

[54] **THERAPEUTIC APPARATUS**

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[58] Field of Search..... **128/25, 44, 51, 52, 32, 24.2**

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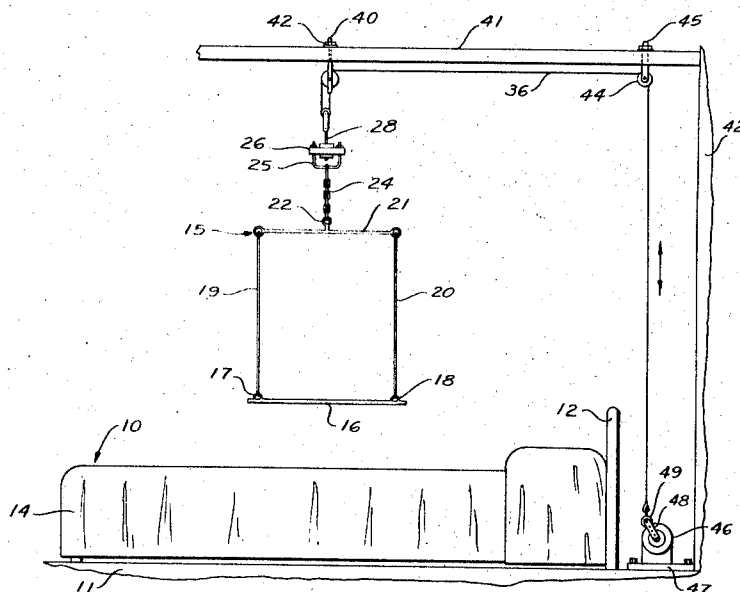
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[57] **ABSTRACT**

Therapeutic apparatus to aid certain disabled and bedridden persons to participate in physical activities otherwise prevented because of their infirmities. In one embodiment of the invention, the apparatus includes an exercise bar supported above a bed by a block and tackle assembly connected with motor means operative therethrough to reciprocate the bar vertically. The bar is also supported for angular displacements about a generally vertical axis, and a reversible drive motor may be included to impart angular displacements to the bar. The apparatus may be used, for example, in exercising the back, leg, arm, and shoulder muscles of a bedridden person.

7 Claims, 4 Drawing Figures



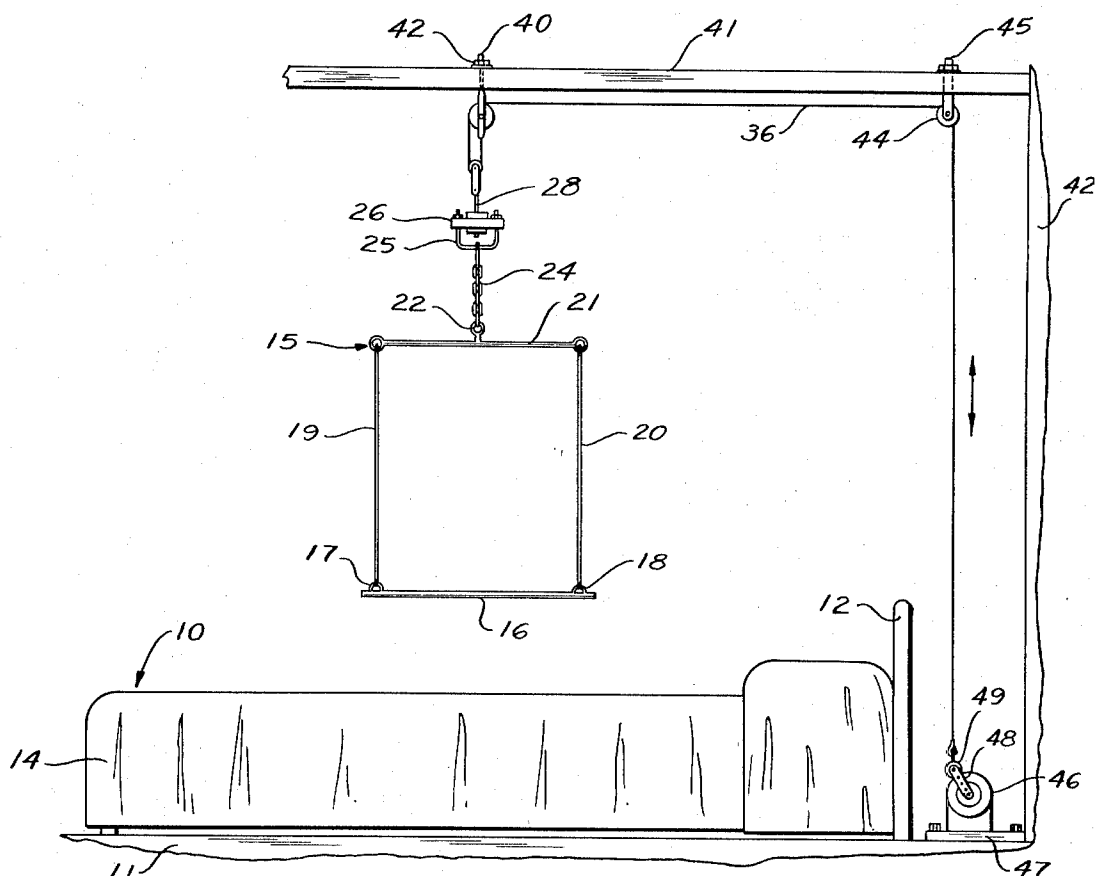


FIG. 1

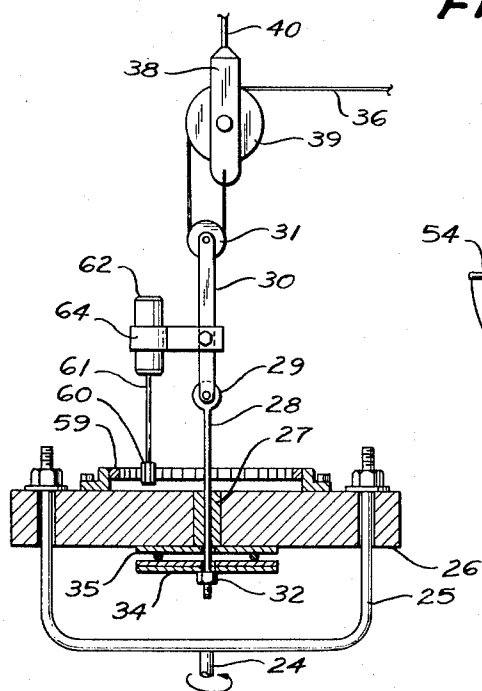


FIG. 4

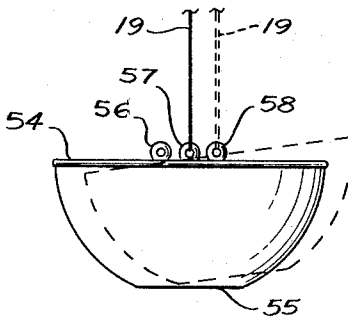


FIG. 3

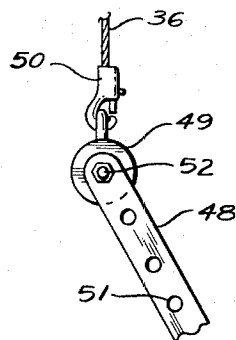


FIG. 2

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THERAPEUTIC APPARATUS

This invention relates to medical or therapeutic apparatus and, more particularly, to apparatus useful in association with a bed or the like to enable an occupant thereof to participate in physical activities that he might otherwise be prevented from enjoying and deriving benefit from.

There are many persons that are either wholly or partially confined in bed because they are physically disabled or are otherwise incapacitated, but who would benefit from physical exercise and other physical activities enjoyed by persons not so restricted in their activities. So far as is known, little has been done to aid such persons, and an object, among others, of the present invention is to provide therapeutic apparatus that will enable such persons to engage in beneficial physical activities while confined within a bed.

Another object of the invention is in the provision of improved therapeutic apparatus of the character described that will enable persons incapacitated by obesity, a heart condition, injured limbs, fractured ribs, back ailments, and the like to engage in certain physical activities while confined to a bed, including exercises for the back, leg, arm, and shoulder muscles and the act of coitus without the physical exertion and discomfort for such person that otherwise are sometimes associated therewith.

Additional objects and advantages of the invention, especially as concerns particular features and characteristics thereof, will become apparent as the specification continues.

Apparatus embodying the present invention includes oscillator structure adapted to be located over a bed or the like in spaced relation therewith, and which structure may take the form of an elongated exercise bar or a concave basket having an open bottom. The oscillator structure is vertically reciprocable with respect to such bed and is also angularly displaceable relative thereto either because of manually applied torque imparted thereto or because of energization of a drive motor provided for this purpose. The oscillator structure is carried by support mechanism that includes hanger means in the form of a pulley wheel attached to a ceiling beam or other component available for this purpose. Carrier means which may include a block and tackle assembly and swivel connection are operative between the oscillator structure and hanger means to supportingly interconnect the latter. Motor means, such as a variable speed electric motor having a crank attached thereto, is operatively associated with the carrier means for effecting reciprocable displacements of the oscillator structure.

Embodiments of the invention are illustrated in the accompanying drawing, in which:

FIG. 1 is a broken side view in elevation illustrating one embodiment of the invention in association with a bed;

FIG. 2 is an enlarged, broken side view in elevation showing the details of the crank forming a part of the motor means for reciprocating the oscillator structure;

FIG. 3 is a side view in elevation of a modified embodiment of the invention in which a concave basket forms the oscillator structure; and

FIG. 4 is an enlarged, broken side view in elevation of a slightly modified form of the invention.

As indicated hereinbefore, apparatus constituting the present invention has various uses as a therapeutic aid especially for persons that are bedridden or suffer from physical disability or limitation such as might be occasioned by obesity, a heart condition, fractured ribs, broken limbs, back ailments, etc. In this reference, the apparatus includes an oscillator structure that in variant forms thereof can be used either to enforce movement or exercise upon a person occupying a bed with which the apparatus is associated or to minimize or eliminate the requirement for movement or other physical exertion. Such versatility in the usefulness or utility of the apparatus will become more apparent hereinafter as the specific motions attributable to the apparatus are more fully explained.

Referring now to FIG. 1, it is evident that a bed 10 is illustrated which is supported upon a floor or platform 11. As respects the present invention, the bed 10 may be of any type and take any form, but for purposes of specificity, it may be taken to be a hospital bed. As shown, it has a head board 12 but no visible foot board since it is covered by a spread 14. The floor 11 may be of any conventional type, and as concerns the present invention neither the details of the bed 10 nor of the floor 11 are germane to the present invention.

Associated with the bed 10 in FIG. 1 is an embodiment of the therapeutic apparatus constituting the present invention, and such apparatus in its entirety is denoted with the numeral 15. The apparatus 15 includes oscillator structure 16 adapted to be located over the bed 10 ordinarily in spaced relation therewith. In the form shown in FIG. 1, the oscillator structure 16 is an elongated rod or exercise bar equipped adjacent the ends thereof with eyes or connectors 17 and 18 to which are respectively attached depending straps or tension elements 19 and 20 forming a part of the support mechanism from which the oscillator structure 16 is suspended.

The straps 19 and 20 may be rigid rods or bars or they may be flexible cables such as plastic or fabric rope, and at their upper ends they are respectively attached to the outer ends of a generally horizontal support 21. The support 21 is a rigid metal bar able, through the straps 19 and 20, to support any load carried by the oscillator structure 16. Intermediate its ends, the support 21 is equipped with a centrally located eye or connector 22 to which is attached a strap 24 that may be either rigid or flexible, and at its upper end it is fixedly secured to a U-shaped bracket 25. The spaced apart legs of the bracket 25 extend upwardly through openings provided therefor in a swivel plate 26 that forms part of a joint or coupling enabling the oscillator structure 16 to traverse angular displacements about a generally vertical axis through the center of the plate 26. As is perhaps more apparent in FIG. 4, the legs of the U-shaped bracket 25 are constrained against downward displacement relative to the plate 26 by nuts threadedly secured to the ends of the bracket legs and bearing against the upper surface of the plate.

In the form of the invention illustrated in FIG. 1, any such angular displacements of the oscillator structure 16 are manually enforced thereon and are most satisfactorily accomplished when all of the components securing the oscillator structure 16 to the plate 26 are rigid. That is to say, whenever the straps 19 and 20,

support bar 21, strap 24, and U-shaped bracket 25 are all stiff or rigid elements, any tendency toward angular displacements enforced upon the oscillator structure 16 will occur at the swivel connection defined in part by the plate 26.

More particularly, and referring to FIG. 4, it will be seen that the plate 26 has a central opening therethrough in which a sleeve bearing 27 may be mounted to provide a journal for a vertical shaft or axle 28 having an eye or connector 29 at its upper end by means of which it is secured to a pair of parallel hanger straps 20 forming a part of a block and tackle assembly which includes a pulley wheel or sheave 31 rotatably supported between the straps 30. The lower end portion of the axle 28 is threaded so as to receive a nut 32 thereon which carries the plate 26 through a large washer 34 and thrust bearing 35 interposed between the upper surface of the washer 34 and facing lower surface of the plate 26. Evidently then, the plate 26 and members attached thereto by means of which the oscillator structure 16 is supported are angularly displaceable about the vertical axis defined by the axle 28.

The block and tackle assembly further includes a tackle or cable 36 which may be of conventional form and will usually constitute a stranded fabric, plastic, or metal wire cable. In any case, the cable 36 is entrained about the pulley wheel 31 and at one end is attached to hanger means in the form of a hanger member 37 having a bifurcated lower end defining spaced apart legs 38 that rotatably receive a pulley wheel 39 therebetween. At its upper end, the hanger 37 has a threaded stem 40 adapted to pass through an opening provided therefor in a beam 41. The beam 41 may be attached to the ceiling of the room space within which the bed 10 is located, and which room space has a vertical side wall 42 spaced from the head of the bed, or it may form a part of the ceiling and be one of the joists or rafters thereof. In any case, the hanger 37 is held in place by a nut 42 that threadedly engages the stem 40 and bears downwardly against the upper surface of the beam 41.

The cable 36 passes over the pulley wheel 39 so as to change the direction of the cable from a generally vertical to a generally horizontal orientation, and the direction of the cable is again changed as it passes over a pulley wheel 44 attached to the beam 41 by hanger structure 45 located a spaced distance from the hanger 37. The cable 36 passes downwardly from the pulley wheel 44 along the vertical room wall 42, and at its lower end it is attached to a crank forming a part of motor means operative to effect vertical reciprocations of the oscillator structure 16.

In the form shown, the motor means comprises an electric motor 46 which may be a variable speed motor, bolted or otherwise rigidly attached to the floor 11, as through a base plate 47. The crank includes an arm 48 drivingly connected to the output shaft of the motor 46 so as to be rotated thereby, and it further includes a rotatable handle 49 to which the cable 36 is attached by means of a coupling or fastener 50. The handle 49 is adjustably mounted upon the arm 48 at any of a number of locations therealong so as to vary the radial distance of the handle from the axis of rotation of the output shaft of the motor 46 and thereby adjust the throw of the crank. In this respect, the arm 48 has a plurality of spaced apart apertures 51 therealong

through which a machine screw 52 selectively extends and by means of which the handle 49 is removably secured to the arm 48.

The motor 46 has a low operating speed or velocity, and in the usual case it will be a gearhead motor having relatively high torque but delivering a relatively low angular velocity to the arm 48 of the crank. In the event of the motor 46 being a variable speed motor, the angular velocity imparted to the crank can be adjusted as desired. It will be evident that an energizing circuit for the motor 46 must be provided and that suitable controls therefor will be associated with the bed 10 so as to be within convenient reach of an occupant thereof, but since circuitry and controls are standard and well known, they have been omitted for convenience, simplification, and clarity.

Prior to describing an operational cycle of the apparatus, the modified oscillator structure illustrated in FIG. 3 will be discussed. Referring thereto, it will be observed that the oscillator structure takes the form of an upwardly concave container or basket 64 having a hollow interior defining a compartment therewithin. The basket 54 is relatively large and able to support a persons weight, and it has an opened bottom indicated generally at 55. Along opposite sides thereof, the basket 54 is provided with a plurality of spaced apart connectors 56, 57 and 58 which are selectively secured to the depending straps 19 and 20, only one of which is shown in FIG. 3. Each connector 47 is located at the center of the basket 54 so that when the straps 19 and 20 are secured to the connectors 57, the basket will be balanced with the open bottom 55 thereof generally parallel to the plane of the underlying bed 10. Whenever the straps 19 and 20 are attached to either the connectors 56 or 58, the basket 54 will assume an angular disposition such as shown by broken lines in FIG. 3 corresponding to attachment of the straps to the connectors 58.

A further modification of the apparatus is shown in FIG. 4, and it varies from the embodiments heretofore considered in that a motor is used to impart angular displacements to the block 26 and oscillator structure carried thereby. In order to effect such motor-driven angular displacements of the plate 26 relative to the axle 28, an internal ring gear 59 is bolted or otherwise secured to the plate 56 along the upper surface thereof. In meshing engagement with the teeth of the gear 59 is a pinion gear 60 attached to the output shaft 61 of a motor 62 rigidly secured by bracket structure 64 to the hanger straps 30. The motor 62 may be an electric motor and will have the usual energizing circuit and controls, none of which are shown since conventional and well known. The motor 62 is advantageously a reversible motor so that the plate 26 can be rotated or displaced angularly in either direction about the shaft or axle 28.

In use of the apparatus, one occupying the bed 10 can energize the motor 46 by means of the controls (not shown) therefor which are located at a position appropriate for this purpose. When the motor 46 is energized, the crank comprising the arm 48 and handle 49 are rotated about the axis of the output shaft of the motor with the result that the handle 49 traverses an orbital path about such axis of rotation. As a consequence of such orbital movement of the handle 49,

the cable 36 will cyclically traverse a reversible path of travel, as indicated by the arrows in FIG. 1, so that the vertical distance between the pulley wheels 31 and 39 is continuously varied, thereby imparting reciprocable displacements to the oscillator structure 16.

It should be appreciated that the block and tackle assembly can be made as complex as desired to change the magnitude of the torque required to be delivered by the motor 46 to accommodate any given weight or load carried by the oscillator structure, and to change the extent of the reciprocable displacements of the oscillator structure in accordance with the rotary motion of the handle 49. In the particular arrangement illustrated in FIGS. 1 and 4, the mechanical advantage defined by the block and tackle assembly is in the ratio of two-to-one so that a force of 100 pounds applied to the cable 36 will be able to support a load of 200 pounds bearing downwardly upon the hanger straps 30 (neglecting friction). At the same time, however, the displacement defined by the block and tackle assembly is in the ratio of one-to-two so that the vertical distance traversed by the pulley wheel 31 will be one half the vertical distance traversed by the handle 49 to which the cable 36 is attached. Although the displacement ratios will remain the same, the throw or vertical displacement of the handle 49 can be changed by varying the position thereof along the arm 48, as heretofore explained.

Assuming the apparatus as shown in FIG. 1, the oscillator structure 16 can be made to move angularly in either direction during such reciprocatory displacements thereof because of the swivel connection defined between the block 26 and axle 28. The extent and direction of any such angular displacements will be determined manually such as by application of an appropriate force to the oscillator structure. In the case of the apparatus shown in FIG. 4 in which the motor 52 and ring gear 59 are provided, angular displacements may be imparted selectively in either direction to the oscillator structure simply by energizing the motor 62 in the appropriate direction. It will be apparent that the vertical reciprocatory displacements of the oscillator structure 16 and horizontal angular displacements thereof are independent one from the other so that they may be used individually or in combination.

Especially in the configuration of the apparatus shown in FIG. 1, it may be used to enforce muscular use and exercise while relieving some of the strain otherwise attributable thereto. For example, one laying in the bed 10 could grasp the oscillator structure 16 with his hands individually and upon energization of the motor 46, the individual would be cyclically raised and lowered through a predetermined distance so as to exercise his back muscles. At the same time, he could move such muscles in a rotational sense by twisting the oscillator structure so as to displace the same angularly about the vertical axis defined by the axle 28. Alternatively, appropriate manipulation of the energizing circuit for the motor 62 would afford some angular stretching of the body muscles during the reciprocable displacements of the oscillator structure. The leg and hip muscles could similarly be exercised by placing the ankles or legs over the oscillator apparatus 16 so as to rest thereupon. The oscillator structure in the form of the basket 54 has similar utilities and can serve to support the female partner during coitus so as to enable

participation by a bed ridden male otherwise prevented therefrom because of a disabling physical condition of some type.

The height of the oscillator structure relative to the bed 10 can be adjusted to the desired elevation by changing the effective length of the cable 36 as, for example, by varying the point at which it is secured to the coupling 50 attached to the rotatable handle 49. Thus, the oscillator structure 16 can be raised or lowered to accommodate the requirements of any particular occupant of the bed 10.

It will be evident that the various components and elements maintaining the oscillator structure at the general elevation selected therefor comprise support mechanism which may be subdivided conveniently into hanger means secured to the beam 41 and carrier means operative between the hanger means and oscillator structure. The motor means, although actually contributing to the support of the oscillator structure, is considered for the most part as the source of motive power effecting reciprocable displacements of the oscillator structure.

While in the foregoing specification embodiments of the invention have been set forth in considerable detail for purposes of making a complete disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

What is claimed is:

1. In apparatus of the character described: oscillator structure adapted to be located over a bed or the like in spaced relation therewith and to be vertically reciprocable with respect thereto; support mechanism for said oscillator structure to support the same at such location including hanger means attachable to a fixed support therefor, and carrier means interconnecting said oscillator structure and hanger means in supporting the former; and motor means operatively connected with said carrier means for effecting reciprocable displacements therethrough of said oscillator structure, said oscillator structure comprising a concave basket having an open bottom, said carrier means being connected to said basket at spaced apart locations therealong.

2. The apparatus of claim 1 in which said motor means comprises an electric motor.

3. The apparatus of claim 6 in which said electric motor is a variable speed motor.

4. The apparatus of claim 2 in which said motor means further comprises a crank having an arm drivingly connected with said electric motor so as to be rotated thereby and a handle rotatably supported by said arm and orbited thereby along a circular path upon energization of said electric motor, in which said carrier means includes a block and tackle assembly having a cable connected with said handle so as to effect the aforesaid reciprocable displacements of said oscillator structure upon energization of said electric motor, and in which said hanger means includes a pulley wheel forming a part of said block and tackle assembly.

5. The apparatus of claim 4 in which said handle is adjustably secured to said arm so as to be selectively attached thereto at various locations therealong so that the throw of said crank can be adjusted to vary the ex-

tent of the reciprocable displacements of said oscillator structure.

6. The apparatus of claim 4 in which said carrier means comprises a swivel connection affording angular displacements of said oscillator relative to said hanger means structure about a generally vertical axis.

7. The apparatus of claim 6 in which said carrier means further comprises a motor drivingly connected

with said swivel connection so as to enforce angular displacements therethrough upon said oscillator structure, said basket being equipped with a plurality of paired connectors to which said carrier means are selectively attachable so as to enable the angular orientation of said basket to be selectively adjusted.

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