A wearable exercise pulley comprising: an electrically conducting disc rotatable about an axis of the disc perpendicular to the plane of the disc; a cable coiled around the axis, which when pulled to uncoil the cable from around the axis causes the disc to rotate; at least one magnet that produces a magnetic field, which penetrates the disc and generates eddy currents in the disc when the disc is rotated; and a spring that operates to coil the cable around the axis.
MAGNETIC PULLEY RESISTANCE EXERCISER

RELATED APPLICATIONS

[0001] The present application claims the benefit under 35 U.S.C. 119(e) of U.S. Provisional Application 61/590,346 filed on Jan. 25, 2012, the disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] Embodiments of the invention relate to exercise equipment

BACKGROUND

[0003] Various and sundry exercise equipment for exercising the body and maintaining aerobic and strength fitness and health are ubiquitous. Known equipment spans a large gamut that includes relatively simple elastic bands, which an exerciser stretches to exercise and strengthen muscle sets, free weights of various degrees of finish, and stationary exercise machines of different levels of sophistication which a person mounts to peddle, pull, or push against resistance. Wearable resistance suits and harnesses that resist various body motions are also known for use in exercising, training and/or strengthening muscle groups and/or aerobic stamina.

SUMMARY

[0004] An aspect of an embodiment of the invention relates to providing a wearable, lightweight, portable, and relatively small exercise pulley comprising a pull cable coupled to an eddy current “brake” and a return spring. The eddy current brake generates the torque that opposes the pull cable being pulled out of the exercise pulley. The return spring operates to pull the cable into the exercise pulley after it is pulled out. A person using the exercise pulley may exercise by repeatedly pulling on the pull cable with a pulling force that overcomes the torque generated by the eddy current brake to pull the cable out of the exercise pulley, and then relaxing the pulling force to allow the return spring to pull the cable back into the exercise pulley.

[0005] In an embodiment of the invention, the torque with which the eddy current brake resists the pull cable being pulled out from the exercise pulley is adjustable. Optionally, the torque is adjustable so that a pulling force applied by the person to the pull cable to pull it out from the exercise pulley is adjustable between about 0 N (Newtons) to about 300 N.

[0006] According to an aspect of an embodiment of the invention, the exercise pulley comprises a connector for mounting the exercise pulley to a pulley holder, which may be attached to a pulley support so that the exercise pulley may be securely mounted to the holder and thereby to the support. When mounted to a pulley support, the exercise pulley is held substantially stationary relative to an exerciser’s body so that the exercise pulley may be used to exercise. The pulley support may be of example, comprise a wearable “exercise harness”. Optionally, the exercise harness comprises a vest harness, hereinafter also referred to as an “exercise vest”, having pulley holders to receive the exercise pulley connector at different locations on the vest. Optionally, the exercise harness comprises a belt harness, hereinafter also referred to as an “exercise belt” to which the pulley can be mounted at different locations of the belt. Optionally, the exercise harness comprises a leg harness, in accordance with an embodiment of the invention.

[0007] In an embodiment of the invention, the pulley holder may comprise a “grip handle” that enables the exercise pulley to be held in one hand by a person while the person pulls on the pull cable with the other hand. Optionally, the grip handle is configured to be held by the person’s foot while he or she pulls on the pull cable.

[0008] In the discussion, unless otherwise stated, adjectives such as “substantially” and “about” modifying a condition or relationship characteristic of a feature or features of an embodiment of the invention, are understood to mean that the condition or characteristic is defined to within tolerances that are acceptable for operation of the embodiment for an application for which it is intended.

[0009] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

BRIEF DESCRIPTION OF FIGURES

[0010] Non-limiting examples of embodiments of the invention are described below with reference to figures attached hereto that are listed following this paragraph. Identical structures, elements or parts that appear in more than one figure are generally labeled with a same numeral in all the figures in which they appear. Dimensions of components and features shown in the figures are chosen for convenience and clarity of presentation and are not necessarily shown to scale.

[0011] FIGS. 1A and 1B schematically show top and bottom perspective views of an exercise pulley, in accordance with an embodiment of the invention;

[0012] FIG. 1C schematically shows a pulley connector for attaching the exercise pulley shown in FIGS. 1A and 1B to a pulley holder, in accordance with an embodiment of the invention;

[0013] FIG. 2 schematically shows an exploded view of the exercise pulley shown in FIGS. 1A and 1B, in accordance with an embodiment of the invention;

[0014] FIGS. 3A-3K schematically show enlarged views of components of the exercise pulley shown in FIG. 2, in accordance with an embodiment of the invention;

[0015] FIGS. 4A and 4B schematically show a vest harness and a waist harness having pulley holders for mounting exercise pulleys to the harnesses, in accordance with an embodiment of the invention;

[0016] FIGS. 5A-5D schematically show different ways in which a person may exercise using an exercise pulley attached to an exercise vest, in accordance with an embodiment of the invention;

[0017] FIGS. 6A-6B schematically shows different ways in which a person may exercise using an exercise pulley attached to an exercise belt, in accordance with an embodiment of the invention;

[0018] FIG. 6C schematically shows a person exercising with an exercise pulley mounted to a leg harness, in accordance with an embodiment of the invention; and

[0019] FIG. 7 schematically shows an exerciser using an exercise pulley attached to a grip handle, in accordance with an embodiment of the invention.
DETAILED DESCRIPTION

[0020] In the following detailed description, external features of an exercise pulley in accordance with an embodiment of the invention are discussed with reference to FIGS. 1A-1C. An exploded view of the exercise pulley that shows internal components of the pulley in accordance with an embodiment of the invention is shown in FIG. 2. FIGS. 3A-3K show enlarged views of the components shown in FIG. 2. Details of the components, and how the components are assembled to provide an exercise pulley in accordance with an embodiment of the invention are discussed with reference to the figures. Configurations of exercise vest and exercise belts to which exercise pulleys may be attached in accordance with an embodiment of the invention are discussed with reference to FIGS. 4A and 4B. 5A-7 schematically show exercise pulleys similar to that shown in FIGS. 1A-3K being used to exercise.

[0021] FIGS. 1A and 1B schematically show top and bottom perspective views respectively of an exercise pulley 20, in accordance with an embodiment of the invention. Exercise pulley 20 optionally comprises a first magnet housing 30, also referred to as a “magnetic stator” 30, a second magnetic housing 40 also referred to as a magnetic rotor 40, formed having a threaded hole 41, and a rotor mount 50. The rotor mount comprises a rotor turret 51 having threads 52 that match the threads (not shown in FIG. 1A) of threaded hole 41. A pull cable 21 extends out from the exercise pulley through a cable aperture 32 formed in a cable guide 31 comprising in the magnetic stator. Optionally, a pull handle 22 is attached to the pull cable 21 to facilitate manually pulling the cable out from the exercise pulley.

[0022] A person working out with exercise pulley 20 exercises by repeatedly pulling pull cable 21 out of exercise pulley 20 with a pulling force that opposes resistance generated by the pulley to the pull cable being pulled out. A return spring in the exercise pulley operates to pull the cable into the exercise pulley after it is pulled out.

[0023] A torque created by eddy currents in an eddy current disc comprised in exercise pulley 20, which is shown in FIG. 2 and discussed below, provides the resistance that opposes extraction of pull cable 21 from the exercise pulley. The eddy current disc is located between magnets in magnetic rotor 40 and magnets in magnetic stator 30 that generate a magnetic field at the location of the disc. Pulling pull cable 21 out of exercise pulley 20 causes the eddy current disc to rotate in the magnetic field. The motion of the disc in the magnetic field gives rise to eddy currents in the disc that generate a magnetic field, which in consonance with Lenz’s law, results in force and torque that opposes the motion of the disc and extracting the pull cable out of the exercise pulley. Magnitude of the opposing force, the resultant torque and resistance to extracting the pull cable, increases with increase in magnitude of the magnetic field at the desk and speed of rotation of the disc.

[0024] Magnetic rotor 40 may be rotated on rotor turret 51 to move the magnetic rotor towards or away from the stator to respectively increase or decrease the magnetic field to which the eddy current disc is exposed and corresponding torque that opposes pull cable 21 being pulled out of exercise pulley 20. For a given speed with which pull cable 21 is pulled out from exercise pulley 20, a larger pull force is required to pull the pull cable out of the exercise pulley the closer magnetic rotor 40 is to magnetic stator 30. Magnetic rotor 40 optionally comprises protruding “finger” ridges 42 configured to facilitate holding and turning the magnetic rotor. Components and features of exercise pulley 20, and operation and adjustment of the exercise pulley, are discussed below with reference to FIG. 2-FIG. 3K.

[0025] A pulley connector 60, shown in FIG. 1B for connecting exercise pulley 20 to a pulley holder is optionally comprised on magnetic stator 30 and is configured to mate with a pulley holder optionally formed as a “lock plate” 70, schematically shown in FIG. 1C. Pulley connector 60 is optionally formed as a “slide connector” having a square slide frame 61 mounted on a stalk 62 and surrounding a square, lock recess 63. Lock recess 63 is bounded by inside frame edges 64 of slide frame 61.

[0026] Lock plate 70 optionally comprises a slide channel 71 into which slide frame 61 may be inserted, and a snap arm 72 having a lock ridge 73 for locking the slide frame, and thereby the exercise pulley, to the lock plate. When the slide frame is fully inserted into the slide channel, lock ridge 73 engages an inside frame edge 64 (FIGS. 1B, 1C) of slide frame 61 and locks the slide frame, and thereby the exercise pulley, to lock plate 70. The exercise pulley may be released from the lock plate by depressing a press tab 74 comprised in snap arm 72 to displace lock ridge 73 from the inside frame edge 64 with which it is in contact. Lock plate 70 is attachable to any of various pulley supports for convenient mounting of the exercise pulley to the supports for use in exercising. Examples of pulley supports that are exercise harnesses to which a lock plate 70 may be attached are discussed below and shown in FIGS. 4A and 4B.

[0027] It is noted that because slide frame 61 is square, exercise pulley 20 may be mounted to lock plate 70 in each of four different angular orientations separated one from the other by a rotation angle of 90° relative to a direction parallel to lock ridge 73. The orientations and their uses are discussed below with reference to FIGS. 5A-6B. Components and features of exercise pulley 20 and operation and adjustment of the exercise pulley are discussed below with reference to FIGS. 2 and FIGS. 3A-3K.

[0028] FIG. 2 schematically shows an exploded view of exercise pulley 20, in accordance with an embodiment of the invention.

[0029] Exercise pulley 20 comprises magnetic stator 30 referred to above, a cable spool 80 on which pull cable 21 is wound, a conductive eddy current disc 90, a return coil spring housing 100, a coil spring 101, a spring housing cover 102, rotor mount 50 referred to above, a magnet support annulus 110, and a rotor cover plate 120. The magnet support annulus and rotor cover are components of magnetic rotor 40 referred to above and shown in FIG. 1A-1C. Enlarged views of the components of exercise pulley 20 shown in the exploded view of FIG. 2 and how they are assembled to provide exercise pulley 20 are schematically shown in FIGS. 3A-3K.

[0030] FIGS. 3A and 3B schematically show enlarged views of rotor cover plate 120 and magnet support annulus 110, in accordance with an embodiment of the invention. Rotor cover plate 120 optionally comprises a central cylinder 121 formed having lock recesses 122 and a hole 41 threaded with threads 125. The rotor cover plate has an outer rim 123 formed having lock recesses 124. Threads 125 match threads 52 on rotor turret 51 of rotor mount 50 shown in FIG. 2 and enlarged in FIG. 3C. Optionally, rotor turret 51 protrudes from a central portion of a turret plate 53 having a rim 54 on which snap teeth 55 are formed. Cover plate 120, magnet support annulus 110 and rotor mount 50 are optionally injected molded from a suitable medium or high impact polymer such
as a polystyrene or an amorphous thermoplastic copolymer blended from Acrylonitrile, Butadiene and Styrene (ABS). [0031] Magnet support annulus 110 comprises a plurality of optionally seven disc shaped magnets 111. Each magnet 111 is snapped into place between, and held on magnet support annulus 110 by, optionally three, cantilever, toothed prongs 112. Magnet support annulus 110 has an inner rim 113 on which snap teeth 114 are formed and an outer rim 115 on which snap teeth 116 are formed. Snap teeth 114 and 116 match snap lock recesses 122 and 124 in central cylinder 121 and outer rim 123 of rotor cover plate 120 (FIG. 3A) respectively. Magnetic rotor 40 may be assembled by pressing magnetic support annulus 110 to rotor cover plate 120 so that snap teeth 114 and 116 of the magnetic support annulus snap into their corresponding snap lock recesses 122 and 124 respectively in cover plate 120.

[0032] Once assembled, magnetic rotor 40 may be mounted to rotor mount 50 by threading the magnetic rotor onto rotor turret 51. FIG. 3D) schematically shows assembled magnetic rotor 40 mounted to rotor mount 50.

[0033] FIG. 3E schematically shows an enlarged view of magnetic stator 30. The magnetic stator is optionally injection molded from a high impact plastic such as a plastic from which cover plate 120, is formed and comprises optionally seven disc shaped magnets 33 mounted therein. Optionally, the magnets are supported on circularly cylindrical bases 34 and are held on the bases by toothed cantilever snap prongs 35. Magnetic stator 30 optionally comprises a pair of cylindrical guide bearings 36 for guiding pull cable 21 (FIG. 3F) from cable spool 80 to cable aperture 32. Cable spool 80 shown in FIG. 2 is shown enlarged and mounted to the magnetic stator in FIG. 3F. The magnetic stator is formed having a socket 39 (FIG. 3E) for receiving a shaft 81 shown in FIG. 3F. The shaft, which is formed having a spring seating slot 82, is locked to and rotates with cable spool 80 when pull cable 21 is pulled out of the magnetic stator. Magnetic stator 30 has a rim 37 formed having lock recesses 38 that match snap teeth 55 on rotor mount 50 (FIG. 3C).

[0034] Conductive eddy current disk 90 shown in FIG. 2 is shown enlarged and mounted to shaft 81 in FIG. 3G. The conductive eddy current disk is optionally formed from a metal, such as aluminum and is locked to shaft 81, optionally by a disc lock collar 83, so that the disc rotates with the shaft. Spring housing 100 and return coil spring 101 are optionally mounted over eddy current disk 90 as schematically shown in FIG. 3H. An end 103 of a return coil spring 101 seats in a slot 82 (FIG. 3C) in shaft 81 so that as pull cable 22 is pulled out of magnetic stator 30 causing shaft 81 to rotate, rotation of the shaft winds up the coils of the return coil spring. Winding up of the coils is enabled by maintaining spring housing 100 stationary relative to magnetic stator 30 as discussed below. FIG. 31 schematically shows spring housing 100 closed by spring housing cover 102 and a bearing 84, which is optionally press fit onto an end of shaft 81. Housing cover 102 is formed optionally having a plurality of anchor holes 104.

[0035] Magnetic stator 30 is closed by rotor mount 50 by snapping snap teeth 55 (FIG. 3C) of the rotor mount into lock recesses 38 of magnetic stator 30. FIG. 3J schematically shows the magnetic stator closed by rotor mount 50. When the magnetic stator is closed by the rotor mount, bearing 84 (FIG. 31) seats in a matching recess (not shown) in the inside top of rotor turret 51, and anchor pegs (not shown) in the inside top of the turret seat in anchor holes 104. The anchor pegs seating in the holes prevent rotation of spring housing 100 relative to magnetic stator 30 so that the spring housing does not rotate with shaft 81 when pull cable 21 is pulled out of the magnetic stator. Assembly of exercise pulley 20 is completed by screwing magnetic rotor 40 onto rotor turret 51 as schematically indicated in FIG. 3K.

[0036] By way of numerical example, in an embodiment of the invention an overall diameter of exercise pulley 20 is less than or equal to about 18 cm (centimeters). Optionally, the overall diameter is less than or equal to about 15 cm. In an embodiment of the invention the overall diameter is less than or equal to about 12 cm. Conductive eddy current disk 90 is formed from aluminum is optionally about 3 mm (millimeters) thick and has a diameter less than or equal to about 15 cm. Optionally, the diameter of the conductive eddy current disk is less than or equal to about 12 cm. In an embodiment of the invention the conductive eddy current disk has a diameter less than or equal to about 9 cm. Optionally, pulley cable 22 has a diameter of about 2 mm and is wound up on a portion of cable spool 80 having a diameter, a “coiling diameter”, less than or equal to about 4 cm.

[0037] In an embodiment of the invention, a pair of magnets 111 and 33 when directly opposite and closest to each other generates a magnetic field in eddy current disk 90 having a magnitude that is greater than or equal to about 0.18 gauss. Optionally, the magnets generate a magnetic field having magnitude greater than or equal to about 0.22 gauss. Optionally, the magnets generate a magnetic field having magnitude greater than or equal to about 0.22 gauss. In an embodiment of the invention, each magnet 111 (FIG. 3I) and 33 (FIG. 3J) has a diameter of about 20 mm and a thickness of about 5 mm. Magnets 33 are optionally positioned about 1 mm below the plane of the bottom surface of conductive eddy current disk. Magnets 111, which are located in magnetic rotor 40, may be moved from a maximum distance optionally equal to about 25 mm from the plane of the top surface of conductive eddy current disk 90 to about a minimum distance optionally equal to about 5 mm from the plane of the upper surface of the conductive eddy current disk.

[0038] Assume a 9 cm diameter aluminum conductive eddy current disk 90, and a magnetic field generated by a pair of magnets 33 and 111 having magnitude of about 0.23 gauss, and a coiling diameter equal to about 4 cm for cable spool 80. If pulley cable 20 is pulled out of exercise pulley 20 at a speed of about 1.6 cm/s, the eddy current disk rotates at about 9 rpm and a pulling force having magnitude of about 300 N is required to pull pull cable 21 out of the exercise pulley.

[0039] It is noted that in the above discussion, a magnetic field to which conductive eddy current disk 90 is exposed is increased or decreased by appropriately rotating magnetic rotor 40 to adjust a pull force required to pull pull cable 21 out of exercise pulley 20. However, practice of the invention is not limited to adjusting a required effort by changing distances of magnets from the conductive eddy current disc. For example, the pull force may be increased or decreased by moving magnets 33 and/or magnets 111 radially, towards or away from an axis of conductive eddy current disk 90 about which the disc rotates. Moving the magnets towards the axis reduces a torque, which is to be overcome to pull pull cable 21 out from exercise pulley 20.

[0040] FIG. 4A schematically show lock plates 70 attached to an exercise vest 202 in accordance with an embodiment of the invention. Exercise vest 202 optionally comprises shoulder strips 203, rib straps 204 and a breastplate 205 and a back plate 206, only a part of which is shown in FIG. 4A. The
shoulder and rib straps are attached to the exercise vest and are adjustable to provide a snug fit to an exerciser’s body, optionally using suitable arrangements of hook and loop fasteners such as Velcro® fasteners and/or buckles (not shown). Optionally, four lock plates 70 are attached to the exercise vest for mounting exercise pulleys 20 to the exercise vest. Two of lock plates 70 are optionally attached to breastplate 205, and two of lock plates 70 (not shown in FIG. 4A, but shown in FIG. 5D) are attached to the back plate.

Optionally, the lock plates are attached to the vest so that when the exercise vest is worn by an exerciser, lock ridges 73 (FIG. 1C) are oriented either substantially parallel or substantially perpendicular to the ground. Having the lock ridges oriented either parallel or perpendicular to the ground allows exercise pulleys 20 to be mounted to the exercise vest so that cable guides 31 of the exercise pulleys point along any direction up or down, perpendicular to the ground, or left and right, parallel to the ground. Cable guides pointing parallel or perpendicular to the ground, facilitate exercising with the exercise pulleys by pulling out pull cables 21 of the exercise pulleys sideways, left or right, or vertically, up or down.

Any of various devices and methods may be used to attach lock plates 70 to the breastplate and/or back plate. For example, rivets and/or screws may be used to attach the lock plates to the breastplate or back plate. To support the rivets and/or screws and resist tearing, the breastplate or back plate may be made from a robust natural or synthetic fabric and comprise an internal support layer (not shown) optionally made from a suitable plastic.

FIG. 4B schematically shows an exercise belt 212 having mounted thereto optionally two lock plates 70, in accordance with an embodiment of the invention. Exercise belt 212 is optionally made from materials similar to materials from which exercise vest 202 is made and may be fit and adjusted to an exerciser’s waist by a suitable arrangement of a hook and loop fastener such as a Velcro® fastener (not shown) and buckles (not shown).

FIGS. 5A-5D schematically show an exerciser 220 exercising with exercise pulleys 20 attached to lock plates 70 (FIG. 4A) and mounted to exercise vest 202, in accordance with embodiments of the invention. FIG. 5A schematically shows exercise pulleys 20 oriented with cable guides 31 pointing sideways and the exerciser pulling out pull cable 21 horizontally. FIGS. 5B and 5C schematically show exercise pulleys mounted to the exercise vest with their cable guides 31 pointing up or down respectively and the exerciser exercising in a corresponding up or down direction. FIG. 5D schematically shows the exerciser using exercise pulley mounted to the back of exercise vest 202.

FIG. 6A and 6B schematically show exerciser 220 exercising with exercise pulleys 20 mounted to exercise belt 212. FIG. 6C schematically shows the exerciser exercising with exercise pulleys 20 mounted to leg harnesses 214, in accordance with an embodiment of the invention.

FIG. 7 schematically shows exerciser 220 exercising with an exercise pulley 20 mounted to a lock plate 72, only an edge of which is shown in FIG. 7, having a grip handle 74, in accordance with an embodiment of the invention. It is noted that in the above discussion exercise pulley 20 is attached to a harness, such as a harness shown in FIGS. 5A-7, using a square shaped pulley connector 60 and matching lock plate 70. The pulley connector and lock plate enable attaching the connector to the lock plate in one of four fixed angular orientations relative to an axis perpendicular to conductive eddy current plate 90. However, practice of the invention is not limited to such “four orientation” pulley connectors and lock plates. For example, a hexagonal rather than a square shaped pulley connector and matching lock plate permit attaching the connector to the holder in each of six different fixed angular directions, in accordance with an embodiment of the invention. A circular pulley connector and matching lock plate connect the connector and lock plate so that the exercise pulley is freely rotatable about an axis substantially perpendicular to conductive eddy current disc 90, in accordance with an embodiment of the invention.

In the description and claims of the present application, each of the verbs, “comprise”, “include” and “have”, and conjugates thereof, are used to indicate that the object or objects of the verb are not necessarily a complete listing of components, elements or parts of the subject or subjects of the verb.

Descriptions of embodiments of the invention in the present application are provided by way of example and are not intended to limit the scope of the invention. The described embodiments comprise different features, not all of which are required in all embodiments of the invention. Some embodiments utilize only some of the features or possible combinations of the features. Variations of embodiments of the invention that are described, and embodiments of the invention comprising different combinations of features noted in the described embodiments, will occur to persons of the art. The scope of the invention is limited only by the claims.

1. A wearable exercise pulley comprising:
   an electrically conducting disc rotatable about an axis of the disc perpendicular to the plane of the disc;
   a cable coiled around the axis, which when pulled to uncoil the cable from around the axis causes the disc to rotate;
   at least one magnet that produces a magnetic field, which penetrates the disc and generates eddy currents in the disc when the disc is rotated; and
   a spring that operates to coil the cable around the axis.

2. An exercise pulley according to claim 1 wherein the disc has a diameter less than or equal to about 15 cm

3. (canceled)

4. An exercise pulley according to claim 1 wherein the disc has a diameter less than or equal to about 9 cm

5. An exercise pulley according to claim 1 wherein the at least one magnet comprises at least one first magnet on a first side of the plane of the disc and at least one second magnet on a second side of the plane of the disc.

6. An exercise pulley according to claim 5 and comprising a first magnet housing that comprises the at least one first magnet and maintains the at least one first magnet at a fixed distance from the plane of the disc, and comprising a second magnet housing that comprises the at least one second magnet and is moveable relative to the first magnet housing to change a distance of the at least one second magnet from the plane of the disc.

7. (canceled)

8. An exercise pulley according to claim 6 wherein the second magnet housing is moveable relative to the first magnet housing by rotation about the disc axis to change a distance of the at least one second magnet from the plane of the disc.

9. An exercise pulley according to claim 8 and comprising a threaded turret, wherein the first magnet housing is formed having a hole comprising threads matching the threads on the turret, and wherein the turret is threaded into the hole, and the
first magnet housing is rotated to move the at least one second magnet along the turret towards or away from the plane of the disc.

10. (canceled)

11. An exercise pulley according claim 6 wherein at a closest distance of the second at least one magnet to the plane of the disc, the at least one first magnet and at least one second magnet produce a magnetic field at the disc equal to about 0.18 gauss.

12. An exercise pulley according to claim 11 wherein the closest distance is equal to about 5 mm.

13. An exercise pulley according to claim 11 wherein at the closest distance, a pulling force greater than or equal to about 300 N is required to uncoil the cable and rotate the disc at an angular speed of at least 8 rpm.

14. An exercise pulley according to claim 1 and comprising a connector for attaching the exercise pulley to a matching pulley holder wherein the connector and matching pulley holder are configured so that the exercise pulley may conveniently be attached to, and detached from, the holder.

15. (canceled)

16. An exercise pulley according to claim 14 wherein the connector and pulley holder are configured so that the exercise pulley may be mounted to the pulley holder at each of a plurality of discrete angles relative to a reference direction perpendicular to the disc axis.

17. An exercise pulley according to claim 16 wherein adjacent discrete directions are separated by a same angle of rotation.

18. An exercise pulley according to claim 17 wherein the number of discrete directions is four, and adjacent directions are separated by 90°.

19. An exercise pulley according to claim 14 wherein the pulley holder is attached to a pulley support so that the exercise pulley may be mounted to the pulley support by mounting the exercise pulley to the pulley holder, and wherein the pulley support comprises a wearable harness.

20. (canceled)

21. An exercise pulley according to claim 19 wherein the harness has attached thereto a plurality of pulley holders.

22. An exercise pulley according to claim 19 wherein the harness comprises a harness selected from the group consisting of: a vest harness, a belt harness and a leg harness.

23-25. (canceled)

26. An exercise pulley according to claims 19 and comprising a handle so that the exercise pulley may securely be held in one hand while pulling the cable with the other.

27. An exercise apparatus comprising:

an exercise pulley according to claim 14; and

a wearable exercise harness comprising at least one pulley holder.

28. An exercise pulley according to claim 27 wherein the harness has attached thereto a plurality of pulley holders.

29-31. (canceled)

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