(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 737 465 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.10.1996 Bulletin 1996/42

(51) Int Cl.[6]: **A61G 7/10**

(21) Application number: **96302545.7**

(22) Date of filing: **11.04.1996**

(84) Designated Contracting States:
DE ES FR GB IT

(30) Priority: **11.04.1995 JP 85295/95**

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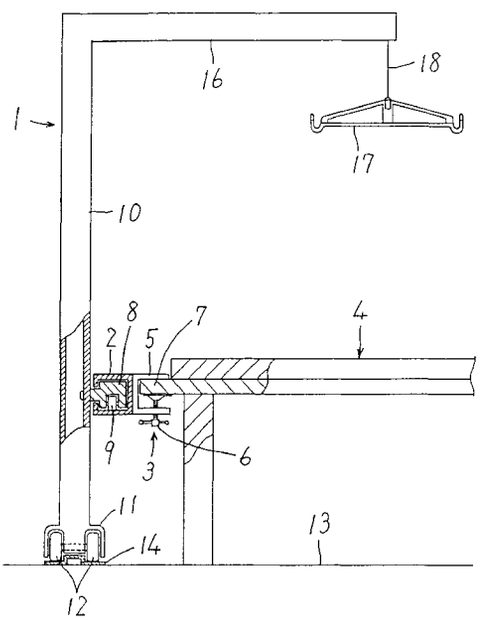
(54) Lift apparatus for invalid

(57) A lift apparatus for an invalid comprises a guide rail (57a) which is detachably mounted on a bed (52) on one longitudinal end thereof to extend widthwise along the bed (52), a movable body (58a, 58b) which is guided to be movable along the guide rail (57a), and lift means (51) which is mounted on the movable body (58a, 58b). The lift means (51) includes an upright (59) which is fixed to the movable body (58a) on a side portion to extend in the vertical direction, and an arm member (65) having a first end which is coupled to an upper end portion of the upright (59) and a second end which serves as a working end. The guide rail is mounted on a movable part of a vertically movable bed (52), and the movable body (58a) is vertically slidably mounted on the upright (59). According to this structure, the upright of the lift means itself is not vertically moved but enables cross-directional movement along the guide rail upon vertical movement of the movable part of the bed comprising a vertically movable mechanism.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a lift apparatus for an invalid, which is employed for lifting an invalid such as a sick person, a physically handicapped person or a bed-ridden old person for nursing him.

Description of the Background Art

For example, Japanese Patent Laying-Open No. 2-215462 (1990) proposes an improved bed apparatus. In consideration of the housing situation in Japan, this bed apparatus is rendered employable in a six- or four-and-a half-mat room, with provision of a lift apparatus which can lift up or lay down an invalid from or on the bed body, or move him to a bedside.

In more concrete terms, the aforementioned bed apparatus comprises guide rails which are fixedly provided on both longitudinal ends of the bed body to extend widthwise. Sliders are mounted on the bed body to be movable widthwise along the guide rails respectively. These sliders can be made to extend sideward from the bed body due to the movement along the guide rails. Further, uprights are mounted to extend upward from the sliders respectively. Two parallel side bars extend across the uprights, to be movable along the uprights and stoppable on arbitrary positions.

In the aforementioned bed apparatus, the pair of uprights are movable between positions within and out of the cross-directional dimension of the bed apparatus. The side bars are vertically movable along the uprights and stoppable on the moved positions wherever the uprights are located. Consequently, the side bars can be located in arbitrary positions in the range of spaces above and beside the bed body.

When the side bars are employed for supporting the body of an invalid, therefore, the invalid who lies on the bed body can be lifted up from the bed body or moved to a bedside, and vice versa. According to this bed apparatus, the bed sheet can be promptly exchanged, or the invalid can be readily bathed or seated on a wheelchair or a chamber pot.

In the bed apparatus of the aforementioned structure, the bed body has strong mechanical relevance to the lift apparatus. In other words, a mechanism which is included in the lift apparatus is partially integrated into the bed body. Therefore, an operation of assembling the overall bed apparatus is troublesome. Such a bed apparatus is so large that the same is hardly shipped in a finished state but parts thereof are brought to the place for setting the bed apparatus in separate states and assembled there. Thus, the operation for assembling the bed apparatus is preferably as simple as possible.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a lift apparatus for an invalid, which can be assembled independently of a bed and can be mounted on a vertically movable bed.

In order to solve the aforementioned problem, the inventive lift apparatus for an invalid comprises a guide rail which is detachably mounted on a bed on one longitudinal end thereof to extend widthwise along the bed, a movable body which is guided to be movable along the guide rail, and lift means which is mounted on the movable body. The lift means includes an upright which is fixed to the movable body on a side portion to extend in the vertical direction, and an arm member having a first end which is coupled to an upper end portion of the upright and a second end serving as a working end. In this inventive apparatus, the aforementioned guide rail is mounted on a vertically movable part of a bed, and the movable body is vertically slidably mounted on the upright.

According to this structure, the movable body on which the lift means is mounted is moved widthwise in relation to the bed along the guide rail, while the forward end portion of the arm member which extends from the upper end portion of the upright in the lift means is employed as a working end for lifting up an invalid from the bed for nursing him.

Further, the guide rail is detachable from the bed, whereby the lift apparatus for an invalid can be assembled in a state mechanically separated from the bed. Thus, the operation of assembling this lift apparatus for an invalid is relatively simplified.

In addition, the lift apparatus for an invalid according to the present invention may comprise no elements, such as the side bars included in the lift apparatus which is assembled with the aforementioned conventional bed apparatus, having lengths corresponding to the longitudinal dimension of the bed. Thus, the lift apparatus for an invalid itself is miniaturized, and can be readily handled.

Further, the guide rail can be mounted through a relatively heavy bed, whereby the same can be brought into a strongly fixed state with no requirement for a specific member for mounting the guide rail. Thus, the number of components which are required for the lift apparatus for an invalid can be reduced.

In addition, according to this structure, the upright of the lift means itself is not vertically moved but enables cross-directional movement along the guide rail upon vertical movement of the movable part of the bed comprising the vertically movable mechanism.

Consequently, it is possible to provide a lift apparatus which is mounted on a bed having a vertical moving function for enabling stable cross-directional movement along the bed.

In a preferred embodiment of the inventive lift apparatus for an invalid, the apparatus further comprises

another guide rail mounted on a fixed part of the bed vertically movably supporting the movable part and another movable body guided to be movable along the fixed guide rail.

According to this structure, the guide rails are provided on both of the movable part of the bed comprising a vertically movable mechanism and the fixed part supporting the same so that the movable bodies are moved widthwise along these guide rails, thereby guaranteeing stable movement of the lift means along the cross direction of the bed. In vertical movement of the movable part of the bed, further, the upright of the lift means is ensured in a vertically fixed state.

In another preferred embodiment of the inventive lift apparatus for an invalid, a wheel which rolls along a floor face is further mounted on a lower end portion of the upright in the aforementioned structure.

According to this lift apparatus for an invalid, the lift means is supported not only by the guide rail but by the floor face through the wheel which is provided on the lower end portion of the upright of the lift means, whereby stability is further improved.

In still another preferred embodiment of the inventive lift apparatus for an invalid, the first end of the arm member in the aforementioned structure is rotatably mounted on the upper end portion of the upright, while the lift means further includes an actuator for rotating the arm member with respect to the upright thereby changing the height of the second end of the arm member.

According to this structure, the arm member is driven by the actuator to be rotated about the upper end portion of the lift means, whereby the height of the forward end of the arm member can be freely changed. This arm member is mounted to be also rotatable about the axis of the upright. Thus, the working end of the arm member can be made to extend to a position sufficiently separated from a side portion of the bed by rotating the arm member about the axis of the upright with no extension of the upright itself beyond the cross-directional range of the bed. Consequently, the lift apparatus can softly move the invalid over a wide range, in order to nurse him.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevational view showing a lift apparatus 1 for an invalid according to a first embodiment of the present invention in a partially fragmented manner;

Fig. 2 is a side elevational view of the lift apparatus 1 for an invalid shown in Fig. 1;

Fig. 3 is a sectional view showing apart of a beam 16 of the lift apparatus 1 for an invalid appearing in Fig. 1 in an enlarged manner;

Fig. 4 is a perspective view showing a structure including a guide rail 2 and a second guide rail 14 of the lift apparatus 1 for an invalid appearing in Fig. 1;

Fig. 5 is a front elevational view showing a principal part of a lift apparatus la for an invalid according to a second embodiment of the present invention in a partially fragmented manner;

Fig. 6 is a sectional view showing a second guide rail 14a included in a third embodiment of the present invention;

Fig. 7 is a partially fragmented side elevational view showing a lift apparatus for an invalid according to a fourth embodiment of the present invention with a portion around a longitudinal end of a bed;

Fig. 8 shows the apparatus of Fig. 7 as viewed from the longitudinal end of the bed;

Fig. 9 shows the overall bed having a vertical moving function, on which the lift apparatus according to the fourth embodiment of the present invention is mounted, as viewed from a side portion;

Fig. 10 is a plan view of the overall bed, on which the lift apparatus for an invalid according to the fourth embodiment of the present invention appearing in Fig. 9 is mounted;

Fig. 11 is a partially fragmented perspective view for illustrating a vertical moving mechanism of a bed comprising the vertical moving mechanism, on which the lift apparatus for an invalid according to the second embodiment of the present invention is mounted;

Fig. 12 is a side elevational view, corresponding to Fig. 7, of the apparatus according to the fourth embodiment of the present invention in relation to a bed which is in an upwardly moved state;

Fig. 13 is a diagram corresponding to Fig. 9, showing a state which is identical to that shown in Fig. 12;

Fig. 14 is a general perspective view of the apparatus according to the fourth embodiment of the present invention, which is in the state shown in Figs. 12 and 13;

Fig. 15 is a partial sectional view showing a support mechanism with a spring, which is provided in a bed upright in the apparatus according to the fourth embodiment of the present invention;

Fig. 16 is a partially fragmented side elevational view showing an arm member which is rotated and downwardly moved by an actuator in the lift apparatus for an invalid according to the fourth embodiment of the present invention;

Fig. 17 is a diagram showing the arm member, which is rotated about the axis of the upright so that its forward end extends sideward from the bed, as viewed from the longitudinal end of the bed;

Fig. 18 is a partially fragmented side elevational view showing a lift apparatus for an invalid according to a fifth embodiment of the present invention;

Fig. 19 shows the apparatus according to the fifth embodiment appearing in Fig. 18, as viewed from a longitudinal end of a bed; and

Fig. 20 is a diagram corresponding to Fig. 10, showing the lift apparatus according to the fourth embodiment of the present invention which is most approached to a side of a bed 52.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention are now described with reference to the drawings.

Figs. 1 to 4 are adapted to illustrate a lift apparatus 1 for an invalid according to a first embodiment of the present invention.

The lift apparatus 1 comprises a guide rail 2. The guide rail 2, which has a C-shaped section, for example, is detachably mounted on a bed 4 by clamp devices 3, to extend widthwise along the bed 4 on one longitudinal end portion thereof. The clamp devices 3 comprise clamp fittings 5 having U-shaped sections which are fixed to the guide rail 2, and manually rotatable tie bolts 6 which are fitted with the clamp fittings 5. A projection 7 is formed on the longitudinal end portion of the bed 4, so that the clamp devices 3 clamp this projection 7, thereby mounting the guide rail 2 on the bed 4.

A movable body 8 is guided to be movable along the guide rail 2. The movable body 8 comprises rollers 9 which roll on the inner surface of the guide rail 2. As understood from a state shown by phantom lines in Fig. 2, the movable body 8 preferably has a length exceeding half that of the guide rail 2.

The movable body 8 is mounted on a side portion of a vertically extending upright 10. As understood from a state shown by phantom lines in Fig. 2, the upright 10 is preferably mounted on one longitudinal end of the movable body 8.

A base 11 is provided on a lower end portion of the upright 10, for rotatably holding a plurality of wheels 12. Rolling of these wheels 12 is preferably guided by a wheel guide rail 14 which is fixed onto a floor face 13. The wheel guide rail 14 is fixed to the floor face 13 by screws 15, for example. Head portions of these screws 15 may project from the upper surface of the wheel guide rail 14, thereby serving as stoppers defining the range of rolling of the wheels 12.

A beam 16 is formed to extend from an upper end portion of the upright 10 toward the longitudinal center of the bed 4. The upright 10 and the beam 16 preferably have hollow structures, as shown in Fig. 3. A hanger member 17 is arranged under a forward end portion of the beam 16, to be vertically movable. According to this embodiment, the hanger member 17 is suspended from the forward end portion of the beam 16 through a wire 18. In order to vertically move the hanger member 17, a hoist gear 19 for hoisting the wire 18 is provided in relation to the beam 16.

Principal parts of the hoist gear 19 are arranged in the hollow upright 10 and the hollow beam 16. The hoist gear 19 comprises a drum 20 for taking up the wire 18. The drum 20 is fixed to a first end of a rotatably supported shaft 21, and a worm wheel 22 is fixed to a second end of this shaft 21. A worm 23 is arranged to engage with the worm wheel 22, and rotated by a motor 24 which is mounted on an outer part of the upright 10. The motor 24, which is reciprocally rotatable, rotates the drum 20 in a desired direction, thereby vertically moving the hanger member 17.

A method of using the aforementioned lift apparatus 1 for an invalid is now described.

When the lift apparatus 1 is not used, the upright 10 is positioned at the cross-directional center of the bed 4 as shown in Fig. 2, while the hanger member 17 is brought into a relatively high position as shown in Fig. 1.

In order to lift an invalid who lies on the bed 4, the invalid is hammocked, for example, and the hanger member 17 is downwardly moved and coupled with the hammock. Then, the hanger member 17 is upwardly moved, for suspending the invalid along with the hammock. In this state, a sheet which is spread on the bed 4 can be readily exchanged, for example.

When the upright 10 is moved in response to rolling of the wheels 12 on the wheel guide rail 14 until the movable body 8 projects from the guide rail 2 in the aforementioned state as shown in phantom lines in Fig. 2 and in Fig. 4, the invalid can be moved to a space beside the bed 4.

In this case, the invalid can be bathed or seated on a wheelchair or a chamber pot, by downwardly moving the hanger member 17.

In order to return the invalid on the bed 4 again, the aforementioned operation may be reversely performed.

While the hanger member 17 which is suitably shaped for suspending a hammock is employed in the aforementioned embodiment, a hanger member having another shape may alternatively be employed.

Further, the structure for detachably mounting the guide rail 2 on the bed 4 can be arbitrarily modified in response to the structure provided on the bed 4. One of such modifications is now described with reference to Fig. 5.

Fig. 5 is adapted to illustrate a lift apparatus Ia for an invalid according to a second embodiment of the present invention. Referring to Fig. 5, elements corresponding to those shown in Fig. 1 are denoted by similar reference numerals, to omit redundant description.

Referring to Fig. 5, a bed 4a comprises a head guard 25 including a vertical pair of rods 26 and 27 which extend widthwise. A guide rail 2 is detachably mounted on the bed 4a by clamp devices 28 which are selectively fixed to these rods 26 and 27. The clamp devices 28 comprise J-shaped first clamp fittings 29 which are fixed to the guide rail 2, so that manually rotatable first tie bolts 30 are fitted with the first clamp fittings 29. Parts of the first clamp fittings 29 and the first tie bolts 30 clamp the

upper rod 26, thereby fixing the first clamp fittings 29 to the rod 26. The clamp devices 28 further comprise J-shaped second clamp fittings 32 which are detachably mounted on the first clamp fittings 29 by screws 31, so that manually rotatable second tie bolts 33 are fitted with the second clamp fittings 32. Parts of the second clamp fittings 32 and the second tie bolts 33 clamp the lower rod 27, thereby fixing the second clamp fittings 32 to the rod 27. Thus, the guide rail 2 is fixed to the bed 4a through the clamp devices 28.

Fig. 6 is adapted to illustrate a third embodiment of the present invention. Fig. 6 shows a leg portion 34 of a bed and a wheel guide rail 14a. Fig. 6 also shows wheels 12 which are guided to roll by the wheel guide rail 14a in phantom lines.

According to this embodiment, a part of the wheel guide rail 14a is laid under the leg portion 34 to be fixed to a floor face 13, so that the wheel guide rail 14a is fixed through the weight of the bed which is applied to the floor face 13. Preferably, upwardly projecting pins 35 are provided on the wheel guide rail 14a, while cavities 36 for receiving the pins 35 are provided on the lower surface of the leg portion 34. Thus, the fixed state of the wheel guide rail 14a can be further strongly maintained by making the pins 35 engage with the cavities 36.

While the wheel guide rail 14 or 14a is employed in each of the aforementioned embodiments, the wheels 12 may alternatively directly roll on the floor face 13 with no employment of such a wheel guide rail.

A fourth embodiment of the present invention is now described with reference to Figs. 7 to 17.

Referring to Figs. 7 and 8, a lift apparatus 51 for an invalid is mounted on one longitudinal end of a bed 52 comprising a vertical driving mechanism in this embodiment. A first longitudinal end of a body 53 of the bed 52 is supported by a pair of bed uprights 56a and 56b on both cross-directional ends thereof. In more concrete terms, a first end of the body 53 of the bed 52 is fixed to movable bed upright parts 54a and 54b forming the bed uprights 56a and 56b, so that the body 53 of the bed 52 is vertically driven following vertically movement of the movable bed upright parts 54a and 54b by the vertical driving mechanism as described later.

The bed uprights 56a and 56b comprise the aforementioned movable bed upright parts 54a and 54b and fixed bed upright parts 55a and 55b vertically movably supporting these movable bed upright parts 54a and 54b respectively. A first guide rail 57a is mounted on the pair of movable bed upright parts 54a and 54b to link portions which are close to upper ends thereof with each other, while a second guide rail 57b is mounted to link the pair of fixed bed upright parts 55a and 55b with each other. The first and second guide rails 57a and 57b are fastened/fixed to the bed uprights 56a and 56b by bolting or the like, to be readily attached to and detached from the same.

The first and second guide rails 57a and 57b are provided with first and second movable members 58a and 58b which are moved along the same respectively. The first and second movable members 58a and 58b are mounted on side portions of an upright 59 of the lift apparatus 51, for vertically supporting this upright 59. While the second movable member 58b is fixed to a portion which is close to the lower end of the upright 59, the first movable member 58a is mounted on the upright 59 through a hollow cylindrical sleeve 60 slidably receiving the upright 59, so that the movable bed upright parts 54a and 54b of the bed uprights 56a and 56b can be vertically moved while fixing the upright 59 in the vertical direction by this mechanism. Fig. 20 is a plan view showing the lift apparatus 51 which is most approached to a side of the bed 52.

A base 63 which is provided with a pair of wheels 62a and 62b for rolling along a floor face 61 on both cross-directional ends of the bed 52 is fixed to the lower end of the upright 59 of the lift apparatus 51. Due to this mechanism, the upright 59 of the lift apparatus 51 is also supported by the floor face 61 in addition to the first and second guide rails 57a and 57b, to be stably moved widthwise along the bed 52.

The upright 59 of the lift apparatus 51 includes a lower upright 59a which is mounted on the first and second movable members 58a and 58b, and an upper upright 59b which is mounted on the upper end of the lower upright bar 59a to be rotatable about its central axis. An arm member 65 is mounted on the upper end of the upper upright 59b so that a first end thereof is rotatable about a rotation fulcrum 64.

An actuator 66 has a base end portion which is rotatably supported by a pin 67 in the vicinity of the lower end of the upper upright 59b, and a working end which is rotatably supported by a pin 68 on a first end of an auxiliary link 69a on the forward end of a driving rod 66a. A second end of the auxiliary link 69a is connected to a bracket 69b, which is fixed to the arm member 65, to be rotatable about a pin 70. A shackle 71 for suspending a hanger member or the like is provided on a lower part of a portion close to the forward end of the arm member 65.

Due to this structure, the arm member 65 is rotated about the rotation fulcrum 64 by a driving operation of the actuator 66 according to this embodiment, whereby the forward end of the arm member 65 which is provided with the shackle 71 can be freely vertically moved.

A vertical moving mechanism for the bed according to this embodiment is now described mainly with reference to Figs. 9 to 11. In the bed body 53 of this embodiment, a cross beam 81a is provided to link the movable bed upright parts 54a and 54b with each other on the positions provided with the first guide rail 57a, while another cross beam 81b is provided to link the fixed bed upright parts 55a and 55b with each other on the positions provided with the second guide rail 57b. On a second longitudinal end of the bed body 53, cross beams 81c and 81d are mounted to link movable bed upright parts 54c and 54d and fixed bed upright parts 55c and

55d with each other in correspondence to the cross beams 81a and 81b respectively.

A pair of fixed brackets 82a and 82b are fixed to the cross beam 81b on the first end of the bed body 53. A pair of lower link members 83a and 83b are mounted on the fixed brackets 82a and 82b respectively through a shaft 84a which is mounted to link the same with each other, to be rotatable amount the shaft 84a. A pair of upper link members 86a and 86b are rotatably mounted on the longitudinal centers of the pair of lower link members 83a and 83b by pins 85a respectively. Second ends of the pair of upper link members 86a and 86b are rotatably supported by a shaft 88a linking brackets 87a and 87b, which are fixed to the movable bed upright parts 54a and 54b respectively, with each other.

A shaft 89a is mounted to portions which are close to the upper ends of the pair of lower link members 83a and 83b respectively, to link the same with each other.

A pair of lower link auxiliary members 95a and 95b are provided on positions of the shafts 84a and 89a which are slightly closer to the lower link member 83b to link the same with each other, and integrally rotated with the lower link members 83a and 83b. The forward end of a driving rod 91a of an actuator 91 is rotatably connected to portions which are close to the upper ends of the pair of lower link auxiliary members 95a and 95b by a pin 90.

Also on the second end of the bed body 53, a pair of brackets 82c and 82d are fixed to the cross beam 81d on positions which are symmetrical to those on the first end, so that a pair of lower link members 83c and 83d are rotatably connected thereto by a shaft 84b. Upper link members 86c and 86d are rotatably supported in positions which are close to the longitudinal centers of the lower link members 83c and 83d through a pin 85b, so that second ends thereof are rotatably supported by a shaft 88b which is mounted on a bracket 87c respectively. A shaft 89b is provided in the vicinity of the upper ends of the lower link members 83c and 83d, to link the same with each other.

A chain 92 has a first end which is fixed to a substantially central portion of the shaft 89b and a second end which is connected to a wire 93. A first end of the wire 93 which is opposite to the chain 92 is mounted on a portion close to the center of the shaft 89a. A cross beam 96 is fixed to a portion which is close to the longitudinal center of the bed body 53, to extend widthwise along the bed 52.

Due to the aforementioned mechanism, the pair of lower link members 83a and 83b are rotated about the shaft 84a due to a driving operation of the actuator 91 in a bed driving mechanism of this embodiment. Thus, the upper link members 86a and 86b are upwardly pressed, whereby the shaft 88a and the movable bed upright parts 54a and 54b which are integrally fixed thereto are upwardly moved.

An operation of rotating the lower link members 83a and 83b by the actuator 91 is interlocked by tensile actions of the chain 92 and the wire 93 to rotate the lower link members 83c and 83d provided on the second end of the bed body 53 oppositely to the lower link members 83a and 83b provided on the first end by a symmetrical angle. Consequently, the movable bed upright parts 54c and 54d are upwardly moved at the same speed as the movable bed upright parts 54a and 54b.

Fig. 12 shows a portion around the first end of the bed body 53 which is upwardly moved by the driving operation of the actuator 91, i.e., a portion around the lift apparatus 51.

Fig. 13 illustrates the bed body 53, which is upwardly moved as shown in Fig. 12, as viewed from a side of the overall bed 52, and Fig. 14 is a general perspective view showing the overall bed 52. Referring to Fig. 14, a hanger member 94 is suspended from the shackle 71 which is provided on the forward end of the arm member 65 of the lift apparatus 51, as shown by phantom lines.

In order to downwardly move the bed 52, the driving rod 91a of the actuator 91 is moved toward the interior of the actuator 91. Thus, the pair of lower link members 83a and 83b are rotated/driven in a direction opposite to that for upwardly moving the bed 52, whereby the shaft 88a and the movable bed upright parts 54a and 54b are downwardly moved through the pair of upper link members 86a and 86b.

In the downward movement of the bed 52, only the vertical moving mechanism which is provided on the first end of the bed 52, i.e., that provided with the lift apparatus 51, is driven by the actuator 91 while that provided on the second end of the bed 52 is not driven by the actuator 91 due to no tensile actions of the chain 92 and the wire 93 but downwardly moved by the own weights of the bed body 53 and an invalid or the like who lies on the bed 52 in practice.

A compression spring 95 is provided between each of the movable bed upright parts 54a, 54b, 54c and 54d and each of the fixed bed upright parts 55a, 55b, 55c and 55d as shown in Fig. 15, for supporting the own weights of the bed body 53 and the invalid or the like who lies thereon by the total compression reactive force thereof. The compression reactive force values of such compression springs 95 are not equally set on four bed uprights, but are so set that the compression reactive force is smaller on the second end of the bed 52 which is downwardly moved by the own weights. The compression reactive force values of the springs 95 are set in the ratio of about 7:3 between the first and the second sides of the bed 52, for example.

The arm member 65 of the lift apparatus 51 can be freely rotated about the rotation fulcrum 64 by a driving operation of the actuator 66, thereby vertically moving the shackle 71 which is provided on a lower portion which is close to the forward end of the arm member 65. Fig. 16 shows the arm member 65 which is rotated to most downwardly position the shackle 71. Further, the arm member 65 can be manually rotated about the axis of the upright 59 by rotating the upper upright 59b about

the axis of the lower upright 59a. Fig. 17 shows the arm member 65 which is so rotated that the shackle 71 provided on its forward end projects sideward from the bed 52.

A fifth embodiment of the present invention is now described with reference to Fig. 18.

This embodiment is different from the first embodiment in a point that a second guide rail 57b, which is provided to link the fixed bed upright parts 55a and 55b with each other in the first embodiment, is mounted on a portion close to the lower end of a movable bed upright part 54b. The remaining points of this embodiment are entirely similar in structure to those of the first embodiment.

According to this embodiment, the second guide rail 57b is mounted on the side of the movable bed upright part 54b, whereby a second movable member 58b is mounted on a lower upright 59a to be vertically slidable through a sleeve 160.

According to this embodiment having such a structure, a lift apparatus 51 can be stably supported to be movable widthwise along a bed 52 by first and second guide rails 57a and 57b and wheels 62a, even if there is no sufficient space for mounting the second guide rail 57b on fixed bed upright parts 55a and 55b upon movement of a bed body 53 to the lowermost position.

Fig. 19 illustrates the bed 52 in the same state as that shown in Fig. 18, as viewed from its first end.

While the wheels 62a and 62b are moved in contact with the floor faces in the lift apparatuses 51 according to the fourth and fifth embodiments, the lift apparatuses 51 can be further stably and reliably moved by providing the wheel guide rails 57a and 57b for guiding the wheels 62a and 62b as shown in the lift apparatuses 1 and 1a according to the first to third embodiments. Further, the lift apparatuses having integrated uprights and arm members shown in the first to third embodiments can also be mounted on the beds 52 having the vertical moving mechanisms shown in the fourth and fifth embodiments,.as a matter of course.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims.

Claims

1. A lift apparatus for an invalid, comprising:

   a guide rail (57a) being detachably mounted on a bed (52) on one longitudinal end thereof to extend widthwise along said bed (52);
   a movable body (58a) being guided to be movable along said guide rail (57a); and
   lift means (51) being mounted on said movable body (58a),
   said lift means (51) including:
   an upright (59) being fixed to said movable body (58a) on a side portion to extend in the vertical direction, and
   an arm member (65) having a first end being coupled to an upper end portion of said upright (59) and a second end serving as a working end, wherein
   said guide rail (57a) is mounted on a vertically movable part of a bed (52),
   said movable body being vertically slidably mounted on said upright (59).

2. The lift apparatus for an invalid in accordance with claim 1, further comprising;

   another guide rail (57b) being mounted on a fixed part of said bed (52) vertically movably supporting said vertically movable part, and
   another movable body (58b) being guided to slide along said another guide rail (57b).

3. The lift apparatus for invalid in accordance with claim 1, further comprising;

   another guide rail (57b) being mounted on said vertically movable part of said bed (52); and
   another movable body (58b) being guided to slide along said another guide rail (57b), wherein
   said guide rail (57a) and said another guide rail (57b) are mounted on an upper and lower portions of said vertically movable part of said bed (52) respectively.

4. The lift apparatus for an invalid in accordance with claims 1 to 3, further comprising a wheel (62a, 62b) being mounted on a lower end portion of said upright (59) for rolling along a floor face (61).

5. The lift apparatus for an invalid in accordance with claims 1 to 4, wherein

   said first end of said arm member (65) is rotatably mounted on said upper end portion of said upright (59),
   said lift means (51) further including an actuator (66) for rotating said arm member (65) with respect to said upright (59), thereby changing the height of a second end of said arm member (65).

6. The lift apparatus for an invalid in accordance with claim 5, wherein

   said arm member (65) is mounted to be rotatable about the axis of said upright (59).

7. A device for liftably supporting a person comprising:

guide means detachably mountable to a bed apparatus;
guided means guidably moveable relative to said guide means; and
support means for liftably supporting a person having a substantially vertically extending portion to which said guided means is mounted.

8. A device as claimed in claim 7, wherein said guide means is mountable to a vertically adjustable bed apparatus and said guided means is mounted to said vertically extending portion for vertical movement relative thereto.

FIG. 1

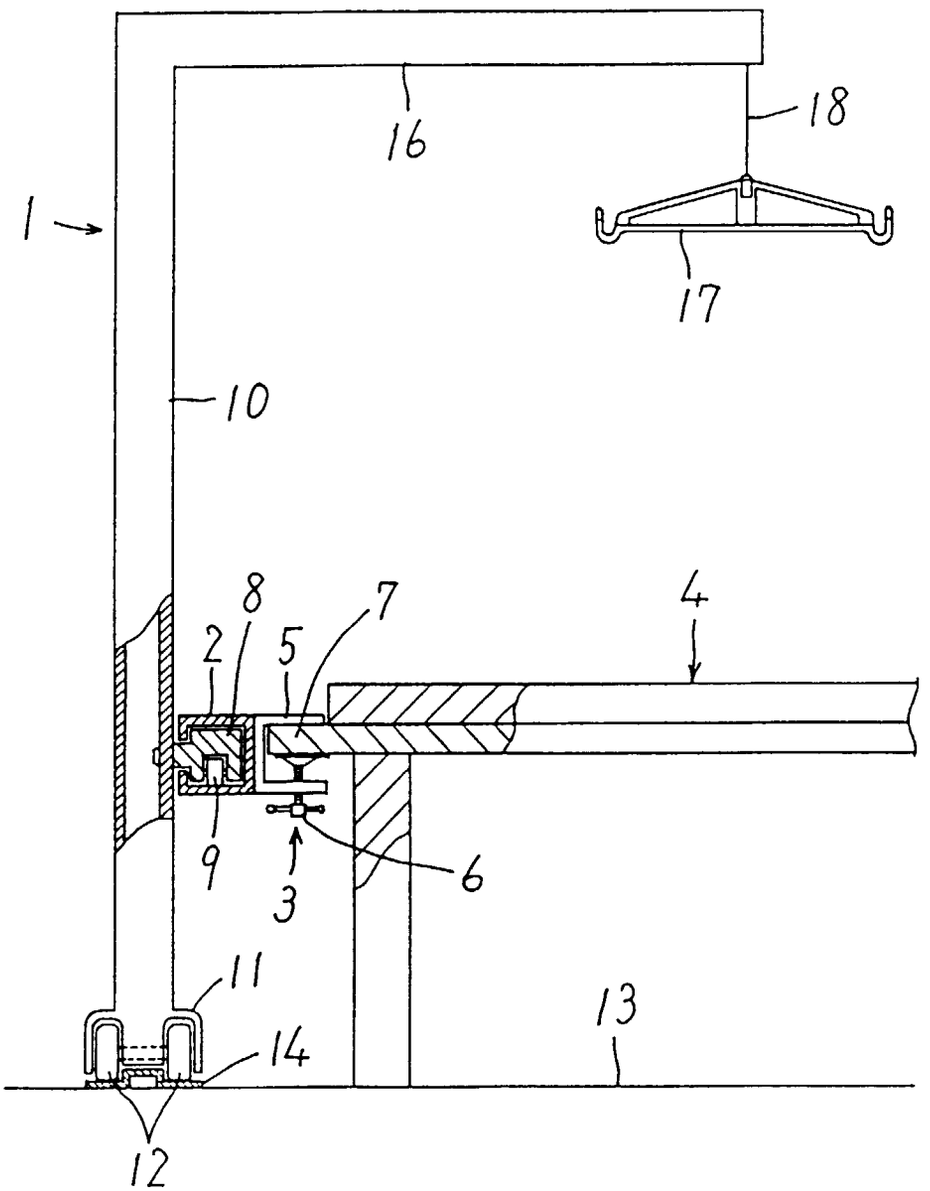


FIG. 2

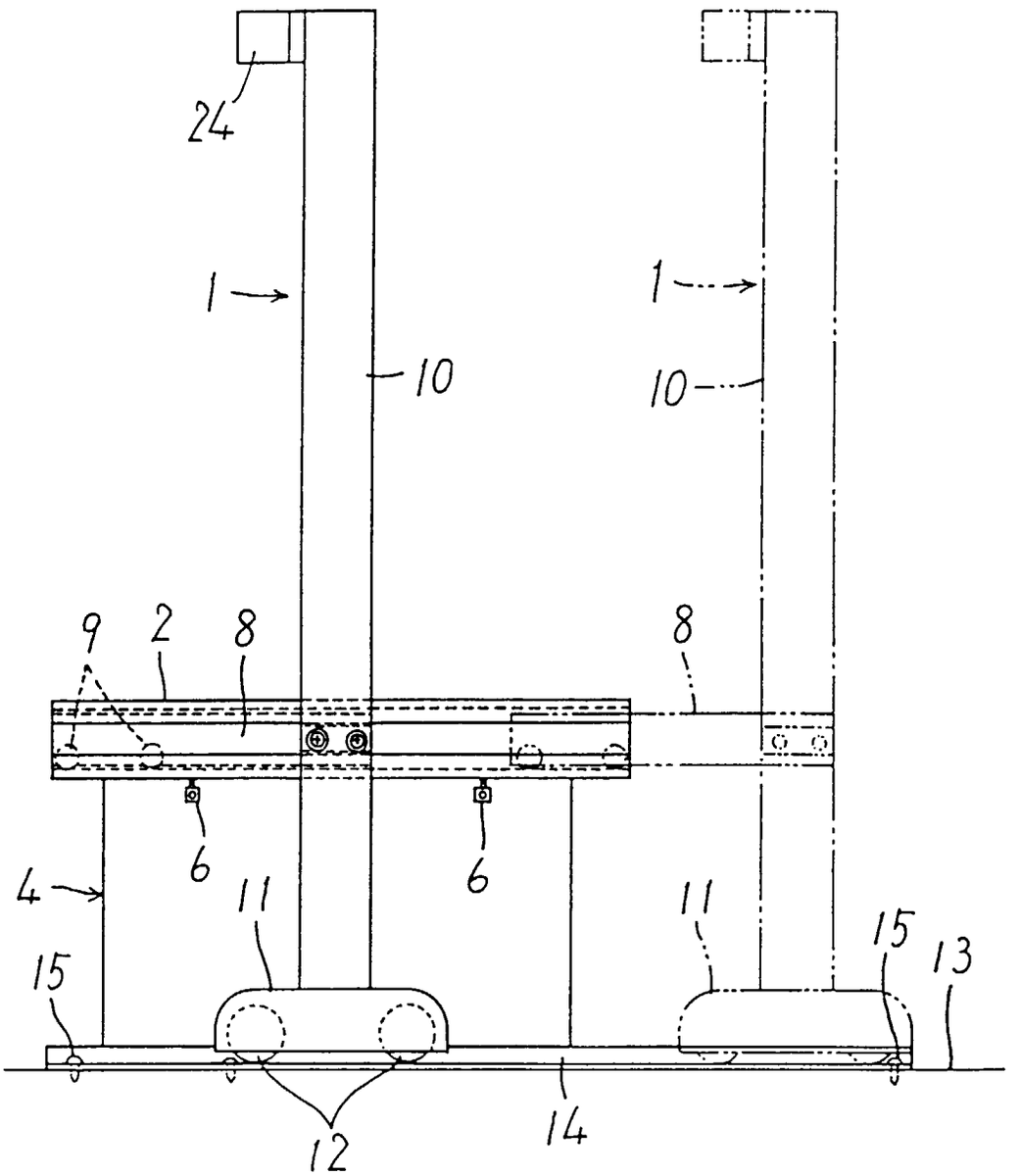
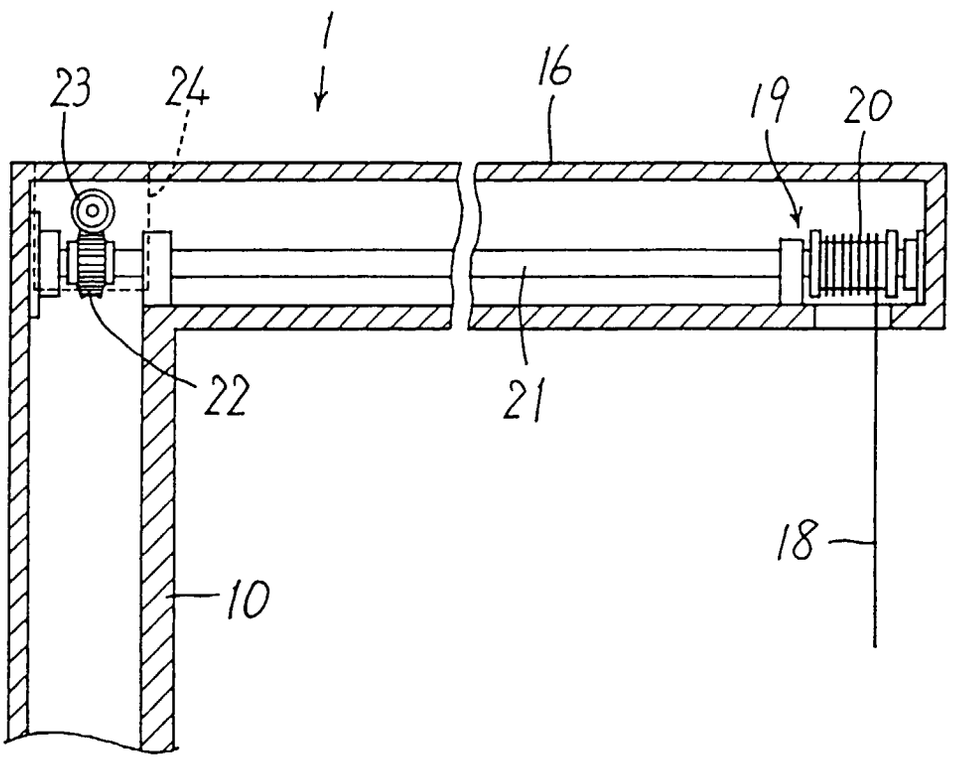


FIG. 3



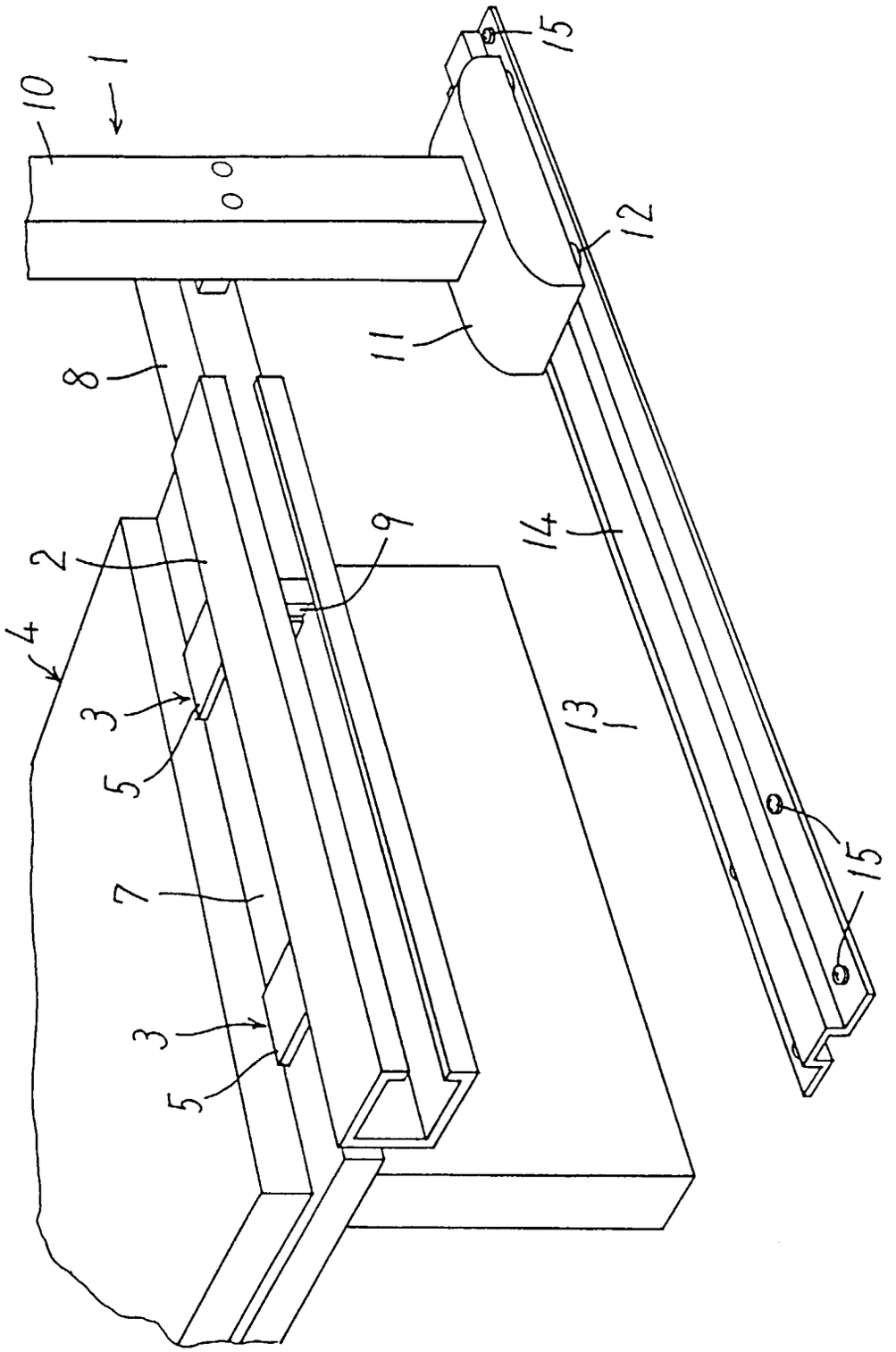


FIG. 4

FIG. 5

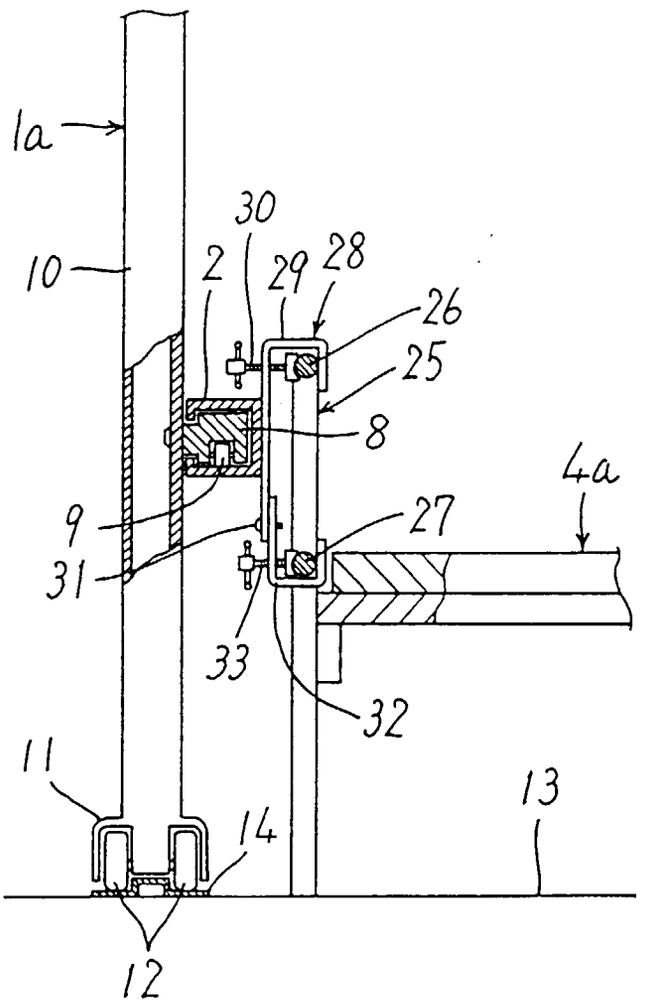


FIG. 6

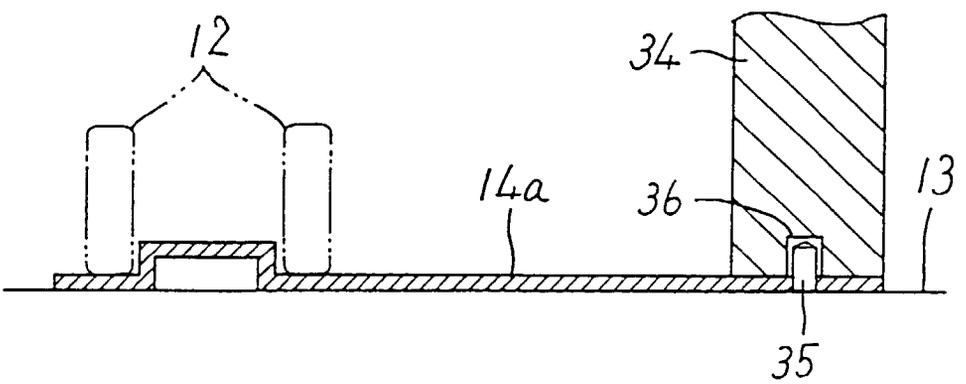


FIG. 7

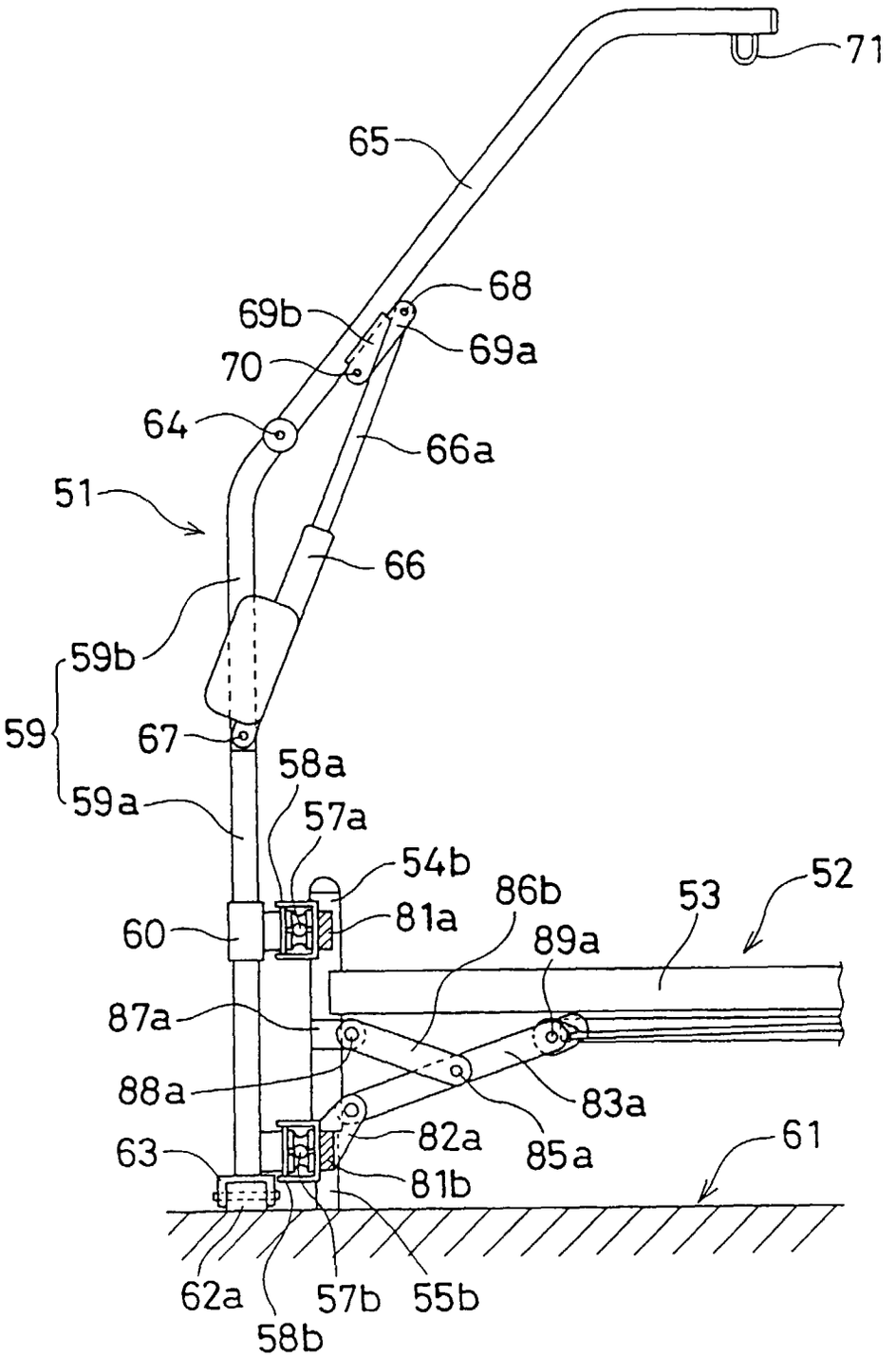

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FIG. 8

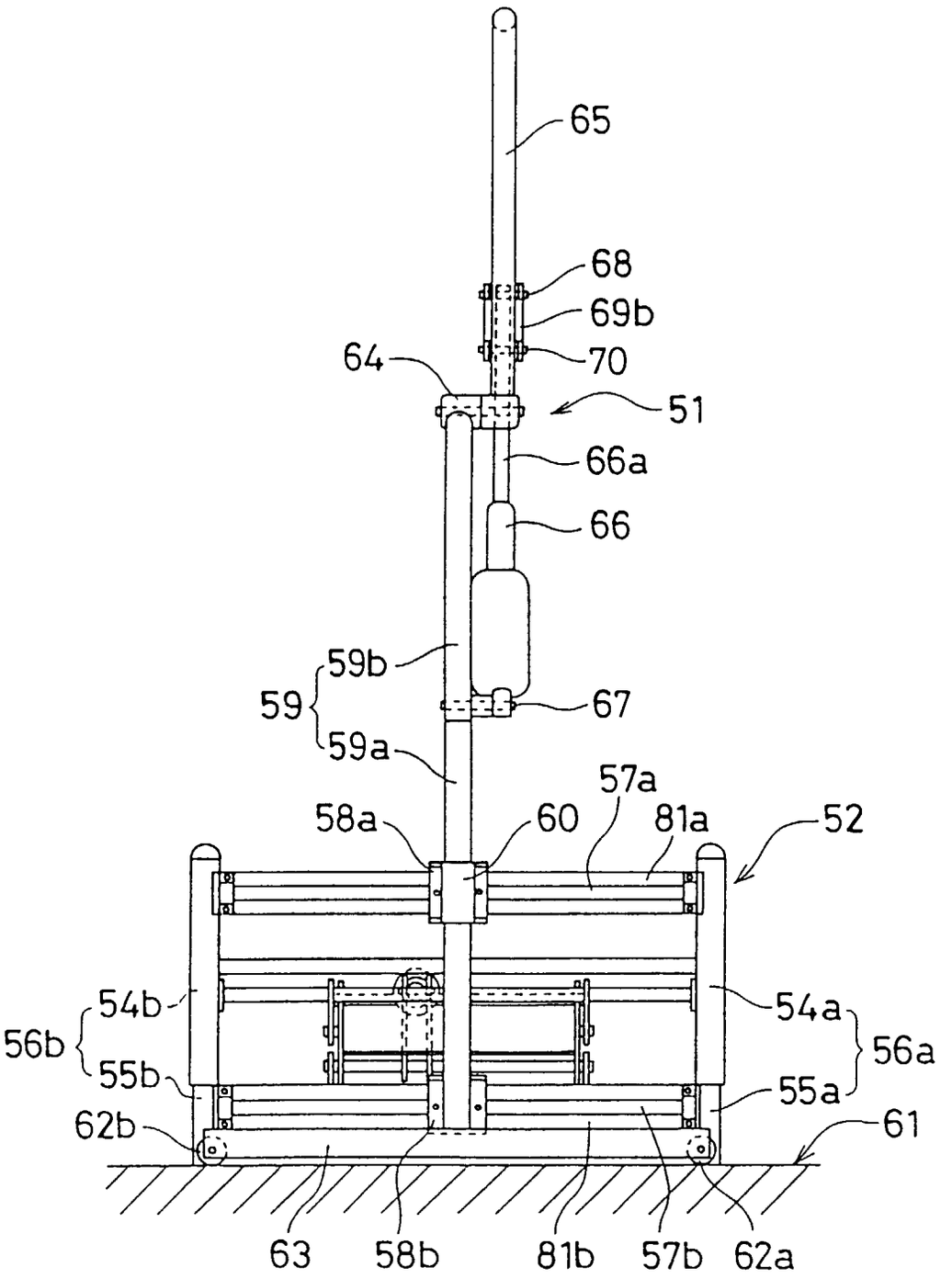
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FIG. 9

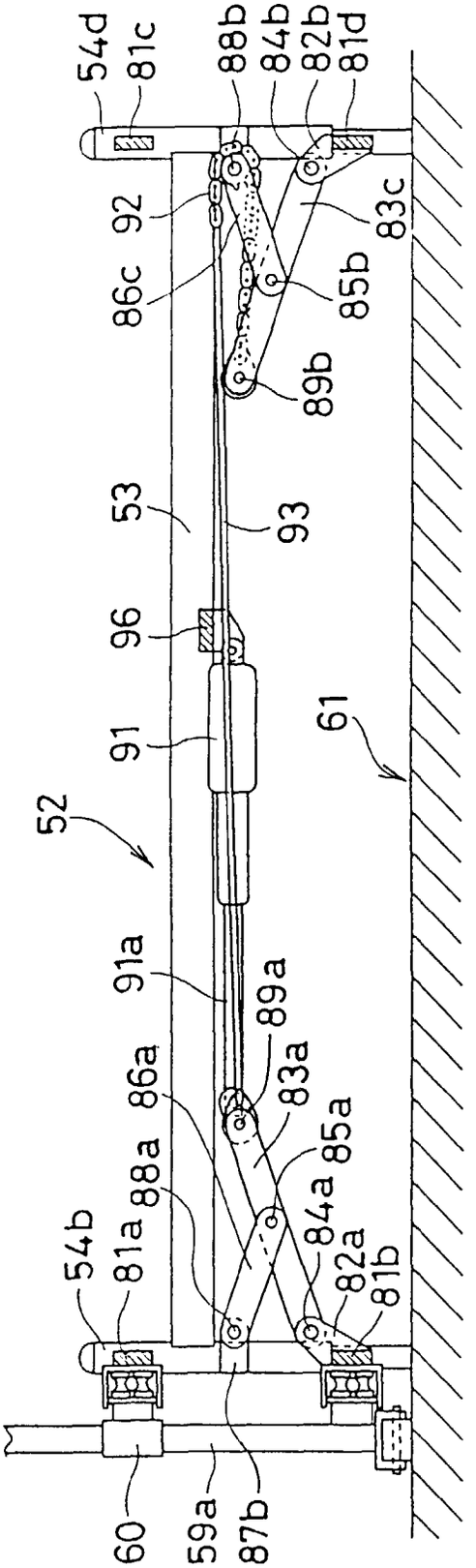
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FIG. 10

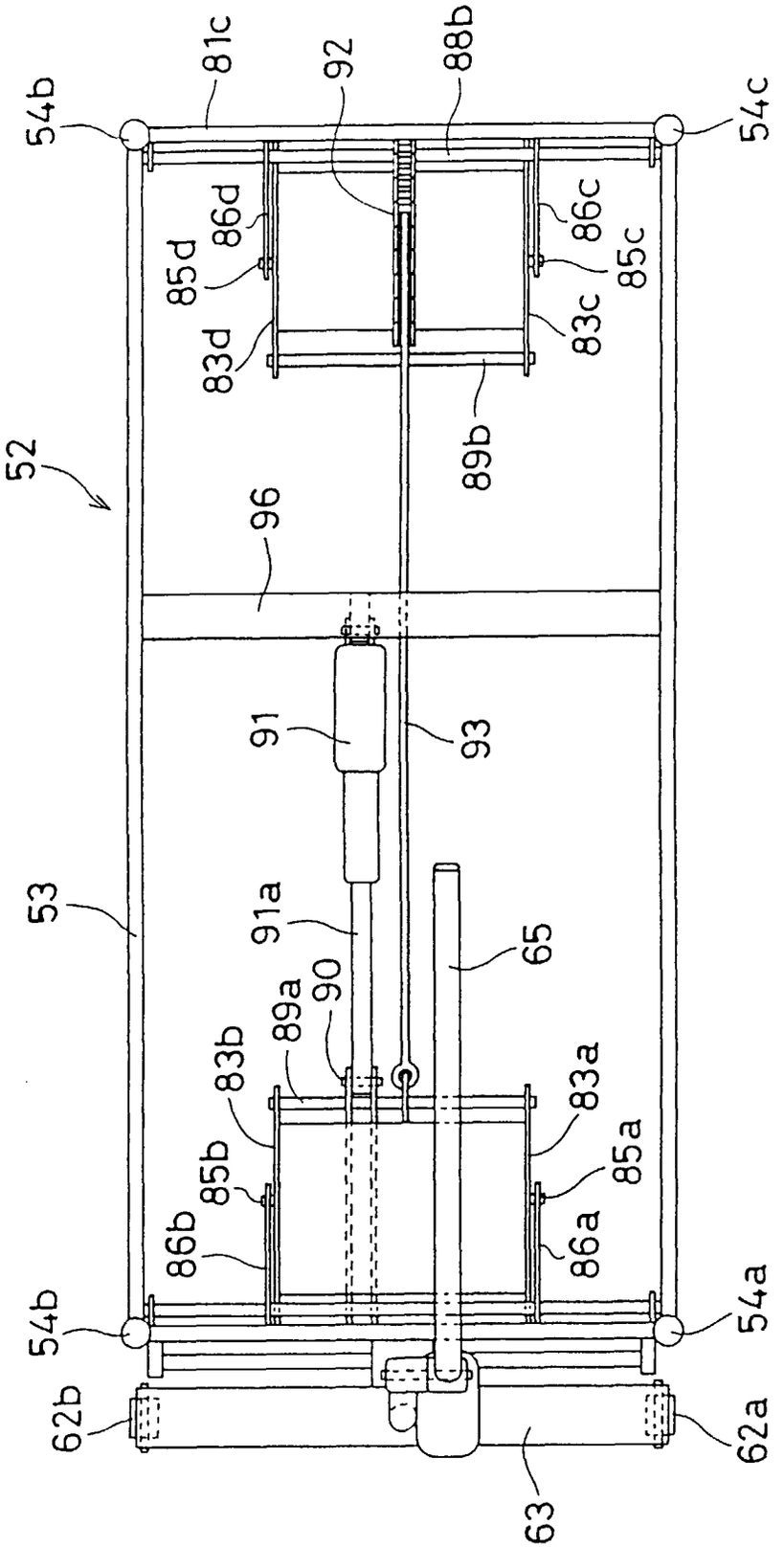
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FIG. 11

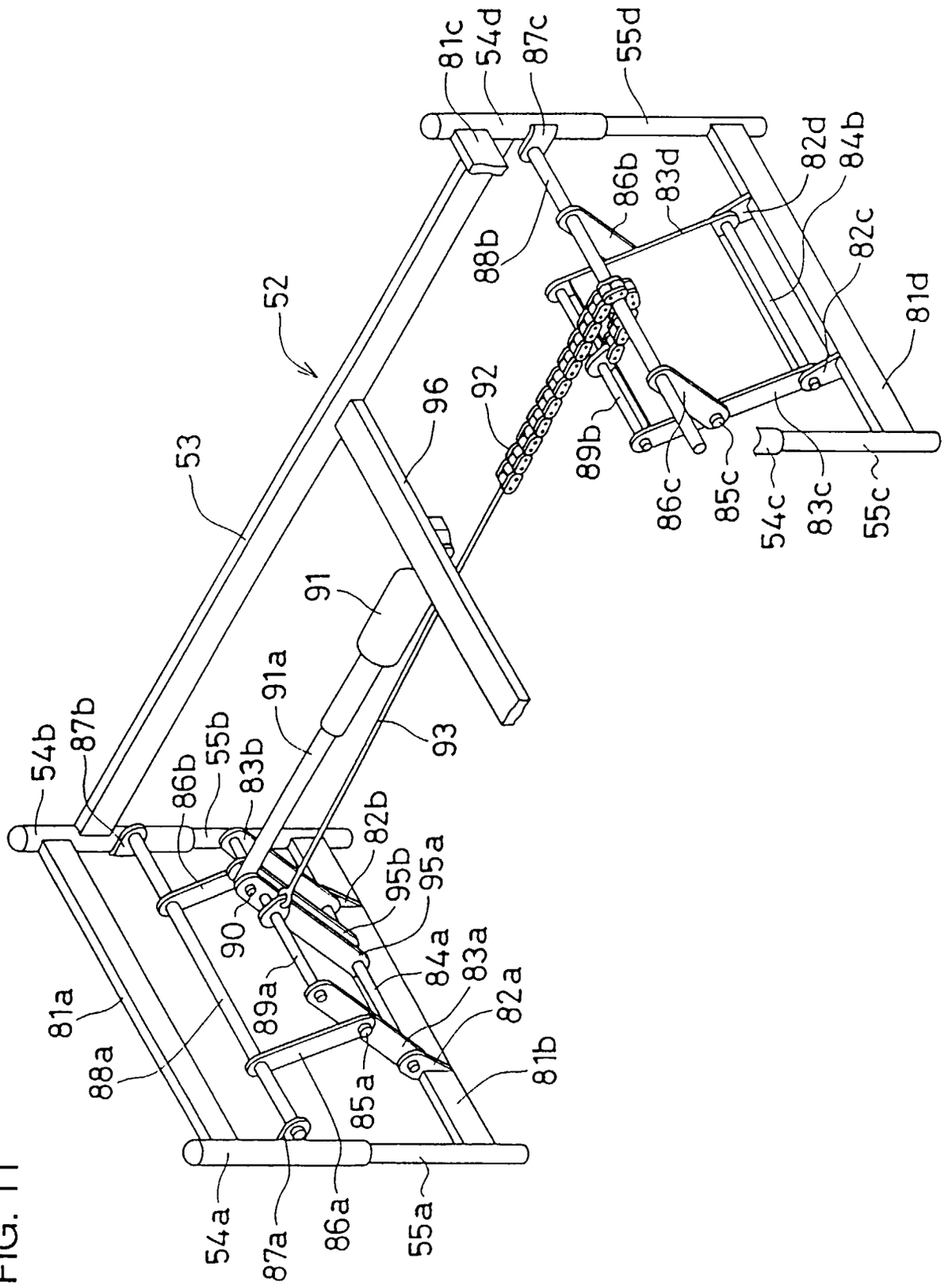
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FIG. 12

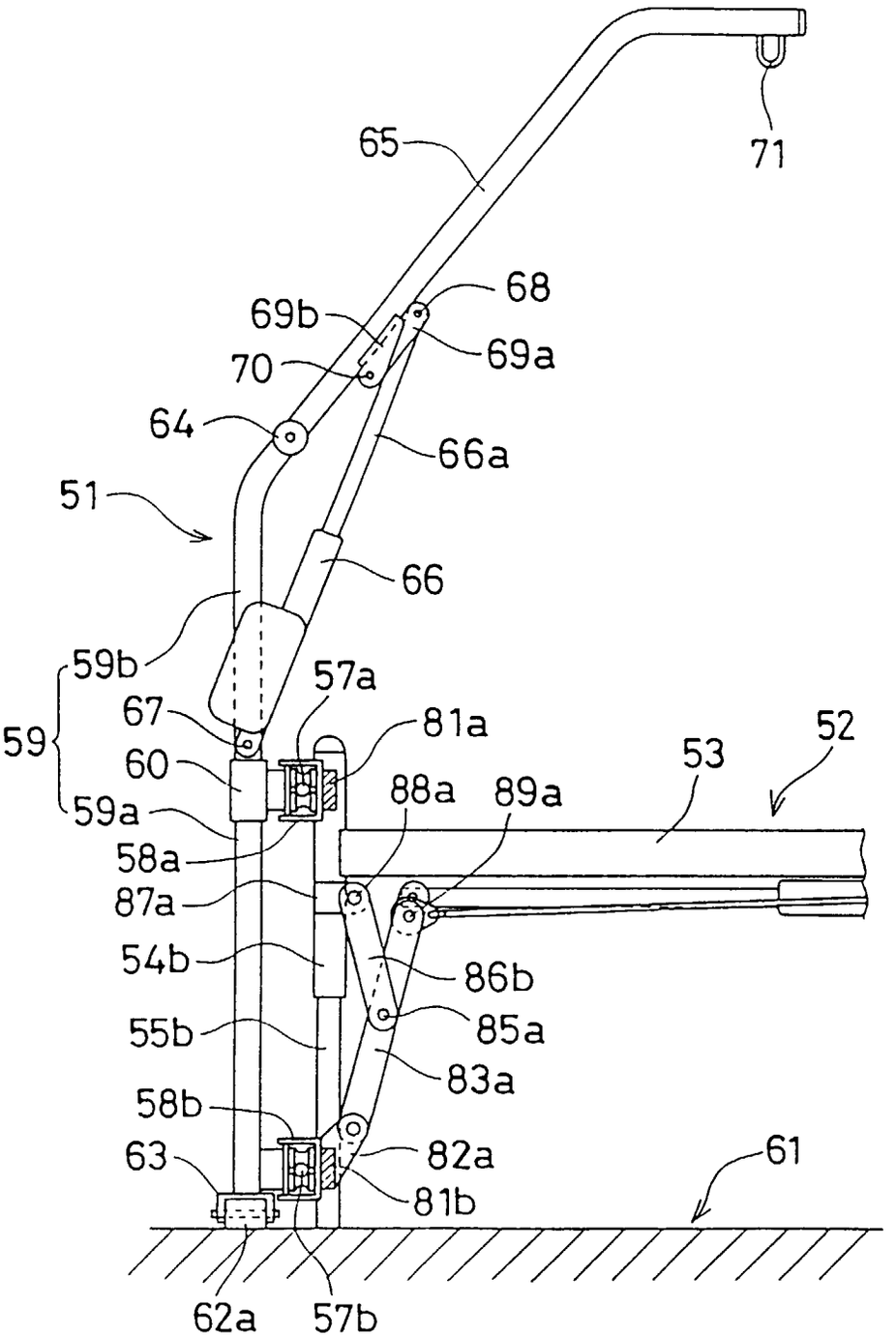
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FIG. 13

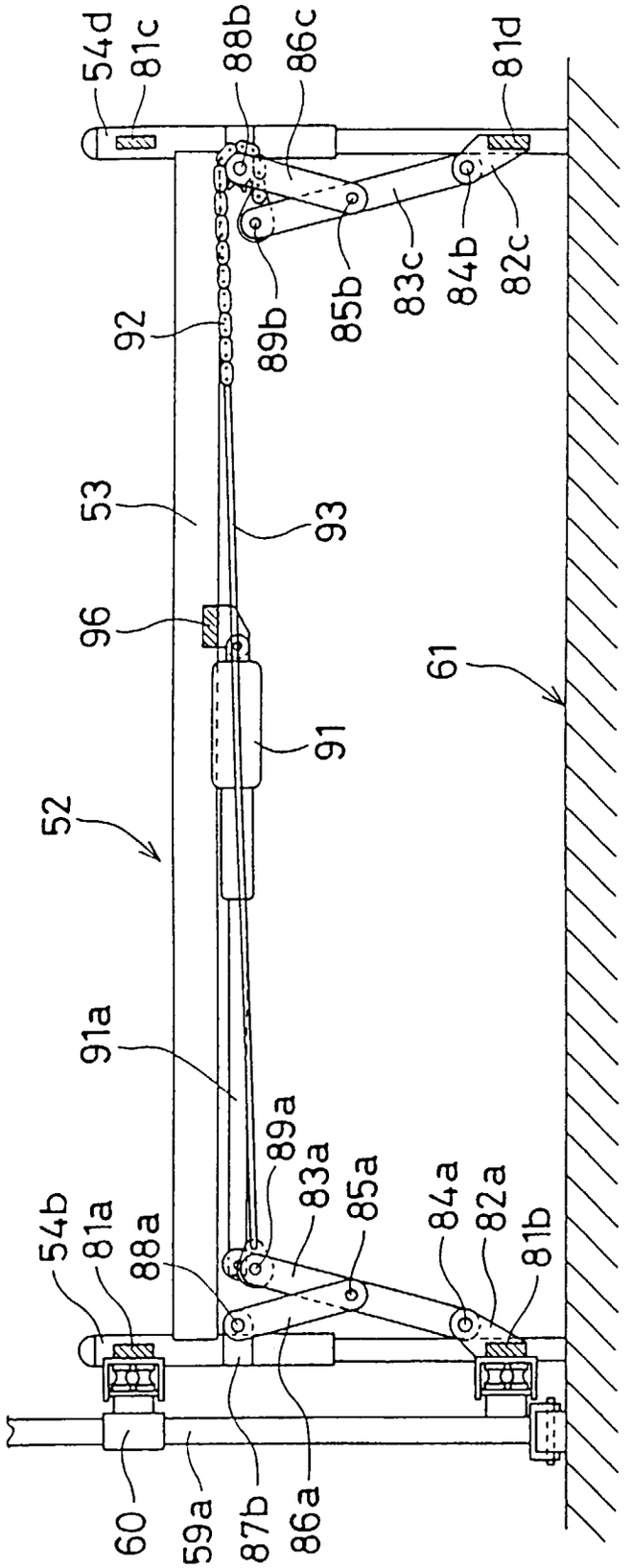
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FIG. 14

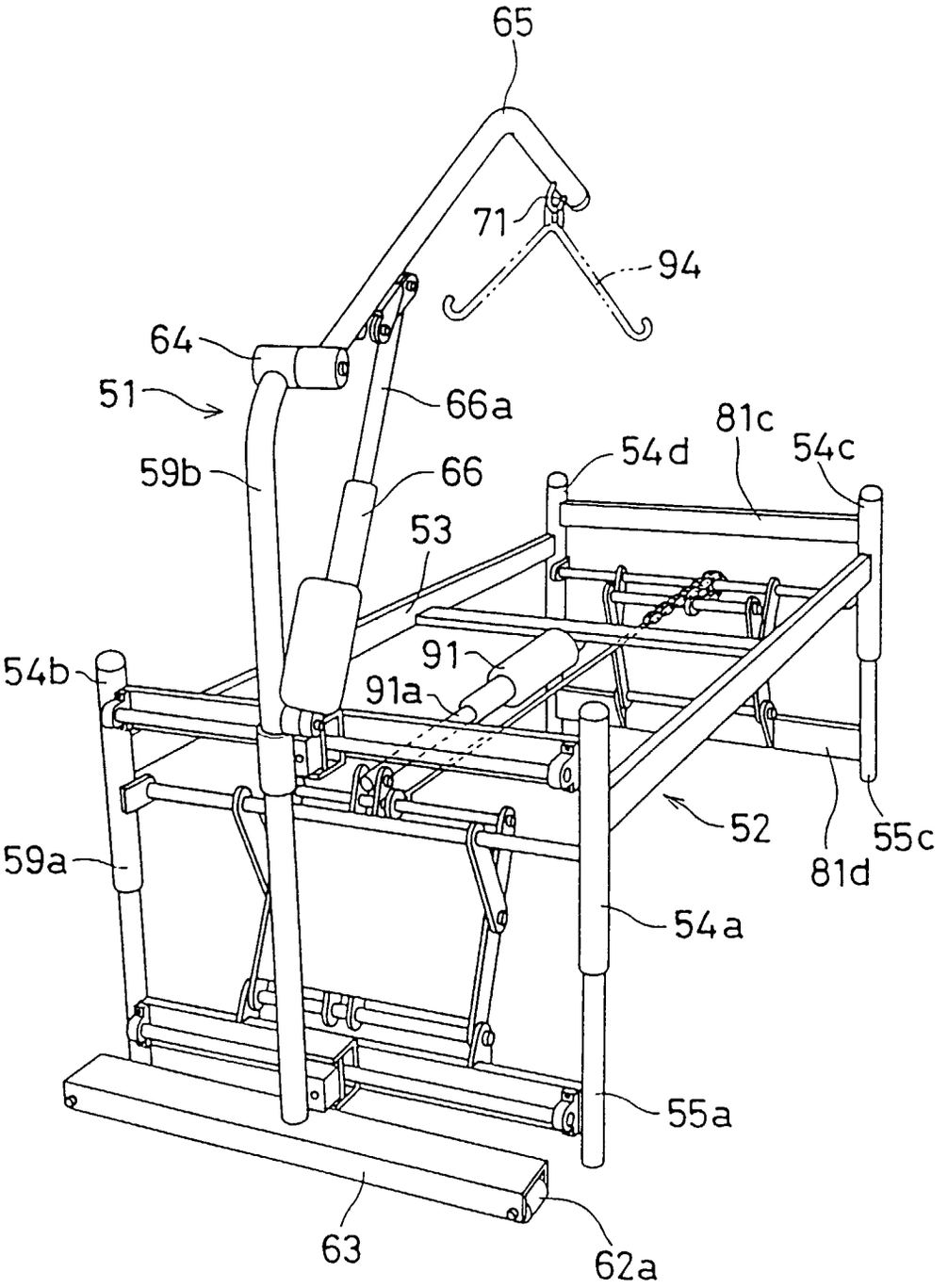
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FIG. 15

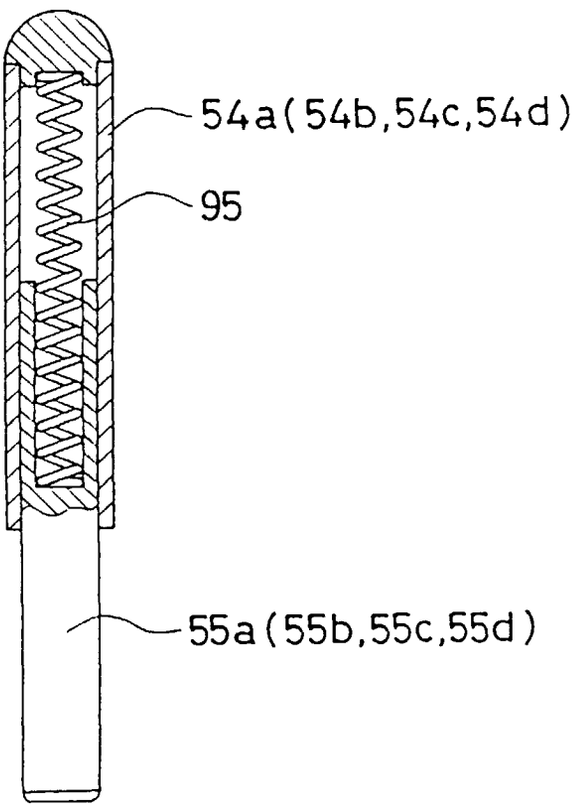

FIG. 16

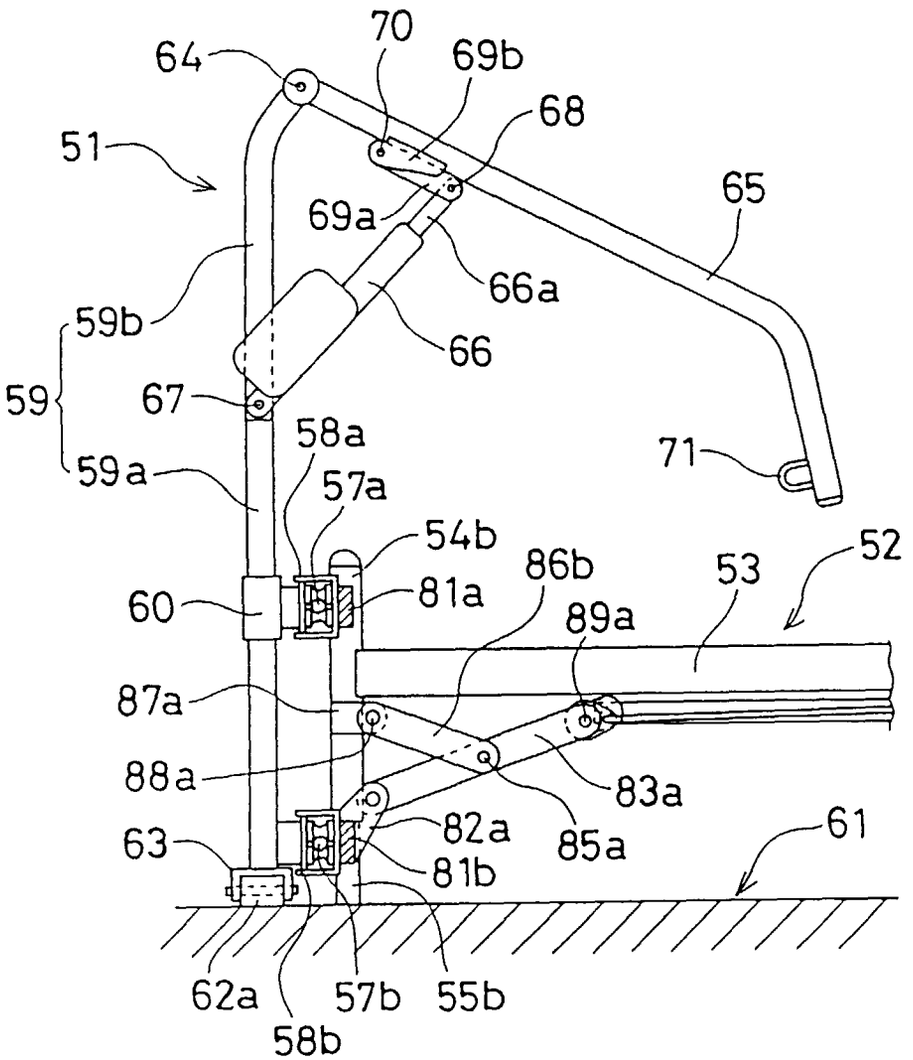
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FIG. 17

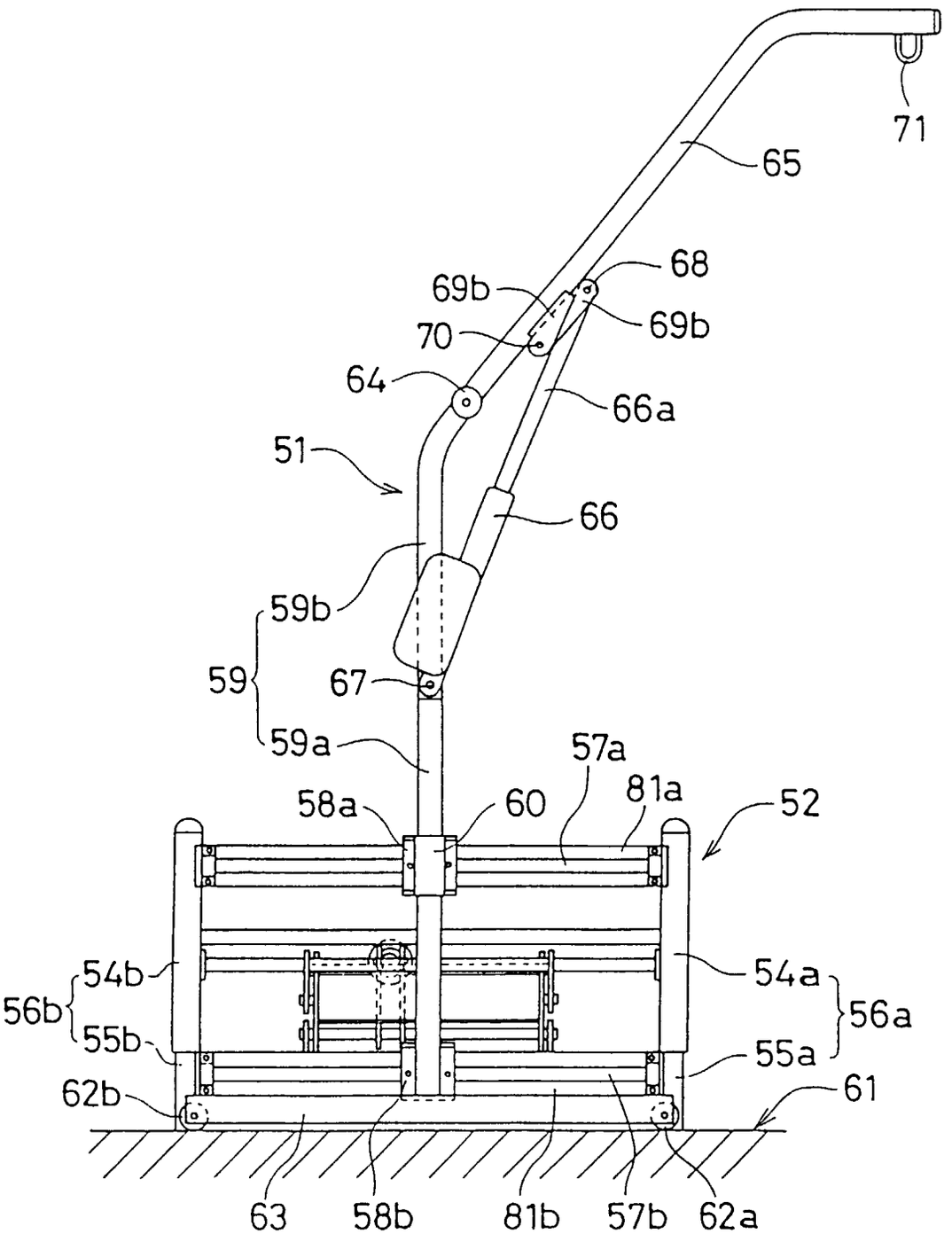
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FIG. 18

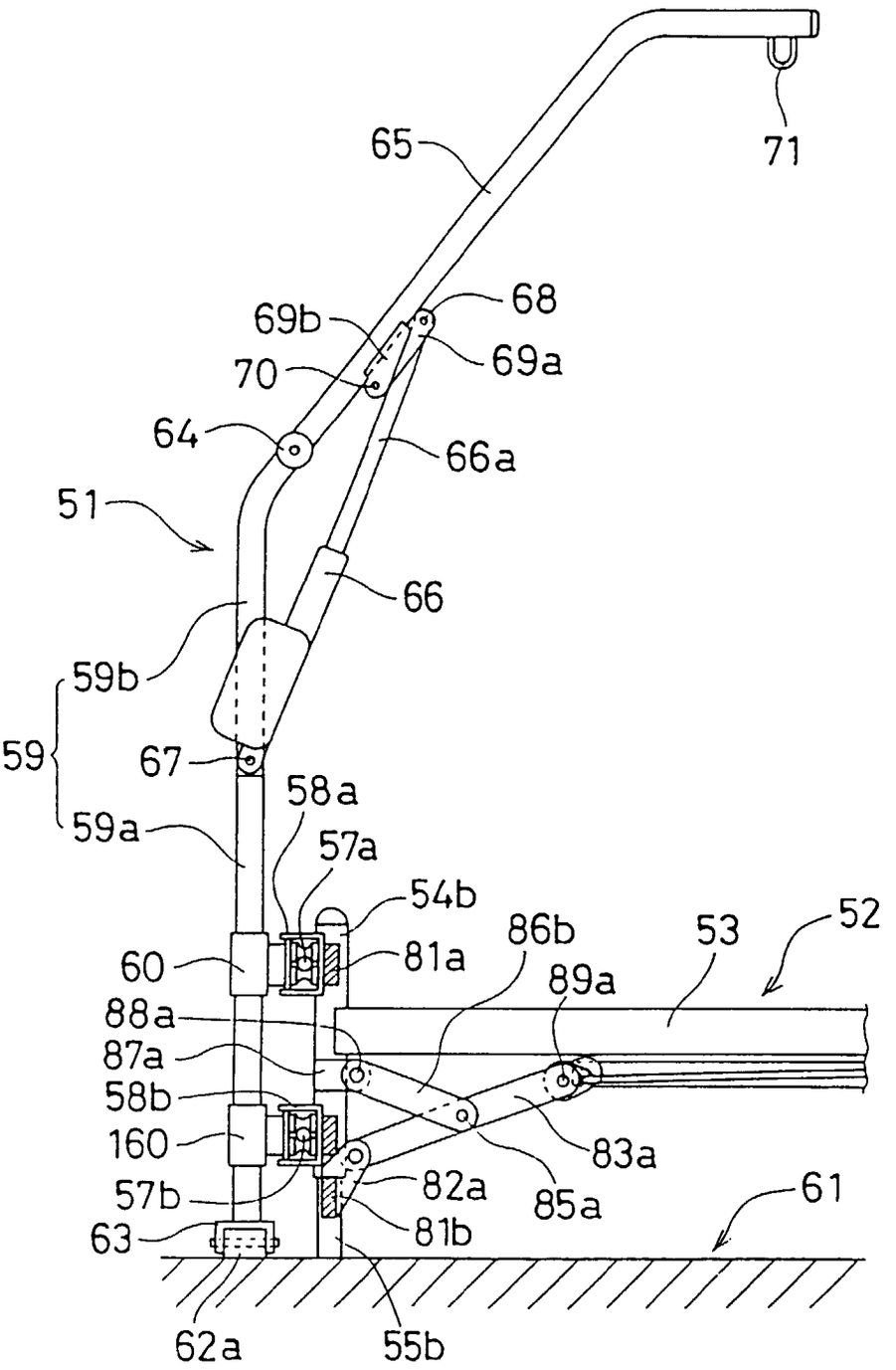
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FIG. 19

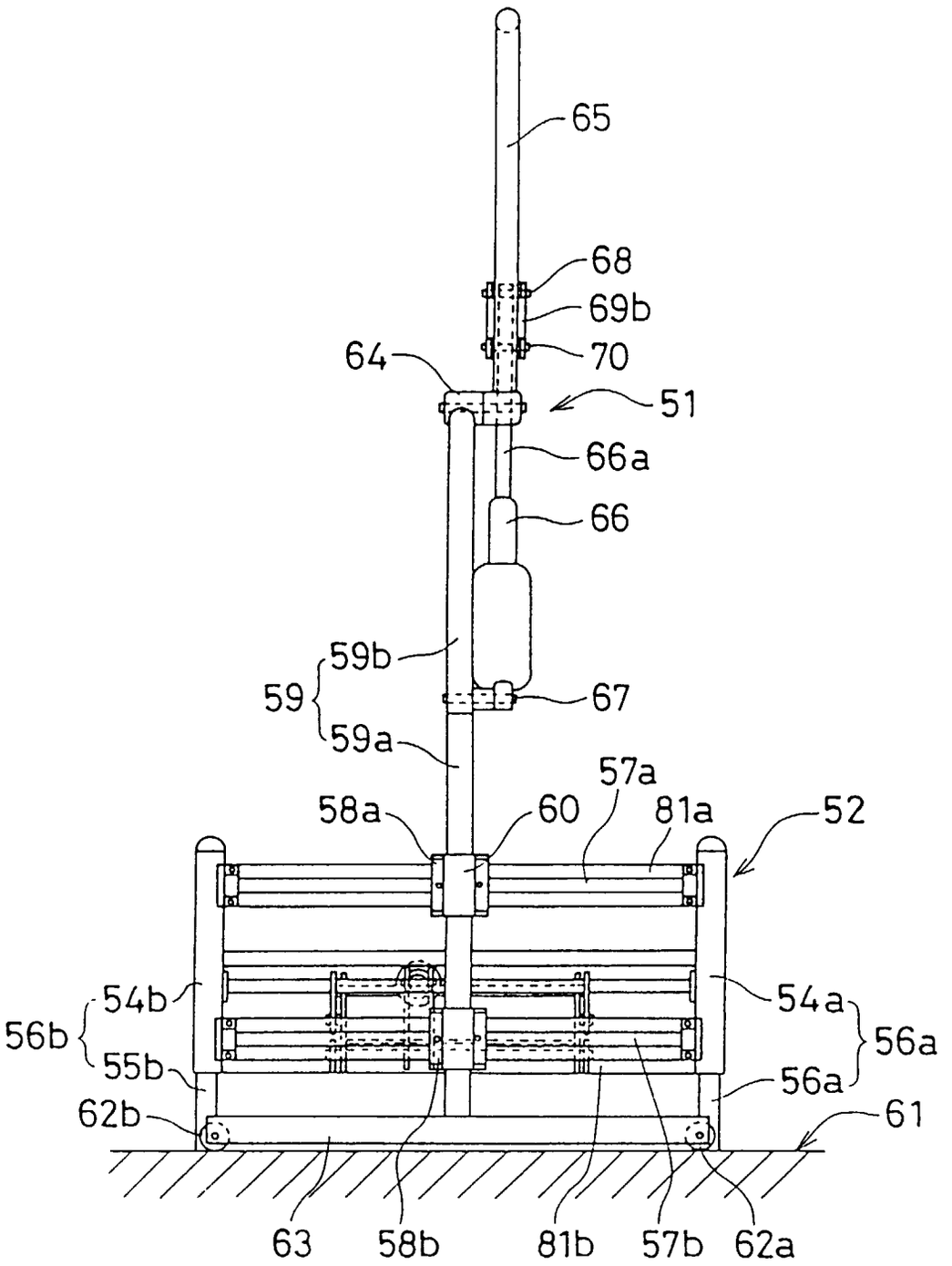
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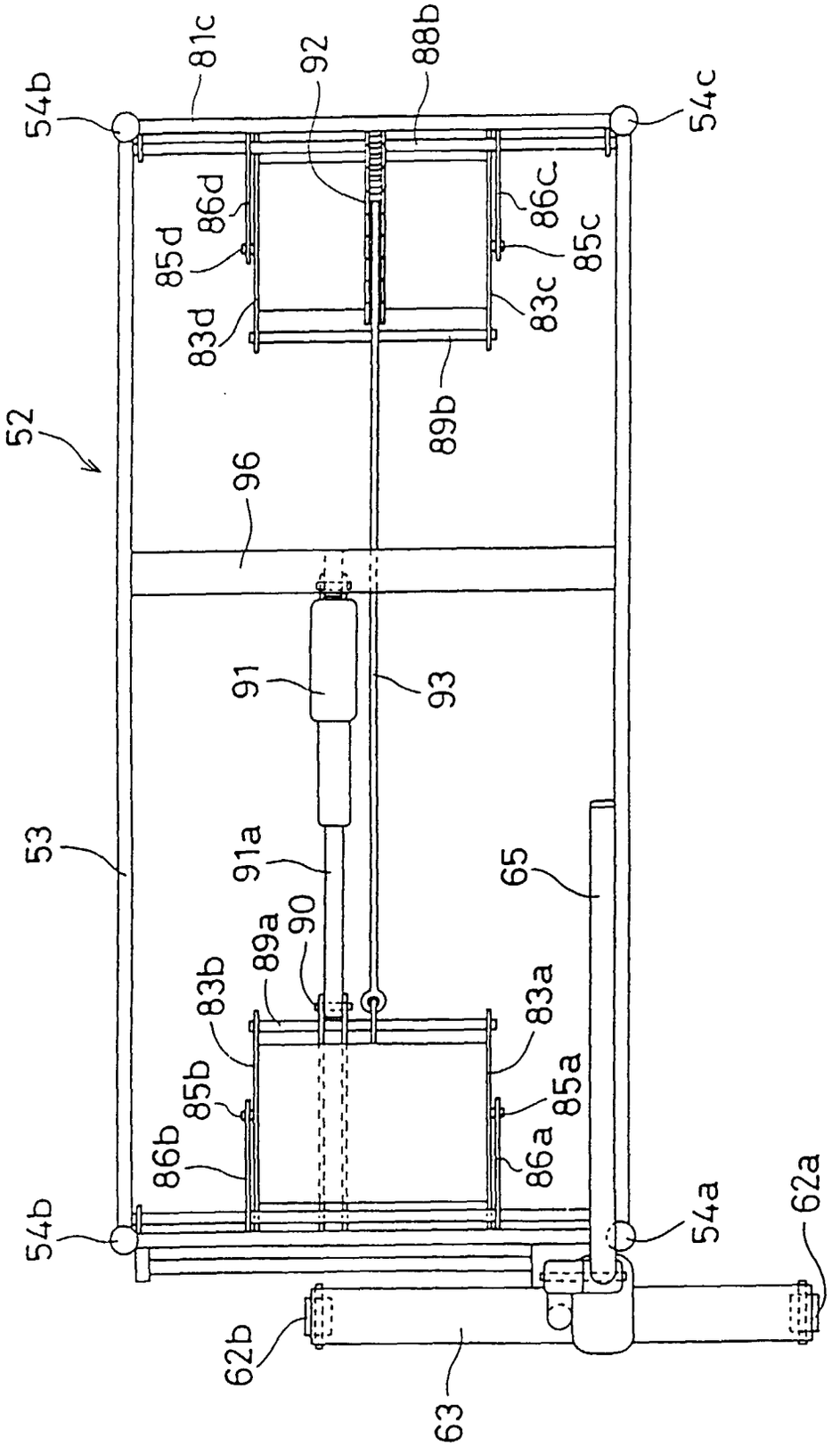
FIG. 20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