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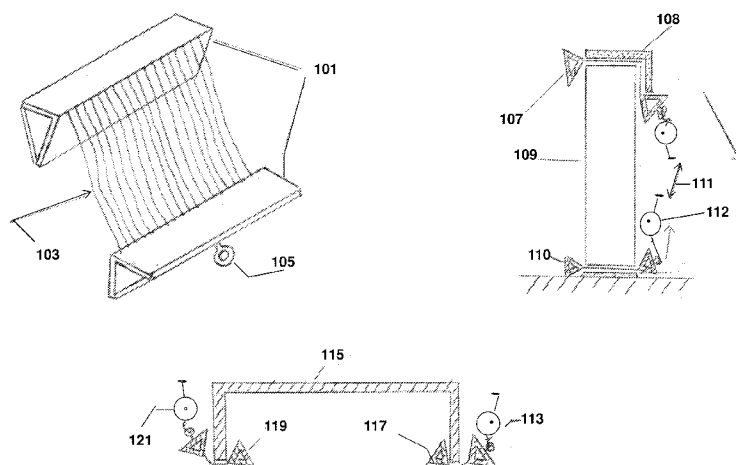


FIG 1

(57) Abstract: Pairs of magnetic disks (403, 503, 703, 803, 911) and reciprocation piston-cylinders (605, 610, 611, 613, 709, 707, 713, 721) filled with viscous fluid are used to provide friction for a portable exercise harness (112, 113, 101). The viscous fluid in cylinder-piston push-pull configuration provide resistance to a extension cable for the physical exercise. The exercise apparatus fits in a harness for travel and easy attachment to ordinary household furniture and fixtures.

MAGNETIC AND VISCOUS CYLINDER-PISTON RESISTANCE PORTABLE EXERCISE EQUIPMENT

TECHNICAL FIELD

[0001] The present invention generally relates to portable exercise equipment and specifically to exercise equipment whose physical weight is much less than the exercise forces that free weights can afford.

BACKGROUND

[0002] The area of physical exercise contains a large diversity of products. In addition, some systems provide feedback to a user of a weight stack machine having a stack of weight plates for lifting one or more of plates from a stack during lifts. Some of these systems use load cells for determining the weight of the weight plates prior to lift and for determining the weight of weight plates remaining on the stack after the user has lifted the plates. These systems may also provide means for evaluating the height of lifted weight plates or the distance that the weight stack is pulled.

[0003] One problem which arises from use of weight of a weight stack and the work done on the weight stack. The work done by the user in exerting a force on that weight provides only part of the resistance through which a user applies force and work. The work can also be done without a mass moving, strain work. Work can be done by accelerating the mass, not taken account by a straight weight-height calculation. The work done on a weight machine is not the desired quantity. What is needed is the force and work done by the muscle and on the muscle, which is not the same as the work done on an exercise object or weight stack. In addition, the weight stack machine variety is very heavy and not portable. What is needed are portable light-weight exercise apparatus for the traveler or just the weight lifter that wishes to store the equipment in a small closet.

[0004] There exists many body-part centric resistance training equipment such as Arm Curl Machine, Leg Curl Machine, Shoulder Press, Pull down Machine, Leg Extension Machine, Back Extension, Triceps Pushdown, and

more. Some can accommodate more than one set of body muscles. But these are all relatively heavy and difficult to port. In addition to the portability is the physical weight cost. An exercise regime using weights for resistance machines are costly and stationary once assembled. Travel, storage space and quick assemble are barriers to regular exercise. What is needed is light, inexpensive and easily portable exercise equipment.

SUMMARY

[0005] The present invention discloses a portable tension-resistance exercise equipment with harness to replace much heavier physical weight load equipment. The harness couples an anchor component for wedging in an anchor apparatus conveniently in typical living environments using household furniture or dwelling door jams and alternate static household structures, flexibly attached to a harness having a housing assembly with a freely rotatable gear. An exercise harness with an anchor component for wedging between household furniture and dwelling household structures is flexibly attached to the exercise harness with attached main housing assembly having at least two subassembly friction resistance generation units. The first subassembly contains a magnetic friction unit housed in a cartridge and the second subassembly contains a viscous fluidic cylinder-piston friction unit housed in a separate cartridge with both subassembly units slidably mounted in the main housing assembly and gear mesh coupled to the main gear in the main housing assembly. Each subassembly unit gear is power engaged with the main housing main gear for transmitting resisting tension to power transmitting cable wrapping about the main gear center via a sprocket gear. The wrapping cable attached to the main gear shaft centered rewinding spring and sprocket coupled to the main gear center with both cable ends, entering the main housing structure and wrapping around the main gear center for transmitting power to and from the cable ends. The sprocket free wheel coupled concentrically with the main gear for unidirectional tension transmission and rewinding to its original position after each extension or traction of the power cable about the main gear center. The magnetic subassembly have a rotatable gear affixed to the magnetic subassembly housing, the gear having embedded magnets concentric with an equal number of fixed assembly embedded magnets having magnetic attraction to the concentric fixed non-rotating subassembly magnets in resistance to gear rotation in the magnetic subassembly housing. The magnetic subassembly unit gear with magnetic resistance is meshed with a main gear for power transmission from the cable. The main gear is rigidly affixed to a harness attached shaft common to a rewinding spring with one end affixed to the shaft storing tension with shaft winding. The main gear also has a flexible

cable or rope with one end affixed to main gear for turning the gear with load. The cylinder-piston subassembly has a pair of tandem opposing cylinders-piston units alternately pressuring viscous fluid through a channel between the distal ends of the opposing cylinders-piston units. The complementing reciprocating cylinders each have racks coupled to each piston each with a pinion meshed with a half circle toothed pinion, each pinion half gear teeth complementary to the other to coincide with the push-pull piston-cylinder mechanism such that the unit gear upon which the two half gears are rigidly attached to a common shaft whose half gear teeth are 180 degrees out of phase to synchronize with the reciprocating cylinder-piston mechanisms. The cable are rotably attached to the main gear and upon user applied tension provides resistance to exerciser extension, whereby the harness provides resistance force to the turning of the main gear power rope or cable.

BRIEF DESCRIPTION OF DRAWINGS

- [0006] Specific embodiments of the invention will be described in detail with reference to the following figures.
- [0007] FIG. 1 illustrates the exercise harness anchor components and placement in an embodiment of the present invention.
- [0008] FIG. 2 illustrates the exercise exemplars in application of embodiments of the present invention.
- [0009] FIG. 3 illustrates a 5 magnet pair embedded in a gear and assembly according to an aspect of the present invention.
- [0010] FIG. 4 illustrates a 5 magnet pair gear meshed with a main gear showing an aspect of the present invention.
- [0011] FIG. 5 illustrates complementary half-toothed gears rigidly connected with power transfer gear according to aspects of the present invention.
- [0012] FIG. 6 illustrates complementary pair of rack-in-piston cylinder friction mechanisms according to embodiments of the present invention.
- [0013] FIG. 7 shows an integration of the complementing 180 degree teeth shifted half-gear components coupled to the synchronizing rack-in-piston-pinion components in an embodiment of the present invention.
- [0014] FIG. 8 shows power transmission from the main gear meshed with the unit gear rigidly coupled to complementing opposite half-gears in an aspect of the present invention.

[0015] FIG. 9 shows a power transmission gear meshed with a complementary half-teeth gear component meshed with the magnetic friction assembly in an embodiment of the present invention.

[0016] FIG. 10 shows front and isometric views of a main housing base assembly with open slots for mechanism subassemblies in an embodiment of the present invention.

[0017] FIG. 11 shows front view of a main housing base assembly with slots occupied with friction mechanism subassemblies in an embodiment of the present invention.

DETAILED DESCRIPTION

[0019] In the following detailed description of embodiments of the invention, numerous specific details are set forth in order to provide a more thorough understanding of the invention. However, it will be apparent to one of ordinary skill in the art that the invention may be practiced without these specific details. In other instances, well-known features have not been described in detail to avoid unnecessarily complicating the description.

[0020] OBJECTS AND ADVANTAGES

[0021] The present invention discloses a portable exercise apparatus. Accordingly, it is an object of the present invention to use light-weight components to create the load resistance equivalent to much heavier and more expensive weight load portable exercise equipment.

[0022] Embodiments of the invention are based on two separate types of force resistance integrated into a flexible harness which can be used inside a dwelling taking advantage of a dwelling structure door ways, furniture or exerciser feet as anchor component fix positions, to exercise the different muscle systems in various convenient living locations. The harness is to anchor exercise apparatus conveniently in typical living environments and light weight for portability, yet sturdy and strong enough to handle the typical tension load requirements for indoor and comparable exercise.

[0023] FIG. 1 illustrates the exercise harness, anchor components and placement in an embodiment of the present invention.

[0024] In this embodiment of the invention as Super Portable Weigh, SPW, an apparatus whose harness 112, 113, 101 is anchored to structures 109, 115 at indoor convenient locations 107, 110, 117 for purposes of resistance type exercise indoor exercise. Locations on a door 109 frame or bed frame 115 are used to place anchors 101, 107, 110, 117. The anchor consists of lite-

weight rigid 101 material blocks coupled by flexible fiber 103, rope, ribbon, wire ribbon, plastic or composite tape or cable; a wire ribbon is shown. The flat fiber connection can be of any material that is flexible yet able to support a tension of at least 200 lbs. The anchor blocks 101, 107 110 119 117 are positioned relative to the door frame 108 or a bed frame as 115 respectively as shown in FIG. 1 and have a coupling attachment 105 to the harness. The motion resistance device portion 112 113 121 is attached to the typical anchor 101 110 117 119 via the SPW harness with the anchor attaching coupler 105. The harness anchor-wedge component 101 103 105 is designed to be wedged primarily in furniture or household structures for exercising trapezoids, pectoralis, supraspinatus, supraclavicular, deltoid, and other muscle groups.

[0025] The portable tension-resistance exercise apparatus, SPW, harness with an anchor component 101 110 117 119 for wedging between household furniture and alternate dwelling household structures to the anchor component is flexibly 105 attached via the exercise harness coupler 105 to a main housing assembly buckle FIG. 11 1101 with at least 2 subassembly friction resistance generation units.

[0026] FIG. 2 illustrates the exercise exemplars in application of embodiments of the present invention. The pulling or pushing motions 210 213 depicted by the thick arrows exercise the various muscle groups including the Trapezoids 207, Supraspinatus/ Supraclavicular/ Pectoralis 209, Deltoid 201, Pectoralis 205, and the Scapula 203. The person figures illustrate some of the modes of exercise which can be done for the benefit of the above muscle groups.

[0027] FIG. 3 illustrates a 5 magnet pair embedded in a gear and assembly according to an aspect of the present invention. A magnetic resistance gear 301 is a component in the magnet pair embedded assembly view A-A. The A-A view of the holding plate and gear assembly shows a rigid

stationary magnet holder plate 303 with concentric embedded magnets 307 each paired with a concentrically aligned rotating gear 307 rigidly coupled magnets 313. Five such magnet pair placements are depicted 301. The assembly housing is comprised of a flat lite weight but rigid plate casing 311 concentric to and coupled at the gear 307 center. The plate casing is coupled to the holder plate 305 with fasteners 309 on the periphery of the housing 311. When the gear is rotated through the concentric magnet pair field lines are broken and opened causing the initiation and collapse of the coupling magnetic pair field lines producing a resisting mechanical force. The mechanical resistance force is proportional to the magnetic pairs, size, residual magnetism of the materials and components. Many materials and magnetic types can be used. The magnetic force of attraction increases the static and kinetic friction on the gear 313 plate surfaces causing opposing resistance to rotational motion. The magnet pairs are each split, with the gear 301 having one member of each pair 313 and the static plate or holder 303 housing having the other pair member 305 307 on the holder plate 303. The embedded magnet pairs can be of variable size, thickness and shape, but are shown here as flat round and thin in one embodiment.

[0028] FIG. 4 illustrates a 5 magnet pair gear meshed with a main gear showing an aspect of the present invention.

[0029] The assembly of gear 403, magnets 401 and back housing plate 405 are packaged with a thin flat rigid casing anchored to the plate 405 via fasteners 407, allowing the magnet holding gear 403 to be rotated through magnetic friction about an axis meshed with another gear 409, the main gear 409, through a port cut on one side of this casing 403. The rotational transmission of applied force received through wrapped cable coupled free wheel 411 and is transmitted from the main gear 409 to the meshed magnetic resistant gear 403. The transmission cable and free wheel 411 are coupled to accommodate sudden repeated brief accelerations and intermittent surface seizing from dust. The intermittent friction bursts are smoothed out through

alternative friction means. the magnetic subassembly having a rotatable gear 403 rotatably anchored to the magnetic subassembly housing 405, the magnet embedded gear 403 having embedded magnet concentric with an equal number of fixed assembly embedded magnet 401 opposite partners having magnetic attraction to the concentric fixed subassembly magnets in resistance to gear 403 rotation in the magnetic subassembly housing 405. The magnetic subassembly unit gear with magnetic resistance is meshed with a main gear for power transmission from an exerciser pulling cord, rope or cable.

[0030] FIG. 5 illustrates complementary half-toothed gears 503 505 rigidly connected by shaft with power transfer gear 501 according to aspects of the present invention. The half gears 503 505 are concentrically rigidly mounted to the power transfer gear 501 on a rigid coupling shaft, such that power is transmitted from the gear teeth engaging half gears 503 505 in complementary fashion, each half gear 503 505 with gear teeth on half the revolution and mounted 180 degrees opposite the other. This so that only one of the half gears is engaged for transmission for only half the revolution.

[0031] FIG. 6 illustrates complementary pair of rack-in-piston cylinder friction mechanisms according to embodiments of the present invention.

[0032] The reciprocating pair of rack-in-piston cylinder 611 603 provide a second type of force resistance to the a meshed gear force transmission. The cylinders 611 contain a viscous fluid that is pushed from one cylinder 611 to the reciprocating cylinder through a conduit 609 with a throttling section 607 for adjusting the viscous fluid resistance through a channel 609 cross section manipulation 607 via a valve or other flow control component. The piston 605 drives the rack-and-pinion 601 gear through the cylinder 603.

[0033] FIG. 7 shows an integration of the complementing 180 degree teeth shifted half-gear 703 719 components coupled to the synchronizing rack-in-piston-pinion 705 721 components in an embodiment of the present invention.

[0034] The unit gear 701 is rigidly coupled to a shaft 701, between two pinion half gears 703 719 concentrically mounted on a transmission shaft 701. The two pinion half gears 703 719 are positioned with gear teeth covering only half of each gear and with the gear teeth on opposite gears having the gear teeth configured 180 degrees offset from each other, in such a way that when one half gear engages with its rack 705 721, the other disengages with its own rack 705 721. The resulting power transmission alternates from piston A 708 at top of stroke pushing the viscous substance into cylinder B 713 to out stroking the piston B 717 which is not gear teeth engaged to half gear 719, and freely filling the cylinder 713 with viscous fluid without engaging power transmission to the unit gear 701. As the unit gear 701 rotates the half gear 719 engages at the in stroke of the piston 717 driving the piston 717 into the cylinder 713 and pushing the viscous fluid through the connecting channel 711 to the reciprocating cylinder 709. On this cylinder 709 piston 708 outstroke, the opposite half gear 701 drives the half gear on the opposite side. The cylinder-piston subassembly contains a pair of tandem opposing cylinders-piston 713, 717, 709, 709 units alternately pressuring viscous fluid through a channel 711 between the distal ends 709, 713 of the opposing cylinders-piston units; the complementing cylinders 709 713 each with racks 705 721 affixed to each piston 708 717 respectively each meshed with a half circle toothed pinion 703 719, each pinion half gear teeth complementary to the other synchronous with the push-pull piston-cylinder mechanism such that the unit gear 701 upon which the two half gears 701 719 are rigidly attached to a common shaft whose half gear teeth are 180 degrees out of phase.

[0035] FIG. 8 shows power transmission from the main gear 807 meshed with the unit gear 801 rigidly coupled on a shaft 805 to complementing opposite half-gears 803 in an aspect of the present invention.

[0036] The main gear 807 in the assembly transmits power to the unit gear 801 which then transfers the power to its rigidly coupled concentric mounted half-gears 803. The main gear 807 is concentrically coupled to a free wheel 817 coupled to one end of a cable or rope 811 from which the other end is used for human exercise extension and tension. A sprocket free wheel 817 is also coupled to an rewind spring cable 815 which serves to rewind the free wheel 817 and reposition the pulling cable 811 extension end after each extension.

[0037] FIG. 9 shows a power transmission main gear 907 meshed with a unit gear center shaft coupled to complementary half-teeth gear 905 component meshed with the magnetic friction assembly 911 in an embodiment of the present invention.

[0038] The main gear 907 engages the unit gear 903 coupled to the friction enhancing viscous piston-cylinder 901 rack-and-pinion 902 subassembly. The rack-and-pinion 902 assembly is coupled to the complementing half gears 905 such that the engaging half gear teeth are synchronized with the two opposite stroke reciprocating cylinder 901 pistons. The transmitted force originating in the power cable or exerciser pull cord 915 via the sprocket free wheel 909 and into the main gear 907 is attached to the free wheel 909 which is rotated by traction through a wrap around cord 915. A rewinding spring and cord 913 is coupled to the free wheel 909 and functions to rewind the free wheel to its original position after each extension or traction were the rewind spring catch or stick. The sprocket free wheel 909 is coupled concentrically with the main gear 907, for unidirectional tension transmission and to rewind the free wheel 909 to its original position after each extension or traction of the power cable 915 about the main gear center 907.

[0039] . FIG. 10 shows front 1001 and isometric view 1017 of a main housing base assembly with open slots for mechanism subassemblies in an embodiment of the present invention.

[0040] The Main housing base assembly 1001 is comprised of rigid materials such as metal, hard plastic or composites. A center hole 1007 for coupling the main gear anchors the main gear to the main housing base 1001. Slots for the magnetic 1003 1011 and Cylinder-Piston subassembly cartridges are radial situated with respect to the main gear axial 1007 center. Fasteners 1009 secure the slot walls to the base 1001 which provide for slide placement of the magnetic and Cylinder-Piston half gear subassemblies. A suspension buckle 1015 is rigidly attached to the base to support the tensions and forces for the manual exercises to a ready indoor anchor point.

[0041] FIG. 11 shows front view of a main housing base assembly with slots occupied with friction mechanism subassemblies in an embodiment of the present invention

[0042] A port 1121 for a magnetic gear cartridge subassembly containing a magnetic friction unit housed in a cartridge and a port for a second subassembly containing the viscous fluidic cylinder-piston friction unit 1103 housed in a separate cartridge, both subassembly units slidably fixed to the main housing assembly 1102 and gear meshed to the main gear 1116 in the main housing assembly 1102. Each subassembly unit gears 1121 1103 are power meshed with the main housing gear 1116 for transmitting resisting tension force to power transmitting cable 1113 wrapping about the main gear center 1115.

[0043] The second assembly containing the viscous fluidic friction unit 1103 provides a smoothing function on the main housing unit and specifically on the first subassembly magnetic friction unit. Magnetic unit design can vary and some designs for the first assembly can produce intermittent surface seizing or friction bursts between the magnetic pair surface contact. The

viscous fluid subassembly adds a dampening effect to the mechanism to smooth out any jerking motion from the magnetic subassembly.

[0044] A suspension buckle 1101 is hinge coupled to the main assembly housing base 1102. The base slots are shown occupied with cylinder-piston 1103 cartridge and two magnetic cartridges 1107 1121. These have locking mechanisms 1105 1109 1119 1123 to for slidably installing and removing the cartridges 1103 1107 1121 into their base slots. A slot opposite the suspension buckle 1101 is maintained for the extensor cord 1113 and sprocket rewind spring 1117 on the main gear. The main gear is coupled to the base through the base center hole 1115.

[0045] The wrapping cable or exerciser pulling rope 1113 is power coupled to the main gear shaft 1115 centered free wheel rewinding spring 1117 and coupled to a main gear center 1115 shaft with both cable ends 1117 1113 entering the main housing structure 1102 and wrapping around the main gear center 1115 for transmitting power to and from using the cable 1117. The main gear 1116 is coupled to the main housing 1102 shaft 1115 and user exercise tension is harnessed by coupling the tension to a free wheel sprocket rewinding spring with one end coupled to the shaft for transmitting tension to shaft winding. The main gear 1116 is coupled to the free wheel via a common shaft center, and the flexible puller component, cable or rope having one end coupled to main gear 1116 for turning the gear with load for transmission of load to the subassemblies 1121 1103 1107. The rope or cable 1113 sprocket winding rotably coupled to the main gear 1116 upon which exerciser pulling will engage with the resistance gear subassemblies 1121 1103 1107 to provide resistance to puller tension. The exercise harness is coupled to the suspension buckle 1101 to anchor the exercise harness to provide resistance force to the turning of the main gear power rope or cable.

[0046] An embodiment of the invention is to provide a modularity to the SPW component of the exercise harness. The main housing provides slots for magnetic friction cartridges or viscous fluid cylinder-rack cartridges. These

are all packed and packaged in strong durable rigid material with a small opening in the housing for the extension cable. The packaging can be of such materials as plastic, metal, composite, wood and combinations. A prototype composed of:

[0047]

1 magnetic resistor cartridge weighs 8 OZ	provides 128 OZ	resistance force
1 magnetic resistor cartridge weighs 8 OZ	provides 128 OZ	resistance force
1 magnetic resistor cartridge weighs 8 OZ	provides 128 OZ	resistance force
1 viscosity resistor cartridge weighs 9 OZ	provides 114 OZ	resistance force
The free wheel, the main gear, the box weigh 16 OZ		
The total weight	49 OZ	provides 488 OZ
resistance force		

[0048] This proves out an object of the invention to provide exerciser extension resistance force that is roughly 10 times the weight of the device.

[0049] Therefore, while the invention has been described with respect to a limited number of embodiments, those skilled in the art, having benefit of this invention, will appreciate that other embodiments can be devised which do not depart from the scope of the invention as disclosed herein. Other aspects of the invention will be apparent from the following description and the appended claims.

CLAIMS

What is claimed is:

1. A portable tension-resistance exercise apparatus with harness to anchor apparatus conveniently in typical living environments comprising:

an exercise harness with an anchor component for wedging between household furniture and dwelling household structures;

the anchor component flexibly attached to the exercise harness having main housing assembly with at least two subassembly friction resistance generation units;

the first subassembly containing a magnetic friction unit housed in a cartridge and the second subassembly containing a viscous fluidic cylinder-piston friction unit housed in a separate cartridge, both subassembly units slidably mounted in the main housing assembly and gear mesh coupled to the main gear in the main housing assembly;

each subassembly unit gears are power engaged with the main housing main gear for transmitting resisting tension to power transmitting cable wrapping about the main gear center via a sprocket gear;

the wrapping cable attached to the main gear shaft centered rewinding spring and sprocket coupled to the main gear center with both cable ends entering the main housing structure and wrapping around the main gear center for transmitting power to and from the cable ends;

the sprocket free wheel coupled concentrically with the main gear, for unidirectional tension transmission and rewinding the free wheel to its original position after each extension or traction of the power cable about the main gear center;

the magnetic subassembly having a rotatable gear affixed to the magnetic subassembly housing, the gear having embedded magnets concentric with an equal number of fixed assembly embedded magnets having magnetic attraction to the concentric fixed subassembly magnets in resistance to gear rotation in the magnetic subassembly housing;

the magnetic subassembly unit gear with magnetic resistance meshed with a main gear for power transmission from the cable;

the main gear rigidly affixed on a harnessed attached shaft common to a rewinding spring with one end affixed to the shaft storing tension with shaft winding and also having a flexible cable or rope with one end affixed to main gear for turning the gear with load;

the cylinder-piston subassembly having a pair of tandem reciprocating cylinders-piston units synchronized for alternately pressuring viscous fluid through a channel between the distal ends of the opposing cylinders-piston units;

the reciprocating cylinder units each with racks affixed to each piston each with a pinion meshed to a half circle toothed pinion, each pinion half gear teeth complementary to the other to coincide with the push-pull piston-cylinder mechanism such that the unit gear upon which the two half gears are rigidly attached to a common shaft whose half gear teeth are 180 degrees out of phase;

the rope or cable on rotably attached to the main gear and upon tension provides resistance to exerciser extension,

whereby the harness provides resistance force to the turning of the main gear power rope or cable.

2. A portable force resistant exercise equipment of claim 1, wherein there are at least five flat magnets with concentric pair in the magnetic friction assembly unit.
3. A portable force resistant exercise equipment of claim 1 or 2, wherein the anchor to gear flexible attachment can be rope, flat tape or gable.
4. A portable force resistant exercise equipment of claim 1, 2, or 3, wherein the anchor can be wedged in furniture or household structures for exercising trapazoids, perctoralis, supraspinatus, supraclavicular, deltoid, and other muscle groups.

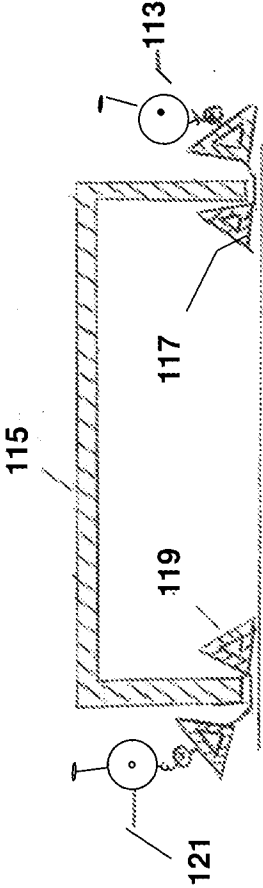
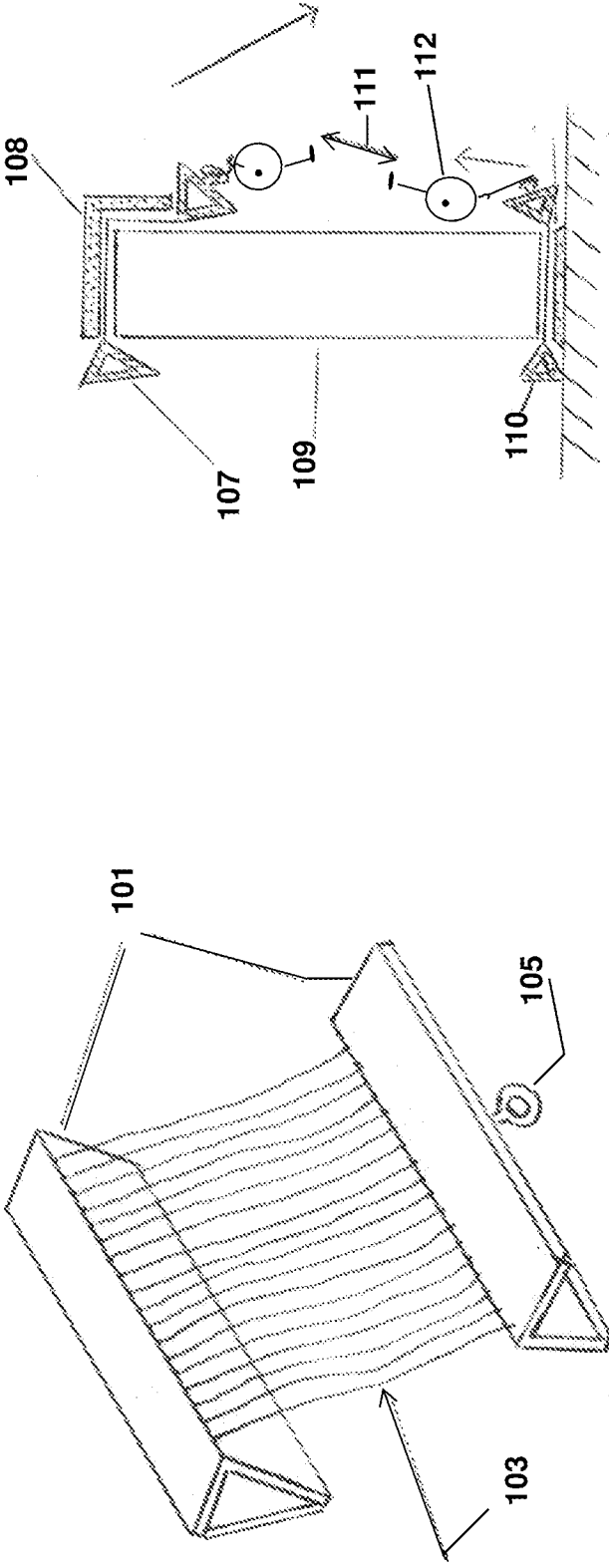
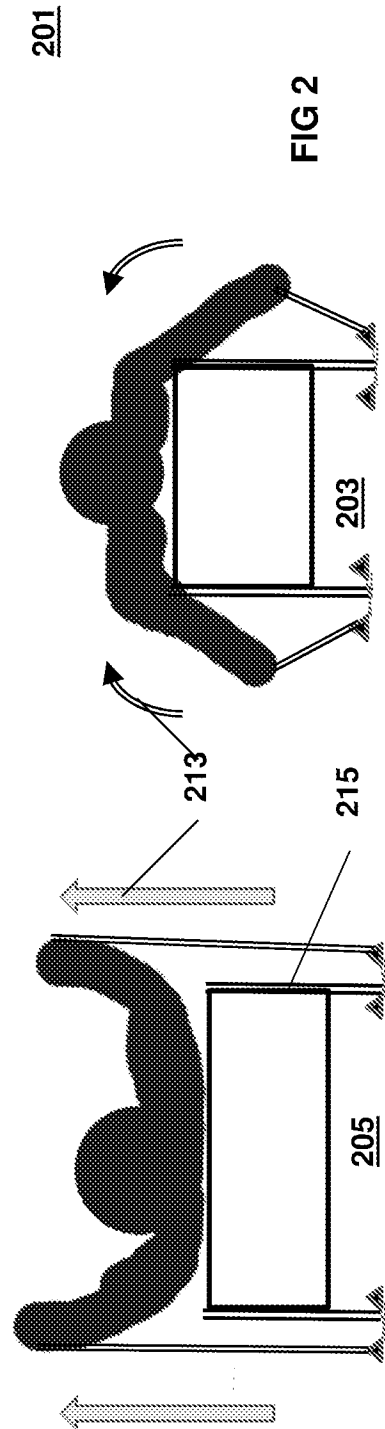
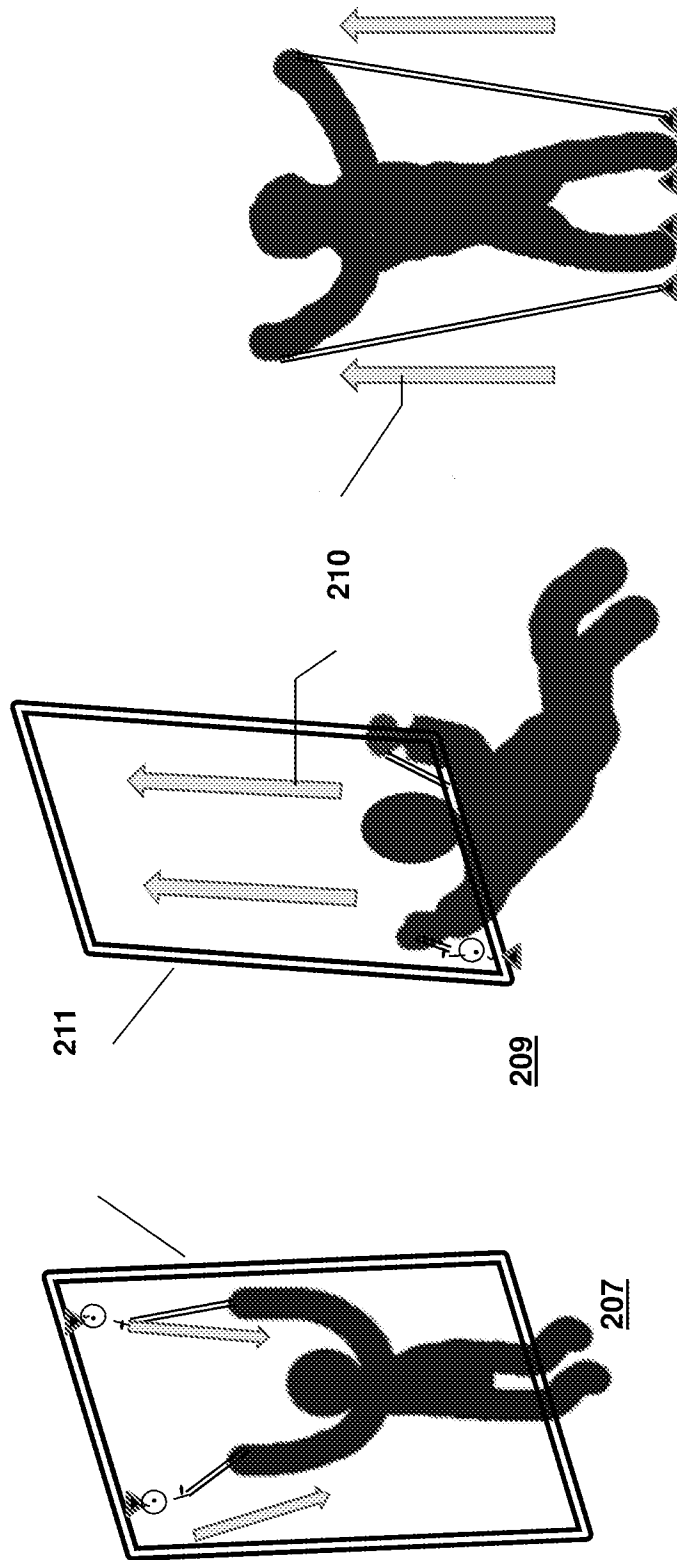
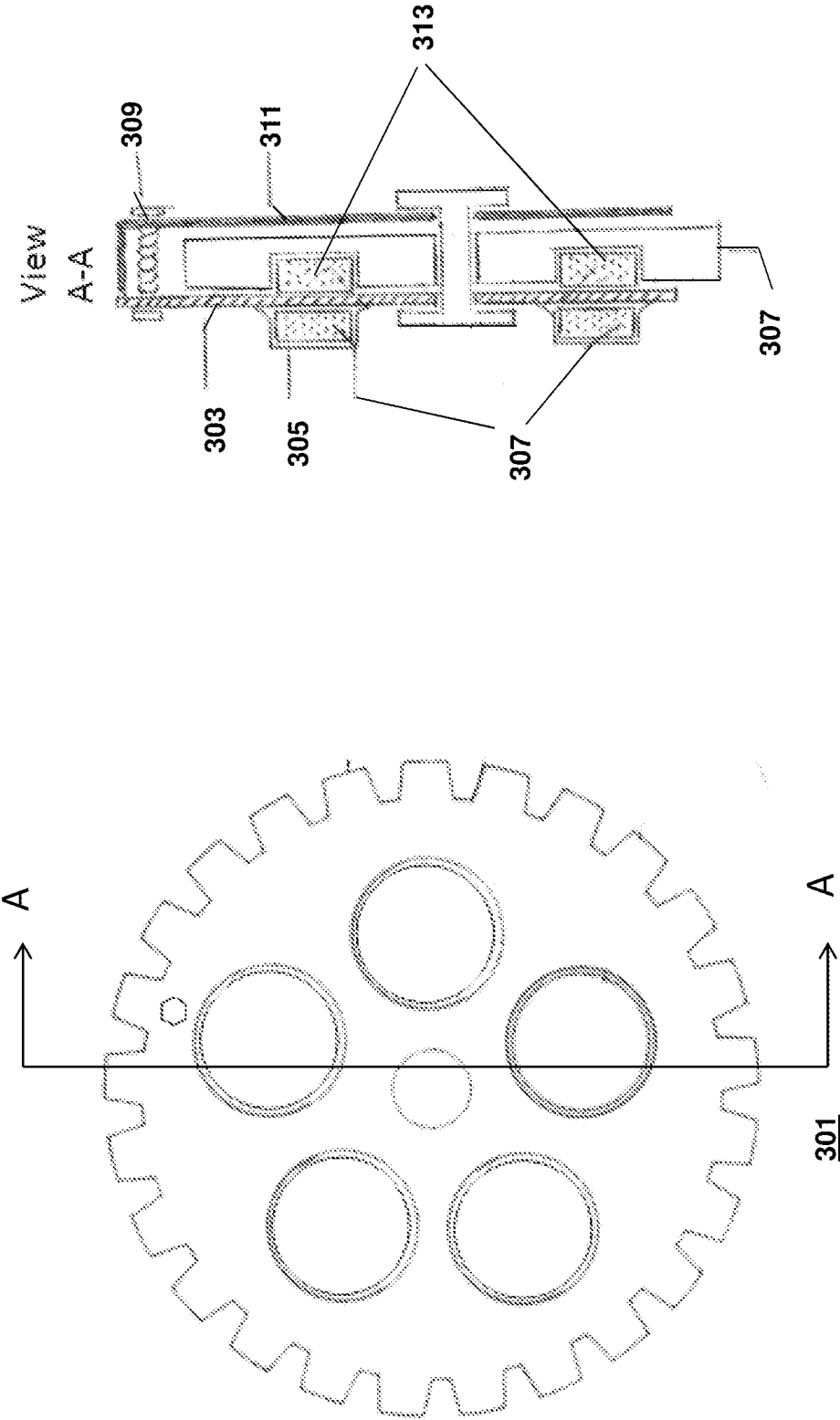
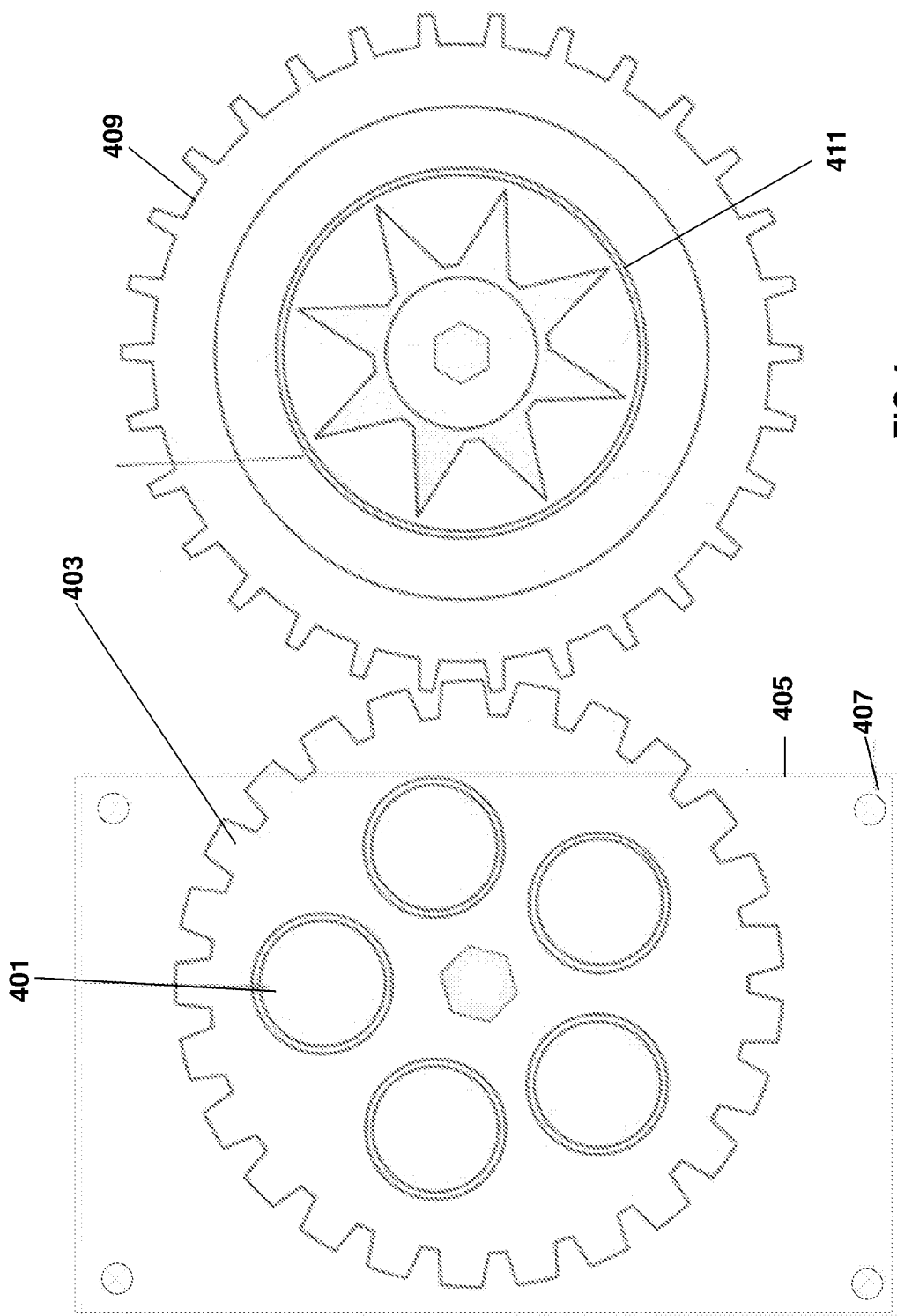


FIG 1

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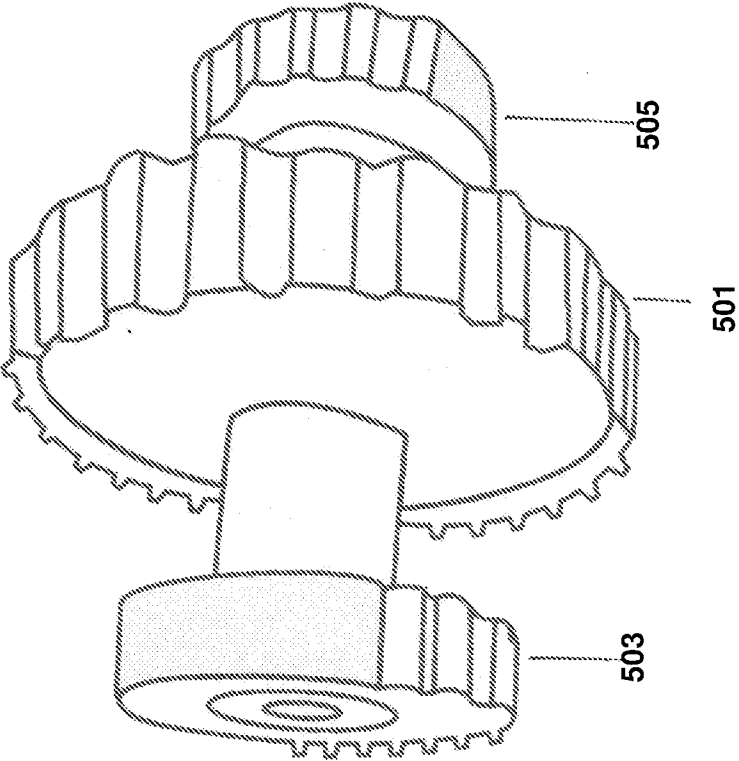


FIG 5

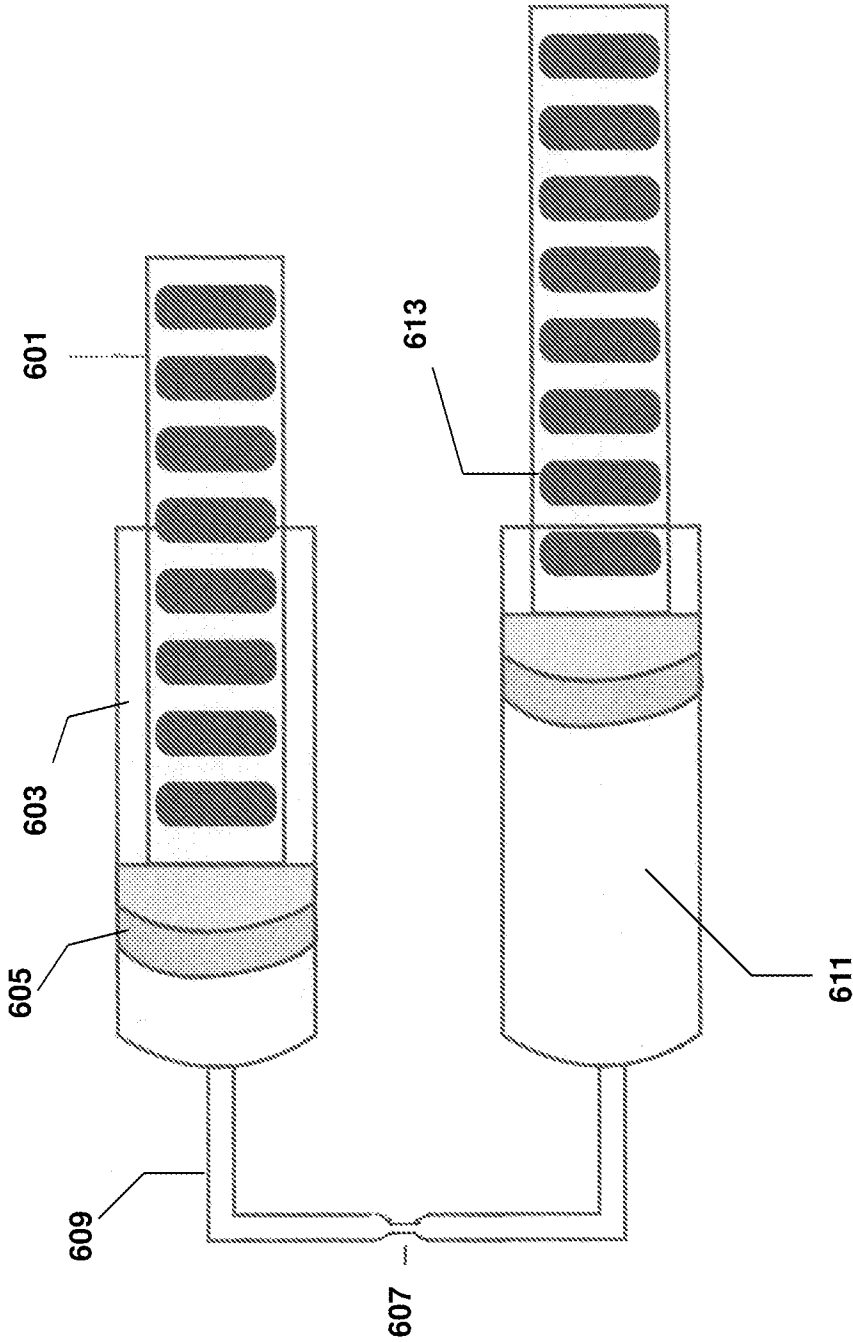


FIG 6

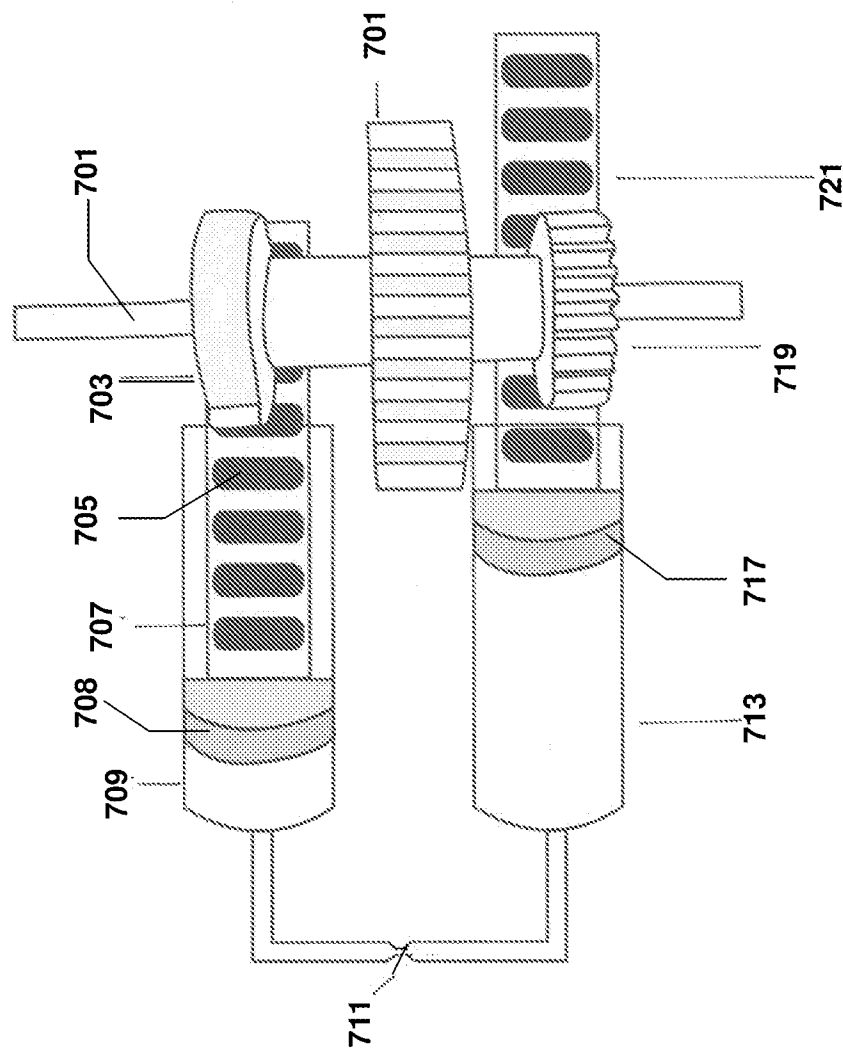
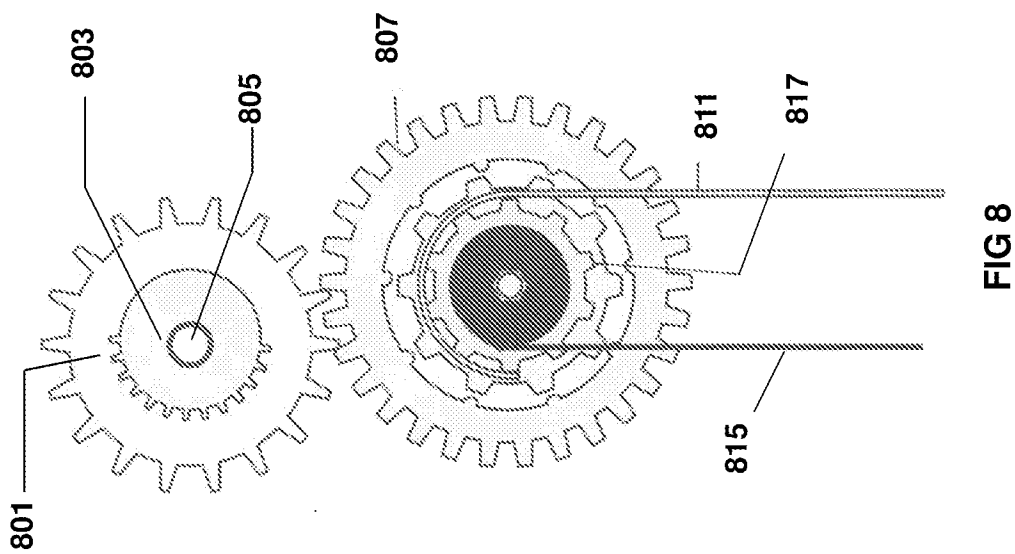
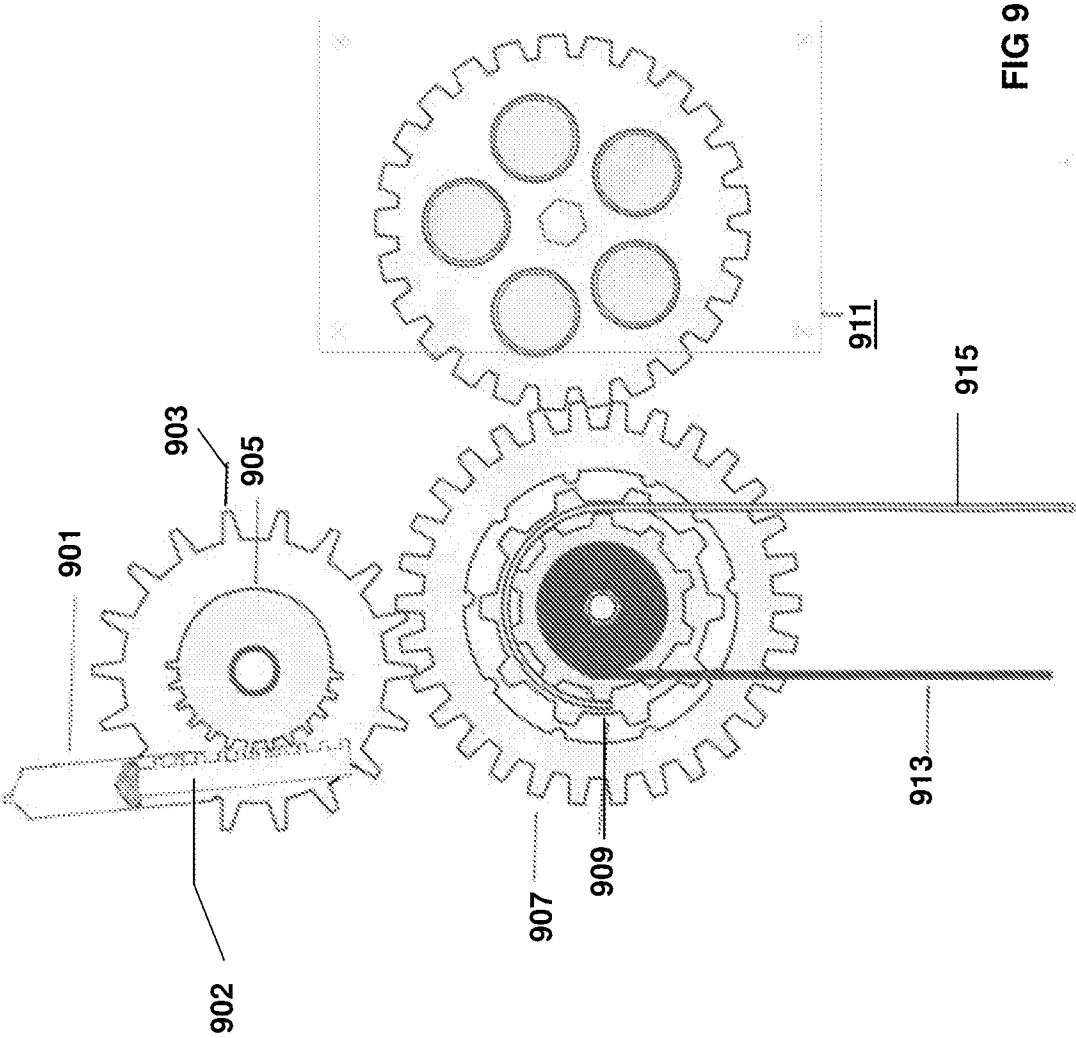


FIG 7





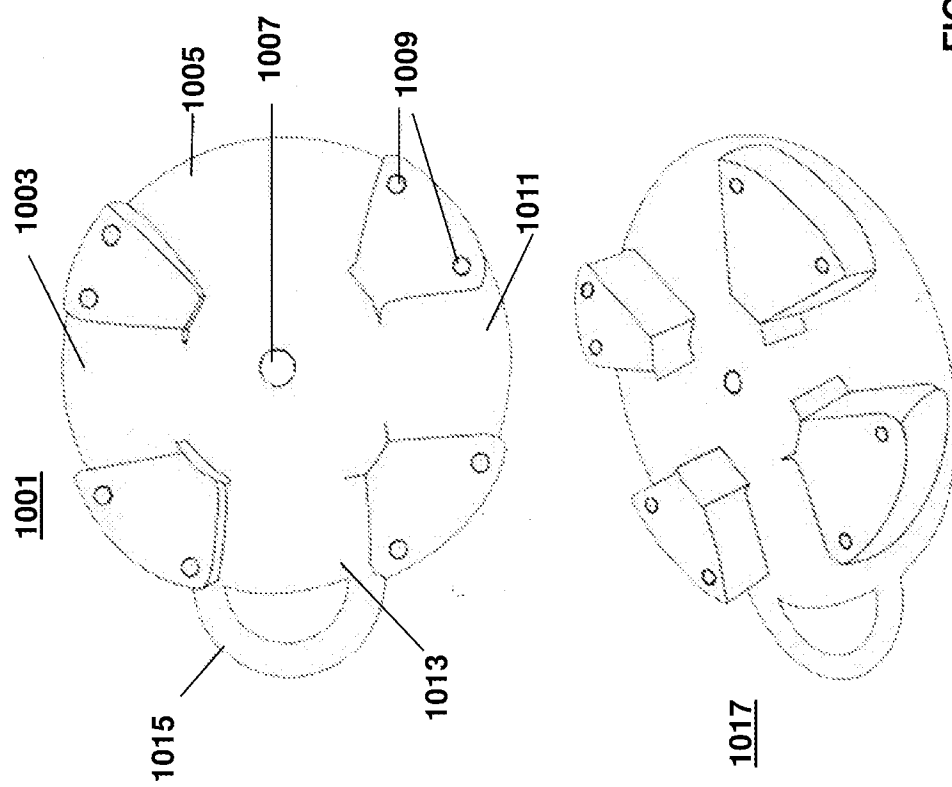


FIG 10

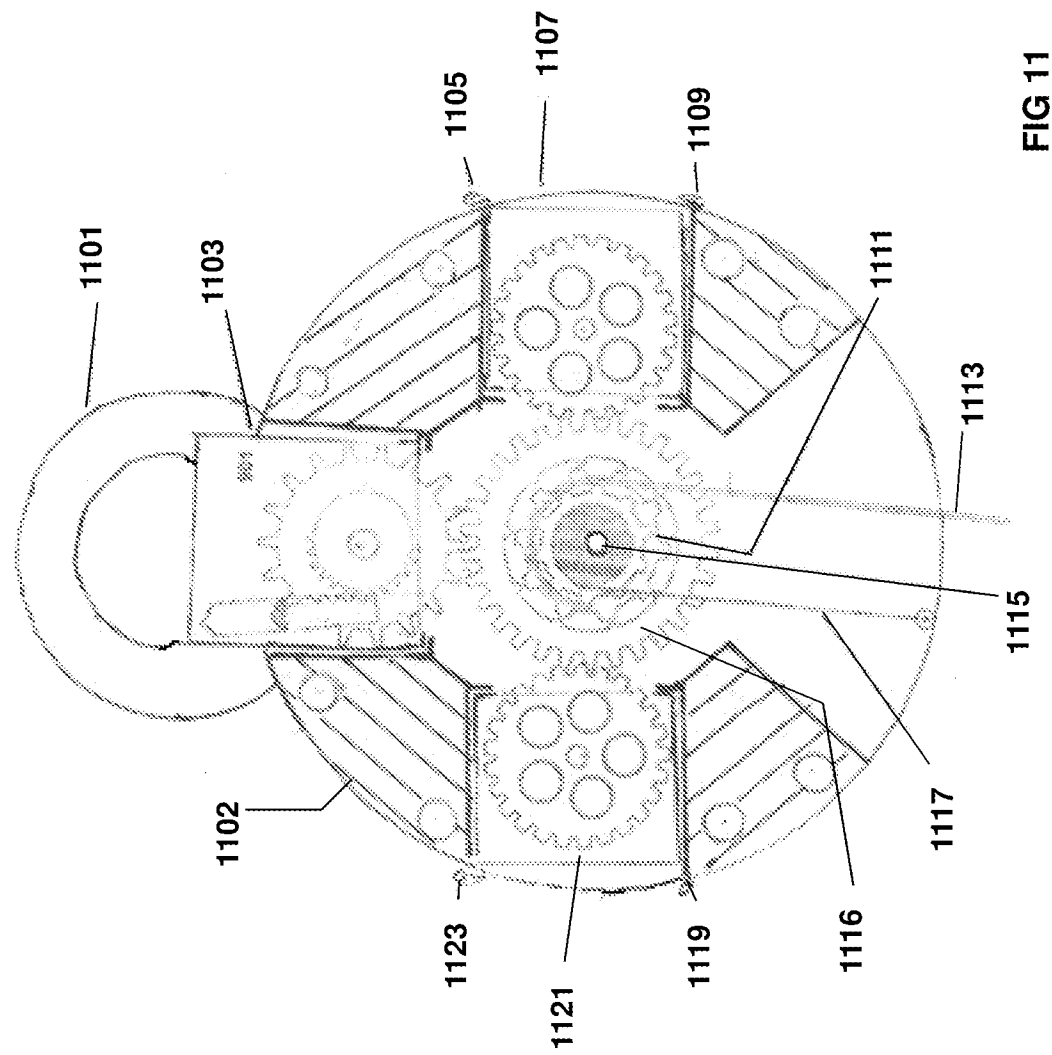


FIG 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/052242

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A63B 21/22 (2015.01)

CPC - A63B 21/225 (2015.11)

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)

IPC(8) - A63B 21/00058, 21/00192, 21/0083, 21/0087, 21/012, 21/018, 21/023, 21/153, 21/225 (2015.01)

CPC - A63B 21/00, 21/008, 21/012, 21/018, 21/02, 21/22 (2015.11)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC - 482/93, 114, 115, 116, 120 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patents, Google.

Search terms used: exercise equipment, friction resistance, harness, anchor, housing, gear, sprocket, pinion, rack, piston, cylinder, reciprocating, viscous fluid, magnet, embedded, wheel, tension, power cable, rewinding spring

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/0086779 A1 (WILKINSON) 04 July 2002 (04.07.2002) entire document	1-3
A	US 2011/0111923 A1 (BACANOVIC et al) 12 May 2011 (12.05.2011) entire document	1-3
A	US 5,230,674 A (TERAUDS) 27 July 1993 (27.07.1993) entire document	1-3
A	US 2007/0259759 A1 (SUMNERS et al) 08 November 2007 (08.11.2007) entire document	1-3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

12 November 2015

Date of mailing of the international search report

14 DEC 2015

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Blaine Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/052242

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 4
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.