

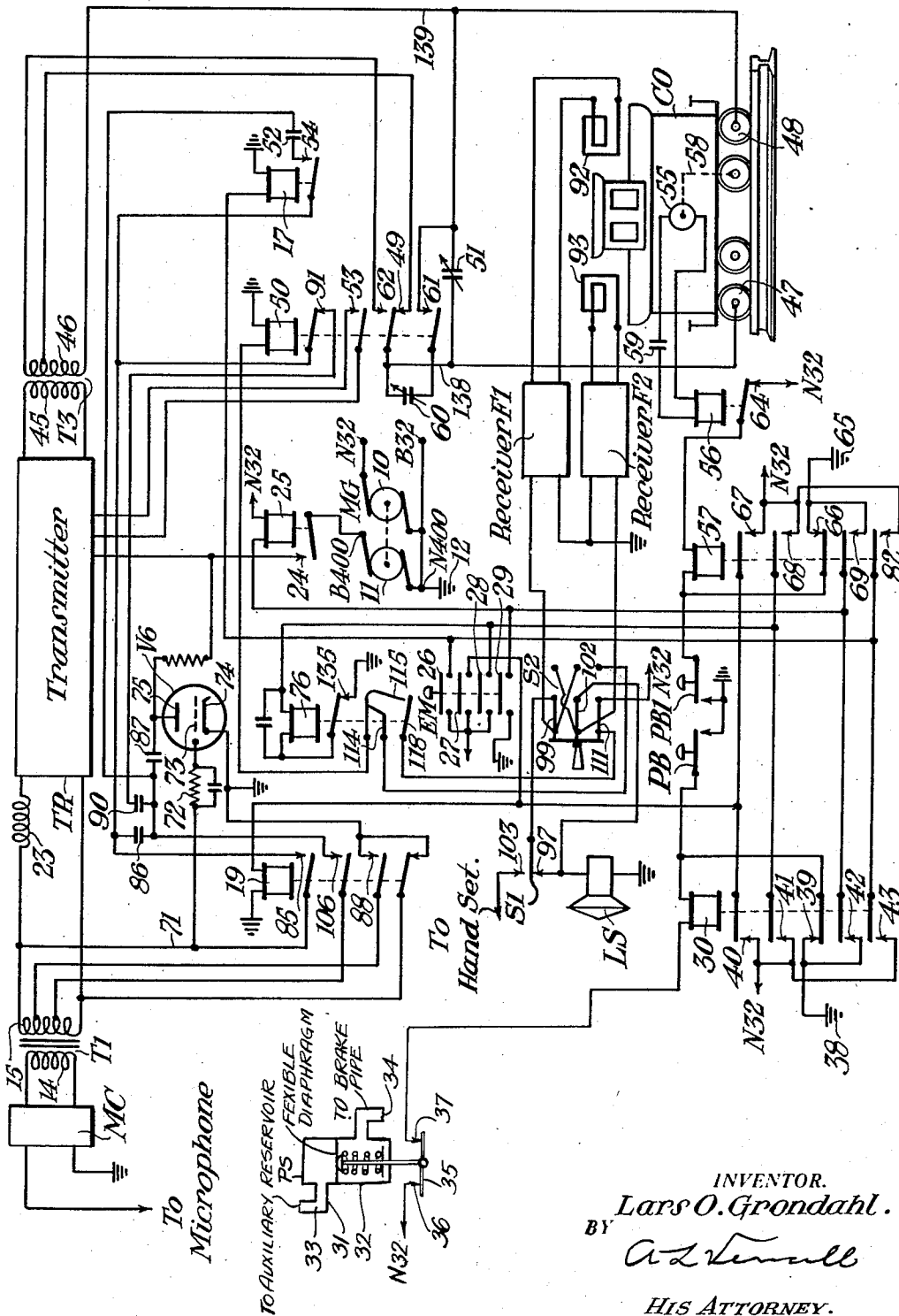
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RAILWAY TRAIN EMERGENCY ALARM APPARATUS

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RAILWAY TRAIN EMERGENCY ALARM
APPARATUS

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8 Claims. (Cl. 246—169)

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My invention relates to railway train emergency alarm apparatus, and more particularly to apparatus to send out an emergency alarm through railway train communication equipment.

In the operation of railway trains, derailed cars, dragging equipment, and other circumstances create conditions that are more or less of a hazard to all trains in the vicinity. Many times these accidental hazards are observed by railway personnel at a wayside station and by crew members on trains other than of the train to which the danger impends. Under all of such circumstances it would be a point toward safety if all the trains in the vicinity of such a hazard can be given an emergency alarm so that the crews of all these trains can be on the alert and each crew can take what steps are necessary to bring their train under full control. In other words, it is desirable to have some means through which an emergency alarm can be given without delay when a hazard occurs, such alarm being created through devices automatically actuated when the hazard occurs or created through a circuit controller to be actuated by railway personnel when the hazard is observed.

Accordingly, a feature of my invention is the provision of novel emergency alarm apparatus for use in the operation of railway trains.

Another feature of my invention is the provision of novel emergency alarm means for use with railway train communication equipment.

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

To attain the foregoing features, objects and advantages of my invention I provide novel apparatus through which an emergency alarm current will be sent out from wayside stations and from train carried stations to be picked up by the associated receiving apparatus of each such station. The sending of this alarm current is accomplished automatically through a controller actuated due to the occurrence of a given hazard or is accomplished in response to manual operation of a controller by a watchman, operator or train crew member when the hazard is observed. For example, on trains the automatic sending of the alarm current can be effected through a controller actuated by a predetermined drop in the brake pipe pressure or by a high deceleration or by a hot journal bearing detector. At wayside points, automatic sending of the alarm current can be based on the operation of a controller actuated upon the occurrence of a landslide, burnt bridge, high water, misplaced switch

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or similar circumstance. At all wayside stations and at all train carried stations there is provided a manually operable controller which when actuated causes the sending of the alarm current, and thus any railway employee at wayside stations or on trains can cause the sending of the alarm current. The alarm current is of a preselected characteristic to which the receiving apparatus at all stations responds in a special manner to create a predetermined alarm signal. When used with train communication equipment the alarm current is effective to influence the receiving apparatus not only under its normal or non-communicating conditions, but also to break in on any conversation that is in progress so that under no circumstances is there a delay in the display of the alarm signal.

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

The accompanying drawing is a diagrammatic view showing one form of apparatus embodying my invention when used with train communication equipment of the carrier inductive type.

It is to be understood that my invention is not limited in its use to this one type of train communication apparatus and the present application serves to illustrate the principle of the invention and the many places the apparatus is useful.

Referring to the drawing, the reference character CO designates a vehicle of a railway train, such as a locomotive or caboose of a freight train, and in the drawing a caboose is shown.

This vehicle is provided with communication equipment for two-way telephone communication with remote stations. That is, the caboose CO is equipped with apparatus for telephone communication with the locomotive of the same train, with other trains in the vicinity and with wayside stations. Each such train carried and wayside station would be provided with communication equipment similar to that disclosed in the drawing. The communication equipment may take different forms, and I shall assume for the present application that the communication equipment is similar to that disclosed in a copending application for Letters Patent of the United States, Serial No. 575,311, filed January 30, 1945, by Paul N. Bossart, for Railway train communication systems, and reference is made to this Bossart application for a full description of the communication equipment. It is sufficient for the present application to point out that such communication equipment utilizes the

track rails and paralleling conductors, such as line wires, as a medium for transmitting the current along the railway, each station equipment being electrically coupled to the transmitting circuit or medium. Each equipment includes transmitting apparatus and receiving apparatus which use a modulated carrier current, the carrier being modulated by voice frequencies for telephone purposes and modulated by a pre-selected frequency for calling purposes. To provide non-interference between different trains and break-in facilities two different carrier frequencies are provided, and each carrier channel is further provided with an individual calling frequency, and by way of illustration carriers of frequencies f_1 and f_2 may form a first and a second carrier channel, respectively, and a first and a second tone frequency may serve as the calling current for the channels f_1 and f_2 , respectively.

Each receiving apparatus is normally energized and conditioned to receive the calling current of either carrier channel, the received current being demodulated and applied to the loud-speaker to sound the respective calling tone. Furthermore, when a telephone conversation is to be carried on through either channel, the loud-speaker is disconnected from the channel to be used for telephoning and the earphones of a hand set are connected thereto, but the receiving apparatus during a conversation remains conditioned to also pick up the calling current of the other channel and sound the corresponding tone in the loud-speaker as a break-in, such tone informing the operator that some signal or message which takes precedence over the telephone communication is to be transmitted.

The transmitting apparatus is normally deenergized and is energized and made active only during periods of sending the calling current or the telephone current. Also, the transmitting apparatus is capable of sending the calling tone currents individually or to send the two calling currents alternately in a cyclic manner, this last condition serving as an emergency calling. That is, this feature of sending the two calling currents alternately is used to call all trains within the range of the equipment to assure that although different trains may be communicating through one or the other of the two channels, all trains will be called by the emergency call. It is clear that in such instances such emergency calling could be utilized as an emergency alarm signal by providing apparatus which would control the transmitting apparatus to send the calling current alternately when a hazardous condition occurs. However, I preferably use different tone currents for an emergency alarm, and in that way the emergency alarm is distinct from the usual calling of the communication system.

In the accompanying drawing, only such portions of the communication equipment of the aforementioned Bossart application necessary for a full understanding of my invention are shown, and in the drawing elements corresponding to like elements of the Bossart application are given the same reference characters.

The caboose is provided with a source of power, such as the usual 32 volt car lighting system, the terminals of this source being designated B32 and N32. The 32 volts of this source are converted into a voltage suitable for use with electron tubes of the apparatus through a motor generator MG, a motor 10 of which is connected to terminals B32 and N32 and a generator 11 of which supplies a relatively high voltage at termi-

nals B400 and N400. The positive terminal B32 of the source and the negative terminal N400 of the generator are connected to a ground electrode 12. The caboose is also provided with a series of control relays and different controlling switches which will be referred to from time to time as the specification progresses.

The transmitting apparatus of the caboose comprises a transmitter TR, a voice frequency supply means, a calling current and emergency current supply means, an input transformer, an output transformer, and associated circuits.

The transmitter TR is shown in block form for the sake of simplicity since its specific structure forms no part of my present invention and it is sufficient to point out that it would include a carrier oscillator, a modulator and a power amplifier, which devices may be similar to those disclosed in the previously mentioned Bossart application. The transmitter TR is proportioned to supply two different carrier frequencies to provide two different carrier channels, and I shall assume these carrier frequencies are of the frequency f_1 and f_2 to form a first and a second carrier channel, respectively. The selection of the channel frequency is obtained through a control relay 50, the arrangement being such that when relay 50 is released the transmitter is conditioned to supply the carrier of the first channel frequency f_1 and when relay 50 is picked up, closing front contact 53, the transmitter is conditioned to supply the carrier of the second channel frequency f_2 .

The voice frequency supply means includes a microphone not shown and a circuit network MC connected to primary winding 14 of an input transformer T1, a secondary winding 15 of which transformer is connected to the input side of the transmitter TR through a reactance 23. Consequently, the voice frequency serves to modulate the carrier and a carrier telephone current is supplied to primary 45 of an output transformer T3, the carrier being of the channel frequency f_1 or f_2 according as the control relay 50 is released or picked up.

The calling current and the emergency alarm current supply means includes a vacuum tube V6 and secondary winding 15 of transformer T1 serving as an inductor of an oscillating circuit associated with tube V6, the circuits of tube V6 being governed by control relays 17, 19, 25 and 50. Power is applied to the plate circuit of tube V6 as well as to the plate circuits of the tubes of the transmitter TR from generator 11 through front contact 24 of control relay 25 when that relay is energized in a manner to appear hereinafter. An oscillating circuit network for tube V6 is formed by the top terminal of winding 15 being connected through wire 71 and grid leak unit 72 to control grid 73 of tube V6; cathode 74 of tube V6 being connected to an intermediate terminal of winding 15 through front contact 83 of relay 19; plate 75 of tube V6 being connected to another intermediate terminal of winding 15 through blocking capacitor 87 and front contact 106 of relay 19; and a capacitor 86 being connected between the grid and plate circuit leads through front contact 85 of relay 19. An additional capacitor 90 is connected in multiple with capacitor 86 through back contact 91 of relay 50. Furthermore, a third capacitor 52 is included in the oscillating circuit through front contact 54 of control relay 17. It is clear from the foregoing description that when relays 19 and 25 are picked up and relays 50 and 17 are released, the tube V6 is supplied with

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power and is connected for it to function as an oscillator, the oscillations being of a frequency predetermined by the capacitors 86 and 90 in multiple and which frequency I shall refer to as being a first calling tone frequency. These oscillations are applied to the transmitter TR to modulate the first carrier channel frequency *f*₁ and a calling current of a first tone frequency appears in the winding 45 of output transformer T3. When relays 19, 25 and 50 are picked up and relay 17 is released, the tube V6 functions as an oscillator the same as before and the oscillations are of a frequency predetermined by the capacitor 86, and I shall assume that these oscillations are of a second tone frequency. These oscillations are applied to the transmitter to modulate the second carrier channel frequency *f*₂ and a calling current of the second tone frequency appears in winding 45 of output transformer T3. These two calling tones are those used in connection with the communication equipment. To effect the calling tones the several control relays may be controlled in a manner similar to that disclosed in the aforementioned Bossart application but such control circuits are omitted in order to not unduly complicate the drawing since the calling control circuits form no part of my present invention. In addition I provide two emergency alarm tones in the following manner. When relays 19, 25 and 17 are picked up and relay 50 is released, capacitors 86, 90 and 52 in multiple are included in the oscillating circuit for tube V6 and oscillations of a first emergency alarm tone frequency are supplied to the transmitter for modulating the first channel carrier frequency *f*₁ and a first emergency alarm tone current appears at the output transformer T3. Again, when relays 19, 17, 25 and 50 are all picked up, capacitors 86 and 52 in multiple are included in the oscillating circuit of tube V6 and oscillations of a second emergency alarm tone frequency are applied to the transmitter to modulate the second channel frequency *f*₂ and a second emergency alarm tone current appears at the output transformer.

A secondary winding 46 of output transformer T3 is connected to a sending loop circuit coupled to the transmitting circuit by being connected to the track rails through wheels 47 and 48 of the caboose, the connection to the wheels being preferably made through the journal bearings in the well-known manner. When relay 50 is released closing back contact 49, a preselected portion of winding 46 is connected to wheels 47 and 48 through wires 138 and 139 and a capacitor 51 is connected across the connection to condition the loop circuit for efficient transfer of energy of the first carrier frequency *f*₁. When relay 50 is picked up closing front contacts 61 and 62, a different preselected portion of winding 46 and another capacitor 60 are included in the sending loop circuit for efficient transfer of energy of the second carrier frequency *f*₂.

The calling and emergency alarm apparatus is conditioned through a control relay 76 to supply the two calling tones or the two emergency alarm tones in a cyclic manner as will be more fully explained hereinafter.

The receiving apparatus comprises two pick-up coils 92 and 93 and two complete receivers designated receiver F1 and receiver F2, respectively, coil 92 being connected to the input of receiver F1 and coil 93 being connected to the input of receiver F2. Pick-up coils 92 and 93 are mounted on the caboose for inductive coupling to the way-

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side transmitting medium which includes the track rails and paralleling conductor as explained hereinbefore. Each receiver F1 and F2 is shown conventionally because the specific construction of these devices forms no part of my present invention and each may be of any one of several arrangements, and it is sufficient for the present application to point out that receivers F1 and F2 are responsive to the channel carrier frequency *f*₁ and *f*₂, respectively, and each receiver includes means to demodulate the respective carrier current.

The output sides of the receivers F1 and F2 are normally connected in multiple to a loud-speaker LS through a three-pole double-throw switch S2 and a hook switch S1, hook switch S1 being of the usual form on which a standard hand set not shown is placed, and which hand set is part of the communication equipment. Specifically, when switch S2 is set to the left, that is, to the position illustrated in the drawing, and the hand set is on the hook switch, the receiver F1 is connected to the loud-speaker LS through contact blade 99 of switch S2 and normally closed contact 97 of hook switch S1; and the output of receiver F2 is connected to the loud-speaker through contact blade 102 of switch S2. When switch S2 is set to the right, contact blade 99 and contact 97 of the hook switch are included in the connection of receiver F2 and contact blade 102 is included in the connection of receiver F1. The earphone of the hand set is connected to normally open contact 103 of the hook switch and thus when the hand set is removed from the hook switch the loud-speaker is disconnected from either receiver F1 or F2 according to the position of switch S2, and the earphone of the hand set is connected to that receiver for telephone purposes. The loud-speaker remains connected to the receiver not being used for telephoning.

It should be noted that the switch S2 also serves as a channel selector for selecting the channel frequency. The switch S2 when set to the left prepares the circuit for control relay 50 which selects the channel frequency of transmitter TR, such circuit extending from terminal B32 through ground, winding of relay 50, transfer contact 115 and front contact 118 of continuity transfer contact of relay 76, and contact blade 111 of switch S2 to terminal N32; and when switch S2 is set to the right a circuit is formed from terminal B32 through ground, winding of relay 50, transfer contact 115 and back contact 114 of relay 76 and contact blade 111 to terminal N32. Consequently, when switch S2 is set to the left the relay 50 is normally released and the transmitter TR supplies channel frequency *f*₁ and when switch S2 is set to the right relay 50 is normally energized and the transmitter conditioned to supply channel frequency *f*₂. It is clear, however, that relay 76 controls through its contacts 114, 115 and 118 the control relay 50 and in turn thus controls the carrier channel frequency as will be more fully explained shortly.

The caboose is further provided with apparatus for governing the emergency alarm means automatically and manually. The first automatic switching means includes a pneumatic switch PS and a relay 30. The pneumatic switch PS is shown conventionally and includes a flexible diaphragm 31 mounted in a reservoir 32. The chamber of reservoir 32 to one side of the diaphragm 31 is connected through pipe 33 to the auxiliary reservoir of the brake equipment on the caboose CO, and the chamber of the reservoir

32 to the other side of the diaphragm is connected through plate 34 to the brake pipe on the caboose. The arrangement is such that with equal pressures on each side of the diaphragm 31 and in fact when the brake pipe pressure is reduced for service application of the train brakes, a contact member 35 which is operatively connected with diaphragm 31 is in engagement with fixed contacts 36 and 37 to complete the connection there-through, but when a large reduction in brake pipe pressure occurs, such as occurs when an emergency brake application is made, the contact member 35 is moved far enough by diaphragm 31 to disengage contacts 36 and 37. Relay 30 is normally energized through a stick circuit which includes contact 35, this circuit being traced from terminal B32 through ground, ground electrode 38, front contact 39 and winding of relay 30, and contact 35 of the device PS to terminal N32. Relay 30 once released by the opening of contact 35 remains released although the contact 35 is reclosed, until such time as a pick-up circuit is closed through spring return type push button PB as will be readily understood by an inspection of the drawing. Relay 30 when released to close back contacts 40, 41, 42 and 43 governs control relays 17, 19, 25 and 76 to control the emergency alarm means in a manner to appear shortly.

A second automatic means on the caboose includes an axle driven generator 55 and relays 56 and 57. Generator 55 is preferably a direct current generator connected to an axle of the caboose through a drive mechanism indicated conventionally by a dotted line 58. The terminals of generator 55 are connected across the winding of relay 56 through a capacitor 59. Thus capacitor 59 serves to block the flow of direct current from the generator 55 as long as the voltage of the generator is substantially constant, but a sudden change in the voltage would cause a current impulse to be applied to the relay. The parts are proportioned so that the relatively high deceleration in the rate of rotation of the axle of the caboose caused by an emergency brake application or some other predetermined brake application creates a change of voltage of generator 55 that results in a current impulse which energizes relay 56 sufficiently to pick up the relay and open back contact 64. Relay 57 is normally retained energized through a stick circuit including terminal B32, ground electrode 65, front contact 66 and winding of relay 57 and back contact 64 of relay 56 to terminal N32. Relay 57 once released can be reset through a pick-up circuit that includes push button PB1. Relay 57 governs at its back contacts 67, 68, 69 and 82 the control relays 17, 19, 25 and 76, and in turn the emergency alarm means, as will be pointed out shortly.

A manually operable switch EM is provided with contacts 26, 27, 28 and 29 to also control the several control relays and in turn the emergency alarm means, as will also be described presently.

Normally each receiver F1 and F2 is active, the transmitter TR is deenergized and the several control relays and switches occupy the positions shown in the drawing. With the train operating under normal conditions the equipment can be used for telephone communication in the usual manner. In the event danger impends and an emergency application of the train brakes is made, such brake pipe reduction will actuate device PS to open contact 35 and deenergize relay 30, and relay 30 releases and remains released until such time as its pick-up circuit is closed through push button PB. With relay 30 released closing back

contact 42, an obvious energizing circuit for relay 25 is completed and relay 25 is picked up to close front contact 24 and apply power to tube V6 and to the transmitter TR. The closing of back contact 40 completes a circuit for relay 19 and that relay is picked up to form the oscillating circuit of tube V6. The closing of back contact 43 of relay 30 completes a simple circuit for relay 17 and that relay is picked up so that capacitor 52 is included in the oscillating circuit of tube V6. The closing of back contact 41 of relay 30 completes a circuit for relay 76, this circuit extending from terminal B32 through ground, back contact 135 and winding of relay 76 and back contact 41 of relay 30 to terminal N32. Relay 76 being thus controlled through its own back contact 135, the relay is operated at a rate predetermined by the construction of the relay and by the capacitor connected across the winding of the relay. Such operation of relay 76 causes control relay 50 to be alternately picked up and released. Each period that relay 50 is released, carrier current of the first channel frequency f1 modulated by the first emergency alarm tone frequency is supplied to the transmitting circuit and each period relay 50 is picked up, carrier current of the second channel frequency f2 modulated by the second emergency alarm frequency is supplied to the transmitting circuit. These two emergency alarm currents will be alternately supplied as long as relay 30 remains released.

Such emergency alarm current will be picked up by the receiving apparatus of each nearby station and the emergency alarm sounded at the loud-speaker of each such station. That is to say, when an emergency brake application is made on the train of which caboose CO is a part, an emergency alarm signal is provided for nearby trains, such emergency alarm serving as a step toward safety, due to the fact that the hazard for which the emergency brake application was made may be a hazard for other trains. Also, an emergency brake application of a train may cause derailment of a car of the train which would become a hazard for any train on adjacent tracks.

In the event relay 56 is picked up by a current impulse from generator 55 due to a predetermined deceleration of the train, relay 57 is in turn released closing its back contacts and the relays 17, 19, 25, 50 and 76 are governed in substantially the same manner as when relay 30 is released. That is, the closing of back contacts 67, 68, 69 and 82 of relay 57 completes circuits for relays 19, 76, 25 and 17, respectively. It follows that an emergency alarm is provided for nearby trains when the train of which caboose CO is a part is decelerating as may be caused by an emergency brake application.

It is to be observed that as here illustrated the automatic device PS and the generator 55 provide automatic control of the emergency alarm signal in response to braking conditions. It is apparent that either one of the two devices may be used alone, or the two may be used as an extra precaution. Furthermore, it is apparent that the relay 30 or the relay 56 can be governed through a hot journal bearing detector or some other part of the train and thus provide emergency alarm for other conditions of the train.

The manually operable switch EM when actuated to close contacts 26, 27, 28 and 29 completes circuit paths for energizing the control relays 17, 19, 76 and 25, respectively, these circuit paths for the relays being in multiple with

corresponding paths governed by the relays 30 and 57, as will be readily understood by an inspection of the drawing.

Thus operation of the switch EM causes the transmitter TR to alternately supply the two emergency alarm currents for sending an emergency alarm to all nearby trains and wayside stations. The switch EM would be used by a member of the crew in the caboose CO who might observe some hazardous condition either on his own train or on some other nearby train or some condition along the trackway.

It is to be seen, therefore, that the apparatus disclosed in the drawing is effective for sending a distinctive emergency alarm current when a hazard occurs, and which alarm current is effective to create on all trains in the vicinity of such hazard a distinctive alarm, causing the crews of these trains to be on the alert to take such action as may be required to bring their trains under control.

Although I have herein shown and described but one form of railway train emergency alarm 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 combination, a railway train vehicle having mounted thereon transmitting apparatus operable to supply either a first or a second current of different preselected carrier frequencies, generating means operable to supply oscillations of either a first or a second preselected tone frequency, said generating means connected to said transmitting apparatus to modulate the first and second carrier frequency current by said first and second tone frequencies respectively to supply a first and a second alarm current, control means having contacts to govern the conditioning of said transmitting apparatus and said generating means to alternately supply said first and second alarm currents in a cyclic manner, and means including a contact member connected to a given element of said vehicle to automatically govern said control means when a predetermined operating condition occurs.

2. In combination, a railway train vehicle having mounted thereon transmitting apparatus operable to supply either a first or a second current of different preselected carrier frequencies, generating means operable to supply oscillations of either a first or a second preselected tone frequency, said generating means connected to said transmitting apparatus to modulate the first and second carrier frequency current by said first and second tone frequencies respectively to supply a first and a second alarm current, control means having contacts to govern the conditioning of said transmitting apparatus and said generating means to alternately supply said first and second alarm currents in a cyclic manner, and means including a contact member actuated by the brake pipe pressure of said vehicle to govern said control means for supplying said alarm currents when a predetermined brake application is made.

3. In combination, a railway train vehicle having mounted thereon transmitting apparatus operable to supply either a first or a second current of different pre-selected carrier frequencies, generating means operable to supply oscillations of either a first or a second preselected tone fre-

quency, said generating means connected to said transmitting apparatus to modulate the first and second carrier frequency current by said first and second tone frequencies respectively to supply a first and a second alarm current, control means having contacts to govern the conditioning of said transmitting apparatus and said generating means to alternately supply said first and second alarm currents in a cyclic manner, a generator connected to an axle of said vehicle to generate a voltage due to the speed of rotation of the axle, a relay connected to said generator to be effectively energized in response to a given rate of change in the generated voltage due to a predetermined change of the speed of rotation of the axle, and circuit means controlled by said relay to govern said control means.

4. In combination, a railway station having telephone equipment using either a first or a second carrier frequency for telephone communication with trains within a given range of the station through a transmitting circuit common to all the trains, an electron tube oscillator at said station, control relay means to govern the transmitting portion of the telephone equipment at the station to select the carrier frequency to be supplied and to connect at times said oscillator to the transmitting portion for modulating the carrier by the generated oscillations, a circuit controlling contact at said station to be operated in response to a predetermined hazard, and means including said circuit controlling contact to automatically govern said control relay means to condition said transmitting portion and said oscillator to supply said first and second carrier frequency alternately in a cyclic manner and modulated by a first and a second tone oscillation to sound through the receiving portion of the telephone equipment of each train within said range an alarm of the occurrence of said hazard.

5. In combination, a railway station having telephone equipment using either a first or a second carrier frequency for telephone communication with trains within a given range of the station through a transmitting circuit common to all the trains, an electron tube oscillator at said station, a first control relay to govern the transmitting portion of the telephone equipment at the station to select the carrier frequency to be supplied, a second control relay to connect at times said oscillator to the transmitting portion to modulate the carrier supplied, a third control relay to govern said oscillator to generate either a first or a second tone frequency, a circuit controlling contact at said station automatically operated when a given hazard occurs, and means including said circuit controlling contact to govern said first, second and third control relays as required to condition the transmitting portion and said oscillator for supplying said first and second carrier frequencies alternately in a cyclic manner and modulated by a first and a second tone frequency respectively to sound through the receiving portion of the telephone equipment of each train within said range an alarm of the occurrence of said hazard.

6. In an emergency alarm means for use with a railway train telephone equipment using a carrier frequency current for telephone communication with remote stations having similar telephone equipments, the combination comprising, alarm current supply means on said train operable when energized to create oscillations of a preselected tone frequency and having connections to the transmitter portion of the train telephone equip-

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ment to modulate the carrier current by said oscillations to provide an emergency alarm current, a circuit interrupting device on said train operable when actuated to recurrently interrupt said oscillations to provide recurrent pulses of the emergency alarm current for recurrently sounding an alarm signal through the receiver portion of the telephone equipments of said remote stations, a contact member on said train operatively connected to a train element to actuate the contact member when a given hazardous condition occurs, and means including said contact member to energize said alarm current supply means and to actuate said circuit interrupting device.

7. In combination, a railway train having mounted thereon a transmitter operable to supply a carrier current of a preselected frequency, train carried generating means operable to supply oscillations of a preselected frequency characteristic, said generating means having connections to said transmitter to modulate said carrier by said oscillations to provide an emergency alarm current, a circuit interrupter operable to recurrently actuate a contact, a contact member operably associated with an element of said train to actuate the contact member in response to a given train hazardous condition, and control means including said interrupter contact and said

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contact member to govern said generating means to recurrently create said oscillations to provide recurrent pulses of said emergency alarm current.

8. In combination, a railway train having mounted thereon a transmitter operable to supply a carrier current of a preselected frequency, train carried generating means operable to supply oscillations of a preselected frequency characteristic, said generating means having connections to said transmitter to modulate said carrier by said oscillations to provide an emergency alarm current, a circuit interrupter operable to recurrently actuate a contact, a contact member operatively connected to an element of said train to actuate the contact member in response to a given train hazardous condition, and control means including said interrupter contact and said contact member to recurrently interrupt said emergency alarm current.

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