

[54] UNIVERSAL EXERCISING MACHINE

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[51] Int. Cl.⁴ A63B 21/02

[52] U.S. Cl. 272/135; 272/134; 272/136; 272/173

[58] Field of Search 272/135, 136, 142, 143, 272/117, 93, 72, 134, 145

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Primary Examiner—Richard J. Apley

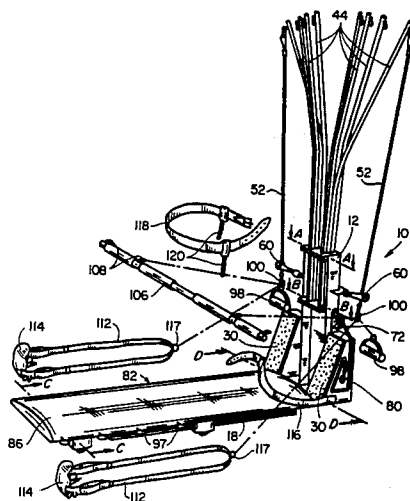
Assistant Examiner—John L. Welsh

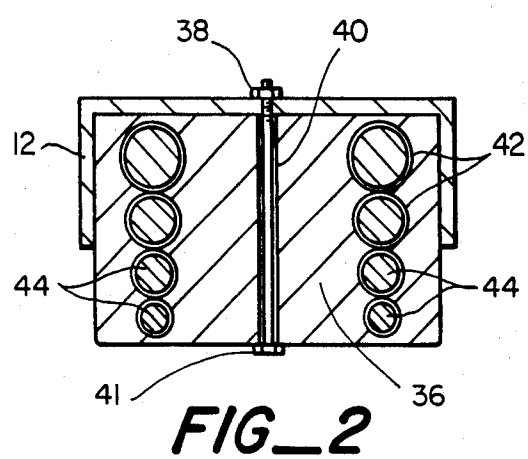
Attorney, Agent, or Firm—Flehr, Hohbach, Test, Albritton & Herbert

[57] ABSTRACT

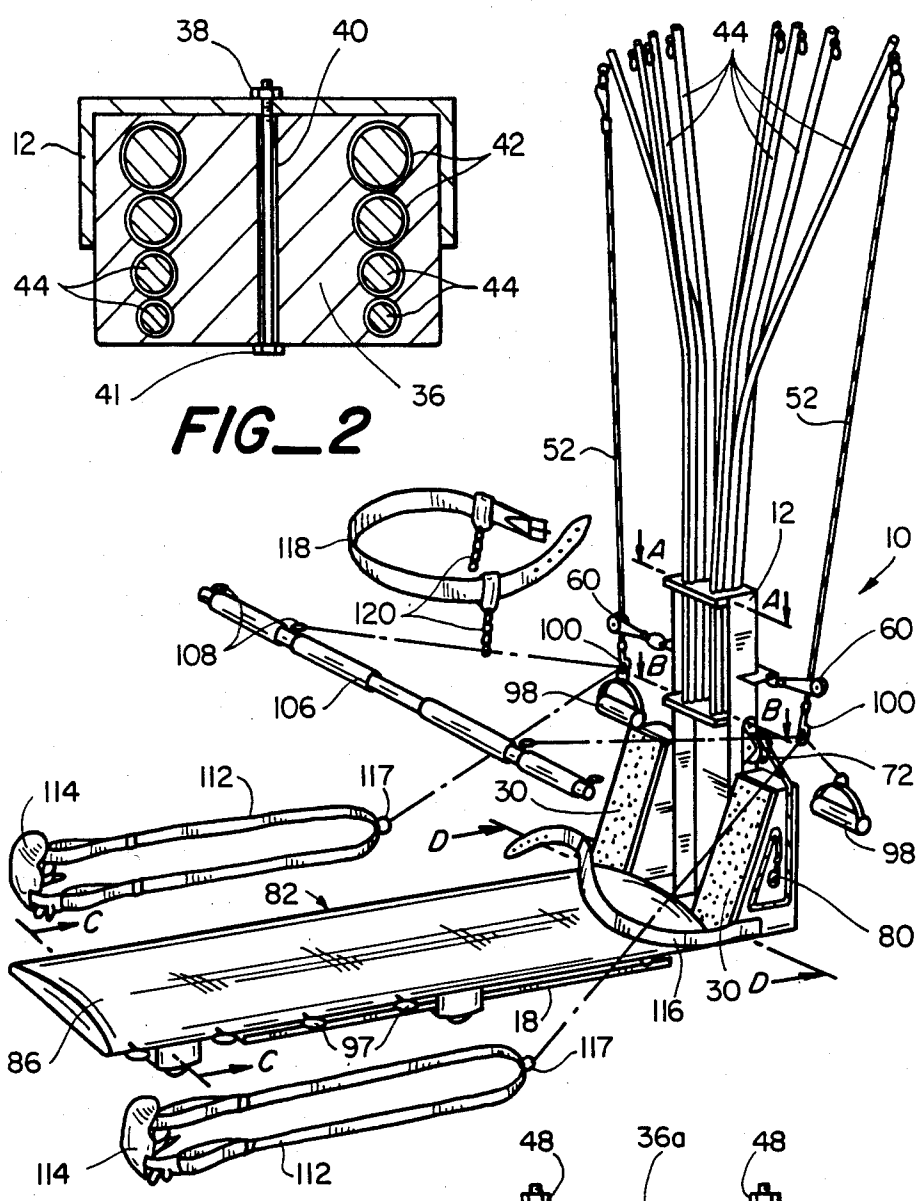
Exercising machine having a plurality of resilient rods which are flexed and resist movement of a person using the machine. Forces are exerted on the resilient rods through cables to which a variety of attachments such as hand grips, foot stirrups and a sliding bench can be connected to exercise different parts of the body. The rods can be used in any combination to suit the requirements and physical abilities of the person using the machine.

26 Claims, 22 Drawing Figures

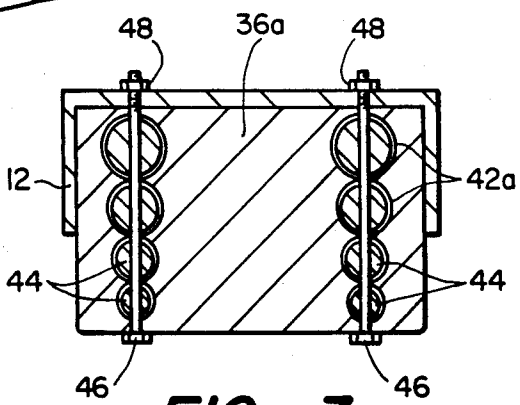




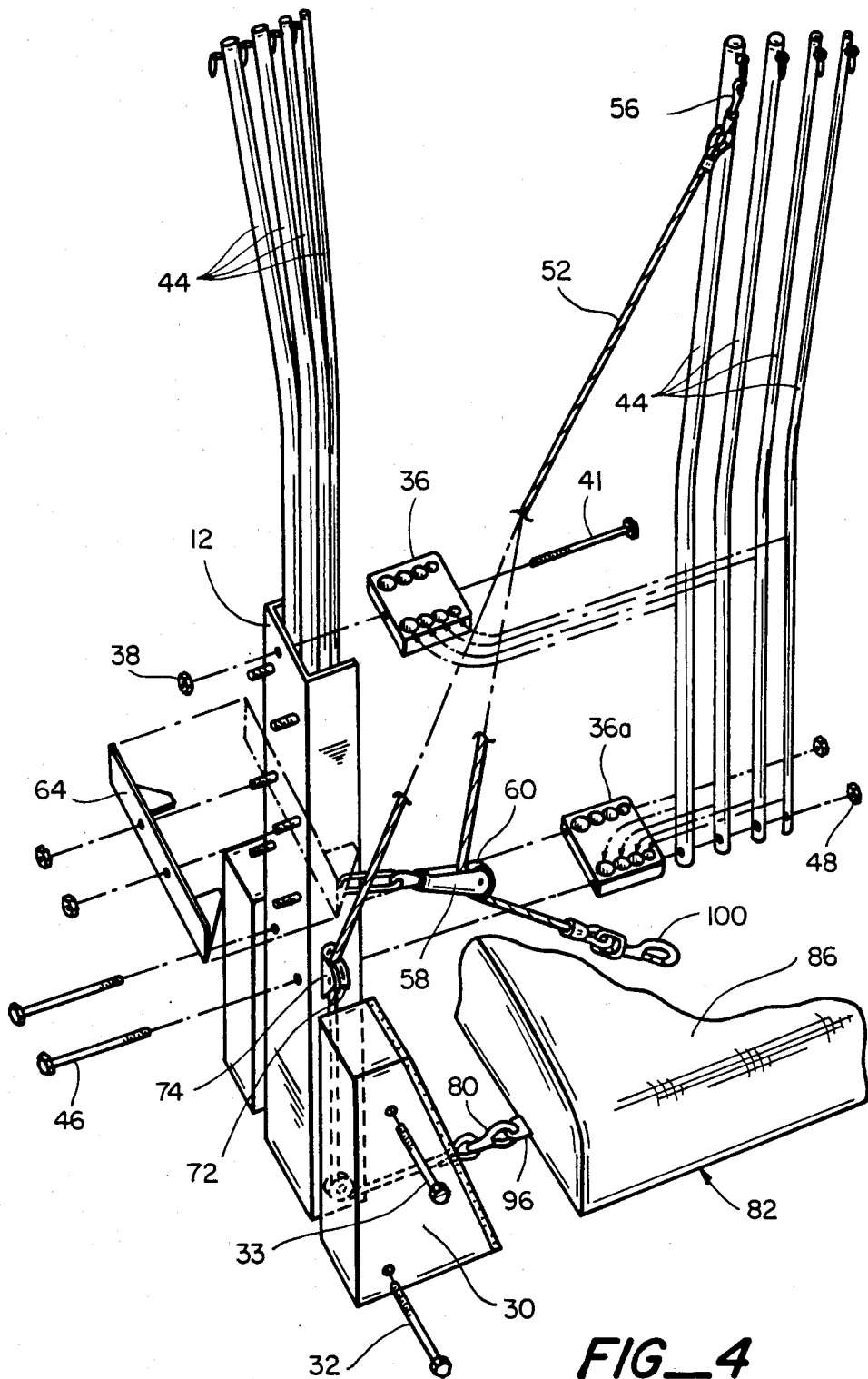
FIG_2

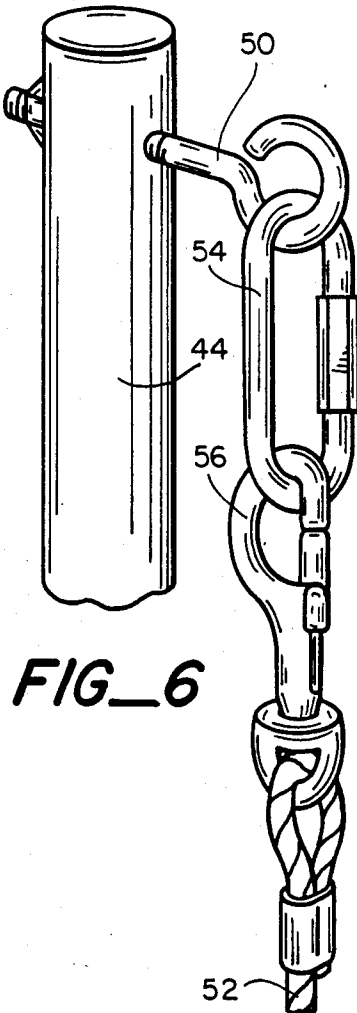
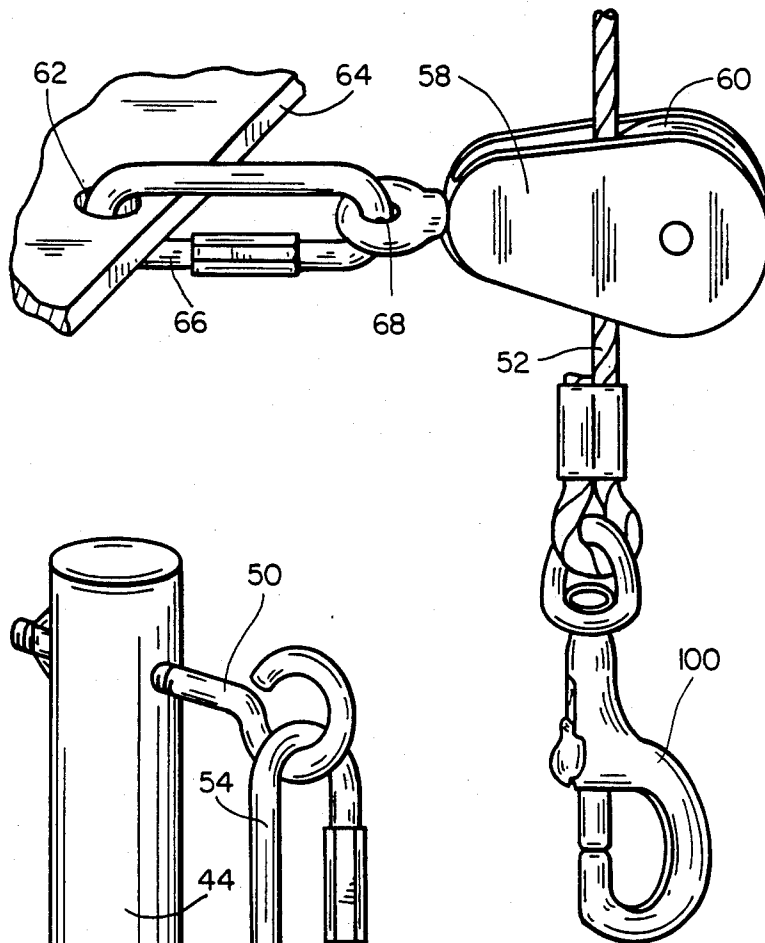


FIG_1



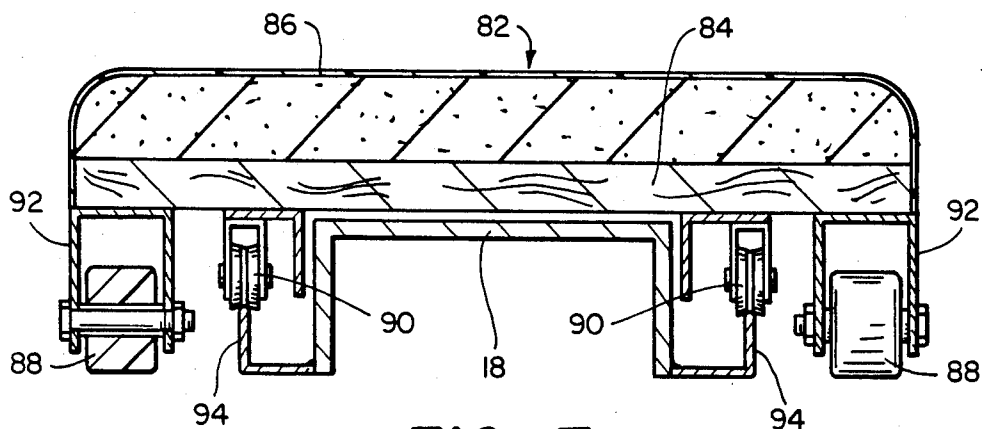
FIG_3



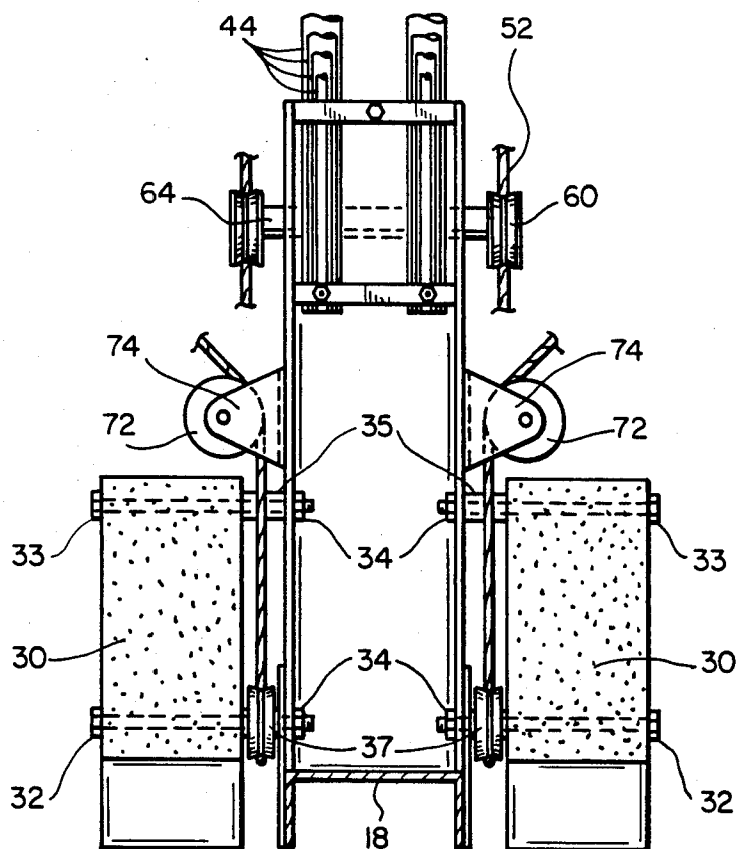


FIG_5

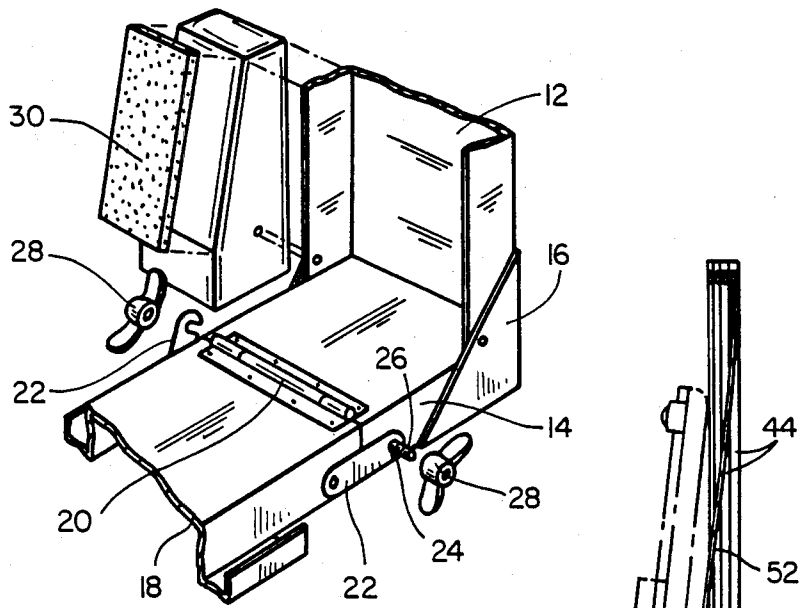
FIG_6



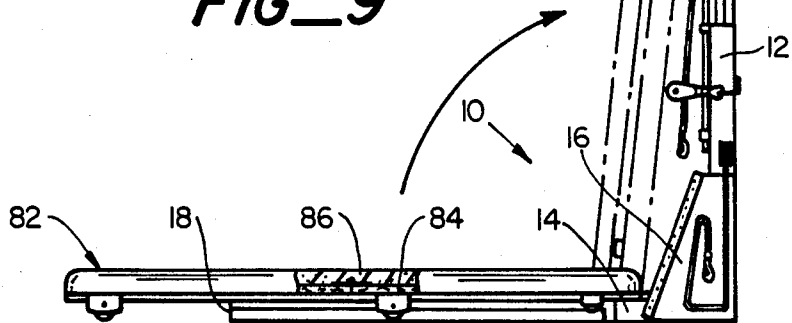
FIG_7



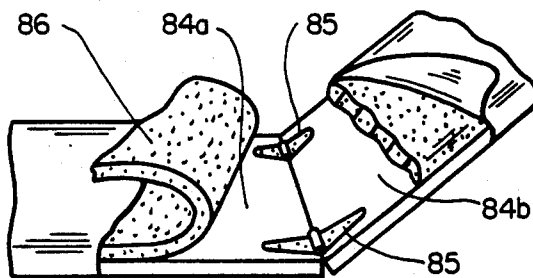
FIG_8



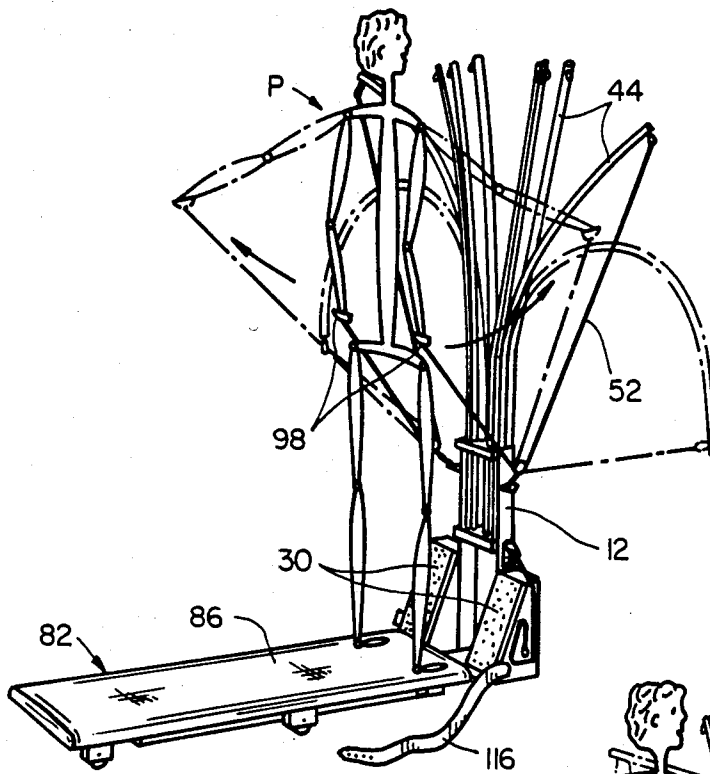
FIG_9



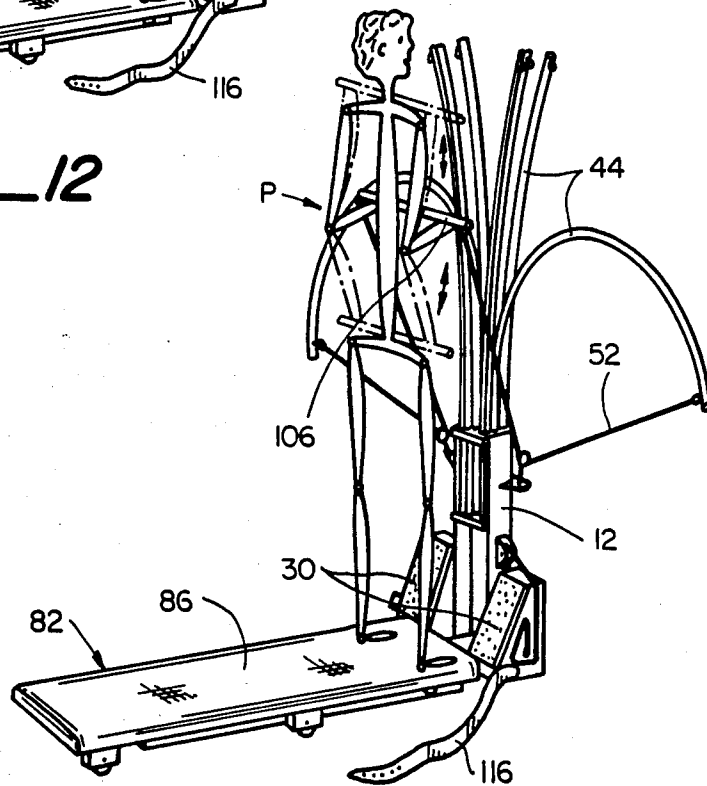
FIG_11



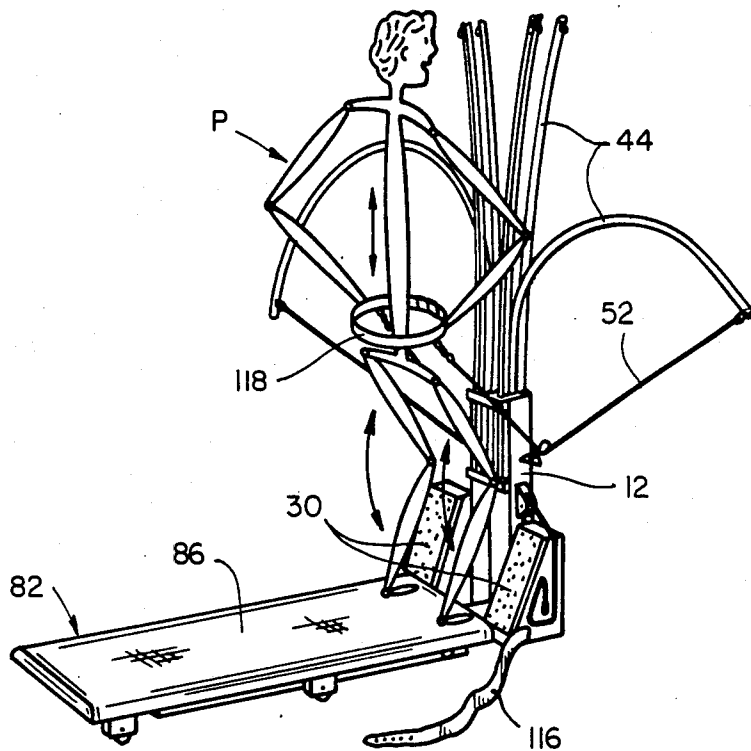
FIG_10



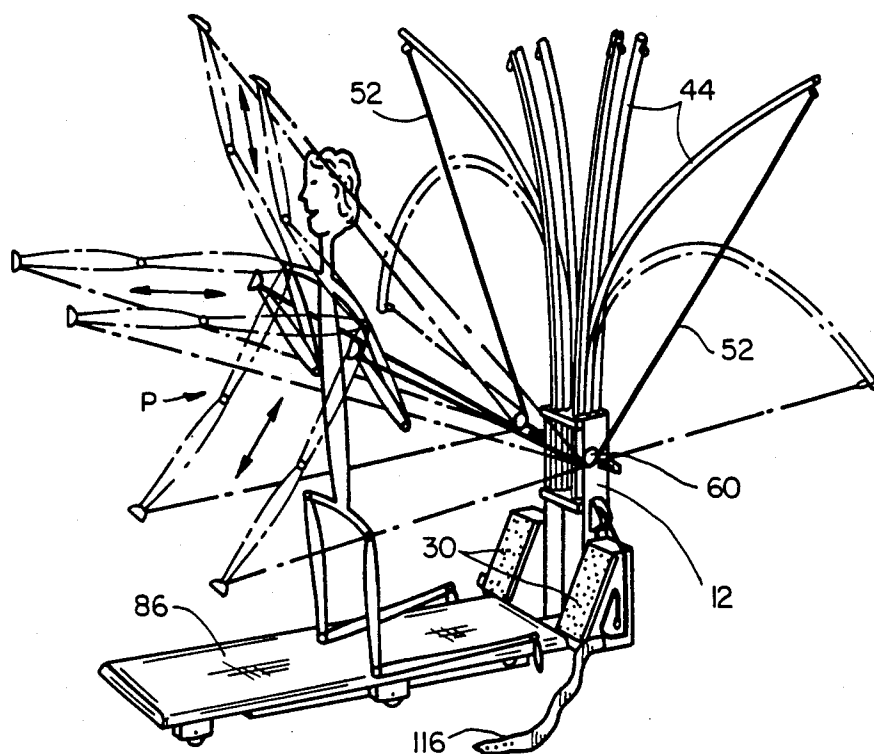
FIG_12



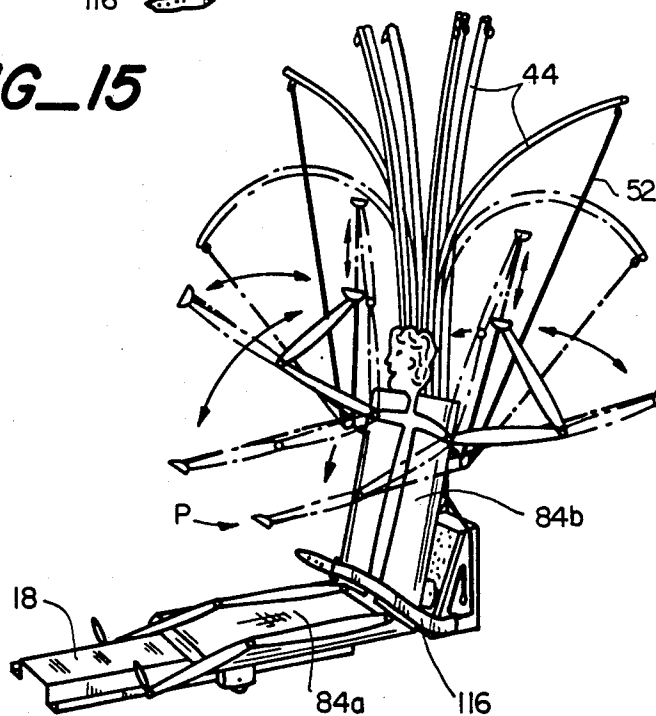
FIG_13



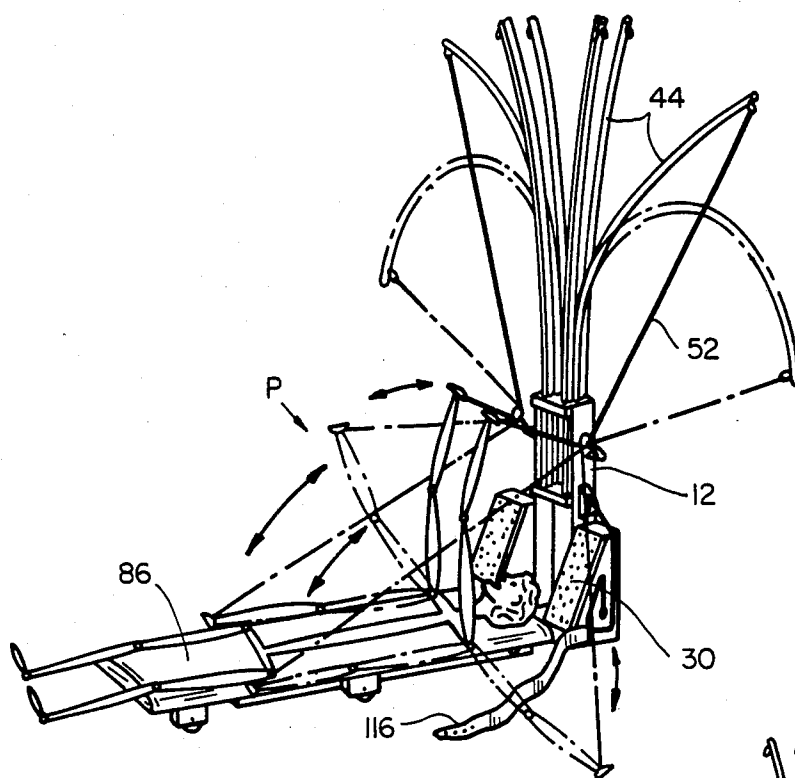
FIG_14



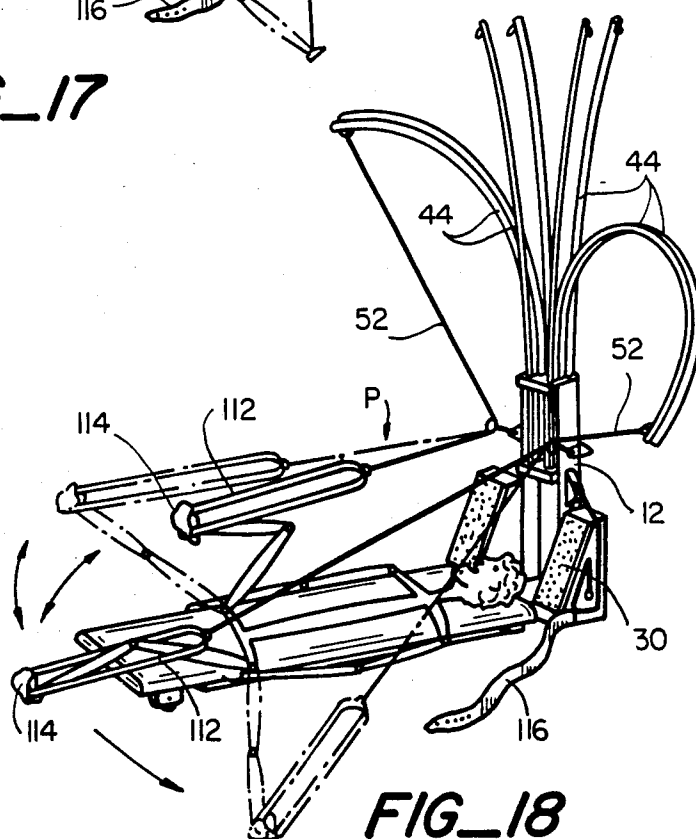
FIG_15



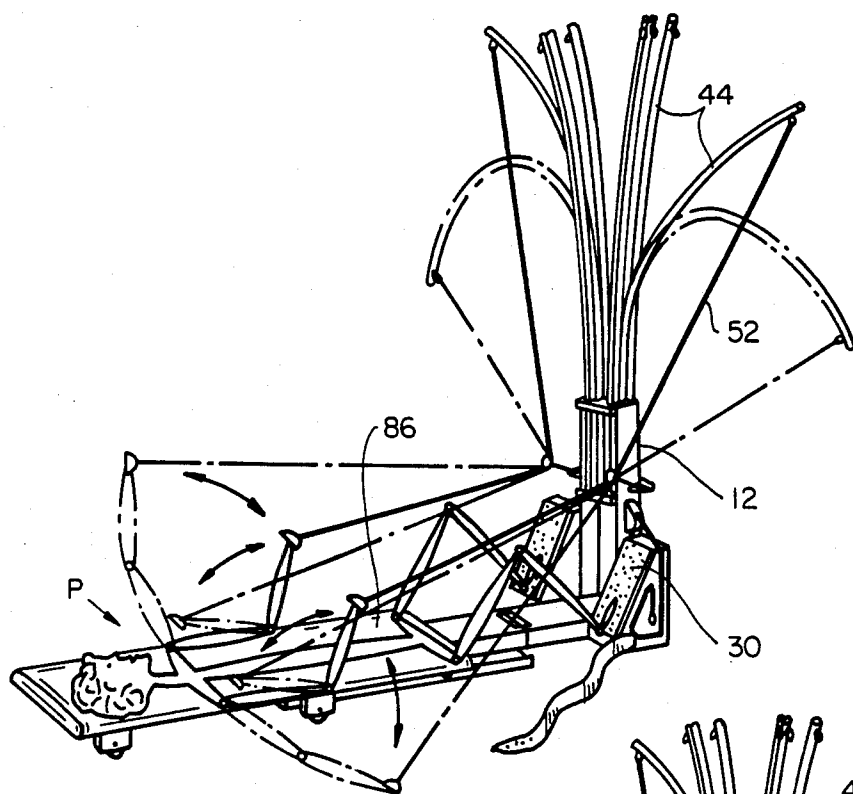
FIG_16



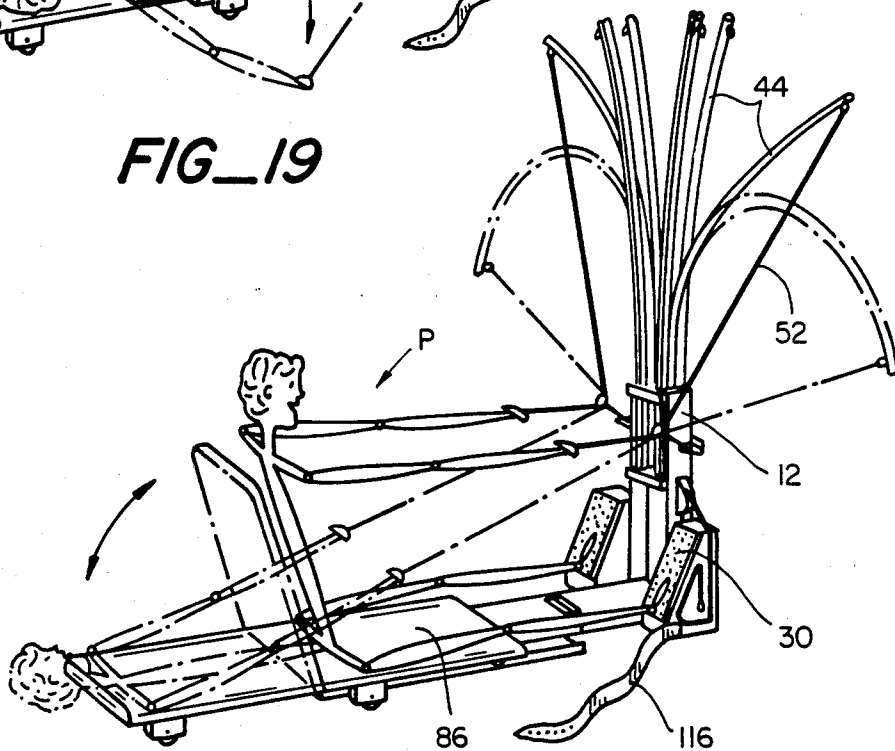
FIG_17



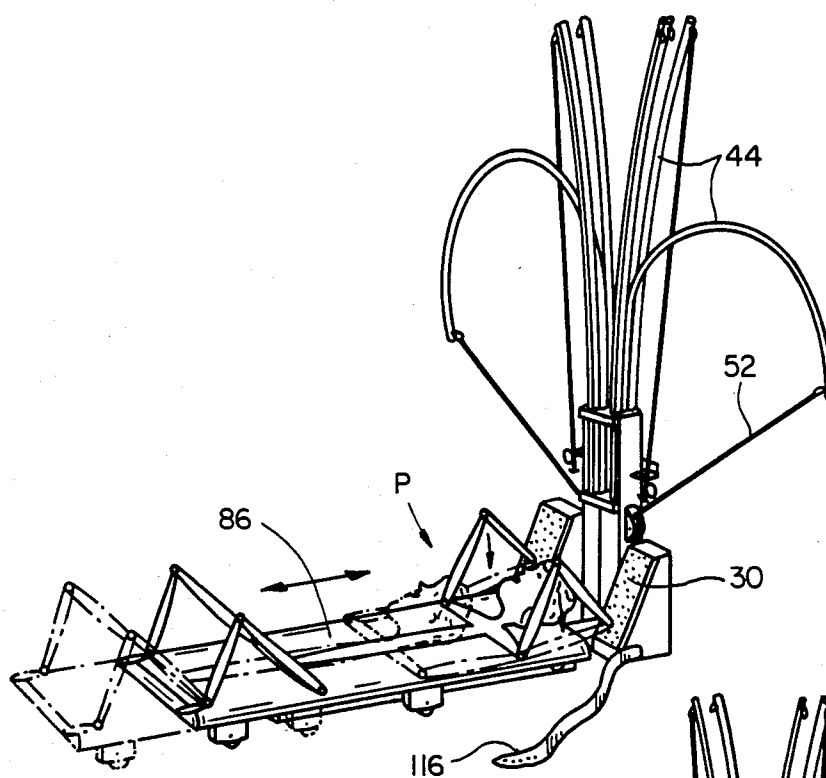
FIG_18



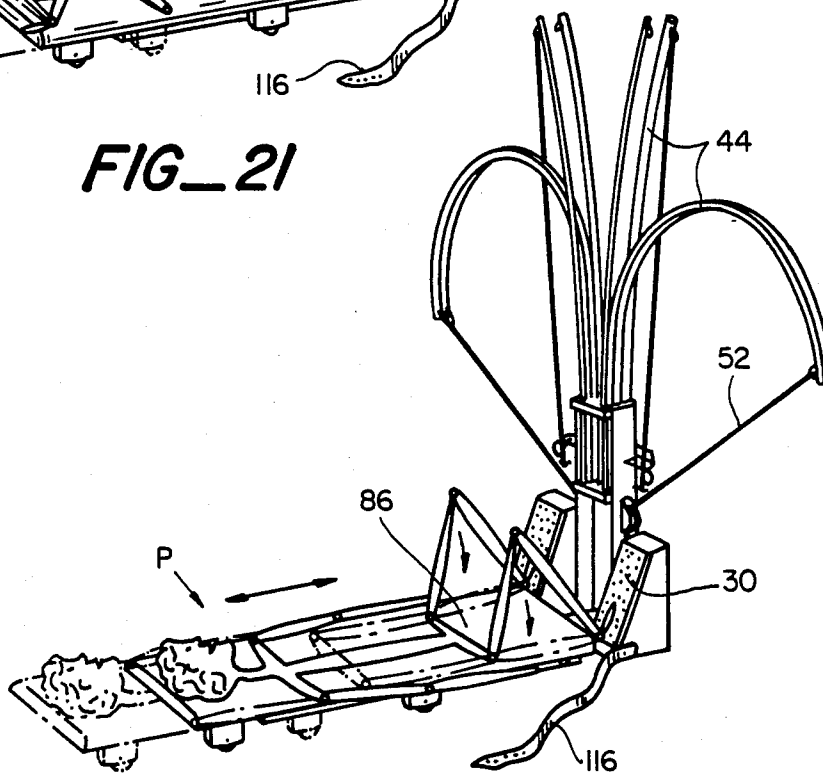
FIG_19



FIG_20



FIG_21



FIG_22

UNIVERSAL EXERCISING MACHINE

BACKGROUND

1. Field of the Invention

The present invention relates to exercising machines, particularly to exercising machines of the type using resilient loading elements.

2. Description of Prior Art

Nowadays various types of exercising machines and devices are available on the market. One conventional exercising device, shown in U.S. Pat. No. 4,205,839 to M. Best, issued June 3, 1980 comprises a pair of cords which pass over sheaves in pulley blocks carried on a rigid member pivotally attached to a fixed support. One end of each cord is hand held, and the other end is provided with foot stirrups for the user's feet. In operation, the resistance or load for the arm muscles is provided by the force applied from legs, and vice-versa. An exercising device of this type, however, does not possess versatility and cannot be used for exercising and developing various types of a person's body muscles. Furthermore, it is not a self-contained device: i.e., it cannot be utilized in a variety of locations since it requires an appropriate fixed or stationary support.

Another known exercising device is disclosed in U.S. Pat. No. 4,185,816 to M. Bernstein, issued Jan. 29, 1980. This device is a sit-up exercising apparatus which is adapted to be utilized in conjunction with a door. The apparatus comprises a U-shaped frame which is inserted beneath the door and which is provided with means for rigid attachment to the door. The U-shaped frame is used as a support for a bracket carrying a bar; the bar is used, in the course of exercising, as a foot support. This device also possesses a number of disadvantages, the main ones being lack of versatility and a restricted field of application since it is suitable only for the development of abdominal muscles.

Another exercising machine of a self-contained type, which is now produced by Marcy Fitness Products under the trademark BODYBAR, is illustrated in "1984 Spring and Summer Supplement Consumers Catalog", (Consumers Distributing, 205 Campus Plaza, Edison, N.J. 08837), CD-3, page 149³, items C and D. This apparatus comprises an upright rigid frame which is used for guiding an adjustable weight attached to a cable which is threaded through a pulley system. The free end of the cable is attached to a hand grip. The apparatus is provided with a removable bench which carries a leg support connected to the weight through a cable and a lower pulley. Although this apparatus is self-contained, it cannot be used universally for developing various groups of muscles, as well as for aerobic exercises. For example, it cannot be used as a bicycle simulator. Moreover, this device is heavy, occupies much space, is expensive to manufacture, and is inconvenient for transportation and storage. Since the resistance is provided by weights, this apparatus cannot be used in a spaceship for astronauts' training under weightlessness conditions.

Some conventional exercisers are based on the principle of gas-filled cylinders. One such device, which is produced by M. & R. Industries, Inc. (9215-151st Avenue NE, Redmond, WA 98052) comprises a frame with a slidable seat and foot supports. It is provided with a pair of air cylinders attached to both sides of the frame and corresponding pivotal handles which are connected to the piston rods of the cylinders' pistons. This exer-

ciser can simulate rowing as well as other exercises: a user swings the pivotable handles to displace air from the cylinders. This device lacks versatility and provides but a one-directional resistance. Thus it does not provide continuous loading and requires extra time for returning the pistons to their original positions, resulting in poor efficiency.

OBJECTS AND ADVANTAGES OF THE PRESENT INVENTION

Accordingly several objects of the present invention are to provide a universal exercising machine which is cheap in price, simple to manufacture, easy to use, and versatile. Also it enables an individual to perform a great variety of aerobic, isotonic, and stretching exercises. It is light in weight, portable, and convenient for storage. The device of the present invention can be used for astronauts' training under weightlessness conditions. Further objects and advantages of the present invention will become apparent from a consideration of the ensuing description and drawings.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a general perspective view of a universal exercising machine of the present invention with various attachments connected to their corresponding points of fixation by dotted lines.

FIG. 2 is a cross-sectional view taken in the direction of lines A—A in FIG. 1.

FIG. 3 is a cross-sectional view taken in the direction of lines B—B in FIG. 1.

FIG. 4 is an exploded perspective view of the machine of FIG. 1 illustrating the attachment and interconnection of various parts thereof.

FIG. 5 is a view illustrating the attachment of a hinged pulley of the machine to its frame.

FIG. 6 is a view illustrating the attachment of a cable of the machine to resilient rods thereof.

FIG. 7 is a cross-sectional view taken in the direction of lines C—C in FIG. 1.

FIG. 8 is a cross-sectional view taken in the direction of lines D—D in FIG. 1.

FIG. 9 is a partially exploded, fragmentary perspective view of the base portion of the machine.

FIG. 10 is a partial perspective view illustrating a hingeable connection of parts of a slidable bench of the machine.

FIG. 11 is a side view of the device of the present invention; broken lines show how the machine collapses for storage or transportation.

FIGS. 12 to 20 illustrate various applications of the exercising machine of the present invention with the bench disconnected from the lower pulley system.

FIGS. 21 and 22 illustrate various applications of the exercising machine of the present invention with the bench slidable on the base.

10 - frame	12 - upright post
14 - horizontal leg	16 - corner plate
18 - base	20 - hinge
22 - hook	24 - pin
26 - threaded end	28 - wing nut
30 - foot support	32, 33 - bolts
34 - nut	35 - spacer
36, 36a - retainers	37 - sheave
38 - nut	40 - hole
41 - bolt	42, 42a - holes
44 - resilient rod	46 - transverse bolt
48 - nut	50 - eyelet bolt

-continued

52 - hand cable	54 - detachable link
56 - spring clip	58 - yoke
60 - sheave	62 - eye bolt
64 - nut	66 - detachable link
68 - hole	70 - spring clip
72 - sheave	74 - bracket
76 - foot cable	78, 80 - spring clips
82 - slidable bench	84 - wooden frame
84a, 84b - frame parts	86 - vinyl-covered padding
88 - floor wheel	90 - base wheel
92 - bracket	94 - rail
96 - eye bolt	98 - hand grip
100 - spring clip	102 - handle
104 - ring	106 - stick bar
108 - ring	110 - foot strap
112 - belt	114 - stirrup
116 - waist strap	118 - belt
120 - chain	P - exercising individual

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, which is a perspective view of a universal exercising machine of the present invention with various attachments, and to FIGS. 2-11, which show various details and interconnections between parts, the machine comprises a rigid frame or base 10 having an upright U-shaped post 12 and a short horizontal leg 14 rigidly connected to post 12, e.g., by means of triangularly-shaped side corner plates 16. An elongated section 18 is hinged to leg 14 by means of a hinge 20, which is clearly shown in FIG. 9. As will be explained further, this hingeable connection is used for folding the machine into a collapsed position for storage or transportation.

In its working or unfolded position, base section 18 is fixed by means of hooks 22 pivotally attached to the sides of base section 18 and engageable with pins 24 which protrude outwardly from horizontal leg 14. Pins 24 are provided with threaded ends 26 for engagement with wing nuts 28 which fix the hooks in their engaged position and, hence base 10 in its unfolded position (FIG. 9).

The exercising machine is provided with foot supports 30 which comprise triangularly-shaped blocks, one for each foot on the left and right sides of upright post 12 to which they are attached, e.g., by bolts 32 and 33 and nuts 34 (FIG. 8). Upper bolts 33 pass through spacers 35 located between the inner sides of foot supports 30 and outer walls of upright posts 12, whereas sheaves 37 are located and rotatably mounted in corresponding lower spaces on bolts 32 between the inner sides of foot supports 30 and outer surfaces of upright post 12. The purpose of sheaves 37 will be explained later.

Base 10, including horizontal leg 14, corner plates 16, and base 18, can be made of a light metal, such as aluminum or aluminum alloy, or of any other suitable material.

A retainer 36 is inserted into the upper interior portion of U-shaped post 12 and is attached thereto by bolts 41 and nuts 38 (FIG. 2). Bolts 41 pass through holes 40 provided in retainer 36. Retainer 36 can be made of a plastic, wood, or metal.

A second retainer 36a is inserted into the lower interior portion of U-shaped post 12. Two symmetrically arranged sets of holes 42 and 42a are drilled or formed by any other suitable method in both retainers 36 and 36a respectively. In the assembled state of retainers 36 and 36a, holes 42 and 42a in both retainers are aligned with

respect to each other. These holes receive respective cantilevered resilient rods or arms 44, the free ends of which extend upward from retainer 36 and frame or base 10. Resilient rods 44 may be of different diameters and are preferably made from nylon. Their diameter may vary from 6 mm ($\frac{1}{4}$ " to 51 mm (2"). Lower ends of resilient rods 44 are fixed in retainer 36a by transverse bolts 46 with nuts 48. Bolts 46 pass through aligned holes drilled in retainer 34 and the lower ends of the rods.

As shown in FIGS. 1 and 6, eye bolts 50 are attached to the upper ends of resilient rods 44. Hand cables 52 are connected to eyelets of said bolts through detachable links 54 and spring clips 56 (FIG. 6).

A yoke 58 with a sheave 60 is pivotally attached to each side wall of upright post 12 (FIG. 5). This attachment is made through an eye bolt 62, fixed to upright post 12 by nuts 64, and intermediate detachable link 66 which passes through the eyelet of bolt 62 and a hole of yoke 58. The connection described above functions as a universal joint which enables the yoke to rotate freely in a wide range. Free ends of hand cables 52 pass through yoke 58 and are guided by sheaves 60. Spring clips 70 are attached to the ends of hand cables 52.

Another pair of sheaves 72 is supported by brackets 74; each bracket 74 is rigidly fixed to the left and right outer walls of upright post 12, respectively, so that sheaves 72 lie in a transverse vertical plane. Foot cables 76 with spring clips 78 and 80 (FIG. 4) at their ends are guided by sheaves 72 so that upper ends of the foot cables can be connected to detachable links 54 on the upper ends of resilient rods 44, whereas their lower ends can be connected to a slidable bench described hereinafter.

A slidable bench 82 comprises a padded wooden frame 84 which is covered with soft vinyl 86 or any other suitable material; covering 86 is attached to the upper surface of the frame. Frame 84 consists of two parts, 84a and 84b, which are pivotally interconnected by hinges 85 (FIG. 10). The bench is provided with two pairs of floor wheels 88 and one pair of base wheels 90. Wheels 88 are mounted in U-shaped brackets 92 arranged on the left and right sides of the bench symmetrically with respect to the longitudinal axis of the exerciser (FIG. 7). Base wheels 90 roll on rails 94 which are attached to or made integrally with base section 18. Thus bench 82 can be moved (with respect to upright post 12 and base section 18) on wheels 88 and 90. Eye bolts 96 (only one of which is shown in FIG. 4) are engaged with spring clips 80 and are attached to the front end of bench 82 so as to face upright post 12. These eye bolts are used for attaching the bench to foot cables 76.

Rings 97 are attached in various positions to the sides of bench 82. These rings serve as additional means of attaching various elements of the harness. The harness in turn is used to secure an individual body—or handles which the individual may hold with his or her hands while doing leg exercises. This will be explained further with reference to the description of the operation of the exerciser.

The universal exercising machine of the present invention is provided with various attachments which broaden its applications and enable an individual to perform an endless variety of physical exercises for developing various groups of his or her muscles (FIG. 1). These attachments comprise two hand grips 98 (for

the left and right hands respectively) attachable to hand cables 52 through spring clips 100 connected to the lower ends of the cables. These hand grips may have any form convenient for holding. In the illustrated embodiment, each hand grip 98 comprises an U-shaped yoke with a handle 102 for the individual's hand and with a ring 104 attachable to spring clip 100. With the use of these hand grips, an individual can work with each hand independently.

A single stick bar 106 can be used instead of separate hand grips 98 when one desires to work with both hands simultaneously. A series of rings 108 are provided on stick bar 106 for selecting various cable attachment positions with regard to physical abilities of the individual and his or her personal requirements. Rings 108 also can be attached to spring clips 100.

Another attachment comprises two foot straps 110 formed by belts 112 with stirrups 114 at one end and attachment rings at the other end. The belts are adjustable to match the individual's height. This attachment is used for simulating bicycle driving and for stretching, as will be explained further with reference to the machine's operation.

Another element of the harness is a waist strap 116, which is attached to foot supports 30 (FIG. 1) and is used as an airplane seat belt when the individual exercises in a seating position facing away from upright post 12. Waist strap 116 also can be used for securing an astronaut's body to the machine when the astronaut performs exercises in a spaceship under weightlessness conditions.

A second belt 118 is provided with chains 120 which can be attached, e.g., to spring clips 100 at the ends of cables 52. This belt can be fastened around the individual's waist for one type of exercise, or it can be used as an additional means for attaching the individual's body to the upright post in another type of exercise, i.e., when the individual assumes a sitting position with his or her back to the upright post and belt 118 around his or her chest.

When not in use, the universal exercising machine of the present invention can be folded into an inoperative position which is very convenient for transportation or storage. For this purpose, wing nuts 28 are loosened (FIG. 9), hooks 22 are disconnected from pins 24, and the hinged base section 18 is turned in the direction of the arrows in FIG. 11, along with bench 82, to a position shown by the broken lines in FIG. 11. In a folded state the machine will occupy a space of about 15×30×107 cm (6"×12"×42") and this can be rolled into any closet. The whole machine weighs 17 kg (38 lb).

OPERATION OF THE MACHINE OF THE PRESENT INVENTION

Operation of the universal exercising machine of the present invention will be described further with reference to FIG. 1 and FIGS. 12-22.

In FIGS. 12-22 an individual P is shown schematically. Motions of such individual's arms, legs, or body, as well as motions of the movable parts of the machine, are illustrated by broken lines. The resistance is provided by resilient rods 44; these can be used in any combination to suit the individual's requirements and physical abilities. Given below are various types of exercises in connection with various positions of the individual and the use of the various attachments.

In FIG. 12, individual P is shown in a standing position facing resilient rods 44. The individual holds hand grips 98, the latter being attached to hand cables 52. The individual is shown doing shoulder and arm exercises: the individual lifts his or her arms from a straight-down position into positions shown by broken lines, i.e. to the back and up, to the front and up, etc. Only one resilient rod 44 is employed for ease of illustration, but a plurality can be employed for stronger individuals by connecting the free ends of several adjacent resilient rods 44 together, e.g., by inserting detachable link 54 (FIG. 6) into eyelet bolts 50 of these rods 44.

FIG. 13 illustrates the individual in the same position as shown in FIG. 12. Stick bar 106, however, is attached to hand cables 52 instead of separate hand grips 98. The individual works with the bar with both hands simultaneously swinging his or her arms and performing knee-bends, thereby to develop his or her biceps, forearm muscles, and calf muscles.

In FIG. 14 the individual is in the same position as in FIG. 12 with belt 118 fastened around his or her waist and attached to hand cables 52. An individual is doing knee-bends so as to work with the thigh muscles.

In FIG. 15 an individual is shown on his or her knees facing in a direction opposite to resilient rods 44. The individual uses separate hand grips 98 or single stick bar 106 for working the chest and hand muscles.

FIG. 16 illustrates the individual in a seating position facing in a direction opposite to resilient rods 44. For this position bench 82 is converted into a seat by folding it around hinges 85 (FIG. 10) and leaning part 84b of the bench against upright post 12. The individual is fastened by waist strap 116 and works with his or her shoulders, chest and triceps. Both separate hand grips 98 or stick bar 106 can be used in this position.

FIG. 17 shows the individual in a supine position on the bench with his or her head towards upright post 12. Separate hand grips 98 or single stick bar 106 can be used for exercising in this position. Triceps, chest and shoulder muscles are developed by pushing and spreading the individual's arms. This exercises immitates swimming.

In FIG. 18 the individual is in the same position as in FIG. 17. The individual holds hand grips 98 attached to corresponding rings 97 on the bench. The feet are inserted into stirrups 114 of foot straps 110. Working the legs, the individual immitates pedaling a bicycle in order to load the heart. It is possible in this position also to immitate running or working, or to spread the legs apart for loading other groups of muscles, as is illustrated by broken lines in FIG. 18.

In FIG. 19 the individual is again in a supine position, but facing the resilient rods and with feet planted against foot supports 30. The individual develops the biceps, triceps, forearm, and shoulder muscles by pulling hand cables 52 or spreading the arm apart.

In FIG. 20 the individual is in a sitting position facing the machine. The abdomen muscles are loaded by doing situps.

The exercises illustrated in FIGS. 12-20 are performed with bench 82 in a stationary position. The exercising machine of the present invention, however, enables individual P to execute also a variety of physical exercises with the movable bench. For this purpose, spring clips 78 are attached to the upper ends of resilient rods 44, whereas spring clips 80 are attached to corresponding eye bolts 96 on bench 82. Thus the bench appears to be connected to the load through foot cables

76 and can slide with respect to the floor and base 18 on wheels 88 and 90 respectively.

Typical exercises with the slidable bench are illustrated in FIGS. 21 and 22. In FIG. 21 individual P is shown in the same position as in FIGS. 17 and 18. The individual pushes his or her body, together with the bench, away from upright post 12, overcoming the resistance exerted by resilient rods 44. In this case the individual exercises his (her) hands, biceps, triceps, and other muscles.

In FIG. 22 the individual assumes the same position as shown in FIG. 19. He or she pushes his or her body by using the legs against foot supports 30, thereby exercising the thigh and calf muscles.

It is obvious that many other modifications of the universal exercising machine are possible. For example, the resilient rods can be made of spring metal, bench frame can be made of plastic material, other types of connections apart from spring clips can be used for connecting cables to the resilient rods or other parts of the machine. Furthermore, the exercises and positions of the individual's body on the machine were shown only as illustrative but not limitative. It is obvious also that attachments and harness elements can vary according to individual's needs. Therefore the scope of the invention should be determined, not by the examples given, but by the appended claims and their legal equivalents.

What I claim is:

1. In an exercising machine: a base, a plurality of resilient rods mounted on the base in cantilevered fashion with one end of each rod being secured in a fixed position and the other end being free, a cable upon which an axial pull is exerted by a person using the machine, means for connecting the cable to the free end of at least one of the resilient rods, and guide means for the cable mounted on the base in a predetermined position relative to the fixed ends of the rods so that the pull on the cable causes the rods to flex and resist the pull in a predetermined manner regardless of the direction from which the pull is applied.

2. The exercising machine of claim 1 including a hand grip connected to the cable for engagement by the hand of a person using the machine.

3. The exercising machine of claim 1 including a bar connected to the cable for engagement by the hands of a person using the machine.

4. The exercising machine of claim 1 including a foot stirrup connected to the cable for engagement by the foot of a person using the machine.

5. The exercising machine of claim 1 including a belt connected to the cable for engagement with the waist of a person using the machine.

6. The exercising machine of claim 1 including a strap connected to the base for securing the body of the person using the machine in a predetermined position on the base.

7. The exercising machine of claim 1 including a seat movably mounted on the base and connected to the cable for receiving the body of the person using the machine.

8. The exercising machine of claim 1 wherein the base is adapted to rest on a horizontal supporting surface, and the seat includes wheels engageable with the supporting surface.

9. The exercising machine of claim 1 wherein the base and the fixed ends of the resilient rods are hingedly connected together for movement between a working

position in which the rods extend in a direction generally perpendicular to the base and a collapsed position in which the rods are generally parallel to the base.

10. The exercising machine of claim 1 wherein the guide means comprises a sheave pivotally mounted on the base near the fixed ends of the resilient rods.

11. The exercising machine of claim 1 wherein the means for connecting the cable to the free end of at least one of the resilient rods includes means for selectively connecting the cable to any desired number of the rods.

12. A universal exercising machine comprising: a base; resilient arm means having one end thereof attached to said base and an opposite end extending vertically up from said base in cantilever fashion; a support horizontally movable with respect to said base and adapted to receive the body of a person using the machine; and means for operatively connecting said support to said resilient arm means such that movement of said support will cause said resilient arm means to flex.

13. A universal exercising machine according to claim 1 wherein said resilient arm means comprises a plurality of rods made of a resilient plastic material.

14. A universal exercising machine according to claim 13 wherein each of said resilient rods has a circular cross section with a diameter ranging from $\frac{1}{4}$ " (6 mm) to 2" (51 mm).

15. A universal exercising machine according to claim 12 together with a plurality of cables, each of said cables having one end connected to said resilient arm means and having its other end connected to a hand grip.

16. A universal exercising machine according to claim 12 together with a plurality of cables, each of said cables having one end connected to said resilient arm means and having its other end connected to a foot stirrup.

17. A universal exercising machine according to claim 12 wherein said support comprises a bench having a solid frame, a soft pad on said frame, and means for movably supporting said bench on the floor and on said base.

18. A universal exercising machine according to claim 17 wherein said means for movably supporting said bench comprises rails on said base, at least one pair of wheels for rolling on the floor, and at least one pair of wheels for rolling on said rails, both of said pairs of wheels being attached to said bench.

19. A universal exercising machine according to claim 17 wherein said bench frame consists of two hingedly connected parts, one of said parts being adapted to lean against the base and serve as a back rest for an individual sitting on the other part.

20. A universal exercising machine according to claim 12 further including foot supports attached to the sides of said base.

21. A universal exercising machine according to claim 12 wherein said base includes a horizontally extending section and an upright post connected pivotally together and adapted to be folded together for storage and transportation.

22. A universal exercising machine according to claim 21 wherein said horizontally extending section is pivotally connected to said upright post by at least one hinge, together with means including a hook for releasably securing the horizontally extending section in a horizontal position.

23. A universal exercising machine according to claim 12 wherein said base comprises an upright post

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having a U-shaped cross-sectional configuration with a
retainer means inside said U-shaped profile for holding
said one end of said resilient arm means, and fastening
means for attaching said retainer means to said upright
post, whereby said resilient arm means is rigidly secured 5
at said one end to said upright post.

24. A universal exercising machine according to
claim 12, wherein said means for connecting said support
to said resilient arm means comprises a flexible cable.

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25. A universal exercising machine according to
claim 12 including a cable connected to the resilient arm
means for flexing said arm means when pulled, and a
sheave connected to said base about which the cable is
trained.

26. A universal exercising machine according to
claim 25 wherein the cable is connected between said
bench and said resilient arm means.

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