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(54) **PATIENT SUPPORT DEVICE WITH LOWER EXTREMITY RAISER**

**Publication Classification**

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(57) **ABSTRACT**

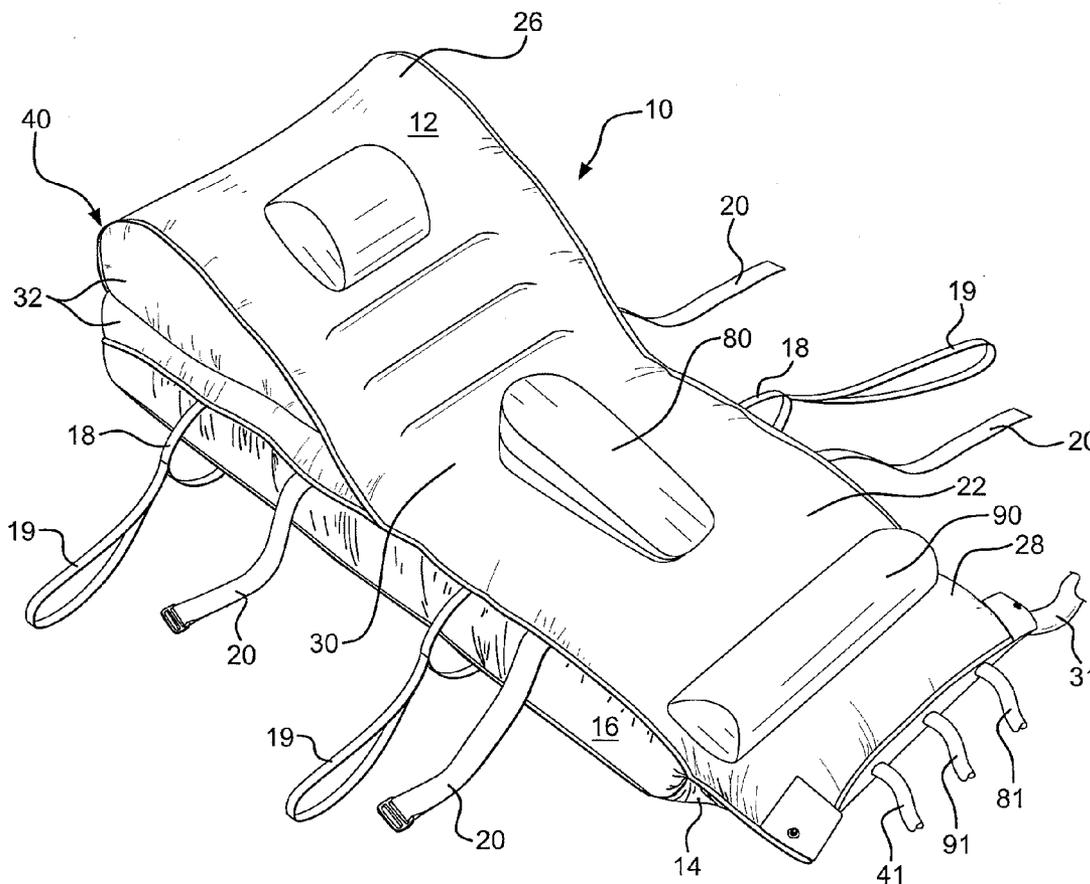
(21) Appl. No.: **13/186,010**

A patient support device includes a mattress including an inflatable plenum, an inflatable torso support chamber located on one end portion of the mattress to elevate the upper torso of a patient with respect to the lower torso and legs, the torso support chamber being isolated from the plenum so as to be separately inflatable, and an inflatable lower extremity support chamber located on an opposite end portion of the mattress to elevate one or more lower extremities of a patient with respect to the upper torso and lower torso, the lower extremity support chamber being isolated from the plenum and the torso support chamber so as to be separately inflatable.

(22) Filed: **Aug. 15, 2011**

**Related U.S. Application Data**

(60) Provisional application No. 61/365,618, filed on Jul. 19, 2010.



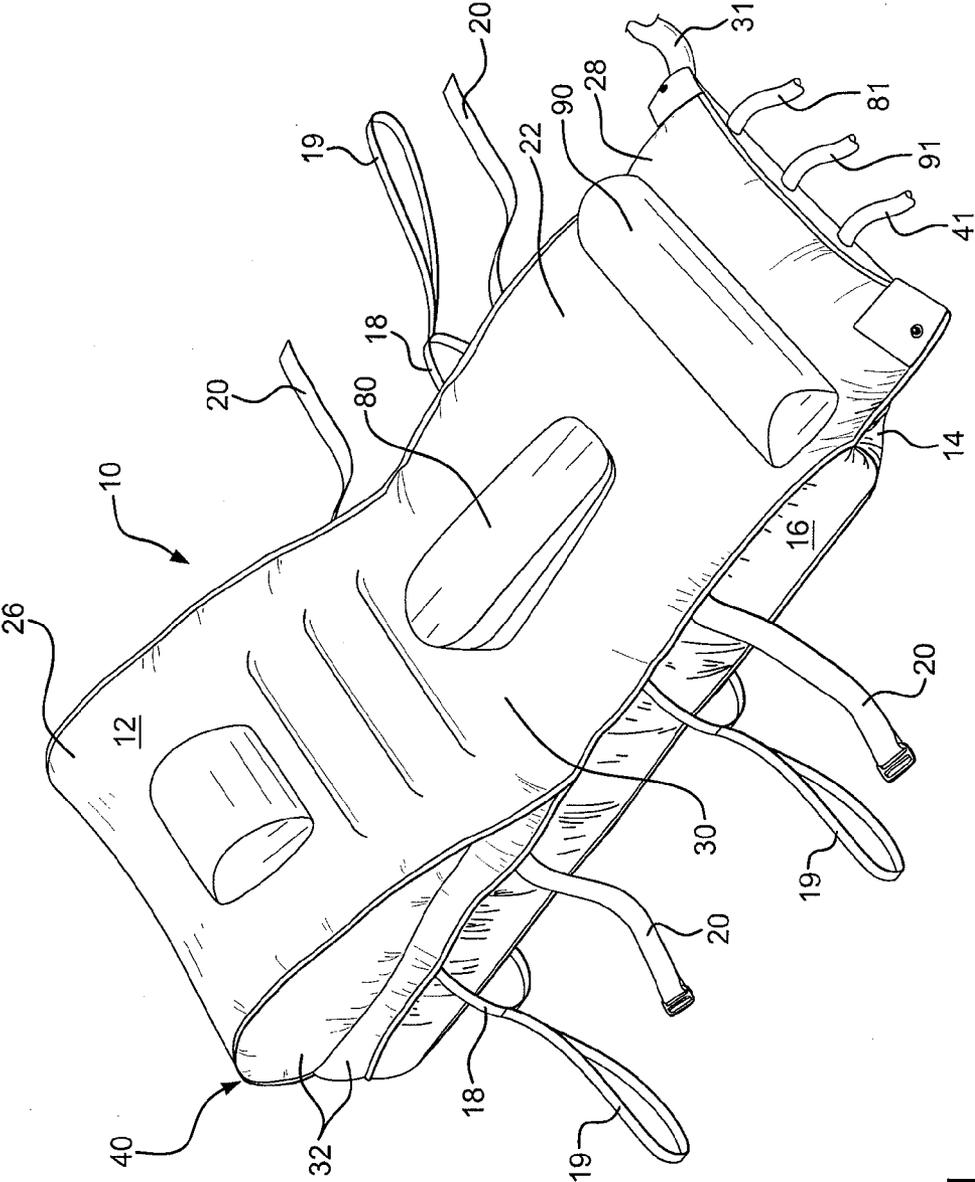


FIG. 1

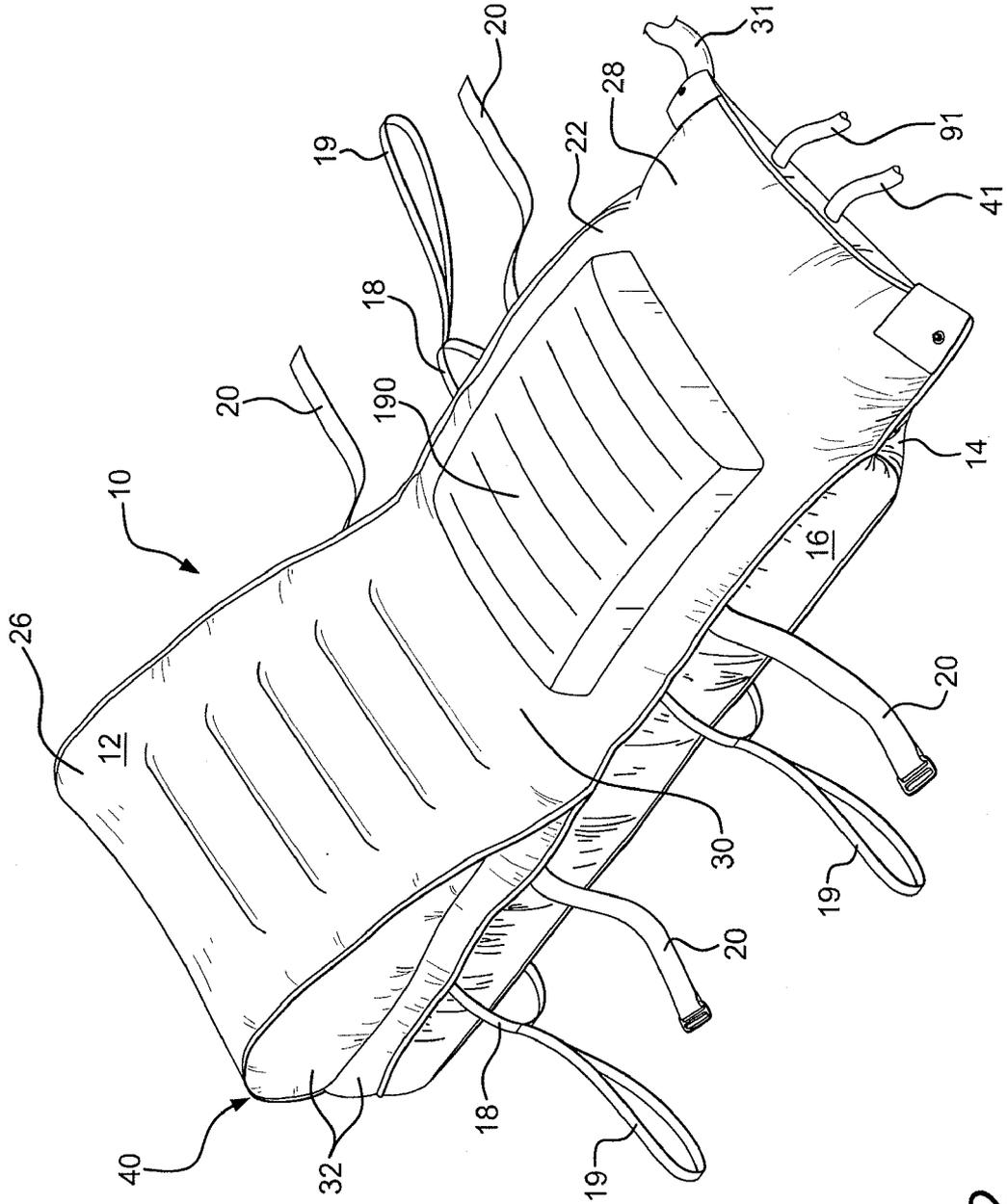


FIG. 2

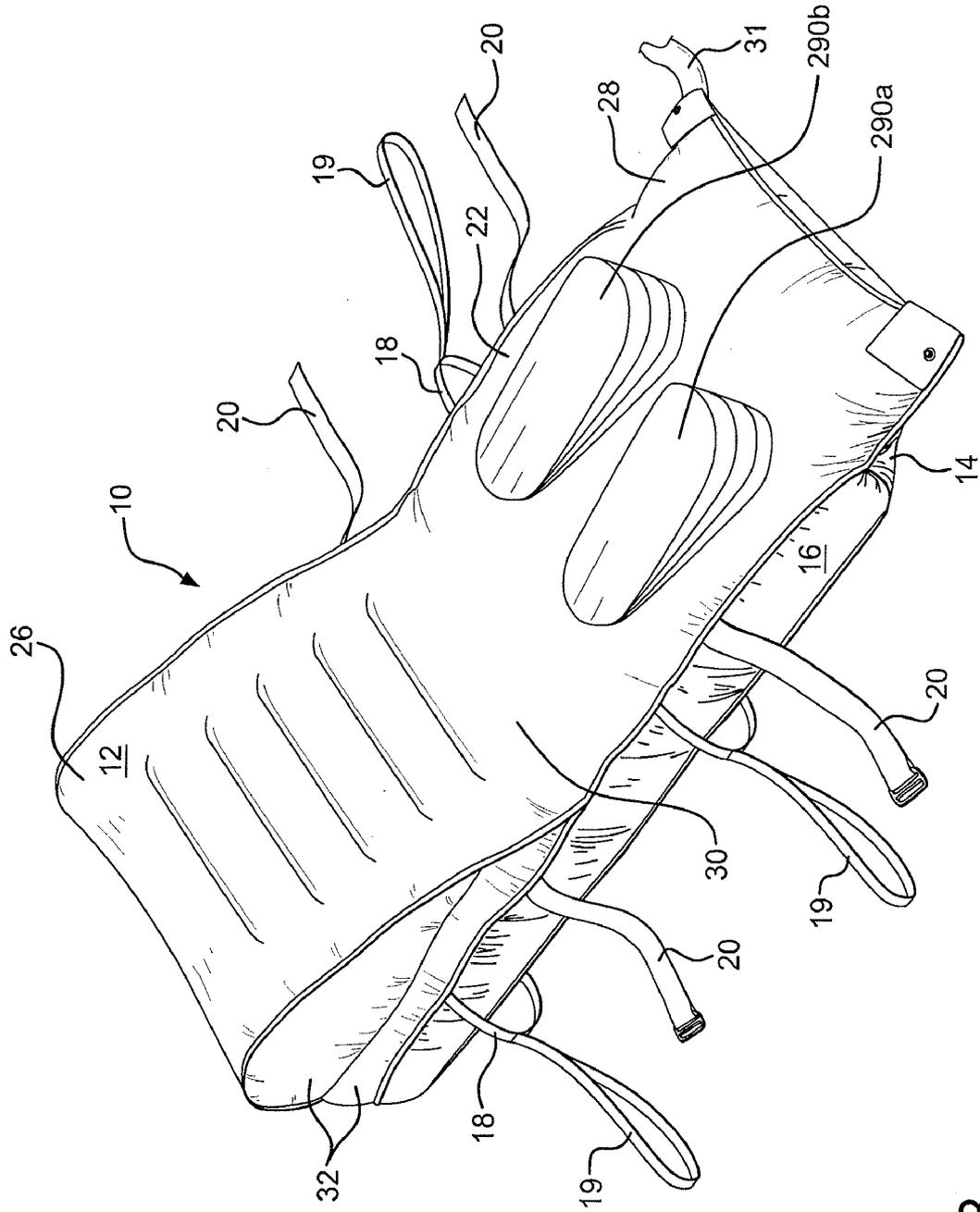


FIG. 3

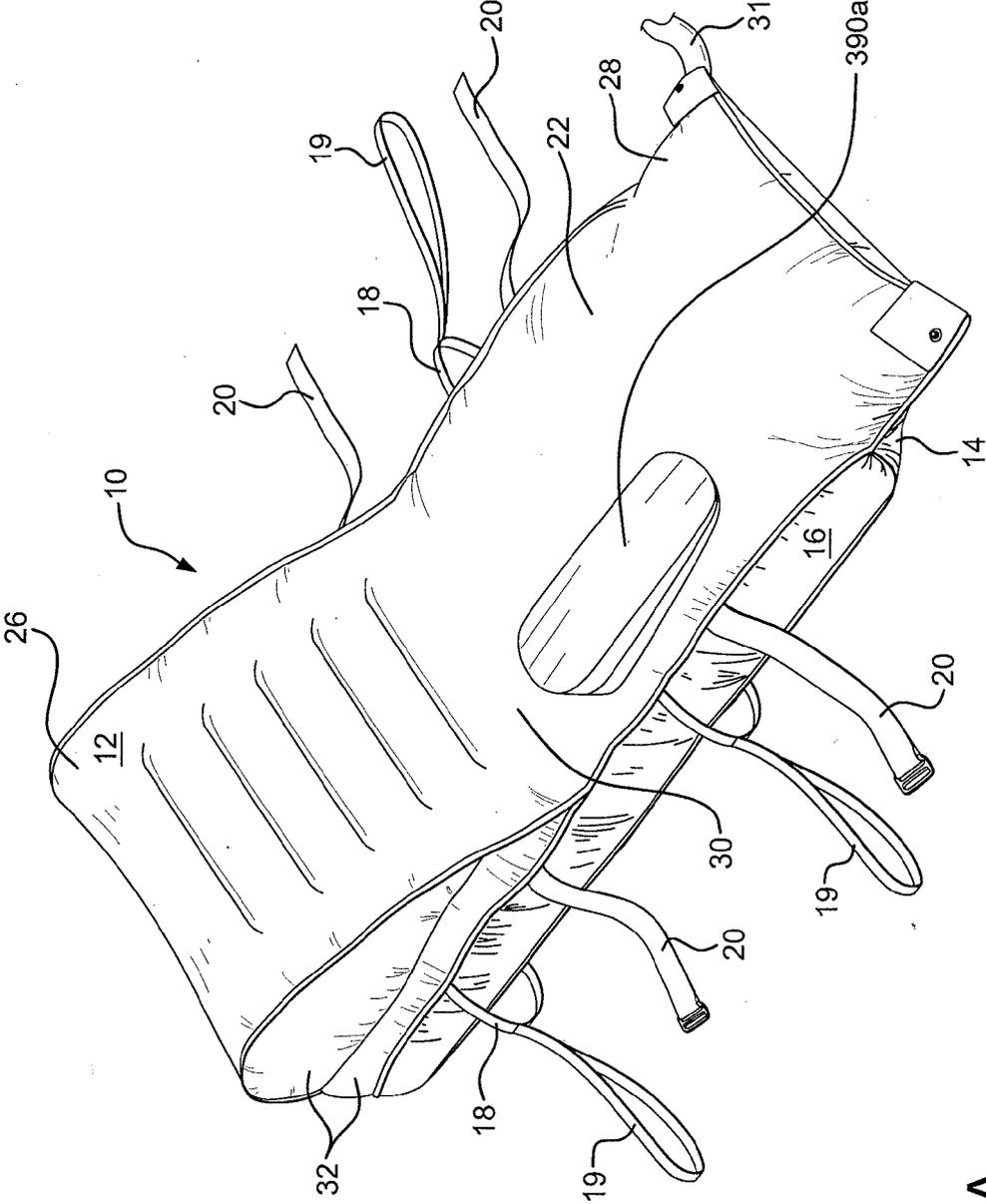


FIG. 4A

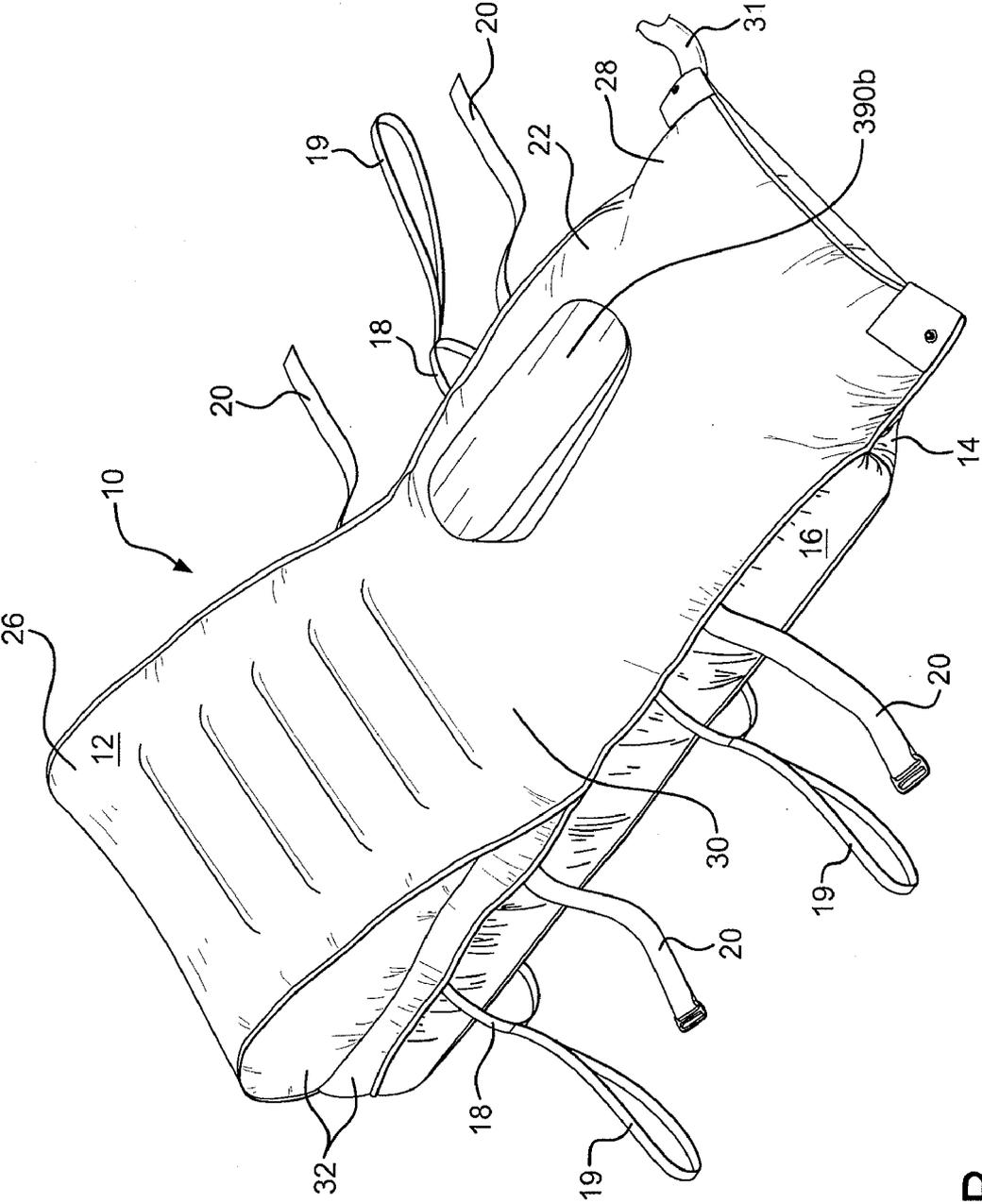


FIG. 4B

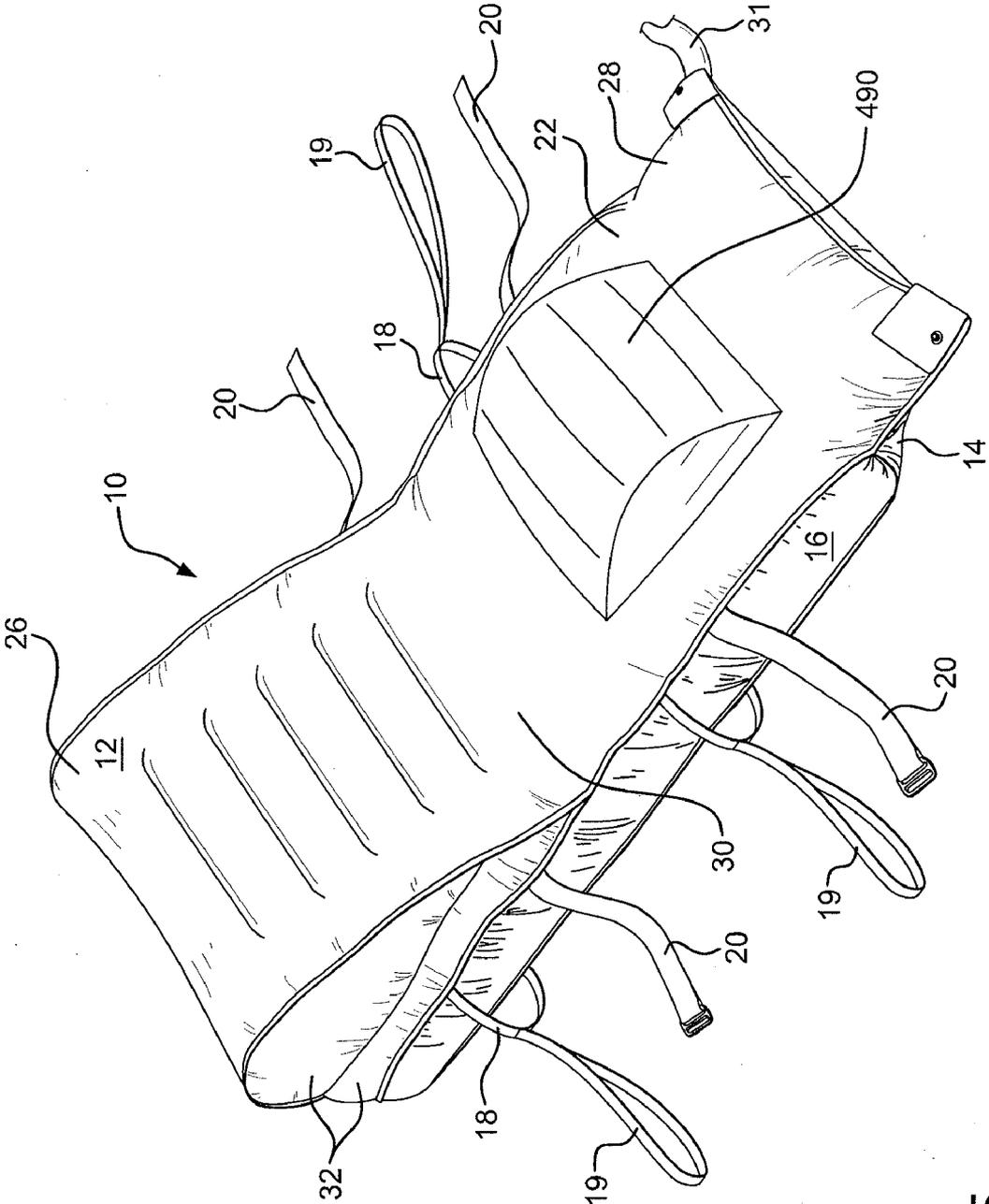


FIG. 5

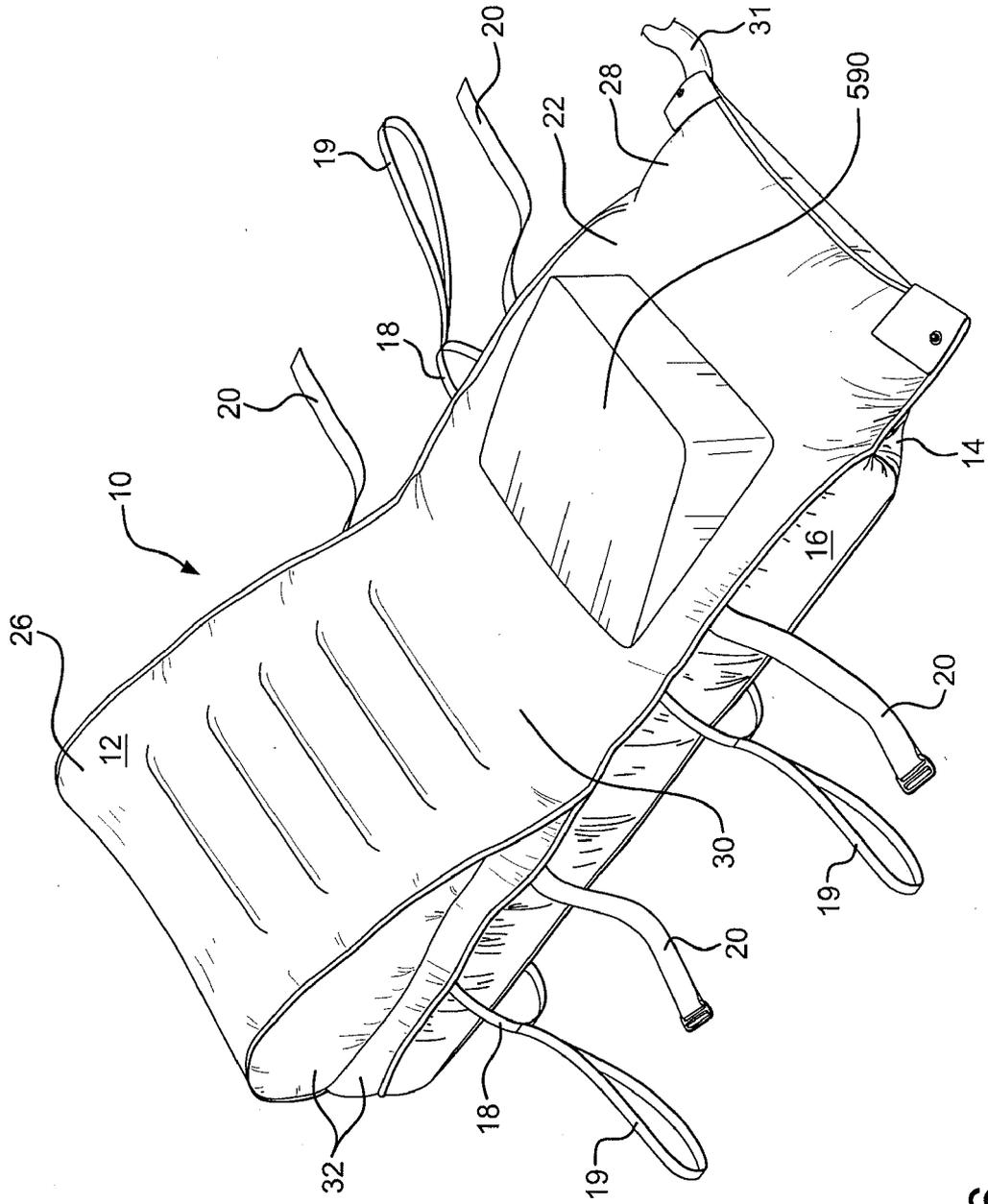


FIG. 6

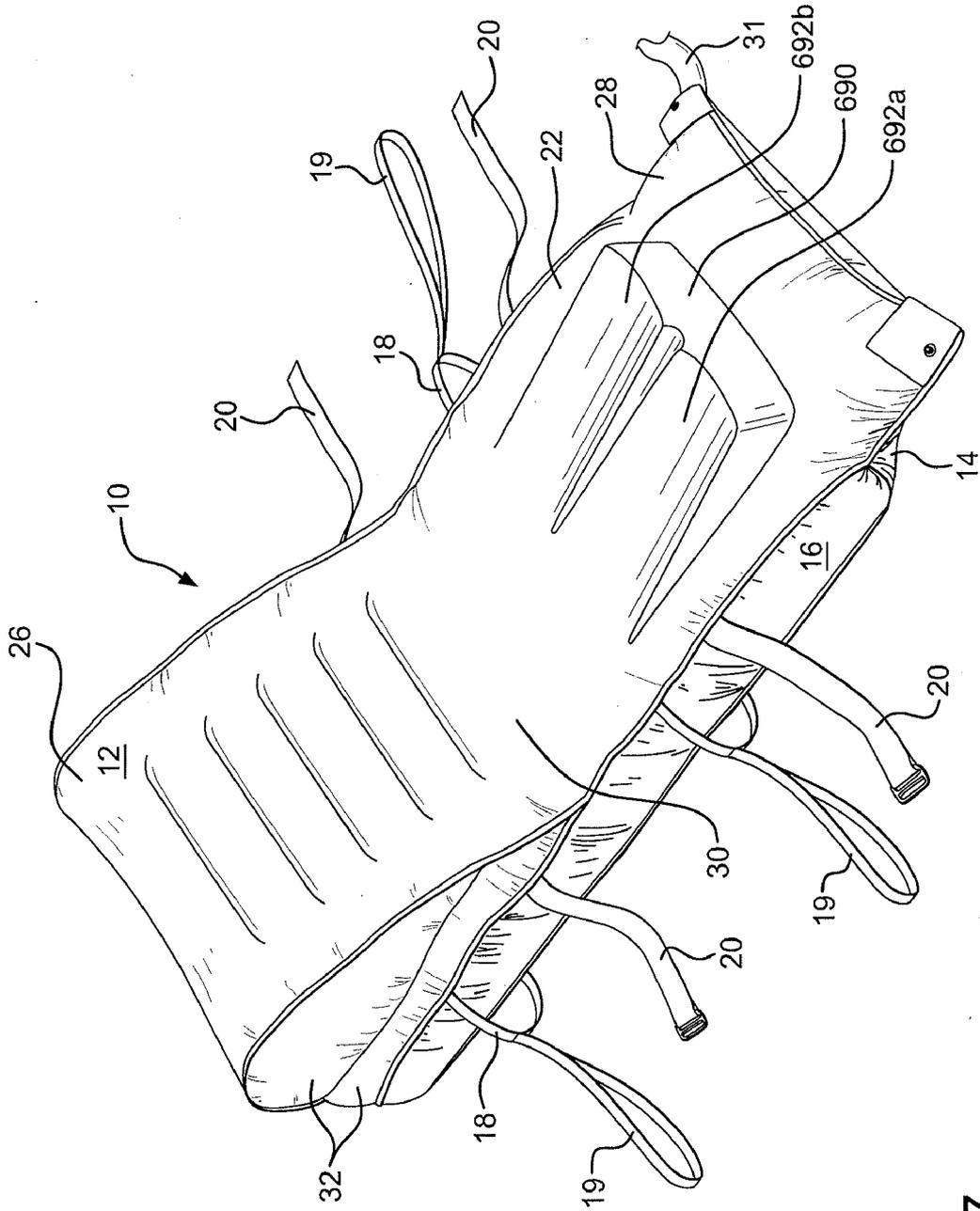


FIG. 7

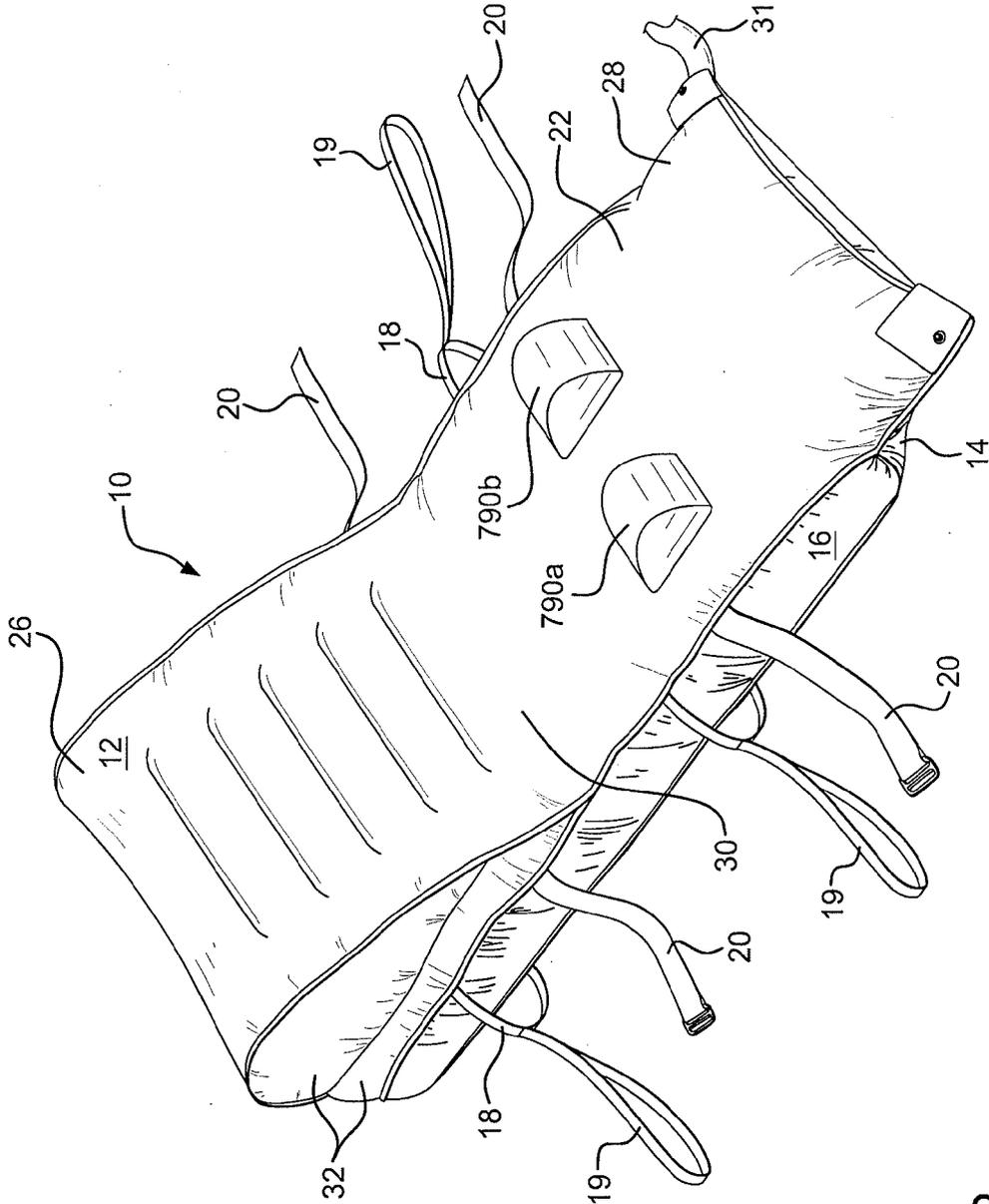


FIG. 8

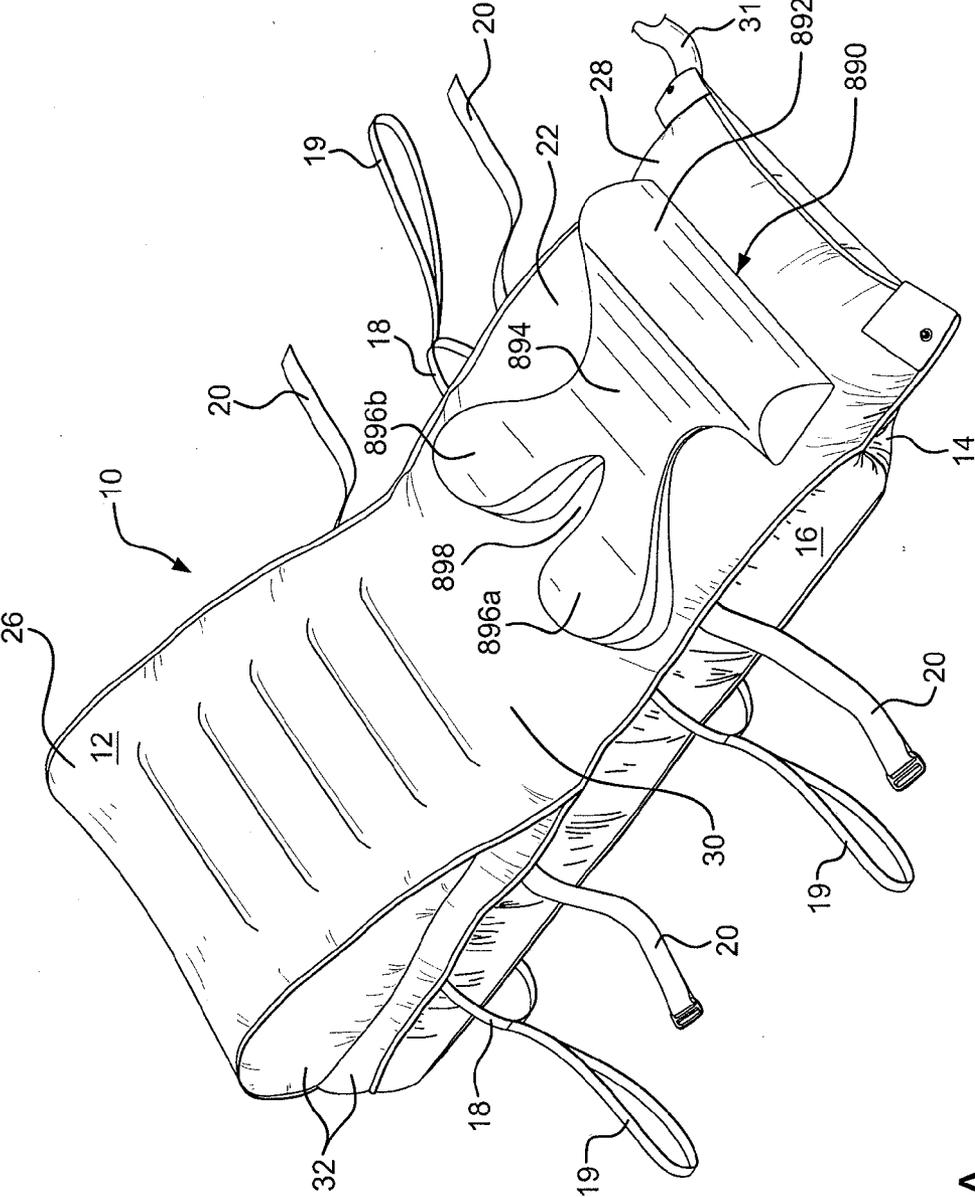


FIG. 9A

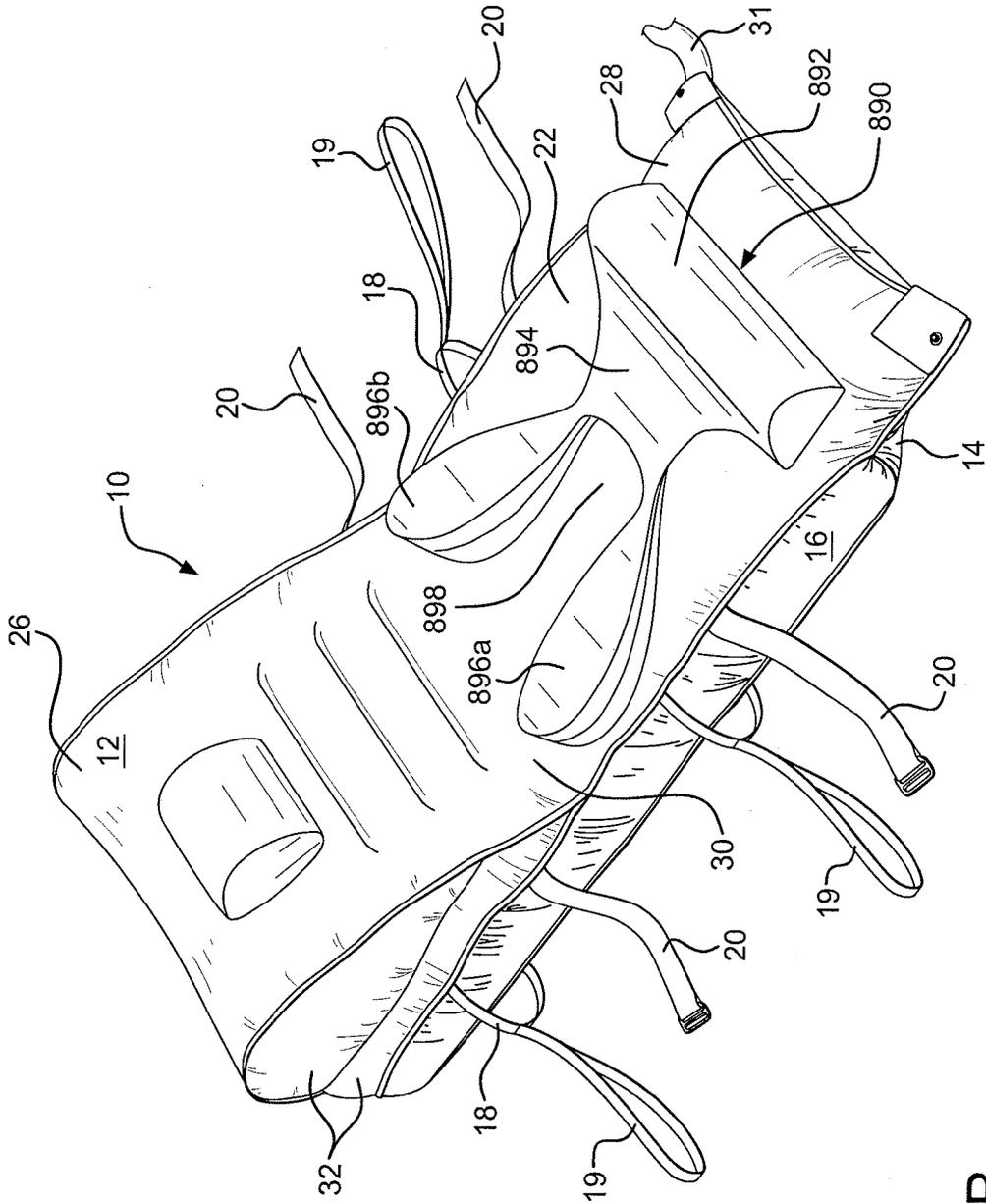


FIG. 9B

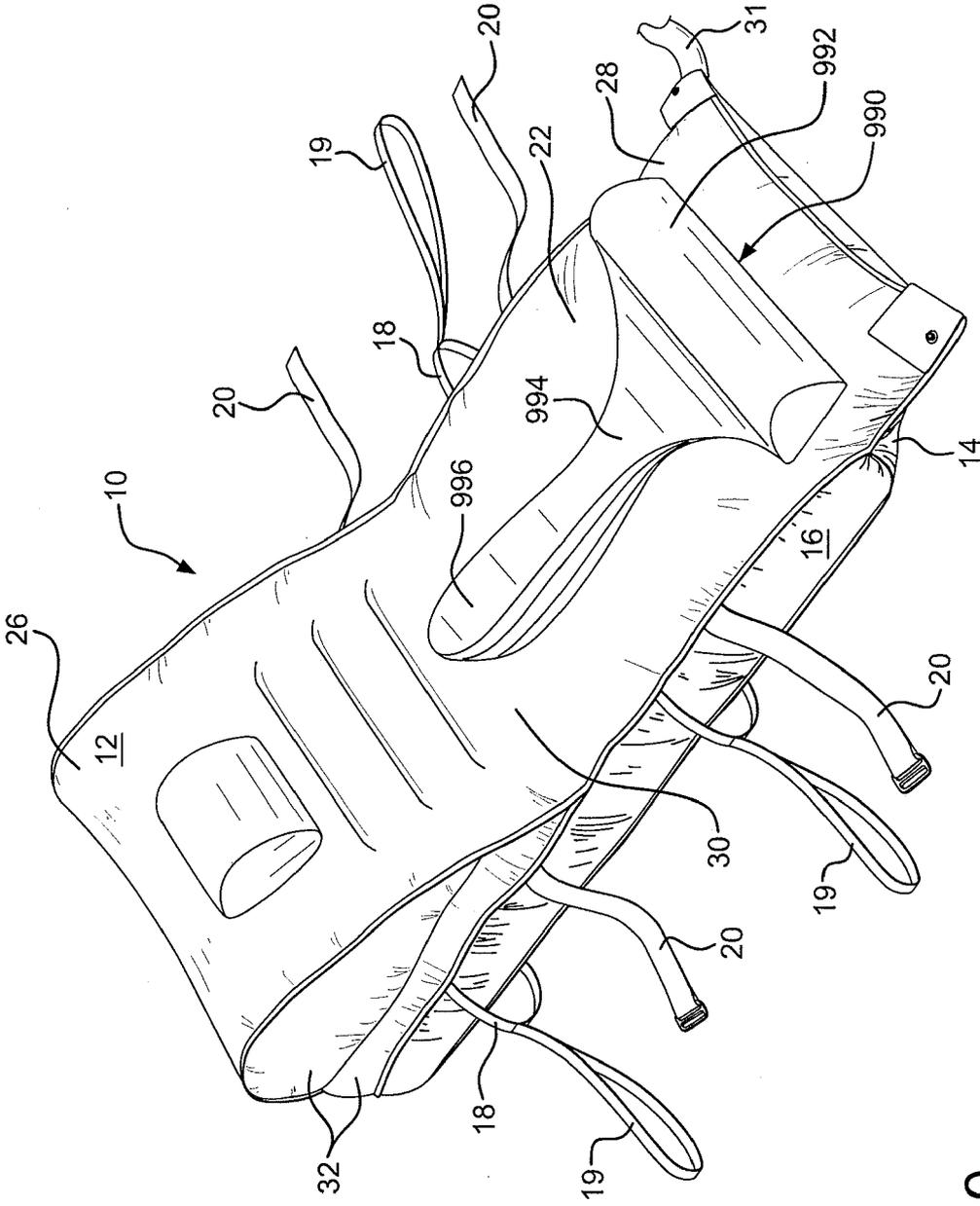


FIG. 10

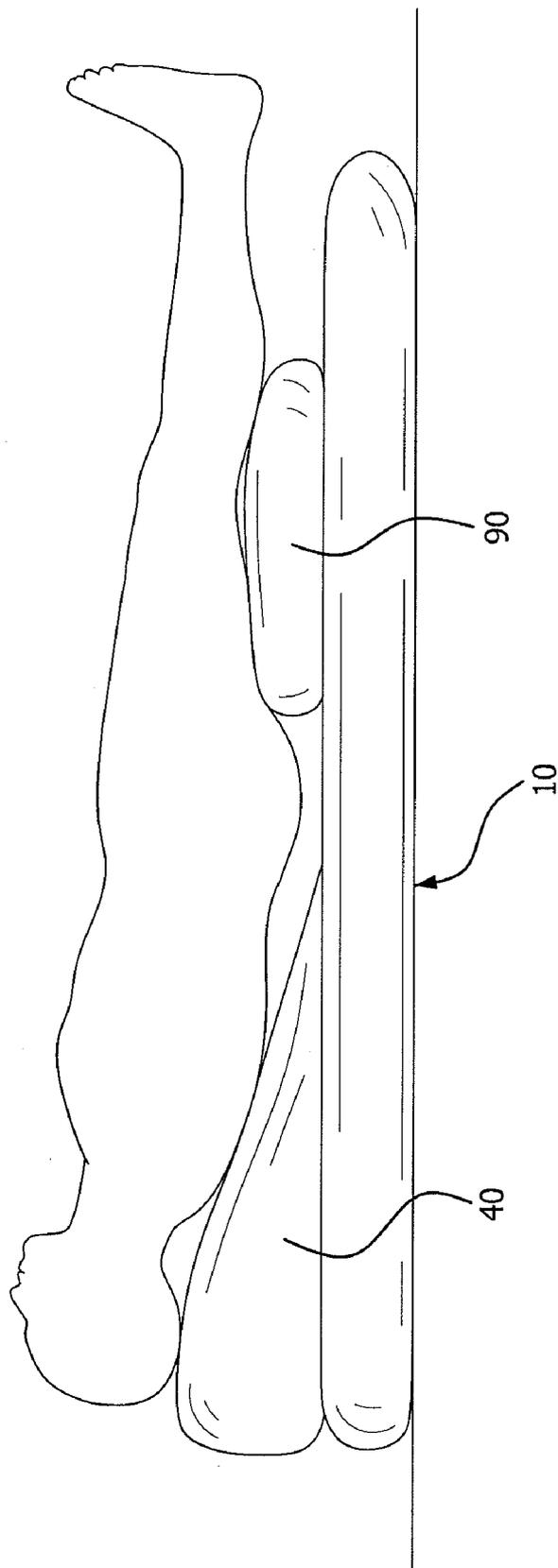


FIG. 11

**PATIENT SUPPORT DEVICE WITH LOWER EXTREMITY RAISER**

**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims priority of U.S. Provisional Application No. 61/365,618, filed Jul. 19, 2011, entitled "Patient Positioning Device with Leg Raiser", which is incorporated herein by reference in its entirety.

**FIELD OF THE INVENTION**

[0002] The present invention relates to a patient support device. More particularly, the present invention relates to a patient support mattress with a lower extremity raiser, which may be useful for raising and supporting the buttocks, upper legs, knees, and/or lower legs of obese patients for the purpose of providing medical treatment to the hips, legs, and feet.

**BACKGROUND OF THE INVENTION**

[0003] Patient support devices, including patient transfer mattresses, have an inflatable plenum that provides an air cushion to lift and support a patient laying on a bed or other support surface. Some contemporary examples of patient transfer mattresses are disclosed in U.S. Pat. No. 7,210,176 (Weedling).

[0004] Patients, particularly those that are morbidly obese, often have coexisting physical conditions, including chronic lesions or wounds on portions of the hips, buttocks, legs, and feet on which the patient's weight is normally supported. Treating these wounds, including activities such as changing wound dressings, typically requires lifting the hips, buttocks, legs or feet of a patient, and sometimes necessitates rolling a patient on his or her side. For morbidly obese patients, these actions can be particularly problematic. First, the sheer weight of the patient's hip, buttock, or leg (perhaps in excess of 200 pounds) may be difficult for a caregiver to manipulate and support. Second, rolling a patient can cause damage to the area under treatment, as well as to adjacent areas of the skin and underlying tissue.

**SUMMARY OF THE INVENTION**

[0005] In one embodiment, a patient support device is disclosed having a mattress including an inflatable plenum. An inflatable torso support chamber is located on one end portion of the mattress to elevate the upper torso of a patient with respect to the lower torso and legs, the torso support chamber being isolated from the plenum so as to be separately inflatable. An inflatable lower extremity support chamber is located on an opposite end portion of the mattress to elevate one or more lower extremities of a patient with respect to the upper torso and lower torso, the lower extremity support chamber being isolated from the plenum and the torso support chamber so as to be separately inflatable.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0006] FIG. 1 is a perspective view of a first embodiment of a patient support with a lower extremity raiser.

[0007] FIG. 2 is a perspective view of a second embodiment of a patient support with a lower extremity raiser.

[0008] FIG. 3 is a perspective view of a third embodiment of a patient support with a lower extremity raiser.

[0009] FIG. 4A is a perspective view of one variation of a fourth embodiment of a patient support with a lower extremity raiser.

[0010] FIG. 4B is a perspective view of another variation of a fourth embodiment of a patient support with a lower extremity raiser.

[0011] FIG. 5 is a perspective view of a fifth embodiment of a patient support with a lower extremity raiser.

[0012] FIG. 6 is a perspective view of a sixth embodiment of a patient support with a lower extremity raiser.

[0013] FIG. 7 is a perspective view of a seventh embodiment of a patient support with a lower extremity raiser.

[0014] FIG. 8 is a perspective view of an eighth embodiment of a patient support with a lower extremity raiser.

[0015] FIG. 9A is a perspective view of one variation of a ninth embodiment of a patient support with a lower extremity raiser.

[0016] FIG. 9B is a perspective view of another variation of a ninth embodiment of a patient support with a lower extremity raiser.

[0017] FIG. 10 is a perspective view of a tenth embodiment of a patient support with a lower extremity raiser.

[0018] FIG. 11 is a side view of a patient support with a lower extremity raiser in use.

**DESCRIPTION OF THE INVENTION**

[0019] FIG. 1 shows an inflatable mattress 10 that includes a top sheet 12, a bottom sheet 14 and side panels 16 sealed together to form a plenum. If the mattress 10 is used as a transfer mattress, the bottom sheet 14 may include a plurality of openings for discharging air from the mattress 10 to create an air cushion beneath the mattress to facilitate sliding of the mattress 10 along an underlying support surface. The transfer mattress 10 may include looped handles 18 and straps 19 secured to the sides of the mattress 10 to facilitate application of a pulling force to guide the movement of mattress, as well as patient restraint straps 20 for securing a patient to the mattress.

[0020] The inflatable mattress 10 may include longitudinally extending side air chambers 22 and transverse chambers 24 extending between the side chambers 22. The mattress 10 includes a head portion 26 at one end, a foot portion 28 at an opposite end, and an intermediate portion 30 located between the head and foot portions 26, 28.

[0021] The head portion 26 of the transfer mattress 10 includes an upper torso support chamber 40 bounded on its top surface by the top sheet 12 and on its sides by side panels 32. The torso support chamber 40 is preferably separately inflatable and deflatable from the main plenum of the mattress 10. The side panels 32 have a triangular shape that results in a sloped elevation of the top sheet 12 in the head portion 26 of the mattress 10 above the rest of the top sheet 12 when the upper torso support chamber 40 is inflated. In the depicted embodiment, the side panels 32 are dimensioned such that the top sheet 12 is inclined at a substantially uniform rate throughout a majority of the head portion 26. The angle of inclination,  $\theta$ , of top sheet 12 in the head portion 26 with respect to portion of the top sheet 12 between the intermediate portion 30 and the foot portion 28 may be between approximately 30 degrees and approximately 40 degrees when fully inflated and not loaded by a patient. The invention, however, is not limited to any particular angle of inclination. The inclination elevates the head and upper torso of a supported patient above the patient's lower torso and legs. Supporting an obese

patient in a more upright position facilitates circulation and respiration, both at rest and lateral transfer.

[0022] The mattress 10 includes an air inlet hose 31 for supplying air to the plenum to inflate the mattress 10. The torso support chamber 40 may communicate with the plenum of the mattress 10 so that the torso support chamber 40 and the plenum of the mattress 10 can be inflated and deflated together. Constructed in this manner, the entire mattress 10, including the inclined head portion 26 defined by the torso support chamber 40, would be inflated in common from the same source of air via the air inlet hose 31. Alternatively, the torso support chamber 40 may be isolated from the remainder of the mattress 10. Arranged in this manner, the torso support chamber 40 could receive a separate supply of air through an inlet valve or air inlet hose 41 for optional inflation of the torso support chamber 40 when desired. Such an arrangement provides the option of supporting a patient in a substantially flat position, or in a more upright position.

[0023] FIG. 1 shows a first embodiment of a lower extremity support chamber 90 located on the top sheet 12 in the foot portion 28 of the mattress 10. The lower extremity support chamber 90 may be positioned to support various portions of a patient's leg or legs (lower extremities). As depicted, the lower extremity support chamber 90 is positioned to raise the lower legs or calves of a patient to cause the legs and feet to extend outward above the top sheet 12, in order to facilitate treatment of the feet and lower calves. For example, a caregiver can inflate the lower extremity support chamber 90 to raise the feet of a patient to change a negative pressure wound dressing on the heel or ankle. The lower extremity support chamber 90 may communicate with the plenum of the mattress 10 so that the lower extremity support chamber 90 and the plenum of the mattress 10 can be inflated and deflated together. However, the lower extremity support chamber 90 is preferably separately inflatable and deflatable via valves to a common air source (not shown) or via an air inlet hose 91 from a separate air source. The lower extremity support chamber 90 may be used alone or in combination with the torso support chamber 40 to position the patient as desired. When each of the mattress 10, the torso support chamber 40, and the lower extremity support chamber 90 is separately inflatable and deflatable, each can be selectively inflate or deflated separately from the others.

[0024] Also shown in FIG. 1 is hip region support chamber 80 that is centrally located on the mattress 10. The hip region support chamber 80 may be positioned beneath the center of a patient's pelvis (i.e., the sacrum), and may be inflated to raise the hips up off the top sheet 12 of the mattress 10. This would enable treatment of regions of the hips, buttocks, and upper thighs that would otherwise be inaccessible, or otherwise would require rolling a patient to one side of the other. As shown, the hip region support chamber 80 is sloped when inflated so as to provide a maximum amount of lift beneath the lower spine and sacrum region and a progressively lower amount of lift toward the feet. The hip region support chamber 80 may be used alone or in combination with the lower extremity support chamber 90 and/or the torso support chamber 40 to position the patient as desired.

[0025] Systems for independently inflating air chambers, such as the torso support chamber 40, the lower extremity support chamber 90, and the hip region support chamber 80, are known. For example, U.S. Pat. No. 7,210,176 discloses an exemplary system in FIG. 8 and col. 7, line 55—col. 8, line 33, which are incorporated by reference herein.

[0026] FIG. 2 shows a second embodiment of a lower extremity support chamber 190 located on the top sheet 12 in the foot portion 28 of the mattress 10. As depicted, the lower extremity support chamber 190 has a generally rectangular shape and provides a uniform lift height throughout. The lower extremity support chamber 190 can be used to raise the buttocks and thighs of a patient to provide pressure relief to the lower back, and to enable access to behind the knees and lower legs for treatment. The lower extremity support chamber 190 can be separately inflated via valves (not shown) or the air inlet hose 91.

[0027] FIG. 3 shows a third embodiment of a lower extremity support chamber 290, including a right support chamber 290a and a left support chamber 290b. In variations of this embodiment, only one or the other of the support chambers 290a, 290b may be provided. The right support chamber 290a can be used to elevate the right thigh of a patient to provide access to the area behind the knee and along the calf. The left support chamber 290b can perform the same function for the left thigh. The support chambers 290a, 290b may be inflated together via a common air inlet tube 91 (not shown) or may be separately inflatable via valves or separate air supplies indicated generally as air inlet tubes 91a, 91b. Each of the support chambers 290a, 290b has a ramp shape to provide its greatest lift beneath the lower portion of a patient's thigh, and lesser lift going up toward the buttocks. In this way, the knee will be suspended above the top sheet 12 of the mattress 10, and the knee can be used as a fulcrum for a caregiver to manually raise and lower the foot and ankle by pivoting about the knee.

[0028] FIGS. 4A and 4B show variations of a fourth embodiment of a lower extremity support chamber 390. FIG. 4A shows a right support chamber 390a to be positioned beneath a patient's upper thigh. The right support chamber 390a has a ramped or sloped shape so as to provide its maximum lift beneath the buttock or hip, and lesser lift toward the knee. FIG. 4B shows a left support chamber 390b that is similarly positioned and shaped to the right support chamber 390a. The support chambers 390a, 390b may be provided separately or in combination, and may be inflated separately via air inlet hoses 91a, 91b, or together via a common air source or valve (not shown).

[0029] FIG. 5 shows a fifth embodiment of a lower extremity support chamber 490. As depicted, the lower extremity support chamber 490 has a generally arcuate shape, gradually rising from the top surface 12 of the mattress 10 below the hips and above the ankles, and peaking behind the knees of a patient. Alternatively, a patient may be positioned so the peak lift is positioned in the middle of the thigh, so that the lower portion of the thigh and knee extends straight out, and the lower leg can be manually pivoted up and down about the knee. The lower extremity support chamber 490 can be separately inflated via the air inlet hose 91.

[0030] FIG. 6 shows a sixth embodiment of a lower extremity support chamber 590. As depicted, the lower extremity support chamber 590 has a generally convex ramped shape, gradually rising from the top surface 12 of the mattress 10 below the hips, peaking behind the knees of a patient, and then dropping off sharply. Alternatively, a patient may be positioned so the drop off is positioned in the middle of the thigh, so that the lower portion of the thigh and knee extends straight out, and the lower leg can be manually pivoted up and down about the knee. The lower extremity support chamber 590 can be separately inflated via the air inlet hose 91.

[0031] FIG. 7 shows a seventh embodiment of a lower extremity support chamber 690. The support chamber 690 includes a pair of concave ramped partially cylindrical surfaces 692a, 692b, each shaped to support a thigh of a patient. The concave shape of the surfaces 692a, 692b helps to extend the patient's leg outward so that it is elevated above the top sheet 12 of the mattress 10. The lower extremity support chamber 690 can be separately inflated via the air inlet hose 91. In an alternate embodiment, the support chamber 690 may include only one or the other of the concave surfaces 692a, 692b, so that one leg can be raised while the other remains flat. In another alternate embodiment, the support chamber 690 may be divided into two separate chambers so that the concave surfaces 692a, 692b can be inflated and deflated separately.

[0032] FIG. 8 shows an eighth embodiment of a lower extremity support chamber 790. The support chamber 790 includes a pair of separately inflatable air pods 790a, 790b, each designed to be positioned under the knee of a patient. Air for inflation can be separately supplied to the air pods 790a, 790b via valves or air inlet hoses 91a, 91b.

[0033] FIGS. 9A and 9B show two variations of a ninth embodiment of a lower extremity support chamber 890. The support chamber 890 includes a leg raiser 892 extending across the mattress 10 beneath both legs, a pair of hip raisers 896a, 896b positioned beneath each hip and separated by a lower spinal gap 898, and a central buttocks raiser 894 connecting the leg raiser 892 and the hip raisers 896a, 896b. When inflated, the support chamber 890 lifts the hips and thighs of a patient, and supports the central buttocks region, while providing pressure relief and treatment access to the both buttocks (situated on either side of the central buttocks raiser 894) and the sacrum region (situated in the lower spinal gap 898). The variation depicted in FIG. 9A has a relatively small lower spinal gap 898 such that the hip raisers 896a, 896b are relatively close together to enable access to the outer hip regions. The variation depicted in FIG. 9B has a relatively large lower spinal gap 898 such that the hip raisers 896a, 896b are relatively far apart to provide broader support for the hips while enabling better access to the crotch and lower spinal region. Air for separate inflation of the support chamber 890 can be supplied by an air inlet hose 91.

[0034] FIG. 10 shows a tenth embodiment of a lower extremity support chamber 990. The support chamber 990 includes a leg raiser 992 extending across the mattress 10 beneath both legs, a hip raiser 996, and a central buttocks raiser 994 connecting the leg raiser 992 to the hip raiser 996. When inflated, the support chamber 990 raises the hips from a central point, as well as the thighs, and provides broad pressure relief and access to the lower back, buttocks, and upper thighs. Note that the support chamber 990 of the tenth embodiment can be used to perform a very similar function to a combination of the support chambers 80 and 90 shown in the first embodiment FIG. 1, the only difference between the first embodiment and the tenth embodiment being the central buttocks raiser 994 that connects the hip support chamber 80 (hip raiser 996) and the lower extremity support chamber 90 (leg raiser 992). Air for separate inflation of the support chamber 990 can be supplied by an air inlet hose 91.

[0035] FIG. 11 is a side view depicting access to the buttocks region that can be provided by any of the lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 described herein, in combination with the upper torso support chamber 40.

[0036] Further, any of the lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 described herein can be used separately on a mattress 10, or two or more of the support chambers lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 can be used in combination at the same time, as necessary, space permitting.

[0037] Additionally, any of the lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 can be integrally incorporated into the top sheet 12 of the mattress 10 or can be removably attached to the top sheet 12 of the mattress by way of any fastening mechanism known or that may be envisioned by a person of ordinary skill in the art. For example, one or more of the lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 may be removably attached to the top sheet 12 using hook and loop type fasteners, snaps, straps, clips, zippers, or any other mechanical means that can enable repeated fastening and unfastening. In this way, any of the lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 can be precisely positioned under a particular patient, as desired, to enable a caregiver to elevate specific portions of a patient's lower anatomy to provide comfort or access to certain regions for treatment. By making the lower extremity support chambers 90, 190, 290, 390, 490, 590, 690, 790, 890, 990 removable, the patient support device described herein can be adjusted without limit depending on the particular patient and the specific needs of that patient.

[0038] The foregoing describes the invention in terms of embodiments preferred by the inventor for which an enabling description was available, notwithstanding that insubstantial modifications of the invention, including those not presently foreseen, may nonetheless represent equivalents thereto.

What is claimed is:

1. A patient support device comprising:

a mattress including an inflatable plenum;  
an inflatable torso support chamber located on one end portion of the mattress to elevate the upper torso of a patient with respect to the lower torso and legs; and  
an inflatable lower extremity support chamber located on an opposite end portion of the mattress to elevate one or more lower extremities of a patient with respect to the upper torso and lower torso, the lower extremity support chamber being isolated from the plenum and the torso support chamber so as to be separately inflatable.

2. The patient support device of claim 1, wherein the mattress is a transfer mattress having a perforated bottom sheet to provide a cushion of air for moving the mattress across a surface when the plenum is inflated.

3. The patient support device of claim 1, wherein the leg support chamber includes a right side chamber and a left side chamber that are selectively and separately inflatable.

4. The patient support device of claim 1, wherein the lower extremity support chamber includes a lower leg raiser positioned so as to support one or both legs of a patient below the knee.

5. The patient support device of claim 4, wherein the lower extremity support chamber further includes a hip raiser centrally located between the hips.

6. The patient support device of claim 5, wherein the lower extremity support chamber further includes a central buttocks raiser connecting the lower leg raiser and the hip raiser.

7. The patient support device of claim 1, wherein the lower extremity support chamber further includes a hip raiser centrally located between the hips.

**8.** The patient support device of claim 1, wherein the lower extremity support chamber includes a leg raiser positioned so as to support one or both legs of a patient above the knee so that the lower portion of the one or both legs below the knee can be freely pivoted about the knee.

**9.** The patient support device of claim 1, wherein the lower extremity support chamber has a wedge shape.

**10.** The patient support device of claim 1, wherein the lower extremity support chamber has a concave upper surface.

**11.** The patient support device of claim 1, wherein the lower extremity support chamber has a convex upper surface.

**12.** The patient support device of claim 1, wherein the lower extremity support chamber includes a leg raiser, a pair of hip raisers separated by a lower spinal gap, and a central buttocks raiser connecting the leg raiser to the pair of hip raisers.

**13.** The patient support device of claim 1, wherein the lower extremity support chamber is integrally formed with the mattress.

**14.** The patient support device of claim 1, wherein the lower extremity support chamber is removably fastened to the mattress.

**15.** The patient support device of claim 14, wherein two or more of the lower extremity support chambers can be fastened to the mattress, in combination, to selectively lift portions of a patient's anatomy.

**16.** The patient support device of claim 1, wherein the torso support chamber is isolated from the plenum so as to be separately inflatable

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