

[54] **AUTOMATIC TIME-CONTROLLED ALARM SYSTEM**

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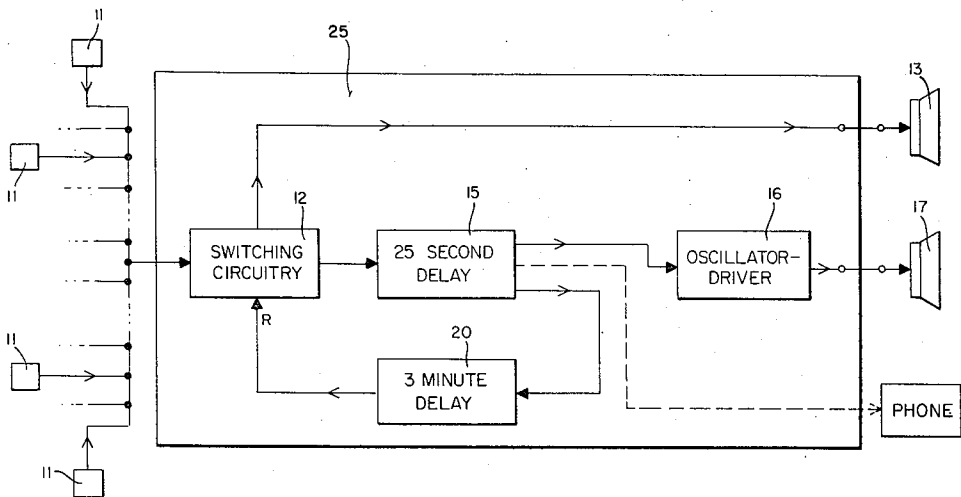
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[57] **ABSTRACT**

In an electronically-timed multiple-alarm warning system, a plurality of sensors connected to a first switch which controls a first alarm, a first timing circuit triggered by the first switch and which operates a second switch after a first predetermined time delay, the second switch controlling a second alarm and a second alarm driving circuit, a second timing circuit for de-energizing the system after a second predetermined time delay, and a re-set switch for manually resetting the system in case of false alarm.

7 Claims, 2 Drawing Figures



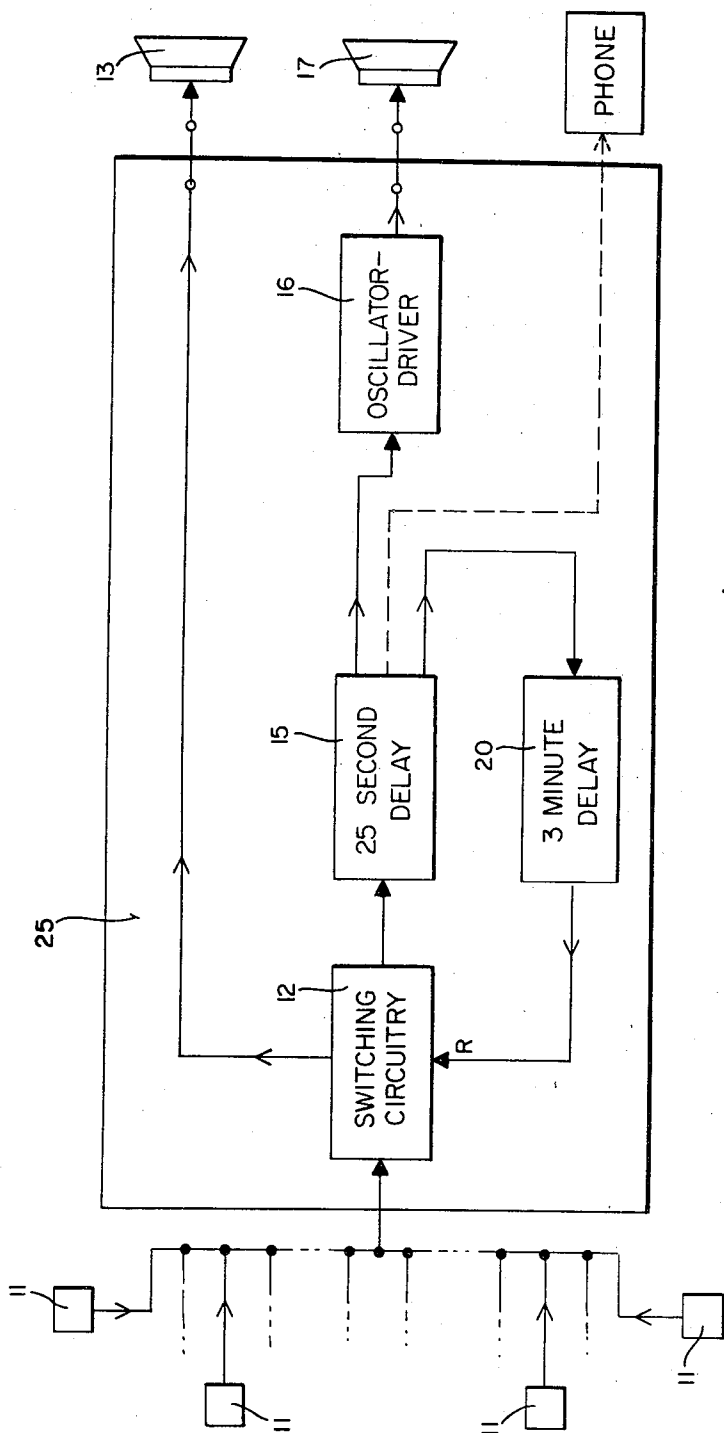


Fig. 1

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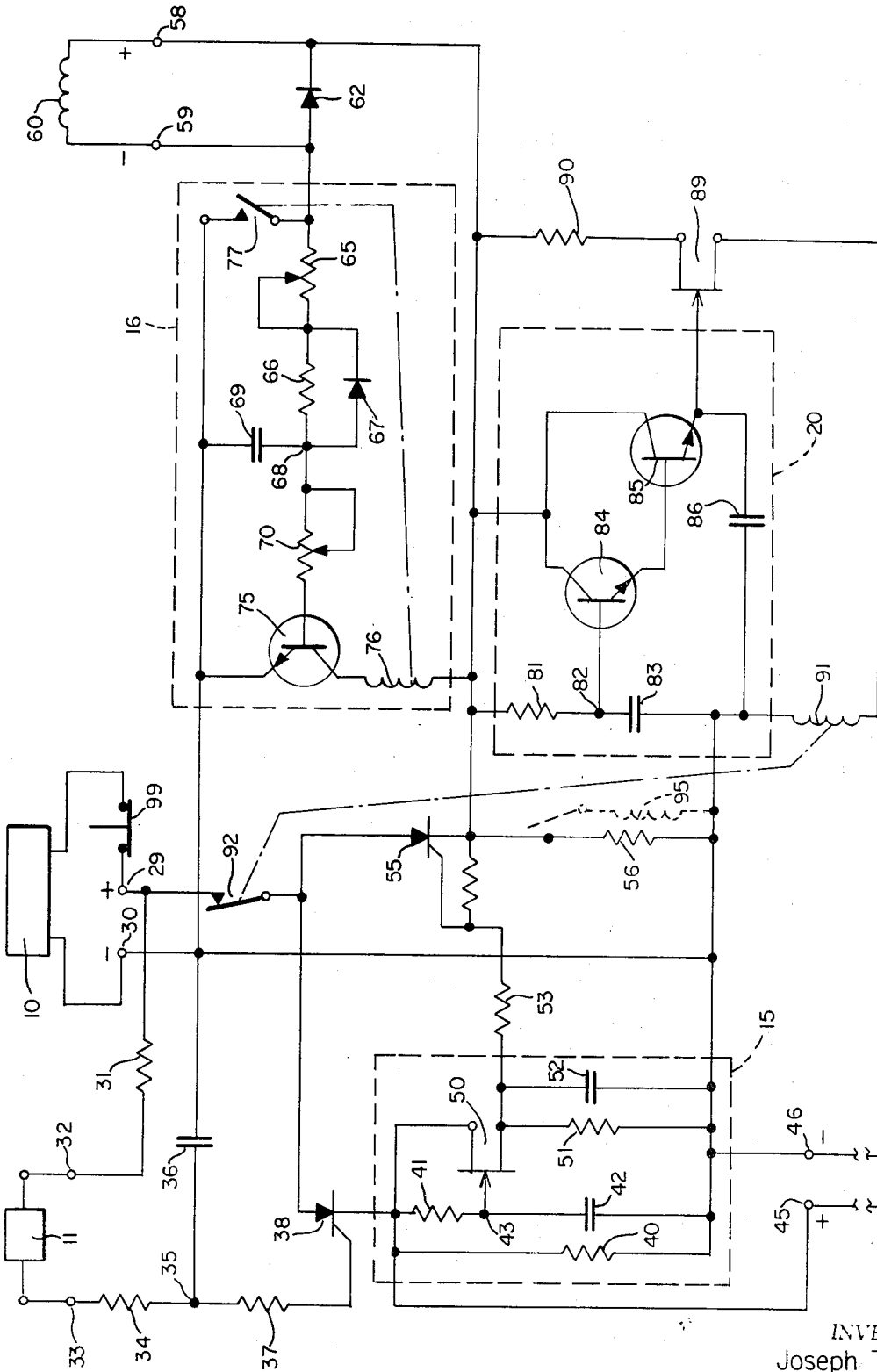


Fig. 2

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AUTOMATIC TIME-CONTROLLED ALARM SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention lies in the field of electronic alarm systems and, more particularly, self-powered electronic alarm systems with a re-set mechanism for terminating the alarm within a timed period.

2. Description of the Prior Art

The need for effective alarm systems for protection of person and property is a very critical need in the nation today. The rising rate of crimes committed against commercial and personal property has produced a soaring demand for efficient and economical alarm systems. A number of alarm systems are presently available commercially but generally are very expensive, unreliable, and most critically, are given to producing false alarms. The high rate of false alarms is a natural consequence of the conventional sensing mechanisms which are employed in such systems, e.g., pressure sensitive mats concealed beneath rugs and hidden door switches. To be effective, such sensors are normally placed in positions where they are inadvertently tripped by normal users of the property. Where such alarm systems are connected to remote points by telephone, the false alarms are automatically registered, as at a police station, with no effective means for invalidating the false alarm. The police forces of many large cities are reporting an extremely high percentage of false alarms coming from such business and home alarm systems, causing expensive and highly time consuming investigations by the police. There thus exists a great need for an efficient alarm system which permits the use of conventional sensing devices in the manner adapted to the particular property being protected, but which provides the user the ability to correct and cancel false sensor energizations of the system before false alarms are generated and transmitted.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an inexpensive, reliable and self-energized alarm system having a first alarm triggered immediately upon operation of a sensor, and a second alarm which is energized a given time delay thereafter, with means for de-energizing the alarm system during the time delay if the alarm is false, the second alarm acting as the "true" alarm.

Accordingly, a battery powered alarm system is provided having a first high frequency relatively low volume alarm energized immediately upon tripping of any one of a set of conventional sensors, the high frequency alarm being of a volume to alert anyone present that the alarm has been tripped, but not being loud enough to provide warning, and not being remotely connected, as through a telephone line to a police station. If the system is not de-energized within a given time period predetermined by a time delay circuit, a second "true" alarm is energized which may provide a warning signal in the area of the protected property, and/or be remotely connected to a receiving station. A second time delay circuit turns off and resets the system after a second predetermined time period. The electrical portion of the system is battery operated, the alarms being powered by cylinders of freon which are solenoid-controlled.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow diagram showing the signals which activate and deactivate the two alarms of the system.

FIG. 2 is a schematic diagram of the switching and timing circuitry of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, a flow diagram is shown tracing the flow of signals generated when an intruder is sensed by one of the sensors 11 of the system. The sensors are conventional sensing mechanisms used for the detection of intruders, fire, freezing temperatures, etc., comprising thin pressure sensitive mats concealed beneath rugs, hidden door and window switches, thermal sensitive and optically sensitive devices. Also, conventional push-button, or "panic button" sensors may be utilized. When a sensor 11 is activated, a signal is transmitted to switching circuitry of control box 26, the switching circuitry including a switch which immediately switches on to provide an activating signal which is coupled to the first alarm, designated 13. The switching circuitry also initiates a count of approximately 25 seconds by counter 15. At the end of the 25 second time period, a signal is transmitted to oscillator-driver unit 16 which energizes alarm 17, causing that alarm to be driven repetitively, producing a pulsating high volume sound. At the end of the 25 second time delay, delay circuit 15 also transmits a signal to a second delay circuit 20 which counts a time delay of approximately three minutes, after which a signal is transmitted back to the set-reset circuit 12 to turn off both alarms 13 and 17 and reset the system for the next sensor signal.

Referring now to FIG. 2, the details of the electronic control circuitry are seen in more detail. A DC power supply 10 is connected to terminals 29 and 30. The supply may be a conventional 12 volt battery. The positive terminal is connected through a resistor 31, nominally 470 ohms, to one terminal of sensor terminal pair 32-33. It is understood that a plurality of sensors 11 may be connected across terminals 32 and 33. Terminal 33 is connected through resistor 34 to node 35, which in turn is connected through a capacitor 36 to negative terminal 30, and through a resistor 37 to the gate terminal of an SCR 38. The purpose of capacitor 36 is to act as a filter, to prevent spurious signals, as from lightening flashes, from tripping SCR 38.

The anode of SCR 38 is coupled through normally closed switch 92 to the positive terminal 30, and the cathode is coupled to the negative terminal through resistor 40 in parallel with a series combination of resistor 41 and capacitor 42. Resistor 40 is typically 10 K ohms, resistor 41 is typically 1 megohm and capacitor 42 is typically 10 microfarads. Resistor 41 in combination with capacitor 42 provides a time constant of about 10 seconds.

From the above, it is seen that whenever a sensor 11 is tripped, causing a short circuit between terminals 32 and 33, a plus voltage is applied to the gate of SCR 38, causing it to conduct. SCR 38 will have a small but negligible voltage drop across it, such that the cathode will be at appreciably plus 12 volts with respect to negative terminal 30. The cathode is tied directly to terminal 45, and terminal 46 is tied directly to negative

terminal 30, such that an appreciably full 12 volt signal appears across terminals 45 and 46, which in turn are coupled to first alarm mechanism 13. Accordingly, as soon as a sensor 11 is tripped, power is supplied to alarm 13.

As was mentioned before, the combination of resistor 41 and capacitor 42 may typically have a time constant of 10 seconds. The junction 43 between the resistor and capacitor is tied to the emitter of unijunction transistor 50, which has one base terminal tied to the cathode of SCR 38 and the other to resistor 51 and capacitor 52. The unijunction transistor 50 is turned on when capacitor 42 charges to approximately 75 percent of the supply voltage. The output of the unijunction transistor is derived across resistor 51 in parallel with capacitor 52, typically 10 microfarads, and is transmitted through a resistor 53 to a second SCR 55. As capacitor 52 charges up, the voltage supplied to the gate of SCR 55 reaches a value sufficient to turn it on, providing a closed path from positive terminal 29 through SCR 55 and resistor 56 to the negative terminal. Resistor 56, connected to the cathode of SCR 55, is a current limiting resistor, chosen low enough that current is maintained through SCR 55. The combination of the time for charging resistor-capacitor combination 41-42 and for charging capacitor 52 through unijunction transistor 50 is typically 25 seconds and, of course, may be varied by varying the parameters of components 41, 42 and 52.

Thus, after approximately a 25 second time delay, a signal of approximately +12 volts, neglecting the voltage drop across SCR 55, appears on the cathode terminal of SCR 55, which is connected to the positive solenoid terminal 58. Solenoid 60, which actuates second alarm 17, is tied between positive terminal 58 and negative terminal 59, having thereacross an arc suppression diode 62.

Still referring to FIG. 2, the portion designated 16 comprises the adjustable oscillator-driver, for periodically energizing solenoid 60, which in turn causes alarm mechanism 17 to be driven. Terminal 59 is connected to a variable resistor, or pot, 65, typically of 25 kilohms, the other terminal of which is connected to a parallel combination of resistor 66 and diode 67. Resistor 66 is typically 47 kilohms in value, and in turn is connected at node 68 to a capacitor 69 and a second 25 kilohm pot 70. The other terminal of capacitor 69 is connected to negative terminal 30, and the other terminal of pot 70 is connected to the base of transistor 75. The emitter of transistor 75 is also connected to negative terminal 30, and the collector is connected to the coil 76 of a reed relay having make-break contacts 77 connected between terminals 59 and 30.

In operation, capacitor 69, typically 500 microfarads, charges through pot 65 and resistor 66. When capacitor 69 charges sufficiently, a positive voltage is transmitted through pot 70 to the base of transistor 75, turning the transistor on, thereby driving current through relay coil 76, causing switch 77 to close. During the time that capacitor 69 is charging, the charging current, which flows through solenoid 60, is insufficient to operate the solenoid. However, when switch 77 is closed, appreciably the full 12 volt supply is placed across solenoid 60, causing it to operate and activate alarm mechanism 17.

However, when switch 77 closes, capacitor 69 discharges through diode 67 and pot 65. Pot 65 may be adjusted so as to determine the discharge time. In a similar manner, pot 70 may be adjusted so as to determine the voltage to which capacitor 69 must be charged before transistor 75 is turned on, thereby activating relay 77. When capacitor 69 discharges sufficiently, the positive bias on transistor 75 is reduced such that the transistor turns off, at which time current ceases to flow through relay coil 76 and relay 77 is opened, terminating the energization of solenoid 60. Thus, the circuit provides for periodic energization and de-energization of solenoid 60, with means to control the on-off periods by adjusting pots 65 and 70.

The dashed line marked 20 indicates a second time delay circuit which, in the preferred embodiment of this invention, times a delay of approximately three minutes. The cathode of SCR 55, which carries a positive signal after the first time delay, is tied to a resistor 81, the other terminal of which is tied at node 82 to capacitor 83. Resistor 81 and capacitor 83 are chosen to have a time constant in excess of 1 minute, e.g., 22 megohms and 4 microfarads respectively. Node 82 is connected to the base of transistor 84, the emitter of which is coupled into the base of transistor 85 in a conventional Darlington-type circuit. The emitter of transistor 85 is coupled to a capacitor 86, being typically 500 microfarads, which capacitor is charged through the Darlington circuit when the voltage at 82 rises to a level sufficient to turn on transistor 84. The emitter of transistor 85 is connected to the emitter of unijunction transistor 89, such that the voltage across capacitor 86 turns on unijunction transistor 89 when it rises to a sufficient level. Transistor 89 is in series with a resistor 90 and relay coil 91, between the cathode of SCR 55 and negative terminal 30. Thus, when transistor 89 is turned on, current flows through relay coil 91, opening relay switch 92, thereby cutting off current to SCRs 38 and 55, and thereby de-energizing the entire circuit. Upon de-energization of the circuit, current ceases to flow through coil 91, at which point switch 92 is again closed, and the circuit is reset to be tripped again by activation of a sensor 11.

Reviewing the timing of the circuit, energization of the circuit is initiated by the tripping at a given time, T_1 , of a sensor 11. The first alarm 13 is immediately energized at such time T_1 . At a later time, T_2 , equal to T_1 plus about 25 seconds, the second alarm 17 is energized. At a time T_3 , equal to T_2 plus about 3 minutes, both alarms are de-energized and the system is reset to be triggered again by one of the sensors.

It is frequently desired to connect an automatic alarm system, such as the system of this invention, to a telephone for automatic dialing to provide a remote signal, as at a police station. This can be done simply and reliably by energizing a relay coil, which relay activates a conventional automatic dialing mechanism. In the system of this invention, the desired remote signaling may be achieved after the initial 25 second delay by placing a telephone relay coil 95 between the cathode of SCR 55 and negative terminal 30. The remote telephone signal may be in place of or in addition to energization of alarm mechanism 17.

In operation, if the alarm has been falsely tripped, there is a time period of about 25 seconds during which

the property owner may reset the alarm, avoiding energization of the louder alarm 17 or transmission of a remote signal to a police station. Of course, this time period may be set to any desired length for the particular user. By depressing button-switch 99, connected between battery 10 and terminal 29, the circuit is de-energized and reset. The user may install button switch 99 at any conveniently secret location in his home or on the property being protected.

It is to be noted that the system of this invention is entirely self-powered. The electrical system is operated by battery 10, which battery is not drained at all except when the system is activated by tripping of a sensor. This is because both SCRs 38 and 55 are normally open, and as long as they are open, no current can be conducted therethrough to the remainder of the circuit. Alarm 13 is typically a conventional small mechanical oscillator which produces a high frequency, extremely irritating sound. It is designed to give sufficient alert to the user in case of false alarm, but is not powerful enough to alert people outside of the property. A typical such high frequency unit draws from 6 to 16 milliamps of power. The second alarm mechanism 17 is typically a freon powered, solenoid actuated horn, which produces an extremely loud and strident noise. The freon is stored in a cylinder, and is released upon activation of the solenoid, which draws approximately three quarters of an ampere when energized. The cylinder may be placed at any convenient location, and connected through tubing to the horn which is mounted at a suitable location. It is noted that more than one such horn may be powered by the control system of this invention.

The novelty of this invention lies in the control devices, circuitry and components as detailed above, and is not limited to any particular application. For instance, the invention may be suitably used in homes, commercial properties, on boats, and in a wide variety of applications. It may be used for the detection of fire by utilizing a temperature sensitive sensor 11. Similarly, it may be utilized to sense freezing conditions, such as by immersing a sensor 11 in a liquid which is to be monitored so as to prevent it from freezing.

I claim:

1. A self powered alarm system which provides for a predetermined time period during which a false alarm may be corrected, comprising:

- a. electrical sensor means for sensing an alarm condition;
- b. electrically actuated first alarm signal means for generating a first audible alarm signal;
- c. first electronic alarm switching means switchably connecting said sensor means and said first alarm signal means for energizing said first alarm signal means immediately upon tripping of said sensor means;
- d. first electronic time delay means, connected to and triggered by said first alarm switching means, for measuring a first time delay following energization of said first alarm signal means;
- e. electrically actuated second alarm signal means for producing a second alarm signal;
- f. second alarm signal interrupt means for periodically

interrupting said second alarm signal means for driving said second alarm signal means, and having a transistor with its input in parallel with a capacitor and its output connected to a relay, the transistor and relay cooperating to cause the capacitor to alternately charge and discharge, producing an alternating signal which drives said second alarm signal means, said second alarm signal interrupt means being connected in series with said second alarm signal means so that electrical current through said second alarm signal means operates said second alarm signal interrupt means;

- g. second electronic time delay means for measuring a second time delay, said second time delay commencing at the termination of said first time delay;
- h. automatic reset means connected to and driven by said second time delay means for de-energizing and re-setting said alarm system;
- i. false alarm reset means for manually de-energizing and resetting said alarm system;
- j. power means for energizing said alarm system; and
- k. second electronic alarm switching means, connected to and activated by said first time delay means, for connecting said power means to said second alarm signal means and to said second time delay means when said first time delay has been measured.

2. The system as described in claim 1 wherein said second alarm signal means comprises a freon energized horn, said horn being solenoid controlled, said first alarm signal means comprising a high frequency relatively low volume horn, and said power means comprising a battery having normally negligible power drain unless said sensing means is tripped.

3. The system as described in claim 1 wherein said first time delay means comprises a resistor-capacitor combination which drives a unijunction transistor, the output of said unijunction transistor being coupled to a parallel combination of resistance and capacitance.

4. The system as described in claim 1 wherein said second time delay means comprises a resistor and capacitor in combination driving a Darlington-type amplifier having a capacitor connected across the output thereof.

5. The system as described in claim 4 wherein said Darlington-type amplifier is connected to the input of a transistor switch, said input having a capacitor connected to same, and wherein said automatic reset means comprises a reed relay having a relay coil connected to the output of said transistor switch and which, when energized, disconnects said power means from the remainder of said system.

6. The system as described in claim 1 wherein said alarm signal driving means comprises first and second variable resistances for controlling the frequency of driving said alarm signal means.

7. The system as described in claim 1 wherein said first and second electronic alarm switching means are connected to said power means in a manner that all current from said power means passes through one or the other of said switching means, such that there is power output delivered from said power means only when said sensor means senses an alarm condition.

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