

[54] THERAPEUTIC EXERCISE APPARATUS

[76] Inventor: Vera L. Mossman, 5612 Griggs Dr., Flint, Mich. 48504

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Primary Examiner—Richard C. Pinkham

Assistant Examiner—Joseph R. Taylor

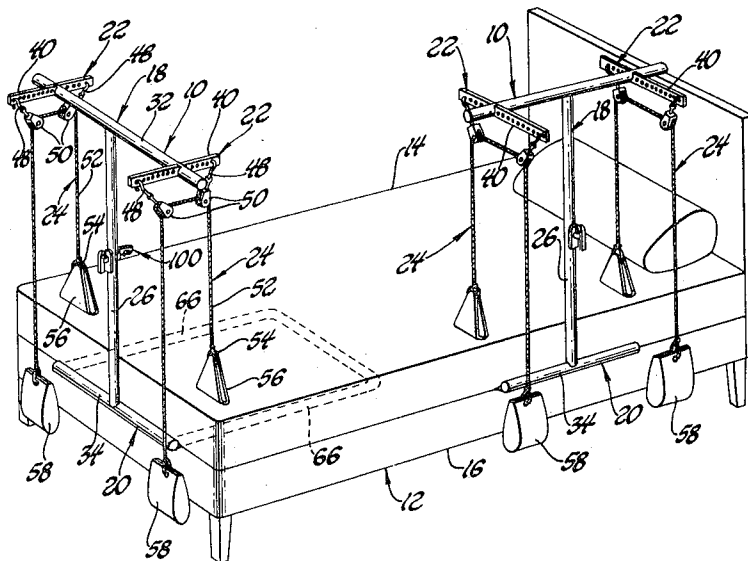
Attorney, Agent, or Firm—Fisher, Krass, Young & Gerhardt

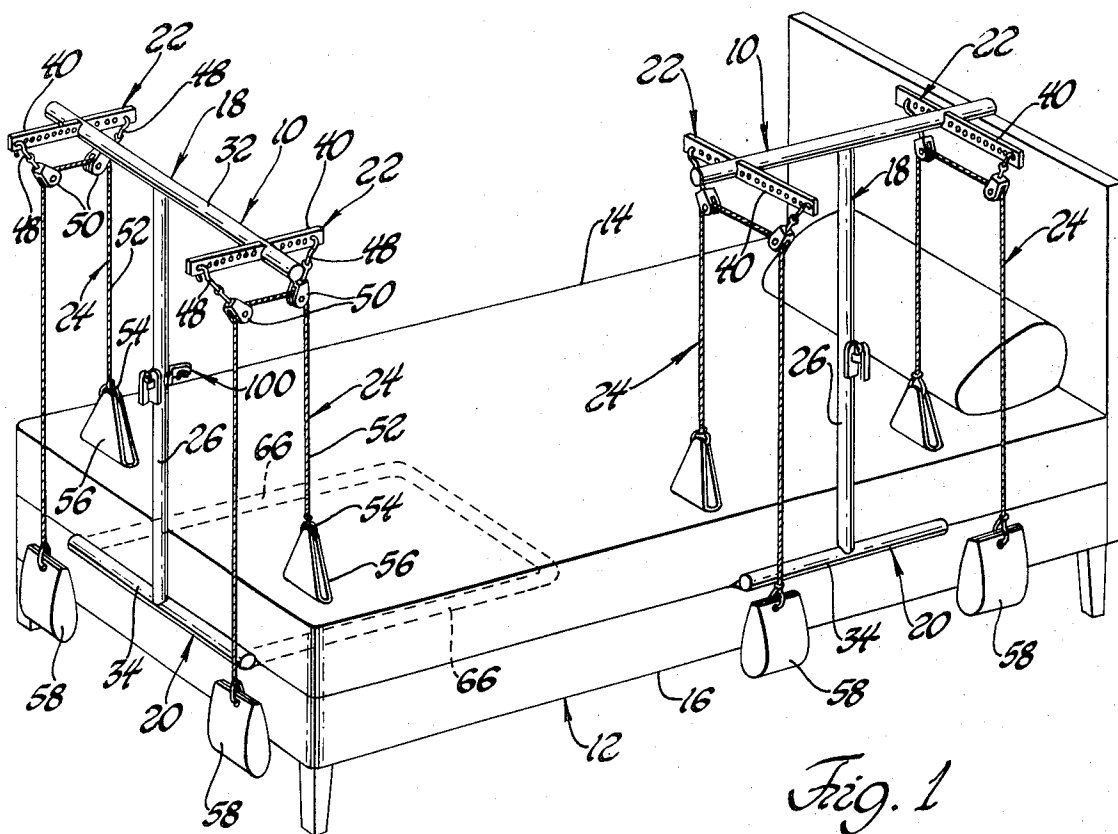
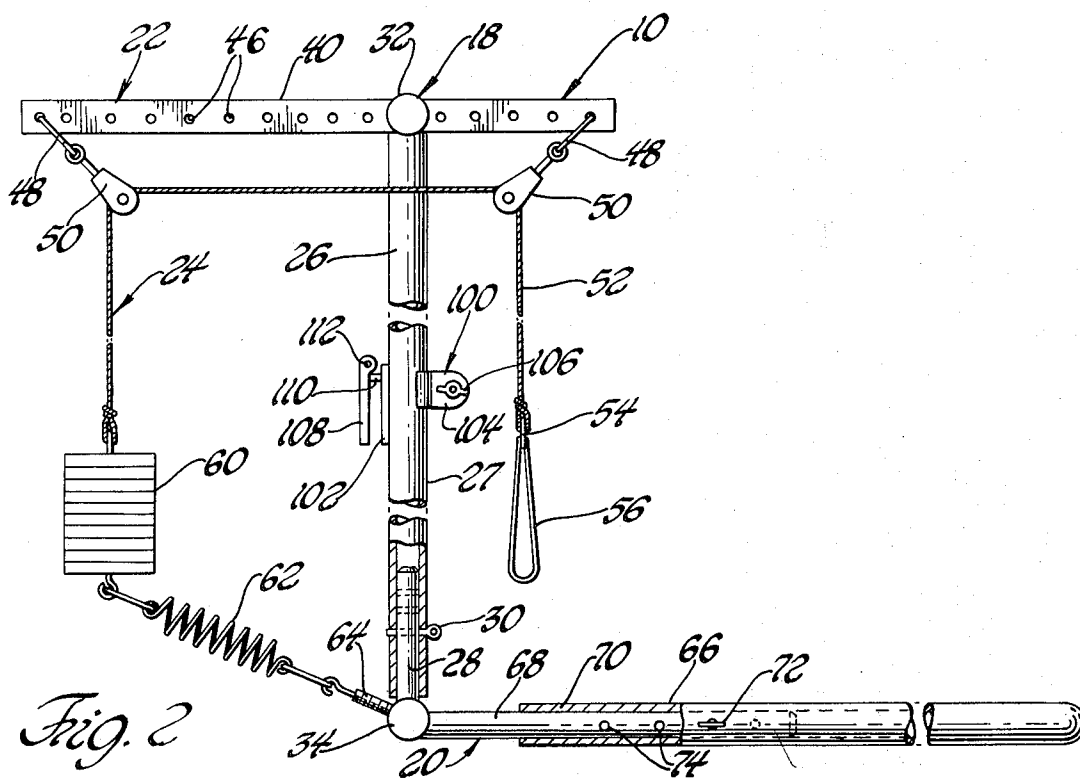
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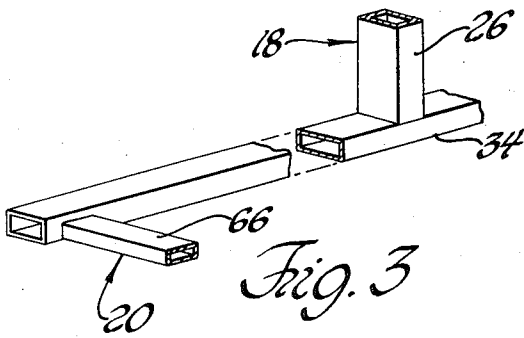
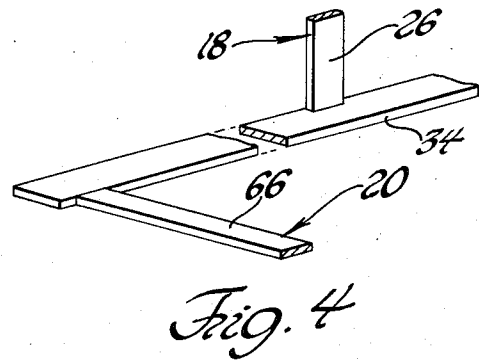
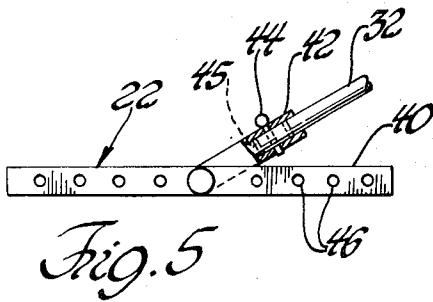
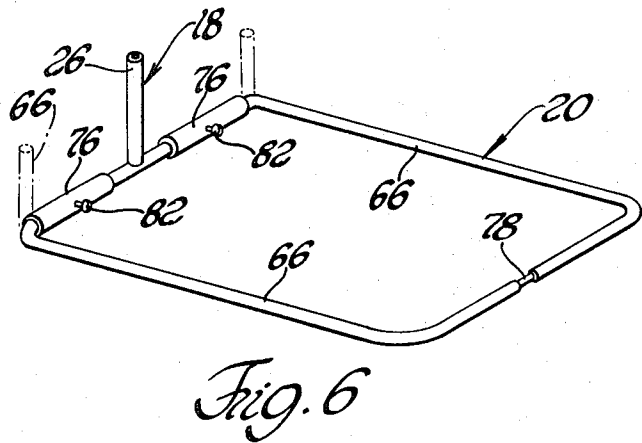
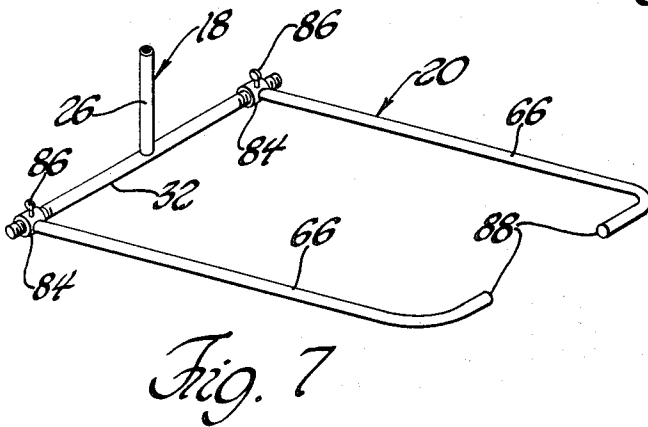
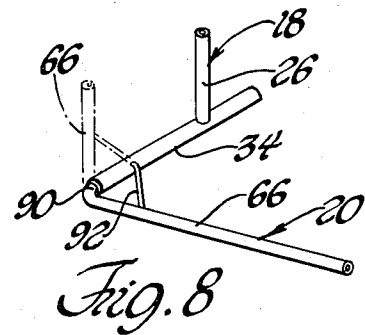
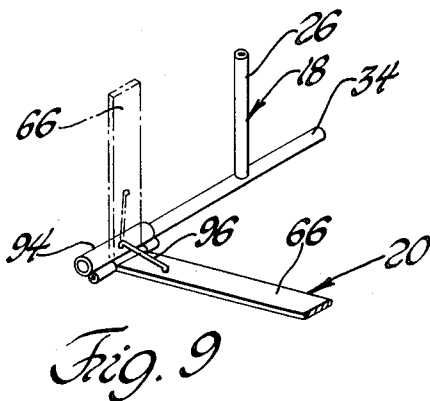
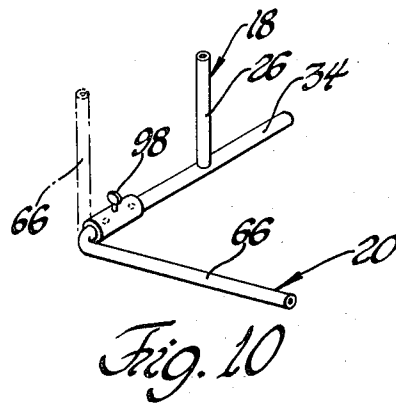
ABSTRACT

Therapeutic exercise apparatus for insertion beneath a patient occupied bed mattress. The apparatus has a base that is so constructed and arranged that it is conveniently insertable under any part of the bed mattress and has joined to it a weight support which includes a guide device and a cable device. The cable device has a cable with variable weights on one end and a sling on the other. The weights resist movement of the sling by the user of the apparatus. Additionally, the apparatus affords various adjustments and is foldable to facilitate portability and storage.

18 Claims, 10 Drawing Figures







THERAPEUTIC EXERCISE APPARATUS

This invention relates to improvements in exercise apparatus adapted although not exclusively, for therapeutic purposes.

Exercise apparatus, particularly that used for therapeutic purposes, is generally bulky and heavy so as to be neither easily movable nor conveniently stored. Also this apparatus is relatively complicated and expensive. Consequently, it is generally precluded from home use and even its clinical use is somewhat restricted.

With the foregoing in mind, new and different therapeutic apparatus is contemplated that is light weight, portable, easily stored, simple to operate and inexpensive.

Also contemplated is therapeutic exercise apparatus that can be installed beneath any conventional patient reclining surface.

Further contemplated is therapeutic exercise apparatus that is foldable for storage and transportation purposes.

Other objects include the provision of therapeutic exercise apparatus that affords various adjustments to facilitate versatility in its use.

The foregoing and other objects and advantages of this invention will become apparent from the following description and from the accompanying drawings in which:

FIG. 1 is a perspective view of therapeutic exercise apparatus, incorporating the principles of the invention, shown installed beneath the mattress of a bed.

FIG. 2 is a side elevational view partially in section of a modification of the FIG. 1 therapeutic exercise apparatus.

FIGS. 3 and 4 are fragmentary perspective views of the FIG. 1 apparatus using respectively rectangular shaped stock and flat stock.

FIG. 5 is a fragmentary perspective view of an alternative guide provision for the FIG. 1 apparatus.

FIGS. 6, 7, 8, 9 and 10 each show fragmentary perspective views of different modifications of a base for the FIG. 1 apparatus.

Referring first to FIG. 1 the numeral 10 denotes generally therapeutic exercise apparatus installed for purposes of demonstration only, to a bed 12 of the conventional type having a pad or mattress 14 supported by the usual springs 16. It should be understood that the exercise apparatus 10 can be used with other than beds; e.g., the patient may install the apparatus beneath any user occupied apparatus such as a chair, a couch, the cushions of the chair or the couch or beneath a pad on a floor. The exercise apparatus 10, shown positioned at the foot of the bed and also at the side of the bed, comprises an upright weight support denoted generally at 18 and a base denoted generally at 20. The base 20 slides under the mattress 14 and is constructed and arranged as will be explained to preclude tilting of the weight support 18 during use. The weight support 18 carries a guide device 22 and two cable devices 24 which combine to provide resistance type exercise for the user of the apparatus 10.

Considering first the weight support 18 and with reference to FIGS. 1 and 2, the weight support 18 includes a vertical post 26 that may be of one piece non-adjustable construction as shown in FIG. 1 or formed in two pieces that are adjustable as shown in FIG. 2. In FIG. 2 the vertical post 26 comprises an upper section

27 and a lower section 28 that is slidable within the upper section 27 for vertical adjustment purposes. This adjustable connection of the two sections 27 and 28 can employ any other well known adjustable connection; e.g., a threaded connection. To maintain the selected position of the two sections 27 and 28 a locking device, such as a pin 30 can be inserted through both the upper and lower sections 27 and 28. In the alternative a screw could be employed. When the pin 30 is used, a series of spaced apart holes 31 can be provided in the lower section 28 so as to permit the locking of the sections 27 and 28 at the selected different vertical height of the post 26.

The vertical post 26 has at its upper end a top cross member 32 and at its lower end a bottom cross member 34. As viewed in FIG. 2, the top and bottom cross members 32 and 34 are substantially parallel and slightly out of vertical alignment with the top cross member 32 being slightly offset relative to the bottom cross member 34. This alignment as well as the parallelism can, of course, be varied to meet the requirements of different applications. The vertical post 26 and the top and bottom cross members 32 and 34 are preferably made of a lightweight, durable and strong material such as steel, or aluminum and may be made in different cross sectional forms determined by the particular application. For example, the vertical post 26 and the top and bottom cross member 32 and 34 can have a tubular cross section as shown in FIG. 2 or a square or rectangular hollow cross section as shown in FIG. 3, be formed of flat stock as shown in FIG. 4, have a solid cross section or be formed from a combination of these. The connection between the top and bottom cross member 32 and 34 and the vertical post 26 can be made in any of the usual ways such as by welding, threading or pressed fitting the parts together.

The guide device 22 functions to provide guide ways for the two cable devices 24 and includes a pair of guide bars 40. Two cable devices 24 are required if the user is to exercise both limbs; hence the two guide bars 40 would usually be provided so that this dual use option is always available. These guide bars 40 are joined to the top cross member 32 on opposite sides of the vertical post 26 and are formed of flat steel stock but they may be of any other cross section and material such as those suggested for the vertical post 26 and the top and bottom cross members 32 and 34. The guide bars 40 can, as shown in FIG. 1, be permanently affixed to the top cross member 32 intermediate its ends by welding or the equivalent, or they can, as shown in FIG. 5, have an adjustable provision with their position on the top cross member 32 adjustable to accommodate different size users and uses. To obtain the adjustment, the guide bars 40 are provided with flanges 42 to slidably receive the ends of the top cross member 32. In this way the guide bars 40 can be moved inwardly or outwardly with respect to the vertical post 26 and fixed into position by a locking device, such as a pin 44 or a screw as with the adjustable vertical post in FIG. 2. The different positions of the guide bars 40 can be established by providing spaced holes 45 in the ends of the top cross member 32 for receiving the pin 44. Also with the FIG. 5 construction and if preferred, the guide elements or bars 40 can be either maintained horizontal or rotated to some selected position by a threaded connection or by appropriately aligning holes through the flange 42 and the end of the top cross member 32 to ac-

comodate these non-horizontal positions and then inserting the pin 44.

The guide bars 40 have spaced holes 46 for receiving hooks 48 or the like which are permanently joined to or releasably attached to pulleys 50. By use of the hooks 48 the pulleys 50 can be positioned along the guide bars 40 at different distances from the vertical post 26 so as to provide the desired overhang and additionally whatever desired angular relationship is wanted by the user of the apparatus 10.

The cable devices 24 afford the weight resistance to the user of the exercising apparatus 10. Each cable device 24 includes a cable 52 of any rope or wirelike material either metallic or nonmetallic and having the desired strength and flexibility characteristics for the application of the apparatus 10. Each cable 52 is strung through a pair of pulleys 50 which perform as cable runs and has attached at its inside or bedside end, by a hook or ring 54, a limb engaging element or sling 56. The sling 56 is intended to be exemplary only, since a grip on whatever the user desires can be connected either to the ring 54 or directly to the cable end. At the other end the cable 52 has a variable weight provision, such as a bag 58 depicted in FIG. 1 which may contain sand or an equivalent material that can be added or removed to provide weight variation or individual metallic weights 60 as viewed in FIG. 2 which can be increased or decreased in number to also vary the weight. It is also contemplated that a spring 62 could be used separately or together with the weights 60 to provide resistance. The resistance provided by the spring 62 can be made variable by a screw 64 threadedly joined to the bottom cross member 34 of the vertical post 26 such that rotation of the screw 64 will either increase or decrease the tension and accordingly the resistance provided by the spring 62.

The base 20 can be formed in different ways to serve its function of providing a stable support or stand for the weight support 18; otherwise, the weight support 18 would tend to tilt or rotate during use, about the bottom cross member 34 or in a plane parallel to the bed 12. The base 20 includes a pair of spaced apart legs 66 that are joined to opposite ends of the bottom cross member 34. The material and cross section of these legs 66 can be any of those suggested for the vertical post 26 and the top and bottom cross members 32 and 34. The distance that these legs 66 are separated will be determined by the use of the apparatus but the minimum distance will be adequate to insure that the weight support 18 is not permitted to rotate in the aforementioned plane parallel to the mattress edge. The length that the legs 66 extend under the mattress 14 can also be varied according to the use, but again should be adequate to prevent any tendency for the weight support 18 to tilt about the bottom cross member 34; i.e., in a plane that would be substantially perpendicular to the other plane of rotation about the mattress edge. The legs 66 can have their ends permanently joined as by welding to the opposite ends of the bottom cross member 34 and also have their opposite ends integrally joined together so that they present a U-shaped configuration as shown in FIG. 1. The maximum distance that the integral, fixed legs 66 in FIG. 1 can extend under the mattress 14 is determined by the bottom cross member 34 of the weight support 18 which serves as a stop when it encounters the edge of the mattress 14.

If it is desired to be able to vary the distance that the legs 66 extend underneath the mattress 14; e.g., the apparatus 10 is to be inserted under the short side of the mattress 14 and the legs 66 are too long, then the FIG. 2 construction can be employed. In FIG. 2 the legs 66 are formed in two parts 68 and 70 with the part 68 telescopically received within the part 70. Therefore, the parts 68 and 70 are slidably adjustable relative to each other and can be locked into place by a locking device, such as a pin 72, a screw or something equivalent. Spaced apart holes 74 in the part 68 can be provided as discussed before to receive the pin 72 for locking the legs 66 at whatever length is selected.

If it is desired to vary the distance that the legs 66 are separated, the constructions shown in FIGS. 6 and 7 can be used. Considering first FIG. 6, the legs 66 have flanges 76 at each end which slide over the ends of the bottom cross member 34. If it is preferred that the opposite ends of the legs 66 be interconnected in some way, then they can have a telescopic connection as shown at 78. The flanges 76 can be locked when the legs 66 are separated the desired distance by any appropriate locking device, such as the illustrated locking screws 82 or the aforementioned locking pins.

In FIG. 7, the legs 66 have at the one end of each, flanges 84 which are threaded onto the ends of the bottom cross member 34 and are locked into place by a locking device such as locking screws 86. It will be noted that the opposite ends denoted generally by the numerals 88 are open and have no interconnection; hence, the legs 66 can be separately installed. If preferred, the FIG. 1 and FIG. 7 bases 20 can also have these open ends.

The FIG. 6, 7, 8, 9, and 10 constructions also provide a connecting provision for providing the folding feature. For example, in FIG. 6 the legs 66 can, by loosening the locking screws 82, be removed from the horizontal position shown to a vertical folded position shown in broken lines relative to the vertical post 26 of the weight support 18. The legs 66 can be locked into the vertical folded position by tightening the locking screws 82. In FIG. 7 the locking screws 86 are loosened to permit the legs 66 to be moved to the folded position and then tightened.

This folding feature can also be achieved with the FIG. 8 construction in which the legs 66 form ball and socket connections at 90 with the ends of the bottom cross member 34 of the weight support 18. A suitable locking strut 92 is interconnected between the bottom cross member 34 and an associated leg 66. These locking struts 92 maintain the legs 66 in the horizontal position when the apparatus 10 is in use and can be released so that the legs 66 can be folded to the vertical position.

In the FIG. 9 construction, a hinge shown at 94 interconnects the opposite ends of the bottom cross member 34 with the ends of the legs 66. The legs 66 are shown formed of flat stock but they can be made with any of the other cross sectional areas previously discussed. A locking strut 96 similar to the locking strut 92 in FIG. 8 is used to maintain the leg 66 in the illustrated vertical position and is released when it is desired to move the legs 66 to the vertical folded position shown in broken lines.

In FIG. 10 a construction similar to that in FIG. 6 is shown except that instead of the locking screw 82 a locking pin 98 is employed and is also used to permit

variation of the distance apart of the legs 66 as well as locking the legs 66 in the broken line vertical folded position.

One should be mindful that the apparatus 10 can include one or more of the foregoing features. Whether or not these different features are included, will be determined by various considerations including cost and the intended application of the apparatus 10.

If the bed 12 has, for example, a foot board, (not shown) a clamping device shown generally at 100 can be used. The clamping device 100 has an arcuate member 102 that partially surrounds the periphery of the vertical post 26 and cooperates with a clamp 104 to hold the device 100 in the selected vertical position. This is done by tightening a nut and screw 106 or the like so that the clamp 104 holds the arcuate member 102 in a clamping relationship with the periphery of the vertical post 26. The device 100 on the side opposite the side with the nut and screw 106 has a swingable arm 108 that pivots about a boss 110 on the device 100 and can be held in whatever position is selected by a nut and screw 112 similar to the nut and screw 106. The arm 108 is intended to embrace the edge of the footboard of a bed and thus afford additional support if needed.

To use the therapeutic exercise apparatus 10, the base 20 is removed from the folded vertical position if this feature is included to the horizontal position then adjusted both in length and width, if these features are also included, so that it can be inserted under the mattress 14. Next the weight support 18 is adjusted if the vertical post 26 has the FIG. 2 adjustment. The guide device 18 is then adjusted by arranging the pulleys 50 so that the weights 58 or 60 will extend beyond the bed 12 and are unrestricted in their movement, and also, so that the slings 56, either separately or together, depending whether one or both are to be used, are conveniently accessible for use by the patient's arms or legs or whatever part of the body is to be exercised. Also, if the FIG. 5 construction is used, the guide bars 40 can be rotatably adjusted and spatially adjusted to facilitate convenience. Finally, the cable devices 24 are adjusted so that the desired weight is available to provide the required resistance.

From the foregoing it will now be appreciated that therapeutic exercising apparatus is provided that is simple in construction, requires no special training to use and operate, affords numerous adjustments if wanted for versatility and convenience, is foldable for storage and transportation purposes and is light-weight.

What is claimed:

1. In portable therapeutic exercise apparatus adapted for removable installation to patient occupied apparatus having a pad or like which user occupies; the combination of a weight support arranged for positioning beside the user occupied apparatus and including an upright post having substantially parallel top and bottom cross members at the opposite ends thereof, guide means carried by the top cross member, the guide means including pulley means and a pair of guide elements joined to and spaced apart one on each of the top cross members and laterally extending therefrom, the pair of guide elements each including means variably positioning the pulley means therealong and cable means including a cable slidably supported by each guide element and having a limb engaging element

joined to one end of each cable and weight means joined to the other end of each cable for resisting movement of the patient's limb, each guide element slidably supporting a respective cable so that the limb engaging element can be freely reciprocated above the pad by the patient's limb against the resistance from the weight means and the weight means extends away from the patient occupied apparatus; and a base constructed and arranged for slidable positioning beneath the pad, the base being non-attachable to the patient occupied apparatus and including a pair of spaced apart legs joined to a respective one of the opposite ends of the bottom cross member and adapted to extend a predetermined distance beneath the pad and in a plane extending laterally to the side of the pad so as to prevent tilting of the weight support about the bottom cross member, said legs being spaced apart a predetermined distance so as to prevent tilting of the weight support in a plane substantially parallel to a side of the pad, the base being further constructed and arranged to be swingable to a folded position relative to the upright post.

2. Portable therapeutic exercise apparatus as described in claim 1, wherein the weight support includes clamping means adjustably movable on the upright post and arranged to releasably clamp to a portion of the patient occupied apparatus to provide additional support.

3. Portable therapeutic exercise apparatus as described in claim 2, wherein the base includes connecting means rotatably joining the ends of the spaced apart legs to the opposite ends of the bottom cross member so that the base is swingable from a horizontal position to a folded position relative to the upright post.

4. Portable therapeutic exercise apparatus as described in claim 2, wherein the base includes connecting means rotatably joining the ends of the spaced apart legs to the opposite ends of the bottom cross member so that the base is swingable from an operative position relative to the upright post.

5. Portable therapeutic exercise apparatus as described in claim 1, wherein the upright post comprises aligned upper and lower sections adjustable relative to each other to vary the height of the top cross member above the patient occupied apparatus.

6. Portable therapeutic exercise apparatus as described in claim 1, wherein the guide means includes means releasably, slidably and rotatably connecting the guide element to an end of the top cross member.

7. Portable therapeutic exercise apparatus as described in claim 1, wherein the base includes connecting means rotatably joining the ends of the spaced apart legs to the opposite ends of the bottom cross member so that the base is swingable from an operative position to a folded position relative to the upright post.

8. Portable therapeutic apparatus as described in claim 7, wherein the connecting means is a pair of hinges each connecting an end of the bottom cross member to a respective one of the legs and the connecting means includes locking means releasably retaining the base in either the horizontal or vertical position.

9. Portable therapeutic exercise apparatus as described in claim 7, wherein the connecting means is a threaded connection between each end of the bottom cross member and an end of a respective one of the legs, the threaded connection being constructed so that

the legs are separable and the predetermined distance between the spaced apart legs is thereby rendered variable.

10. Portable therapeutic exercise apparatus as described in claim 7, wherein the connecting means is a telescopic connection between each end of the spaced apart legs and a respective end of the bottom cross member, the telescopic connection being constructed so that the legs are axially, separable and the predetermined distance between the spaced apart legs is thereby rendered variable.

11. Portable therapeutic exercise apparatus as described in claim 7, wherein the connecting means is a ball and socket connection and the connecting means includes means releasably locking the base in either the folded position of the operative position.

12. Portable therapeutic exercise apparatus as described in claim 7, wherein the connecting means also slidably joins the ends of the spaced apart legs to the opposite ends of the bottom cross member for axial movement therealong to vary the predetermined distance between the spaced apart legs.

13. Portable therapeutic exercise apparatus as described in claim 12, wherein the spaced apart legs each comprise interconnected retractable and extensible parts for varying the length of the legs and means locking the parts in a selected position and wherein the guide means further includes means releasably, slidably and rotatably connecting each of the pair of guide ele-

ments to a respective end of the top cross member.

14. Portable therapeutic exercise apparatus as described in claim 1, wherein the spaced apart legs at the ends opposite the ends joined to the opposite ends of the bottom cross member are integrally joined to form a U-shaped base.

15. Portable therapeutic exercise apparatus as described in claim 1, wherein the spaced apart legs are L-shaped.

16. Portable therapeutic exercise apparatus as described in claim 1, wherein the spaced apart legs each comprise interconnected retractable and extensible parts for varying the length of the legs and means locking the parts in a selected position.

17. Portable therapeutic exercise apparatus as described in claim 1, wherein the base includes connecting means rotatably and axially movably joining the ends of each of the legs to the opposite end of the bottom cross member so that the base is swingable from an operative position or a folded position relative to the upright post and the predetermined distance between a spaced apart legs is variable.

18. Portable therapeutic exercise apparatus as described in claim 17, wherein the spaced apart legs of the base have their ends opposite the ends joined to the bottom cross member telescopically joined to each other to facilitate the adjustment of the predetermined distance between the spaced apart legs.

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