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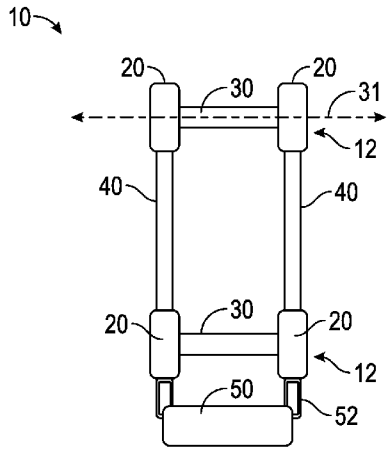

FIG. 1

(57) Abstract: An apparatus for exercising may include a gripping assembly having a grip fixed to at least one spring member and at least one tether connected to the at least one spring member. The tether winds around the longitudinal axis of the at least one spring member. Also, an object may be connected to the tether. In some embodiments, the object may be a weight, an anchor, or a second gripping assembly. Alternatively, the apparatus may include a gripping assembly having at least one spring member connected to a tether and a grip connected to the tether. A free standing object may be connected to the tether. Methods according to the present disclosure use the apparatus by applying a force to the grip(s).

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EXERCISE DEVICE

BACKGROUND OF THE DISCLOSURE

1. Field of Disclosure

[0001] The present disclosure relates to a devices and methods for strengthening and conditioning muscles.

2. The Related Art

[0002] Traditional devices used for strengthening and conditioning muscles tend to be bulky and sometimes apply an irregular resistive force during a given exercise movement. Moreover, the moving components may brush or otherwise cause undesirable contact with the user during use.

[0003] The present disclosure addresses these and other drawbacks of the prior art.

SUMMARY OF THE DISCLOSURE

[0004] In aspects, the present disclosure provides an apparatus for exercising. The apparatus may include a gripping assembly. The gripping assembly may have at least one spring member, and a grip fixed to the at least one spring member. The apparatus may also include at least one tether connected to the at least one spring member. The tether winds around the longitudinal axis of the at least one spring member. Also, an object may be connected to the tether. The tether unspools out of the gripping assembly as the distance separating the object and the gripping assembly increases. In some embodiments, the object may be a weight, an anchor, or a second gripping assembly.

[0005] In another aspect, the present disclosure provides an apparatus for exercising that includes a gripping assembly having at least one spring member and a grip connected to a tether. The tether winds around the longitudinal axis of the at least one spring member. A free standing object may be connected to the tether. The

free standing object has a mass selected to keep the at least one spring member coiled while no impulsive force is applied to the grip and to allow the at least one spring member to uncoil when an impulsive force of a predetermined value is applied to the grip.

[0006] In another aspect, the present disclosure provides methods for exercising that utilize the above-described devices.

[0007] The above-recited example of features of the disclosure have been summarized rather broadly in order that the detailed description thereof that follows may be better understood, and in order that the contributions to the art may be appreciated. There are, of course, additional features of the disclosure that will be described hereinafter and which will form the subject of the claims appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] For detailed understanding of the present disclosure, references should be made to the following detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings listed below:

FIG. 1 illustrates one embodiment of an exercise device according to the present disclosure;

FIG. 2 illustrates a side view of the FIG. 1 embodiment;

FIGS. 3A-3B illustrates one use of the FIG. 1 embodiment;

FIGS. 4A-4B illustrates another use of the FIG. 1 embodiment;

FIG. 5 illustrates an embodiment of an exercise device that uses two spring members;

FIG. 6 illustrates an embodiment of an exercise device that uses one spring member;

FIG. 7 illustrates an embodiment of an exercise device uses a free standing object;

FIG. 8 illustrates an embodiment of an exercise device that uses a torsion spring;

FIG. 9 illustrates an embodiment of an exercise device that uses a spring element as a tether; and

FIG. 10 illustrates various modifications and variants that may be used in connection with embodiments of exercise devices according to the present disclosure.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0009] Referring to **Fig. 1**, there is shown one embodiment of an exercise device **10** that may be used for aerobic and / or anaerobic exercises. As will be apparent from the discussion below, the exercise device **10** counteracts the motion of a user with a predetermined force. The predetermined force may be a constant force (*e.g.*, torque or tension) or a variable force. The motion may be a repetitive movement of a bodily limb such as an arm, trunk, or leg. These exercises may be used to improve endurance, flexibility, strength, condition, etc. In some embodiments, the predetermined force enables the user to experience a relatively constant resistance to movement over the entire range of movement. That is, the force encountered at the beginning or end of a movement is substantially the same as that encountered during the middle of the movement. Additionally, embodiments of exercise devices **10** according to the present disclosure are compact, easy to manipulate, and cause minimal undesirable contact with the user.

[0010] Referring to **Fig. 1**, in one arrangement, the exercise device **10** includes two gripping assemblies **12**. Each gripping assembly **12** includes two spring members **20** secured to a grip **30**. The grip **30** may be a loop, bar, ring, handle, strap, or other structural element that is shaped and sized to be grasped or otherwise manipulated by a user. The grip **30** may be rigid or pliant. Opposing spring members **20** of each gripping assembly **12** are connected to one another by the tethers **40**. The tethers **40** may be shaped as a ribbon, wire, cable, tape, string, cord or other non-rigid member than may be spooled and unspooled from an axle. Suitable materials for the

tether **40** include, but are not limited to, pliable materials such as a plastic (e.g., nylon), cotton, twine, etc. Pulling the handles **30** apart unwinds the tether **40**. As the tether **40** unwinds, the coil spring members **20** are activated; e.g., wind or unwind. When activated, the spring members apply a constant tension that resists the pulling action of the user.

[0011] Referring to **Fig. 2**, the spring members **20** may include a case or housing **21** that includes coil springs **22** wound around an axle **25**. The coil spring **22** may be a pre-stressed flat strip of spring material (*e.g.*, spring steel). The tether **40** is wound around the axle **25** such that unwinding the tether **40** causes the coil spring **22** to elastically deform (*e.g.*, wind or unwind). That is, the tether **40** and the spring members **20** share a common longitudinal axis when coiling and uncoiling. Herein, the terms "spooling / unspooling" and "coiling / uncoiling" are used synonymously. The effective length of the tether **40** decreases during spooling and increases during unspooling. It should be noted that the tether **40** winds around the same longitudinal axis **31** that the spring members **20** are wound. Such an arrangement provides a compact configuration and allows the exercise device **10** to be used in cramped or otherwise space-restricted environments. A coil spring is only one illustrative spring that may be used to provide a predetermined force or torsion during use. Other suitable springs include torsion springs. Embodiments using the spring member **20** are discussed below.

[0012] As shown in **Fig. 3A**, in a relaxed state, the tether **40** is mostly wound on the axles **25** (**Fig. 2**) of the spring member **20**. Thus, the exercise device is in an axially compact condition. As shown in **Fig. 3B**, when the spring members **20** are pulled apart, the tether **40** unwinds, but the coil springs **22** (**Fig. 2**) of each spring member **20** resist the pulling action with a tension applied to the tether **40**. Beneficially, it should be noted that the tether **40** at portion **41** can remain stationary relative to the user's torso as the spring members **20** move apart. That is, because the tether **40** unwinds and spools out of the gripping assembly **12**, it is not necessary for a middle portion **41** of the tether **40** to move in order for the tether **40** to extend linearly outward. Thus, a user who is next to the tether **40** will not suffer from being abraded by the spooling or unspooling action of the tether **40**.

[0013] Referring now to **Figs. 4A** and **B**, there is shown the use of the exercise device **10** that is used in conjunction with an optional free standing weight **50**. In **Fig. 4A**, the user is shown holding the exercise device **10** stationary. When held stationary, the exercise device **10** is in a compact condition. It should be noted that the spring force of the spring member **20** is sufficiently strong to maintain the tether **40** wound on the axle **25** (**Fig. 2**) even though the mass of the weight **50** is acting on the tether **40**. In one sense, the spring force of the spring member **20** counterbalances the gravitational force acting on the weight **50**. In **Fig. 4B**, the user applies an upward impulse force to the upper grip **30**. This upward impulse force unwinds the tether **40**. Because the upper grip **30** is secured to the spring member **20**, the upper grip **30** and the spring member **20** move as an integral unit. The weight **30** applies a constant static downward force due to gravity as discussed previously. The spring force is selected to allow the tether **40** to unwind when the grip **30** is impulsively pressed upward by the user. Thus, in one embodiment, the spring force or tension applied by the spring member **20** has an upper limit and a lower limit. The spring force is strong enough to maintain the tether **40** in a wound condition while in a static state but weak enough to allow the tether **40** to unwind while in a dynamic state. Generally, a high predetermined spring force is desirable when the user wishes to exercise with a high impulsive force and a low predetermined spring force is desirable when the user wishes to exercise with a low impulsive force.

[0014] It should be further appreciated that the exercise device **10** enables the user to practice controlled explosive movement. For example, as shown in **Fig. 4B**, the user may perform repetitive movements by applying an upward impulse force to the grip **30**, but control the upward force to maintain the weight **50** in a mostly stationary position. As used throughout, the term impulse or impulse force refers to a change in linear momentum of a body. It may be defined as a product of the average force multiplied by the time over which the force is exerted.

[0015] It should be appreciated that exercise devices according to the present disclosure may be susceptible to numerous variations. Some non-limiting embodiments are discussed below.

[0016] Referring now to **Fig. 5**, there is shown another embodiment of the present disclosure. In this embodiment, the exercise device **10** also has two gripping

assemblies **12**. However, each gripping assembly **12** has one spring member **20**. The spring members **20** are connected by a common tether **40**. Each spring member **20** is secured to an associated grip **30**. As discussed previously, the tether **40** can remain stationary relative to the user as the spring members **20** move apart because the tether **40** unwinds and spools out of the gripping assembly **12**.

[0017] Referring now to **Fig. 6**, there is shown another embodiment of the present disclosure. In this embodiment, the exercise device **10** has one gripping assembly **12** that has one spring member **20** and a grip **30**. The spring member **20** has a tether **40** that includes an secondary object, such as anchor **70**. The anchor **70** may be attached to furniture, a door, or other structural feature. Because the grip **30** is fixed to the spring member **20**, the tether **40** spools in and out of the gripping assembly. The secondary object may also be a second grip **30** or a second gripping assembly **12** (**Fig. 1**).

[0018] Referring now to **Fig. 7**, there is shown another embodiment of the present disclosure. In this embodiment, the exercise device **10** has a grip **30** that is connected to a spring member **20** by a tether **40**. The spring member **20** is secured to an object **72** that acts as a counterweight. Further, the object **72** is free standing. In this context, the term "free standing" means that the entire weight of the object **72** is supported at the grip **30** and none of the weight is supported by another structure such as a surface **74**, which is physically separated from the object **72**. Because the object **72** is secured to the spring member **20**, the object **72** and the spring member **20** move as an integral unit. In a related embodiment, the grip **30** is connected to the spring member **20**, which in turn is connected to the tether **40**. The object **72** is connected to the tether **40.** The weight of the object **70** and the spring force of the spring member **20** may be selected to be in a range that unspooling of the tether **40** only when a specified impulse force is applied to the grip **30**. For instance, when the object **72** is free standing, the spring force of the spring member **20** is sufficiently high to keep the tether **40** coiled if the grip **30** is stationary relative to the user. However, the spring force is sufficiently low to allow the tether **40** to unspool if the user applied as specified impulse force (*i.e.*, a specified force within a specified time period) to the grip **30**.

[0019] It should be appreciated that the spring members may incorporate any known mechanism for applying a predetermined force to a tether. Further, certain structural features may be formed as integral devices. For instance, referring to **Fig. 8**, there is shown an exercise device **10** that has gripping assemblies **12** that enclose the grips **30** and thereby integrate the grip **30** with the spring member **20**. The spring members **20** may be torsion springs **25** that are wound around and integrated into an axle **35** of the grip **30**. As the tether **40** unwinds from the axle **35**, the torsion spring **25** generates a resistive tension force. It should be noted that the tether **40** winds around the same axis **31** that the spring members **20** are wound, which provides a compact configuration.

[0020] Referring now to **Fig. 9,** there is shown another embodiment wherein structural features are combined. In **Fig. 9**, an exercise device **10** includes gripping assemblies **12** that have a spring member **20** that uses a coil spring **27**. However, the coil spring **27** is used to connect the two spring members **20**. Thus, the coil element of the coil spring **27** functions as the tether **40** shown in the other embodiments of the present disclosure.

[0021] It should be appreciated that the teachings of the present disclosure are susceptible to various modifications. For instance, referring back to **Fig. 5**, the exercise device **10** may optionally include an adapter **90** positioned on the tether **40**. The adapter **90** can have a single purpose or have multi-purposes. For example, the adapter **90** may be an additional grip. Such a variant may be useful for making the exercise device **10** even more compact or to vary resistance. The adapter **90** may also be an anchoring device that allows the tether to be fixed to a stationary object such as a sofa or table. In still other embodiments, the adaptor **90** may be a clip, strap, or harness that allows the tether **10** to be attached to an article of clothing or a body part. In yet other embodiments, the adapter **90** may be used to attach a moving object, such as a weight, to the tether **40**.

[0022] Referring now to **Fig. 10**, there are shown still other variations and modifications that may be used in connection with the teachings of the present disclosure. One class of variants are directed to varying the resistance of the exercise device **10**. In one arrangement, a variable resistance module **92** may be used to modulate the spring force of the spring members **20**. For instance, the module **92** may

include a spinning fan or paddles that are attached to the axle **25** (**Fig. 2**) The spring members **20** and the module **92** provide a resistance when the user pulls the grips **30** apart. The amount of fluid in the module **92** may be varied to vary the resistance provided by the module **92**. Alternatively, the blade angles of the fan or paddles (not shown) can also be varied to change the resistance.

[0023] In another arrangement, a variable resistance module **94** may be used to apply a frictional force on the tethers **40**. For example, the variable resistance module **94** may include pads or calipers on opposing sides of the tethers **40**. The pads or calipers (not shown) may provide a frictional force that increases the resistance the user encounters when using the exercise device **10**. The degree to which the pads or calipers (not shown) grip the tethers **40** can vary the amount of applied resistance.

[0024] In still other variants, the modules **92** and **94** may be configured to have a speed modulating function. That is, the modules **92** and **94** may allow the tethers **40** to wind and / or unwind within a predetermined speed. This may be used to minimize instances where the user pulls the grips **30** apart too quickly or instances where the grips **30** close quicker than desired.

[0025] Further modifications may include visual, audio, and / or tactile cues that assist the user during exercising. For instance, the tether **40** may include color coded regions **96**a-c. Region **96**b may be coded to signify a target range. Regions **96a** and **96c** maybe coded to signify a distance goal for physical therapy or other purpose. Thus, when the user sees only the region **96b** color (e.g., green), the user knows that the exercise device **10** is being used to the specifications prescribed by a medical professional or physical therapist. However, when the user sees either or both of regions **96**a and **96**c, then the user has an indication that the movement is excessive (e.g., the grips **30** are being pulled too far apart) or that the exercise movement is asymmetric.

[0026] In other embodiments, cues as to desirable movement can be provided by an audio signal. For instance, a bell or beeper may activate when the tether **40** has been unwrapped beyond a predetermined distance. Similarly, a device such as "rumble strips" or other surface treatments may be used to vibrate the tethers **40** if an undesirable amount of uncoiling is encountered.

[0027] In a different aspect, the variants and modifications of the present disclosure may be directed to integrating the exercise device **10** into a larger health and fitness management system. Such embodiments may include a processor **100**, one or more sensors **102**, a communication device **104**, and a remote unit **106**. Known devices such as batteries and wiring are not shown.

[0028] The processor **100** may include micro-processors, memory modules, and other peripherals for communicating with the sensor(s) **102** and communicating with the remote unit **106** by using the communication device **104**. In some embodiments, the processor **100** may simply store data acquired during operation in the memory module. In other embodiments, the processor **100** may transmit the data periodically or in "real time" to the remote unit **106**. It should be understood that these operating modes are merely illustrative and not limiting to the processor **100**.

[0029] One or more sensors **102** may be configured to estimate, directly or indirectly, one or more parameters associated with the exercising activity. For example, the sensor **102** may be measure total number of rotations, rotational speed, speed, acceleration, time, pacing (e.g., stroke per unit time), distance the tether **40** is extended, etc. It should be understood that these parameters are illustrative and not limiting. In essence, the sensors **102** may be any sensor that provides information that the user, a health care professional, fitness instructor, or other individual may find useful in evaluating the user's movements during an exercising routine and the user's overall health. For example, the information provided by the sensors may be used to estimate endurance, dexterity, muscle explosiveness, range of movement, coordination, agility, etc.

[0030] The communication device **104** may be any component that allows the transmission of data between the processor **100** and the remote unit **106**. The data transmission may be uni-directional or bi-directional. Illustrative, but not exclusive wireless data transmission components, include wireless devices, (e.g., "wi fi"), RF transmitters, BLUETOOTH" devices, etc. In other embodiments, the communication device **104** may be a wired system that communicates through known plugs such as USP ports and cables.

[0031] The remote device **106** may be any device that is configured to receive information from the processor **100** and present that information, either in a processed

or unprocessed form. In some arrangements, the remote device may be a mobile phone that includes an 'app' that enables the mobile phone to communicate with the processor **100**. This may be useful in situations where a local individual, such as the user or fitness instructor, wishes to personally monitor progress either during an exercise or over a period of time. In other arrangements, the remote device may be a computer located at a remote location such as a health care facility. This arrangement may be useful in situations where a health care professional wishes to remotely monitor and evaluate the health of the user.

[0032] As used above, the term "secured to" or "fixed to" refers to a connection that prevents relative movement between two features. The term "connected to" refers to a connection that only limits relative movement between two features. For example, in **Fig. 5**, the grips **30** and the spring members **20** are secured to one another. Thus, there is no relative movement between these two features. The tether **40** connects the two spring members **20**. Thus, the two spring members **20** have some relative freedom of movement. Additionally, several embodiments have been having described as having a specific number of features (e.g., one spring). It should be noted that the embodiments of the present disclosure are not limited to the specific embodiments described above. Thus, for instance, various embodiments may have two or more springs, which may be arranged in parallel, in a serial fashion, or any other configuration.

[0033] The foregoing description is directed to particular embodiments of the present disclosure for the purpose of illustration and explanation. It will be apparent, however, to one skilled in the art that many modifications and changes to the embodiment set forth above are possible without departing from the scope of the disclosure. Thus, it is intended that the following claims be interpreted to embrace all such modifications and changes.

CLAIMS

We claim:

1. An apparatus for exercising, comprising:

- a gripping assembly including:
  - at least one spring member, and
  - a grip fixed to the at least one spring member; and
- at least one tether connected to the at least one spring member, wherein the tether winds around the longitudinal axis of the at least one spring member; and
- an object connected to the tether, the tether being configured to unspool out of the gripping assembly as the distance separating the object and the gripping assembly increases.

2. The apparatus of claim 1, wherein the object is a second gripping assembly that includes at least one spring member and a grip fixed to the at least one spring member.

3. The apparatus of claim 2, wherein the at least one spring member of the gripping assembly includes two spring members, wherein the at least one spring member of the second gripping assembly includes two spring members, and wherein the at least one tether includes at least two tethers, each of which connect at least one of the two spring members of the gripping assembly to at least one of the two spring members of the second gripping assembly.

4. The apparatus of claim 3, wherein the grip of the gripping assembly connects the two spring members of the gripping assembly, and wherein the grip of the second gripping assembly connects the two spring members of the second gripping assembly

5. The apparatus of claim 2, wherein the grip of the gripping assembly is

encloses the at least one spring member of the gripping assembly, and wherein the grip of the second gripping assembly encloses the at least one spring members of the second gripping assembly.

6. The apparatus of claim 2, wherein the at least spring of the gripping assembly and the second gripping assembly is a torsion spring wound around an axle.

7. The apparatus of claim 1, wherein the object is a free standing object that has a mass selected to keep the at least one spring member coiled while no impulsive force is applied to the grip and to allow the at least one spring member to uncoil when an impulsive force of a predetermined value is applied to the grip.

8. The apparatus of claim 1, further comprising at least one sensor configured to estimate a parameter of interest representative of a response at least one of (i) the spring member to a force applied by a user, and (ii) the tether to the force applied by the user.

9. The apparatus of claim 8, wherein the at least one sensor estimates one of: (i) a linear distance, (ii) a rotational distance, (iii) linear speed, (iii) rotational speed, (iv) acceleration, (v) a number of a repeated movement.

10. The apparatus of claim 8, further comprising a communication device in signal communication with the at least one sensor, the communication device configured to transmit information received from the at least one sensor to a remote unit.

11. An apparatus for exercising, comprising:

- a gripping assembly including:

- a tether,
- at least one spring member connected to the tether, and
- a grip connected to the tether, wherein the tether winds around the longitudinal axis of the at least one spring member; and
- an free standing object connected to the tether, wherein the free standing object that has a mass selected to keep the at least one spring member coiled while no impulsive force is applied to the grip and to allow the at least one spring member to uncoil when an impulsive force of a predetermined value is applied to the grip.

12. An apparatus for exercising, comprising:

- a first gripping assembly including:
  - a first and a second spring member, and
  - a grip connecting the first spring member to the second spring member;
- a second gripping assembly including:
  - a first and a second spring member, and
  - a grip connecting the first spring member to the second spring member; and
- a first tether connecting the first spring member of the first gripping assembly with the first spring member of the second gripping assembly; and
- a second tether connecting the second spring member of the first gripping assembly with the second spring member of the second gripping assembly.

13. The apparatus of claim 12, wherein the spring members cooperate to apply a substantially constant resistive force to the tethers as the tethers unwind.

14. The apparatus of claim 12, wherein the spring members are coil springs.

15. A method for exercising, comprising:

- applying a force to a gripping assembly, the gripping assembly including:
  - at least one spring member, and
  - a grip fixed to the at least one spring member; and
- at least one tether connected to the at least one spring member, wherein the tether winds around the longitudinal axis of the at least one spring member; and
  - an object connected to the tether,

wherein the applied force unspools the tether and increases a distance separating the object and the gripping assembly.

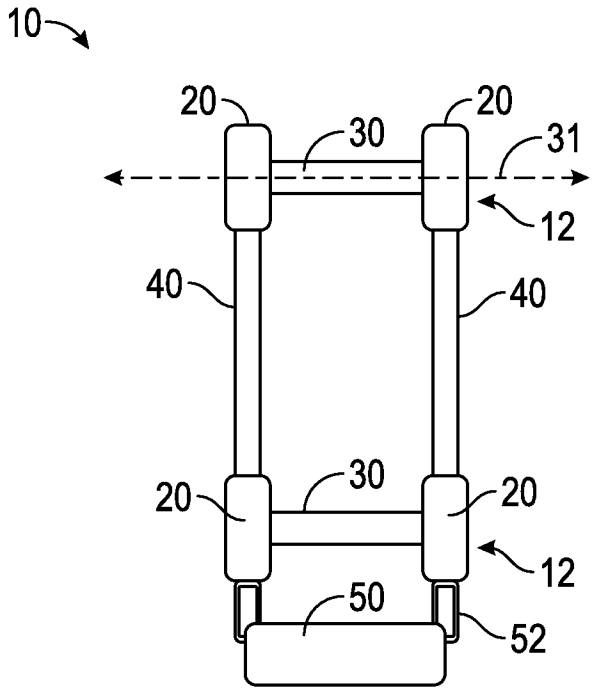

FIG. 1

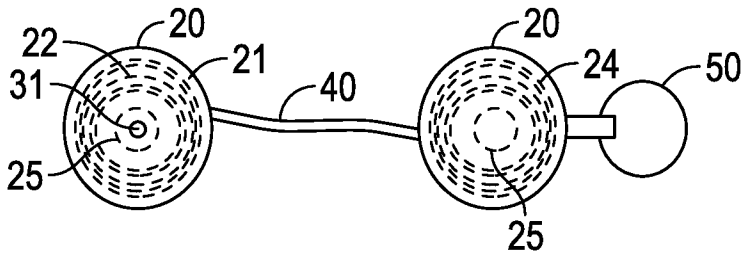

FIG. 2

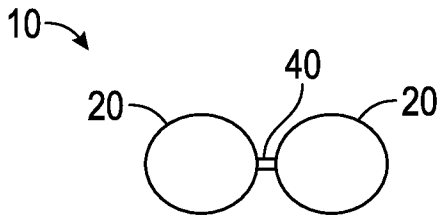

FIG. 3A

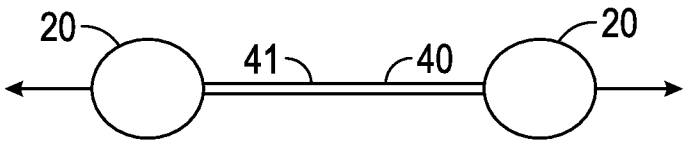

FIG. 3B

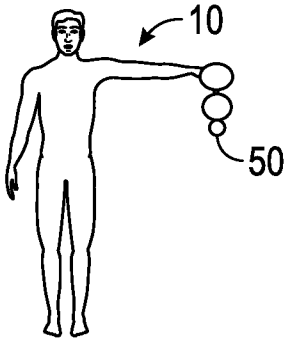

FIG. 4A

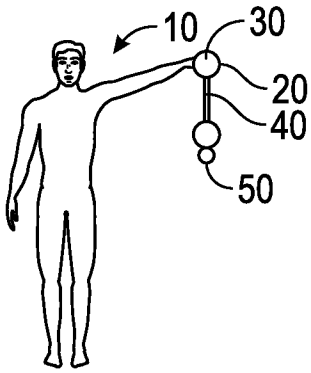

FIG. 4B

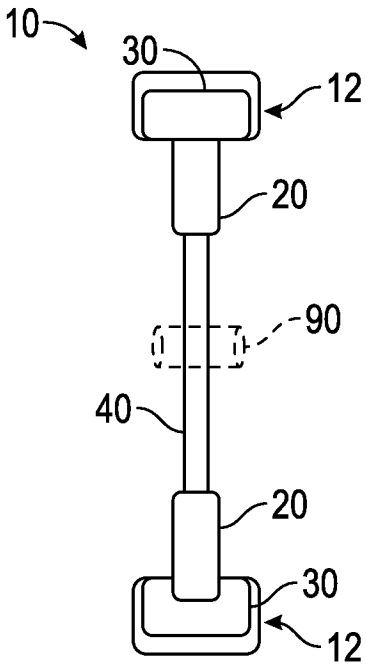

FIG. 5

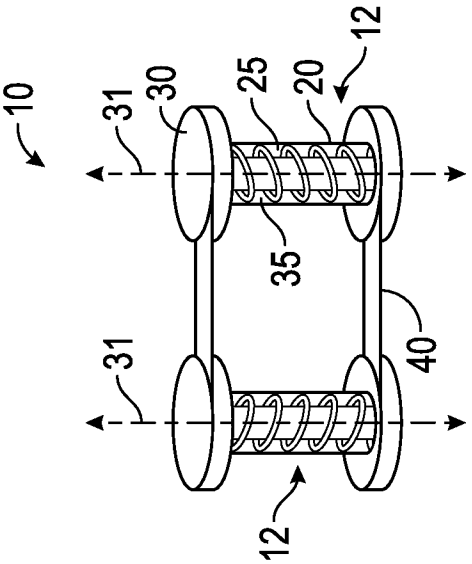

FIG. 8

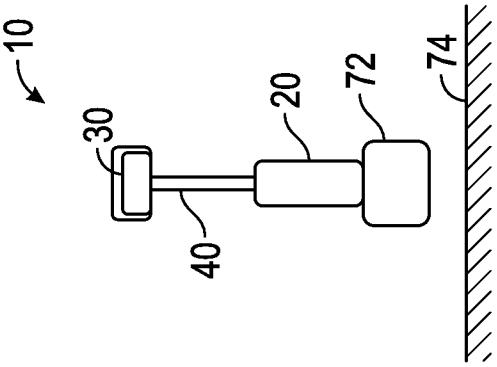

FIG. 7

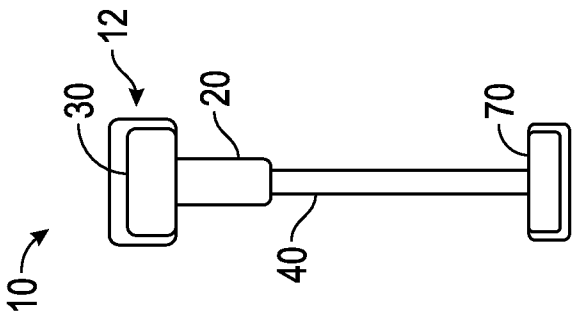

FIG. 6

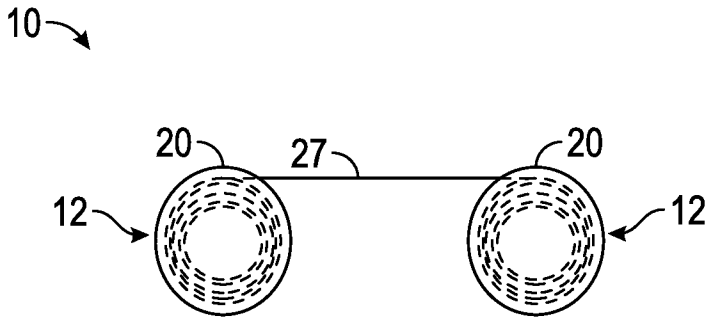
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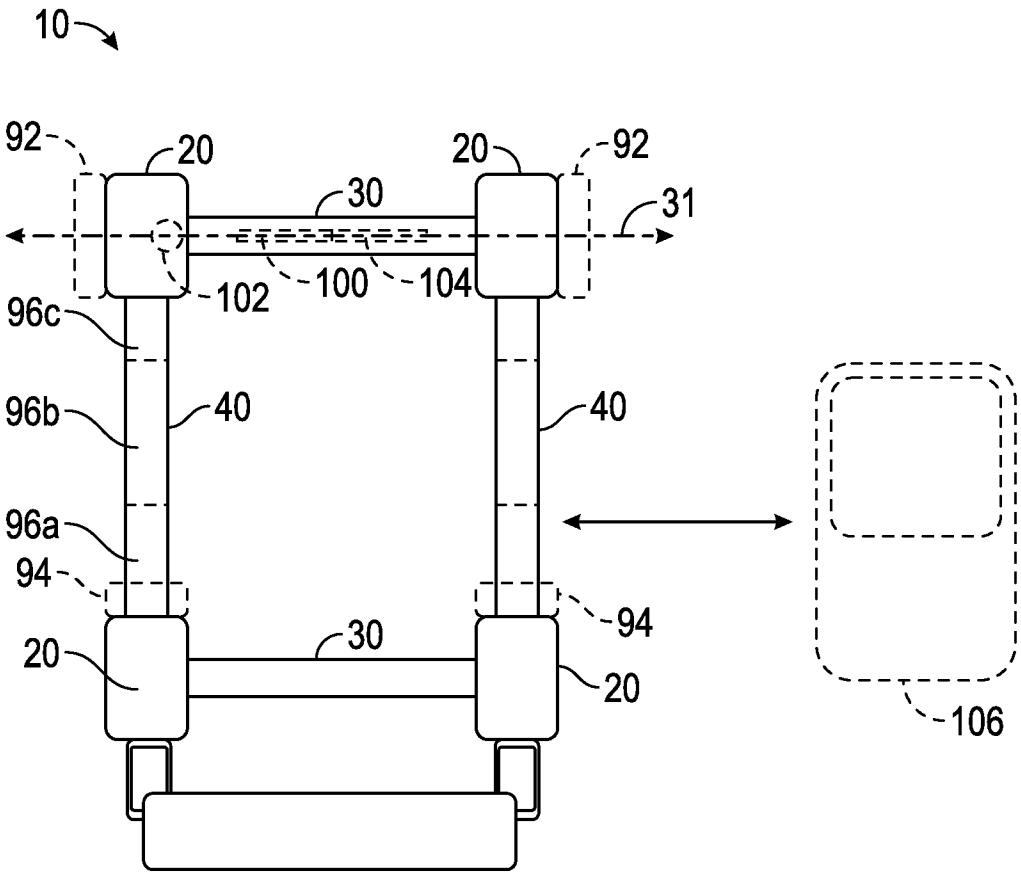
FIG. 9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106

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034006

A. CLASSIFICATION OF SUBJECT MATTER

A63B 21/02(2006.01)i, A63B 21/055(2006.01)i, A63B 21/06(2006.01)i, A63B 23/12(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A63B 21/02; A63B 21/05; A63B 21/045; A63B 21/30; A63B 23/00; A63B 21/018; A63B 21/00; A63B 21/055; A63B 21/06; A63B 23/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords:grip, spring, tether, weight, exercising apparatus

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 20-0380556 Y1 (KIM) 31 March 2005 See abstract; pages 1-2; claim 1; and Figures 1-2 and 4.	1-15
A	US 5437591 A (CHEN) 01 August 1995 See abstract; claims 1-2; columns 1-4; and Figures 1, 4.	1-15
A	US 7771331 B2 (LUCANO) 10 August 2010 See abstract; claims 1-20; and Figures 1-2.	1-15
A	US 7223219 B2 (LIESTER) 29 May 2007 See abstract; claims 1-9; columns 7-10; and Figures 4-6.	1-15
A	US 4291871 A (LIPPERT) 29 September 1981 See abstract; claims 1-5; columns 2-3; and Figures 1-3.	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 August 2014 (13.08.2014)	**13 August 2014 (13.08.2014)**

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2014/034006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 20-0380556 Y1	31/03/2005	None	
US 5437591 A	01/08/1995	None	
US 7771331 B2	10/08/2010	US 2010-0041525 A1	18/02/2010
US 7223219 B2	29/05/2007	US 2005-0221964 A1 US 2005-0227827 A1	06/10/2005 13/10/2005
US 4291871 A	29/09/1981	None	