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(54) Person support apparatus

(57) A person support apparatus comprising a person support frame (3) having two sides, a head end and a foot end, and a support assembly for supporting the person support surface and moving it relative to a floor surface. The support assembly comprises a lower frame including a pair of longitudinal lower frame elements (35) running substantially parallel to the sides of the person support frame (3), the lower frame having floor engaging elements (14) for supporting the frame above the floor. The support assembly also includes two leg assemblies (6f, 6h). Each leg assembly includes a leg element having a first end pivotally coupled to the person support surface and a second end pivotally coupled to a longitudinal lower frame element. The lower end of the foot end leg element (7f) is pivotally connected to the longitudinal lower frame element via an extension piece (42) having a first end and a second end. The first end portion of the extension piece (43) is pivotally connected to the longitudinal lower frame element and the second end of the leg element is pivotally connected to a second end portion portion of the extension piece (43).

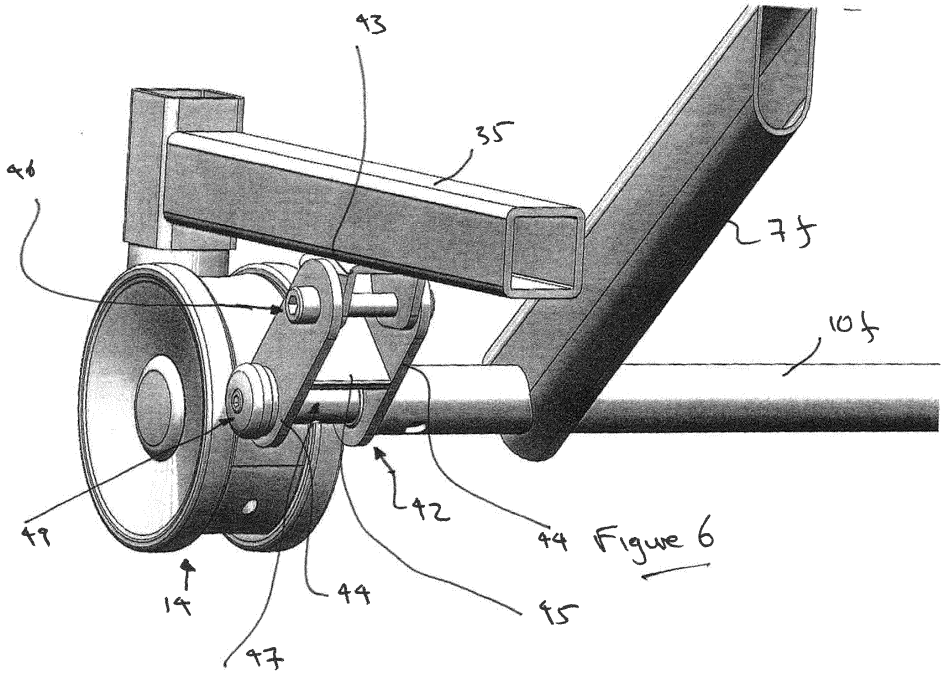

Figure 6

EP 2 873 399 A1

Description

[0001] The present invention is concerned with person support apparatus, such as a bed and with a mechanism suitable for adjusting the height and orientation of a person support surface mounted on that bed. It is more particularly suitable for a hospital or long-term care (LTC) bed.

[0002] Person or patient support apparatus, such as hospital and long-term care beds, typically include a deck and a support surface, such as a mattress, supported by the deck. Such apparatus is often provided with a mechanism for adjusting the height of the deck and hence support surface above the floor on which the apparatus is located, and to control the orientation or inclination of the support surface relative to the floor. Adjustment of the height is helpful to allow care givers to access the patient, and to facilitate patient movement into and out of the bed. The inclination of the person support surface is desirable so as to make the patient more comfortable, or to, for example, take up the Trendelenburg position in which the body is laid flat on the back (supine position) with the feet higher than the head by 15-30 degrees, or the reverse Trendelenburg position, where the body is tilted in the opposite direction.

[0003] The existing adjustable beds allowing the support surface to be placed in the Trendelenburg or reverse Trendelenburg positions are of two main types. In one, the legs or support elements engage the floor directly via a castor at their bottom end and the distance between the head and foot castors changes to reflect the modified geometry as the person support surface is moved from the horizontal position to either the Trendelenburg or the reverse Trendelenburg position. Alternatively, the lower portion of the leg support assemblies are slidably connected to a horizontal lower rail or frame on which the castors are mounted. In such an arrangement, the necessary change in distance between the lower portions of the legs and support assemblies coupled to the horizontal rails is accommodated by a sliding movement of those lower leg ends along or relative to those rails. The arrangement with the legs without the lower rails or frame makes for a relatively unstable structure whereas the mechanism with the legs sliding relative to a lower frame is more stable but the sliding mechanisms are prone to failure and cause abrasion on the surface of the lower rail or rails.

[0004] Thus a need exists for further contributions in this area of technology.

[0005] The present invention provides apparatus as defined in Claim 1 to which reference should now be made.

[0006] The arrangement of Claim 1 results in a bed which is robust and stable and can accommodate the changes in geometry necessary for movement or adjustment between the horizontal, Trendelenburg and reverse Trendelenburg positions without the need for sliding mechanisms which create stresses and wear and are prone to failure.

[0007] Features of some preferred embodiments of the invention are set out in the dependent claims to which reference should now be made.

[0008] The invention will now be described by way of non-limiting example with reference to the accompanying drawings, in which:

Figure 1 is a perspective isometric side view of a person support apparatus embodying the inventions and in the raised horizontal position;

Figure 2 is a side view corresponding to Figure 1;

Figure 3 is a side view of the apparatus of Figure 1 in its lowermost horizontal position;

Figure 4 is a side view of the apparatus of Figure 1 in the Trendelenburg position;

Figure 5 is a view of the apparatus of Figure 1 in the reverse Trendelenburg position;

Figure 6 is a side isometric and partially cut away view illustrating details of the extension piece when the foot end of the frame is in a raised position;

Figure 7 is a view of the extension piece along the longitudinal axis of the bed or frame from a position between the extension piece and the head end of the bed; and

Figure 8 is a side perspective view of the extension piece with the bed in a lowered position.

[0009] A hospital bed embodying the invention includes a deck supporting a mattress or other person support element. The deck may be divided into articulated sections (not shown) so as to create various seating and lying down configurations. Articulated beds with a controllable articulation system for the person support surface are known and are not a novel and inventive part of the subject invention so will not be described in detail.

[0010] Referring to Figures 1 and 2, the hospital bed includes a deck support frame 3 to which a head board (not shown) and a foot board (not shown) may be mounted. The head board is mountable on head board plates 33 and the foot board on foot board plates 34. The deck support frame 3 has two leg or support structures 6f, 6h pivotally mounted or coupled to its under surface. There is a foot end leg assembly 6f and a head end leg assembly 6h. Each of the leg structures 6f, 6h include a pair of legs 7 each coupled to the deck support frame 3 by a moveable upper pivot 8 at their deck or upper end 9. The moveable upper pivot 8 can move parallel to the longitudinal axis of the deck frame. For example, the moveable upper pivot of the left-hand leg in Figure 1 can move in the directions shown by arrows D1, D2 in Figures 2 and 3 to

respectively lower and raise the deck support frame 3.

[0011] The lower portions of the legs 7 of each pair of legs are connected together by a lower bracing cross-element 10 at the bottom 12 of the legs. The lower ends of the legs are also pivotally connected to a support frame including longitudinal side elements 35 which have wheels or castors 14 for movement of the bed along the floor.

[0012] The lower cross-elements 10 are each in turn connected to the lower longitudinal or side elements 35 and able to rotate about their longitudinal axis. Each end of the foot end leg assembly lower cross-element 10f is pivotally connected to a lower portion of a respective length extension element 42 and the upper portion of each length extension element 42 is pivotally connected to a lower longitudinal side element 35. The foot and head ends of the lower side elements 35 each have a castor or castor device 14 so that the support assembly can move over a floor or surface on which it is placed.

[0013] A pair of stabilizer elements 16 are connected to each pair of legs. A stabilizer element is connected to and links each leg to the underside of the deck support frame. The stabilizer elements 16, which are each coupled to a leg 7, are pivotally connected at their first upper ends 17 to the underside of the deck support frame 3. The upper ends 17 of each stabilizer are connected to a fixed upper pivot 18 displaced from the leg upper moveable pivot 8 of the respective leg, and are pivotally connected at their second lower ends 19 to the respective pair of legs at a pair of respective lower stabilizer pivots 20.

[0014] A stabilizer cross-element 37 is pivotally connected between the pair of stabilizers 16 for each leg assembly. The respective stabilizer cross-element is connected to each respective stabilizer at a point 36 between its upper 17 and lower 19 ends.

[0015] An actuator-stabilizer yoke 21 is connected to each stabilizer cross-element at a point substantially midway along the stabilizer cross-element so that it is in the middle of the bed. The actuator-stabilizer yoke 21 is pivotally coupled to an end of an actuator 22 (which may be an hydraulic actuator) which controllably extends and retracts an actuator rod 23 connected to the actuator-stabilizer yoke 21. Extension and retraction of the actuator rod 23 causes the respective stabilizer cross-element 37 and hence the pair of stabilizers 16 connected to that stabilizer cross-element 37 to move and thence the pair of legs 7 connected to that stabilizer 16 to rotate relative to the deck support frame 3 and thence raises or lowers the deck support frame 3 and the person support surface arranged on that deck support frame. The actuators 22 may be controlled by either the patient or a care-giver. Control mechanisms for such actuators are well known and may be either a foot operated pedal, control panel on the side of the bed, remote control or other control mechanism. Suitable actuators are well known and are therefore not described in detail in this application. They may be hydraulic, electric or pneumatic. An example of hydraulic actuators controlling the height of a deck is described in EP 2 181 685 and WO 2004/021952.

[0016] Referring to figure 1, the deck support frame 3 is formed by three sides of a rectangle and comprises parallel side elements 24 connected at their head ends by a head frame element 25. In the described embodiment there is no foot frame element closing the rectangle other than the foot board (not shown) when that is attached to the foot board plates 34 (not shown) but one could be provided if appropriate. One of the known person support deck arrangements such as that described in EP 2 181 685 and WO 2004/021952 may be secured to the person support frame.

[0017] The bottom end of the foot end leg elements 7f are each coupled to a length extension piece 42. The top end of the length extension piece is pivotally connected to the longitudinal rails 35 on the bottom frame and the bottom end of the leg extension piece is pivotally coupled to the bottom end portion of the respective leg element 7f. As shown in, for example, figures 6, 7 and 8, a length extension bracket 43 is fixed to the underside of the lower rail 35. The length extension piece comprises two plate-like elements 44 connected at their mid-point by a length extension cross-element 45. The top end of the length extension piece 42 is pivotally connected to the length extension bracket 43 by a first axle or nut and bolt arrangement 46, and the lower end of the length extension piece is pivotally connected to a rod or bolt 47 extending from the respective end of the lower cross-element 10f at the foot end of the apparatus.

[0018] The bottom end of the head end leg elements are each pivotally coupled to a head end bracket 48. The head end bracket 48 is fixed to the underside of a respective lower rail 35. The lower cross-element at the head end is pivotally coupled to the head end bracket 48. A rod or bolt extending from the respective end of the lower cross-element 10h runs through and is held within holes in the head end bracket 48 in a manner similar to the pivotable connection between the foot end cross-element 10f and the length extension bracket 42.

[0019] Referring to figures 2 to 6,and 8, when the deck support frame, for example, moves from the upper raised horizontal position shown in figure 2 to the Trendelenburg position shown in figure 4 (or to the reverse Trendelenburg position shown in figure 5), the length extension piece pivots in direction B about its upper pivot 46 to extend the distance between the foot end lower leg pivot 49 or fixing on the foot end leg assembly 7f and the head end lower leg pivot 50 or fixing and thereby allow the frame to effectively take up a stable Trendelenburg (or reverse Trendelenburg) position.

Claims

1. A person support apparatus comprising:

a person support element, surface or frame (3)

having two sides, a head end and a foot end, and a support assembly for supporting the person support element, surface or frame and moving it relative to a floor surface,

wherein
the support assembly comprises:

a lower frame including a pair of longitudinal lower frame elements (35) running substantially parallel to the sides of the person support element, surface or frame, the lower frame having floor engaging elements (14) for supporting the lower frame above the floor;
at least one leg assembly (6f), the leg assembly including a leg element (7f) having a first end pivotally coupled to the person support element, surface or frame, and a second end pivotally coupled to a longitudinal lower frame element (35), the leg assembly also including an actuator rod element (23) having a first end pivotally coupled to the person support element, surface or frame (3) and a second end coupled to the leg element (7f) at a position between the leg element's first and second ends such that extension and/or retraction of the actuator rod (23) moves the person support element, surface or frame (3) relative to the lower frame;

and wherein
the lower end of the leg element (7f) is pivotally connected to the longitudinal lower frame element (35) via an extension piece (42) having a first end and a second end, the first end portion of the extension piece (42) being pivotally connected to the longitudinal lower frame element (35) and the second end of the leg element being pivotally connected to a second end portion portion of the extension piece.

2. Apparatus according to claim 1 wherein the leg assembly includes two leg elements, one leg element being pivotally coupled to each of the two longitudinal lower frame elements.

3. Apparatus according to any preceding claim comprising a foot end leg assembly (6f) and a head end leg assembly (6h), and wherein the lower end of one of the head end and the foot end leg assemblies is pivotally connected to the longitudinal lower frame (35) via an extension piece (42) and the other one of head end and foot end leg assemblies is not so connected.

4. Apparatus according to any preceding claim comprising an inverted substantially U-shaped bracket (43) fixed to a lower surface of the longitudinal lower frame element, and wherein the first end portion of extension piece (42) is pivotally connected to the bracket (43).

5. Apparatus according to any preceding claim wherein the leg assembly comprises a pair of leg elements (7f) connected by at least one cross-element (10f) and wherein the cross-element extends between the lower end of each leg elements and the end portion of the cross-element (10f) are coupled to and pivotable relative to their respective extension pieces (42).

6. Apparatus according to claim 5 wherein the cross-element (10f) includes a projecting bolt like element (47) which extends through a space or hole in the extension piece.

7. Apparatus according to any preceding claim in which the extension piece (42) comprises a pair of parallel plates (44).

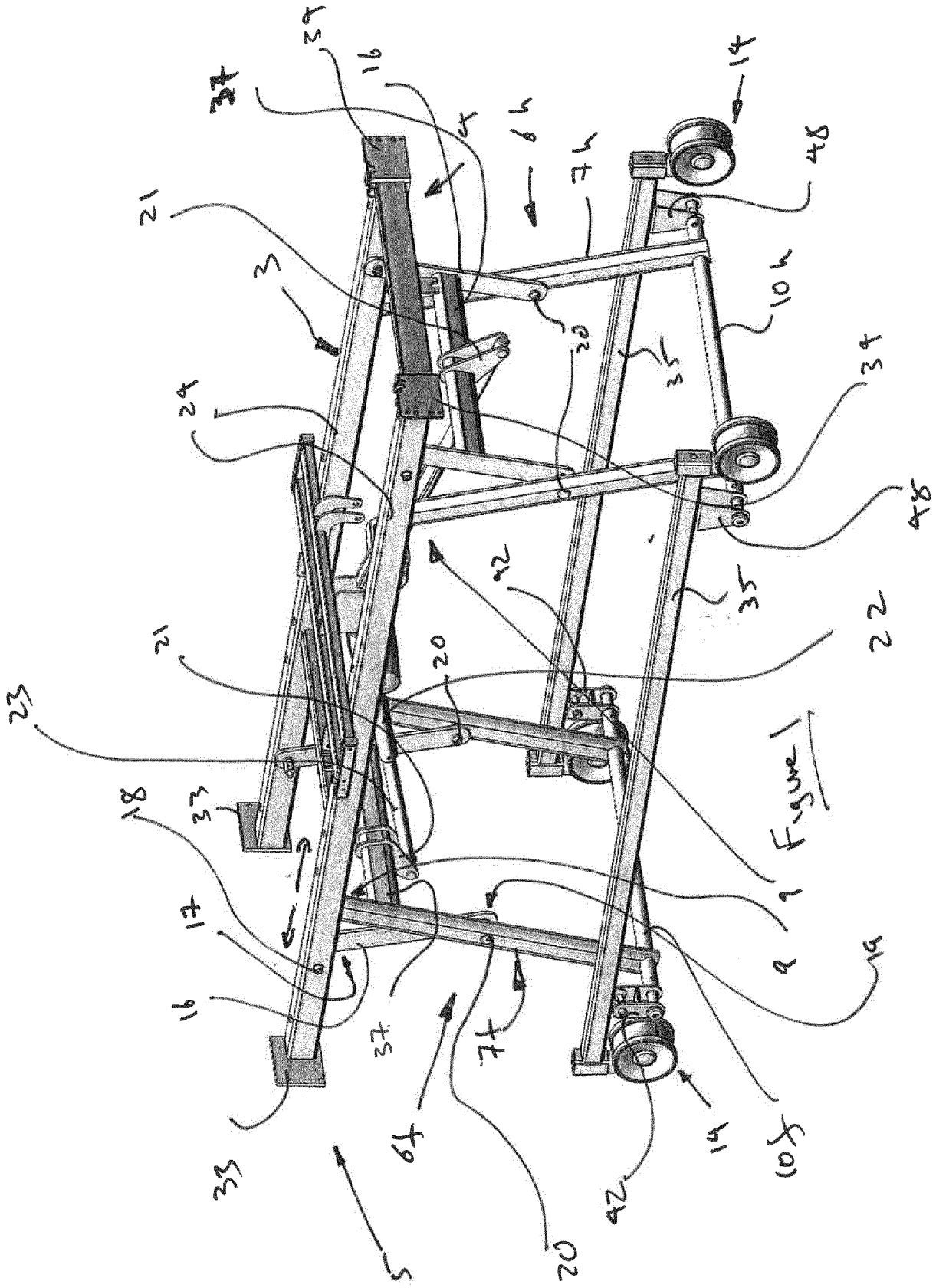

Figure 1

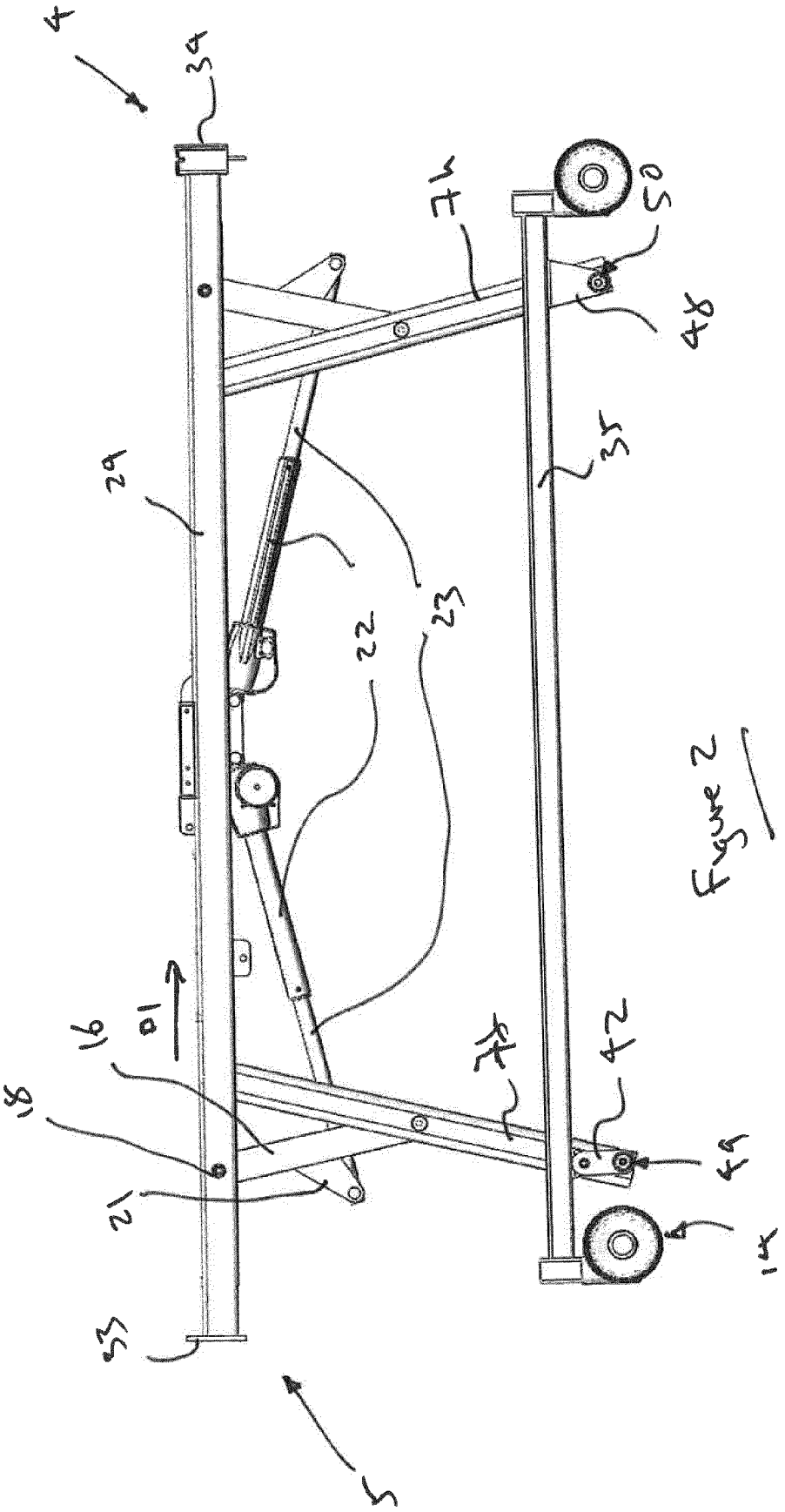

Figure 2

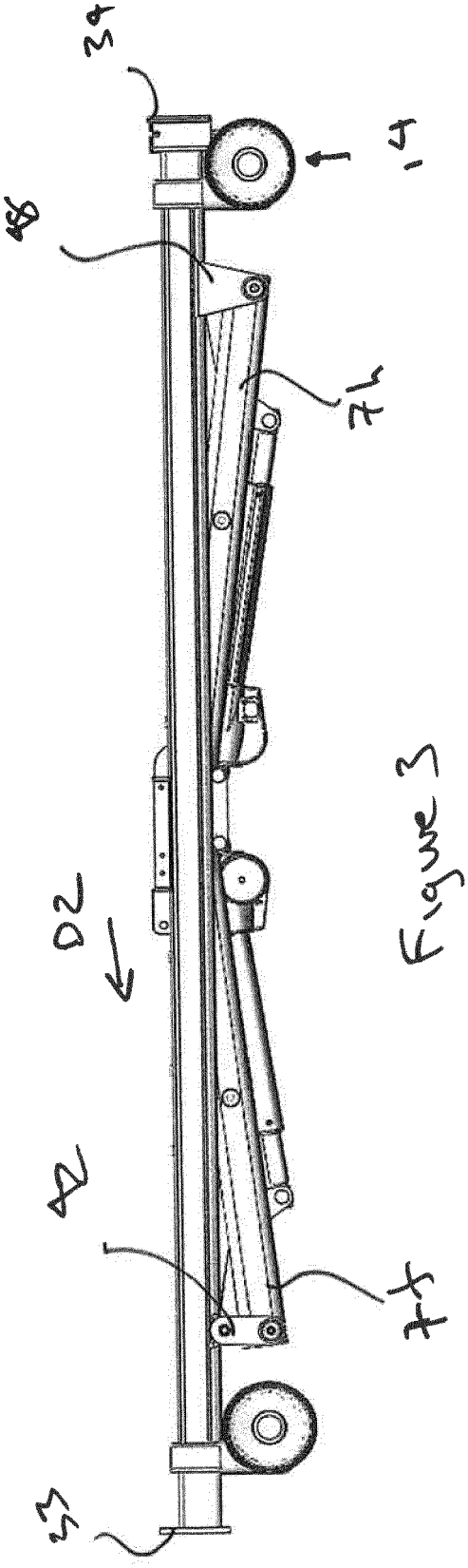

Figure 3

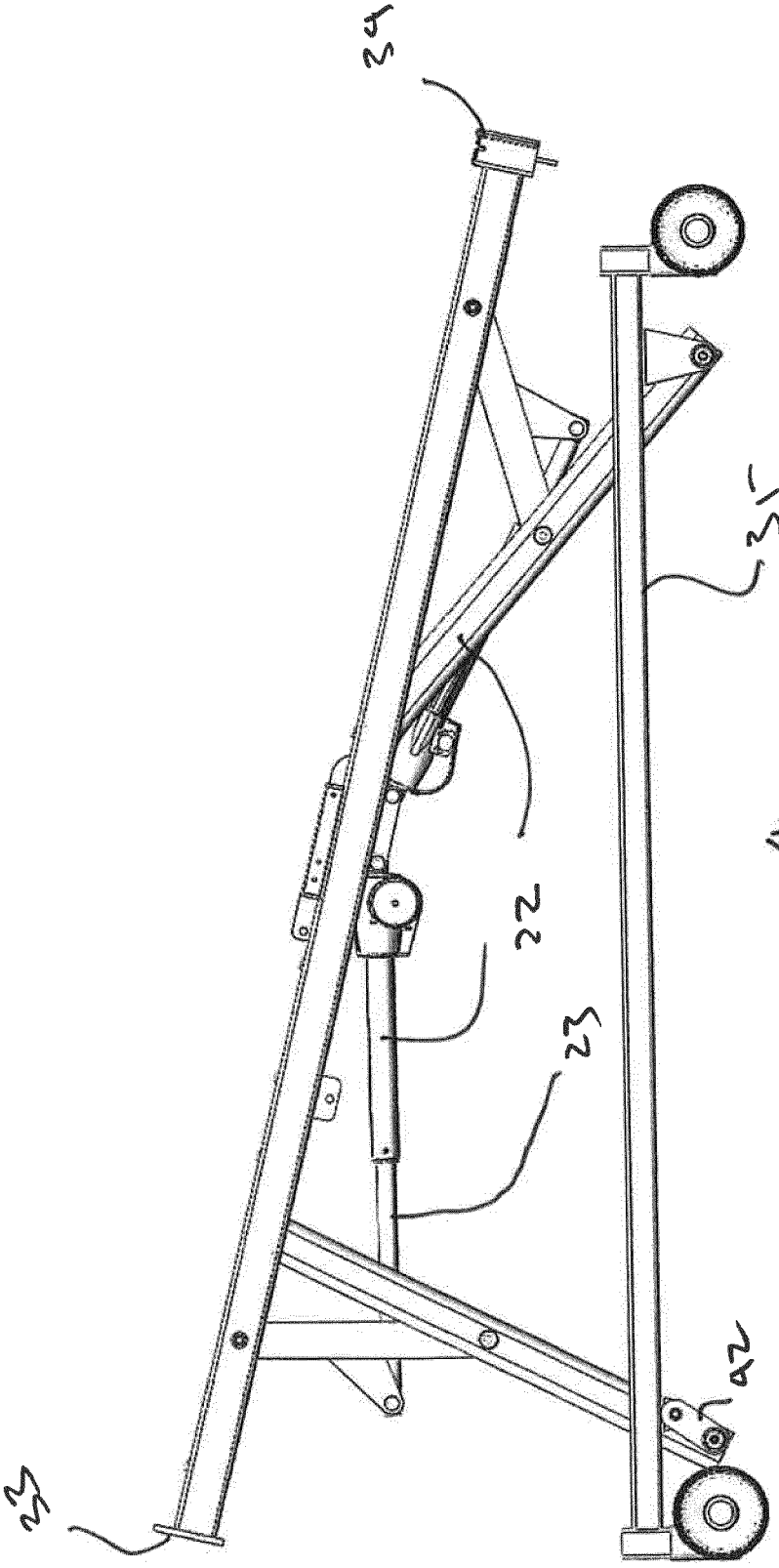

Figure 4

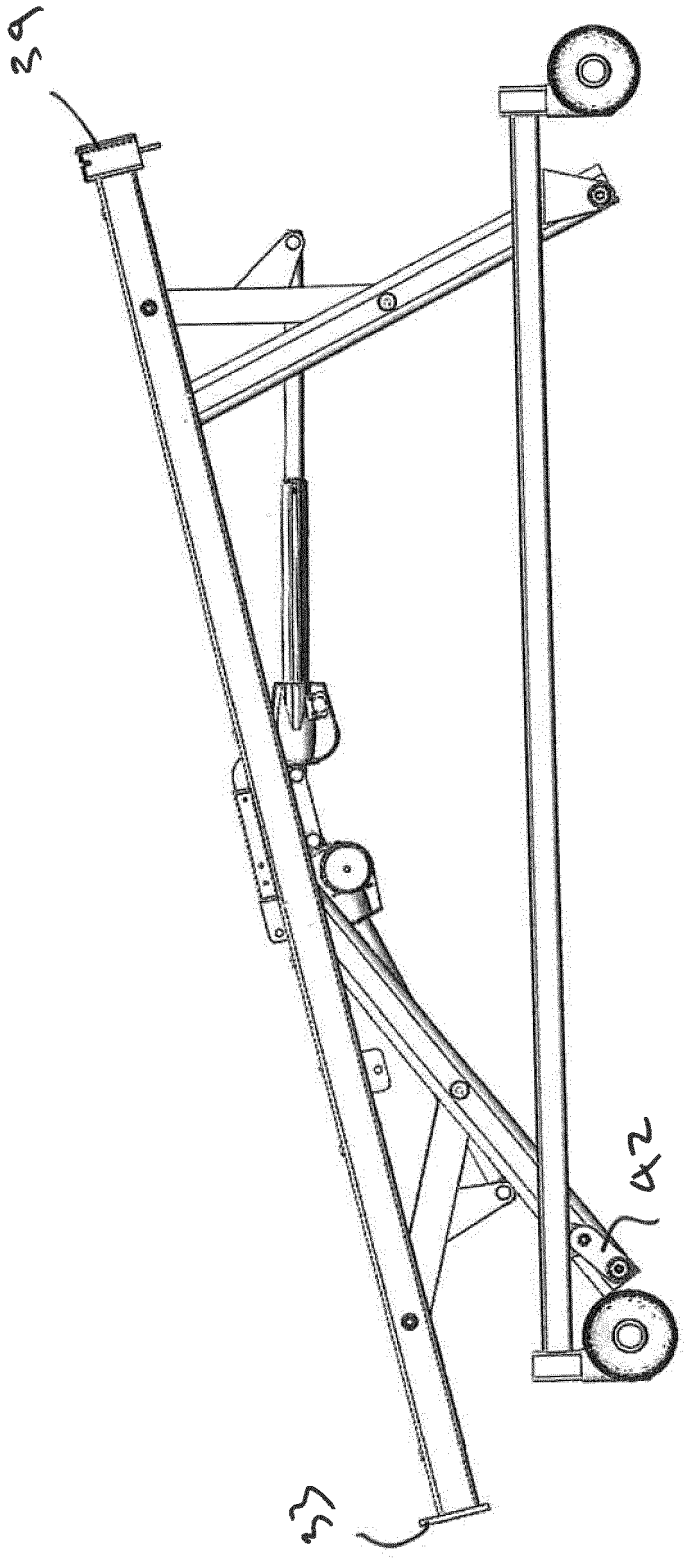

Figure 5

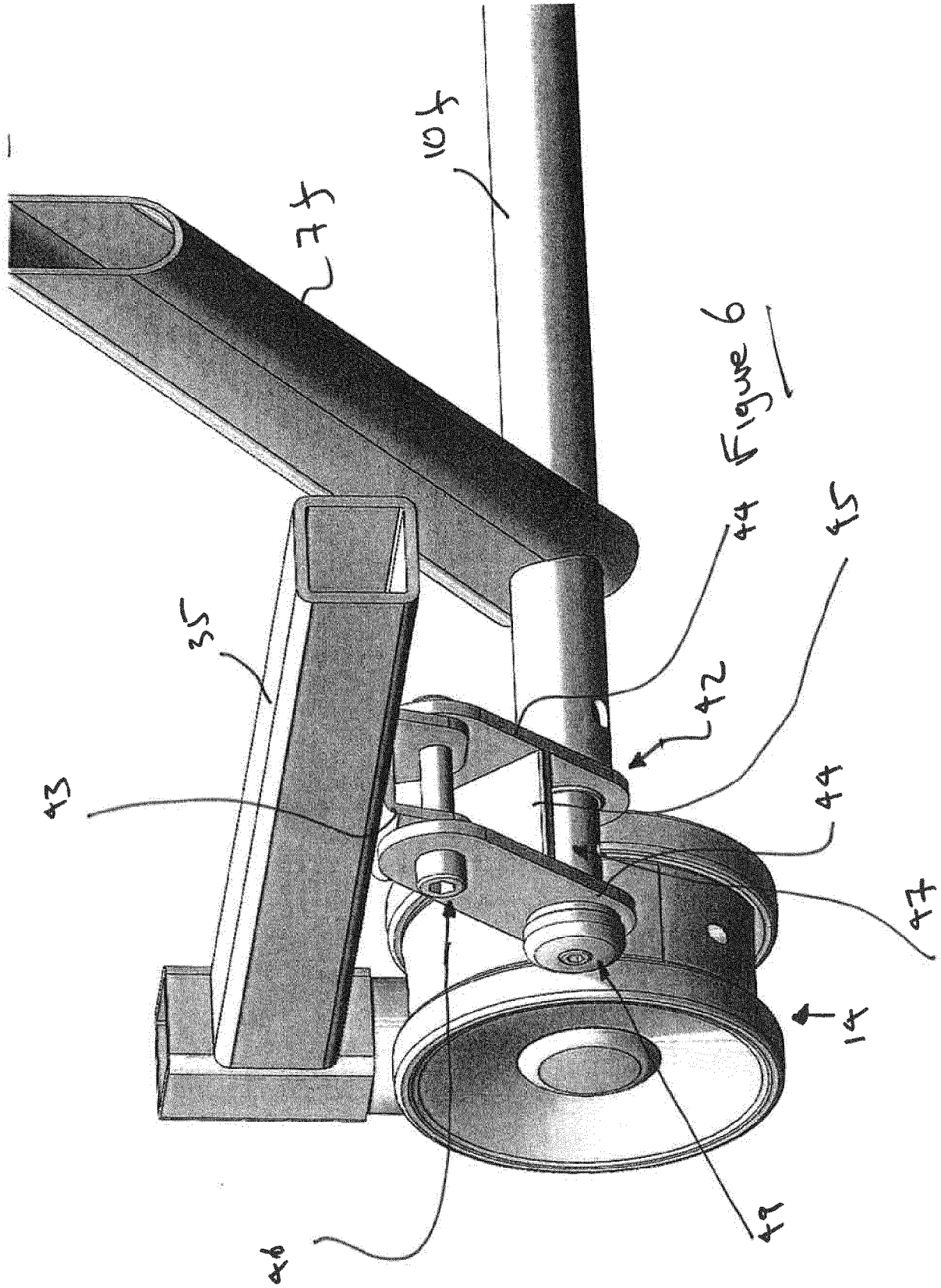

Figure 6

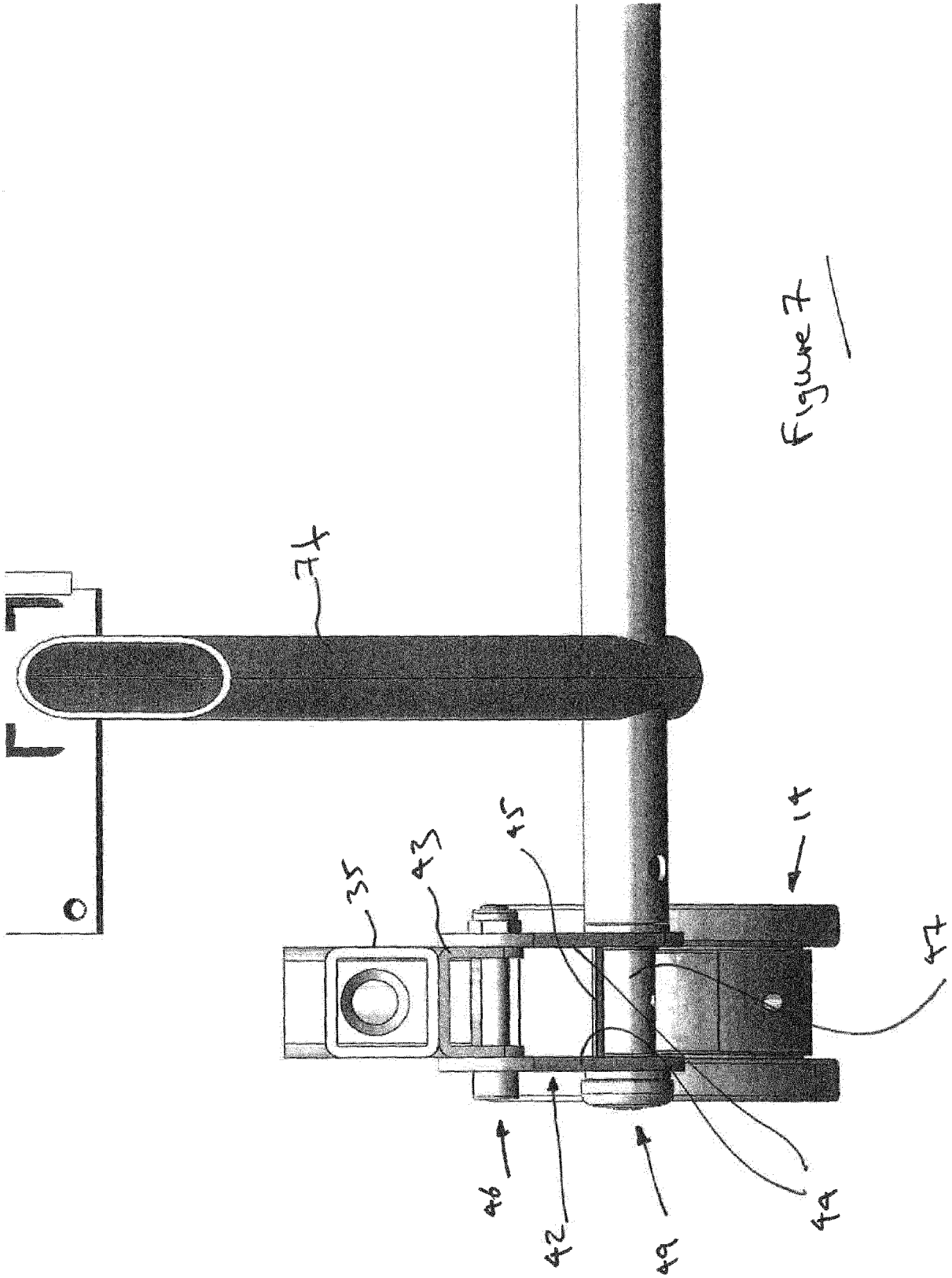

Figure 7

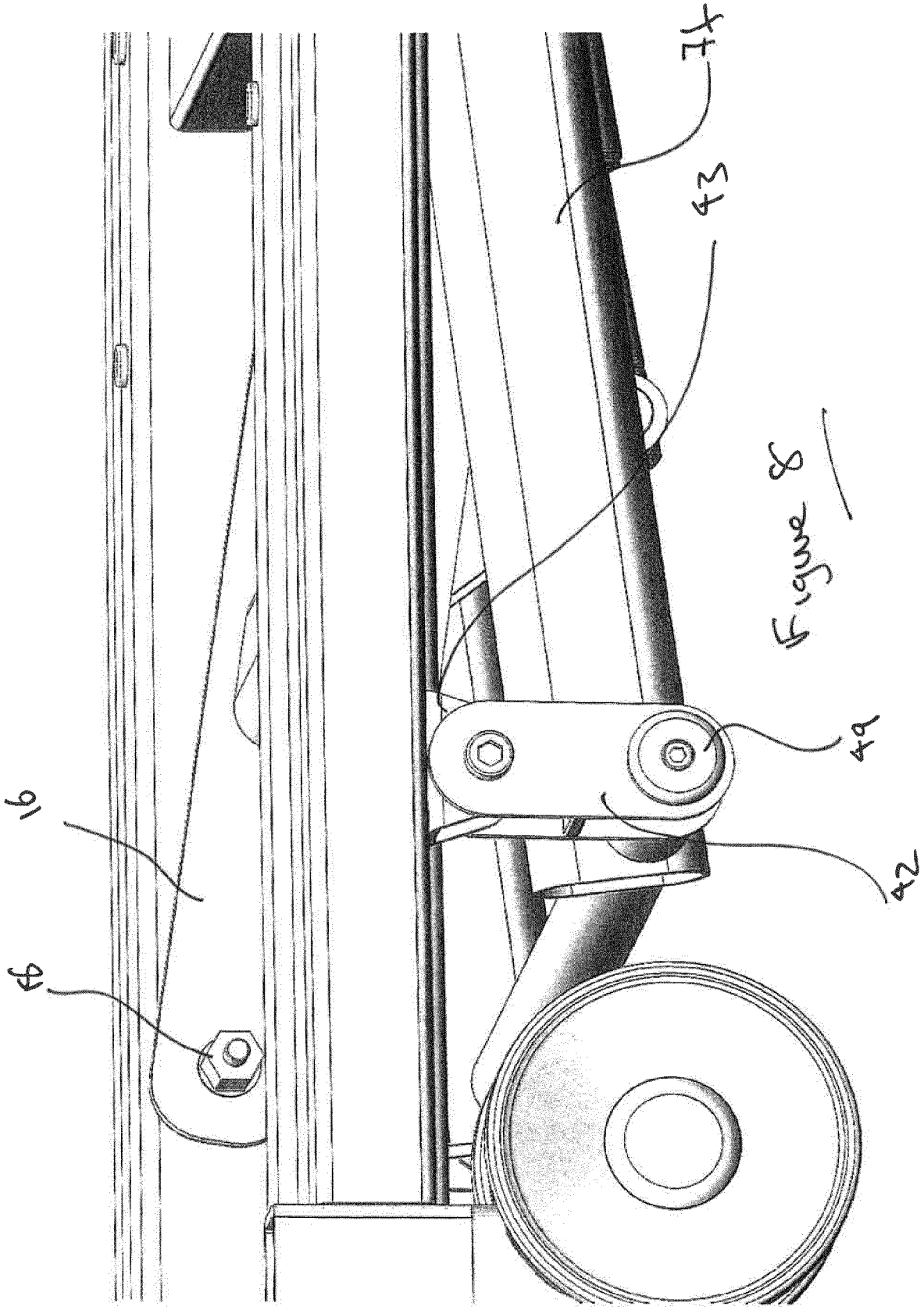

Figure 8

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 3366

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	CN 202 173 539 U (UNIV GUANGZHOU) 28 March 2012 (2012-03-28) * the whole document *	1-4,7	INV. A61G7/012 A61G1/013 A61G1/056
A	US 8 484 780 B1 (EDGERTON JOHN [US]) 16 July 2013 (2013-07-16) * figures * * column 3 *	1-7	ADD. A61G1/02
A	EP 2 158 890 A2 (HILL ROM SERVICES INC [US]) 3 March 2010 (2010-03-03) * the whole document *	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 April 2014	Edlauer, Martin

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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08-04-2014

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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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