IE0

DETECTOR DE PÉRDIDA DE OBJETOS DE COMUNICACIONES MÓVILES, EN ESPECIAL DE TELÉFONOS MÓVILES

Sector de la técnica

La presente invención se refiere a un dispositivo electrónico de comunicaciones que utiliza comunicaciones de radiofrecuencia, tipo bluetooth o wifi para detectar la pérdida de otro objeto.

Estado de la técnica

Existen en la actualidad dispositivos que a través del uso de un emisor de radiofrecuencias permiten, con un aparato detector localizar el aparato emisor. De esta manera, asociando físicamente el dispositivo emisor a un objeto cualquiera (introduciéndolo o pegándolo a dicho objeto), es posible con la ayuda del aparato receptor localizar el objeto en caso de pérdida y ello gracias al dispositivo emisor que se le ha asociado.

Asimismo, se ha desarrollado y comercializado un dispositivo que, colocado en un objeto, permite detectar su pérdida utilizando como aparato receptor un teléfono móvil tipo smartphone. Este dispositivo funciona de la siguiente manera: mediante un apps, o aplicación específica, instalada en el teléfono móvil, el dispositivo físico que presenta una forma y tamaño similar al de una tarjeta de crédito, establece un enlace de bluetooth con el teléfono móvil, si el dispositivo se aleja a más de cierta distancia del teléfono móvil, este detecta la pérdida del enlace bluetooth y emite un pitido que advierte al usuario del teléfono del hecho. Su aplicación es evidente en el terreno de la seguridad, como medio para avisar de una posible pérdida o robo.

Esta aplicación utiliza al teléfono móvil como aparato detector de la pérdida del dispositivo.

Sin embargo hasta ahora no se ha desarrollado un dispositivo cuya funcionalidad específica y principal sea actuar como detector de la pérdida de un teléfono móvil, o de cualquier otro dispositivo de mercado que incorpore, de origen, una funcionalidad de comunicaciones basada en bluetooth o wifi.

Explicación de la invención

La presente invención tiene el cometido específico y principal de evitar la pérdida de un dispositivo móvil dotado, de origen, de una capacidad programable de comunicación por radiofrecuencia, tipo bluetooth o wifi, como por ejemplo un teléfono móvil.

Así, al contrario de la aplicación descrita en el anterior apartado, que utiliza un teléfono móvil para detectar la pérdida de un dispositivo, la invención aquí propuesta se propone detectar la pérdida del dispositivo móvil preexistente, como, en especial, ejemplo la de un teléfono móvil.

Ello se consigue con un dispositivo electrónico de comunicaciones que integra las siguientes funciones:

a) Dispositivo autónomo, que consigue la energía para su funcionamiento de una batería recargable o no.
b) Funcionamiento basado en el establecimiento de una conexión vía radiofrecuencia (ya sea bluetooth, o wifi) con un dispositivo móvil dotado de capacidad de comunicación por este tipo de radiofrecuencia (por ejemplo un teléfono móvil).
c) Detección de la ruptura de dicha conexión cuando el nivel de intensidad de la señal radioeléctrica disminuye por debajo de cierto valor (ajustable o no), o sencillamente desaparece.
d) Emisión de una alarma acústica, luminosa o de vibración cuando este hecho se produce.
e) Integración de las funciones de activación, desactivación y programación necesarias, mediante botones, dispositivo externo adicional, menú táctil o programación de fábrica.
f) La presentación física del dispositivo puede ser diversa y no es crítica para la propia naturaleza de este modelo de utilidad. Sin embargo tenderá a ser tal que sea fácil de portar por su usuario y podrá estar integrada eventualmente en un dispositivo de uso habitual (por ejemplo en un reloj de pulsera).

Para su mejor comprensión y a título de ejemplo clarificador, el funcionamiento práctico de esta invención que, de ahora en adelante y para mayor claridad de la exposición, llamaremos **"Dispositivo Guardián"** es el siguiente: El usuario del Dispositivo Guardián lo porta con él, por ejemplo en una correa en torno a la muñeca, a modo de reloj, enganchado a su cinturón, en un bolso, como un broche, etc. El dispositivo establece una

conexión por radiofrecuencia (por ejemplo, vía bluetooth) con el dispositivo que se pretende vigilar y que llamaremos a partir de ahora **"Dispositivo Asociado"**, que puede ser, en especial, un teléfono móvil del propio usuario. Cuando el Dispositivo Asociado es olvidado por el usuario, al ser alejado del Dispositivo Guardián que el usuario porta con él, se rompe la conexión de radio y el dispositivo emite el aviso de alarma que permite al usuario evitar la pérdida del Dispositivo Asociado o, eventualmente, su robo.

Breve descripción de los dibujos

La **Figura 1** representa una implementación del Dispositivo Guardián, en integración con una función accesoria de reloj. En este caso el dispositivo Guardián está dotado de una correa (1), de dos botones de control (2) y de una pantalla tipo LCD o similar (3).

La **Figura 2** representa el dispositivo guardián (1) activado y en comunicación normal con un móvil (2). El dispositivo guardián está enlazado con el móvil, a través de un enlace bluetooth (3), por lo que no emite señal de alarma y se mantiene sin emitir alarmas, en estado de vigilancia.

La **Figura 3** representa el dispositivo guardián (1) con su alarma activada (2) al haber perdido la conexión radioeléctrica (3) con el teléfono móvil al que estaba asociado (4) al haberse producido un alejamiento físico de ambos dispositivos (5).

La **Figura 4** representa la funcionalidad adicional de búsqueda, que podrá ser o no implementada en el dispositivo Guardián. En este caso se representa al dispositivo guardián (1) con su alarma activada (2) al haberse restablecido la conexión radioeléctrica (3) con el teléfono móvil al que estaba asociado (4), al haberse producido un acercamiento físico suficiente entre ambos dispositivos (5).

Exposición detallada de un modo de realización de la invención

Según posible forma de realización, el Dispositivo Guardián adopta una apariencia de forma similar a la de un reloj portado por su usuario mediante una correa que el propio dispositivo guardián incorpora. Estará provisto de una pantalla tipo LCD y de dos botones de control. Se tratará de un dispositivo bluetooth que establece un enlace radio con el Dispositivo Asociado, por ejemplo un teléfono móvil. No es preciso detallar las características técnicas de este tipo de enlace ya que son de dominio público.

La programación del enlace bluetooth con el teléfono móvil adecuado se realiza con la ayuda de la pantalla LCD y las dos teclas de programación.

La programación del enlace quedará memorizada mientras no se programe otro nuevo enlace con otro Dispositivo Asociado.

Igualmente se podrá programar la sensibilidad de la detección de la pérdida de enlace (equivalente a la distancia necesaria para que se active la alarma en caso de alejamiento del dispositivo del teléfono móvil), así como el tipo de alarma sonora y eventualmente vibración.

Una vez que se active la alarma, será posible desactivarla presionando uno de los botones de control. Así si el teléfono móvil asociado se aleja del Dispositivo Guardián, este activará la alarma advirtiendo al usuario de la pérdida de la conexión bluetooth.

En caso de haberse producido la pérdida del teléfono móvil, será posible activar el modo de búsqueda en el Dispositivo Guardián. En dicho caso al acercarse al teléfono móvil, el Dispositivo Guardián emitirá otro tipo de pitido cuya intensidad o frecuencia podrá ser más pronunciada al acercarse más al dispositivo móvil asociado.

Finalmente, una vez localizado el teléfono móvil, el usuario podrá seleccionar el modo normal de funcionamiento mediante los botones de control, lo que será indicado convenientemente en la pantalla LCD del dispositivo.

A partir de ese momento el Dispositivo Guardián iniciará su actividad normal de vigilancia para prevenir una nueva pérdida del teléfono móvil.

REIVINDICACIONES

1.- Detector de Pérdida de Objetos de Comunicaciones Móviles, en especial de Teléfonos Móviles, caracterizado por ser un dispositivo dotado de la capacidad de establecer una comunicación por radiofrecuencia, tipo bluetooth o wifi, con otros dispositivos de mercado dotados de esta misma capacidad, por ejemplo Teléfonos Móviles, y de detectar la pérdida de dicha comunicación, produciendo una alarma sonora, lumínica y/o de vibración. El dispositivo se caracteriza, además, por estar dotado de una apariencia de reloj, de broche ajustable a un cinturón o no, o de objeto fácilmente transportable en un bolsillo, dotado de uno o varios botones de control y de una pila y de un medio avisador del estado de la misma, o de una batería recargable con un conector para su recarga.

2.- Detector de Pérdida de Objetos de Comunicaciones Móviles, en especial de Teléfonos Móviles, según la reivindicación 1, que comprende, eventualmente, la capacidad de ajustar el nivel de sensibilidad para la detección de pérdida del enlace radioeléctrico con el dispositivo de mercado asociado.

3.- Detector de Pérdida de Objetos de Comunicaciones Móviles, en especial de Teléfonos Móviles, según las reivindicaciones anteriores, que comprende, eventualmente, una pantalla tipo LCD o similar.

4.- Detector de Pérdida de Objetos de Comunicaciones Móviles, en especial de Teléfonos Móviles, según las reivindicaciones anteriores, que comprende, eventualmente, un conector tipo USB o similar.

5.- Dispositivo"Detector de Pérdida de Objetos de Comunicaciones Móviles", según las reivindicaciones anteriores, que comprende, eventualmente, la capacidad de producir una alarma al recuperarse la comunicación con el dispositivo de mercado asociado.

6.- Detector de Pérdida de Objetos de Comunicaciones Móviles, en especial de Teléfonos Móviles, según las reivindicaciones anteriores, que comprende, eventualmente, la capacidad de la programación de sus funciones desde un ordenador externo.

7.- Detector de Pérdida de Objetos de Comunicaciones Móviles, en especial de Teléfonos Móviles, según las reivindicaciones anteriores, que comprende, eventualmente, otras funciones de dominio público como pueden ser: funciones de reloj, de despertador, de agenda, etc.

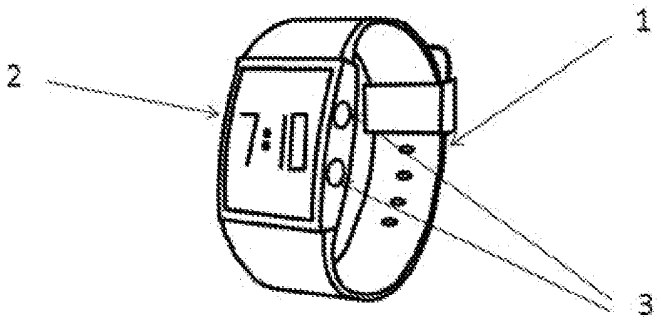


Figura 1

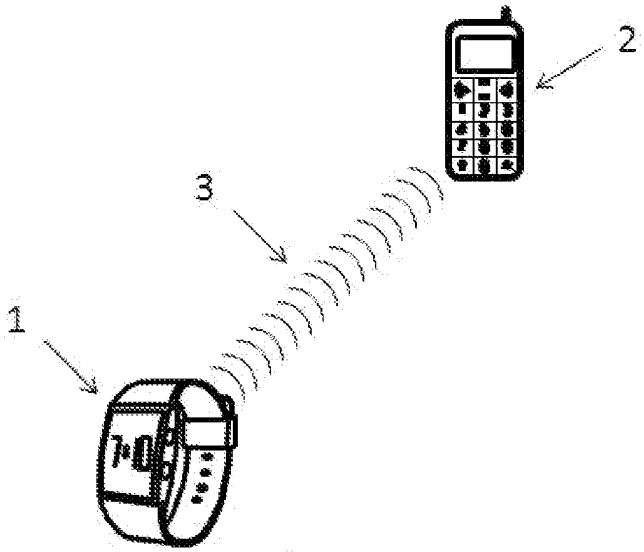


Figura 2

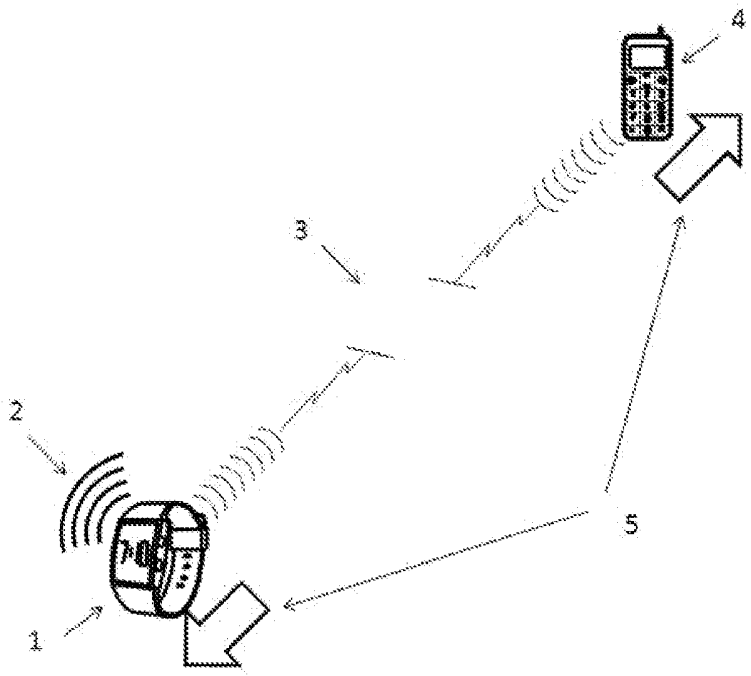


Figura 3

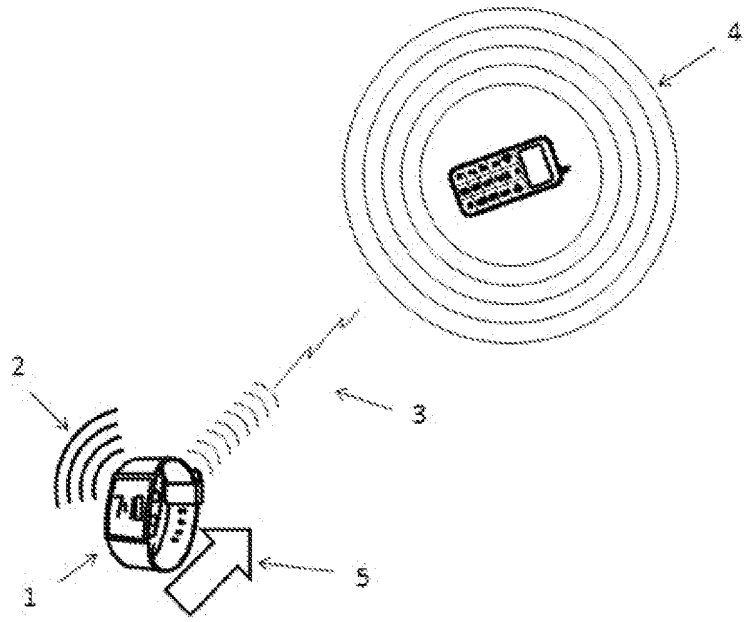


Figura 4

IE1

Fig. 1A

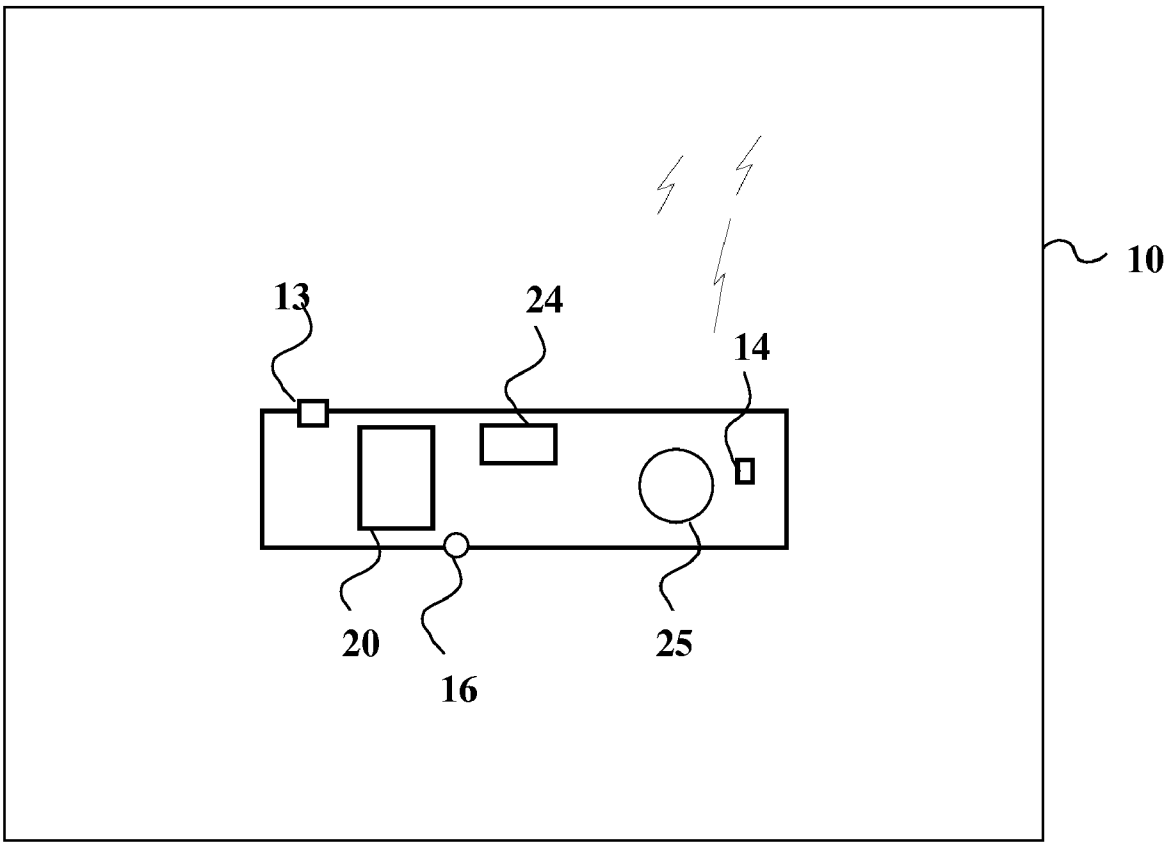


Fig. 1B

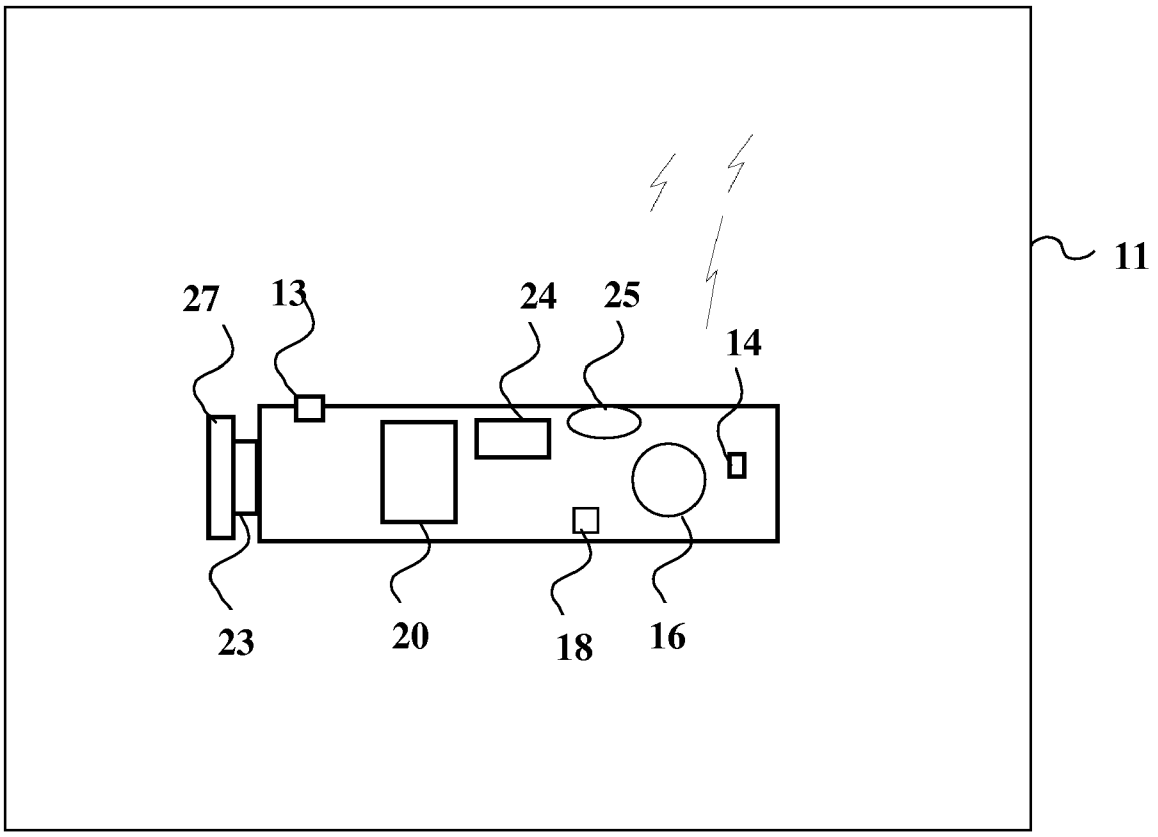


Fig. 1C

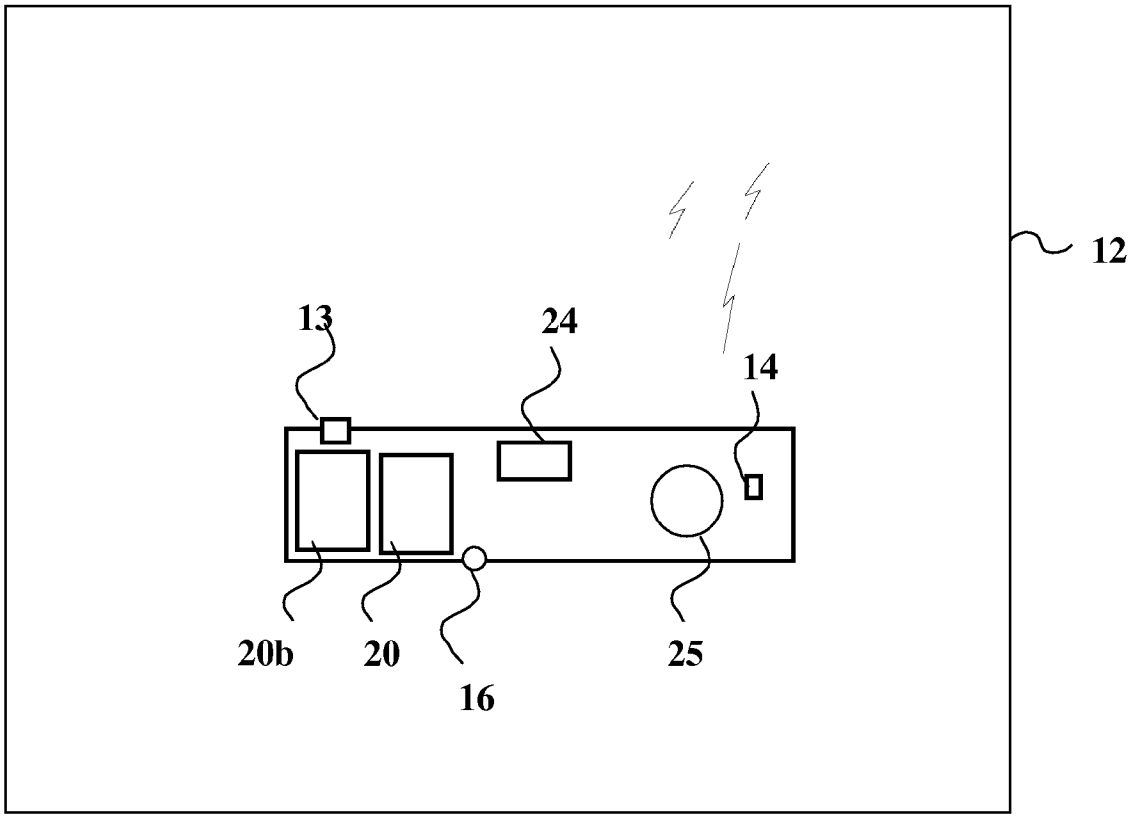


Fig. 2A

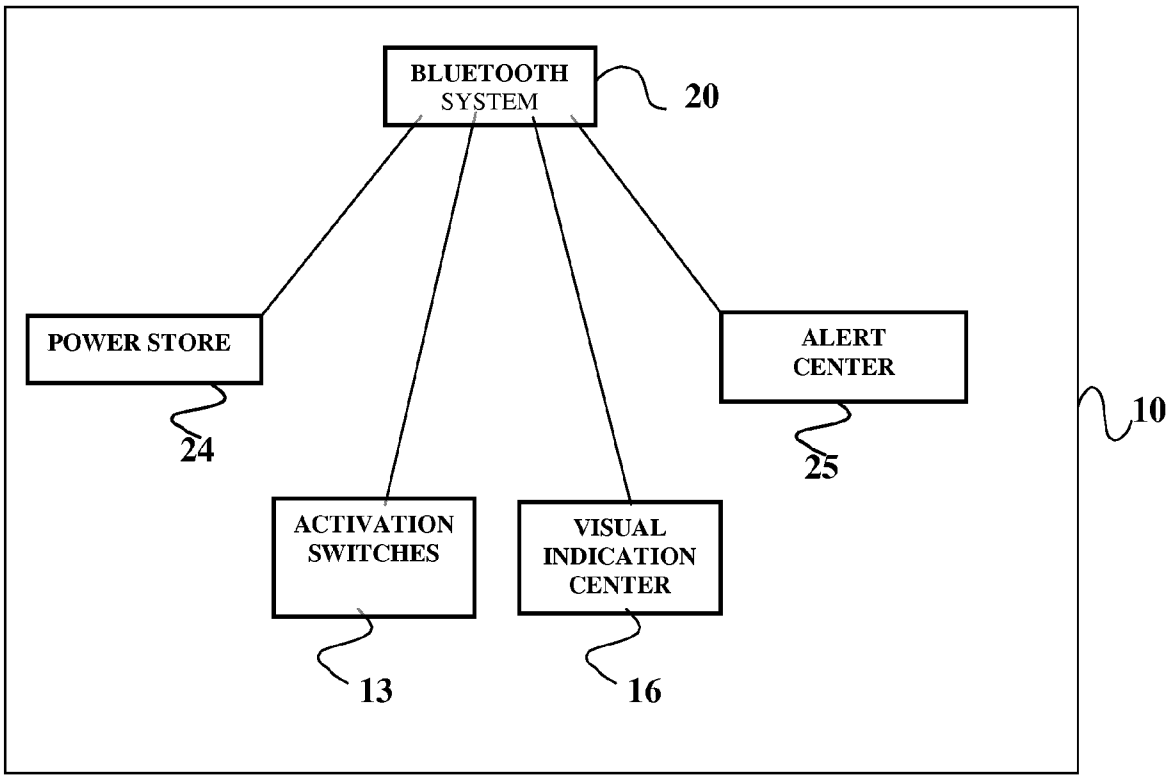

BLUETOOTH
SYSTEM
20
POWER STORE
24
ALERT
CENTER
25
ACTIVATION
SWITCHES
13
VISUAL
INDICATION
CENTER
16
10

Fig. 2B

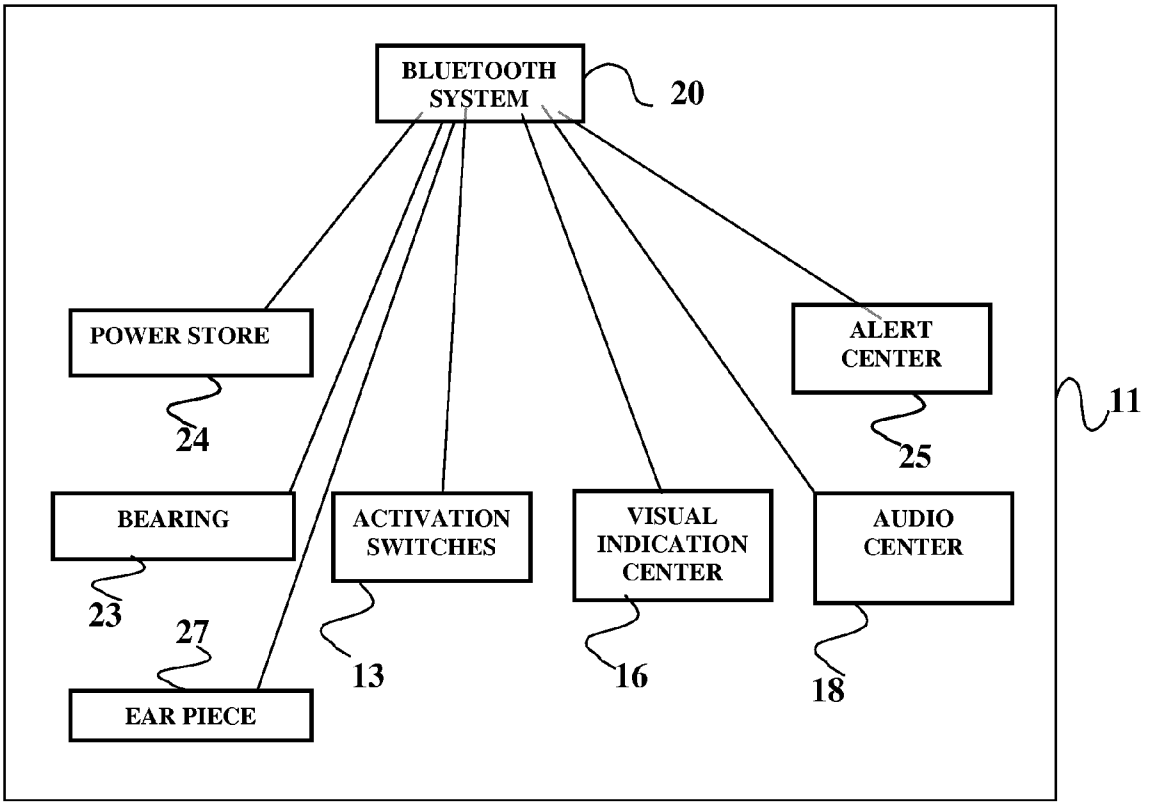

BLUETOOTH SYSTEM
20
POWER STORE
24
ALERT CENTER
25
11
BEARING
23
ACTIVATION SWITCHES
13
VISUAL INDICATION CENTER
16
AUDIO CENTER
18
27
EAR PIECE

Fig. 2C

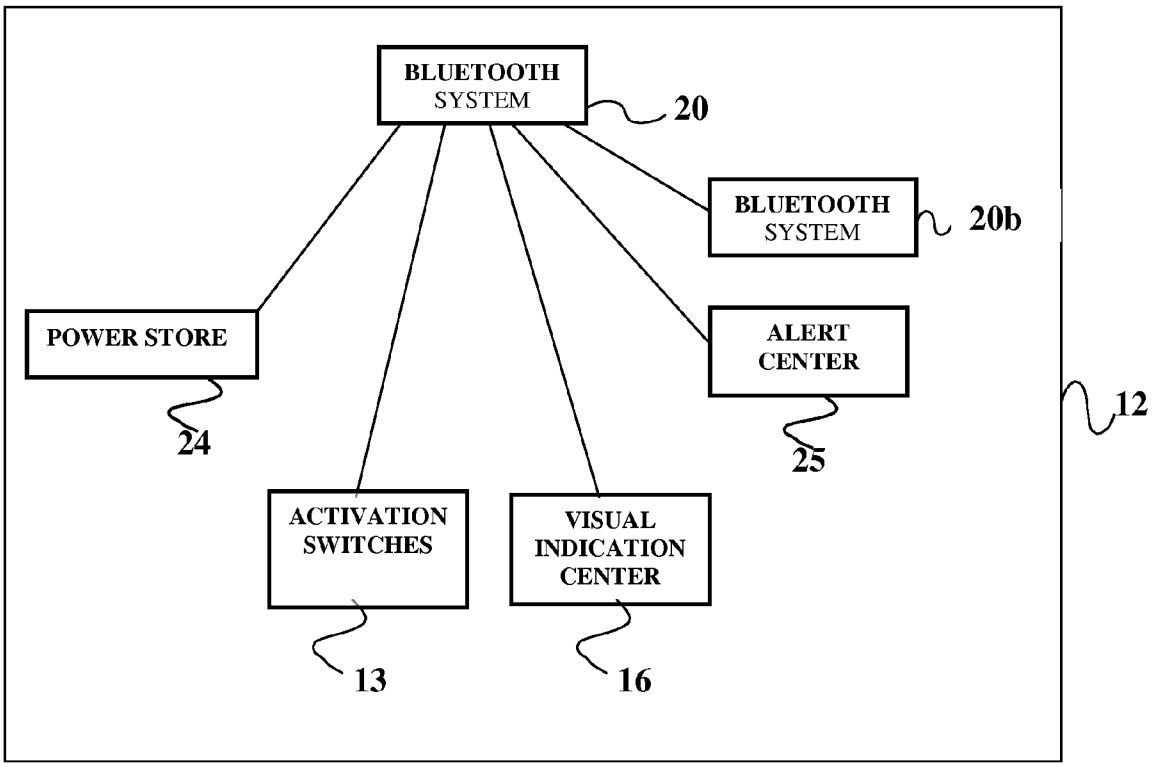

BLUETOOTH SYSTEM
20
BLUETOOTH SYSTEM
20b
POWER STORE
24
ALERT CENTER
25
12
ACTIVATION SWITCHES
13
VISUAL INDICATION CENTER
16

Fig. 3A

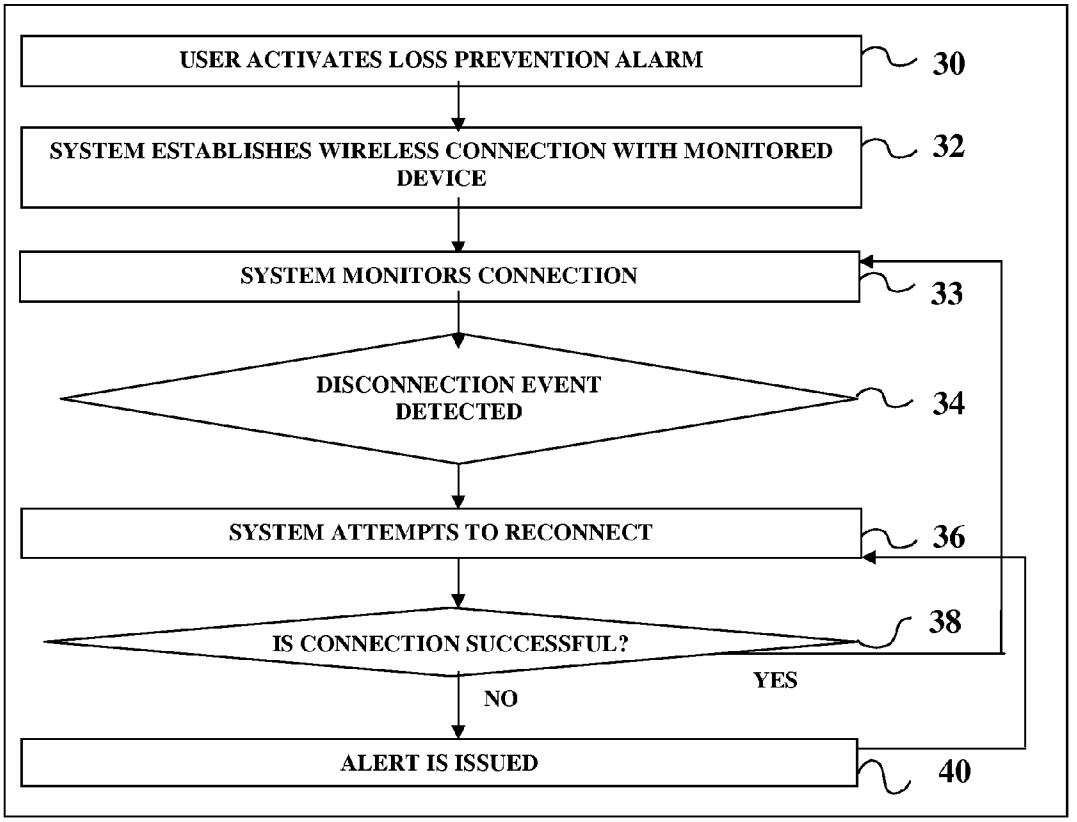

USER ACTIVATES LOSS PREVENTION ALARM
30
SYSTEM ESTABLISHES WIRELESS CONNECTION WITH MONITORED DEVICE
32
SYSTEM MONITORS CONNECTION
33
DISCONNECTION EVENT DETECTED
34
SYSTEM ATTEMPTS TO RECONNECT
36
IS CONNECTION SUCCESSFUL?
38
YES
NO
ALERT IS ISSUED
40

Fig. 3B

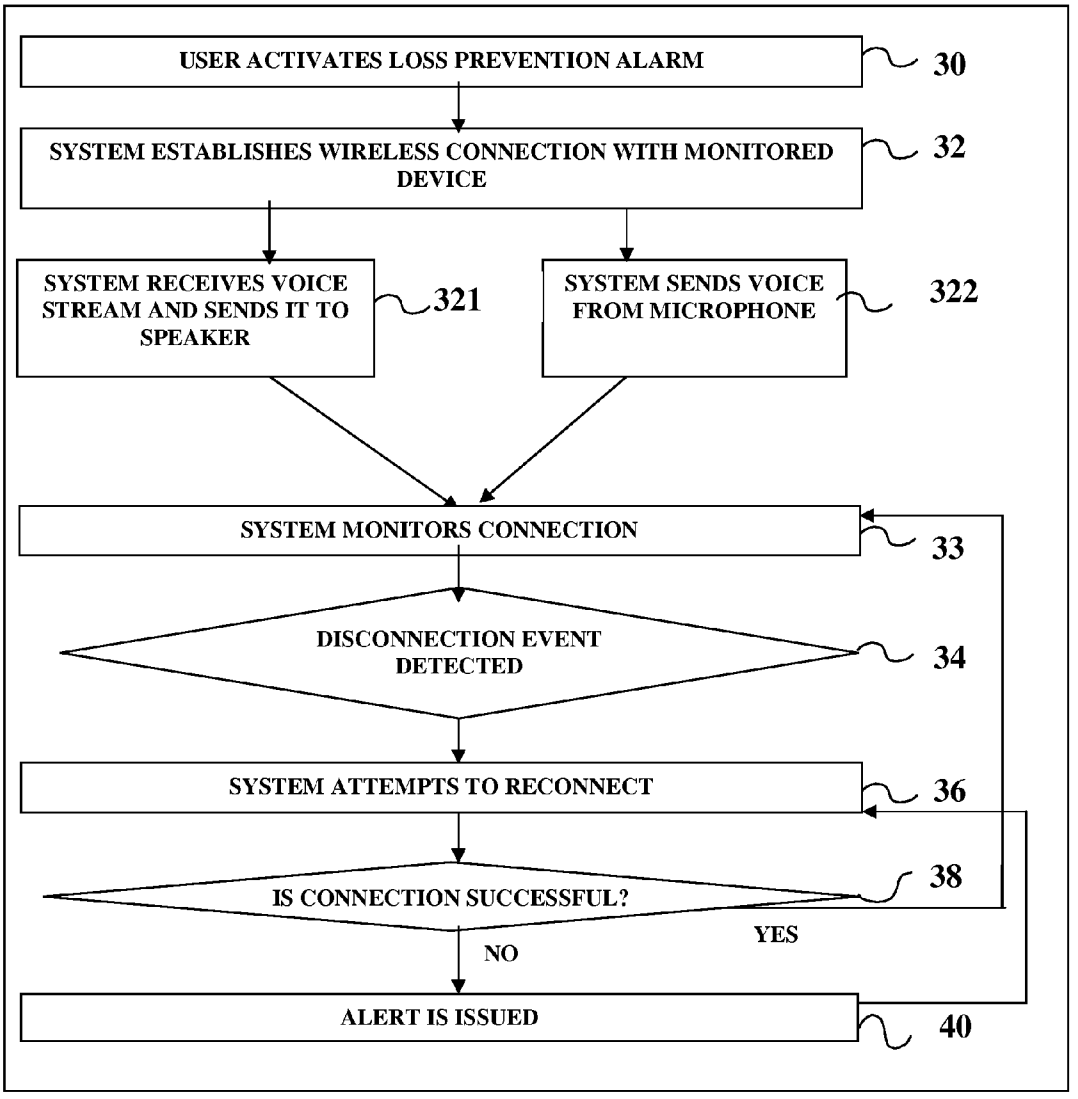

USER ACTIVATES LOSS PREVENTION ALARM
30
SYSTEM ESTABLISHES WIRELESS CONNECTION WITH MONITORED DEVICE
32
SYSTEM RECEIVES VOICE STREAM AND SENDS IT TO SPEAKER
321
SYSTEM SENDS VOICE FROM MICROPHONE
322
SYSTEM MONITORS CONNECTION
33
DISCONNECTION EVENT DETECTED
34
SYSTEM ATTEMPTS TO RECONNECT
36
IS CONNECTION SUCCESSFUL?
38
YES
NO
ALERT IS ISSUED
40

Fig. 3C

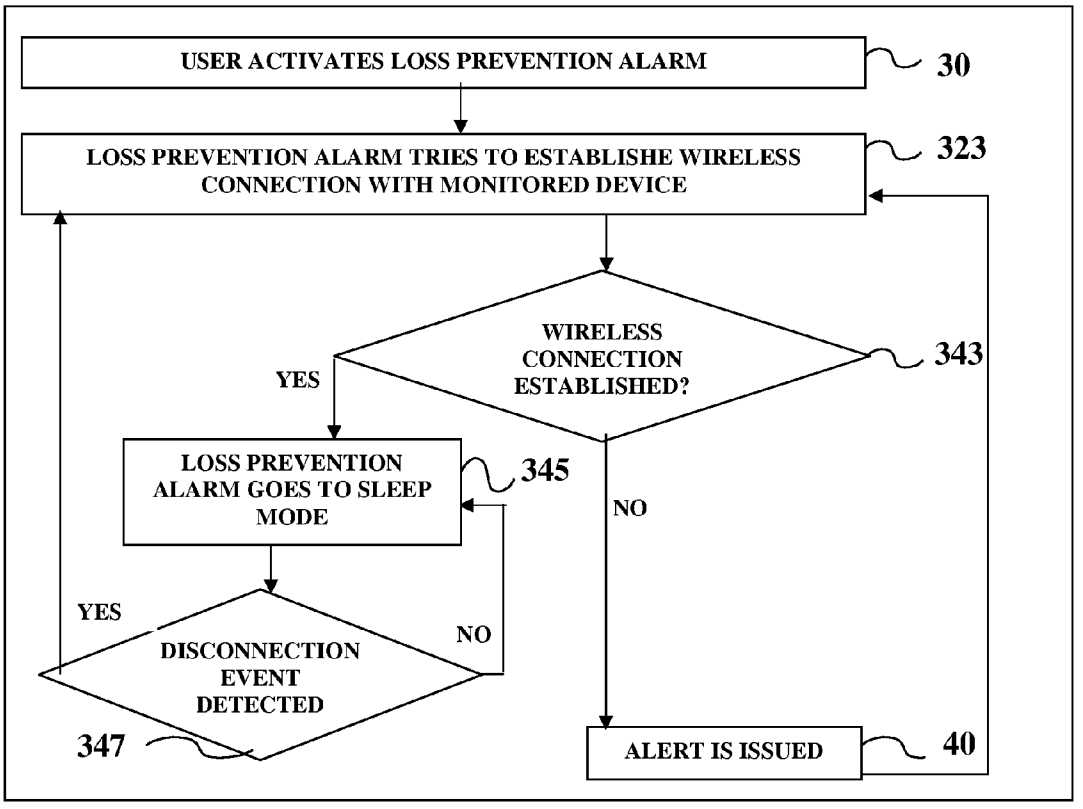

USER ACTIVATES LOSS PREVENTION ALARM
30
LOSS PREVENTION ALARM TRIES TO ESTABLISHE WIRELESS CONNECTION WITH MONITORED DEVICE
323
WIRELESS CONNECTION ESTABLISHED?
343
YES
NO
LOSS PREVENTION ALARM GOES TO SLEEP MODE
345
YES
NO
DISCONNECTION EVENT DETECTED
347
ALERT IS ISSUED
40

Fig. 4A

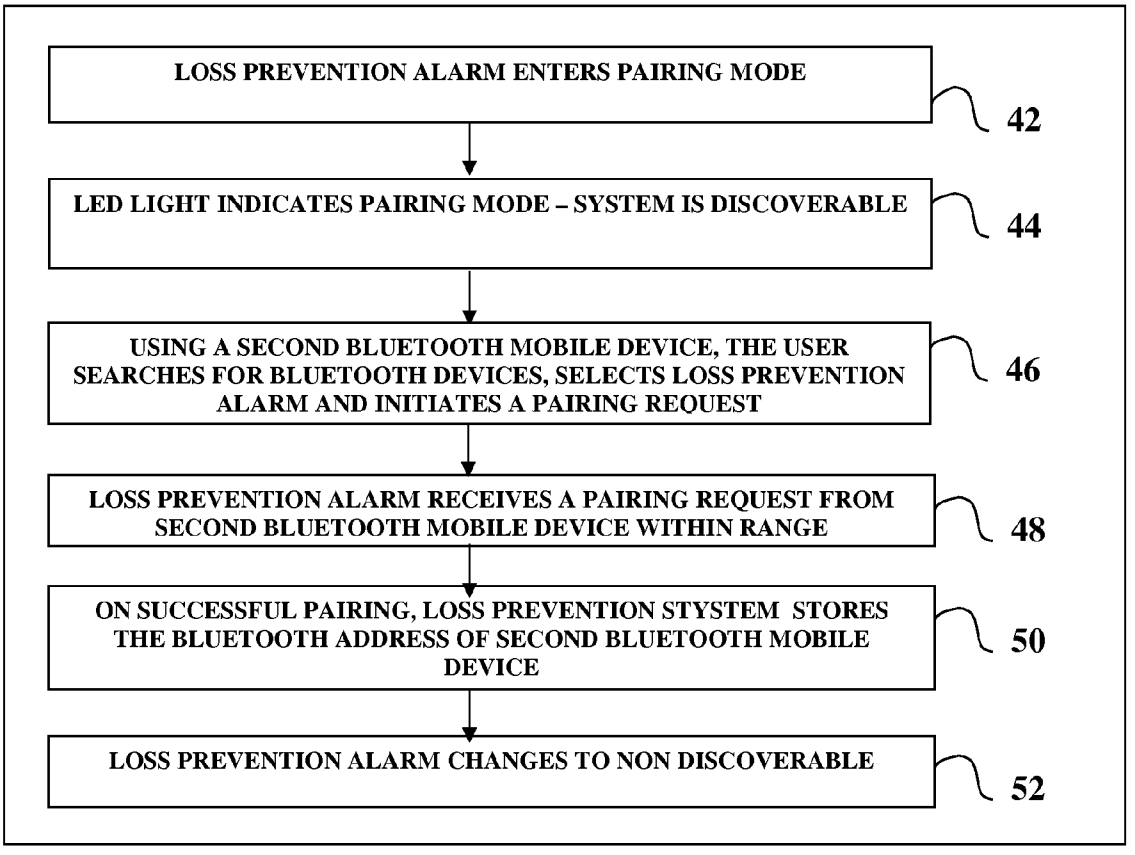

LOSS PREVENTION ALARM ENTERS PAIRING MODE
42
LED LIGHT INDICATES PAIRING MODE – SYSTEM IS DISCOVERABLE
44
USING A SECOND BLUETOOTH MOBILE DEVICE, THE USER SEARCHES FOR BLUETOOTH DEVICES, SELECTS LOSS PREVENTION ALARM AND INITIATES A PAIRING REQUEST
46
LOSS PREVENTION ALARM RECEIVES A PAIRING REQUEST FROM SECOND BLUETOOTH MOBILE DEVICE WITHIN RANGE
48
ON SUCCESSFUL PAIRING, LOSS PREVENTION STYSTEM STORES THE BLUETOOTH ADDRESS OF SECOND BLUETOOTH MOBILE DEVICE
50
LOSS PREVENTION ALARM CHANGES TO NON DISCOVERABLE
52

Fig. 4B

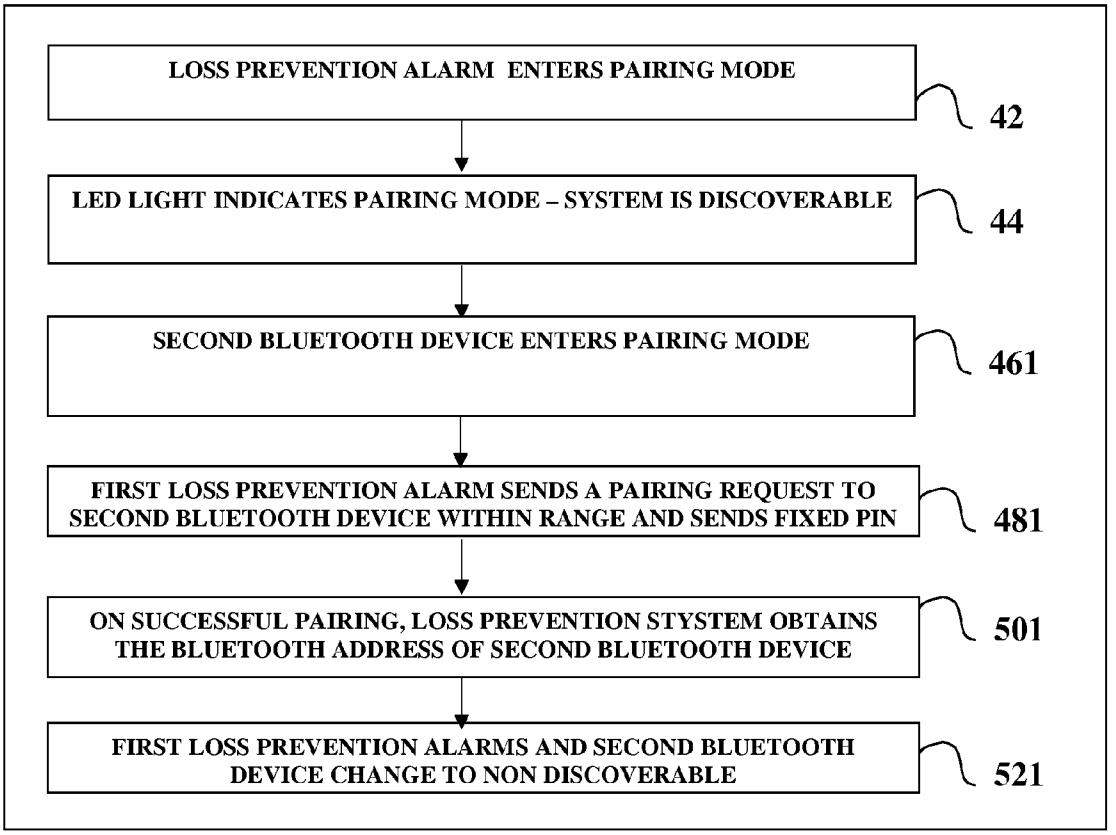

LOSS PREVENTION ALARM ENTERS PAIRING MODE
42
LED LIGHT INDICATES PAIRING MODE – SYSTEM IS DISCOVERABLE
44
SECOND BLUETOOTH DEVICE ENTERS PAIRING MODE
461
FIRST LOSS PREVENTION ALARM SENDS A PAIRING REQUEST TO SECOND BLUETOOTH DEVICE WITHIN RANGE AND SENDS FIXED PIN
481
ON SUCCESSFUL PAIRING, LOSS PREVENTION STYSTEM OBTAINS THE BLUETOOTH ADDRESS OF SECOND BLUETOOTH DEVICE
501
FIRST LOSS PREVENTION ALARMS AND SECOND BLUETOOTH DEVICE CHANGE TO NON DISCOVERABLE
521

Fig. 5

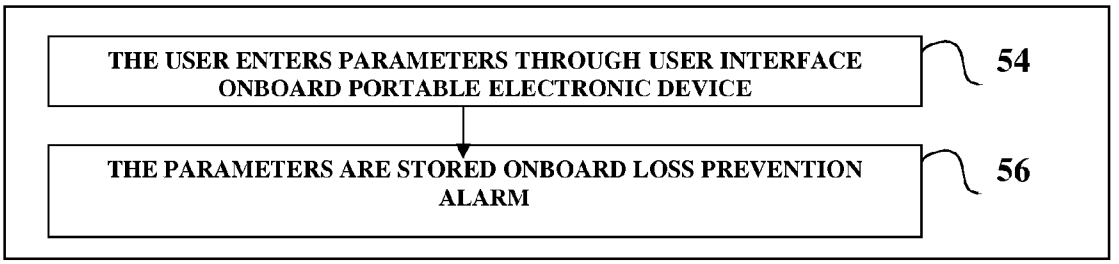

THE USER ENTERS PARAMETERS THROUGH USER INTERFACE ONBOARD PORTABLE ELECTRONIC DEVICE
54
THE PARAMETERS ARE STORED ONBOARD LOSS PREVENTION ALARM
56

Fig. 6

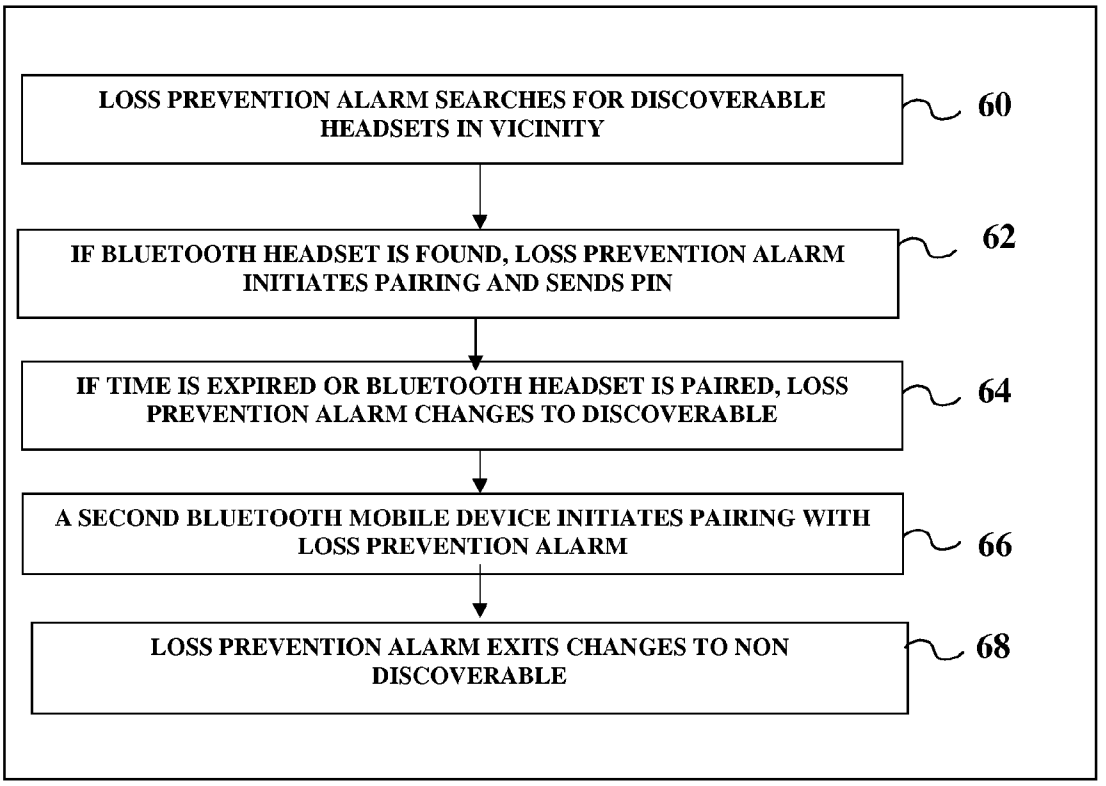
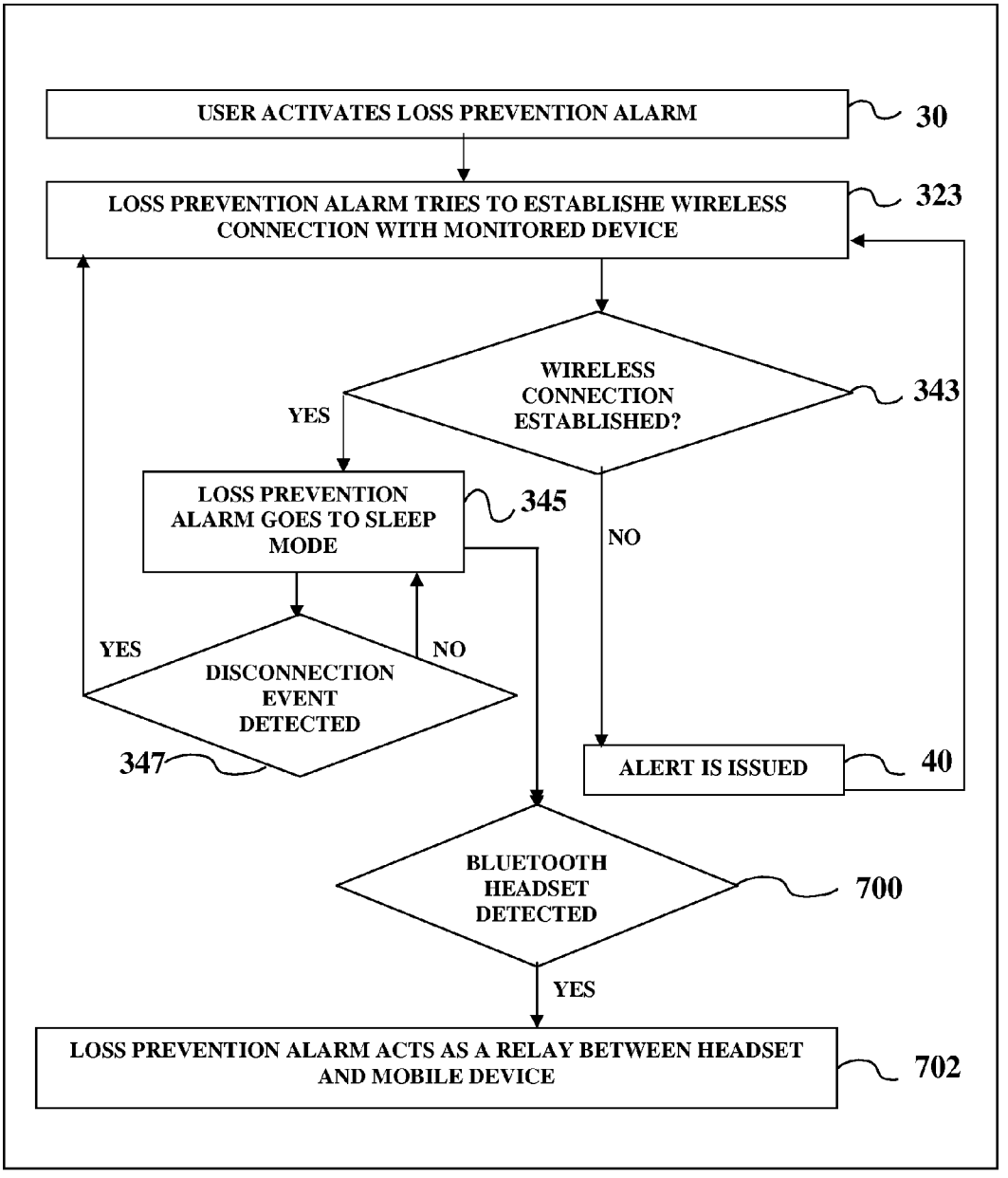

LOSS PREVENTION ALARM SEARCHES FOR DISCOVERABLE HEADSETS IN VICINITY
60
IF BLUETOOTH HEADSET IS FOUND, LOSS PREVENTION ALARM INITIATES PAIRING AND SENDS PIN
62
IF TIME IS EXPIRED OR BLUETOOTH HEADSET IS PAIRED, LOSS PREVENTION ALARM CHANGES TO DISCOVERABLE
64
A SECOND BLUETOOTH MOBILE DEVICE INITIATES PAIRING WITH LOSS PREVENTION ALARM
66
LOSS PREVENTION ALARM EXITS CHANGES TO NON DISCOVERABLE
68

Fig. 7


USER ACTIVATES LOSS PREVENTION ALARM
30
LOSS PREVENTION ALARM TRIES TO ESTABLISHE WIRELESS CONNECTION WITH MONITORED DEVICE
323
WIRELESS CONNECTION ESTABLISHED?
343
YES
NO
LOSS PREVENTION ALARM GOES TO SLEEP MODE
345
YES
NO
DISCONNECTION EVENT DETECTED
347
ALERT IS ISSUED
40
BLUETOOTH HEADSET DETECTED
700
YES
LOSS PREVENTION ALARM ACTS AS A RELAY BETWEEN HEADSET AND MOBILE DEVICE
702

SYSTEMS FOR MONITORING PROXIMITY TO PREVENT LOSS OR TO ASSIST RECOVERY

PRIORITY

[0001] The present application is a Continuation-In-Part ("CIP") of pending U.S. patent application Ser. No. , .

FIELD OF THE INVENTION

[0002] The present inventions relate to devices that detect and/or prevent loss via proximity detection system alarms, and more specifically relates to devices that monitor the presence of at least one wireless communication device and that issue an alarm when said device is not within a desired proximity.

BACKGROUND

[0003] Portable electronic devices such as cellular telephones, personal digital assistants (PDAs), wireless email devices, instant messaging devices, pagers, portable compact disk (CD) players, portable MP3 players, and others are often forgotten, lost, or stolen (a "PED" includes any portable device that can be used for communication, performing intellectual and/or physical work, and/or entertainment). Existing wireless device loss detection approaches focus primarily on remotely accessing a device after it is lost. This allows prohibiting the device, such as a cell phone, from placing phone calls. It also allows hiding the device owner's information or erasure of sensitive data. This strategy aims to increase the user's chances of recovering the device and to protect data stored in the device. This method does not allow users to quickly recover their lost devices. Other methods for tracking and locating a lost cell phone include network triangulation and GPS interrogation. These methods do not allow users to automatically and/or instantaneously recover their lost devices. Another method and apparatus for reducing the likelihood of losing a portable electronic device is disclosed in U.S. Pat. No. 6,836,212, and in U.S. Pat. No.7,005,999, which monitors inadvertent removal of a portable electronic device (PED) from its retaining device. So, if the PED is already removed from its retaining device for use or the retaining device and PED are left behind together or move out of a desired range, this apparatus does not protect users from losing their PEDS.

[0004] U.S. Patent application publication 20050280546 discloses two mobile transceivers that are linked through a Bluetooth link. The Bluetooth enabled RF link between the first and second mobile transceiver units forms a monitoring piconet. The second mobile transceiver unit provides an alarm indication when the first mobile transceiver unit moves beyond a distance of approximately ten meters from the second mobile transceiver unit. The second device repeatedly pages the first device, and waits for a response. If a response is not received, an alarm is issued. This system is unreliable and unfit for use as a proximity alarm because paging consumes 40 mA, a rate that would inconvenience the user by requiring an expensive and/or heavy battery or frequent recharging. Further, paging is often blocked by human bodies, which can result in false alarms when a page does not reach the first device. Nevertheless, a Bluetooth based communication system has many benefits over traditional analog systems, including greater security and the ease of designing and building transceiver systems using Bluetooth. Due to the widespread acceptance and use of the Bluetooth standard, circuitry for Bluetooth systems has been built into small, lightweight chips, which are readily available at low cost.

[0005] U.S. Pat. No. 6,885,848 is directed to an apparatus for preventing the loss of a portable telephone that uses Bluetooth communication protocol. The signal strength is periodically monitored and an alarm issued to the headphone when the signal is below a threshold. Bluetooth protocol provides for a received signal strength indicator (RSSI) value or the Link Quality value to be determined at any time. If the value received is below a threshold, an alarm is issued to the headphone. This system and method have been tested, and not found to a reliable way for indicating that a mobile phone has left a proximity range due to production of false positives. Further, the system requires that the headphone be proximate an ear for the alarm to be detected.

[0006] U.S. Patent application publication 20020080036 discloses the use of a mobile network for tracking the position of a plurality of objects and displaying them on a map; the apparatus in this patent requires expensive transceivers, and has a significant time delay for indicating object is out of range.

[0007] U.S. Pat. No. 6,989,748 discloses a battery with an integrated tracking device. The system is difficult to commercialize because of the large variety of batteries on the market. Furthermore, the transmitter/receiver system needs an antenna, and it would be a challenge to install an antenna inside the battery or on its surface as that would compromise its performance.

[0008] U.S. Pat. No. 7,002,473 discloses a loss prevention system that uses RFID. It requires a bulky transceiver that interrogates all the RFID tags. It is not convenient for portable applications inter alia.

[0009] U.S. Pat. No. 5,796,338 discloses a system and method for preventing loss of a cellular phone or similar portable device. The system includes a wireless transmitter in cell phones for intermittently sending security signals to a pager worn by the user. An alarm is actuated when the strength of the security signal falls below a predetermined threshold. This system cannot be used with existing phones and requires cell phone manufacturers to modify their designs.

[0010] In general, there exists a need for technologies that enable one to know that certain persons, animals or things (e.g., mobile phones, and computers) stay within a desired proximity of a specified area. For example, a parent in a shopping mall may want their child to stay within a certain proximity of the parent and may wish to remotely monitor the child's activities; should the child go beyond the desired proximity it is desired that a clear notice be given (e.g., alarm requiring acknowledgement) and perhaps even communicate with the child. Another example is that a parent walking in a park may want their walking child to stay within a certain range. Or a person walking their dog wants it to stay within a certain range. With respect to things, people generally want their mobile phone and/or portable computers or other PEDs to stay within a certain range to avoid loss thereof and/or unauthorized access or to have them at hand for use.

[0011] In order to solve these problems, there is a need for technologies that are simple to use, inexpensive to build and use, small and light weight enough to be mobile, adaptable for different situations, and secure.

[0012] However, such an analog RF system is capable of being undermined by other interfering devices. While the manufacturer may vary the signal frequency used by different pairs of transmitters and receivers, it is possible for a receiver in a first pair to detect a transmitter from a second pair, thus risking the possibility that the first receiver would not detect the first transmitter going out of range, which could not only mean that a child being monitored goes out of range without an alarm but that the parents would have a false sense of security that the child was within range and so consequently they do not look after the child as much they may otherwise have without the system. This derives from the system being designed to work at a common pre-set frequency between the transmitter and receiver, and the receiver cannot discriminate between different transmitters transmitting at substantially the same frequency. Further, when a transmitter or receiver is lost, it is not likely that a replacement can be readily obtained that has a matching fixed frequency transmission or reception range, despite the possibility of an interfering transmitter being encountered at random in use. The lack of security on these RF type transmitter receiver pairs means that a child or pet abductor can monitor the frequency of a first transmitter and program a second transmitter that can be used as a decoy to defeat the system. While an analog transmitter and receiver can be preset to be a pair, i.e., one can receive the signal of the other automatically when within range, this should not be confused with the process of pairing of two digital devices that also use RF type communication. For example, Bluetooth headset devices are available that pair with a mobile phone. A Bluetooth headset can provide a tone to the ear of a wearer when the Bluetooth connection to the mobile phone is dropped. However, one must be generally within about 3 feet of the headset to hear the tone if the mobile phone is moved out of range of the headset.

[0013] Thus, a need exists for systems for monitoring persons, things, and animals that are reliable, simple to use, cost effective, mobile, adaptable and secure. Such systems should provide an alarm to users upon detecting that a person, animal or thing is not within a desired proximity, wherein the alarm is appropriate to the circumstances. Further, there is also a need for more proactive systems to reduce the risk of loss of a person, animal or thing, and to make such systems ubiquitous as standard accessories.

SUMMARY OF THE INVENTION

[0014] A proximity detection alarm device, comprising a first unit, said first unit comprising a first Bluetooth transceiver system; at least one alarm; at least one control; a power input; an attachment mechanism and wherein said first Bluetooth transceiver system can pair with a second Bluetooth transceiver system in a first range, wherein said attachment mechanism is selected from the group consisting of a key chain, a ring, a hook, a notebook security lock, an insert, a pin, a clip, a tee, a collar, Velcro fastener, a ring, and a sticky surface, wherein said Bluetooth transceiver system is selected from the group consisting of a class 1 Bluetooth transceiver, a class 2 Bluetooth transceiver, a class 3 Bluetooth transceiver, and a Wibree transceiver, wherein said at least one control comprises at least one of the group consisting of a button, a switch, and a sensor, wherein said at least one alarm is audible and when activated produces an alarm signal of at least 60 decibels, wherein following pairing with a second Bluetooth transceiver system, said first Bluetooth transceiver system will utilize a power saving mode selected from the group consisting of sniff, park, and hold, wherein upon said first Bluetooth transceiver detecting a connection drop from a second Bluetooth transceiver system to which said first Bluetooth system has formed a pair, said first Bluetooth transceiver system will periodically attempt to reconnect to the second Bluetooth transceiver system, wherein said alarm will be activated within a predetermined time after a connection drop between said first Bluetooth transceiver system and a second Bluetooth transceiver system to which said first Bluetooth system has formed a pair. In an embodiment, the alarm will not be activated if a pair is formed again before a predetermined time has elapsed after a connection drop.

[0015] A method for securing a portable electronic device comprising: running a client software on a portable electronic device, wherein upon said client detecting a connection drop from a first Bluetooth transceiver system to which said client has formed a pair, said client will periodically attempt to reconnect to the first Bluetooth transceiver system, wherein said client issues an alert within a predetermined time after a connection drop between said client and said first Bluetooth transceiver system to which said client has formed a pair. In another embodiment, a proximity detection alarm device, comprising: a first unit, said first unit comprising a first Bluetooth transceiver system; at least one control; a power input; a microphone; an ear piece; a bearing joining said ear piece to the main body of said first unit; wherein said ear piece can fold and unfold.

BRIEF DESCRIPTION OF THE FIGURES

[0016] The present inventions may be more clearly understood by referring to the following figures and further details of the inventions that follow.

[0017] FIG. **1**A is a schematic of a portable loss prevention alarm.

[0018] FIG. **1**B is a schematic of an alternative portable loss prevention alarm.

[0019] FIG. **1**C is a schematic of an alternative portable loss prevention alarm.

[0020] FIG. **2**A is a block diagram of portable loss prevention alarm.

[0021] FIG. **2**B is a block diagram of an alternative portable loss prevention alarm.

[0022] FIG. **2**C is a block diagram of an alternative portable loss prevention alarm.

[0023] FIG. **3**A is a flowchart illustrating the operation of a loss prevention alarm.

[0024] FIG. **3**B is a flowchart illustrating an alternative operation of a loss prevention alarm.

[0025] FIG. **3**C is a flowchart illustrating operation of a recovery alarm.

[0026] FIG. **4**A is a flowchart illustrating initiating the loss prevention alarm.

[0027] FIG. **4**B is a flowchart illustrating initiating the loss prevention alarm with another Bluetooth device.

[0028] FIG. **5** is a flowchart illustrating configuring the loss prevention alarm.

[0029] FIG. **6** is a flowchart illustrating pairing portable prevention system with a Bluetooth headset and a Bluetooth mobile device.

[0030] FIG. **7** is a flowchart illustrating the relay operation of a portable loss prevention alarm.

[0031] Similar reference numerals are used in different figures to denote similar components.

FURTHER DETAILS OF THE INVENTIONS

[0032] The following provides further details of the present inventions summarized above and illustrated in a schematic fashion in the Figures. In accordance with a first aspect of the present inventions, FIG. **1**A is a schematic illustration of a portable loss prevention alarm **10** comprising a Bluetooth system **20** operatively connected with at least one activation switch **13**, a visual indication center (or display) **16**, a power store **24**, an alarm center **25** and an antenna **14**. Display **16** can be used to indicate the status of the device, such as whether it is powered, if the Bluetooth transceiver system (BT) is discoverable or non-discoverable, if the BT is pairing or paired with another BT, the BT mode, inter alia.

[0033] In a preferred embodiment, the components of the portable loss prevention alarm **10** can fit in a volume less about 60×30×10 mm or 18 cc, so that alarm **10** can fit into a housing having an interior with dimensions of 60×30×10 mm or no more than 18 cc. In another embodiment, alarm **10** can fit into a volume 10 cc, and weigh about 50 grams or less, and preferably less than about 10 g. Devices of the present invention should take up minimal volume and be light weight. For example, each device of the present inventions will preferably fit into a space having a volume of 56 cubic centimeters, 25 cubic centimeters, 22.5 cubic centimeters, 18 cubic centimeters, 10 cubic centimeters, or 1 cubic centimeters, and each device of the present inventions preferably has a weight less than about 200 grams, less than about 50 grams, or less than about 10 grams.

[0034] An attachment mechanism or system, including but not limited to a hook, harness, notebook security lock, insert, pin, clip, badge, clip, key chain, ring, tee, dog collar, Velcro, ring, fastening mechanism, sticky surface are optionally attached to the loss prevention alarm **10**.

[0035] Control or activation switches **13** can be any type of button, switch, remote sensor, touch sensor, contact sensor or activation system. Activation switches **13** are used to turn the loss prevention alarm ON/OFF, to shut off the alarm, to change the Bluetooth system mode to pairing mode, and/or to start voice transmission for embodiments that have a microphone and/or speaker. For example, a single control button can cycle through a menu of functions by changing the length of time that the button is held and/or the speed with which a first press is followed by a second press (analogous to the single and double click on a computer mouse). One or two control buttons coupled with a simple display screen can adjust a variety of operational parameters.

[0036] Bluetooth system **20** enables connectivity over the 2.4 GHz radio frequency (RF) band. Bluetooth system **20** includes a radio and base band IC for Bluetooth 2.4 GHz systems. In a preferred embodiment, Bluetooth system **20** includes ROM, Flash memory or external memory or any other type of memory. In an alternative embodiment, Bluetooth system **20** includes a power amplifier (PA) and/or low noise amplifier (LNA) for increasing the Bluetooth transmission range.

[0037] In a preferred embodiment, Bluetooth system **20** includes a processor, RAM and Flash for loading and executing program. The processor executes the Bluetooth protocol, as well as the program that provides the proximity detection and alarming functionality. The processor can also executes other functionality such as sending files on pairing, flashing lights, providing voice functionality, relaying voice to a remote Bluetooth device, detecting connection from a remote Bluetooth device, etc.

[0038] The Bluetooth specification (a de facto standard containing information required to ensure that devices supporting Bluetooth can communicate with each other worldwide) defines two transmission ranges for personal area networking. The range is between 10 m and 100 m without a line of sight requirement. The radio link is capable of voice and data transmission up to a maximum capacity of 720 kbps per channel. Any other range can be designed.

[0039] A Bluetooth network is completely self organising, and ad hoc personal area networks (PANs) can be established wherever two or more Bluetooth devices are sufficiently close to establish radio contact. Equipment capable of Bluetooth connectivity is able to self-organise by automatically searching within range for other Bluetooth-enabled devices. Upon establishing a contact, information is exchanged which determines if the connection should be completed or not. During this first encounter, the Bluetooth devices connect via a process of authorisation and authentication.

[0040] Bluetooth Pairing happens when two Bluetooth enabled devices agree to communicate with one another. When this happens, the two devices join what is can be referred to as a trusted pair. When one device recognizes another device in an established trusted pair, each device automatically accepts communication, bypassing the discovery and authentication process that normally happen during Bluetooth interactions.

[0041] When Bluetooth pairing is being set up, the following usually happens:

[0042] 1. Device A (such as a handheld) searches for other Bluetooth enabled devices in the area.

[0043] How does A find these devices? The devices that are found all have a setting that makes them discoverable when other Bluetooth devices search. It's like raising your hand in a classroom: the discoverable devices are announcing their willingness to communicate with other Bluetooth devices. By contrast, many Bluetooth devices can toggle their discoverability settings off. When discoverability is off, the device will not appear when other devices search for it. Undiscoverable devices can still communicate with other Bluetooth devices, but they must initiate all the communications themselves.

[0044] 2. A detects Device B (such as a second handheld that's discoverable).

[0045] During the discovery process, the discoverable devices usually broadcast what they are (such as a printer, a PC, a mobile phone, a handheld, etc.), and their Bluetooth Device Name (such as "Bob's Laptop" or "deskjet995c"). Depending on the device, you may be able to change the Device Name to something more specific. If there are 10 Bluetooth laptops and 5 Bluetooth mobile phones in range, and they are all discoverable, this can come in handy when selecting a specific device.

[0046] 3. A asks B to send a Passkey or PIN

[0047] A passkey (or PIN) is a simple code shared by both devices to prove that both users agree to be part of the trusted pair. With devices that have a user interface, such as handhelds, mobile phones, and PCs, a participant must enter the passkey on the device. With other types of devices, such as printers and hands-free headsets, there is no interface for changing the passkey on the

device, so the passkey is always the same (hard coded). A passkey used on most Bluetooth headsets is "0000". The passkeys from both parties must match.

[0048] 4. A sends the passkey to B

[0049] Once you've entered the passkey on A, it sends that passkey to B for comparison. If B is an advanced device that needs the user to enter the same passkey, it will ask for the passkey. If not, it will simply use its standard, unchanging passkey.

[0050] 5. B sends passkey back to A

[0051] If all goes well, and B's passkey is the same entered by A, a trusted pair is formed. This happens automatically when the passkeys agree. Once a trusted pair is developed, communication between the two devices should be relatively seamless, and shouldn't require the standard authentication process that occurs between two devices who are strangers. Embodiments of the present inventions take advantage of the reduced power requirements of certain Bluetooth modes following pairing of two Bluetooth enabled devices.

[0052] Bluetooth has several types:

[0053] i) Class 2: a class 2 Bluetooth transceiver can discover pair and communicate with any Bluetooth transceiver within a radius of 10 meters seamlessly.

[0054] ii) Class 1: A class 1 Bluetooth transceiver can discover pair and communicate with any Bluetooth transceiver within a radius of 100 meters.

[0055] iii) Class 3: A class 3 Bluetooth transceiver can discover pair and communicate with any Bluetooth transceiver within a radius of 2 meters.

[0056] iv) Non standard devices: can be designed to discover pair and communicate with any Bluetooth transceiver within any distance less than 300 meters.

[0057] Power store **24** provides power to some of the components of loss prevention alarm **10**. Power store **24** can be a capacitor, a battery (fuel cell, nickel-cadmium, lithium, lithium polymer, lithium ion, alkaline or nickel-hydride battery or any other portable source of electric power) or a combination of a capacitor and a battery, whereby the capacitor onboard a main unit is used to power Bluetooth system **20** for a number of utilizations and it can be charged from time to time by attaching the main unit to a detachable battery unit. Power store **24** can also be replaced with photovoltaic cells, a rechargeable battery, or a battery rechargeable from a distance (such as by induction). When loss prevention alarm **10** is not in operation it remains in a dormant state ("sleep-mode") to conserve the energy of power store **24**. For example, small 1.5 volt batteries, and the like, such as those used in small devices like hearing aids, calculators and watches are widely available and can be used as for a power source. One of ordinary skill in the art can readily determine the battery size and power requirements for different embodiments of the present inventions. It is envisioned that other low power specifications can be used in connection with the present inventions. For example, an ultra-low-power wireless technology called Wibree has been developed. Wibree addresses devices with very low battery capacity and can be easily integrated with Bluetooth technology.

[0058] Visual indication center **16** comprises one or more LED. The LED can turn on and off periodically to indicate the system is on. The color and frequency of the LEDs can indicate different events such as normal mode, pairing mode, alarm mode, low battery mode, voice mode, etc In a preferred embodiment, visual indication center **16** while indicating the status of the system also illuminates a customizable face plate, made out of clear material such as acrylic. A logo or graphic can be printed on the face plate thus allowing to easily and economically change the look and branding of the device. This automatically leverages the visual indication center, and adds a promotional value and function to the device, above and beyond the main loss prevention function.

[0059] In another embodiment, a business method consists of building a marketing campaign centered around an innovative product. In this case, loss prevention alarm **10/11/12** are part of a promotional campaign based on the safety and security theme. Such promotional campaign would give away to customers some branded loss prevention alarm **10/11/12** units. This serves the value of building relationship with customers, reinforcing image, reducing churn and providing customers with a sticky application, that of security for their mobile/laptop devices and data. The customers use the sticky application for a long time, and at the same time, the logo will be flashed.

[0060] In another embodiment, visual indication center **16** can be an LCD or any other indication means, and alarm center **25** includes an alarm audible from a distance greater than 6 feet. A regular alarm is between 65 and 120 decibels at 10 feet. Noise levels above 85 decibels can harm hearing over time. Noise levels above 140 decibels can cause damage to hearing after just one exposure. In a preferred embodiment, alarm center 25 has more than 50 decibels or 50 dBA at 10 feet or exceeds ambient sound level by 5 decibels minimum. In a preferred embodiment, the alarm provides an audible signal of at least 60 decibels to notify the user of a designated event, such as a monitored child leaving a desired proximity. The human ear does not respond equally to all frequencies: humans are much more sensitive to sounds in the frequency range about 1 kHz to 4 kHz (1000 to 4000 vibrations per second) than to very low or high frequency sounds. Sound meters are usually fitted with a filter that has a frequency response similar to the human ear. If the "A weighting filter" is used, the sound pressure level is given in units of dB(A) or dBA. In residential areas, most noise comes from transportation, construction, industrial, and human and animal sources. Road traffic noise is the leading source of community noise. The noise can be highly variable. It is common that Day-Night sound levels in different areas vary over a range of 50 dB. The outdoor level in a wilderness area may occur as low as 30 to 40 dBA, and as high as 85-90 dBA in an urban area. Most urban dwellers lives in areas of noise level more than 48 dBA.

[0061] Alarm center **25** can be any type of audio, video, tactile or mechanical user interface means capable of conveying information to the user. Audio means can be any audio device such as a speaker, a buzzer, a Piezo buzzer, omni-directional speaker, directional speaker, an ultrasound or any other audio device. Visual means can be an LED, or any visual information display device. Tactile means can be any tactile sensor such as a vibrator, or a heat-generating device.

[0062] Antenna **14** can be any type of antenna including chip antenna, patch antenna, PCB antenna and dipole antennas.

[0063] In an embodiment, portable loss prevention alarm **10** can be inserted beneath the skin of a human or animal or included inside the housing of objects such as portable computers. In an embodiment, alarm **10** is contained within a capsule formed of an implant-grade material that has minimal risk for rejection by mammalian immune systems and the

capsule inserted under the skin. It can also be carried as a keychain or attached to people, animals or objects through a hook, harness, notebook security lock, insert, pin, clip, badge, clip, key chain, ring, tee, dog collar, Velcro fastener, ring, fastening mechanism, sticky or adhesive surface or any other attachment mechanism. Many notebook computers have a security slot on the side, which can be utilized by inserting a notebook security lock; the lock can be attached to an external device, such as a cable or desktop securing mechanism.

[0064] Portable loss prevention alarm **10** can also be encased in waterproof packaging and attached to clothes. The packaging can also be shock or impact resistant. System **10** can be incorporated in any other plastic or portable electronic device or object, including for example a cell phone, PDA, a wireless email device, an instant messaging device or pager, a portable computer, an MP3 player, a portable music player, a portable radio device, or any portable electronic device. Alarm **10** can also be sewn into clothes. Preferably, system **10** is as small as is practical so as to avoid distracting or annoying the person or animal carrying it. In an embodiment, the present invention includes clothing that has at least one pocket for holding the remote proximity sensor; the pocket has a closure that can be repeatedly opened and closed to operate the device and/or to remove it for other uses and/or users. Preferably, alarm **10** has dimensions of less than 10 cm×10 cm×5 cm (otherwise stated as "10×10×10 cm") and is less than 200 g in weight. In an embodiment, there are no manually operated controls (e.g, off-on or activation button is magnetically operated, so the housing is not provided with button or switch access), and the device may not have a display. In an embodiment, the housing of the device includes at least one seal and/or is waterproof so that immersion in water, or preferably even running the device through laundering machines, does not damage the electronic components. In a preferred embodiment, system **10** has a size equal to or smaller than 5 cm×3 cm×1.5 cm or 22.5 cubic centimeters ("cc"). A device having the desired functions of the present inventions can fit all of its components into a volume less than 1000 cc, preferably less than about 56 cc, 22.5 cc, and even 10 cc. Each mobile proximity sensor or remote sensor weighs less than 200 grams, preferably less than 50 g, and even less than 10 g. A preferred device has no than four manually operated buttons or switches, and preferably has only one manually operated button or activation switch and no more than one display

[0065] An embodiment of a remote sensor for attachment to or carrying by a person or animal to be monitored has no manually operated controls and no display; such an embodiment would be difficult to disable and particularly durable to operate under robust physical and environmental challenges. Such a device might be carried by soldiers and law enforcement personnel and have a beacon or alarm that is activated should the housing be broken; small children, animals and others that are being monitored would not be able to disable the device without an alarm being given.

[0066] FIG. **1**B is a schematic of an alternative portable loss prevention alarm **11** comprising a Bluetooth system **20** connected with activation switches **13**, visual indication center (or display) **16**, power store **24**, alarm center **25**, antenna **14**, Audio center **18**, bearing **23** and ear piece **27**.

[0067] Audio center **18** can be any type of microphone, speaker, earphone wire, etc. In a preferred embodiment, the electronic components of portable loss prevention alarm **11** can be fit into a volume of about 60×30×10 mm or 18 cc or less. For example, portable loss prevention alarm **11** may be fit into a volume less than about 56 cc, 22.5 cc, 18 cc or 10 cc. Ear piece **27** is an earphone or speaker that fits in the ear. Bearing **23** can be a pivot, articulation, U joint or a ball joint. Bearing **23** is generally mounted to ear piece **27** and allows adjusting the angle of ear piece **27** relative to the main body of portable loss prevention alarm **10** across one or more planes.

[0068] FIG. **1**C is a schematic of an alternative portable loss prevention alarm **12** comprising a Bluetooth system **20** connected with Bluetooth system **20***b*, activation switches **13**, visual indication center (or display) **16**, power store **24**, alarm center **25** and antenna **14**. Bluetooth system **20***b* is similar to Bluetooth system **20**, except that it runs a different Bluetooth profile. In a preferred embodiment, Bluetooth system **20***b* runs AGHFP profile.

[0069] Referring to FIG. **2**A, in an embodiment, portable loss prevention alarm **10** comprises a Bluetooth system **20** connected with activation switches **13**, visual indication center **16**, power store **24**, and alert (or alarm) center **25**.

[0070] Referring to FIG. **2**B, in an embodiment, portable loss prevention alarm **11** comprises a Bluetooth system **20** connected with activation switches **13**, visual indication center **16**, power store **24**, alert center **25**, audio center **18**, bearing **23** and ear piece **27**.

[0071] Referring to FIG. **2**B, in an embodiment, portable loss prevention alarm **11** comprises a Bluetooth system **20** connected with activation switches **13**, visual indication center **16**, power store **24**, alert center **25**, audio center **18**, bearing **23** and ear piece **27**.

[0072] Referring to FIG. **2**C, in an embodiment, portable loss prevention alarm **12** comprises a Bluetooth system **20** connected with Bluetooth system **20***b*, activation switches **13**, visual indication center **16**, power store **24**, and alert (or alarm) center **25**.

[0073] Turning now to FIG. **3**A, the flowchart illustrates the steps involved in detecting that a portable electronic device (PED) is outside a desired range of a base device (a base device may be referred to as a master and the monitored remote devices referred to as slaves). The PED can be for example a mobile phone, a PDA, a wireless email device, an instant messaging device, a pager, a portable computer, an MP3 player, a portable music player, a portable radio, or any PED. In step **30**, the user activates loss prevention alarm **10**/**11** by pressing activation switch or button **13**.

[0074] Activation switch **13** has several modes. In a preferred mode, a long press of activation button **13** on the base unit **10** indicates ON/OFF event. A long press may be defined by either the length of time that switch **13** is manually held in a second position against a bias that holds the switch in a first position when at rest, or a signal may be given to indicate that a desired mode of operation or desired action has been initiated. For example, a very long press can cause a switch to pairing mode.

[0075] In another embodiment, intermittent button presses can cause a switch to audio mode whereby the device will send and/or receive audio from a second device. In step **32**, Bluetooth system **20** in a base unit establishes a Bluetooth connection with a monitored remote device. The wireless connection can be an HSP (headset profile) connection or a HFP (Hands-Free profile) connection. Other connection profiles that can be used include AGHFP (audio gateway HFP), SPP (serial port profile), RFCOMM, A2DP (advanced audio distribution profile), AVRCP (audio video remote control profile), AVCTP (audio video control transport protocol),

AVDTP (audio video distribution transport protocol), DUN (dial up networking), and GAVDP (general audio video distribution profile).

[0076] In one embodiment, Bluetooth system **20** does not redirect voice calls, thus the mobile phone operations remain intact. Bluetooth system **20** uses a Bluetooth operational mode that uses minimal power, e.g., one of sniff, hold, or park modes. In a preferred embodiment, only Bluetooth sniff mode is used after pairing to assure low power usage and optimize convenience to the user by reducing the frequency of battery recharging or replacement.

[0077] In sniff mode, a device listens only periodically during specific sniff slots, but retains synchronization with the paired Bluetooth device onboard the monitored device. In other embodiments, Bluetooth system **20** can use hold mode wherein a device listens only to determine if it should become active, or park mode wherein a device transmits its address. Sniff mode assures very low power consumption and thus extends battery life. In sniff mode, a Bluetooth master radio frequency unit (e.g., base) addresses a slave radio frequency unit (e.g., remote), which enables the slave to synchronize to the master by sending poll packets and optionally null packets over an active link, the master being arranged so that receipt of a response from the slave unit to a poll packet is sufficient to maintain the active link. The slave unit does not have to respond to all poll packets. This approach can allow the slave to preserve more (transmit) power by going into a deep sleep mode in which a low power oscillator may be used while still allowing the master unit to detect whether the slave has resynchronized or not (and thus to update a Link Supervision Timer, for example).

[0078] Bluetooth Wireless Technology Profiles: In order to use Bluetooth wireless technology, a device must be able to interpret certain Bluetooth profiles. The profiles define the possible applications. Bluetooth profiles are general behaviors through which Bluetooth enabled devices communicate with other devices. Bluetooth technology defines a wide range of profiles that describe many different types of uses.

[0079] At a minimum, each profile specification contains information on (1) dependency on other profiles, (2) suggested user interface formats, and (3) specific parts of the Bluetooth protocol stack used by the profile. To perform its task, each profile uses particular options and parameters at each layer of the stack. This may include an outline of the required service record, if appropriate.

[0080] Hands-Free Profile (HFP). HFP describes how a device can be used to pair, to connect to an audio gateway such as a mobile phone, and to place and receive calls. A typical application is a Bluetooth headset device or a Bluetooth car kit. Hands-Free Audio Gateway Profile (AGHFP) describes how a gateway device such as a mobile phone can be used to pair, to connect and to send and receive calls to/from a hands-free device. A typical configuration is a mobile phone.

[0081] Headset Profile (HSP). The HSP describes how a Bluetooth enabled headset should communicate with a computer or other Bluetooth enabled device such as a mobile phone. When connected and configured, the headset can act as the remote device's audio input and output interface. The HSP relies on SCO for audio and a subset of AT commands from GSM 07.07 for minimal controls including the ability to ring, answer a call, hang up and adjust the volume.

[0082] Serial Port Profile (SPP). SPP defines how to set-up virtual serial ports and connect two Bluetooth enabled devices. SPP is based on the ETSI TS07.10 specification and uses the RFCOMM protocol to provide serial-port emulation. SPP provides a wireless replacement for existing RS-232 based serial communications applications and control signals. SPP provides the basis for the DUN, FAX, HSP and LAN profiles. This profile supports a data rate up to 128 kbit/sec. SPP is dependent on GAP.

[0083] Object Push Profile (OPP). OPP defines how to push a file to a Bluetooth device.

[0084] RFCOMM. The RFCOMM protocol emulates the serial cable line settings and status of an RS-232 serial port and is used for providing serial data transfer. RFCOMM connects to the lower layers of the Bluetooth protocol stack through the L2CAP layer. By providing serial-port emulation, RFCOMM supports legacy serial-port applications while also supporting the OBEX protocol among others. RFCOMM is a subset of the ETSI TS 07.10 standard, along with some Bluetooth-specific adaptations.

[0085] Advanced Audio Distribution Profile (A2DP). A2DP describes how stereo quality audio can be streamed from a media source to a sink. The profile defines two roles of an audio source and sink. A typical usage scenario can be considered as the "walkman" class of media player. The audio source would be the music player and the audio sink is the wireless headset. A2DP defines the protocols and procedures that realize distribution of audio content of high-quality in mono or stereo on ACL channels. The term "advanced audio", therefore, should be distinguished from "Bluetooth audio", which indicates distribution of narrow band voice on SCO channels as defined in the baseband specification.

[0086] Audio/Video Control Transport Protocol (AVCTP). AVCTP describes the transport mechanisms to exchange messages for controlling A/V devices.

[0087] Audio/Video Distribution Transport Protocol (AVDTP). AVDTP defines A/V stream negotiation, establishment and transmission procedures.

[0088] Audio/Video Remote Control Profile (AVRCP). AVRCP is designed to provide a standard interface to control TVs, hi-fi equipment, or other A/C equipment to allow a single remote control (or other device) to control all the A/V equipment that a user has access to. It may be used in concert with A2DP or VDP. AVRCP defines how to control characteristics of streaming media. This includes pausing, stopping and starting playback and volume control as well as other types of remote control operations. The AVRCP defines two roles, that of a controller and a target device. The controller is typically considered the remote control device while the target device is the one whose characteristics are being altered. In a "walkman" type media player scenario, the control device may be a headset that allows tracks to be skipped and the target device would be the actual medial player.

[0089] This protocol specifies the scope of the AV/C Digital Interface Command Set (AV/C command set, defined by the 1394 trade association) to be applied, realizing simple implementation and easy operability. This protocol adopts the AV/C device model and command format for control messages and those messages are transported by the Audio/Video Control Transport Protocol (AVCTP).

[0090] In AVRCP, the controller translates the detected user action to the A/V control signal, and then transmits it to a remote Bluetooth enabled device. The functions available for a conventional infrared remote controller can be realized in this protocol. The remote control described in this protocol is designed specifically for A/V control only.

[0091] Dial-up Networking Profile (DUN). DUN provides a standard to access the Internet and other dial-up services over Bluetooth technology. The most common scenario is accessing the Internet from a laptop by dialing up on a mobile phone wirelessly. It is based on SPP and provides for relatively easy conversion of existing products through the many features that it has in common with the existing wired serial protocols for the same task. These include the AT command set specified in ETSI 07.07 and PPP.

[0092] Like other profiles built on top of SPP, the virtual serial link created by the lower layers of the Bluetooth protocol stack is transparent to applications using the DUN profile. Thus, the modem driver on the data-terminal device is unaware that it is communicating over Bluetooth technology. The application on the data-terminal device is similarly unaware that it is not connected to the gateway device by a cable. DUN describes two roles, the gateway and terminal devices. The gateway device provides network access for the terminal device. A typical configuration consists of a mobile phone acting as the gateway device for a personal computer acting as the terminal role.

[0093] General Audio/Video Distribution Profile (GAVDP). GAVDP provides the basis for A2DP and VDP, the basis of the systems designed for distributing video and audio streams using Bluetooth technology. GAVDP defines two roles, an initiator and an acceptor. In a typical usage scenario, a device such as a "walkman" is used as the initiator and a headset is used as the acceptor. GAVDP specifies signaling transaction procedures between two devices to set up, terminate and reconfigure streaming channels. The streaming parameters and encode/decode features are included in A2DP and VDP which depend on this profile.

[0094] In step **33**, Bluetooth system **20** monitors the Bluetooth connection automatically. In this step, Bluetooth system **20** is in sniff mode, and power consumption is below 1 mA. A significant benefit of this system is the ability to monitor a connection while keeping power consumption to a very low level. This enables one of ordinary skill in the art to build portable devices in accordance with the present inventions that use small batteries (100-200 mAh), which can last for at least 2 or 3 weeks before being recharged or swapped. In step **34**, on detection of connection drop, i.e., disconnection, Bluetooth system **20** attempts to reconnect in step **36**. For example, when a connection is dropped while the system is in sleep mode or sniff mode, a Bluetooth system can automatically generate an event indicating connection drop. In the base and/or remote devices of the present invention, upon the Bluetooth system indicating a connection drop either the base and/or the remote will attempt to reconnect to one another or an alarm will be triggered in the base and/or the remote, as illustrated by issuance of an alarm in step **40**. For a mobile phone proximity detector, a connection drop is generally due to the distance between Bluetooth system **20** and the mobile phone being too large, an obstacle being between the two devices that is preventing communication, and/or the mobile phone is powered down. One of ordinary skill in the art will understand from the foregoing that the programming of the Bluetooth system can be adjusted to include instructions to reconnect and/or to trigger an alarm in accordance with the present invention. Automatic reconnection minimizes false alarms and makes the systems of the present invention more reliable and easy to use. An exemplary benefit of the automatic reconnect feature is that when a user comes into proximity of the mobile phone from out of range, the alarm automatically shuts off without requiring any additional input from the user.

[0095] In an embodiment of the present inventions, the Bluetooth system will generate an indication or message on detection of a connection drop. For example, firmware running on a Bluetooth chipset, or on a virtual machine which in turn runs on a Bluetooth chipset, can receive or capture that disconnect indication or message. The present invention includes programming that instructs one or more responses to a disconnect indication. For example, the program will instruct a reconnection attempt and/or instruct issuance of an alarm. One of ordinary skill in the art can use market available development tools to write programming to perform the desired functions. It has been discovered by the present inventor that the disconnect event indicator is reliable for detecting that a monitored device is outside a desired range. The claimed invention has an automatic reconnect attempt feature, so that upon detection of a disconnect event, reconnection is attempted; this can avoid many false alarms. Preferably, in an embodiment, an alarm instruction is not given until at least one active reconnect attempt is made and fails. Upon the alarm issuing, periodic reconnect efforts are made, and upon reconnection the alarm will not continue. Avoidance of false alarms makes the invention more convenient for the user.

[0096] In an embodiment, the automatic reconnection feature enables the user to locate lost keys that are connected to a proximity alarm device of the present inventions. Turning the mobile phone off automatically triggers an alarm on the key chain device and helps one to locate the keys. The human body can block Bluetooth signals; it is believed that the interference of the human body with Bluetooth signals may be due to the Bluetooth signal being close to the resonance frequency of water (the human body is about 70% water). However, the present invention benefits from a surprising discovery that in the "sniff" mode interference from the human body does not generally block the signals enough to undermine the alarm system reliability, which is in contrast to the interference in paging mode. Hence, a Bluetooth system using sniff mode can be relied upon more than for example Bluetooth modes that require data transfer.

[0097] Referring again to the Figures, upon a monitored PED leaving a desired proximity Bluetooth system **20** can start a buzzer, a vibrator, or a sound system. Bluetooth system **20** can also activate LEDs. An example of an audible warning message could loudly state "Your phone is no longer in authorized area". In a preferred embodiment, after an alarm is issued in step **40**, system **20** regularly attempts to reconnect with the monitored device.

[0098] Turning now to FIG. **3**B, the flowchart illustrates the steps involved in detecting that a portable electronic device is outside a desired range and for transmitting or receiving voice.

[0099] Since most people prefer to limit the number of devices they carry, this preferred embodiment allows adding Bluetooth headset functionality to loss prevention alarm **11**. When earpiece **27** is folded around bearing **23**, the system automatically functions as a Bluetooth headset. When earpiece **27** is unfolded, the system is a flat device that can be carried as a key chain. The system automatically functions as a loss prevention alarm key chain. Earpiece **27** can also pivot around bearing **23** in order to provide better fit and comfort.

[0100] This design allows the user:

[0101] To have a quick access to a Bluetooth headset,

[0102] To carry the Bluetooth headset as a keychain,

[0103] Loss prevention alarm alarms when phone is not in proximity,

[0104] To adjust the ear piece for better comfort,

[0105] The ear piece is shielded when not in use by inserting it in a key chain part,

[0106] The keychain can hold several functions such as a USB Flash drive, MP3/MP4 player, recording device, bio sensor, comb, flash light, lighter, home key, car key, Swiss knife, inter alia . . .

Most Bluetooth headsets on the market:

[0107] Do not have a convenient way to carry them, except by attaching them to the ear,

[0108] Have a fixed angle between the ear piece and the main body of the device,

[0109] Have a cover for the ear piece that is small and not practical. It also gets lost easily.

[0110] In another embodiment, the microphone comprises an extendable arm. The extendable arm can fold, rotate or slide. This allows for a smaller size for the main part, as well as good microphone voice capture capability.

[0111] In another embodiment, the battery is removed from the main body of the device and placed in a second part, such as a lid. This makes the Bluetooth headset lighter and smaller considering that a battery generally accounts for more than 60% of components volume. When inserted into the lid unit, the capacitor onboard the main body recharges.

[0112] In step **321** the system receives voice from a second device, and sends it to its onboard speaker. The second device is generally a PED such as a mobile phone. In step **322**, the system sends voice from an onboard microphone to a second Bluetooth device.

[0113] Turning now to FIG. **3**C, the flowchart illustrates the steps involved in detecting that a portable electronic device has come within desired vicinity. In step **30**, the user activates loss prevention alarm **10**. In step **323** the system tries to establish wireless connection with a monitored device. In step **343**, if a wireless connection is not established. A periodic alert is issued in step **40**. The system also periodically tries to reconnect in step **323**. If a wireless connection is established in step **343**, the system goes to sleep mode in step **345**. In step **345**, if a disconnection event is detected in step **347**, the system automatically tries to re-establish the connection in step **323**.

[0114] Turning now to FIG. **4**A, the flowchart illustrates the steps involved in initializing the loss prevention alarm. In step **42**, loss prevention alarm **10** enters pairing mode. When it is started for the first time, loss prevention alarm **10** will be in pairing mode. The user can also reset the system or force it into pairing mode by pushing activation switch **13** for a sufficiently long duration, or pressing a button a predetermined number of times, to indicate that the user wants to "pair" the loss prevention alarm with a new device to be monitored (i.e., the user makes a "long press"). In step **44**, the loss prevention alarm enters pairing mode. Visual indication center **16** can indicate pairing mode using a combination of LED effects, for example, alternating colored LEDs. When Bluetooth system **20** is set to discoverable mode, in accordance with step **46** the user uses a second Bluetooth mobile device to be monitored to search for Bluetooth devices in range and to select the loss prevention alarm from the search list. In a preferred embodiment, the loss prevention alarm appears as a headset to other Bluetooth mobile devices. When the user initiates a pairing request, as shown in step **48**, the loss prevention system **10/11** receives a pairing request from the device to be monitored, and requests a PIN code. On successful pairing in step **50**, the loss prevention alarm obtains the Bluetooth address of the device to be monitored and stores it in memory as shown by step **52**. Bluetooth system **20** changes to non-discoverable mode and visual information center **16** changes to normal mode.

[0115] In another embodiment, after pairing, Bluetooth system **20** may send a file to second Bluetooth device using OPP profile. This file can be one or more promotional files such a brochures, music, video, or application software such as a game, a client application, etc.

[0116] Turning now to FIG. **4**B, the flowchart illustrates the steps involved in initializing the loss prevention alarm. In step **461** the second Bluetooth device enters pairing mode. In step **481**, the first loss prevention alarm sends a pairing request and fixed PIN such as "0000" to a second Bluetooth device in range. In step **501**, upon successful pairing, the first loss prevention system obtains the Bluetooth address of the second Bluetooth device and stores it. In step **521**, the first loss prevention alarm and second Bluetooth device change to non-discoverable mode.

[0117] Turning now to FIG. **5**, the flowchart illustrates an alternative embodiment using an application onboard the monitored device. The client application is used to configure the loss prevention alarm **10/11**. In step **54** the user views and enters configuration parameters through said application. Configuration parameters may include but are not limited to operation hours, operation days, buzzer type, buzzer volume, buzzer duration, range and alarm type. The configuration parameters are stored onboard the loss prevention alarm in step **56** and can be used to change the properties or to program the loss prevention alarm.

[0118] The user may record a voice message that will be broadcast in the event of an alarm, for example, a message containing "Please call xxx xxxx" (where x is a number). The voice message will be stored onboard the loss prevention alarm in step **56**. At initialization stage, the loss prevention alarm can install a program on the portable electronic device from a USB flash, a CD, or from other source, such as the Internet. The program can install a user interface or other functionalities on the portable electronic device. For example, the program can allow the portable electronic device to store the address of the loss prevention alarm and to monitor the presence of the loss prevention alarm within range. This will also allow the portable electronic device to issue an alarm when the loss prevention alarm leaves range.

[0119] In an alternative embodiment, the loss prevention alarm calculates GPS coordinates and regularly sends them to the application onboard the portable electronic device. In case the connection is dropped, the portable electronic device calculates and displays the direction and distance back to the last known location of the loss prevention alarm.

[0120] The loss prevention alarm **10/11** can have several embodiments for each of several applications. In an embodiment, loss prevention alarm **10/11** is attached to or acts as a key chain and can be used as a phone leash. The alarm is triggered when the keychain alarm is at least a predetermined distance from the mobile phone. Therefore, it can prevent the mobile phone from being lost, forgotten or stolen. In this embodiment, the same hardware is used as in a standard Bluetooth headset. However, some components are not

needed such as a speaker, microphone, CODEC, and volume buttons. An extra buzzer is used to issue alarms. The system appears to the mobile phone as a headset, however, audio is not redirected from the phone, and thus the phone functionality remains unchanged. On detection of a connection drop, the device periodically attempts to reconnect, and on failure, activates an alarm. In an embodiment, the range of the device is less than about 15 meters or less than about 20 meters.

[0121] In another embodiment, loss prevention alarm **10**/**11** has a PC lock insert that is used to lock the system to the side of a computer laptop or attaches to a laptop carry case. The alarm onboard loss prevention alarm **10** is triggered when the laptop is more than a predetermined distanced from a mobile phone that has a paired Bluetooth system. Therefore, it prevents the laptop from being lost, forgotten or stolen. Preferably the alarm is triggered when the PC and the mobile phone are more than about 5 meters apart.

[0122] In another embodiment, a software running on PED consisting of: a Bluetooth profile, a non standard Bluetooth profile or an application running on PED allows establishing a connection with loss prevention alarm **10** and to trigger an alert onboard said PED on connection drop. The alert can be a ring, alert, alarm, video or voice message indicating "Your monitored device is not in your vicinity". A non standard Bluetooth profile is one that is not part of the profiles adopted by the Bluetooth Special Interest Group.

[0123] In a preferred embodiment, the software makes efficient use power consumption by controlling Bluetooth sleep modes. It can perform also several other functions including:

[0124] Automatically log the user in the operating system security (such a Window password screen, Linux password screen, Internet web site, Internet Web 2.0 account, application access screen . . .) when loss prevention alarm is in proximity, and automatically log the user out when out of proximity.

[0125] Automatically decrypt files onboard PED when the loss prevention alarm is in proximity and encrypt them when PED is outside proximity.

[0126] Provide access or privileges to specific files when loss prevention alarm is in proximity.

[0127] When a PC or laptop is stolen, a person can install a new copy of Windows and have access to all the files on that system thus bypassing Windows security. Encrypting the data can make it more difficult to access the data when a laptop is stolen.

[0128] The Bluetooth ("BT") protocol includes programmable and built-in Security/authentication features and several built-in power usage modes, for example sniff mode has low-power consumption (<0.5 mA), while voice transmission can use more than 20 mA. Bluetooth modules are readily available on the market at a reasonable cost of around US$5 (in 2007). Bluetooth frequency is 2.4 GHz, similar to the frequency used in microwave ovens and close to the resonance frequency of water.

[0129] Since the human body is 70% water Bluetooth signals can be distorted and attenuated by a human body. For example, Bluetooth range can drop dramatically when a parent and child each having one of a set of BT communicators in front of them stand back to back. Bluetooth range is not easily adjustable and does not change gradually.

[0130] Turning now to FIG. **6**, the flowchart illustrates pairing portable prevention system with a Bluetooth headset and a Bluetooth mobile device.

[0131] Some mobile phones such as Blackberry and iPhone only allow one Bluetooth headset connection to be active at one time when a phone conversation is taking place. The user cannot use a loss prevention alarm device **10**/**12** emulating HSF/HFP if he/she already uses a Bluetooth headset device with his/her mobile phone. Bluetooth headset is any Bluetooth headset available on the market and capable of providing headset functionality.

[0132] In a preferred embodiment, the Bluetooth headset is not paired directly with the PED. Loss prevention alarm **10**/**12** can automatically pair with one or more of the user's Bluetooth headset by issuing a PIN code of "0000" which is used by a large majority of Bluetooth headsets. When a paired Bluetooth headset device is active, loss prevention alarm switches to a relay mode. In a relay mode, voice streams and commands from PED are sent to/from Bluetooth headset. When the Bluetooth headset is not active, loss prevention alarm **10** monitor proximity of PED, and does not re-direct voice streams.

[0133] In step **60**, loss prevention alarm **11** runs two Bluetooth profiles, HFP or HSP and AGHFP. It runs AGHFP to search for headsets in the vicinity that are discoverable for a period of time. In step **62**, if loss prevention alarm **11** finds one or more discoverable headsets, it initiates pairing and sends PIN code of "0000". In step **64**, if the period of time is expired or a discoverable Bluetooth headset is found, loss prevention alarm **11** stops the search, switches to discoverable mode, runs as HFP or HSP and waits for a pairing request from a PED. Loss prevention alarm **11** may pair with multiple headsets/car kits. In step **66**, a second Bluetooth PED such as a mobile phone initiates pairing with loss prevention alarm **11**. In step **68**, loss prevention alarm **11** exits pairing mode and changes to non discoverable.

[0134] Turning now to FIG. **7**, the flowchart illustrates an alternative embodiment whereby loss prevention alarm **10** acts as a relay.

[0135] Loss prevention alarm **10** runs HSP/HFP and AGHFP simultaneously on the same Bluetooth system **20**. Loss prevention **10** appears to PED as a headset (HSP or HFP) and monitors proximity to it while instructing it not to send or receive voice streams.

[0136] If paired with one or more Bluetooth headsets, loss prevention **10** appears to Bluetooth headset as PED. In step **30**, user activates loss prevention alarm **10**. In step **323**, loss prevention alarm **10** tries to establish HSP or HFP connection with monitored device. In step **343**, if connection is not established, an alarm is issued and the system tries to reconnect in step **323**. If a connection is established, loss prevention alarm **10** goes to sleep mode in step **345**. If later a disconnection event is detected, the system tries to reconnect in step **323**.

[0137] In step **700**, if a connection event is detected from a paired Bluetooth headset through AGHFP, loss prevention alarm changes mode and relays voice streams and commands programmatically between paired Bluetooth headset and PED in step **702**. Voice streams and commands coming from Bluetooth headset are transferred to PED and voice streams and commands coming from PED are transferred to Bluetooth headset. Detecting connection event from a paired Bluetooth headset is a standard feature of AGHFP profile.

[0138] Turning again to FIG. **7**, the flowchart illustrates an alternative embodiment whereby loss prevention alarm **12** acts as a relay. Loss prevention alarm **12** has two Bluetooth systems. Bluetooth system **20** runs HSP/HFP and Bluetooth system **20***b* runs AGHFP. In this configuration, Bluetooth

system **20** is the controller. The input voice channels from Bluetooth system **20** are physically connected to the output voice channels of Bluetooth system **20***b*, and the output voice channels from Bluetooth system **20** are physically connected to the input voice channels of Bluetooth system **20***b*.

[0139] Bluetooth system **20** appears to PED as a headset (HSP/HFP) and monitors proximity to it while instructing it not to send or receive voice streams. It alarm if the link is disconnected.

[0140] If paired with a Bluetooth headset, Bluetooth system **20***b* appears to the paired Bluetooth headsets as PED. Bluetooth system **20***b* may be in low power mode such as sniff, park, hold modes. If not paired with a Bluetooth headset, Bluetooth system **20***b* is powered down.

[0141] In step **30**, the user activates loss prevention alarm **12**. In step **323**, loss prevention alarm **12** tries to establish HSP/HFP connection with monitored device. In step **343**, if connection is not established, and alarm is issued and the system tries to reconnect in step **323**. If a connection is established, loss prevention alarm goes to sleep mode in step **345**. If later a disconnection event is detected in step **347**, the system tries to reconnect in step **323**.

[0142] In step **700**, if Bluetooth system **20***b* is on and it detects a connection event from a paired Bluetooth headset, loss prevention alarm **12** changes to a relay mode in step **702**.

[0143] First, an indication is sent to Bluetooth system **20**. Bluetooth system **20** and PED connect voice streams. Bluetooth system **20***b* and paired Bluetooth headset connect voice streams. Since Bluetooth system **20** and Bluetooth system **20***b* are connected through wiring, voice streams and commands flow between paired Bluetooth headset and PED, through Bluetooth system **20** and Bluetooth system **20***b*.

[0144] The details of certain embodiments of the present inventions have been described, which are provided as illustrative examples so as to enable those of ordinary skill in the art to practice the inventions. The summary, figures, abstract and further details provided are not meant to limit the scope of the present inventions, but to be exemplary. Where certain elements of the present inventions can be partially or fully implemented using known components, only those portions of such known components that are necessary for an understanding of the present invention are described, and detailed descriptions of other portions of such known components are omitted so as to avoid obscuring the invention. Further, the present invention encompasses present and future known equivalents to the components referred to herein.

[0145] The inventions are capable of other embodiments and of being practiced and carried out in various ways, and as such, those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other methods and systems for carrying out the several purposes of the present inventions. Therefore, the claims should be regarded as including all equivalent constructions insofar as they do not depart from the spirit and scope of the present invention. The following claims are a part of the detailed description of the invention and should be treated as being included in this specification.

1. A proximity detection alarm device, comprising:

a first unit, said first unit comprising a first Bluetooth transceiver system;

at least one alarm;

at least one control;

a power input;

an attachment mechanism and

wherein said first Bluetooth transceiver system can pair with a second Bluetooth transceiver system in a first range,

wherein said attachment mechanism is selected from the group consisting of a key chain, a ring, a hook, a notebook security lock, an insert, a pin, a clip, a tee, a collar, Velcro fastener, a ring, a wire, a case, and a sticky surface,

wherein said Bluetooth transceiver system is selected from the group consisting of a class 1 Bluetooth transceiver, a class 2 Bluetooth transceiver, a class 3 Bluetooth transceiver, and a Wibree transceiver,

wherein said at least one control comprises at least one of the group consisting of a button, a switch, and a sensor,

wherein said at least one alarm is audible and when activated produces an alarm signal of at least 60 decibels,

wherein upon said first Bluetooth transceiver detecting a connection drop from a second Bluetooth transceiver system to which said first Bluetooth system has formed a pair, said first Bluetooth transceiver system will periodically attempt to reconnect to the second Bluetooth transceiver system,

wherein said alarm will be activated within a predetermined time after a connection drop between said first Bluetooth transceiver system and a second Bluetooth transceiver system to which said first Bluetooth system has formed a pair.

2. The proximity detection alarm device of claim **1** further comprising a logo.

3. The proximity detection alarm device of claim **2**, wherein said logo illuminates periodically.

4. The proximity detection alarm device of claim **1**, wherein following pairing with a portable electronic device, said first Bluetooth transceiver system will use object push profile to send a file from flash memory to said second Bluetooth transceiver system.

5. The proximity detection alarm device of claim **4**, wherein said file is a client application.

6. The proximity detection alarm device of claim **1**, wherein said first Bluetooth transceiver system is set to use a protocol selected from the set comprising Hands-Free protocol, hand-set protocol, HID protocol.

7. The proximity detection alarm device of claim **1**, wherein following connection with a second Bluetooth transceiver system, said first Bluetooth transceiver system will utilize a power saving mode selected from the group consisting of sniff, park, and hold,

8. The proximity detection alarm device of claim **1**, wherein said device will fit into a space having a volume selected from the group consisting of 56 cubic centimeters, 25 cubic centimeters, 22.5 cubic centimeters, 18 cubic centimeters, and 10 cubic centimeters, and wherein said device has a weight selected from the group consisting of less than about 200 grams, less than about 50 grams, and less than about 10 grams.

9. The proximity detection alarm device of claim **1**, wherein said loss prevention alarm runs two Bluetooth profiles simultaneously, HFP/HSP and AGHFP.

10. The proximity detection alarm device of claim **9**, wherein said loss prevention alarm transfers voice streams between a portable electronic device and a Bluetooth headset.

11. The proximity detection alarm device of claim **10**, wherein said proximity detection alarm device automatically

transfers voice streams between a portable electronic device and said Bluetooth headset on detection of a connection request from a paired Bluetooth headset.

12. The proximity detection alarm device of claim **11**, wherein on detection of a disconnection request from a paired Bluetooth headset, said proximity detection alarm device automatically directs voice streams to portable electronic device interfaces.

13. The proximity detection alarm device of claim **9**, wherein when said first Bluetooth transceiver system is not paired, it searches for a Bluetooth headset device within range that is in discoverable mode, issues a PIN code and pairs with said Bluetooth headset.

14. The proximity detection alarm device of claim **13**, wherein said first Bluetooth transceiver system changes to discoverable upon pairing with said Bluetooth headset device, or upon the occurrence of a predetermined timeout.

15. The proximity detection alarm device of claim **9**, wherein on pairing with a second portable electronic device, said first Bluetooth transceiver system changes to non-discoverable mode.

16. The proximity detection alarm device of claim **1**, wherein said alarm will be deactivated upon reconnection to the second Bluetooth transceiver system, or upon the occurrence of a predetermined alarm function or timeout.

17. The proximity monitoring alarm system of claim **1**, wherein said proximity detection alarm device requires power selected from the group consisting of less than 100 mA, less than 50 mA, less than 8 mA, and less than 1 mA.

18. The proximity detection alarm device of claim **13**, wherein said PIN code is "0000".

19. The proximity detection alarm device of claim **9**, comprising a second Bluetooth transceiver system wherein:

first Bluetooth transceiver voice input channels are connected to second Bluetooth transceiver voice output channels,

first Bluetooth transceiver voice output channels are connected to second Bluetooth transceiver voice input channels,

first Bluetooth transceiver runs HFP or HSP profile,

second Bluetooth transceiver runs AGHFP profile.

20. A method for securing a portable electronic device using a unitary Bluetooth transceiver system comprising:

activating a client software on said portable electronic device,

wherein upon activation, said client software establishing a Bluetooth connection with said unitary Bluetooth transceiver system to which said client has formed a pair,

wherein upon said client software detecting a connection drop from said unitary Bluetooth transceiver system, said client will periodically attempt to reconnect to said unitary Bluetooth transceiver system,

wherein said client software issuing an alert within a predetermined time after a connection drop between said client and said unitary Bluetooth transceiver system to which said client has formed a pair.

21. The method of claim **20** whereby following pairing with said Bluetooth transceiver system, said client will utilize a power saving mode selected from the group consisting of sniff, park, and hold.

22. The method of claim **20** whereby when connection is established between said client and said Bluetooth transceiver system, said client automatically performs actions selected from the group comprising: user authentication, user log in, decrypt files, grant access.

23. The method of claim **20** whereby on disconnection between said client and said Bluetooth transceiver system, said client automatically performs actions selected from the group comprising: user is user logged, encrypt files, deny access.

24. A proximity detection alarm device, comprising:

a first unit, said first unit comprising a first Bluetooth transceiver system;

at least one control;

a power input;

a microphone;

an ear piece;

a bearing joining said ear piece to the main body of said first unit;

wherein said ear piece can fold and unfold.

25. The proximity detection alarm device of claim **24**, wherein upon said first Bluetooth transceiver detecting a connection drop from a second Bluetooth transceiver system to which said first Bluetooth system has formed a pair, said first Bluetooth transceiver system will periodically attempt to reconnect to the second Bluetooth transceiver system,

wherein an alarm will be activated within a predetermined time after a connection drop between said first Bluetooth transceiver system and a second Bluetooth transceiver system to which said first Bluetooth system has formed a pair.

26. The proximity detection alarm device of claim **24**, wherein said ear piece can be folded and aligned with said main body.

27. The proximity detection alarm device of claim **24**, wherein on folding said ear piece, said proximity detection alarm device functions as a Bluetooth headset.

28. The proximity detection alarm device of claim **24** further comprising a device selected from the set comprising: USB Flash drive, MP3/MP4 player, recording device, bio sensor, comb, flash light, lighter, home key, car key and Swiss knife.

29. The proximity detection alarm device of claim **24** further comprising a capacitor onboard said main body and a detachable battery separate from said main body wherein said capacitor is recharged from said battery when said main body is attached to said battery.

* * * * *

IE2

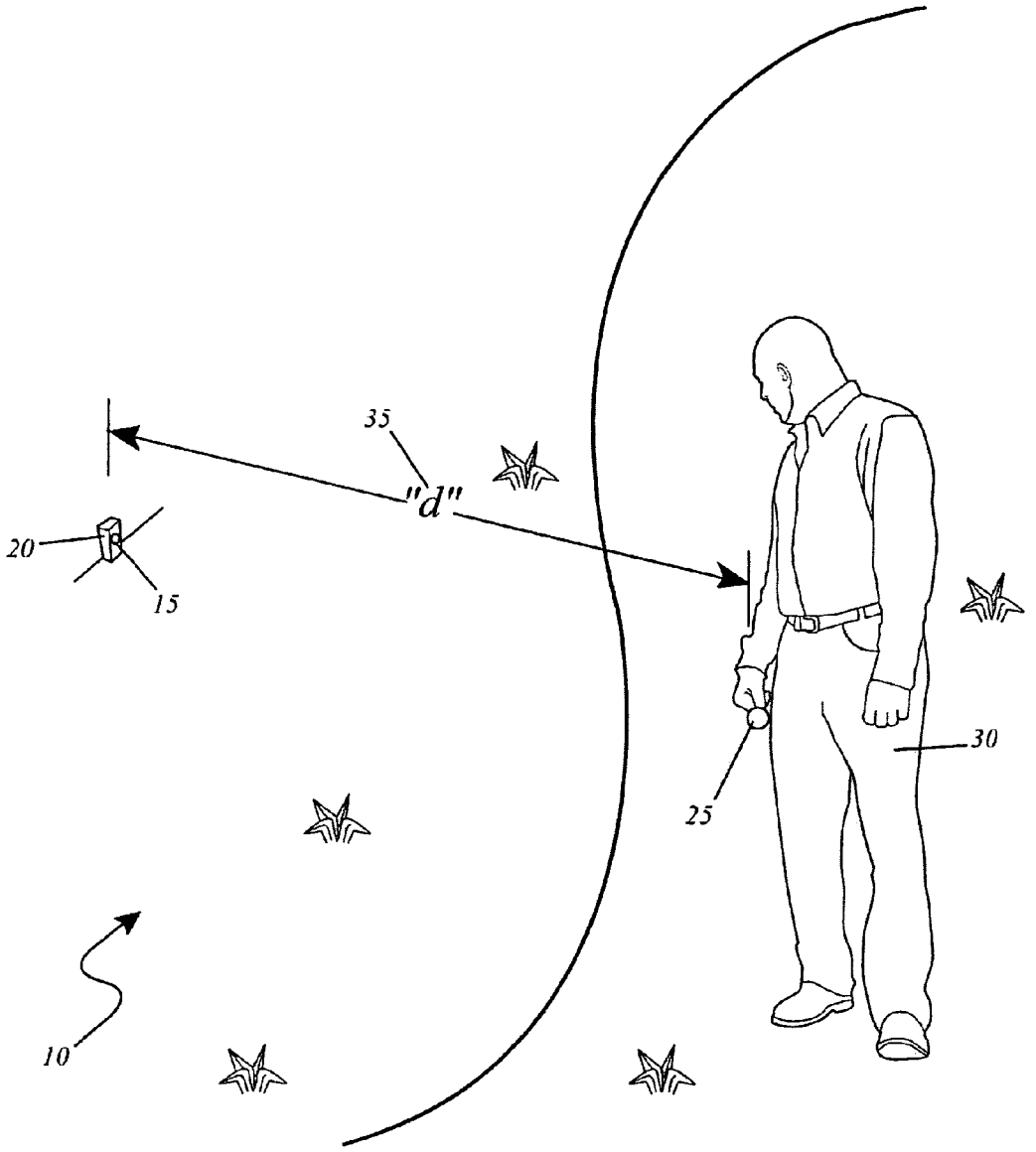


FIG. 1

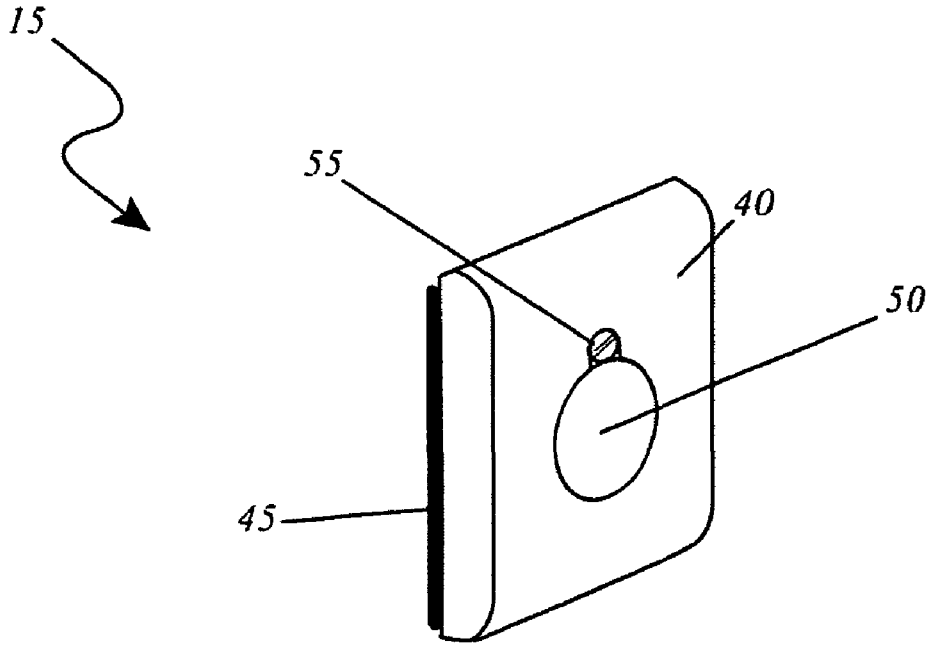


Fig. 2a

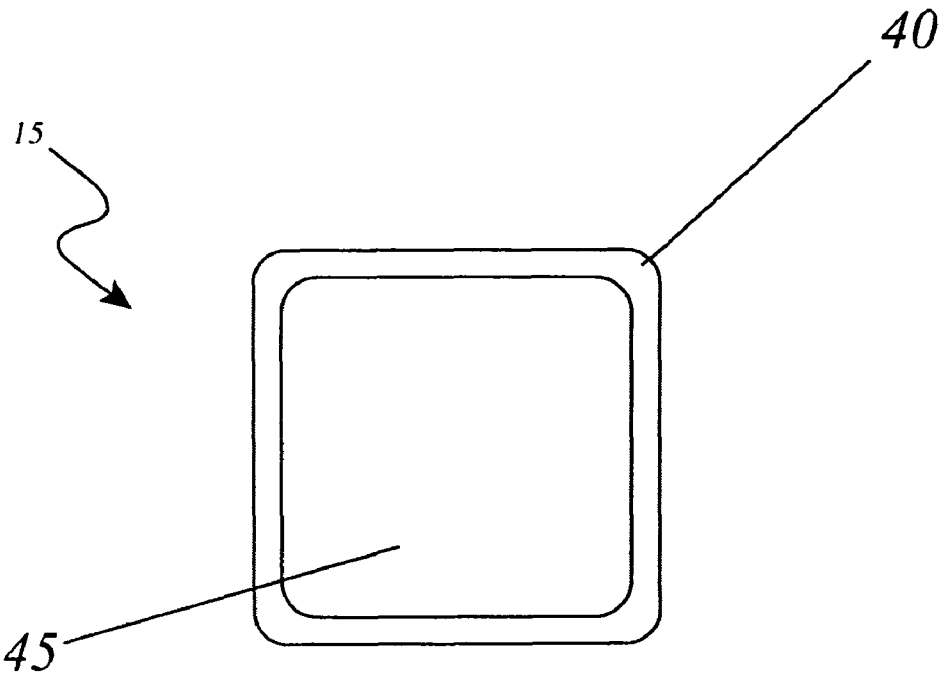


Fig. 2b

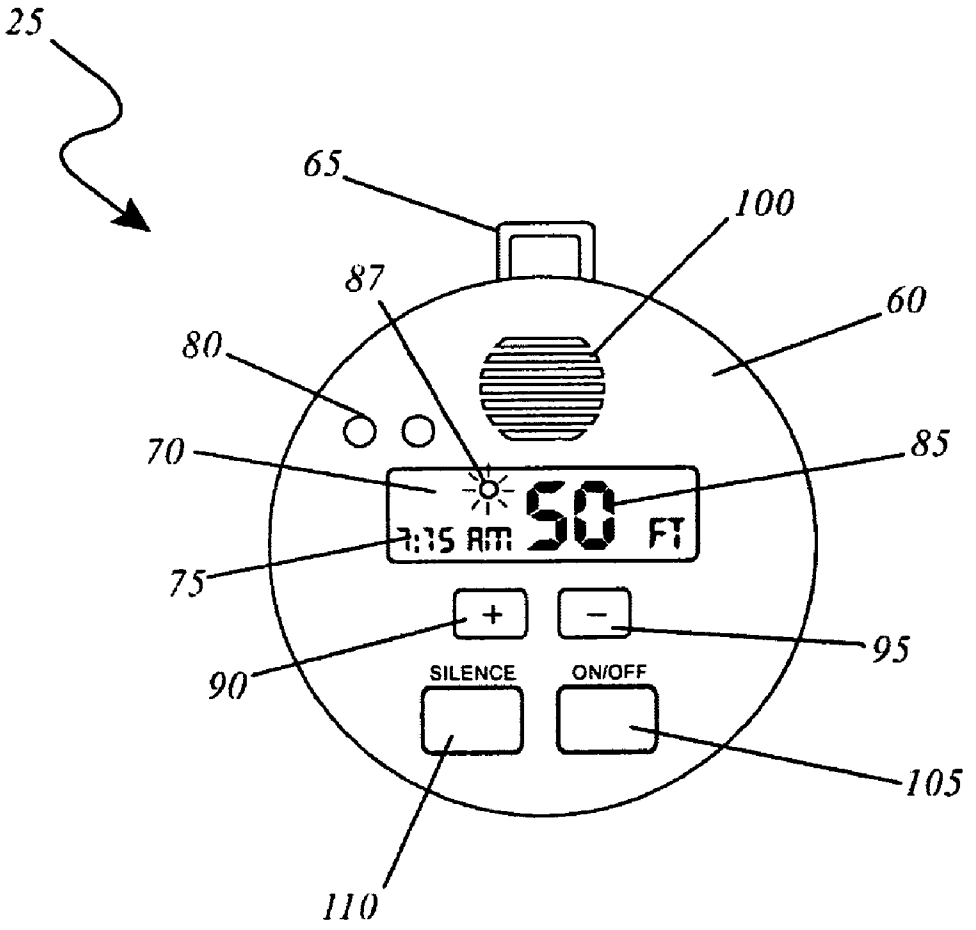

25
65
100
87
60
80
70
85
7:15 AM
50
FT
75
+
−
95
90
SILENCE
ON/OFF
105
110

Fig. 3a

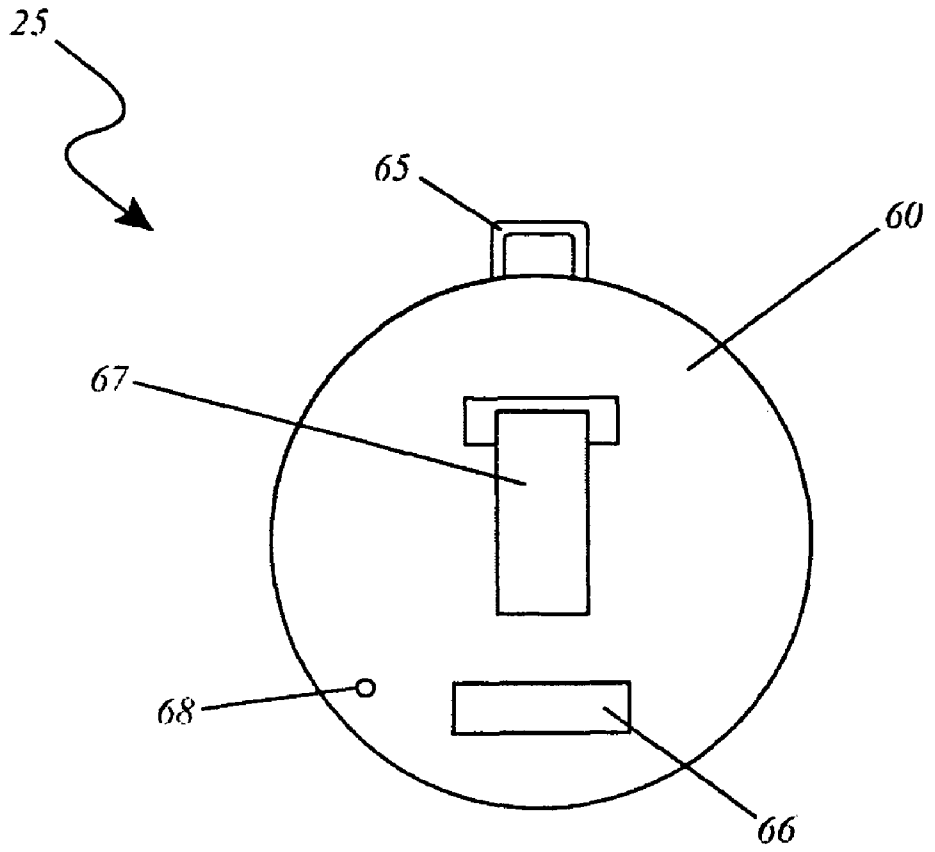


Fig. 3b

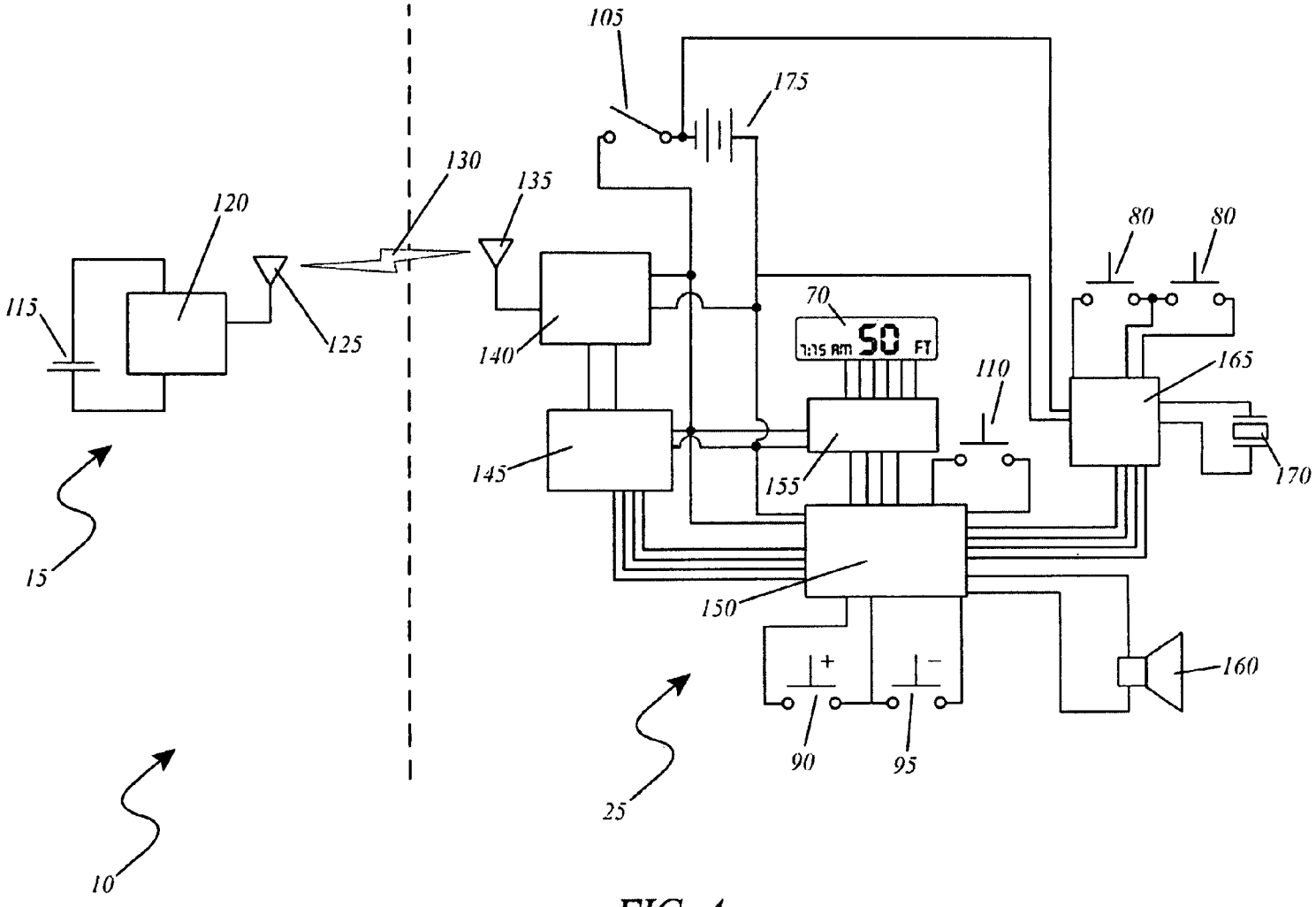

105
175
130
135
120
115
125
140
70
7:15 AM 50 FT
80
80
110
165
145
155
170
15
150
160
+
−
90
95
25
10

FIG. 4

MOBILE TELEPHONE TRACKING SYSTEM

RELATED APPLICATIONS

The present invention was first described in and claims the benefit of U.S. Provisional Patent
, the entire disclosures of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates generally to a personal item tracking and monitoring system and, more particularly, to a personal item tracking and monitoring system comprising a transmitter unit attached to an object that emits a radio frequency coded signal to a receiver unit carried by a person that alerts a user by an audible or visual warning signal if said object is located farther then a distance set by a user using a range selection control located on said receiver unit.

BACKGROUND OF THE INVENTION

Nothing is perhaps more frustrating than not being able to find common personal items that you just had in your hand minutes ago. These items include wireless phones, keys, eyeglass cases, remote controls, toys, and similar objects. They become easily lost due to their small size, and are accidentally left behind. They can fall on the floor, become lost in chairs and seat cushions or under furniture. Other times, they may be accidentally carried from the room and left elsewhere in the home or office. Whatever the reason, the frustration level is high while trying to locate them. Many valuable minutes of one's day can be spent simply looking for lost items. Accordingly, there is a need for a means by which common household or personal objects can be tracked easily and recovered quickly when misplaced. The development of the invention herein fulfills this need.

The present invention is a personal item tracking and monitoring system which wireless telephones or similar personal objects can be easily found by the use of a radio frequency system. It is intended to be used for finding objects such as cell phones, cordless phones, eyeglasses, remote controls, toys, tools, and similar objects that are easily and often misplaced around a home or work. A small transmitter unit is attached to the object to be tracked. The user then carries a small receiver unit on his or her person. The receiver unit is of the general size of a key fob and is provided with an on/off control and a range selection control that allows permissible ranges between the object and the receiver unit on the order to ten (10) feet to hundreds of feet. The transmitter emits a radio frequency coded signal either on a continuous or periodic basis. When the receiver unit receives this signal and it is of the strength required by the range selector or higher, the personal item tracking and monitoring system is in an armed and active state. However, when the object, or receiver unit, wander farther than the range control allows, the personal item tracking and monitoring system is in an alarm state and the receiver unit emits an audible tone or beep to remind the user to retrieve the object. The present invention can also be used as an aid to retrieve the tagged item when lost. This is accomplished by setting the range on the receiver unit on progressively smaller settings until the target area is identified. The use of the present invention reduces frustration by allowing for the easy tracking and location of common personal objects.

Several attempts have been made in the past to provide lost object locating systems. U.S. Pat. No. 5,939,981, issued in the name of Renney, describes an item locator with attachable receiver and transmitter. The Renney device comprises a hand held device and multiple sensors which are attached to objects a user desires to locate. However, unlike the present invention the Renney device does not provide a receiver unit that allows a user to adjust an allowable distance between a transmitter unit and the receiver unit. Furthermore, the Renney device does not provide a receiver unit that emits a warning signal when a length between a transmitter unit and the receiver unit reaches or extends beyond a programmable allowable distance.

U.S. Pat. No. 6,573,832, issued in the name of Fugere-Ramirez, discloses a locating device for finding lost personal items, such as keys, remote controls, a pager, a cellular phone, or a pair of eyeglasses. The Fugere-Ramirez device comprises a receiver that is attached to a personal item and a remote control transmitter that a user holds. When the user wants to find the personal item a button is pressed corresponding with the item to be found. The transmitter sends out a signal to the receiver that is received and then the receiver emits a beeping sound to help the user locate the personal item. However, unlike the present invention, the Fugere-Ramirez device produces a beeping sound on the lost personal item and does not emit a beeping sound on a hand-held device with the user thereby alerting the user when they are entering an area beyond a pre-set allowable distance from the personal item, thus enabling the user to know they need to find the personal item now.

U.S. Pat. No. 5,680,105, issued in the name of Hedrick, discloses a locating device for locating objects by means of matching coded sensors and receivers. The Hedrick device includes elements for attachment that are coded to respond to corresponding individual finders. However, unlike the present invention, the Hedrick device has a large number of parts which are subject to be lost themselves, is an extremely expensive locator device because of the high costs of having individual finders with separate circuits, and the elements are large and would not be appropriate for small personal objects.

U.S. Pat. No. 5,689,238, issued in the name of Cannon, Jr. et al., discloses an object locator system for finding marked documents in a random file in a file cabinet. The files are provided with a sound emitting device which is interrogated by a coded finder or a homing device which responds to a particular coded electronic signal sending device that produces an audible sound which increases in loudness upon approaching the file to be found. However, unlike the present invention, the Cannon, Jr. et al. system is restricted to a filing system environment.

The prior art appears to disclose various lost object locating systems. However, none of the prior art particularly describes a personal item tracking and monitoring system comprising a transmitter unit attached to an object that emits a radio frequency coded signal to a receiver unit carried by a person that alerts a user by an audible or visual warning signal if said object is located farther then a distance set by a user using a range selection control located on said receiver unit that the instant invention possesses. Accordingly, there is a need for a means by which common household or personal objects can be tracked easily and recovered quickly when misplaced that operates without the disadvantages as described above.

SUMMARY OF THE INVENTION

In view of the foregoing disadvantages inherent in the prior art, it has been observed that there is need for a personal item tracking and monitoring system and method by which wire-

less telephones or similar personal objects can be easily found by the use of a radio frequency system.

It is an object of the present invention to provide a personal item tracking and monitoring system allowing a user to be alerted if they go beyond a pre-set distance from a personal object.

A further object of the present invention is to provide a personal item tracking and monitoring system using a radio frequency system.

To achieve the above objectives, it is an object of the present invention to provide a personal item tracking and monitoring system comprising a transmitter unit and a receiver unit.

A further object of the present invention is having the transmitter unit removably attachable thereto an object by an attachment means and a receiver unit allowing a user to adjust an allowable distance between said transmitter unit and said receiver unit.

Another object of the present invention is having the transmitter unit transmit a radio frequency signal thereto a receiving antenna of the receiver unit thereby allowing the receiving unit to determine a length between the transmitter unit and the receiving unit.

Yet another object of the present invention is having the receiver unit emit a warning signal when the length between the transmitter unit and the receiver unit reaches or extends beyond the allowable distance and the personal item tracking and monitoring system is in an alarm state.

Still yet another object of the present invention is having the warning signal be audible.

Still yet another object of the present invention is having the warning signal by visual.

Yet still another object of the present invention is having the attachment means comprise a double-sided foam tape, an adhesive, a screw fastener, or a clip fastener.

Still another object of the present invention is utilizing a digital modulation scheme to produce a pulsed signal thereby avoiding interference with other said personal item tracking and monitoring systems in a nearby area or other devices which could be on a same or an adjacent frequency band.

Still yet another object of the present invention is having the transmitter unit further comprise a transmitter circuit electrically connected thereto a transmitting antenna and generating the radio frequency signal, the transmitting antenna that transmits the radio frequency signal, and a first battery providing power to the transmitter circuit.

Yet another object of the present invention is having the transmitter unit further comprise a first enclosure providing housing for the transmitter unit, a battery compartment cover for covering the first battery, and a battery compartment cover retaining means for opening and closing the battery compartment cover.

Still yet another object of the present invention is having the transmitter unit approximately one (1) inch long, three-quarters (¾) inch wide, and one-quarter (¼) inch thick.

Still yet another object of the present invention is having the receiver unit further comprise a second enclosure providing housing for the receiver unit, a digital display located thereon a face of the second enclosure allowing the user to view what the allowable distance has been set at, and a receiver circuit.

Yet still another object of the present invention is having the receiver unit further comprise the receiving antenna for receiving the radio frequency signal therefrom the transmitter unit and relaying the radio frequency signal thereto the receiver circuit, a squelch circuit electrically connected thereto the receiver circuit, and an increase alarm distance pushbutton and a decrease alarm distance pushbutton that allows the user to adjust the squelch circuit by adjusting the allowable distance between the transmitter unit and the receiver unit.

Still another object of the present invention is having the receiver unit further comprise a display driver circuit, a discrete controller which operates the increase alarm distance pushbutton and the decrease alarm distance pushbutton and is connected thereto the digital display by the display driver circuit, and an audible annunciator that receives an alarm indication signal when the personal item tracking and monitoring system is in the alarm state.

Yet another object of the present invention is having the receiver unit further comprise an alarm speaker that converts the alarm indication signal to an audible sound thereby alerting the user when the personal item tracking and monitoring system is in the alarm state, an on/off switch providing a means to control power thereto the receiving unit when in an on mode and allowing the user to deactivate the receiving unit when in an off mode, and a second battery providing power therethrough the on/off switch thereto the receiver circuit, the squelch circuit, the discrete controller, and the display driver circuit.

Another object of the present invention is having the receiver unit further comprise a crystal regulator, a clock circuit which receives inputs from the crystal regulator, and a first clock set pushbutton and a second clock set pushbutton that allows the user to adjust a time setting displayed on the digital display.

Yet another object of the present invention is having the clock circuit receive power therefrom the second battery but the power does not go therethrough the on/off switch thereby allowing the user to turn off the receiver unit without turning off the clock circuit.

Yet still another object of the present invention is having an attachment ring connected thereto the second enclosure thereby allowing the user to attach the receiver unit thereto a support structure adjacent thereto or located thereon the user.

Still another object of the present invention is having the receiver unit further comprise a belt clip connected thereto a rear side of the second enclosure.

Still yet another object of the present invention is having the receiver unit further comprise a low battery level indicator for indicating the user when a battery level of the transmitter unit and the receiver unit is low.

Yet another object of the present invention is having the low battery level indicator indicated through the receiver unit by use of a visual indication located thereon the digital display.

Yet another object of the present invention is having the low battery level indicator indicated through the receiver unit by use of an audible indication therewith the audible annunciator and the alarm speaker.

Yet still another object of the present invention is having the receiver unit approximately one (1) inch wide, one and one-quarter (1¼) inch long, and three-quarter (⅜) inch thick.

Another object of the present invention is having the discrete controller an integrated circuit that accepts digital and analog inputs and provides associated digital and analog outputs based upon a predetermined set of programmed instructions.

Still yet another object of the present invention is having the receiver unit further comprise a silence pushbutton enabling the user to deactivate the receiver unit for a short-term separation between the transmitter unit and the receiving unit wherein the receiver unit would be automatically re-activated upon return.

Still another object of the present invention is having the receiver unit further comprise a battery recharging port allowing the user to recharge the second battery.

Yet another object of the present invention is providing a method for using the present invention to allow the user to be alerted, if they go beyond a pre-set distance from a personal object.

BRIEF DESCRIPTION OF THE DRAWINGS

The advantages and features of the present invention will become better understood with reference to the following more detailed description and claims taken in conjunction with the accompanying drawings, in which like elements are identified with like symbols, and in which:

FIG. **1** is an overall perspective diagram of the personal item tracking and monitoring system **10** according to the preferred embodiment of the present invention;

FIG. **2***a* is a front view of the transmitter unit **15** as used with the personal item tracking and monitoring system **10**;

FIG. **2***b* is a rear view of the transmitter unit **15** as used with the personal item tracking and monitoring system **10**;

FIG. **3***a* is a front view of the receiver unit **25** as used with the personal item tracking and monitoring system **10**;

FIG. **3***b* is a rear view of the receiver unit **25** as used with the personal item tracking and monitoring system **10**; and,

FIG. **4** is an electronic block diagram of both the transmitter unit **15** and the receiver unit **25** as used with the personal item tracking and monitoring system **10**.

DESCRIPTIVE KEY

10 personal item tracking and monitoring system
15 transmitter unit
20 personal object
25 receiver unit
30 user
35 distance "d"
40 first enclosure
45 physical attachment means
50 battery compartment cover
55 battery compartment cover retaining means
60 second enclosure
65 attachment ring
66 receiver battery compartment cover
67 belt clip
68 battery recharging port
70 digital display
75 first field
80 clock set pushbuttons
85 second field
87 battery low indicator
90 increase alarm distance pushbutton
95 decrease alarm distance pushbutton
100 alarm speaker
105 ON/OFF switch
110 silence pushbutton
115 first battery
120 transmitter circuit
125 internal transmitting antenna
130 radio frequency radio wave
135 receiving antenna
140 receiver circuit
145 squelch circuit
150 discrete controller
155 display driver circuit
160 audible annunciator

165 clock circuit
170 crystal regulator
175 second battery

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The best mode for carrying out the invention is presented in terms of its preferred embodiment, herein depicted within FIGS. **1** through **4**. However, the invention is not limited to the described embodiment and a person skilled in the art will appreciate that many other embodiments of the invention are possible without deviating from the basic concept of the invention, and that any such work around will also fall under scope of this invention. It is envisioned that other styles and configurations of the present invention can be easily incorporated into the teachings of the present invention, and only one particular configuration shall be shown and described for purposes of clarity and disclosure and not by way of limitation of scope.

The terms "a" and "an" herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced items.

The present invention is a personal item tracking and monitoring system **10** and method by which wireless telephones or similar personal objects **20** can be easily found by the use of a radio frequency system. A small transmitter unit **15** is attached to the object **20** to be tracked. The user then carries a small receiver unit **25**. The receiver unit **25** is provided with an on/off control **105** and a means to select the allowable range of separation distance "d" **35** using an increase alarm distance pushbutton **90** and a decrease alarm distance pushbutton **95** with feedback from a digital display **70**. When the object **20**, or receiver unit **25**, wander farther than the range control allows, the receiver unit **25** emits an audible tone or beep to remind the user to retrieve the object **20**. Furthermore, the personal item tracking and monitoring system **10** can also be used as an aid to retrieve the tagged object **20** when lost. This is accomplished by setting the range on the receiver unit **25** on progressively smaller settings until the target area is identified.

Referring now to FIG. **1**, an overall perspective diagram of the personal item tracking and monitoring system **10** according to the preferred embodiment of the present invention is disclosed. The personal item tracking and monitoring system **10** is comprised of two major but separate components. The first component, a transmitter unit **15** is provided on a personal object **20** such as a cellular telephone, an eyeglass case, a remote control, a portable computer, a personal digital assistant (PDA) or the like. The second component, a receiver unit **25**, is carried by a user **30**. The transmitter unit **15** is of a small size relative to the personal object **20** it is attached to the personal object **20** by use of a mechanical fastening means **45**. The transmitter unit **15** and its fastening means will be described in greater detail herein below. The receiver unit **25** is envisioned to be the size of a key fob typically used to wirelessly lock and unlock the doors of a motor vehicle. As such, the receiver unit **25** is envisioned to be carried on a ring of keys, carried in one's hands, carried in a pocket, purse, or briefcase, worn upon a belt, or similar manner. The physical size and method of carrying or attachment of both the transmitter unit **15** and the receiver unit **25** do nor affect the features and benefits of the present invention, and as such, should not be interpreted as a limiting factor of the present invention. Under normal situations, since the transmitter unit **15** is permanently attached to the personal object **20**, it would be present on or near the user **30**, as would be expected with

personal object **20** such as car keys, wireless telephones and the like. Under abnormal situations such as the case of theft, forgetfulness, unintentional removal, abandonment and the like, the distance between the transmitter unit **15** and the receiver unit **25** will increase as indicated by a distance "d" **35**. When the distance "d" **35** reaches a predetermined and adjustable set point envisioned to be between 10 feet to 99 feet, the receiver unit **25** will emit an audible warning signal. In such a manner, the user **30** may take immediate corrective action to retrieve the personal object **20**, thus silencing the audible alarm. Further functionality and operation of the transmitter unit **15** and the receiver unit **25** will be described in greater detail herein below.

Referring next to FIG. **2***a*, a front view of the transmitter unit **15** as used with the personal item tracking and monitoring system **10** is shown. This figure more clearly shows the overall shape and size configuration of the transmitter unit **15**. The transmitter unit **15** is housed in a first enclosure **40** envisioned to be provided with rounded corners. The overall size of the transmitter unit **15** is envisioned to be approximately one inch long, three-quarters (¾) inch wide and one-quarter (¼) inch thick. Such a size will not impart a physical burden to the personal object **20** (as shown in FIG. **1**). On the face of the transmitter unit **15**, a battery compartment cover **50** secured by a battery compartment cover retaining means **55** is provided. Such features are envisioned to be the only external features of the transmitter unit **15**. There is no ON/OFF switch the transmitting antenna would be internal to the first enclosure **40**. In such a manner, the transmitter unit **15** would be always active, and less likely to be deactivated as would be the case if the transmitter unit **15** were equipped with an ON/OFF switch.

Referring now to FIG. **2***b*, a rear view of the transmitter unit **15** as used with the personal item tracking and monitoring system **10** is disclosed. The rear of the first enclosure **40** of the transmitter unit **15** comprises a physical attachment means **45**. The transmitter unit **15** is attached to the personal object **20** by the physical attachment means **45** such as double-sided foam tape, adhesive, or fasteners such as screws or clips. The preferred embodiment of the personal item tracking and monitoring system has the physical attachment means **45** covering almost the entire rear surface of the first enclosure **40** to provide a larger contact surface thereby providing a more secure attachment thereto the object **20**.

Referring now to FIG. **3***a*, a front view of the receiver unit **25** as used with the personal item tracking and monitoring system **10** is depicted. The receiver unit **25** utilizes a second enclosure **60** envisioned to be the size of a key fob with the approximate overall dimensions of one (1) inch wide, one-and-a-quarter (1¼) inch tall and three-eighths (⅜) inch thick. An attachment ring **65** is provided on the top of the second enclosure **60** for attaching it to a ring of keys, a neck chain or the like. The face of the second enclosure **60** is provided with a digital display **70**. A first field **75** of the digital display **70** indicates the current time. Such time is generated internally, and would be set by the use of a pair of clock set pushbuttons **80** in a conventional and expected manner. A second field **85** of the digital display **70** indicates the approximated distance "d" **35** (as shown in FIG. **1**) at which point the receiver unit **25** will enter its alarm state. Such increases and decreases of said alarm distance is provided by use of an increase alarm distance pushbutton **90** and decrease alarm distance pushbutton **95** respectively. The audible annunciation associated with the use of the personal item tracking and monitoring system **10** is provided by an alarm speaker **100**. The receiver unit **25** also provides a battery low indicator **87** thereupon the digital display **70** as well as providing a periodic beep emitted therefrom the audible annunciator **160**.

An ON/OFF switch **105** provides power to the receiver unit **25**. In such a manner the user **30** is able to deactivate the receiver unit **25** and associated personal item tracking and monitoring system **10** during periods of time when such separation between the transmitter unit **15** and the receiver unit **25** is long-term, repeated and intentional. Additionally, a silence pushbutton **110** is provided to allow intentional, single time, short-term separation, which would automatically re-activate the receiver unit **25** upon return. An example of such short term separation would be when one leaves a desk or car for a short time period and would leave behind personal items such as wireless phones, eyeglasses, computers and the like. When one returns, the receiver unit **25** would automatically reset and allow the receiver unit **25** to re-alarm when the user was separated again. This feature would alleviate having to remember to re-activate the receiver unit **25** when the user **30** would return.

Referring now to FIG. **3***b*, a rear view of the receiver unit **25** as used with the personal item tracking and monitoring system **10** is depicted. The receiver unit **25** further comprises a receiver battery compartment cover **66**, a belt clip **67**, and a battery recharging port **68** on the rear of the second enclosure **60**. The belt clip **67** would be provided on the rear of the second enclosure **60** and allow for attachment to a belt, a strap or the like. The receiver unit **25** is battery powered and would allow for replaceable batteries or the recharging of rechargeable batteries through an access opening or a battery recharging port **68** on the rear of the second enclosure **60**.

Referring finally to FIG. **4**, an electronic block diagram of the transmitter unit **15** as used with the receiver unit **25** is shown. The transmitter unit **15** is shown on the left-hand side of the diagram. A first battery **115** provides power to a transmitter circuit **120**, which is interconnected to an internal transmitting antenna **125** as shown. The transmitter circuit **120** generates a radio frequency radio wave signal **130**. The internal transmitting antenna **125** transmits the radio frequency radio wave **130** which provides indication to a receiving antenna **135** as to the presence of the transmitter unit **15** and its relative strength. The radio frequency radio wave **130** is envisioned to be of the type licensed for use on appropriate frequencies and modulation schemes. While a multitude of different modulation schemes such as amplitude modulation, frequency modulation, side-band, and the like could be utilized, it is envisioned that digital modulation which would produce a pulsed signal would be best due to its ability to be modulated to avoid interference with other personal item tracking and monitoring system **10** in the nearby area or other devices which may be on the same or adjacent frequency bands. However, any specific modulation scheme is not required by the present invention, and as such, should not be interpreted as a limiting factor of the present invention. The receiving antenna **135** relays the radio frequency radio wave **130** to a receiver circuit **140**. The receiver circuit **140** is in turn connected to a squelch circuit **145** which operates in a manner similar to that of a squelch circuit on a conventional radio. The squelch circuit **145** comprises a preset threshold value for the radio frequency signal **130**, thereby detecting an acceptable proximal location of the transmitter unit **15**. As such, if a radio frequency signal **130** being of an adequate strength and being above said preset threshold is detected, the squelch is broken and the personal item tracking and monitoring system **10** is in an armed and active state. Should the strength of the radio frequency radio wave **130** drop below the preset threshold, as would be the case if the transmitter unit **15** is displaced a distance away, the squelch will close and the receiver unit **25**

will enter an alarm state. The adjustment of the squelch circuit **145** is controlled by the increase alarm distance pushbutton **90** and the decrease alarm distance pushbutton **95** which operate through a discrete controller **150**. The discrete controller **150** is envisioned to be a dedicated integrated circuit that accepts digital and analog inputs and provided associated digital and analog outputs based upon a predetermined set of programmed instructions. Such design can also be provided by a basic stamp controller, an analog circuit driven into saturation, or the like, and as such, one particular design should not be interpreted as a limiting factor of the present invention. The discrete controller **150** connects to the digital display **70** through use of a display driver circuit **155**. Alarm indication output is made to an audible annunciator **160** from the discrete controller **150** as well. A clock circuit **165** with inputs from a crystal regulator **170** and the clock set pushbuttons **80** provide display of the current time to the digital display **70** as well. Finally, a second battery **175** provides power through the ON/OFF switch **105** to the receiver circuit **140**, the squelch circuit **145**, the discrete controller **150**, and the display driver circuit **155**. Power is also provided to the clock circuit **165** as well, but before the ON/OFF switch **105** such as to not interrupt time keeping ability when the receiver unit **25** is switched off.

It is envisioned that other styles and configurations of the present invention can be easily incorporated into the teachings of the present invention, and only one particular configuration shall be shown and described for purposes of clarity and disclosure and not by way of limitation of scope.

The preferred embodiment of the present invention can be utilized by the common user in a simple and effortless manner with little or no training. After procurement of the personal item tracking and monitoring system **10**, the user would install an appropriate first battery **115** and second battery **175** in the transmitter unit **15** and receiver unit **25** respectively. The user **30** would then set the appropriate time of day on the receiver unit **25** using the clock set pushbuttons **80**. Next, the user **30** would adjust the receiver unit **25** for an allowable separation distance "d" **35** using the increase alarm distance pushbutton **90** and the decrease alarm distance pushbutton **95** with feedback from the digital display **70**. At this point the personal item tracking and monitoring system **10** is ready for use and monitoring.

Should the receiver unit **25** be separated from the transmitter unit **15**, thus including the personal object **20**, for an approximate distance greater than that permitted by the receiver unit **25**, an audible alarm will sound through the audible annunciator **160**. This provides adequate warning to the user **30** to take preemptive action and retrieve the associated personal object **20**. Should the user **30** allow such separation, the silence pushbutton **110** would be pressed to temporarily silence the audible annunciator **160**. However, once the transmitter unit **15** returns within the distance "d" **35**, the receiver unit **25** will automatically reset and thus alarm again should the distance "d" **35** be exceeded. In the event the features of the personal item tracking and monitoring system **10** are not required, the user **30** can deactivate the receiver unit **25** by use of the ON/OFF switch **105**.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention and method of use to the precise forms disclosed. Obviously many modifications and variations are possible in light of the above teaching. The embodiment was chosen and described in order to best explain the principles of the invention and its practical application, and to thereby enable others skilled in the art to best utilize the

invention and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omissions or substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but is intended to cover the application or implementation without departing from the spirit or scope of the claims of the present invention.

What is claimed is:

1. A personal item tracking and monitoring system, comprising:

a transmitter unit removably attachable to an object by an attachment means; and,

a receiver unit allowing a user to adjust an allowable distance between said transmitter unit and said receiver unit, further comprising:

a second enclosure providing housing for said receiver unit;

a digital display located on a face of said second enclosure allowing said user to view what said allowable distance has been set at;

a receiver circuit;

a receiving antenna for receiving a radio frequency signal from said transmitter unit and relaying said radio frequency signal to said receiver circuit;

a squelch circuit electrically connected to said receiver circuit;

an increase alarm distance pushbutton and a decrease alarm distance pushbutton that allows said user to adjust said squelch circuit by adjusting said allowable distance between said transmitter unit and said receiver unit;

a display driver circuit;

a discrete controller which operates said increase alarm distance pushbutton and said decrease alarm distance pushbutton and is connected to said digital display by said display driver circuit;

an audible annunciator that receives an alarm indication signal when said personal item tracking and monitoring system is in an alarm state;

an alarm speaker that converts said alarm indication signal to an audible sound thereby alerting said user when said personal item tracking and monitoring system is in said alarm state;

an on/off switch providing a means to control power to said receiving unit when in an on mode and allowing said user to deactivate said receiving unit when in an off mode; and,

a second battery providing power through said on/off switch to said receiver circuit, said squelch circuit, said discrete controller, and said display driver circuit;

wherein said length between said transmitter unit and said receiver unit is determined by a signal strength transmitted by said transmitter unit to said receiver unit;

wherein when said signal strength of said radio frequency signal is of an adequate strength, said squelch circuit is broken and said personal item tracking and monitoring system is in an armed and active state;

wherein when said signal strength of said radio frequency signal does not reach said adequate strength, said squelch circuit is closed and said receiver unit enters said alarm state;

wherein said transmitter unit transmits said radio frequency signal to said receiving antenna of said receiver unit thereby allowing said receiving unit to determine a length between said transmitter unit and said receiving unit; and,

wherein said receiver unit emits a warning signal when said length between said transmitter unit and said receiver unit reaches or extends beyond said allowable distance and said personal item tracking and monitoring system is in said alarm state.

2. The personal item tracking and monitoring system of claim **1**, wherein said warning signal is audible.

3. The personal item tracking and monitoring system of claim **1**, wherein said warning signal is visual.

4. The personal item tracking and monitoring system of claim **1**, wherein said attachment means comprises one (1) of the following list: a double-sided foam tape, an adhesive, a screw fastener, or a clip fastener.

5. The personal item tracking and monitoring system of claim **1**, wherein said system utilizes a digital modulation scheme to produce a pulsed signal thereby avoiding interference with other said personal item tracking and monitoring systems in a nearby area or other devices which could be on a same or an adjacent frequency band.

6. The personal item tracking and monitoring system of claim **1**, wherein said transmitter unit further comprises:

a transmitter circuit electrically connected to a transmitting antenna and generating said radio frequency signal;

said transmitting antenna that transmits said radio frequency signal; and,

a first battery providing power to said transmitter circuit;

wherein said transmitter unit transmits said radio frequency signal thereby allowing said receiving antenna to determine said length between said transmitter unit and said receiving unit.

7. The personal item tracking and monitoring system of claim **6**, wherein said transmitter unit further comprises:

a first enclosure providing housing for said transmitter unit;

a battery compartment cover for covering said first battery; and,

a battery compartment cover retaining means for opening and closing said battery compartment cover.

8. The personal item tracking and monitoring system of claim **7**, wherein said transmitter unit is approximately one (1) inch long, three-quarters (¾) inch wide, and one-quarter (¼) inch thick.

9. The personal item tracking and monitoring system of claim **1**, wherein said receiver unit further comprises:

a crystal regulator;

a clock circuit which receives inputs from said crystal regulator; and,

a first clock set pushbutton and a second clock set pushbutton that allows said user to adjust a time setting displayed on said digital display;

wherein said clock circuit receives power from said second battery but said power does not go through said on/off switch thereby allowing said user to turn off said receiver unit without turning off said clock circuit.

10. The personal item tracking and monitoring system of claim **9**, wherein said receiver unit further comprises an attachment ring connected to said second enclosure thereby allowing said user to attach said receiver unit to a support structure adjacent to or located on said user.

11. The personal item tracking and monitoring system of claim **9**, wherein said receiver unit further comprises a belt clip connected to a rear side of said second enclosure.

12. The personal item tracking and monitoring system of claim **9**, wherein said receiver unit further comprises a low battery level indicator for indicating said user when a battery level of said transmitter unit and said receiver unit is low.

13. The personal item tracking and monitoring system of claim **12**, wherein said low battery level indicator is indicated through said receiver unit by use of a visual indication located on said digital display.

14. The personal item tracking and monitoring system of claim **12**, wherein said low battery level indicator is indicated through said receiver unit by use of an audible indication said audible annuciator and said alarm speaker.

15. The personal item tracking and monitoring system of claim **9**, wherein said receiver unit is approximately one (1) inch wide, one-and-a-quarter (1¼) inch long, and three-quarter (⅜8) inch thick.

16. The personal item tracking and monitoring system of claim **9**, wherein said discrete controller is an integrated circuit that accepts digital and analog inputs and provides associated digital and analog outputs based upon a predetermined set of programmed instructions.

17. The personal item tracking and monitoring system of claim **9**, wherein said receiver unit further comprises a silence pushbutton enabling said user to deactivate said receiver unit for a short-term separation between said transmitter unit and said receiving unit wherein said receiver unit would be automatically re-activated upon return.

18. The personal item tracking and monitoring system of claim **9**, wherein said receiver unit further comprises a battery recharging port allowing said user to recharge said second battery.

19. A method for using a personal item tracking and monitoring system, said method comprising the steps of:

providing said system, comprising:

a transmitter unit removably attachable to an object by an attachment means; and,

a receiver unit allowing a user to adjust an allowable distance between said transmitter unit and said receiver unit, further comprising:

a second enclosure providing housing for said receiver unit;

a digital display located on a face of said second enclosure allowing said user to view what said allowable distance has been set at;

a receiver circuit;

a receiving antenna for receiving a radio frequency signal from said transmitter unit and relaying said radio frequency signal to said receiver circuit;

a squelch circuit electrically connected to said receiver circuit;

an increase alarm distance pushbutton and a decrease alarm distance pushbutton that allows said user to adjust said squelch circuit by adjusting said allowable distance between said transmitter unit and said receiver unit;

a display driver circuit;

a discrete controller which operates said increase alarm distance pushbutton and said decrease alarm distance pushbutton and is connected to said digital display by said display driver circuit;

an audible annunciator that receives an alarm indication signal when said personal item tracking and monitoring system is in an alarm state;

an alarm speaker that converts said alarm indication signal to an audible sound thereby alerting said user when said personal item tracking and monitoring system is in said alarm state;

an on/off switch providing a means to control power to said receiving unit when in an on mode and allowing said user to deactivate said receiving unit when in an off mode; and,

a second battery providing power through said on/off switch to said receiver circuit, said squelch circuit, said discrete controller, and said display driver circuit;

wherein said length between said transmitter unit and said receiver unit is determined by a signal strength transmitted by said transmitter unit to said receiver unit;

wherein when said signal strength of said radio frequency signal is of an adequate strength, said squelch circuit is broken and said personal item tracking and monitoring system is in an armed and active state;

wherein when said signal strength of said radio frequency signal does not reach said adequate strength, said squelch circuit is closed and said receiver unit enters said alarm state;

wherein said transmitter unit transmits said radio frequency signal thereto said receiving antenna of said receiver unit thereby allowing said receiving unit to determine a length between said transmitter unit and said receiving unit; and,

wherein said receiver unit emits a warning signal when said length between said transmitter unit and said receiver unit reaches or extends beyond said allowable distance and said personal item tracking and monitoring system is in said alarm state;

installing a first battery in said transmitter unit and a second battery said receiver unit;

setting an appropriate time of day on said receiver unit using a first clock set pushbutton and a second clock set pushbutton;

adjusting said allowable distance between said transmitter unit and said receiver unit using an increase alarm distance pushbutton and a decrease alarm distance pushbutton with feedback from a digital display; and,

utilizing said personal item tracking and monitoring system to alert said user if said personal object goes beyond said allowable distance.

20. A personal item tracking and monitoring system, comprising:

a transmitter unit further comprising:

a transmitter circuit electrically connected to a transmitting antenna and generating said radio frequency signal;

said transmitting antenna that transmits said radio frequency signal; and,

a first battery providing power to said transmitter circuit;

a receiver unit further comprising:

a second enclosure providing housing for said receiver unit;

a digital display located on a face of said second enclosure allowing said user to view what said allowable distance has been set at;

a receiver circuit;

a receiving antenna for receiving a radio frequency signal from said transmitter unit and relaying said radio frequency signal to said receiver circuit;

a squelch circuit electrically connected to said receiver circuit;

an increase alarm distance pushbutton and a decrease alarm distance pushbutton that allows said user to adjust said squelch circuit by adjusting said allowable distance between said transmitter unit and said receiver unit;

a display driver circuit;

a discrete controller which operates said increase alarm distance pushbutton and said decrease alarm distance pushbutton and is connected to said digital display by said display driver circuit;

an audible annunciator that receives an alarm indication signal when said personal item tracking and monitoring system is in said alarm state;

an alarm speaker that converts said alarm indication signal to an audible sound thereby alerting said user when said personal item tracking and monitoring system is in said alarm state;

an on/off switch providing a means to control power to said receiving unit when in an on mode and allowing said user to deactivate said receiving unit when in an off mode; and,

a second battery providing power through said on/off switch thereto said receiver circuit, said squelch circuit, said discrete controller, and said display driver circuit;

wherein said transmitter unit is removably attachable to an object by an attachment means;

wherein said length between said transmitter unit and said receiver unit is determined by a signal strength transmitted by said transmitter unit to said receiver unit;

wherein when said signal strength of said radio frequency signal is of an adequate strength, said squelch circuit is broken and said personal item tracking and monitoring system is in an armed and active state;

wherein when said signal strength of said radio frequency signal does not reach said adequate strength, said squelch circuit is closed and said receiver unit enters said alarm state;

wherein said receiver unit allows a user to adjust an allowable distance between said transmitter unit and said receiver unit;

wherein said transmitter unit transmits said radio frequency radio wave said receiving antenna of said receiver unit thereby allowing said receiving unit to determine a length between said transmitter unit and said receiving unit; and,

wherein said receiver unit emits a warning signal when said length between said transmitter unit and said receiver unit reaches or extends beyond said allowable distance and said personal item tracking and monitoring system is in said alarm state.

21. The personal item tracking and monitoring system of claim **20**, wherein said attachment means comprises one (1) of the following list: a double-sided foam tape, an adhesive, a screw fastener, or a clip fastener.

* * * * *

IE3

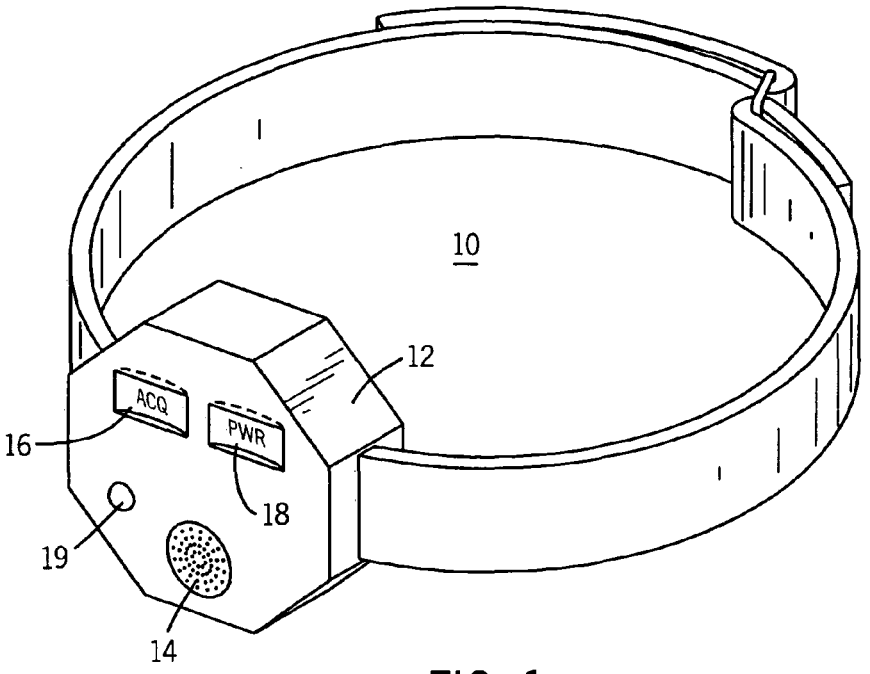


FIG. 1

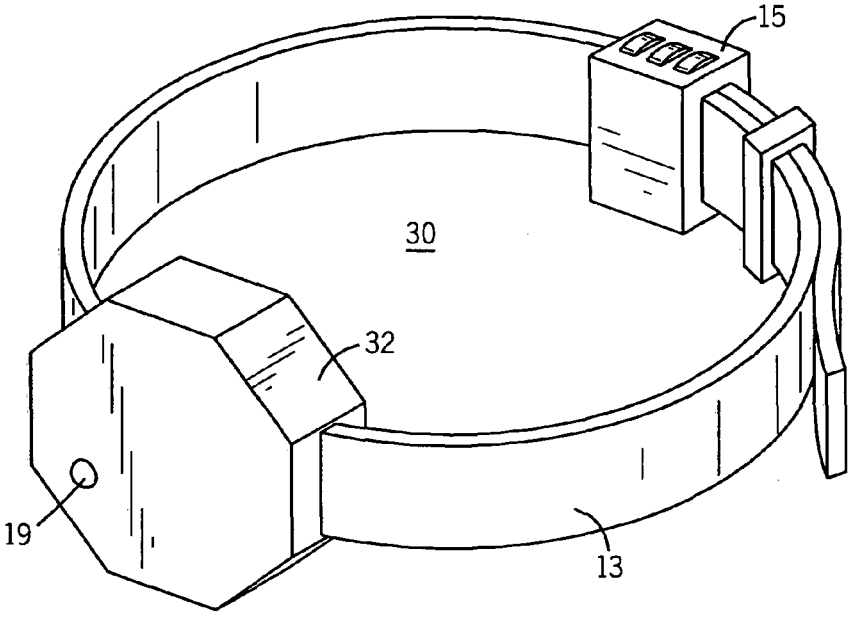


FIG. 2

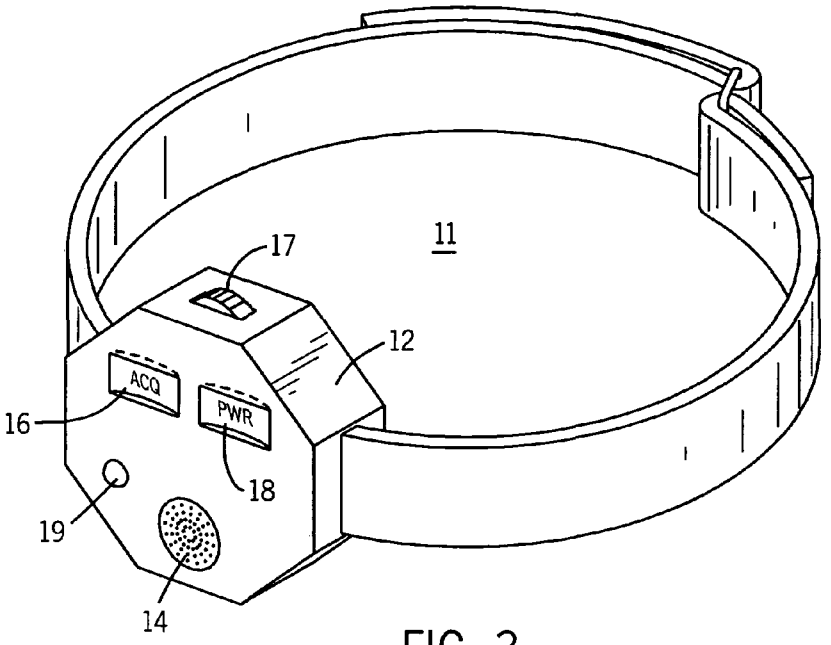

11
17
12
ACQ
PWR
16
18
19
14

FIG. 3

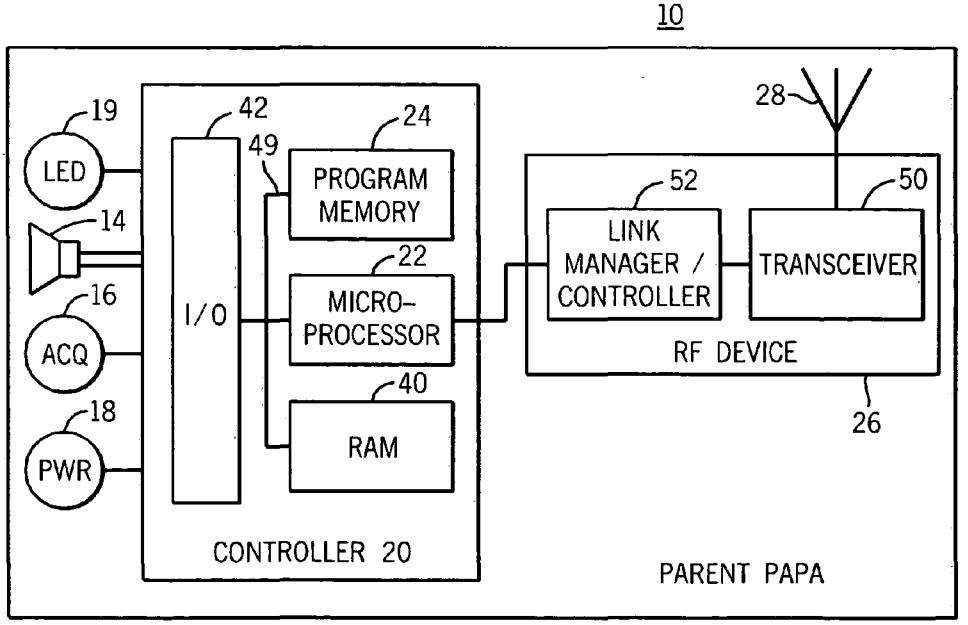

10
19
LED
14
16
ACQ
18
PWR
42
49
I/O
24
PROGRAM MEMORY
22
MICRO-PROCESSOR
40
RAM
CONTROLLER 20
28
52
LINK MANAGER / CONTROLLER
50
TRANSCEIVER
RF DEVICE
26
PARENT PAPA

FIG. 4

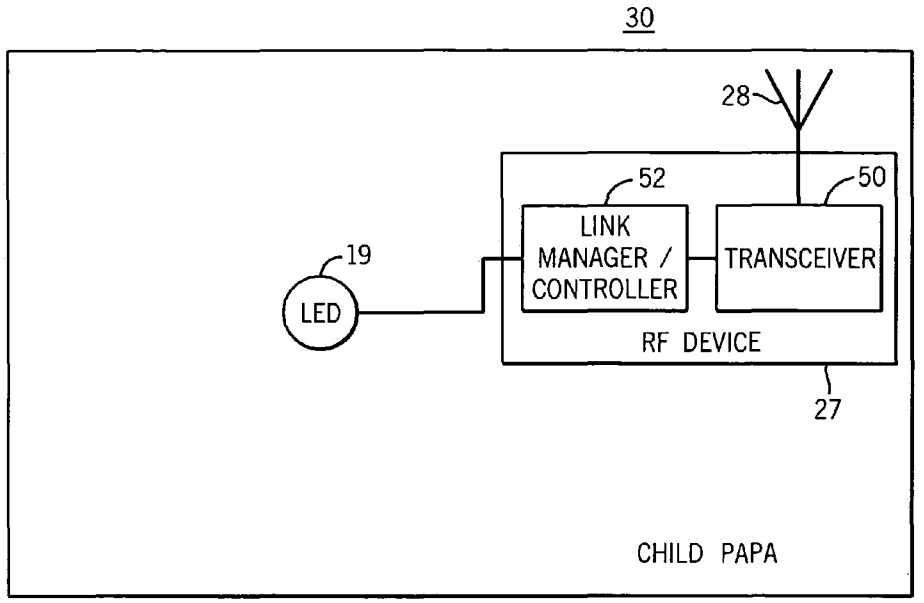
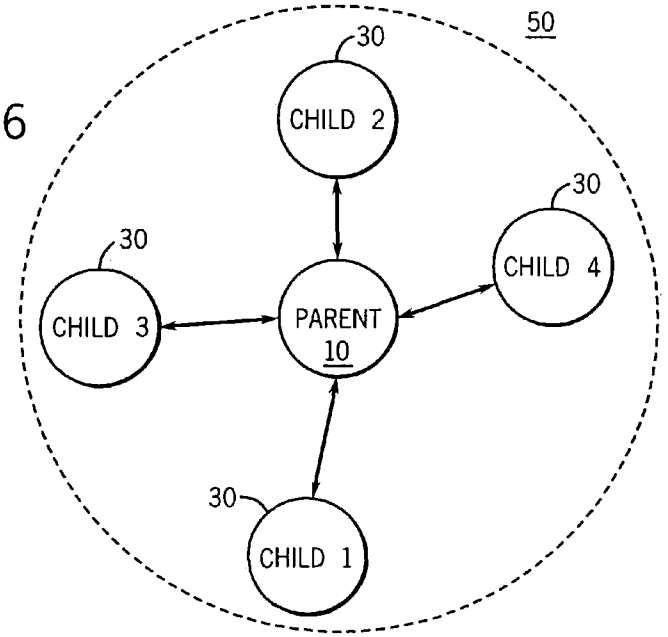

30
28
52
50
LINK
MANAGER /
CONTROLLER
TRANSCEIVER
19
LED
RF DEVICE
27
CHILD PAPA

FIG. 5

FIG. 6


50
30
CHILD 2
30
30
CHILD 3
CHILD 4
PARENT
10
30
CHILD 1

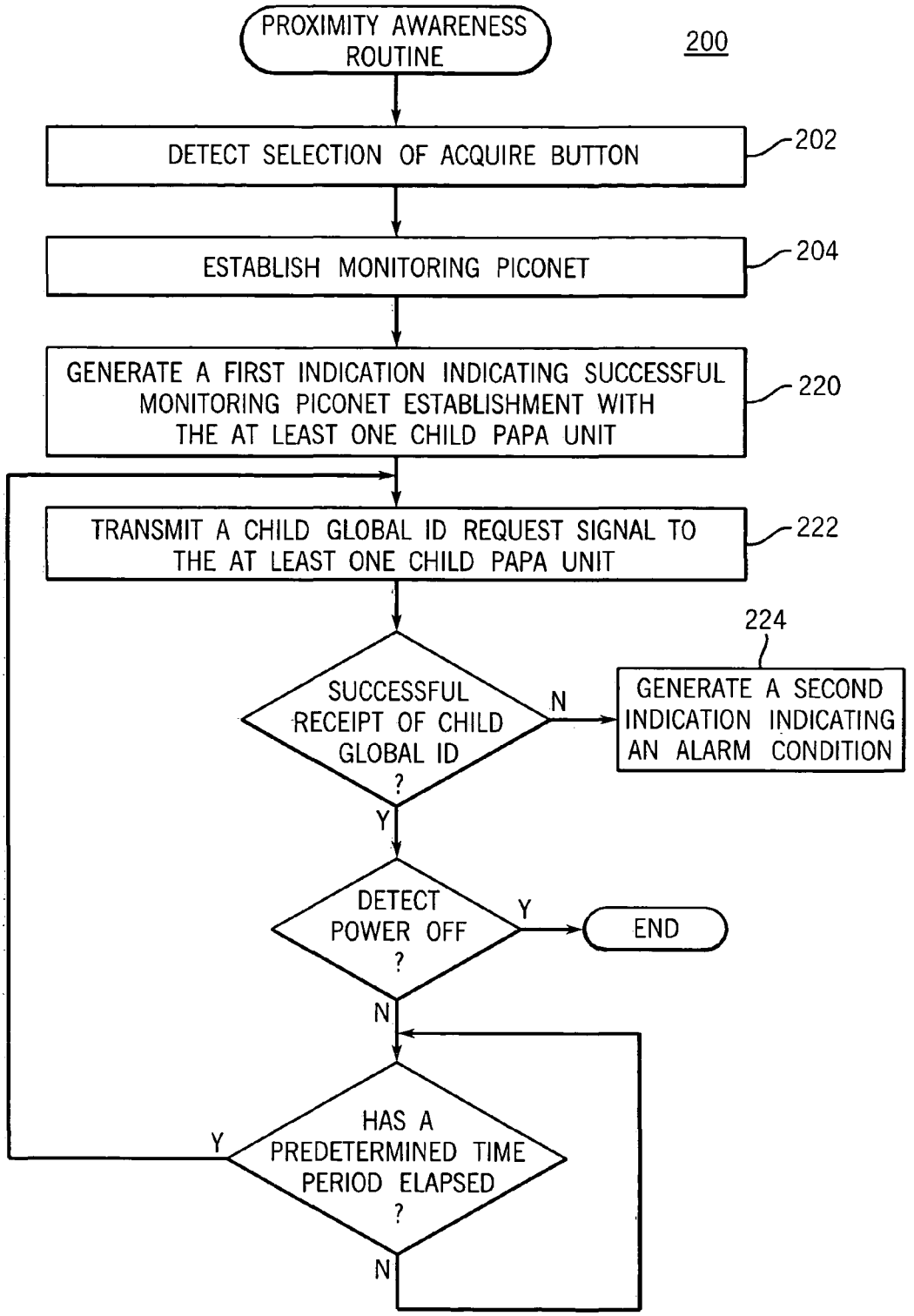

PROXIMITY AWARENESS ROUTINE
200
DETECT SELECTION OF ACQUIRE BUTTON
202
ESTABLISH MONITORING PICONET
204
GENERATE A FIRST INDICATION INDICATING SUCCESSFUL MONITORING PICONET ESTABLISHMENT WITH THE AT LEAST ONE CHILD PAPA UNIT
220
TRANSMIT A CHILD GLOBAL ID REQUEST SIGNAL TO THE AT LEAST ONE CHILD PAPA UNIT
222
224
SUCCESSFUL RECEIPT OF CHILD GLOBAL ID ?
N
GENERATE A SECOND INDICATION INDICATING AN ALARM CONDITION
Y
DETECT POWER OFF ?
Y
END
N
HAS A PREDETERMINED TIME PERIOD ELAPSED ?
Y
N

FIG. 7

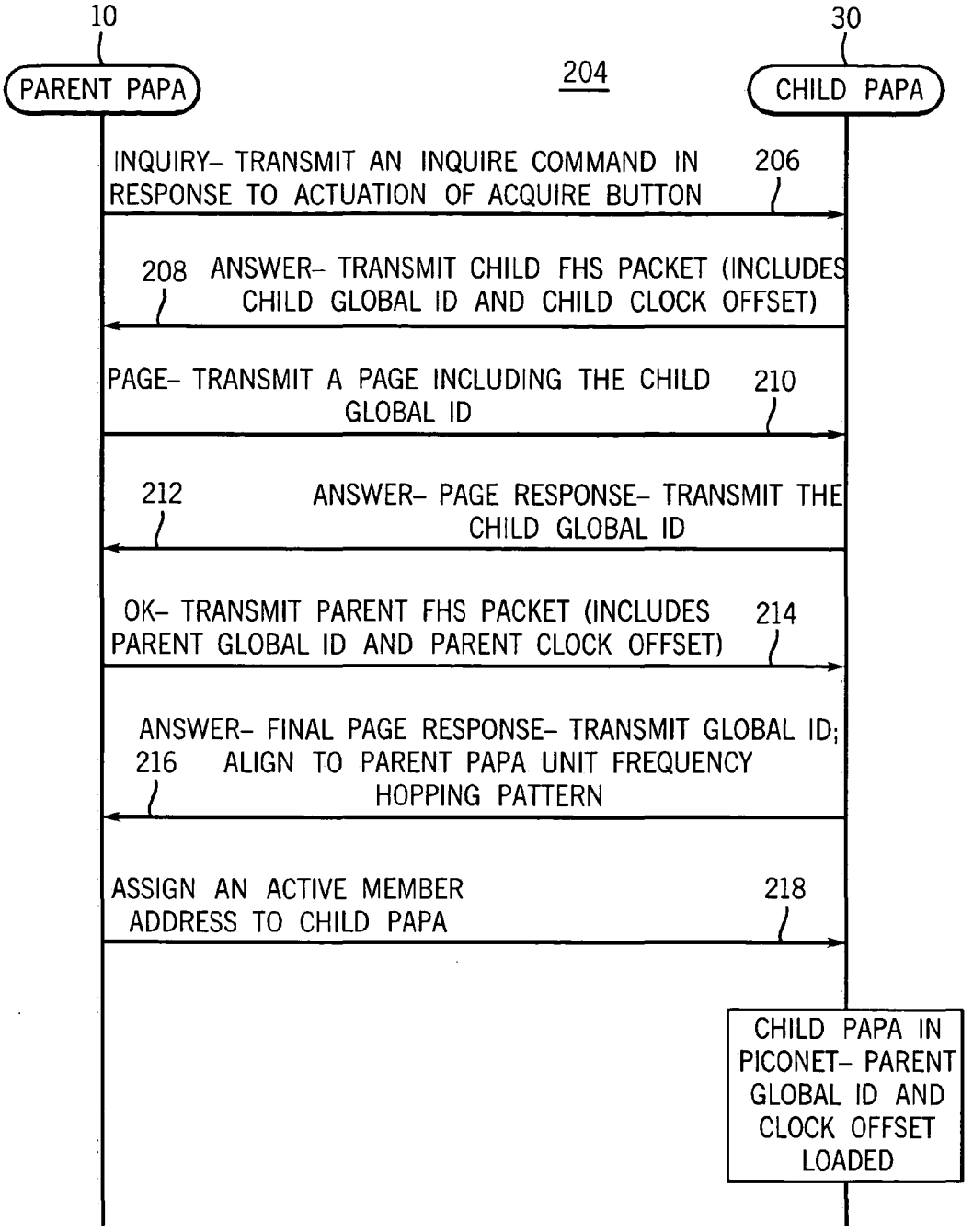

10
30
PARENT PAPA
204
CHILD PAPA
INQUIRY- TRANSMIT AN INQUIRE COMMAND IN RESPONSE TO ACTUATION OF ACQUIRE BUTTON
206
208
ANSWER- TRANSMIT CHILD FHS PACKET (INCLUDES CHILD GLOBAL ID AND CHILD CLOCK OFFSET)
PAGE- TRANSMIT A PAGE INCLUDING THE CHILD GLOBAL ID
210
212
ANSWER- PAGE RESPONSE- TRANSMIT THE CHILD GLOBAL ID
OK- TRANSMIT PARENT FHS PACKET (INCLUDES PARENT GLOBAL ID AND PARENT CLOCK OFFSET)
214
ANSWER- FINAL PAGE RESPONSE- TRANSMIT GLOBAL ID; ALIGN TO PARENT PAPA UNIT FREQUENCY HOPPING PATTERN
216
ASSIGN AN ACTIVE MEMBER ADDRESS TO CHILD PAPA
218
CHILD PAPA IN PICONET- PARENT GLOBAL ID AND CLOCK OFFSET LOADED

FIG. 8

PROXIMITY AWARE PERSONAL ALERT SYSTEM

BACKGROUND

[0001] This disclosure relates to a device that prevents separation and more particularly to a portable wireless monitoring device that causes an indication when a predetermined distance has been exceeded between two or more persons or objects.

[0002] Devices to prevent physical separation between persons and/or objects are known in the art. Although their applications vary, for example, preventing physical separation of an elderly person from their caregiver, preventing physical separation of an object from its owner, etc., devices that prevent physical separation of a child from his/her parent or caregiver have been in use for many years. For example, in the 1980's child tethering devices were not an uncommon sight at the local shopping mall. While effective for short distances, the child tethering devices were cumbersome, easily tangled and overall, visually unsettling.

[0003] Today, various electronic devices in one of many configurations have replaced the traditional child tethering devices of the past with electronic monitoring devices and monitoring device networks. For example, monitoring device networks that utilize a fixed base apparatus to prevent separation are known in the art. U.S. Pat. Nos. 4,593,273 and 4,675,656, to Narcisse entitled "Out-of-Range Personnel Monitor and Alarm," disclose an out-of-range monitor and alarm system that utilizes a fixed base unit and at least one mobile unit. Similarly, U.S. Pat. No. 6,720,881 to Halliday, entitled "Perimeter Security Systems", discloses a perimeter securing system for providing a security alarm for persons leaving or entering a predetermined area. The security system includes a main sensor wearable by a user, a perimeter defining assembly for providing an indication of a predefined area, and a remote unit for receiving a signal from the main sensor indicating that the boundary of the predefined area has been broken. Fixed base monitoring devices to prevent separation, however, do not lend themselves to mobile applications involving monitoring children on the move.

[0004] Mobile monitoring device networks that utilize mobile devices to prevent separation are known in the art. For example, U.S. Pat. No. 5,119,072 to Hemingway, entitled "Apparatus for Monitoring Child Activity", discloses an apparatus that includes a mobile child transmitter with a voice encoder, a microphone, an oscillator and an antenna, and a mobile parent receiver. The oscillator frequency modulates a radio frequency (RF) carrier signal which is then transmitted from the antenna. The parent receiver unit includes circuitry for separating the audio and carrier components of the signal received from the child transmitter, and for comparing field strength of the carrier component to a range threshold. The audio component is fed into a speaker of the parent receiver for child activity monitoring purposes. When the amplitude of the carrier component drops below a threshold, an alarm is sounded on the parent receiver indicating that the child unit is out of the desired range.

[0005] U.S. Pat. No. 5,646,593 to Hughes et al, entitled "Child Proximity Detector", discloses a child proximity detection network that includes two transceivers (transmitter/receiver) rather than a child transmitter and a parent receiver of the Hemingway patent. The 1st transceiver unit (parent transceiver unit) includes a parent identification number and the 2nd transceiver (child transceiver unit) unit includes a child identification number, assigned only upon physical connection with the 1st transceiver. During operation, the parent transceiver unit produces and transmits a polling message (including parent ID) to the child transceiver unit to determine if the child transceiver unit is further than a predetermined distance. Upon receipt, the child transceiver unit which "investigates" the polling message contact for matching with predetermined criteria and returns response if matched, and detects whether parent transceiver unit is more than a predetermined distance. Alarms sound if either detects other beyond the predetermined distance.

[0006] U.S. Pat. No. 5,661,460 to Sallen et al., entitled "Distance Determination and Alarm System", discloses a monitoring device network that includes at least two transceivers such as a parent unit and a child unit for generating one alarm when the child unit is more than a predetermined distance away from the parent unit. Unlike similar designs where the distance is based on signal strength, the distance of the parent and child unit of the Sallen et al. patent is determined by a phase relationship of a reference signal from the time it is transmitted on an RF signal by the parent unit, received and retransmitted by the child unit, and then received again by the parent unit.

[0007] In some cases, a direction-finding feature is added to the mobile monitoring device network. For example, U.S. Pat. No. 6,127,931 to Mohr, entitled "Device for Monitoring the Movement of a Person", discloses a homing unit (child unit) for generating and omitting a homing signal at predetermined intervals, and a base unit (parent unit) having a receiver for receiving the homing signal and a processor for processing homing signal strength and time of receipt between homing signals to determine whether the homing unit is within a predetermined distance. In addition to an alarm, the base unit includes a display for displaying the distance and direction between the base and homing unit. Similarly, U.S. patent application Publication, 2002/0046658 to Turner et al. entitled "Dual Watch Sensors to Monitor Children" and having a publication date of Mar. 11, 2004, includes a display on the caregiver or parent unit that displays which child transceiver is out of range as well as other visual indications of distances of child transceivers.

[0008] In other cases, one or more elements of the child unit are controlled by the parent unit. For example, U.S. Pat. No. 6,078,260 to Desch entitled "Method and Apparatus for Keeping Track of Children" discloses a system for monitoring the proximity and location of a child (having a child transceiver unit) by a parent (having a parent transceiver unit). In addition to a directional indicator, the parent transceiver unit includes a power switch which controls powering of both child and parent transceiver units and which when activated causes the parent transceiver unit to transmit a signal to activate the child transceiver unit. Similarly, in U.S. Pat. No. 5,939,988 to Neyhart, entitled "Child Proximity Monitor and Alarm", an alarm included in the child transceiver unit is only deactivated via a deactivation signal from the parent unit. Likewise, U.S. Pat. No. 6,542,080 to Page, entitled "Monitoring Device to Prevent Separation", discloses a wearable transmitter portion for the monitored child and a wearable receiver portion for the monitoring parent. The receiver portion includes a prede-

termined separation parameter, a means for determining distance between, an alarm and a reset button for turning off the receiver portion alarm and for resetting the alarm. The transmitter portion also has an alarm, however it can only be turned off by the receiver portion.

[0009] More advanced mobile monitoring devices that include GPS systems are also known in the art. U.S. Pat. No. 5,900,817 entitled "Child Monitoring System" to Olmassakian, and U.S. Pat. No. 6,570,504 and U.S. Published patent application U.S. 2002/0080036 to Rabanne et al, entitled "System for Tracking Possessions" disclose mobile monitoring devices that indicate not only that a child or possession has moved beyond a pre-determined maximum distance limit but also indicate a distance and direction via an GPS assembly included in the monitoring devices.

SUMMARY

[0010] The proximity aware personal alert (PAPA) system disclosed herein improves on the prior art in a number of ways. Among other things, it is simple to use, inexpensive, mobile, adaptable and secure. With a focus on providing an indication to the monitoring person (having a parent PAPA unit) when a monitored person (having a child PAPA unit) has strayed too far, there is no need for additional circuitry to determine exact distances or direction. In addition, there is no need for additional circuitry to engage location finding services such as services relying on the use of the global positioning satellite system (GPS). As a result, the proximity aware personal alert system disclosed herein is inexpensive to build.

[0011] Further, by utilizing one of the wireless technologies described herein, signals transmitted and received on an established and synced RF link between the parent PAPA unit and the child PAPA units are secure against tampering.

[0012] The design of the child PAPA unit prevents its easy removal from the monitored person or object. As a result, neither the a monitored child nor a would-be abductor can quickly remove the child PAPA unit from the monitored child. Similarly, the design of the child PAPA unit prevents a powered-off condition from occurring during use, prevents interruption of an established RF link to the parent PAPA unit **10** during use, and prevents RF link establishment with devices other than the parent PAPA device **10** during use. As a result, neither the monitored child nor a would-be abductor can turn off the child PAPA unit or interrupt an established RF link to the parent PAPA unit **10**. Therefore any termination of expected transmission from the child PAPA unit indicates that the monitored child or object has moved out of range of, or a predetermined distance from the monitoring person.

[0013] The PAPA system includes a first mobile transceiver unit and a second mobile transceiver unit in communication with the first mobile transceiver unit via an RF link where the second mobile transceiver provides an alarm indication when the first mobile transceiver has moved a predetermined distance from the second mobile transceiver unit. When the RF link is configured as a Bluetooth link, the first and second mobile transceiver units form a monitoring piconet where the second mobile transceiver unit provides the alarm indication when the first mobile transceiver unit moves beyond a distance of approximately ten meters from the second mobile transceiver unit. The distance may be adjusted via the addition of a signal amplification device (e.g., a power amplifier) and a user accessible RF range adjustment mechanism to the second mobile transceiver unit. The first transceiver unit is worn by a monitored person such as a child and the second transceiver unit is worn by a monitoring person such as a parent of the child.

[0014] Other objects, advantages and novel features of the present disclosure will become apparent from the following detailed description when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] **FIG. 1** is a perspective view of an exemplary parent proximity aware personal alert (PAPA) unit in accordance with an embodiment of the invention;

[0016] **FIG. 2** is a perspective view of an exemplary child PAPA unit in accordance with an embodiment of the invention;

[0017] **FIG. 3** is a perspective view of another exemplary child PAPA unit in accordance with an embodiment of the invention;

[0018] **FIG. 4** is a functional block diagram of a number of components that may be included in the parent PAPA unit of **FIG. 1**;

[0019] **FIG. 5** is a functional block diagram of a number of components that may be included in the child PAPA unit of **FIG. 2**;

[0020] **FIG. 6** is an exemplary monitoring piconet established by the parent PAPA unit of **FIG. 1** and further including three child PAPA units of **FIG. 2** in accordance with an embodiment of the invention;

[0021] **FIG. 7** is a flowchart of a proximity awareness routine that may be performed by the parent PAPA unit of **FIG. 1** in accordance with an embodiment of the invention; and

[0022] **FIG. 8** is a high level ladder flow of the sequence of steps required to establish the RF link between the parent and child PAPA units of **FIGS. 1 and 2**.

DETAILED DESCRIPTION

[0023] While the present disclosure may be susceptible to embodiment in different forms, there is shown in the drawings, and will be described herein in detail, one or more embodiments with the understanding that the present description is to be considered an exemplification of the principles of the disclosure and is not intended to be exhaustive or to limit the disclosure to the details of construction and the arrangements of components set forth in the following description or illustrated in the drawings.

[0024] **FIG. 1** is a perspective view of an exemplary parent proximity aware personal alert (PAPA) unit **10** in accordance with an embodiment of the invention. The parent PAPA unit **10** includes a housing **12** upon which is mounted a speaker **14**, a light emitting diode (LED), an acquire (ACQ) button **16** and a power (PWR) button **18**, all of which are coupled to a controller **20** (discussed below in connection with **FIG. 4**) concealed within the housing **12**. The housing **12** is preferably constructed of a light weight and water resistant material such as plastic. Also included within

the housing **12** is a radio frequency (RF) device **26** coupled to the controller **20**. The radio frequency device **26** is adapted to provide an RF link to other like devices over intervening air space.

[**0025**] **FIG. 2** is a perspective view of an exemplary child PAPA unit **30** in accordance with an embodiment of the invention. Like the parent PAPA unit **10** of **FIG. 1**, the child PAPA unit **30** includes a housing **32** enclosing an RF device **27** configured and operable as described in connection with the RF device **26** of **FIG. 1**. An LED **19**, mounted to the housing **32**, is coupled to the RF device **27**. Although lightweight, the housing **32** is preferably constructed of a crush resistant material to prevent its breakage by a child or by a would-be abductor. For example, the housing **32** may be constructed of a light weigh metal alloy or ceramic/plastic combination material. A cartoon character or one of any number of other images appealing to the child or other holder of the child PAPA apparatus **30**, may also be included on the housing **32**.

[**0026**] **FIG. 3** is a perspective view of another exemplary parent PAPA unit **11** in accordance with an embodiment of the invention. In addition to the components discussed in connection with the parent PAPA unit of **FIG. 1**, the parent PAPA unit of **FIG. 3** includes a user accessible RF range adjustment mechanism **17** such as a rotatable wheel to enable adjustment of the transmission and reception range of the parent PAPA unit **11**. One or more of any suitable signal amplification devices (not separately illustrated) coupled the RF device **26** and the RF range adjustment mechanism **17** may provide additional adjustable transmission and reception range above that provided by the RF device **26** alone. As a result, manual adjustments made via the RF range adjustment mechanism **17** may be made to vary the transmission and reception capability of the parent PAPA device **11** to one of any number of distances between a nominal distance provided by the RF device **26** alone and a maximum distance provided by the RF device **26** coupled to the suitable signal amplification device.

[**0027**] For example, a suitable power amplifier, coupled to the RF range adjustment mechanism **17**, may be utilized to provide dynamic power control to the RF device **26** to vary the transmission and reception distances of the parent PAPA device **11**. Similarly, a suitable antenna and/or an RF device having adjustable sensitivity may be used. It should be understood that the child PAPA unit **30** may also include a suitable signal amplification device in order to extend its transmission and reception distances beyond that provided by the RF device **27** contemplated in **FIG. 2**. The child PAPA device **30** however, preferably does not include the RF range adjustment mechanism **17**.

[**0028**] Unlike the parent PAPA units **10**, **11**, the child PAPA unit **30** does not include an acquire button or a power button for reasons that will be detailed below. Additionally, the child PAPA unit **30** does not include a separate controller. As a result, functionality and control of the child PAPA unit **30** is performed by its included RF device **27**. A speaker, configured and operable as described in connection with the speaker **14** of **FIG. 1** may however, be included in the child PAPA unit **30**, depending on the desired design.

[**0029**] Although not separately illustrated, each of the parent PAPA units **10**, **11** and the child PAPA unit **30** also includes a power supply, preferably a rechargeable battery, sized to be contained with the their respective housings. If a rechargeable battery is utilized, each of the parent PAPA unit **10** and the child PAPA unit **30** also includes a suitably configured charger port mounted in their respective housings and coupleable to a suitably configured charger cable.

[**0030**] The LED **19** of each of the parent PAPA units **10**, **11** and the child PAPA unit **30** may be configured to visually notify a holder of a charged battery condition. For example, if a bi-color LED **19** is selected for use in the parent and child PAPA units **10**, **11**, **30**, the LED **19** may emit a red color to indicate that a charge is needed, and may emit a green color to indicate a fully charged condition. Thus, much like a mobile phone or personal digital assistant (PDA) device, the parent and child PAPA units **10**, **11**, **30** may be conveniently charged for subsequent use.

[**0031**] In addition, although not illustrated in detail, it is contemplated that each of the parent PAPA units **10**, **11** and the child PAPA unit **30** may also include a means for attaching to a person or object, for example, a loop or pouch configured and sized for use with a belt, a wrist strap, a pendant strap, etc. In a preferred embodiment, the child PAPA unit **30** is attached to the body in such as way as to discourage easy removal, for example, attached via a sturdy, cut-resistant wrist strap **13** that may include a locking mechanism **15** for latching. The locking mechanism **15** may be one of any number of suitable locking mechanisms, for example a combination lock. The parent PAPA unit **10**, **11** may be latched via a simple buckle or VELCRO™.

[**0032**] The parent PAPA unit **10**, **11** and the child PAPA unit **30** are adapted to communicate for purposes of alerting a holder of the parent PAPA unit **10**, **11** (e.g., parent, caregiver, guardian, etc.) when the holder of the child PAPA unit **30** (e.g., child, elderly person, pet, etc.) has moved beyond a predetermined distance from the parent PAPA unit **10**. Thus, the RF devices of the parent and child PAPA units **10**, **11**, **30** may be configured using one of variety of suitable radio links, depending on the desired range and/or security level.

[**0033**] One particularly advantageous radio link is the Bluetooth radio link (see, www.bluetooth.org/spec/) which is a short-range, cable replacement, radio technology. The Bluetooth radio link utilizes the 2.4 GHz Instrumentation, Science, Medical (ISM) unlicensed band. Un-enhanced, Bluetooth enabled RF devices of the parent and child PAPA units **10**, **30** may be set to a nominal range of 10 meters. Enhanced with a power amplifier and an adjustment means however, the Bluetooth enabled RF devices of the parent and child PAPA units **11**, **30** may be adjusted to communicate with other "acquired" Bluetooth enabled RF devices at distances of up to 100 meters (see, **FIG. 3**). Although described herein as utilizing a Bluetooth radio link, it is contemplated that other short range or adjustable radio links (e.g., IEEE 802.11b, IEEE 802.11b, IEEE 802.11g, etc.) may be utilized in the RF devices **26**, **27** of the parent and child PAPA units.

[**0034**] **FIG. 4** is a functional block diagram of a number of components of the parent PAPA unit **10**. Referring to **FIG. 4**, the parent PAPA unit **10**, **11** includes the controller **20** coupled to the RF device **26**. The controller **20** includes one or more of a program memory **24** (including a read only memory (ROM)), a microcontroller-based platform or microprocessor (MP) **22**, a random-access memory (RAM)

40 and an input/output (I/O) circuit **42**, all of which may be interconnected via an address/data bus **44**. Among other things, the microprocessor **22** is capable of causing audible sounds to be generated upon occurrence of predetermined conditions (e.g., an alarm condition). The RAM **40** is capable of storing event data or other data used or generated during operation of the parent PAPA unit **10**, **11**. The program memory **24** is capable of storing program code that controls the operation of the parent PAPA unit **10**, **11**.

[**0035**] It should be appreciated that although one microprocessor **22**, one RAM **40** and one program memory **24** are shown, other controller configurations are possible. For example, the controller **20** may include multiple RAMs **40** and multiple program memories **24**. The RAM **40** and program memory **24** may be implemented as semiconductor memories, magnetically readable memories, and/or optically readable memories, etc. Further, although the I/O circuit **42** is shown as a single block, it should be appreciated that the I/O circuit **42** may include a number of different types of I/O circuits, for example, one or more of a pulse code modulation (PCM) circuit, a universal serial bus (USB) circuit, a universal asynchronous receiver/transmitter (UART) circuit, depending on the desired interface configuration. In addition, **FIG. 4** illustrates that multiple peripheral devices, depicted as the speaker **14**, the ACQ button **16**, the PWR button **18** and the LED **19**, may be operatively coupled to the I/O circuit **42**.

[**0036**] The RF device **26** includes a Bluetooth transceiver **50** coupled to a Bluetooth link manager/controller **52** and an antenna **28**. The Bluetooth transceiver **50** includes a transceiver for transmitting a communication to, and receiving a communication from other selected Bluetooth devices using well known methods. The Bluetooth link manager/controller **52** therefore includes a memory element (e.g., RAM, ROM), a controller element, a management element and an I/O (not separately illustrated), to provide baseband processing, management and control of the Bluetooth RF link. The antenna **28** facilitates communications over intervening air space to/from selected child PAPA units **30**. Although concealed within the housing interior for reasons of durability and aesthetics, it is contemplated that the antenna **28** may extend from an exterior portion of the housing **12**.

[**0037**] It should be appreciated that although the controller **20** is a preferable implementation, the parent PAPA unit **10**, **11** may also include implementation via one or more application specific integrated circuits (ASICs), field programmable gate arrays (FPGA), adaptable computing integrated circuits, or one or more hardwired devices. Is should also be appreciated that although the controller **20** is shown coupled to the Bluetooth link manager/controller **52**, it is contemplated that the functionality of the controller **20** may be subsumed by the link manager/controller **52**, rendering inclusion of the separate controller **20** unnecessary.

[**0038**] **FIG. 5** is a functional block diagram of a number of components of the child PAPA unit **30**. As mentioned above, unlike the parent PAPA unit **10**, **11**, the child PAPA unit **30** does not include an ACQ button or a PWR button. This ensures that the child being monitored can not power-off his/her device, cannot interrupt an established RF link to the parent PAPA unit **10**, **11** and cannot establish RF links with devices other than the parent PAPA device **10**, **11**. It does however, include the RF device **27** coupled to the LED **19**. As a result, aspects of child PAPA unit operation may be provided by the link manager/controller **52** of the RF device **27** rather than by a separate controller.

[**0039**] One manner in which the parent and child PAPA units **10**, **11**, **30** may operate is described below in connection with one or more flowchart(s) that represents a number of portions or routines of one or more computer programs, which may be stored in one or more of the memories of either the controller **20** or the link manager/controller **52**.

[**0040**] Utilizing Bluetooth technology, the parent PAPA unit **10**, **11** can be linked to up to seven child PAPA units **30** to form a "monitoring piconet" or a personal area network, where the proximity of child PAPA unit(s) holders can be monitored. Generally, to establish such a monitoring piconet, RF characteristics of the child PAPA unit(s) **30** are aligned to respective RF characteristics of the parent PAPA unit **10**, **11**. Although discussed below using the parent PAPA **10** it should be understood that the same principals apply to parent PAPA unit **11**.

[**0041**] Specifically, in order for the parent PAPA unit **10** to "acquire" child PAPA unit(s) **30** and form the monitoring piconet, using a series of paging messages the parent PAPA unit **10** aligns the frequency hopping sequence and timing of the child PAPA unit(s) **30** to its own frequency hopping sequence and timing.

[**0042**] For example, **FIG. 6** is a Bluetooth enabled monitoring piconet **50** established by the parent PAPA unit **10** (carried by a parent or guardian) and includes three child PAPA units **30** (each carried by a child) in accordance with an embodiment of the invention. As illustrated by **FIG. 6**, each of the three child PAPA units **30** is in communication with the parent PAPA unit **10**. However, the three child PAPA units **30** are not in communication with each other. Thus, in addition to the child PAPA unit design precluding formation of inadvertent RF links with other like RF devices in the vicinity, once established, characteristics of the RF links of monitoring piconet **50** preclude formation of inadvertent RF links between child PAPA units **30**.

[**0043**] Once acquired and on-channel with the parent PAPA unit **10**, each of the child PAPA units **30** must nominally be located within 10 meters of the parent PAPA unit **10** to remain in the monitoring piconet. As described below, an indication, preferably audible, will signal a holder of the parent PAPA unit **10** when a child PAPA unit(s) **30** has moved out of RF range of the parent PAPA unit **10**. It should be understood that although the RF device **26** of the parent PAPA unit **10** and the RF device **27** the child PAPA units **30** are functionally symmetric with each other in that each can become a master or slave radio, the parent PAPA unit **10** is adapted to be the master radio and the child PAPA units **30**, the slave radios.

[**0044**] Prior to establishing the monitoring piconet **50**, each of the parent and child PAPA units **10**, **30**, respectively, have a unique Global ID associated with a particular hopping pattern and clock offset that provides the offset into the hopping pattern. As mentioned above, the parent PAPA unit **10** coordinates establishment of the monitoring piconet **50** and ensures that all PAPA units of the monitoring piconet **50** are aligned with the parent PAPA unit's particular hopping pattern and clock offset.

[**0045**] After powering-on, the parent PAPA unit **10** must first acquire the child PAPA unit(s) **30**, pass its unique Global

ID to the child PAPA unit(s) **30** and vice versa, and then finally ensure that each child PAPA unit **30** is synced to the hopping pattern and offset within that pattern (i.e., the timing) of the parent PAPA unit **10**. Once acquired and on-channel transmissions between the parent and child PAPA units **10, 30** continue until signals transmitted by the child PAPA unit **30** are no longer detected by the parent PAPA unit **10** or until a signal transmitted by the child PAPA transmission falls below a predetermined threshold as measured by the parent PAPA unit **10**, or until one of the PAPA units falls out of sync, and/or vice versa.

[**0046**] **FIG. 7** is a flowchart of a proximity awareness routine **200** that may be performed by the parent PAPA unit **10** in accordance with an embodiment of the invention. The proximity awareness routine **200** provides one example of establishing a monitoring piconet such as the monitoring piconet **50**, and then notifying a holder of the parent PAPA unit **10** when a child PAPA unit **30** moves out of RF range of the parent PAPA unit **10**. Although discussed below in the context of a wearable watch-like unit for illustrative purposes, it is contemplated that the proximity awareness routine **200** may be executed in conjunction with one of any number of suitable mobile devices. In addition, although preferably performed by the controller **20**, it is contemplated that the proximity awareness routine **200** may be performed by the RF device **26** or by another controller coupled to the RF device **26**.

[**0047**] Referring to **FIG. 7**, prior to beginning the proximity awareness routine **200**, the controller **20** detects actuation of the PWR button **18**. The PWR button **18** is preferably adapted to be actuated via sliding up or down, or via depressing. If actuated via depressing, the PWR button **18** is preferably protected from inadvertent depressing by the addition of button guard (i.e., a raised housing edge around the perimeter of the PWR button **18**) and/or a concave button face having perimeter edges flush with the surface of the housing **12**. Conversely, the child PAPA unit **30** is always powered on when in a charged condition so that it cannot inadvertently be powered-off by its holder (e.g., a child) or purposely powered-off by an abductor or the like.

[**0048**] If the parent PAPA unit **10** is powered on and the child PAPA unit **30** is charged, the proximity awareness routine **200** begins upon detecting actuation of the ACQ button **16** (step **202**) of the parent PAPA unit **10** (see, **FIG. 3**). Detection of actuation of the ACQ button **16** causes the controller **20** to initiate establishment of the monitoring piconet.

[**0049**] **FIG. 8** is a high level ladder flow of a method **204** for establishing a monitoring piconet that includes Bluetooth RF links between the parent and child PAPA unit(s) **10, 30**. Referring to **FIG. 8**, upon detecting actuation of the ACQ button **16**, the controller **20** causes the RF device **26** to execute an Inquiry procedure to discover the Global ID(s) of one or more child PAPA units **30** intended for the monitoring piconet (step **206**). Preferably, the child PAPA unit(s) **30** is powered-up (as indicated by its LED **19**) and in a "Standby" state, listening, via an Inquiry scan every 1.25 seconds over a unique sequence of 32 channels, for an "Inquiry" (i.e., page function on a special global address that has been set aside for the Inquiry procedure) from the parent PAPA unit **10**. In response to receipt of the Inquiry from the PAPA unit **10**, the child PAPA **30** transmits its Global ID (step **208**) via a child frequency hopping selection (child FHS) packet that also includes, among other things, its clock offset.

[**0050**] In one embodiment, the parent PAPA unit **10** simply accepts the received Global ID of the child PAPA unit **30** per the standard Bluetooth protocol. In another embodiment, the parent PAPA unit **10** compares the received Global ID of the child PAPA unit **30** with a list (e.g., a lookup table) of acceptable Global IDs stored in memory. If the received Global ID does not appear in the list, then that particular child PAPA unit or other Bluetooth device is excluded from a subsequent Paging procedure used to establish the RF link. In yet another embodiment, the list of acceptable Global IDs is resident in the memory of the parent PAPA unit **10** and therefore, the Paging procedure may begin by broadcasting a Page command to the intended child PAPA unit(s) **30** at a predetermined clock offset.

[**0051**] Upon receipt of an acceptable child Global ID (via the child FHS packet) from the child PAPA unit **30** responding to the Inquiry, the parent PAPA unit **10** establishes the RF link to the child PAPA unit **30**. Specifically, the parent PAPA unit **10** begins to systematically broadcast a Page command across the 32 page scanning channels of the child PAPA unit **30** based on the child Global ID, the frequency hopping pattern and clock offset received via the child FHS packet (step **210**). The timing of the broadcast scan is aligned to the frequency where the parent PAPA unit **10** believes the child PAPA unit **30** would most likely be. When the child PAPA unit **30** receives the Page command addressed to its Global ID, a coarse frequency hopping synchronization between the parent and child PAPA units **10, 30** is established. The child PAPA unit **30** then acknowledges receipt of the Page command to the parent PAPA unit **10** by transmitting a Page response that again includes its child Global ID (step **212**).

[**0052**] Upon receipt of the Page response from the child PAPA unit **30**, the parent PAPA unit **10** transmits a time aligned FHS packet to the child PAPA unit **30** and "freezes" its own frequency hopping generator (step **214**). Next, upon receipt of the time aligned FHS packet from the parent PAPA unit **10**, the child PAPA unit **30** transmits a final Page response that once again includes its child Global ID. The child PAPA unit **30** also adopts the frequency hopping pattern of the parent PAPA unit **10** (step **216**). At this point, the parent PAPA unit **10** switches to its own frequency hopping pattern and clock offset, enters a "Connection" state and assigns the child PAPA unit **30** a 3-bit Active Member Address (AMA) for the monitoring piconet (step **218**). Finally, the parent PAPA unit **10** transmits a Polling packet to the child PAPA unit **30**, the child PAPA unit **30** acknowledges receipt of the Polling packet, and then each PAPA unit transmits and responds to a series of control messages to further synchronize and characterize the RF link. Nominally, establishment of the RF link is completed in 1.28-2.56 seconds.

[**0053**] Referring again to **FIG. 7**, upon successful establishment of the RF link between the parent PAPA unit **10** and the child PAPA unit **30**, the controller **20** causes an indication to the parent or other holder of the parent PAPA unit **10** (step **220**). The indication signals to the holder of the parent PAPA unit **10** that the RF link has been established.

[**0054**] The indication is preferably an audible indication such as a brief chirp delivered via the speaker **14**. The indication may also be visual, for example, blinking of the

LED **19**. In another embodiment, a visual indication may be also displayed on the child PAPA unit **30** to signal the successful establishment of the RF link. The visual indication displayed on the child PAPA unit **30** may be caused by the controller **20** or by the link manager controller **52** of the parent or child PAPA unit **10**, **30**, depending on the design of the PAPA system.

[**0055**] After establishment of the monitoring piconet as described above, the parent PAPA unit **10** begins monitoring the proximity of the child PAPA units **30** to determine whether the child PAPA unit(s) **30** is/are in RF range. Specifically, the parent PAPA unit **10** begins transmitting periodic ID Requests to each child PAPA unit **30** in the monitoring piconet. The ID requests prompt each child PAPA unit(s) **30** to respond with an identity packet that includes its child Global ID (step **222**). The identity packet is preferably a standard Bluetooth packet (i.e., Bluetooth packet that includes access code, header and payload) but may be configured in one of any number of acceptable Bluetooth packet formats depending on the design of the PAPA system.

[**0056**] Transmission of the ID Requests by the parent PAPA unit **10** preferably occur every 2 seconds. It is contemplated however, that the rate at which the ID Requests are transmitted may be one of any number of suitable of rates for example, every second, every 3 seconds, every 3.5 seconds, etc.

[**0057**] If the child PAPA unit **30** is actively connected in the monitoring piconet, indicating that it is within an acceptable distance from the parent PAPA unit **10**, it responds to the ID Request by transmitting its Global ID to the parent PAPA unit **10**. Then, after a predetermined time period has elapsed (e.g., 3.5 seconds), the parent PAPA unit **10** transmits another ID Request to the child PAPA unit **30** requesting that the child PAPA unit **30** respond with its Global ID (step **222**). This process continues until (1) the parent PAPA unit **10** is powered off or (2) the child PAPA unit **30** does not timely respond to an ID Request from the parent PAPA unit **10**.

[**0058**] If the child PAPA unit **30** is not actively connected in the monitoring piconet, indicating that it has moved an unacceptable distance from the parent PAPA unit **10**, it cannot respond to the ID Request. Similarly, even if the child PAPA unit **30** has received the ID Request but subsequently becomes disconnected from the monitoring piconet, indicating that it has moved an unacceptable distance from the parent PAPA unit **10**, the parent PAPA unit **10** will not receive a timely response from the child unit **30**. If the parent PAPA unit **10** does not receive a timely response due to any circumstance an alarm indication is generated notifying the holder of the parent PAPA unit **10** that the child PAPA unit **30** has moved too far away from the parent PAPA unit **10**. In this way, a child's proximity to the parent can be easily monitored and the parent alerted when the child has moved an unacceptable distance from the parent.

[**0059**] As mentioned above, the parent and child PAPA units **10**, **11**, **30** are preferably configured as described in connection with **FIGS. 1-5**. It is contemplated however, that other mobile devices having short range RF capability, for example a Bluetooth enabled cell phone or a PDA, may be configured with parent PAPA unit functionality, child PAPA unit functionality, or both.

[**0060**] As also mentioned above, the parent and child PAPA units **10**, **30** operate as described in connection with **FIGS. 7 and 8** representing a number of portions or routines of one or more computer programs, which may be stored in one or more of the memories of either the controller **20** or the link manager/controller **52**. Although such portions or routines of one or more computer programs PAPA (software) described in connection with **FIGS. 7 and 8** are preferably included in the parent and/or child PAPA units **10**, **30**, it is contemplated that that they may be downloaded from a suitably configured server via a suitably configured browser displayed via a personal computer.

[**0061**] For example, PAPA software in the parent and child PAPA units **10**, **30** may be upgraded via a PAPA unit docking device operatively coupled to a personal computer. The PAPA unit docking device may be coupled to the personal computer in one of many ways including via a cable link (e.g., a USB), an infrared link, a Bluetooth link, a WiFi link, a WiMax link, a Mobile-Fi link, an Ultrawideband link, to name a few. The holder of the parent and/or child PAPA units **10**, **30** can then place the parent and/or child PAPA units **10**, **30** in the PAPA unit docking device, access the appropriate PAPA software via their browser and download the PAPA software to the parent and/or child PAPA units **10**, **30** from a coupled server via the Internet.

[**0062**] In a further embodiment, a mobile device such as a mobile phone or PDA can be similarly coupled to a personal computer and configured with PAPA software downloaded from a coupled server via the Internet. In the case of a mobile phone, the PAPA software may be downloaded to the mobile phone via a local cell site and base station using well-known transmission methods (e.g., CDMA, GSM). A fee may or may not be charged for the PAPA software, depending on the business model used. In this way, additional functionality to enable proximity monitoring as a parent and/or child PAPA unit can be easily added to a mobile device.

[**0063**] As may be apparent from the discussion above, the PAPA system for monitoring the proximity of a monitored child is simple to use, inexpensive, mobile, adaptable and secure. The PAPA system does not require complicated circuitry to determine exact distances or direction, or to engage location finding services such as services relying on the use of the GP system. Further, the design of the child PAPA unit prevents its easy removal from the monitored person or object, prevents a powered-off condition from occurring during use, prevents interruption of an established RF link to the parent PAPA unit **10** during use, and prevents RF link establishment with devices other than the parent PAPA device **10** during use. Moreover, establishing the monitoring piconet by the PAPA system is as easy as actuating a first button on the parent PAPA unit **10**. Similarly, dissolving the monitoring piconet by the PAPA system is as easy as actuating a second button on the parent PAPA unit **10**.

[**0064**] While embodiments have been illustrated and described in the drawings and foregoing description, such illustrations and descriptions are considered to be exemplary and not restrictive in character, it being understood that only illustrative embodiments have been shown and described and that all changes and modifications that come within the spirit of the invention are desired to be protected. The

applicants have provided description and figures which are intended as illustrations of embodiments of the disclosure, and are not intended to be construed as containing or implying limitation of the disclosure to those embodiments. There are a plurality of advantages of the present disclosure arising from various features set forth in the description. It will be noted that alternative embodiments of the disclosure may not include all of the features described yet still benefit from at least some of the advantages of such features. Those of ordinary skill in the art may readily devise their own implementations of the disclosure and associated methods, without undue experimentation, that incorporate one or more of the features of the disclosure and fall within the spirit and scope of the present disclosure and the appended claims.

1. A proximity aware personal alert system comprising:

a first mobile transceiver unit; and

a second mobile transceiver unit in communication with the first mobile transceiver unit via an RF link, the second mobile transceiver providing an alarm indication when the first mobile transceiver has moved a predetermined distance from the second mobile transceiver unit.

2. The proximity aware personal alert system of claim 1, wherein the RF link comprises a Bluetooth link, and wherein the first and second mobile transceiver units form a monitoring piconet.

3. The proximity aware personal alert system of claim 2, wherein the predetermined distance is in the range of ten meters.

4. The proximity aware personal alert system of claim 1, wherein the first mobile transceiver unit includes:

a first antenna;

a first transceiver operatively coupled to the first antenna; and

a first link manager controller operatively coupled to the first transceiver,

wherein the first antenna, the first transceiver and the first link manager are enclosed in a first housing of the first mobile transceiver unit.

5. The proximity aware personal alert system of claim 4, wherein the first mobile transceiver unit further includes a first illumination source coupled to the first link manager controller and mounted to an exterior portion of the first housing.

6. The proximity aware personal alert system of claim 5, wherein the first mobile transceiver unit further includes a first means for attaching the first mobile transceiver unit to a first body.

7. The proximity aware personal alert system of claim 6, wherein the first means for attaching further includes a means for locking the first attaching means, the means for locking discouraging easy removal of the first mobile transceiver unit from the first body.

8. The proximity aware personal alert system of claim 1, wherein the second mobile transceiver unit includes:

a second antenna;

a second transceiver operatively coupled to the second antenna; and

a second link manager controller operatively coupled to the second transceiver,

wherein the second antenna, the second transceiver and the second link manager controller are enclosed in a second housing of the second mobile transceiver unit.

9. The proximity aware personal alert system of claim 8, wherein the second transceiver unit further includes:

a second illumination source operatively coupled to the second link manager controller;

a speaker operatively coupled to the second link manager controller;

a first button operatively coupled to the second link manager controller; and

a second button operatively coupled to the second link manager controller,

wherein the second illumination source, the speaker, the first button and the second button are mounted to an exterior portion of the second housing.

10. The proximity aware personal alert system of claim 9, wherein the second mobile transceiver unit further includes a second means for attaching the second mobile transceiver unit to a second body.

11. The proximity aware personal alert system of claim 9, wherein the alarm indication comprises a audible indication transmitted via the speaker.

12. The proximity aware personal alert system of claim 9, wherein the alarm indication comprises a visual indication provided by the second illumination source.

13. The proximity aware personal alert system of claim 8, wherein the second transceiver unit further includes:

a second illumination source operatively coupled to the second link manager controller;

a speaker operatively coupled to the second link manager controller;

a signal amplification device coupled to the second link manager controller;

a user accessible radio frequency range adjustment mechanism coupled to the signal amplification device; and

at least one button operatively coupled to the second link manager controller.

14. The proximity aware personal alert system of claim 13, wherein the signal amplification device comprises a power amplifier.

15. The proximity aware personal alert system of claim 13, wherein the predetermined distance can be selected by a user of the second mobile transceiver unit by adjusting the user accessible radio frequency range adjustment mechanism.

16. The proximity aware personal alert system of claim 13, wherein the second transceiver unit further includes:

a power button operatively coupled to the second link manager controller; and

an acquire button operatively coupled to the second link manager controller,

wherein the second illumination source, the speaker, the power button, the acquire button and the user accessible radio frequency range adjustment mechanism are mounted to an exterior portion of the second housing.

17. The proximity aware personal alert system of claim 16, wherein the second mobile transceiver unit further includes a second means for attaching the second mobile transceiver unit to a second body.

18. The proximity aware personal alert system of claim 13, wherein the alarm indication comprises a audible indication transmitted via the speaker.

19. The proximity aware personal alert system of claim 13, wherein the alarm indication comprises a visual indication provided by the second illumination source.

20. The proximity aware personal alert system of claim 8, wherein the second transceiver unit further includes:

a controller electrically coupled to the second link manager controller, the controller including a processor and a memory coupled to the processor;

a second light source coupled to the controller;

a speaker coupled to the controller;

a first button coupled to the controller; and

a second button coupled to the controller,

wherein the second light source, the speaker, the first button and the second button are mounted to an exterior portion of the second housing.

21. The proximity aware personal alert system of claim 20, wherein the second mobile transceiver unit further includes a second means for attaching the second mobile transceiver unit to a second body.

22. The proximity aware personal alert system of claim 20, wherein the alarm indication comprises a audible indication transmitted via the speaker.

23. The proximity aware personal alert system of claim 20, wherein the alarm indication comprises a visual indication provided by the second light emitting diode.

24. A method for detecting when a first mobile transceiver unit has moved a predetermined distance from a second mobile transceiver unit, the second mobile transceiver unit including a controller having a processor and a memory coupled to the processor, the method comprising:

establishing a communication between the second mobile transceiver unit and at least one first mobile transceiver unit;

providing a first indication indicating successful communication establishment between the second mobile transceiver unit and the at least one first mobile transceiver unit;

transmitting a periodic request for a first identification to the at least one first mobile transceiver unit, the first identification providing an identity of the at least one first mobile transceiver unit; and

providing a second indication if a response to the periodic request for the first identification is not detected by the second mobile transceiver unit within a pre-selected time, the second indication indicating that the at least one first mobile transceiver unit has moved the predetermined distance from the second mobile transceiver unit.

25. The method of claim 24, further comprising:

detecting actuation of a first button of the second mobile transceiver unit, actuation of the first button enabling power to the second mobile transceiver unit; and

detecting actuation of a second button of the second mobile transceiver unit after detecting actuation of the first button, actuation of the second button enabling establishment of the communication.

26. The method of claim 25, wherein establishing the communication comprises establishing a monitoring piconet, the monitoring piconet including Bluetooth enabled RF links between the second mobile transceiver unit and the at least one first mobile transceiver unit.

27. The method of claim 26, wherein establishing the monitoring piconet comprises:

causing an inquiry command to be transmitted in response to detecting actuation of the second button;

detecting receipt of a first data packet, the first data packet including the first identification and a first radio frequency operational parameter of the at least one first mobile transceiver unit;

causing a page command to be transmitted in response to detecting receipt of the first data packet, the page command including the first identification of the at least one first mobile transceiver unit;

detecting receipt of a second data packet transmitted in response to receipt of the page command, the second data packet including the first identification of the at least one first mobile transceiver unit;

causing a third data packet to be transmitted in response to detecting receipt of the second data packet, the third data packet including a second identification and a second radio frequency operational parameter of the second mobile transceiver unit;

detecting receipt of a fourth data packet transmitted in response to receipt of the third data packet, the fourth data packet including the first identification of the at least one first mobile transceiver unit and indicating that the first radio frequency operational parameter has been replaced by the second radio frequency operational parameter; and

causing a monitoring piconet address of the monitoring piconet to be assigned to the first mobile transceiver unit.

28. The method of claim 24, wherein the first and second indications are selected from the group consisting of an audible indication provided by a speaker of the second mobile transceiver and a visual indication provided by a light emitting diode of the second mobile transceiver.

29. The method of claim 24, wherein the first indication comprises an audible chirp, and wherein the second indication comprises an audible alarm.

30. The method of claim 24, further comprising lockingly attaching the first mobile transceiver device to a monitored person and attaching the second mobile transceiver device to a monitoring person.

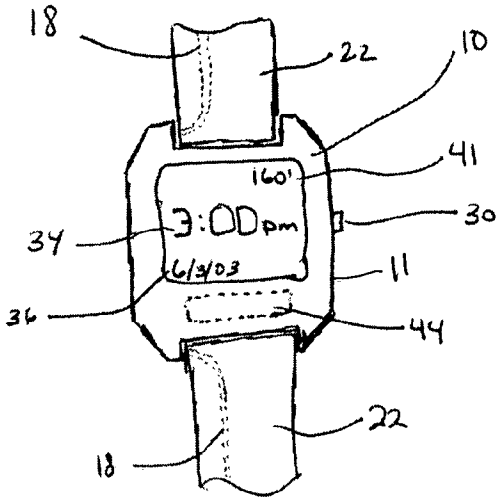
31. The method of claim 24, wherein the predetermined distance is in the range of ten meters.

32. The method of claim 24, wherein the pre-selected time comprises two seconds.

33. The method of claim 24, wherein the pre-selected time is in the range of one second to five seconds.

* * * * *

IE4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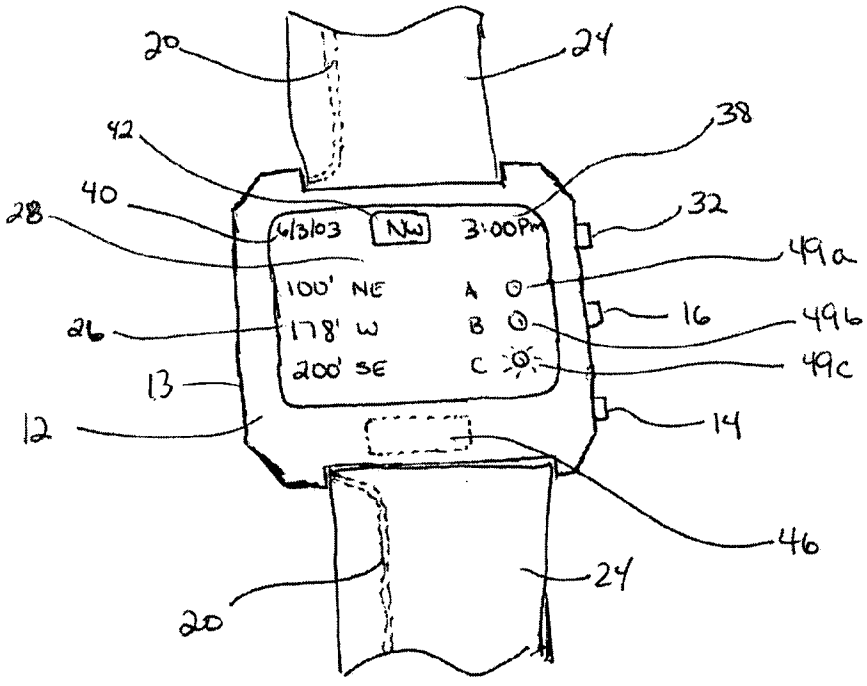
41
160'
3:00pm
6/3/03
34
30
11
36
44
22
18

Fig. 1A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38
40
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32
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B
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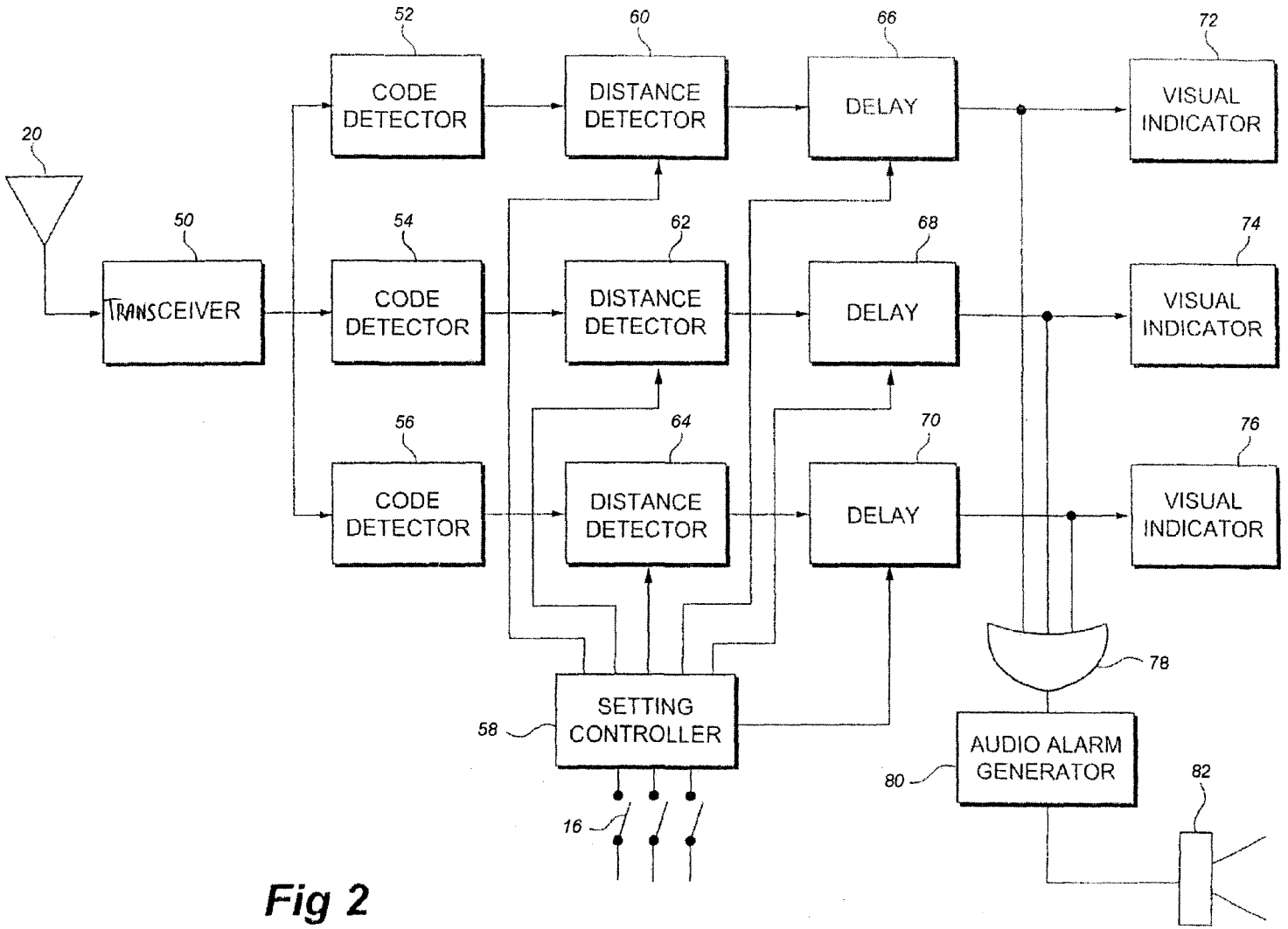
26
200' SE
C
49c
13
12
14
46
20
24

Fig. 1B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52
CODE DETECTOR
54
CODE DETECTOR
56
CODE DETECTOR
60
DISTANCE DETECTOR
62
DISTANCE DETECTOR
64
DISTANCE DETECTOR
66
DELAY
68
DELAY
70
DELAY
72
VISUAL INDICATOR
74
VISUAL INDICATOR
76
VISUAL INDICATOR
78
58
SETTING CONTROLLER
16
80
AUDIO ALARM GENERATOR
82

Fig 2

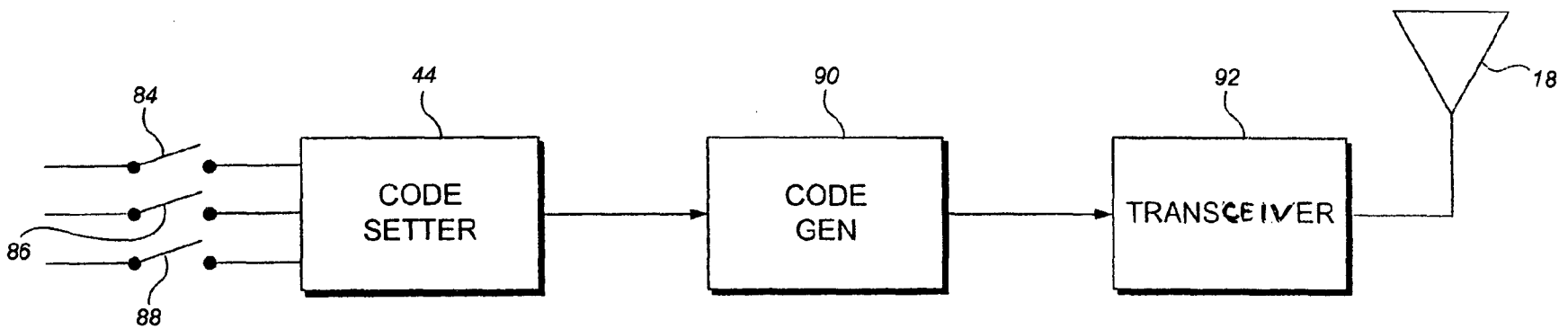

Fig 3

DUAL WATCH SENSORS TO MONITOR CHILDREN

[0001] This Application claims priority from Provisional Patent Application No.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to electronic child locators, allowing the parent or caregiver the ability to receive an audible or vibration alarm from a portable device when one or more children wearing a another portable device have wandered outside a predetermined, adjustable range from the parent or caregiver device.

[0004] 2. Background Information

[0005] To reduce the number of child abductions due to preoccupied or distracted parent or caregivers, electronic locators commonly use a system having a device worn by a child that transmits a radio signal to a transceiver worn by the caregiver, which determines that the transceiver on the child is out of range by sensing the signal strength of the received signal. One of the problems frequently encountered is that the electronic locators need to be used in environments that vary in size, space or the amount of walls and corners. Consequently, a wearer of the locator does not know how such various environments will effect the detection range. The parent will find locating the child harder in a smaller, crowded, environment over a larger, less crowded, environment if the range of the locator is fixed. Another frequent problem is that the number children that need to be monitored by a single caregiver transceiver may vary or be more than one. A further frequent problem encountered is the larger number and variety of radio transmitters such as cell phones, pagers, etc.

[0006] There is a need for an electronic child locator system in which the caregiver unit allows the caregiver to program the number of child units that are simultaneously monitored using an unique address or code transmitted from the child unit which would avoid interference or jamming from other sets of children-parent units, to easily and quickly program the maximum allowable distance between the caregiver and child before the alarm is sounded, and to reliably indicate the direction of the child unit relative to the parent unit would be desirable.

[0007] A variety of electronic location devices have been proposed to solve some of the above problems. Many such devices include a transmitter that is worn on a child and receiver or direction finder that notify caregivers or security persons when the transmitter is outside of a fixed range. Exemplary electronic location devices of this type are shown in: U.S. Pat. No. 5,289,163 issued to Perex et al; U.S. Pat. No. 5,689,240 issued to Traxler; U.S. Pat. No. 5,923,255 issued to Vahdatshoar; and U.S. Pat. No. 6,078,260 issued to Desch. Other devices use long range transmitter and/or receiver combinations, such as cellular phones or GPS, to locate a missing person. Exemplary devices of this type are disclosed in: U.S. Pat. No. 5,021,794 to Lawrence; U.S. Pat. No. 5,742,233 issued to Hoffman et al.; U.S. Pat. No. 5,905,461 issued to Neher; and U.S. Pat. No. 5,936,530 issued to Meinhold.

[0008] In addition, U.S. Pat. No. 5,677,673 to Kipnis et al discloses a locator of a plurality of objects each having a receiver unit and having a transmitter unit.

[0009] It would be desirable to have an electronic location system which is adjustable in setting the distance at which an alarm on a caregiver's device sounds when the child's transmitter is outside of that adjustable distance and which provides an indication of the child's direction relative to the parent when the child's transmitter has exceeded that set distance.

[0010] In one example, U.S. Pat. No. 5,617,074 to White discloses a child finder worn on the child which sends a signal to a caretaker's unit. The caretakers receiver as disclosed in **FIG. 7** shows a distance programmer.

[0011] In still another example, U.S. Pat. No. 5,119,072 to Hemingway describes a pair of transceiver units wherein a desired distance or range is preset and an alarm is sounded when the distance between the transceiver units is exceeded. The alarm circuit is operated by measuring the field strength of the carrier component of the signal generated by the child transceiver unit. When the strength of the carrier component falls below a threshold value, an alarm on the guardian transceiver unit is sounded.

[0012] In a further example, U.S. Pat. No. 4,899,135 to Ghahariiran discloses a device having two transceivers which will sound an alarm when a preset distance between them is exceeded.

[0013] In another example, the article entitled; "Next Up For Wireless Communication: The Computer Chip Itself", 1995-2002, Science Daily Magazine; discloses that silicon chips or computer chips will be built using wireless communication with antennas installed onto chips.

[0014] In another example, U.S. Pat. No. 5,812,056 to Law discloses a child locator and caregiver monitor. A transmitter worn by the child transmits to a caregiver receiver. The caregiver receiver detects when the child transmitter is outside a preset range and is configurable to set a maximum allowable distance between the child and caregiver units before an alarm is sounded. The child and caregiver units are capable of remotely establishing an operating address and time marker. If the caregiver unit detects other similarly configured units operating in the vicinity of a child/caregiver pair or if the caregiver unit does not receive a communication from its corresponding child unit for a predetermined number of occurrences of its time marker, the caregiver unit is able to establish a new operating address and/or time marker with its corresponding child unit to avoid possible interference or jamming with other similar units operating in the vicinity.

[0015] It would be desirable to have a portable electronic location system in which the location of a child wearing a child unit relative to the parent unit can be reliably and inexpensively determined.

[0016] In one example, U.S. Pat. No. 6,441,778 to Durst discloses a pet locator wherein a locating device is attached to an animal. The locating device contains a GPS receiver which receives the current location of the animal. That location is transmitted via radio frequency to a fixed base station. Also to Durst, U.S. Pat. No. 6,518,919 discloses a mobile object locator wherein a locating device is attached to an object whose location is to be determined. The locating device contains a GPS receiver which receives the current location of the object and transmits that location to a fixed base station via radio frequency, two-way paging, or satellite communication.

[0017] A shortcoming in the above referenced inventions is that they either lack the ability to disclose to the monitoring or parent unit the location of the monitored or child unit, or provide a method of disclosing that location information that is prohibitively expensive.

[0018] None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

SUMMARY OF THE INVENTION

[0019] The present invention is an electronic child locator system which uses a portable parent unit having a transmitter and a receiver and a plurality portable child units each having a transceiver. Each child unit is preferably in the form of or contained in a watch encouraging each child to wear it at all times. The portable parent unit is also preferably in the form of or contained in a watch. The portable parent unit allows the parent to easily and quickly program the maximum allowable distance between the parent and child before the alarm is sounded or a vibrator is activated. The portable parent unit allows the parent to easily and quickly program the number of child units that are simultaneously monitored using an unique address or code transmitted from the child unit. Each system of portable parent unit and plural child units are distinguished from other similar systems by setting and programming address codes in both the child unit and the parent unit.

[0020] Accordingly, it is a principle object of the invention is to provide an electronic child locator system having plural child units and a single parent unit which avoids interference or jamming from other similar sets of plural children—single parent units, and any other similar single child single parent units, other transmitter or transceiver devices such as pagers, cell phones, GPS devices, etc., that maybe found in the same environment or range.

[0021] It is another object of the invention to provide electronic child locator used in multiple environments that vary in size, space or the amount of walls and corners by providing a parent unit that is easily and quickly programmed by extra switches on a watch that also contains the parent transceiver, detection and programming units.

[0022] It is a further object of the invention to provide an electronic child locator system where the number of children and child units to be monitored by a single parent unit transceiver is programmed easily and quickly by extra switches on a watch that also contains the parent transceiver, detection and programming units.

[0023] It is a further object of the invention to provide an electronic child locator system where the number children and child units to be monitored by a single parent unit transceiver is plural; the parent can use visual indicator on the parent watch unit to determine which particular one or more child is missing, when the particular one or more child units goes out of the programmable range sounding the single audio alarm or vibrator.

[0024] It is still a further object of the invention to provide an electronic child locator system where the general direction of the child transceiver units relative to the parent transceiver unit is automatically ascertainable.

[0025] It is a further object of the invention to provide an electronic child locator system where the parent unit and child units all contain a panic button which when activated will sound an audible alarm or vibration on the parent unit if depressed by one of the child units and on any one or all of the child units if depressed by the parent unit.

[0026] It is an object of the invention to provide a programmable detection delay in the parent watch unit for each of the child units to be monitored.

[0027] It is another object of the invention to provide an electronic child locator system having plural child units and a single parent unit which use computer chip communication.

[0028] It is another object of the invention to provide an electronic child locator system having plural child units and a single parent unit which have the dual function of telling time thereby encouraging children to wear the child unit.

[0029] It is another object of the invention to provide an electronic child locator system having a single parent unit which alerts the parent of the missing child via alarm sound or vibration.

[0030] It is an object of the invention to provide an electronic child locator system in which the child units and parent unit are constructed of waterproof material.

[0031] It is another object of the invention to provide an electronic child locator system in which the child units are constructed with a cut-proofband and coded lock so that the child unit will not be removable except by a parent or caregiver.

[0032] It is a further object of the invention to provide an electronic child locator system having child units which are tamper resistant and signal the parent unit if an attempt is made to modify the settings of any child unit.

[0033] It is an object of the invention to provide improved elements and arrangements thereof in an apparatus for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

[0034] These and other objects of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] **FIG. 1A** is an environmental view of a child watch containing a transceiver to monitor children according to the present invention.

[0036] **FIG. 1B** is an environmental view of a parent watch containing a transceiver to monitor children according to the present invention.

[0037] **FIG. 2** is an electronic block diagram of the parent transceiver unit.

[0038] **FIG. 3** is an electronic block diagram of the child transceiver unit.

[0039] Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0040] The present invention is an electronic child locator system shown in **FIGS. 1A and 1B**. In **FIG. 1A, a** set of

child transceiver units (**10**) are radio linked to a single parent transceiver unit as shown in **FIG. 1B**. Alternatively, the units are linked by way of Bluetooth, WiFi, two-way directional radio, or signal interference/cutoff. In operation, if anyone of the child transceiver units, **FIG. 1**A, is detected to be outside a preprogrammed range, an alarm will sound or vibrate on the parent transceiver unit, **FIG. 1B**. The parent unit (**12**) has a switch (**14**) to program the range at which the alarm will sound or unit will vibrate, when any child unit (**10**) in **FIG. 1A** is beyond that range or distance. Additionally, the parent unit (**12**) in **FIG. 1**B, uses switch (**16**) to program the number of child units (**10**) in **FIG. 1**A, to be monitored in the programmed range.

[**0041**] The parent unit (**12**) and the child units (**10**) maybe tamper resistant watch cases (**11** and **13**) which include the time telling feature as shown in **FIGS. 1A and 1B**. The protective casing for the units are more durable than an average watch case.

[**0042**] Antennas, (**18**) in **FIG. 1**A and (**20**) in **FIG. 1**B, are mounted within the cut proof or tamper resistant watch bands (**22**) in **FIG. 1**A and (**24**) in **FIG. 1B**. The ends of the child bands (**22**) may be provided with a locking mechanism (not shown) to further ensure that the bands cannot be easily removed. Antennas, (**18**) in **FIG. 1**A and (**24**) in **FIG. 1B** could be embedded inside the watch enclosure or embedded on the computer or communication chips inside the watch enclosure. The visual indicators (**26**) in **FIG. 1B** on the watch face (**28**) of the parent watch (**12**) allow the parent to determine the distance and direction for each monitored child unit (**10**).

[**0043**] The parent unit (**12**) and the child units (**10**) each include panic buttons, (**30**) in **FIG. 1**A and (**32**) in **FIG. 1**B, which will trigger an alarm on each child unit (**10**) if the panic button of a parent unit (**32**) is on or will trigger the parent unit (**12**) if the panic button of a child unit (**30**) is pressed.

[**0044**] Each child unit (**10**) and the parent unit (**12**) will have the capability to show the current date and time, (**34**) and (**36**) in **FIG. 1**A and (**38**) and (**40**) in **FIG. 1B**. Each child unit will also display the distance from the child to the parent (**41**).

[**0045**] In addition to displaying the directions of each child unit (**10**), the parent unit (**12**) will also display the current direction (**42**) the parent unit (**12**) is facing.

[**0046**] Each child unit (**10**) and the parent unit (**12**) have a code setter chip (**44**) in **FIG. 1**A and (**46**) in **FIG. 11**B, which are used to relate the parent unit (**12**) and the child units (**10**) to each other.

[**0047**] The electronic transceiver unit mounted inside the parent's watch (**12**) of **FIG. 1B** has circuitry as shown, in **FIG. 2**. In **FIG. 2**, the electronic transceiver is coupled to an antenna (**20**) which provides a received signal to a receiver (**50**) having a modulation type and frequency tuned to the same frequency and modulation type as the transceivers of the child units as is well known in the communication art. The transceiver (**50**) and antenna (**20**) are designed to have a reception range dictated by a maximum programmable detection range, modulation type and frequency and power output of the matching child transceiver units as is well known in the communication art. In the embodiment of the instant invention, the maximum programmable range could be 20, 50, 100, or a variable amount as dictated by a visual monitoring of children by parents within the environment. The direction of the signals transmitted by each child unit relative to the parent unit will be determined as is well known in the communication art.

[**0048**] The transceiver (**50**) then provides a demodulated signal to three code detectors (**52**), (**54**), and (**56**) which are connected in parallel to the transceiver (**50**). The number of code detectors depends on the designed maximum programmable number of children to be monitored or what is practical as to the number of children any one parent can monitor at the same time. Each of the code detectors (**52**), (**54**), and (**56**) correspond to a corresponding one of the programmable number of child watch units to be monitored. The codes to be detected can be any type electronic signal such as a pulse, audio tone, or digital logic signal etc, as is well known in the electronics art.

[**0049**] The first kind of code or address to be detected by all the code detectors (**52**), (**54**) and (**56**) are those indicating a single adult code designed or programmed to be the same type originally generated by each child transceiver in the same set transmitting to the single adult transceiver. The second kind of code or address to be detected individually by code detectors (**52**), (**54**), and (**56**) are those indicating which one of the corresponding child watch transceivers within the same set generated that particular code. Each code detector (**52**), (**54**), and (**56**) outputs a signal generated by a corresponding one of the child transceivers, if it detects both the first kind of code and the second kind of code. These codes may be programmably set by switches that are internal or hidden in the watch since they would be used rarely, (**44**) in **FIG. 1**A and (**46**) in **FIG. 1B**.

[**0050**] Each one of the distance and direction detectors (**60**), (**62**), (**64**) inputs the signal from the corresponding one of the code detectors (**52**), (**54**), and (**56**) and a corresponding signal from the setting controller (**58**). The corresponding signal from the setting controller (**58**) enables or disables a corresponding one of the distance and direction detectors (**60**), (**62**) and (**64**) based on the parent programming how many or which child unit to monitor through programming switch (**16**). The corresponding signal from the setting controller (**58**) also sets the signal strength to be detected for each one of the corresponding distance and direction detectors (**60**), (**62**) and (**64**) based on the parent programming the range at which to monitor the child through programming switch (**14**). Each one of the distance and direction detectors (**60**), (**62**) and (**64**) determine if the signal strength from the corresponding one of code detectors (**52**), (**54**), and (**56**) are within the particular range programmed for the corresponding child watch. The number of distance and direction detectors would depend on the designed maximum programmable number of children to be monitored or what is practical as to the number of children any one parent can monitor at the same time.

[**0051**] The programmed signal strength of the child watch signal determines the distance of the child watch from the parent watch. Each of the distance and direction detectors (**60**), (**62**), and (**64**) outputs a digital logic signal the active logic level of which indicates a corresponding child's watch is out of range.

[**0052**] Optionally, the digital logic signal output from each of the distance and direction detectors (**60**), (**62**), and

(64) is input to a corresponding one of the delay circuits (66), (68), and (70) and a corresponding programming signal is input from setting controller (58). The corresponding signal from the setting controller (58) sets an amount of delay for a corresponding one of the delay circuits (66), (68) and (70) based on the parent programming the amount of delay through programming switch (14). Each of the delay circuits (66), (68) and (70) provides a programmed amount of delay to the corresponding digital logic signal.

[0053] The digital logic signal output from the each of the delay circuits (66), (68), and (70) are input to plural input of a logic OR gate (78) which will output a single active logic level if any one or any two or all three of the logic signals from the delay circuits are at an active logic level. Thus, if any one, any two or all three of the child watch units are out of range, the output of logic OR gate (78) will have an active logic signal output. All three logic signals from the delay circuits (66), (68), and (70) will be at an inactive logic level while all of the child units are within a corresponding programmed range.

[0054] The active logic signal output of the logic gate (78) is input to the audio alarm generator (60) which will cause the audio alarm generator (80) to produce an audio electronic signal for speaker (82) or vibrating motor. Thus, the alarm sound will be heard or a vibration felt by the parent wearing the parent unit when any one or two or all three of the child units is out of range. An inactive logic signal output of the logic gate (78) will not activate audio alarm generator (80) when none of the child units is out range.

[0055] Each of the delay circuits (66), (68), and (70) outputs are connected to corresponding inputs of the visual indicators (72), (74), and (76). Individual indicators (72), (74), and (76) will light up or activate only when the logic level outputs from the delay circuits (66), (68) and (70) are at an active logic level when a corresponding child watch unit is out of range. Therefore, the visual indicators (49*a*), (49*b*), and (49*c*) in **FIG. 1B**[indicators (72), (74), and (76) of **FIG. 3**] on the watch face (28) of the parent watch (12) allow the parent to distinguish which child has gone out of range of the parent when the audio alarm has sounded. Visual indicator (49*c*) is shown in an activated state.

[0056] The parent transceiver unit circuitry of **FIG. 2** and antenna (20) may be included in or made a part of a computer communication chip inside the parent watch unit, if the reception range is acceptable. The parent transceiver unit may include the time telling function in analog or digital format.

[0057] As seen in **FIG. 1**A, each of the child electronic transceiver units are mounted within a child watch (10). Each child watch transceiver contains switches (84), (86), and (88) as shown in **FIG. 3**, that are hidden or mounted away inside the watch transceiver unit (10) in **FIG. 1**A, since they are accessed less often and must be kept away from the children's ability to manipulate.

[0058] The switches (84), (86), and (88) in **FIG. 3** program the codes or addresses that each of the child transceiver units of **FIG. 3** will transmit. The switches (84), (86), and (88) are connected and input to the code setter (44). Code setter (44) allows two kinds of codes to be programmed by the switches and stored. One code setting provides a unique code of the particular child watch with respect to other child watches in the same set of child parent watch units. Another code setting provides a unique code that represents the particular set of child parent units. In other words, a code setting that will associate the child watch within a set with only one parent unit watch transceiver.

[0059] The code setter (44) in each of the child watch units constantly provides the kind codes to be generated to the code generator (90). Code generator (90) in each of the child watch units generates the unique code signals to be transmitted by the transceiver (92).

[0060] All the parts in each of the child watch transceiver units operate constantly as long as power to the unit is supplied or not turned off.

[0061] The transceiver (90) in each of the child watch units modulates and transmits the unique code signals to through the antenna (18) using a chosen frequency, modulation type, and output power as is well known in the communications art.

[0062] The child transceiver unit circuitry of **FIG. 3** and antenna (18) may be included or made a part of a computer communication chip inside the child watch unit, if the transmission range is acceptable. The child transceiver unit may include the time telling function in analog or digital format. Thus, children will be encouraged to wear the child transceiver unit.

[0063] Communication between the child transceiver units (10) and the parent transceiver unit (12) may be either by two-way radio frequency or by an industry accepted communication protocol such as Bluetooth, WiFi, two-way directional radio, or signal interference/cutoff. An advantage of utilizing an industry standard communication such as Bluetooth is the cost and power savings associated with an efficient, low-cost radio system.

[0064] It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

What is claimed:

1. An electronic child location system, comprising:

a plurality of child unit watches having a code setter, a code generator, transceiver and an antenna;

a parent unit watch having an antenna, a transceiver, plural code detectors, plural distance and direction detectors, a setting controller, a logic circuit, an audio alarm generator, a visual indicator, and a speaker element;

each of said child unit watches code setters programming unique codes for each said child unit watch coupled to said code generator for generating said codes and further coupled to said child transceiver for generating a radio transmission signal and further coupled to said child antenna for transmitting said radio transmission signal;

said parent unit watch antenna receiving said radio transmission signal from each of said child unit watches and coupled to said parent transceiver for demodulating said child radio transmission signal, and further coupled to said plural code detectors for detecting said child codes and further coupled to said plural distance

and direction detectors for detecting programmable signal strengths outside of a range of values based on inputs from said setting controller, each of said plural distance and direction detectors coupled to inputs of said logic circuit for detecting if any one or any two or all three of outputs of said plural distance and direction detectors indicates signal strength that is out of range, said logic circuit reporting the direction from which each said child radio transmission originated, and further coupled to said audio alarm or vibration generator for generating an audio alarm output to said speaker element.

2. The electronic child location system of claim 1 further comprising panic buttons on said parent unit and on each of said child units which will produce an alarm sound or vibration on said parent unit if any of said child unit panic buttons is pressed on a child unit and said panic button on said parent unit will produce an alarm on all child units if said parent panic button is pressed on said parent unit.

3. The electronic child location system of claim 1 wherein the cases of said child units are tamper resistant.

4. The electronic child location system of claim 1 wherein the band of said child units are cut-proof and contain a locking mechanism for lockably connecting the first end of said band to the second end of said band.

* * * * *