



US 20030159218A1

(19) **United States**

(12) **Patent Application Publication**

Lin et al.

(10) **Pub. No.: US 2003/0159218 A1**

(43) **Pub. Date: Aug. 28, 2003**

(54) **INFLATABLE PRODUCT**

(22) **Filed: Feb. 26, 2002**

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Publication Classification

(51) **Int. Cl.⁷ A47C 27/10**

(52) **U.S. Cl. 5/710; 5/655.3**

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(57) **ABSTRACT**

This invention is an inflatable product that includes a plurality of chambers at least two of which are adjoining, with at least one unidirectional valve connecting any pair of adjoining chambers, an inlet port, and an exhaust port.

(21) **Appl. No.: 10/085,700**

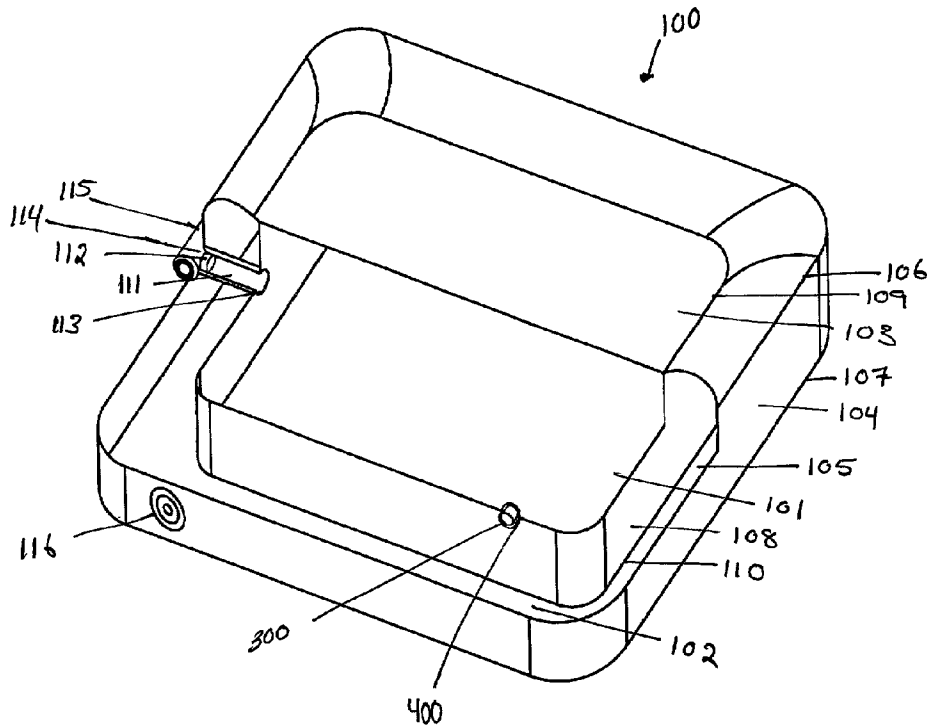


FIG. 1

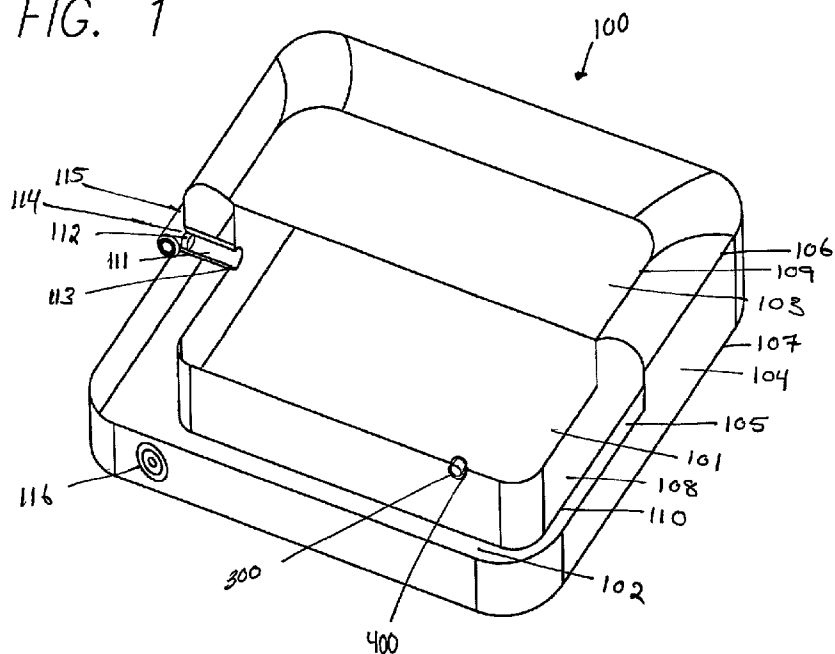


FIG. 2

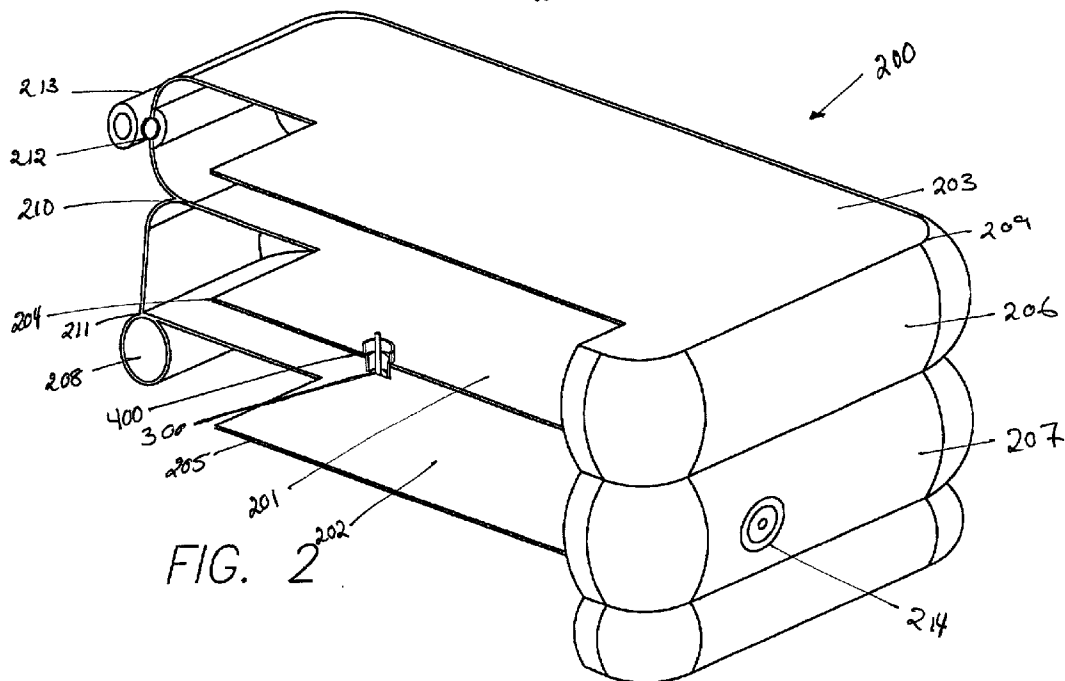
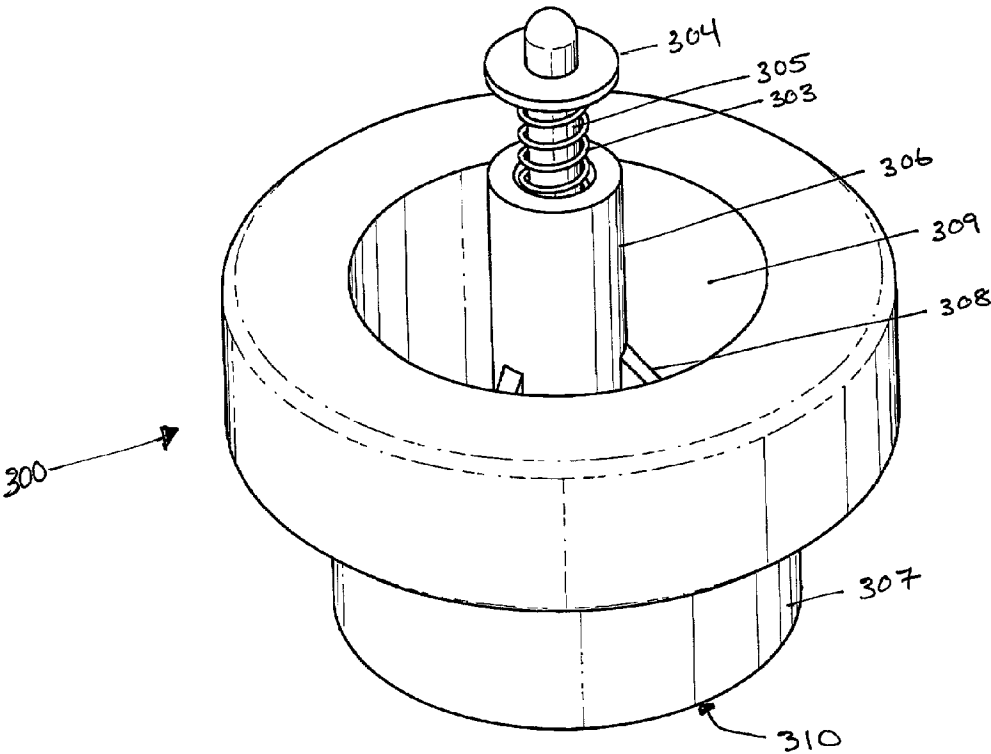
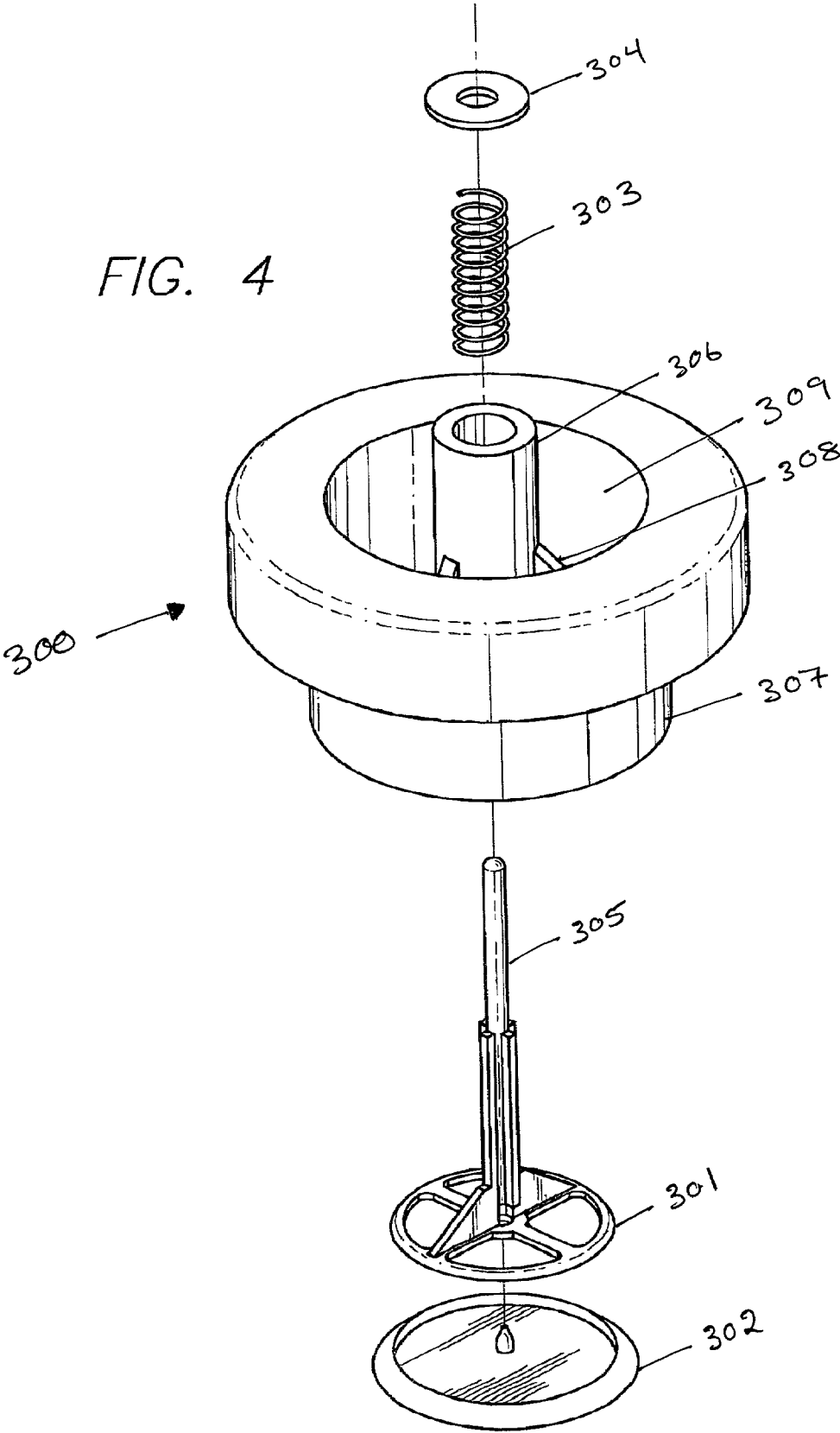
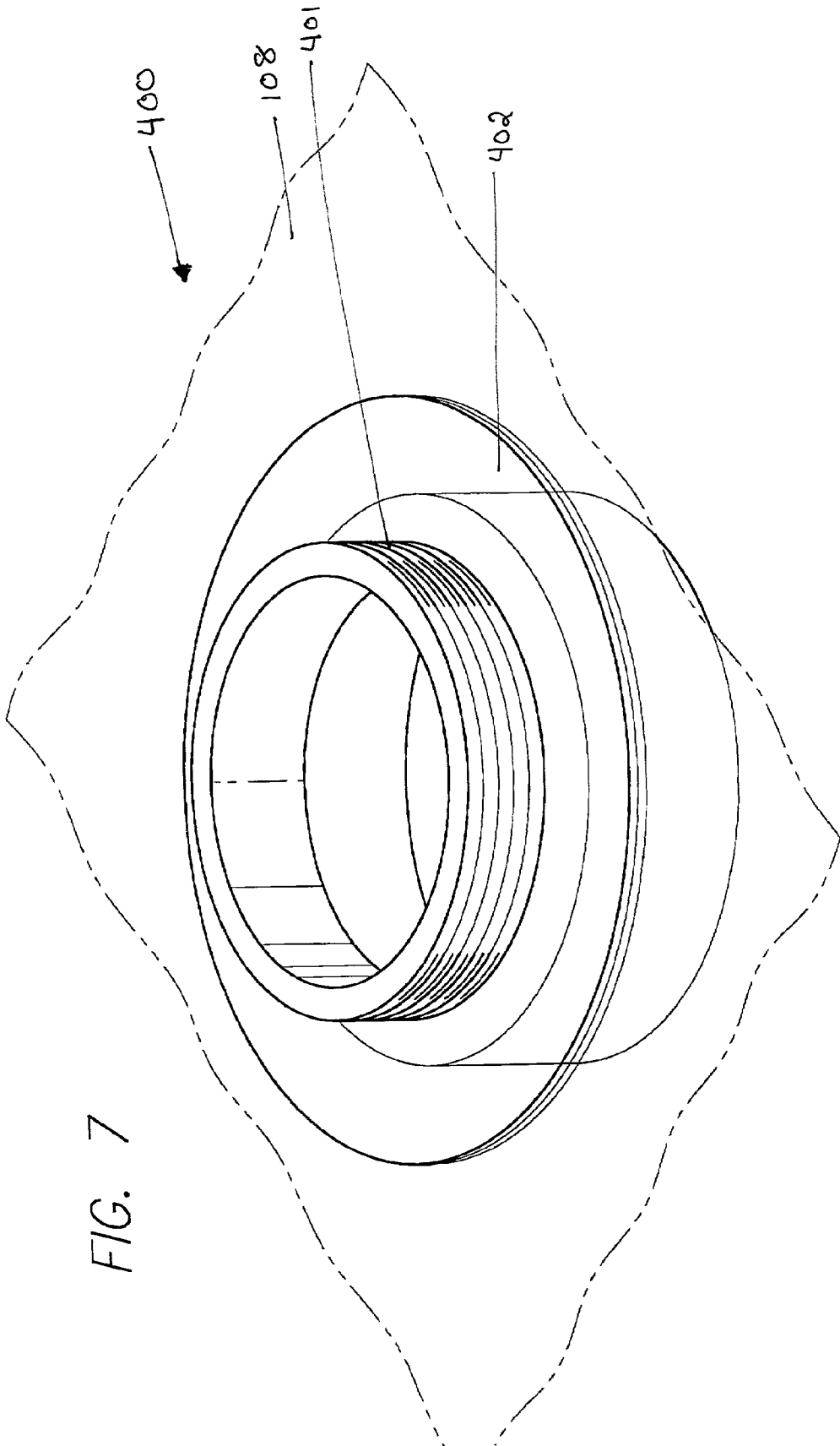


FIG. 3







INFLATABLE PRODUCT

BACKGROUND OF INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to inflatable products, and more particularly, to inflatable furniture such as mattresses, chairs and the like, which are easily inflated and deflated.

[0003] 2. Discussion of Related Art

[0004] Inflatable furniture such as air mattresses and chairs have enjoyed wide popularity for a number of reasons. When not in use, such inflatable products occupy a small area in relation to their inflated size and are thus easily stored and transported. When inflated, a piece of inflatable furniture provides its user with a high level of comfort as he or she is literally supported upon a cushion of air isolating him or her from an uncomfortable resting surface such as a floor or the uneven terrain often associated with outdoor excursions.

[0005] Although inflatable furniture is relatively inexpensive and enjoys the advantages recited above, such products have never gained universal acceptance by the consuming public and are not seen as entirely suitable replacements for conventional furniture. One of the primary reasons for this lack of universal acceptance is that inflatable furniture, at least to date, has not been capable of fast and efficient inflation while at the same time providing its user with a level, firm and stable supporting surface. This is because conventional inflatable furniture tends to be constructed such that all parts are in fluid communication which results in a characteristic "give" caused by the redistribution of fluid which occurs when the user applies a downward force on the furniture. Even though certain structural methods have been used to reduce this bulging effect, such as I-beam stabilization, such methods only partially address the bulging problem because fluid redistribution still occurs during use. When this redistribution occurs, the resultant bulging and compressing of the inflatable product can cause a loss of evenness and stability.

[0006] Attempts have been made to address this perceived shortcoming in several different ways. For example, U.S. Pat. No. 3,705,429 discloses an inflatable mattress which uses a plurality of individual inflatable beams, columns or chambers within an outer inflatable chamber. Each beam or chamber is separately inflatable and independent, having its own inlet/outlet port, without fluid communication between contiguous chambers. Although this design may prevent the redistribution of fluid between chambers during use, it has another shortcoming. Each independent chamber must be inflated and deflated through multiple inlet ports, thus the task of inflating and deflating the mattress can prove lengthy or tedious to the user.

[0007] Therefore, there is a need for an inflatable product that allows for fluid communication between contiguous chambers during inflation, thus allowing for easy inflation from a single inlet port, while at the same time maintaining product firmness and stability by preventing the bulging associated with the redistribution of fluid during use. The present invention accomplishes these goals and overcomes the inadequacies of the prior art.

SUMMARY OF THE INVENTION

[0008] It is the object of the present invention to provide an inflatable product which characteristically maintains its firmness and stability while not being overly complex to produce and maintain.

[0009] A further object of the present invention is to provide an inflatable product that demonstrates a firmness and stability similar to that of conventional furniture.

[0010] It is a further object of this invention to provide an inflatable product that can be readily inflated and deflated.

[0011] Additional features and advantages of the invention will be set forth in the description which follows, and will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as in the drawings.

[0012] The present invention comprises an inflatable product having a plurality of chambers with at least two of said chambers adjoining one another in whole or in part, at least one unidirectional valve connecting any pair of adjoining chambers, an inlet port through which fluid can be introduced into said product, and an exhaust port through which fluid can exit said inflatable product.

[0013] It is to be understood that the foregoing general description and the following detailed description are exemplary and intended to provide a further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0015] **FIG. 1** is a partial sectional view of the first embodiment of an inflatable mattress with adjoining inner and outer chambers having an interconnecting unidirectional valve.

[0016] **FIG. 2** is a cross-sectional view of a second embodiment of an inflatable mattress with stacked multiple chambers having an interconnecting unidirectional valve.

[0017] **FIG. 3** is a perspective view of a unidirectional valve suitable for use in the invention which is biased in a closed position by a spring.

[0018] **FIG. 4** is an exploded view of the unidirectional valve of **FIG. 3**.

[0019] **FIG. 5** is a top plan view of the unidirectional valve of **FIG. 3**.

[0020] **FIG. 6** is a cross-sectional view of the unidirectional valve of **FIG. 5** taken along line 6-6.

[0021] **FIG. 7** is a perspective view of the mounting boot for the unidirectional valve of **FIG. 3**.

DETAILED DESCRIPTION

[0022] **FIG. 1** illustrates the first embodiment of the present invention. In particular **FIG. 1** illustrates a partial-

sectional view of an inflatable mattress **100**, which comprises an inner chamber **101** surrounded by an outer chamber **102**. The outer chamber **102** is formed by the sealing or joining of the top layer **103** and bottom layer **105** to the outer wall **104** along an upper outer wall seam **106** and a lower outer wall seam **107**. The inner chamber **101** is formed by sealing or joining the top layer **103** and bottom layer **105** to the inner wall **108** along an upper inner wall seam **109** and a lower inner wall seam **110**. A tube **111** allows for the introduction of fluid into the inner chamber **101**. The tube **111** is sealed within the outer wall **104** at a circular seam **112** about the periphery of tube **111** and into the inner wall **108** by a second circular seam **113** about the periphery of tube **111**.

[0023] In both the first and second embodiments the materials forming the walls, layers and tube comprise a flexible and resilient material such as polyvinyl chloride sheeting (or PVC), thermoplastic impregnated cloth or other materials known to one having ordinary skill in the art. The seals between the walls, layers and tube are formed using radio frequency (RF) sealing or other processes known to one having ordinary skill in the art.

[0024] According to the first embodiment of the inflatable mattress **100** shown in FIG. 1 the inner chamber **101** and outer chamber **102** are inflated through a single inlet port **114** of the tube **111** using an electro-mechanical pump **115** inserted into the edge of the tube **111**. The pump can be affixed to the outer edge of the mattress for use as needed. Fluid is first introduced into the inner chamber **101** after which some fluid passes through an unidirectional valve **300** into the outer chamber **102**. Once the inner chamber **101** and outer chamber **102** are inflated, the unidirectional valve **300** prevents the reverse flow of fluid from the outer chamber **102** back into the inner chamber **101**, as could occur for a number of reasons such as by the application of force by a user's body on the mattress.

[0025] The air pressure in the inner chamber **101** can be adjusted through a deflation valve contained in the electro-mechanical pump **115**. In such usage when air is released from the inner chamber **101**, air pressure in the outer chamber **102** remains constant as the unidirectional valve **300** prevents the back flow of air from the outer chamber **102** into the inner chamber **101**. Thus differentiated pressures can be maintained in the inner and outer chambers.

[0026] Deflation of the entire air mattress **100** can be accomplished by the opening of the exhaust port **116** which is sealed within the outer wall **104**. When the exhaust port **116** is opened, the pressure in the outer chamber will decrease. The resulting air pressure change will cause the unidirectional valve **300** to open allowing the passage of air from the inner chamber **101** into the outer chamber **102** and out the exhaust port **116**.

[0027] FIG. 2 represents a second embodiment of the invention. Particularly FIG. 2 represents a cross-sectional view of an inflatable mattress **200** wherein the multiple chambers of the air mattress **200** are comprised of an upper chamber **201** and a lower chamber **202**. The upper chamber **201** and lower chamber **202** are formed by first sealing a top layer **203** to an upper side wall **206** along a seam **209**. Next the middle layer **204** is sealed to both the upper side wall **206** and the lower side wall **207** along a seam **210**. Finally, the bottom layer **205** is sealed to the lower side wall **207** along

a seam **211**. In addition, a tubular chamber **208** acts as a base preventing lateral movement the mattress **200**, and is in fluid communication with the lower chamber **202**.

[0028] The air mattress **200** can be inflated by introducing fluid through the inlet port **212** using an electro-mechanical pump **213** attached to the upper chamber **201**. As fluid is introduced, it will pass into the upper chamber **201** through the unidirectional valve **300** into the lower chamber **202** and the tubular chamber **208**. As with the first embodiment, when all chambers are filled the unidirectional valve **300** will prevent the reverse flow of fluid from the lower chamber **202** into the upper chamber **201**.

[0029] The upper chamber **201** of the air mattress **200** can also be partially deflated by a valve incorporated within the electro-mechanical pump **213**. As in the first embodiment the partial deflation of the upper chamber **201** will not affect the air pressure of the lower chamber **202** due to the restriction of air flow by the unidirectional valve **300**.

[0030] Deflation of the mattress **200** can be accomplished by the opening of the exhaust port **214** which is within the lower wall **207** resulting in the decrease of the pressure in the lower chamber. The decreased fluid pressure in the lower chamber **202** will allow for the opening of the unidirectional valve **300** which in turn will allow for the passage of the fluid in the upper chamber **201** to pass through to the lower chamber **202** and finally through the exhaust port **214**.

[0031] FIGS. 3-7 depict a valve suitable for use in the present invention, a spring loaded unidirectional valve. The valve comprises a movable valve element **301** and gasket **302**. The gasket can be made of rubber or other suitable gasket material known to those having ordinary skill in the art. The movable valve element **301** is biased in a closed position against the valve seat **311** by a partially compressed resilient coil spring **303**. The spring **303** is held in place about the shaft **305** of the movable valve element **301** by a retaining washer **304** affixed to said shaft.

[0032] The movable valve element **301** will move vertically with respect to the valve seat **311** through the central sleeve **306** thereby opening the unidirectional valve **300** when sufficient pressure is exerted on the movable valve element **301** to overcome the biasing tension created by the partially compressed spring **303**.

[0033] The central sleeve **306** is an integral part of the valve body **307** and is attached to the valve body **307** by three triangular shaped support arms **308** which are integral with both the central sleeve **306** and the valve body **307**.

[0034] In the first embodiment, the unidirectional valve **300** is mounted within the air mattress **100** such that it permits the unidirectional flow of air between the inner chamber **101** and the outer chamber **102**. The mounting is accomplished by attaching a standard mounting boot **400**, as shown in FIG. 7, approximately midway between the upper layer **103** and the lower layer **105** in the inner wall **108**. The mounting boot has a male-threaded portion **401** capable of being received by the complementary female thread **312** of the unidirectional valve **300**. The male threaded portion of said mounting boot is sealed to the inner wall **108** forming a seal **402** tight enough to prevent fluid leakage.

[0035] Once the valve is attached to the inner wall **108** the inlet side of the valve **309** will be in communication with the

inner chamber **101** while the outlet side of the valve **310** will be in communication with the outer chamber **102**.

[0036] In the second embodiment, the unidirectional valve **300** is mounted in the same manner as in the first embodiment except that the unidirectional valve **300** is mounted in between the upper chamber **201** and the lower chamber **202**. Thus, the inlet side of the valve **309** will be in communication with the upper chamber **201** and the outlet side of the valve **310** will be in communication with the lower chamber **202**.

[0037] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

We claim:

1. An inflatable product comprising:

- a. a plurality of chambers;
- b. at least two of said chambers adjoining one another in whole or in part;
- c. at least one unidirectional valve connecting any pair of adjoining chambers;
- d. an inlet port through which fluid can be introduced into said inflatable product; and

e. an exhaust port through which fluid can exit said inflatable product.

2. The inflatable product of claim 1 wherein said unidirectional valve is a spring loaded unidirectional valve.

3. The inflatable product of claim 1 wherein any pair of adjoining chambers are joined together at an adjoining surface.

4. The inflatable product of claim 1 having an inlet port further comprised of an unidirectional valve.

5. The inflatable product of claim 1 wherein the inlet port further permits the exhausting of fluid from the chamber.

6. The inflatable product of claims 1, 2, 3, 4 or 5 further comprising a means for introducing fluid into said inflatable product.

7. The inflatable product of claim 6 wherein said means for introducing fluid is mechanical, electrical, or electro-mechanical.

8. The inflatable product of claim 6 wherein said means for introducing fluid is assisted by the use of mechanical, electrical, electro-mechanical, hand or foot power.

9. The product of claim 1 wherein the fluid is air.

10. The product of claim 1 wherein the fluid is liquid.

11. The product of claim 1 wherein the product is an air mattress.

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