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(54) **Air cushion bed with sensing mat capable of detecting the lying of a patient thereon**

(57) An air cushion bed includes an inflatable air mattress; a first sensing mat provided on an outer surface of the air mattress and including a first upper and a first lower sensing sheet with a first soft pad sandwiched between them; and a first determining module electrically connected to the first upper and lower sensing sheets. When the first sensing mat is compressed and the first upper and lower sensing sheets are electrically connect-

ed to each other via holes on the first soft pad, the first determining module determines there is a patient lying on the air mattress or the air mattress with a patient lying thereon is insufficiently inflated. A second sensing mat and a second determining module can be additionally provided on another outer surface of the air mattress opposite to the first sensing mat for the air cushion bed to determine both of the above two situations.

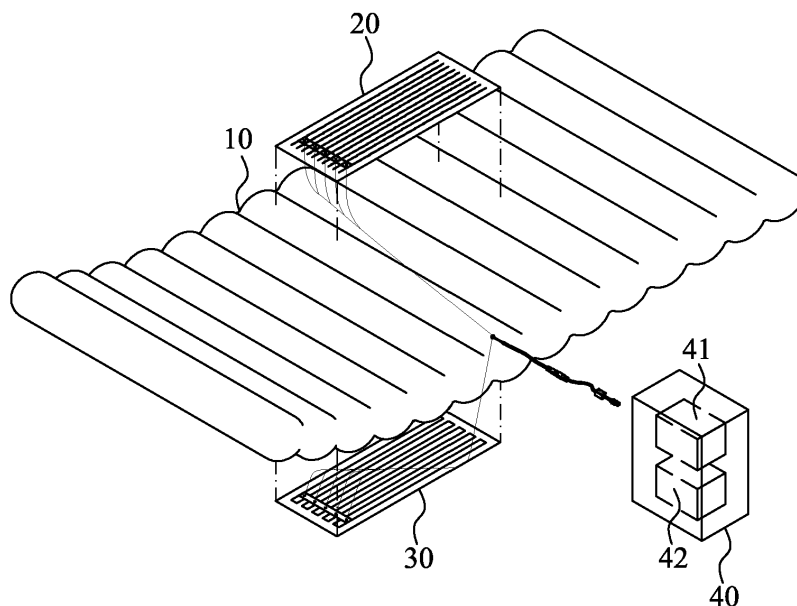


FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an air cushion bed, and more particularly to an air cushion bed with sensing mat capable of detecting whether there is a patient lying on an air mattress thereof and/or sensing an inflation state of the air mattress with a patient lying thereon, so as to increase the use safety of the air cushion bed.

BACKGROUND OF THE INVENTION

[0002] People who are not able to freely move around or get out of bed due to illness are usually confined to bed. A bedridden patient is prone to bedsores, which are local tissue necrosis caused by prolonged pressure on and insufficient blood flow to the skin and muscles that continuously contact with the bed. Almost all the bedridden patients are suffering from bedsores, which cause uncomfortable skin ulceration or even septicemia and amputation in worse conditions.

[0003] A common way to minimize the development of bedsores in a bedridden patient is to help the patient to change his or her lying position by, for example, rolling him or her over from one position to another periodically, such as every one or two hours, so as to avoid continuous pressure on the same body areas. The bedridden patients have become a heavy burden to nurses because a lot of time and energy is required to help the patients to change their lying position.

[0004] Therefore, air cushion beds are developed and introduced into the market for the purpose of preventing bedridden patients from forming bedsores. Generally, an air cushion bed includes a plurality of air bladders that can be alternately inflated and deflated. By inflating and deflating the air bladders alternately, it is possible to alternately and temporarily relieve different areas of the bedridden patient's body from prolonged pressure and accordingly reduce the possibility of developing bedsores. However, in the event the air bladders are insufficiently inflated, the air cushion bed is almost useless in terms of relieving the prolonged pressure on the bedridden patient's skin. On the other hand, in the event the air bladders are excessively inflated, the patient might undesirably slip down the air cushion bed.

[0005] It is therefore necessary to develop an air cushion bed that includes additional functions of determining whether there is a patient lying on the air mattress thereof and whether the air mattress having a patient lying thereon is sufficiently inflated for use.

SUMMARY OF THE INVENTION

[0006] A primary object of the present invention is to provide an air cushion bed with sensing mat capable of determining whether there is a patient lying on an air

mattress thereof and/or sensing an inflation state of the air mattress having a patient lying thereon, so as to increase the use safety of the air cushion bed.

[0007] To achieve the above and other objects, the air cushion bed with sensing mat according to the present invention includes an inflatable air mattress, a first sensing mat, and a first determining module. The first sensing mat is provided on an outer surface of the inflatable air mattress and includes a first upper sensing sheet, a first lower sensing sheet, and a first soft pad.

[0008] The first upper sensing sheet has a first upper conductive printed pattern provided thereon; the first lower sensing sheet has a first lower conductive printed pattern provided thereon, and the first lower conductive printed pattern is oriented to the first upper conductive printed pattern on the first upper sensing sheet; and the first soft pad is sandwiched between the first upper sensing sheet and the first lower sensing sheet and has a plurality of first through holes provided thereon.

[0009] The first determining module is electrically connected to the first upper conductive printed pattern and the first lower conductive printed pattern for determining whether the first upper sensing sheet is electrically connected to or disconnected from the first lower sensing sheet.

[0010] When the first sensing mat of the air cushion bed is compressed by an external force applied thereto and the first upper sensing sheet is brought to contact with the first lower sensing sheet via the first through holes on the first soft pad, the first upper conductive printed pattern is electrically connected to the first lower conductive printed pattern.

[0011] In a preferred embodiment of the present invention, the first sensing mat is provided on a top surface of the inflatable air mattress, and the first determining module detects an electrical connection state between the first upper sensing sheet and the first lower sensing sheet for determining whether there is a patient lying on the inflatable air mattress.

[0012] In another preferred embodiment of the present invention, the first sensing mat is provided on a bottom surface of the inflatable air mattress, and the first determining module detects an electrical connection state between the first upper sensing sheet and the first lower sensing sheet for determining whether the inflatable air mattress is sufficiently inflated when a patient is lying thereon.

[0013] In the above two preferred embodiments, the first sensing mat further may include at least one first fastening element provided on between the first upper sensing sheet and the first lower sensing sheet for fixedly fastening the first upper sensing sheet to the first lower sensing sheet with the first soft pad sandwiched between them. In an operable embodiment, the first fastening element may be configured as a male fastener and a mating female fastener; and the male and the female fastener are separately provided on two facing sides of the first upper sensing sheet and the first lower sensing sheet.

[0014] According to the present invention, the first upper sensing sheet and the first lower sensing sheet may be flexible printed circuit boards; the first upper conductive printed pattern and the first lower conductive printed pattern may be formed with a conductive graphite material; and the first soft pad can be a foam pad or a latex pad.

[0015] According to a further preferred embodiment of the present invention, the air cushion bed includes an inflatable air mattress, a first sensing mat, a first determining module, a second sensing mat, and a second determining module. The first sensing mat and the first determining module are similar to those in the previous embodiments. The second sensing mat is provided on another outer surface of the inflatable air mattress opposite to the first sensing mat, and includes a second upper sensing sheet, a second lower sensing sheet, and a second soft pad.

[0016] The second upper sensing sheet has a second upper conductive printed pattern provided thereon; the second lower sensing sheet has a second lower conductive printed pattern provided thereon, and the second lower conductive printed pattern is oriented to the second upper conductive printed pattern on the second upper sensing sheet; and the second soft pad is sandwiched between the second upper sensing sheet and the second lower sensing sheet, and has a plurality of second through holes provided thereon.

[0017] Further, the second determining module is electrically connected to the second upper conductive printed pattern and the second lower conductive printed pattern for determining whether the second upper sensing sheet is electrically connected to or disconnected from the second lower sensing sheet.

[0018] When the second sensing mat is compressed by an external force applied thereto and the second upper sensing sheet is brought to contact with the second lower sensing sheet via the second through holes on the second soft pad, the second upper conductive printed pattern is electrically connected to the second lower conductive printed pattern.

[0019] In the further preferred embodiment of the present invention, the first sensing mat is provided on a top surface of the inflatable air mattress, and the first determining module detects an electrical connection state between the first upper sensing sheet and the first lower sensing sheet for determining whether there is a patient lying on the inflatable air mattress; and the second sensing mat is provided on a bottom surface of the inflatable air mattress, and the second determining module detects an electrical connection state between the second upper sensing sheet and the second lower sensing sheet for determining whether the inflatable air mattress is sufficiently inflated when a patient is lying thereon.

[0020] In an operable embodiment, the first through holes on the first soft pad may have an inner diameter smaller than that of the second through holes on the second soft pad. In another operable embodiment, the first soft pad may have a thickness larger than that of the

second soft pad.

[0021] In the further preferred embodiment of the present invention, the first sensing mat further includes at least one first fastening element provided on between the first upper sensing sheet and the first lower sensing sheet for fixedly fastening the first upper sensing sheet to the first lower sensing sheet with the first soft pad sandwiched between them; and the second sensing mat further includes at least one second fastening element provided on between the second upper sensing sheet and the second lower sensing sheet for fixedly fastening the second upper sensing sheet to the second lower sensing sheet with the second soft pad sandwiched between them. In an operable embodiment, the first fastening element and the second fastening element may respectively include a male fastener and a mating female fastener; the male and the female fastener of the first fastening element are separately provided on two facing sides of the first upper sensing sheet and the first lower sensing sheet, and the male and the female fastener of the second fastening element are separately provided on two facing sides of the second upper sensing sheet and the second lower sensing sheet.

[0022] Further, in the present invention, the first upper and lower sensing sheets as well as the second upper and lower sensing sheets may be flexible printed circuit boards; the first upper and lower conductive printed patterns as well as the second upper and lower conductive printed patterns may be formed with a conductive graphite material; and the first soft pad and the second soft pad may be selected from the group consisting of a foam pad and a latex pad.

[0023] The air cushion bed of the present invention is advantageous in that a first and a second sensing mat are respectively provided on a top and a bottom surface of the inflatable air mattress, and a first and a second determining module together constitute a sensing and determining device and are respectively electrically connected to the first and the second sensing mat. With these advantageous arrangements, the air cushion bed of the present invention is able to automatically detect whether there is a patient lying on the inflatable air mattress and whether the inflatable air mattress is sufficiently inflated when a patient is lying thereon, so as to avoid the occurrence of undesirable conditions, such as poor cushioning effect due to an insufficiently inflated air mattress and a patient slipped down the air cushion bed due to an excessively inflated air mattress. Therefore, the present invention largely upgrades the patient's safety and comfort in lying on an air cushion bed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

Fig. 1 is an exploded perspective view of an air cushion bed with sensing mat capable of detecting the lying of a patient thereon according to a first preferred embodiment of the present invention;

Fig. 2 is an exploded perspective view of a first sensing mat for the air cushion bed as shown in Fig. 1;

Fig. 3 is an exploded perspective view of a second sensing mat for the air cushion bed as shown in Fig. 1;

Fig. 4 includes two sectional views showing how the first and second sensing mats work to indicate the use condition and the inflation condition of the air cushion bed of the present invention;

Fig. 5 is an exploded perspective view of an air cushion bed according to a second preferred embodiment of the present invention; and

Fig. 6 is an exploded perspective view of an air cushion bed according to a third preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] The present invention will now be described with some preferred embodiments thereof and with reference to the accompanying drawings. For the purpose of easy to understand, elements that are the same in the preferred embodiments are denoted by the same reference numerals.

[0026] Please refer to Fig. 1 that is an exploded perspective view of an air cushion bed with sensing mat capable of detecting the lying of a patient thereon according to a first preferred embodiment of the present invention. As shown, in the first embodiment, the air cushion bed includes an inflatable air mattress 10, a first sensing mat 20, a second sensing mat 30, a first determining module 41, and a second determining module 42. The first sensing mat 20 and the second sensing mat 30 are provided on a top surface and a bottom surface of the air mattress 10, respectively. The first and the second determining module 41, 42 are included in a sensing and determining device 40, and are electrically connected to the first and the second sensing mat 20, 30, respectively.

[0027] Fig. 2 is an exploded perspective view of the first sensing mat 20. As shown, the first sensing mat 20 includes a first upper sensing sheet 21, a first lower sensing sheet 22, and a first soft pad 23.

[0028] The first upper and the first lower sensing sheet 21, 22 are provided on one side with a first upper and a first lower electrically conductive printed pattern 211, 221, respectively, such that the first upper and the first lower conductive printed pattern 211, 221 face toward each other. The first soft pad 23 is sandwiched between

the first upper and the first lower sensing sheet 21, 22, and has a plurality of first through holes 231 distributed over it.

[0029] The first determining module 41 is electrically connected to the first upper and the first lower conductive printed pattern 211, 221 for detecting whether the first upper sensing sheet 21 and the first lower sensing sheet 22 are electrically connected to or disconnected from each other. And, according to the detected connection state between the first upper sensing sheet 21 and the first lower sensing sheet 22, the first determining module 41 can further determine whether there is any patient lying on the inflatable air mattress 10 of the air cushion bed of the present invention.

[0030] In the illustrated first preferred embodiment, at least one first fastening element 24 is provided on between the first upper sensing sheet 21 and the first lower sensing sheet 22, so as to firmly connect the first upper and the first lower sensing sheet 21, 22 to each other with the first soft pad 23 sandwiched between them. In an operable embodiment, the first fastening element 24 includes a male fastener and a mating female fastener, which are separately located on two facing sides of the first upper and the first lower sensing sheet 21, 22.

[0031] Fig. 3 is an exploded perspective view of the second sensing mat 30. As shown, the second sensing mat 30 includes a second upper sensing sheet 31, a second lower sensing sheet 32, and a second soft pad 33. The second upper and the second lower sensing sheet 31, 32 are provided on one side with a second upper and a second lower electrically conductive printed pattern 311, 321, respectively, such that the second upper and the second lower conductive printed pattern 311, 321 face toward each other. The second soft pad 33 is sandwiched between the second upper and the second lower sensing sheet 31, 32, and has a plurality of second through holes 331 distributed over it.

[0032] The second determining module 42 is electrically connected to the second upper and the second lower conductive printed pattern 311, 321 for detecting whether the second upper sensing sheet 31 and the second lower sensing sheet 32 are electrically connected to or disconnected from each other. And, according to the detected connection state between the second upper sensing sheet 31 and the second lower sensing sheet 32, the second determining module 42 can further determine whether the inflatable air mattress 10 of the air cushion bed is sufficiently inflated when there is a patient lying on the inflatable air mattress 10.

[0033] In the illustrated first preferred embodiment, at least one second fastening element 34 is provided on between the second upper sensing sheet 31 and the second lower sensing sheet 32, so as to firmly connect the second upper and the second lower sensing sheet 31, 32 to each other with the second soft pad 33 sandwiched between them. In an operable embodiment, the second fastening element 34 includes a male fastener and a mating female fastener, which are separately located on two

facing sides of the second upper and the second lower sensing sheet 31, 32.

[0034] For the first sensing mat 20 and the second sensing mat 30 to respectively sense a different degree of compression force externally applied thereto, according to an operable embodiment of the present invention, the first through holes 231 provided on the first soft pad 23 may have an inner diameter smaller than that of the second through holes 331 on the second soft pad 33. Alternatively, according to another operable embodiment, the first soft pad 23 may have a thickness larger than that of the second soft pad 33.

[0035] In a most preferred embodiment, the first upper sensing sheet 21, the first lower sensing sheet 22, the second upper sensing sheet 31, and the second lower sensing sheet 32 are configured as flexible printed circuit boards (PCBs); the first upper conductive printed pattern 211, the first lower conductive printed pattern 221, the second upper conductive printed pattern 311, and the second lower conductive printed pattern 321 are formed with a conductive graphite material; and the first soft pad 23 and the second soft pad 33 can be foam pads or latex pads.

[0036] Please refer to Fig. 4. When the first sensing mat 20 for the air cushion bed of the present invention is compressed by an externally applied force, the first upper sensing sheet 21 made of a soft material is deformed under the force to thereby contact with the first lower sensing sheet 22 via the first through holes 231 of the first soft pad 23. At this point, the first upper conductive printed pattern 211 is electrically connected to the first lower conductive printed pattern 221, and the first determining module 41 receives a signal indicating the above electrical connection state and accordingly, determines there is a patient lying on the inflatable air mattress 10 of the air cushion bed. On the other hand, in the case the first upper sensing sheet 21 is not in contact with the first lower sensing sheet 22, and the first upper conductive printed pattern 211 is electrically disconnected from the first lower conductive printed pattern 221, it is determined by the first determining module 41 there is not any patient lying on the inflatable air mattress 10.

[0037] Further, when the second sensing mat 30 for the air cushion bed of the present invention is compressed by an externally applied force while the inflatable air mattress 10 is inflated to maintain sufficient internal pressure, the second upper sensing sheet 31, even if in a deformed state, would not get into contact with the second lower sensing sheet 32 via the second through holes 331 of the second soft pad 33. On the other hand, when the second sensing mat 30 is compressed by an externally applied force while the inflatable air mattress 10 is not sufficiently inflated to maintain optimal internal pressure, the second upper sensing sheet 31 would become deformed and get into contact with the second lower sensing sheet 32 via the second through holes 331 of the second soft pad 33, bringing the second upper conductive printed pattern 311 to electrically connect to the

second lower conductive printed pattern 321. In the latter case, the second determining module 42 can determine the inflatable air mattress 10 is either insufficiently inflated or in a damaged condition.

[0038] Fig. 5 shows an air cushion bed according to a second preferred embodiment of the present invention. The air cushion bed in the second preferred embodiment is generally structurally similar to the first preferred embodiment, except that the second sensing mat 30 and the second determining module 42 are omitted. That is, in the second preferred embodiment, only the first sensing mat 20 is provided on the top surface of the inflatable air mattress 10 and only the first determining module 41 is included in the sensing and determining device 40.

[0039] More specifically, in the second preferred embodiment, the first sensing mat 20 includes a first upper sensing sheet 21, a first lower sensing sheet 22 and a first soft pad 23; and the electrical connection state between the first upper and lower sensing sheets 21, 22 as well as the functional relation between the first determining module 41 and the first sensing mat 20 are just the same as those described in the first preferred embodiment.

[0040] Therefore, the first determining module 41 detects the electrical connection between the first upper sensing sheet 21 and the first lower sensing sheet 22 to determine whether there is a patient lying on the inflatable air mattress 10. In this case, the air cushion bed of the present invention has the function of determining whether the inflatable air mattress 10 is in use.

[0041] Fig. 6 shows an air cushion bed according to a third preferred embodiment of the present invention. The air cushion bed in the third preferred embodiment is generally structurally similar to the first preferred embodiment, except that the second sensing mat 30 and the second determining module 42 are omitted, the first sensing mat 20 is provided on the bottom surface of the inflatable air mattress 10, and only the first determining module 41 is included in the sensing and determining device 40. More specifically, in the third preferred embodiment, the first sensing mat 20 includes a first upper sensing sheet 21, a first lower sensing sheet 22 and a first soft pad 23, and the electrical connection state between the first upper and lower sensing sheets 21, 22 as well as the functional relation between the first determining module 41 and the first sensing mat 20 are just the same as those described in the first preferred embodiment.

[0042] Therefore, the first determining module 41 detects the electrical connection between the first upper sensing sheet 21 and the first lower sensing sheet 22 to determine whether the inflatable air mattress 10 has sufficient internal air pressure when a patient is lying thereon. In this case, the air cushion bed of the present invention has the function of determining whether the inflatable air mattress 10 in use is sufficiently inflated.

[0043] In summary, the present invention provides an air cushion bed that includes an inflatable air mattress,

at least one sensing mat provided on an outer surface of the inflatable air mattress, and a sensing and determining device consisting of at least one determining module electrically connected to the sensing mat. With these arrangements, the air cushion bed of the present invention is able to automatically detect whether there is a patient lying on the inflatable air mattress and whether the inflatable air mattress is sufficiently inflated when a patient is lying thereon, and can therefore avoid the occurrence of undesirable conditions, such as poor cushioning effect due to an insufficiently inflated air mattress and a patient slipped down the air cushion bed due to an excessively inflated air mattress. Therefore, the present invention largely upgrades the patient's safety and comfort in lying on an air cushion bed.

[0044] The present invention has been described with some preferred embodiments thereof and it is understood that many changes and modifications in the described embodiments can be carried out without departing from the scope and the spirit of the invention that is intended to be limited only by the appended claims.

Claims

1. An air cushion bed with sensing mat capable of detecting the lying of a patient thereon, comprising:

an inflatable air mattress;

a first sensing mat being provided on an outer surface of the inflatable air mattress and including:

a first upper sensing sheet having a first upper conductive printed pattern provided thereon;

a first lower sensing sheet having a first lower conductive printed pattern provided thereon, and the first lower conductive printed pattern being oriented to the first upper conductive printed pattern on the first upper sensing sheet; and

a first soft pad being sandwiched between the first upper sensing sheet and the first lower sensing sheet, and having a plurality of first through holes provided thereon; and

a first determining module being electrically connected to the first upper conductive printed pattern and the first lower conductive printed pattern for determining whether the first upper sensing sheet is electrically connected to or disconnected from the first lower sensing sheet;

wherein when the first sensing mat is compressed by an external force applied thereto and the first upper sensing sheet is brought to contact with the first lower sensing sheet via the first through holes on the

first soft pad, the first upper conductive printed pattern is electrically connected to the first lower conductive printed pattern.

2. The air cushion bed as claimed in claim 1, wherein the first sensing mat is provided on a top surface of the inflatable air mattress, and the first determining module detects an electrical connection state between the first upper sensing sheet and the first lower sensing sheet for determining whether there is a patient lying on the inflatable air mattress.

3. The air cushion bed as claimed in claim 1, wherein the first sensing mat is provided on a bottom surface of the inflatable air mattress, and the first determining module detects an electrical connection state between the first upper sensing sheet and the first lower sensing sheet for determining whether the inflatable air mattress is sufficiently inflated when a patient is lying thereon.

4. The air cushion bed as claimed in claim 1, wherein the first sensing mat further includes at least one first fastening element provided on between the first upper sensing sheet and the first lower sensing sheet for fixedly fastening the first upper sensing sheet to the first lower sensing sheet with the first soft pad sandwiched between them.

5. The air cushion bed as claimed in claim 4, wherein the first fastening element includes a male fastener and a mating female fastener; and the male and the mating female fastener being separately provided on two facing sides of the first upper sensing sheet and the first lower sensing sheet.

6. The air cushion bed as claimed in claim 1, wherein the first upper sensing sheet and the first lower sensing sheet are flexible printed circuit boards; and wherein the first upper conductive printed pattern and the first lower conductive printed pattern are formed with a conductive graphite material; and wherein the first soft pad is selected from the group consisting of a foam pad and a latex pad.

7. The air cushion bed as claimed in claim 1, further comprising:

a second sensing mat being provided on another outer surface of the inflatable air mattress opposite to the first sensing mat, and including:

a second upper sensing sheet having a second upper conductive printed pattern provided thereon;

a second lower sensing sheet having a second lower conductive printed pattern provided thereon, and the second lower con-

ductive printed pattern being oriented to the second upper conductive printed pattern on the second upper sensing sheet; and a second soft pad being sandwiched between the second upper sensing sheet and the second lower sensing sheet, and having a plurality of second through holes provided thereon; and

a second determining module being electrically connected to the second upper conductive printed pattern and the second lower conductive printed pattern for determining whether the second upper sensing sheet is electrically connected to or disconnected from the second lower sensing sheet;

wherein when the second sensing mat is compressed by an external force applied thereto and the second upper sensing sheet is brought to contact with the second lower sensing sheet via the second through holes on the second soft pad, the second upper conductive printed pattern is electrically connected to the second lower conductive printed pattern.

8. The air cushion bed as claimed in claim 7, wherein the first sensing mat is provided on a top surface of the inflatable air mattress, and the first determining module detects an electrical connection state between the first upper sensing sheet and the first lower sensing sheet for determining whether there is a patient lying on the inflatable air mattress; and wherein the second sensing mat is provided on a bottom surface of the inflatable air mattress, and the second determining module detects an electrical connection state between the second upper sensing sheet and the second lower sensing sheet for determining whether the inflatable air mattress is sufficiently inflated when a patient is lying thereon.
9. The air cushion bed as claimed in claim 8, wherein the first through holes on the first soft pad have an inner diameter smaller than that of the second through holes on the second soft pad.
10. The air cushion bed as claimed in claim 8, wherein the first soft pad has a thickness larger than that of the second soft pad.
11. The air cushion bed as claimed in claim 7, wherein the first sensing mat further includes at least one first fastening element provided on between the first upper sensing sheet and the first lower sensing sheet for fixedly fastening the first upper sensing sheet to the first lower sensing sheet with the first soft pad sandwiched between them; and wherein the second sensing mat further includes at least one second fas-

tening element provided on between the second upper sensing sheet and the second lower sensing sheet for fixedly fastening the second upper sensing sheet to the second lower sensing sheet with the second soft pad sandwiched between them.

12. The air cushion bed as claimed in claim 11, wherein the first fastening element and the second fastening element respectively include a male fastener and a mating female fastener; the male and the female fastener of the first fastening element being separately provided on two facing sides of the first upper sensing sheet and the first lower sensing sheet, and the male and the female fastener of the second fastening element being separately provided on two facing sides of the second upper sensing sheet and the second lower sensing sheet.
13. The air cushion bed as claimed in claim 7, wherein the first upper and lower sensing sheets as well as the second upper and lower sensing sheets are flexible printed circuit boards; and wherein the first upper and lower conductive printed patterns as well as the second upper and lower conductive printed patterns are formed with a conductive graphite material; and wherein the first soft pad and the second soft pad are selected from the group consisting of a foam pad and a latex pad.

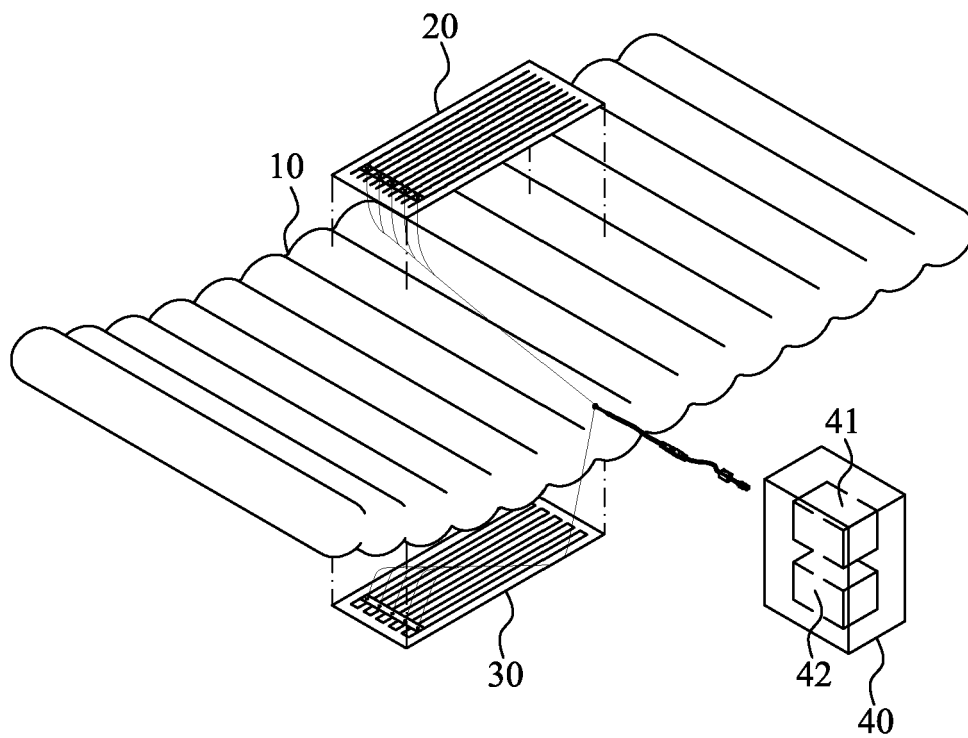


FIG. 1

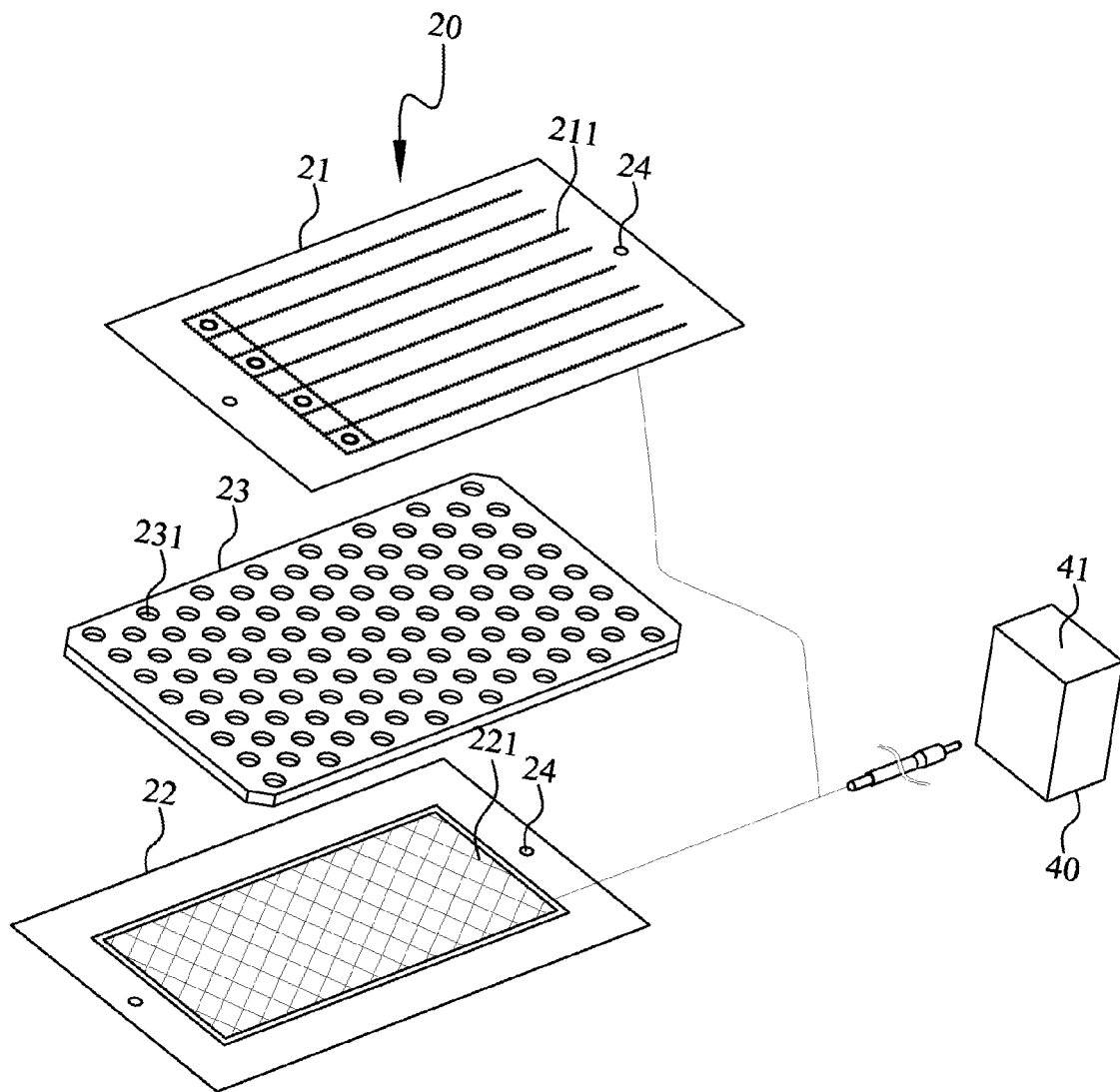


FIG. 2

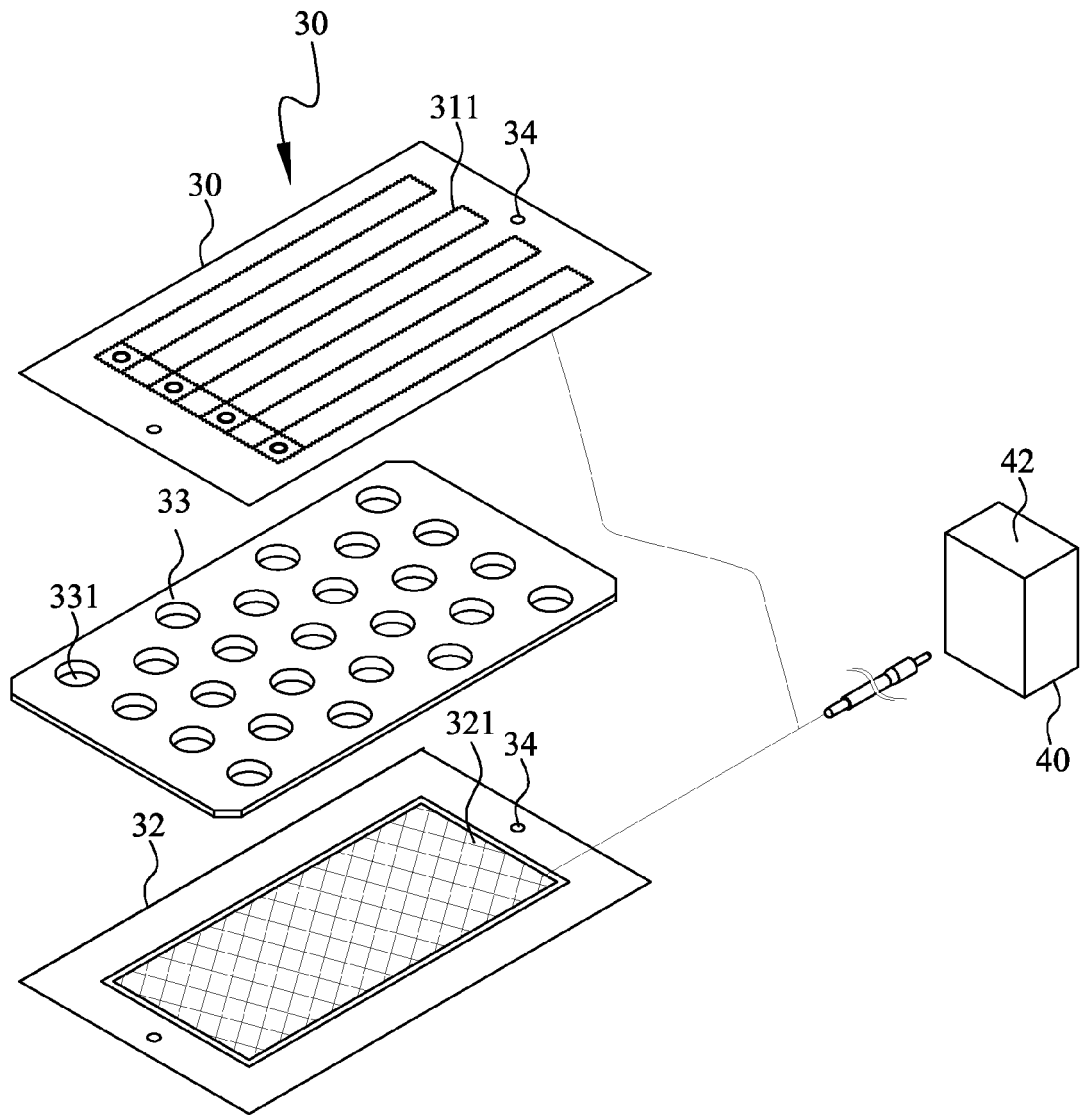


FIG. 3

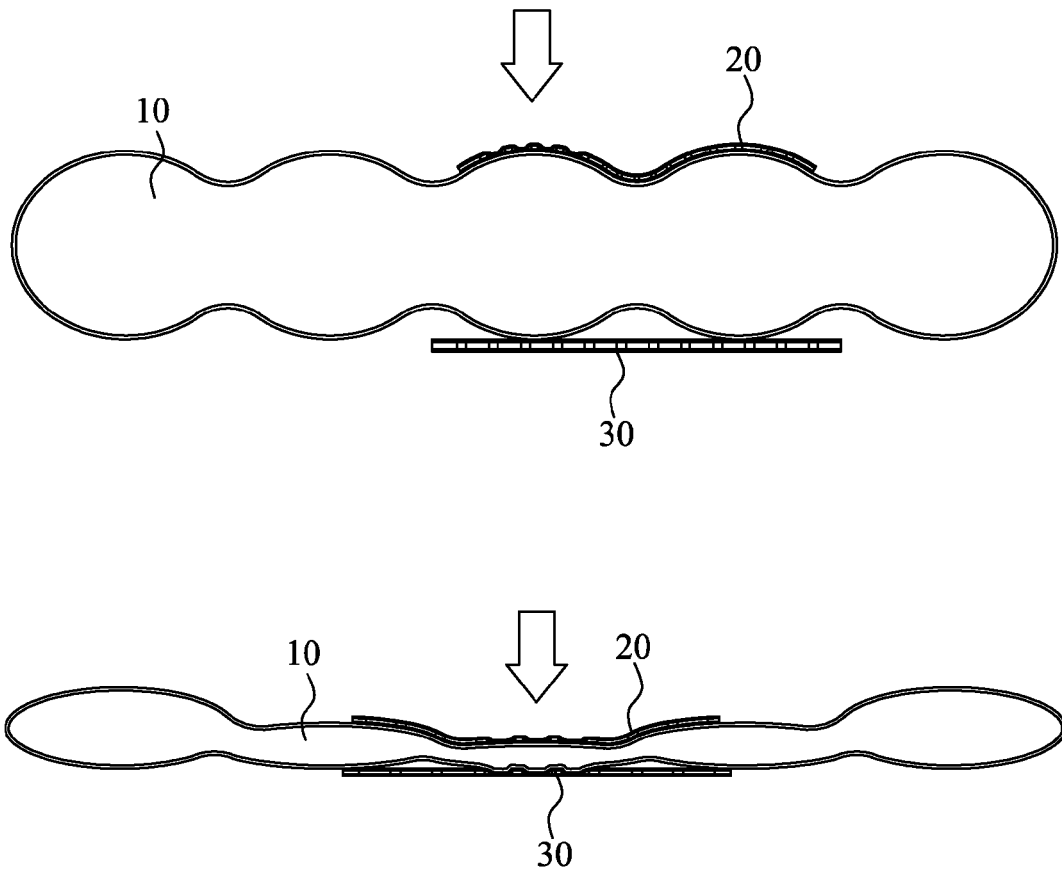


FIG. 4

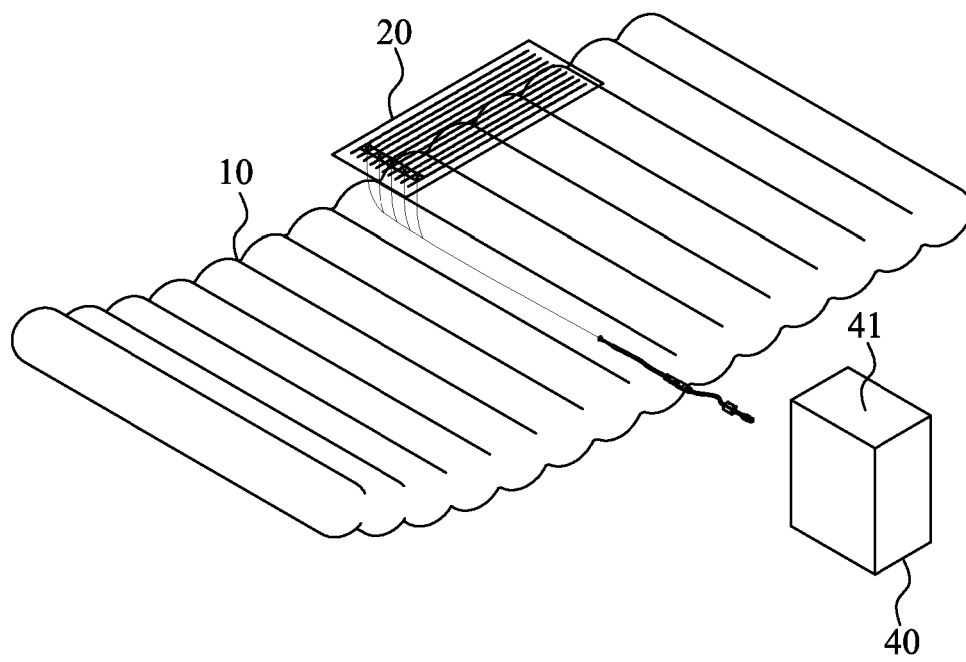


FIG. 5

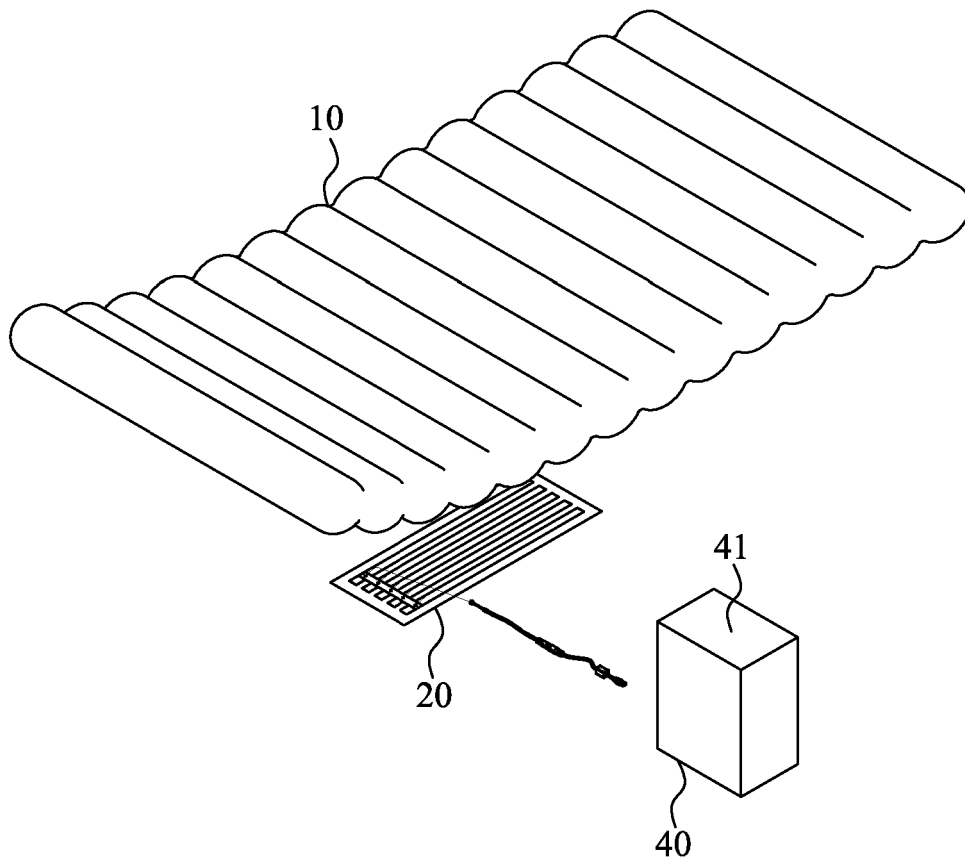


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 1003

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		19 June 2012	Kroeders, Marleen
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 12 15 1003

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