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(54) **Title**: AN IMPROVED EVENT TAG

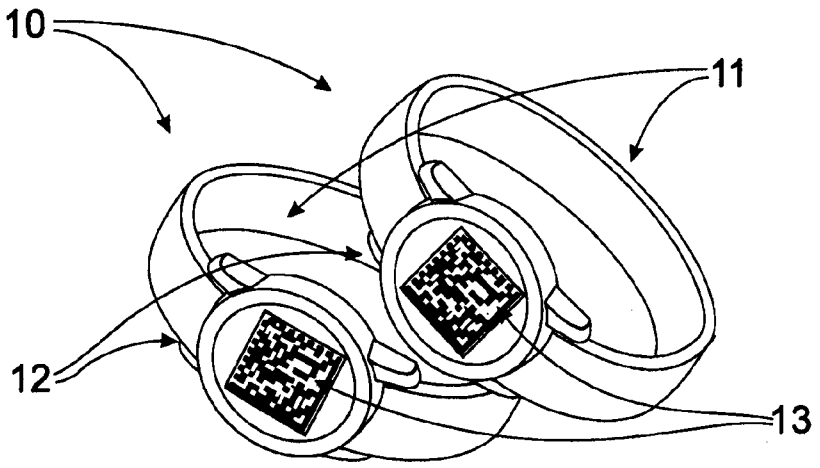

FIGURE 1

(57) **Abstract**: A tag for monitoring a patient, the tag including a strap (11) and a housing (12) mounted to the strap (11), the housing (12) including electronic circuitry. The electronic circuitry includes an event logging portion to record event data pertaining to the patient, a data storage portion for storing one or more of the event data, tag data pertaining to information concerning the tag and patient data pertaining to information concerning the patient. A data transfer portion transfers data from one or more of the data storage portion and the event logging portion.

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TITLE

AN IMPROVED EVENT TAG

FIELD OF THE INVENTION

The invention relates to an improved event tag and, more particularly, to a tag that is affixable to an article (or wearable by an animal/person) that stores data as well as having an event log, preferably of recent events experienced by the tag.

BACKGROUND ART

[Mere reference to background art herein should not be construed as an admission that such art constitutes common general knowledge in relation to the invention.]

Records for articles or animals, or the like, are often stored physically, such as on paper, or electronically, such as on a computer. However, when a record relating to the article/animal is retrieved, it is possible that the incorrect record is returned and, if this is not apparent, the wrong information may be ascertained about the article/animal. In some cases this may have minor effects, but in others, the effects of having the wrong record may be severely detrimental.

For example, medical records for people are typically stored in a physical form, with details sometimes being stored electronically on a computer. When a person visits a medical practitioner, their medical record is usually retrieved. Although in many cases it will be apparent if the wrong medical record is retrieved, in some cases it may not be and, furthermore, during certain tasks the medical record may not actually be on hand for the medical practitioner to review when performing an action. This can result in mistreatment, and/or misdiagnosis of a patient which, depending on the actions taken based on incorrect information can have serious consequences.

Assuming a correct record is retrieved, information relating to the article/animal (e.g. patient) may be required to be added to the record,

which is usually entered manually. Information to be recorded is usually noted and then either directly or indirectly added to the record. Only limited information is usually added/recorded and, furthermore, errors can easily be introduced. Furthermore, in some cases periphery information which may not have appeared important at the time but, later, was found to be of importance may not have been recorded at all.

Tags can sometimes be used to assist in identification of an article (or animal/person), such as a tag with a barcode. However, these are often temporary, and only store limited information is stored. Additionally, information regarding the article is usually passive and limited in nature, such as a unique identifier.

It is an aim of this invention to provide an event tag which overcomes or ameliorates one or more of the disadvantages or problems described above, or which at least provides a useful alternative.

SUMMARY OF THE INVENTION

In one form, although not necessarily the only or broadest form, the invention resides in a tag for monitoring a patient, the tag including:

a strap; and

a housing mounted to the strap, the housing including electronic circuitry, the electronic circuitry including:

an event logging portion to record event data pertaining to the patient;

a data storage portion for storing one or more of the event data, tag data pertaining to information concerning the tag and patient data pertaining to information concerning the patient; and

a data transfer portion that transfers data from one or more of the data storage portion and the event logging portion.

Preferably, the event logging portion includes at least one sensor.

Preferably, the at least one sensor measures a temperature of the patient.

Preferably, the at least one sensor measures a blood oxygen level of the patient.

Preferably, the at least one sensor measures an electrocardiogram (ECG) of the patient.

Suitably, the at least one sensor measures a blood oxygen level of the patient non-invasively.

Preferably, the at least one sensor includes a vibration or movement sensor, for detecting a movement of the patient.

Preferably, the at least one sensor includes an emergency response button.

Preferably, the at least one sensor includes a tracking element to determine the patient's movements.

Preferably, the tracking element includes a Global Positioning System (GPS).

Preferably the data storage portion includes electronic memory.

Preferably, the tag data includes a unique identifier.

Preferably, the data storage portion includes a 2D barcode.

Preferably, the electronic circuitry further includes a power supply portion.

Preferably, the power supply portion includes a solar panel.

Preferably the solar panel utilises silver cell technology for charging a battery of the power supply portion using artificial light.

Preferably, the data transfer portion includes a Radio Frequency (RF) device.

Preferably, the RF device includes a wireless local area network.

Preferably, the RF device includes a radio-frequency identification device (RFID).

Preferably, the RFID is an active RFID element.

Optionally, the RFID is a passive RFID element.

Preferably, the RF device includes a near field communications (NFC) device for reading a passive RFID element or a NFC tag.

Preferably, the RF device includes a Zigbee device.

Preferably, the RF device includes a 433MHz radio module.

Preferably, the RF device includes one or more of an IEEE 802.11, IEEE 802.11a/b/g/n and an IEEE 802.16 device.

Preferably, the patient data includes medical records of the patient.

Preferably, the medical records of the patient are encrypted.

Preferably, the medical records of the patient are associated with the unique identifier of the tag.

Optionally, the data transfer portion receives an electronic prescription and stores the electronic prescription in the data storage portion.

In another form, the invention resides in a tag for monitoring a medication, the tag including:

a container for storing the medication; and

a seal covering an opening of the container;

wherein one or more of the container and the seal includes electronic circuitry, the electronic circuitry including:

an event logging portion to record event data to detect when the seal has been broken;

a data storage portion for storing the event data; and

a data transfer portion that transfers data from one or more of the data storage portion and the event logging portion.

Preferably, the data storage portion additionally stores one or more of medication data pertaining to information regarding the medication, and patient data pertaining to information regarding a patient.

In yet another form, the invention resides in a monitoring device including:

a processor;

memory; and

an interface adapted to receive and analyse the data transferred from one or more tags.

Preferably, the monitoring device further includes internet connectivity for remotely monitoring the data transferred from one or more tags.

According to a yet another aspect of the invention, there is provided a tag comprising:

an affixing portion adapted to affix the tag to an article;

an event logging portion adapted to record event data; and

a data transfer portion that transfers data relating to the recorded event data.

The tag, and in particular the affixing portion and/or event logging portion, is preferably adapted to be suitable for the application in which it is being utilised. For example, if the tag is to be utilised on articles the affixing portion may be an adhesive, or if the tag is to be utilised on animals/humans the affixing portion may be a wearable element (e.g. a bracelet).

The event logging portion preferably comprises one or more sensors, or the like, adapted to determine variables relating to the tag and/or article. The event logging portion may comprise one or more of: a temperature sensor, humidity sensor, pulse sensor, gyroscope, accelerometer, positional sensor (e.g. localised and/or GPS), force sensor, magnetic sensor, compass, proximity sensor, electrical sensors (e.g. current, voltage, and/or electrical field), or the like.

The tag preferably further comprises at least one data storage portion. Such a data storage portion may be able to store data such as, for example, data relating to the tag itself (e.g. a unique identifier or information on the article it is applied), recorded event data, and/or data transferred. In an embodiment, the data storage portion comprises an electronically readable element such as, for example, a barcode (preferably 2D) and/or an RFID element. Furthermore, the data storage portion may comprise electronic memory, such as FLASH or a type of RAM or ROM that stores data. Preferably, one or more electronically readable elements store substantially static data (e.g. data that does not

change frequently) and one or more electronic memory elements store at least dynamic data (e.g. data that changes more frequently). Preferably the electronically readable element(s) store data relating to the particular tag or article to which it is applied, and the electronic memory elements store data relating to recorded event data and/or transferred data.

The tag is preferably active, and may further comprise a power supply portion. The power supply portion preferably comprises an energy storage element, such as a battery (e.g. rechargeable battery such as lithium ion battery) and/or capacitor (e.g. high capacity capacitor, double layer capacitor, or supercapacitor). The energy storage element may be rechargeable, replaceable, or single use.

The power supply portion may include one or more of a solar panel, kinetic (e.g. power generated by movement), induction (e.g. wirelessly transmitted from a source), and RF harvesting (e.g. using intentional RF sources, anticipated ambient RF sources, and/or unknown ambient RF sources such as fluorescent light sources and LED light sources). The power supply portion is preferably integrated into the tag, and charges the energy storage element. In the case of the RF harvesting, the solar panel may utilise silver cell technology.

In the event of a solar module being utilised in the power supply portion, the module may comprise a 'panel' printed on the tag, integrated with the tag, or may be a discrete component affixed to the tag. The solar module may provide a trickle charge (e.g. to the storage element) using available light sources such as, for example, light from internal light (e.g. fluorescent bulbs) and ambient sources (e.g. the sun). A dedicated light source may be provided to ensure the solar panel receives sufficient light to charge the tag, for example by trickle charging the tag.

The data transfer portion preferably transfers data wirelessly to another external device. The data transfer portion may comprise radio frequency transmission (e.g. RFID/RF-SIM), Bluetooth, WIFI, infrared, Zigbee, a 433MHz radio module or the like. In an embodiment the data transfer portion comprises RFID, preferably with at least one active RFID

element. In this embodiment, the RFID element is preferably an active RFID element. In yet a further embodiment, the data transfer portion may comprise a Near Field Communications (NFC) device. The NFC device may read a passive RFID element or a NFC tag.

In an embodiment, the tag is a patient tag that stores information pertaining to a patient that it relates to. The tag is preferably affixed by a strap (e.g. a watch strap), or similar, and may contain information such as medical records, treatments being carried out, medications, patient contact details, patient history, or the like. In a preferred embodiment, medical records are stored and are retrievable by an electronically reader such as, a PDA, phone, barcode scanner, Near Field Communications (NFC) device or other suitable device. In a particularly preferred embodiment, at least a portion of the medical records are stored in a 2D barcode and/or in an RFID element. Alternatively, or in combination, the 2D barcode and/or RFID element may provide a hyperlink to a database, with the information be stored remotely.

The tag preferably also has sensors for measuring one or more physiological characteristics of the patient such as, for example, the temperature and/or pulse of a wearer. The tag may monitor/record blood flows and/or blood oxygen levels, such as hemodynamic monitoring (invasive and/or non-invasive). The tag may have a tracking element to allow patient locations to be determined (e.g. in a hospital) and to determine patient movements.

Preferably a monitoring device is provided that receives at least a portion of the transferred data, and may provide an alert in certain circumstances (e.g. an alarm to staff when a patient is leaving the building without authorisation, is being moved to the wrong ward, has an irregular heartbeat, is in a feverous state, or the like).

In another embodiment, the tag is a sports tag that tracks wearers (e.g. animals such as horses, or sportsmen). The sports tag preferably measures and/or monitors physiological characteristics of the wearer, and preferably logs details of the measured characteristics for either real time

(or at least near real time) or subsequent analysis. The tag may also be utilised for accurately determining the location of the wearer and/or for determining the position of individual wearers among others (e.g. to determine who crosses certain points, such as a finishing line, first).

The sports tag may be utilised for various sports such as, for example, races (e.g. horse, running, swimming, skiing, or the like). In a skiing environment, the tag may be utilised in relation to individual skiers, providing authorisation of lift passes, or the like, to ensure only skiers who have an appropriate pass may utilise certain equipment (e.g. chair lifts). The tag may also be utilised to gather information, including tracking, of an individual. For example, it may show which ski runs were traversed, the time taken, the date/time of day, temperatures, altitude, etc. Furthermore, in the event of an emergency (e.g. a lost individual and/or in an avalanche scenario) the tag may be utilised to locate the individual. Preferably the tag comprises at least one active element (e.g. active RFID) with a range of greater than 50m or, more preferably, a range greater than 100m.

In yet another embodiment, the tag is an asset tag that is applied to assets/articles, such as equipment. Details of the asset may be stored on the tag, and the event logging portion of the tag may record characteristics relating to the tag such as temperature, humidity, and/or location. For equipment that needs regular or routine testing, maintenance, and/or servicing (e.g. electrical equipment) the asset tag may be utilised to record details of the testing/maintenance/servicing. Compliancy of articles can then readily be ascertained by reading and/or communicating with the tag.

In still yet another embodiment, the tag is a perimeter tag for determining when the tag (and any article/animal it is applied to) breaches a predefined perimeter. For example, the tag may be applied to a child or pet and when the child/pet leaves a property, a monitoring device may notify someone of the breach. Furthermore, the tag may comprise an alarm circuit which notifies the wearer by sound, light, or other means (e.g. electric shock).

In yet another embodiment, the tag is a safety tag to be worn by infants/youngsters with the event logging portion having sensors for determining if the wearer could be in a dangerous situation such as determining whether the tag is wet, excessively hot, and/or subjected to abnormal forces/impacts (e.g. from falling of collision). For example, the tag may be able to determine whether an infant falls into water (e.g. a pool, bath, or the like) and transfers data to a monitoring device which can alert/warn another person (e.g. a parent or caretaker) who can then locate and check on the wearer.

A tag may be utilised within a body of water, such as a pool, with a vibration sensor, or the like, adapted to sense water movements (e.g. movement of a float is detected). If significant vibrations are detected, such as those generated by a person/animal entering the water the tag may transfer data to a monitoring device which can alert a person of the water movement. For example, if an infant falls into a pool, the tag may detect the water movements, transfer data to the monitoring device, which can alert/warn another person who can then check on the pool.

In another embodiment, the tag is a school tag, with tags worn by students and/or staff members (or built into ID cards). Immediate identification of student/staff attendance and/or their location on school grounds (e.g. in a student is in an out of bounds area while they should be in class) can be conducted by a monitoring device. Furthermore, the reports/grades of students as well as any other characteristics may be stored on the tag. For example, the tag may store emergency contact details and/or allergies and the like in case of emergencies.

In a further embodiment, the tag is a monitoring tag that is placed on, or in an article, to monitor certain characteristics. For example, a tag may be applied to/within an article during manufacture to measure variables such as, temperature. Furthermore, a tag may be adapted to be embedded into an article to allow future reading of characteristics of that article. In an embodiment, the tag is inserted into concrete casts and also into the actual concrete before it is set. The tag event logging portion of

the tag can measure, and preferably record, data in the inside of the concrete such as temperature and humidity. The tag stays within the concrete and at least a portion of the data can be retrieved by a monitoring device via the data transfer portion.

In a more particular example, tags may be included in casts to monitor at least temperature and time to assure maximum strength and structural integrity of the concrete (or other material(s) being cast) is obtained. Tags may be incorporated at time of cast so that concrete spans can be traced after leaving a production facility until they are placed in position on site. Furthermore, the tags may be configured to monitor characteristics which may arise over the life of concrete spans. Often such spans are in bridges or roadways and, typically, once fully integrated it is difficult to monitor and determine the integrity of the span. A monitoring device may be communicable with the tag within the span(s) and can relay pertinent information, such as the presence of water inside the span. It is envisaged that the monitoring device could be manoeuvrable on a vehicle which is driven over/near the spans to be read and records and/or analyses the data transferred by the data transfer portion of each tag.

According to a further aspect of the invention, there is provided a system for monitoring events, the system comprising:

at least one tag affixed to an article, wherein the tag has an event logger that records event data and transfers data relating to the recorded event data; and

at least one monitoring device that receives data from the tag.

According to another aspect of the invention, there is provided a system of monitoring a plurality of tags and/or events, the system comprising:

a plurality of monitoring devices that receive data from a plurality of tags, the monitoring devices being distributed over and/or adjacent an area within which the tags are to be monitored, wherein at least a portion of the monitoring devices are moveable during use.

The system preferably comprises a plurality of tags each having a unique identifier. Preferably when receiving data from a tag, the monitoring device can receive the unique identifier to associate the data with a particular tag. The tags may be tracked in an area of coverage provided by one or more monitoring devices. The tags and/or monitoring device(s) may be movable. In some embodiments the monitoring device is preferably stationary, and in others the monitoring device is preferably movable. However, combinations of movable and stationary tags and/or monitoring devices may be utilised.

In an embodiment over a large area, the system comprises a plurality of monitoring devices that move continually through the area and can track and receive data from tags within range. For example, over a city there may be many users with tags (e.g. drivers licences, vehicle licence plates, public transport tickets, etc.) and a plurality of monitoring devices, with some of the monitoring devices being fixed at points of interest (e.g. points where constant monitoring is desired) and some of the monitoring devices being movable around the city, to provide an expanded coverage. The movable monitoring devices may be located in particular vehicles such as buses, taxis, police, and/or emergency service vehicles.

The monitoring device(s) may provide other services to the vehicle in which it is located. For example, in cars it may be utilised as a 'black box' which records data relating to the vehicle for recovery during a crash, or the like. An I/O interface integrated into the monitoring device may be utilised to communicate with the vehicle. For example, the speed of the vehicle, engine status, temperature (external, internal, engine, etc.), any warning notifications, conditions, steering wheel angle, pedal angles, and the like may be communicated to the monitoring device. The monitoring device may also record video, preferably front and/or rear views of the vehicle and, in the case of emergency vehicles (e.g. a police vehicle), the recordings may be utilised for recording evidence (e.g. evidence of infringements).

The monitoring device may also provide other services/functions, such as a media/entertainment centre for TV, movies, games, or the like; and the provision of in vehicle internet connectivity (e.g. by providing a wireless network for the vehicle). It is envisaged that the in vehicle internet connectivity would be particularly useful in transport providers, such as buses, trains, taxis, and the like, where passengers can connect to the internet (e.g. to check their email, etc.) while travelling.

In an embodiment where the tags are incorporated into registration labels and/or vehicle licence plates, the speed and location of vehicles may be determined from the monitoring devices reading the tags. The monitoring devices may be placed at points of interest to determine whether certain vehicles (e.g. vehicles reported stolen) drive through the monitored area, or to determine drivers that are speeding in that area. Monitoring devices are preferably located in other vehicles such as police (or highway patrol) vehicles, which can use the monitoring device to capture information on the vehicle of interest, and may then subsequently locate it. Furthermore, if monitoring devices are in other vehicles (e.g. busses and/or taxis) then vehicles throughout a large area can be identified and, if they are of interest (e.g. speeding, or reported stolen) then the authorities can be notified of the relevant details (e.g. time, location, etc.). If the tag was also integrated into driver licences, then the driver of a vehicle could also be identified (either alone or in combination with other tags, such as the licence plate or vehicle registration tag described above).

Further applications for such a tag includes the determination of a vehicle when tolls are incurred, and/or when being weighed. For example, a truck may have a tag which can report a maximum load the truck is allowed to carry, and this data can be compared with the actual weight of the truck when passing over a weigh station. Furthermore, a tag can be utilised to track and monitor drivers to ascertain if they were involved in, or at the scene of an accident. A tag may be utilised to track the history of a driver such as, for example, with learner or restricted level drivers who

have to keep a log book of all driving. The tag may track the travel of the vehicle, including the times of travel, and automate such a log book.

Preferably the tags of the system relate to a plurality of different entities, and the one or more monitoring device communicates with (by at least receiving information from) the tags. The monitoring device(s) preferably analyses the information from the tags, determining the different entities and associated information received from the respective tag. One monitoring device may therefore be utilised to monitor a variety of different tags (or tag types) and present information for an operator relating to the different entities. For example, in a home environment, a single monitoring device may be utilised to monitor (and advise on) people, pets, intruders, assets, vehicles, pool (e.g. activity, water level, chemicals), and/or other entities of interest.

According to another aspect of the invention, there is provided a monitoring device comprising:

a processor;

memory; and

an interface adapted to detect a tag, and

a portion adapted to receive and analyse data from the tag.

The monitoring device preferably comprises both random access memory (RAM) and storage memory. In an embodiment, the monitoring device comprises a computer motherboard with CPU therein, RAM, and at least one storage drive. Preferably the interface adapted to detect a tag and the portion adapted to receive and analyse data from the tag is integrated such that detection and reception/analysis is performed at the same time.

Preferably the monitoring device further comprises internet connectivity. The internet connectivity may be provided by any suitable source, but in a preferred embodiment comprises a mobile/cellular network modem. The modem may interface with a motherboard of the monitoring device, preferably via the USB protocol (which may be connected to a header on the motherboard). The internet connectivity

from the modem may then be provided to other devices utilising other protocols, such as the wireless LAN (WLAN) protocol, preferably adhering to one or more of the IEEE 802.11 or 802.16 standards (e.g. 802.11a/b/g/n, or 802.11p or 802.16 directed towards 'wireless access in vehicular environments').

The monitoring device is preferably modular, with a base system comprising the essential components, and with the facility for additional systems to be added. The base system may be standalone, or may be utilised with the additional systems to increase functionality.

In an embodiment the base system and additional systems are stackable modules. Preferably the stackable modules have apertures to provide fluid communication between each other (e.g. for airflow for cooling). In an embodiment, the base system comprises one layer of a stack, and may be utilised as a standalone monitoring device, or integrated with more layers. In another embodiment, the base system comprises two layers of a stack, and may be utilised as a standalone monitoring device, or integrated with more layers.

The base system preferably has a housing that can be sealed, preferably utilising metal configured to conduct heat away from the internal components. The housing may comprise heatsinks and/or heatpipes to assist in cooling the internal components. In an embodiment, the housing is made of aluminium. The housing may have one or more external heatsinks that are thermally connected to heat generating portions (e.g. the CPU) of the internal components. The external heatsink may be provided with a fan, or the like, to assist in heat dissipation. An advantage in having the heatsink external to the casing is that it allows the housing to be sealed, providing a dust proof and/or weather proof enclosure for the base system, while also facilitating cooling of the internal components (that may otherwise overheat due to having no fresh air circulation).

The housing of the base system may have removable portions to create apertures when removed. The apertures preferably provide fluid communication between the base system and any additional systems

being utilised. The apertures may also allow cables to pass between the base system and additional systems or, more preferably, connectors may be provided between each system (e.g. base system and any additional systems) to connect the respective internal components.

Additional systems may comprise communications, graphics, interface, battery/UPS, storage, media, fan, and/or filter modules, or a combination thereof. Where multiple system layers are utilised (e.g. the base system and one or more additional system layers) then active cooling layers may be utilised. The active cooling layers preferably comprise at least an air inlet and/or outlet. In an embodiment, two cooling layers are provided, an air inlet, preferably with a dust filter, and an air outlet, preferably with a fan. The inlet and filter are preferably located on the bottom of the device, with air being drawn into the inlet from underneath. The outlet and fan are preferably located on the top of the device, and draw air through the system layers from the inlet. Preferably the layers, and their respective apertures between them, are arranged to ensure airflow across the components within the housing. For example, the apertures of each layer are preferably located on alternating sides of each respective housing, such that air 'snakes' its way through the system.

Preferably the monitoring device is capable of outputting audio and/or visual signals. Even more preferably, the monitoring device may be utilised as a multi-purpose device such as, for example, data storage and/or backup, automation (e.g. home automation for power, lights, air conditioning, appliances, etc.), and/or a media server (e.g. a media player (music, videos, or the like), personal video recorder (PVR)).

The monitoring device may comprise tag readers that detect and/or monitor tags within a predetermined proximity. The tag readers may be integral, or wired or wireless connected to the monitoring device. The tag readers may receive data transferred from a tag, and also may transfer data to a tag. Preferably the tag readers are placed in fixed locations of interest. In an embodiment, the tag readers are integrated into a door frame, allowing tracking/monitoring of tags passing therethrough.

In order that the invention may be more readily understood and put into practice, one or more embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a perspective view of a tag according to an embodiment of the invention.

Figure 2 illustrates a perspective view of tag according to another embodiment of the invention.

Figure 4 illustrates a diagrammatic isometric view of various applications in a medical/hospital environment that embodiment(s) of the invention may be utilised in relation to.

Figure 3 illustrates a diagrammatic plan view of an example output of an embodiment of the invention.

Figure 5 illustrates a tag according to an embodiment of the invention.

Figure 6a illustrates a tag according to an embodiment of the invention.

Figure 6b illustrates a monitoring device according to an embodiment of the invention.

Figure 6c illustrates another monitoring device according to an embodiment of the invention.

Figure 7 illustrates a diagrammatic plan view of an example output of an embodiment of the invention.

Figure 8 illustrates a cross sectional elevation view of a monitoring device according to an embodiment of the invention.

Figure 9 illustrates a cross sectional elevation view of a monitoring device according to an embodiment of the invention.

Figure 10 illustrates a cross sectional diagrammatic elevation view of a monitoring device according to an embodiment of the invention.

Figure 11 illustrates a perspective view of the monitoring device illustrated in figure 10.

Figure 12a illustrates a plan view of a fan layer of the monitoring device illustrated in figure 10.

Figure 12b illustrates a plan view of a hardware layer of the monitoring device illustrated in figure 10.

Figure 12c illustrates a plan view of a filter layer of the monitoring device illustrated in figure 10.

Figure 13 illustrates a cutaway perspective view of a monitoring device according to an embodiment of the invention.

Figure 14 illustrates a cross-sectional elevation view of a monitoring device according to an embodiment of the invention.

Figure 15a illustrates plan and elevation views of a standard doorway with tag readers contained therein.

Figure 15b illustrates plan and elevation views of a double doorway with tag readers contained therein.

DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 shows tags 10 according to an embodiment of the invention. The tags 10 are adapted to be fitted to a limb, such as a wrist of a person (not shown). Accordingly, each tag 10 has an affixing portion in the form of a strap 11. Each tag 10 also has a housing 12 mounted on the strap 11, with the housing enclosing electronic circuitry to record event data and transfers data relating to the recorded event data to another device. Additionally, the tags 10 have printed electronically readable elements in the form of 2D barcodes 13, displayed on the housing. Each 2D barcode may store information relating to the tag and/or the wearer such as, in one preferred application, personal information and medical records of a wearer.

A similar tag 20 is illustrated in figure 2, having a strap 21 and a housing 22. The housing 22 in the tag 20 is transparent, revealing the electronic circuitry that records event data and transfers data relating to the recorded event data to another device. Although the tag 20 in figure 2 does not have a 2D barcode (as the tags in figure 1 illustrate), this could

be affixed to the housing and/or utilised by a wireless source such as, for example, an RFID element (which the tags 10 in figure 1 may also include).

In a medical/hospital application, a plurality of tags may be utilised in relation to a variety of different applications. Tags may be utilised in relation to patient solutions 30, providing tracking and/or measurement of physiological characteristics of the patients, as well as monitoring treatments and/or containing the wearer's medical records. In one embodiment, the tag 20 of FIG 2 may wirelessly communicate with an electrocardiogram (ECG) monitor connected to electrodes positioned on the patient. For example the tag 20 may communicate with the ECG monitor using Bluetooth® wireless LAN or any other suitable wireless communications. The tag 20 may then transmit the information gathered from the ECG monitor to a reader using RFID, Zigbee, Near Field Communications (NFC) a 433MHz wireless module or any other suitable wireless communications.

In addition, the tag 20 may be linked to a patient's Medical Record Number by associating a unique identification (ID) of the tag 20 with the Medical Record Number. The medical records may then be downloaded from a medical records depository to the tag 20 for viewing by a medical practitioner for example. In order to access the records, the tag 20 sends the unique ID of the tag via the internet, using a cellular telephone for example, to the medical records depository. For security reasons, the unique ID may be encrypted. The medical records depository sends the applicable records to the tag 20 according to the unique ID of the tag 20. The medical records sent from the depository may be encrypted, and once received by the tag 20, decrypted by the tag 20. The medical records may also include, but is not limited to, x-rays, pathology results, past treatments and previous medical practitioners. The medical practitioner then has access to a complete medical record.

In another embodiment, the tag 20 may store (either directly or indirectly) medical prescriptions for prescribed drugs in the form of an

electronic prescription. When a General Practitioner (GP) issues a prescription to a patient, the GP may electronically send the prescription to the tag 20 of the patient using an RFID programmer attached to his or her computer. When the patient visits the pharmacy, the pharmacist may electronically read the prescription stored on the patient's tag 20 and remove the prescription electronically from the patient's tag 20 or amend a number of repeat prescriptions for a particular drug.

The tag 20 may also include a call button, an emergency response button or a panic button. When a patient presses the call button, the tag 20 signals to a reader and the reader may signal to the emergency services to attend. In one embodiment, the tag 20 may include two-way communications, such as a cellular telephone, or an intercom between the tag 20 and a base station or reader.

The tag 20 may also include a vibration/movement sensor to indicate a movement of a patient. A lack of movement over a period of time may indicate that the patient may be at an increased risk of developing bed sores or pressure sores also known as Decubitus Ulcers and the tag 20 may signal to medical practitioners, via a reader, to attend to the patient. In another example, the vibration/movement sensor may detect movement associated when a patient is fitting, for example, and send a suitable alert through a reader connected to the internet.

The tag 20 may also include a Near Field Communications (NFC) device. The NFC device may read a passive RFID element. As is known in the art, NFC requires that the NFC device is placed in close proximity (touching or almost touching) in order to read data from an RFID element.

Tags may also be utilised in relation to treatment solutions 31, such as on medications, and may store information regarding the medication and, preferably, characteristics thereof (e.g. expiry dates, location, dosage requirements, and the like). In an embodiment, a tag, or at least a portion of a tag, may be placed over an opening mechanism of the medication, as a seal. For example the medication may be stored in a container with the seal covering the opening. When the medication is opened/used, the tag,

or portion, may be destroyed (e.g. breaking a portion of a circuit). This allows the tag, and/or a monitoring device, to determine whether medication has been opened/used or not. The time and date when the medication was opened may be stored in the tag. The tag may also include a Near Field Communications (NFC) device for reading a passive RFID element.

In addition, the tag may store medical records of the patient, and may also communicate with the tag 20 of FIG 2 to store a patient's medication history. A pharmacist may then review the medication history to determine whether the patient is taking his or her medication. If the patient is not taking his or her medication, the pharmacist may educate the patient. Furthermore, the tag 20 may be used to store whether the patient has any allergies to particular medications and automatically determine whether any combinations of drugs may produce adverse side effects.

Tags may be utilised for hardware solutions 32, such as asset management, preferably including tracking of mobile elements such as wheelchairs, beds, equipment, etc. Medical records 33 may also be tagged, in addition to having the medical records stored in a wearable tag (e.g. under patient solutions 30) the medical records themselves may have tags which allow them to be tracked, read, and updated electronically. Tags with medical records would be updated to reflect the current medical status of a patient automatically, preferably via a monitoring device which may have received information on the patient via patient solutions 30.

Staff 34 may also be monitored, with the tags forming part of identification cards, or similar. The tags may facilitate security and/or access levels (e.g. door access) for staff, as well as provide tracking to locate staff. Finally (for the illustrated example), tags may be utilised for maintenance solutions 35, such as maintenance of electrical equipment. The tags for maintenance solutions 35 may be updated as various equipment (e.g. electrical equipment) is updated.

Figure 4 illustrates an example output from a monitoring device. In the output, a graphical representation of a plan view of a building layout 40 is provided, with a configuration window 41 shown on the right. Tracking tags labelled as 'B' and 'X' are received by the monitoring device and then shown in the building layout 40 with their locations in the building. In the illustration, the configuration (in the configuration window 41) is set to display only 'Beds' and 'X-Ray – Portable' and, accordingly, on the building layout 40 the beds labelled 'B' are shown, and an X-Ray labelled 'X' is shown. The trail dots 42 are illustrative of previous locations of the tags, in this case it shows that the X-Ray unit was moved down the hallway, into a room, and then down to the room that it is presently located in.

A pointer 42 (e.g. mouse pointer) can be placed over a particular tag (as illustrated for the 'X' tag and one of the 'B' tags in figure 4) to provide further information in a pop-up window 43. For the bed with a pop-up window 43, a unique identification number, the location, and an identifier for a patient are all shown. For the X-Ray pop-up window 43, a unique identification number and the type of asset (i.e. Xray-portable) are shown, with three selectable options, namely: find in database, display movement, and hide all of (this) type. Of course, the output may vary, and may include raw data, processed data, graphical representations, and the like. The output is typically adapted to suit the application, and the operator's needs in interpreting the data. Preferably, multiple user-selectable (or configurable) output types are provided.

Figure 5 shows a tag in the form of a testing/maintenance tag 50 having various information printed thereon, including the date the equipment was installed and tested, and three barcodes, being two 2D barcodes 51 and one 1D barcode 52. The maintenance tag 50 is typically placed on asset/article (e.g. equipment or, in this case, medical equipment) contains details/information/data relating to the maintenance of the equipment it is applied to. The barcodes 51 and 52 store information relating to the equipment such as, a unique identifier (typically in at least

the 1D barcode 52), details of the equipment, testing/maintenance/service/etc., including historical information, and/or a link to a database (preferably a database stored remotely on a monitoring device).

Figures 6a to 6c show embodiments of portions of the invention, namely two tags 60 shown in 6a, and two forms of monitoring devices 61 and 62. In use, preferably the tags 60 are communicable with one or more monitoring devices 61 and 62. In one embodiment, the tags are movable as well as the monitoring device(s). Typically the monitoring device(s) have a limited range and, hence, multiple monitoring devices are required to cover an area larger than that range.

In some cases, it may not be required to have complete coverage of a large area at all times and if the area to be covered is very large (relative to the range of the monitoring device), it will likely not be practical to cover the area at all times. An embodiment of the invention therefore utilises several fixed and movable monitoring devices to cover the area. Although portions of the area will have no coverage, it is preferred that the movable devices will move throughout the area (in either a planned of 'random' manner) and over a period of time provide substantial (if not full) coverage to the area.

Figure 7 shows an example output for covering a city/town having eight monitoring devices 70. A coverage radius of a single monitoring device 71 is illustrated, and the tags identified over the city/town are shown as dark dots 72 (only a small portion of which are numerated due to the quantity). In this example, the tags may be representative of individuals/people over the area, and the monitoring devices may be fixed, movable, or a combination thereof. For example, fixed monitoring devices (e.g. the monitoring device 6b) may be provided at points of interest, and movable monitoring devices (e.g. the more portable monitoring device 6c) may be employed in vehicles (preferably vehicles which travel the area frequently, such as busses and/or taxis) to cover the remainder area over a period of time. Preferably the combination of fixed and movable

monitoring devices are capable of reading at least the vast majority of tags in the area over a predetermined period of time (e.g. 24 hours).

Figures 8 to 12 illustrate a preferred embodiment of a monitoring device 80. The monitoring device 80 comprises various layers 81 (or stackable modules). The monitoring device 80 illustrated in figure 8 comprises two layers 81, one (the bottom layer) being a computer hardware layer 85 for a motherboard, CPU, and RAM, and the other (the upper layer) being a storage and peripheral hardware layer 86. The storage is preferably one or more hard disk drives 82 and, more preferably solid state hard disc drives (SSDs). The peripherals include a USB modem, an I/O card (preferably for digital and analogue inputs/outputs), and an active reader, which is adapted to receive data from one or more tags.

In the illustrated two layer embodiment in figure 8, preferably the casing 84 is completely enclosed/sealed. Such a sealed environment can cause heat build-up and, accordingly, it is preferred that that the casing is utilised to conduct at least some of the heat generated by the internal components. The sealed nature of the unit makes it particularly useful in dirty/dusty and/or outdoor environments, as the internal components are protected from the elements by the casing. The top and bottom surfaces are preferably removable/replaceable, to allow them to be sealed (as in this arrangement), or removed/replaced for placement of additional layers (either both above and/or below).

In a larger, expanded, system as illustrated in figure 9, three layers have been added to the unit illustrated in figure 8. The two layers of figure 8 are sill present (third and fourth layers from the top) as well as a filter layer 87, a further hardware layer 88, and a fan layer 89. The additional layers also provide the capability to fit a full size computer graphics card 90 into the monitoring device for applications that may require such processing (e.g. applications with advanced graphics processing, and/or applications which utilise the graphics processor as a general purpose processing unit (GPGPU) to provide additional computational power).

The filter layer 87 has an air inlet, preferably substantially the size of the bottom of the unit, with a filter element designed to catch dust, and other contaminants, from entering the internal space of the device 80. The filter is removable for replacement and/or cleaning (in a preferred embodiment the filter is cleanable by putting it through a dishwashing cycle). Air is drawn into the filter by negative pressure inside the device 80, which is generated by the fan layer 89. The fan is preferably a large fan with a relatively low spin speed to reduce noise. A 200mm fan, such as an Antec® 'Big Boy 200', has been found to be suitable to generate the required air flow without increasing the noise of the unit significantly.

The fan layer 89 with the filter layer 87 provide a flow of air from the bottom to the stop of the device 80, providing air cooling to all internal components. To ensure adequate cooling of components in each layer, the floor/roof between each layer preferably has apertures positioned to force the air across the components. Illustrated in figure 10 is an example of a preferred airflow arrangement, with the air being illustrated by the large arrows.

First, air is pulled into the device 80 by negative pressure created by the fan layer 89 at the top of the unit. The air is pulled through the filter layer 87, which extracts contaminants (e.g. dust) and is passed to an inlet in the mother board layer on one side. The outlet from the motherboard layer, which has a corresponding inlet for the first hardware layer, is positioned on the other side of the layer to ensure the air traverses the full width of the mother board layer. This trend continues, with the inlet and outlet for each respective layer being opposed to ensure the air flows across the layer before proceeding into the next. Finally, the (warmed) air is pulled from the uppermost hardware layer to the fan layer 89, and expelled through a grill, or similar, to the surrounding environment. Preferably the most heat sensitive components are positioned towards the bottom of the layers, where the air is cooler, with less heat sensitive components being positioned towards the top, where the air will be warmer (from being heated by previous components it has passed).

Figure 11 illustrates a perspective view of the five layer device 80 shown in figures 9 and 10, with the outlet grill 91 clearly visible on the top layer. It is envisaged that air could be drawn (or pushed) downwards through the layers, being inlet in the top and outlet out the bottom, but the preferred arrangement is to have the air rising, to work in tandem with usual convention currents within the enclosure.

Figure 12a illustrates a preferred arrangement for a fan 92 within its layer 89. Figure 12b illustrates an intermediary layer (e.g. the motherboard layer or hardware layer) showing the upper outlet apertures 93 disposed to one side of the layer, with the opposed inlet apertures being concealed behind a plate element 94 upon which components may reside within the layer. Finally, figure 12c illustrates the filter layer, with a filter grill 95 holding the filter in place over the air inlet.

Figure 13 illustrates an embodiment of the monitoring device comprising an external heatsink 100 which is thermally connected to heat generating internal components via a conductive portion 101. The conductive portion may be a metal block (e.g. an aluminium block) or heat pipes, or the like, adapted to transfer heat away from the internal heat generating components to the heatsink portion 100. Depending on the level of heat required to be removed, the heatsink portion 100 may remove sufficient heat from the device 80 to be passively cooled. Alternatively, a fan may be employed to provide additional cooling, as illustrated in figure 14. The heat conducting portion 101 may be thermally insulated on surfaces which are not in contact with heat generating components (that are being cooled) to prevent heat radiation from the heat conducting portion 101 from heating the internal components and/or volume of the sealed enclosure.

Such an arrangement advantageously provides a sealed environment for the hardware to operate in, while still providing sufficient cooling to higher heat output parts (such as more powerful CPUs, e.g. a full Intel i3-i7 processor, instead of a ULV or 'Atom' processor). If additional hardware components are required, the heatsink location may

be moved (e.g. to the sides or underneath the hardware layer 86) or the additional hardware layers may be added below the hardware layer 86 (instead of on top of, as illustrated in figures 9 and 10.

Figures 15a and 15b illustrate an arrangement of tag readers 131 which may be integrated into existing building structures, namely (as illustrated) a doorway 130. As tag(s) pass through the doorway, one or more tag readers 131 detect the tag(s) and can notify a monitoring device accordingly. The tag readers are preferably in communication with a monitoring device, and may receive information from the tag which can subsequently be sent to the monitoring device. By having tag readers 131 integrated into existing structures, such as a door way, tag(s) that pass through can be read seamlessly with no interruption to the wearer, or the like, and without personnel even being aware of the tag(s) being read. Furthermore, integration into existing structures is unobtrusive and visually appealing, as the components are hidden from view.

Doorways are found to be particularly suitable for such readers as typically when tag(s) are moved from one location to another, they pass through one or more doorways and, in any event, it may be of interest when a tag passes through one or more particular doorways (e.g. an exit from a building). The tag readers 131 contained in doorways 130 are preferably utilised in addition to normal tracking of the tag(s) by a monitoring device to improve accuracy, provide notification when a tag passes through a point of interest, and/or to extend the monitoring range (e.g. by monitoring a doorway, or the like, further away than the typical range of the monitoring device).

The tag(s) and/or monitoring device(s) have many applications, particularly in relation to monitoring and tracking of assets, articles, equipment, animals, people, and the like.

It is to be understood that the terminology employed above is for the purpose of description and should not be regarded as limiting.

The term 'article' is to be considered in a broad sense encompassing all entities, including items, assets, equipment, and animal

and/or human entities. In relation to animals (including humans) the article may refer to an article worn by the animal/human (e.g. an article of clothing), or may in fact refer to the animal/human itself, or portions thereof.

The foregoing embodiments are intended to be illustrative of the invention, without limiting the scope thereof. The invention is capable of being practised with various modifications and additions as will readily occur to those skilled in the art.

Throughout this specification, including the claims, where the context permits, the term "comprise" and variants thereof such as "comprises" or "comprising" are to be interpreted as including the stated integer or integers without necessarily excluding any other integers.

Claims:

1. A tag for monitoring a patient, the tag including:

a strap; and

a housing mounted to the strap, the housing including electronic circuitry, the electronic circuitry including:

an event logging portion to record event data pertaining to the patient;

a data storage portion for storing one or more of the event data, tag data pertaining to information concerning the tag and patient data pertaining to information concerning the patient; and

a data transfer portion that transfers data from one or more of the data storage portion and the event logging portion.

2. The tag of claim 1 wherein the event logging portion includes at least one sensor.

3. The tag of claim 2 wherein the at least one sensor measures a temperature of the patient.

4. The tag of claim 2 wherein the at least one sensor measures a blood oxygen level of the patient.

5. The tag of claim 2 wherein the at least one sensor measures an electrocardiogram (ECG) of the patient.

6. The tag of claim 4 wherein the at least one sensor measures a blood oxygen level of the patient non-invasively.

7. The tag of claim 1 wherein the at least one sensor includes a vibration or movement sensor, for detecting a movement of the patient.

8. The tag of claim 1 wherein the at least one sensor includes an emergency response button.

9. The tag of claim 1 wherein the at least one sensor includes a tracking element to determine the patient's movements.

10. The tag of claim 9 wherein the tracking element includes a Global Positioning System (GPS).

11. The tag of claim 1 wherein the data storage portion includes electronic memory.

12. The tag of claim 1 wherein the tag data includes a unique identifier.

13. The tag of claim 1 wherein the data storage portion includes a 2D barcode.

14. The tag of claim 1 wherein the electronic circuitry further includes a power supply portion.

15. The tag of claim 14 wherein the power supply portion includes a solar panel.

16. The tag of claim 15 wherein the solar panel utilises silver cell technology for charging a battery of the power supply portion using artificial light.

17. The tag of claim 1 wherein the data transfer portion includes a Radio Frequency (RF) device.

18. The tag of claim 17 wherein the RF device includes a wireless local area network.

19. The tag of claim 17 wherein the RF device includes a radio-frequency identification device (RFID).

20. The tag of claim 19 wherein the RFID is an active RFID element.

21. The tag of claim 19 wherein the RFID is a passive RFID element.

22. The tag of claim 17 wherein the RF device includes a near field communications (NFC) device for reading a passive RFID element or a NFC tag.

23. The tag of claim 1 wherein the patient data includes medical records of the patient.

24. The tag of claim 23 wherein the medical records of the patient are encrypted.

25. The tag of claim 23 wherein the medical records of the patient are associated with the unique identifier of the tag.

26. The tag of claim 1 wherein the data transfer portion receives an electronic prescription and stores the electronic prescription in the data storage portion.

27. The tag of claim 17 wherein the RF device includes a Zigbee device.

28. The tag of claim 17 wherein the RF device includes a 433MHz wireless module.

29. The tag of claim 17 wherein the RF device includes one or more of an IEEE 802.11, IEEE 802.11a/b/g/n and an IEEE 802.16 device.

30. A tag for monitoring a medication, the tag including:

a container for storing the medication; and

a seal covering an opening of the container;

wherein one or more of the container and the seal includes electronic circuitry, the electronic circuitry including:

an event logging portion to record event data to detect when the seal has been broken;

a data storage portion for storing the event data; and

a data transfer portion that transfers data from one or more of the data storage portion and the event logging portion.

31. The tag of claim 30 wherein the data storage portion additionally stores one or more of medication data pertaining to information regarding the medication, and patient data pertaining to information regarding a patient.

32. A monitoring device including:

a processor;

memory; and

an interface adapted to receive and analyse the data transferred from one or more of the tag of claim 1 and the tag of claim 30.

33. The monitoring device of claim 32 further including internet connectivity for remotely monitoring the data transferred from one or more of the tag of claim 1 and the tag of claim 30.

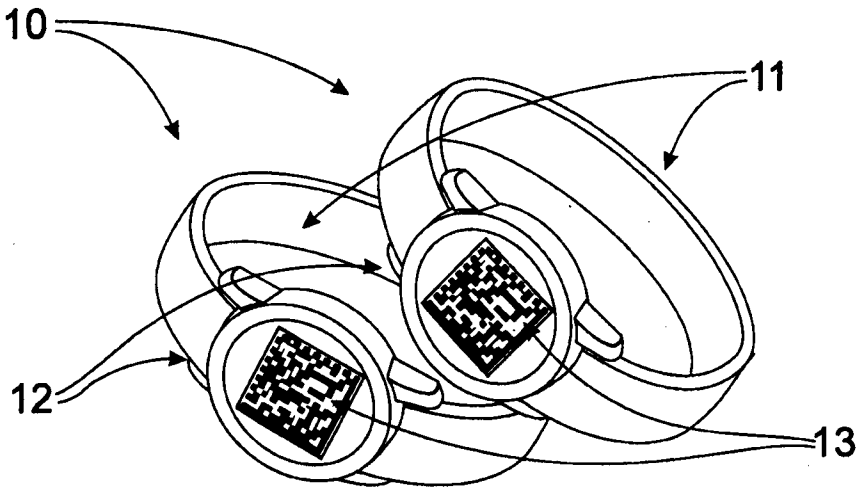


FIGURE 1

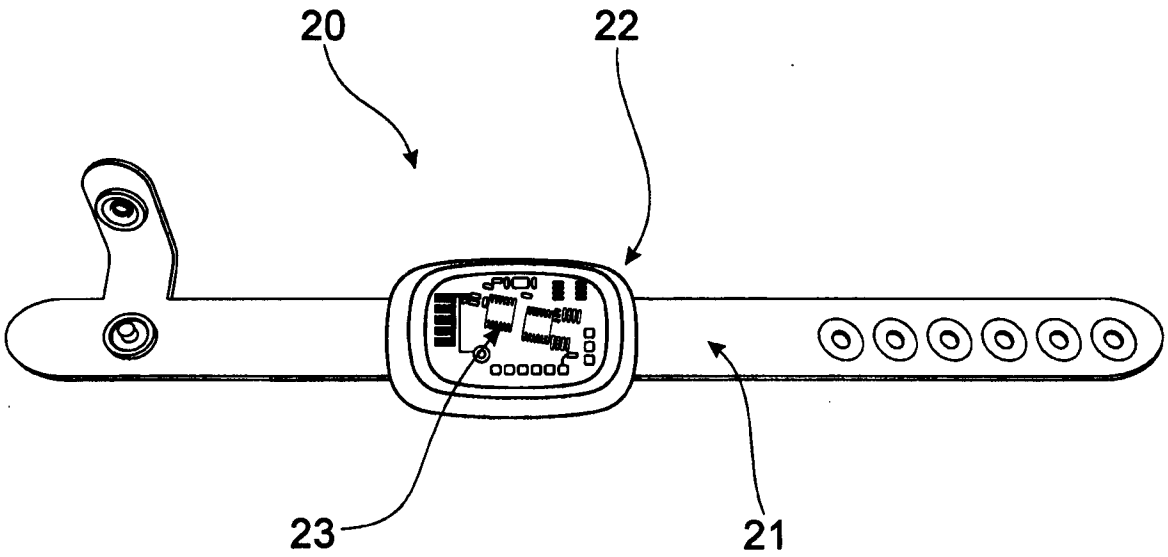


FIGURE 2

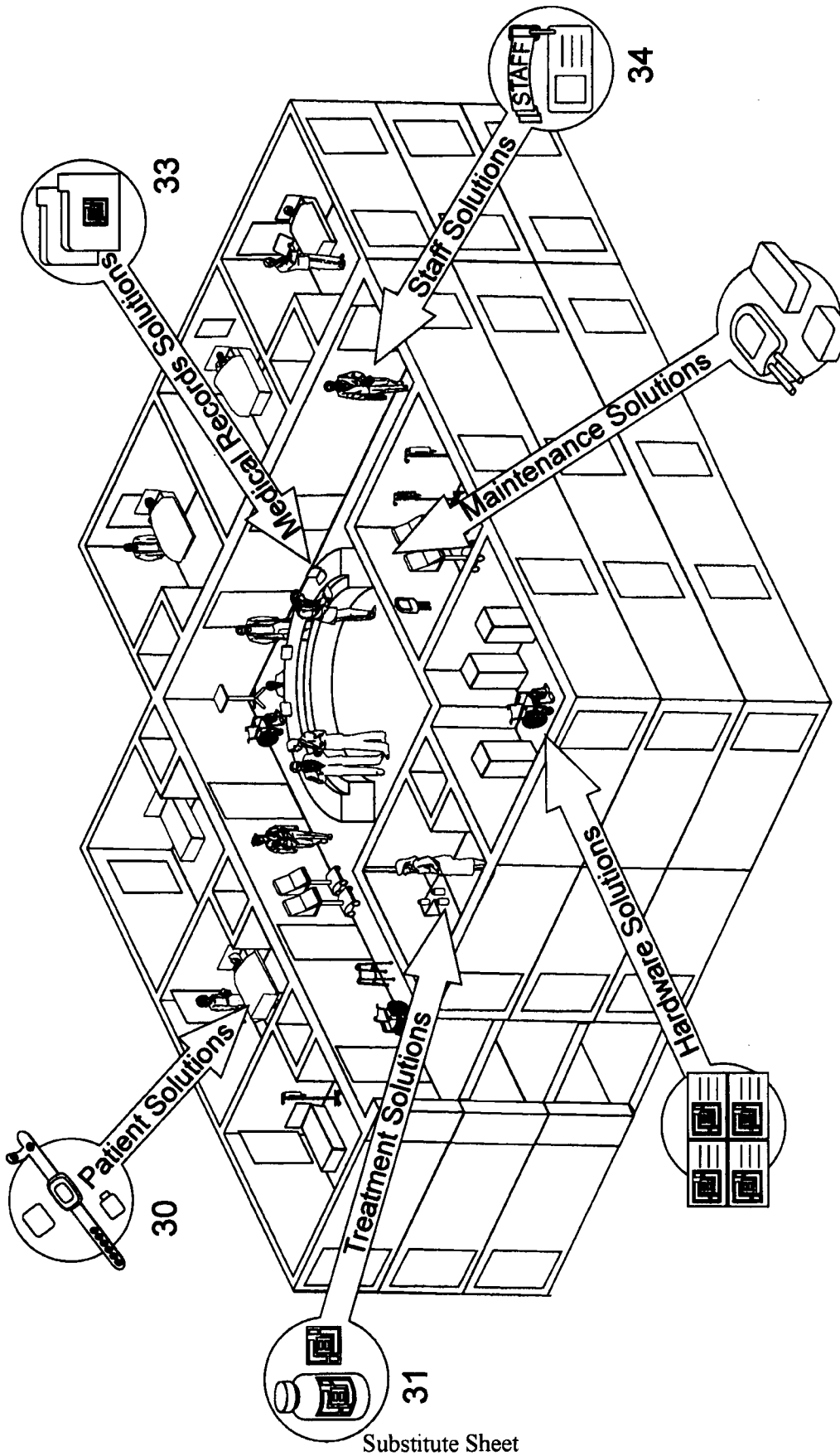
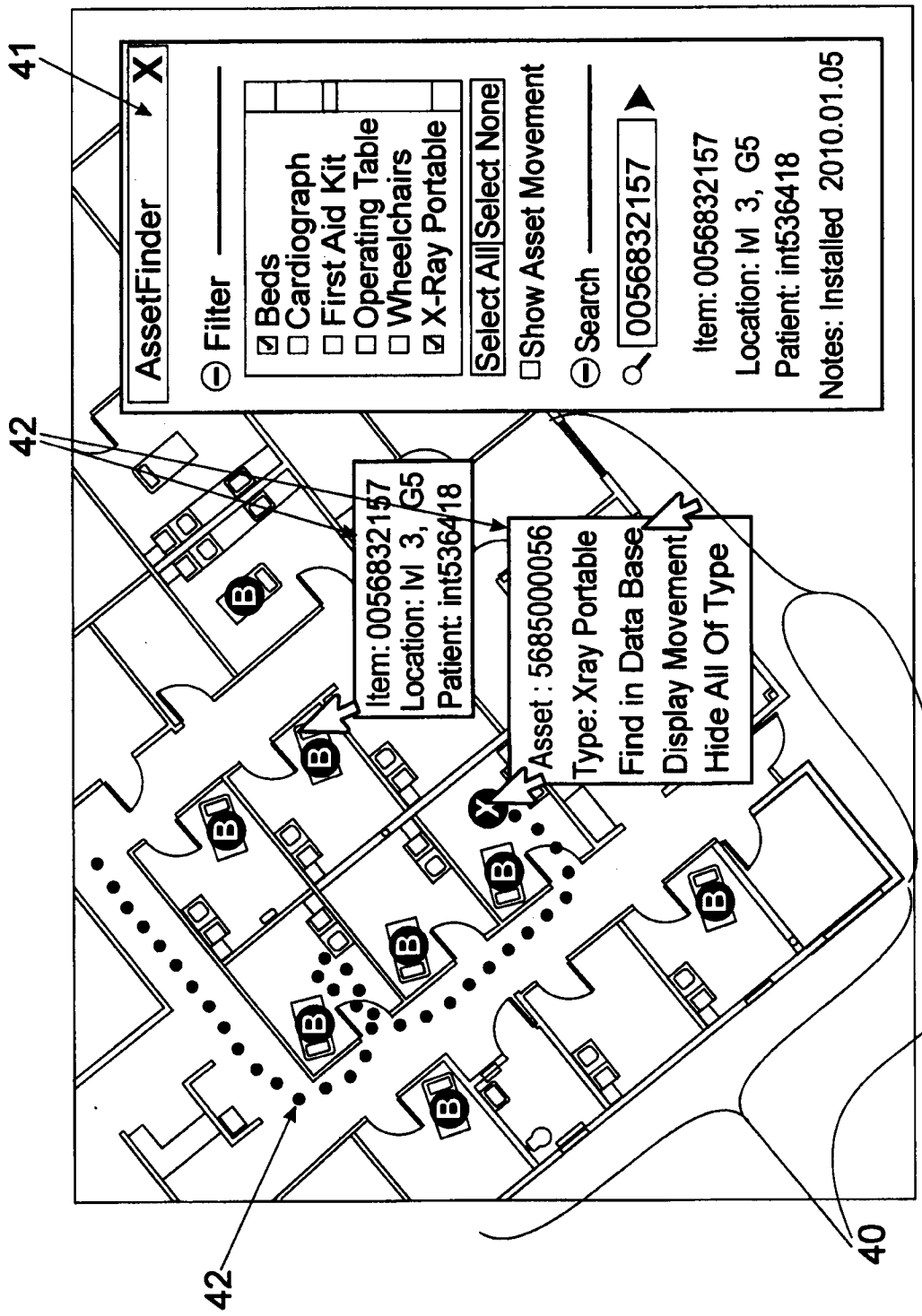

STAFF
34
33
Staff Solutions
Medical Records Solutions
35
Maintenance Solutions
Hardware Solutions
Patient Solutions
30
Treatment Solutions
31

FIGURE 3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42
42
40
AssetFinder
X
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Cardiograph
First Aid Kit
Operating Table
Wheelchairs
X-Ray Portable
Select All
Select None
Show Asset Movement
Search
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Item: 0056832157
Location: lvl 3, G5
Patient: int536418
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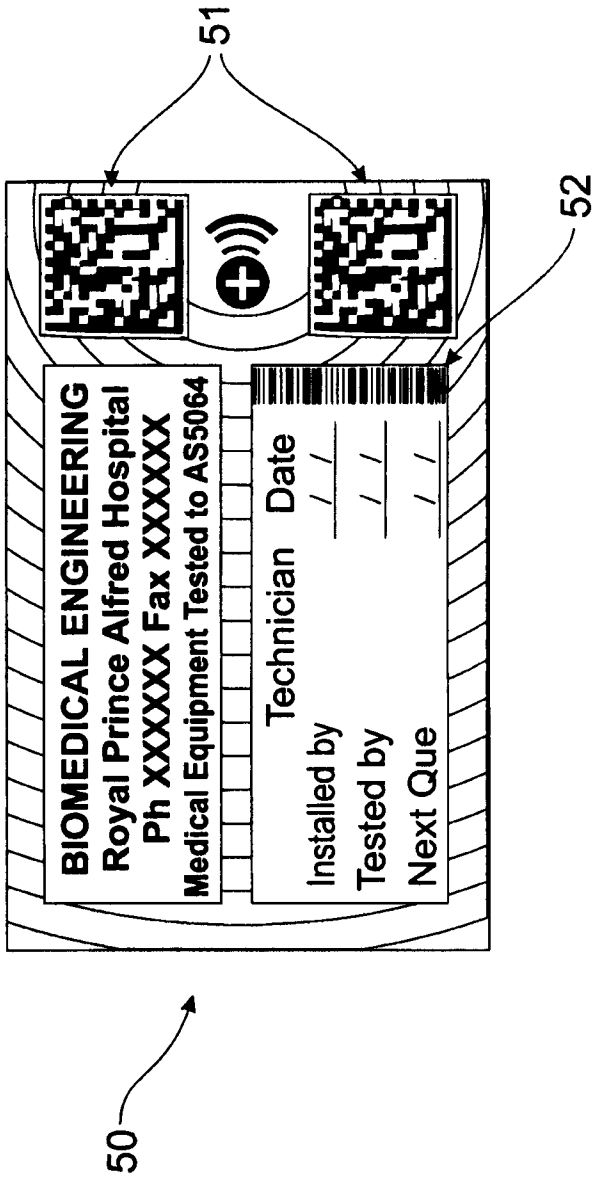
Asset : 5685000056
Type: Xray Portable
Find in Data Base
Display Movement
Hide All Of Type

FIGURE 4


51
52
BIOMEDICAL ENGINEERING
Royal Prince Alfred Hospital
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Technician Date
Installed by / /
Tested by / /
Next Que / /
50

FIGURE 5

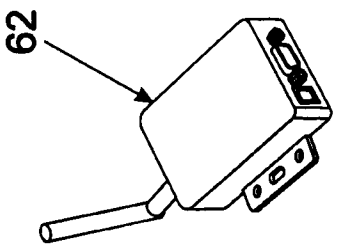

FIGURE 6c

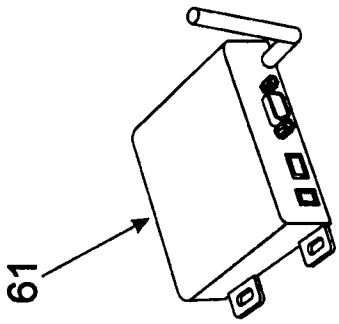

FIGURE 6b

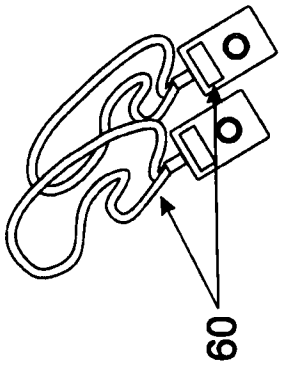

FIGURE 6a

FIGURE 7

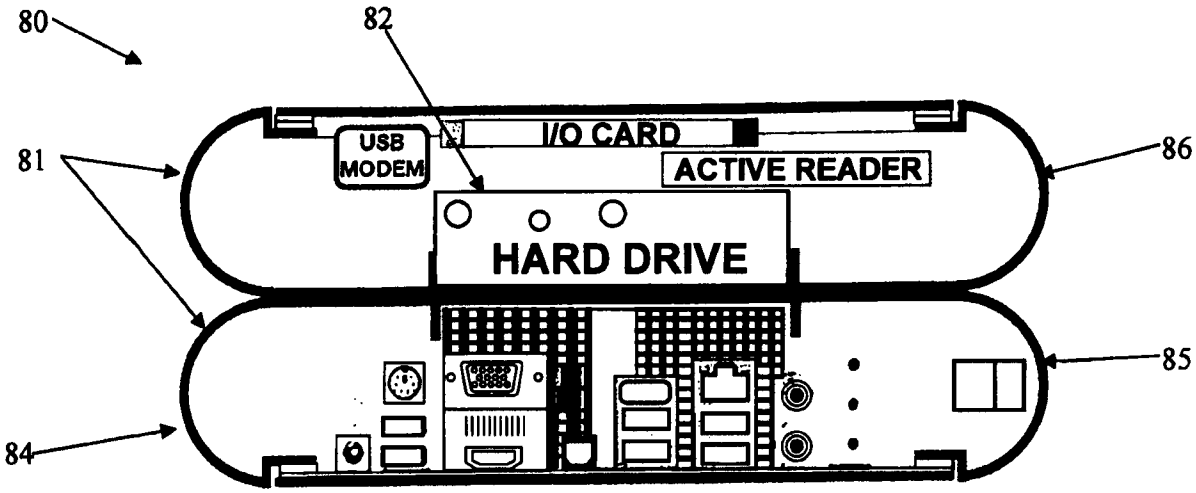

FIGURE 8

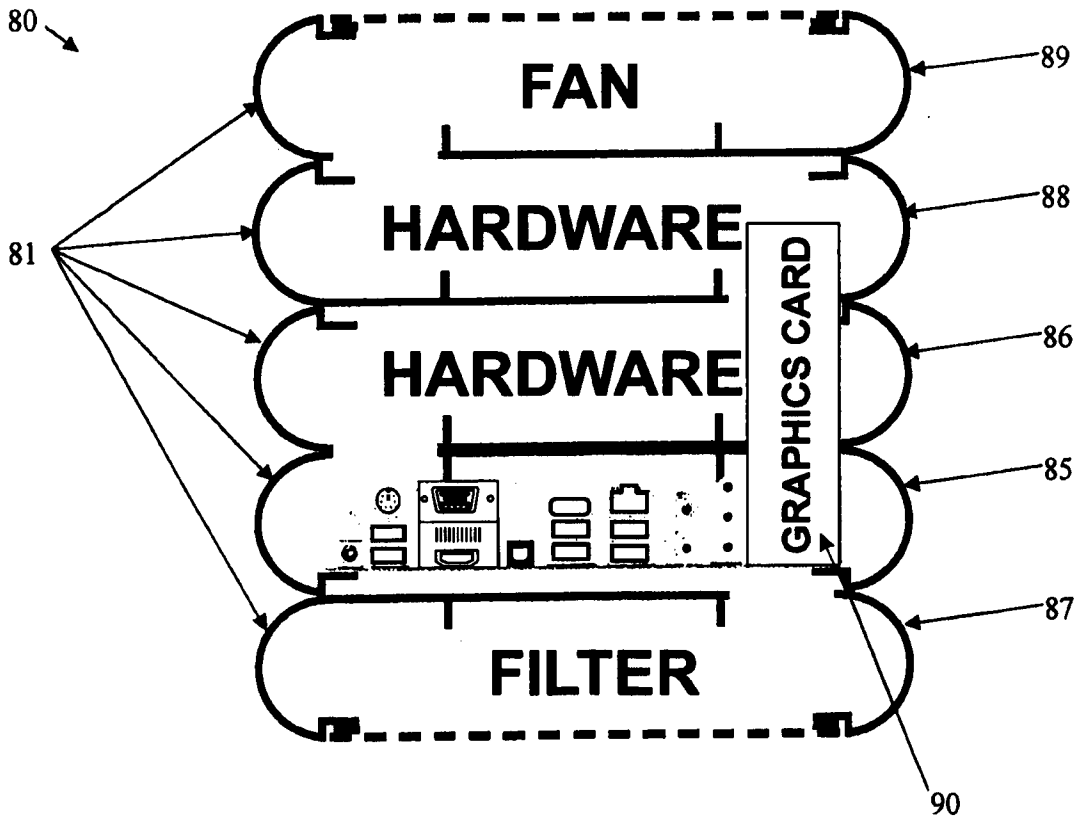

FIGURE 9

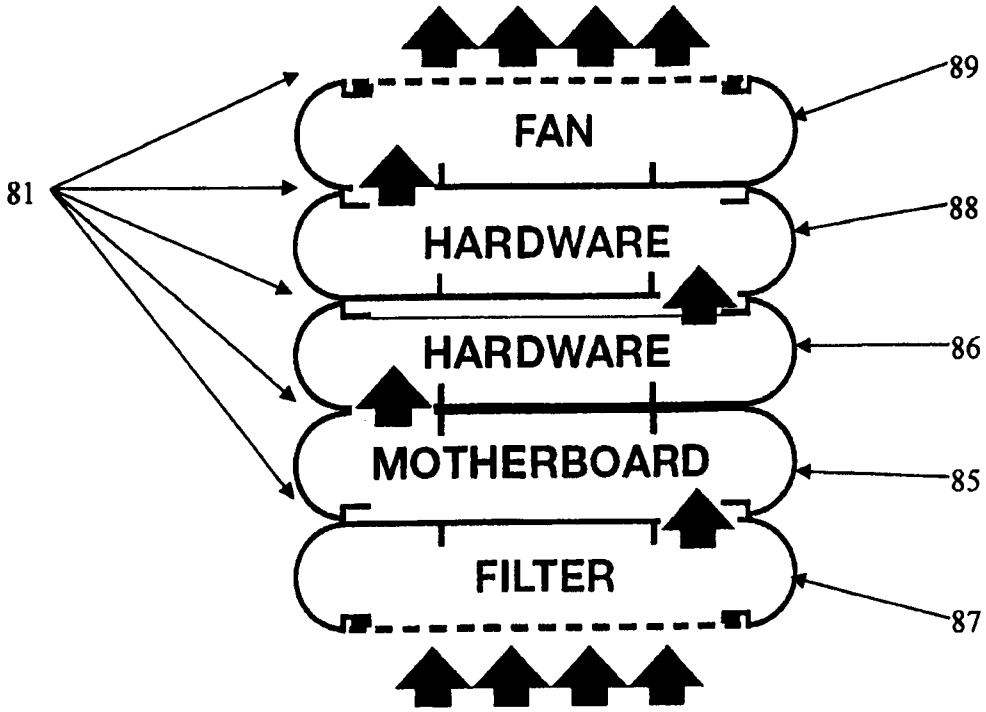

FIGURE 10

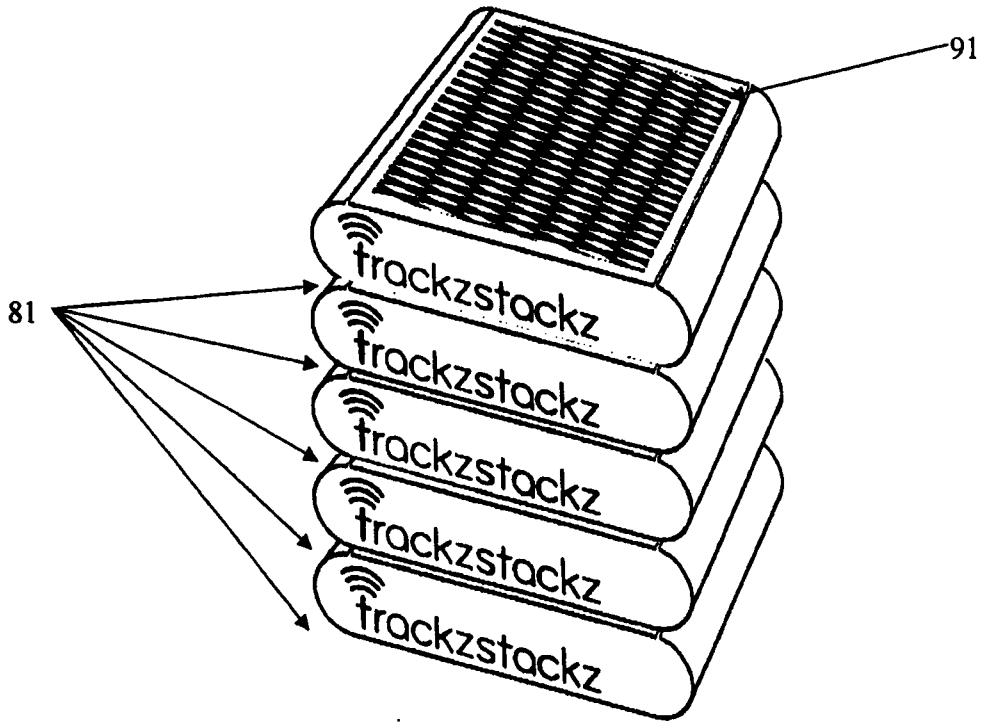

FIGURE 11

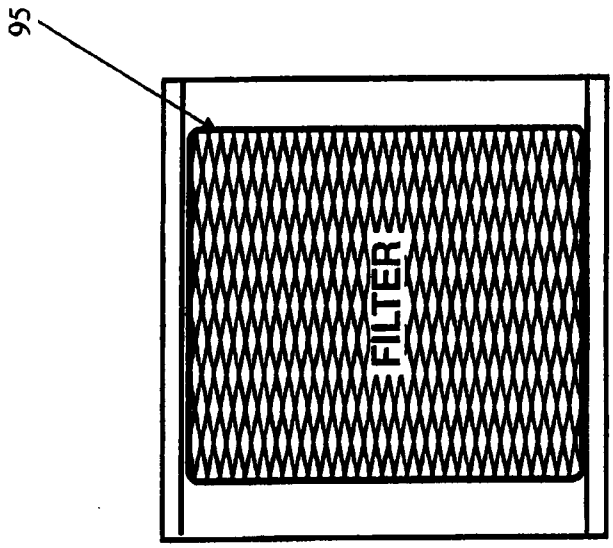

FIGURE 12c

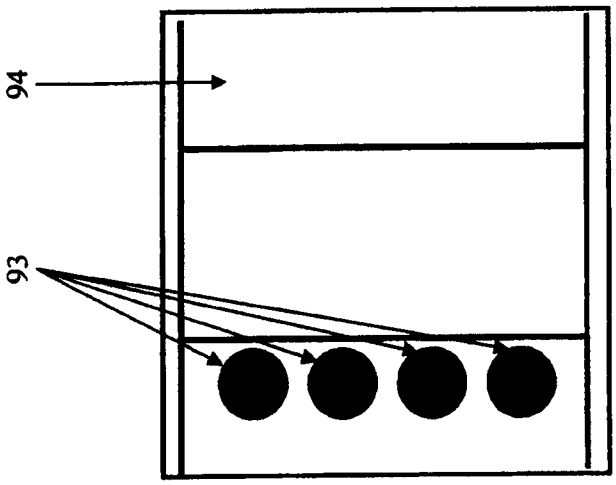

FIGURE 12b

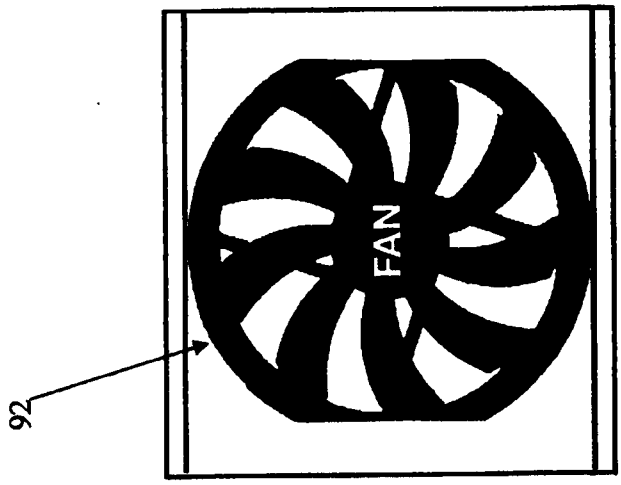

FIGURE 12a

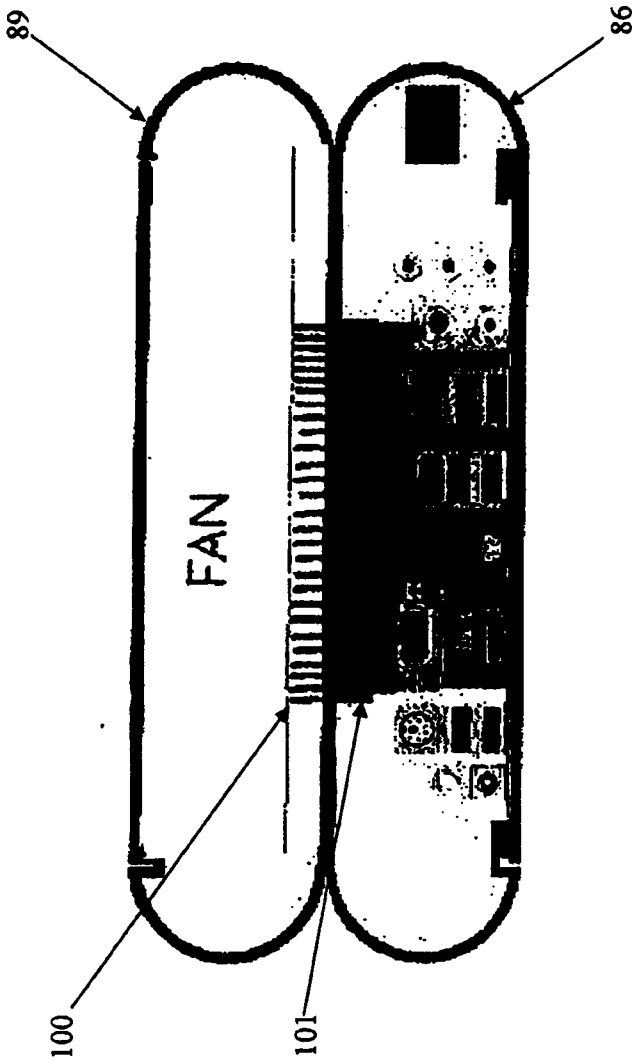

FIGURE 14

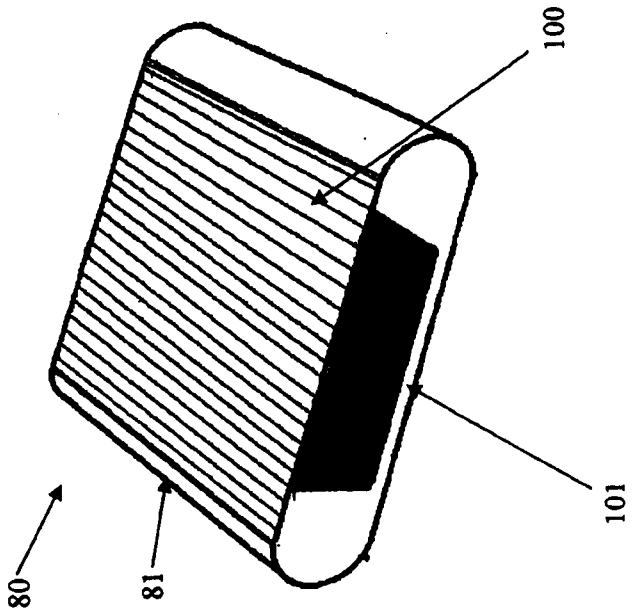

FIGURE 13

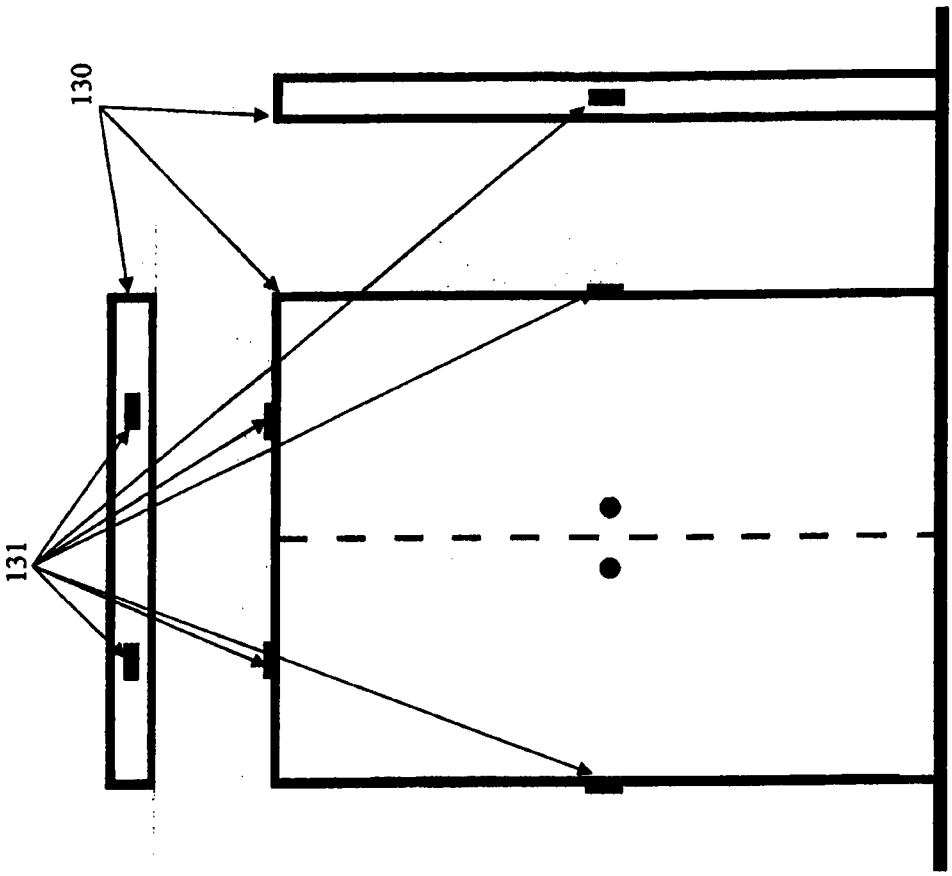

FIGURE 15b

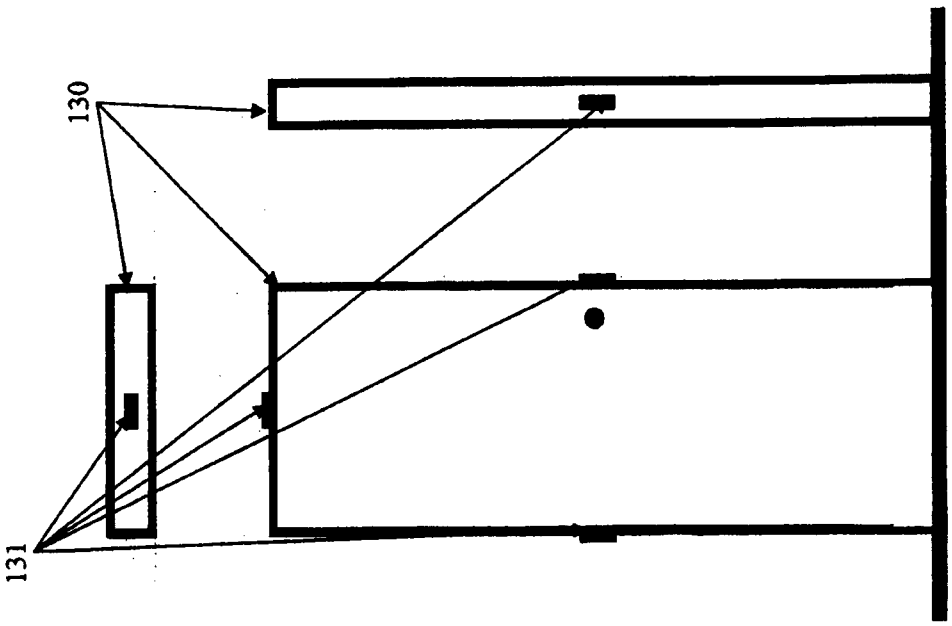

FIGURE 15a

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2011/000963

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

G08B 23/00 (2006.01) ***G06K 19/07*** (2006.01) ***G08B 29/00*** (2006.01)
G06F 19/00 (2011.01) ***G08B 19/00*** (2006.01) ***G08C 21/00*** (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPODOC, WPI: IPC, ECLA: G08B23/-, G08B29/-, G08B9/-, G08C21/-, G06F19/-, G06Q10/-, G06K19/07, A61B5/11, A01K29/00, A61D99/00 & keywords (tag, beacon, strap, band, housing, casing, log, record, memory, RAM, transmit, transcode) and like terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2008/0303638 A1 (NGUYEN et al.) 11 December 2008 Abstract; Para [0042], [0049], [0050], [0135], [0176], [0178] – [0183]; FIG. 2B, 9 and 12A	1 – 33
X	US 2008/0186139 A1 (BUTLER et al.) 07 August 2008 Abstract; Para [0778] and figures	30 and 31
X	US 2010/0156606 A1 (GOLD) 24 June 2010 Abstract ; FIG. 4 – 6; Para [0009]	30 and 31
X	US 5406263 A (TUTTLE) 11 April 1995 Abstract; FIG. 1 – 7B); col. 1, line 45 – col. 2, line 11	30 – 31

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 November 2011	29/11/2011
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **VIJAY SINGH** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2665

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2011/000963

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7382255 B2 (CHUNG) 03 June 2008	
A	US 6144301 (FRIEDEN) 07 November 2000	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2011/000963

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	2008303638	NONE					
US	2008186139	EP	1958172	EP	2147399	EP	2208390
		EP	2368235	JP	2009521740	JP	2010535365
		JP	2011516933	US	2007210923	US	2008157928
		US	2008164975	US	2008164977	US	2008180249
		US	2008186137	US	2008186138	US	2008186180
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		WO	2009058778	WO	2010065688		
US	2010156606	NONE					
US	5406263	AU	15282/97	AU	50945/96	BR	9607786
		DE	4319878	DE	4402099	EP	0826228
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		US	5300875	US	5326652	US	5365551
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		US	5627544	US	5631619	US	5646592
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US	7382255	AU	13128/02	AU	97012/01	AU	2001297675
		AU	2003207671	AU	2003236571	CA	2456098

		CA	2469146	EP	1344166	EP	1421459
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		WO	0233511	WO	02070998	WO	03012595
		WO	03062961	WO	03063055		
US	6144301	AU	61532/98	WO	9835243		

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX