

[54] **IMPACT PRESSURE THERAPY APPARATUS**

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128/49

[56] **References Cited**

UNITED STATES PATENTS

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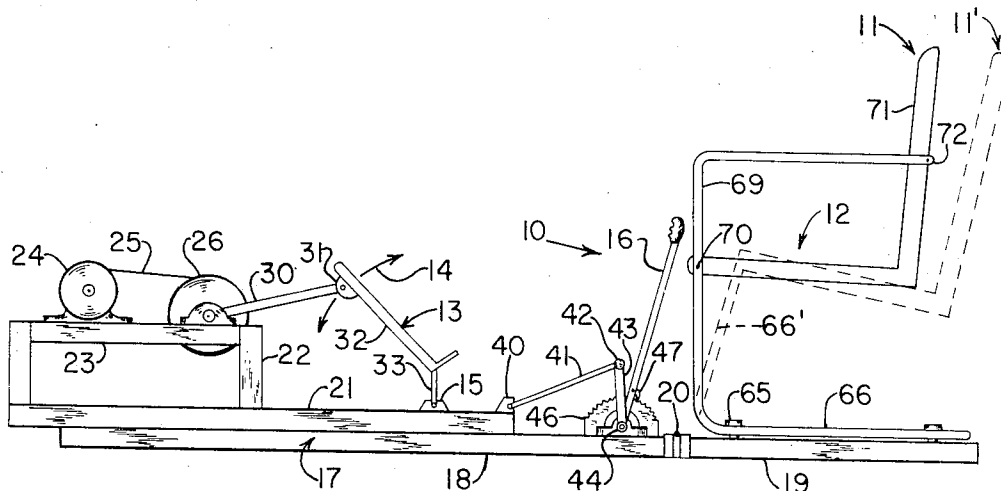
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ABSTRACT

Exercising apparatus that is especially adapted to impart a particular desirable motion into the lower limbs of an individual who may be suffering from paralysis and certain other muscular injuries or disorders. The apparatus includes a fixed base to which there is captured a sliding base, with the sliding base having an oscillating foot rest located thereon. A seat is resiliently mounted to the fixed base and a control lever is disposed in proximity of a person seated thereon for controlling the location of the foot rest relative to the seat. Reciprocatory motion is used to induce oscillatory motion into the foot rest, while the seat moves in response thereto so as to impart a particular exercising motion into the lower limbs of the patient's anatomy. The severity of the motion induced into the patient's leg is controlled by the patient himself who avoids straining his impaired muscles by positioning the lever to thereby control the amount of force imparted into his body.

7 Claims, 7 Drawing Figures



IMPACT PRESSURE THERAPY APPARATUS

BACKGROUND OF THE INVENTION

Various exercising machines have been proposed in the prior art as evidenced by the patent to Carl A. Ragon et al., U.S. Pat. No. 3,450,132, issued June 17, 1969. However, the prior art fails to provide persons with injured muscles, as for example, polio or accident victims, with an exercising machine which is controlled by the patient himself so as to provide the maximum manipulative action the patient can withstand, such an expedient often being necessary for the rehabilitation of injured muscles. It is desired that exercising machines for this purpose be specifically fabricated to induce particular motions in various muscles of the victim wherein each important portion of the lower limb of the victim, especially the knee, can be exercised in a particular manner, the severity of which is determined by the patient himself.

SUMMARY OF THE INVENTION

This invention is related to an exercising apparatus for inducing motion into the lower extremity of a person's body, and particularly to the lower limbs, such as the knee or hip joints. The apparatus is comprised of a fixed base to which there is resiliently affixed a seat which can move in response to motion being induced into the leg of the patient. The patient's foot is received by an oscillating foot rest, with the foot rest being pivotally mounted upon a sliding base. A means for producing reciprocatory motion is connected to and imparts motion into the foot rest.

The sliding base can be moved towards and away from the chair by the patient himself, so that he can control the amount of bend induced into his ankle, hip, or knee, thereby enabling the patient to govern the severity of exercise which is induced into his body.

Accordingly, it is an object of this invention to provide a motor driven therapeutic apparatus that includes means for providing exercise to the leg, thigh, hips, and especially the knee.

Another object of the invention is to provide a therapeutic exercise machine which can be readily adjusted to meet the specific physical requirements of any particular patient.

A further object of this invention is to disclose and provide a therapeutic machine that imparts a predetermined amount of force into either lower limb and at the same time provides means by which one limb can be spread apart with respect to the other a predetermined amount to thereby influence the particular exercise imparted into the hip muscles as well as the pelvic region.

A still further object of this invention is to provide an exercising apparatus having adjustable means associated therewith for lengthening or shortening the device to accommodate either adults or children.

Another and still further object of this invention is to provide exercising apparatus for inducing motion into the lower extremity of a person's body, as for example, the knee, in a manner which avoids exceeding the patient's capacity for movement of the particular limb being manipulated.

These and various other objects and advantages of the invention will become readily apparent to those skilled in the art upon reading the following detailed description and claims and by referring to the accompanying drawings.

The above objects are attained in accordance with the present invention by the provision of a combination of elements which are fabricated in a manner substantially as described in the above abstract and summary.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the preferred embodiment of the invention;

FIG. 2 is a top plan view of the apparatus disclosed in FIG. 1, with some parts thereof being broken away and other parts being removed so as to better disclose the invention;

FIG. 3 is an enlarged, fragmentary, part cross-sectional representation of part of the apparatus seen in the foregoing figures;

FIG. 4 is a fragmentary representation of part of the apparatus seen in the foregoing figures;

FIG. 5 is an enlarged, part cross-sectional view of part of the apparatus seen in FIGS. 1 and 2;

FIG. 6 is an enlarged, fragmentary, part cross-sectional representation of part of the apparatus seen in FIGS. 1 and 2; and

FIG. 7 is an enlarged, part cross-sectional, fragmentary presentation of a modification of part of the apparatus disclosed in the foregoing figures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. 1 and 2, the numeral 10 broadly indicates an exercising apparatus for inducing motion into the lower extremity of a person's body. The apparatus includes a chair 11 comprised of a seat 12 which supports the major portion of the weight of the patient who may be seated therein. Footrest 13 is forwardly disposed of the seat where it is pivotally moved in the directions indicated by the arrows at numeral 14. A journal 15, located at the lower extremity of the footrest, maintains the footrest properly aligned with the remainder of the apparatus. Lever 16 upwardly depends into close proximity of the chair.

A longitudinally extending fixed base 17 is comprised of a first portion 18 which is affixed to a second portion 19 by means of spaced apart hinges 20. A sliding base 21 is slidably captured in supporting relationship upon the fixed base and is movable longitudinally thereof. The base includes four spaced apart vertical members 22 which upwardly depend from the horizontal member 21, with opposed pairs of members being interconnected by spaced apart horizontal side members 23.

A ¼-horsepower motor 24 is bolted to the horizontal side members and provided with a composition V-belt 25 so that the motor can drive pulley 26, which in turn drives shaft 27. The shaft is held in journaled relationship with respect to horizontal members 23, and is rigidly affixed to an eccentric member 28. Housing 29 receives the eccentric member in journaled relationship therewithin and forms one end of connecting rod 30. Hence, rotation of the shaft imparts reciprocatory motion into the rod.

The opposed end of the connecting rod is journaled to the upper marginal free end of the foot rest by journal means 31. The foot rest includes an inclined portion 32 for receiving one's foot thereon, while a vertical member 33 is affixed to the before mentioned journal 15.

Four spaced apart bolts such as indicated at 34 and 35 maintain the movable base superimposed upon and

captured to the fixed base. Each bolt is received through a longitudinally extending slot 36 which admits for the before mentioned movement between the fixed and movable bases.

Spaced apart springs 37 have the depending ends thereof received within the illustrated apertures formed within members 38 and 39 so as to present a biasing force which urges one member towards the other.

Upstanding spaced apart ears 40 are rigidly affixed to the opposed sides of member 21 of the slidable base and each form a journal for receiving one depending end of a drag link 41 which is attached thereto. The opposed end of the drag link is journaled at 42 to linkage 43, which in turn is affixed to a lateral control rod 44. Rod 44 has the marginal end portions thereof journaled to opposed frame members, with levers 16 being rigidly affixed to an end portion of the rod. Plate 46 has the outer diameter thereof provided with serrations or teeth which engagingly cooperate with a movable member 47 in the manner of a rack and pawl so as to releasably position the lever 16 at a number of different positions.

Plate 49 is adjustably captured by lateral plate 50. The lateral plate extends from and is attached to opposed side members of the movable base. Slots 51, 52 receive bolts 53 therethrough with the bolts being affixed to a lower plate member 54. A depending marginal edge portion of the plate is turned vertically downward at 55 and threadedly receives the threaded portion 56 of a crank member therethrough. Journal means 57 receives a polished portion 58 of the crank therein, with the end of the crank terminating in the form of a handle 59. Member 60 is affixed to member 61 so as to secure shaft 58 against longitudinal movement.

The foot rest portion 62 is adjustably attached to portion 63 by means of the spaced apart holes and bolts. Lowermost portion 64 of the foot rest receives a shaft therethrough in the illustrated manner of FIG. 3.

Four spaced apart bolts 65 secure the lower extremity of the chair to the fixed base by means of four spaced apart holes drilled through the lowermost portion 66 of the chair. The bolts 65 extend through the spaced apart resilient leg 66 and through an aperture 67 formed in the fixed base. Spaced apart vertical resilient leg 69 is bent into the horizontal position where it travels rearwardly of the back 71 of the chair, with the rearward most portion 72 being affixed to the back of the chair. Hence, a single length of tubular spring steel can form the chair frame.

FIG. 7 illustrates a modification of the connecting rod 30 seen in the foregoing figures. The rod is eccentrically journaled at 29 as in the manner of FIG. 5, with portion 130 of the rod being provided with a threaded marginal end 174 which terminates at 175. Portion 130' of the rod is provided with a journal for enabling it to be connected to the foot rest at 31. A marginal threaded end 176 terminates at 177. Internally threaded coupling member 180 engages the marginal threaded end of the rod members so as to enable the distance between the shaft 27 and the journal 31 to be changed by merely rotating the coupling member in the desired direction.

In operation, the patient is seated within the chair 12 with either foot placed upon the foot rest 13. The chair is moved towards or away from the foot rest by relocating the four spaced apart bolts 65 as may be necessary.

The height of the foot rest is adjusted by relocating the bolts 63. The angle of the foot rest relative to the base may be changed by adjustment means 180. The heel portion of the foot rest can likewise be moved towards and away from the chair by cranking handle 59 in the proper direction. Lever 16 is moved in a forward direction by disengaging the rack and pawl. The electric motor 24 is energized, thereby driving pulley 26 which in turn rotates the eccentric 28 by means of shaft 27. The eccentric imparts reciprocal motion into the depending end of shaft 30 which in turn pivots the foot rest in a limited arc about journal 15 as indicated by the arrows at numeral 14. As the foot rest pivotally oscillates towards and away from the patient, the patient can move handle 16 towards him and against the biasing action of the springs 37.

The motion of the foot rest will manipulate the patient's ankle, leg muscles, knee, thigh muscles, and hip joints. As the patient's leg is moved towards and away from the chair, the resiliently mounted chair will move towards and away from the dashed line position indicated by numeral 11'. This important feature of the invention augments the therapeutic action of the foot rest in that the body of the patient is slightly changing position during each cycle of the foot rest. Moreover, the resilient legs of the chair have a dampening effect upon the action of the foot rest and thereby precludes imparting an excessive force which might otherwise damage the patient's limbs.

The patient can selectively increase the amount of bend in his knee as the limb is being flexed by the foot rest by merely increasing the pressure on lever 16. Several treatments may be required before the patient can move the lever towards himself any significant amount. Repeated treatment with the machine will enable the knee to be continuously and progressively bent an increasing amount, which signifies that the patient is favorably responding to the treatment.

The chair frame preferably is fabricated from a single piece of tubular structural steel approximately 5/8ths inch in diameter with the ends of the tubing being joined at 72. Where deemed desirable, the frame can be made of two spaced apart flat pieces of structural steel having a cross-sectional configuration of 1 inch by 1/4 inch. It is important that the spaced apart legs of the member between attachment points 70 and bolts 65 be sufficiently resilient so that a definite movement of the chair can be visually observed during the treatment.

It is important to realize that the patient himself selectively imposes several different forces upon his leg. One force is the pressure he places on his leg by pushing against the foot rest. Another force is the pressure which results from thrusting the pelvic region forward while using the small of the back to provide a force against the chair. The patient can spread his legs apart so as to attain various motion variation in his hips. The manipulation of the lever controls the magnitude of force imparted into the limb as well as the angle of bend of the knee.

Since the patient himself is in complete control of the magnitude of the exercise he is receiving, he soon loses fear of pain associated with some muscular disorders, and this expedient enables him to rapidly increase the force to which he subjects his limb.

The present invention stimulates blood circulation and is beneficial for general physical therapy as well as for exercising muscles to their extreme limit of travel.

I claim:

1. Exercising apparatus for inducing motion into the lower extremity of a person's body, comprising:

a fixed base, a seat, a sliding base, and a foot rest; means by which said sliding base is slidably supported by said fixed base; means resiliently mounting said seat to said fixed base in spaced apart relationship with respect to said sliding base;

pivot means for pivotally mounting said foot rest to said sliding base, and said foot rest being spaced apart with respect to said seat;

power means for inducing oscillatory motion into said foot rest so as to pivot said foot rest a limited distance about said pivot means, and;

means for moving said sliding base relative to said seat and said fixed base, whereby:

a person can be seated on said seat with one foot rested upon said foot rest, so as to cause motion to be induced into a lower extremity of his body.

2. The apparatus of claim 1, wherein said means for inducing oscillatory motion into said foot rest includes a connecting rod, means for inducing reciprocatory motion into said rod which includes a shaft, an eccentric affixed to said shaft, said connecting rod having one end thereof affixed to said eccentric, and a motor for rotating said shaft.

3. The apparatus of claim 1, wherein said foot rest includes means by which it can be moved towards and away from said seat.

4. The apparatus of claim 1, wherein said means for moving said sliding base includes lever means affixed to

said fixed base and having an end thereof disposed in close proximity of said chair so that a person seated therein can control the action of the lever, linkage means, said lever being connected to said sliding base by said linkage means so that a person seated in said seat can control the degree of bend to which his knee is subjected.

5. The apparatus of claim 1, wherein said seat is mounted in spaced apart relationship with respect to said fixed base by a resilient member, said resilient member enabling said seat to move relative to said fixed base in response to the oscillatory motion imparted into said foot rest.

6. The apparatus of claim 1, wherein said means for inducing oscillatory motion into said foot rest includes a connecting rod, means for inducing reciprocatory motion into said rod which includes a shaft, an eccentric affixed to said shaft, said connecting rod having one end thereof affixed to said eccentric, and a motor for rotating said shaft; said foot rest includes means by which it can be moved towards and away from said seat.

7. The apparatus of claim 1, wherein said foot rest includes means by which it can be moved towards and away from said seat;

said seat is mounted in spaced apart relationship with respect to said fixed base by a resilient member, said resilient member enabling said seat to move relative to said fixed base in response to the reciprocatory motion imparted into said foot rest.

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