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EP A2 0072342

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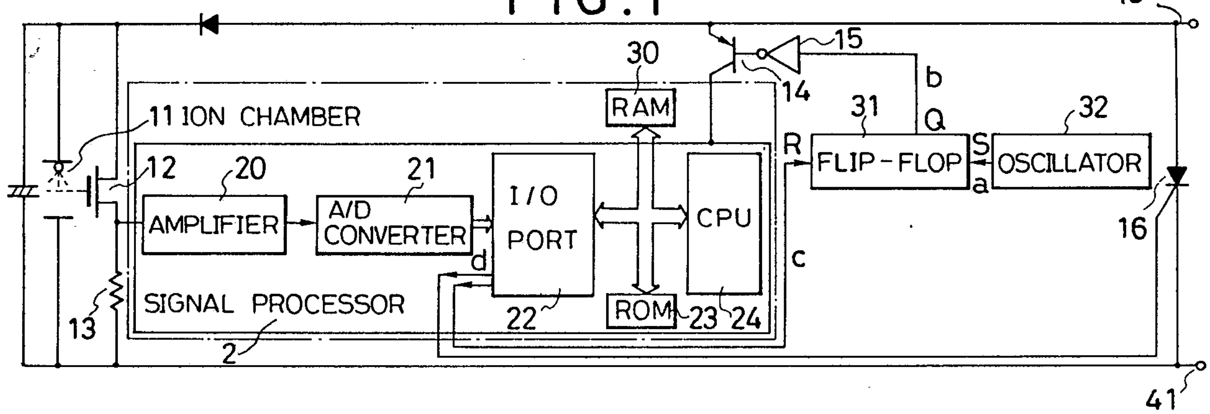
G1N
Selected US specifications from IPC sub-class G08B

(54) Environmental abnormality detection apparatus

(57) The apparatus includes a detection portion 11, 12, 13 for detecting a phenomenon such as a fire or gas leakage and a signal processor 2 constituted by a microcomputer or the like for determining whether an environmental abnormality has occurred in accordance with a detection signal from the detection portion and for generating an alarm signal when the abnormality occurs. A power source control circuit 14, 15, 31, 32 is provided intermittently to supply power to the signal processor and to stop power the supply in accordance with a signal processing end signal from the signal processor. This circuit comprises a transistor 14 which is intermittently turned-on via an oscillator 32, a flip-flop 31 and an inverter 15 to supply power to the processor. Each time the processor is so supplied, it processes the signal from the detector and, at the end of processing, it applies the processing end signal to reset the flip-flop and turn-off the transistor. The transistor is turned-on again in response to the next pulse from the oscillator.

FIG. I



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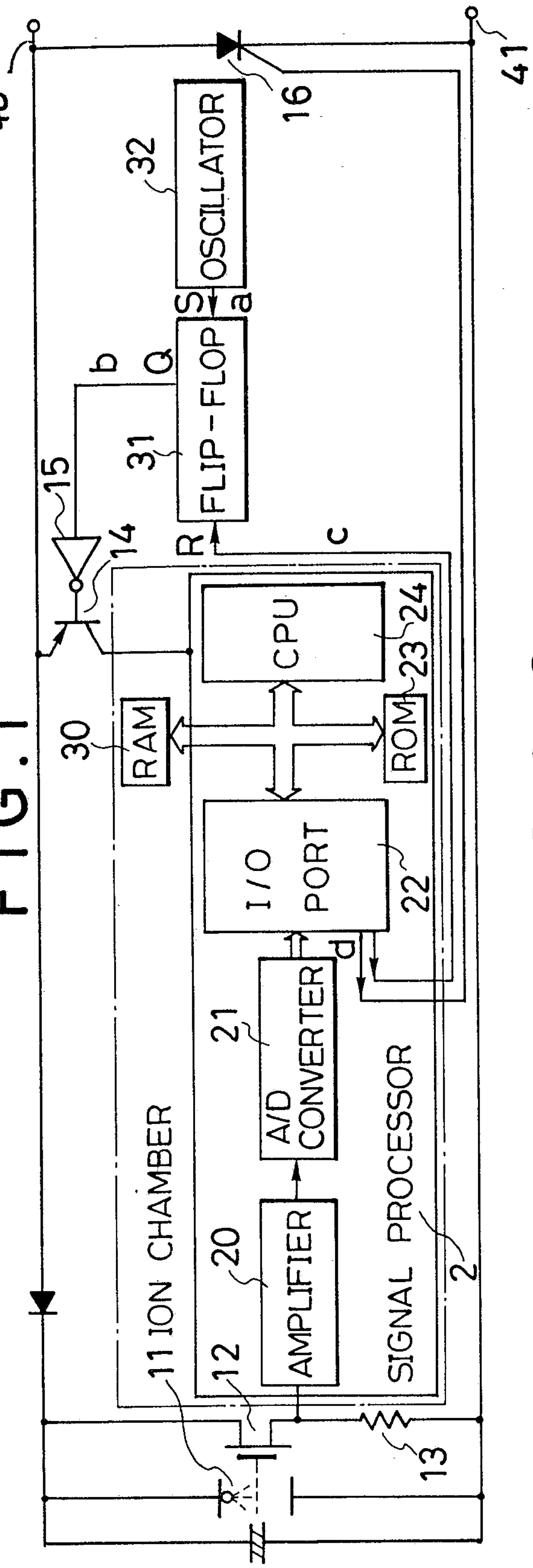
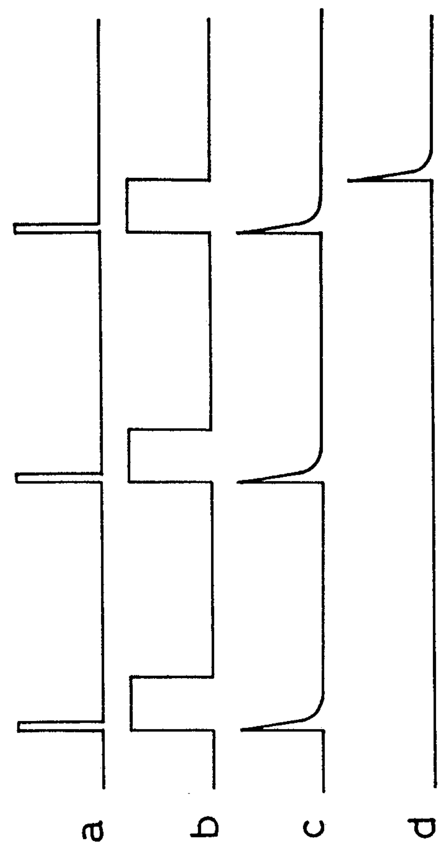
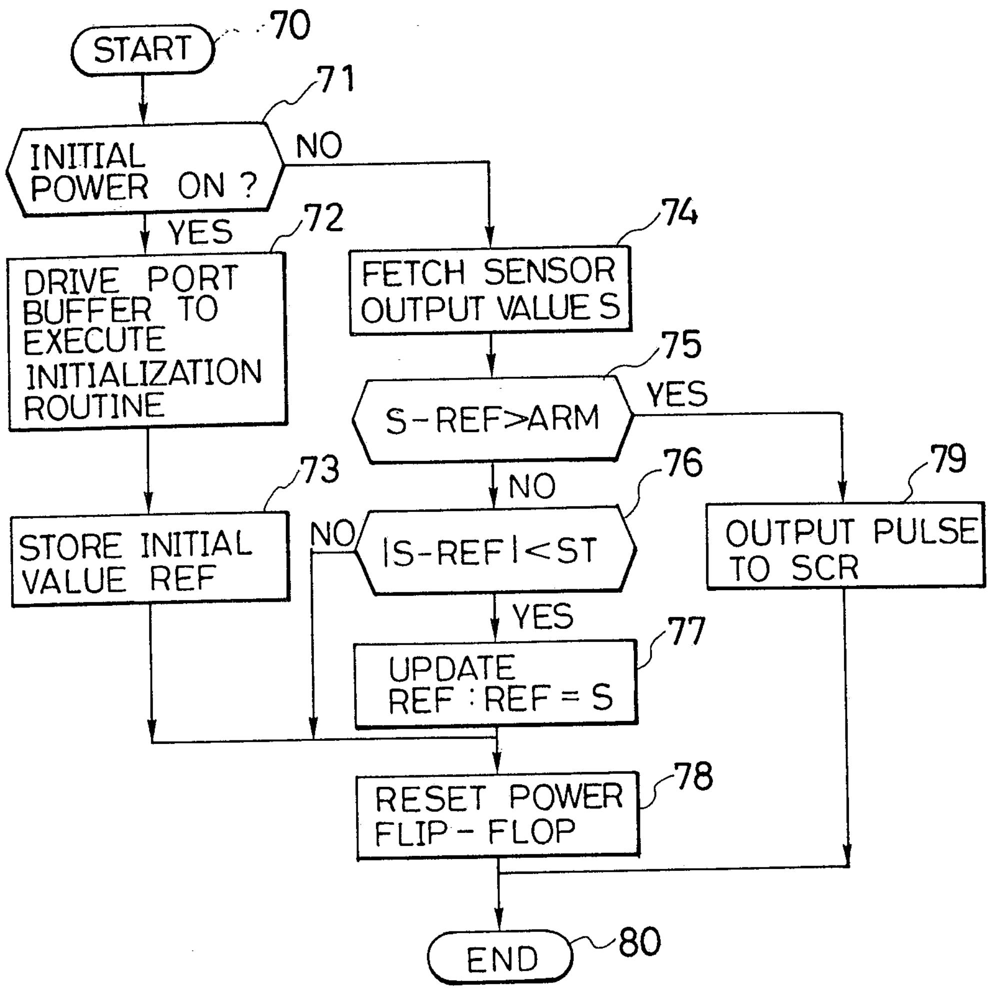

40
41
16
32
OSCILLATOR
S
a
Q
b
FLIP-FLOP
31
15
14
R
c
CPU
24
23
ROM
30
RAM
I/O
PORT
22
d
A/D
CONVERTER
21
AMPLIFIER
20
11 ION CHAMBER
12
SIGNAL PROCESSOR
2
13

F I G . 1


a
b
c
d

F I G . 2

FIG.3


START
70
71
INITIAL POWER ON ?
NO
YES
72
DRIVE PORT BUFFER TO EXECUTE INITIALIZATION ROUTINE
74
FETCH SENSOR OUTPUT VALUE S
75
S-REF>ARM
YES
73
STORE INITIAL VALUE REF
NO
76
NO
|S-REF|<ST
79
OUTPUT PULSE TO SCR
YES
77
UPDATE REF : REF = S
78
RESET POWER FLIP-FLOP
END
80

SPECIFICATION

Environmental abnormality detection apparatus

The present invention relates to an environmental abnormality detection apparatus used in an alarm device for detecting fires, gas leakages, or the like.

A conventional fire detector using a microcomputer in a signal processor for improving reliability is disclosed in Japanese Patent Disclosure (Kokai) No. 60-164896. In addition, a fire alarm device constituted by a receiver and a plurality of fire detectors has been designed to minimize the monitoring current of each fire detector so as to reduce the entire power consumption.

The incorporation of a microcomputer in an environmental abnormality detection apparatus such as a fire detector gives rise to a highly reliable device which is suitable for applications where alarm errors are not often generated. However, a microcomputer requires large power consumption regardless of whether it executes processing or not. Even a microcomputer using a CMOS requires several mA which is several hundred times that of a conventional fire detector.

According to this invention, there is provided an environmental abnormality detection apparatus comprising:

a detection portion for detecting a phenomenon such as a fire or gas leakage;

a signal processor, for example a microcomputer, for determining whether an environmental abnormality has occurred in accordance with a detection signal from said detection portion and for generating an alarm signal when an abnormality occurs, and

a power source control circuit provided intermittently to supply power to said signal processor and to stop said power supply in response to a signal processing end signal from the signal processor.

The disclosed embodiment of the present invention provides an environmental abnormality detection apparatus wherein monitoring current consumption may be minimized or at least reduced. Furthermore, in the disclosed embodiment, optimal conditions may be set and variations in detection may be less.

The invention will now be described by way of non-limiting example, reference being made to the accompanying drawings, in which:—

Figure 1 is a block diagram of an embodiment of an environmental abnormality detection apparatus of the present invention;

Figure 2 is a timing chart for explaining an operation of the detector in Fig. 1; and

Figure 3 is a flow chart of the detector in Fig. 1.

Fig. 1 is a block diagram of environmental abnormality detection apparatus of an embodiment of the present invention. The environmental abnormality detection apparatus shown in Fig. 1 is an ionization smoke detector, terminals 40 and 41 of which are connected to a pair of transmission lines extending from a central monitor device (not shown). The ionization smoke detector includes a detection portion, a signal processor 2 and a power control circuit. The detection portion consists of an ion chamber 11 which is ionized by a radiation source, a field effect transistor 12 for converting the impedance of the intermediate electrode of the ion chamber 11, and a resistor 13 for extracting the output from the field effect transistor 12. The signal processor 2 consists of an amplifier 20; an A/D converter 21; and I/O port 22; a RAM (Random Access Memory) 30; a ROM (Read Only Memory) 23, and a CPU 24. The power control circuit consists of a transistor 14; an inverter 15; a flip-flop 31; an oscillator 32, and an SCR 16 operable to short-circuit a pair of transmission lines with a low impedance. The oscillator 32, the flip-flop 31, the inverter 15, and the RAM 30 are continuously supplied with power through a stabilized power source circuit (not shown).

The operation of the ionization smoke detector having the above arrangement will be described below with reference to the timing chart shown in Fig. 2. The oscillator 32 continuously outputs a pulse signal *a* of a predetermined cycle as shown in Fig. 2. The pulse signal *a* is input to the set terminal S of the flip-flop 31. When the flip-flop 31 is set, it sets the Q output *b* at High level. Therefore, the output from the inverter 15 goes to Low level to cause a predetermined current to flow to the base of the transistor 14 so as to turn it on. At this time, power is supplied to the signal processor 2 through the transistor 14. When the CPU 24 of the signal processor 2 is supplied with power, it executes programs stored in the ROM 23 starting from the beginning. On the other hand, a voltage proportional to the smoke concentration detected in the ion chamber 11 is output across the resistor 13. The smoke detection operation in the ion chamber 11 is the same as that of a conventional ionization smoke detector, and a detailed description thereof will not be given. The detection voltage is amplified to a predetermined level by the amplifer 20, A/D-converted by the A/D converter 21, and then input to the I/O port 22. The CPU 24 determines whether an abnormality (fire) has occurred in accordance with past data stored in the RAM 30 and currently fetched data (smoke concentration). If the CPU 24 determines that no abnormality has occurred, it outputs a signal processing end signal *c* at the reset terminal R of the flip-flop 31 through the I/O port 22. When the flip-flop 31 is reset, it sets the Q output *b* at Low level. The output from the inverter 15 goes to High level to turn off the transistor 14, so that the signal processor 2 is no longer supplied with power. Then, a pulse is output from the oscillator 32 again after a predetermined time, and the signal processor 2 is supplied with power to execute a monitoring operation. Thus, the monitoring operation is executed every few seconds in a normal monitoring state. If the signal processor 2 determines that an environmental abnormality has occurred, an alarm signal *d* is output from the I/O port 22. The alarm signal *d* is applied to the gate of the SCR 16 to energize it so that terminals 40 and 41 are connected with a low impedance and so that the operation state of the detector can be output to the outside.

When the CPU determines whether an environmental abnormality has occurred, higher complexity processing may require further information such as past data (history data) and a time interval. When history data must be stored, the RAM 30 must be continuously supplied with power. However, when history data is not necessary, the RAM 30 need only be applied with power when the CPU 24 operates.

A fire alarm device can generally monitor a fire if a monitoring operation is executed every few seconds. In addition, if signal processing is executed by a microcomputer, the processing time becomes very short although it differs case by case, and the power supply is stopped at the same time as the signal processing is completed, resulting in efficient saving of energy.

An example of a program of the signal processing will now be described below with reference to the flow chart shown in Fig. 3. In step 70, a power source is turned on. In step 71, the CPU determines whether the power on is an initial power on, on the basis of the presence or absence of a password which is registered in the RAM. If YES in step 71, the flow advances to step 72, and if NO in step 71, the flow advances to step 74. In step 72, the port, the buffer, and the like are driven to execute the initialization routine. At the same time, the password is registered. In step 73, a sensor (smoke detection) output value S is fetched and an initial value REF is stored in the buffer. Then, the flow advances to step 78.

In step 74, the sensor output value S is fetched. In step 75, the CPU determines whether the sensor output value S exceeds the initial value REF by an amount greater than a predetermined alarm value ARM. If YES in step 75, the flow advances to step 79, and if NO in step 75, the flow advances to step 76. In step 79, a pulse (alarm signal) is output to the SCR to trigger it. In step 76, the CPU determines whether the difference between the sensor output value S and the initial value REF falls within a predetermined range ST. If YES in step 76, the flow advances to step 77, and if NO in step 76, the flow advances to step 78. In step 77, the initial value REF is updated to be the new sensor output value S. In step 78, the signal processing end signal for resetting the flip-flop is output. In step 80, the signal processing is ended and the power source is turned off. As described above, according to this program, the initial value REF as a reference value is initialized during initial power on (e.g. installation of the detector), and is automatically corrected thereafter during the monitoring operation to compensate for variation over time.

As has been described above, since the above embodiment of environmental abnormality detection apparatus uses a microcomputer for the signal processing for determining environmental abnormalities, optimal conditions can be set, and variations in intelligent sensors can be minimized. In addition, power is supplied to the signal processor only for a processing time, resulting in lower power consumption.

CLAIMS

1. An environmental abnormality detection apparatus comprising:

a detection portion for detecting a phenomenon such as a fire or gas leakage;

a signal processor, for example a microcomputer, for determining whether an environmental abnormality has occurred in accordance with a detection signal from said detection portion and for generating an alarm signal when an abnormality occurs, and

a power source control circuit provided intermittently to supply power to said signal processor and to stop said power supply in response to a signal processing end signal from the signal processor.

2. Apparatus according to claim 1, wherein said power control circuit comprises: an oscillator; a flip-flop, a set terminal of which is connected to an output terminal of said oscillator; an inverter which is connected to a Q output terminal of said flip-flop; and a transistor, a base of which is connected to the output terminal of said inverter, and a collector of which is connected to said signal processor.

3. An apparatus according to claim 1 or claim 2, which includes a random access memory for storing data output from said signal processor, said random access memory being continuously supplied with power and not through said power source control circuit.

4. An environmental abnormality detection apparatus substantially as hereinbefore described with reference to, and as illustrated in, any of the accompanying drawings.

5. Any and all novel features and combinations and subcombinations thereof disclosed herein.

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