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P. C. GOLDMARK ETAL

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RADIO WARNING SYSTEM

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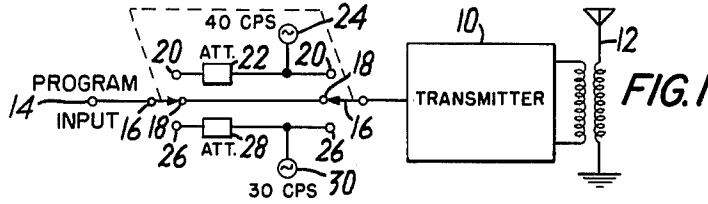


FIG. 1

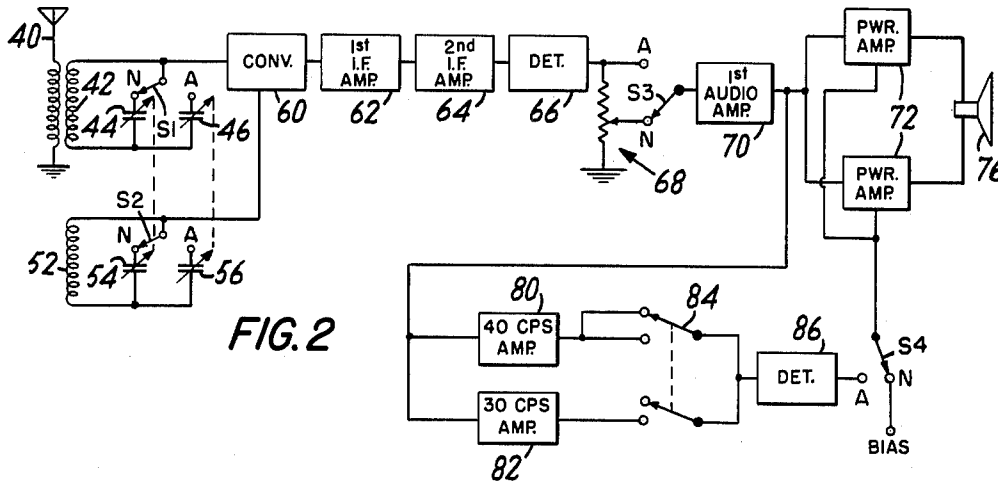


FIG. 2

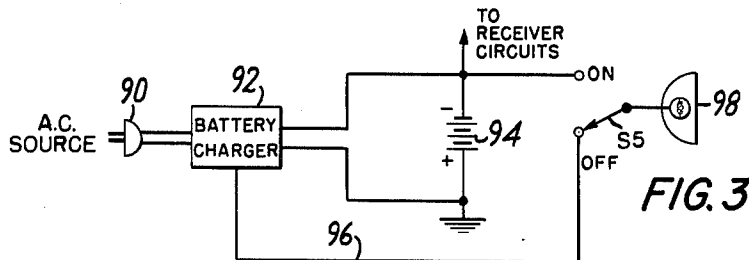


FIG. 3

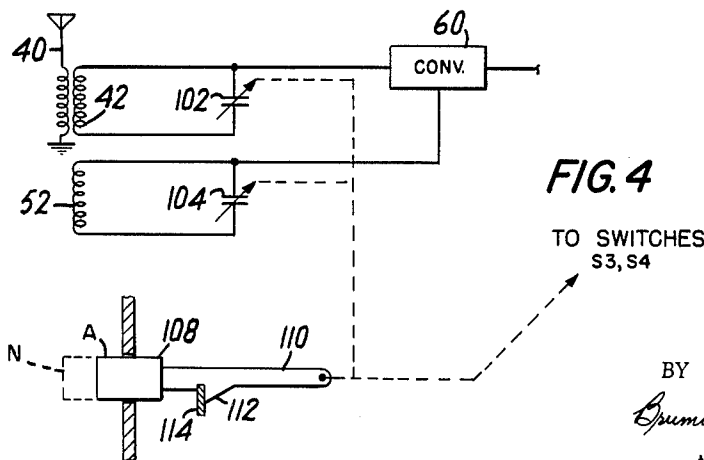


FIG. 4

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RADIO WARNING SYSTEM

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5 Claims. (Cl. 325—364)

This invention relates to alarm systems, and more particularly to a warning system utilizing radio broadcast transmission and reception facilities for advising the public of emergency conditions.

Radio broadcasting facilities enable information to be rapidly communicated to large segments of the population at a moment's notice. In times of emergency, radio broadcasts have proved to be invaluable aids in minimizing the loss of life and property. Civilian defense authorities, charged with the protection of the public in the event of attack from without, have recognized this ability and have set aside specific broadcast channels, known as the Conelrad frequencies, for dissemination of information and instructions in time of emergency. These frequencies are within the normal reception band of home radio receivers and the listener is required to tune his receiver to the proper frequency to receive the broadcasts. Moreover, he must depend upon other warning devices, such as sirens, etc. to apprise him of the existence of an emergency and the need to tune his receiver to the emergency frequency.

Stand-by receiver arrangements have been proposed in the past to enable radio warnings to be received automatically, without requiring the user to tune in to a specified frequency. Most of these, however, take the form of completely separate receiver units intended only for the reception of warning information. The user is thus required to purchase what amounts to a complete radio receiver that has no utility except in time of emergency. Furthermore, known stand-by receivers often require large amounts of power to maintain them in the stand-by condition and also, often require a conscious act of the user to place it in stand-by operation. All of these factors contribute towards making these devices expensive in both initial cost and maintenance, and of lesser effectiveness as warning devices.

Accordingly, it is the primary object of the present invention to provide an improved radio warning system which avoids the foregoing disadvantages of the prior art system.

A further object of the present invention is to provide a radio warning system including a radio receiver which may also be used for standard broadcast reception and which, when not receiving standard broadcasts, is automatically placed in the stand-by condition.

Still another object of the present invention is to provide a radio warning system utilizing low frequency tones for controlling the operation of the stand-by receiver.

An additional object of the present invention is to provide a radio warning system having a receiver which may be operated either from an A.C. source or a self-contained battery, and which requires a minimum amount of power when in the stand-by condition.

Briefly, the system of the present invention includes apparatus at the radio transmitter for modulating a low or subaudible frequency signal on the transmitted carrier wave, together with emergency information and instructions, when necessary. The carrier frequency may be that normally assigned to the broadcasting station or, a special frequency assigned only for emergency purposes.

The receiver of the system is a standard superheterodyne receiver, transistorized for low power drain, and modified to be receptive to emergency signals when not receiving normal broadcasts. The latter modification is effected by providing an auxiliary tuning control, a volume control bypass, and a muting and unmuting circuit for the output audio amplifier, all actuated simultaneously upon operation of the normal ON-OFF switch of the receiver to its OFF position. Thus, with the control switch in what corresponds to the ON position, the receiver may be tuned to any desired broadcast frequency and normal radio signals are received and reproduced at the loudspeaker. It is assumed, that in times of emergency, information will be broadcast on all broadcast frequencies, as well as any special emergency frequencies, and the listener will thus be kept informed during normal listening.

When the listener no longer cares to hear the normal broadcast, he turns the switch to what corresponds to the OFF position, in the usual manner. However, instead of turning off the power supply to the receiver, the throwing of the switch (1) tunes the receiver to a predetermined frequency, (2) bypasses the volume control associated with the detector in the receiver, and (3) disconnects the bias circuit of the output audio amplifier from the normal bias to the output of a special tone responsive network coupled to the output of the receiver detector. The latter mutes the output amplifier except when the low frequency tone is received.

In the absence of an emergency broadcast and with the receiver in the stand-by condition as described above, no sound at all is detectable at the loudspeaker, although all circuits are ready to receive signals at the predetermined frequency. Preferably, the receiver circuits are transistorized, in well known fashion, to minimize the power drained in this condition. Upon transmission of an emergency message, along with which is sent the low frequency tone, a selective amplifier and detector separates the low frequency tone and derives a voltage therefrom which is applied to the output amplifier to render it operative. The emergency information signals may now be amplified and rendered audible. As long as the tone is transmitted along with the information, an audible output will be available from the loudspeaker. As soon as the emergency broadcast ceases, the tone is removed and the circuit automatically returns to its stand-by condition without any additional manual operation. When it is desired to again listen to a standard broadcast, the control switch is simply tuned to what corresponds to the conventional ON position.

According to the invention, two different types of emergency information signals may be transmitted: one in which only emergency warnings are sent and another in which both warning and more general information such as news releases etc. are transmitted. To accommodate both selectively at the receiver, each type of broadcast is accompanied by its individual low frequency tones. The receiver is provided with a separate switch which renders the tone detecting circuitry responsive to just the one tone corresponding to the emergency warning information, or either of the tones which will enable the receiver to reproduce whatever type of emergency information is being broadcast.

The foregoing and other objects, features and advantages of the present invention will become more apparent from the following detailed description thereof when taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a block diagram of the transmitter usable with the present invention;

FIGURE 2 is a block diagram of the receiver of the present invention;

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FIGURE 3 is a schematic diagram of a suitable type of power supply for the receiver of FIGURE 2; and FIGURE 4 is a modification of the receiver circuit of FIGURE 2 utilizing push button tuning controls.

Referring now to FIGURE 1 of the drawings, a radio transmitter 10, of conventional form radiates a carrier wave modulated with audio signals in known manner, by means of any suitable antenna 12. The transmitter 10 may be the equipment used by existing commercial radio stations for normal broadcast programs or, in the alternative, may be special equipment operative only in emergency situations. In either case, the carrier wave transmitted will be of a predetermined frequency assigned in accordance with governmental regulations.

Program input signals, which in the case of a commercial broadcasting station may consist of music, drama, public events, etc., are applied to the input terminal 14 and through the contacts 16 of a double pole switch to modulate the carrier wave in known manner for broadcasting purposes. Under normal broadcasting conditions, the program material will produce 100% modulation of the carrier wave, in accordance with conventional operation.

When it is desired to broadcast signals warning of an emergency condition, the contacts 16 of the double pole switch are thrown to their upper position in contact with the terminals 20. Between the terminals 20 are connected an attenuator 22 and a source of low frequency tone, for example, a frequency of 40 cycles per second. The attenuator 22 and the tone source 24 are so regulated that the program input signal will provide 80% modulation of the transmitted carrier and the tone signal 20%. The transmitted signal will thus consist of a carrier modulated both by the low frequency tone and emergency information.

An alternate tone source 30, of a frequency different than that of source 24, e.g., 30 cycles per second, may be connected in series with an attenuator 28 between a third set of terminals 26. With the contacts 16 on the terminals 26, an alternate type of emergency program information may be applied to the transmitter. As in the previous case, the program information may supply 80% modulation with the remaining 20% being provided by the 30 cycle source.

Assuming that the broadcast station is transmitting its usual program, and an emergency situation arises warranting the transmission of warning signals, the operator merely moves the contacts 16 to the desired pairs of terminals 20 or 26 and applies the emergency announcements to the program input. For example, with the switch arms on the terminals 20, the program input may consist of emergency warnings of extreme urgency, while with the arms on the terminals 26, the information may be of lesser urgency, with news briefs etc. interspersed therein to provide information relative to an expected or possible danger.

The receiving apparatus according to the invention is illustrated in FIGURE 2. A receiving antenna 40, which may be of the ferrite stick type, couples the received carrier wave to the receiver input tuned circuit including inductance 42 and capacitor 44. The conventional local oscillator tuned circuit is shown as comprising a coil 52 and associated capacitor 54. The capacitors 44 and 54 are gang tunable in the usual manner to select the broadcast frequency to be received. The received signal and the local oscillator frequency are supplied to the converter 60 which in conventional fashion provides an intermediate frequency signal. The latter is supplied through first and second I.F. amplifiers 62, 64, and thence to a detector 66. The latter derives the audio frequency modulating signals from the intermediate frequency signal and couples them through a conventional volume control 68 to a first audio amplifier stage 70. The output of the latter is applied to the audio power amplifier 72, which in the embodiment shown is of the push-pull type, and thence to the loud-speaker 76. It will be realized that the apparatus thus far described is a conventional broadcast re-

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ceiver and each of the elements thereof may take any suitable form known in the art.

The receiver and local oscillator tuned circuits are provided with additional capacitors 46 and 56, respectively. A switch S1 selectively connects capacitor 44 or 46 in parallel with the coil 42, while a similar switch S2 in the oscillator tuned circuit likewise connects either the capacitor 54 or 56 in parallel with the coil 52. As will be explained more fully hereinafter, with the switches S1 and S2 in the N or normal position shown, the receiver may be tuned to any existing broadcast frequency in the manner of the conventional radio receiver. With the switches in the A or alarm position, connected to capacitors 46 and 56 respectively, the receiver is tuned to the predetermined frequency on which emergency signals are broadcast. The capacitors 46 and 56 are shown as being gang tunable whereby they may be adjusted to set their respective tuned circuits to the predetermined warning frequency then in use.

A third switch member S3 is provided between the detector and the first audio amplifier 70. In the N position, the detector is connected to the amplifier 70 through the volume control 68, whereby the output volume may be adjusted by control of the potentiometer in the usual manner. With the switch S3 in the A position, the volume control 68 is completely bypassed and rendered ineffective.

The output of the first audio amplifier 70 is also connected in parallel to the inputs of a pair of frequency selective amplifiers 80 and 82. The amplifier 80 is tuned to select only 40 c.p.s. signals while the amplifier 82 is responsive only to 30 cycle tones. A switch 84 connects the outputs of the amplifiers 80, 82 to the input of a detector 86. As evident from the drawing, the switch 84 and the associated contacts at the output of the amplifiers are so arranged that in one position, only the 40 cycle output is connected to the detector 86 while in the other position, either or both the 40 cycle and 30 cycle tones will be supplied to the detector. The detector 86 produces a unidirectional voltage of a given magnitude in response to the application thereto of a tone signal from either of the amplifiers 80, 82.

An operating bias source for the power amplifier 72 is connected through the N contact of the switch S4, the A contact coupling the output of the detector 86 to the amplifier bias control elements.

With the switches S1 through S4, which are ganged for simultaneous actuation, in the normal, or N positions as shown, the receiver of FIGURE 2 operates as an ordinary broadcast receiver. The station may be selected by tuning of the capacitors 44, 54 in the usual manner and the volume of the audio output may be controlled by means of the volume control 68. When the switches S1 through S4 are thrown to the alarm, or A position, which will correspond to the OFF position of the usual ON-OFF switch of the conventional radio receiver, operation of the circuit is changed. The switches S1 through S4 may conveniently be stacked for operation by a single control shaft, in well known manner.

With the switches S1 through S4 in their alarm positions, the tunable circuits of the receiver are tuned to the emergency frequency of the transmitter 10 (FIGURE 1). At the same time, the output of the detector 66 is connected directly to the input of the amplifier 70, bypassing the volume control 68, and the output of detector 86 is applied to the bias control of the power amplifier 72, 74 in place of the normal bias supply. As will be explained in connection with FIGURE 3, changing of the switches from the normal to alarm positions does not disconnect the power supply, and all of the circuits of the receiver remain in their active condition.

In the absence of a received signal from the transmitter 10 modulated with a suitable low frequency tone, no operating bias is applied to the amplifier 72 from the output of the detector 86 and the receiver is thus muted. No audible output is provided by the speaker to disturb

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or interfere with the activities of the user. When an alarm signal is transmitted with a low frequency tone modulated thereon, such as when the switch 16 of FIGURE 1 is in contact with the terminals 20, the tone as well as the emergency information thereon is detected in the detector 66 and applied to the audio amplifier 70 and thence to the power amplifiers. The tones are of sufficiently low frequency that they will be inaudible on all but the very highest fidelity receivers, and will not interfere with the intelligibility of the alarm broadcast.

The 40 cycle tone is also supplied to the amplifier 80, which rejects other audio signals, and through switch 84 to the detector 86. The D.C. voltage provided by the latter in response to the tone is applied as operating bias to the power amplifier 72 through contact A of switch S4, rendering the amplifier operative and enabling the information content of the emergency signal to be amplified and applied to the loud-speaker 76. The user is thus warned of the alarm condition. Since the volume control 68 has been bypassed by switch S3, the warning will be at sufficient volume to awaken the user if asleep or to attract his attention if he happens to be at some distance from the receiver.

As discussed briefly hereinabove, if the switch 16 is in contact with the terminals 26, a 30 cycle tone will be transmitted along with a different form of emergency information. The user can select, by means of switch 84, whether he wishes to be advised of the more general emergency information that is accompanied by the 30 cycle tone, or only of the urgent alarm signals accompanied by the 40 cycle tone. In the upper position shown in the drawings, only the 40 cycle tone will be received. In the lower position, both types of emergency information will be made available to the user.

It will be appreciated from the foregoing, that with the gang-controlled switches S1 through S4 replacing the normal ON-OFF switch of a conventional radio receiver, the user cannot, through any lapse of memory, forget to put the receiver in the stand-by condition. The almost reflex action of turning the receiver switch to the conventional OFF position when it is no longer desired to listen to normal broadcast programs, effects the conversion. While in the latter condition, the receiver will be muted except during those periods in which emergency information is actually being transmitted. The muting and unmuting of the receiver amplifier is performed completely automatically and requires no user attention. When the user desires to hear a standard broadcast program again, he merely switches the knob to the normal ON position and tunes the receiver in the normal manner.

Although the circuitry illustrated in FIGURE 2 is entirely feasible for use with vacuum tubes, the use of transistors as the active components is more desirable in view of their low power consumption. This is of special importance under emergency conditions in which the commercial power sources may be no longer available.

A suitable power supply for the receiver of FIGURE 2 is shown in FIGURE 3. Where normal 117 volt 60 cycle A.C. power is available, the plug 90 may connect such source to a battery charger 92 which, in known manner, supplies a D.C. charging current to the storage battery 94. The charger may conveniently consist of a transformer having its secondary supplying alternating current at suitable voltage to a simple rectifying device for conversion to direct current. The battery 94, which may be a nickel-cadmium cell, is shown with its positive terminal grounded and its negative terminal connected to the receiver circuits. It will be realized, of course, that suitable voltage divider arrangements will be provided to distribute the voltages at the proper amplitudes to the various circuit elements in the receiver.

The battery charger 92 may also be provided with a low voltage output winding coupling alternating current over conductor 96 and through the switch S5 to a flash-

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light or similar light source 98. The switch S5, in the "Off" position, will be connected to the low voltage winding on the battery charger 92. This voltage is sufficient only to produce a feeble glow of the light 98, to indicate that the battery charger is receiving power from the A.C. source and also that the battery 94 is being charged by the charger 92. It thus serves as an indication that the circuit is functioning.

With the switch S5 in the "On" position, the light cell 98 is connected directly across the battery 94 causing it to glow brightly, thereby providing an auxiliary light source. Under emergency conditions, when it may be impossible or dangerous to maintain existing light sources, the auxiliary light source 98 may provide valuable assistance.

The power supply shown in FIGURE 3 enables the receiver to be operated with a connection to the A.C. supply mains where power is available, or as a portable, functioning on the battery 94 only. Since the battery 94 is of the rechargeable type, it can be replenished when A.C. power is restored or made available again. Therefore, the user may carry the receiver with him at all times in whatever environment he happens to be. As an additional safeguard, the battery holding structure for the cell 94 may be made of a suitable size to accept standard flashlight cells, should they become necessary.

A modification of the control switch arrangement of the circuit of FIGURE 2 is illustrated in FIGURE 4, wherein like reference numerals have been used to indicate elements corresponding to those of FIGURE 2. In FIGURE 4, the receiver and oscillator tuned circuits are each provided with only a single tunable capacitor 102 and 104 respectively. A push button control 108 is provided in the receiver housing to switch the receiver between the alarm and normal positions.

In accordance with a conventional construction, the push button is provided with an arm 110 having a detent portion 112 along the lower edge thereof. The latter is formed with a sloping forward edge and a vertical trailing edge for engaging a resiliently mounted locking member 114. In conventional push button tuning arrangements, a plurality of such buttons will be placed side by side cooperating with a single member 114. All of the push buttons will also be urged by spring means (not shown) to normally assume their outer or extended position. Thus, the pressing of any one button to its inward or depressed position, will initially force the bar 114 downwardly, by virtue of the sloping forward edge of the detent 112, and thus release the push button previously retained thereby in its forward position. The newly pressed button then locks in its forward position.

In the embodiment of FIGURE 4, the button 108 may be comparable to the OFF push button of conventional push button receivers. However, instead of disconnecting the circuits from the power supply, pressing of the button simultaneously adjusts the capacitors 102, 104 in the receiver tuned circuits to the predetermined frequency of the transmitter 10, and changes the switches S3 and S4 from the normal to the alarm positions. The receiver circuit is now readied in stand-by condition to receive emergency broadcasts. When the user desires to listen to standard broadcasts again, he presses the push button corresponding to the desired station, thereby releasing the push button 108 and tuning the receiver to the desired program. At the same time the switches S3 and S4 are returned to their normal position.

It will be seen from the foregoing, that the present invention provides a warning system adaptable to standard present day broadcast procedures, which enables wide spread dissemination of alarm information with a minimum of additional equipment at the transmitter and a simple, economically operated receiver for the individual listener. The latter, in addition to being able to receive alarm broadcasts, also function as a conventional broadcast receiver whenever desired. Moreover, transi-

tion between the normal broadcast and alarm broadcast conditions of the receiver is effected in a manner which does not permit an act of omission by the user from disabling the alarm circuit. While in the alarm condition, the audio portion of the receiver remains muted until alarm signals are actually received. The receiver may be operated from an A.C. source or from its self-contained battery and is completely portable.

Although one type of conventional receiver circuit has been illustrated, it will be understood that the invention is applicable to a wide range of variations thereof, and it is intended that the scope of the invention not be limited except as set forth in the appended claims.

We claim:

1. A radio receiver usable for both conventional broadcast reception and for reception of warning signals comprising, circuit means tunable to both broadcast and warning signals, detecting means for deriving audio frequency signals from the received signals, a volume control coupled to said detecting means for controlling the amplitude of said audio signals, amplifier means for said audio signals, means for controlling the operability of said amplifier means, selective circuit means coupled to receive audio frequency signals derived by said detecting means and responsive to signals of a predetermined frequency to develop an output potential, and two-position control switch means operable in one position to connect the receiver tunable circuit means for conventional broadcast reception, couple the detector output through said volume control to said amplifier means, and render said amplifier means operative, and operable in the other position to tune said receiver for warning signal reception, couple the detector output directly to said amplifier means, and couple said selective circuit means to said controlling means for said amplifier means to render the latter operable in response to said output potential, said control switch means corresponding to a conventional on-off switch whereby switching of said receiver to discontinue conventional broadcast reception necessarily connects the receiver for warning signal reception.

2. Apparatus according to claim 1 wherein said tunable circuit means include separate tuning elements for conventional broadcast and warning signal reception, respectively, and wherein said control switch means comprises a plurality of simultaneously actuated switching elements, one of which is movable between a first position in which said conventional broadcast tuning elements are selected and a second position in which said warning signal tuning elements are selected, a second of which is movable between a first position in which said volume control is operably connected between said detector and said amplifier means and a second position in which said detector is coupled directly to said amplifier means by-passing said volume control, and a third of which is movable between a first position in which said amplifier means is rendered continually operable and a second position in which said selective circuit means is coupled to said controlling means to render said amplifier means operable in response to said output potential.

3. In a radio receiver for use in a radio warning system having tunable circuit means, detecting means for deriving audio frequency signals from the received signals, and amplifier means for said audio frequency signals, the improvement comprising control switch means having

only two positions and operable between a first position in which said receiver, including said audio amplifier means, is connected and rendered operable for reception of standard broadcast signals, and a second position in which said receiver is connected and tuned for reception of warning signals on a predetermined frequency and said audio amplifier means is rendered operable only in response to a given audio frequency component derived by said detector, said control switch means corresponding to a conventional on-off switch whereby switching of said receiver to discontinue standard broadcast reception necessarily connects and tunes said receiver for warning signal reception.

4. A radio receiver for reception of both conventional program and warning signals, the latter being modulated on a carrier frequency within the broadcast band, comprising input circuits continuously tunable over the broadcast band, detecting means for deriving audio frequency signals from the received signals, amplifier means for said audio frequency signals, manually operative push-button actuating means in said receiver operable in one position to adjust said tunable circuits to select a carrier frequency on which said warning signals will be broadcast and to connect said amplifier means to be operable only during the occurrence of warning signals, and in another position to render said amplifier means continuously operable and responsive to both conventional program and warning signals.

5. In a radio receiver for use in a radio warning system having tunable circuit means, detecting means for deriving audio frequency signals from the received signals, volume control means, and amplifier means for said audio frequency signals, the improvement comprising two-position control switch means operable between a first position in which said receiver is connected and rendered operable for reception of standard broadcast signals with said volume control means operatively coupled between said detecting means and said amplifier means, and a second position in which said receiver is connected and tuned for reception of warning signals on a predetermined frequency, said volume control rendered inoperative whereby the output of said detector is coupled directly to said amplifier means, and said audio amplifier is rendered operable only in response to a given audio frequency component derived by said detector, said control switch means corresponding to a conventional on-off switch whereby switching of said receiver to discontinue standard broadcast reception necessarily connects and tunes said receiver for warning signal reception.

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