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[54] **AUDIBLE SIGNALING DEVICE FOR A COMPUTER**

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[52] **U.S. Cl.** ..... **340/228 S**; 340/328; 250/215

[51] **Int. Cl.**[2] **G08B 21/00**

[58] **Field of Search** ..... 340/251, 228 S, 328, 266; 250/567, 215

[56] **References Cited**

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[57] **ABSTRACT**

An audible signaling device adapted to monitor and sense light indications from illuminated computer halt codes, and illuminated display buttons. The occurrence of any of the above conditions is detected with one or more phototransistors positioned relative to the visual indications and the signal is electronically converted to a short tone with visual indication or to a continuous tone to audibly alert an operator of the system that the computer has halted operation.

14 Claims, 3 Drawing Figures

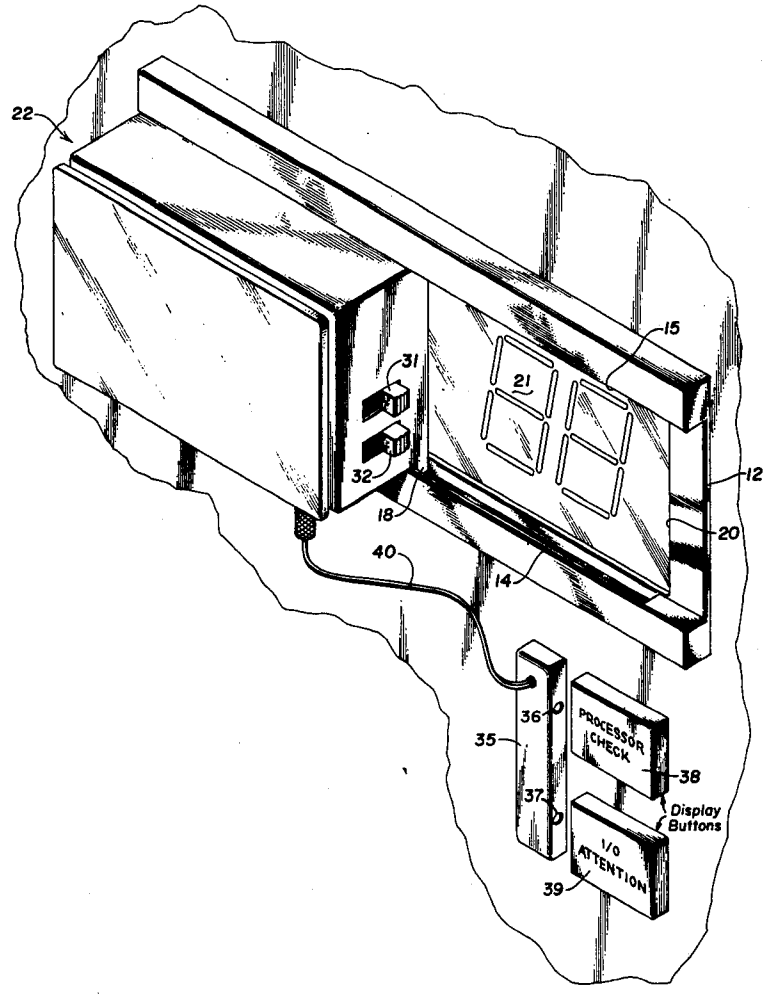


Fig. 1

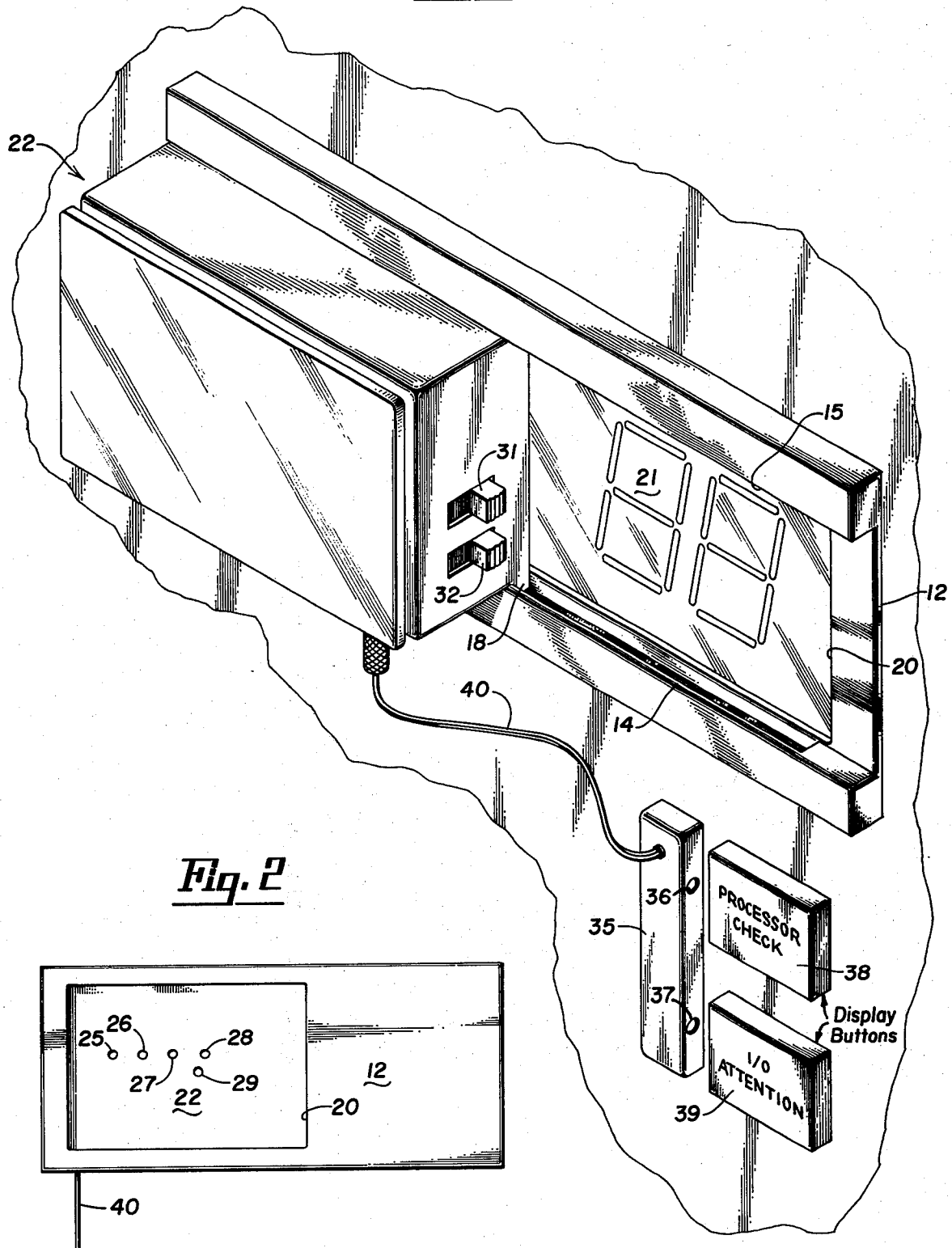
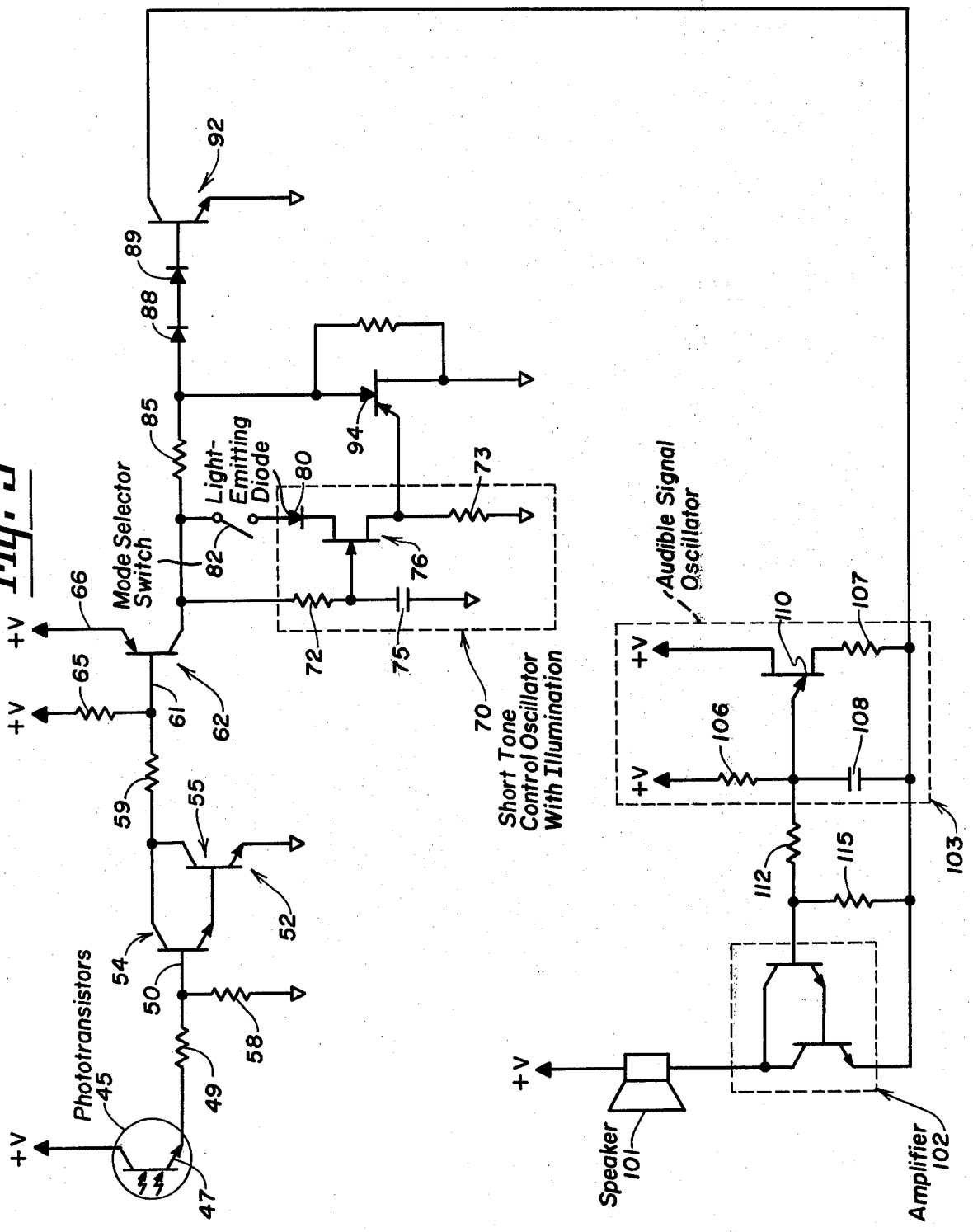

22
15
31
21
32
12
18
20
40
14
36
35
PROCESSOR CHECK
38
37
Display Buttons
I/O ATTENTION
39

Fig. 2

26
25
28
27
29
22
12
20
40
35

Fig. 3


+V
Phototransistors
45
47
49
50
54
55
52
58
59
61
62
65
66
Mode Selector Switch
82
Light-Emitting Diode
80
85
88
89
92
94
72
75
76
73
70
Short Tone Control Oscillator With Illumination
Audible Signal Oscillator
106
107
108
110
112
115
103
Speaker
101
Amplifier
102

AUDIBLE SIGNALING DEVICE FOR A COMPUTER

BACKGROUND OF THE INVENTION

The IBM System 3 computer is a popular and commercially successful computer. It is virtually automatic requiring only minimum attention by an operator to start and stop the system. In addition, only a minimum of effort and attention is required to care for the system in the event the computer stops for a specific programmed purpose or the system halts for a variety of unprogrammed reasons.

The System 3 computer currently gives a visual indication of having halted, either through a display window or by lighting two buttons designated "Processor Check" or "I/O Attention."

However, the unfortunate situation occasionally occurs that the operator of the system is performing another assignment and not monitoring the visual display. Consequently, substantial computer time may be lost with the consequential economic losses attendant therewith.

SUMMARY OF THE INVENTION

The present invention is designed to eliminate the attendant economic loss and loss of time which occurs with a System 3 halt. The invention is adapted to be positioned relative to the System 3 display window to monitor any halt code. Also provided are detectors to detect the occurrence of illumination of the "Processor Check" read-out and the "I/O Attention" read-out. The monitoring is accomplished by seven phototransistors in parallel, the signal from any one of which is amplified to provide an audible tone alerting the operator that a halt has occurred.

The tone can be continuous or short depending on which mode of operation is selected. In the event the short tone mode of operation is elected, after the short tone a light emitting diode is illuminated and may be flashed with a relaxation oscillator to indicate that a halt has occurred. Upon hearing the tone and noticing the halt light, the operator can slideably move the detection device to read the video display of where the halt occurred.

If the continuous tone mode of operation is selected a tone is produced upon the halt and continues until it is turned off by the operator or until the halt is resolved. In the same manner as above the operator can then check the video display window to determine where the halt has occurred or perform the appropriate function if the processor check or I/O attention displays are illuminated.

Thus, an operator may be utilized to perform a plurality of duties while system programs are operating. While doing so he can have assurance that in the event the system ceases to operate or halts that he will be immediately alerted so that he can make maximum utilization of computer time.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of our invention affixed to an IBM System 3 computer wherein the detecting unit is slideably positioned adjacent the visual display window so that the operator can read the halt code.

FIG. 2 is a rear view of our invention mounted in its normal operating position so that the detector unit is positioned over the visual display window of the IBM System 3 computer with five phototransistors positioned to detect the occurrence of a visual halt signal; and

FIG. 3 is a schematic diagram of the electronic portion of my invention which is utilized to detect the occurrence of halt codes and create the audible signal to alert the operator that a halt has occurred.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The outward appearance of the audible alarm is shown most clearly in FIG. **1.** A frame **12** having slide rails **14, 15** is fixedly secured to a control panel of an IBM System 3 computer. While the preferred embodiment of my invention is custom designed to be adapted to a System 3 computer it should be obvious that my invention can be designed for any similar visual display system and all such designs are within the intendment of my invention.

The frame **12** for the mounting plate **18** is securedly fixed to the control panel so that the aperture **20** formed in the frame **12** corresponds to the edges of the System 3 display window **21.** Slideably mounted in the frame **12** in the slide rails **14, 15** is the detector unit **22.** The detector unit **22** is normally slid along the slide rails **14, 15** to a position where it completely covers the aperture **20** in the mounting plate **12.** When it is in this position five phototransistors **25 – 29** are positioned to detect the occurrence of light emission from five of the fourteen elements in the display window. It has been statistically determined and verified with an IBM System 3 code book that these five phototransistors will detect the occurrence of any halt code which would occur.

These five phototransistors **25 – 29** are most clearly shown in FIG. **2** which is a back view of the detector unit **22** as it is positioned over the display window **21.**

Referring again to FIG. **1** the positioning of the power switch **31** and the mode selector switch **32,** discussed more fully below, are shown as well as an auxiliary unit **35** containing two phototransistors **36, 37** which is alligned adjacent to the processor check display button **38** and the I/O attention display button **39.** These display buttons **38, 39** also are illuminated in the event either of those functions halt the system. The housing **35** for these additional two phototransistors **36, 71** is connected to the detector unit **22** with a cord **40** and female plug adapter.

Referring now to FIG. **3** the electronic circuitry is shown schematically which detects the occurrence of the visual signal and converts it to a continuous or short audible tone. Seven phototransistors, the five **25 – 29** shown in FIG. **2** and the two **36, 37** contained in the additional housing **35,** are connected in parallel and are represented by the one schematic representation **45** shown in FIG. **3.** It should be understood that it is only necessary to have one indication to produce the audible tone.

The emitters **47** of the phototransistors **45** are connected to a current limiting resistor **49** which is connected to the base **50** of a Darlington amplifier **52** composed of two transistors **54, 55.** The base **50** of the Darlington amplifier **52** is also connected to ground through a resistor **58** to accommodate transistor leakage current. The output of the Darlington amplifier **52** is connected through a current limiting resistor **59** to the base **61** of a control transistor **62.** The base **61** of

the control transistor **62** is also connected to the voltage supply through a resistor **65** to assure a back bias on the emitter-base junction of the transistor **62** to hold the transistor **62** off until a signal is detected. The emitter **66** of the control transistor **62** is also connected to the voltage source.

The output of the control transistor **62** is connected to the input of a relaxation oscillator **70** comprising resistors **72, 73,** a capacitor **75** and a unijunction transistor **76** which operates in the conventional manner. The relaxation oscillator **70** will not oscillate however, unless a voltage is connected to the unijunction transistor **78** through a light emitting diode **80** and switch **82.** This switch **82** is the mode selection switch **82.** If the switch **82** is in the open position this indicates that the operator desires a continuous tone. In this mode of operation the output of the control transistor **62** is connected through a current limiting resistor **85** and two voltage dropping diodes **88, 89** to the base of a second control transistor **92.** As long as this second control transistor **92** remains energized the audible signal will be produced as explained below.

In the event that the short tone mode of operation is selected the mode selection switch **82** will be closed. If it is closed a tone will be produced immediately upon detection of light emission by one of the phototransistors **45.** The values of the resistor **72,** and capacitor **75** are chosen to provide an oscillation time of approximately 3 to 4 seconds. A resistor **72** value of 10 kilohms and a capacitor **75** value of 250 microfarads has been found sufficient to accomplish this oscillation time. The first oscillation, or discharge of the capacitor **75** will energize the unijunction transistor **76** and thus the light emitting diode **80** connected from the voltage source through the first control transistor **62,** the mode selector switch **82,** to the diode **80** and from the diode **80** through the transistor **76.** In addition, the output of the unijunction transistor **76** is also connected to a silicon controlled rectifier **94,** the input of which is connected to the voltage source through the current limiting resistor **85** and also to the base of the second control transistor **92** through the voltage dropping diodes **88, 89.** When the silicon controlled rectifier **94** is fired it will take the voltage off the base of the second control transistor **92** thus shutting the transistor **92** off as well as the audible signal as explained below. Thereafter, the light emitting diode **80** will remain energized and may be flashed periodically, approximately every three to four seconds.

In the event the continuous tone is chosen the mode selector switch **82** will be in the open position. Thus, the light emitting diode **80** will not be energized and the silicon controlled rectifier **94** will not be fired. Accordingly, the second control transistor **92** will remain energized and the audible tone will continue until the computer begins operating again thus eliminating the illuminated halt signal or the operator turns off power to the unit.

The emitter of the second control transistor **92** is connected to ground and thus the second control transistor **92** provides the ground return for the speaker **101,** a speaker amplifier **102** and oscillator **103.** The input to the second control transistor **92** is connected to a second relaxation oscillator **103** comprising resistors **106** and **107,** a capacitor **108** and unijunction transistor **110.** This oscillator is connected with a current limiting resistor **112** to the input of the Darlington amplifier **102.** The Darlington amplifier **102** is connected to ground through a transistor leakage current resistor **115** and the second control transistor **92.** The output of the Darlington amplifier **102** is connected to a conventional speaker **101** which will emit an audible tone at the frequency determined by the relaxation oscillator **103.**

In the above described manner the device provides all functions which are necessary to provide an effective audible warning to alert an operator of a computer halt. The operator may choose either to receive a continuous tone which will call him back to the computer or he may choose by operation of the mode selector switch **32** to receive a short tone to alert him of the halt but to thereafter receive only a red signal to remind him of the halt and not be distracted by the sound of the alarm.

The construction of the device is such that it slides easily into and out of service and consequently does not interfere with computer operation. The system runs independently of the computer and requires no electrical connections to the computer. It should also be noted that no power is used by the unit unless it is energized due to light emission from the computer. As such, it is a device well suited for its intended purpose.

In additon, from a consideration of the foregoing disclosure it should be obvious that the invention is simply constructed and economically manufactured. It should be understood that modifications and variations may be resorted to without departing from the spirit of the invention as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the present invention as defined by the following claims.

Having described my invention I claim:

1. An audible signaling device for a computer having a visual display window in which at least one halt signal is illuminated, when the computer halts, comprising:

sensing means for sensing the illuminated halt signal from the computer;

electrical means connected to the sensing means for producing an audible signal when the halt signal is sensed;

a frame securely fastened to the computer and surrounding the visual display window; and

a sensor unit housing the sensing means slideably mounted in the frame relative to the visual display window so that when the computer is operating the sensing means can sense the visual display and when the computer is halted the sensing unit may be slideably removed to permit observation of the halt code in the display window.

2. The audible signaling device of claim **1** wherein said sensing means comprises at least one photosensitive element.

3. The audible signaling device of claim **1** wherein said sensing means comprises a plurality of photosensitive elements.

4. The audible signaling device of claim **1** wherein said sensing means comprises at least one phototransistor.

5. The audible signaling device of claim **1** wherein the sensing means comprises a plurality of phototransistors.

6. The audible signaling device of claim **1** wherein the computer halt signal is coded in the visual display window and wherein the sensing means are positioned to detect any of the coded halt signals so displayed.

7. The audible signaling device of claim 1 wherein the computer also has display buttons which may be illuminated when the computer halts and further comprising second sensing means electrically connected to the sensor unit for sensing the illuminated display buttons.

8. The audible signaling device of claim 7 further comprising

a second housing for the second sensing means which is securely fixed to the computer and electrically connected to the electrical means with flexible wiring whereby the sensor unit can be slideably removed from the display window without removing the second sensing means.

9. The audible signaling device of claim 1 wherein the electrical means for producing an audible signal comprises

first oscillating means for creating the frequency of the signal;

amplifying means connected to the first oscillating means; and

at least one speaker for producing the audible tone.

10. The audible signaling device of claim 1 wherein the electrical means is selectively activated to produce a continuous tone or a short tone.

11. The audible signaling device of claim 10 further comprising illumination means attached to the switching means for indicating that a short tone has been produced.

12. The audible signaling device of claim 11 further comprising

second oscillating means connected to the switching means for determining the time duration of the short tone.

13. The audible signaling device of claim 12 wherein the second oscillating means initially determines the time duration of the short tone and thereafter flashes the illumination means to indicate that the short tone has occurred.

14. The audible signaling device of claim 11 wherein the illumination means comprises a light emitting diode.

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