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(71) Applicant: **Lite Sport Srls**
47826 Verucchio (RN) (IT)

(72) Inventor: **Dolci, Filippo**
47826 Verucchio RN (IT)

(74) Representative: **Montebelli, Marco**
Brema SRL
Piazza Enriquez, 22/c
47891 Dogana (SM)

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(54) **ISOINERTIAL TRAINING APPARATUS**

(57) An isoinertial training apparatus comprising a flywheel (20) provided with a shaft (22), a flexible traction member (2) connected to and windable on the same shaft

(22), and a device (10) that enables the variance of the effective diameter of the shaft (22).

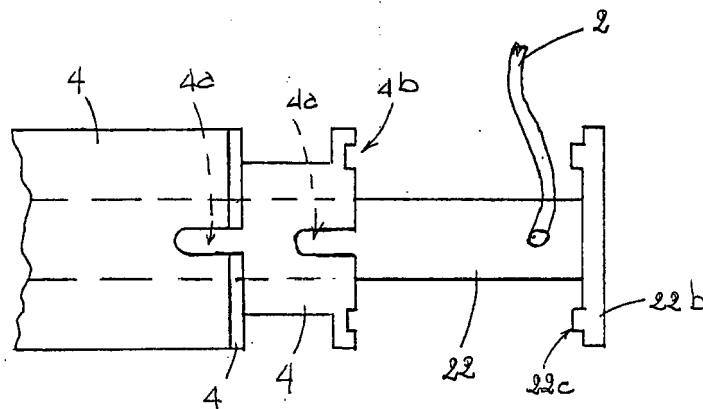


FIG. 2

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Description

[0001] The present invention refers to an apparatus for "isoinertial training", also defined as "flywheel training". This training method is widely established and spread in the area of physical exercise and has shown itself to be useful in training for various sporting disciplines, as well as in physical rehabilitation and injury preventions, thanks to its capacity of inducing physiological and neuromuscular adaptations which are beneficial for increasing muscle strength and hypertrophy. The growing interest in physical activity and training, also at the amateur level, has accelerated research and development in the field, thus contributing to developing new working methods, new machinery and equipment, as well as the development of dedicated software for the performance of exercises that are more specific and innovative than traditional ones.

[0002] The technology of the isoinertial machines introduced above essentially relates to a system whereby the inertial mass of a flywheel produces resistance during both the concentric and eccentric phases of the exercise of the operator. This clearly distinguishes it from other ergometric devices (such as exercise bikes and rowing machines), in which the flywheel only exerts resistance during the concentric phase. Specifically, an isoinertial machine is commonly provided with a flywheel and a flexible traction member, generally a belt or a rope, which is unwound and rewound over the shaft of the flywheel itself in alternate directions. At the beginning of exercise, the traction member is wound partially or fully around this shaft. During the concentric phase of the exercise, the operator pulls the traction member, which begins to unwind from the shaft, causing the shaft itself and the connected flywheel to rotate. At the end of the concentric motion and once the flexible traction member has completely unwound, the flywheel mass continues to rotate in the same direction, due to its inertia, rewinding the flexible traction member around the same shaft, albeit in the opposite direction. During this (eccentric) phase, the operator performs exercises by trying to slow down or halt the rewinding of the traction member in order to interrupt the exercise or start a new concentric phase whereby the traction member begins to unwind from the shaft once more.

[0003] Apparatuses for isoinertial training of this type are described in the following prior documents: US 1,783,376, US 3,841,627, WO 90/10475 and US 6,283,899.

[0004] The drawbacks of this equipment type essentially derive from the fact that the resistance to the muscular effort exerted by the operator, both in the concentric and in the eccentric phase, depends on the flywheel's inertia, which is determined by the mass, the diameter and the distribution of the mass along the diameter of the flywheel itself. Therefore, to vary the resistance, it is commonly necessary to change different flywheels or the mass distributed on them. The limited practicality in var-

ying the resistance of these machines makes it particularly cumbersome when an operator must perform different exercises using the same machine which require different resistances, or when the same machine is alternately used by persons with different strength levels, which can occur in gyms or sports teams. Indeed, this method for varying resistance is time-consuming as it requires the user to waste time for removing and fixing different flywheels (or masses) on the rotation shaft.

[0005] Another variable that affects the resistance of an exercise is the size of the shaft around which the traction member is wound. The smaller the shaft's diameter, the greater the resistance. To exploit this variable for changing the resistance, isoinertial systems have been developed with conical shafts.

[0006] In this latter system (isoinertial devices with conical shafts), the user can change, by using an additional pulley, the diameter where the rope unrolls at the start of the exercise, hence partly changing the resistance of the exercise.

[0007] However, when the traction member rolls and unrolls around a conical shaft, the resistance is not constant but can become lower only at the start of the concentric phase and at the end of the eccentric phase. This makes isoinertial systems with conical shafts less effective during strength exercises, where it is important to maintain a constant resistance throughout the exercise.

[0008] The aim of the present invention is therefore to eliminate the aforementioned drawbacks, in particular to eliminate the need to vary the resistance by directly intervening on the flywheel or using a conical shaft to vary the resistance of the exercise.

[0009] The invention, as characterised in the claims, achieves this aim by using a device that allows the variance of the dimensions of the flywheel shaft while maintaining a cylindrical shape.

[0010] The advantage obtained from the present invention is essentially that it allows the resistance of the exercise to be changed without intervening on the flywheel in any way and by keeping the shaft cylindrical and not conical; therefore, the needs of different users can be met with a single flywheel, for instance for athletes who need to perform high-resistance exercises and for patients in the rehabilitation phase who can only withstand a lower resistance. Additionally, changing resistance becomes faster and helps the user to save time during training.

[0011] Further advantages and features of the invention will become more apparent from the detailed description below with reference to the accompanying drawings, which show a non-limiting embodiment, in which:

- Figure 1 is a schematic side view of the invention;
- Figure 2 is a plan view of a detail of the invention.

[0012] As shown in the figures, the present invention concerns an isoinertial training apparatus, comprising a flywheel (20) provided with a shaft (22), a flexible traction

member (2) connected to the same shaft (22), on which it can be wound and unwound, and a supporting structure (1), which is fitted with a hole (3b) through which the traction member (2) and a user-supporting platform (3a) can pass, and a device (10) to vary the effective diameter of the shaft (22), comprising at least one sleeve (4) slidable along the shaft (22) of the traction member (2) and of the flywheel (20).

[0013] The unwinding of the traction member (2) sets the flywheel (20) in motion, imparting on it a velocity (and, therefore, a resistance) that depends not only on the dimensions and mass of the flywheel itself, but also on the dimensions of the shaft (22); indeed, the greater the radius of the shaft (22), the lower the resistance offered by the flywheel (20).

[0014] Employing one or more sleeves (4) of differing radii and slidable along the shaft (22) of the traction member (2) and of the flywheel (20) enables the variance of the effective diameter of the shaft (22) itself and, therefore, the length of the circumference along which the traction member (2) ravel and unravels: in this way, exercises can be performed with varying levels of resistance without intervening on the flywheel (20) in any way.

[0015] Each sleeve (4) has a slot (4a) into which the traction member (2) is made to travel and, preferably, although not indispensably, means for fastening (4b) to an end-stop plate (22b) built into the shaft (22) of the traction member (2) to ensure that the sleeve (4) rotates integrally with this shaft (22).

[0016] In the example shown, the fastening means (4b) comprise shaped grooves complementing radial rods (22c) fastened to the end-stop plate (22b).

5. Apparatus according to Claim 4, **characterised in that** the fastening means (4b) comprise shaped grooves complementing to radial rods (22c) fastened to an end-stop plate (22b) built into the shaft (22) of the traction member (2).

6. Apparatus according to claim 1, **characterized in that** the support structure (1) comprises a user-supporting platform (3a).

Claims

1. Isoinertial training apparatus, comprising a flywheel (20) provided with a shaft (22), a flexible traction member (2) connected to and windable to the same shaft (22) and a supporting structure (1), fitted with an outlet hole (3b) for the traction member (2), **characterised in that** it comprises at least one sleeve (4) slidable along the shaft (22) of the traction member (2) and of the flywheel (20) so as to vary the effective diameter of the shaft (22).

2. Apparatus according to Claim 1, **characterised in that** it comprises a plurality of sleeves (4) of various radii so as to vary the exercise resistance.

3. Apparatus according to Claim 1 or 2, **characterised in that** the sleeve (4) is fitted with a slot (4a) into which the traction member (2) is made to travel.

4. Apparatus according to Claim 1 or 2, **characterised in that** the sleeve (4) comprises means of fastening (4b) onto the shaft (22) of the traction member (2).

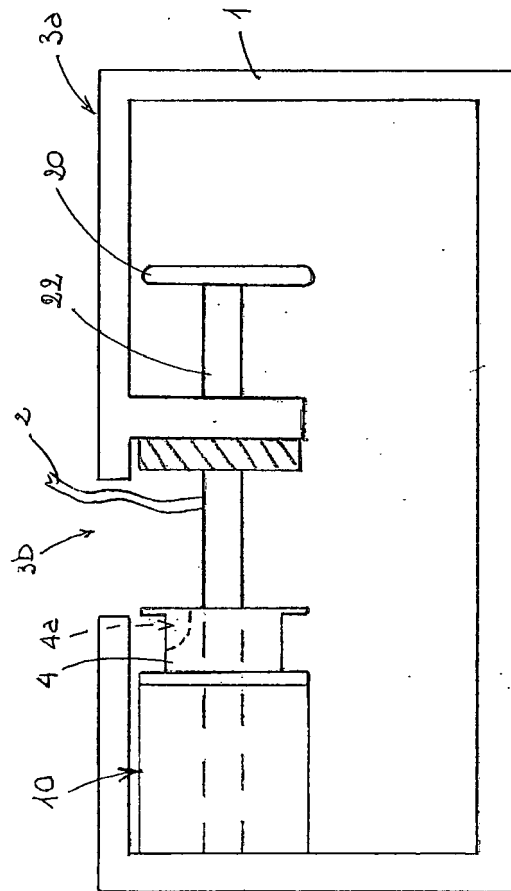


Fig. 1

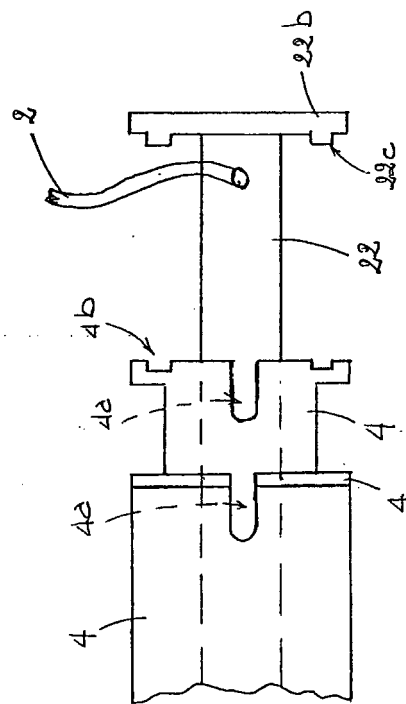


FIG. 2



EUROPEAN SEARCH REPORT

 Application Number
EP 20 00 0221

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A	WO 2012/156516 A2 (LOACH ANDREW [GB]) 22 November 2012 (2012-11-22) * page 7, lines 26-31; figures *	1	INV. A63B21/00 A63B21/22
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			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 9 November 2020	Examiner Squeri, Michele
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 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 00 0221

5 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
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09-11-2020

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