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(54) **Title:** A SHEET HOLDING ARRANGEMENT AND A PATIENT TRANSFER DEVICE

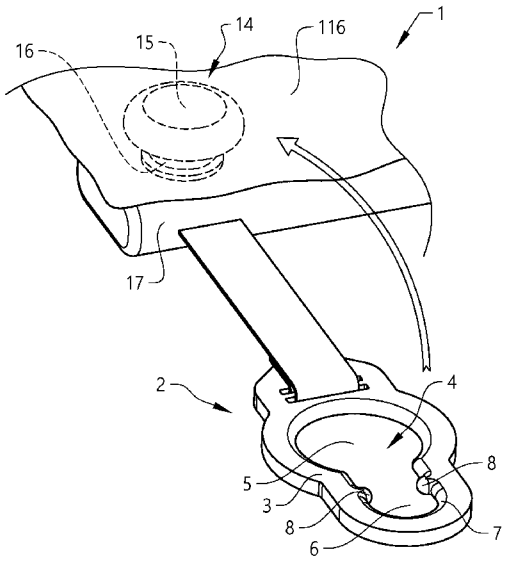

FIG. 4b

(57) **Abstract:** A sheet holding arrangement (1) for holding a sheet (116) when transferring a patient placed on the sheet (116), comprising at least two knobs (14) and at least two holder elements (2), where the sheet (116) is held between the knobs (14) and holder elements (2) when connected to each other, where the holder element (2) is provided with an opening (4) adapted to allow insertion of the knob (14) through the opening (4), where the sheet holding arrangement (1) is connectable to a pulling arrangement (107), where the sheet holding arrangement (1) comprises a connecting member (17) provided with at least two knobs and where the stem (16) comprises a circumferential groove (18) having a shape that corresponds to a semi-circular end section (10) of the holder element (2), such that the sheet (116) is held between the groove (18) and the semi-circular end section (10) when the holder element (2) is connected to the knob (18). The advantage of the invention is that a patient placed on a sheet can be transferred from a first surface to a receiving surface in an easy and secure manner.

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A SHEET HOLDING ARRANGEMENT AND A PATIENT TRANSFER DEVICE

TECHNICAL FIELD

The present invention relates to a patient transfer device.

BACKGROUND ART

In hospitals, care facilities, and other settings, certain situations require that patients are transported from one surface to an adjoining surface, such as from one bed to an adjoining bed or to an operating table. This manoeuvre may either be done manually, requiring the cooperation of several nurses or other professionals, or by means of a patient transfer device. Patient transfer devices configured to move a patient from one surface to another are generally known.

Specifically, a patient transfer device for transferring a patient placed on a movable sheet on a first hospital bed to a second, receiving hospital bed is known from US2006090258. This patient transfer device comprises a base, a motor attached to the base, two straps connected to the motor such that these are retractable by means of the motor, and a clamping assembly releasably attachable to a sheet. Thus, the patient transfer device may be arranged on one side of a receiving hospital bed, opposite the first hospital bed, and connected to a sheet on which a patient lies. The clamping assembly may then be used in connection with the motor and the two straps to pull a sheet on which a patient lies from the first bed to the second, receiving bed.

WO9613239 discloses a patient transport system for transporting a patient from a bed to a stretcher or vice versa, using a bed sheet and a conveyor attached to the bed or the stretcher. The sheet is removably attached to the conveyor by a clip arrangement, where a flexible belt attaches the clip to the conveyor. The conveyor is operated manually by the use of a handle.

However, the use of many of these devices often involve labour intensive, time consuming and/or ergonomically challenging steps. There is therefore a need for an improved sheet holding arrangement.

DISCLOSURE OF INVENTION

An object of the invention is therefore to provide an improved sheet holding arrangement. A further object is to provide an improved patient transfer device.

The solution to the problem according to the invention is defined by the sheet holding arrangement according to claim 1 and by the patient transfer device according to claim 11, which contains the sheet holding arrangement according to claim 1. The other claims contain advantageous embodiments and further developments of the sheet holding arrangement and the patient transfer device.

A sheet holding arrangement for attaching to and holding a sheet when moving the sheet and transferring a patient placed on the sheet, said sheet holding arrangement comprising at least two knobs and at least two corresponding holder elements, wherein the holder elements are connectable to the knobs so as to hold the sheet in place between the knobs and holder elements when connected, wherein each knob comprises a head and a stem, wherein the stem has a circular cross section and wherein the head is larger than the stem, wherein the holder element is provided with an opening adapted to allow insertion of the head through the opening and to allow connection of the holder element to the knob, and wherein the sheet holding arrangement is connected or connectable to a pulling arrangement configured to pull the holder elements and thereby move the sheet and thus transfer a patient placed on the sheet, the object of the invention is achieved in that the sheet holding arrangement comprises a connecting member, wherein the at least two knobs are arranged onto the connecting member at a distance from each other in a longitudinal direction of the connecting

member, wherein the stem comprises a circumferential extending rounded groove, wherein the opening comprises a first portion that is larger than the head and a second portion that is smaller than the head, wherein the second portion comprises a straight section and a semi-circular end section, wherein the semi-circular end section has a rounded bulging surface with a shape corresponding to that of the rounded shape of the groove of the stem such that, when a sheet is placed above the knob and the corresponding holder element is connected to the knob with the sheet positioned between the knob and the holder element, and when the position of the holder element in relation to the knob is such that the stem is located as close as possible to the semi-circular end section of the second portion of the opening, the sheet is clamped between the rounded bulging surface and the rounded groove along the semi-circular end section.

By this first embodiment of the sheet holding arrangement according to the invention, a sheet holding arrangement that allows for a quick and reliable attachment of a sheet is provided. With such a sheet holding arrangement, a patient laying on a bed can be transferred from a first surface of the bed to a receiving surface by the use of a pulling arrangement. The sheet holding arrangement is easily attached to the sheet when the patient is positioned beside the receiving surface and will hold the sheet in a secure manner during the transfer of the patient. When the patient has been transferred, the sheet holding arrangement can easily be detached from the sheet and from the pulling arrangement. The shape of the contact surface between the holder element and the knob corresponds to each other and will provide a form-fit, which will enlarge the contact surface for the sheet. The larger contact surface will reduce the wear and stress on the sheet, and will prevent the sheet holding arrangement from slipping or tearing the sheet.

The opening of the holder element may further be provided with inner protrusions. The protrusions will help to secure the holder element to the

knob and will provide a tactical feedback to an operator attaching a sheet to the sheet holding arrangement. With the protrusions, an operator is able to detect when a holder element is correctly positioned. The connecting member of the sheet holding arrangement may be either a stiff rod-like member or may be a flexible wire or the like.

The holder element is provided with one or more slots adapted to attach the holder element to a knob of the sheet holding arrangement or to the connecting member of the sheet holding arrangement. The holder element is preferably attached with a ribbon or a string such that it does not fall off or disappears. The holder element further comprises a pulling opening to which a pulling wire can be attached with a hook, e.g. a safety hook. The sheet holding arrangement can thus easily be connected to and disconnected from a pulling arrangement. One advantage with this is that the sheet holding arrangement can be removed from the pulling arrangement, e.g. for cleaning, and that it can be used with different pulling arrangements. It is even possible to attach a handle to the sheet holding arrangement, such that a patient can be transferred manually. The pulling arrangement may also be used to pull other items, such as stretcher matrasses, trauma matrasses or other heavy items.

The sheet holding arrangement may be used in a patient transfer device comprising a pulling arrangement. The patient transfer device preferably comprises an electric motor that will transfer a patient from a bed to a receiving surface. The receiving surface may be another bed, or may e.g. be a resting surface in an X-ray, CT or MRI machine.

BRIEF DESCRIPTION OF DRAWINGS

The invention will be described in greater detail in the following, with reference to the embodiments that are shown in the attached drawings, in which

Fig. 1 shows a patient transfer device according to the invention,

Fig. 2 shows a holder element used in a sheet holding arrangement according to the invention,

Fig. 3 shows a knob used in a sheet holding arrangement according to the invention,

Fig. 4a shows the sheet holding arrangement in an unlocked state,

Fig. 4b shows the sheet holding arrangement with a sheet,

Fig. 4c shows the sheet holding arrangement before a locked state,

Fig. 4d shows the sheet holding arrangement in a locked state,

Fig. 4e shows a hook being attached to the sheet holding arrangement,

Fig. 5a, 5b shows the patient transfer device of Fig. 1 when used to transfer a patient from a first surface to a receiving surface, and

Fig. 6 shows a further example of a patient transfer device according to the invention.

MODES FOR CARRYING OUT THE INVENTION

The embodiments of the invention with further developments described in the following are to be regarded only as examples and are in no way to limit the scope of the protection provided by the patent claims.

Fig. 1 shows a view of a patient transfer device comprising a sheet holding arrangement according to the invention, Figs. 2 and 3 show details of the sheet holding arrangement, Figs. 4a – 4e show the attachment of a sheet to the sheet holding arrangement, Figs. 5a – b show a patient transfer device in use and Fig. 6 shows a second example of a patient transfer device.

The patient transfer device 101 shown in Fig. 1 comprises in the shown example a sheet holding arrangement 1, a pulling arrangement 107 and a frame 102, onto which the pulling arrangement 107 is attached. The frame 102 is arranged to be placed on a horizontal surface, such as a floor, and is provided with wheels 105 for moving the patient transfer device 101 across this surface. The pulling arrangement 107 comprises a motor 103 connected to two wire bobbins 108 and an outer casing 104 that covers and protects the motor 103 and the wire bobbins 108 from contamination caused by for example contact with dust or bodily fluids from a patient that is transferred using this patient transfer device 101. The outer casing may be removed completely or may be attached with hinges, such that the outer casing can be opened when the wire bobbins are to be cleaned or replaced. The casing may be provided with pads attached to the outer casing in a removable manner, such that they may be removed from the outer casing.

The shown patient transfer device 101 comprises means for vertically adjusting the position of the pulling arrangement 107. This may for example be an electrical motor (not shown) arranged in the frame 102 that can move the pulling arrangement 107 along a vertical track 106 or groove in the frame 102. This simplifies the use of the patient transfer device 101 in certain situations where the height of the receiving surface 114 may vary.

The motor 103 is coupled to two laterally spaced apart wire bobbins 108 that are used when pulling a patient from a first surface to a receiving surface. The pulling arrangement comprises a wire bobbin 108 provided with a wire 109 wound on the bobbin. The bobbin 108 is mechanically connected to the motor 103, either directly to the motor or to a shaft driven by the motor. The ends of the two wires 109 that are not connected to the bobbin 108 are provided with hooks 110 adapted to be attached to a sheet holding arrangement 1, which is provided with an elongated connecting

member 17 and which is adapted to be attached to the respective ends of the wires 109.

The sheet holding arrangement 1 comprises an elongated connecting member 17, a plurality of knobs 14 and a plurality of holder elements 2. The connecting member 17 may be a stiff rod or may be a flexible wire of some kind. In the shown examples, a rod is used as the connecting member. The knobs are mounted on the rod in a spaced apart manner, in the shown example with a distance corresponding to the distance between the wire bobbins of the pulling arrangement 107. This will allow the pulling arrangement 107 to pull the sheet holding arrangement in a straight manner. A rod may be provided with more than two knobs, depending on e.g. the length of the rod or the size of a sheet. The rod allows the load from pulling a sheet on which a patient lies to be distributed to both wires 109. In the shown example, the rod is provided with two knobs arranged at the ends of the rod. A rod or a wire may also simplify the handling of the sheet holding arrangement, e.g. by allowing both wires 109 to be pulled out from the pulling arrangement at the same time. The connecting member will also ensure that the distance between the two knobs corresponds to the distance between the pulling wires of the pulling arrangement.

Fig. 2 shows an example of a holder element 2. The holder element is provided with a circumferential body 3 that is provided with a keyhole-shaped opening 4. The opening is provided with a first portion 5 and a second portion 6. The first portion is in the shown example circular, but other shapes are possible. The first portion is adapted to be threaded over a knob covered with a sheet, thus the size of the first portion is somewhat larger than the size of the head of a knob. The second portion 6 comprises a semi-circular end section 10 and a straight section 9. The edges of the straight section are parallel and interconnects the semi-circular end section with the first portion. The inner edge 7 of the semi-circular section is rounded and

convex. The diameter of the rounded edge is in one example equal to the thickness of the holder element, but other rounded shapes are also possible. In one example, the holder element is 5 mm thick, and is preferably between 2 to 10 mm thick. The holder element 2 is flat.

Fig. 3 shows an example of a knob 14. The knob is provided with a head 15 and a stem 16. The stem is provided with a circumferential rounded groove 18 that is concave and that is adapted to cooperate with the semi-circular end section 10 of the holder element. The shape of the concave rounded groove 18 corresponds substantially to the shape of the convex inner edge 7 of the semi-circular end section 10. The height of the groove 18 equals in one example the thickness of the holder element 2, but may also be slightly smaller. The diameter of the groove is somewhat smaller than the diameter of the semi-circular end section. The size difference between the groove and the semi-circular end section allows a sheet to be clamped between the groove and the semi-circular end section in a secure manner with a tight fit. In this way, a sheet will be clamped between the entire inner edge of the semi-circular end section and the groove, which will provide a relatively large contact surface and will reduce the risk of the sheet slipping or ripping during the transfer of a patient from one surface to another surface.

The width of the second portion, i.e. the distance between the edges of the straight section and also the diameter of the semi-circular section is for this reason slightly larger than the rounded groove of the stem. In one example, the width of the second section is 21 mm and the diameter of the groove is 15 mm. This will allow a sheet to be clamped between the semi-circular end section and the groove in a secure and tight manner, which will reduce the contact load on the sheet. Other measures are possible, but tests has shown that a size difference between the width of the second section and the diameter of the groove in the region between 15-30% gives a secure hold of a sheet for smaller knobs having a diameter of a few centimetres.

This will give space for more than one layer of a sheet, since the sheet will not be folded evenly over the knob when it is attached to the sheet holding arrangement.

The knob is preferably made in a stiff material, such as a reinforced plastic. The holder element is preferably somewhat resilient, and may be made from an elastic plastic or rubber. It is of advantage that both the holder element, the knob and the connecting member are all made from a material that is transparent to electromagnetic waves. This will give low to zero disturbance of the applicability, interoperability, and output of radiating machines in hospital environments. In this way, the sheet holding arrangement may not have to be removed when a patient is examined with radiation.

The holder element further comprises one or more strap slots 11 adapted to attach the holder element to the knob or the connecting member. This will prevent the holder element from disappearing and will ensure that a holder element is always at hand. The holder element is in one example attached with a flexible ribbon 13. The ribbon may be fixedly attached to the holder element or may be attached to the holder element in a removable manner, such that the holder element can be replaced if damaged. The ribbon may be attached to the knob or connecting member in a removable manner, such that the ribbon can be replaced. The knob is in one example mounted to a rod with a screw, and the ribbon is mounted between the knob and the rod.

The holder element is adapted to be attached to a pulling arrangement 107. In the shown example, the holder element is provided with a pulling opening 12 arranged at one end of the holder element, the end opposite the semi-circular end section. The pulling opening may e.g. be attached to the pulling arrangement by a hook, e.g. a safety hook. In this way, the attachment and detachment of the holder element to and from the pulling arrangement can be made in a quick manner. The holder element can also be provided with a hook element and the wire of the pulling arrangement can be provided

with a loop element. Since the pulling opening 12 is arranged in the same plane as the semi-circular end section, the pulling forces acting on the sheet will be parallel to the pulling wires of the pulling arrangement. There will thus not be any misalignment of the sheet holding arrangement during transfer of a patient.

The straight section 9 of the holder element is in the shown example provided with inner protrusions 8. The protrusions will help to secure the holder element to the knob when holding a sheet and will provide a tactical feedback to an operator attaching a sheet to the sheet holding arrangement. With the protrusions, an operator is able to detect when a holder element is correctly positioned and that a sheet is clamped between the semi-circular end section and the groove. In one example, the distance between the protrusions equals the diameter of the groove. Thus, an empty knob will not give any resistance when the holder element is mounted to the knob. When a sheet is wrapped on the knob, the knob with the sheet will give a tactical feedback to an operator.

Figs. 4a – 4e illustrates the attachment of a sheet to a sheet holding arrangement where the connecting member is a rod. Here, the attachment of a sheet 116 to one knob 14 of the sheet holding arrangement 1 is shown.

Fig. 4a shows part of a sheet holding arrangement with a knob and a holder element in an unlocked state. In Fig. 4b, a sheet 116 is placed on top of the knob 14 of the sheet holding arrangement 1. The holder element is moved towards the knob with the sheet. In Fig. 4c, the holder element is positioned above the knob and is pushed down with the first portion 5 of the opening 4 extending over the head 15 of the knob. The sheet will at the same time be pushed down over the knob and will be drawn together somewhat by the opening.

In Fig. 4d, the knob and the holder element is in a locked state. The second portion 6 of the opening 4 has been pulled towards the knob such that the semi-circular end section 10 of the holder element is close to the groove 18, and such that the sheet is pressed and held between the semi-circular end section and the groove in a tight manner. The protrusions 8 have passed the centre of the knob and helps to hold the holder element in place. In Fig. 4e, a hook 110 of a pulling arrangement is attached to the pulling opening 12 of the holder element.

Figs. 5a - 5b show perspective views illustrating the use of the patient transfer device 101 in transferring a patient 117 from a first surface 113, in the illustrated case of a first bed, to a receiving surface 114, in the illustrated case of a receiving bed 115. In Fig. 5a, the patient 117 is lying on a sheet 116 on the first bed, and the sheet holding arrangement 1 of the patient transfer device 101 is connected thereto. The receiving bed 115 is arranged side-by-side with the first bed, and the patient transfer device 101 is arranged on the opposite side of the receiving bed than the first bed. In Fig. 5b, the motor 103 of the patient transfer device 101 casus the retraction of the sheet holding arrangement 1 towards the patient transfer device 101 and the first bed 115. This causes a pulling force on the sheet 116 on which the patient 117 lies. Thus, the patient 117 is transferred from a first surface 113 to a receiving surface 114.

Fig. 6 shows a perspective view of a patient transfer device according to another aspect of the present invention. Here, the pulling arrangement 107 of the patient transfer device 101 is mounted on an adjustable movable arm 111 that is mounted to a wall 112. It should be understood that the movable arm 111 may alternatively extend from a ceiling mount instead of a wall mount, and that the number of joints on the arm may vary. In the shown example, the sheet holding arrangement 1 comprises five knobs 14 and five holder elements 2 arranged on a longer rod 17. Two knobs are as described

above arranged with a distance corresponding to the distance between the wire bobbins of the pulling arrangement 107. This will allow the pulling arrangement 107 to pull the sheet holding arrangement in a straight manner. One knob is arranged between the two knobs used for pulling the sheet holding arrangement and two knobs are arranged at the outer ends of the rod. The use of more knobs may distribute the load on the sheet more evenly, which may be of advantage when heavier patients are to be transferred.

The invention is not to be regarded as being limited to the embodiments described above, a number of additional variants and modifications being possible within the scope of the subsequent patent claims. The sheet holding arrangement may be used to attach and hold any type of thin fabric or cloth.

REFERENCE SIGNS

1:	Sheet holding arrangement
2:	Holder element
3:	Body
4:	Opening
5:	First portion
6:	Second portion
7:	Inner edge
8:	Inner protrusion
9:	Straight section
10:	Semi-circular section
11:	Strap slot
12:	Pulling opening
13:	Ribbon
14:	Knob
15:	Head
16:	Stem
17:	Connecting member
18:	Groove
101:	Patient transfer device
102:	Frame
103:	Motor
104:	Casing
105:	Wheel
106:	Vertical track
107:	Pulling arrangement
108:	Bobbin
109:	Wire
110:	Hook
111:	Arm
112:	Wall
113:	First surface
114:	Receiving surface
115:	Bed

116: Sheet
117: Patient

CLAIMS

1. A sheet holding arrangement (1) for attaching to and holding a sheet (116) when moving the sheet (116) and transferring a patient placed on the sheet (116), said sheet holding arrangement (1) comprising at least two knobs (14) and at least two corresponding holder elements (2), wherein the holder elements (2) are connectable to the knobs (14) so as to hold the sheet (116) in place between the knobs (14) and holder elements (2) when connected, wherein each knob (14) comprises a head (15) and a stem (16), wherein the stem (16) has a circular cross section and wherein the head (15) is larger than the stem (16), wherein the holder element (2) is provided with an opening (4) adapted to allow insertion of the head (15) through the opening (4) and to allow connection of the holder element (2) to the knob, and wherein the sheet holding arrangement (1) is connected or connectable to a pulling arrangement (107) configured to pull the holder elements (2) and thereby move the sheet (116) and thus transfer a patient placed on the sheet (116), c h a r a c t e r i z e d i n that the sheet holding arrangement (1) comprises a connecting member (17), wherein the at least two knobs (14) are arranged onto the connecting member (17) at a distance from each other in a longitudinal direction of the connecting member (17), wherein the stem (16) comprises a circumferentially extending rounded groove (18), wherein the opening (4) comprises a first portion (5) that is larger than the head (15) and a second portion (6) that is smaller than the head (15), wherein the second portion (6) comprises a straight section (9) and a semi-circular end section (10), wherein the semi-circular end section (10) has a rounded bulging surface (7) with a shape corresponding to that of the rounded shape of the groove (18) of the stem (16) such that, when a sheet (116) is placed above the knob (14) and the corresponding holder element

(2) is connected to the knob (14) with the sheet (116) positioned between the knob (14) and the holder element (2), and when the position of the holder element (2) in relation to the knob (14) is such that the stem (16) is located as close as possible to the semi-circular end section (10) of the second portion (6) of the opening (4), the sheet (116) is clamped between the rounded bulging surface (7) and the rounded groove (18) along the semi-circular end section (10).

2. Sheet holding arrangement according to claim 1, characterized in that the straight section (9) of the second portion (6) comprises at least one protrusion (8).

3. Sheet holding arrangement according to claim 1 or 2, characterized in that the connecting member (17) is a rod.

4. Sheet holding arrangement according to claim 1 or 2, characterized in that the connecting member (17) is a wire.

5. Sheet holding arrangement according to any of claims 1 to 4, characterized in that the height of the groove (18) equals the thickness of the holder element (2).

6. Sheet holding arrangement according to any of claims 1 to 5, characterized in that the holder element (2) comprises a pulling opening (12) adapted to be connected to a pulling arrangement (107).

7. Sheet holding arrangement according to claim 6, characterized in that the pulling opening (12) is positioned at the end opposite the semi-circular end section (10) of the holder element (2).

8. Sheet holding arrangement according to any of the preceding claims, characterized in that the holder element (2) comprises at

least one strap slot (11) adapted to secure the holder element (2) to the sheet holding arrangement (1) by a flexible ribbon (13).

9. Sheet holding arrangement according to any of the preceding claims, characterized in that the holder element (2) is flat with a thickness between 2 to 10 mm.

10. Sheet holding arrangement according to any of the preceding claims, characterized in that the sheet holding arrangement (1) comprises at least three knobs (14) and at least three holder elements (2).

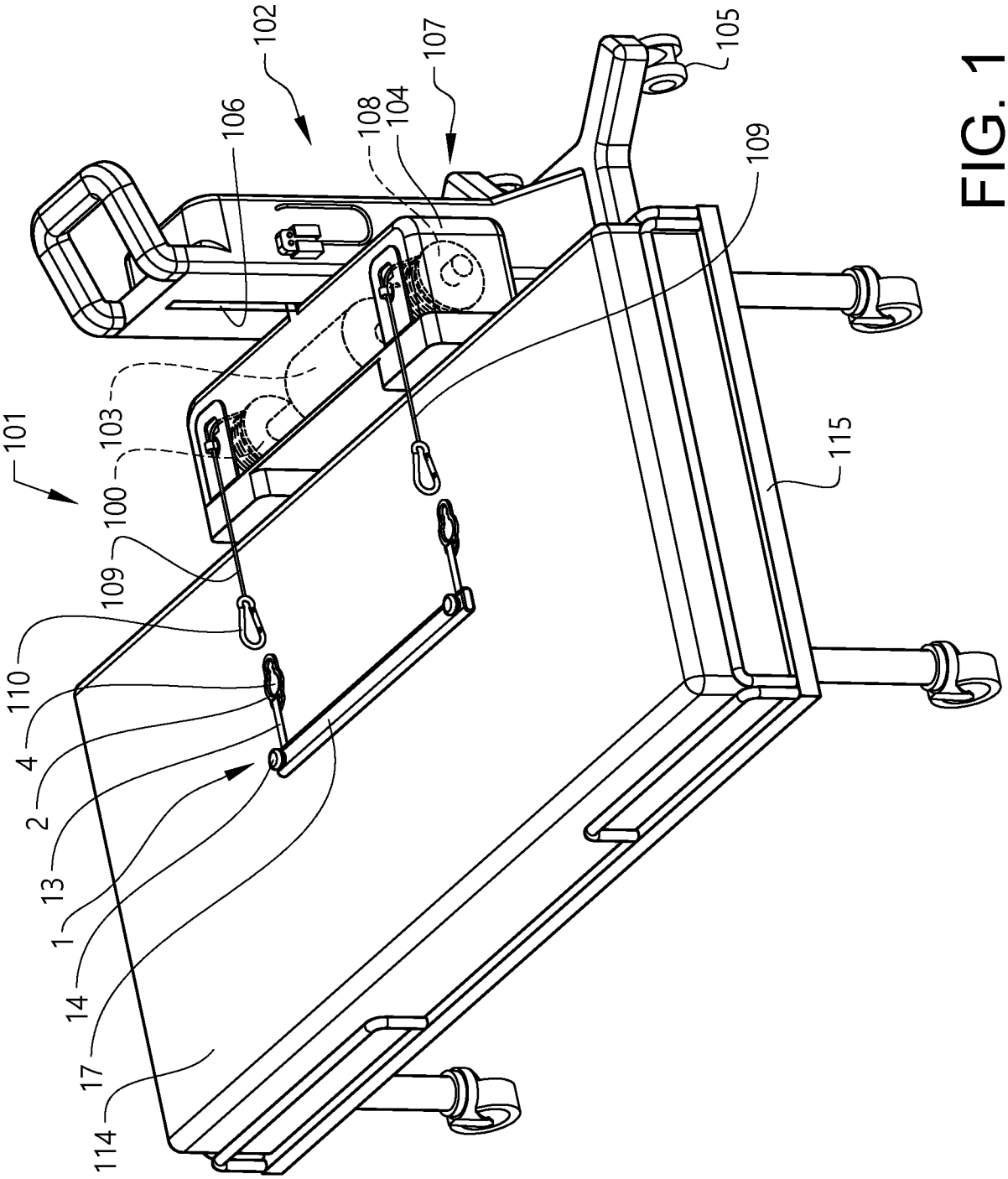
11. Patient transfer device (101) for transferring a patient placed on a movable sheet from a first surface to a receiving surface, where the patient transfer device (101) comprises a sheet holding arrangement (1) according to any of claims 1 to 10, characterized in that the patient transfer device (101) further comprises a pulling arrangement (107) provided with two pulling wires (109) connected to the sheet holding arrangement (1).

12. Patient transfer device according to claim 11, characterized in that the patient transfer device (101) comprises at least one motor (103) operatively connected to the pulling wires (109) so as to allow retraction of the sheet holding arrangement (1).

13. Patient transfer device according to any of claims 11 or 12, characterized in that the patient transfer device (101) is mounted on a frame (102) provided with wheels (105).

14. Patient transfer device according to claim 13, characterized in that the sheet pulling arrangement (107) is mounted on the frame (102) in a height adjustable manner.

15. Patient transfer device according to any of claims 11 or 12, characterized in that the patient transfer device (101) is mounted on an adjustable wall mounted arm (111).


102
107
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114
115

FIG. 1

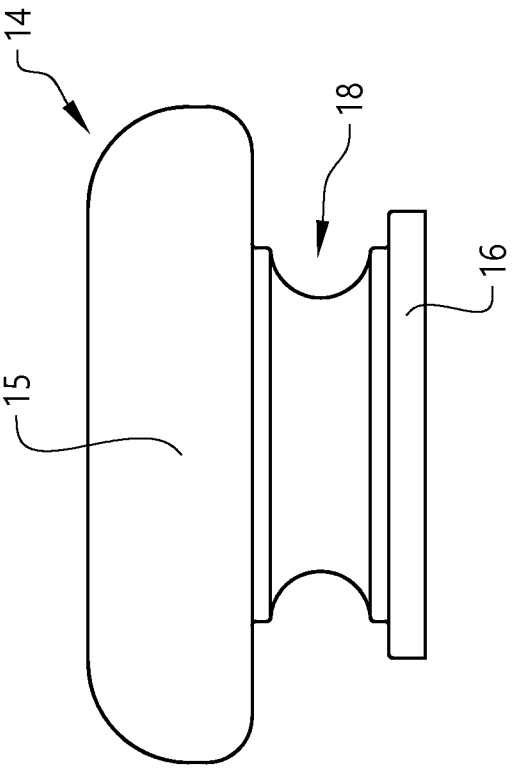

FIG. 3

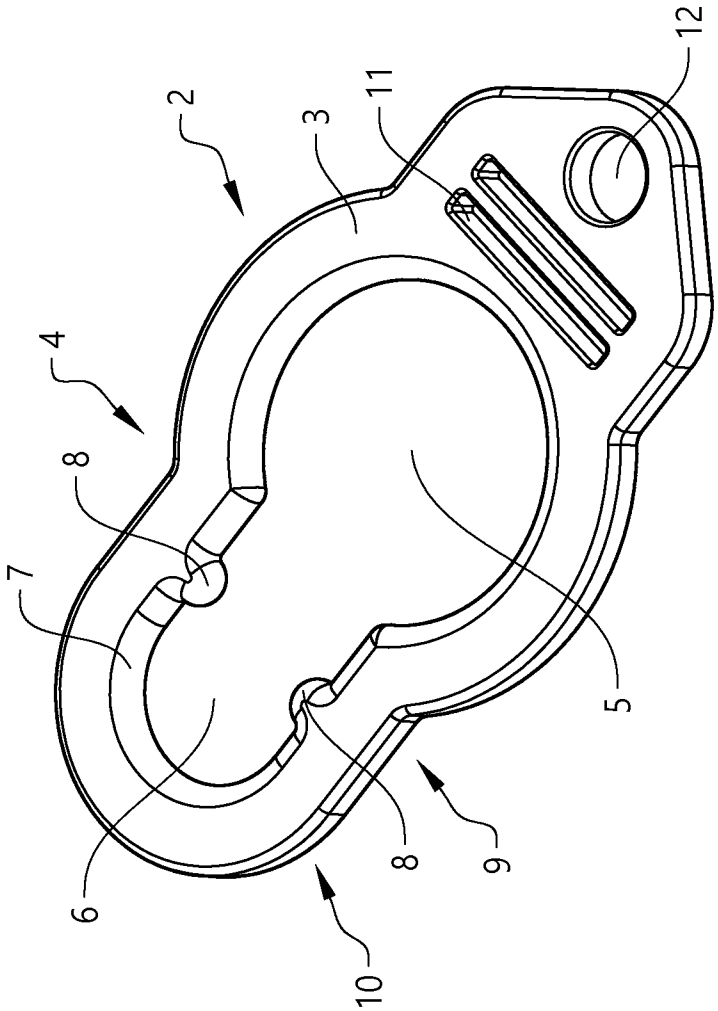

FIG. 2

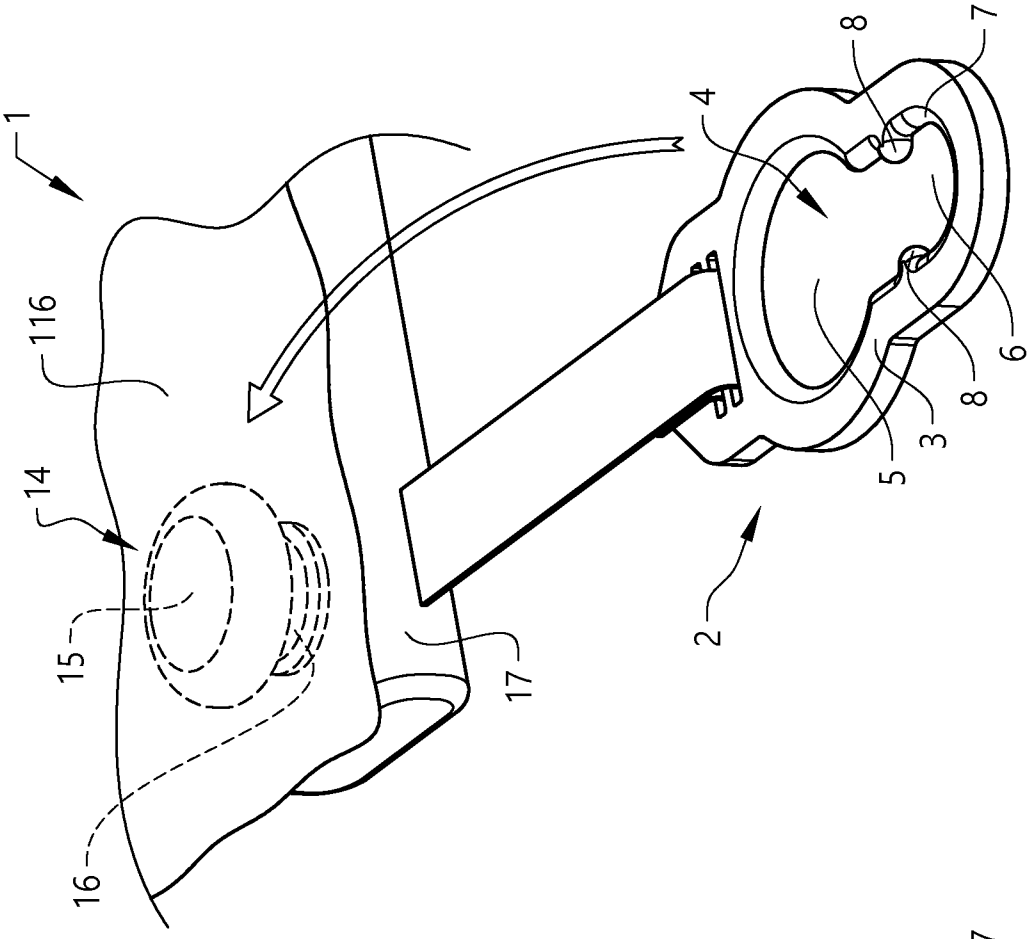

FIG. 4b

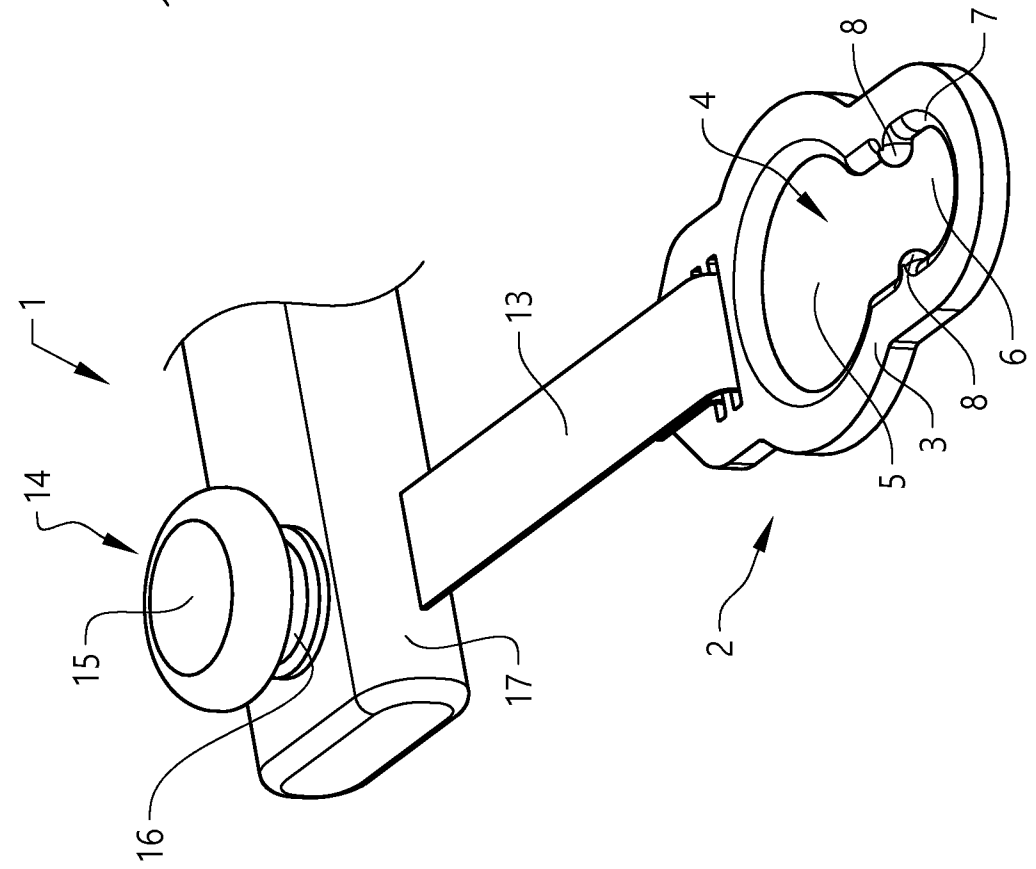

FIG. 4a

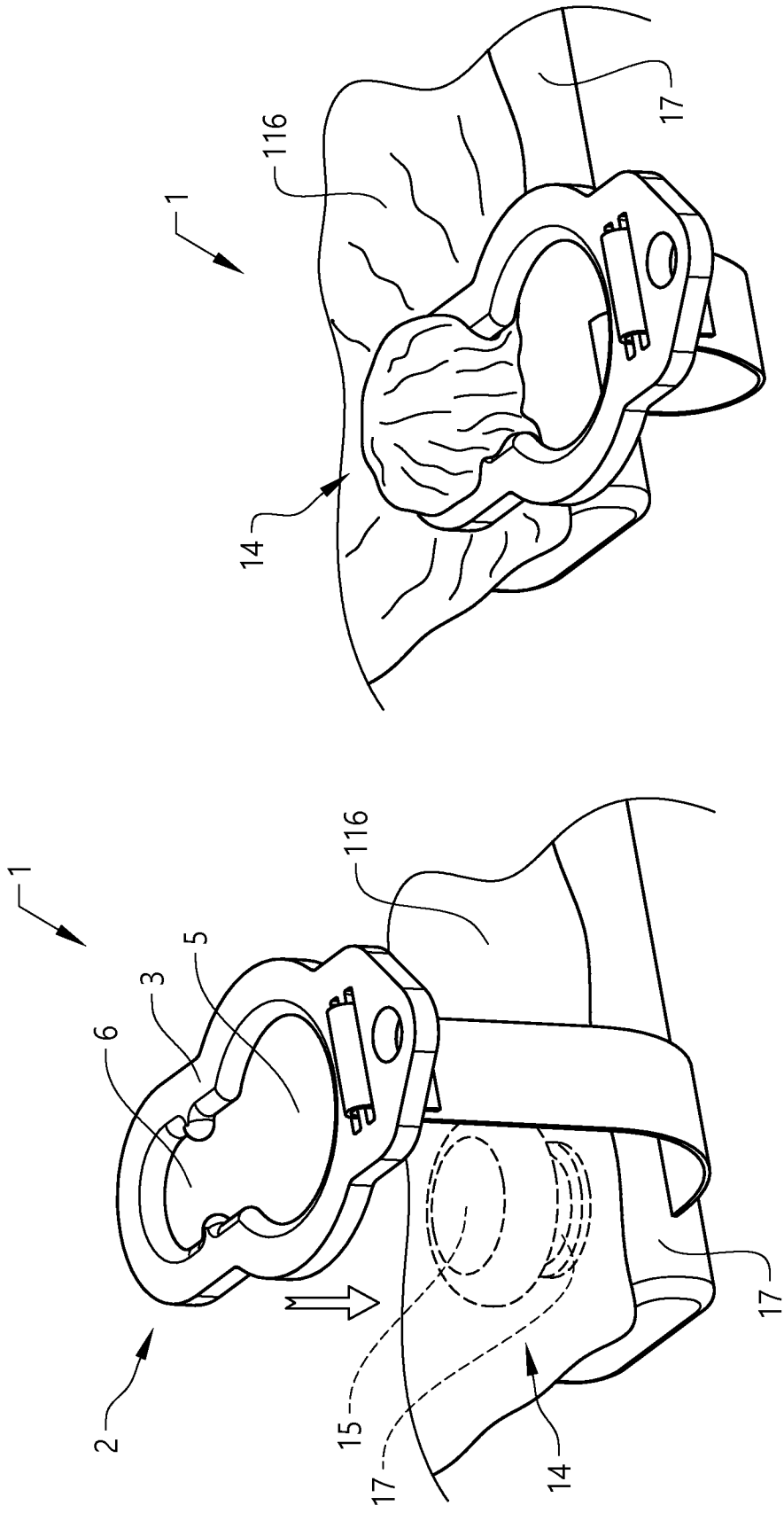

FIG. 4d

FIG. 4c

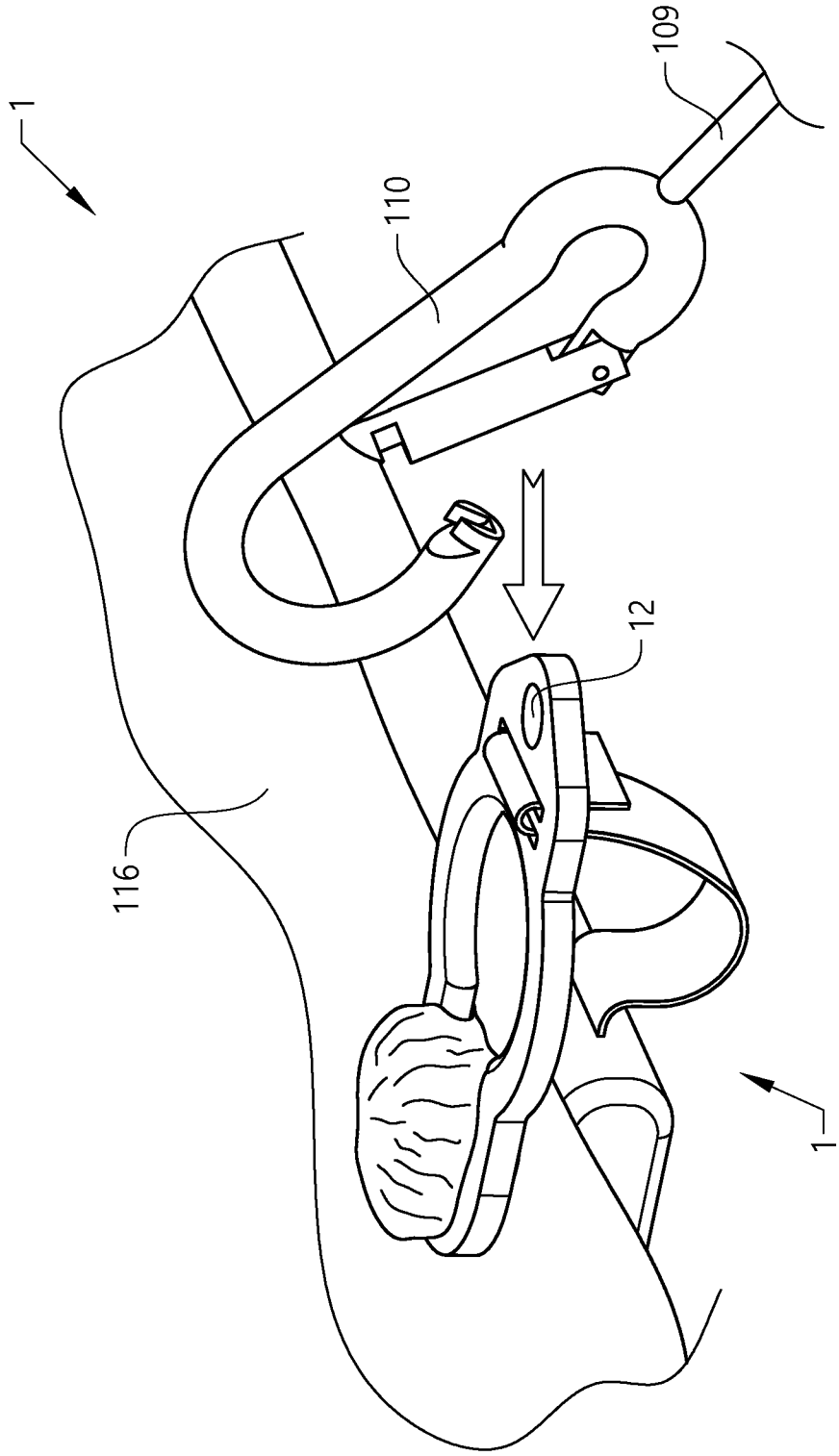

FIG. 4e

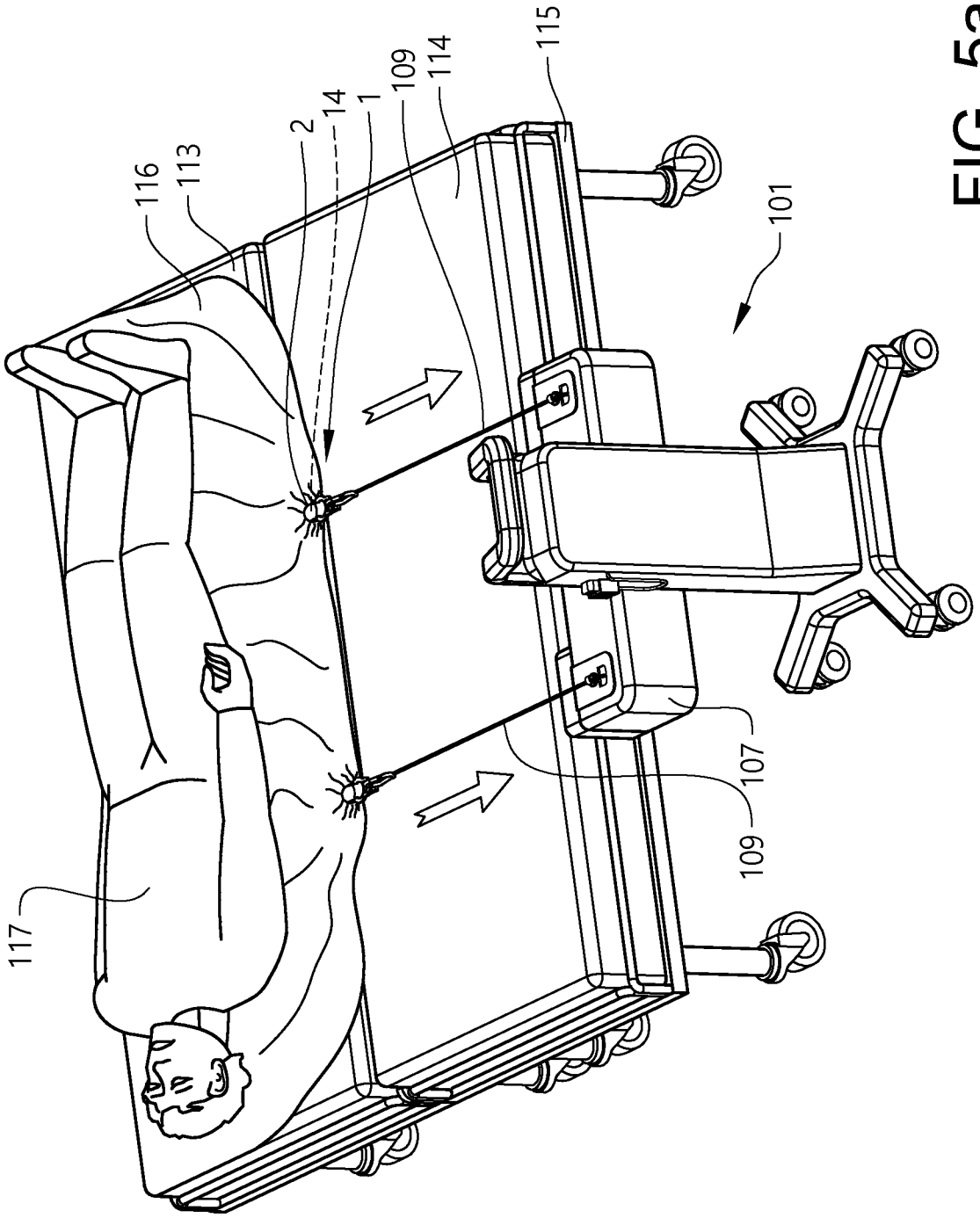

FIG. 5a

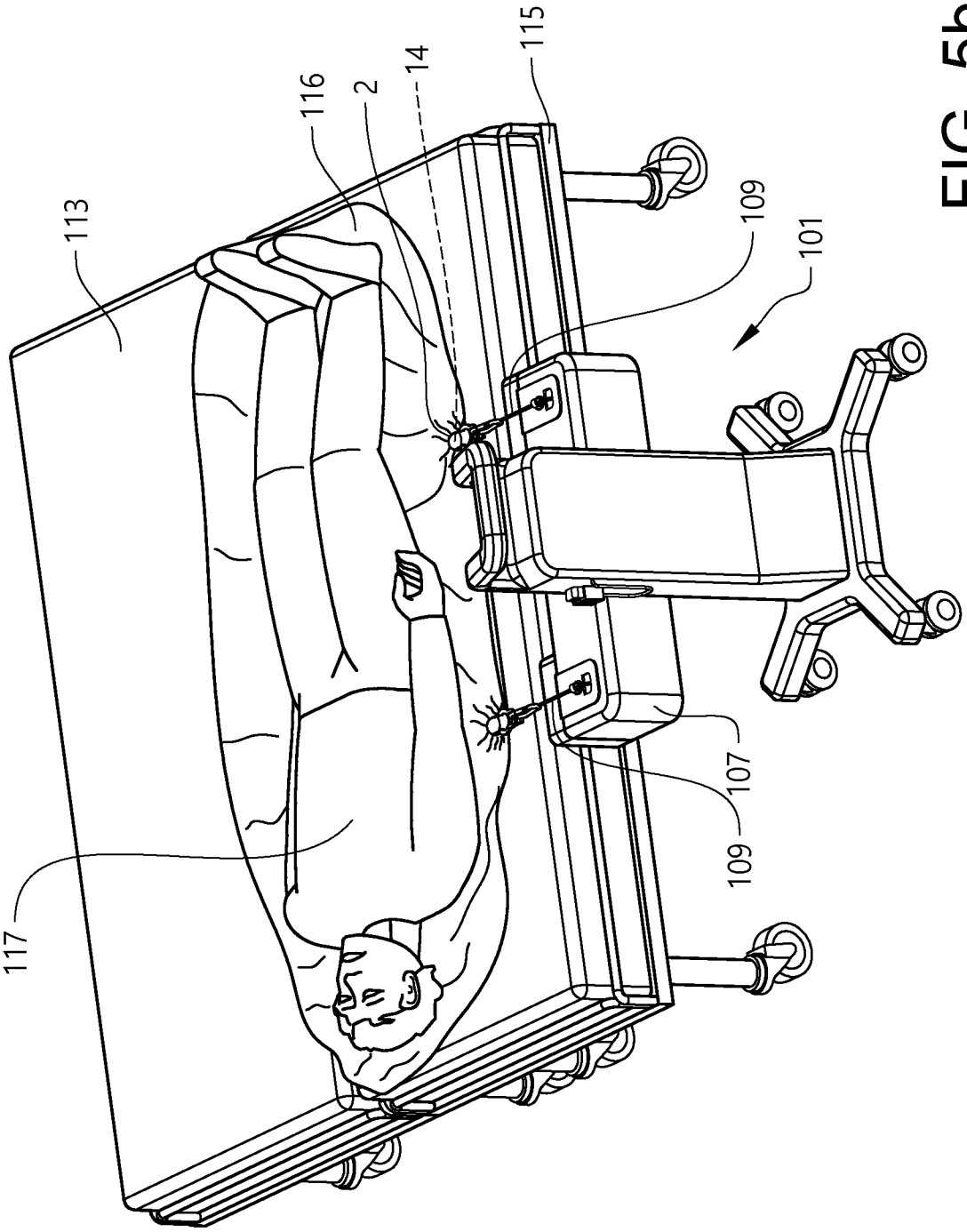

FIG. 5b

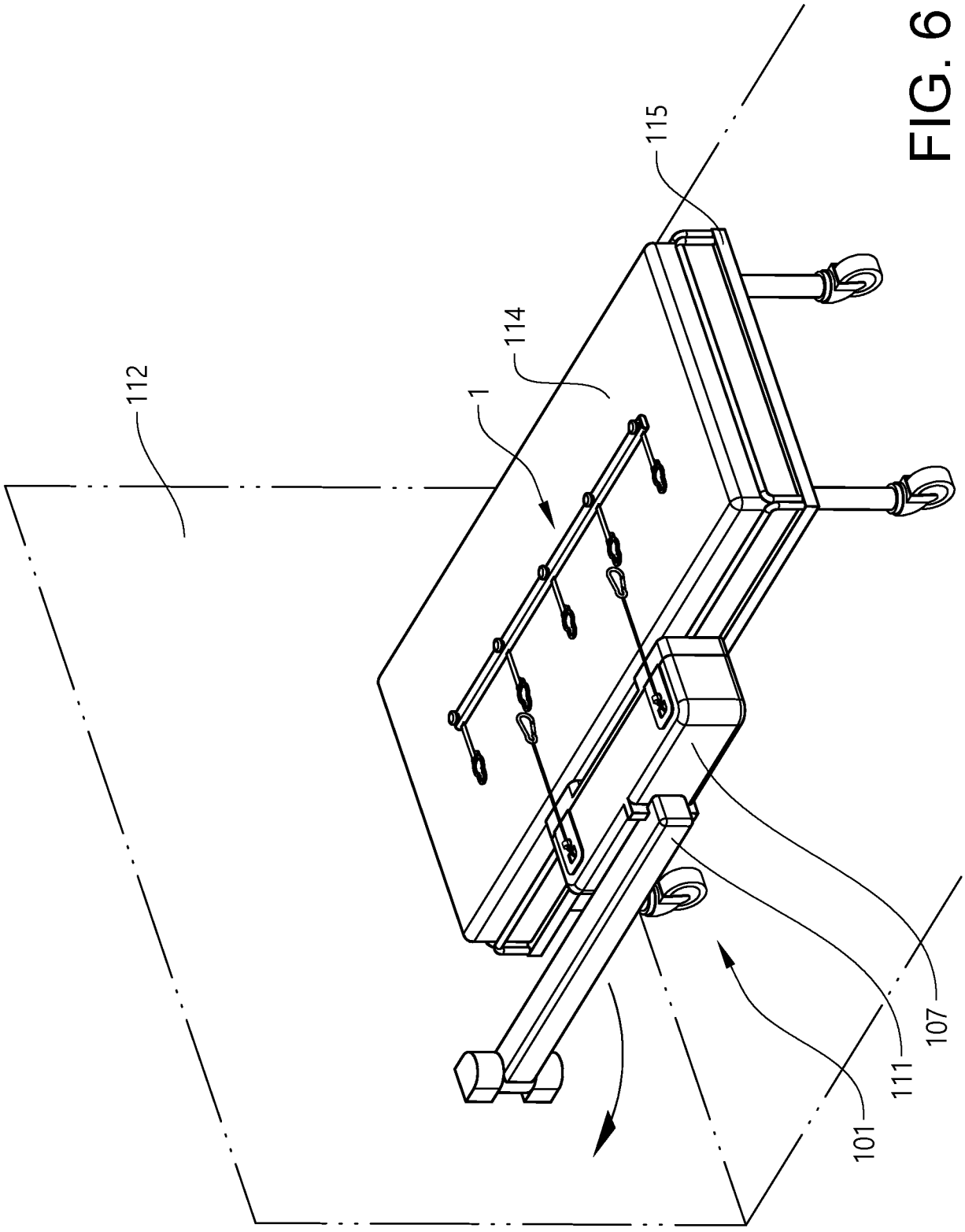

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2022/050307

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A61G

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2021006799 A1 (DRAGHJAELP AB), 14 January 2021 (2021-01-14); abstract; page 5, line 24 - page 6, line 29; figure 1	1-15
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D, A	WO 9613239 A1 (BARTON MED CORP ET AL), 9 May 1996 (1996-05-09); abstract; all figures	1-15
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A	JP 2002209943 A (TAKANO CO LTD), 30 July 2002 (2002-07-30); abstract; figures 6-7	1-15
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A	US 5033170 A (EWERT ABRAM), 23 July 1991 (1991-07-23); abstract; all figures	1-15
	--	

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27-04-2022	27-04-2022

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2022/050307

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2093231 A (BROADWELL WILLIAM C), 14 September 1937 (1937-09-14); abstract; all figures --	1-15
A	US 2745163 A (BUREN JR HAROLD S VAN), 15 May 1956 (1956-05-15); all figures --	1-15
A	US 4686748 A (KAIVANTO PEKKA J), 18 August 1987 (1987-08-18); abstract; all figures -- --------	1-15

International application No.
PCT/SE2022/050307

Continuation of: second sheet

International Patent Classification (IPC)

A61G 7/10 (2006.01)

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				SE	543312	C2	24/11/2020
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US	2745163	A	15/05/1956	GB	753431	A	25/07/1956
US	4686748	A	18/08/1987	CA	1269017	A	15/05/1990