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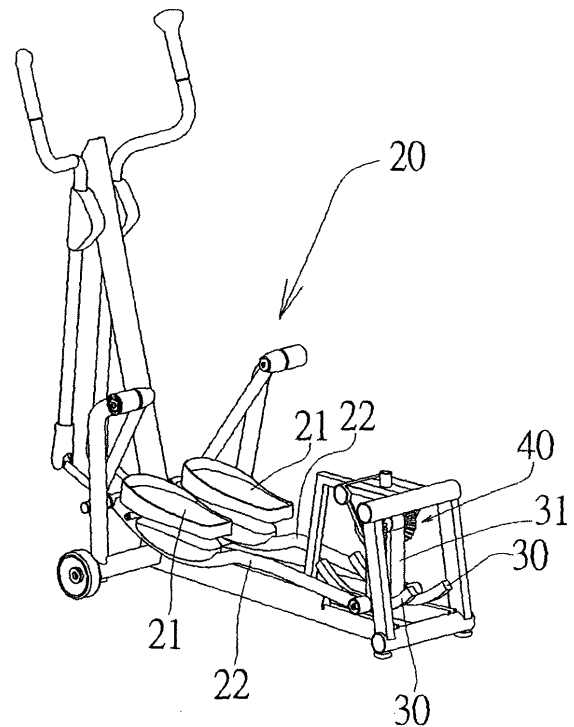
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(54) **Inertia load mechanism of a reciprocating exercise equipment**

(57) In an inertia load mechanism of a reciprocating exercise equipment (20; 60), a pendulum load mechanism is installed to an exercise link rod of said reciprocating exercise equipment (20; 60), such that the pendulum load mechanism forms an inertia link and gives an exercise resistance. If the moving link rod of the reciprocating exercise equipment (20; 60) is at a moment of changing its exercise direction, the speed of changing direction of the pendulum load mechanism will be slowed down by the gravitational force, so that an exerciser's muscle has sufficient response time for the change of the exercise direction to eliminate a possible sport injury.



**FIG.1**

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## Description

### BACKGROUND OF THE INVENTION

**[0001]** The present invention relates to an inertia load mechanism of a reciprocating exercise equipment, and more particularly to an innovative mechanism that prevents sport injuries.

**[0002]** Reciprocating exercise equipment refers to exercise and fitness equipment such as elliptical exercise machine, a rowing exercise machine, a treadmill, a dumbbell or a waist twisting exercise machine. As known, such exercise training equipments are nothing more than providing a reciprocating exercise such as a back-and-forth, up-and-down, lift-and-drop, pull-and-release, or left-and-right movement of a certain part of the body including hands, legs or waist. With reference to FIG. 9 for a general conventional reciprocating exercise mechanism (usually applied in an elliptical exercise equipment), a circular moving inertia load flywheel 10 is operated together with an exercise link rod 11 to complete a back-and-forth elliptical exercise status 12. In FIG. 9, the inertia load flywheel 10 not only provides an appropriate exercise load (or resistance of an exercise) for the exercise link rod 11, but also drives the exercise link rod 11 to move reciprocally by the inertia operating function of the inertia load flywheel 10.

**[0003]** As to the principle of mechanical exercise, an installation of the aforementioned conventional exercise mechanisms has its advantage on basic structure. As to the principle of physiological exercise, the characteristics and conditions of these mechanical exercises are major causes of sport injuries. In the following, a treadmill is used as an example for the illustration as follows.

**[0004]** While an exerciser is doing a natural treadmill reciprocating exercise, the exerciser's leg is lifted to a maximum height and then lowered in an opposite direction, the moving speed slows down naturally or the movement may even stop, so that the exerciser's muscle has sufficient response time to line up with the change of a moving direction. Similarly, the above applies in a situation when the exerciser lowers a leg, stands stably or switches exercising another leg. In short, the speed of the exercise is faster when the reciprocating movement of the exerciser's body is situated at a linear displacement stage, and the speed of the exercise is slower when the reciprocating movement is carried out to a stage of maximum height and changes its moving direction, so as to comply with the physiological mechanism of exercising a human body and eliminate a possible sport injury.

**[0005]** The speed of a reciprocating movement can be maintained constant with the assistance of a conventional inertia load flywheel, but when the direction of the exercise's limbs is switched, there is no mechanism to retard the speed, and the inertia load flywheel produces a mechanical inertia driving vector. As a result, the exerciser's muscle has insufficient time for the preparation of responding to the change of a moving direction, and sport

injuries may be resulted unnoticeably in this case, and exercisers do not know about the injury until they feel the pain.

**[0006]** In view of the shortcomings of the prior art including an appropriate design concept of the conventional reciprocating exercise equipment and the serious sport injury caused by doing exercising with the reciprocating exercise equipment such as the aforementioned circular flywheel with an inertia load, the inventor of the present invention based on years of experience in the related industry to conduct extensive researches and experiments, and finally developed an inertia load exercise mechanism of a reciprocating exercise equipment in accordance with the present invention to overcome the foregoing shortcomings of the prior art.

**[0007]** It is a primary object of the invention to overcome the shortcomings of the prior art by providing an inertia load exercise mechanism of a reciprocating exercise equipment, wherein the principle of swinging a pendulum and its inertia load mechanism are adopted to replace the existing flywheel mechanism, and the invention fully complies with the natural exercising rhythm of a human body, and thus the invention can eliminate a possible sport injury.

**[0008]** This object being achieved by an inertia load mechanism according to independent claims 1, 4 and 6.

**[0009]** According to an inertia load mechanism of a reciprocating exercise equipment of an exemplary embodiment, a pendulum load mechanism is installed to an exercise link rod of a reciprocating exercise equipment, such that the pendulum load mechanism forms an inertia link and gives an exercise resistance. If the moving link rod of the reciprocating exercise equipment is at a moment of changing its exercise direction, the speed of changing direction of the pendulum load mechanism will be slowed down by the gravitational force, so that an exerciser's muscle has sufficient response time for the change of the exercise direction to eliminate a possible sport injury.

**[0010]** The accomplishment of this and other objects of the invention will become apparent from the following description and its accompanying drawings of which:

FIG. 1 is a perspective view of a preferred embodiment of the invention;

FIG. 2 is a partial front view of a pendulum load mechanism of the invention;

FIG. 3 is a planar view of FIG. 1;

FIG. 4 is a schematic view of exercising the mechanism as depicted in FIG. 1;

FIG. 5 is a planar view of another preferred embodiment of the invention;

FIG. 6 is a schematic view of operating the mecha-

nism as depicted in FIG. 5;

FIG. 7 is a planar view of a further preferred embodiment of the invention;

FIG. 8 is a planar view of the mechanism as depicted in FIG. 7; and

FIG. 9 is a schematic view of exercising a conventional flywheel load mechanism.

**[0011]** The technical measures and structural characteristics of the present invention will become apparent with the detailed description of preferred embodiments and related drawings as follows.

**[0012]** With reference to FIGS. 1 to 4 for an elliptical exercise equipment 20 in accordance with a preferred embodiment of the present invention, an end of a pedal link rod 22 with a pedal 21 is pivotally coupled to a pendulum 30 having a specific weight, and the pendulum 30 is limited by a swinging arm 31 and its axial connecting point 32 to swing sideway to left and right sides in a semicircular path, and drive the pedal link rod 22 and its pedal 21 to perform a back-and-forth inertia displacement movement.

**[0013]** While the pendulum 30 is swinging sideway to a maximum height, the speed of exercise is retarded naturally due to the gravitational force, and then the swinging speed driven by an exerciser is resumed after the pendulum falls in an opposite direction. In other words, the pendulum 30 provides a resistance effect to an exercise load due to its own weight, and also provides a basic condition for the pedal link rod 22 to produce an inertia movement. If the reciprocating movement of the pedal link rod 22 is situated at a unidirectional linear displacement stage, the speed of the exercise is accelerated due to the gravitational force of the pendulum 30 (or an inertia swing produced by the gravitational acceleration of a free falling object). If the reciprocating exercise is carried out to a stage of the maximum height and the direction of an exercise is changed, the speed of the exercise will be retarded naturally, so as to comply with the physiological mechanism of exercising a human body and eliminate possible sport injuries.

**[0014]** The quantity of installed pendulums 30 may vary according to actual need or economic consideration, such as an application of a single pendulum 30 with two pedal link rods 22, or one pendulum 30 for each pedal link rod 22 to achieve the expected effect and performance. If more than one pendulum 30 is installed, a link module can be used to link each pendulum 30 as shown in FIGS. 1 to 6, and this embodiment adopts a bevel gear set 40 to link the pendulums 30 on left and right sides. However, such link is a basic mechanical connection and the installation of a gear structure is a prior art, and thus they will not be described here.

**[0015]** With reference to FIGS. 5 and 6, a magnetic induction plate 51 is installed on a side of the pendulum

30 and at a position adjacent to a magnetoresistance mechanism 50 in accordance with the present invention, such that if the magnetic induction plate 51 is displaced with the pendulum 30, the magnetic induction plate 51 will pass through an area of magnetic forces produced by the magnetoresistance mechanism 50 to give a non-frictional resistance. An adjusting control mechanism 52 is provided for adjusting the distance between the magnetoresistance mechanism 50 and the magnetic induction plate 51 to adjust the resistance of an exercise.

**[0016]** With reference to FIGS. 7 and 8 for planar views of another preferred embodiment of the invention, the inertia load mechanism of the invention is applied to a waist twisting exercise equipment 60, the equipment 60 comprises a handle 61, a rotating disc 62 and a vertical axle 63, wherein a plurality of link gears 64, 65, 66 are pivotally coupled to the base 67 and disposed at the bottom of the handle 61, the rotating disc 62 and the vertical axle 63, respectively, and a transversal bevel gear 631 is installed at the top of the vertical axle 63, and a longitudinal bevel gear 68 is provided for driving and swinging a pendulum 69.

**[0017]** When the handle 61 and the rotating disc 62 are moving in opposite directions (while the user is doing a waist twisting exercise), each link gear 64, 65, 66 installed at the bottom of the two modules will be rotated reciprocally in an expected way due to the link relation. Similarly, the vertical axle 63 and its transversal bevel gear 631 are rotated with the rotation of the link gear 66 accordingly, so that the pendulum 69 driven by the longitudinal bevel gear 68 produces a movement to left and right sides in a semicircular path, and this embodiment achieves the same expected exercise effect as the foregoing embodiments.

**[0018]** Many changes and modifications in the above-described embodiments of the invention can, of course, be carried out without departing from the scope thereof. Accordingly, to promote the progress in science and the useful arts, the invention is disclosed and is intended to be limited only by the scope of the appended claims.

## Claims

1. An inertia load mechanism of a reciprocating exercise equipment (20), **characterized in that** a pendulum load mechanism is installed to a connecting link rod of said reciprocating exercise equipment (20), such that said pendulum load mechanism constitutes an inertia link and gives a resistance effect of an exercise load.
2. The inertia load mechanism of a reciprocating exercise equipment (20) as recited of claim 1, wherein said pendulum load mechanism comprises a pendulum (30), an axial connecting point (32) used for positioning, and a swinging arm (31), such that said pendulum (30) is swung to left and right sides in a

substantially semicircular path.

3. The inertia load mechanism of a reciprocating exercise equipment (20) as recited in claim 1, wherein a magnetic induction plate (51) is installed at a side of said pendulum load mechanism, and a magnetoresistance mechanism (50) is installed at a position adjacent to said magnetic induction plate (51), such that when said magnetic induction plate (51) is displaced with said pendulum (30), said magnetic induction plate (51) is passed through an area of magnetic forces produced by said magnetoresistance mechanism (50) to generate an exercise resistance, and an adjusting control mechanism (52) is provided for adjusting the distance between said magnetoresistance mechanism (50) and said magnetic induction plate (51) to adjust said exercise resistance.
4. An inertia load mechanism of a reciprocating exercise equipment (20), **characterized in that** an end of a pedal link rod (22) of said reciprocating elliptical exercise equipment (20) is pivotally coupled to a pendulum (30) having a specific weight, and said pendulum (30) is restricted by a swinging arm (31) and an axial connecting point (32) of said swinging arm (31) to swing to left and right sides in a substantially semicircular path, and said pedal link rod (22) produces a back-and-forth inertia displacing movement.
5. The inertia load mechanism of a reciprocating exercise equipment (20) as recited in claim 4, wherein a magnetic induction plate (51) is installed at a side of said pendulum (30), and a magnetoresistance mechanism (50) is installed at a position adjacent to said magnetic induction plate (51), such that when said magnetic induction plate (51) is displaced with said pendulum (30), said magnetic induction plate (51) is passed through an area of magnetic forces produced by said magnetoresistance mechanism (50) to generate an exercise resistance, and an adjusting control mechanism (52) is provided for adjusting the distance between said magnetoresistance mechanism (50) and said magnetic induction plate (51) to adjust said exercise resistance.
6. An inertia load mechanism of a reciprocating exercise equipment, wherein a waist twisting exercise equipment (60) comprises a handle (61), a rotating disc (62) and a vertical axle (63); wherein a plurality of link gears (64, 65, 66) are pivotally coupled to the base (67) and disposed at the bottom of the handle (61), the rotating disc (62) and the vertical axle (63), respectively; and wherein a transversal bevel gear (631) is installed at the top of the vertical axle (63), and a longitudinal bevel gear (68) is provided for driving and swinging a pendulum (69) so as to achieve a semicircular

swing to the right and left sides.

7. The inertia load mechanism of a reciprocating exercise equipment as recited in claim 6, wherein a magnetic induction plate is installed at a side of said pendulum (69), and a magnetoresistance mechanism is installed at a position adjacent to said magnetic induction plate, such that when said magnetic induction plate is displaced with said pendulum (69), said magnetic induction plate is passed through an area of magnetic forces produced by said magnetoresistance mechanism to generate an exercise resistance, and an adjusting control mechanism is provided for adjusting the distance between said magnetoresistance mechanism and said magnetic induction plate to adjust said exercise resistance.

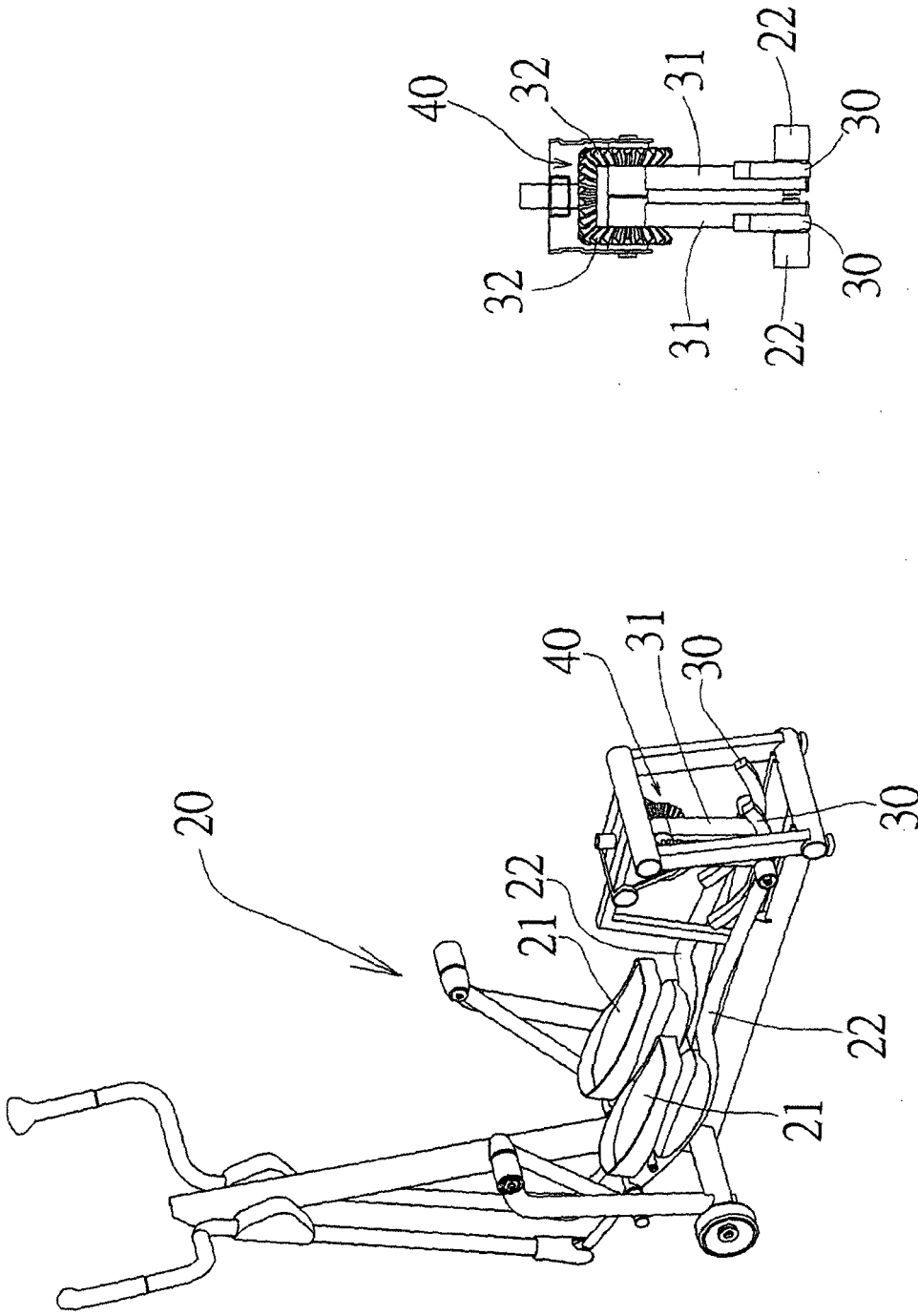


FIG.2

FIG.1

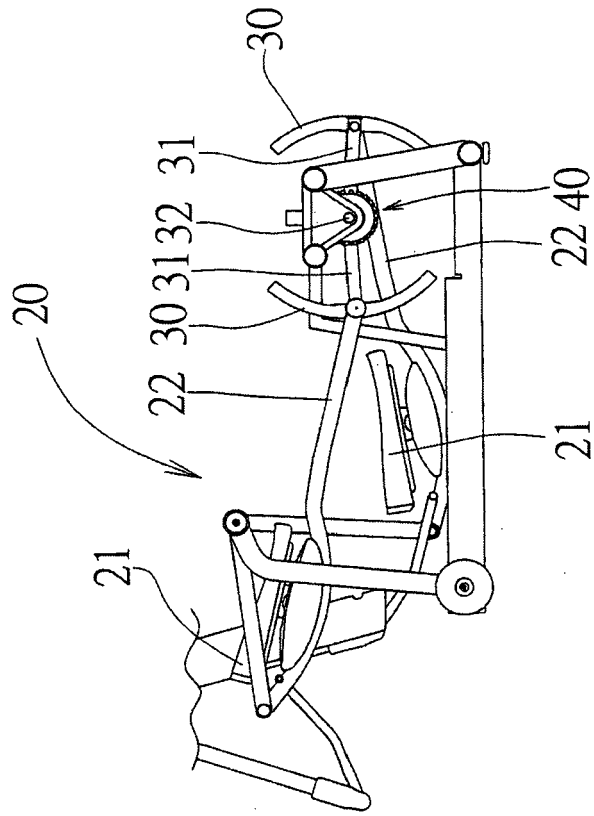


FIG. 4

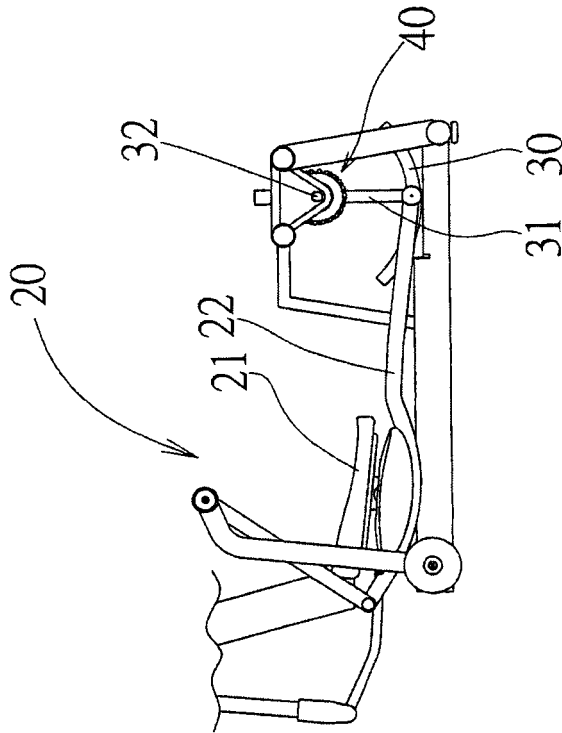


FIG. 3

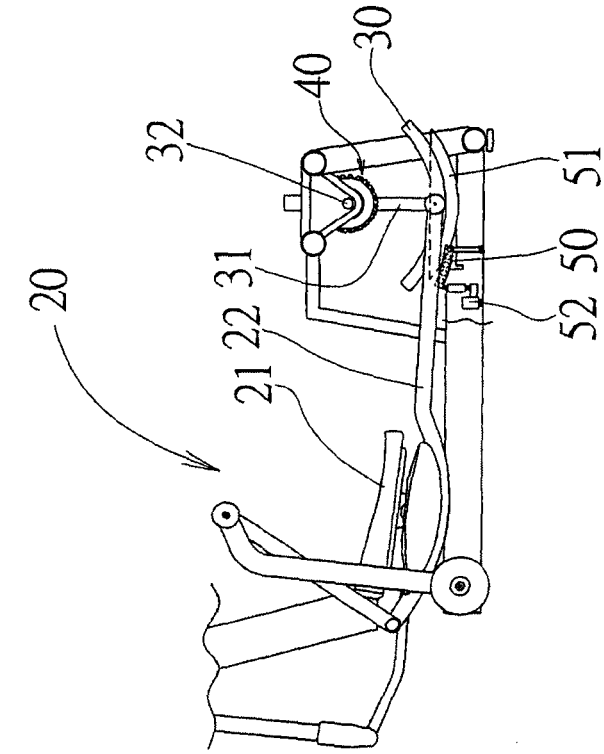


FIG.5

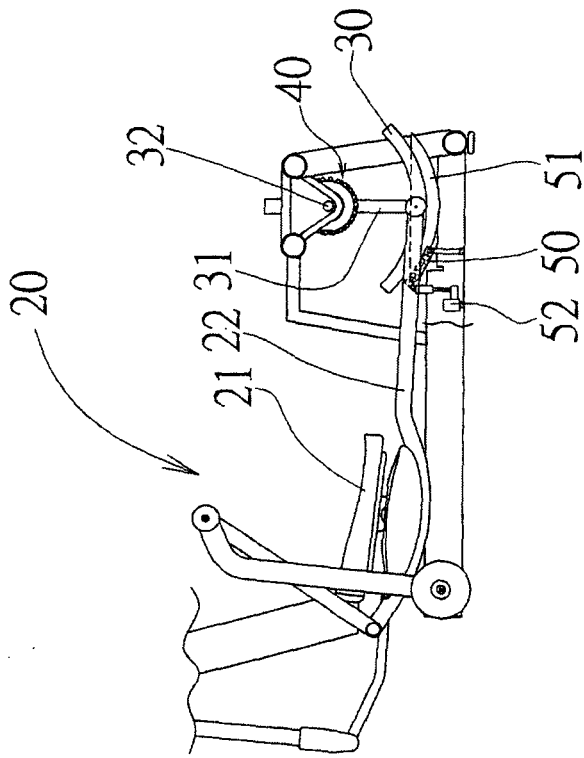


FIG.6

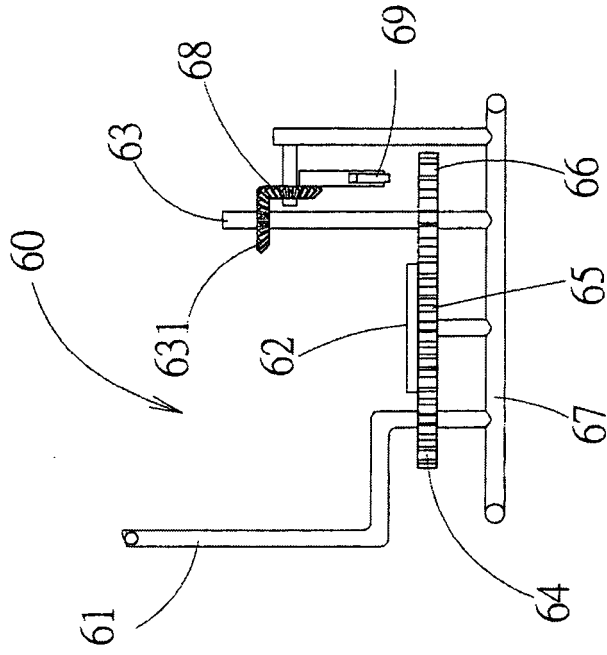


FIG. 8

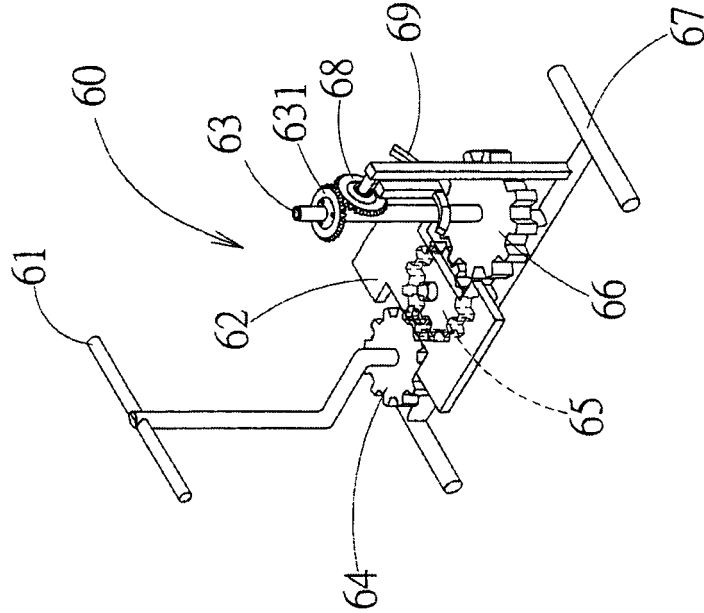


FIG. 7

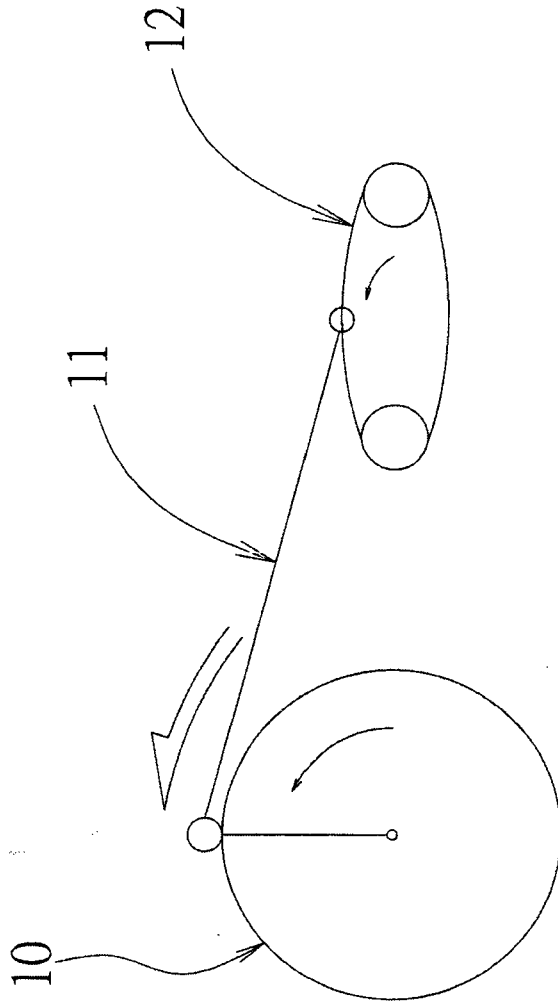


FIG.9



EUROPEAN SEARCH REPORT

Application Number  
EP 08 01 4104

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 855 198 A (TECHNOGYM SRL [IT]) 29 July 1998 (1998-07-29) * column 1, line 1 - column 6, line 37; figures 1-4 *	1-3	INV. A63B21/005 A63B21/06 A63B22/14 A63B23/02 A63B23/04
A	----- US 2 387 966 A (RICHARD ZANDER GUSTAF) 30 October 1945 (1945-10-30) * the whole document *	1-3	
A	----- WO 2007/032664 A (UNIV EINDHOVEN TECH [NL]; MISCHI MASSIMO [NL]) 22 March 2007 (2007-03-22) * the whole document *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			A63B
-The present search report has been drawn up for all claims-			
Place of search Munich		Date of completion of the search 18 February 2009	Examiner Jekabsons, Armands
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.02 (P04C01)



Application Number

EP 08 01 4104

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

- Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:  
1-3
- The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 08 01 4104

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3

Pendulum load mechanism  
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2. claims: 4,5

Elliptical exercise equipment  
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3. claims: 6,7

Waist twisting exercise equipment  
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-02-2009

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82