(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 January 2001 (04.01.2001)

PCT

(10) International Publication Number
WO 01/00130 A1

(51) International Patent Classification[6]: A61G 7/057

(21) International Application Number: PCT/US99/15066

(22) International Filing Date: 2 July 1999 (02.07.1999)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/340,097 25 June 1999 (25.06.1999) US

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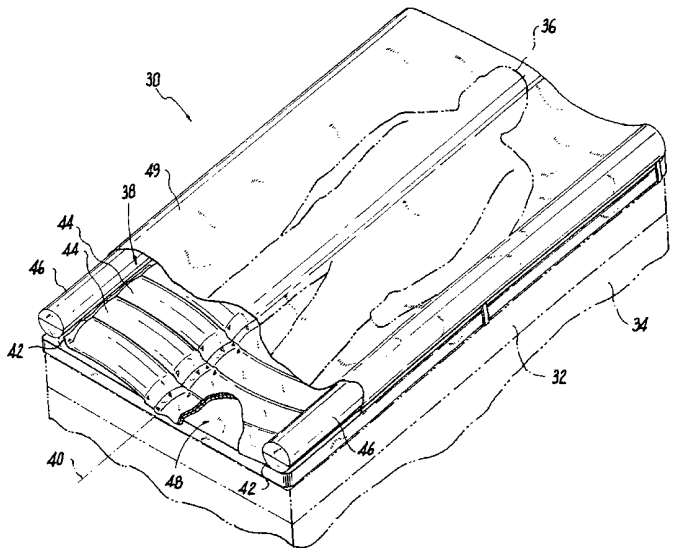
(81) Designated States *(national)*: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, GH, GM, HU, ID, IL, IS, JP, KE, KP, KR, LC, LK, LR, LS, LT, LV, MG, MK, MN, MW, MX, NO, NZ, PL, RO, SD, SG, SI, SK, SL, TR, TT, UA, UG, UZ, VN, YU, ZW.

(84) Designated States *(regional)*: Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ANTI-DECUBITUS PNEUMATIC MATTRESS



(57) Abstract: A mattress (30) that includes a main assembly (38), a pair of bolsters (46), and a bottom assembly (48). The main assembly (38) is adapted to overlay the conventional mattress (32) of the bed (34), and has opposing longitudinal sides (42) and comprises a plurality of cells (44) that are selectively inflatable for moving the patient (36) in preselected ways so as to prevent skin breakdown. The pair of bolsters (46) are replaceably attached to and extend along the opposed longitudinal sides (42) of the main assembly (38), and are inflatable to form barriers that prevent the patient (36) from falling off the mattress (30) when the patient is being turned. The bottom assembly (48) underlies the main assembly (38) and is adapted to overlay the conventional mattress (32) of the bed (34), and is inflatable to form a static air space between the main assembly (38) and the bed (34).

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ANTI-DECUBITUS PNEUMATIC MATTRESS

The present invention relates to an anti-decubitus pneumatic mattress. More particularly, the present invention relates to an anti-decubitus pneumatic mattress that is adapted to replaceably overlay a conventional mattress of a bed and have a patient lie thereon and be moved in preselected ways so as to prevent the patient from having skin breakdowns, and which prevents the patient from falling off the bed when the patient is turning, and which further prevents the patient from bottoming out on a low side of the turning, while being suspended in a cushion of static air if power fails.

A disadvantage of a conventional mattress is that after relatively short periods of time the patient becomes subject to bed sores and tissue degradation. This is particularly a problem when the patient cannot, or may not, exercise, even for a short time. Local message is a palliative measure and not very economical nor effective for long term patients.

Some patients require mattresses which extend the entire length of their bodies, while in other cases the turning movement of the patient is restricted to certain regions, for example the seat. Its is sometimes also necessary to exempt a certain region of the patient's body from the lifting pressure exerted by the mattress's air chambers.

An attempt to overcome these problems has been to provide a pneumatic air mattress. A later attempt has been to provide an air mattress by which the patient may be caused to turn periodically and thereby relieve stress on the body. A problem, however, with these known devices is that the frequency of inflation and deflation of the chambers, together with the lack of patient body movement, is often not sufficient to prevent skin breakdown.

In our U.S. Patent No. 5,394,577, we attempt to overcome these problems by teaching a therapeutic anti-decubitus lateral rotation mattress, which is incorporated herein by reference. As shown in **FIGURE 1**, the mattress **10** includes a plurality of pairs of inflatable air cells **12** disposed on opposite sides of a longitudinal axis **14** and arranged along the length of a bed. Each cell of the plurality of pairs of inflatable air cells **12** extends substantially transverse to the longitudinal axis **14** and are supplied with air so that cells of the plurality of pairs of inflatable air cells **12** on alternate sides are inflated, while cells of the plurality of pairs of inflatable air cells **12** on the other side are simultaneously deflated. An upper layer **16** of a resinous foam pad is provided on which the patient lies. The upper layer **16** is provided with a groove **18** along its longitudinal axis for comfort of the patient. The mattress **10** is completed by a covering **20** that has an upper sheet member **22** that is removably attached to a lower sheet member **24** so that when soiled it may be easily removed.

Although our patent appears to overcome these problems of the prior discussed *supra*, it only allows the patient to be turned in alternative directions, without allowing different portions of the patient to be alternatively raised and lowered. It does not prevent the patient from falling off the bed when the patient is turning, or does it prevent the patient from bottoming out on the low side of the turning, or be suspended in a cushion of static air, if power fails.

ACCORDINGLY, AN OBJECT of the present invention is to provide an anti-decubitus pneumatic mattress that avoids the disadvantages of the prior art.

ANOTHER OBJECT of the present invention is to provide an anti-decubitus pneumatic mattress that is simple and inexpensive to manufacture.

STILL ANOTHER OBJECT of the present invention is to provide an anti-decubitus pneumatic mattress that is simple to use.

BRIEFLY STATED, YET ANOTHER OBJECT of the present invention is to provide an anti-decubitus pneumatic mattress that is adapted to replaceably overlay a conventional mattress of a bed and have a patient lie thereon and be moved in preselected ways so as to prevent the patient from having skin breakdowns, and which prevents the patient from falling off the bed when the patient is turning, and which further prevents the patient from bottoming out on a low side of the turning, while being suspended in a cushion of static air, if power to the anti-decubitus pneumatic mattress fails. The mattress includes a main assembly, a pair of bolsters, and a bottom assembly. The main assembly is adapted to overlay the conventional mattress of the bed and have the patient lie thereon, and has opposing longitudinal sides, and comprises a plurality of cells that are selectively inflatable for moving the patient in the preselected ways so as to prevent the patient from having the skin breakdowns. Each bolster of the pair of bolsters is replaceably attached to, and extends along, a respective longitudinal side of the opposing longitudinal sides of the main assembly and are inflatable, and when inflated, form barriers that prevent the patient from falling off the bed when the patient is turning. The bottom assembly is adapted to overlay the conventional mattress of the bed and underlie the main assembly and is inflatable, and when inflated, forms a static air space between the main assembly and the conventional mattress of the bed that prevents the patient from bottoming out on the low side of the turning, while suspending the patient in the cushion of static air, if the power to the main assembly fails.

The novel features which are considered characteristic of the present invention are set forth in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of the specific embodiments when read and understood in connection with the accompanying drawing.

The figures on the drawing are briefly described as follows:

FIGURE 1 is a diagrammatic perspective view of a prior art therapeutic anti-decubitus lateral rotation mattress taught by our U.S. Patent No. 5,394,577 to James *et al.*;

FIGURE 2 is a diagrammatic perspective view of the present invention;

FIGURE 3 is an enlarged diagrammatic perspective view of the main assembly of the present invention and the pair of bolsters of the present invention attached thereto;

FIGURE 4 is an enlarged diagrammatic cross sectional view taken on line **4-4** in **FIGURE 3**;

FIGURE 5 is a fragmented diagrammatic perspective view illustrating the conduit distribution of the main assembly;

FIGURE 6 is a diagrammatic perspective view of the bottom assembly of the present invention;

FIGURE 7 is a diagrammatic perspective view of the top sheet of the two-piece cover of the present invention;

FIGURE 8 is a diagrammatic perspective view of the bottom sheet of the two-piece cover of the present invention; and

FIGURE 9 is a view similar to that of Fig. 2, illustrating at alternate embodiment for securing the air chambers.

Referring now to the figures in which like numerals indicate like parts, and particularly to **FIGURE 2**, the anti-decubitus pneumatic mattress of the present invention is shown generally at **30** adapted to replaceably overlay a conventional mattress **32** of a bed **34** and have a patient **36** lie thereon and be moved in preselected ways so as to prevent the patient **36** from having skin breakdowns, and which prevents the patient **36** from falling off the bed **34** when the patient **36** is turning, and which further prevents the patient **36** from bottoming out on a low side of the turning, while being suspended in a cushion of static air, if power to the anti-decubitus pneumatic mattress **30** fails.

The anti-decubitus pneumatic mattress includes a main assembly **38** that is adapted to overlay the conventional mattress **32** of the bed **34** and have the patient **36** lie thereon, and has a longitudinal axis **40** and opposing longitudinal sides **42**, and comprises a plurality of cells **44** that are selectively inflatable for moving the patient **36** in the preselected ways so as to prevent the patient **36** from having the skin breakdowns.

The anti-decubitus pneumatic mattress further includes a pair of bolsters **46**. Each bolster of the pair of bolsters **46** is replaceably attached to, and extends along, preferably the entire length of, a respective longitudinal side of the opposing longitudinal sides **42** of the main assembly **38**, and are selectively inflatable, and when inflated, form barriers that prevent the patient **36** from falling off the bed **34** when the patient **36** is turning.

The anti-decubitus pneumatic mattress **10** further includes a bottom assembly **48** that is adapted to overlay the conventional mattress **32** of the bed **34** and underlie

the main assembly **38**, preferably in its entirety, and is inflatable, and when inflated, forms a static air space between the main assembly **38** and the conventional mattress **32** that prevents the patient **36** from bottoming out on the low side of the turning, while suspending the patient **36** in the cushion of static air, if the power to the main assembly fails **38**.

The anti-decubitus pneumatic mattress further includes a two-piece cover **49** that replaceably encloses the main assembly **38**, the pair of bolsters **46**, and the bottom assembly **48**, as a unit.

The configuration of the main assembly **38** can best be seen in **FIGURES 3** through **5**, and as such will be discussed with reference thereto.

As shown in **FIGURE 3**, the plurality of cells **44** of the main assembly **38** are in edge to edge contact with each other, are substantially identical to each other, are readily interchangeable with each other, and have adjacent cells replaceably attached to each other, side by side, and end to end. The integrity of the main assembly **38** is maintained by male and female fastener elements **50** disposed on marginal flanges **52** on facing edges **54** of the plurality of cells **44**.

The number of cells of the plurality of cells **44** attached side by side determine its length, with its length, in one case, allowing the main assembly **38** to support the patient **36** completely, and in another case, allowing the main assembly **38** to support only a small region of the patient **36**. The length of the main assembly **38** is preferably shorter than the patient **36** so as to allow in one case, just the heels of the patient **36** to extend beyond the main assembly **38** and avoid sores thereon, while allowing in another case, only a selected portion of the patient **36** to be exempt for support.

The plurality of cells **44** are divided by the longitudinal axis **40** of the main assembly **38** into a pair of side by side banks of cells **56** that extend

longitudinally, with each bank of the pair of side by side banks of cells **56** being elongated, independently formed, and separately removable.

A shown in **FIGURE 4**, each cell of the plurality of cells **44** comprises a base **58** that is generally rectangular-shaped, generally planar, and non-resilient, and has peripheral edges **60**. Each cell of the plurality of cells **44** further comprises a cover **62** that is resilient and has peripheral edges **64** that are fused to the peripheral edges **60** of the base **58**, with the base **58** and the cover **62** defining an inflatable air chamber **66** therebetween, which when extended, by inflation, assumes a generally semi-cylindrically shape, but when contracted, by deflation, lies flat for easy storage and transport.

Each cell of the plurality of cells **44** is preferably about 6" about 8" wide, preferably about 12" long, and inflatable to a height of preferably1521Xeast 3.5", with about 12 to about 15 cells of the plurality of cells **44** in each bank of the pair of side by side banks of cells **56** accommodating the full length of the bed **34** when the bed **34** is a hospital bed, and with about 18 cells of the plurality of cells **44** in each bank of the pair of side by side banks of cells **56** accommodating the full length of the bed **34** when the bed **34** is a home care bed of about 35" in width and about 80" in length.

As shown in **FIGURE 5**, the pair of side by side banks of cells **56** are divided into side by side rows of cells **68**, whose long sides **70** extend substantially transverse to the longitudinal axis **40** of the main assembly **38**.

The main assembly **38** further has four distinct air conduits **72** that are in fluid communication with the plurality of cells **44** by inlet/outlet ports **74** that have stems **76** of T-fittings **78** secured therein. The four distinct air conduits **72** fluidly connect the plurality of cells **44** to an air source **80** for selective inflation and deflation of particular cells of the plurality of cells **44**, with each port of the inlet/outlet ports **74** being in

fluid communication with a respective cell of the plurality of cells **44** and being disposed adjacent the opposing longitudinal sides **42** of the main assembly **38**.

A first air conduit **82** of the four distinct air conduits **72** is in fluid communication with alternating cells **84** of one bank of the pair of side by side banks of cells **56**, with arms **86** of the T-fittings **78** of the first air conduit **82** being in serial fluid communication with each other by first short flexible conduits **88**, and with a lead T-fitting of the T-fittings **78** of the first air conduit **82** being in fluid communication with a controller **90** and the air source **80** by a first long flexible conduit **92**.

A second air conduit **94** of the four distinct air conduits **72** is in fluid communication with the remaining cells **96** of the one bank of the pair of side by side banks of cells **56**, with the arms **86** of the T-fittings **78** of the second air conduit **94** being in serial fluid communication with each other by second short flexible conduits **98**, and with a lead T-fitting of the T-fittings **78** of the second air conduit **94** being in fluid communication with the controller **90** and the air source **80** by a second long flexible conduit **100**.

A third air conduit **102** of the four distinct air conduits **72** is in fluid communication with alternating cells **104** of the other bank of the pair of side by side banks of cells **56**, which are adjacent to the alternating cells **84** of the one bank of the pair of side by side banks of cells **56**, with the arms **86** of the T-fittings **78** of the third air conduit **102** being in serial fluid communication with each other by third short flexible conduits **106**, and with a lead T-fitting of the T-fittings **78** of the third air conduit **102** being in fluid communication with the controller **90** and the air source **80** by a third long flexible conduit **108**.

A fourth air conduit **110** of the four distinct air conduits **72** is in fluid communication with the remaining

cells **112** of the other bank of the pair of side by side banks of cells **56**, which are adjacent to the remaining cells **96** of the one bank of the pair of side by side banks of cells **56**, with the arms **86** of the T-fittings **78** of the fourth air conduit **110** being in serial fluid communication with each other by fourth short flexible conduits **114**, and with a lead T-fitting of the T-fittings **78** of the fourth air conduit **110** being in fluid communication with the controller **90** and the air source **80** by a fourth long flexible conduit **116**.

The air source **80** passes air at high volume, but under low pressure, through the four distinct air conduits **72**, with the controller **90** having four bi-directional valves **118** that selectively allow air to pass through, and be removed from, particular conduits of the four distinct air conduits **72**.

The air source **80** is preferably integral with the controller **90**, and preferably is a pump that is small, since it needs to only provide high volume rather than high pressure, and with the controller **90** preferably being either mechanical or computer controlled.

The configuration of the pair of bolsters **46** can best be seen in **FIGURE 3**, and as such will be discussed with reference thereto.

Each bolster of the pair of bolsters **46** is hollow, elongated, about 4" in diameter, and about 12.5" in circumference so as to provide a sufficient barrier to prevent the patient **36** from falling off the bed **34** when the patient **36** is turning.

Each bolster of the pair of bolsters **46** comprises a lower sheet **120** that is resilient and has peripheral edges **122**, and an upper sheet **124** that is resilient and has peripheral edges **126** that are fused to the peripheral edges **122** of the lower sheet **120**, with the lower sheet **120** and the upper sheet **124** defining an inflatable air chamber **127** therebetween, which when extended, by inflation, assumes a generally cylindrically shape, but when

contracted, by deflation, lies flat for easy storage and transport.

The lower sheet **120** of each bolster of the pair of bolster **46** has a one-way valve **128**, at a foot end **130** thereof, and a manual release valve **132** disposed slightly forward of the one-way valve **128**, with the one-way valve **128** being in fluid communication with the controller **90** and the air source **80** by a fifth long flexible conduit **134**.

The pair of bolsters **46** are replaceably attached to the main assembly **38** by two-piece vinyl straps **136** that are replaceably attached to the main assembly **38** by buttons **138**, and which releasably encircle the pair of bolsters **46**, and which are maintained therearound by hook and loop fasteners **140** disposed on their free ends **142**.

Each strap of the two-piece vinyl straps **136** is about 1" in width and about 15" in length, with the length of each strap of the two-piece vinyl straps **136** being sufficient to encircle a respective bolster of the pair of bolsters **46** with sufficient overlap to engage the hook and loop fasteners **140**.

The two-piece vinyl straps **136** are preferably six two-piece vinyl straps, three of which replaceably attaches one bolster of the pair of bolsters **46** to the respective longitudinal side of the opposing longitudinal sides **42** of the main assembly **38**, and which are evenly spaced therealong.

The configuration of the bottom assembly **48**, can best be seen in **FIGURE 6**, and as such will be discussed with reference thereto.

The bottom assembly **48** is thin, hollow, and generally rectangular-parallelepiped-shaped with rounded corners **144**, and has a top **146** that underlies, preferably the entirety of, the main assembly **38** and the pair of bolsters **46**, as a unit, and has a foot end **148**, and a bottom **150** that is adapted to overlay the conventional mattress **32**.

The bottom assembly **48** is made from vinyl, and is preferably about 2" in height, preferably about 80" in length, and preferably about 35" in width so as to accommodate the bed **34** when the bed **34** is a home care bed of about 35" in width and about 80" in length.

The top **146** of the bottom assembly **48** has an inlet port **152** with a one-way valve **154** that is in fluid communication with the controller **90** and the air source **80** by a short flexible conduit **156** which is in fluid communication with the fifth long air conduit **134** by a Y-fitting **158** so as to allow the pair of bolsters **46** and the bottom assembly **48** to be inflated simultaneously, with the inlet port **152** being centered about 2" in from the foot end **148** of the top **146** of the bottom assembly **48**.

The top **146** of the bottom assembly **48** further has an air escape valve **160** that permits any excess air to escape and keeps the bottom assembly **48** at a constant pressure of about .5 lb, and which is centered about 10" in from the foot end **148** of the bottom assembly **48**.

The configuration of the two-piece cover **49** can best be seen in **FIGURES 7** and **8**, and as such will be discussed with reference thereto.

The two-piece cover **49** is hollow and generally rectangular-parallelepiped-shaped, and conforms substantially to the main assembly **38**, the pair of bolsters **46**, and the bottom assembly **48**, as a unit.

As shown in **FIGURE 7**, the two-piece cover **49** includes a top sheet **162** with a planar base **164** that overlays the main portion **38**, and depending peripheral walls **166** that are slightly downwardly outwardly flaring, and which overlay side portions **168** of the pair of bolsters **46**.

The top sheet **162** is about 35" in width, about 80" in length, and about 5.5" in height so as to accommodate the main assembly **38** and the pair of bolsters **46**, as a unit, and is made from a two-way stretch fabric, lined with quilting that is comfortable for the patient **36** lying thereon. The two-way stretch fabric is either moleskin,

flannel, or the like, with a typical such fabric being one sold under the trade name DARTEX™, which conforms to California code 117 Section E (CS 191-53), and which has a polyurethane coating thereon that is bacteriostatic, fluid-proof, non-staining, and moisture vapor permeable.

The depending sides **166** of the top sheet **162** have a run of teeth **175** of two zippers **176** disposed slightly before their termination edges **178**, on inner surfaces thereof **180**. The run of teeth **175** of the two zippers **176** have their origination stops **182** at a center **184** of a foot end wall **186** of the depending peripheral walls **166**, and extend laterally outwardly therefrom, in opposite directions, along the foot end wall **186** of the top sheet **162**, longitudinally along a respective longitudinal wall of the depending peripheral walls **166**, laterally inwardly, in opposite directions, along a head end wall **188** of the depending peripheral walls **166**, which opposes the foot end wall **186**, and have their termination stops **190** at a center **192** of the head end wall **188**, with each zipper of the two zippers **176** being about 115" in length.

The top sheet **162** further has six non-slip nylon straps **194** with D-rings **196** for replaceably securing the main assembly **38**, the pair of bolsters **46**, and the bottom assembly **48**, as a unit, to a frame of the bed **34** so as to prevent the main assembly **38**, the pair of bolsters **46**, and the bottom assembly **48** from falling off the bed **34** when the patient **36** is lying thereon.

The six non-slip nylon straps **194** depend from all four corners **200** of the top sheet **162**, and midway between each widest separated pair of straps of the six non-slip nylon straps **194**, with each strap of the six non-slip nylon straps **194** being about 1" wide and about 25" long so as to provide sufficient securement to the frame of the bed **34**.

As shown in **FIGURE 8**, the two-piece cover **49** further includes a bottom sheet **202** with a planar base **204** that underlies the bottom assembly **48**, and upstanding

peripheral walls **206** that overlay side portions of the bottom assembly **48**, with the bottom sheet **202** being about 35" in width, about 80" in length, and about 2 in height so as to accommodate the bottom assembly **48**. The bottom sheet **202** is made from a fabric that is strong, resistant to fluids, bacteria, fire, stains and tears, and self-deodorizing, non-allergenic, and anti-static, with a typical such fabric being one sold under the trade name STAPH-CHEK COMFORT®.

The upstanding peripheral walls **206** of the bottom sheet **202** have a mating run of teeth **210** of the two zippers **176** disposed at their termination edges **212**. The mating run of teeth **210** of the two zippers **176** have their origination stops **214** at a center **216** of a foot end wall **218** of the upstanding peripheral walls **206**, and extend laterally outwardly therefrom, in opposite directions, along the foot end wall **218**, longitudinally along a respective longitudinal wall of the upstanding peripheral walls **206**, laterally inwardly, in opposite directions, along a head end wall **220** of the upstanding peripheral walls **206**, which opposes the foot end wall **218**, and have their termination stops **222** at a center **224** of the head end wall **220**.

The mating run of teeth **210** of the two zippers **176** selectively mate with the run of teeth **175** of the two zippers **176** by pull slides **225** disposed at their origination stops **182**, **214** so as to be readily accessible for easy opening of the two-piece cover **49** when the top sheet **162** requires replacement, without having to fully dismantle the anti-decubitus pneumatic mattress **30**, and which also facilitates monitoring of the main assembly **38**, and with the termination edges **178** of the depending peripheral walls **166** of the top sheet **162** forming a flap **226** for concealing and forming invisible zippers.

The bottom sheet **202** further has a rectangular stitched throughbore **228** that is centered in the foot end wall **218** thereof, and which is about .75" in height and

about 2.5" in length so as to easily accommodate passage of at least the first long flexible conduit **92**, the second long flexible conduit **100**, the third long flexible conduit **108**, the fourth long flexible conduit **116**, and the fifth long flexible conduit **134** outwardly therethrough.

In operation, to turn the patient **36** in alternative directions, one bank of the pair of side by side banks of cells **56** is inflated, while the other bank of the pair of side by side banks of cells **56** is simultaneously deflated, and *vise versa*.

The complete unit is supplied with a constant flow of air by the use of an alternating pressure pump. The pump is connected to the air chambers by two (2) long hoses at the foot end. The air pressure in the pump is regulated by a dial with "comfort zone" according to the patient's weight and desired comfort level.

The method of inflating the air chambers, detachable side bolsters, and static two inch (2") air mattress can be accomplished in two (2) different ways as follows:

1. The use of the alternating pressure air pump which supplies a constant flow of air to all chambers. It takes about 25-30 minutes for full inflation. Thereafter, the pump alternates at eight (8) minute intervals.
2. The second method of inflation is the use of a fast inflate/deflate pump with a tightly sealing valve and CPR feature. This pump can be used for very rapid inflation, less than two (2) minutes, of all the air chambers, bolsters and static air mattress.

There are four (4) hoses at the CPR valve connected with all hoses for the air supply inside the cover at the foot end of the overlay. One of the hoses bypasses the one-way valve. By simply turning the pump around and sucking the air from the mattress through the fast

inflate/deflate valve, it will rapidly deflate all air chambers, the two (2) air side bolsters and the static air mattress. To accomplish this, the controller **90** passes air from the air source **80** through the first conduit **82** and the second conduit **94** and inflates the one bank of the pair of side by side banks of cells **56**, while simultaneously removes air through the third conduit **102** and the fourth conduit **110** and deflates the other bank of the pair of side by side banks of cells **56**, and *vise versa*.

To raise and lower different parts of the patient **36**, alternating rows of the side by side rows of cells **68** of the pair of side by side banks of cells **56** are inflated, while the remaining rows of the side by side rows of cells **68** of the pair of side by side banks of cells **56** are simultaneously deflated, and *vise versa*. To accomplish this, the controller **90** passes air from the air source **80** through the first conduit **82** and the third conduit **102** and inflates the alternating rows **68** of the pair of side by side banks of cells **56**, while simultaneously removes air through the second conduit **94** and the fourth conduit **110** and deflates the remaining rows of the side by side rows of cells **68** of the pair of side by side banks of cells **56**, and *vise versa*.

Simply, turning of the patient in a lateral rotation (turning) mode is affected by inflating the centrally divided air chambers on one side turning the patient along the central axis from side to side up to thirty degrees each side. Alternating pressure mode a waving support of the patient is affected by inflating the air chambers all the way across, but only every other row inflates, i.e., rows 1, 3, 5, 7, etc. inflate, while the other rows, i.e., rows 2, 4, 6, 8, etc. deflate. This is possible by having the hoses attached at the side to every other air chamber as enumerated above.

Alternatively, all the air chambers can be inflated simultaneously to provide a cushion of air at all times.

In this static air flotation mode, programs involving bowel treatment, personal care wound treatment and patient transfer to a gurney of wheelchair can be made. The control unit can accomplish this mode in either the lateral rotation mode or alternating pressure mode without changing conduits or valves.

The lateral rotation (turning) preferably should not keep the patient in any one position for any length of time. As soon as the turning cycle reaches the lowest point, the air source, i.e., pump assembly, switches the turning to the other side. Thus the patient is continuously and very gently moved from side to side up to thirty degrees each side. Any "bottoming out" should be for a few seconds only on each side.

The underlying base mattress of the bottom assembly may be replaced by two inch foam mattress. Also, the cover fabric can be exchanged for nylon taffeta instead of PENN NYLA DARTEX™. With nylon taffeta, both the top and bottom cover are made of the same fabric with two non-detachable zippers. The cover opens only on one long side and the head and foot end. It is fully washable in the washing machine.

The above described unit can be further modified by the elimination of the two inch static air mattress for countries that do not have a requirement for "bottoming out" which has been demonstrated not to be a factor with the continuous, gentle rotation (turning) function of the Volkner Turning System.

With this version, it is not necessary to use the fast inflate/deflate pump and valve with CPR. The time for full inflation is 12-15 minutes without it. The CPR function can be accomplished by attaching two quick release connectors at the foot end to the long air hoses from the pump with white CPR letters imprinted on a red strap.

The air bolsters will be attached to the sides with straps, and at the foot end with air hoses containing a

one-way valve to keep the bolsters inflated at all times. To deflate the entire unit for shipping, storage or transport, it will be necessary to let the air escape from the side bolsters as well as the air chambers. This is accomplished by simply detaching the side bolsters from the L-connectors at the air intake at the foot end, and letting the air escape. By then, reattaching the flat air side bolsters to the L-connectors, the unit is ready for reinflation.

Low air loss -- with an increase in the air flow, the modular air chambers can be made with laser sized orifices to provide gentle air flow through the vapor permeable PENN NYLA DARTEX™ cover. The orifices are in each or selected ones of the air chambers, if so desired.

An alternate means of securing the interchangeable air chamber 44 is illustrated in Fig. 9. Here, each chamber is held within at least one of a series of loops 45 which are attached to a base sheet 47 attached at each of its four corners to the corner air cells of the turning chambers, by buttons or snaps. The air chambers are 3 1/2 inches high when inflated and overlap or interleaves with each other when held in the loops 45. The loops 45 are vinyl and are fused to the base sheet 47 which itself is nylon vinyl. Each loop, 3 inches wide, is aligned approximately 4 inches from the center line 40. In this manner, buttons or snaps for the individual air chambers are removed form the interior area of the mattress.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in an anti-decubitus pneumatic mattress, however, it is not limited to the details shown, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and its operation can be

made by those skilled in the art without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute characteristics of the generic or specific aspects of this invention.

CLAIMS

1. An anti-decubitus pneumatic mattress adapted to replaceably overlay a conventional mattress of a bed and have a patient lie thereon, said anti-decubitus pneumatic mattress comprising:

a) a main assembly adapted to overlay the conventional mattress of the bed and have the patient lie thereon, and having a longitudinal axis and opposing longitudinal sides, and comprising a plurality of cells being selectively inflatable for turning the patient so as to prevent the patient from having skin breakdowns, and when all said plurality of cells being simultaneously inflated, the patient being cushioned for static treatment;

b) a pair of bolsters, each of which being replaceably attached to, and extending along, a respective longitudinal side of said opposing longitudinal sides of said main assembly, and being selectively inflatable, and when inflated, forming barriers preventing the patient from falling off the bed when the patient is turning by way of said plurality of cells of said main assembly; and

c) first means for selectively inflating said plurality of cells of said main assembly and each of said pair of bolsters.

2. An anti-decubitus pneumatic mattress according to claim 1; further comprising a bottom assembly adapted to overlay the conventional mattress of the bed and underlie said main assembly, and being

inflatable, and when inflated, forming a static air space between said main assembly and the conventional mattress of the bed preventing the patient from bottoming out on a low side of turning, while suspending the patient in the cushion of static air, if power to said main assembly fails; said bottom assembly being selectively inflated by said first means.

3. The anti-decubitus pneumatic mattress as defined in claim 1, wherein said plurality of cells are in edge to edge contact with each other, are substantially identical to each other, and are readily interchangeable with each other.

4. The anti-decubitus pneumatic mattress as defined in claim 1, wherein each cell of said plurality of cells comprises a base that is generally rectangular-shaped, generally planar, and non-resilient, and has peripheral edges; each cell of said plurality of cells further comprises a cover that is resilient and has peripheral edges that are fused to said peripheral edges of said base, with said base and said cover defining an inflatable air chamber therebetween, which when extended, by inflation, assumes a generally semi-cylindrically shape, but when contracted, by deflation, lies flat for easy storage and transport.

5. The anti-decubitus pneumatic mattress as defined in claim 1, wherein the number of cells of said plurality of cells attached side by side determine its length, with its length in one case, allowing said main assembly to support the patient completely, and in another case, allowing said main

assembly to support only a small region of the patient.

6. The anti-decubitus pneumatic mattress as defined in claim 1, wherein said plurality of cells are divided by said longitudinal axis of said main assembly into a pair of side by side banks of cells that extend longitudinally and wherein each bank of said pair of side by side banks of cells is elongated, independently formed, and separately removable.

7. The anti-decubitus pneumatic mattress as defined in claim 6, including means wherein one bank of said pair of side by side banks of cells is inflated, while the other bank of said pair of side by side banks of cells is simultaneously deflated, and vise versa so as to cause the patient to turn in alternative directions.

8. The anti-decubitus pneumatic mattress as defined in claim 7, wherein said first means includes:

a) a first air conduit in fluid communication with alternating cells of one bank of said pair of side by side banks of cells, with arms of T-fittings of said first air conduit being in serial fluid communication with each other by first short flexible conduits, and with a lead T-fitting of said T-fittings of said first air conduit being in fluid communication with a controller and an air source by a first long flexible conduit;

b) a second air conduit in fluid communication with remaining cells of

said one bank of said pair of side by side banks of cells, with arms of T-fittings of said second air conduit being in fluid communication with each other by second short flexible conduits, and with a lead T-fitting of said T-fittings of said second air conduit being in fluid communication with said controller and said air source by a second long flexible conduit;

c) a third air conduit in fluid communication with alternating cells of the other bank of said pair of side by side banks of cells, which are adjacent said alternating cells of said one bank of said pair of side by side banks of cells, with arms of T-fittings of said third air conduit being in serial fluid communication with each other by third short flexible conduits, and with a lead T-fitting of said T-fittings of said third air conduit being in fluid communication with said controller and said air source by a third long flexible conduit;

d) a fourth air conduit in fluid communication with remaining cells of said other bank of said pair of side by side banks of cells, which are adjacent said remaining cells of said one bank of said pair of side by side banks of cells, with arms of T-fittings of said fourth air conduit being in serial fluid communication with each other by fourth short flexible conduits, and with a lead T-fitting of said T-fittings of said fourth air conduit being in fluid

communication with said controller and said air source by a fourth long flexible conduit; and

e) second means for controlling the selective inflation of said cells causing the patient to turn in alternative directions by passing air through said first conduit and said second conduit, and inflating said one bank of said pair of side by side banks of cells, while simultaneously removing air through said third conduit and said fourth conduit, and deflating said other bank of said pair of side by side banks of cells, and vise versa; said second means further causing different parts of the patient to alternatively rise and lower by passing air through said first conduit and said third conduit, and inflating alternating rows of said pair of side by side banks of cells, while simultaneously removing air through said second conduit and said fourth conduit, and deflating remaining rows of said pair of side by side banks of cells.

9. The anti-decubitus pneumatic mattress as defined in claim 8, wherein said air source passes air at high volume, but under low pressure, through said four distinct air conduits, and said controller has four bi-directional valves that selectively allow air to pass through, and be removed from, particular conduits of said four distinct air conduits.

10. The anti-decubitus pneumatic mattress as defined in claim 1, wherein each bolster of said pair of bolsters is hollow and elongated, and extends along the entirety of a respective side of said opposing longitudinal sides of said main assembly.

11. The anti-decubitus pneumatic mattress as defined in claim 10, wherein each bolster of said pair of bolster comprises a lower sheet that is resilient and has peripheral edges, and an upper sheet that is resilient and has peripheral edges that are fused to said peripheral edges of said lower sheet, with said lower sheet and said upper sheet defining an inflatable air chamber therebetween that when extended, by inflation, assumes a generally cylindrically shape, but when contracted, by deflation, lies flat for easy storage and transport.

12. The anti-decubitus pneumatic mattress as defined in claim 11, wherein said lower sheet of each bolster of said pair of bolster has a one-way valve at a foot end thereof, and a manual release valve slightly forward of said one-way valve, said one-way valve being in fluid communication with a controller and an air source by a fifth long flexible conduit for selectively feeding air to said bolsters.

13. The anti-decubitus pneumatic mattress as defined in claim 1, wherein said pair of bolsters are replaceably attached to said opposing longitudinal sides of said main assembly by straps.

14. The anti-decubitus pneumatic mattress as defined in claim 13, wherein said straps include two-piece vinyl straps that have free ends and are replaceably attached to said main assembly by buttons, and which releasably encircle said pair of bolsters, and which are maintained therearound by hook and loop fasteners on their free ends.

15. The anti-decubitus pneumatic mattress as defined in claim 14, wherein each strap of said two-piece vinyl straps is about 1" in width and about 15" in length, with said length of each strap of said two-piece vinyl straps being sufficient to encircle a respective bolster of said pair of bolsters with sufficient overlap to engage said hook and loop fasteners on said free ends thereof.

16. The anti-decubitus pneumatic mattress as defined in claim 2, wherein said bottom assembly is thin, hollow, and generally rectangular-parallelepiped-shaped with rounded corners, and has a top that underlies the entirety of said main assembly and said pair of bolsters, as a unit, and has a foot end; said bottom assembly further has a bottom that is adapted to overlay the conventional mattress of the bed.

17. The anti-decubitus pneumatic mattress as defined in claim 2, wherein a top of said bottom assembly has an inlet port with a one-way valve that is in fluid communication with a controller and an air source by a short flexible conduit that is in fluid communication with a fifth long air conduit by a Y-fitting, which allows said pair of bolsters and said bottom assembly to be inflated simultaneously.

18. The anti-decubitus pneumatic mattress as defined in claim 16, wherein said top of said bottom assembly further has an air escape valve that permits any excess air to escape and keeps said bottom assembly at a constant pressure of about .5 lb.

19. The anti-decubitus pneumatic mattress as defined in claim 2; further comprising a two-piece cover for replaceably enclosing said main assembly, said pair of bolsters, and said bottom assembly, as a unit.

20. The anti-decubitus pneumatic mattress as defined in claim 19, wherein said two-piece cover is hollow and generally rectangular-parallelepiped-shaped, and conforms substantially to said main assembly, said pair of bolsters, and said bottom assembly, as a unit, said two-piece cover including a top sheet with a planar base that overlays said main portion, and depending peripheral walls that are slightly downwardly outwardly flaring, and which overlay side portions of said pair of bolsters.

21. The anti-decubitus pneumatic mattress as defined in claim 20, wherein said top sheet of said two-piece cover further has cover securing means for replaceably securing said main assembly, said pair of bolsters, and said bottom assembly, as a unit, to a frame of the bed, while preventing said main assembly, said pair of bolsters, and said bottom assembly from falling off the bed when the patient is lying thereon.

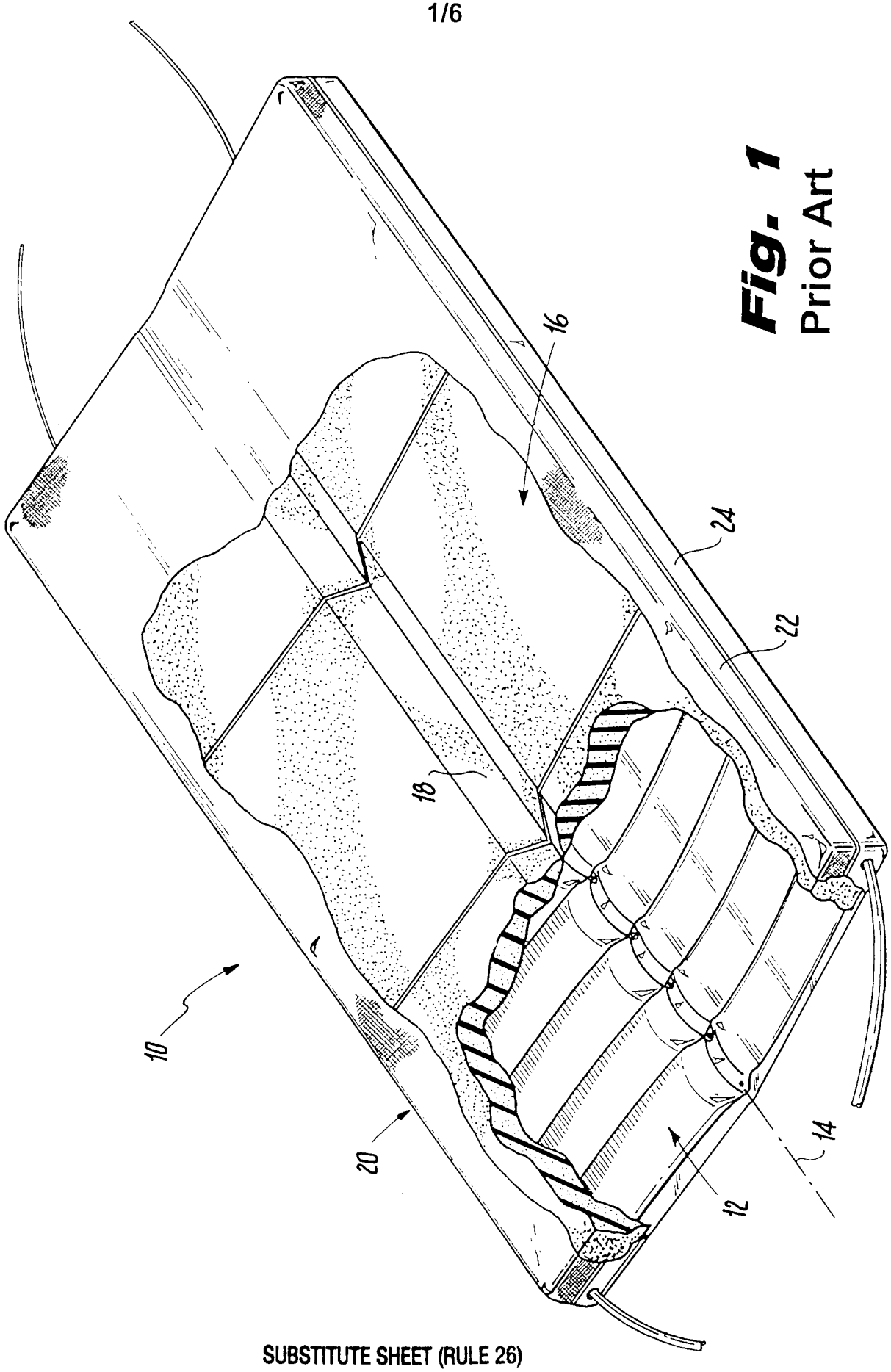

Fig. 1
Prior Art

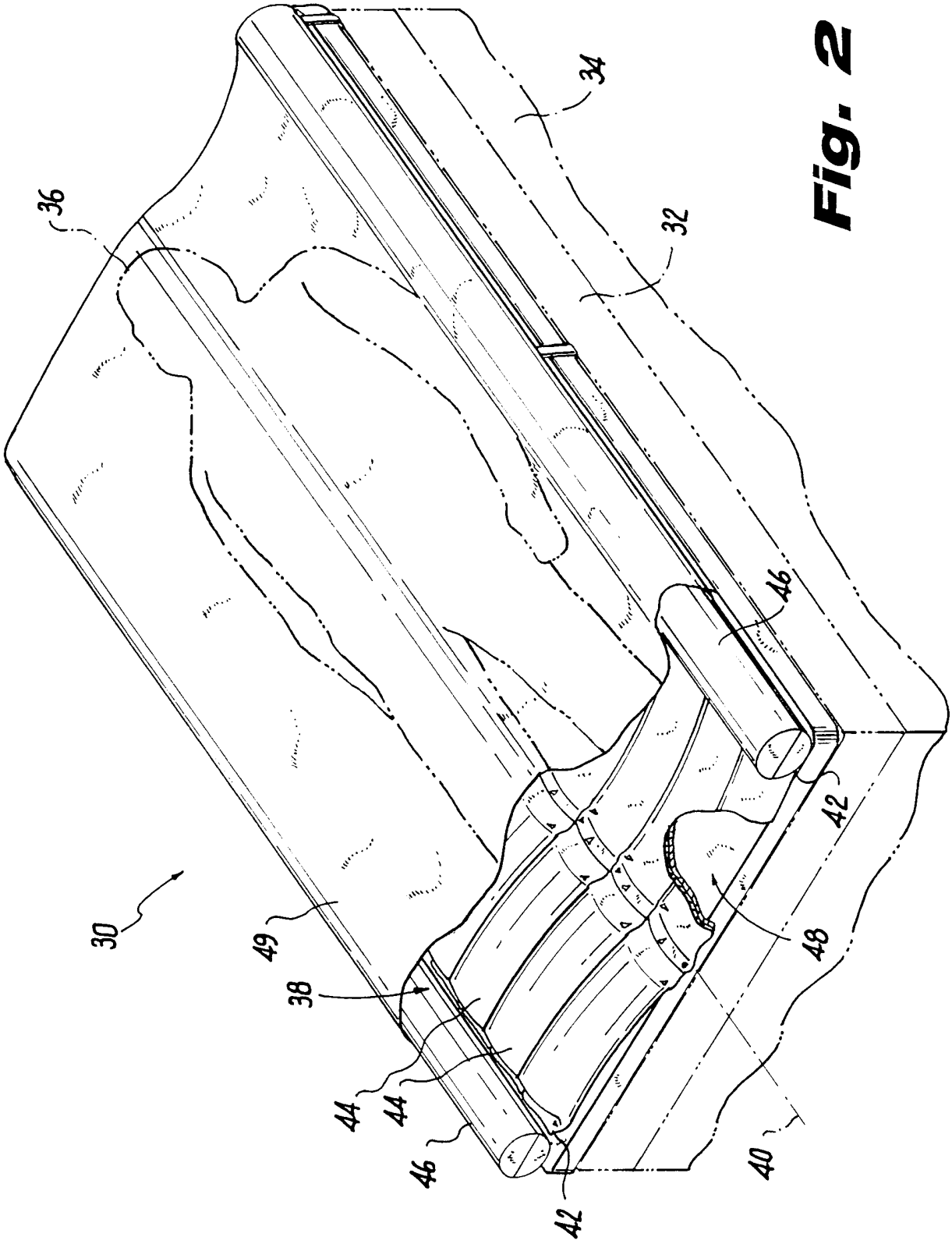

Fig. 2

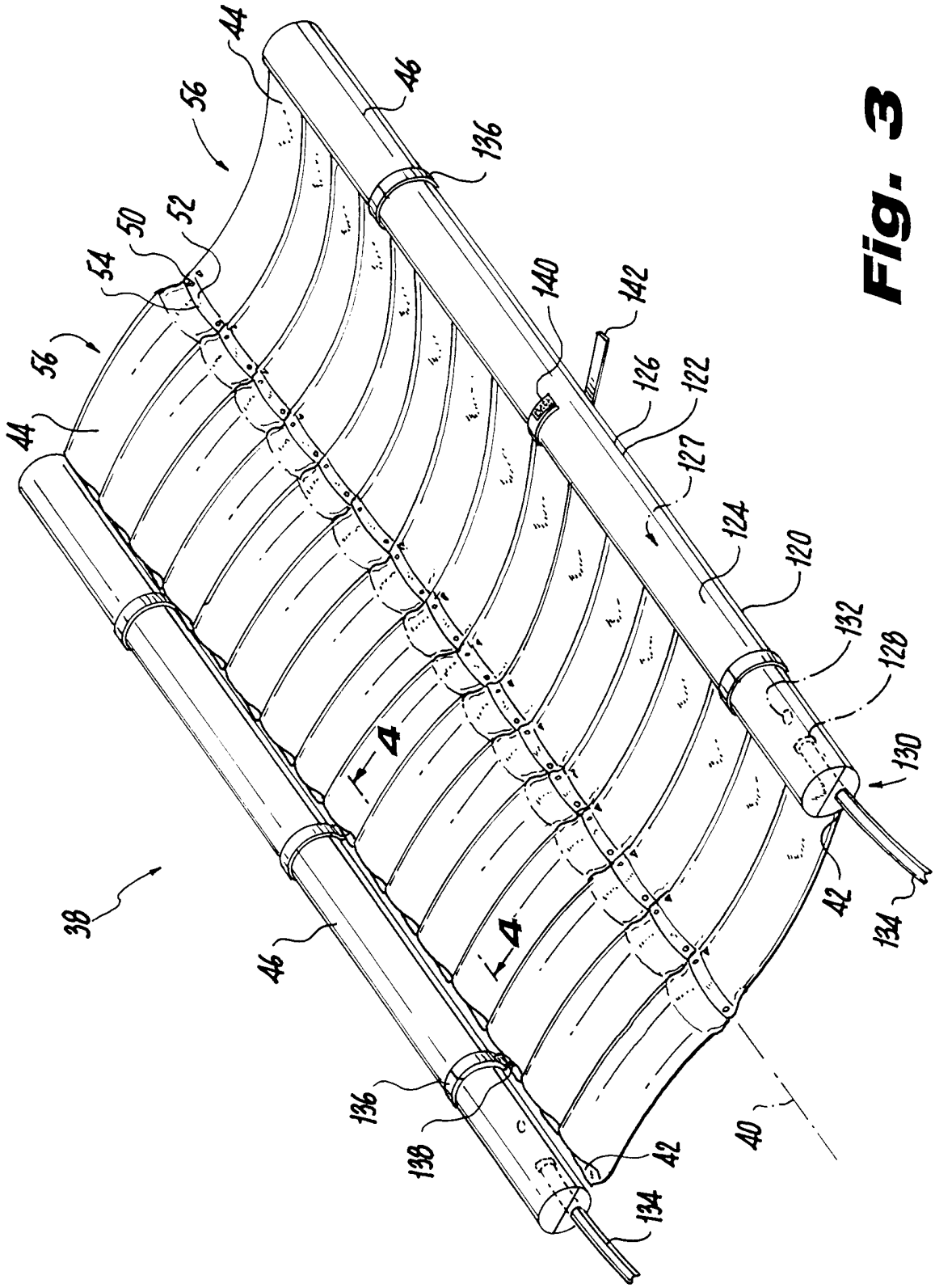
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Fig. 3

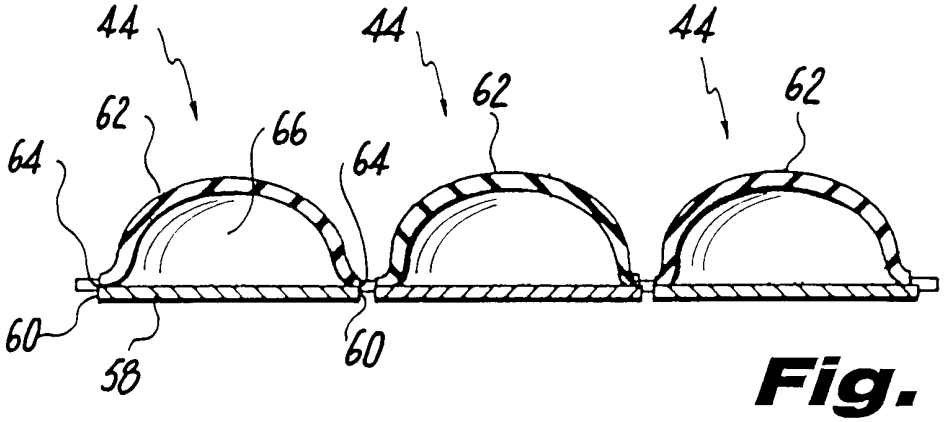
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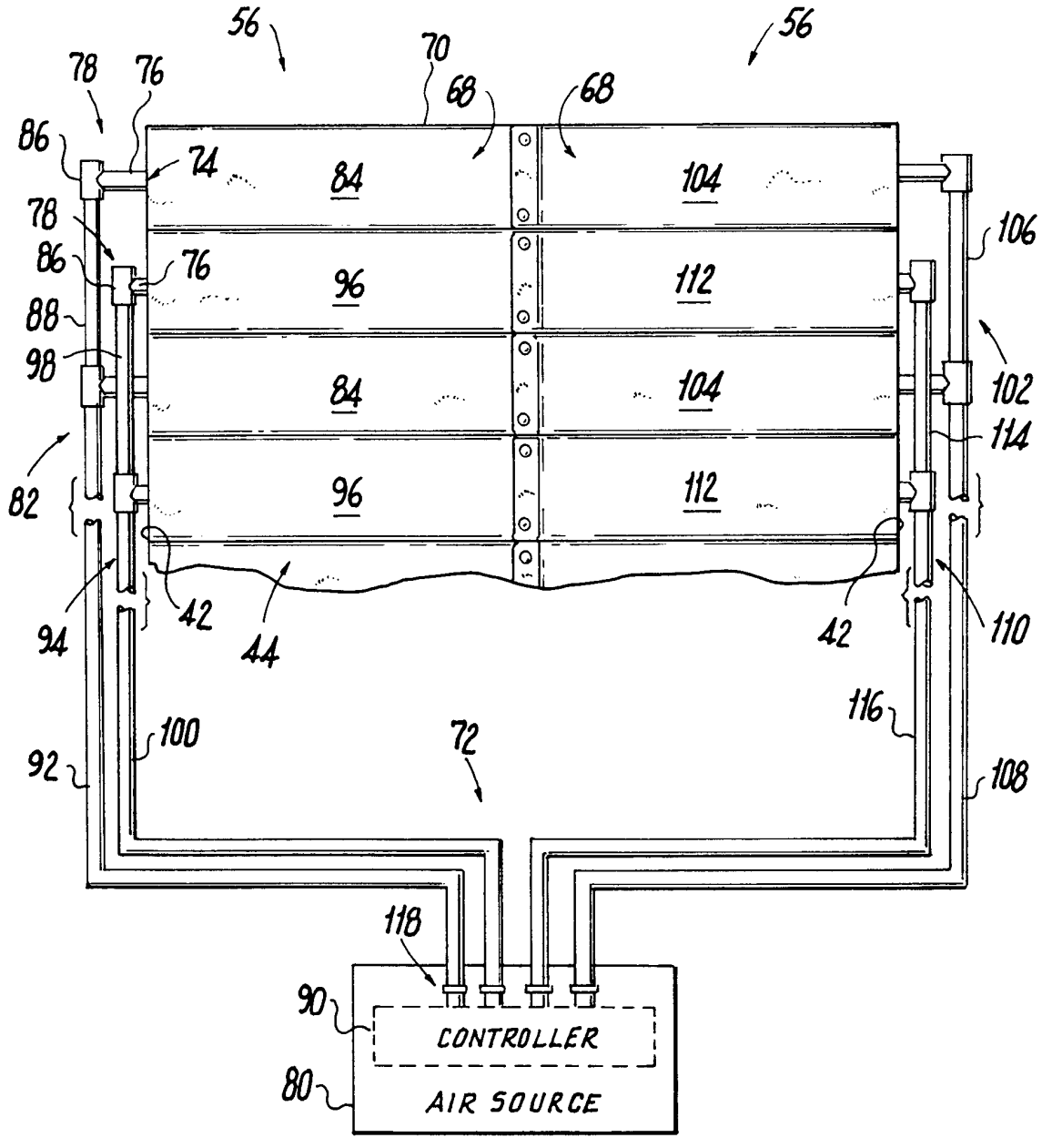
Fig. 4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CONTROLLER
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AIR SOURCE

Fig. 5

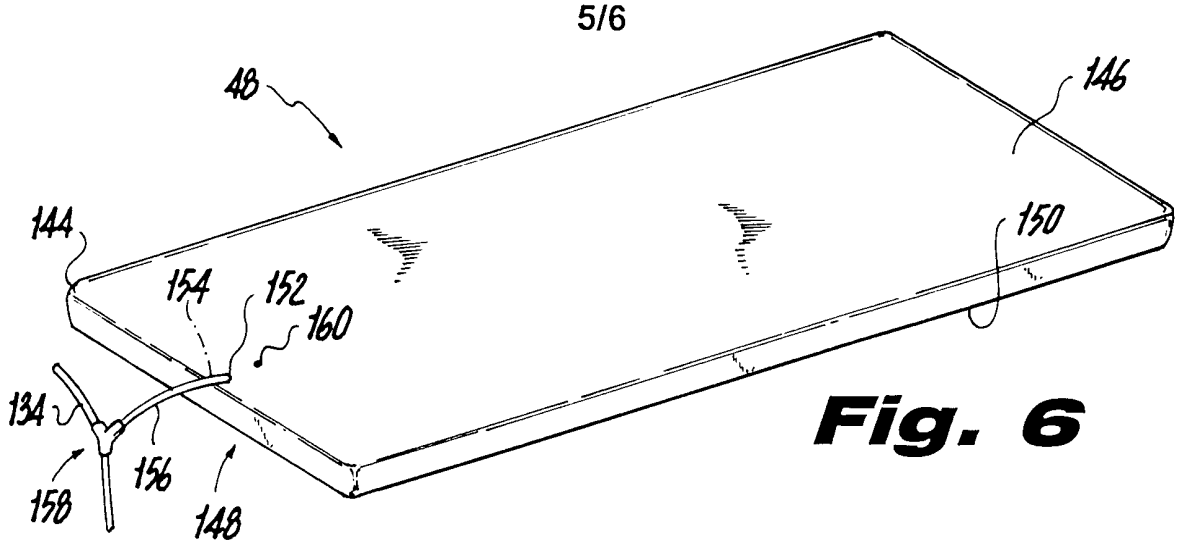

Fig. 6

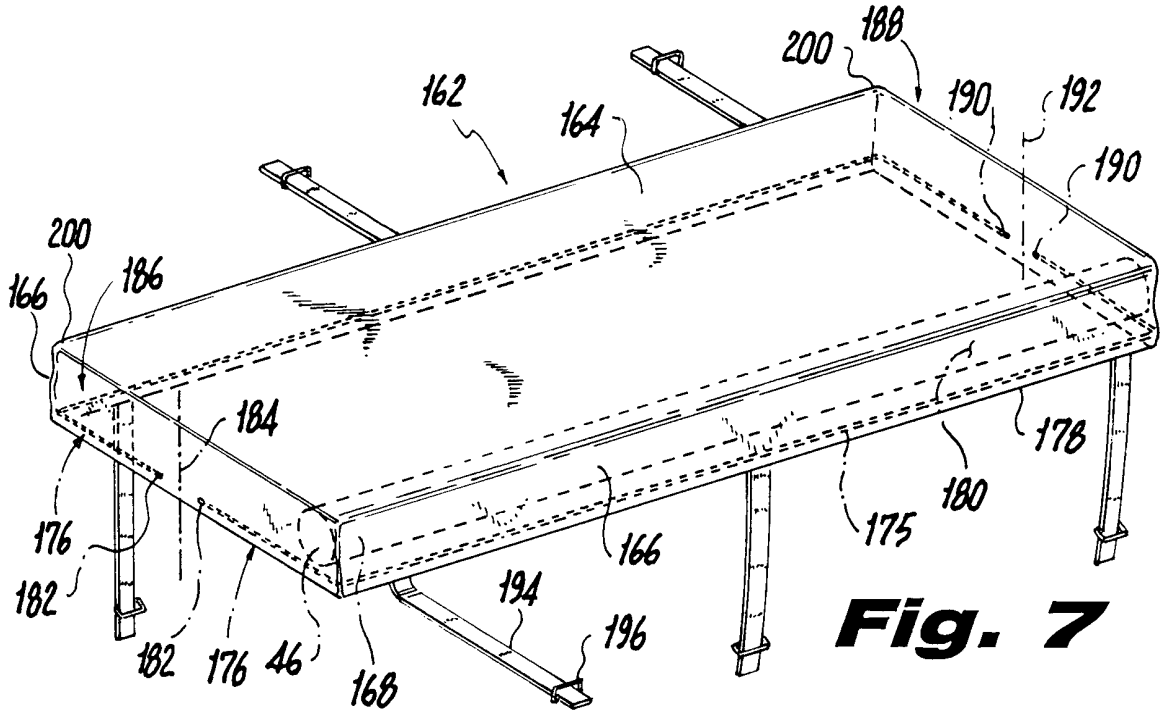

Fig. 7

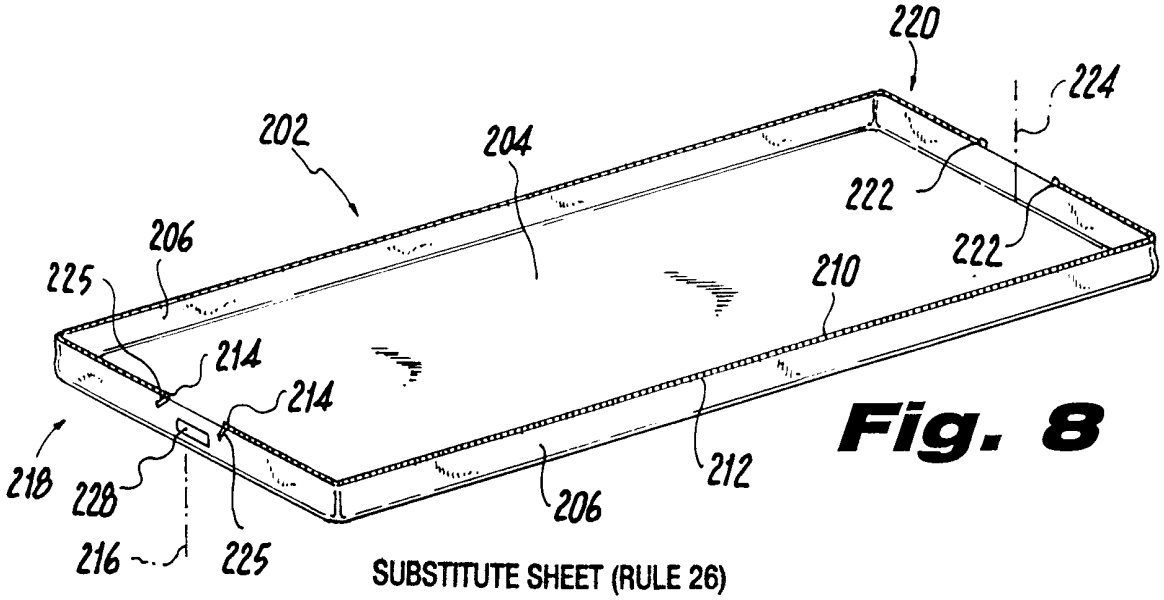

Fig. 8

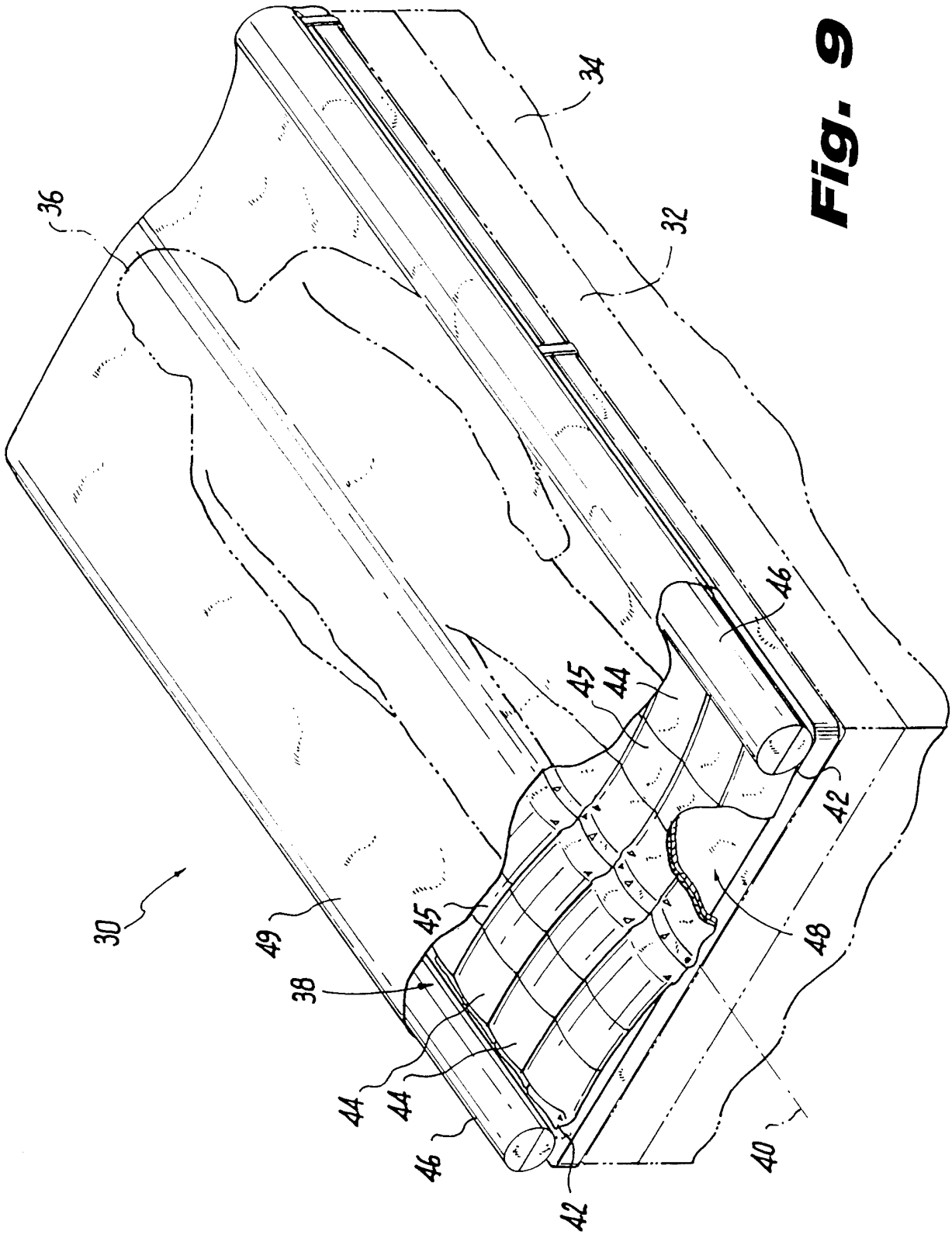

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/15066

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61G 7/057
US CL :5/713
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 5/713, 710, 715, 732, 738, 739, 411, 903

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, E	US 5,956,787 A (JAMES et al) 28 September 1999 (28/09/99), see the entire document.	1-21
A	US 5,774,917 A (LIU) 07 July 1998 (07/07/98), see Figure 5.	1
A	US 5,619,764 A (LOPAU) 15 April 1997 (15/04/97), see Figures 1 and 2.	1
A	US 5,092,007 A (HASTY) 03 March 1992 (03/03/92), see Figure 6.	1
A	US 5,745,942 A (WILKERSON) 05 May 1998 (05/05/98), see Figures 1 and 2.	1
A	US 5,267,364 A (VOLK) 07 December 1993 (07/12/93), see Figures 1 and 3-6.	1-21

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
07 OCTOBER 1999

Date of mailing of the international search report
05 NOV 1999

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Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/15066

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,394,577 A (JAMES et al) 07 March 1995 (07/03/95), see Figure 1.	1-21