response to reception of such telephone current. When calling or signaling current is received, energy of the single preselected frequency appears in the output of the demodulator and this calling energy is used to govern a suitable signaling or calling device, such as a lamp or electric bell. The loud speaker may be normally set at an inactive condition and switched to an active condition upon reception of the calling current. Again the calling or signaling current may be transmitted at all times except when telephone communication is desired to continuously check the active condition of the apparatus and under such circumstances a signal lamp or indicator is normally energized to indicate to the operator an active condition of the system, and the loud speaker is held at an inactive condition as long as such signaling current is received and is switched to an active condition when such signaling current ceases.

Accordingly, a feature of my invention is the provision of receiving apparatus for a train communication system incorporating novel and improved means responsive to a signaling current for controlling signaling devices according to the presence or absence of such signaling current.

Another feature of my invention is the provision of receiving apparatus for communication systems of the type here contemplated incorporating means for controlling a first indicator to display to the operator a steady indication as long as signaling current is received and to display a second and different indicator when the signaling current ceases, such second indicator being used to inform the operator that telephone communication can be expected.

Another feature of my invention is the provision of receiving apparatus for a railway train communication system incorporating a secondary

source of current for controlling the operation of signaling devices.

A further feature of my invention is the provision in receiving apparatus for a train communication system including effective and inexpensive calling and signaling means.

The above cited features of my invention, as well as other advantages which will be apparent from the following specification, are attained according to my invention by providing an electron tube, a control relay and a secondary source of current. The electron tube is effectively influenced by the signaling or calling current to govern the control relay which is included in the anode circuit of the tube. The control relay in turn governs the secondary source of current which is preferably a condenser, and the relay and condenser jointly govern the energization of two different signaling devices. A filter tuned to pass only energy of the frequency corresponding to that of the signaling current is connected across the output terminals of the usual demodulator included in such receiving apparatus, and the energy passed by the filter controls the electron tube so that the control relay interposed in the anode circuit is picked up when such energy is passed by the filter and is released when such energy ceases. The secondary source of current which is preferably a condenser is maintained charged as long as the control relay is picked up and is discharged when the relay is released. A first signal lamp is illuminated when the control relay is picked up to indicate reception of signaling current energy. A signal bell is controlled to sound an audible indication during the discharge period of the condenser subsequent to the release of the control relay as an indication that signaling current is no longer received and telephone communication can be expected. Another or second signal lamp is illuminated when the control relay is released as an additional indication that signaling current is no longer received. The loud speaker is disconnected from the demodulator as long as the control relay is picked up and is automatically connected thereto when the control relay is released.

I shall describe two forms of apparatus embodying my invention and shall then point out the novel features thereof in claims.

In the accompanying drawing, Figs. 1 and 2 are diagrammatic views showing two different forms of apparatus each of which embodies my invention. In each of the two views like reference characters are used to designate similar parts.

Referring to Fig. 1, the reference character IC designates an inductor mounted on a vehicle of a railway train in inductive relation to a transmitting circuit, not shown. Ordinarily inductor IC is mounted on the train in inductive relation to the track rails since the track rails are preferably included in a transmitting circuit to which communication current is supplied at a station remote from the vehicle on which inductor IC is located. Such transmitting circuit may be, for example, that covered by Letters Patent of the United States No. 2,112,364, granted March 29, 1938, to L. O. Grondahl, for Electric train signaling systems.

The electromotive forces induced in inductor IC in response to current flowing in the associated transmitting circuit are applied to the input side of a filter BPF, the output side of which is connected across the input terminals of an amplifier-demodulator AD. The filter BPF is of the usual band pass type and is proportioned to pass the frequency band of the communication current used and to substantially suppress frequencies both above and below such frequency band. For example, it has been proposed for communication systems for railway trains to employ the upper side band of a carrier current of 6,000 cycles per second modulated by voice frequency for telephone communication and to use the equivalent of such carrier current modulated by a single preselected frequency within the voice frequency range for calling and signaling. Under such circumstances, the filter BPF would pass a band extending from 6,500 to 8,500 cycles, the voice frequency range being taken as extending from 500 cycles to 2,500 cycles. For signaling and calling the current transmitted may be of 7,000 cycles which is the equivalent of the upper side band of the carrier of 6,000 cycles modulated by the voice frequency of 1,000 cycles.

The amplifier-demodulator AD may be any one of several well-known types for such devices and is shown conventionally for the sake of simplicity since the specific structure of the amplifier-demodulator forms no part of my present invention. It is sufficient for this application to point out that the amplifier-demodulator AD includes a normally active source of carrier current for mixing with the incoming communication current, and is operative to cause only the voice frequencies to appear at the output terminals of the demodulator, the local carrier and the other products of demodulation being suppressed. One or more stages of amplification may be employed in the amplifier-demodulator. On the assumption that the communication current is of the frequency range referred to above, voice frequencies extending from 500 to 2,500 cycles appear at the output terminals of the amplifier-demodulator when telephone current is picked up by the inductor IC and energy of the single preselected frequency of 1,000 cycles appears at the output terminals of the demodulator when signaling current is picked up by inductor IC. It will be understood of course that my invention is not limited to the frequencies set forth hereinbefore but such are used for illustration only.

A filter F'1 including a reactor 2, a transformer T'1 and a condenser 3, is connected across the output terminals of the amplifier-demodulator AD, the arrangement being that primary winding 4 of transformer T'1, condenser 3 and reactor 2 are connected in series across the output terminals of the amplifier-demodulator. The parts

of filter F'1 are proportioned so as to pass only energy of the frequency of the signaling current, that is, to pass only energy of 1,000 cycles per second when signaling current of the frequency referred to hereinbefore is used.

The apparatus includes an electron tube ET, a source of alternating current CS, a control relay R'1, and two condensers C'1 and C'2. The electron tube ET is preferably of the cold cathode gas filled type, and it is provided with an anode 7, a control element 8 and a cathode 9. The source of alternating current may be any suitable means and is shown as comprising a vibrator VB and a transformer T2. An operating winding 10 of vibrator VB is connected over its own armature 11 and contact 17 to a suitable source of direct current, such as the usual train carried 32 volt generator or battery, not shown, but whose terminals are indicated at B32 and N32. Armature 11 of vibrator VB is caused to vibrate as long as operating winding 10 is energized, the rate of vibration being predetermined by the proportion of the parts. Armature 11 when vibrated alternately engages contacts 12 and 13 and completes a circuit by which current from the train carried source is alternately supplied to two portions of primary winding 14 of transformer T2 with the result that an alternating electromotive force is induced in secondary winding 15 of transformer T2. The parts are so proportioned that the electromotive force induced in secondary winding 15 is of a voltage of say 110 volts and of a frequency of say 60 cycles per second. It will be understood of course that other voltages for the alternating current source and other frequencies for the alternating current supplied may be used if desired. A condenser 16 is connected across contact 17 of vibrator VB to suppress sparking and a condenser 18 is connected across secondary winding 15 of transformer T2 to improve the operation. Tube ET is provided with an anode circuit which includes the lower terminal of secondary winding 15 of transformer T2, anode 7 and intervening tube space to cathode 9 of tube ET, a resistor 21 and winding 19 of control relay R'1 to the upper terminal of the secondary winding 15, condenser C'1 being preferably connected across the winding 19. Relay R'1 is a direct current relay of the usual acting type. A control circuit for tube ET includes a secondary winding 6 of transformer T'1 connected across control element 8 and cathode 9 of tube ET. When no electromotive force is applied to control element 8 of tube ET the voltage applied across anode 7 and cathode 9 by the source of alternating current CS fails to ionize the tube and no current flows so that control relay R'1 is released. Under this condition condenser C'2, which is a relatively large condenser, is connected across winding 19 of relay R'1 over back contacts 22 and 23 of a relay R2 to be later described, such connection being obvious from an inspection of Fig. 1. When energy is passed by filter F'1 due to reception of signaling current, the control element 8 of tube ET is driven more positive in potential with respect to cathode 9 during the positive half cycle of such energy and tube ET is ionized so that current flows in the anode circuit. Since the signaling energy is of the frequency of 1000 cycles per second and each positive half cycle drives control element 8 more positive in potential, tube ET is ionized and rectified current flows in the anode circuit as long as the signaling energy is present. Due to the flow of such rectified

current in the anode circuit, condenser C2 gradually accumulates a charge and a voltage gradually builds up at the two terminals of the condenser and therefore builds up across winding 19 of relay R1. When the voltage reaches the pick-up value of relay R1, the relay is picked up. When relay R1 is picked up to close front contact 24, a circuit easily traced is completed by which relay R2 is connected across terminals B32 and N32 of the train carried current source and relay R2 is picked up to open back contacts 22 and 23 to disconnect condenser C2 from across winding 19 of relay R1. Condenser C1 which is also connected across winding 19 may be relatively small in capacity and serves to prevent the current through winding 19 from falling off too much when condenser C2 is disconnected. When relay R2 is picked up to close front contacts 25 and 26, the condenser C2 is connected to the train carried current source over a circuit extending from terminal B32, front contact 24 of relay R1, front contact 26 of relay R2, condenser C2, front contact 25 of relay R2, and to terminal N32, and condenser C2 is maintained charged as long as relay R1 is picked up. That is to say, condenser C2 is maintained charged as long as signaling current is received. When relay R2 is picked up a signal lamp L1 is illuminated over an obvious circuit including front contact 27 of relay R2. A second signal lamp L2 is controlled over an easily traced circuit including back contact 28 of relay R2. Another signaling device in the form of an electric bell B1 is provided and is energized over a circuit extending from terminal B32, front contact 27 of relay R2, back contact 29 of relay R1, operating winding of bell B1 and to terminal N32.

A loud speaker LS is included in the apparatus and as here shown is provided with an energizing winding 30 preferably connected to terminals B32 and N32 of the current source and with an operating winding 31 connected across the output terminals of the amplifier-demodulator AD over an obvious circuit including back contact 32 of relay R2.

Thus, as long as signaling current is received and energy is passed by filter F1, relays R1 and R2 are picked up, condenser C2 is maintained charged, lamp L1 is illuminated to indicate the presence of such signaling current and the apparatus is in a working condition, and the loud speaker LS is maintained in an inactive condition.

Assuming such signaling current is no longer transmitted then the alternating current applied to the anode circuit of tube ET causes the tube to be deionized during the negative half cycle of the current and relay R1 is released. With relay R1 released to open front contact 24, the circuit for relay R2 and the circuit by which condenser C2 is maintained charged are open. Condenser C2 now discharges through the winding of relay R2, since it is connected across that winding over front contacts 25 and 26 of the relay. Relay R2 is therefore retained energized and picked up during the discharge interval of condenser C2. During the interval relay R1 is released closing back contact 29 and relay R2 is picked up closing front contact 27, the bell B1 is energized to provide an audible indication that reception of signaling current has ceased and that telephone communication can be expected. When condenser C2 is discharged relay R2 is deenergized and released and lamp L1 is extinguished and lamp L2 is illuminated. The release of relay R2

to close back contact 32 also connects the loud speaker to the amplifier-demodulator so that when telephone current is subsequently received the voice frequencies are reproduced by the loud speaker.

It is to be pointed out that when the telephone current contains the voice frequency of 1,000 cycles, energy is passed by filter F1 and tube ET may be ionized so that current flows in the anode circuit of the tube. Relay R1 is not however immediately picked up because condenser C2 must first be charged and a voltage build up across its terminals equal to the pick-up value of relay R1, and the interval thus required to charge condenser C2 is greater than that during which the voice frequency of 1,000 cycles ordinarily exists. When however the telephone current ceases and signaling current is again transmitted so that energy is passed by filter F1 to cause tube ET to be ionized, then relay R1 is picked up subsequent to the charging of condenser C2 and the apparatus is restored to the normal position, that is, to the position shown in Fig. 1.

In Fig. 2, the apparatus of Fig. 1 is modified by relay R2 being omitted, condenser C2 being charged from the train carried source of direct current, by the energy stored in condenser C2 being used to operate bell B1 directly and by condenser C1 being replaced by a relatively large condenser C3.

It is believed that the apparatus of Fig. 2 will be best understood from a description of its operation. When signaling current is first received, the energy passed by filter F1 causes tube ET to ionize and current to flow in the anode circuit. Condenser C3 being of relatively large capacity gradually builds up a charge and after a predetermined interval the voltage across its terminals reaches the pick-up value of control relay R1 and the relay is picked up after which it is held picked up as long as signaling current is received. When relay R1 is picked up to close front contact 33, condenser C2 is connected across terminals B32 and N32 and is charged and is maintained charged as long as relay R1 is held picked up. The closing of front contact 34 of relay R1 completes a simple circuit for lamp L1 and that lamp is illuminated to indicate reception of signaling current. The operating winding 31 of loud speaker LS is disconnected from the amplifier-demodulator AD at back contact 35 of relay R1.

When the signaling current ceases, the alternating current supplied to the anode circuit of tube ET causes the tube to be deionized and relay R1 to be released. With relay R1 released to open front contact 33 and to close back contacts 36 and 37, condenser C2 is disconnected from the current source and is connected to bell B1. The energy stored in condenser C2 is now discharged through the operating winding of bell B1, and bell B1 is sounded during the discharge period of condenser C2 to provide an audible indication that signaling current is no longer received and that telephone communication can be expected. With relay R1 released to open front contact 34, lamp L1 is extinguished and with the closing of back contact 38 a simple circuit is formed for lamp L2 and that lamp is illuminated to indicate that signaling current is no longer received. The closing of back contact 35 of relay R1 effectively connects loud speaker LS to the output terminals of the amplifier-demodulator AD and hence when telephone current is received the voice frequencies are reproduced at the loud

speaker. It is to be pointed out that when the telephone current contains the voice frequency of 1,000 cycles and energy is passed by filter F1 so that tube ET is ionized, relay R1 is not picked up until after condenser C3 is charged with the result that relay R1 will not ordinarily be picked up under such circumstances because of the short duration of such frequency of the telephone current.

It is to be seen, therefore, that I have provided novel and inexpensive selective means for train communication systems wherewith a first signal lamp is illuminated to indicate reception of signaling current, a signal bell is sounded during a predetermined interval as an indication that signaling current is no longer received and that telephone communication can be expected, a second signaling lamp is illuminated to indicate the absence of such signaling current, and the loud speaker is maintained in an inactive condition as long as signaling current is received and is automatically switched to an active condition when such signaling current ceases.

Although I have herein shown and described only two forms of receiving apparatus for train communication systems 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. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band, an electron tube, a control relay, means to connect said electron tube to said filter and said relay to said tube to cause energization of said relay as long as energy is passed by the filter, a condenser, means controlled by said relay to maintain said condenser charged as long as said relay is energized, and means energized by the discharge of said condenser when said relay is deenergized to provide an indication.

2. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band, an electron tube, a control relay, means to connect said electron tube to said filter and said relay to said tube to cause said relay to be energized and picked up as long as energy is passed by said filter, a condenser, means including a front contact of said relay to maintain said condenser charged, and means controlled by the discharge of said condenser when said relay is released due to energy being no longer passed by said filter, to provide an indication for a predetermined interval.

3. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected

frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element, a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a condenser, means including a contact closed when said relay is energized to maintain said condenser charged, and means controlled by the discharge of said condenser when said relay is released due to energy being no longer passed by said filter to provide an indication during the discharge period of the condenser.

4. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band, an electron tube, a control relay, means to connect said electron tube to said filter and said relay to said tube to cause said relay to be energized and picked up as long as energy is passed by said filter, another relay, a condenser, a circuit including a front contact of said control relay to energize and pick up said other relay, means including a front contact of said other relay in series with a front contact of said control relay to maintain said condenser charged, means including a front contact of said other relay to connect said condenser to said other relay to maintain said other relay energized by the discharge of the condenser subsequent to release of said control relay, and a signaling device energized over a circuit including a back contact of the control relay in series with a front contact of said other relay to provide during the discharge period of said condenser an indication that energy is no longer being passed by said filter.

5. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element; a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a condenser, another relay, means including a back contact of said other relay to connect said condenser across the winding of said control relay to delay the picking up of the control relay when the tube is ionized, means including a front contact of said control relay to energize said other relay, and a signal lamp energized over a front contact of said other relay.

6. Receiving apparatus for a train communication system comprising, a demodulator oper-

able to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element; a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a condenser, another relay, means including a back contact of said other relay to connect said condenser across the winding of said control relay to delay the picking up of the control relay until said condenser is charged when the tube is ionized, means including a front contact of said control relay to pick up said other relay, means including a front contact of said control relay and of said other relay to maintain said condenser charged, means including a front contact of said other relay to connect the condenser across the winding of said other relay to delay its release due to the discharge of the condenser when said control relay is released, a first signal device controlled over a front contact of said other relay and a second signal device controlled over a back contact of the control relay in series with a front contact of said other relay.

7. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element; a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a condenser, another relay, means including back contacts of said other relay to connect said condenser across the winding of said control relay to charge the condenser when the tube is ionized and delay for a predetermined period the picking up of the control relay, means including a front contact of the control relay to pick up said other relay, means including a front contact of the control relay and a front contact of the other relay to connect said condenser to a direct current source to maintain the condenser charged, means including the last mentioned front contact of the other relay to connect said condenser across the winding of said other relay to provide a preselected slow release period for said other relay when the control relay is released, a signal lamp illuminated over a front contact of said other relay, and a signal bell energized over a back contact of said control relay in series with a front contact of said other relay.

8. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current con-

sisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element; a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a condenser, another relay, means including back contacts of said other relay to connect said condenser across the winding of said control relay to charge the condenser when the tube is ionized and delay for a predetermined period the picking up of the control relay, means including a front contact of the control relay to pick up said other relay, means including a front contact of the control relay and a front contact of the other relay to connect said condenser to a direct current source to maintain the condenser charged, means including the last mentioned front contact of the other relay to connect said condenser across the winding of said other relay to provide a preselected slow release period for said other relay when the control relay is released, a first signal lamp controlled over a front contact of said other relay to provide a continuous indication as long as energy is passed by said filter, a signal bell energized over a back contact of said control relay in series with a front contact of said other relay to provide an audible indication for a preselected interval when energy ceases to be passed by said filter, and a second signal lamp controlled over a back contact of said other relay to provide a continuous indication when energy is not being passed by the filter.

9. Receiving apparatus for a train communication system comprising, a demodulator operable to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element; a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a condenser, a source of direct current, means including a front contact of said control relay to connect said condenser to said direct current source to charge the condenser, a first signaling device controlled over a front contact of said control relay to indicate when energy is being passed by said filter, a second signaling device, and means including a back contact of said control relay to connect said condenser to said second signaling device to energize that signaling device by the discharge of the condenser to indicate when energy is no longer being passed by the filter.

10. Receiving apparatus for a train communication system comprising, a demodulator oper-

able to demodulate a communication current consisting of a carrier current modulated by a given voice frequency band, a filter connected across the output terminals of said demodulator and tuned to pass only energy of a preselected frequency within said voice frequency band; a gas filled electron tube having an anode, a cathode and a control element; a control relay, a source of alternating current, an anode circuit including a winding of said control relay and said source of alternating current connected to the anode and cathode of the tube to energize said relay when said tube is ionized, a control circuit to connect said filter across the control element and cathode of the tube to cause ionization of the tube by the energy passed by the filter, a first condenser connected in multiple with the winding of the control relay to delay the picking up of the control relay until said condenser is charged to require that energy be passed by said filter for a predetermined period to pick up the control relay, a second condenser, a circuit including a front contact of said control relay to connect said second condenser to a source of direct current to charge that condenser, a signal lamp controlled over a front contact of the control relay to indicate when energy is being passed by said filter, an electric signal bell, and a circuit including a back contact of said control relay to connect said second condenser to said bell to energize the bell by the discharge of the condenser to indicate when energy is no longer passed by the filter.

11. Receiving apparatus for a train communication system using a carrier telephone current consisting of a carrier current modulated by a

given voice frequency band and a signaling current equivalent to said carrier current modulated by a single preselected frequency within said voice frequency band, comprising, a demodulator operable to demodulate such telephone and signaling current when such currents are applied thereto, a filter connected to the output terminals of said demodulator and tuned to pass only energy of said preselected frequency, a gas filled electron tube, a control relay, a source of alternating current, an anode circuit including said source of alternating current and control relay connected across the anode and cathode of said tube to energize the relay when the tube is ionized, a control circuit to connect the output side of said filter across the control element and cathode of said tube to cause ionization of the tube by the single frequency energy passed by the filter, a condenser, means including a front contact of said control relay to connect said condenser to a source of direct current to charge the condenser, a signal lamp controlled over a front contact of said relay to indicate when said signaling current is applied to said demodulator, an electric bell, means including a back contact of said relay to connect said condenser to said bell to energize the bell by the discharge of the condenser when such signaling current ceases to be applied to the demodulator, a loud speaker, and means including a back contact of said relay to connect an operating winding of the loud speaker to the output terminal of the demodulator to reproduce the voice frequencies when said telephone current is applied to the demodulator.

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