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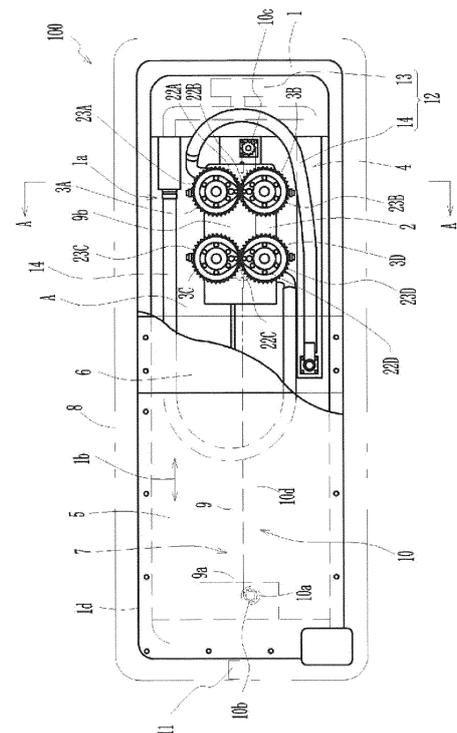
(54) **HYDRAULIC MASSAGE APPARATUS**

(57) [Problem]

To provide a hydraulic massage apparatus advantageous in that excessive sagging of a flexible sheet is prevented without compromising a desired massage effect.

[Solution]

In a fluid tank (1) is installed a movable carriage (2) that is movable in a direction (1b) along one side of the fluid tank direction (1b). On the movable carriage (2) is mounted a jet fluid ejector that ejects a jet fluid (B) toward an opening (1a) of the fluid tank (1). A flexible sheet (5) is attached to the fluid tank (1) so as to cover at least a part of the opening (1a). A flexibility reinforcing strip (6) is disposed above the flexible sheet (5) in a manner that bridges both ends of the opening of the fluid tank (1) in a direction intersecting the one-side direction (1b). The flexibility reinforcing strip (6) is disposed in a portion of the flexible sheet (5) in contact with buttocks of a massage recipient when he/she is seated on and dismantled from the flexible sheet (5).



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Description

TECHNICAL FIELD

5 **[0001]** The invention relates to a hydraulic massage apparatus configured to apply the hydraulic pressure of a jet fluid to the cervix, soma, and upper and lower extremities of a massage recipient in a seated or reclined posture to massage such body regions.

BACKGROUND ART

10 **[0002]** In some conventional hydraulic massage apparatuses, a movable carriage is installed in a fluid-containing fluid tank movably along one side direction thereof. A jet fluid is ejected toward an opening of the fluid tank from a jet fluid ejector mounted on the movable carriage. The opening of the fluid tank is covered by a flexible sheet. Thereby the treatment region of a massage recipient getting on the flexible sheet in seating or lying posture, is massaged (for example, Patent Document 1).

PRIOR ART DOCUMENT

PATENT REFERENCE

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[0003]

Patent Document 1: Unexamined Japanese Patent Application Laid-Open No. 2003-052782

Patent Document 2: Unexamined Japanese Patent Application Laid-Open No. 2005-261824

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SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

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[0004] At the time of performing massage by the hydraulic massage apparatus, the massage recipient about to be seated on or dismounted from the sheet may lift his/her lower extremity from the sheet or floor surface to change the direction of his/her body. In doing so, only a part of the flexible sheet often bears the massage recipient's whole body weight solely applied by his/her buttocks. This may cause the sheet to excessively sag downward, possibly inviting the massage recipient seated on it to lose the balance of his/her body and fall over. Such an excessive sagging of the flexible sheet could be avoided by lessening its flexibility or increasing its stiffness to a certain extent. Neither of these changes is, however, advisable because they may undermine the shape adaptability of the flexible sheet, weakening a desired massage effect to be attained by the jet fluid.

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[0005] The Patent Document 2 describes a hydraulic massage apparatus including a fluid tank, a water-proof flexible sheet covering an opening of the fluid tank, and an auxiliary support net or sheet disposed below the flexible water-proof sheet, wherein the auxiliary support net or sheet is fixedly disposed on the fluid tank across its width at an intermediate position in a direction along longer sides of the fluid tank. In this apparatus, even if a thin flexible sheet is used to cover the opening of the fluid tank, the massage recipient can be safely seated on and dismounted from the flexible sheet.

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[0006] The flexible sheet of the hydraulic massage apparatus may be a commercially available flexible sheet formed of a natural rubber. Such a flexible sheet may include a natural rubber layer and a special rubber layer formed on one surface of the natural rubber layer (surface which the massage recipient is seated on and dismounted from). In this apparatus, the auxiliary support net is disposed on the fluid tank across its width below the flexible sheet. This structural feature may cause the natural rubber layer and the auxiliary support net to rub against each other every time when the massage recipient is seated on and off the apparatus, which may follow that the natural rubber layer wears away over time.

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[0007] The invention was accomplished to solve such problems of the conventional massage apparatuses. The invention has a main object to provide a hydraulic massage apparatus that succeeds in preventing excessive sagging of a flexible sheet and wear of the flexible sheet without compromising a desired massage effect.

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SOLUTION TO THE PROBLEMS

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[0008] The invention provides a hydraulic massage apparatus, including a fluid tank having an opening on an upper side thereof and containing therein a fluid, a movable carriage installed in the fluid tank movably in a direction along one side of the fluid tank, a jet fluid ejector mounted on the movable carriage to eject a jet fluid toward the opening, a jet fluid

feeder for feeding the jet fluid to the jet fluid ejector, a flexible sheet on which a massage recipient can be seated or reclined with a region of his/her body to be massaged in contact with an upper surface thereof, the flexible sheet being attached to the fluid tank so as to cover the opening, and a flexibility reinforcing strip disposed above the flexible sheet, wherein the flexibility reinforcing strip is disposed in a manner that bridges both ends of the opening of the fluid tank in a direction intersecting the direction along one side of the fluid tank.

5 [0009] A massage recipient about to be seated on or dismounted from the sheet may lift his/her lower extremity from the sheet or floor surface to change the direction of his/her body. In doing so, only a part of the flexible sheet often bears the massage recipient's whole body weight solely applied by his/her buttocks. This may cause the sheet to excessively sag downward, possibly inviting the massage recipient seated on it to lose the balance of his/her body and fall over. 10 According to the invention providing the described technical features, the flexibility reinforcing strip reinforces the flexible sheet, thereby preventing excessive sagging of the flexible sheet. This avoids such a mishap that the excessively sagging flexible sheet invites the massage recipient to lose the balance of his/her body and fall over. Further, the flexibility reinforcing strip is used to prevent the flexible sheet from being unduly weighed down, which makes an additional process unnecessary, for example, making changes to the flexibility or stiffness of the flexible sheet. Therefore, a desired massage effect remains substantially unaffected. 15

[0010] According to an aspect of the invention, the flexibility reinforcing strip is disposed at a position in contact with the massage recipient's buttocks when the massage recipient is seated on and dismounted from the flexible sheet. The massage recipient is most likely to fall over with his/her buttocks alone being rested on the flexible sheet when seated on or dismounted therefrom. To overcome this disadvantage, the flexibility reinforcing strip is disposed at a position in 20 contact with the massage recipient's buttocks when the massage recipient is seated on and dismounted from the flexible sheet. This certainly avoids such a mishap that the flexible sheet sinks very far down under the weight of the recipient's buttocks, inviting the massage recipient to accidentally fall over. The massage recipient can accordingly be easily and safely seated on and dismounted from the massage apparatus.

[0011] According to another aspect of the invention, the flexibility reinforcing strip is set to a minimum dimension in the direction along one side of the fluid tank in such a degree that the massage recipient's buttocks are not protruded therefrom. According to this aspect, when the massage recipient is reclined on the flexible sheet, end parts of the flexibility reinforcing strip are unlikely to contact his/her back. This effectively avoids discomfort possibly felt by the massage recipient if the end parts of the flexibility reinforcing strip contact his/her back. As a result, the massage recipient can comfortably enjoy the massage. 25

[0012] According to yet another aspect of the invention, an end part of the flexibility reinforcing strip has a rectangular-shaped portion rectangular in cross section, and the flexibility reinforcing strip is fixedly coupled to an upper edge of the fluid tank by means of a pressing fixture inserted through the rectangular-shaped portion. According to this aspect of the invention, the end parts of the flexibility reinforcing strip can be more easily fixedly coupled to the upper edge of the fluid tank than direct coupling to the upper edge without such fixtures, leading to a better working efficiency. The flexibility reinforcing strip is disposed at a position which the massage recipient is seated on and off the apparatus, which is a 30 portion where displacement of the flexibility reinforcing strip is most likely to occur. The invention providing the fixture-mediated coupling, however, can firmly fix the flexibility reinforcing strip to the upper edge, reducing the possibility of displacement of the flexibility reinforcing strip every time when the massage recipient is seated on and off the apparatus.

[0013] According to yet another aspect of the invention, the flexibility reinforcing strip has a double-sided fastener with a female member and a male member, and a sheet member overlaying the flexible sheet has a male member and a female member to be respectively engaged with the female and male members of the flexibility reinforcing strip. According to this aspect of the invention, when the sheet member is laid out on the flexible sheet from above the flexibility reinforcing strip, the female and male members of the sheet member are respectively engaged with the male and female members of the flexibility reinforcing strip, so that the sheet member can be partly secured to the flexibility reinforcing strip. 35

[0014] According to yet another aspect of the invention, the flexibility reinforcing is formed of a high efficiency / high performance fiber. According to this aspect of the invention, the high efficiency / high performance fiber, such as a para-aramid fiber, has a high coefficient of elasticity and a remarkable strength. By virtue of these advantages of the fiber, a desired massage effect is not adversely affected, and a large and heavy massage recipient can be well-supported. The high efficiency / high performance fiber, which is further advantageously shock-proof and wear-proof, is less likely to become slack due to wear or damage over time, and more durable over long-term use than the other fibers. The flexibility reinforcing strip formed of such a fiber needs not be replaced as often as the other fibers, which economically reduces running costs. 40 45 50

EFFECT OF THE INVENTION

55 [0015] According to the invention, excessive sagging of the flexible sheet can be prevented without compromising a desired massage effect. The flexible sheet of the hydraulic massage apparatus may be a commercially available flexible sheet formed of a natural rubber. Such a flexible sheet may include a natural rubber layer and a special rubber layer

formed on one surface of the natural rubber layer (surface which the massage recipient is seated on and dismantled from). In that case, the invention, wherein the flexibility reinforcing strip is disposed above the flexible sheet across its width, eliminates the risk that frictional contact between the natural rubber layer and the auxiliary supporting net wears the natural rubber layer away over time every time when the massage recipient is seated on and off the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is a partially broken plan view illustrating the structure of a hydraulic massage apparatus according to an embodiment of the invention.

Fig. 2 is a sectional view cut along A-A of Fig. 1, illustrating principal elements of the hydraulic massage apparatus.

Fig. 3 is a sectional view of a central portion in the lateral direction of the hydraulic massage apparatus from which the illustration of its inner structure is omitted, representing a first feature of a casing of the apparatus.

Fig. 4 is a sectional view of a central portion in the lateral direction of the hydraulic massage apparatus from which the illustration of its inner structure is omitted, representing a second feature of a casing of the apparatus.

Fig. 5 is a sectional view illustrating a flexible sheet and a flexibility reinforcing strip fixing structure.

Fig. 6 is a plan view illustrating the hydraulic massage apparatus on which a massage recipient is reclined.

Fig. 7 is a schematic sectional view illustrating the sagging state of a flexible sheet in the hydraulic massage apparatus.

EMBODIMENT OF THE INVENTION

[0017] Hereinafter, structural features of a hydraulic massage apparatus 100 according to an embodiment of the invention are described in detail referring to Figs. 1 to 7. The hydraulic massage apparatus 100 has a fluid tank 1, a movable carriage 2, first through fourth jet fluid ejectors 3A to 3D, a jet fluid feeder 4, a flexible sheet 5, a flexibility reinforcing strip 6, a carriage moving mechanism 7, and a casing 8.

[0018] The fluid tank 1 has a cuboidal internal volume (including an elliptical shape in planar view) having an opening 1A on an upper side thereof. The fluid tank 1 contains therein a fluid A, such as water. The casing 8 covers side surfaces of the fluid tank 1 in its entire circumference. As illustrated in Fig. 2, the movable carriage 2 has rollable wheels 2a. By rolling the wheels 2a at the bottom section of the fluid tank 1, the movable carriage 2 is allowed to horizontally move along one side direction 1b of the fluid tank 1. According to this embodiment, one opposing sides of the fluid tank 1 in a direction are longer than the other opposing sides. The one-side direction 1b is a direction along the longer one sides.

[0019] The first through fourth jet fluid ejectors 3A to 3D eject the jet fluid B from the bottom side of the fluid tank toward the opening 1a. The first jet fluid feeder 4 feeds a jet fluid B to the first through fourth jet fluid ejectors 3A to 3D.

[0020] The flexible sheet 5 is made of a rubber sheet member and is attached to the fluid tank 1 on all over the opening 1a. A massage recipient C can be seated or reclined on the flexible sheet 5 with a region of his/her body to be massaged in contact with an upper surface of the sheet. As illustrated in Fig. 5, the flexible sheet 5 is fixed with bolts to an upper edge 1c of the fluid tank 1 in its whole circumference. According to this embodiment, the flexible sheet 5 overlays the whole opening 1a.

[0021] The flexibility reinforcing strip 6 includes a sheet member or a net-like member formed of a high efficiency / high performance fiber having a high coefficient of elasticity and a remarkable strength. Examples of the high efficiency / high performance fiber are para-aramid fibers, ultrahigh molecular weight polyethylene fibers, polyarylate fibers, PBO fibers, and carbon fibers. The flexibility reinforcing strip 6 is disposed on the opening 1a across its width above the flexible sheet 5 in a direction intersecting the one-side direction 1b of the fluid tank 1. The flexibility reinforcing strip 6 is disposed at a position in contact with the buttocks of the massage recipient C when he/she is seated on and dismantled from the flexible sheet 5. The portion that makes contact with the buttocks of the massage recipient C, which is a portion provided with the flexibility reinforcing strip 6, refers to an area of the flexible sheet 5 in contact with body regions, lower back to buttocks and vicinity, of the massage recipient C reclined on the flexible sheet 5 in the one-side direction 1b. The flexibility reinforcing strip 6 is set to a minimum dimension in the direction along one side of the fluid tank 1 in such a degree that the massage recipient's buttocks is not protruded therefrom (400 mm to 500 mm).

[0022] The flexibility reinforcing strip 6 is disposed on the opening 1a across its width with its both-side strip ends 6a being secured with bolts to the upper edge 1c of the fluid tank 1. Specifically, as illustrated in Fig. 5, there is the flexible sheet 5 on the upper edge 1c of the fluid tank 1, and a belt 30 on the flexible sheet 5. This sheet 5 and belt 30 are both laid out in the whole circumference of the upper edge 1c. Then, a support fixture 31 is disposed on the belt 30 at the upper edge 1c and secured with a bolt 33. A rectangular-shaped portion 6b rectangular in cross section is formed at the strip ends 6a of the flexibility reinforcing strip 6. The rectangular-shaped portion 6b with a pressing fixture 32 inserted therethrough is disposed on the support fixture 31. Then, the pressing fixture 32 extending from the rectangular-shaped portion 6b is coupled to the upper edge 1c with a bolt 33. Then, the bolt 33 is inserted through an upper surface of the

rectangular-shaped portion 6b to couple the flexibility reinforcing strip 6 to the upper edge 1c. This embodiment increases a coupling strength by forming the strip ends 6a of the flexibility reinforcing strip 6 in a rectangular shape in cross section, and coupling the pressing fixture 32 inserted through the rectangular-shaped portion 6b to the upper edge 1c by means of the bolt 33.

5 **[0023]** Fig. 6 illustrates the strip ends 6a of the flexibility reinforcing strip 6 respectively provided with double-sides fasters 40. The double-sided faster 40 includes female and male members. One of the female and male members is formed in the flexibility reinforcing strip 6, while the other one is formed in a sheet member not illustrated in the drawing. In the case where the sheet member (not illustrated in the drawing) is laid out on the surface of the flexible sheet 5 from above the flexibility reinforcing strip 6, and the female and male members of the sheet member are respectively engaged with the male and female members of the flexibility reinforcing strip. In any other portions of the sheet member, female and male members formed in these portions can be engaged with male and female members correspondingly formed fixedly on the flexible sheet 5 (not illustrated in the drawing).

10 **[0024]** The jet fluid feeder 4 has a jet fluid generator 12 and an intra-carriage flow path 26. The jet fluid generator 12 has a suction pump 13 and a winding pipe 14. The suction pump 13 suctions and pressure- feeds the fluid A from the fluid tank 1. The winding pipe 14 pressure-feeds the fluid A suctioned by the suction pump 13 to the movable carriage 2. As illustrated in Fig. 2, the intra-carriage flow path 26 is formed in a bottom section 2b of the movable carriage 2. The intra-carriage flow path 26 is formed by water-tightly sealing the bottom section 2b of the movable carriage 2. Though not illustrated in the drawing, the intra-carriage flow path 26 is connected to and communicating with the winding pipe 14. The intra-carriage flow path 26 may be formed at a position in any available inner space of the movable carriage 20. This embodiment provides the intra-carriage flow path 26 in the bottom section 2b of the movable carriage 2, which is a non-limiting example.

15 **[0025]** As illustrated in Figs. 1 and 2, the first through fourth jet fluid ejectors 3A to 3D are mounted on the movable carriage 2. The first jet fluid ejector 3A and the second jet fluid ejector 3B constitute a pair that moves in an interlocking manner. The third jet fluid ejector 3C and the fourth jet fluid ejector 3D constitute a pair that moves in an interlocking manner.

20 **[0026]** The first jet fluid ejector 3A has a first ejector shaft unit 20A, a first ejector body 21A, and a first jet nozzle 22A. Similarly, the second through fourth jet fluid ejectors 3B to 3D respectively have second through fourth ejector shaft units 20B to 20D, second through fourth ejector bodies 21B to 21D, and second through fourth jet nozzles 22B to 22D.

25 **[0027]** The first through fourth ejector shaft units 20A to 20D are installed on the movable carriage 2 with their shaft centers perpendicularly extending. Specifically, the first through fourth ejector shaft units 20A to 20D are disposed in a standing manner on a ceiling surface 26a of the intra-carriage flow path 26. The first and second ejector shaft units 20A and 20B are disposed so that their opposing direction α is orthogonal to the one-side direction 1b of the fluid tank 1. Likewise, the third and fourth ejector shaft units 20C and 20D are disposed so that their opposing direction α is orthogonal to the one-side direction 1b of the fluid tank 1.

30 **[0028]** A first rotary cylinder 18A is externally fitted on the outer peripheral side of the first ejector shaft unit 20A coaxially with the first ejector shaft unit 20A. Specifically, the first rotary cylinder 18A is fitted by means of bearings 19 at both ends thereof to be coaxial with and rotatable relative to the first ejector shaft unit 20A. Likewise, second through fourth rotary cylinders 18B to 18D are respectively externally fitted on the outer peripheral sides of the second through fourth ejector shaft units 20B to 20D coaxially with the second through fourth ejector shaft units 20B to 20D. Specifically, the second through fourth rotary cylinders 18B to 18D are fitted by means of bearings 19 to be coaxial with and rotatable relative to the second through fourth ejector shaft units 20B to 20D.

35 **[0029]** A first coupling gear 23A is fitted to an upper end of the first rotary cylinder 18A to be coaxial with and rotatable integrally with the first rotary cylinder 18A. Likewise, second through fourth coupling gears 23B to 23D are respectively fitted to upper ends of the second through fourth rotary cylinders 18B to 18D to be coaxial with and rotatable integrally with the second through fourth rotary cylinders 18B to 18D. The first coupling gear 23A and the second coupling gear 23B are meshed with each other in an interlocking manner. Likewise, the third coupling gear 23C and the fourth coupling gear 23D are meshed with each other in an interlocking manner.

40 **[0030]** The first ejector body 21A has an oval shape in planar view and is fitted to an upper surface of the first coupling gear 23A. Specifically, the first ejector body 21A is fitted to the first coupling gear 23A in a manner that its main shaft is coaxial with and its rotation is integral with the first coupling gear 23A. Similarly, the second through fourth ejector bodies 21B to 21D have an oval shape in planar view and are respectively fitted to upper surfaces of the second through fourth coupling gears 23B to 23D. Specifically, the second through fourth ejector bodies 21B to 21D are respectively fitted to the second through fourth coupling gears 23B to 23D so that their main shafts are respectively coaxial with and their rotations are integral with the second through fourth coupling gears 23B to 23D.

45 **[0031]** The first through fourth jet nozzles 22A to 22D are attached to upper surfaces of the first through fourth ejector bodies 21A to 21D. The first through fourth jet nozzles 22A to 22D are configured to receive the jet fluid B from the jet fluid feeder and eject the jet fluid B toward the opening 1a from the bottom side of the fluid tank 1.

50 **[0032]** In the interior of the first ejector shaft unit 20A is formed an intra-shaft flow path 20Aa extending from its axial

one end to the other end. An intra-ejector flow path 21Aa is formed in the interiors of the first coupling gear 23A and the first ejector body 21A. As to the intra-shaft flow path 20Aa, its lower end is connected to and communicating with the intra-carriage flow path 26, while its upper end is connected to and communicating with the intra-ejector flow path 21Aa. The intra-ejector flow path 21Aa is connected to and communicating with the first jet nozzle 22A. The first jet nozzle 22A is accordingly in fluid communication with the intra-carriage flow path 26 through the intra-ejector flow path 21Aa and the intra-shaft flow path 20Aa.

[0033] Similarly, in the interiors of the second through fourth ejector shaft units 20B to 20D are respectively formed intra-shaft flow paths 20Ba to 20Da extending from their axial one ends to the other ends, and intra-ejector flow paths 21Ba to 21Da are formed in the interiors of the second through fourth coupling gears 23B to 23D and the second through fourth ejector bodies 21B to 21D. As to the intra-shaft flow paths 20Ba to 20Da, their lower ends are connected to and communicating with the intra-carriage flow path 26, while their upper ends are respectively connected to and communicating with the intra-ejector flow paths 21Ba to 21Da. The intra-ejector flow paths 21Ba to 21Da are respectively connected to and communicating with the second through fourth jet nozzles 22B to 22D. The second through fourth jet nozzles 22B to 22D are accordingly in fluid-communication with the intra-carriage flow path 26 through the intra-ejector flow paths 21Ba to 21Da and the intra-shaft flow paths 20Ba to 20Da, respectively.

[0034] A first passive gear 24A including a screw gear is formed on a peripheral surface of the first rotary cylinder 18A. A first screw gear 25A is meshed with the first passive gear 24A in an interlocking manner. The shaft center of the first screw gear 25A is horizontally situated. Similarly, a second passive gear 24B including a screw gear is formed on a peripheral surface of the third rotary cylinder 18C. A second screw gear 25B is meshed with the second passive gear 24B in an interlocking manner. The shaft center of the second screw gear 25B is horizontally situated.

[0035] As illustrated in Fig. 1, the carriage moving mechanism 7 includes a shaft 9, a chain drive unit 10, and a rotation drive unit 11. The shaft 9 is rectangular in cross section and horizontally situated along the one-side direction 1b at the bottom section of the fluid tank 1. The rotation drive unit 11 is attached to one end side of the shaft 9 on the outside of the fluid tank 1. The shaft 9 has an end 9a coupled by means of bearings to the rotation drive unit 11 in an interlocking manner. The shaft 9 is extending along the one-side direction 1b at the bottom section of the fluid tank 1 and driven to rotate by the rotation drive unit 11.

[0036] The shaft 9 guides the movable carriage 2 to allow for repetitive linear motion of the movable carriage 2 along the one-side direction 1b as described below. As described earlier referring to Fig. 2, there are the first and second passive gears 24A and 24B and the first and second screw gears 25A and 25B in an upper part of the movable carriage 2a. The first and third rotary cylinders 18A and 18C having the first and second passive gears 24A and 24B are relatively rotatable to the movable carriage 2. The first and second screw gears 25A and 25B are meshed with the first and second passive gears 24A and 24B in a manner that shaft centers of the gears 24A and 24B are horizontally situated and coincident with the shaft center of the shaft 9.

[0037] The shaft center of the first screw gear 25A has a coupling bore 25Aa formed in an equal shape to the transverse sectional shape of the shaft 9. Similarly, the shaft center of the second screw gear 25B has a coupling bore 25Ba formed in an equal shape to the transverse sectional shape of the shaft 9. The shaft 9 has the other end 9b on the other side penetrating through the coupling bores 25Aa and 25Ba of the first and second screw gears 25A and 25B. The first and second screw gears 25A and 25B are accordingly coupled to the other end 9b of the shaft 9 in an interlocking manner. This allows for repetitive linear motions of the first and second screw gears 25A and 25B relative to the shaft 9 along its axial direction and rotations of these screw gears integral with the shaft 9. Further, the other end 9b of the shaft 9 is mechanically supported by the first and second screw gears 25A and 25B.

[0038] As illustrated in Fig. 1, the chain drive unit 10 includes a drive motor 10a, a driving gear 10b, a driven gear 10c, and a chain 10d. The driving gear 10b and the driven gear 10c are disposed in a direction parallel to the shaft 9. The driving gear 10b is driven to rotate by the drive motor 10a. The chain 10d is engaged on the driving gear 10b and the driven gear 10c and extending across an interval therebetween. The both ends of the chain 10d are coupled to the movable carriage 2. When the driving gear 10b is rotated by the drive motor 10a, the chain 10d bridging the driving gear 10b and the driven gear 10c linearly moves in parallel with the axial direction of the shaft 9. Since the movable carriage 2 is coupled to the both ends of the chain 10d, the linear motion of the chain 10d urges repetitive linear motion of the movable carriage 2, being guided by the shaft 9, along the one-side direction 1b.

[0039] At the bottom section of the casing 8, there are recessed portions 8a as illustrated in Figs. 3 and 4. The recessed portions 8a are formed on side surfaces of the fluid tank 1 along the one-side direction 1b at the bottom section of the casing 8. The bottom section refers to a region from an intermediate part to the very bottom of the casing 8 in the direction of its height. The recessed portions 8a are large enough to accept a heel Ca and/or a tiptoe of the massage recipient C seated on and off the flexible sheet 5 or a tiptoe Da of a helper D who assists the massage treatment. The recessed portion 8a has any shape where the heel Ca and/or the tiptoe Da can be located. Figs. 3 and 4, for example, illustrate a shape linearly inclined inward of the casing 8 from an upper end of the recessed portion 8a to a lower end of the casing 8. Other examples of the shape are; a curved shape inclined inward of the casing 8 from an upper end of the recessed portion 8a to a lower end of the casing 8, a shape formed with straight and curved lines, and a rectangular shape cutout

from an upper end of the recessed portion 8a to a lower end of the casing 8.

[0040] The recessed portion 8a having any of these shapes may be formed in all of portions of the casing 8 on side surfaces of the fluid tank 1 along the one-side direction 1b. This embodiment defines the following requirement. The recessed portion 8a at a position and its vicinity where the heel Ca and/or tiptoe of the massage recipient C is located when the massage recipient C standing on a fluid tank installation surface E near the side surface of the fluid tank along the one-side direction 1b is about to be seated on or the seated massage recipient C is dismounted from the flexibility reinforcing strip 6 (see Fig. 3) is recessed by a larger degree than the recessed portions 8a at any other positions (see Fig. 4). The degree of recess referred to in this paragraph may be represented by a cross-sectional area of the recessed portion 8a in a direction orthogonal to the one-side direction 1b, or a clearance between a recessed surface portion and a non-recessed surface portion of the casing in a direction orthogonal to the one-side direction 1 at the very bottom where the recessed portions are formed.

[0041] The operation of the hydraulic massage apparatus 100 thus structurally and technically characterized is hereinafter described. As illustrated in Fig. 6, the massage recipient C is seated or reclined (for example, lying down on his/her back) on the flexible sheet 5 of the hydraulic massage apparatus 100 with his/her body regions to be massaged in contact with the upper surface of the flexible sheet 5. Then, the massage recipient C or the helper D who assists the massage treatment turns on the apparatus 100 via a switch. When the apparatus 100 is turned on, the suction pump 13 is driven to suction the fluid A from the fluid tank 1 and pressurizes the suctioned fluid A to form the jet fluid B, and pressure-feeds the jet fluid B through the winding pipe 14 into the intra-carriage flow path 26 of the movable carriage 2. The jet fluid B that arrived at the intra-carriage flow path 26 passes through the intra-shaft flow paths 20Aa to 20Da and the intra-ejector flow paths 21Aa to 21Da, and then further flows under pressure into the first through fourth jet nozzles 22A to 22D of the first through fourth jet fluid ejectors 3A to 3D. The jet nozzles 22A to 22D eject the jet fluid B toward the opening 1A and into the fluid A in the fluid tank 1. The ejected jet fluid B runs against the back surface of the flexible sheet 5 and diffuses in the fluid A in the fluid tank 1. At the time, the flexible sheet 5 is partly bent and deformed upward by the ejected jet fluid B and thus the body surface of the massage recipient C located at the upwardly deformed part of the sheet is massaged.

[0042] While the jet fluid B is thus being ejected, the drive motor 10a of the chain drive unit 10 is optionally rotated forward and backward to allow for repetitive linear motion of the movable carriage 2 along the one-side direction 1b. At the time, the shaft 9 rectangular in cross section is inserted through the coupling bores 25Aa and 25Ba of the first and second screw gears 25A and 25B to guide the repetitive linear motion. This urges repetitive linear motions of the first through fourth jet nozzles 22A to 22D of the first through fourth ejector bodies 21A to 21D mounted on the movable carriage 2.

[0043] At the same time, the rotation drive unit 11 drives the shaft 9 to rotate forward and backward, and the rotating shaft 9, in turn, rotates the first and second screw gears 25A and 25B forward and backward. The rotations of these screw gears urge rotations of the first and second passive gears 24A and 24B coupled to and interlocked with the first and second screw gears 25A and 25B, further rotating the first and third rotary cylinders 18A and 18C, first and third coupling gears 23A and 23C, and first and third ejector bodies 21A and 21C. Further, the second and fourth coupling gears 23B and 23D meshed with the first and third coupling gears 23A and 23C are also rotated, and the second and fourth ejector bodies 21B and 21D are accordingly rotated. Of these rotations, the first and third ejector bodies 21A and 21C and the second and fourth ejector bodies 21B and 21D rotate in reverse directions. As a result, the first through fourth jet nozzles 22A to 22D attached to the first through fourth ejector bodies 21A to 21D are rotated on the shaft centers of the first through fourth ejector shaft units 20A to 20D.

[0044] In response to the repetitive linear motions and repetitive rotational motions, the first through fourth jet nozzles 22A to 22D, while drawing complex trajectories along the one-side direction 1b, move around inside the fluid tank 1. Then, the massage recipient C is thoroughly and comfortably massaged by the jet fluid B ejected through the first through fourth jet nozzles 22A to 22D moving on the complex trajectories.

[0045] The hydraulic massage apparatus 100 is provided with the flexibility reinforcing strip 6 to serve the purpose of reinforcing the flexible sheet 5. This structural feature, as illustrated in Fig. 7, prevents excessive sagging of the flexible sheet 5, thereby avoiding such an event that the massage recipient C loses the balance of his/her body on the flexible sheet 5 excessively sagging and fall over. The shape of the flexible sheet 5 illustrated with a solid line in Fig. 7 indicates the sagging state of the flexible sheet 5 supported by the flexibility reinforcing strip 6 in the hydraulic massage apparatus 100 according to this embodiment. The shape of the flexible sheet 5 illustrated with a virtual line in Fig. 7 indicates the sagging state of a conventional flexible sheet 5 in the absence of the flexibility reinforcing strip 6.

[0046] The massage recipient C is most likely to fall over with his/her buttocks alone being rested on the flexible sheet C when seated on and off the apparatus. In the hydraulic massage apparatus 100, the flexibility reinforcing strip 6 is disposed at a position in contact with the buttocks of the massage recipient C when he/she is seated on and dismounted from the flexible sheet 5. This certainly prevents such an event that the flexible sheet 5 excessively sinks downward under the weight of the recipient's buttocks, inviting the massage recipient to accidentally fall over. The flexibility of the flexible sheet 5 is dealt with by simply adding the flexibility reinforcing strip 6 without any changes in the flexibility or

stiffness of the flexible sheet 5. Thus, excessive sagging of the flexible sheet 5 is successfully prevented without any adverse impact on a desired massage effect.

[0047] The hydraulic massage apparatus 100 has the recessed portions 8a formed at the bottom section of the casing 8, providing the following technical advantages. When the massage recipient C standing on the floor surface (apparatus installation surface) E near the side surface 1d of the fluid tank along the one-side direction 1b is sitting down on the flexible sheet 5 or the massage recipient C seated on the flexible sheet 5 is standing up, the massage recipient's posture is better stabilized to allow his/her body to move with ease by locating his/her heel Ca and/or tiptoe as close to the bottom section of the casing 8 near the side surface 1d of the fluid tank as possible. The hydraulic massage apparatus 100 has the recessed portions 8a formed at the bottom section of the casing 8 on the side surfaces 1d of the fluid tank in a dimension large enough to accept the heel Ca and/or tiptoe of the massage recipient C or the tiptoe Da of the helper D. This allows the massage recipient C to more easily locate his/her heel Ca and/or tiptoe near the casing 8, helping the massage recipient C to stabilize his/her posture and to get on and off the apparatus.

[0048] The helper D may approach the hydraulic massage apparatus 100 currently operating to assist the massage recipient C or assist the operation of the hydraulic massage apparatus 100. In such an event, the helper D, by locating his/her tiptoe Da in the recessed portion 8a, can more easily approach the hydraulic massage apparatus 100, facilitating his/her work in assisting the massage recipient C or assisting the operation of the hydraulic massage apparatus 100. In the presence of the recessed portions 8a, the heel Ca and/or tiptoe of the massage recipient C or the tiptoe Da of the helper D are unlikely to contact the casing 8. This avoids unfavorable events, for example, wounding the heel Ca and/or tiptoe Da by beating them against the casing 8, and soiling the casing 8 through contacts with the heel Ca and/or tiptoe Da.

[0049] According to the hydraulic massage apparatus 100, the recessed portion 8a at a position of and vicinity of the heel Ca and/or tiptoe of the massage recipient C who locates his/her feet on the fluid tank installation surface E near side surface of the fluid tank along the one-side direction 1b when seated on or dismounted from the flexibility reinforcing strip 6 is recessed by a larger degree than the recessed portions 8a at any other positions. This allows the heel Ca and/or tiptoe of the massage recipient C to be located even closer to the casing 8.

[0050] Fig. 3 illustrates shapes of the recessed portions 8a at positions where the flexibility reinforcing strip 6 is provided. Fig. 4 illustrates shapes of the recessed portions 8a at positions where the flexibility reinforcing strip 6 is not provided.

[0051] Thus far was described a non-limiting embodiment of this invention. The technical scope of this invention includes any suitable modifications unless such modifications depart from the purport of this invention. For example, the both ends 6a of the flexibility reinforcing strip 6 are not necessarily fixedly coupled to the upper edge 1c of the fluid tank 1 in the described manner. For example, the flexibility reinforcing strip 6 may be a member attached and detached by means of slide fasteners provided at the both ends 6a of the flexibility reinforcing strip 6. This allows the flexibility reinforcing strip 6 to be more readily attached and detached, facilitating maintenance of the flexibility reinforcing strip 6 and cleaning of the flexible sheet 5 after the flexibility reinforcing strip 6 is removed.

DESCRIPTION OF REFERENCE SYMBOLS

[0052]

- 1 fluid tank
- 1a opening
- 5 flexible sheet
- 6 flexibility reinforcing strip
- 6b rectangular-shaped portion
- 8 casing
- 40 double-sided fastener
- 100 hydraulic massage apparatus
- A fluid
- B jet fluid
- C massage recipient
- D helper who assists massage treatment

Claims

1. A hydraulic massage apparatus, comprising:

a fluid tank having an opening on an upper side thereof and containing therein a fluid;

a movable carriage installed in the fluid tank movably in a direction along one side of the fluid tank;
a jet fluid ejector mounted on the movable carriage to eject a jet fluid toward the opening;
a jet fluid feeder for feeding the jet fluid to the jet fluid ejector;
5 a flexible sheet on which a massage recipient can be seated or reclined with a region of his/her body to be
massaged in contact with an upper surface thereof, the flexible sheet being attached to the fluid tank so as to
cover the opening; and
a flexibility reinforcing strip disposed above the flexible sheet, wherein
10 the flexibility reinforcing strip is disposed in a manner that bridges both ends of the opening of the fluid tank in
a direction intersecting the direction along one side of the fluid tank.

2. The hydraulic massage apparatus as claimed in claim 1, wherein
the flexibility reinforcing strip is disposed at a position in contact with the massage recipient's buttocks when the
massage recipient is seated on and dismounted from the flexible sheet.

3. The hydraulic massage apparatus as claimed in claim 1 or 2, wherein
15 the flexibility reinforcing strip is set to a minimum dimension in the direction along one side of the fluid tank in such
a degree that the massage recipient's buttocks are not protruded therefrom.

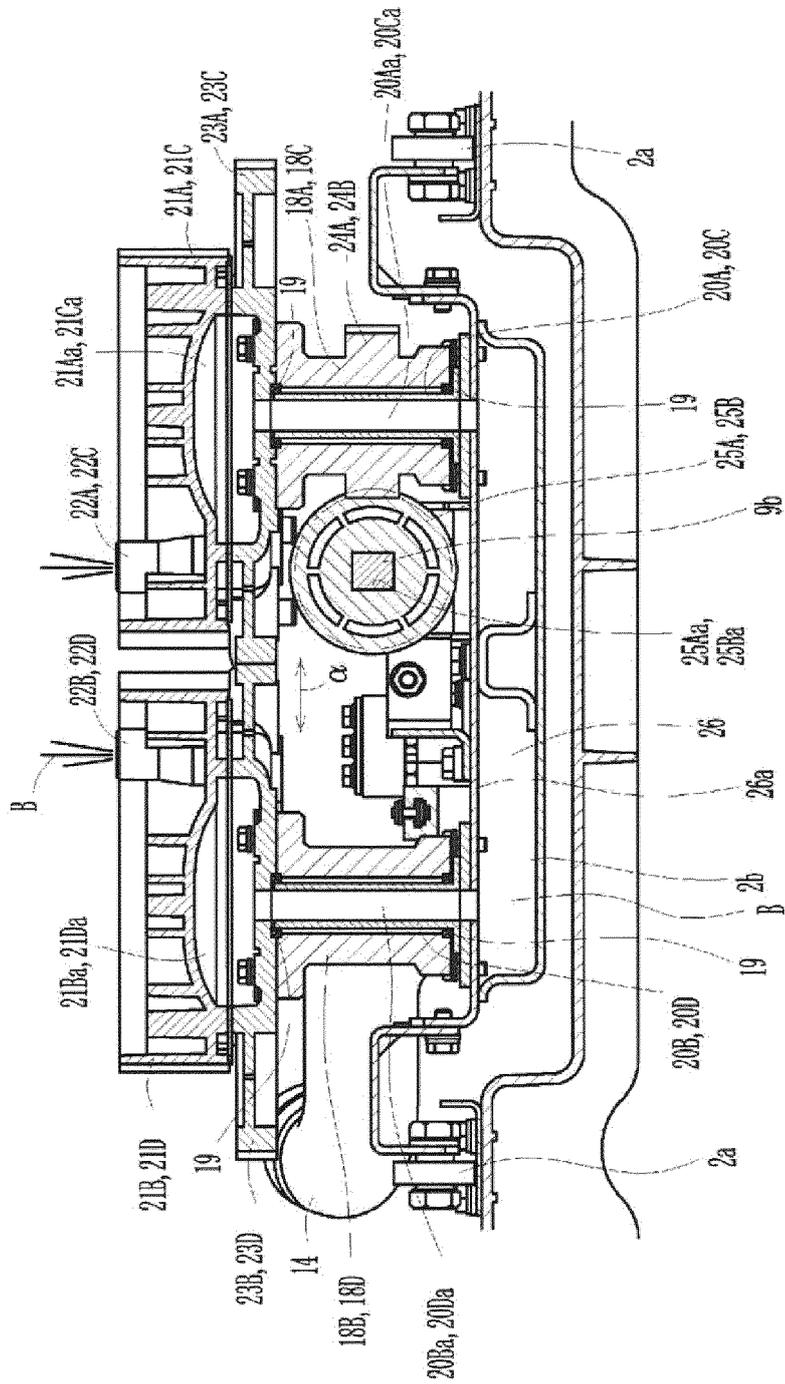
4. The hydraulic massage apparatus as claimed in any one of claims 1 through 3, wherein
20 an end part of the flexibility reinforcing strip has a rectangular-shaped portion rectangular in cross section, and the
flexibility reinforcing strip is fixedly coupled to an upper edge of the fluid tank by means of a pressing fixture inserted
through the rectangular-shaped portion.

5. The hydraulic massage apparatus as claimed in any one of claims 1 through 4, wherein
25 the flexibility reinforcing strip has a double-sided fastener with an female member and an male member, and a sheet
member overlaying the flexible sheet has an male member and an female member to be respectively engaged with
the female and male members of the flexibility reinforcing strip.

6. The hydraulic massage apparatus as claimed in any one of claims 1 through 5, wherein
30 the flexibility reinforcing strip is formed of a high efficiency / high performance fiber.

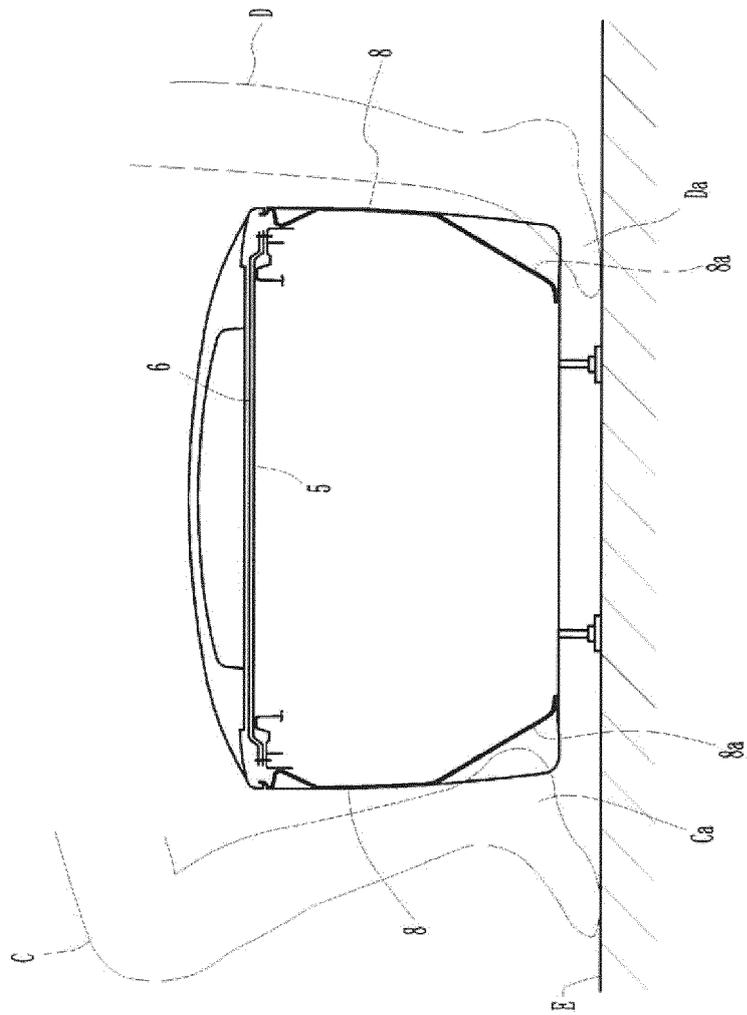
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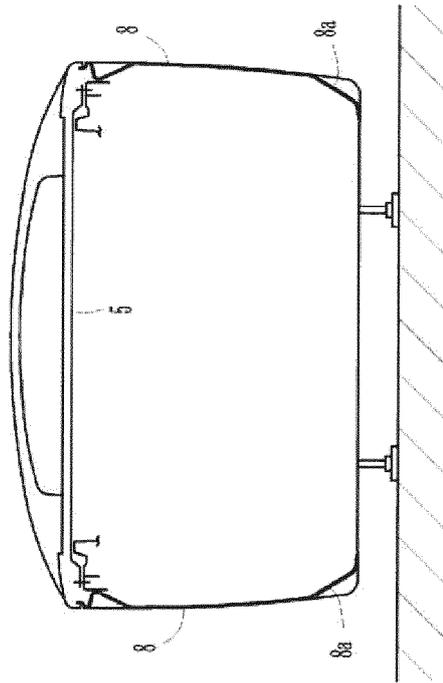
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F I

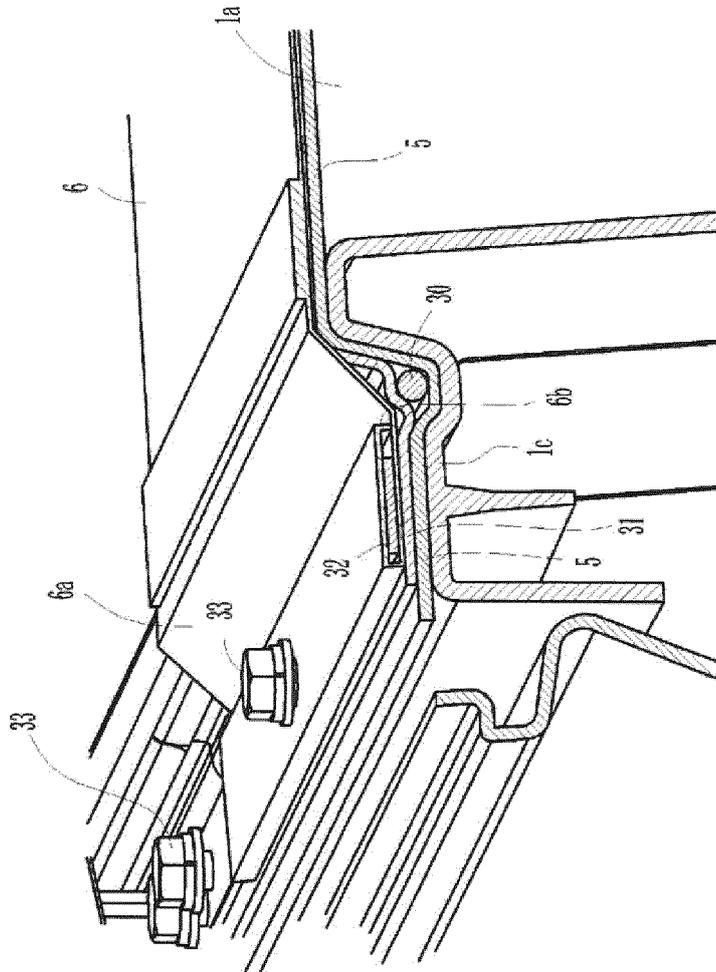
G. 3





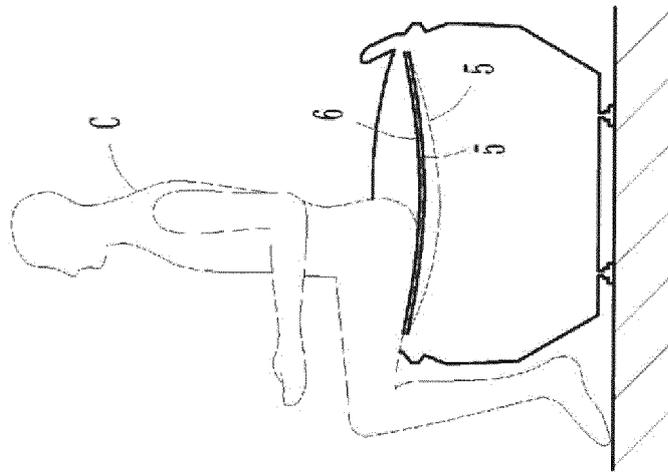
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G. 4



F I

G. 5



F I

G. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/078021

A. CLASSIFICATION OF SUBJECT MATTER

A61H23/04(2006.01)i, A61H9/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61H23/04, A61H9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2005-261824 A (SML Ltd.), 29 September 2005 (29.09.2005), entire text; all drawings (Family: none)	1-6
Y	JP 2000-23790 A (Calsonic Corp.), 25 January 2000 (25.01.2000), entire text; all drawings (Family: none)	1-6

 Further documents are listed in the continuation of Box C.
 See patent family annex.

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Date of the actual completion of the international search
26 November, 2013 (26.11.13)Date of mailing of the international search report
10 December, 2013 (10.12.13)Name and mailing address of the ISA/
Japanese Patent Office

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Patent documents cited in the description

- JP 2003052782 A [0003]
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