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(54) **Stationary exercise apparatus**

(57) A stationary exercise device has adjustable members for varying the stride path and the exercise intensity of a user. The stationary device having a stationary frame and a movable frame that moves relative to the stationary frame to vary the exercise intensity of a use.

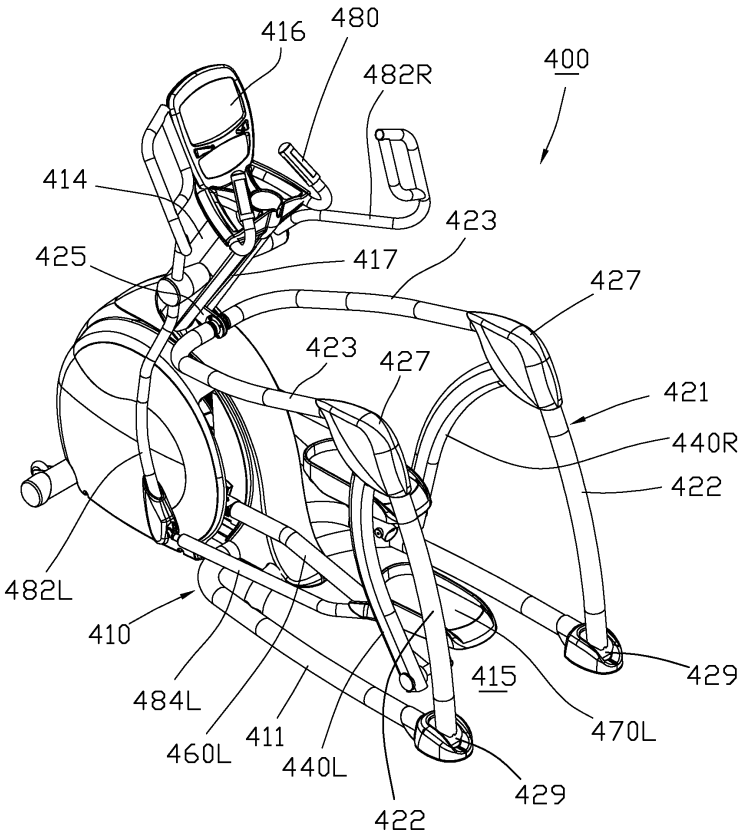

Fig.1

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Description

Technical Field

[0001] This invention relates to a stationary exercise apparatus, and more particularly to a stationary exercise apparatus with adjustable components to vary the foot-path and enhance exercise intensity of a user.

Background Art

[0002] Stationary exercise apparatus have been popular for several decades. Early exercise apparatus typically had a single mode of operation, and exercise intensity was varied by increasing apparatus speed. More recently, enhancing exercise intensity in some apparatus has been made by adjusting the moving path of user's feet, such as by adjusting the incline or stride length of user's foot path.

[0003] U.S. Patent 5,685,804 discloses two mechanisms for adjusting the incline of a stationary exercise apparatus, one of them having a linear track which can be adjusted and the other having a length adjusting swing arm. The swing arm lower end can be moved upwardly for a high incline foot path. U.S. Patent 6,168,552 also discloses a stationary exercise apparatus having a linear track for changing the incline of the stationary exercise apparatus. U.S. Patent 6,440,042 discloses a stationary exercise apparatus having a curved track for adjusting the incline of the stationary exercise apparatus.

[0004] Nonetheless, there is still a need for an exercise apparatus that can increase varieties of exercise and enhance exercise intensity of a user.

Disclosure of Invention

[0005] A stationary exercise apparatus in accordance with the present invention includes a stationary frame having a base, first and second supporting members coupled to the stationary frame to rotate about an axis, a driving assembly coupled to the base, and first and second pedals coupled to the first and second supporting members. While operating the stationary exercise apparatus, the first and second pedals move along a closed loop path that can have a variety of shapes to vary the exercise experience and intensity. The present invention provides: a user of the stationary exercise apparatus with a benefit of high exercise intensity; an inclined foot path; a variable stride length; a better mode to adjust the inclined foot path; a better gluteus exercise; and a more compact and succinct appearance.

Brief Description of Figures in the Drawings

[0006] Fig. 1 is a perspective view of an embodiment of a stationary exercise apparatus in accordance with the present invention; Fig. 2 is another perspective view of Fig. 1;

[0007] Fig. 3 is a back view of Fig. 1;

[0008] Fig. 4 is a top view of Fig. 1;

[0009] Fig. 5 is a right side view of Fig. 1 illustrating both a relatively low incline condition and a relatively high incline condition;

[0010] Fig. 6 is a partial perspective view of Fig.1, showing the movable frame in both a lower and higher incline condition;

[0011] Figs. 7A, 7B and 7C are cutaway views showing the operation of one possible incline mechanism for the embodiment of Fig. 1;

[0012] Fig. 8 is a cutaway view about the 408-408 axis of Fig. 7B;

[0013] Fig. 9 is a perspective view of part of the pedals;

[0014] Figs. 10A and 10B are right side views showing two different rotating positions of the embodiment in a relatively low incline condition; and11A and 11 B are right side views showing two different rotating positions of the embodiment in a relatively high incline condition.

Mode(s) for Carrying Out the Invention

[0015] Illustrated in Figs. 1 through 6 is a stationary exercise apparatus 400 including a stationary frame 410 having a base 411 and a post 412 mounted to the front of the base 411. The stationary frame 410 also includes a standard 414 extended substantially upward from the top of the post 412. A fixed handle assembly 480 and a console 416 are also provided. The handle assembly 480 is for grabbing by a user. The console 416 is for showing exercise information and for controlling some exercise parameters.

[0016] The stationary exercise apparatus 400 also includes a movable frame 421 which respectively has a first portion 423 and a second portion 422 on each side. The first portion 423 is in a substantially horizontal orientation and the second portion 422 is in a substantially vertical orientation. The second portion 422 of each side of the movable frame 421 is pivotally connected to the base 411 of the stationary frame 410 by a pivot 429 so that the movable frame 421 can pivot about an axis A, as illustrated in Fig. 6. The movable frame 421 is connected to a lifting member 425.The lifting member 425 is optional, but it provides a convenient mechanical interface with the motorized lifting mechanism components described below.

[0017] As illustrated in Fig. 6, the first portions 423 from each side of the movable frame 421 are joined directly or indirectly to one another in a U-shape 415 to define an exercise space for a user. As used herein, "joined to" is defined as being integral with, joined directly to, or joined indirectly, either in a relatively fixed relationship or an operable relationship in which one component moves relative to another component. The first portion 423 and the second portion 422 on each side of the movable frame 421 are connected to each other by swing brackets 424. In Fig. 1, for example, the swing brackets 424 are covered by covers 427 provided for a user to hold while exercising,

and to cover any pinch points in the swing brackets 424.

[0018] Referring to Figs. 5 and 6, the pivot axis A is shown as the location where the movable frame 421 pivots with respect to the stationary frame 410. Near the opposite end of the movable frame 421 is the lifting member 425, where a driving assembly 430 lifts and lowers the movable frame 421.

The entire movable frame 421 acts as a lever, with pivot axis A acting as the fulcrum. The weight of the user is substantially supported by the first and second supporting members 460L/460R and the first and second swing members 440L/440R, and the load goes through the first and second swing members 440L/440R and into the movable frame 421 at pivot axis B. A line drawn from the lifting member 425 to pivot axis A called L1, and another line drawn from pivot axis A to pivot axis B called L2, represent the lever arms for the forces at the lifting member 425 and pivot axis B, respectively. In this embodiment, the lever arm L1 is longer than the lever arm L2. The longer lever arm, L1, allows a relatively small force from the driving assembly 430 to lift the weight of the movable frame 421 and the user. More details and advantages of this lever will be discussed below.

[0019] Now referring to Figs. 7 and 8, a driving assembly 430 is coupled to the stationary frame 410. The driving assembly 430 preferably comprises an actuator 431, a motor 432, a screw rod 433, and a threaded nut 434, but other driving assemblies could be used in the present invention. In a preferred embodiment of the present invention as shown in Fig. 7, the actuator 431 of the driving assembly 430 is located at the bottom of the standard 414, and is pivotally connected to the stationary frame 410. The screw rod 433 extends up inside the standard 414, and one end portion of the screw rod 433 of the driving assembly 430 is connected to the actuator 431, while the other end portion of screw rod 433 is free. The threaded nut 434 of the driving assembly 430 is engaged to the screw rod 433 of the driving assembly 430 and to the lifting member 425 of the movable frame 421. The motor 432 of the driving assembly 430 is coupled to the actuator 431, and a user can control the motor 432 with touch screens, buttons, dials, or other interactive components in the console 416. Therefore, a user can control the motor 432 from the console 416, causing the actuator 431 to rotate the screw rod 433 and causing the threaded nut 434 to move up or down the screw rod 433. This in turn causes the lifting member 425 to be moved up or down the standard 414. The screw rod 433 and nut 434 combination is preferred, but other "movable members" can be used within the scope of the present invention.

[0020] One advantage of this embodiment is that the large lever arm L1 provides a mechanical advantage to lift the weight of the movable frame 421 and the user. This mechanical advantage in turn allows a smaller motor 432 and actuator 431 to be used. A smaller motor 432 is potentially less expensive. Additionally, a smaller motor 432 fits into a smaller package which is important to allow the drive mechanism 430 to fit inside the standard 414. Another advantage of this embodiment is that the movable frame 421 can be raised and lowered using a single driving assembly 430. This can further reduce cost and complexity. In Figs. 1 and 3, the standard 414 of the stationary frame 410 includes a slot 417 that preferably extends along the entire length of the standard 414. It is through this slot 417 that the lifting member 425 extends to be mounted on the threaded nut 434 of the driving assembly 430. As is mentioned earlier, rotation of the screw rod 433 by the motor 432 moves the threaded nut 434 along the length of the screw rod 433. Because the lifting member 425 is mounted to the threaded nut 434, the lifting member 425 also moves up or down the screw rod 434.

[0021] As stated above, the lifting member 425 extends through the slot 417 of the standard 414, and is connected to the movable frame 421. Therefore, actuation of the driving assembly 430 raises or lowers the lifting member 425 which in turn causes the movable frame 421 to rotate through pivots 429 about axis A. The first portions 423 are joined directly or indirectly by a rigid connection, so the entire movable frame 421 rotates about axis A as a single rigid unit. As the movable frame 421 pivots about the axis A, the lifting member 425 moves through an arcuate path. To accommodate this movement, the threaded nut 434 of the driving assembly 430, the screw rod 433 and the actuator 431 are pivotally connected to the stationary frame 410 at a pivot 436, and pivot during the lifting process as shown by the different angles of the screw rod shown in Figs. 7A, 7B, and 7C.

[0022] Referring to Figs. 7A and 7C, it can be seen that the lifting member 425 can be controlled to move between an upper and a lower point by the driving assembly 430. As the lifting member 425 moves down, the first portion 423 of the movable frame 421 will move forward and down. As the lifting member moves up, the first portion 423 of the movable frame 421 will move rearward and up. In other words, the driving assembly 430 moves the first portion 423 of the movable frame 421 between a foremost point (Fig. 7A) and a rearmost point (Fig. 7C).

[0023] To increase the stability of the driving assembly 430 and the movable frames 421, a preferred embodiment of the present invention is shown in Fig. 8, where guiders 418 are mounted on the inner surface of the standard 414 of the stationary frame 410. In a preferred embodiment, each of the guiders 418 is L-shaped in cross-section and is arc-shaped with a radius defined by the axis A. The lifting member 425 further includes rollers 435 rotatably connected therewith and positioned to have rolling contact on at least one side of the guiders 418, but in a preferred embodiment, rollers 435 sandwich the guiders 418 to provide stability and smooth operational motion.

[0024] This embodiment of the stationary exercise apparatus 400 is used to support first and second swing members 440L/440R. The first and second swing members 440L/440R are respectively pivotally connected to the movable frame 421 about a swing axis B as shown

in Fig. 6. Each of the swing members 440L/440R has an upper portion and a lower portion. The upper portions of the first and second swing members 440L/440R are pivotally connected to the movable frame 421. The lower portions of the first and second swing members 440L/440R swing through arc paths relative to the movable frame 421. When the movable frame 421 changes angles relative to the base 411 of the stationary frame 410, the upper portions of the first and second swing members 440L/440R move forward or backward with the movable frame 421.

[0025] The exercise apparatus 400, includes a horizontal first axis 452 in proximity to a post 412 of the stationary frame 410 as shown in Fig. 5. Left and right cranks 454 rotate about the first axis 452. A resistance member 456 is coupled to the stationary exercise apparatus 400 which can be controlled through the console 416 to adjust the rotating resistance of the left and right cranks 454.

[0026] Now still referring to Fig. 5, the stationary exercise apparatus 400 also includes first and second supporting members 460L/460R. Each of the first and second supporting members 460L/460R has a first end portion and a second end portion. The first end portions are respectively joined to the left and right cranks 454 to rotate about a closed path about the first axis 452. The second end portions of the first and second supporting members 460L/460R are respectively pivotally connected to the lower portions of the first and second swing members 440L/440R.

[0027] The stationary exercise apparatus 400 also includes first and second pedals 470L/470R. Each of the first and second pedals 470L/470R is respectively supported by the first and second supporting members 460L/460R proximate to the second end portions of the respective supporting members 460L/460R. Referring to Fig. 9, the first and second pedals 470L/470R are pivotally connected to the respective first and second supporting members 460L/460R so that the rear portions of the first and second pedals 470L/470R move upwardly or downwardly about the pivots relative to the respective first and second supporting members 460L/460R. Referring to Figs. 10a-b and Figs. 11 a-b, the motion of the first and second supporting members 460L/460R causes the first and second pedals 470L/470R to move along a closed-loop path 490.

[0028] Similar to the embodiments described above, the embodiment of Figs. 1 and 9 also includes linkages comprising first and second handle links 482L/482R, and first and second control links 484L/484R. Each of the first and second handle links 482L/482R has an upper portion and lower portion. Each of the first and second control links 484L/484R has a first end portion and a second end portion. In the preferred embodiment of the present invention, the standard 414 of the stationary frame 410 is pivotally connected to the first and second handle links 482L/482R at a location that is between the upper and lower portions of the first and second handle links 482L/482R, such that the upper and lower portions of the first and second handle links 482L/482R can swing forward and backward as the first and second handle links 482L/482R pivot about the pivotal connection on the standard 414. Also, the lower portions of the first and second handle links 482L/482R are respectively pivotally connected to the first end portions of the first and second control links 484L/484R, such that as the first and second handle links 482L/482R pivot about their pivotal connection to the standard 414, the first and second handle links 482L/482R move in a forward and rearward direction. The second end portions of the first and second control links 484L/484R are connected to the respective first and second pedals 470L/470R, such that the first and second control links 484L/484R control the angular orientation of the respective first and second pedals 470L/470R, which are pivotally connected at the forward ends of the first and second pedals 470L/470R to the respective first and second supporting members 460L/460R. The first and second handle links 482L/482R, the first and second control links 484L/484R, the first and second pedals 470L/470R, the first and second supporting members 460L/460R, the left and right cranks 454, and the first and second swing members 440L/440R are all interconnected such that motion in one causes movement in all the rest, and the motion of the first and second pedals 470L/470R is constrained to follow a closed-loop path 490 that is preferably substantially elliptical in shape.

[0029] A similar closed-loop path 490 for the first and second pedals 470L/470R may be attained with alternative machine geometry. For example, the first and second pedals 470L/470R may be directly supported by the respective first and second supporting members 460L/460R, or the first and second pedals 470L/470R may be directly supported by the respective first and second control links 484L/484R, and thereby indirectly supported by the respective first and second supporting members 460L/460R.

[0030] Referring to Fig. 6, the movable frame 421 is substantially rigid, moving as a unit, so that the upper portions of the left and right swing members 440L/440R stay in alignment as they pivot along a single axis B. When the movable frame 421 is positioned at the minimum angle such as illustrated in Figs. 10A and 10B, the swing axis B is at the foremost point, and the reciprocating path T1 of the lower portions of the first and second swing members 440L/440R are in a lower incline level. Referring to Figs. 11A and 11B, when the movable frame 421 is positioned at the maximum angle such as illustrated in Figs. 11A and 11B, the swing axis B is at the rearmost point, and the reciprocating path T2 of the lower portions of the first and second swing members 440L/440R are in a higher incline level. When adjusted from the lower incline level to the higher incline level, the stationary exercise apparatus 400 enhances the exercise intensity of a user.

[0031] Besides the adjustable paths of the first and second pedals 470L/470R, the described embodiment of the present invention has many advantages, including,

but not limited to the movable frame 421 acts as a lever, providing mechanical advantage to the driving assembly 430 to more easily raise and lower the movable frame 421. At one end of the movable frame 421 is the lifting member 425, and at the other end of the movable frame 421 is the pivot axis A, where the movable frame 421 is pivotally connected to the base 411 of the stationary frame 410. In the middle portion of the movable frame 421 is a second pivot axis B, where the first and second swing members 440L/440R are pivotally connected to the movable frame 421. This movable frame 421 acts like a lever, allowing the use of a smaller and more efficient motor 432 in the driving assembly 430 to reposition the swing members 440L/440R and to set the angle of incline for the stationary exercise apparatus 400.

[0032] Another advantage is the rigid movable frame 421 that is moved by a single, centrally located driving assembly 430, so that the stationary exercise apparatus 400 is very stable and durable due to the balanced loading of the stationary exercise apparatus. Thus, when a user steps on the first and second pedals 470L/470R, the rigid movable frame 421 can better balance the weight of a user by spreading the load between each side of the movable frame 421 to add stability to the machine and reduce the offset loads which might require a larger support structure.

[0033] Referring to Figs. 7A, 7B, and 7C, another advantage of the preferred embodiment of the present invention is depicted. Here, the single driving assembly 430 is enclosed within the standard 414 and is coupled to the stationary frame 410, to reduce the overall volume and footprint of the stationary exercise apparatus 400. A user can directly and quickly observe the level of incline of the first and second pedals 470L/470R by observing the position of the lifting member 425. Another advantage is that the substantially rigid U-shaped movable frame 421 allows the user easy access to mount and dismount the stationary exercise apparatus 400, while providing a wrap-around handrail to allow the user to feel comfortable and safe.

[0034] It is noted that instead of using only one lifting member 425 and one drive assembly 430 to raise or lower a single movable frame 421, the movable frame 421 could be split into two movable frames 421, with two independent lifting members 425 and two independent drive assemblies 430 to independently adjust the incline of the closed-loop path 490 of the first and second pedals 470L/470R, and still be within the scope of the present invention.

[0035] The present invention does not require that all the advantageous features and all the advantages described need to be incorporated into every embodiment thereof. Although the present invention has been described in considerable detail with reference to certain preferred embodiments thereof, other embodiments are possible. Therefore, the spirit and scope of the appended claims should not be limited to the description of the preferred embodiment contained herein.

Claims

1. A stationary exercise apparatus comprising a stationary frame (410); first and second supporting members (460L/460R), each supporting member having a first end portion joined to the stationary frame (410) to rotate about a closed path and a second end portion; first and second swing members (440L/440R), each of the swing members having an upper portion and a lower portion, the lower portions of the first and second swing members (440L/440R) respectively pivotally connected to the second portions of the first and second supporting members (460L/460R); first and second pedals (470L/470R), each of the pedals supported by the respective first and second supporting members (460L/460R); a movable frame (421) pivotally connected to the stationary frame (410) defining a pivot axis A and the upper portions of the first and second swing members (440L/440R) pivotally connected to the movable frame (421) defining a pivot axis B; **characterised in that** a lifting member (425) extending from the movable frame (421) is to be adjustably coupled to the stationary frame (410); and a first linear distance (L1) between the pivot axis A and the lifting member (425) is longer than a second linear distance (L2) between the pivot axis A and the pivot axis B.

2. The stationary exercise apparatus according to claim 1, **characterised in that** the movable frame (421) respectively has two first portions (423) and two second portions (422) configured apart to constitute an exercise space.

3. The stationary exercise apparatus according to claim 2, **characterised in that** the movable frame (421) is substantially U-shaped.

4. The stationary exercise apparatus according to claim 1, **characterised in that** the stationary frame (410) further comprises a standard (414) extended substantially upward and the standard (414) has a slot (417) for the lifting member (425) to move along.

5. The stationary exercise apparatus according to claim 4, **characterised in that** a screw rod (433) is substantially configured within the standard (414) for coupling to lifting member (425).

6. The stationary exercise apparatus according to claim 1, **characterised in that** the stationary frame (410) further comprises at least a guider (418) and the lifting member (425) further comprises at least a roller (435) contacting the guider (418).

7. The stationary exercise apparatus according to claim 6, **characterised in that** the guider (418) is arc-shaped.

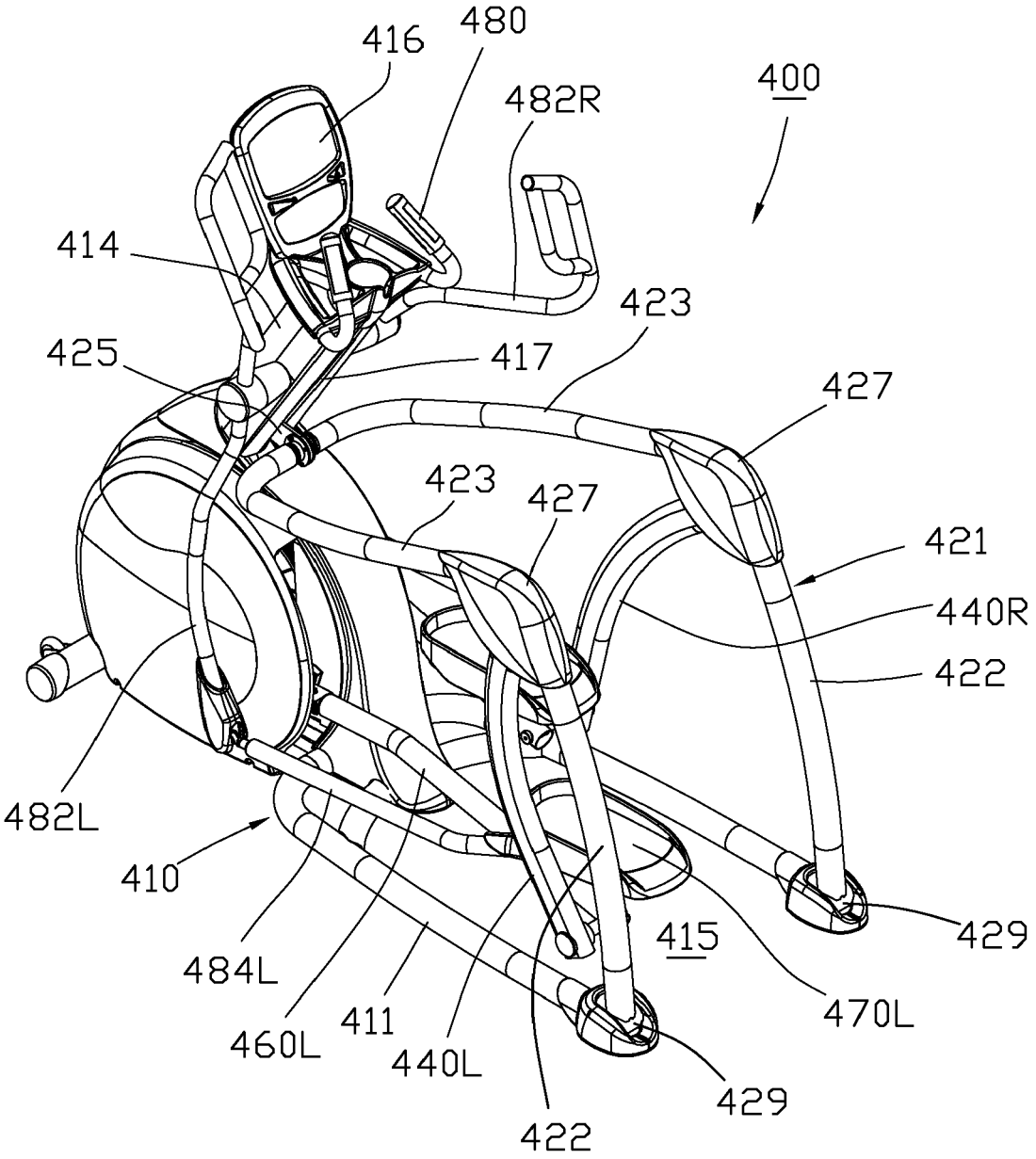
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Fig.1

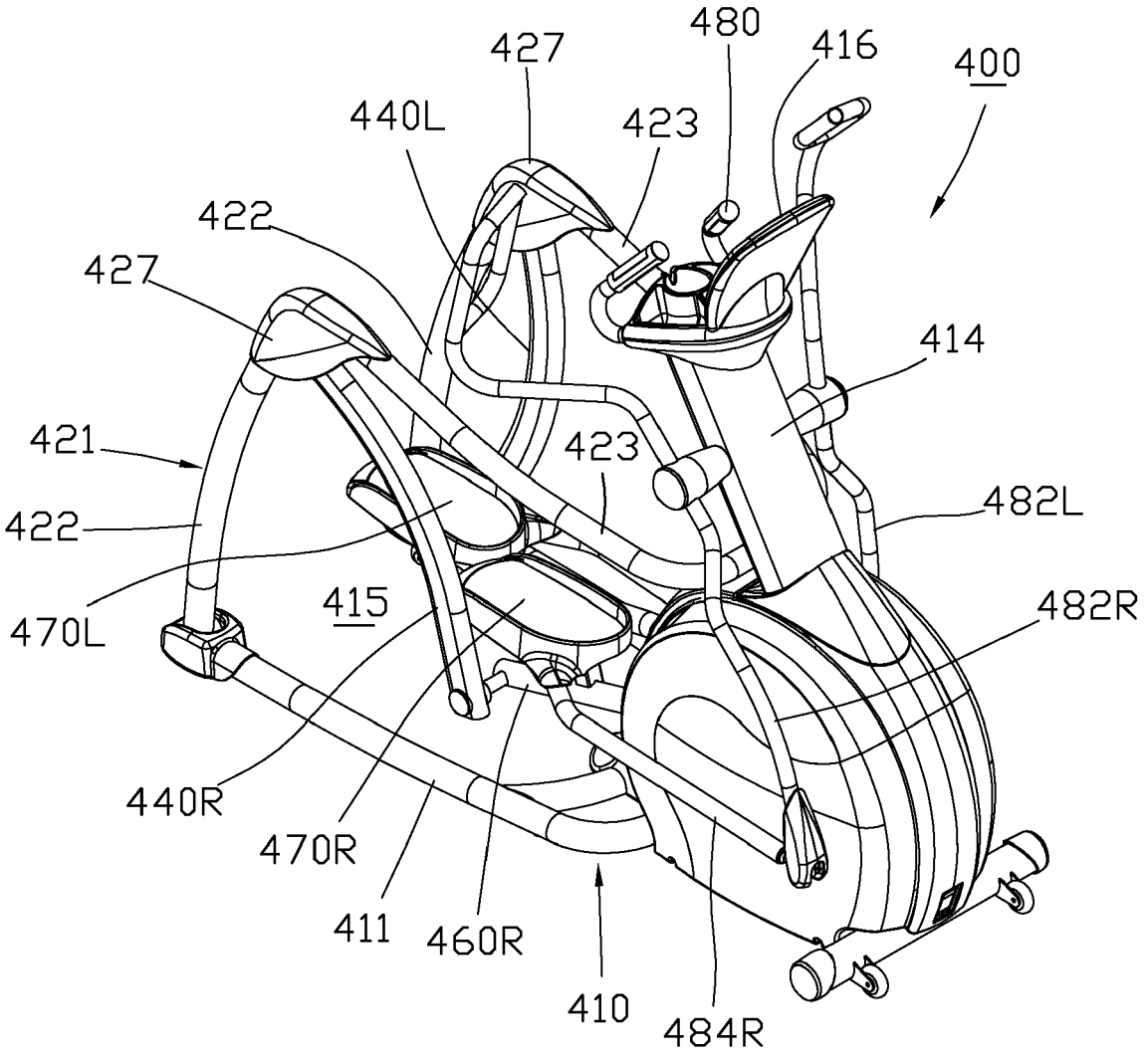
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Fig.2

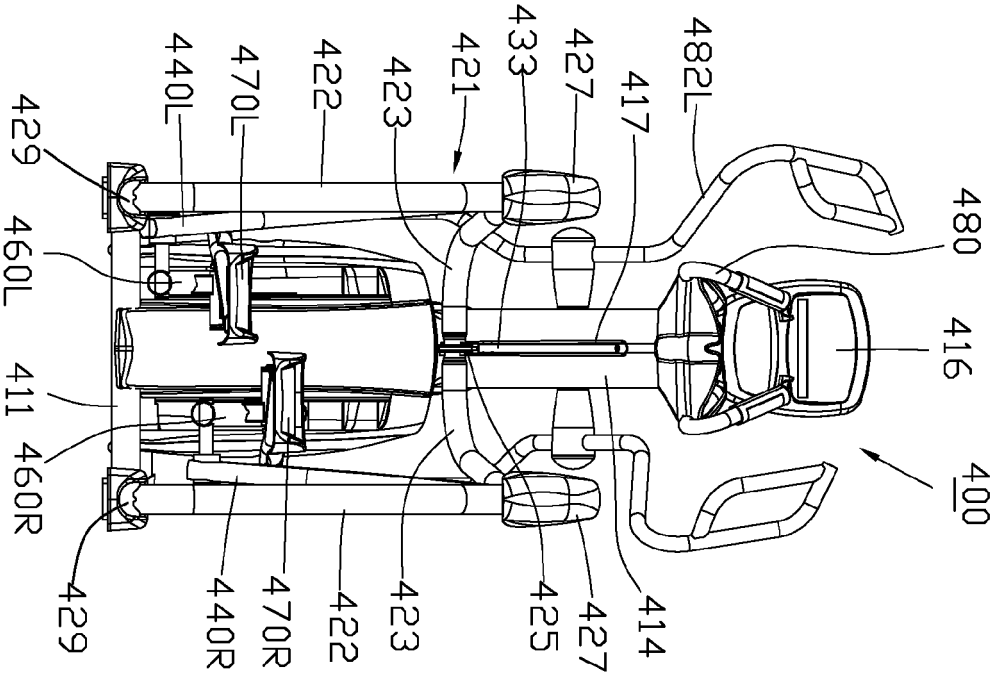
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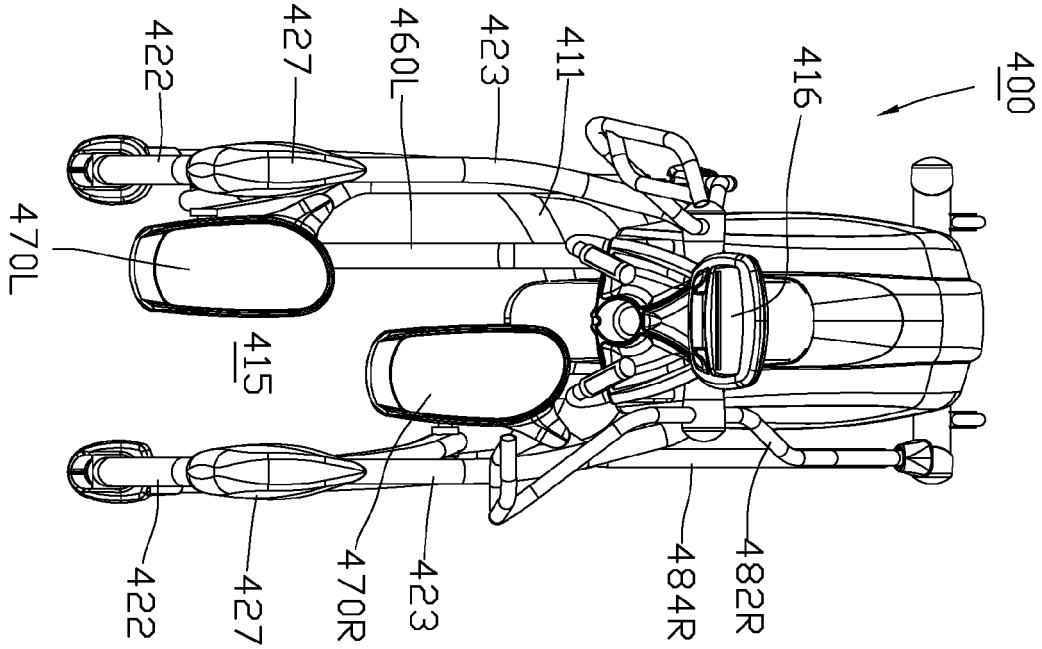
Fig.3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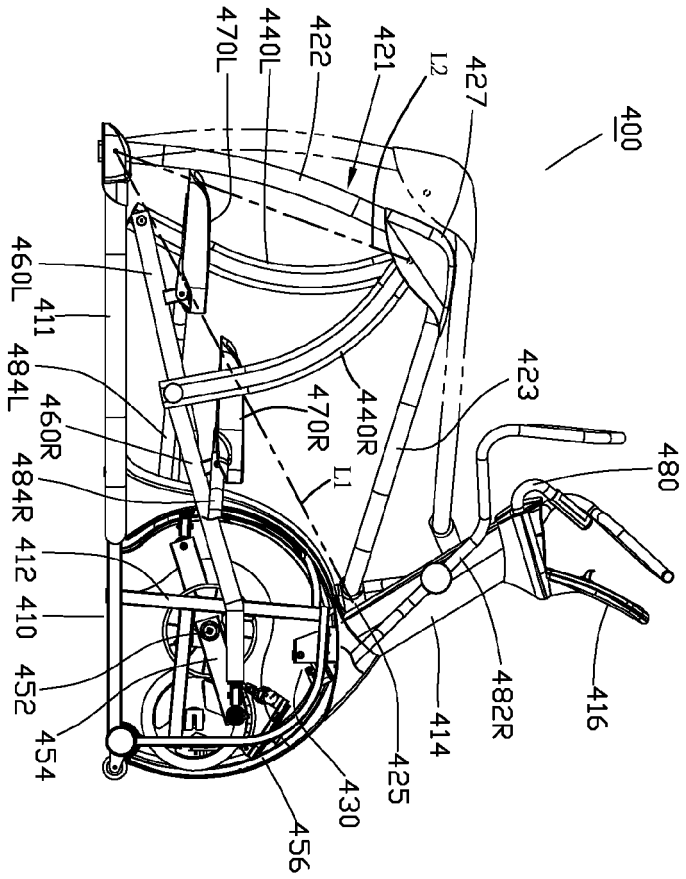
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L1

Fig.5

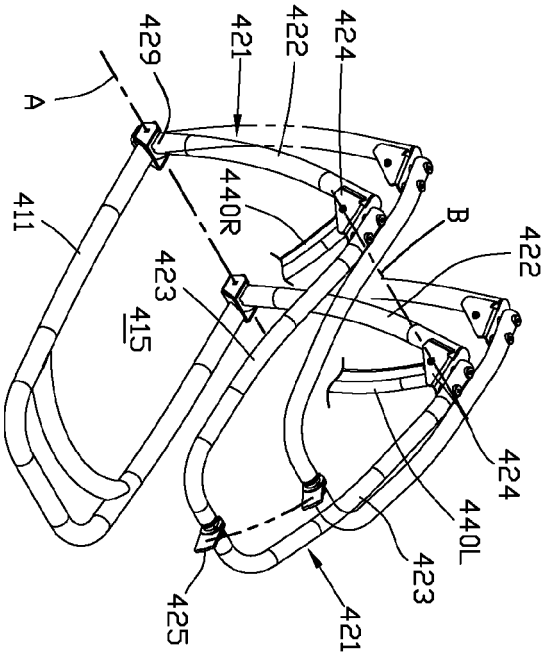
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Fig.6

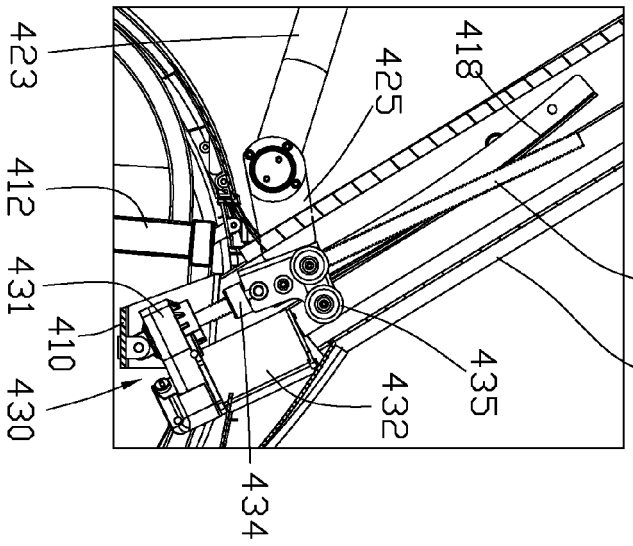

Fig.7A

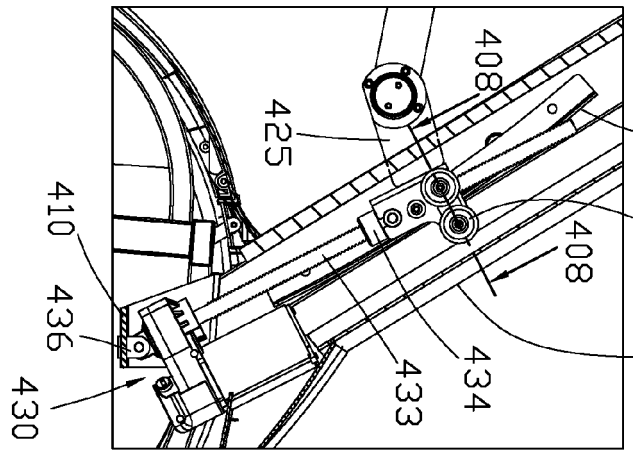

Fig.7B

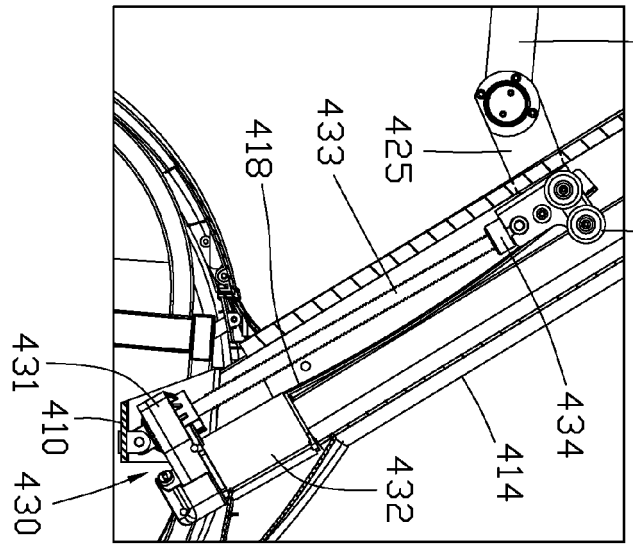

Fig.7C

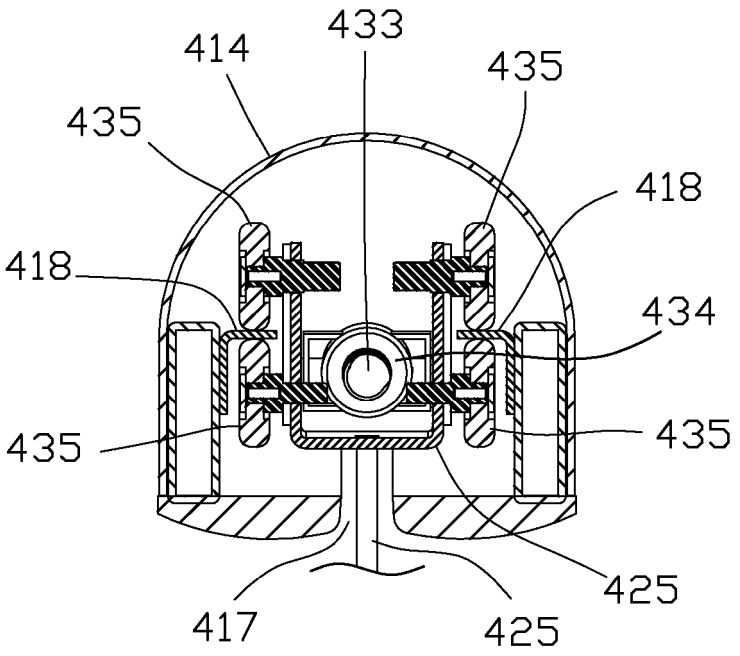
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Fig.8

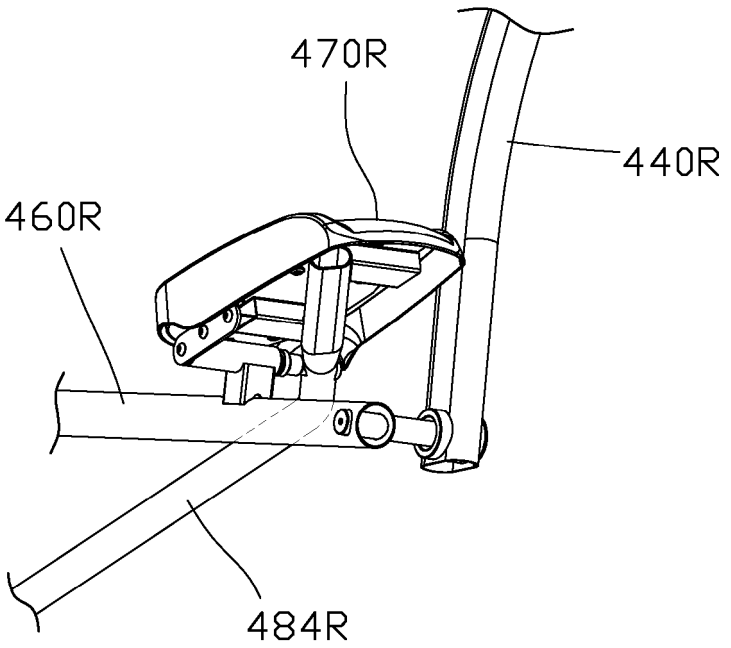
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Fig.9

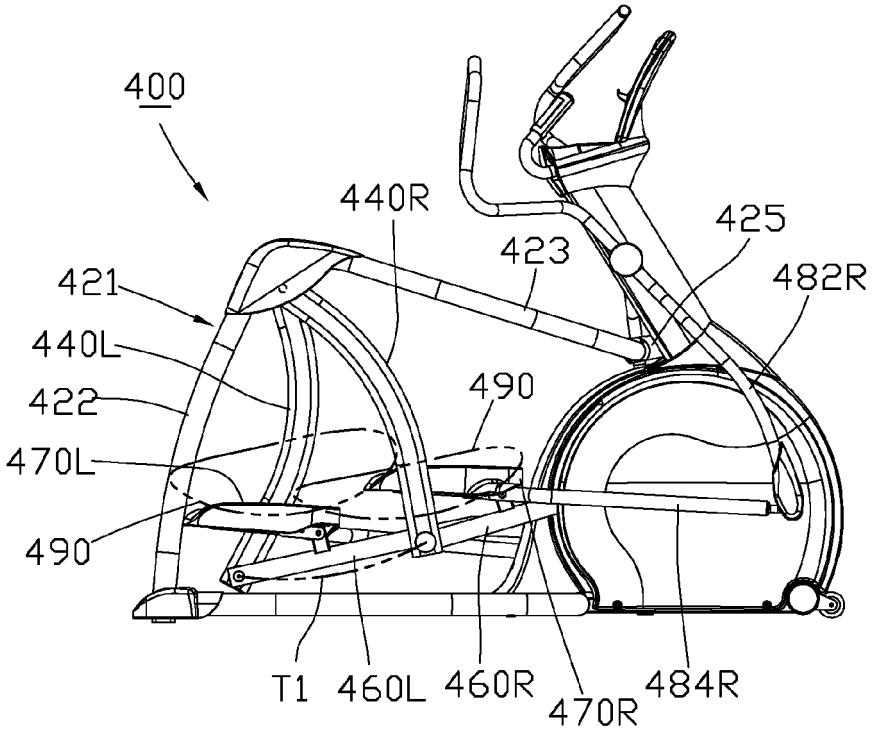

Fig.10A

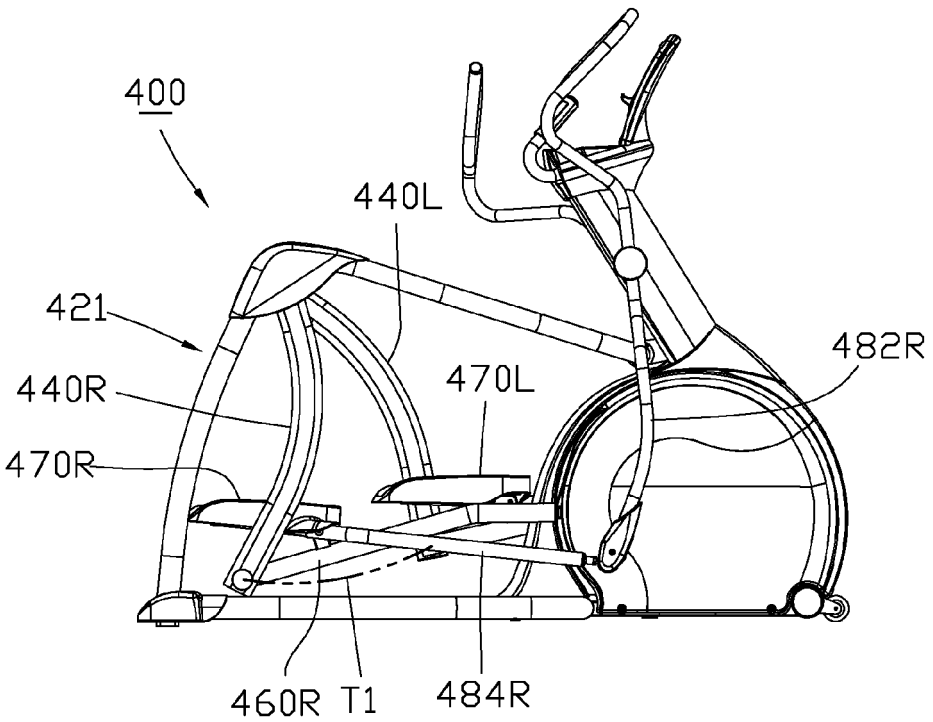

Fig.10B

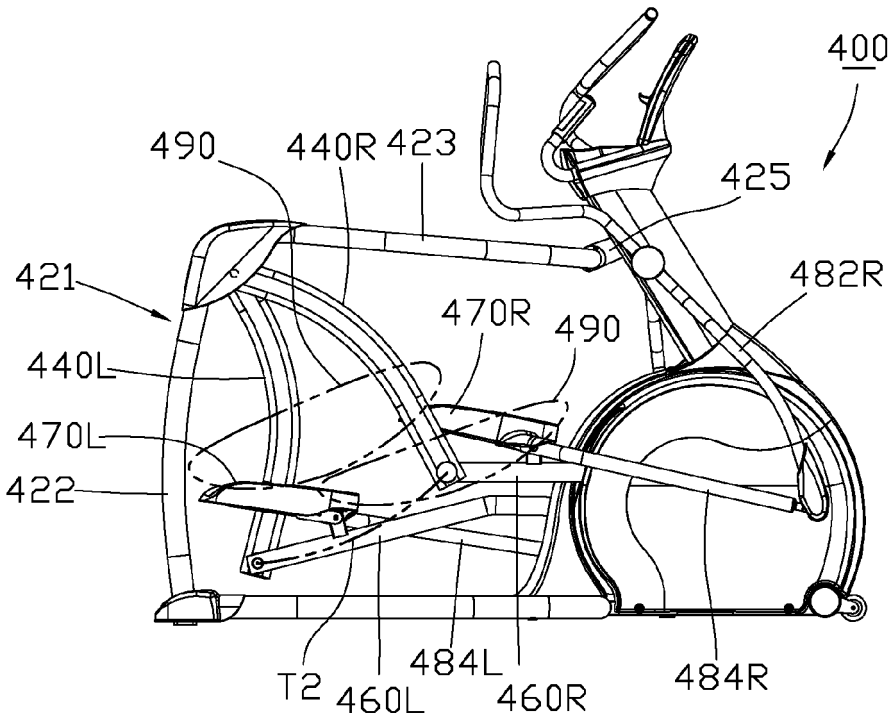

Fig.11A

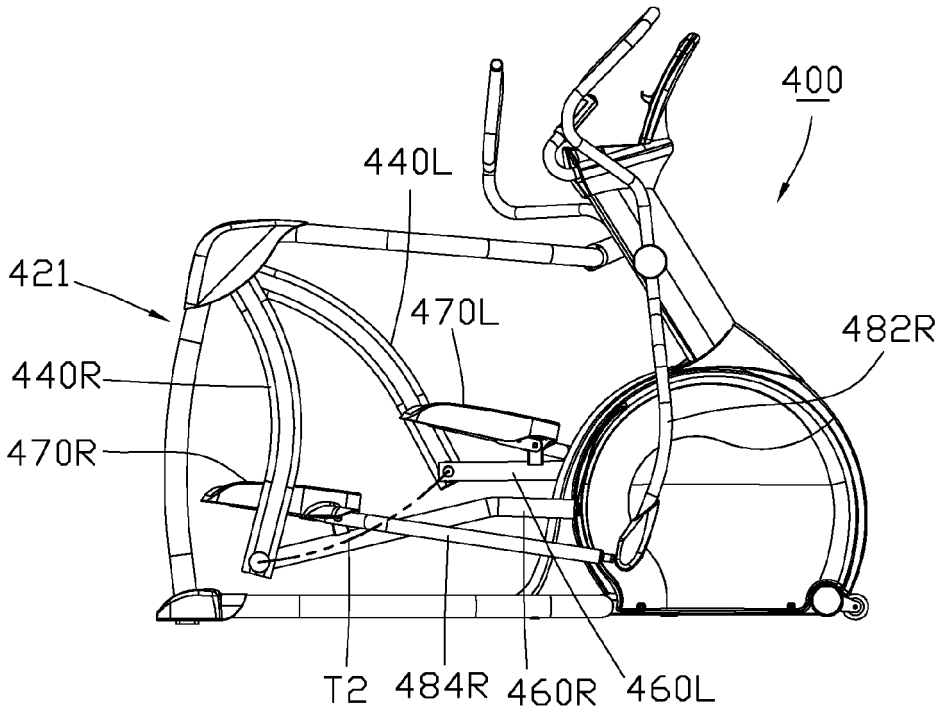

Fig.11B

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 10 4817

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	US 2007/099763 A1 (WANG LEAO [TW]) 3 May 2007 (2007-05-03) * paragraphs [0015] - [0022]; figures *	1-7	INV. A63B23/04
A	US 5 916 065 A (MCBRIDE ROBERT W [US] ET AL) 29 June 1999 (1999-06-29) * columns 8-10; figures *	1-7	
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