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(54) **Készülék emberi test súlypontáthelyezése és/vagy izomműködtetése keltette mozgások végrehajtására**

The invention relates to a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body.

From sports equipment development, training devices for use in fitness studios such as treadmills, steppers or bicycle ergometers are known. A user sits or stands thereon and carries out predetermined movements. The aim is to burn calories, to achieve a training effect, and to generate fun for the user by physical exercise.

Furthermore, game consoles such as a Microsoft Wii® or a Sony PlayStation Move® are known, wherein the user performs physical movements that are detected by a sensor, which can influence or control game play on a TV screen.

Furthermore, 3D cinemas are known, in which films are shown using a three-dimensional effect, in order to be able to offer the audience a film experience which is as realistic as possible. The purpose of a 3D effect in movies is, on the one hand,

to increase the joy of watching, and, on the other hand, to make the action on the screen look more realistic and to make the movie audience forget about being in a movie showing. It is desired for the audience to have the perception to be part of the action as much as possible.

Furthermore, simulators are known, in which, for example, a user controls a Formula 1 car or a racing motorcycle, wherein, instead of a real windshield, a system of computer monitors is provided to the user. Moreover, a realistic driving experience can be enhanced by the fact that the user sits in a realistically replicated vehicle cockpit and the controls differ only insignificantly from those of a real vehicle.

Furthermore, video goggles are known, which are positioned on the head of a user and fixed thereon. A virtual reality can be displayed visually on such video goggles, wherein, during the use of such a device, a user feels as if he could look around in this virtual reality and move freely within it. When the user rotates his head and thus also the video goggles, a stationary receiver system receives the common movement of the head and the goggles and transmits the direction and the speed of movement to a computing unit which calculates the video image displayed by means of the video goggles correspondingly, so that a user gets the impression to relay be able to move in the virtual space.

Furthermore, flight simulators for pilot training are known, which, on the one hand, replicate an authentic cockpit and, on the other hand, simulate the actual movements and accelerations acting on a real cockpit during the flight, during the take-off and the landing. This is achieved, for example, by arranging

the cockpit on a movement platform such as a tripod, and the cockpit can be moved, tilted and accelerated in different directions by means of the movement platform.

Furthermore, from prior art, training devices are known as disclosed in GB 2 510 136 A.

Furthermore, from prior art, a diagnostic device is known as disclosed in US 5 830 150 A.

It is an object of the present invention to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body wherein a user generates a shift in the centre of gravity by moving his waist region while the user is supported on the device and is able to incline the device including the body of the user in different directions. In addition, it is conceivable for the user to wear video goggles during this and to be able to move in a virtual environment through the overall system of video goggles and said motion device, as well as to interact therewith. Herein, the movements caused by the user may be generated solely by the gravity by means of a shift in the centre of gravity. In addition, it is also conceivable that the movements of the device are influenced by motors or dampers arranged on the device. It is also conceivable to provide an overall system of the device and an apparatus for visually outputting moving images, the user on the device being at least partially enclosed by the output apparatus. The output apparatus may be formed in a semicircular shape, the head of the user including the front part of the device being located within the output apparatus. By visually outputting, for example, a simulator application on the inside of the apparatus, a realistic impression of the user

during a simulator application may be produced. Herein, the output apparatus should be dimensioned such that the user can move freely on the device without bumping into the output apparatus. Furthermore, three-dimensional images could be displayed by the output apparatus as well as on video goggles.

This object is achieved with a device, a system, and a method according to the independent claims.

Advantageous further developments are the subject matter of the dependent claims.

The free movability of the hip region of a user can ensure that the user can shift the centre of gravity of the user or the overall centre of gravity of the movable part of the device as well as the user's own body in such a way that this shift of the centre of gravity results in a movement of the device due to gravity, whereby a particularly comfortable operating behaviour is achieved. This is because the device reacts very quickly to wishes directed to changes in the movement, and after a short adaptation period, a user is able to operate or move the device intuitively and in a measured manner.

Resulting from the convex curvature of the exterior surface of the base portion the device is able to move without the need to provide a complex and expensive kinematics device for this purpose.

Advantageously, the curvature of the convex surface of the base portion is variable. Resulting from this, before manufacturing, that is during constructing, the moving behavior of the device can be determined as desired. Advantageously, due to a variable

curvature, a raising momentum is generated as follows: The curvature of the standing surface in the middle portion (that is the portion which is in contact with the ground in a position which is not deflected, that is in a resting position) of the base portion is low, and rises outwardly. In a further embodiment, advantageously, the curvature of the standing surface in the middle portion is large, and decreases outwardly. Resulting from this, some kind of end stop is generated, since at the portion with the decreasing curvature the device can only further be tilted with a high amount of force.

Advantageously, the common centre of gravity of the user's body and the device is located just below the longitudinal and lateral axes. As a result, the movable system comprising the human and the device is in a stable state. The fact that the centre of gravity is arranged below the longitudinal and lateral axes means that the centre of gravity is located below the axes in the vertical direction. Advantageously, it is possible for the user to position the centre of gravity of the user's body by means of a movement of the waist region in such a way that a displacement of the device results therefrom or is caused thereby. In addition, the user feels as if he were hovering due to the free mobility of the user's waist region or the centre of gravity of the user's body.

Advantageously, the arm support, the leg support and the handle elements are provided rigid relative to one another. By means of such an arrangement, a user is able to shift the user's centre of gravity in a particularly simple and precise manner, as it is required for a current application. Furthermore, resulting from such an arrangement, the user can freely move his/her

waist region in order to perform a shifting of the centre of gravity as easy as possible.

Advantageously, the device comprises a stiffening element generating from the "open profile" comprising arm rests, leg rests, and base portion a "closed profile". Said "closed profile" has a sensibly enhanced stiffness.

Advantageously, the device has two handle elements, which can each be gripped by a hand of the user so that the user can simply secure or hold himself or herself in position.

Advantageously, the device is made from plastic. Therefore, the device can be manufactured via injection molding at low-cost and in high quantity. Furthermore, due to the plastic material, the device can easily and rapidly be cleaned. Thus, the device can be maintained hygienically in a simple manner.

Advantageously, the device includes a detection device for detecting the current position of the device, as well as a transmission device for transmitting the position data. Such an embodiment results in a wide variety of possible applications of the invention. By acquiring the position data, it is possible to transmit them to a computing unit, whereby applications for simulating virtual realities can be realized. For example, it is thereby possible to use the movements of the device for controlling functions in a computer game or a simulator application. For controlling an aircraft during a flight simulator application, it would be conceivable, for example, for a user of the device to rotate himself or herself and the device about a longitudinal axis, thereby also causing the aircraft in the

flight simulator to rotate about its longitudinal axis. In order to also control the aircraft about its lateral axis, a user could also rotate himself or herself and the device about a lateral axis, typically by shifting the centre of gravity of the user's body.

Two exemplary embodiments of the invention are discussed with reference to the accompanying drawings.

The drawings:

Fig. 1 shows a first exemplary embodiment of the invention in a perspective view.

Fig. 2 shows a first exemplary embodiment of the invention in a front view.

Fig. 3 shows a first embodiment of the invention in a view from the left.

Fig. 4 shows a first embodiment of the invention in plan view.

Fig. 5 shows a second embodiment of the invention in a perspective view.

Fig. 6 shows a second exemplary embodiment of the invention in a front view.

Fig. 7 shows a second embodiment of the invention in a view from the left.

Fig. 8 shows a second embodiment of the invention in plan view.

Fig. 1 shows a perspective view of a first exemplary embodiment of the device 1 for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body. A longitudinal axis is shown, which extends in a longitudinal direction of the device. A lateral axis is shown, which extends in a lateral direction of the device. And a height axis is shown, which extends in a vertical direction. The height axis may extend vertically, as shown in the present exemplary embodiment, or may also be inclined forwards or backwards. The directional and positional indications front, rear, left and right are also drawn in Fig. 1, and are additionally clearly shown in plan view in Fig. 4. The embodiment shown in Fig. 1 includes a base plate 5 and a base 3, via which the entire device 1 rests on the ground. The supporting means 2 has handle elements 20, arm shells 21 and leg shells 23. By means of the supporting means 2, the body of a user is supported on the device. The individual parts of the supporting means are connected to a frame element 81. The arm shell 21 on the right side of the device forms a unit with the handle element 20 on the right side of the device, and similarly the handle element 20 on the left side forms a unit with the arm shell 21 on the left side of the device 1. The handle element 20 and the arm shell 21, each forming a unit, are fixedly connected to each other in this embodiment. Each unit is connected to the frame element 81 by a rail element 51, whereby the respective units can move within fixed bounds in the longitudinal direction of the device 1. The individual elements of the supporting means 2 may be tilted together with the frame element 81 about the lateral axis of the device 1. This tilting functionality is made possible by an arrangement 420 of shaft and bearing, which connects the supporting structure (frame element 81) accommodating the supporting

means 2 to an arcuate further supporting element (arcuate element 82). This further arcuate element 82 is supported by a roller support 41 and guided therethrough such that the supporting means 2, together with the frame element 81 and the arcuate element 82, can rotate about the longitudinal axis of the device. The roller guide 41 has an arcuate arrangement of roller elements 410 on which the components, that is, the supporting means 2, the frame element 81, and the arcuate element 82, are mounted, wherein, in addition, at least one roller is arranged in the vertical direction above the arcuate element 82 to also secure these components in a vertical direction. The components, that is, the supporting means 2, the frame element 81, and the arcuate element 82, are referred to as the movable part of the device. Furthermore, at the rear end of the supporting means 2, strut elements 24 are arranged, by means of which a user can support the soles of the feet. The height axis of the device 1 is arranged vertically in this embodiment. However, it would also be conceivable for the height axis to be inclined forwards or backwards. Further, in this embodiment, the longitudinal axis extends horizontally. It would also be conceivable for the longitudinal axis to be tilted downwards or upwards. In this exemplary embodiment, the lateral axis is fixed relative to the frame element 81. Thus, if the frame element 81 is tilted about the longitudinal axis, the lateral axis of the device also tilts. If the movable part of the device 1 has already been tilted about the longitudinal axis, a further tilting of the supporting means 2 together with the frame element 81 occurs therefore about the likewise tilted lateral axis.

The arcuate supporting element or arcuate element 82 does not necessarily have to be arcuate. In another embodiment, this

supporting element may, for example, follow an arbitrary curve function with its shape. Furthermore, it would also be conceivable to configure the support element as a closed circle. In such an embodiment, it could be possible for the user to perform a full rotation about the longitudinal axis with the device.

Fig. 2 shows the front view of the first embodiment of a device 1 for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body, the height axis of the device extending in the vertical direction and the lateral axis of the device extending in the horizontal direction. In this view, it can be seen clearly that the frame element 81 includes two parts arranged on the right and left sides of the image. The individual parts of the device 1 may be made of different materials, for example, carbon fibre reinforced plastics, conventional plastics or metal. In a preferred embodiment, the entire configuration of the device is as light as possible. By a small mass, in particular of the movable parts of the device, the operating convenience for the user may be increased since a tilting can be induced easier.

Fig. 3 shows a side view of the first embodiment of the device 1 with the longitudinal axis of the device extending in the horizontal direction and the height axis extending in the vertical direction. When the frame element 81 tilts about the lateral axis of the device, the lateral axis extending in the direction of the drawing plane, that is to say out of the drawing plane, the supporting means 2, which comprises, among other elements, the arm shells 21, the handle elements 20 and the leg shells 23, tilts also about the lateral axis of the device.

Fig. 4 shows a plan view of the first embodiment of the device 1, the lateral axis of the device in the figure extending vertically and the longitudinal axis of the device extending horizontally, wherein the rear region of the device 1 is arranged on the right side of the image, the front region of the device 1 is arranged on the left side of the image, the right region of the device 1 is arranged at the upper edge of the image, and the left region of the device 1 is arranged at the lower edge of the image. Furthermore, the leg supports 23, the foot struts 24, the arm shells 21, and the handle elements 20 are recognizable.

Fig. 5 shows a perspective view of a second embodiment of the device 1 for carrying out movements by shifting the center of gravity and/or actuating muscles of a human body. Said second embodiment 100 differs from the first embodiment 1 in that the device 100 is a "starting version" respectively a "low-cost version" of the device 1. Compared to the device 1, the device 100 is not divided in a movable part and a fixed part. Rather, the device 100 is embodied in a single piece, wherein the device 100 has a base portion 150 with a convex surface 151 directed to the outside and a concave surface 152 directed to the inside. In the section of Fig. 5 on the left, that is, in the front area of the device 100, handle elements 120 are provided for being gripped by the hands. Furthermore, above the base portion 150, the device 100 has two arm rests 121, which are provided in the front portion of the device 100, as well as two leg rests 123 which are provided in the back portion of the device 100. The arm rests 121 as well as the leg rests 123 are connected by means of a stiffening element 125. By the stiffening element 125, the shell-like shape of the device 100 is at least partially closed in the upper portion, in order to create

a "closed profile" giving the device 100 a high stiffness, despite lightweight construction. The stiffening element 125 is provided above the arm rests 121 and above the leg rests 123. Indeed, a user of the device 100 moves his body freely above the stiffening element 125, however, he is able to lay down his body at least temporarily on the stiffening element, for resting purpose or in order to control further functions. Moreover, the whole device 100 is built in a single part, wherein the respective elements passing into each other without being separated in different parts. In a further embodiment which is not shown, the device 100 is manufactured from several parts, wherein said parts will be joined/assembled after manufacturing or after selling to the customer.

Furthermore, in Fig. 5, a longitudinal axis and a lateral axis are shown. If the device 100 is in contact with the ground by its convex surface 151, the device 100 can be tilt around its longitudinal axis and around its lateral axes by means of a rolling movement. The locations of said axes results from the curvatures of the part of the convex surface 151 being actually in contact with the ground. If the curvature of the convex surface 151 is variable, then, the axes will move during a rolling movement of the device 100. Resulting from this, the lateral axis of the device 100 is precisely defined by the rotating axis around which the device 100 rotates during tilting to the front or to the back (the definition front, back, left and right resulting from the respective labels in Fig. 5). If the curvature of the convex surface 151 in the contact point with the ground differs during tilting to the front or to the back, then, the rotating axis of the device 100 which defines the lateral axes is moving as well. The same is true for the location of the lateral axis during tilting to the left/right.

Fig. 6 shows a front view of the second embodiment of the device 100. According to this view, the base portion 150 is located in the lower portion of the device 100, and the stiffening element 125 is located in the upper portion of the device 100. Furthermore, from the lowest line in Fig. 6, the curvature of the convex surface 151 can be identified. In the middle section of Fig. 6, this line is bended stronger than in the outer section. Said bending comes into operation during tilting the device around the longitudinal axis. It should be noted that the bending which can be seen in Fig. 6 results merely from projecting the edge of the convex surface 151 into the image plane. Resulting from this, the curvature of said projected line can change if the device 100 is tilted to the front respectively to the back (tilting around the lateral axis). Then, another part of the convex surface 151 can be identified as the edge.

Fig. 7 shows a side view of the second embodiment of the device 100. In the left section of Fig. 7, a first handle element 120 can be seen for being gripped by the left hand, wherein the second handle element 120 for being gripped by the right hand is covered, but can be seen in Figs. 5, 6 and 8. Furthermore, in the left portion of Fig. 7, an arm rests 121 can be seen. In the right portion of Fig. 7, a leg rests 123 is shown. In the upper portion of Fig. 7, the stiffening element 125 is shown, wherein, in in the lower portion, the convex surface 151 of the base portion 150 is shown. In the back portion of the device 100, that is, in the right portion of Fig. 7, the convex surface 151 has an edge 160 extending in the picture plane of Fig. 7. Said edge 160 functions as a stopping element for a tilting

movement of the device 100 to the back, respectively as a rotating point support during tilting the device 100 to the back, if tilting is executed over and above the stop.

Fig. 8 shows a plan view of the second embodiment of the device 100.

One aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body, said device comprising:

a supporting means for supporting body parts, wherein the waist region of the body is freely movable,

a base for supporting forces on the ground and/or on a wall,

a kinematic device for connecting the supporting means and said base, wherein said kinematic device is adapted to allow a movement of the body about a virtual longitudinal axis and about a virtual lateral axis.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein said supporting means 2 supports the body exclusively at the body's extremities.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein the longitudinal axis and the transverse axis form an intersection point.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein the common center of gravity of the body and the movable part of said device 1 is located at or below said intersection point of the longitudinal and transverse axes in a resting state.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein said base 3 has a height axis, which is substantially vertical,

wherein said height axis intersects a contact plane which divides said device 1 into upper and lower parts,

wherein said upper part of said device 1 is rotatable about said height axis relative to said lower part,

wherein said height axis is not identical to the normal of said contact plane,

wherein the overall centre of gravity of said device 1 is raisable as a result of a relative rotation in order to generate a restoring moment.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein a damping element is provided between said upper and lower parts of said device 1.

A forther aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein all elements of said supporting means 2 are not movable relative to one another.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein said supporting means 2 for supporting the body parts comprises

two arm shells 21 for respectively supporting a forearm of the body, and

two leg shells 23 for respectively supporting a lower leg of the body.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein said supporting means 2 for supporting the body parts comprises two strut elements 24 for respectively supporting a sole of a foot.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein said supporting means 2 for supporting the body parts comprises two handle elements 20, each to be gripped with one hand.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein each handle element 20 is formed as a unit 22 with the corresponding arm shell 21,

wherein each unit 22 consisting of said arm shell 21 and said handle element 20 is displaceable independently of the other unit 22.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

a position detecting means for detecting the current position of each movable part of said device, and a transmitting means for transmitting the position data to a computing unit for further processing.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

at least one motor and/or at least one damping element,

whereby the movement of the movable elements of said device 1 can be influenced,

wherein said damping element is adapted to counteract a movement,

wherein said motor is adapted to counteract a movement and/or to assist a movement.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein the individual elements of said supporting means 2, which support the body, are moveable relative to one another.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

stops for limiting the possibility of movement of the movables parts of said device,

wherein the degrees of freedom of the possibility of movement and said stops are adjustable at will.

A further aspect of the disclosure is to provide a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body,

wherein said kinematic device comprises a supporting element 82 in the form of a closed circle or at least a circular arc segment, said supporting element 82 being adapted to allow a rotation of the human body about the longitudinal axis of said device.

A further aspect of the disclosure is to provide a method for carrying out movements with a device according to one of the preceding aspects,

wherein said supporting means 2 is moved, together with the body parts supported thereon, about the lateral axis and the longitudinal axis by a shift of the centre of gravity of the body.

A further aspect of the disclosure is to provide a method for carrying out movements with a device,

wherein a control signal is generatable by moving said units 22 of said arm shell 21 and said handle element 20.

A further aspect of the disclosure is to provide a method for carrying out movements with a device, the method comprising the steps of:

applying a torque about the height axis of said device 1, thereby preventing a rotation of said upper part of said device 1 relative to said lower part of said device 1 from being caused,

shifting the overall centre of gravity of said device upwards in the vertical direction,

generating a restoring moment by raising the overall centre of gravity upwards, canceling the rotation by shifting the overall centre of gravity downwards in the vertical direction into the initial position, which is caused by gravity.

A further aspect of the disclosure is to provide a system comprising a device for carrying out movements by shifting the centre of gravity and/or actuating muscles of a human body, and a visual output apparatus.

A further aspect of the disclosure is to provide a system,

wherein said visual output apparatus comprises video goggles worn on the head of the human body.

A further aspect of the disclosure is to provide a system,

wherein the position of the head and said video goggles worn thereon as well as the position of the movable parts of said device 1 are independently detected and further processed to carry out movements by shifting the centre of gravity and/or actuating muscles of a human body.

A further aspect of the disclosure is to provide a system,

wherein the user is at least partially surrounded by said visual output apparatus on said device.

A further aspect of the disclosure is to provide a system, wherein said visual output apparatus is adapted to output still and/or moving images.

A further aspect of the disclosure is to provide a system, wherein said visual output apparatus is adapted to output three-dimensional images.

The free movability of the hip region of a user can ensure that the user can shift the centre of gravity of the user or the overall centre of gravity of the movable part of the device as well as the user's own body in such a way that this shift of the centre of gravity results in a movement of the device due to gravity, whereby a particularly comfortable operating behaviour is achieved. This is because the device reacts very quickly to changes in the movement, and after a short adaptation period, a user is able to operate or move the device intuitively and in a measured manner.

A movement of users and moving parts of the device is possible about two virtual axes, a longitudinal axis and a lateral axis. These advantageously form an intersection point, which allows the user to initiate a movement about the longitudinal axis and a movement about the lateral axis with identical application of force.

Advantageously, the common centre of gravity of the user's body and the moving parts of the device is located just below the intersection point of the longitudinal and lateral axes. As a

result, the movable system is in a stable state. The fact that the centre of gravity is arranged below the intersection point of the longitudinal and lateral axes means that the centre of gravity is located below the intersection point of the axes in the vertical direction. Advantageously, it is possible for the user to position the centre of gravity of the user's body by means of a movement of the waist region in such a way that a displacement of the movable parts of the device results therefrom or is caused thereby. In addition, the user feels as if he were hovering due to the free mobility of the user's waist region or the centre of gravity of the user's body.

Advantageously, the device is divided into an upper and a lower part (up and down in the vertical direction), wherein the partitioning or contact plane may be located in the region of the base. In this plane, a planar surface of the upper and lower parts, respectively, abut against one another in a flange-like manner. The contact plane is intersected by a bolt which is inserted into both the upper and the lower parts of the device. The axial direction of the bolt does not coincide with the normal direction of the contact plane. Due to the kinematics resulting therefrom, the geometry of the upper contact surface is lifted from the geometry of the lower contact surface (and vice versa) when a twisting between the upper and lower device parts is triggered. A mutual lifting can be triggered by the fact that a circumferential edge of the one contact surface is at least partly pivoted into the other contact surface or forcedly pivoted into said other contact surface and is thereby forcedly moved upwards along the bolt. Furthermore, the axial direction of the bolt may be vertical. If a user of the device now performs a jerky motion, which results in a torque about the

height axis of the device, this torque would result in a jerking or wobbling of the entire device in the case of a one-part device implementation. By means of a partition with the kinematics described, however, a torque about the height axis of the device results in a twisting between the upper and lower parts of the device, the upper and lower parts being lifted off during the twisting since the outer circumferential edge of the upper part is guided along the lower part (or vice versa) and performs, depending on the angular position of the bolt, a movement curve relative to the normal of the two contact planes more or less extensively. This will raise the centre of gravity of the upper part of the device. By raising the centre of gravity, the weight force of the upper part of the device causes a restoring moment whereby the device moves back into its initial position. As a result, jerky movements of a user on the device may be dampened or stabilized.

A damping element may advantageously be provided between the above-described contact surfaces of the upper and lower parts of the device, which is, for example, made of a rubber-like material which causes an additional damping effect. This damping element may be circular and may be inserted between the contact surfaces. Furthermore, it may have a through bore for receiving the bolt.

In the first embodiment, all elements of the supporting means, that is, the shells for receiving the lower arms and lower legs, as well as the strut elements and handle elements, may be provided rigid relative to one another. By means of such an arrangement, a user is able to shift the user's centre of gravity in a particularly simple and precise manner, as it is possible for a current application.

Advantageously, the supporting means for supporting the body parts includes two arm shells, each for supporting a forearm of the body, and two leg shells, each for supporting a lower leg of the body. By means of such an arrangement, it is possible for the user to freely move the user's waist region in order to be able to perform a shift of the centre of gravity as simply as possible.

Advantageously, the supporting means for supporting the body parts also has two strut elements, each for supporting a sole of a foot. These struts are particularly suitable for securing the human body in the longitudinal direction thereof. Furthermore, the footrests facilitate mounting the device. Typically, prior to mounting, the device is positioned such that the foot struts themselves or an area around them get ground contact. This stabilizes the movable part of the device, which may be easily and securely mounted by a user.

Advantageously, the supporting means for supporting the body parts also has two handle elements, which can each be gripped by a hand of the user so that the user can simply secure or hold himself or herself in position. The user can lean into the device by means of the possibilities for support between the foot struts and the handle elements, thus shifting the centre of gravity of the user's body in a particularly simple and defined manner.

Furthermore, in a preferred embodiment, the handle element may be formed as a unit with the corresponding arm shell. Corresponding means that the arm shell is closest to the handle element. Furthermore, each unit of arm shell and handle element

may be provided such that it is displaceable independently of the other unit. Such a displacement may be made possible by the fact that the units of arm shell and handle element are guided on a rail system which is located between the movable part of the device and the unit of arm shell and handle element.

Advantageously, the device includes a detection device for detecting the current position of each movable part of the device, as well as a transmission device for transmitting the position data. Such an embodiment results in a wide variety of possible applications of the invention. By acquiring the position data, it is possible to transmit them to a computing unit, whereby applications for simulating virtual realities can be realized. For example, it is thereby possible to use the movements of the movable parts of the device for controlling functions in a computer game or a simulator application. For controlling an aircraft during a flight simulator application, it would be conceivable, for example, for a user of the device to rotate himself or herself and the moving parts of the device about a longitudinal axis, thereby also causing the aircraft in the flight simulator to rotate about its longitudinal axis. In order to also control the aircraft about its lateral axis, a user could also rotate himself or herself and the moving part of the device about a lateral axis, typically by shifting the centre of gravity of the user's body. In order to operate the yaw rudder of the aircraft, that is, a rotation of the aircraft about the height axis, it would be conceivable that a user has to simultaneously move one unit of arm shell and handle element forward and the other unit backward.

Furthermore, it is conceivable for the device to have at least one motor and/or at least one damping element in order to be

able to influence the movements of the device or of the person located thereon. For example, effects may be generated from a computer application, which result in a change in the position of the movable part of the device and thus also of the user located thereon. While operating a computer racing game, for example, a user could be tilted backwards during an acceleration operation, tilted forward during a braking operation, and tilted to the corresponding side as turns are passed. When a left turn is passed, a tilting of the device to the same side, namely also to the left, may be triggered in order to generate an effect which corresponds to "banking". However, it would also be conceivable to trigger a tilting of the movable part of the device to the right when a left turn is passed in order to simulate the effect of centrifugal force on the user. It would also be conceivable to make the handle elements movable and to detect the current position of the handle elements by a sensor and to transmit it to the computing unit. The handle elements could be formed such that they can be rotated like a twistgrip of a motorcycle. Such an embodiment could be applied if a motorcycle race is to be simulated. The possibility of movement of the units of arm shell and handle element on a rail system may also be detected in order to control acceleration or deceleration in a simulator application or another desired function.

Furthermore, it would be conceivable that the individual elements for supporting the extremities of the body, for example the forearms and the lower legs, are configured to be movable relative to one another. By means of corresponding mechanical kinematics of the possibilities of movement of these elements or by influencing the possibilities of movement by means of motors or damping elements, it would be possible, for example, to force a user to make certain movements or to allow only specif-

ic movements to the user. In this case, it would be conceivable to allow, during a swimming simulator application, a movement to a user which corresponds to the crawl stroke. Furthermore, it would be possible to make the movements of the user more difficult by means of electric motors or damping elements. As a result, a variety of further application possibilities of the device, such as, for example, the use as a sports simulator are obtained, wherein the user has to perform a physical activity during the simulator application which corresponds to or at least resembles the physical activity during the exercise of the corresponding sport. During a swimming simulator application, for example, the water resistance, which would also occur during actual swimming in the water and which counteracts a movement of the swimmer, may be simulated by means of motors or damping elements. The risk of drowning, to which a swimmer is permanently exposed in case of a faint or fatigue, may be significantly reduced by such a swimming simulator application. Nevertheless, the desired training effect takes place. Also, the risk of a crash for pilots may be avoided if they only practice aviation in the simulator, and no longer in open air space.

717093/DO

KÉSZÜLÉK EMBERI TEST SÚLYPONTÁTHELYEZÉSE ÉS/VAGY IZOMMŰKÖDTETÉSE KELTETTE MOZGÁSOK VÉGREHAJTÁSÁRA

SZABADALMI IGÉNYPONTOK

1. Készülék (100) emberi test súlypontáthelyezése és/vagy izomműködtetése keltette mozgások végrehajtására, amelynek van:

egy támasztószerkezete testrészek alátámasztására, amelynél a test csípőtájéka szabadon mozgatható, és

egy alaprésze (150) erők padlón megtámasztására,

ahol az alaprész (150) és a támasztószerkezet egymással össze van kapcsolva,

amelynél az alaprész (150) rendelkezik egy üzemelés közben a padló felé néző konvex felülettel (151), ahol

az alaprész (150) arra alkalmasan van kialakítva, hogy lehetővé tegye a testnek és a készüléknek (100) egy virtuális hossztengely és egy virtuális haránttengely körüli mozgását,

azzal jellemezve, hogy

a támasztószerkezet két kartámasszal (121) és két lábtámasszal (123) van ellátva,

amelyek a testet kizárólag a végtagoknál támasztják alá.

2. Az 1. igénypont szerinti készülék (100), amelynél

a konvex felület (151) arra alkalmasan van kialakítva, hogy a padlóval érintkezésben legyen.

3. Az előző igénypontok egyike szerinti készülék (100), amelynél

a tengelyek helyzete a konvex felületnek (151) az alaprész (150) padlóval való érintkezési pontjában mutatott görbületétől függ,

amelynél a készülék (100) arra alkalmasan van kialakítva, hogy a mozgás alatt gördülőérintkezésben legyen a padlóval.

4. Az előző igénypontok egyike szerinti készülék (100), amelynél az alaprész (150) konvex felületének (151) görbülete változó.

5. Az előző igénypontok egyike szerinti készülék (100), amelynél az alaprész (150) konvex felületének (151) görbülete az alaprésznek (150) a padlóval nyugalmi pozícióban való érintkezési pontjában a legnagyobb.

6. Az előző igénypontok egyike szerinti készülék (100), amely arra alkalmasan van kialakítva, hogy

a készülék (100) és az emberi test közös súlypontja állandóan a hossztengely és a haránttengely alatt legyen.

7. Az előző igénypontok egyike szerinti készülék (100), amely továbbá

egy merevítőelemmel (125) van ellátva, amely a készüléket (100) zárt profilúvá teszi.

8. Az előző igénypontok egyike szerinti készülék (100), amely továbbá

egy-egy kézzel való megmarkolásra két fogantyúelemmel (120) van ellátva.

9. Az előző igénypontok egyike szerinti készülék (100), amelynél a készülék (100) egyik alkatrésze sem mozgatható a többihez képest.

10. Az előző igénypontok egyike szerinti készülék (100), amely műanyagból van.

11. Az előző igénypontok egyike szerinti készülék (100), amelynél a készülék (100) arra alkalmasan van kialakítva, hogy kedvező áron, fröccsöntő eljárással elő lehessen állítani.

12. Eljárás mozgásoknak az 1–11. igénypont egyike szerinti készülékkel (100) való végrehajtására,

amelynek során a készüléket (100) az arra támaszkodó testrészekkel együtt a testsúlypont haránttengely és hossztengely körüli eltolásával mozgatjuk.

13. Rendszer az 1–11. igénypont egyike szerinti készülékből (100) és egy vizuális kimeneti egységből.

14. Az előző igénypont szerinti rendszer,

amelynél a vizuális kimeneti egység az emberi test fején viselt videoszemüveg.

15. Az előző igénypont szerinti rendszer, amely alkalmassá van téve arra, hogy emberi test testsúlyáthelyezése és/vagy izomműködtetése keltette mozgások végrehajtásához egymástól függetlenül érzékelje, és további feldolgozásnak vesse alá a fej és az azon viselt videoszemüveg pozícióját, valamint a készülék (100) pozícióját.

16. A 13. igénypont szerinti rendszer,

amelynél a vizuális kimeneti egység alkalmassá van téve arra, hogy a készüléket (100) és a készüléken (100) lévő használót legalábbis részben körülvegye.

17. Az előző 13–16. igénypont egyike szerinti rendszer,

amelynél a vizuális kimeneti egység alkalmassá van téve arra, hogy álló és/vagy mozgó képeket adjon ki.

18. Az előző 13–17. igénypont egyike szerinti rendszer,

amelynél a vizuális kimeneti egység alkalmassá van téve arra, hogy háromdimenziós képeket adjon ki.

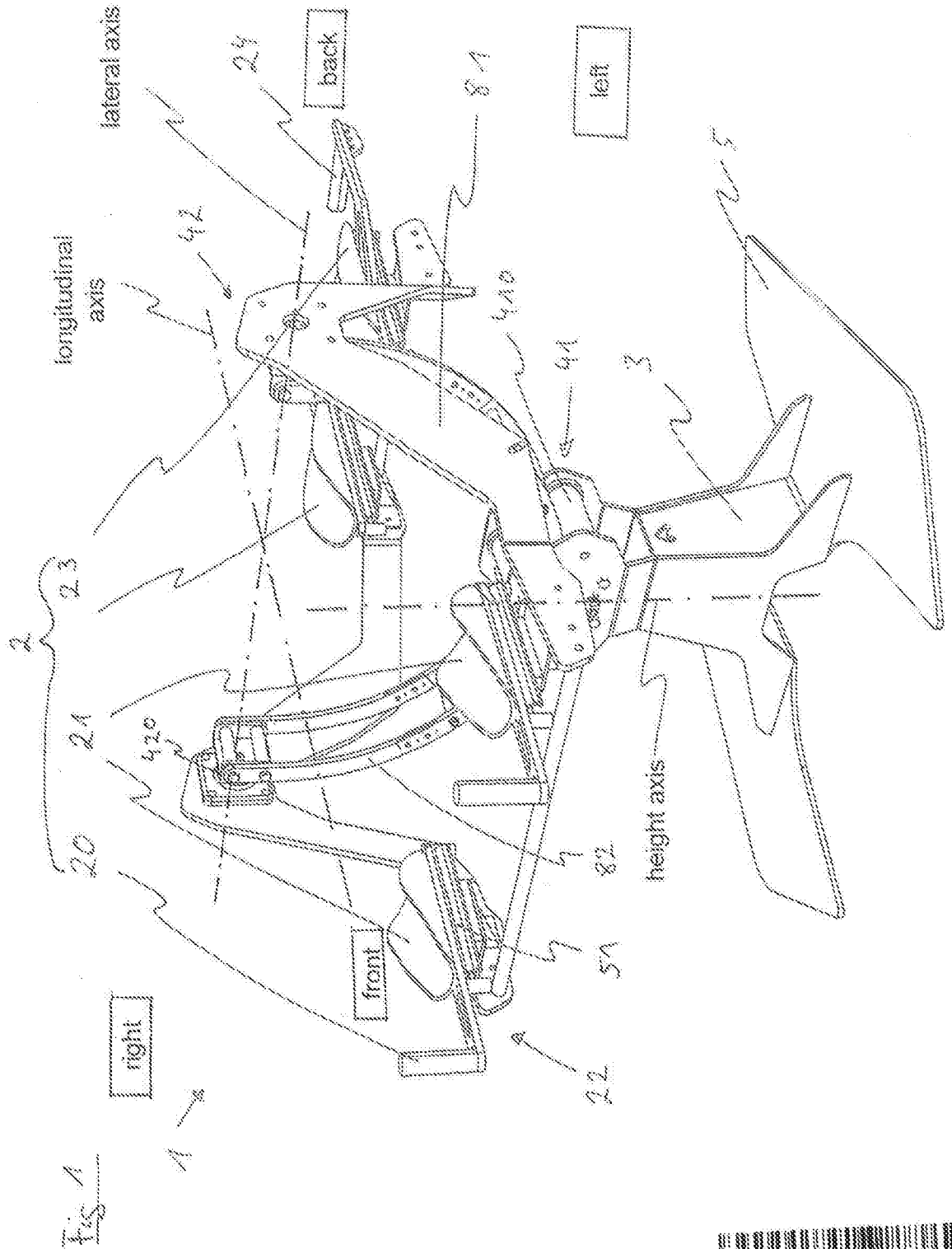


Fig. 1

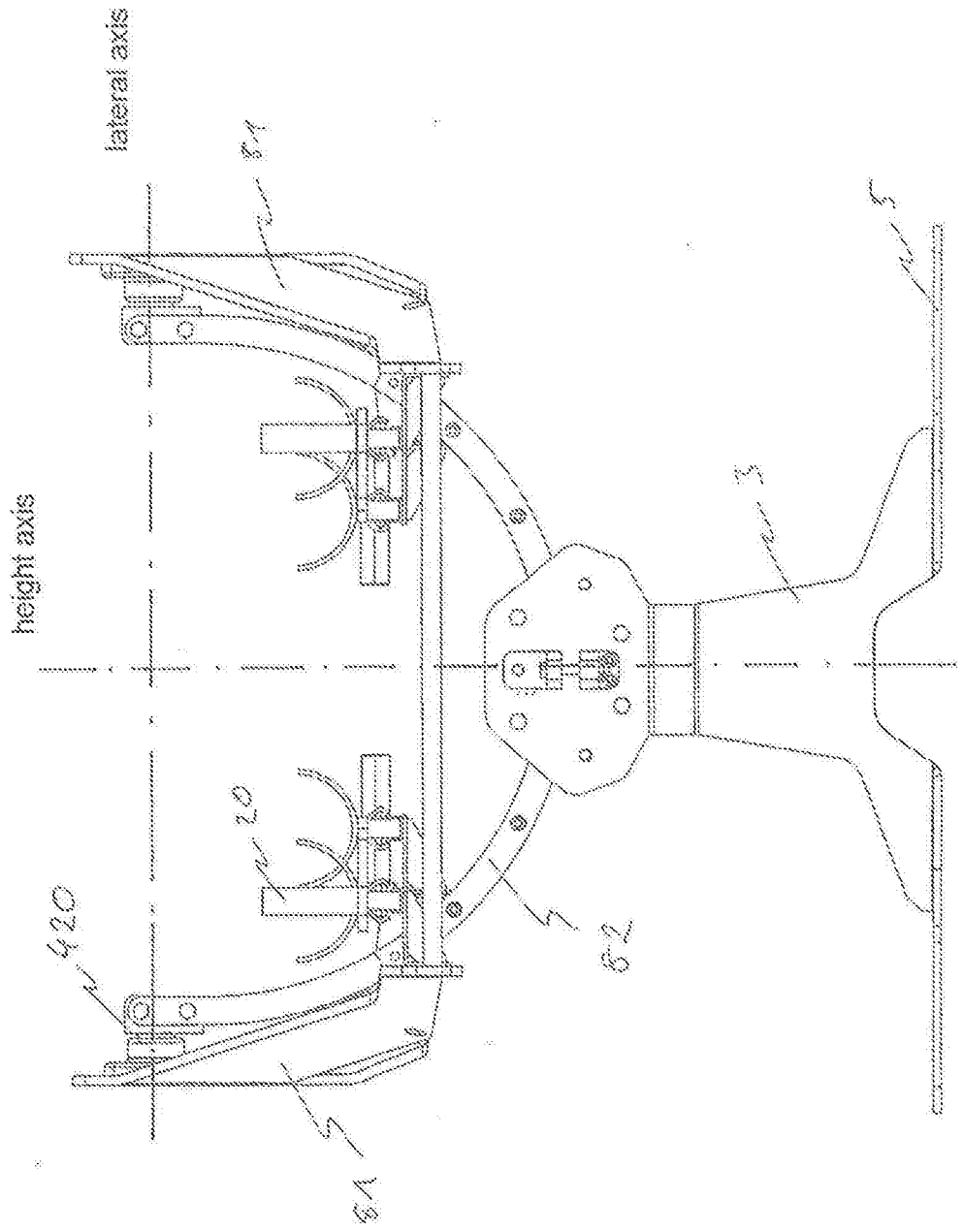


Fig. 2

Fig 3

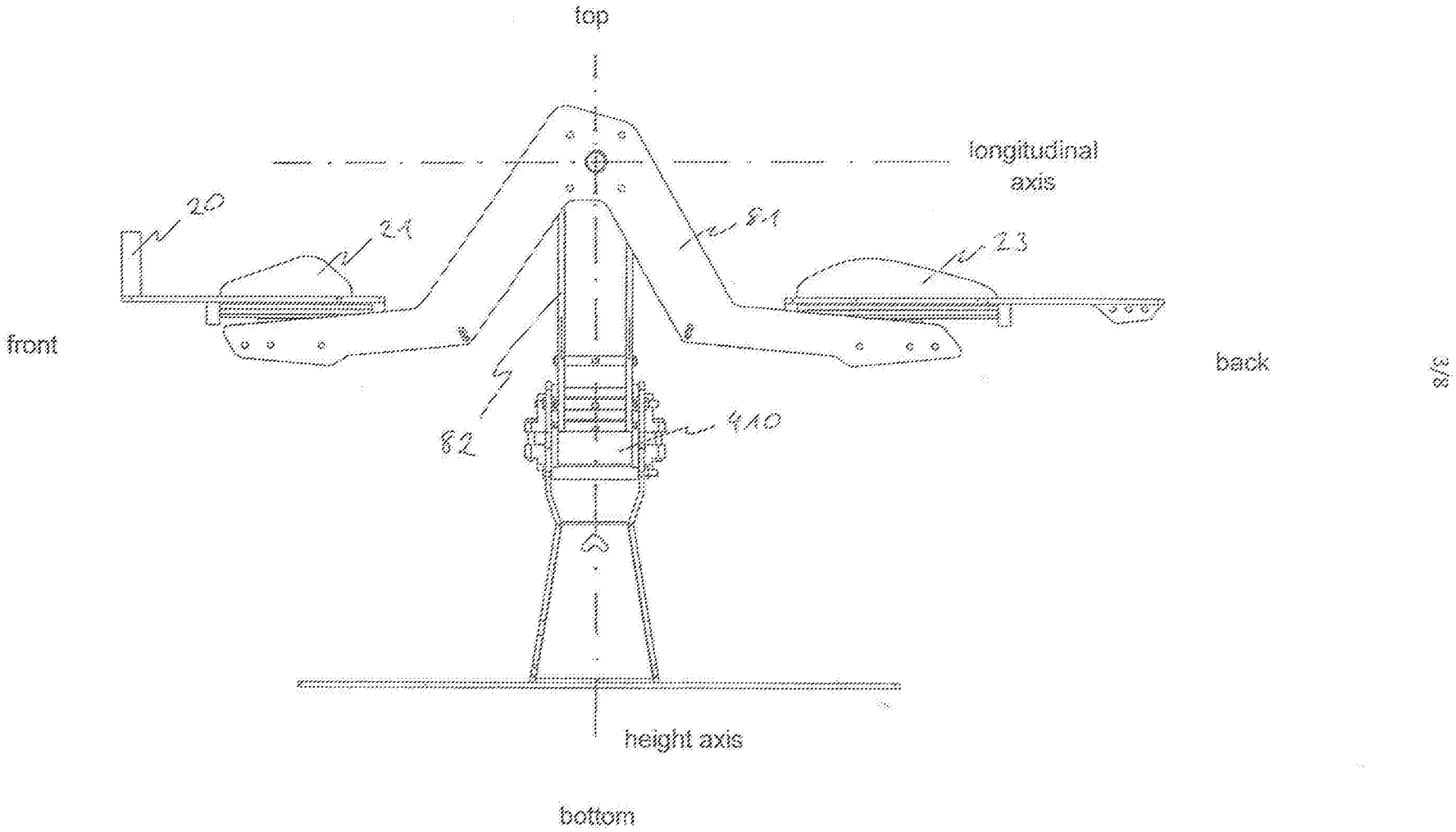

top
longitudinal axis
20
21
81
23
front
back
82
410
height axis
bottom

Fig 4

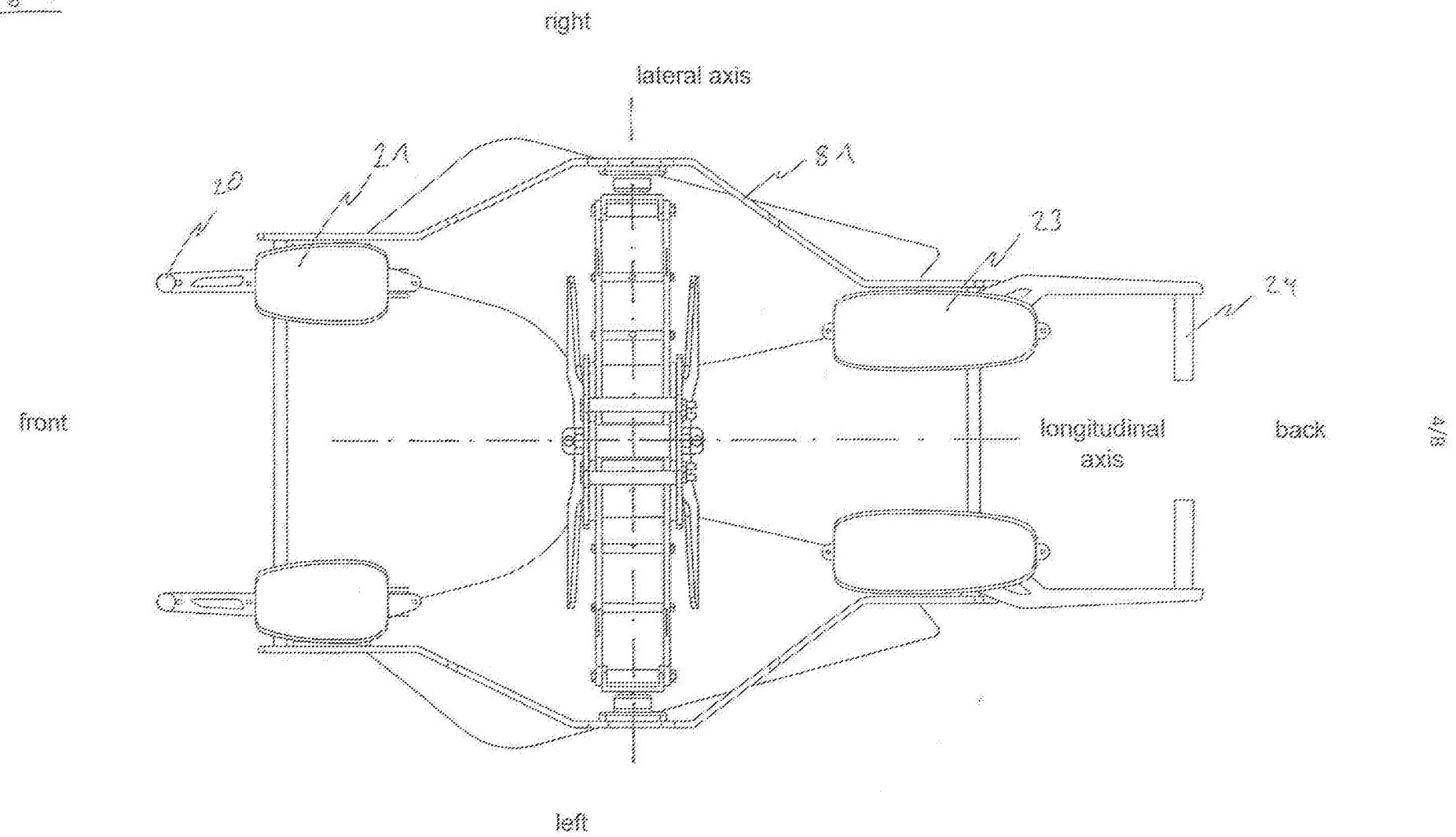
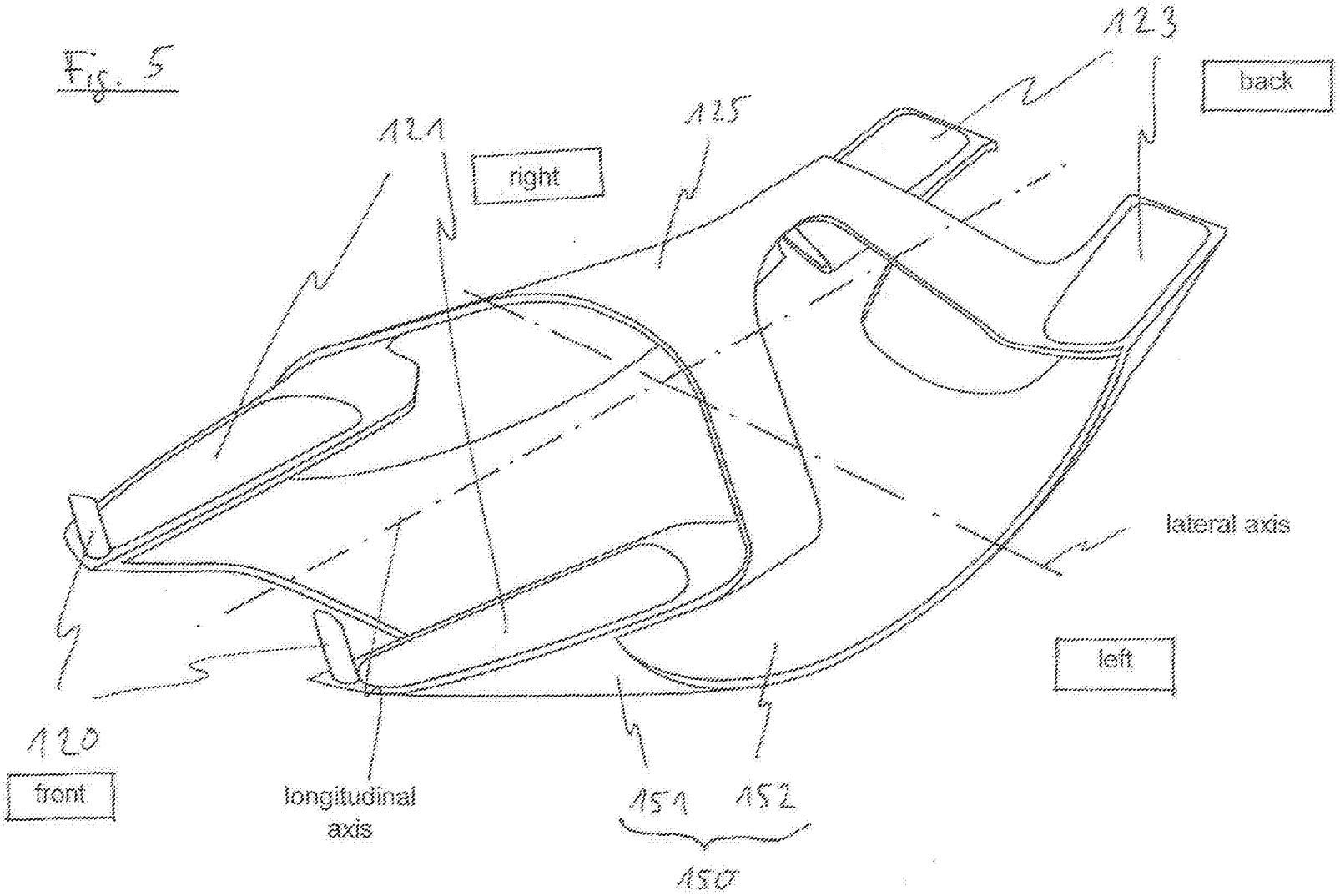

right
lateral axis
20
21
22
23
24
front
longitudinal axis
back
left

Fig. 5


123
back
121
right
125
lateral axis
left
120
front
longitudinal axis
151
152
150

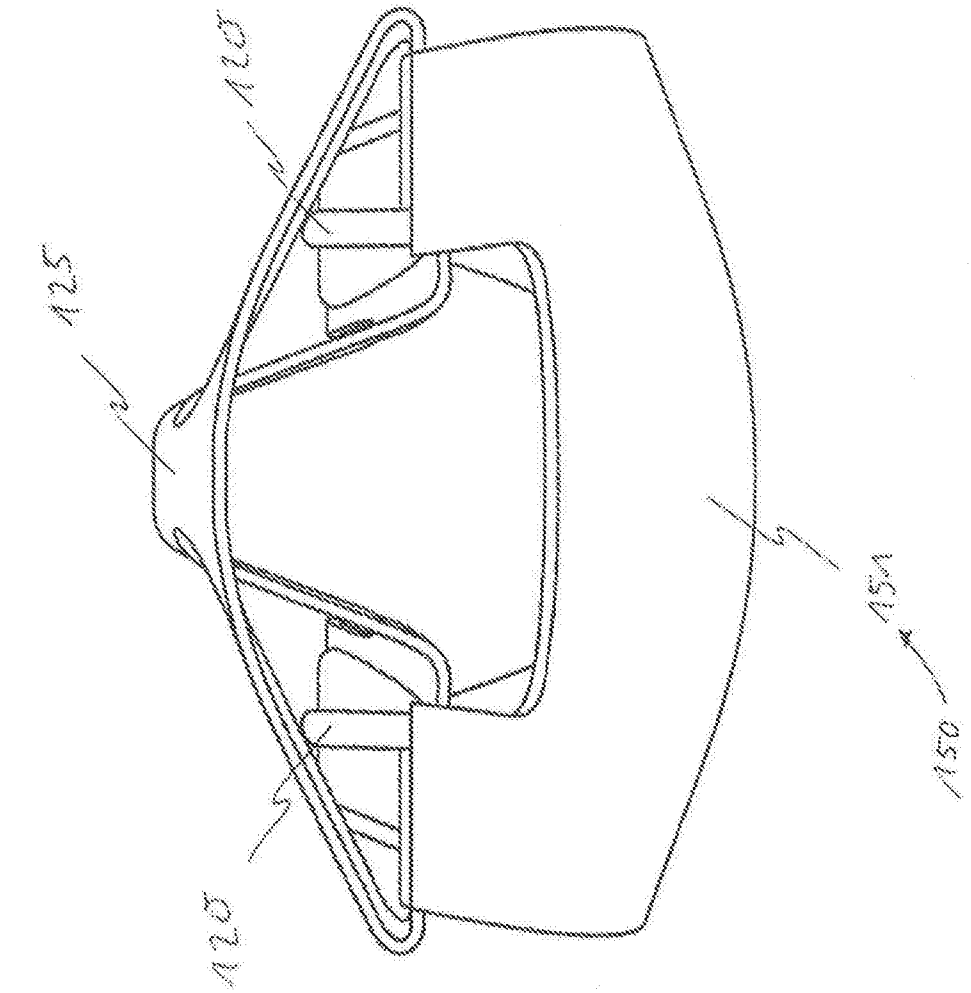


Fig. 6

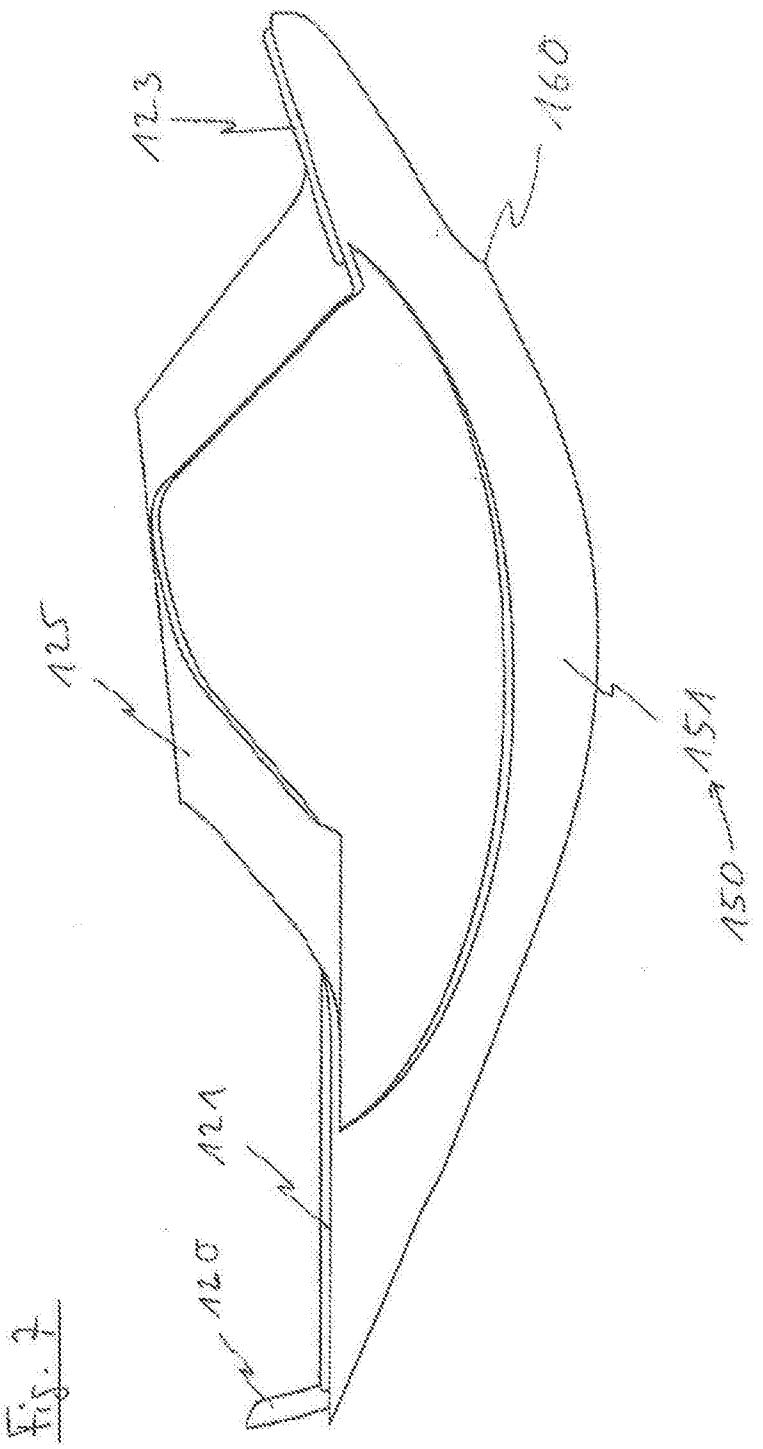


Fig. 7

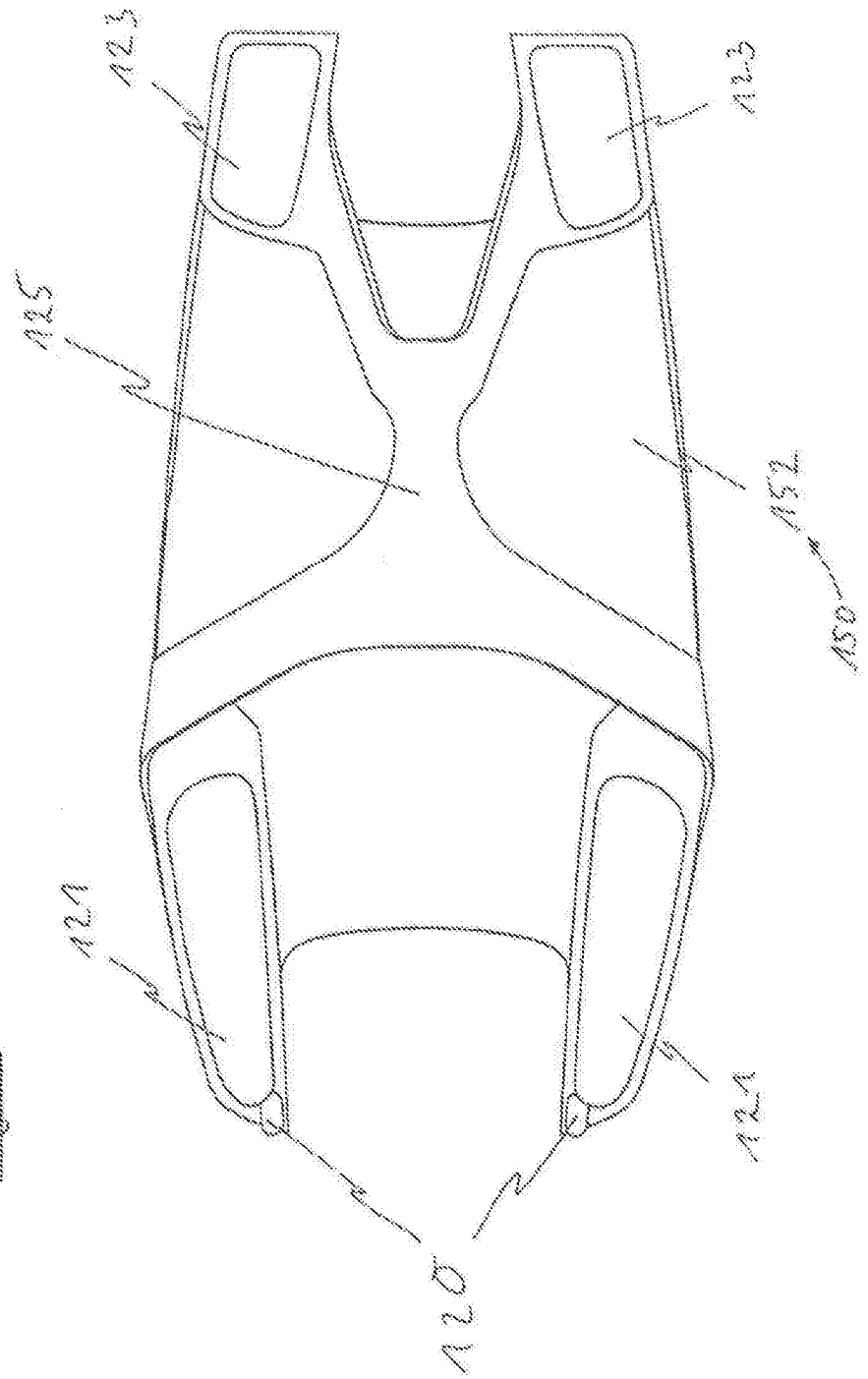


Fig. 8