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OMNI-DIRECTIONAL TREADMILL

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Abstract of KR20210023190 (A)

An omnidirectional treadmill is disclosed. The omnidirectional treadmill according to an embodiment of the present invention comprises: an inner core having a dome shape having a flat upper surface, and having a plurality of inner omnidirectional wheels rotatable in all directions on the surface; an omnidirectional belt surrounding the inner core, having a plurality of cell pads connected to each other to have a net structure, and being rotatable in all directions around the inner core; a plurality of external rotation supports being in contact with the outside of the omnidirectional belt to support the omnidirectional belt, and having external wheels rotatable to correspond to the rotation of the omnidirectional belt; and a main body frame accommodating the inner core, the omnidirectional belt, and the external rotating support so that the upper surface of the omnidirectional belt is exposed to the outside.

Notice

DESCRIPTION KR20210023190A

11 Omni-Directional Treadmill {OMNI-DIRECTIONAL TREADMILL}

[0001]

15 The present invention relates to an omni-directional treadmill, and more particularly to an omni-directional treadmill implemented in a novel manner.

[0002]

20 In general, a treadmill is an exercise device that a user moves while walking or running on the upper part of a caterpillar rotating belt, and is also called a treadmill. However, since the conventional caterpillar rotary belt can only move forward and backward in one direction while rotating forward or reverse by a driving force such as a motor, there is a problem in that it cannot respond to the user's movement in various directions. In particular, in recent years, as virtual reality-related technologies develop, there is a demand for a treadmill capable of being driven in an omni-directional manner that can be interlocked with virtual reality.

[0003]

31 In response to this demand, a plurality of caterpillar rotary belts capable of moving (rotating around the x-axis) in one direction (y-axis direction) are movable (rotating about the y-axis) in a direction perpendicular to one direction (x-axis direction). The Omni-Directional Treadmill has been developed, which is divided into unit rotating belts and allows simultaneous movement (rotation) in the x and y-axis directions.

37 However, in the case of such an omni-directional treadmill, it is not a complete omni-

directional treadmill as a two - degree - of - freedom system that can move forward, backward, left and right, and there is still a limit to complete tracking of the user's omnidirectional movement.

[0004]

44 On the other hand, referring to Patent Document 1 (US7,399,258), the inner platform frame 28 provided with the omnidirectional wheel 40 along the edge is formed of a dome - shaped (disk - shaped) belt 46 made of an elastic material. wrapped around, and as the user proceeds in any direction on this belt 46, the belt 46 rotates about the inner platform frame 28 in any direction (opposite the direction of travel of the user) in an omnidirectional manner. An omnidirectional treadmill of three degrees of freedom (forward, backward, left and right, rotation in a plane) is disclosed which realizes movement.

[0005]

55 However, in order for the belt 46 to wrap the inner platform frame 28, for example, after the frame 28 is wrapped with two separate sheets, the two sheets need to be sewn together. Then, a seam line is formed on the belt 46. do.

58 The seam portion of the belt 46 has a different elasticity or coefficient of friction from other portions, so it does not provide uniform elasticity or frictional force as a whole of the belt 46. There is a difficult problem.

[0006]

64 US registered patent US7,399,258 (2008.07.15)

[0007]

68 Accordingly, it is an object of the present invention to provide a new type of omnidirectional treadmill capable of more complete tracking and smooth operation of the user's omnidirectional movement.

[0008]

74 According to one aspect of the present invention, the upper surface has a flat dome shape, the inner core having a plurality of inner omnidirectional wheels rotatable in all directions on the surface; an omnidirectional belt that surrounds the inner core, a plurality of cell pads are connected to each other to have a network structure, and is rotatable in all directions around the inner core; a plurality of external rotational supports in contact with the outside of the omnidirectional belt to support the

omnidirectional belt and having external wheels rotatable to correspond to the rotation of the omnidirectional belt; and a body frame accommodating the inner core, the omnidirectional belt, and the plurality of external rotational supports so that the upper surface of the omnidirectional belt is exposed to the outside.

[0009]

87 Here, according to the embodiment, the omnidirectional belt may include a plurality of link members interconnecting the plurality of cell pads; and a plurality of joint members to which the plurality of link members are coupled, wherein the plurality of cell pads are connected to each other by the plurality of link members and the plurality of joint members to form the omnidirectional belt.

[0010]

95 In this case, the plurality of link members are provided to be radially coupled to one joint member, respectively, and the link member coupled to any one joint member among the plurality of joint members may be coupled to another adjacent joint member. have.

[0011]

102 Also, in this case, the plurality of cell pads are formed in an equilateral triangle, and the omnidirectional belt is radially arranged so that the six link members have the same angle from any one of the plurality of joint members. It is coupled to a joint member, and the cell pads are respectively disposed in a space formed by the plurality of link members to have a first unit structure connected to the link member, and the plurality of first unit structures are coupled to each other to form the omnidirectional belt can form.

[0012]

112 In addition, according to an embodiment, the omni - directional belt further includes a plurality of joint members to which the plurality of cell pads are coupled, and the plurality of cell pads are connected to each other by the plurality of joint members to form the omnidirectional belt. can form.

[0013]

119 In this case, the plurality of cell pads are formed in an equilateral triangle, and the omnidirectional belt is radially arranged such that the six cell pads have the same angle from any one joint member of the plurality of joint members. It has a second

unit structure coupled to, and a plurality of the second unit structures may be coupled to each other to form the omnidirectional belt.

[0014]

127 In addition, according to an embodiment, the omnidirectional belt further includes a plurality of pad direct connecting members connecting the plurality of cell pads to each other, and the plurality of cell pads are connected to each other by the plurality of pad direct connecting members, so that the It is possible to form an omnidirectional belt.

[0015]

135 In this case, the plurality of cell pads are formed in an equilateral triangle, and the omnidirectional belt is radially arranged such that the six cell pads have the same angle with respect to the center, and any one cell of the plurality of cell pads is provided. The edge of the pad and the edge of another adjacent cell pad may have third unit structures connected to each other by the pad direct coupling member, and a plurality of the third unit structures may be coupled to each other to form the omnidirectional belt.

[0016]

145 In addition, the inner core, a portion of the lower surface including the central portion of the lower surface may be open.

[0017]

150 In addition, the omnidirectional treadmill may further include a control unit for controlling the driving of the external wheel in response to the user's movement.

[0018]

155 In addition, according to an embodiment, each of the plurality of external rotation supports has a plurality of the external wheels connected by a connecting shaft, and the omnidirectional belt by gripping the outer side surfaces of the omnidirectional belt by the plurality of external wheels can support

[0019]

162 In this case, the plurality of external rotation support may be configured to be lifted individually or simultaneously.

[0020]

167 In addition, the omni - directional treadmill may further include a plurality of lift driving units respectively disposed at a plurality of locations under the body frame to lift and drive the body frame.

[0021]

173 In addition, the omni - directional treadmill may further include a virtual reality unit that implements virtual reality.

[0022]

178 According to the present invention, it is possible to provide an omni - directional treadmill capable of more complete and smooth omnidirectional operation.

[0023]

183 1 is a schematic cross - sectional view of an omni - directional treadmill according to an embodiment of the present invention.

185 2 (a) and 2 (b) are views for explaining the operating principle of the omni - directional treadmill according to the present invention.

187 3 is a view for explaining a design process of an omnidirectional belt in an omnidirectional treadmill according to the present invention, and is a view showing an icosahedron formed by an equilateral triangle.

190 4 is a diagram illustrating a state in which any one equilateral triangle constituting each face of the icosahedron of FIG. 3 is again divided into several equilateral triangles.

193 FIG. 5 is a view of a state in which the equilateral triangle divided into a plurality in FIG. 4 is corrected to have the same radius from the center of the icosahedron and approximated to a sphere.

196 6 is a view showing the unit structure of the omnidirectional belt according to the first example in the omnidirectional treadmill of the present invention.

198 7 is a view illustrating a state in which a plurality of unit structures of FIG. 6 are provided and coupled to each other.

200 8 is a perspective view illustrating omnidirectional wheels applicable to an inner wheel or an outer wheel in the omnidirectional treadmill of the present invention.

202 9 is a schematic cross - sectional view of an omni - directional treadmill according to another embodiment of the present invention.

204 FIG. 10 is a schematic perspective view showing an arrangement example of an external rotary support in the omni - directional treadmill shown in FIG. 9 .

11 is a view for explaining a method of driving an external rotary support in the omni-directional treadmill shown in FIG.

12 is a view of a user wearing a virtual reality unit and using the omni-directional treadmill in the omni-directional treadmill according to the present invention.

13 is a view showing the unit structure of the omnidirectional belt according to the second example in the omnidirectional treadmill of the present invention.

14 is a view illustrating a state in which a plurality of unit structures of FIG. 13 are provided and coupled to each other.

15 is a view showing the unit structure of the omnidirectional belt according to the third example in the omnidirectional treadmill of the present invention.

16 is a view illustrating a state in which a plurality of unit structures of FIG. 15 are provided and coupled to each other.

[0024]

Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings.

The terms or words used in the present specification and claims are not to be construed as being limited to their ordinary or dictionary meanings, and the inventor may properly define the concept of the term in order to best describe his invention. Based on the principle that there is, it should be interpreted as meaning and concept consistent with the technical idea of the present invention.

Therefore, the configuration shown in the embodiments and drawings described in this specification is only the most preferred embodiment of the present invention and does not represent all of the technical idea of the present invention, so at the time of the present application, various It should be understood that there may be equivalents and variations.

[0025]

In the drawings, the size of each component or a specific part constituting the component is exaggerated, omitted, or schematically illustrated for convenience and clarity of description.

Accordingly, the size of each component does not fully reflect the actual size.

If it is determined that a detailed description of a related known function or configuration may unnecessarily obscure the gist of the present invention, such description will be omitted.

[0026]

As used herein, the term 'coupled' or 'connected' refers to a case in which one member and another member are directly coupled or directly connected, as well as

when one member is indirectly coupled to another member through a joint member, or indirectly. Including cases connected to

[0027]

253 1 is a schematic cross - sectional view of an omnidirectional treadmill according to an embodiment of the present invention, FIG. 2 is a diagram for explaining the principle of an omnidirectional treadmill according to the present invention, and FIGS. 3 to 5 are front views according to the present invention It is a view for explaining the design process of the omni - directional belt in the directional treadmill, and FIGS. 6 and 7 are views showing the construction process of the omni - directional belt according to the first example in the omni - directional treadmill of the present invention, and FIG. It is a perspective view illustrating omnidirectional wheels applicable to the omnidirectional treadmill of the present invention.

[0028]

265 Referring to FIG. 1 , an omnidirectional treadmill 10 according to a first embodiment of the present invention includes an omnidirectional belt 100 , an inner core 200 , an external rotation support 300 , and a body frame 400 .) is included.

[0029]

271 The omnidirectional belt 100 may move in all directions according to the movement of the user.

273 That is, when the user moves in an arbitrary direction on the upper surface of the omnidirectional belt 100 , it may move (rotate) in any direction (in a direction opposite to the user's movement) to correspond to the user's movement.

[0030]

279 1 and 2 , the omnidirectional belt 100 may have a shape corresponding to the case in which an object such as a gimbal 1 formed in a sphere is pressed and the cross - section has an approximately elliptical shape. have.

[0031]

285 2 (a) and 2 (b) for explaining the principle of the omni - directional belt 100 of the omni - directional treadmill, in Fig. 2 (a), the upper plate 2 on the upper side and the lower side of the sphere 1) and the lower plate 3 (ground) are in contact, respectively, and when the upper and lower sides of the sphere 1 are pressed by the upper plate 2 and the lower plate 3 as shown in Fig. 2(b), the sphere (1) is pressed

into a thick disk shape with an approximately elliptical cross section to form flat parts on the upper and lower surfaces.

[0032]

295 As such, the upper plate 2 in contact with the upper surface of the sphere 1 pressed in FIG. 2(b) can move smoothly in all directions, and the omnidirectional belt 100 of the omnidirectional treadmill 10 according to the present invention is According to this principle, it can move smoothly in all directions.

299 That is, the omnidirectional belt 100 of FIG. 1 may be formed in a similar manner to the pressed sphere 1 of FIG. 2(b), and an inner core 200 is provided inside the omnidirectional belt 100, An external rotation support 300 is provided on the outside so that it can move smoothly and naturally in all directions.

[0033]

306 The omnidirectional belt 100 is configured to surround the inner core 200 to be described later.

308 Here, if the omnidirectional belt 100 is integrally manufactured, the inner core 200 cannot be put therein.

310 Therefore, in Patent Document 1, the belt is formed as a separate sheet, the platform frame is put inside, and then the two sheets are sewn together. In this case, there is a problem of the seam as described above.

[0034]

316 Accordingly, in the present invention, a new method is introduced to form the omnidirectional belt 100 .

318 Hereinafter, the design process of the omnidirectional belt in the present invention will be described with reference to FIGS. 3 to 5 .

[0035]

323 First, referring to FIG. 3 , an icosahedron 4 is formed by 20 equilateral triangles 5 .

324 And, referring to FIG. 4 , the equilateral triangular face 5 constituting each face of the icosahedron 4 of FIG. 3 may be configured to be divided into several equilateral triangles 6 again.

327 Then, if the equilateral triangle 6 divided into a number is corrected to have the same radius from the center of the icosahedron 4, it is approximated to the sphere 7 as in FIG. 5 .

[0036]

333 That is, if the operation of dividing the equilateral triangle 5 from the icosahedron 4 and correcting the divided plurality of equilateral triangles 6 to have the same radius from the center of the icosahedron 5 is repeated, The icosahedron 4 is approximated to the sphere 7 of FIG. 5 by a number of small equilateral triangles 6 .

337 And, when this sphere 7 is pressed up and down, it becomes the pressed sphere 1 of FIG. 2(b), that is, an omnidirectional belt.

339 However, the omnidirectional belt 100 according to the embodiment of the present invention is different from the one-piece (strictly, two sheets of sheet) belt of Patent Document 1 described above, a plurality of equilateral triangular cell pads are connected to each other to form a net structure. have

[0037]

346 Specifically, in the omnidirectional belt 100 according to the first example, as shown in FIGS. 6 and 7 , a plurality of equilateral triangular cell pads 111 are formed by a link member 113 and a joint member 115 . It may be provided to form a shape similar to a sphere by connecting.

350 That is, the cell pad 111 of the equilateral triangle of FIG. 6 corresponds to the equilateral triangle 6 of FIG. 5 , and the link member 113 of FIG. 6 corresponds to the side (edge) of the equilateral triangle 6 of FIG. The joint member 115 of 6 corresponds to the vertex of the equilateral triangle 6 of FIG. 5 .

[0038]

357 Here, the cell pad 111 does not necessarily have to be an equilateral triangle, and if a plurality of cell pads 111 are connected to form a spherical-like network structure, the cell pad 111 may have various shapes other than an equilateral triangle. .

360 The cell pad 111 has an arbitrary shape other than an equilateral triangle, for example, a combination of regular hexagons or rhombuses, or a soccer ball in which pentagonal and hexagonal shapes are repeated, or a volleyball ball, baseball, or basketball ball in which the unit cell pad has a curved outline. It can be approximated to a sphere with

[0039]

368 However, iterative division into a plurality of cell pads described with reference to FIGS. 3 to 5 or the convenience of manufacturing a spherical omnidirectional belt by connecting a plurality of cell pads shown in FIGS. 6 and 7 ; Furthermore, in consideration of uniform distribution of the stretching force in any direction, the shape of the cell pad is preferably an equilateral triangle.

373 Here, as the shape of the cell pad, a regular hexagon can be viewed as a combination

of six equilateral triangles, and a rhombus can be viewed as a combination of two equilateral triangles.

[0040]

379 Therefore, hereinafter, for convenience of description, a case in which the cell pad 111 is 'basically an equilateral triangle' will be mainly described.

381 When the cell or cell pad has an equilateral triangle to form a sphere, it is advantageous for balanced distribution of forces applied to each link, joint, and cell pad fixing member.

384 Here, 'basically an equilateral triangle' means, referring to FIG. 6 , the shape of a slightly deformed shape from the original equilateral triangle, such as rounding or chamfering the vertices for the necessity of coupling or interference prevention, etc. It is also within the scope of an equilateral triangle. This means that the concept is included, and in the present specification, the shape of the cell pad 111 of FIG. 6 will also be described as an equilateral triangle.

[0041]

393 The link member 113 may be configured to interconnect the plurality of cell pads 111 .

395 That is, as shown in FIG. 6 , one link member 113 may be coupled to the edge (side) of the cell pad 111 in the longitudinal direction.

397 That is, the side surface of the link member 113 may be coupled to the edge of the cell pad 111 .

[0042]

402 In addition, a plurality of link members 113 may be coupled to the joint member 115 .

403 The joint member 115 and the link member 113 may be coupled in various ways.

404 For example, a coupling groove 150 (refer to FIG. 7) is formed in the joint member 115 , a coupling protrusion 140 is formed at an end of the link member 113 , and the coupling protrusion 140 of the link member 113 is formed.) may be inserted into the coupling groove 150 of the joint member 115 to be coupled.

408 However, the coupling method of the joint member 115 and the link member 113 is not limited thereto.

410 In this way, the plurality of cell pads 111 , the plurality of link members 113 , and the plurality of joint members 115 may be connected to each other to form the omnidirectional belt 100 .

[0043]

416 Here, the plurality of link members 113 are provided to be radially coupled to one joint member 115 , and the link member 113 coupled to any one joint member 115 among the plurality of joint members 115 . may be provided to be coupled to another adjacent joint member 115 .

[0044]

423 Specifically, referring to FIG. 6 , the first unit structure 110 is provided in the omnidirectional belt 100 according to the first example, and the first unit structure 110 is provided with six link members 113 . , the six link members 113 are radially arranged to have the same angle from any one of the joint members 115 of the plurality of joint members 115 and are coupled to the joint member 115 .

428 In addition, the equilateral triangular cell pad 111 may be configured to be respectively disposed in a space formed by the plurality of link members 113 to be connected to the link members 113 .

[0045]

434 And, as shown in FIG. 7 , a plurality of first unit structures 110 may be coupled to each other to form the omnidirectional belt 100 .

436 Although FIG. 7 shows a plan view in which several first unit structures 110 are coupled to each other, when more first unit structures 110 are coupled to each other and bent in a curved shape to form a sphere, the ends are coupled , it is possible to manufacture an omnidirectional belt 100 of a net structure having a shape similar to a sphere.

441 However, the first unit structures 110 are bent in a curved shape so as to form a spherical shape by being coupled to each other so that, before the ends are coupled, the inner core 200 to be described later is wrapped around the first unit structures 110 , and then the first unit structures 110 are completely removed. It should be connected to complete the omnidirectional belt 100 .

[0046]

449 On the other hand, the cell pads 111 , 121 , 131 , the link member 113 , the joint members 115 and 125 , and the pad direct connection member 133 to be described later are elastic and flexible (easy to bend) synthetic resin, synthetic or natural rubber, synthetic or natural fiber. These materials may be used alone or in combination.

454 In addition, the same material as the rotary belt in the conventional one - way treadmill may be used.

456 Here, the cell pads 111 , 121 , and 131 , the link member 113 , the joint members 115 and 125 , and/or the pad direct connection member 133 may be formed of the

same material or different materials.

[0047]

462 The omnidirectional belt 100 can be formed by this new method, and the cell pad 111 is coupled to the link member 113 and the joint member 115 to have a mesh structure connected to each other. The inner core 200 can be easily accommodated on the inside of the.

466 In addition, each separable member and the net structure facilitate access to the inner core 200 by disassembling a part of the net structure for maintenance as well as the process of accommodating the inner core 200 .

[0048]

472 In addition, in this way, the problem caused by the seam of Patent Document 1 described above is solved.

474 That is, in the case of the omnidirectional belt 100 of the omnidirectional treadmill 10 according to the present invention, there is no suture as in Patent Document 1, or numerous sutures (link members) are uniform throughout the omnidirectional belt 100. is formed

478 Accordingly, it is possible to provide even elasticity and frictional force over the entire omnidirectional belt 100 , so that the inner platform frame (inner core) edge can be smoothly crossed.

[0049]

484 The inner core 200 has a dome shape with a flat upper surface, and has a plurality of inner omnidirectional wheels 220 rotatable in all directions on the surface.

486 The inner omnidirectional wheel 220 is disposed to face the inner side of the omnidirectional belt 100 , and is rotatable in any direction (forward direction) in contact with the inner side of the omnidirectional belt 100 .

489 The inner omni - directional wheel 220 may include any wheel capable of rotating in an omni - direction, for example, the inner omni - directional wheel 220 is an omni - ball 700, omni - ball as shown in FIG. 8(a).) may be, or it may be an omni wheel 710, omni - wheel, such as FIG. 8(b) or a mecanum wheel 720, such as in FIG. It may include various wheels.

[0050]

497 The inner core 200 may further include a guide member 210 .

498 Referring to FIG. 1 , the guide member 210 may have a dome shape with a flat upper surface, and may be formed in a shape corresponding to the shape of the

omnidirectional belt 100 , that is, a cross - section is approximately oval.

501 And, the inner omnidirectional wheel 220 is coupled to the surface of the guide member 210 is provided to rotate in the omnidirectional direction.

[0051]

506 On the other hand, since the user moves on the upper surface of the omnidirectional belt 100, the inner core 200 may have a portion of the lower surface including the central portion of the lower surface open.

509 That is, the guide member 210 may have a shape in which a portion of the lower portion is cut out from an elliptical shape as shown in FIG. 1 .

511 As such, when a portion of the lower portion of the guide member 210 is cut out, the weight of the inner core 200 is reduced.

[0052]

516 And, although it is shown that the external rotation support 300 is disposed at a position corresponding to the part where the guide member 210 is cut in FIG. 1, the external rotation support 300 is the guide member 210 in the part where it is cut. It may not be arranged in a corresponding position.

[0053]

523 The external rotation support 300 is in contact with the outside of the omnidirectional belt 100 to rotatably support the omnidirectional belt 100 around the inner core 200 .

526 A plurality of external rotation support 300 is provided to be rotatable in all directions.

528 In particular, the external rotation support 300 supports the omnidirectional belt 100 and the inner core 200 while rotating to correspond to the rotation of the omnidirectional belt 100 when the omnidirectional belt 100 moves (when rotating). do.

532 In addition, as described later, when the control unit 500 detects or predicts the user's movement through a sensor and the like and drives the external rotation support 300 according to the user's movement, the The direction belt 100 may rotate.

[0054]

539 The external rotation support 300 may be implemented as an omni - directional wheel that can rotate in omni - directional like the above - described internal omni - directional wheel 220, specifically, the omni ball 700, omni wheel 710 or It may be a

Mecanum wheel 720 .

[0055]

546 The body frame 400 includes an inner core 200, an omnidirectional belt 100 and an external rotational support 300 such that at least a portion (upper surface) of the omnidirectional belt 100 is exposed to the outside, as shown in FIG. 1 . Accept.

549 However, the shape of the body frame 400 is not limited to the shape shown in FIG. 1 and may be variously changed.

[0056]

554 In addition, the omnidirectional treadmill 10 according to the present invention may be driven to be inclined at a predetermined angle with respect to the ground, thereby realizing a situation such as a user moving on a slope.

557 That is, as shown in FIG. 1 , the omnidirectional treadmill 10 according to an exemplary embodiment may include a lift driving unit 410 disposed at a plurality of lower portions of the body frame 400 .

[0057]

563 The lifting driving unit 410 may be implemented as a hydraulic cylinder or a pneumatic cylinder, each of which is individually controlled by the control unit 500 to vertically expand and contract to incline the entire body frame 400 in any direction.

566 Here, in order to incline the body frame 400 in any direction, at least three elevating driving units 410 expand and contract vertically while supporting the body frame 400 at three points, or one point is fixed and the remaining two points or more. Two or more elevating driving units 410 are disposed, one for each, and can be vertically expanded and contracted, respectively.

[0058]

574 Furthermore, by simultaneously raising and lowering the plurality of lifting driving units 410 , a situation as if the user is on an elevator may be implemented.

[0059]

579 On the other hand, when the omnidirectional belt 100 is mounted on the inner core 200, the omnidirectional belt 100 is in its original shape (spherical as in FIG. is transformed

582 Therefore, the omnidirectional belt 100 is stretched the most in the portion located at the side edge of the disk rather than the upper and lower surfaces of the disk, and

the degree of expansion and contraction for each part of the omnidirectional belt 100 is not uniform.

586 This non - uniform expansion and contraction is dispersed and absorbed by the cell pad 111, the link member 113, and the joint member 115 made of a stretchable material. There is a fear that the direction belt 100 may not be able to move (rotate) smoothly.

590 In order to minimize the non - uniformity of the degree of expansion and contraction, the shape of the omnidirectional belt 100 should be maintained as close to a spherical shape as possible. will grow bigger

[0060]

596 Accordingly, an omnidirectional treadmill according to another embodiment capable of maximally suppressing an increase in the device size while minimizing the non - uniformity of the degree of expansion will be described with reference to FIGS. 9 to 11 .

[0061]

603 9 is a schematic cross - sectional view of an omnidirectional treadmill according to another embodiment of the present invention, FIG. 10 is a schematic perspective view showing an example of arrangement of an external rotation support, and FIG. 11 is a view for explaining a method of driving the external rotation support to be.

[0062]

610 Meanwhile, in the present embodiment shown in FIGS. 9 to 11 , the same reference numerals are assigned to the same and similar components as those of the above - described embodiment, and detailed descriptions thereof are omitted.

613 However, it goes without saying that the individual configurations, features, or modifications described in the above - described embodiment and the present embodiment can be interchanged and selectively applied as long as they do not contradict each other.

[0063]

620 In the omni - directional treadmill 10' according to this embodiment, the shape of the omni - directional belt 100 mounted on the inner core 200' is different from the omni - directional treadmill 10 of the above - described embodiment.

623 That is, in the present embodiment, the omnidirectional belt 100 has an upper surface flat as in the above - described embodiment, but a substantially hemispherical shape with a downward convex or a spherical shape cut out from the upper part.

[0064]

629 Accordingly, the degree of expansion and contraction of the remaining parts except for the upper surface of the omnidirectional belt 100 is approximately the same, so that the non - uniformity of the overall degree of expansion is significantly reduced compared to the above - described embodiment, and the movement of the omnidirectional belt 100 in any direction (rotation) is smoother.

634 In addition, since the overall shape of the omnidirectional belt 100 is not a perfect spherical shape, but a shape obtained by cutting out a portion of the spherical upper part, it is possible to suppress the increase in the overall size of the device while reducing the non - uniformity of the degree of expansion and contraction.

[0065]

641 In this way, to maintain the shape of the omnidirectional belt 100 in a substantially hemispherical or spherical shape, the lower shape of the inner core 200 ′, particularly the guide member 210 ′, is different from the above embodiment. Alternatively, it forms into an approximately hemispherical shape that is convex downwards.

646 On the other hand, in this embodiment, as in the above - described embodiment, the inner core 200 ′ may have a part of the lower surface including the central portion of the lower surface open.

[0066]

652 In addition, the body frame 400 ′ of the present embodiment also has an accommodating space 420 having a shape obtained by cutting out an upper part from a substantially hemispherical or spherical shape along the shapes of the inner core 200 ′ and the omnidirectional belt 100 .

656 On the other hand, the body frame 400' of this embodiment may be installed on the ground as in the above - described embodiment, but in this embodiment, the height (depth of the accommodation space) of the device increases compared to the above - described embodiment, so the (including the floor surface of the building) is preferably formed by digging down in a substantially hemispherical shape.

661 In this case, the body frame 400' becomes the ground.

[0067]

665 In this embodiment, the external rotation support 300 ′ may be arranged to support the outer side of the omnidirectional belt 100 .

667 Specifically, the external rotation support 300 ′, as shown in FIGS. 9 and 10 ,

includes a plurality of external wheels 310 , a connecting shaft 320 and an external wheel driving unit 330 (in FIGS. 10 and 12). not shown) may be included.

[0068]

673 The plurality of outer wheels 310 support the omnidirectional belt 100 and the inner core 200 ′ in the form of gripping the outer side surfaces of the omnidirectional belt 100 from above and below.

676 According to this configuration, as shown in FIG. 9 , even if an external rotation support or an external wheel is not disposed under the omnidirectional belt 100 and the inner core 200', the omnidirectional belt 100 and the inner core 200 ') can be supported in a floating state on the floor of the accommodation space 420 .

680 In addition, the most deformation (elongation) occurs during movement (rotation) of the omnidirectional belt 100, and therefore, the portion having the greatest resistance is the outer side portion of the inner core 200'.

683 Therefore, if the external rotation support 300' is disposed in this part and the external wheel 310 is rotationally driven as described later, the external wheel is disposed below the omnidirectional belt 100 and the inner core 200', It is possible to move (rotate) the omnidirectional belt 100 much more efficiently and smoothly than in the case of rotational driving.

[0069]

691 When the omnidirectional belt 100 moves (rotates) according to the user's movement, the outer wheel 310 of the external rotation support 300' is moved in a direction corresponding to that, that is, the omnidirectional belt 100 moves (rotates).) by being driven to rotate in the opposite direction to the direction, the omnidirectional belt 100 can be moved (rotated) to facilitate the user's movement.

[0070]

699 To this end, the omni - directional treadmill 10 ′ according to the present embodiment may further include a control unit 500 .

701 The control unit 500 controls the movement or rotation of the omnidirectional belt 100 by driving the outer wheel 310 to correspond to the movement of the user moving on the upper surface of the omnidirectional belt 100 .

[0071]

707 Specifically, in Fig. 11, in order to move the omnidirectional belt 100 in a desired direction (a thick arrow direction), four external wheels 310 capable of forward and reverse rotation about a central axis (connecting shaft 320), respectively, are

provided. The driving direction of each of the outer wheels 310 of the provided external rotation support 300 is shown.

[0072]

715 For example, when the user moves backward (moving in the 4:30 direction in FIG. 11) on the upper surface of the omnidirectional belt 100, as shown in FIG. 11(a), the omnidirectional belt 100 moves leftward. (Move in the direction of the bold arrow at 10 o'clock).

719 In this case, the control unit 500 stops the outer wheel 310 disposed on the upper left and lower right sides in FIG. and the outer wheel 310 disposed on the lower left side is rotationally driven in a counterclockwise direction when viewed from the lower left side.

[0073]

726 In this way, the control unit 500 may drive and control each of the outer wheels 310 so that the omnidirectional belt 100 moves in a desired direction (a thick arrow direction).

729 Here, although only eight directions of driving control are shown in FIGS. 11(a) to 11(h), by varying the rotational speed of each outer wheel 310, it can be moved in any direction not shown in FIG. Movement of the omnidirectional belt 100 can be implemented.

[0074]

736 In addition, when the omnidirectional belt 100 is rotated on a plane about an axis perpendicular to the ground in FIGS. 11(i) and 11(j), the driving directions of each of the outer wheels 310 are shown.

739 For example, as shown in Fig. 11(i), when the omnidirectional belt 100 is rotated rightly on a plane, all of the four outer wheels 310 may be rotated counterclockwise when viewed from the outside.

[0075]

745 Meanwhile, in this embodiment, the outer wheel 310 may be implemented as a simple wheel rotatable about each central axis, but like the inner omnidirectional wheel 220, it may be implemented as an omnidirectional wheel rotatable in any direction. .

748 That is, the outer wheel 310 may be implemented as the omni ball 700 , the omni wheel 710 or the Mecanum wheel 720 shown in FIG. 8 .

[0076]

753 In addition, in this embodiment, as in the above - described embodiment, a situation such as a user moving on a slope can be implemented.

755 However, in this embodiment, since the body frame 400' is the ground itself, it is difficult to implement the inclined driving of the body frame itself using the elevating driving unit 410 as in the above - described embodiment.

[0077]

761 Accordingly, in this embodiment, as shown in FIG. 9 , the plurality of external rotation supports 300 ′ holding the omnidirectional belt 100 and the inner core 200 ′ from the outer side are individually or interlocked with each other. By driving up and down, the omnidirectional belt 100 and the inner core 200' are driven obliquely.

[0078]

768 Specifically, the plurality of external rotation support 300 ′ , the external wheel driving unit 330 is fixed to the upper end of the inner wall of the accommodation space 420 to be movable up and down as indicated by the arrow A within a predetermined range.

772 In addition, an elevating driving unit (not shown) for moving each of the external wheel driving units 330 up and down is provided inside the body frame 400 ′ .

774 In addition, the control unit 500 performs rotation control of the external wheel 310 as described above, and controls the lifting driving unit (not shown) to move the external wheel driving unit 330 up and down, so that the body frame 400 is ') may be inclined to drive the omnidirectional belt 100 and the inner core 200' in a fixed state.

[0079]

782 Furthermore, by simultaneously raising and lowering the plurality of external rotational supports 300 ′ , it is possible to implement a situation as if the user got on the elevator.

[0080]

788 The omni - directional treadmill 10 according to the present invention may be used in combination with a virtual reality system.

790 That is, referring to FIG. 12 , a user may wear a virtual reality unit 600 , and the omnidirectional treadmills 10 and 10 ′ according to an embodiment of the present invention are a virtual reality unit 600 that implements virtual reality. It can be used for various purposes such as games or training with

[0081]

797 In this case, the control unit 500 may control the movement or rotation of the omnidirectional belt 100 to correspond to the movement of the user wearing the virtual reality unit 600 .

800 For example, by installing a sensor for detecting movement on the user's body or installing a camera sensor in a space where the omnidirectional treadmills 10 and 10' are installed, the control unit 500 detects or predicts the user's movement direction And in response, it is possible to control the driving of the external rotation support (300, 300').

[0082]

808 Meanwhile, although it is illustrated that the user wears the virtual reality unit 600 in FIG. 12 , the virtual reality unit may be implemented as an image projected on a screen disposed in a space in which the omnidirectional treadmills 10 and 10 ' are installed.

[0083]

815 13 and 14 are views showing the configuration of an omnidirectional belt according to a second example in the omnidirectional treadmill of the present invention.

[0084]

820 Hereinafter, the configuration of the omnidirectional belt 100 according to the second example will be described with reference to the drawings, but differences from the first example will be mainly described, and common contents will be replaced with the above description.

[0085]

827 The second example is different from the first example in that the cell pad 121 is directly coupled to the joint member 125 without a link member.

[0086]

832 Referring to FIG. 13 , the omnidirectional belt 100 includes a cell pad 121 and a joint member 125 .

834 The cell pad 121 may have various shapes, but as in the first example, a case in which the cell pad 121 is 'basically an equilateral triangle' will be mainly described.

836 That is, as shown in FIG. 13 , the shape in which the coupling protrusions 160 are formed at the vertices of the cell pad 121 will also be described as an equilateral triangle.

[0087]

842 In the second example, since there is no link member, a plurality of cell pads 121 are directly coupled to the joint member 125 as shown in FIG. 13 .

844 Specifically, referring to FIG. 13 , the omnidirectional belt 100 may have a second unit structure 120 , and the second unit structure 120 includes six equilateral triangular cell pads 121 and a plurality of joint members. It may be formed by being radially disposed to have the same angle from any one of the joint members 125 of 125 and coupled to the joint member 125 .

849 Here, the coupling method between the cell pad 121 and the joint member 125 is not limited to the illustrated example.

[0088]

854 And, referring to FIG. 14 , a plurality of second unit structures 120 may be coupled to each other to form the omnidirectional belt 100 .

[0089]

859 15 and 16 are views showing the configuration of an omnidirectional belt according to a third example in the omnidirectional treadmill of the present invention.

[0090]

864 Hereinafter, the configuration of the omnidirectional belt 100 will be described in the third example with reference to the drawings, but the differences from the first and second examples will be mainly described, and the common contents will be replaced with the above description .

[0091]

871 The third example is different from the first or second example in that the cell pad 131 is directly connected to the pad direct connection member 133 without a joint member and a link member.

[0092]

877 Referring to FIG. 15 , the omnidirectional belt 100 includes a cell pad 131 and a pad

direct connection member 133 .

879 Although the cell pad 131 may have various shapes, the case where the cell pad 131 is 'basically an equilateral triangle' as in the first and second examples will be mainly described.

882 That is, as shown in FIG. 15 , the shape in which the coupling groove 170 is formed in the edge (side) of the cell pad 121 will also be described as an equilateral triangle.

[0093]

888 In the third example, since there are no joint members and link members, a plurality of cell pads 131 are directly coupled to each other using the pad direct connection member 133 as shown in FIG. 15 .

891 In addition, the plurality of cell pads 131 and the plurality of pad direct connecting members 133 are connected to each other to form the omnidirectional belt 100 .

[0094]

896 Here, referring to FIG. 15 , the omnidirectional belt 100 may have a third unit structure 130 , and the third unit structure 130 has six equilateral triangular cell pads 131 forming a central portion P. They are radially arranged to have the same angle as the reference.

[0095]

903 In addition, the pad direct connecting member 133 may be provided to connect the edge of one of the plurality of cell pads 131 and the edge of the other adjacent cell pad 131 to each other.

[0096]

909 Here, one pad direct connecting member 133 may connect the corners of the cell pad 131 to each other, or two pad direct connecting members 133 may connect the corners of the cell pad 131 to each other as shown in FIG. 15 . Alternatively, a larger number of pad direct connecting members 133 may connect the edges of the cell pad 131 to each other.

914 A method in which the pad direct connecting member 133 is coupled to each cell pad 131 is not limited to the illustrated example.

[0097]

919 And, referring to FIG. 16 , a plurality of third unit structures 130 may be coupled to

each other to form the omnidirectional belt 100 .

[0098]

924 In the above, although the present invention has been described with reference to limited embodiments and drawings, the present invention is not limited thereto and will be described below with the technical idea of the present invention by those of ordinary skill in the art to which the present invention pertains. Of course, various modifications and variations are possible within the scope of equivalents of the claims.

[0099]

933 10, 10'
934 : Omnidirectional treadmill 100 : Omnidirectional belt
935 110 : first unit structure 111 : cell pad
936 113 : link member 115: joint member
937 120 : second unit structure 121 : cell pad
938 125 : joint member 130: third unit structure
939 131 : cell pad 133: pad direct connection member
940 140 : coupling protrusion 150: coupling groove
941 200, 200' : inner core 210, 210' : guide member
942 220 : Inner forward wheel 300, 300': Outer rotation support
943 310 : outer wheel 320 : connecting shaft
944 330 : External wheel drive 400, 400' : Body frame
945 410 : elevating driving unit 420: receiving space
946 500 : control unit 600: virtual reality unit

Notice

CLAIMS KR20210023190A

1.

14 An inner core having a dome shape with a flat upper surface and having a plurality of inner omnidirectional wheels rotatable in all directions on the surface; Enclosing the inner core, a plurality of cell pads are connected to each other to have a network structure, and the inner core An omnidirectional belt rotatable in all directions about the center; A plurality of external rotational support members contacting the outer side of the omnidirectional belt to support the omnidirectional belt and having external wheels rotatable to correspond to the rotation of the omnidirectional belt; and a body frame accommodating the inner core, the omnidirectional belt, and the plurality of external rotation supports so that the upper surface of the omnidirectional belt is exposed to the outside.

2.

27 According to claim 1, The omnidirectional belt, a plurality of link members interconnecting the plurality of cell pads; and a plurality of joint members to which the plurality of link members are coupled, wherein the plurality of cell pads are connected to each other by the plurality of link members and the plurality of joint members to form the omnidirectional belt. omnidirectional treadmill.

3.

35 The method of claim 2, wherein the plurality of link members are provided to be radially coupled to one joint member, respectively, and the link member coupled to any one joint member among the plurality of joint members is also coupled to another

adjacent joint member. An omni - directional treadmill characterized in that it is coupled.

4.

43 The method of claim 3, wherein the plurality of cell pads are formed in an equilateral triangle, and the omnidirectional belt is radially arranged such that six of the link members have the same angle from any one of the plurality of joint members. The cell pad is coupled to the joint member and each of the cell pads is disposed in a space formed by the plurality of link members to have a first unit structure connected to the link member, wherein the plurality of first unit structures are coupled to each other to form the first unit structure in the omnidirectional direction An omnidirectional treadmill characterized in that it forms a belt.

5.

54 The omnidirectional belt according to claim 1, wherein the omnidirectional belt further comprises a plurality of joint members to which the plurality of cell pads are coupled, and the plurality of cell pads are connected to each other by the plurality of joint members to form the omnidirectional belt. Omnidirectional treadmill, characterized in that forming.

6.

62 The method of claim 5, wherein the plurality of cell pads are formed in an equilateral triangle, and the omnidirectional belt is radially arranged such that the six cell pads have the same angle from any one of the plurality of joint members. and a second unit structure coupled to the joint member, wherein a plurality of the second unit structures are coupled to each other to form the omnidirectional belt.

7.

70 According to claim 1, The omni - directional belt, further comprising a plurality of pad direct connecting members interconnecting the plurality of cell pads, The plurality of cell pads are connected to each other by the plurality of pad direct connecting members to the front An omnidirectional treadmill characterized in that it forms a directional belt.

8.

78 The method of claim 7 , wherein the plurality of cell pads are formed in an equilateral triangle, and the omnidirectional belt is radially disposed such that six cell pads have

the same angle with respect to the center, and any one of the plurality of cell pads is provided. and a third unit structure in which an edge of one cell pad and an edge of another adjacent cell pad are connected to each other by the pad direct coupling member, and a plurality of third unit structures are coupled to each other to form the omnidirectional belt. Omnidirectional treadmill, characterized in that.

9.

88 According to claim 1, The inner core, the omnidirectional treadmill, characterized in that a portion of the lower surface including the central portion of the lower surface is opened.

10.

94 The omnidirectional treadmill according to claim 1, further comprising a control unit configured to drive the outer wheel in response to the user's movement.

11.

99 The omni - directional belt according to claim 1, wherein each of the plurality of external rotation supports has a plurality of the external wheels connected by a connecting shaft, and grips an outer side surface of the omnidirectional belt by the plurality of external wheels. An omnidirectional treadmill, characterized in that it supports.

12.

107 The omnidirectional treadmill according to claim 11, wherein the plurality of external rotational supports are configured to be lifted individually or simultaneously.

13.

112 The omnidirectional treadmill according to claim 1, further comprising: a plurality of lifting driving units respectively disposed at a plurality of locations under the main body frame to lift and lower the main body frame.

14.

118 The omnidirectional treadmill according to claim 1, wherein an upper surface of the omnidirectional belt is flat, and a lower portion of the omnidirectional belt surrounds the inner core in a convex shape.

15.

124 The omni-directional treadmill according to claim 1, further comprising a virtual reality unit implementing virtual reality.