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(54)

Training device for cyclists

(57) A training device (11) for cyclists, which is applied to a bicycle (10) and which comprises a support (12) composed of two uprights (13), at the lower ends of which respective supporting bases (14) are fixed; on the support (12) a containing casing (24), containing a driving pulley (15), equipped with a free wheel (16) on which a fork (17) of the bicycle (10) is engaged, a snub pulley (18) and a driven pulley (19), suitable for allowing a shaped belt (20) running, is fixed. In correspondence of

the driven pulley (19) and opposite to the abovementioned pulleys (15, 18, 19) a housing (22) of a sealed room (23) is mounted, which is closed by an external shell (29) covering the housing (22) and which is filled by oil; a flywheel (25) is placed within the sealed room (23), and rotates about a rotating pin (27) of the driven pulley (19) and provides an axis of rotation parallel to the axis of rotation of the driving (15) and snub (18) pulleys.

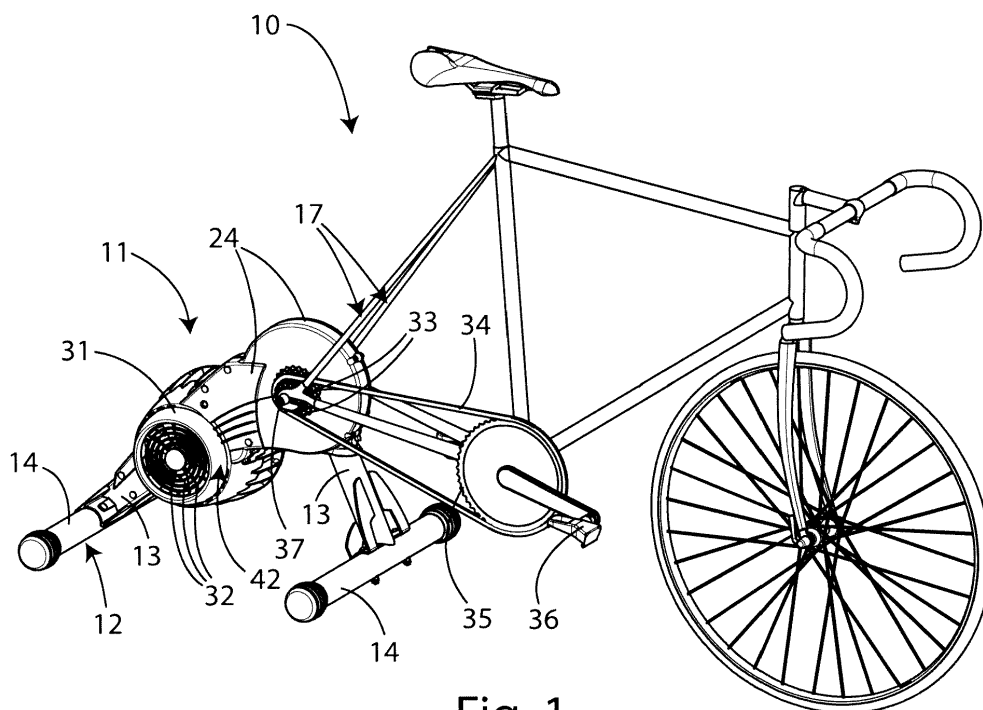


Fig. 1

Description

[0001] The present invention relates, in general, to a training device for cyclists.

[0002] In particular, the invention relates to a training device based on flow resistance, which offers the advantage of the possibility of applying one's own bike to the device; further, the device allows overcoming the main problems related to the cycle training, so developing an efficient tool for evaluating the performance of the athlete.

[0003] It is known that in many sports, as each level of cycling (from the occasional amateur, from bicycle touring to the proper competitive cycling), various training sessions are needed in order to reach an adequate level of preparation.

[0004] On the other hand it is clear that, with specific reference to the practice of cycling, training on the road is not always possible, because of the conditions of the roads, which are always very busy (and thus dangerous) and often damaged by potholes, bumps, etc., due to weather conditions, which are not always favorable, also because of the difficulty of finding paths that allow the athlete maintaining a constant pace, and because of the need to alternate between specific workouts on the bike and overload in the gym and/or other physical activities (foot race, swimming, etc.). Similar alternatives are represented by exercise bikes (room bicycle or gym bicycle), which, however, are unsuitable for training the cyclists, as exercise bike provides a posture which is different than the one of the race bike and provides a kind of resistance which does not correspond to real situations and feelings that one could have riding a bicycle, and/or using rollers, which, even if they allow applying the one's own bicycle to the instrument, however do not allow simulating road conditions.

[0005] A training device for cyclists is also known, as "*Ciclo-mulino*", and subject matter of the European Patent EP2014339B1, comprising a supporting element for housing a hub, equipped with a series of cogs lying side by side and with decreasing diameters, suitable for coupling with the chain and with the rear fork of the bicycle, a wheel or flywheel attached to the supporting element, to which a sprocket kinetically connected to a single sprocket of the hub, and elements of aerodynamic deceleration applied to the wheel.

[0006] In practice, in order to use such device, disengaging the rear wheel from the bike and attaching the rear fork, therefore free, to the hub of the device gearing the bicycle chain on the sprockets of the hub is enough; at the end of the workout, the athlete may unhook the bike from the device and replace the standard wheel on the rear fork of the same bicycle. Nevertheless, the aforementioned device is considerably noisy because of the vibrations generated by the transmission system.

[0007] Object of the present invention is thus realizing a training device for cyclists, allowing cycle training regardless of weather and road conditions, without necessarily having to ride on the road without having to access

to systems with tracks or circuit, even keeping developing higher powers compared to the prior art and a typical pedaling progressivity of road cycling.

[0008] Other object of the present invention is realizing a training device for cyclists, which enables reproducing conditions as similar as possible to the conditions of competition or otherwise of training on the road.

[0009] Other object of the invention is realizing a training device for cyclists, that meets the performance demands required by particularly powerful and explosive cyclists.

[0010] Further object of the present invention is realizing a training device for cyclists, which allows eliminating or at least reducing noise, during the various types of training that may be performed, due to annoying and powerful vibrations that develop over a certain cadence.

[0011] These and other objects are achieved by a training device for cyclists according to the attached claim 1; other technical features are present in the subsequent dependent claims.

[0012] Advantageously, the training device which is subject matter of the present invention allows developing very high powers, with the typical pedaling progressivity of road cycling.

[0013] Choosing a direct transmission, combined with the elimination of the rear wheel of the bicycle, as well as the sizing which is achieved and the technical solutions which are applied to the brake unit, allowed obtaining a device which meets the professional requirements required in particular by powerful and explosive cyclists, while keeping an optimal pedalability (meant as a feeling of roundness typical of riding on the road).

[0014] Lastly, the device according to the invention reaches a level of optimum power for all types of training, without causing noise, which in the known devices is normally due to vibrations which may develop beyond a certain cadence or during the sprints.

[0015] Further objects and advantages of the training device for cyclists according to the invention will be apparent from the description which follows, relating to a preferred and exemplary, but not limiting, embodiment of the said device, and from the accompanying drawings, wherein:

- Figure 1 shows a perspective view of a bicycle to which the training device for cyclists according to the invention is applied;
- Figure 2 is an exploded view of the first part of the training device for cyclists, according to the present invention;
- Figure 3 is an exploded view of the second part of the training device for cyclists, according to the present invention.

[0016] With reference to the mentioned figures, a bicycle is generically indicated with 10, to which bicycle the training device 11, subject matter of the present invention, is applied.

[0017] In particular, such device 11 comprises a support 12, that, in working position, sets in a displacement in order to support the respective structural components of the device 11, as well as the same bicycle 10, and in order to ensure the stability of the bicycle 10 in all directions. According to favorite embodiments, the support 12 is comprised of two uprights 13, substantially placed in the shape of inverted V, at the lower ends of which two supporting bases 14 are fixed.

[0018] On the uprights 13 a containing casing structure or carter, divided in two shaped shells 24 and containing a driving pulley 15, is fixed, and is equipped with a free wheel 16, on which the rear fork 17 of the bicycle 10, a snug pulley or idle or belt tensioner 18 and a driven pulley 19 are engaged; on the aforesaid pulleys 15, 18 and 19, moreover, a shaped belt 20 runs.

[0019] In correspondence of the driven pulley 19 and at the side of the uprights 13, where the pulleys 15 and 18 are placed, a cooling fan 21 is mounted, while, opposing to the fan 21, the housing 22 of a sealed room 23 is provided.

[0020] Within the sealed room 23, filled by oil, a flywheel 25 is placed, equipped with braking elements constituted of four shaped vanes 26, placed at both sides of the flywheel 25 and fixed, as the flywheel 25, to the pin 27, which, in turn, is connected to the driven pulley 19 by a special nut 28; the pin 27 is the seat for rotation of the flywheel 25 and provides an axis of rotation parallel to the axis of rotation of the driven pulley 19, of the snug pulley 18 and of the driving pulley 15, while the driven pulley 19 is the seat of rotation of the fan 21, which rotates within a special cap 31 of the half shell 24 communicating with outside by means of appropriate shaped slits 32 of a grid 42.

[0021] The sealed room 23 is closed by an external shell 29, which covers the sides of the housing 22, thanks also to the interposition of a seal 30.

[0022] The device 11 is mounted on the bicycle 10 so as, inserting the rear fork 17 of the bicycle 10 in correspondence of the free wheel 16 and of the side hubs 37, 38 (protruding from the half shells 24 of the carter by means of the appropriate seats 39), the gears 33 for transmitting the motion of the bicycle 10 (on which the chain 34 connected, in turn, to the gear 35 moved by the pedals 36, runs) are on the same side of the pulleys 15, 18 and 19 and so as the flywheel 25 is placed opposite to said pulleys 15, 18 and 19. According to exemplary and favourite, but not limiting, embodiments of the invention, the flywheel 25 is constituted of a solid disk and provides a diameter equal to 197 mm, a thickness equal to 25 mm and a weight of about 5,9 Kg, while each vane 26, which is arranged radially and close, at both sides, of the flywheel 25, provide a substantially flat rectangular shape, having dimensions of 12 mm × 70 mm on which four carvings 40 are made, arranged in the same direction of the axis of rotation of the pin 27, having width 6 mm and thickness 12 mm.

[0023] In a preferred variant of realization of the vanes

26, they have dimensions of 13.5 mm x 74.5 mm, and four carvings 40, having width 6 mm and thickness 10.5 mm.

[0024] In particular, the carvings 40 of the vanes 26 arranged between the flywheel 25 and the bottom of the sealed room 23 face to said bottom of the room 23, while the carvings 40 of the vanes 26 arranged between the flywheel 25 and the external shell 29 face to said shell 29.

[0025] Always according to favourite embodiments of the invention, the distance between the ends of the shaped 40 and the internal walls of the room 23 is equal to about 6 mm, preferably 5.9 mm, while the quantity of oil within the room 23 is equal to 200 g; moreover, a belt 20 of "PolyV PJ" type is used, since such model allows containing the diameter of the driving pulley 15 (the bigger pulley) up to 210 mm, also reducing the overall volumes of the training device.

[0026] The carvings made into the vanes 40 allow oil within the room 23 infiltrate the same carvings during the rotation of the flywheel 25 and so preventing an effect of accumulation of the mass of oil on the outside of the room 23, which would be forced to rotate eccentrically close to the shaped 40 and that, beyond a certain cadence, because a powerful vibration resulting in a remarkable noise.

[0027] The distance between the shaped 40 and the internal walls of the room 23 provides an additional step to the rotating mass of oil in order to further reduce and even eliminate the vibrations, while the quantity of oil, as well as the transmission ratio between the driving pulley 15 and the driven pulley 19 (which is set equal to 7), allows increasing the speed of rotation of the shaped 40 and, thus, friction with the mass of oil, obtaining, at the same time, a considerable degree of power.

[0028] In conventional devices, during the ride, an air bubble is created close to the vanes 26, on the side opposite to the one facing to the in the advancing direction of the same vanes 26. This is due to the fact that the vane 26 moves the oil, comprising it, and accumulates the air behind it, as a result of the cavitation, or of the depression created by the boost.

[0029] This causes, once a level of maximum resistance is reached, stalling, no more increasing the resistance, while increasing the speed of pedalling. For this reason, introducing a very high amount of oil is necessary, because this effect of cavitation is reduced.

[0030] In the device of the invention, instead, introducing into the device a quantity of oil equal in volume to the same amount of air is possible.

[0031] This because, in any case, whatever the proportion between air and oil, during the pedalling, the conformation of the vanes 26, equipped with carvings 40 in a direction parallel to the axis of rotation of the same vanes 26, allows oil infiltrating in the accumulated air.

[0032] So an emulsion of oil and air is created, substantially increasing the volume of braking oil, allowing continuing to increase the power of the braking.

[0033] Insofar, according to the invention, as inserting

also more than two vanes 26 is possible, using just two of them is preferable, as shown in the attached figures, since this facilitates creating the emulsion, and thus increasing the braking power, or the resistance of the device at high speed.

[0034] Another source of noise of the device is given by the presence of the fan 21, which faces to the protective grid 42; in fact, when the edge of each blade 43 of the fan 21 crosses a barrier of the grid 42 the air which moves, dragged from relative blade 43, impacts on the barrier and thus creates the noise, and the more extensive is the area of impact, the higher is the noise.

[0035] Thus, according to the present invention, the fan 21 provides an inclination of the blades 43 such to ensure a good flow of air with a low noise; moreover, the edges of the blades 43 are arcuated, so as the front of the blade 43 which advances is curved and comes into interference with the ribs of the grid 42 in a progressive manner, in order to reduce the impact noise.

[0036] Additionally, the edge of the blades 43 is indented, so that the advancing front is not a continuous line and, consequently, the moved air is divided and the impact is less violent; finally, the grid 42 that covers the fan 21 has no solid straight spokes from the centre to the outside, but a series of broken segments and distributed radially in order to break up and reduce the extended surfaces on which the moved air impacts from the blade 43. Since all the energy that the rider develops during exercise is converted into heat, the load-bearing structure of the device subject matter of the invention, made up of the uprights 13 and of the half shells 24 of the carter, is preferably realized with highly resistant materials, such as steel, for instance, used for the upright 13 and/or die-cast aluminium for at least one of the half shells 24, in particular the one incorporates within it the sealed or even watertight room 23, since aluminium transmits the heat well and provides a fast cooling of the entire device; in this way, the supporting structure itself contributes, with the surface thereof, to the dissipation of the heat; moreover, obtaining a series of fins around the watertight room 23 in order to increase the dissipating surface is possible.

[0037] The cooling fan 21, which is mounted on the axis of rotation of the driven pulley 19, produces a direct ventilation on the watertight room 23, with the function of maintaining as cold as possible the aluminium body and, consequently, the oil inside; it is known, in fact, that the reduction of the temperature of the oil determines stability in the values of the power developed at various speeds of rotation, since the viscosity of the oil is strictly conditioned by the values of the operating temperature.

[0038] Finally, the half shells 24 of the casing, which cover the pulleys 15, 18, 19, the belt 20 and the fan 21, act, not only as protection for the rotating parts, but also as conveyors for the air flow generated by the fan 21 toward the body of aluminium, so that the air is forced toward the hottest part of the body, thus increasing considerably the cooling efficiency.

[0039] The use of the training device 11 for cyclists,

according to the invention, is very simple.

[0040] In practice, unhooking from one's own bicycle 10 the rear wheel and fasten the rear fork 17, which is now free, to the hubs 37, 38 of the device 11 is enough, keeping the chain 34 of the bicycle 10 on its own gears 33 for transmitting the motion, so as the pedaling transmission may be freely varied, as in the case of using traditional bicycle 10.

[0041] At the end of training or at a later time the athlete can unhook the bicycle 10 from the device 11 and mount again the normal wheel on the rear fork 17.

[0042] From the description made the technical features of the training device for cyclists, subject matter of the present invention, are clear as well as purposes and advantages.

[0043] In particular, the abovementioned advantages are represented by the following technical features:

- possibility to perform the indoor cycling workout without going to the facilities with a slope or a path;
- possibility to perform the training whatever the weather conditions;
- possibility to perform the training in conditions as similar as possible to the conditions of competition or training on the road, with the usual set-up saddle-pedals;
- possibility to vary the pedalling transmission;
- possibility to perform the training in repeatable and measurable conditions;
- possibility to vary the pedalling frequencies in function of the type of training and of the workload;
- possibility to quickly assess the conditions, the level of preparation and the quality of the athlete and to compare the values obtained with the results of previous tests in a precise and effective way;
- savings in time and costs;
- possibility to use also for training of the upper limbs, due to the possible application of a further device for the rotation of the arms (rowing ergometer);
- possibility to perform rehabilitation exercises and / or rehabilitation of the lower or upper limbs in the recovery phase following a traumatic event.

[0044] It is clear, finally, that, although the invention has been described by way of illustration and not limitation, according to its preferred embodiments, it is understood that variations and/or modifications may be made by those skilled in the art without departing from its scope of protection, as defined by the appended claims.

Claims

1. Training device (11) for cyclists, which can be applied to a bicycle (10) and which comprises a support (12) for supporting the structural components of said device (11) and of said bicycle (10), said support (12) being composed of at least two uprights (13), at the

- lower ends of which respective supporting bases (14) are fixed and on which a containing casing (24) is fixed containing a driving pulley (15), equipped with a free wheel (16) on which a fork (17) of said bicycle (10) can be engaged, a idle or snub pulley (18) and a driven pulley (19), on which pulleys (15, 18, 19) a shaped belt (20) runs, **characterized in that**, in correspondence of said driven pulley (19) and opposite to said pulleys (15, 18, 19), in respect with said uprights (13), a housing (22) of a sealed or tight room (23) is mounted, which is closed by an external shell (29) covering said housing (22) and which is filled by oil, within said sealed room (23) at least a flywheel (25) being positioned, said flywheel (25) rotating about a rotating pin (27) of said driven pulley (19) and having a rotating axis which is parallel to the rotating axis of said snub pulley (18) and of said driving pulley (15).
2. Training device (11) according to claim 1, **characterized in that**, in correspondence of said driven pulley (19) and by the side of the uprights (13) where said pulleys (15, 18, 19) are placed, a cooling fan (21) for cooling said sealed or tight room (23) is mounted, said cooling fan (21) having a rotating axis parallel to the rotating axis of said driven pulley (19) and rotating within a cap (31) of said containing casing (24), said cap (31) having a grid (42) with shaped slits (32) communicating with outside.
 3. Training device (11) according to at least one of the previous claims, **characterized in that** said flywheel (25) is connected to a plurality of vanes (26), placed at both sides of the flywheel (25) and fixed to said rotating pin (27) of said driven pulley (19).
 4. Training device (11) according to at least one of the previous claims, **characterized in that** said fork (17) of the bicycle (10) can be inserted in correspondence of said free wheel (16) and of respective side hubs (37, 38) coupled with said free wheel (16), so that the gears (33) for transmitting the motion of the bicycle (10), which are connected to the pedals (36) of the bicycle (10), are to be located on the side of the device (11) where said pulleys (15, 18, 19) are placed.
 5. Training device (11) according to at least one of the previous claims, **characterized in that** said flywheel (25) is constituted by a solid disk, while said vanes (26) are placed radially and close to, at least one side, the flywheel (25) and each has a series of carvings (40), placed towards the rotating axis of said rotating pin (27).
 6. Training device (11) according to at least one of the previous claims, **characterized in that** the internal walls of said sealed room (23) are set at a prefixed distance from the ends of said vanes (40).
 7. Training device (11) according to at least one of the previous claims, **characterized in that** between said driving pulley (15) and said driven pulley (19) there is a predetermined ratio of transmission equal to 7.
 8. Training device (11) according to at least one of the previous claims, **characterized in that** said cooling fan (21) has a series of blades (43) which are tilted and have arcuated and ragged edges.
 9. Training device (11) according to at least one of the previous claims, **characterized in that** said grid (42) which covers said cooling fan (21) has a series of broken and radial segments.
 10. Training device (11) according to at least one of the previous claims, **characterized in that** said uprights (13), at least a part of said containing casing (24) and/or said sealed room (23) are made up of die-cast aluminum.

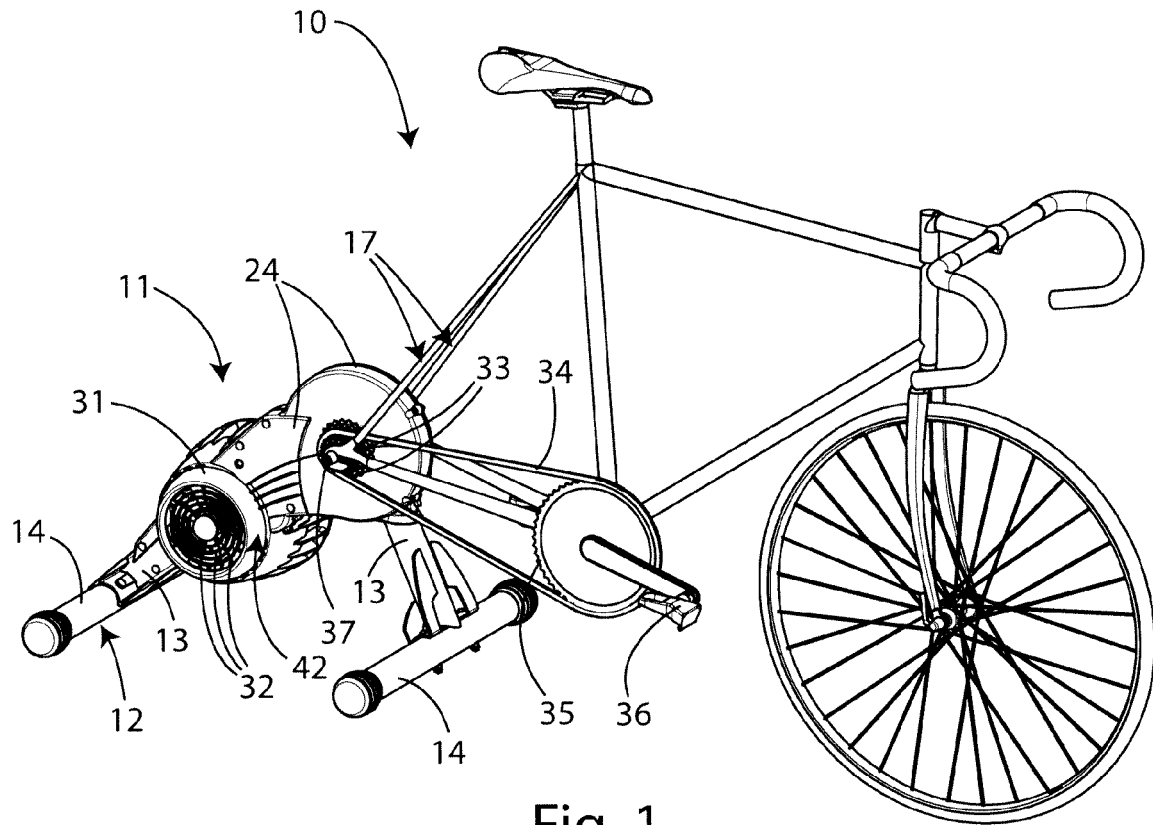


Fig. 1

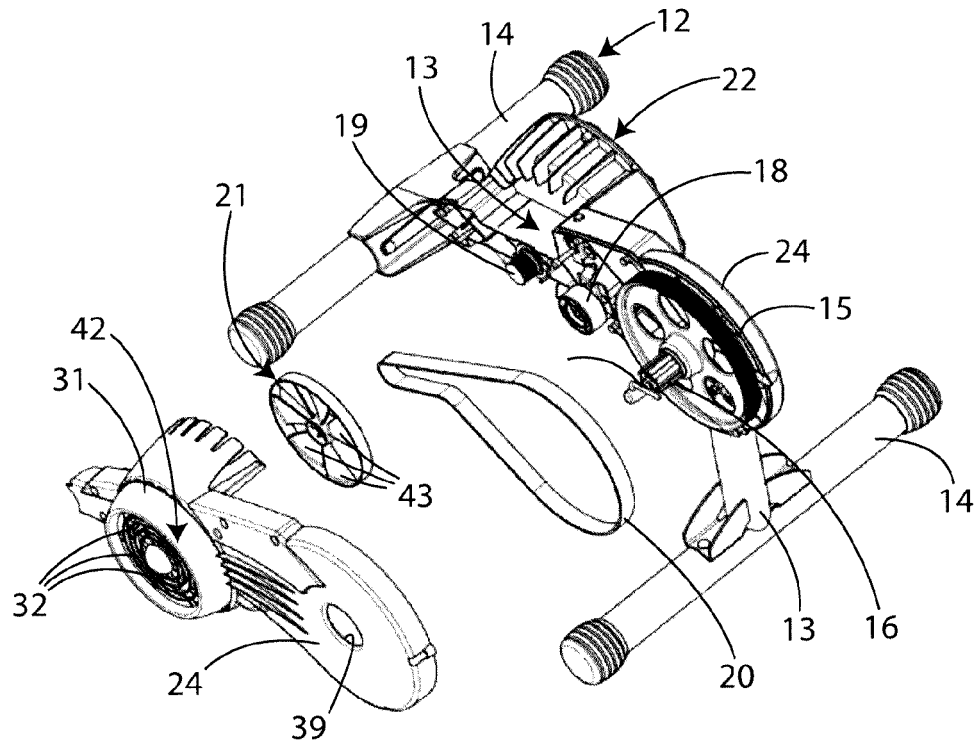


Fig. 2

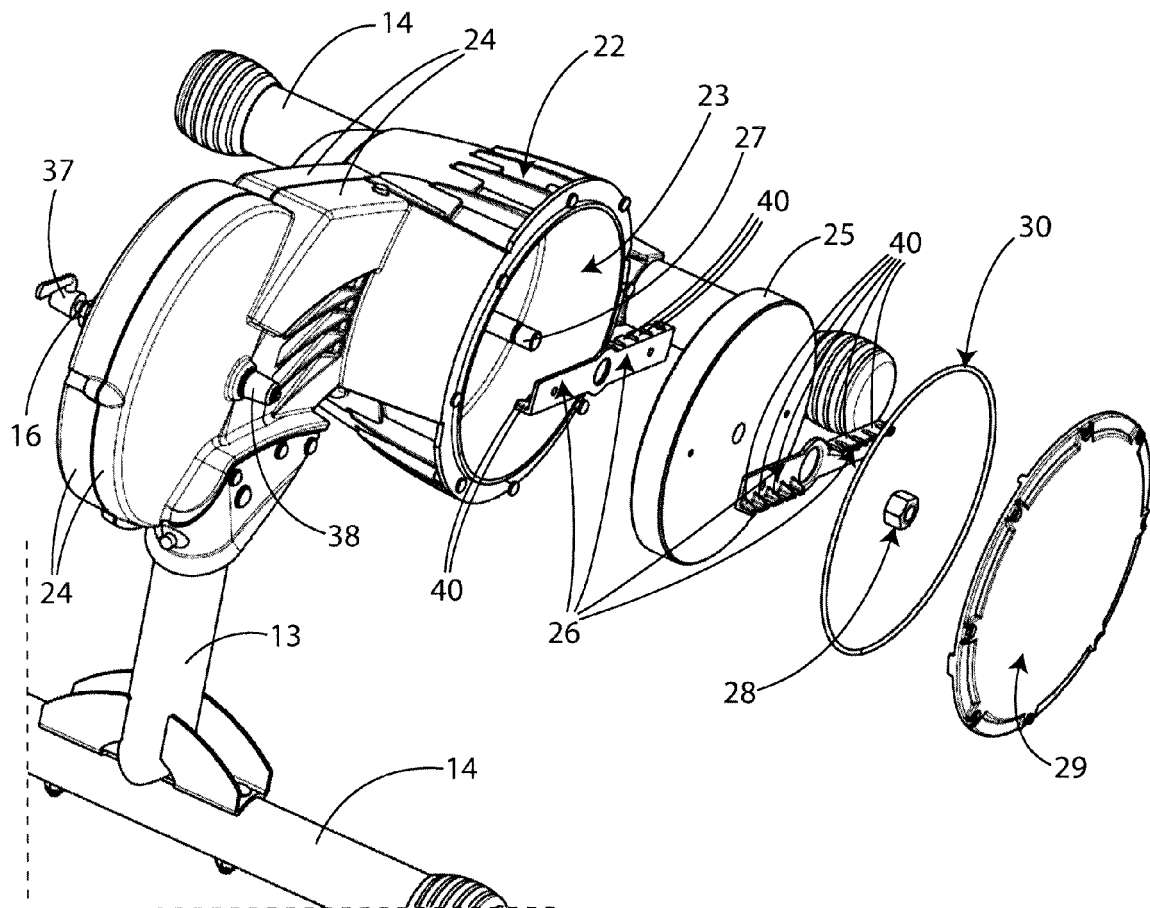


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 14 42 5067

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 September 2014	Examiner Jekabsons, Armands
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

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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.
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