



(12) **EUROPEAN PATENT APPLICATION**  
 published in accordance with Art. 153(4) EPC

(43) Date of publication:  
**22.12.2010 Bulletin 2010/51**

(51) Int Cl.:  
**A63B 23/04 (2006.01) A63B 23/00 (2006.01)**

(21) Application number: **08739405.2**

(86) International application number:  
**PCT/JP2008/056291**

(22) Date of filing: **31.03.2008**

(87) International publication number:  
**WO 2009/122479 (08.10.2009 Gazette 2009/41)**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR**  
 Designated Extension States:  
**AL BA MK RS**

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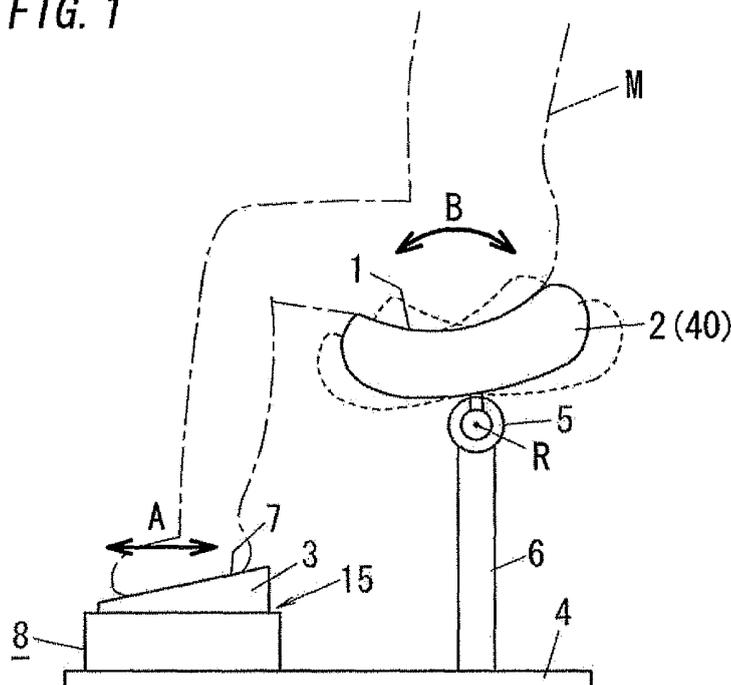
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(54) **EXERCISE APPARATUS**

(57) An exercise device with which a user can train a sense of balance and muscles effectively, even the user is accustomed to exercise in certain degree is provided. The exercise device comprises: a support part **2** which has a support surface **1** on which a user **M** can put

user's body, and which can rock within a prescribed range; and an external force exerting part **15** configured to rock the support part **2** within the prescribed range by exerting an external force on the support part **2** through the user **M** whose body is supported on the support surface **1**.

**FIG. 1**



## Description

### TECHNICAL FIELD

[0001] The invention relates to a passive exercise device with which a user performs an exercise while keeping the balance of the body.

### BACKGROUND ART

[0002] In Japanese Patent Application Laid-Open No. 2007-260186, a passive type exercise device as shown in Fig. 11, with which a user **M** performs an exercise while keeping the balance of the body, has been disclosed. This prior exercise device comprises a riding part 50 on which a user can put the body, and a base part 51 for supporting the riding part 50 on a floor surface. A driving part 52 for oscillating the riding part 50 with respect to the base part 51 is interposed between the base part 51 and the riding part 50.

[0003] The prior exercise device comprising above configuration can cause a user **M** riding on the riding part 50 to perform a passive exercise, by forcibly oscillating the riding part 50. However, the riding part 50 of the prior exercise device moves only along the prescribed route preliminarily set in the driving part 52. Therefore, the effect to train a sense of balance and muscles may become descended, because the user **M** accustomed to exercise in certain degree can anticipate the motion of the riding part 50.

### DISCLOSURE OF THE INVENTION

[0004] In the light of the above, it is an object of the present invention to provide an exercise device with which a user **M** can train a sense of balance and muscles effectively, even the user **M** is accustomed to exercise in certain degree.

[0005] An exercise device of the present invention to attain the above object comprises: a support part 2 which has a support surface 1 on which a user **M** can put the user's body, and which can rock within a prescribed range; and an external force exerting part 15 configured to rock the support part 2 within the prescribed range by exerting an external force on the support part 2 through the user **M** whose body is supported on the support surface 1.

[0006] In the exercise device comprising above configuration, the support part 2 rocks randomly, because the support part 2 rocks by the external force transmitted through the body of the user **M**. The user **M** is unsteadily rocked on the support part 2, and hence the balance of the body of the user **M** is made upset forcibly and randomly. If the user **M** keeps the balance against this, a sense of balance and muscles are trained unintentionally and effectively. Therefore, even the user **M** is accustomed to exercise in certain degree, the user **M** can train a sense of balance and muscles effectively.

[0007] Preferably, the exercise device of the present invention comprises a base part 20 having a base side slide surface 21 on its upper part, said base side slide surface 21 being in the shape of a convex curve or a concave curve, wherein a support side slide surface 22 is formed at a lower part of the support part 2, said support side slide surface 22 is formed in the shape of a curved surface following the base side slide surface 21, wherein the support part 2 is supported on the base part 20 so that the support part 2 can rock by making the support side slide surface 22 of the support part 2 slide with respect to the base side slide surface 21 of the base part 20. It becomes then possible that the support part 2 smoothly rocks on the base part 20. Furthermore, an orbit plane on which the support part 2 rocks can be freely decided by setting the curved shape of the base side slide surface 21 and the support side slide surface 22.

[0008] Preferably, the support part 2 has a roller 30, for supporting so that it can be rocked, at a lower part of the support part 2. It becomes then possible that the support part 2 smoothly rocks via the roller 30.

[0009] Preferably, the external force exerting part 15 comprises a footrest 3 on which a user **M** being on the support surface 1 of the support part 2 can put the user's foot, and a footrest driving means 8 for moving the footrest 3. It becomes then possible that the support part 2 rocks randomly when the footrest 3 on which the user **M** puts the user's foot is moved forcibly, and hence the balance of the body of the user **M** is made upset forcibly and randomly. If the user **M** keeps the balance against this, a sense of balance and muscles are trained effectively.

[0010] It is also preferred that the external force exerting part 15 comprises a grip part 25 for being gripped by a user **M** being on the support surface 1 of the support part 2, and a grip part driving means 27 for moving the grip part 25. It becomes then possible that the support part 2 is rocked randomly when the grip part 25 gripped by the user **M** is moved forcibly, and hence the balance of the body of the user **M** is made upset forcibly and randomly. If the user **M** keeps the balance against this, a sense of balance and muscles are trained effectively.

[0011] In this case, preferably, there is further provided a rod-shaped member 26 having the grip part 25, said grip part 25 being located at one end side in the longitudinal direction of the rod-shaped member 26, wherein the grip part driving means 27 oscillates the grip part 25 located at said one end side by turning the other end side in the longitudinal direction of the rod-shaped member 26. It becomes then possible that the grip part 25 oscillates efficiently.

[0012] It is also preferred that the support part 2 comprises a seat 40 on which a user **M** can put the user's buttock and a footrest 3 on which the user **M** can put the user's foot, said seat 40 being provided with footrest 3. It becomes then possible that each joint, such as hip joint, knee joint and ankle angle, is substantially kept in certain state while the user **M** keeps the balance. Therefore, it can excite the muscle contraction of leg with maintaining

the joint angles, whereby joint stress can be reduced.

## BRIEF DESCRIPTION OF THE DRAWINGS

### [0013]

FIG. 1 is a schematic lateral view showing an overall structure in accordance with an exercise device of present invention.

FIG. 2 is a schematic lateral roughly showing a structure of a footrest driving means in accordance with said exercise device.

FIG. 3 is a schematic lateral view showing an overall structure of a modified example in accordance with an exercise device of the present invention.

FIG. 4 is a schematic lateral view showing an overall structure of a modified example in accordance with an exercise device of the present invention.

FIG. 5 is a schematic lateral view showing an overall structure of a modified example in accordance with an exercise device of the present invention.

FIG. 6 is a schematic lateral view showing an overall structure of a modified example in accordance with an exercise device of the present invention.

FIG. 7 is a schematic perspective view showing an essential structure of a modified example in accordance with an exercise device of the present invention.

FIG. 8 is a schematic perspective view showing the essential structure of another posture.

FIG. 9 is a schematic perspective view showing an essential structure of a modified example in accordance with an exercise device of the present invention.

FIG. 10 is a schematic lateral view showing said essential structure.

FIG. 11 is a schematic lateral view showing an overall structure of a prior exercise device.

## BEST MODE FOR CARRYING OUT THE INVENTION

[0014] To give a detailed explanation of the present invention, it is explained based on attached drawings. The directions described in the explanation below, such as front, back, right or left, are defined as seen from a user **M** getting on the support surface **1**.

[0015] In Fig. 1, an overall structure of an exercise device in accordance with the present invention is shown. The exercise device of the present invention comprises a support part **2** having a support surface **1**, said support surface **1** being configured so that a user **M** can put the user's buttock on to become a sitting posture, a footrest **3** on which the user **M**, whose buttock is put on the support surface **1**, can put the soles of right and left feet, and a plate-like connection body **4** connecting the support part **2** and the footrest **3**.

[0016] The support part **2** forms a seat **40** or a chair, and has a support surface **1** on its upper part, wherein

the support surface **1** is in the shape of a concave curve. A support post **6** is vertically arranged on a connection body **4**. A lower part of the support part **2** is turnably supported on an upper end part of the support post **6** via a rotation connection part **5**. In the illustrated example, the rotation connection part **5** supports the support part **2** so that the support part **2** can turn in the front-back direction (the direction indicated by an arrow **B** shown in Fig. 1) about a turn axis **R** as a center, wherein the axial direction of the turn axis **R** is set at the right-left direction. However, the rotation direction of the rotation connection part **5** is not restricted to the above direction, and the axial direction of the turn axis **R** may be set at another direction. Furthermore, the rotation connection part **5** may be configured to support the support part **2** so that the support part **2** can turn in any directions.

[0017] The footrest **3** is formed like a rest having a foot support surface **7** on its upper part, wherein the foot support surface **7** is formed into an inclined surface. A footrest driving means **8** for reciprocally driving the footrest **3** in the front-back direction (the direction indicated by an arrow **A** shown in Fig. 1) is connected to a lower part of the footrest **3**.

[0018] As shown in Fig. 2, the footrest driving means **8** comprises a box **9**, a motor **10** as a drive source, and a motion transmission mechanism **11**. The box **9** is fixed on the connection body **4**, and houses the motor **10** and the motion transmission mechanism **11**. The motion transmission mechanism **11** converts a rotational motion of the motor **10** into a front-back directional reciprocating motion, and to transmit to the footrest **3**. The motion transmission mechanism **11** is a piston crank mechanism. The motion transmission mechanism **11** has a crank arm part **12** one end side of which is eccentrically rotated by the motor **10**, a piston part **13** connected to the other end side of the crank arm part **12**, and a linear guide part **14** for guiding the moving direction of the piston part **13** into the front-back direction. The footrest **3** is connected to the piston part **13**, which is located in the box **9**, and is reciprocally driven in the front-back direction with sliding on a top surface of the box **9**.

[0019] In order to provide a passive exercise by using above-described exercise device, a user **M** first puts the user's buttock on the support surface **1** of the support part **2** while the user **M** puts the user's left and right soles on the foot support surface **7** of the footrest **3**, and to be a sitting posture. Under the user **M** being this sitting posture, when an operation part (not shown in the figure) is operated to rotary drive the motor **10** located in the box **9**, the footrest **3** is reciprocally moved in the front-back direction via the motion transmission mechanism **11**, and exerts an external force, which cause a reciprocating movement in the front-back direction, on the user **M** whose sole is put on the foot support surface **7**. The user **M** rocks the support part **2** in the front-back direction with respect to the support pole **6** by the external force transmitted through the lower part of the user's own body.

[0020] In other words, the external force exerting part

15, which rocks the support part 2 within a prescribed range by exerting an external force through the user M whose body is put on the support surface 1, consists of the footrest 3 on which the user M being on the support surface 1 of the support part 2 can put the user's foot, and the footrest driving means 8 for reciprocally moving the footrest 3 in the front-back direction.

[0021] In the exercise device having above-described configuration, the footrest 3 and the support part 2 execute different forms of oscillation or rock with each other. Furthermore, the support part 2 rocks in a random pattern because the motion is executed by the external force transmitted through the body of the user M. Therefore, when the feet of the user M on the footrest 3 are oscillated forcibly, the buttock of the user M on the support part 2 is unsteadily rocked, and hence the balance of the body of the user M is made upset forcibly and randomly. If the user M keeps the balance against this especially around the thigh and the trunk of the body, a sense of balance and muscles are trained effectively.

[0022] A footrest 3 for left-foot and a footrest 3 for right-foot may be separated, and a footrest driving means 8 for left-foot and a footrest driving means 8 for right-foot may be separated. The footrest 3 for left-foot and the footrest 3 for right-foot may be reciprocally moved independently. In this case, the balance of the user M can be made upset to a greater degree. In addition, muscles of right or left foot can be trained intensively.

[0023] Next, various modified examples in accordance with the exercise device of the present invention are described in turn. In the explanation about modified examples described below, like kind elements are assigned the same reference numerals as depicted in modified examples, and detailed description thereof is omitted.

[0024] A modified example shown in Fig. 3 is characterized in that there is provided a base part 20 for supporting a support part 2 so that the support part 2 can slide. The base part 20 is fixed to a top end part of a support post 6. A base side slide surface 21, which is in the shape of a convex curve, is formed at an upper part of the base part 20. A slide part 24 is formed at a lower part of the support part 2. A lower surface of the slide part 24 is a support side slide surface 22, which is in the shape of a concave curve following the base side slide surface 21.

[0025] The support side slide surface 22, which is a lower surface of the support part 2, slide with respect to the base side slide surface 21, which is an upper surface of the base part 20. Thereby, the support part 2 is supported on the base part 20 so that the support part 2 can slide.

[0026] When the support side slide surface 22 slides on the base side slide surface 21, the support part 2 rocks on a orbit plane following the shape of the convex curve of the base side slide surface 21 (the direction indicated by an arrow B shown in Fig. 3). In addition, the base part 20 is provided with a stopper 23 for preventing the support part 2, which is configured to rock, from dropping off.

[0027] In the above-described configuration, the orbit plane, on which the support part 2 rocks, can be freely decided by adequately setting the curved shape of the base side slide surface 21 and the support side slide surface 22. Then, it is permitted to form the base side slide surface 21 into a concave curved shape and form the support side slide surface 22 into a convex curved shape following the base side slide surface 21.

[0028] A modified example shown in Fig. 4 is characterized in that an external force exerting part 15 has a grip part 25 which is in the shape of a horizontal bar and is gripped by a user M in a sitting posture by sitting on a support surface 1 of a support part 2, a rod-shaped member 26 of which the grip part 25 is fixed to one end side (upper side in the figure) in the longitudinal direction, and a grip part driving means 27 for oscillating the grip part 25 in the front-back direction via the rod-shaped member 26. The grip part driving means 27 is a motor 28 connected to the other end side (lower side in the figure) in the longitudinal direction of the rod-shaped member 26. The grip part driving means 27 oscillates the grip part 25, which is fixed to a top end part of the rod-shaped member 26, in the direction indicated by an arrow A shown in Fig. 4, by turning a lower end part of the rod-shaped member 26 in the front-back direction by means of the motor 28.

[0029] In addition, the grip part 25 may be formed into a ling-like shape for surrounding the front and each side of the user. In this case, falling of the user M can be prevented, and safety can be ensured.

[0030] In the modified example of Fig. 4, a footrest 3 is fixed to a connection body 4. Then, such a configuration of connecting the support part 2 with the base part 20 so as to slide with each other is similar to that of the modified example of Fig. 3.

[0031] In order to provide a passive exercise by using the exercise device shown in Fig. 4, a user M first puts the user's buttock on the support surface 1 of the support part 2 and puts the right and left soles on the footrest 3 while the user M grips the grip part 25 located in front of the user M with each or one hand, and to be a sitting posture. Under the user M being this sitting posture, when an operation part (not shown in the figure) is operated to rotary drive the motor 28, the grip part 25 is reciprocally moved in the front-back direction via the rod-shaped member 26, and exerts an external force, which cause a reciprocating movement in the front-back direction, on the user M gripping the grip part 25. The user M rocks the support part 2 in the front-back direction (the direction indicated by an arrow B shown in Fig. 4) with respect to the support part 20 by the external force transmitted through the upper part of the user's own body.

[0032] In the exercise device having above-described configuration, the grip part 25 and the support part 2 execute different forms of oscillation or rock with each other. Furthermore, the support part 2 rocks in a random pattern because the motion is executed by the external force transmitted through the body of the user M. Therefore, when the arm gripping the grip part 25 and the upper

body of the user **M** are oscillated forcibly, the buttock of the user **M** on the support part **2** is unsteadily rocked, and hence the balance of the body is made upset forcibly and randomly. If the user **M** keeps the balance against this especially around the thigh and the trunk of the body,

a sense of balance and muscles are trained effectively. **[0033]** A grip part **25** for left-hand and a grip part **25** for right-hand may be separated, and a grip part driving means **27** for left-hand and a grip part driving means **27** for right-hand may be separated. The grip part **25** for left-hand and the grip part **25** for right-hand may be reciprocally moved independently. In this case, the balance of a user **M** can be made upset to a greater degree. In addition, muscles of right or left hand can be trained intensively.

**[0034]** Furthermore, in such a configuration of taking off the footrest **3**, an exercise load especially to the trunk of the body is increased, because a user **M** performs an exercise with the user's feet floating.

**[0035]** A modified example shown in Fig. 5 is **characterized in that** a support part **2** is a footrest **3**. That is, a support surface **1**, which is an upper part of the support part **2**, consists of a foot support surface **7** on which a user **M** can put the user's right and left soles. The user **M** performs an exercise with standing on the support surface **1**. In the modified example of Fig. 5, such a configuration of connecting the support part **2** with a base part **20** so as to slide with each other is similar to that of the modified example of Fig. 3. Furthermore, in the modified example of Fig. 5, such a configuration of forming an external force exerting part **15** by a grip part **25** and a grip part driving means **27** is similar to that of the modified example of Fig. 4.

**[0036]** In order to provide a passive exercise by using the exercise device shown in Fig. 5, a user **M** first puts the soles on the support surface **1** of the support part **2** while the user **M** grips the grip part **25** located in front of the user **M** with each or one hand, and to be a standing posture. Under the user **M** being this standing posture, when an operation part (not shown in the figure) is operated to rotary drive a motor **28**, the grip part **25** is reciprocally moved in the front-back direction via a rod-shaped member **26**, and exerts an external force, which causes a reciprocating movement in the front-back direction, on the user **M** gripping the grip part **25** and being in the standing posture. The user **M** rocks the support part **2** as the footrest **3** in the front-back direction with respect to the support part **20** by the external force transmitted downward through the user's own body.

**[0037]** In the exercise device having above-described configuration, the support part **2** as the footrest **3** and the grip part **25** execute different forms of oscillation or rock with each other. Furthermore, the support part **2** rocks in a random pattern because the motion is executed by the external force transmitted through the body of the user **M** who is in the standing posture. Therefore, when the arm gripping the grip part **25** and the upper body of the user **M** are oscillated forcibly, the lower body of the user

**M** standing on the support part **2** is unsteadily rocked, and hence the balance of the body is made upset forcibly and randomly. If the user **M** keeps the balance against this, a sense of balance and muscles, especially around the thigh and the trunk of the body, are trained effectively.

**[0038]** A modified example shown in Fig. 6 is **characterized in that** a support part **2** as a footrest **3** is supported by a plurality of rollers **30** located at a lower part of the support part **2**, and in that a cam mechanism is used for a grip part driving means **27** for oscillating a grip part **25** in the front-back direction via a rod-shaped member **26**.

**[0039]** Rollers **30** are arranged so that they can move in the front-back direction within a slide frame **29** fixed on a connection body **4**. Therefore, the support part **2** rocks in the front-back direction when the rollers **30** rotate to move in the front-back direction.

**[0040]** The grip part driving means **27** has a rotation connection part **31**, an elastic member **32**, a cam member **33**, and a motor **34**. The rotation connection part **31** turnably supports the end part of the rod-shaped member **26** on the connection body **4**, wherein said the end part of the rod-shaped member **26** is the opposite side (lower side in the figure) to the side connected with the grip part **25**. The elastic member **32** biases the rod-shaped member **26** toward a given direction (front direction in the figure). The cam member **33** comes into contact with the rod-shaped member **26** from the side opposite to the elastic member **32**. The motor **34** drives the cam member **33** so as to give an eccentric rotation.

**[0041]** In order to provide a passive exercise by using the exercise device shown in Fig. 6, a user **M** first puts the soles on a support surface **1** of the support part **2** while the user **M** grips the grip part **25** located in front of the user **M** with each or one hand, and to be a standing posture. Under the user **M** being this standing posture, when an operation part (not shown in the figure) is operated to rotary drive the motor **34** of the grip part driving means **27**, the cam member **33**, which is eccentrically rotated, reciprocally oscillates the rod-shaped member **26** with pressing. The grip part **25** is reciprocally moved in the front-back direction via the rod-shaped member **26**, and exerts an external force, which causes a reciprocating movement in the front-back direction, on the user **M** gripping the grip part **25** and being in the standing posture. The user **M** rocks the support part **2** as the footrest **3** in the front-back direction (the direction indicated by an arrow **B** shown in Fig. 6) via the rotation of the roller **30** by the external force transmitted downward through the user's own body.

**[0042]** A modified example shown in Fig. 7 and Fig. 8 is **characterized in that** a support part **2** as a footrest **3** comprises such a mechanism that right and left stepper parts **35** move up and down accompanying the rock of the support part **2**. Other configurations are similar to those of the modified examples of Fig. 5 etc.

**[0043]** In the modified example of Fig. 7 and Fig. 8, the support part **2** as the footrest **3** is supported so that the

support part **2** can turn in the right-left direction (the direction indicated by an arrow **B** shown in Fig. 7) about a turn axis **R** as a center, wherein the axial direction of the turn axis **R** is set at front-back direction. Left sole of a user **M** can be put on the left side (with respect to the turn axis **R**) of the support part **2**, and right sole of the user **M** can be put on the right side (with respect to the turn axis **R**) of the support part **2**. The stepper parts **35** are located where the heels of right or left soles are put so that the stepper parts **35** can move up and down. In addition, a connection body **4**, which is located under the support part **2**, is provided with resistance members **36**. The resistance members **36** are configured to press to lift up the stepper part **35**, when the support part **2** inclines in the right-left direction and hence one of the stepper parts **35** come down. Each of the resistance members **36** is located where it faces right or left stepper parts **35**.

**[0044]** In performing a passive exercise by using the exercise device shown in Fig. 7 and Fig.8, when the support part **2** rocks in the right-left direction by an external force exerted by an external force exerting part **15**, the heel of right or left sole is lifted up by the stepper part **35** accompanying said rock. In other words, an exercise to lift up the right and left heels is performed passively, thereby exercise effect about leg region can be further increased. Similar stepper parts **35** may be located where the toes of right and left soles are put. In this case, the toes of right and left soles are lifted up by the stepper parts **35** when the support part **2** rocks in the right-left direction.

**[0045]** A modified example shown in Fig. 9 and Fig. 10 is **characterized in that** a support part **2**, which is rocked by an external force, integrally comprises a seat **40**, on which a user **M** can put the user's own buttock to become a sitting posture, and a footrest **3**, on which the user **M** being in the sitting posture can put the right and left soles. Other configurations such as an external force exerting part **15** are similar to those of modified example of Fig. 4.

**[0046]** In the modified example of Fig. 9 and Fig. 10, since the seat **40** is integrally provided with the footrest **3**, each joint such as hip joint, knee joint and ankle angle, is substantially kept in certain state while the user **M** keeps the balance. Therefore, muscle contraction of leg can be excited with maintaining joint angles, whereby joint stress is reduced.

## Claims

1. An exercise device comprising:

a support part which has a support surface on which a user can put user's body, and which can rock within a prescribed range; and  
 an external force exerting part configured to rock the support part within the prescribed range by exerting an external force on the support part through the user whose body is supported on

the support surface.

2. The exercise device as set forth in claim 1, comprising a base part having a base side slide surface on its upper part, said base side slide surface being in the shape of a convex curve or a concave curve, wherein a support side slide surface is formed at a lower part of the support part, said support side slide surface being formed in the shape of a curved surface following the base side slide surface, wherein the support part is supported on the base part so that the support part can rock by making the support side slide surface of the support part slide with respect to the base side slide surface of the base part.
3. The exercise device as set forth in claim 1, wherein the support part has a roller, for supporting so that it can be rocked, at a lower part of the support part.
4. The exercise device as set forth in any one of claims 1-3, wherein the external force exerting part comprises a footrest on which the user being on the support surface of the support part can put the user's foot, and a footrest driving means for moving the footrest.
5. The exercise device as set forth in any one of claims 1-3, wherein the external force exerting part comprises a grip part for being gripped by the user being on the support surface of the support part, and a grip part driving means for moving the grip part.
6. The exercise device as set forth in claim 5, comprising a rod-shaped member having the grip part, said grip part being located at one end side in the longitudinal direction of the rod-shaped member, wherein the grip part driving means oscillates the grip part located at said one end side by turning the other end side in the longitudinal direction of the rod-shaped member.
7. The exercise device as set forth in any one of claims 1-3,5,6, wherein the support part comprises a seat on which the user can put user's buttock and a footrest on which the user can put user's foot, said seat being integrally provided with the footrest.

FIG. 1

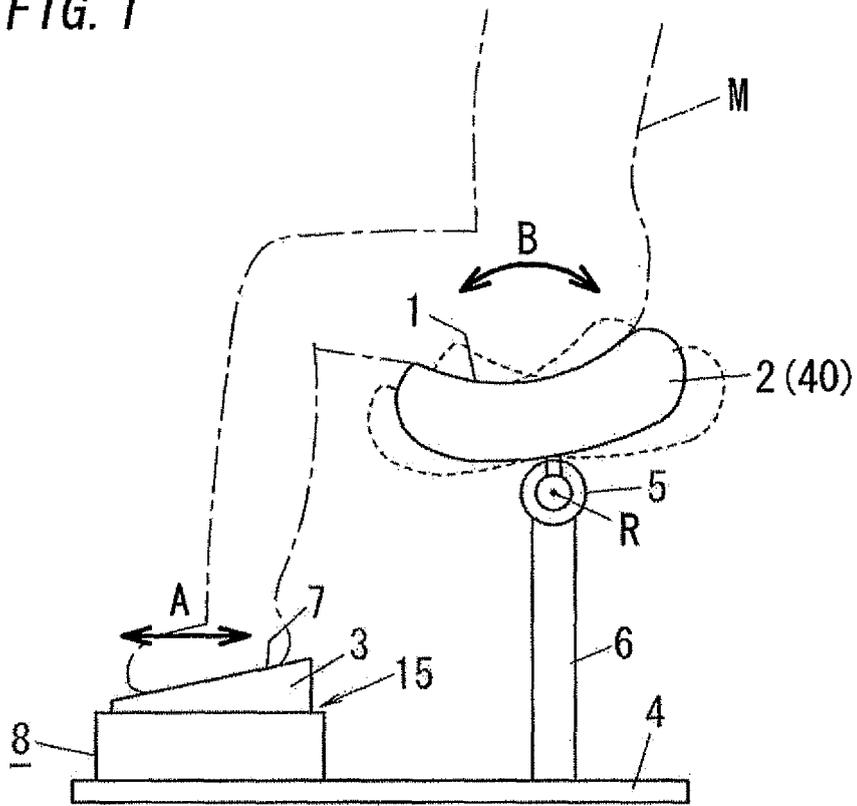


FIG. 2

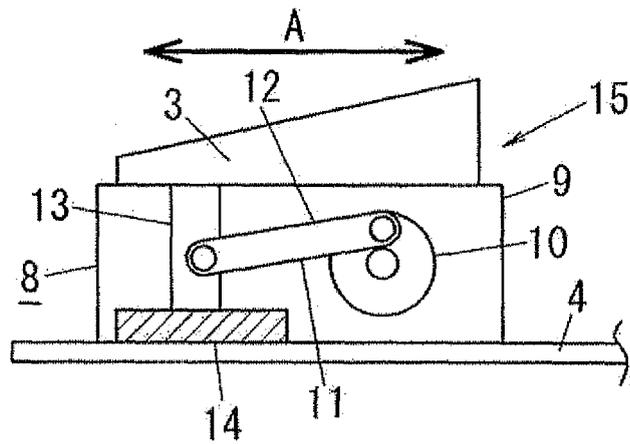




FIG. 5

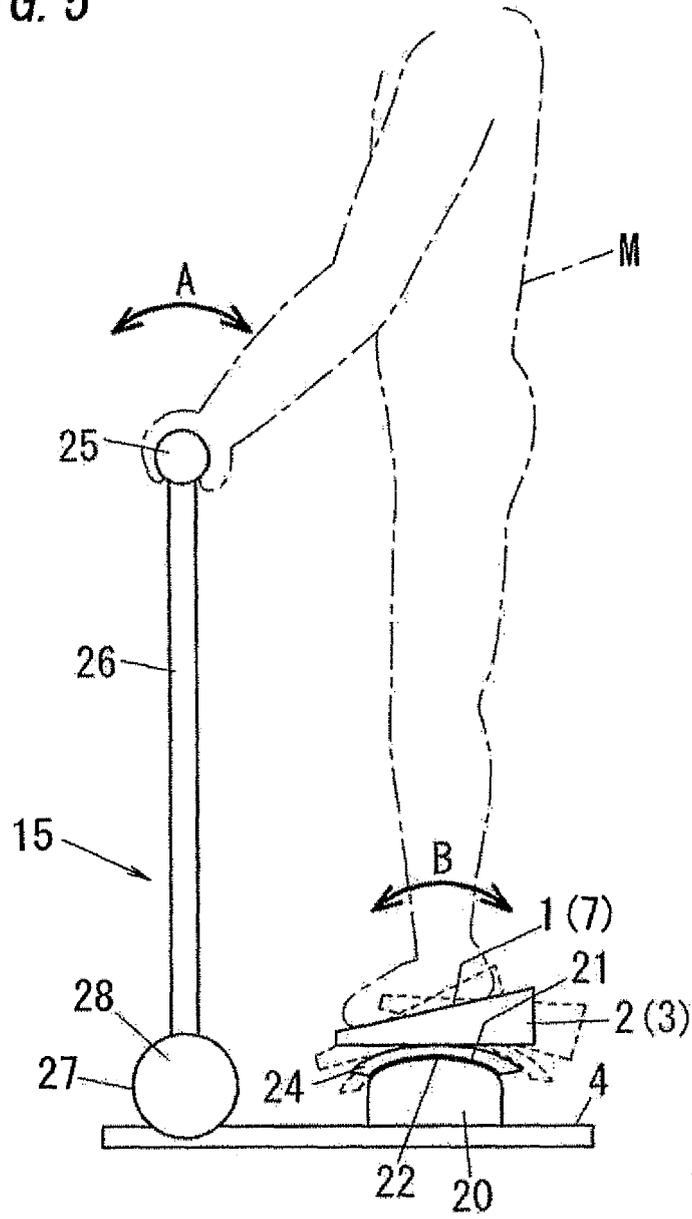


FIG. 6

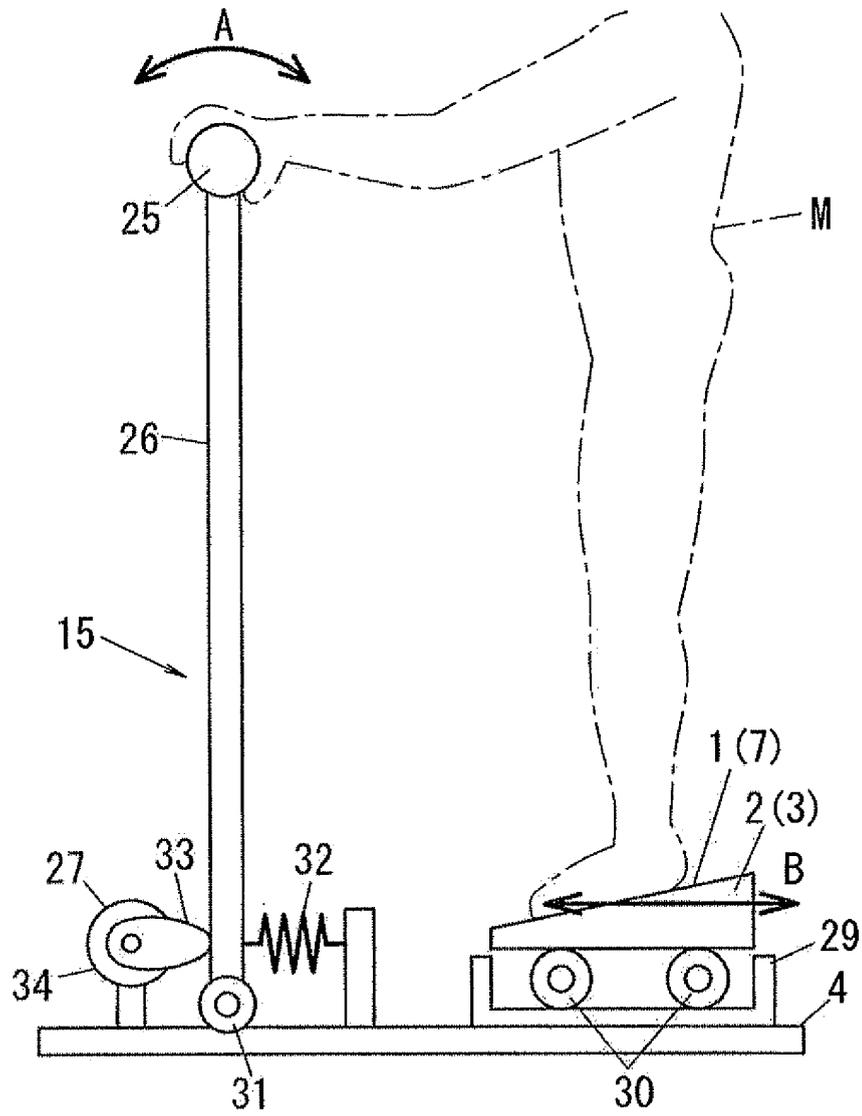


FIG. 7

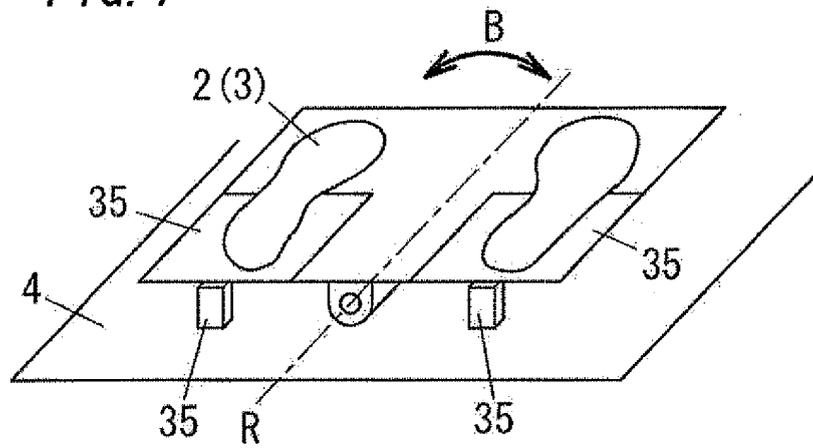


FIG. 8

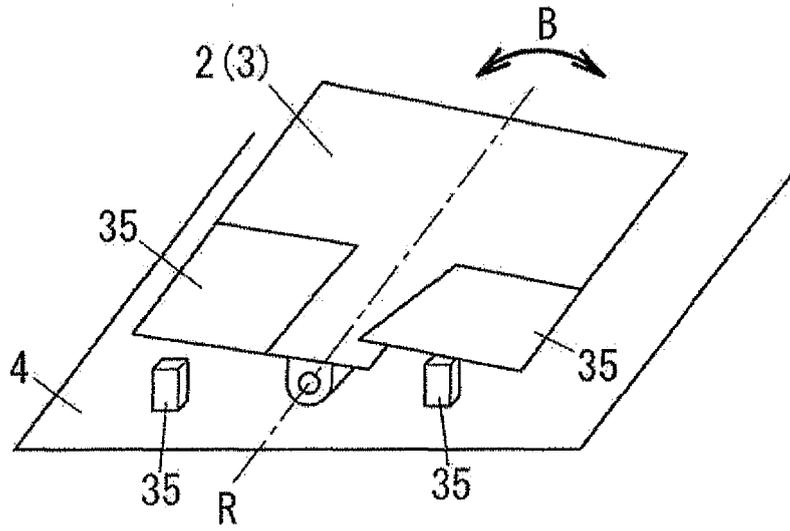


FIG. 9

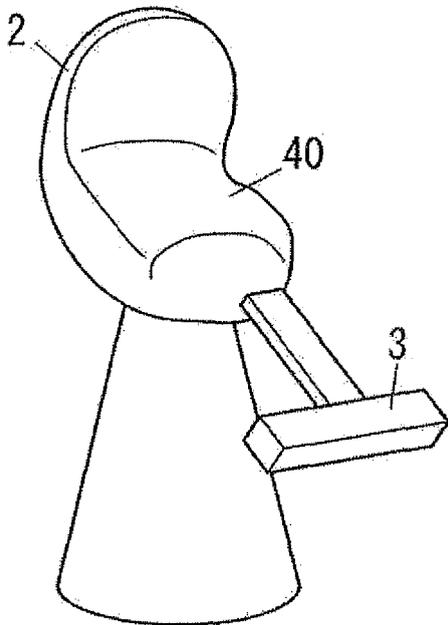


FIG. 10

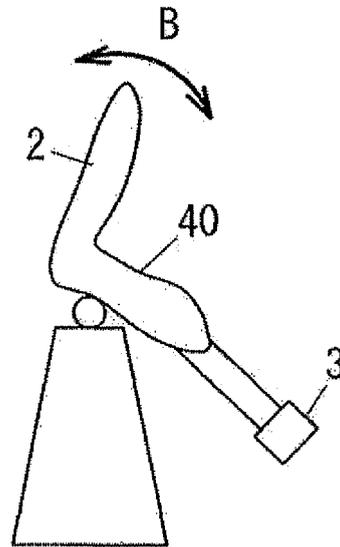
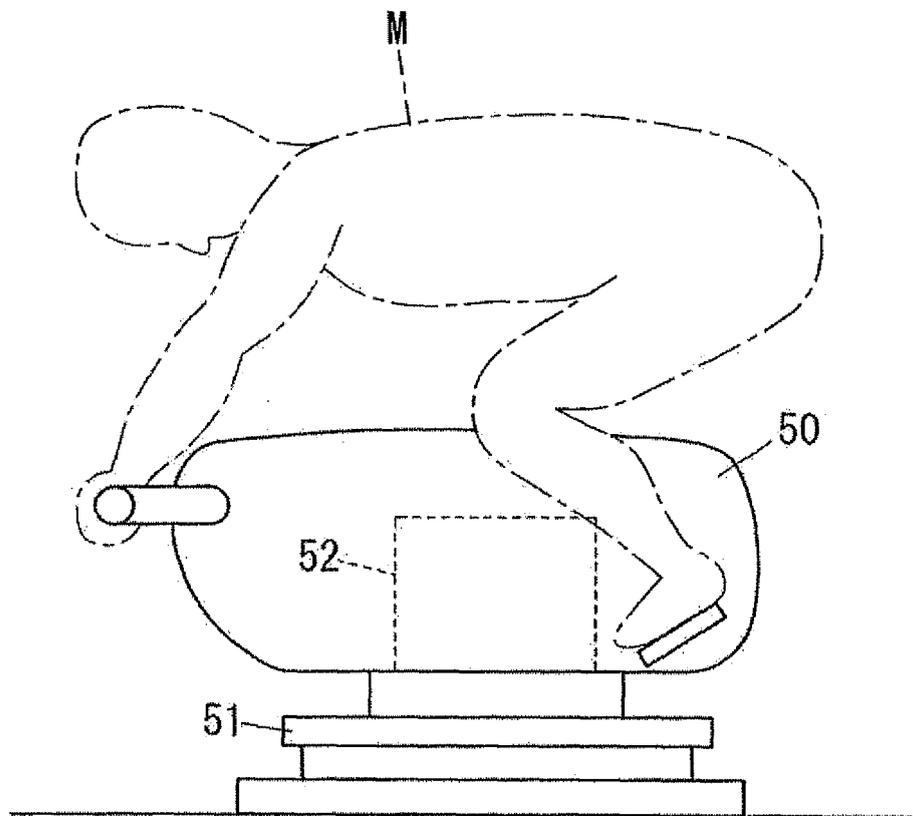


FIG. 11



**EP 2 263 761 A1**

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/JP2008/056291

<p>A. CLASSIFICATION OF SUBJECT MATTER A63B23/04 (2006.01) i, A63B23/00 (2006.01) i</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>																				
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) A63B23/04, A63B23/00</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched                  Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008                  Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p>																				
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X Y</td> <td>WO 2008/026336 A1 (YAMAN Ltd.), 06 March, 2008 (06.03.08), Par. Nos. [0029] to [0031], [0035], [0040], [0042]; Figs. 1 to 9 (Family: none)</td> <td>1-2, 4-5 3, 6-7</td> </tr> <tr> <td>Y</td> <td>JP 2001-178847 A (Ryuji TSUNODA), 03 July, 2001 (03.07.01), Par. Nos. [0006], [0013]; Figs. 1 to 5 (Family: none)</td> <td>3</td> </tr> <tr> <td>Y</td> <td>JP 2007-307180 A (Matsushita Electric Industrial Co., Ltd.), 29 November, 2007 (29.11.07), Par. Nos. [0023] to [0024], [0030] to [0032]; Figs. 1, 3 (Family: none)</td> <td>6</td> </tr> </tbody> </table> <p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.      <input type="checkbox"/> See patent family annex.</p> <p>* 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          "&amp;" document member of the same patent family</p> <table border="1"> <tr> <td>Date of the actual completion of the international search 21 April, 2008 (21.04.08)</td> <td>Date of mailing of the international search report 01 May, 2008 (01.05.08)</td> </tr> <tr> <td>Name and mailing address of the ISA/ Japanese Patent Office</td> <td>Authorized officer</td> </tr> <tr> <td>Facsimile No.</td> <td>Telephone No.</td> </tr> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X Y	WO 2008/026336 A1 (YAMAN Ltd.), 06 March, 2008 (06.03.08), Par. Nos. [0029] to [0031], [0035], [0040], [0042]; Figs. 1 to 9 (Family: none)	1-2, 4-5 3, 6-7	Y	JP 2001-178847 A (Ryuji TSUNODA), 03 July, 2001 (03.07.01), Par. Nos. [0006], [0013]; Figs. 1 to 5 (Family: none)	3	Y	JP 2007-307180 A (Matsushita Electric Industrial Co., Ltd.), 29 November, 2007 (29.11.07), Par. Nos. [0023] to [0024], [0030] to [0032]; Figs. 1, 3 (Family: none)	6	Date of the actual completion of the international search 21 April, 2008 (21.04.08)	Date of mailing of the international search report 01 May, 2008 (01.05.08)	Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer	Facsimile No.	Telephone No.
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INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2007-289348 A (Toyota Motor Corp.), 08 November, 2007 (08.11.07), Par. Nos. [0019] to [0020]; Fig. 1 (Family: none)	7
A	JP 2007-181731 A (Matsushita Electric Works, Ltd.), 19 July, 2007 (19.07.07), Par. Nos. [0029], [0056]; Figs. 1, 9 & US 2006/0229170 A1 & EP 001629868 A1	2
A	JP 2007-202841 A (Family Kabushiki Kaisha), 16 August, 2007 (16.08.07), Par. Nos. [0023] to [0025]; Figs. 1 to 4 (Family: none)	3
A	JP 2006-325990 A (Matsushita Electric Works, Ltd.), 07 December, 2006 (07.12.06), Par. Nos. [0017] to [0019], [0025] to [0026]; Figs. 1, 4 to 5 (Family: none)	4

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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