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(54) **Inflatable mattress**

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Description

[0001] The present invention refers, in general, to an air inflatable mattress. More particularly, it is an anti-bedsore mattress to support a patient.

[0002] As is known, there are many types of anti-bedsore mattress including at least two series of cells, inflated and deflated alternately according to predefined time cycles, in order to vary the position of the areas on which the patient on the mattress rests over time.

[0003] The anti-bedsore mattresses are inflated by one or more compressors, whose operation is controlled by a suitable management and control system, thereby adjusting the inflation and deflation of each of the two series of cells present in the mattress as described in the patent document WO 2010/132931. The compressors can be used alternately during normal operation, or simultaneously for situations that require greater power or speed of inflation.

[0004] These management and control systems must, in particular, ensure that adequate pressure is maintained in the mattress.

[0005] To measure the pressure that the user exerts on the mattress itself, mattresses according to prior art require that the air flowing out from the mattress flows into a sensor mat underneath the mattress.

[0006] Due to a system configured in this way, the mattress must be continuously fed, as the air, albeit in varying quantities, flows out of the mattress into the mat and from here into the external environment. Consequently, in prior systems, at least one of these compressors must be constantly running.

[0007] A further problem in mattresses belonging to prior art concerns the cell feed conduits. In fact, in the mattresses belonging to prior art, there is a side manifold connected with the feed tube that conveys the air exiting the compressor. The side manifold communicating with the cells of the mattress, manufactured according to prior art, does not guarantee uniform pressure distribution inside the mattress itself.

[0008] Another problem of anti-bedsore mattresses belonging to prior art concerns the shape of the mattress cells, which are usually mainly parallelepiped-shaped, with a rectangular cross section, attached to the bottom of the mattress with simple hooks secured at the ends of the cell itself.

[0009] This way of securing the cells does not allow ideal mattress behaviour. In a completely deflated mattress, in fact, the cells are laid on the long side, while during subsequent inflation, some cells may assume positions and directions other than those originally desired, for example remaining horizontal. The result is an uneven surface of the mattress or sinking due to excessive distances between one cell and the next.

[0010] A further problem of anti-bedsore mattresses belonging to prior art concerns the devices for detecting tilting of a portion of the mattress, for example due to the tilting of the backrest of the bed on which the patient rests.

[0011] These devices are placed inside the anti-bedsore mattress, usually near the patient's head.

[0012] There are, for example, devices featuring a spherical container, inside which there is a mercury sphere, with electrical contacts along its circumference. The container can measure the movement of the mercury sphere inside it, movement which may be caused by the tilting of the backrest on the bed. Other systems belonging to prior art use equalizers or other mechanisms to allow or prevent the escape of air from the appropriate holes, mechanically changing the amount of air introduced into the mattress, inevitably dispersing compressed air outside.

[0013] The devices that use electricity are potentially dangerous, while pneumatic-mechanical systems are often heavy and bulky.

[0014] The purpose of the invention is therefore to make an anti-bedsore mattress that overcomes the problems of prior art.

[0015] A further purpose of the invention is to provide a mattress that is easy-to-use and reduces consumption.

[0016] These purposes and advantages are all achieved by an inflatable mattress, connected with an inflation and deflation system and adapted to lift a patient in the therapy for treatment of bedsores, comprising:

- a first series of inflatable cells;
- a second series of inflatable cells;
- at least one feed tube to be connected with the inflation and deflation system;
- a first manifold connected with the first series of cells and the at least one feed tube;

in which the first series of cells and the second series of cells are arranged next to each other, forming together a single structure having a first side edge and a second side edge, in which the first manifold is positioned along the first side edge.

[0017] In particular, the mattress according to the invention comprises a second manifold connected with the second series of cells and the at least one feed tube and positioned along the second side edge. Thanks to the presence of two manifolds fed by the same feed tube, but arranged separated from each other and positioned on opposite sides of the mattress, each feeding a respective series of cells, more balanced inflation of the cells is achieved, in other words, one series of cells can be fed by a manifold on the left of the mattress, which the other series of cells is fed by a manifold on the right of the mattress. In this way, the two series of cells on the mattress according to the invention, which are

inflated alternately, are not subject to unbalanced inflation on one side, as can occur with mattresses according to prior art in which there is only one manifold, located along one side only.

[0018] The inflatable mattress according to the invention includes one or more cells with two distinct chambers. In particular, one cell from the first series of cells may have two chambers, of which one may be on top, connected with the first manifold. Likewise, at least one cell from the second series of cells may also (or alternatively) have two chambers, of which one is connected with the second manifold. The second chamber of the cells, i.e. the one not connected with the respective manifold, may be inflated at a predefined pressure and not be connected with any feed conduit, so that the mattress, regardless of the inflation of the chambers suitably connected with the manifold, nevertheless has a minimum level of inflation that cannot be reduced, due to the cell chamber that is already inflated.

[0019] To ensure that the pressure in the second chambers is always at its highest, the inflatable mattress according to the invention is characterized by the fact that the first chamber and the second chamber of the first and/or second series are connected together by means of a non-return valve, so that the air in each of the second chambers is at a pressure equal to or greater than that of the air contained in the respective first chamber with which they are connected.

[0020] Advantageously, the first manifold may include a first conduit and a second conduit and similarly the second manifold may include a first conduit and a second conduit. The first chamber and second chamber of the first series of cells may be connected respectively to the first conduit and second conduit of the first manifold and, similarly, the first chamber and the second chamber of the second series of cells may be connected respectively to the first conduit and to the second conduit of the second manifold. In this way, the air present in both the first chamber and the second chamber of each cell can have controlled pressure.

[0021] Furthermore, the inflatable mattress according to the invention may comprise a third and fourth series of cells. The third series of cells may comprise a first chamber connected with a third conduit included in the first manifold, and a second chamber connected with the second conduit on the first manifold. The fourth series of cells may comprise a first chamber connected with a third conduit included in the second manifold, and a second chamber connected with the second conduit of the second manifold. The cells in the first series of cell and the second series of cells may be arranged next to each other and to a first portion of the patient's body, which the cells in the third series of cells and the fourth series of cells may be arranged next to each other and to a second portion of the patient's body.

[0022] Thanks to this feature, different portions of the patient's body may be treated differently, as it is possible to control the pressure in four or even more series of cells.

[0023] Advantageously, the second conduit of the first manifold and the second conduit of the second manifold can be interconnected so as to obtain the same pressure in the second chambers of all the series of cells.

[0024] To strengthen the structure of the cells, the first chamber of one or more cells may have a holed diaphragm inside.

[0025] Advantageously, the inflatable mattress may comprise a cover designed to contain the various components, in particular the series of cells, the first manifold and the second manifold. In this way, the inflatable mattress is presented as a single structure with a feed tube coming out of it. Furthermore, the inflatable mattress according to the invention may comprise a ventilation device connected with the feed tube and designed to ventilate the mattress internally.

[0026] There may also be a sensor mat connected with the feed tube. Advantageously, the inflatable mattress according to the invention may comprise a flexible hose arranged in the mattress longitudinally, said flexible hose being connected with the inflation and deflation system, compressed air being fed in said flexible hose. Thanks to this flexible hose, the inflation and deflation system can detect if the mattress is folded, resulting in partial or total obstruction of the flexible hose and an increase in pressure.

[0027] The inflatable mattress may also comprise a deflation device connected with the first manifold and with the second manifold, said device providing fast deflation of the mattress when necessary.

[0028] Advantageously, the second chamber of the cell in the first series of cells and/or the second chamber of the cell in the second series of cells can accommodate a pad inside. In this way, a smooth base layer is further guaranteed, even if the chambers connected with the manifold are completely deflated. Furthermore, thanks to this arrangement, the pad cannot be damaged or contaminated.

[0029] For exemplary and non-exhaustive purposes, the invention's additional specifications and features are provided in greater detail within the description below, as well as within the attached diagrams, which include:

figure 1	showing an axonometric projection of a mattress, according to the invention;
figure 2	showing the mattress in figure 1 according to a different axonometric view;
figure 3	showing the mattress in figure 2, with one transparent element;
figure 3A	showing a detail of the mattress in figure 3, marked A;
figure 4	showing an exploded view of a mattress according to the invention;
figure 5	showing a sectional view of a mattress according to the invention;
figures 6 to 10	showing a component of a mattress according to the invention with two axonometric views, one from above and one sectional, respectively;
figures 11 and 12	showing the section and axonometric views, respectively, of an internal element of a mattress,

according to a variant of the invention;

[0030] On the upper sheet (11), a figure in the shape of feet (13) can be identified, in order to recognise in which direction the mattress should be positioned (10). Furthermore a rapid deflation device (76), described in detail below, protrudes from the upper sheet (11).

[0031] As shown in figure, a head valve (7), also described in detail below, protrudes from the upper sheet (11) on the opposite side to the one described previously.

[0032] With reference to figures 3 and 3A, the upper sheet (11) is joined to a lower sheet (15) by means of a zip (17). Between the upper sheet (11) and the lower sheet (15), there are twenty cells shown in figure 3 with the reference 21.

[0033] The twenty cells (21) are held in position by a pair of bands (23) that enclose each cell (21), by a right manifold (14) and a left manifold (16), the latter shown in figure 4.

[0034] Each cell (21) is attached to the right and left manifold (14, 16) in two points, at the base and top of the cell itself, respectively, for a total of four attachment points for each cell (21). In addition, each pair of bands (23) is attached to the respective cell (21). Thanks to the attachments described above, each cell (21) is kept in the correct position and direction, preventing the cells from remaining horizontal and preventing the formation of sinking.

[0035] With reference to figure 4, the feed tube (12) communicates with the right manifold (14), the left manifold (16), a sensor mat (20) and with a micro air transfer device (19) located on a thin sheet (18).

[0036] The feed tube (12) is connected with suitable inflation means via channels present on one side (22), thus enabling it to exchange compressed air with the right manifold (14) via a first right nozzle (28) and a second right nozzle (30). Similarly, the feed tube (12) exchanges compressed air with the left manifold (16) through a first left nozzle (24) and a second left nozzle (26). The right manifold (14) comprises three distinct chambers that develop in parallel to each other and are hereinafter defined as first right track (32), second right track (34) and third right track (36). Similarly, the left manifold (16) comprises three distinct chambers that are hereinafter defined as first left track (38), second left track (40) and third left track (42)

[0037] The first right nozzle (28) is connected with the first right track (32) on the right manifold (14), while the second right nozzle (30) is connected with the second right track (34) on the right manifold (14) itself. Similarly, the first left nozzle (24) is connected with the first left track (38) on the left manifold (16), while the second left nozzle (26) is connected with the second left track (40) on the left manifold (16) itself.

[0038] The third left track (42) and the third right track (36), are arranged in a frame, surrounding the first and second tracks, thus obtaining better behaviour of the respective manifold, encouraging the containment and compactness of the whole inflatable mattress (10).

[0039] The third right track (36) communicates with the third left track (42) by means of a conduit (37). The first left track (38) transmits compressed air to a first series of cells (44) by means of a first connection (46), while the first right track (32) transmits compressed air to a second series of cells (48) by means of a second connection (50).

[0040] In order to promote understanding of the mattress (10) according to the invention, the first series of cells (44) and the second series of cells (48) have been shown in figure 4 with a single cell for each series. There are, in fact, more cells in each series, and they alternate consecutively with each other, as shown in figure 3.

[0041] Similarly, the second left track (40) transmits compressed air to a third series of cells (52) by means of a third connection (54), while the second right track (34) transmits compressed air to a fourth series of cells (56) by means of a fourth connection (58) . With regard to the number of cells visible in figure 4, the same considerations apply as for the first series of cells (44) and the second series of cells (48) .

[0042] The first series of cells (44) includes a dynamic portion (60), fed directly by the first connection (46), and a static portion (62), adjoining the third left track (42) on the left manifold (16) by means of a static connection (64). Likewise, the second series of cells (48) includes a dynamic portion (66), fed directly by the second connection (50), and a static portion (68), adjoining the third right track (36) on the right manifold (14) by means of a static connection (70). The third series of cells (52) also includes a dynamic portion (61), fed directly by the third connection (54), and a static portion (63), adjoining the third left track (42) on the left manifold (16) by means of a static connection (64). Likewise, the fourth series of cells (56) includes a dynamic portion (67), fed directly by the fourth connection (58), and a static portion (69), adjoining the third right track (36) on the right manifold (14) by means of a static connection (71).

[0043] The third right track (36) also communicates with a head valve (73) by means of a conduit (74). The head valve (73) regulates the flow of air to a fifth series of cells (72). The fifth series of cells (72) includes a single portion (75) and is not, therefore, divided into dynamic and static portions. The considerations relating to the number of elements shown in figure 4 also apply for the fifth series of cells (72).

[0044] The inflatable mattress (10) comprises twenty cells (shown in figure 3 generically with the reference number 21, of which twelve are configured as the first and second series of cells (44, 48), five as the third and fourth series of cells (52, 56) and three as the fifth series of cells (72).

[0045] As shown in figure 4, the rapid deflation device (76), also shown in figure 1, is connected with the right manifold (14) and the left manifold (16) by means of four channels (78), connected with the first right track (32), the first left track

(38), the third right track (36) and the third left track (42) respectively, thus enabling sudden deflation when necessary.

[0046] The micro air transfer device (19) is also connected with the feed tube (12) by means of a nozzle (80) and the sensor mat (20) by means of two nozzles (82, 84).

[0047] The nozzle (80), comprising a series of very small holes, designed to introduce air into the inflatable mattress (10) between the various elements from which it is composed is connected directly to the micro air transfer device (19). This improves the behaviour of the mattress, imposing air recirculation, for example reducing the humidity present inside and facilitating steam removal.

[0048] The sensor mat (20) comprises a control tube (25) that covers much of the surface of the sensor mat (20) itself.

[0049] The control tube (25) has one end connected with the nozzle (82) and a second end connected with a second nozzle (84).

[0050] The sensor mat (20) comprises a series of layers, in particular a first hard base layer, a second layer including the control tube (25) and a third layer with calibrated density. The three layers described above are conveniently inserted in a sealed cover.

[0051] Furthermore, the sensor mat (20) is positioned between the right and left manifolds (14, 16) under the thin sheet (18) .

[0052] As shown in figure 5, the first series of cells (44), as well as the second, third and fourth series of cells (48, 52 and 56) not shown, comprises a separation membrane (86), in turn comprising a non-return valve, not shown in the figure, which allows air to pass from the dynamic portion (60) to the static portion (62) in a single direction.

[0053] The connector (90) as shown in figures 6 and 7, comprises an upper body (92) and a lower body (108). On the upper body (92), there is a first outlet (94), a second outlet (96), a third outlet (98), a fourth outlet (100), a fifth outlet (102), a sixth outlet (104) and a seventh outlet (106).

[0054] A first plug (112), a second plug (114), a third plug (116), a fourth plug (118), a fifth plug (120), a sixth plug (122) and a seventh plug (124) protrude from the lower body (108), secured to the upper body (92) by means of seven screws (110).

[0055] The plugs protruding from the lower body (108), described above, are connected with the feed tube (12). The cross section of the plugs is mainly rectangular and hollow, to enable the plugs to be inserted in the corresponding channels in the side (22) of the feed tube (12).

[0056] The feed tube (12) conveniently comprises channels whose cross sections are mainly rectangular, each of which can be separated from the rest of the feed tube (12) for the desired length.

[0057] As shown in figure 7, a tab (126), designed to enable the removable attachment of the connector (90) to the management and control systems, not shown in the figure, is hinged to the upper body (92).

[0058] The sixth outlet, whose cross section is shown in figure 9, comprises a suspended body (128), kept in position by a spring (130) resting on the portion of the upper body (82) in which the sixth outlet (104) is obtained. On the opposite side of the spring (130), a ring seal (132), prevents the spring (130) from pushing the outside of the suspended body (128) and keeps the sixth outlet (104) tightly closed, preventing communication with the sixth plug (122). The suspended body (128) acts as a self-locking valve in relation to the sixth plug (104).

[0059] The second outlet (96), the third outlet (98) and the fifth outlet (102) are made in the same way as the sixth outlet (104), conveniently communicating with the respective first left nozzle (24), second left nozzle (26), first right nozzle (28) and second right nozzle (30).

[0060] The fourth outlet (100), whose cross section is shown in figure 10, communicates directly with the fourth plug (118). The first outlet (94) and the seventh outlet (106) are made in the same way as the fourth plug (100).

[0061] The first outlet (94), the fourth outlet (100) and the seventh outlet (106) communicate conveniently with the three nozzles (80, 82, 84), communicating with the micro air transfer device (19) and the control tube (25) on the sensor mat (20) respectively.

[0062] The respective communications are created to enable the management and control system to control the air pressure inside each one, ensuring the correct correspondence with the respective elements of the inflatable mattress (10).

[0063] The operation of the inflatable mattress (10) according to the invention, with reference to figure 4, is described below.

[0064] The feed tube (12), connected with the management and control system, comprising the appropriate means of inflation that control the pressure of the air introduced into each of the seven channels in the side (22), transmits the compressed air to each element of the inflatable mattress (10) described beforehand, thus determining its behaviour in relation to a patient lying on top of the inflatable mattress (10) itself.

[0065] The patient's body may, for example, have the trunk on the first and second series of cells (44, 48), the feet on the third and fourth series of cells (52, 56) and the head on the fifth series of cells (72).

[0066] Varying the pressure set on the right manifold (14) and the left manifold (16) ensures independent behaviour of the first series of cells (44) compared to the second series of cells (48) e.g. by inflating and deflating the two series alternately to create rest areas that vary constantly for the patient lying on top. Similarly, the third series of cells (52)

and the fourth series of cells (56) can be inflated and deflated alternately or as required, according to other methods. Only the pressure in the dynamic portions (60, 61 66) of the first, second, third and fourth series of cells (44, 48, 52, 56) is controlled, while the static portions (62, 63, 68, 69) result as communicating between each other and fed by the dynamic portions (61, 67 and/or 60, 66) by means of a non-return valve. The static portions (62, 63, 68, 69) communicate with the third right and left tracks (36, 42).

[0067] Furthermore, the third right track (36) is attached to the third left track (42) by the conduit (37), obtaining the effect of having a uniform average pressure between the various static portions.

[0068] The construction of the head valve (73) means it can be adjusted in two positions. The first position puts the third right track (36) in direct communication with the fifth series of cells (72), thus making it possible to maintain the latter at the same pressure as the third right track (36). The second position of the head valve (73) interrupts communication between the right third track (36) and the fifth series of cells (72), deflating the latter, thus releasing the air contained in the fifth series of cells (72) into the external environment, at the same time leaving the third right track (36) inflated. This second position may, for example, be used for the independent deflation of the fifth series of cells (72) when necessary, for example to promote intubation of the patient, ensuring localised deflation of the head area only.

[0069] If necessary, an operator acts on the rapid deflation device (76), which deflates the first right and left tracks (32, 38) and the third right and left track (36, 42), thus deflating the mattress as quickly as possible.

[0070] Usually, in fact, rapid deflation is used, for example, for emergency resuscitation.

[0071] If necessary, an operator acts on the tab (126) on the connector (90) to extract it from its seat, thus interrupting the communication with the management and control system. The particular construction of the second outlet (96), third outlet (98), fifth outlet (102) and sixth outlet (104), prevents the undesired deflation of the cells (21) in the inflatable mattress (10), thus guaranteeing support to the patient, for example during movement.

[0072] The construction of the first outlet (94), the fourth outlet (100) and the seventh outlet (106) puts the micro air transfer device (19) and the control tube (25) on the sensor mat (20) in communication with the outside.

[0073] According to a variant of the invention, the first series of cells and the second series of cells may include a tightly sealed separation diaphragm to prevent communication between the respective dynamic and static portions. The third right and left tracks would therefore be at the same pressure as the static portion of the third series of cells and the fourth series of cells, thus making it possible to check the pressure of the static portions of the first series of cells and the second series of cells, limiting the check to the third and fourth series of cells only, for example checking the pressure of the static portions of the inflatable mattress by checking the cells at the feet area only.

[0074] According to another variant of the invention, an inflatable mattress may comprise a triple cell (144) with a special shape, shown in figures 11 and 12, comprising a first dynamic portion (146), communicating with its respective first or second track on the right or left manifold (14, 16) by means of a first door (148). The first dynamic portion (146) in turn communicates with a second dynamic portion (150) by means of passage slots (152) obtained in a first separation diaphragm (154), dividing the first dynamic portion (146) from the second dynamic portion (150).

[0075] A static portion (156), separated from the second dynamic portion (150) by a second separation diaphragm (158), communicates with its respective third track on the right or left manifold (14, 16) by means of a second door (160). There is a pad (162) of elastic material, such as polyurethane foam, inside the static portion (156). The presence of the pad (162) inside the static portion (156) makes it possible to eliminate the elastic pad used in prior art. Its role of minimum support is in fact carried out by each pad (162) contained inside the static portion (156). This gives the advantage of not having the additional thickness of the pad during normal operation of the inflatable mattress (10), while if the mattress is completely deflated or is malfunctioning, minimal support for the patient is nevertheless guaranteed.

[0076] According to another variant of the invention, an inflatable mattress may include a flexible hose, with a small diameter, placed below the upper sheet, for example under the right or left manifold, as compressed air passes through the flexible hose. When the inflatable mattress is bent, for example if the bed on which the patient is lying is tilted, the flexible hose is crushed, preventing air from passing through. This interruption of the flow of air can therefore be detected by the management and control system in the mattress, which reacts accordingly, for example by increasing the minimum inflation pressure of the cells. The minimum inflation pressure is increased to better support the weight of the patient who, if the bed is tilted, weighs differently on the cells than if the bed is completely horizontal.

[0077] The construction and positioning of the flexible hose may be sufficient to detect tilting of the backrest of the bed which is, for example, more than a minimum angle, below which it is not considered necessary to increase the support pressure of the cells supporting the patient.

[0078] According to another variant of the invention, an inflatable mattress may include an independent sensor pad (170), mainly rectangular in shape, shown in figure 13, in turn comprising a sensor tube (172) arranged in a spiral starting from the centre of the independent sensor pad (17) itself, in order to cover most of its surface.

[0079] The sensor tube spiral (172), terminating on the edge of the independent sensor mat (170), connects with a valve (176) via a conduit (174).

[0080] The valve (176) is in turn connected, via a conduit (178), with a pressure sensor (180), which communicates the pressure measured to the management and control system by means of a connection (182).

[0081] The valve (176) may conveniently comprise a device that interrupts the passage of air in the event that the conduit (178) becomes detached, thus preventing air from leaking out of the conduit (174) and the sensor tube (172). The independent sensor mat (170) may if necessary replace the sensor mat (20), with the advantage of measuring the variation in pressure in relation to the weight/position of the patient without the use of compressed air sent to the management and control system, thus guaranteeing reduced consumption and greater independence in relation to the management and control system.

[0082] If the sensor tube (172) is crushed, the air contained inside it and in the conduit (174), initially at atmospheric pressure, increases proportionally, and is then measured by the pressure sensor (180).

[0083] The pressure change measured can be used, for example, to estimate the weight/position of the patient and assess the inflation pressure needed to feed the cells (21) to keep the patient safely suspended.

[0084] The particular construction of the independent sensor mat (170) and the sensor tube (172) also makes it possible to measure the tilting of the bed, for example the backrest, as the different distribution of the weight/position of the patient on the sensor tube (172) translates into a different pressure measured by the pressure sensor (180) and consequently a different estimate of the weight/position of the patient. This different estimate of the weight of the patient will result in an increased inflation pressure of the cells (21) if the bed backrest is tilted.

[0085] According to a variant of the invention, an independent sensor mat may comprise a sensor tube made entirely or partially from elastic material, to prevent excessive crushing, thus preventing a part of the sensor tube from remaining isolated from the rest, with the risk of distorting the pressure measured by the pressure sensor.

[0086] The inflatable mattress (10) according to the invention has the advantage of comprising the two right and left manifolds (14, 16) which give the inflatable mattress (10) greater stability and capacity compared to mattresses belonging to prior art, for example guaranteeing side containment of the cells (21) and the patient. Side containment is further guaranteed by the greater height maintained while the manifolds are operating, as they are not crushed by the cells.

[0087] Furthermore, the two right and left manifolds (14, 16) together with the alternating connection with the cells (21), make it possible to prevent side unbalancing in the inflation and deflation stages of the cells themselves, unlike mattresses belonging to prior art, which have only one side manifold. The inflatable mattress (10) according to the invention also has the advantage of having series of cells dedicated to specific parts of the body, whose pressure can be controlled independently as required, thus ensuring a greater flexibility of use than mattresses belonging to prior art. For example, the area dedicated to the feet can be managed independently from the areas dedicated to the trunk and head, for example by requiring the cells at the feet to operate alternately, according to a predetermined timescale.

[0088] The special construction of the triple cell (144), according to the invention, in addition to the benefits shown above, also ensures better behaviour from a cleanliness point of view, as the pad (162) made from elastic material is inside the triple cell (144) itself, unlike prior art. Furthermore, the use of the triple cell (144) gives the anti-bedsore mattress greater fire resistance, thus improving the level of safety guaranteed.

[0089] The sensor mat (20) does not discharge the air that passes through it directly outwards, but returns it to the management and control system, keeping the anti-bedsore mattress at the required pressure without continuously feeding compressed air, thus enabling the compressor to be switched off for certain periods of time, for example, unlike prior art, in which constant compressed air must be fed to the mattress.

[0090] Inside the mattress, to ensure optimum maintenance of the internal elements, air is introduced through the micro air transfer device that may come from the feet area cells, when they are deflated, and/or directly from the air feed means, thanks to appropriate settings in order to achieve programmed ventilation.

[0091] The effective construction of the flexible hose, designed to be crushed in the event that the bed on which the patient is lying is tilted, means that there are no moving mechanical elements and/or devices through which electrical current passes inside the anti-bedsore mattress.

[0092] There are also additional variations and methods of creation, to be considered included in the scope of protection defined by the following claims.

Claims

1. Inflatable mattress (10) to be connected with an inflation and deflation system and adapted to lift a patient in the therapy for treatment of bedsores, comprising:

    - a first series of inflatable cells (44);
    - a second series of inflatable cells (48);
    - at least one feed tube (12) to be connected with the inflation and deflation system;
    - a first manifold (16), connected with the first series of cells (44) and the at least one feed tube (12);

    said first series of cells (44) and said second series of cells (48) being arranged next to each other on forming

together an only structure having a first side edge and a second side edge, said first manifold (16) being positioned along the first side edge, wherein it comprises a second manifold (14), connected with the second series of cells (48) and the at least one feed tube (12), and positioned along the second side edge;
wherein at least one cell of the first series of cells (44) comprises a first chamber (60; 146, 150), connected with the first manifold (16), and a second chamber (62; 156) and/or wherein at least one cell of the second series of cells (48) comprises a first chamber (66), connected with the second manifold (14), and a second chamber (68); **characterized in that** the first chamber (60) and the second chamber (62) of the at least one cell of the first series of cells (44) are connected with each other through a non-return valve, and/or the first chamber (66) and the second chamber (68) of the at least one cell of the second series of cells (48) are connected with each other through a non-return valve so that the pressure of the air in each of said second chambers (62, 68) is higher or equal to the pressure of the air contained in the respective first chamber (60, 66) with which the second chamber is connected.

2. Inflatable mattress (10) according to any of the claim 1, wherein the first manifold (16) comprises a first conduit (38) and a second conduit (42) and the second manifold (14) comprises a first conduit (32) and a second conduit (36), and wherein the first chamber (60; 146, 150) and the second chamber (62; 156) of the first series of cells (44; 144) are connected with the first conduit (38) and second conduit (42) of the first manifold (16), respectively, and the first chamber (66) and the second chamber (68) of the second series of cells (48) are connected with the first conduit (32) and second conduit (36) of the second manifold (14), respectively.

3. Inflatable mattress (10) according to claim 2, wherein a third series of cells (52) comprises a first chamber (61), connected with a third conduit (40) included in the first manifold (16), and a second chamber (63), connected with the second conduit (42) of the first manifold (16), and wherein a fourth series of cells (56) comprises a first chamber (67), connected with a third conduit (34) included in the second manifold (14), and a second chamber (69), connected with the second conduit (36) of the second manifold (14); the cells of the first series of cells (44) and second series of cells (48) being arranged next to each other and to a first portion of the body of the patient, the cells of the third series of cells (52) and fourth series of cells (56) being arranged next to each other and to a second portion of the body of the patient.

4. Inflatable mattress (10) according to claim 2 or 3, wherein the second conduit (42) of the first manifold (16) and the second conduit (36) of the second manifold (14) are connected with each other.

5. Inflatable mattress (10) according to any of the preceding claims, wherein the first chamber of the at least one cell of the first series of cells (44) and/or the first chamber of the at least one cell of the second series of cells (48) comprise, in the inside, a holed diaphragm, adapted to strengthen the cell.

6. Inflatable mattress (10) according to any of the preceding claims, wherein a covering (11, 15) is comprised and is adapted to include the series of cells (44, 48, 52, 56), the first manifold (16) and the second manifold (14).

7. Inflatable mattress (10) according to any of the preceding claims, wherein a ventilation device (19) is comprised and is connected with the feed tube (12) and is adapted to ventilate the mattress (10) in the inside.

8. Inflatable mattress (10) according to any of the preceding claims, wherein a sensor mat (20) is comprised and is connected with the feed tube (12).

9. Inflatable mattress (10) according to any of the preceding claims, wherein a flexible hose is comprised and is arranged in the mattress (10) longitudinally, said flexible hose being connected with the inflation and deflation system, compressed air being fed in said flexible hose.

10. Inflatable mattress (10) according to any of the preceding claims, wherein a deflation device (76) is comprised and is connected with the first manifold (16) and the second manifold (14).

11. Inflatable mattress according to any of the preceding claims, wherein the second chamber (156) of the cell (144) of the first series of cells and/or the second chamber of the cell of the second series of cells include a pad (162) in the inside.

Patentansprüche

1. Aufblasbare Matratze (10) zur Verbindung mit einem Auf- und Ablasssystem sowie geeignet zum Heben eines Patienten in Therapie zur Behandlung von wund gelegenen Stellen, die umfasst:

   - eine erste Reihe aufblasbarer Zellen (44);
   - eine zweite Reihe aufblasbarer Zellen (48);
   - mindestens eine Zuflussleitung (12) zur Verbindung mit dem Auf- und Ablasssystem;
   - eine erste Hauptleitung (16), die mit der ersten Zellenreihe (44) und der mindestens einen Zufuhrleitung (12) verbunden ist;

   wobei die genannten ersten Zellenreihen (44) und die genannten zweiten Zellenreihen (48) nebeneinander angeordnet sind, um zusammen eine einzige Struktur zu bilden, die eine erste und eine zweite Seitenkante aufweist, wobei die genannte erste Hauptleitung (16) entlang der ersten Seitenkante angeordnet wird während eine zweite Hauptleitung (14) vorhanden ist, die mit den zweiten Zellenreihen (48) und der mindestens einen Zufuhrleitung (12) verbunden und entlang der zweiten Seitenkante angeordnet ist.
   wobei mindestens eine Zelle der ersten Zellenreihe (44) eine erste Kammer (60, 146, 150) umfasst, die mit der ersten Hauptleitung (16) verbunden ist, sowie eine zweite Kammer (62, 156), und/oder wobei mindestens eine Zelle der zweiten Zellenreihe (48) eine erste Kammer (66), die mit der zweiten Hauptleitung (14) verbunden ist, und eine zweite Kammer (68) umfasst; **dadurch gekennzeichnet, dass** die erste Kammer (60) und die zweite Kammer (62) der mindestens einen Zelle der ersten Zellenreihen (44) miteinander über ein Rückschlagventil verbunden sind, und/oder die erste Kammer (66) und die zweite Kammer (68) der mindestens einen Zelle der zweiten Zellenreihe (48) miteinander über ein Rückschlagventil verbunden sind, so dass der Druck in jeder der genannten zweiten Kammern (62, 68) höher oder gleich dem Druck der Luft ist, die in der jeweiligen ersten Kammer (60, 66) enthalten ist, mit der die zweite Kammer verbunden ist.

2. Aufblasbare Matratze (10) gemäß Anspruch 1, wobei die erste Hauptleitung (16) eine erste Leitung (38) und eine zweite Leitung (42) sowie die zweite Hauptleitung (14) eine erste Leitung (32) und eine zweite Leitung (36) umfassen sowie wobei sie in der ersten Kammer (60; 146, 150) und in der zweiten Kammer (62; 156) der ersten Zellenreihen (44; 144) jeweils mit der ersten Leitung (38) und der zweiten Leitung (42) der ersten Hauptleitung (16) verbunden sind sowie die erste Kammer (66) und die zweite Kammer (68) der zweiten Zellenreihe (48) jeweils mit der ersten Leitung (32) und der zweiten Leitung (36) der zweiten Hauptleitung (14) verbunden sind.

3. Aufblasbare Matratze (10) gemäß Anspruch 2, wobei eine dritte Zellenreihe (52) eine erste Kammer (61) umfasst, die mit einer dritten Leitung (40), die zur ersten Hauptleitung (16) gehört, und einer zweiten Kammer (63) verbunden ist, die mit der zweiten Leitung (42) der ersten Hauptleitung (16), sowie bei der eine vierte Zellenreihe (56) eine erste Kammer (67), die mit einer dritten Leitung (34) in der zweiten Hauptleitung (14), und einer zweiten Kammer (69) verbunden ist, die mit der zweiten Leitung (36) der zweiten Hauptleitung (14) verbunden ist; die Zellen der ersten Zellenreihen (44) und zweiten Zellenreihen (48) sind nebeneinander und zu einem ersten Teil des Körpers des Patienten angeordnet, während die Zellen der dritten Zellenreihen (52) und vierten Zellenreihen (56) nebeneinander und zu einem zweiten Teil des Körpers des Patienten angeordnet sind.

4. Aufblasbare Matratze (10) gemäß Anspruch 2 oder 3, bei der die zweite Leitung (42) der ersten Hauptleitung (16) und die zweite Leitung (36) der zweiten Hauptleitung (14) miteinander verbunden sind.

5. Aufblasbare Matratze (10) gemäß einem beliebigen der vorausgehenden Ansprüche, wobei die erste Kammer der mindestens einen Zelle der ersten Zellenreihe (44) und/oder die erste Kammer der mindestens einen Zelle der zweiten Zellenreihe (48) auf der Innenseite eine gelochte Membran aufweisen, die angebracht wurde, um die Zelle zu verstärken.

6. Aufblasbare Matratze (10) gemäß einem beliebigen der vorausgehenden Ansprüche, wobei eine Hülle (11, 15) vorhanden ist und angebracht wurde, um die Zellenreihen (44, 48, 52, 56), die erste Hauptleitung (16) und die zweite Hauptleitung (14) aufzunehmen.

7. Aufblasbare Matratze (10) gemäß einem beliebigen der vorausgehenden Ansprüche, wobei eine Belüftungsvorrichtung (19) vorhanden und mit der Zufuhrleitung (12) verbunden ist, um die Matratze (10) auf der Innenseite zu belüften.

8. Aufblasbare Matratze (10) gemäß einem beliebigen der vorausgehenden Ansprüche, wobei ein Mat-Sensor (20)

vorhanden und mit der Zufuhrleitung (12) verbunden ist.

9. Aufblasbare Matratze (10) gemäß einem beliebigen der vorausgehenden Ansprüche, wobei ein Schlauch vorhanden ist, der an der Matratze (10) in Längsrichtung angebracht ist; der genannte Schlauch ist mit dem Auf- und Ablasssystem verbunden und über den genannten Schlauch wird Druckluft zugeführt.

10. Aufblasbare Matratze (10) gemäß einem beliebigen der vorausgehenden Ansprüche, wobei eine Ablassvorrichtung (76) vorhanden sowie mit der ersten Hauptleitung (16) und der zweiten Hauptleitung (14) verbunden ist.

11. Aufblasbare Matratze gemäß einem beliebigen der vorausgehenden Ansprüche, wobei die zweite Kammer (156) der Zelle (144) der ersten Zellenreihen und/oder der zweiten Kammer der Zelle der zweiten Zellenreihen auf der Innenseite eine Einlage (162) aufweisen.

Revendications

1. Matelas gonflable (10) destiné à être relié à un système de gonflage et de dégonflage et adapté pour soulever un patient de la thérapie pour le traitement des escarres, comprenant:

- une première série de cellules gonflables (44);
- une deuxième série de cellules gonflables (48);
- au moins un tube d'alimentation (12) pour être connecté avec le système de gonflage et de dégonflage;
- un premier collecteur (16), relié à la première série de cellules (44) et au moins un tube d'alimentation (12);

ladite première série de cellules (44) et ladite deuxième série de cellules (48) étant disposées l'une à côté de l'autre formant ensemble une structure unique ayant un premier bord latéral et un deuxième bord latéral, ledit premier collecteur (16) étant positionné le long du premier bord latéral, dans lequel il y a un second collecteur (14), relié à la deuxième série de cellules (48) et au moins un tube d'alimentation (12), et positionné le long du deuxième bord latéral;

dans lequel au moins une cellule de la première série de cellules (44) comprend une première chambre (60; 146, 150), connectée avec le premier collecteur (16), et une seconde chambre (62; 156) et/ou dans lequel au moins une cellule de la deuxième série de cellules (48) comprend une première chambre (66), connectée avec le second collecteur (14), et une seconde chambre (68);

caractérisé en ce que la première chambre (60) et la seconde chambre (62) d'au moins une cellule de la première série de cellules (44) sont reliées les unes aux autres par le biais d'un clapet anti-retour, et / ou de la première chambre (66) et la seconde chambre (68) d'au moins une cellule de la deuxième série de cellules (48) sont reliées les unes aux autres par le biais d'un clapet anti-retour de telle sorte que la pression de l'air dans chacune desdites secondes chambres (62 , 68) est supérieure ou égale à la pression de l'air contenu dans la première chambre respective (60, 66) avec laquelle la deuxième chambre est reliée.

2. Matelas gonflable (10) selon la revendication 1, dans lequel le premier collecteur (16) comprend un premier conduit (38) et un second conduit (42) et le second collecteur (14) comprend un premier conduit (32) et un second conduit (36), et dans lequel la première chambre (60; 146, 150) et la seconde chambre (62; 156) de la première série de cellules (44; 144) sont reliées avec le premier conduit (38) et le second conduit (42) du premier collecteur (16), respectivement, et la première chambre (66) et la seconde chambre (68) de la deuxième série de cellules (48) sont reliées avec le premier conduit (32) et le second conduit (36) du second collecteur (14), respectivement.

3. Matelas gonflable (10) selon la revendication 2, dans lequel une troisième série de cellules (52) comprend une première chambre (61), reliée à un troisième conduit (40) inclus dans le premier collecteur (16), et une seconde chambre (63), reliée avec le deuxième conduit (42) du premier collecteur (16), et dans lequel une quatrième série de cellules (56) comprend une première chambre (67), reliée à un troisième conduit (34) inclus dans le second collecteur (14), et une seconde chambre (69), connectée avec le second conduit (36) du second collecteur (14); les cellules de la première série de cellules (44) et la deuxième série de cellules (48) étant disposées l'une à côté de l'autre et à une première partie du corps du patient, les cellules de la troisième série de cellules (52) et la quatrième séries de cellules (56) étant disposées les unes à côté des autres et à une seconde partie du corps du patient.

4. Matelas gonflable (10) selon la revendication 2 ou 3, dans lequel le second conduit (42) du premier collecteur (16) et le second conduit (36) du second collecteur (14) sont reliés les uns aux autres.

5. Matelas gonflable (10) selon l'une quelconque des revendications précédentes, dans lequel la première chambre d'au moins une cellule de la première série de cellules (44) et/ou de la première chambre d'au moins une cellule de la deuxième série de cellules (48) comportent, à l'intérieur, un diaphragme perforé, apte à renforcer la cellule.

6. Matelas gonflable (10) selon l'une quelconque des revendications précédentes, dans lequel un revêtement (11, 15) est constitué et est adapté pour inclure la série de cellules (44, 48, 52, 56), le premier collecteur (16) et le second collecteur (14).

7. Matelas gonflable (10) selon l'une quelconque des revendications précédentes, dans lequel un dispositif de ventilation (19) est constitué et est relié avec le tube d'alimentation (12) et est adapté pour aérer le matelas (10) à l'intérieur.

8. Matelas gonflable (10) selon l'une quelconque des revendications précédentes, dans lequel un tapis sensible (20) est constitué et est relié avec le tube d'alimentation (12).

9. Matelas gonflable (10) selon l'une quelconque des revendications précédentes, dans lequel un tuyau flexible est constitué et est disposée dans le matelas (10) longitudinalement, ledit tuyau flexible étant relié au système de gonflage et de dégonflage, de l'air comprimé étant alimenté dans ledit tuyau flexible.

10. Matelas gonflable (10) selon l'une quelconque des revendications précédentes, dans lequel un dispositif de dégonflage (76) est constitué et est relié avec le premier collecteur (16) et le second collecteur (14).

11. Matelas gonflable selon l'une quelconque des revendications précédentes, dans lequel la deuxième chambre (156) de la cellule (144) de la première série de cellules et / ou la seconde chambre de la cellule de la deuxième série de cellules comprend un tampon (162) à l'intérieur.

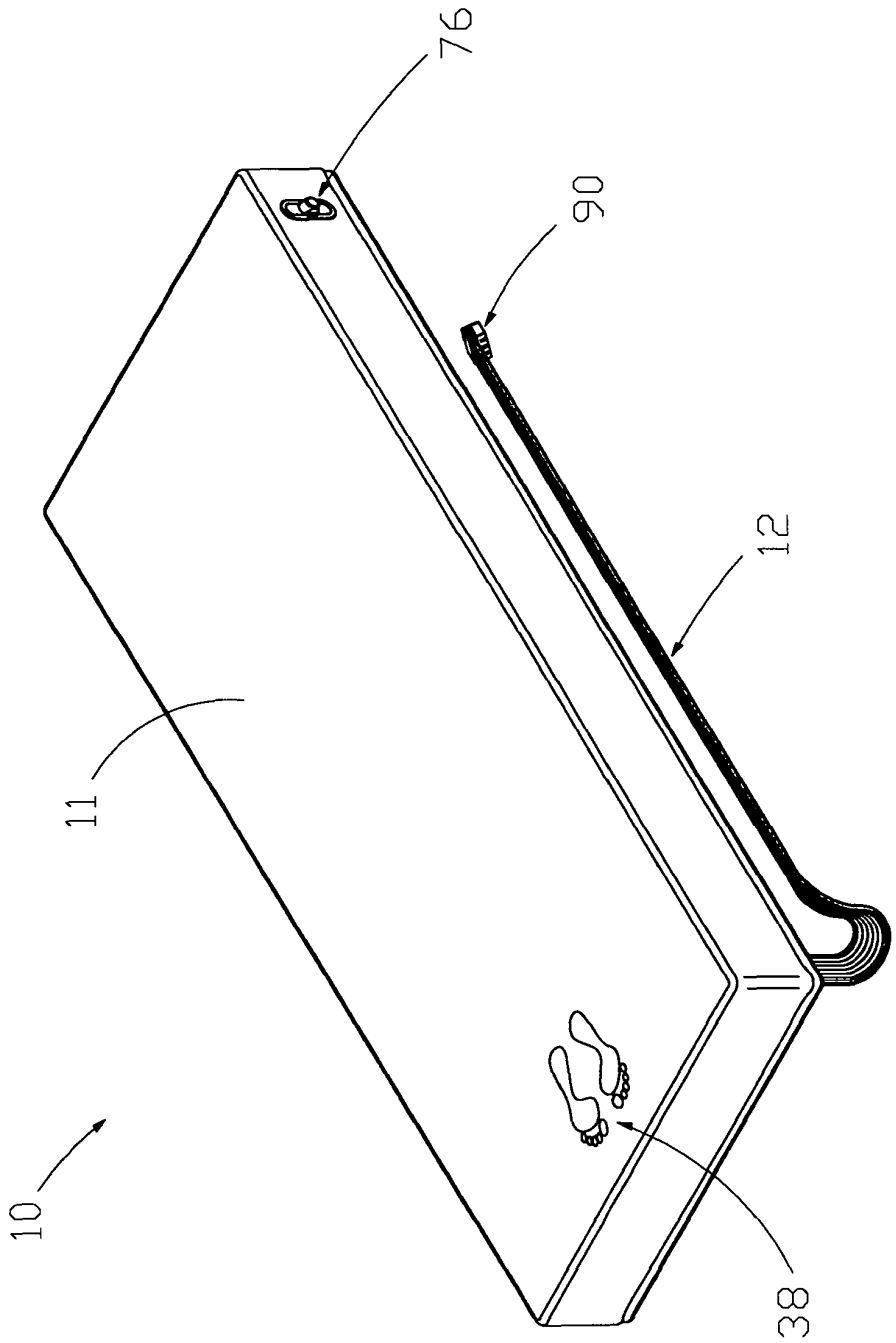


Fig. 1

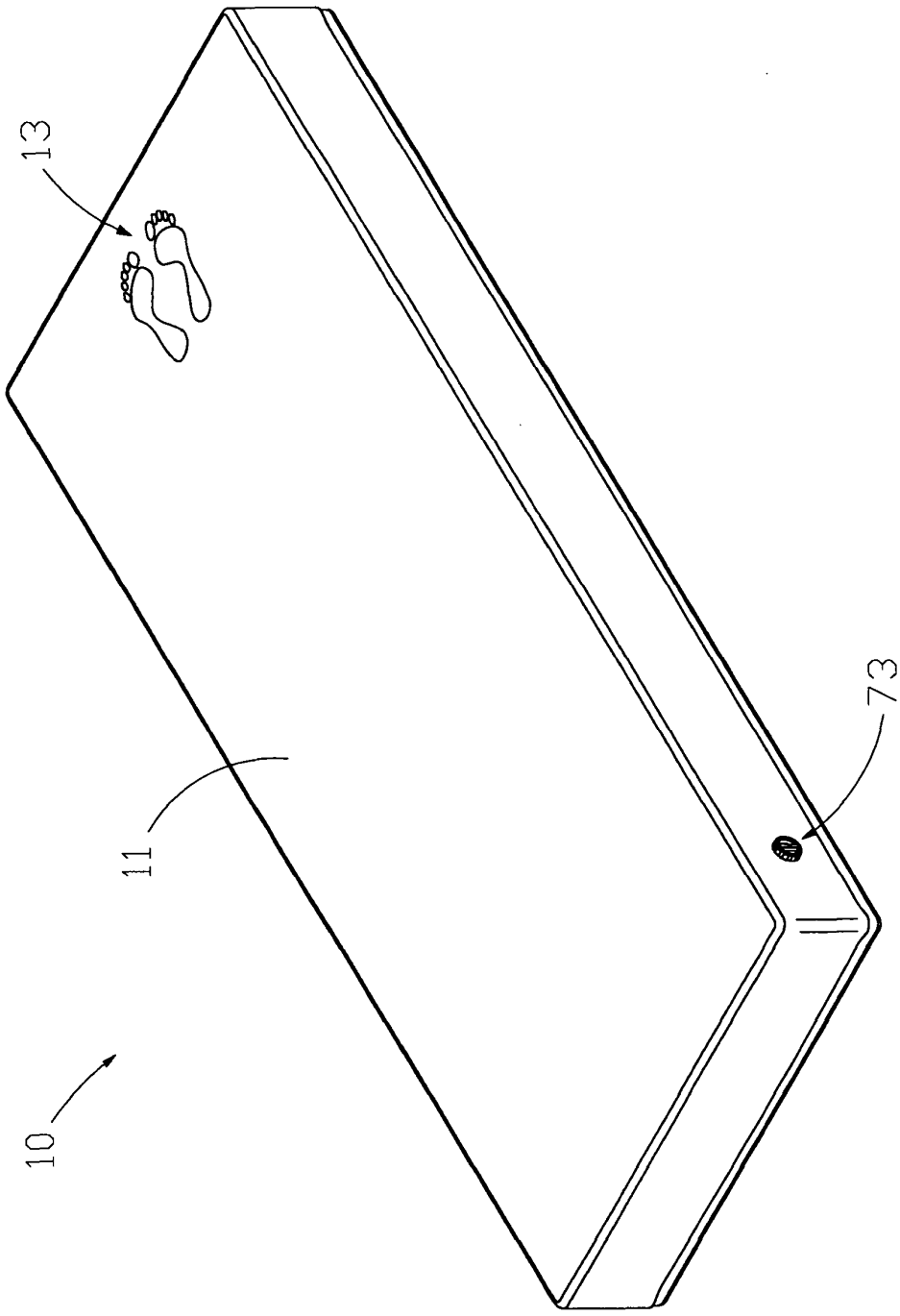


Fig. 2

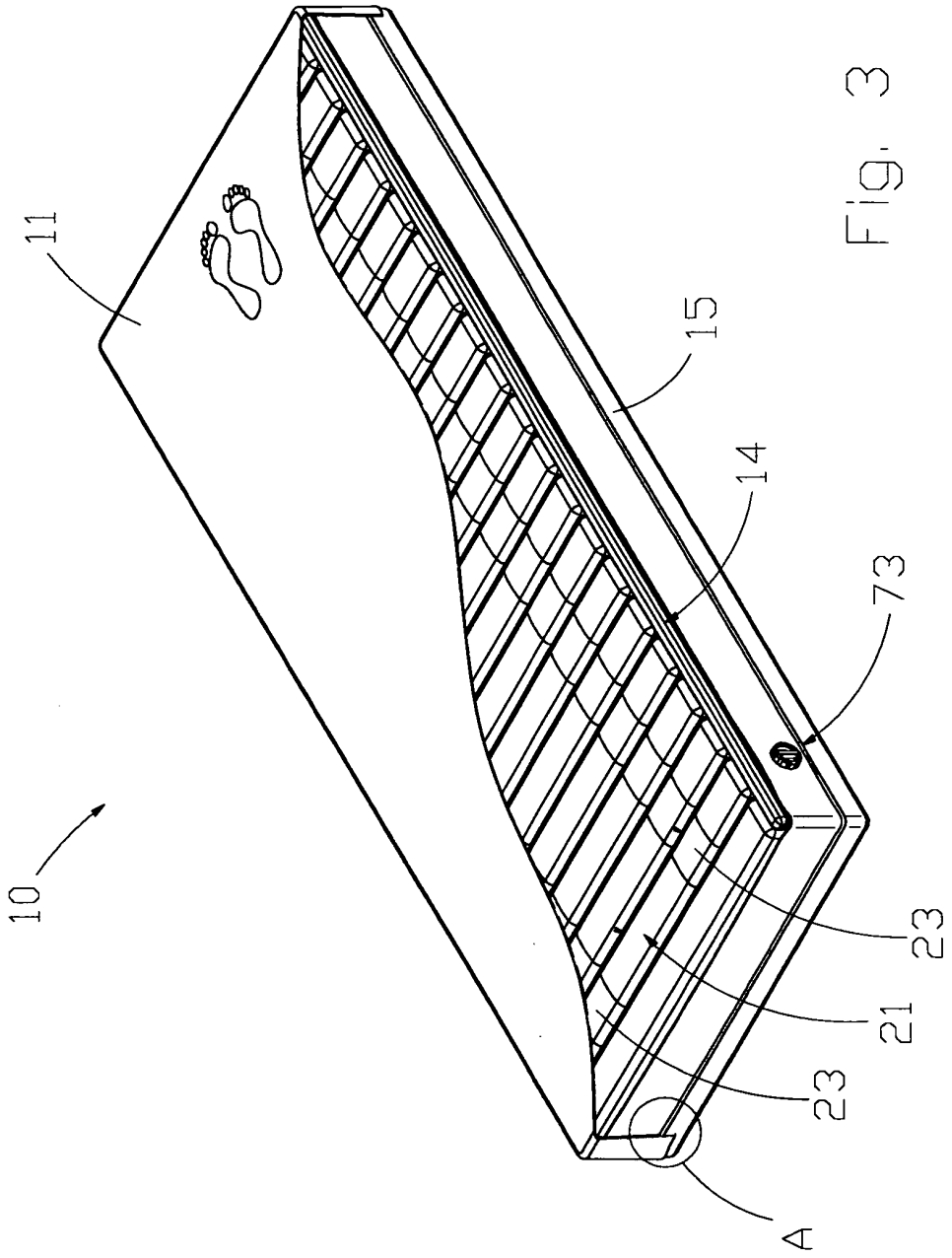


Fig. 3

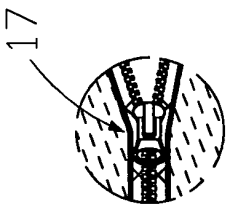


Fig. 3A

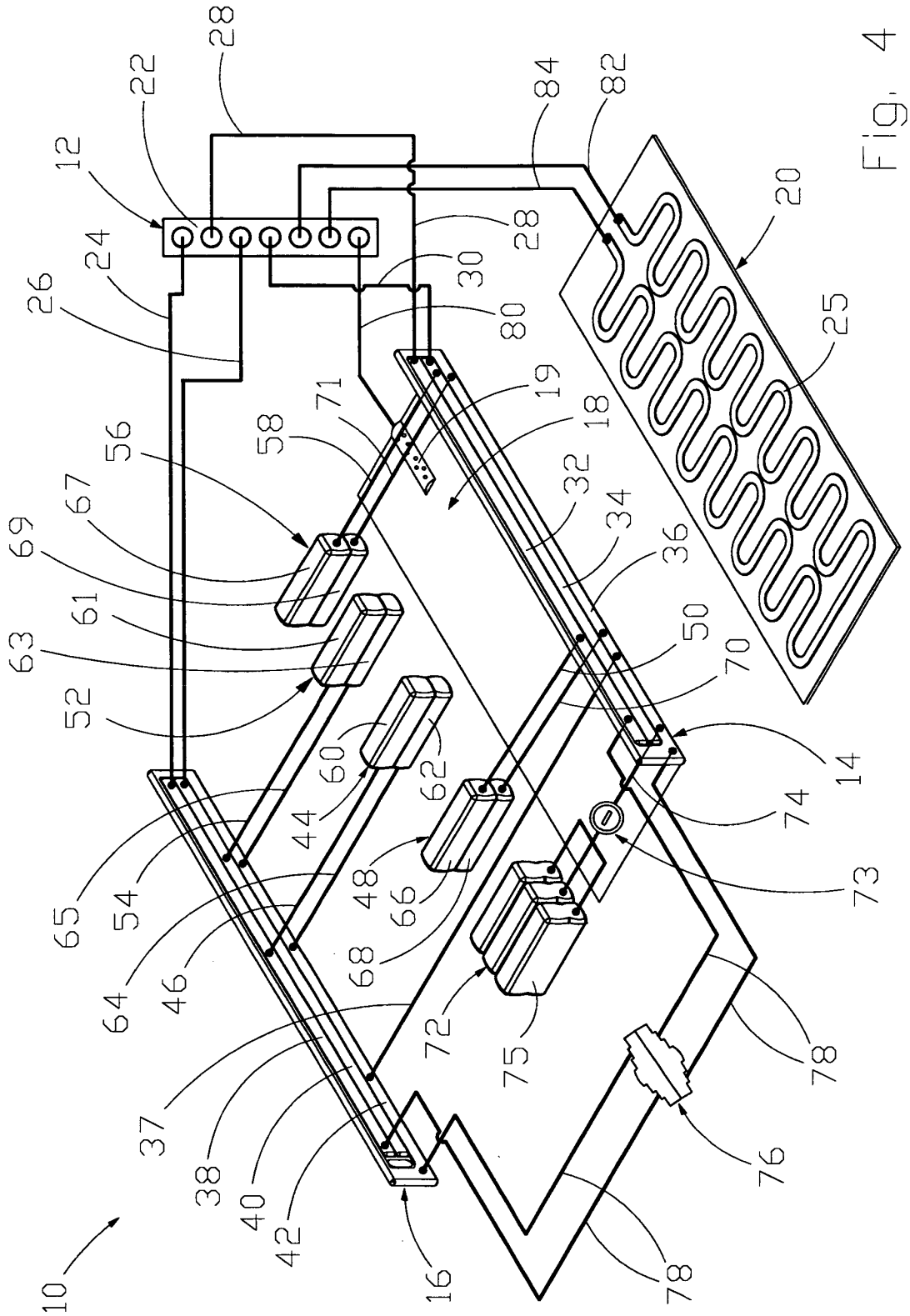

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Fig. 4

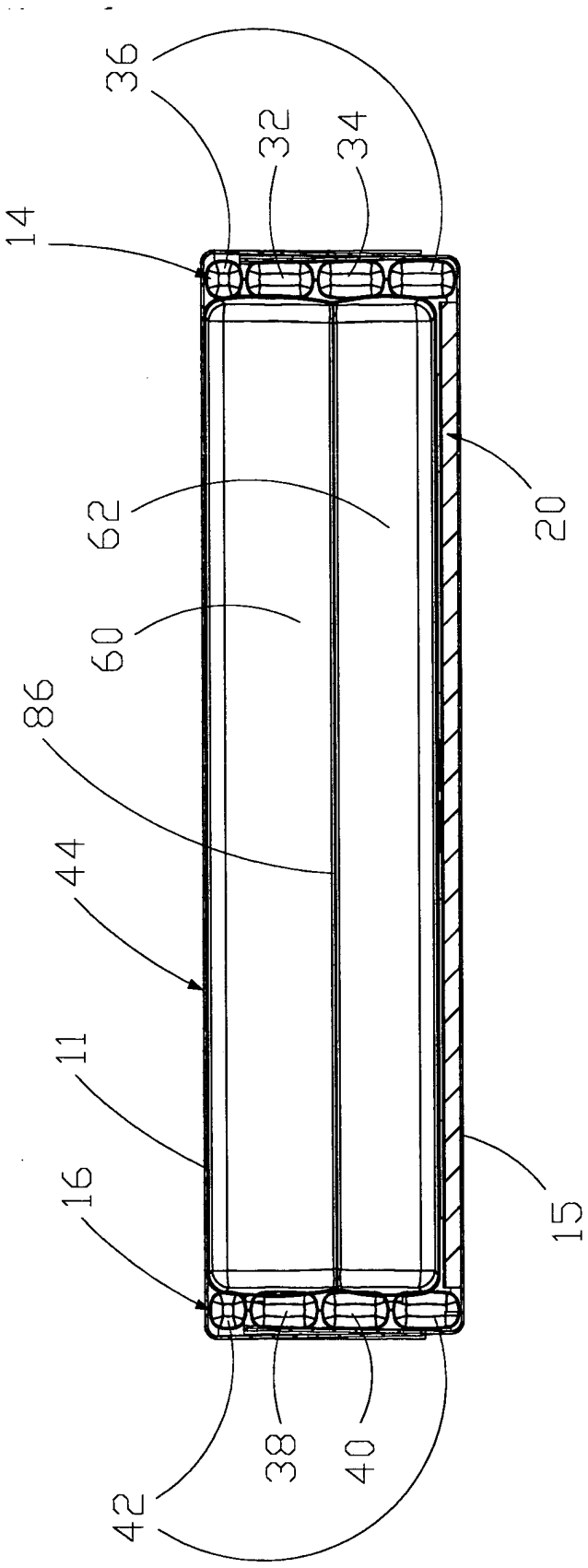


Fig. 5

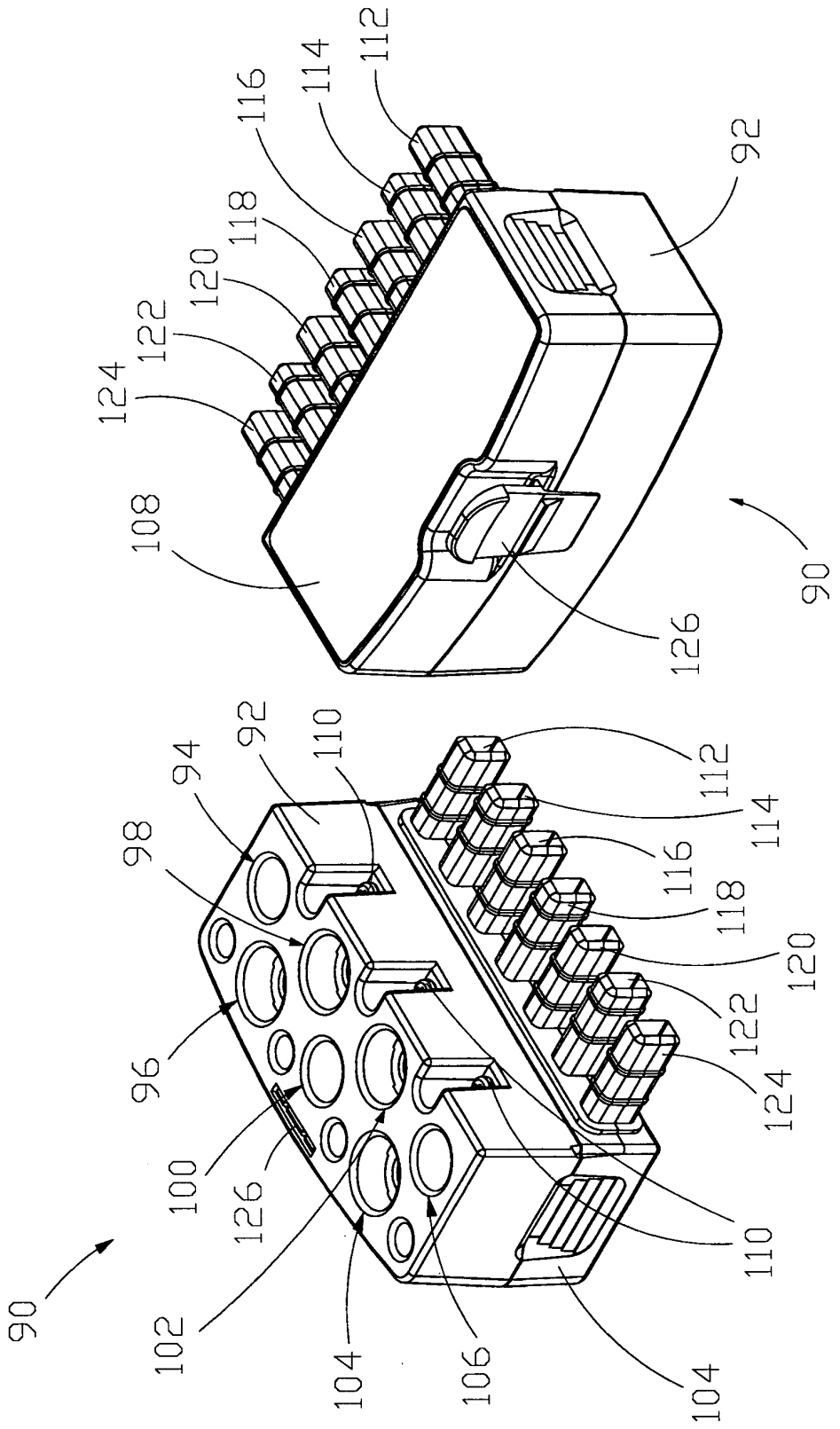

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Fig. 6

Fig. 7

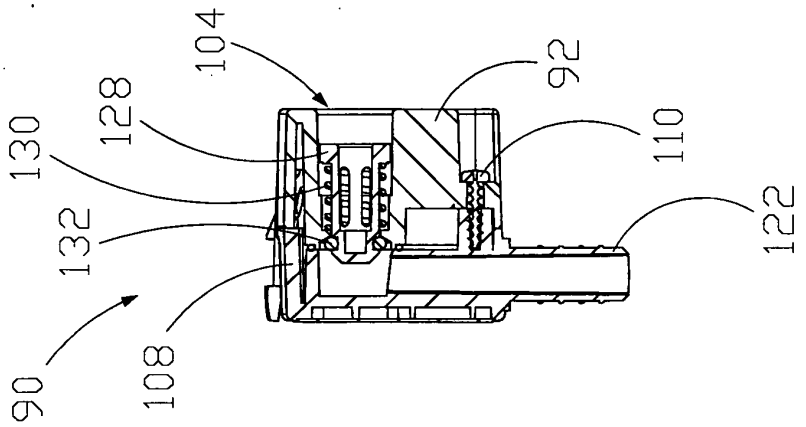


Fig. 9

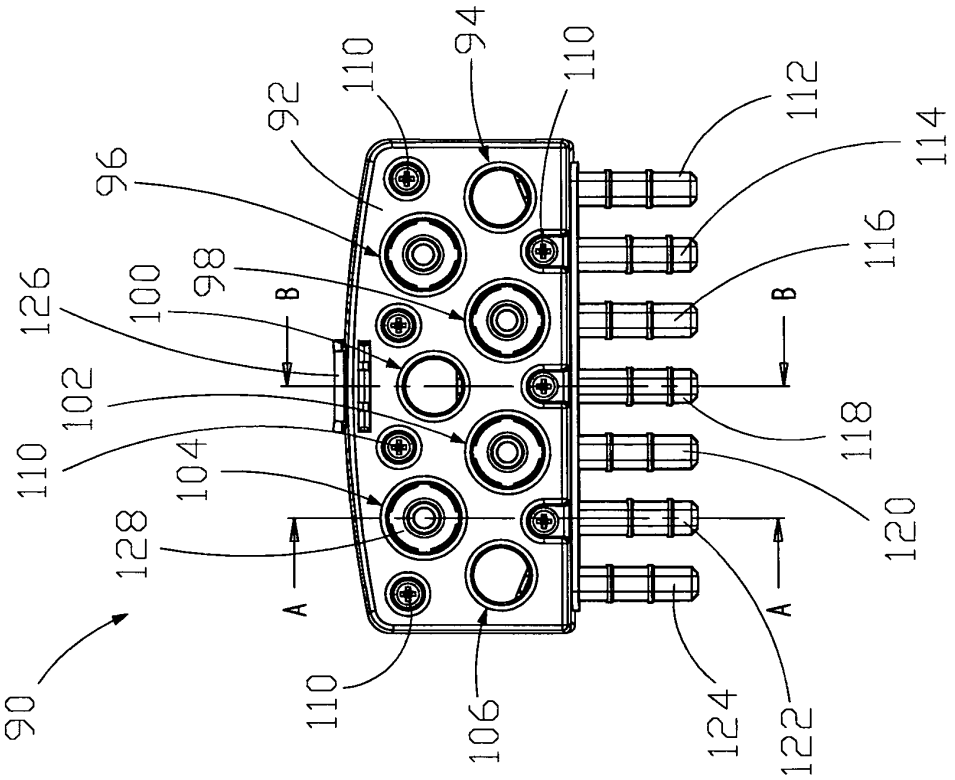


Fig. 8

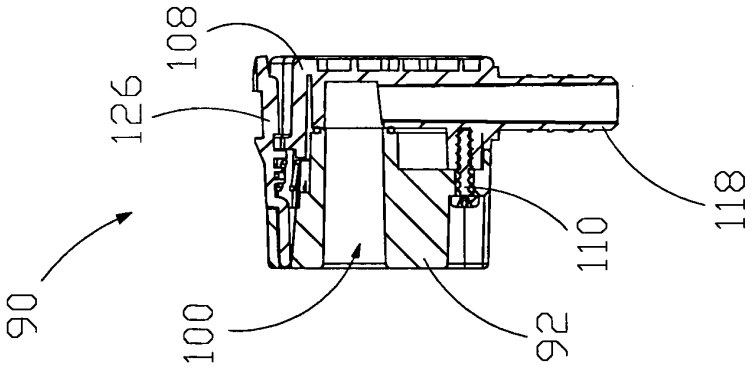


Fig. 10

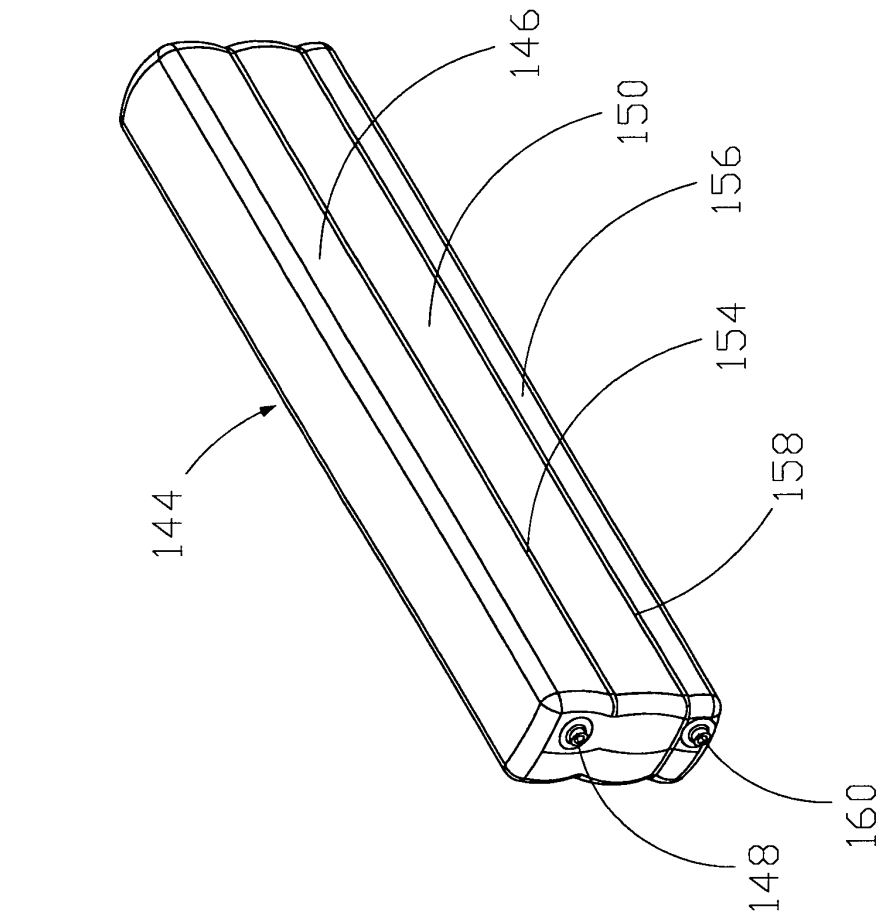

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Fig. 12

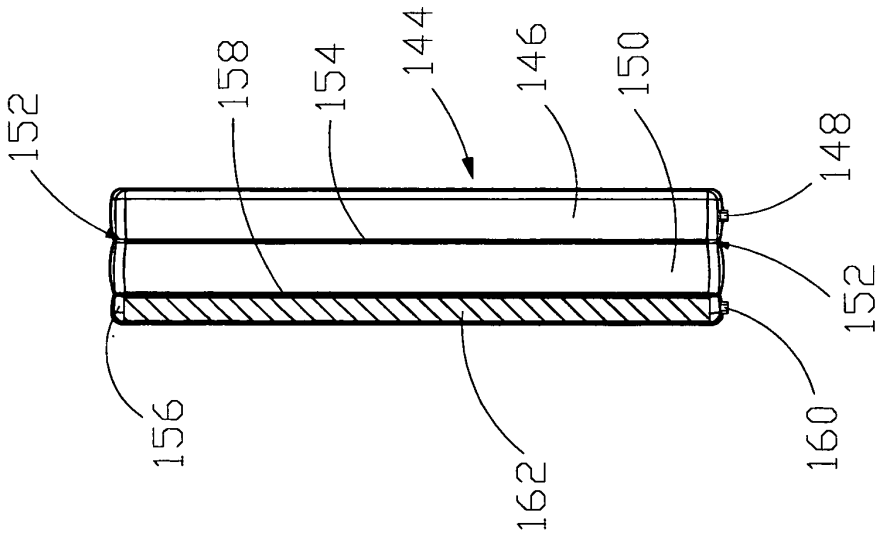

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Fig. 11

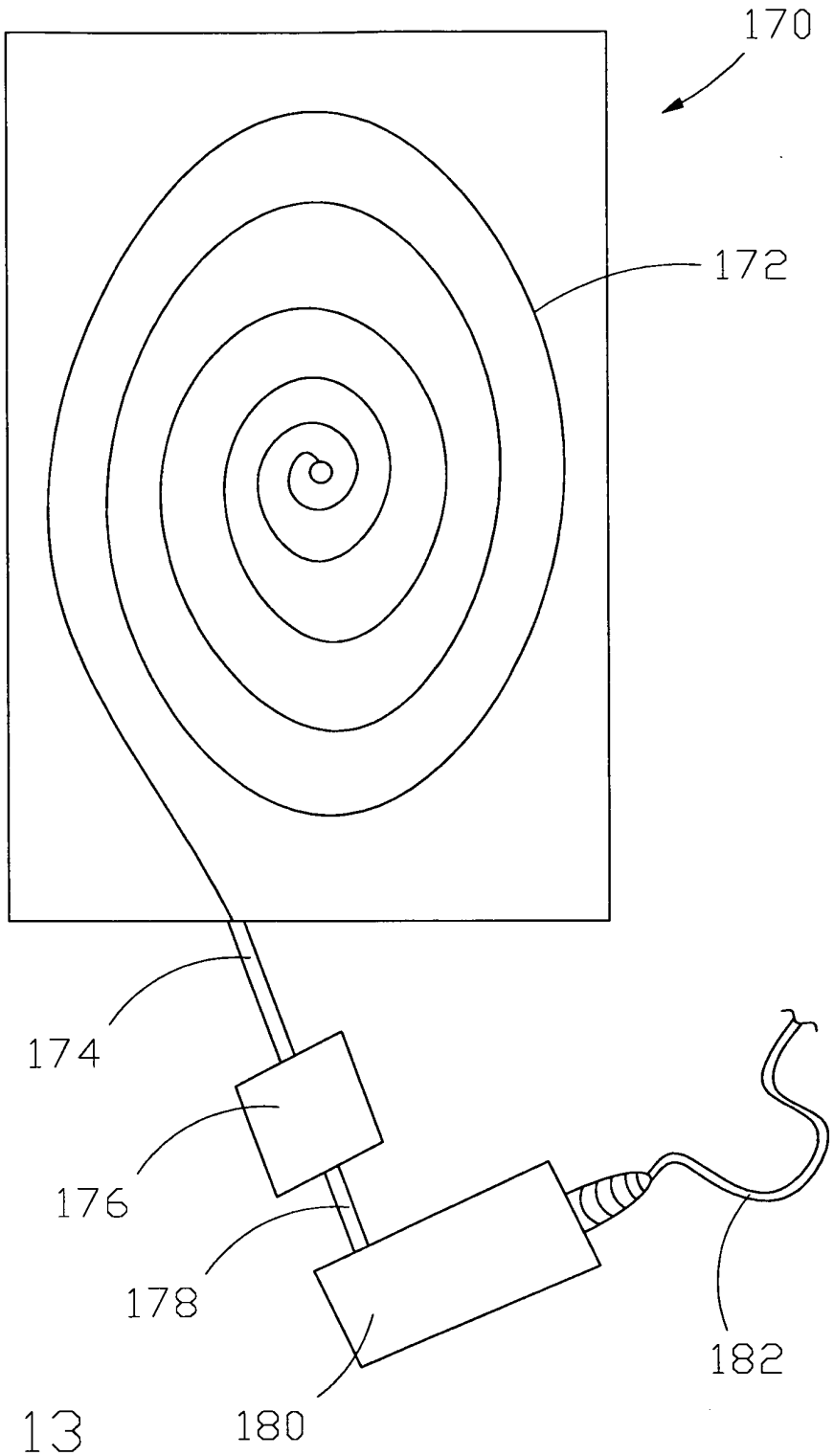


Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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