

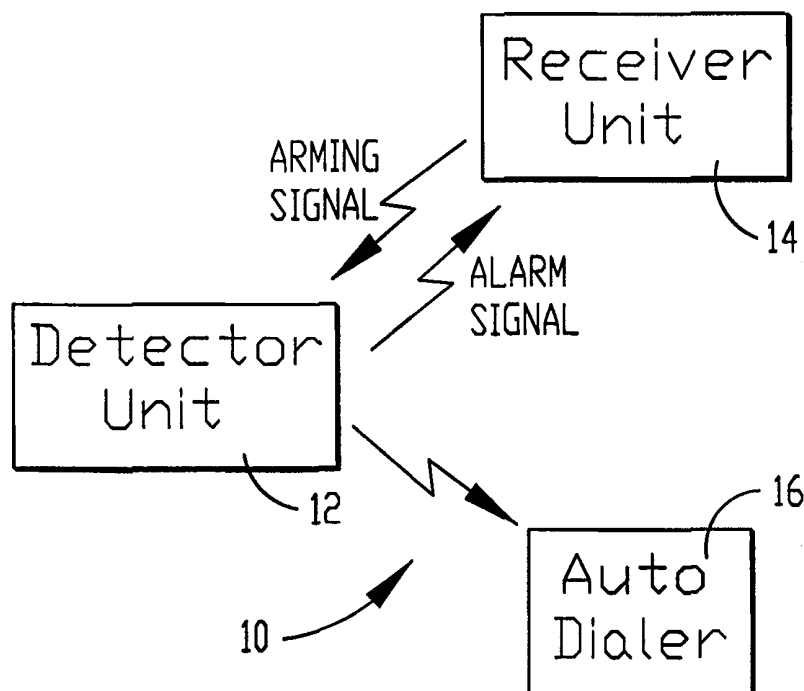


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US98/26909 <b>(22) International Filing Date:</b> 17 December 1998 (17.12.98)  <b>(30) Priority Data:</b> 08/992,390                17 December 1997 (17.12.97)    US 09/212,748               16 December 1998 (16.12.98)    US  <b>(71)(72) Applicants and Inventors:</b> THOMAS, Keith, A. [US/US]; 1509 W. 20th Park Place, Emporia, KS 66801 (US). KEARNS, Timothy, A. [US/US]; 951 Whildin, Emporia, KS 66801 (US). DAVIS, Bruce, R. [US/US]; 519 W. Lincoln, Madison, KS 66860 (US).  <b>(74) Agent:</b> ELLIOTT, Kyle, L.; Hovey, Williams, Timmons & Collins, Suite 400, 2405 Grand Boulevard, Kansas City, MO 64108 (US).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>

**(54) Title:** PORTABLE DETECTION SYSTEM WITH WIRELESS SIGNALING OF INTRUSION CONDITION**(57) Abstract**

A portable, self-contained, economical detection apparatus (10) includes a detector unit (12) for sensing an alert condition such as unauthorized intrusion and responsive thereto for transmitting a wireless alarm signal to a receiver unit (14) or an autodialer (16). The preferred receiver unit (14) is portable and is small enough to be carried in one's pocket and responds to the alarm signal by activating a beeper (68) or vibrator (66). The receiver unit (14) also includes an actuatable arming transmitter (58) for transmitting an arming signal to the detector unit (12) which is enabled only upon receipt of the arming signal. The autodialer (16) responds to the alarm signal by dialing a designated telephone number and indicating the alert condition. An alternate detection apparatus (99) includes multiple zone units (100, 102, 104) with zone sensors (112, 118, 124) for detecting alert conditions. Zone detection units (110, 116, 122) are operable to transmit encoded wireless alarm signals (128, 130, 132) to a receiver (106). The receiver (106) causes an alert device (108) having a display (142) to notify a remote individual of the alert condition and which zone it occurred in.



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## PORTABLE DETECTION SYSTEM WITH WIRELESS SIGNALING OF INTRUSION CONDITION

### 5 BACKGROUND OF THE INVENTION

#### 1. FIELD OF THE INVENTION

The present invention relates to the field of portable detection systems for alert conditions. More particularly, the invention is concerned with a portable detection apparatus including a detector unit for sensing an alert condition such as unauthorized intrusion and for transmitting a wireless alarm signal in response, to a portable receiver unit or an autodialer. In a preferred embodiment, multiple detector units are positioned in separate zones for transmitting encoded wireless alarm signals to a portable receiver unit which displays the zone in which the alert condition occurred.

#### 15 2. DESCRIPTION OF THE PRIOR ART

The prior art includes building security systems that can detect alert conditions such as an intruder or a fire and use wire connections to prompt a telephone dialer to dial a selected telephone number and indicate the alert condition. These prior art security systems are generally wired, permanent installations and can be expensive to install and maintain.

### 20 SUMMARY OF THE INVENTION

The present invention solves the prior art problems mentioned above and provides a distinct advance in the state of the art. In particular, the detection system hereof is economical to install and maintain.

The preferred detection apparatus includes a portable detector unit, a portable receiver unit, and a portable autodialer. The detector unit is operable to sense an alert condition within an area and to transmit at least one wireless alert signal in response. The receiver unit responds to receipt of the alert signal by activating an alert output. The autodialer is also responsive to the wireless alert signal for dialing a selected telephone number and indicating the alert condition.

The receiver unit also includes an actuatable arming transmitter for sending an arming signal to the detector unit, which is enabled only upon receipt of the arming signal. In preferred forms, the detector unit toggles

between enabled and disabled conditions upon receipt of sequential arming signals.

The present invention is further directed to a detection apparatus including a plurality of zone sensors for placement in detection zones and a plurality of zone detector units having zone transmitters. The zone transmitters are operable to transmit encoded wireless alarm signals when an alert condition is detected by the sensors. A receiver unit receives the alarm signals, and an alert device notifies an individual of the alert condition and the zone in which the alert condition occurred.

In a preferred embodiment, the alert device comprises a display, and the receiver unit is portable. If alert conditions are detected in multiple zones, the alert device displays the alert conditions in the sequence of their occurrence. Multiple sensors can be provided in one or more zones with each sensor in the zone being capable of detecting a different type of alert condition. The sensors and detection units are also portable. Other preferred aspects of the present invention are disclosed herein.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an electrical block diagram of the preferred detection apparatus in accordance with the present invention;

Fig. 2 is an electrical schematic diagram of the preferred detector unit of Fig. 1;

Fig. 3 is an electrical schematic diagram of the preferred receiver unit of Fig. 1;

Fig. 4 is an electrical schematic diagram of the preferred autodialer of Fig. 1; and

Fig. 5 is an electrical block diagram of an alternate preferred detection apparatus in accordance with the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in Fig. 1, preferred detection apparatus 10 includes a detector unit 12, receiver unit 14, and autodialer unit 16.

Referring to Fig. 2, detector unit 12 includes detector circuit 18, transmitter circuit 20 and arming circuit 22. Detector circuit 18 includes sensor 24 and detector chip 26 (Type LS6501). Sensor 24 is preferably a motion sensor such as Model PIR Sensor Lhi 888 using infrared to detect the

presence of an intruder in the protected area. Other types of sensors could also be used such as ultrasound, microwave, photoelectric eyes, window switches, door switches, impact or shock detector, tilt sensor, heat or smoke sensors, and the like. It will also be appreciated that a plurality of sensors can be used including different types of sensors depending upon the alert condition to be detected. Upon the occurrence of an alert condition, sensor 24 activates chip 26 which in turn provides a sensor output on line 28.

Transmitter circuit 20 includes microcontroller 30 (Type PIC1655) that receives the sensor output from chip 26. In response, microcontroller 30 provides an encoded alert signal on line 32. This signal is encoded according to the programming code.

The encoded alert signal is provided by way of resistor R1 (18K) to the base of transistor T1 (NE02133) and also to SAW filter 34 (Type R02103). Resistor R2 (100 Ohms) and capacitor C1 (10pF) are connected in parallel between the emitter of transistor T1 and ground as shown in Fig. 2. Capacitor C2 (2.5pF) is connected between the collector and emitter of transistor T1. Supply voltage at +5VDC is provided by way of inductor L1 (10nh) to the collector of transistor T1 and also to one side of inductor L2 (100nh). The other side of inductor L2 is connected to stub antenna 36.

These components configure transmitter circuit 20 to transmit a low power (0.25 mW) alert signal at about 900 MHZ encoded according to the data inputs to microcontroller 30. At this frequency and power rating, regulatory approval is not necessary.

Arming circuit 22 is configured to respond to an encoded arming signal from receiver unit 14 and to respond by providing supply voltage at +5VDC to detector circuit 18 and transmitter circuit 20 as illustrated in Fig. 2. This enables circuits 18 and 20 to transmit the encoded alert signal upon the occurrence of an alert condition. An arming signal is received at antenna 38 and provided to receiver 40 (900 MHZ receiver module) which demodulates and decodes the arming signal according to the programming of microcontroller 30. Upon detection of the arming signal, microcontroller 30 provides an output on line 44 to toggle 46 (Type 7474FF).

In response to the arming signal, toggle 44 switches on to provide input power to voltage regulator 48 (Type LM317) by way of 9VDC relay 49 in order to provide regulated supply voltage at 5VDC to microcontroller 30 and to detector and transmitter circuits 18, 20. Upon receipt of the next arming

signal, toggle 46 switches off the power to regulator 48 which disables circuits 18, 20 and microcontroller 30. In this way, alternate arming signals enable and disable circuits 18, 20 and microcontroller 30. Power is supplied by way of 120VAC/9VDC converter 50 (Type ENG8796) or rechargeable 9 volt battery 52 depending upon the position of power selector switch 54. Capacitors C3, C4 and C5 (10uF each) are connected as shown in Fig. 2.

In the preferred embodiment, detector unit 12 is small, portable, economical, self-contained and integrally constructed. For example, detector unit 12 is small enough to fit within an attache case with a small hole therethrough to expose sensor 24 for operation. Similarly, preferred detector unit 12 could be fitted in a VCR case or a housing configured to resemble a book. In this way, detector unit 12 is very portable and can be placed unobtrusively in an individual office or hotel room, for example. Unit 12 can also be fitted with a tilt sensor to notify the pager if the detection unit 12 is physically moved. Additionally, unit 12 can be equipped to sound an audible tone or voice message.

Turning to Fig. 3, receiver unit 14 includes receiver circuit 56 and arming signal circuit 58. Receiver circuit 56 includes antenna 60 coupled with receiver 62 (900 MHZ receiver module). Receiver 62 is responsive to alert signals at 900 MHZ at a selectable code that is matched to the programming of microcontroller 30 in detector unit 12. Upon receipt of the properly encoded alert signal, receiver 62 responds by providing an alert output by way of selector switch 64 to either vibrator 66 or beeper 68 through amplifier 67, connected as shown in Fig. 3. In the preferred embodiment, receiver circuit 56 and the housing thereof is in the nature of a conventional pager which is small enough to fit within one's pocket or to clip to one's belt. Rechargeable battery 70 (10V) supplies power to receiver circuit 56 and to arming signal circuit 58.

Arming signal circuit 58 includes microcontroller 74, actuator switch 76 and antenna 78. Circuit 58 is operable to send a low power (0.25mW), arming signal at 900 MHZ encoded according to the programming of microcontroller 74 which matches the programming of microcontroller 30 in detector unit 12. (The encoder setting for the arming signal is different from that of that of the alert encoder setting.) This arming signal is actuated upon the user pressing switch 76.

Resistors R3 (22K Ohms) and R4 (8.2K Ohms) along with capacitor C6 (0. 1uF) are connected to microcontroller 74 as shown in Fig. 3.

Circuit 58 is otherwise the same as transmitter circuit 2.0. Specifically, circuit 58 includes resistor R5 (18K Ohms), SAW filter 75, transistor T2 (type NE02133), resistor R6 (100 Ohms), capacitor C7 (12pF), capacitor C8 (4.7pF), inductor L3 (18nh) and inductor L4 (150nh).

5 Fig. 4 illustrates autodialer unit 16 which includes receiver 80 (900 MHZ receiver module) connected to antenna 82, power supply 84 (Panasonic Type KXII 12VDC power supply) and autodialer 86 (Radio Shack Model 49-434) connected as illustrated. In the preferred embodiment, power supply 84 includes a rechargeable battery and supplies power to receiver 80 and autodialer 86. Receiver 80 is operable to respond to the encoded alert signal from detector unit 12 by activating autodialer 86. Upon activation, autodialer 86 seizes a telephone line by way of telephone jack 90, dials a selected telephone number, and indicates the existence of alert condition when the telephone call is answered. As will be appreciated, other devices can be used with autodialer unit 16 such as cellular, standard, satellite, and radio telephones.

10 In use, detector 12 is placed in an area to be protected for indicating the desired alert condition. For example, detector 12 could be placed in a location to monitor a door or windows for intrusion, or to alert for any of the other desired alert conditions mentioned above, for example. The user operates switch 54 to select converter 50 or battery 52 as the source of power. Initially, detector 12 is disabled. Examples of areas to be alerted include rooms such as hotel rooms, offices, construction sites, trucks, trailers, boats, laptop computers, airplanes, storage sheds, warehouses, desks, cabinets, campsites, toolboxes, or any area where the user desires to be alerted for intrusion or other alert conditions.

25 After leaving the-area, the user actuates switch 76 which causes arming signal circuit 58 of receiver unit 14 to transmit the encoded arming signal. Upon receipt of the arming signal, arming circuit 22 of detector unit 12 responds by enabling the transmission of alert signals by detector circuit 18 and transmitter circuit 20. The user can then place receiver unit 14 in a pocket or clip it to the user's belt as is conventional with pagers.

30 It will be appreciated that the operation of apparatus 10 can be tested by arming detector unit 12 before the user leaves the location. The motion of the user in the location would cause transmission of the alert signal and activation of the receiver unit, either the vibrator 66 or beeper 68 as

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selected by the user. Upon a successful test, the user again actuates switch 76 which disables detector unit 12. The user rearms detector unit 12 after leaving the location.

5 If an alert condition occurs, detector unit 12 transmits an alert signal. Receiver unit 14 responds by activating the alert output such as vibrator 66 or beeper. This alerts the user to the alert condition.

10 If the user anticipates being out of signal range of detector unit 12, autodialer unit 16 can be used. This is achieved by plugging telephone jack 90 into an available telephone socket with autodialer 86 set up to dial a user selected telephone number. This telephone number could be, that of a security service or the user's own cellular telephone, for example. In this way, if the user is out of signal range, the alert condition is still noted by the operation of autodialer unit 16.

15 Upon returning to the location, the user again actuates switch 76. This causes another transmission of the arming signal and toggle 44 switches to the off status to disable the transmission of alert signals by detector unit 12.

20 Referring to Fig. 5, an alternate detection apparatus 99, which will be described to the extent that it is different, is preferably utilized to detect alert conditions in a large or divided area which cannot be adequately observed and protected by a single sensor. To accomplish this, a plurality of preferably portable zone units 100, 102, 104 are positioned in separate zones, and a receiver unit 106 having an alert device 108 is remotely located from the zone units 100-104.

25 The first zone unit 100 includes a zone one detector unit 110, a zone one sensor 112, and a zone one power source 114. Similarly, the second zone unit 102 includes a zone two detector unit 116, a zone two sensor 118, and a zone two power source 120, and the third zone unit 104 includes a zone three detector unit 122, a zone three sensor 124, and a zone three power source 126.

30 The zone detection units 110, 116, 122 are preferably portable and comprise the same elements and features as described above in connection with Fig. 2. The zone detection units each include a zone transmitter operable to transmit encoded wireless alarm signals upon occurrence of an alert condition in the respective zone. The zone one transmitter is operable to transmit a zone one encoded wireless signal 128,  
35 and the zone two transmitter is operable to transmit a zone two encoded



wireless signal 130. Similarly, the zone three transmitter is operable to transmit a zone three encoded wireless signal 132. In preferred forms, the detector units include controllers operable to time encode the wireless alarm signals.

5                   The zone sensors 112, 118, 124 are preferably portable and include any of the above listed types of sensors and others. The sensors are operable to sense the occurrence of an alert condition in their respective zones in which they are positioned. Connective wires 134, 136, 138 preferably connect the zone sensors with the zone detector units.

10                   The zone power sources 114, 120, 126 are preferably provided by batteries, but can comprise the converter 50, relay 49, and regulator 48 illustrated in Fig. 2. The zone detector units are electrically connected with the zone power sources, so that the zone detector units and sensors are powered thereby.

15                   In a preferred embodiment, at least one of the zone units includes multiple sensors. To that end, the first zone unit 100 includes an additional zone one sensor 140. The first zone one sensor 112 comprises a type one alert condition sensor capable of sensing, for example, the presence of an intruder, and the second zone one sensor 140 comprises a type two alert condition sensor capable of sensing a different type of alert condition than the first zone three sensor. For example, the type two zone one sensor is capable of sensing smoke. The zone one detection unit transmitter is operable to transmit the zone one encoded wireless alarm signal 128 including a selected one of a plurality of codes each corresponding to one of the zone one sensors.

20                   The receiver unit 106 is preferably portable and comprises the same elements and features as described above in connection with Fig. 3. The receiver 106 is operable to receive the zone one, two, and three encoded wireless alarm signals and is operative to send an arming signal to the detector units 110, 116, 122. The arming signal activates and deactivates the detector units which are operative to receive the arming signal, and in one embodiment, the arming signal is received individually by each detector unit.

25                   The alert device 108 includes a display 142 operable to notify a remote individual of the occurrence of the alert condition and the zone of occurrence in which the alert condition occurred. The alert device also includes an audible alert and/or a vibration alert to bring the attention of the remote individual to the display 142. The alert device is further operative to

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display the alert conditions in their sequence of occurrence when multiple alert conditions occur in different zones or in the same zone. The display is preferably capable of including the time encoding information provided by the controller and encoded into the alarm signals. The alert device and receiver unit are preferably held in the same pager housing.

In operation, the zone units 100-104 are positioned at desired locations in an area to be observed and/or protected. Such areas include, for example, a building perimeter or a deer trail. An individual operating the detection apparatus 99 operates the receiver to send the wireless arming signal to the detection units 110, 116, 122 which are activated by the arming signal.

When one of the zone sensors 112, 118, 124, 140 detects the occurrence of an alert condition the detector unit corresponding to the detecting sensor transmits the wireless alarm signal. The receiver unit 106 receives the encoded wireless alarm signal and operates the alert device to vibrate or issue an audible alert. The display 142 is activated to show which zone the alert condition has occurred in.

Using the zone one unit 100 as an example, if the type one sensor 112 detects an intruder, the zone one detector unit 110 sends the zone one wireless alarm signal 128 encoded with the information and selected code that an alert condition has occurred in zone one and that the alert condition has been caused by an intruder. The receiver unit 106 receives the signal 128, and the alert device displays an appropriate message such as, "zone one intruder." If the type two sensor 140 detects smoke, for example, the zone one detector unit 110 sends the zone one wireless alarm signal 128 encoded with the information and selected code that the alert condition has occurred in zone one and that the alert condition has been caused by smoke. The receiver unit receives the signal 128, and the alert device 108 displays an appropriate message such as, "zone one smoke."

When the detection apparatus is used on a deer trail, for example, the sequence in which the alert conditions occur is especially helpful information. If a deer passes through zone one at a first time and then passes through zone two at a subsequent time, the alert device will display the alert conditions in the order of their occurrence. This is preferably accomplished by displaying the messages in the order they are received. Alternatively, the alarm signals are encoded with the time data, and the alert device displays

them in sequence according to the time data. Thus, the detection apparatus according to the present invention senses an alert condition and notifies a responsible, potentially remote, individual of the zone of occurrence and the type of alert condition. Further, the detection apparatus 99 is capable of notifying the responsible individual of the sequence in which the alert conditions occur.

Those skilled in the art will appreciate that the present invention encompasses many variations in the preferred embodiment described herein. For example, multiple detector units can be used in different areas; any one of which could activate a single receiver unit, multiple receiver units or the autodialer upon detection of an alert condition, and many more zone detection units could be provided as needed. Having thus described the preferred embodiment, the following is claimed as new and desired to be secured by Letters Patent:

We (I) claim:

1. A detection apparatus comprising:  
a detector unit including means for sensing an alert condition within an  
5 area and responsive thereto for transmitting at least one wireless  
alert signal representative thereof; and  
a portable receiver unit including means for receiving said alert signal  
and responsive thereto for activating an alert output,  
said receiver unit including selectively actuatable arming signal means  
10 for transmitting a wireless arming signal in response to actuation  
thereof,  
said detector unit including arming means for receiving said arming  
signal and means for enabling the transmission of said alert  
signal only in response to receipt of said arming signal.  
15
2. The apparatus as set forth in claim 1, said alert condition including the  
presence of an unauthorized intruder.
3. The apparatus as set forth in claim 1, said means for sensing an alert  
20 condition including a motion detector.
4. The apparatus as set forth in claim 1, said alert signal being digitally  
encoded and microcontroller controlled.
5. The apparatus as set forth in claim 1, said receiver unit including a  
25 paper.
6. The apparatus as set forth in claim 1, said alert signal being digitally  
encoded, said receiver including means for decoding said alert signal.  
30
7. The apparatus as set forth in claim 1, said alert output including an  
audible alert.
8. The apparatus as set forth in claim 1, said alert output including a  
35 vibrator.

9. The apparatus as set forth in claim 1, said arming signal being digitally encoded, said detector unit including means for decoding said arming signal.
- 5 10. The apparatus as set forth in claim 1, said means for enabling including means for supplying operating power to said detector unit.
- 10 11. The apparatus as set forth in claim 1, said means for enabling including means for toggling between enabled and disabled conditions upon receipt of subsequent arming signals.
12. The apparatus as set forth in claim 1, said detector unit including means for operating with battery-supplied power.
- 15 13. The apparatus as set forth in claim 1, said receiver unit including means for operating with battery-supplied power.
- 20 14. A detection apparatus for sensing an alert condition and a zone of occurrence of the alert condition and for notifying a remote individual of the alert condition and the zone of occurrence, the detection apparatus comprising:
- 25 a zone one sensor for positioning in a first detection zone, and the zone one sensor being operable to sense occurrence of an alert condition;
- a zone one detector unit including a zone one transmitter operable to transmit a zone one encoded wireless alarm signal upon occurrence of an alert condition;
- 30 a zone two sensor for positioning in a second detection zone, and the zone two sensor being operable to sense occurrence of an alert condition;
- a zone two detector unit including a zone two transmitter operable to transmit a zone two encoded wireless alarm signal upon occurrence of an alert condition;
- 35 a receiver unit operable to receive the zone one encoded wireless signal and the zone two encoded wireless signal;

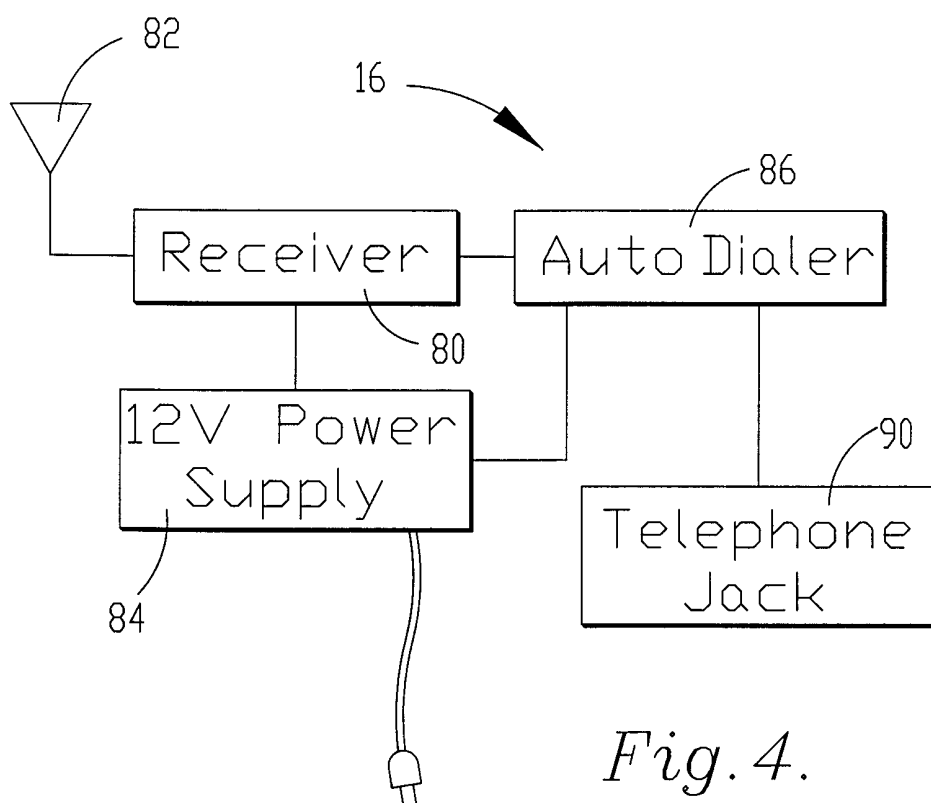
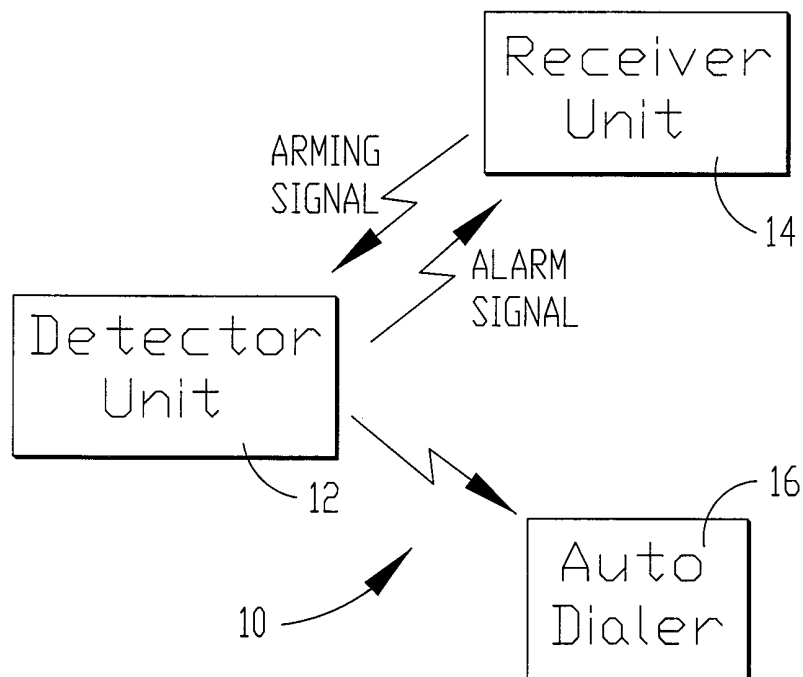
an alert device operable to notify the remote individual of the occurrence of the alert condition and the zone of occurrence in which the alert condition occurred.

- 5        15.    The detection apparatus according to claim 14 further comprising a  
zone three sensor for positioning in a third detection zone and the zone  
three sensor being operable to sense occurrence of an alert condition,  
and a zone three detector unit including a zone three transmitter  
operable to transmit a zone three encoded wireless alarm signal upon  
10       occurrence of an alert condition.
- 15       16.    The detection apparatus according to claim 14 further comprising a  
second zone one sensor for positioning in the first detection zone and  
the zone one sensor being operable to sense occurrence of a different  
alert condition, and wherein the zone one detector unit is operable to  
transmit the zone one encoded wireless alarm signal including a  
selected one of a plurality of codes corresponding to the zone one  
sensors to notify the remote individual which type of alert condition has  
occurred.
- 20       17.    The detection apparatus according to claim 14 wherein the alert device  
comprises a display.
- 25       18.    The detection apparatus according to claim 14 wherein the receiver unit  
is operable to transmit a wireless arming signal, and each of the zone  
detectors is operable to receive the arming signal and activate upon  
receiving the arming signal.
- 30       19.    The detection apparatus according to claim 18 wherein each of the zone  
detectors is operable to individually receive the arming signal and  
activate upon receiving the arming signal.

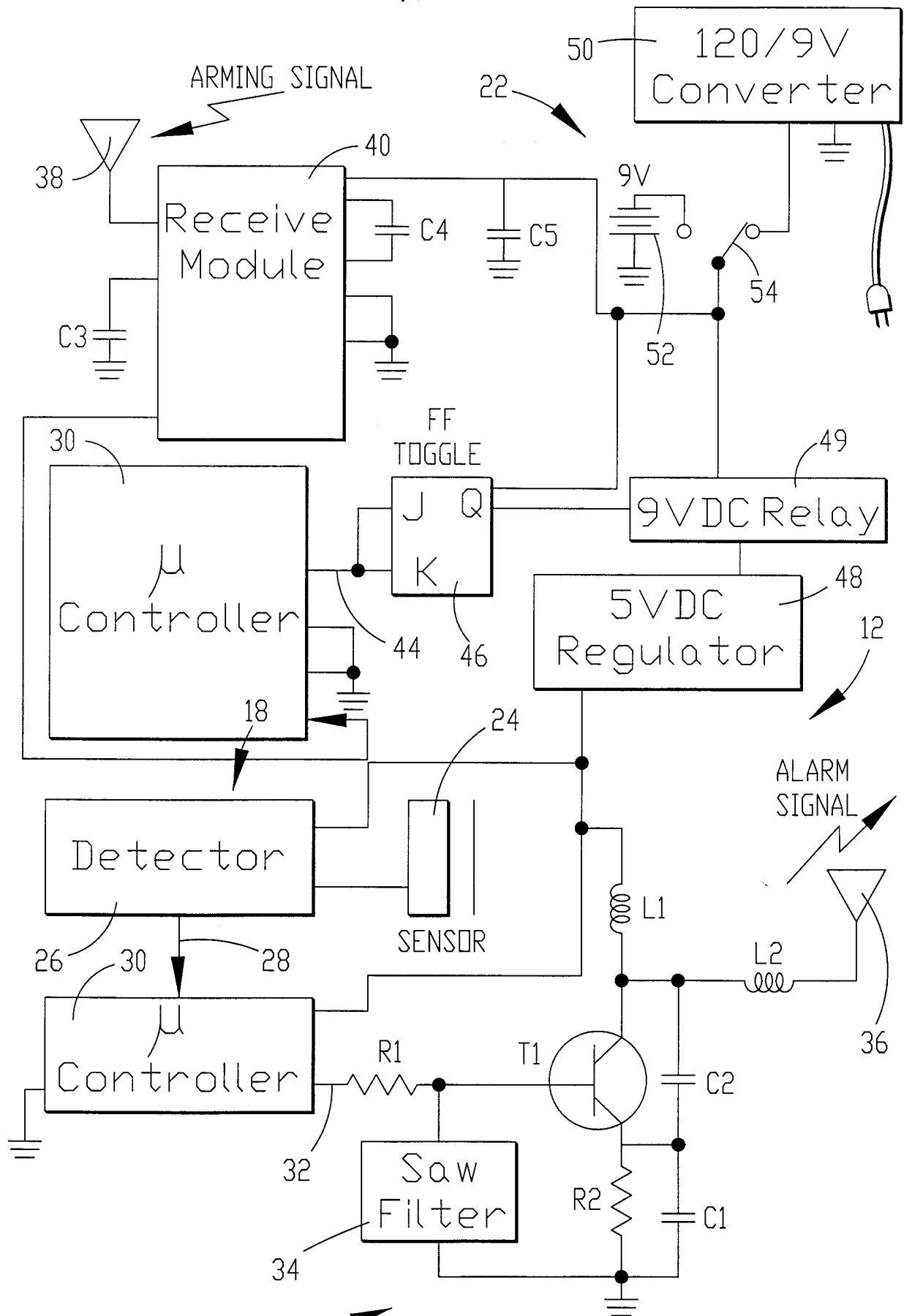
20. A detection apparatus for sensing an alert condition and a zone of occurrence of the alert condition and for notifying a remote individual of the alert condition and the zone of occurrence, the detection apparatus comprising:
- 5 a plurality of zone sensors for positioning in detection zones, and the zone sensors being operable to sense occurrence of an alert condition;
- 10 a plurality of zone detector units each including a zone transmitter operable to transmit an encoded wireless alarm signal upon occurrence of an alert condition in a respective zone;
- a receiver unit operable to receive the encoded wireless signals;
- 15 an alert device operable to notify the remote individual of the occurrence of the alert condition and the zone of occurrence in which the alert condition occurred.
21. The detection apparatus according to claim 20 wherein at least one sensor is positioned in each detection zone.
- 20 22. The detection apparatus according to claim 20 wherein multiple sensors are positioned in at least one detection zone, and each sensor in a single detection zone is operable to detect an occurrence of a different alert condition.
- 25 23. The detection apparatus according to claim 20 further comprising a plurality of zone power supplies electrically connected with the zone detector units to power the zone detector units.
- 30 24. The detection apparatus according to claim 23 further comprising a plurality of connective wires connecting the zone sensors with the zone detector units, and wherein the zone power supplies comprise batteries.

25. A detection apparatus for sensing an alert condition and a zone of occurrence of the alert condition and for notifying a remote individual of the alert condition and the zone of occurrence, the detection apparatus comprising:
- 5 a zone one sensor for positioning in a first detection zone, and the zone one sensor being operable to sense occurrence of an alert condition in the first detection zone;
- 10 a zone one detector unit including a zone one transmitter operable to transmit a zone one encoded wireless alarm signal upon occurrence of an alert condition, and the zone one detector including a controller operable to time encode the zone one encoded wireless alarm signal;
- 15 a zone two sensor for positioning in a second detection zone, and the zone two sensor being operable to sense occurrence of an alert condition in the second detection zone;
- 20 a zone two detector unit including a zone two transmitter operable to transmit a zone two encoded wireless alarm signal upon occurrence of an alert condition, and the zone two detector including a controller operable to time encode the zone two encoded wireless alarm signal;
- a receiver unit operable to receive the zone one encoded wireless signal and the zone two encoded wireless signal;
- 25 an alert device operable to notify the remote individual of the occurrence of the alert condition and the zone of occurrence in which the alert condition occurred.



*Fig. 1.**Fig. 4.*

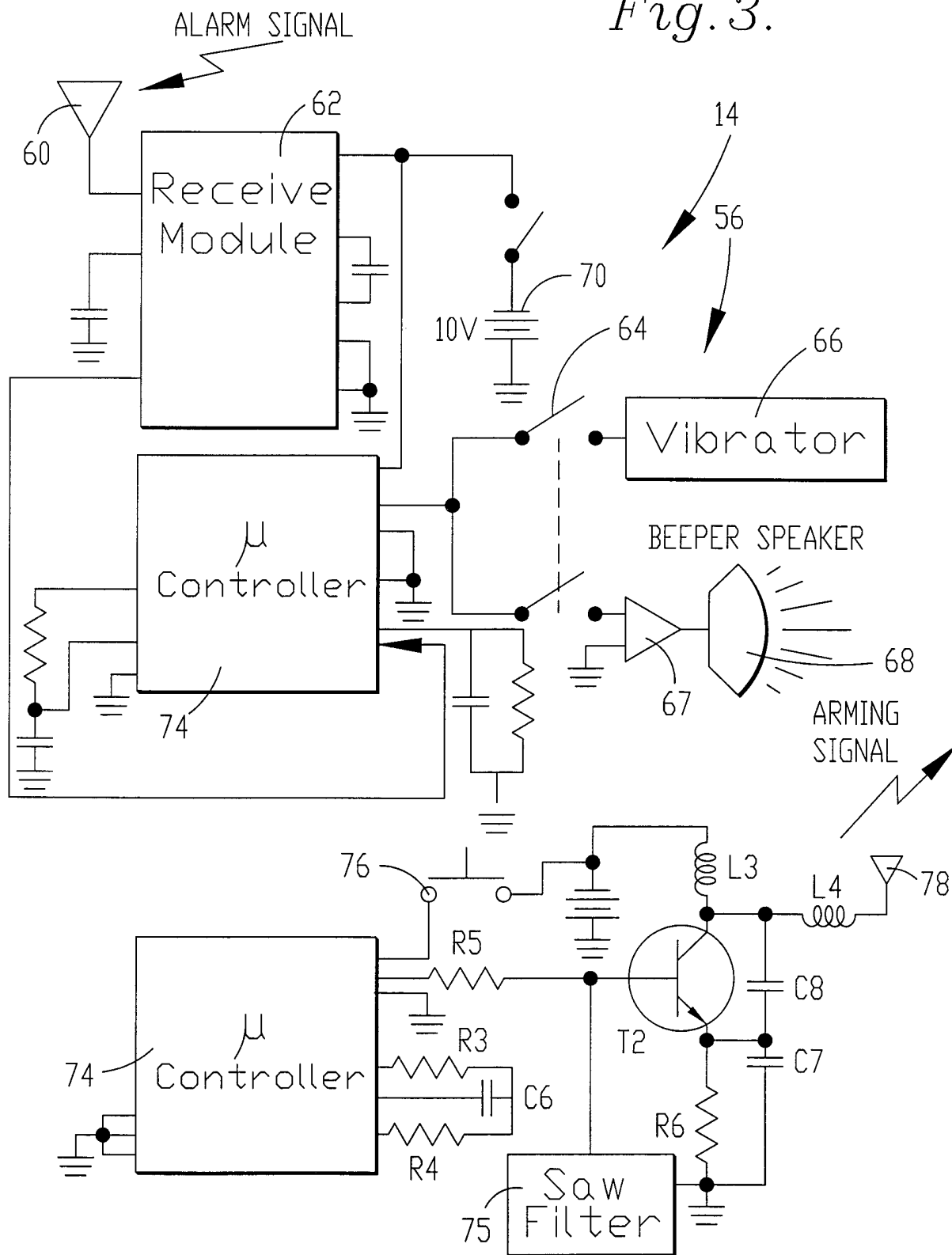
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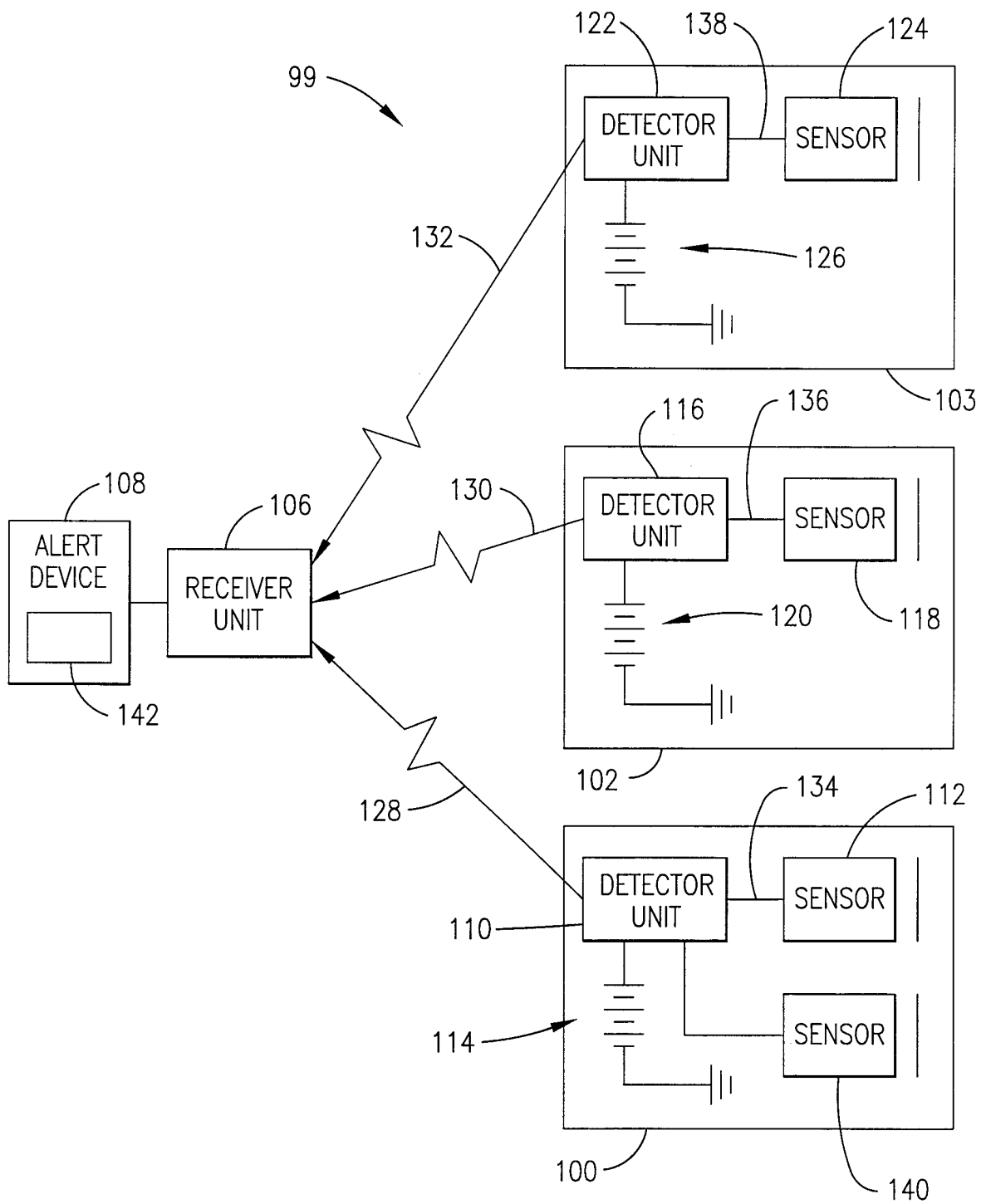


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Fig. 2.

*Fig. 3.*



*Fig. 5.*

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/26909

**A. CLASSIFICATION OF SUBJECT MATTER**

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US CL :340/825.44, 539

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/825.44, 539, 426, 438; 307/10.4; 180/287

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,703,714 A (ANDREWS) 21 November 1972, col. 2 lines 41-67, col. 3 lines 26-62, col. 5 lines 34-46 and col. 5 line 60-col. 6 line 50.	1-25
Y	US 4,905,271 A (NAMEKAWA) 27 February 1990, col. 1 line 55 - col. 2 line 30, col. 3 line 41 - col. 5 line 7 and col. 6 lines 51-62.	1-25
X --- Y	US 4,940,964 A (DAO) 10 July 1990, col. 1 lines 17-23, col. 3 lines 4-63, col. 4 lines 10-46, col. 5 lines 7-15.	1-3, 5, 7, 9, 12-13 ----- 14-25

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

31 JANUARY 1999

Date of mailing of the international search report

23 APR 1999

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/26909

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 4,947,151 A (ROSENBERGER) 07 August 1990, col. 2 lines 67-68, col. 3 line 17 - col. 4 line 25.	1-4, 7, 9, 12-13 ----- 14-25
X --- Y	US 4,692,742 A (RAIZEN et al.) 08 September 1987, col. 3 line 4 - col. 4 line 58.	14-17, 20-25 ----- 1-13,18-19
Y	US 4,644,351 A (ZABARSKY et al.) 17 February 1987, col. 1 lines 6-63, col. 4 line 32 - col. 5 line 12.	8-9,12-13, 17