US 20080022461A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2008/0022461 A1**

Bartlett et al. (43) **Pub. Date: Jan. 31, 2008**

(54) **PATIENT SUPPORT WITH WELDED MATERIALS**

(75) Inventors: **Alan L. Bartlett**, New Braunfels, TX (US); **Cesar Z. Lina**, Universal City, TX (US); **John H. Vrzalik**, San Antonio, TX (US)

Correspondence Address:
KINETIC CONCEPTS, INC.
LEGAL DEPARTMENT INTELLECTUAL PROPERTY
P.O. BOX 659508
SAN ANTONIO, TX 78265

(73) Assignee: **KCI Licensing, Inc., Legal Department, Intellectual Property**, San Antonio, TX (US)

(21) Appl. No.: **11/780,119**

(22) Filed: **Jul. 19, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/833,460, filed on Jul. 26, 2006.

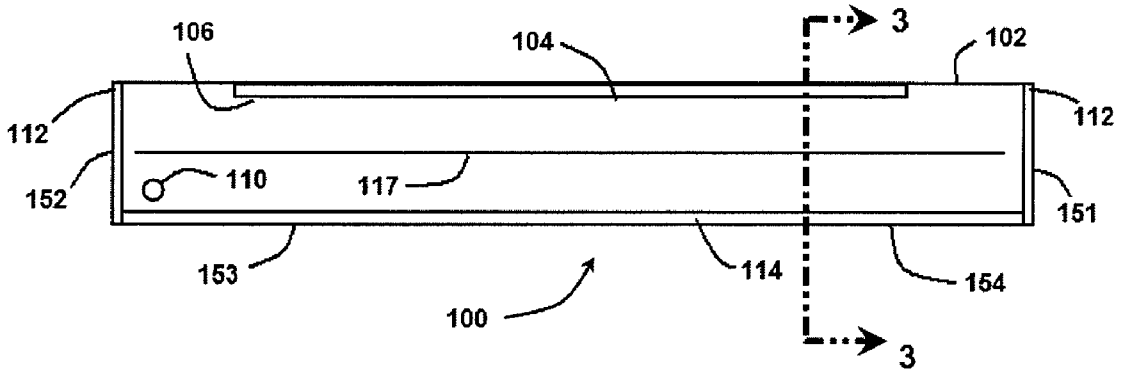
Publication Classification

(51) **Int. Cl.**
A47C 21/04 (2006.01)

(52) **U.S. Cl.** **5/714**; 5/706; 5/724

(57) **ABSTRACT**

Apparatus, systems, and methods to support a patient or other person include a first material that is substantially air impermeable welded to a second material that is substantially air permeable and liquid impermeable. The first material may also be liquid and vapor impermeable and the second material may be vapor permeable. Exemplary embodiments may include an inflatable enclosure formed from a sheet of the first material with an aperture, and the second material may cover a portion of the aperture.



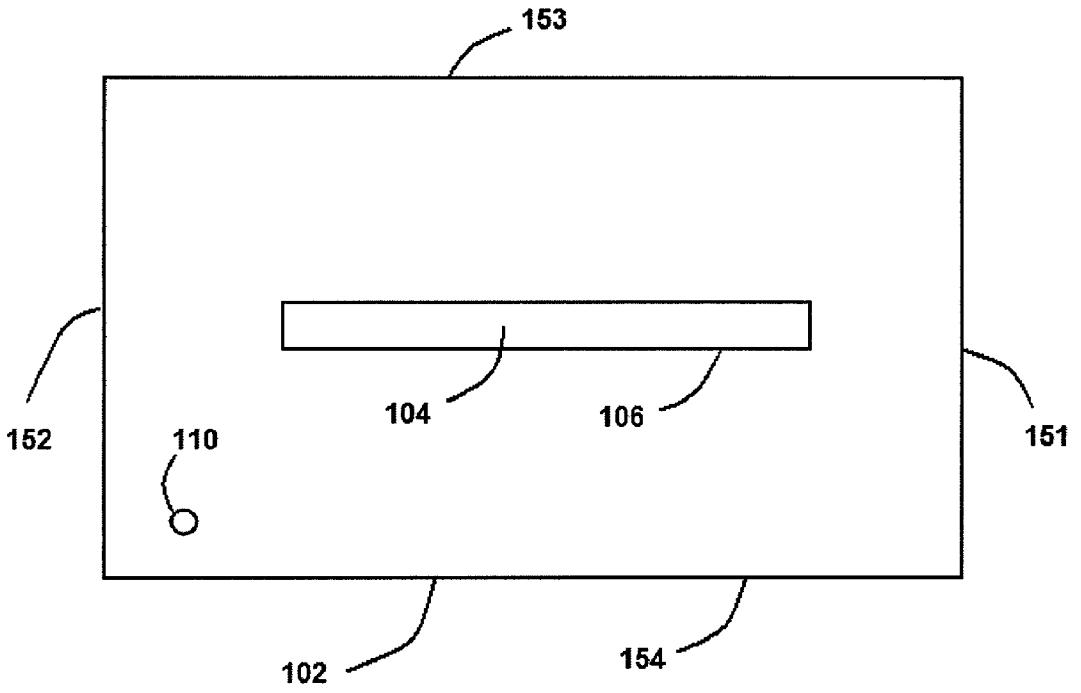


FIG. 1

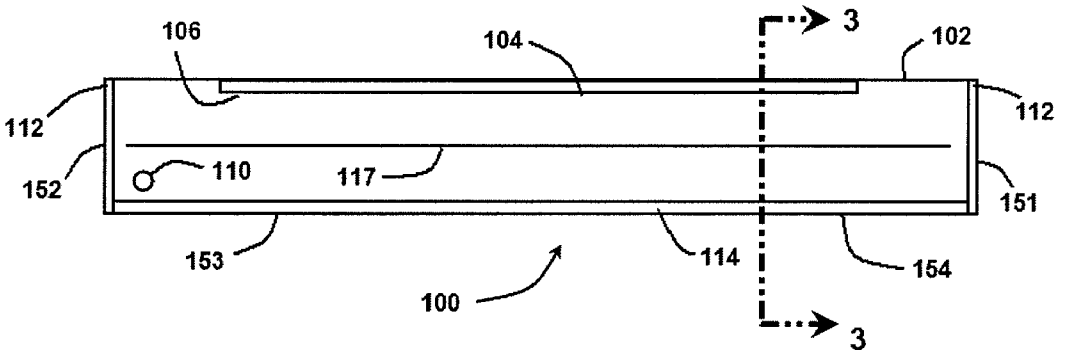

106
104
3
102
112
112
152
110
117
151
153
114
154
100
3

FIG. 2

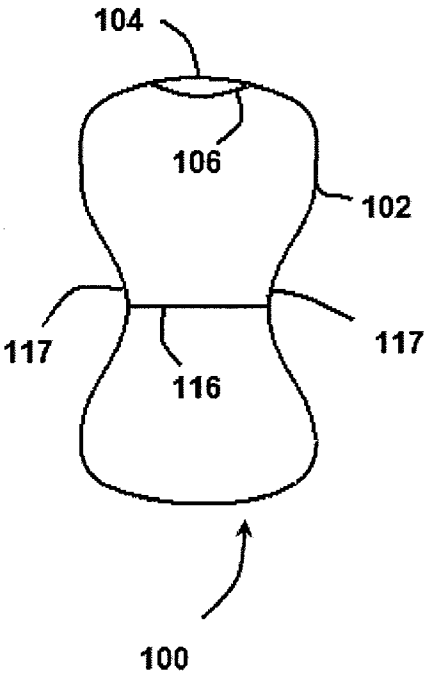

104
106
102
117
117
116
100

FIG. 3

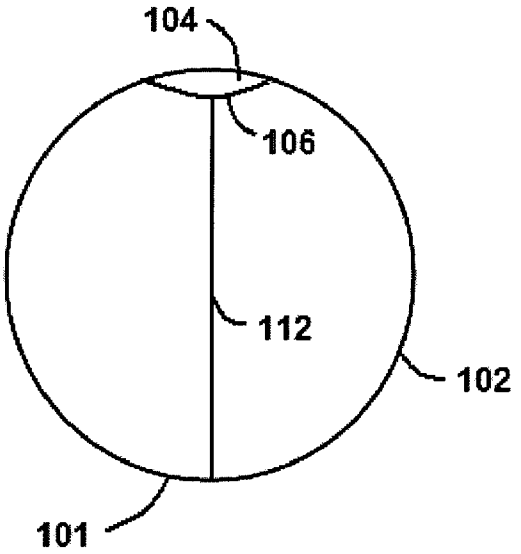


FIG. 4

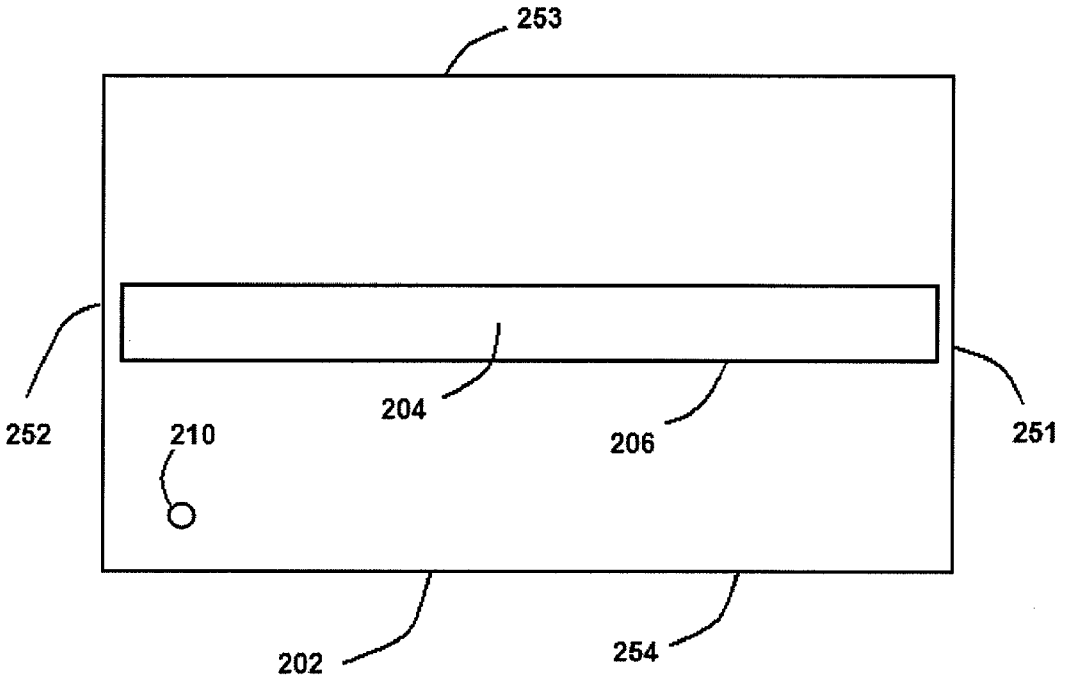


FIG. 5

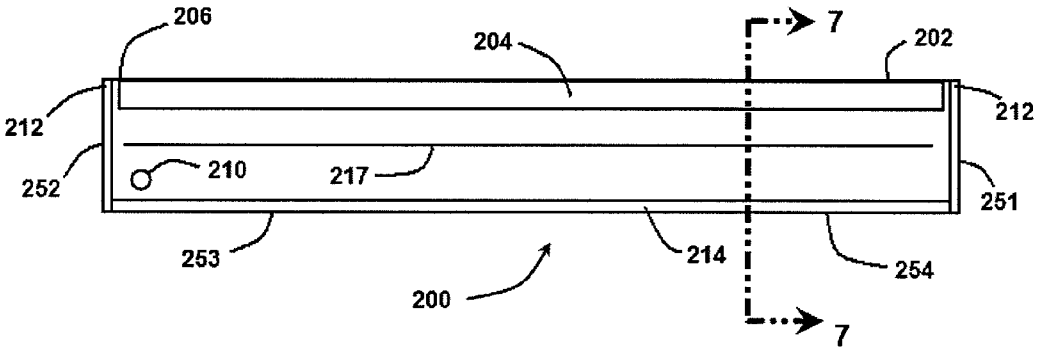

206
204
7
202
212
212
252
210
217
251
253
214
254
200
7

FIG. 6

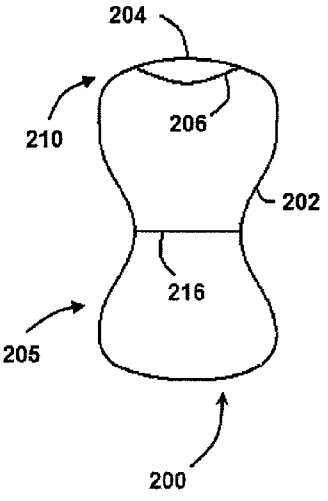

204
210
206
202
216
205
200

FIG. 7

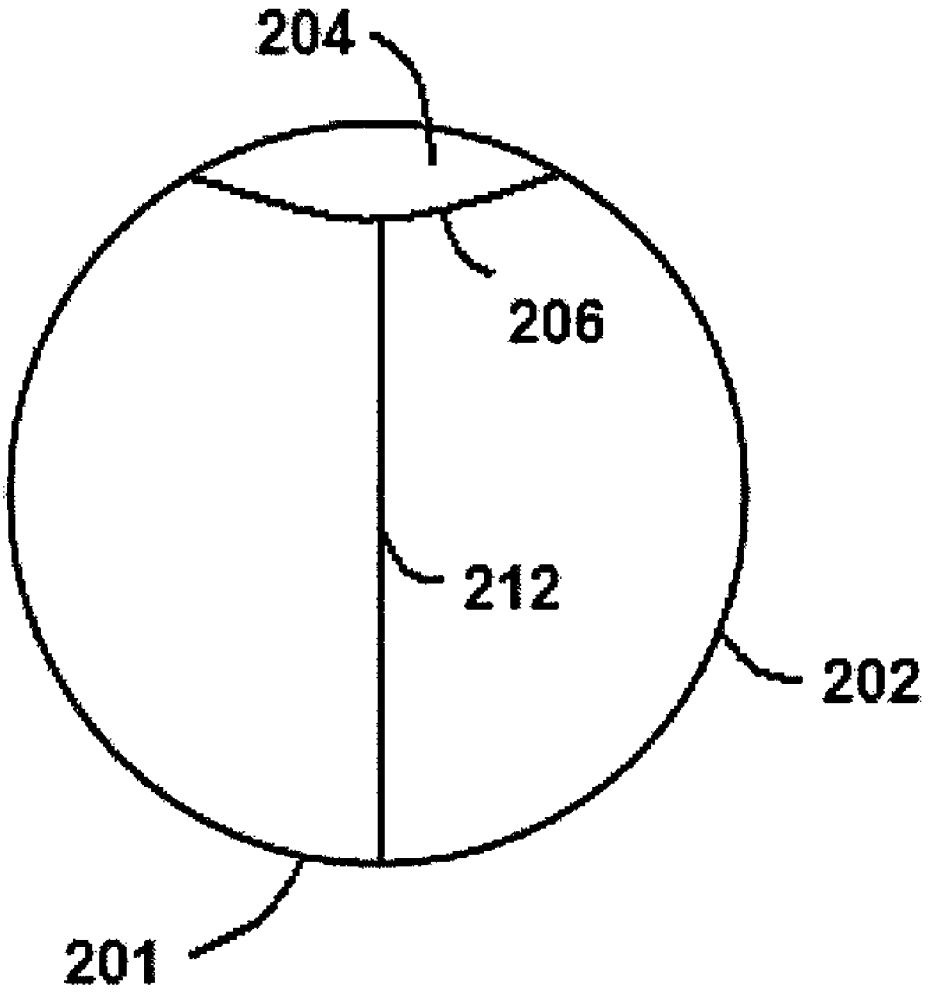


FIG. 8

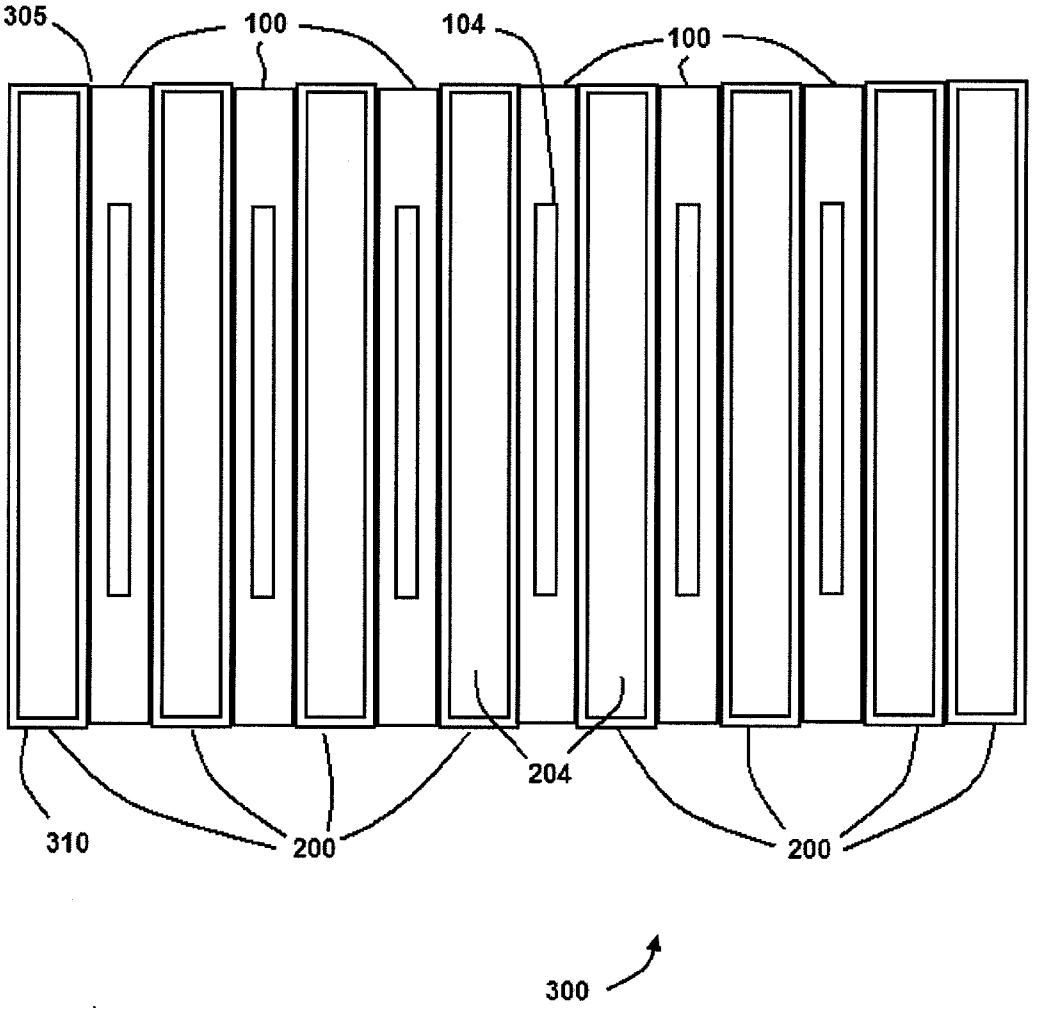


FIG. 9

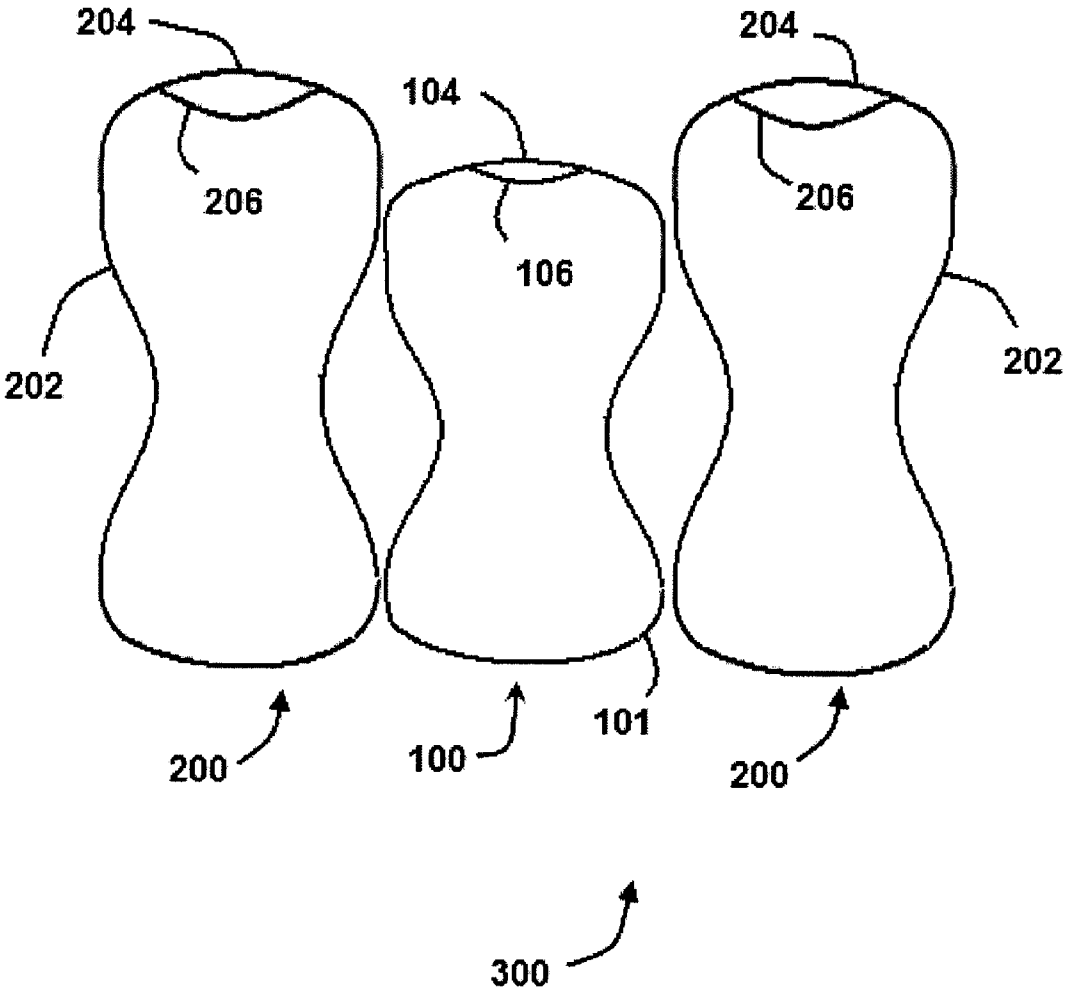


FIG. 10

PATIENT SUPPORT WITH WELDED MATERIALS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 60/833,460, filed Jul. 26, 2006, which is incorporated by reference herein without disclaimer.

FIELD OF THE INVENTION

[0002] The present disclosure relates generally to systems and methods for supporting patients or other persons, and more particularly but not by way of limitation to systems and methods for supporting patients or other persons with materials that have been coupled or joined by welding.

BACKGROUND

[0003] Patient support surfaces, including therapeutic surfaces, are common in medical settings such as hospitals, clinics, and patients' homes, among other places. Some surfaces (commonly referred to as "low air loss" surfaces) include inflatable enclosures that flow air through air permeable materials adjacent to the patient in an effort to prevent or treat pressure ulcers.

[0004] The treatment and/or prevention of pressure ulcers are serious and expensive issues in the health care industry. Pressure ulcer development is related, in part, to the accumulation of heat and perspiration on the skin. Heat and moisture increase skin susceptibility to the damaging effects of pressure and shear and decrease the resiliency of the epidermis to external forces. Ongoing compressive forces on skin tissues are known to promote ischemia with subsequent development of pressure ulcers. Therefore, controlling the microclimate of the skin and providing a quality patient support system appear to be necessary to prevent pressure ulcers.

[0005] Low-air-loss (LAL) broadly refers to a system comprising a mattress casing, a vapor permeable coverlet with or without lofting or cushioning material, and an air delivery system to move air under the coverlet and, in some cases, to leak through the coverlet. Some LAL mattress systems function as integral parts of patient support systems; whereas, others are not actively coupled.

[0006] Currently, low-air-loss (LAL) mattress systems are the most prevalent tools used for pressure ulcer treatment and prevention. LAL mattress systems were developed and are used in the belief that they help to control the microclimate of the skin. These systems have been found to be highly effective in treating and/or preventing pressure ulcers.

[0007] Certain support surfaces comprise more than one material, with each material having different air, vapor, and liquid permeability properties. For example, it may be desirable to have a vapor permeable material adjacent to the patient's skin to allow moisture vapor to transfer away from the patient and into the support surface. It may also be desirable to have an air permeable material adjacent to the patient's skin to allow air to flow proximal to the patient and assist in removing moisture vapor from the patient and the support surface. Furthermore, it may be desirable for portions of the support surface to be air impermeable in order to restrict air flow and minimize power requirements and noise levels for the support system. For hygienic reasons, it may be desirable that the support surface comprise a liquid impermeable material.

[0008] LAL mattresses typically include a foundation of a series of interconnected air cells that allow air to flow through and exit the mattress. Other common elements include an adjustable pump that can maintain air inflation of the air cells. In addition to the mattress, the LAL mattress system also includes the coverlet (waterproof and/or vapor permeable), and coverlet lofting material (e.g., quilted polyester fabric batting) that attach over the mattress. The coverlet is typically made of one or more materials that are permeable to moisture, is impermeable to bacteria, and is waterproof. Coverlets also function to prevent excessive loss of body heat, have high moisture vapor permeability to minimize/prevent the accumulation of perspiration on the skin, and have high air porosity for removal of excessive body heat through a continuous airflow provided by the LAL mattress. Together, the LAL mattress and the coverlet form the LAL mattress system.

[0009] The LAL mattress can further include a fabric cover over the foundation (i.e., the air cells). In some cases, this fabric cover is formed from a GORE-TEX® fabric that is formed integrally with the air cells. The GORE-TEX® fabric is liquid impermeable and has significantly higher air-permeable and vapor permeable characteristics as compared to urethane-backed nylon materials used in other mattresses. The GORE-TEX® fabric moisture vapor transfer characteristics help to prevent or speed up healing of pressure ulcers in patients by reducing the amount of moisture buildup on the skin and by helping to keep patients cooler by allowing body heat to more easily escape.

[0010] It is therefore desirable to construct a support surface from different types of materials. As a result, it is often necessary to couple or join different types of material used to form the support surface.

SUMMARY

[0011] Exemplary embodiments of the present disclosure are directed to apparatus, systems, and methods to support a patient or other person. Exemplary embodiments comprise a first air impermeable material welded to a second material that is air permeable and liquid impermeable. In exemplary embodiments, the first material is liquid and vapor impermeable and the second material is vapor permeable. In exemplary embodiments, an inflatable enclosure is formed from a sheet of the first material with an aperture, and the second material covers a portion of the aperture. In other exemplary embodiments, an inflatable enclosure may be formed by several individual panels of the first material welded to a panel of the second material.

[0012] Exemplary embodiments comprise a support member comprising an, inflatable enclosure having a first material and a second material, wherein the first material is substantially air impermeable, the second material is air permeable and substantially liquid impermeable, and the second material is welded to the first material. In exemplary embodiments, the first material comprises an aperture and the second material covers a portion of the aperture. In other exemplary embodiments, the second material is high frequency (HF) welded to the first material. In still other exemplary embodiments, the second material is vapor permeable. Certain exemplary embodiments comprise an internal baffle. In still other exemplary embodiments, the first

material is urethane. Certain exemplary embodiments comprise an opening configured to be coupled to a source of pressurized fluid.

[0013] Other exemplary embodiments comprise an apparatus for supporting a person, comprising: a sheet comprising a first material, wherein the first material is substantially air impermeable; an aperture in the sheet; a second material covering the aperture, wherein the second material is air permeable and substantially liquid impermeable and the second material is welded to the first material. In certain exemplary embodiments, the sheet comprises a first end, a second end, a first side and a second side; the first side is coupled to the second side; the first end is sealed; and the second end is sealed, so that the sheet is configured to form an elongated inflatable enclosure. In exemplary embodiments, the sheet is configured to form a generally cylindrical enclosure when inflated. Certain exemplary embodiments comprise an internal baffle, wherein the elongated inflatable enclosure has a cross-section having a height and a width, wherein the height is greater than the width. In exemplary embodiments, the second material is high frequency (HF) welded to the first material. In certain exemplary embodiments, the second material is vapor permeable and/or the first material is urethane. In certain exemplary embodiments, the sheet comprises an opening configured to be coupled to a source of pressurized fluid.

[0014] Other exemplary embodiments comprise a support system comprising: a plurality of first and second support members, wherein the first support members are a first height and comprise a first material that is substantially air impermeable and the second support members are a second height and comprise a second material that is air permeable and substantially liquid impermeable. In exemplary embodiments, the first height is greater than the second height and a second support member is located between two first support members. In exemplary embodiments, the second material is vapor permeable. In certain exemplary embodiments, the first support members comprise a vapor permeable and liquid impermeable third material. In other exemplary embodiments, a first source of pressurized fluid is coupled to the first support member and coupled to the second support member. In still other exemplary embodiments, a first source of pressurized fluid is coupled to the first support member and a second source of pressurized fluid is coupled to the second support member.

[0015] Other exemplary embodiments comprise a method of manufacturing a support member, the method comprising: providing a sheet of first material, wherein the first material is air impermeable; creating an aperture in the sheet; covering a portion of the aperture with a second material, wherein the second material is air permeable and liquid impermeable; welding the second material to the first material; and configuring the sheet to form an inflatable enclosure. In exemplary embodiments, the second material is high frequency welded to the first material.

BRIEF DESCRIPTION OF THE FIGURES

[0016] While exemplary embodiments of the present invention have been shown and described in detail below, it will be clear to the person skilled in the art that changes and modifications may be made without departing from the scope of the invention. As such, that which is set forth in the following description and accompanying figures is offered by way of illustration only and not as a limitation. The actual scope of the invention is intended to be defined by the following claims, along with the full range of equivalents to which such claims are entitled.

[0017] In addition, one of ordinary skill in the art will appreciate upon reading and understanding this disclosure that other variations for the invention described herein can be included within the scope of the present invention. For example, exemplary embodiments are disclosed with a single sheet configured to form an inflatable enclosure. In other exemplary embodiments, the inflatable enclosure may comprise multiple panels coupled to form an inflatable enclosure. For example, exemplary embodiments may comprise an inflatable enclosure with separate top, bottom, side and end panels.

[0018] In the following Detailed Description of Disclosed Embodiments, various features are grouped together in several embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that exemplary embodiments of the invention require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus, the following claims are hereby incorporated into the Detailed Description of Disclosed Embodiments, with each claim standing on its own as a separate embodiment.

[0019] The following Figures are referenced herein. The Figures illustrating the exemplary embodiments are not to scale.

[0020] FIG. **1** provides a top view of one exemplary embodiment of a support system component according to the present disclosure.

[0021] FIG. **2** provides a side view of one exemplary embodiment of a support member according to the present disclosure.

[0022] FIG. **3** provides a cross-section view of one exemplary embodiment of a support member according to the present disclosure.

[0023] FIG. **4** provides an end view of one exemplary embodiment of a support member according to the present disclosure.

[0024] FIG. **5** provides a top view of one exemplary embodiment of a support system component according to the present disclosure.

[0025] FIG. **6** provides a side view of one exemplary embodiment of a support member according to the present disclosure.

[0026] FIG. **7** provides a cross-section view of one exemplary embodiment of a support member according to the present disclosure.

[0027] FIG. **8** provides an end view of one exemplary embodiment of a support member according to the present disclosure.

[0028] FIG. **9** provides a top view of a one exemplary embodiment of a support system according to the present disclosure.

[0029] FIG. **10** provides a side view of a one exemplary embodiment of a support system according to the present disclosure.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0030] Exemplary embodiments of the present disclosure are directed to an apparatus that functions as a patient

support surface or therapeutic surface formed from multiple materials that exhibit various properties and are joined at various locations using a welding technique to produce a biologically sealed and controlled air loss surface. In certain exemplary embodiments, the welding technique used to couple or join the materials is a high frequency (HF) welding technique. The materials may comprise varying properties, including liquid, vapor, and air permeability, as well as friction coefficients.

[0031] For example, in exemplary embodiments of the present disclosure, HF welding, also referred to as dielectric welding or radio frequency (RF) welding can be used to join a urethane based material to a polytetrafluoroethylene (PTFE or Teflon)-based material such as GORE-TEX®, to form a support cushion having low-air-loss features, antimicrobial features, structurally sound features, and controlled air loss features, among others.

[0032] High frequency welding is a process that uses high frequency radio energy to produce molecular agitation, and therefore heat, in various types of materials so as to fuse the materials together. Thus, in various embodiments, materials used to form support surfaces and therapeutic surfaces of the present disclosure that are capable of being HF welded are contemplated and are not limited to urethane based materials and Teflon based materials such as GORE-TEX®.

[0033] Exemplary embodiments of the process involve subjecting the materials to be fused or joined to a high frequency (between ~13 and ~100 MHz) electromagnetic field, which is normally applied between two metal surfaces (e.g., metal bars). These surfaces also function as pressure applicators during heating and cooling. The electromagnetic field causes the molecules in polar thermoplastics to oscillate and thus, depending on their geometry and dipole moment, these molecules may translate some of this oscillatory motion into thermal energy and cause heating of the material and eventually, the joining or fusing of the material.

[0034] HF welding is useful for joining polymers that have strong dipoles, such as polyvinyl chloride (PVC), polyurethanes, and polyamides, among others. It is possible to RF weld other polymers including nylon, Polyethylene Terephthalate (PET), Ethylene Vinyl Acetate (EVA) and some Acrylonitrile Butadiene Styrene (ABS) resins, among others.

[0035] In various exemplary embodiments, other forms of welding are also contemplated. Hot gas welding, hot plate welding, ultrasonic welding, vibration or friction welding, laser welding, and solvent welding, among others may be implemented. As one of ordinary skill in the art will appreciate, some of these forms of welding might be more conducive to welding various plastics and other materials than other forms of welding and thus, the types of materials to be welded to form a patient support surface and/or therapeutic surface of the present disclosure can be chosen based upon the form of welding desired or vice versa.

[0036] The Figures herein follow a numbering convention in which the first digit or digits correspond to the drawing Figure number and the remaining digits identify an element or component in the drawing. Similar elements or components between different Figures may be identified by the use of similar digits. For example, an element in FIG. **1** may be referenced as **110**, and a similar element may be referenced as **210** in FIG. **2**. As will be appreciated, elements shown in the various exemplary embodiments herein can be added, exchanged, and/or eliminated so as to provide any number of additional embodiments of the support members and support systems of the present disclosure.

[0037] Referring now to FIG. **1**, a sheet **102** comprises an aperture **106**. In the exemplary embodiment shown in FIG. **1**, sheet **102** comprises a first end **151**, a second end **152**, a first side **153**, and a second side **154**. In exemplary embodiments, sheet **102** is comprised of a substantially air impermeable material. In a particular exemplary embodiment, sheet **102** is comprised of a material that is also substantially vapor and liquid impermeable, such as urethane-backed nylon. As shown in FIG. **1**, a material **104** covers aperture **106** (or a portion thereof). In exemplary embodiments, material **104** is substantially air permeable. In certain exemplary embodiments, material **104** may be a substantially vapor permeable and liquid impermeable material comprising PTFE, such as GoreTex®.

[0038] In the exemplary embodiment shown in FIG. **1**, material **104** is welded to sheet **102** around the perimeter of aperture **106**. In particular exemplary embodiments, material **104** is welded to sheet **102** via a high frequency welding process. In the exemplary embodiment shown, sheet **102** comprises an opening **110** which may be connected to a source (not shown) of pressurized air or other fluid.

[0039] In exemplary embodiments, material **104** may be sized so that it is slightly larger than aperture **106** and overlaps sheet **102** at the perimeter of aperture **106**. In such exemplary embodiments, material **104** may be lap welded to sheet **102**. In other exemplary embodiments, material **104** may be sized so that it is substantially the same size as aperture **106**. In such exemplary embodiments, a ring of backing material (not shown) may be placed at the junction of material **104** and sheet **102** to allow a butt-weld to be formed between material **104** and sheet **102**. In certain exemplary embodiments, the backing material may be comprised of the same material as sheet **102**.

[0040] In the exemplary embodiment shown in FIG. **1**, aperture **106** is approximately centered between first side **153** and second side **154**. In the exemplary embodiment shown in FIG. **1**, aperture **106** also extends along a majority of the length of sheet **102**.

[0041] Referring now to FIGS. **2** and **3**, sheet **102** can be configured to form a support member **100** that can be inflated with air or another pressurized fluid. In the exemplary embodiment shown in FIGS. **2** and **3**, sheet **102** has been arranged so that first side **153** is coupled to second side **154**. In addition, first end **151** and second end **152** have been sealed so that sheet **102** forms an elongated enclosure. In exemplary embodiments, first side **153** is coupled to second side **154** via welding to form a flat seam weld **114** and first end **151** and second end **152** are sealed via welding to form a pair of flat seam welds **112**. In certain exemplary embodiments, first side **153** is high frequency welded to second side **154** and first end **151** and second end **152** are sealed via high frequency welding. In exemplary embodiments, opening **110** can be connected, for example, to an air pump (not shown) to move air into the support member **100** to both inflate the support member **100** and to maintain a partial pressure difference of vapor and thus, aid in moisture and heat removal from the patient and from the environment surrounding the patient.

[0042] FIG. **3** illustrates a cross-section of FIG. **2** taken at section line **3-3**. As shown in the exemplary embodiment of FIG. **3**, support member **100** may incorporate a baffle **116** that extends across support member **100**. In this exemplary

embodiment, each end of baffle **116** is coupled to sheet **102** so the cross-section of support member **100** is narrower than it is high. In the exemplary embodiment shown in FIG. **3**, baffle **116** is sized so that the cross-section of support member generally forms an hourglass or "figure-8" shape with an indentation **117** at each side of support member **100**. The incorporation of baffle **116** provides a narrower cross-section for support member **100** and allows for a greater number of support members **100** to be incorporated into a patient support system.

[0043] FIG. **4** illustrates an end view of an exemplary embodiment of a support member **101** that does not incorporate a baffle. As shown, the cross-section of support member **100** in FIG. **4** is a generally circular shape. Other features are generally equivalent to those disclosed in the discussion of FIG. **3**.

[0044] Referring now to FIGS. **5-8**, an exemplary embodiment of a support member **200** comprises a lower portion **205** with a cap or upper portion **210**. Exemplary embodiments of support member **200** are similar to those of support member **100**. However, exemplary embodiments of support member **200** comprise a material **204** that is substantially air impermeable, rather than the air permeable material **104** used in support member **100**. In exemplary embodiments, material **204** is also vapor permeable and liquid impermeable. In addition, exemplary embodiments of support member **200** comprise an aperture **206** that is larger than aperture **106** of support member **100**. In exemplary embodiments, aperture **204** extends substantially across the entire length of support member **200** so that it is proximal to first end **251** and second end **252**.

[0045] Similar to the construction techniques used to form support member **100**, exemplary embodiments of support member **200** may be formed by welding a first side **253** to a second side **254** and sealing first and second ends **251** and **252**. Material **204** may also be welded to sheet **202** to cover aperture **206** in exemplary embodiments.

[0046] In other embodiments, support member **200** may be constructed in other manners. For example, support member **200** may comprise separate pieces of material, rather than a single sheet **202** with an aperture **206**.

[0047] In the exemplary embodiment shown in FIG. **7**, sheet **202** has been formed into a support member with an hourglass or "figure-8" cross-section. In this exemplary embodiment, support member **202** incorporates a baffle **216**. As shown in the exemplary embodiment of FIG. **8**, sheet **202** may also be formed into a support member **201** that is generally cylindrical with a circular cross section in certain exemplary embodiments.

[0048] Referring now to FIGS. **9** and **10**, an exemplary embodiment of a support system **300** comprises a first set of support members **100** and a second set of support members **200**. As shown in the top view of FIG. **9**, support members **100** and **200** are arranged in a generally alternating configuration so that a support member **100** is located between two support members **200**. Support members **100** and **200** may be inflated with pressurized air or another source of fluid.

[0049] As shown in the partial side view of the exemplary embodiment in FIG. **10**, support members **200** are taller than support members **100**. In exemplary embodiments, support members **200** are comprised of material **202** that is substantially air impermeable with a cap of material **204** that is air impermeable and vapor permeable. In exemplary embodiments, support members **100** comprise a material **102** that is air impermeable and a cap of material **104** that is air permeable and liquid impermeable. In exemplary embodiments, support members **200** will provide primary support for a person (not shown) laying on support member **300**. In exemplary embodiments, air can flow through support members **100** and exit material **104** covering aperture **106**. Such air flow can assist in transferring moisture vapor from a person's body as they lay on support system **300**. Air flow may also assist in removing moisture vapor from support members **100**.

[0050] In exemplary embodiments, moisture vapor may transfer from a person through material **204** and into support member **200**. In the exemplary embodiment shown in FIG. **9**, material **204** extends nearly to edges **305** and **310** of support system **300**. Therefore, a significant portion of material **204** will not be in contact with a person laying on support system **300**. As a result, moisture vapor can also exit support member **200** via material **204**. In exemplary embodiments, increasing the area covered by material **204** will increase the rate at which moisture vapor can be transferred from a person being supported by support system **300**.

[0051] In the exemplary embodiment shown in FIGS. **9** and **10**, support system **300** is configured to reduce the amount of air flow needed to support a person and provide moisture vapor transfer capabilities. Primary support is provided by support members **200**, which comprise material that is substantially air impermeable, and therefore requires minimal air flow to remain inflated and provide support. Support members **100** comprise material **104** which is air permeable and therefore requires more airflow than support members **200** to stay inflated. The amount of air (or other pressurized fluid) required to inflate support members **100** and **200** can be reduced because the air flow is restricted to areas covered by material **104**. In addition, the power requirements and noise levels of equipment needed to inflate support members **100** and **200** are also reduced. In certain exemplary embodiments, support members **100** may be coupled to one source of pressurized fluid and support members **200** may be coupled to a second source of pressurized fluid. In such exemplary embodiments, each source of pressurized fluid can be configured to the operating parameters required. For example, the source of pressurized fluid for support members **100** may be a lower pressure, higher volume source than the source of pressured fluid for support members **200**.

[0052] In exemplary embodiments, support members **100** and **200** can be welded together to form the contiguous patient support surface system **300**. In other embodiments, the support members **100** and **200** can be enclosed by a cover (not shown) to form the contiguous patient support surface **300**.

[0053] While exemplary embodiments have been shown and described in detail above, it will be clear to the person skilled in the art that changes and modifications may be made without departing from the scope of the invention. As such, that which is set forth in the foregoing description and accompanying drawings is offered by way of illustration only and not as a limitation. The actual scope of the invention is intended to be defined by the following claims, along with the full range of equivalents to which such claims are entitled.

[0054] In addition, one of ordinary skill in the art will appreciate upon reading and understanding this disclosure

that other variations for the invention described herein can be included within the scope of the present invention. For example, the patient support surface can be coated with an antimicrobial agent, as are known or will be known.

[0055] In the foregoing Detailed Description, various features are grouped together in several embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the embodiments of the invention require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus, the following claims are hereby incorporated into the Detailed Description, with each claims standing on its own as a separate embodiment.

We claim:

1. A support member comprising:
an inflatable enclosure comprising a first material and a second material, wherein:
the first material is substantially air impermeable;
the second material is air permeable and substantially liquid impermeable; and
the second material is welded to the first material.

2. The support member of claim **1** wherein the first material comprises an aperture and the second material covers a portion of the aperture.

3. The support member of claim **1**, wherein the second material is high frequency (HF) welded to the first material.

4. The support member of claim **1** wherein the second material is vapor permeable.

5. The support member of claim **1**, further comprising an internal baffle.

6. The support member of claim **1** wherein the first material comprises urethane and the second material comprises polytetrafluoroethylene.

7. The support member of claim **1** further comprising an opening configured to be coupled to a source of pressurized fluid.

8. An apparatus for supporting a person, the apparatus comprising:
a sheet comprising a first material, wherein the first material is substantially air impermeable;
an aperture in the sheet;
a second material covering the aperture, wherein the second material is air permeable and substantially liquid impermeable and the second material is welded to the first material.

9. The apparatus of claim **8** wherein:
the sheet comprises a first end, a second end, a first side and a second side;
the first side is coupled to the second side;
the first end is sealed; and
the second end is sealed, so that the sheet is configured to form an elongated inflatable enclosure.

10. The apparatus of claim **9**, wherein the sheet is configured to form a generally cylindrical enclosure when inflated.

11. The apparatus of claim **9** further comprising an internal baffle, wherein the elongated inflatable enclosure has a cross-section having a height and a width, wherein the height is greater than the width.

12. The apparatus of claim **8** wherein the second material is high frequency (HF) welded to the first material.

13. The apparatus of claim **8** wherein the second material is vapor permeable.

14. The apparatus of claim **8** wherein the first material comprises urethane and the second material comprises polytetrafluoroethylene.

15. The apparatus of claim **8** wherein the sheet comprises an opening configured to be coupled to a source of pressurized fluid.

16. A support system comprising:
a plurality of first support members, wherein:
the first support members comprise a first material that is substantially air impermeable; and
the first support members are a first height; and
a plurality of second support members, wherein:
the second support members comprise a second material that is air permeable and liquid impermeable;
the second support members are a second height;
the first height is greater than the second height; and
a second support member is located between two first support members.

17. The support system of claim **16** wherein the second material is vapor permeable.

18. The support system of claim **16**, wherein the first support members comprise a third material and the third material is vapor permeable and liquid impermeable.

19. The support system of claim **16**, further comprising a first source of pressurized fluid coupled to the first support member and coupled to the second support member.

20. The support system of claim **16**, further comprising a first source of pressurized fluid coupled to the first support member and a second source of pressurized fluid coupled to the second support member.

21. A method of manufacturing a support member, the method comprising:
providing a sheet of first material, wherein the first material is air impermeable;
creating an aperture in the sheet;
covering a portion of the aperture with a second material, wherein the second material is air permeable and liquid impermeable;
welding the second material to the first material; and
configuring the sheet to form an inflatable enclosure.

22. The method of claim **21** wherein the second material is high frequency welded to the first material.

* * * * *