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(54) **DYNAMIC AIR BAG SYSTEM**

(57) It is disclosed an inflatable support element (100) for supporting a backpack (200) when carried by a user (300),
the inflatable support element (100) defining an adjustable confined space (180), and comprises:
- a valve (120), having an open position and a closed position, the valve (120) being adapted to adjust a flow of air into and out of the confined space (180); and
- an inner structure (110) having a predetermined shape and wherein the inner structure (110) is in contact with an inner surface of the inflatable support element (100);
wherein the inner structure (110) is made of a resilient material enabling the inner structure (100) to deform and return to its predetermined shape;
wherein the inner structure (100) is made of an air permeable material and comprises a plurality of air-filled through holes (115) and/or pockets;
wherein the inner structure (110) is configured to transfer air between the air-filled through holes (115) and/or pockets.

It is also disclosed a method for adjusting an inflatable support element (100) for supporting a backpack (200) when carried by a user (300).

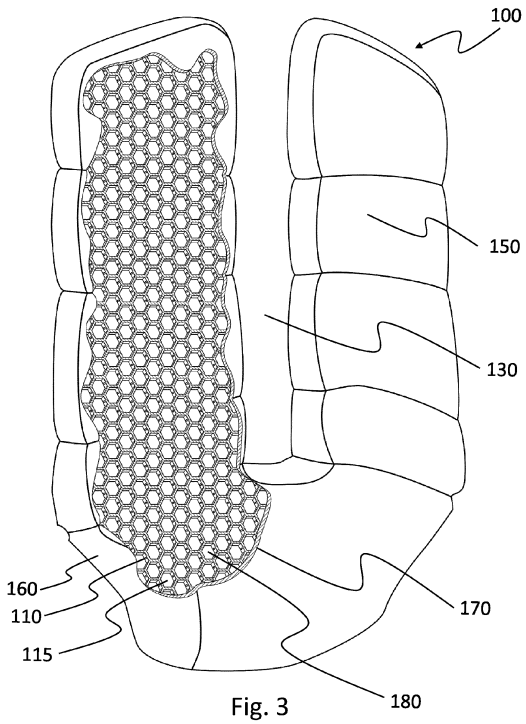

Fig. 3

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Description

Technical Field

[0001] The present invention relates to a support element, in particular to an inflatable support element for a backpack, a backpack comprising such an inflatable support element, as well as a method of adjusting a backpack with an inflatable support element to a user.

Background

[0002] Backpacks can induce a strain on the back and shoulders of a user carrying the backpack, in particular if the back pack is heavy loaded. Several solutions have been developed to provide support to the user of the backpack, such as padding in the back panel and in the shoulder straps, wide shoulder strap, hip belt, trampoline mesh in the back panel, sternum strap, built in frame, etc.

[0003] Between each regular backpack with a substantially straight back panel and the back of the user is a cavity. This is an unergonomic way of carrying which causes pressure issues and enforces spinal deformation. Shaping the back panel of the backpack to fit the contour of the user's spine would be beneficial; however, this may require individual adaptation to every user.

[0004] A solution is provided by US2002158097 which discloses a back-support apparatus for use with a backpack. It provides an inflatable back support apparatus for use with a backpack which vertically aligns with the user's spinal column on opposite sides thereof to provide cushioned and contoured support to at least the thoracic region of the user's back when the user wears the backpack. The support apparatus is inflatable by means of a hand pump and may be deflated by means of a valve.

[0005] The prior art backpacks and support devices are all designed to support the backpack when carried by a user with a healthy spine. Every spine has its unique shape; however, a healthy spine typically forms an approximate S-curve, when seen from the side. Thus, the prior art devices are not designed for users with back problems such as lordosis (abnormal inward concave *lordotic* curving of the cervical and lumbar regions of the spine), kyphosis (abnormally excessive convex curvature of the spine as it occurs in the thoracic and sacral regions) or scoliosis (sideways curvature of the spine).

[0006] An objective of the present invention is to provide an improved support device and associated method of adjusting, of the above-mentioned type which also deals with the above-mentioned shortcoming in relation to abnormal spines such as lordosis, kyphosis and scoliosis.

Summary of the invention

[0007] The invention relates to an inflatable support element for supporting a backpack when carried by a user as set forth in the independent claims. Preferred embodiments are set forth in the dependent claims.

[0008] It is described an inflatable support element for supporting a backpack when carried by a user, the inflatable support element defining an adjustable confined space, and comprises:

- a valve, having an open position and a closed position, the valve being adapted to adjust a flow of air into and out of the confined space; and
- an inner structure having a predetermined shape and the inner structure is in contact with an inner surface of the inflatable support element;

wherein the inner structure is made of a resilient material enabling the inner structure to deform and return to its predetermined shape;
wherein the inner structure is made of an air permeable material and comprises a plurality of air-filled through holes and/or pockets;
wherein the inner structure is configured to transfer air between the air-filled through holes and/or pockets.

[0009] The resilient material of the inner structure may deform in response to an applied force. The air in the through holes and/or pockets may be displaced from one through hole and/or pocket to another through hole and/or pocket in response to an applied force. By means of this synergistic effect, it is achieved an inflatable support element which may adapt to the unique curvature of any spine.

[0010] The air permeable material of the inner structure may provide a damped air reflux within the inflatable support element, i.e. delaying the transfer of air between the through holes and/or pockets, which in turn delays the change in shape of the inner structure, and thus also delays the change in the shape of the inflatable support element. The thickness of the material between each through hole and/or pocket may also affect the damped air reflux. Without the damped air reflux, air could be transferred freely within the inflatable support element such that the shape of the inflatable support element could change immediately. Said delay will have a shape-reinforcing effect on the inflatable support element. The shape of the inflatable support element may thus have a temporary memory. By acting in a shape-reinforcing way in the inflatable support element, this damped air reflux of the inner structure of the inflatable support element may provide an improved support to the spine of the user.

[0011] It is thus achieved an inflatable support element which adapts to any given spine curvature and at the same time supports the spine.

[0012] The resilient material of the inner structure will be biased to returning to its predetermined shape (i.e. initial shape). If the inner structure is compressed and the valve is closed, the inner structure will not be able to return to its predefined shape. If the valve is opened, air is allowed to enter the support element and the inner structure is allowed to return to its predetermined shape.

It is thus achieved a self-inflatable support element.

[0013] The inflatable support element may also be manually or automatically inflated by means of a pump, a mouthpiece inflated by a user, or similar.

[0014] It is thus achieved an ergonomic inflatable support element for a backpack. This inflatable support element is equally suitable for all types of spines, including, in addition to healthy spines, also those with lordosis, kyphosis or scoliosis.

[0015] It is thus achieved an inflatable support element which distributes the load from the backpack more evenly across the spine of the user.

[0016] The inner structure may be attached to an inner surface of the inflatable support element. In this way air transferred from one through hole or pocket to another through hole or pocket must travel through the inner structure, i.e. not pass between the inner surface of the inflatable support element and the inner structure.

[0017] The shape of the inflatable element may be defined by the inner structure.

[0018] The inner structure (and thus the support element) may be shaped to have a predetermined shape which is more adapted to the curvature of a spine than the substantially straight back panel of the backpack, and which is at the same time able to adapt to the curvature of any spine.

[0019] A change of the shape of inner structure may cause a similar change of the shape of the support element.

[0020] The inner structure may be moulded as one piece with the desired shape (moulding techniques are considered known and a skilled person would know which to use). The inner structure may be worked to the desired shape from a block of material. Materials considered suitable for the inner structure will typically be easily worked by means of cutting, milling or similar. Alternatively, a plurality of pieces may be assembled to form the inner structure.

[0021] The through holes and/or pockets may be distributed throughout the inner structure.

[0022] The through holes and/or pockets may be uniform.

[0023] The through holes and/or pockets may be organized in a pattern.

[0024] It is thus achieved an inner structure with uniform properties.

[0025] The through holes and/or pockets may be distributed in certain areas of the inner structure to achieve different properties in different areas of the inner structure.

[0026] It is thus achieved an inner structure which may provide more support in certain areas then in other areas.

[0027] The through holes and/or pockets may have any geometry, such as an irregular shape, spherical shape, cubical shape, etc.

[0028] The through holes and/or pockets may be arranged randomly.

[0029] The inner structure and/or the inflatable support element may have a groove or slot located in a position of the spine of a user. When seen in a front view, the inner structure may have an approximate U-shape. When seen in a front view, the inflatable support element may have an approximate U-shape.

[0030] The inner structure of the inflatable element may be covered by one or several layers. The inner surface of the inflatable support element may be said at least one layer.

[0031] The inflatable support element may comprise a layer of a flexible and durable material.

[0032] With a layer of a durable material, it is achieved an inflatable support element which may not easily get torn or punctured; thus, loss of functionality may be prevented.

[0033] With a layer of a flexible material, it is achieved an inflatable support element which may be allowed to follow any changes in the shape of the inner structure.

[0034] A layer of the inflatable support element may be made of a material with elastic properties.

[0035] A polyurethane foam material (PUR) may provide the desired resilient and air permeable properties of the inner structure of the inflatable support element.

[0036] Other materials providing resilient and air permeable properties may also be suitable for use in the inner structure.

[0037] Air channels may be provided between the through holes and/or pockets in the inner structure. Said air channels may provide a damped air reflux between the through holes and/or pockets by means of a small diameter and/or a tortuous path.

[0038] Said air channels may be particularly preferred if a material which is not air permeable is to be used for the inner structure.

[0039] The inflatable support element may comprise:

- a first surface to facing a part of the backpack interfacing the user; and
- an opposite second surface facing the user, the second surface having a curved profile.

[0040] The first surface interfacing the backpack preferably has the same profile as a back plate of the backpack. The connection between the first surface and the backpack may be by means of a hook and loop connection, zipped connection, glued connection, sewn together, etc.

[0041] The second surface may have a curved profile forming an approximate S-curve, i.e. approximating a healthy spine.

[0042] The second surface of the inflatable element may be an uneven surface for providing circulation of air between the inflatable element and the user.

[0043] An uneven surface may comprise a plurality of protrusions or bulges providing air channels therebetween. An uneven surface may comprise grooves forming air channels.

[0044] The second surface of the inflatable support element may be provided with an outer layer of padding.

[0045] The padding may provide increased comfort for the user of the inflatable support element. The padding may also transport moisture away from the user and provide air circulation between the user and the inflatable support element.

[0046] The inflatable support element may comprise:

- a third surface, different from the first and second surface, to which the valve is connected.

[0047] The valve may then be easily accessible for the user also when the user is wearing the inflatable support element and a backpack.

[0048] The valve may be connected to the third surface by means of a tube or similar, typically with a first end of the tube connected to the third surface and a second end of the tube connected to the valve. In this way the valve may be easier accessible for the user in particular when the user is wearing the inflatable support element and a backpack. The length of the tube may be adjusted to make the operation of the valve as convenient as possible for the user. The length of the tube may e.g. be 30-50 cm.

[0049] Alternatively, the valve may be connected to the first or second surface.

[0050] It is described a backpack which comprises the above-mentioned inflatable support element, wherein the inflatable support element forms an interface between the backpack and a user.

[0051] The inflatable support element may be an attachable and detachable element for use in combination with a backpack, or the inflatable support element may be an integrated element of the backpack.

[0052] The backpack may comprise a waist belt and/or a sternum belt.

[0053] It is thus achieved a distribution of the backpack load onto the lumbar region.

[0054] The valve may be integrated in the waist belt, e.g. be arranged to be accessible via a pocket or similar in the waist belt, enabling the wearer of the backpack to operate it.

[0055] It is described a method of adjusting a backpack to a user's back,
wherein the backpack comprises an inflatable support element e.g. as described herein. Wherein the method comprises the steps of:

- putting the backpack on the user;
- opening the valve, allowing the confined space to be inflated;
- closing the valve;
- allowing the inflatable support element to be adapted to a contour of a back of the user.

[0056] The method may be executed by putting the backpack on a user after the confined space has self-inflated.

[0057] The method may, after the last step, further comprise a step of:

- opening the valve to vent air from the confined space and adjust the firmness of the inflatable support element.

[0058] It may be easier to allow the inflatable support element to self-inflate, or manually inflate the inflatable support element, prior to putting it on a user.

[0059] The inflatable support element may initially be fully inflated with air, either before or after it has been put on a user. After the inflatable support element has adapted to the spine of the user, the user may choose to adjust the firmness of the inflatable support element by means of the valve, i.e. by adjusting the amount of air inside the inflatable support element. The firmness of the inflatable support element is reduced by venting air from the inflatable support element. The firmness of the inflatable support element is increased by inflating air into the inflatable support element.

[0060] When adjusting the firmness of the inflatable support element while worn by a user, it may be easier to reduce the firmness than increasing the firmness. It is thus preferred to start with an inflatable support element which is fully inflated with air rather than a semi-inflated or uninflated inflatable support element.

[0061] When referring to the spine of a user of the inflatable support element, the skilled person will understand that the same also applies to the back of the user in general.

[0062] The inflatable support element is a postural supportive/corrective device for children and adolescents in the growth phase as well as adults, in everyday life.

[0063] The dynamic displacement of air between the through holes and/or pockets allows a smooth and physiological freedom of movement as pressure points, e.g. on the spine, are avoided during movement.

[0064] Conventional backpacks may cause pressure points which trigger stimuli in the muscles, making the muscles tense. Tense muscles may eventually cause pain. The body automatically starts to compensate in order to alleviate this pain. This compensation will normally apply an increased load on other parts of the body, e.g. the spine, hips, shoulders, etc.

[0065] The smooth and physiological freedom of movement achieved by the inflatable support element in combination with the waist belt that absorbs the load, will have a synergistic effect on the reduction of the tensioning of the muckles in the shoulder/neck region. The waist belt will distribute the load from the shoulder to the hips. At the same time the inflatable support element will prevent tensioning of muscles caused by the body when trying to compensate in order to alleviate pain.

[0066] The interaction between the inflatable support element and the muscles creates a form of massage of the muscles, which in turn promotes enhanced blood circulation, in particular in the back and pelvic muscles/re-

gion.

[0067] Gaps between the backpack and the wearer caused by postural defects of the spine, such as scoliosis, kyphosis and lordosis are prevented by the inflatable support element, ensuring the load/pressure is evenly distributed throughout the spine.

[0068] The inflatable support element acts as a dynamic corset on the upper body (holding and training the torso into a desired posture), which in turn relieves the load on the underlying hip and knee joints.

[0069] The inflatable support element promotes a physiological healthy gait (diagonal stride) and freedom of movement of the spine and the physical skeleton as a whole.

[0070] The inflatable support element has a prophylactic effect for wearers with a healthy spine/back.

[0071] The inflatable support element counteracts so-called "text-neck". Text neck is the term used to describe the neck pain and damage sustained from looking down at a cell phone, tablet, or other wireless devices too frequently and for too long. Using a mobile device often can lead to poor posture and symptoms of text neck.

Brief description of the drawings

[0072] The invention will now be described with reference to the exemplifying nonlimiting embodiments shown in the accompanying drawings, wherein:

Fig. 1 shows a side view of a user wearing a prior art backpack;

Fig. 2 shows a side view of a user wearing a backpack comprising an inflatable support element of the present invention;

Fig. 3 shows a partial cross-section through the inflatable support element, showing the inner structure with through holes arranged as a honeycomb pattern;

Fig. 4 shows a partial cross-section through the inflatable support element, showing the inner structure with circular through holes wherein an area of the inner structure is compressed; and

Fig. 5 shows a perspective view of the inflatable support element in a partly inflated state;

Fig. 6 shows a perspective view of the inflatable support element in a fully inflated state;

Fig. 7 shows a front view of a backpack comprising the inflatable support element;

Fig. 8 shows a side view of the inflatable support element adjusted to a user with a healthy spine;

Fig. 9 shows a side view of the inflatable support element adjusted to a user with kyphosis;

Fig. 10 shows a perspective view of the inflatable support element adjusted to a spine with kyphosis;

Fig. 11 shows a side view of the inflatable support element adjusted to a user with lordosis;

Fig. 12 shows a perspective view of the inflatable support element adjusted to a spine with lordosis; and

Fig. 13 shows a side view and a front view of a healthy spine on which the cervical region, thoracic region, lumbar region and sacrum region are indicated.

Detailed description of a preferred embodiment

[0073] Fig. 1 shows a side view of a user 300 wearing a prior art backpack 200. A cavity can be seen between the back of the user 300 and the back plate of the backpack. This is an unergonomic way to carry the backpack 200, which causes pressure issues and enforces spinal deformation on the user 300.

[0074] Fig. 2 shows a side view of a user 300 wearing a backpack 200 comprising an inflatable support element 100 of the present invention. The inflatable support element 100 may fill the cavity between the back plate of the backpack 200 and the back of the user 300.

[0075] The inflatable support element 100 may comprise a first surface 140 and a second surface 150. The first surface 140 of the inflatable support element 100 may face a part of the backpack 200 interfacing the user 300. The opposite second surface 150 of the inflatable support element 100 may face the back of the user 300. In addition to the first surface 140 and the second surface 150, the inflatable support element 100 may comprise a third surface 160.

[0076] The part of the backpacks 200 interfacing the user 300 (back plate of the backpack 200) are typically flat. Therefore, to interface the back plate of the backpack 200 in a best possible fashion, the first surface 140 of the inflatable support element 100 may also be flat.

[0077] The back of a user 300 typically forms an approximate S-curve. Therefore, to interface the back of the user 300 in a best possible fashion, the second surface 150 of the inflatable support element 100 may also form an approximate S-curve.

[0078] The third surface 160 may connect the first surface 140 and the second surface 150.

[0079] Fig. 3 shows a perspective view of the inflatable support element 100, with a partial cross-section through the inflatable support element 100 showing an inner structure 110 of the inflatable support element 100.

[0080] The inflatable support element 100 may define a confined space 180. The confined space 180 may be filled with air. An inner structure 110 may be provided inside the confined space 180. The inflatable support element 100 may comprise at least one layer 170 provided around the inner structure 110. The inner structure 110 may preferably fill the entire confined space such that it is in contact with an inner surface of the inflatable support element 100.

[0081] As illustrated, the inner structure 110 may comprise through holes 115. The through holes 115 may be hexagonal through holes 115 arranged to form a honeycomb pattern. In this example the through holes 115 are oriented perpendicular on the first surface 140. However, other orientations of the through holes 115 may be pos-

sible, e.g. parallel with or inclined relative to the first surfaces 140 of the inflatable support element 100. The through holes 115 may alternatively be replaced with pockets. The through holes 115 or pockets may be filled with air.

[0082] The inner structure 110 is preferably made of a resilient material enabling the inner structure 100 to deform and return to its initial (i.e. predetermined) shape. The material of the inner structure 110 is preferably also air permeable. The inner structure 110 may be shaped in a certain way, e.g. to provide a first surface 140, a second surface 150 and a third surface 160 as described above.

[0083] An inner structure 110 with an air permeable material may be configured to transfer air between the air-filled through holes (115) or pockets.

[0084] Fig. 4 shows a perspective view of the inflatable support element 100, with a partial cross-section through the inflatable support element 100 showing the inner structure 110 of the inflatable support element 100.

[0085] The through holes 115 of this example are circular and oriented in a pattern in which they don't intersect each other. Alternatively, pockets may be used in addition to or instead of the through holes 115.

[0086] In the cross-section of Fig. 4, an area of the inner structure 110 is compressed. Compression is caused by a pressure applied in a point marked PPC (Pressure Point Centre).

[0087] When pressure is applied to an area of the inflatable support element 100, the inner structure 110 may be compressed, as seen in Fig. 4. Air located in the through holes 115 and/or pockets in the compressed area of the inner structure 110 may be transferred through the inner structure 110 into through holes 115 and/or pockets outside of the compressed area. In this way the inflatable support element 100 may adapt to the back of a user 300.

[0088] The air permeability and thickness of the inner structure 110 may both determine the flow rate of air from one through hole 115 or pocket to another. The air permeability and thickness of the inner structure 110 may cause the inner structure 110 to slowly adapt to the back of the user 300, and thus also maintain the adapted shape for some time before slowly returning to its initial (i.e. predetermined shape). In this way the inflatable support element 100 provides an improved support to the user 300.

[0089] Fig. 5 shows the inflatable support element 100 in a partly inflated state. The inflatable support element 100 may comprise a valve 120 arranged to adjust a flow of air into or out of the confined space 180. The valve 120 may be connected to the third surface 160, either directly or through a tube 125. The valve has an open state and a closed state.

[0090] Due to the resilient property of the inner structure 110, the inflatable support element 100 may self-inflate when the valve 120 is open, thus increasing the volume of the confined space 180.

[0091] If a sufficient external force is applied to the inflatable support element 100 while the valve 120 is open, air may be discharged from the inflatable support element 100, thus reducing the volume of the confined space 180.

[0092] When the valve 120 is closed, no air can escape (or enter) the confined space 180.

[0093] Fig. 6 shows the inflatable support element 100 of Fig. 5 in a fully inflated state.

[0094] When seen in a front view, the inflatable support element 100 may have an approximate U-shape. The groove 130 or slot of the inflatable support element 100 may be arranged to house the spine 310, 320, 330 of a user 300.

[0095] Fig. 7 shows a front view of a backpack 200 comprising the inflatable support element 100. The backpack may be provided with a hip belt 210. The hip belt 210 and the inflatable support element 100 may have a synergistic effect in distributing the load from the backpack 200 in an ergonomic manner on the user 300. The majority of the load from the backpack 200 may preferably be distributed to the lumbar region 360.

[0096] Fig. 7 shows a preferred orientation of the inflatable support element 100 on the backpack 200. The groove 130 or slot of the inflatable support element 100 will typically be arranged to face the cervical region 340 and thoracic region 350 of the spine 310, 320, 330 of a user 300. Each side of the groove 130 or slot (i.e. the region of the inflatable support element 100 comprising the groove 130 or slot) will typically be arranged to face the back of a user 300 on each side of the spine 310, 320, 330 in the cervical region 340 and thoracic region 350.

[0097] The lumbar region 360 (and possibly also the sacrum region 370) of the spine 310, 320, 330 of a user 300 will typically face the inflatable support element 100. The back on each side of the lumbar region 360 of the spine 310, 320, 330 of a user 300 will typically face the inflatable support element 100. The buttock on each side of the sacrum region 370 of the spine 310, 320, 330 may face the inflatable support element 100.

[0098] Fig. 8 shows a side view of the inflatable support element 100 adjusted to a user 300 with a healthy spine 310.

[0099] As illustrated, the second surface 150 may have a curved profile forming an approximate S-curve, i.e. approximating a healthy spine 310. In such cases, only minor adjustments of the inflatable support element 100 may be necessary to adapt it to a healthy spine 310.

[0100] Fig. 9 shows a side view of the inflatable support element 100 adjusted to the spine 320 of a user 300 with kyphosis.

[0101] The illustrated inflatable support element 100 may have an initial shape wherein the second surface 150 may have a curved profile forming an approximate S-curve, i.e. approximating a healthy spine 310.

[0102] To adapt to the spine 320 with kyphosis, air is displaced from a cervical region 340 of the inflatable support element 100, i.e. an area of the inflatable support

element 100 which interfaces the cervical region 340 of the spine 320 of the user 300. The displaced air is transported to other areas of the inflatable support element 100, e.g. to areas which may need more air to provide support to other parts of the spine 320 of the user 300.

[0103] If the balance between the volume of the confined space 180 to be displaced in a first area and the volume needed to provide support in a second area is uneven, the firmness of the inflatable support element 100 may change. An excess volume in the confined space 180 may cause the firmness of the inflatable element 100 to increase. If the inflatable support element 100 becomes firmer than what is perceived as comfortable for the user 300, air may be discharged through the valve 120. If the user 300 would like to increase the firmness of the inflatable support element 100 air may be supplied to the confined space 180 through the valve 120 e.g. manually or self-inflating.

[0104] The valve 120 may be arranged to be within reach of the user 300.

[0105] Fig. 10 shows a perspective view of the inflatable support element 100 adjusted to a spine 320 with kyphosis.

[0106] When the inflatable support element 100 is adapted to the spine 310, 320, 330 of a user 300, the adjustment primarily appears on the second surface 150.

[0107] Fig. 11 shows a side view of the inflatable support element 100 adjusted to the spine 330 of a user 300 with lordosis.

[0108] The illustrated inflatable support element 100 may have an initial shape wherein the second surface 150 may have a curved profile forming an approximate S-curve, i.e. approximating a healthy spine 330.

[0109] To adapt to the spine 330 with lordosis, air is supplied to a lumbar region 360 of the inflatable support element 100, i.e. an area of the inflatable support element 100 which interfaces the lumbar region 360 of the spine 330 of the user 300. The supplied air is provided from other areas of the inflatable support element 100, e.g. from areas which may be compressed by other parts of the spine 330 of the user 300.

[0110] Fig. 12 shows a perspective view of the inflatable support element 100 adjusted to a spine 330 with lordosis.

[0111] It is illustrated and described examples with a healthy spine 310, a spine with kyphosis 320 and a spine with lordosis 330. The skilled person would understand that the same will apply for a spine with scoliosis.

[0112] Fig. 13 shows a side view and a front view of a healthy spine 310 on which the cervical region 340, thoracic region 350, lumbar region 360 and sacrum region 370 are indicated.

Reference list

[0113]

100 - inflatable support element
110 - inner structure
115 - through hole / pocket
120 - valve
125 - tube
130 - groove or slot
140 - first surface
150 - second surface
160 - third surface
170 - layer
180 - confined space
190 - padding

200 - backpack
210 - waist belt

300 - user / wearer / human

310 - spine (with typical healthy shape)
320 - spine (with typical kyphosis shape)
330 - spine (with typical lordosis shape)
340 - cervical region
350 - thoracic region
360 - lumbar region
370 - sacrum region

PPC - point of pressure center

Claims

1. An inflatable support element (100) for supporting a backpack (200) when carried by a user (300),
the inflatable support element (100) defining an adjustable confined space (180), and comprises:

- a valve (120), having an open position and a closed position, the valve (120) being adapted to adjust a flow of air into and out of the confined space (180); and
- an inner structure (110) having a predetermined shape and wherein the inner structure (110) is in contact with an inner surface of the inflatable support element (100);

wherein the inner structure (110) is made of a resilient material enabling the inner structure (100) to deform and return to its predetermined shape;
wherein the inner structure (100) is made of an air permeable material and comprises a plurality of air-filled through holes (115) and/or pockets;
wherein the inner structure (110) is configured to transfer air between the air-filled through holes (115) and/or pockets.

2. The inflatable support element (100) according to claim 1,
wherein the shape of the inflatable element (100) is defined by the inner structure (110).

3. The inflatable support element (100) according to claim 1 or 2,
wherein the through holes (115) and/or pockets are distributed throughout the inner structure (110).

4. The inflatable support element (100) according to claim 3,
wherein the through holes (115) and/or pockets are uniform and organized in a pattern.

5. The inflatable support element (100) according to any preceding claims,
wherein the inflatable support element (100) comprises a layer (170) of a flexible and durable material.

6. The inflatable support element (100) according to any preceding claims,
wherein the inner structure (110) is made of a polyurethane foam material.

7. The inflatable support element (100) according to any preceding claims,
wherein the inflatable support element (100) further comprises:

- a first surface (140) facing a part of the backpack (200) interfacing the user (300); and
- an opposite second surface (150) facing the user (300), the second surface (150) having a curved profile.

8. The inflatable support element (100) according to claim 7,
wherein the second surface (150) is an uneven surface for providing circulation of air between the inflatable element (100) and the user (300).

9. The inflatable support element (100) according to any one of claims 7 or 8, wherein the second surface (150) of the inflatable support element (100) is provided with an outer layer of padding (190).

10. The inflatable support element (100) according to any one of claims 7-9,
wherein the inflatable support element (100) further comprises:

- a third surface (160), different from the first and second surfaces (140, 150), to which the valve (120) is connected.

11. A backpack (200) comprising an inflatable support element (100) according to any one of claims 1-10;
wherein the inflatable support element (100) forms the interface between the backpack (200) and a user (300).

12. The backpack (200) according to claim 11,
wherein the backpack (200) comprises a waist belt (210) and/or a sternum belt.

13. A method of adjusting a backpack (200) to a user's (300) back,
wherein the backpack (200) comprises an inflatable support element (100) according to any one of claims 1-10;
wherein the method comprises the steps of:

- putting the backpack (200) on the user (300);
- opening the valve (120), allowing the confined space (180) to be inflated;
- closing the valve (120);
- allowing the inflatable support element (100) to be adapted to a contour of a back of the user (300).

14. The method according to claim 13,
wherein the method is executed by putting the backpack (200) on a user (300) after the confined space (180) has self-inflated.

15. The method according to claim 13 or 14, wherein after the last step, the method further comprises a step of:

- opening the valve (120) to vent air from the confined space (180) and adjust the firmness of the inflatable support element (100).

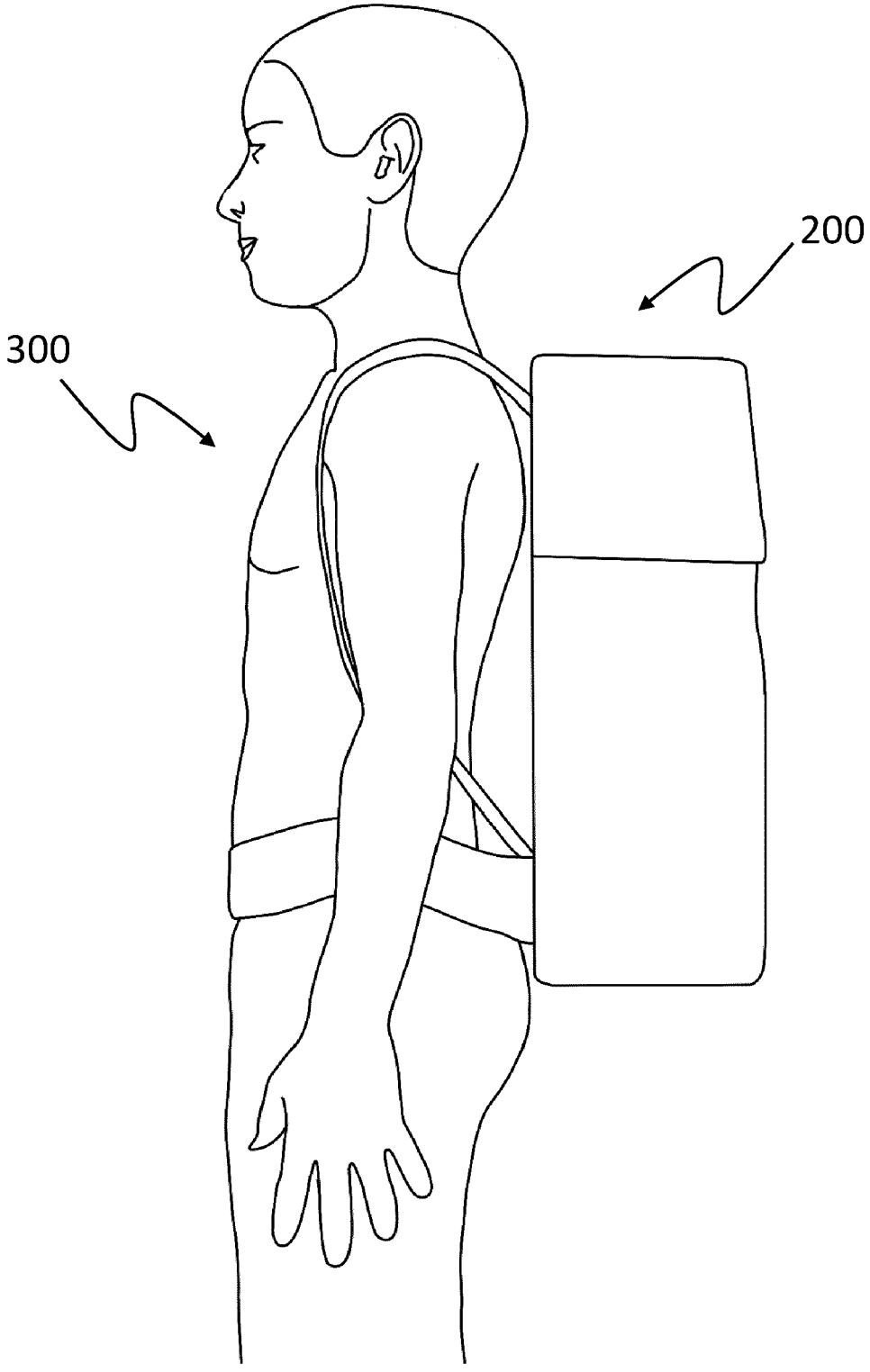

Fig. 1

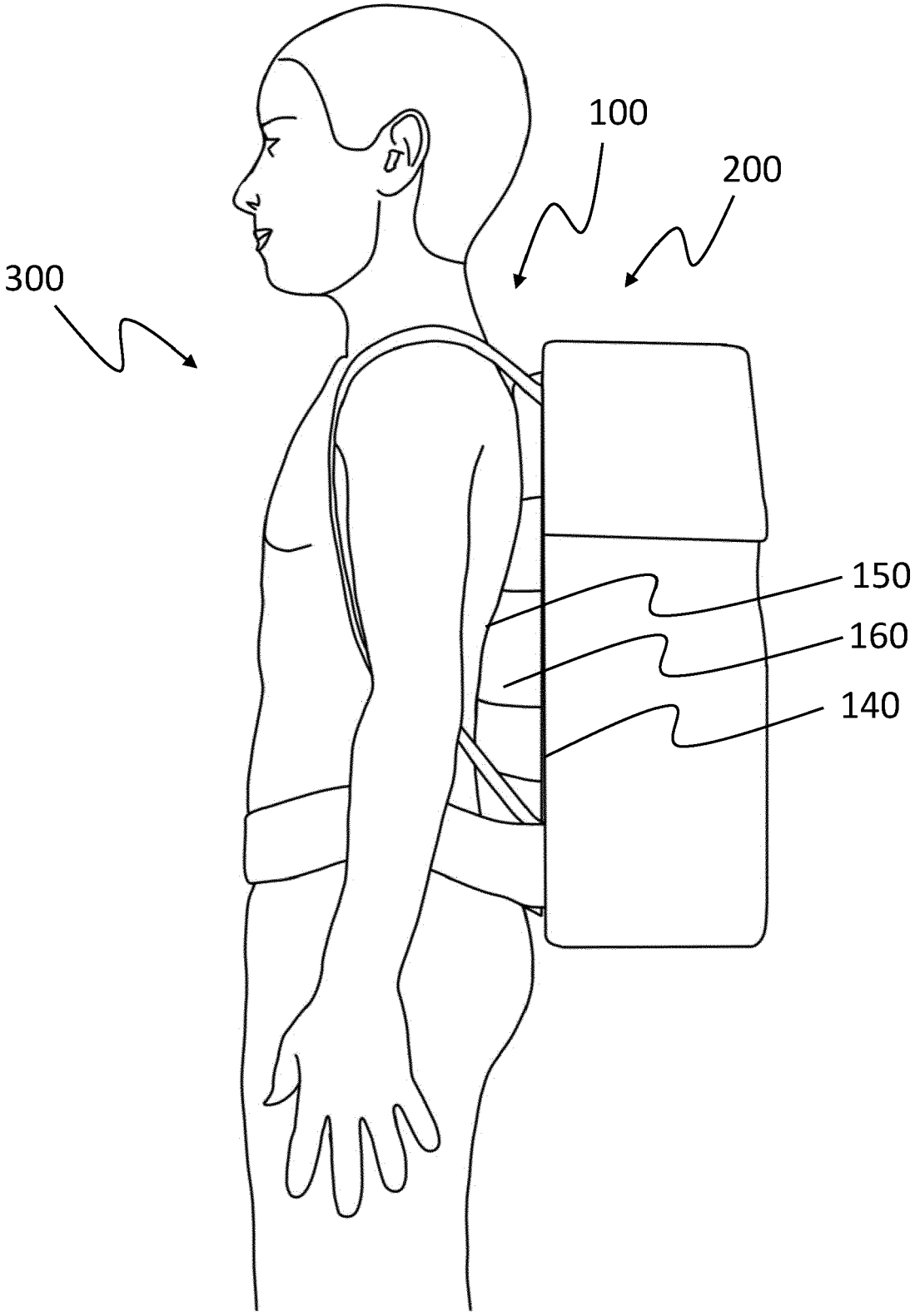

Fig. 2

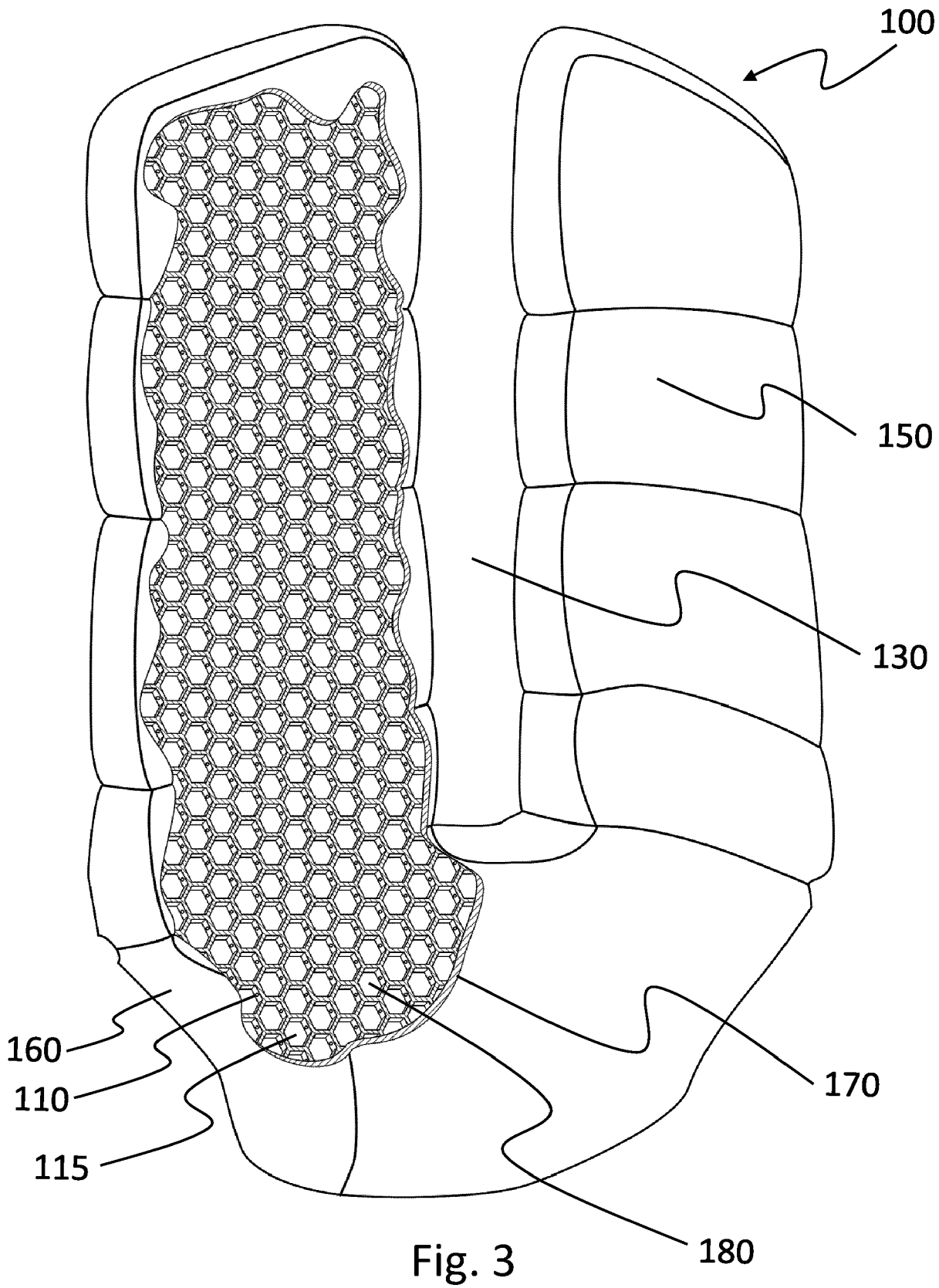

Fig. 3

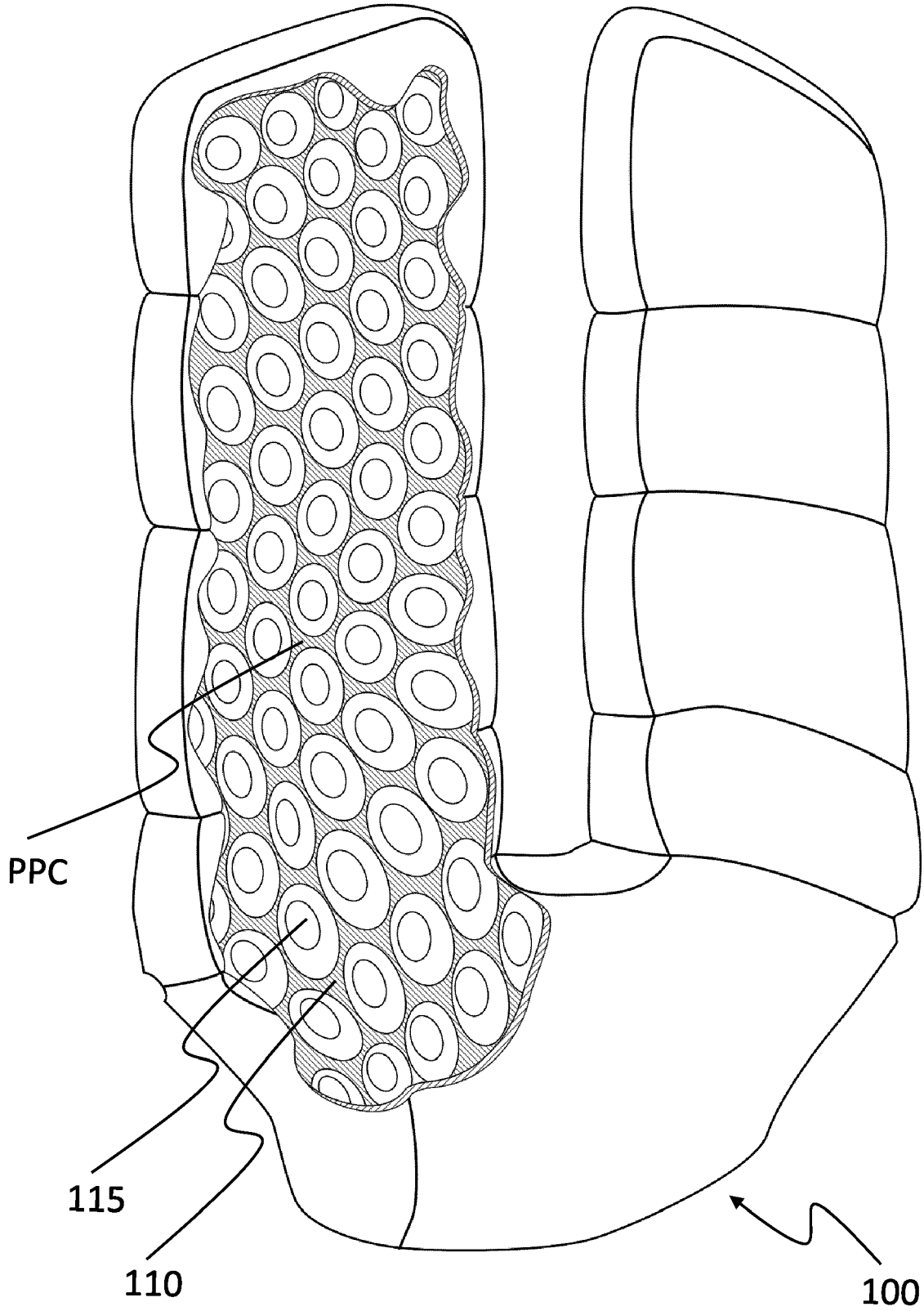

Fig. 4

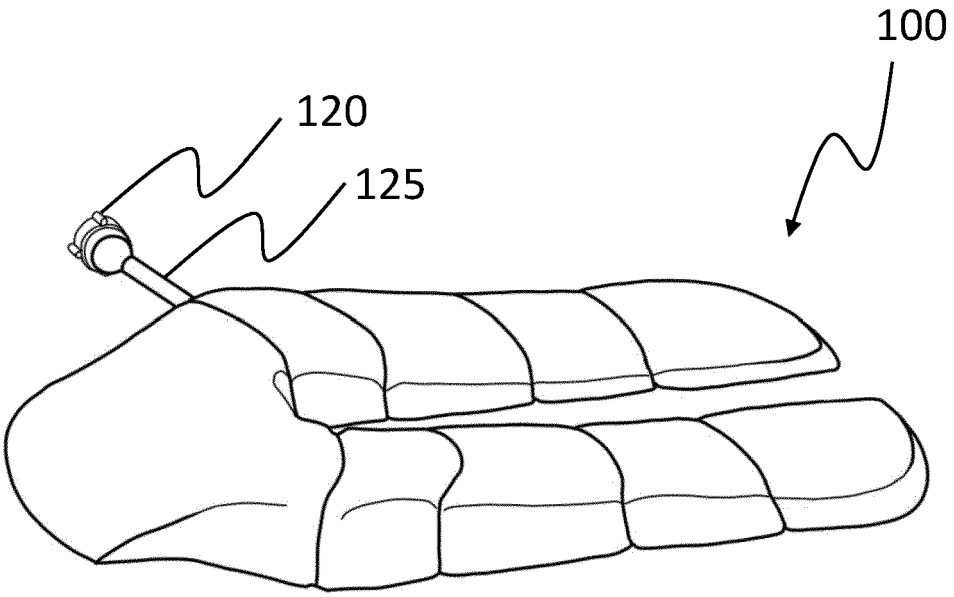

Fig. 5

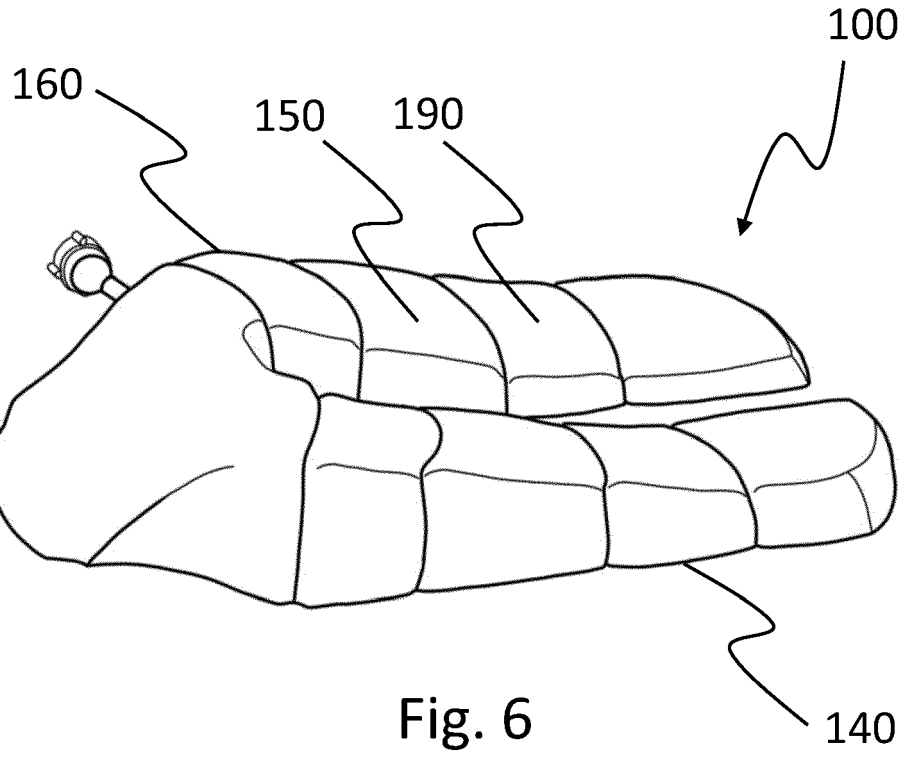

Fig. 6

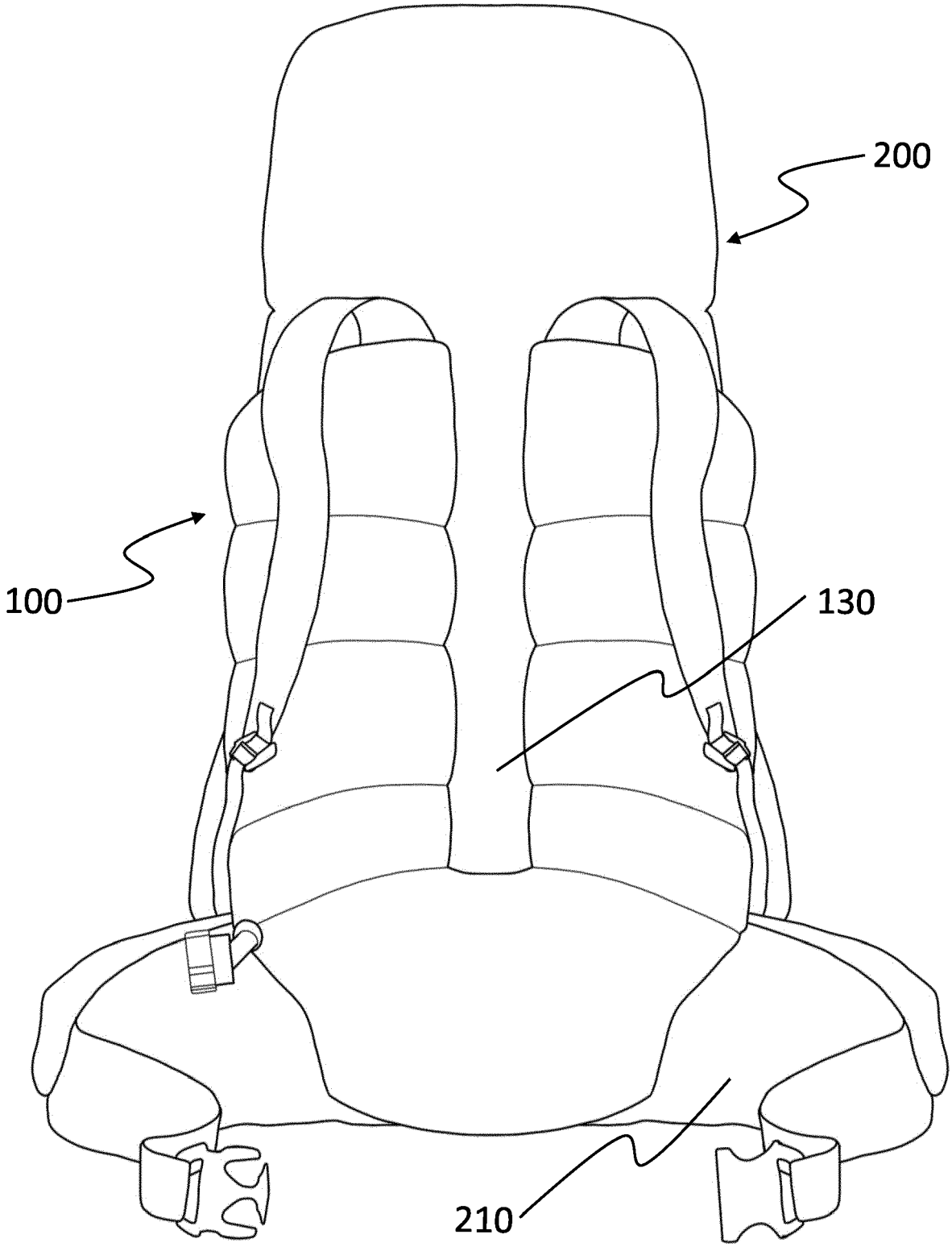

Fig. 7

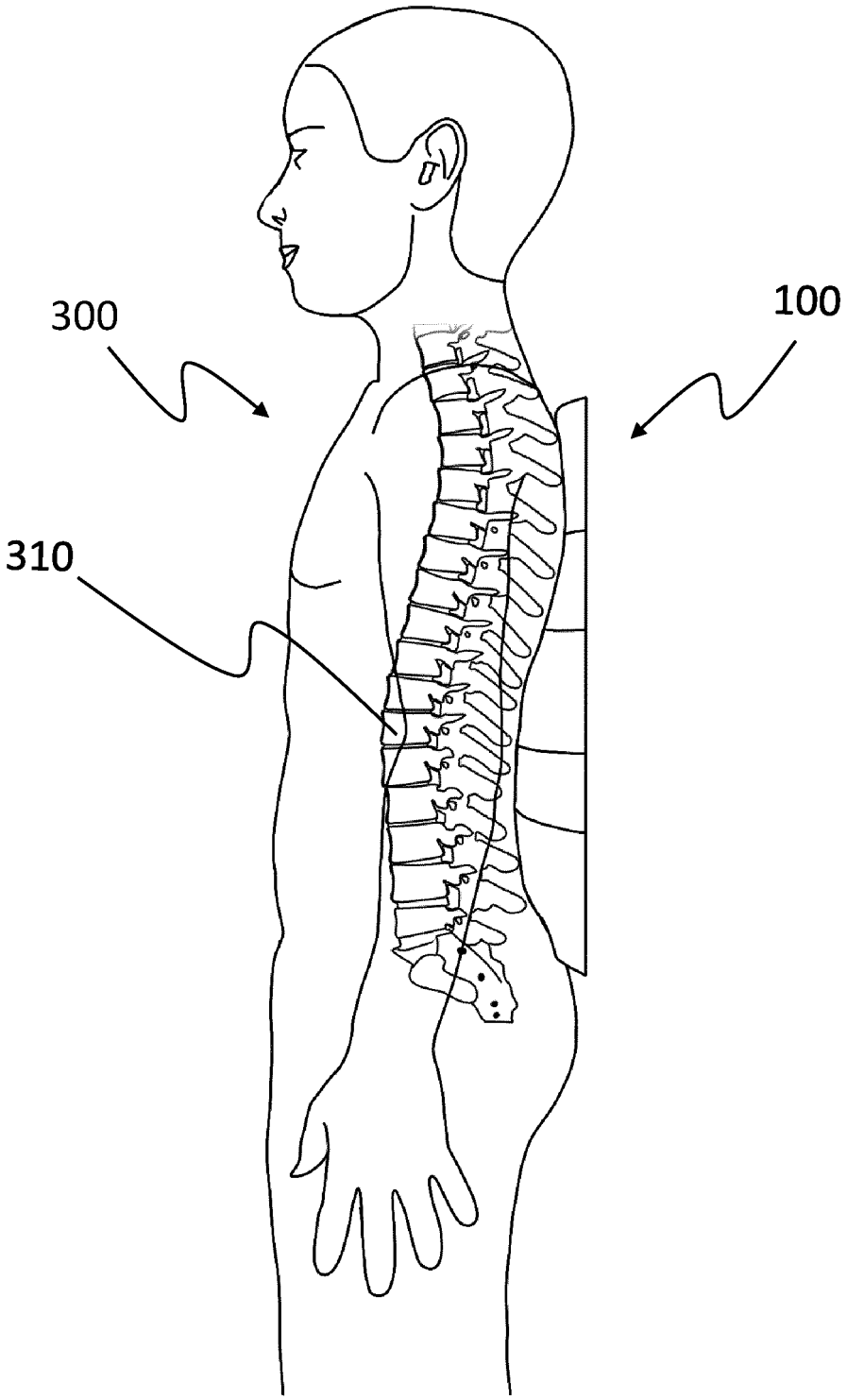

Fig. 8

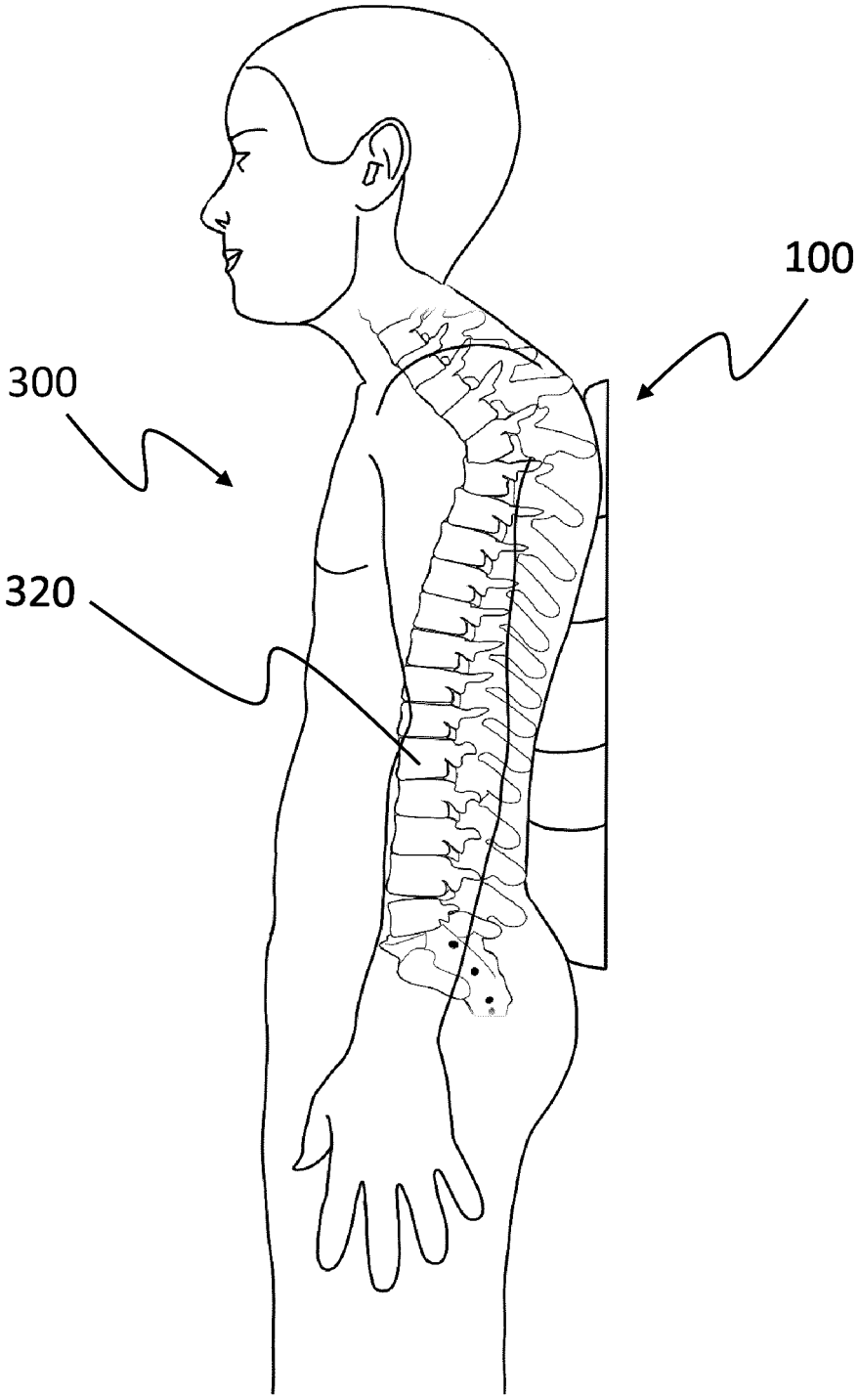

Fig. 9

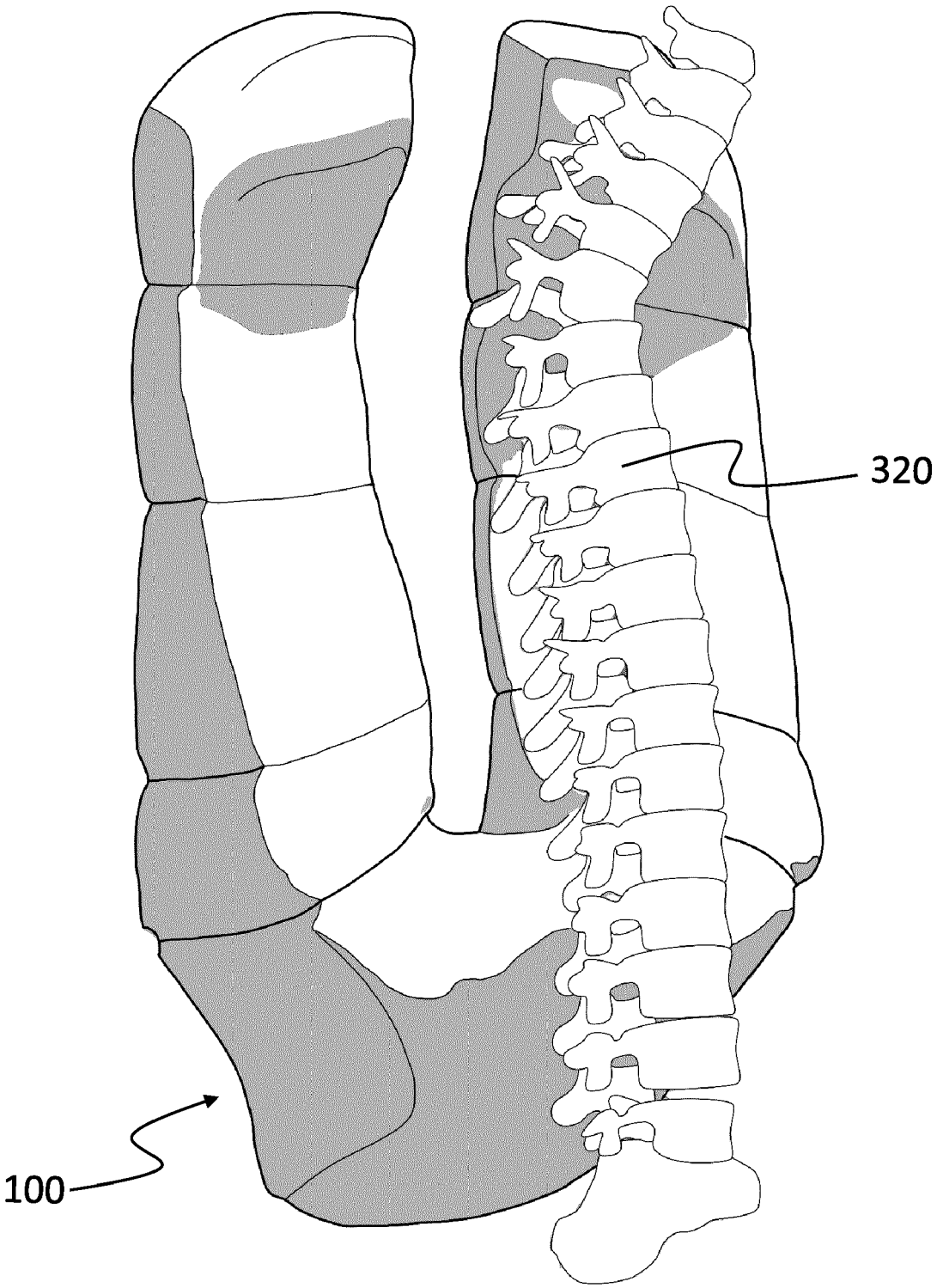

Fig. 10

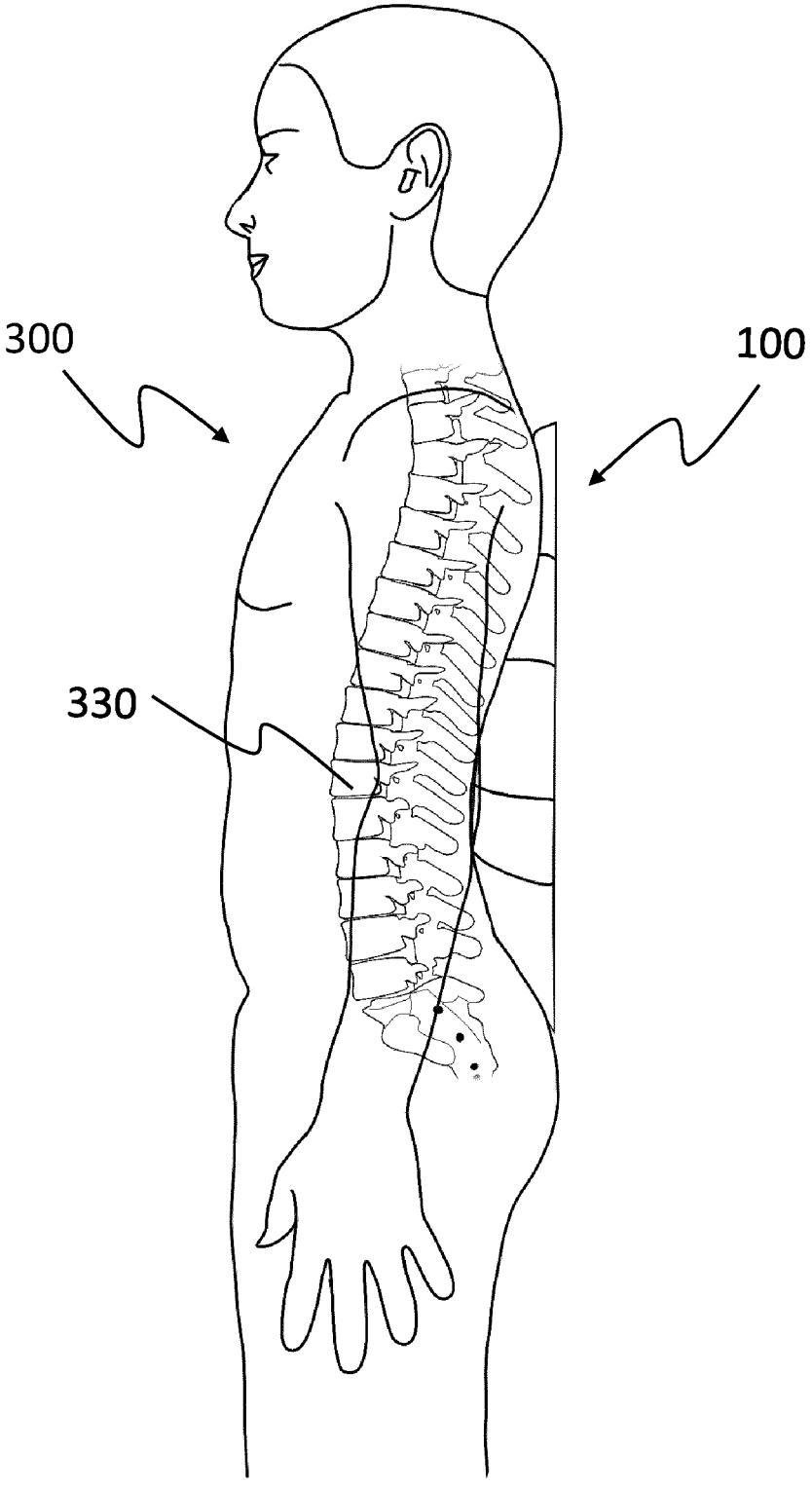

Fig. 11

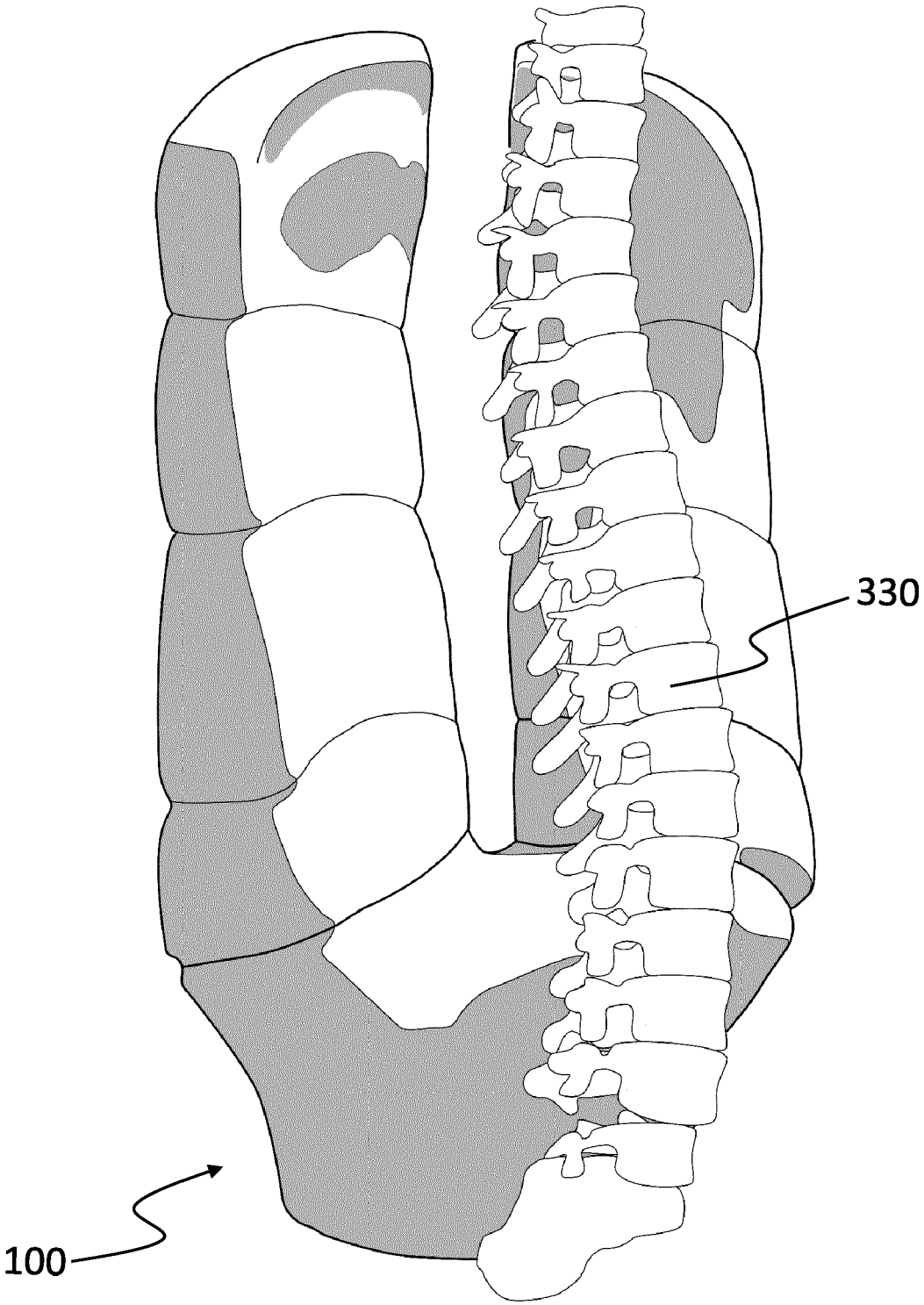

Fig. 12

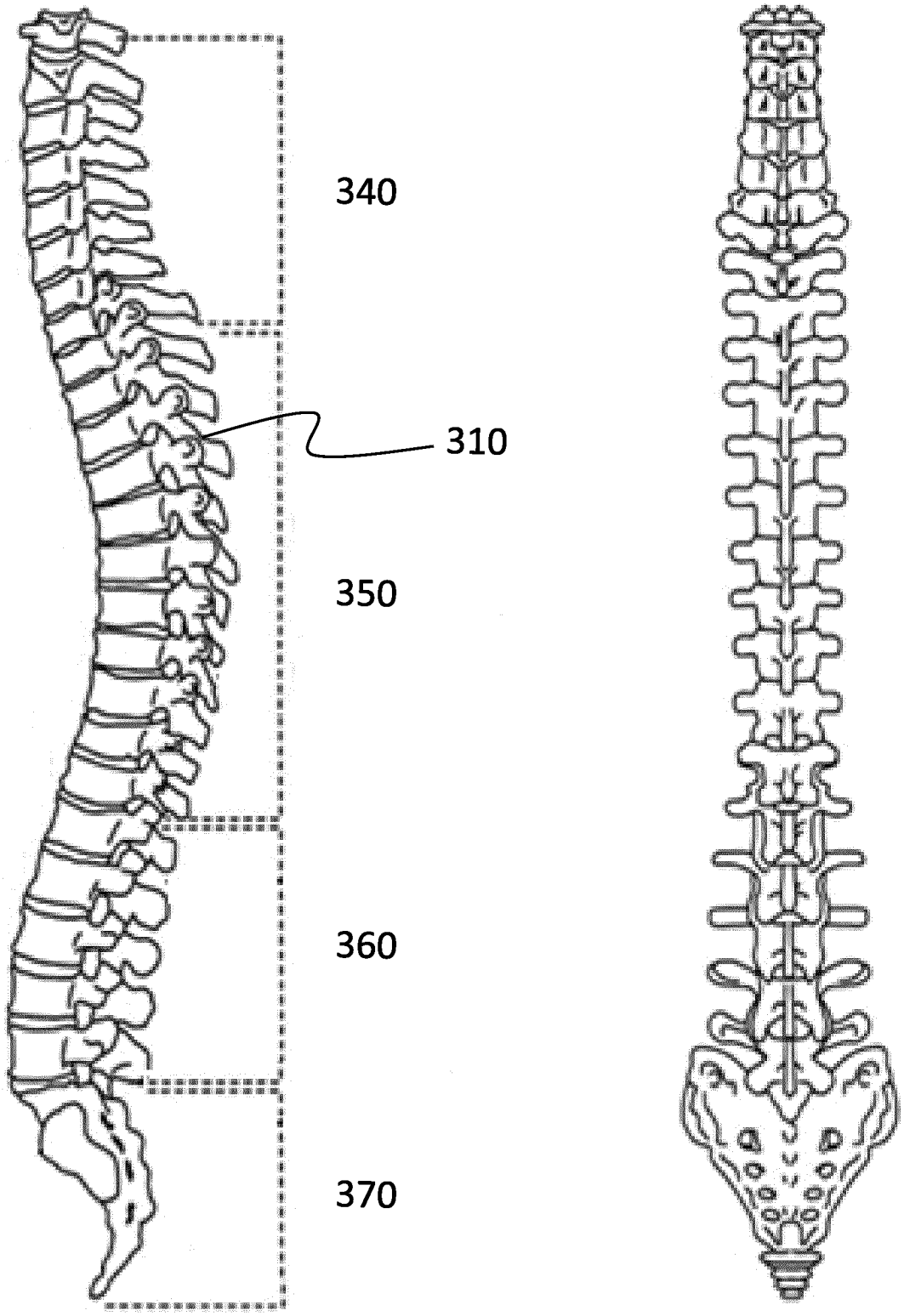

Fig. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 0283

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 2 441 342 A1 (CHRISTY PHILIP TROY [US]) 18 April 2012 (2012-04-18) * paragraph [0021] - paragraph [0033]; claims 1-11; figures 1-9 *	1-13,15 14	INV. A45F3/04 A45F3/12
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TECHNICAL FIELDS SEARCHED (IPC)

A45F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 December 2020	Oliveras, Mariana

CATEGORY OF CITED DOCUMENTS

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08-12-2020

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