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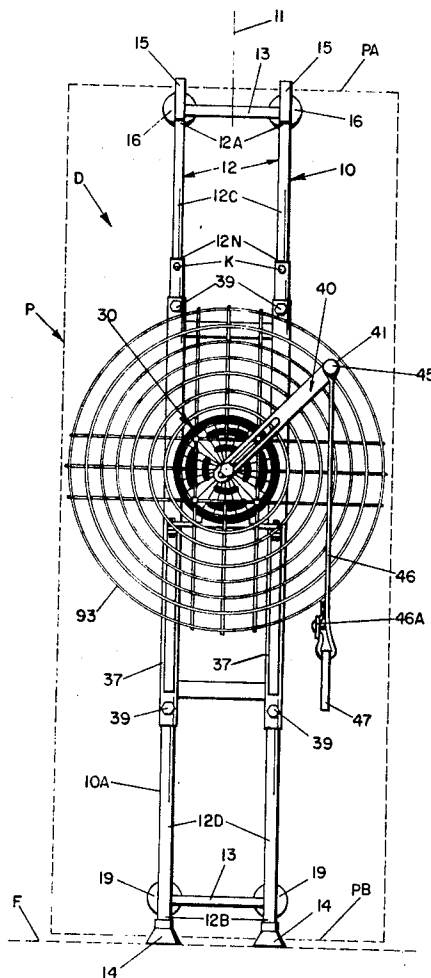
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Primary Examiner—L. W. Trapp
Attorney—George R. Nimmer

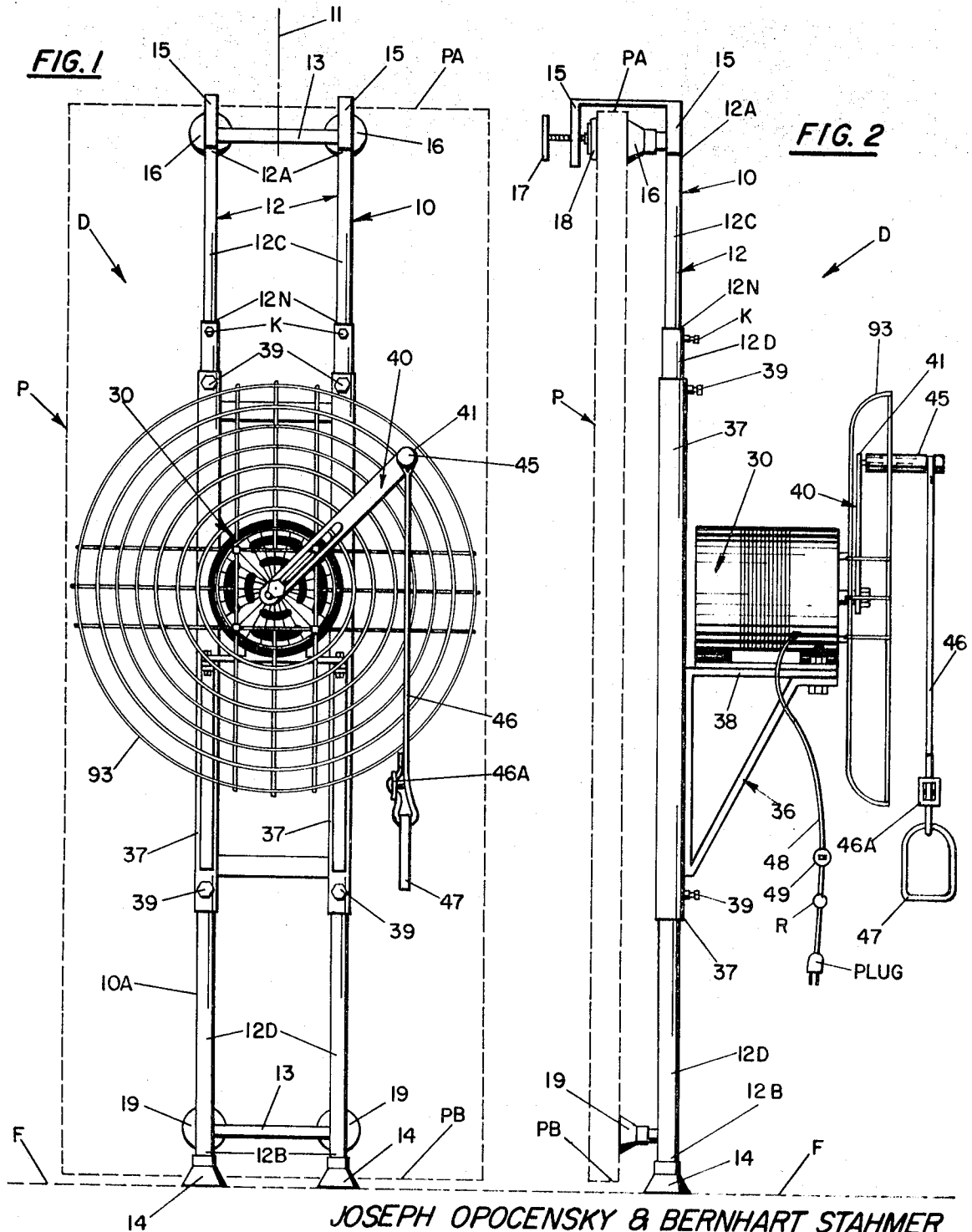
[54] **PHYSICAL THERAPY DEVICE WITH VERSATILE
 ADJUSTING AND MOUNTING MEANS**
20 Claims, 7 Drawing Figs.

[52] U.S. Cl..... **128/25**
 [51] Int. Cl..... **A61h 1/02**
 [50] Field of Search..... **128/25, 32,**
46, 47, 56

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ABSTRACT: A physical therapy device for imparting rotary and reciprocating exercising motions to arms and legs of languid patients. There is a plurality of novel structural features rendering the physical therapy device versatile in providing valuable exercise for variously endowed patients and at various levels of muscular development, and for patients of various degrees of vigor including even for those that can receive treatment from sitting or supine positions only. The physical device has further versatility in that it can be stably mounted for use in all sorts of encountered environments, including within the normal dwelling home, in hospital rooms, and elsewhere.





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FIG. 4

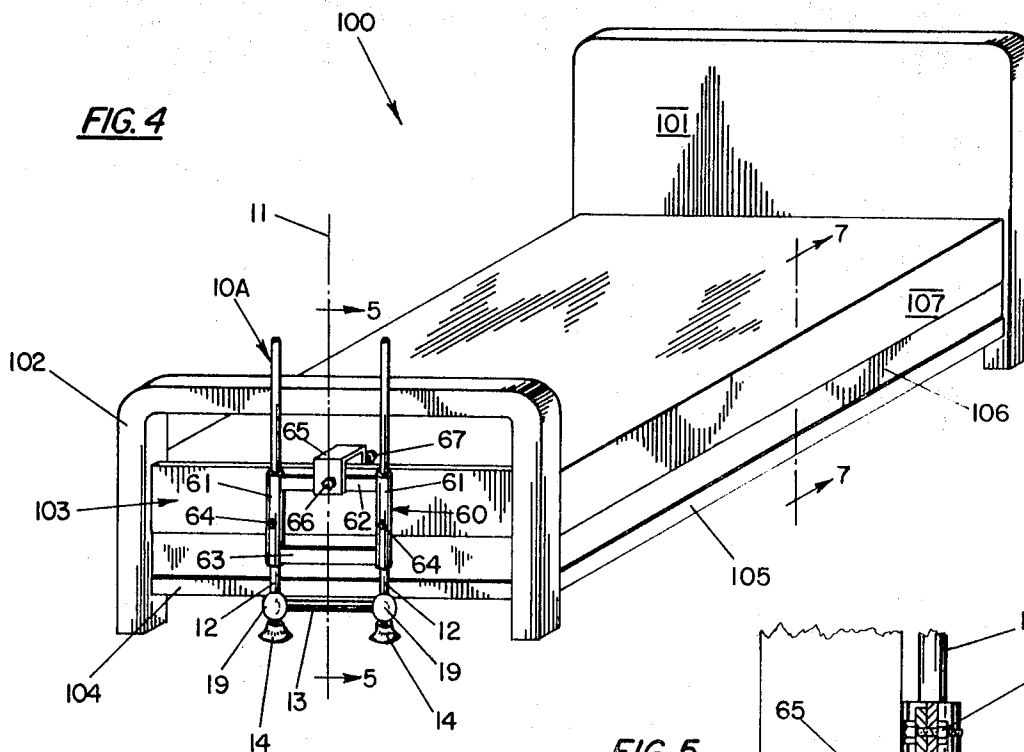


FIG. 3

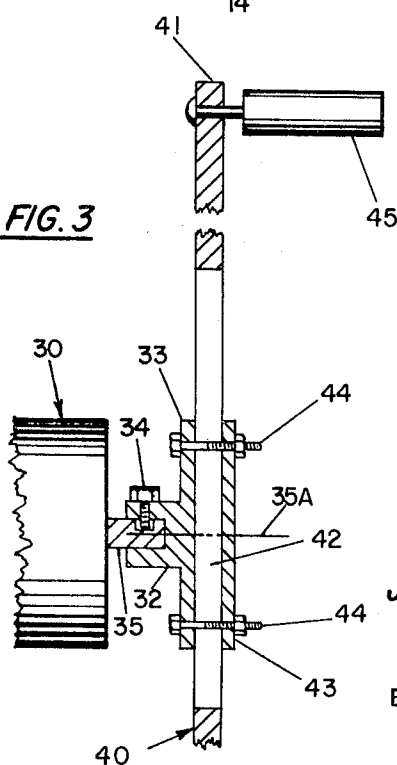
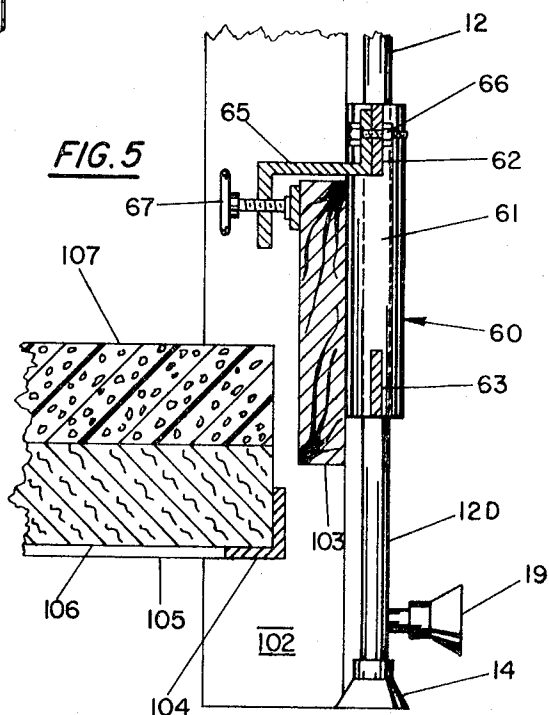


FIG. 5



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FIG. 6

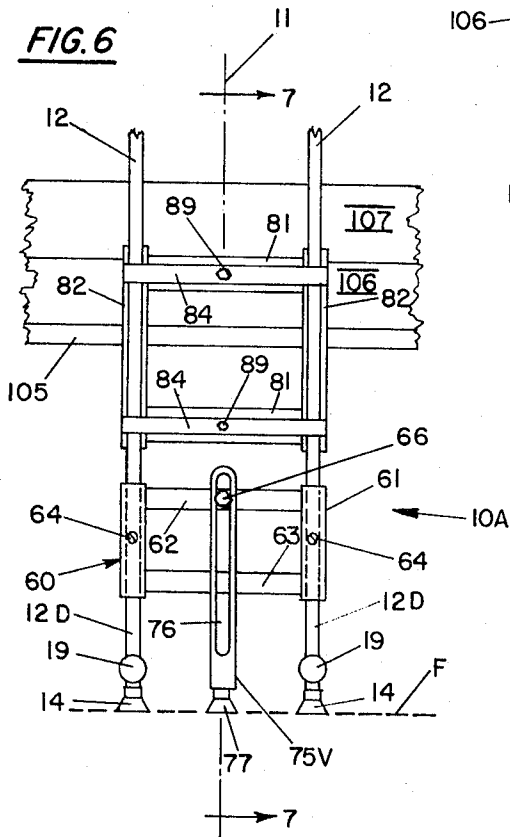
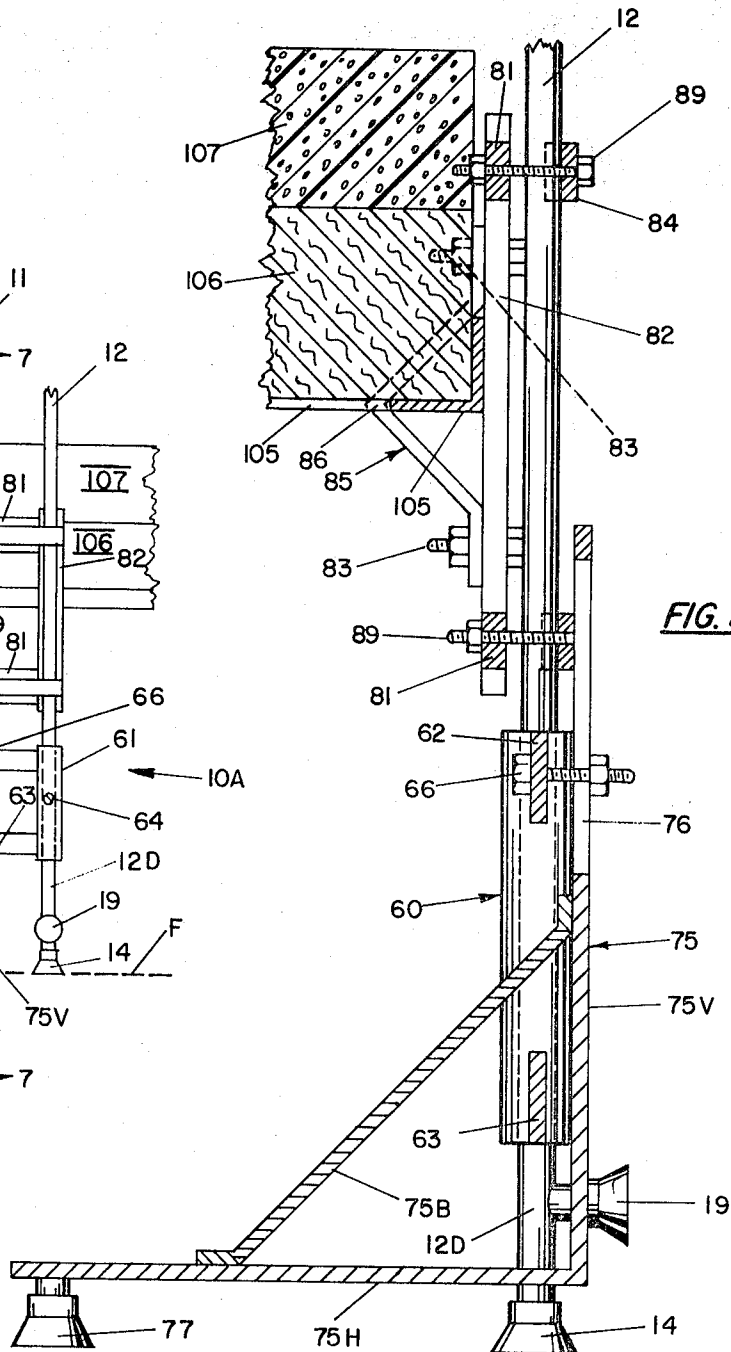


FIG. 7



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PHYSICAL THERAPY DEVICE WITH VERSATILE ADJUSTING AND MOUNTING MEANS

The prior art teaches the general concept of mechanical or electrical devices to impart rotary and/or reciprocating exercising motions to various parts of the human body, including to the arms, legs, and proximal portions of the torso. Such prior physical therapy devices are typically designed to offer relatively vigorous and high-speed motions to the selected body limbs, an while they are efficacious and desirable for relatively young and healthy individuals, they are too vigorous and grossly inappropriate for the elderly and the more languid. In addition, such prior art devices tend to be bulky, heavy, and difficult to move from one location to another; thus, they are usually necessarily semipermanently maintained in a gymnasium or other special room, and hence not conveniently available to less ambulatory individuals and practically unavailable to the infirm and the bedridden. Attempts have been made to design less vigorous type exercising machines specifically for the feeble and bedridden, but such machines are soon "outgrown" by the patient as his physical condition progressively improves.

It is accordingly a general object of the present invention to provide a physical therapy device for exercising the body limbs and proximal torso parts for patients at various levels of muscular development, including for patients progressing to higher levels of body development and recovery.

It is another object of the present invention to provide a physical therapy device having novel structural adjustment features whereby the exercising device will versatily accommodate normally encountered ranges of body sizes, including for males, females, tall, short, obese, slender, etc.

It is a further object to provide a physical therapy device that is relatively lightweight and portable, and that can be stably employed in a variety environmental situations, such as in the typical dwelling home, in hospital rooms, and in physical therapy rooms. Ancillary objects include versatily mounting the device in conjunction with an ordinary pivotal door panel, a wall, or a bed in a typical dwelling or elsewhere, or in a typical hospital or nursing home room as adjacent to the kinds of beds and physical environments customarily encountered thereat.

Further and related objects include the provision of a physical therapy device that is light in weight, stable, of economical and unencumbered construction, of safe and reliable operation, versatily amenable to normally encountered use environments, operatable by most patients without the necessity for attendant personnel, and adaptable for progressive improvements in physical and muscular vigor.

With the above and other objects and advantages in view, which will become more apparent as this description proceeds, the physical therapy device generally comprises: an upright lofty frame or standard, together with novel fastener means for temporarily immovably stationing the lofty standard with respect to an appropriate relatively stationary anchoring means, such as a door panel, a wall, a sleeping bed, etc., a powered rotatable shaft attached to the upright standard and vertically reciprocatably therealong to a selected height; and elongate arm member attached to and directly revolvable with the powered revolvable shaft, the arm member extending generally radially from the revolvable shaft and being of adjustably selectable length whereby the vertical circumscribable path of the arm member outward end is of selectably variable radius; and means attachable to said arm member to permit removable engagement with a patient's anatomical limb and for imparting rotary and reciprocating exercising motions thereto.

In the drawing, wherein like characters refer to like parts in the several views, and in which:

FIG. 1 is a front elevational view of a representative embodiment of the physical therapy device of the present invention, herein the device being temporarily stably attached uprightly alongside a door panel anchoring means, indicated in phantom line.

FIG. 2 is a side elevational view of the FIG. 1 embodiment, the end of the door panel anchoring means being indicated in phantom line.

FIG. 3 is a detail front elevational view of the FIG. 1 embodiment showing in particular an adjustable connection between the powered rotatable shaft and the arm member.

FIG. 4 is a perspective view of a typical sleeping bed, the paneled foot end of which serves as an anchoring means for the lower portion of the FIG. 1 physical therapy device.

FIG. 5 is a sectional elevational view taken along line 5-5 of FIG. 4.

FIG. 6 is an elevational view of lower portions of the FIG. 1 physical therapy device shown mounted onto a siderail of the FIG. 4 sleeping bed, and positioned uprightly along line 7-7 of FIG. 4.

FIG. 7 is a sectional view taken along lines 7-7 of FIGS. 6 and 4.

The primary embodiment "D" of the physical therapy device will now be described, general reference initially being made to FIGS. 1-3. There is a vertically upright lofty standard or frame 10 extending along a vertical axis 11, said upright frame 10 being temporarily immovably stationed with respect to a relatively stationary uprightly extending anchoring means, e.g. the conventional door panel "P" of FIGS. 1 and 2, the sleeping bed 100 of FIG. 4 etc. A horizontally revolvable shaft 35, powered herein by electric motor 30, is vertically reciprocatably attached along standard 10, as through shelf 36, whereby shaft 35 has a plurality of selectable fixed elevations along said upright standard. Elongate arm member 40 (having an outward end 41) is attached to and directly revolvable with powered shaft 35, said arm member 40 extending generally radially and perpendicularly from shaft 35. Arm member 40 is of adjustable length from shaft 35 whereby the vertically planar circumscribable circular path of the arm member outward end 41 is of selectably variable radius. There are means for permitting removable engagement between a patient's anatomical limb and arm member 40, such as a horizontal bar, e.g. hand grip 45, revolvably attached to arm member 40 at 41. Moreover, bar 45 might carry an elongate flexible member 46 terminating as a lower end stirrup 47. Thus, as motor shaft 35 revolves at a slow angular velocity about its shaft axis 35A, a patient might manually grasp handle grip 45 to impart circular exercising motions to the arms and shoulders, or he might insert his foot or calf through stirrup 47 to impart similar exercising motions to the legs and hips.

There are important adjustable structural features for physical therapy device "D" to accommodate patients having a wide range of physical attributes and anatomical dimensions. For example, the adjustable height for powered shaft 35, the adjustable radial length for arm member 40 between 35 and 41, and the adjustable length of flexible strap 46, will allow accommodation to the patient's precise height, position, and anatomical dimensions. The speed and torque of powered shaft might be selectably varied appropriate to a patient's level of anatomical muscular development.

Having now generally described the primary embodiment "D" of FIGS 1-3, the same FIGS. will now be described in greater detail. Upright frame or standard 10 has a lower portion 10A nearer to floor "F." Upright standard 10 herein comprises a pair of opposed upright poles 12, each having an upper end 12A near the door panel horizontal upper end "PA" and having a lower end 12B near the door panel horizontal lower end "PB." Poles 12 are rigidly maintained in spaced-apart parallel relationship with a transversely extending horizontal spacer bar 13 attached to the respective poles, closer to their lower ends 12B than to 12A. The removable attachment means of upright standard 10 to the door panel anchoring means "P" comprises a hook means for the door panel upper edge "PA," said hook means herein comprising a three-sided member 15 attached to the respective poles at 12A. The forward vertical portion of each hooked member 15 carries a rearwardly extending resiliently compressible member such as a rubber cup 16 to abut the upright forward

side of door panel "P" immediately below "PA." The rearward vertical portion of each hooked member 15 carries a forwardly extending threaded engaged wing screw 17, there being a resiliently compressible member as felt pad 18 on screw 17 for abutting the upright rearward side of door panel "P" and in horizontal alignment with the respective cups 16. Thus, the standard upper end 12A is securely removably attached to the upper portion of door panel "P" with members 15-18. The lower portion of each pole 12 carries a rearwardly extending rubber cup 19, similar to 16, adapted to abut the upright forward side of door panel "P" immediately above "PB." The lower end 12B of each pole 12 carries a downwardly extending rubber cup 14, similar to rod 16 and 19, for abutting against a horizontal floor "F," to help stabilize the standard lower end 12B and to keep the door panel "P" from pivoting at its hinges (not shown).

Door panels, e.g. "P," come in a range of heights between the horizontal edges "PA" and "PB," and to accommodate the exact door panel height encountered, vertically telescoping poles 12 are preferably employed. For example, each pole 12 might comprise an upright lower tubular segment 12D extending upwardly from 12B and having an upper terminus 12N below 12A; each pole 12 further comprises an upright upper elongate segment 12C extending downwardly from 12A into the internal bore of lower segment 12D. A set screw "K" threadedly engaged with tubular segment 12D near 12N acts as a means to temporarily immobilize the axial relationship between telescoping members 12C and 12D.

Revolvable shaft 35, extending horizontally forwardly from upright standard 10, is herein powered by a slow-speed (1 to 12 r.p.m.) constant-torque electric motor 30. Motor shaft 35 is vertically reciprocated along upright frame 10 to the desired elevation, as by mounting the motor 30 onto a shelf 36, which is vertically reciprocatable along 10. Shelf 36 comprises an upright collar portion having a pair of parallel upright bores whereby collar 37 is vertically slidable along the respective tracklike poles 12 of standard 10. Shelf 36 further comprises an angular support 38 extending integrally forwardly from collar portion 37, and motor 30 is attached atop support portion 38. A pair of setscrews 39 threadedly engaged with collar portion 37 and adapted to abut the respective poles 12 (herein along 12D) sets the selected height for revolvable shaft 35 of motor 30. There is a wire-grid-type upright safety guard 93 attached to the forward end of the motor housing and interposed between arm member 40 and motor 30, the radius of circular guard 93 exceeding the maximum radial length of arm member 40 between outward end 41 and shaft 35.

The radially extending length of arm member 40 from revolvable shaft 35 to the arm member outward end 41 is herein accomplished by providing a longitudinal slot 42 for arm member 40, shaft 35 passing through slot 42. The forward end of shaft 35 carries a hub 32 (attached to 35 with setscrew 34), said hub 32 including a forward flange 33 abutting the rearward side of arm member 40 at slot 42. Plate 43 abuts the forward side of arm member 40 at slot 42. A pair of screws 44, each passing through the intervening slot 42 and the members 33 and 43, temporarily sets the selected radial length for arm member 40 between its outward end 41 and its selected inward end at 35.

Horizontal bar 45, functionable as a handgrip, is revolvably attached to arm member 40 and extends forwardly from its outward end 41. For exercising the feet, legs, and hips, a flexible elongate annular member 46 loops over and extends downwardly from bar 45. A conventional leather strap with spaced perforations therealong together with a prong-type buckle 46A provides desirable adjustable length features. A stirrup 47, adapted to engage the patient's foot or calf, extends downwardly from the lower end of flexible elongate member 46.

There is an electrical cord, such as the conventional plug-in type 48, to supply motive power to the electric motor 30. There is a medial switch 49 along cord 48 and positionable relatively close to bar 45 whereby the patient can turn the

electric power "on" and "off." Moreover, there might be a speed control such as rheostat "R" so that the patient could control the angular speed of shaft 35, even down to an "off" or zero level. Motor 30 might include a locking means, such as a high resistance internal clutch, or as a magnetic brake, to immediately stop the shaft 35 and arm member 40 when the switch means, e.g. 49, is deactuated.

It is readily apparent that the primary embodiment of the physical therapy device "D" is readily employable with a stationary wall anchoring means, as by use of an elongate horizontal screw (not shown) attaching frame 10 to such wall. Embodiment "D" might also be removably anchored to conventional and hospital-type beds. For example, more languid patients might be confined to a sleeping bed of the representative type 100 shown in FIG. 4 and typically comprising an upright headboard 101 for the bed transverse forward head end and an inverted U-member 102 at the bed transverse foot end. Members 101 and 102 are commonly rigidly tied together with a pair of longitudinally extending parallel side rails 105 which are substantially L-shaped in transverse cross section. The side rails 105 also serve to horizontally support a box spring 106 which in turn might horizontally support a mattress 107 thereupon. The bed foot end might include a transversely extending rigid upright panel 103 integrally attached to member 102, and might further include a transversely extending L-shaped foot rail 104 integrally attached to member 102 below panel 103.

FIGS. 4 and 5 best describe the situation wherein the physical therapy device "D" has the sleeping bed foot end region serving as the anchoring means. Lower portions 10A only of the vertical frame 10 are shown, it being understood that the rotatable shaft 35 extends forwardly from frame 10 and from bed foot end 102-104 whereby arm member 40 is above mattress 107. There is a carriage member 60 vertically reciprocatably attachable along lower portions 10A of physical therapy device "A," said carriage 60 herein comprising a pair of upright tubular portions 61 slidably surrounding the respective poles 12 of frame 10. The respective tubular portions 61 are integrally tied together with a pair of rigid spacer bars including an upper spacer bar 62 and a lower spacer bar 63. Each tubular portion 61 is provided with a setscrew 64 adapted to engage a pole 12 (herein along 12D) whereby the vertical height of carriage 60 along frame 10 might be selected. A Z-shaped bracket 65 is removably attached to upper spacer bar 62 with a threaded bolt 66 so that bracket 65 extends codirectionally forwardly with shaft 35, and bracket 65 hooks over the upper edge of lofty transverse panel 103. A winged bolt 67 is threadedly engaged with bracket 65, bolt 67 having a compressible pad 68 to abut the forward upright surface of panel 103, the rearward upright surface of 103 abutting carriage 60. Thus, the combination of bracket 65 securely attached to the lofty upper edge of panel 103 together with floor abutments 14 provides a secure anchoring means for physical therapy device "D."

FIGS. 6 and 7 best describe the situation wherein the physical therapy device "D" has one of the sleeping bed side rails 105 serving as an anchoring means. Carriage 60 is employed with tubular portions 61 slidably surrounding the respective poles 12 (herein along 12D) below side rail 105. However, Z-shaped bracket 65 is replaced by an L-shaped foot rest member 74 having a vertical leg 75V, a horizontal leg 75H (extending codirectional with shaft 35), and a diagonal brace portion 75B. Foot rest vertical leg 75V is provided with a vertical slot 76 for passage of bolt 66 through slot 76 and spacer bar 62 whereby foot rest 75 is positionable at the desired elevation. There is a pad 77, similar to pads 14, extending downwardly from horizontal leg 75H to abut the floor immediately below box springs 106.

Attachment means at the bed rail 105 includes a pair of upright angular plates 85, each angular plate 85 being provided with a 90° angular bed 86 to partially surround bed rail 105. The two ends of each angular plate 85 are removably attached to a vertical bar 82 with a pair of bolts 83, the two vertical bars

82 being tied together with horizontal spacer bars 81. Vertical bars 82 abut the forward side of the respective poles 12 and are vertically reciprocally attached to poles 12 as by pivotal bars 84 on the rearward side of poles 12. The vertical bars 82 are temporarily secured at a desired height along poles 12 (appropriate to the height of bed rail 105) as by two bolts 89 along axis 11. Each bolt 89 extends from a spacer bar 81 to a pivotal bar 84. Each pivotal bar abuts the rearward side of both poles 12. Thus, the foot rest 75 supplements the attachment to relatively low anchoring means (lower than panel 103), and stably supports the lofty center of gravity for device "D."

Thus, it can be seen that the physical therapy device is amenable to a plurality of normally encountered anchoring means, is of adjustable height as along frame 10, is adjustably adaptable to various anatomical endowments and conditions as through controlled motor speeds and arm member radii, and appropriate to various anatomical limb regions.

From the foregoing, the construction and operation of the physical therapy device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

We claim:

1. A physical therapy device comprising:

A. An upright standard disposed along a vertical axis, said upright standard including fastener means for temporarily immovably stationing the upright standard at a fixed position with respect to a relatively stationary uprightly extending anchoring means;

B. A substantially horizontal revoluble shaft with a forward portion and a powering means for said revoluble shaft, said shaft being vertically reciprocally attached to the upright standard whereby the shaft has a plurality of selectable fixed elevations along the upright standard, and

C. An elongate arm member attached to and directly revoluble with the forward portion of the revoluble shaft, said arm member extending generally radially from the shaft and having an outward end remote from the shaft whereby the arm member outward end circumscribes a circular path concentric about the shaft and lying in an upright plane substantially parallel to the standard vertical axis, the arm member being of selectable finite length between the shaft and the outward end thereof whereby the radius of said circumscribable circular path is selectably variable, and means attached to the arm member for removably engaging a patient's anatomical limb.

2. The physical therapy device of claim 1 wherein the upright standard includes an upright track means portion extending parallel to said vertical axis, and wherein the powering means for the horizontal revoluble shaft is the powered shaft of an electric motor, said electrical motor being reciprocally attached to the upright track means portion of the upright standard.

3. The physical therapy device of claim 2 wherein the limb engagement means includes a horizontal bar revolubly attached to the of member nearer to the outward end than to the inward end thereof and extending forwardly from the arm member.

4. The physical therapy device of claim 3 wherein the limb engagement means further includes a flexible elongate strap removably attached to and extending vertically downwardly from the horizontal revoluble bar, said flexible elongate strap being of adjustable length and including foot engagement means located nearer to the lower free end of said strap.

5. The physical therapy device of claim 4 wherein the electric motor is of the constant-torque slow-speed type, the angular speed of the horizontal revoluble shaft being selectably

variable at least within the range of 1 to 12 revolutions per minute.

6. The physical therapy device of claim 5 wherein there are locking means to immediately stop the revoluble shaft and radial arm upon deactuation of the powering means.

7. The physical therapy device of claim 2 wherein the fastener means are appropriate to temporarily immovably stationing the upright standard alongside a vertically extending door panel anchoring means having a horizontal top edge and having a horizontal bottom edge spaced a small finite distance immediately above a horizontal floor, said fastener means including a hook means attached to the upper portion of the upright standard for hooking over the door top edge, and further including a floor abutment means attached to the lower portion of the upright standard for abutting against said horizontal floor.

8. The physical therapy device of claim 7 wherein the hook means includes a pair of spaced apart resiliently compressible pads to accommodate the upper portion of a vertical door panel therebetween, at least one of said pads being disposed on the end of a horizontal screw threadedly engaged with the hook means; wherein the floor abutment means includes a downwardly extending resiliently compressible pad; and wherein there is a resiliently compressible pad attached to the upright standard lower portion above the floor abutment means, said pad extending rearwardly to contact the lower portion of the door panel.

9. The physical therapy device of claim 8 wherein the upright standard includes at least one upright tubular lower segment having an upper end and includes an upright upper segment having a lower end extending movably downwardly into the axial bore of the tubular lower segment, there being means to temporarily immobilize the axial telescoping relationship between the upper and lower segments appropriate to the height of the door panel anchoring means; and wherein the floor abutments means comprises a suction cup.

10. The physical therapy device of claim 9 wherein the upright standard includes a pair of said upright telescoping members with the vertical axis therebetween and held together in spaced-apart parallel relationship.

11. The physical therapy device of claim 2 wherein the fastener means are appropriate to temporarily immovably stationing the upright standard alongside a sleeping bed anchoring mean of the type having a horizontal longitudinally extending side rail positioned a short distance above a horizontal floor, said fastener means being removably attached to the upright standard below the vertically reciprocally electric motor and being adapted to engage the sleeping bed side rail.

12. The physical therapy device of claim 11 wherein there is a floor abutment means attached to the lower portion of the upright standard for abutting against said horizontal floor.

13. The physical therapy device of claim 12 wherein there is an L-shaped member including a vertically extending leg attached to a lower portion of the upright standard and further including a horizontal leg extending forwardly from the lower end of the vertical leg, the lower side of the horizontal leg nearer to the forward free end thereof carrying a resiliently compressible pad floor abutment means for resting upon the floor beneath the sleeping bed side rail.

14. The physical therapy device of claim 13 wherein the fastener means for the side rail is vertically reciprocally disposed along the upright standard to accommodate the encountered elevation of the sleeping bed side rail; and wherein the vertical leg of the floor abutment means is in vertically reciprocally attached relationship with the upright standard.

15. The physical therapy device of claim 14 wherein the upright standard includes a pair of upright members held together in spaced apart parallel relationship; and wherein the fastener means for the side rail comprises an upright angular plate with a 90° angle medial bend, the two ends of said bent bar being removably attachable to and reciprocally disposed along the respective parallel members of the upright standard.

16. The physical therapy device of claim 11 wherein the fastener means for the bed side rail comprises an upright angular plate provided with a 90° angle medial bend, the two ends of said angular plate being removably attachable to and reciprocatably disposed along with respect to the upright standard.

17. The physical therapy device of claim 2 wherein the electric motor is mounted upon a shelf member, said shelf member being vertically reciprocatably attached to the upright track means of the upright standard.

18. The physical therapy device of claim 17 wherein there is an upright guard member attached to the motor housing and being disposed wholly rearwardly of the circular pathway for the arm member.

19. The physical therapy device of claim 18 wherein the

fastener means are appropriate to temporarily immovably stationing the upright standard at a transverse paneled end of a sleeping bed anchoring means, said removable attachment means comprising an angular bracket adapted to engage the transverse bed panel together with a horizontal screw threadedly engaged with the angular bracket carrying a pad on the free end thereof for abutting against said bed panel.

20. The physical therapy device of claim 19 wherein the electric motor is of the constant-torque slow-speed type, the angular speed of the revolvable shaft being selectably variable within the range of about 1 to 12 revolutions per minute; and wherein the limb engagement means includes a horizontal bar revolvably attached to the arm member and extending forwardly therefrom.

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