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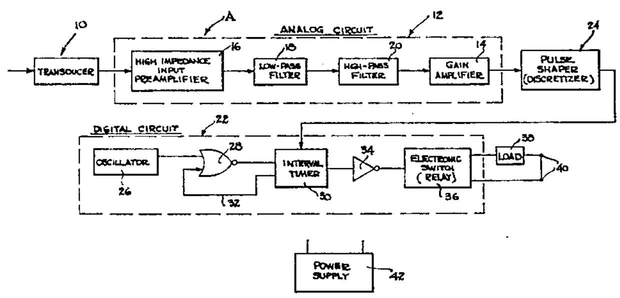
(54) **Monitoring the presence of human activity in an environment.**

(57) A apparatus for automatically de-energizing electrically oberable equipment in response to a lack of animal activity, such as human activity, in a specified environment during predetermined time period. The apparatus utilizes a circuit (10) which is designed to detect activity which generates energy in a certain wavelength range and particularly, sonic energy. If sound is sensed in the specified environment within the time interval determined by timer (30), a signal is generated to energize or maintain energization of one or more electrical devices (38). Contrarywise, if no sound is detected within the predetermined time interval, there is a resultant de-energization of the electrically operable equipment. A control may be provided to adjust the predetermined time delay period. A control may also be provided for adjusting the sensitivity of the device.



EP 0 093 810 A1

MONITORING THE PRESENCE OF HUMAN ACTIVITY IN AN ENVIRONMENT

This invention relates to automatically de-energizing power utilizing equipment after a lack of animal activity or sound for a predetermined time period.

As a result of fossil fuel shortage, strong opposition to nuclear generated electrical power, and economic unavailability of other forms of power, e.g. geothermal power and the like, there has been a strong need for energy saving devices. There have been several prior art detection systems designed to detect human activity in a specified environment as for example, a room or other enclosure. One such prior art device utilized a source of microwave radiation. Human activity within the specified environment with the microwave radiation would cause a triggering of a signal to energize or de-energize electrically operable equipment.

There have been other systems to detect human activity, as for example, passing through a doorway or across some barrier or threshold. One such detection system used a light beam and light sensor such that breaking of the beam would cause initiation of an electrical signal to operate some electrically operable equipment, e.g. trigger an alarm or cause a door to open.

Exemplary of burglar alarm circuits are the Stettner et al Patent No. 3,761,912 in which a timing circuit is used in connection with a silicon controlled rectifier for generating an alarm or energizing lights for a selected period of time in response to the occurence of a sound and immediately after the sound. After a substantial period of time, the circuit is de-energized and turns off the lights and/or sound.

U.S. Patent No. 4,102,732 also discloses a circuit to sense an inanimate object as well as an animate object and relies upon a clocking system to actuate an alarm after a predetermined period of inactivity. U.S. Patent No. 3,445,836 also discloses an alarm system which operates by means of audio frequency signals and includes a plurality of sound actuated sensors. U.S. Patent No. 4,099,168 discloses an intrusion alarm system which operates on the basis of an audio frequency signal.

There has been at least one proposed system using ultrasonic radiation for generating a standing wave in a specified environment for sensing the presence of or a lack of human activity. If the wave was not disturbed, then equipment could be automatically de-energized. Any disturbance in the standing wave would cause a re-energization of the equipment. A similar system has been proposed using a standing wave of microwave radiation. These systems were not passive in sensing and were not specifically sensitive to human activity.

It is, therefore, an object of the present invention to provide an apparatus which is capable of sensing energy within a certain wavelength range generated as a result of animal activity and in a particular environment for a predetermined time interval.

BRIEF SUMMARY OF THE DISCLOSURE

An apparatus for detecting the presence of animal activity or the lack of animal activity in a specified environment and during a predetermined time interval. The apparatus is designed to control energization and de-energization of equipment, preferably electrically operable equipment. If animal activity is not detected in the specified environment within the predetermined time interval, then the apparatus is effective to de-energize the electrically operable equipment in order to provide at least energy savings. On the other hand, if the animal activity is detected in the specified environment, the apparatus is designed to permit energization, or otherwise, to maintain energization of the electrically operable equipment. In this way, the apparatus of the present invention functions as a so-called "intelligent switch". The apparatus is not limited to use only with electrically operable equipment and can be used with other forms of powered equipment.

The apparatus of the invention includes an analog circuit portion and a digital circuit portion. The analog circuit portion is designed to provide for the detection of energy within a specified wavelength range which results from animal activity. In a preferred embodiment, the energy is in the sonic wavelength range which is deemed for the purposes of this invention to include the subsonic wavelength as well as super-sonic wavelength. The analog circuit portion includes a sensor mechanism, such as a microphone, in order to detect sound within a specified environment, such as a room or the like, which constitutes a defined volume. The analog circuit portion may also include band pass filters, gain amplifiers and the like in order to process the signal for further use in the digital portion of the circuit, as hereinafter described.

The animal activity in accordance with the present invention, is preferably human activity. Moreover, the specific area or environment is preferably an enclosed environment or limited environment. The human or other animal activity is detected by the registration of a noise level (spectral signature) above a user-adjustable threshold level and within a predefined spectral bandwidth. The user-adjustable threshold level is preferably manually operable or adjustable in connection with the present invention.

A pulse shaper, e.g. a Schmitt trigger inverter is used as an interface between the analog portion and the digital portion of the circuit. This Schmitt trigger acts as a discretizer to provide output pulses in a form which are compatible with and capable of being effectively used by the digital portion of the circuit.

More specifically, the system of the present invention senses the presence or absence of human activity within a defined volume by registering the special signatures above the user-adjustable threshold level and within the spectral bandwidth. Upon detection of signal above this threshold level within a predetermined time period, the noise is used to activate a built-in-user selectable time delay mechanism. The output of the system is an electrical impulse and may be used to activate or de-active electrical devices or systems connected to the system of the present invention.

As a specific example, if the user of the invention selects the noise threshold level appropriate to the environment and sets the time delay, i.e. a predetermined time interval or period, for e.g., ten minutes the system will moniter for noise characteristics of human activity within the specified environment. If no noise is registered there will be no inputs over this ten minute time period. Consequently, the system will shut off all lights, air-conditioning, stereo or other electrically operable devices that may be connected to the system. On the other hand, if the system of the invention does register a noise input during the ten minute or other time interval and above the threshold level, it will automatically reset its timing circuit to zero and thereby energize all of the electrically operable equipment connected thereto and thereby restart the proces and the predetermined time period.

The apparatus is passive in that it does not generate any form of standing wave or other signal form. It is thus pasive in the sense that it does not generate any signal which must be detected or interrupted in order for the apparatus to be operative.

The "predetermined" time interval is a time interval or time period which may be manually set in the apparatus itself by a manually operable control, such as a potentiometer, as hereinafter described. The term "predetermined" time interval will, of course, also include fixed time intervals which could be the same or vary from apparatus to apparatus, and which could also be factory-set.

The predetermined time interval in the apparatus of the present invention will be an appreciable time interval or time period, at least compared to a standard burgular alarm system.

In the conventional burgular alarm, the alarm is initiated as soon as an intrusion is detected. In the present invention, there will be an appreciable delay which is usually one minute or longer, and typically, will be considerably longer, e.g., in the range of ten to fifteen minutes or longer.

The apparatus of the invention is essentially a so-called "intelligent" apparatus or "intelligent switch" as aforesaid. The apparatus is intelligent at least in the sense that it is capable of making a decision, even though it may be a somewhat elementary decision making process. In essence, the apparatus effectively searches for human or other animal activity at all times and thereby effectively monitors a lack of animal activity, at least within the predetermined time period and thereby makes a decision to effectively energize or de-energize the electrical operable equipment.

In this respect, it should be understood that other forms of decision making apparatus or the so-called "intelligent components" could be used with or to modify the apparatus of the invention. For example, the apparatus is capable of being operated with programmed logic utilizing a form of microprocesor as opposed to the random logic circuit as described herein. In this way, the circuitry could be software programmed to make the necesary decisions which are now being made by the random logic in the apparatus of the invention. Decision making software program logic of this type could be designed to average out background noise in an accurate manner and account for the existence of such background noise.

THE DRAWINGS

FIGURE 1 is a schematic block diagram showing the overall electronic protion of the apparatus of the present invention;

FIGURE 2 is a schematic circuit view of one form of analog circuit portion;

FIGURE 3 is a schematic circuit view of a modified form of analog circuit portion;

FIGURE 4 is a schematic circuit view of a digital circuit portion; and

FIGURE 5 is a schematic circuit view of a modified form of digital circuit portion.

DETAILED DESCRIPTION

"A" designates a circuit forming part of the apparatus of the present invention which automatically permits de-energization and energization of equipment operable by the circuit. The circuit is illustrated in a block diagram form in Figure 1. The apparatus A comprises a transducer 10, such as microphone, or the like, designed to detect energy within the sonic or so-called acoustic wavelength range.

The analog circuit portion, designated by reference numeral 12, may or may not be deemed to include the transducer 10. The analog circuit portion 12 includes a gain amplifier 14 and a high impedence input preamplifier 16, although the latter is not absolutely necessary. The analog circuit portion 12 preferably includes a low pass filter 18 and a high pass filter 20. It is important that the analog circuit portion includes at least a gain amplifier.

The apparatus of the present invention also includes the digital circuit portion 22 comprising a pulse shaper, such as a Schmitt trigger inverter 24. This pulse shaper functions as a discretizer and enables the analog circuit portion to be directly coupled to the digital circuit portion 22. In this respect, the disretizer 24 may be considered to be part of the analog circuit portion, or the digital circuit portion, or considered a separate element..

The digital circuit portion 22 comprises a clock generator which is often referred to as a timer, such as an oscillator 26. The output of the oscillator 26 is introduced into a NOR gate 28 which serves to provide an input to and also receives a feedback from an internal timer 30 over a feedback circuit 32.

The output of the internal timer 30 is introduced through a switching circuit including an inverter 34 and an electrical switch, such as a relay 36. A load 38 is illustrated as being connected to a source of electrical power 40 through the electronic switch 36.

Each of the aforesaid components could be operated by a suitable power supply, as for example, a power supply 42 illustrated in Figure 1 of the drawings. This power supply could be an AC power source taken directly from the environment from which the apparatus is used, as for exampe, a 120 volt AC power source. A battery power source or the like, could be provided in order to enable portability of the apparatus.

Each of the aforesaid components forming part of the apparatus A of the present invention and which are shown somewhat schematically in Figure 1, are more fully illustrated in more detail in Figures 2 to 5 of the drawings.

The transducer 10 may be a microphone or other sound pick-up-device which is connected through a capacitor 44 to the adjustable gain amplifier 14. The capacitor 44 is designed to isolate the amplifier 14 from the microphone 10, and the latter of which has one terminal thereof grounded.

A feedback circuit 48 is connected to the output and one of the inputs of the amplifier 14 and includes a resistor 50 for biasing the amplifier and establishing a full open loop gain. An externally adjustable gain control potentiometer 52 is connected to the feedback circuit 48 to thereby enable external adjustment of the gain of the amplifier. A capacitor 54 of 6,000 microgarads is connected to the last mentioned input of the amplifier 14 for detecting a low frequency cutoff point of the amplifier as for example, a one thousand hertz cutoff point.

Connected to the output of the amplifier 14 is a voltage dividing circuit 56 comprised of a pair of resistors 58 and 60 and each of which have essentially the same value. Finally, connected between the resistors 38 and 60 of the voltage dividing circuit 56 is an amplifier output line 62. The voltage dividing circuit 56 is also designed to prevent overloading of the input. In the output line 62 is a filter 65 which may be a combination of a low gain filter and a high pass filter as heretofore described.

The amplifier 14 provides an open loop gain of approximately 320,000 and is designed to have a low frequency cutoff as aforesaid at approximately 3 dB frequency of approximately 500 Hz. which may be adjusted over a limited range by means of the potentiometer 52. The amplifier may be operated by a 15 volt power supply.

Figure 3 illustrates a modified form of analog circuit portion 12' and is comprised of a transducer such as a crystal microphone 10', similar to the microphone 10. A capacitor 44' couples the microphone 10' into an input amplifier stage 64 comprised of a preamplifier 66 having a resistive-feedback circuit 68. A potentiometer 70 is connected to the feedback circuit 68 and is also grounded through a capacitor 72. This potentiometer 70 is designed to provide adjustable gain from about 10 to about 100. The feedback circuit 68 contains a resistor 74, which in combination with a similar resistor 76, forms a voltage dividing network. The resistor 74 and the setting of the potentiometer 70 effectively determine the gain of the amplifier. The capacitor 72 is designed to provide an AC gain with a low frequency cut off at about 100 Hz.

The output of the preamplifier 66 is connected through a coupling capacitor 78 to a low pass filter 80 with linear phase characteristics and with a three decibel (break) frequency of 5 KHz. In one preferred aspect the cut-off slope would have a -20 decibel per decade starting at 10 KHz, thus providing attenuation abouve 8.5 KHz.

The output of the low pass filter 80 is introduced into a high pass filter 82, preferably configured as a high pass eliptic filter with a three decibel cut off (break) frequency of one thousand KHz. The cut off slope is again about -20 dB per decade at a frequency of about one KHz and in this way, is capable of providing effective low frequency attenuation. The combination of the low pass filter 80 and the high pass filter 82 effectively forms a band pass filter combination with a spectral bandwidth or response of about 6.5 KHz.

The output of the high pass filter is introduced into the gain amplifier 14 which is linear with a fixed gain of about 10.94.

The gain amplifier has an output connected to discretizer 24, which may be a Schmitt trigger inverter. The discretizer 24 operates as the interface between the analog and digital portions of the circuit and is designed to provide an output of rectangularly shaped pulses between about 0V and 10V from the analog output of the analog portion of the circuit, and also eliminates low level background noise within the spectral band of the circuit. The discretizer 24 is also provided with an output line 32 which is capable of being introduced into the digital circuit portion.

The potentiometer 70 is preferably externally located to enable a user to compensate for background noise and provide a desired degree of sensitivity. A light emitting diode 84 located at the discretizer would be turned off and on with respect to the sensitivity when the potentiometer 70 is adjusted so that, an optimum condition is achieved. The low pass filter is designed for a cut off at about 300 Hz although it could have a low cut off point as low as a 100 Hz. The high pass filter is designed with a cut off frequency of about 7.5 KHz although it could have a high cut off frequency as much as 20 KHz or greater.

The digital circuit portion 22 in one embodiment, is more fully illustrated in Figure 4. This circuit portion 22 in Figure 4 can also be referred to as a time delay and output circuit section and receives the output line 32 from the amplifier circuit portion or otherwise the output line 32' from the circuit portion 22'.

The time delay and output circuit 22 also comprises a first counter 90 having an output connected through an inverting NOR gate 92 to a second counter 94. The counters 90 and 92 are preferably solid state counters. However, one solid state counter could be substituted for the two counters 90 and 94.

The first of the counters 90 receives an input through a NOR gate 96 from a solid state timer 98. The NOR gate 96 can be considered to form part of the timer to constitute a timer circuit 100. The gate 96 serves as a disable gate in order to disable the counters.

The output of the timer 94 is connected to a decoder NAND gate 102 which serves as a decoder and allows the timer 94 to function as a divider by six counter. The output of the decoder gate 102 is connected through another NOR gate 104 to a third sold state counter functioning as a timer 106, and connected to the timer 106 is a manually operable solid state, programable timing switch 108 to permit external control over a predetermined time period which may be manually adjusted.

An output of the counter 106 is connected to a flip-flop 110 and also to part of a feedback circuit 112, including a NAND gate 114 which serves as an inverter or inverting gate. This gate 114 is connected to another NAND gate 116 and an inverting gate 118. The gate 116 receives an input from the flip-flop 116 and also from the output of the amplifier 38. The output of the gate 118 is introduced back into the third counter 106 in order to complete the feedback path. The flip-flop 110 has also one input to the NOR gate 96.

The output of the flip-flop 110 is connected through an inverting buffer amplifier 120 to a relay e.g., the electrical solid state switching relay 36. The relay is operable by means of an optically isolated triac 126 and is provided with output terminals 128 for connection to a suitable load 38.

The load 38 as indicated above, may adopt any electrically operable device or equipment, e.g. lights, air-conditioning equipment, etc. When the circuit detects sound over a certain level within a specified environment during or after a predetermined time period, it generates a signal which is an enable signal to operate the equipment and when no sound is detected in the environment during the time period, the relay cuts power to the equipment.

The discretizer 24 clears the first and second counters 90 and 94, respectively, and resets the third counter 96 and the flip-flop 110 as well as energizes the solid state relay 36. This decoder is capable of detecting for example, six counts and then shifts to a zero level. When the counter 106 reaches a maximum count, its output will shift to a zero level and thereby turns off the flip-flop 110 which, energizes the relay 36 effectively creating a disenable signal since the third counter 106 generates a signal which enables the clock through Nor gate 96. The disenable signal turns off the relay to discontinue power to the load.

The flip-flop 110 can turn on the solid state relay 36 and thereby functions as a latch. It is reset as soon as the noise is detected as being above the threshold level. Thus, the flip-flop 110 remains reset until the predetermined time period, set through the manually operable solid state time delay mechanism 58, has expired.

The first and second counters 90 and 94, the decoder gate 102, and the third counter 106 form an adjustable time delay circuit. The basic time-base is supplied by the timer 98. The count of the third counter 106 is set by the programable switch 108 which allows for the programable time delay. The output of the JK flip-flop 110 is set by the timing circuit which receives the output from the third counter 106. The setting of the flip-flop 110 disables the output from the timer 98, thus preventing the timer circuit from counting any further. The output of the JK flip-flop 110, when set, enables the output of the solid state relay 36 through the inverting buffer.

The entire system may be reset from the output of the discretizer 24. Whenever a signal which is above the Schmitt trigger threshold is received from the amplifier, all of the counters and the flip-flop 110 are reset to zero, thereby restarting the time delay. This action will also energize the solid state relay 36. The solid state relay 36 will only be in the "on" condition as long as noise levels from the amplifier are above the Schmitt trigger thresholds. During period of inactivity, and depending upon which time period has been selected, the timing circuitry will time-out, thereby setting the output of the flip-flop 110 and turning off the solid state relay 36.

Figure 5 illustrates a modified form of digital circuit portion 22 which receives an input over the output line from the discretizer 24 and which is introduced into a NOR gate 134, the latter of which also receives an input from a counter 136. The counter 136 is designed to replace the two counters 90 and 94 in Figure 4. The output of the inverted NOR gate 134 is directed to a second counter 138 and the latter, of which, functions in a manner similar to the counter 96. The counter 138 also functions as a timer and is provided with a timing switch 140 connected thereto.

The circuit 22 also employs a timer circuit 142 similar to the timer circuit 100. The timer circuit 142 includes a solid state timing chip 144 provided with a resistive-capactive network as illustrated. The output of the timing circuit 142 is directed to a NOR gate 146 which receives an input from a switching circuit 148. The output of the NOR gate 146 is introduced, as an input, into the first counter 136. Thus, the construction of the timing circuit 142 and the NOR gate 146 is similar to that of the counter 90 and the NOR gate 92.

The timer 142 is configured as an atable multivibrator with a rectangular output wave form, perferably between 0 and 10 volts and with a time period of about 6 seconds. The frequency of the timer is determined by a pair of resistors 149 and 150 in a voltage dividing network along with a capacitor 151. The output of the timer 142 through the NOR gate 146 is a compliment of the actual output of the timer 142 if the other input into the NOR gate were a low or logic zero level.

The output of the timer circuit 142 is introduced into the counter 136, preferably an a divide by ten up-counter. Thus, the counter 146 will produce an output after 10 counts (approximately 60 seconds) thereby causing the counter 138 to increment by one. The counter 138 is preferably a divide-by-sixteen up-counter. Certain inputs to the counter 138 are programable inputs from the timing switch 140, which can be adjusted to provide a time interval of about 1 to 15 minutes in units of one minute increments. The counter 138 actually begins a count with a number programmed by the switches 140 and always ends with the count of 15 or whatever is elected and preprogrammed as the highest number of a count.

The switching circuit 148 effectively operates as an output switching circuit and receives an output from the main timer 138 through an inverting NOR gate 150 and is comprised of a pair of JK flip-flops 152 and 154. These flip-flops 152 and 154 each provide electrical signals to one or more amplifiers 156 and 158 and which are connected to relays (not shown). When the flip-flops 152 and 154 are shifted to the set state, they will provide an electrical output signal which is amplified by the amplifiers 156 and 158 and this signal causes the electrically operable equipment to be de-energized.

A capacitor 160 is connected across the output of the NOR gate 134 and the input to the flip-flop 154 and is grounded. The capacitor 160 operates as a pulse stretcher and functions as a low pass filter. This prevents a narrow pulse from inadvertently triggering the apparatus and thus makes the apparatus more reliable.

When the counter 138 begins a count and ends with the highest number of count, a signal is transmitted to the JK flip-flop 152 in the output circuit 48 through a NOR gate inverter 150 which causes the JK flip-flop 154 to immediately set. A low level signal from the analog circuit portion immediately resets the counter 136 as well as each of the flip-flops 152 and 154. This same signal also presets the counter 138 in accordance with the code introduced by the manually operable switches 140.

The flip-flop 154 sets the flip-flop 152 and also acts as a 1-count delay during the timing period, that is the period before the counter 138 is reset and the flip-flop 152 is set. As the flip-flop 154 is set, its positive going output pulse goes high and the lower or negative going output pulse goes low. The positive going pulse causes the output of the NOR gate 150 to go low which preloads the counter 138 and also clears the flip-flop 154. The flip-flop 152, which may have already previously cleared, remains uneffected by this operation. Upon clearing the flip-flop 154, the lower or inverted pulse goes high which thereby sets the flip-flop 152. When the flip-flop 152 is set, its Q or positive output, that is the upper output, goes high which disenables the clock input from the counter 142 to the counter 136. Accordingly, any further counting is inhibited.

In accordance with the above outlined construction, a steady state condition then results with the count or both of the counters 136 and 138 being inhibited. The flip-flop 154 is set and the output of the flip-flop 152 is connected to the relay. This condition remains until a high level signal is received from the amplifier which will clear the counter 136, thereby preloading the counter 138. This will also clear both of the flip-flops and enable the clocking pulses from the timer 142 to further energize each of the relays.

CLAIMS:-

1. Apparatus for monitoring the presence of human activity in an environment comprising a passive sensing device responsive to energy resulting from such human activity and an output circuit generating signals controlled by the sensing device characterized by a counter connected to the sensing device and a clock generator supplying said counter, the counter being connected to count a predetermined time interval and to re-start the said interval whenever a signal is received from the sensing device, the output circuit being connected to the counter and constructed to control the supply of power to a load and to de-energize the load when no signal is received within the predetermined interval.

2. Apparatus as claimed in claim 1 wherein time delay control means is operatively connected to said counter to adjust the predetermined time interval.

3. Apparatus as claimed in claim 2 wherein the time delay control means is manually adjustable.

4. Apparatus as claimed in any of claims 1 to 3 comprising signal generating means operatively associated with said sensing device for generating a signal upon the detection of sound in the specified environment.

5. Apparatus as claimed in claim 4 including sensitivity control means operatively connected to said signal generating means to adjust and control the sensitivity of the apparatus to account for background noise.

6. Apparatus as claimed in claim 4 comprising logic circuit means operatively connected to said counter and output circuit to determine if there was no sound for at least the predetermined time interval, and causing said output circuit to provide a responsive action.

7. Apparatus as claimed in claims 4, 5 or 6 comprising low pass filter means for filtering out low frequency components of the signal and using a portion of the signal more representative of human activity.

8. Apparatus as claimed in any of the preceding claims wherein said passive sensing means senses for sound of the type associated with physical activity normally associated with the presence of a human being in a specified environment and thereby also recognizing a lack of such activity during a predetermined time interval without generating or relying upon a standing wave for such sensing, and which also does not rely upon generation of any signal by said apparatus to be introduced into said specified environment and which signal must be detected or interrupted in the specified environment for operation.

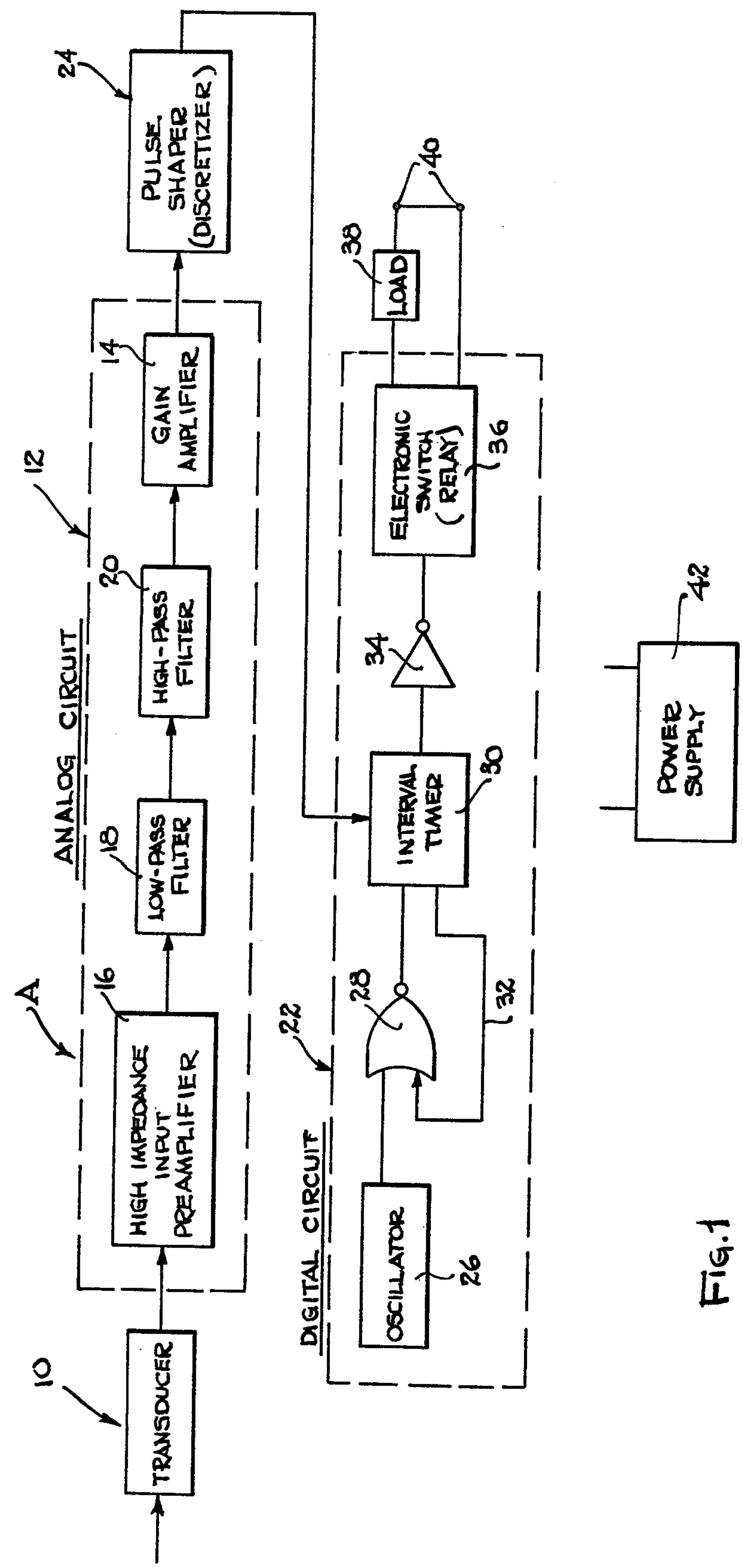
9. Apparatus as claimed in claim 8 wherein the output circuit comprises a relay means coupled to the electrically operable device and controls the electrical power delivered to the electrically operable device in response to the occurrance of the presence of a human being.

10. Apparatus as claimed in any of the preceding claims wherein said counter comprises:

(a) a first counter operatively connected to said clocking circuit means to initiate a counting operation upon detection of sound in said predetermined time interval in said specified environment, and

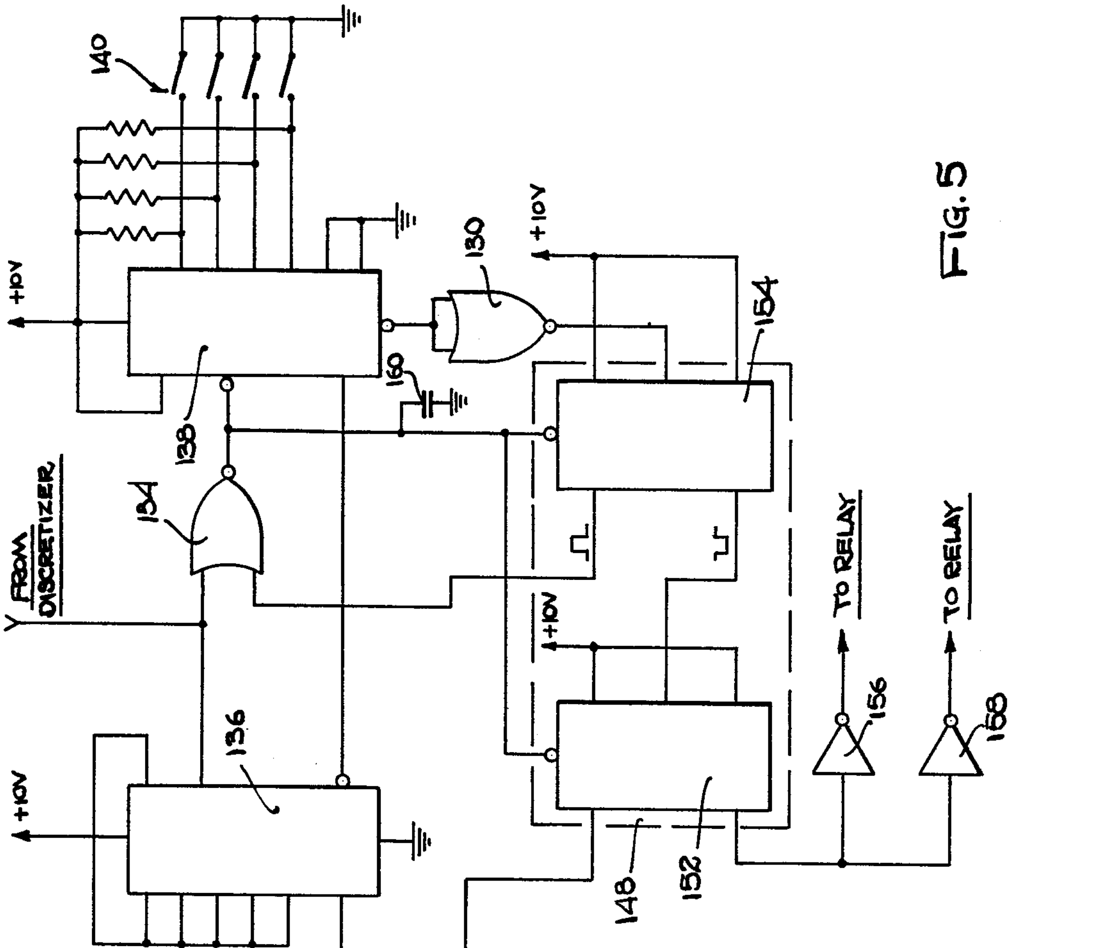
(b) a second counter operatively connected to said first counter to reset a counting operation in response to a lack of sound in said predetermined time interval.

11. Apparatus as claimed in claim 10 wherein the first counter provides a rectangular wave determining a count period, for example one second, and the second counter is configured to count to a certain modulo number, for example six.

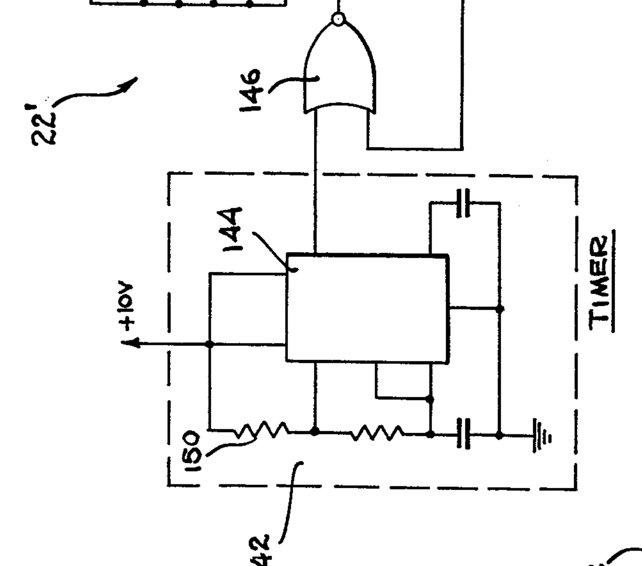


TRANSDUCER
10
A
HIGH IMPEDANCE INPUT PREAMPLIFIER
16
LOW-PASS FILTER
18
HIGH-PASS FILTER
20
GAIN AMPLIFIER
14
ANALOG CIRCUIT
12
PULSE SHAPER (DISCRETIZER)
24
DIGITAL CIRCUIT
22
OSCILLATOR
26
28
32
INTERVAL TIMER
30
34
ELECTRONIC SWITCH (RELAY)
36
LOAD
38
40
POWER SUPPLY
42

FIG.1

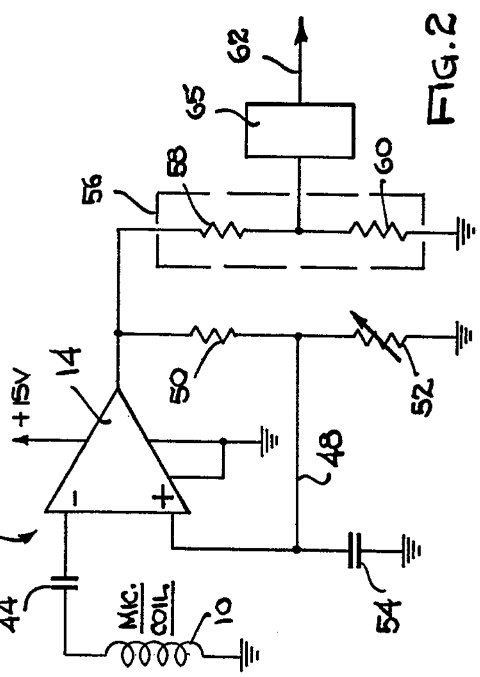


+10V
140
130
154
138
160
134
FROM DISCRETIZER
TO RELAY
TO RELAY
136
156
158
148
152



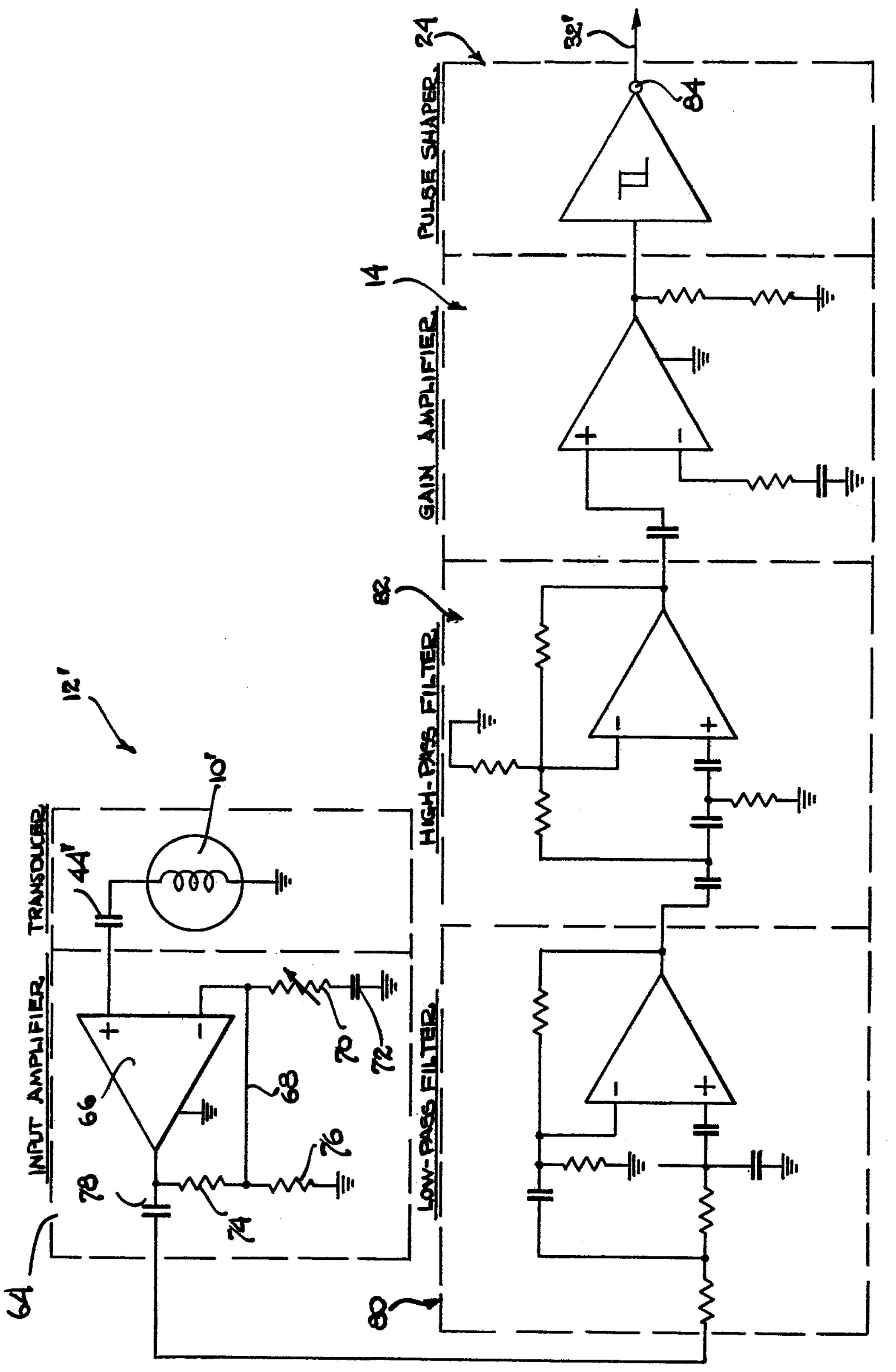
22'
146
144
TIMER
+10V
150
142

FIG. 5



62
65
56
58
60
+15V
14
50
52
48
12
44
MIC. COIL
10
54

FIG. 2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GAIN AMPLIFIER
HIGH-PASS FILTER
LOW-PASS FILTER
INPUT AMPLIFIER
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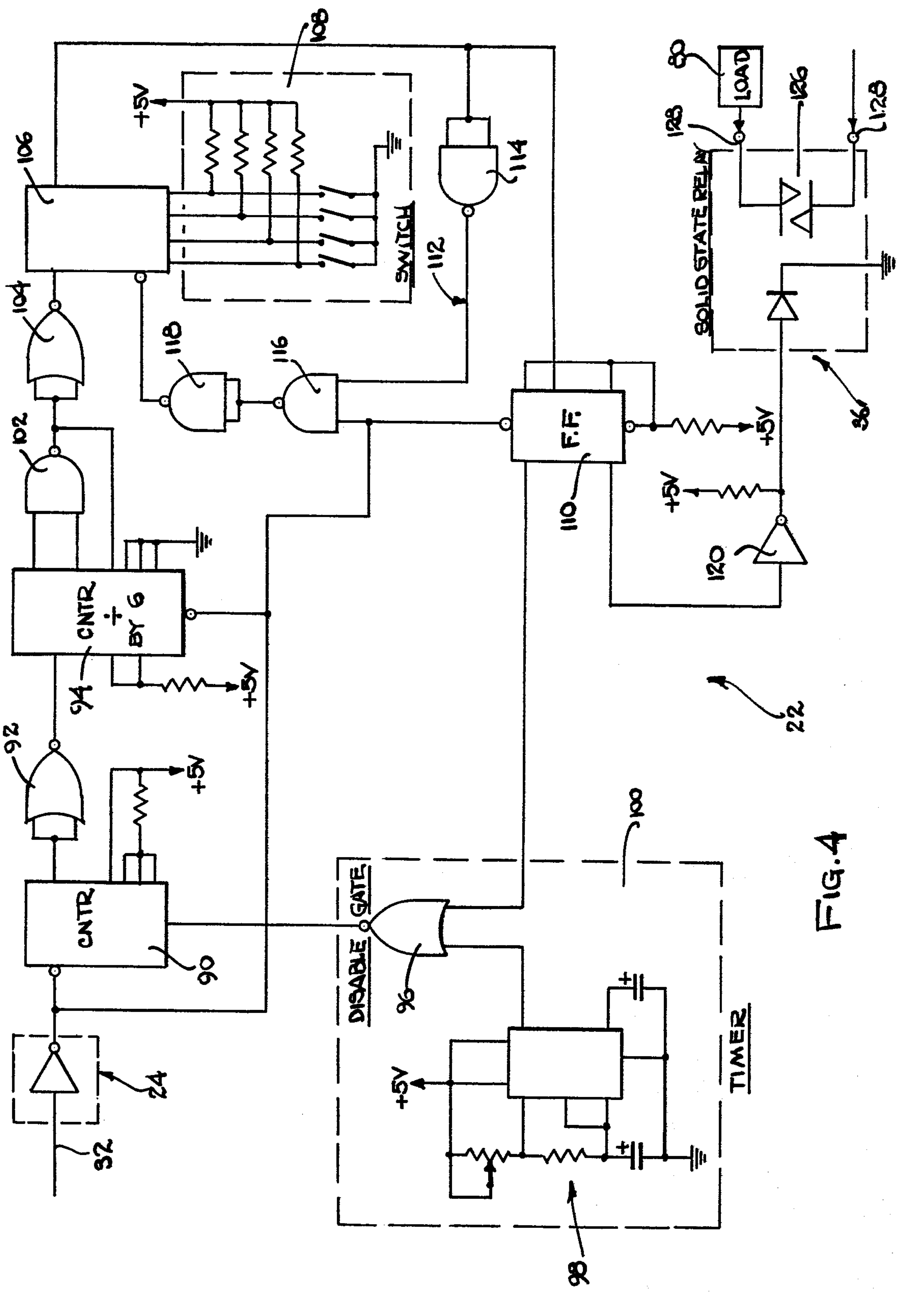
FIG. 3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92
CNTR
90
24
32
DISABLE GATE
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TIMER
98
100
F.F.
110
120
LOAD
80
126
128
SOLID STATE RELAY
36
22

FIG.4

0093810

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 82 30 2319

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Y	US-A-4 012 732 (HERRICK) *The whole document*	1,9	G 08 B 13/16 G 08 B 21/00
Y	US-A-4 151 515 (PEASE et al.) *Claims 1-5,13*	1,9	
D,Y A	US-A-4 099 168 (KEDJIERSKI et al.) *Claims*	1,4,5, 7-9	
A	US-A-3 982 238 (BYERS) *Claims*	1-3	
A	FR-A-2 357 017 (FICHTNER) *Claim 1*	1	
A	US-A-3 764 832 (STETTNER) *Column 2, lines 17-60*	1-5	

TECHNICAL FIELDS SEARCHED (Int. Cl. 3)

G 08 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-01-1983	REEKMANS M.V.

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