United States Patent [19]

Jungreis

[11] **3,731,922**

[45] **May 8, 1973**

[54] METHOD OF ISOTONIC EXERCISE

[76] Inventor: **Sidney W. Jungreis,** 21 Roosevelt Road, Maplewood, N.J.

[22] Filed: **Jan. 21, 1971**

[21] Appl. No.: **108,314**

Related U.S. Application Data

[62] Division of Ser. No. 760,409, Sept. 18, 1968, Pat. No. 3,588,101.

[52] **U.S. Cl.**.....**272/81,** 272/DIG. 5, 272/DIG. 4

[51] **Int. Cl.**.....**A63b 21/24,** A63b 21/00

[58] **Field of Search**.....272/79 R, 79 B, 79 C, 272/79 D, DIG. 4, 81, 57 R, 72, 67; 73/65; 177/214

[56] **References Cited**

UNITED STATES PATENTS

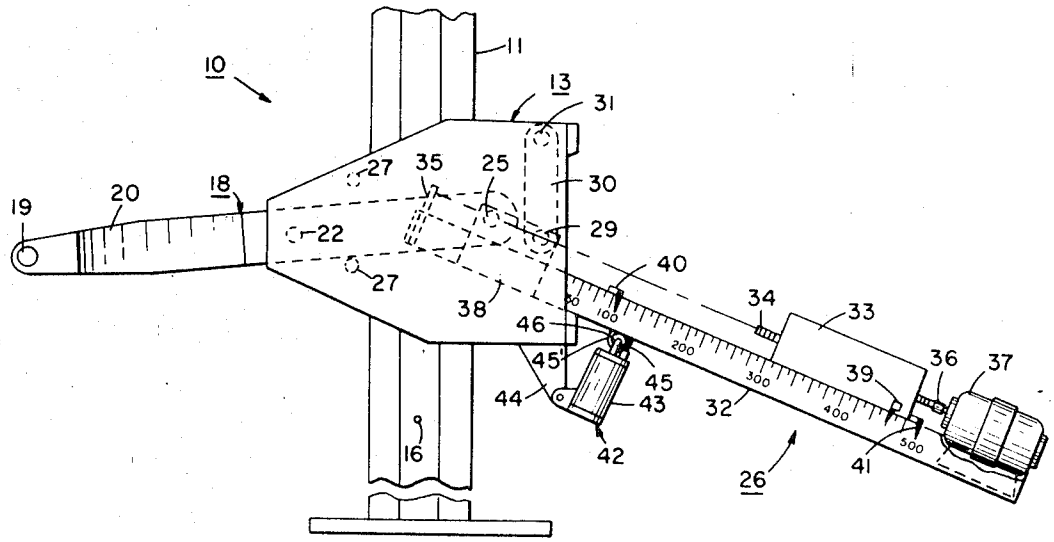
857,447	6/1907	Cooper	272/81
1,166,304	12/1915	Albert	272/81

Primary Examiner—Anton O. Oechsle
Assistant Examiner—William R. Browne
Attorney—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

Method of isotonic exercise involving the lifting of a load responsive arm to approximately the waist position and holding it there while varying loads are applied to the load responsive arm.

6 Claims, 5 Drawing Figures



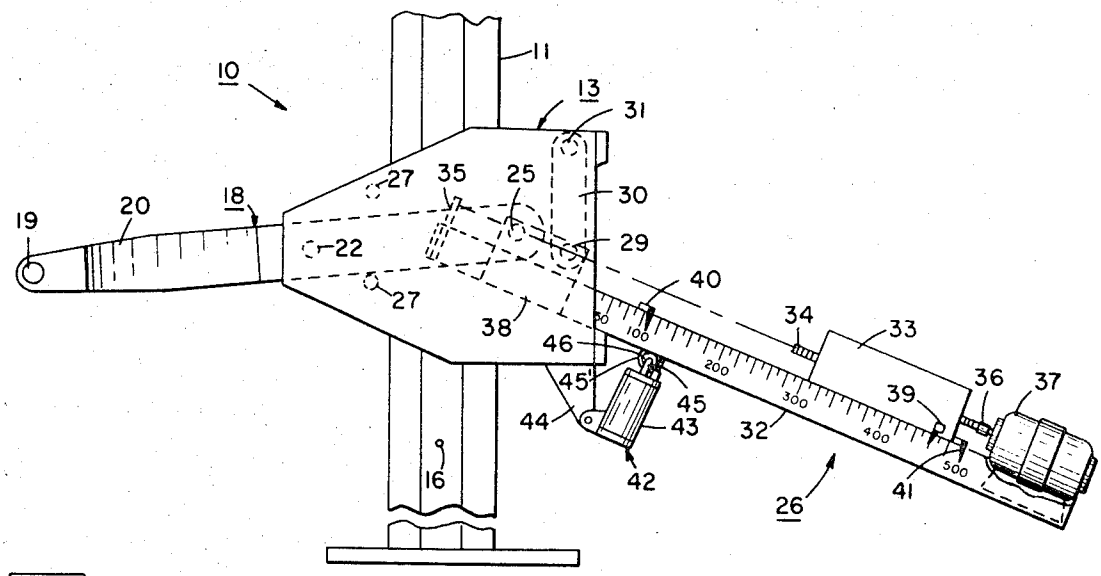

10
11
13
31
27
35
25
30
19
20
18
22
29
27
40
38
34
33
46
36
37
45'
45
39
44
43
32
42
41
26
16

Fig. 1

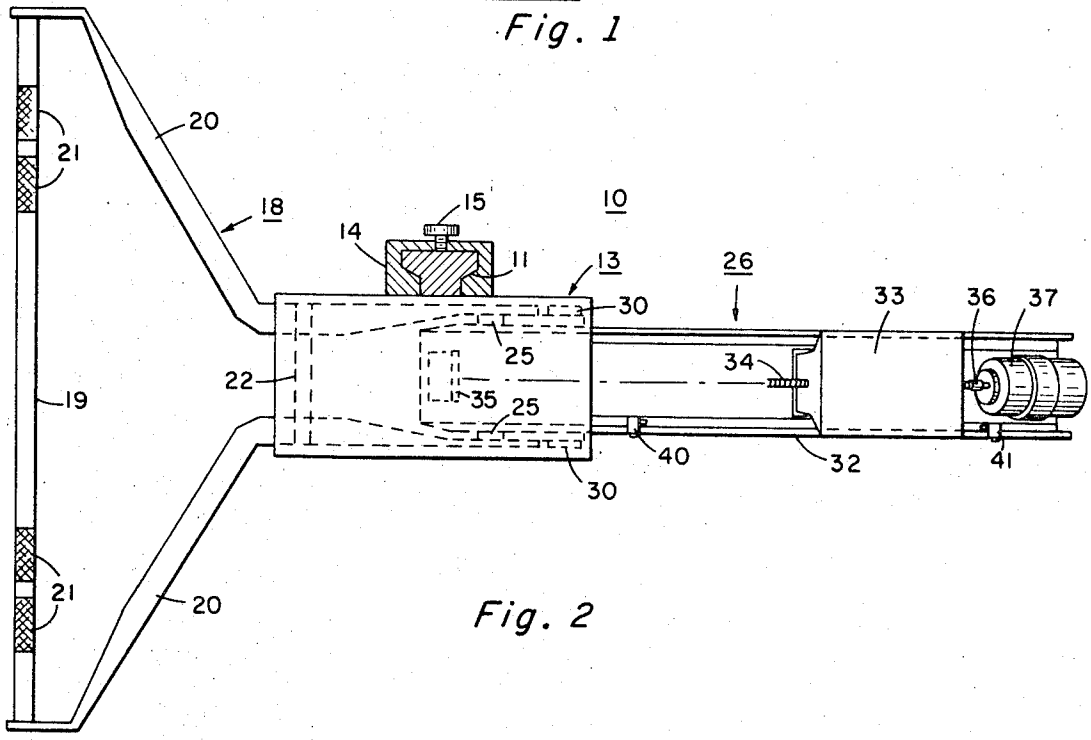

20
21
18
15
10
14
11
13
26
30
33
36
37
25
22
34
19
35
25
40
32
41
30
21
20

Fig. 2

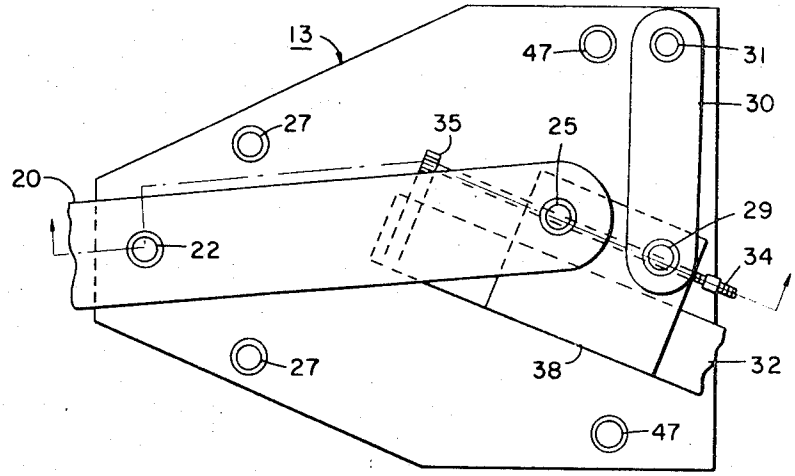

13
47
31
30
27
35
25
20
29
22
34
27
38
32
47

Fig. 3

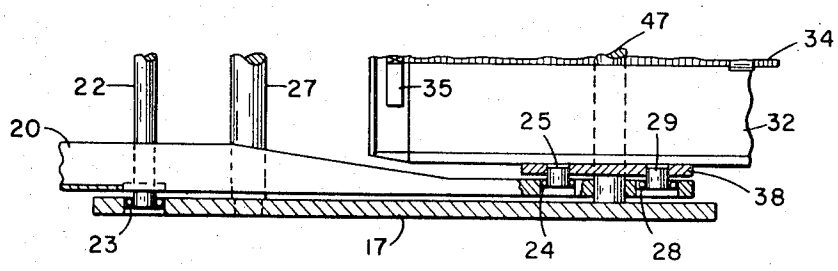

47
34
22
27
35
20
25
29
32
38
23
17
24
28

Fig. 4

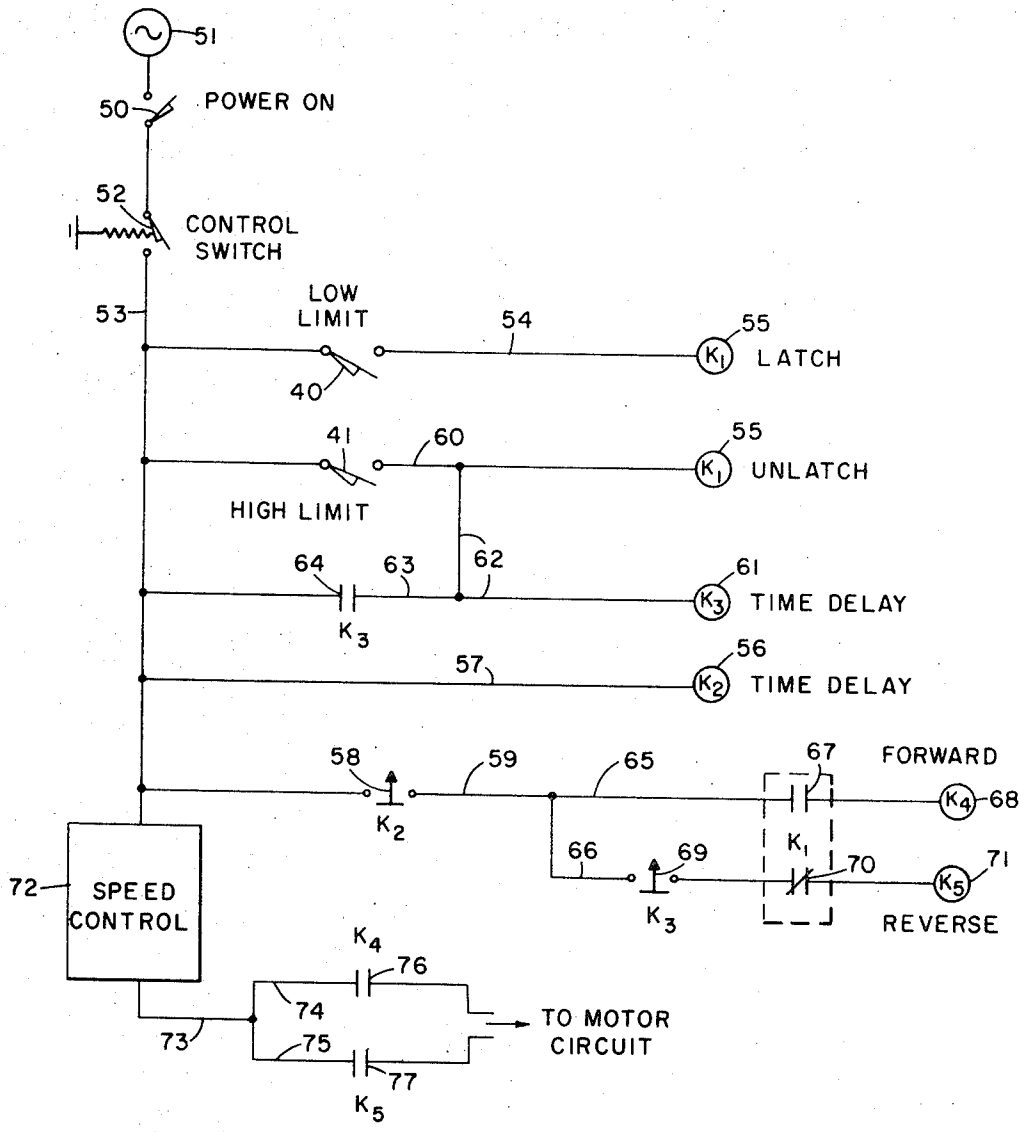

51
50
POWER ON
52
CONTROL SWITCH
53
LOW LIMIT
54
55
K1
LATCH
40
41
60
55
K1
UNLATCH
HIGH LIMIT
64
63
62
61
K3
TIME DELAY
K3
57
56
K2
TIME DELAY
58
59
65
67
FORWARD
K4
68
K2
66
69
K1
70
71
K5
72
SPEED CONTROL
K3
REVERSE
K4
76
74
TO MOTOR CIRCUIT
73
75
77
K5

Fig. 5

METHOD OF ISOTONIC EXERCISE

This application is a division of application Ser. No. 760,409 filed Sept. 18, 1968, now U.S. Pat. No. 3,588,101.

This invention relates to a method of exercise. More particularly, this invention relates to a method for developing muscle strength.

It is an object of the invention to provide a method of exercise for rapidly and efficiently building up muscle strength.

It is another object of the invention to exercise muscles in a kinetic manner under loads greater than the capacity of the muscles.

It is another object of the invention to utilize a muscle's capability of resisting loads greater than the loads which the muscle could otherwise move.

It is another object of the invention to provide a method which can be used to exercise different muscles of a user's anatomy.

It is another object of the invention to provide a method of exercise which is capable of being used safely and reliably to build up muscle strength.

Briefly, the invention provides a method of exercise which allows a user to vary the force exerted by the exercise device in a positively controlled and predetermined automatic fashion without any large motion excursions.

The exercise device includes a frame which has an exercise bar pivotally mounted thereon for manipulation by the user to exert an isotonic force on a set of particular muscles. In addition, the exercise device includes a beam on the frame which is connected to the exercise bar via a suitable linkage to pivot about a different pivot axis from the exercise bar simultaneously with the exercise bar. The linkage between the exercise bar and the beam is such that pivoting of the exercise bar causes a reactionary pivoting of the beam. Also, a weight is movably mounted on the beam to slide longitudinally along the beam so as to effect different moments about the beam pivot axis for counteraction by the force on the exercise bar. By changing the position of the weight on the beam a greater force becomes required on the exercise bar in order to maintain the exercise bar in an elevated position. This causes the muscles of the user's anatomy which are supporting the exercise bar in substantially a stationary elevated position to build up strength in a resistive manner to an increasing load caused by movement of the weight. The mass of the weight and the moments created by the weight are such that only a minimum of pivoting of the exercise arm is needed to effectuate the exercise program of the exercise device.

Various means can be provided in order to move the weight along the beam. In one embodiment, an electromechanical system is used to move the weight. In this system, the movable weight is threaded onto a rotatable screw means which is rotated by a motor. The motor, in turn, is actuated after the exercise bar is initially displaced into the abovesaid elevated position via a signal means so as to begin rotation of the screw means and, consequently, movement of the weight along the beam. The motor is mounted on the beam in a fixed position so as to conveniently activate the screw means and to also act as a dead weight to be lifted along with the exercise bar.

Additionally, the rate of movement of the weight can be controlled through a suitable speed control in the electrical circuit so as to regulate the exercise program to the individual user.

In order to enhance the safety of the exercise device, during use, a suitable stop means is mounted on the frame in opposition to the beam. This stop means includes a damper which serves to limit the speed of return pivoting of the beam should the exercise bar be released suddenly.

The exercise bar and linked beam are mounted on the frame of the device within a suitable housing which is adjustably mounted in a vertical direction on the frame. This permits different parts of the anatomy to be exercised. For example, with the housing in a lowermost position, the exercise bar is moved by a user's legs or feet; with the housing in an upper position, the exercise bar is manipulated by a user's hands and arms.

The method of the invention includes the subjection of a user's muscles, first, to an isotonic exercise to support a first load in the manner of a bar bell and, second, to a following kinetic exercise involving the resistance to a continuous increase in the supported load. The initial step of the method requires the user to lift a constant load isotonically to a predetermined elevation. This causes the muscles being used to develop sufficient force and strength to support the load and maintain the load in the elevated position. The following step of the method requires the muscles of the user to resist an increase in the weight of the load while the load remains in the elevated position. This causes the muscles to build up strength without further movement.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a side view of an exercise device of the invention;

FIG. 2 illustrates a plan view of the exercise device of FIG. 1;

FIG. 3 illustrates a partially broken view of the linkage of the exercise bar to the beam according to the invention;

FIG. 4 illustrates a view taken on line 4—4 of FIG. 3; and

FIG. 5 schematically illustrates an electrical circuit for actuation of the movable weight on the beam.

Referring to FIGS. 1 and 2, the exercise device 10 includes an upright frame 11 which is adapted to be mounted in a stationary position or mounted on suitable rollers for movement from place to place. The frame 11 is vertically disposed and T-shaped in cross section along the entire height. In addition, the exercise device 10 includes a housing 13 which is slidably mounted on the frame 11 via a slotted guide 14 integral therewith and selectively locked in place on the frame 11 by a threaded bolt 15. The bolt 15 is threaded into the guide 14 in order to abut the frame 11 under a force sufficient to hold the housing 13 in place.

Referring to FIGS. 2, 3 and 4, the housing 13 has a pair of side walls 17 in which a bar means 18 is pivotally mounted. The exercise bar means 18 includes a bar 19 which is disposed to lie in a horizontal plane and a pair of arms 20 which are fixed to opposite ends of the bar

19 and pivotally mounted in the housing side walls 17. The bar 19 includes pairs of knurled or otherwise formed surfaces 21 which act as gripping surfaces for lifting of the bar 19. The arms 20 are each pivoted on a horizontal pivot pin 22 journalled in suitable bearings 23 in the opposite side walls 17 of the housing 13. Additionally, a pair of shafts 27 are fixedly mounted in the housing side walls 17 on opposite sides of the arms 20 to fix the side walls 17 in place.

The beam means 26 is pivotally mounted via bearings 28 on stub shafts 29 journalled within a respective pair of links 30. Each link 30 is further pivotally mounted in a respective side wall 17 of the housing 13 on a shaft 31 so that the beam means 26 is free to pivot about the links 30 upon pivoting of the bar means 18.

Referring to FIGS. 1 and 2, the beam means 26 includes a beam 32 having a graduated scale of weights thereon and a weight 33 which is slidably mounted on the beam 32. In order to move the weight 33 along the beam 32 a threaded screw 34 is threaded through the weight 33 and journalled at one end in a mounting plate 35 on the beam 32 and at the opposite end in a rotatable shaft 36 of a motor 37. In addition, the beam means 36 includes a pair of upstanding plates 38 secured on the beam 32 within the housing 13 which mount the beam means 26 to the links 30.

The weight 33 is also provided with an indicator 39 which cooperates with the graduated scale on the beam 32 to indicate the weight of an equivalent load on the bar 19 of the bar means 18 when the weight 33 is moved along the beam 32.

A pair of limit switches 40, 41 are mounted in the path of the weight 33 at opposite ends of the beam 32 to represent a lower weight limit and a higher weight limit for the exercise device. Upon actuation of the higher weight limit switch 41 by the weight the motor 37 is reversed to cause the weight 33 to return towards the housing 13. These limit switches 40, 41 are connected to the motor 37 via a circuit as described below.

A damping means 42 (FIG. 1) is mounted on the housing 13 below the plane of the beam 32 in order to provide a safety arrangement for preventing sudden dropping of the exercise bar 19 upon release by the user. To this end, the damping means 42 includes a cylinder 43 which is pivotally mounted on a depending plate 44 from the housing 13 and a piston 45 slidably mounted in the cylinder 42. The piston 45 has a pin 46 mounted on the end which engages a strut 45' on the beam 32. As the beam 32 pivots counterclockwise as viewed in FIG. 1, the piston 45 is pulled out of the cylinder 43 by the pin 46. Upon release of the bar 19, the beam 32 rotates clockwise as viewed. However, as the movement of the piston 45 into the cylinder is damped as is known, the motion of the beam 32 is retarded to a relatively low safe speed.

Referring again to FIGS. 3 and 4, the housing 13 is provided with a pair of fixed shafts 47 secured between the side walls 17 which serve to rigidify the housing 13. Further, the housing 13 is formed so as to be closed on all sides except for the spaces required for pivoting of the bar means 18 and beam means 26.

In operation, with the bar means 18 in the rest position as shown in FIG. 1, the exercise bar 19 is lifted, as by the hands of the user, to pivot about the pivot pin 22. This causes the beam 32 to also pivot about the stub shaft 29. The exercise arm 19 is pivoted a limited amount, for example, three inches, so that the arms 20 are positioned adjacent the lower shaft 27. As the exercise bar 19 is lifted, a control switch 52 is actuated in order to energize the motor 37. The switch 52 cooperates with a time delay so as to actuate the motor 37 to move the weight 33 after a predetermined period of time, for example, three seconds. Initially, the weight 33 is placed at the end of the beam nearest the pivot point. At this point, the mass of the weight 33 as well as the mass of the motor 37 and beam 32 provide a counterweight for the force lifting the exercise bar 19. Consequently, once the exercise bar has been lifted to a predetermined position, the muscles of the user exerts a force to counterbalance the moments acting upon the bar means 18 due to the mass of the weight 33, motor 37, and beam 32.

After the exercise bar 19 has been lifted to the predetermined position and the motor 37 has been actuated thereby, the weight 33 begins to move along the beam 32 in the direction of the motor 37. This movement of the weight 33 causes an increase in the moment about the stub shaft 29 (pivot point of the beam means 26. Consequently, a greater force is needed at the exercise bar 19 in order to maintain the bar in a stationary position. This added force is developed by the muscles of the user. The weight 33 continues to move until reaching the limit switch 41. Upon reaching the limit switch 41, the weight closes the switch to de-energize the motor 37. At this time, the user is supporting the maximum load intended for the exercise program.

The movement of the weight 33 can be controlled by a suitable speed control so as to move at a rate which imposes a constantly increasing force on the muscles of the user. In this way, the muscles of the user can gradually build up sufficient force to maintain the exercise bar in place. Alternatively, the speed control can be suitably programed to create a known uniform pattern of speed for the weight 33 so that the build up of forces on the muscles can be varied with time. For example, the weight can be moved at a rapid rate at the beginning of motion and can be decelerated near the end of the path of movement. After the weight 33 has moved over the limit switch 41 and the motor 37 has been deenergized, the exercise bar can be released. In this event, the beam 32 will pivot downwardly as shown in FIG. 1 against the damping means 42. As the damping means 42 is adapted to slow the rate of motion of the beam a sudden dropping of the exercise bar 19 is avoided. Alternatively, after de-energization of the motor 37, the motor can be restarted in a reverse direction so as to move the weight 33 back towards the pivot point of the beam 32. This causes a decrease in the force necessary by the user's muscles to maintain the exercise bar 19 in place. After the weight passes over the limit switch 40 and returns to its initial position, the user may return the exercise bar to the initial position of rest.

Referring to FIG. 5, the electrical circuit for actuating the motor 37 for moving the weight 31 is as shown. The electrical circuit includes an on-off switch 50 for connecting the circuit to a power source 51. In addition, a control switch 52 is placed in the power line 53 with the on-off switch 50. The switch 52 cooperates

with the exercise bar 19 so as to be closed upon lifting of the bar 19 and opened on dropping of the bar 19. The limit switch 40 which normally is open is connected in a line 54 to a relay 55 so as to actuate the relay 55 upon closing in response to passage of the weight 33. A time delay relay 56 is connected by a line 57 to line 53 in parallel with the line 54 to be actuated upon closing of switch 52. The relay 56 actuates a contact 58 in a line 59 connected to line 53 after a predetermined time delay to energize the line 59. The limit switch 41 which is normally open is connected in a line 60 in parallel with the line 54 to the relay 55 to deactivate the relay 55 upon closing of the switch 41 in response to movement of the weight 33 thereacross. Additionally, the line 60 connects with a time delay relay 61 in parallel with relay 55 via a lead 62. A line 63 containing a contact 64 of the relay 61 connects the lead 62 to the power line 53.

A line 59 connects with two lines 65, 66 in parallel. One line 65 contains a normally open contact 67 of the relay 55 and a relay 68. The other line 66 contains a normally open contact 69 of the time delay relay 61, a normally closed contact 70 of the relay 55 and a relay 71. A speed control 72 is interposed in the power line 53 to control the speed of the motor shaft 36 in a known manner and is not therefore further described. Finally,a line 73 is connected to the power line 53 downstream of the speed control 72 and to a pair of leads 74, 75 in parallel which connect to the circuit of the motor 37. One lead 74 contains a normally open contact 76 of the relay 68 while the other lead 75 contains a similar normally open contact 77 of relay 71.

When the exercise device is placed in operation, the power switch 50 is closed and, as the movable weight is positioned between the limit switches 40, 41, the limit switch 40 is also closed. Thereafter, when the exercise bar is lifted, the control switch 52 opens energizing the relay 55, the time delay relay 56 and speed control 72. As the relay 55 is energized, contact 67 is closed and contact 70 is opened. After a time period of 1 to 5 seconds lapses, the time delay relay 56 closes contact 58. This causes energizing of relay 68 which in turn closes contact 76 to activate the motor to move the weight forwardly along the beam. As the weight moves over the higher limit switch 41, the switch closes to deenergize the relay 55 and energize the time delay relay 61. Deenergization of relay 55 causes opening of control 67, so as to shut off the motor and closing of contact 70. After a time period lapses, the time delay relay 61 causes closing of contacts 64,69. This causes energizing of relay 71 which in turn closes contact 77 to reverse the motor and, consequently, the direction of movement of the weight. As the weight moves in the reversed direction, the limit switch 41 reopens. However, relay 61 remains energized through contact 64. As the weight passes over limit switch 40 the switch closes to reactivate relay 55. Also, the exercise bar is dropped so as to open the control switch 52 and deenergize the motor to complete the cycle.

Referring finally to FIG. 1, the exercise device 10 can be provided with a suitable read-out means to indicate to a user the force which is being counteracted by his muscles. Such a read-out means can incorporate the indicator 39 on the weight 33 and the scale along the beam 32 so that the indicator 39 points to the degree of force on the scale necessary to support the exercise bar 19. For example, as shown with the beam scale graded to represent from 50 to 500 pounds of force, the weight 33 is initially positioned so that the indicator 39 points to the force necessary to lift the dead weight isotonically. Thereafter, as the weight 33 is moved along the beam 32 to increase the load on the muscles, the indicator 39 successively points to the force necessary to maintain the exercise bar in place. Alternatively, the read-out means can be suitable connected to the movable weight 33 or screw means 34 to read-out the forces imposed on the exercise bar and mounted on the housing 13 for viewing by the user.

The weight 33 on the beam 32 is removable so that weights of different mass can be placed on the beam to produce different ranges of force. In this regard, the scale on the beam 32 can be replaceable to correspond with the particular weight 33 on the beam 32 or can be one of a number of scales formed on the beam 32 for reading with a corresponding weight.

The invention provides an exercise device which is simple to use and which is effective in rapidly building up strength of muscles. The invention relies on the isotonic exercise of muscles coupled with resistance to a kinetic increase in a load. That is, the invention first permits the muscles to lift and support a load slightly below the maximum capacity of the muscles and thereafter superimposes a continuously increasing load on the muscles withour further movement of the muscles. By increasing the load on the muscles, the maximum strength of the muscles is exceeded so that the muscles are activated to increase in strength in order to resist the increased load. Consequently, the muscles of a user can be rapidly built up without the requirement of any large motion excursions by the parts of the user's anatomy incorporating such muscles.

It is further noted that the range of loads which are possible with the exercise device can be from 25 pounds to 1000 pounds. Further, for each exercise cycle, it is possible to set an independent initial load at which the movable weight begins to move and an independent final load at which the movable weight will stop or reverse. In such a case, the final load should be considerably higher than the initial load, for example, at least twice as high, and the rate at which the load increases from initial to final load should require a total of from 2 to 10 seconds or more.

It is further noted that the exercise device can be adjusted to any suitable height so that various parts of the user's anatomy can be properly exercised. For example, when a housing is placed near the floor the exercise device can be used to exercise the muscles in the feet and legs of the user. When the housing is placed near the top of the frame, the exercise device can be used to exercise the arm and neck muscles of the user. To this end, the height of the device is adjustable in a range from 2 feet to 5 feet above the floor.

Finally, it is noted that various systems other than the systems as described above can be used to achieve the same purpose of exercise, i.e. hydraulic, pneumatic or electro-mechanical systems can be used.

What is claimed is:

1. A method of exercising muscles comprising the steps of

exerting a force on the muscles with said muscles in a fixed location by isotonically lifting an exercise bar to a predetermined position; and subsequently increasing said force by imposing a load on the bar while maintaining the bar in said predetermined position and while maintaining said muscles stationary in said fixed location to resist the increase in said force.

2. A method as set forth in claim 1 wherein the load imposed on the bar is a kinetic load.

3. A method as set forth in claim 1 wherein the load imposed on the bar is increased at a predetermined rate.

4. A method as set forth in claim 1 wherein the force is increased after a predetermined period of time.

5. A method as set forth in claim 1 wherein the force is increased to an amount substantially larger than the initial force.

6. A method as set forth in claim 1 which further comprises the step of decreasing the force from an increased amount to the initial force.

* * * * *