

(19)



Europäisches Patentamt

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Office européen des brevets



(11)

EP 0 852 939 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

15.07.1998 Bulletin 1998/29

(51) Int. Cl.⁶: **A61G 7/10**

(21) Application number: **97115441.4**

(22) Date of filing: **06.09.1997**

(84) Designated Contracting States:

**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

(30) Priority: **10.01.1997 IT BO970009**

(71) Applicants:

- **Francesconi, Romana**
48018 Faenza (Ravenna) (IT)
- **Perfetti, Stefano**
48018 Faenza (Ravenna) (IT)

(72) Inventors:

- **Francesconi, Romana**
48018 Faenza (Ravenna) (IT)
- **Perfetti, Stefano**
48018 Faenza (Ravenna) (IT)

(74) Representative:

Sassatelli, Franco T., Dr.
c/o INIP
5, via Ruggi
40137 Bologna (IT)

(54) **Bed assembly to lift up a lying patient at an adjustable height and position**

(57) The bed assembly consists of a lifting apparatus set on tracks of a plane support where the patient can be positioned, such a support can be rapidly actuated by assembling three plane modular system where the first modular structure (1) operates as a modular stabilizing structure of a second counterposed couple of modular structure (2) which act as upright parts. To assemble the equipment, placed transversally on the floor under the bed the modular stabilizing structure (1) its corresponding clutching means (3) is to be inserted into the locking receptacles (4) of the upright modular structure (2) thus obtaining a U-shaped frame integrated structure fitted onto two couples of pivoting wheels (5) featured on the upright modular structures. In this way the lifting apparatus is placed in a condition interacting with the bed that, acting as a guideline between the end limits formed by the bedhead and foot of the bed, limits the apparatus movement to the only longitudinal translation so to place it either in a central position to suit bedside procedures when needed, or in a different position against the foot of the bed when no special treatment are needed. Inside the upper walls of the assembled upright modular structures (2), two couples of worm screw devices are provided for bearing and moving up and down two couples of holding hocks (6), going out from two counterposed vertical clefts (7), on which a plane lying support is to be set up by means of the application of its protruding eyelets (8). To carry out the up and down movement the shaft (9) is set in rotation, thus causing the vertical translation of the coaxial bodies (16) with inside threading engaged onto the guidelines (15) for the folding effect caused by clefts (7).

EP 0 852 939 A2

Description

The invention refers to a bed assembly to support and lift up a bedridden patient to an adjustable height and position. Said equipment consists of a modular apparatus set on tracks, the said apparatus holds on opposed upright components, by means of a vertical translation either combined or disjointed, two couples of supports which hook two couples of holding means protruding from the sides of a plane lying support with an adjustable basis which allows long-term patients confined to bed to have a reduced body pressure against the bed surface or no body contact at all with the bed of predetermined parts of their body. In case of disabled patients confined to bed, to allow bedside procedures or to facilitate precise positioning for treatment with specialist equipment (i.e.: to help patients with bed-pans, urinals, or to wash them, to dress and undress them, to carry out surgical dressings and therapies, to change soiled bed linen, etc.), the whole patient's body or part of it should be lifted up from the bed. This may result a laborious and rather difficult operation if carried out manually. At present, traditional hospital technologies make use of mechanical counterweight elevators which operate in the same way as the hospital systems featured to set limbs in traction during the post-operative course and in the therapies for the recovery of the mobility. All these apparatuses must be carried out in special treatment rooms and under the specialist's control as their use outside the hospital could be unsafe; the said bed assemblies also allow specific treatments to be carried out during short-term stays of patients at hospital. To treat long-term disabled patients confined to bed at hospital or at home, it is known the device described in the Italian Patent Application no. B094A 000569 featured a winch elevator with an adjustable protruding arm, hand-wheel operated, and located in the bed support basis, which permitted to lift up by hand the patient lying in bed by means of a passing belt set over his pelvis. If compared with traditional systems, the above stated device was easier and simpler to use, even if the patient was lifted up under conditions of uncertain support and unstable equilibrium owing to the belt holding means which excessively compressed his body when set in place. Moreover, the use of a winch elevator to be located on the floor, on the bed side, had high production and operative costs as well as too large overall dimensions if placed into a room. A further Italian Patent Application no. B096A 000181 from the same Inventor of the present application and with the same object, featured a support system equipped with rails which could be singularly assembled on the bed sides so to hold the patient in a lying position on a stretcher, the said rails could be duly fitted with one or more pre-adjustable openings where the patient's skin zones to be treated could be easily positioned for treatment. The above stated apparatus could be moved up and down by hand, either to a lower position to reduce the bed sur-

face pressure against the patient's sore parts and prevent bedsores, or to a higher position which allowed treatments to be carried out on the patient's back. The said up and down machining movements could be operated in a sequence on four constraint positions: at first, the relative rail position hook was to be connected by means of a cable with an outstanding eyelet set as a counterpart on the support means, than the said cable was to be knotted onto the end parts to obtain a linking annular connection; subsequently, the support means was to be risen with one hand from the relative end terminal so to bring the eyelet near the hook, while the outward cable end was to be drawn with the other hand so to tie it in a firm knot and block it. In principle, from a structural point of view the above stated system has some limits and namely: a) the assembly of the rail apparatus was rather complicated as it needed a separate assembly integral with the said rails on the bed sides; b) the said apparatus was unstable and, as its four components could undergo a torsional effect, it needed setting structures which could hold it firmly in place; c) the said support system could be unsafe as, if one of the said setting structures or the frame structure which held them gave way, the patient would crash to the ground; d) the patient was hindered from getting out of the bed. The invented device solves all the above stated problems as it features an operative system which can be used everywhere and everytime; such a system can be positioned by hand through a rapid assembly that can be carried out by a mnemonic checking starting from a plane modular structure with three components which form a U-shaped carriage apparatus to be fixed up to the bed structure in a possible longitudinal translation with the carrying structure of the conventional hospital bed itself in such a way that the two structures interact on each other, even if independently, so to rise a plane support to lay with the holding basis that can be assembled in several ways but such to leave, according to the position requested, one or more open spaces where the patient's body parts to be treated can be placed, while his whole body rests on a soft cover. A first structure is located onto the floor as a stabilizing connecting plane, while a pair of counterposed modular upright structures, mounted on wheels, comes out at a suitable distance from the bed sides and holds the lifting apparatus in place. Each of the said modular upright structures features - in parallel and in elevation - a couple of worm screw devices with a synchronous hand movement or with an automatic motion, the said worm screw devices can be activated disjointly or in combination one with the other to translate counterposed coupling means that protrude from the inside walls of the modular structures themselves, where counterposed couples of eyelets coming out from the support plane on which the patient should lie are set. The whole structure can be fitted up in different ways to get the movement of the couples of lifting devices; it can be separately operated either by hand or automatically

through the joint movement of the couples of devices operated by motor groups synchronically timed by an electronic card. In particular, by regulating the height of the couples of hooking means according to adjustable positions, it is possible to vary also the patient's position according to need, so to facilitate his positioning on one side for bedside treatment. The present equipment features a lifting apparatus set on tracks of a plane support where the patient can be positioned, such a support can be rapidly actuated by assembling three plane modular systems where the modular structure 1 operates as a modular stabilizing structure of a counterposed couple of modular structures 2 which act as upright parts. To assemble the equipment the modular stabilizing structure 1 must be placed transversally on the floor under the bed and its corresponding clutching means 3 must be inserted into the locking receptacles 4 of the upright modular structures 2 thus obtaining a U-shaped frame integrated structure fitted onto two couples of pivoting wheels 5 featured on the upright modular structures. Thus the lifting apparatus is placed in a condition interacting with the bed that, acting as a guideline between the end limits formed by the bedhead and the foot of the bed, limits the apparatus movement to the only longitudinal translation so to place it either in a central position to suit bedside procedures when needed, or in a different position against the foot of the bed when no special treatment are needed. Inside the upper walls of the assembled upright modular structures 2 that stand out of the the bed frames, two couples of worm screw devices are provided for bearing and moving up and down two couples of holding hooks 6, going out from two counterposed vertical clefts 7, on which a plane lying support is to be set up by means of the application of its protruding eyelets 8. To carry out manually the up and down movement system of the plane support on one bedside the shaft 9 is set in rotation, by means of the relative knob, thus determining through the kinematic chain with gear trains 10 and 11 with transmission 12, the simultaneous movement of the screw devices 13 on bearings 14 that inside guidelines 15, according to the prefixed direction of rotation, cause the vertical translation of the coaxial bodies 16 with inside threading engaged onto the said guidelines for the folding effect caused by clefts 7 in which their hooking means 6 are caused to pass through. For the automatic starting of the up and down movement system, the shaft 9 is set in action by an electric motor group 17 by depressing push-buttons 18 and 19 operating the sense of translation requested by the lifting hooks 6. An electronic equipment with a joint activating control is featured for the automatic and symultaneous set in motion of the two up and down movement systems of the couple of upright modular structures 2. The lying plane support features a square setting structure in structural steel consisting - on the bedsides - of a couple of elements 20 that have longitudinally located on their outside parts fixing receptacles 21 with openings 22 in the inlets 23 of

which clutching means 24 of the end transverse sections 25 must be set up. The support basis is to be made by using two means with transverse assembly to act as bands with a soft contact cover 26, made out in cloth or other materials, fitted on terminals with stop means 27 and with bands of superimposed flags in cloth 28 fitted in the same way as the previous ones and operated by seam systems which allow a differentiated pliability thus producing a variable pressure effect of the support surface on the patient's anatomic part under pressure; empty spaces can be left to allow the patient's parts to be treated. Flags 26 and/or 28 are to be transversally assembled in a continuous sequence or by leaving intermediate spaces by introducing previously one of their end parts slantwise through the opening 22, so to allow their passing through, as well as their subsequent block with a ledge effect inside the constraining seat 21 through the stop means 27; the same operation must be made by carrying out a traction of the band on the other end part. The described apparatus consists in practice of three plane modular structures: one union structure 1 and two upright structures 2; of four linear elements: two bedsides 20 and two transversal components 25; and of a series of cloth bands 26 and 28; therefore, the said apparatus is available for used packed in a wrapper so to facilitate the storage and transport. By means of grip handles 29 the bed position can be adjusted with the modular apparatus on tracks to set it ready for use or for a non-use position, or otherwise to allow its displacement according to the lying patient's treatment needs. A preferred embodiment of the present invention is illustrated by way of example in drawings of sheets 1, 2, 3, 4 and 5. In sheet 1 fig. 1 is a local view of the longitudinal section of the up and down worm screw device. Fig. 2 is a perspective view of the longitudinal section, but staggered by 90° with respect to fig. 1, showing the simultaneous movement system. In sheet 2 the modular components of the lifting apparatus on tracks are illustrated. In particular, fig. 4 is an inside front view of an upright modular structure 2. Fig. 5 is a front view of the connecting modular structure 1. Fig. 6 is an exploded view of the three modular components of the apparatus on tracks. In sheet 3, fig. 7 is a view of the transversal section A-A' of the bed seen from the foot and to have a complete full view of the lifting apparatus on tracks. Fig. 8 is a view of the longitudinal section B-B' of the bed showing both the bed operative system and the patient. Sheet 4 shows the composition and assembling system of the lying plane support. In particular, fig. 9 is an exploded top view of the setting structure components. Fig. 10 is a top view of a suggested version of the said support. Fig. 11 is a local sectional view which shows in particular the assembling system of bands 26 and 28. Fig. 12 is a perspective view of the lying plane. In sheet 5, fig. 13 is a local perspective view of an end part of a cloth band 26. Fig. 14 is a perspective view of the end part of a soft contact cloth band 28. Fig. 15 is a perspective view of the whole

operative system.

Claims

1. Bed assembly to lift up a lying patient at an adjustable height and position consists of a lifting apparatus set on tracks of a plane support where the patient can be positioned, such a support can be rapidly actuated by assembling three plane modular system where the first modular structure (1) operates as a modular stabilizing structure of a second counterposed couple of modular structure (2) which act as upright parts; characterized in that:
 - to assemble the equipment the modular stabilizing structure (1) is to be placed transversally on the floor under the bed and its corresponding clutching means (3) is to be inserted into the locking receptacles (4) of the upright modular structures (2) thus obtaining a U-shaped frame integrated structure fitted onto two couples of pivoting wheels (5) featured on the upright modular structures;
 - the lifting apparatus is placed in a condition interacting with the bed that, acting as a guideline between the end limits formed by the bed-head and the foot of the bed, limits the apparatus movement to the only longitudinal translation so to place it either in a central position to suit bedside procedures when needed, or in a different position against the foot of the bed when no special treatment are needed;
 - inside the upper walls of the assembled upright modular structures (2) that stand out of the bed frames, two couples of worm screw devices are provided for bearing and moving up and down two couples of holding hooks (6), going out from two counterposed vertical clefts (7), on which a plane lying support is to be set up by means of the application of its protruding eyelets (8);
 - to carry out manually the up and down movement system of the plane support on one bedside the shaft (9) is set in rotation, by means of the relative knob, thus determining through the kinematic chain with gear trains (10 and 11) with transmission (12), the simultaneous movement of the screw devices (13) on bearings (14) that inside guidalines (15), according to the prefixed direction of rotation, cause the vertical translation of the coaxial bodies (16) with inside threading engaged onto the said guidalines for the folding effect caused by clefts (7) in which their hooking means (6) are caused to pass through.
2. Bed assembly to lift up a lying patient at an adjustable height and position, as per claim 1), characterized in that for the automatic starting of the up and down movement system, the shaft (9) is set in action by an electric motor group (17) by depressing push-buttons (18 and 19) operating the sense of translation requested by the lifting hooks (6).
3. Bed assembly to lift up a lying patient at an adjustable height and position, as per claim 1), characterized in that an electronic equipment with a joint activating control is featured for the automatic and simultaneous set in motion of the two up and down movement systems of the couple of upright modular structures (2).
4. Bed assembly to lift up a lying patient at an adjustable height and position, as per claim 1), characterized in that the lying plane support features a square setting structure in structural steel consisting - on the bedsides - of a couple of elements (20) that have longitudinally located on their outside parts fixing receptacles (21) with openings (22) in the inlets (23) of which clutching means (24) of the end transverse sections (25) must be set up; the support basis is to be made by using two means with transverse assembly to act as bands with a soft contact cover (26), made out in cloth or other materials, fitted on terminals with stop means (27) and with band of superimposed flags in cloth (28) fitted in the same way as the previous ones and operated by seam systems which allow a differentiated pliability thus producing a variable pressure effect of the support surface on the patient's anatomic part under pressure; empty spaces can be left to allow the patient's parts to be treated; said flags (26 and/or 28) are to be transversally assembled in a continuous sequence of by leaving intermediate spaces by introducing previously one of their end parts slantwise through the opening (22), so to allow their passing through, as well as their subsequent block with a ledge effect inside the constraining seat (21) through the stop means (27); the same operation must be made by carrying out a traction of the band on the other part.
5. Bed assembly to lift up a lying patient at an adjustable height and position, as per claim 1), characterized in that the apparatus consists in practice of three plane modular structures: one union structure (1) and two upright structures (2); of four linear elements: two bedsides (20) and two transversal components (25); and of a series of cloth bands (26 and 28); therefore the said apparatus is available for used packed in a wrapper so to facilitate the storage and transport.
6. Bed assembly to lift up a lying patient at an adjustable height and position, as per claim 1), characterized in that by means of grip handles (29) the bed

position can be adjusted with the modular apparatus on tracks to set it ready for use or for a non-use position, or otherwise to allow its displacement according to the lying patient's treatment needs.

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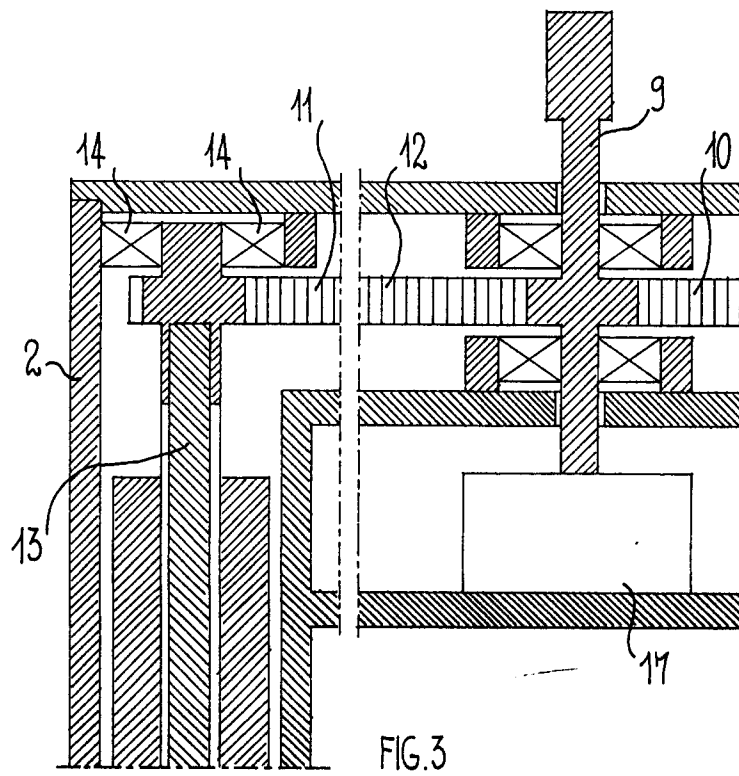
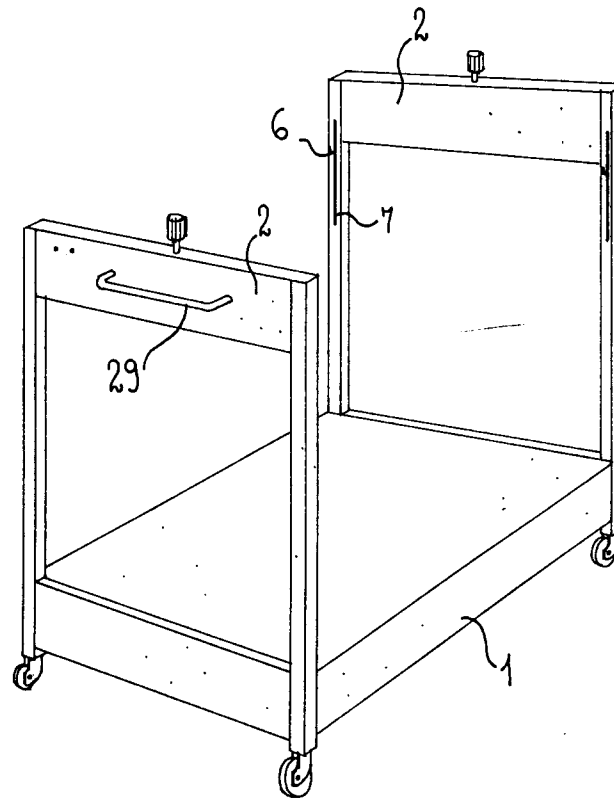
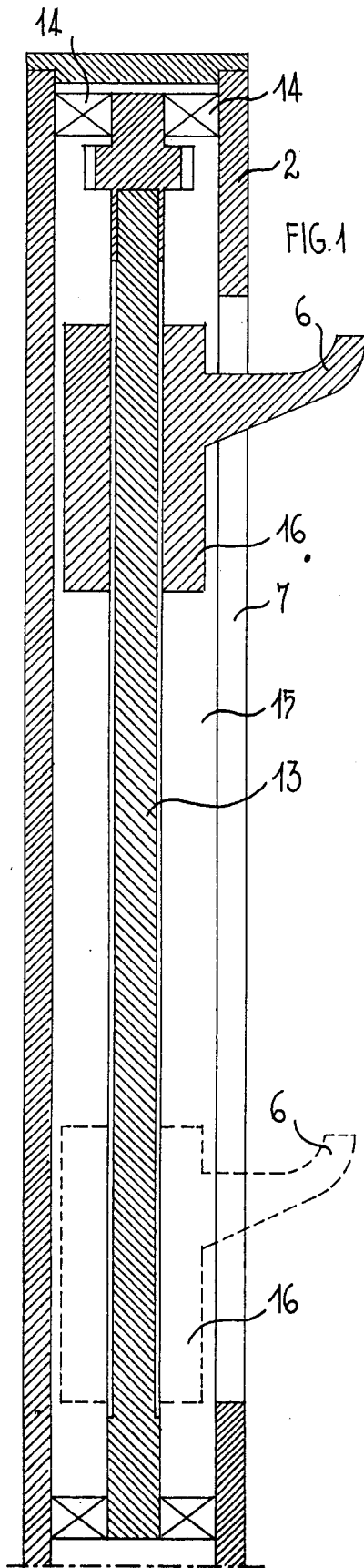
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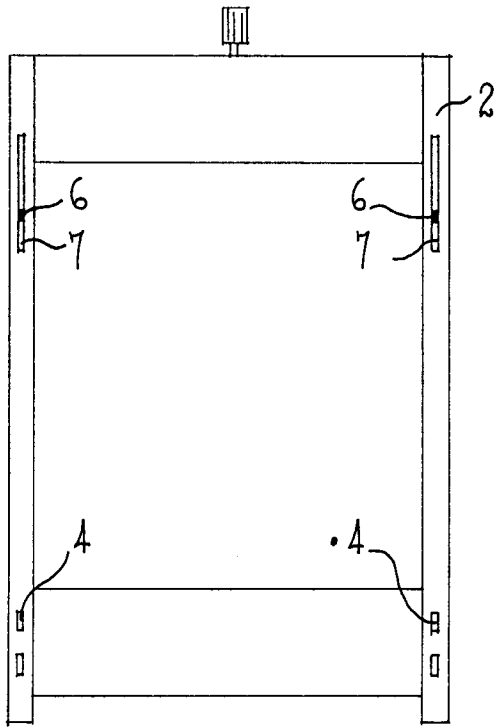


FIG. 4

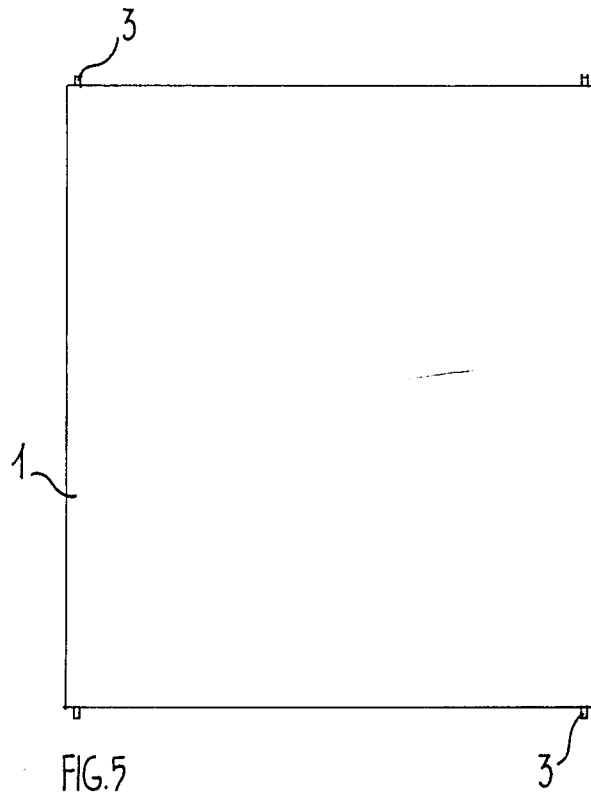


FIG. 5

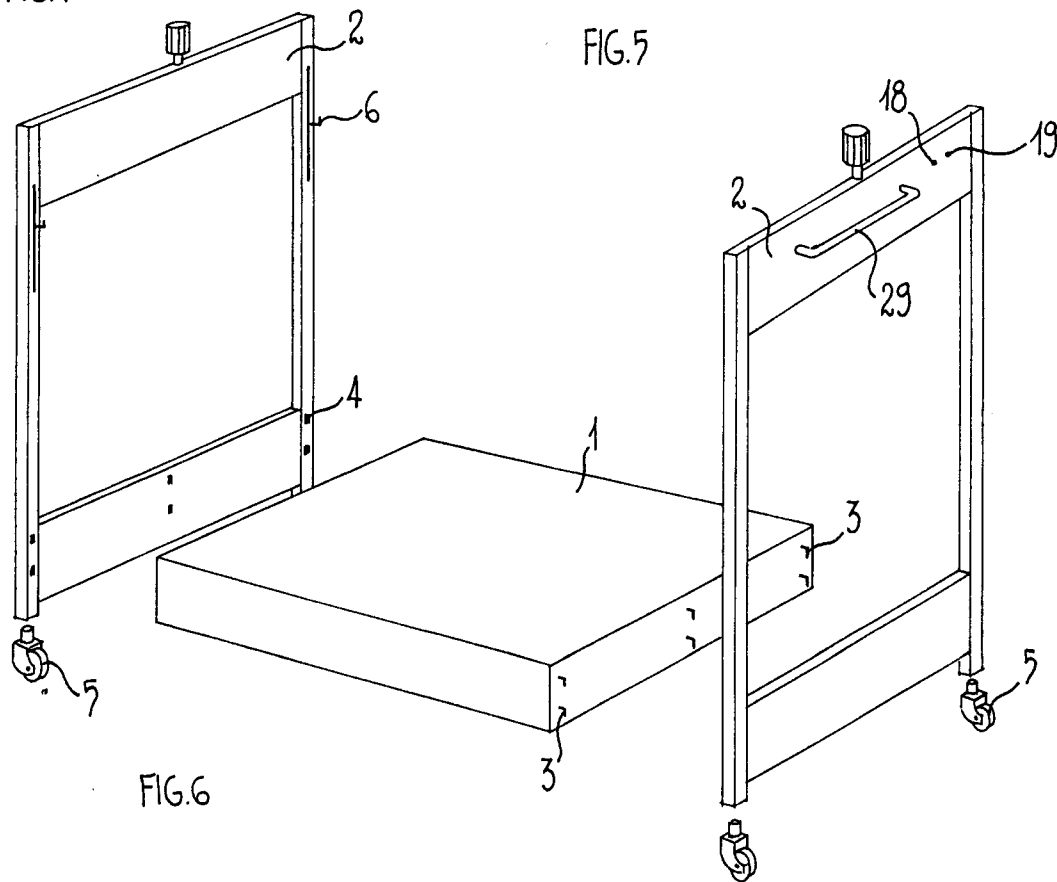
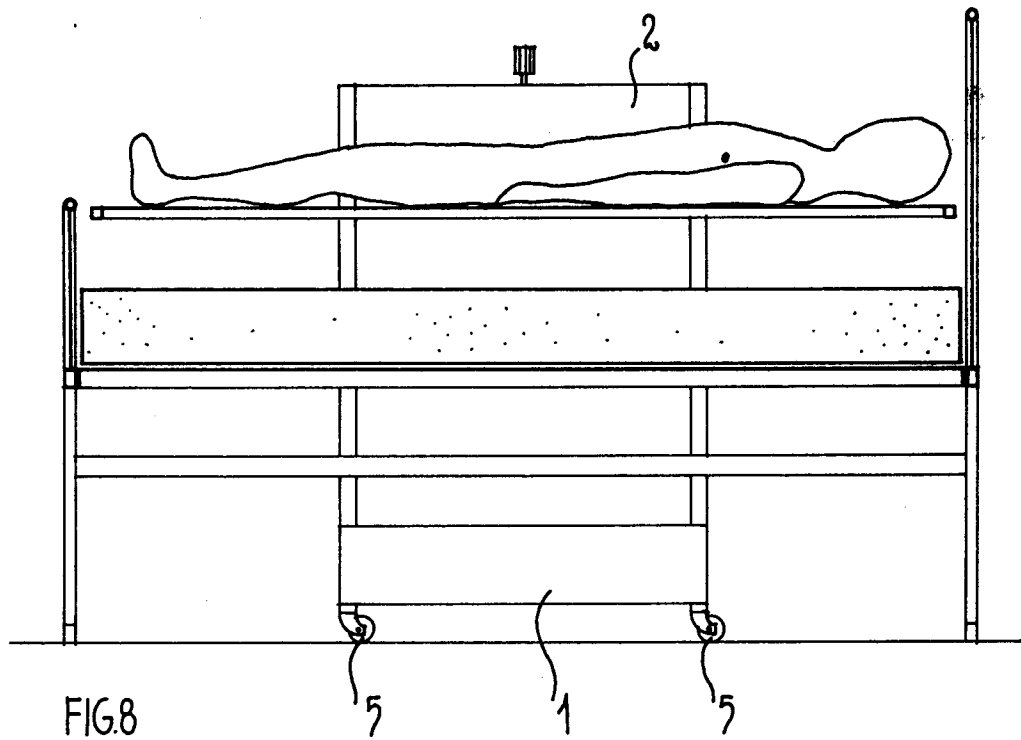
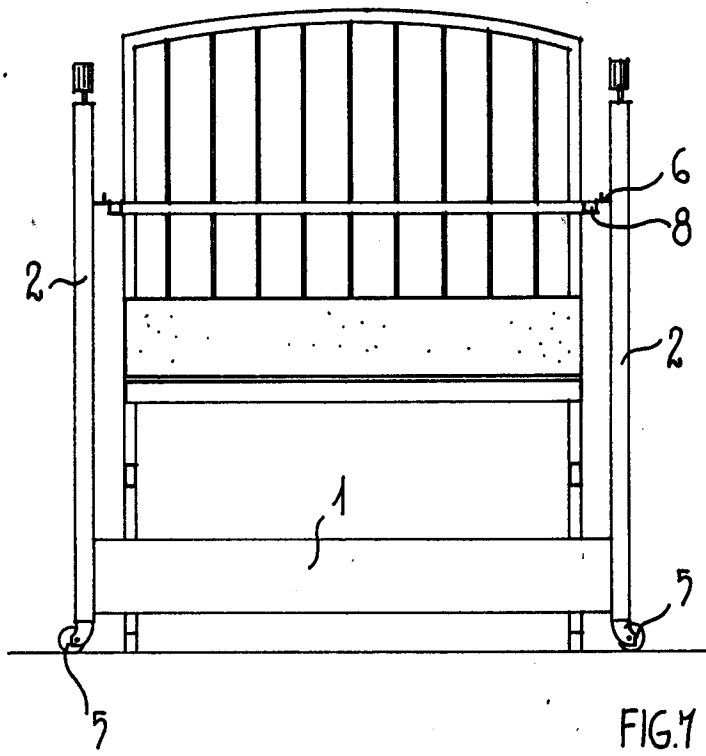
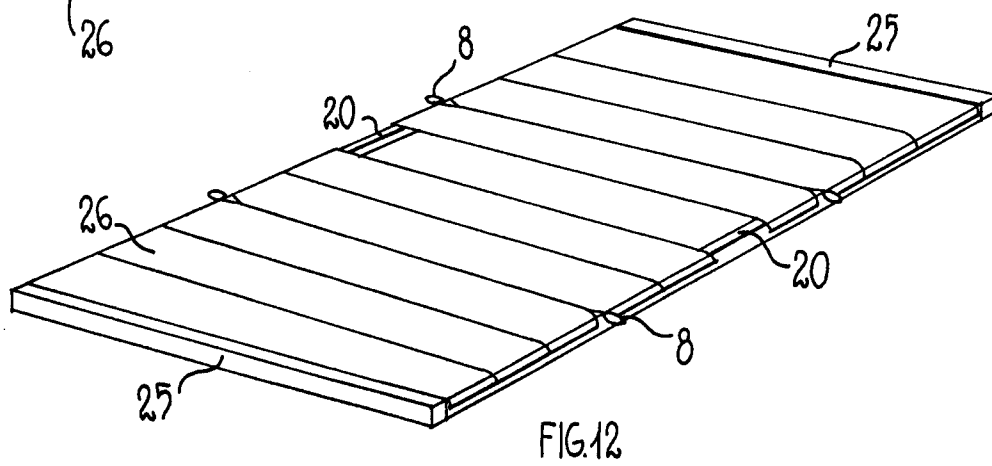
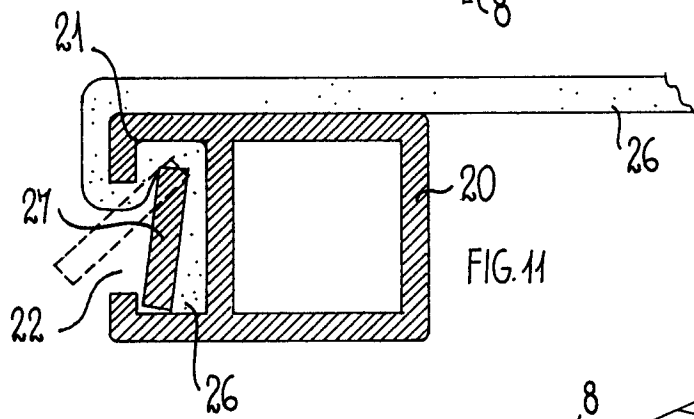
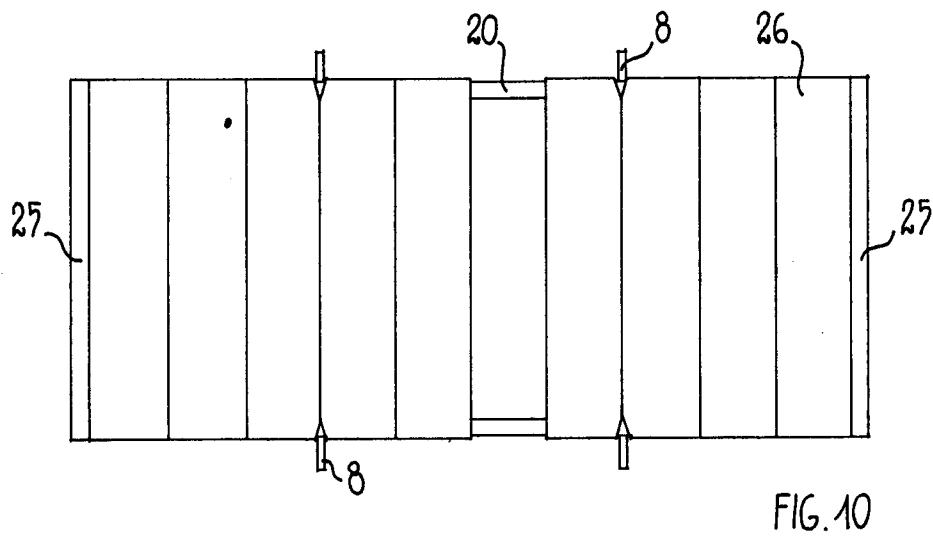
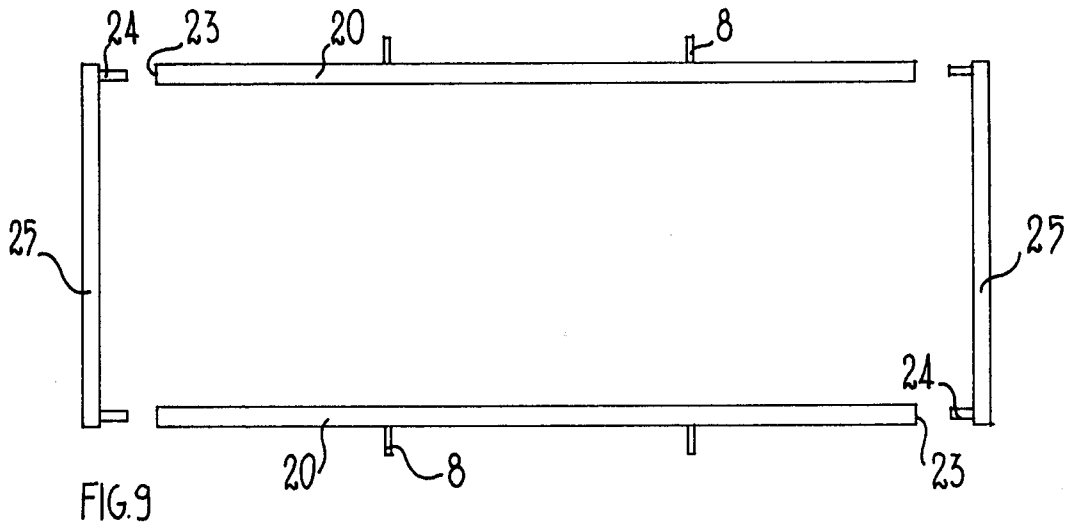


FIG. 6





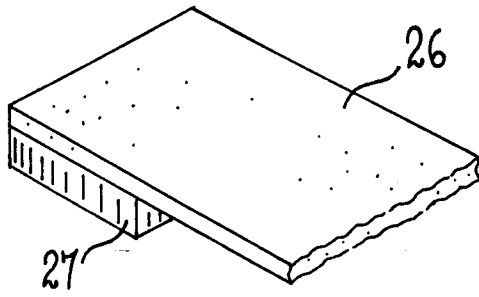


FIG. 13

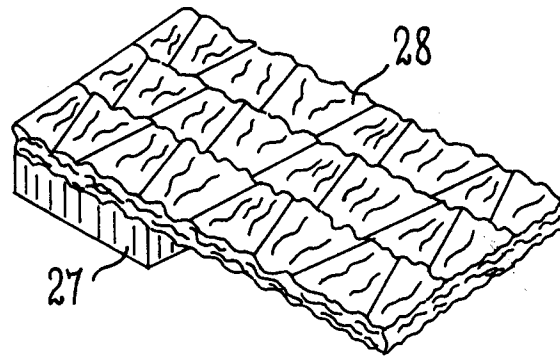


FIG. 14

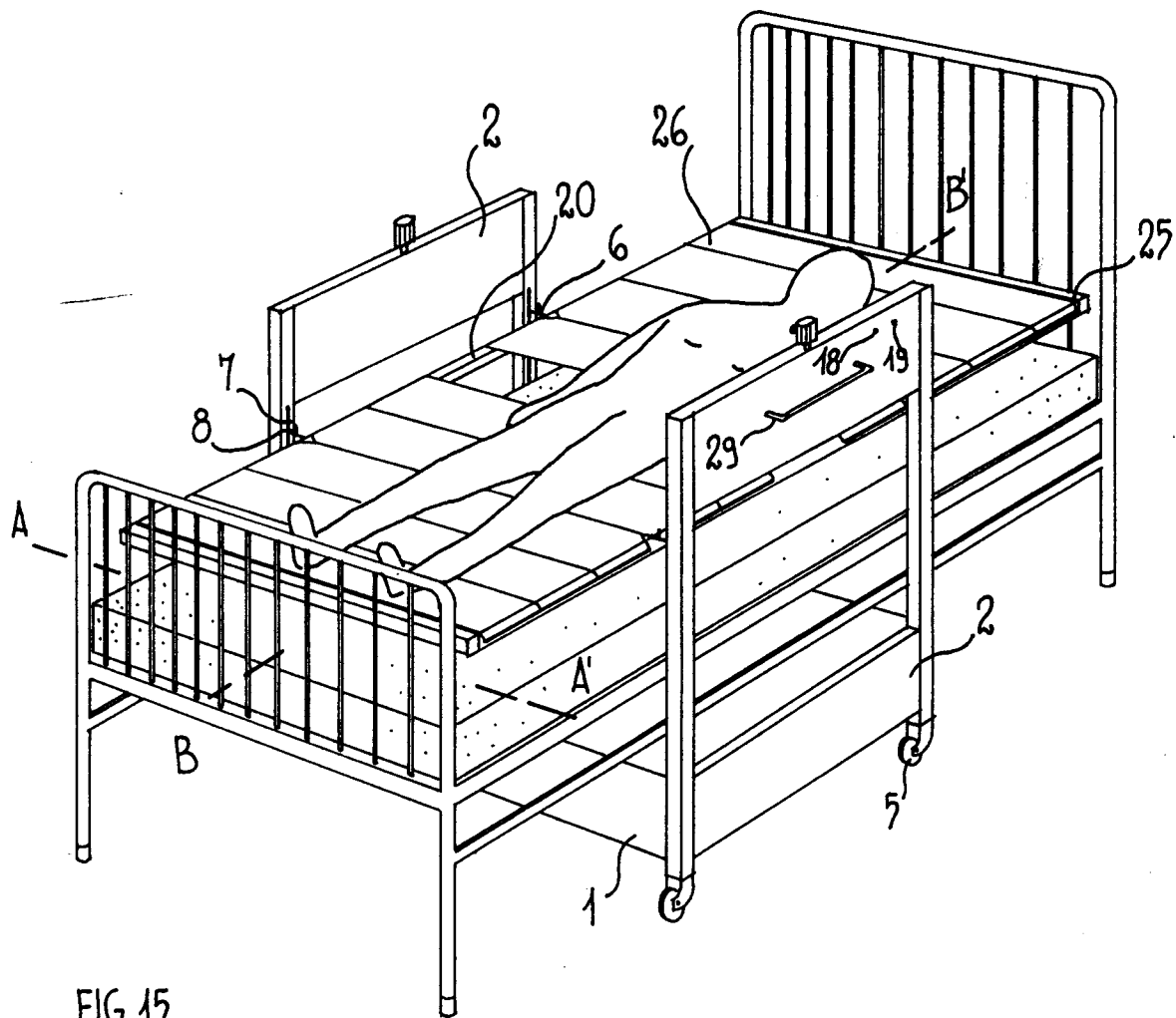


FIG. 15