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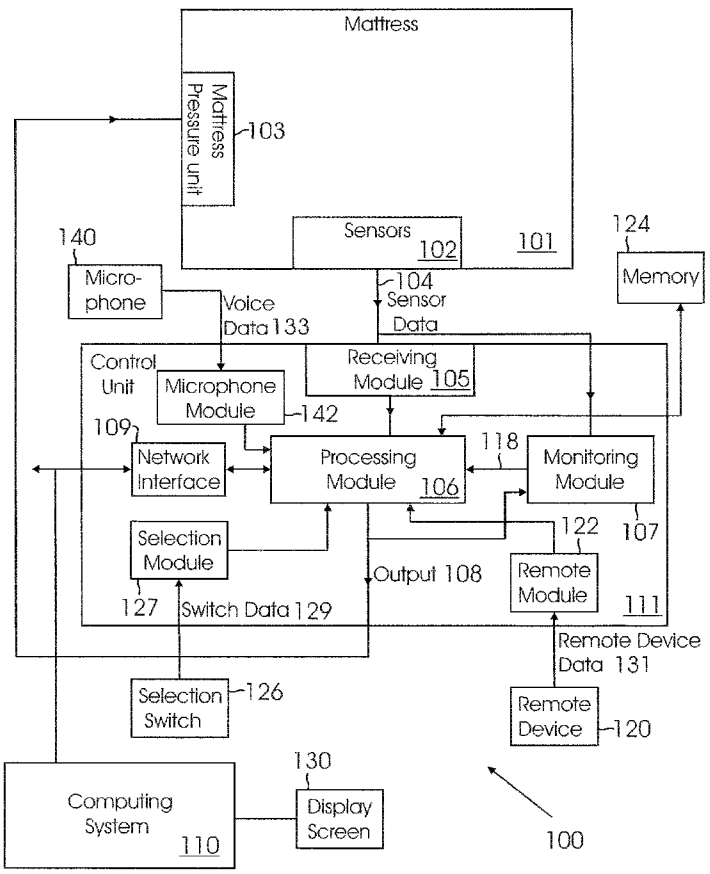
(54) Title: SYSTEM AND METHOD FOR ADJUSTING PRESSURE IN POCKETS OR ZONES



(57) Abstract: A method and system for adjusting pressure in pockets is provided. The system including at least one pressure measuring device in at least one pocket of a structure to detect stress areas in an individual; a control unit for receiving device data transmitted by the at least one pressure measuring device, the control unit comprising: a receiving module and a monitoring module for receiving the device data; a processing module for receiving the device data from the receiving module and determining if pressure in the at least one pressure measuring device requires change; and a pressure unit in the structure for receiving instructions from the processing module, wherein the instructions are provided to the at least one pressure measuring device for adjusting the pressure in the at least one pocket.

WO 2007/100991 A2

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SYSTEM AND METHOD FOR ADJUSTING PRESSURE IN POCKETS OR ZONES

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BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to adjusting pressure and more particularly, to adjusting the pressure in a pocket in response to stress areas of an individual.

2. Background

[0002] For a healthy mind and body, an individual needs to get a good night's sleep so that the body can rest and regenerate. However, far too many people are not getting enough restful sleep, especially when under stress. Inadequate sleep can reduce an individual's immunity to disease, infections, and allergies. Other effects of lack of sleep include: trouble concentrating and remembering, sluggishness, mood shifts, depression, and irritability. In addition to sleep deprivation, old or unsuitable beds can create or sustain neck or back problems. As such, there is growing interest in better sleeping solutions.

[0003] A comfortable mattress is vital to a more restful sleep. Relieving stress in the body can provide for a more restful sleep and stress can be relieved by increasing or decreasing pressure in various spots of the body. Some conventional mattresses allow the firmness to be adjusted; however, the firmness is manually adjusted based upon how a person is feeling and not based on measured parameters, for example, pressure, in the body which corresponds to stress.

[0004] A mattress that can continually adjust to the needs of an individual's body based on objective measured parameters would help alleviate sleeping problems. Therefore, what is needed is a system and method that detects stress areas in an individual by measuring pressure and adjusts the firmness of a mattress to alleviate these stress areas.

SUMMARY OF THE PRESENT INVENTION

[0005] In one aspect of the present invention, a system for adjusting pressure in pockets is provided. The system including at least one pressure measuring device in at least one pocket of a structure to detect stress areas in an individual; a control unit for receiving device data transmitted by the at least one pressure measuring device, the control unit comprising: a receiving module and a monitoring module for receiving the device data; a processing module for receiving the device data from the receiving module and determining if pressure in the at least one pressure measuring device requires change; and a pressure unit in the structure for receiving instructions from the processing module, wherein the instructions are provided to the at least one pressure measuring device for adjusting the pressure in the at least one pocket.

[0006] In yet another aspect of the present invention, a method for adjusting pressure in pockets is provided. The method includes detecting stress area on an individual using at least one pressure measuring device in at least one pocket of a structure; wherein the individual is on the structure; determining if the pressure in the at least one pocket requires adjustment; and adjusting the pressure in the at least one pocket to alleviate stress in the stress area.

[0007] This brief summary has been provided so that the nature of the invention may be understood quickly. A more complete understanding of the invention can be obtained by reference to the following detailed description of the preferred embodiments thereof in connection with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The foregoing features and other features of the present invention will now be described with reference to the drawings of a preferred embodiment. In the drawings, the same components have the same reference numerals. The

illustrated embodiment is intended to illustrate, but not to limit the invention. The drawings include the following Figures:

[0009] Figures 1A is a block diagram of a system for adjusting pressure in pockets of a mattress, according to one embodiment of the present invention;

[0010] Figure 1B illustrates zone patterns of the pockets in the mattress;

[0011] Figure 1C illustrates a system for continuously adjusting pressure in the pockets of the mattress, according to a second embodiment of the present invention;

[0012] Figure 2 illustrates a pocket utilizing various types of sensors which could be implemented with the present invention;

[0013] Figure 3 is a flow chart illustrating the steps of adjusting pressure in pockets of a mattress; and

[0014] Figure 4 is a flow chart illustrating the steps of continuously adjusting pressure in pockets of a mattress.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] The following detailed description is of the best currently contemplated modes of carrying out the invention. The description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention, since the scope of the invention is best defined by the appended claims.

[0016] According to the present invention, a method and system for adjusting pressure in pockets of a mattress are provided. Although the system and method of the present invention are implemented using a mattress, those skilled in the art will recognize that the principles and teachings described herein may be applied to a variety of structures, including, but not limited to, sofas, chairs, pillows, mattress toppers, hospital beds, seats, car seats, and airplanes seats.

[0017] Figure 1A shows a system 100 for adjusting pressure in pockets 112 (described below with reference to Figure 1B) within a mattress 101. Pockets are receptacles, within mattress 101, that contain a certain volume of air, any liquid, any soft solids or spring tension that is adjustable and creates pressure. Mattress

101 includes a plurality of zones where each zone includes one or more pockets 112. In the preferred embodiment, the liquid utilized is water; however, any type of liquid can be used. Sensors 102 (or any device capable of measuring pressure), within pockets 112, detect stress areas of an individual sitting or lying on mattress 101 by measuring the individual's body pressure at the location of each of pockets 112. Sensors 112 may be located on the mattress, in a layer of the mattress or the mattress toppers.

[0018] A stress area is an area of an individual's body that is receiving too little or too much pressure from mattress 101. If a stress area is detected, the volume, or spring tension, in the corresponding pocket or zone, is adjusted to alleviate the stress. The pressure in each pocket can be adjusted manually, automatically or in response to voice commands. Any indicia of stress measurement can be used to measure the stress of an individual and the present invention is not limited to any particular type of stress data format.

[0019] System 100 includes mattress 101, a control unit 111 for controlling a pressure unit 103, a computing system 110 for executing computer executable processes, and a display screen 130 for displaying the measured pressure of each of pockets 112 as an individual is either lying or sitting on mattress 101. In a preferred embodiment, each of pockets 112 is represented on display screen 130 by a separate object, such as a box (the image of an individual is shown lying on the boxes (Display Method)), and the stress levels at each of pockets 112 are indicated by (any color or different densities of one color). For example, a red box (dots) indicates a high stress level; a yellow box indicates a lower level of stress and a green box indicates a relaxed state. By viewing the colors of each of the pockets 112 on display screen 130, the individual can determine how or if the pressure in any of pockets 112 should be adjusted. Display screen 130 may be a television or wireless device, such as a cell phone or personal digital assistant. Alternatively, the stress levels can be displayed on a monitor 115 of computing system 110 (described below with reference to Figure 1C).

[0020] To adjust pressure in any of pockets 112, a processing module 106 in control unit 11 transmits output data 108 to pressure unit 103 causing the

pressure to increase or decrease in accordance with output data 108. Adjusting the pressure in pockets 112 results in an increase or decrease of firmness in specific areas of mattress 101 and as a result, alleviates the stress areas.

[0021] Control unit 111 connects to a computer network (not shown) or computing system 110 via a network interface 109. One such network is the Internet that allows computing system 110 to upgrade the firmware, in control unit 111, by downloading applications, code, documents and other electronic information. Control unit 111 can be located inside or outside of mattress 101. In a preferred embodiment, control unit 111 is a card that can be installed in a computer, television, monitor, digital recording device, network, entertainment unit, or any other electronic device.

[0022] As described above, sensors 102 monitor the stress areas of an individual and continuously transmit sensor data 104 to a receiving module 105, such as a register, and a monitoring module 107 in control unit 111. Receiving module 105 receives sensor data 104 and transmits sensor data 106 to processing module 106. Processing module 106 calculates the lowest mean value of sensor data 104 from receiving module 105, for a specific time frame. The lowest mean value is then used to indicate the pressure in pockets 112, within mattress 101. Sensor data 104 maybe stored in non-volatile memory 124 in control unit 111 and can be used to generate a report of sleeping habits, such as movement while sleeping and the levels of stress at each pocket 112 while sleeping. The report can then be shown to a doctor or any sleep specialist to assist in diagnosing medical problems.

[0023] Control unit 111 operates in three modes, (1) a manual mode allowing an individual to manually adjust pressure; (2) an automatic mode which automatically adjusts pressure based on sensor data; and (3) a voice mode which adjusts pressure in response to voice commands. An individual selects the mode using a selection switch 126. A selection module 127 receives switch data 129 from selection switch 126 and transmits switch data 129 to processing module 106. Processing module 106 uses switch data 129 to look up the operating mode of the system in non-volatile memory 124, such as SRAM.

[0024] If the individual selects the manual mode, a remote device 120 is used to adjust the pressure in pockets 112 while lying or sitting on mattress 101. As described above, stress areas are displayed on display screen 130. Based on the viewable stress areas, the individual uses remote device 120 to select a specific pocket or zone and then adjusts the pressure in the selected pocket or zone using remote device 120. It should be noted that connections to control unit 111, including remote device 120, pressure unit 103, sensors 102 and computing system 110, can be either wired or wireless.

[0025] A remote module 122, in control unit 111, receives remote device data 131 and transmits the remote device data 131 to processing module 106. Processing module 106 then processes remote device data 131 into output data 108 and transmits output data 108 to pressure unit 103. Output data 108 instructs pressure unit 103 to adjust pockets 112 or zones and whether the pressure should be increased or decreased and by how much.

[0026] Output data 108 is also transmitted to a monitoring module 107 in control unit 111. Monitoring module 107 monitors sensor data 104 and output data 108 for any problems, and if a problem is detected, monitoring module 107 sends an interrupt via transmission line 118 to processing module 106 stopping transmission of output data 108 to pressure unit 103 or makes an adjustment to correct the problem. Problems can include, but are not limited to, a high data value which would cause the volume or spring tension in a pocket to be adjusted such that mattress 101 would increase pressure in the stress area.

[0027] Upon receiving output data 108, pressure unit 103 adjusts pressure in pockets 112 accordingly. The adjustment of mattress 101 provides comfort and pressure relief to the individual. Any automation control system can be used to make adjustments to the pressure.

[0028] If the individual selects the automatic mode, pressure in pockets 112 are automatically adjusted based on sensor data 104. Sensors 102 monitor the stress areas of an individual and continuously transmit sensor data 104 to receiving module 105 and monitoring module 107 in control unit 111. Processing module 106 then processes sensor data 104 into output data 108 and transmits output data

108 to pressure unit 103 and monitoring module 107 to adjust pressure in pockets 112 to provide comfort and pressure relief to the individual.

[0029] As with the manual mode, monitoring module 107 monitors sensor data 104 and output data 108 for any problems and either stops transmission of output data 108 to pressure unit 103 or makes an adjustment to correct the problem. Output data 108 is continually transmitted to pressure unit 103 to continually adjust pressure in pockets 112 accordingly. Any automation control system can be used to make adjustments to the pressure.

[0030] If the individual selects the voice mode, the individual uses voice commands to adjust the pressure while lying or sitting on mattress 101. As with the manual and automatic modes, sensors 102 monitor the stress areas of an individual and continuously transmit sensor data 104 to receiving module 105 and monitoring module 107 in control unit 111. As described above, display screen 130 displays the measured pressure of each of pockets 112 as an individual is either lying or sitting on mattress 101. By viewing the colors of each of pockets 112 on display screen 130, the individual can determine how or if the pressure in any of pockets 112 should be adjusted and verbally provides instructions in the form of voice commands to system 100. For example, saying "Increase Zone 1" causes the pressure in all pockets in Zone 1 to increase. The individual can also indicate how much to increase or decrease the level.

[0031] A microphone 140 receives the voice commands and transmits voice data 133 to a microphone module 142. System 100 recognizes a pre-defined set of voice commands. Each voice command corresponds to a pre-programmed routine (i.e. which pockets 112 to adjust, when and by how much) stored in non-volatile memory 124. Alternatively, the individual can program routines for new commands that will be executed upon receiving a specific voice command.

[0032] After receiving voice data 133, microphone module 142 then transmits voice data 133 to processing module 106, which looks up the pre-programmed routine in non-volatile memory 124. Processing module 106 then processes the pre-programmed routine into output data 108 and transmits output

data 108 to pressure unit 103, which adjusts pressure in pockets 112 accordingly. Any automation control system can be used to make adjustments to the pressure.

[0033] Turning to Figure 1B, pockets 112 are arranged in a zone pattern within mattress 101. Each pocket measures body pressure at a specific location on an individual's body, which determines if there is excess pressure, not enough pressure, or, just the right amount of pressure in each pocket. If there is excess pressure, or not enough pressure, pressure of the respective pocket is adjusted accordingly.

[0034] A three-zone configuration 101A, as shown in Figure 1B, has a first zone 135 for the neck and shoulders, a second zone 137 for the lower back and a third zone 139 for the legs. In alternative embodiments, pockets 112 can be placed in a five-zone configuration 101B or a multi-zone configuration 101C targeting more specifics areas of a body.

[0035] Figure 1C illustrates a system for continuously adjusting pressure in pockets 112 of mattress 101, according to a second embodiment of the present invention. As shown in Figure 1C, two individuals are laying on mattress 101. Sensors 102, within pockets 112, transmit sensor data 104 to computing system 110, which contains control unit 111 of Figure 1A. Pockets 112 are adjusted based on the stress areas of each individual and can be adjusted using the automatic mode, manual mode or voice mode. Each individual has the ability to separately control each pocket 112 that he or she is laying on.

[0036] Computing system 110 includes monitor 115 which may be a CRT type, a LCD type, or any other type of color or monochrome display. Also provided with computing system 110 are a keyboard 117 for entering data and user commands, and a pointing device (for example, a mouse, not shown) for processing objects displayed on monitor 115.

[0037] Computing system 110 receives sensor data 104 and uses this data 104 to determine output data 108 to transmit to pressure unit 103 of mattress 101. Output data 108 will instruct pockets 112 to increase, decrease or not to change the pressure in each of pockets 112. The pressure is adjusted in each of pockets 112 for each individual on mattress 101.

[0038] Various types of sensors can be utilized in a pocket 112, as shown in Figure 2. First, a pressure sensor 102A can be installed in pocket 112. Pressure sensor 102A detects the body pressure of an individual at a particular location on the body and sends sensor data 104, containing the pressure value, to control unit 111 to determine if there is a stress area. If too much pressure is detected, control unit 111 instructs pocket 112, via output data 108, to release air causing the firmness of mattress 101 at the location to be decreased. If too little pressure is detected, control unit 111 instructs pocket 112, via output data 108, to add air to pocket 112 causing the firmness of mattress 101 at the location to be increased. If a stress area is not detected, the volume of pressure sensor 102A remains unchanged.

[0039] In a second alternative, a water sensor 102B can be installed in pocket 112. Water sensor 102A detects the body pressure of an individual at a particular location on the body and sends sensor data 104, containing the pressure value, to control unit 111 to determine if there is a stress area. If too much pressure is detected, control unit 111 instructs pocket 112, via output data 108, to release water decreasing the volume of pocket 112, which causes the firmness of mattress 101 at the location to be decreased. If too little pressure is detected, control unit 111 instructs pocket 112, via output data 108, to add water increasing the volume causing the firmness of mattress 101 at the location to be increased. If a stress area is not detected, the volume of water sensor 102B remains unchanged. Although a water pressure sensor has been described, the present invention can be utilized with any liquid to change the volume in the pockets.

[0040] In a third alternative, a spring 102C can be installed in pocket 112. Spring 102C detects the body pressure of an individual at a particular location on the body and sends sensor data 104, containing the pressure value, to control unit 111 to determine if there is a stress area. If too much or tool little pressure is detected, control unit 111 instructs pocket 112, via output data 108, to increase or decrease the tension of spring 102C causing the firmness of the mattress to be increased or decreased, respectively. If too little pressure is detected, control unit 111 instructs pocket 112, via output data 108, to increase the spring tension causing

the firmness of the mattress at the location to be increased. If too much pressure is detected, control unit 111 instructs pocket 112, via output data 108, to decrease the spring tension causing the firmness of the mattress at the location to be decreased. If a stress area is not detected, the spring tension of spring 102C remains unchanged.

[0041] Turning to Figure 3, a flow chart illustrating the steps of adjusting pressure in pockets of a mattress, according to a preferred embodiment of the present invention is shown. The method begins in step S300 when control unit 111 is configured using computing system 110 to enter data and user commands, such as voice commands. Next, in step S301, the operating mode of the system 100 is selected, i.e. manual mode/voice mode, automatic mode, or voice mode is selected to adjust pressure in pockets 112. In step S305, the automatic mode is selected and the process continues in step S400, described below with reference to Figure 4.

[0042] Alternatively, the manual or voice mode is selected in step S302. In step S303, the stress levels/zone areas are displayed on display screen 130. As described above, each of pockets 112 is represented on display screen 130 by a separate box (the image of an individual is shown lying on the boxes) and the stress levels at each of pockets 112 or zone areas are indicated by color. (A red box indicates a high stress level; a yellow box indicates a lower level of stress and a green box indicates a relaxed state.) By viewing the colors of each of the pockets 112 on display screen 130, the individual can determine how or if the pressure in any of pockets 112 should be adjusted. In step S304, pressure unit 130 in mattress 101 adjusts the pressure in each of pockets 112 per the instructions of the individual.

[0043] Figure 4 is a flow chart illustrating the steps of continuously adjusting pressure in pockets of a mattress, according to a preferred embodiment of the present invention. The method begins in step S400 when stress areas are detected. Next, processing module 106 determines if the pressure pocket 112 of mattress 101 requires change in step S401. If the pressure does not require change, monitoring module 107 continues to monitor for stress areas, in step S402. If the pressure requires change, the pressure in pocket is changed, in step S403. After the

change in pressure, monitoring module 107 continues to monitor for stress areas. This method is repeated for each pocket 112 in pockets 112.

[0044] The method and system of the present invention can be utilized to provide an individual with comfort and pressure relief for a restful night's sleep, or alternatively, to adjust the stress areas of an individual who is bedridden and subject to bed sores.

[0045] Although the present invention has been described with reference to specific embodiments, these embodiments are illustrative only and not limiting. Many other applications and embodiments of the present invention will be apparent in light of this disclosure.

What is claimed is

1. A system for adjusting pressure in pockets, comprising:

at least one pressure measuring device in at least one pocket of a structure to detect stress areas in an individual; wherein the individual is on the structure;

a control unit for receiving device data transmitted by the at least one pressure measuring device, the control unit comprising:

a receiving module and a monitoring module for receiving the device data;

a processing module for receiving the device data from the receiving module and determining if pressure in the at least one pressure measuring device requires change; and

a pressure unit in the structure for receiving instructions from the processing module, wherein the instructions are provided to the at least one pressure measuring device for adjusting the pressure in the at least one pocket.

2. The system of claim 1, further comprising a display screen for receiving the device data and displaying the device data on the display screen.

3. The system of claim 1, wherein the system operates in a manual mode, an automatic mode, or a voice mode.

4. The system of claim 3, further comprising a remote device for manually adjusting the pressure in the at least one pocket; wherein the at least one pocket contains air, liquid, soft solids or a spring for adjusting the pressure; and wherein the at least one pressure measuring device is a sensor.

5. The system of claim 3, further comprising:

a microphone for detecting voice commands; and

a remote module for receiving the voice command and transmitting to the processing module for retrieving a pre-programmed routine in memory.

6. The system of claim 4, wherein the pressure unit and sensors are connected to the control unit wirelessly.

7. The system of claim 4, wherein the pressure unit and sensors are connected to the control unit with wires or optical fibers.

8. The system of claim 1, wherein the at least one pressure measuring device is air pressure sensor.

9. The system of claim 1, wherein the at least one sensor is a water pressure sensor.

10. The system of claim 1, wherein the at least one pressure measuring device is a strength spring sensor.

11. The system of claim 2, wherein the individual selects the at least one pressure measuring device to adjust and the amount to be adjust based upon the device data displayed on the screen.

12. The system of claim 11, wherein the device data is color-coded with a different color representing a different level of stress.

13. The system of claim 1, wherein the structure is selected from the group consisting of mattresses, mattress toppers, hospital beds, sofas, seats, car seats, and airplanes seats.

14. The system of claim 1, wherein the structure has at least one zone; wherein the at least one zone includes the at least one pressure measuring device; and wherein the at least one pressure measuring device is located on the structure or in a layer of the structure.

15. A method for adjusting pressure in pockets, comprising

detecting stress area on an individual using at least one pressure measuring device in at least one pocket of a structure; wherein the individual is on the structure;

determining if the pressure in the at least one pocket requires adjustment; and

adjusting the pressure in the at least one pocket to alleviate stress in the stress area.

16. The method of claim 15, wherein the stress areas are displayed on a display screen using colors.

17. The method of claim 15, wherein the pressure can be adjusted manually, automatically, or by using voice commands.

18. The method of claim 17, wherein a remote device is used for manually adjusting the pressure in the at least one pocket; and wherein the at least one pocket contains air, liquid, soft solids or a spring for adjusting the pressure.

19. The method of claim 15, wherein the at least one pressure measuring device is an air pressure sensor.

20. The method of claim 15, wherein the at least one pressure measuring device is a water pressure sensor.

21. The method of claim 15, wherein the at least one pressure measuring device is a strength spring sensor.

22. The method of claim 15, wherein the structure is selected from the group consisting of mattresses, mattress toppers, hospital beds, sofas, seats, car seats, and airplanes seats.

23. The method of claim 15, wherein in the structure has at least one zone; wherein the at least one zone includes the at least one sensor, and wherein the at least one pressure measuring device is located on the structure or in a layer of the structure.

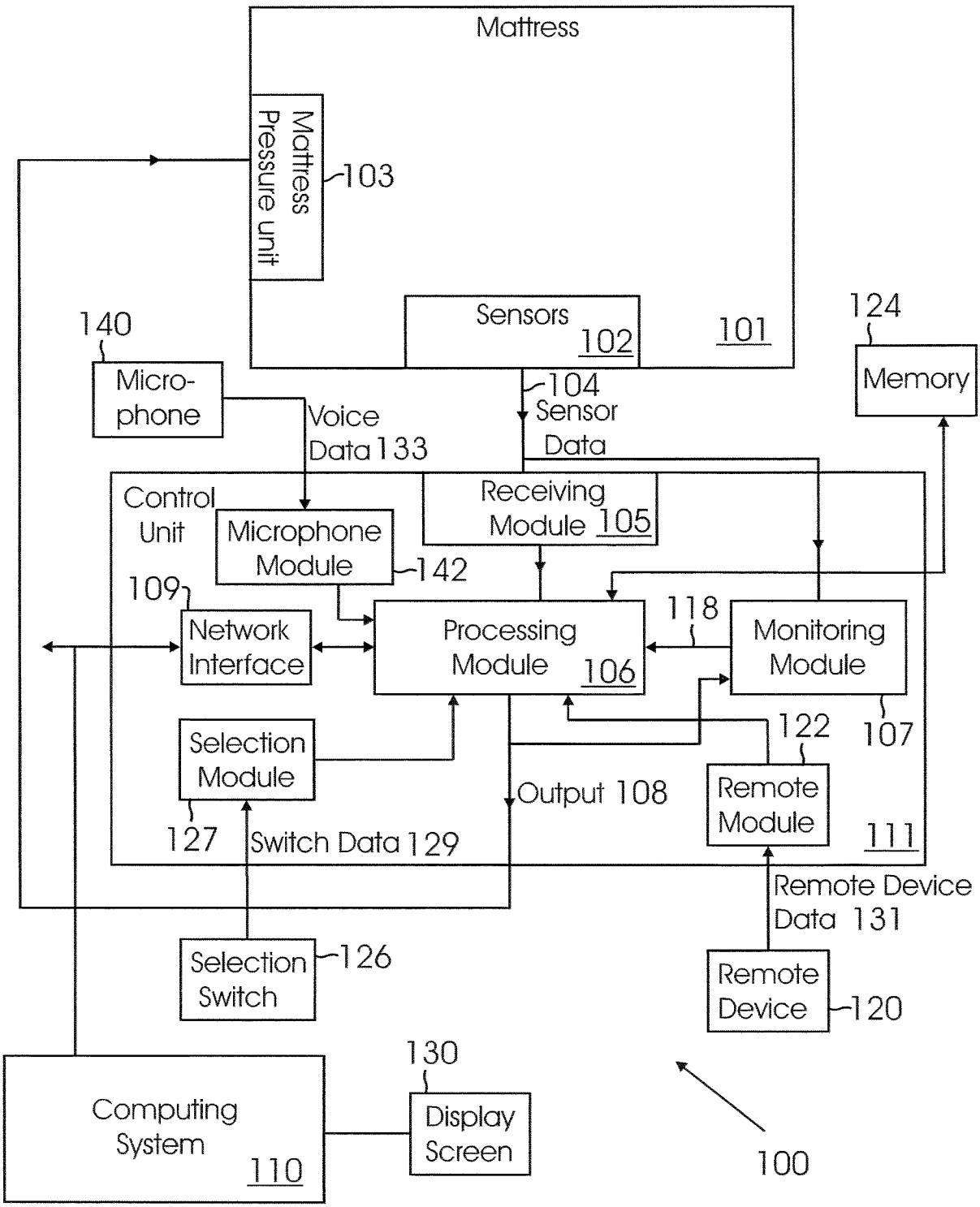
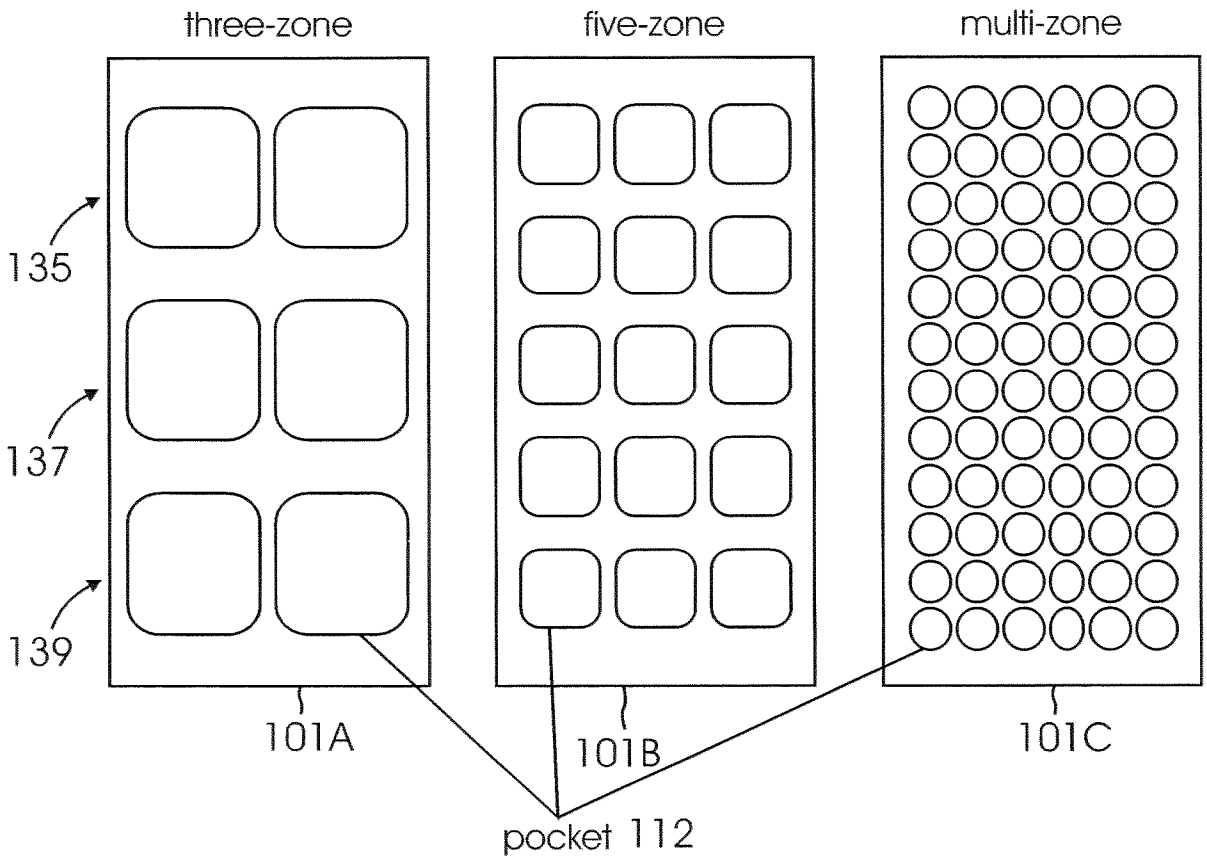

Mattress
Mattress Pressure unit
103
Sensors
102
101
140
Micro-phone
Voice Data 133
104
Sensor Data
124
Memory
Control Unit
Microphone Module
142
Receiving Module 105
109
Network Interface
Processing Module 106
118
Monitoring Module
107
122
Selection Module
127
Switch Data 129
Output 108
Remote Module
111
Remote Device Data 131
Selection Switch
126
Remote Device
120
130
Computing System
110
Display Screen
100

Fig. 1A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five-zone
multi-zone
135
137
139
101A
101B
101C
pocket 112

Fig. 1B

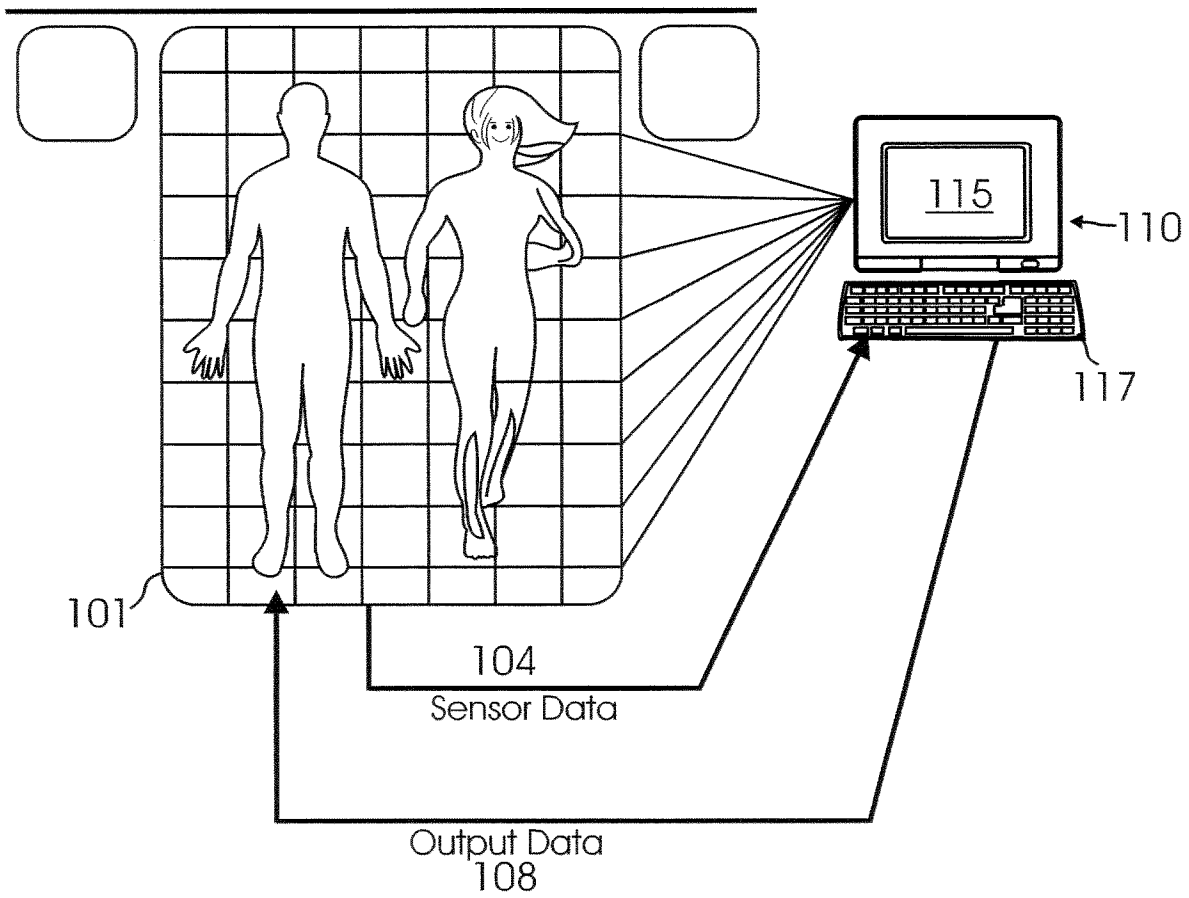
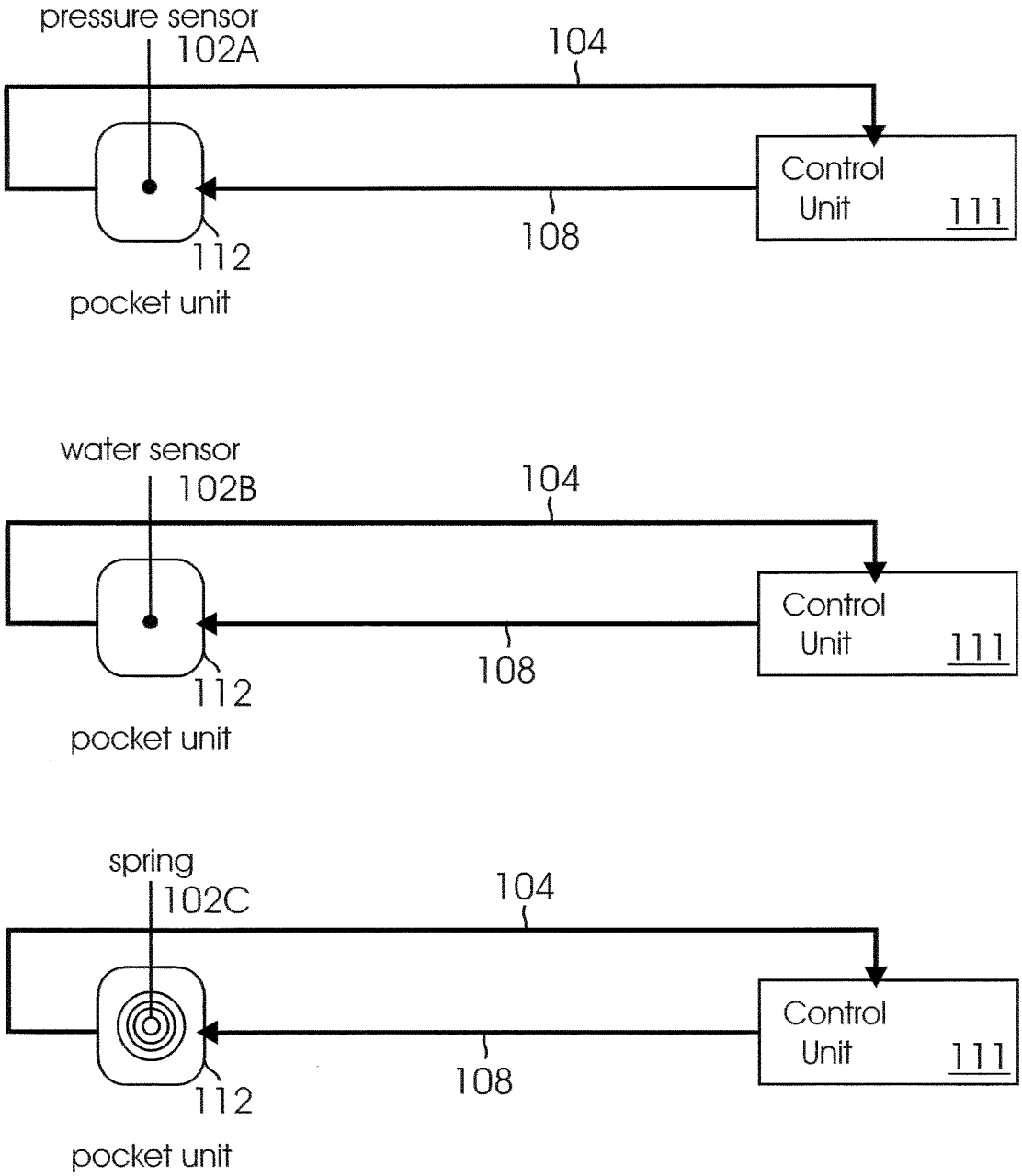


Fig. 1C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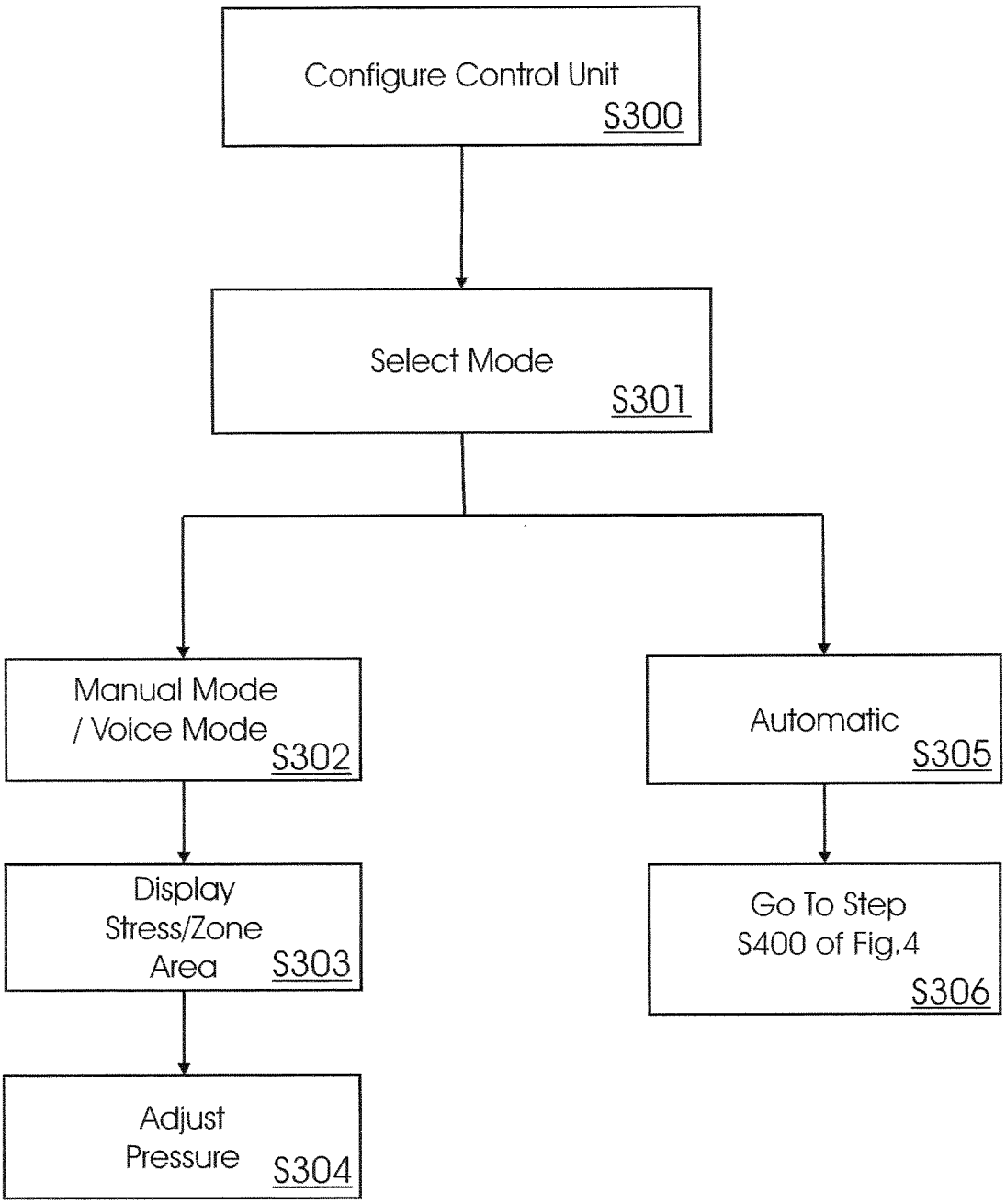
102A
104
Control
Unit
111
108
112
pocket unit
water sensor
102B
104
Control
Unit
111
108
112
pocket unit
spring
102C
104
Control
Unit
111
108
112
pocket unit

Fig. 2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S300
Select Mode
S301
Manual Mode
/ Voice Mode
S302
Automatic
S305
Display
Stress/Zone
Area
S303
Go To Step
S400 of Fig.4
S306
Adjust
Pressure
S304

Fig. 3

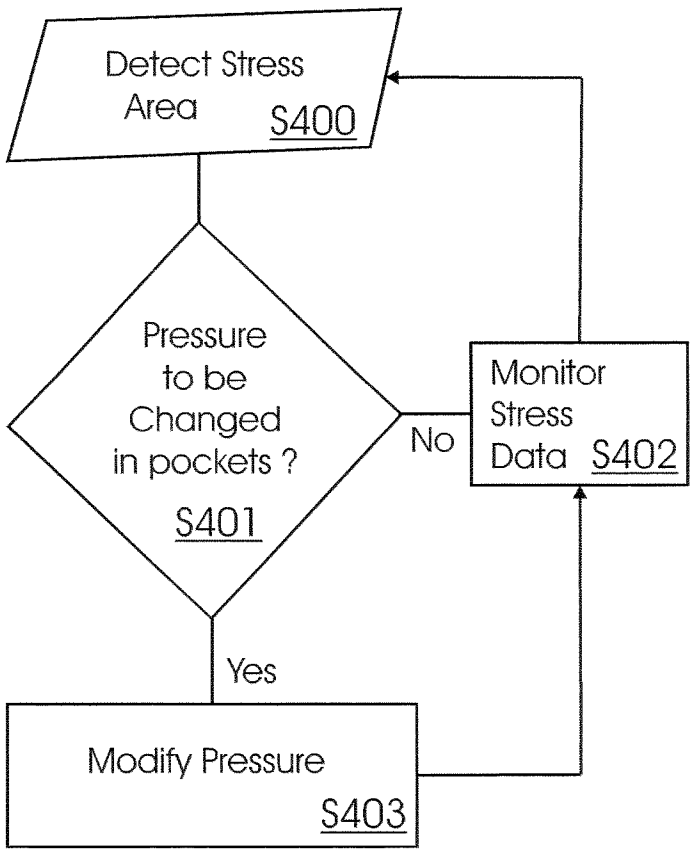
Detect Stress Area S400
Pressure to be Changed in pockets ? S401
No
Monitor Stress Data S402
Yes
Modify Pressure S403

Fig. 4