CONELRAD WARNING DEVICE WITH MOTOR DRIVEN SWITCH FOR OPERATING CAPACITOR CHARGING MEANS
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BY
This invention relates to a radio warning device and more particularly to a radio receiver warning device for developing and delivering an audible warning of a conelrad alert.

More specifically, the present invention relates to an electronically actuated signal decoding apparatus, the operation of which is dependent upon the reception of radio frequency signals transmitted pursuant to and in accordance with the standard conelrad warning system.

The present invention may be used in applications where an alerting signal of the predetermined conelrad code actuates a decoding portion of the apparatus which in turn causes a standard superheterodyne transistorized radio receiver to be activated so as to render a signal reproducing device operative and thereby result in an audible announcement of an impending and imminent national emergency.

Coping pending application Serial No. 123,469, filed July 12, 1961, in the names of Craig and McCartney, discloses a warning device for use in the home which warning device takes the form of a small transistor radio receiver. The present invention relates to a warning device of the type disclosed in said copending application but provides a mechanical decoder portion for uniquely corresponding to the conelrad warning system and for rendering such device capable of emitting an audible warning of an impending and imminent national emergency.

In the past, numerous devices and systems capable of providing radio warnings of an impending disaster, such as, air raid warnings, hurricane and tornado warnings, police alerts, or fire warnings, have been developed and known in corresponding technical and scientific areas. None of these systems, however, has been suited for use in conjunction with the standard conelrad system. In general, most of the prior known devices and systems require highly complicated equipment and unreasonable expensive circuit components for performing the purpose for which the devices were created.

Further, most of the heretofore known radio warning systems and devices required specific and cumbersome attachment thereof to existing superheterodyne radio receivers commonly found in civilian, industrial and governmental sites. Such arrangements were often objectionable in that the normal operation or use of the radio receiver was impaired or the cost for connecting the device or system thereto was considerable.

Still further, most of the prior known radio warning systems or devices were unreliable, ineffective and inefficient in performing the function intended should the commonly available 110 volt, 60 cycle, A.C. power supply be disconnected. That is to say, the receipt of a warning of an impending disaster or the like was not perfect in the event that conventional A.C. power commonly available in this country is disconnected for one reason or the other.

Still further, most of the heretofore known radio warning systems relied principally upon the fact that, in the event of a national emergency, modulation of the broadcast carrier frequency of standard transmitting stations would cease, thereby causing signalling means, such as lights, buzzers, bells, etc., to be activated. Such systems, however, are not practical or effective, since there are often circumstances when standard transmitting stations only transmit a carrier wave for short periods of time. It is apparent, therefore, that under such conditions, systems operating on the above-mentioned principle would emit false alarms.

Still further, since it is obviously desirable to quickly alert the populace and induct them on the proper course of action to be taken in the event of a national emergency, many of the heretofore known systems have suggested the use of centrally located loudspeakers. However, an obvious disadvantage, regarding centrally located loudspeakers, is that a sizeable portion of the populace may not hear the emergency because of their physical location in respect to the loudspeakers.

The present invention avoids the above-mentioned difficulties by providing a simplified and inexpensive device which is capable of either civilian, industrial or governmental use so that an audible indication or warning may result in the event of a national emergency and which device is particularly suited for use in conjunction with the standard conelrad warning system.

While the present invention may be used in a variety of industrial, governmental and civilian applications, the principle of operation makes it particularly useful for the unattended reception and decoding of conelrad code signals. Accordingly, the present invention may be used for civilian defense purposes, by the general public, by operators of radio broadcasting equipment and by commercial, industrial or amateur services which are presently required by law to have available decoding equipment in order that radio broadcasting, except for civil defense purposes, may be discontinued during a national emergency.

The heretofore known radio warning systems have required the continuous operation of the entire warning device, whereas the device and principles of the present invention permit conventional superheterodyne transistorized radio receivers to be uniquely modified so as to receive and decode conelrad alerts and yet not require the continuous full operation of the apparatus, thereby resulting in a noticeable economy of operation.

It is therefore a primary object of the present invention to provide a novel radio warning device capable of industrial, governmental and civilian use.

Another object of the present invention is to provide a unique warning system for developing and delivering audible warnings of a national emergency.

A further object of the present invention is to provide a simplified receiving unit for industrial, governmental or civilian use for developing audible warnings of a national emergency.

A still further object of the present invention is to provide a radio warning device particularly suited for use in conjunction with the existing conelrad warning system.

A still further object of the present invention is to provide a modified conventional superheterodyne transistorized receiver which is capable of receiving conelrad signal code and yet does not require the continuous full operation of the receiver apparatus thereby resulting in economy of operation.

A yet still further object of the present invention is to provide a novel radio warning device whereby a conelrad emergency signal code actuates a decoding portion of the device which in turn causes the conventional radio
receiver portion of the device to be actuated thereby giving an audible warning of an impending national emergency.

It is a still further object of the present invention to provide a modified radio receiver warning device wherein a continuously operating, unattended, decoding circuit thereof is responsive to the conelrad signal code and which circuit automatically actuates an alerting circuit thereby resulting in an audible warning of an impending national disaster.

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It is a still further object of the present invention to provide a novel emergency warning device particularly suited for use in conjunction with the existing conelrad warning system which device is simple in construction, economical to manufacture and highly reliable in performing the function intended.

These and further objects and advantages of the invention will be more apparent upon reference to the following specification, claims and appended drawings, wherein:

FIGURE 1 is a perspective view of the warning device of the present invention; and

FIGURE 2 is a detailed circuit diagram of the novel portions of the receiver warning device of the present invention for use in conjunction with the conelrad system.

While the present invention will be described in conjunction with, and is particularly suited for, use with the existing conelrad warning system, it will be apparent that it has utility for use in conjunction with other warning systems, such as fire alarms, police alarms, flood alarms or other weather alerts.

In the event of a national emergency, such as an enemy bomber or missile attack, fire, hurricane or tornado warnings, police alerts, etc., it is desirable to quickly alert the public and instruct them on the proper course of action to be taken. In the specific case of an enemy bomber or missile attack, it is well known that the general public will have very little warning and will have only a short time to take cover, evacuate, or to make other arrangements essential to their protection and survival during such attack. The time after general warning and before attack has been estimated by experts to be merely a matter of minutes and even the most optimistic estimates consider 45 minutes as about the greatest possible warning time present systems are able to provide to the general public.

While conventional air raid warning sirens to some extent provide a useful general warning system, they have many undesirable features, among which may be listed the high expense of installation and upkeep along with the periodic disturbance and annoyance when the sirens are tested or inadvertently turned on.

In order to achieve the same of performance and economy desired, the novel and unique warning device of the present invention was incorporated in a small portable container in the form and size of a conventional super-heterodyne transistORIZED radio receiver, and made to be remotely plugged into the conventional A.C. outlet of a home or other sites. The device of the present invention uniquely provides a decoder for detecting the conelrad signal code.

By way of example, the current conelrad code consists of a standard broadcast station carrier being first OFF five seconds, then ON five seconds, then OFF five seconds, then modulated with a thousand cycle signal for fifteen seconds, and finally audio modulated with instructions announcing the proper course of action to be taken in view of the specific impending disaster. When the device of the present invention receives the conelrad code, it is actuated and caused to amplify the one thousand cycle signal to such an amplitude so as to provide an audible warning which can be heard throughout an entire household or other sites.

Further, the device of the present invention is operative throughout an entire twenty-four hour period. This may depend on the owner thereof having the conventional receiver portion of the device turned ON, and will operate to warn the owner of an emergency event during the night when most are asleep.

Referring to FIGURE 1, the warning device of the present invention comprises a modified radio receiver generally indicated at 10 which is approximately the size of a conventional transistORIZED radio receiver and includes a speaker 12, three button switch 14, and a cord 16 leading to a plug 18 for insertion into the conventional 110 volt, 60 cycle power outlet available in most homes or other sites.

The warning device of the present invention further includes: (1) the conventional RF antenna for receiving radio broadcast transmissions over the commercial AM or FM radio broadcast bands; (2) the conventional radio receiver RF and first IF stages; and (3) the conventional first and second detector stages, all of which are omitted from FIGURE 2 for the sake of clarity and simplicity of description.

The novel portion of the receiver of the present invention is illustrated in detail in FIGURE 2 wherein the lead 21 receives the output from the second detector (not shown) of a conventional receiver from end. From lead 21, the incoming signal passes through first and second audio amplifier stages and is developed across the primary of a conventional output transformer T2.

Referring to FIGURE 2, wherein the warning device of the present invention is shown in schematic representation, the lead 21, which is connected to the second detector stage of the radio receiver (not shown), is connected to the upper end of resistor 22 whose other end is connected to B—source of potential 21. The incoming signal is developed across variable resistor 22 and is fed to the base 32 of transistor amplifier TR—through coupling capacitor 24 which has one end connected to slider 26 of resistor 22 and the other end connected to base 32. The base 32 of transistor TR—4 is connected to B—supply line 31 by the resistor 28 and is connected to B+ supply line 41 by the resistor 30. The emitter 36 of transistor TR—4 is connected to B+ supply line 31 through the parallel RC circuit comprising resistor 40 and capacitor 38. The amplified output signal from transistor TR—4 is developed across resistor 42 which has one end connected to the collector 34 and the other end connected to B—supply line 31.

The amplified output signal from transistor TR—4 is capacitively coupled to base 50 of transistor amplifier TR—3 through coupling capacitor 46 which has one end connected to collector 34 of transistor TR—4 and the other end connected to base 50 of transistor TR—3. The base 50 of TR—3 is connected to B—supply line 31 through resistor 44 and connected to B+ supply line 41 through resistor 48. The emitter of transistor TR—3 is connected to B+ supply line 41 through the parallel RC circuit comprising resistor 58 and capacitor 56. The amplified output signal of transistor TR—3 is developed across the primary 60 of output transformer TR—2 which has one end connected to collector 52 of transistor TR—3 and the other end connected to B—supply line 31. The output of transistor amplifiers TR—4 and TR—3 is conventional and well known to those skilled in the prior art; therefore, a detailed explanation thereof is not considered necessary.

Referring now to the lower left hand portion of FIGURE 2, there is shown the rectifying and filter circuit for providing the operating potentials for the device of the present invention, the primary 160 of power.
transformer T-1 is coupled across a conventional 110 volt, 60 cycle, A.C. source of supply, commonly available in homes and other sites and commonly used as the basic source of supply for superheterodyne radio receivers. The 110 volt, A.C. potential is inductively coupled across primary 160 to secondary 162 of power transformer T-1. The upper end of secondary 162 is connected to the cathode 155 of a diode rectifier 156 and the anode 157 of that diode is connected to the junction of a filter capacitor 164 and limiting resistor 166. The other end of resistor 166 is connected to filter capacitor 164 and the anode 159 of a second diode rectifier 158. The other ends of capacitors 164 and 169 are connected to the lower end of secondary 162 of power transformer T-1. The cathode 261 of diode rectifier 158 is connected to the negative terminal of a storage battery 170 and the positive terminal of storage battery 170 is connected to the lower end of secondary 162 of power transformer T-1. The power transformer T-1 is so wound that the voltage available thereacross is approximately stepped down to six or seven volts. The storage battery 170 is a six volt storage battery. Therefore, the diode rectifier 158 is back biased, thereby preventing current flow out from the storage battery 170. Thus, the B- terminal 161 delivers minus seven volts D.C. potential to the line 163 which is connected to the B- supply line 31. Accordingly, the B+ terminal 171 delivers plus 7 volts D.C. to the line 173 which is connected to the B+ supply line 41. It will be noted that the storage battery 170 is not connected to the device of the present invention so long as the 110 volt, A.C. power supply is inductively coupled to the secondary 162 of power transformer T-1. However, should there be a disruption in the 110 volt, A.C. voltage supply, the voltage at terminal 161 will fall to below minus 7 volts D.C. thereby rendering diode rectifier 158 forward biased and connecting the storage battery 170 to the device of the present invention. Accordingly, the operation of the device of the present invention does not rely upon the existence of conventional 110 volt, 60 cycle A.C. supply since upon the loss of the 110 volt, A.C. supply the storage battery 170 will be connected to the device of the present invention and provide the operating potentials needed thereby. It is to be therefore understood that the device of the present invention not only operates when the conventional 110 volt, 60 cycle, A.C. supply is unavailable, but also permits remote operation from the 110 volt, A.C. to be commonly found in the home or other sites and may be used as a portable self-contained warning device which can be carried by the owner thereof during an alert or disaster. That is to say, notwithstanding the existence of 110 volts A.C. supply, the device of the present invention provides an audible alarm of the existence of an impending disaster or national emergency, and in the case of enemy bomber or missile attack, the owner of the device may remove it from the wall socket of the home and carry it with him to the shelter area, thereby permitting continuous and uninterrupted reception of information and instructions during the alert or emergency. The decoder portion of the present invention is shown in the middle section of FIGURE 2 and it utilizes only that portion of the conrel code which consists of five second intervals of presence and absence of standard broadcast carrier (not carrier period of the conrel code), to wit, when the carrier wave is modulated with a 1000 cycle signal. Thus, the audio output of the device of the present invention will be muted, that is to say, nothing will emit from the speaker 80 until the decoding portion detects the five second intervals of presence and absence of standard broadcast carrier waves. Then, and only then, will the device connect the speaker 80 to the output transistor TR-3 so as to give an audible alarm to alert the owner of the device of the impending disaster or national emergency. The signal used to activate the decoder portion of the device is the A.V.C. voltage, converted and available in superheterodyne radio receivers. The A.V.C. voltage is fed to the base 82 of transistor TR-1 and will render transistor TR-1 conductive when the conrel code signal is received by the radio receiver. The emitter 86 of transistor TR-1 is connected to B- terminal 161 via line 163 and the collector 84 of transistor TR-1 is connected to the upper end of coil 88 of relay K-1. The lower end of coil 88 of relay K-1 is connected to the B+ terminal 171 via line 173. The relay K-1 comprises upper and lower contacts 92 and 94, respectively, and the switch 90 adapted to engage contacts 92 or 94. The switch 90 is connected to the B- terminal 161 via line 163. The decoder portion of the device of the present invention comprises a motor 150 which is connected to a disc 101. The disc 101 has two slots 147 and 149 cut therein. The degrees in slot 147 is thirty degrees in arc length. Physically located about the periphery of disc 101 are switches SW-1, SW-2, SW-3, SW-4 and SW-5. The thirty degree slot 149 is positioned radially from the center of disc 101 so as to move the switch 116, 110, and 100 of switches SW-1, SW-2, SW-3, respectively, from the position shown in the drawing to the position shown by the dotted lines when the switches are within the slot 149. The ten degree slot 147 causes switch 120 and 130 of switch SW-4 and SW-5, respectively, to move from the position shown in the drawing to the position shown by the dotted lines when the switches are within the slot 147. The switches SW-1, SW-2 and SW-3 are not affected by slot 147 and switches SW-4 and SW-5 are not affected by slot 149. The motor 150 has two terminals 152 and 154. Terminal 152 is connected to swinger 130 of switch SW-5 and terminal 154 is connected to the B+ terminal 171 via lead 153. Referring now to the circuit connections of switches SW-1 to SW-5, the swinger 116 of switch SW-1 is connected to one end of resistor 104, and the other end of resistor 104 is connected to contact 94 of relay K-1 and contact 128 of switch SW-5. The swinger 110 of switch SW-2 is connected to resistor 102 and the other end of resistor 102 is connected to contact 92 of relay K-1 and contact 124 of switch SW-4. The swinger 100 of switch SW-3 is connected to contact 94 of relay K-1. The swinger 120 of switch SW-4 is connected to contact 126 of switch SW-5 and swinger 130 of switch SW-5 is connected to terminal 152 of motor 150. Contact 114 of switch SW-1, contact 106 of switch SW-2, and contact 98 of switch SW-3, are each connected to lead 131 which is connected to one end of resistor 132. The other end of resistor 132 is connected to the base 140 of transistor TR-2. Contact 112 of switch SW-1, contact 106 of switch SW-2, and contact 96 of switch SW-3, are not connected to the device of the present invention and merely act as means for holding the respective swingers of the switches SW-1 to SW-3 in the positions shown in FIGURE 2. Contact the B+ supply line 41. The swinger 136 of transistor TR-2 is connected to the B- terminal 161 via lead 121. Referring now to the middle righthand portion of FIGURE 2 wherein the means for connecting the speaker 80 to the output transformer T-2 is shown, the base 140 of transistor TR-2 is connected to B+ supply line 41 through the capacitor 134 and the emitter of that transistor is directly connected to the B+ supply line 41. The collector 136 of transistor TR-2 is connected through coil 144 of relay K-2 to the B- supply line 31. The upper end of coil 144 of relay K-2 is connected through
that a conelrad code is not being transmitted, i.e., the standard broadcasting stations carrier waves are being transmitted in a conventional and normal manner, the automatic volume control voltage developed by the radio receiver is insufficient to render transistor TR-1 conductive. Accordingly, since the speaker 80 across the secondary 62 of transformer T-2 through contacts 147 of relay K-2, any audio signal developed across primary 60 of transformer T-2 will not be reproduced by speaker 80.

Assuming now that the conelrad code is being transmitted, to wit, all transmission of standard broadcast station carrier waves will be discontinued for a second period, then transmitted (ON) for a second period, then discontinued (OFF) for a second period, then transmitted (ON) for a second period with a 1000 cycle signal applied thereto, then transmitted (ON) for an indefinite period with audio instructions and information applied thereto. When the standard broadcast station carrier wave is OFF during the first five second interval of the conelrad code, the automatic volume control (AVC) voltage of the radio receiver is no longer present or at a voltage level sufficient to render transistor TR-1 non-conductive. That is to say, when a carrier wave is received by the radio receiver 20 there is sufficient negative voltage developed by the automatic volume control circuit of the receiver 20 to render the transistor TR-1 non-conductive. Thus, when the standard broadcast station carrier wave is OFF during the first five second period of the conelrad code, transistor TR-1 is rendered conductive, thereby energizing coil 89 of relay K-1, which in turn causes swinger 119 of that relay to engage contact 94.

Referring again to the disc 101, it will be recalled that the position of slots 147 and 149 as shown in FIGURE 2 is the normal position thereof when the decoder portion of the present invention is in readiness for a cycle of operations. Therefore, swinger 130 is in the position shown by the dotted lines since the swinger 130 is in the 10 degree slot 147 of the disc 101. 

Referring again to relay K-1, when that relay is energized, motor 150 is also energized since voltage is applied thereto through the circuit including R-1 transistor 161, lead 163, swinger 90, contactor 127, contact 128, swinger 130, lead 151, terminal 152, terminal 154, lead 153, and B+ terminal 171. Thus, the motor will commence to rotate the disc 101 clockwise and cause the swinger 130 to subsequently move to its normally closed position, i.e., in engagement with contact 126 of disc 101. When swinger 130 moves from the swinger 130 as the disc 101 rotates. To insure that the motor will continue to run after the swinger 130 moves out of the slot 147 of disc 101, contact 126 is connected via lead 125 to swinger 120 of switch SW-4. Thus, energizing potential for motor 150 is not discontinued when swinger 130 moves out of the slot 147 of disc 101, but is provided through the circuit including R-1 transistor 161, lead 121, contact 118, swinger 120, lead 125, contact 126, swinger 130, lead 151, terminal 152, terminal 154, lead 153, and B+ terminal 171. Thus, the motor 150 will continue to run until switch SW-4 is caused to open, i.e., to move to the position shown by the dotted lines.

Referring now to slot 149 of disc 101, the swinger 116 of switch SW-1 will be in the slot 149 during the first five second period of the conelrad code and therefore swinger 116 will be in engagement with contact 114 of that switch. The angular speed of disc 101 and the thirty degree arcuate distance of slot 149 are so related that the swinger 116 will be caused to be in engagement with contact 114 for a five second period which corresponds to the first five second period of the conelrad code.

During the second five second period that swinger 116 is in engagement with contact 114, the condenser 154 con-
nected to the base 140 of transistor TR-2 is caused to be charged to a predetermined voltage level through the charging path including B— supply line 31, transistor 90, contact 94, lead 127, resistor 104, switch 116, contact 114, lead 131, resistor 132, capacitor 134, and B+ supply line 41.

During the second five second period of the conenrad code, relay K-1 is de-energized and swinger 90 returns to its normal position, i.e., in engagement with contact 92 of that relay. During this second period of the conenrad code, swinger 110 of switch SW-2 is positioned within slot 149 and caused to engage contact 108 of that swinger. When swinger 110 is in engagement with contact 108, the capacitor 134 is again charged to a predetermined voltage level through the charging path including B— supply line 31, swinger 90, contact 92, resistor 102, swinger 110, contact 108, lead 131, resistor 132, capacitor 134, and B+ supply line 41.

During the third five second period of the conenrad code relay K-1 is again energized and swinger 90 caused to again engage contact 94 of that relay. During this five second period of the conenrad code, swinger 100 of switch SW-3 is positioned within slot 149 and caused to engage contact 90 of that switch. When swinger 100 is in engagement with contact 98, the capacitor 134 is again charged to a third predetermined voltage level through the charging path including B— supply line 31, swinger 90, contact 94, swinger 100, contact 98, lead 131, resistor 132, capacitor 134, and B+ supply line 41.

Thus, it will be noticed that (1) the switching time of switch SW-2 corresponds to the first five second carrier OFF period of the conenrad code, (2) the switching time of switch SW-2 corresponds to the first five second carrier ON period of the conenrad code, and (3) the switching time of switch SW-3 corresponds to the second carrier OFF period of the conenrad code.

It is to be also noted that the series combination of resistor 104, resistor 132 and capacitor 134 during the first five second carrier OFF period of the conenrad code and resistor 102, resistor 132, and capacitor 134 during the first ON period of the conenrad code, each constitute an integrating circuit. Thus, the amount of voltage that will be developed across capacitor 134 will be proportionate to the voltage applied, the resistance of resistor 132 plus either the resistance of 102 or 104, and the amount of time that the voltage is applied to capacitor 134. Clearly, the higher the resistance of the integrating circuit, the longer the capacitor 134 will take and therefore the smaller the voltage will be which is developed across the capacitor 134 during the five second intervals of the conenrad code. The resistance of resistors 102, 104 and 152 are so related that the amount of voltage developed across capacitor 134 will be equal during each of the switching periods of switches SW-1 to SW-3. Accordingly, during each five second interval of the conenrad code, the capacitor 134 will be charged to a predetermined level in increments of three equal voltage values.

At the completion of the three consecutive five second charging periods of capacitor 134, the voltage across 134 will be sufficient to render transistor TR-2 conductive, thereby energizing coil 144 of relay K-2 and causing contacts 147 of that relay to close. When contacts 147 of relay K-2 are closed, terminal 61 of secondary 62 of transformer T-2 and terminal 63 of speaker 80 are connected together, thereby placing speaker 80 across secondary 62. Accordingly, the 1000 cycle signal developed across primary 60 of output transformer T-2 will be coupled to secondary 62 and reproduced by speaker 80.

Recalling for a moment that switch SW-6 has two positions, i.e., an alarm and listen position, when this switch is in the alarm position, transistor 142 is connected through contacts 75 and 76 of switch SW-6 to the B+ supply line 41, thereby completing a current path through coil 144 of relay K-2. The amount of current through the last-mentioned current path, though insufficient to close contacts 147 of that relay, is sufficient to hold the contacts closed after transistor TR-2 has provided sufficient current flow through coil 144 (energized the coil) to close the contacts. Therefore, the subsequent return of transistor TR-2 to its normally non-conductive state after the capacitor 134 has discharged therethrough will not result in the opening of contacts 147 of relay K-2.

Further, when switch SW-6 is in the alarm position, contacts 73 and 78 of that switch also provide a regenerative feedback path from secondary 62 of output transformed T-2 to the input portion of amplifying transistor TR-4 through condenser 81. Thus, an enhancement in the volume of the 1000 cycle signal being reproduced by speaker 80 is provided so that the possibility of not hearing the warning signal is considerably reduced, or conversely the audio range of the device is considerably increased.

Referring back to line 101, after slot 149 has cleared swinger 100, the fourth period of the conenrad code commences, that is, the broadcast station carrier frequency (or conenrad frequencies) is modulated with a 1000 cycle signal and transmitted for fifteen seconds. During this period of the conenrad code, the relay K-1 will be de-energized and swinger 90 will be in engagement with contact 92 of that relay. When swinger 120 engages slot 147 during this fifteen second period of the conenrad code, the swinger moves to the position as shown by the dotted lines and motor 150 will remain energized through the current path including B— terminal 161, lead 163, swinger 90, contacts 92, lead 123, contact 124, swinger 120, contact 126, swinger 130, terminal 152, terminal 154, lead 153, and B+ terminal 47.

When the swinger 130 thereafter engages the slot 147 the motor will stop since energizing voltage is no longer applied thereeto through relay K-1 which is now de-energized. That is to say, when swinger 130 engages contacts 128 the motor energizing path is broken since contact 128 is connected to contact 94 of relay K-1 and relay K-1 is de-energized with swinger 90 engaging contact 92, as shown.

Thus, the decoder portion of the device of the present invention is now in readiness for a subsequent conenrad warning signal code.

Referring back to switch SW-6, after the regenerated 1000 cycle warning signal has been reproduced by speaker 80, the user of the device of the present invention may switch from the alarm to the listen position. When in the listen position, the reproduction of signals coupled to secondary 62 from the output of a transformer T-2 is not dependent upon the closing of contacts 147 of relay K-2. This is so because terminals 73 and 74 of switch SW-6 connect terminals 61 and 63 of secondary 62 and speaker 80, respectively, thereby shorting out the contacts 147. Also, when in the listen position, the regeneration of the audio output via capacitor 81 is disconnected, as in the application of negative potential to coil 144 of relay K-2 through resistor 142. Thus, coil 144 is de-energized and contacts 147 open and any subsequent moving of switch SW-6 to the alarm position will not result in contacts 147 closing since, as above mentioned, the current flow therethrough as a result of the current path including resistor 142, is insufficient to close the contacts 147. Accordingly, when switch SW-6 is in the listen position, the device of the present invention operates as a conventional radio receiver.

Referring to the middle upper portion of FIGURE 2, there is shown a switch SW-7 which is a standard broadcast frequency or conenrad frequency selector switch. That is to say, when switch SW-7 is in the position as shown, the device of FIGURE 2 operates to decode the conenrad signal code which is applied to the standard broadcast station frequency (or conenrad frequencies) and to give a warning of an impending and imminent
national emergency. Wherewith, when switch SW-7 is put in the conelrad position, the radio receiver 20 is automatically tuned to the conelrad frequency, to wit, 640 kc., or 1280 kc., and decodes only when the conelrad warning signal code is transmitted over conelrad frequencies.

It is to be understood that although the disc 101 is shown and described in detail as having slot members 147 and 149 formed therein, any other well known rotatable switch actuating member may be used to open and close switches SW-1 to SW-5 in the above mentioned predetermined order. By way of example, slots 147 and 149 could be detents or camming surfaces and the swngers of switches SW-1 to SW-5 may be cam followers which operate the position shown by the heavy lines to the positions shown by the dotted lines when the detents or camming surfaces engage the respective swingers.

Still further, it is to be understood that although the device of the present invention has been described in detail with reference to the preferred conelrad code, to wit, carrier ON five seconds, carrier OFF five seconds, 1000 cycle modulated carrier ON fifteen seconds, and followed by an audio modulated instruction and information period with the carrier ON, any change of the specific periods or code of the conelrad radio warning system may be accounted for in the present invention by varying or changing the relationship of the disc 101 and the switches cooperating therewith in a manner that is obvious to those skilled in the prior art. And yet still further, it is to be understood that the device of the present invention through described in detail with reference to reception of the conelrad warning signal code when transmitted via radiant energy, is equally adaptable to reception of any national warning system which may utilize such signal link means as telephone lines, power transmission lines, etc., without departing from the scope of the present invention.

It is apparent from the above that the present invention provides a novel radio receiver alarm device of relatively simple construction and of a size comparable with portable transistorized radio receivers. The alarm system of the present invention is operative both day and night, and can be preset or variably tuned to a local or conelrad frequency so at any time that the conelrad alert is transmitted the receiver is automatically energized and caused to reproduce the 1000 cycle conelrad signal as an audible sound to warn the owner of the device of the fact that an alert is being given.

Further, the manual switch SW-6 provides a feature whereby the device of the present invention may be switched to a listen position without providing the unique regeneration feature, and thereby permitting the device to be used as a conventional radio receiver which is tunable to any station in the broadcast band and wherein the speaker 80 is caused to reproduce the intelligence transmitted by the broadcast without regeneration. Thus, with the switch SW-6 in the listen position, the device may be removed from the wall socket which provides the 110, 60 cycle, A.C. supply of voltage, and carried around by the owner thereof and used as a portable transistor radio capable of automatically warning the user of an impending or imminent danger being transmitted by the conelrad radio warning system.

Still further, when the device is removed from the wall outlet the storage battery 170 immediately provides the voltages necessary to operate the device for reception of transmitted radio signals.

And yet, still further, there is provided a second manual switch SW-7 which permits the automatic tuning of the radio receiver to the conelrad frequencies so that the device of the present invention constitutes a portable transistor radio preset to the conelrad frequencies for receiving conelrad radio warning signals.

It will be apparent from the foregoing that the device of the present invention is low in cost, rugged in construction and requires very little maintenance. The use of a standby storage supply provides economy in that the life of the battery in conjunction with the present invention is near the shelf life thereof.

Furtth, it will be apparent from the foregoing that the novel rotating switch actuating disc 101 provides a unique method of preventing actuation of the speaker 80 upon the absence of carrier wave frequency as a result of standard broadcast station breakdown or the like.

Still further, it will be apparent from the foregoing that the present invention is uniquely adapted to obtain all of the ends and objects hereinbefore set forth, together with other advantages which are obvious and inherent in the device. It will be understood, therefore, that certain features and subcombinations of utility may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the appended claims.

It is to be understood that the device of the present invention may be readily modified so as to be responsive to any code signal which may be adopted by governmental authorities for the purpose of varying the populace of an imminent and impending emergency without departing from the scope of the invention. Accordingly, the hereinabove described conelrad signal code system is merely exemplary of one of the presently adopted civil defense systems to which the advice of the present invention is responsive and should not be construed as restricting or limiting. By way of example, the device of the present invention may be modified to be responsive to a signal code system which utilizes power transmission lines or telephone lines as the means for linking the signal between the transmitter and the receiver. A system of the latter type has been adopted by civil defenses and is commonly referred to as the NEAR warning system. Thus, a modification of the device of the present invention so as to be responsive to the NEAR signal code is clearly contemplated and requires only minor circuit changes.

It is to be understood further that the parameters of the regenerative feedback circuit (56-58) are preferably designed so as to drive the rear-end of the transistor radio (18-20) into oscillation so that the audio tone (1000 c.p.s.) reproduced by the speaker 42 will continue until the switch 44 is moved to the listen position. Of course, it is not necessary that the rear-end of the radio be driven into oscillation since the 1000 c.p.s. signal transmitted during the fourth interval of the conelrad signal code will be heard for approximately fifteen seconds.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and the range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A warning device responsive to a transmitted signal code comprising: a radio receiver having an audio amplifier and an automatic volume control circuit; a speaker; a switch for connecting said speaker to said audio amplifier; a decoder coupled to said automatic volume control circuit and operative in response thereto to cause said switch to connect said speaker to said audio amplifier; said switch including a relay having a coil and normally open contacts; said coil being energized by said decoder thereby closing said contacts and connecting said speaker
to said audio amplifier; said speaker being operative to reproduce the audio output of said audio amplifier; said automatic volume control circuit being responsive to said signal code and adapted to actuate said decoder whereby said speaker is caused to reproduce said audio output of said audio receiver; said decoder including a motor driven switch actuating means; a plurality of charging switches; storage means; said switch actuating means being responsive to said automatic volume control circuit and causing said charging switches to be sequentially actuated; each of said charging switches being adapted to charge said storage means to a predetermined voltage level when actuated by said switch actuating means; said storage means being adapted to energize said coil of said relay thereby causing said contacts of said relay to close.

2. A warning device in accordance with claim 1 wherein said decoder further includes: a charging relay responsive to said automatic volume control circuit; a source of potential; said charging relay adapted to connect said source of potential to said charging switches when energized by said automatic volume control circuit whereby said charging switches cause said storage means to charge to a predetermined level when actuated.

3. A warning device responsive to a transmitted signal code comprising: signal reproducing means, audio amplifying means and automatic volume control means; switch means for connecting said signal reproducing means to said audio amplifying means; decoding means coupled to said automatic volume control means and operative in response thereto; said automatic volume control means being responsive to said signal code and adapted to actuate said decoding means; storage means for controlling the operation of said switch means; said storage means being normally discharged; switch means being normally in a first position with said signal reproducing means disconnected from said audio amplifying means; said decoding means adapted to step charge said storage means under the control of said automatic volume control means; means for discharging said storage means after said storage means is charged to a predetermined voltage level thereby causing said switch means to move to a second position and connect said signal reproducing means to said audio amplifying means.

4. A warning device in accordance with claim 3 wherein: said signal reproducing means being a speaker; said storage means being a capacitor; said switch means including a relay coil for connecting said speaker to said audio amplifying means; and said means for discharging said storage means being a transistor.

5. A warning device in accordance with claim 4 wherein: said decoding means comprises: a motor driven rotary switch actuating means; a plurality of charging switches; said switch actuating means being responsive to said automatic volume control circuit and causing said charging switches to be sequentially actuated; said automatic volume control circuit being operative to actuate said decoding means under the influence of said signal code; each of said charging switches being in a normally first position with said capacitor discharged; a source of direct current potential; said switch actuating means being adapted to sequentially move each of said charging switches to a second position; each of said charging switches when in said second position connect said direct current potential to said capacitor thereby causing said capacitor to step-charge to a predetermined level.

6. A warning device responsive to a transmitted signal code comprising: a radio receiver having an audio amplifier and an automatic volume control circuit; a speaker; a relay switch including a relay coil for connecting said speaker to said audio amplifier; a transistor for controlling the current flow through said relay coil; a capacitor connected to the control element of said transistor; a decoder coupled to said automatic volume control circuit and operative in response thereto and including a motor driven switch for controlling the potential across said capacitor; said motor driven switch including a plurality of contacts for sequentially step-charging said capacitor; a regenerative feedback circuit connected between the input and output of said audio amplifier; said relay switch upon actuation rendering said feedback circuit operative; said capacitor upon reaching a predetermined voltage level being discharged through said relay coil for actuating said relay switch and connecting said speaker to said audio amplifier whereby the audio output of said radio receiver is reproduced by said speaker.

7. A warning device in accordance with claim 6 wherein: said transmitted signal code comprises sequential intervals of code; said motor driven switch causes said capacitor to step-charge during each of said intervals through one only of said plurality of contacts.

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