Jan. 16, 1945. G. L. BEERS 2,367,327

RADIO WARNING SYSTEM

Filed Feb. 27, 1942 2 Sheets-Sheet 1

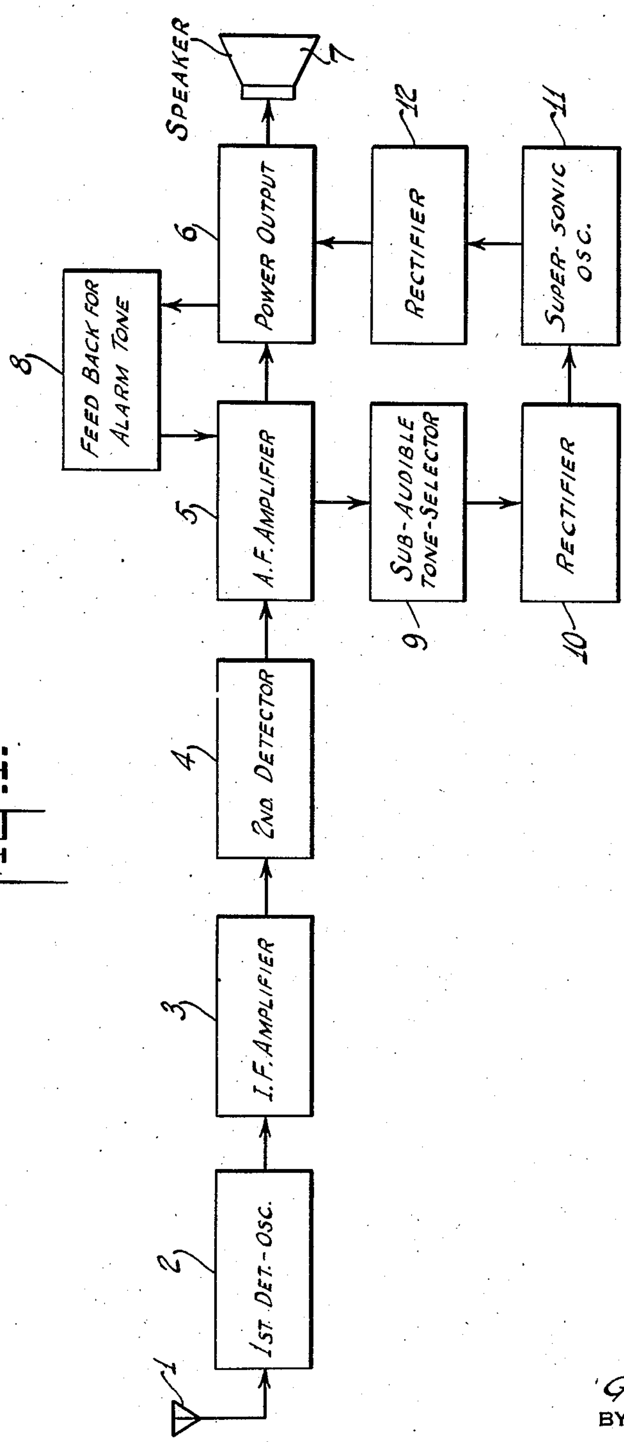

Fig. 1.

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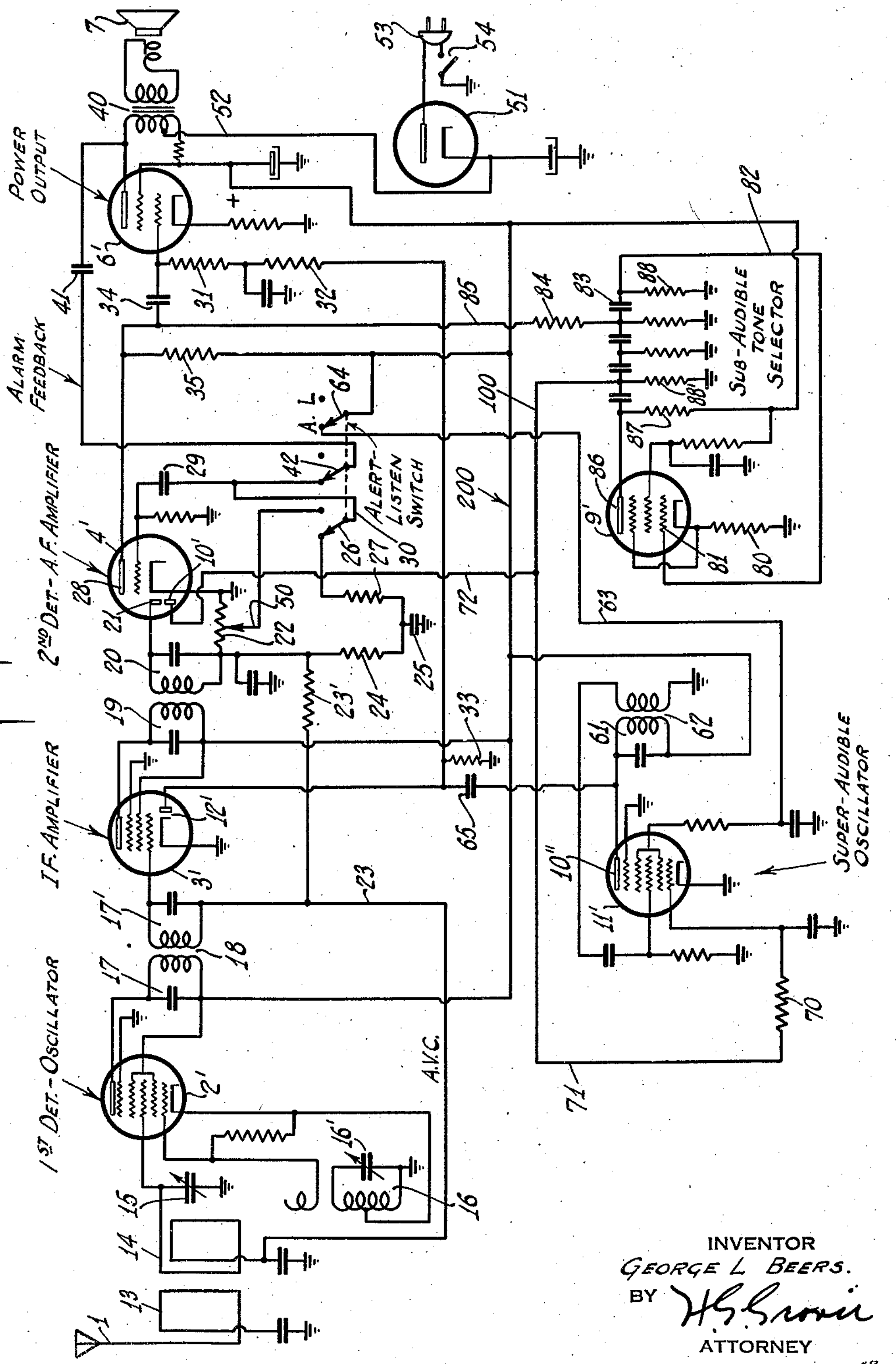
Filed Feb. 27, 1942 2 Sheets-Sheet 2

Fig. 2.



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RADIO WARNING SYSTEM

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15 Claims. (Cl. 250—2)

My present invention relates to improved radio warning systems, and more particularly to a receiver of the so-called "alert" type which is responsive to a radiated control signal which appears as a sub-audible tone modulation on a radiated carrier wave.

In the past there have been disclosed various types of radio warning systems. One of these systems, as disclosed by H. B. Deal in application Serial No. 403,736, filed July 23, 1941, patented February 1, 1944, as U. S. Patent No. 2,340,798, utilized a normal radio receiver, two tuned-reed relays, and a power relay for controlling the loudspeaker of the receiver. Modulation of the transmitted carrier with one sub-audible tone for a few seconds would make the loudspeaker operative, while modulation for a few seconds with another sub-audible tone would silence the loudspeaker. The purpose of that system was to assure reception of emergency information, as in air raid warnings, making use of existing broadcast stations without interference at other times with the program, and without requiring listening to all the programs. In that system provision was, also, made for operation of a visual, or audible, alarm signal.

Another system of the radio warning type has been disclosed by W. R. Koch in application Serial No. 404,902, filed July 31, 1941, patented March 21, 1944, as U. S. Patent No. 2,344,618. In that system electrical tuned circuits are employed for the selection of the sub-audible control tones instead of tuned-reed relays. These electronic tone selectors essentially comprise resistance-capacity networks employing regenerative feedback for improving the selectivity characteristic of the system, and inverse, or degenerative, feedback for stabilizing the amplifier operation without utilizing a high degree of degenerative feedback. In this way there was secured low-cost electrical tone selection, in addition to simplification of the entire system. Specifically, the receiver of the aforesaid Koch application employed a first tube operating as a first detector-local oscillator, a second tube operating as an intermediate frequency amplifier, a third tube functioning as a second detector-audio frequency amplifier, and tone-selecting and relay-operating tubes. These various tubes were operative at all times. In that receiver a relay was employed, as in the aforementioned Deal patent.

It may be stated to be one of the main objects of my present invention to provide a receiver of the type referred to above, but which is improved in various aspects, and the receiving system requiring only a single sub-audible control tone transmitted during the "alert" period.

Another important object of the present invention is to provide an air raid warning system utilizing only a single control modulation tone thereby reducing the selectivity necessary in the tone selecting circuit, since it is only necessary to provide sufficient selectivity to separate the control tone from the normal modulation. A single tuned circuit of relatively poor "Q" is, therefore, sufficient in the tone selector circuit.

Another object of my invention is to provide an "alert" type of receiver designed to provide an alarm signal consisting of a loud, interrupted audible tone, and the tone being produced whenever the sub-audible modulation tone is transmitted; the audible tone continuing until the user operates a switch to put the receiver in a "listen" position.

Another object of the invention is to provide a radio warning receiver which can be muted, without the expense of a power relay, by blocking off the audio amplifier through the use of a superaudible oscillator; a warning signal being provided by permitting the audio amplifier of the receiver to oscillate whenever the sub-audible modulation tone is being transmitted.

Still other objects of this invention are to improve generally the simplicity and efficiency of a receiver of the "alert" type, and more especially to reduce the cost and weight of such receivers.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims; the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawings in which I have indicated diagrammatically a circuit organization whereby my invention may be carried into effect.

In the drawings:

Fig. 1 shows in schematic form the essential networks of my present system;

Fig. 2 shows the circuit details of the invention.

Referring now to the accompanying drawings, the present system is shown in block diagram form in Fig. 1. It will be seen that generally the system comprises a signal collector device 1, which may be of any well known and desired type. As explained previously the collector 1 will collect the usual broadcast carrier waves in the broadcast band of 550 to 1700 kilocycles (kc.). The collected signals are transmitted to a conventional first detector—local oscillator network

2 thereby to reduce the collected modulated carrier waves to an intermediate frequency (I. F.). For example, an I. F. of the order of 455 kc. may be employed, as is well known in broadcast reception practice. The network 3 is an I. F. amplifier, and the amplified I. F. energy is fed to a second detector 4. There is derived from the detected modulated carrier energy the modulation voltage which is fed to the audio frequency amplifier 5.

As will be shown later in Fig. 2, the electrode elements of the second detector and audio frequency amplifier may be embodied in a single electron discharge tube. The amplified modulation voltage is then fed to a power output tube 6, and a loud speaker 7 is fed with the output of the stage 6. It will be understood that when the receiving system is in the "listen" state then the usual program reception is had, and the output of the loud speaker will be the program modulation which was imposed upon the carrier at the broadcast transmitter. However, when the receiver is switched to the "alert" condition and the control tone is transmitted, then the output of the loud speaker will be the audible warning signal. When the control tone is not transmitted and the receiver is in the "alert" condition, there will be no sound output from the loud speaker.

To provide the audible warning, there is connected a feedback path 8 between the power output stage 6 and the audio amplifier 5. This feedback path provides an audio oscillation network which can be adjusted to provide a distinctive alarm tone. Control of the alarm tone is provided by a control network which includes the sub-audible modulation tone selector 9. As stated heretofore, this selector may be of the electronic type. The output of the selector 9 is fed to a rectifier 10, and the rectified voltage is utilized to control the operation of a super-sonic, or super-audible, oscillator 11.

The use of the super-sonic oscillator 11 provides two distinct advantages. In the first place, it can be started and stopped by applying a proper control potential and thus provide a definite "on-off" characteristic. The second advantage is that the rectified output of the oscillator provides a source of high negative potential for controlling the output stage, which otherwise would not be available without materially increasing the cost of the +B supply system.

The super-audible oscillations are rectified in a rectifier circuit 12, and the rectified voltage is employed to control the effectiveness of the power output stage 6. The feedback for producing the alarm tone is effective only when the receiver is in the "alert" condition and the bias on the output stage is normal, i. e., when the super-sonic oscillator 11 is rendered inoperative. In turn, the super-sonic oscillator can operate only when the receiver has been switched to the "alert" condition so as to be prepared to select from the modulated carrier the sub-audible modulation tone, and when no such tone is being transmitted. Obviously in order to condition the receiving system so as to receive the usual programs in the broadcast band, or in the particular band which the receiver is operating in, it is only necessary to stop the super-audible oscillator and open the sub-audible control path and the feedback path. The receiver operation band may be in the short wave range, the frequency modulation range or the television range. It will now be seen that the receiver is "muted" by blocking off the audio amplifier through the use of a super-audible oscillator 11 which is adapted to be rendered inoperative in response to the sub-audible modulation tone, and a warning signal being provided by permitting the feedback path 8 to produce audio oscillations whenever the "alert" tone is being transmitted.

Referring, now, to the specific circuits of the receiving system, which circuits are shown in Fig. 2, it is first pointed out that the receiving system comprises tube 2′ which includes the electrodes for the combined first detector—local oscillator network. This tube may be of the 12SA7 type. The I. F. amplifier tube 3′ may be of the 12SF7 type. The tube 4′ may be of the 12SQ7 type, and, as shown, performs simultaneously the functions of demodulation, audio frequency amplification and automatic volume control (AVC) bias production. The power output tube 6′ can be of the 35L6GT type, and the loudspeaker, of course, can be of any well known and desired type.

The tube 9′ is included in the sub-audible tone selector network, and can be of the 12SJ7 type. The rectifier 10, shown in Fig. 1, is provided by the auxiliary diode included in tube 4′. The super-audible oscillator includes the tube 11′ which may be of the 12SA7 type as in the case of tube 2′, and rectifier 12′ may be included in the tube 3′. It is to be clearly understood that these tube types are purely illustrative, since any other types of tubes which can perform the functions of the tubes shown herein can be employed.

There will first be described the well known broadcast receiving circuits of the receiving system. The signal collector 1 may be a grounded antenna circuit, and is shown as including a coupling winding 13. This winding may be coupled to the loop 14 provided in the signal input circuit of the tube 2′. Since the various circuits of the first detector—local oscillator are purely conventional it is believed sufficient to make brief reference thereto. The variable condenser 15 is connected in shunt with the loop 14, and is capable of providing a tunable input circuit which can be adjusted over the entire receiving range. The tank circuit of the local oscillator section of tube 2′ is designated by numeral 16, and variable condenser 16′ adjusts the tank circuit over a range of oscillation frequencies which differs from the signal input range by the frequency of the I. F. output circuit 17.

Those skilled in the art are fully aware of the fact that the primary and secondary circuits 17 and 17′ of the I. F. input transformer 18 are each fixedly tuned to the operating I. F. value. Of course, this value may be chosen from a wide range of frequency values. The I. F. amplifier 3′ has its cathode at ground potential; the cathode of tube 2′ is shown connected to an intermediate tap on the coil of tank circuit 16. The resonant output circuit 19 of I. F. amplifier tube 3′ is fixedly tuned to the operating I. F. value. Circuit 19 is reactively coupled to the resonant input circuit 20 of the demodulator, or second detector, circuit.

The demodulator is provided by a diode whose anode 21 is located adjacent to the common cathode of multiple function tube 4′. The load resistor 22 is connected between the low potential side of circuit 20 and the grounded cathode of tube 4′. The direct current voltage component of the rectified I. F. current developed across resistor 22 is utilized for AVC (automatic volume control) by application to the signal grids of tubes 2′ and 3′. Thus, the anode end of resistor 22 is connected by the AVC lead 23 to the low potential sides of input circuit 14—15 and input circuit 17′. The filter resistor 23′ is included in the AVC lead to suppress all pulsating voltage components in the AVC bias.

In shunt with the resistor **22** are connected the resistor **24** and condenser **25** which provide a path adapted to feed the sub-audible control tone voltage to the adjustable contact of switch **26** when the latter is closed. The resistor **27** is connected from the junction of resistor **24** and condenser **25** to the fixed contact of switch **26**. The switch **26** is shown in the "alert" position. The triode section of tube **4'** comprises the common cathode, a control grid, and a plate **28**. The plate **28** is coupled to the control grid of the power output tube **6'**. The control grid of the audio amplifier section of tube **4'** is connected by audio coupling condenser **29** and lead **30** to the adjustable contact of switch **26**.

The amplifier tube **6'** has its cathode connected to ground through a self-biasing resistor. The signal input grid is connected to ground through a path comprising resistor **31**, resistor **32** and resistor **33**. The junction of resistors **31** and **32** is by-passed to ground by an audio by-pass condenser. The audio coupling condenser **34** transmits the amplified audio frequency voltage output of the audio amplifier section of tube **4'** to the signal input grid of tube **6'**. The resistor **35** is arranged in circuit with plate **28**, and is connected to a point of proper positive potential on the power supply system of the receiver. The remaining electrodes of tube **6'** are energized from the power supply system in the usual manner as shown, and the audio output transformer **40** couples the plate circuit of tube **6'** to the voice coil of loudspeaker **7**.

The alarm feedback path for providing the audio oscillations to produce the alarm tone comprises the condenser **41** connected between the plate of tube **6'** and the adjustable contact of switch **42**. The switch **42** is shown adjusted to feed audio signal voltage from the plate of tube **6'** to the condenser **29** connected to the signal input grid of the audio amplifier section of tube **4'**. Of course, when the switch **42** is adjusted to the free, or "L," contact of the switch then feedback is not had. It will be understood that the positions of switches **26**, **42** and **64**, shown in Fig. 2, are the alert, or "A," positions of these switches. When switch **26** is adjusted to the "L" contact then condenser **29** is connected to the adjustable tap **50** slidable along the load resistor **22**. This means that audio voltage is fed to the audio amplifier from the load resistor, and that program modulation voltage is derived thereacross. In the position of switch **26** shown in Fig. 2 the network **24**—**25**—**27** acts as a filter network to attenuate all modulation frequencies, except the subaudible modulation frequency which can be as low as 24 cycles.

The power rectifier **51**, of the diode type, may be utilized to provide the power supply voltage for the power output tube **6'** and the other tubes of the system as shown in Fig. 2. The lead **52** is shown connected to the cathode of diode **51**, the cathode being connected to ground through a proper electrolytic condenser. The anode of diode **51** is connected to one line of a power supply plug **53** which includes in circuit therewith a control switch **54**. Since it is not desired to have any reproduction from the speaker **7**, while the receiver is in the "alert" condition, unless a control signal is on the received carrier, there is provided the super-audible oscillator tube **11'**. This tube has its plate **10''** connected to a resonant circuit **61** which is tuned to a desired super-audible frequency. The selection of the particular frequency to be used depends upon the wishes of the designer. For example, the circuit **61** may be tuned to a frequency of 20 kc. The third grid, or oscillator grid, is coupled as at **62** to the tuned circuit **61**.

It will be seen that the oscillator is of a well known form. The second and fourth grids of tube **11'** are connected to act as a positive shielding grid, and are connected through a resistor and lead **63** to the "A" contact of switch **64**. The adjustable contact of switch **64** is connected to a point of proper positive potential on the power supply circuit. The "L" contact of switch **64** is free, and, therefore, when switch **64** is in that position the screen grids of tube **11'** are de-energized and the oscillator will not function. Hence, in the "listen" position of switch **64** the super-audible oscillator will not be functioning. The super-audible oscillations produced are utilized to provide a muting, or cut-off, bias for the signal grid of tube **6'**. This is provided by connecting the anode of diode **12'** to the ungrounded end of resistor **33**. That same end of resistor **33** is connected by coupling condenser **65** to the plate **10''**. In other words, the resistor **33** acts as a load resistor for the diode circuit which includes the electrodes of diode **12'**. The rectified voltage developed across resistor **33** is impressed upon the signal grid of tube **6'**, and biases the power output tube sufficiently to be ineffective to transmit any audio voltage to the reproducer.

As pointed out in Fig. 1, the oscillator **11** is under the control of the sub-audible modulation tone on the received carrier. Referring again to Fig. 2, it will be noted that the first grid, adjacent the grounded cathode, of tube **11'** is connected through a path comprising resistor **70**, lead **71** and lead **72** to the second auxiliary anode of tube **4'**. This auxiliary anode is designated by the numeral **10'** to indicate that it is the anode of the diode which provides the rectifier **10** schematically shown in Fig. 1. The diode **10'** rectifies the sub-audible modulation tone which is transmitted through the selector network. The rectifier **10'** develops a bias voltage for biasing tube **11'** to cut-off thereby eliminating the source of the muting bias for tube **6'**.

Considering the circuit of the sub-audible tone selector, it is pointed out that the selector consists of a network constructed in a manner disclosed generally in the aforesaid Koch application. The cathode of tube **9'** is connected to ground through an unby-passed resistor **80**. The control grid **81** is connected by lead **82** to the condenser **34** through a path including coupling condenser **83**, resistor **84** and lead **85**. The plate **86** of tube **9'** is connected to a point of proper positive potential of the power supply network through resistor **87**. The screen grid of tube **9'** is similarly connected, through a properly by-passed reducing resistor, to the plate energizing circuit. It will be understood that lead **85** acts as the input lead which feeds the control tone voltage from the audio system to the tone selector circuit. The path **86**—**82** acts as a regenerative feedback path for the sub-audible modulation voltage. The modulation voltage developed across resistor **80** is applied in degenerative phase to grid **81**. This is accomplished by connecting the grid return resistor **88** from the grid side of condenser **83** to ground. The selector circuit is tuned, or resonated, to the desired sub-audible tone of 24 cycles by the R—C network arranged in the plate circuit of tube **9'**. This network comprises a plurality of series connected condensers and a plurality of shunt resistors.

It is believed sufficient for the purposes of this application to point out that the R—C network of the selector circuit provides a simple method of securing selectivity at the sub-audible modulation frequency. It is desired to have the "alert" circuits function when the percentage of control tone modulation of a received carrier wave is 5% or greater. In the present case the selector circuit uses only R—C elements with positive and negative feed-back to procure stable selectivity. In order to secure frequency selective positive feedback a phase shift of 180 degrees is necessary at the desired frequency, and as much difference from this value as can be readily secured at all other frequencies. Networks having zero degrees phase shift at the desired frequency can be used, but a second amplifier tube must be employed to secure the 180 degrees phase shaft. From a cost and stability standpoint a single tube is preferable, and, therefore, a network furnishing 180 degrees phase shift was used.

While three-section networks can be made to give 180 degrees phase shift, four sections will give it with less attenuation, and, therefore, greater positive feedback. This, in turn, permits greater stabilizing negative feedback, and, therefore, more stable operation. More sections would give 180 degrees phase shift at more than one frequency. The series C-shunt R type was adopted, because it fitted in with voltage supply to tube 9'. It, also, provided ground potential for direct current at points in the circuit to which input and output could be coupled. A resistor can be inserted in series with grid 81 to suppress any overload or response to high frequencies.

The tuning of the R—C circuit can be easily adjusted by changing or shunting one or more of the resistors, and the Q brought to the desired value by adjusting the magnitude of resistor 80. The effective Q of the selector circuit at the sub-audible modulation frequency of 24 cycles is approximately 10. The output terminal of the tone selector circuit is the junction of the first two series condensers adjacent plate 86, and the junction is connected by lead 100 to lead 72. In other words, the selector circuit output is fed to the rectifier 10', and the rectified voltage developed is employed, through lead 71, to bias the first grid of tube 11' to cut-off.

Summing up, then, the various characteristics and functions of the receiving system disclosed herein, it will be first noted that only a single sub-audible control tone is employed. The use of only a single control tone reduces the selectivity necessary in the tone selecting circuit, and, hence, a single tuned circuit of relatively poor Q is found to be sufficient. The receiver is designed to provide an alarm signal consisting of a loud, interrupted audible tone. This tone is produced whenever the sub-audible modulation is applied to the received carrier, and continues until the user throws the simultaneously controlled switches 26, 42 and 64 into the "listen" position.

The muting of the reproduction occurs when the switches 26, 42 and 64 are set in the "alert" position and no control tone is being received. This causes the super-audible oscillator to be effective, and biases off power output tube 6'. When the sub-audible modulation tone is present on the carrier the former is selected by the tone selector; the selected voltage being rectified so as to bias the oscillator 11' to cut-off thereby permitting output tube 6' to function. Of course, the feedback path and the audio circuit are also functioning. Therefore, there will be emitted from the loudspeaker a loud audible tone. Upon the oscillator 11' being rendered ineffective, due to the rectified modulation developed across resistor 88', the bias of tube 6' will be normal, because no rectified voltage will be developed across resistor 33.

It will be understood that when the switches are all adjusted for "alert" the alarm tone emitted from the reproducer, in response to existence of the sub-audible modulation tone on the carrier, is intermittent due to the blocking action of the first audio grid circuit. In order to hear instructions during the "alert" or alarm period, the listener will throw switches 26, 42 and 64 into the "L" position. The alarm signal will cease, and the operation of the receiver is then normal. Upon conclusion of the instructions the switches may then be returned to the "alert" position, and the receiver will be muted until the broadcasting station again transmits the sub-audible modulation tone. The energizing connections from the power supply rectifier to the various electrodes of the system are denoted by numeral 200. The cathode heater elements will, of course, be continuously energized.

The receiving system shown herein sounds an alarm tone, permits instant reception, has low first cost, low stand-by and operating power consumption. Moreover, it is reliable and of light weight, and is little affected by temperature variations and can be manufactured in quantities without alteration of existing facilities. Of course, if several services are required, each using its respective sub-audible tone, vibrating reeds, or cascaded electrical circuits, are necessary. It will be understood that in place of the R—C network shown in the tone selector circuit, mechanical resonators of any desired or well known type capable of producing an output voltage for biasing off the super-audible oscillator, may be employed. For example, there may be used mechanical resonators driven by Rochelle salt crystals. In some cases a second crystal can be used to secure electrical output from the resonator instead of contacts. With such arrangements it is easy to secure selectivity corresponding to coupled circuits. Lumped constants for the mechanical resonators will be necessary to prevent response to harmonics of the fundamental frequency.

While I have indicated and described a system for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organization shown and described, but that many modifications may be made without departing from the scope of my invention, as set forth in the appended claims.

What I claim is:

1. In a radio receiving system including a source of sustained audio frequency oscillations, means for producing super-audible oscillations, means for rendering said source of audio frequency oscillations inoperative in response to said super-audible oscillations being produced, and means, responsive to reception of a predetermined signal, for rendering said super-audible oscillation producing means ineffective.

2. A radio receiving system including, in combination, an audio network constructed to act as a source of sustained audio frequency oscillations, means for producing super-audible oscillations, means for rendering said source of audio

frequency oscillations inoperative in response to said super-audible oscillations, and a selective means, resonant to the predetermined frequency of a received signal, for rendering said super-audible oscillation means ineffective.

3. A radio receiving system including, in combination, means for producing sustained audio frequency oscillations, a source of super-audible oscillations, means, including said super-audible source, for preventing the production of said audio frequency oscillations, and signal-responsive means for rendering said super-audible oscillation source inoperative.

4. A radio receiving system including, in combination, means for producing audio oscillations, a source of super-audible oscillations, means, including said super-audible source, for preventing the production of said audio oscillations, and additional means, responsive to a received signal, for rendering said super-audible source inoperative thereby operating said audio oscillation means to produce an alarm.

5. In a radio warning receiving system including an audio frequency amplifier, provided with a regenerative feedback circuit to produce warning-representative oscillations, means including a super-audible oscillator for supplying cut-off biasing potential to said audio frequency amplifier, and signal-responsive means for rendering inoperative said super-audible oscillator whereby said warning-representative oscillations are produced by said audio amplifier.

6. In a radio receiving system including, in combination, means responsive to a sub-audible control tone modulation on a received carrier wave for producing a control potential, a source of audio frequency oscillations, and means, including a source of super-audible oscillations and a rectifier, for utilizing the control potential derived from said first named means to control said source of audio frequency oscillations.

7. In a radio receiving system including, in combination, a source of audio frequency oscillations and a loudspeaker responsive thereto for producing an alarm signal, means normally preventing operation of said source, means responsive to a sub-audible control tone modulation on a received carrier wave for deriving a control potential, and means for utilizing said control potential to render said first means ineffective thereby to cause said source of audio frequency oscillations and loudspeaker to produce an alarm signal whenever the received carrier wave is modulated with said sub-audible control tone.

8. In a radio receiving system, an audio frequency amplifier and loudspeaker for reproducing an alarm signal, means, including said audio frequency amplifier, for producing audio frequency oscillations for providing said alarm signal, means responsive to a sub-audible control tone modulation on a received carrier wave for deriving a control potential, means for utilizing said control potential to cause said means for producing audio frequency oscillations to produce an alarm signal whenever the received carrier wave is modulated with said sub-audible control tone, and additional means constructed and arranged to render said source of audio frequency oscillations inoperative but permit said audio frequency amplifier and loudspeaker to reproduce the audio frequency modulation on the received carrier wave.

9. In combination with a source of carrier wave energy whose modulation includes a control tone, means for deriving control tone voltage from a received modulated carrier wave, means for providing audio frequency oscillations, means for reproducing such oscillations, means for preventing production of said audio frequency oscillations in the absence of said modulation control tone on the received carrier wave, and additional means, responsive to the presence of said modulation control tone on the said carrier wave, for rendering said last named means ineffective.

10. A method of radio reception which includes collecting a carrier wave modulated with a sub-audible tone, deriving from the collected wave modulation voltage of said tone, producing oscillations of an audio frequency, reproducing the oscillations to produce an alarm, preventing the production of said audible oscillations in the absence of said tone on the collected wave, and automatically rendering said oscillation production effective in response to the derivation of said modulation tone voltage.

11. A method of producing an audible alarm upon the reception of a carrier wave having modulation which includes a control frequency, comprising deriving from the received modulated carrier wave voltage of said control frequency, producing audio oscillations to provide an audible alarm, rendering said oscillation production ineffective in the absence of said modulation control frequency on the received wave, and automatically rendering said oscillation production effective with said control frequency voltage.

12. In a radio warning system of the type employing at least a carrier amplifier, means to apply to the amplifier a carrier wave modulated with a warning signal, a demodulator to derive warning signal voltage, an audio amplifier, a regenerative feedback circuit electrically associated with the audio amplifier to produce oscillations in the audible range, means for reproducing the oscillations, a device for normally preventing production of the oscillations and means, responsive to said warning signal voltage, for rendering said device ineffective thereby to permit said audio frequency oscillations to be produced.

13. In a radio warning system of the type employing at least a carrier amplifier, means to apply to the amplifier a carrier wave modulated with a warning signal, a demodulator to produce warning signal voltage, an audio amplifier, a regenerative feedback circuit electrically associated with the warning voltage amplifier to produce oscillations in the audible range, means to provide super-audible oscillations, means for deriving from the super-audible oscillations a first control voltage, means for rendering said audio amplifier ineffective in response to said first control voltage, and means responsive to said warning signal voltage for rendering said super-audible oscillation means ineffective.

14. In combination, an amplifier of modulation voltage, means preceding said amplifier for demodulating a modulated carrier wave which includes as a modulation component a sub-audible frequency, a source of super-audible oscillations, means for deriving a control biasing voltage from said oscillations, means for applying said biasing voltage to said amplifier to render it ineffective in the absence of said modulation component, and means selectively responsive to said sub-audible frequency for rendering said source ineffective in response to said modulation component being included in the modulation of said carrier wave.

15. In a radio receiver of the type comprising

a carrier wave transmission network, a demodulator and a modulation amplifier network, a regenerative feedback circuit electrically associated with said modulation network to provide oscillations in the audible range, means for reproducing the oscillations, an oscillator to produce oscillations which are super-audible, means for rectifying the latter oscillations, means to apply the rectified oscillation voltage to said modulation network to render it ineffective, a selector circuit responsive to the existence of a modulation control frequency in the modulation of said carrier waves, means responsive to the output of said selector circuit for rendering said super-audible oscillator ineffective, and additional means for selectively and concurrently rendering said feedback circuit and super-audible oscillator inoperative.

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