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(54) **DELIVERY BED**

(57) The invention relates to a bed, particularly a delivery bed, comprising:

- a support frame;
- a back support part mounted on the support frame for the purpose of supporting the back of a user;
- a foot support part for supporting the feet of the user;
- a storage space under the back support part, suitable for accommodating the foot support part therein;

- a displacing unit for sliding the foot support part respectively into and out of the storage space, between a slid-in position in which the foot support part is accommodated substantially in the storage space and a slid-out position in which the foot support part has been slid at least partially out of the storage space and has been displaced over a height such that the foot support part extends substantially in line with the back support part.

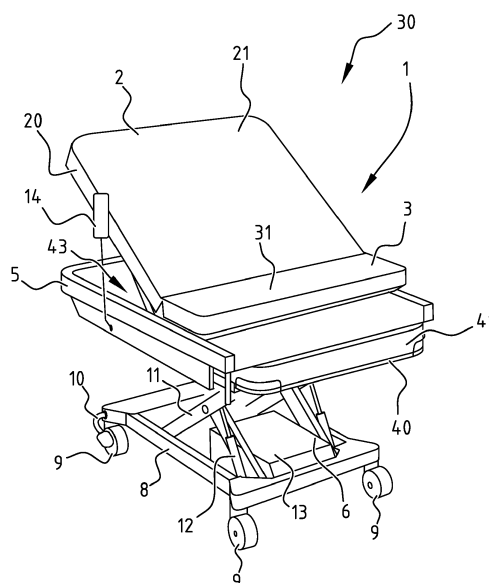


FIG. 2

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Description

[0001] The invention relates to a bed, particularly a delivery bed, comprising a support frame, a back support part mounted on the support frame for the purpose of supporting the back of a user, and a foot support part for supporting the feet of the user.

[0002] Beds in general and patient care beds in particular can be adjusted to all sorts of positions. It is thus often possible to place a backrest partially upright via an adjusting mechanism in order to provide improved comfort for a patient. In the case of so-called delivery beds it is often not only the backrest that is adjustable, but the footrest can also be folded away and the legs of the patient can be placed on two stirrups.

[0003] Beds known from the prior art, such as from US 6 408 464 B1, comprise a foot support part which provides comfort when a user adopts a reclining position. In the delivery position this foot support part is absent, whereby the patient need not switch beds when childbirth is taking place. In the prior art this is solved by providing a foot support part which can be removed as a whole.

[0004] For the greatest possible comfort the foot support part is preferably removed as late as possible before the delivery. The moment of delivery can however not always be accurately predicted, and removing the foot support part requires multiple operations and therefore takes a relatively long time.

[0005] Removal must further take place with great certainty, and must not fail. Finally, removal must take place while the patient is already on the bed. As a precaution, the delivery bed is therefore sometimes converted well before the delivery, which results in a waiting time and thereby in less comfort for the patient.

[0006] An object of the present invention is to provide a bed wherein the above stated drawback is at least partially obviated. A further object is to provide a bed, particularly a delivery bed, which can be adjusted with a high degree of certainty, speed and reliability between different positions, for instance a reclining position in which the user can lie on the bed and be supported fully, and a delivery position in which the user can rest in the desired birthing position.

[0007] At least one of the objectives is achieved at least partially in a bed, particularly a delivery bed, comprising:

- a support frame;
- a back support part mounted on the support frame for the purpose of supporting the back of a user;
- a foot support part for supporting the feet of the user;
- a storage space under the back support part, suitable for accommodating the foot support part therein;
- a displacing unit for sliding the foot support part respectively into and out of the storage space, between a slid-in position in which the foot support part is accommodated substantially in the storage space and a slid-out position in which the foot support part has been slid at least partially out of the storage space

and has been displaced over a height such that the foot support part extends substantially in line with the back support part.

[0008] In such a bed it is not necessary for a foot support part to be fully dismantled and removed, instead the foot support part is stored in the storage space under the back support part when it is not needed, such as during childbirth. The storage space can here be provided in the support frame itself or can be provided somewhere else. Because the foot support part and back support part extend mutually in line (and, in the case that the foot support part and back support part are disposed horizontally, because both support parts extend at the same height), the bed enables a completely flat upper side of the bed and thereby a comfortable reclining position of the user. When the foot support part is temporarily not needed, for instance during childbirth, it can be pushed away into a storage space. The storage space is embodied and positioned such that the medical personnel caring for the user need not be inconvenienced thereby at all.

[0009] In an embodiment the displacing unit is not only configured to hold the foot support part substantially horizontal in the fully slid-in and fully slid-out position, the foot support part also extends substantially horizontally during the sliding in and out. The fact that the foot support part then does not protrude upward makes the sliding in and out more convenient when a user has taken up position on the bed. The fact that the foot support part then does not protrude downward means that the bed can be disposed close to the ground without the foot support part touching the ground, which would restrict sliding in.

[0010] According to an embodiment, the displacing unit comprises:

- a lower slide-out frame arranged slidably in the storage space;
- an upper slide-out frame coupled via a coupling mechanism to the slidable lower slide-out frame, wherein the foot support part is arranged on the upper slide-out frame or is formed integrally therewith.

[0011] By coupling the two slide-out frames to each other only one of the slide-out frames need be displaced. The other slide-out frame is automatically co-displaced by the coupling. The coupling mechanism can comprise pivot arms. The pivot arms are arranged pivotally on the lower and upper slide-out frame. The slide-out frames and the pivot arms preferably form a parallelogram construction. In the latter case it is not just the case that the one slide-out frame follows the other slide-out frame when the one slide-out frame is slid in or out in longitudinal direction, but the slide-out frames can also be displaced toward each other or away from each other in a direction transversely of the longitudinal direction, this such that the two slide-out frames remain positioned parallel to each other.

[0012] According to an embodiment, the displacing

unit is configured to displace the foot support part from the wholly slid-in position in substantially horizontal direction first, and then also displace the foot support part in vertical direction. Guiding the upper slide-out frame in this way has the advantage that the upper slide-out frame is not displaced in the vertical direction unexpectedly, which could result in a blocking of the foot support part when the foot support part is situated in the vicinity of other elements of the bed.

[0013] According to a further embodiment, the displacing unit comprises:

- first displacing means for displacing the lower slide-out frame in horizontal direction, wherein the displacing means preferably comprise one or more rails in which the lower slide-out frame can travel reciprocally;
- second displacing means for displacing the upper slide-out frame in upward or downward direction when the lower slide-out part is displaced.

[0014] The division of this movement has the advantage that it is possible to displace the foot support part out of the support frame in (substantially) its entirety first, before it is slid upward. A space between the foot support part and the support frame hereby remains constant during sliding out, and a mattress or pillow can remain in place during the sliding in and out of the foot support part.

[0015] According to an embodiment, the displacing means comprise:

- two upright plates positioned adjacently of the lower slide-out frame on either side, wherein each plate is provided with an elongate slot, wherein the slot comprises a substantially horizontally extending slot part and an upward extending curved slot part;
- a guide which is connected to the upper slide-out frame and the outer ends of which are arranged in the slots and are guidable therein.

[0016] These displacing means allow the upper slide-out frame a great freedom of movement, whereby it can be displaced with a smoother motion.

[0017] According to an embodiment, the displacing unit comprises a drive for driving the displacement of the lower slide-out frame. This drive comprises for instance a scissor construction, connected on a first side to a head end of the support frame and connected on a second, opposite side to the lower slide-out frame, and an actuator, arranged at the head of the bed and configured to lengthen or shorten the scissor construction in order to move the lower slide-out frame respectively out of and into the storage space in horizontal direction relative to the support frame. This construction has the advantage that the space in the support frame which is taken up by the displacing means is located substantially at the head end, whereby there is a lot of space for the foot support part at the foot end.

[0018] The actuator can here be embodied as one single extending cylinder, particularly a hydraulic or pneumatic extending cylinder. This makes the drive simple and reliable. It is preferred for the actuator to be a hydraulic or pneumatic actuator. This enables the foot support part to be slid in or slid out electrically and thereby remotely controlled, and still at a reasonable speed. Such actuators also ensure that the foot support part can be displaced almost silently.

[0019] According to an embodiment, the lower slide-out frame is displaced substantially horizontally by rails during the horizontal and vertical displacement of the foot support part. In possible preferred embodiments the rails are arranged on either side of the lower slide-out frame, and/or the plate is arranged parallel to the rails, on either side of the upper slide-out frame. This enables the two frames to rest on enough support points, and no undesired leverage is created when a user leans on an outermost side of the foot support part, which could cause a great amount of force on the opposite side.

[0020] According to an embodiment, the upper slide-out frame moves through the substantially horizontal slot part during the horizontal displacement of the foot support part so that this frame is displaced substantially horizontally. The upper slide-out frame further moves through a substantially inclining slot part during the vertical displacement of the foot support part, and the upper slide-out frame is thereby displaced in accordance with the path described by the inclining slot part.

[0021] According to an embodiment, the displacing unit further comprises one or more extension elements for lifting the upper slide-out frame and the foot support part mounted or formed thereon to a height position above the maximum height of the outer end of the slot, wherein the extension elements are preferably arranged at opposite positions on a transverse rod of the guide.

[0022] According to an embodiment, the bed also comprises a pelvis support part for supporting the pelvis of the user. In further embodiments pivoting means are provided for the purpose of pivoting at least one of the back support part, pelvis support part and foot support part independently of each other. In a preferred embodiment the bed has a pelvis support part which is arranged at the foot end of the backrest and is adjustable using a further actuator between a first position, in which the pelvis support part is disposed substantially horizontally, and a second position in which the pelvis support part is disposed obliquely toward the head end. A user can sit on such a pelvis support when it has been adjusted, without this pelvis support getting in the way when the bed is set up as a lying surface. The back support part can otherwise also be embodied for adjustment, for instance using an actuator, between a first position, in which the backrest is disposed substantially horizontally, and a second position, in which the backrest is disposed obliquely toward the foot end. This has the advantage that the bed can be used in different situations and a user need not be moved off the bed between these situations.

[0023] According to an embodiment, the displacing unit comprises one or more actuators which are electrically powered by a battery which is arranged on the bed, particularly the support frame. Electrical adjusting means have the advantage that they require less power from a user or practitioner, particularly when they are powered via a battery, since the bed is hereby less dependent on its environment and can hereby be employed in different environments.

[0024] Further advantages, features and details of the present invention will be elucidated on the basis of the following description of several embodiments thereof. Reference is made in the description to the figures, in which:

Fig. 1 is a perspective view of an embodiment of a delivery bed in a reclining position with upright back support part;

Fig. 2 is a perspective view of the embodiment of the delivery bed of figure 1 in the delivery position;

Fig. 3 is a partially cut-away side view of the embodiment of the delivery bed of figures 1 and 2 in a further position;

Fig. 4 is a partially cut-away side view of the embodiment of the delivery bed of figures 1-3 in the delivery position;

Fig. 5 is a partially cut-away side view of the embodiment of the delivery bed of figures 1-4 in the delivery position;

Fig. 6 is a partially cut-away top view of the embodiment of the delivery bed of figures 1-5 in the reclining position;

Figures 7A and 7B are respectively a partially cut-away side view and a partially cut-away top view of the delivery bed of figures 1-6 in a first intermediate position;

Figures 8A and 8B are respectively a partially cut-away side view and a partially cut-away top view of the delivery bed of figures 1-6 in a second intermediate position;

Figures 9A and 9B are respectively a partially cut-away side view and a partially cut-away top view of the delivery bed of figures 1-6 in a third intermediate position;

Figures 10A and 10B are respectively a partially cut-away side view and a partially cut-away top view of the delivery bed of figures 1-6 in a fully collapsed position; and

Figure 11 is a schematic representation of a further embodiment of a delivery bed according to the invention.

[0025] Figure 1 shows a delivery bed 1 comprising a mobile frame 8 with wheels 9 whereby the bed 1 can travel over a ground surface, a support frame 5 disposed substantially horizontally (so parallel to the ground surface), and lifting means 11 arranged between mobile frame 8 and support frame 5. In the shown embodiment

these lifting means 11 comprise a number of bars 11 which are arranged in a pivoting scissor construction and are mounted rotatably on mobile frame 8 and support frame 5. One or more of the bars can be displaced using an actuator 12. The shown embodiment shows an (optional) second actuator 18. The operation of the latter actuator will be elucidated below.

[0026] Actuator 12, 18 is preferably a hydraulic or pneumatic actuator. Such actuators have the advantage, among others, that support frame 5 can be adjusted slowly and carefully. When actuator 12, 18 comprises for instance one or more extending cylinders (as shown in figure 1), extending of the cylinders enables support frame 5 to be displaced in upward direction while, when the extending cylinders are retracted, support frame 5 is displaced in downward direction. Support frame 5 remains in a substantially horizontal position during the upward and downward displacement, whereby the patient remains reclined/seated in place on the bed and is thus inconvenienced as little as possible by the displacement.

[0027] Actuator 12, 18 can be controlled by means of a control unit 14. The control unit is connected to actuator 12, 18 via a wireless or wired connection. Both the actuator 12, 18 and the control unit 14 can be powered by a battery 13 disposed on frame 8. When a battery is used, it remains possible to adjust for instance the height of support frame 5 when delivery bed 1 is displaced. It is also possible for actuator 12, 18 and control unit 14 to be powered by a wired connection to a socket outlet.

[0028] In the shown embodiment delivery bed 1 comprises three sections which can be moved substantially independently of each other and which support on support frame 5, i.e. a back section 2, a foot section 4 and a pelvis section 3 positioned therebetween. Back section 2 comprises a back support part 20 with a first mattress part 21 placed thereon, the pelvis part comprises a pelvis support part 30 with a second mattress part 31 placed thereon, and foot section 4 comprises a foot support part 40 with a third mattress part 41 placed thereon. The three sections can in principle be moved, more particularly pivoted, independently of each other relative to support frame 5 in order to be able to optimally support the patient in different positions. Driving of the pivoting movement of back support part 20 and pelvis support part 30 is realized by actuators 16 and 17, which can be actuators similar to actuator 12 or actuator 18. Actuators 16 and 17 can also be controlled by control unit 14.

[0029] Figures 1-5 all show the same embodiment of delivery bed 1. Figure 5 shows delivery bed 1 in the so-called reclining position. In this position the back support part 20, the pelvis support part 30 and the foot support part 40 are all positioned mutually in line. In the reclining position the back support part 20, pelvis support part 30 and foot support part 40 usually extend substantially horizontally. Back support part 20, pelvis support part 30 and foot support part 40 then together form a flat whole on which the patient can lie and rest before or after the delivery.

[0030] When the delivery is about to begin, the sections are placed in the delivery position. This position is for instance shown in figures 2 and 4. In the delivery position the back support part 20 is pivoted upward, usually to an oblique position between a horizontal and vertical position. Pelvis support part 30 is further also pivoted upward to an oblique position, so that the pelvis of a patient lying obliquely against back support part 20 is supported by pelvis support part 30. In the birthing position the lower legs of the patient are held up by two separate supports (not shown) provided on the sides of support frame 5. Finally, foot support part 40 is slid in (and thereby disappears wholly or partially under the pelvis support part and the back support part) so that foot support part 40 does not get in the way during the delivery and medical staff can optimally support the delivery.

[0031] In order to move foot support part 40 from the inclining position to the delivery position the foot support part 40 must not only be displaced in horizontal direction, but must also be displaced downward far enough that it can be placed in a storage space 43 provided under back support part 20 and pelvis support part 30. Likewise, when foot support part 40 is slid out of storage space 43 and moved to the reclining position, foot support part 40 must also be displaced upward so that foot support part 40 can be placed in line with back support part 20 and pelvis support part 30.

[0032] As stated above, a further actuator 18 can also be utilized in addition to actuator 12 during adjustment of support frame 5 relative to frame 8. When delivery bed 1 is embodied as shown in the figures with two actuators 12, 18, it is also possible to tilt support frame 5 over the width of the bed, whereby the surface created by the two support parts 20 and 30 is adjusted relative to a surface on which delivery bed 1 is arranged. Rear back support part 20 can hereby for instance be moved further upward, whereby pelvis support part 30 can be moved relatively further downward. It is hereby also possible to still provide a horizontal lying surface on an uneven floor surface.

[0033] As stated above, it is possible to supply actuators 12, 16, 17, 18 and the control unit with power via a cabled connection. For this purpose delivery bed 1 can be equipped with a plug 15. This cabled connection also makes it possible to recharge battery 13. This has the advantage that battery 13 can be at least largely charged at all times, or in any case to an extent such that battery 13 is able to ensure the functioning of actuators 12, 16, 17 and 18, among other things, when delivery bed 1 is displaced.

[0034] The construction with which foot support part 40 can be slid in and out will be described in more detail below. Reference is made to the accompanying figures, particularly to figures 5-11.

[0035] Foot support part 40 is displaceable relative to support frame 5 by a displacing unit. The displacing unit can here be configured to displace foot support part 40 both in longitudinal direction (more particularly in horizontal direction when support parts 20, 30, 40 extend

horizontally) and in up and downward direction. For this purpose the displacing unit can for instance comprise a special guide and drive mechanism. The guide and drive mechanism of the displacing unit comprises a lower slide-out frame 6 which is supported in support frame 5 and is displaceable therein in horizontal direction, an upper slide-out frame 7 which carries on the upper side the above stated foot support part 40, a coupling mechanism 37 provided between the lower and upper slide-out frame 6, 7 for the purpose of supporting the upper slide-out part 7, a drive for driving the displacement of the lower slide-out frame 6, and guide means for guiding upper slide-out frame 7 during the displacement of lower slide-out frame 6.

[0036] In determined preferred embodiments of the invention the coupling mechanism 37 is embodied as a so-called parallelogram construction. In such an embodiment a number of pivot arms, together with two parallel elongate construction parts which are mutually coupled by the pivot arms, define substantially a parallelogram form. This makes it possible to move the two coupled construction parts reciprocally in a direction perpendicularly of the longitudinal direction, wherein the construction parts are always held substantially parallel relative to each other by the pivot arms. Such a parallelogram construction can be formed by the elongate lower slide-out frame 6, the elongate upper slide-out frame 7 and the pivotable arms mounted therebetween. The lower and upper slide-out frame 6, 7 more particularly form two opposite sides of the parallelogram construction 37. The other opposite sides of parallelogram construction 37 are formed by the pivotable (hingable) arms 20A-20D. More particularly, a rear arm 20A and a front arm 20B is provided on a first long side of each of the lower and upper slide-out frame 6, 7, while a rear arm 20C and front arm 20D is provided on a second, opposite long side of each of the lower and upper slide-out frame 6, 7. The two rear arms 20A and 20C are also mutually coupled roughly halfway along via at least a first transverse arm 38, while the two front arms 20B and 20D are mutually coupled via at least a second transverse arm 39. In other embodiments (not shown) the arms are however coupled to each other in other manner, still further transverse arms are provided in the vicinity of the hinges, or no mutual coupling is present. Each of the arms 20A-20D is further provided with hinges 24 so that they are hingeable relative to the lower and upper slide-out frame 6, 7. The parallelogram construction 37 is here embodied such that the upper slide-out frame 7 can be displaced between a lower position and an upper position in supported manner without the orientation of the foot support part 40 changing. In other words, foot support part 40 can be lifted and lowered while remaining in the horizontal position.

[0037] In order to be able to slide in and slide out the lower slide-out frame 6 (and the whole of parallelogram construction 37 and foot support part 40 mounted hingedly thereon) in horizontal direction the following provisions have been made. Support frame 5 comprises an essen-

tially flat horizontal upper plate 28. Two rails 25 are arranged on either side of upper plate 28. Each of the frame parts 6A and 6B on the long sides of lower slide-out frame 6 are further provided with wheels 33 which are placed at some distance relative to each other and which can be confined in rails 25, and whereby the lower slide-out frame 6 can be rolled reciprocally in longitudinal direction of the bed, i.e. in a substantially horizontal direction. Slide-out frame 6 is always supported by rails 25 on both sides in any position, i.e. in the fully slid-in position, in the fully slid-out position and in all intermediate positions.

[0038] Driving of the reciprocal movement of the lower slide-out frame 6 is realized by the drive means to be described below. In the shown embodiment the drive means comprise a scissor construction 26 disposed in substantially the same plane as lower slide-out frame 6, and an actuator 27. Scissor construction 26 comprises a number of hingable swivel arms 29A-29D displaceable relative to each other via hinges 34, relative to a stationary transverse fixing beam 35 of support frame 5 and relative to a movable fixing beam 36 as part of the lower slide-out frame 6. At one free outer end swivel arm 29A is further connected hingedly via a hinge 50 to a carriage 51 which can be moved reciprocally in transverse direction 53 transversely of the longitudinal direction of bed 1 along a carriage rail 52 mounted fixedly on the upper plate. At one free outer end swivel arm 29D is likewise mounted hingedly via a hinge 60 on a carriage 61 which can be moved reciprocally in transverse direction 53 transversely of the longitudinal direction of bed 1 along a carriage rail 62 mounted fixedly on the upper plate.

[0039] The drive means further comprise one or more actuators 27. In the shown embodiment only one actuator 27 in the form of a hydraulic, pneumatic or electric extending cylinder is applied. This actuator 27 is connected hingedly via hinges 54 and 55 to one of the swivel arms. When extending cylinder 27 is pushed out, this has the result that a force is exerted evenly via the two hinges 34 and 60 over the width of movable fixing beam 36 and thereby of lower slide-out frame 6. The lower slide-out frame 6 is pulled smoothly to the slid-in position by hinge construction 26 in similar manner.

[0040] In order to ensure that when the lower slide-out frame 6 is slid out by the drive means of storage space 43, the upper slide-out frame 7 and mounted thereon the foot support part 40 with mattress 41 are simultaneously also slid out of storage space 43, and the upper slide-out frame 7 and mounted thereon the foot support part 40 with mattress 41 moreover come to lie at the same height as pelvis part 30 and its accompanying mattress 31, the above stated parallelogram construction 37 between the lower and upper slide-out frame 6, 7 is provided, as is a guide construction which urges the upper slide-out frame 7 upward.

[0041] The guide construction comprises two upright plates or side plates 65, 66 extending on either side of scissor construction 26. Each of the upright plates 65, 66 is provided with an elongate slot 67. The elongate slot

has a straight slot portion 67A and a curved slot portion 67B. The curved slot portion 67B extends in an upward direction, as seen from the head of the bed, so as to displace the upper slide-out frame 7 upward when actuator 27 extends, as will be elucidated below.

[0042] The outer ends 72 of a guide 68 can be placed in said slots 67. Guide 68 comprises essentially a transverse rod 69 extending transversely of the longitudinal direction of bed 1 and extension elements 70 provided on transverse rod 69. Extension elements 70 are arranged on transverse rod 69 at opposite positions, close to the upright plates 65, 66. Each extension element 70 is more particularly mounted with its first outer end fixedly on transverse rod 69 and arranged with its other, opposite outer end via a hinge 71 hingedly on the upper slide-out frame 7.

[0043] Figures 5 and 6 show the situation in which the upper slide-out frame 7 is in the wholly slid-out position. By retracting lifting cylinder 27 the length of scissor construction 26 becomes shorter and it pulls the movable fixing beam 36 rearward in horizontal direction (in the direction of the head of the bed). When the movable fixing beam moves rearward in horizontal direction, the lower slide-out frame 6 formed thereon co-displaces. Due to the oblique position of the arms 20A, 20B of the parallelogram construction, these arms 20A, 20B also tend to pull the upper slide-out frame 7 rearward. Because the upper slide-out frame 7 is however guided in the two slots 67, the parallelogram construction collapses and slide-out frame 7 (also) moves in downward direction.

[0044] Figures 7A and 7B show a first intermediate position in which slide-out frame 7 has already been partially pulled in (has been displaced in rearward direction and has also been displaced downward). Figures 8A and 8B and figures 9A and 9B show respective further intermediate positions in which the upper slide-out frame 7 has been displaced further in each case. In the second intermediate position the upper slide-out frame 7 has already been slid into storage space 43 to some extent. Finally, figures 10A and 10B show the delivery position in which the upper slide-out frame 7 (with the foot support part 40 and mattress 41 mounted thereon) has been pulled in fully and is located wholly in storage space 43.

[0045] Figure 11 shows the different positions of an outer end 72 of transverse rod 69 when the lower slide-out frame 6 and the upper slid-out frame 7 coupled thereto are slid out from the fully slid-in position (for instance in the delivery position). P1 shows the first position, in which the transverse rod 69 (or at least outer end 72 thereof), which is connected to the upper slide-out frame 7, is situated in each of the supports 25 at the beginning of the slot 67 (i.e. the beginning of the horizontal part 67A of slot 67). When lower slide-out frame 6 is slid out, arms 20A-20D of the parallelogram construction push upper slide-out frame 7 along and the two slide-frames 6, 7 move outward together. At position P2 each of the outer ends 72 arrives at the curved part 67B of slot 67. The outer end of slide-out frame 7 connected to transverse

rod 69 hereby starts moving upward. The parallelogram construction now ensures that the whole slide-out frame 7 moves upward, this such that the position of the upper slide-out frame 7 always remains parallel to the position of the lower slide-out frame 6. This can be seen in the parts of the figure showing the positioning at positions P3 and P4.

[0046] In the schematically shown embodiment of figure 11 the upper slide-out frame 7 is otherwise directly connected to transverse rod 69. This means that the maximum height that the upper slide-out frame 7 can reach is determined by the height at which curved part 67B of slots 67 ends. In the embodiments of figures 7A-10B the upper slide-out frame 7 is however connected indirectly to transverse rod 69 of guide 68. The connection runs via the above stated extension elements 70. These make it possible to slide the upper slide-out frame 7 upward just slightly further than the highest position of slots 67 during sliding out. This makes it possible on one side to transport upper slide-out element 7 upward to an extent such that the foot support part 40 arranged thereon comes to lie exactly in line with pelvis support part 30 and/or back support part 20.

[0047] The invention further comprises the further examples of a bed described below.

[0048] Example 1: Bed, particularly a delivery bed, comprising:

- a support frame;
- a back support part (20) mounted on the support frame for the purpose of supporting the back of a user;
- a foot support part (40) for supporting the feet of the user;
- a storage space (43) under the back support part (20), suitable for accommodating the foot support part (40) therein;
- a displacing unit for sliding the foot support part (4) respectively into and out of the storage space (43), between a slid-in position in which the foot support part (40) is accommodated substantially in the storage space (43) and a slid-out position in which the foot support part (40) has been slid at least partially out of the storage space (43) and has been displaced over a height such that the foot support part (40) extends substantially in line with the back support part (20).

[0049] Example 2: Bed according to example 1, wherein the displacing unit is configured to hold the foot support part (40) substantially horizontal in the fully slid-in and fully slid-out position, and wherein the foot support part (40) preferably also extends substantially horizontally during the sliding in and out.

[0050] Example 3: Bed according to example 1 or 2, wherein the displacing unit comprises:

- a lower slide-out frame arranged slidably in the stor-

age space;

- an upper slide-out frame coupled via a coupling mechanism to the slidable lower slide-out frame, wherein the foot support part (40) is arranged on the upper slide-out frame or is formed integrally therewith.

[0051] Example 4: Bed according to example 3, wherein the coupling mechanism comprises pivot arms (20A-20D) which are arranged pivotally on the lower and upper slide-out frame and wherein the slide-out frames and the pivot arms form a parallelogram construction.

[0052] Example 5: Bed according to any one of the foregoing examples, wherein the storage space (43) is provided in the support frame (5).

[0053] Example 6: Bed according to any one of the foregoing examples, wherein the displacing unit is configured to displace the foot support part (40) from the wholly slid-in position in substantially horizontal direction first, and then also displace the foot support part (40) in vertical direction.

[0054] Example 7: Bed according to any one of the foregoing examples, wherein the displacing unit comprises:

- first displacing means for displacing the lower slide-out frame in horizontal direction, wherein the displacing means preferably comprise one or more rails in which the lower slide-out frame can travel reciprocally;
- second displacing means for displacing the upper slide-out frame in upward or downward direction when the lower slide-out part is displaced.

[0055] Example 8: Bed according to example 7, wherein the second displacing means comprise:

- two upright plates (25) positioned adjacently of the lower slide-out frame on either side, wherein each plate is provided with an elongate slot (67), wherein the slot comprises a substantially horizontally extending slot part (67A) and an upward extending curved slot part (67B);
- a guide (68) which is connected to the upper slide-out frame (7) and the outer ends (72) of which are arranged in the slots (67) and are guidable therein.

[0056] Example 9: Bed according to any one of the foregoing examples, wherein the displacing unit comprises a drive for driving the displacement of the lower slide-out frame (6).

[0057] Example 10: Bed according to example 9, wherein the drive comprises a scissor construction (26), connected on a first side to a head end of the support frame (5) and connected on a second, opposite side to the lower slide-out frame (6); and an actuator (27), arranged at the head of the bed and configured to lengthen or shorten the scissor construction (26) in order to move

the lower slide-out frame (6) respectively into and out of the storage space (43) in horizontal direction relative to the support frame (5).

[0058] Example 11: Bed according to example 10, wherein the actuator (27) has a single extending cylinder, particularly a hydraulic or pneumatic extending cylinder.

[0059] Example 12: Bed according to any one of the foregoing examples, wherein the lower slide-out frame (6) is displaced substantially horizontally by rails (25) during the horizontal and vertical displacement of the foot support part (40).

[0060] Example 13: Bed according to any one of the foregoing examples, wherein the upper slide-out frame (7) moves through the substantially horizontal slot part (67A) during the horizontal displacement of the foot support part (40) and is thereby displaced substantially horizontally.

[0061] Example 14: Bed according to any one of the foregoing examples, wherein the upper slide-out frame (7) moves through a substantially inclining slot part (67B) during the vertical displacement of the foot support part (40) and is thereby displaced in accordance with the path described by the inclining slot part (67A).

[0062] Example 15: Bed according to any one of the foregoing examples 8-14, wherein the displacing unit further comprises one or more extension elements (70) for lifting the upper slide-out frame (7) and the foot support part (40) mounted or formed thereon to a height position above the maximum height of the outer end of the slot (67), wherein the extension elements (70) are preferably arranged at opposite positions on a transverse rod (69) of the guide.

[0063] Example 16: Bed according to any one of the foregoing examples, also comprising a pelvis support part (30) for supporting the pelvis of the user and/or comprising pivoting means for pivoting at least one of the back support part (20), pelvis support part (30) and foot support part (40) independently of each other.

[0064] Example 17: Bed according to any one of the foregoing examples, wherein the displacing unit comprises one or more actuators which are electrically powered by a battery (13) which is arranged on the bed, particularly the support frame (5).

[0065] Example 18: Bed according to any one of the foregoing examples, further comprising a frame (8) with wheels (9) to be disposed on a ground surface and arranged at least partially under the support frame (5), and wherein the mutual distance between the frame (8) and the support frame (5) is adjustable, preferably by a hydraulic or pneumatic actuator.

[0066] Example 19: Use of a bed according to any one of the foregoing examples.

[0067] The invention is not limited to the embodiments thereof described herein. Other constructions can be envisaged wherein the adjustable foot support part is movable relative to another surface. The rights sought are not therefore limited to the specific embodiments described herein, but are rather defined by the following

claims, within the scope of which many modifications and adjustments can be envisaged.

5 Claims

1. Bed, particularly a delivery bed (1), comprising:

- a support frame (5);
- a back support part (20) mounted on the support frame (5) for the purpose of supporting the back of a user;
- a foot support part (40) for supporting the feet of the user;
- a storage space (43) under the back support part (20), suitable for accommodating the foot support part (40) therein;
- a displacing unit for sliding the foot support part (4) respectively into and out of the storage space (43), between a slid-in position in which the foot support part (40) is accommodated substantially in the storage space (43) and a slid-out position in which the foot support part (40) has been slid at least partially out of the storage space (43) and has been displaced over a height such that the foot support part (40) extends substantially in line with the back support part (20),

wherein the displacing unit comprises:

- a lower slide-out frame (6) arranged slidably in the storage space (43);
- an upper slide-out frame (7) coupled via a coupling mechanism to the slidable lower slide-out frame (6), wherein the foot support part (40) is arranged on the upper slide-out frame (7) or is formed integrally therewith.

2. Bed according to claim 1, wherein the displacing unit comprises a drive for driving the displacement of the lower slide-out frame (6), wherein the drive comprises:

- a scissor construction (26), connected on a first side to a head end of the support frame (5) and connected on a second, opposite side to the lower slide-out frame (6); and
- an actuator (27), arranged at the head of the bed and configured to lengthen or shorten the scissor construction (26) in order to move the lower slide-out frame (6) respectively into and out of the storage space (43) in horizontal direction relative to the support frame (5).

3. Bed according to claim 1 or 2, wherein the displacing unit further comprises:

- first displacing means for displacing the lower

- slide-out frame in horizontal direction, wherein the displacing means preferably comprise one or more rails in which the lower slide-out frame can travel reciprocally;
- second displacing means for displacing the upper slide-out frame in upward or downward direction when the lower slide-out part is displaced, wherein the second displacing means comprise two upright plates (25) positioned adjacently of the lower slide-out frame on either side, wherein each plate is provided with an elongate slot (67), wherein the slot comprises a substantially horizontally extending slot part (67A) and an upward extending curved slot part (67B); and a guide (68) which is connected to the upper slide-out frame (7) and the outer ends (72) of which are arranged in the slots (67) and are guidable therein.
4. Bed according to any one of the foregoing claims, wherein the displacing unit is configured to hold the foot support part (40) substantially horizontal in the fully slid-in and fully slid-out position, and wherein the foot support part (40) preferably also extends substantially horizontally during the sliding in and out.
 5. Bed according to any one of the foregoing claims, wherein the coupling mechanism comprises pivot arms (20A-20D) which are arranged pivotally on the lower and upper slide-out frame and wherein the slide-out frames and the pivot arms form a parallelogram construction.
 6. Bed according to any one of the foregoing claims, wherein the storage space (43) is provided in the support frame (5).
 7. Bed according to any one of the foregoing claims, wherein the displacing unit is configured to displace the foot support part (40) from the wholly slid-in position in substantially horizontal direction first, and then also displace the foot support part (40) in vertical direction.
 8. Bed according to any one of the foregoing claims, wherein the actuator (27) has a single extending cylinder, particularly a hydraulic or pneumatic extending cylinder.
 9. Bed according to any one of the foregoing claims, wherein the lower slide-out frame (6) is displaced substantially horizontally by rails (25) during the horizontal and vertical displacement of the foot support part (40) and/or wherein the upper slide-out frame (7) moves through the substantially horizontal slot part (67A) during the horizontal displacement of the foot support part (40) and is thereby displaced substantially horizontally.
 10. Bed according to any one of the foregoing claims, wherein the upper slide-out frame (7) moves through a substantially inclining slot part (67B) during the vertical displacement of the foot support part (40) and is thereby displaced in accordance with the path described by the inclining slot part (67A).
 11. Bed according to any one of the foregoing claims, wherein the displacing unit further comprises one or more extension elements (70) for lifting the upper slide-out frame (7) and the foot support part (40) mounted or formed thereon to a height position above the maximum height of the outer end of the slot (67), wherein the extension elements (70) are preferably arranged at opposite positions on a transverse rod (69) of the guide.
 12. Bed according to any one of the foregoing claims, also comprising a pelvis support part (30) for supporting the pelvis of the user and/or comprising pivoting means for pivoting at least one of the back support part (20), pelvis support part (30) and foot support part (40) independently of each other, wherein the backrest (2) is preferably adjustable using for instance an actuator (16) between a first position, in which the backrest (2) is disposed substantially horizontally, and a second position in which the backrest is disposed obliquely toward the foot end.
 13. Bed according to any one of the foregoing claims, wherein the displacing unit comprises one or more actuators which are electrically powered by a battery (13) which is arranged on the bed, particularly the support frame (5).
 14. Bed according to any one of the foregoing claims, further comprising a frame (8) with wheels (9) to be disposed on a ground surface and arranged at least partially under the support frame (5), and wherein the mutual distance between the frame (8) and the support frame (5) is adjustable, preferably by a hydraulic or pneumatic actuator.
 15. Use of a bed according to any one of the foregoing claims.

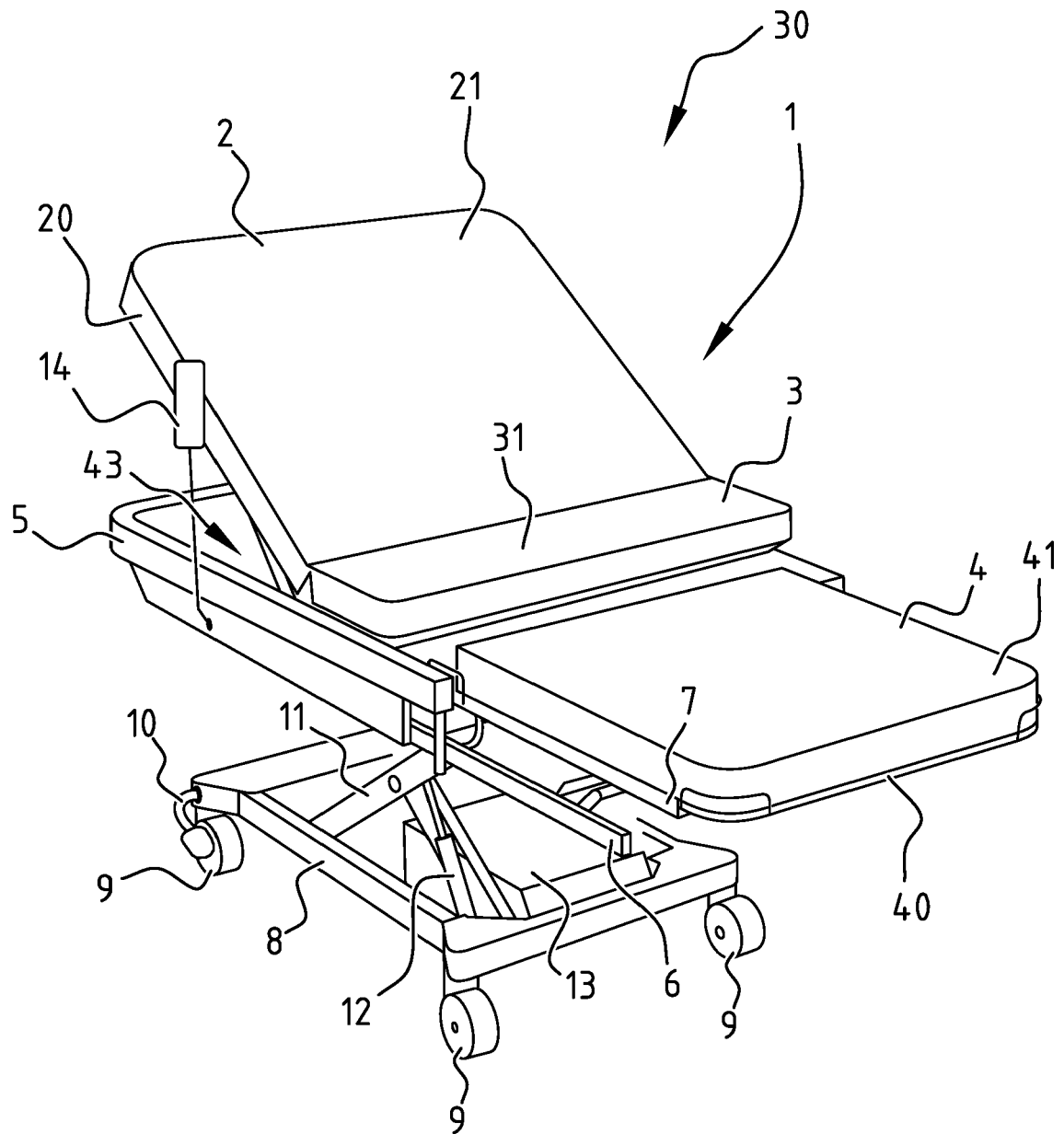


FIG. 1

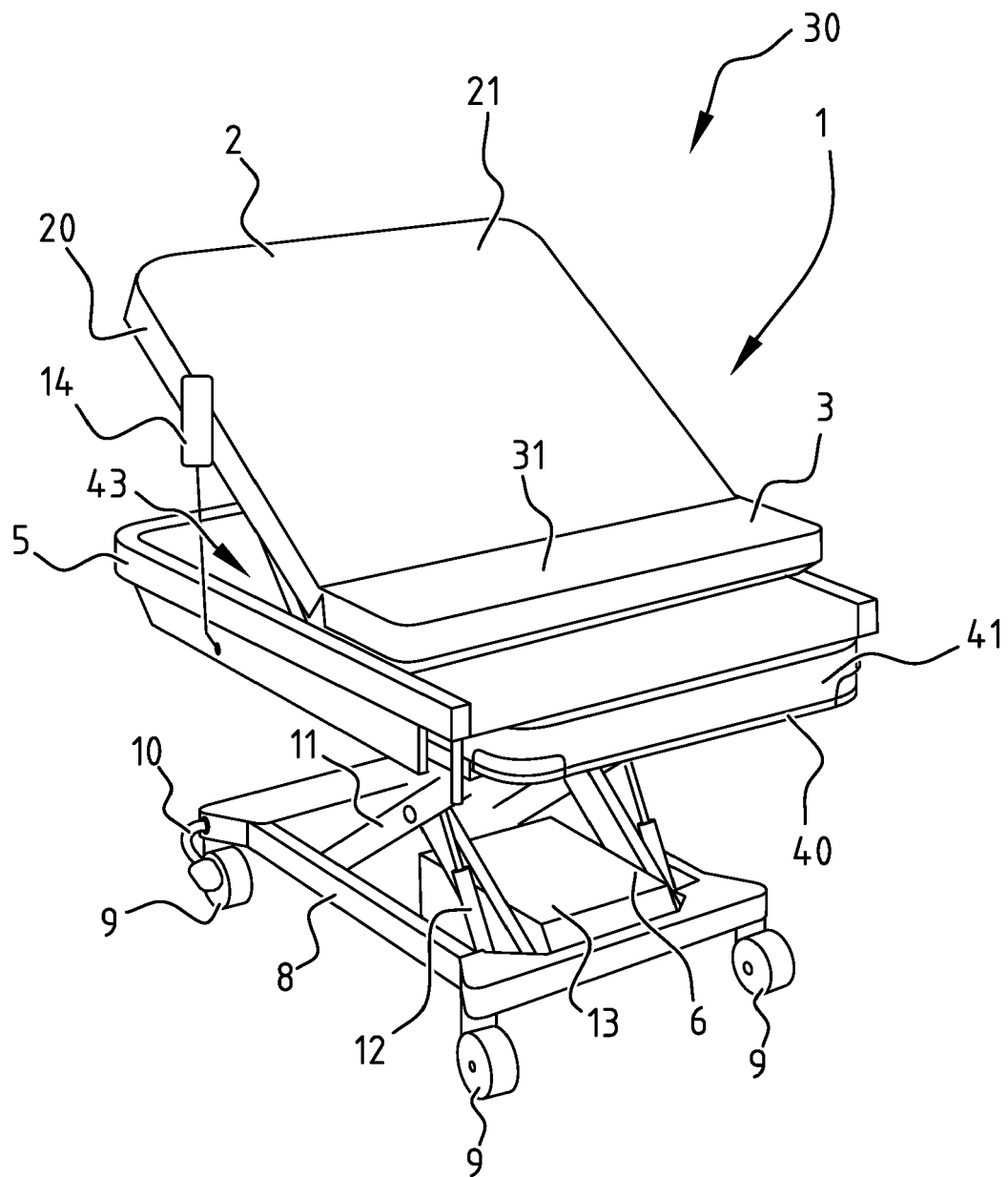


FIG. 2

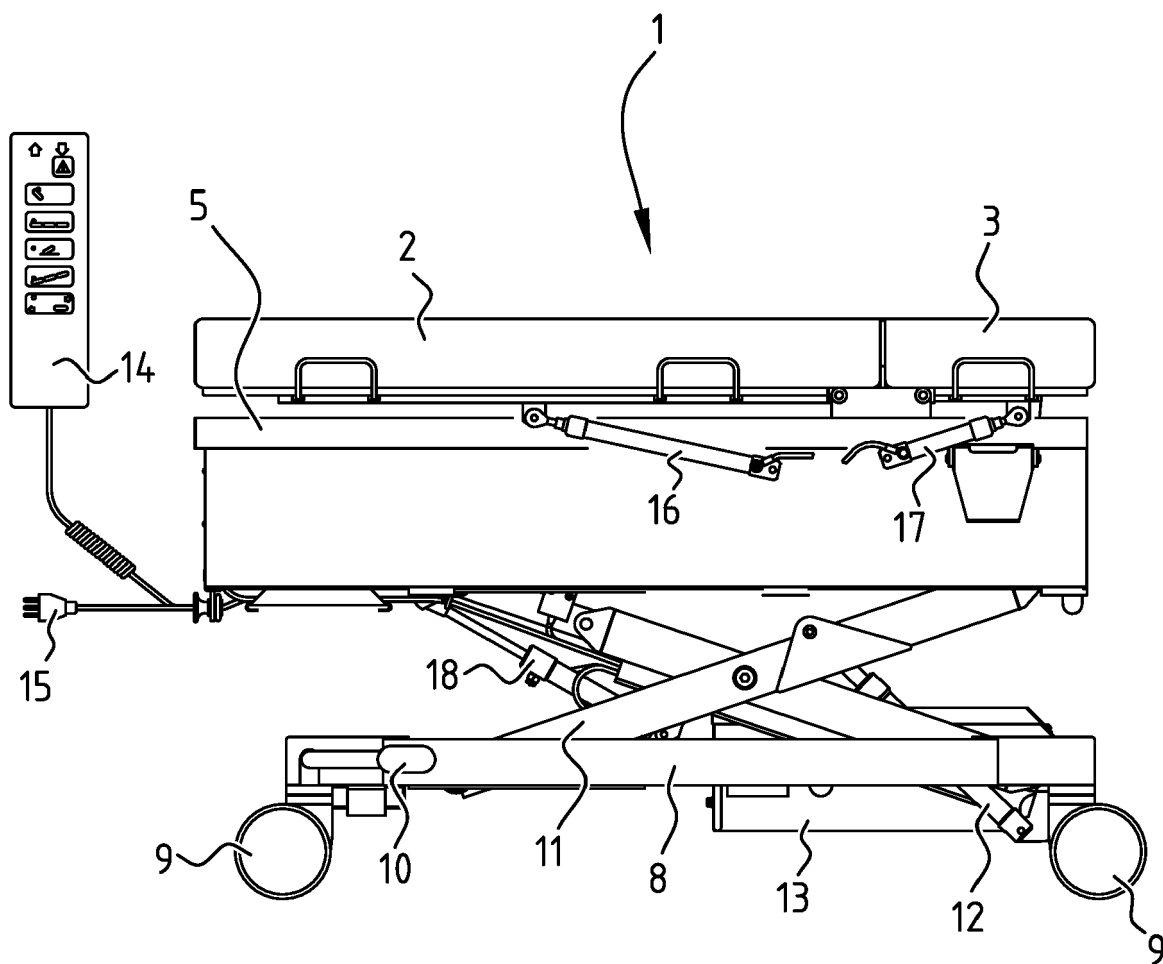


FIG. 3

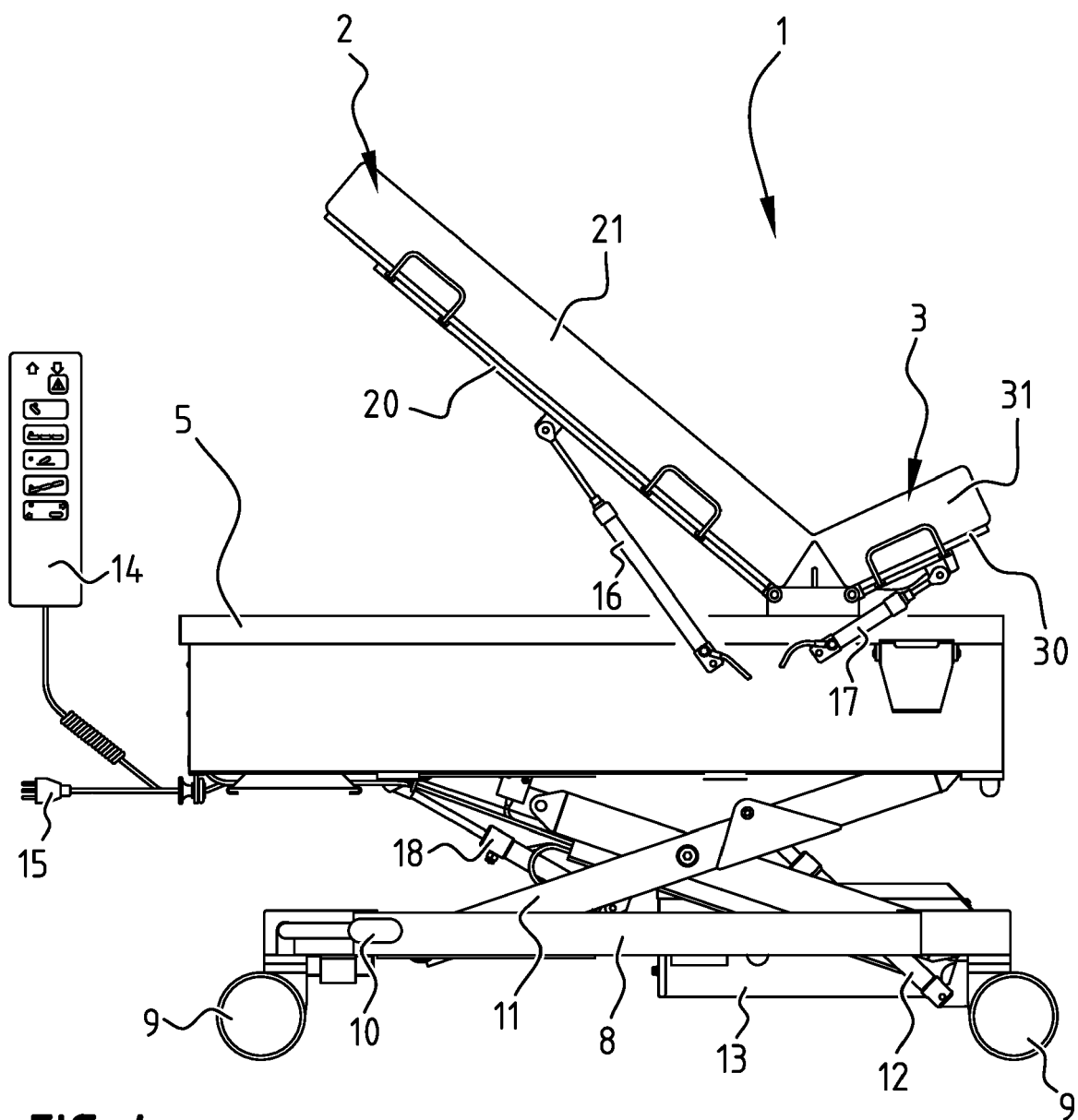


FIG. 4

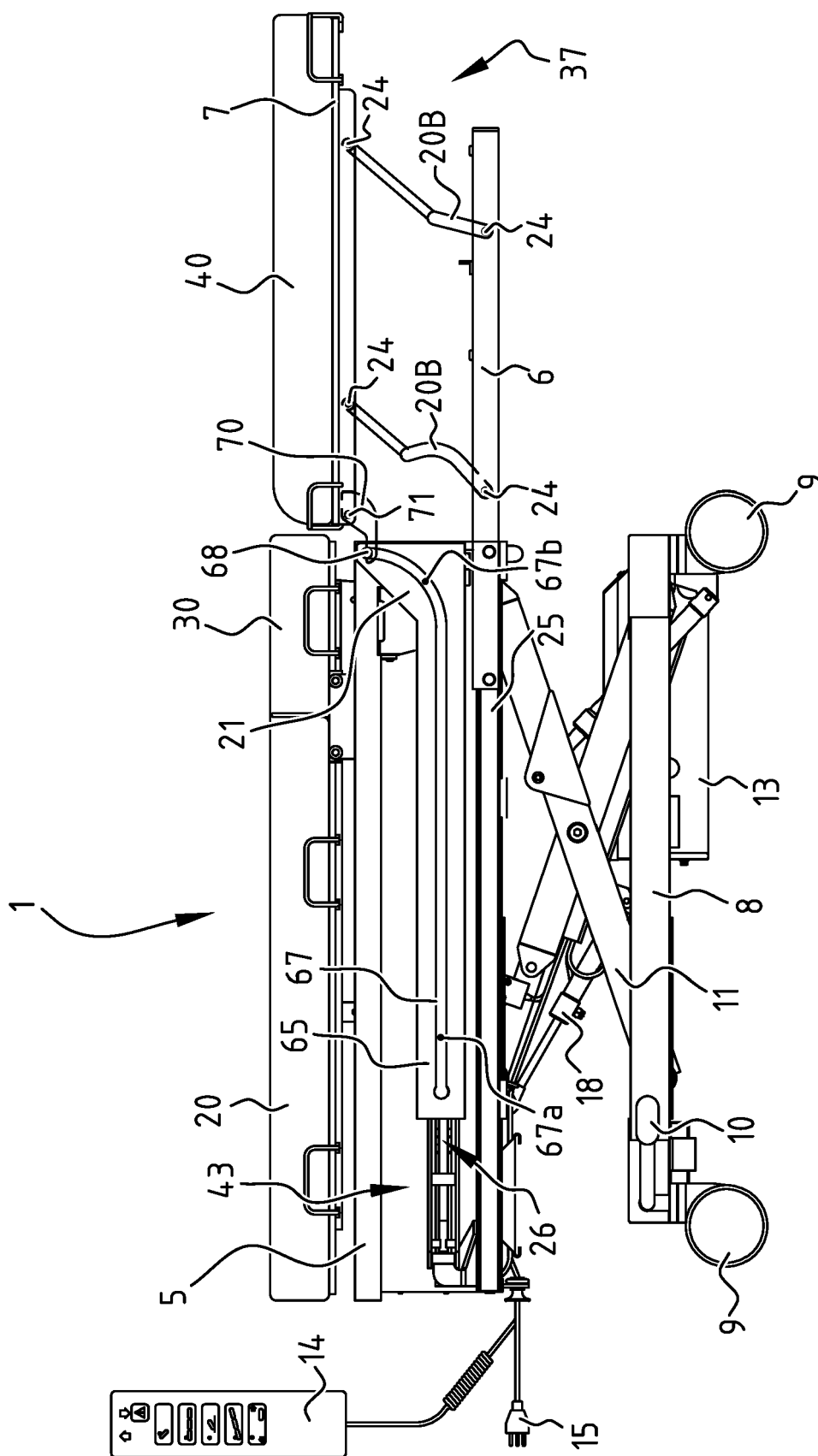


FIG. 5

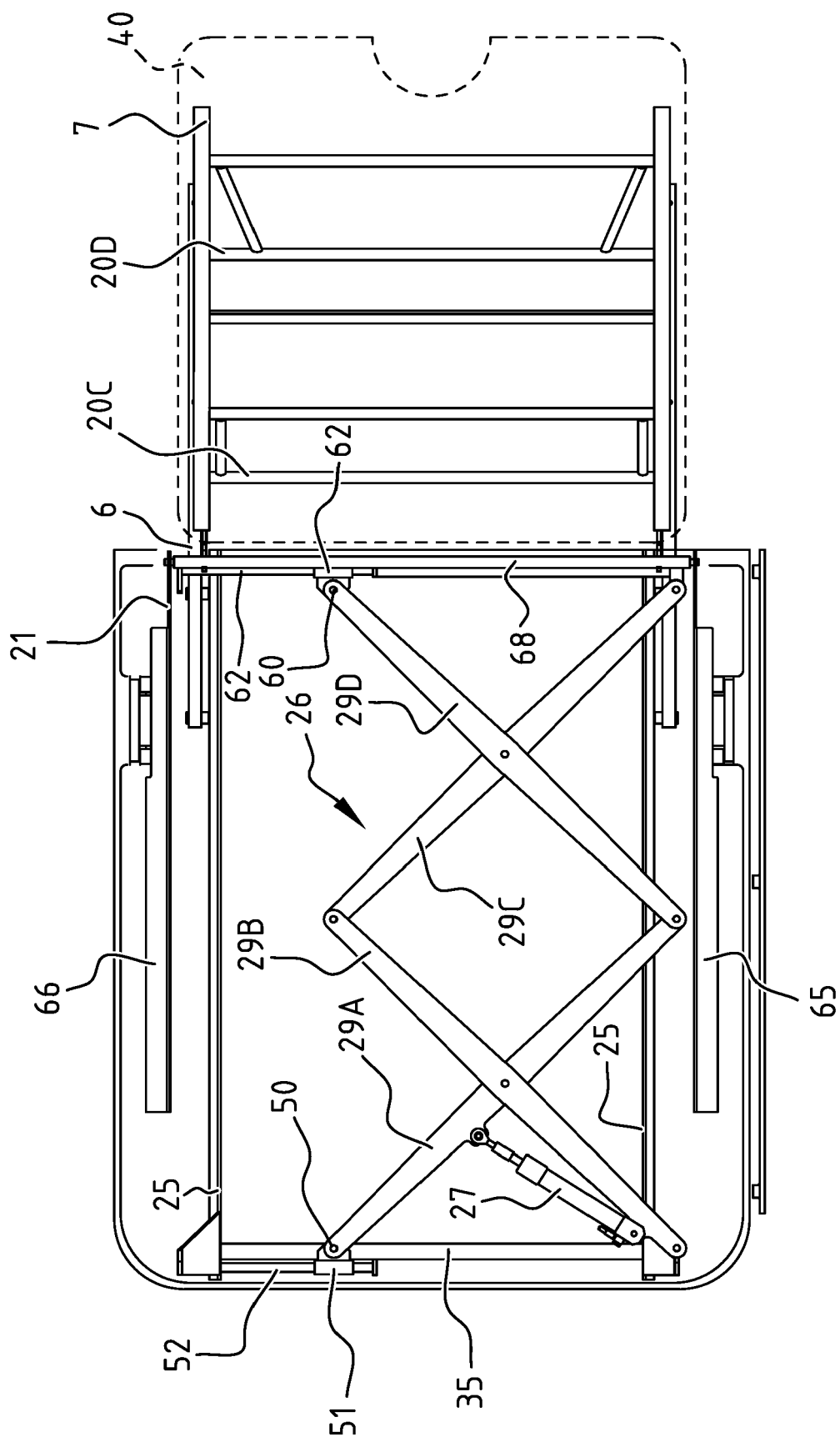


FIG. 6

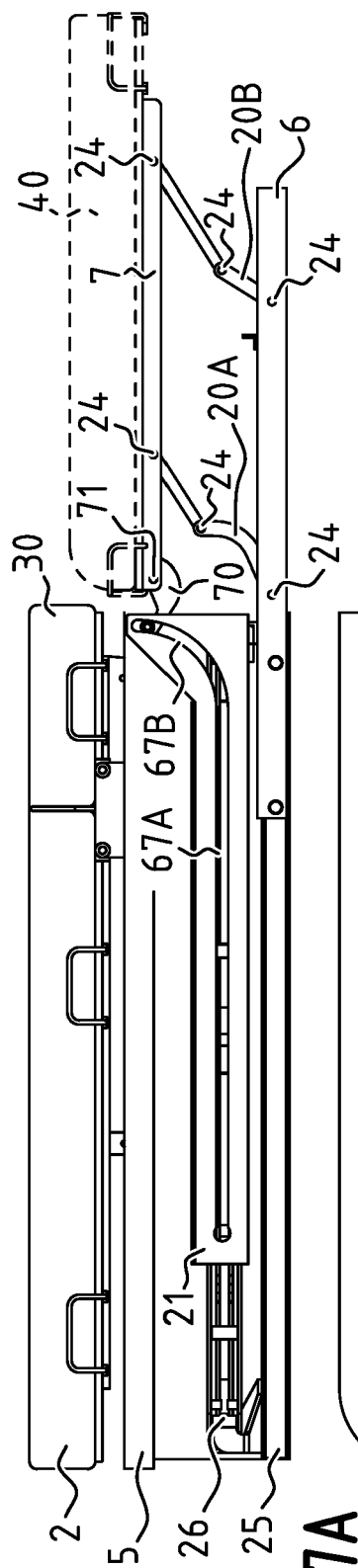


FIG. 7A

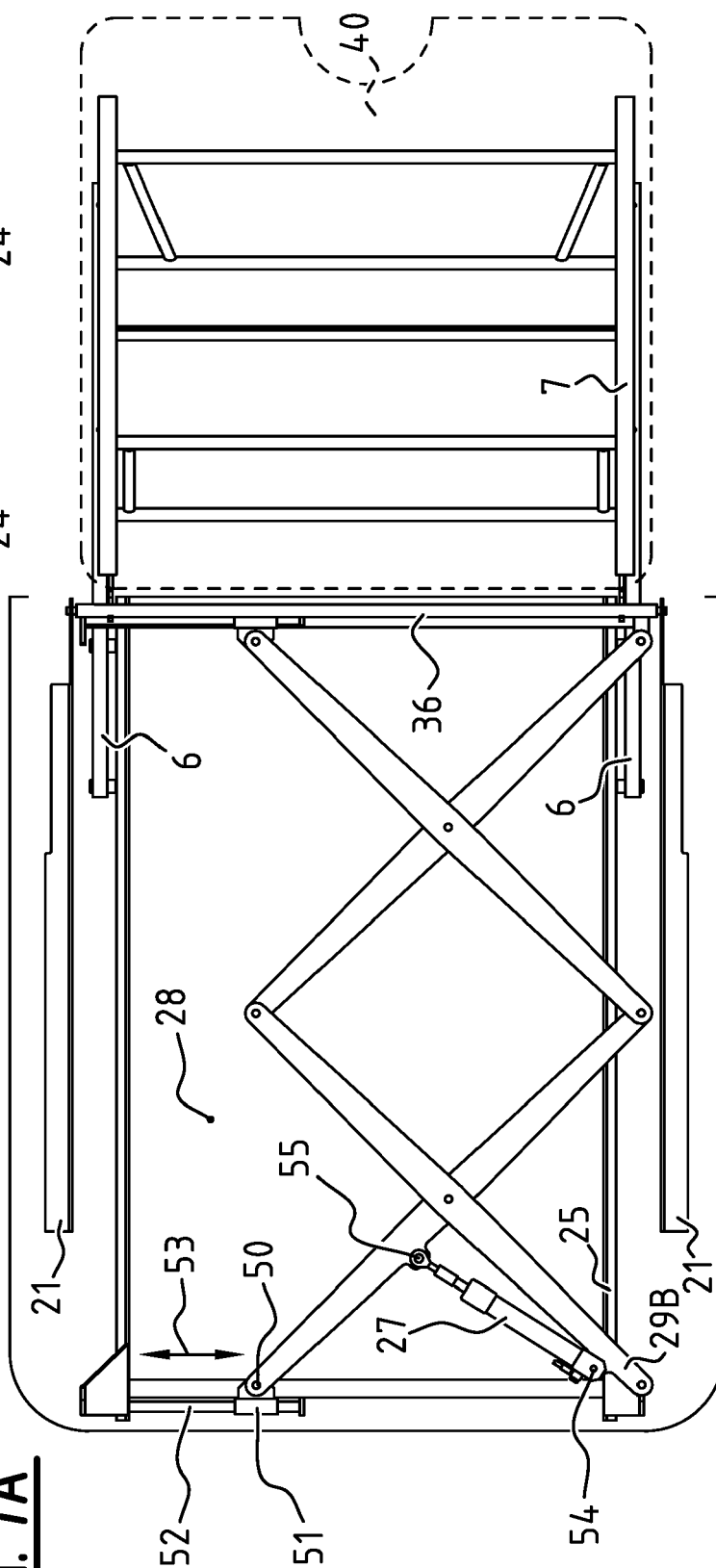


FIG. 7B

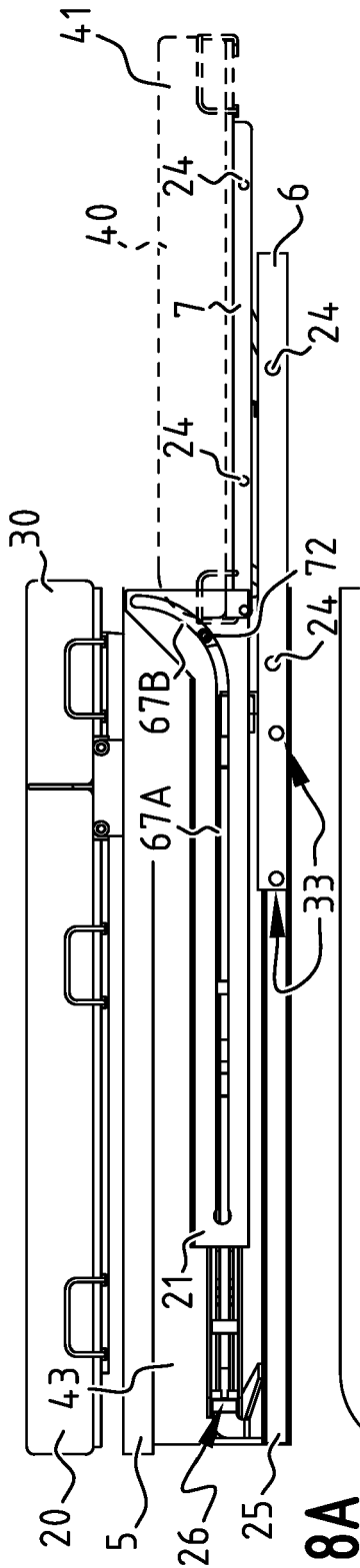


FIG. 8A

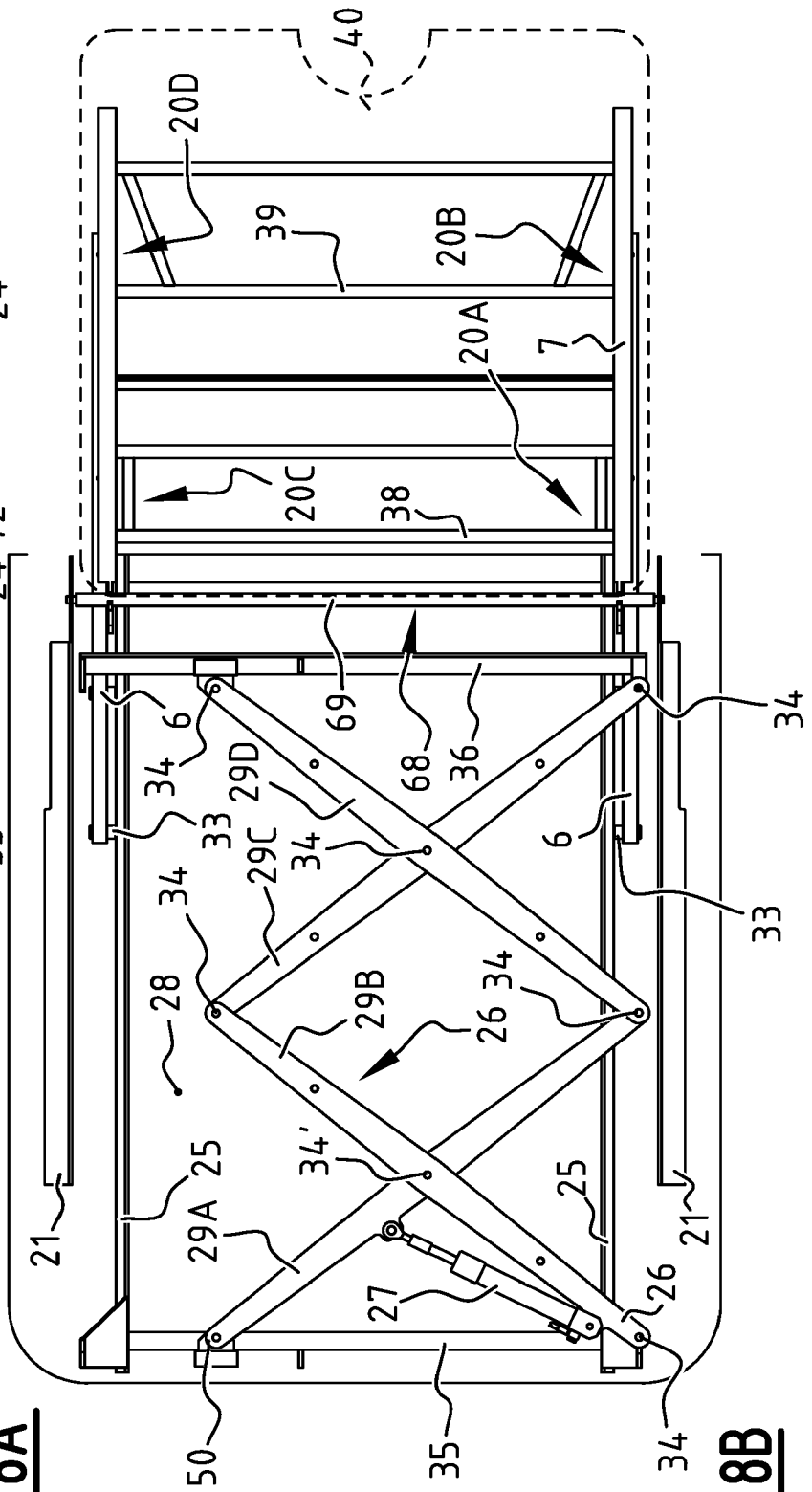


FIG. 8B

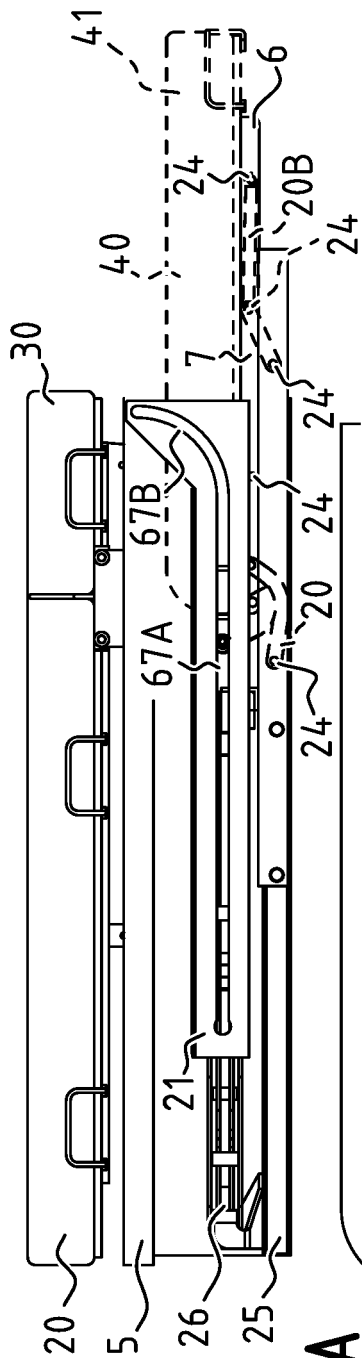


FIG. 9A

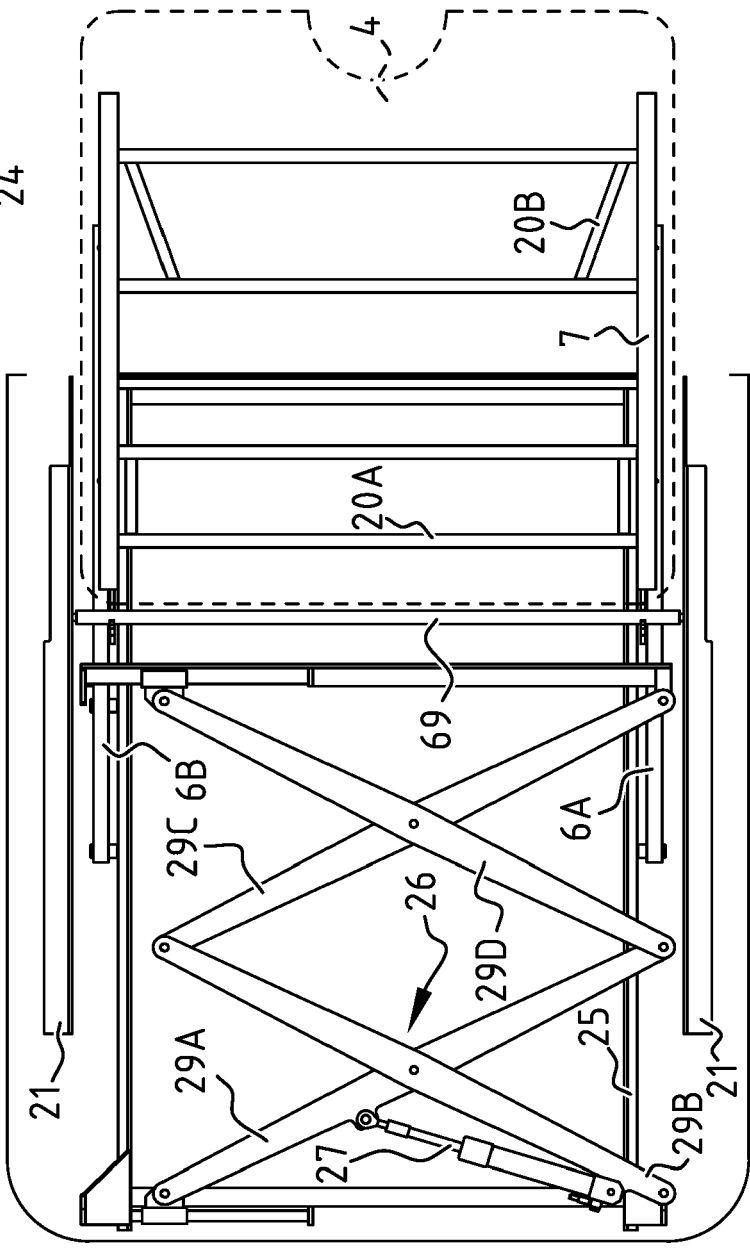


FIG. 9B

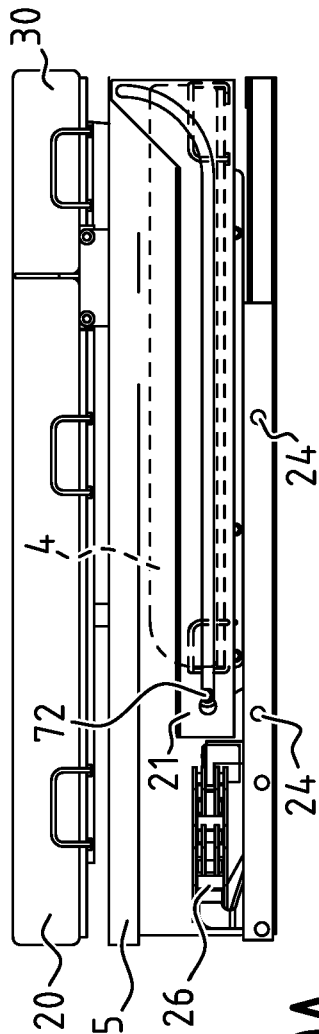


FIG. 10A

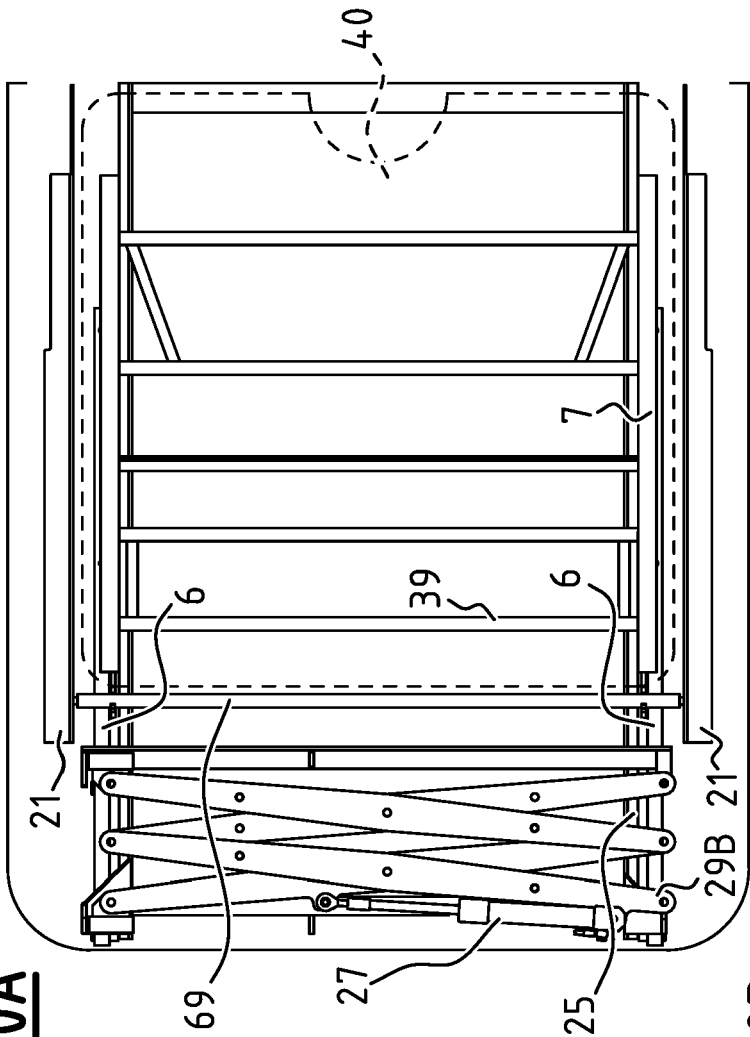


FIG. 10B

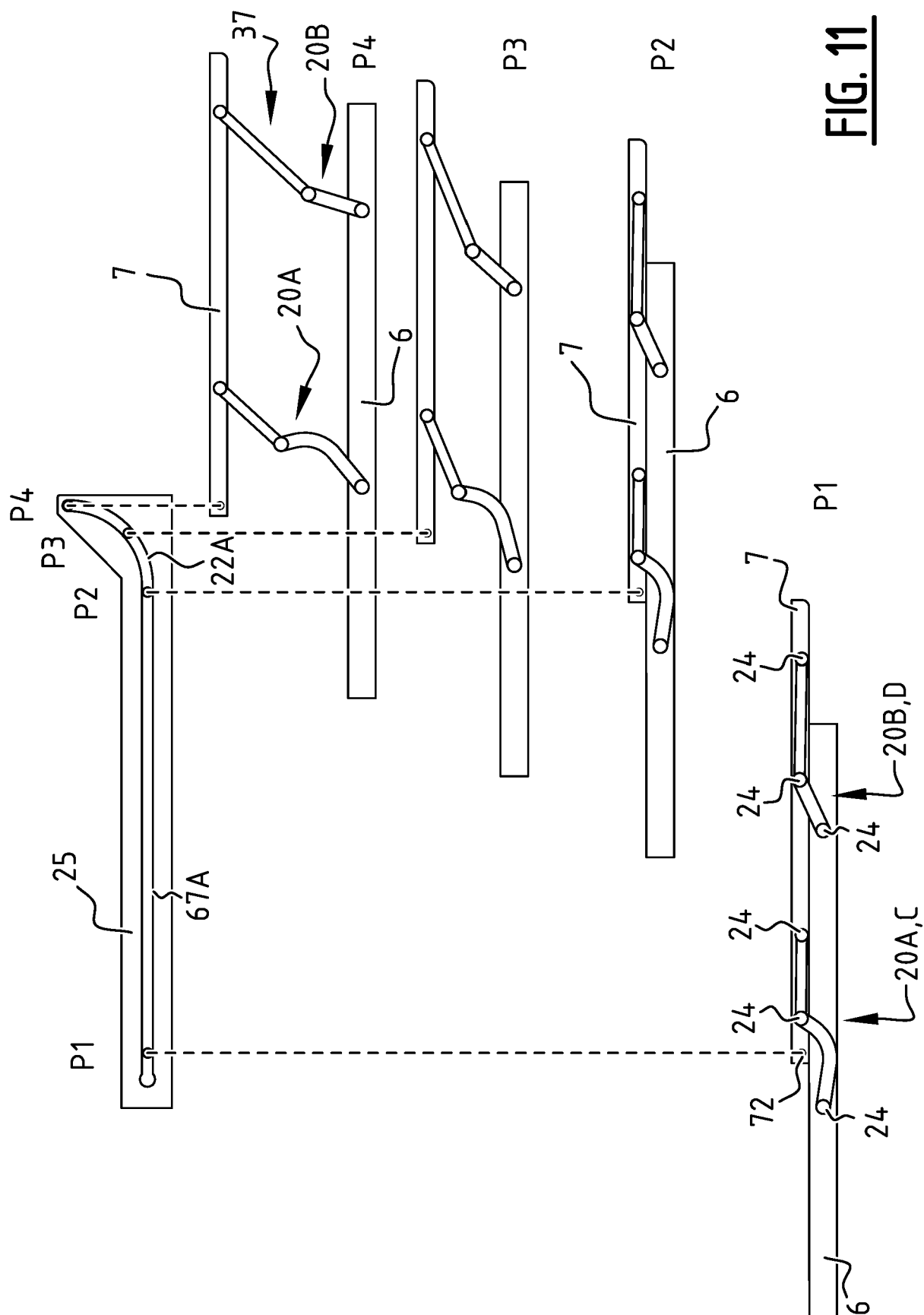


FIG. 11



EUROPEAN SEARCH REPORT

 Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	WO 93/09750 A1 (PODGORSCHKE IRIS [AT]) 27 May 1993 (1993-05-27) * page 6, paragraph 2 - page 11, last paragraph; figures * -----	1,4-6,9, 11-13,15 2,3,8, 10,14	INV. A61G13/00 A61G13/02 A61G13/12
X A	CN 101 773 439 B (HUZHOU NANXUN XINJIANG MEDICAL INSTR CO LTD) 1 April 2015 (2015-04-01) * paragraphs [0025], [0026], [0035]; figures 1-5 * -----	1,4-7,9, 12-15 2,3,8, 10,11	
			TECHNICAL FIELDS SEARCHED (IPC)
			A61G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 January 2021	Examiner Petzold, Jan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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14-01-2021

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