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(54) MECHANISM FOR COLLAPSIBLE BUNK-BEDS

MECHANISMUS FÜR KLAPPBARE STOCKBETTEN

MÉCANISME POUR LITS SUPERPOSÉS PLIABLES

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(72) Inventor: **Manzoni, Giulio**
23814 Cremono (IT)

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(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

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(73) Proprietor: **Manzoni, Giulio**
23814 Cremono (IT)

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Description

[0001] The present invention relates to a mechanism for collapsible bunk-beds and to a sofa bed comprising such mechanism.

BACKGROUND OF THE INVENTION

[0002] To allow the closing or opening of a mechanism for bunk-beds, it is known to use lever systems connected between the frame of the upper bed and the fixed base of the mechanism.

[0003] Among known lever systems there are those which, in order to achieve the closing motion of the bunk-bed, entail the rotation through 180° of the upper bed frame.

[0004] In other solutions, instead, the lever systems comprise pivoting axes that can move on a horizontal plane toward the inside of the mechanism.

[0005] These known mechanisms are not devoid of drawbacks, among which mention must be made of the fact that the 180° rotation of the upper bed frame entails the use of straps in order to keep the mattress integral with the upper bed frame during rotation.

[0006] Moreover, the lever systems that can move horizontally toward the inside of the bunk-bed can entail problems of interference with the mattress of the lower bed frame.

[0007] Besides, in mechanisms of the known type in general there can be stability problems.

[0008] To ensure the safety of the user, locking systems are provided which prevent the upper bed frame, when it is in the raised position, from returning to the lowered position or in any case from changing its own stable position for use.

[0009] These known locking systems are not devoid of drawbacks, among which mention must be made of the fact that they are typically suitable only for the specific lever system used to lift and close the mechanism of the bunk-bed.

[0010] Moreover, known locking systems run the risk of being difficult to identify by the user, who for this reason may forget to activate them before lying for example on the lower bed.

[0011] Another drawback of known safety mechanisms is constituted by the barriers provided longitudinally on the upper bed frame, which are needed to prevent the accidental fall of the user from the upper bed while sleeping. Such known safety barriers are typically awkward to apply, particularly when the mechanism of the collapsible bunk-bed is used in a sofa bed, since in the closed configuration of the bunk-bed they have to be removed in order to be able to use the sofa or they have to be folded onto the upper bed frame under the corresponding mattress. Such known solutions, besides awkwardness in use, have less than optimum safety, since the user can in any case use the upper bed without assembling or raising the corresponding longitudinal safety

barriers.

[0012] Another drawback of known bunk-bed mechanisms is that in addition to safety sides, in order to reach the closed position of the bunk-bed mechanism it is necessary to remove the ladder that is used to access the upper bed.

[0013] BE 472 181 A discloses a double ottoman with upper and lower ottomans connected into an open-out condition and adapted for a lifting motion to two lateral supporting frames each comprising a pair of arms arranged in scissors fashion and connected to the lower ottoman so that the upper surfaces of the two ottomans will be brought to the same height.

SUMMARY OF THE INVENTION

[0014] The aim of the present invention is to overcome the drawbacks of the background art, by devising a mechanism for collapsible bunk-beds that is particularly sturdy and easy to move.

[0015] Within this aim, an object of the invention is to provide a movement mechanism for collapsible bunk-beds that is not interposed between the upper and lower bed frames.

[0016] A further object of the invention is to provide a mechanism for collapsible bunk-beds that does not entail a rotation of the upper bed frame.

[0017] Another object of the invention is to provide a mechanism for collapsible bunk-beds that uses an extremely limited number of levers while maintaining high structural stability.

[0018] Moreover, a further object of the present invention is to devise a mechanism for collapsible bunk-beds that can be used to obtain a sofa bed.

[0019] A further object of the present invention is to provide a safety mechanism for collapsible bunk-beds which allows the user to lock the upper bed frame in position.

[0020] Within this aim, an object of the invention is to render the safety mechanism activatable compulsorily by the user in order to be able to use the bunk-bed.

[0021] Another object of the invention is to provide a safety mechanism that forces the user to assemble at least one longitudinal safety barrier of the upper bed frame in order to be able to use the bunk-bed.

[0022] Another object of the present invention is to provide a mechanism for collapsible bunk-beds that avoids the need to have a removable ladder.

[0023] Another object of the invention is to provide a mechanism for collapsible bunk-beds that is highly reliable, relatively easy to provide and at competitive costs.

[0024] In accordance with the invention, there is provided a mechanism for collapsible bunk-beds as defined in the appended claims.

BRIEF DESCRIPTION OF DRAWINGS

[0025] Further characteristics and advantages of the

invention will become better apparent from the description of preferred but not exclusive embodiments of the mechanism according to the invention, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a mechanism according to the invention in a fully open position;

Figure 1a is a detail view of a locking element of Figure 1;

Figure 1b is a detail view of another locking element of Figure 1;

Figure 2 is a view of the lowering movement of the lower bed frame;

Figure 3 is a view of the mechanism of Figure 1, in which the lower bed frame has been lowered completely;

Figure 4 is a view of an intermediate position of the upper bed frame during closure;

Figure 5 is a view of the mechanism of Figure 1 in the fully collapsed position;

Figures 6a-6c are views of three positions of one of the lever systems for moving the upper bed frame;

Figures 7a-7c are detail side views of the lever system for the movement of the lower bed frame, respectively in the three raised, inclined and lowered positions;

Figure 8 is a view of a mechanism for bunk-beds according to the invention in the raised position;

Figures 9a and 9b are views of the two positions of the safety lock;

Figure 10 is a view of the sliding motion of the safety barrier used in the mechanism of Figure 8;

Figure 11 is a view of the tilting motion of the safety barrier used in the mechanism of Figure 8;

Figure 12 is a view of the tilting motion of the supporting frame used in the mechanism of Figure 8.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0026] With reference to the figures, a mechanism for collapsible bunk-beds according to the invention, generally designated by the reference numeral 1, comprises a base 2 that is substantially shaped like a parallelepiped and is provided at its opposite sides with lateral sides 21

that connect a front part 22 and a rear part 26, so as to form a containment seat for a lower bed frame 4. The lateral sides 21 are such as to protrude vertically with respect to said containment seat and to the surface of the lower bed frame, so that they can be used conveniently both as barriers for the lateral containment of the mattress 43 and as frames in order to obtain the armrests of a sofa bed that uses the mechanism 1.

[0027] Moreover, the front part 22 comprises at least one pair of resting elements 24, for example brackets that are welded onto the front part 22 and protrude toward the inside of the containment seat formed in the base 2. The resting elements 24 are adapted to support the lower bed frame 4 in its raised position and the upper bed frame 3 in its collapsed position.

[0028] The lower bed frame 4 can be constituted by a pair of crossmembers 41 and a pair of longitudinal members 42, so as to define a frame that is adapted to support a mattress 43, for example by means of wood slats of a known type which are connected like a bridge between the longitudinal members 42.

[0029] Moreover, the mechanism 1 comprises an upper bed frame 3, which is also defined by a pair of crossmembers 31 and a pair of longitudinal members 32 so as to define a frame suitable to support a mattress 33, for example by means of wood slats of a known type which are connected like a bridge between the longitudinal members 32.

[0030] A front safety barrier 34 can be provided on at least one longitudinal member 32 and is preferably fixed detachably to said longitudinal member 32 for example by means of handwheels. Additional safety barriers 35, which are not necessarily removable and are useful to prevent the sliding of the mattress 33 on the surface of the upper bed frame 3, can be present on the crossmembers 31.

[0031] The lateral sides 21 of the base 2 are connected to the crossmembers 31 of the upper bed frame by way of respective first lever systems 5, which are adapted to allow the movement of the upper bed frame 3 away and toward the base 2. Each one of the first lever systems 5 defines an articulated quadrilateral that lies on a plane that is substantially perpendicular to the plane of the upper bed frame 3.

[0032] The articulated quadrilateral is preferably an articulated parallelogram 6, shown in broken lines in Figures 6a-6c, and has a hinge, obtained for example by means of a hinged joint 61, the pivoting axis of which coincides with the longitudinal axis of the upper bed frame 3 that passes substantially through the center of the crossmembers 31 of the upper bed frame 3. The articulated parallelogram 6 further has two additional hinges that are integral with the base 2 and are also obtained preferably by means of hinged joints 62 and 63. The fourth hinge of the articulated parallelogram 6, also preferably obtained by means of a hinged joint 64, is integral with the motion of the upper bed frame 3, and so is the hinged joint 61.

[0033] A short side of the parallelogram 6 is defined between the joints in a fixed position with respect to the base 2, i.e., the joints 62 and 63, and is inclined with respect to the floor resting surface of the base 2 so as to define an acute angle toward the rear part 26 of the base 2, for example of approximately 60°. In this manner, with the closing motion of the bunk-bed, the joint 61 that is arranged on the upper bed frame 3 can approach the fixed joints 62 and 63, allowing the upper bed frame 3, in the collapsed position, to arrange itself substantially above the lower bed frame 4.

[0034] The hinged joints 61, 62, 63 and 64 can be adapted to allow a mutual rotation of no more than approximately 90° between the levers that are connected thereto. Such levers are preferably four L-shaped levers 52-53 and 54-55 that are identical in pairs and are adapted to define a substantially rectangular shape and more preferably square shape when the upper bed frame 3 is in the fully raised position with respect to the base 2.

[0035] A first L-shaped lever 52 is fixed rigidly to an inner side of the respective lateral side 21 of the base 2, and a second L-shaped lever 53 is fixed rigidly laterally to the upper bed frame 3, for example by a fixing angled element 533 that is fixed along the respective crossmember 31 so as to prevent relative rotation between the upper bed frame 3 and said second L-shaped lever 53. The L-shaped levers 52 and 53 are crossed by a diagonal of the substantially rectangular shape of the lever system 5, while the third L-shaped lever 54 and the fourth L-shaped lever 55 are crossed by the other diagonal of said substantially rectangular shape.

[0036] A rotation of the upper bed frame 3 about itself during its opening and closing movements is prevented with the structure described above.

[0037] The first and second L-shaped levers 52 and 53 each comprise two arms that are arranged at right angles to each other and have a substantially identical extension, 521-522 and 531-532 respectively, and are connected by a curved portion. The third and fourth L-shaped levers 54 and 55 also each comprise two arms 541-542 and 551-552 respectively, which are oriented at right angles to each other and have a substantially mutually identical extension that is greater than the extension of the arms 521-522 and 531-532 of the first and second L-shaped levers 52 and 53.

[0038] The mutually pivoted arms are substantially perpendicular to each other when the upper bed frame 3 is in the collapsed position, as shown in Figure 6c, in which the first lever system 5 is interposed between the lateral side 21 of the base 2 and the crossmember 31.

[0039] The third L-shaped lever 54 advantageously comprises a locking element to prevent the movement of the first lever system 5. Such locking element can be obtained by means of a lock 543 on the arm 541, which is provided with a bolt 544, which can move between an extended position, in which the bolt of 544 abuts above the lateral side 21 of the base 2, and a retracted position, in which the bolt 544 does not protrude transversely from

the third L-shaped lever 54 and allows its rotation with respect to the first L-shaped lever 52. The bolt 544 can be moved by means of a removable key 546.

[0040] A further locking element 553 can be provided between the first lever systems 5 and the upper bed frame 3, for example in the form of a bar 554 that can slide in a fork-shaped bracket 555 that is fixed below the arm 551 of the fourth L-shaped lever 55 so as to engage detachably below the respective crossmember 31.

[0041] The arm 541 may further be connected to a gas cylinder actuator 23, for example by means of a plate 545 in a position that is substantially intermediate to the arm 541. The gas cylinder actuator 23 is connected, at its other end, to the rear part 26 or to the side 21, preferably in a point that is substantially aligned vertically with the articulation 62 and is close to the resting surface of the base 2, so as to facilitate the opening and closing movements of the upper bed frame 3.

[0042] As an alternative to the gas cylinder actuator 23 it is possible to use a motorized actuator.

[0043] Advantageously, the first lever systems 5 can be connected rigidly to each other by transverse reinforcement bars, for example by a reinforcement bar 56 that is welded between the fourth L-shaped levers 65 at the arms 552. The reinforcement bar 56, if welded proximate to the articulations 62, can constitute advantageously a supporting element for the cushions of the back of the sofa bed that uses the mechanism 1 according to the invention.

[0044] Each one of the L-shaped levers 52, 53, 54, 55 may further have angular reinforcement elements 57 that are arranged in a bridge-like fashion between the respective arms.

[0045] The lower bed frame 4 of the mechanism according to the invention can also be liftable with respect to the base 2 by means of second lever systems 71 and 75.

[0046] In particular, on each one of the opposite longitudinal ends of the lower bed frame 4 it is possible to provide a first lower lever 71 that has an end that is pivoted on a substantially intermediate point of a crossmember 41 of the lower bed frame 4 and the other end pivoted on the front part 22 of the base 2, for example on a vertical extension 25 of the bracket that constitutes the resting element 24.

[0047] The two first lower levers 71 can have a bracket 73 in a substantially intermediate position, on which a rod 72 for connecting the two first lower levers 71 is fixed and is arranged below the lower bed frame 4. The bracket 72 can be connected by means of a spring 74 to the front part 22 of the base 2, preferably at a higher level than the pivoting point of the lever 71 on the vertical extension 25 of the resting element 24, so that the spring 74 arranges itself substantially parallel to the crossmembers 41 of the lower bed frame 4 when said frame is in the raised position, shown in Figures 1 and 7a.

[0048] The corner ends of the crossmembers 41 on the opposite side with respect to the front part 22 are

instead connected to second lower levers 75, each pivoted between one of said corner ends or a bracket that is integral therewith and the rear part 26 of the base 2, for example in a point substantially at the same height as the pivoting point of the first lower levers 71 on the front part 22 of the base 2. The second lower levers 75 also can be connected rigidly to each other by a connecting rod, which is welded onto the second lower levers 75 proximate to their pivoting point on the rear part 26 of the base 2.

[0049] Operation of the invention is evident from the embodiment described above.

[0050] In particular, considering the initial situation of Figure 1, when the bunk-bed is to be collapsed, the lower bed frame 4 is raised at the longitudinal member 42 and, with a combined rotary and translational motion, the lower bed frame 4 in a position that is thus tilted is lowered with the rotation of the second lower levers 75 about their pivoting point on the rear part 26 of the base 2. The lower bed frame 4 is then pushed downward so as to make it abut in a substantially horizontal position with respect to the resting surface of the base 2.

[0051] By means of the key 546, the locks 543 are then opened so that the bolts 544 no longer protrude transversely from the arm 541 of the third L-shaped lever 54, which can thus rotate freely about the hinged joint 63 with respect to the lateral sides 21. The bars 554 also can be disengaged, by translating them manually outwardly, so as to no longer abut under the respective crossmembers 31. By applying a downward force to the upper bed frame 3, as shown in Figure 3, the upper bed frame 3 is lowered manually, remaining substantially parallel to the resting surface of the base 2 and guided by the first lever systems 5 and by the gas cylinder actuator 23, until it abuts against the resting elements 24 provided on the front part 22 of the base 2.

[0052] The opening movement of the bunk-bed instead follows the steps that are the opposite of the ones described above.

[0053] Advantageously, the mechanism described above can be used in a sofa bed, by adding back cushions to the mechanism in the collapsed position shown in Figure 5 in order to obtain a sofa.

[0054] According to another aspect of the invention, shown in Figures 8 to 12 in the particular, but not necessary, use in combination with the mechanism 1 described earlier, the base 2 can comprise a supporting frame 600 that can rotate with respect to the base 2, in particular with respect to a longitudinal axis A thereof. Such supporting frame 600 can be pivoted to a front longitudinal member of the base 2 by means of two props 610 connected by a crossmember 620, which preferably has a longitudinal extension that is substantially equal to that of the longitudinal members 32 of the upper bed frame 3. The props 610 instead have an extension that is substantially equal to or greater than the difference in height, with respect to the plane of the base 2, between the pivoting axis A of the supporting frame 600 and the upper

bed frame 3 when the latter is in the fully raised position.

[0055] In this manner, when the supporting frame 600 is in the raised position, the corresponding crossmember 620 is at a height, with respect to the plane of the base 2, that is substantially equal to the height of the upper bed frame 3 and the props 610 consequently can be used to support frontally the weight that bears on the upper bed frame 3 and discharge it onto the base 2.

[0056] When instead the supporting frame 600 is in the lowered position, it lies above the lower bed frame 4, more precisely above the mattress 43 arranged on the lower bed frame 4, so as to be visible when the upper bed frame 3 is moved to the raised position.

[0057] Advantageously, on the supporting frame 600 a ladder 670 is defined that moves rigidly together with the supporting frame 600. One of the stringers of the ladder 670 can be one of the props 610, while the other stringer of the ladder 670 is fixed to the crossmember 620 at one end and is pivoted at the other end along the same pivoting axis A as the supporting frame 600. The rungs of the ladder 670 are thus fixed to these two uprights, for example by welding.

[0058] An assembly 640 for locking the movement of the upper bed frame 3 is provided on the crossmember 620 of the supporting frame 600 and is adapted to interact with the front longitudinal member 32 of the upper bed frame 3 when the supporting frame 600 is in the raised position, in order to maintain this position and allow the discharge of the weight onto the base 2.

[0059] This locking assembly 640 can be obtained by means of at least one bolt coupled to the crossmember 620. To achieve locking, the bolt interacts with suitable abutments 660 that are fixed rigidly to the upper bed frame 3, for example to the longitudinal member 32.

[0060] A safety barrier 630 can be pivoted to the crossmember 620 of the supporting frame 600 and can rotate between an inactive position, in which the safety barrier can rotate freely with respect to the supporting frame 600, and a safety position, in which the barrier 630 is external to the perimeter of the supporting frame 600 and lies in a locked condition on a plane that is substantially perpendicular to the plane of the upper bed frame 3. In the safety position, the rotation of the safety barrier 630 is locked.

[0061] Advantageously, the safety barrier 630 can integrate the locking assembly 640. In particular, bolts 650 are fixed rigidly to the safety barrier 630 substantially at the pivoting axis of the safety barrier on the crossmember 620 of the supporting frame 600.

[0062] In this manner, by means of the rotation of the safety barrier 630 from the inactive position to the safety position, it is possible to achieve not only the locking of the supporting frame 600 on the upper bed frame 3 but also the locking of the rotation of the safety barrier 630 with respect to the crossmember 620.

[0063] In the particular illustrated embodiment, the bolts 650 are oriented substantially parallel to the crossmember 620 of the supporting frame 600. For example,

each bolt 650 can be fixed to one of the two arms of a fork that is fitted rotatably on the crossmember 620, the other arm of the fork being fixed to the safety barrier 630.

[0064] The safety barrier 630 can further slide along the crossmember 620 so that when the safety barrier 630 slides the bolts 650 engage the corresponding abutments 660, for example tubular elements, that are fixed on the longitudinal member 32 of the upper bed frame 3.

[0065] Optionally, in order to avoid inadvertently releasing the safety barrier 630, it is possible to provide a safety lock 680, which can be operated by means of a removable key and prevents, once actuated, the sliding of the safety barrier 630 along the crossmember 620. The lock 680, for example, can interact with an abutment 690 that protrudes from the cross member 620 of the supporting frame 600. As an alternative, said abutment can be provided on the longitudinal member 32 of the upper bed frame 3.

[0066] Optionally, it is possible to provide on the crossmember 620 of the supporting frame 600 at least one spring latch 700 adapted to engage automatically the upper bed frame 3 by means of a spring that is loaded toward said upper bed frame, in order to prevent the supporting frame 600 from falling during the operations for moving the safety barrier 630. The spring latch 700 can be deactivated by pulling manually an eyelet that is integral with the spring latch. In order to maximize the safety of the structure, however, it is preferable to avoid the use of the spring latch 700.

[0067] Operation of the safety mechanism according to the invention is evident from the embodiment that has just been described. In particular, when the upper bed frame 3 is moved by the user to the raised position, the supporting frame 600 becomes visible and therefore is raised by the user, for example by gripping the safety barrier 630. The supporting frame 600 is then rotated with respect to the base 2 until it reaches the raised position. This position can optionally be defined by an angular stroke limit.

[0068] The safety barrier 630 is then made to rotate further so as to move it to the safety position. In this position, the bolts 650 are aligned with respect to the corresponding eyelets 660 of the upper bed frame 3. Finally, the user pushes the safety barrier 630 so as to make it slide with respect to the crossmember 620 of the supporting frame 600 and insert the bolts 650 in the eyelets 660.

[0069] The frame 600, therefore, can support the weight of the upper bed while remaining locked in position. In this position, the user can use the ladder 670 that is integrated in the supporting frame 600.

[0070] When the bunk-bed is to be closed, the safety barrier 630 is translated along the crossmember 620 so as to move the bolts 650 away from the eyelets 660 and the entire supporting frame 600 is finally accompanied by the user until it lies on the mattress 43 of the lower bed frame 4.

[0071] In practice it has been found that the mecha-

nism for collapsible bunk-beds according to the invention achieves fully the intended aim, since it allows to have a rigid and safe structure with a very limited number of components.

[0072] Moreover, closure of the bunk-bed is achieved with the upper bed frame which always remains substantially parallel to the floor and by using lever systems that can move exclusively on substantially vertical planes, interposed advantageously between the lateral sides of the base and the crossmembers of the upper and lower bed frames.

[0073] Moreover, safety can be increased. The safety mechanism according to the invention, which can be used with the described mechanism for collapsible bunk-beds but also with other mechanisms adapted to collapse bunk-beds, in fact must be considered by the user, since in addition to being clearly visible because it lies on the mattress of the lower bed it prevents the user from accessing the lower bed. Moreover, thanks to the integrated ladder, access to the upper bed is prevented if the safety mechanism is not activated.

[0074] Moreover, thanks to the fact that a safety barrier is integrated, the safety mechanism according to the invention prevents the user from having to remember to assemble such barrier before lying on the upper bed.

[0075] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0076] In practice, the materials used, as well as the dimensions, may be any according to the requirements and to the state of the art.

Claims

1. A mechanism (1) for collapsible bunk-beds, comprising a base (2) and an upper bed frame (3) which are connected, on opposite sides, by a pair of first lever systems (5) adapted to allow the movement of the upper bed frame (3) between two stable positions above the base (2), the upper bed frame being adapted to support a mattress (33), each one of said first lever systems (5) comprising an articulated quadrilateral (6) that lies on a plane that is substantially perpendicular to the plane of said upper bed frame (3), **characterised in that** said articulated quadrilateral being an articulated parallelogram (6) and being composed of four L-shaped levers that are identical in pairs (52, 53, 54, 55) and are adapted to define a substantially rectangular shape when the upper bed frame (3) is in the fully raised position with respect to said base (2),
a first L-shaped lever (52) of said L-shaped levers being fixed rigidly to the base (2) and a second L-shaped lever (53) of said L-shaped levers being fixed rigidly to the upper bed frame (3), said first and sec-

- ond L-shaped levers (52, 53) being crossed by a diagonal of said substantially rectangular shape, third and fourth L-shaped levers (54, 55) of said L-shaped levers being crossed by the other diagonal of said substantially rectangular shape, each one of said first and second L-shaped levers (52, 53) comprising two arms (521, 522; 531, 532) that are substantially mutually perpendicular and each one of said third and fourth L-shaped levers (54, 55) comprising two arms (531, 532; 541, 542) which are substantially perpendicular to each other and are longer than the length of the arms (521, 522; 531, 532) of the first and second L-shaped levers (52, 53), wherein the mutually pivoted arms are substantially perpendicular to each other when the upper bed frame (3) is in the fully collapsed position.
2. The mechanism according to claim 1, **characterized in that** said articulated quadrilateral (6) comprises a hinge (61) on a longitudinal axis of said upper bed frame (3) and two hinges (62, 63) on said base (2).
 3. The mechanism according to claim 2, **characterized in that** said longitudinal axis of said upper bed frame passes through a substantially central point of the crossmembers (31) of said upper bed frame (3).
 4. The mechanism according to one or more of the preceding claims, **characterized in that** the third L-shaped lever (54) pivoted to said base comprises a locking element (543) to prevent the movement of said first lever system (5) with respect to a lateral side (21) of said base (2), said fourth L-shaped lever (55) optionally comprising a second locking element (553).
 5. The mechanism according to one or more of the preceding claims, further comprising a lower bed frame (4) that is adapted to support a mattress (43), said lower bed frame (4) being arranged below the upper bed frame (3) and being movable with respect to the base (2) between a raised position and a lowered position, by means of second lever systems (7) that are connected between said base (2) and crossmembers (42) of said lower bed frame (4), said second lever systems (7) being able to rotate on planes that are substantially perpendicular to the plane of said lower bed frame (4).
 6. The mechanism according to claim 5, **characterized in that** said base (2) is substantially shaped like a parallelepiped such as to define a containment seat in order to accommodate completely the lower bed frame (4) in the lowered position, said base (2) comprising, at each side on which said first lever system (5) is pivoted, a lateral side (21) that protrudes above said containment seat of the lower bed frame (4) and which is laterally adjacent to said upper bed frame (3) in the collapsed position.
 7. The mechanism according to one or more of claims 5 and 6, **characterized in that** said base (2) comprises at least one resting element (24) on a front part (22) that is substantially perpendicular to the sides of the base (2) where the first lever systems (5) are connected, said at least one resting element (24) being adapted to support said lower bed frame (4) in its raised position and said upper bed frame (3) in its fully collapsed position.
 8. The mechanism according to one or more of claims 5 to 7, further comprising a safety mechanism that comprises a supporting frame (600) that is connected to said base (2) and that can rotate with respect to a longitudinal axis of said base (2) between an inactive position, in which the supporting frame (600) lies substantially above the lower bed frame (4), and a raised position, in which the supporting frame (600) engages the upper bed frame (3) so as to support its weight along a longitudinal member (32) of said upper bed frame (3), said supporting frame (600) comprising a locking assembly (640) that is adapted to fix detachably said supporting frame (600) to said upper bed frame (3).
 9. The mechanism according to claim 8, **characterized in that** said supporting frame (600) is pivoted to the base (2) by means of two props (610) connected by a crossmember (620), which has a longitudinal extension that is substantially equal to that of the longitudinal member (32) of the upper bed frame (3), said props (610) having such an extension as to allow the crossmember (620) to be at a height, with respect to the resting surface of the base (2), that is substantially equal to the height of the upper bed frame (3) when the supporting frame (600) is in said raised position.
 10. The mechanism according to one or more of claims 8 and 9, **characterized in that** the locking assembly (640) comprises at least one bolt (650) that is coupled to the crossmember (620) of the supporting frame (600), said upper bed frame (3) comprising abutments (660) adapted to mate with said at least one bolt (650) in order to fix detachably said supporting frame (600) to said upper bed frame (3).
 11. The mechanism according to one or more of claims 8-10, **characterized in that** a safety barrier (630) is pivoted on the crossmember (620) of the supporting frame (600), said safety barrier (630) being able to rotate between an inactive position, in which the safety barrier can rotate freely with respect to said supporting frame (600), and a safety position, in which the barrier (630) is locked with respect to the supporting frame (600) and lies on a plane that is

substantially perpendicular to the plane of the upper bed frame (3).

12. The mechanism according to claim 11, **characterized in that** the safety barrier (630) comprises said locking assembly (640). 5
13. The mechanism according to claim 12, **characterized in that** said locking assembly (640) comprises said at least one bolt (650), which is fixed rigidly to the safety barrier (630) substantially at the pivoting axis of the safety barrier (630) on the crossmember (620) of the supporting frame (600). 10
14. The mechanism according to claim 13, **characterized in that** said at least one bolt (650) is directed substantially parallel to the crossmember (620) of the supporting frame (600) and the safety barrier (630) can also slide along said crossmember (620) so that when the safety barrier (630) slides along the crossmember (620) said at least one bolt (650) engages said upper bed frame (3) in order to fix detachably said supporting frame (600) to said upper bed frame (3). 20
15. The mechanism according to claim 14, **characterized in that** said safety barrier (630) further comprises a lock (680) to prevent or allow said sliding. 25
16. The mechanism according to one or more of claims 8-15, **characterized in that** a ladder (670) is defined on the supporting frame (600) and can move integrally with the supporting frame (600). 30
17. The mechanism according to one or more of claims 8-16, **characterized in that** said supporting frame (600) comprises at least one spring latch (700) that is adapted to engage with said upper bed frame (3). 35
18. A sofa bed, **characterized in that** it comprises the mechanism (1) according to one or more of the preceding claims. 40

Patentansprüche

1. Ein Mechanismus (1) für zusammenklappbare Etagenbetten, umfassend ein Basis- (2) und ein oberes Bettgestell (3), welche miteinander verbunden sind, auf gegenüberliegenden Seiten durch ein Paar von ersten Hebelsystemen (5) angepasst, um die Bewegung des oberen Bettgestells (3) zwischen zwei stabilen Positionen oberhalb der Basis (2) zu erlauben, wobei das obere Bettgestell angepasst ist, um eine Matratze (33) zu tragen, wobei jedes der genannten ersten Hebelsysteme (5) ein Gelenkviereck (6) umfasst, das auf einer Ebene liegt, die im Wesentlichen senkrecht zu der Ebene des genannten oberen Bett-

gestells (3) ist,

dadurch gekennzeichnet, dass

das genannte Gelenkviereck ein Gelenkparallelogramm (6) ist und aus vier L-geformten Hebeln besteht, die paarweise identisch sind (52, 53, 54, 55) und angepasst sind, um eine im Wesentlichen rechteckige Form zu definieren, wenn das obere Bettgestell (3) in der vollständig angehobenen Position hinsichtlich der genannten Basis (2) ist, ein erster L-förmiger Hebel (52) der genannten L-förmigen Hebel starr an die Basis (2) befestigt ist und ein zweiter L-förmiger Hebel (53) der genannten L-förmigen Hebel starr an das obere Bettgestell (3) befestigt ist, wobei die genannten ersten und zweiten L-förmigen Hebel (52, 53) durch eine Diagonale der genannten im Wesentlichen rechteckigen Form gekreuzt werden, dritte und vierte L-förmige Hebel (54, 55) der genannten L-förmigen Hebel durch die andere Diagonale der genannten im Wesentlichen rechteckigen Form gekreuzt werden, wobei jeder der genannten der ersten und zweiten L-förmigen Hebel (52, 53) zwei Arme umfasst (521, 522; 531, 532) die im Wesentlichen zueinander senkrecht sind und jeder der genannten dritten und vierten L-förmigen Hebel (54, 55) umfasst zwei Arme (531, 532; 541, 542), welche im Wesentlichen senkrecht zueinander sind und länger sind als die Länge der Arme (521, 522; 531, 532) der ersten und zweiten L-förmigen Hebel (52, 53), worin die gegeneinander verdrehbaren Arme im Wesentlichen senkrecht zueinander sind, wenn das obere Bettgestell (3) in der vollständig zusammengeklappten Position ist.

2. Der Mechanismus gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das genannte Gelenkviereck (6) ein Scharnier (61) auf einer Längsachse des genannten oberen Bettgestells (3) und zwei Scharniere (62, 63) auf der genannten Basis (2) umfasst. 35
3. Der Mechanismus gemäß Anspruch 2, **dadurch gekennzeichnet, dass** die genannte Längsachse des genannten oberen Bettgestells durch einen im Wesentlichen zentralen Punkt der Querträger (31) des genannten oberen Bettgestells (3) verläuft. 40
4. Der Mechanismus gemäß einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der dritte L-förmige Hebel (54) geschwenkt zu der genannten Basis ein Verriegelungselement (543) umfasst, um die Bewegung des genannten ersten Hebelsystems (5) in Bezug auf eine Seitenfläche (21) der genannten Basis (2) zu verhindern, wobei der genannte vierte L-förmige Hebel (55) wahlweise ein zweites Verriegelungselement (553) umfasst. 55
5. Der Mechanismus gemäß einem oder mehreren der vorhergehenden Ansprüche, weiter umfassend ein

unteres Bettgestell (4), das angepasst ist, um eine Matratze (43) zu tragen, wobei das genannte untere Bettgestell (4) unterhalb dem oberen Bettgestell (3) angeordnet ist und in Bezug auf die Basis (2) zwischen einer angehobenen Position und einer erniedrigten Position beweglich ist, mit Hilfe von zweiten Hebelsystemen (7), welche zwischen der genannten Basis (2) und Querträgern (42) des genannten unteren Bettgestells (4) verbunden sind, wobei die genannten zweiten Hebelsysteme (7) in der Lage sind in Ebenen zu rotieren, die im Wesentlichen senkrecht zu der Ebene des genannten unteren Bettgestells (4) sind.

6. Der Mechanismus gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die genannte Basis (2) im Wesentlichen quaderförmig ist, um einen Aufnahmeplatz zu definieren, um das untere Bettgestell (4) in der erniedrigten Position vollständig unterzubringen, wobei die genannte Basis (2) an jeder Seite, an welcher das genannte erste Hebelsystem (5) geschwenkt ist, eine Seitenfläche (21) umfasst, welche oberhalb dem genannten Aufnahmeplatz des unteren Bettgestells (4) hervorsteht, und welche seitlich neben dem genannten oberen Bettgestell (3) in der zusammengeklappten Position ist.
7. Der Mechanismus gemäß einem oder mehreren der Ansprüche 5 und 6, **dadurch gekennzeichnet, dass** die genannte Basis (2) mindestens ein Abstützelement (24) auf einer Vorderseite (22) umfasst, das im Wesentlichen senkrecht zu den Seiten der Basis (2) ist, wo die ersten Hebelsysteme (5) angeschlossen sind, wobei das genannte mindestens eine Abstützelement (24) angepasst ist, um das genannte untere Bettgestell (4) in seiner erhöhten Position zu stützen und das genannte obere Bettgestell (3) in seiner vollständig zusammengeklappten Position.
8. Der Mechanismus gemäß einem oder mehreren der Ansprüche 5 bis 7, weiter umfassend einen Sicherheitsmechanismus, der einen Tragrahmen (600) umfasst, der mit der genannten Basis (2) verbunden ist und der in Bezug auf eine Längsachse der genannten Basis (2) zwischen einer Ruhestellung, in welcher der Tragrahmen (600) im Wesentlichen über dem unteren Bettgestell (4) liegt, und einer erhöhten Position, in welcher der Tragrahmen (600) in das obere Bettgestell (3) eingreift, um sein Gewicht entlang einem Längsträger (32) des genannten oberen Bettgestells (3) zu stützen, rotieren kann, wobei der Tragrahmen (600) eine Verriegelungsvorrichtung (640) umfasst, die angepasst ist, um lösbar den genannten Tragrahmen (600) an das genannte obere Bettgestell (3) zu fixieren.
9. Der Mechanismus gemäß Anspruch 8, **dadurch ge-**

kennzeichnet, dass der genannte Tragrahmen (600) zu der Basis (2) geschwenkt ist mittels zweier Stützen (610) verbunden durch einen Querträger (620), welcher eine Längsausdehnung hat, die im Wesentlichen gleich der des Längsglieds (32) des oberen Bettgestells (3) ist, wobei die Stützen (610) eine solche Verlängerung haben, um dem Querträger (620) zu erlauben auf einer Höhe zu sein, im Bezug auf die Auflagefläche der Basis (2), die im Wesentlichen gleich ist zu der Höhe des oberen Bettgestells (3), wenn der Tragrahmen (600) in der genannte erhöhte Position ist.

10. Der Mechanismus gemäß einem oder mehreren der Ansprüche 8 und 9, **dadurch gekennzeichnet, dass** die Verriegelungsvorrichtung (640) mindestens einen Bolzen (650) umfasst, der mit dem Querträger (620) des Tragrahmens (600) gekoppelt ist, wobei das genannte obere Bettgestell (3) Widerlager (660) umfasst, angepasst um dem genannten mindestens einen Bolzen (650) zu entsprechen, um lösbar den genannten Tragrahmen (600) an das genannte obere Bettgestell (3) zu fixieren.
11. Der Mechanismus gemäß einem oder mehreren der Ansprüche 8-10, **dadurch gekennzeichnet, dass** eine Sicherheitsbarriere (630) auf den Querträger (620) des Tragrahmens (600) geschwenkt ist, wobei die Sicherheitsbarriere (630) in der Lage ist, zwischen einer Ruheposition, in welcher die Sicherheitsbarriere frei in Bezug auf den genannten Tragrahmen (600) rotieren kann, und einer Sicherheitsposition, in welcher die Barriere (630) gesperrt ist in Bezug auf den Tragrahmen (600), zu rotieren, und auf einer Ebene liegt, die im Wesentlichen senkrecht zu der Ebene des oberen Bettgestells (3) ist.
12. Der Mechanismus gemäß Anspruch 11, **dadurch gekennzeichnet, dass** die Sicherheitsbarriere (630) die genannte Verriegelungsvorrichtung (640) umfasst.
13. Der Mechanismus gemäß Anspruch 12, **dadurch gekennzeichnet, dass** die genannte Verriegelungsvorrichtung (640) den genannten mindestens einen Bolzen (650) umfasst, welcher fest an die Sicherheitsbarriere (630) fixiert ist im Wesentlichen an der Schwenkachse der Sicherheitsbarriere (630) auf dem Querträger (620) des Tragrahmens (600).
14. Der Mechanismus gemäß Anspruch 13, **dadurch gekennzeichnet, dass** der genannte mindestens eine Bolzen (650) im Wesentlichen parallel zu dem Querträger (620) des Tragrahmens (600) gerichtet ist und die Sicherheitsbarriere (630) kann auch entlang dem genannten Querträger (620) gleiten, so dass, wenn die Sicherheitsbarriere (630) entlang dem Querträger (620) gleitet, der genannte mindes-

tens eine Bolzen (650) in das genannte obere Bettgestell (3) eingreift, um lösbar den genannten Tragrahmen (600) an das genannte obere Bettgestell (3) zu fixieren.

15. Der Mechanismus gemäß Anspruch 14, **dadurch gekennzeichnet, dass** die genannte Sicherheitsbarriere (630) weiter ein Schloss (680) umfasst, um das genannte Gleiten zu verhindern oder zu erlauben.
16. Der Mechanismus gemäß einem oder mehreren der Ansprüche 8-15, **dadurch gekennzeichnet, dass** eine Leiter (670) auf dem Tragrahmen (600) definiert ist und sich integral mit dem Tragrahmen (600) bewegen kann.
17. Der Mechanismus gemäß einem oder mehreren der Ansprüche 8-16, **dadurch gekennzeichnet, dass** der genannte Tragrahmen (600) mindestens einen Federriegel (700) umfasst, der angepasst ist, um in das genannte obere Bettgestell (3) einzugreifen.
18. Ein Sofabett, **dadurch gekennzeichnet, dass** es den Mechanismus (1) gemäß einem oder mehreren der vorhergehenden Ansprüche umfasst.

Revendications

1. Mécanisme (1) de lits superposés pliants, comprenant une base (2) et un châlit supérieur (3) qui sont connectés, sur les bords opposés, par une paire de premiers systèmes de leviers (5) adaptés pour permettre le déplacement du châlit supérieur (3) entre deux positions stables au-dessus de la base (2), le châlit supérieur étant adapté pour supporter un matelas (33), chacun desdits premiers systèmes de leviers (5) comprenant un quadrilatère articulé (6) qui se trouve dans un plan qui est sensiblement perpendiculaire au plan dudit châlit supérieur (3), **caractérisé en ce que** ledit quadrilatère articulé est un parallélogramme articulé (6), et se compose de quatre leviers en forme de L qui sont identiques par paires (52, 53, 54, 55), et qui sont adaptés pour définir une forme sensiblement rectangulaire lorsque le châlit supérieur (3) se trouve dans la position entièrement relevée par rapport à ladite base (2), une premier levier en forme de L (52) desdits leviers en forme de L, est fixé rigidement à la base (2), et un deuxième levier en forme de L (53) desdits leviers en forme de L est fixé rigidement au châlit supérieur (3), lesdits premier et deuxième leviers en forme de L (52, 53) sont traversés par une diagonale de ladite forme sensiblement rectangulaire, lesdits troisième et quatrième leviers en forme de L (54, 55) desdits leviers en forme de L sont traversés par l'autre dia-

gonale de ladite forme sensiblement rectangulaire, chacun desdits premier et deuxième leviers en forme de L (52, 53) comprennent deux bras (521, 522 ; 531, 532) qui sont sensiblement mutuellement perpendiculaires, et chacun desdits troisième et quatrième leviers en forme de L (54, 55) comprennent deux bras (531, 532 ; 541, 542) qui sont sensiblement perpendiculaires entre eux, et qui sont plus longs que la longueur des bras (521, 522 ; 531, 532) des premier et deuxième leviers en forme de L (52, 53), où les bras articulés mutuellement sont sensiblement perpendiculaires entre eux lorsque le châlit supérieur (3) se trouve dans la position entièrement pliée.

2. Mécanisme selon la revendication 1, **caractérisé en ce que** ledit quadrilatère articulé (6) comprend une charnière (61) sur un axe longitudinal dudit châlit supérieur (3) et deux charnières (62, 63) sur ladite base (2).
3. Mécanisme selon la revendication 2, **caractérisé en ce que** ledit axe longitudinal dudit châlit supérieur passe par un point sensiblement central des traverses (31) dudit châlit supérieur (3).
4. Mécanisme selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le troisième levier en forme de L (54) articulé par rapport à ladite base, comprend un élément de verrouillage (543) afin d'empêcher le déplacement dudit premier système de leviers (5) par rapport à un côté latéral (21) de ladite base (2), ledit quatrième levier en forme de L (55) comprenant éventuellement un deuxième élément de verrouillage (553).
5. Mécanisme selon l'une quelconque des revendications précédentes, comprenant en outre un châlit inférieur (4) qui est adapté pour supporter un matelas (43), ledit châlit inférieur (4) étant agencé sous le châlit supérieur (3) et étant mobile par rapport à la base (2) entre une position relevée et une position abaissée, au moyen de deuxième systèmes de leviers (7) qui sont connectés entre ladite base (2) et les traverses (42) dudit châlit inférieur (4), lesdits deuxième systèmes de leviers (7) pouvant tourner dans des plans qui sont sensiblement perpendiculaires au plan dudit châlit inférieur (4).
6. Mécanisme selon la revendication 5, **caractérisé en ce que** ladite base (2) présente sensiblement une forme de parallélépipède de façon à définir un siège de retenue afin de recevoir complètement le châlit inférieur (4) dans la position abaissée, ladite base (2) comprenant, au niveau de chaque côté où ledit premier système de leviers (5) est articulé, un côté latéral (21) qui fait saillie au-dessus dudit siège de retenue du châlit inférieur (4), et qui est adjacent

- latéralement audit châlit supérieur (3) dans la position pliée.
7. Mécanisme selon l'une quelconque ou plusieurs des revendications 5 et 6, **caractérisé en ce que** ladite base (2) comprend au moins un élément de repos (24) sur une partie avant (22) qui est sensiblement perpendiculaire aux côtés de la base (2) où les premiers systèmes de leviers (5) sont connectés, ledit ou lesdits éléments de repos (24) étant adaptés pour supporter ledit châlit inférieur (4) dans sa position relevée et ledit châlit supérieur (3) dans sa position entièrement pliée.
8. Mécanisme selon l'une quelconque ou plusieurs des revendications 5 à 7, comprenant en outre un mécanisme de sécurité qui comprend un bâti de support (600) qui est connecté à ladite base (2) et qui peut tourner par rapport à l'axe longitudinal de ladite base (2) entre une position inactive, dans laquelle le bâti de support (600) se situe sensiblement au-dessus du châlit inférieur (4), et une position relevée, dans laquelle le bâti de support (600) vient en prise avec le châlit supérieur (3) afin de supporter son poids le long d'un élément longitudinal (32) dudit châlit supérieur (3), ledit bâti de support (600) comprenant un ensemble verrouillage (640) qui est adapté pour fixer de manière amovible ledit bâti de support (600) sur ledit châlit supérieur (3).
9. Mécanisme selon la revendication 8, **caractérisé en ce que** ledit bâti de support (600) est articulé par rapport à la base (2) au moyen de deux supports (610) connectés par une traverse (620), qui présente une extension longitudinale qui est sensiblement égale à celle de l'élément longitudinal (32) du châlit supérieur (3), lesdits supports (610) présentant une extension qui permet à la traverse (620) d'être à une hauteur, par rapport à la surface de repos de la base (2), qui est sensiblement égale à la hauteur du châlit supérieur (3) lorsque le bâti de support (600) se trouve dans ladite position relevée.
10. Mécanisme selon l'une quelconque ou plusieurs des revendications 8 et 9, **caractérisé en ce que** l'ensemble verrouillage (640) comprend au moins un boulon (650) qui est accouplé à la traverse (620) du bâti de support (600), ledit châlit supérieur (3) comprenant des butées (660) adaptées pour s'accoupler audit ou auxdits boulons (650) afin de fixer de manière amovible ledit bâti de support (600) audit châlit supérieur (3).
11. Mécanisme selon l'une quelconque ou plusieurs des revendications 8 à 10, **caractérisé en ce qu'**une barrière de sécurité (630) est articulée sur la traverse (620) du bâti de support (600), ladite barrière de sécurité (630) pouvant tourner entre une position inactive, dans laquelle la barrière de sécurité peut tourner librement par rapport audit bâti de support (600), et une position de sécurité, dans laquelle la barrière (630) est verrouillée par rapport au bâti de support (600), et se situe dans un plan qui est sensiblement perpendiculaire au plan du châlit supérieur (3).
12. Mécanisme selon la revendication 11, **caractérisé en ce que** la barrière de sécurité (630) comprend ledit ensemble verrouillage (640).
13. Mécanisme selon la revendication 12, **caractérisé en ce que** ledit ensemble verrouillage (640) comprend ledit ou lesdits boulons (650), qui sont fixés rigidement à la barrière de sécurité (630) sensiblement au niveau de l'axe de pivotement de la barrière de sécurité (630) sur la traverse (620) du bâti de support (600).
14. Mécanisme selon la revendication 13, **caractérisé en ce que** ledit ou lesdits boulons (650) sont dirigés sensiblement parallèles à la traverse (620) du bâti de support (600), et la barrière de sécurité (630) peut également coulisser le long de ladite traverse (620) de sorte que lorsque la barrière de sécurité (630) coulisse le long de la traverse (620), ledit ou lesdits boulons (650) viennent en prise avec ledit châlit supérieur (3) afin de fixer de manière amovible ledit bâti de support (600) sur ledit châlit supérieur (3).
15. Mécanisme selon la revendication 14, **caractérisé en ce que** ladite barrière de sécurité (630) comprend en outre un verrou (680) destiné à empêcher ou à permettre ledit coulisement.
16. Mécanisme selon l'une quelconque des revendications 8 à 15, **caractérisé en ce qu'**une échelle (670) est définie sur le bâti de support (600) et peut se déplacer d'une pièce avec le bâti de support (600).
17. Mécanisme selon l'une quelconque ou plusieurs des revendications 8 à 16, **caractérisé en ce que** ledit bâti de support (600) comprend au moins un verrou à ressort (700) qui est adapté pour venir en prise avec ledit châlit supérieur (3).
18. Canapé-lit, **caractérisé en ce qu'**il comporte le mécanisme (1) selon l'une quelconque ou plusieurs des revendications précédentes.

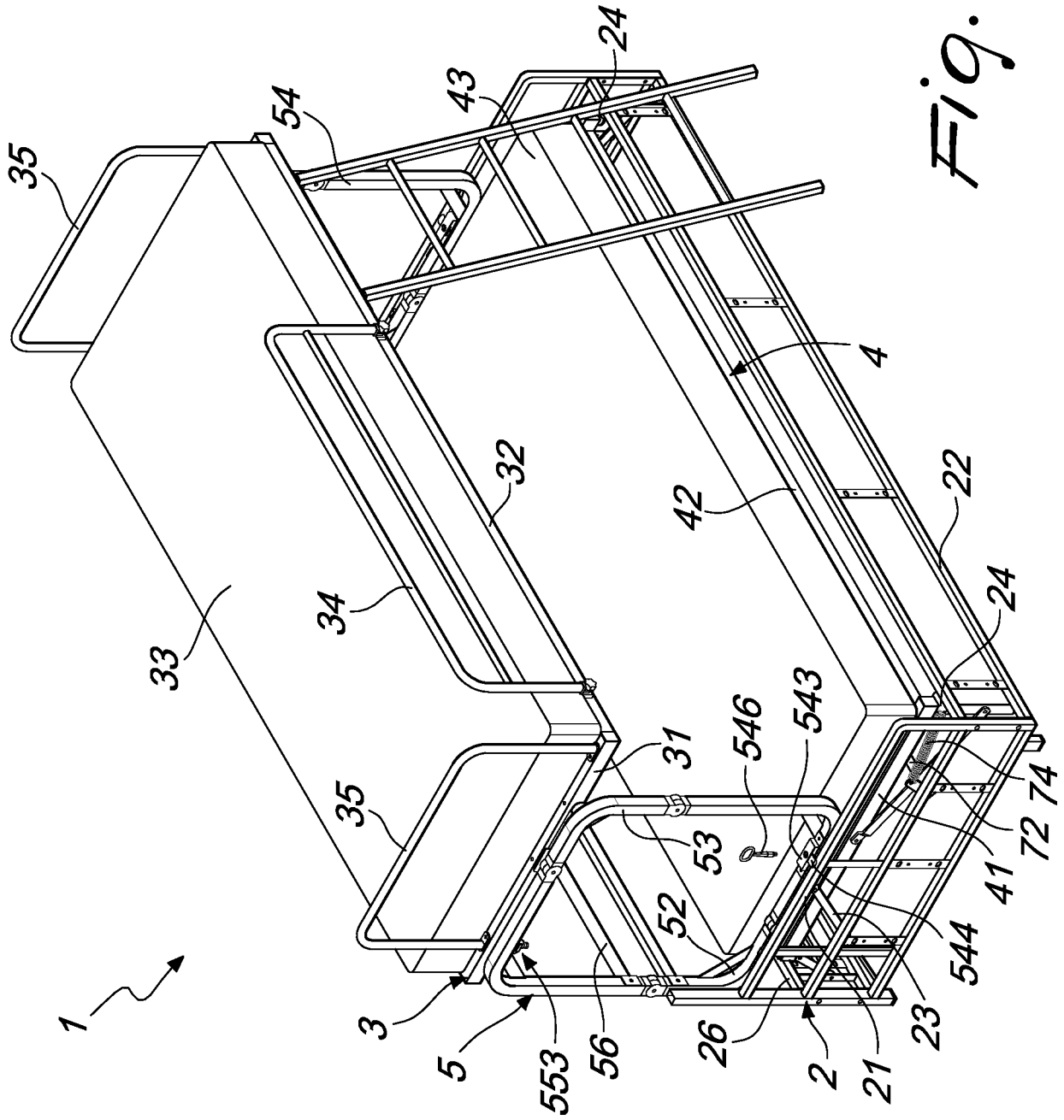


Fig. 1

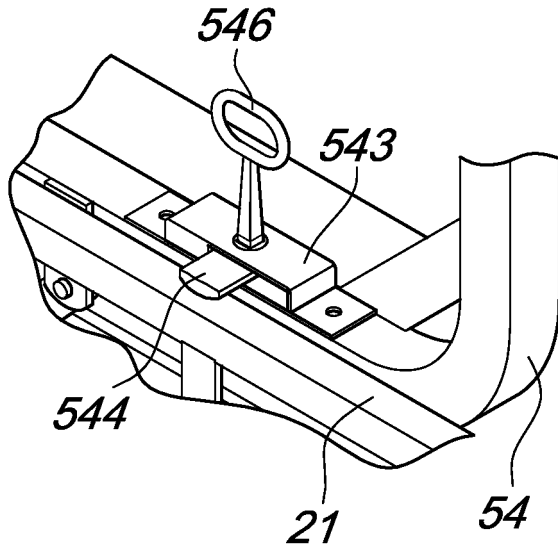


Fig. 1a

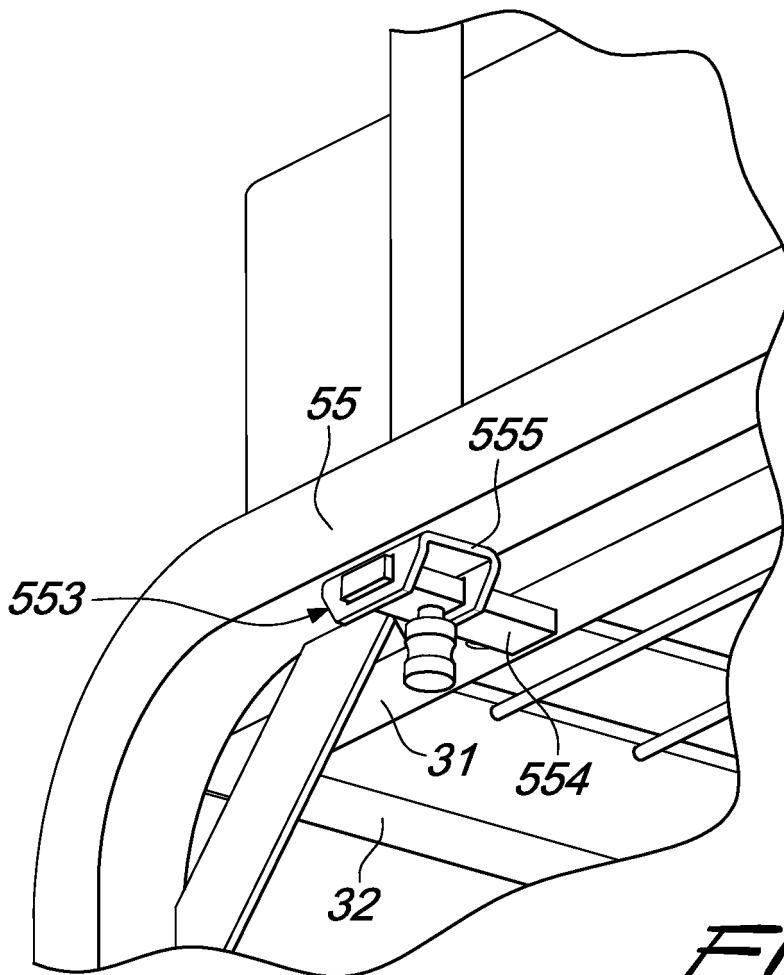


Fig. 1b

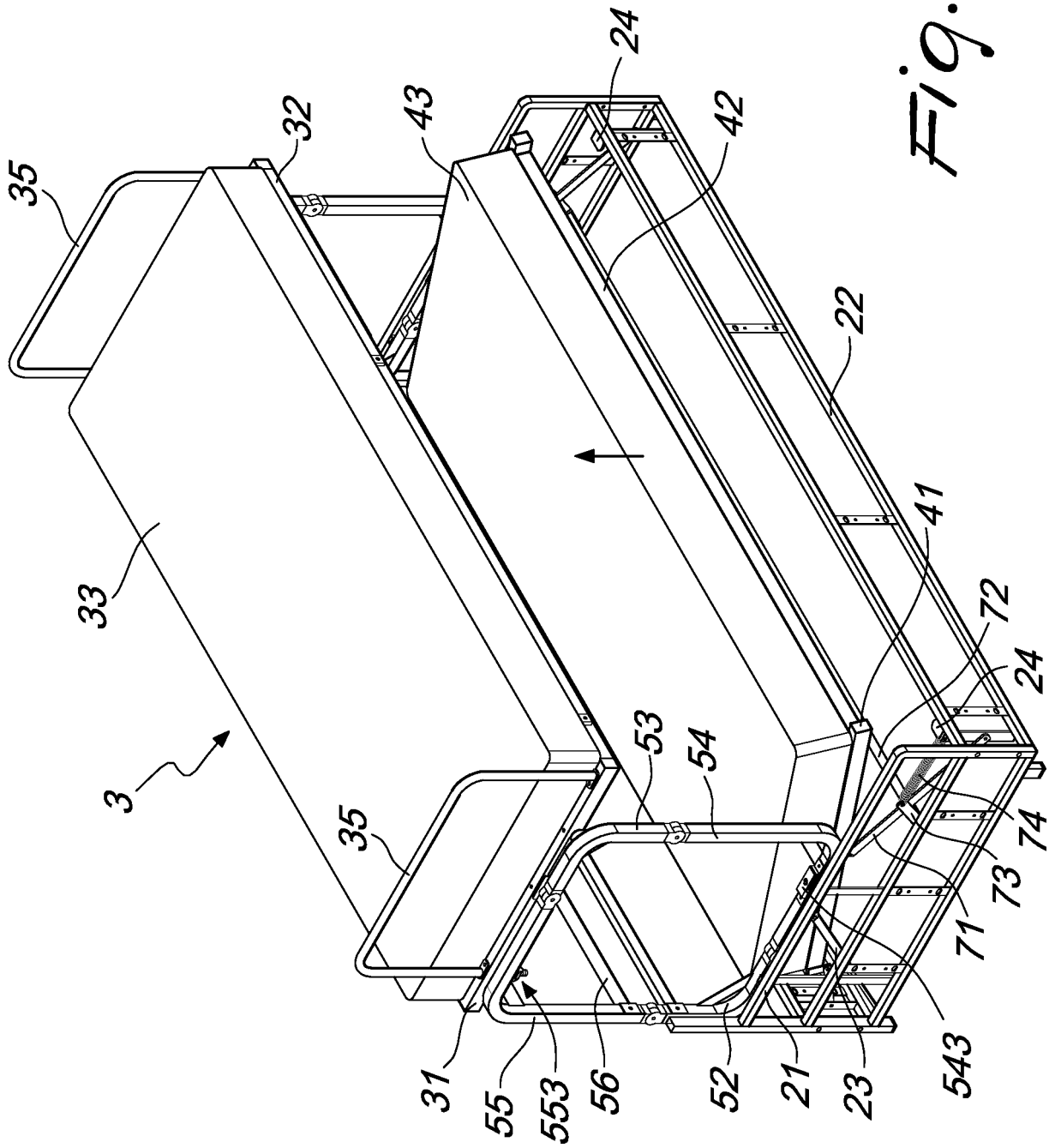


Fig. 2

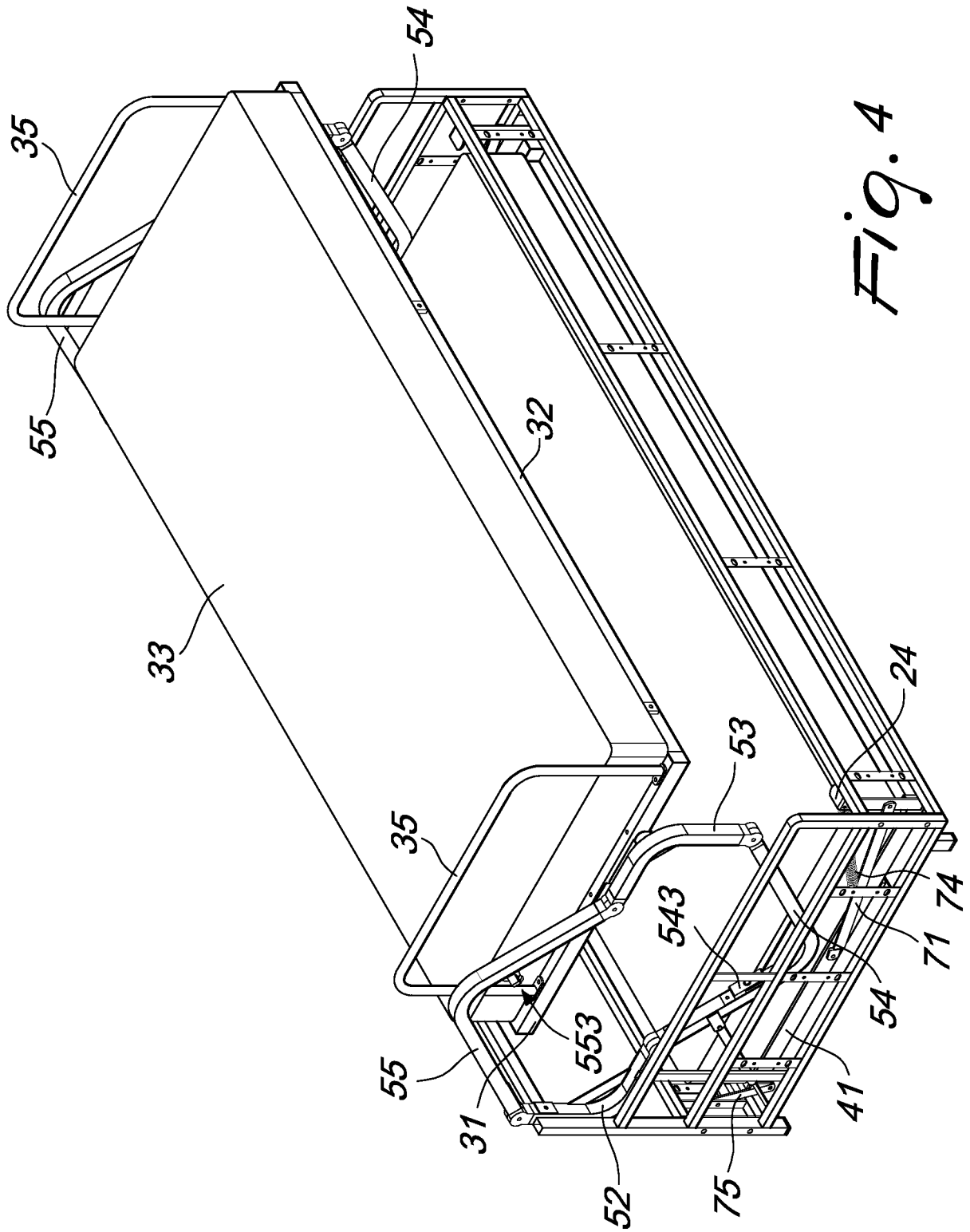


Fig. 4

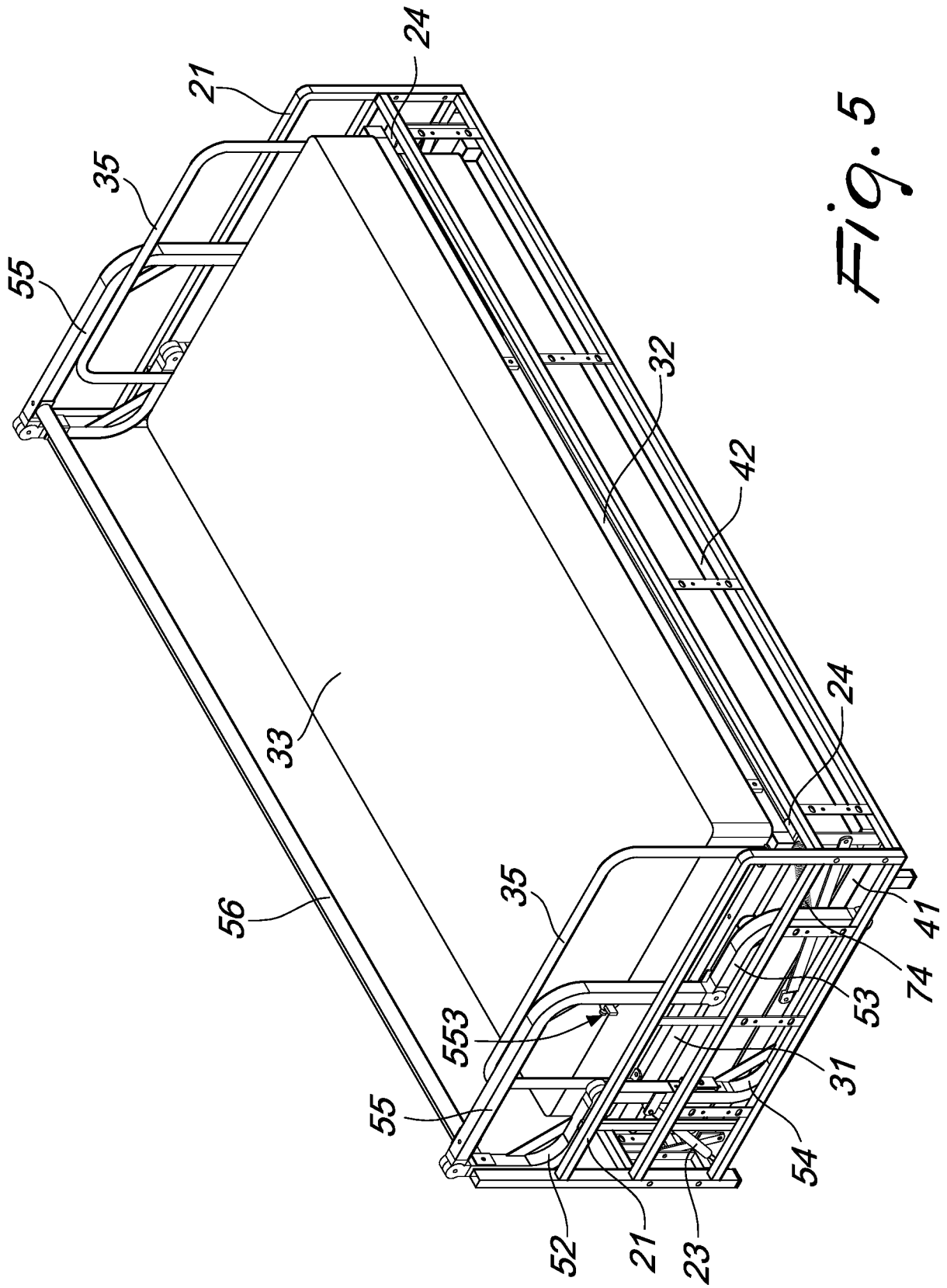
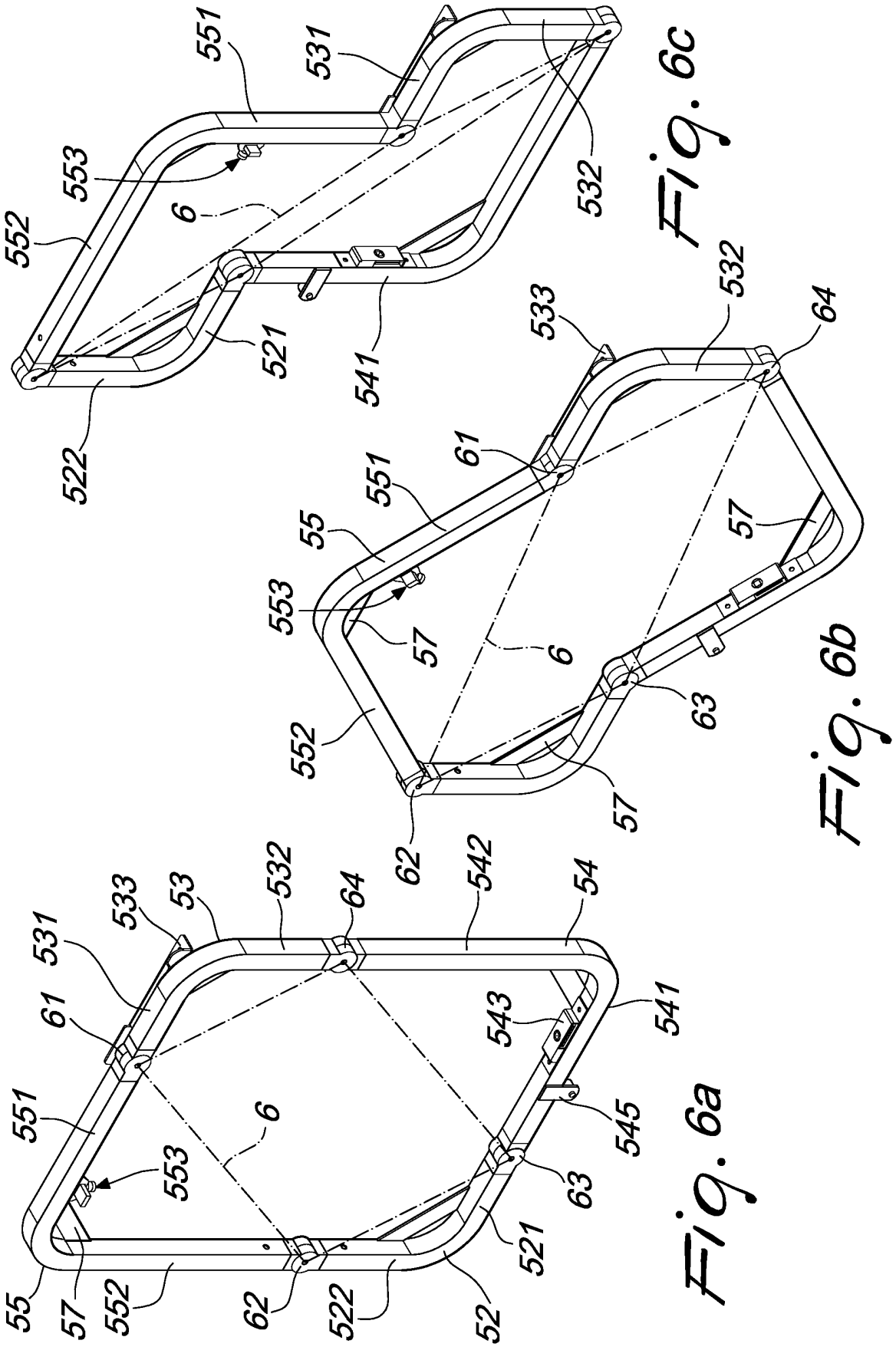


Fig. 5



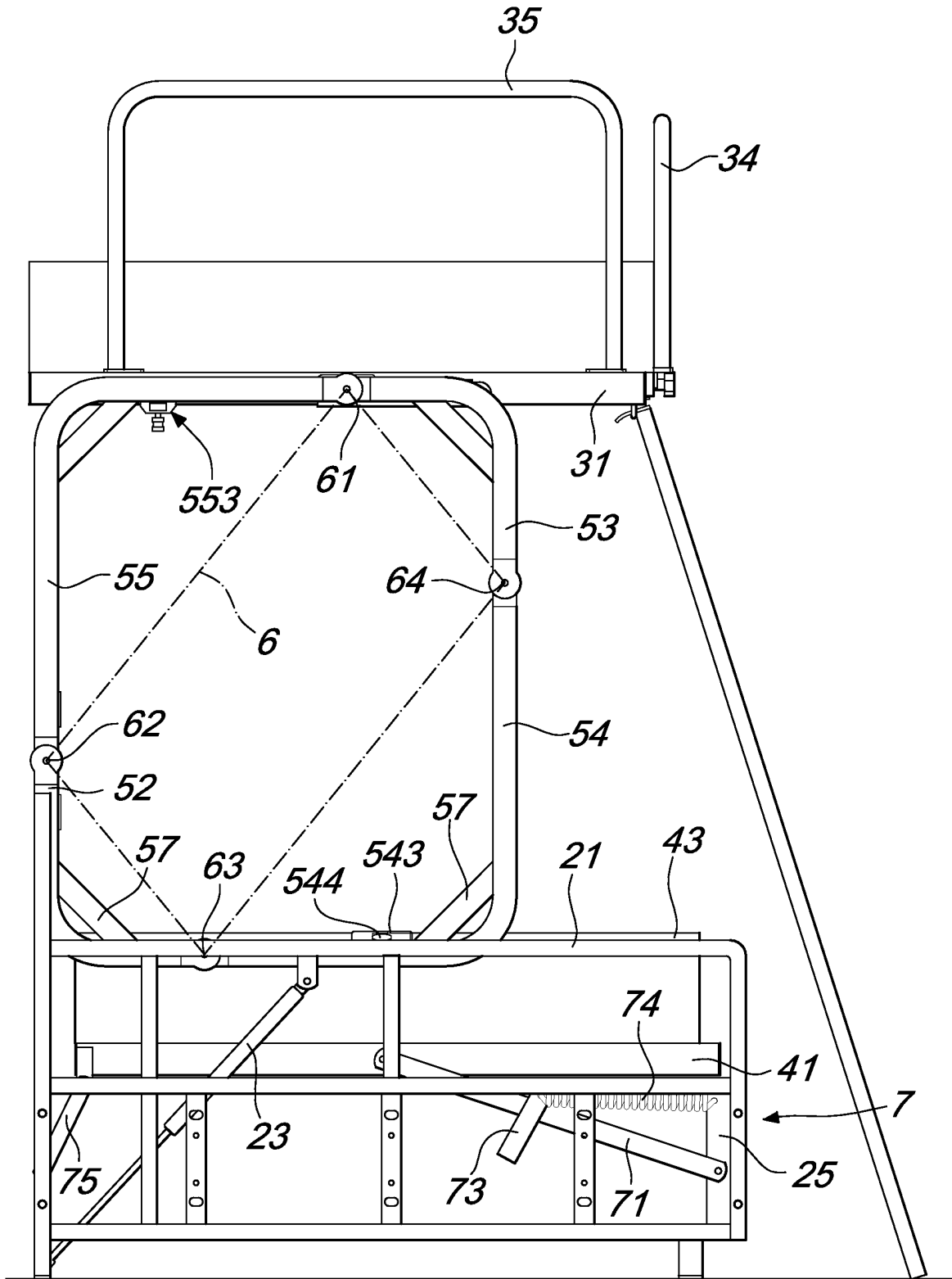


Fig. 7a

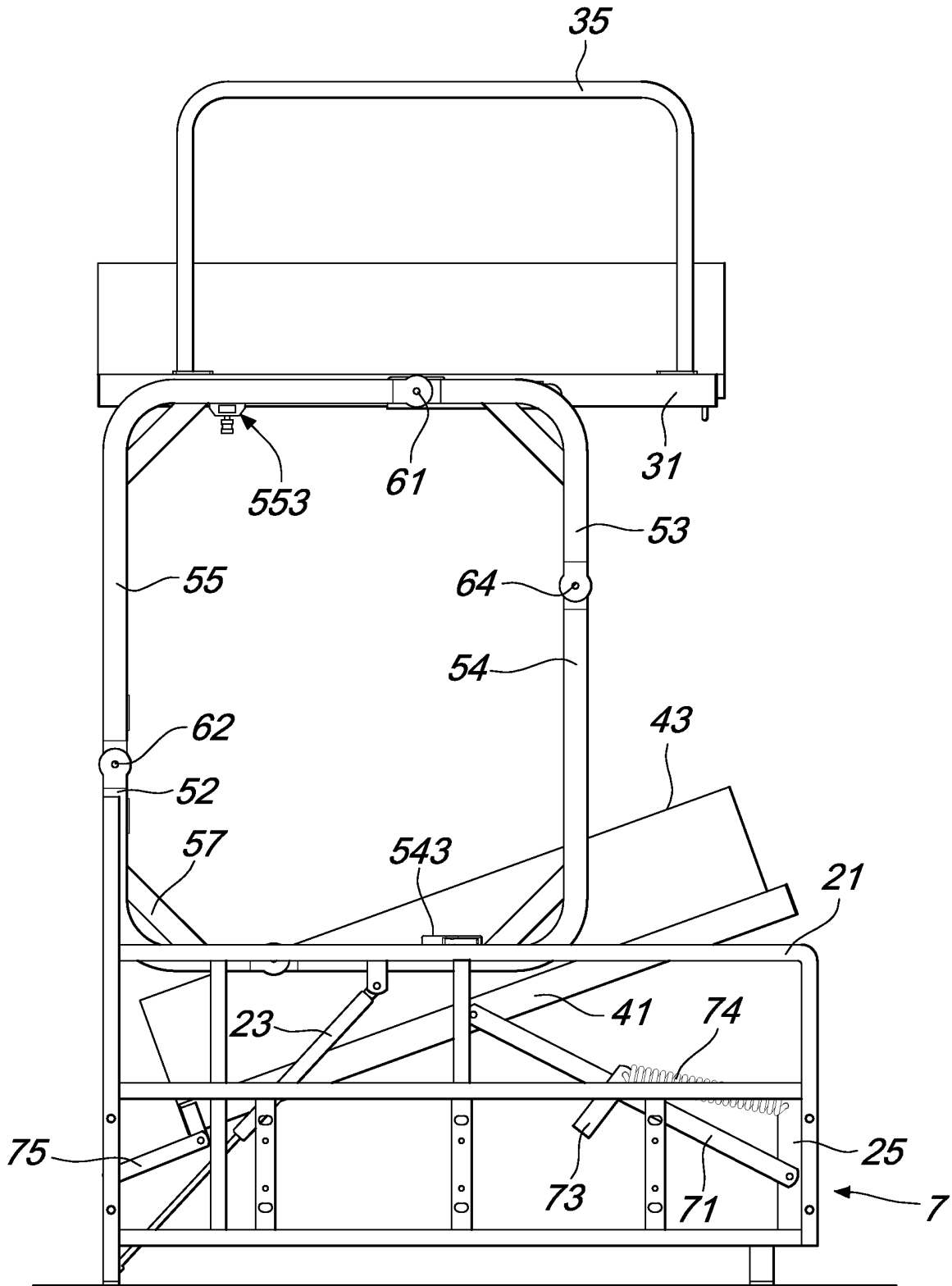


Fig. 7b

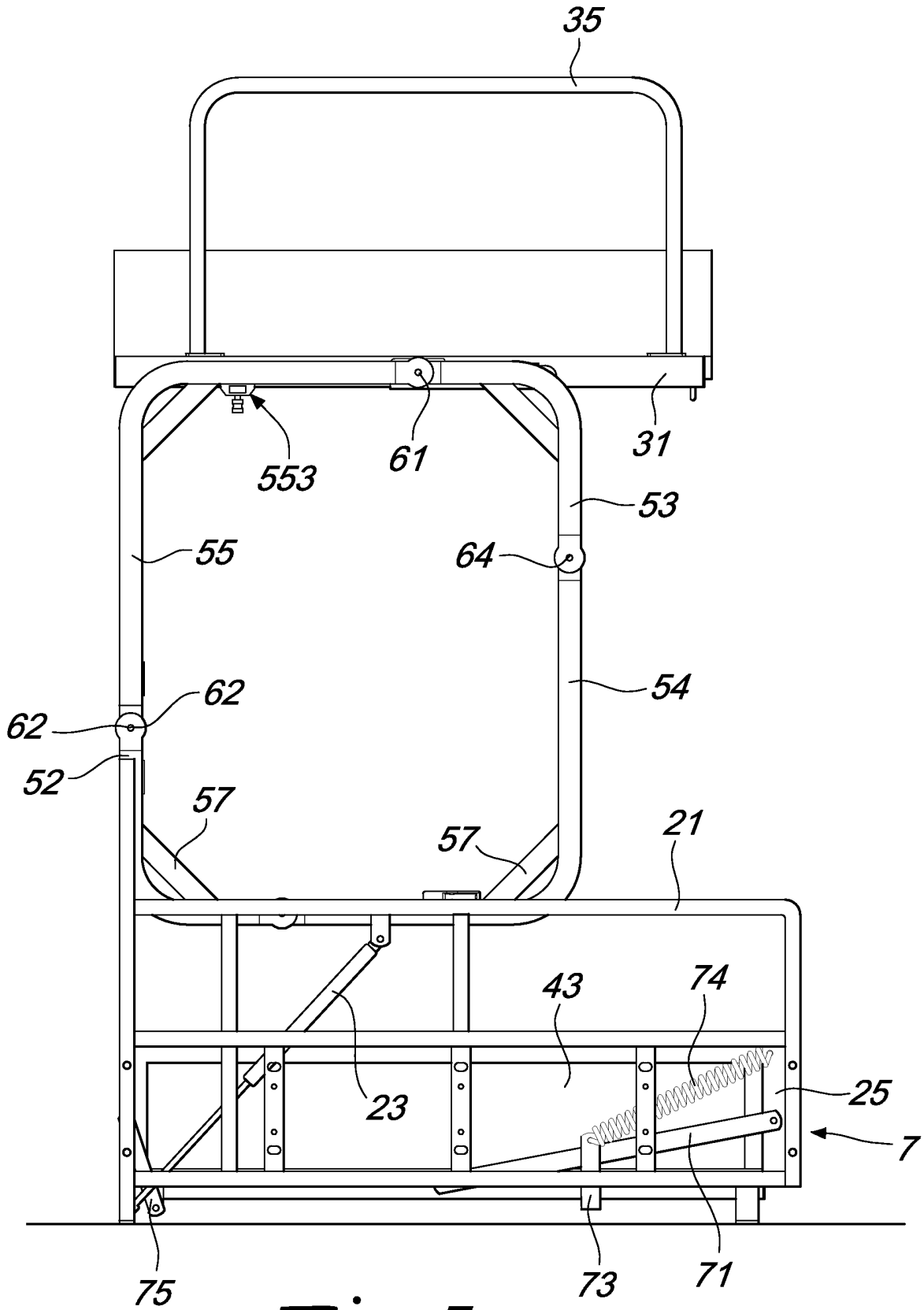


Fig. 7c

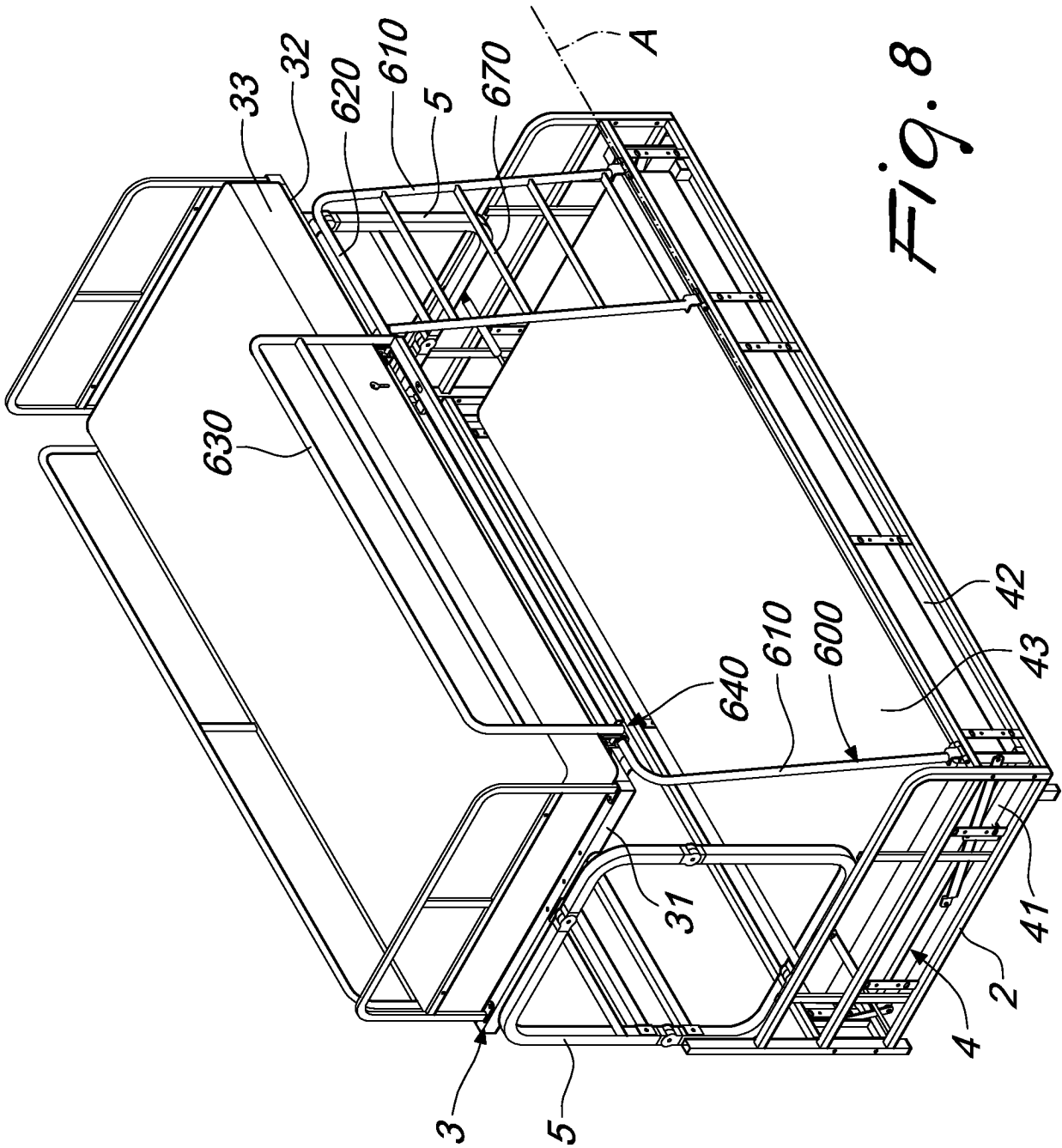


Fig. 8

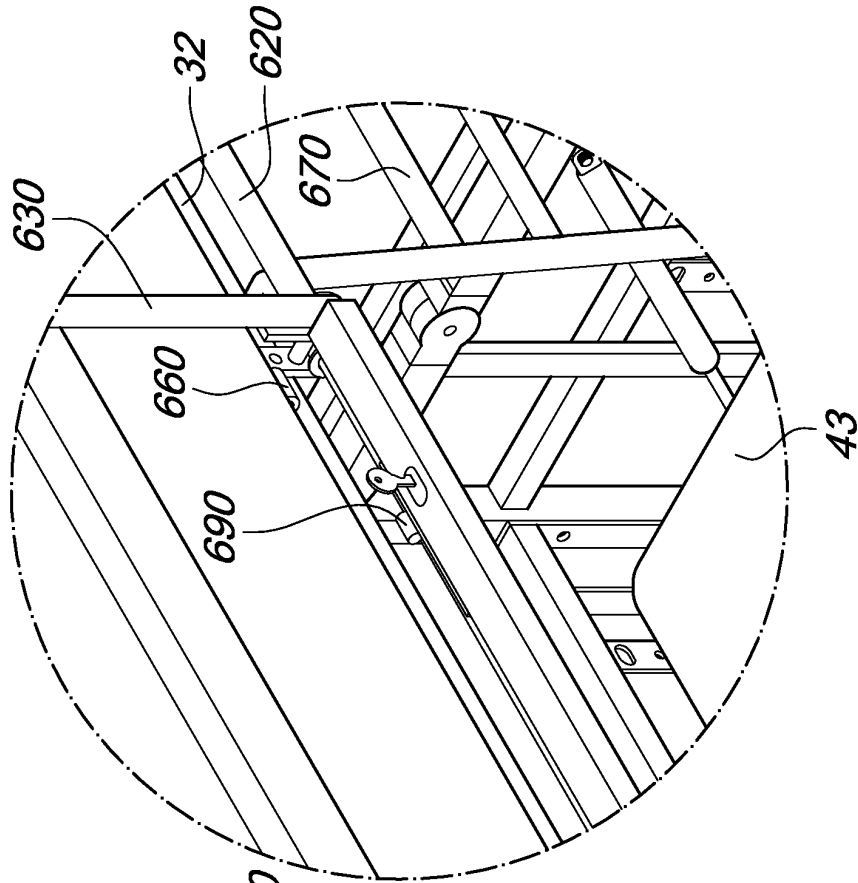


Fig. 9b

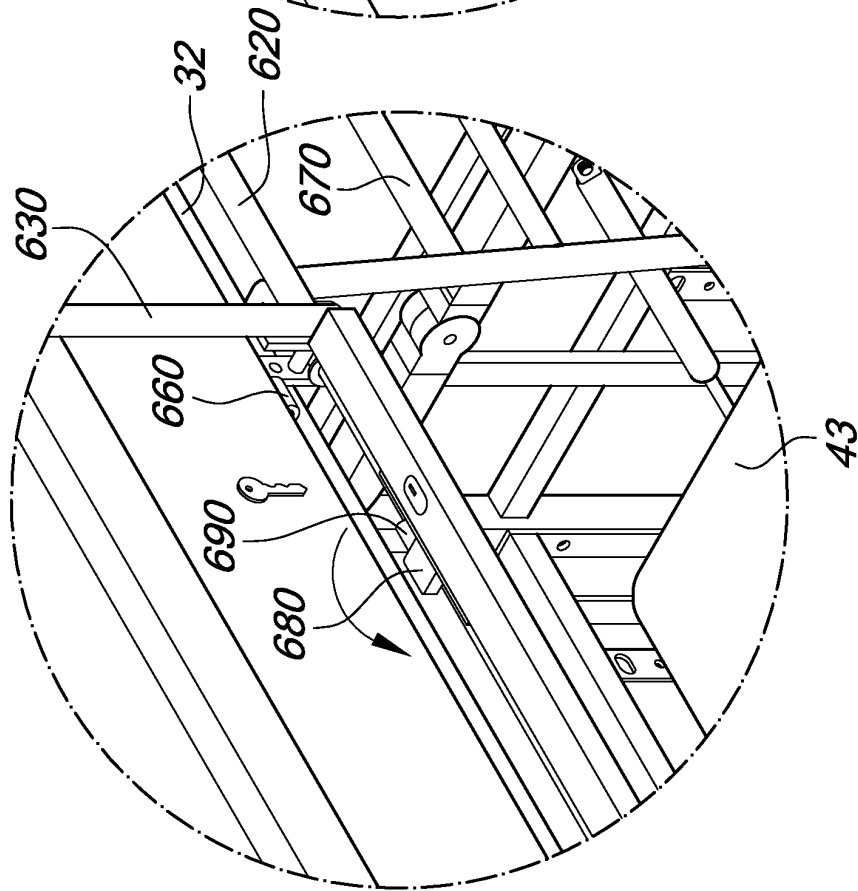


Fig. 9a

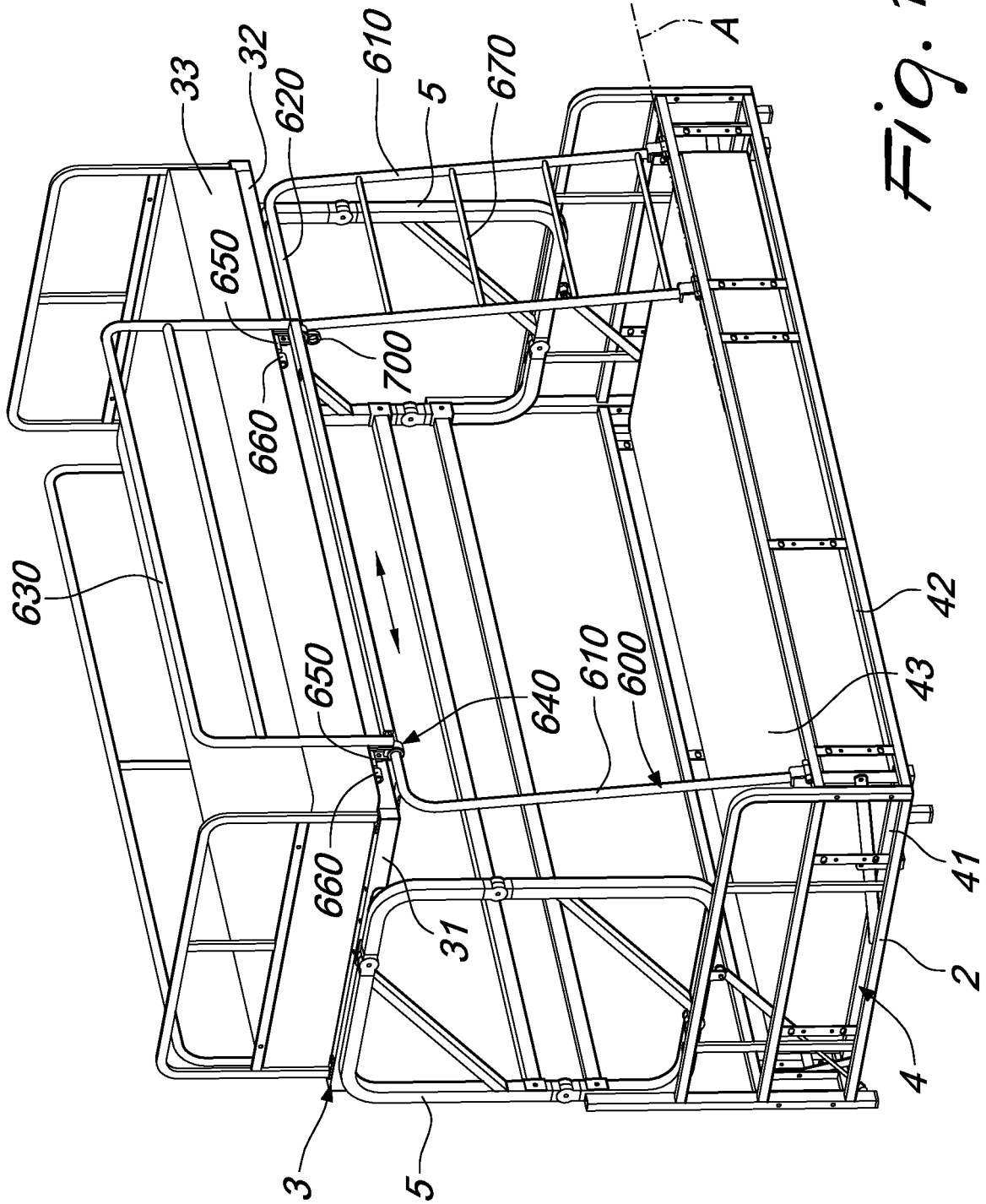


Fig. 10

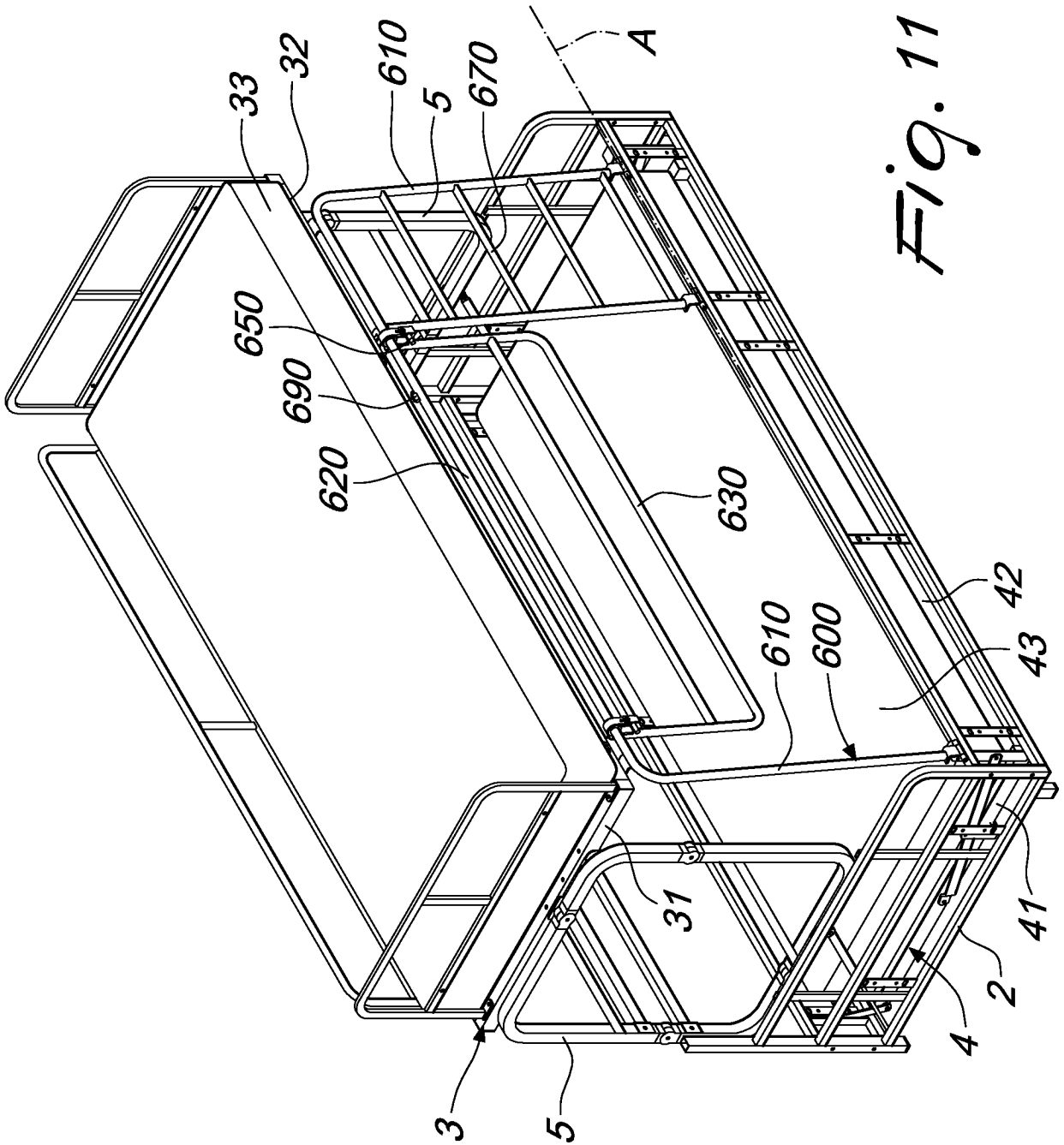


Fig. 11

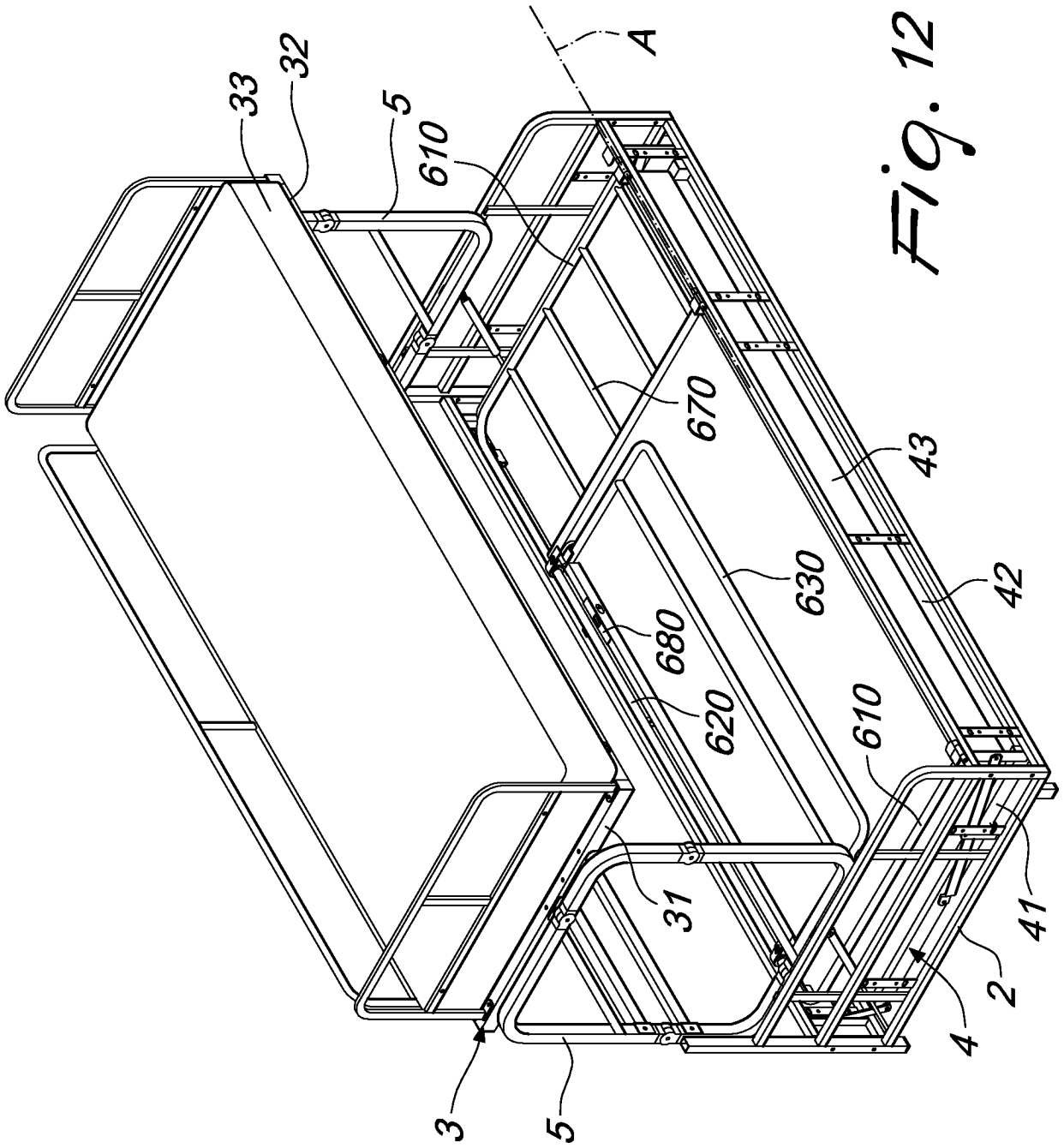


Fig. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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