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(54) **REVERSIBLE CUSHION MEANS AND METHODS OF MANUFACTURE AND USE THEREOF**

(57) The invention provides cushion means for a user to lie or sit on in use, the cushion means including a first layer on a first side of the cushion means, having a plurality of inflatable cells; and at least a second layer on a second, opposing side of the cushion means having a

foam surface. The cushion means is provided to be reversible such that a patient may lie or sit on either of the first or second, opposing sides of the cushion means, depending on their specific needs.

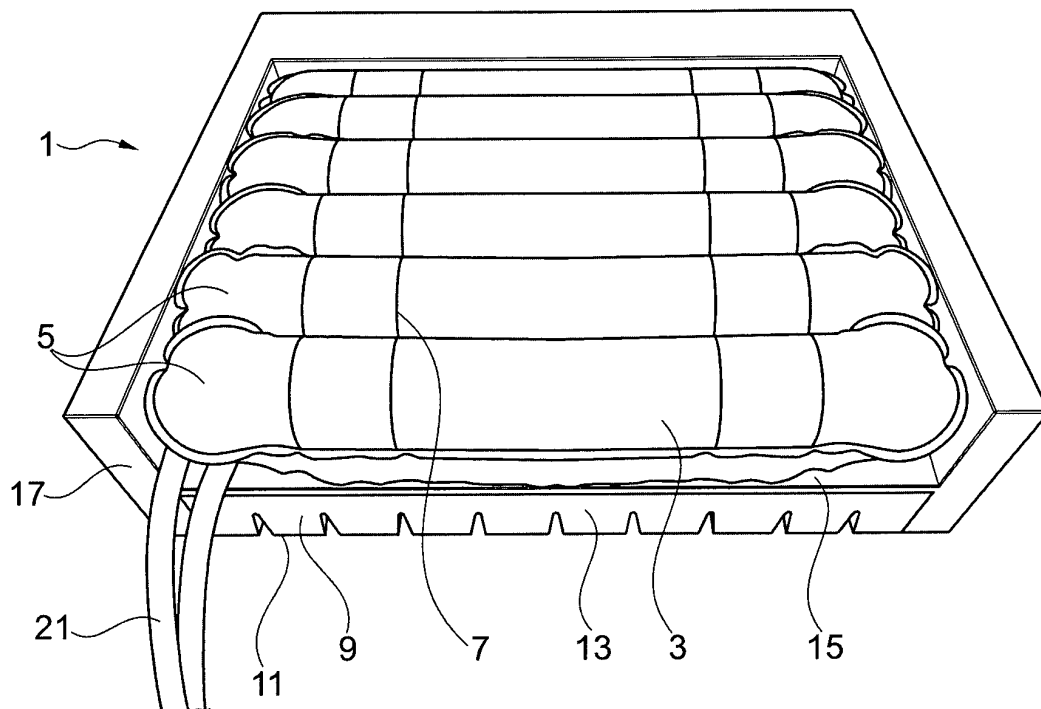


Fig. 1

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Description

[0001] The invention to which this application relates is a reversible cushion means and a method of use thereof.

[0002] Although the following description refers to a reversible mattress or, in smaller examples, a reversible cushion, for use in treating and/or reducing the risk of pressure ulcers developing in a person, the person skilled in the art will appreciate that the present invention could also be used for medical and/or therapeutic processes and/or conditions.

[0003] The use of varying types of mattresses in beds for treating patients with pressure ulcers has been known for some time. Pressure-redistributive mattresses are used to reduce pressure on prominent or bony areas of the body and most mattresses of this type do so by immersing and/or enveloping the patient's body into the surface of the mattress. There are two principle types of mattress used for such treatment. Anti-decubitus mattresses are provided containing multiple air chambers or cells that can be alternately inflated or deflated. With such mattresses, a patient lies on the mattress with their weight spread across it. The air chambers or cells of the mattress are typically arranged in rows; the length of each cell typically extending from one side of the mattress to the other. Each air chamber or cell can be inflated and deflated by a pump system attached thereto. With the pump activated, alternating cells of the mattress can be inflated and deflated, and depending on the treatment required, such mattresses can be programmed to inflate every other, every third, fourth cell etc. along the mattress (A:B, A:B:B, A:B:B:B alternating). The pump can be provided with a timer such that air is pumped into alternating cells in time cycles. Typical cycles of cell inflation can vary between 2 - 20 minutes. Deflation of the cells is caused by air escaping from the interior of the cells and back through the pump into the surrounding atmosphere.

[0004] Another form of pressure-redistributive mattress that is commonly used is a foam mattress. The foam mattresses can be provided in numerous forms and comprise varying and/or multiple types and/or layers of foam to redistribute the pressure placed by a patient on the mattress. One of the more common examples of foam mattresses used in this treatment is a castellated mattress. Castellated mattresses are generally provided as a castellated layer of foam located within a slightly more robust U-shaped foam base, which provides stability and support to the base and side-walls of the mattress. Within the U-shaped base is located the castellated layer of foam having individually castellated cells designed to conform individually to the part of the patient's body that rests on top, thereby allowing the mattress to profile the patient's body more easily. The same principles as described above can also be applied in smaller more compact versions, i.e., cushions, on which a patient may sit for a predetermined period of time, according to the therapy they are undergoing.

[0005] Mattresses have also since been developed that have attempted to combine the features of the above two types of pressure-redistributive mattress. Known as hybrid mattresses, these incorporate the alternating pump mattresses described above, but further include a thin layer of foam on top of the mattress cells. The foam layer is designed to form around and fit the profile of the patient's body, while the alternating pump cells, below, run on the desired cycle. Variations of the hybrid mattresses exist, some notable examples being where the alternating pump cells and the foam portions are provided in the same layer, targeting different parts of the patient's body; and also non-powered examples, wherein the body weight of the patient regulates the flow of the cells, which again are located below a foam layer.

[0006] As will be appreciated, mattresses and cushions can take up a significant amount of space and depending on the needs of the patient, different mattresses and cushions would be suitable for different people. Therefore, it can become quite cumbersome to change mattresses and cushions on a frequent basis and also provide storage space for those not being used.

[0007] It is therefore an aim of the present invention to provide a cushion means that overcomes the aforementioned problems associated with the in the prior art.

[0008] It is a further aim of the present invention to provide a method of manufacturing a cushion means that overcomes the aforementioned problems associated with the in the prior art.

[0009] It is yet a further aim of the present invention to provide a method of using a cushion means that overcomes the aforementioned problems associated with the in the prior art.

[0010] According to a first aspect of the invention there is provided a cushion means for a user to lie or sit on in use, said cushion means including: a first layer on a first side of the cushion means having a plurality of inflatable cells; and at least a second layer on a second, opposing side of the cushion means having a foam surface, and characterised in that said cushion means is reversible such that a patient may lie or sit on either of the first or second, opposing sides of the cushion means, depending on their specific needs.

[0011] In one embodiment, said cushion means is provided in the form of a mattress.

[0012] Thus, the present invention therefore has the advantage that a cushion means is provided, either in a smaller cushion form or a larger mattress form, which includes both the inflatable cells and the foam layer configured to be wholly reversible, unlike anything previously described in the prior art. This has very important advantages insofar as storage of the cushion means are concerned as it would not be required to buy both a foam-based cushion/mattress and an inflatable cell cushion/mattress. Rather than swapping such cushions or mattresses depending on the patient needs and finding somewhere to store the un-used cushion or mattress, a single cushion means is now provided that can simply

be flipped over such that the opposing side, when required, can be used. As such, no extra storage space is required. Furthermore, this saves costs to the purchaser of the cushions/mattresses and also within manufacturing, wherein time and money is saved by producing a single, reversible cushion means as opposed to two distinct types.

[0013] In one embodiment, at least a third layer is provided intermediate said first and second layers. Typically, said third layer or intermediate layer is formed as a foam layer. Further typically, said third layer is formed of a distinct or different foam layer to that of the second layer.

[0014] In one embodiment, said at least third layer or intermediate layer is formed from a block foam material. Typically, said third or intermediate layer has a foam density of between approximately 38 and 40 kg m⁻³. Further typically, said third or intermediate layer has a nominal hardness of between approximately 175 and 215 N.

[0015] In one embodiment, said at least third layer is provided to support said first and second layers. Typically, said at least third layer extends to include side walls, forming an H- or I-shaped cross-section when viewed along a longitudinal axis or plane. Further typically, said first and second layers are located within the cross-section of the at least third layer. Alternatively, said at least third layer extends to include side walls, forming a U-shaped cross-section. Further typically, said first layer is located within the cross-section of the at least third layer.

[0016] In one embodiment, said first and/or second layer are removable from said third layer.

[0017] In one embodiment, side walls of the at least third layer extend along a length of the cushion means and also across a width of the cushion means. Typically, said first and second layers are located within recesses created by the side walls of the third layer.

[0018] In one embodiment, said at least third layer is of a thickness sufficient to mask the effects of the first layer when a user is sitting / lying / resting on the second layer, and vice versa. Typically, said thickness is between 1cm and 10cm. Further typically, said thickness is between 2cm and 7.5cm. Preferably, said thickness is approximately 5cm. In an alternative embodiment, said third layer is sufficiently thin as to allow the effects of the first layer be felt as a user is sitting / lying / resting on the second layer.

[0019] In one embodiment, said first layer, comprising said plurality of inflatable cells, further includes connection means for connection with a pump system. Typically, said connection means are provided as one or more valves. Further typically, said one or more valves are provided to connect to one or more hoses associated with said pump system.

[0020] In one embodiment, the inflatable cells of said first layer are elongate and arranged in rows along a length of the cushion means. Typically, each cell extends substantially from one edge of the cushion means to an opposing edge. Further typically, each cell extends substantially from one side wall provided by a third layer to an

opposing side wall provided by said third layer.

[0021] In one embodiment, one or more columns of rows of inflatable cells are arranged across a width of the cushion means. Typically, two or more columns are provided across the width of the cushion means, each having rows of inflatable cells along the length of the cushion means.

[0022] In one embodiment, said two or more columns provide adjacent rows of inflatable cells. In an alternative embodiment, said two or more columns provide rows of inflatable cells offset from those in an adjacent column or columns, providing a staggered arrangement.

[0023] In reference to the statements above, the person skilled in the art will appreciate that the terms "length" and "width" are interchangeable and should not be construed so as to limit the arrangement of rows and columns of inflatable cells as such.

[0024] In one embodiment, the inflatable cells of said first layer can be inflated and deflated via connection to a pump system. Typically, alternate cells may be inflated and deflated. That is to say, every second cell may be inflated, while the remaining, alternate cells are deflated.

[0025] In one embodiment, every third cell may be inflated, while remaining cells are deflated. In one embodiment, every fourth cell may be inflated, while remaining cells are deflated. In one embodiment, inflation and deflation of cells may be staggered or provided in sequence in each set of two, three, four or more cells.

[0026] In one embodiment, the inflation and deflation of cells may be programmed in predetermined time cycles. Typically, said time cycles may range from 2 - 60 minutes.

[0027] In one embodiment, where inflatable cells are arranged in rows and in two or more columns, inflation and deflation of the cells may alternate between adjacent rows and adjacent columns.

[0028] In one embodiment, said inflatable cells are divided into at least two compartments; a distal compartment, substantially adjacent the first side of the cushion means; and a proximal compartment.

[0029] In one embodiment, said distal and proximal compartments are provided in a "figure of eight" formation. Typically, fluid pressure in the distal and proximal compartments is separately controlled by a pump system.

[0030] In one embodiment, the proximal compartment of each cell is provided with a one way valve, such that if there is a power cut or if the distal compartment is punctured i.e., by a needle puncture, the proximal compartment remains inflated and prevents the cushion means from deflating. This ensures that a degree of inflation is maintained in the cells of the cushion means for the comfort of the user.

[0031] In one embodiment, where the cushion means is provided as a mattress, three distinct areas are provided: a head region; a central body region; and a lower limb region. Typically, inflation and deflation of the cells may be directed to one or more of the said three areas

of the mattress.

[0032] In one embodiment, said at least second layer, comprising foam, includes at least one distinct form of foam, selected from any or any combination of: castel-

[0033] Typically, said gel-infused visco-elastic foam includes gel beads infused within visco-elastic foam. Further typically, said gel-infused visco-elastic foam may be castellated. Said gel-infused visco-elastic foam is provided generally to increase the pressure distribution capacity of the surface of the foam.

[0034] In one embodiment, at least two distinct types of foam are provided in the second layer, thereby forming two or more sub-layers of foam.

[0035] In one embodiment, a protective layer may be provided on an outer side of said second layer. Typically, said protective layer is attached to said second layer. Further typically, said protective layer is formed from a further type of foam or alternate material.

[0036] In one embodiment, cover means may be provided in which the cushion means may be removably located. Typically, said cover means provides a protective barrier for the cushion means between it and a user of the same.

[0037] In another aspect of the present invention, there is provided a method of manufacturing a cushion means for a user to lie or sit on in use, said method including the steps of: providing a first layer on a first side of the cushion means having a plurality of inflatable cells; and providing at least a second layer on a second, opposing side of the cushion means having a foam surface, and characterised in that said cushion means is provided to be reversible such that a patient may lie or sit on either of the first or second, opposing sides of the cushion means, depending on their specific needs.

[0038] In one embodiment, said cushion means is manufactured as a mattress for use as such by a user.

[0039] According to another aspect of the present invention, there is provided a method of using a cushion means for a user to lie or sit on in use, said cushion means including: a first layer on a first side of the cushion means having a plurality of inflatable cells; and at least a second layer on a second, opposing side of the cushion means having a foam surface, and characterised in that said cushion means is reversible such that a patient may lie or sit on either of the first or second, opposing sides of the cushion means, depending on their specific needs.

[0040] Typically, in between uses by patients, said cushion means may be flipped such that either the first or the second, opposing side is upwardly facing, depending on the particular need of the next user. Consequently, as opposed to substituting different types of cushion means and storing away those which are not required, the cushion means may be simply flipped 180 degrees to reveal the side that is required and, thus, hide the side that is not required at that time.

[0041] Typically, said cushion means is provided in the

form of a mattress to be used by a user.

[0042] Thus, a novel, space and cost saving cushion means is provided that is provided with two distinct, opposing sides/faces that perform different functions according to the needs of the user. The cushion means is fully reversible and can be provided, in a smaller embodiment, as a cushion on which a user may sit, or in a larger embodiment, as a mattress on which a user can lie / rest for a more prolonged period of time.

[0043] Embodiments of the present invention will now be described with reference to the accompanying figures, wherein:

Figure 1 illustrates a first view of a cushion means according to an embodiment of the present invention;

Figure 2 illustrates a second view of a cushion means according to an embodiment of the present invention;

Figure 3 illustrates a cushion means with a first layer separated therefrom, in accordance with an embodiment of the present invention;

Figure 4 illustrates a cushion means, with a first layer separated therefrom, in accordance with another embodiment of the present invention;

Figure 5 illustrates a plan view of a cushion means in accordance with another embodiment of the present invention;

Figure 6 illustrates a side view of a cushion means in accordance with another embodiment of the present invention;

Figure 7 illustrates a side view of the cushion means of Figure 6, having been flipped 180 degrees, in accordance with an embodiment of the present invention;

Figure 8 illustrates the connection of a pump system with a cushion means, in accordance with an embodiment of the present invention;

Figure 9 illustrates a cushion means located within cover means, in accordance with an embodiment of the present invention; and

Figure 10 a cushion means located within cover means, in accordance with another embodiment of the present invention.

[0044] Referring firstly to Figures 1 and 2, there is provided a cushion means in the form of a cushion 1, which is provided in this embodiment, as having a first, layer 3 having a plurality of inflatable air chambers or cells 5

arranged in rows. The first layer 3 is provided as a first side 7 of the cushion 1. A second layer 9 is provided as a second, opposing side 11 of the cushion 1 and is formed from a foam material 13. The two layers are formed such that the cushion 1 is reversible, such that a user may lie or sit on either of the first or second, opposing sides 7, 11 of the cushion means, depending on their specific needs; the inflatable cells 5 being provided to serve one function; and the foam 13 being provided to serve another function. Figures 1-4 illustrate the present invention as a cushion 1, on which a user may sit. However, it is also within the scope of the present invention that the cushion be provided on a larger scale, as illustrated in Figures 5-9, wherein the cushion means is provided as a mattress 51 on which a user may lie or rest. The principle remains the same in that two distinct layers are provided and the mattress is reversible and can be easily flipped to expose whichever side is required by the particular user. The present invention therefore has the advantage of providing a cushion means, either in a smaller cushion form 1 or a larger mattress form 51, which includes both the inflatable cells 5 and the foam layer 13, which are known from the mattresses previously described in the prior art, yet the present invention is designed to be wholly reversible, unlike anything previously known in the prior art. The advantages of such a product are clear, in that the burden of storage of cushions and mattresses are greatly reduced as the requirement to buy both a foam-based cushion/mattress and an inflatable cell cushion/mattress has now been eliminated by the present invention. Rather than swapping such cushions or mattresses depending on the patient needs and finding somewhere to store the un-used cushion or mattress, a single cushion or mattress is now provided that can simply be flipped over such that the opposing side, when required, can be used. No extra storage space is required. Furthermore, this saves costs to the purchaser of the cushions/mattresses and also within manufacturing, wherein time and money is saved by producing a single, reversible cushion or mattress as opposed to two distinct types.

[0045] As can also be seen from the figures, in particular, Figures 1-3, a third, intermediate layer 15 is provided on the cushion 1, separating the first 3 and second 9 layers. The third layer 15 is also generally formed from a foam material, however, this will be a more robust foam material than that of the second layer 9, ensuring the cushion 1 maintains its shape and is more sturdy as a result. Typically, the third layer 15 is formed from a block foam material, having a foam density of between approximately 38 and 40 kg m⁻³ and/or a nominal hardness of between approximately 175 and 215 N. The third layer 15 is therefore provided to act primarily as a support for the first and second layers 3, 9 and further extends outwardly to form side walls 17 of the cushion 1. As shown in Figures 1-3, the side walls provide the cushion 1 with an H- or I-shaped cross-section, in which the first and second layers 3, 9 can be located. The side walls 17 can be located along the length of the cushion and also along

the width, effectively creating a recess on either side 7, 11, in which the first and second layers 3, 9 may be located. Another way the side walls may be formed, as is best illustrated in Figures 6-7, is such that they extend to provide more of a U-shaped cross section, creating a single recess in which the first layer 3 is located. On the reverse side, the second layer 9 extends across the entire length and width of, in this case, the mattress 51 (although it is perfectly feasible that the same arrangement could apply to the smaller cushion 1), negating the need for side walls extending to the second layer 9.

[0046] Figures 3 and 4 illustrate a cushion 1 and mattress 51 respectively, wherein the layer of inflatable cells 5 is removable from the third layer 15. It is equally plausible that the foam material 13 of the second layer 9 is also removable from the third layer 15. The ability to allow the first and second layers 3, 9 to be removed makes it easier to perform any maintenance or repairs that make be required after use. For example, if a puncture occurs in one or more of the cells 5 and repair is needed, this becomes a lot easier if the layer of cells 5 can be removed from the cushion 1 or mattress 51 and addressed directly, rather than having to perform the maintenance or repair while the layer is still situated with the cushion 1 or mattress 51. Further, the thickness and robustness of the third layer 15 may be provided in varying forms depending on the specific purpose of the mattress. In a preferred embodiment, the third layer 15 will be provided of a thickness and/or robustness so as to mask the effects of the first layer when a user is sitting / lying / resting on the second layer, and vice versa. The thickness of the third layer 15 will generally range between approximately 1cm and 10cm, preferably between approximately 2cm and 7.5cm, and most preferably will have an approximate thickness 5cm or 2 inches. Alternatively, the third layer 15 may be provided slightly thinner or more flexible in order that the effects of the first layer may be felt as a user is sitting / lying / resting on the second layer.

[0047] The inflatable cells 5 of the first layer 3 are connected to a pump system 19, as depicted in Figure 8. Valves (not shown) are provided that connect the cells 5, via hoses 21, to the pump system 19. As can be seen in the figures, the cells 5 are provided as elongate air chambers that extend across the width of the cushion 1 or mattress 51, from one side wall 17 to an opposing side wall. The cells 5 are arranged in rows which extend along the length of the cushion 1 or mattress 51. In the figures provided, a single column of rows of cells 5 is provided, whereby the cells 5 extend across the width of the cushion 1 or mattress 51. However, in alternative embodiments, the cells 5 may be reduced in length and provided as two or more columns with rows of the cells extending along the length of the cushion 1 or mattress 51. Two or more columns, where present, therefore provide adjacent row of inflatable cells 5. These can be directly adjacent or, alternatively, the rows in adjacent columns may be offset from one another, providing a more staggered arrangement.

[0048] The cells 5 may be inflated and deflated by the pump system 19, which controls the fluid pressure within the cells 5. Generally, alternate cells 5 are inflated and deflated by the pump system 19, i.e., every second is inflated while the remaining cells, interposed between the inflated cells, are deflated. Other sequences of inflation and deflation may also be provided, for example, rather than every second cell being inflated, as described above, every third or every fourth cell may, instead, be inflated. This can be as simple as inflating one cell for a period, deflating it and subsequently inflating the next in the sequence of three, four etc. or, the inflation and deflation of cells in a group of three or four may be provided in sequence. For example, in a sequence of four cells, one may be fully inflated, a further two cells in the sequence may then be partially inflated at decreasing levels and the fourth and final cell in the sequence may be fully deflated. Such options and sequences for inflation and deflation of the cells 5 is all controlled by the pump system and a user interface/control panel provided thereon. Such inflation and deflation may also be programmed in predetermined time cycles, as controlled by the pump system 19. In particular, such cycles may vary between 2 and 60 minutes, depending on the specific needs of the user of the cushion 1 or mattress 51. Where two or more columns of cells 5 are provided, inflation and deflation of the cells may alternate between adjacent rows and adjacent columns.

[0049] The cells 5 of the first layer 3 may further be divided into two compartments, which, in relation to the third layer 15, would be seen as distal and proximal compartments; the distal compartments being the ones that contact the user when in use. Such compartments are provided so that the cells 5 are arranged in a "figure of eight" formation and the fluid pressure in each of the compartments can be controlled separately by the pump system 19. A one way valve may also be provided in the proximal compartment, such that if there is a power cut or if the distal compartment is punctured i.e., by a needle puncture, the proximal compartment remains inflated and prevents the cushion 1 or mattress 51 from fully deflating. This ensures that a degree of inflation is maintained in the cells 5 of the cushion 1 or mattress 51 for the comfort of the user. As a further feature, the mattress 51 can also be provided as having three distinct areas: a head region; a central body region; and a lower limb region. As such, inflation and deflation of the cells 5 may be directed to one or more of the said three areas of the mattress 51, with each of the three regions being provided with differing inflation/deflation time cycles, if required.

[0050] The second layer 9 of the cushion 1 or mattress 51, as highlighted above, is formed from a foam material 13. As shown most clearly in Figure 2, the foam material 13 can be formed from castellated foam, however, numerous other types of foam may instead be used, including but not limited to: memory foam; air-layer (interlock knit polyurethane fabric) foam; or gel-infused visco-elastic foam. The foam material 13 can sit within the side

walls 17 of the third layer 15 or, alternatively, as shown most clearly in Figures 6 and 7, it can extend right to the edges of the cushion 1 or mattress 51, negating the requirement for side walls. Where the foam material 13 is formed from gel-infused visco-elastic foam, it is gel beads that are infused within the visco-elastic foam. This foam may itself also be castellated and the gel-infused visco-elastic foam is provided generally to increase the pressure distribution capacity of the surface of the foam. In some examples, and as shown in Figure 6 and 7, at least two distinct types of foam are provided in the second layer 9, thereby forming two or more sub-layers of foam 23 and 23'. These sub-layers will be provided having different specific properties, which will subsequently alter the performance of the second layer 9 as required according to the particular need of the cushion 1 or mattress 51. In addition, a protective layer 25 may also be provided over the second layer 9. This may be permanently attached to the second layer 9 via stitching, chemical bonding or any other appropriate fashion. This may also be formed from another distinct type of foam or a different material entirely.

[0051] Finally, and with reference to Figures 9 and 10, an outer cover 27 can be provided in which to locate the cushion 1 or mattress 51. This is provided to form a protective barrier between the component parts of the cushion 1 or mattress 51 and the user of the same. The cushion 1 or mattress 51 is easily removed from the outer cover 27, which may be fastened shut via a zip or other appropriate fastening means. The outer cover further includes a sheath 29 attached thereto through which the hoses 21 extending between the cushion 1 or mattress 51 and the pump system 19 are located and protected.

Claims

1. Cushion means for a user to lie or sit on in use, said cushion means including:
 - a first layer on a first side of the cushion means having a plurality of inflatable cells; and
 - at least a second layer on a second, opposing side of the cushion means having a foam surface,
 - and **characterised in that** said cushion means is reversible such that a patient may lie or sit on either of the first or second, opposing sides of the cushion means, depending on their specific needs.
2. Cushion means according to claim 1, wherein at least a third layer is provided intermediate said first and second layers.
3. Cushion means according to claim 2, wherein said third layer or intermediate layer is formed as a foam layer.

4. Cushion means according to claim 2, wherein said at least third layer is provided to support said first and second layers.
5. Cushion means according to claim 2, wherein said at least third layer extends to include side walls, forming an H- or I-shaped cross-section, or a U-shaped cross-section, when viewed along a longitudinal axis or plane. 5
6. Cushion means according to claim 2, wherein said first and/or second layer are removable from said third layer. 10
7. Cushion means according to claim 2, wherein said first and second layers are located within recesses created by the side walls of the third layer. 15
8. Cushion means according to claim 1, wherein said first layer, comprising said plurality of inflatable cells, further includes connection means for connection with a pump system. 20
9. Cushion means according to claim 1, wherein the inflatable cells of said first layer are elongate and arranged in rows along a length of the cushion means. 25
10. Cushion means according to claim 1, wherein the inflatable cells of said first layer are inflated and deflated via connection to a pump system. 30
11. Cushion means according to claim 1, wherein inflation and deflation of cells may be alternated, staggered or provided in sequence in sets of two, three, four or more cells. 35
12. Cushion means according to claim 1, wherein said inflatable cells are divided into at least two compartments; a distal compartment, substantially adjacent the first side of the cushion means; and a proximal compartment. 40
13. Cushion means according to claim 12, wherein fluid pressures in the distal and proximal compartments are controlled separately by a pump system. 45
14. Cushion means according to claim 1, wherein cover means are provided in which the cushion means may be removably located. 50
15. A method of manufacturing a cushion means for a user to lie or sit on in use, said method including the steps of: 55
 - providing a first layer on a first side of the cushion means having a plurality of inflatable cells; and
 - providing at least a second layer on a second,

opposing side of the cushion means having a foam surface, and **characterised in that** said cushion means is provided to be reversible such that a patient may lie or sit on either of the first or second, opposing sides of the cushion means, depending on their specific needs.

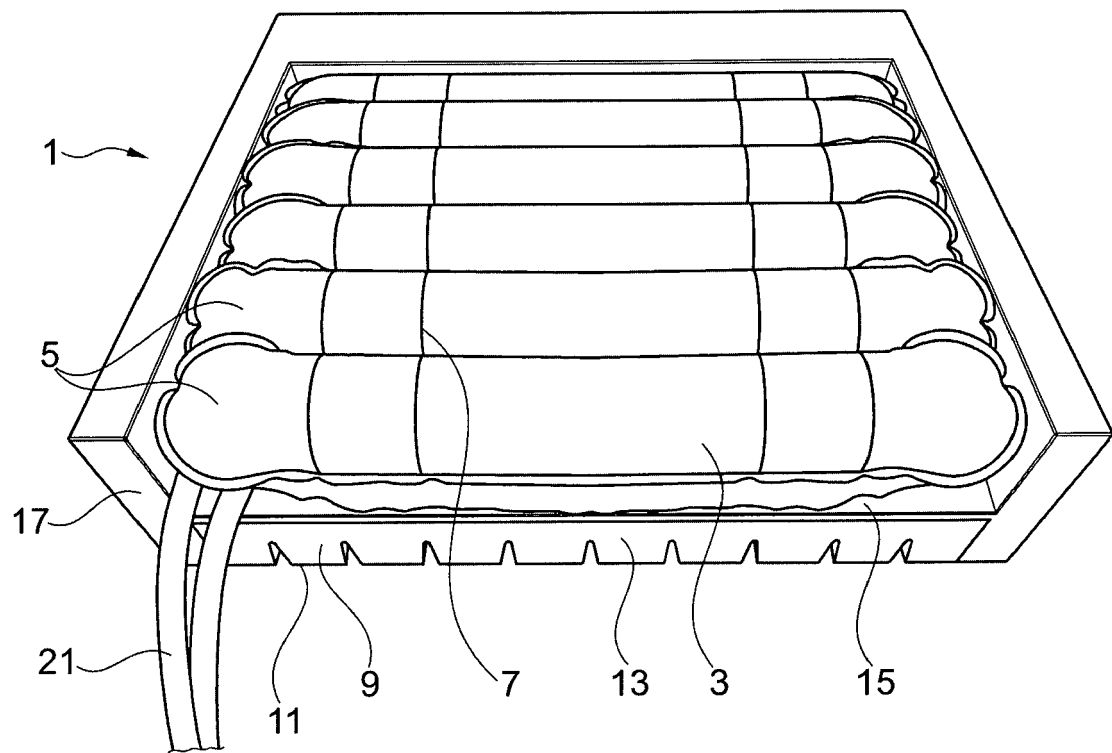


Fig. 1

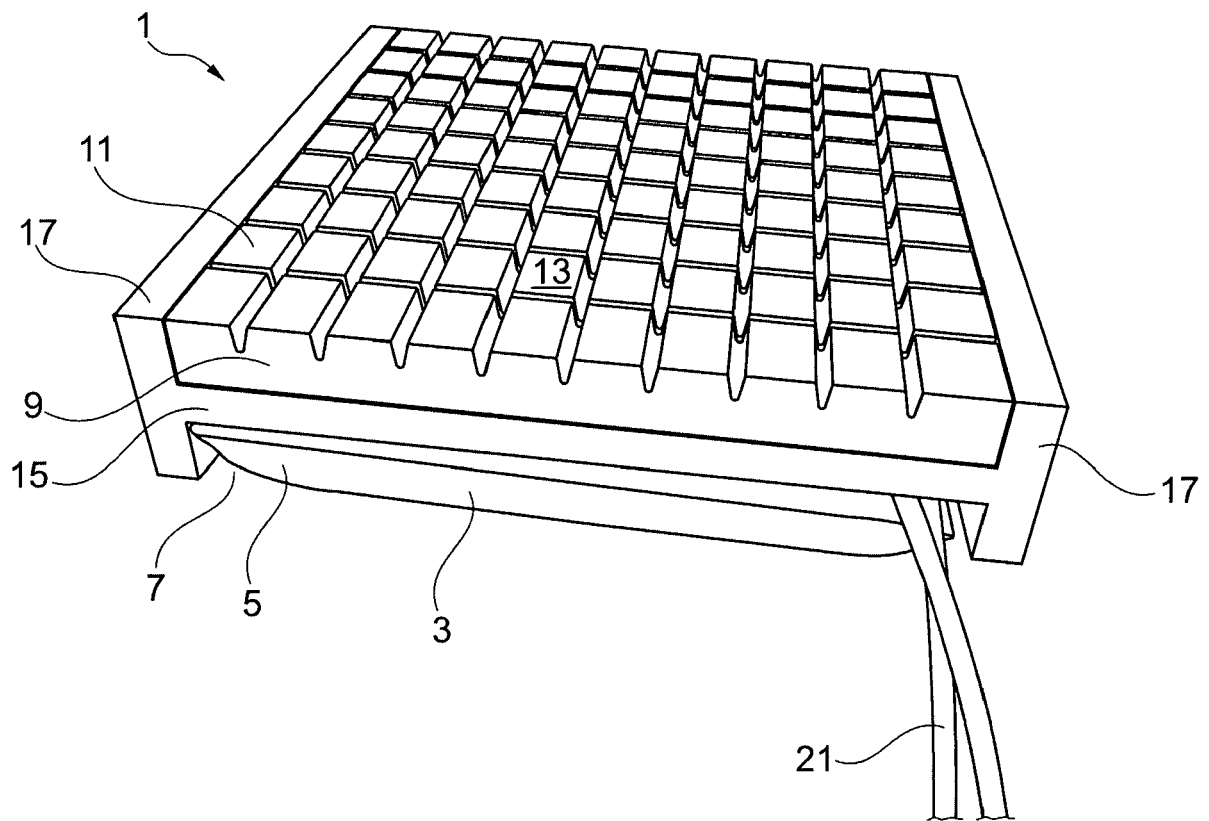


Fig. 2

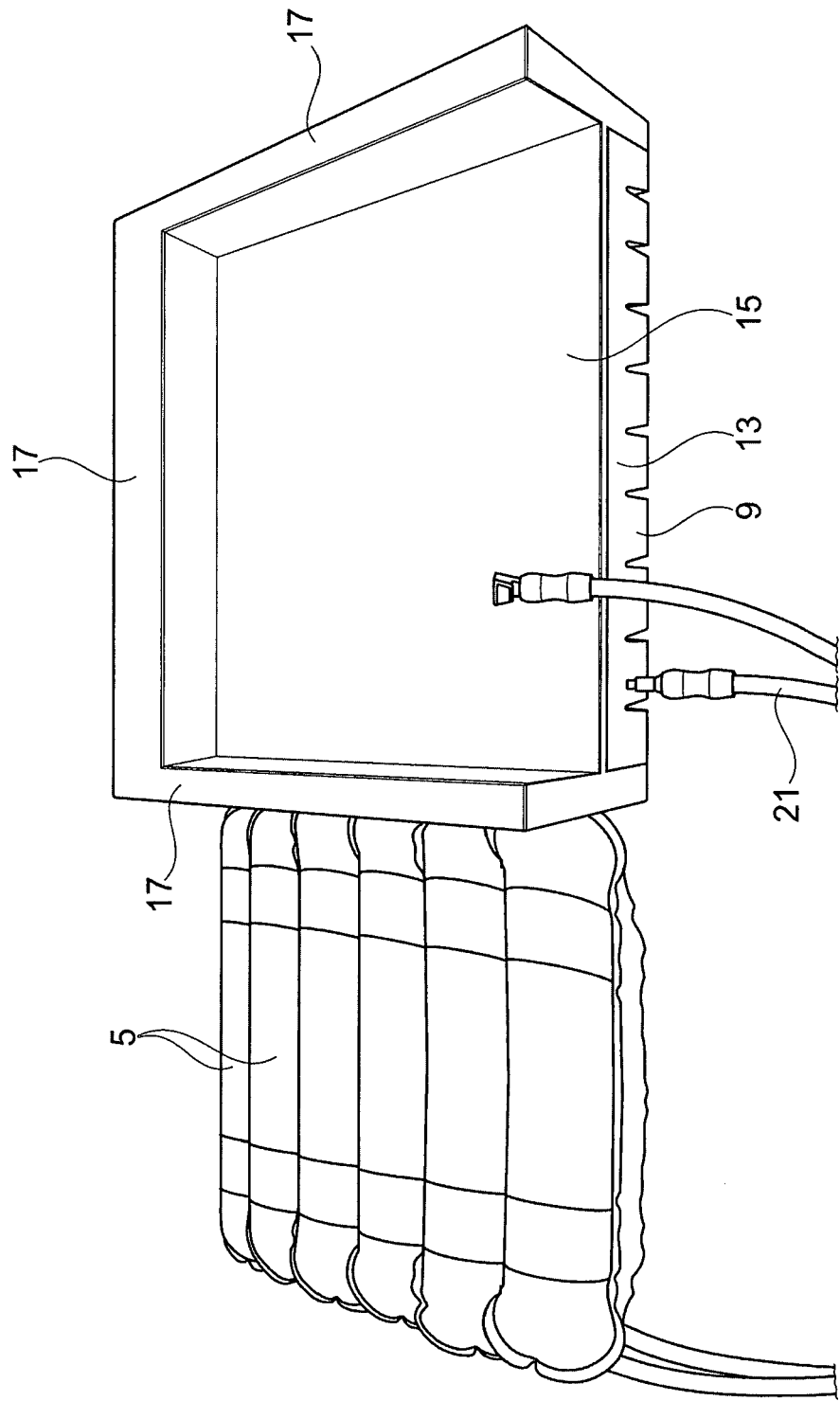


Fig. 3

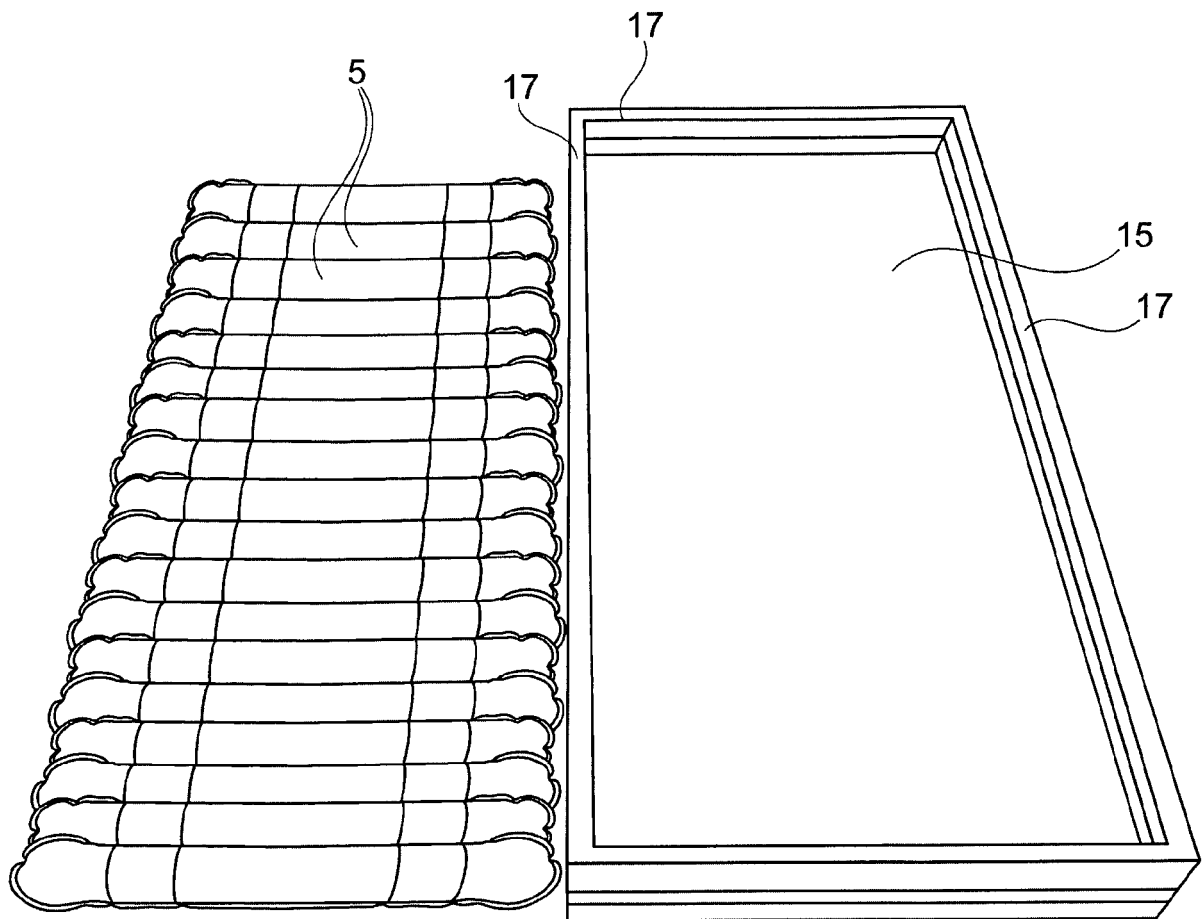


Fig. 4

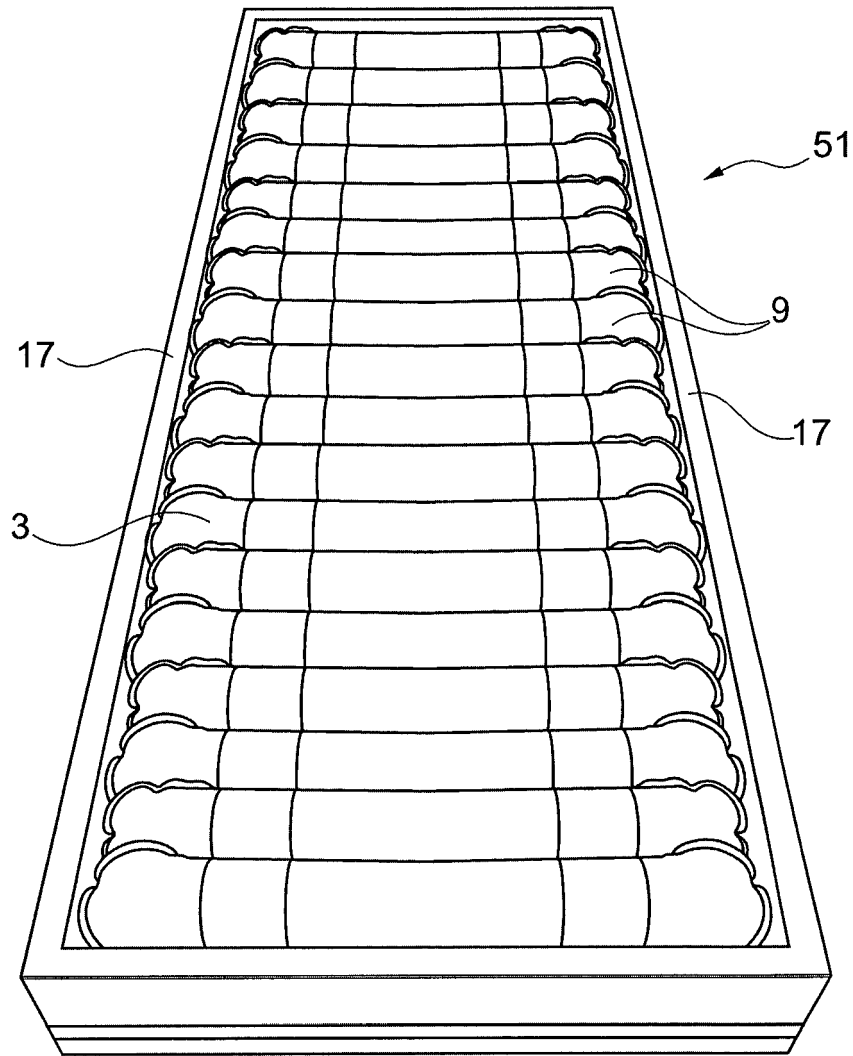


Fig. 5

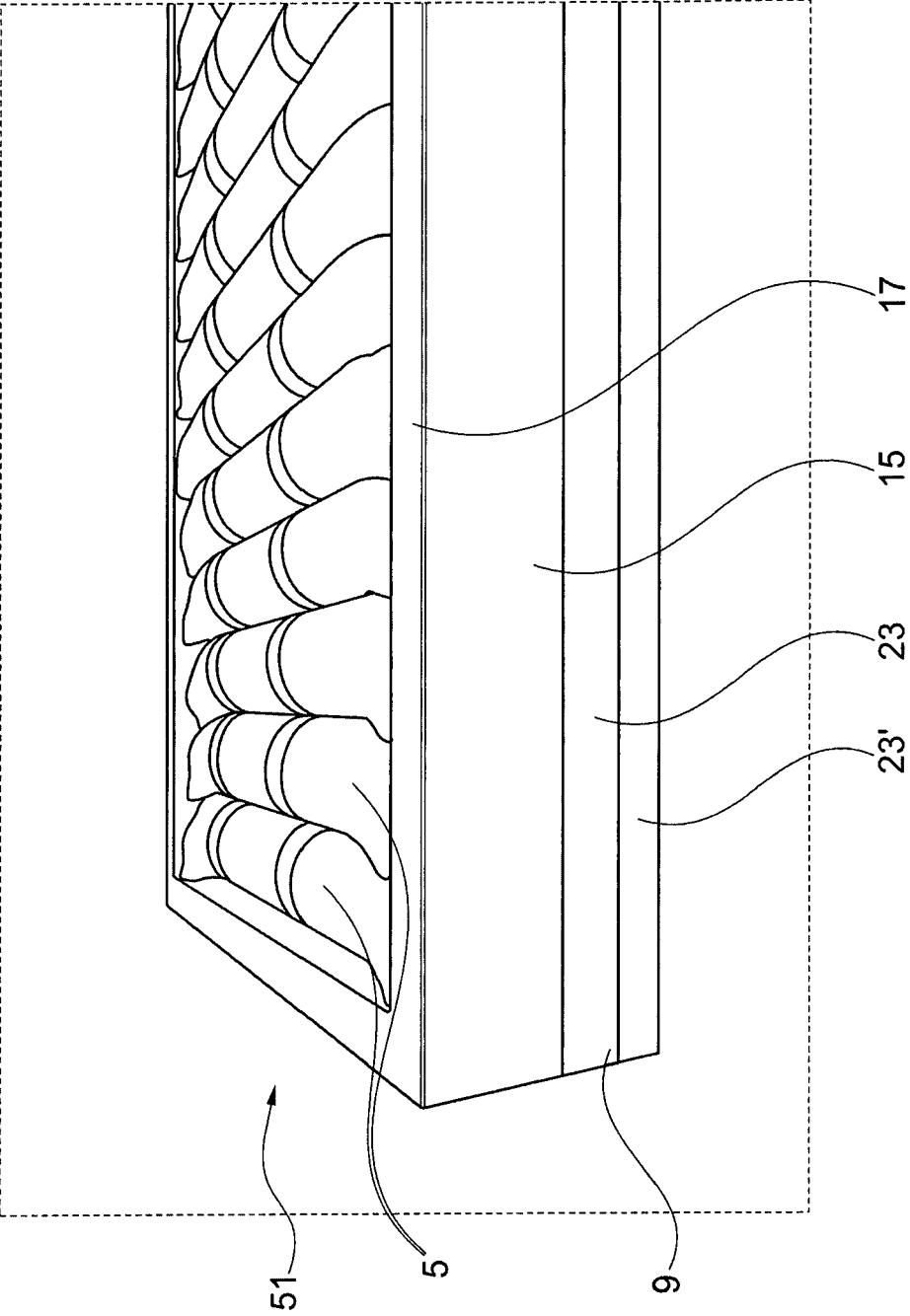


Fig. 6

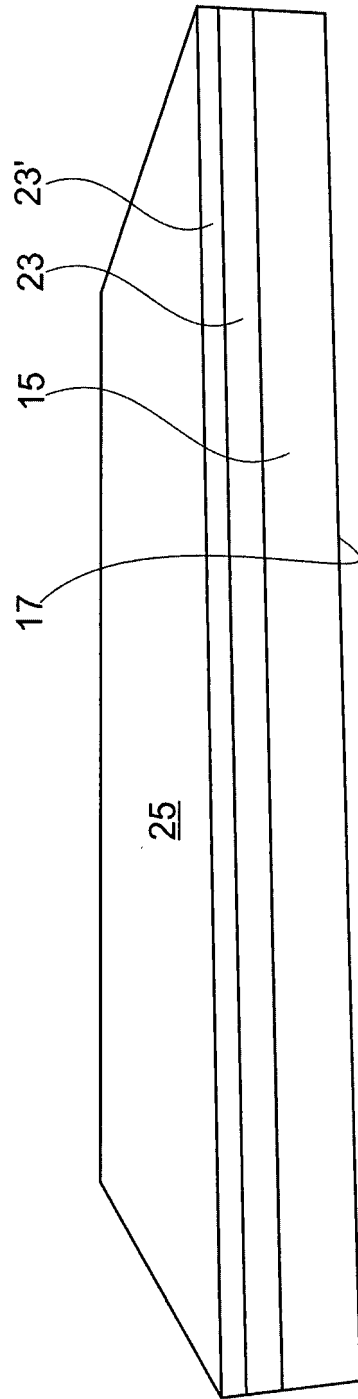


Fig. 7

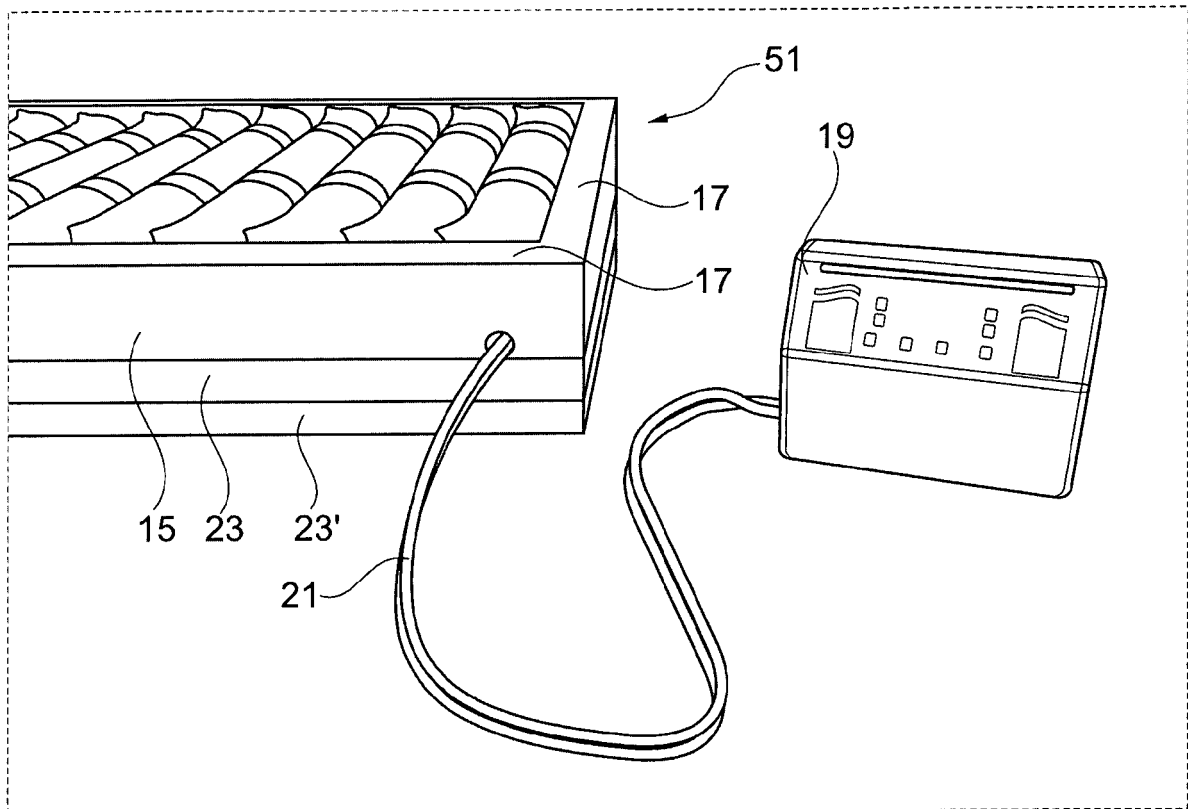


Fig. 8

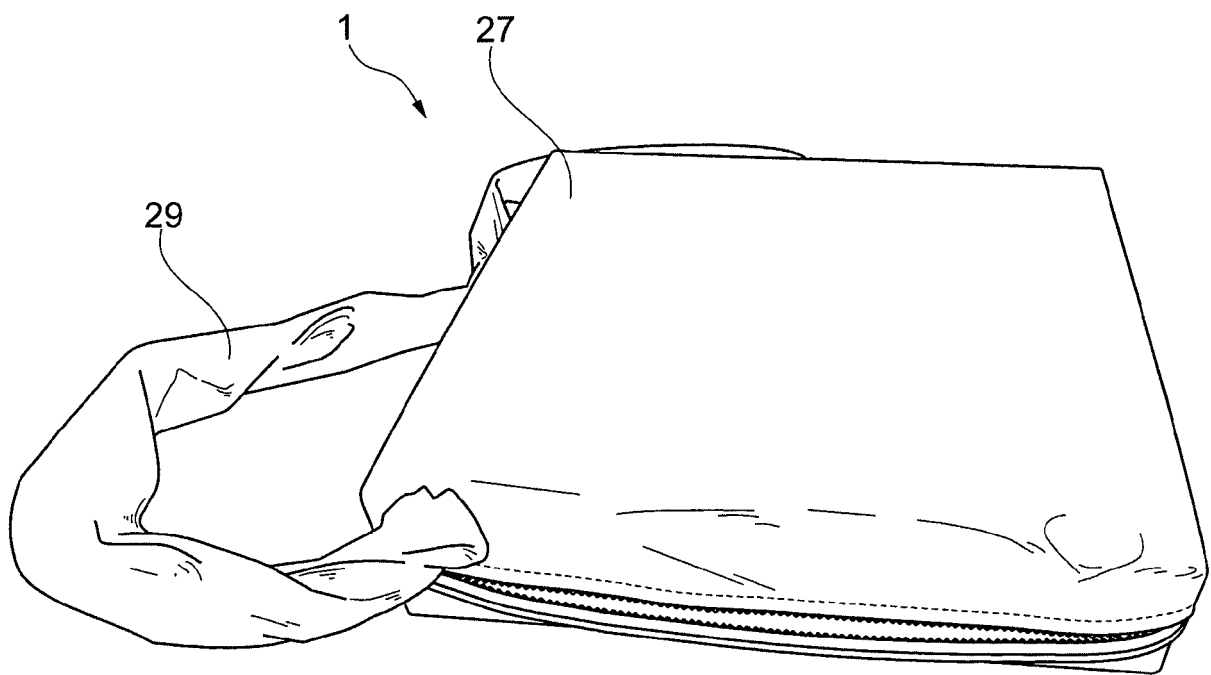


Fig. 9

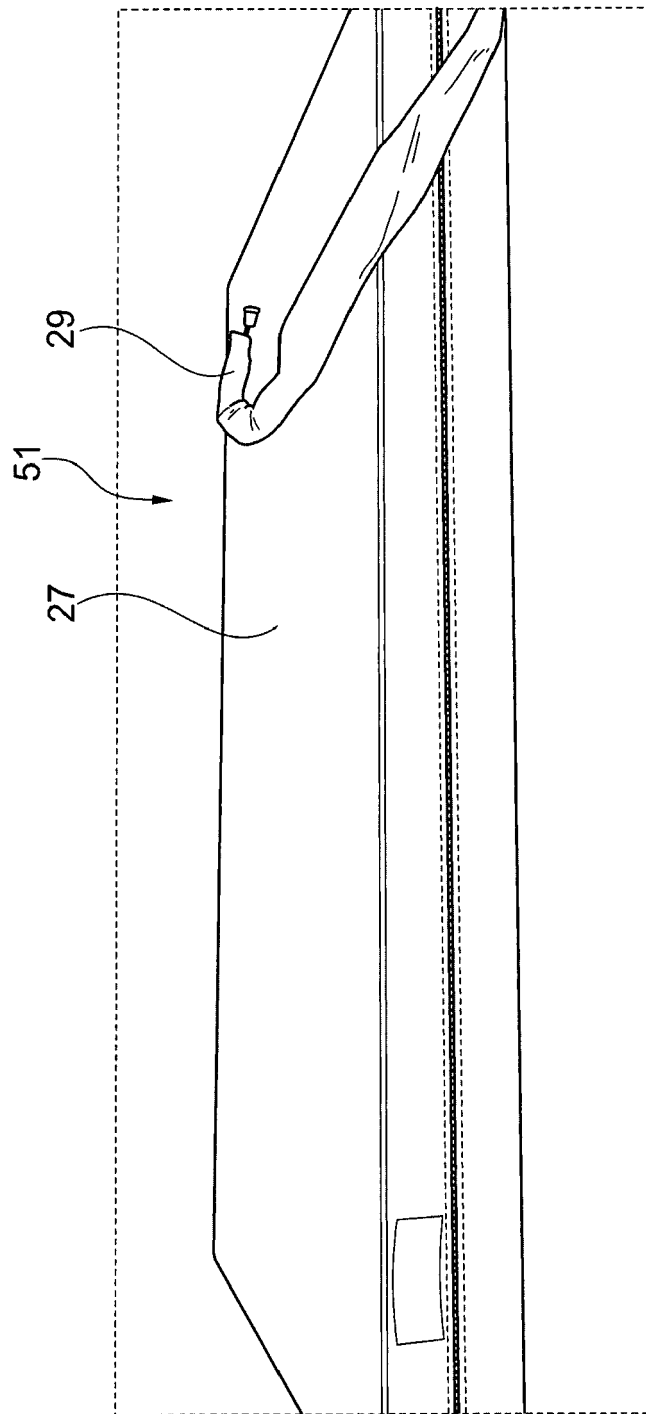


Fig. 10



EUROPEAN SEARCH REPORT

Application Number
EP 16 27 5079

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Place of search The Hague		Date of completion of the search 20 September 2016	Examiner Edlauer, Martin
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