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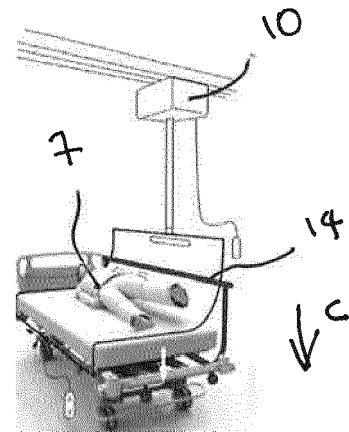
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(54) **PATIENT TURNING APPARATUS AND METHOD**

(57) A patient turning system for use with a patient support device having a mattress (5) which may carry a sheet (6) thereon. The patient support surface (2,20) has a head end (21), a foot end (22) and two sides (23,24) between the foot and head ends and includes a lateral bar (14) for fixing adjacent and alongside a side (23) of a patient support surface, the bar being controllably moveable between a first position alongside and at the same height as the patient support surface, and a second position alongside and above the height of the patient support surface. A patient on a sheet may be turned by pulling the sheet on the patient support surface under the bar and upwards and away from the respective side of the patient support surface.



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EP 3 424 478 A1

Description

[0001] The present invention relates to apparatus and method for turning a patient on a patient support device, such as a hospital bed.

[0002] Some patient support devices, such as hospital beds, stretchers, surgical tables, and the like, have associated or supplementary mechanisms for turning a patient. It can be necessary to turn a patient for comfort and medical reasons. For example, prone positioning is a treatment protocol used to improve pulmonary gas exchange and to reduce the rate of VAP (ventilator associated pneumonia) in critically ill patients with acute lung failure, ARDS (acute respiratory distress syndrome) and/or ALI (acute lung injury). Turning and/or re-positioning a patient can also be necessary to reduce the likelihood of bed or pressure sores.

[0003] To initiate prone positioning, caregivers turn the patient face down from the supine position. Thereafter, the patient may be turned from one position to another as often as three times a day until the requirement for a high concentration of inspired oxygen is resolved. Research suggests that prone positioning can improve oxygenation in up to 70% of patients with ARD or ALI. It is indicated when mechanical ventilation fails to reverse severe hypoxemia.

[0004] A problem or difficulty is the need to move the patient from a supine to a prone position. It takes 5 to 8 caregivers to move a patient from the supine to the prone position (and back). This includes one person at the head of the bed to secure and manage the airways during positioning and control the pressure applied to the head and prevent the application of direct pressure to the eyes, ears and endotracheal tube. During re-positioning as many invasive lines as possible are disconnected to ease the procedure, and then reconnected once the patient has been turned into the prone position (or the supine position if being returned there from the prone position).

[0005] EP 0 519 735, US 5,544,371 and US 7,434,278 disclose large frame structures for mounting above and around a bed to help caregivers turn a patient. These take up a considerable amount of room around a bed, are expensive to make and complicated to use.

[0006] US 4,536,903 discloses a device for manipulating invalid bed patients which includes a sheet of fabric to underlie the torso of a patient facilitating rolling of a patient onto his or her side. This arrangement cannot fully turn a patient beyond his or her side and move a patient from a supine to a prone position (and vice versa).

[0007] The present invention in a first aspect provides a patient turning system for use with a patient support device having a patient support surface which may carry a sheet thereon, the patient support surface having a head end, a foot end and two sides between the foot and head ends, the patient turning system including: a lateral bar for fixing adjacent and alongside a side of a patient support surface, the bar being controllably moveable between a first position alongside and at the same height

as the patient support surface, and a second position alongside and above the height of the patient support surface; and the patient turning system also including means for pulling a sheet on the patient support surface under or towards the bar and upwards and away from the respective side of the patient support surface.

[0008] The system of the invention allows for the turning of a patient with significantly fewer care givers and without bulky and expensive equipment, at a reduced risk of strain to the care giver(s). The system can be implemented relatively cheaply using existing patient lift units and/or the height adjustment mechanisms of a hospital bed.

[0009] Preferably the means for pulling the sheet comprises an overhead patient lift system connectable to a sheet. This allows one to reduce costs by using existing equipment.

[0010] Alternatively or additionally, the means for pulling the sheet includes an actuator for changing the height of the patient support surface above the floor on which the patient support device is located. This allows one to reduce costs by using existing equipment.

[0011] Alternatively or additionally the means for pulling the sheet includes a rotatable side bar including means for fixing a sheet thereto. The side bar can be rotated by a handle or alternatively a motor.

[0012] Preferably, the patient turning system includes a support frame fixable relative to the frame of a patient support device and including bar mounts for holding the lateral bar. This allows for retro-fitting to, or using with, existing patient support device.

[0013] The support frame may include two bar mounts and each bar mount supports an end of the lateral bar.

[0014] The bar mounts may include telescopic means for adjusting the height of the lateral bar relative to the floor on which the patient support device is located. This allows embodiments of the system to work with patient support devices which do not have a height adjustment (HiLo) mechanism.

[0015] The frame may include connectors to rigidly mount the frame to the patient support device. This allows retro-fitting to existing patient support devices.

[0016] The frame may be separate from the patient support device but lockable in position relative to the patient support device. This allows the provision of a system which can be moved into position adjacent to a patient support device, used there to turn a patient before being moved away if so desired.

[0017] The invention in a second aspect provides a method of turning a patient on a patient support device having a patient support surface and which supports a sheet thereon on which a patient may be located, the method including and/or comprising the steps of:

- i) locating a side of a sheet on the patient support surface under a bar alongside and adjacent the patient support surface at substantially the same height as the patient support surface;

ii) pulling the side of the sheet under the bar and then upwards and away from the patient support surface to pull a patient on the sheet towards the side of the patient support surface;

iii) raising the height of the bar above the height of the patient support surface; and then, or whilst,

iv) continuing to pull the side of the sheet under the bar and then upwards and away from the patient support surface to turn a patient on the sheet.

[0018] Steps (iii) and (iv) may include lowering the height of the patient support surface relative to the floor on which the patient support device is located.

[0019] Preferred embodiments of the invention will now be described by way of non-limiting example with reference to the accompanying figures in which:

Figures 1 a to 1f are a series of perspective views of a patient support apparatus (e.g. hospital bed) including an embodiment of the invention and illustrating its operation;

Figures 2a and 2b are schematic views from the foot end of apparatus such as that shown in figures 1a to 1f respectively illustrating a patient being moved then turned with that apparatus;

Figures 3a to 3f are a series of perspective views of a patient support apparatus (e.g. hospital bed) including an alternative embodiment of the invention and illustrating its operation;

Figures 4a to 4f are a series of perspective views of a patient support apparatus (e.g. hospital bed) including a further alternative embodiment of the invention and illustrating its operation; and

Figures 5a to 5f are a series of perspective views of a patient support apparatus (e.g. hospital bed) including a further alternative embodiment of the invention and illustrating its operation.

[0020] Any feature in one aspect or embodiment of the invention may be applied to other aspects or embodiments of the invention, in any appropriate combination. In particular, method aspects may be applied to apparatus aspects and vice versa. Furthermore, any, some and/or all features in one aspect or embodiment can be applied to any, some and/or any other aspect or embodiment, in any appropriate combination.

[0021] It should also be appreciated that particular combination of the various features described and defined in any aspects or embodiments of the invention can be implemented and/or supplied and/or used independently.

[0022] A hospital bed 1 includes a patient support deck

2 coupled to a base portion or lower frame portion 3 for supporting the patient support deck 2 above the floor 5 (see, for example, figure 1a). The bed includes a mattress 5 supported by the patient support deck 2. A sheet 6 is fitted around the mattress 5 on which a patient 7 lies. The mattress 5 and deck 2 provide a patient support portion of the bed. The bed or patient support device has a head end 21, foot end 22, and sides 23,24. The bed includes actuators (not shown) coupling the patient support deck 2 to the base portion or lower frame portion 3. The actuators are controllably moveable to move the patient support deck among multiple positions. Such positions include a flat lowered deck position as shown in figures 1f, 3f and 4f, a flat raised deck position as shown in figures 1a, 3a and 4a, a so-called Trendelenburg position with the head end below the foot end (not shown) and an anti-Trendelenburg position (not shown) with the foot end above the head end. The patient support surface deck comprises various articulated portions arranged in the manner known in the art and driven by further actuators (not shown) which allow the bed deck surface to take up different orientations and as described in, for example, EP 1 517 662. These include a flat position and a seating position.

[0023] Movement of the patient support surface relative to the base portion therefore moves the patient support deck 2 also relative to the floor 4. The bed includes a head board 8 or head frame portion connected to the base or lower frame portion of the bed, and may include a foot board or foot frame portion (not shown) connected and fixed to the patient support deck.

[0024] Referring to figure 1a, a ceiling mounted patient lift unit 10 having a moveable strap 11 is provided. An edge 12 of the sheet 6 may be connected to the strap 11. The ceiling mounted unit includes a pendant control 13 which can controllably move the strap 11 (and anything attached to it) up and down. A suitable ceiling unit is the LikoGuard L/XL overhead lift from the Hill-Rom Group of companies.

[0025] A horizontal side bar 14 is provided alongside a lateral edge 15 of the mattress 5. The horizontal side bar 14 may be fixed to a frame 16 which is itself fixed to the bed base or lower frame portion 3. The frame 16 includes support arms having upper bar mounts 28 on which the bar 14 is mounted and/or supported. Alternatively the frame 16 may be independent from the bed and locatable alongside the bed. The side bar 14 may be folded away under the bed or removed from the bed or vicinity of the bed when it is not needed. In the described embodiments of the attached figures 1 a to 1f, 3a to 3f, 4a to 4f and 5a to 5f, the lateral bar support frame 16 is mounted on casters 26 so that it can be moved into position adjacent to a bed when needed and then removed and stored elsewhere. The frame 16 includes locking means (not shown) for locking the frame into position relative to the bed and preventing movement of the frame during patient handling and/or turning.

[0026] Referring to figures 1a to 1f, a patient 7 lying on

the top surface 20 of the mattress 5 on the bed in a supine (i.e. on his or her back with the mattress flat) may be moved into a prone position (i.e. on his or her front with the mattress flat) as follows:

First and as shown in figure 1a, a first lateral edge 12 of the sheet 6 (which may be an ordinary patient sheet or a modified strengthened and dedicated moving and turning sheet) is attached to the ceiling unit strap 11 and the second opposite edge 17 of the sheet is released so that it can move freely relative to the mattress 5 (i.e. it is untucked from under the mattress if it had been tucked in). The bed upper frame is in its top position so that the mattress upper surface 20 is approximately level with the bottom surface of the lateral side bar 14 and the sheet 6 passes under the lateral side bar from the mattress surface to the connection with the strap 11. Controlled movement upwards in the vertical direction of the strap 11 pulls the sheet 6 under and around the lateral side bar 14 so that vertical movement in direction A of the strap and the sheet edge attached thereto is converted into horizontal movement of the sheet 6 in direction B across the surface of the mattress (see figures 1a and 1b) which pulls a patient in the middle of the mattress to the side of the mattress as shown in figures 1a and 1b.

[0027] Secondly and as shown in figure 1c, the patient support surface and mattress thereon are lowered relative to the lateral or side sheet bar. In the bed shown in the figures this is done by lowering the upper bed frame 18 (arrow C in figure 1c) whilst the side bar 14 remains at the same height relative to the floor. Referring to figure 2b, the distance z between the surface of the mattress 2 and the bottom edge of the lateral bar 14 about which the sheet 6 is pulled affects the angle $\emptyset$ which is taken up by the sheet 6 as it is pulled by the relative movement between the end of the moving strap (i.e. the sheet edge 12) and the floor 4 and thereby controls the amount the patient is turned by the moving sheet. In a preferred embodiment the range of movement z is of the order of 40cm. Referring to figures 1c to 1f, the sheet 6 is pulled under the lateral bar 14 until the patient 7 has been turned into the prone position as shown in figure 1f. The strap 11 is then be disconnected from the sheet.

[0028] Figures 3a to 3f illustrate an alternative embodiment of the invention in which the sheet 6 is pulled under the bottom surface of the lateral bar 14' using a manually rotatable side bar 14' to which the sheet is fixed and around which the sheet is rolled. Turning of handle 19 in direction E rolls the sheet 6 around the bar 14' and thereby pulls the sheet onto the bar.

[0029] Referring to figure 3a, the lateral sheet bar 14' is rotatable about its longitudinal axis by a handle 19 at the foot end of the bed. An edge of the sheet is fixed to the bar 14'. The bed sheet may be fixed using clamping or wedging arrangements such as those shown in EP

3108866.

[0030] As shown in figures 3a and 3b (and similarly to the method described above with reference to figures 1a to 1f), the handle is turned to pull the sheet around the lateral bar and pull the sheet (and the patient on the sheet) towards that bar. Once the patient 7 has reached the side of the bed adjacent the lateral bar 14', the mattress 5 is lowered whilst the handle continues to be turned. This then turns the patient 7 (see figures 3c to 3f). The handle 19 may be removable from the frame as shown in figure 3f.

[0031] Figures 4a to 4f illustrate a further alternative embodiment of the invention in which the sheet is pulled under the bottom surface of the lateral bar using an electrically rotatable side bar 14" to which the sheet is fixed and around which the sheet is rolled. This embodiment is similar to that of figures 3a to 3f except in that rather than turn the lateral bar manually using a handle, a motor (not shown) is provided to controllably turn the side bar. A control (not shown) is provided for the motor so that a care giver may controllably roll the sheet around the side bar and hence control the system.

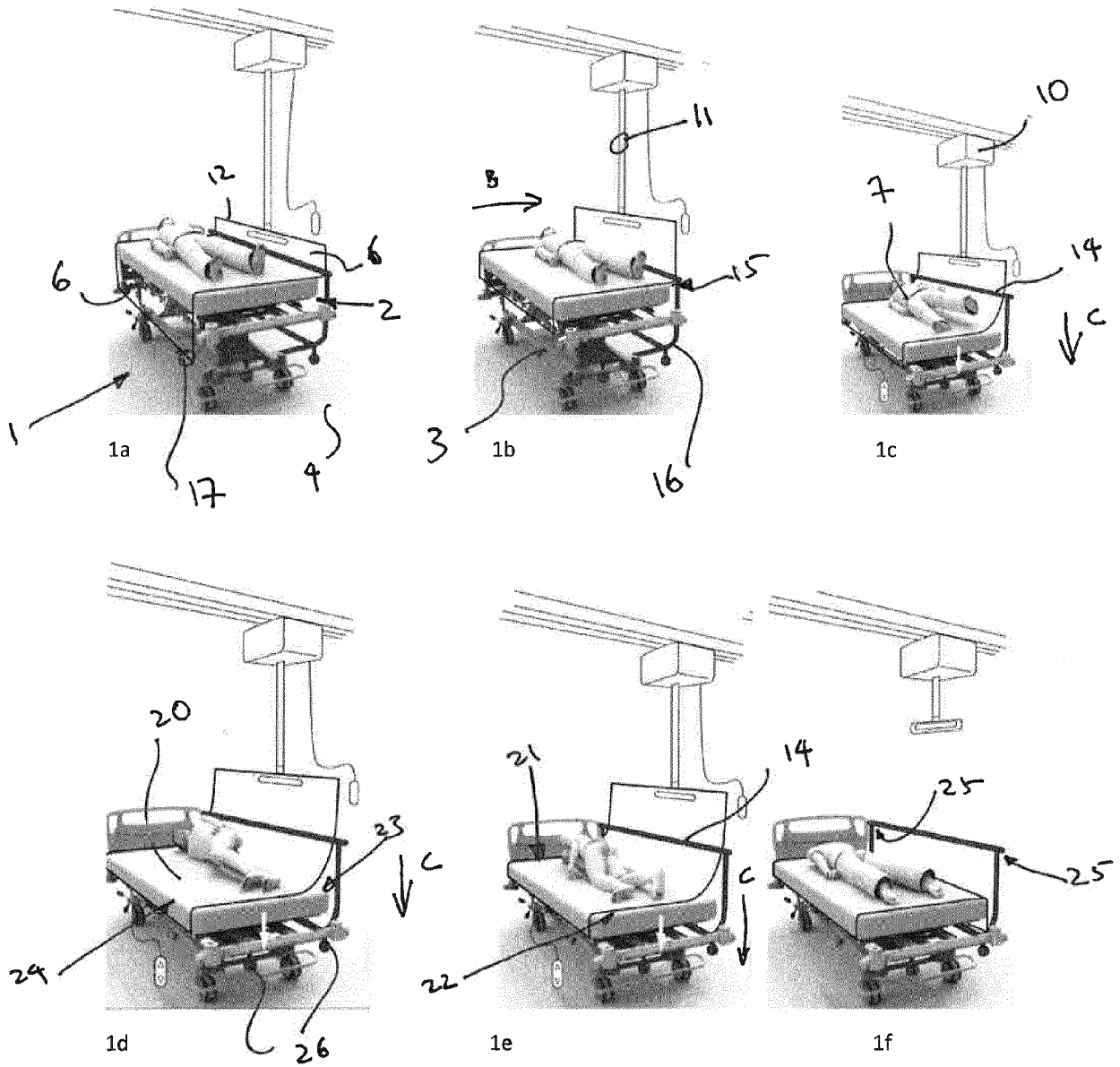
[0032] Figures 4a to 4f also illustrate a further alternative embodiment of the invention in which the sheet is pulled under the bottom surface of the lateral bar using an electrically rotatable side bar 14" to which the sheet is fixed and around which the sheet is rolled but in which the side bar is moved vertically relative to the mattress by controlled movement (see arrow D in figure 5c) of the side bar 14" rather than a lowering of the bed. The frame 16 includes telescopic arms 27 which can raise and lower the bar mounts 28 and leave the bar 14" mounted thereon. This embodiment is suitable for patient support devices (eg beds) which do not have a mechanism (eg a HiLo mechanism) for adjusting their height. A motor is provided to raise and lower the frame portion of which the side bar 14" is an element. A pendant control 13 may be provided. This embodiment does not require the raising and lowering of the patient support device so does not need a patient support device (eg hospital bed) which is so enabled.

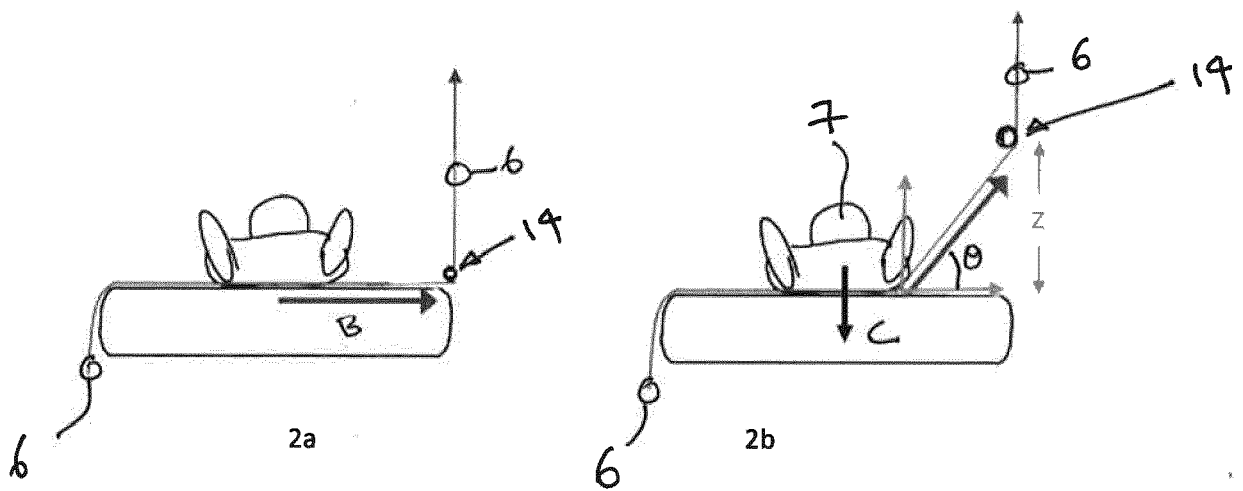
Claims

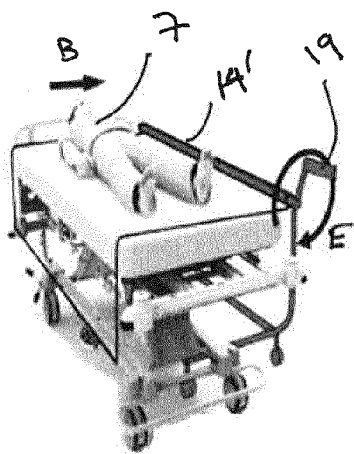
1. A patient turning system for use with a patient support device having a patient support surface (2,20) which may carry a sheet thereon, the patient support surface (2,20) having a head end (21), a foot end (22) and two sides (23,24) between the foot and head ends, the patient turning system including:

a lateral bar (14, 14', 14'') for fixing adjacent and alongside a side (23) of a patient support surface, the bar being controllably moveable between a first position alongside and at the same height as the patient support surface, and a second position alongside and above the height of

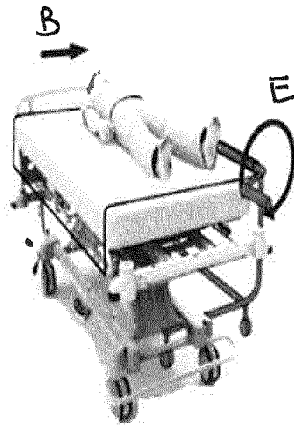
- the patient support surface; and
the patient turning system also including means
(10, 11; 2) for pulling a sheet on the patient sup-
port surface under or towards the bar and up-
wards and away from the respective side of the
patient support surface. 5
2. A patient turning system according to claim 1 where-
in the means for pulling the sheet comprises an over-
head patient lift system (10,11) connectable to a
sheet. 10
3. A patient turning system according to any preceding
claim wherein the means for pulling the sheet in-
cludes an actuator for changing the height of the pa-
tient support surface above the floor on which the
patient support device is located. 15
4. A patient turning system according to any preceding
claim wherein the means for pulling the sheet in-
cludes a rotatable side bar (14', 14'') including means
for fixing a sheet thereto. 20
5. A patient turning system according to claim 4 includ-
ing a handle (19) for rotating the bar (14'). 25
6. A patient turning system according to claim 4 includ-
ing a motor for rotating the bar (14'').
7. A patient turning system according to any preceding
claim including a support frame (16) fixable relative
to the frame of a patient support device and including
bar mounts (25) for holding the lateral bar (14, 14',
14''). 30
8. A patient turning system according to claim 7 where-
in support frame (16) includes two bar mounts and
each bar mount supports an end of the lateral bar
(14, 14', 14''). 35
9. A patient turning system according to claim 7 where-
in the bar mounts include telescopic means for ad-
justing the height of the lateral bar (14'') relative to
the floor on which the patient support device is lo-
cated. 40
10. A patient turning system according to any of claims
7 to 9 wherein the frame includes connectors to rig-
idly mount the frame to the patient support device. 45
11. A patient turning system according to any of claims
7 to 9 wherein the frame is separate from the patient
support device but lockable in position relative to the
patient support device. 50
12. A method of turning a patient on a patient support
device having a patient support surface (2,20) and
which supports a sheet (6) thereon on which a patient
(7) may be located, the method including and/or
comprising the steps of:
- i) locating a side (12) of a sheet (6) on the patient
support surface under a bar (14, 14', 14'') along-
side and adjacent the patient support surface at
substantially the same height as the patient sup-
port surface;
ii) pulling the side (12) of the sheet (6) under the
bar (14, 14', 14'') and then upwards and away
from the patient support surface to pull a patient
on the sheet towards the side of the patient sup-
port surface;
iii) raising the height of the bar (14, 14', 14'')
above the height of the patient support surface;
and then, or whilst,
iv) continuing to pull the side of the sheet under
the bar and then upwards and away from the
patient support surface to turn a patient on the
sheet.
13. A method according to claim 12 wherein steps (iii)
and (iv) include lowering the height of the patient
support surface relative to the floor on which the pa-
tient support device is located.



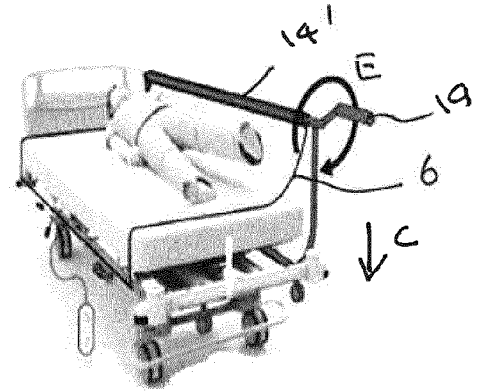




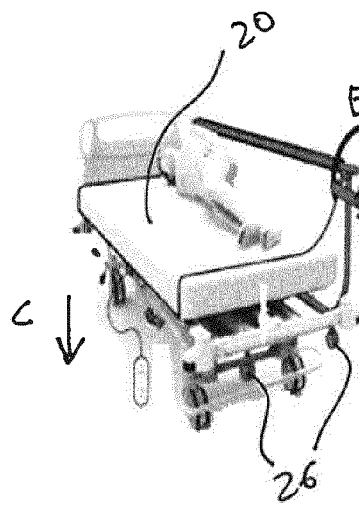
3a



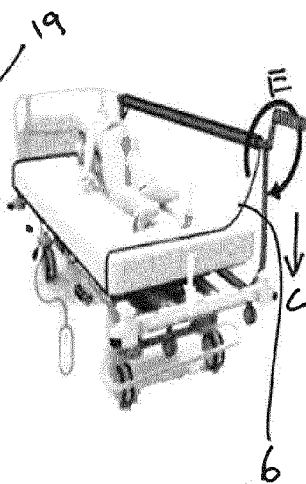
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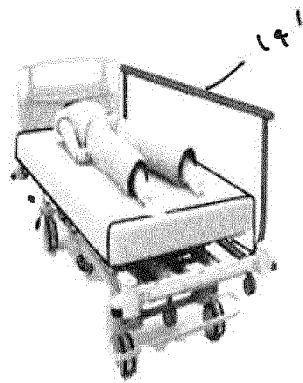
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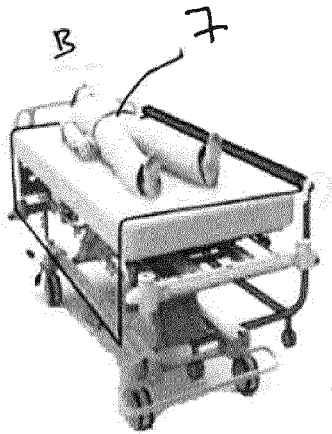
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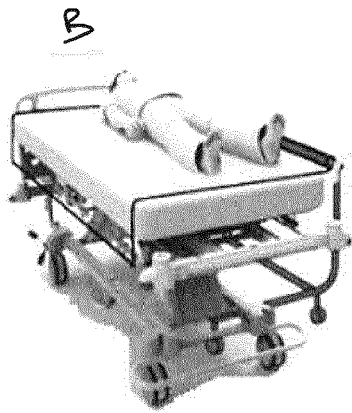
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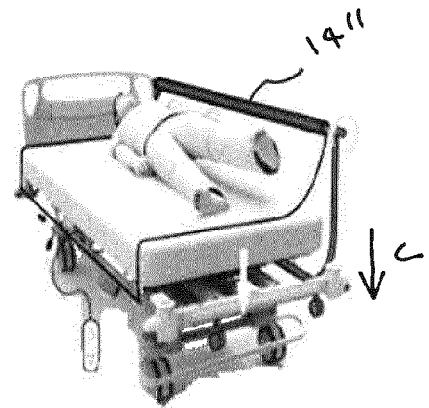
3f



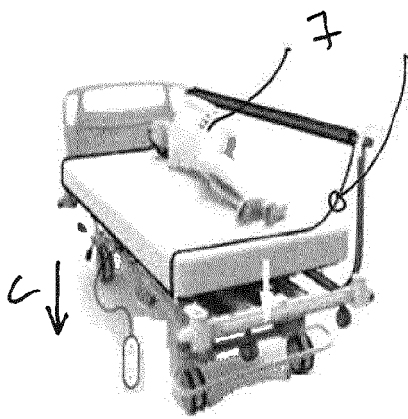
4a



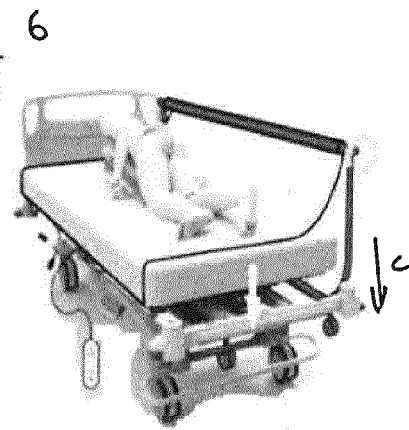
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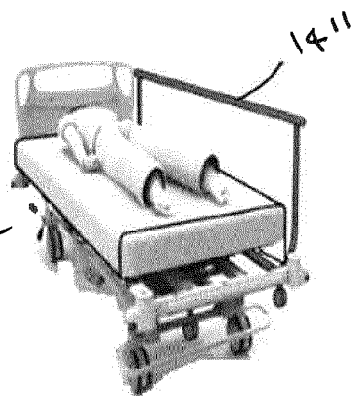
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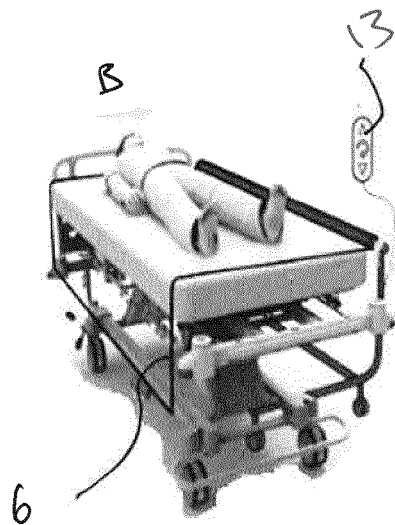
4d



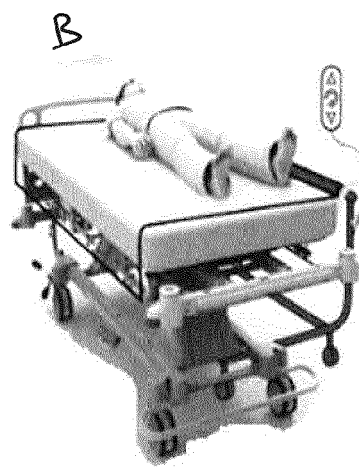
4e



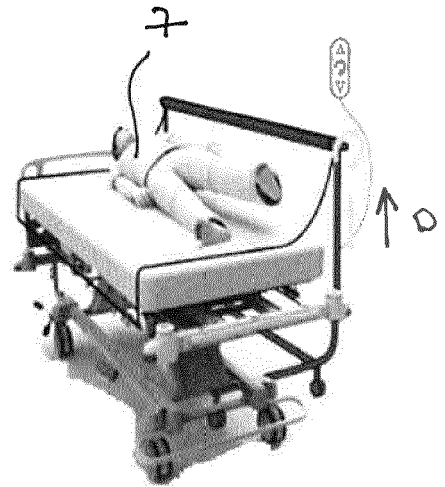
4f



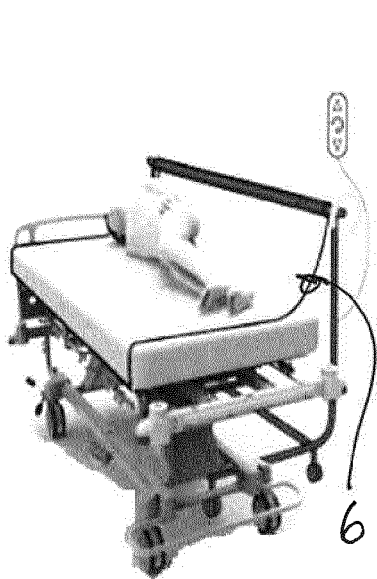
5a



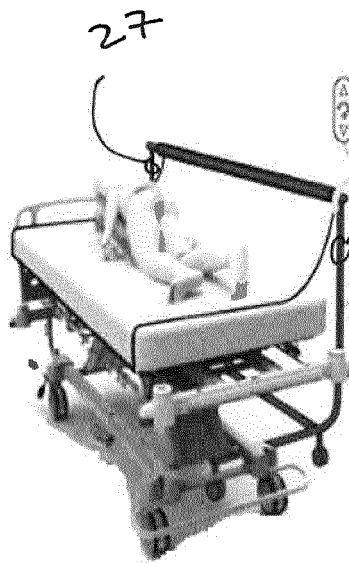
5b



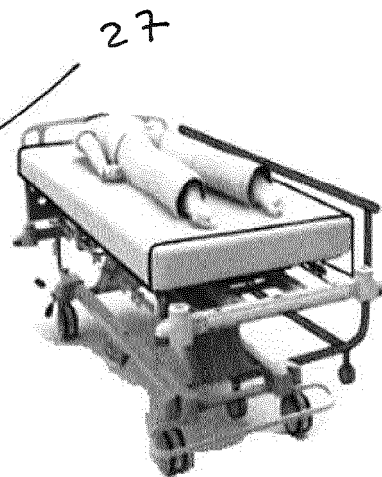
5c



5d



5e



5f



EUROPEAN SEARCH REPORT

Application Number
EP 17 30 5890

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 December 2017	Examiner Schiffmann, Rudolf
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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19-12-2017

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