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(54) PATIENT LIFT APPARATUS

(57) There is in particular described a patient lift apparatus (1) comprising a static support structure (1A), a pivotable transfer structure (1B) that is pivotably supported by a bearing portion (10) of the static support structure (1A) so as to pivot about a substantially vertical pivot axis (PA), and a hoisting device (50) with at least one lifting strap (50a, 50b) configured to selectively lift or lower a patient, which hoisting device (50) is provided at a radial outward end portion (1b) of the pivotable transfer structure (1B). The static support structure (1A) is a three-leg support structure configured to allow support of the patient lift apparatus (1) onto a floor portion (FL), which static support structure (1A) comprises three legs (11, 12A, 12B), namely a longitudinal leg (11) and two lateral legs (12A, 12B) extending transversally with respect to the longitudinal leg (11), the longitudinal leg (11) and the two lateral legs (12A, 12B) extending from a base of the bearing portion (10).

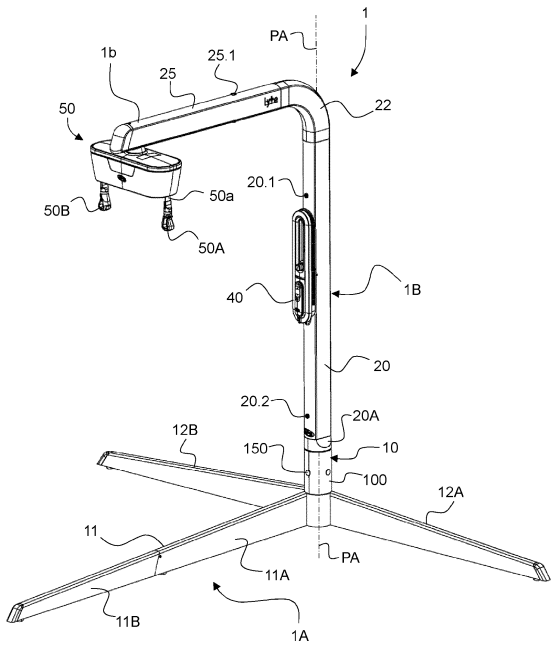

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention generally relates to a patient lift apparatus employed for lifting and transferring patients, which apparatus can be used in the health care industry, but more favourably for home care applications. The patient lift apparatus of the invention is in particular intended to be used for providing safe and comfortable assisted transfers for those patients with limited mobility or with rehabilitation needs, especially for the purpose of transferring a patient from a bed to a chair, and vice versa.

BACKGROUND OF THE INVENTION

[0002] Patient lift apparatuses are already known in the art and commercially available on the market. Examples thereof include for instance Invacare®'s Robin® and Robin® Mover hoists, which include a dual-strap hoisting device that is designed to be suspended under and guided along an overhead track that can be mounted on a ceiling or along walls of a room (or multiple rooms as the case may be) or supported by a suitable gantry structure or structural frame placed in the room. Such a patient lift apparatus and dual-strap hoisting system are disclosed in International (PCT) Publication No. WO 2005/074853 A1, the content of which is incorporated herein by reference in its entirety.

[0003] According to International (PCT) Publication No. WO 2005/074853 A1, the hoisting device is suspended under an overhead track which is mounted in a permanent manner on a ceiling and/or along walls of a room (or multiple rooms) or requires installation of a semi-permanent gantry structure or like structural frame.

[0004] U.S. Patent No. US 5,809,591 A likewise discloses a patient lift apparatus comprising a gantry structure supporting a single-strap hoisting device.

[0005] German Patent No. DE 43 37 527 C2 discloses a patient lift apparatus of the type comprising a dual-strap hoisting device that is supported by a pivotable transfer structure that is permanently mounted on a wall or ceiling of the room.

[0006] Australian Patent No. AU 559512 B2 discloses a patient lift apparatus of the type comprising a three-leg support structure that supports a lifting unit comprising a fluid-actuated lifting column with a lower column section and an upper column section that is telescopically slidable within the lower column section. The lifting unit of Australian Patent No. AU 559512 B2 in essence operates in a manner similar to a hydraulic cylinder to selectively raise or lower a seat assembly that is secured in a radial outward position to an upper portion of the upper column section. The upper column section is freely pivotable with respect to the lower column section, thus permitting pivoting of the seat assembly about the vertical axis of the lifting column. This particular solution is not satisfactory in that it leads to a rather bulky and heavy structure. The use of a fluid-actuated lifting unit is furthermore not desirable.

[0007] U.S. Patent No. US 5,390,380 A discloses a bed with an integral lifting apparatus which is pivotably attached to the frame of the bed. The lifting apparatus comprises a boom supported by a mast, the boom being pivotable with respect to the mast about a horizontal pivot axis. The boom is actuated by means of an actuator to selectively raise or lower a patient that is attached to a distal end of the boom by means of a sling or like harness using a spreader bar.

[0008] The aforementioned solutions are not fully satisfactory. Wall- or ceiling-mounted systems and gantry structures are in particular very stigmatizing for the patient due to the inherent and strong "medical" look and feel of such systems. Such systems furthermore necessitate a permanent or semi-permanent installation which does not blend very well into a home environment.

[0009] There therefore remains a need for an improved solution.

SUMMARY OF THE INVENTION

[0010] A general aim of the invention is to provide an improved patient lift apparatus.

[0011] More specifically, an aim of the present invention is to provide such a patient lift apparatus that does not necessarily require a permanent installation of an overhead track or a bulky gantry structure or structural frame to support the hoisting device.

[0012] A further aim of the present invention is to provide such a solution that more easily blends into a home environment.

[0013] Yet another aim of the invention is to provide such a solution which could easily be displaced or even dismantled for installation in a different location.

[0014] A further aim of the invention is to provide such a solution which is more easily transportable to a different location, yet without compromising stability, robustness, or usability.

[0015] Still another aim of the invention is to provide such a solution that is particularly suitable for facilitating assisted transfer of a patient from a bed to a chair, and vice versa.

[0016] These aims are achieved thanks to the solutions defined in the claims.

[0017] In accordance with a first aspect of the invention, there is provided a patient lift apparatus according to claim 1, namely a patient lift apparatus comprising a static support structure, a pivotable transfer structure that is pivotably supported by a bearing portion of the static support structure so as to pivot about a substantially vertical pivot axis, and a hoisting device with at least one lifting strap configured to selectively lift or lower a patient, which hoisting device is provided at a radial outward end portion of the pivotable transfer structure. According to this first aspect of the invention, the static support structure is a three-leg support structure configured to allow

support of the patient lift apparatus onto a floor portion, which static support structure comprises three legs, namely a longitudinal leg and two lateral legs extending transversally with respect to the longitudinal leg, the longitudinal leg and the two lateral legs extending from a base of the bearing portion.

[0018] The longitudinal leg may in particular be dismantlable in at least two leg sections.

[0019] Advantageously, a pivoting range of the pivotable transfer structure is such that the pivotable transfer structure is not allowed to move outside of an imaginary volume coinciding with a floor area covered by the static support structure, the pivoting range of the pivotable transfer structure being of less than 180°.

[0020] A longitudinal length of the patient lift apparatus, as measured parallel to a length of the longitudinal leg, is preferably of the order of 2'000 mm or more. A lateral length of the patient lift apparatus, as measured parallel to a length of the lateral legs, is preferably of the order of 2'600 mm or more. A height of the patient lift apparatus may in particular exceed 2'000 mm and is preferably of the order of 2'100 mm.

[0021] In accordance with a particularly preferred embodiment, the bearing portion comprises a hollow section configured to receive a lower end section of the pivotable transfer structure and at least one friction-reducing sleeve bearing is interposed between an outer peripheral surface of the lower end section of the pivotable transfer structure and an inner peripheral wall of the hollow section of the bearing portion.

[0022] The aforementioned features in effect form the subject-matter of another aspect of the present invention which is applicable independently of the particular configuration of the static support structure. In that respect, in accordance with another aspect of the invention, there is provided a patient lift apparatus according to claim 7, namely a patient lift apparatus comprising a static support structure, a pivotable transfer structure that is pivotably supported by a bearing portion of the static support structure so as to pivot about a substantially vertical pivot axis, and a hoisting device with at least one lifting strap configured to selectively lift or lower a patient, which hoisting device is provided at a radial outward end portion of the pivotable transfer structure. According to this other aspect of the invention, the bearing portion comprises a hollow section configured to receive a lower end section of the pivotable transfer structure and at least one friction-reducing sleeve bearing is interposed between an outer peripheral surface of the lower end section of the pivotable transfer structure and an inner peripheral wall of the hollow section of the bearing portion.

[0023] By way of preference, the at least one friction-reducing sleeve bearing comprises a first friction-reducing sleeve bearing provided around a portion of the lower end section of the pivotable transfer structure, at a distal end portion of the hollow section of the bearing portion, and a second friction-reducing sleeve bearing provided around a distal end portion of the lower end section of the pivotable transfer structure, at a bottom end portion of the hollow section of the bearing portion.

[0024] Each friction-reducing sleeve bearing may in particular be a polymer sleeve bearing.

[0025] According to an embodiment, the pivotable transfer structure is a substantially L-shaped structure comprising a substantially vertical mast section extending from the bearing portion along the pivot axis and a substantially horizontal boom section extending perpendicularly to the pivot axis, the hoisting device being provided at a radial outward end portion of the boom section. A length of the boom section, as measured with respect to the pivot axis, may in particular be of the order of 1'200 mm.

[0026] In this latter context, a radial position of the hoisting device may in particular be adjustable along the radial outward end portion of the boom section. The radial position of the hoisting device is preferably adjustable along the radial outward end portion of the boom section over a range of the order of 100 mm or more. In particular, the radial position of the hoisting device, as measured with respect to the pivot axis, is adjustable from approximately 900 mm to 1000 mm or more.

[0027] In accordance with a preferred embodiment, the hoisting device is selectively releasable form the boom section and comprises a mounting element having a head section and a neck section and the radial outward end portion of the boom section comprises a longitudinal inner channel configured and dimensioned to receive the head section of the mounting element. In addition, the radial outward end portion of the boom section further comprises a longitudinal mounting slot communicating with the longitudinal inner channel, the longitudinal mounting slot being configured and dimensioned to receive and guide the neck section of the mounting element and allow the neck section to be slid along the longitudinal mounting slot when no load is applied onto the mounting element. Furthermore, the head section of the mounting element is configured and dimensioned to come to rest against a portion of an inner peripheral wall of the longitudinal inner channel, on either side of the longitudinal mounting slot, when load is applied onto the mounting element.

[0028] Preferably, the head section of the mounting element comprises chamfered surfaces configured to come to rest against the portion of the inner peripheral wall of the longitudinal inner channel.

[0029] Advantageously, the boom section and mounting element may both be made of metal and the inner peripheral wall of the longitudinal inner channel may be provided with a friction-enhancing sleeve or liner, which friction-enhancing sleeve or liner is preferably made of or comprises rubber.

[0030] The patient lift apparatus may furthermore comprise a range-limiting mechanism configured to mechanically restrict a pivoting range of the pivotable transfer structure, the pivoting range of the pivotable transfer structure being preferably restricted to less than 180°. In

particular, the range-limiting mechanism may be configured to restrict the pivoting range of the pivotable transfer structure to a first operating range and to allow the pivoting range to be selectively extended to a second operating range greater than the first operating range.

[0031] The static support structure and/or pivotable transfer structure (preferably both) may advantageously be dismantlable, thereby facilitating transport and installation of the patient lift apparatus.

[0032] Further advantageous embodiments of the invention are discussed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] Other features and advantages of the present invention will appear more clearly from reading the following detailed description of embodiments of the invention which are presented solely by way of non-restrictive examples and illustrated by the attached drawings in which:

Figure 1 is a perspective view of a patient lift apparatus in accordance with a preferred embodiment of the invention, the patient lift apparatus comprising a static support structure, a pivotable transfer structure that is pivotably supported by the static support structure, and a hoisting device provided at a radial outward end portion of the pivotable transfer structure;

Figure 1A is an enlarged perspective view of the hoisting device provided at the radial outward end portion of the pivotable transfer structure of the patient lift apparatus of Figure 1;

Figure 1B is an enlarged perspective view of a bearing portion of the static support structure of the patient lift apparatus of Figure 1, which bearing portion pivotably supports the pivotable transfer structure;

Figure 2 is a front view of the patient lift apparatus of Figure 1;

Figure 2A is an enlarged front view of the hoisting device as shown in Figure 2;

Figure 3 is a side view of the patient lift apparatus of Figure 1;

Figure 4 is a top view of the patient lift apparatus of Figure 1;

Figure 5A is a partial perspective view of a cross-section of the bearing portion shown in Figure 1B also showing a lower end of the pivotable transfer structure that is pivotably supported onto the bearing portion;

Figure 5B is a partial perspective view of the lower end of the pivotable transfer structure as partially shown in Figure 5A;

Figure 6A is a perspective view of the hoisting device of Figure 1 shown in isolation;

Figure 6B is an enlarged perspective view showing a mounting element of the hoisting device of Figure 6A;

Figure 7 is a partial perspective view of the underside of the radial outward end portion of the pivotable transfer structure of Figure 1, without the hoisting device, showing a mounting slot configured to receive the mounting element of the hoisting device of Figure 6A;

Figure 8 is a partial perspective view showing an inner portion of the radial outward end portion of the pivotable transfer structure of Figure 1, without the hoisting device;

Figure 9 is a partial view of a cross-section of the radial outward end portion of the pivotable transfer structure showing a portion of the mounting element of the hoisting device;

Figure 10A is a top view of the patient lift apparatus of Figure 1 as positioned next to a bed in accordance with an illustrative room configuration;

Figures 10B and 10C are top views of the patient lift apparatus of Figure 1 as positioned next to a bed in accordance with two other illustrative room configurations; and

Figure 10D is a top view of a slightly modified version of the patient lift apparatus of Figure 1 as positioned next to a bed in accordance with yet another room configuration.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0034] The present invention will be described in relation to various illustrative embodiments. It shall be understood that the scope of the invention encompasses all combinations and sub-combinations of the features of the embodiments disclosed herein.

[0035] As described herein, when two or more parts or components are described as being connected, secured or coupled to one another, they can be so connected, secured or coupled directly to each other or through one or more intermediary parts.

[0036] More specifically, the invention will be described in relation to various embodiments of a patient lift apparatus, as depicted in Figures 1 to 10A-D. The patient lift apparatus shown in the Figures is generally designated by reference numeral 1 and is especially designed to facilitate transfer of a patient from a bed to a chair (be it a conventional chair, a wheelchair or a shower or toilet chair), and vice versa.

[0037] Referring to the embodiment shown in Figures 1 to 4, the patient lift apparatus 1 comprises a static support structure 1A, a pivotable transfer structure 1B that is pivotably supported by a bearing portion 10 of the static support structure 1A so as to pivot about a substantially vertical pivot axis PA (as shown and discussed in greater detail with reference to Figures 1B and 5A-B), and a hoisting device 50 with two lifting straps 50a, 50b configured to selectively lift or lower a patient, as is known for instance from International (PCT) Publication No. WO 2005/074853 A1. The hoisting device 50 is provided at a radial outward end portion 1b of the pivotable transfer

structure 1B. Each lifting strap 50a, 50b is provided with a corresponding hook portion 50A, resp. 50B for attachment to a sling or like harness (not shown). For the sake of illustration, the distance separating the two lifting straps 50a, 50b is of approximately 40 cm, which dimension is by no means limiting.

[0038] In the illustrated example, the static support structure 1A is a three-leg support structure configured to allow support of the patient lift apparatus 1 onto a floor portion FL. More specifically, the three-leg static support structure 1A comprises a longitudinal leg 11 and two lateral legs 12A, 12B extending transversally with respect to the longitudinal leg 11, the longitudinal leg 11 and the two lateral legs 12A, 12B extending from a base of the bearing portion 10, thereby forming an essentially T-shaped support structure. The legs 11, 12A, 12B are preferably secured to the base of the bearing portion 10 by means of bolts (or any other suitable securing means) to facilitate dismantling thereof from the base. In addition, the leg 11 is preferably designed to be dismantlable in two leg sections 11A, 11B.

[0039] In the illustrated example, the pivotable transfer structure is a substantially L-shaped structure comprising a substantially vertical mast section 20 extending from the bearing portion 10 along the pivot axis PA and a substantially horizontal boom section 25 extending perpendicularly to the pivot axis PA. The hoisting device 50 is provided at a radial outward end portion 1b of the boom section 25. The mast section 20 and boom section 25 are likewise preferably dismantlable. In the illustrated example the boom section 25 is connected to the mast section 20 via an intermediate coupling section 22 (here shown as a curved section). Releasable locking of the sections 20, 22, 25 one onto the other is ensured by removable locking pins 25.1 and 20.1. A removable locking pin 20.2 is further provided at a lower end of the mast section 20, next to a base 20A of the mast section 20.

[0040] Positioned on an intermediate portion of the mast section 20 is a control unit 40, including e.g. a remote control that can be used to control operation of the hoisting device 50 in a manner known as such in the art.

[0041] By way of preference, a longitudinal length L1 of the patient lift apparatus 1, as measured parallel to a length of the longitudinal leg 11 (see Figure 3), is of the order of 2'000 mm or more. A lateral length L2 of the patient lift apparatus 1, as measured parallel to a length of the lateral legs 12A, 12B (see Figure 4), is of the order 2'600 mm or more (each lateral leg 12A, 12B measuring of the order of 1'300 mm). A height H of the patient lift apparatus 1 (see Figure 3) preferably exceeds 2'000 mm. In the illustrated example, the height H is of the order of 2'100 mm. A length of the boom section 25, as measured with respect to the pivot axis PA, is preferably of the order of 1'200 mm. Such dimensions have been selected to ensure a stable support of the patient lift apparatus 1 on floor surfaces having an angle of inclination not exceeding 10°. It will be understood however that other dimensions could be contemplated.

[0042] In the illustrated example, the pivotable transfer structure 1B is pivotable by hand about the pivot axis PA. In other embodiments, additional means could be provided to automate such pivoting movement if needed or desirable.

[0043] In the context of the illustrated embodiment, a pivoting range, designated PR, of the pivotable transfer structure 1B is such that the pivotable transfer structure 1B is not allowed to move outside of an imaginary volume coinciding with a floor area covered by the static support structure 1A, the pivoting range PR of the pivotable transfer structure 1B being less than 180°. This is schematically illustrated in Figure 10A which shows the patient lift apparatus 1 installed in an illustrative room R comprising a bed BD. In this illustrative example, the patient lift apparatus 1 is positioned against a wall of the room R, with the longitudinal leg 11 extending away from the wall and the lateral legs substantially aligned with the wall. One of the lateral legs 12A, 12B, namely lateral leg 12B, is here positioned below the bed BD, which bed BD is aligned, longitudinally, with the longitudinal leg 11. The pivoting range PR does not exceed 180° to prevent the pivotable transfer structure 1B (and associated hoisting device 50) from inadvertently hitting the wall. In effect, a range-limiting mechanism is preferably provided to ensure that the pivoting range PR does not exceed a certain range.

[0044] Figures 5A and 5B show a preferred configuration of the bearing portion 10 and of a lower end section of the pivotable transfer structure 1B (namely of the mast section 20) in accordance with a particularly advantageous embodiment, which embodiment is applicable independently of the particular nature and configuration of the static support structure 1A.

[0045] As shown in Figure 5A, the bearing portion 10 comprises a hollow section 100 that is configured to receive a lower end section 200 of the pivotable transfer structure 1B, namely a lower end section 200 provided at the base 20A of the mast section 20. As shown in Figures 5A and 5B, the lower end section 200 protrudes beyond the base 20A and is entirely received inside the hollow section 100 of the bearing portion 10. Furthermore, two friction-reducing sleeve bearing elements 30, 35 are interposed between an outer peripheral surface of the lower end section 200 and an inner peripheral wall of the hollow section 100. In an alternate embodiment, a single friction-reducing sleeve bearing could be provided instead of two as shown.

[0046] The first friction-reducing sleeve bearing 30 is provided around a portion of the lower end section 200 of the pivotable transfer structure 1B, at a distal end portion of the hollow section 100 of the bearing portion 10. In the illustrated example, the first sleeve bearing 30 is shaped as a bushing with a collar projecting radially outward so as to be interposed between the base 20A of the mast 20 and the front face of the hollow section 100.

[0047] The second friction-reducing sleeve bearing 35 is provided around a distal end portion of the lower end

section 200 of the pivotable transfer structure 1B, at a bottom end portion of the hollow section 100 of the bearing portion 10.

[0048] A spacer could be provided between the two sleeve bearings 30, 35.

[0049] Each friction-reducing sleeve bearing 30, 35 is preferably a polymer sleeve bearing as is for instance available commercially from company IGUS GmbH (www.igus.com) under the product designation *iglide*®.

[0050] As further shown in Figure 5A, a radial locking pin 150 is provided on a front part of bearing portion 10, which radial locking pin 150 extends radially through the peripheral wall of the hollow section 100 to cooperate with a groove 200a provided on the circumference of the lower end section 200. As shown in Figure 5B, this groove 200a extends circumferential over a determined angle, here of the order of 120°, to act as a range-limiting mechanism limiting the range of pivoting movement of the pivotable transfer structure 1B under normal operating conditions. The radial locking pin 150 is here designed as a spring-loaded indexing plunger that is urged by default towards and inside the groove 200a. The radial locking pin 150 can be pulled manually out of engagement with the range-limiting groove 200a so that the pivotable transfer structure 1B can be pivoted, if need be, beyond the restricted pivoting range that is limited to 120° in the present example.

[0051] As further shown in Figure 5A, a washer 110 is located inside the hollow section 100, interposed between the lower end section 200 and the bottom end of the hollow section 100. Furthermore, a longitudinal locking pin 115 is positioned on a peripheral portion of the bottom end of the hollow section 100 for cooperation with a corresponding arcuate recess 200b formed on the distal end of the lower end section 200. In the illustrated example, the arcuate recess 200b extends over an angle of the order of 180° (or less) and ensures that the mast section 20 (and therefore the pivotable transfer structure 1B as a whole) is not allowed to pivot beyond a pivoting range PR of less than 180°.

[0052] In the illustrated example, the pivoting range PR about pivot axis PA is in effect restricted, under normal operating conditions, to 120° (namely +/- 60° with respect to a longitudinal direction coinciding with the longitudinal leg 11) by the combination of the radial locking pin 150 and circumferential groove 200a, which jointly define a first operating range. The pivoting range PR about pivot axis PA can however be extended to a second, greater operating range, namely up to approximately 180° (i.e. +/- 90° with respect to the longitudinal direction), if needed, by pulling the spring-loaded indexing plunger 150 out of engagement with the range-limiting groove 200a, thereby allowing the pivotable transfer structure 1B to be moved further beyond the first operating range. The spring-loaded indexing plunger 150 automatically returns to its default position, in engagement with the groove 200a, upon bringing back the pivotable transfer structure 1B within the first operating range.

[0053] By way of preference, the aforementioned lower end section 200 is dismantlable from the mast section 20, the locking pin 20.2 being used to releasably secure the lower end section 200 to the mast section 20. In this way, when dismantling the patient lift apparatus 1, the hollow section 100 and lower end section 200 do not need to be disassembled from one another, thereby preserving the bearing and minimizing the risk that dust or extraneous material enters the interface between both sections, which could otherwise interfere with a proper operation of the bearing and of each sleeve bearing 30, 35 in particular.

[0054] Turning to Figure 6A-B to 9, one will now describe a further aspect of the invention pertaining to the hoisting device 50 and the coupling interface thereof with the boom section 25.

[0055] Figure 6A shows the hoisting device 50 in isolation, which hoisting device 50 could in essence be designed in accordance with the principles already disclosed in International (PCT) Publication No. WO 2005/074853 A1 with regard to the manner in which the lifting straps 50a, 50b are wound or unwound from associated winding spools. More advantageously, the hoisting device 50 is structured and configured in accordance with the principles that are disclosed in co-pending European application titled "DUAL-STRIP HOISTING DEVICE AND PATIENT LIFT APPARATUS COMPRISING THE SAME" in the name of the present Applicant which is filed concurrently with the instant application. The particular structure and configuration of the hoisting device 50 will not be described herein as such structure and configuration do not fundamentally impact the invention as presently claimed. It suffices to understand that the lifting straps 50a, 50b are wound or unwound onto first and second winding spools located within the hoisting device 50 and that the hoisting device 50 is preferably further provided with a built-in scale to measure load applied on the hoisting device 50, in particular for the purpose of determining the weight of the patient being lifted.

[0056] All of the functional components of the hoisting device 50 (including the aforementioned built-in scale) are housed within a housing 51A-C, including a main housing element 51A, an upper housing element 51B, as well as a further housing element 51C surrounding a mounting element, designated by reference numeral 55, that is used to mount the hoisting device 50 under the boom section 25 (see also Figures 1A and 2A). The two lifting straps 50a, 50b protrude from the underside of the main housing element 51A through corresponding apertures (not specifically shown). Reference numeral 52 in Figure 6A (and Figures 1A and 2A) designates a display provided on a front face of the hoisting device 50 that can be used to display information, including e.g. the weight of the patient being lifted. Further functional elements could be provided, including e.g. an ambient lighting system (e.g. a LED system) located on a bottom section of the hoisting device 50 to illuminate the area below the hoisting device 50.

[0057] Figure 6B is an enlarged perspective view showing the mounting element 55 in greater detail. This mounting element 55 and the associated structure on the boom section 25 are configured in such a way as to allow the hoisting device 50 to be selectively released from the boom section 25. To this end, the mounting element exhibits a head section 55A and a neck section 55B. The lower portion of the head section 55A, on either side of the neck section 55B preferably exhibits chamfered surfaces 55a as shown. Furthermore, a pair of through-holes 55b extending all the way vertically through the mounting element 55 are provided. The through-holes 55b allow passage and routing of wiring 50W (see Figure 9) from the hoisting device 50 inside the boom section 25 for connection e.g. to the aforementioned control unit 40 and associated remote control.

[0058] The mounting element 55 is secured mechanically to the hoisting device 50 to ensure adequate support thereof. In the illustrated example, while not specifically shown, the mounting element 55 is coupled to the built-in scale to measure load applied onto the hoisting device 50, but the mounting element 55 could alternatively be connected directly to a structural frame of the hoisting device 50.

[0059] Figure 7 is a partial perspective view of the underside of the radial outward end portion 1b of the pivotable transfer structure 1B, namely of the boom section 25, without the hoisting device 50. Figure 7 shows the provision of a longitudinal mounting slot 250 that extends longitudinally along a portion of the radial outward end portion 1b of the boom section 25, namely over a distance designated by reference RA. At the outermost end of the longitudinal mounting slot 250 there is provided a mounting aperture 250a that is large enough to allow the mounting element 55 to be extracted out of or inserted into the boom section 25. Figure 7 also shows the presence of a removable stop element 25B that is here positioned to close the mounting aperture 250a and thereby prevent inadvertent disengagement of the mounting element 55 and associated hoisting device 50. This removable stop element 25B can be positioned and secured in place via a front end of the boom section 25, namely after removal of a front cap 25A provided at the distal end of the boom section 25.

[0060] Figure 8 shows the distal end of the boom section 25 with the front cap 25A removed, as well as the removable stop element 25B. As shown, the boom section 25 here takes the shape of a profiled section (such as e.g. an aluminium profile) that is shaped to exhibit a longitudinal inner channel 25a that is configured and dimensioned to receive the head section 55A of the mounting element 55. Reinforcing ribs are here provided around the longitudinal inner channel 25a to maximize structural strength and robustness of the boom section 25.

[0061] Both of the aforementioned longitudinal mounting slot 250 and mounting aperture 250a communicate with the longitudinal inner channel 25a, the longitudinal mounting slot 250 being configured and dimensioned to receive and guide the neck section 55B of the mounting element 55. More specifically, in the illustrated embodiment, the neck section 55B can be slid along the longitudinal mounting slot 250 when no load is applied onto the mounting element 55. Conversely, as shown in Figure 9, when load is applied on the mounting element 55, the head section 55A of the mounting element 55 comes to rest against a portion of an inner peripheral wall of the longitudinal inner channel 25a, on either side of the longitudinal mounting slot 250. In effect, the configuration is such that the mounting element 55 is prevented from freely moving along the longitudinal mounting slot 250 due to the applied load. The aforementioned chamfered surfaces 55a on the head section 55A of the mounting element 55 favour a more intimate connection between the mounting element 55 and the inner peripheral wall of the inner channel 25a.

[0062] In accordance with another embodiment of the invention, the boom section 25 and mounting element 55 are both made of metal and the inner peripheral wall of the of the longitudinal inner channel 25a may be provided with a friction-enhancing sleeve or liner, which friction-enhancing sleeve or liner is preferably made of rubber.

[0063] In the illustrated example, the radial position of the hoisting device 50 is preferably adjustable along the radial outward end portion 1b of the boom section 25 over a range RA of the order of 100 mm or more. In that respect, the radial position of the hoisting device 50, as measured with respect to the pivot axis PA, is in particular adjustable from approximately 900 mm to 1'000 mm or more. Referring again to the illustration of Figure 10A, one will understand that the effective range of operation of the patient lift apparatus 1 covers an arcuate region defined by variables PR and RA, as shown and designated by reference Z. It will be understood that the radial position of the hoisting device 50 along the boom section 25 is normally set once for good depending on the need, desire and corpulence of the patient and the relevant room configuration, and that this radial position is not normally adjusted during operation of the patient lift apparatus 1, it being however possible to carry out subsequent adjustments in case of need.

[0064] Figures 10B and 10C are top views of the patient lift apparatus 1 as positioned next to a bed BD in accordance with two other illustrative room configurations, the relevant room R being of smaller dimensions. It will be apparent that the patient lift apparatus 1 can be installed in many different ways depending on the location and orientation of the bed. As schematically shown in Figure 10C, the bed BD does not necessarily need to be located above one of the lateral legs of the patient lift apparatus 1 but could be located at a distance from the relevant wall.

[0065] For even smaller room dimensions, especially rooms having a width smaller that the overall lateral width (L2) of the patient lift apparatus 1, it is potentially possible to replace one of the lateral legs 12A, 12B by a shorter later leg 15 having an angled section 15A as shown.

[0066] Various modifications and/or improvements may be made to the above-described embodiments without departing from the scope of the invention as defined by the annexed claims.

[0067] For instance, as already mentioned, the particular configuration of the boom portion as discussed with reference to Figures 5A and 5B is not necessarily restricted to the use of a three-leg static support structure 1A as show e.g. in Figure 1. Other static support structures could be contemplated, including e.g. a wall-mounted structure.

LIST OF REFERENCE NUMERALS AND SIGNS USED THEREIN

[0068]

1	patient lift apparatus
1A	static support structure / three-leg support structure
1B	pivotable transfer structure
1b	radial outward end portion of pivotable transfer structure 1B (radial outward end portion of boon section 25)
10	bearing portion of static support structure 1A pivotably supporting pivotable transfer structure 1B
11	longitudinal leg of static support structure
11A, 11B	dismantlable leg sections of longitudinal leg 11
12A, 12B	lateral legs
15	lateral leg with angled section
15A	angled section of lateral leg 15
20	mast section of pivotable transfer structure 1B
20.1	removable locking pin
20.2	removable locking pin
20A	base of mast section 20
22	intermediate coupling section
25	boom section of pivotable transfer structure 1B
25A	removable front cap of boom section 25
25B	removable stop element
25a	inner channel of boom section 25
25.1	removable locking pin
40	control unit
50	hoisting device
50A	(first) hook portion for sling (not shown)
50a	(first) lifting strap
50B	(second) hook portion for sling (not shown)
50b	(second) lifting strap
50W	wiring for e.g. connection of hoisting device 50 to control unit 40
51A-C	housing of hoisting device 50
52	display
55	mounting element of hoisting device 50
55A	head section of mounting element 55
55a	chambered surfaces on lower portion of head section 55A
55b	through-holes allowing passage of wiring 50W
55B	neck section of mounting element 55
100	hollow section of bearing portion 10 configured to receive lower end section 200 of pivotable transfer structure 1B
110	washer interposed between lower end section 200 and bottom end of hollow section 100
115	longitudinal locking pin cooperating with range-limiting recess 200b
150	radial locking pin (e.g. spring-loaded indexing plunger) cooperating with range-limiting groove 200a (part of range-limiting mechanism)
200	lower end section 200 of pivotable transfer structure 1B received within hollow section 100 of bearing portion 10
200a	range-limiting groove 200a cooperating with radial locking pin 150
200b	range-limiting recess 200b cooperating with longitudinal locking pin 115
250	longitudinal mounting slot communicating with longitudinal inner channel 25a of boom section 25
250a	mounting aperture communicating with longitudinal inner channel 25a of boom section 25
FL	floor portion
PA	pivot axis of pivotable transfer structure 1B
PR	pivoting range of pivotable transfer structure 1B
RA	range of adjustment of radial position of hoisting device 50 along radial outward end portion 1b of boom section 25
L1	longitudinal length of patient lift apparatus 1 as measured parallel to a length of longitudinal leg 11
L2	lateral length of patient lift apparatus 1 as measured parallel to a length of lateral legs 12A, 12B
H	height of patient lift apparatus 1
R	room
BD	bed
Z	possible range of operation of patient lift apparatus 1

Claims

1. A patient lift apparatus (1) comprising a static support structure (1A), a pivotable transfer structure (1B) that is pivotably supported by a bearing portion (10) of the static support structure (1A) so as to pivot about a substantially vertical pivot axis (PA), and a hoisting device (50) with at least one lifting strap (50a, 50b) configured to selectively lift or lower a patient, which

hoisting device (50) is provided at a radial outward end portion (1b) of the pivotable transfer structure (1B),
characterized in that the static support structure (1A) is a three-leg support structure configured to allow support of the patient lift apparatus (1) onto a floor portion (FL), which static support structure (1A) comprises three legs (11, 12A, 12B), namely a longitudinal leg (11) and two lateral legs (12A, 12B) extending transversally with respect to the longitudinal leg (11),
and **in that** the longitudinal leg (11) and the two lateral legs (12A, 12B) extend from a base of the bearing portion (10).

2. The patent lift apparatus (1) according to claim 1, wherein the longitudinal leg (11) is dismantlable in at least two leg sections (11A, 11B).

3. The patient lift apparatus (1) according to claim 1 or 2, wherein a pivoting range (PR) of the pivotable transfer structure (1B) is such that the pivotable transfer structure (1B) is not allowed to move outside of an imaginary volume coinciding with a floor area covered by the static support structure (1A), and wherein the pivoting range (PR) of the pivotable transfer structure (1B) is of less than 180°.

4. The patient lift apparatus (1) according to any one of the preceding claims, wherein a longitudinal length (L1) of the patient lift apparatus (1), as measured parallel to a length of the longitudinal leg (11), is of the order of 2'000 mm or more, and/or
wherein a lateral length (L2) of the patient lift apparatus (1), as measured parallel to a length of the lateral legs (12A, 12B), is of the order of 2'600 mm or more.

5. The patient lift apparatus (1) according to any one of the preceding claims, wherein a height (H) of the patient lift apparatus (1) exceeds 2'000 mm and is preferably of the order of 2'100 mm.

6. The patient lift apparatus (1) according to any one of the preceding claims, wherein the bearing portion (10) comprises a hollow section (100) configured to receive a lower end section (200) of the pivotable transfer structure (1B),
and wherein at least one friction-reducing sleeve bearing (30, 35) is interposed between an outer peripheral surface of the lower end section (200) of the pivotable transfer structure (1B) and an inner peripheral wall of the hollow section (100) of the bearing portion (10).

7. A patient lift apparatus (1) comprising a static support structure (1A), a pivotable transfer structure (1B) that is pivotably supported by a bearing portion (10) of the static support structure (1A) so as to pivot about a substantially vertical pivot axis (PA), and a hoisting device (50) with at least one lifting strap (50a, 50b) configured to selectively lift or lower a patient, which hoisting device (50) is provided at a radial outward end portion (1b) of the pivotable transfer structure (1B),
characterized in the bearing portion (10) comprises a hollow section (100) configured to receive a lower end section (200) of the pivotable transfer structure (1B),
and **in that** at least one friction-reducing sleeve bearing (30, 35) is interposed between an outer peripheral surface of the lower end section (200) of the pivotable transfer structure (1B) and an inner peripheral wall of the hollow section (100) of the bearing portion (10).

8. The patient lift apparatus (1) according to claim 6 or 7, wherein the at least one friction-reducing sleeve bearing (30, 35) comprises a first friction-reducing sleeve bearing (30) provided around a portion of the lower end section (200) of the pivotable transfer structure (1B), at a distal end portion of the hollow section (100) of the bearing portion (10), and a second friction-reducing sleeve bearing (35) provided around a distal end portion of the lower end section (200) of the pivotable transfer structure (1B), at a bottom end portion of the hollow section (100) of the bearing portion (10).

9. The patient lift apparatus (1) according to any one of claims 6 to 8, wherein each friction-reducing sleeve bearing (30, 35) is a polymer sleeve bearing.

10. The patient lift apparatus (1) according to any one of the preceding claims, wherein the pivotable transfer structure (1B) is a substantially L-shaped structure comprising a substantially vertical mast section (20) extending from the bearing portion (10) along the pivot axis (PA) and a substantially horizontal boom section (25) extending perpendicularly to the pivot axis (PA), the hoisting device (50) being provided at a radial outward end portion (1b) of the boom section (25),
and wherein a length of the boom section (25) as measured with respect to the pivot axis (PA), is preferably of the order of 1'200 mm.

11. The patient lift apparatus (1) according to claim 10, wherein a radial position of the hoisting device (50) is adjustable along the radial outward end portion (1b) of the boom section (25),
wherein the radial position of the hoisting device (50) is preferably adjustable along the radial outward end portion (1b) of the boom section (25) over a range (RA) of the order of 100 mm or more,
and wherein the radial position of the hoisting device

(50), as measured with respect to the pivot axis (PA), is in particular adjustable from approximately 900 mm to 1'000 mm or more.

12. The patient lift apparatus (1) according to claim 11, wherein the hoisting device (50) is selectively releasable form the boom section (25) and comprises a mounting element (55) having a head section (55A) and a neck section (55B),
wherein the radial outward end portion (1b) of the boom section (25) comprises a longitudinal inner channel (25a) configured and dimensioned to receive the head section (55A) of the mounting element (55),
wherein the radial outward end portion (1b) of the boom section (25) further comprises a longitudinal mounting slot (250) communicating with the longitudinal inner channel (25a), the longitudinal mounting slot (250) being configured and dimensioned to receive and guide the neck section (55B) of the mounting element (55) and allow the neck section (55B) to be slid along the longitudinal mounting slot (250) when no load is applied onto the mounting element (55),
and wherein the head section (55A) of the mounting element (55) is configured and dimensioned to come to rest against a portion of an inner peripheral wall of the longitudinal inner channel (25a), on either side of the longitudinal mounting slot (250), when load is applied onto the mounting element (55).

13. The patient lift apparatus (1) according to claim 12, wherein the head section (55A) of the mounting element (55) comprises chamfered surfaces (55a) configured to come to rest against the portion of the inner peripheral wall of the longitudinal inner channel (25a), and/or
wherein the boom section (25) and mounting element (55) are both made of metal and wherein the inner peripheral wall of the longitudinal inner channel (25a) is provided with a friction-enhancing sleeve or liner, which friction-enhancing sleeve or liner is preferably made of or comprises rubber.

14. The patient lift apparatus (1) according to any one of the preceding claims, further comprising a range-limiting mechanism (150, 200a, 115, 200b) configured to mechanically restrict a pivoting range (PR) of the pivotable transfer structure (1B),
wherein the pivoting range (PR) of the pivotable transfer structure (1B) is preferably restricted to less than 180°,
and wherein the range-limiting mechanism (150, 200a, 115, 200b) is in particular configured to restrict the pivoting range (PR) of the pivotable transfer structure (1B) to a first operating range and to allow the pivoting range (PR) to be selectively extended to a second operating range greater than the first operating range.

15. The patient lift apparatus (1) according to any one of the preceding claims, wherein the static support structure (1A) and/or the pivotable transfer structure (1B) is/are dismantlable.

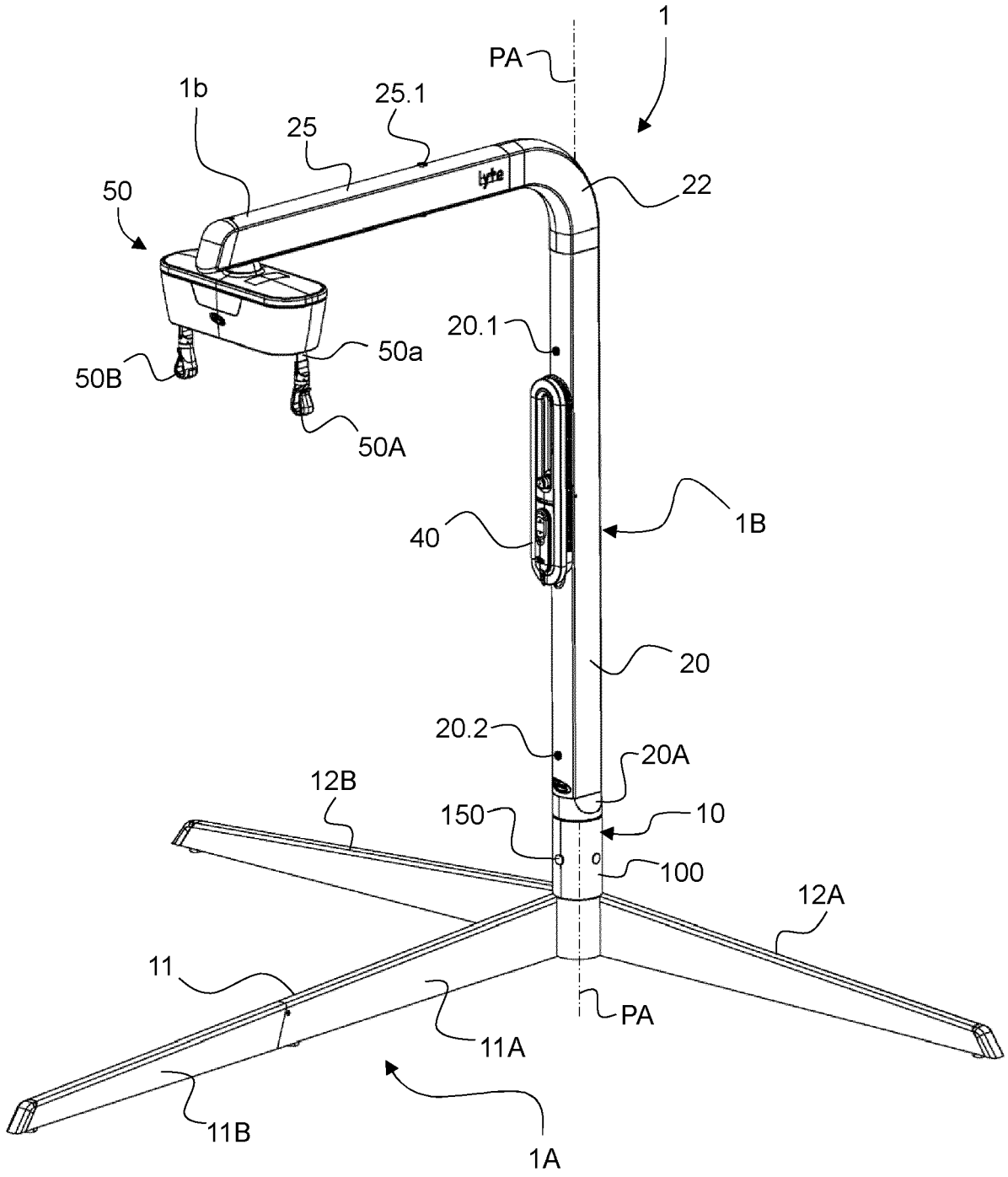
1
PA
1b
25.1
25
50
22
20.1
50a
50B
50A
40
1B
20
20.2
20A
12B
150
10
100
12A
11
PA
11A
11B
1A

Fig. 1

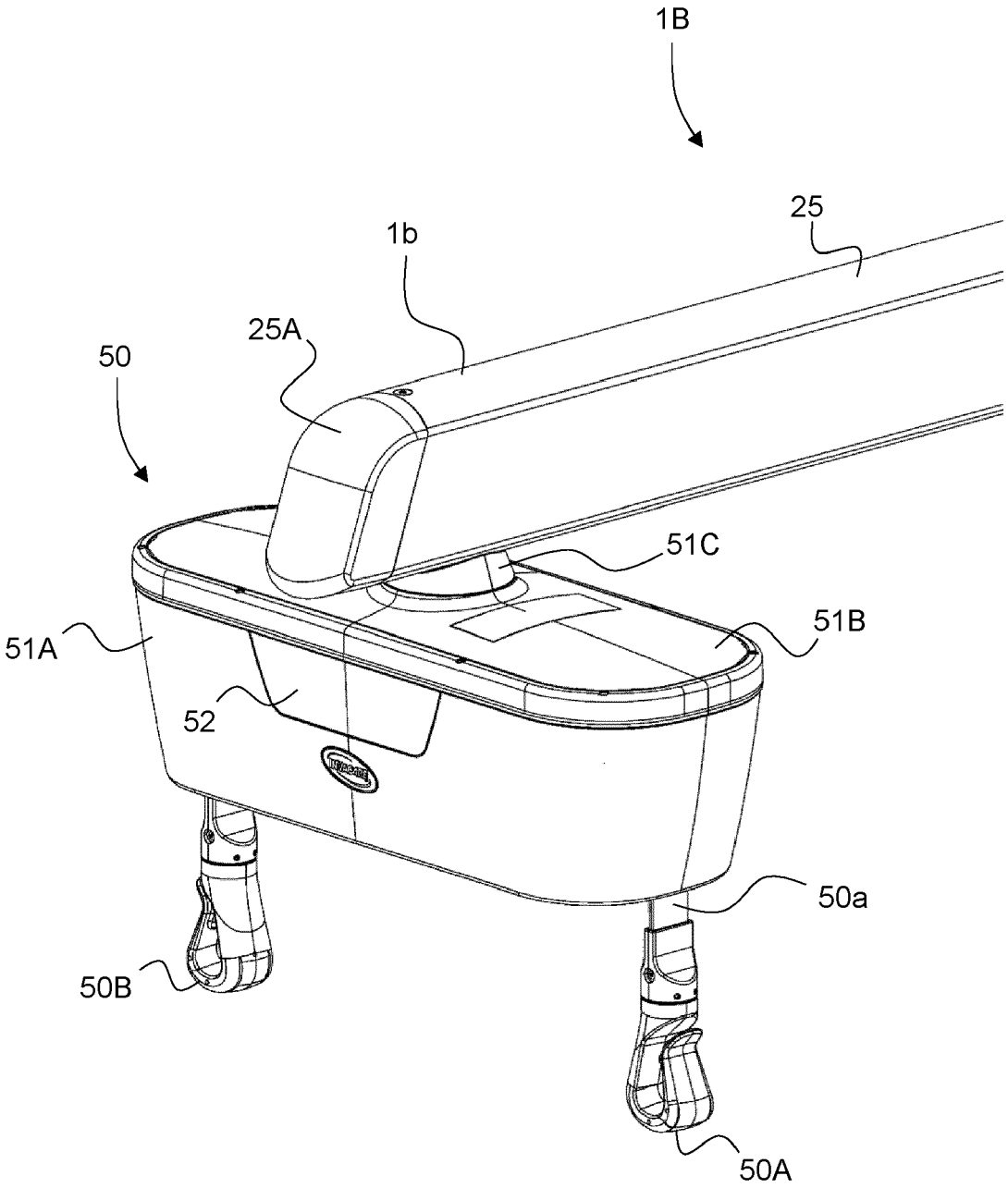

Fig. 1A

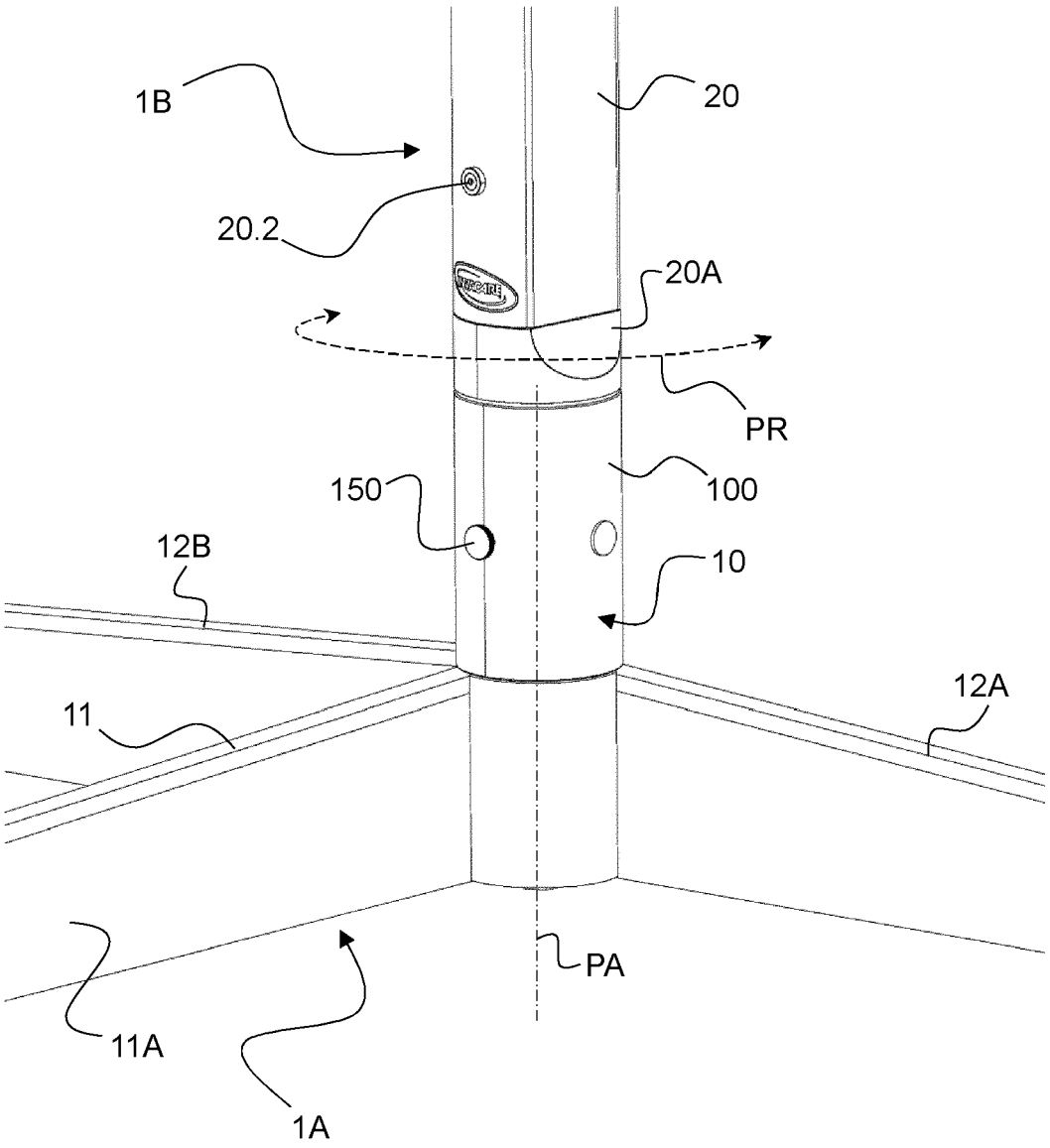

Fig. 1B

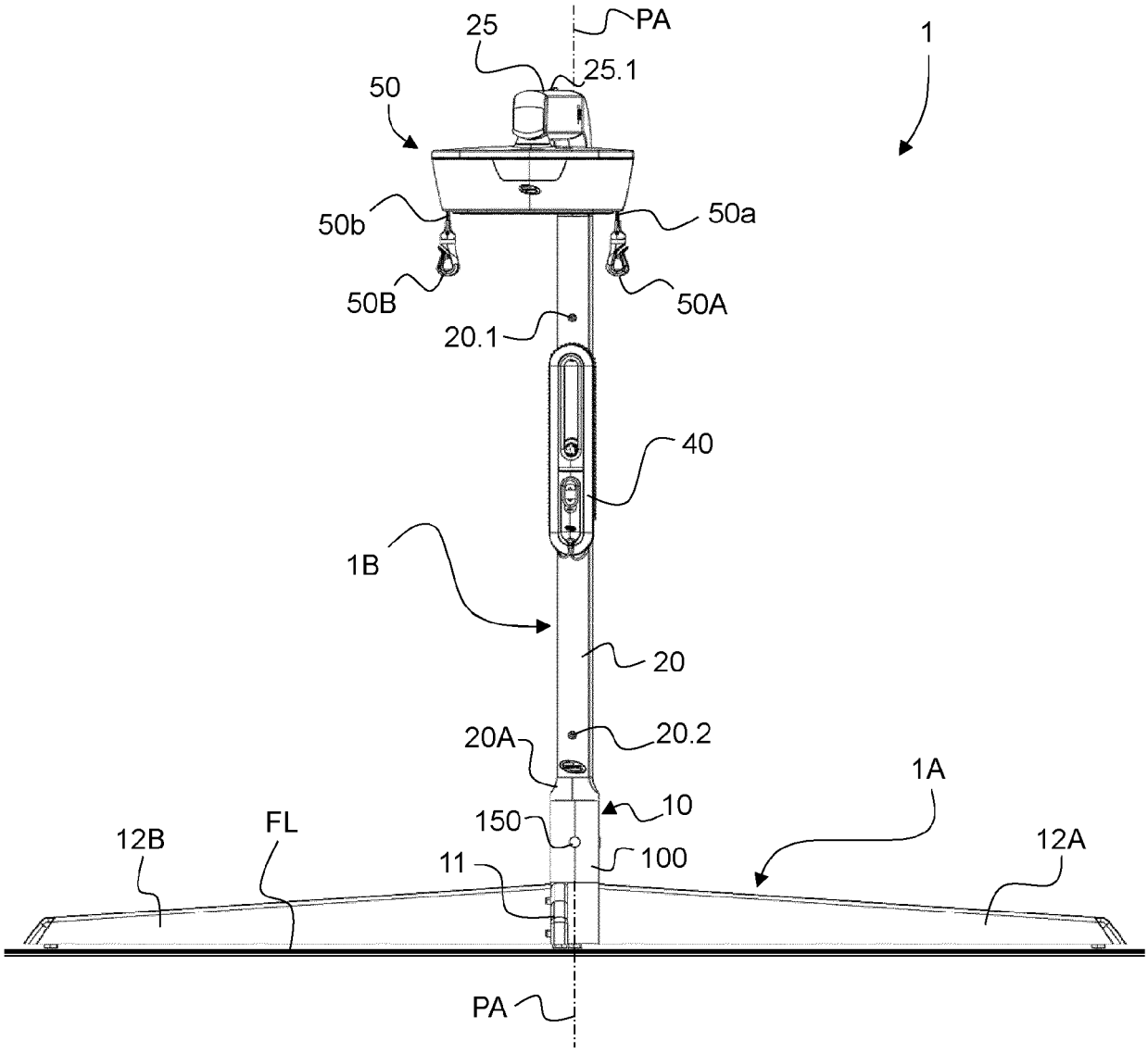
25
PA
25.1
1
50
50b
50a
50B
50A
20.1
40
1B
20
20A
20.2
1A
10
150
12B
FL
12A
11
100
PA

Fig. 2

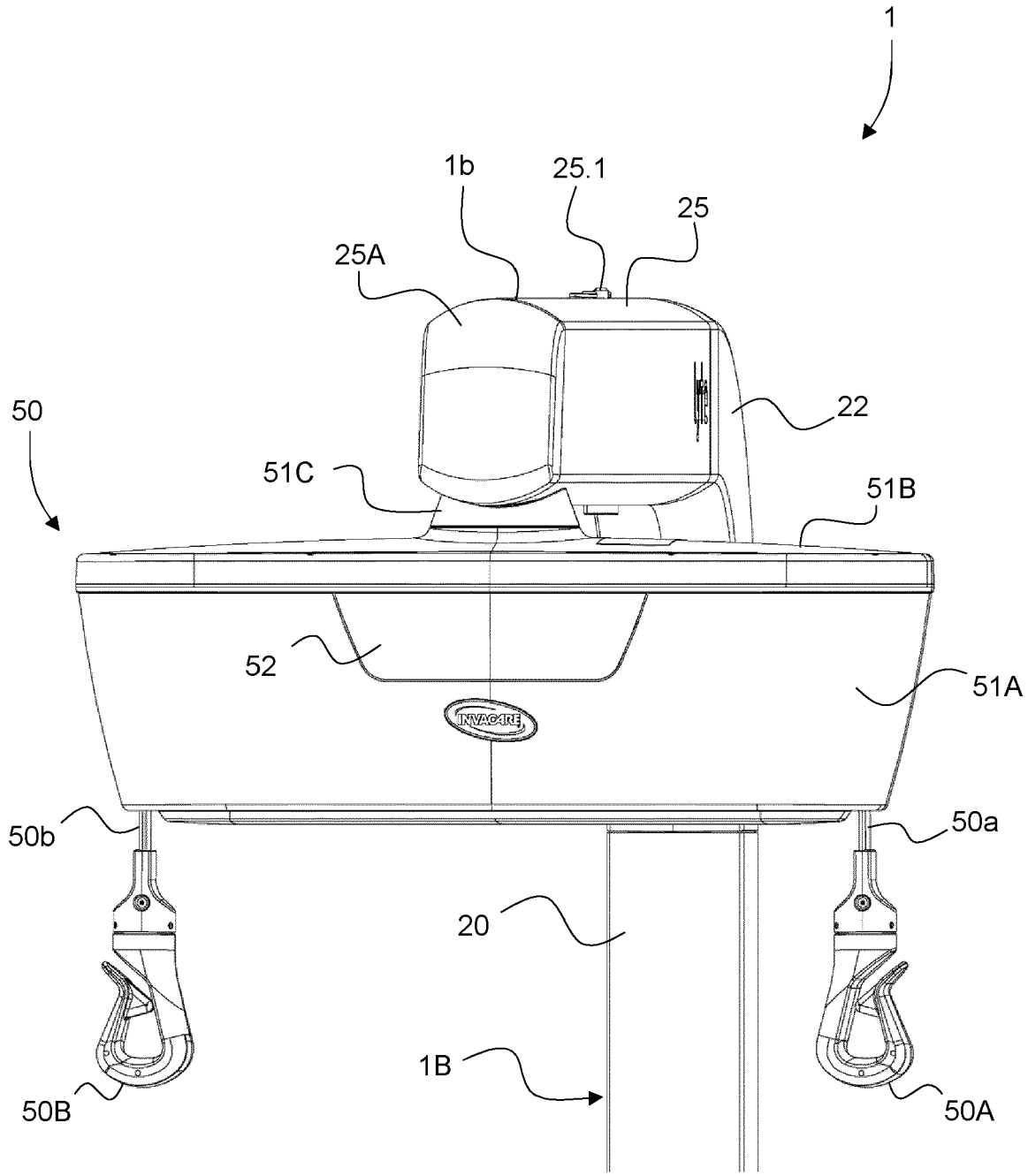

Fig. 2A

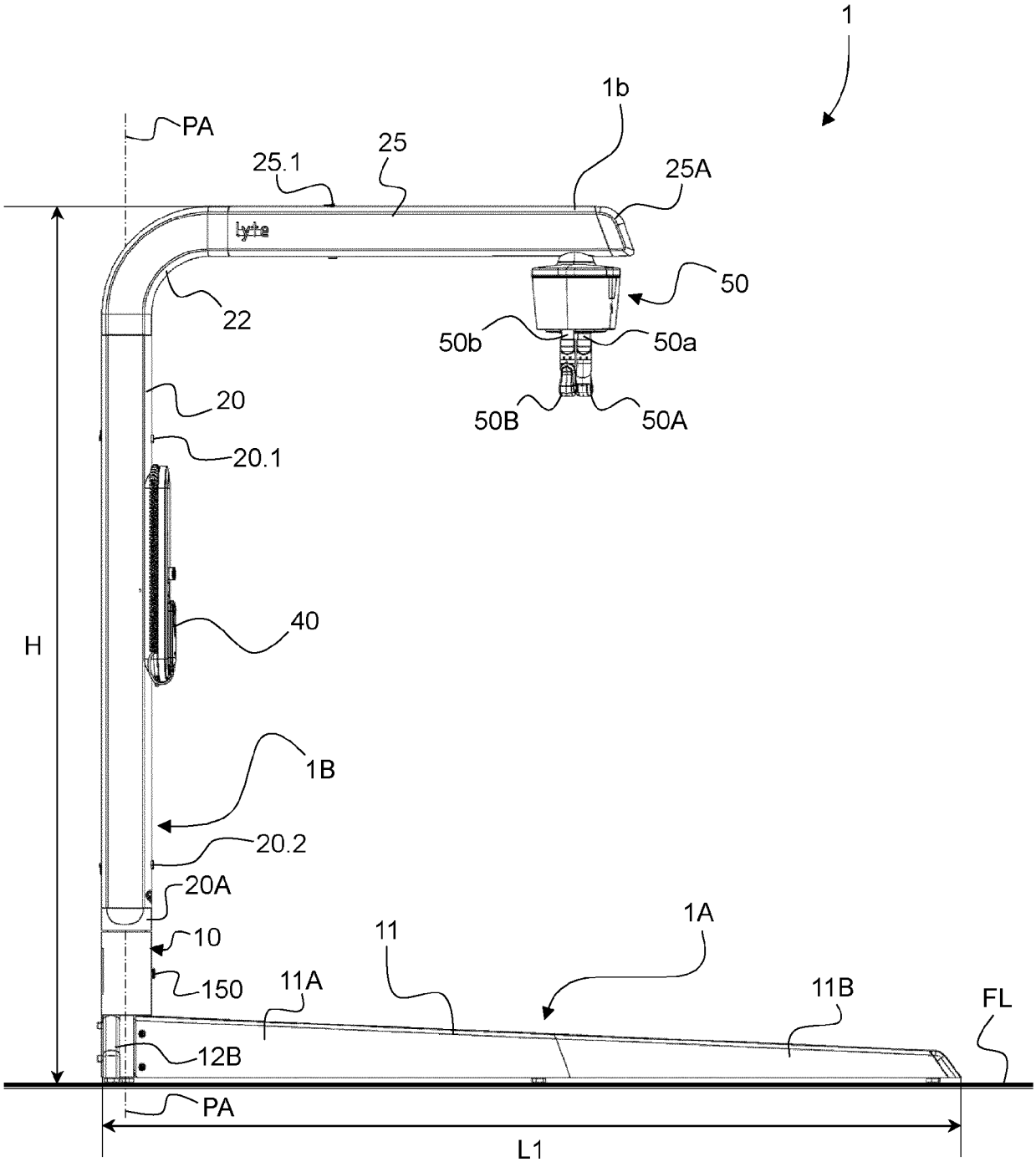
1
1b
PA
25.1
25
25A
50
22
50b
50a
20
50B
50A
20.1
40
H
1B
20.2
20A
1A
11
10
150
11A
11B
FL
12B
PA
L1

Fig. 3

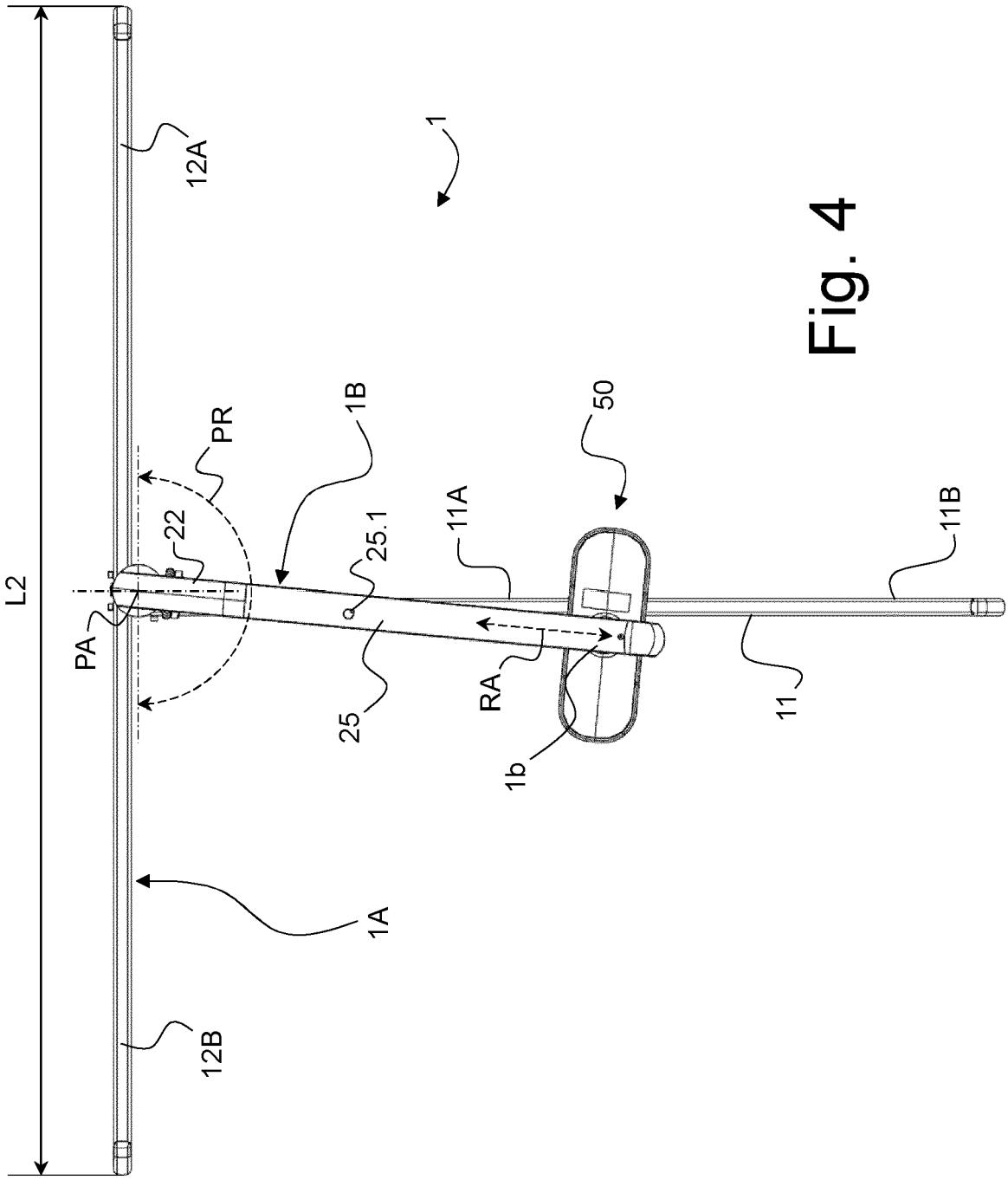

Fig. 4

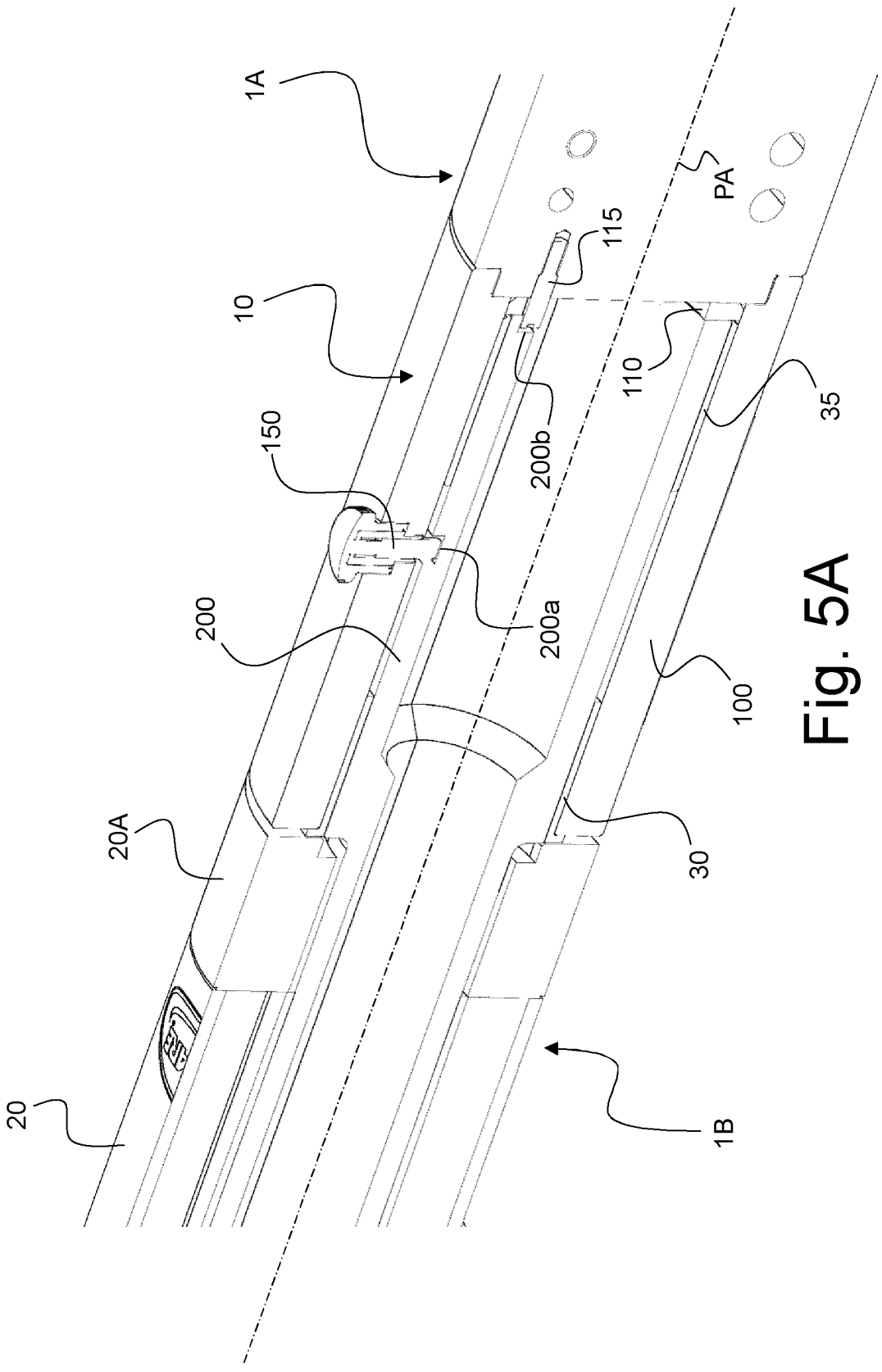

Fig. 5A

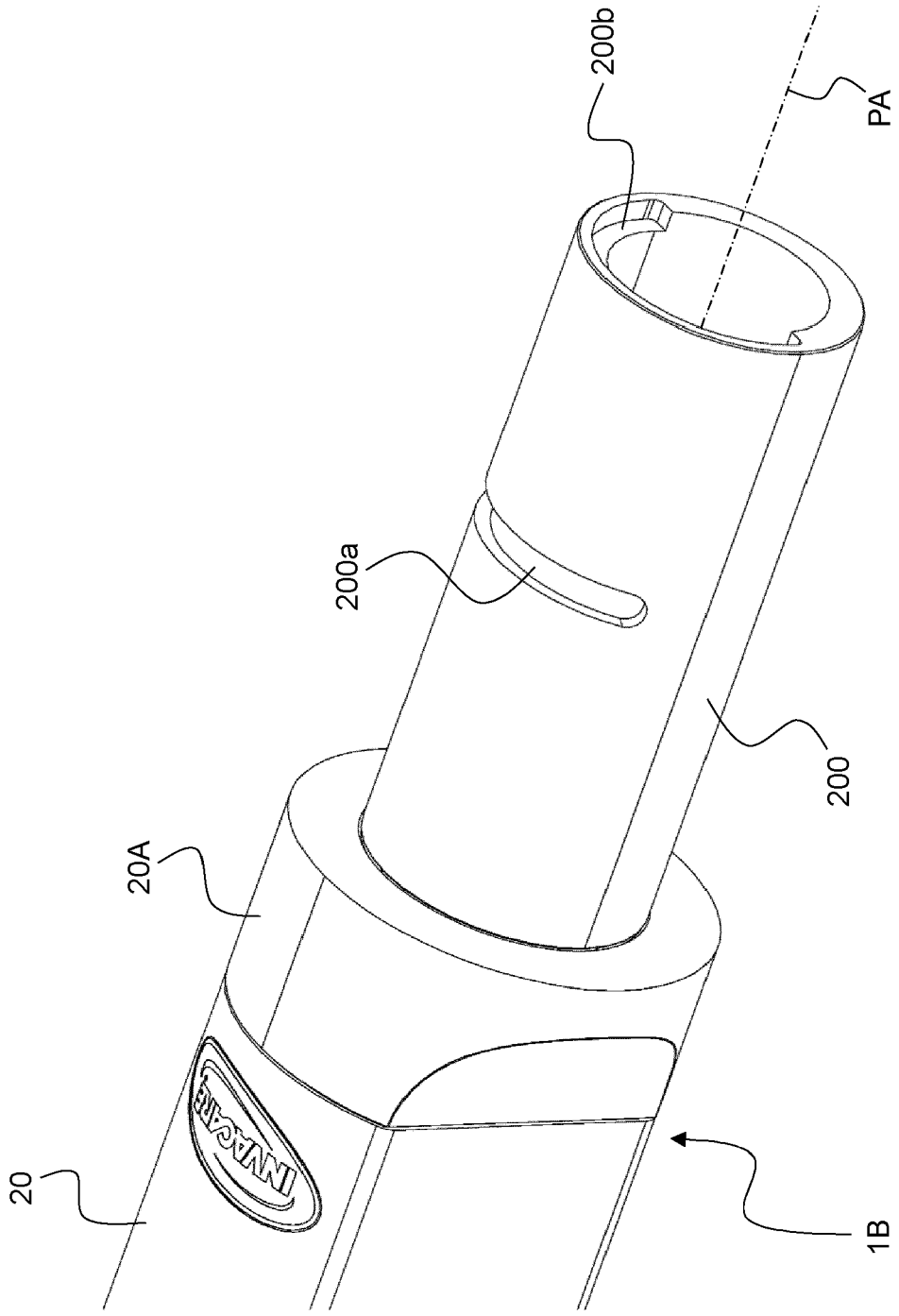

Fig. 5B

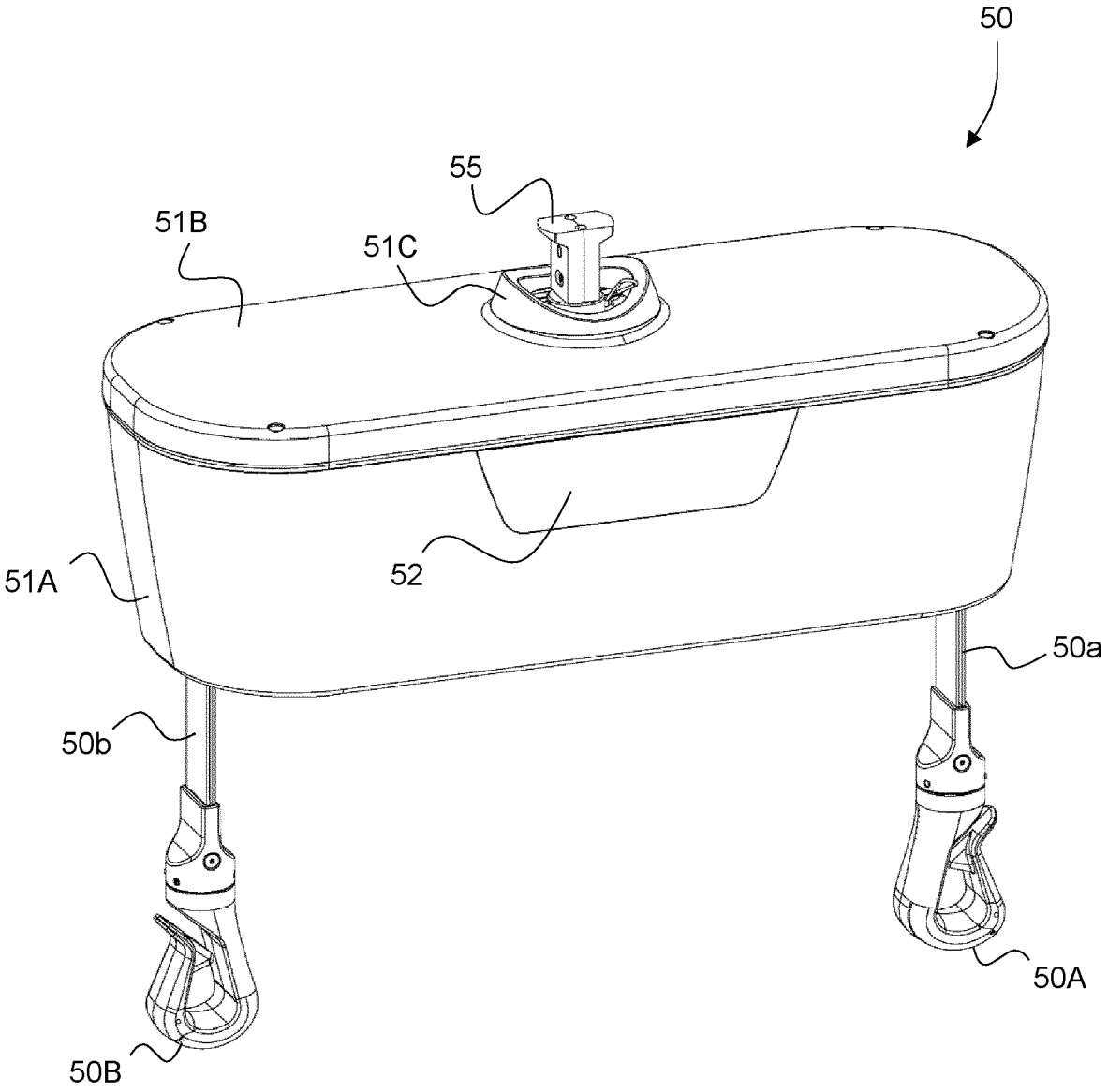

Fig. 6A

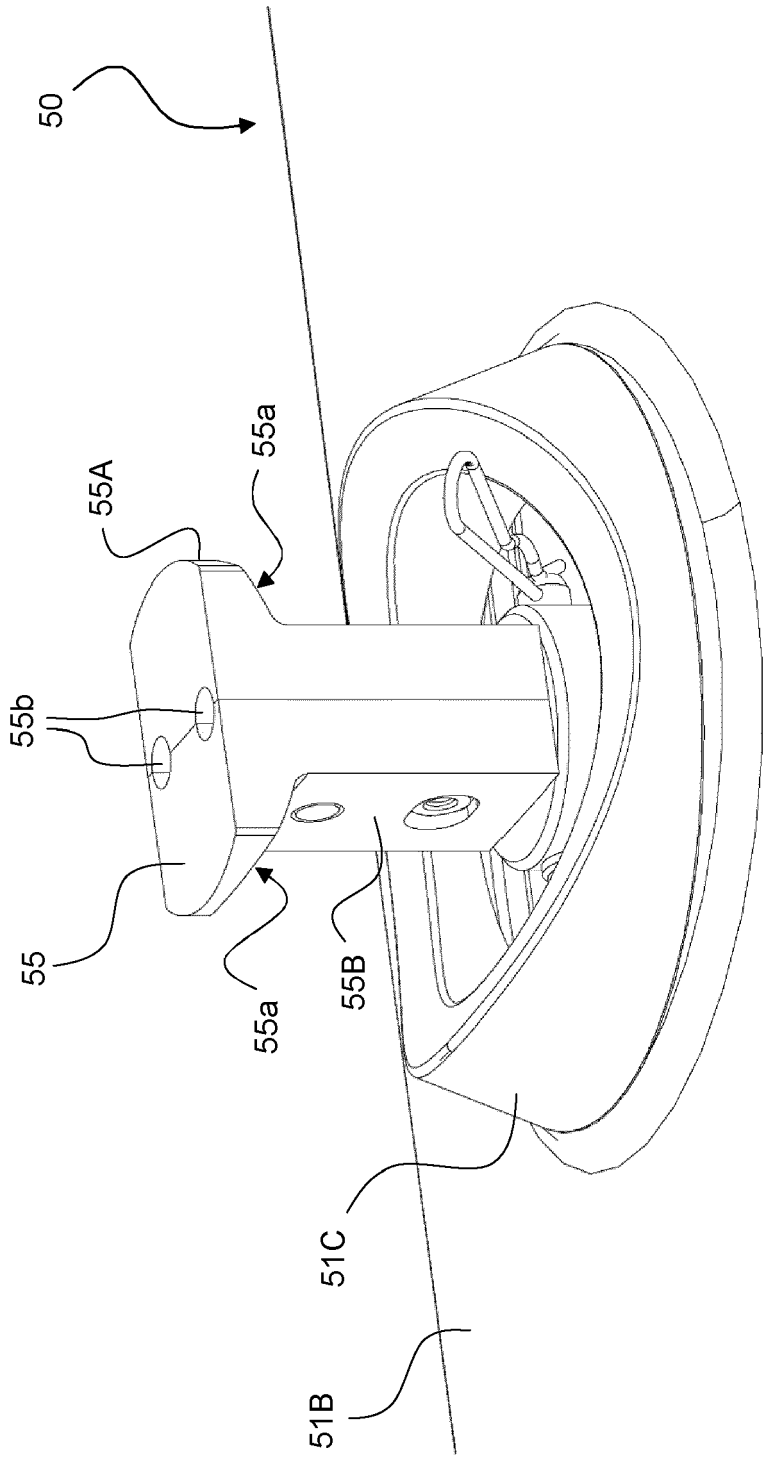

Fig. 6B

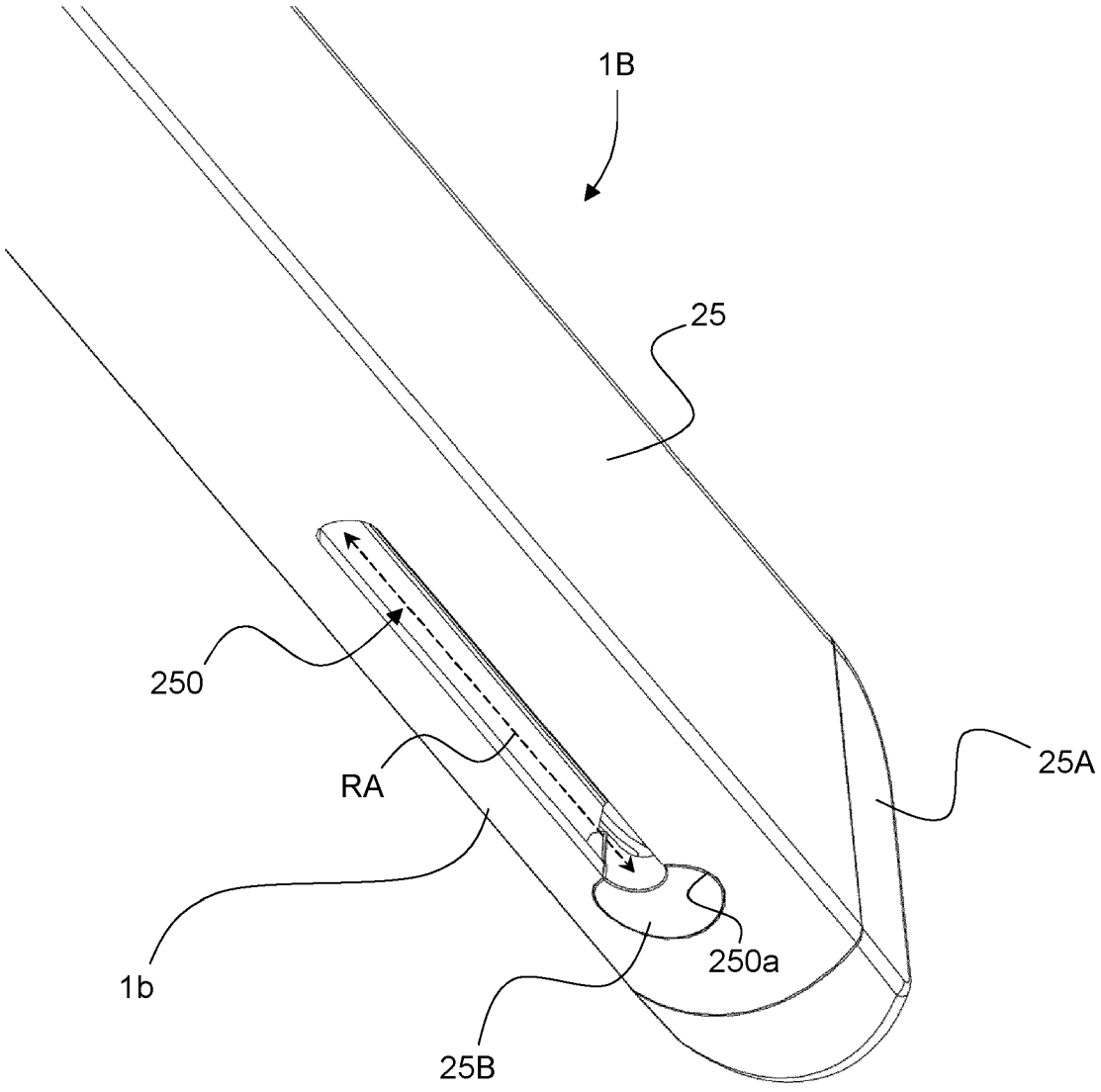

Fig. 7

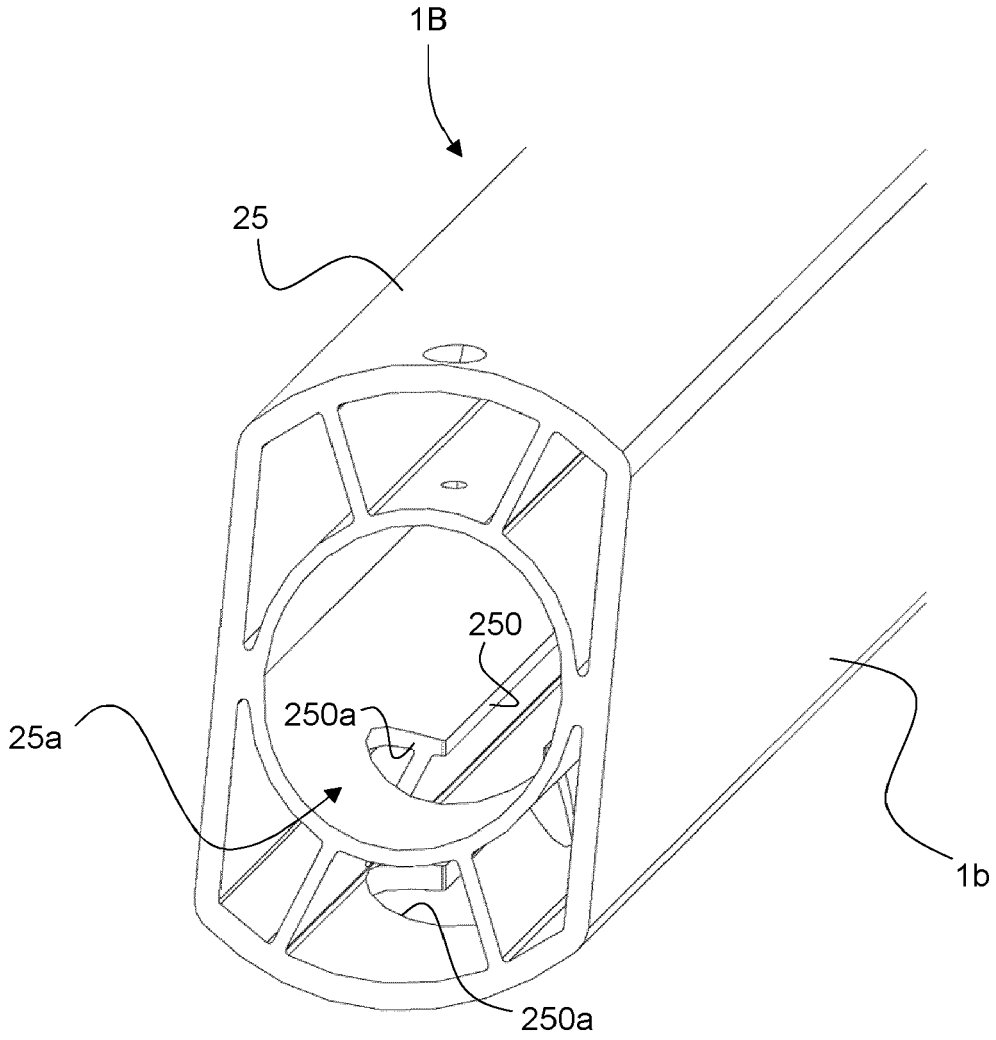

Fig. 8

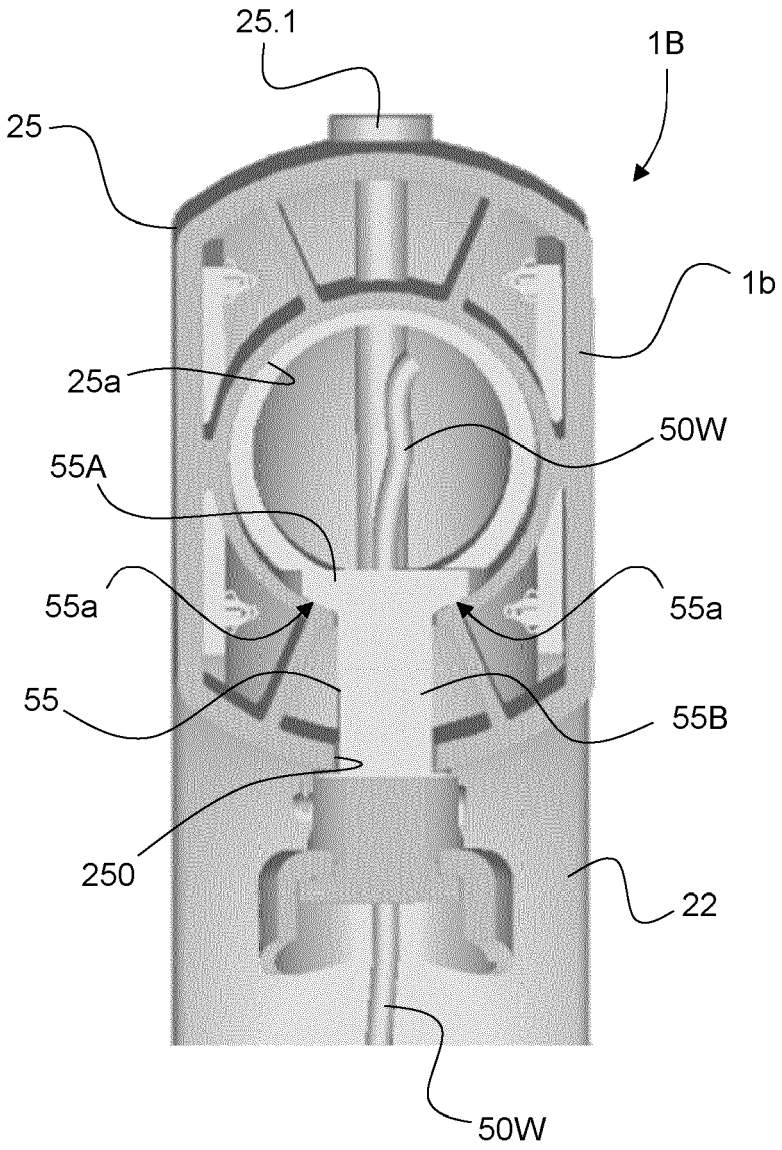

Fig. 9

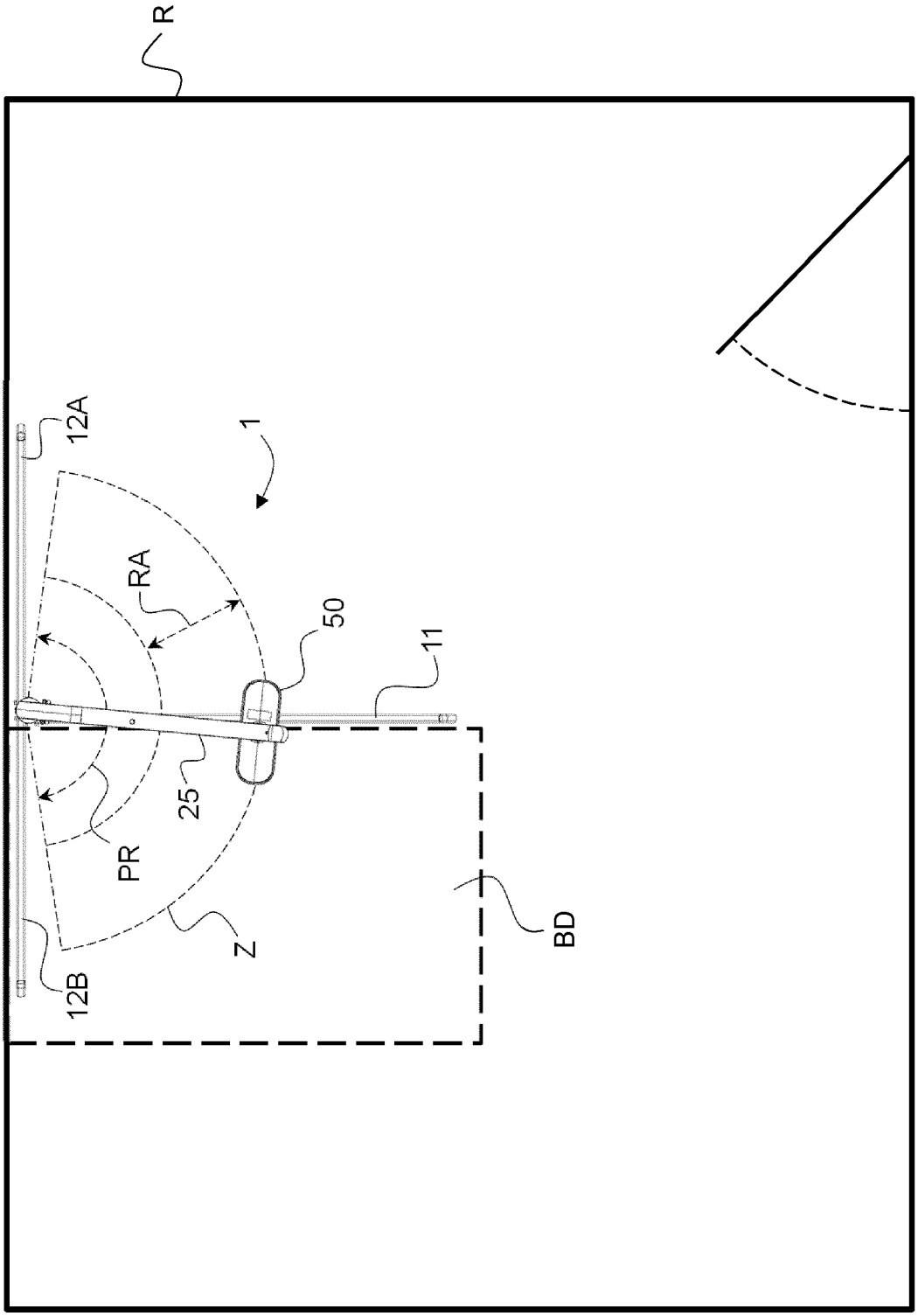

Fig. 10A

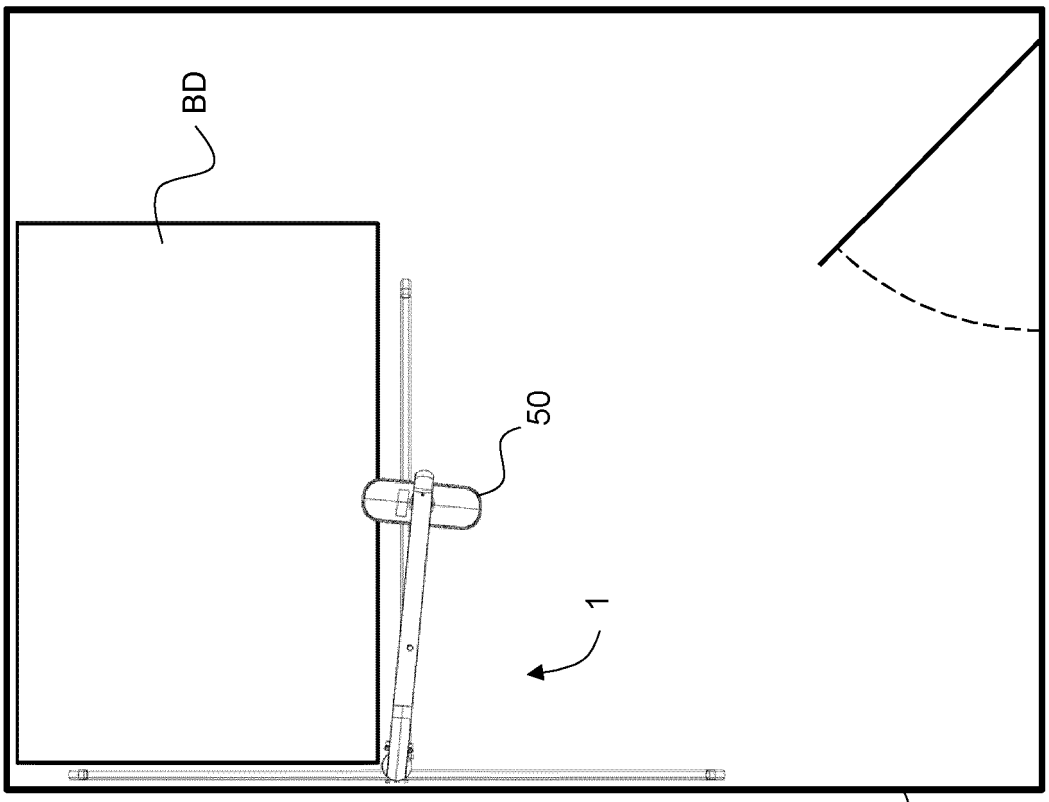

Fig. 10C

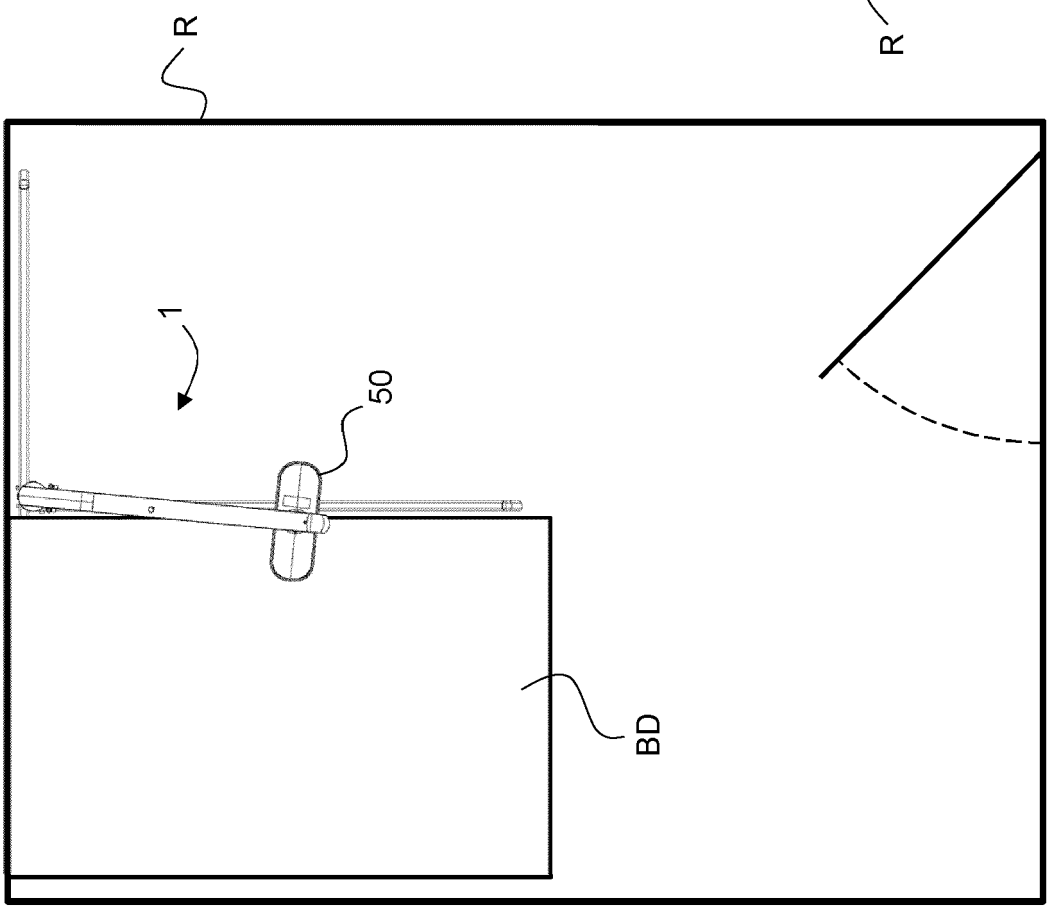

Fig. 10B

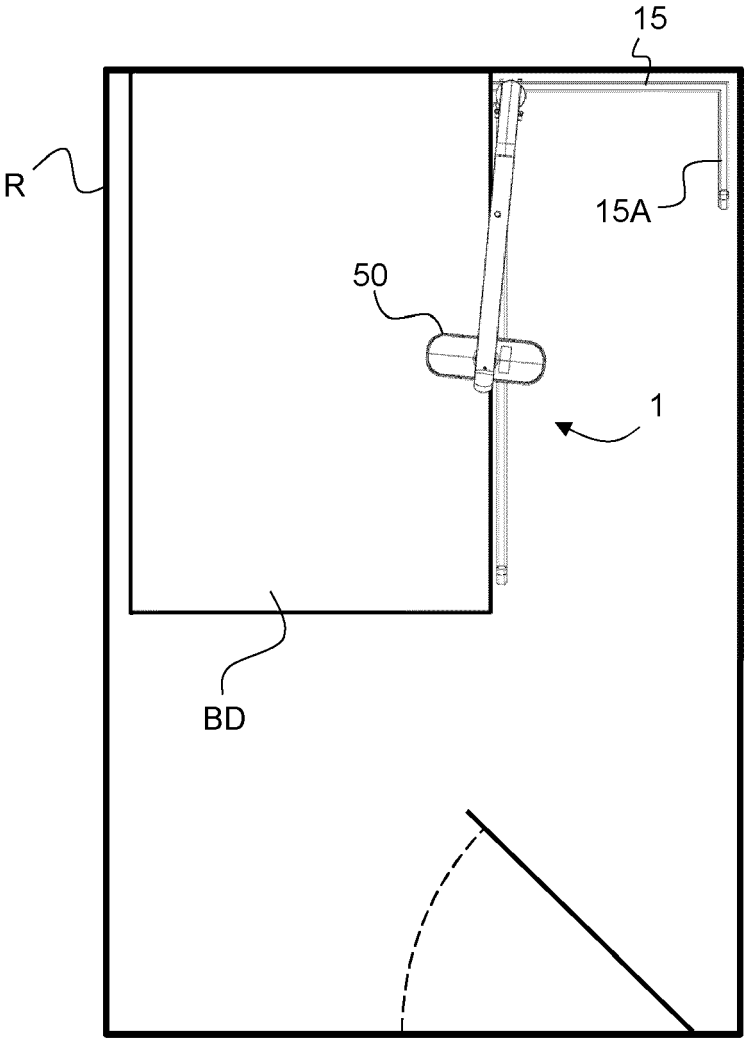

Fig. 10D

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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 5686

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 2005/006631 A1 (MING-HWA SHOU [TW]) 13 January 2005 (2005-01-13) * paragraph [0018] - paragraph [0024]; figures *	1-6, 10-15 7,8	INV. A61G7/10
X	US 686 425 A (SOMMERFELD HEINRICH [US]) 12 November 1901 (1901-11-12) * page 1, line 31 - line 90; figures *	1	
X A	CN 110 664 568 A (KUNSHAN JIAKANGSHUN MEDICAL APPARATUS CO LTD) 10 January 2020 (2020-01-10) * the whole document *	1 7,8	
X	AU 559 512 B (AUTOMATIC ELECTRIC CO) 22 July 1913 (1913-07-22) * the whole document *	1,7-9	
A	WO 2010/108255 A1 (PRISM MEDICAL LTD [CA]; CHEPURNY MARK [CA]) 30 September 2010 (2010-09-30) * abstract; figures *	7,9	TECHNICAL FIELDS SEARCHED (IPC) A61G
A	US 5 018 225 A (FERGNI BRUNO [IT] ET AL) 28 May 1991 (1991-05-28) * abstract; figures *	7,8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 March 2021	Kousouretas, Ioannis

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

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EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
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Application Number
EP 20 19 5686

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 20 19 5686

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-6, 10-15

A patient lift apparatus having a static support structure, a pivotable transfer structure and a hoisting device, wherein the static support structure is a three-leg support structure.

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2. claims: 7-15

A patient lift apparatus having a static support structure, a pivotable transfer structure and a hoisting device, wherein the bearing portion comprises a hollow section and at least one friction reducing sleeve.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 19 5686

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25-03-2021

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		EP 0374784 A2	27-06-1990
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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