



TITLE OF THE INVENTION

Bed Apparatus and Rehabilitation Attachment

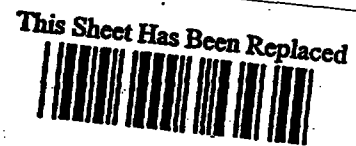
BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to a bed apparatus
which comprises a mechanism for rehabilitation and a
rehabilitation attachment which is combined with such a
bed apparatus, and more particularly, it relates to a bed
apparatus and a rehabilitation attachment which are
10 suitable for a sick person, a physically handicapped
person or a bed-ridden old person (hereinafter simply
referred to as "sick person or the like") who is nursed at
his home, for example.

Description of the Background Art

15 The inventor has proposed an improved bed apparatus
in U.S. Patent Application No. 755,448, European Patent
Application No. 9130718.8, Korean Patent Application No.
91-15962 and Formosan Utility Model Application No.
80210925, for example. In consideration of housing
20 circumstances in Japan, this bed apparatus is rendered
applicable to a 6-mat room of about 270 cm by 360 cm or a
4.5-mat room of about 270 cm by 270 cm, for example, while
the same is provided with a lifting mechanism which can
simply raise up or lay down a sick person or the like from
25 or on the bed body and move him onto a side portion of the



bed body.

A bed-ridden state is rather unpreferable for a sick person or the like to recover from illness or disorder.

In recent years, importance of rehabilitation has been

5 watched in particular, and many reports have been made on the fact that it is rather advisable for a sick person or the like to take light exercise, in order to recover sooner.

SUMMARY OF THE INVENTION

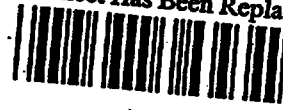
10 Accordingly, an object of the present invention is to provide a bed apparatus which has the aforementioned lifting mechanism and enables rehabilitation of a sick person or the like through parts of such a lifting mechanism, and a rehabilitation attachment which is
15 mounted on such a bed apparatus.

The present invention is first directed to a bed apparatus having a lifting mechanism, which comprises:

a bed body having a longitudinal dimension and a cross-directional dimension,

20 a pair of sliders which are mounted on both end portions of the bed body along its longitudinal direction to be slidable along the cross direction of the bed body for extending in the cross direction of the bed body upon such sliding movement,

25 A pair of upright bars which are mounted on the



respective sliders to upwardly extend from the sliders,
a pair of support members which are mounted to be
movable along the upright bars and stoppable at moved
positions, and

5 a pair of parallel side bars for coupling the pair of
support members with each other.

According to the present invention, such a bed
apparatus having a lifting mechanism is further provided
with:

10 a rail coupling the pair of support members with each
other and positioned above the pair of side bars, and

a rehabilitation attachment movable along the rail
and having a pulley whose angle is changeable about a
vertical axis.

15 The present invention also provides a rehabilitation
attachment which is advantageously combined with the
aforementioned bed apparatus. This rehabilitation
attachment comprises:

a wheel rolling on a rail,
20 an upper yoke rotatably holding the wheel,
a lower yoke which is mounted on the upper yoke to be
rotatable about a vertical axis, and

a pulley which is rotatably held by the lower yoke.

With the bed apparatus or the rehabilitation
25 attachment according to the present invention, a sick



person or the like can take hand exercise and limb exercise.

5 The rail is brought into a position above the bed body, on which the sick person or the like is laid down, and a rope is extended along the pulley, so that the sick person or the like grasps both end portions of the rope with his left and right hands in a lying state and alternately moves his hands, to take hand exercise.

10 Similarly to the case of the hand exercise, a rope may be extended along the pulley so that the sick person or the like engages his feet with an end of the rope and grasps the other end thereof with his hands to raise up the feet by moving the hands, thereby taking limb exercise in a lying state.

15 Further, the sick person or the like can take walking exercise with the bed apparatus according to the present invention.

20 The pair of sliders are made to extend in the cross direction of the bed body and the positions thereof are adjusted on the pair of upright bars, so that the sick person or the like can take walking exercise between the two side bars while grasping the same with his hands.

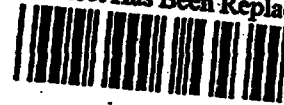
25 Thus, according to the present invention, it is possible to use the bed apparatus for various purposes by utilizing the lifting mechanism itself for lifting the

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sick person or the like and mounting the rehabilitation attachment on the bed apparatus so that the bed apparatus fulfills its original function as a bed and the lifting mechanism serves as a lift for the sick person or the like
5 while these equipments can also be adapted for rehabilitation. Further, such a multifunctional bed apparatus occupies a relatively small space for its functions, whereby the inventive bed apparatus can be used in an ordinary house, which is generally restricted in
10 space, with no problem.

According to the present invention, it is possible to nurse a sick person or the like with a single bed apparatus over a relatively long period of time in the process of recovery. When the sick person or the like is
15 confined to his bed whether willing or not, the lifting mechanism fulfills its original function for lifting him for defecation, bathing, change of sheets or the like. In this case, not only the two side bars included in the lifting mechanism but also the rail or the rehabilitation
20 attachment can be used for lifting the sick person or the like at need. When the sick person or the like is so convalescent that he can move his limbs, he can take hand exercise and limb exercise with the rehabilitation attachment in the aforementioned modes. When the sick
25 person or the like is ambulatory, further, he can take

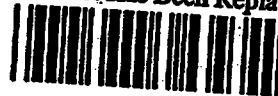


walking exercise in safety while grasping the two side bars which are included in the lifting mechanism.

According to the present invention, the sick person or the like can take hand/limb exercise and walking
5 exercise on the bed body and in the vicinity of the bed body respectively. Therefore, the sick person or the like can safely take such exercise by himself, and no particular space is required for such rehabilitation.

It is possible to adjust the rail for holding the
10 rehabilitation attachment which is employed for hand exercise and limb exercise as well as the pair of parallel side bars for serving as handrails for the sick person or the like who takes walking exercise, to provide the optimum vertical positions in response to the situation
15 and the physical constitution of the sick person or the like. In the rehabilitation attachment, the angle of the pulley for receiving the rope is changeable about a vertical axis, so that the pulley is regularly at an optimum angle following the direction of extension of the
20 rope. Therefore, it is possible to prevent the rope from undesirable displacement in relation to the pulley.

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



accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevational view showing a bed apparatus 1 according to an embodiment of the present invention;

Fig. 2 is a plan view of the bed apparatus 1 shown in Fig. 1;

Fig. 3 is a left side elevational view of the bed apparatus 1 shown in Fig. 1;

Fig. 4 is a plan view corresponding to Fig. 2, showing states of sliders 4 and 5 most extending from a bed body 3;

Fig. 5 is a left side elevational view corresponding to Fig. 3, showing the state shown in Fig. 4;

Fig. 6 is a left side elevational view corresponding to Fig. 3, showing states of the sliders 4 and 5 most retracted with respect to the bed body 3;

Fig. 7 is a front elevational view corresponding to Fig. 1, showing a side bar 10 upwardly moved following rotation of arms 29 and 29a;

Fig. 8 is a left side elevational view corresponding to Fig. 3, showing a mechanism for making the slider 4 slide along the bed body 3;

Fig. 9 is a left side elevational view corresponding to Fig. 5, showing the mechanism shown in Fig. 8;



Fig. 10 is a left side elevational view corresponding to Fig. 6, showing the mechanism shown in Fig. 8;

Fig. 11 is a right side elevational view showing the structure of a support member 8;

5 Fig. 12 is a plan view showing the structure of the support member 8;

Fig. 13 is a front elevational view showing the structure of the support member 8;

10 Fig. 14 is a longitudinal sectional view showing relation between a sliding block 27, which is included in the support member 8, and an upright member 6 related thereto;

Fig. 15 is an enlarged sectional view taken along the line XV - XV in Fig. 14;

15 Fig. 16 is a front elevational view showing a hanger shovel 61;

Fig. 17 is a right side elevational view showing the hanger shovel 61;

20 Fig. 18 is a plan view partially showing the hanger shovel 61;

Fig. 19 is a sectional view taken along the line XIX - XIX in Fig. 16;

Fig. 20 is a front elevational view showing a rehabilitation attachment 68 in an enlarged manner;

25 Fig. 21 is a sectional view taken along the line



XXI - XXI in Fig. 20;

Fig. 22 is a bottom plan view of the attachment 68 shown in Fig. 20;

Fig. 23 is a perspective view showing a sick person
5 100 or the like who takes hand exercise;

Fig. 24 is a perspective view showing the sick person
100 or the like who takes limb exercise;

Fig. 25 is a perspective view showing the sick person
100 or the like who is lifted by a hammock 87;

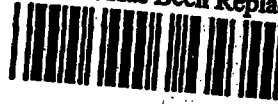
10 Fig. 26 is a front elevational view showing the sick
person 100 or the like who takes walking exercise with the
side bars 10 and 11; and

Fig. 27 is a left side elevational view illustrating
the state shown in Fig. 26.

15 DESCRIPTION OF THE PREFERRED EMBODIMENTS

As hereinafter described, Fig. 23 shows a sick person
or the like who takes hand exercise, and Fig. 24 shows the
sick person or the like who takes limb exercise. Figs. 26
and 27 show the sick person or the like who takes walking
20 exercise. Such rehabilitation can be made with a bed
apparatus 1, which is now described in detail.

Figs. 1 to 6 show the overall structure of the bed
apparatus 1. Figs. 1 to 3 show a first typical available
mode of the bed apparatus 1 and Figs. 4 and 5 show a
25 second typical mode thereof, while Fig. 6 shows a third



typical mode of the bed apparatus 1. Fig. 1 is a front elevational view, Figs. 2 and 4 are plan views, and Figs. 3, 5 and 6 are left side elevational views respectively.

As to principal components included in this embodiment, the bed apparatus 1 comprises a bed body 3 and a mattress 2 which is spread thereon. The bed body 3 is so hinged that it is possible to arbitrarily change a partially inclined state of the mattress 2. Fig. 7 shows a partially raised state of the mattress 2 with phantom lines.

A pair of sliders 4 and 5 are mounted on both end portions along the longitudinal direction of the bed body 3, to be slidable along the cross direction of the bed body 3. Upon such sliding movement, the sliders 4 and 5 extend in the cross direction of the bed body 3, as most clearly shown in Figs. 4 and 5.

A pair of upright bars 6 and 7 are mounted to upwardly extend from the sliders 4 and 5 respectively.

A pair of support members 8 and 9 are mounted to be movable along the upright bars 6 and 7 respectively and stoppable at moved positions.

Two parallel side bars 10 and 11 are provided to couple the pair of support members 8 and 9 with each other.

The bed apparatus 1 is now described in more detail.



First, a structure for making the slider 4 or 5 slide along the cross direction of the bed body 3 is described. Figs. 8, 9 and 10, which correspond to Figs. 3, 5 and 6 respectively, show the first slider 4. The second slider 5 is provided with a structure which is substantially identical to that for the first slider 4. It is noted here that Figs. 8 to 10 are partially fragmented or simplified, in order to facilitate easy understanding of the operation related to the slider 4.

10 The sliders 4 and 5, having L-shaped configurations as a whole, are provided with vertically extending leg portions 12 and 13 respectively. Wheels 14 and 15 are mounted on lower ends of the leg portions 12 and 13 respectively.

15 The sliders 4 and 5 are respectively driven to slide by traverse motors 16 and 17, which are fixed to the sliders 4 and 5 respectively.

Mainly with reference to Figs. 8 to 10, the structure for driving the first slider 4 is now described.

20 According to this embodiment, the upright bar 6 is also moved on the slider 4 upon sliding movement of the slider 4.

25 A chain 18 is arranged on a horizontally extending portion of the slider 4. This chain 18 may be replaced by a belt or the like. The chain 18 is extended along

sprocket wheels 19 and 20, which are held by the slider 4. Rotation of the motor 16 is transmitted to the first sprocket wheel 19 through a belt 21, for example.

5 A fixture 22 is fixed to a prescribed position on a lower path for the chain 18. This fixture 22 is also fixed to a prescribed position of a guide 23 which is provided on the bed body 3.

10 When the rotation of the motor 16 is transmitted to the sprocket wheel 16 through the belt 21 and the chain 18 circulates in response, therefore, the slider 4 slides along the guide 23 since the lower path for the chain 18 is fixed with the guide 23 through the fixture 22. The sliding direction of the slider 4 can be varied with the direction of rotation of the motor 16. In such sliding
15 movement of the slider 4, the wheel 14 rolls on a floor face 24.

Another fixture 25 is fixed to a prescribed position on an upper path for the chain 18. This fixture 25 is also fixed to a base portion 26 of the upright bar 6.

20 When the chain 18 circulates in the aforementioned manner, therefore, the base portion 26, i.e., the upright bar 6, is displaced with respect to the slider 4, since the upper path for the chain 18 is fixed with the base portion 26 through the fixture 25.

25 When the slider 4 slides along the bed body 3,



therefore, the upright bar 6 is displaced in the same direction on the slider 4. In this case, the amount of displacement of the slider 4 with respect to the bed body 3 is equal to that of the upright bar 6 with respect to the slider 4.

In the state shown in Fig. 8, the upright bar 6 is located at the cross-directional center of the bed body 3. In this state, the slider 4 slightly extends sidewardly from the bed body 3.

When the slider 4 most sidewardly extends from the bed body 3 as shown in Fig. 9, the upright bar 6 is brought into a position close to the leg portion 12 on the slider 4. As to movement with reference to the bed body 3, the upright bar 6 is moved by an amount of displacement twice that of the slider 4 with respect to the bed body 3. Thus, it is possible to sufficiently sidewardly separate the upright bar 6 from the bed body 3 while reducing the amount of extension of the slider 4 from the bed body 3.

When the slider 4 is further approached to the bed body 3 as shown in Fig. 10 from the state of Fig. 8, on the other hand, the upright bar 6 is brought into a position close to the motor 16 on the slider 4. As the result, the upright bar 6 is moved toward a side portion along the cross direction of the bed body 3. The state shown in Fig. 10 is generally implemented when the



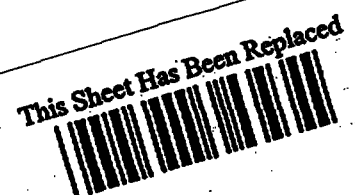
aforementioned side bars 10 and 11 are not used.

Therefore, such movement of the upright bar 6 is further effective for protecting the sick person or the like, who is laid on the bed body 3, against oppression caused by
5 the side bars 10 and 11, the support members 8 and 9 and the upright bars 6 and 7.

The structure of the support member 8 or 9 is now described in detail. The support members 8 and 9 are symmetrical in structure to each other. Fig. 11 is a
10 right side elevational view showing the first support member 8, Fig. 12 is a plan view thereof, and Fig. 13 is a front elevational view of the support member 8, respectively.

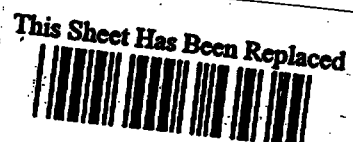
The support member 8 comprises a sliding block 27
15 which is moved along the related upright bar 6. The relation between the sliding block 27 and the upright bar 6 is described later with reference to Figs. 14 and 15. A bracket 28 having a U-shaped section, for example, is fixed to the sliding block 27. This bracket 28 is also
20 shown in Fig. 15, as described later. A pair of arms 29 and 30 are mounted on the bracket 28. These arms 28 and 29 oppositely extend from the bracket 28 along the cross direction of the bed body 3.

As shown by phantom lines in Fig. 11, the arms 29 and
25 30 are upwardly rotatable about pins 31 and 32 with



respect to the bracket 28. Further, the sliding block 27 rotatably holds two hook links 33 and 34 by a common pin 35. Hook portions 36 and 37 are provided on respective free ends of the hook links 33 and 34. On the other hand, engaging pins 38 and 39, which are engageable with the hook portions 36 and 37 respectively, are provided on respective free ends of the arms 29 and 30. When the arms 29 and 30 are upwardly rotated as shown by phantom lines in Fig. 11, therefore, the hook portions 36 and 37 of the hook links 33 and 34 engage with the engaging pins 38 and 39 respectively, to fix the upwardly rotated states of the arms 29 and 30.

The aforementioned two side bars 10 and 11 are mounted on the arms 29 and 30 respectively. Thus, the side bars 10 and 11 can be located at upper and lower positions, following the aforementioned rotation of the arms 29 and 30. Fig. 11 shows the lower and upper positions of the side bars 10 and 11 with solid and phantom lines. Fig. 6, above described, shows a state corresponding to the state shown with the phantom lines in Fig. 11. The side bars 10 and 11 are thus brought into the upper positions to protect the sick person or the like, who is laid on the bed body 3, against oppression, as well as to facilitate medical examination of the sick person or the like with no hindrance. Further, it is also



possible to facilitate an operation for partially raising the bed body 3 as shown in Fig. 7, by bringing the side bars 10 and 11 to the upper positions as shown with the phantom lines in Fig. 11.

5 While Figs. 11 to 13 show a structure which is related to the first support member 8, Figs. 1 to 7 show the second support member 9. Elements of the second support member 9 which are in laterally symmetrical positions with respect to those included in the first
10 support member 8 are denoted by the same reference numerals as shown in Figs. 11 to 13 with subscripts "a", to omit redundant description.

 According to this embodiment, the positions of the side bars 10 and 11 are changeable on the arms 29, 29a, 30
15 and 30a. As to the relation between the arms 29 and 30 and the side bars 10 and 11 shown in Figs. 11 to 13, clamps 40 and 41 having inverted U-shaped sections are mounted on respective end portions of the side bars 10 and
20 11. On the other hand, the arms 29 and 30 have T-shaped sections. Further, guide blocks 42 and 43 for holding lower portions of the arms 29 and 30 having the T-shaped sections are mounted on the clamps 40 and 41, as shown in Fig. 13 with reference to the clamp 40. Thus, the clamps
25 40 and 41, which are longitudinally movable along the arms 29 and 30, are inhibited from sideward displacement from

the arms 29 and 30. The clamps 40 and 41 are provided with clamp screws 44 and 45 respectively. These clamp screws 44 and 45 are so tightened as to fix the positions of the clamps 40 and 41 on the arms 29 and 30.

5 The aforementioned structure is also employed on the other ends of the side bars 10 and 11 respectively.

 Thus, the distance between the pair of side bars 10 and 11 can be varied with the positions of the side bars 10 and 11 with respect to the arms 29 and 30. For
10 example, the distance between the side bars 10 and 11 shown in Fig. 2 is wider than that shown in Fig. 4. The distance between the side bars 10 and 11 is thus changed in response to the physical constitution of the sick person or the like, for example, as hereinafter described.

15 A structure for making the support member 8 or 9 movable along the upright bar 6 or 7 and stoppable at a moved position is now described. Fig. 14 is a longitudinal sectional view showing relation between the sliding block 28 which is included in the first support
20 member 8 and the related upright bar 6. Fig. 15 is an enlarged sectional view taken along the line XV - XV in Fig. 14. As to relation between the sliding block 27a which is included in the second support member 9 and the upright bar 7 related thereto, a structure (not shown)
25 which is symmetrical to that shown in Figs. 14 and 15 is

employed. Therefore, only the relation between the sliding block 27 which is included in the first support member 8 and the related upright bar 6 is described in detail.

5 Referring to Figs. 14 and 15, the upright bar 6 has a C-shaped section, in order to receive the sliding block 27 as well as to enable mounting of the bracket 28 (Fig. 15) on the sliding block 27. A lead screw 46 is arranged in the upright bar 6, to be rotatable about its central axis. 10 Fig. 14 shows brackets 47a and 48 for rotatably holding both ends of the lead screw 46.

The aforementioned base portion 26 of the upright bar 6 has a hollow structure, to contain a motor 49 for vertical movement therein. This motor 49 is reciprocally 15 rotatable. Rotation of the motor 49 is transmitted to the lead screw 46, successively through gears 50, 51 and 52.

A female screw block 54 is fixed to the sliding block 27 through a mounting plate 53. This female screw block 54 is provided with a female screw, which is fitted with 20 the lead screw 46. When the lead screw 46 is rotated upon rotation of the motor 49, therefore, the sliding block 27 is vertically moved. When the motor 49 is stopped, on the other hand, the lead screw 46 is also stopped so that it is impossible to transmit operation from the female screw 25 block 54 to the lead screw 46, whereby the sliding block



27 is stopped in its moved position by such stoppage of the lead screw 46.

Fig. 15 shows some elements for smoothly guiding the movement of the sliding block 27 along the upright bar 6. A plurality of rotatable guide rollers 55, 56, 57 and 58 and guide shoes 59 and 60 are provided on the sliding block 27. The guide rollers 55 to 58 and the guide shoes 59 and 60 come into contact with the inner surface of the upright bar 6 from various directions, thereby facilitating smooth vertical movement of the sliding block 27 within the upright bar 6.

Although Fig. 15 shows four guide rollers 55 to 58 and two guide shoes 59 and 60, appropriate numbers of such guide rollers and guide shoes (not shown) may be vertically distributed along the sliding block 27.

The bracket 28 is mounted on the lower end of the sliding block 27. The lower end of the sliding block 27 is movable to downwardly project from the upright bar 6 beyond the gear 52 and the lower end of the upright bar 6. Thus enabled is the position of the support member 8, which is shown with phantom lines in Fig. 5.

Figs. 1 to 5 illustrate appropriate numbers of hanger shovels 61, which are provided on the side bars 10 and 11 respectively. These hanger shovels 61 are adapted to raise the sick person or the like in a lying condition.



Figs. 16 to 19 show the structure of each such hanger shovel 61 in detail.

Fig. 16 is a front elevational view showing the hanger shovel 61 and Fig. 17 is a right side elevational view thereof, while Fig. 18 is a plan view partially showing the hanger shovel 61, and Fig. 19 is a sectional view taken along the line XIX - XIX in Fig. 16.

The hanger shovel 61 is formed of a relatively rigid material such as hard plastic, aluminum or stainless steel, for example. The hanger shovel 61 is curved to provide an L-shaped configuration as a whole, and provided with a hook portion 62, which is engageable with the side bar 10 or 11, on its one end. A plurality of ribs 63 are distributed on the hanger shovel 61, in order to ensure at least a prescribed level of strength while reducing the thickness as well as the weight of the hanger shovel 61 to the utmost. As clearly shown in Fig. 19, such ribs 63 are preferably formed to provide rounded sections.

Such hanger shovels 61 are prepared in plural. In order to use the hanger shovels 61, horizontally extending bottom portions 64 of the hanger shovels 61 are inserted under the body of the sick person or the like, who is laid on the bed body 3. In this case, the plurality of hanger shovels 61 are appropriately distributed on both sides of the body of the sick person or the like in consideration



of the weight of the sick person or the like. On the other hand, the height of and the distance between the pair of side bars 10 and 11 are adjusted in accordance with the aforementioned mechanism in consideration of the positions of the hook portions 62 of the hanger shovels 5 61. Then, the hook portions 62 of the hanger shovels 61 are made to engage with the slide bars 10 and 11.

The aforementioned hanger shovels 61 can be advantageously inserted under the body of the sick person 10 or the like, without raising him. After the hook portions 62 of the hanger shovels 61 engage with the side bars 10 and 11, the side bars 10 and 11 are so displaced that it is possible to move the sick person or the like to a desired position.

15 Typical available states of the bed apparatus 1 are now described with reference to Figs. 1 to 6.

When the sliders 4 and 5 and the upright bars 6 and 7 are in the states shown in Figs. 1 to 3, the sick person or the like who is laid on the bed body 3 is raised. The 20 support members 8 and 9 and the side bars 10 and 11 are downwardly moved from the states shown in Figs. 1 to 3, to positions engageable with the hook portions 62 of the hanger shovels 61, which have been inserted under the body of the sick person or the like. Further, the distance 25 between the pair of side bars 10 and 11 is adjusted in



response to the physical constitution of the sick person or the like. This distance may be adjusted only once in an initial stage of employment of the bed apparatus 1.

Then, the support members 8 and 9 and the side bars 10 and 11 are upwardly displaced to such positions that the hanger shovels 61 are separated from the mattress 2 on the bed body 3.

A bed sheet or the like, which is spread on the mattress 2, may be exchanged in this state, and the bed apparatus 1 may be returned to its original state after such exchange.

Operation for sidewardly moving the sick person or the like from the bed body 3 for bathing him, for example, is now described.

In this case, the sliders 4 and 5 are made to sidewardly extend from the bed body 3, as shown in Figs. 4 and 5. Thus, the sick person or the like is sidewardly moved from the bed body 3 at the same level.

Then, the support members 8 and 9 and the side bars 10 and 11 are downwardly moved, thereby downwardly moving the sick person or the like at the side of the bed body 3. This embodiment is so designed that the support members 8 and 9 can be downwardly moved to bring the sick person or the like into contact with the floor face 24, as shown by phantom lines in Fig. 5. The sick person or the like thus



placed on the floor face 24 is then brought into a bathtub for bathing.

In the state shown in Figs. 4 and 5, the vertical positions for stopping the support members 8 and 9 may be selected in response to the type of care for the sick person or the like. For example, the sick person or the like may not be temporarily placed on the floor face 24 dissimilarly to the above, but a bathtub may be arranged immediately under the side bars 10 and 11 in the state shown in Figs. 4 and 5, so that the sick person or the like can be brought into the bathtub in an intermediate stage of downward movement of the side bars 10 and 11.

Operation reverse to the above may be carried out in order to return the sick person or the like on the bed body 3.

When the support members 8 and 9 and the side bars 10 and 11 are not used, as shown in Fig. 6, it is preferable to make the sliders 4 and 5 further slide toward the bed body 3 while moving the upright bars 6 and 7 toward an end along the cross direction of the bed body 3. More preferably, the arms 29a and 30a (and 29 and 30) are fixed in upwardly rotated states, to raise up the vertical positions of the side bars 10 and 11.

The bed apparatus 1 having such a lifting mechanism is further provided with a mechanism for rehabilitation.



Figs. 1, 2, 4 and 7 illustrate a rail 67 which extends across the pair of upright bars 6 and 7. As shown in Figs. 11 to 14, each end of the rail 67 is fixed to the sliding block 27 or 27a included in the support member 8 or 9. This rail 67 is positioned above the two side bars 10 and 11, and its vertical position is changeable following vertical movement of the sliding blocks 27 and 27a along the upright bars 6 and 7.

A rehabilitation attachment 68 is movably provided on the rail 67. Figs. 20 to 22 illustrate this attachment 68 in an enlarged manner. Fig. 20 is a front elevational view showing the attachment 68, Fig. 21 is a sectional view taken along the line XXI - XXI in Fig. 20, and Fig. 22 is a bottom plan view showing the attachment 68.

The attachment 68 comprises, for example, two wheels 69 which roll on the rail 67. These wheels 69 are rotatably held by an upper yoke 70. A lower yoke 71 is located under the upper yoke 70 and coupled thereto by a rivet 72. This rivet 72 enables rotation of the lower yoke 71 about a vertical axis with respect to the upper yoke 70. The lower yoke 71 rotatably holds a pulley 73.

The upper yoke 70 may be provided with a mechanism for fixing the attachment 68 to the rail 67 at need. Such a mechanism is provided by a brake lever 74, for example, so that an eccentric shaft 75 which is provided on this



lever 74 clamps the rail 67 between the same and the wheels 69 when the brake lever 74 is rotated as shown by phantom lines in Fig. 20, thereby fixing the attachment 68 to a prescribed position on the rail 67.

5 The lower yoke 71 is preferably provided with hooks 76 on both end portions thereof. A method of using the hooks 76 is described later with reference to Fig. 25.

 For the purpose of rehabilitation, a rope 77 is extended along the pulley 73 as shown by phantom lines in
10 Fig. 20, for example. As clearly shown in Fig. 21, a shaft 78 rotatably supporting the pulley 73 overhangs from the lower yoke 71, whereby the rope 77 can be easily mounted on/detached from the pulley 73.

 Fig. 23 shows a sick person 100 or the like, who
15 takes hand exercise. Hand grips 79 and 80 are mounted on both ends of the aforementioned rope 77. As shown in Fig. 23, the sick person 100 or the like grasps the hand grips 79 and 80 with his left and right hands 81 and 82 and alternately moves the hands 81 and 82, to take hand
20 exercise. Referring to Fig. 23, the direction of the pulley 73 is changed following the direction of extension of the rope 77, whereby the longitudinal direction of the lower yoke 71 is perpendicular to the rail 67.

 Fig. 24 shows the sick person 100 or the like, who
25 takes limb exercise.



An end of the aforementioned rope 77 is provided with an engaging belt 85, which can be engaged with both feet 83 and 84 of the sick person 100 or the like. The other end of the rope 77 is provided with a hand grip 86 to be grasped by the hands 81 and 82 of the sick person 100 or the like. The sick person 100 or the like engages his feet 83 and 84 with the engaging belt 85 and grasps the hand grip 86 with his hands 81 and 82 and moves the hands 81 and 82, to raise up his feet 83 and 84. Thus, the sick person 100 or the like can take limb exercise. The sick person 100 or the like can arbitrarily engage only one of his feet 83 and 84, or grasp the hand grip 86 with only one of his hands 81 and 82, to take such exercise.

Referring to Fig. 24, the angle of the pulley 73 is changed following the direction of extension of the rope 77, whereby the longitudinal direction of the lower yoke 71 is in parallel with the rail 67.

In relation to the rail 67, the position of the attachment 68 for the exercise shown in Fig. 23 is different from that for the exercise shown in Fig. 24. The wheels 69 roll on the rail 67, to achieve such positional change. While the sick person 100 or the like takes either exercise, however, it is not necessary to move the attachment 68 along the rail 67. Therefore, the attachment 68 may be currently fixed to the rail 67

through the brake lever 74. Further, additional means (not shown) may be provided for selectively inhibiting the lower yoke 71 from rotation with respect to the upper yoke 70.

5 The vertical position of the rail 67 can be adjusted in a stepless manner following vertical movement of the sliding blocks 27 and 27a. Thus, the vertical position of the attachment 68 can also be adjusted in a stepless manner. Therefore, it is easy to properly select the
10 vertical position of the attachment 68 in response to the physical constitution or the condition of the sick person 100 or the like, who takes the exercise shown in Fig. 23 or 24. The attachment 68 may be vertically reciprocated by the motor 49, for facilitating hand or limb exercise.
15 Such exercise is advantageously applied when the sick person 100 or the like cannot move his hands and/or feet unaided.

 The attachment 68 can also be used for suspending a hammock 87, as shown in Fig. 25. This hammock 87 is
20 adapted to lift the sick person 100 or the like in a sitting state for making him relieve himself or moving him onto a wheelchair, for example. Belt portions 88 of the hammock 87 are engaged with the hooks 76 which are provided on the lower yoke 71. The lower yoke 71 has a
25 relatively long configuration so that it is possible to



relatively increase the distance between the hooks 76 provided on its end portions, whereby the hammock 87 is not twisted round on its upper portion. Thus, the sick person 100 or the like is prevented from cramp to some extent when he is held by the hammock 87.

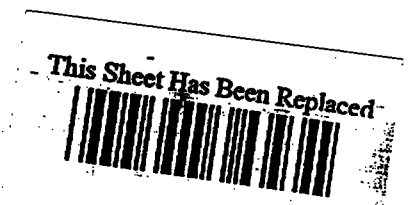
Figs. 26 and 27 illustrate the sick person 100 or the like, who takes walking exercise. In this case, the bed apparatus 1 is brought into the following state:

First, the pair of sliders 4 and 5 slide to extend in the cross direction of the bed body 3, as shown in Figs. 26 and 27. According to this embodiment, the pair of upright bars 6 and 7 are also moved in the same direction by the aforementioned mechanism. This state corresponds to that shown in Figs. 4 and 5.

The positions of the pair of support members 8 and 9 are adjusted on the upright bars 6 and 7 on the basis of the aforementioned mechanism. Thus, the vertical positions of the two parallel side bars 10 and 11 are adjusted to those optimum for the situation or the physical constitution of the sick person 100 or the like who takes walking exercise.

Further, the distance between the side bars 10 and 11 may also be adjusted on the basis of the aforementioned mechanism.

The hanger shovels 61 (Fig. 2, for example) are



removed from the side bars 10 and 11.

5 Upon such adjustment, the sick person 100 or the like stands between the two side bars 10 and 11 and grasps the same with his hands to take walking exercise. In this case, the hammock 87 shown in Fig. 25 may be suspended from the attachment 68 to hold the sick person 100 or the like, who takes walking exercise. Thus, the sick person 100 or the like can put out his feet from the hammock 87 and move them on the floor face 24, to take walking
10 exercise.

When the sick person 100 or the like gets tired during such walking exercise, he can take a seat on a chair. Such a chair may be provided by a stool type movable chamber pot, for example.

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



WHAT IS CLAIMED IS:

1. A bed apparatus comprising:

a bed body having a longitudinal dimension and a cross-directional dimension;

5 a pair of sliders being mounted on both end portions of said bed body along its longitudinal direction to be slidable along the cross direction of said bed body for extending in the cross direction of said bed body upon such sliding movement;

10 a pair of upright bars being mounted on respective said sliders to upwardly extend from respective said sliders;

a pair of support members being mounted to be movable along said upright bars and stoppable at moved positions;

15 a pair of parallel side bars coupling said pair of support members with each other;

a rail coupling said pair of support members with each other and being positioned above said pair of side bars; and

20 a rehabilitation attachment being movable on said rail and having a pulley whose angle is changeable about a vertical axis.

2. A rehabilitation attachment comprising:



a wheel rolling on a rail;
an upper yoke rotatably holding said wheel;
a lower yoke being mounted to be rotatable about a
5 vertical axis with respect to said upper yoke; and
a pulley rotatably held by said lower yoke.

3. A rehabilitation attachment in accordance with
claim 2, further comprising means for selectively fixing
said upper yoke to said rail.

4. A rehabilitation attachment in accordance with
claim 2, wherein said lower yoke comprises hooks.

5. A rehabilitation attachment in accordance with
claim 2, wherein said lower yoke comprises a pair of walls
being opposite to each other with a prescribed space, and
said pulley is rotatably supported by a shaft which is
5 mounted on one of said walls.



6. In combination with, or for, a bed, a device comprising a structure nestable with the bed so as not to extend substantially therefrom in the longitudinal direction and the cross-direction thereof and moveable in the cross-direction of the bed to a position to a side of the bed, support means mounted on said structure for relative sliding movement thereto in at least the cross-direction of said bed whereby said support means are moveable to said side of the bed by (i) movement of the structure in the cross-direction of the bed and (ii) sliding movement of the support means relative to the structure in said cross-direction, said support means including rail means extending in the longitudinal direction of the bed above the same, and a rehabilitation attachment for example including a pulley, supported on said rail means.

