

(19)



(11)

EP 1 707 115 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
06.05.2009 Bulletin 2009/19

(51) Int Cl.:
A61B 5/00 (2006.01)

(21) Application number: **06251860.0**

(22) Date of filing: **31.03.2006**

(54) **Wireless patient monitoring system**

Drahtloses Patientenüberwachungsgerät

Appareil sans fils pour la surveillance d'un patient

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

(30) Priority: **01.04.2005 US 97499**

(43) Date of publication of application:
04.10.2006 Bulletin 2006/40

(73) Proprietor: **Codman & Shurtleff, Inc.
Raynham,
Massachusetts 02767 (US)**

(72) Inventors:
• **Fifolt, Douglas A.
Wrentham
MA 02093 (US)**
• **Rosenberg, Miki
Newton
Ma 02459 (US)**

(74) Representative: **Mercer, Christopher Paul et al
Carpmaels & Ransford
43-45 Bloomsbury Square
London WC1A 2RA (GB)**

(56) References cited:
EP-A- 0 830 878 EP-A- 1 057 448
DE-A1- 4 125 746 US-A1- 2003 004 403

EP 1 707 115 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to a system and method for measuring, storing and communicating sensor readings from a patient to a central system for display and analysis.

2. Discussion of the Related Art

[0002] For certain medical conditions, such as head trauma, it is necessary to place sensors on and in a patient to take continuous sensor readings. One shortcoming of the prior art is the need to wire the sensors to receiving and recording units located near the patient. The wires, especially leading to implanted sensors, cause difficulty for caregivers to move and treat the patient, both in and out of bed. In response, wireless sensor systems were developed that record the sensor data and do not tether the patient to wired receivers. The sensor data is transmitted wirelessly to the receiver. However, continuous wireless data transmission draws a significant amount of power. Since the sensors are wireless, they must rely on battery power and the continuous wireless transmission shortens the battery life and thus the operational life of the sensor.

[0003] To overcome some of the above shortcomings, US-A-4,519,401 discloses a minimized "pulse" power scheme wherein the sensors and transmitters are placed in a low power cycle when readings are not being taken and then pulse powered up to take a sensor reading and transmit it to a receiver. This power conservation scheme is useful for sensor readings that are only taken at intervals and not continuously. Continuous data sampling would defeat US-A-4,519,401's pulse power scheme, as the sensors and transmitter can never power down.

[0004] US-A-6,533,733 discloses a sensing system wherein the sensor readings are continuously read and stored. The stored data is then periodically transmitted to a receiver. The sensors are continuously powered and transmitter is also continuously powered and draws additional power during power transmission. US-A-6,533,733 realizes that this system is power consumptive and solves the problem by using a combination of power supplies. US-A-6,533,733 is silent regarding powering down the system and US-A-6,533,733's system could not take continuous readings without constant power. Further, since US-A-6,533,733's sensor data is stored, the sensor readings are not resented to the caregiver in approximately real-time. Thus, there is a time lag between when the sensor data is taken and displayed. US-A-6,533,733 compensates for this lag by providing the sensor controller with an alarm function to notify a caregiver of an anomalous sensor reading.

[0005] US-A-6,731,976 discloses a passive sensing

system wherein sensor readings are taken and transmitted only when powered externally. The sensing and transmission only last as long as the external power is supplied. This embodiment provides "real-time" sensor data but only while the system is externally powered. Further, US-A-6,731,976 discloses an embodiment of providing a power supply for the system but, as US-A-6,533,733 does, US-A-6,731,976 takes and stores the sensor data but does not disclose powering down the transmitter to conserve energy. Further, US-A-6,731,976 does not disclose how to compensate for the lag between when the sensor data is taken and when it is transmitted.

[0006] US 2003/0004403 discloses a device comprising the features of the preamble of claim 1.

[0007] Thus, there is a need in the art for a sensor system that can take continuous readings and provide the sensor data to a caregiver in pseudo-real-time. Further, there is a need to conserve power of the sensing device and transmitter by powering down the transmitter and transmitting the sensor data only over bursts.

SUMMARY OF INVENTION

[0008] The invention is defined in the appended claims.

[0009] A device for monitoring a patient sensor has a sensing device disposed on or in the patient and takes sensor data continuously. A transmitter is located on the patient and internally powered. The transmitter is normally in a power-down state and typically only powered-up for transmitting the sensor data. A first link is formed between the sensing device and the transmitter so the transmitter can receive the sensor data. The first link can include a wired and a wireless link. Further, the wireless transmission can be sent over any known wireless frequencies and utilize any protocols known in the art. A receiver is located remote from the patient and receives the sensor data transmitted wirelessly from the transmitter. The transmission is typically a burst and can also be initiated on a command.

[0010] A method of monitoring a patient sensor having the steps of acquiring sensor data from the sensing device and linking the sensor data to the transmitter. The transmitter is powered internally and located on the patient. Typically, the transmitter is powered down in a normal state and powered up to transmit the sensor data from the transmitter to a receiver, which is disposed remote from the transmitter. The transmission can be sent by a burst or upon command.

[0011] Another embodiment of the present method includes acquiring sensor data from the sensing device. Typically sensor data is acquired continuously, but can also be taken at intervals. The sensor data is linked to a transmitter by the first communication link and the transmitter is powered internally by a power supply. The sensor data is accumulated over a first period of time which can be a few seconds to a few minutes and, in one embodiment, is a one minute interval. The transmitter can

be powered-up and transmitting the sensor data from the transmitter to the receiver over a second period of time. The second period of time is shorter than the first period of time and is typically a factor of shorter. Once the transmission is complete, transmitter can be powered down. A further step displays the sensor data at the receiver in pseudo real-time. The display is shifted by a sum of the first and the second period of time. For example, if the sensor data is accumulated over 1 minute and the burst transmission is 6 seconds, the displayed data is time shifted (or lagged) 66 seconds from real-time.

[0012] In a further embodiment, the sensor data can be compressed prior to transmitting the sensor data and then it can be decompressed prior to the displaying the sensor data. Compressing the sensor data can assist in shortening the second period of time and thus shortening the burst period and the lag time.

[0013] One or more sensing devices can be linked to a single transmitter. Each sensing device can include a unique sensing device ID which identifies each sensing device. The unique sensing device ID can include the serial number of the sensing device and an identifier to identify the type, model, manufacturer and calibration information of the sensing device. The unique sensing device ID can identify the sensing device for the transmitter. Furthermore, the transmitter can have a unique transmitter ID identifying the transmitter to a receiver and the receiver can also have a unique receiver ID. Receiver ID identifies the receiver to a central server and the sensor data can be encoded/encrypted with the unique receiver ID as outlined above regarding the other unique IDs.

[0014] In one embodiment, the receiver is located within 15 feet of the transmitter. The proximity of the receiver to the transmitter can prolong the life of power supply because less power is needed if the transmission is over a short distance. Also, the proximity prevents dropped signals and interference from outside sources.

[0015] In another embodiment, the sensor data can be encrypted before it is transmitted wirelessly to prevent unauthorized access or tampering with the sensor data. In a further embodiment, one or both of the unique sensing device ID and the transmitter ID can be used as base keys for encrypting the data. The IDs can be used as a public key and thus either every sensing device's or transmitter's sensor data can be uniquely encrypted.

[0016] Further to the above, the first link can include a power link to provide power to the sensing device from the transmitter. The receiver can send a confirmation signal to the transmitter to acknowledging receipt of the sensor data. The confirmation signal is a safety feature to assure that the sensor data is received by the receiver.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0017] The above and still further objects, features and advantages of the present invention will become apparent upon consideration of the following detailed description of a specific embodiment thereof, especially when

taken in conjunction with the accompanying drawings wherein like reference numerals in the various figures are utilized to designate like components, and wherein:

- 5 Figure 1 is schematic diagram of the system of the present invention;
- Figure 2 is a flow chart of an embodiment of a method of the present invention;
- 10 Figure 3 is a flow chart of another embodiment of a method of the present invention; and
- Figure 4 is a flow chart of a further embodiment of a method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Referring to Figure 1, a system 100 for monitoring a patient sensor is illustrated. The system 100 includes a sensing device 102 disposed on the surface of or implanted in the patient 10 that takes sensor data 104. The sensing device can be disposed or implanted anywhere on the patient 10, including implanted in the patient's brain. Sensing device 102 can be any medical sensing device, including a pressure sensor, an oxygen sensor, neural impulse sensor, temperature sensor, pH sensor, an electroencephalogram and a fetal heart monitor. The sensing device 102 can collect sensor data 104 over many different time periods. Sensor data 104 can be collected continuously, over either a predetermined or random interval, or upon a command issued from a caregiver. Sensing device 102 can be powered internally by, for example, disposable batteries, rechargeable batteries, or a capacitive device capable of storing energy transmitted through an inductive power coupling or directly through the inductive power coupling.

[0019] Sensing device 102 transmits the sensor data 104 to a transmitter 106 located outside the patient 10. The transmitter 106 is typically located on or very close to the patient 10 but not implanted in the patient 10. Typically, transmitter 106 can be strapped to the nearest appendage or adhered to the patient's skin. Transmitter 106 is internally powered by power supply 108. Power supply 108 can be, for example disposable batteries, rechargeable batteries, or a capacitive device capable of storing energy transmitted through an inductive power coupling.

[0020] The transmitter 106 receives the sensor data 104 over a first link 110 between the sensing device 102 and the transmitter 106. The first link 110 can be a wired 110a or a wireless link 110b. If the first link 110 is wired link 110a, the transmitter 106 can have multiple leads or ports to accept one or more wired links. The leads and ports can be any type known in the art to transmit at least analogue or digital data to allow the transmission of sensor data 104 to the transmitter 106. If the first link 110 is a wireless link 110b, the transmission can be sent over any known wireless frequencies and utilize any protocols known in the art. Further, wireless link 110b can be transmitted inductively by using the patient's body at the an-

tenna.

[0021] Further, the sensing device 102 and the transmitter 106 can undergo handshake protocols to "introduce" the sensing device 102 to the transmitter 106. The handshake can be performed automatically upon the powering up or the plugging in of either the sensing device 102 or the transmitter 106. Alternately, the caregiver can initiate a handshake protocol manually.

[0022] One or more sensing devices 102 can be linked to a single transmitter 106. Each sensing device 102 can include a unique sensing device ID which identifies each sensing device 102. The unique sensing device ID can include the serial number of the sensing device 102 and an identifier to identify the type, model, manufacturer and calibration information of the sensing device 102. The unique sensing device ID can identify the sensing device 102 for the transmitter 106. Furthermore, the transmitter 106 can have a unique transmitter ID identifying the transmitter 106 to a receiver 112.

[0023] Transmitter 106 transmits the sensor data 104 to receiver 112. Receiver 112 is typically located remote from the patient 10. In one embodiment, the receiver 112 is located within 15 feet of the transmitter. The proximity of the receiver 112 to the transmitter 106 can prolong the life of power supply 108 because less power is needed if the transmission is over a short distance. Also, the proximity prevents dropped signals and interference from outside sources.

[0024] The receiver 112 and the transmitter 106 communicate wirelessly, thus allowing patient 10 the freedom to move around and shift position or be moved to aid caregivers activities without disrupting the communications between the two. The communication between the transmitter 106 and the receiver 112 can take place continuously, at an interval, or upon a command. The interval can be either predetermined or random and in one embodiment, the transmitter 106 provides a burst transmission at least every minute. Burst transmissions are used to conserve the power of the transmitter 106. Sending the transmission to the receiver 112 is power consumptive and minimizing the number of transmissions can extend the life of the internal power supply 108. Short interval bursts allow a caregiver to receive nearly real-time sensor data 104 and still conserve the power supply 108.

[0025] Further, transmitter 106 can process sensor data 104 through a compression algorithm to compress the data before transmitting it to receiver 112. Compressing sensor data 104 allows for a shorter burst period and assists in reducing the overall power consumption of the transmitter 106 and prolong the life of the power supply 108. Compressed sensor data 104 also conserves storage space on the receiver 112 or server 114. Compressed sensor data 104 can be stored compressed and decompressed for processing or display to the caregiver. Alternately, the receiver can decompress the sensor data 104 upon receipt and store it decompressed to reduce the wait time for processing or displaying.

[0026] Further, the wireless transmission can be sent

over any known wireless frequencies and utilize any protocols known in the art. Additionally, the transmitter 106 and the receiver 112 can undergo handshake protocols to "introduce" the transmitter 106 to the receiver 112. The handshake can be performed automatically upon the powering up or the plugging in of either the transmitter 106 or the receiver 112. Alternately, the caregiver can initiate a handshake protocol manually.

[0027] In an embodiment, transmitter 106 communicates with receiver 112 utilizing a "burst mode." Burst mode collects and stores sensor data 104 in the transmitter 106 over a set period of time. Typically, the sensor data 104 is compressed to reduce the size of the data packet. Transmitter 106, at the predetermined time, powers up and transmit the stored sensor data 104 in a burst that is typically much, much shorter than the time period over which the sensor data 104 is collected. Transmitter 106 then powers down. The receiver 112 receives and collects the sensor data 104 from the transmitter 106 and decompresses the sensor data 104 back to the original timescale for display or analysis. The receiver 112 displays the data in pseudo real-time - the sensor data 104 is displayed in the same spatial resolution that it was collected with but delayed from real-time by the length of the time period over which it was originally collected plus the communications "burst" time. This embodiment allows transmitter 106 to limit the power expenditure overhead of powering on and establishing link 110 by not requiring the transmitter 106 to perform these tasks for each individual sensor reading taken.

[0028] The receiver 112 can be powered by any source, but typically is powered externally, i.e. plugged into the nearest electrical outlet. In an embodiment, receiver 112 can be designed as a permanent or semi-permanent device in the patient's room. Utilizing an external power source to power receiver 112 has advantages. Receiver 112 can be active continuously and can perform storage, analysis, and display functions. Receiver 112 can store and accumulate sensor data 104 for an extended period of time and can store sensor data 104 from numerous transmitters 106 and/or patients 10. Receiver 112 can analyze the sensor data 104 and display it for the caregiver. Additionally, an external power supply allows receiver 112 more flexibility in communicating the sensor data 104, analyzed or not, to a central server 114 located remote from the receiver 112.

[0029] Receiver 112 and central server 114 can be linked directly or through a network, LAN, WAN, or the Internet. The connection can be wired or wireless using any protocols known in the art. Central server 114 can be remote from the receiver, i.e. in another room, building or state and a patient 10 can be monitored by a caregiver remote from the patient's location.

[0030] In an embodiment, central server 114 can be a portable device (e.g. PDA, cell phone, beeper, BlackBerry®) or a semi-portable device (laptop and desktop on wheels) that can be carried by the caregiver or kept in proximity to patient 10 so the caregiver can move into

proximity with the patient 10 and display the sensor data 104 at, for example, the patient's bedside. Central server 114 can also store, analyze, and display the sensor data 104. In an embodiment, either the receiver 112 or the central server 114 analyzes the data, or receiver 112 can perform basic analysis and central server 114 performs more detailed analysis if required.

[0031] Receiver 112 can also send notifications to central server 114 in response to a number of preset or programmed conditions. For example, if the sensor data 104 shows that there is a critical condition (e.g. the patient's heart stops beating) a notification can be sent (e.g. messaging a pager, ringing a cell phone) notifying the caregiver of the critical condition. As described below, the caregiver can then issue remote instructions to further monitor the patient 10.

[0032] If the receiver 112 and the central server 114 communicate wirelessly, all the protocols, handshake procedures and frequencies described above can be used here as described above.

[0033] In an embodiment, sensor data 104 can be encoded with the unique sensing device ID and the encoded sensor data is transmitted to the receiver 112 and to the central server 114. Using the unique sensing device ID can identify the specific sensor and thus the specific patient 10. This can help the organization of the sensor data 104 when stored and can assist in the search and retrieval of the sensor data 104 at a later time. Further, sensor data 104 can be encoded with the unique transmitter ID alone or in combination with the unique sensing device ID. The unique transmitter ID can further assist in storage, searching and retrieval.

[0034] In one embodiment, the sensor data 104 can be encrypted before it is transmitted wirelessly to prevent unauthorized access or tampering with the sensor data 104. In a further embodiment, one or both of the unique sensing device ID and the transmitter ID can be used as base keys for encrypting the data. The IDs can be used as a public key and thus either every sensing device's or transmitter's sensor data 104 can be uniquely encrypted.

[0035] Further to the above, the first link 110 can include a power link to provide power to the sensing device 102 from the transmitter 106. In this embodiment, sensing device 102 does not have a stand alone power supply. If first link 110 is wired 110a, the power can be transmitted directly to the sensing device 102 along the same wire or a different wire than the sensor data 104 is transmitted. Alternately, the power link can be an induced connection. An induction coil from the transmitter 106 can be placed in proximity to an inductance coil in the sensing device 102 to provide power to the sensing device 102. Power supply 108 can provide continuous power or act as a charging station to charge the sensing device 102 on demand. This can be used especially with implanted sensing devices 102. Since transmitter 106 is disposed outside of patient 10, it is easier to recharge power supply 108 and use the transmitter to power sensing device 102.

[0036] In an embodiment, transmitter 106 includes a

first memory 116 that temporarily stores the sensor data 104 prior to the transmission to the receiver 112. The first memory 116 can be flash RAM or any other type of permanent or removable memory known in the art. First memory 116 can be kept small to allow transmitter 106 to be light weight. Once the sensor data 104 stored on first memory 116 is transmitted to the receiver 112, the sensor data can be erased or overwritten. The overwriting procedure can include overwriting the oldest data first.

[0037] Additionally, receiver 112 can include a confirmation signal 118 transmitted from the receiver 112 to the transmitter 106 to acknowledging receipt of the sensor data 104. The confirmation signal 118 is a safety feature to assure that the sensor data 104 is received by the receiver 112. The confirmation signal 118 can also be used as a trigger for the transmitter 106 to erase the first memory 116.

[0038] In an embodiment, if the transmitter 106 does not receive the confirmation signal 118, the transmitter 106 can repeat the transmission one or more times until the confirmation signal 118 is received. Also, the transmitter 106 can include an alarm 120 that can send an alarm signal when the confirmation signal 118 is not received once or for a period of time.

[0039] Alternately, transmitter 106 can resend the "old" sensor data 104 from the unconfirmed transmission as an add-on to the next transmission of "new" sensor data 104. If the transmitter 106 is set to burst transmissions, adding-on sensor data 104 can lengthen the transmission time but maintains the interval so keep power consumption at a minimum.

[0040] In another embodiment, transmitter 106 can be used to communicate with sensing device 102. First link 110 can provide an instruction to the sensing device 102. Examples of instructions can be to turn on/off, change data retrieval intervals, perform a diagnostic test, report power and/or communication status and to take sensor data essentially contemporaneous with the instruction. This allows a caregiver to receive real-time sensor data 104, if the caregiver deems it necessary. The instructions can be originated at the transmitter 106 or at the receiver 112 and/or central server 114 to be transmitted to the transmitter 106 to be relayed to sensing device 104. This configuration allows instructions to originate anywhere the caregiver is located.

[0041] Embodiments include using one transmitter 106 per patient 10 and linking multiple sensing devices 104 to the single transmitter 106. A second sensing device 122 can be implanted in the patient 10. The second sensing device 122 takes second sensor data 124 and can include any or all of the features described above for sensing device 102. In a further embodiment, second sensing device can include a unique second sensing device ID. Unique second sensing device ID can be used as above, to identify second sensing device and to encode or encrypt second sensor data 124.

[0042] A second link 126 between the second sensing

device 122 and the transmitter 106 can be formed similarly to first link 110. Transmitter 106 can receive both sensor data 104 and second sensor data 124. In an embodiment, the transmitter 106 can be programmed to combine the sensor data 104, 124 into a single sensor data file to be transmitted to receiver 112 or can keep the sensor data 104 and the second sensor data 124 separate. To assist in differentiating between the two sensor data, the unique sensing device ID and the unique second sensing device ID can be used to encode and separate the data.

[0043] A further embodiment includes using multiple transmitters with one receiver 112. Typically, a second transmitter 128 is linked to a second sensing device 122 implanted in a second patient 20. However, multiple transmitters can be used with the same patient 10, if the positioning of the sensing devices 102 or receiver 112 dictates. As above, second sensing device 122 takes second sensor data 124 and transmits it to second transmitter 128 via second link 126. Second transmitter 128 can include a unique second transmitter ID identifying it. Receiver 112 can receive sensor data 104 and second sensor data 124 from the transmitter 106 and the second transmitter 128, respectively. In an embodiment, the sensor data 104, 124 can be encoded or encrypted using the unique transmitter and second transmitter IDs. Furthermore, if multiple sensing devices are attached to each transmitter, the sensor data can be encoded with both the unique sensing device ID and the unique transmitter ID.

[0044] Receiver 112 can also have a unique receiver ID to identify the receiver to the central server 114 and the sensor data 104 can be encoded/encrypted with the unique receiver ID as outlined above regarding the other unique IDs.

[0045] Figure 2 illustrates a method of monitoring a patient sensor. Sensor data 104 can be acquired from sensing device 102 implanted in the patient (step 200) and linked to the transmitter 106 either continuously, at an interval, a burst, or upon command (step 202). The transmitter 106 is powered internally (step 204) and located external to the patient 10 (step 206). Typically, transmitter 106 is in a powered down condition (step 207). The transmitter 106 is powered up and then transmits the sensor data from the transmitter 106 to receiver 112 (step 208) and the receiver 112 is disposed remote from the transmitter 106 (step 210). The sensor data 104 is communicated from the receiver 112 to the central server 114 (step 212) and central server 114 can store, analyze, or display the sensor data 104 (step 214). In an alternate embodiment, the receiver 112 can store, analyze and display the sensor data 104 for an individual patient.

[0046] Embodiments include, identifying the sensing device 102 with a unique sensing device ID (step 216) and optionally encoding the sensor data 104 with the unique sensing device ID (Step 218). Further embodiments include powering the sensing device 102 from the transmitter 106 using a power link (step 220) by option-

ally, transmitting energy over a wire from the transmitter 106 to the sensing device 102 (step 222) or inducing energy through induction coils in the transmitter 106 and the sensing device 102 (step 224). Another embodiment is temporarily storing the sensor data 102 in a first memory 116 prior to the transmitting step (step 226) and erasing and/or overwriting the sensor data after the transmitting step (step 228).

[0047] Referring to Figure 3, the method can further include sending a confirmation signal acknowledging receipt of the sensor data 104 (step 230) and issuing an alarm upon failure to receive the confirmation signal (step 232). Additionally, the transmitter 106 can receive the confirmation signal (step 234) and erase the first memory 116 storing the sensor data 104 upon receipt of the confirmation signal (step 236).

[0048] Returning to Figure 2, the transmitter 106 can provide an instruction to the sensing device (step 238). Also, the receiver can optionally, store the sensor data 104 (step 240), analyze the sensor data 104 (step 242) or display the sensor data 104 (step 244). Further, the communicating step above can include communicating the analyzed sensor data 104 to the central server 114 (step 246). Also, the transmitter 106 can be identified with a unique transmitter ID (step 248). In an alternate embodiment, transmitter 106 can compress sensor data 104 (step 250) and receiver 112 can decompress the data (step 252). Alternately, central server 114 can decompress the sensor data.

[0049] Turning to Figure 4, another embodiment of the present method is illustrated. The method of monitoring a patient sensor includes acquiring sensor data 104 from a sensing device 102 disposed on the patient 10 (step 300). Typically sensor data 104 is acquired continuously, but can also be taken at intervals. The sensor data can be linked to a transmitter by the first communication link 110 (step 302). The transmitter is powered internally (step 304) by power supply 108 and is typically located on patient 10 (step 306). The sensor data can be accumulated over a first period of time (step 308). The first period of time can be a few seconds to a few minutes and, in one embodiment, is a one minute interval. Transmitter 106 is powered-up and transmits the sensor data 104 from the transmitter 106 to receiver 112 over a second period of time (step 310). The second period of time is shorter than the first period of time and is typically a factor of shorter. Once the transmission is complete, transmitter 106 is powered down (step 312). A further step is displaying the sensor data at the receiver in pseudo real-time (step 314). The display is shifted by a sum of the first and the second period of time. For example, if the sensor data is accumulated over 1 minute and the burst transmission is 6 seconds, the displayed data is time shifted (or lagged) 66 seconds from real-time.

[0050] In a further embodiment, the sensor data can be compressed prior to transmitting the sensor data 104 (step 316) and then it can be decompressed prior to the displaying the sensor data 104 (step 318). Compressing

the sensor data 104 can assist in shorting the second period of time and thus shortening the burst period and the lag time. The compression compresses the waveform of the sensor data and the decompression returns the waveform of the sensor data back to its original data.

[0051] Further, it is known in the art that any analogue signals can be converted to digital signals before transmission and converted back to analogue signals, if necessary, for display and analysis.

[0052] While there have been shown, described, and pointed out fundamental novel features of the invention as applied to a preferred embodiment thereof, it will be understood that various omissions, substitutions, and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit and scope of the invention. For example, it is expressly intended that all combinations of those elements and/or steps which perform substantially the same function, in substantially the same way, to achieve the same results are within the scope of the invention. Substitutions of elements from one described embodiment to another are also fully intended and contemplated. It is also to be understood that the drawings are not necessarily drawn to scale, but that they are merely conceptual in nature. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

Claims

1. A device (100) for monitoring a patient sensor, comprising:

a sensing device (102) for disposal on or in the patient (10) for taking sensor data (104) continuously;
 an internally powered transmitter (106) for location on the patient (10), which transmitter (106) is normally in a power-down state and is powered-up for transmitting the sensor data (104), said transmitter (106) comprising a first memory (116) for temporarily storing sensor data (104);
 a wired or wireless first link (110) between the sensing device (102) and the transmitter (106) wherein the transmitter (106) receives the sensor data (104) from the sensing device (102);
 and
 a receiver (112), for location remote from the patient (10), for receiving the sensor data (104) transmitted wirelessly from the transmitter (106),

wherein the sensor data (104) transmission is a burst or is initiated on a command and a confirmation signal (118) is transmitted from the receiver (112) to the transmitter (106) to acknowledge receipt of the sensor data (104); **characterised in that:**

the confirmation signal (112) instructs the transmitter (106) to erase and/or overwrite the first memory (116) temporarily storing the sensor data (102).

2. The device (100) of claim 1, wherein the sensing device (102) comprises a unique sensing device ID and the sensing device (102) is identified by the transmitter (106) using the unique sensing device ID.
3. The device (100) of claim 2, wherein the sensor data (104) is encoded with the unique sensing device ID and the encoded sensor data is transmitted to the receiver (112) and to a central server (114).
4. The device (100) of any one of claims 1 to 3, wherein the first link (110) further comprises a power link to provide power to the sensing device (102) from the transmitter (106), wherein the power link provides power by a direct connection or an induced connection.
5. The device of claim 1, wherein the transmitter (106) further comprises an alarm (120) for sending an alarm signal upon failure to receive the confirmation signal (118).
6. The device (100) of any one of claims 1 to 5, wherein the transmitter (106) provides an instruction to the sensing device (102).
7. The device (100) of any one of claims 1 to 7, further comprising a central server (114), for location remote from the receiver (112), for receiving the sensor data (104) from the receiver (112) and for storing, analyzing and/or displaying the sensor data (104) wherein the receiver (112) is adapted to transmit the sensor data (104) to the central server (114) continuously, at an interval or upon a command.
8. The device (100) of any one of claims 1 to 7, wherein the receiver (112) stores, analyzes and/or displays the sensor data (104).
9. The device (100) of claim 8, wherein the receiver (112) transmits the analyzed sensor data (104) to a central server (114).
10. The device (100) of any one of claims 1 to 9, wherein the transmitter (106) comprises a unique transmitter ID and the transmitter (106) is identified by the receiver (112) using the unique transmitter ID.
11. The device (100) of claim 10, wherein the sensing device (102) comprises a unique sensing device ID and the sensing device (102) is identified by the transmitter (106) using the unique sensing device ID, wherein the sensor data (104) is encoded with the

unique sensing device ID and the unique transmitter ID and the encoded sensor data is transmitted to the receiver (112).

- 12.** The device (100) of any one of claims 1 to 11, further comprising:

a second sensing device (122) for implantation in the patient, for taking second sensor data (124) continuously, at an interval and/or upon a command, comprising a unique second sensing device ID and the second sensing device (122) is identified by the transmitter (106) using the unique second sensor device ID, wherein the second sensor data (124) is encoded with the unique second sensing device ID; and a wired or wireless second link (126) between the second sensing device (122) and the transmitter (106) wherein the transmitter (106) receives the second sensor data (124) from the second sensing device (122) and the second link (126);

wherein the sensing device (102) comprises a unique sensing device ID, the sensing device (102) is identified by the transmitter (106) using the unique sensing device ID, and the sensor data (104) is encoded with the unique sensing device ID, and wherein the encoded sensor data and the encoded second sensor data are transmitted to the receiver (112).

- 13.** The device (100) of any one of claims 1 to 12, further comprising:

a second sensing device (122) for implantation in a second patient (20), for taking second sensor data (124) continuously, at an interval and/or upon a command; an internally powered second transmitter (128) for location outside the second patient (20), for transmitting the second sensor data (124) to the receiver (112) continuously, at an interval and/or upon a command and comprises a unique second transmitter ID and the second transmitter (128) is identified by the receiver (112) using the unique second transmitter ID; and a wired or wireless second link (126) between the second sensing device (122) and the second transmitter (128) wherein the second transmitter (128) receives the second sensor data (124) from the second sensing device (122).

- 14.** The device (100) of any one of claims 1 to 13, wherein the transmitter (106, 128) compresses the sensor data (104, 124) prior to transmitting to the receiver (112) and wherein the receiver (112) decompresses the compressed sensor data (104, 124).

- 15.** The device (100) of claim 7, further comprising a notification, sent from the receiver (112) to the central server (114) upon a met condition.

- 16.** The device (100) of any one of claims 1 to 15, wherein the transmitter (106, 128) comprises a first memory (116) for temporarily storing the sensor data (104, 124) prior to the transmission to the receiver (112), wherein the sensor data (104, 124) is compressed prior to transmission and decompressed by the receiver (112).

- 17.** A method of monitoring a patent sensor, comprising the steps of:

acquiring sensor data (104) from a sensing device (102) on or in the patient (10); linking the sensor data (104) to a transmitter (106) continuously, at an interval and/or upon a command, said transmitter (106) having a first memory (116); temporarily storing the sensor data (104) in the first memory (116); powering the transmitter (106) internally; locating the transmitter (106) on the patient (10); powering the transmitter (106) down in a normal state; powering the transmitter (106) up and transmitting the sensor data (104) stored in the first memory (116) from the transmitter (106) to a receiver (112) by a burst and/or upon command; receiving a confirmation signal (118) sent from the receiver (112) to the transmitter (106) to acknowledge receipt of the sensor data (104); erasing and/or overwriting the sensor data (104) stored in the first memory (116) upon receipt of the confirmation signal (118); and disposing the receiver (112) remote from the transmitter (106).

- 18.** The method of claim 17, further comprising the steps of:

communicating the sensor data (104) from the receiver (112) to a central server (114); and storing, analyzing and/or displaying the sensor data at the central server (114).

- 19.** The method of claim 17 or claim 18, further comprising the steps of:

identifying the sensing device (102) with a unique sensing device ID; and optionally, encoding the sensor data (104) with the unique sensing device ID.

- 20.** The method of any one of claims 17 to 19, further comprising the step of powering the sensing device

(102) from the transmitter (106) by transmitting energy over a wire from the transmitter (106) to the sensing device (102) or inducing energy through induction coils in the transmitter (106) and the sensing device (102).

21. The method of claim 17, further comprising the step of issuing an alarm (120) upon failure to receive the confirmation signal (118).
22. The method of any one of claims 17 to 21, further comprising the step of providing an instruction from the transmitter (106) to the sensing device (102).
23. The method of any one of claims 17 to 22, further comprising storing the sensor data (104) at the receiver (112), analyzing the sensor data (104) at the receiver (112) and/or displaying the sensor data (104) at the receiver (112).
24. The method of any one of claims 17 to 23, which includes communicating the analyzed sensor data (104) to a central server (114).
25. The method of any one of claims 17 to 24, further comprising the step of identifying the transmitter (106) with a unique transmitter ID.
26. The method of any one of claims 17 to 25, further comprising the step of compressing the sensor data (104) prior to the transmitting step.
27. The method of claim 26, further comprising the step of decompressing the sensor data (104) prior to analysis.
28. The method of any one of claims 17 to 27, further comprising the step of communicating a notification to a central server (114).
29. The method of claim 17, further comprising the steps of:
 - accumulating the sensor data (104) over a first time;
 - transmitting the sensor data (104) from the transmitter (106) to the receiver (112) over a second time, shorter than the first time;
 - powering off the transmitter (106); and
 - displaying the sensor data (104) at the receiver (112) in pseudo real-time shifted by a sum of the first and the second times.
30. The method of claim 29, further comprising the steps of:
 - compressing the sensor data (104) prior to the transmitting step; and

decompressing the sensor data (104) prior to the displaying step.

5 Patentansprüche

1. Vorrichtung (100) zum Überwachen eines Patientensensors, die aufweist:
 - eine Abfühleinrichtung (102) zur Anordnung auf oder in dem Patienten (10) zum kontinuierlichen Aufnehmen von Sensordaten (104);
 - einen intern mit Energie versorgten Sender (106) zur Einrichtung auf dem Patienten (10), wobei der Sender (106) normalerweise in einem heruntergefahrenen Zustand ist und zum Senden der (104) hochgefahren wird, wobei der Sensor einen ersten Speicher (116) zum zeitweiligen Speichern von Sensordaten (104) aufweist;
 - eine verdrahtete oder drahtlose erste Verbindung (110) zwischen der Abfühleinrichtung (102) und dem Sender (106), wobei der Sender (106) die Sensordaten (104) von der Abfühleinrichtung (102) erhält; und
 - einen Empfänger (112) zum Einrichten entfernt von dem Patienten (10) zum Empfangen der Sensordaten (104), die drahtlos von dem Sender (106) gesendet werden,

wobei die Übertragung der Sensordaten (104) ein Impuls ist oder auf einen Befehl hin eingeleitet wird und ein Bestätigungssignal (118) von dem Empfänger (112) an den Sender (106) gesendet wird, um den Empfang der Sensordaten (104) zu bestätigen; **dadurch gekennzeichnet, dass:**

 - das Bestätigungssignal (112) den Sender (106) anweist, den ersten Speicher (116), der die Sensordaten (104) zeitweilig speichert, zu löschen und/oder zu überschreiben.
2. Vorrichtung (100) nach Anspruch 1, bei der die Abfühleinrichtung (102) eine eindeutige Abfühleinrichtung-ID aufweist und die Abfühleinrichtung (102) von dem Sender (106) identifiziert wird, indem die eindeutige Abfühleinrichtung-ID verwendet wird.
3. Vorrichtung (100) nach Anspruch 2, bei der die Sensordaten (104) mit der eindeutigen Abfühleinrichtung-ID codiert werden und die codierten Sensordaten an den Empfänger (112) und an einen Zentralserver (114) gesendet werden.
4. Vorrichtung (100) nach einem der Ansprüche 1 bis 3, bei der die erste Verbindung (110) weiter eine Energieverbindung aufweist, um der Abfühleinrichtung (102) von dem Sender (106) Energie zur Verfügung

zu stellen, wobei die Energieverbindung die Energie durch eine direkte Verbindung oder eine induzierte Verbindung zur Verfügung stellt.

5. Vorrichtung nach Anspruch 1, bei der der Sender (106) weiter einen Alarm (120) zum Senden eines Alarmsignals bei einem Fehler beim Empfangen des Bestätigungssignals (118) aufweist. 5
6. Vorrichtung (100) nach einem der Ansprüche 1 bis 5, bei der der Sender (106) einen Befehl an die Abfühleinrichtung (102) liefert. 10
7. Vorrichtung (100) nach einem der Ansprüche 1 bis 7, weiter mit einem Zentralserver (114) zur Anordnung entfernt von dem Empfänger (112), zum Empfangen der Sensordaten (104) von dem Empfänger (112) und zum Speichern, Analysieren und/oder Anzeigen der Sensordaten (104), wobei der Empfänger (112) dazu ausgelegt ist, die Sensordaten (104) kontinuierlich, intervallweise oder auf einen Befehl hin an den Zentralserver (114) zu senden. 15
20
8. Vorrichtung (100) nach einem der Ansprüche 1 bis 7, bei der der Empfänger (112) die Sensordaten (104) speichert, analysiert und/oder anzeigt. 25
9. Vorrichtung (100) nach Anspruch 8, bei der der Empfänger (112) die analysierten Sensordaten (104) an einen Zentralserver (114) sendet. 30
10. Vorrichtung (100) nach einem der Ansprüche 1 bis 9, bei der der Sender (106) eine eindeutige Sender-ID aufweist und der Sender (106) durch den Empfänger (112) identifiziert wird, indem die eindeutige Sender-ID verwendet wird. 35
11. Vorrichtung (100) nach Anspruch 10, bei der die Abfühlvorrichtung (102) eine eindeutige Abfühleinrichtung-ID aufweist und die Abfühleinrichtung (102) von dem Sender (106) identifiziert wird, indem die eindeutige Abfühleinrichtung-ID verwendet wird, wobei die Sensordaten (104) mit der eindeutigen Abfühleinrichtung-ID codiert werden und die eindeutige Sender-ID und die codierten Sensordaten an den Empfänger (112) gesendet werden. 40
45
12. Vorrichtung (100) nach einem der Ansprüche 1 bis 11, die weiter aufweist: 50

eine zweite Abfühleinrichtung (122) zum Implantieren in den Patienten zum kontinuierlichen, intervallweisen und/oder auf einen Befehl hin Aufnehmen von zweiten Sensordaten (124), die eine eindeutige zweite Abfühleinrichtung-ID aufweist, und wobei die zweite Abfühleinrichtung von dem Sender (106) identifiziert wird, indem die eindeutige zweite Abfühleinrichtung-ID

verwendet wird, wobei die zweiten Sensordaten (124) mit der eindeutigen zweiten Abfühleinrichtung-ID codiert werden; und eine verdrahtete oder drahtlose zweite Verbindung (126) zwischen der zweiten Abfühleinrichtung (122) und dem Sender (106), wobei der Sender (106) die zweiten Sensordaten (124) von der zweiten Abfühleinrichtung (122) und der zweiten Verbindung (126) empfängt;

wobei die zweite Abfühleinrichtung (102) eine eindeutige Abfühleinrichtung-ID aufweist, die Abfühleinrichtung (102) von dem Sender (106) identifiziert wird, indem die eindeutige Abfühleinrichtung-ID verwendet wird, und die Sensordaten (104) mit der eindeutigen Abfühleinrichtung-ID codiert werden, und wobei die codierten Sensordaten und die codierten zweiten Sensordaten an den Empfänger (112) gesendet werden.

13. Vorrichtung (100) nach einem der Ansprüche 1 bis 12, die weiter aufweist:

eine zweite Abfühleinrichtung (122) zum Implantieren in einen zweiten Patienten (20) zum kontinuierlichen, intervallweisen und/oder auf einen Befehl hin Aufnehmen von zweiten Sensordaten (124);

einen intern mit Energie versorgten zweiten Sender (128) zur Anordnung außerhalb des zweiten Patienten (20), zum kontinuierlichen, intervallweisen und/oder auf einen Befehl hin Senden der zweiten Sensordaten (124) an den Empfänger (122) und mit einer zweiten Sender-ID und wobei der zweite Sender (128) von dem Empfänger (112) identifiziert wird, indem die eindeutige zweite Sender-ID verwendet wird; und

eine verdrahtete oder drahtlose zweite Verbindung (126) zwischen der zweiten Abfühleinrichtung (122) und dem zweiten Sender (128), wobei der zweite Sender (128) die zweiten Sensordaten (124) von der zweiten Abfühleinrichtung (122) erhält.

14. Vorrichtung (100) nach einem der Ansprüche 1 bis 13, bei der der Sender (106, 128) die Sensordaten (104, 124) vor dem Senden an den Empfänger (112) komprimiert und bei der der Empfänger (112) die komprimierten Sensordaten (104, 124) dekomprimiert. 55
15. Vorrichtung (100) nach Anspruch 7, weiter mit einer Meldung, die von dem Empfänger (112) an den Zentralserver (114) bei einer erfüllten Bedingung gesendet wird.
16. Vorrichtung (100) nach einem der Ansprüche 1 bis

15, bei der der Sender (106, 128) einen ersten Speicher (116) zum zeitweiligen Speichern der Sensordaten (104, 124) vor dem Senden an den Empfänger (112) speichert, wobei die Sensordaten (104, 124) vor dem Senden komprimiert und von dem Empfänger (112) dekomprimiert werden.

17. Verfahren zum Überwachen eines Patientensensors, das die Schritte aufweist:

Erlangen von Sensordaten (104) von einer Abfühleinrichtung (102) auf oder in den Patienten (10);
kontinuierliches, intervallweises und/oder auf einen Befehl hin Einkoppeln der Sensordaten (104) in einen Sender (106), wobei der Sender (106) einen ersten Speicher (116) hat;
zeitweilige Speichern der Sensordaten (104) in dem ersten Speicher (116);
internes Versorgen des Senders (106) mit Energie;
Anordnen des Senders (106) auf dem Patienten (10);
Herunterfahren des Senders (106) in einen normalen Zustand;
Hochfahren des Senders (106) und Senden der Sensordaten (104), die in dem ersten Speicher (116) gespeichert sind, von dem Sender (106) an einen Empfänger (112) in einem Impuls und/oder auf einen Befehl hin;
Empfangen eines Bestätigungssignals (118), das von dem Empfänger (112) an den Sender (106) geschickt wird, um den Empfang der Sensordaten (104) zu bestätigen;
Löschen und/oder Überschreiben der Sensordaten (104), die in dem ersten Speicher (116) gespeichert sind, auf den Empfang des Bestätigungssignals (118) hin; und
Anordnen des Empfängers (112) entfernt von dem Sender (106).

18. Verfahren nach Anspruch 17, das weiter die Schritte aufweist:

Kommunizieren der Sensordaten (104) von dem Empfänger (112) an einen Zentralserver (114); und Speichern, Analysieren und/oder Anzeigen der Sensordaten in dem Zentralserver (114).

19. Verfahren nach Anspruch 17 oder Anspruch 18, das weiter die Schritte aufweist:

Identifizieren der Abfühleinrichtung (102) mit einer eindeutigen Abfühleinrichtung-ID; und als Option Codieren der Sensordaten (104) mit der eindeutigen Abfühleinrichtung-ID.

20. Verfahren nach einem der Ansprüche 17 bis 19, wei-

ter mit dem Schritt des Versorgens der Abfühleinrichtung (102) von dem Sender (106) durch Senden von Energie über einen Draht von dem Sender (106) an die Abfühleinrichtung (102) oder durch Induzieren von Energie durch Induktionsspulen in dem Sender (106) und in der Abfühleinrichtung (102).

21. Verfahren nach Anspruch 17, weiter mit dem Schritt des Ausgebens eines Alarms (120) bei einem Fehler beim Empfang des Bestätigungssignals (118).

22. Verfahren nach einem der Ansprüche 17 bis 21, weiter mit dem Schritt des Liefers eines Befehls von dem Sender (106) an die Abfühleinrichtung (102).

23. Verfahren nach einem der Ansprüche 17 bis 22, weiter mit dem Speichern der Sensordaten (104) im Empfänger (112), dem Analysieren der Sensordaten (104) im Empfänger (112) und/oder dem Anzeigen der Sensordaten (104) am Empfänger (112).

24. Verfahren nach einem der Ansprüche 17 bis 23, welches das Kommunizieren der analysierten Sensordaten (104) an einen Zentralserver (114) umfasst.

25. Verfahren nach einem der Ansprüche 17 bis 24, weiter mit dem Schritt des Identifizierens des Senders (106) mit einer eindeutigen Sender-ID.

26. Verfahren nach einem der Ansprüche 17 bis 25, weiter mit dem Schritt des Komprimierens der Sensordaten (104) vor dem Sendeschritt.

27. Verfahren nach Anspruch 26, weiter mit dem Schritt des Dekomprimierens der Sensordaten (104) vor der Analyse.

28. Verfahren nach einem der Ansprüche 17 bis 27, weiter mit dem Schritt des Kommunizierens einer Meldung an einen Zentralserver (114).

29. Verfahren nach Anspruch 17, das weiter die Schritte aufweist:

Sammeln der Sensordaten (104) über eine erste Zeitdauer;
Senden der Sensordaten (104) von dem Sender (106) an den Empfänger (112) über eine zweite Zeitdauer, die kürzer ist als die erste Zeitdauer;
Abschalten des Senders (106); und
Anzeigen der Sensordaten (104) an dem Empfänger (112) in Pseudo-Echtzeit, verschoben um eine Summe aus der ersten und der zweiten Zeitdauer.

30. Verfahren nach Anspruch 29, das weiter die Schritte aufweist:

Komprimieren der Sensordaten (104) vor dem Sendeschritt; und
 Dekomprimieren der Sensordaten (104) vor dem Anzeigeschritt.

Revendications

1. Dispositif (100) de surveillance d'un capteur de patient, comprenant :

> un dispositif de détection (102) destiné à être disposé sur le patient (10), ou à l'intérieur de celui-ci, afin de prélever des données de capteur (104) de manière continue ;
 > un émetteur alimenté de manière interne (106) destiné à être placé sur le patient (10), lequel émetteur (106) se trouve normalement dans un état hors tension et est alimenté afin d'émettre les données de capteur (104), ledit émetteur (106) comprenant une première mémoire (116) destinée à stocker de façon temporaire les données de capteur (104) ;
 > une première liaison câblée ou sans fil (110) entre le dispositif de détection (102) et l'émetteur (106) dans lequel l'émetteur (106) reçoit les données de capteur (104) en provenance du dispositif de détection (102) ; et
 > un récepteur (112), destiné à être placé à distance du patient (10), destiné à recevoir les données de capteur (104) émises de manière sans fil par l'émetteur (106),

> dans lequel la transmission des données de capteur (104) est une salve ou est déclenchée sur commande, et un signal de confirmation (118) est émis par le récepteur (112) vers l'émetteur (106) de manière à accuser réception des données de capteur (104) ; **caractérisé en ce que :**

> le signal de confirmation (112) demande à l'émetteur (106) d'effacer et/ou d'écraser la première mémoire (116) qui stocke de manière temporaire les données de capteur (102).

2. Dispositif (100) selon la revendication 1, dans lequel le dispositif de détection (102) comprend un identifiant unique de dispositif de détection et le dispositif de détection (102) est identifié par l'émetteur (106) en utilisant l'identifiant unique de dispositif de détection.
3. Dispositif (100) selon la revendication 2, dans lequel les données de capteur (104) sont codées avec l'identifiant unique de dispositif de détection et les données de capteur codées sont émises vers le ré-

cepteur (112) et vers un serveur central (114).

4. Dispositif (100) selon l'une quelconque des revendications 1 à 3, dans lequel la première liaison (110) comprend en outre une liaison d'alimentation de manière à fournir une alimentation au dispositif de détection (102) à partir de l'émetteur (106), dans lequel la liaison d'alimentation fournit l'alimentation grâce à une connexion directe ou une connexion induite.
5. Dispositif selon la revendication 1, dans lequel l'émetteur (106) comprend en outre une alarme (120) destinée à envoyer un signal d'alarme en cas de défaut de réception du signal de confirmation (118).
6. Dispositif (100) selon l'une quelconque des revendications 1 à 5, dans lequel l'émetteur (106) fournit une instruction au dispositif de détection (102).
7. Dispositif (100) selon l'une quelconque des revendications 1 à 7, comprenant en outre un serveur central (114), situé à distance du récepteur (112), destiné à recevoir les données de capteur (104) en provenance du récepteur (112) et à stocker, analyser et/ou afficher les données de capteur (104) dans lequel le récepteur (112) est apte à transmettre les données de capteur (104) au serveur central (114) de manière continue, selon un intervalle ou sur commande.
8. Dispositif (100) selon l'une quelconque des revendications 1 à 7, dans lequel le récepteur (112) stocke, analyse et/ou affiche les données de capteur (104).
9. Dispositif (100) selon la revendication 8, dans lequel le récepteur (112) transmet les données de capteur analysées (104) à un serveur central (114).
10. Dispositif (100) selon l'une quelconque des revendications 1 à 9, dans lequel l'émetteur (106) comprend un identifiant unique d'émetteur et l'émetteur (106) est identifié par le récepteur (112) en utilisant l'identifiant unique d'émetteur.
11. Dispositif (100) selon la revendication 10, dans lequel le dispositif de détection (102) comprend un identifiant unique de dispositif de détection et le dispositif de détection (102) est identifié par l'émetteur (106) en utilisant l'identifiant unique de dispositif de détection, dans lequel les données de capteur (104) sont codées avec l'identifiant unique de dispositif de détection et l'identifiant unique d'émetteur et les données de capteur codées sont émises vers le récepteur (112).
12. Dispositif (100) selon l'une quelconque des revendications 1 à 11, comprenant en outre :

- > un second dispositif de détection (122) destiné à être implanté à l'intérieur du patient, afin de prélever des secondes données de capteur (124) de manière continue, selon un intervalle et/ou sur commande, comprenant un second identifiant unique de dispositif de détection et le second dispositif de détection (122) est identifié par l'émetteur (106) en utilisant le second identifiant unique de dispositif de capteur, dans lequel les secondes données de capteur (124) sont codées avec le second identifiant unique de dispositif de détection ; et
 > une seconde liaison câblée ou sans fil (126) entre le second dispositif de détection (122) et l'émetteur (106) dans lequel l'émetteur (106) reçoit les secondes données de capteur (124) en provenance du second dispositif de détection (122) et de la seconde liaison (126);
- > dans lequel le dispositif de détection (102) comprend un identifiant unique de dispositif de détection, le dispositif de détection (102) est identifié par l'émetteur (106) en utilisant l'identifiant unique de dispositif de détection, et les données de capteur (104) sont codées avec l'identifiant unique de dispositif de détection, et
 > dans lequel les données de capteur codées et les secondes données de capteur codées sont émises vers le récepteur (112).
- 13.** Dispositif (100) selon l'une quelconque des revendications 1 à 12, comprenant en outre :
- > un second dispositif de détection (122) destiné à être implanté à l'intérieur d'un second patient (20), afin de prélever des secondes données de capteur (124) de manière continue, selon un intervalle et/ou sur commande ;
 > un second émetteur alimenté de manière interne (128) destiné à être placé à l'extérieur du second patient (20), destiné à émettre les secondes données de capteur (124) vers le récepteur (112) de manière continue, selon un intervalle et/ou sur commande et comprenant un second identifiant unique d'émetteur et le second émetteur (128) est identifié par le récepteur (112) en utilisant le second identifiant unique d'émetteur ; et
 > une seconde liaison câblée ou sans fil (126) entre le second dispositif de détection (122) et le second émetteur (128) dans lequel le second émetteur (128) reçoit les secondes données de capteur (124) en provenance du second dispositif de détection (122).
- 14.** Dispositif (100) selon l'une quelconque des revendications 1 à 13, dans lequel l'émetteur (106, 128)
- comprime les données de capteur (104, 124) avant de les émettre vers le récepteur (112) et dans lequel le récepteur (112) décompresse les données de capteur compressées (104, 124).
- 15.** Dispositif (100) selon la revendication 7, comprenant en outre une notification, envoyée par le récepteur (112) au serveur central (114) quand une condition est satisfaite.
- 16.** Dispositif (100) selon l'une quelconque des revendications 1 à 15, dans lequel l'émetteur (106, 128) comprend une première mémoire (116) destinée à stocker de manière temporaire les données de capteur (104, 124) avant leur émission vers le récepteur (112), dans lesquelles les données de capteur (104, 124) sont compressées avant leur émission et décompressées par le récepteur (112).
- 17.** Procédé de surveillance d'un capteur de patient, comprenant les étapes consistant à :
- > acquérir des données de capteur (104) en provenance d'un dispositif de détection (102) situé sur un patient (10), ou à l'intérieur de celui-ci ;
 > transmettre les données de capteur (104) à un émetteur (106) de manière continue, selon un intervalle et/ou sur commande, ledit émetteur (106) disposant d'une première mémoire (116) ;
 > stocker de manière temporaire les données de capteur (104) dans la première mémoire (116) ;
 > alimenter l'émetteur (106) de manière interne ;
 > placer l'émetteur (106) sur le patient (10) ;
 > mettre hors tension l'émetteur (106) dans un état normal ;
 > mettre sous tension l'émetteur (106) et émettre les données de capteur (104) stockées dans la première mémoire (116) à partir de l'émetteur (106) vers un récepteur (112) par une salve et/ou sur commande ;
 > recevoir un signal de confirmation (118) envoyé par le récepteur (112) à l'émetteur (106) de manière à accuser réception des données de capteur (104) ;
 > effacer et/ou écraser les données de capteur (104) stockées dans la première mémoire (116) lors de la réception du signal de confirmation (118) ; et
 > placer le récepteur (112) à distance de l'émetteur (106).
- 18.** Procédé selon la revendication 17, comprenant en outre les étapes consistant à :
- > communiquer les données de capteur (104)

- qui proviennent du récepteur (112) à un serveur central (114) ; et
 > stocker, analyser et/ou afficher les données de capteur au niveau du serveur central (114).
- 19.** Procédé selon la revendication 17 ou la revendication 18, comprenant en outre les étapes consistant à :
- > identifier le dispositif de détection (102) avec un identifiant unique de dispositif de détection ; et
 > éventuellement, coder les données de capteur (104) avec l'identifiant unique de dispositif de détection.
- 20.** Procédé selon l'une quelconque des revendications 17 à 19, comprenant en outre l'étape consistant à alimenter le dispositif de détection (102) à partir de l'émetteur (106) en transmettant une énergie sur un fil à partir de l'émetteur (106) vers le dispositif de détection (102) ou en induisant une énergie par l'intermédiaire de bobines d'induction dans l'émetteur (106) et le dispositif de détection (102).
- 21.** Procédé selon la revendication 17, comprenant en outre l'étape consistant à déclencher une alarme (120) en cas d'absence de réception du signal de confirmation (118).
- 22.** Procédé selon l'une quelconque des revendications 17 à 21, comprenant en outre l'étape consistant à fournir une instruction en provenance de l'émetteur (106) au dispositif de détection (102).
- 23.** Procédé selon l'une quelconque des revendications 17 à 22, comprenant en outre les étapes consistant à stocker les données de capteur (104) au niveau du récepteur (112), analyser les données de capteur (104) au niveau du récepteur (112) et/ou à afficher les données de capteur (104) au niveau du récepteur (112).
- 24.** Procédé selon l'une quelconque des revendications 17 à 23, comprenant l'étape consistant à communiquer les données de capteur analysées (104) à un serveur central (114).
- 25.** Procédé selon l'une quelconque des revendications 17 à 24, comprenant en outre l'étape consistant à identifier l'émetteur (106) avec un identifiant unique d'émetteur.
- 26.** Procédé selon l'une quelconque des revendications 17 à 25, comprenant en outre l'étape consistant à compresser les données de capteur (104) avant l'étape consistant à les émettre.
- 27.** Procédé selon la revendication 26, comprenant en outre l'étape consistant à décompresser les données de capteur (104) avant de les analyser.
- 28.** Procédé selon l'une quelconque des revendications 17 à 27, comprenant en outre l'étape consistant à communiquer une notification à un serveur central (114).
- 29.** Procédé selon la revendication 17, comprenant en outre les étapes consistant à :
- > accumuler les données de capteur (104) au cours d'une première période de temps ;
 > émettre les données de capteur (104) à partir de l'émetteur (106) vers le récepteur (112) au cours d'une seconde période de temps, plus courte que la première période de temps ;
 > mettre hors tension l'émetteur (106) ; et
 > afficher les données de capteur (104) au niveau du récepteur (112) selon un pseudo temps réel décalé d'une somme de la première période de temps et de la seconde période de temps.
- 30.** Procédé selon la revendication 29, comprenant en outre les étapes consistant à :
- > compresser les données de capteur (104) avant l'étape consistant à les émettre ; et
 > décompresser les données de capteur (104) avant l'étape consistant à les afficher.

FIG. 1

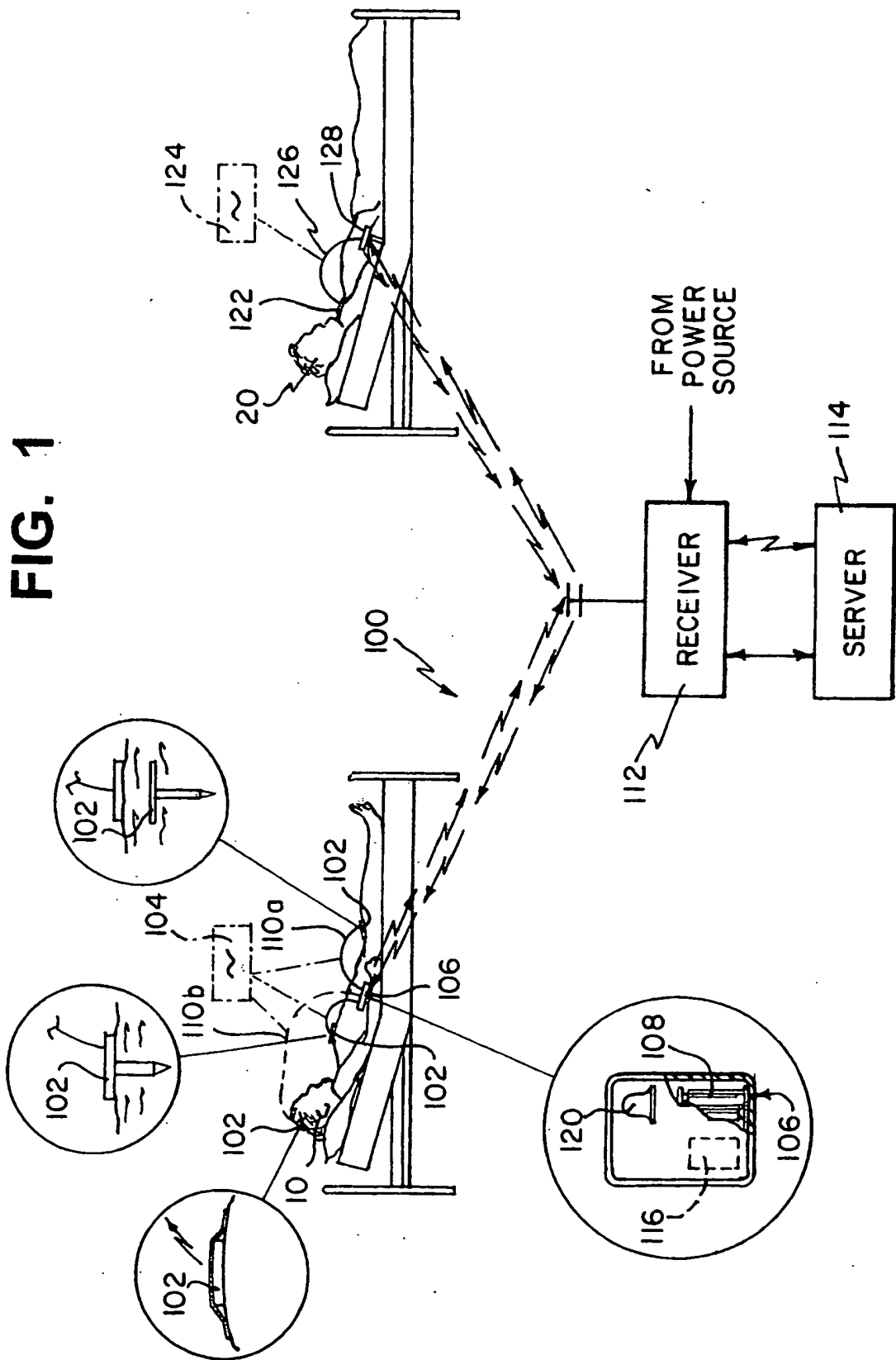


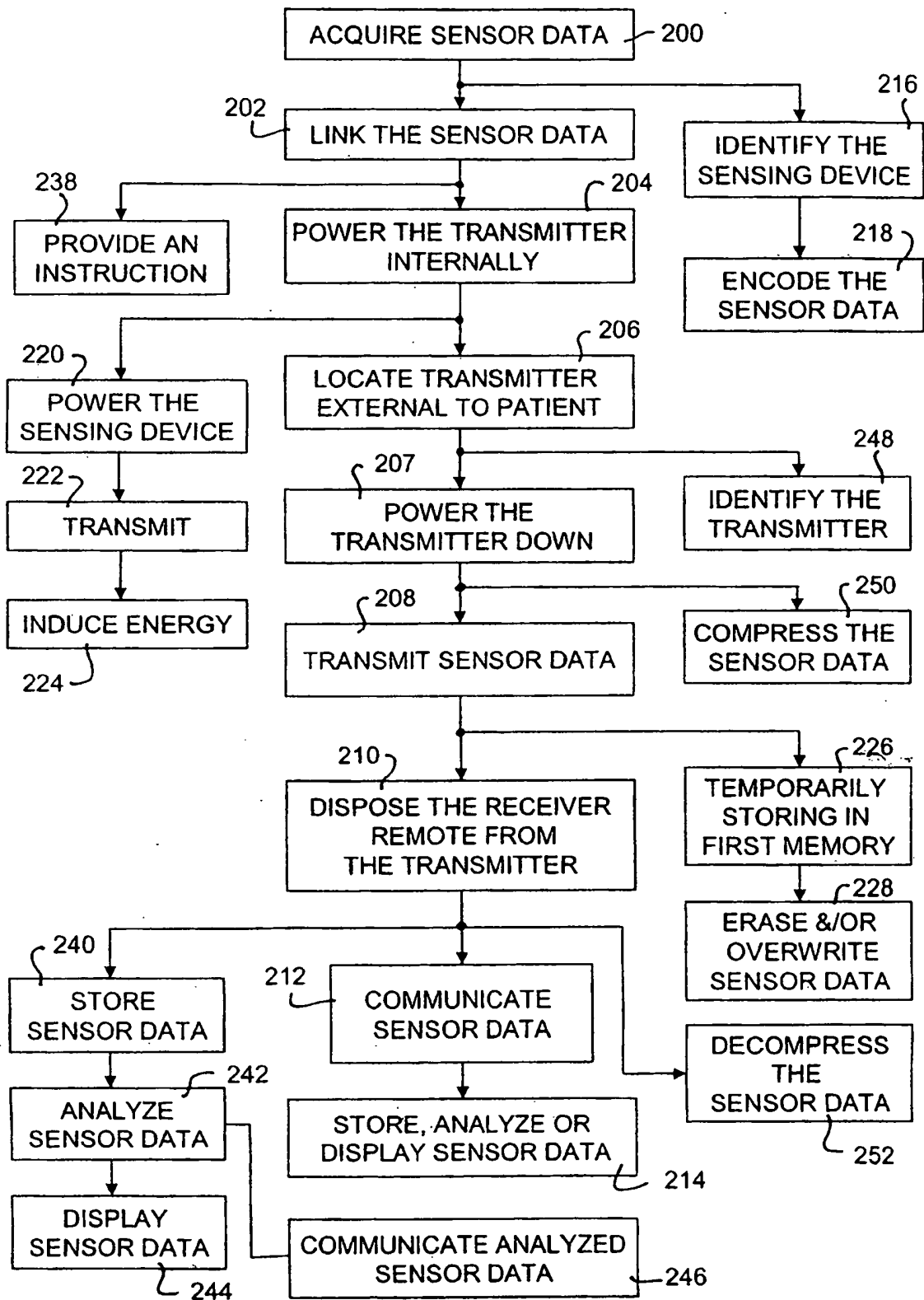
FIG. 2

FIG. 3

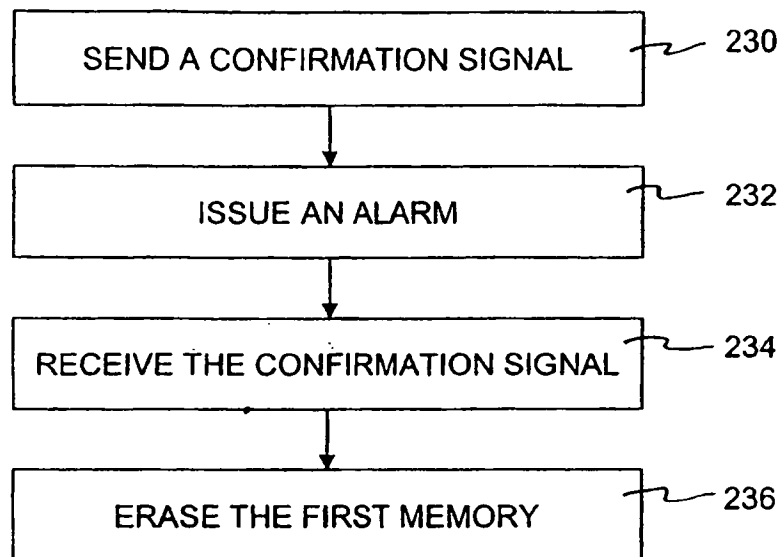
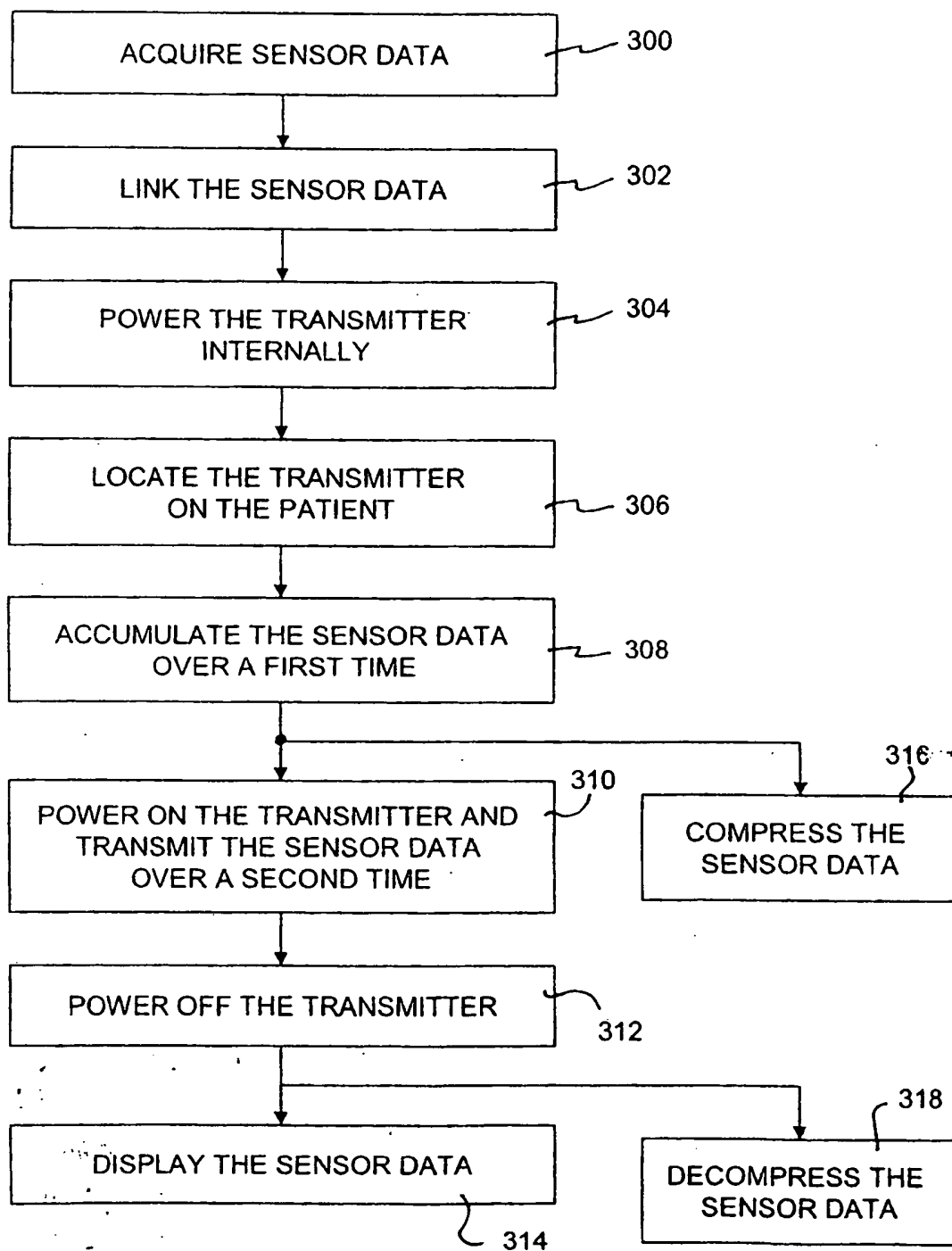


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4519401 A [0003] [0003]
- US 6533733 A [0004] [0004] [0004] [0004] [0004] [0004] [0005]
- US 6731976 A [0005] [0005] [0005] [0005]
- US 20030004403 A [0006]

专利名称(译)	无线病人监护系统		
公开(公告)号	EP1707115B1	公开(公告)日	2009-05-06
申请号	EP2006251860	申请日	2006-03-31
申请(专利权)人(译)	科德曼 & 舒特尔夫, INC.		
当前申请(专利权)人(译)	科德曼 & 舒特尔夫, INC.		
[标]发明人	FIFOLT DOUGLAS A ROSENBERG MIKI		
发明人	FIFOLT, DOUGLAS A. ROSENBERG, MIKI		
IPC分类号	A61B5/00		
CPC分类号	A61B5/0002 A61B5/0031 A61B5/7232		
代理机构(译)	MERCER , CHRISTOPHER PAUL		
优先权	11/097499 2005-04-01 US		
其他公开文献	EP1707115A2 EP1707115A3		
外部链接	Espacenet		

摘要(译)

一种用于监测患者的装置和方法，所述患者具有连续获取传感器数据的感测装置和位于患者体内并且内部供电的发射器。发送器通常处于断电状态并上电以传输传感器数据。接收器远离患者并且接收从发射器无线传输的传感器数据。传输通常是突发，也可以在命令上启动。对于突发，传感器数据在第一周期累积。发射器可以在第二段时间内传输传感器数据。第二段时间比第一段时间短。传输完成后，可以关闭发射器。进一步的步骤以伪实时方式在接收器处显示传感器数据。显示器移动第一和第二时间段的总和。

