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(54) A side rail assembly for a bed or the like

(57) A lifting side rail mechanism for a bed or the like comprises at least one side rail frame (112) having at least two side rail members (113,114) pivotally mounted at each end of respective support arms (108) pivotally connectable to a bed base (102) or other fixed support (103) such that the side rail frame (112) can be moved by rotation of the support arms (108) between a service position with the side rail members (113,114) of the side rail frame (112) spaced from one another and above the plane of the bed base (102) and a lowered, stowed position, in which the upper side rail member is lowered to the same level as or below the plane of the bed base (102). The connections of the side rail members (113,114) to the support arms (108) are such that the separation of the side rail members (113,114) increases to a maximum as the support arms (108) are turned to move the side rail mechanism between the service and stowed positions and is less than this maximum in each of the service and stowed positions.

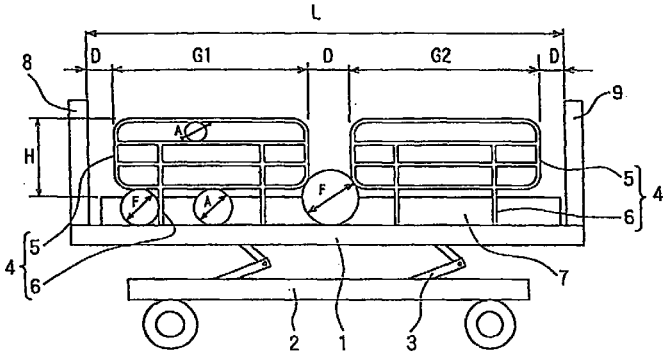

FIG 1

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Description

[0001] The present invention relates generally to side rails disposed to one side of a bed or the like for preventing the bedding such as a bed quilt or a user such as a patient from falling, and particularly a side rail assembly incorporating a lifting mechanism for liftable side rails, in which the side rails can be lifted and lowered between a raised service position in which it projects above the plane of the bed and a stored position below the plane of the bed.

[0002] As used in this specification the term "bed or the like" will be understood to include hospital trolleys, operating tables stretchers and any other structure incorporating a horizontal surface on which a user may lie. Conventional side rails for a bed or the like include a detachable side rail assembly in the form of a side rail frame and support columns which are inserted into sockets formed in the bed base for supporting the side rail in its service condition, and a liftable side rail in which a side rail in which a side rail frame is supported liftably by a lifting mechanism to be used in a raised position and stored in a lowered position to avoid disturbance by the top of the side rail frame. Known side rails also include a full side rail which extends along an entire side of a bed and a partial side rail which extends only part way along the side of a bed and requires other side rails to cover the whole of the side of a bed. Medical beds are specified with reference to the dimensions of respective portions by standards to allow their safe use. For example, for partial side rails, IEC specifies the dimensions of respective portions as described in more detail below.

[0003] One problem encountered with detachable side rails is where to store them when not in use. Liftable side rails do not suffer from this problem but prior art liftable side rails are bulky and project downwardly below the plane of the bed take to an unacceptable amount as will be discussed in more detail below.

[0004] The present invention seeks to provide a side rail structure which does not suffer from these problems. In particular this invention seeks to provide a liftable side rail mechanism, in which the side rails can be raised and lowered by the pivotal rotation of support arms between a raised, service position in which the side rails project sufficiently far above the plane of the bed to provide adequate security for a user while the distance between the bottoms of the side rails frames and the floor surface is nevertheless large enough when the side rail is in the stowed position to avoid any problems of encumbrance suffered by prior art side rails.

[0005] According to the present invention, therefore, a lifting side rail mechanism for a bed or the like is characterised in that it comprises at least one side rail frame having at least two side rail members pivotally mounted at each end to respective support arms pivotally connectable to a bed base or other fixed support such that the side rail frame can be moved by rotation of the support arms between a service position with the side rail members of the side rail frame spaced from one another and above the plane of the bed base and a lowered, stowed position, and in that the connections of the side rail members to the support arms are such that the separation of the side rail members increases to a maximum as the support arms are turned to move the mechanism between the service and stowed positions and is less than this maximum in each of the service and stowed positions.

[0006] In this side rail lifting mechanism, the pair of support arms connected with the horizontal side rail members lift and lower the side rail frame by the pivotal rotation of the support arms between a raised service position and a lowered stowed position.

[0007] In this motion, the connection points between the support arms and the side rail members are disposed in such a manner that the connection points of the upper side rail member move in relation to the connection points of the lower side rail member in such a way that the separation between the side rails first increases and then decreases as the side rail frames move from the service position to the stored position or vice versa. Hence the lifting stroke of the lowest side rail member can be made large to allow the heights of the rails in the stowed position and the service position to match the above described requirements.

[0008] Furthermore, the side rail frame becomes effectively smaller in vertical height at the stowed position than at the service position; thus the distance between the bottom of the side rail and the floor surface in the stowed position can be kept large while keeping the bed base height low and nevertheless keeping vertical height at the service position sufficiently high.

[0009] In this way the distance between the side rail members does not increase continuously in the motion from the stowed position to the service position, but becomes a maximum during this motion and becomes a little smaller again. Thus, it can be prevented that the gap between the respective side rail members becomes too large at the service position.

[0010] In the above side rail support mechanism, it is preferable that the plurality of side rail members are connected with the support arms, to form a parallel motion link mechanism. However, it is not necessarily required to form a perfect parallel motion link mechanism, and an adequate quadrilateral link mechanism can also be adopted.

[0011] In the side rail support mechanism of the invention, the side rail frames at each end of the bed can be lowered to by turning the arms towards the adjacent end of the bed so that the side rail frames themselves are stowed near respective ends of the bed.

[0012] One embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings in which:

Figure 1 is a side view illustrating a standard for dimensions of respective portions of partial side rails for a bed;

Figure 2 is a side view showing a bed to which a conventional partial side rail mechanism is fitted;

Figure 3 is a side view of a first embodiment of the invention showing a side rail mechanism fitted to a bed;

Figure 4 is an enlarged view illustrating the action of a part of the embodiment of Figure 3;

Figure 5 is a partial sectional view taken on the line V-V of Figure 4 showing a locking mechanism for holding the side rail in the service position or the stored position.

Figure 6 is a side view showing an alternative embodiment comprising a partial side rail mechanism for a bed.

Figure 7 is a schematic side view of a further alternative embodiment of partial side rail mechanism for a bed;

Figure 8 is a schematic side view of another alternative embodiment of a side rail mechanism for a bed; and

Figure 9 is a schematic side view of a further embodiment formed as a full side rail mechanism for a bed;

[0013] Before describing the embodiments of the present invention reference will be made to Figures 1 and 2 which show prior art structures useful for explaining the background to the present invention.

[0014] In Figure 1 symbol 1 denotes the base of a bed which is liftably supported above a support frame 2 by a link mechanism 3. The bed base 1 is raised and lowered by a drive mechanism not illustrated. Symbol 4 denotes a partial side rail which is supported by a support mechanism at one side of the bed base 1 in its service position. Two such partial side rail 4 are installed side by side, to cover the whole of one side of the bed base. Each of the partial side rails 4 consists of a side rail frame 5 and legs 6 which are inserted into fitting holes (not illustrated) formed at the side of the bed base 1. As for other illustrated components, symbol 7 denotes a mattress placed on the bed base 1; 8, a head board; and 9, a foot board.

[0015] The specified dimensions of the respective portions shown in Figure 1 are described below.

[0016] The dimension indicated by A represents the dimension of each closed space formed in the side rail frame 5 of the side rail 4. The dimension of each space A is specified to be 120 mm or less, to prevent the head of the user from entering into the space.

[0017] The dimension indicated by D is the dimension of the gap between two adjacent side rail frames 5 and the head board 8 or foot board 9. The dimension of any of these gaps is specified to be 60 mm or less to prevent the neck of the user from entering into the gap, or to be 235 mm or more, to prevent the head from being caught in the gap.

[0018] The dimension indicated by F is the dimension of the gap between the bottom of a side rail frame 5 and the bed base 1. The dimension of this gap is specified to be 120 mm or less to prevent the head from entering into the gap when there is no risk of the neck entering into it or to be 60 mm or less to prevent the neck from entering the gap below the side rails frame 5 when the neck can enter into it.

[0019] G1 and G2 indicate the horizontal lengths of the side rail frames 5 of the respective side rail assemblies 4, and are specified to satisfy a formula of $G1 + G2 > L/2$, where L is the total length L of the bed base 1.

[0020] The dimension indicated by H is the height of the side rail frames 5, that is the dimension between the upper surface of the mattresses 8 and the tops of the side rail frame, being specified to be 220 mm or more.

[0021] The dimensions of respective portions of the partial side rail assemblies described above are applied also when liftable side rails are used at a lifted position.

[0022] A prior art example of a liftable side rail, particularly a partial side rail is described below with reference to Figure 2.

[0023] In Figure 2, symbol 11 generally denotes a bed equipped with liftable side rails. In this drawing, the structure of the bed is not illustrated in detail, some components only being indicated by chain lines.

[0024] Symbol 12 denotes a bed base intended to have a mattress (not illustrated) placed on it. The bed base 12 is divided into four portions 12a 12b, 12c and 12d respectively corresponding to the back, waist, thigh and legs of the user. They are pivotally connected together to allow pivotal rotation. The bed base 12 is supported on a base support frame 13 to which the portion 12b is fixed. The bed base portions 12a and 12c are pivotally connected to the portion 12b as described above, and turnable about their pivotal connection by boost arms 14 and 14c which are components of a drive mechanism (not illustrated since it is well-known).

[0025] The bed base support frame 13 is supported by any appropriate support mechanism (not illustrated) on the floor 15. For example, the support frame 13 may be supported at a predetermined height by stands or may be liftably supported by a lifting link mechanism above a base as shown in Figure 1. In Figure 2, symbol 16 denotes a head board, and 17, a foot board.

[0026] Two pairs of support arms 18a and 18b are pivotally mounted on the bed base support frame 13 and at their free ends they are pivotally connected to side rail frames 19a and 19b, connected to form a parallelogram link mechanism. The support arms 18a and 18b may alternatively be pivotally rotatably supported on the bed base portions 12a, 12c, etc, rather than the bed base support frame 13.

[0027] The side rails frames 19a and 19b can be lifted and lowered by the pivotal motion of the support arms 18a and 18b turning in parallel. The lowered posi-

tion is the stowed condition, and the lifted position is the service condition. The side rail frames 19a and 19b are shown schematically by their outline only, but have components such as lattice members to satisfy the above-mentioned standard dimensions, and though the locking mechanism for handling the frames in the service position and the stowed position is not illustrated, any well-known adequate mechanism can be used for this purpose.

[0028] The liftable side rails, the side rail frames and the lifting mechanism must all conform to the standard dimensions as described above in the service position. However, also in the stowed position, there are desirable dimensions in view of convenience.

[0029] That is, in the use of the bed shown in Figure 2, when the side rails are held at the stowed position, it can happen that an attendant nurses the user such as a patient lying on the bed, or that the table of a movable bed side table is moved and located above the bed. In the former case, it can happen that the attendant needs to position his/her legs into the gap between the bottom of the side rail frames in the stowed position and the floor 15 of the sickroom etc, in the latter case, the base of the bedside table is moved into this gap. It is thus desirable that the gap is as large as possible, and as can be seen in Figure 2 in the prior art side rails this gap is small and the space is obstructed by the lower parts of the side rail frames.

[0030] On the other hand, recently there is a tendency to keep the bed base height low, because of various advantages; for example a user such as a patient can easily get on and off the bed and sit at the edge of the bed base 12 and the attendant can more easily nurse if the bed is low in deck height.

[0031] Liftable side rails, the side rail frames of which can be raised and lowered in parallel by the pivotal rotation of support arms, involve a contradictory challenge to keep the bed base height low, while keeping the distance h between the bottoms of the side rail frames and the floor surface large. This is because if it is attempted to keep the distance h between the bottoms of the side rail frames and the floor surface large while keeping the height H of the side rail frames shown in Figure 1 sufficiently high (this is necessary for safety), the positions where the support arms are fixed, hence the position of the bed base must be kept high.

[0032] Hitherto these dimensions, which are set for safety reasons, have made it very difficult to keep the distance h between the bottoms of the side rail frames and the floor surface large while keeping the bed base height low, and at the same time keeping the height H of the side rail frames sufficiently high in the service position.

[0033] Referring now to Figure 3, there is shown a first embodiment of the invention in which a lifting side rail mechanism of this invention is shown in relation to a bed. In Figure 3, symbol 101 generally denotes a bed. In the drawing, the detailed structure of the bed is not illustrated, some components only being indicated by a double dash chain line.

[0034] Symbol 102 denotes a bed base on which in use a mattress (not illustrated) is placed; the base 102 is divided into four bed base portions, 102a, 102b, 102c and 102d respectively corresponding to the back, waist, thigh and legs of the user. They are connected to allow pivotal rotation about their respective connections. The bed base 102 consisting of these bed base portions is supported by a bed base support frame 103. Particularly, the bed base portion 102b is supported on the bed base support frame 103 and the bed base portions 102a and 102c are pivotally rotatably connected to it as described above, so as to be displaceable by an adjustment mechanisms (not shown) into inclined positions to allow a patient to adopt a partly recumbent position.

[0035] The bed base support frame 103 is supported by any known support mechanism on the floor 105 of a room, a cubicle or the like. The support mechanism is not illustrated. For example, the bed base support frame 103 may be supported at a predetermined height by stands or may be supported by a lifting link mechanism above a base as shown in Figure 1. The symbol 106 in Figure 3 denotes a head board, and 107 denotes a foot board. Relative positions of parts of the side frame will hereinafter be described in relation to their proximity (or otherwise) to the head end of the bed at which the headboard 106 is located or the foot end of the bed at which the footboard 107 is located. The side rail is formed as two side rail assemblies. Each side rail assembly comprises a side rail frame 112 comprising two side rail members 113, 114, supported on a respective pair of support arms 108. As seen in Figure 3 the side rail assembly to the left will be referred to as the head end assembly and that on the right as the foot end assembly. Each support arm 108 is carded pivotally rotatably about a pivot axis extending transversely of the length of the bed 101. The pivot points about which these support arms 108 turn are indicated 109 in the drawing. In the following description like components are indicated by the same symbols for the sake of convenience.

[0036] Each of the support arms 108 is cranked at an intermediate point or elbow to form a lower arm portion 110 and an upper arm portion 111. The terms "upper" and "lower" refer to the orientation of the arms 108 when the side rails are in the service position as will be described in more detail below.

[0037] When the side rail frames 112 are raised to their service position, the cranked support arms 108 at the head end assembly are orientated with their elbows pointing towards the headboard 106 while the arms 108 of the foot end assembly are oriented so that their elbows point towards the footboard 107. As can be seen in Figure 3 when turned to the stored position the elbows of the support arms 108 both point downwardly. The significance of this configuration will be explained below.

[0038] Thus, the support arms 108 on the head end side rail assembly are designed to turn clockwise as the side rail assembly is raised to its service position and to turn counterclockwise to descend to the stowed position. On the other hand, the support arms 108 on the foot end side rail assembly are designed to turn clockwise to descend to the stowed position and counterclockwise to be raised to the service position.

[0039] The lower side rail member 114 is pivotally connected at the elbow of the arm 108 by a pivot 115, and the upper side rail member 113 is pivotally connected to the free end of the upper arm portion 111 at pivot points 116. These pivotal connection points 115 and 116 and the above pivotal connections 109 have appropriate pivot mechanisms to allow pivotal motion.

[0040] The lower side rail member 114 of the head end side rail frame 112 has an outer profile which is smaller in vertical height at the head end, that is to the left side as viewed in Figure 3, than the foot end thereof to form relatively narrower and wider portions at the left and right ends respectively, separated by a step 117 between these left and right portions. Furthermore the upper side rail member 113 of the head end of the side rail frame 112 has an outer profile larger in vertical height towards the head end than towards the foot end, and having a step 118 between respective narrower and wider parts.

[0041] The foot end side rail frame 112 has side rail members of mirror image form to those of the head end side rail frame.

[0042] In Figure 3 the components of the head end side rail frame in the service position are shown in solid lines, and the components of the side rail frame in the stowed position are shown in single dash chain lines. However, at the foot end, the components of the side rail frame in the service position are shown in chain lines and the components of the side rail frame held in the stowed position are shown in solid lines.

[0043] As can be seen in Figure 3, when a side rail frame 112 is in the service position, the lower side rail member 114 and the upper side rail member 113 are disposed with a predetermined distance between them, while the narrow part of the lower side rail member 114 faces the wide part of the upper side rail member 113, while in the stowed position, the lower side rail member 114 and the upper side rail member 113 are disposed with a predetermined distance between them and the narrow part of the lower side rail member 113 faces the narrow part of the upper side rail member 113.

[0044] Thus, the distance from the top edge of the upper side rail member 113 to the bottom edge of the lower side rail member 114, that is the vertical height of the side rail frame 112 is smaller in the stowed position than in the service position.

[0045] The motion of the components of the side rail frame in moving from the stowed position to the service position and back, and the mechanism for holding the side rail frame at the stowed position or the service position is described below with reference to Figure 3, 4 and 5 in which the components shown in Figure 4 and 5 corresponding to those of Figure 3 are indicated by the same symbols, to avoid double explanation. However, in Figure 4, in addition to the illustration of the side rail frame at the stowed position and the service position, the components of the side rail frame at an intermediate position between these two are indicated by broken lines.

[0046] The mechanism for holding the side rail frame 112 in position will first be described with reference to Figure 5 in which symbol 119 denotes a locking pin set in the lower side rail member 114, so that it can protrude towards the arm 108. A compression coil spring 120 urges the locking pin 119 to protrude and it can be retracted by pulling a control knob 121. A hole 122 into which the locking pin 119 can be introduced is formed in the upper arm portion 111.

[0047] As can be seen in Figure 4 a hole 123 is also formed in the lower arm portion 110 (though not illustrated in Figure 5) to receive the locking pin when the side rail frame is in the stowed position). The holes 122 and 123 are located on the same circle around the connection point 115.

[0048] In the raised position shown in solid lines in Figure 2, the locking pin 119 is fitted in the hole 122 of the upper arm portion 111, and because of it, the support arm 108 cannot be turned about the connection point 115 with respect to the lower side rail member 114. For this reason, the lower side rail member 114, the pair of support arms 108 and the upper side rail member 113, which are components of a quadrilateral link mechanism, are held in the position shown in a solid line in Figure 4; this is the service position of the side rail frame 112.

[0049] In this service position the vertical distance between the upper side rail member 113 and the lower side rail member 114 is kept at a predetermined value, and thus, the height of the side rail frame 112 can be set at a height in conformity with the standard.

[0050] To move the side rail frame 112 from the service position to the stowed position, the control knob 121 is first pulled to retract the locking pin 119 from the hole 122. As a result, the support arms 108 as components of the quadrilateral link mechanism can now be pivotally turned about the connection points 115, 116 relative to the two side rail members 113, 114. The support arms 108 may be pivotally turned, for example, by manually manipulating a handling portion 124 provided at the top of the side rail member 113, to allow the upper and lower side rail members 113 and 114 to be lowered towards the stowed position, in which movement the pivot points 115, 116 follow arcuate loci as shown by the arcuately curved double arrows A, B in Figure 4.

[0051] As the two support arms 108 are rotated counterclockwise, the lower side rail member 114 descends, remaining in a horizontal orientation, with each end travelling along the arcuate path followed by

the connection points 115 at the elbows of the arms 108 as represented by the double arrows B. Likewise, the upper side rail member 113 descends in a horizontal orientation, with each end travelling along the arcuate paths followed by the connection points 116 with the upper arm portions 111, as represented by the double arrows A.

[0052] In this case the downward component of the movement of the upper rail member 113 lags behind the corresponding component of the motion of the lower side rail member 114 due to the fact that as the upper arm portions 111 are pivotally rotated relative to the lower side rail member 114 considering the connection points 115 as the fulcra, the inclination of the upper arm portions 111 with respect to that of the lower arm portions 110, due to the cranked elbow at the point where these two portions meet, results in the upper side rail member 113 and the lower side rail member 114 initially moving apart.

[0053] That is, although the lower side rail member 114 progressively descends along the loci of the pivot points 115 to the lower arm portions 110, the upper side rail member 113 first moves gradually upward in relation to the lower side rail member 114 due to the rotation of the upper arm portions 111 from an inclined to a vertical orientation. The upper side rail member 114 when the upper arm portions 111 are vertical is indicated by the broken lines in Figure 4. Thereafter, the upper side rail member 113 gradually approaches the lower side rail member 114 as they both descend while gradually moving horizontally to the left of Figure 4 to reach the positions indicated by the chain lines in the drawing.

[0054] At this lowermost position, the locking pins 119 corresponds to the holes 123 in the lower arm portions 110, and are urged to enter the holes 123 by the resilience of the compression coil springs 120. Thereafter the support arms 108 cannot be pivotally rotated relative to the lower side rail member 114. The upper side rail member 113 and the lower side rail member 114 are thus held at the lowered position, namely the stowed position of the side rail frame 112.

[0055] The side rail frame 112 can be relocated from the stowed position to the service position by an action in reverse to the above.

[0056] In this embodiment, the connection points 115 and 116 between the upper and lower side rail members 113 and 114 and the support arms 108 are disposed to ensure that the vertical separation between the connection points 115 and 116 increases to a maximum during the ascending and descending motion of the side rail members 113 and 114 due to the pivotal motion of the support arms 108 as described above. The distance between the top edge of the upper side rail member 113 and the bottom edge of the lower side rail member 114 does not increase continuously in the movement from the stored position to the service position, but becomes a maximum and then becomes smaller again. Thus the distance between the bottom edge of the upper side rail member 113 and the top edge of the lower side rail member 114, that is the gap between the respective side rail members 113 and 114 is not too large in the service position.

[0057] Figure 6 shows a second embodiment, in which the lifting side rail mechanism of this invention is fitted to a bed. This second embodiment is generally different from the first embodiment in that the upper side rail member and the lower side rail member are of differen shape, and the elbows of the support arms 108 of both the head end and the foot end side rail frames point in the same direction so that the horizontal component of motion of the head end and foot end are both the same. Otherwise this embodiment is generally similar to that of Figures 3 to 5. In this drawing, therefore, the same components as those of the first embodiment are indicated by the same symbols, to avoid double explanation.

[0058] In this embodiment the side rail frames 112 both at the head end 106 and the foot end 107 each comprise an upper side rail member 113 and a lower side rail member 114, but these side rail members 113 and 114 are formed as straight elongate horizontal beams. They do not have any narrower or wider portions like the embodiment of Figures 3 to 5. Each beam 113 has a rail 124 attached to each end thereof at which ends the side rail members 113, 114 are pivotally connected to the support arms 108 at the points 116, 115 respectively.

[0059] The relative movements of the upper and lower side frame members 113, 114 in moving from the raised service position to the lowered stowed position are the same as in the embodiment of Figures 3 to 5 and will not be described again.

[0060] Figure 7 illustrates a third embodiment of the invention, in which the lifting side rail mechanism is shown fitted to a bed. The third embodiment is different from the second embodiment only in that the support arm 108 at the head end of the side rail assembly is pivotally attached to the head end part 102b of the bed base 102 itself rather than to the support frame 103 as in the previous embodiments. Thus as can be seen in Figure 7, the head end side rail frame 112 can be used in the service position, not only when the bed base portion 102a is horizontal, but also when the bed base portion 102a is raised by pivotal rotation.

[0061] Figure 8 shows a fourth embodiment of side rail lifting mechanism of this invention, shown fitted to a bed. The fourth embodiment is different from the other embodiments in the shape and number of side rail members of a side rail frame 112 and in the form of the support arms of the side rail assembly and is the same in all other respects. As before, the same components as those of the other embodiments are indicated by the same reference symbols, to avoid double explanation.

[0062] In this embodiment, each of the side rail frames 112 consists of three rail members 201, 202 and 203, carried by support arms 204 in the form of triangu-

lar plates in place of the cranked arms in the embodiments of Figures 3 to 7, each connected at a respective pivotal connection point 205, 206, 207 spaced along the edge of the triangular plate which is inclined and uppermost when in the service position.

[0063] In this embodiment, as illustrated, the connection points 205, 206 and 207 between the triangular support plates 204 and the side rail members 201, 202 and 203, pass through a position of greater separation as the rails 201, 202 and 203 are lowered by turning the support arms 204 about the connection points 109 with the bed base support frame 103.

[0064] Figure 9 illustrates a fifth embodiment of lifting side rail mechanism shown fitted to a bed. The fifth embodiment is similar to the fourth embodiment illustrated with reference to Figure 8, but differs from that embodiment in that whereas the other embodiment comprises two partial side rail frames the fifth embodiment comprises a single rail frame which extends over substantially the whole length of one side of the bed. Again, in Figure 9, the same components as those of the fourth embodiment are indicated by the same reference symbols, to avoid double explanation.

[0065] In this embodiment, the rails 201 and 202 and 203 are longer and pivotally supported by a pair of triangular support arms 204 respectively adjacent the head board 106 side and the foot board 107 to constitute a full side rail frame. This embodiment functions in substantially the same way as the embodiment of Figure 8 and will not be described in more detail here except to say that because of the length of the rails 201, 202, 203 of a number of connecting links 208 are connected, as shown in Figure 9, at intermediate positions along the rails 201, 202 and 203, to form a parallelogram link mechanism. The connecting links 208 reinforce the long rails 201, 202 and 203 and allow the support arms to be smoothly pivotally rotated to raise and lower the side rails.

[0066] A lifting side rail formed as an embodiment of the present invention has the advantage that the side rail frame maintains the same horizontal orientation as it is raised or lowered by the pivotal rotation of support arms. The conflicting challenge of keeping the bed base height low and at the same time maximising the distance between the floor and the bottom edge of the side rail frame in the stowed position can be solved so that even a bed with a low bed base height can have a side rail frame with a sufficient height which nevertheless allows the distance between the bottom edge of the side rail frame and the floor surface to be kept large.

[0067] The pattern of the ascending and descending motion of a plurality of side rail members can be varied as desired by varying the connection points between support arms and the respective side rail members.

Claims

1. A lifting side rail mechanism for a bed or the like, characterised in that it comprises at least one side rail frame (112) having at least two side rail members (113,114) pivotally mounted at each end on respective support arms (108) pivotally connectable to a bed base (102) or other fixed support (103) such that the side rail frame (112) can be moved by rotation of the support arms (108) between a service position with the side rail members (113,114) of the side rail frame (112) spaced from one another and above the plane of the bed base (102) and a lowered, stowed position, and in that the connections (115,116) of the side rail members (113,114) to the support arms (108) are such that the separation of the side rail members (113,114) increases to a maximum as the support arms (108) are turned to move the side rail mechanism between the service and stowed positions and is less than this maximum in each of the service and stowed positions.

2. A lifting side rail mechanism according to Claim 1, characterised in that the connection points (115,116) between the support arms (108) and the respective side rail members (113,114) at each end thereof are disposed in a line which is inclined to the vertical when the side rail mechanism is in its service position and passes through a vertical orientation upon moving from its service position to its stowed position.

3. A lifting side rail mechanism according to Claim 1 or Claim 2, characterised in that said side rail members (113,114) are connected to the support arms (108), to form a parallelogram link mechanism.

4. A lifting side rail mechanism according to any of Claim 1 to 3, characterised in that the side rail frame (112) comprises two side rail members (113,114) positioned one above the other, and each having a profile shape comprising a first, narrower part and a second wider part, the profiles being complementary such that the narrower part of the upper side rail member (115) overlies the wider part of the lower side rail member (114) in the service position.

5. A lifting side rail mechanism according to any of Claims 1 through 3 characterised in that the side rail frame (112) has three or more side rail members (201, 202, 203).

6. A lifting side rail mechanism according to Claim 5 , characterised in that an extra connecting link (108) is connected between intermediate points of the side rail members (201, 202, 203), to form a parallel motion link mechanism together with the support arms (204) at both ends of the side rail members.

7. A lifting side rail mechanism according to any of

Claims 1 to 6, characterised in that the support arms (108) are connected with the ends of the respective side rail members (201, 202, 203).

8. A lifting side rail mechanism according to any of Claims 1 to 7, characterised in that each of the support arms (108) is cranked with an elbow pointing towards the adjacent end (106, 107) of the bed, the pivotal connection (109) to the bed base being such that the support arm (108) turns in the direction of the elbow in moving from its service to its stowed position.

9. A lifting side rail mechanism according to any of Claims 1 to 7, characterised in that each of the support arms is formed as a plate (204) pivotally connected to the bed or a fixed frame and to the side rail members (201, 202, 203).

10. A lifting side rail mechanism according to any of Claims 1 to 9, characterised in that two side rail frames (112) are provided along one side of the bed.

11. A lifting side mechanism according to Claim 10, characterised in that the side rail frames (112) move towards the respective adjacent end (106,107)of the bed as they are turned to their stowed position.

12. A lifting side rail mechanism according to any of Claims 1 to 9, characterised in that one side rail frame (112) is provided along one substantially the whole of one side of the bed.

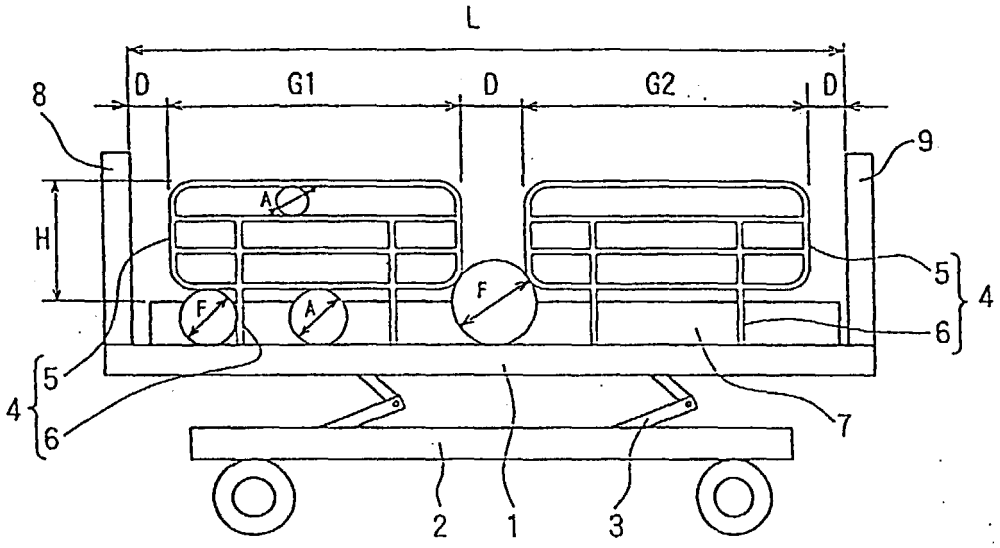

FIG 1

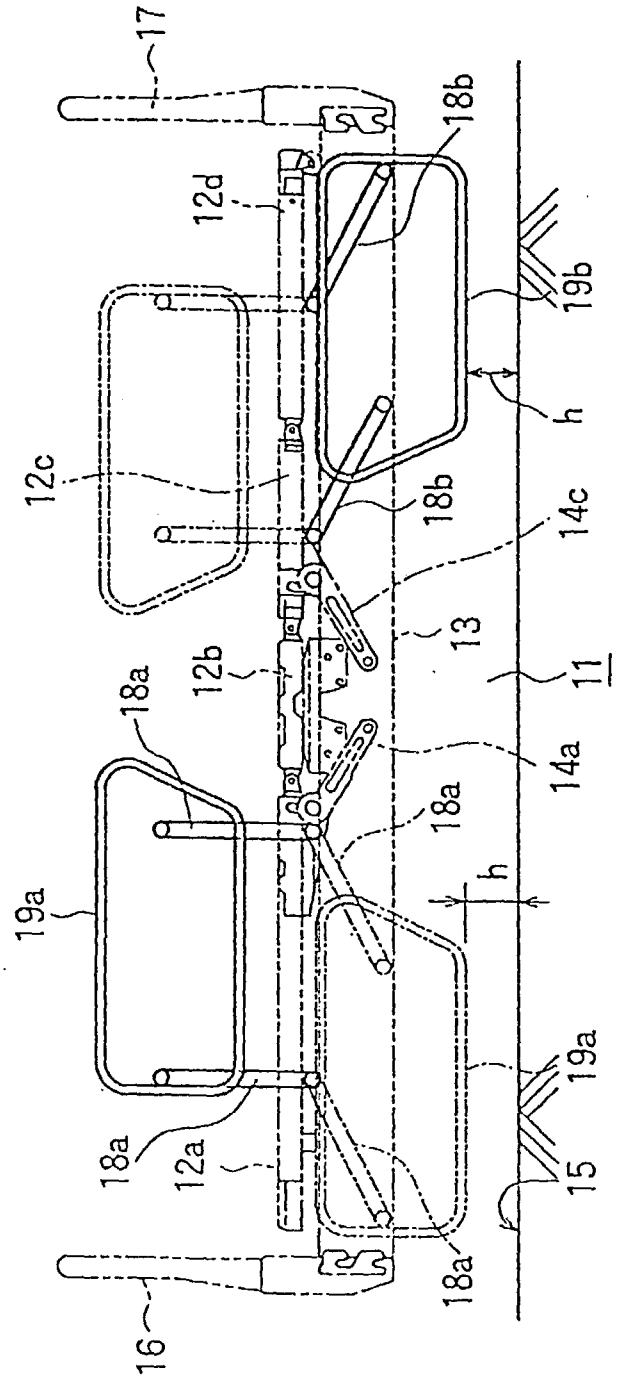
17
18b
12d
19b
h
12c
18b
14c
13
12b
11
18a
14a
18a
19a
h
19a
18a
12a
15
18a
16

FIG 2

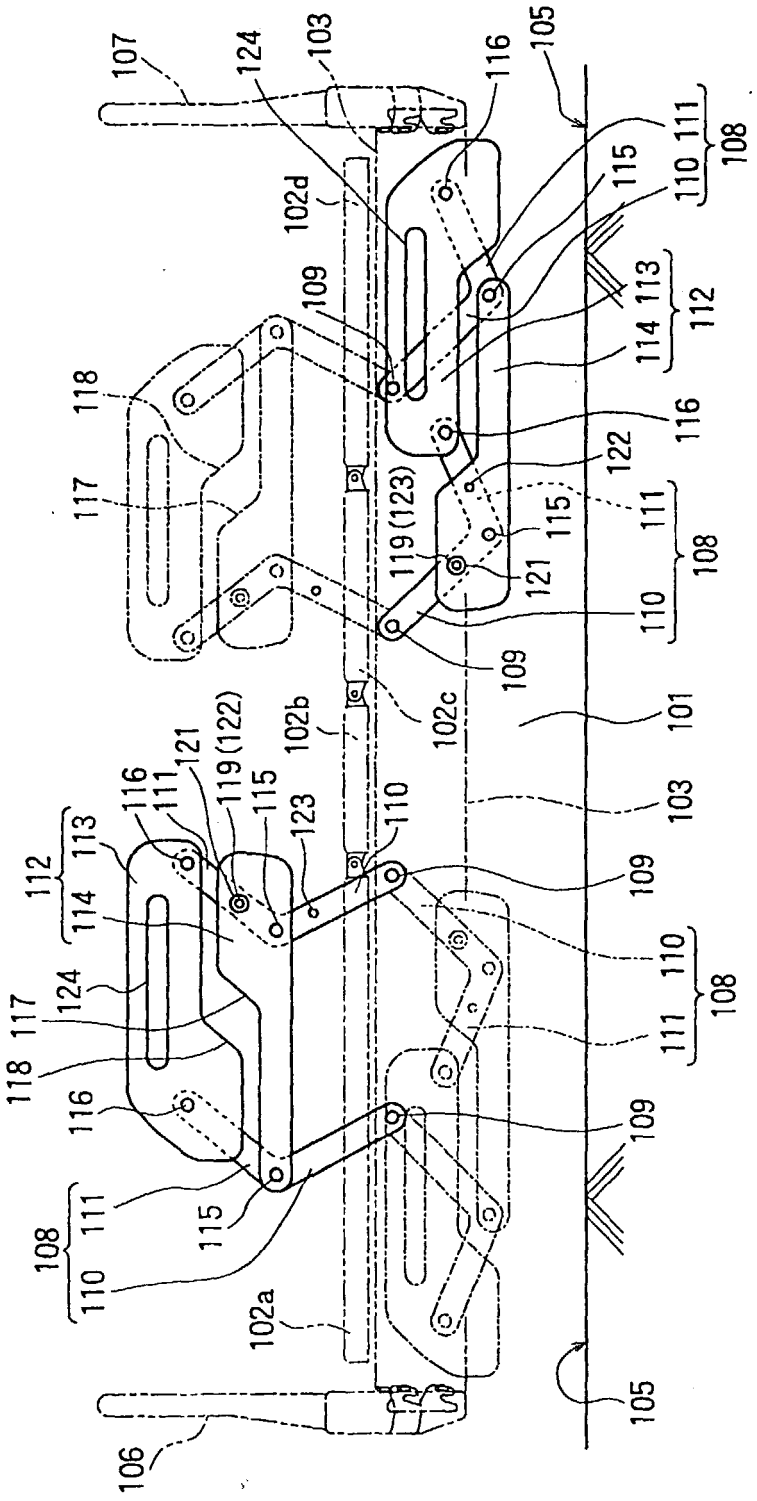
107
124
103
116
105
102d
109
118
117
119(123)
121
115
122
111
108
110
102c
101
102b
119(122)
123
112
113
114
124
118
117
116
115
102a
106

FIG 3

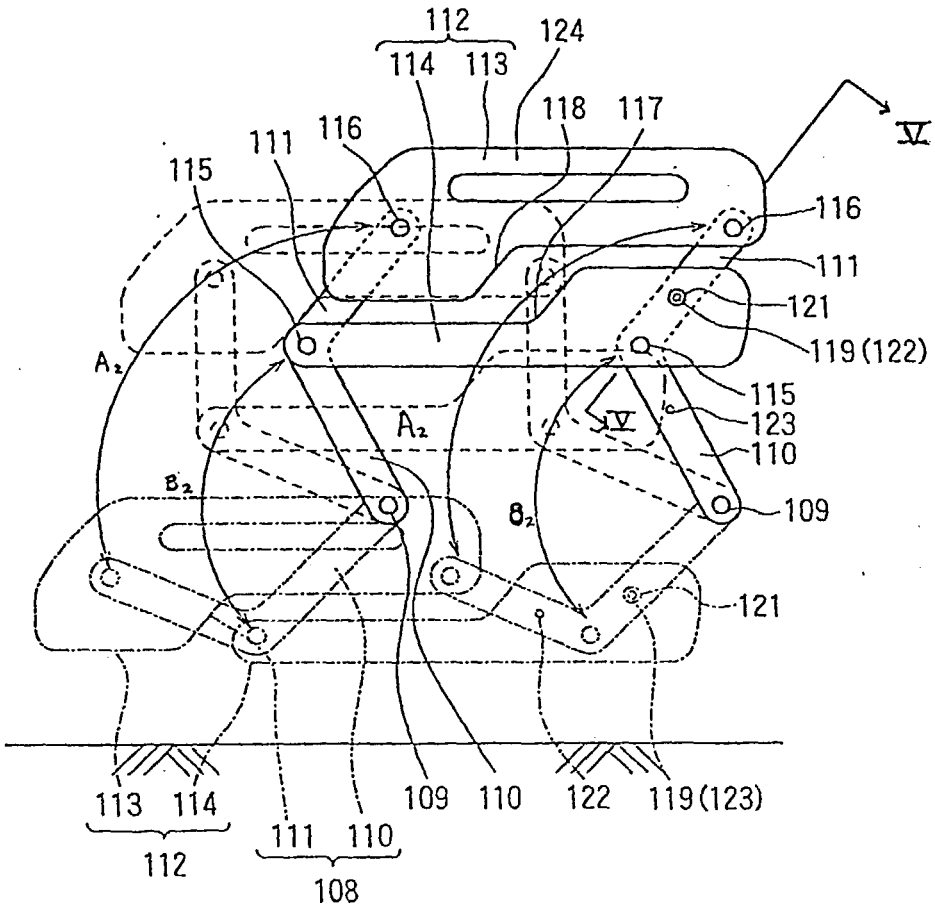
112
114
113
124
118
117
111
116
115
V
116
111
121
119(122)
A2
A2
V
115
123
110
B2
B2
109
121
113
114
112
111
110
108
109
110
122
119(123)

FIG 4

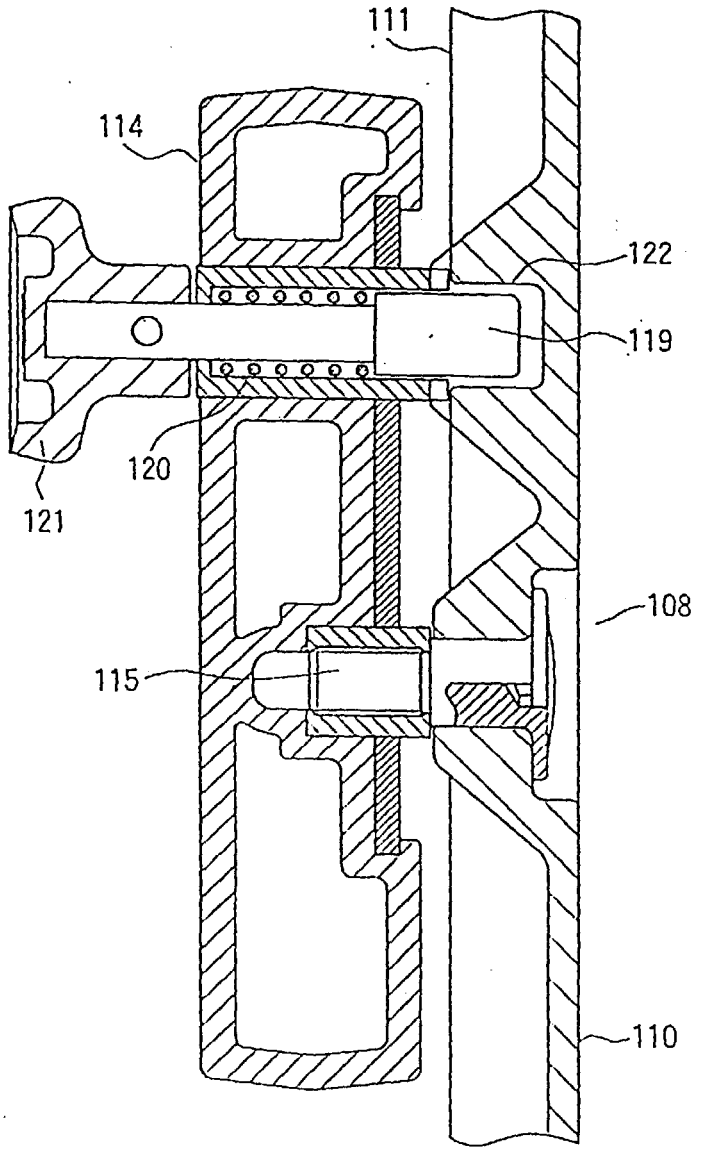

FIG 5

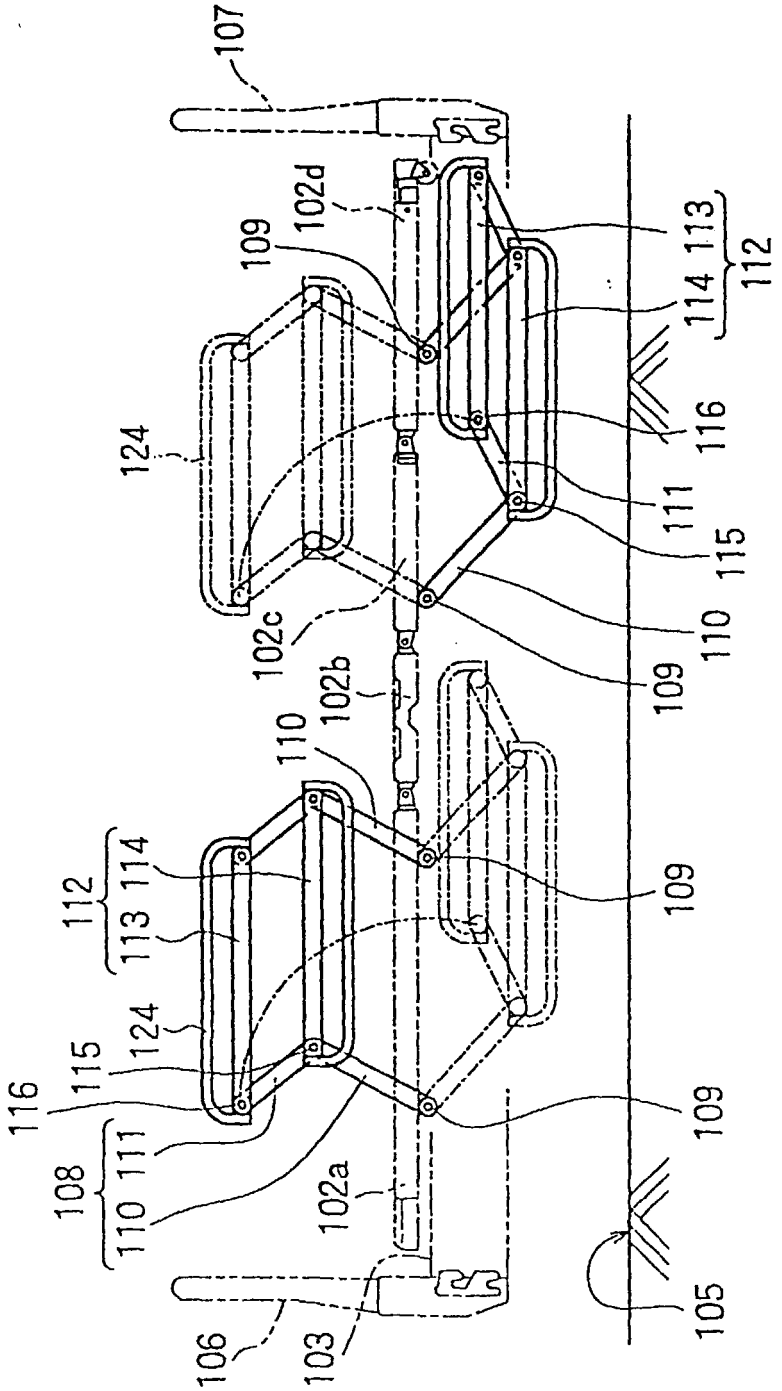
107
102d
109
114 113
112
124
116
111
115
110
102c
109
102b
110
112
114
113
124
115
116
108
110 111
102a
109
109
106
103
105

FIG 6

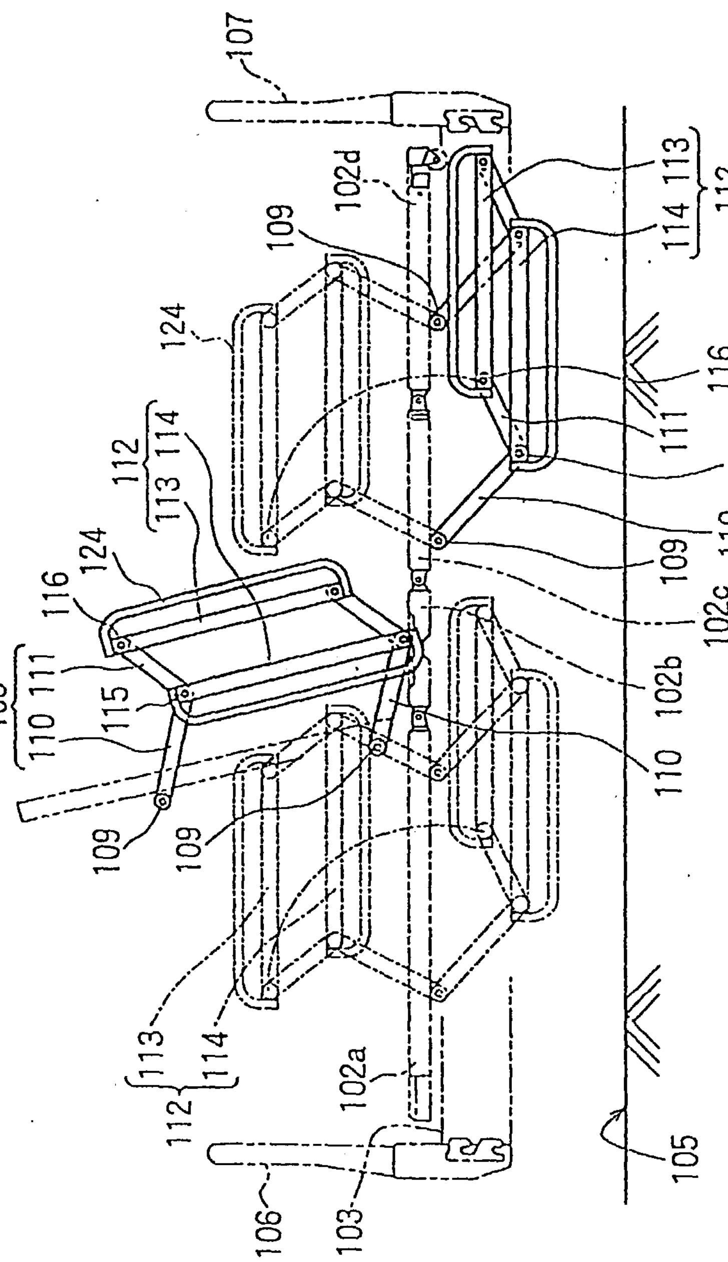
107
102d
109
124
114 113
112
116
111
115
110
109
102c
112
113 114
124
116
108
110 111
115
102b
110
109
109
113
114
112
102a
106
103
105

FIG 7

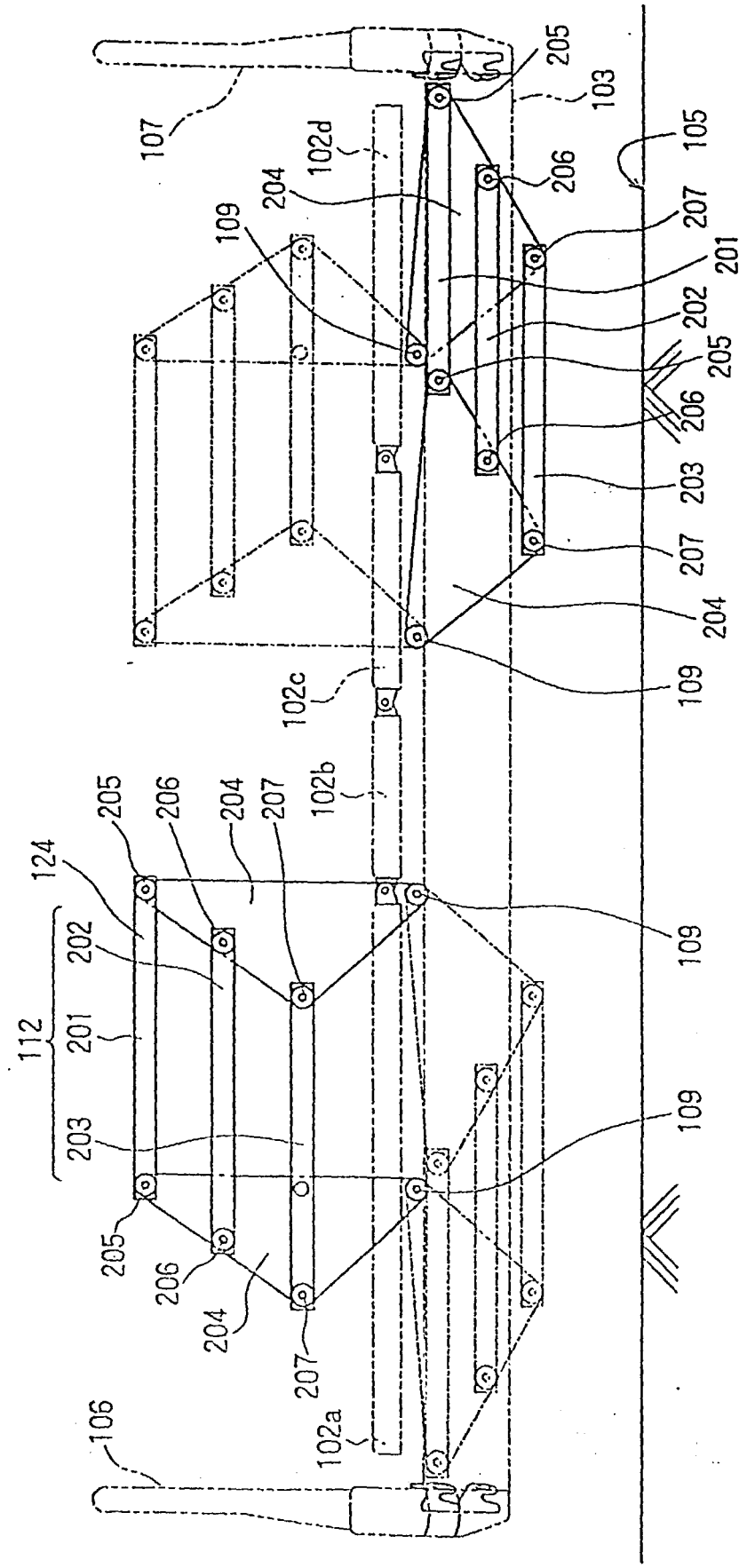
107
102d
204
109
205
103
105
206
207
201
202
205
206
203
207
204
109
102c
102b
205
206
204
207
124
202
201
112
203
205
206
204
207
102a
106
109
109
109

FIG 8

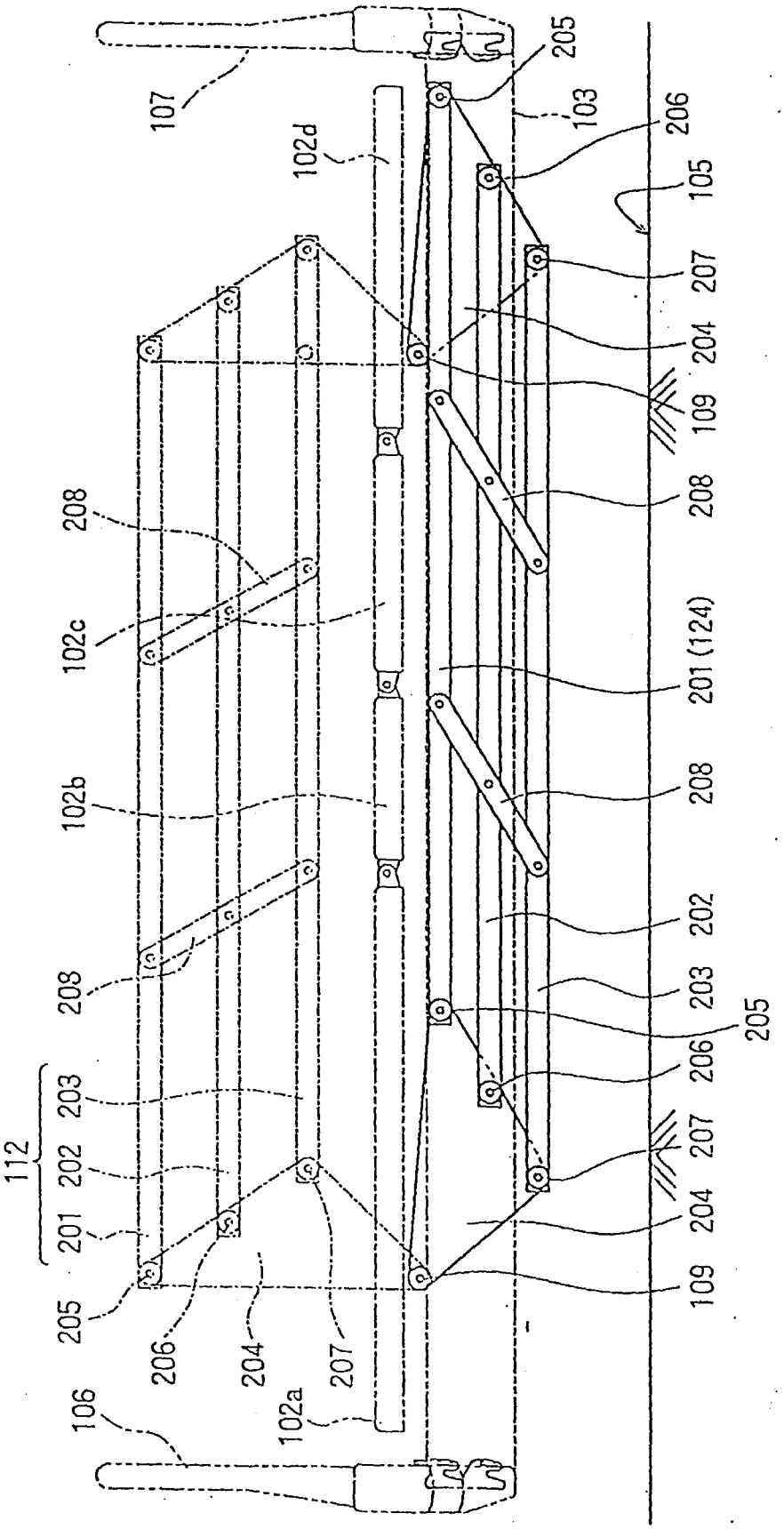
107
102d
205
103
206
105
207
204
109
208
102c
201 (124)
102b
202
203
112
201
106
102a

FIG 9