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(54) **Adjustable Nursing bed**

(57) The object of the invention is a nursing bed, which comprises a frame formed of at least two frame parts (1, 2), legs (3, 4) attached to the frame parts, one or several adjusting devices to move the frame or the part connected to it in the direction of height of the bed and/or to move the frame or the part connected to it into inclined position as well as a power motor to run the adjusting device. In the nursing bed in accordance with the invention the frame parts (1, 2) have been attached by

means of a joint (5) turnable to each other and the nursing bed comprises an adjusting device (65-70) connected by means of gliding elements (25-28) to the frame parts (1, 2) and to the legs (3, 4) to adjust the mutual position of the frame parts together with the leg of the upper frame and to adjust the height of the nursing bed in which case the turning angle of the leg of the upper frame while the back rest turns reaches over 90 degrees.

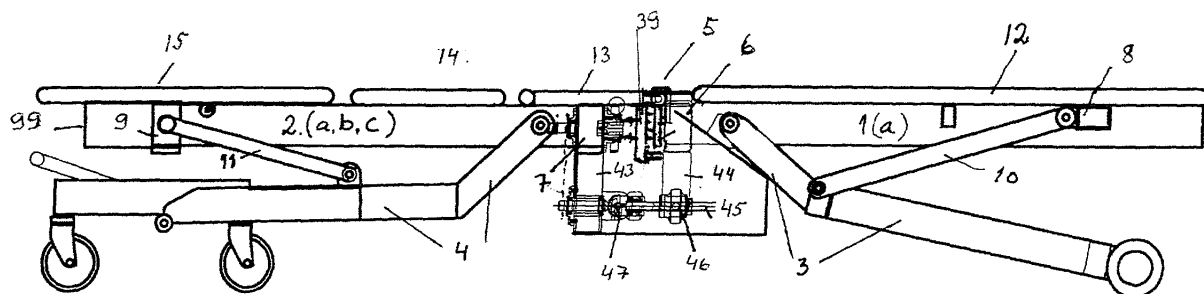


Fig. 1

Description

[0001] The present invention relates to a nursing bed, which comprises a frame, legs fixed to the frame, one or several adjusting devices for moving the frame or a part connected to it in vertical direction of the bed and/or for moving the frame or a part connected to it into inclined position as well as a power device for driving the controlling device.

[0002] Beds are usually used as lying and resting platforms in homes, nursing homes, hospitals and, in general, in places where people need to rest.

[0003] Standard models of beds are known where there is a frame or a framework, legs fixed to it and possibly ends. In addition, there are various more specialized solutions in which, apart from the earlier mentioned parts, there are constructions and functions, among other things, for adjusting the height of the bed and/or the bed plane, for adjusting, inclining the back rest position and/or other parts of the bed.

[0004] Nursing beds are in use in various kinds of nursing institutions such as hospitals, nursing homes, old people's homes and so on. Elderly people, patients and/or other people who, for one reason or the other, are not able to move by themselves are taken care of in nursing beds. Therefore, nursing beds must be able to be lowered and lifted to various heights as well as adjusted in other ways. In addition, nursing beds comprise ends, side rails and other necessary functions and accessories, which may be adjusted in different ways for facilitating the nursing of a patient.

[0005] There are recognized bed solutions, in which there are in themselves several necessary functions to facilitate the adjustment of the bed and, at the same time, to facilitate the nursing of the person in the nursing bed. In these bed solutions, each function has its own regulating unit by means of which positions of the bed or its parts are influenced. In many cases, a nursing bed comprises a lower frame and an upper frame and a motor between them to adjust the upper frame with respect to the lower frame.

[0006] As a disadvantage of recognized solutions in respect of the versatile functioning is the abundance of regulating units, which raises manufacturing costs. In some bed construction, the incompatibility of solutions to each other is the problem and in many constructions, the problem is involved with the mutual moving of parts and their incompatibility, which causes problems related with operating safety.

[0007] The object of the invention is to provide a nursing bed with which the problems related to recognized nursing beds are eliminated. Especially, the object of the invention is to provide a nursing bed, which is simple by construction and economical by manufacturing costs, but which is easy to use and which has versatile adjusting possibilities.

[0008] The object of the invention is accomplished by a nursing bed, the characteristics of which are present-

ed in the claims.

[0009] The frame of the nursing bed in accordance with the invention comprises two parts, which are adjusted turnable to each other by a joint. In addition, the nursing bed comprises an adjusting device connected with gliding elements to the parts and the legs of the bed in order to adjust the mutual position of the parts of the frame with the leg of the upper frame and to adjust the height of the nursing bed, in which case the turning angle of the leg of the upper frame while the back rest turns is more than 90 degrees. By means of adjusting devices, advantageously with a spindle, placed in both frame parts connected to the parts of the frame and with gliding bricks straight to the legs, mutual positions of frame parts as well as the height of the nursing bed may be adjusted. In this case, the part of the frame acting as a backrest turns by changing the angle of the transverse central joint and by adjusting the position of legs. As the frame is functioning at the same time as the legs, there is no need for a separate framework and therefore the construction is simpler.

[0010] In an advantageous application of the invention, both parts of the frame have their own adjusting device, in which case the positions of the legs may be adjusted separately. Since the legs may be separately adjusted, it makes it possible to have a large adjusting range in terms of height as well as when lifting the backrest.

[0011] Due to its large range of adjusting, the nursing bed is suitable, for example, for nursing homes, old people's homes, and, in general, for places where beds with versatile functions are required. There is only one power motor in the nursing bed in accordance with the invention, with which all functions may be driven. Due to its construction, the nursing bed has very low initial height and high possible lifting height. In addition, the nursing bed is possible to be adjusted to several various positions easily and without effort.

[0012] In the second advantageous application of the invention the central point of the turning radius of side rails is placed in the middle of the turning point of the frame parts and the opposite parts of the side rails are compatible along the radius as to their curved shape, in which case the distance between the side rails does not change in connection with mutual moving of the frames. The side rail elements of the nursing bed are compatible with the transverse turning central line of the nursing bed, as the central point of the turning radius of side rails is placed in the middle of the turning point of the frame parts of the bed. Although the frame folds in this kind of solution of side rails, the position of side rails does not change but they turn along with the frame parts and the distance between the side rails stays unchanged and no caps for fingers to be pressed occur.

[0013] In the next advantageous application of the invention, the adjusting device has been attached to the upper frame part and the lower frame part of the bed. The adjusting device comprises a pair of cogwheels, in

which the outer wheel, attached to the lower frame, has advantageously a rim of pivot-like cogs and a smaller plane cogwheel has been connected to the upper frame. The upper edge of the pitch circle of the both cogwheels of both wheels is in the same line with the turning point of the frame of the bed. This solution makes it possible for the mutual angle of the wheels to change during their rotation.

[0014] Next, the invention will be explained in more detail with reference to the accompanying drawings, in which,

Figure 1 illustrates the nursing bed in accordance with the invention viewed from side,

figure 2 illustrates an application of side rails to be attached to the nursing bed in accordance with figure 1 viewed from side and from the end of the bed,

figure 3 illustrates the nursing bed in accordance with figure 1 viewed from above,

figure 4a and 4b illustrate a pair of wheels of an adjusting device of the nursing bed in accordance with the invention and parts of its switch as cross section viewed from side,

figure 5 illustrates an application of a profile used in the nursing bed viewed from the end,

figure 6-9 illustrate parts of leg constructions of back parts of the nursing bed,

figure 10 illustrates another leg construction of the lower frame of the nursing bed and a moving device,

figure 11 illustrates a leg construction of upper frame of the nursing bed and

figure 12 illustrates a lifting device to be attached to the nursing bed viewed from side

figure 13 illustrates another construction of the middle part of the nursing bed and a backrest framework construction,

figure 14 illustrates a lock of the end of the nursing bed.

[0015] In an application in accordance with figures 1 and 3 the frame comprises two frame parts, the upper frame 1 and the lower frame 2, which together with legs 3 and 4 make an active whole. A central joint 5, placed in between the frame parts 1 and 2 connects the frames together and makes it possible for the bed to turn in the middle. There are transverse beams 6, 7, 8 and 9 at a distance from each other in the frame parts of the nursing bed. The transverse beam 6 is placed at the end

which is located in the middle part in the lower edge of the upper frame of the nursing bed and the transverse beam 7 is placed at the end which is located in the middle part in the upper edge of the lower frame of the nursing bed, in which case the central joint 5 is placed between these two transverse beams 6 and 7. The transverse beam 8 is placed in the upper part of the upper frame of the bed, and the transverse beam 9 in the lower part of the lower frame of the bed. The transverse beams 6 and 8 connect the profile 1a as a part of the upper frame. The transverse beams 7 and 9 connect the profiles 2a, 2b and 2c as a part of the lower frame.

[0016] Legs 3 and 4 are both formed out of a pair of legs, directing to an advantageous width from below and connected below the profiles to the groove of the gliding brick. The leg 3 is connected to the profile 1a and the leg 4 is connected to the middle profile 2b of the lower frame. There is a fold above the middle point of the legs 3 and 4. The supporting bar 10 is connected from this fold point with a joint to the transverse beam 8 of the upper frame and the supporting bar 11 is connected with a joint to the transverse beam 9 of the lower frame. Together the legs form four supporting points to the frame of the nursing bed.

[0017] On the frame parts, there is a supporting framework which is formed out of two or more square frameworks connected with hinges to each other and which frameworks have plane-like lamina at intervals. The supporting framework 12 of the upper part and the middle framework 13 are fixed with other frame parts. In addition to the middle framework, the supporting frameworks 14 and 15 placed below the lower frame in the figure may be in use as one part or in several parts or as fixed.

[0018] Side rails illustrated in figure 2 function flexibly while the frame is turning. The upper side rail 16 is connected by quick fixing to the upper frame 1. The other side of its adjusting part 17 is first placed inside the transverse beam 8 and the shoulder in the end of the adjusting part will be then placed inside the link in the transverse beam 8. The other plate like adjusting part of part 17 is locked to its place with spring handle lock. The tubular adjusting parts 16a of the side rail part are lowered on the vertical pegs 17a of the adjusting part and locked in place with a spring handle lock.

[0019] The lower side rail 18 is connected to the lower frame 2. The adjusting frame 19 of the lower side rail is connected with a peg 19a to the frame of the bed, to the middle of the transverse turning line. The other adjusting part 20 of the side rail glides inside the adjusting part 19 of the lower side rail in longitudinal direction and is fixed to a connecting point below calf level. The joint parts 21 of the adjusting frame are formed of plate-like parts placed at a suitable distance from each other and a transverse peg and they make it possible for the hook like joint parts 22 of the side rail to function as locking and opening. The side rail 18 may be turned away from its place by lifting slightly and turning outwards on the

pegs placed in joints. The spring handle lock 23, placed in the other joint of the lower side rail, is non-central by adjusting.

[0020] The side rails shown in figure are compatible due to their curved shape 24 and are compatible with the transverse turning middle line of the frame, in which case the distance between the sides remains the same while moving the backrest of the bed.

[0021] Figure 3 illustrates the gliding bricks 25 and 26 functioning as gliding parts which are connected to the legs 3 and 4 of the nursing bed and two other gliding bricks 27 and 28, which are reserved for possibly adjusting leg parts and/or lifting device. Gliding part move by means of spiral spindles inside profiles. The spindle 29 moves the gliding brick 25 and the spindle 30 moves the gliding brick 26, which move the upper end of the legs 3 and 4 by means of grooves attached to them. Thus, the middle profiles are partly inside the grooves placed under them. The spindle 31, for one, moves the gliding brick 27 and the spindle 32 moves the gliding brick 28.

[0022] Figures 4a and 4b present an adjusting device, which has been connected to the frame parts 1 and 2 in accordance with figure 1. The power transmission from one power motor is carried out by a wheel transmission with reduction transmissions and ball couplings, in which by means of an adjusting peg 35 placed in the middle of two overlapping sleeves 33 and 34, the switching and unswitching of balls 37 in holes placed radially in sleeves is controlled. Outside, in the flange of the outer sleeve 33, there is a wheel 38, which rotates and turns the wheels by its side.

[0023] The adjustable peg 35 in the middle of the switch is controlled, for example, by means of a rocker switch, the other end of which is fixed to the frame. The other end is controlled by an adjusting brick 48, illustrated in figure 3, moving inside a transverse square tube, which adjusting brick has a shaped groove guiding the end of the rocker switch and cogging on sides, by means of which the cogs of the wheel of the controlling motor transmit the motion.

[0024] The controlling unit converts the commands from the driving brick to functioning commands, which are controlled and limited by switches. The controlling motor and the gliding brick convert electrical commands into mechanical movements for switches.

[0025] In accordance with figure 1 beneath the transverse beams 6 and 7 there is an adjusting spindle 45 between the shoulders 43 and 44. In the spindle, there is a part 46 connected with a joint to the shoulder 44, which part 46 makes it possible to loosen up the parts from each other. Power from outside is brought, in this application, by means of chain wheels and a chain placed on the left side of the shoulder 43, as viewed in the figure, to the left end of the adjusting spindle in the figure. A switch loosens and adjusts the adjusting device in a recognized way if desired. The power coming by means of a chain is transmitted to the adjusting spindle

through the joint 47, the turning point of which makes functioning possible while the spindle turns to different positions.

[0026] Power transmission between the lower and the upper frame is carried out with a pair of wheels, in which there is an outer wheel 39 connected to the lower frame and a smaller plate cogwheel 41 connected to the upper frame (figure 1). Power transmission is carried out as a mutual function of the rim, formed by the peg like teeth 40 of the outer wheel 39 placed in the direction of the middle line and the smaller plate cogwheel 41 placed inside them. The pitch circle rim 42 of both cogwheels is placed in the upper edge at the same point with the turning point of the frame, which makes the changing of their mutual angle possible during rotating.

[0027] In the profile illustrated in figure 5 there are holes 51 in the corners of the longitudinal profile 50, in the middle part a channel 52 open in the lower part for the gliding part, sealing edges 53 below and between the upper holes a channel 54 for switches and cables.

[0028] In the application in accordance with figures 6-9 beneath the legs of the back part of the nursing bed there is a bogie like construction with a frame 80 and castors 81 and turning arms 82 inside the side parts of the frame, which turning arms are directed up and down by means of hooks 84 placed at the ends of the pedal 83. In the turning arms 82 there are peg like legs 85 or there is a transverse beam 86 connected to them, which transverse beam has legs at the ends of side parts 87 which glide to the side.

[0029] In the application in accordance with figure 10 beneath the legs of the back part of the nursing bed, there is a fixed leg with ends 88, a connecting rod 89 and fixing points for legs 90. In addition, in the figure, there is a transporting cart with two turning castors 91, a connecting rod 92, an arm 93 and a handle 94.

[0030] In the application in accordance with figure 11 between the front leg part 3 there is a rod 95 organized to be an eccentric axle at the ends, with a castor and axle construction (not illustrated) which is adjusted downwards lifting the side castors 96 up when the rod with an axle is rotated with pedals 97 placed on sides.

[0031] The leg part 98 of the lifting device in accordance with figure 12 has been attached to the transverse beam 9 in the lower frame (figure 1), which beam is placed inside the shaped tube 99 reaching backwards. There is an arm 100 of the lifting part placed inside the leg part 98, which arm reaches first upwards for some distance and turns then to reach the middle part of the bed. At the end of the arm, there is a folding wheel 101 and a lifting cloth 102, the other end of which has been attached to a lifting aid or similar by means of a connecting part 103. The other end of it 104 has been attached to the gliding brick 28 of the spindle of the third profile 2c of the lower frame of the nursing bed (figure 1) and goes through advantageous guiding points, through the foot part 98 of the lower end and the hollow crane arm 100 down at the point of the folding wheel 101. By

means of this kind of lifting device, it is possible to lift a person in the nursing bed relatively simply, for example, by moving the earlier mentioned gliding brick by means of the spiral spindle with the same power motor as the other functions.

[0032] In the application in accordance with figure 13, parts of the frame are the same as presented earlier but the transverse central joint is excluded. It has connecting parts in the middle of the frame such that the frame may be connected and disconnected. By way of function, the frame is straight and stiff. The spindles moving the legs 3 and 4 of the upper and lower end may be connected to function together and separately. The legs are symmetric by shape. There is a bar between the front axle and the supporting arm in the front leg, which bar keeps the front axle and the castors in the right position during the turning of the leg.

[0033] In the application in accordance with figure 13 the backrest frame 121 functions above the frame, separately from it. The joint angle 123 of the backrest has been deviated above the plane such that while the backrest turns upwards the lower end of the backrest moves towards the upper end. The attaching parts 17 and the side rail have been attached to the backrest framework and the side rail moves along with the backrest framework.

[0034] In the end part of the nursing bed illustrated in figure 14 there are frame tubes and plates. The lock of the end comprises a turnable handle part 105, in the wider end of which there is a hollow for locking the axle 107. Around the end of the handle, there is an eccentric broadening ring with locking depressions as well as a tension screw 108 for controlling the functioning force. The axle 107 is placed on the edge of the groove-like plate 106, which has an opening for the handle part 105. The groove-like part has been fixed to the frame tube 109 of the end such that when in its place, the tube of the supporting framework 12 or 15 is placed under and inside the groove. By turning the handle part downwards the bed the locking is tightened and to the other direction loosened.

[0035] The nursing bed in accordance with the invention is adjusted to various positions as follows: As adjusting medium one or several recognized controllers are used, which have been connected to the controlling unit. The controller has typically several various, for example, buttons or pairs of switches, marked with codes, by pressing of which the functions of the nursing bed may be controlled. While a user presses a button in the controller "up" the control unit adjusts through a control motor the adjusting brick 48 to a suitable position, which connects ball switches by means of rockers and an adjustable peg to the ends of the upper spindle 29 and the lower spindle 30. When the adjusting has been finished, the controlling circuit gives a command to motor relays to run the motor to the opposite direction. In this case, also the spindles start to rotate and, while rotating, they move the legs to upright position by means of gliding

bricks 25 and 26. The motor runs when the button is being pressed or when the limit switch switches the function off. Such is the case with other commands; while a command button is pushed the control unit checks the position of the gliding brick and adjusts it to be right and starts to run the power motor and, by means of switches and wheels, it starts to run spindles to make functions happen.

[0036] The nursing bed and its position may be varied in recognized way, for example, by pressing a certain button or buttons the complete nursing bed may be moved upwards and similarly by pressing another button or buttons it may be moved downwards. By pressing a button only the backrest, that is the head end, may be turned upwards and by pressing another button the backrest may be turned downwards. Correspondingly, by pressing the third buttons the foot end is adjusted first to triangle position and keeping the button down long, the adjustable part below the hollow of the knee rises up to horizontal plane to upper position. With the other button of the push buttons, the foot end is lowered down until it reaches the lower position.

[0037] In one application of the invention the frame consists of two parts and may be separated in the middle, the connecting part is fixed and the frame as a whole is straight. In this model the legs function mainly as connected together. The backrest rises from the frame of the head end together with the side rails of the upper part along with the movements of the gliding brick of the spindle through a bar. The joint angle of the backrest has been deviated above the plane.

[0038] The invention is not limited to the presented advantageous application but it can vary within the frames of the idea of the invention formed in the claims.

Claims

1. Nursing bed, which comprises a frame formed of at least two frame parts (1, 2), legs (3, 4) attached to the frame parts, one or several adjusting devices for moving the frame or the part connected to it in the direction of height of the bed and/or for moving the frame or the part connected to it into inclined position as well as a power motor to run the adjusting device, **characterized in that** the frame parts (1, 2) have been attached by means of a joint (5) turnable to each other and that the nursing bed comprises an adjusting device (65-70) connected by means of gliding elements (25-28) to the frame parts (1, 2) and to the legs (3, 4) to adjust the mutual position of the frame parts together with the leg of the upper frame and to adjust the height of the nursing bed in which case the turning angle of the leg of the upper frame while the back rest turns reaches over 90 degrees.
2. Nursing bed in accordance with claim 1, in which

side rails (16, 18) have been attached to the frame parts (1, 2), **characterized in that** the middle point of the turning radius of the side rails is placed in the middle of the turning point of the frame parts (1, 2) and the opposite parts of the side rails (24) are compatible along the radius as to their curved shape, in which case the distance between the side rails does not change in connection with mutual moving of the frames.

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3. Nursing bed in accordance with claim 1 or 2, **characterized in that** the adjusting device has been connected to the upper frame (1) and to the lower frame (2) and that it comprises a pair of wheels, which has an outer wheel (39) connected to the lower frame (2) and the rim formed by its cogs (40) and a smaller plate cogwheel (41) connected to the upper frame (1), and pitch circle (42) of both cog wheels (39, 41) is placed in the upper edge at the same point with the turning point of the frame.

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4. Nursing bed in accordance with any of claims 1-3, **characterized in that** the nursing bed comprises a lifting device, the leg part (98) of which has been attached to a shaped tube (99) attached to the lower frame (2) of the nursing bed, the arm (100) of the lifting device reaches upwards and the towards the middle part of the bed and that the lifting device comprises a lifting cloth (102) one end of which (104) has been attached to the gliding brick which is moved by a spindle, gearing and mutual power motor, while the other end is directed through advantageous guiding points to the connecting part (103) for attaching the lifting aid or similar.

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5. Nursing bed in accordance with any of claims 1 - 4, **characterized in that** the nursing bed comprises a ball switch for connecting different devices, which ball switch comprises an outer (33) and inner (34) sleeve, in which, in the flange of the outer sleeve, there is a wheel (38) and in the inner sleeve, there is a peg wheel (39) or a spindle sleeve (110) and, by means of an adjusting peg (35) placed in the middle of two sleeves, switching balls (37) placed in holes (36) located radially in the sleeves are controlled.

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6. Nursing bed in accordance with any of claims 1-5, **characterized in that** the nursing bed comprises a lock of the end, with a turning handle part (105), in the wider end of which there is a hollow for locking the axle (107), around the end of the handle there is an eccentric broadening ring with locking depressions as well as a tension screw (108) for controlling the acting force, and that the axle (107) is placed on the edge of the groove-like plate (106) which has an opening for the handle part 105, the groove like part has been fixed to the frame tube (109) of the

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end such that when in its place the longitudinal edge tube of the supporting frame (12 or 15) is placed under and inside the groove, in which case by turning the handle part downwards the locking is tightened and to the other direction loosened.

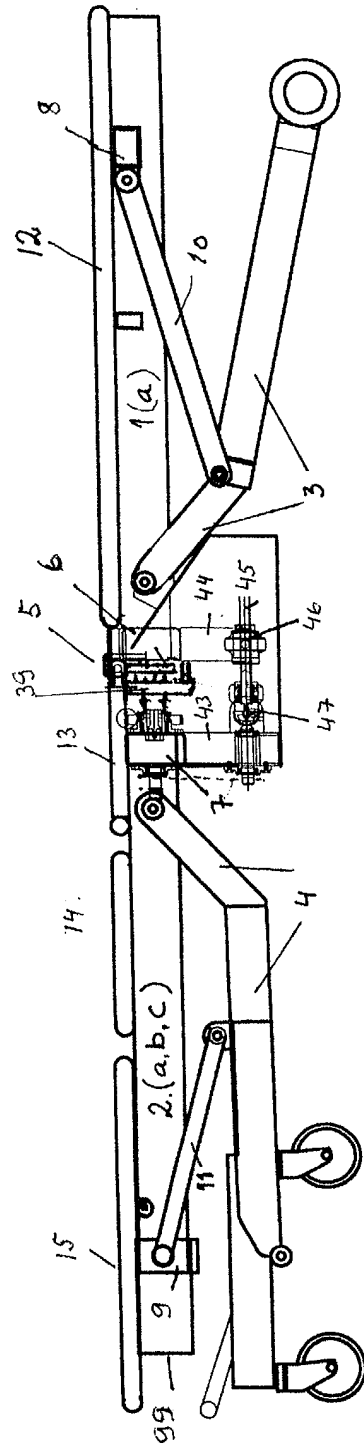


Fig. 1

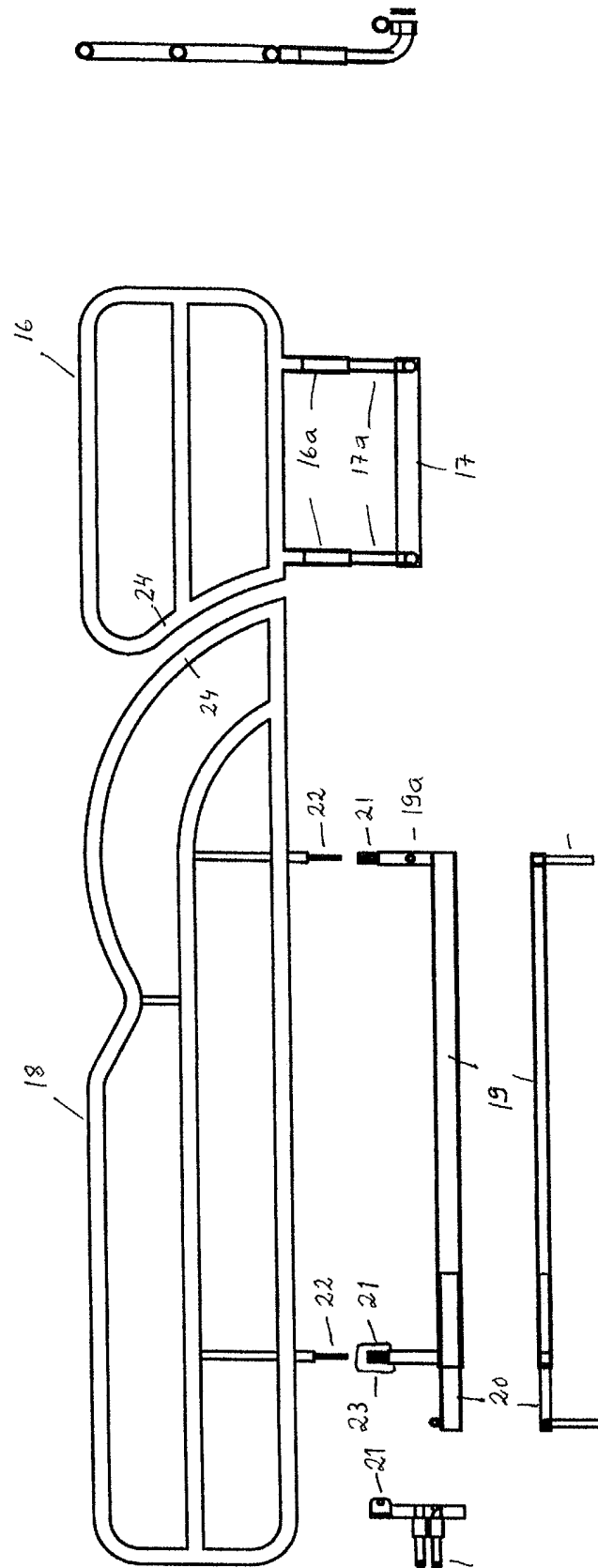


Fig. 2

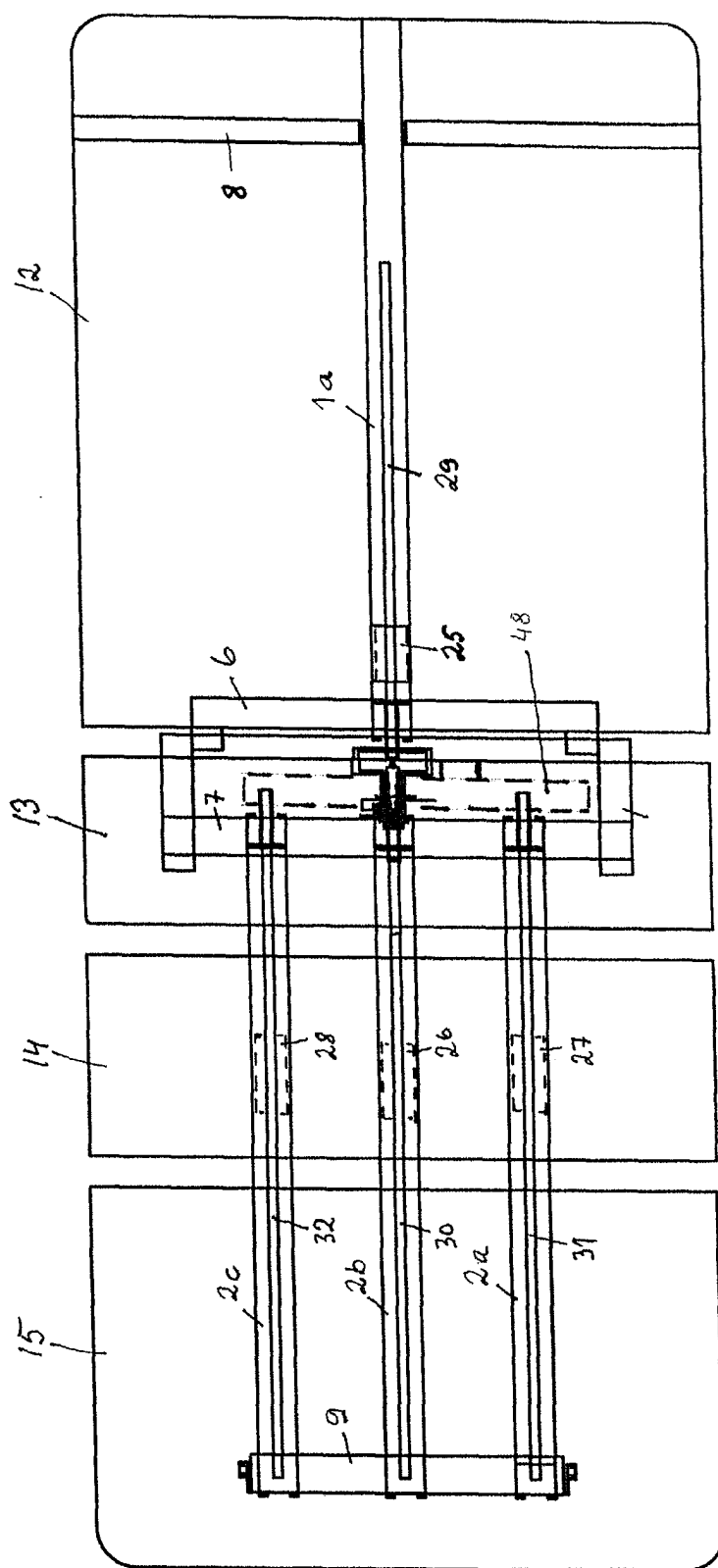


Fig. 3

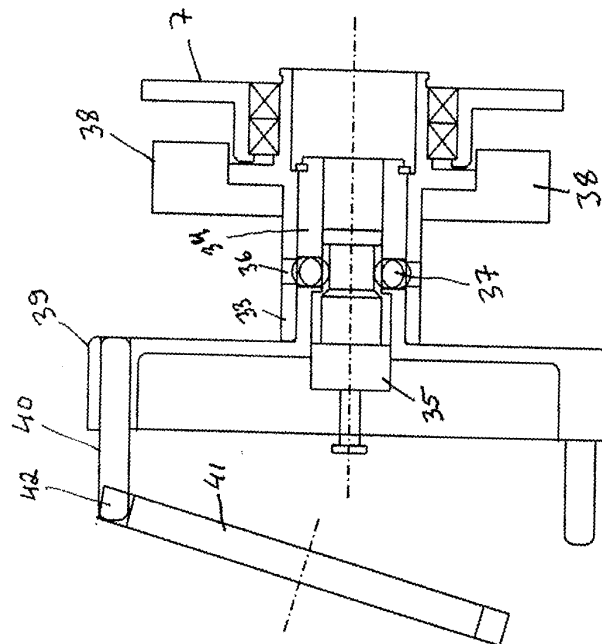


Fig. 4 a.

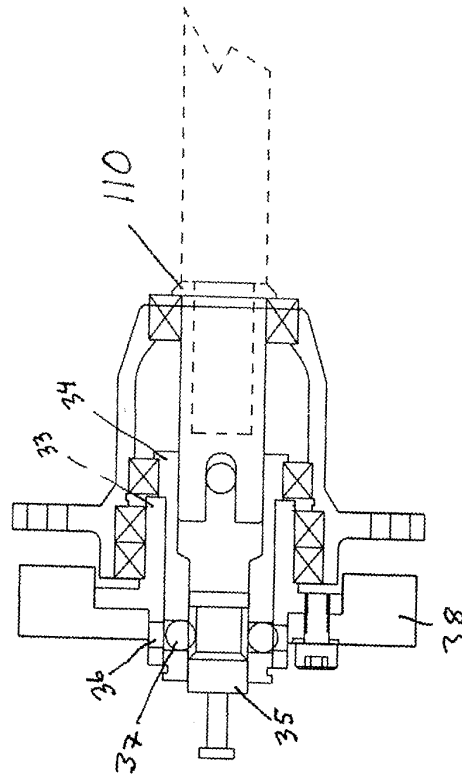


Fig. 4 b.

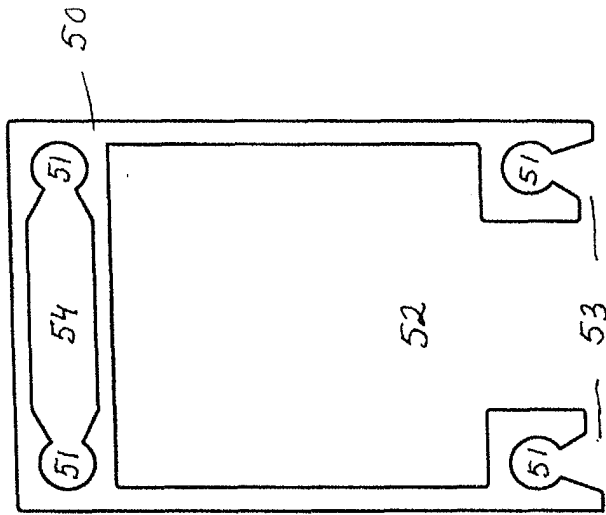


Fig. 5

Fig. 6

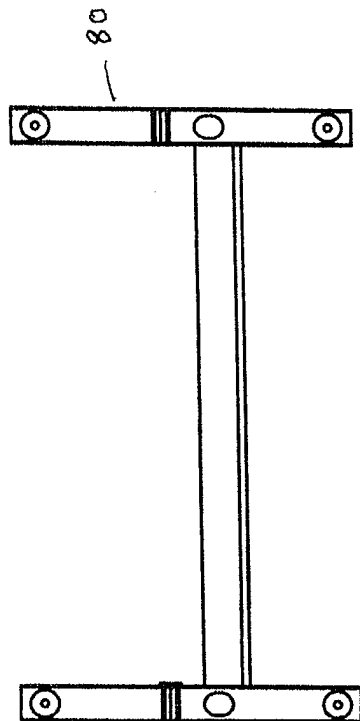


Fig. 7

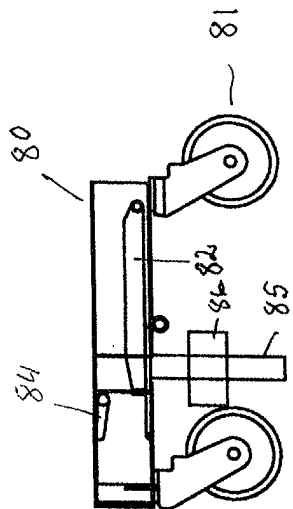


Fig. 8

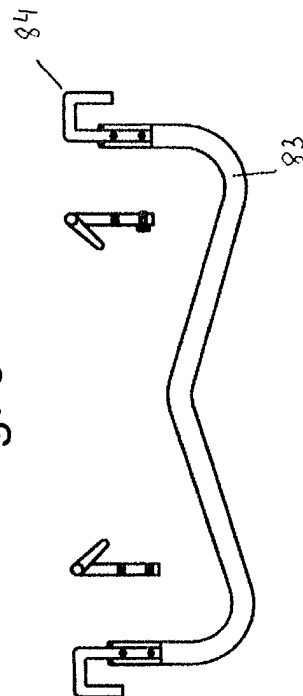


Fig. 9

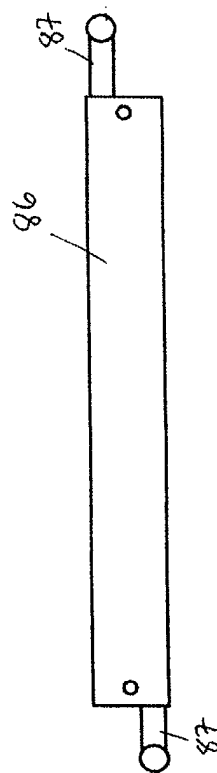
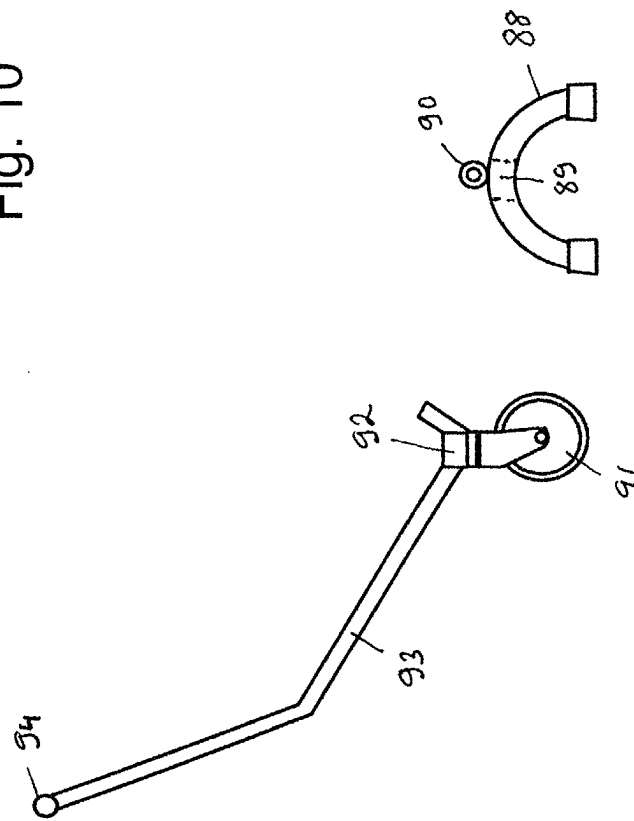


Fig. 10



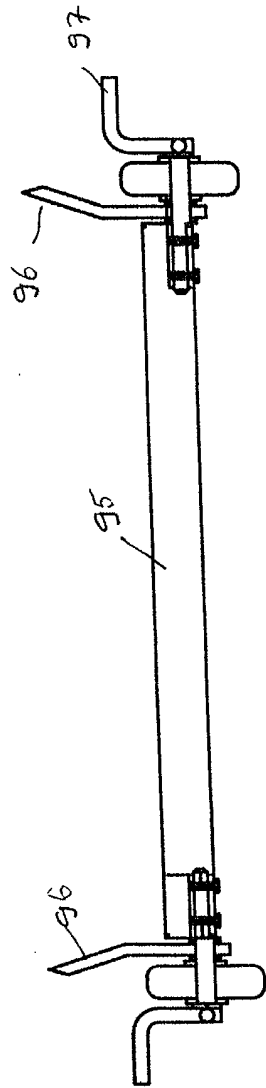
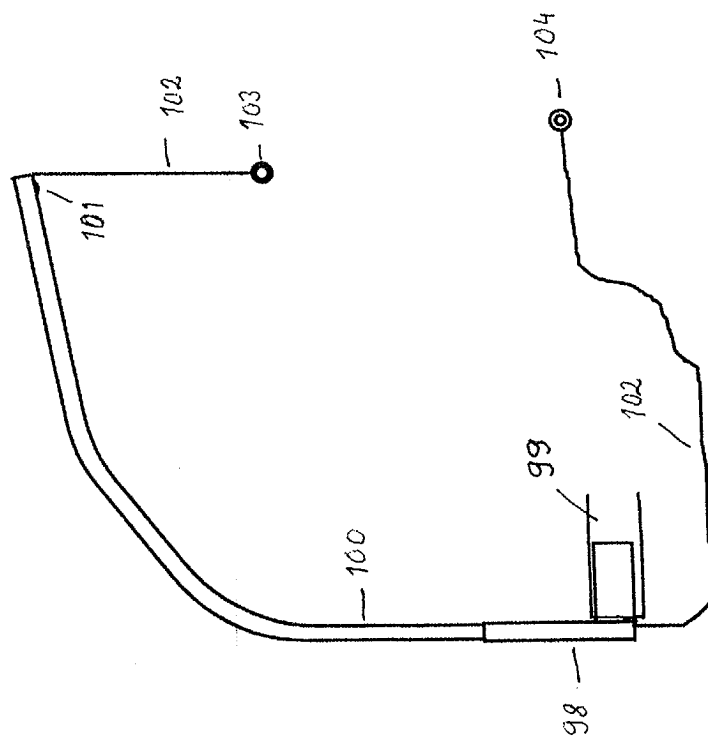


Fig. 11

Fig. 12



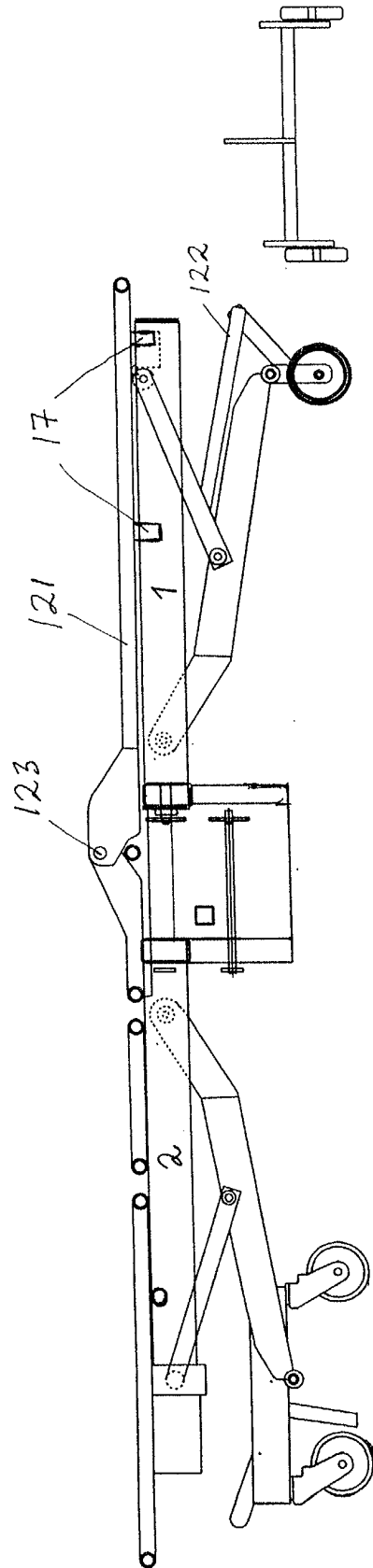


Fig. 13

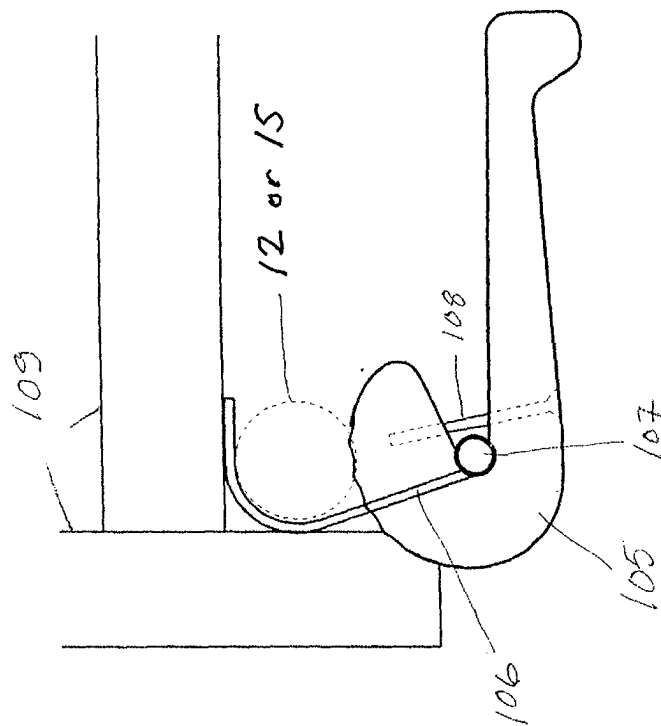


Fig. 14



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 39 6058

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 1 155 670 A (VASSILLI SRL) 21 November 2001 (2001-11-21) * abstract; figures *	1-6	A61G7/00
A	EP 1 138 227 A (PROTON CARETEC AB) 4 October 2001 (2001-10-04) * abstract; figures *	1-6	
A	EP 0 558 108 A (SCHELL IND BV) 1 September 1993 (1993-09-01) * abstract * * column 2, line 21 - column 3, line 54; figures 1,4 *	1-6	
A	US 6 357 065 B1 (ADAMS CRAIG D) 19 March 2002 (2002-03-19) * abstract; figures 1-6 *	1-6	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A61G
Place of search		Date of completion of the search	Examiner
Munich		24 November 2004	MacCormick, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 39 6058

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