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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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(54) Title: MULTI-FUNCTIONAL PATIENT TRANSFER DEVICE

(57) Abstract: One embodiment of the present invention comprises a multi-functional patient transfer device for transferring mobility-impaired patients. In one embodiment, the multi-functional patient transfer device includes a lift cart and one or more lift components. The lift components may attach to the lift cart and/or other lift components. The lift components may include frontal bars, a tabletop, a central arm, lifting forks, a hoist, a knee blocker, footrests, a transfer chair, detachable handles, and/or safety cushions. Embodiments of the present invention may include one or more patient interfaces. The patient interfaces may attach to the lift cart and/or one or more lifting components. The patient interfaces may include slings, chairs, straps, harnesses, and/or transfer sheets. In one embodiment, the patient interfaces may include foldable panels. In one embodiment, the patient interfaces may include a buttock/link support. Example embodiments of methods of the present invention may include frontal transfers, lateral seated transfers, lateral bed transfers, and sit-to-stand transitions.

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TITLE

MULTI-FUNCTIONAL PATIENT TRANSFER DEVICE

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MULTI-FUNCTIONAL PATIENT TRANSFER DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This non-provisional application claims priority based upon prior U.S. Provisional Patent Application Serial No. 61/042587 filed April 04, 2008 in the name of Frederic Palay and William E. Burak, Jr., entitled "Multi-Functional Patient Transfer Device," the entirety of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates generally to patient handling systems and, more particularly, to patient handling systems with a multi-functional patient transfer device.

[0003] The field of patient handling is gaining increased attention as a result of nursing shortages, caregiver injuries, and the rising incidence of obesity in western societies. At the same time, existing approaches to patient handling have several limitations. Manual patient handling systems, for example, generally rely on various lifting and sliding techniques to move a patient. Such systems can lead to discomfort and injury to both patient and caregiver and, in many cases, require the presence of more than one caregiver. Traditional mechanical solutions, such as floor-based hoists, ceiling lifts, and lateral transfer systems, have been shown to decrease the incidence of caregiver musculoskeletal injury but still present significant safety risks to patients. In addition, traditional mechanical solutions are generally large, heavy, and difficult to transport. Traditional mechanical solutions also typically perform only a single transfer function.

[0004] Therefore, it can be appreciated that there is a significant need for a multi-functional patient transfer device that can be compact, lightweight, and easily transportable. It can further be appreciated that there is a significant need for a multi-functional patient transfer device that is capable of performing more than one patient transfer function.

Embodiments of the present invention can provide these and other advantages, as will be apparent from the following detailed description and accompanying figures.

BRIEF SUMMARY OF THE INVENTION

[0005] One embodiment of the present invention comprises a multi-functional patient transfer device for transferring mobility-impaired patients. In one embodiment, the multi-functional patient transfer device includes a lift cart and one or more lift components. The lift components may attach to the lift cart and/or other lift components. The lift components may include frontal bars, a tabletop, a central arm, lifting forks, a hoist, a knee blocker, footrests, a transfer chair, handles, and/or safety cushions. In one embodiment, the multi-functional patient transfer device may include one or more patient interfaces. The patient interfaces may attach to the lift cart and/or one or more lifting components. The patient interfaces may include slings, chairs, straps, harnesses and/or transfer sheets. Example methods that may be performed with embodiments of the multi-functional patient transfer device include frontal seated transfers, lateral seated transfers, lateral bed transfers, and standing aid transfers.

[0006] In one embodiment, the multi-functional patient transfer device may include a lift cart containing a central structure and a central arm connectable to the central structure and including a patient interface connectable to the central arm. In this embodiment, the shape of the central arm includes a curve that approximates the curvature of the chest of a patient. In addition, the central structure is capable of raising and lowering a patient with (i) the patient interface supporting the patient, (ii) the patient interface connected to the central arm, and (iii) the central arm extending horizontally across the front of the patient and positioned approximately between the head and knees of the patient.

[0007] In another embodiment, the multi-functional patient transfer device may include a lift cart containing a central structure, frontal bars connectable to the central structure and

having two arms that are approximately parallel, and a cable connectable to the frontal bars and to the lift cart. In this embodiment, the central structure is capable of raising and lowering the frontal bars. In addition, in this embodiment, the frontal bars may rotate between angles in which the arms extend outward from the lift cart with an approximately horizontal orientation and in which the arms extend upwards from the lift cart with an approximately vertical orientation. Also, in this embodiment, the cable may assist the rotation of the frontal bars when the central structure raises the frontal bars.

[0008] In yet another embodiment, the multi-functional patient transfer device may include a lift cart containing a central structure, a central arm connectable to the central structure and including a patient interface connectable to the central arm, and frontal bars having two arms that are approximately parallel. In this embodiment, the central structure is connectable to the frontal bars and capable of raising and lowering the frontal bars. Also, in this embodiment, central structure is capable of raising and lowering a patient with (i) the patient interface supporting the patient, (ii) the patient interface connected to the central arm, and (iii) the central arm extending horizontally across the front of the patient and positioned approximately between the head and knees of the patient.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] **FIG. 1** shows a perspective view of one embodiment of the device of the present invention with frontal bars rotated horizontally;

[0010] **FIG. 2** shows a perspective view of one embodiment of the device of the present invention with frontal bars rotated vertically;

[0011] **FIG. 3a** shows a perspective view of one embodiment of the device of the present invention with cables to assist rotation of the frontal bars;

[0012] **FIG. 3b** shows a side view of one embodiment of the device of the present invention with a cable assisting the rotation of the frontal bars;

[0013] **FIG. 4** shows a perspective view of one embodiment of adjustable frontal bars of one embodiment of the device of the present invention;

[0014] **FIG. 5** shows a perspective view of one embodiment of the device of the present invention with frontal bars containing individually pivoting arms;

[0015] **FIG. 6** shows a perspective view of one embodiment of the device of the present invention with a tabletop rotated horizontally;

[0016] **FIG. 7** shows a perspective view of one embodiment of the device of the present invention with a tabletop rotated vertically;

[0017] **FIG. 8a** shows a perspective view of one embodiment of a central arm of one embodiment of the device of the present invention;

[0018] **FIG. 8b** shows a side view of one embodiment of a central arm of one embodiment of the device of the present invention;

[0019] **FIG. 8c** shows a perspective view of example embodiments of a central arm of one embodiment of the device of the present invention;

[0020] **FIG. 8d** shows a perspective view of one embodiment of a central arm and a safety mechanism of one embodiment of the device of the present invention;

[0021] **FIG. 8e** shows an example of the method of operating one embodiment of a central arm and a safety mechanism of one embodiment of the device of the present invention;

[0022] **FIG. 9** shows a front view of example embodiments of winches of one embodiment the device of the present invention;

[0023] **FIG. 10** shows a perspective view of a first example embodiment of a lift fork of one embodiment of the device of the present invention;

[0024] **FIG. 11** shows a perspective view of a second example embodiment of a lift-fork of one embodiment of the device of the present invention;

[0025] **FIG. 12** shows a perspective view of one embodiment of a hoist of one embodiment of the device of the present invention;

[0026] **FIG. 13** shows a perspective view of one embodiment of a transfer chair of one embodiment of the device of the present invention;

[0027] **FIG. 14** shows a perspective view of one embodiment of a transfer chair connected to a lift cart of one embodiment of the device of the present invention;

[0028] **FIG. 15** shows a perspective view of a second example embodiment of the transfer chair of one embodiment device of the present invention;

[0029] **FIG. 16a** shows a perspective view of one embodiment of a frontal bar cushion of one embodiment of the device of the present invention;

[0030] **FIG. 16b** shows a side view of one embodiment of a frontal bar cushion connected to horizontally extending frontal bars of one embodiment of the device of the present invention;

[0031] **FIG. 16c** shows a side view of one embodiment of a frontal bar cushion connected to vertically extending frontal bars of one embodiment of the device of the present invention;

[0032] **FIGS. 17a-c** show perspective views of example embodiments of safety cushions of one embodiment of the device of the present invention;

[0033] **FIGS. 18a-d** show perspective views of example embodiments of detachable handles of one embodiment of the device of the present invention;

[0034] **FIG. 19** shows a perspective view of one embodiment of the patient interface of one embodiment of the device of the present invention;

[0035] **FIG. 20a** shows a perspective view of one embodiment of the patient interface of one embodiment of the device of the present invention;

[0036] **FIG. 20b** shows a second perspective view of one embodiment of the patient interface of one embodiment of the device of the present invention;

[0037] **FIGS. 21a-d** show perspective views of one embodiment of a foldable patient interface of one embodiment of the device of the present invention;

[0038] **FIG. 21e** shows an end view of one embodiment of a foldable patient interface of one embodiment of the device of the present invention;

[0039] **FIGS. 22a-d** show perspective views of example embodiments for attaching patient interfaces of one embodiment of the device of the present invention;

[0040] **FIGS. 23a-d** show examples of the method of operating one embodiment of the device of the present invention with a central arm attached in a horizontal orientation;

[0041] **FIGS. 24a-d** show examples of the method of operating one embodiment of the device of the present invention in connection with a seated transfer; and

[0042] **FIG. 25** shows an example of operating one embodiment of the device of the present invention in connection with a transition between sitting and standing.

DETAILED DESCRIPTION

[0043] One preferred embodiment of the present invention comprises a multi-functional patient transfer device for transferring mobility-impaired patients. In one embodiment, the multi-functional patient transfer device includes a lift cart and one or more lift components. The lift components may attach to the lift cart and/or other lift components. As described in more detail below, the lift components may include frontal bars, a tabletop, a central arm, lifting forks, a hoist, a knee blocker, footrests, a transfer chair, detachable handles, and/or safety cushions. Embodiments of the present invention may also include one or more patient interfaces. The patient interfaces may attach to the lift cart and/or lifting components. As described in more detail below, the patient interfaces may include slings, chairs, straps, harnesses and/or transfer sheets. Example embodiments of methods of the present invention may include frontal transfers, lateral seated transfers, lateral bed transfers,

and sit-to-stand transitions. Embodiments of the present invention may be used in a hospital, long-term care facility, skilled nursing facility, rehabilitation facility, a patient's home or other locations and can be used alone or in conjunction with other patient lifting devices such as a ceiling lift, a floor-based hoist, low-friction sliding transfer sheets or a sliding roller board.

[0044] Reference is now made to **FIG. 1** which shows a perspective view of one embodiment of the device of the present invention with frontal bars **102** rotated horizontally. In this embodiment, the multi-functional patient transfer device **101** is shown to include frontal bars **102** and a lift cart **103**. The lift cart **103** may contain wheels **110** which allow it to roll across floors or ground surfaces. The wheels **110** may be in the form of casters. The lift cart **103** may also contain brakes (not shown) for restricting movement of the lift cart **103**. In one embodiment, the distal wheels **110a** are of a smaller size than the proximal wheels **110b**. The lift cart **103** is shown to contain a central structure **104** with a vertical orientation that connects to the frontal bars **102** and a base **105**. In one embodiment, the base **105** is shown to include a u-shaped frame **106** with two legs **107** that may provide stability to the central structure **104**. In one embodiment, the length of the legs **107** of the u-shaped frame **106** may extend in order to provide additional stability to the lift cart **103**. For example, the legs **107** may include telescoping extensions. The distance **108** between the legs **107** may also be increased. In one embodiment, for example, the legs **107** may pivot at their point of attachment to the base **105** so that the distal portion of the legs **107a** spread apart from one another. In addition, the base **105** is shown to include footrests **111** in this embodiment. In one embodiment, a knee blocker (not shown) may be attached to the central structure **104**.

[0045] In this embodiment, the central structure **104** is attached in a vertical orientation from the base **105**. The shape of the central structure **104** in this embodiment is shown to include a cylinder **109**, but other embodiments may include other shapes without

departing from the spirit and scope of the invention. The central structure **104** may contain a sliding sleeve **112** and may extend and retract in a vertical direction in order to raise and lower the central structure **104**. In alternative embodiments, the central structure **104** of the lift cart **103** may be raised or lowered using powered lifting mechanisms such as a hydraulic pump, actuator, motor, threaded screw mechanism or mechanical jack. The movement of the central structure 104 may also raise and lower the height of the frontal bars **102**, as well as other lift components that may be connected to the central structure **104** from time to time, patient interfaces that may be connected to such lift components, and patients supported by such lift components and/or patient interfaces.

[0046] Still referring to **FIG. 1**, the frontal bars **102** are shown attached to an attachment plate **113** that, in this embodiment, is secured to the central structure **104**. The attachment plate **113** may securely hinge to the attachment bar **116** of the frontal bars **102** to the central structure **104** and allow the frontal bars **102** to rotate without exposing a patient to pinch points. The degree of allowable rotation may be varied. In one embodiment, the frontal bars **102** may rotate between angles in which the arms **120** of the frontal bars **102** extend outward from the lift cart **103** in a horizontal orientation, such as shown in **FIG. 1**, and angles in which the arms **120** of the frontal bars **102** extend upwards from the lift cart **103** with an approximately vertical orientation, such as shown in **FIG. 2**. In addition, the degree of rotation of the frontal bars **102** at any given time may be independent of the height of the frontal bars **102** or, as explained in more detail below, may be dependent on the height of the frontal bars **102**.

[0047] Reference is now made to **FIG. 2**, which shows a perspective view of one embodiment of the device of the present invention with frontal bars **102** rotated vertically. In this embodiment, foot pedals **201** are shown located at the base **105** to allow a caregiver to spread the legs **107** of the lift cart **103** as described above. It can be appreciated that other

embodiments may include other mechanisms for moving the legs **107**, such as a hand activated lever, for example, without departing from the spirit and scope of the invention. Also, a control box **204**, which may contain an electric actuator, for example, is shown attached to the central structure **104**. A handheld control unit **205** is shown to connect to the control box **204** via a modular communication cord **203**. A safety bar **202** is also shown which can serve to restrict the caregiver movements toward the central structure **104** and add structural support to the lift cart **103**.

[0048] Referring again to **FIG. 1**, the frontal bars **102** are shown in this embodiment to contain a left arm **120a** and a right arm **120b**. The left arm **120a** and the right arm **120b** may be gripped by a patient, for use as a standing aid, for example. A variety of patient interfaces may connect to the left arm **120a** and the right arm **120b**. For example, patient interfaces may connect to the left arm **120a** and right arm **120b** and assist the transition of a patient from a sitting position to a standing position or assist the transfer of a patient in a seated position. In one embodiment, the arms **120** provide multiple points of attachment for patient interfaces. Such multiple attachment points may, for example, allow a particular patient interface to attach in a manner that is best suited for a particular patient or may allow for the attachment of different types of patient interfaces.

[0049] The frontal bars **102** are also shown in this embodiment to have an inner handlebar **114** and an outer handlebar **115**. When the frontal bars **102** are rotated so that the arms **120** extend horizontally, as shown in **FIG. 1**, a patient may grip the inner handlebar **114** for support while standing or as an aid to transition from a sitting to a standing position. In addition, a caregiver may grip the outer handlebar **115** to move the lift cart **103** to a desired location or to manually rotate the frontal bars **102**. Similarly, when the frontal bars **102** are rotated so that the arms **120** extend vertically, as shown in **FIG. 2**, a caregiver may grip the inner handlebar **114** to move the lift cart to a desired location or manually rotate the frontal

bars **102** so that the arms **120** extend horizontally, as shown in **FIG. 1**. In one embodiment, the frontal bars **102** may connect to the lift cart **103** in a detachable manner.

[0050] Reference is now made to **FIG. 3a**, which shows a perspective view of one embodiment of the device of the present invention with cables **305** to assist rotation of the frontal bars **102**. In one embodiment, the frontal bars **102** may function as lever machine with the arms **120** of the frontal bars **102** functioning as load arms, the attachment bar **116** functioning as a fulcrum, and a portion of the frontal bars **102**, other than the arms **120** and the attachment bar **116**, functioning as a lever. The frontal bars **102** in this embodiment are shown to contain a left arm **304a** with a lever end **304a**' and a right arm **304b** with a lever end **304b**'. The frontal bars **102** are also shown to contain alternative embodiments of an inner handlebar **114** and an outer handlebar **115**. In one embodiment, the lifting mechanism of the lift cart **103** may be used to assist the rotation of the frontal bars **102**. For example, a cable **305a** may connect to the lever end **304a**' of the left arm **304a** and a secure portion of the lift cart **103** that, for example, does not increase in height with upward movement of the central structure **104** or decrease in height with downward movement of the central structure **104**. An example secure position may be a first connector **306a** on the base **105**. In an alternative embodiment, a second cable **305b** may attach to the lever end **304b**' of the right arm **304b** and a secure portion of the lift cart **103**, such as a second connector **306b** on the base **105**. In an alternative embodiment, the cable **305** may attach to the inner handlebar **114** or the outer handlebar **115** as the lever portion.

[0051] Reference is now made to **FIG. 3b**, which shows a side view of one embodiment of the device of the present invention with a cable **305** assisting the upward rotation of the frontal bars **102**. With the attachment of one or both cables **305**, raising the central structure **104** will rotate the arms **304** of the frontal bars **102** upwards **308** until the arms **304** extend vertically. Conversely, if the central structure **104** is lowered with the

attachment of one or both cables **305**, the arms **304** of the frontal bars **102** will rotate downwards until the arms **304** extend horizontally **307**. In an alternative embodiment, the arms **304** frontal bars **102** may rotate past horizontal.

[0052] As described in more detail below, rotation of the frontal bars **102** may be used to assist a patient transitioning from a sitting to a standing position. In one embodiment, the length of the cable **305** may be adjusted in order to synchronize the rotation of the frontal bars **102** with the vertical movement of the central structure **104**. For example, shortening the cable **305** may allow the frontal bars **102** to begin rotating at a lower point in the vertical movement of the central structure **104** than the point in the vertical movement of the central structure **104** at which the frontal bars **102** begin to rotate with a longer cable **305**. It can be appreciated that other embodiment may include other types of mechanism to assist rotation of the frontal bars without departing from the scope and spirit of the present invention.

[0053] Reference is now made to **FIG. 4**, which shows a perspective view of one embodiment of adjustable frontal bars **102** of one embodiment of the device of the present invention. In this embodiment, the width and height of the arms **403** of the frontal bars **102** may be individually or mutually adjustable. The width and height of the arms **120** of the frontal bars **102** may also be adjusted without vertical movement of the central structure **104**. For example, the frontal bars **102** are shown in **FIG. 4** to contain a u-shaped section **402** and two elongated s-shaped arms **403**. One elongated s-shaped arm **403** is shown extending from each end **408** of the u-shaped section **402**. Each elongated s-shaped arm **403** may be rotated about its longitudinal axis within the u-shaped section **402** in order to position the distal end **403'** of the elongated s-shaped arm **403**. The frontal bars **102** may also contain a locking mechanism **401** for restricting the rotation of the elongated s-shaped arms **403**. For example, the distal end **403'** of the elongated s-shaped arm **403** may be positioned so that the width **404** between the distal ends **403'** of the two elongated s-shaped arms **403** is either wider or

narrower than the width **405** between the two ends **408** of the u-shaped section **402**. Alternatively, the distal ends **403'** of the elongated s-shaped arms **403** may be positioned so that the height **406** of the distal ends **403'** of the two elongated s-shaped arms **403**, relative to a point on the central structure **104**, for example, is either greater than or less than the height **407** of the two ends **408** of the u-shaped section **402**. For example, the distal ends **403'** of the elongated s-shaped arms **403** may be positioned so that the width **404** between the distal ends **403'** of the two elongated s-shaped arms **403** is wider than the width **405** between the two ends **408** of the u-shaped section **402**. This additional width **404** may be preferable for patients with broad shoulders or a wide girth. In addition, the distal ends **403'** of the elongated s-shaped arms **403** may be positioned so that the height **406** of the distal ends **403'** of the two elongated s-shaped arms **403** is less than the height **407** of the two ends **408** of the u-shaped section **402** in order to, for example, compensate for the relative height or arm length of a particular patient.

[0054] Reference is now made to **FIG. 5**, which shows a perspective view of one embodiment of the device of the present invention with frontal bars **102** containing individually pivoting arms **502**. In this embodiment, the arms **502** of the frontal bars **102** may individually pivot, and may lock into place, at multiple angles between, and including, horizontal and vertical. In **FIG. 5** for example, the left arm **502a** of the frontal bars **102** is shown to extend horizontally. The right arm **502b**, however, is shown to have been pivoted and locked at an angle between horizontal and vertical. As will be described in more detail below, a patient may be transferred laterally with one embodiment of the device of the present invention that includes individually pivoting arms **502**.

[0055] Reference is now made to **FIG. 6** and **FIG. 7**, which show a perspective view of one embodiment of the device of the present invention with a tabletop **601**. In this embodiment, a tabletop **601** may be easily attached to, and removed from, the arms **120** of

the frontal bars **102**. When the tabletop **601** is attached to the frontal bars **102**, the frontal bars **102** may be rotated so that the arms **120** and the attached tabletop **601** extend horizontally, as shown in **FIG. 6**. In this horizontal position, the tabletop **601** may be used as table. The tabletop **601** may also be raised and lowered by the central upright structure **104** of the lift cart **103**. For example, the tabletop **601** may be raised to an appropriate height for use as an over-the-bed table or lowered to a height appropriate for use as a bedside table. The frontal bars **102** may also be rotated, when the tabletop **601** is attached to the frontal bars **102**, so that the arms **120** and the attached tabletop **601** extend vertically, as shown in **FIG. 7**. For example, the lift cart **103** may be easily stored when the frontal bars **102** and tabletop **601** are in a vertical position.

[0056] Reference is now made to **FIG. 8a**, which shows a perspective view of one embodiment of a central arm **801** of one embodiment of the device of the present invention. In **FIG. 8a**, the central arm **801** is shown to attach to the central structure **104** of the lift cart **103** and extend horizontally from the central structure **104**. In one embodiment, the central arm extends in a direction that is approximately parallel to the direction of the arms **120** of the frontal bars **102** extend when the arms **120** are rotated horizontally. A patient **811** may grip the central arm **801** for support and patient interfaces **810** may connect to the central arm **801** in order to support a patient **811**. The central arm **801** may connect to the central structure **104** with or without frontal bars **102** attached to the central structure **104**. In one embodiment, the central arm **801** may permanently attach to the lift cart **103**. In other embodiments, the central arm **801** may be easily attached to, and removed from, the lift cart **103**.

[0057] Reference is now made to **FIG. 8b**, which shows a side view of one embodiment of a central arm **801** of one embodiment of the device of the present invention. In one embodiment, the central arm **801** may also attach vertically to the lift cart **103**, such as

shown in **FIG. 8b**. For example, the central arm **801** may be attached in a vertical position to the lift cart **103** in order to store the central arm **801** on the lift cart **103** when the central arm **801** is not being used. In one embodiment, a tabletop may connect to the central arm **801**.

[0058] The shape of the central arm **801** may vary in different embodiments of the device of the present invention. Referring again to **FIG. 8a**, the central arm **801** is shown to contain a proximal end **802** that can attach to the central structure **104**. In this embodiment, the shape of the proximal end **802** includes a right angle **803** that allows a portion of the proximal end **802** to be inserted into a vertical receptacle in the central structure **104** and allows the distal portion **804** of the central arm **801** to extend horizontally.

[0059] Reference is now made to **FIG. 8c**, which shows a perspective view of example embodiments of a central arm **801** of one embodiment of the device of the present invention. In **FIG. 8c**, one embodiment of the central arm **801** is shown in which the right angle **803** may rotate relative to the distal portion **804** of the central arm **801**.

[0060] Reference is now made to **FIG. 8d**, which shows a perspective view of one embodiment of a central arm **801** and a safety mechanism **807** of one embodiment of the device of the present invention. In **FIG. 8d**, the proximal end **802** of the central arm **801** is shown to include a connector **805**. In this embodiment, a corresponding mating connector **806** is included in a safety mechanism **807**. The safety mechanism **807** is shown to attach to the attachment plate **113**. In this embodiment, the safety mechanism **807** is hinged **808** to the attachment plate **113**.

[0061] Reference is now made to **FIG. 8e**, which shows an example of the method of operating one embodiment of a central arm **801** and a safety mechanism **807** of one embodiment of the device of the present invention. In **FIG. 8e**, the central arm **801** and safety mechanism **807** are shown to pivot upwards **809** in the event that an upwardly directed force **810** is applied to the underside of the central arm **801**. For example, in the event that an

upwardly directed force **810** is applied to the underside of the central arm **801**, such as if the central arm **801** were to be mistakenly lowered onto a patient's leg, the safety mechanism **807** will move upwards so that the central arm **801** also moves upwards. It can be appreciated that other embodiments may include other types of attachment mechanisms and safety mechanisms without departing from the spirit and scope of the invention.

[0062] Referring again to **FIG. 8a**, the shape of the central arm **801** may also include curves. In one embodiment, the distal portion **804** of the central arm **801** is curved in a horizontal plane. The degree of curvature of the distal portion **804** of the central arm **801** shown in this embodiment generally approximates the curvature of a patient's chest. In one embodiment, the direction of the curvature of the central arm **801** relative to the lift cart **103** may be adjusted. For example, in one embodiment, the distal portion **804** of the central arm **801** may be rotated at least 180 degrees about the longitudinal axis of the central arm **801**, such as shown in **FIG. 8c**. In an alternative embodiment, the proximal end **802** of the central arm **801** may attach to the central structure **104** in alternate orientations in order to allow the direction of the curvature of the central arm **801** to be adjusted. A caregiver may, for example, adjust the direction of the curvature of the central arm **801** so that the direction of curvature will be concave from the perspective of a patient **811**, regardless of the position of the lift cart **103** relative to the patient **811**. For example, the direction of curvature may be adjusted depending on whether the lift cart **103** is positioned to the left or right side of a patient **811**. As will be described in more detail below, the central arm **801** may be used to transfer a patient **811** from either side of a patient **811** and with the central arm **801** extending horizontally across the front of the patient **811** and positioned approximately between the height of the head and knees of the patient **811**. A variety of patient interfaces **812** may also be attached to the central arm **801**.

[0063] Reference is now made to **FIG. 9**, which shows a front view of example embodiments of winches **901** and **902** of one embodiment of the device of the present invention. A first example arm **906** is shown as a partial representation of the central arm **801** and/or an arm **120** of the frontal bars **102**. The first example arm **906** may include one or more winches **901** and **902**. In one embodiment, a ratchet winch **901** may be attached to the outer surface of the first example arm **906**. The ratchet winch **901** may also include a brake/release mechanism **903** that controls the length of the webbing **904** that may extend from the first example arm **906**. In one embodiment, an internal worm winch **902** may be included inside the first example arm **906**. The internal worm winch **902** may also include a switch **905** that controls the length of the webbing **904** that may extend from the first example arm **906**.

[0064] Reference is now made to **FIG. 10**, which shows a perspective view of a first example embodiment of a lift-fork **1001** of the device of the present invention. Referring to **FIG. 10**, a lift-fork **1001** capable of supporting a wheelchair **1005** is shown attached to the central structure **104** of the lift cart **103**. In this embodiment, the lift-fork **1001** includes a vertical extension arm **1002** so that the forks **1003** of the lift-fork **1001** extend horizontally at a height that is below the point of attachment **1004** of the lift-fork **1001** to the central structure **104**. The lift-fork **1001** may attach to the attachment plate **113** with or without frontal bars **102** also attached to the central structure **104**. When the lift-fork **1001** is attached to the central structure **104**, the lifting mechanism of the central structure **104** can raise and lower the lift-fork **1001**. If the lift-fork **1001** is used to support a wheelchair **1005**, the lift cart **103** can raise and lower the wheelchair **1005**, and optionally a patient supported by the wheelchair **1005**, such as in connection with, for example, a transfer of the wheelchair **1005** to and from locations of different elevations.

[0065] Reference is now made to **FIG. 11**, which shows a perspective view of a second example embodiment of a lift-fork **1101** of one embodiment of the device of the present invention. In this embodiment, the lift-fork **1101** does not include a vertical extension arm **1002**. Consequently, the forks **1103** of the lift-fork **1101** extend horizontally at a height that may be approximately equal to, or slightly below or slightly above, the point of attachment **1104** of the lift-fork **1101** to the central structure **104**. In this embodiment, the lift-fork **1101** may support a rigid patient interface **1105**, for example, by sliding the forks **1103** of the lift-fork **1101** into receptacles **1107** of the rigid patient interface **1105**. If the lift-fork **1101** is used to support a rigid patient interface **1105**, the lift cart **103** can raise and lower the lift-fork **1101**, the rigid patient interface **1105**, and optionally a patient supported by the rigid patient interface **1105**, such as in connection with, for example, a transfer of the rigid interface **1105** to and from locations of different elevations.

[0066] Reference is now made to **FIG. 12**, which shows a perspective view of one embodiment of a hoist **1201** of one embodiment of the device of the present invention. In this embodiment, a hoist **1201** is shown attached to the central structure **104** of the lift cart **103**. The hoist **1201** may contain a vertical extension arm **1202** and a horizontal support arm **1203**. In one embodiment, the horizontal support arm **1203** may consist of a central arm **801** that is adapted to connect to a vertical extension arm **1202**. In one embodiment, the shape of the horizontal support arm **1203** may be arched to provide, for example, additional head room for a patient **1206**. In one embodiment, the vertical extension arm **1202** and the horizontal support arm **1203** may be connected together with a hinge **1207**. In one embodiment, the vertical extension arm **1202** and the horizontal support arm **1203** may be folded together or separated from one another when not in use. The hoist **1201** may also include an angled support bar **1204** in order to, for example, increase the amount of weight that may be supported by the horizontal support arm **1203**. In one embodiment, the hoist **1201** may

include a means for allowing the distal end **1203'** of the horizontal support arm **1202** to pivot above or below horizontal. For example, in one embodiment, the angled support bar **1204** may include a hydraulic cylinder that may extend to raise the distal end **1203'** of the horizontal support arm **1203** and retract to lower the distal end **1203'** of the horizontal support arm **1203**.

[0067] The vertical extension arm **1202** may attach to the lift cart **103** by, for example, insertion of the vertical extension arm **1202** into a receptacle in the central structure **104**. The vertical extension arm **1202** may attach to the lift cart **103** with or without frontal bars **102** also attached to the central structure **104**. The horizontal support arm **1203** may support a patient **1206** by allowing the patient **1206** to grip the horizontal support arm **1203** or by connecting to patient interfaces **1205** that support the patient **1206**. A variety of patient interfaces **1205** may be attached to the horizontal support arm **1203**. In **FIG. 12**, the patient interface **1205** is shown to be suspended from the horizontal support arm **1203**. As will be described in more detail below, the hoist **1201** may be used to transfer a patient **1206** laterally from either side of the patient **1206**.

[0068] Reference is now made to **FIG. 13**, which shows a perspective view of one embodiment of a transfer chair **1301** of the device of the present invention. In this embodiment, the transfer chair **1301** may attach directly to the lift cart **103**. The transfer chair **1301** is shown to include a connector **1302** on the side **1304** of the seat portion **1303** of the transfer chair **1301**. Alternatively, the transfer chair **1301** may include a connector **1302** on either or both sides **1304** of the seat portion **1303** of the transfer chair **1301** and/or on the back side **1305** of the seat portion **1303** of the transfer chair **1301**. In this embodiment, the connector **1302** may be connected to a mating connector **1306** in the central structure **104** of the lift cart **103**. It can be appreciated that other embodiments may include other types of connection mechanisms without departing from the spirit and scope of the invention.

[0069] Reference is now made to **FIG. 14**, which shows a perspective view of one embodiment of a transfer chair **1301** connected to a lift cart **103** of one embodiment of the device of the present invention. Once the transfer chair **1301** is connected to the lift cart **103**, the lift cart **103** may raise and lower the transfer chair **1301** in order to, for example, transfer a patient to and from locations at different elevations. In this embodiment, the sides **1401** of the transfer chair **1301** are hinged **1404**. The sides **1401** may rotate between a position that is approximately perpendicular **1405** with the upper surface **1407** of the portion of the transfer chair **1301** to which the side **1401** is connected and a position that is approximately parallel **1406** with the upper surface **1407** of the portion of the transfer chair **1301** to which the side **1401** is connected. For example, the sides **1401** may be rotated a position that is approximately perpendicular **1405** with the upper surface **1407** of the portion of the transfer chair **1301** to which the sides **1401** are connected in order to help secure a patient within the boundaries of the upper surfaces **1407** of the transfer chair **1301**. In addition, the sides **1401** may be rotated to a position that is approximately parallel **1406** with the upper surfaces **1407** of the portion of the transfer chair **1301** to which the sides **1401** are connected in order to assist a patient transitioning between the transfer chair **1301** and another location such as a bed **1408**. In one embodiment, the sides **1401** are removable from the transfer chair **1301**. In one embodiment, the width of the sides **1401** of the transfer chair **1301** may be varied. In **FIG. 14**, for example, the width of the sides **1401** decreases from the proximal end **1402** of the sides **1401** to the distal end **1403** of the sides in **1401** order to, for example, assist a patient sliding from the transfer chair **1301** to a bed **1408**.

[0070] Reference is now made to **FIG. 15**, which shows a second example embodiment of a transfer chair **1501** of one embodiment of the device of the present invention. In this embodiment, the transfer chair **1501** includes a rigid frame **1502**. The rigid frame **1502** is shown to include hinges **1503** that allows the back portion **1504** of the rigid

frame **1502** to recline in relation to the seat portion **1505** of the rigid frame **1502**. The reclining position of the transfer chair **1501** may also be assisted and controlled by alternative means such as by use of a locking gas spring, an actuator, hydraulic cylinder, adjustable straps, or zero-gravity system. The transfer chair **1501** is also shown to include a connector **1506** that may attach to the hinges **1503** or the seat portion **1505** of the rigid frame **1502**. The transfer chair **1501** may also include fabric **1507** attached to the rigid frame **1502**.

[0071] Reference is now made to **FIG. 16a**, which shows a perspective view of one embodiment of a frontal bar cushion **1601** of one embodiment of the device of the present invention. In **FIG. 16a**, the frontal bar cushion **1601** is shown to be generally rectangular in shape with a width **1602** that is slightly less than the distance between the arms **120** of the frontal bars **102**. The frontal bar cushion **1601** may also include a means for attaching the frontal bar cushion **1601** to the frontal bars **102** or the central structure **104**. In this embodiment, the frontal bar cushion **1601** includes two straps **1603**. For example, a strap **1603b** at the bottom right corner of the frontal bar cushion **1601** may connect to the right arm **120**b of the frontal bars **102** and a strap **1603a** at the bottom left corner of the frontal bar cushion **1601** may connect to the left arm **120**a of the frontal bars **102**. In this embodiment, the straps **1603** also support the frontal bar cushion **1601** so that the frontal bar cushion **1601** rests above the horizontal plane of the arms **120** of the frontal bars **102** when the frontal bars **102** are rotated horizontally.

[0072] Reference is now made to **FIG. 16b**, which shows a side view of one embodiment of a frontal bar cushion **1601** connected to horizontally extending frontal bars **102** of one embodiment of the device of the present invention. In **FIG. 16b**, the frontal bar cushion **1601** is also shown to rest against the top of the central structure **104** at an angle so as to prevent a patient **1604** from bumping against the top **1605** of the central structure **104**.

[0073] Reference is now made to **FIG. 16c**, which shows a side view of one embodiment of a frontal bar cushion **1601** connected to vertically extending frontal bars **102** of one embodiment of the device of the present invention. In **FIG. 16c**, the arms **120** of the frontal bars **102** are rotated towards vertical, the frontal bar cushion **1601** will continue to rest against the top **1605** of the central structure **104** even though the bottom **1606** of the frontal bar cushion **1601** may rise. For example, the bottom **1606** may rise the same amount that the arms **120** of the frontal bars **102** rise at the point of attachment **1607** of the straps **1603** to the frontal bars **102**. In addition, the slope of the frontal bar cushion **1601**, as it rests against the central structure **104**, may increase. The height and width of the frontal bar cushion **1601** may vary.

[0074] Reference is now made to **FIGS. 17a-c**, which show perspective views of example embodiments of safety cushions of one embodiment of the device of the present invention. In **FIG. 17a**, a safeguard cushion **1701**, shown shaped in a strip for example, may cover the interior of the u-shaped frame **106** and the distal portion **107**a of the legs **107**. In one embodiment, the safeguard cushion **1701** may flexibly bend if the legs **107** of the lift cart **103** are spread apart and straighten if the legs **107** are moved closer together. One embodiment of an s-shaped cushion **1710** is also shown.

[0075] In **FIG. 17b**, a wheel cushion **1702**, shaped in a strip, covers each distal portion **107**a of the legs **107**. In another embodiment, a base cushion **1703** may cover at least a portion of the interior of the u-shaped frame **106** and also extend upwards to cover at least a portion of the central structure **104**.

[0076] In **FIG. 17c**, another embodiment of an s-shaped cushion **1704** may attach to the central structure **104**. The first straight portion **1705** of the s-shaped cushion **1704** covers a portion of the bottom of the central structure **104**. The curved section **1706** of the s-shaped cushion **1704** extends over a feature **1709** of the central structure **104** that protrudes laterally

from the central structure **104**. Also, a second straight portion **1707** of the s-shaped cushion **1704** extends upwards to cover portions of the central structure **104** and/or a portion of the protruding feature **1709**. The s-shaped cushion **1704** may also include a lower portion **1706** that covers at least a portion of the interior of the u-shaped frame **106**. The s-shaped cushion **1704** may also include an upper portion **1708**. In one embodiment, the upper portion **1708** is transparent. Embodiments of the above referenced safety cushions – including the safeguard cushion **1701**, the wheel cushion **1702**, the base cushion **1703**, the s-shaped cushion **1704**, the alternate s-shaped cushion **1710**, and portions of each of the aforementioned - may be employed individually or in combination to improve, for example, the safety or comfort of the operation of the lift cart.

[0077] Reference is now made to **FIGS. 18a-d**, which show perspective views of example embodiments of detachable handles **1801** of one embodiment of the device of the present invention. In **FIG. 18a**, two example detachable handles **1801** are shown attached to a second example arm **1806**. The second example arm **1806** is shown as a partial representation of the central arm **801** or an arm **120** of the frontal bars **102**. In this embodiment, the detachable handles **1801** include a handle **1802** at their distal end and a hook **1803** at their proximal end. The hook **1803** may clip onto the second example arm **1806**. In this embodiment, the detachable handles **1801** are shaped to include a straight portion **1803** and a curved portion **1804** so that the handle **1802** extends horizontally when the hook **1803** is fastened to the second example arm **1806**. In one embodiment, the detachable handle **1801** may include a locking mechanism **1805**. The locking mechanism in this embodiment is shown to be a push-button lock. The locking mechanism **1805** may also be positioned at different orientations so that when the detachable handle **1801** fastens to the arm **1806** the handle **1802** may extend at angles other than horizontal. In one embodiment, the handle **1802** may also include an arm support **1807**. In this embodiment, the arm support

1807 includes an open cuff **1808** and an extension rod **1809**. The extension rod **1809** is shown to extend through an opening **1810** in the handle **1802** and to be fastened in place by an additional locking mechanism **1805**. The height of the open cusp **1808** relative to the handle **1802** may be adjusted by securing the locking mechanism **1805** at different points along the extension rod **1809**.

[0078] In **FIG. 18b**, an embodiment of the arm support **1807** is shown supporting a forearm **1811**.

[0079] In **FIG. 18c**, an alternative embodiment of a detachable handle **1801** is shown. In this embodiment, the detachable handle **1801** includes a ring **1812** for fastening the detachable handle **1801** to the second example arm **1806**. The ring **1812** may include a clasp **1813** that allows the ring **1812** to open and fasten to the second example arm **1806** at multiple locations. The ring **1812** may also include a locking mechanism **1805**.

[0080] In **FIG. 18d**, an alternative embodiment of the detachable handle **1801** is shown. In this embodiment, the handle **1802** and the hook **1803** of the detachable handle **1801** exist as separate components that may be fastened together. In this embodiment, the height of the handle **1802** relative to the hook **1803** may be varied and the yaw of the handle **1802** may be varied. It can be appreciated that other embodiments of the detachable handle may include other types of locking mechanisms and/or connection mechanisms without departing from the spirit and scope of the invention.

[0081] Reference is now made to **FIG. 19**, which shows a perspective view of one embodiment of the patient interface **1901** of one embodiment of the device of the present invention. In this embodiment, the patient interface **1901** includes a backrest sling **1902**, a thigh sling **1903** and straps **1908**. The backrest sling **1902** may be positioned on the upper back of a patient **1904**. In one embodiment, the backrest sling **1902** may include shoulder flaps **1905**, a neck flap **1906**, and/or slide flaps **1907**. The thigh sling **1903** may be positioned

underneath the thighs of a patient **1904**. The straps **1908** may connect together and may connect to the lift cart **103** or to lift components.

[0082] In one embodiment, components of the patient interface **1901** may include semi-rigid articulated panels **1909**. For example, the backrest sling **1902** may be reinforced with semi-rigid articulated panels **1909** in order to assist with the positioning of the back-rest sling **1902** under a patient **1904**. The semi-rigid articulated panels **1909** may assist with the direct positioning of the patient interface **1901** under a patient **1904** or with the positioning of the patient interface **1901** under a patient **1904** by means of log-rolling the patient **1904** onto the patient interface **1901**.

[0083] Reference is now made to **FIG. 20a**, which shows a perspective view of one embodiment of the patient interface **1901** of one embodiment of the device of the present invention. In this embodiment, the patient interface **1901** includes a backrest sling **1902**, a thigh sling **1903**, straps **1908** and a buttock/link support **2001**. The buttock/link support **2001** may connect to the backrest sling **1902** and the thigh sling **1903**. For example, the buttock/link support **2001** may connect to the backrest sling **1902** and the thigh sling **1903** by means of Velcro attachment mechanism **2002**. The buttock/link support **2001** may also include a cutaway portion **2003**. For example, the cutaway portion **2003** may be positioned to allow a patient **1904** to urinate or defecate without removing the patient interface **1901**. In **FIG. 20a**, the side flaps **1907** have been pulled around the sides of the patient **1904** and the shoulder flaps **1905** have been pulled over the shoulders of the patient **1904**. The side flaps **1907** may be placed under or over the arms of a patient **1904**. The neck flap **1906** is also shown to support the neck and head of the patient **1904**. In one embodiment, tightening straps **1908** around the shoulder flaps **1905** serves to position the neck flap **1906** against the neck and head of the patient **1904**. In one embodiment, the straps **1908** may be adjusted to change the position of the patient **1904**. For example, tightening the straps **1908** may allow

the patient **1904** to sit in a tucked seated position and loosening the straps **1908** may allow the patient to lie in an open position.

[0084] Reference is now made to **FIG. 20b**, which shows a second perspective view of one embodiment of the patient interface **1901** of one embodiment of the device of the present invention. In one embodiment, the buttock/link support **2001** may also include a handle **2004**. In one embodiment, the patient interface **1901** may include the buttock/link support **2001** and two or more of the following: a backrest sling **1902**, a thigh sling **1903**, straps **1908**.

[0085] Reference is now made to **FIGS. 21a-d**, which show perspective views of one embodiment of a foldable patient interface **2101** of one embodiment of the device of the present invention. In this embodiment, the foldable patient interface **2101** is shown to include a seat portion **2102** and a back portion **2103**, each containing straps **2104** and three panels **2102a,b,&c** and **2103a,b,&c**. The seat portion **2102** and the back portion **2103** may fold together or apart along a lateral crease **2105**. For example, the seat portion and the back portion may fold along the lateral crease to form a chair **2106**, as shown in **FIG. 21b**. In addition, the panels of the seat portion **2102a,b,&c** and the panels of back portion **2103a,b,&c** may also fold along a first lengthwise crease **2107** and a second lengthwise crease **2108**. For example, the panels of the seat portion and the panels of back portion may fold along the first and second lengthwise crease, as shown in **FIG. 21c**.

[0086] In **FIG. 21d**, one means for placing the foldable patient interface **2101** underneath a patient is shown. The foldable patient interface **2101** is shown to be folded along the first lengthwise crease **2107** with the outside panels **2102a** and **2103a** resting on top of the middle panels **2102b** and **2103b**, respectively. The outer edge **2109** of the first lengthwise crease **2107** is shown to be placed under the right side of a patient **2110**. In this embodiment, the patient **2110** is resting on her right side and the first lengthwise crease **2107**

is placed under the patient **2110** from the direction of the patient's backside. From this position, the patient **2110** may roll over the folded outside panels **2102a** and **2103a** and the middle panels **2102b** and **2103b** to rest with her left side against the outside panels **2102c** and **2103c**. While the patient **2110** is on her left side, the outside panels **2102a** and **2103a** can be unfolded from the middle panels **2102b** and **2103b** and the patient **2110** may roll onto her back with the patient interface **2101** correctly positioned underneath the patient **2110**.

[0087] Reference is now made to **FIG. 21e**, which shows an end view of one embodiment of a foldable patient interface **2101** of one embodiment of the device of the present invention. The end view of **FIG. 21e** only shows the ends of the panels **2103a,b&c** of the back portion **2103**. In this embodiment, however, panels **2102a** and **2103a** have been inserted underneath the patient **2110** with panels **2102c** and **2103c** folded on top of **2102b** and **2103b**. After panels **2102c** and **2103c** have been unfolded, the patient **2110** may roll onto her back with the patient interface **2101** correctly positioned underneath the patient **2110**. This means for placing the foldable patient interface **2101** may be employed as an alternative to the means described above with reference to **FIG. 21d**.

[0088] Reference is now made to **FIGS. 22a-d**, which show perspective views of example embodiments for attaching patient interfaces **2204** of one embodiment of the device of the present invention. In **FIG 22a**, a loop **2201** is shown attached to a buckle **2202**. The strap **2203** of the patient interface **2204** passes into the buckle **2202** and may be progressively tightened or loosened. The strap **2203** may also contain a graduation **2205** in numbers or symbols on at least one of its surfaces. In **FIG. 22b**, the loop **2201** is shown to connect to an attachment ring **2206** on the arm **2207** by passing the loop **2201** through the attachment ring **2206** and passing the buckle **2202** through the loop **2201**. In **FIG. 22c**, alternative buckling arrangements are shown. In **FIG. 22d**, a tube connector **2208** is shown to connect around the circumference of the arm **2207**. The tube connector **2208** may slide along the arm **2207** and

lock into place at particular points along the arm **2207**. The tube connector **2208** may be comprised of plastic, metal or webbing, for example.

[0089] Reference is now made to **FIGS. 23a-d**, which show examples of the method of operating one embodiment of the device of the present invention with a central arm **801** attached in a horizontal orientation. In **FIG. 23a**, a caregiver **2301** is shown pushing the lift cart **103** towards one side of a bed **2302** containing a patient **2303**. Once the lift cart **103** is an appropriate distance from the bed **2302**, the caregiver **2301** may engage brakes on the wheels **110** of the lift cart **103** and may also spread the legs **107** of the lift cart **103** apart. In this embodiment, the frontal bars **102** of the lift cart **103** have been rotated so that the arms **120** of the frontal bars **102** extend vertically. The central arm **801** has also been attached to the lift cart **103** so that the central arm **801** extends horizontally from the lift cart **103** with the curvature of the central arm **801** concave from the perspective of the patient 2303.

[0090] In **FIG. 23b**, a caregiver **2301** is shown positioning patient interfaces **2304** under the patient **2303**. For example, a caregiver **2301** may insert patient interfaces **2304** underneath a patient **2303** without moving the patient. Alternatively, the caregiver **2301** may roll the patient **2303** onto the patient's side to in order to position the patient interfaces **2304**.

[0091] In **FIG. 23c**, a caregiver **2301** is shown connecting the patient interfaces **2304** to the central arm **801**. In this embodiment, the central arm **801** extends horizontally across the front of the patient **2303**. The central arm is also positioned approximately between the head **2310** and knees **2311** of the patient **2303**. The height of the central arm **801** is also shown to be between the height of the shoulders **2305** and waist **2306** of the patient **2303**. Once the patient interfaces **2304** have been securely fastened to the central arm **801**, the lift cart **103** may raise the central arm **801** with the patient **2303** secured to the central arm **801** by the patient interfaces **2304**.

[0092] In **FIG. 23d**, the lift cart **103** is shown supporting the patient **2303** above the bed **2302**. In this embodiment, the central arm **801** extends horizontally and across the front of the patient **2303**. The central arm is also positioned approximately between the head **2310** and knees **2311** of the patient **2303**. In this embodiment, the central arm is also shown to extend in front of the chest **2312** of the patient **2303** and over the thighs **2308** of the patient **2303**. The distance between the suspended patient **2303** and the central arm **801** may prevent or reduce swaying of the suspended patient **2303**, improve the patient's **2303** feelings of safety and dignity, and improve a caregiver's **2301** ability to monitor the patient **2303** and the multi-functional patient transfer device **101**. With the patient **2303** suspended, the lift cart **103** may be used to transfer the patient **2303** to another location. In this embodiment, the patient interfaces **2304** include a two-piece, semi-rigid patient interface that is shown underneath the thighs **2308** and back **2309** of the patient. In one embodiment, the patient **2303** may be laterally transferred with the lift cart **103** employing a hoist **1201**, such as shown in **FIG. 12**, as an alternative to a lateral transfer with the central arm **801**. In one embodiment, the patient **2303** may be laterally transferred with the lift cart **103** employing the frontal bars **102** with individually rotating arms **120**, such as shown in **FIG. 5**, as an alternative to the central arm **801**.

[0093] Reference is now made to **FIGS. 24a-d**, which show examples of the method of operating one embodiment of the device of the present invention in connection with a seated transfer. In **FIG. 24a**, a patient **2401** is shown seated in a chair **2402**. A patient interface **2403** is also shown to be placed underneath the patient **2401** and between the patient **2401** and the chair **2402**. A lift cart **103** is shown to be in front of the patient **2401**. The frontal bars **102** of the lift cart **103** have been rotated so that the arms **120** of the frontal bars **102** extend vertically. In **FIG. 24b**, a caregiver **2404** is shown rotating the frontal bars **102** so that the arms **120** are rotating towards horizontal. The caregiver **2404** may also move the lift

cart **103** closer to the patient **2401**. The caregiver **2404** may also raise or lower the frontal bars **102** so that the height of the frontal bars **102** is, for example, between the shoulders and waist of the patient **2401**.

[0094] In **FIG 24c**, the lift cart **103** is shown to be positioned closer to the patient **2401**. The patient **2401** may, for example, place her feet onto footrests **111** connected to the base **105** of the lift cart **103**. The caregiver **2404** is shown to be attaching the patient interface **2403** to the frontal bars **102**. The caregiver **2404** has also spread the legs **107** of the lift cart **103** apart so that one leg **107** of the lift cart **103** extends along either side of the chair **2402**. Once the patient interface **2403** has been securely fastened to the frontal bars **102**, the lift cart **103** may be used to raise the frontal bars **102**, and the patient **2401** secured to the frontal bars **102** with the patient interface **2403**. In **FIG. 24d**, the lift cart **103** is shown supporting the patient **2401** above the seat **2405** of the chair **2402**. The central structure **104** of the lift cart **103** is also shown to have extended upward so as to raise the frontal bars **102** and the supported patient **2401**. With the patient **2401** suspended, the lift cart **103** may be used to transfer the patient **2401** to another location.

[0095] Reference is now made to **FIG. 25**, which shows an example of operating one embodiment of the device of the present invention in connection with a transition between sitting and standing. In **FIG. 25**, a patient **2501** is shown transitioning from a sitting position to a standing position. In one embodiment, patient interfaces **2502** may be placed behind the back **2503** and underneath the thighs **2504** of the patient **2501** while the patient **2501** is seated. The lift cart **103** may then be moved in front of the patient **2501**, the frontal bars **102** of the lift cart **103** may be rotated horizontally, and the patient interfaces **2502** may be attached to the frontal bars **102**. The wheels **110** of the lift cart **103** may also be locked to prevent the lift cart **103** from rolling. The cable **305**, shown in **FIG. 25** as a belt, has been attached to the outer handlebar **115** of the frontal bars **102** and an extension **2506** of the base

105 of the lift cart **103**. The length of the cable **305** may also be adjusted to match the rotation of the frontal bars **102** with the vertical movement of the central structure **104** and/or personal attributes of the patient **2501**. Such personal attributes of the patient **2501** may include height, torso length, arm length, and/or leg length. The patient **2501** is shown in **FIG. 25** to grip the attachment bar **116** of the frontal bars **102**. Alternatively, the patient **2501** may choose to grip the arms **120** of the frontal bars **102**. The patient **2501** may also choose to place her feet **2505** on the ground or on footrests **111** attached at the base **105** of the lift cart **103**. As the central structure **104** is raised, the cable **305** assists the rotation of the frontal bars **102** from a position in which the arms **120** of the frontal bars **102** extend horizontally to a position in which the arms **120** of the frontal bars **102** extend at an angle between horizontal and vertical, such as shown in **FIG. 25**. This rotation of the frontal bars **102** may allow the patient interfaces **2502** to partially support the weight of the patient **2501** and move the center of gravity of the patient **2501** closer in line vertically with her feet **2505**. In one embodiment, the patient **2501** may also rest her knees or shins against a knee blocker (not shown) as the rotation of the frontal bars **102** raise her upper torso towards the lift cart **103**. If the feet **2505** are placed on the footrests **111**, the lift cart **103** may also be used to transfer the patient **2501** in a standing or near standing position. In one embodiment, the patient **2501** may repeat transitions between a sitting and standing position with the multi-functional patient transfer device **101** as part of rehabilitation therapy.

[0096] It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove and other embodiments may fall within the spirit and scope of the invention, as defined by the following claims.

CLAIMS

What is claimed is:

1. A patient transfer device comprising:

   a lift cart containing a central structure;

   a central arm connectable to said central structure and including a patient interface connectable to said central arm;

   wherein the shape of said central arm includes a curve that approximates the curvature of the chest of a patient; and

   wherein said central structure is capable of raising and lowering said patient with said patient interface supporting said patient, with said patient interface connected to said central arm, and with said central arm extending horizontally across the front of said patient and positioned approximately between the head and knees of said patient.

2. The device of claim 1 wherein the direction of said curve may be adjusted.

3. The device of claim 1 wherein the direction of said curve may be adjusted by connecting said central arm to said central structure in multiple orientations.

4. The device of claim 1 wherein the direction of said curve may be adjusted by rotating said central arm about its longitudinal axis.

5. The device of claim 1 wherein said central arm may be stored vertically on said lift cart.

6. The device of claim 1 wherein said central arm connects to said central structure by connecting to a safety mechanism that is attached to said central structure.

7. The device of claim 1 wherein said central structure allows said central arm to pivot upwards if an upwardly directed force is applied to the underside of said central arm.

8. The device of claim 1 wherein a tabletop may connect to said central arm.

9. The device of claim 1 wherein said central arm includes a winch.

10. The device of claim 1 wherein said central arm includes a detachable handle.

11. The device of claim 1 wherein said lift cart includes a safety cushion.

12. The device of claim 1 wherein said patient interface includes foldable panels.

13. The device of claim 1 wherein said patient interface includes a buttock/link support and two or more of a backrest sling, a thigh sling, and straps.

14. The device of claim 1 wherein said central structure is connectable to frontal bars and capable of raising and lowering said frontal bars.

15. The device of claim 1 wherein said central structure is connectable to frontal bars and capable of raising and lowering said frontal bars; wherein said frontal bars have two arms that are approximately parallel; and wherein said frontal bars may rotate between angles in which said arms extend outward from the lift cart with an

approximately horizontal orientation and angles in which said arms extend upwards from said lift cart with an approximately vertical orientation.

16. The device of claim 1 wherein said central structure is connectable to a lift-fork and capable of raising and lowering said lift-fork.

17. The device of claim 1 wherein said central structure is connectable to a hoist and capable of raising and lowering said hoist.

18. The device of claim 1 wherein said central structure is connectable to a transfer chair and capable of raising and lowering said transfer chair.

19. A patient transfer device comprising:

a lift cart containing a central structure;

frontal bars connectable to said central structure and having two arms that are approximately parallel;

a cable connectable to said frontal bars and to said lift cart;

wherein said central structure is capable of raising and lowering said frontal bars;

wherein said frontal bars may rotate between angles in which said arms extend outward from said lift cart with an approximately horizontal orientation and angles in which said arms extend upwards from said lift cart with an approximately vertical orientation; and

wherein said cable may assist the rotation of said frontal bars when said central structure raises said frontal bars.

20. The device of claim 19 wherein said lift cart includes two legs that extend horizontally from said lift cart and may be spread apart.

21. The device of claim 19 wherein said frontal bars include an inner handlebar and an outer handlebar.

22. The device of claim 19 wherein said cable connects to a lever position of said frontal bars.

23. The device of claim 19 wherein said cable connects to a secure position of said lift cart.

24. The device of claim 19 wherein the length of said cable may be adjusted in order to synchronize said rotation of said frontal bars with said raising of said frontal bars.

25. The device of claim 19 wherein the length of said cable may be adjusted in order to synchronize said rotation of said frontal bars with a personal attribute of a patient.

26. The device of claim 19 wherein the width of said arms of said frontal bars may be adjusted.

27. The device of claim 19 wherein the height of said arms of said frontal bars may be adjusted without moving said central structure.

28. The device of claim 19 wherein said frontal bars include at least one elongated s-shaped arm that may be rotated about its longitudinal axis.

29. The device of claim 19 wherein at least one of said arms of said frontal bars may individually pivot.

30. The device of claim 19 wherein a tabletop may be connected to said frontal bars.

31. The device of claim 19 further comprising a frontal bar cushion connectable to said frontal bars.

32. The device of claim 19 wherein said lift cart includes a safety cushion.

33. The device of claim 19 wherein said frontal bars include a winch.

34. The device of claim 19 wherein said frontal bars include a detachable handle.

35. The device of claim 19 further comprising a central arm connectable to said central structure and including a patient interface connectable to said central arm; wherein said central structure is capable of raising and lowering a patient with said patient interface supporting said patient, with said patient interface connected to said central arm, and with said central arm extending horizontally across the front of said patient and positioned approximately between the head and the knees of said patient.

36. The device of claim 19 wherein said central structure is connectable to a lift-fork capable of raising and lowering said lift-fork.

37. The device of claim 19 wherein said central structure is connectable to a hoist and capable of raising and lowering said hoist.

38. The device of claim 19 wherein said central structure is connectable to a transfer chair and capable of raising and lowering said transfer chair.

39. The device of claim 19 further comprising a patient interface that includes foldable panels.

40. The device of claim 19 further comprising a patient interface that includes a buttock/link support and two or more of a backrest sling, a thigh sling, and straps.

41. A patient transfer device comprising:

a lift cart containing a central structure;

a central arm connectable to said central structure and including a patient interface connectable to said central arm;

frontal bars having two arms that are approximately parallel;

wherein said central structure is connectable to said frontal bars and capable of raising and lowering said frontal bars; and

wherein said central structure is capable of raising and lowering a patient with said patient interface supporting said patient, with said patient interface connected to said central arm, and with said central arm extending horizontally across the front of said patient and positioned approximately between the head and knees of said patient.

42. The device of claim 41 wherein the shape of said central arm includes a curve that approximates the curvature of the chest of said patient.

43. The device of claim 41 wherein the shape of said central arm includes a curve that approximates the curvature of the chest of said patient and wherein the direction of said curve may be adjusted.

44. The device of claim 41 wherein the shape of said central arm includes a curve that approximates the curvature of the chest of said patient and wherein the direction of said curve may be adjusted by connecting said central arm to said central structure in multiple orientations.

45. The device of claim 41 wherein said central arm includes a curve that approximates the curvature of the chest of said patient and wherein the direction of said curve may be adjusted by rotating said central arm about its longitudinal axis.

46. The device of claim 41 wherein said central arm may be stored vertically on said lift cart.

47. The device of claim 41 wherein said central arm connects to said central structure by connecting to a safety mechanism that is attached to said central structure.

48. The device of claim 41 wherein said central structure allows said central arm to pivot upwards if an upwardly directed force is applied to the underside of said central arm.

49. The device of claim 41 wherein a tabletop may connect to said central arm.

50. The device of claim 41 wherein said central arm includes a winch.

51. The device of claim 41 wherein said central arm includes a detachable handle.

52. The device of claim 41 wherein said lift cart includes a safety cushion.

53. The device of claim 41 wherein said patient interface includes foldable panels.

54. The device of claim 41 wherein said patient interface includes a buttock/link support and two or more of a backrest sling, a thigh sling, and straps.

55. The device of claim 41 wherein said frontal bars may rotate between angles in which said arms extend outward from the lift cart with an approximately horizontal orientation and angles in which said arms extend upwards from said lift cart with an approximately vertical orientation.

56. The device of claim 41 wherein said central structure is connectable to a lift-fork and capable of raising and lowering said lift-fork.

57. The device of claim 41 wherein said central structure is connectable to a hoist and capable of raising and lowering said hoist.

58. The device of claim 41 wherein said central structure is connectable to a transfer chair and capable of raising and lowering said transfer chair.

59. The device of claim 41 wherein the width of said arms of said frontal bars may be adjusted.

60. The device of claim 41 wherein the height of said arms of said frontal bars may be adjusted without moving said central structure.

61. The device of claim 41 wherein said frontal bars include at least one elongated s-shaped arm that may be rotated about its longitudinal axis.

62. The device of claim 41 wherein at least one of said arms of said frontal bars may individually pivot.

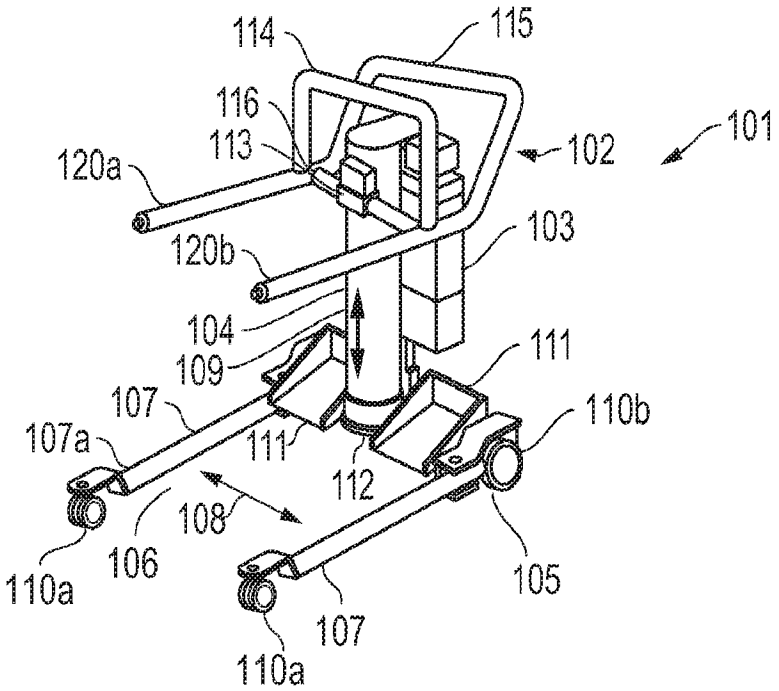

114
115
116
113
102
101
120a
103
120b
104
111
109
107
110b
107a
111
112
108
106
110a
105
107
110a

FIG. 1

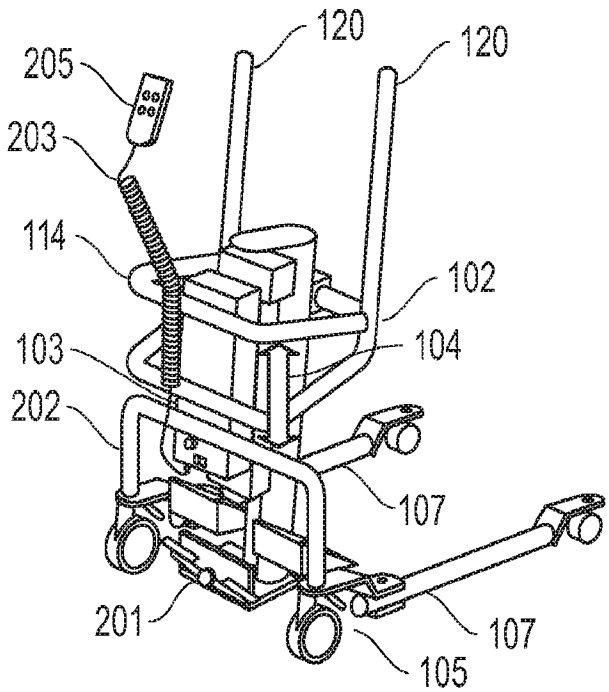

120
120
205
203
114
102
104
103
202
107
201
107
105

FIG. 2

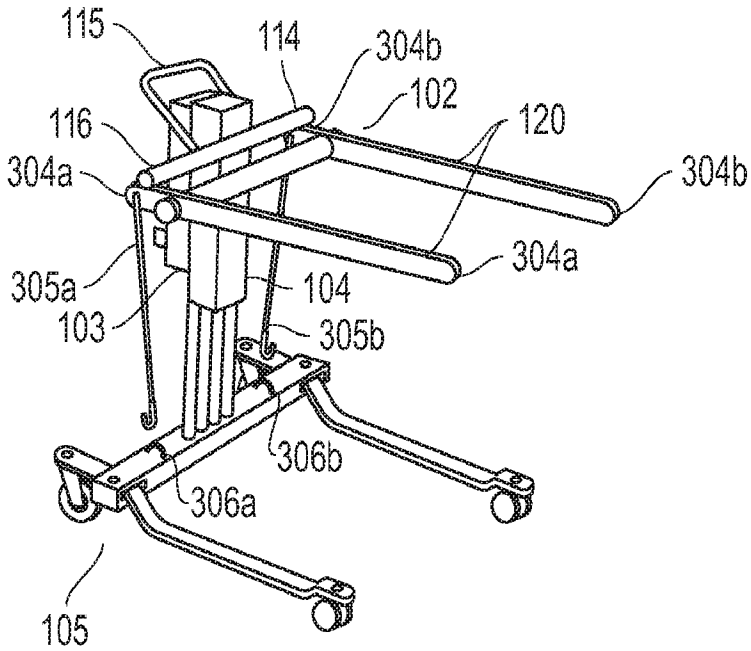

115
114
304b
102
120
116
304a
304b
304a
305a
104
103
305b
306b
306a
105

FIG. 3A

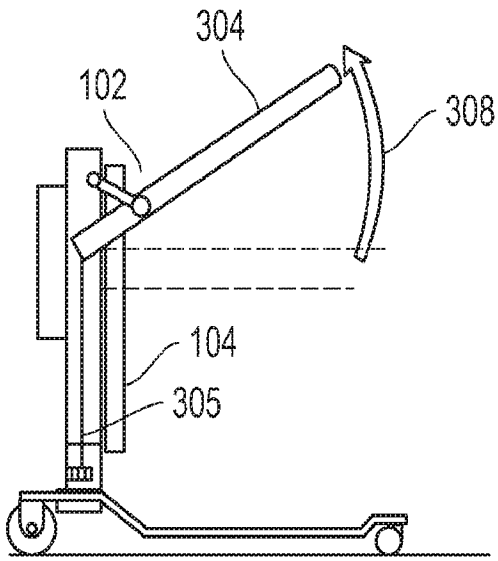

304
102
308
104
305

FIG. 3B

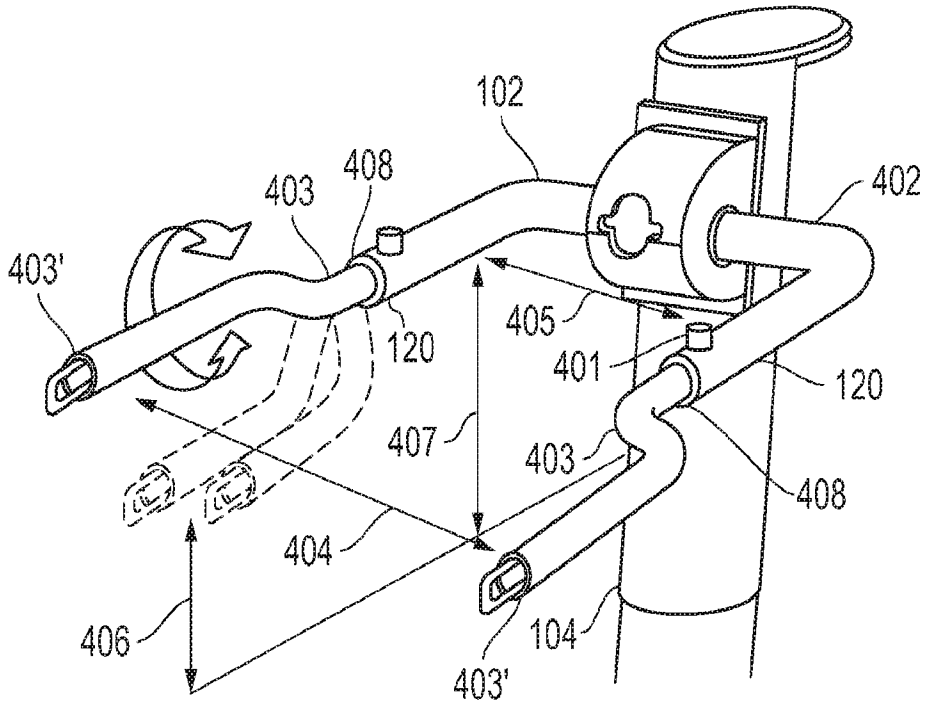

102
403
408
402
403'
405
120
401
120
407
403
408
404
406
104
403'

FIG. 4

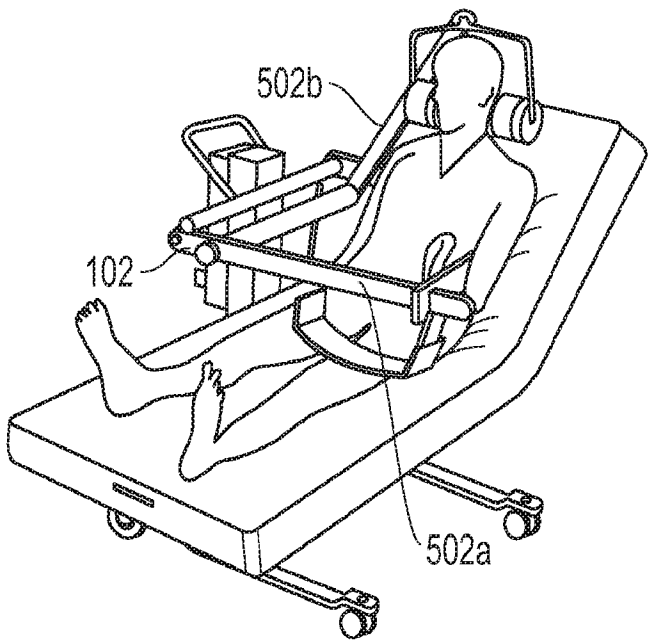

502b
102
502a

FIG. 5

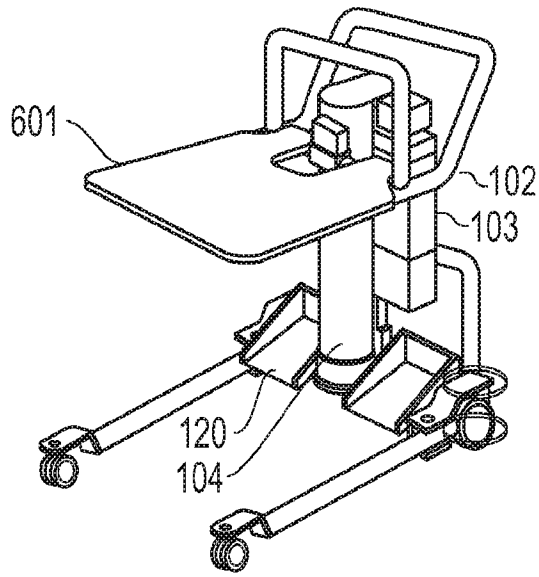


FIG. 6

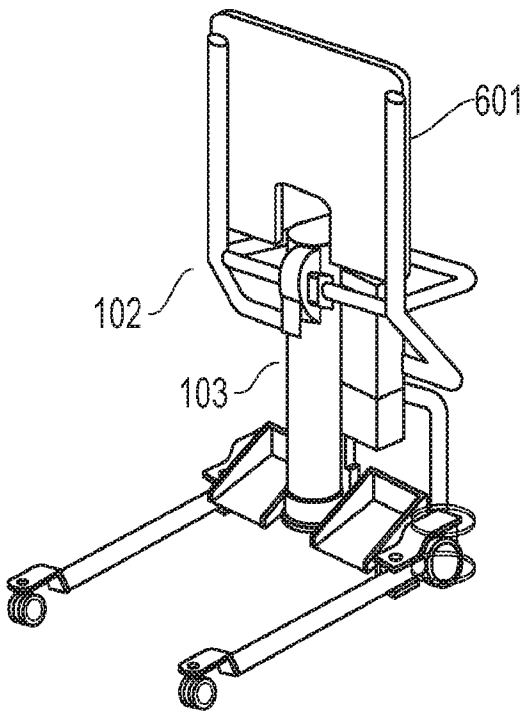


FIG. 7

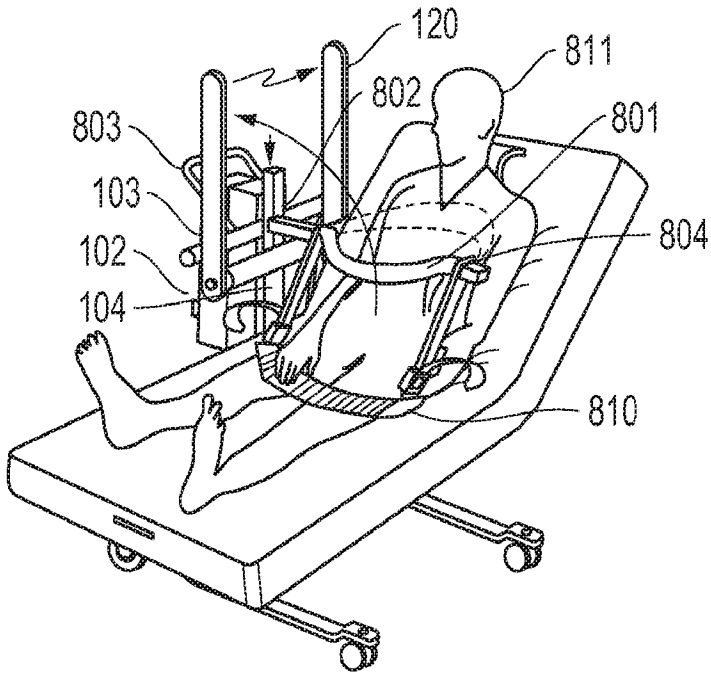


FIG. 8A

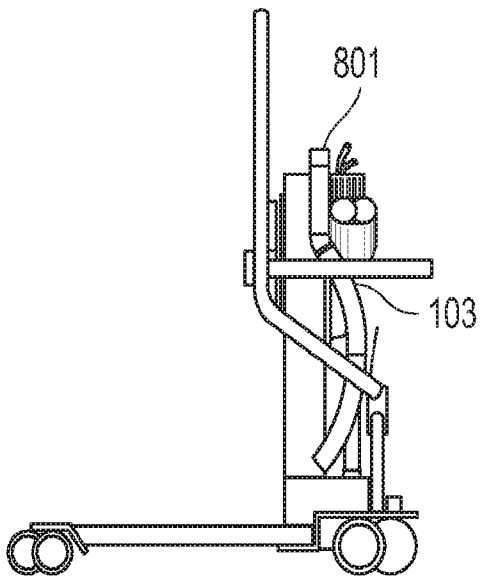


FIG. 8B

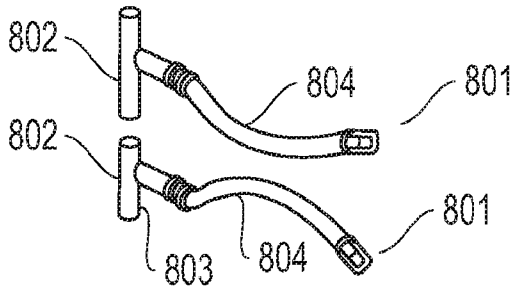


FIG. 8C

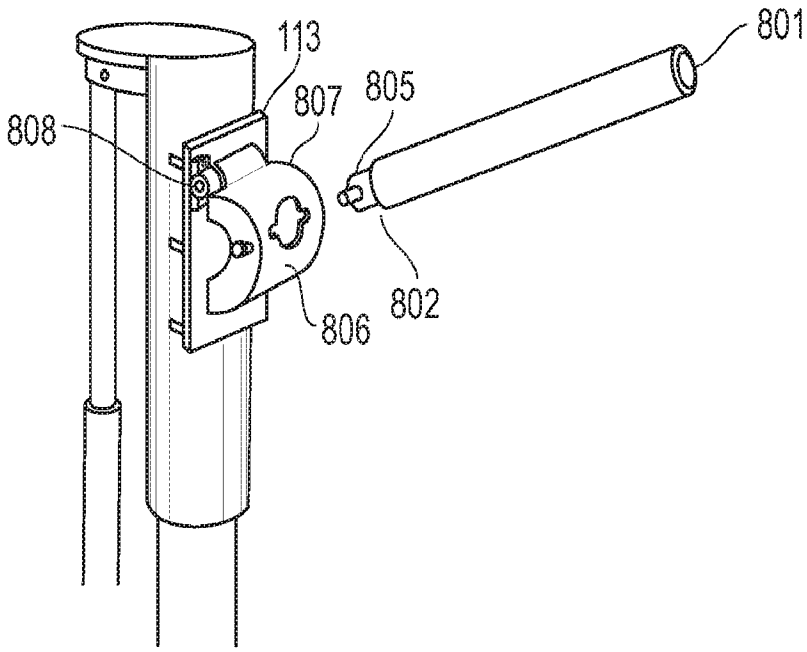


FIG. 8D

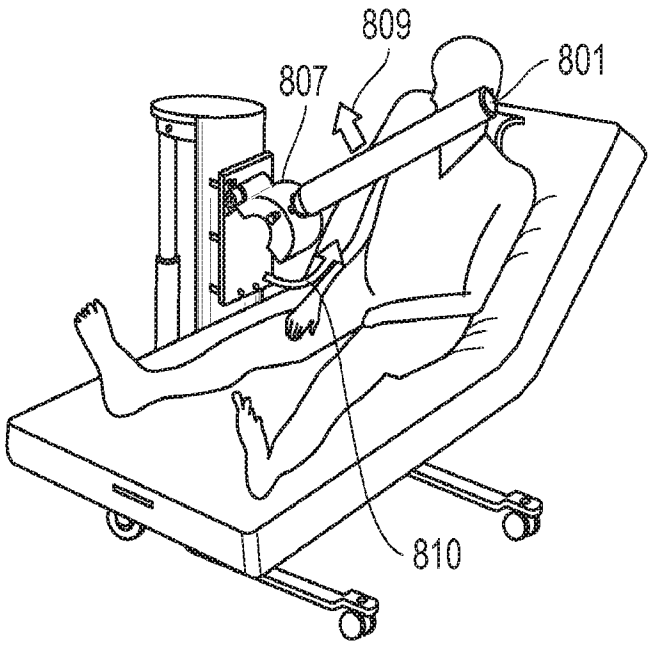


FIG. 8E

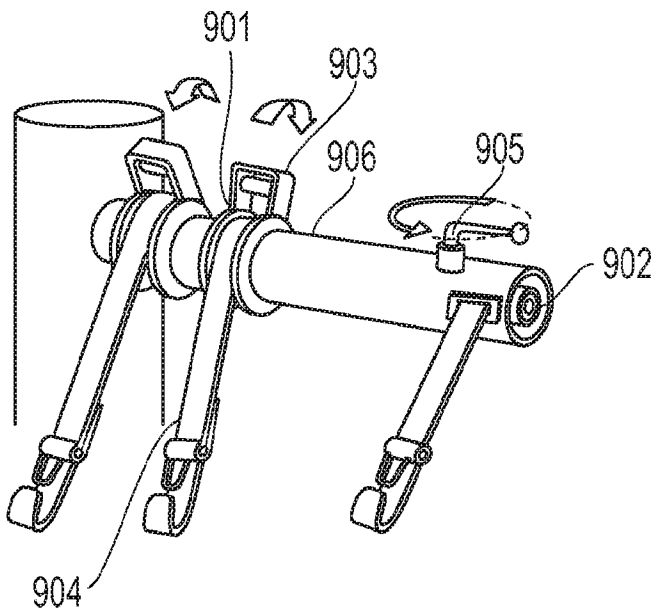


FIG. 9

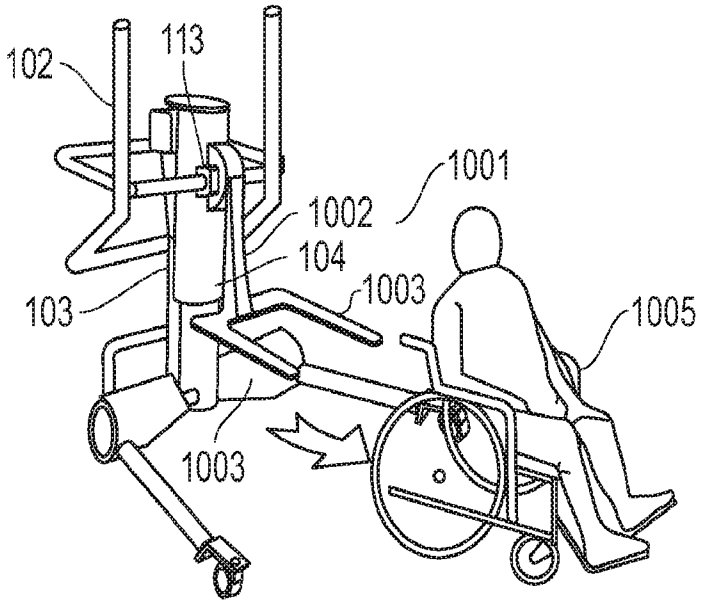

102
113
1001
1002
104
103
1003
1005
1003

FIG. 10

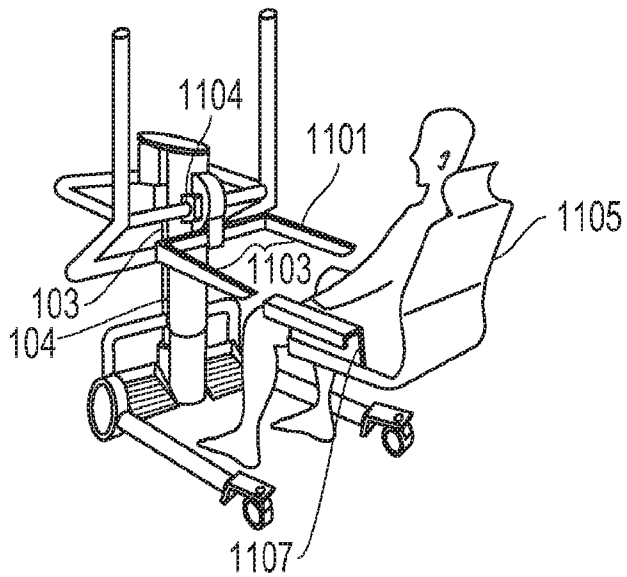

1104
1101
1105
1103
103
104
1107

FIG. 11

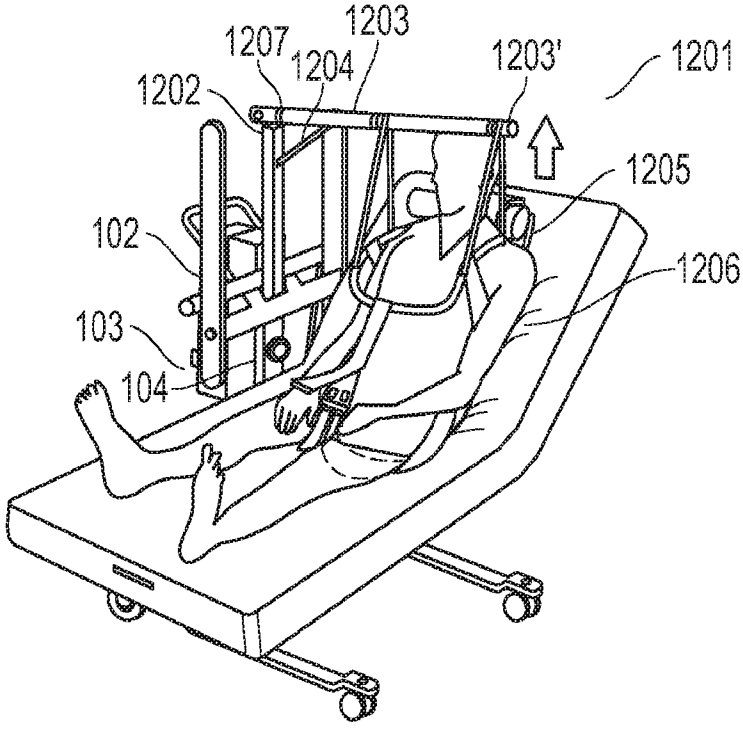

1207
1203
1204
1203'
1201
1202
1205
102
1206
103
104

FIG. 12

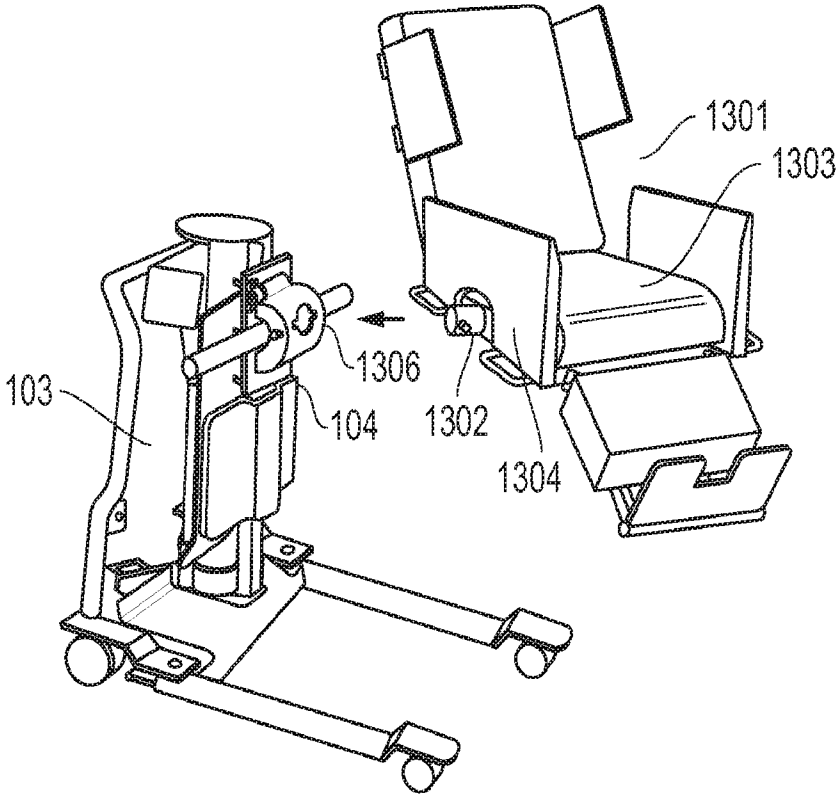

1301
1303
1306
103
104
1302
1304

FIG. 13.

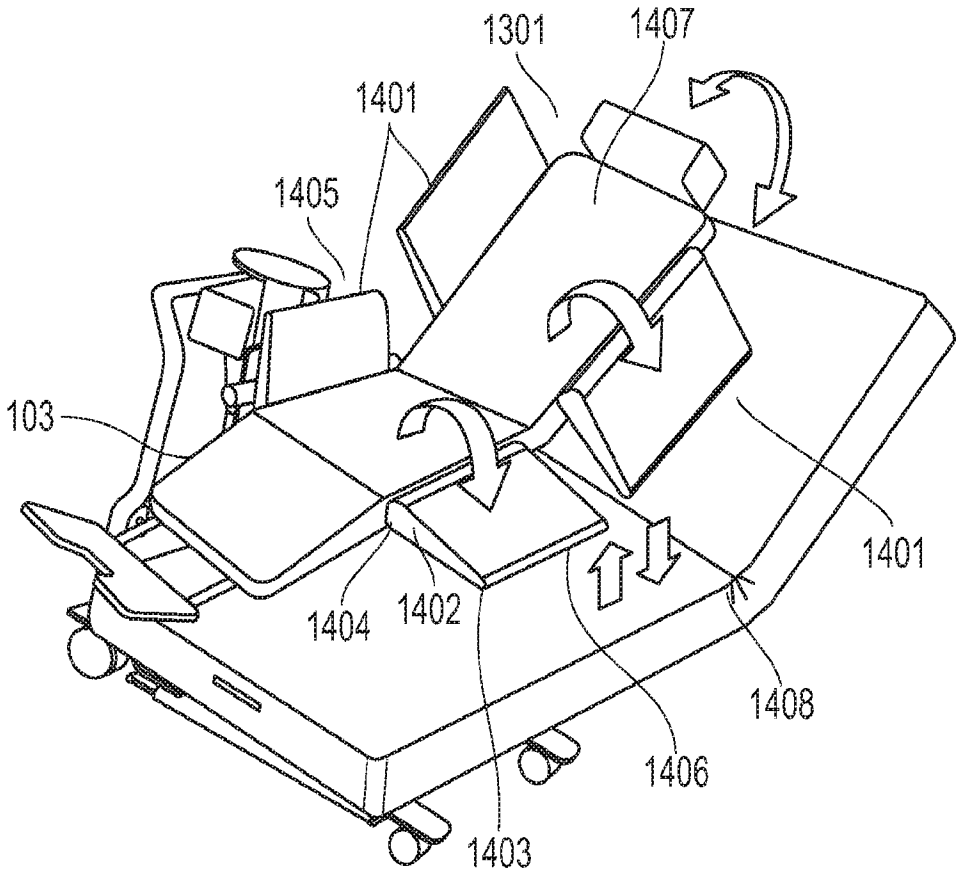

1301
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1405
103
1401
1404
1402
1408
1406
1403

FIG. 14

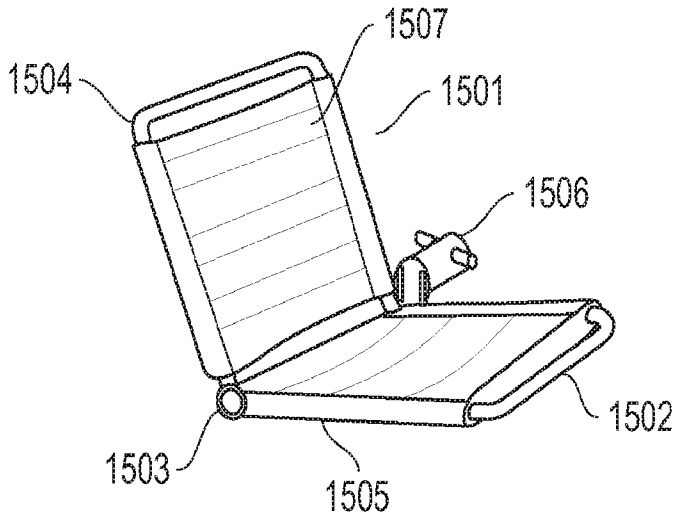

1507
1504
1501
1506
1502
1503
1505

FIG. 15

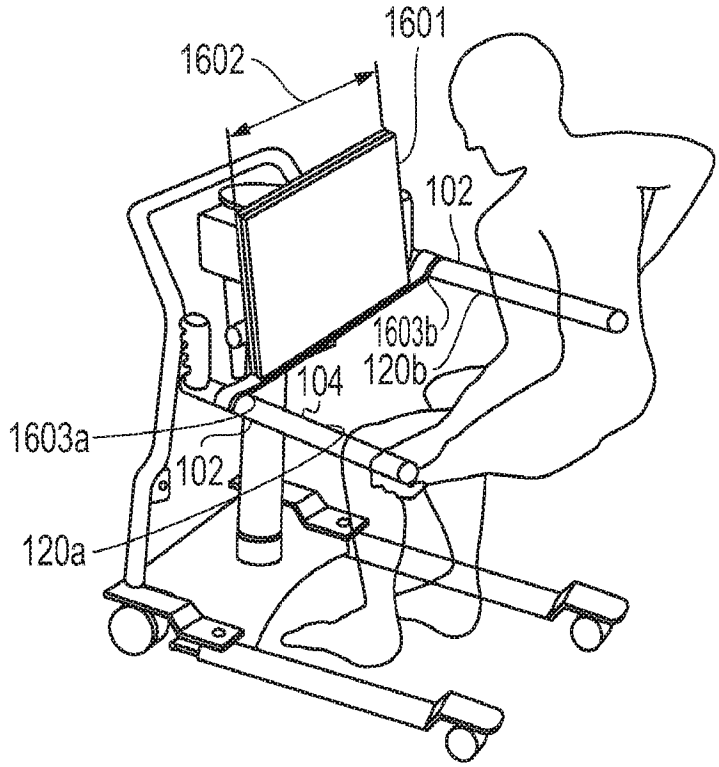


FIG. 16A

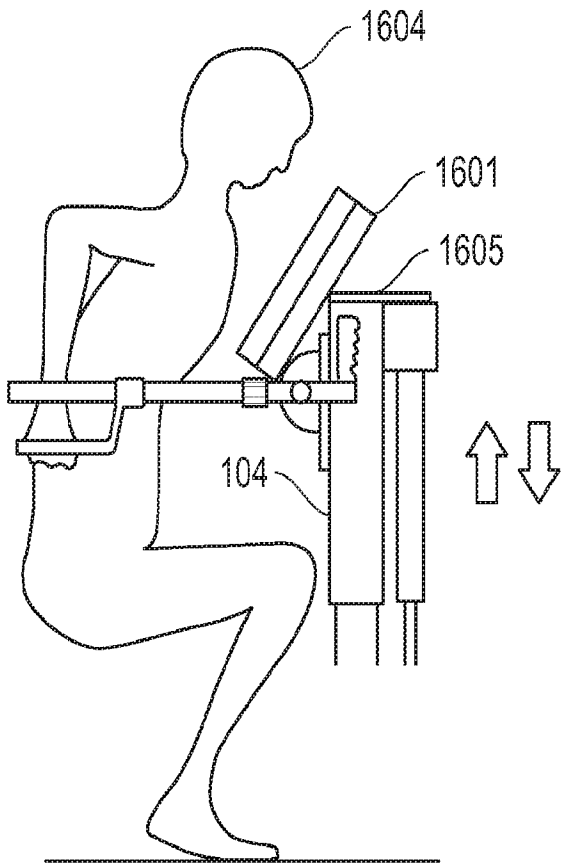


FIG. 16B

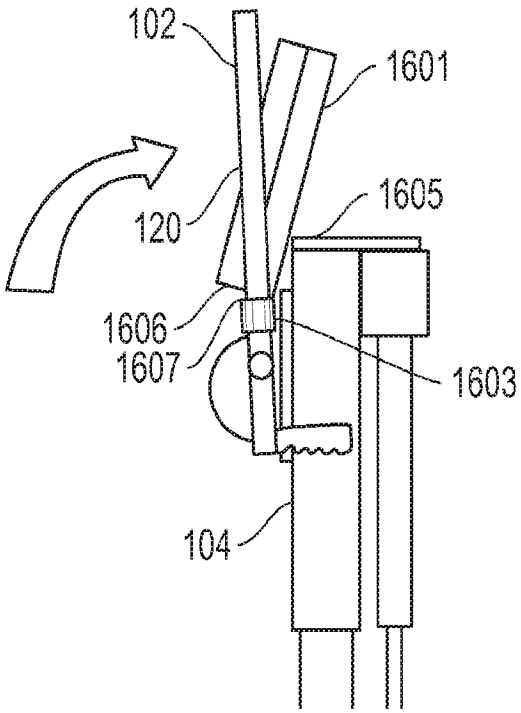


FIG. 16C

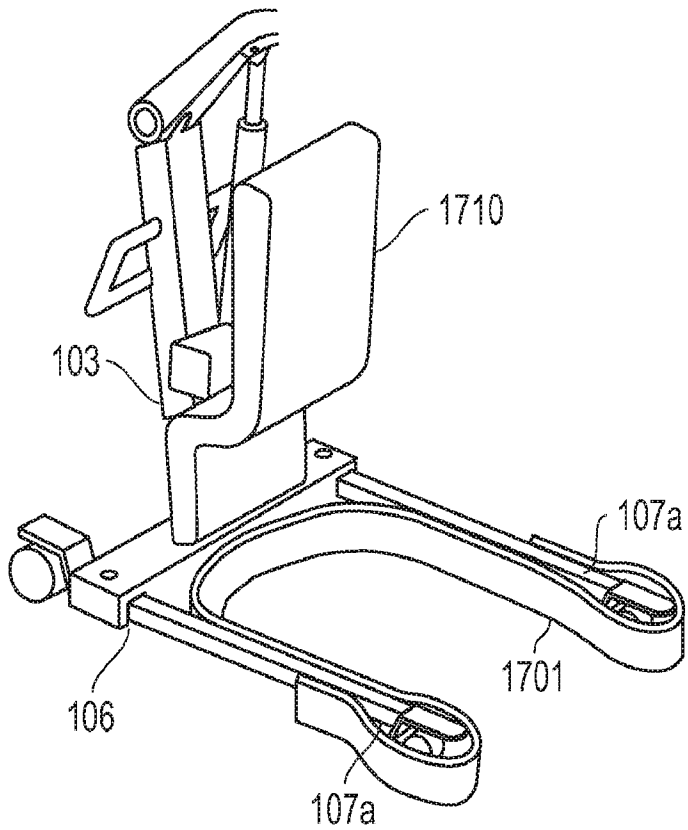


FIG. 17A

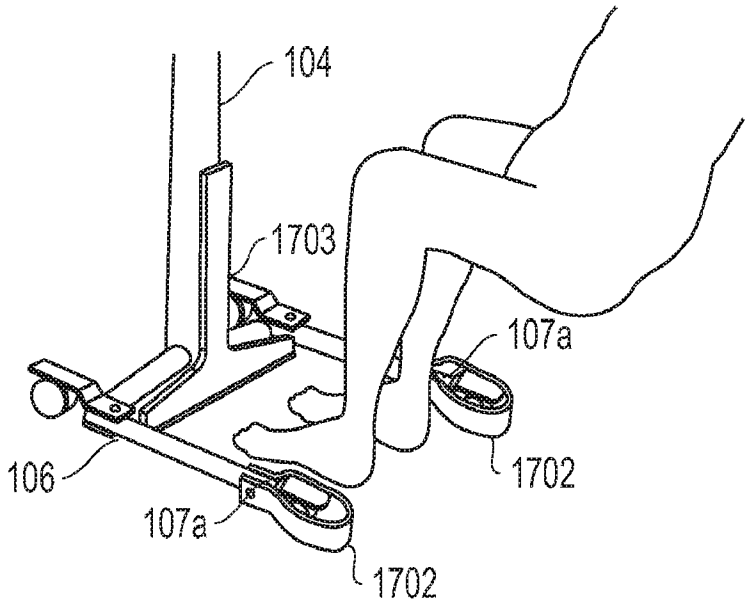


FIG. 17B

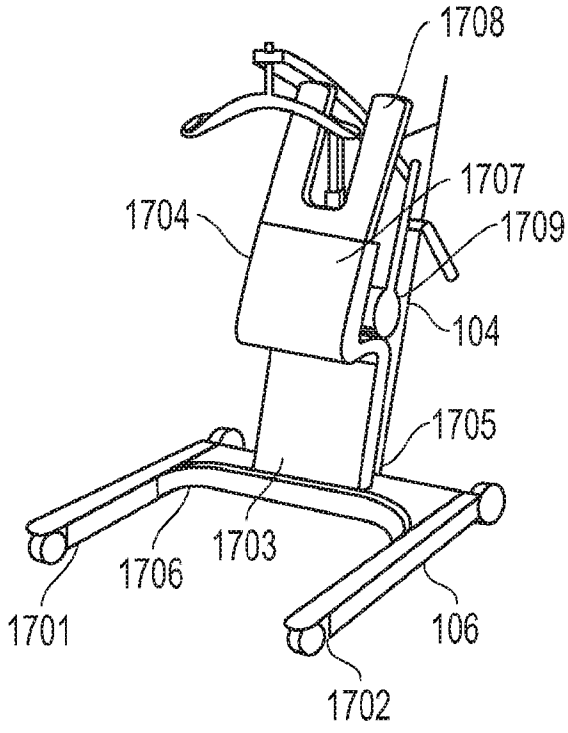


FIG. 17C

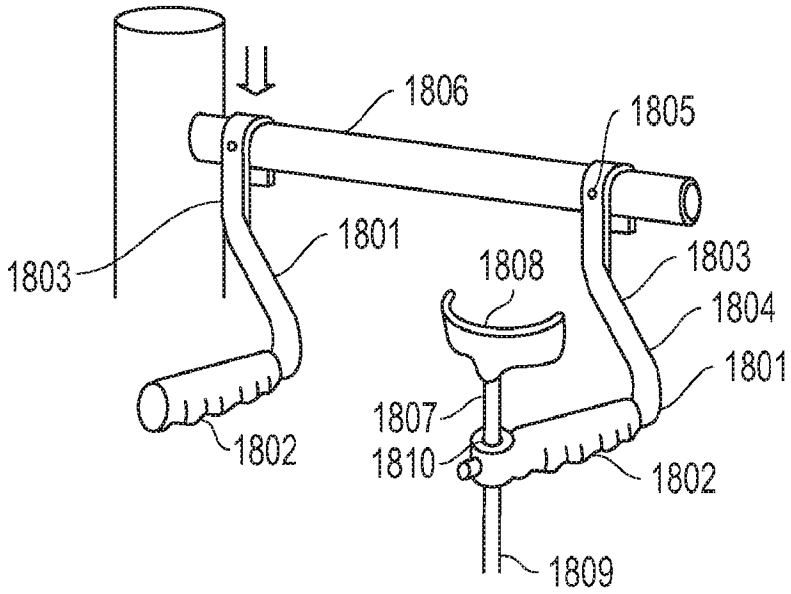


FIG. 18A

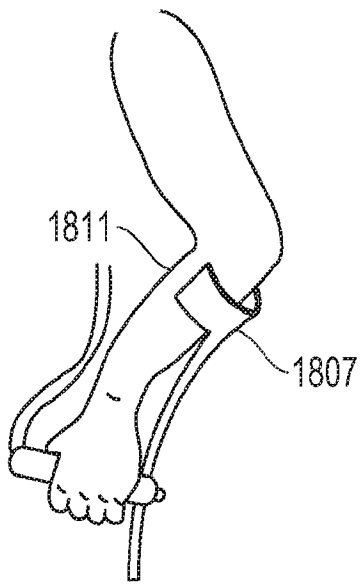


FIG. 18B

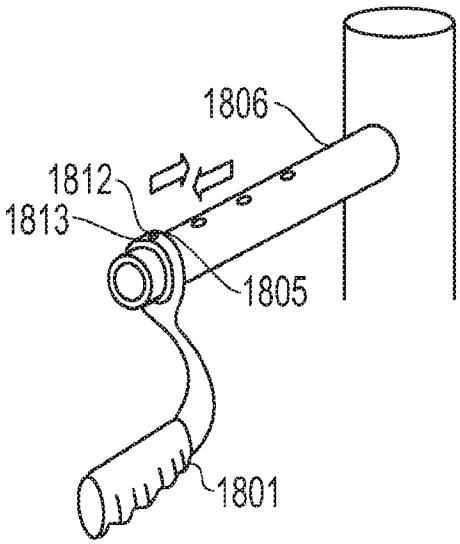


FIG. 18C

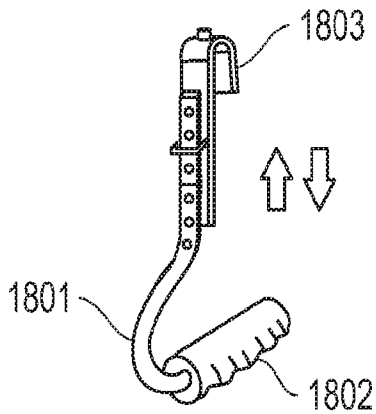


FIG. 18D

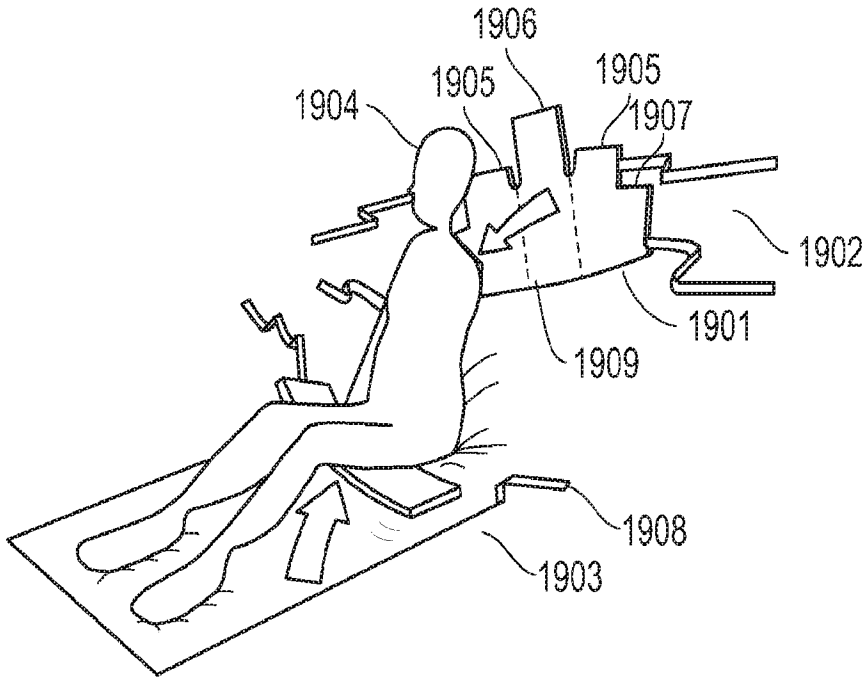


FIG. 19

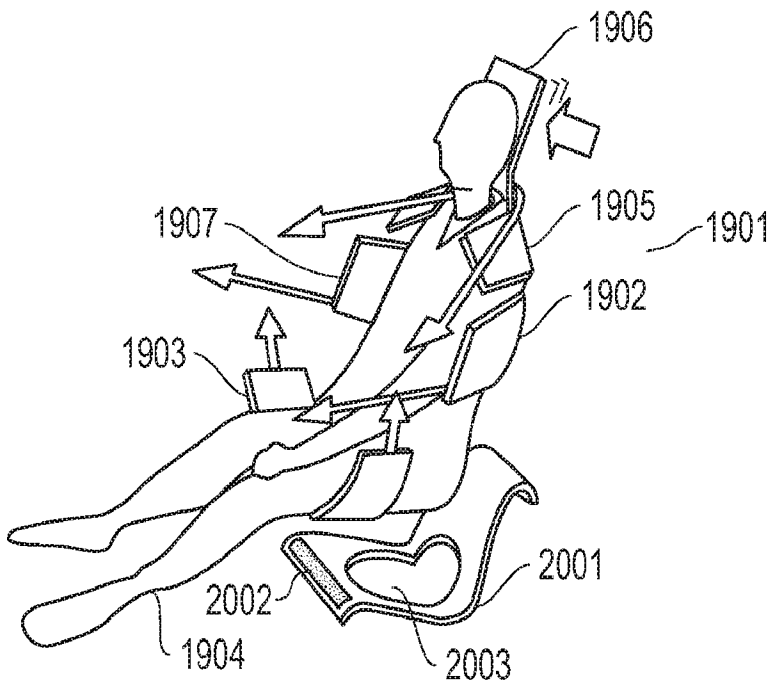


FIG. 20A

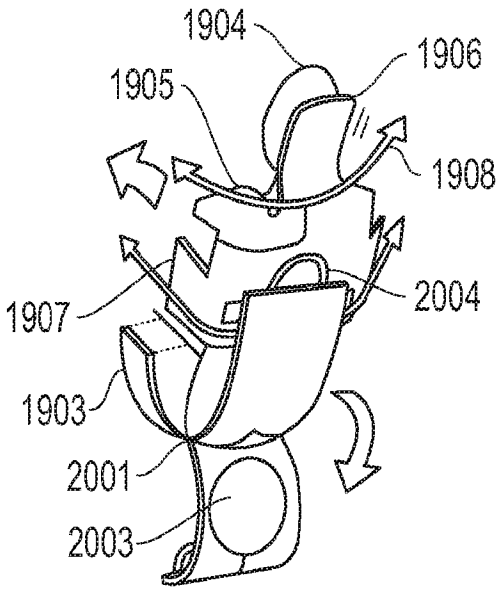


FIG. 20B

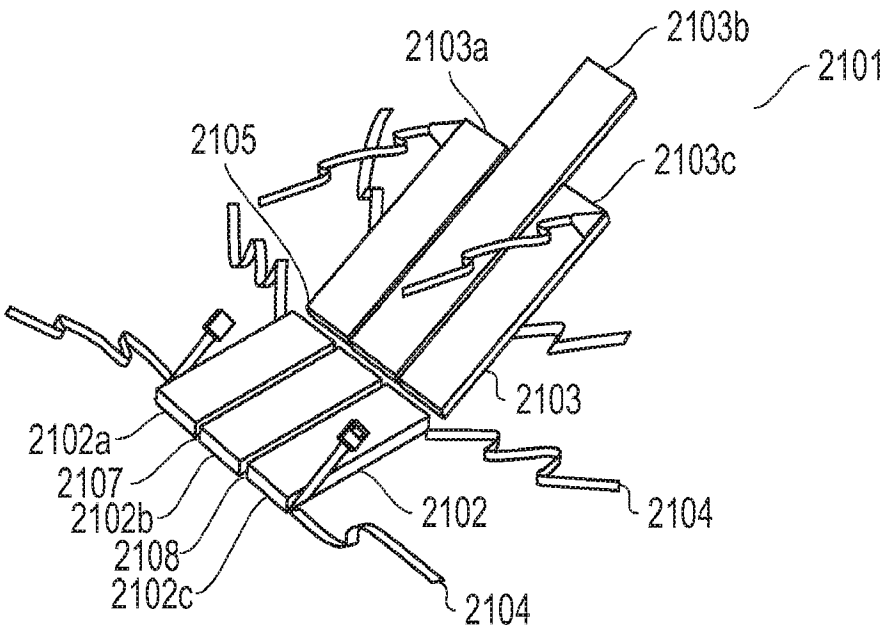


FIG. 21A

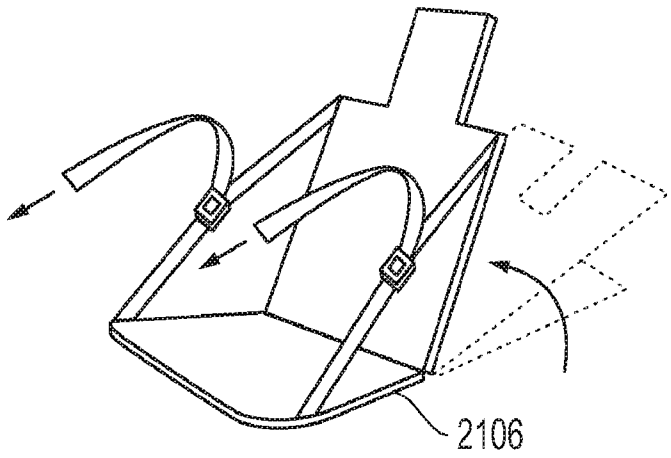


FIG. 21B

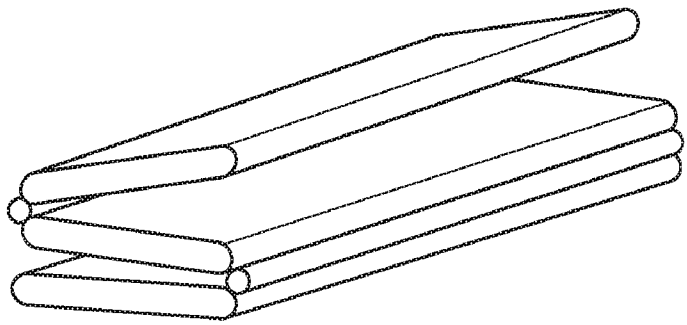


FIG. 21C

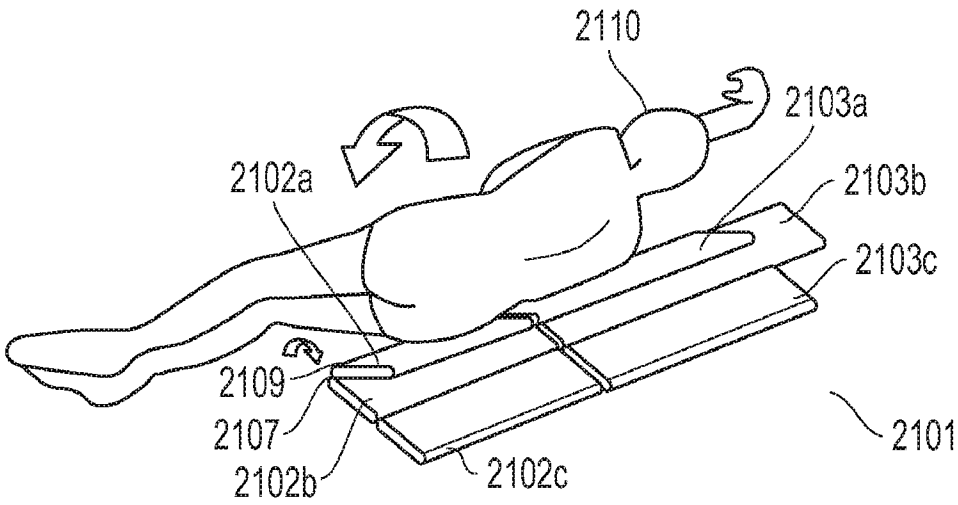


FIG. 21D

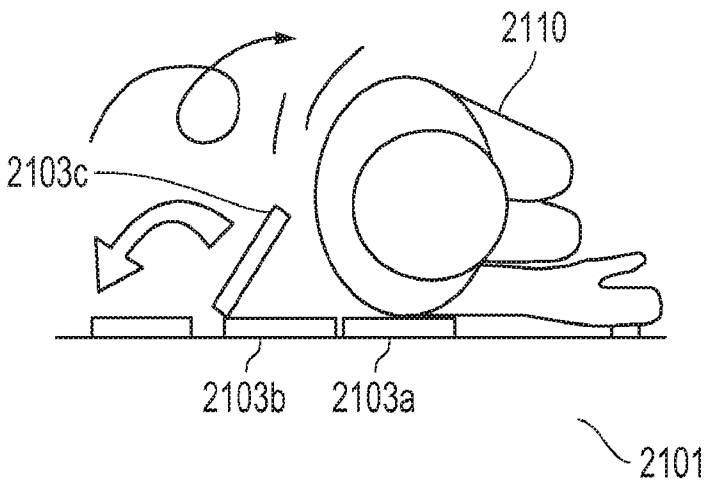


FIG. 21E

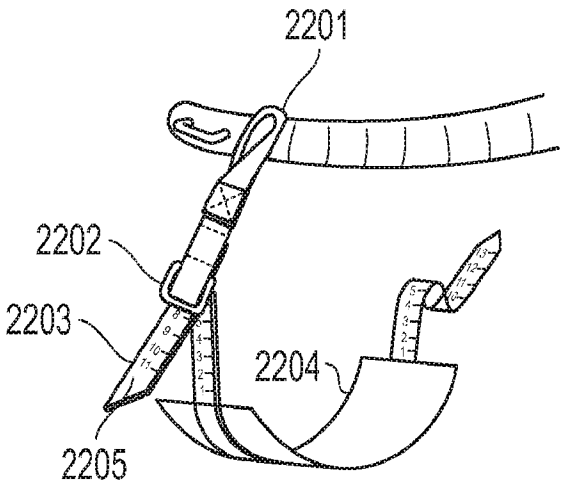


FIG. 22A

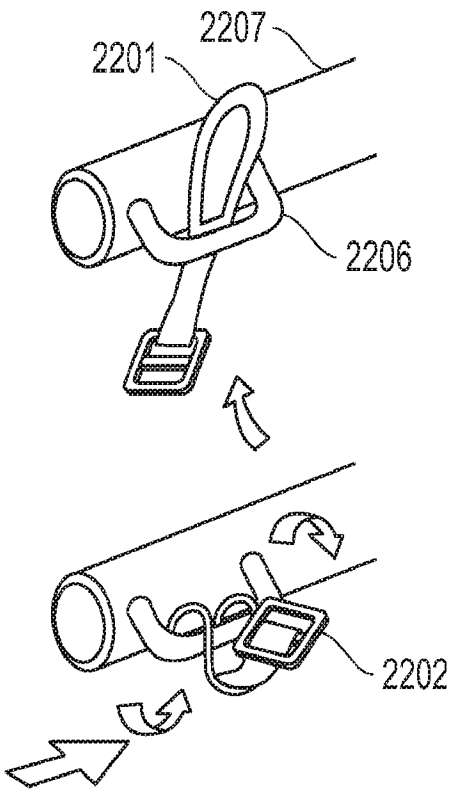


FIG. 22B

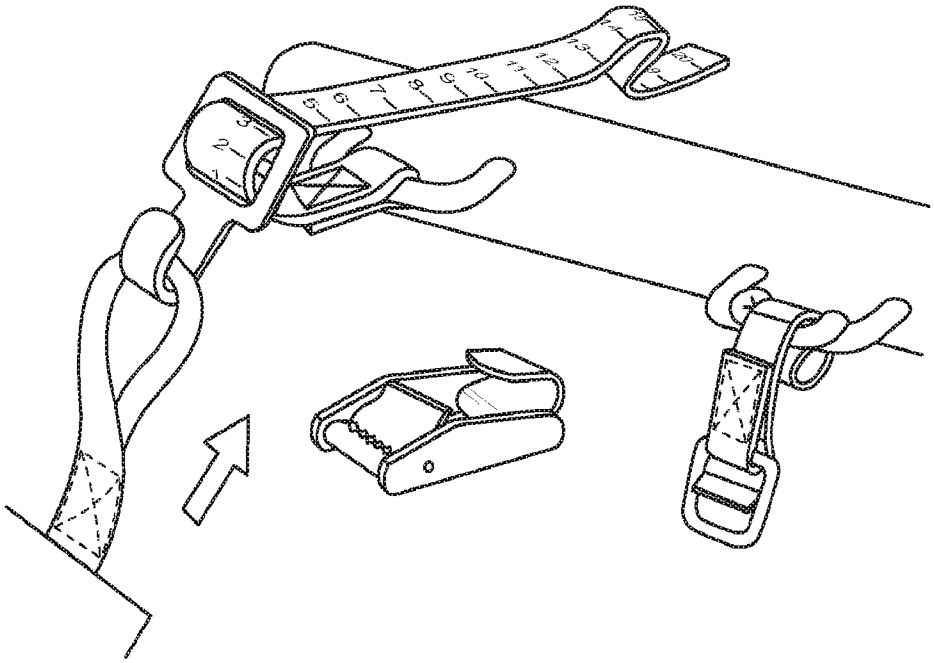


FIG. 22C

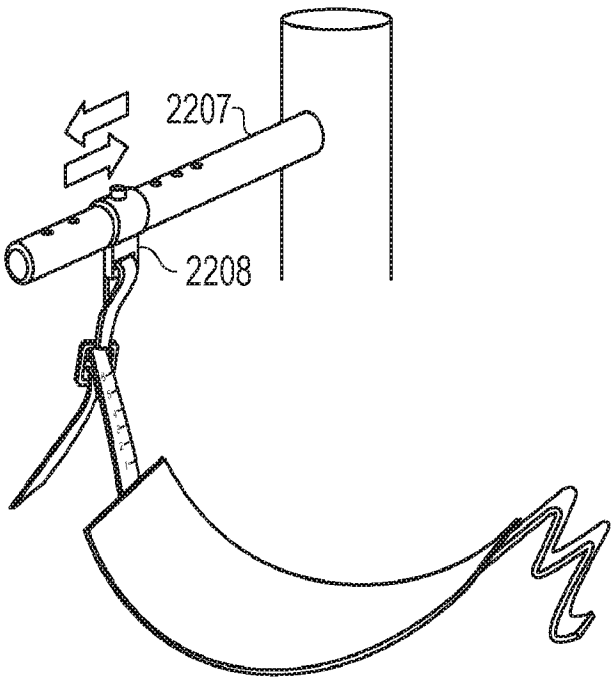


FIG. 22D

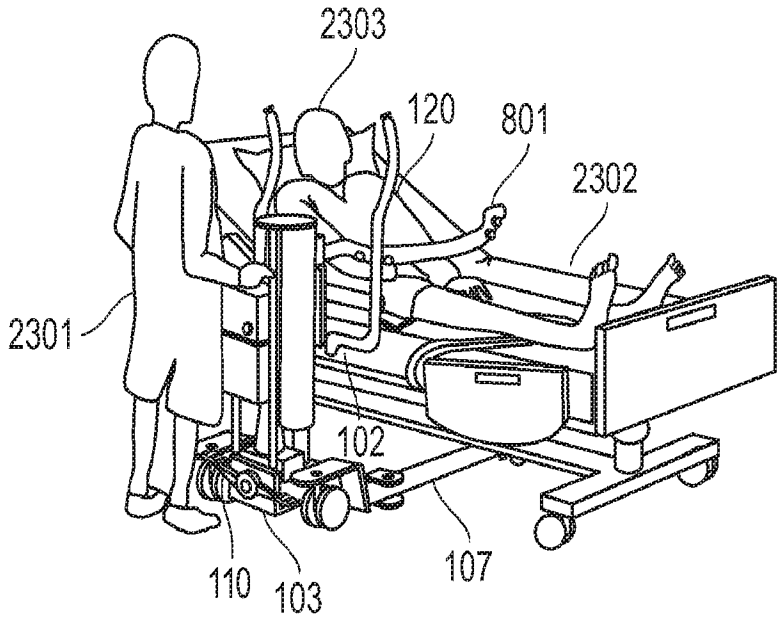


FIG. 23A

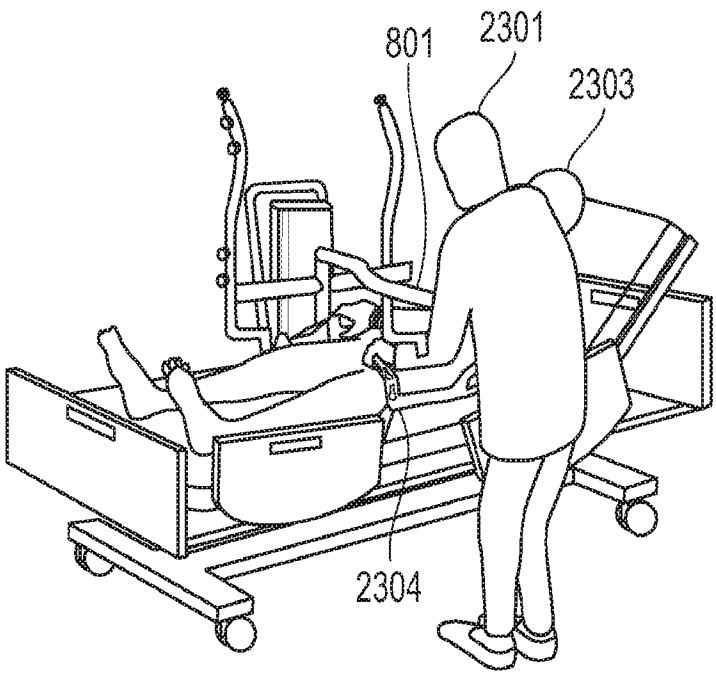


FIG. 23B

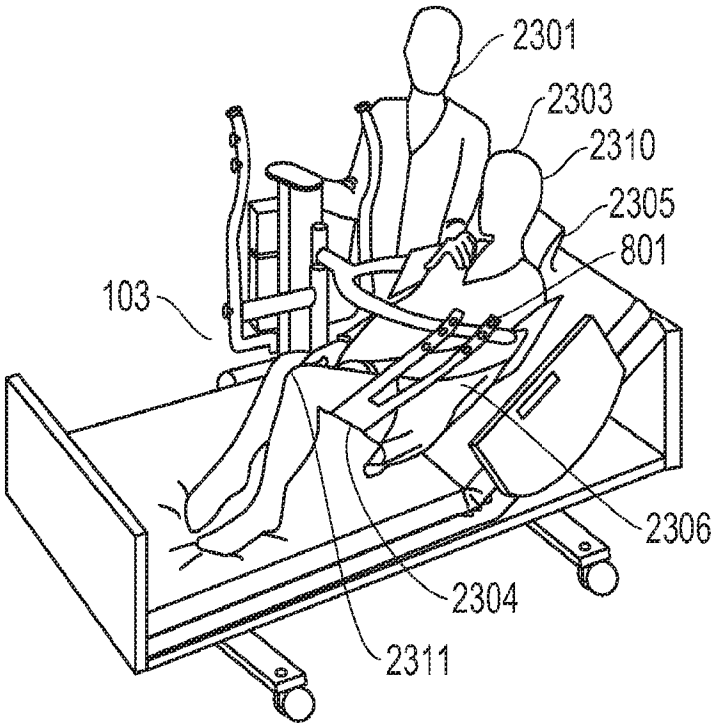


FIG. 23C

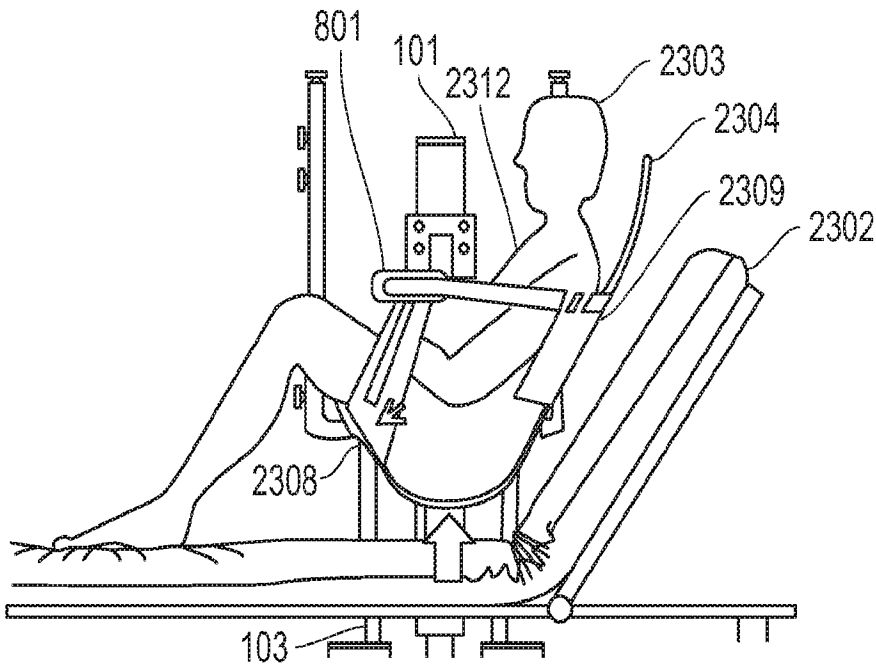


FIG. 23D

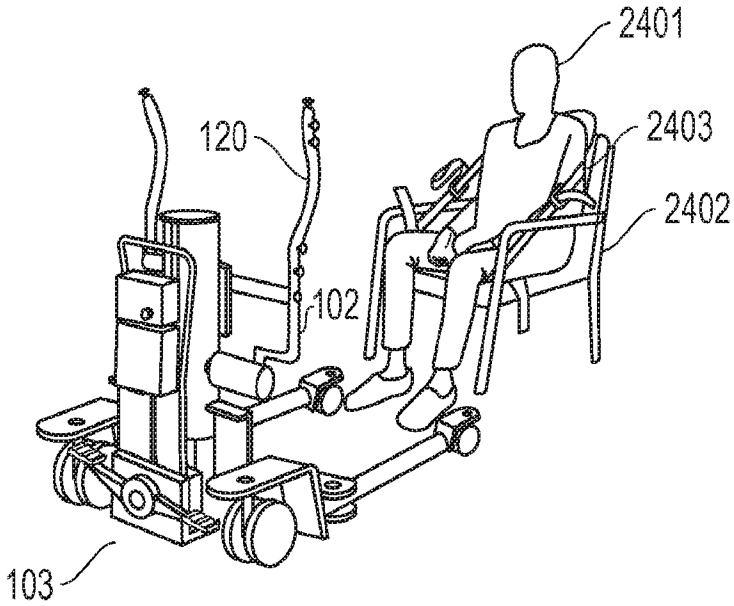


FIG. 24A

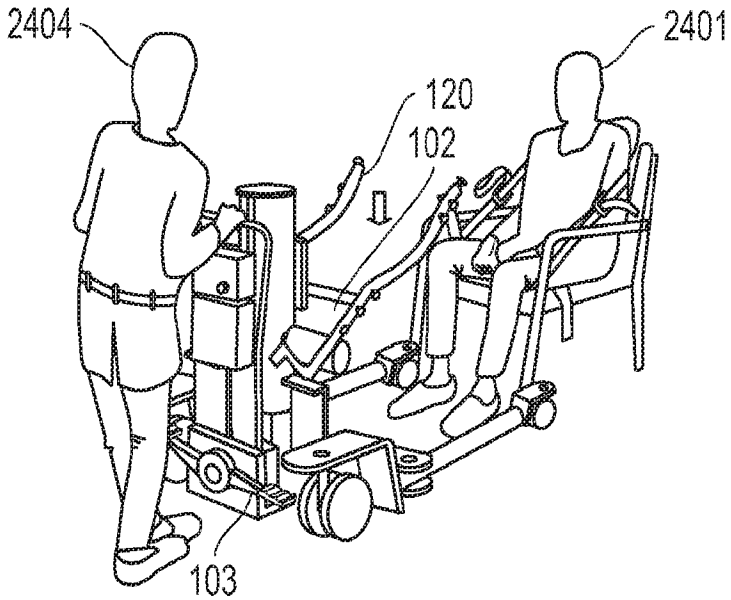


FIG. 24B

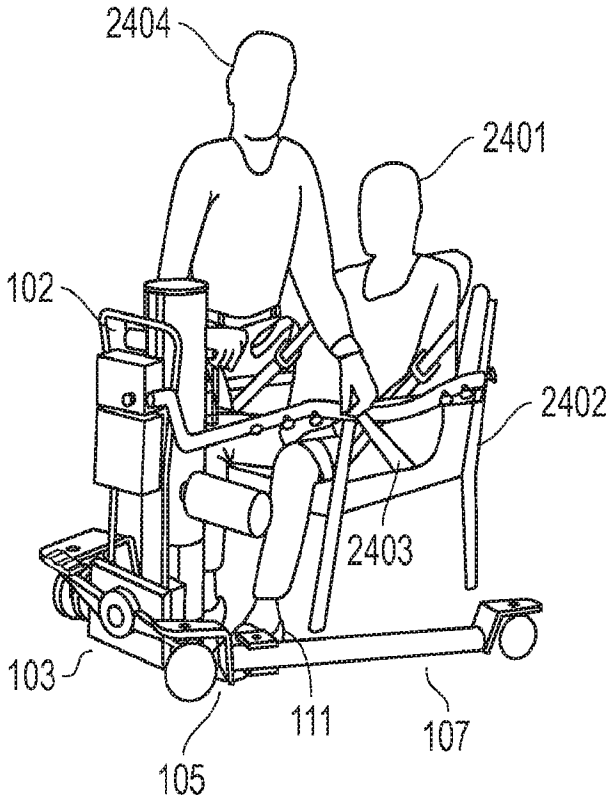


FIG. 24C

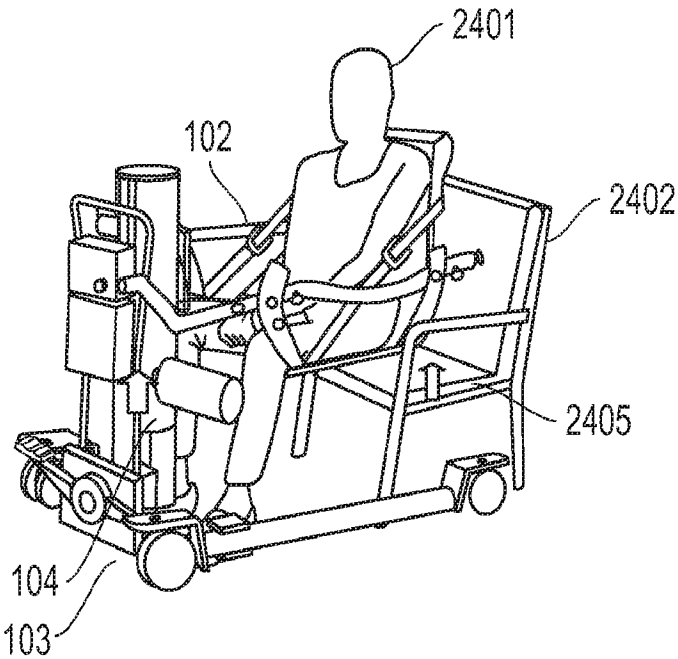


FIG. 24D

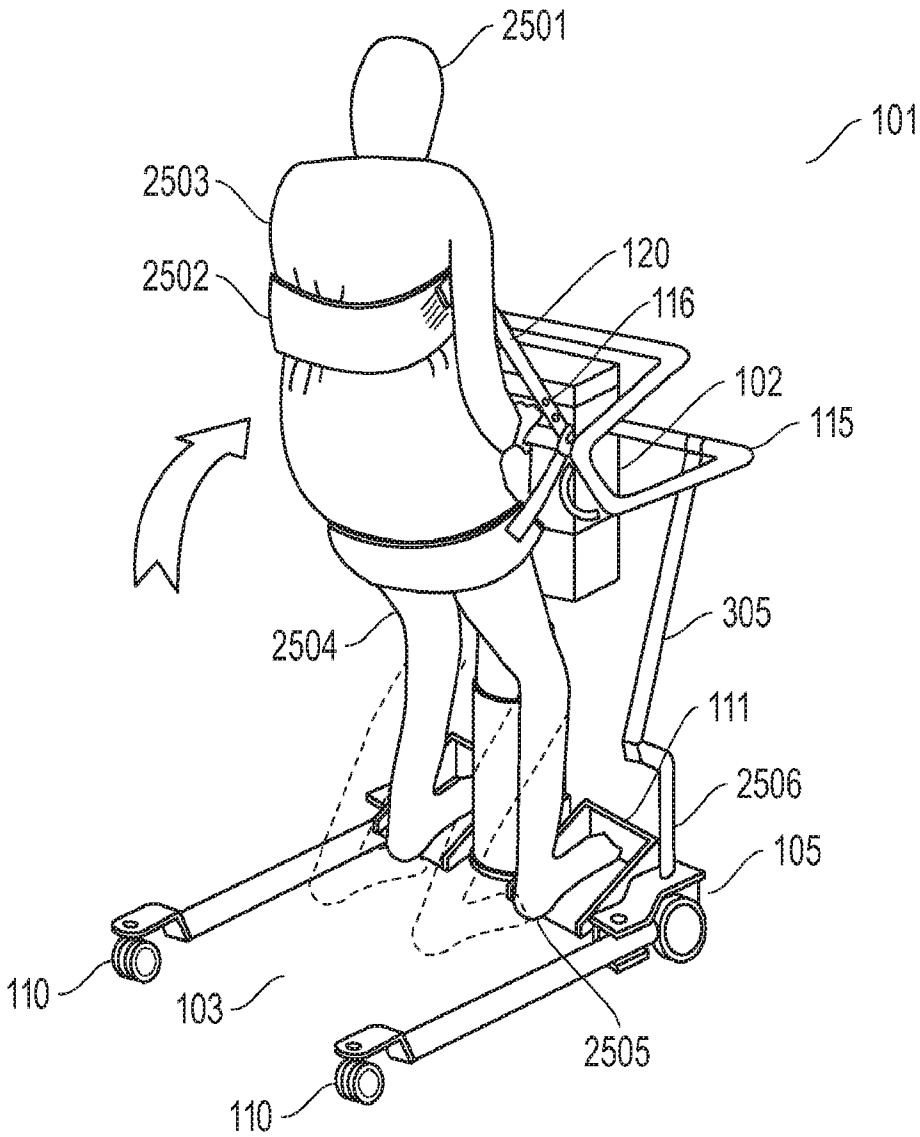

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FIG. 25