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(54) **ADJUSTABLE WIDTH MATTRESS**

(57) The invention relates to an adjustable-width mattress comprising a central portion, that includes pneumatically-separated first center air cells and second center air cells; the first center air cells are pneumatically connected to a first expansion portion by first air chan-

nels; the first expansion portion includes a first outer cell and a first inner cell; the first outer cell and the first inner cell each encapsulate, respectively, a first and second foam element; the first outer cell and the first inner cell are attached to each other at a hinge line.

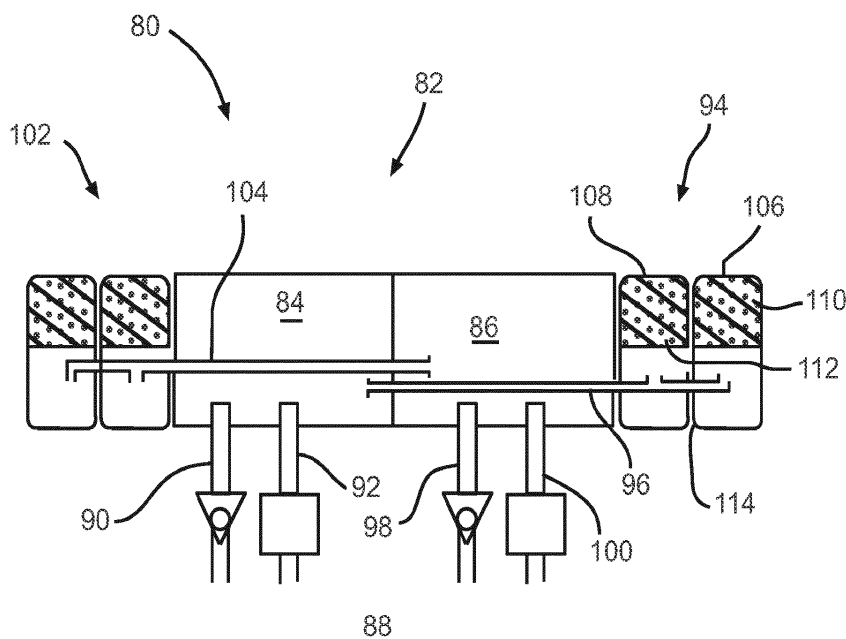


FIG. 8

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of United States Provisional Application No. 61/675639, filed July 25, 2012, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] This invention relates in general to a mattress with an adjustable, variable width. More particularly, this invention relates to a mattress that provides a support surface suitable for use by an occupant wherein the width of the support surface may be changed.

[0003] Mattresses are used to provide a cushioned support for an occupant of a bed. Beds are typically provided in one of several standard widths to accommodate different sizes and different numbers of occupants. Beds are commonly used in the healthcare industry to support patients. Healthcare beds are typically provided in one of different standard widths. A standard width bed is used for most applications while a bariatric bed may be used for obese patients requiring a larger support surface. Beds of different sizes require corresponding mattresses of different sizes. It would be advantageous to have a single mattress that could be used on different size beds.

SUMMARY OF THE INVENTION

[0004] This invention relates to an adjustable-width mattress. The adjustable-width mattress includes a support surface that has a length dimension and a width dimension perpendicular to the length dimension. The width dimension of the support surface may be varied.

[0005] This invention also relates to an adjustable-width mattress with a support surface having a length dimension and a width dimension perpendicular to the length dimension. The adjustable-width mattress includes a central portion that provides a portion of the support surface. The adjustable-width mattress includes an expansion portion that provides a portion of the support surface. An inward force applied to the expansion portion of the support surface in a direction parallel to the width dimension causes the expansion portion to collapse so that the width dimension of the support surface is decreased.

[0006] This invention also relates to an adjustable-width mattress with a support surface having a length dimension and a width dimension perpendicular to the length dimension. The adjustable-width mattress includes a first central portion that provides a portion of the support surface. The first central portion comprises an air cell containing a foam inflation structure. The adjustable-width mattress includes a second central portion that provides a portion of the support surface. The second central portion comprises an air cell containing a second

foam inflation structure. The adjustable-width mattress includes first expansion portion that provides a portion of the support surface. The first expansion portion comprises an air cell containing a first expansion foam inflation structure. The adjustable-width mattress includes a second expansion portion that provides a portion of the support surface. The second expansion portion comprises an air cell containing a second expansion foam inflation structure. The first central portion is located between the second expansion portion and the second central portion, and is in fluid communication with the first expansion portion. The second central portion is located between the first expansion portion and the first central portion, and is in fluid communication with the second expansion portion.

[0007] Various aspects of this invention will become apparent to those skilled in the art from the following detailed description of the disclosed embodiments, when read in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a perspective view of a first embodiment of an expandable width mattress.

Fig. 2 is a cross-sectional view taken along the line 2-2 of Fig. 1.

Fig. 3 is an schematic, cross-sectional view taken along the line 3-3 of Fig. 1.

Fig. 4 is an overhead, schematic view of the mattress shown in Fig. 1.

Fig. 5 is a perspective view of the mattress shown in Fig. 1, showing an optional top sheet.

Fig. 6 is an end view of a first embodiment of an adjustable side rail.

Fig. 7 is an end view of a second embodiment of an adjustable side rail.

Fig. 8 is a schematic, cross-sectional view of an alternative embodiment of a width expanding mattress.

Fig. 9 is a view similar to that shown in Fig. 8, when the mattress is in a narrow configuration.

Fig. 10 is a perspective view of an alternative embodiment of an expandable width mattress.

Fig. 11 is an overhead view of the mattress of Fig. 10 in a narrow configuration.

Fig. 12 is an overhead view of the mattress of Fig. 10 in an expanded configuration.

Fig. 13 is a perspective view of an alternative embodiment of an expandable width mattress.

Fig. 14 is an exploded, perspective view of an alternative embodiment of an adjustable-width mattress.

Fig. 15 is an exploded, perspective view of an alternative embodiment of an adjustable-width mattress.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Referring now to the drawings, there is illustrated in Fig. 1 a perspective view of a first embodiment of an adjustable width mattress, indicated generally at 10. The adjustable width mattress 10 has a length dimension 12 along a longitudinal axis 14. The adjustable width mattress 10 has a width dimension 16 that is perpendicular to the longitudinal axis 14. The length dimension 12 is greater than the width dimension 16. The length dimension 12 and the width dimension 16 define the size of a support surface 18 of the adjustable width mattress 10.

[0010] The adjustable width mattress 10 includes a central portion 20. The central portion 20 provides at least a portion of the support surface 18. The adjustable width mattress 10 also includes a first expansion portion 22 and a second expansion portion 24. The first expansion portion 22 and the second expansion portion 24 each provide a portion of the support surface 18. The first expansion portion 22 and the second expansion portion 24 allow the width dimension 16 of the support surface 18 to be varied, as will be described in detail below. In the illustrated embodiment, the first expansion portion 22 and the second expansion portion 24 are located on opposed sides of the central portion 20, but this is not necessary, and the adjustable width mattress may have fewer or more expansion portions than the two illustrated, if desired.

[0011] Referring to Fig. 2, there is shown a cross-sectional view taken along the line 2-2 of Fig. 1. The central portion 20 includes a central relatively air-impermeable envelope 26 that defines a central space 28. A central foam support 30 is located in the central space 28. The central foam support 30 is a self-inflating structure that expands when not loaded to return the central portion 20 to an unloaded state, illustrated in Fig. 2. Alternatively, the central portion 20 may include air cells, springs, or other desired support mechanisms suitable to support an occupant.

[0012] The first expansion portion 22 includes a first relatively air-impermeable envelope 32 that defines a first expansion space 34. The first expansion space includes a first expansion foam 36. The first expansion foam 36 is a self-inflating structure that expands when not loaded to return the first expansion portion 22 to an unloaded

state, illustrated in Fig. 2. Similarly, the second expansion portion 24 includes a second relatively air-impermeable envelope 38 that defines a second expansion space 40. The second expansion space 40 includes a second expansion foam 42. The second expansion foam 42 is a self-inflating structure that expands when not loaded to return the second expansion portion 24 to an unloaded state, illustrated in Fig. 2.

[0013] The adjustable width mattress 10 may be placed on a bed surface 44 for use. The bed includes side rails 46 and 48 that are attached to outer ends of the bed surface 44 and extend perpendicular to the bed surface 44. The illustrated bed surface 44 is capable of being adjusted in the width dimension 16 to provide the bed surface 44 with different widths. When the width of the bed surface 44 is changed, the side rails 46 and 48 are moved in an outward direction 50 or an inward direction 52. The illustrated bed surface 44 is configured so that the side rails 46 and 48 move simultaneously in either the outward direction 50 or the inward direction 52. When the side rails 46 and 48 are moved in the inward direction 52, the movement is resisted by the adjustable width mattress 10 and the side rails 46 and 48 apply a compressive force on the adjustable width mattress 10. The central portion 20 is more resistant to being compressed than the first expansion portion 22 and the second expansion portion 24. Therefore, the first expansion portion 22 and the second expansion portion 24 collapse, eventually reaching the disposition shown in Fig. 3. The central portion 20 is more resistant to being compressed due to having a higher air to foam ratio within the central space 28.

[0014] However, the central portion 20 may be made more resistant to being compressed by other desired means, such as by making the central foam support 30 from a more rigid foam than the first expansion foam 36 and the second expansion foam 42, or by providing structural reinforcement to the central portion 20 that resists force in the inward direction 52.

[0015] Fig. 3 is a schematic, cross-sectional view of the adjustable width mattress 10 taken along the line 3-3 of Fig. 1, illustrating the adjustable width mattress 10 when the first expansion portion 22 and the second expansion portion 24 are fully collapsed. The foam elements are not shown in Fig. 3, for clarity. As shown, when the first expansion portion 22 and the second expansion portion 24 are collapsed, the support surface 18 has a second width dimension 16 that is smaller than a first width dimension (shown in Fig. 4). It should be appreciated that the width dimension 16 of the support surface 18 can vary while the length dimension 12 does not change. The adjustable width mattress 10 includes air channels 54 that allow fluid communication between the central space 28 and the first expansion space 34, as well as between the central space 28 and the second expansion space 40. When the compressive force is applied to the adjustable width mattress 10 so that the first expansion space 34 and the second expansion space

40 collapse, air is displaced from the first expansion space 34 and the second expansion space 40 into the central space 28 through the air channels 54. The adjustable width mattress 10 includes an air outlet 56 that allows fluid communication between the central space 28 and an external fluid reservoir 58. The illustrated external fluid reservoir 58 is the ambient air surrounding the adjustable width mattress 10. The air outlet 56 allows air to escape from the adjustable width mattress 10 when the compressive force is applied to the adjustable width mattress 10 so that the first expansion space 34 and the second expansion space 40 collapse. The air outlet 56 includes a relief valve 60 that may be used to set a target air pressure within the adjustable width mattress 10. The relief valve 60 allows air to travel from the central space 28 to the external fluid reservoir 58 when the pressure in the central space 28 exceeds the target air pressure.

[0016] Referring to Fig. 4, a view similar to that of Fig. 3 is shown when the side rails 46 and 48 are moved in the outward direction 50. The compressive force is no longer applied to the adjustable width mattress 10 and the first expansion foam 36 and the second expansion foam 42 (shown in Fig. 2) have expanded to return the first expansion space 34 and the second expansion space 40 to their respective unloaded states. Air is drawn from the central space 28 into the first expansion space 34 and the second expansion space 40 through the air channels 54. The adjustable width mattress 10 includes an air inlet 62 that allows fluid communication between the central space 28 and the external fluid reservoir 58. It should be appreciated that the air inlet 62 may provide fluid communication with a second external fluid reservoir (not shown) rather than the external fluid reservoir 58, if desired. The air inlet 62 includes a check valve 64 that prevents air from escaping from the central space 28 through the air inlet 62.

[0017] Only one embodiment of fluid paths has been illustrated in Figs. 3 and 4. It should be appreciated that the adjustable width mattress 10 may include different air paths from those illustrated. For example, the air inlet 62 and the air outlet 56 may be connected to a manifold (not shown) with air channels (not shown) such as tubing connected to the central space 28, the first expansion space 34, and the second expansion space 40, if desired.

[0018] Referring to Fig. 5, a perspective view of the adjustable width mattress 10 is shown. The adjustable width mattress 10 includes an optional top sheet 66. The top sheet 66 is attached to the side rails 46 and 48 by hook-and-loop fasteners at the location indicated at 68 (only the connection to side rail 48 is visible in Fig. 5). Alternatively, the top sheet 66 may be attached to the side rails 46 and 48 by other desired fasteners such as, for example, snaps, hooks, zippers, or clamps. It should be appreciated that the top sheet 66 may alternatively be attached to the side rails 46 and 48 using a relatively permanent attachment such as stitching or adhesives, if desired. The top sheet 66 is able to support the weight of the occupant 70 so that the weight of the occupant 70

may be temporarily removed from the support surface 18. By removing the weight of the occupant 70 from the support surface 18 the adjustable width mattress 10 may be better able to equalize pressure between the central space 28, the first expansion space 34, and the second expansion space 40 (shown in Fig. 2), for example, when the side rails 46 and 48 are moved in the outward direction 50 and in the inward direction 52.

[0019] Referring to Fig. 6, an end view of the adjustable air mattress 10 and side rails 46 and 48 is shown. The side rails 46 and 48 are shown in a raised position relative to the support surface 18, as compared to a lowered position shown in Fig. 2. When the side rails 46 and 48 are in the raised position, the top sheet 66 creates a hammock-like support for the occupant 70. The side rails 46 and 48 may be raised using an electric motor (not shown), a hydraulic system, a mechanical jack, or other desired mechanisms. It should be appreciated that by providing the side rails 46 and 48 this mechanism allows an attendant to raise the side rails 46 and 48 even when a relatively large occupant 70 such as an obese person or bariatric patient is supported on the top sheet 66.

[0020] Referring to Fig. 7, the adjustable width mattress 10 is shown with a second embodiment of an adjustable side rails. The second embodiment includes side rails 72 and 74, which are shown in extended positions. The side rails 72 and 74 include wings 76 and 78, respectively and the top sheet 66 is attached (as previously described) to the wings 76 and 78. The wings 76 and 78 are rotated relative to the side rails 72 and 74, respectively, to the illustrated extended positions and the top sheet 66 is pulled taut. This creates a hammock-like support for the occupant 70 and removes the weight of the occupant 70 from the support surface 18. The wings 76 and 78 may be moved relative to the side rails 72 and 74 using an electric motor (not shown), a hydraulic system, a mechanical jack, or other desired mechanisms.

[0021] It should be appreciated that Fig. 7 illustrates one way in which the top sheet 66 may be drawn taut while the adjustable width mattress 10 is occupied by an occupant 70. Other mechanisms to draw the top sheet 66 taut may be used, such as using a roller on one end of the top sheet 66. The roller may be attached to a winch to facilitate use by a single attendant.

[0022] Referring now to Fig. 8, a schematic, cross-sectional view of an alternative embodiment of an adjustable width mattress, indicated generally at 80, is shown. The adjustable width mattress 80 includes a central portion, indicated generally at 82, that includes pneumatically-separated first center air cells 84 and second center air cells 86. The first center air cells 84 are in fluid communication with an external fluid reservoir 88 through a first air inlet 90 and a first air outlet 92. The first center air cells 84 are pneumatically connected to a first expansion portion, indicated generally at 94, by first air channels 96. The second center air cells 86 are in fluid communication with the external fluid reservoir 88 through a second air inlet 98 and a second air outlet 100. The second

center air cells 86 are pneumatically connected to a second expansion portion, indicated generally at 102, by second air channels 104. The first expansion portion 94 includes a first outer cell 106 and a first inner cell 108. The first outer cell 106 and the first inner cell 108 each encapsulate a foam element 110 and 112, respectively. The foam element 110 and the foam element 112 extend longitudinally along the length of the adjustable width mattress 80, and occupy no more than half the cross-sectional space of the first outer cell 106 and the first inner cell 108, respectively. The first outer cell 106 and the first inner cell 108 are attached to each other at a hinge line 114. As shown, the first center air cells 84 are located between the second expansion portion 102 and the second center air cells 86 and the second center air cells 86 are located between the first expansion portion 94 and the first center air cells 84.

[0023] Referring to Fig. 9, a schematic, cross-sectional view of the adjustable width mattress 80 is shown when the adjustable width mattress 80 is in a narrow configuration. The hinge line 144 allows relative rotational movement between the first outer cell 106 and the first inner cell 108. As shown, the first outer cell 106 is folded along the hinge line 114 into a position closer to the central portion 82. This partially collapses both the first outer cell 106 and the first inner cell 108, and causes air contained in the first inner cell 106 and the first inner cell 108 to travel to the first center air cell 84 through the first air channel 96. It should be appreciated that since the first outer cell 106 and the first inner cell 108 each occupy no more than half the cross-sectional space of the cells, both the first outer cell 106 and the first inner cell 108 may occupy the space of a single cell when the air is displaced from both cells, as shown in Fig. 9. The second expansion portion 102 includes components similar to the first expansion portion 94, and will not be described separately.

[0024] When the adjustable width mattress 80 is in the narrow configuration shown in Fig. 9, the first expansion portion 94 and the second expansion portion 102 may be inflated by rotating the occupant (not shown) from side to side. This alternates between apply a load to the first center air cells 84 forcing air into the first expansion portion 94 through the first air channel 96, and the second center air cells 86 forcing air into the second expansion portion 102 through the second air channel 104. The first center air cells 84 and the second center air cells 86 include foam inflation structures (not shown), and when the occupant's weight is removed from the first center air cells 84, the foam inflation structure will cause air to be drawn into the first center air cells 84 through the first air inlet 90. Similarly, the second center air cells will inflate when the occupant's weight is removed. Thus, as the occupant is rocked back and forth on the adjustable width mattress 80, the first expansion portion 94 and the second expansion portion 102 will be pumped full of air. Alternatively, the first expansion portion 94 may include an air inlet (not shown) to allow an operator to inflate the first expansion portion 94 directly using an accessory

pump or other pressurized air source. The second expansion portion 102 may share an air inlet with the first expansion portion 94, if desired.

[0025] When the adjustable width mattress 80 is in the configuration shown in Fig. 8, the first expansion portion 94 may be moved to the narrow configuration (shown in Fig. 9) by the operator manually folding the first outer cell 106 against the first inner cell 108. Alternatively, the first expansion portion 94 may include an air outlet (not shown) that allows the operator to use a vacuum to withdraw air from the first expansion portion 94. Alternatively, the first outer cell 106 may be biased to fold so that the adjustable width mattress 80 is in the narrowed configuration shown in Fig. 9. The first expansion portion 94 may then include an air outlet (not shown) that the operator may open in order to allow air to escape so that the first expansion portion 94 will move to the narrowed configuration. The biasing may be accomplished by any desired mechanism, such as a spring attached to a push plate, or by using a resilient material in the hinge line 114.

[0026] Referring now to Fig. 10, a second alternative embodiment of an adjustable width mattress, indicated generally at 116, is shown. The adjustable width mattress 116 includes a longitudinally- alternating arrangement of lateral full- width air cells 118 and pairs of lateral half- width air cells 120 and 122. The full- width air cells 118 are cylinders 8 inches in diameter. The half- width air cells 120 and 122 are cylinders 10 inches in diameter. Alternatively, the lateral full- width air cells 118 and the lateral half- width air cells 120 and 122 may be other desired sizes. The air pressure in the adjustable width mattress 116 is maintained so that the pressure in the half- width air cells 120 and 122 is approximately 80% of the air pressure in the full- width air cells 118 when the adjustable width mattress 116 is in a narrowed configuration shown in Fig. 10. Alternatively, the difference in pressure between the full- width air cells 118 and the half- width air cells 120 and 122 may be some other desired value. Referring to Fig. 11, an overhead view of the adjustable width mattress 116 in the narrowed configuration is shown. The adjustable width mattress 116 has a length dimension 124 along a longitudinal axis 126. The adjustable width mattress 116 has a width dimension 128 that is perpendicular to the longitudinal axis 126. The length dimension 124 is greater than the width dimension 128.

[0027] Referring now to Fig. 12, an overhead view of the adjustable width mattress 116 is shown in an expanded configuration. As shown, the pairs of half- width air cells 120 and 122 have been moved laterally outward relative to each other. When the adjustable width mattress 116 is in the expanded configuration, there is a central gap 130 between each of the pairs of half- width air cells 120 and 122. The air pressure in the adjustable width mattress 116 is maintained so that the pressure in the half- width air cells 120 and 122 is approximately equal to the air pressure in the full- width air cells 118 when the adjustable width mattress 116 is in the expand-

ed configuration. The adjustable width mattress 116 may include a stretchable or reconfigurable top sheet (not shown) to help distribute the weight of an occupant onto the air cells 118, 120, and 122 and across the relatively open areas including the gaps 130. It should be appreciated that the dimensions detailed above are only one embodiment, and the air cells 118, 120, and 122 may have other desired sizes.

[0028] Referring to Fig. 13, a third alternative embodiment of an adjustable width mattress, indicated generally at 132, is shown. The adjustable width mattress 132 includes a central portion, indicated generally at 134. The central portion 134 includes pneumatically- separated first center air cells 136 and second center air cells 138. The first center air cells 136 and second center air cells 138 include foam inflation elements (not shown) to allow the air cells to self-inflate when they are not loaded. The first center air cells 136 are pneumatically connected to a first expansion portion 140 by first air channels 142. The second center air cells 136 are pneumatically connected to a second expansion portion 144 by second air channels 146. The first expansion portion 140 and the second expansion portion 144 may be inflated by rotating an occupant of the adjustable width mattress 132 from side to side, alternately applying a load to the first center air cells 136 in order to inflate the first expansion portion 140, and applying a load to the second center air cells 136 in order to inflate the second expansion portion 144. Alternatively, the expansion portions may include air inlets and outlets (not shown) to allow an attendant to manually inflate or deflate the expansion portions.

[0029] Referring now to Fig. 14, there is shown an exploded, perspective view of a fourth alternative embodiment of an adjustable-width mattress, indicated generally at 148. The adjustable- width mattress 148 includes a central portion indicated generally at 150 that includes a longitudinally- arranged series of laterally-extending air cells 152. The adjustable-width mattress 148 includes a foam perimeter consisting of foam surround pieces 154. The adjustable-width mattress 148 also includes a first expansion bladder 156 and a second expansion bladder 158, which are located between the central portion 150 and the foam surround pieces 154. In normal use, the adjustable-width mattress 148 is supported by a bed (not shown). The bed includes a first side rail 160 and a second side rail 162 which are able to be moved in an inward direction 164 and an outward direction 166.

[0030] The adjustable- width mattress 148 includes a mattress controller (not shown). The mattress controller may be connected to a position sensor (not shown). Limit switches may be used to sense the relative positions of the side rails 160 and 162 and provide that information to the mattress controller. The mattress controller is able to regulate the air pressure in the first expansion bladder 156 and the second expansion bladder 158. This allows the mattress controller to adjust the size of adjustable-width mattress 148 to correspond to the space between the side rails 160 and 162. The mattress controller may

include a manual interface to allow the attendant to direct the mattress controller to pressurize or vent the first expansion bladder 156 and the second expansion bladder 158. This would be useful when the adjustable-width mattress 148 is installed on a bed frame that allows the width of the frame to be manually adjusted.

[0031] Referring to Fig. 15, there is shown an exploded, perspective view of a fifth alternative embodiment of an adjustable-width mattress, indicated generally at 168. The adjustable- width mattress 168 operates similarly to the previously-described adjustable-width mattress 148 (shown in Fig. 14). However, the adjustable-width mattress 168 includes a central expansion bladder 170 located between a first central portion 172 and a second central portion 174.

[0032] Generally, the mattresses described above are 36 inches wide in their most narrowed configuration, and 42 inches wide in their most expanded configuration. It should be appreciated that the sizes and relative pressures described above refer only to the embodiments shown, and other sizes and relative dimensions may be used if desired. Also, it should be appreciated that side rails described in connection with the adjustable- width mattress 10 may be used with any of the other described mattresses in order to assist an attendant with adjusting the width of the mattress.

[0033] It should be appreciated that the mattresses described above may be paired with an adjustable- width bed so that the bed and mattress may both have their size adjusted. It is advantageous to be able to change the width of a bed. For example, a large bed may be narrowed to fit into a small space. Or a bed may be widened in order to accommodate a larger occupant. The mattresses described above allow the bed to be fitted with a single mattress that is usable with multiple different bed widths such as, for example, two or more bed widths, or any desired bed width between the maximum and the minimum mattress width.

[0034] Some of the embodiments described above allow the width of the mattress to be changed without the need for external power. Additionally, some of the embodiments allow the width of the mattress to be changed without removing the occupant from the support surface. Also, these mattresses allow a single attendant to change the width of the mattress when this may otherwise be problematic for an attendant who is attempting to change the width of a bed occupied by an obese occupant.

[0035] It should be appreciated that embodiments describe how to provide a variable width mattress, and that these embodiments may be modified to provide a variable length mattress, if desired.

[0036] Further embodiments of the present invention are explained with the help of the following examples.

Examples

[0037]

Example 1. An adjustable- width mattress comprising:

a support surface having a length dimension and a width dimension perpendicular to the length dimension, wherein the width dimension of the support surface may be varied.

Example 2. The adjustable width mattress of example 1, wherein the support surface has a first width dimension when in an unloaded state, and has a second width dimension when the mattress is subject to an inward force applied in a direction parallel to the width dimension, the first width dimension being greater than the second width dimension.

Example 3. The adjustable width mattress of example 2, wherein the length dimension of the support surface when the support surface has the first width dimension is the same as the length dimension of the support surface when the support surface has the second width dimension.

Example 4. The adjustable width mattress of example 2, wherein the first width is approximately 42 inches and the second width is approximately 36 inches.

Example 5. An adjustable- width mattress comprising:

a support surface having a length dimension along a longitudinal axis and a width dimension that is perpendicular to the length dimension;
a central portion that provides a portion of the support surface;
an expansion portion that provides a portion of the support surface;
wherein an inward force applied to the expansion portion in a direction parallel to the width dimension causes the expansion portion to collapse so that the width dimension of the support surface is decreased.

Example 6. The adjustable-width mattress of example 5, wherein when the inward force is removed the expansion portion expands to an unloaded state.

Example 7. The adjustable width mattress of example 5, the expansion portion comprising an air cell containing an expansion foam, wherein fluid is displaced from the expansion portion when the expansion portion collapses.

Example 8. The adjustable width mattress of example 7, the central portion comprising an air cell that is in fluid communication with the expansion portion, wherein fluid is displaced from the expansion portion into the central portion when the expansion portion collapses.

Example 9. The adjustable-width mattress of example 7, further comprising a second expansion portion that provides a portion of the support surface, the second expansion portion comprising an air cell containing a second expansion foam, wherein an inward force applied to the second expansion portion in a direction parallel to the width dimension causes the second expansion to collapse and air is displaced from the second expansion portion so that the width dimension of the support surface is decreased.

Example 10. The adjustable- width mattress of example 9, wherein the expansion portion and the second expansion portion are located on opposed sides of the central portion.

Example 11. The adjustable- width mattress of example 10, the central portion comprising an air cell that is in fluid communication with the expansion portion and in fluid communication with the second expansion portion;
wherein fluid is displaced from the expansion portion into the central portion when the expansion portion collapses, and fluid is displaced from the second expansion portion into the central portion when the second expansion portion collapses

Example 12. The adjustable- width mattress of example 11, further comprising an air inlet that allows fluid from an external fluid reservoir into the central portion;
an air outlet that allows fluid to flow from the central portion to the external fluid reservoir when the pressure in the central portion exceeds a target pressure.

Example 13. An adjustable- width mattress comprising:

a support surface having a length dimension along a longitudinal axis and a width dimension that is perpendicular to the length dimension;
a first central portion that provides a portion of the support surface, the first central portion comprising an air cell containing a foam inflation structure;
a second central portion that provides a portion of the support surface, the second central portion comprising an air cell containing a second foam inflation structure; a first expansion portion that provides a portion of the support surface, the first expansion portion comprising an air cell containing a first expansion foam inflation structure; and
a second expansion portion that provides a portion of the support surface, the second expansion portion comprising an air cell containing a second expansion foam inflation structure;
wherein the first central portion is located be-

tween the second expansion portion and the second central portion, and is in fluid communication with the first expansion portion; and the second central portion is located between the first expansion portion and the first central portion, and is in fluid communication with the second expansion portion.

Example 14. The adjustable- width mattress of example 13, wherein the first central portion is in fluid communication with an external fluid reservoir, the second central portion is in fluid communication with the external fluid reservoir, and the first central portion is not in fluid communication with the second central portion.

Example 15. The adjustable- width mattress of example 14, further comprising: a first air inlet that allows fluid from the external fluid reservoir into the first central portion;
a first air outlet that allows fluid to flow from the first central portion to the external fluid reservoir when the pressure in the first central portion exceeds a target pressure;
a second air inlet that allows fluid from the external fluid reservoir into the second central portion;
a second air outlet that allows fluid to flow from the second central portion to the external fluid reservoir when the pressure in the second central portion exceeds a second target pressure;

Example 16. The adjustable-width mattress of example 15, wherein the target pressure has the same value as the second target pressure.

Example 17. The adjustable- width mattress of example 15, wherein in the first expansion portion comprises a first outer cell that encapsulates a foam element that occupies no more than half the cross-sectional space of the first outer cell and a first inner cell that encapsulates a foam element that occupies no more than half the cross-sectional space of the first inner cell.

Example 18. The adjustable-width mattress of example 17, wherein the first outer cell and the first inner cell are connected by a hinge that allows relative rotational movement between the first outer cell and the first inner cell.

Example 19. The adjustable- width mattress of example 18, wherein when the first outer cell is rotated about the hinge relative to the first inner cell, both the first outer cell and the first inner cell are at least partially collapsed.

Example 20. The adjustable- width mattress of example 19, wherein when the first outer cell and the

first inner cell are at least partially collapsed air contained in the first inner cell and the first inner cell to travel to the first center air cell.

- 5 **[0038]** The principle and mode of operation of this invention have been explained and illustrated in its preferred embodiments. However, it must be understood that this invention may be practiced otherwise than as specifically explained and illustrated without departing from its spirit or scope.

Claims

- 10 1. An adjustable-width mattress (80) comprising:
- a central portion (82), that includes pneumatically-separated first center air cells (84) and second center air cells (86);
the first center air cells (84) are pneumatically connected to a first expansion portion (94) by first air channels (96);
the first expansion portion (94) includes a first outer cell (106) and a first inner cell (108);
the first outer cell (106) and the first inner cell (108) each encapsulate, respectively, a first and second foam element (110, 112);
the first outer cell (106) and the first inner cell (108) are attached to each other at a hinge line (114).
2. The adjustable width mattress of claim 1, **characterized in that**
the first center air cells (84) are in fluid communication with an external fluid reservoir (88) through a first air inlet (90) and a first air outlet (92).
3. The adjustable width mattress (80) of any of the preceding claims, **characterized in that**
(i) the second center air cells 86 are in fluid communication with the external fluid reservoir (88) through a second air inlet (98) and a second air outlet (100);
and/or
(ii) the second center air cells (86) are pneumatically connected to a second expansion portion (102) by second air channels (104).
4. The adjustable width mattress (80) of any of the preceding claims, **characterized in that**
(i) the first foam element (110) and the second foam element (112) extend longitudinally along the length of the adjustable width mattress (80), and occupy no more than half the cross-sectional space of the first outer cell (106) and the first inner cell (108), respectively;

and/or

(ii) the first center air cells (84) are located between the second expansion portion (102) and the second center air cells (86) and the second center air cells (86) are located between the first expansion portion (94) and the first center air cells (84).

5. The adjustable width mattress (80) of any of the preceding claims, **characterized in that**

(i) the hinge line (144) allows relative rotational movement between the first outer cell (106) and the first inner cell (108), especially when the adjustable width mattress is in a narrow configuration;

(ii) the first outer cell (106) is folded along the hinge line (114) into a position closer to the central portion (82), whereby preferably both the first outer cell (106) and the first inner cell (108) collapses partially and causes air contained in the first inner cell (106) and the first inner cell 108) to travel to the first center air cell (84) through the first air channel (96);

(iii) the first outer cell (106) and the first inner cell (108) each occupy no more than half the cross-sectional space of the cells and/or the first outer cell (106) and the first inner cell 108 may occupy the space of a single cell when the air is displaced from both cells;

and/or

(iv) the second expansion portion (102) includes components similar to the first expansion portion (94).

6. The adjustable width mattress of any of the preceding claims, **characterized in that**

(i) the adjustable width mattress (80) is designed so that when the adjustable width mattress (80) is in a narrow configuration, the first expansion portion (94) and the second expansion portion (102) can be inflated by rotating an occupant from side to side, thereby alternation between applying a load to the first center air cells (84) forcing air into the first expansion portion (94) through the first air channel (96), and the second center air cells (86) forcing air into the second expansion portion (102) through the second air channel (104);

(ii) the first center air cells (84) and the second center air cells (86) include foam inflation structures, and when the occupant's weight is removed from the first center air cells (84), the foam inflation structure will cause air to be drawn into the first center air cells (84) through the first air inlet (90);

(iii) the second center air cells will inflate when

the occupant's weight is removed;

and/or

(iv) as the occupant is rocked back and forth on the adjustable width mattress (80), the first expansion portion (94) and the second expansion portion (102) will be pumped full of air.

7. The adjustable width mattress of any of the preceding claims, **characterized in that**

(i) the first expansion portion (94) includes an air inlet to allow an operator to inflate the first expansion portion (94) directly using an accessory pump or other pressurized air source;

and/or

(ii) the second expansion portion (102) may share an air inlet with the first expansion portion (94).

8. The adjustable width mattress of any of the preceding claims, **characterized in that**

(i) the first expansion portion (94) includes an air outlet that allows the operator to use a vacuum to withdraw air from the first expansion portion (94);

and/or

(ii) the first expansion portion (94) includes an air outlet that the operator may open in order to allow air to escape so that the first expansion portion (94) will move to the narrowed configuration when the first outer cell (106) is biased to fold so that the adjustable width mattress (80) is in the narrowed configuration, whereby preferably the biasing is accomplished by any desired mechanism, such as a spring attached to a push plate, or by using a resilient material in the hinge line (114).

9. An adjustable width mattress (80), comprising:

a support surface having a length dimension along a longitudinal axis and a width dimension that is perpendicular to the length dimension;

a first central portion that provides a portion of the support surface, the first central portion comprising an air cell (84) containing a foam inflation structure;

a second central portion that provides a portion of the support surface, the second central portion comprising an air cell (86) containing a second foam inflation structure;

a first expansion portion that provides a portion of the support surface, the first expansion portion comprising an air cell containing a first expansion foam inflation structure; and

a second expansion portion that provides a portion of the support surface, the second expansion

sion portion comprising an air cell containing a second expansion foam inflation structure; wherein the first central portion (84) is located between the second expansion portion and the second central portion (86), and is in fluid communication with the first expansion portion (94), and

the second central portion (86) is located between the first expansion portion (94) and the first central portion (84), and is in fluid communication with the second expansion portion.

10. The adjustable-width mattress of claim 9, wherein the first central portion (84) is in fluid communication with an external fluid reservoir (88), the second central portion (86) is in fluid communication with the external fluid reservoir (88), and the first central portion (84) is not in fluid communication with the second central portion (86).

11. The adjustable-width mattress of claim 10, further comprising:

a first air inlet (90) that allows fluid from the external fluid reservoir (88) into the first central portion (84);

a first air outlet (92) that allows fluid to flow from the first central portion (84) to the external fluid reservoir (88) when the pressure in the first central portion (84) exceeds a target pressure;

a second air inlet (98) that allows fluid from the external fluid reservoir (88) into the second central portion (86);

a second air outlet (100) that allows fluid to flow from the second central portion (86) to the external fluid reservoir (88) when the pressure in the second central portion (86) exceeds a second target pressure;

12. The adjustable-width mattress of claim 11, wherein the target pressure has the same value as the second target pressure.

13. The adjustable width mattress of claim 11, wherein in the first expansion portion comprises a first outer cell that encapsulates a foam element that occupies no more than half the cross-sectional space of the first outer cell and a first inner cell that encapsulates a foam element that occupies no more than half the cross-sectional space of the first inner cell.

14. The adjustable-width mattress of claim 13, wherein the first outer cell and the first inner cell are connected by a hinge that allows relative rotational movement between the first outer cell and the first inner cell.

15. The adjustable-width mattress of claim 14, wherein

when the first outer cell is rotated about the hinge relative to the first inner cell, both the first outer cell and the first inner cell are at least partially collapsed, wherein preferably when the first outer cell and the first inner cell are at least partially collapsed air contained in the first inner cell and the first inner cell to travel to the first center air cell.

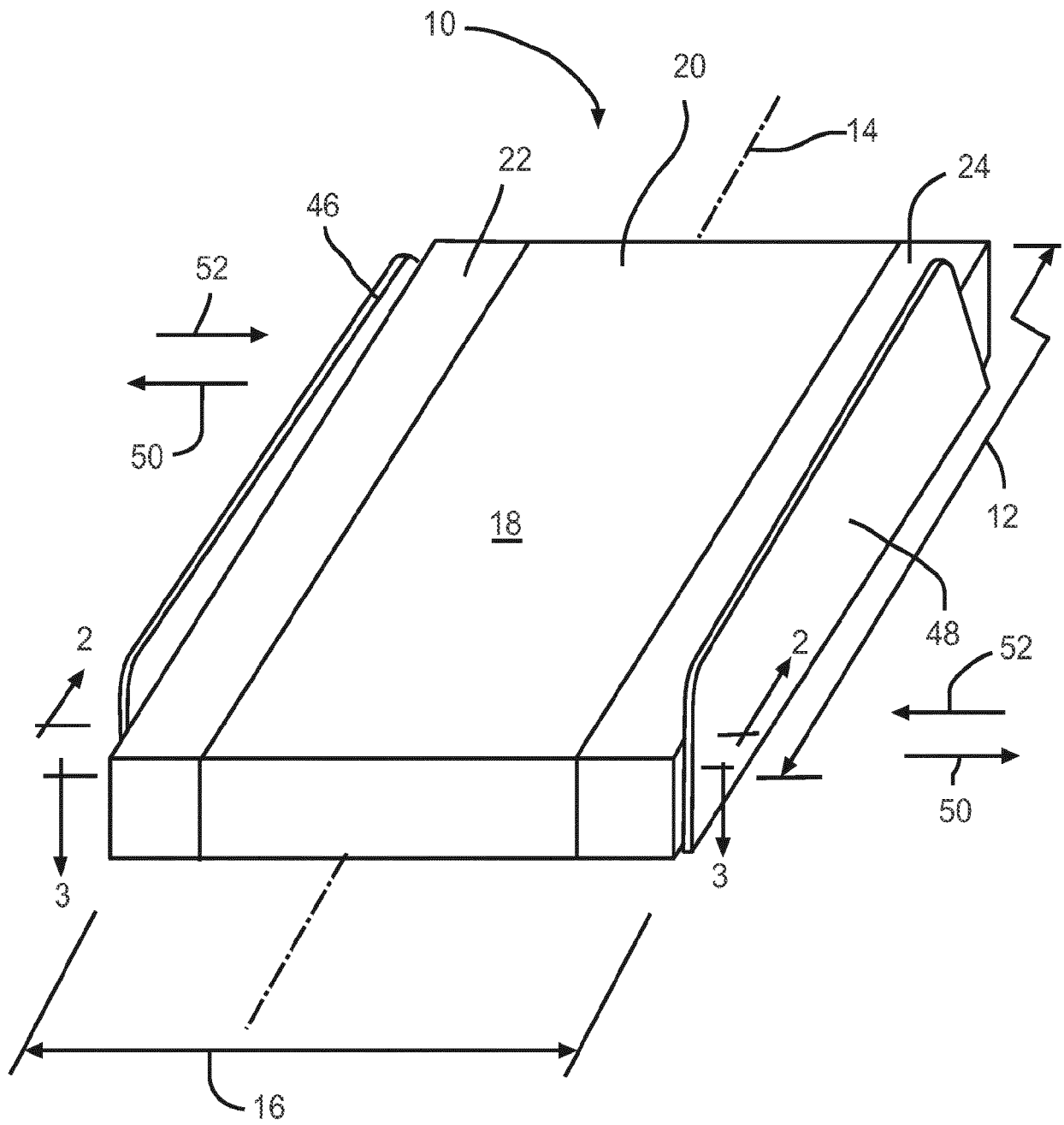


FIG. 1

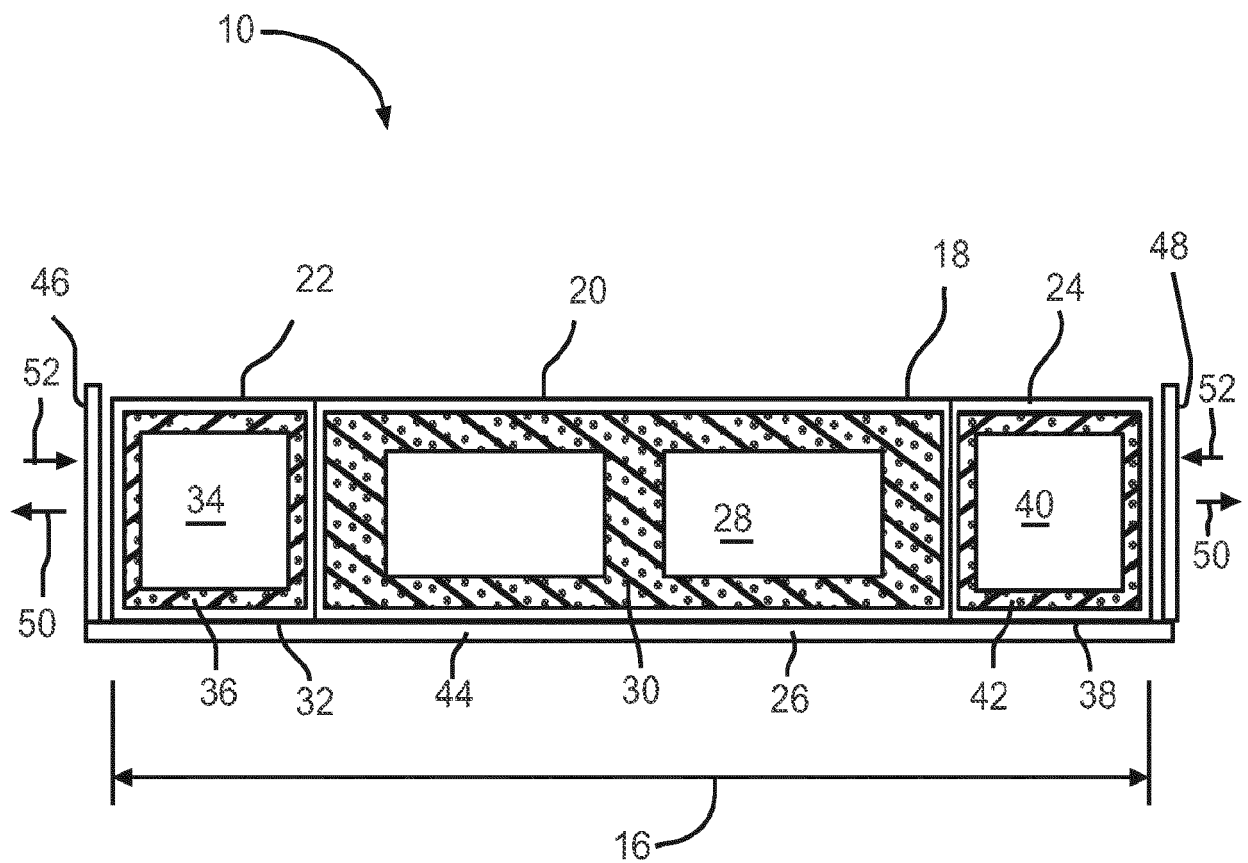


FIG. 2

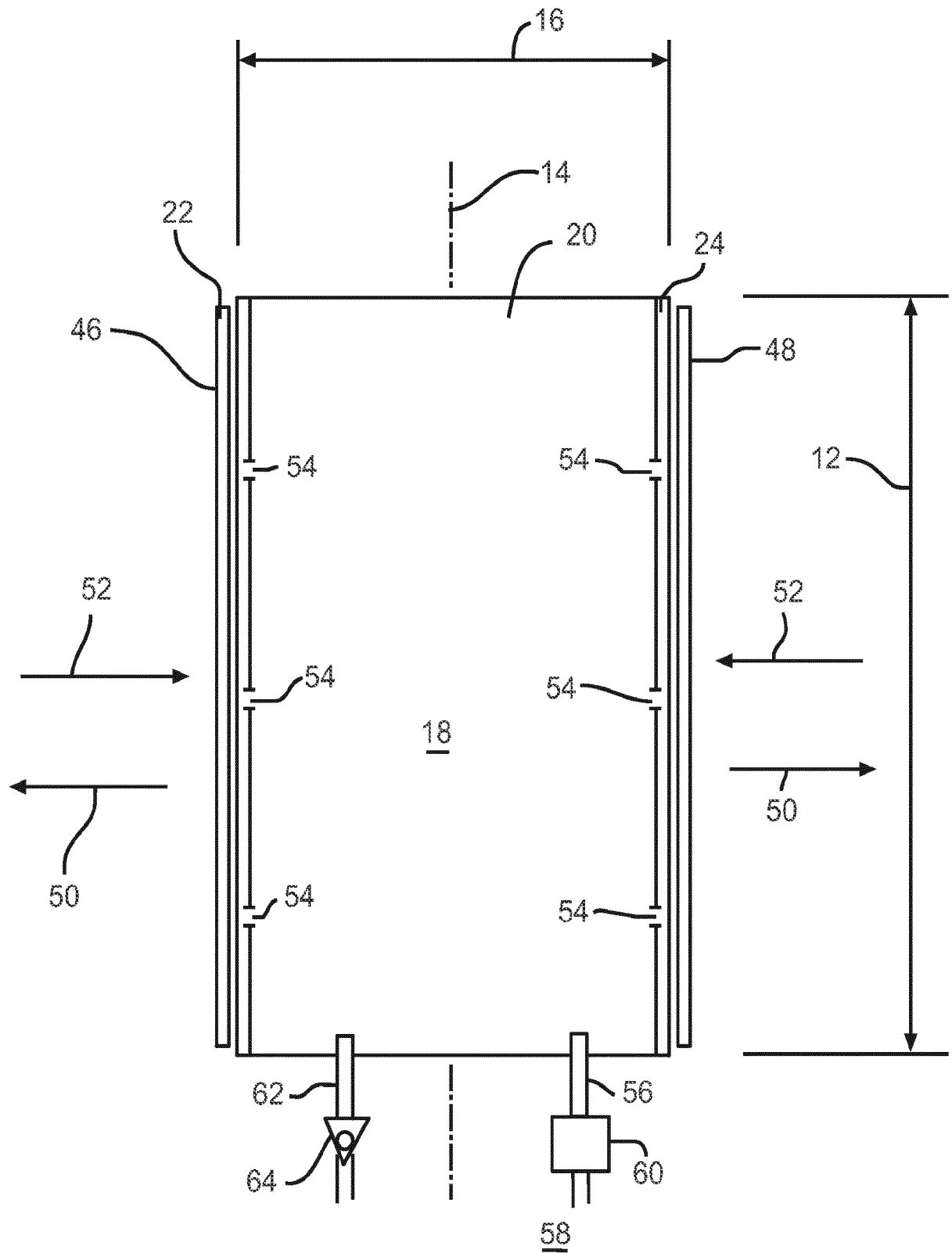


FIG. 3

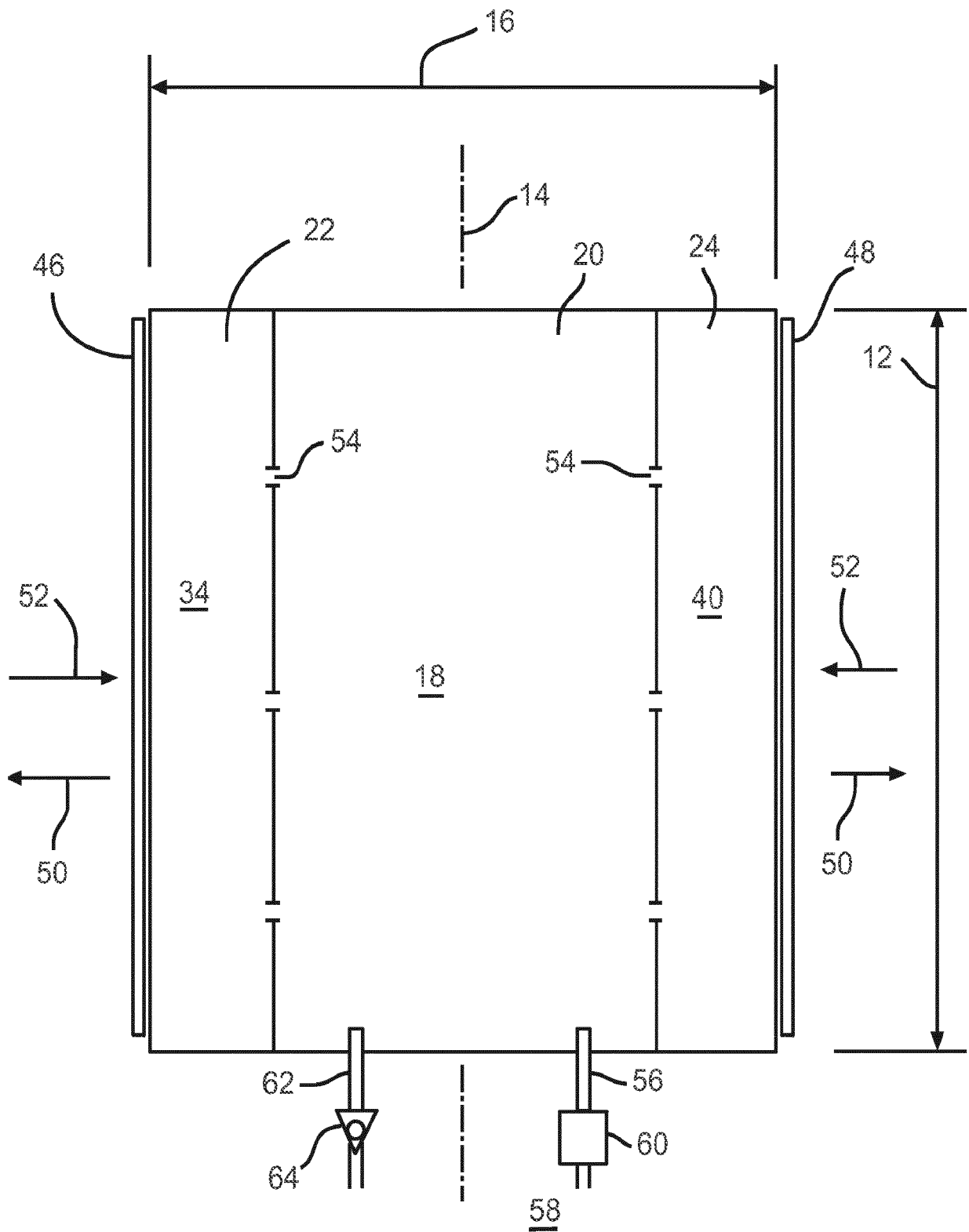


FIG. 4

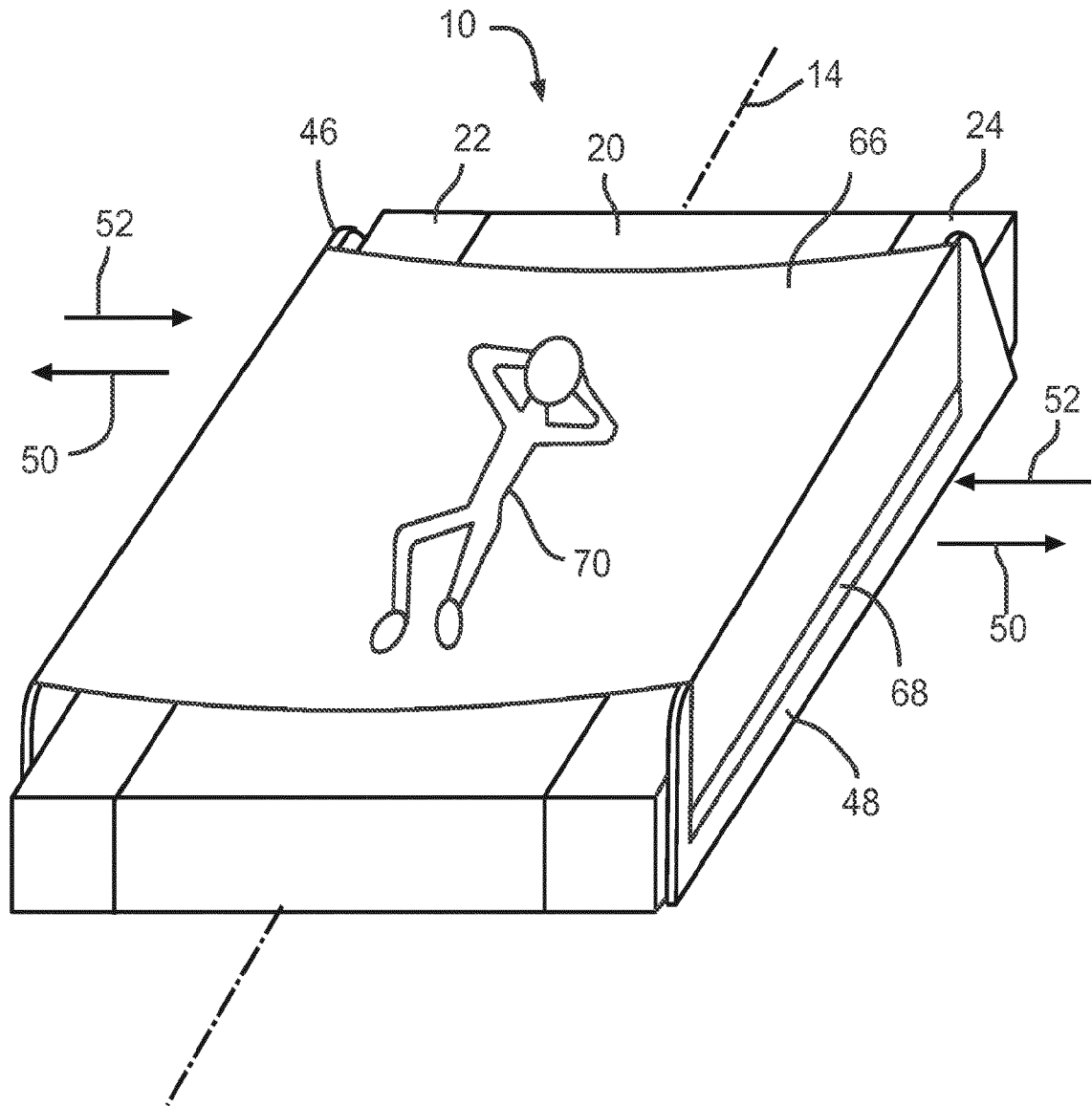


FIG. 5

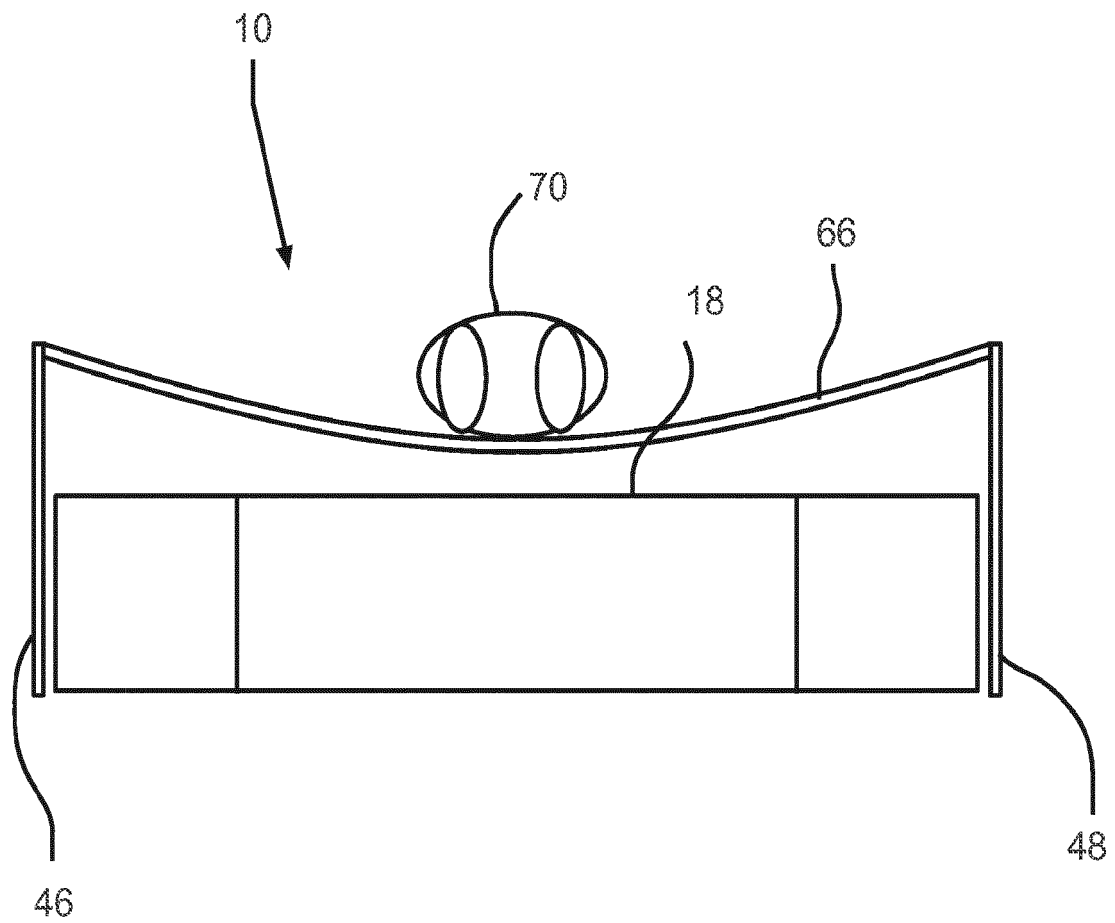


FIG. 6

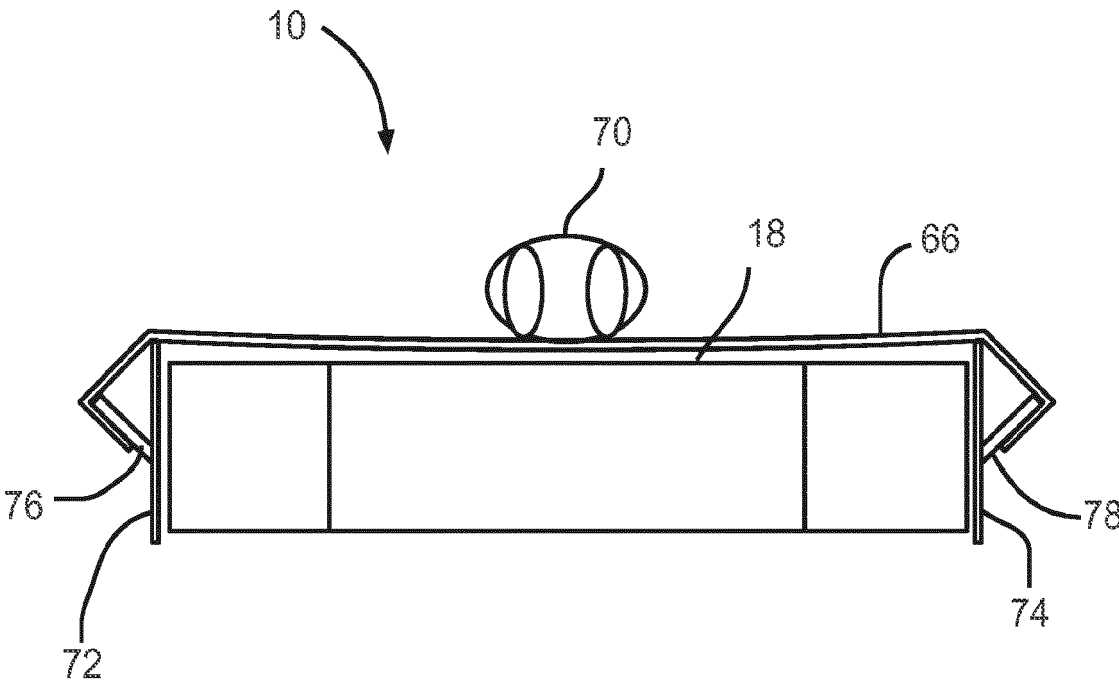


FIG. 7

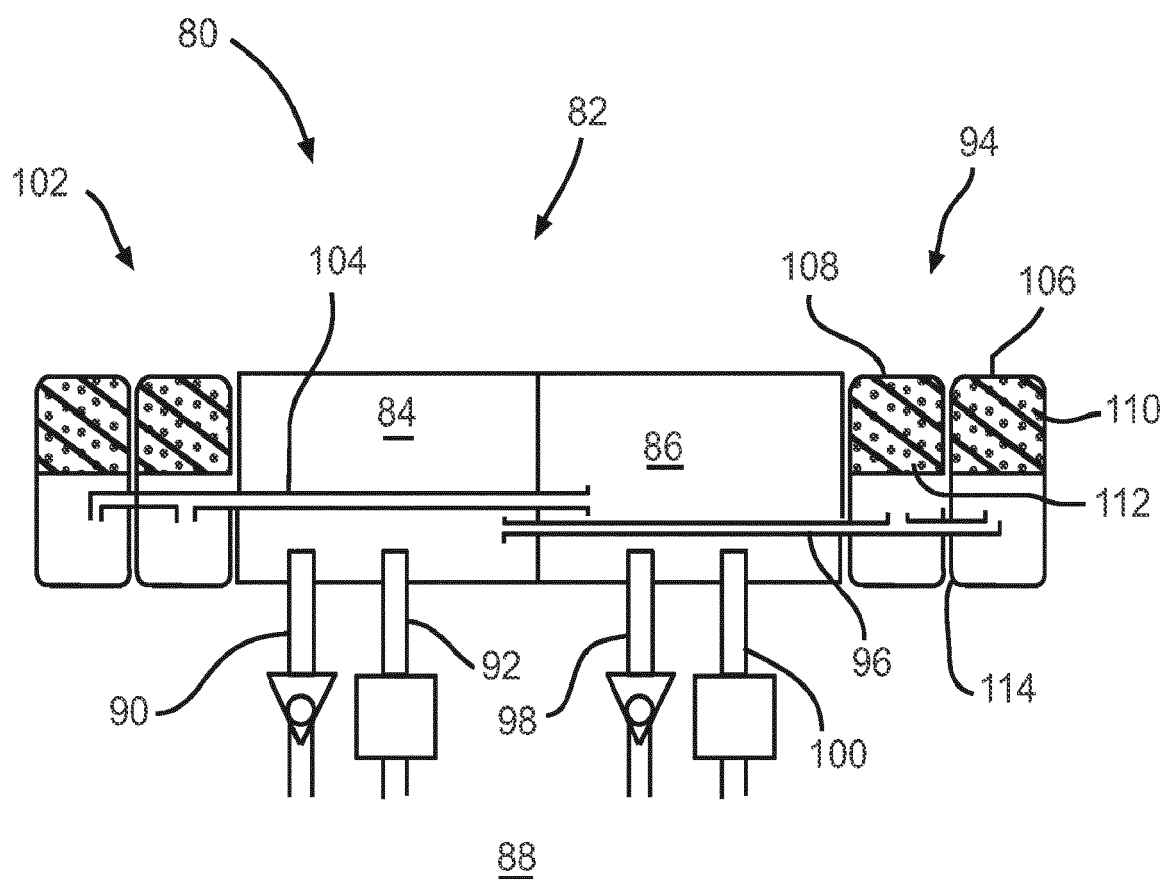


FIG. 8

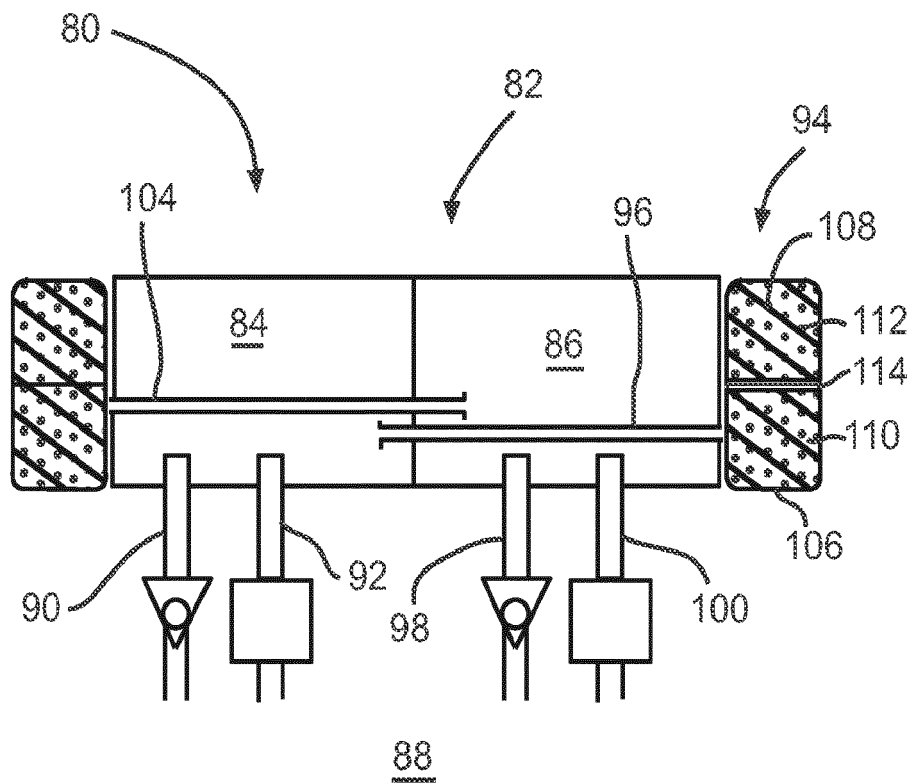


FIG. 9

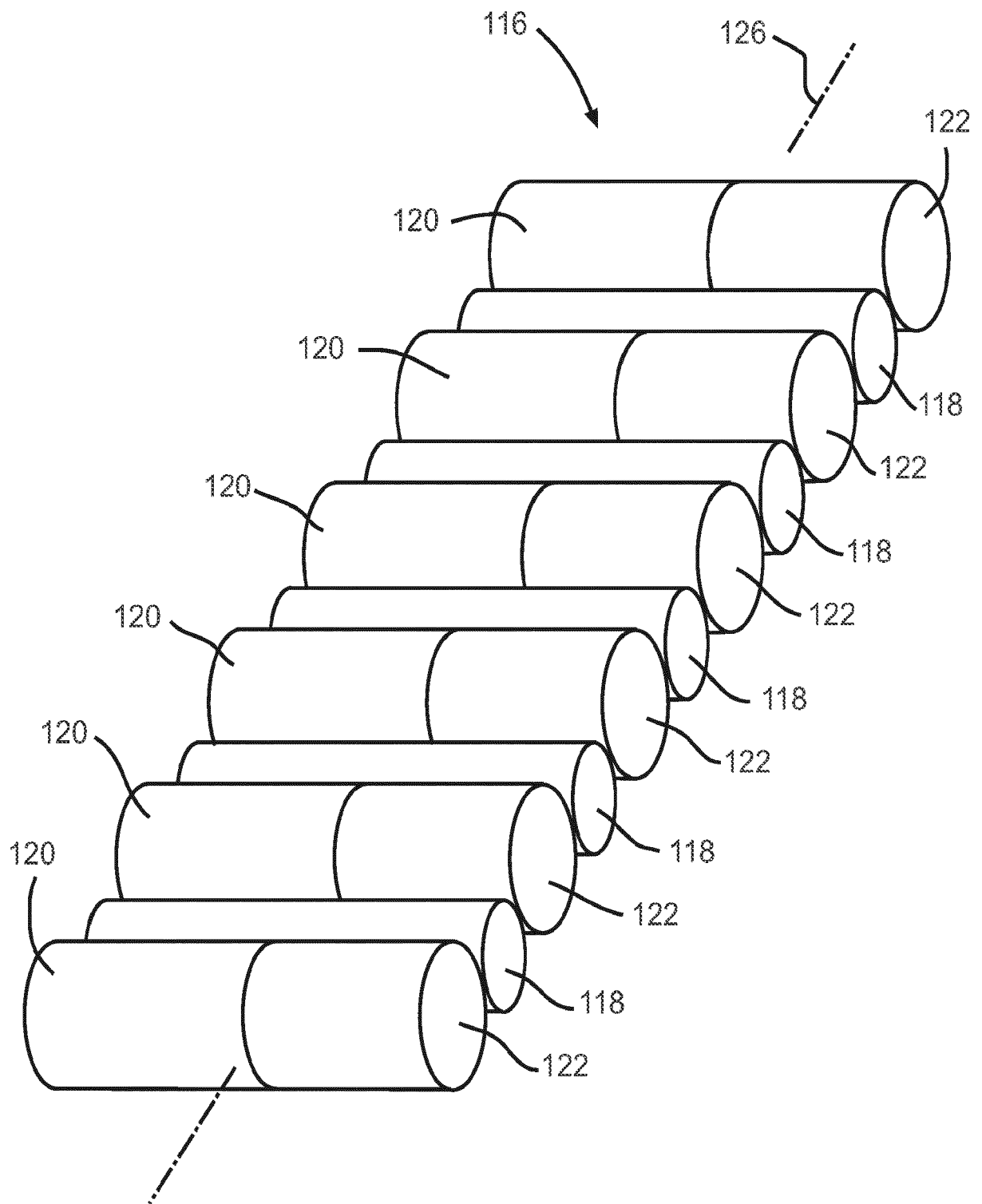
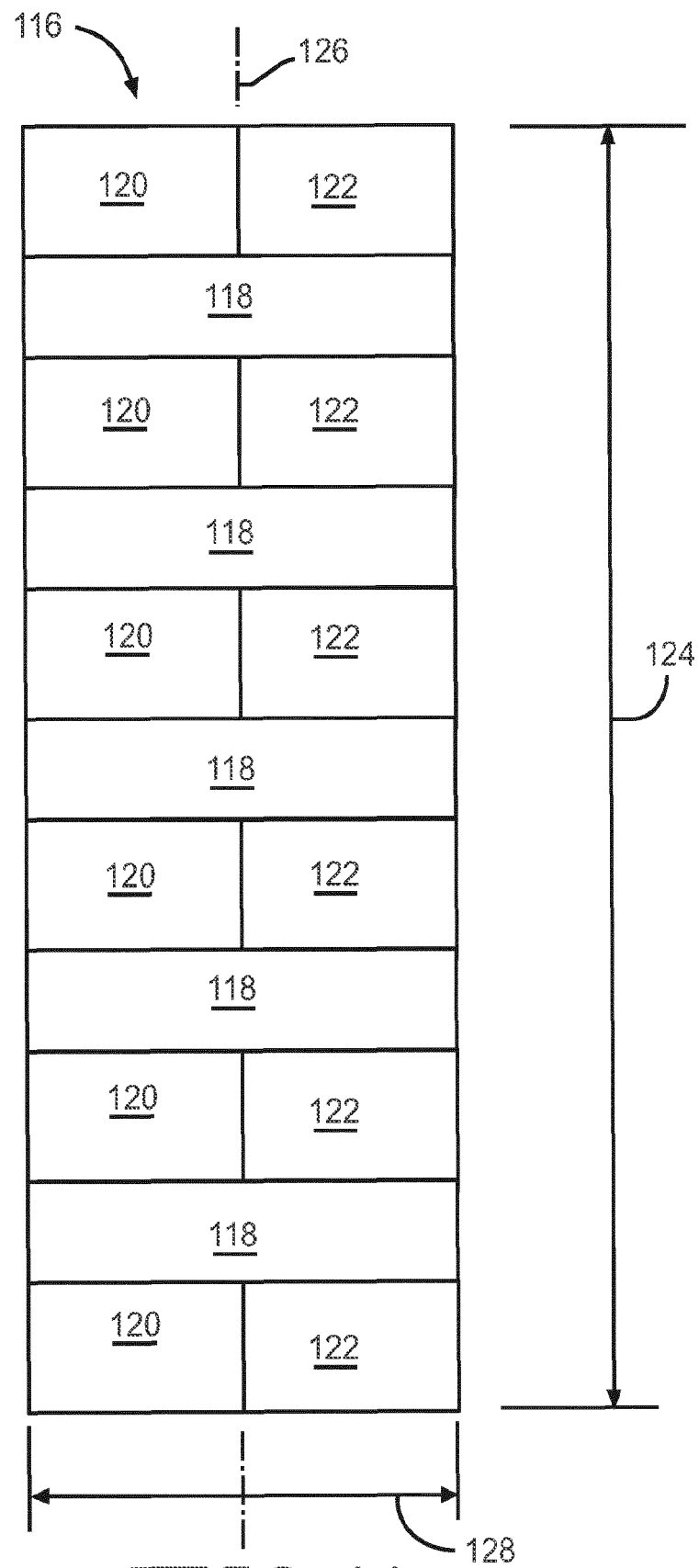


FIG. 10



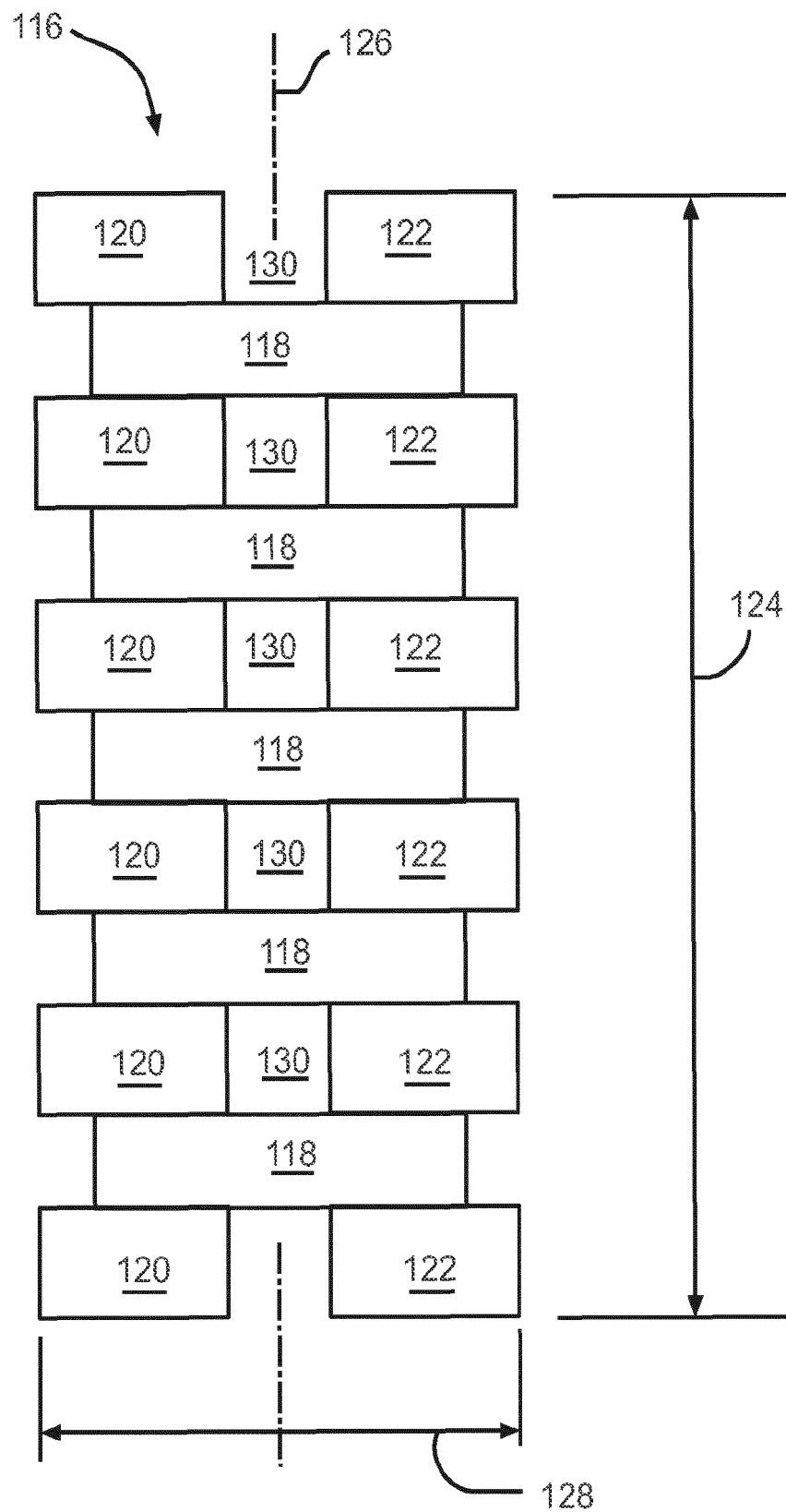


FIG. 12

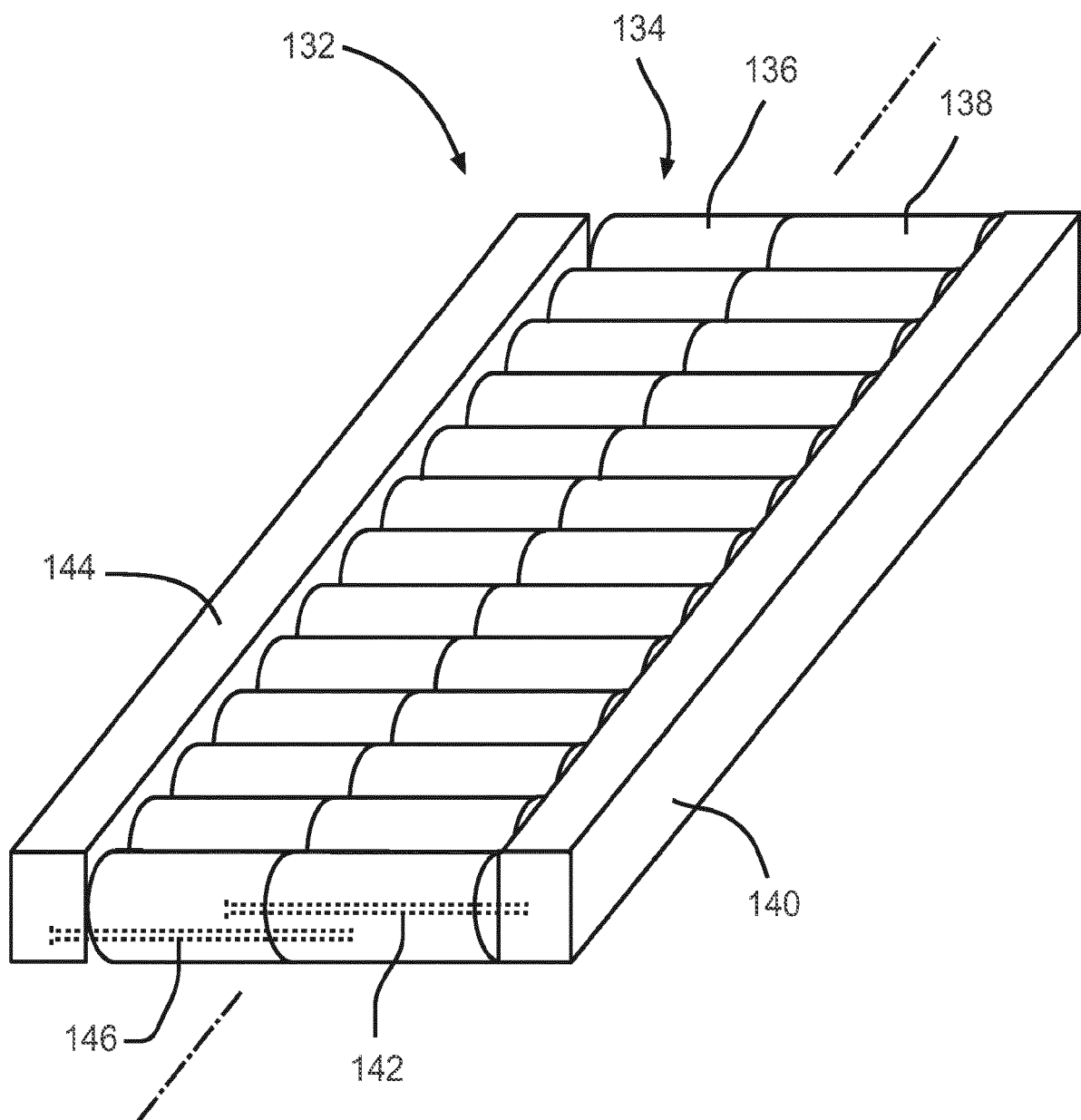


FIG. 13

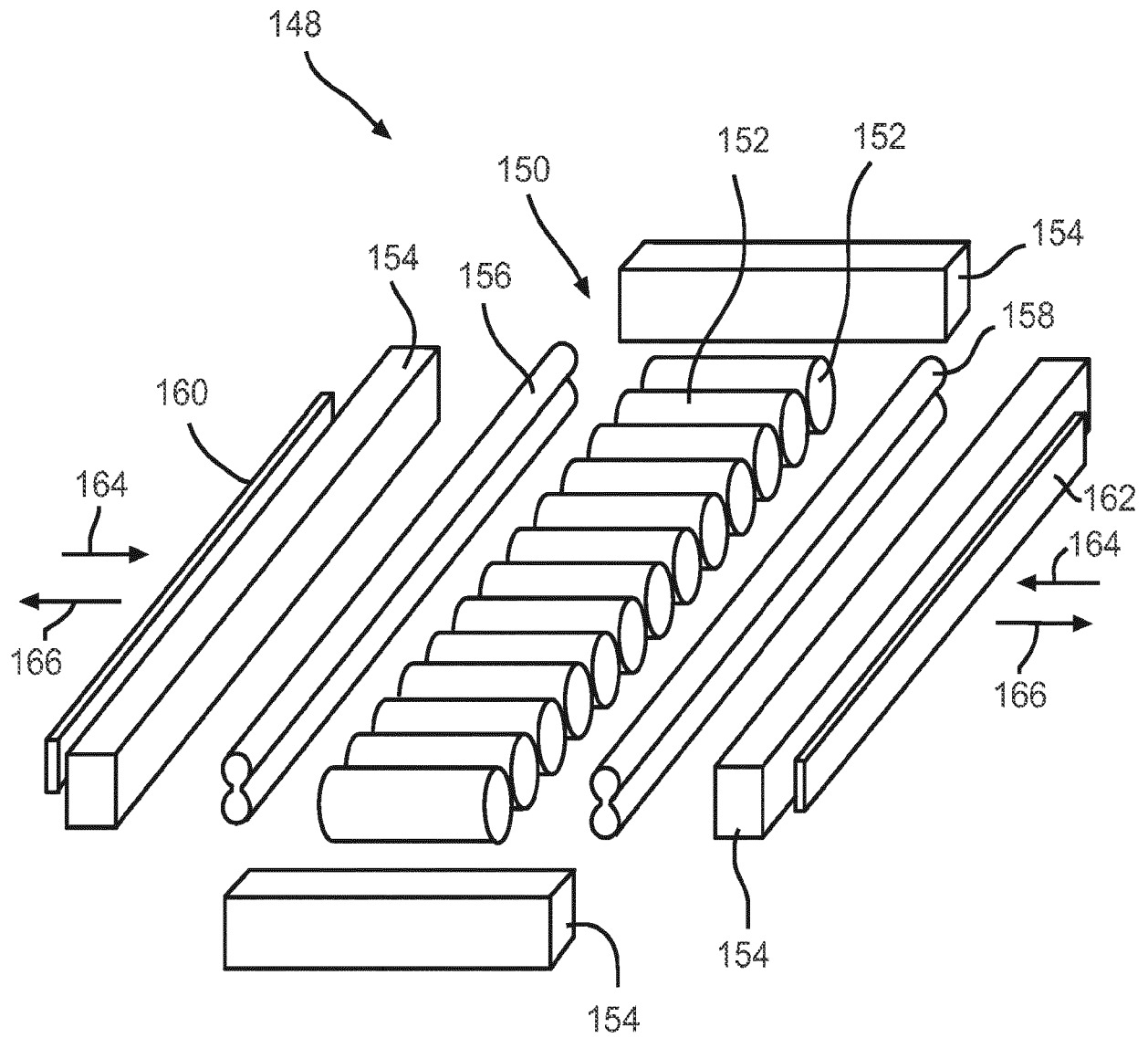


FIG. 14

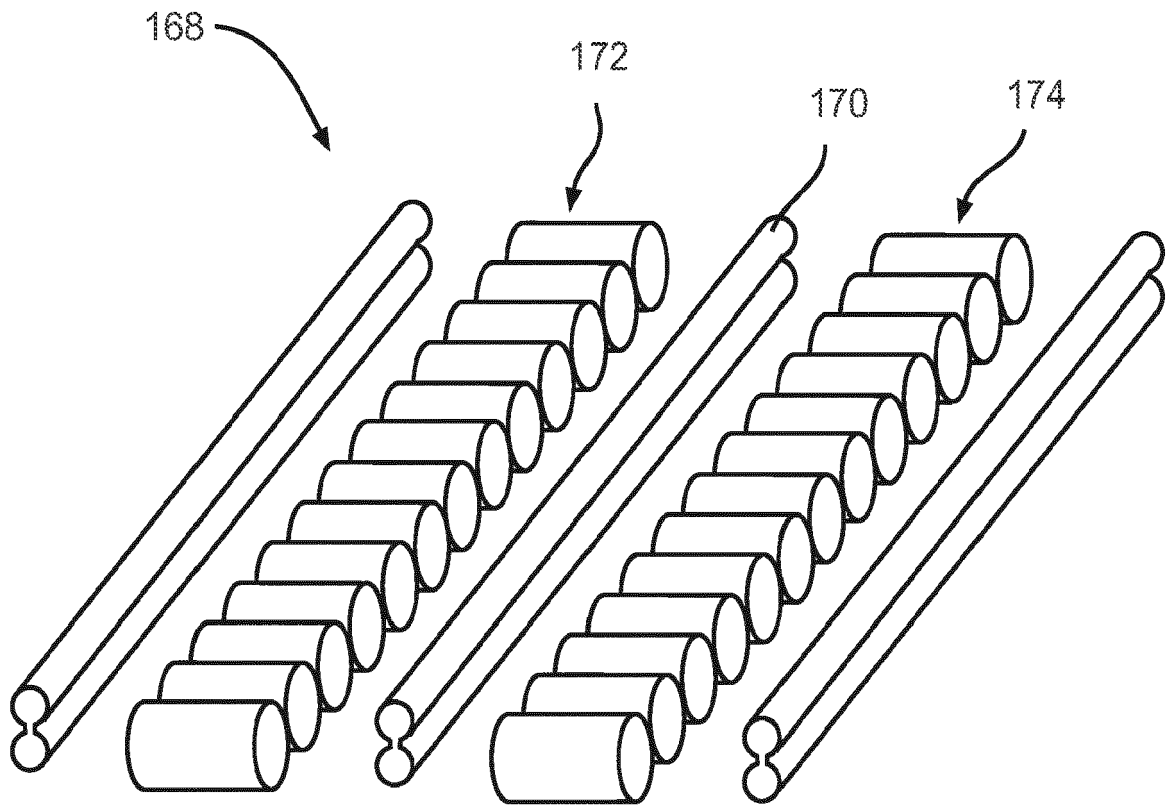


FIG. 15



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A	WO 00/40124 A1 (HILL ROM CO INC [US]) 13 July 2000 (2000-07-13) * figures 1-10 *	1-6	
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			A61G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 July 2019	Examiner Gkama, Alexandra
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