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DESCRIPTION

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 61/446,369 filed February 24, 2011. This invention was made with government support under contract no. HR0011-10-C-0095 awarded by the DARPA. The government has certain rights in the invention.

FIELD

[0002] This technology generally relates to monitoring devices and methods and, more particularly, to event monitoring dosimetry apparatuses and methods thereof

BACKGROUND

[0003] Traumatic brain injury (TBI) from an explosive blast remains a significant problem for military personnel, especially those involved in counter insurgency operations. Mild to moderate TBI may be difficult to detect immediately post event, with cognitive or motor deficits manifesting weeks or months post event.

[0004] Additionally, exposure to other types of blows and other types of events is a significant problem for other individuals as well. For example, recreational and professional athletes in many sport activities are routinely exposed to blows and other types of events with unknown individual or cumulative effects. Additionally, bike and motorcycle riders may experience some type of blow or other event by way of example only.

[0005] Currently, there is no widely deployed system to dose the exposure to an explosive blast, blow or other type of event. Given the nature of TBI, the wide variability in explosions, blows and other events and as well as the physical configurations during a blast events, and the variability in human response to each blast event, a widely deployed system to all personnel in a theater is needed to build a database of sufficient size to allow real-time dosimeter data to be used for triage and to monitor and assess military and non-military personnel depending on the particular application.

[0006] US 2010/171514 describes a dosimeter employed to passively record a peak pressure (e.g., a peak blast pressure) and/or a maximum acceleration experienced by the dosimeter
US 2010/307223 provides an apparatus for recording information about an event resulting in application of a force to a body. The apparatus comprises data recording means for recording the information, sensor means for sensing a parameter which enables a predetermined source of force to be distinguished from another, different source of force, and control means responsive to the sensed parameter for controlling the data recording means. The sensor

means may comprise a pressure sensor for sensing shockwaves resulting from an explosive force and the resulting signal used to distinguish from other events, such as blunt impacts. The pressure signal may be used to control the storage of acceleration data for injury analysis.

[0007] US 7,378,954 describes a safety indicator that monitors environment conditions detrimental to humans e.g., hazardous gases, air pollutants, low oxygen, radiation levels of EMF or RF and microwave, temperature, humidity and air pressure retaining a three month history to upload to a PC via infra red data interface or phone link. Contaminants are analyzed and compared to stored profiles to determine its classification and notify user of an adversity by stored voice messages from, via alarm tones and associated flashing LED, via vibrator for silent operation or via LCD. Environmental radiation sources are monitored and auto-scaled. Instantaneous radiation exposure level and exposure duration data are stored for later readout as a detector and dosimeter. Scans for EMF allow detection with auto scaling of radiation levels and exposure durations are stored for subsequent readout.; Electronic bugs can be found with a high sensitivity EMF range setting. Ambient temperature measurements or humidity and barometric pressure can be made over time to predict weather changes. A PCS RF link provides wireless remote communications in a first responder military use by upload of alarm conditions, field measurements and with download of command instructions. The link supports reception of telemetry data for real time remote monitoring of personnel via the wrist band for blood pressure, temperature, pulse rate and blood oxygen levels are transmitted. Commercial uses include remote environmental data collection and employee assignment tasking. GPS locates personnel and reporting coordinates associated with alarm occurrences and associated environmental measurements.

[0008] US 2010/326192 describes methods and devices for a miniature, ultra-low power impact recorder for detecting, quantifying and recording the energy of an explosive blast or ballistic projectile impact. In one embodiment, the impact recorder can include a sensor comprised of an array of electromechanical resonators that is sensitive to the vibrations produced in selected, discrete frequency ranges that approximate the spectral signature characteristics of the shockwave resulting from the ballistic impact event, even after traveling through impacted material or body tissues.

[0009] US 2010/098270 describes a communication apparatus includes a bone conduction communication apparatus with a housing having a shape which is conformable to at least a portion of at least one tooth of a user; a transceiver mounted in the housing; and a transducer disposed within or upon the housing and in vibratory communication with a surface of the at least one tooth to transmit sound through the at least one tooth. A positioning system is provided to transmit positional information to the transceiver to be delivered to the transducer; and a communication device links the transceiver with a second person. The electronic and transducer assembly may receive incoming sounds either directly or through a receiver to process and amplify the signals and transmit the processed sounds via a vibrating transducer element coupled to a tooth or other bone structure, such as the maxillary, mandibular, or palatine bone structure.

SUMMARY

[0010] According to the present invention there is provided a multiple use dosimetry apparatus as defined in the appended claim 1. Further optional features of the invention are recited in the associated dependent claims.

[0011] This technology provides a number of advantages including providing a more effective and efficient event monitoring dosimetry apparatus. With this technology, event data from a blast or blow can be captured and utilized to guide evaluation of exposed individuals. Additionally, this technology can capture and provide event data that will help to provide a better understanding the mechanisms of traumatic brain injury resulting from an explosive blast, blow, or other event. Further, the exemplary cover provides improved omni-directionality, while the exemplary shock mounting enables capture of peak accelerations with lower g-accelerometers. Even further, this technology provides effective omni-directionality pressure sensors without internal processing capabilities.

[0012] This technology can be used in a variety of different applications, such as for the military, sporting activities, and other daily activities by way of example only. For military applications, this technology could be helmet mounted, helmet strap mounted, worn on the torso, and/or mounted within vehicle cabins. For sporting activities, this technology could be mounted within helmets or on uniforms. For daily activities, this could be mounted to helmets used for bicycles and motorcycles by way of example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a diagram of an exemplary event monitoring dosimetry apparatus;

FIGS. 2A-2C are perspective view of the exemplary event monitoring dosimetry apparatus;

FIG. 3 is a perspective view of the shock mounting devices in the exemplary event monitoring dosimetry apparatus

FIGS. 4A-4D are perspective views of different exemplary covers for an event monitoring dosimetry apparatus;

FIGS. 5A-5B are perspective views of exemplary dosimetry pressure sensors; and

FIG. 6 is an exemplary method for monitoring events with the exemplary event monitoring dosimetry apparatus.

DETAILED DESCRIPTION

[0014] An exemplary event monitoring dosimetry apparatus 10 is illustrated in FIGS. 1-3. The event monitoring dosimetry apparatus 10 includes a housing assembly 11 with a dosimetry processing device 12 with a memory 14, an interface device 16, a pressure sensor 18, a cover 20(1), an inertial monitoring unit 22, shock mounting system 24, mounting system 26, an atmospheric sensor 28, a power system 30, an engagement device 32, and a series of different colored LEDs with different numeric indicators 34(1)-34(3), although the apparatus 10 could include other types and numbers of systems, devices, components and elements in other configurations. This technology provides a number of advantages including provide a more effective and efficient event monitoring dosimetry apparatus.

[0015] Referring more specifically to FIG. 1, the dosimetry processing device 12 comprises one or more processors internally coupled to the memory 14 by a bus or other links, although other numbers and types of systems, devices, components, and elements in other configurations and locations can be used. The one or more processors in the dosimetry processing device 12 executes a program of stored instructions for one or more aspects of the present technology as described and illustrated by way of the examples herein, although other types and numbers of processing devices and logic could be used and the processor could execute other numbers and types of programmed instructions. The memory 14 in the dosimetry processing device 12 stores these programmed instructions for one or more aspects of the present technology as described and illustrated herein, although some or all of the programmed instructions could be stored and executed elsewhere. A variety of different types of memory storage devices, such as a solid state memory, can be used for the memory 14 in the dosimetry processing device 12. The flow chart shown in FIG. 6 is representative of example steps or actions of this technology that may be embodied or expressed as one or more non-transitory computer or machine readable instructions stored in memory 14 that may be executed by the one or more processors.

[0016] The interface device 16 in the dosimetry processing device 12 is used to operatively couple and communicate between the dosimetry processing device 12 and one or more external computing or storage devices, although other types and numbers of communication networks or systems with other types and numbers of connections and configurations can be used.

[0017] Although an example of the dosimetry processing device 12 is described herein, it can be implemented on any suitable computer system or computing device. It is to be understood that the devices and systems of the examples described herein are for exemplary purposes, as many variations of the specific hardware and software used to implement the examples are possible, as will be appreciated by those skilled in the relevant art(s).

[0018] Furthermore, the system of the examples may be conveniently implemented using one or more general purpose computer systems, microprocessors, digital signal processors, and micro-controllers, programmed according to the teachings of the examples, as described and illustrated herein, and as will be appreciated by those ordinary skill in the art.

[0019] One or more aspects of examples may also be embodied as a non-transitory computer readable medium having instructions stored thereon for one or more aspects of the present technology as described and illustrated by way of the examples herein, as described herein, which when executed by a processor, cause the processor to carry out the steps necessary to implement the methods of the examples, as described and illustrated herein.

[0020] The pressure sensor 18 is coupled to the dosimetry processing device 12, although the pressures sensor 18 could be coupled to other types and numbers of devices. In this example, the pressure sensor 18 is a single pressure sensor to help achieve low cost and disposability parameters, although other types and numbers of pressure sensors could be used. Additionally, in this example the pressure sensor 18 is insensitive to direction and will substantially detect the same pressure waveform independent of the relative orientation of the pressure sensor 18 to the pressure front, although the pressure sensor could have other degrees of improved directional sensitivity, such as fifty percent or more by way of example only. To have multi-directional sensitivity, in this example the pressure sensor 18 is positioned below a wire mesh dome cover 20(1) which extends out and away from the housing 11, although other types of covers could be used to enable multi-directional sensing by the pressure sensor 18.

[0021] The mesh dome cover 20(1) comprises a very fine mesh layer, which acts as a filter for particles, sandwiched between two larger mesh layers used for structural strength, although the mesh dome cover 20(1) can be made with other types and numbers of layers. Additionally, the mesh dome cover 20(1) can be made of a variety of different types of materials, such as metallic materials, non-metallic materials, and fabric weaves as well as combinations of different materials by way of example only. Further, a floating body, such as a sphere or beads which are loose, other structures such as beads which are packed in and can not move or a porous matrix structure also may also be inserted within the mesh dome cover 20(1) to improve omni-directionality. Further, a check valve 70 can be situated within the mesh dome cover 20(1) to improve omni-directionality as shown in FIG. 2C.

[0022] By way of example only, other types of covers 20(2)-20(5) which could be seated over and utilized to assist with multi-directional sensitivity of the pressure sensor 18 are illustrated in FIGS. 4A-4D. For example: the cover 20(2) has a plurality of funnel shaped passages 44 angled towards the center; the cover 20(3) has a centralized funnel shaped structure 46 designed to direct the compression wave to the interior of the dosimetry apparatus 10; the cover 20(4) has a plastic dome 48 with perforations; and the cover 20(5) has a matrix of perforations 50 which all are designed to operate as cover 20(1) with or without any added structures as discussed above, although other types and numbers of covers with other shapes and configurations and which may incorporate a porous matrix to improve uniformity and/or fine mesh screen for dust exclusion could be used.

[0023] Referring back to FIG. 1, the inertial monitoring unit 22 is a low-g (for example 16g) three -axis accelerometer to capture linear acceleration in three axes, although other types (such as a high-g accelerometer, for example >100g) and numbers of inertial measurement units could be used. For example, the inertial measurement unit 22 could be a gyroscope which records rotational acceleration. To account for differences in pressure readings from the pressure sensor 18 which depend on the incident direction of the force, the three-axis acceleration information from the inertial monitoring unit 22 can be used by the dosimetry processing device 12 to determine the vector of movement coincident with the arrival of the pressure shock front. This indicates the relative angle of the dosimetry apparatus 10 to the force allowing for compensation of the measured pressure profile including the levels of the stored reading thresholds to improve accuracy and precision with respect to the obtained readings and the identification of events.

[0024] Referring to FIGS. 3, the shock mounting system 24 is used to suspend a printed circuit board 56 which has the dosimetry processing device 12 with the memory 14, the interface device 16, the pressure sensor 18, the inertial monitoring unit 22, the atmospheric sensor 28, and the power system 30 in the housing 11, although other types and numbers of elements and other components could be on the printed circuit board and suspended. The result is an expansion of the dynamic range of the dosimetry apparatus 10 at the expense of resolution. The physical gap between the printed circuit board 56 and the housing 11 is determined by the mass and maximum acceleration impulse.

[0025] In this example, the shock mounting system 24 includes elastic suspension devices 52 and viscoelastic polymer bushings 54, although the apparatus 24 can include other types and numbers of shock mounting systems, such as a grease damping system. Additionally, in this example the printed circuit board 56 is suspend by three points using the elastic suspension devices 52, although the printed circuit board 56 could be suspended by other numbers of points in other manners and other systems, device, and components could be suspended, such as just the inertial monitoring unit 22. The use of the two attenuation schemes with the shock mounting system 24, such as the elastic suspension devices 52 and the viscoelastic polymer bushings 54 in this example, provides a multiplicative effect reducing the requirements on each of these shock mounting systems. This also reduces the required space between the printed circuit board 56 and the housing 11 which reduces the overall size of the dosimetry apparatus 10.

[0026] Referring to FIG. 2C, the mounting system 26 is used to mount the housing 11 of the dosimetry apparatus 10 to an entity, such as an object or person. In this example, the mounting system 26 comprises a strap that can be mounted to a helmet strap or fabric webs on uniforms, although other types of mounting systems 26 could be used. The helmet strap for the mounting system 26 must be non-stiff/flexible/elastomeric, so as to damp any incident vibration/shock, but short enough and well fixed enough to couple the dosimeter effectively into the mass you are trying to measure. Detachably/compliantly mounting of the dosimeter apparatus 10 with a mounting system 26, such as the illustrated helmet strap by way of example allows mounting more directly to a lower stiffness location which in turn couples the dosimetry apparatus 10 into a higher mass than traditional helmet mounting. This coupling provides more significant acceleration measurements for risk injury assessment than connection to a detached part of a wearer, such as a helmet. Both the lower stiffness of the mounting strap and the higher mass the dosimetry apparatus 10 is attached to are part of the lower resultant acceleration.

[0027] By way of example only, other types of mounting systems 26 may include adhesive, hook and loop mating fasteners, fabric wraps with hook and loop mating fasteners, elastic straps with or without snaps, hooks, grommet snaps embedded in the housing and attached to a helmet strap, and non-elastic straps with a tightening mechanism. The manners by which these attachment mechanisms operate are well known to those ordinary skill in the art and thus will not be described in detail here. For example, the elastic strap can comprise an elastic loop that hooks onto a portion of the housing 11, wraps around the desired entity, and attaches to another portion of the housing to secured the housing 11.

[0028] The atmospheric sensor 28 is coupled to the dosimetry processing device 12 and provides atmospheric readings within the dosimetry apparatus 10, although other types and numbers of atmospheric monitors could be used and the atmospheric sensor 28 could be positioned to take other readings

[0029] The power system 30 includes a battery 36 coupled to a regulator 38 which is coupled to the dosimetry processing device 12, although other types of power systems with other types and numbers of components, such as one with an energy harvester and/or without a regulator 38 could be used. The regulator 38 is coupled to regulate power provided by the battery 36 to the dosimetry processing device 12. Additionally, in this example power for the pressure sensor 18, the inertial measurement unit 22, the atmospheric sensor 28, and/or the strain gauge 29 is coupled directly from the dosimetry processing device 12 to save power, although other types and numbers of devices and systems could be coupled directly to the dosimetry processing device 12 to provide power. Additional, power management may be achieved through stored programmed instructions executed by the dosimetry processing device 12 for a standard monitoring mode, a lower power monitoring mode and a sleep mode, although other types and numbers of modes can be used. The inertial measurement unit 22 provides data to the dosimetry processing device 12 to identify periods of inactivity to trigger the lower power standby mode when minimal activity is identified or sleep mode when prolong periods of inactivity are identified for power savings. Activity sensing by the inertial measurement unit 22 enables the dosimetry processing device 12 to switch to standard monitoring mode with a high sampling rate for the inertial measurement unit 22 and pressure sensor 18 by way of example. In this example, all peripheral devices, such as pressure sensor 18, inertial measurement unit 22, and atmospheric sensor 28 by way of example only, are powered through digital input/output (I/O) pins 72 on the processor in the dosimetry processing device 12 rather than from a power bus. This allows peripheral devices to be turned off via the processor in the dosimetry processing device 12 saving power. The regulator 38 is enabled through an I/O input/output (I/O) pin on the processor in the dosimetry processing device 12. This allows the dosimetry processing device 12 to be completely turned off to extend shelf life. The dosimetry processing device 12 is activated either through the button or powering through USB

[0030] The engagement device 32, such as a button by way of example only, is coupled to the dosimetry processing device 12, although the engagement device could be coupled in other manners. The engagement device 32 can be used to request an output of readings including of identified events, stored events and/or assessments of the readings. Additionally, other types and numbers of mechanisms for engaging the dosimetry processing device 12 can be used, such as another computing device coupling to the dosimetry processing device 12 through the interface 16 to request and obtain output data and other information, download a time and date stamp, set and/or reprogram criteria and other parameters by way of example only.

[0031] The series of different colored LEDs with different numeric indicators 34(1)-34(3) are used to provide a status indication for the output stored readings and of the assessment of the stored readings associated with identified events to provide immediate triage of the severity of an event, although other types and numbers of displays which provide other types of outputs can be used. In this example, LED 34(1) is green colored and has a numeric indicator of zero, LED 34(2) is yellow colored and has a numeric indicator of one, and LED 34(1) is red colored and has a numeric indicator of two, although other colors and symbols could be used.

[0032] Referring to FIGS. 5A-5B examples of dosimetry pressure sensing apparatuses 55(1) and 55(2) are illustrated. The dosimetry pressure sensing apparatuses 55(1) and 55(2) are the same as the dosimetry apparatus 10, except as described and illustrated herein. In this example, the dosimetry pressure sensing apparatus 55(1) has a pressure sensor 18 in a housing 60 with a cover 20(1) seated over the pressure sensor 18, although the dosimetry pressure sensing apparatuses could have other numbers and types of system, devices and elements in other configurations. Additionally, the dosimetry pressure sensing apparatuses 55(1) has conductors 62 coupled to the pressure sensor 18 extending out from the housing 60 to couple to an external processing device as opposed to the internal processing device 12 in dosimetry apparatus 10. Additionally, in this example, the dosimetry pressure sensing apparatus 55(2) has two pressure sensors 18 on opposing sides of the housing 60 with a cover 20(1) seated over each of the pressure sensors 18, although the dosimetry pressure sensing apparatuses could have other numbers and types of system, devices and elements in other configurations, such as other locations for and numbers of pressure sensors. Additionally, the dosimetry pressure sensing apparatuses 55(2) has conductors 62 coupled to each of the pressure sensors 18 extending out from the housing 60 to couple to an external processing device as opposed to the internal processing device 12 in dosimetry apparatus 10.

[0033] Referring to FIG. 6, an exemplary method for monitoring events with the exemplary event monitoring dosimetry apparatus will now be described. At step 100, at least one dosimetry apparatus 10 is secured using the mounting system 26 to a location on an object, although other types and manners for securing the one or more dosimetry apparatuses 10 to the object can be used.

[0034] In step 102, the dosimetry processing device in the dosimetry apparatus 10 obtains readings from a single pressure sensor 18 and the inertial measurement unit 22, although the dosimetry apparatus 10 can obtain readings from other types and numbers of sensors. In this example, the pressure sensor 18 is a single pressure sensor which obtains pressure readings, although other types and numbers of pressure sensors could be used. Additionally, in this example, the inertial measurement unit 22 is a three-axis accelerometer which obtains linear acceleration readings in real time, although other types of inertial measurement units can be used, such as a gyroscope which obtains rotational acceleration readings.

[0035] In step 104, the dosimetry processing device 12 stores the obtained pressure readings from the pressure sensor 18, acceleration readings from the inertial measurement unit 22, and atmospheric readings from the atmospheric sensor 28, although other types and amounts of readings and other data could be stored in other locations and manners.

[0036] In step 106, the dosimetry processing device 12 also may conduct an analysis based on the obtained pressure readings, acceleration readings and/or atmospheric readings, although other types and numbers of analyses based on other readings and data can be performed. Additionally, the dosimetry processing device 12 assesses the severity of the event based on the obtained pressure readings, acceleration readings, and/or atmospheric readings, although other manners for conducting an analysis can be used. The dosimetry processing device 12 stores the conducted analysis and assessed severity in memory 14, although the conducted analyses assessed severity can be stored in other locations and manners.

[0037] In step 108, the dosimetry processing device 12 determines whether an output is requested, such as by activation of the engagement device 32 or a request via the interface 16, such as a USB, from another computing device, although other manners for output requests could be used. The activating of the engagement device could trigger a display on one of the LEDs 34(1)-34(3), although other types of outputs could be triggered, such as an output of data and other information. The engagement device 32 also can have other functions, such as providing outputting different information based on a number of times the button is pressed or the length of time the button is pressed or powering on or off the dosimetry apparatus 10. The request for data through the interface 16 from another computing device can be for all or requested portions of the stored data. If in step 108, the dosimetry processing device 12 determines an output has not been requested, then the No branch is taken back to step 102 as described earlier. If in step 108, the dosimetry processing device 12 determines an output has been requested, then the Yes branch is taken back to step 110. In step 110, the dosimetry processing device 12 provides the requested output, such as a display on one of the LEDs 34(1)-34(3) or an output of one or more of the stored readings, the identified event, a determined injury risk assessment based on the conducted analysis, data relating to switches between power modes, data relating to output requests, and/or identified false positive events and related data by way of example only via the interface 16, although the information could be output to other devices, other types and amounts of information and other data could be provided and the information and data can be obtained in other manners, such as through a connection with another computing device interacting with the dosimetry processing device 12 via the interface 16 . In this example, the dosimetry processing device 12 can output the identified event with determined injury risk assessment based on the conducted analysis by illumination of one of the LEDs 34(1) with a numeric indicator in response to the activation by the engagement device 32, although other types and amounts of information could be provided. For example, if the determined injury risk assessment for the identified event is moderate, e.g. within a first range of one or more of the first thresholds then the yellow colored LED 34(2) with the numeric indicator of one is illuminated/flashed. If the determined injury risk assessment for the identified event is severe, e.g. above a first range of one or more of the first thresholds then the red colored LED 34(3) with the numeric indicator of two is illuminated/flashed. If there is no event recorded, the green colored LED 34(1) with the numeric indicator of zero is illuminated. Additionally, a requested output could trigger the dosimetry processing device 12 to output the stored readings, determined direction and other data described in the examples herein with or without the assessment information via the interface device 16 to another computing device. Next, this method can return back to step 102 until the exemplary dosimetry apparatus 10 is turned off or the power runs out.

[0038] Accordingly, as illustrated and described with reference to the examples herein this technology provides a more effective and efficient event monitoring dosimetry apparatus. With this technology, event data from a blast or blow can be captured and utilized to provide real time analysis of exposed individuals. Additionally, this technology can capture and provide event data that will help to provide a better understanding the mechanisms of traumatic brain injury resulting from an explosive blast, blow, or other event.

[0039] Having thus described the basic concept of the invention, it will be rather apparent to those skilled in the art that the foregoing detailed disclosure is intended to be presented by way of example only, and is not limiting. Various alterations, improvements, and modifications will occur and are intended to those skilled in the art, though not expressly stated herein. Additionally, the recited order of processing elements or sequences, or the use of numbers, letters, or other designations therefore, is not intended to limit the claimed processes to any order except as may be specified in the claims. The invention is defined by the appended claims.

REFERENCES CITED IN THE DESCRIPTION

Cited references

liability in this regard.

Patent documents cited in the description

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- US2010307223A **[0006]**
- US7378954B **[0007]**
- US2010326192A **[0008]**
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PATENTKRAV

1. Dosimetriindretning (10) omfattende:

en tryksensor (18), der kan detektere en trykbølgeform tilvejebragt i et hus (11);

en afdækning (20(1)), der er konfigureret til tillade passage af kompressionsbølger derigennem, hvilken afdækning (20(1)) er placeret over sensoren (18) og omfatter en netstruktur omfattende et partikelfiltreringsnetlag konfigureret til udelukke støv, der har sat sig på et strukturelt netlag konfigureret til tilvejebringe strukturel integritet til partikelfiltreringsnetlaget; og

en dosimetribehandlingsanordning (12) med en hukommelse (14) koblet til sensoren (18) i huset (11), hvilken dosimetribehandlingsanordning (12) er konfigureret til eksekvere programmerede instruktioner i hukommelsen (14) omfattende opnåelse af aflæsninger fra sensoren (18), lagring af de opnåede aflæsninger, udførelse af en analyse baseret på de opnåede aflæsninger og udsendelse af mindst én af de lagrede aflæsninger eller den udførte analyse,

hvor

afdækningen (20(1)) omfatter anbragte åbninger, perforeringer eller passager, der muliggør følsomhed i flere retninger, således at tryksensoren (18) har følsomhed i flere retninger.

2. Indretning (10) ifølge krav 1, og som endvidere omfatter mindst én leder (62), der er koblet til sensoren (18) og strækker sig ud fra huset (11).

3. Indretning (10) ifølge krav 1 eller 2, hvor netstrukturen endvidere omfatter en kontraventil (70), der styrer strømninger ind i huset (11).

4. Indretning (10) ifølge et hvilket som helst foregående krav, og som endvidere omfatter et flydende legeme placeret inde i netstrukturen.

5. Indretning (10) ifølge et hvilket som helst foregående krav, og som endvidere omfatter perlestrukturer pakket inde i netstrukturen.

6. Indretning (10) ifølge et hvilket som helst foregående krav, og som endvidere omfatter en porøs matrixstruktur inde i netstrukturen.

7. Indretning (10) ifølge et hvilket som helst foregående krav, hvor indretningen omfatter en inertimåleenhed (22).

8. Indretning (10) ifølge et hvilket som helst foregående krav, og som endvidere omfatter en visningsenhed koblet til dosimetribehandlingsanordningen (12), hvilken visningsenhed er konfigureret til illustrere de lagrede aflæsninger.

9. Indretning (10) ifølge krav 8, hvor visningsenheden omfatter en flerhed af forskellige farvede statusindikatoranordninger (34(1), 34(2), 34(3)) hver med et forskelligt symbol til at illustrere et alvorsniveau for den lagrede aflæsning.

10. Indretning (10) ifølge krav 9, og som endvidere omfatter en indgrebsanordning (32) koblet til dosimetribehandlingsanordningen (12), hvor dosimetribehandlingsanordningen (12) er konfigureret til eksekvere programmerede instruktioner, der er lagret i hukommelsen, og som endvidere omfatter tilvejebringelse af en statusindikator for de lagrede aflæsninger på visningsenheden som reaktion på en aktivering af indgrebsanordningen (32).

11. Indretning (10) ifølge et hvilket som helst foregående krav konfigureret til kobling af effekt til mindst én perifer enhed direkte fra dosimetribehandlingsanordningen (12).

12. Indretning (10) ifølge krav 7, og som endvidere omfatter:

en stødsikker monteringsindretning (24) konfigureret til stødsikker montering af inertimåleenheden (22) i huset (11); og

hvor dosimetribehandlingsanordningen (12) med en hukommelse (14) er koblet til inertimåleenheden (22) i huset (11).

13. Indretning (10) ifølge et hvilket som helst foregående krav, og som endvidere omfatter en monteringsindretning (26) forbundet med huset (11) til at montere huset (11) på en enhed, hvor monteringsindretningen (26) omfatter mindst én af klæbestof, velcrolukning, stofindpakninger med velcrolukning, elastikbånd, kroge, trykknapper indlejret i huset (11) og kan fastgøres til en hjelmrem eller ikke-elastiske bånd med en spændeanordning.

DRAWINGS

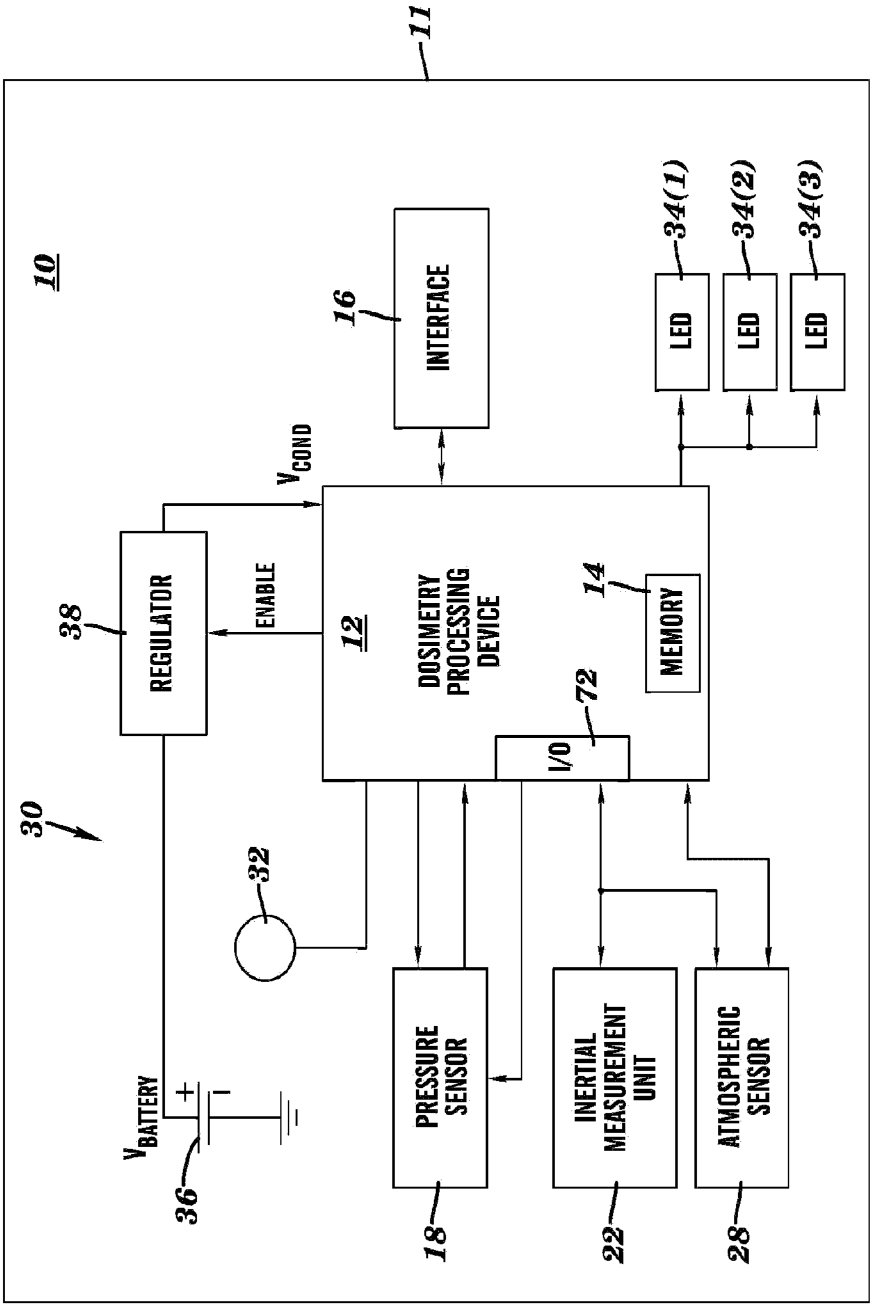

FIG. 1

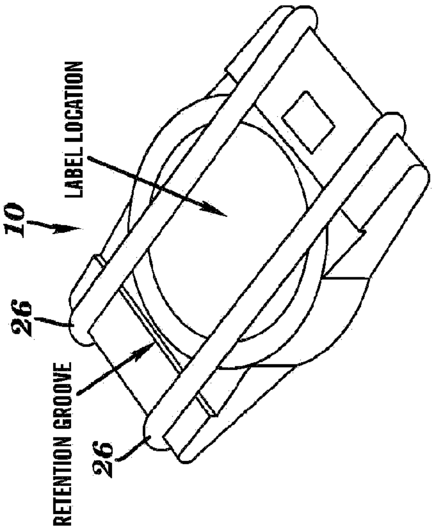

FIG. 2B

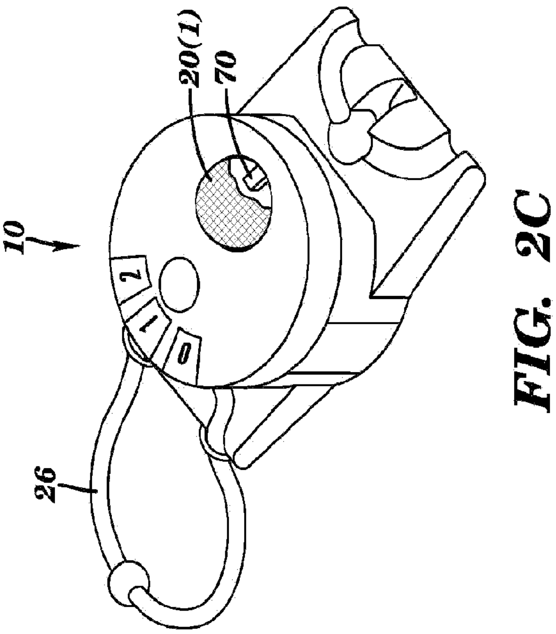

FIG. 2C

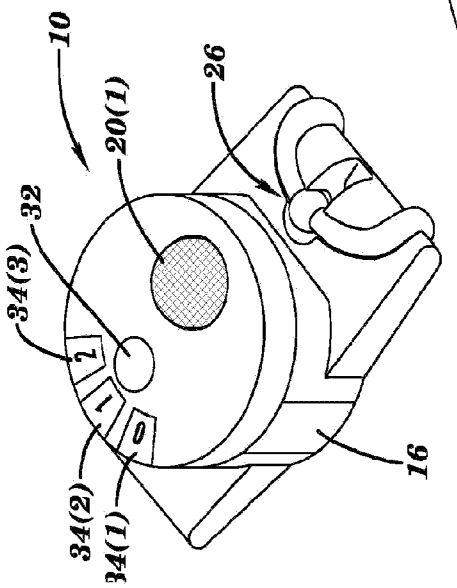

FIG. 2A

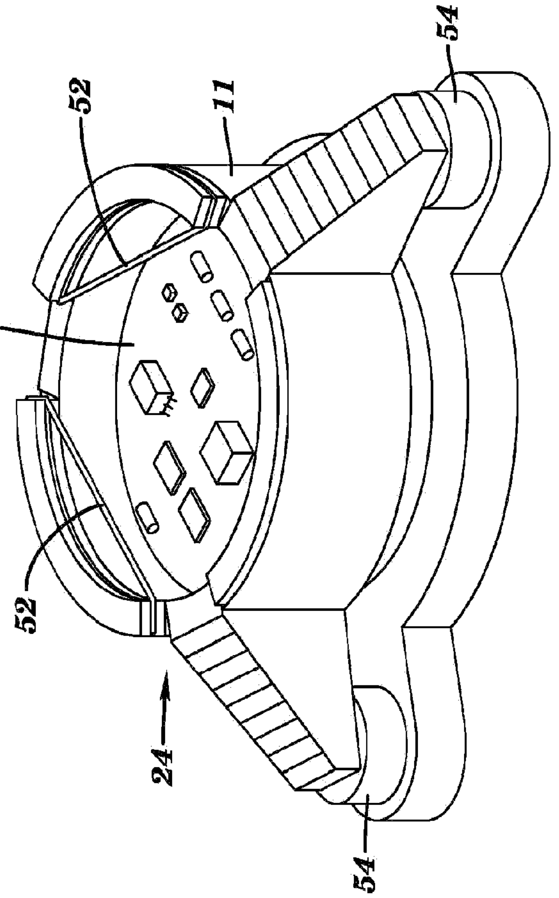

FIG. 3

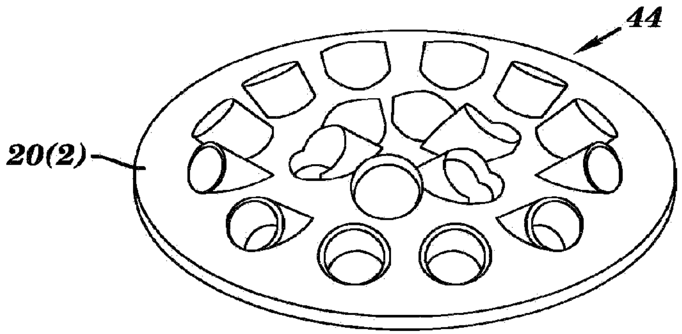

FIG. 4A

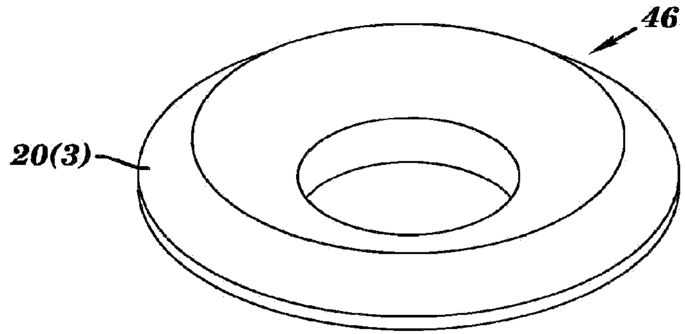

FIG. 4B

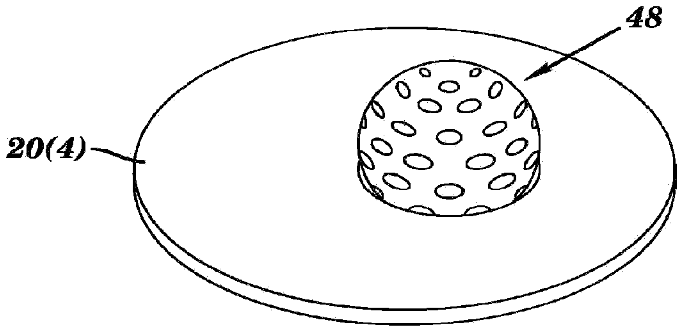

FIG. 4C

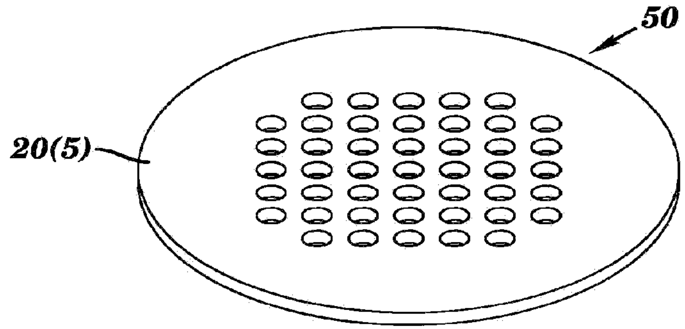

FIG. 4D

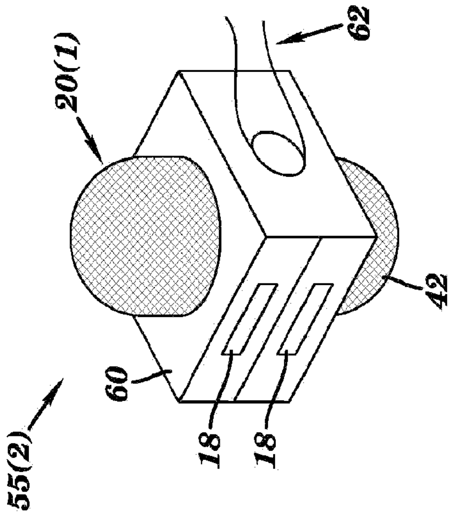

FIG. 5B

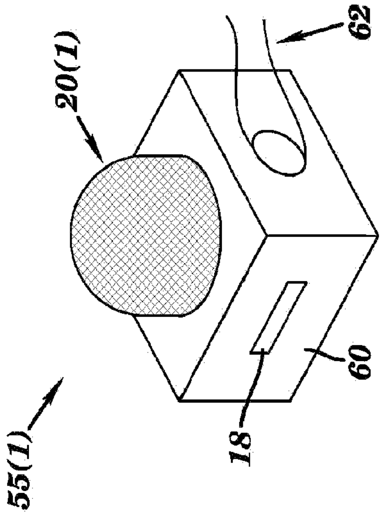

FIG. 5A

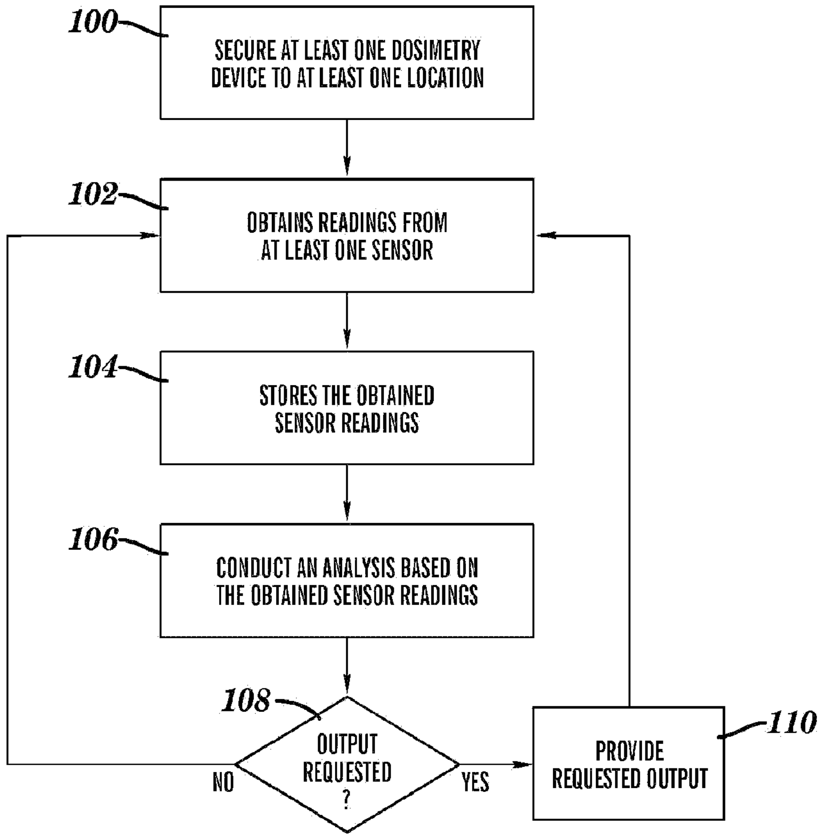
100
SECURE AT LEAST ONE DOSIMETRY DEVICE TO AT LEAST ONE LOCATION
102
OBTAINS READINGS FROM AT LEAST ONE SENSOR
104
STORES THE OBTAINED SENSOR READINGS
106
CONDUCT AN ANALYSIS BASED ON THE OBTAINED SENSOR READINGS
108
OUTPUT REQUESTED ?
NO
YES
PROVIDE REQUESTED OUTPUT
110

FIG. 6