

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 December 2007 (21.12.2007)

PCT

(10) International Publication Number
WO 2007/143802 A1

(51) International Patent Classification:

A63B 21/062 (2006.01)

(21) International Application Number:

PCT/BR2006/000252

(22) International Filing Date:

10 November 2006 (10.11.2006)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

PI0602697-4 14 June 2006 (14.06.2006) BR

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

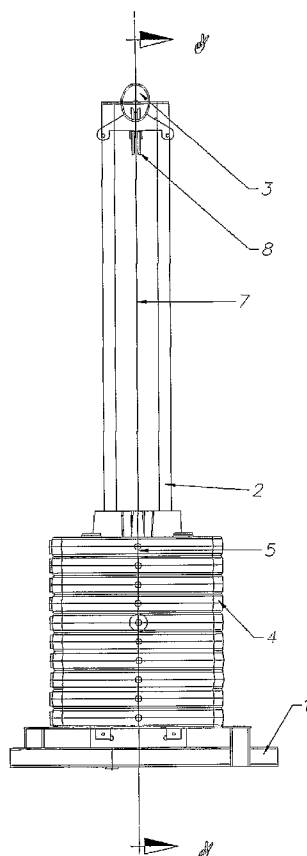
— of inventorship (Rule 4.17(iv))

Published:

— with international search report

[Continued on next page]

(54) Title: AUTOMATIC WEIGHT STACK CONTROLLER FOR FITNESS EQUIPMENT



(57) Abstract: Fitness equipment that is adapted to a frame that is comprised of a base (1) having upright columns (2) and an upper top (3), wherein the steel cable (7) designed to raise a stack of weights (4) or a selected part thereof is centrally located, said cable being tensioned by levers, pulleys or cams of the fitness unit, said weights being comprised of thick plates guided by the columns (2), characterized in that each weight (4) is provided with a vertical central hole having a "V" section or moon shaped circular groove (10) that is slidably fit into the holes of the whole stack of weights, a vertical tube (11) having radial holes (12) at the level of each one of the grooves (10), where balls (13) are disposed, so that in its whole extension, centrally to the tube (11), is located a threaded rod (14) attached to the upper part of the axle of an electric engine (15) wherein a piston (17) with a basic cylindrical shape and conical ends is disposed, the external diameter of which is a little lower than the inner diameter of the tube (11), the wall of said tube being lower than the diameter of the balls, so that the balls (13) that are disposed at the level the piston (17) is located are fit into the groove (10) of the weight (4) located at this same level, the fixed tube (11) being attached to the steel cable (7) for housing (16) the electric engine (15).



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TITLE OF THE INVENTION: "AUTOMATIC WEIGHT STACK
CONTROLLER FOR FITNESS EQUIPMENT"

Abstract

A automatic weight stack controller for fitness units adapted to
5 a frame provided with weights piled up is disclosed, wherein the weights are
provided with central vertical holes having inner circular grooves and a tube fit
into said central holes, said tube being provided with radial holes disposed at the
level of each weight wherein balls are housed, so that said balls can be pushed
towards the grooves by a piston that slides vertically inside the tube, having
10 conical ends and threaded on a vertical threaded bar centrally to the tube, where
there is an eyelet for the steel cable designed to raise the weights, the selection
of weights being carried out through a panel of instruments, with a digital display,
and buttons to increase or decrease the number of weights.

Disclosure of the Invention

15 The present specification is related to automatic weight stack
controller for fitness equipment.

Every fitness equipment is provided with a frame in common,
on the base of which weights are stacked around vertical guides, which weights
can be raised by means of a central cable, pivoted on a pulley on top of the
20 frame. All the weights have a vertical hole in the center thereof, and the central
cable is attached to a vertical rod that passes through the holes of all the weights.
At the middle level of each of the weights, said rod is provided with a transversal
hole that matches with a transversal hole in each weight, and both holes are co-
linear in their resting condition. A bolt is introduced in the hole of the
25 corresponding weight at the desired load, and passes through the corresponding
hole of the rod. While a fitting exercise is being carried out, the rod is raised by
the cable, the bolt raises both the weight where it is fit and all the remaining
weights that are supported thereon. In this condition, the bolt makes it possible to
determine the number of weights that will be raised and, therefore, the load that is

suited to the exercise and the user is selected.

In the many fitness units with their levers, bar bells, seats and backrests the frame together with its weights would be in such a position that the user would not have that to raise his supported body to reach the load selecting
5 bolt and change the load. To this aim, the units should be provided with a large number of pulleys so that the pathway of the cable can suit both the unit and the special position of the frame.

The rising movement of the weights can be dangerous in the event the feet, hands, or fingers are caught between the heavy weights and the
10 other ones.

The frames are then coated on their contour, all over their height, however, there should be a gap where the selecting bolt can be located in the selected weight.

The purpose of the present patent application is to simplify the
15 action of selecting weights, in order to allow the frame to be positioned in a suitable place to achieve the best mechanical solution, without depending on the distance the user can reach, and also allowing the use of a fully closed frame.

The present invention will be described below with reference to the accompanying drawings, in which:

20 Figure 1 represents an elevational view of a conventional frame;

Figure 2 represents a vertical cut of the conventional frame;

Figure 3 represents a vertical cut of a frame provided with the mechanism object of the present invention;

25 Figure 4 represents a horizontal cut of a frame provided with the mechanism object of the invention, at the center level of one of the weights;

Figure 5 represents a vertical cut of a central length of an improved frame, encompassing two of the weights, and with a mechanism that optionally uses radial bolts; and

Figure 6 represents a plan view of a selecting panel of the mechanism driving unit of the invention.

In accordance with these illustrations, the stack of weights for fitness equipment object of the present invention is comprised of a frame that usually comprises a base (1) with two upright columns (2) and a top (3), making out a rigid assembly, as can be seen in figure 1.

Several thick-plate shaped weights (4) are piled up on the base (1) and are provided with holes that the columns (2) pass through. Centrally, the weights (4) are provided with vertical holes and horizontal holes (5), perpendicular to the central holes and half way of the height of each weight.

A vertical rod (6) passes through the central vertical holes of the weights and have radial holes disposed at the levels of the horizontal holes (5) of the weights.

Figure 2 shows that the steel cable (7) is attached to the upper part of the rod (6) that is disposed vertically, and that on top (3) in the upper part of the frame it is deviated by a pulley (8), and runs outwards the frame, where it runs on several pulleys until it reaches the point in the station where it will be connected with a lever or another means for transmitting the muscular force to the cable.

A bolt (9), provided with a cable for handling same, is inserted into a hole (5) of one of the weights (4), passing through one of the radial holes of the rod (6).

By tensioning the cable (7), the rod (6) raises - by means of the bolt (9) - the weight that is crossed by same, and also all the weights above same. This conventional construction is represented in figures 1 and 2, and has been used for many years by almost all the manufacturers of fitness units that use weights.

The present invention is presented in figures 3, 4, 5 and 6 and refers to a new conception for a weight selecting device in a frame.

Since the conventional frame shown in figures 1 and 2 that is comprised of a base (1), upright columns (2) and a top (3), with its weights (4) piled up, and a steel cable (7) is used in the new mechanism, its numbers match the ones of the components, thus evidencing the fact that they are of public domain.

Neither the horizontal holes (5) of the weights (4), nor the central vertical rod (6), nor the bolt (9) for selecting weights are used in the present invention.

Figures 3, 4 and 5 show cut views of the new mechanism for selecting weights, for the sake of clarity of the details.

Each weight (4) is provided with a central vertical hole that has a "V" section or half-moon shaped circular groove (10) similar to the external ring of a ball bearing, located half way of the height of the weight.

Tightly inserted in the central hole of the weights is a tube (11), in the walls of which, there are radial holes (12) at the level of each groove (10), where balls (13) are tightly fit into. In its whole extension, centrally to the tube (11), is located a threaded rod (14) that goes past a bearing on top of the tube (11) and is attached to the axle of an electric engine (15) that is also placed vertically, the carcass of which is attached to a housing (16) of the tube (11).

A piston (17) of a basic cylindrical shape with two conical ends is innerly threaded and is attached to the rod (14), the diameter of which is slightly lower than the external diameter of the tube (11), where it is housed, and its height is such that it can contact only the balls disposed at the same level. So that the piston (17) does not turn when the rod (14) rotates, it is provided with keys (18) that fit into the vertical grooves of the tube (11). In this condition, when the rod (14) rotates, the piston can go up or down.

When the cylindrical part of the piston is disposed at the level of the balls (13), they are pushed outwards, thus getting into the grooves (10) of the weight (4) selected that will be attached to the tube (11), so that the remaining

weights are not attached to the tube, since the balls thereof retreat towards the rod (14). However, if the tube (11) is raised by the steel cable (7) by means of an eyelet (19) or any other attachment means, for the sake of support, all the weights above the one selected will be raised.

5 In figure 5, within the same scope of the invention, bolts (20) can be fit into the holes of the tube (11), so that the weights (4) are provided with another bolt (21) that is in turn provided with a spring (22) in the direction of each bolt (20) to make same return to a position wherein the tube can be moved vertically. This construction requires the holes to be aligned and, therefore, a
10 groove and vertical keys should be provided between the tube (11) and the weights (4).

 In order to actuate the weight stack, conventional electronic means that are driven by an electric engine can be used in the exact number of turns that locate the piston (17) in the desired weight with a great precision. The
15 driving can be carried out by a panel (23) provided with a digital display (24) of the weight selected, plus "more" (25) and "less" (26) buttons for the changes.

 So that the change can never be made without the weights having been supported on the base (1) of the frame, a microswitch (28) assembled on this base allows the electric engine (15) to move when it "feels" the presence
20 of the lower part of the tube (11). Thus, besides preventing the eventual fall of the suspended weight, it is then possible to actuate the mechanism practically without any load.

 The panel (23) - see figure 6 - can be located in a place wherein the user of the unit can most easily access same. The frame, since it
25 does not need the manual intervention of the user, can be fully closed, and located in a place that is more suited to the minimization of pulleys used for deviating cables.

 The electronic portion can also foresee a solenoid latch that keeps the weights and the tube (11) on the base (1) until it is unlocked when the

piston (17) is positioned at the selected level.

The fitness unit provided with the mechanism of the present invention provides the user with a greater comfort, since the selection of weights is then carried out with the simple touch of a finger on an easy-to-access panel.

5 The frame comprised of the base (1), columns (2) and top (3) in the present invention is fully closed, and the vertical walls thereof are very close to the contour faces of the weights. In this condition, the vertical movement of one weight (4) or a group of weights acts as a pneumatic piston with controlled air leak. Therefore, any vertical sudden movements are dampened.

10 A too fast downward movement of the weights suspended on weights resting on the base (1) end up in the gradual compression of the air contained therebetween, thus attenuating eventual undesirable impacts and noises.

Claims

1. AUTOMATIC WEIGHT STACK CONTROLLER FOR FITNESS EQUIPMENT that is adapted to a frame that is comprised of a base (1) having upright columns (2) and an upper top (3), wherein the steel cable (7) designed to raise a stack of weights (4) or a selected part thereof is centrally located, said cable being tensioned by levers, pulleys or cams of the fitness unit, said weights being comprised of thick plates guided by the columns (2), characterized in that each weight (4) is provided with a vertical central hole having a "V" section or moon shaped circular groove (10) that is slidably fit into the holes of the whole stack of weights, a vertical tube (11) having radial holes (12) at the level of each one of the grooves (10), where balls (13) are disposed, so that in its whole extension, centrally to the tube (11), is located a threaded rod (14) attached to the upper part of the axle of an electric engine (15) wherein a piston (17) with a basic cylindrical shape and conical ends is disposed, the external diameter of which is a little lower than the inner diameter of the tube (11), the wall of said tube being lower than the diameter of the balls, so that the balls (13) that are disposed at the level the piston (17) is located are fit into the groove (10) of the weight (4) located at this same level, the fixed tube (11) being attached to the steel cable (7) for housing (16) the electric engine (15).

2. AUTOMATIC WEIGHT STACK CONTROLLER FOR FITNESS EQUIPMENT according to claim 1, characterized in that the piston (17) is provided with keys (18) on the sides thereof that slidably fit into vertical grooves located in the inner wall of the tube (11).

3. AUTOMATIC WEIGHT STACK CONTROLLER FOR FITNESS EQUIPMENT according to claim 1, characterized in that to use in place of the spheres (13), in the same radial holes, bolts (20) that can be fit into holes can be used instead of balls (13), said bolts (21) being provided with springs (22) disposed in the weights (4) that compress the bolts (20) towards the tube (11), so that the junctions are parallel to the external wall of said tube (11), thus allowing

an independent vertical movement, except in respect of the bolts disposed at the level of the piston (17) that are inserted into the holes of the weight located at this same level.

4. AUTOMATIC WEIGHT STACK CONTROLLER FOR
5 FITNESS EQUIPMENT according to claim 1 or 3, characterized in that the electric engine (15) is actuated by a panel (23) having a digital display of the weight selected plus "more" (25) and "less" (26) buttons, for any changes in the selection of weights, the base (1) of the frame being provided with a microswitch (28) that is actuated by the base of the tube (11) when it reaches the lowest level,
10 the function of which is to inhibit the weight selection any time tube (11) is raised, besides actuating a latch that attaches the tube (11) to the base (1) until the weight selection is completed.

5. AUTOMATIC WEIGHT STACK CONTROLLER FOR
FITNESS EQUIPMENT according to claim 1 or 3, characterized in that the
15 protection walls that contour vertically the stack of weights (4) are fully closed, from the base (1) to the top (3), and having their inner faces very close to the contours of the weights (4) in such a way that they can start acting as pneumatic pistons with controlled air leak, thus attenuating the vertical sudden movements as well as dampening the impacts between the weights during their downward
20 movement.

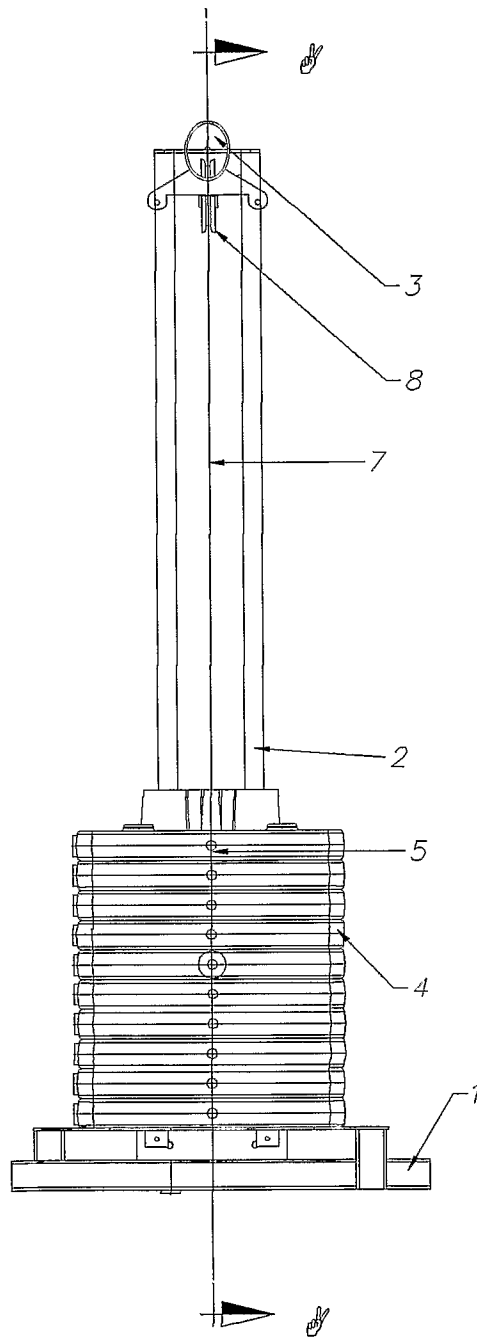


Fig. 1

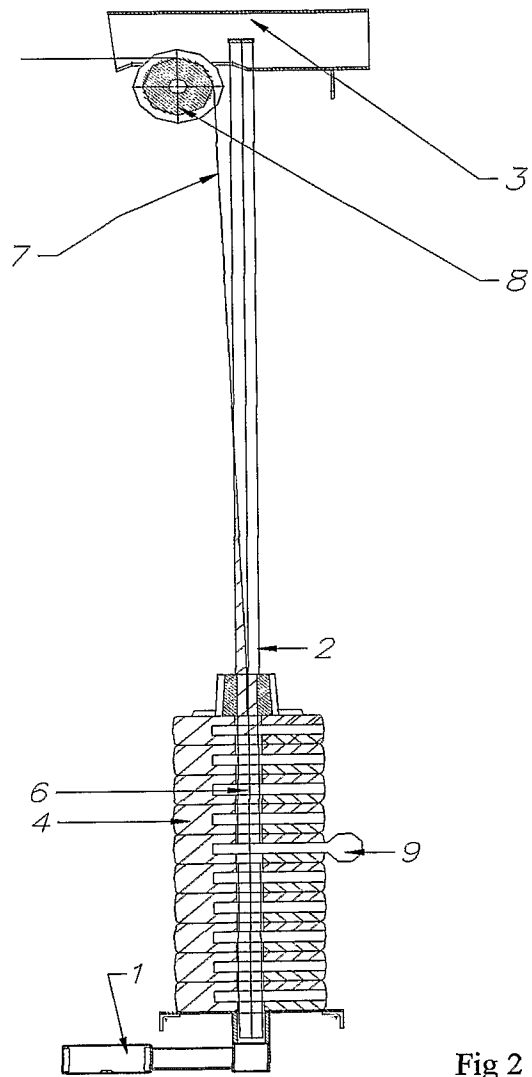
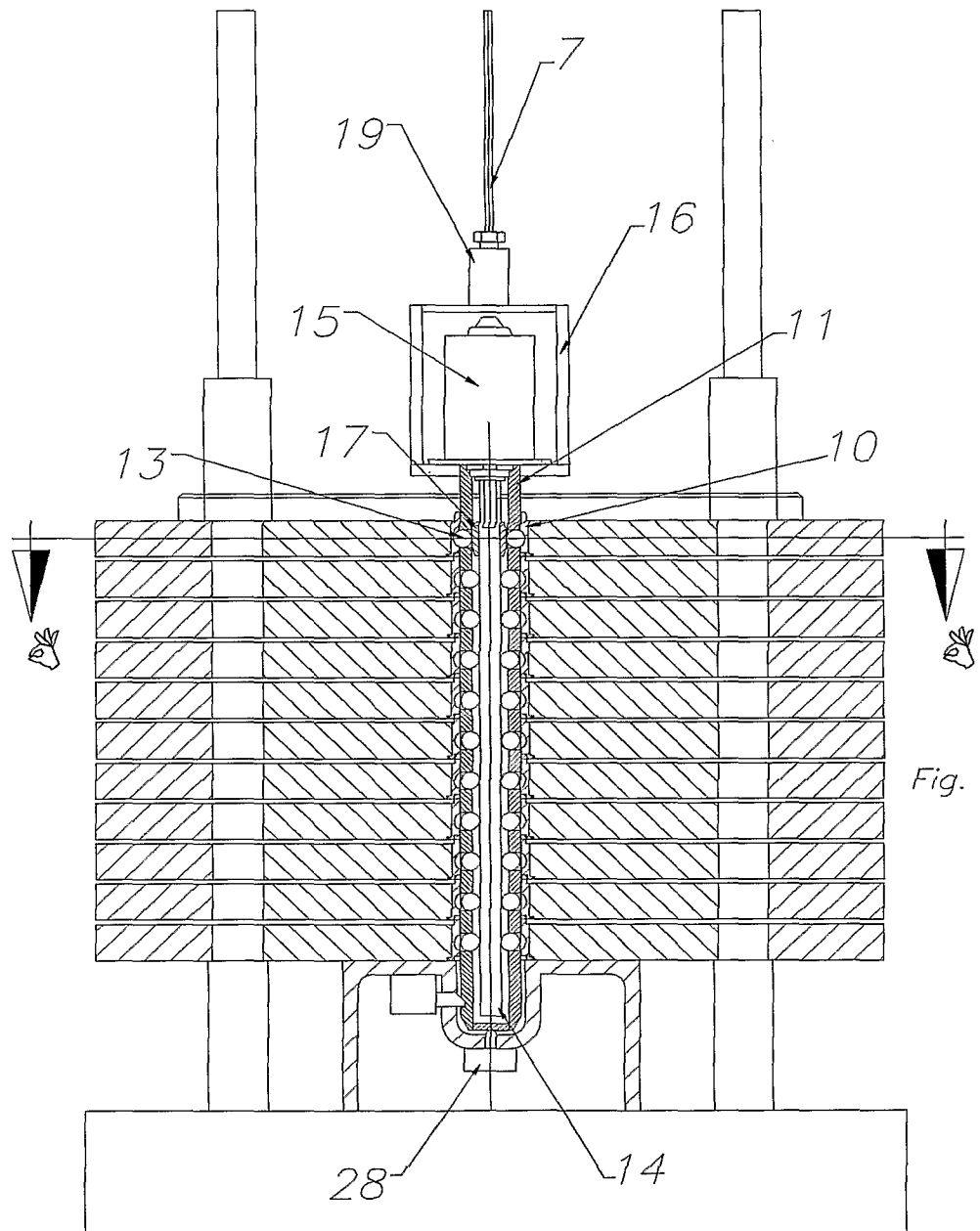


Fig 2



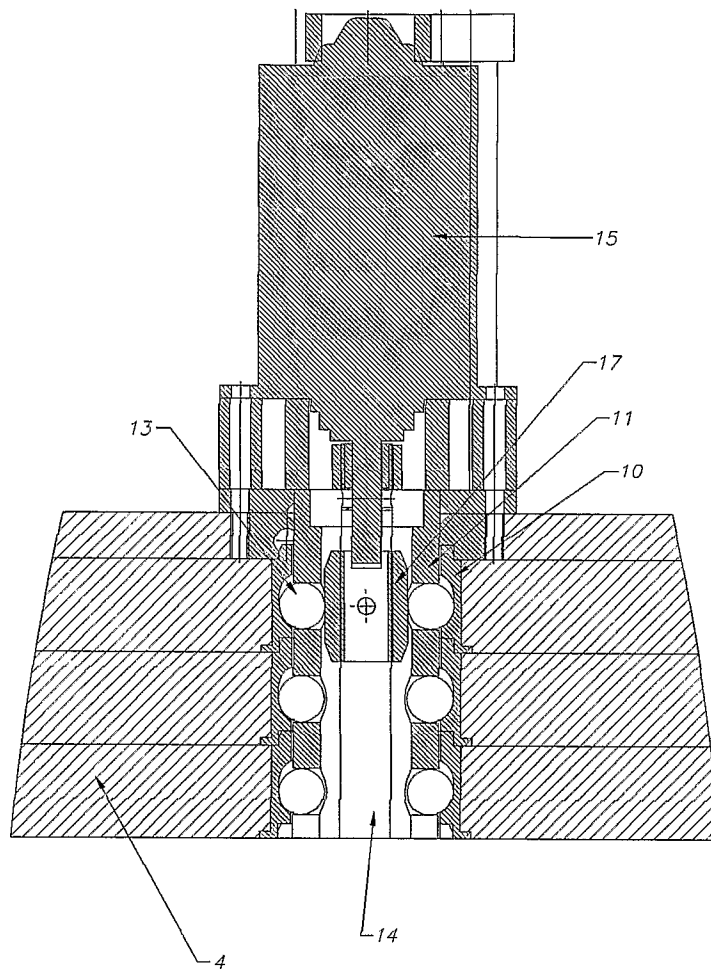


Fig. 3a

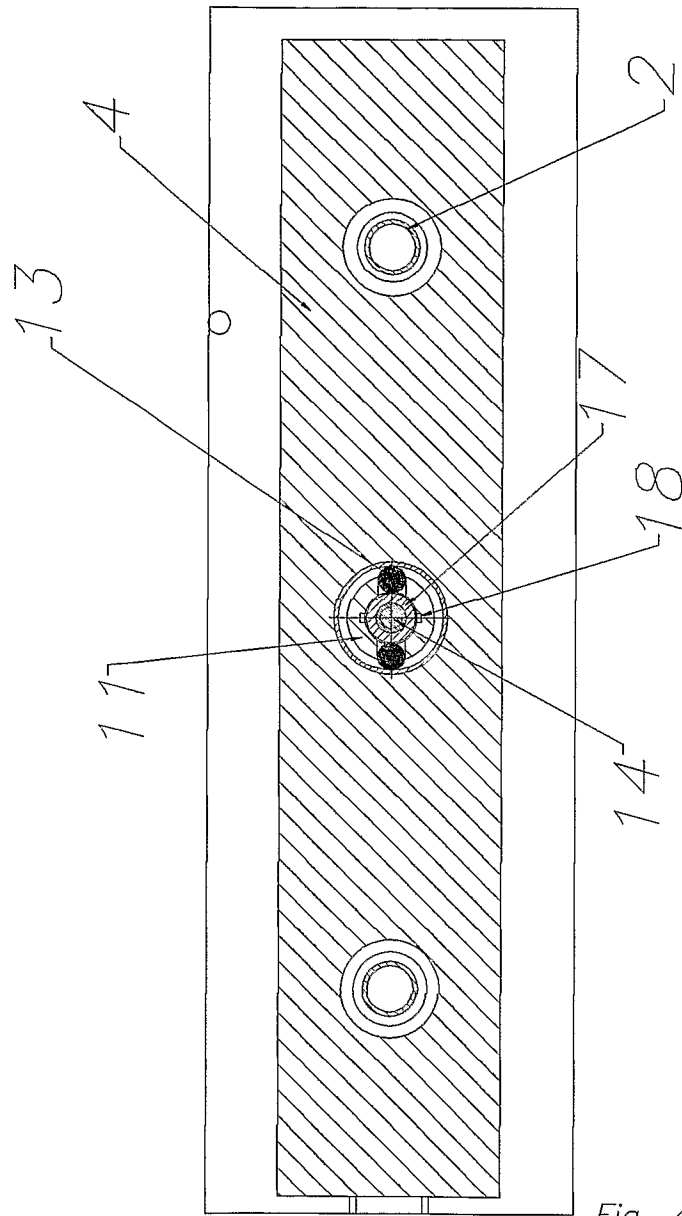


Fig. 4
Corte B-B

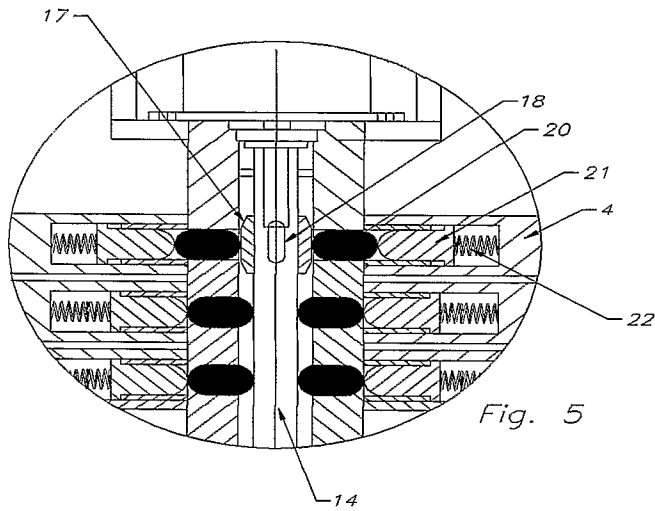


Fig. 5

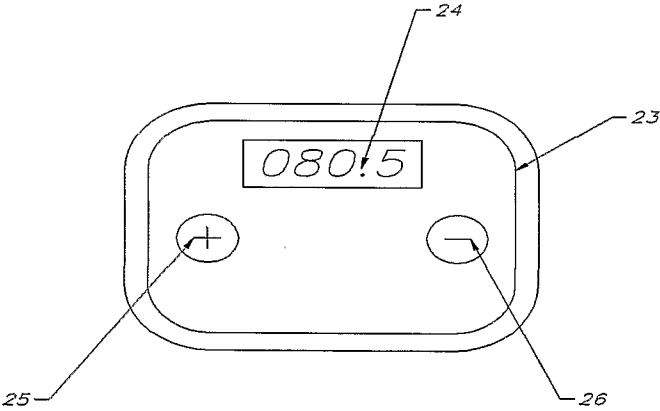


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR 2006/000252

A. CLASSIFICATION OF SUBJECT MATTER

IPC⁸: **A63B 21/062** (2006.01)

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)

IPC⁸: A63B 21/00

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

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

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6117049 A (Lowe) 12 September 2000 (12.09.2000) <i>complete</i>	1,4
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A	EP 0850667 B1 (Vitawell S.p.A) 31 March 2004 (31.03.2004) <i>Fig. 10 and description to this figure; claims 1,8,9</i>	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
6 March 2007 (06.03.2007)Date of mailing of the international search report
28 May 2007 (28.05.2007)Name and mailing address of the ISA/ AT
Austrian Patent Office
Dresdner Straße 87, A-1200 ViennaAuthorized officer
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Telephone No. +43 / 1 / 534 24 / 345

Continuation of first sheet

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:

Continuation No. IV:**Text of the abstract**

(Continuation of item 5 of the first sheet)

FITNESS EQUIPMENT that is adapted to a frame that is comprised of a base (1) having upright columns (2) and an upper top (3), wherein the steel cable (7)

designed to raise a stack of weights (4) or a selected part thereof is centrally located, said cable being tensioned by levers, pulleys or cams of the fitness unit, said weights being comprised of thick plates guided by the columns (2), characterized in that each weight (4) is provided with a vertical central hole having a "V" section or moon shaped circular groove (10) that is slidably fit into the holes of the whole stack of weights, a vertical tube (11) having radial holes (12) at the level of each one of the grooves (10), where balls (13) are disposed, so that in its whole extension, centrally to the tube (11), is located a threaded rod (14) attached to the upper part of the axle of an electric engine (15) wherein a piston (17) with a basic cylindrical shape and conical ends is disposed, the external diameter of which is a little lower than the inner diameter of the tube (11), the wall of said tube being lower than the diameter of the balls, so that the balls (13) that are disposed at the level the piston (17) is located are fit into the groove (10) of the weight (4) located at this same level, the fixed tube (11) being attached to the steel cable (7) for housing (16) the electric engine (15).

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/BR 2006/000252

Patent document cited in search report			Publication date	Patent family member(s)			Publication date
US	A	6117049		US	A	6117049	2000-09-12
EP	A	0850667		US	A	6015367	2000-01-18
				EP	A2	0850667	1998-07-01
				DE	D1	69728367D	2004-05-06
				AT	T	262955T	2004-04-15
				IT	A1	RM960888	1998-06-22