

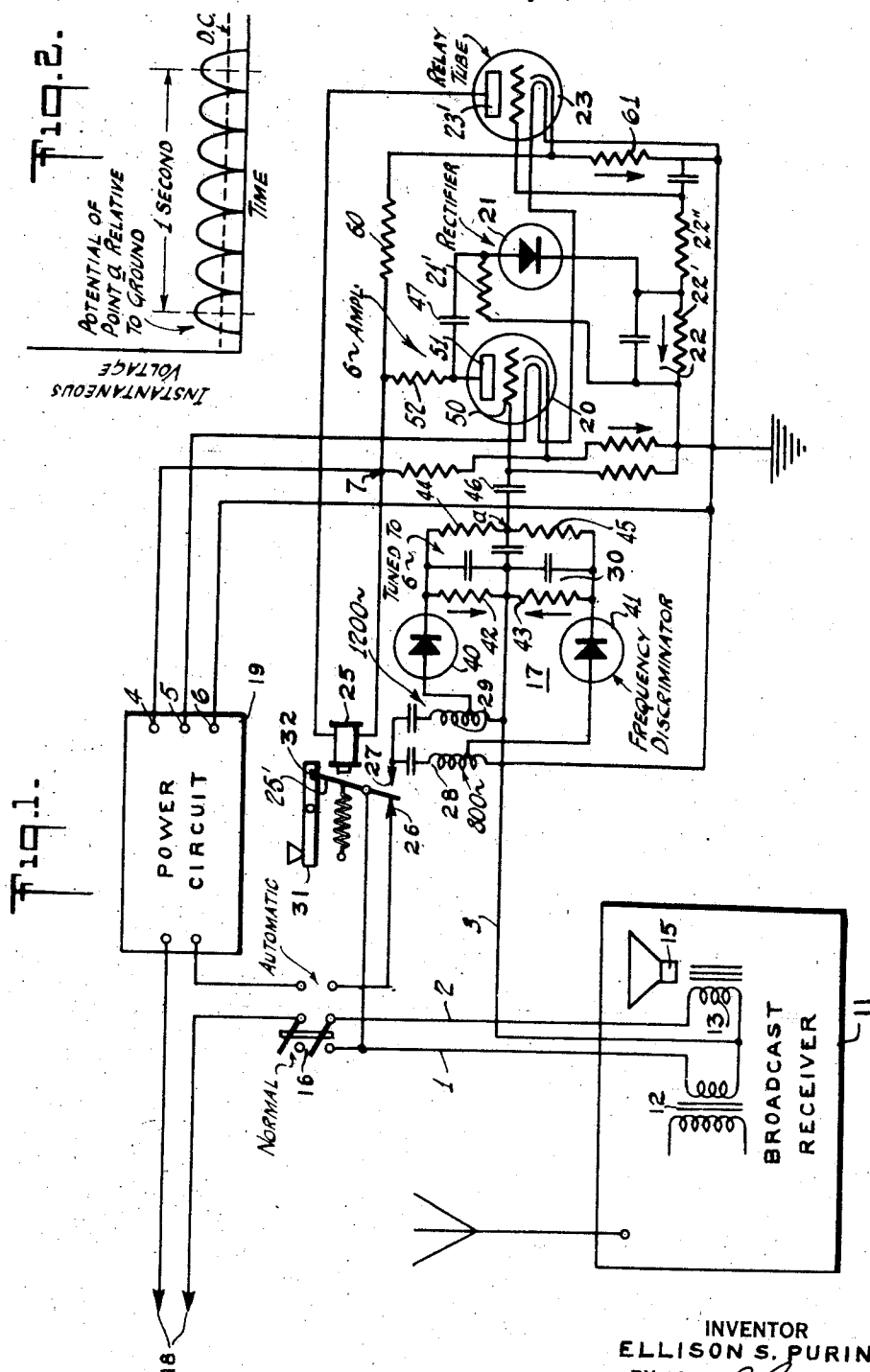
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RADIO ALARM SYSTEM

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RADIO ALARM SYSTEM

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My present invention relates to alarm systems, and more particularly to a radio alarm which produces a distinctive sound when the alarm is broadcast.

For radio alarm purposes, it seems well to utilize a definite sound such as that of an undulating siren. A distinctive sound asserts more authority than the spoken word. The policeman's whistle or the siren of a fire truck, are familiar examples. The sound of an undulating siren can readily be produced by periodically varying a musical tone between two terminal pitch limits at a definite rate of speed. By way of example, a satisfactory siren tone could be produced by frequency modulating an audio tone at a three cycle rate. It will be recognized that in a broadcast studio such a siren tone could readily be produced by any desired means.

A complete radio alarm system should consist of at least three essential possibilities: First, a distinctive tone should indicate that an alarm exists, and automatically turn on loudspeakers; secondly, spoken information should be available as to the city, county or section to which the alarm applies; and thirdly, the distinctive alarm signal should again be available so that it can be repeated over local loudspeaking systems in accordance with the decision of the attendant.

It may be stated, therefore, that it is one of the main objects of my present invention to provide a radio alarm system wherein there is employed means for receiving the alarm signal at a standard broadcast receiver, whether the latter is in use or in a stand-by state; reception of the alarm signal automatically turning on the loudspeaker if the speaker is in a stand-by state.

Another object of my invention is to provide means for maintaining the loudspeaker in operative condition after the cessation of the alarm signal so as to receive any verbal instruction that may be given after the alarm has been sounded.

The present invention, also, consists in certain new and original features of construction, and combination of parts, hereinafter set forth and claimed. Although the novel features which are believed to be characteristic of my invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization, may be better understood by referring to the following description taken in connection with the accompanying drawing forming a part thereof.

In the drawing:

Fig. 1 illustrates diagrammatically a receiver system constructed in accordance with the invention,

Fig. 2 graphically shows the potential at point *a*.

In the following description, and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit. Referring to the accompanying drawing, a receiver is shown for receiving the alarm broadcast. In this instance it is assumed to be a musical tone which is periodically varied between two terminal pitch limits at a definite rate of speed; that is, the audio tone is frequency modulated. This tone can be produced at the broadcast transmitter studio by the use of a beat oscillator, one of the control knobs of which can be turned back and forth either manually or automatically. Anyone skilled in the art could readily provide such a tone. By way of specific example, let it be assumed that the siren tone is produced by varying a tone between 800 and 1200 cycles at the rate of 3 cycles. A satisfactory signal could be produced by causing the frequency of an audio oscillator to change abruptly between the fixed limits, so that a part of the time it generates one frequency, and a part of the time another frequency, each frequency being generated three times a second. This could be accomplished by a motor driven commutator which changes the capacity of a condenser in the oscillatory circuit of the audio oscillator.

The receiver is shown as consisting of a standard broadcast receiver 11 which includes an output transformer 12, and the voice coil 13 of the loudspeaker 15. Three leads are brought out from the secondary of the transformer 12 and the voice coil 13. Two of these leads 1 and 2 are connected to a double-throw, double-pole switch 16, and the third lead 3 is connected to a frequency discriminator 17. The switch 16 has a pair of "normal" contacts, to one of which is connected lead 1. Lead 2 is connected to one of the switch arm terminals. The remaining terminal is connected to an input lead of the power source 18. The "automatic" contacts of switch 16 are connected to the power circuit 19 and contact 25 respectively. The source 18 can be an alternating current source, and in that case the power circuit 19 would include the usual rectifier, transformer and filter for energizing the triodes following the discriminator 17. If the source 18 is direct cur-

rent, then the power circuit 19 would contain only resistors and condensers. The receiver 11 has its own power supply source. The output terminals of the power supply network 19 are designated 4, 5 and 6. Terminal 4 is the high voltage supply point, and is connected to the common supply point 7. Terminal 5 is connected to the heater, or filament, elements of the triodes, and returns to ground to which terminal 6 is connected.

The frequency discriminator 17 is connected to the input grid circuit of an amplifier triode 20, the output anode circuit of which includes a rectifier 21 and a timing circuit 22 which is connected to the grid of a relay tube 23. The plate circuit of the relay tube 23 includes the winding of a direct current relay 25, the armature 25' of which cooperates with two opposed contacts 26 and 27. The contact 26 is connected to one of the "automatic" contact points of the switch 16, and the contact 27 is connected to the high potential sides of the two series-tuned circuits 28 and 29 of the frequency discriminator 17. The circuits 28 and 29 are tuned to 800 and 1200 cycles respectively. The remaining resistor-condenser circuit 30 of the frequency discriminator 17 is "tuned" to 6 cycles. A pivoted key 31, located adjacent to the armature 25' of the relay 25, is provided with a notch 32 which engages the spring-biased relay armature 25' when the relay is energized, and holds it in this position until the key 31 is depressed manually. It will be understood that key 31 also will be provided, in any known manner, with a spring, or gravity control, so that the switch is operative.

The discriminator 17 comprises rectifiers 40 and 41. These rectifiers may be of the diode type if desired. The diode 40 has its input lead to its anode connected to an intermediate tap point on the coil of tuned circuit 29. Diode 41 has its input anode lead connected to an intermediate point on the coil of tuned circuit 28. The low potential ends of circuits 28 and 29 are connected back to ground. The network 30 comprises series-arranged resistors 42 and 43 and the junction of the resistors is returned to ground. Each of resistors 42 and 43 is shunted by its respective condenser. A second pair of series-arranged resistors 44 and 45 are connected in shunt with resistors 42-43. The junction point *a* is connected to the junction of resistors 42 and 43 by a third condenser.

The network between rectifiers 40-41 and rectifier 21 is "tuned" to six cycles. What is meant by the expression "tuned" is that the bypass condensers of the discriminator network are not too great so that the voltage from point *a* to ground does not have the 6 cycle ripple. Condensers 46 and 47 are chosen to prevent response at frequencies below 6 cycles. The control grid 50 of tube 20 is connected to condenser 46, the grid being returned to ground by a grid return resistor. The cathode of tube 20 is connected to ground through a resistor, while it is connected to the point 7 through an additional resistor. The plate 51 of tube 20 is connected through resistor 52 to the voltage supply point 7. The condenser 47 couples the anode of rectifier 21 to the plate end of resistor 52. The cathode of rectifier 21 is connected to the junction of resistors 22' and 22''. The anode of diode 21 is connected by resistor 21' to the grounded end of resistor 22'' of the timing circuit 22.

Rectifier 21 is energized best when the rate of frequency modulation of the transmitter tone is

about three cycles; it is not energized effectively when the rate is about 1 cycle or 10 cycles. It is pointed out that while tuning with resistor-capacitor elements, as in network 30, is not necessarily as sharp as could be accomplished with inductor-capacitor elements, yet in the present case there is secured some considerable degree of selection as to the rate of frequency modulation of the received signal.

It is also pointed out that there are three complete excursions of the tone between the limits of 1200 and 800 cycles in one second. Hence, 1200 cycle pulses occur 3 times a second, and 800 cycle pulses occur 3 times a second. This makes six impulses in the output circuits of the two rectifiers 40 and 41. It is preferred to connect these rectifiers for six cycle operation instead of three cycles for economy of the condensers required in subsequent circuits. Since the frequency modulation reception is not for voice, this frequency doubling arrangement does no harm.

The rectifiers 40 and 41 are connected to intermediate taps on series-tuned circuits 28 and 29 for impedance matching purposes. These series circuits are chosen to match the six ohm output impedance of the usual receiver. The full voltage across the inductance is several times the voltage across the condenser and coil of each tuned circuit. The exact point of tapping would be chosen when the exact lay-out is made, and could be at the upper end of each coil of the tuned circuits. A proper balance between selectivity and sensitivity must be established.

The plate 23' of the relay tube is connected back to ground through the coil of direct current relay 25 and the series resistor 60 and resistor 61. The resistor 21' is necessary to complete a direct current path for the direct current portion of the pulsating current through rectifier 21. This resistor 21' cannot be zero, because in such a case the impulses from the plate 51 would pass to ground directly, instead of principally through the rectifier. The relay 25 being a direct current relay, the six cycle output of amplifier 20 must be converted into direct current.

In Fig. 2 I have shown in a graphic manner the pulsating appearance of the potential at point *a* with respect to ground. The rectifier 21 functions to convert this pulsating potential into a smooth direct current voltage. The pulsating voltage at point *a* could be applied to the grid of tube 23, but in that case there would be no six cycle selectivity. The two-tube circuit shown works out most economically, and is free from spurious operation; particularly is this true with the output of rectifier 21 given a long time constant. The arrows adjacent various resistors in the network indicate the direction of flow of current through the respective resistors.

In the operation of the system, when it is desired to use the receiver 11 to receive broadcast programs, the switch 16 is adjusted to close the circuit through the "normal" contacts. This connects the secondary of transformer 12 to the voice coil 13 so that the normal program is reproduced by loudspeaker 15 in the usual manner. Under these conditions no current from source 18 is supplied to the power circuit 19, and the alarm circuit is entirely inoperative.

When it is desired to put the alarm circuit into operative condition the switch 16 is thrown to the left, or normal position, and the receiver 11 is tuned to the authorized alarm broadcasting station in the usual manner and is brought up to suitable volume. The switch 16 is then thrown

to the right; this connects the voice coil 13 to the contact 26. As the relay 25 is de-energized its armature 25' will be pulled to the left, and the contact 26 will be open. This is the "automatic" position.

The receiving set 11 will be quiet under these conditions, and any programs that may be broadcast by the authorized station will not be reproduced by the loudspeaker 15. When the distinctive standard alarm is broadcast by this station the audio signal passes through the tuned circuits 28 and 29. The lower frequencies near 800 cycles pass through the former, and the higher frequencies near 1200 cycles pass through the latter. The pulsating current produced by the lower frequency currents will then pass through the lower portion of the circuit 30 in the direction of the arrow.

As the audio currents are modulated at 3 cycles, the output of the frequency discriminator 17 will be at 6 cycles. Current of the latter frequency will be impressed upon the grid of the amplifier 20. The amplified current from the amplifier 20 will be rectified by the rectifier 21, and will pass through the timing circuit 22 in the direction of the arrow. The rectified current passing through this circuit will produce, after a predetermined interval of time of, for example, 5 seconds, sufficient positive potential on the grid of the relay tube 23 to cause it to energize the relay 25.

This will move the armature 25' of the relay 25 to the right so that the upper end will engage the notch 32 of the key 31, and the lower end will open the contact 27 and close the contact 26, as shown in the figure. This will connect the secondary of the transformer 12 to the voice coil 13, and will make the loudspeaker 15 operative to produce the alarm signal. After the alarm signal has ceased, the armature of the deenergized relay 25 will still be held against the contact 26 by the key 31 so that any verbal instructions that may be broadcast by the authorized station will be heard by the persons hearing the alarm. The system may be reset by depressing the key 31.

Although only one of the various forms in which this invention may be embodied has been shown herein, it is to be understood that the invention is not limited to any specific construction, but might be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. A method of producing an audible alarm which includes varying an audible tone between a pair of limiting frequencies at a low frequency, transmitting the variable tone energy to a reproducer, normally preventing reproduction of the energy, deriving from the energy a direct current voltage in response to the presence of said low frequency, and utilizing the direct current voltage to render the reproduction of said audible tone effective.

2. A method of producing a radio alarm which includes modulating a carrier with an audible tone, radiating the modulated carrier energy, providing the audible tone at a receiver after demodulation of the radiated energy at the latter, normally preventing reproduction of the audible tone at the receiver, varying the audible tone prior to radiation at a low frequency rate to simulate a siren effect, and permitting reproduction of the variable audible tone at the receiver in response to said tone variation.

3. A method of producing a radio alarm which

includes varying an audible tone between a pair of frequencies at a desired frequency, transmitting the variable tone energy for reproduction, normally preventing reproduction of the energy, deriving from the energy a voltage in response to the presence of said desired frequency, and utilizing the derived voltage to render reproduction of said audible tone effective.

4. In combination with reproducer circuit of a radio receiver of the type adapted to receive radio frequency carrier energy modulated by an audio tone whose frequency is varied between a pair of limits at a subaudible frequency, said receiver being adapted to feed to the reproducer circuit said frequency-variable audio tone for reproduction, a frequency discriminator network coupled to said reproducer circuit and adapted to derive energy of said subaudible frequency from the frequency-variable audio tone, rectifier means, responsive to said subaudible frequency energy, for deriving a control voltage therefrom, and means, responsive to said control voltage, for automatically impairing the transmission of said audio tone to said discriminator network.

5. In combination with reproducer circuit of a radio receiver of the type adapted to receive radio frequency carrier energy modulated by an audio tone whose frequency is varied between a pair of limits at a subaudible frequency, said receiver being adapted to feed to the reproducer circuit said frequency-variable audio tone for reproduction, a frequency discriminator network coupled to said reproducer circuit and adapted to derive energy of said subaudible frequency from the frequency-variable audio tone, rectifier means, responsive to said subaudible frequency energy, for deriving a control voltage therefrom, and means, responsive to said control voltage, for automatically impairing the transmission of said audio tone to said discriminator network, said automatic means concurrently rendering said reproducer circuit operative to reproduce said audio tone.

6. In combination with reproducer circuit of a radio receiver of the type adapted to receive radio frequency carrier energy modulated by an audio tone whose frequency is varied between a pair of limits at a subaudible frequency, said receiver being adapted to feed to the reproducer circuit said frequency-variable audio tone for reproduction, a frequency discriminator network coupled to said reproducer circuit and adapted to derive energy of said subaudible frequency from the frequency-variable audio tone, rectifier means, responsive to said subaudible frequency energy, for deriving a control voltage therefrom, and means, responsive to said control voltage, for automatically impairing the transmission of said audio tone to said discriminator network, and a frequency-selective network coupling the discriminator network output to said rectifier means, said selective network being tuned to said subaudible frequency.

7. In combination with reproducer circuit of a radio receiver of the type adapted to receive radio frequency carrier energy modulated by an audio tone whose frequency is varied between a pair of limits at a subaudible frequency, said receiver being adapted to feed to the reproducer circuit said frequency-variable audio tone for reproduction, a frequency discriminator network coupled to said reproducer circuit and adapted to derive energy of said subaudible frequency from the frequency-variable audio tone, rectifier means, responsive to said subaudible frequency energy, for deriving a control voltage therefrom, and means, responsive to said control voltage, for automatically impair-

ing the transmission of said audio tone to said discriminator network, said automatic means concurrently rendering said reproducer circuit operative to reproduce said audio tone, and an auxiliary means for selectively maintaining said automatic means in said tone transmission-impairing condition.

8. In combination with reproducer circuit of a radio receiver of the type adapted to receive radio frequency carrier energy modulated by an audio tone whose frequency is varied between a pair of limits at a subaudible frequency, said receiver being adapted to feed to the reproducer circuit said frequency-variable audio tone for reproduction, a frequency discriminator network coupled to said reproducer circuit and adapted to derive energy of said subaudible frequency from the frequency-variable audio tone, rectifier means, responsive to said subaudible frequency energy, for deriving a control voltage therefrom, and means, responsive to said control voltage, for automatically impairing the transmission of said audio tone to said discriminator network, said discriminator network being constructed and arranged to double the frequency of said subaudible frequency energy, and a resistor-condenser network, selective for said doubled frequency, coupling the discriminator output and said rectifier means.

9. In combination, a sound reproducer capable of reproducing audible tones of constant or variable frequency within a given range, means normally preventing the reproduction by the reproducer of tones in said frequency range, means responsive to the reception of an audible tone whose frequency is varied within said range at a predetermined low rate of variation for rendering the reproducer effective to reproduce any tone within said range.

10. In combination, means for generating an audible tone whose frequency is varied at a low rate, a sound reproducer, means for preventing reproduction by said reproducer of said audible tone in the absence of said low rate variation, and means responsive to said low rate variation for permitting said reproducer to reproduce said audible tone.

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