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[54] **BODY-MANIPULATING APPARATUS**
9 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **128/25**
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[50] **Field of Search** ..... 128/24, 25, 25 B, 24.2, 33; 272/58

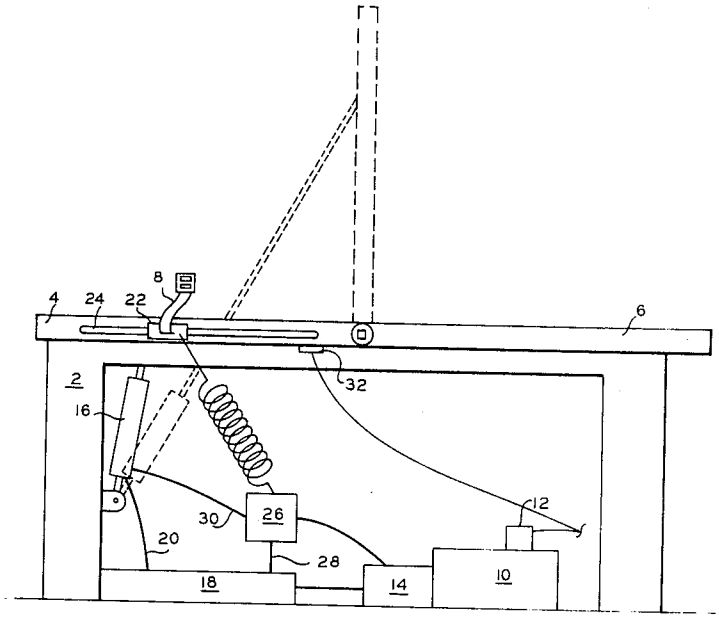
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ABSTRACT: An individual's body-manipulating apparatus has first and second pivotally connected, body-supporting elements with the first element being movable between a first position at which the elements are in a common, substantially horizontal plane and a second position at which the first element is angularly disposed relative to the second element. A power and controlling means is attached to the first body-supporting element on which the portion of the person's body to be manipulated is secured. The controlling means is operably connected to the power means for actuation of the power means and movement of the first element and the individual's body portion in response to a force exerted on the controlling means.



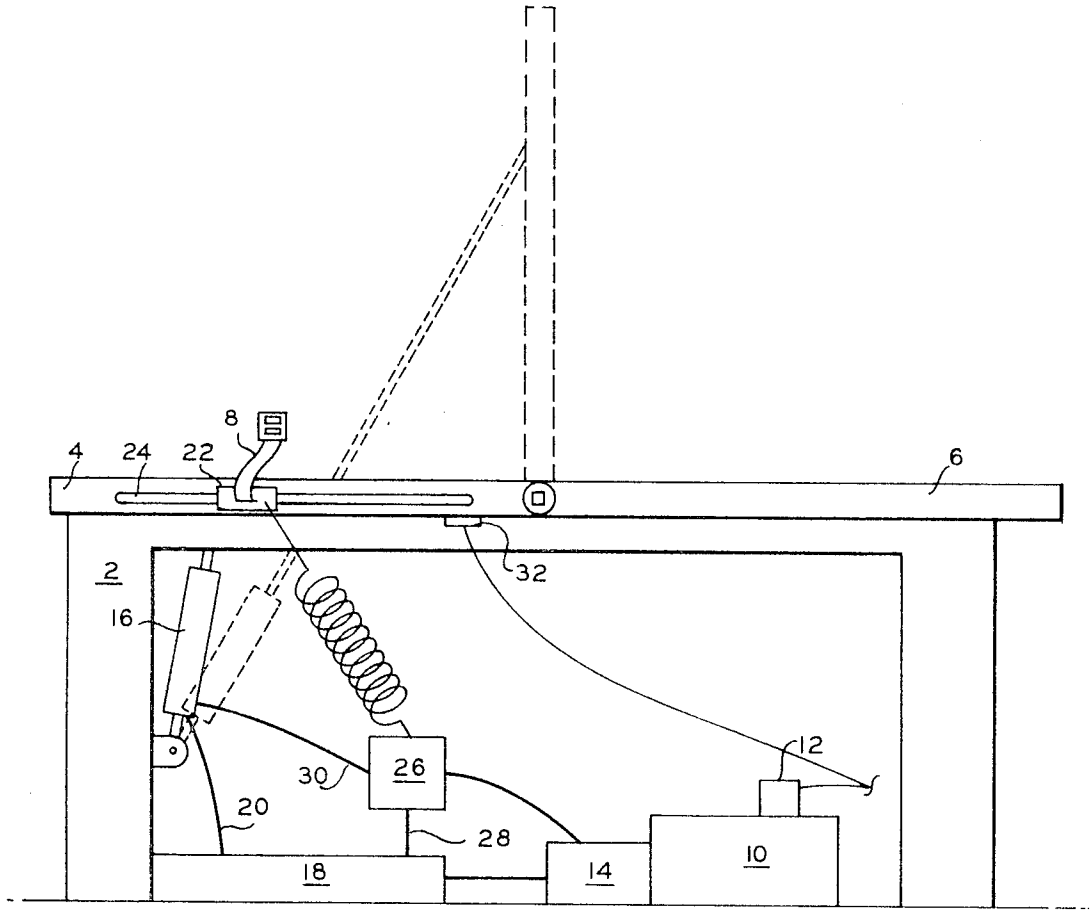
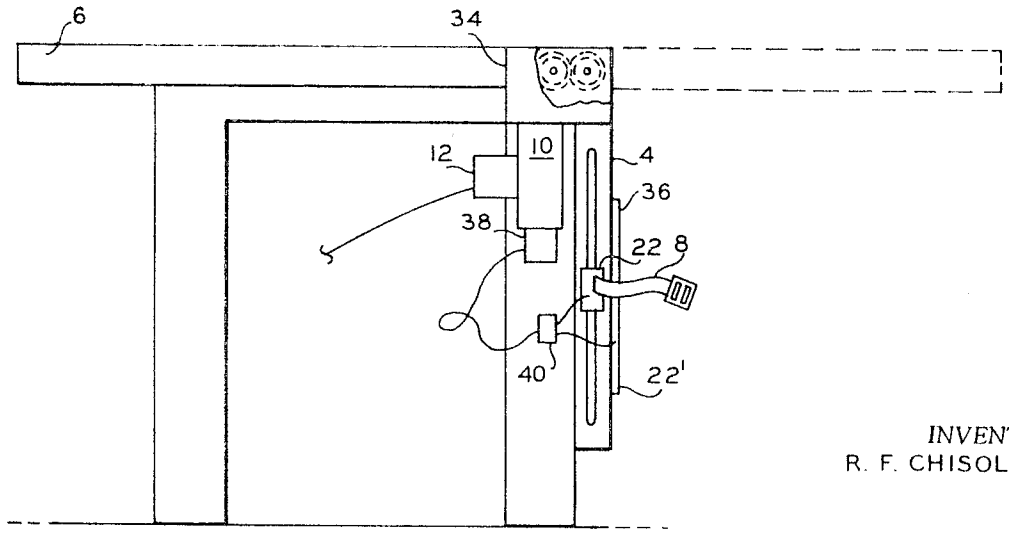


FIG. 1



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FIG. 2

BODY-MANIPULATING APPARATUS

It is desired to provide an apparatus for assisting a person's body in manipulating portions of his body. This apparatus is particularly helpful in toning and strengthening muscles and manipulating the joints of persons who have been the victims of accidents or disease. The apparatus can also be utilized by a healthy person who desires to increase the strength of certain muscles in his body and/or expend energy for controlling his body weight.

Other aspects, objects, and advantages of the present invention will become apparent from a study of the disclosure, the appended claims, and the drawing.

The drawings are diagrammatic views of the apparatus of this invention.

FIG. 1 shows one embodiment of the apparatus and

FIG. 2 shows another embodiment of the apparatus.

Referring to FIG. 1, a frame 2 is attached to first and second body-supporting elements 4, 6. The supporting elements 4, 6 are pivotally connected to one another for movement between a first position (shown by solid lines) at which the elements are in a substantially common, horizontal plane and a second position (shown by broken lines) at which the first element 4 is angularly disposed relative to the second element 6.

In the embodiment shown in FIG. 1, the first body-supporting element 4 is substantially horizontal in the first position and is pivoted upwardly to a substantially vertical location at a higher elevation than the second element 6 in the second position. In the embodiment shown in FIG. 2, the first body-supporting element 4 is substantially horizontal in the first position (shown by broken lines) and is pivoted downwardly to a substantially vertical location at a lower elevation than the second element 6 in the second position.

A power means is associated with the first body-supporting element 4 for moving said first element 4 between its first and second positions. The power means preferably comprises a variable speed electric motor 10 for providing power that is convenient and easy to adjust for operation of the apparatus at various preselected rates. A speed-adjusting apparatus 12 for the electric motor 10 can be a rheostat or other apparatus known in the art.

The motor 10 is operably connected to a fluid pump 14 which is in fluid communication with a power cylinder 16. The power cylinder has a plunger (not shown) that is connected to the first body-supporting element 4 for moving said element between the first and second positions. This cylinder 16 can be an air cylinder or, preferably, a hydraulic cylinder. A hydraulic cylinder is preferred in order that the apparatus can be constructed for more sensitive operation by avoiding timelags that must be compensated for when air is being compressed. Where a hydraulic cylinder is utilized, a liquid reservoir 18 is provided and connected in fluid communication with the pump and a return line 20 is provided between the hydraulic cylinder 16 and the reservoir 18 for movement of liquid from the cylinder for movement of the first element from the second to the first position.

Although the cylinder 16 is shown in FIG. 1 as a single-acting cylinder having a valve therein (not shown) for releasing fluid therefrom upon arrival of the first element 4 at the second position, the cylinder 16 can be a double-acting cylinder wherein power is supplied to the cylinder for also driving the first element 4 from the second to the first position. The power means can also comprise a plurality of synchronously operated cylinders.

A securing means 8, such as straps and a buckle, for example, is associated with the first supporting element 4 and is adapted to maintain a portion of a person's body continuously in contact with the first body-supporting element 4. The securing means 8 is connected to an actuating element 22, such as a strain-gauge-signaling instrument, for detecting the force exerted against the securing means 8 and delivering a signal in response to the application by an individual of a preselected strain being placed on said securing means 8. The actuating element 22 is preferably movable along a track 24 for adjusting the positioning of the securing means 8 to the portion of the person's body being secured thereby.

The actuating element 22 is connected to a fluid diverter 26 that is positioned within the fluid conduit connecting the discharge end of the pump 14 to the cylinder 16. The fluid diverter, which can be, for example, a two-way controlling valve or other apparatus known in the art, passes fluid from the pump 14 through only a first line 28 to the reservoir when no signal is being received from the actuating element 22 and seals the first line 28 and passes fluid through a second line 30 to the cylinder during the period when a signal is being received from the actuating element 22. The actuating element 22-fluid diverter 26 can also be constructed with the diverter having a set point with the actuation of the diverter being regulated by the magnitude of the signal relative to the set point.

A counter 32 can also be associated with the first supporting element 4 and connected to the electric motor 10 for terminating the operation of the apparatus upon completion of a preselected number of operating cycles.

FIG. 2 shows another embodiment of the apparatus of this invention wherein an electric motor 10 is connected through a gear train 34 to the first supporting element 4. The operation of this embodiment is similar to that shown in FIG. 1 but differs in one respect in that the first element 4 is moved by the power means a different direction relative to the second supporting element 6. The actuating element 22' of this embodiment can be a pressure plate 36 that delivers a signal to control means 38 that is operably connected to the electric motor for actuating said motor 10. The electric motor 10 has means associated therewith, such as a position switch, for example, for reversing the motor at the second position of the first element 4 and returning said element 4 to the first position. A plurality of actuating elements 22, 22' are preferably associated with each embodiment of this invention for increasing the function of the apparatus as later described. Where a plurality of actuating elements 22, 22' are employed, a selector switch 40 is associated with the elements 22, 22' for properly controlling the power means.

The second body-supporting element 6 should also be of a length and a width sufficient to satisfactorily support portions of a person's body when said person is lying thereupon with the axis of his body either parallel or perpendicular to the line of joinder of the first and second elements 4, 6. The surface of the elements 4, 6 can also be contoured for receiving in nesting relationships certain portions of a person's body.

In the operation of the apparatus of this invention, a person lies down upon the second body-supporting element 6 with a portion of his body extending onto the second element and being secured thereto with the securing means 8 with a joint of his body adjacent the hinge connection of the first and second elements 4, 6. For exemplary purposes, the apparatus of FIG. 1 will be utilized with the person's legs secured by the securing means with his hips adjacent the pivotal connection. The apparatus is thereafter actuated by energizing the electric motor and, for example, a predetermined force of 5 pounds is set on the actuating element 22 and the counter is set for 15 cycles. The person then attempts to raise his legs. When the person's legs are exerting a force of 5 pounds on the securing means, a signal is delivered to the fluid diverter 26, flow of fluid from the pump to the reservoir is terminated and fluid from the pump 14 is diverted from the pump 14 to the cylinder 16 for raising the first supporting element 4 and the person's legs. If the person reduces the force he is exerting against the securing means to a value below 5 pounds during movement of the first element from the first to the second position, then the signal is interrupted which causes the diverter 26 to terminate he flow of fluid from the pump 14 to the cylinder 16 and direct the fluid to the reservoir 18. Reapplication of the preselected 5-pounds force by the person again cause the cylinder to be actuated.

At the second position of the first supporting element 4 the cylinder retracts, thereby returning the first supporting element 4 to the first position for the initiation of a new cycle.

Upon the completion of the preselected number of operating cycles, here 15, the electric motor is deenergized.

In the embodiment shown in FIG. 2, a person can, for example, place his knees adjacent the pivotal connection and by applying pressure on the pressure plate **36** with his legs and/or feet cause the electric motor to be actuated and control the movement of the first body-supporting element **4**.

It can be seen that by providing a plurality of actuating elements **22**, **22'** with either of the embodiments of this invention, the first supporting element **4** can be controlled to provide a controlled power stroke in either direction. For example, in FIG. **2** by using the pressure plate **22'**, the person can exercise his legs in a manner which requires him to exert a force to bend his knee and by using the actuating element **22** and securing means **8** can exercise his legs in a manner which requires him to exert a force to straighten his legs. In the first example, the apparatus power and controlling stroke is from the first to the second position of the first supporting element **4** and in the second example the apparatus power and controlling stroke is from the second to the first position of said first supporting element **4**.

By so providing an apparatus of this invention, a person can exercise various muscles of his body without requiring said muscles to lift the entire weight of a portion of the body. This apparatus, therefore, does many of the functions of a physical therapist who assists an individual in moving parts of his body. As in the example, the individual in attempting to elevate his legs from the horizontal is requiring his muscles to lift only 5 pounds while the apparatus lifts the remainder of his leg weight.

It should be understood that this apparatus can be utilized for exercising wrists, elbows, arms, legs, backs, or other portions of a person's body by correctly positioning the body relative to the first body-supporting element and securing the body portion thereto. The controlling means can also be regulated for requiring a force of from a few ounces to many pounds of pressure for the actuation of the first supporting element by the electric motor or the cylinder or other motivating means. It can also be seen that by regulating the actuating means for delivering a signal only when several pounds of force is exerted by the individual that said preselected force can be in excess of the weight of the portion of the body and therefore will be useful in greatly strengthening the individual's muscles and/or expending energy for weight-loss purposes. A composite apparatus can also be constructed by combining the two embodiments shown in the drawings into a single apparatus.

Where a centrifugal pump **14** is utilized in the apparatus, the discharge of the pump can be provided with a valving system and a bypass line to the reservoir **18**. The motor then need not be a variable speed motor and speed adjustments can be made by positioning the valve to discharge more or less fluid to the reservoir while delivering fluid to the cylinder **16**.

Other modifications and alternations of this invention will become apparent to those skilled in the art from the foregoing discussion and accompanying drawing, and it should be understood that this invention is not to be unduly limited thereto.

What is claimed is:

1. A body-manipulating apparatus comprising:

first and second body-supporting elements pivotally connected one to the other for movement between a first position at which the elements are in a substantially common plane and a second position at which the first element is angularly disposed relative to the second element, said elements each having dimensions sufficient for supporting portions of an individual's body;

securing means for maintaining a portion of a person in contact with the first element;

power means for moving the first element between its first and second positions; and

controlling means for delivering a signal and actuating the power means in response to a preselected force exerted on the controlling means through the securing means for moving the first element between the first and second positions.

2. An apparatus, as set forth in claim **1**, wherein the first body-supporting element is substantially horizontal in the first position and is pivoted upwardly to a substantially vertical location in the second position.

3. An apparatus, as set forth in claim **1**, wherein the power means comprises a variable speed electric motor;

a fluid pump operably connected to the motor;

a power cylinder having a plunger connected to the first body-supporting element for moving said first element between the first and second positions; and

a fluid conduit for passing fluid from the pump to the cylinder.

4. An apparatus, as set forth in claim **3** wherein the power cylinder is a double-acting, hydraulic cylinder and further includes a fluid reservoir in communication with the pump and a return line for transporting the fluid from the hydraulic cylinder to the reservoir during movement of the first body-supporting element.

5. An apparatus, as set forth in claim **1**, wherein the first body-supporting element is substantially horizontal in the first position and is pivoted downwardly to a substantially vertical location in the second position.

6. An apparatus, as set forth in claim **5**, wherein the power means comprises a variable speed electric motor connected to the first body-supporting element for moving the first body-supporting element between the first and second positions in response to a received signal.

7. An apparatus, as set forth in claim **5**, wherein the power means comprises a variable speed electric motor connected to the first body-supporting element for moving the first body-supporting element from the first to be second position in response to a received signal.

8. An apparatus, as set forth in claim **5**, wherein the power means comprises a variable speed electric motor connected to the first body-supporting element for moving the first body-supporting element from the second to the first position in response to a received signal.

9. An apparatus, as set forth in claim **8**, wherein the controlling means comprises a fluid diverter positioned in the fluid conduit for passing fluid to the power cylinder in response to a received signal; and

an actuating element connected to the securing means and the fluid diverter for delivering a signal to the fluid diverter only while a preselected force is exerted on the actuating element.

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