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(54) **MULTI-EXERCISE CABLE GYM SYSTEM**

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(76) Inventors: **Thomas Baumler**, Forest Lake, MN (US); **John Cassidy**, Elk Rivgr, MN (US)

(57) **ABSTRACT**

Correspondence Address:  
**Steven G. Steger**  
**Mayer, Brown & Platt**  
**P.O. Box 2828**  
**Chicago, IL 60690 (US)**

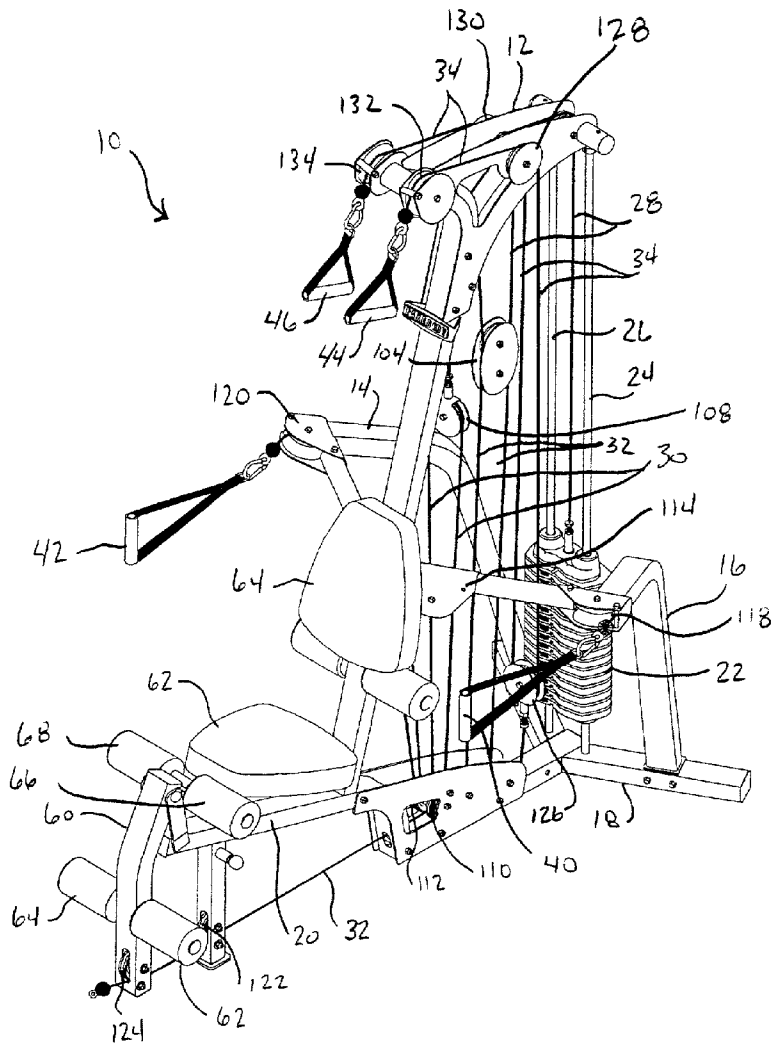
A multi-purpose cable gym system is disclosed that incorporates an arrangement of pulleys and cables and an exercise station having multiple exercise handles that are continuously connected to a single weight stack via the arrangement of pulleys and cables. The cable gym system consists of a frame, a weight stack, an adjustable seat with fixed back pads, a leg extension/leg curl pedestal, multiple deep groove pulleys, multiple directional pulleys, a composite pulley, multiple cables engaged with the pulleys, and a separate handle associated with each deep groove pulley. The pulleys in the preferred embodiment utilized a deeper, wider groove than conventional pulleys allowing the cable to track smoothly along the pulleys while being pulled at different angles and in different directions.

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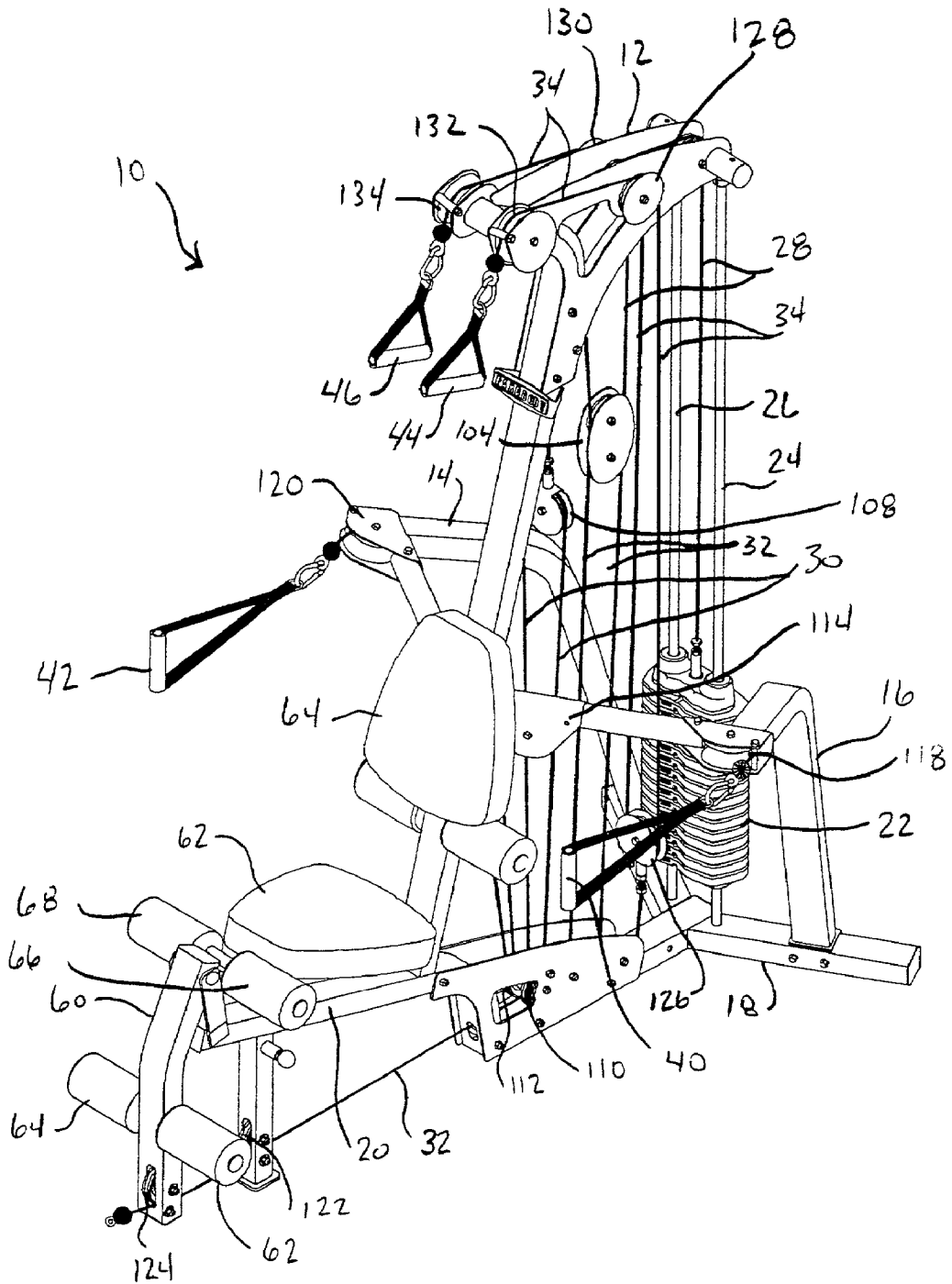


FIGURE 1

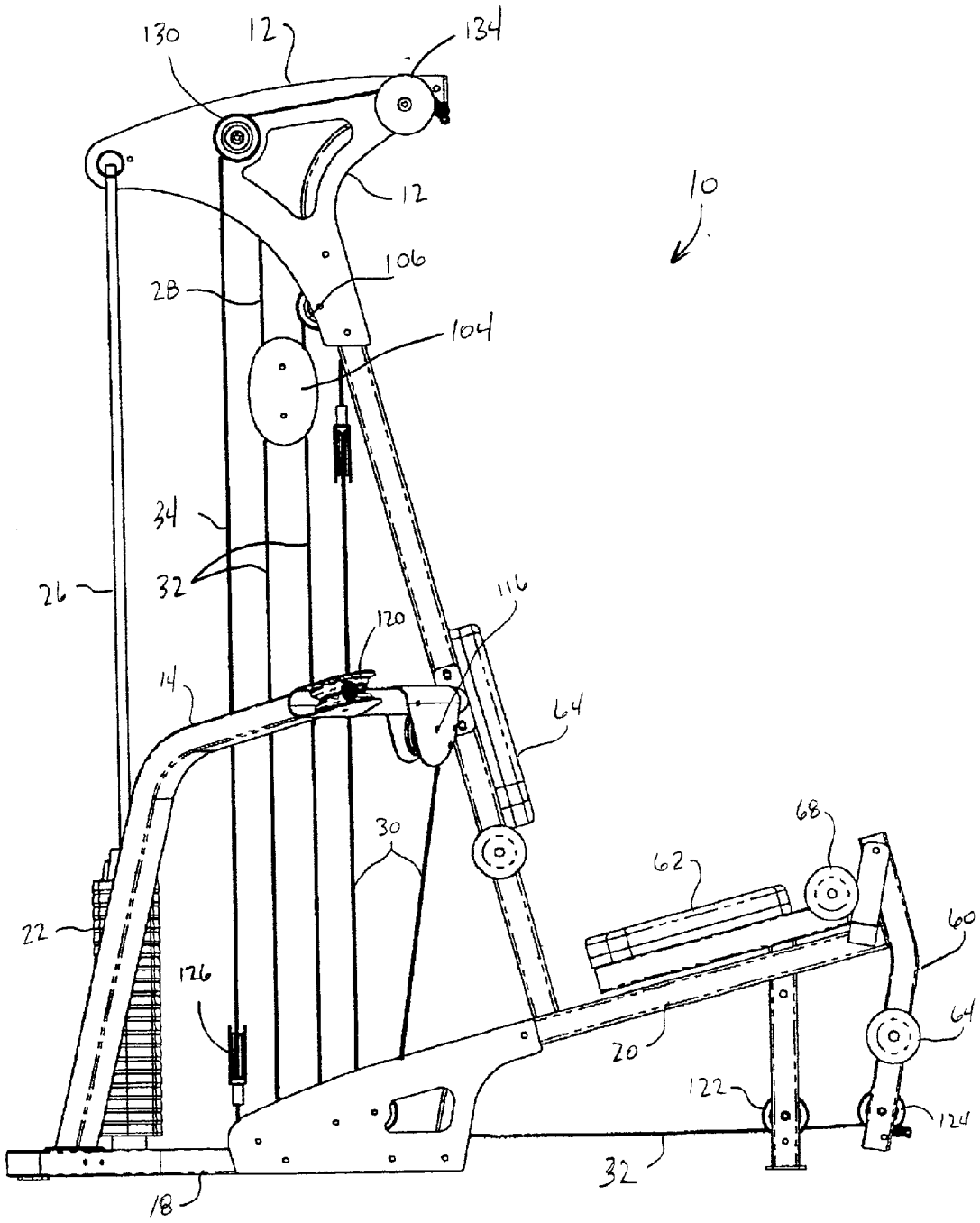


FIG. 2

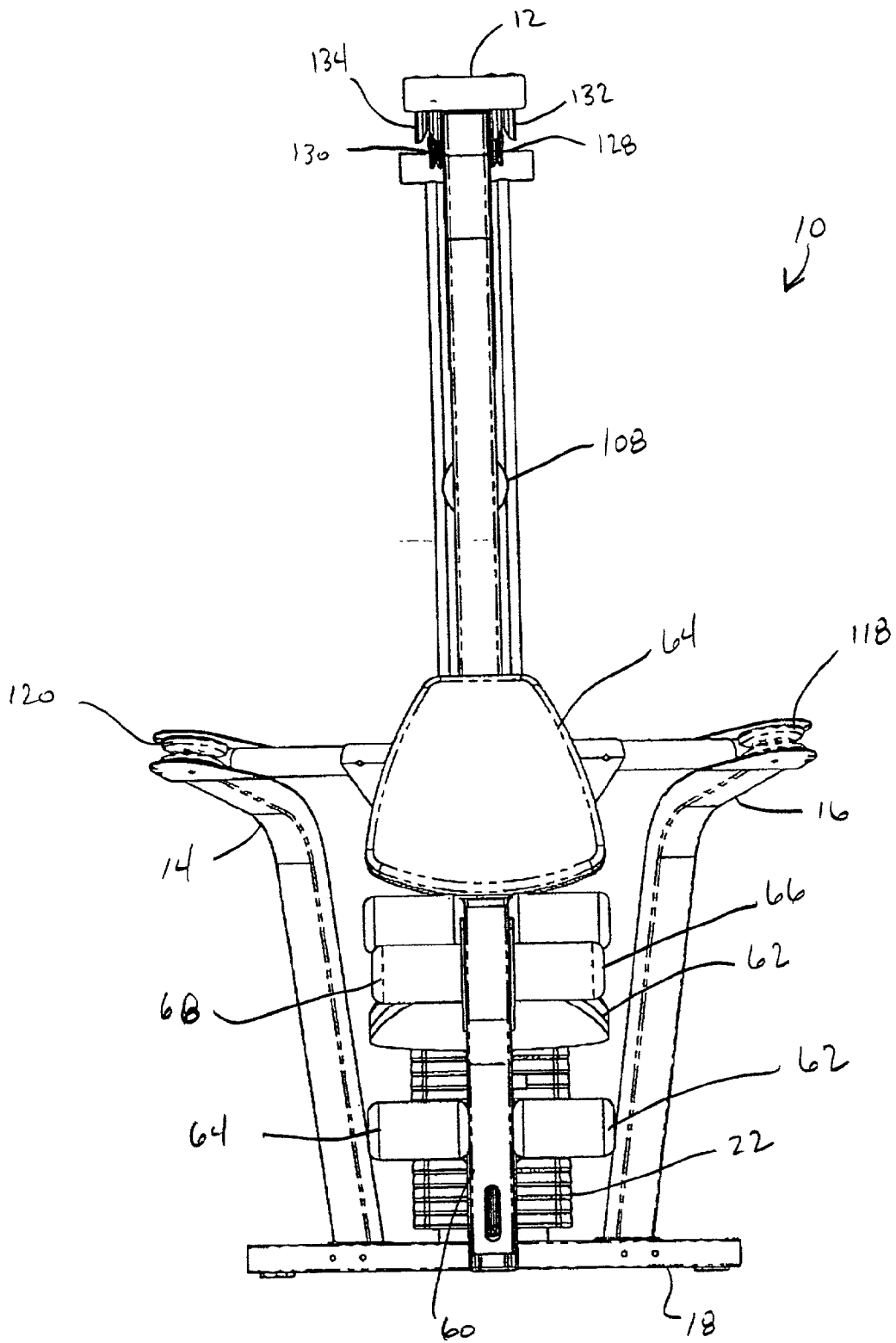


FIG. 3

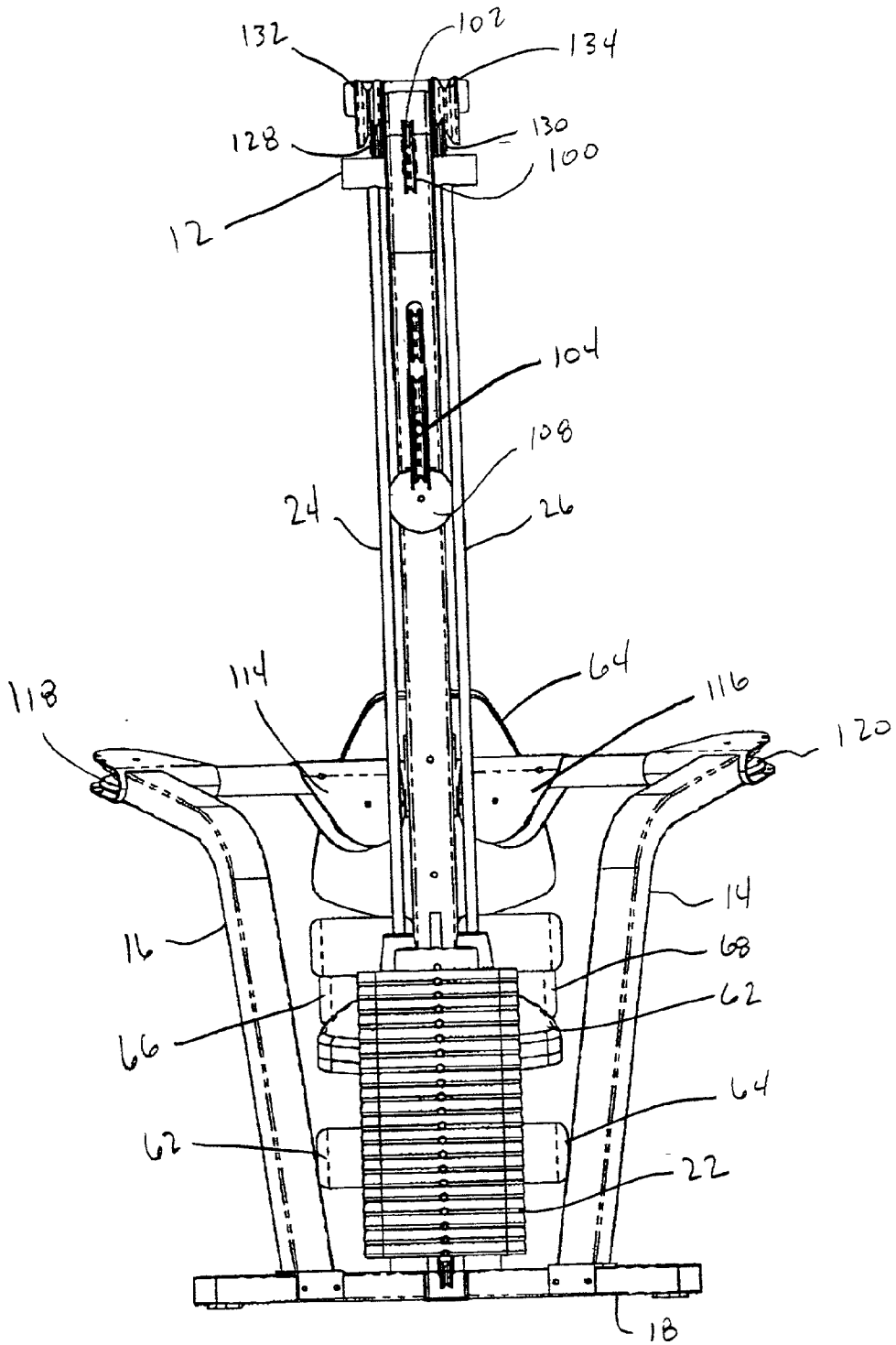


FIG. 4

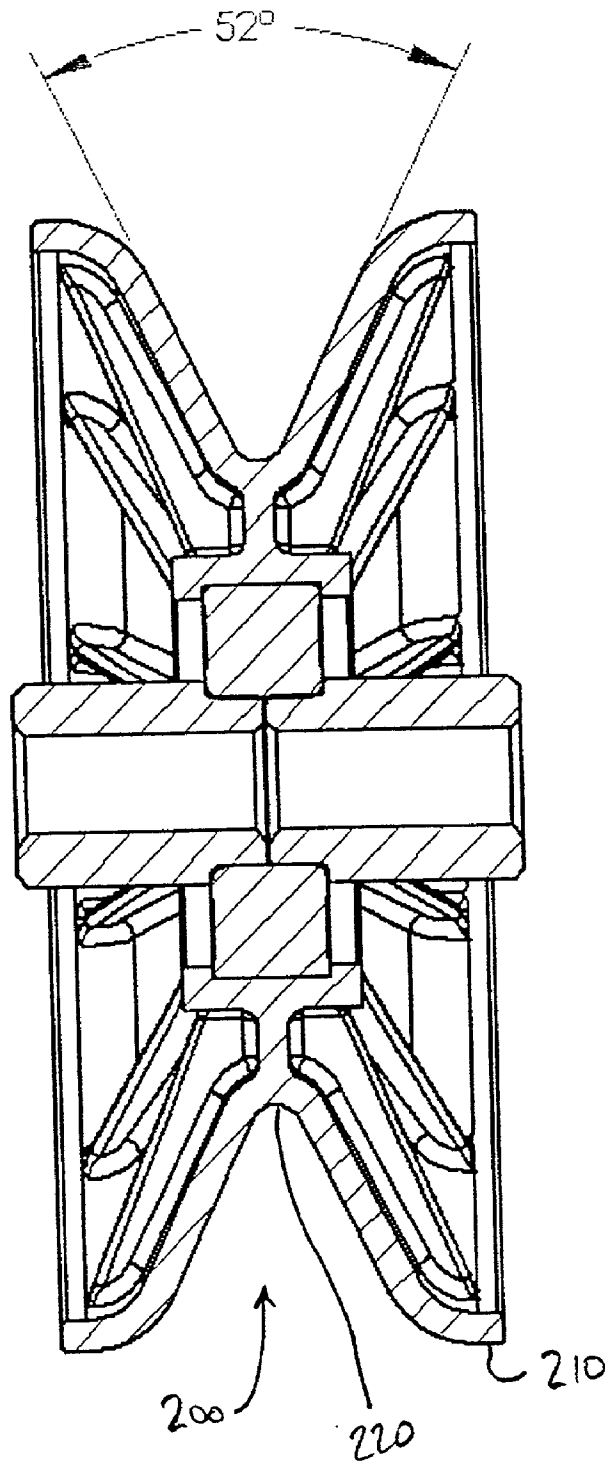


FIG. 5

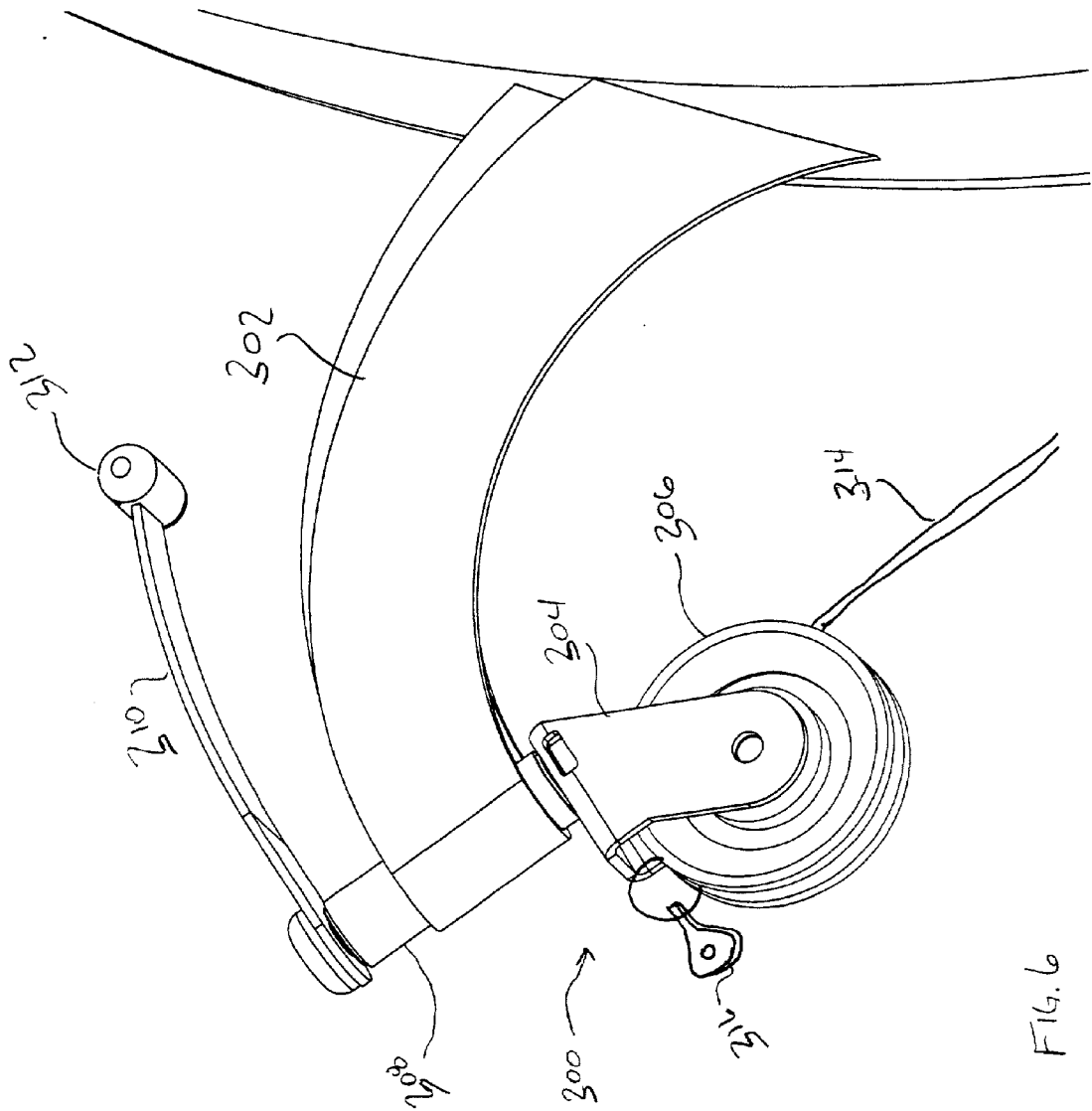


FIG. 6

## MULTI-EXERCISE CABLE GYM SYSTEM

### BACKGROUND

[0001] 1 Field of the Invention

[0002] The present invention relates generally to exercise equipment and more specifically to a multi-exercise cable gym system for exercising the total body utilizing a single weight stack.

[0003] 2 Description of Related Art

[0004] For the past few decades, exercise machines have evolved into rigid machines that produce highly stabilized, fixed path, isolated exercises. These machines are effective at isolating and developing the muscles that create the prime movement of a particular joint ("the prime movers"). Such previous exercise machines achieve development of the prime movers by allowing the user to train to failure without the concern of the stabilizer muscles failing first. For the home environment, machines have been developed that combine multiple fixed path exercises in a single station. The main drawback of these machines is that if the prime movers of a particular joint are overdeveloped in comparison to the stabilizer muscles, that joint may become more susceptible to injury.

[0005] Exercise with free weights is another type of training that overcomes some of the limitations of training with rigid machines. Dumbbells are very effective at training the stabilizer muscles along with the prime movers. They achieve this by allowing the user to work in multiple planes of motion, creating a much less stabilized environment. However, this freedom of motion makes dumbbells and other freeweights inherently more dangerous than fixed motion machines, and often require a "spotter" to ensure safety. Another shortcoming of exercising muscles using free weights is the lack of a variable strength profile for the full exercise motion. Because the resistance is created solely by gravity, the user often does not experience a constant resistance for exercise motions that are not strictly vertical in nature. As a result, the muscles being exercised may not be stressed through the full range of motion, and optimal training does not occur.

[0006] A third method of strength training that has been used in the past utilizes an exercise machine that incorporates cables attached to weight stacks for resistance. Such machines are often referred to as cable cross over machines. Cable cross over machines generally have two weight stacks located a certain distance apart, with each weight stack having a cable attached thereto and an adjustable pulley that the cable interacts with. Handles are attached to the cable ends and a user standing between the two weight stacks can perform numerous exercises against the resistance of the weight stacks attached to the cables. This type of exercise is effective at working both the prime movers and the stabilizer muscles without the need for a spotter. Drawbacks of cable cross over machines are that they are very large, require pulley adjustments for different exercises, and the types of exercises that can be performed are limited by the location of the handles. Furthermore, the motions created by such machines are often not intuitive to the user and usually require instruction from others on how to use the machine.

[0007] More recently, exercise machines for strength training have utilized a weight stack in conjunction with a

cable and multiple pulley system to provide resistance to an exercise motion. These are single exercise machines that simulate the feel and effectiveness of the cable cross over machines, with the advantage that the machines are intuitive for the user and required minimal or no adjustments for exercises being performed because they are single exercise machines. Such machines allow the user to perform exercises with personalized movement patterns and various levels of passive stabilization based on his or her own body structure, and goals. However, because each machine only trains one body part, a large number of machines are required to train an entire body.

[0008] Other more recent machines combine the concept of using multiple, specialized machines utilizing cable exercises into a single machine that has adjustable arms to change the pulley height and angle to allow for a number of exercises on the single machine. Although these machines eliminate the size constraint of cable cross over machines and the need to have multiple specialized machines, they can be difficult to adjust, create exercises that are not very intuitive, and require time away from training to make adjustments to the machine.

[0009] For home use, where size limitations, cost constraints, and complexity issues exist, it is advantageous to combine the above-described training methods into a single machine that is relatively simple to operate. Therefore, there exists a need for a low cost machine requiring minimal adjustments and the ability to train multiple body parts with weight resistance generated by a pulley and cable system.

### SUMMARY

[0010] The purpose and advantages of the invention will be set forth in, and apparent from, the description and drawings that follow, as well as will be learned through practice of the invention. Additional advantages of the invention will be realized and attained by the elements of the apparatus and methods of using the invention described herein.

[0011] In accordance with one aspect of the present invention, an exercise machine is provided that incorporates an arrangement of pulleys and cables that are continuously connected to a single weight stack and allow for multiple exercise motions. The configuration of the pulleys and cables allow for exercises that can be performed both bilaterally and iso-laterally. This allows for a greater degree of exercise variety increasing the effectiveness of exercise sessions. Most exercises can be performed from various seated and standing positions allowing the user to tailor the degree of involvement of his or her primary, secondary, and stabilization muscles. This translates into less repetitive, more beneficial exercise sessions, and improved total body exercises from a single machine with one weight stack.

[0012] In the preferred embodiment, the exercise machine consists of a frame, a weight stack, an adjustable seat with fixed back pad, a leg extension/leg curl pedestal, two deep groove high pulleys, two laterally spaced deep groove mid pulleys, multiple directional pulleys, a composite pulley, multiple cables functionally engaged with the pulleys, and a separate handle or other exercise apparatus attached to the cables associated with each deep groove pulley. The deep groove pulleys in the preferred embodiment utilize a deeper, wider groove, allowing the cable to track smoothly along the



pulley while being pulled in different directions. These deep groove pulleys eliminate the need for swiveling mechanisms and height adjustment mechanisms reducing the cost and complexity of the machine. However, it should be noted that pulleys incorporating swiveling mechanisms can be used in place of the deep groove pulleys in an alternate embodiment of the present invention. The composite pulley allows all of the handles and/or other exercise apparatus to be tied together, allowing a single weight stack to provide resistance to the various handles and exercise apparatus.

[0013] From a seated position facing forward, a user can grasp the handles attached to the cables running over the laterally spaced mid pulleys and perform chest presses, converging presses, and chest fly exercises among other exercises. Because of the deep groove pulleys (or the pulleys incorporating a swiveling mechanism), the user can also perform all exercises in an infinite number of decline and incline angles within an approximate range of 50 degrees. From this position the user can also perform leg extensions and abdominal crunches by grabbing the handles attached to the cables running over the high pulleys.

[0014] By turning around and facing the machine, a user can do a number of back exercises by grasping the handles attached to the cables running over the high pulleys. The design of the pulleys (either deep groove or swivel) allows the user's hands to move in virtually any path towards his or her body.

[0015] The machine does not limit the user to only seated exercises. The handles can be grasped and used to perform arm curls, triceps pushdowns, inner and outer shoulder rotation, or any movement the user would like to perform, such as simulating a golf or baseball swing. Furthermore, an exercise apparatus other than a handle can be attached to the cable, such as an ankle strap, straight bar, abdominal strap, or any other conventional exercise apparatus used with cable cross over machines, allowing even greater variety of exercise motions. Indeed, the machine allows for virtually unlimited weight training motions at any angle, as will be apparent from the disclosure contained herein to a person skilled in the relevant art.

[0016] The resistance of the cables in the upper and mid pulleys are both at  $\frac{1}{2}$  to 1 weight ratio with respect to the weight stack, allowing smaller incremental increases in weight and decreasing stack momentum during the exercise motions. This ratio is created by the equalizer pulley, as discussed further below.

[0017] These and other features and advantages of the invention will be apparent upon consideration of the following detailed description of the presently preferred embodiments of the invention, taken in conjunction with the claims and appended drawings, as well as will be learned through the practice of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a perspective isometric view of an exercise machine incorporating a multiple pulley system in accordance with an embodiment of the present invention;

[0019] FIG. 2 is a side view of an exercise machine incorporating a multiple pulley system in accordance with an embodiment of the present invention;

[0020] FIG. 3 is a front view of an exercise machine incorporating a multiple pulley system in accordance with an embodiment of the present invention (cables not shown);

[0021] FIG. 4 is a rear view of an exercise machine incorporating a multiple pulley system in accordance with an embodiment of the present invention (cables not shown); and

[0022] FIG. 5 is a cross-sectional view of a deep groove pulley incorporated in the exercise machine shown in FIGS. 1-4 in accordance with an embodiment of the present invention.

[0023] FIG. 6 is a perspective view of a pulley incorporating a swivel mechanism in accordance with an alternate embodiment of the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] While the invention can be embodied in many different forms, there is shown in the drawings, and will herein be described in detail, a preferred embodiment of the present invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

[0025] Referring now to FIGS. 1-4, various views of a multi-exercise cable gym machine, which is designated general by the reference character 10, are shown. In accordance with one aspect of the invention, the cable gym machine 10 includes a frame, an exercise station which can include a seat, a pulley system incorporating multiple deep groove pulleys, multiple directional pulleys, and a composite pulley, a weight stack, multiple cables engaged with the pulley system and the weight stack, handles attached to the cables, and a leg extension/leg curl pedestal. In place of the multiple deep groove pulleys, shown in more detail in FIG. 5, the cable gym machine can utilize pulleys incorporating a swivel mechanism, as shown in FIG. 6. These components will be described in more detail below.

[0026] The frame of the cable gym machine 10 includes an upper frame 12, side frames 14 and 16, bottom frame 18, and exercise station frame 20. The frame components 12-20 are bolted together in a manner known in the art and in the configuration illustrated in FIG. 1. The weight stack 22 incorporates multiple weight plates and a bayonet connected to a cable to functionally connect the weight stack to the cable gym system in a manner that is well known in the art. The bayonet extends through the individual plates of the weight stack 22, and the user can select the number of plates to be lifted by inserting a pin through the weight stack 22 into the bayonet. As a result, the bayonet, along with the selected number of weight plates from the weight stack 22, will move upward when exercise is performed by a machine user, providing resistance to the exercise motion. The selected number of weight plates will move upward along guide rods 24 and 26 during exercise. Guide rods 24 and 26 are connected between upper frame 12 and lower frame 18.

[0027] Cable 28 is connected to the weight stack 22 via the bayonet to functionally engage a selected number of weight plates to provide resistance to an exercise motion. Cable 28 extends upward and engages upper directional pulleys 100 and 102 (shown in FIG. 4). Cable 28 then extends to

composite pulley **104**, directional pulley **106** (shown in **FIG. 2**), and is fixed to equalizer pulley **108**. Composite pulley **104** is simply two pulleys that work in conjunction with one another, as is known in the art. Composite pulley **104** ties each exercise location together, allowing each separate exercise location to receive resistance from the weight stack. This enables the use of a single weight stack having a single cable attached to the weight stack.

[0028] Cable **30** engages the equalizer pulley **108**, lower directional pulleys **110** and **112**, directional pulleys **114** and **116**, and laterally spaced, deep groove mid pulleys **118** and **120**. The ends of cable **30** are connected to mid handles **40** and **42**. Thus, when mid handles **40** and **42** are pushed or pulled away from deep groove pulleys **118** and **120** either together or individually, cable **30** pulls downward on equalizer pulley **108**, which in turn pulls cable **28**, raising the selected number of plates in weight stack **22** to provide resistance to an exercise motion. The equalizer pulley **108** allows the mid handles **40** and **42** to be used either together or individually. Also, the action of equalizer pulley **108** creates a  $\frac{1}{2}$  to 1 weight ratio for the resistance of each mid handle **40** and **42** such that the resistance is less than the actual resistance generated by raising the selected number of weight plates in weight stack **22**.

[0029] Cable **32** engages composite pulley **104**, a bottom directional pulley that is not shown, leg extender pulleys **122** and **124**, and one end of cable **32** is fixed to equalizer pulley **126**. The other end of cable **32** terminates at leg extender pulley **124**. When leg extension/leg curl arm **60** is extended, cable **32** pulls downward on composite pulley **104**, which in turn pulls cable **28**, raising the selected number of weight plates in weight stack **22** to provide resistance to an exercise motion. In a further preferred embodiment, the end of cable **32** that terminates at pulley **124** includes a mechanism to attach an additional handle to cable **32** (not shown) to allow for additional exercises performed against the resistance of cable **32**.

[0030] Finally, cable **34** engages equalizer pulley **126**, upper directional pulleys **128** and **130**, and deep grooved, high pulleys **132** and **134**. The ends of cable **34** are connected to high handles **44** and **46**. Thus, when high handles **44** and **46** are pushed or pulled away from deep groove pulleys **132** and **134** either together or individually, cable **34** pulls upward on equalizer pulley **126**, which then pulls downward on composite pulley **104**, which in turn pulls cable **28**, raising the selected number of plates in weight stack **22** to provide resistance to an exercise motion. The equalizer pulley **126** allows the high handles **44** and **46** to be used either together or individually. The action of equalizer pulley **126** creates a  $\frac{1}{2}$  to 1 weight ratio for the resistance of each high handle **44** and **46** such that the resistance is less than the actual resistance generated by raising the selected number of weight plates in weight stack **22**.

[0031] In cable gym machine **10**, an exercise station is defined by the location of the handles **40**, **42**, **44**, and **46**. In the preferred embodiment, the exercise station includes an adjustable seat **62** and a fixed seat back pad **64** connected to the exercise station frame **20**. A leg extension/leg curl arm **60** is connected to the exercise station frame **20** forward of the seat **62**. The leg extension/leg curl arm **60** includes ankle pads **62** and **64** and knee pads **66** and **68**. The leg extension/leg curl arm **60** is connected to, and receives resistance from,

cable **32**. As the leg extension/leg curl arm **60** is pivoted upward, cable **32** pulls downward on composite pulley **104** which in turn pulls cable **28**, raising the selected number of plates from weight stack **22** to provide resistance to an exercise motion.

[0032] Referring now to **FIG. 5**, a cross-sectional view of a deep groove pulley used in the present invention is shown. This is the configuration of deep groove pulleys **118**, **120**, **132**, and **134** discussed with respect to **FIGS. 1-4**. In a preferred embodiment, the deep groove pulley is made from nylon, and the groove is shaped in approximately a "V" groove. The groove **200** in the deep groove pulley is deeper than conventional pulleys so that the cable engaging the pulley can be moved to a wide range of angles with respect to the pulley without having the cable disengage from the pulley. The preferred angle of the "V" groove **200** is less than 60 degrees, and more preferably is about 52 degrees, as is shown in **FIG. 5**. Furthermore, in the preferred embodiment, the depth of groove **200** is at least 20 percent of the diameter of the pulley, and more preferably the groove **200** is approximately one inch from the outer edge **210** of the pulley **200** to the base **220** of the groove **200**, while the diameter of the pulley is approximately  $4\frac{1}{2}$  inches.

[0033] The configuration of the deep groove pulley disclosed herein allows the cable gym machine **10** to incorporate deep groove pulleys **118**, **120**, **132** and **134** without swiveling or height adjustment mechanisms. However, because cable **30** interacts with mid pulleys **118** and **120**, handles **40** and **42** can be used to exercise at any angle in approximately a 50 degree arc with respect to pulleys **118** and **120**. Likewise because cable **34** interacts with high pulleys **132** and **134**, handles **44** and **46** can be used to exercise at any angle in approximately a 50 degree arc with respect to pulleys **132** and **134**. As such, one of skill in the art will understand that many different exercises can be performed on the cable gym machine **10**.

[0034] Finally, referring to **FIG. 6**, one aspect of an alternate embodiment of the present invention is shown. More specifically, rather than deep groove pulleys as shown and **FIGS. 1-5**, pulleys incorporating swivel mechanisms can be used. **FIG. 6** shows a representative example of a swivel pulley generally designated **300**. The swivel pulley **300** is attached to the exercise machine via a swivel pulley arm **302**. The swivel pulley **300** incorporates a bracket **304**, a pulley wheel **306** rotatably mounted on the bracket **304**, a swivel attachment **308** rotatably attached to the swivel pulley arm **302** on which the bracket **304** is fixed, a counterweight arm **310** attached to the swivel attachment **308**, and a counterweight **312** attached to the counterweight arm **310**. A cable **314** engages the swivel pulley **300** and an exercise apparatus can be attached to the end of cable **314** at the exercise apparatus attachment **316**. When an exercise apparatus is attached to the end of cable **314**, exercise can be performed in the same manner as described above with respect to the deep groove pulleys. However, rather than the cable **314** achieving a range of motion for exercise at a variety of angles due to the deep groove of the pulley, cable **314** in this embodiment achieves a range of motion for exercise at a variety of angles as a result of the swiveling ability of the swivel pulley **300**.

[0035] To maintain a smooth swivel motion for the swivel pulley **300**, the axis of rotation of the swivel attachment **308**

should be the same as the axis of the cable 314 that engages the swivel pulley 300. Furthermore, by incorporating a sufficiently heavy counterweight 312 at the end of counterweight arm 310, the swivel motion of the swivel pulley 300 remains smooth. Thus, each deep groove pulley described above with reference to FIGS. 1-5 can be replaced by a swivel pulley as shown in FIG. 6 in an alternate embodiment of the present invention.

[0036] It is to be understood that a wide range of changes and modifications to the embodiments described above will be apparent to those skilled in the art, and these changes and modifications are contemplated herein. It is, therefore, intended that the foregoing detailed description be regarded as illustrative rather than limiting, and that it be understood that it is the following claims, including all equivalents, that are intended to define the spirit and scope of the invention.

We claim:

1. An exercise machine comprising:
  - a frame;
  - a weight stack slidably connected to the frame;
  - a pulley system comprising:
    - a plurality of directional pulleys; and
    - one or more deep groove pulleys;
  - one or more cables functionally engaged with the pulley system and the weight stack; and
  - one or more exercise apparatus connected with at least one of the cables in conjunction with each of the deep groove pulleys such that when the exercise apparatus is moved in an exercise motion, the weight stack provides resistance to the exercise motion.
2. The exercise machine as claimed in claim 1, wherein the deep groove pulleys each include a groove at least 20 percent as deep as the diameter of the pulley.
3. The exercise machine as claimed in claim 2, wherein the groove of each deep groove pulley is "V" shaped with an angle of the "V" of less than 60 degrees.
4. The exercise machine as claimed in claim 1, wherein the one or more exercise apparatus each comprises an exercise handle.
5. The exercise machine as claimed in claim 4, further comprising a seat connected with the frame and defining an exercise station.
6. The exercise machine as claimed in claim 5, wherein two deep groove high pulleys are connected with the frame above the exercise station, and two high handles are connected with each of two ends of a cable that is engaged with the two deep groove high pulleys.
7. The exercise machine as claimed in claim 5, wherein two deep groove mid pulleys are connected with the frame laterally spaced from the exercise station, and two mid handles are connected with each of two ends of a cable that is engaged with the two deep groove mid pulleys.
8. The exercise machine as claimed in claim 6, wherein two deep groove mid pulleys are connected with the frame laterally spaced from the exercise station, and two mid handles are connected with each of two ends of a cable that is engaged with the two deep groove mid pulleys.
9. The exercise machine as claimed in claim 8, wherein the pulley system further includes an equalizer pulley that

creates a ½ to 1 weight ratio for the effective resistance of the weight stack with respect to the high and mid handles.

10. The exercise machine as claimed in claim 8, wherein the pulley system further includes a composite pulley that attaches each handle to a single weight stack.

11. The exercise machine as claimed in claim 1, further comprising a leg extension/leg curl pedestal pivotally connected with the frame and connected with at least one of the cables such that when the leg extension/leg curl pedestal is pivoted, the weight stack provides resistance to the pivotal motion of the leg extension/leg curl pedestal.

12. The exercise machine as claimed in claim 1, wherein the one or more exercise apparatus each is individually selected from the group consisting of an exercise handle, an ankle strap, a straight bar, and an abdominal strap.

13. An exercise machine comprising:

- a frame;
  - a weight stack slidably connected to the frame;
  - a pulley system comprising:
    - a plurality of directional pulleys;
    - one or more deep groove pulleys; and
    - a composite pulley;
  - one or more cables functionally engaged with the pulley system and the weight stack;
  - one or more exercise handles connected with at least one of the cables in conjunction with each of the deep groove pulleys such that when the handle is moved in an exercise motion, the weight stack provides resistance to the exercise motion; and
  - a leg extension/leg curl pedestal pivotally connected with the frame and connected with at least one of the cables such that when the leg extension/leg curl pedestal is pivoted, the weight stack provides resistance to the pivotal motion of the leg extension/leg curl pedestal.
14. The exercise machine as claimed in claim 13, wherein the deep groove pulleys each include a groove at least 20 percent as deep as the diameter of the pulley.
15. The exercise machine as claimed in claim 14, wherein the groove of each deep groove pulley is "V" shaped with an angle of the "V" of less than 60 degrees.
16. The exercise machine as claimed in claim 15, further comprising a seat connected with the frame and defining an exercise station.
17. The exercise machine as claimed in claim 16, wherein two deep groove high pulleys are connected with the frame above the exercise station, and two high handles are connected with each of two ends of a cable that is engaged with the two deep groove high pulleys.
18. The exercise machine as claimed in claim 16, wherein two deep groove mid pulleys are connected with the frame laterally spaced from the exercise station, and two mid handles are connected with each of two ends of a cable that is engaged with the two deep groove mid pulleys.
19. The exercise machine as claimed in claim 17, wherein two deep groove mid pulleys are connected with the frame laterally spaced from the exercise station, and two mid handles are connected with each of two ends of a cable that is engaged with the two deep groove mid pulleys.

**20.** The exercise machine as claimed in claim 19, wherein the composite pulley attaches each handle to a single weight stack.

**21.** The exercise machine as claimed in claim 19, wherein the pulley system further includes an equalizer pulley that creates a ½ to 1 weight ratio for the effective resistance of the weight stack with respect to the high and mid handles.

**22.** An exercise machine comprising:

a frame;

a weight stack slidably connected to the frame;

a pulley system comprising:

a plurality of directional pulleys; and

one or more swivel pulleys;

one or more cables functionally engaged with the pulley system and the weight stack; and

one or more exercise apparatus connected with at least one of the cables in conjunction with each of the swivel pulleys such that when the exercise apparatus is moved in an exercise motion, the weight stack provides resistance to the exercise motion.

**23.** The exercise machine as claimed in claim 22, wherein the one or more exercise apparatus each comprises an exercise handle.

**24.** The exercise machine as claimed in claim 23, further comprising a seat connected with the frame and defining an exercise station.

**25.** The exercise machine as claimed in claim 24, wherein two high swivel pulleys are connected with the frame above

the exercise station, and two high handles are connected with each of two ends of a cable that is engaged with the two high swivel pulleys.

**26.** The exercise machine as claimed in claim 24, wherein two mid swivel pulleys are connected with the frame laterally spaced from the exercise station, and two mid handles are connected with each of two ends of a cable that is engaged with the two mid swivel pulleys.

**27.** The exercise machine as claimed in claim 25, wherein two mid swivel pulleys are connected with the frame laterally spaced from the exercise station, and two mid handles are connected with each of two ends of a cable that is engaged with the two mid swivel pulleys.

**28.** The exercise machine as claimed in claim 27, wherein the pulley system further includes a composite pulley that attaches each handle to a single weight stack.

**29.** The exercise machine as claimed in claim 27, wherein the pulley system further includes an equalizer pulley that creates a ½ to 1 weight ratio for the effective resistance of the weight stack with respect to the high and mid handles.

**30.** The exercise machine as claimed in claim 22, further comprising a leg extension/leg curl pedestal pivotally connected with the frame and connected with at least one of the cables such that when the leg extension/leg curl pedestal is pivoted, the weight stack provides resistance to the pivotal motion of the leg extension/leg curl pedestal.

**31.** The exercise machine as claimed in claim 22, wherein the one or more exercise apparatus each is individually selected from the group consisting of an exercise handle, an ankle strap, a straight bar, and an abdominal strap.

\* \* \* \* \*