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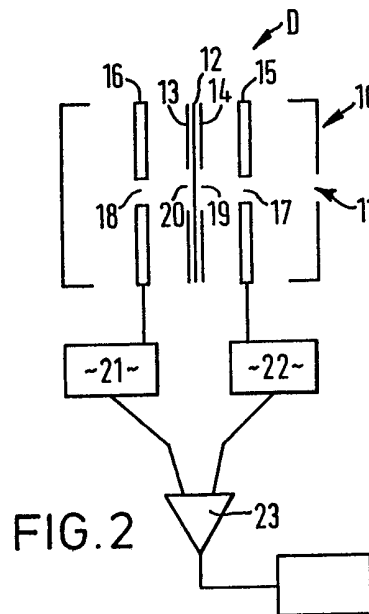
(52) Domestic classification
G4N 1A 1P 2F 4J 4S 5A CA EA FE

(56) Documents cited
None

(58) Field of search
G4N

(54) Detecting intruders

(57) An intruder detection system is arranged to measure ambient air pressure in an enclosed space at frequent periodic intervals and to actuate an alarm when the sensor measures an ambient air pressure at a value substantially different from a reference value, which reference value is arrived at on the basis of the historical measured values themselves. The system therefore self compensates for natural slow changes in ambient air pressure.



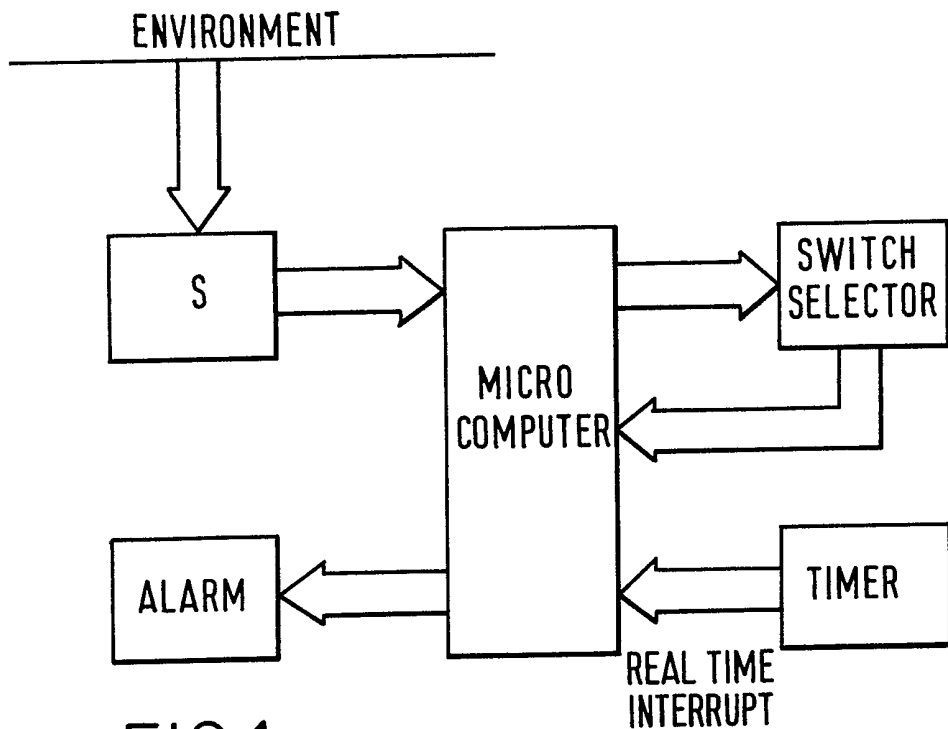


FIG.1

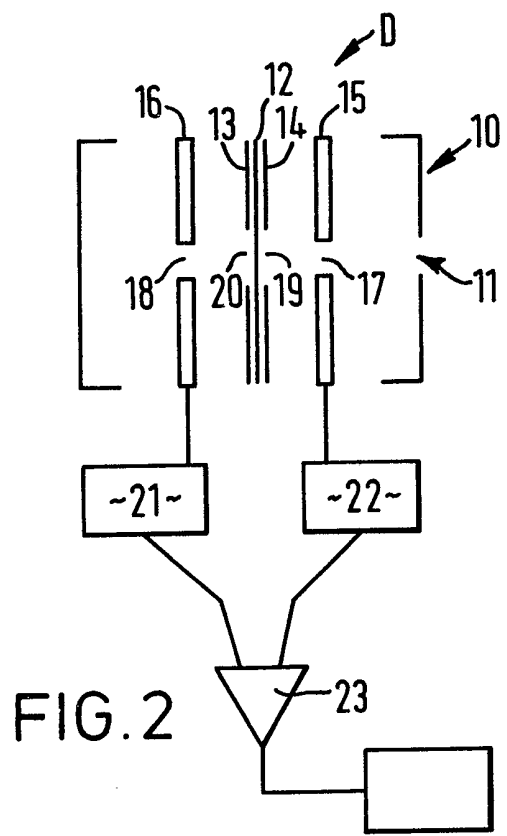


FIG.2

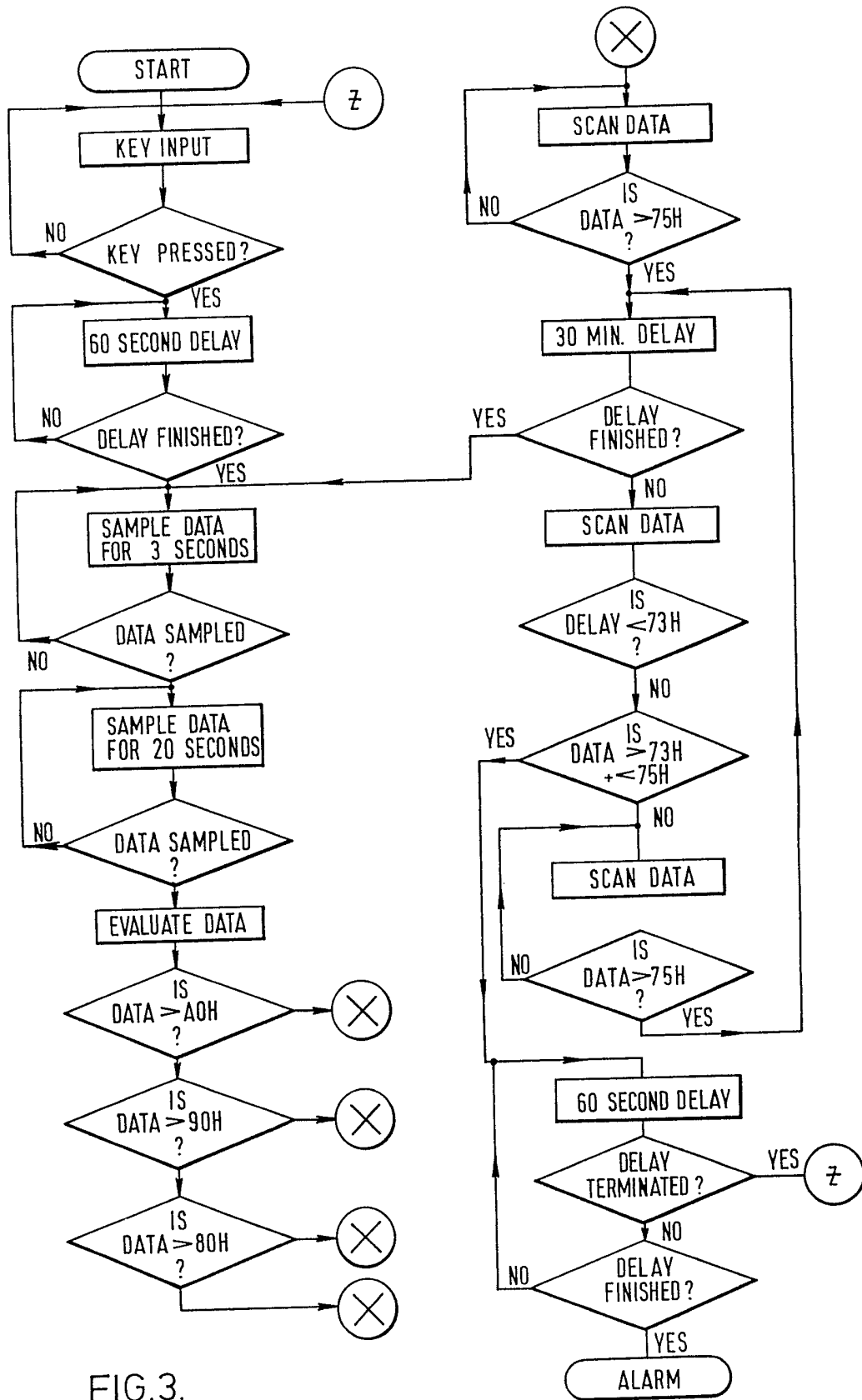


FIG.3.

SPECIFICATION

Detection and alarm system

5 The invention relates to a detection and alarm system, and in particular to a system designed to protect an enclosed space and give warning that the space has been penetrated by an introducer. The space may be a domestic or commercial building, room, safe, vault, etc.

10 It is one object of this invention to provide an improved alarm system which operates on the basis of measuring changes in pressure in the confined space and actuates an alarm when a change in pressure above a predetermined level is detected. It is another object to provide an alarm system that can operate in the absence of pressure foot pads and is of improved reliability and convenience.

20 According to one aspect of the invention there is provided a detection system comprising

- (i) a sensor adapted to measure ambient air pressure in an enclosed space,
- (ii) means for causing the sensor to measure the ambient air pressure at predetermined intervals, and to determine a reference value according to the measurement made, and
- (iii) means to actuate an alarm when the sensor measures an ambient air pressure at a value substantially different from the reference value.

30 Typically, the reference value will be a narrow range of values and the system will include a number of scanning reference value ranges. By providing a range of scanning programmes and monitoring the ambient air pressure, the physical changes due to weather conditions are prevented from affecting the reference value and in this way false alarms are reduced.

40 In a much preferred aspect, there is provided a detection and alarm system for use in an enclosed space, comprising, in combination:

- a switch to actuate and deactivate the system,
- a sensor operating by a capacitive effect and arranged to measure small changes in ambient air pressure,
- a microcomputer having a number of scanning programs, each scanning program having a reference value of a narrow range of air pressures; and
- a selection program to select one of the scanning programs, the selection program being arranged to select a scanning program according to the ambient air pressure first measured, the microcomputer being arranged to (i) cause the sensor to measure the ambient air pressure at frequent time intervals and compare the measurement with the reference value of the selected scanning program,
- (ii) to actuate the scanning selection program at less frequent intervals and, if necessary, to select another scanning program according to the measurement made, and, means for actuating an alarm if the measured ambient air pressure differs from the reference value of the scanning program in use.

65 In a much preferred feature, the sensor is arranged to operate by a capacitive effect and

70 comprises a metal box housing a metal diaphragm, a capacitive plate on each side of the diaphragm, a printed circuit board on the side of the plate remote from the diaphragm, a relatively small air inlet on one side wall of the box, a similar hole in each printed circuit board, and relatively large holes in the plates, the holes all being in substantially axial alignment, the electrical output signals from the boards being sensed by respective integrated circuits and fed to a comparator to provide an analogue signal which is then converted to a digital signal. The opening may be about 7 mm in diameter and the holes in the printed circuit boards may be about 3 mm in diameter and those in the plates may be 80 mm in diameter.

80 In order that the invention may be well understood, it will now be described with reference to the accompanying diagrammatic drawings, in which

- 85 *Figure 1* is block diagram of the system,
- Figure 2* is a side sectional view of the sensor, and
- Figure 3* is a scheme outline of the program of the system.

90 The system of the invention comprises a micro-computer. A central processing unit and peripheral interface adaptor are used. The diagram of *Figure 1* illustrates the transfer of control between the modules. The structure of the sensor *S* is shown in *Figure 2*. The sensor comprises a metal case 10 having an opening 11 in one side wall. The box houses at its centre a diaphragm *D* comprising an aluminium foil 12 between two tin plates 13, 14. Between the diaphragm and the box sides are two printed circuit boards 15, 16 respectively. Each printed circuit board 15, 16 has a hole 17, 18 respectively in axial alignment with the air opening 11. The tin plates 13, 14 also have holes, 19, 20 in axial alignment but these are relatively much larger.

105 Each printed circuit board 15, 16 is in circuit with an integrated circuit 21, 22 respectively and the outputs from these lead to an IC23 which acts as a comparator which generates an analog voltage. This output is converted by a chip to digital form which is then strobed through the chip P10 at about 50 readings/ second.

115 The sensor *S* operates as follows. When the ambient air pressure is stationary, the diaphragm is at rest. The system is thus working at 10 volts, and a control voltage of 5 volts appears as the output of the differential amp. If the air pressure changes suddenly, e.g. a door in the enclosed space opens, the diaphragm will be caused to move relative to the plates and printed circuit boards. This causes a change in voltage reading and a change in the differential amp output which will be fed into the central processing unit via the peripheral interface adaptor. This change will occur both when the diaphragm is moved towards and away from the blind end wall of the box. The sudden change in voltage signal causes the central processing unit data reading to actuate the alarm via the processor.

120 125 130 The method of operation is shown more sche-

matically in Figure 3.

Activation of the system is effected by use of customised code. The program then searches for an A input to start the main program. There is a built in delay of 60 to 120 seconds to enable the user to vacate the premises, if appropriate. Then a monitor section is actuated constantly to read the atmospheric pressure over a 20 second period and enables the selection of one of four scanning programmes which will work in the required range.

The selection programme scans the atmosphere within its set range a minimum of 50 times a second.

Every 30 minutes the programme loops back to select a program and after measuring the immediate pressure a scanning programme is again selected. Fluctuations occurring outside the range of the selected scan programme will cause the alarm to activate after a delay of 60 to 120 seconds, which allows the use to re-enter the premises. The alarm can only be deactivated by use of the customised code.

CLAIMS

1. A detection system comprising
 - (i) a sensor adapted to measure ambient air pressure in an enclosed space,
 - (ii) means for causing the sensor to measure the ambient air pressure at predetermined intervals, and to determine a reference value according to the measurement made, and
 - (iii) means to actuate an alarm when the sensor measures an ambient air pressure at a value substantially different from the reference value.
2. A system according to Claim 1, wherein the reference value is a narrow range of values and the system includes a number of scanning reference value ranges so that physical changes due to weather conditions are prevented from affecting the reference value.
3. A detection and alarm system for use in an enclosed space, comprising, in combination:
 - a switch to actuate and deactuate the system,
 - a sensor operating by a capacitative effect and arranged to measure small changes in ambient air pressure,
 - a microcomputer having a number of scanning programs, each scanning program having a reference value of a narrow range of air pressures; and
 - a selection program to select one of the scanning programs, the selection program being arranged to select a scanning program according to the ambient air pressure first measured,
 - the microcomputer being arranged to (i) cause the sensor to measure the ambient air pressure at frequent time intervals and compare the measurement with the reference value of the selected scanning program, (ii) to actuate the scanning selection program at less frequent intervals and, if necessary, to select another scanning program according to the measurement made, and, means for actuating an alarm if the measured ambient air pressure differs from the reference value of the scanning program in use.

4. A system according to any preceding Claim, in which the sensor is arranged to operate by a capacitative effect.

5. A system according to Claim 4, in which the sensor comprises a metal box housing a metal diaphragm, a capacitative plate on each side of the diaphragm, a printed circuit board on the side of the plate remote from the diaphragm, a relatively small air inlet in one side wall of the box, a similar hole in each printed circuit board, and relatively large holes in the plates, the holes all being in substantially axial alignment, the electrical output signals from the boards being sensed by respective integrated circuits and fed to a comparator to provide an analogue signal which is then converted to a digital signal.

6. A system according to Claim 5, wherein the opening in the housing side wall is about 7 mm in diameter and the holes in the printed circuit boards may be about 3 mm in diameter and those in the plates may be 80 mm in diameter.

7. A system according to any of Claims 3 to 6, in which a program is arranged to scan the atmosphere within its set range a minimum of about 50 times per second.

8. A system according to any of Claims 3 to 7, in which the selection program is arranged to measure the air pressure at intervals of about 30 minutes and thereafter to select a scanning program.

9. A detection system substantially as described with reference to Figures 1, 2 or 3 of the drawings.

10. A domestic or commercial building incorporating a system according to any preceding Claim.