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Vann et al.

(10) **Patent No.: US 9,235,682 B2**
(45) **Date of Patent: Jan. 12, 2016**

(54) **COMBINED EPISODIC AND CONTINUOUS PARAMETER MONITORING**

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(73) Assignee: **Welch Allyn, Inc.**, Skaneateles Falls, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 69 days.

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(51) **Int. Cl.**

G09G 5/00	(2006.01)
G06F 19/00	(2011.01)
A61B 5/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 19/3406*** (2013.01); *A61B 5/7445* (2013.01); *A61B 2505/03* (2013.01); *G06F 19/3487* (2013.01); *G09G 2380/08* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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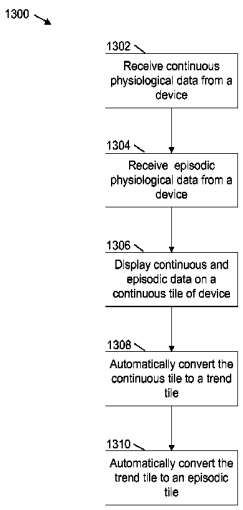
(57) **ABSTRACT**

A method for displaying physiological data on a medical display device includes receiving one or more first units of physiological data from a first monitoring device. At least one of the first units of physiological data is received on a continuous basis. Each first unit of physiological data corresponds to a medical parameter being monitored by the first monitoring device. One or more second units of physiological data are received from a second monitoring device. At least one of the second units of physiological data is received on a non-continuous basis. Each second unit of physiological data corresponds to a medical parameter being monitored by the second monitoring device. The first and second units of physiological data are displayed on a single display screen of the medical display device.

15 Claims, 14 Drawing Sheets



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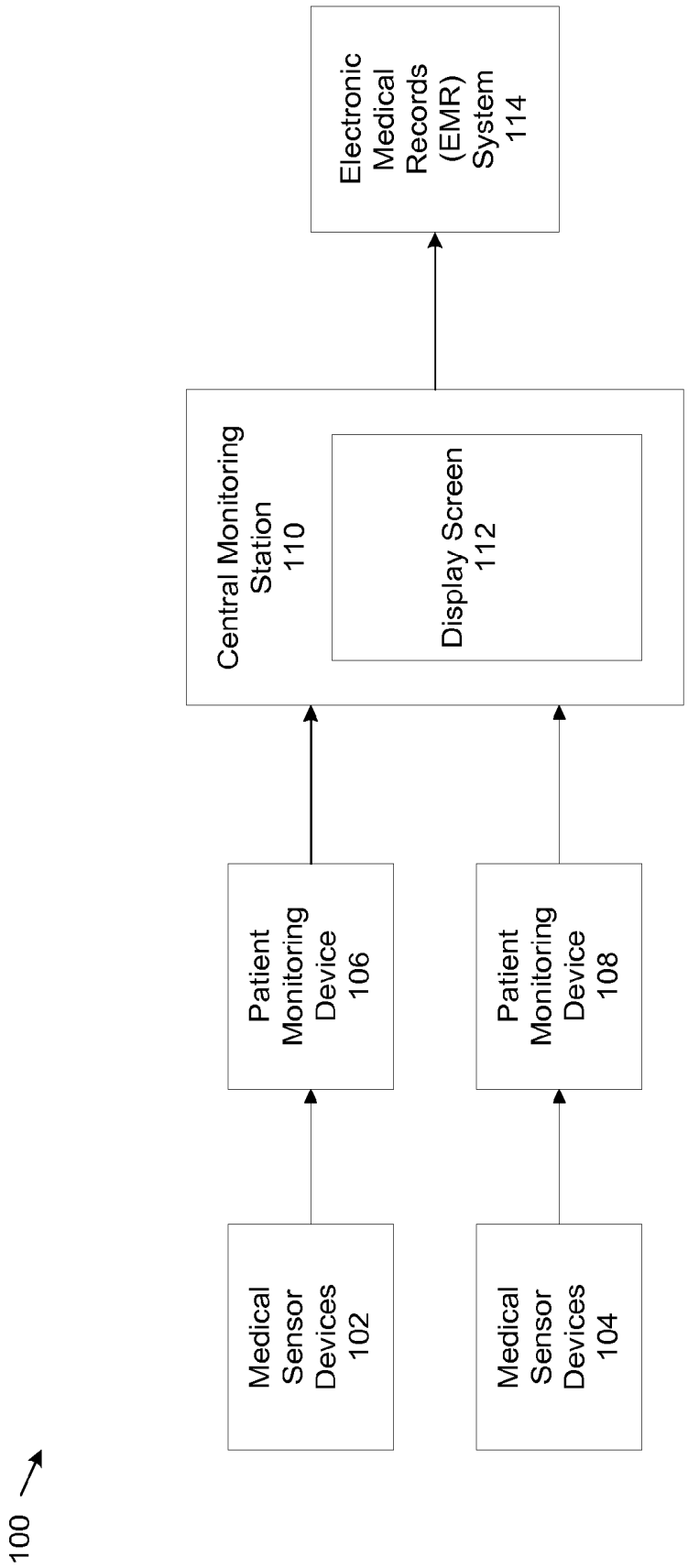
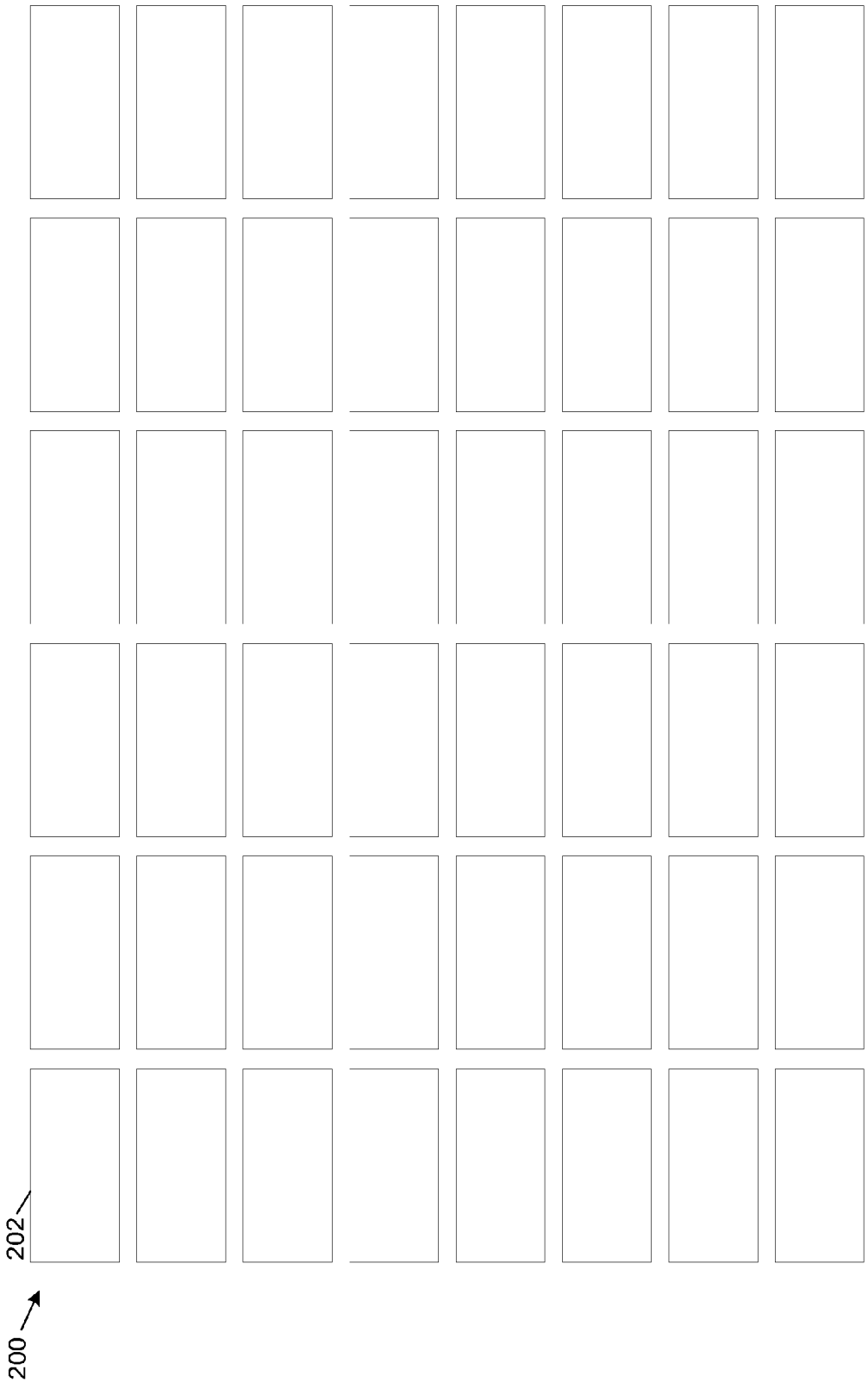

Electronic Medical Records (EMR) System 114
Central Monitoring Station 110
Display Screen 112
Patient Monitoring Device 106
Patient Monitoring Device 108
Medical Sensor Devices 102
Medical Sensor Devices 104
100

FIG. 1

FIG. 2



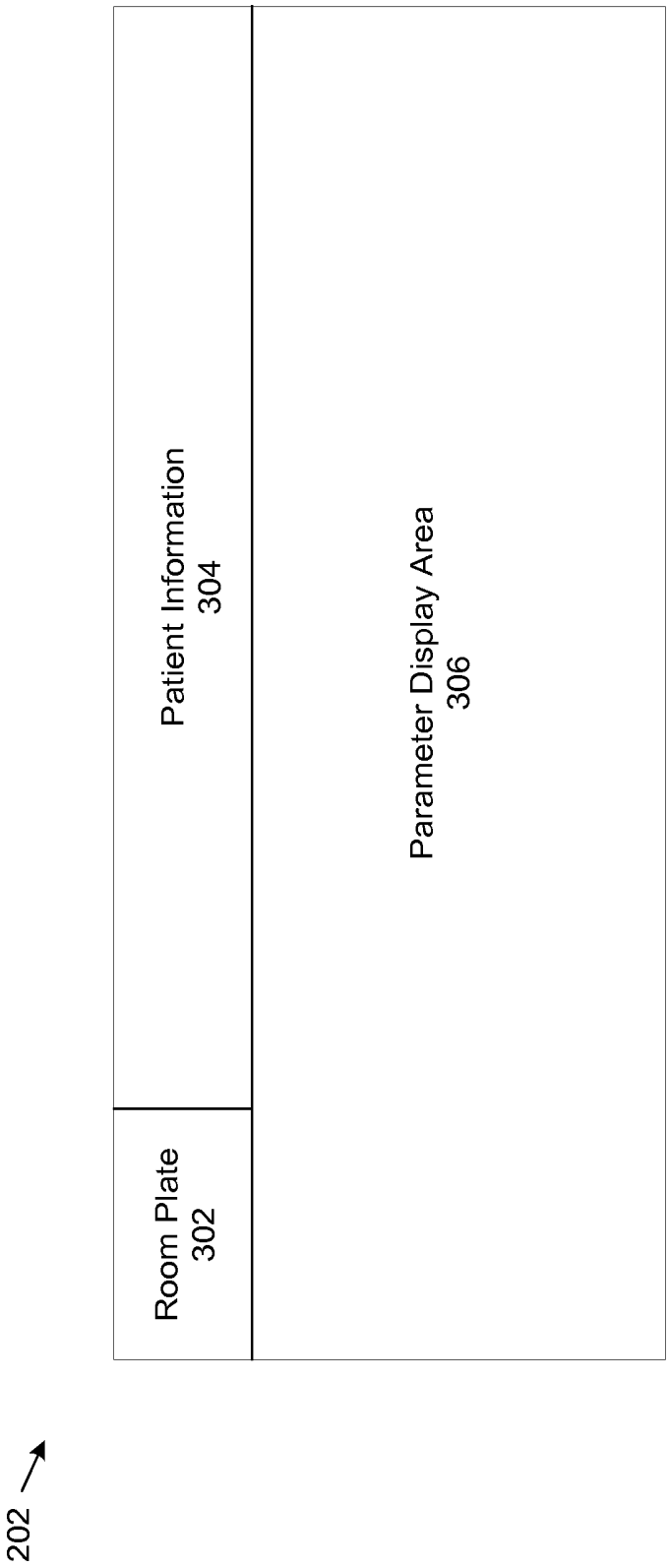

Patient Information
304
Parameter Display Area
306
Room Plate
302
202

FIG. 3

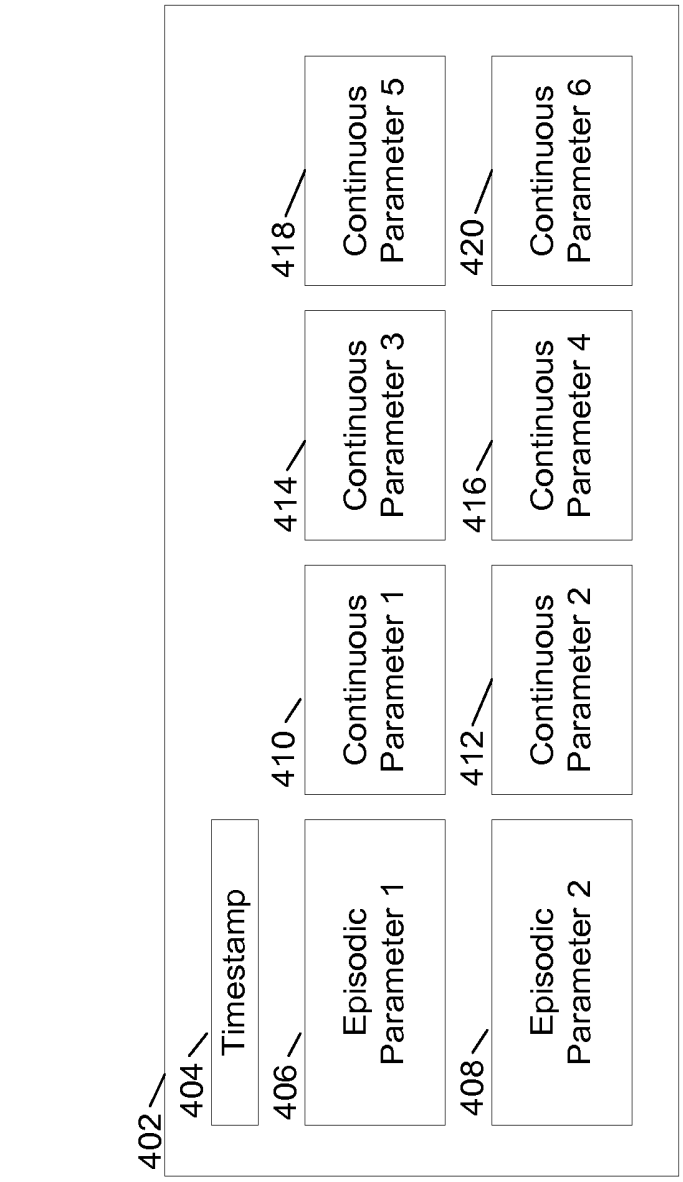
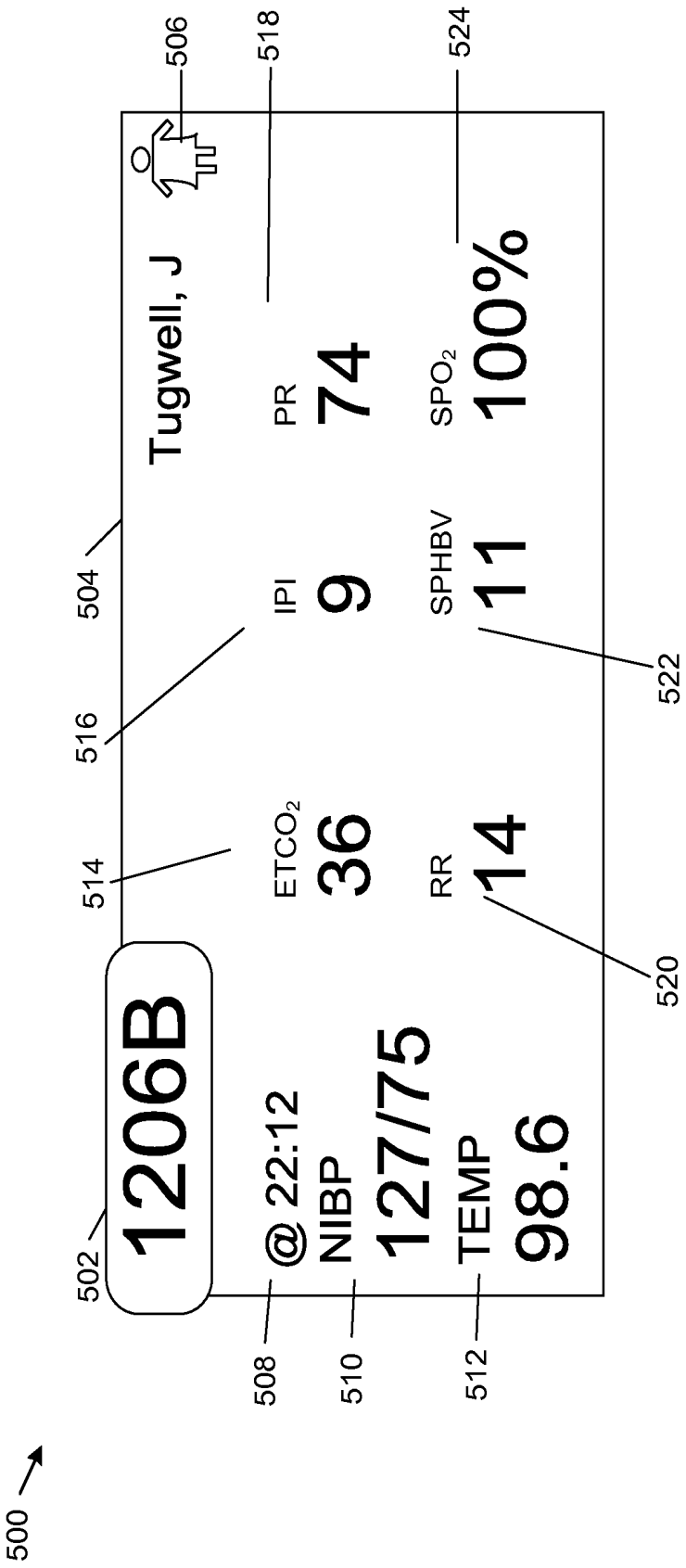

306
402
404
Timestamp
406
Episodic Parameter 1
408
Episodic Parameter 2
410
Continuous Parameter 1
412
Continuous Parameter 2
414
Continuous Parameter 3
416
Continuous Parameter 4
418
Continuous Parameter 5
420
Continuous Parameter 6

FIG. 4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502
1206B
504
Tugwell, J
506
508
@ 22:12
510
NIBP
127/75
512
TEMP
98.6
514
ETCO2
36
516
IPI
9
518
PR
74
520
RR
14
522
SPHBV
11
524
SPO2
100%

FIG. 5

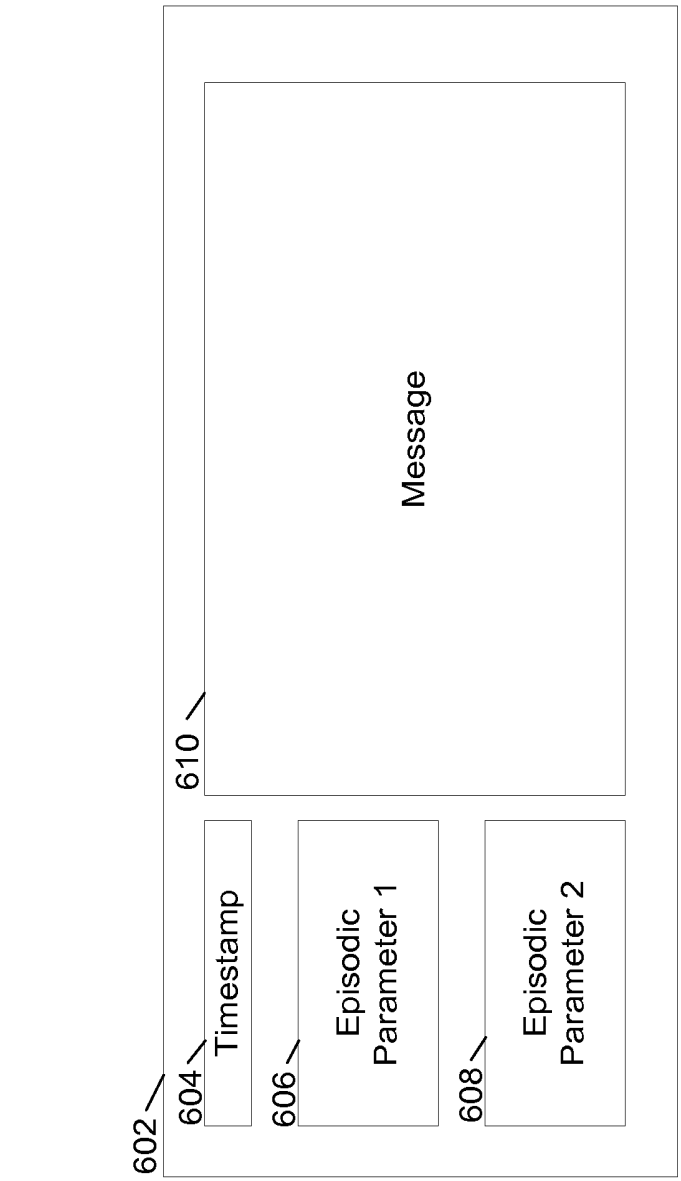

306
602
604
Timestamp
606
Episodic Parameter 1
608
Episodic Parameter 2
610
Message

FIG. 6

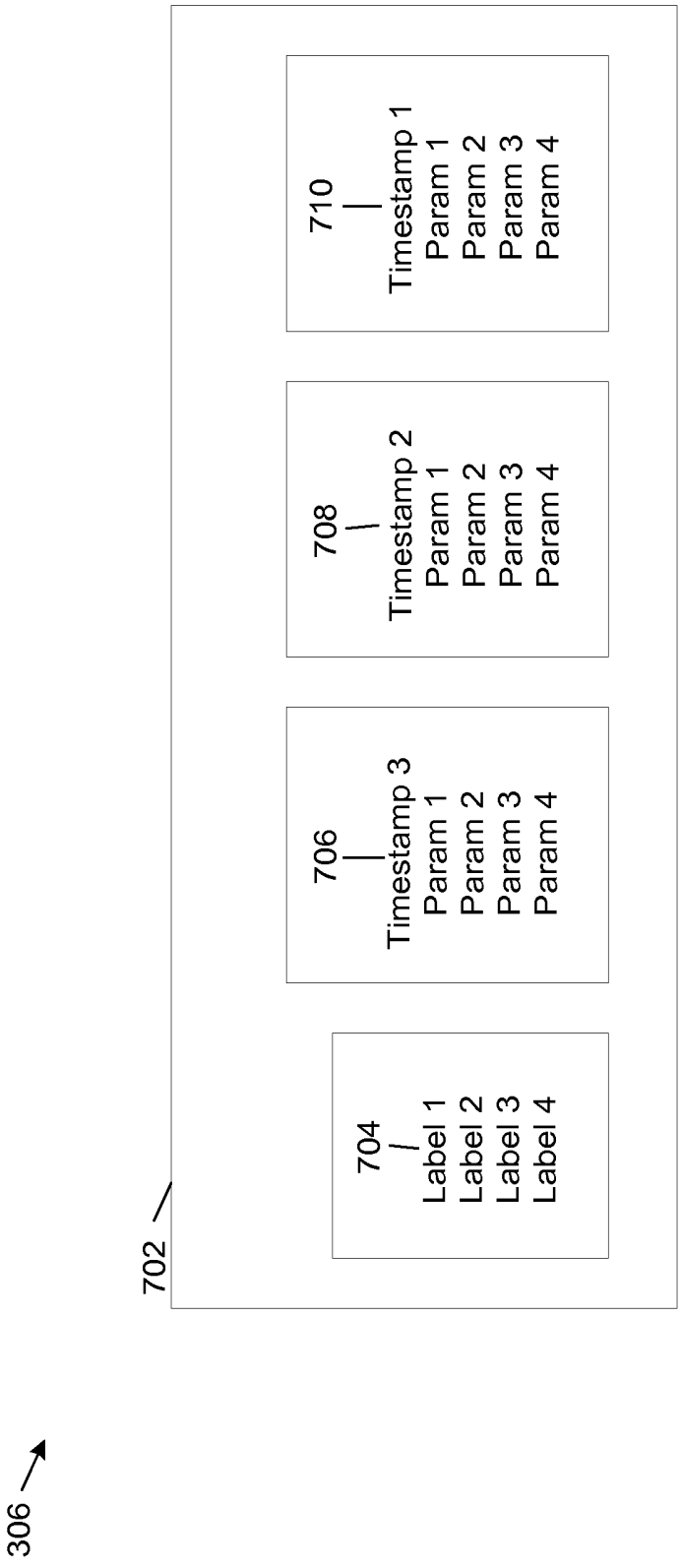

306
702
704
Label 1
Label 2
Label 3
Label 4
706
Timestamp 3
Param 1
Param 2
Param 3
Param 4
708
Timestamp 2
Param 1
Param 2
Param 3
Param 4
710
Timestamp 1
Param 1
Param 2
Param 3
Param 4

FIG. 7

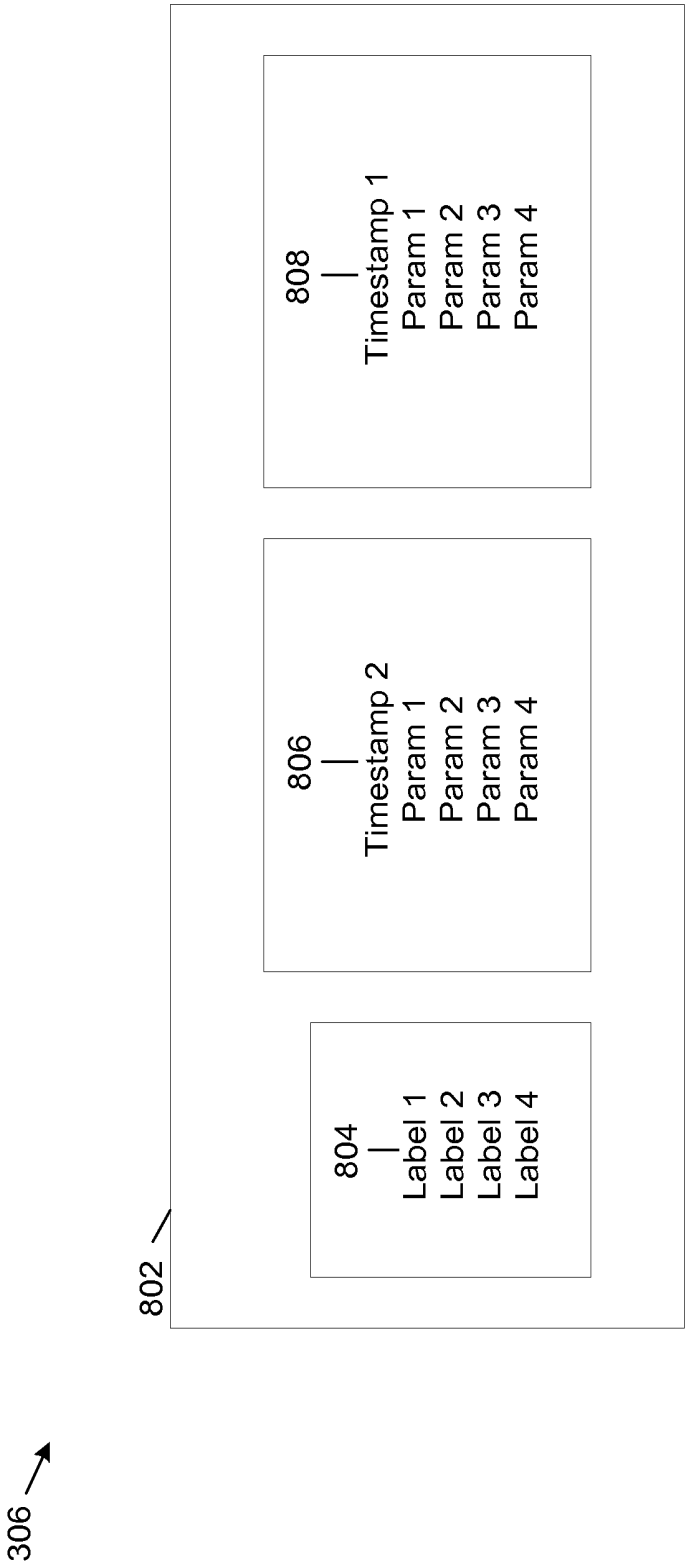
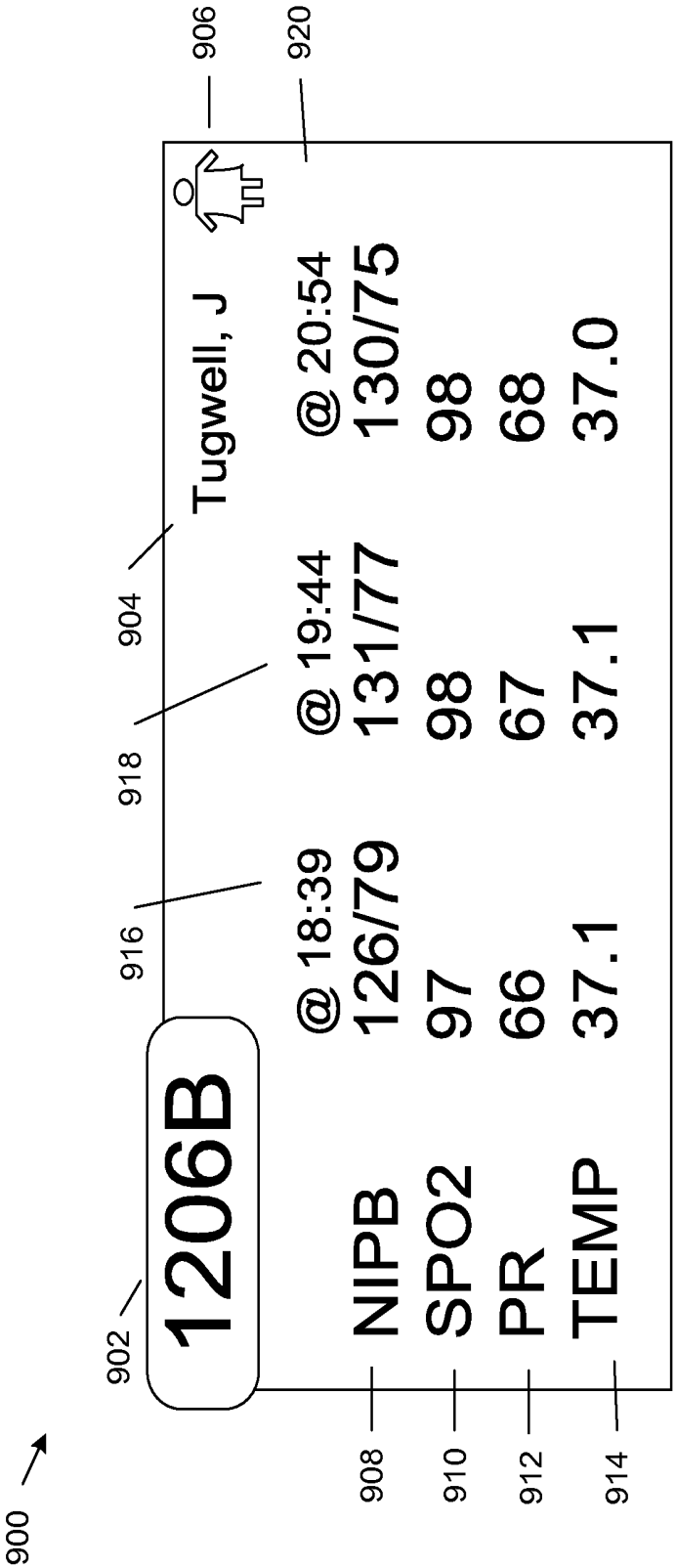

306
802
804
Label 1
Label 2
Label 3
Label 4
806
Timestamp 2
Param 1
Param 2
Param 3
Param 4
808
Timestamp 1
Param 1
Param 2
Param 3
Param 4

FIG. 8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902
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904
Tugwell, J
906
916
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126/79
97
66
37.1
918
@ 19:44
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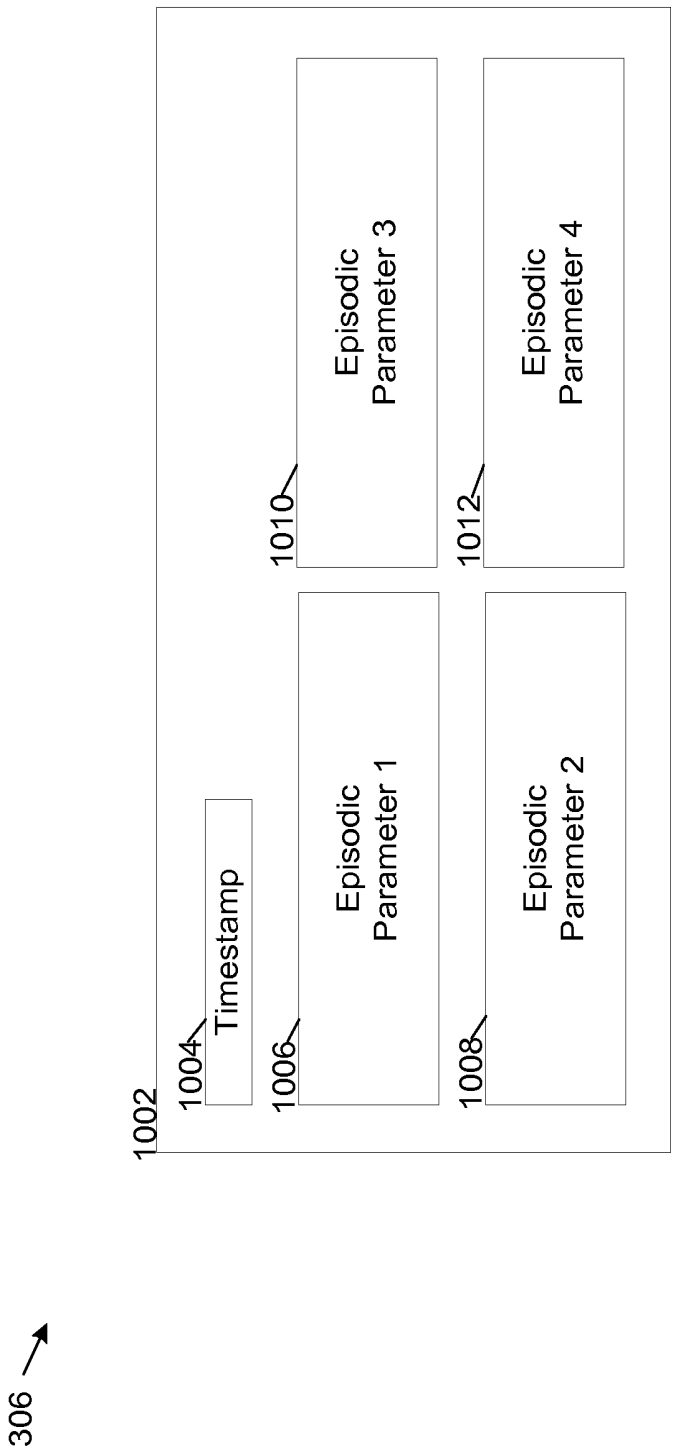
98
67
37.1
920
@ 20:54
130/75
98
68
37.0
908
NIPB
910
SPO2
912
PR
914
TEMP

FIG. 9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1004
Timestamp
1006
Episodic Parameter 1
1008
Episodic Parameter 2
1010
Episodic Parameter 3
1012
Episodic Parameter 4

FIG. 10

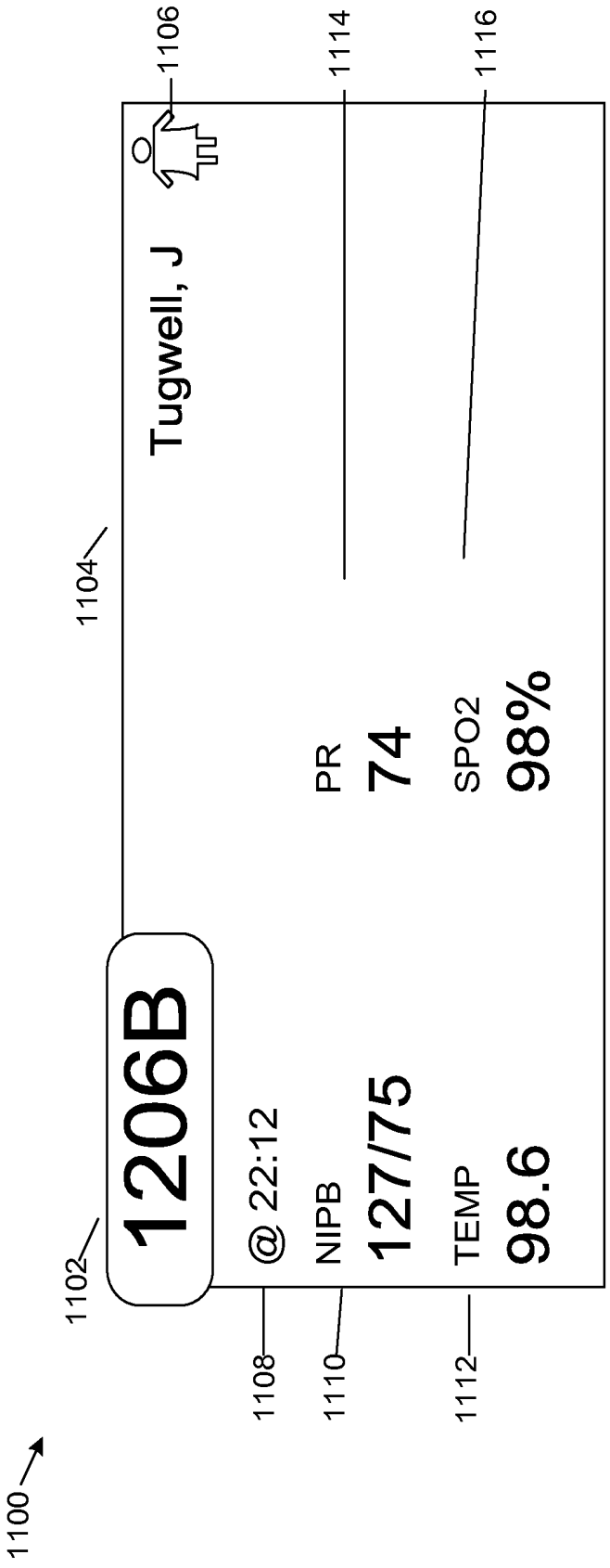
1100
1102
1206B
1104
Tugwell, J
1106
1114
1116
@ 22:12
NIPB
127/75
PR
74
SPO2
98%
TEMP
98.6
1108
1110
1112

FIG. 11

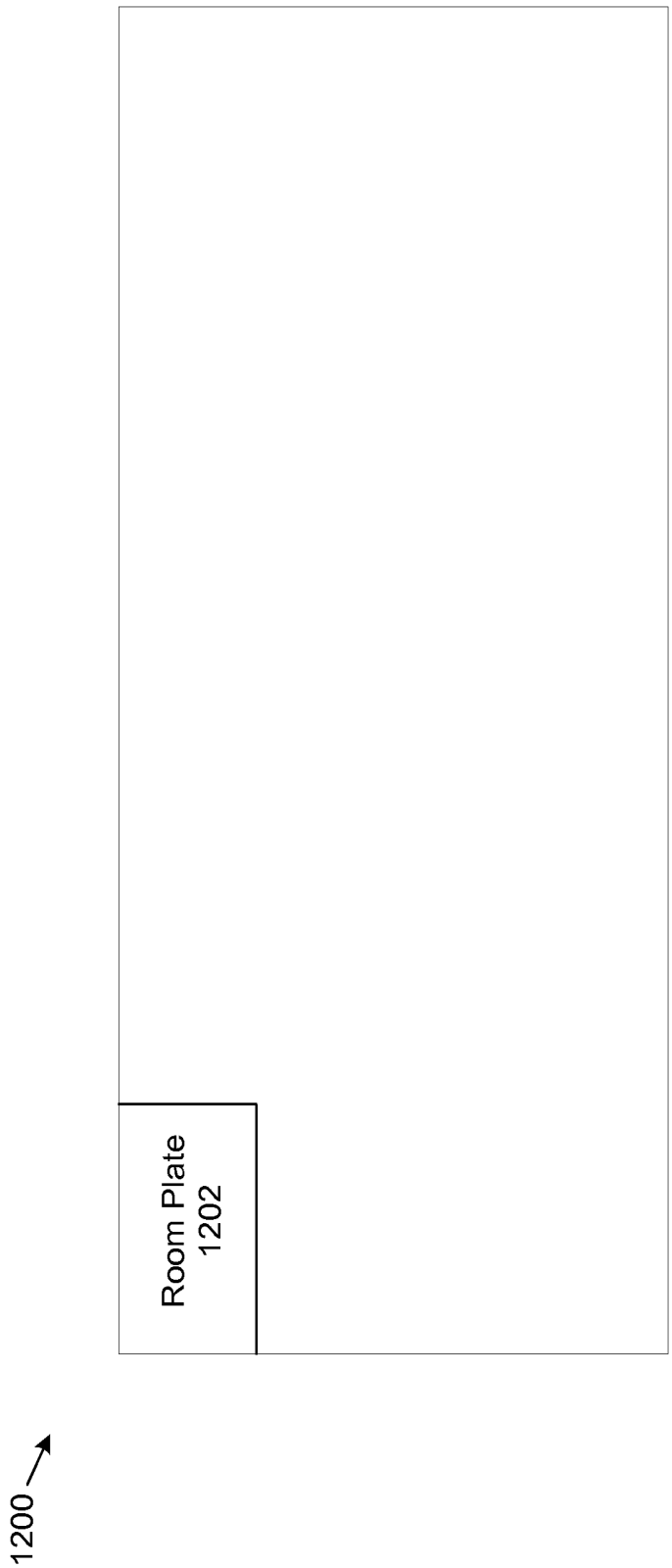

FIG. 12

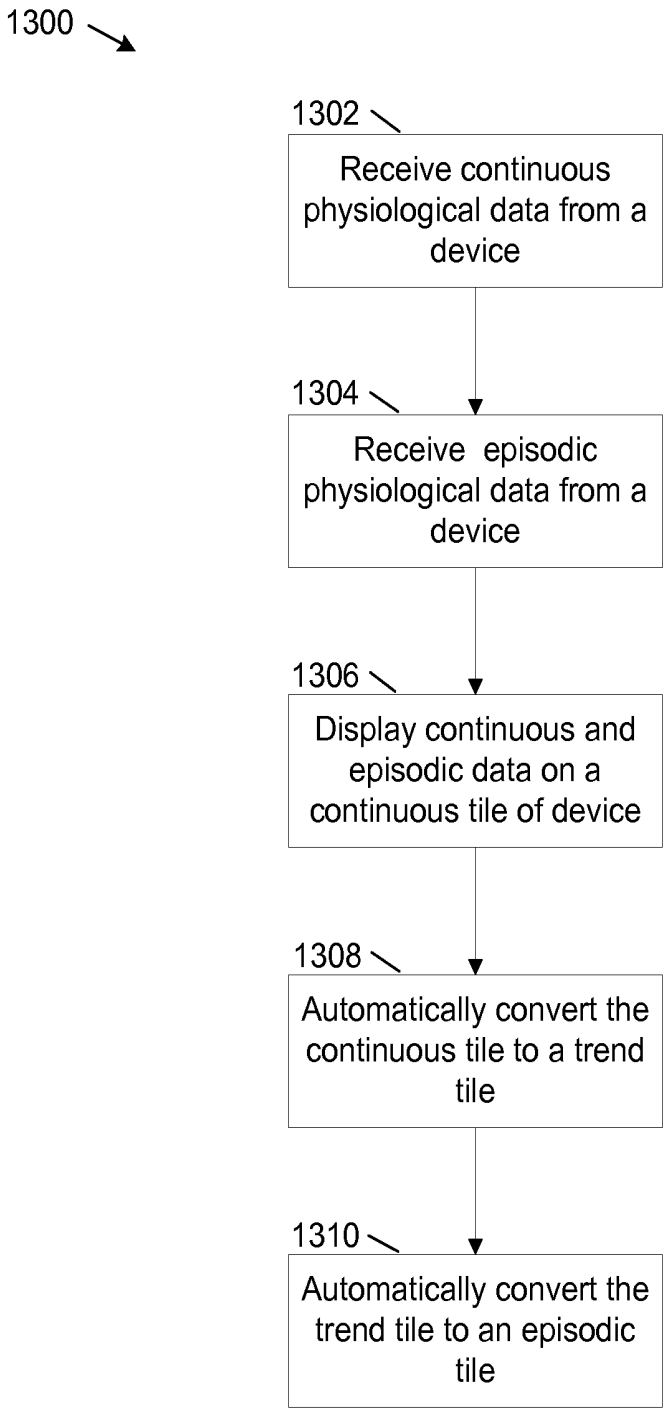
1300
1302
Receive continuous physiological data from a device
1304
Receive episodic physiological data from a device
1306
Display continuous and episodic data on a continuous tile of device
1308
Automatically convert the continuous tile to a trend tile
1310
Automatically convert the trend tile to an episodic tile

FIG. 13

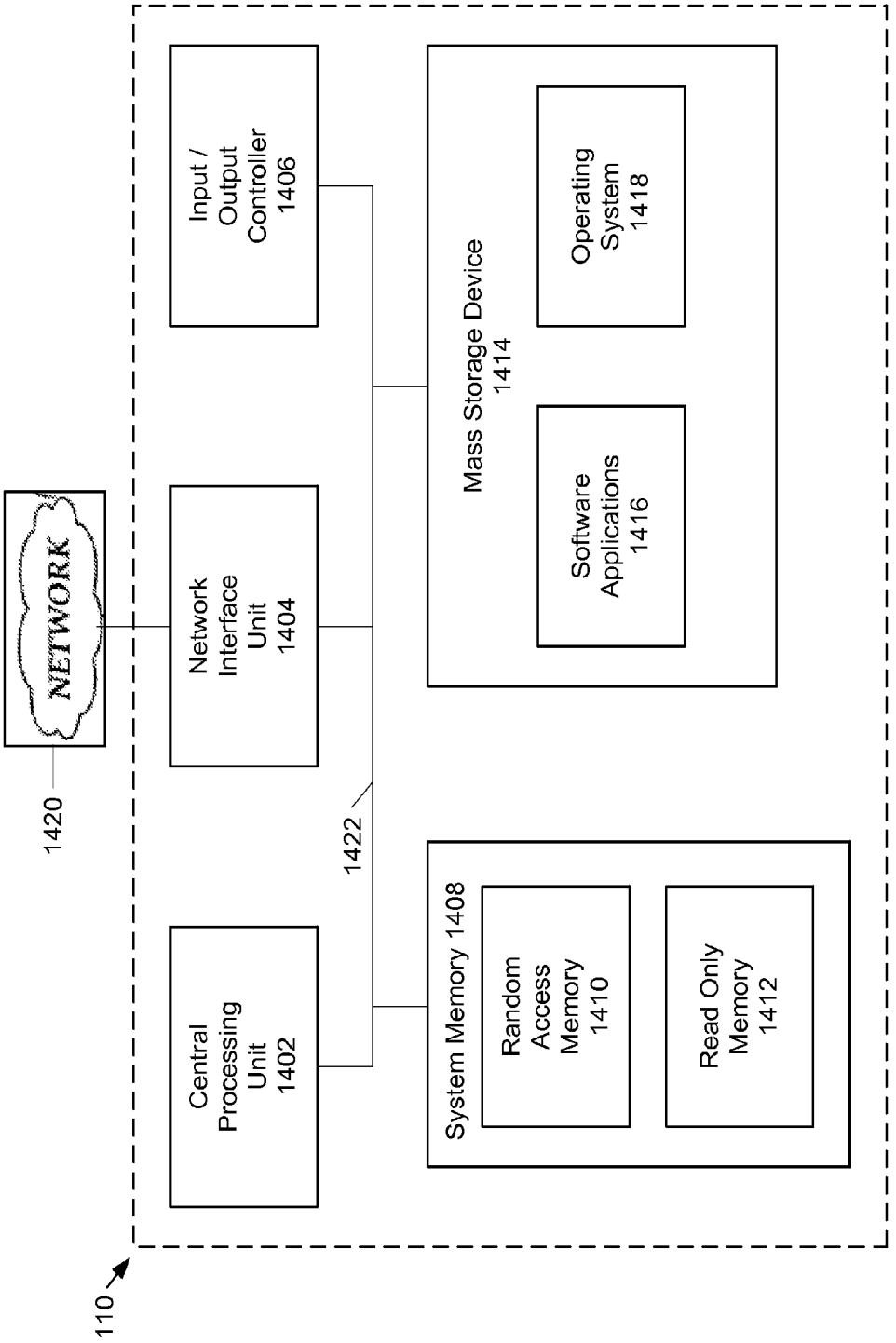
110
Central Processing Unit 1402
Input / Output Controller 1406
Network Interface Unit 1404
1420
NETWORK
1422
System Memory 1408
Random Access Memory 1410
Read Only Memory 1412
Mass Storage Device 1414
Operating System 1418
Software Applications 1416

FIG. 14

COMBINED EPISODIC AND CONTINUOUS PARAMETER MONITORING

BACKGROUND

In a medical setting, different monitoring devices may be used to monitor different types of patients. Surgical patients and post-surgical patients in intensive care are typically connected to monitoring devices that continuously receive physiological data from these patients. Less acute patients may be monitored less frequently using vital signs devices, for example when a clinician periodically takes vital signs for the patients.

Physiological and other data obtained from these patients are often stored and displayed in different places. For example, systems that continuously monitor patients typically display patient data and also send the data to an electronics medical records (EMR) system where the data is stored. For less acute patients, monitoring devices, for example vital signs devices, may be portable and data from these devices may be obtained manually, written on a chart and put outside a patient's room.

SUMMARY

Embodiments of the disclosure are directed to systems and methods for displaying physiological data on a medical display device. On the medical display device, one or more first units of physiological data are received from a first monitoring device. At least one of the first units of physiological data is received on a continuous basis. Each first unit of physiological data corresponds to a medical parameter being monitored by the first monitoring device. One or more second units of physiological data are received from a second monitoring device. At least one of the second units of physiological data is received on a non-continuous basis. Each second unit of physiological data corresponds to a medical parameter being monitored by the second monitoring device. The first and second units of physiological data are displayed on a single display screen of the medical display device.

The details of one or more techniques are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of these techniques will be apparent from the description, drawings, and claims.

DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an example patient monitoring system that supports a central monitoring station for displaying both continuous and episodic physiological data from a patient.

FIG. **2** shows an example user interface of the central monitoring station of FIG. **1**.

FIG. **3** shows an example standard layout for a display tile of the user interface of FIG. **2**.

FIG. **4** shows an example display screen for a continuous tile.

FIG. **5** shows an example screenshot of a continuous tile.

FIG. **6** shows an example display screen for a continuous tile with continuous data temporarily stopped.

FIGS. **7-8** show example display screens for trend tiles.

FIG. **9** shows an example screenshot of a trend tile.

FIG. **10** shows an example display screen for an episodic tile.

FIG. **11** shows an example screenshot for a trend an episodic tile.

FIG. **12** shows an example display screen for an empty room tile.

FIG. **13** shows an example flowchart of a method for displaying continuous and episodic physiological data for a patient on a single display device.

FIG. **14** shows example physical components of the central monitoring station of FIG. **1**.

DETAILED DESCRIPTION

The present disclosure is directed to a central monitoring station that displays both continuous and episodic data for a plurality of patients. Continuous data refers to patient data that is continuously obtained at short intervals, for example on a millisecond or second basis. Episodic data refers to patient data that is obtained as needed, for example at intervals that may range from minutes to hours. The central monitoring station is typically located at a central nurse's station so that the plurality of patients may be monitored from a central location.

Continuous data is typically obtained for acute patients, for example from surgical patients or from post-surgical patients in an intensive care unit. Typically these patients are connected to a monitoring device that continually receives physiological data from these patients. Examples of continuous physiological data include blood pressure, temperature, pulse rate, oxygen saturation level (SPO2), end tidal carbon dioxide (ETCO2) and respiratory rate. Other types of physiological data are possible. The physiological data is typically displayed on the monitoring device, typically located near the patient, and sent to an EMR system where the data is stored.

Episodic data is typically obtained for less acute patients, for example a patient recovering from surgery but out of intensive care. For these patients, physiological data may be obtained via a vital signs device that may be manually operated by a clinician. In this disclosure, episodic data refers to data obtained on a non-continuous basis. Examples of episodic data obtained from the vital signs device include blood pressure, temperature, pulse rate and SPO2. Other examples of episodic data are possible. Episodic data such as blood pressure, temperature, pulse rate and SPO2 may also be obtained on a continuous basis. However, when this data is obtained at random intervals, for example when a nurse manually takes a patient's blood pressure and temperature, the data is designated as episodic data. A nurse may manually obtain an oxygen saturation reading by manually clipping an SPO2 sensor to the patient and monitoring the SPO2 via a vital signs device.

FIG. **1** shows an example system **100** that supports a central monitoring station for displaying both continuous and episodic physiological data from a patient. The example system **100** includes medical sensor devices **102** and **104**, patient monitoring devices **106** and **108**, central monitoring station **110** and EMR system **114**. More or fewer medical sensor devices and patient monitoring devices may be used.

In the example system **100**, medical sensor devices **102** are attached to a patient requiring continuous monitoring, for example a surgical patient or a post-surgical patient in an intensive care unit. The example patient monitor device **106** is a continuous monitoring device, receiving continuous physiological data from medical sensor devices **102**. In this example, continuous physiological data refers to physiological data obtained at short intervals. Certain physiological data, for example SPO2 and pulse rate, may be obtained in millisecond intervals. Other physiological data, for example non-invasive blood pressure (NIBP) may be obtained at longer intervals, for example every few minutes. An example continuous monitoring device is the Welch Allyn 1500 Patient Monitor from Welch Allyn, Inc. of Skaneateles Falls, N.Y.

In the example system **100**, medical sensor devices **104** are attached to a patient receiving non-continuous episodic monitoring. For example, a patient monitor device **108** may include some or all of the medical sensor devices **104**, for example a thermometer, a blood pressure cuff and an SPO2 sensor. The patient monitor device **108** may be a portable vital signs device administered by a clinician on an as needs basis. An example vital signs device is the Connex® Vital Signs Monitor from Welch Allyn, Inc. of Skaneateles Falls, N.Y.

The example central monitoring station **110** receives physiological data from patient monitor device **106** and from patient monitor device **108** and displays the physiological data on example display screen **112**. In addition, the central monitoring station **110** sends physiological data received from patient monitoring devices **106** and **108** to EMR system **114**.

FIG. **2** shows an example user interface **200** of display screen **112**. The example user interface **200** includes a rendering of 48 display tiles. Each display tile provides information about an individual patient. Each display tile identifies the person, provides a location for the patient, for example a hospital room number, and displays physiological data for the patient. Different types of tiles are possible, including a continuous tile, an episodic tile, a trend tile, an empty room tile and a waiting area tile. The example user interface **200** shows six rows of tiles with eight tiles per row. Other tile organizations are possible and more or fewer than 48 tiles may be displayed. For example, an alternative tile organization is to render 36 display tiles, organized into six rows of six tiles per row. Each tile has a standard layout, as explained later herein.

In examples, the position of each tile on the user interface **200** may be configured via one or several modes. In an example automatic mode, the tiles are positioned by room number. In this mode, a tile with the lowest numerical room number is positioned at the upper left portion of the user interface **200** and a tile with the highest numerical room number is position in the lower right portion of the user interface **200**. In an example batch mode, certain positions on the user interface **200** are reserved for certain room numbers. Then, when a patient is assigned a room number, the tile takes a reserved position on the user interface **200**. In an example manual mode, tiles can be manually positioned anywhere on the user interface **200**.

FIG. **3** shows an example standard layout of display tile **202**. The standard layout for display tile **202** includes a room plate area **302**, a patient information area **304** and a parameter display area **306**. The room plate area **302** typically displays a room number for a patient. In examples the room plate area **302** may also include a hospital unit number and a bed number. The patient information area **304** includes identification information for the patient including the patient's name and sex. Other information may be included in the patient information area **304**. The parameter display area **306** displays physiological parameter data for the different types of tiles, as explained herein.

FIG. **4** shows an example display screen **402** for a continuous tile that is displayed in parameter display area **306**. A continuous tile is a tile that is associated with a medical device that continuously monitors physiological data for a patient. However, a continuous tile may display both continuous and episodic parameter data. The display screen **402** shows a layout having two episodic parameters and six continuous parameters. The continuous tile shown in display screen **402** includes a timestamp **404**, episodic parameters **406** and **408** and six continuous parameters **410**, **412**, **414**, **416**, **418** and **420**. Each parameter represents a specific type of physiological data for the patient. More or fewer episodic and continuous parameters may be displayed in parameter display area **306** for a continuous tile.

FIG. **5** shows an example screen shot for a continuous tile **500** with two episodic parameters and six continuous parameters. The continuous tile **500** includes room plate designator **502**, patient information including the name **504** of the patient, in this example Tugwell, J. and the sex of the patient, in this case an icon **506** indicating that the patient is a woman. The continuous tile **500** includes timestamp **508**. The two episodic parameters include parameters for non-invasive blood pressure (NIBP) **510** and temperature **512**. The six continuous parameters include parameters for end tidal carbon dioxide (ETCO2) **514**, IPI (integrated pulmonary index) **516**, pulse rate (PR) **518**, respiratory rate (RR) **520**, venous calibrated total hemoglobin (SPHBV) **522** and oxygen saturation (SPO2) **524**.

FIG. **6** shows an example display screen **602** for a continuous tile that is displayed in parameter display area **306**. For the example display screen **602**, continuous data has been temporarily stopped. The display screen **602** shows that when continuous data is stopped, instead of displaying continuous tiles, a message **610** is displayed in the area of parameter display area **306** reserved for the display of continuous tiles. The message indicates that that continuous data has been stopped temporarily. For example, a patient may be temporarily disconnected from a monitoring device to go the bathroom, get an x-ray, etc. The message may also indicate a reason why the continuous data has been stopped and may indicate an expected time when continuous data may resume. The display screen **602** still shows a timestamp **604** and two episodic parameters **606** and **608**.

FIG. **7** shows an example display screen for a trend tile **702** with three columns of data that is displayed in parameter display area **306**. A trend tile is displayed when a patient steps down from being continuously monitored, but still needs monitoring at relatively short intervals, for example every 15 minutes. The trend tile shows on one screen trends in the parameters being monitored. For example, trend tile **702** includes a column **704** that provides labels for four parameters being monitored. In addition, trend tile **702** includes three columns **706**, **708** and **710** of data. Column **706** includes timestamp **3**, representing the latest data obtained. Column **710** includes timestamp **1**, representing the earliest data being displayed. Column **708** shows parameter data corresponding to a timestamp between the latest and earliest. By viewing trend tile **702**, a clinician may be able to see a trend in the values of parameters being monitored.

FIG. **8** shows an example display screen for a trend tile **802** with two columns of data that is displayed in parameter display area **306**. Trend tiles with more than three columns of data are possible.

FIG. **9** shows an example screen shot for a trend tile **900** for four episodic parameters with three columns of parameter data. The trend tile **900** includes room plate designator **902**, patient information including the name **904** of the patient, in this example Tugwell, J. and the sex of the patient, in this case an icon **906** indicating that the patient is a woman. The trend tile **900** displays data for four episodic parameters including non-invasive blood pressure (NIBP) **908**, oxygen saturation (SPO2) **910**, pulse rate (PR) **912** and temperature (TEMP) **914**. The trend tile **910** includes values of these four episodic parameters for three different timestamps **916**, **918** and **920**. For the example trend tile **900**, the timestamp **916** corresponds to the earliest parameter data displayed and timestamp **920** corresponds to the latest parameter data displayed. For example, timestamp **916** corresponds to readings taken for

the four parameters **908-914** at a time of 18:39, timestamp **918** corresponds to readings taken for the four parameters **908-914** at a time of 19:44 and timestamp **920** corresponds to readings taken for the four parameters **908-914** at a time of 20:54.

FIG. **10** shows an example display screen for an episodic tile **1002** that is displayed in parameter display area **306**. The episodic tile **1002** includes four episodic parameters **1006**, **1008**, **1010** and **1012**. The episodic tile **1002** is displayed when the central monitoring station **110** does not receive parameter data for a predetermined period of time, for example for 90 minutes. In a typical hospital scenario, continuous tiles are displayed for surgical and post-surgical patients. When patients step-down from being continuously monitored to being monitored at longer intervals, for example every 15 minutes, trend tiles are typically displayed. When the condition of a patient is less acute, the patient is typically monitored at still longer intervals, for example once per nursing shift. When physiological data for a patient is not received by the central monitoring station within the still longer time interval, for example 90 minutes, an episodic tile is typically displayed for that particular patient.

FIG. **11** shows an example screen shot for an episodic tile **1100** with four episodic parameters. The episodic tile **1100** includes room plate designator **1102**, patient information including the name **1104** of the patient, in this example Tugwell, J., and the sex of the patient, in this case an icon **1106** indicating that the patient is a woman. The episodic tile **1100** includes timestamp **1108**. The four episodic parameters include parameters for non-invasive blood pressure (NIBP) **1110**, temperature **1112**, pulse rate **1114** and SPO2 **1116**.

FIG. **12** shows an example display screen for empty room tile **1200**. The example empty room tile **1200** is a tile for a patient that has been admitted to a hospital and has been assigned a room number, but physiological data has not been taken and entered into the central monitoring station for the patient yet. When one or more medical devices are associated with the patient and physiological data is taken for the patient, the empty room tile **1200** becomes a standard tile—for example a continuous time, a trend tile or an episodic tile.

FIG. **13** shows an example flowchart for a method **1300** for displaying continuous and episodic physiological data for a patient on a single display device. At operation **1302**, continuous physiological data is received from a first monitoring device. The first monitoring device is a patient monitoring device that is connected to one or more physiological sensors attached to a patient. The patient monitoring device is typically used for acute patients, typically patients in surgery or in an intensive care unit. The physiological sensors continuously monitor physiological data for the patient. Examples of physiological data that is continuously monitored for such acute patients include temperature, blood pressure, pulse rate, oxygen saturation, respiratory rate and end tidal carbon dioxide. Other continuous physiological data is possible. The patient monitoring device is located near the patient and includes a display screen on which the physiological data can be observed by clinicians.

At operation **1304**, episodic physiological data for the patient is obtained from a second patient monitoring device. As discussed, episodic physiological data refers to patient data that is obtained as needed, for example taken manually by a clinician at random time intervals. The second patient monitoring device is typically a vital signs device, for example the Connex® Vital Signs Monitor from Welch Allyn, Inc. of Skaneateles Falls, N.Y. Examples of episodic data include blood pressure, temperature, pulse rate and oxygen saturation. Other episodic physiological data is possible.

At operation **1306**, the continuous physiological data and the episodic physiological data are displayed on a continuous tile of a centrally located medical display device. The central located medical display device, for example central monitoring station **110**, is typically located at a nurse's station, whereby clinicians can view the status of a plurality of patients. The central monitoring station **110** can display a plurality of display tiles, each tile corresponding to one patient. The continuous tile, an example screenshot of which is shown in FIG. **5**, displays both continuous parameters and episodic parameters for a patient on a single tile.

A continuous tile is displayed for a patient when continuous physiological data continues to be received for the patient. At operation **1308**, when the central monitoring station **110** does not receive continuous physiological data within a first predetermined time interval, for example 15 minutes, the continuous tile is automatically converted to a trend tile. The trend tile, an example screenshot of which is shown in FIG. **9**, displays multiple columns of episodic data, each column of episodic data representing a snap shot of the episodic data at a specific time. By viewing the trend tile, a clinician may be able to detect changes in episodic data over time.

When a patient no longer needs acute monitoring, for example, when the patient is out of intensive care and moved to a standard hospital room, the patient is typically monitored at less frequent intervals. For example, the patient's vital signs may be taken during changes of nursing shifts or at random intervals during a nurse's shift. At operation **1310**, when the central monitoring station **110** does not receive any new physiological data from the patient within a second predetermined time interval, for example 90 minutes, the trend tile is automatically converted to an episodic tile. The episodic tile, an example screenshot of which is shown in FIG. **11**, displays the most recently received episodic data.

FIG. **14** illustrates example physical components of the central monitoring station **110**. As illustrated in the example of FIG. **14**, the central monitoring station **110** includes at least one central processing unit ("CPU") **1402**, a system memory **1408**, and a system bus **1422** that couples the system memory **1408** to the CPU **1402**. The system memory **1408** includes a random access memory ("RAM") **1410** and a read-only memory ("ROM") **1412**. A basic input/output system contains the basic routines that help to transfer information between elements within the central monitoring station **110**, such as during startup, is stored in the ROM **1412**. The central monitoring station **110** further includes a mass storage device **1414**. The mass storage device **1414** is able to store software instructions and data.

The mass storage device **1414** is connected to the CPU **1402** through a mass storage controller (not shown) connected to the bus **1422**. The mass storage device **1414** and its associated computer-readable data storage media provide non-volatile, non-transitory storage for the central monitoring station **110**. Although the description of computer-readable data storage media contained herein refers to a mass storage device, such as a hard disk or CD-ROM drive, it should be appreciated by those skilled in the art that computer-readable data storage media can be any available non-transitory, physical device or article of manufacture from which the central monitoring station can read data and/or instructions.

Computer-readable data storage media include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable software instructions, data structures, program modules or other data. Example types of

computer-readable data storage media include, but are not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROMs, digital versatile discs ("DVDs"), other optical storage media, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by the central monitoring station **110**.

According to various embodiments of the invention, the central monitoring station **110** may operate in a networked environment using logical connections to remote network devices through the network **1420**, such as a local network, the Internet, or another type of network. The central monitoring station may connect to the network **1420** through a network interface unit **1404** connected to the bus **1422**. It should be appreciated that the network interface unit **1404** may also be utilized to connect to other types of networks and remote computing systems. The central monitoring station **110** also includes an input/output controller **1406** for receiving and processing input from a number of other devices, including a keyboard, a mouse, a touch user interface display screen, or another type of input device. Similarly, the input/output controller **1406** may provide output to a touch user interface display screen, a printer, or other type of output device.

As mentioned briefly above, the mass storage device **1414** and the RAM **1410** of the central monitoring station **110** can store software instructions and data. The software instructions include an operating system **1418** suitable for controlling the operation of the central monitoring station **110**. The mass storage device **1414** and/or the RAM **1410** also store software instructions, that when executed by the CPU **1402**, cause the central monitoring station **110** to provide the functionality of the central monitoring station **110** discussed in this document. For example, the mass storage device **1414** and/or the RAM **1410** can store software instructions that, when executed by the CPU **1402**, cause the central monitoring station **110** to display the user interface **200** screen and other screens.

The description of the example physical components used on the central monitoring station **110** as shown in FIG. **14** also applies to example physical components used in the EMR system **114**. Thus, each of the one or more computing devices in the EMR system **114** includes at least one central processing unit ("CPU"), a system memory, and a system bus that couples the system memory to the CPU. The system memory also includes a random access memory ("RAM"), a read-only memory ("ROM") and a mass storage device that is able to store software instructions and data. In addition, the mass storage device and its associated computer-readable data storage media provide non-volatile, non-transitory storage for each of the one or more computing devices in the EMR system **114**.

The various embodiments described above are provided by way of illustration only and should not be construed to limiting. Various modifications and changes that may be made to the embodiments described above without departing from the true spirit and scope of the disclosure.

What is claimed is:

1. A method for displaying physiological data on a medical display device, the method comprising:

on the medical display device, receiving one or more first units of physiological data from a first monitoring device, at least one of the first units of physiological data being received on a continuous basis, each first unit of physiological data corresponding to a medical parameter being monitored by the first monitoring device;

receiving one or more second units of physiological data from a second monitoring device, at least one of the second units of physiological data being received on a non-continuous basis, each second unit of physiological data corresponding to a medical parameter being monitored by the second monitoring device;

displaying the first and second units of physiological data on a single display screen of the medical display device;

measuring a first time interval;

when the first time interval expires without receiving the first units of physiological data, automatically converting a continuous tile showing first continuous data to a trend tile, the trend tile displaying one or more columns of the first units of physiological data;

measuring a second time interval, the second time interval being greater than the first time interval; and

when the second time interval expires without receiving the first units of physiological data, automatically converting the trend tile to an episodic tile, the episodic tile displaying the first units of physiological data received non-continuously.

2. The method of claim **1**, wherein the medical display device displays the first and second units of data in a series of display tiles on the medical display device.

3. The method of claim **2**, wherein the display tiles are organized by rows and columns.

4. The method of claim **2**, wherein the display tiles include continuous tiles, episodic tiles and trend tiles.

5. The method of claim **4**, wherein the continuous tiles include a display of physiological data received continuously and physiological data received non-continuously.

6. The method of claim **4**, wherein the episodic tiles include a display of physiological data received non-continuously and do not include a display of physiological data monitored continuously.

7. The method of claim **4**, wherein the trend tiles include displays of two or more groups of second units of physiological data, the two or more groups of physiological data corresponding to physiological data received non-continuously, each group of second unit of physiological data being identified by a timestamp.

8. The method of claim **1**, wherein the first time interval is 15 minutes.

9. The method of claim **1**, wherein the second time interval is 90 minutes.

10. The method of claim **4**, wherein a message is displayed on the continuous tiles when a patient is temporarily disconnected from the first monitoring device.

11. The method of claim **1**, wherein the medical parameters corresponding to the first units of physiological data include blood pressure, temperature, pulse rate, end tidal carbon dioxide, respiratory rate, hemoglobin, oxygen saturation and an index related to pulmonary health for a patient.

12. The method of claim **1**, wherein the medical parameters corresponding to the second units of physiological data include blood pressure, temperature, pulse rate and oxygen saturation.

13. An electronic computing device comprising:

a processing unit; and

system memory, the system memory including instructions that when executed by the processing unit cause the electronic computing device to:

receive one or more first units of physiological data from a first monitoring device, at least one of the first units of physiological data being received on a continuous

basis, each first unit of physiological data corresponding to a medical parameter being monitored by the first monitoring device;

receive one or more second units of physiological data from a second monitoring device, at least one of the second units of physiological data being received on a non-continuous basis, each second unit of physiological data corresponding to a medical parameter being monitored by the second monitoring device;

display the first and second units of physiological data on a single display screen of the electronic computing device;

measure a first time interval;

when the first time interface expires without receiving the first units of physiological data, automatically convert a continuous tile showing first continuous data to a trend tile when the first units of physiological data are not received within a first time interval, the trend tile displaying one or more columns of the first continuous data, with each column representing a snapshot of episodic data at a specific time;

measure a second time interval, the second time interval being greater than the first time interval; and

when the second time interval expires without receiving the first units of physiological data, automatically convert the trend tile to an episodic tile, the episodic tile displaying both:

the first units of physiological data received non-continuously; and

the second units of physiological data received non-continuously.

14. The electronic computing device of claim **13**, wherein the processing unit causes the electronic computing device to display the first and second units of physiological data in a series of display tiles on the electronic computing device, the display tiles including continuous tiles, episodic tiles and trend tiles.

15. The electronic computing device of claim **14**, wherein the processing unit causes the electronic computing device to display one or more first units of physiological data and one or more second units of physiological data in a continuous tile.

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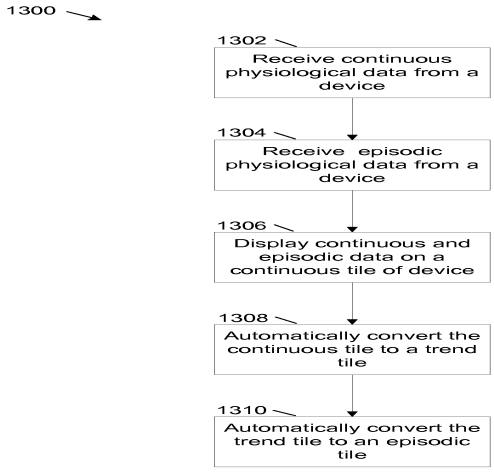
专利名称(译)	结合间歇和连续参数监测		
公开(公告)号	US9235682	公开(公告)日	2016-01-12
申请号	US13/440318	申请日	2012-04-05
[标]申请(专利权)人(译)	约翰雷蒙德Vann 威尔明顿罗伯特保罗 MYERS托马斯 他格雷戈瑞P 爱德华Imboden		
申请(专利权)人(译)	范恩，约翰雷蒙德 威尔明顿，罗伯特·保罗 MYERS，托马斯A. 瓦萨洛，GREGORY P. 因博登，爱德华		
当前申请(专利权)人(译)	伟伦，INC.		
[标]发明人	VANN JOHN RAYMOND WILMINGTON ROBERT PAUL MYERS THOMAS A VASSALLO GREGORY P IMBODEN EDWARD		
发明人	VANN, JOHN RAYMOND WILMINGTON, ROBERT PAUL MYERS, THOMAS A. VASSALLO, GREGORY P. IMBODEN, EDWARD		
IPC分类号	G09G5/00 G06F19/00 A61B5/00 G16H10/60		
CPC分类号	G06F19/3406 A61B5/7445 A61B2505/03 G06F19/3487 G09G2380/08 G16H15/00 G16H40/63 G06F3/0484 G06F40/106		
代理机构(译)	商户德律P.C.		
助理审查员(译)	陈，俞		
其他公开文献	US20130265327A1		
外部链接	Espacenet USPTO		

摘要(译)

一种用于在医疗显示设备上显示生理数据的方法，包括从第一监测设备接收一个或多个第一生理数据单元。至少一个第一生理数据单元是连续接收的。每个第一生理数据单元对应于由第一监测设备监测的医学参数。从第二监测设备接收一个或多个第二生理数据单元。在非连续的基础上接收至少一个第二生理数据单元。每个第二生理数据单元对应于由第二监视设备监视的医学参数。第一和第二生理数据单元显示在医疗显示设备的单个显示屏上。


1300
1302
Receive continuous physiological data from a device
1304
Receive episodic physiological data from a device
1306
Display continuous and episodic data on a continuous tile of device
1308
Automatically convert the continuous tile to a trend tile
1310
Automatically convert the trend tile to an episodic tile