



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

(43) Date of publication:
13.12.2017 Bulletin 2017/50

(51) Int Cl.:
A63B 22/12 ^(2006.01) **A63B 23/035** ^(2006.01)
A61H 1/00 ^(2006.01)

(21) Application number: **15867974.6**

(86) International application number:
PCT/KR2015/013387

(22) Date of filing: **08.12.2015**

(87) International publication number:
WO 2016/093596 (16.06.2016 Gazette 2016/24)

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

(71) Applicant: **Jung, Jae Kong**
Seocho-gu, Seoul 06516 (KR)

(72) Inventor: **SEOL, Marn Taek**
Yangpyeong-gun
Gyeonggi-do 12543 (KR)

(74) Representative: **Beetz & Partner mbB**
Patentanwälte
Steinsdorfstraße 10
80538 München (DE)

(30) Priority: **08.12.2014 KR 20140174846**

(54) **MULTIPURPOSE BICYCLE EXERCISE MACHINE**

(57) A multipurpose bicycle exercise machine is disclosed. The multipurpose bicycle exercise machine according to the present invention comprises: a body; an arm exercise unit provided on the body to be able to rotate in the forward or backward direction; a foot exercise unit provided on the body to be able to rotate in the forward or backward direction; and an independent driving switch unit provided on the arm exercise unit so as to independently operate left and right arm cranks of the arm exercise unit, wherein the arm exercise unit has a flywheel such that, when the left and right arm cranks rotate in the forward and backward directions, a load is applied to the flywheel and makes the user exercise.

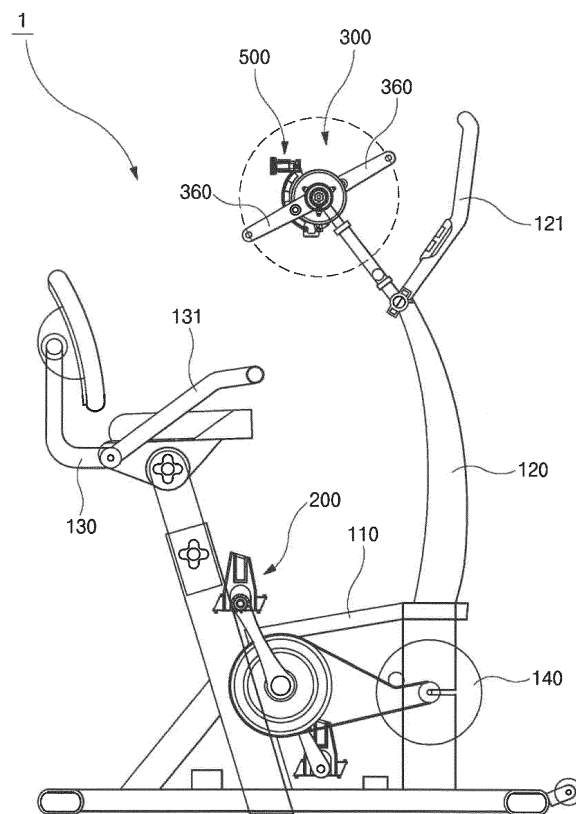


FIG. 1

Description

Technical Field

[0001] The present invention relates to a multipurpose bicycle exercise machine, and more particularly, to a multipurpose bicycle exercise machine capable of maximizing an exercise effect or a rehabilitation treatment effect by simultaneously or independently performing an arm exercise in addition to a mechanism based on a foot exercise of an indoor bicycle.

Background Art

[0002] On the market, bicycles with gear-shifting mechanisms are often used. The gear-change mechanism functions to switch a bicycle operation between different sprockets having different speed ratios.

[0003] In addition to the switching operation between different chain gears having different speed ratios, a conventional gear-shifting mechanism has not worked to quickly operate the operating mode of the bicycle. The fact makes it possible for only specific muscles driving the bicycle to exercise. In addition, the fact makes it possible for the bicycle to be ridden tiresomely for a long time in a single fixed operating mode.

[0004] U.S. Patent Registration No. 5,088,340 having a title of invention of "multipurpose transmission machine for bicycle" filed by the present applicant, discloses a bicycle in a switchable operation mode. That is, in addition to a conventional continuous rotation operation of pedals, other operating modes including a leverage mode and an independent pedal operation mode are also used.

[0005] These various operation modes allow a bicycle driver to select the most appropriate mode for riding on the bicycle. In addition, such a transmission machine may also be applied to stationary bicycles for exercise.

[0006] However, conventional multipurpose driving machines have the following losses and defects.

(A) A bicycle disclosed in US Patent Registration No. 5,088,340 requires a specific-purpose hub mounted on a rear wheel in order to perform a leverage operation mode of the bicycle and the specific-purpose hub has higher manufacturing cost than a general hub.

(B) A rear wheel hub of a bicycle disclosed in US Patent Registration No. 5,088,340 is heavy to make it difficult for any user to handle.

(C) A multipurpose transmission machine of a bicycle disclosed in US Patent Registration No. 5,088,340 easily causes malfunctions.

[0007] In terms of the aforementioned defects, a bicycle transmission machine efficiently overcoming the aforementioned defects by inventors of the present utility model is disclosed in Korean Utility Model Registration

No. 20-0414309 of "Improved multifunctional pedal exercise bicycle".

[0008] However, the known transmission machine needs operate with a bicycle frame for a specific purpose. Accordingly, since the transmission machine can not be attached to a general bicycle frame, it is difficult to easily popularize the bicycle. Also, it is impossible for a general consumer to be assembled itself.

[0009] Accordingly, a more improved bicycle transmission machine which can be compatible with the conventional bicycle frames which is quickly and easily assembled has been expected.

[0010] The present invention is disclosed in Korean Utility Model Registration No. 20-0462643 (September 14, 2012) of "Multipurpose transmission machine for bicycles" filed and registered by the present applicant, which is a prior art for improving the aforementioned problems.

[0011] However, this prior art can only exercise a lower body part of the user, but can not exercise a upper body part including the arm, and as a result, an improvement measure is required.

[0012] The above-described technical structure is a background technique for helping in understanding of the present invention, and does not refer to conventional techniques widely known in the art to which the present invention belongs.

[Prior Art Document]

[Patent Document]

[0013] (Patent Document 1) Korean Utility Model Registration No. 20-0462643 (Applicant: CHUNG, Ok Yeo Chong) (Date of Registration: September 14, 2012)

Disclosure

Technical Problem

[0014] The present invention has been made in an effort to provide a multipurpose bicycle exercise machine capable of maximizing an exercise effect or a rehabilitation treatment effect by simultaneously or independently performing an arm exercise in addition to a mechanism based on a foot exercise of an indoor bicycle.

Technical Solution

[0015] An aspect of the present invention provides a multipurpose bicycle exercise machine including: a body; an arm exercise unit provided on the body to be rotatably provided in forward or backward direction; a foot exercise unit provided on the body to be rotatably provided in the forward or backward direction; and an independent driving switch unit provided on the arm exercise unit so as to independently operate left and right arm cranks of the arm exercise unit, and wherein the arm exercise unit in-

cludes a flywheel and forms an exercise when a load is applied by the flywheel according to rotate the left and right arm cranks in the forward or backward direction.

[0016] The independent driving switch unit may include: a clutch body provided on each of the left and right arm cranks; a transbody rotatably provided to the clutch body; and a shift lever provided to each of the left and right arm cranks and driving the transbody to independently operate the left and right arm cranks.

[0017] The independent driving switch unit may further include a shift spring connecting the shift lever and the transbody.

[0018] A shift lever stopper limiting a rotation range of the shift lever may be provided in the left and right arm cranks.

[0019] The arm exercise unit may include: a spline shaft detachably coupled to the post frame of the body; a pair of clutch units detachably coupled to both sides of the spline shaft and moved in a longitudinal direction of the spline shaft by elastic force, respectively; and arm cranks detachably coupled to both ends of the spline shaft and having a handle rod.

[0020] The flywheel may be provided on at least one of the pair of clutch units.

[0021] The multipurpose bicycle exercise machine may further include a power control unit provided in the post frame of the body and controlling power applied by the flywheel.

[0022] The power control unit may include: a flywheel friction plate detachably coupled to the post frame to control a distance from the flywheel; and a power controller provided on the post frame to control a distance between the flywheel and the flywheel friction plate.

[0023] The foot exercise unit may include: a quick assembly device having a central axis, a plurality of thread collars, and a clip bracket, which is mounted on the base frame of the body; a multi-mode mechanism supported and fixed by the quick assembly device to provide a multi-mode pedal operation to the body; and a control mechanism having a control cable coupled to each of the plurality of clips and a plurality of clips having a support block attached to a clip bracket.

[0024] The exercise machine may be used indoor.

Advantageous Effects

[0025] According to the exemplary embodiments of the present invention, since various functions are driven in addition to the conventional 360° rotation type pedaling and handling, it is possible to perform exercises by freely changing the pedaling and handling according to the purpose as well as various exercise effects.

[0026] As a result, exercise efficiency can be enhanced, and exercise can be enjoyed without boring, and the present invention may have an excellent effect on the use of disabled persons, rehabilitation medical treatment, and training of athletes without restriction of left and right independent driving and up and down strokes.

Description of Drawings

[0027]

FIG. 1 is a side view schematically illustrating a multipurpose bicycle exercise machine according to an exemplary embodiment of the present invention.

FIG. 2 is a schematic front view of the multipurpose bicycle exercise machine illustrated in FIG. 1.

FIG. 3 is a schematic cross-sectional view of an arm exercise unit and an independent driving switch unit illustrated in FIG. 1.

FIG. 4 is a schematic exploded view of FIG. 3.

FIG. 5 is a view schematically illustrating a power control unit illustrated in FIG. 2.

FIG. 6 is a view schematically illustrating a power control unit provided in a peripheral area of a flywheel.

FIG. 7 is a view schematically illustrating that a flywheel friction plate illustrated in FIG. 6 is close to the flywheel by rotation of a control knob.

FIG. 8 is a modified example of the power control unit illustrated in FIG. 5.

FIG. 9 is a view schematically illustrating that an independent driving switch unit is provided in an arm crank.

FIG. 10 is a side view of FIG. 9.

FIG. 11 is an operational view of a transbody illustrated in FIG. 9.

FIG. 12 is a view schematically illustrating a control mechanism controlling an arm exercise unit.

FIG. 13 is a view schematically illustrating a control unit illustrated in FIG. 2.

Modes of the Invention

[0028] In order to fully understand the present invention, operational advantages of the present invention and objects achieved by implementing the present invention, the present invention will be described with reference to the accompanying drawings which illustrate preferred embodiments of the present invention and the contents illustrated in the accompanying drawings.

[0029] Hereinafter, preferred exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings. Like reference numerals illustrated in the respective drawings designate like members.

[0030] FIG. 1 is a side view schematically illustrating a multipurpose bicycle exercise machine according to an exemplary embodiment of the present invention, FIG. 2 is a schematic front view of the multipurpose bicycle exercise machine illustrated in FIG. 1, FIG. 3 is a schematic cross-sectional view of an arm exercise unit and an independent driving switch unit illustrated in FIG. 1, FIG. 4 is a schematic exploded view of FIG. 3, FIG. 5 is a view schematically illustrating a power control unit illustrated in FIG. 2, FIG. 6 is a view schematically illustrating a

power control unit provided in a peripheral area of a flywheel, FIG. 7 is a view schematically illustrating that a flywheel friction plate illustrated in FIG. 6 is close to the flywheel by rotation of a control knob, FIG. 8 is a modified example of the power control unit illustrated in FIG. 5, FIG. 9 is a view schematically illustrating that an independent driving switch unit is provided in an arm crank, FIG. 10 is a side view of FIG. 9, FIG. 11 is an operational view of a transbody illustrated in FIG. 9, FIG. 12 is a view schematically illustrating a control mechanism controlling an arm exercise unit, and FIG. 13 is a view schematically illustrating a control unit illustrated in FIG. 2.

[0031] As illustrated in the drawings, a multipurpose bicycle exercise machine 1 according to the exemplary embodiment includes a body 100; an arm exercise unit 200 provided on the body 100 to be rotatably provided in the forward or backward direction; a foot exercise unit 300 provided on the body 100 to be rotatably provided in the forward or backward direction; an independent driving switch unit 400 provided on the arm exercise unit 300 so as to independently operate left and right arm cranks 360 of the arm exercise unit 300, and a power control unit 500 provided in a post frame 120 of the body 100 to control power applied to a flywheel 380.

[0032] As illustrated in FIGS. 1 and 2, the body 100 may have a bicycle shape, and in the exemplary embodiment, as illustrated in FIG. 1, the body 100 includes a base frame 110 which is a basic structure, a post frame 120 provided in an upper direction from the front portion of the base frame 110 and having a handle 121, a sheet frame 130 provided at a central region of the base frame 110 and having a sheet handle 131, and a driven wheel 140 connected to the foot exercise unit 200 by chains and the like to rotate together.

[0033] The foot exercise unit 200 includes a quick assembly device 210 having a central axis, a plurality of thread collars, and a clip bracket, which is mounted on the base frame 110, a multi-mode mechanism 220 supported and fixed by the quick assembly device 210 to provide a multi-mode pedal operation to the body 100, and a control mechanism 230 having a control cable 240 coupled to each of the plurality of clips and a plurality of clips having a support block attached to a clip bracket.

[0034] In the exemplary embodiment, the foot exercise unit 200 may include all the components of Korean Utility Model Registration No. 20-0462643 filed and registered by the present applicant.

[0035] In the exemplary embodiment, the clip brackets are installed on both sides of the base frame 110, the center axis is inserted through both the clip bracket and the lower frame portion, and each of the plurality of thread collars includes a bearing received therein and may be screwed on both sides of the lower frame portion.

[0036] In addition, in the exemplary embodiment, as illustrated in FIG. 13, the control mechanism 230 provided in the foot exercise unit 200 may be more simply provided than the control mechanism 230 disclosed in Korean Utility Model Registration No. 20-0462643 filed and regis-

tered by the present applicant.

[0037] The arm exercise unit 300 may be provided to perform various arm exercises by independently operating the left and right arm cranks 360 as well as a normal 180° crank fixed type by a shift lever 430.

[0038] A conventional arm exercise machine performs all the operations by taking a load only in the forward rotation and revolted in the backward rotation, and thus, the exercise effect can not be expected.

[0039] Due to the characteristic of the arm exercise, the arm can be turned freely back and forth to require pulling motion (backward rotation) as well as pushing motion (forward rotation), but the conventional method has a disadvantage in that a load is not taken in the backward rotation (when pulling).

[0040] In the exemplary embodiment, it is possible to maximize the exercise and rehabilitation effect of the arm by equally applying the load by the simple operation in the forward and backward (forward rotation and backward rotation) rotation or up and down movement of the arm exercise. That is, the exemplary embodiment may share not only the pushing motion (forward rotation) but also the pulling motion (backward rotation) when the arm is turned back and forth.

[0041] Then, when describing the arm exercise unit 300 in detail, in the exemplary embodiment, the arm exercise unit 300, as illustrated in FIG. 4, includes a spline shaft 310, a pair of elastic members 320 disposed on both sides of the spline shaft 310, a clutch unit 330 disposed in contact with the elastic body 320 and through which the spline shaft 310 passes, a clutch bore 340 provided in contact with one side of the clutch unit 330 and through which the spline shaft 310 passes, a bore fixing hole 350 fixing the clutch bore 340, arm cranks 360 of which the clutch bore 340 is inserted into one side and the bore fixing hole 350 is inserted and fixed into the other side to independently or simultaneously rotate in a forward or backward direction and having a handle rod 361, a cap 370 detachably coupled to the arm cranks 360, and a flywheel 380 provided in one crutch unit 330 of the pair of crutch units 330 to apply a load during exercising.

[0042] The spline shaft 310 of the arm exercise unit 300 may be detachably coupled to the post frame 120.

[0043] The pair of elastic bodies 320 of the arm exercise unit 300 may be retracted by the control mechanism 230 illustrated in FIG. 12, and as a result, a stopper unit of a clamp unit is moved in the direction of the arm crank 360 and engaged with clutch teeth 411 of a clutch body 410 to fix a location of the arm crank 360. For reference, the control mechanism 230 may be connected to a motor provided in the body 100, and the motor may be operated by an operation of the monitor.

[0044] As illustrated in FIG. 4, the clutch unit 330 of the arm exercise unit 300 includes an elastic contact unit 331 being in contact with the elastic body 320 and a stopper rod 332 connected with the elastic contact unit 331 to move together and engaged with the clutch teeth 411 of the clutch body 410.

[0045] As illustrated in FIG. 3, the arm crank 360 of the arm exercise unit 300 may be rotatably provided on the spline shaft 310 and is fixed by the clamp unit to rotate the left and right arm cranks 360 at 180°, and the left and right arm cranks 360 may be rotated independently by the operation of the independent driving switch unit 400.

[0046] As illustrated in FIG. 2, the independent driving switch unit 400 is provided in each of the left and right arm cranks 360 and serves to independently operate the left and right arm cranks 360.

[0047] In the exemplary embodiment, as illustrated in FIG. 10, the independent driving switch unit 400 includes a clutch body 410 provided on each of the left and right arm cranks 360 and having protruding clutch teeth 411, a transbody 420 rotatably provided on the clutch body 410 and having an elastic column 421 and a roller bearing 422, a shift lever 430 provided to each of the left and right arm cranks 360, driving the transbody 420 to independently operate the left and right arm cranks 360 and coupled with the bolts 431, a shift spring 440 connecting the transbody 420 and the shift lever 430, and a shift lever stopper 450 provided on the arm crank 360 and controlling a rotation range of the shift lever 430.

[0048] Hereinafter, an operation of the independent driving switch unit 400 will be described briefly.

[0049] In the arm crank 360 portion, the transbody 420 which is detachably assembled to the elastic column 421 by two roller bearings 422 is assembled in the clutch body 410 coupled with the clutch teeth 411 for fixing at 180°. A circumference of the bore in a state of being assembled on the spline shaft 310 is a right circle and a ground surface of the roller bearing 422 of the clutch body 410 is grounded to an ellipse having a radius larger than the radius of the bore by a certain ratio.

[0050] One roller bearing 422 on both sides of the elastic column 421 is engaged with the bore and the clutch body 410 in accordance with the rotating operation of the shift body 420 in a lateral direction to serve as a clutch. Accordingly, by connecting the shift lever 430 provided on the side of the arm crank 360 and rotating at the left and right, the load direction of the clutch may be freely changed in the forward / backward direction by the elasticity of the shift spring 440, and thus, innovative effects on arm exercise and rehabilitation mechanism may be expected.

[0051] When the shift lever 430 provided on the side of the crank is operated, the roller bearing 422 grounded to the clutch body 410 is moved to the left and right by the transbody 420 to rotate the flywheel 380 required in forward or backward direction, thereby achieving arm exercise and rehabilitation exercise.

[0052] When the shift display of the monitor provided in the body 100 is operated in the normal location, the left and right arm cranks 360 are fixed at 180°, and become a general pedaling and a general arm pedaling, which are 360° rotation driving, like a general bicycle.

[0053] When the shift display of the monitor is multi-changed by operation of the shift button or the shift lever

430, the left and right arm cranks 360 become independent pedaling and independent arm pedaling. Accordingly, various pedaling and handling may be performed by a user's intention, such as vertically alternate pedaling and handling of the left and right arm cranks 360, vertically or 360° rotation of the left and right cranks at the same time, one side stopping and the other side vertically or 360° rotation.

[0054] Therefore, since various functions are driven in addition to the conventional 360° rotation type pedaling and handling, it is possible to perform exercises by freely changing the pedaling and handling according to the purpose as well as various exercise effects.

[0055] As a result, exercise efficiency can be enhanced, and exercise can be enjoyed without boring, and the present invention may have an excellent effect on the use of disabled persons, rehabilitation medical treatment, and training of athletes without restriction of left and right independent driving and up and down strokes.

[0056] The power control unit 500 is in surface contact with the flywheel 380 provided in the clutch unit 330 and serves to control the arm muscle or momentum of an exerciser by applying frictional force to the flywheel 380.

[0057] In the exemplary embodiment, as illustrated in FIGS. 5 to 7, the power control unit 500 includes a flywheel friction plate 510 detachably coupled to the post frame 120 or the spline shaft 310 to control a distance from the flywheel 380 and a power controller 520 provided on the post frame 120 or the spline shaft 310 to control the distance between the flywheel 380 and the flywheel friction plate 510.

[0058] As illustrated in FIG. 6, the power controller 520 of the power control unit 500 includes a knob supporter 521 detachably bolted to the center of the spline shaft 310, and a control knob 522 of which an outer periphery is screw-coupled to the knob supporter 521 and which the upper end of the flywheel friction plate 510 is detachably coupled to the end inserted to the knob supporter 521.

[0059] In the exemplary embodiment, the distance between the flywheel 380 and the flywheel friction plate 510 may be controlled by rotating the control knob 522 clockwise or counterclockwise.

[0060] As described above, in the exemplary embodiment, since various functions are driven in addition to the conventional 360° rotation type pedaling and handling, it is possible to perform exercises by freely changing the pedaling and handling according to the purpose as well as various exercise effects.

[0061] As a result, exercise efficiency can be enhanced, and exercise can be enjoyed without boring, and the present invention may have an excellent effect on the use of disabled persons, rehabilitation medical treatment, and training of athletes without restriction of left and right independent driving and up and down strokes.

[0062] The present invention is not limited to the exemplary embodiments described herein, and it would be apparent to those skilled in the art that various changes

and modifications might be made without departing from the spirit and the scope of the present invention. Accordingly, it will be determined that the changed examples or modified examples are included in the appended claims of the present invention

Claims

1. A multipurpose bicycle exercise machine, comprising:

a body;
 an arm exercise unit provided on the body to be rotatably provided in forward or backward direction;
 a foot exercise unit provided on the body to be rotatably provided in the forward or backward direction; and
 an independent driving switch unit provided on the arm exercise unit so as to independently operate left and right arm cranks of the arm exercise unit, and
 wherein the arm exercise unit includes a flywheel and forms an exercise when a load is applied by the flywheel according to rotate the left and right arm cranks in the forward or backward direction.

2. The multipurpose bicycle exercise machine of claim 1, wherein the independent driving switch unit includes:

a clutch body provided on each of the left and right arm cranks;
 a transbody rotatably provided to the clutch body; and
 a shift lever provided to each of the left and right arm cranks and driving the transbody to independently operate the left and right arm cranks.

3. The multipurpose bicycle exercise machine of claim 2, wherein the independent driving switch unit further includes a shift spring connecting the shift lever and the transbody.

4. The multipurpose bicycle exercise machine of claim 2, wherein a shift lever stopper limiting a rotation range of the shift lever is provided in the left and right arm cranks.

5. The multipurpose bicycle exercise machine of claim 1, wherein the arm exercise unit further includes:

a spline shaft detachably coupled to the post frame of the body;
 a pair of clutch units detachably coupled to both sides of the spline shaft and moved in a longitudinal

direction of the spline shaft by elastic force, respectively; and
 arm cranks detachably coupled to both ends of the spline shaft and having a handle rod.

6. The multipurpose bicycle exercise machine of claim 5, wherein the flywheel is provided on at least one of the pair of clutch units.

7. The multipurpose bicycle exercise machine of claim 1, further comprising:

a power control unit provided in the post frame of the body and controlling power applied by the flywheel.

8. The multipurpose bicycle exercise machine of claim 7, wherein the power control unit includes:

a flywheel friction plate detachably coupled to the post frame to control a distance from the flywheel; and
 a power controller provided on the post frame to control a distance between the flywheel and the flywheel friction plate.

9. The multipurpose bicycle exercise machine of claim 1, wherein the foot exercise unit includes:

a quick assembly device having a central axis, a plurality of thread collars, and a clip bracket, which is mounted on the base frame of the body;
 a multi-mode mechanism supported and fixed by the quick assembly device to provide a multi-mode pedal operation to the body; and
 a control mechanism having a control cable coupled to each of the plurality of clips and a plurality of clips having a support block attached to a clip bracket.

10. The multipurpose bicycle exercise machine of claim 1, wherein the exercise machine is used indoor.

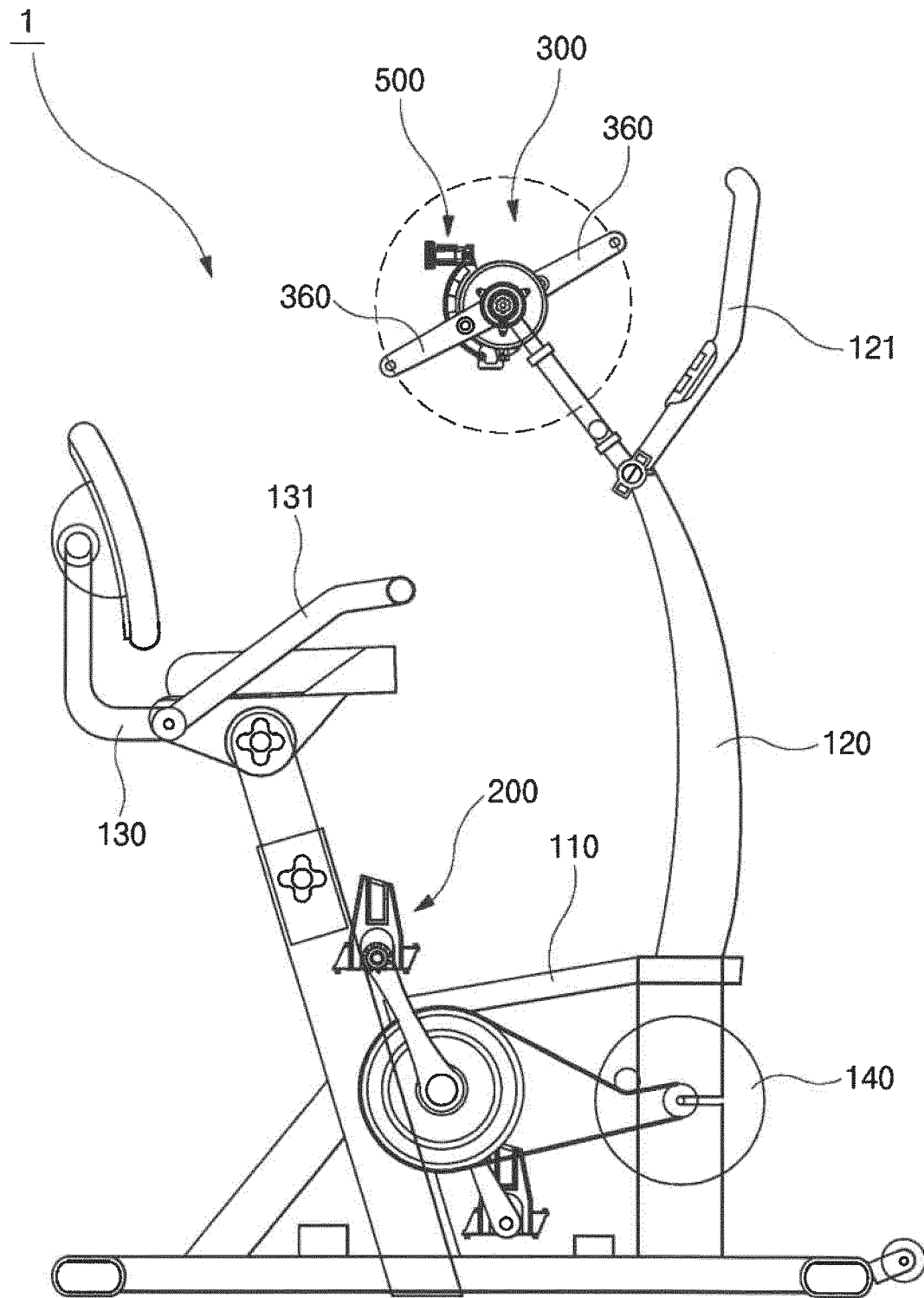


FIG. 1

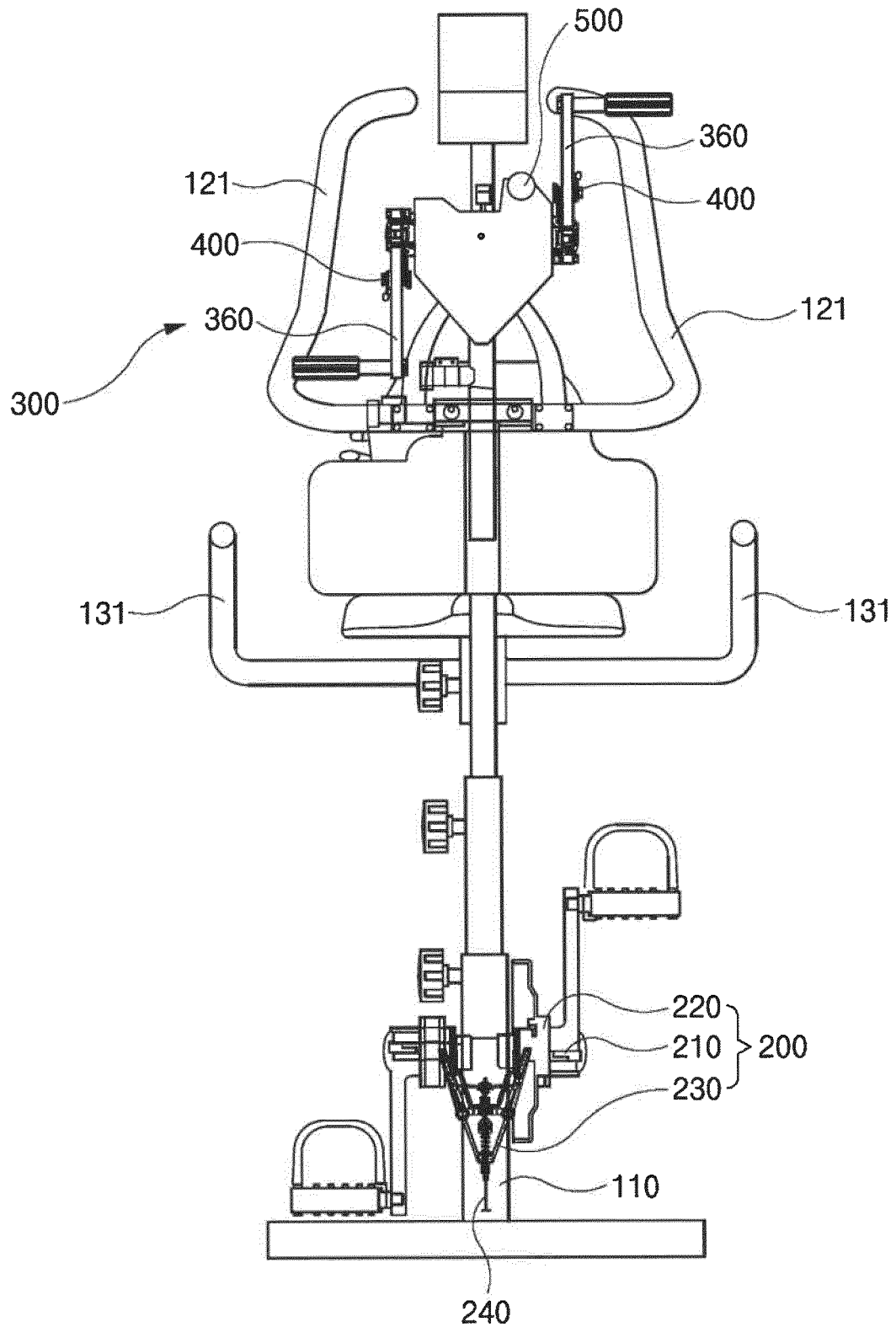


FIG. 2

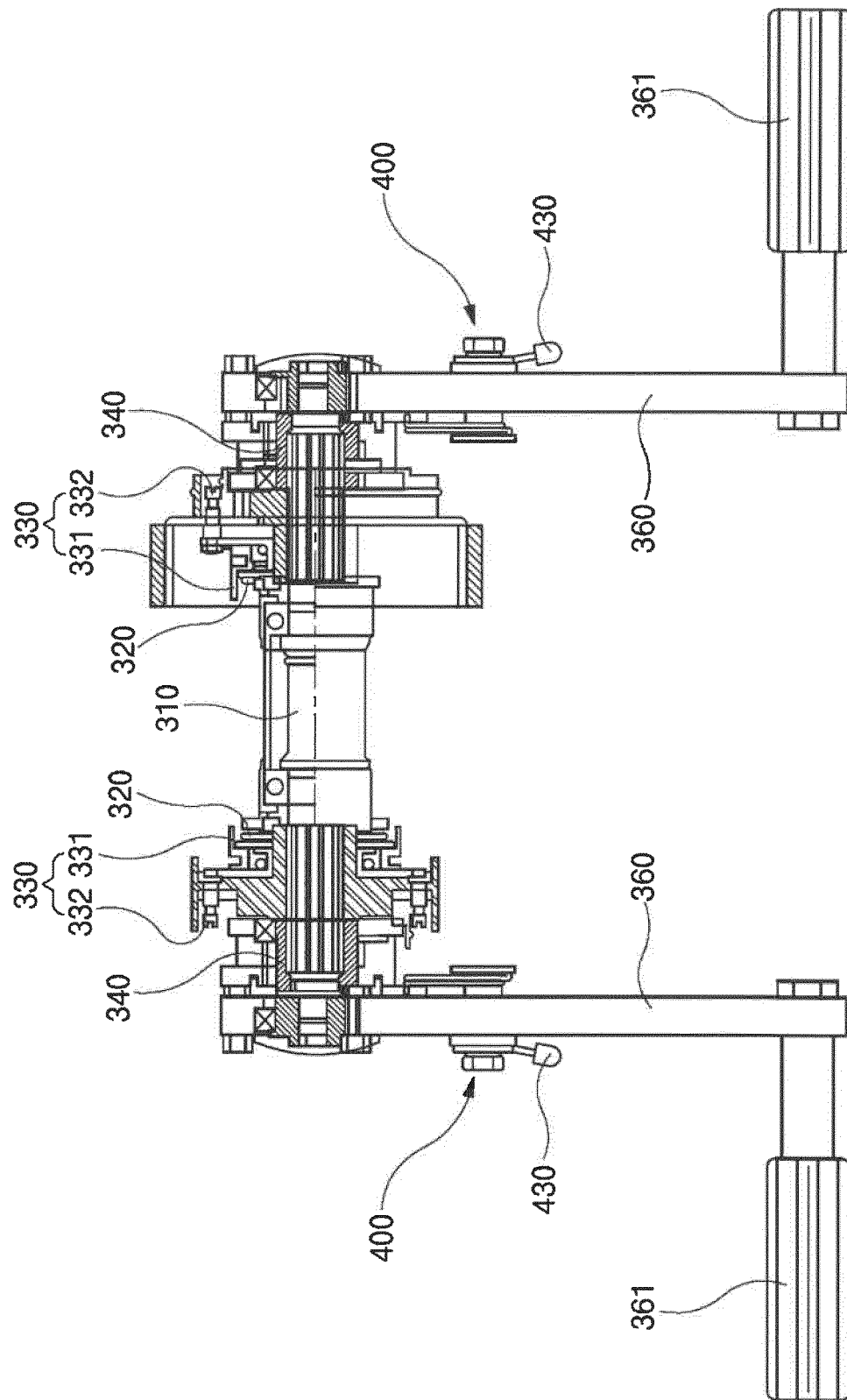


FIG. 3

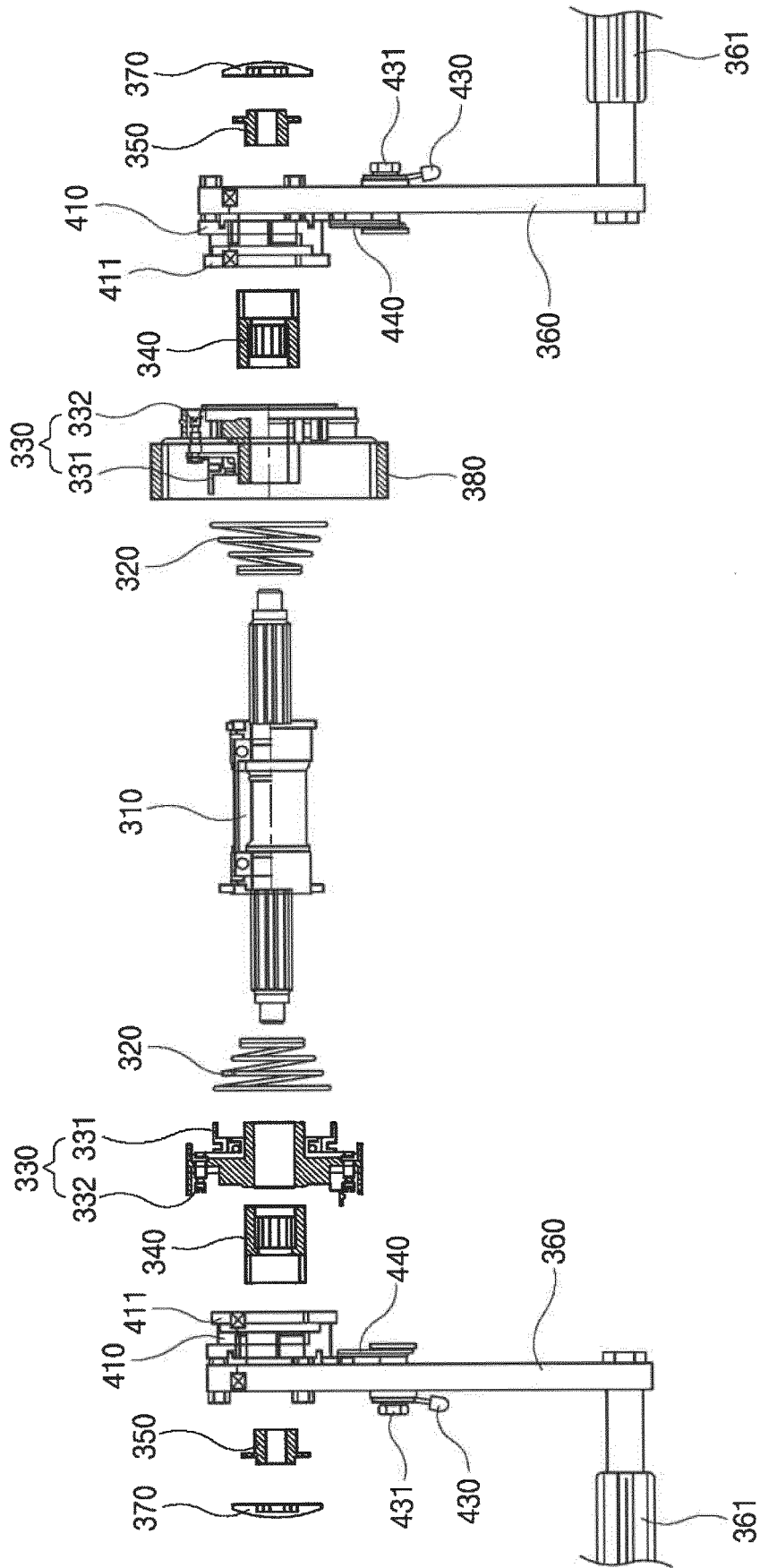


FIG. 4

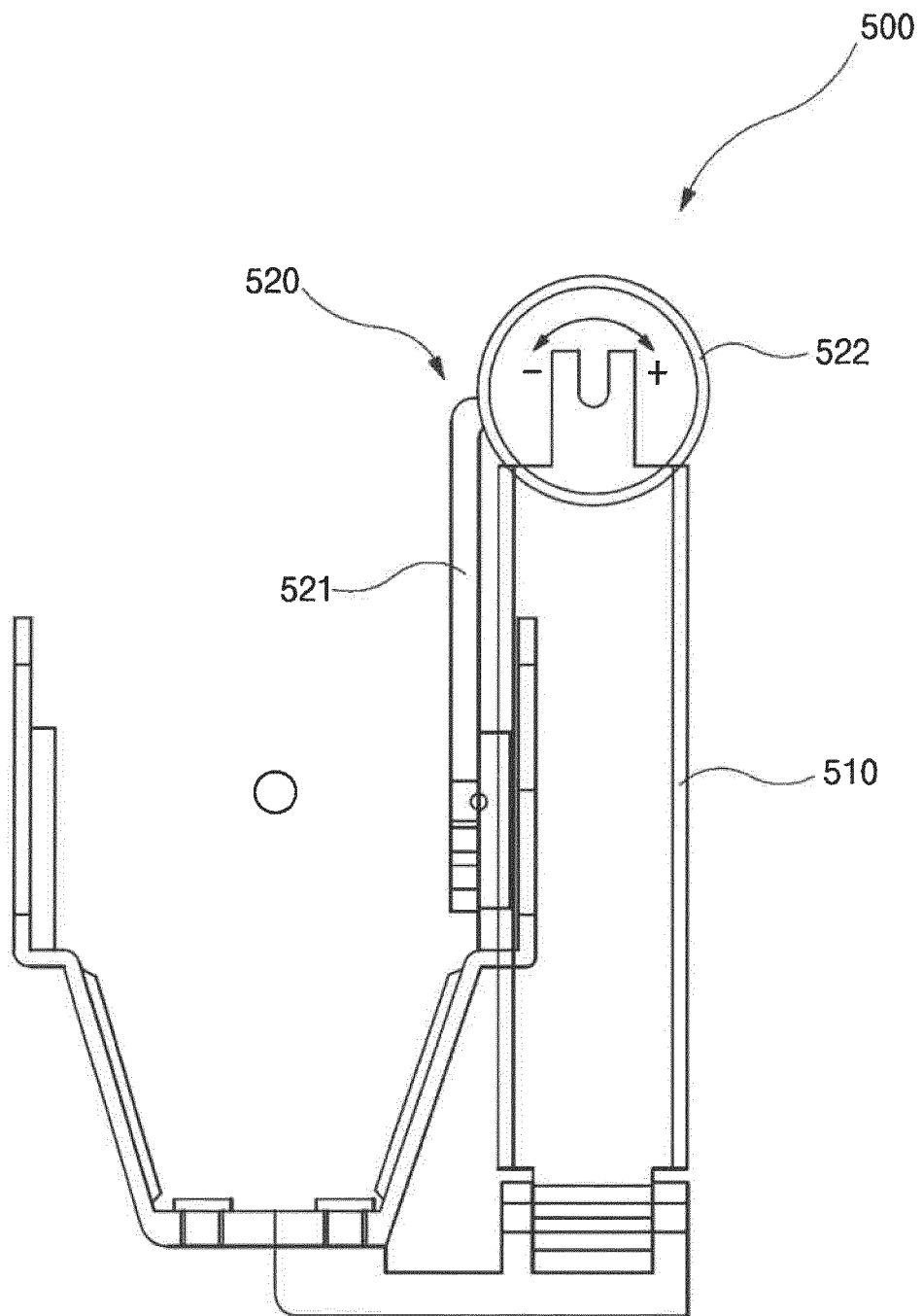


FIG. 5

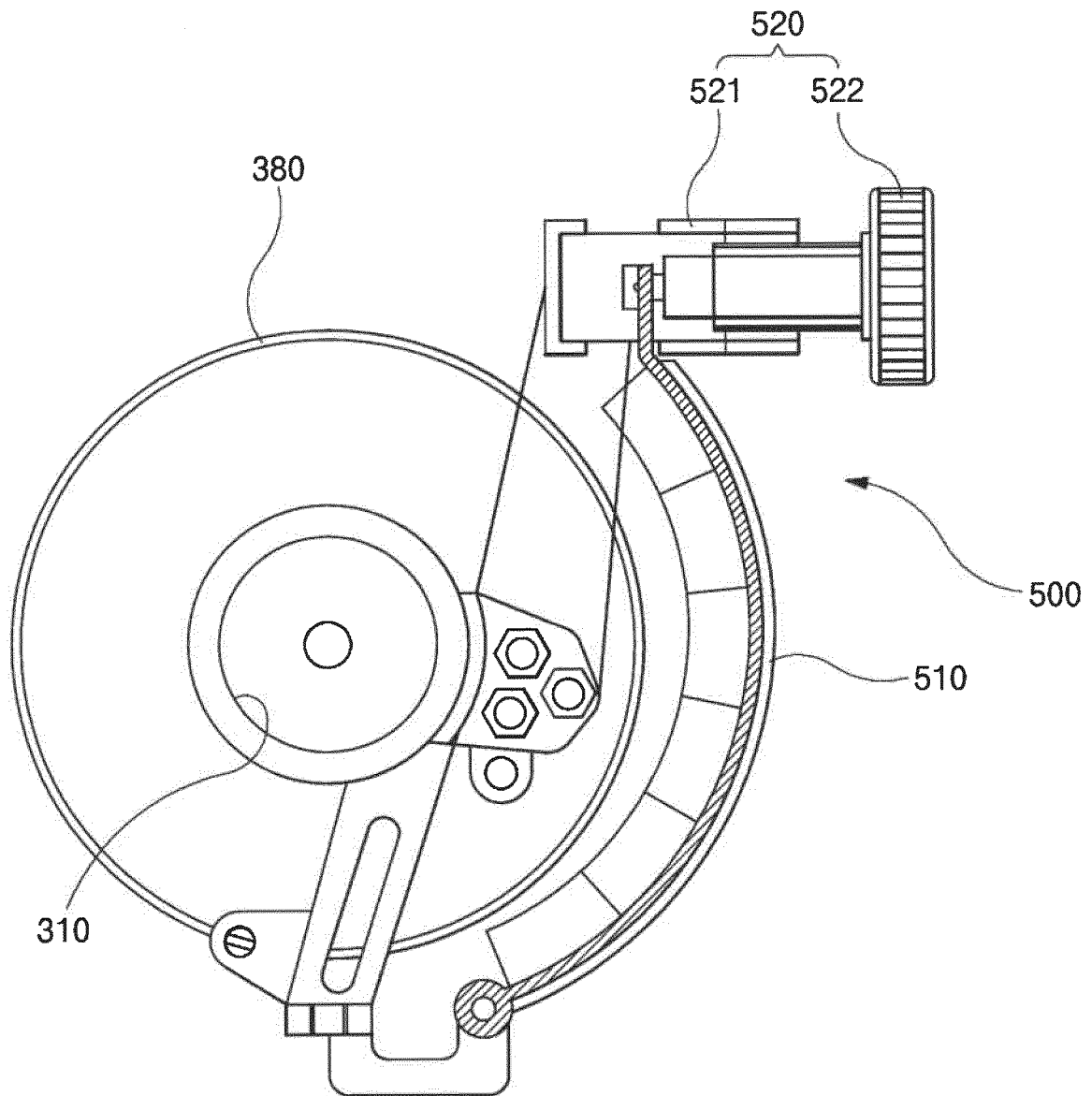


FIG. 6

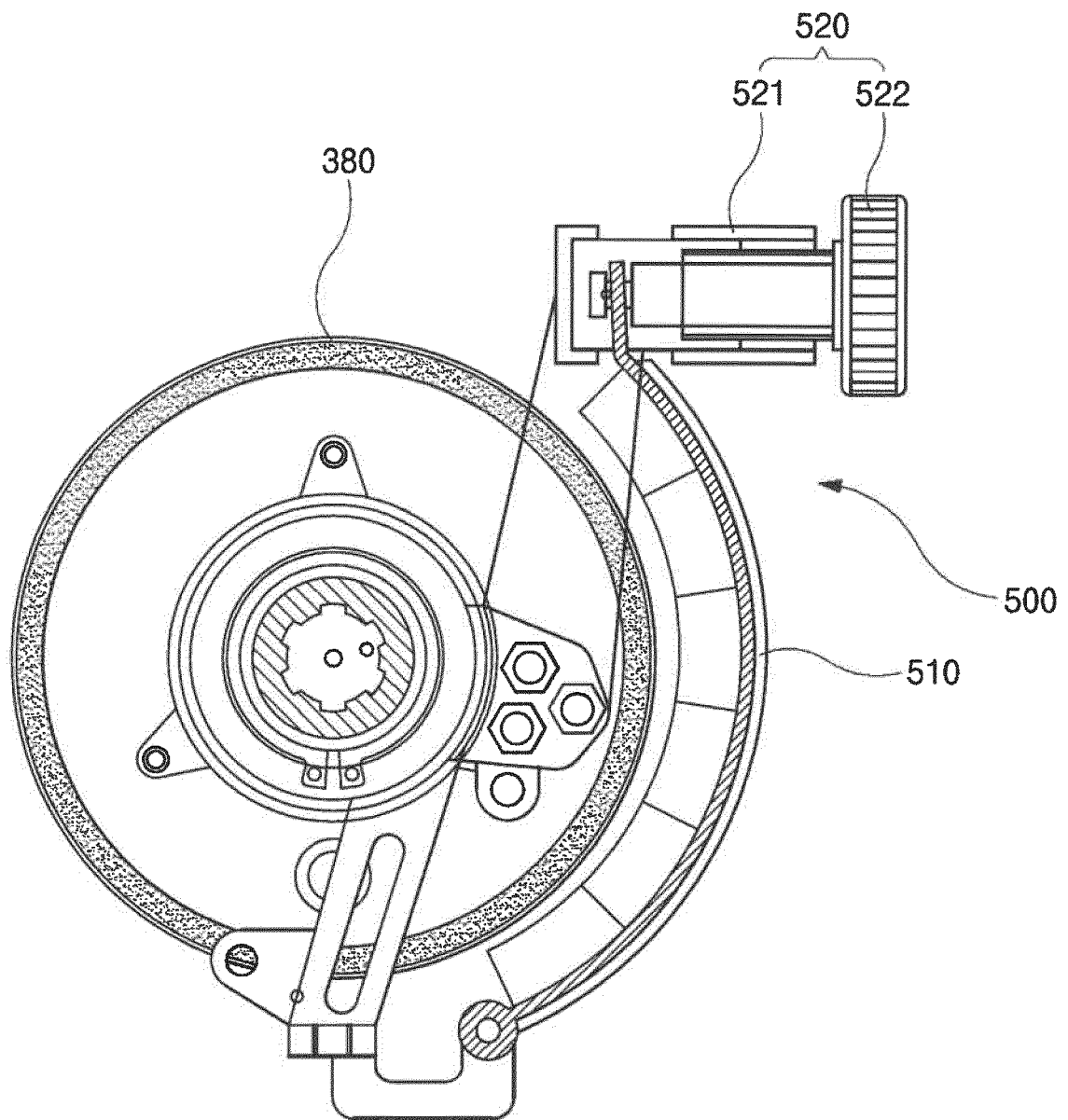


FIG. 7

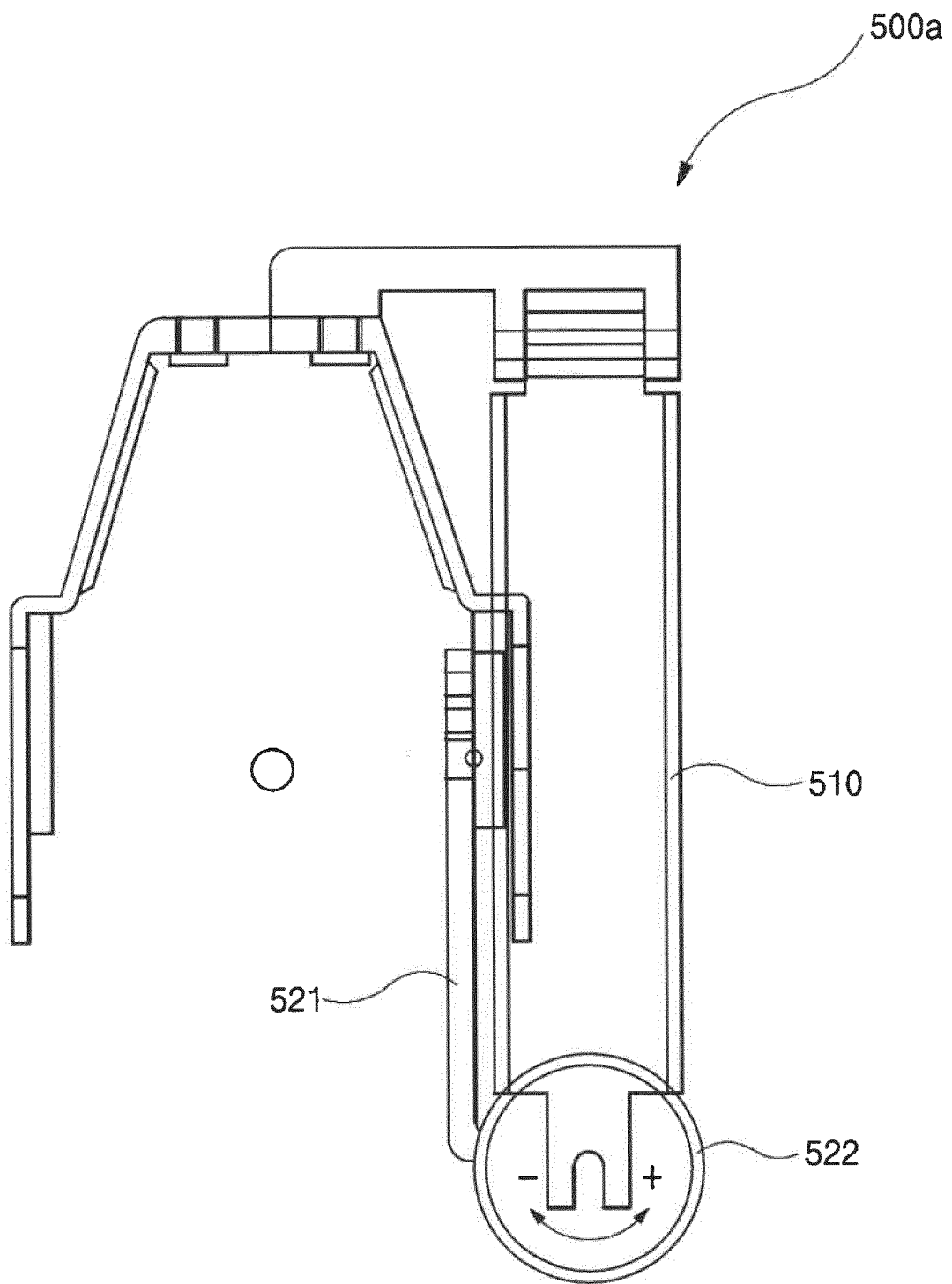


FIG. 8

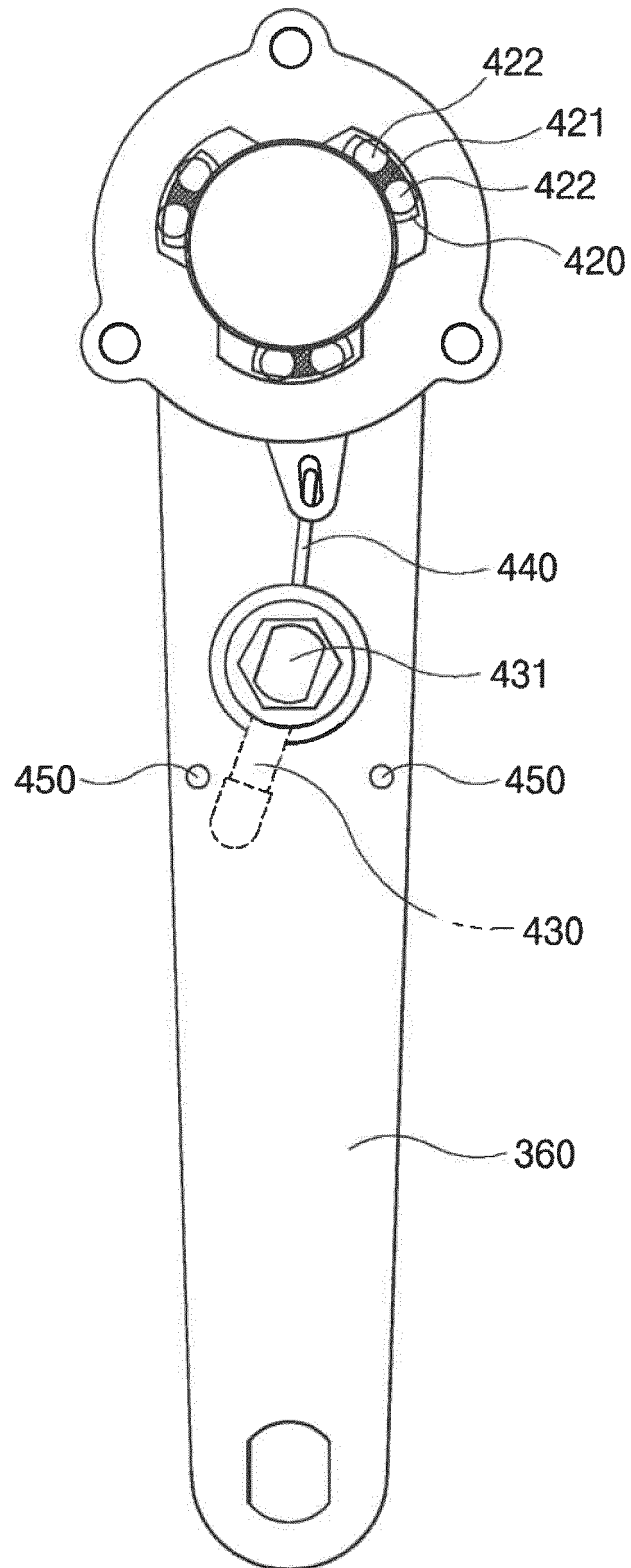


FIG. 9

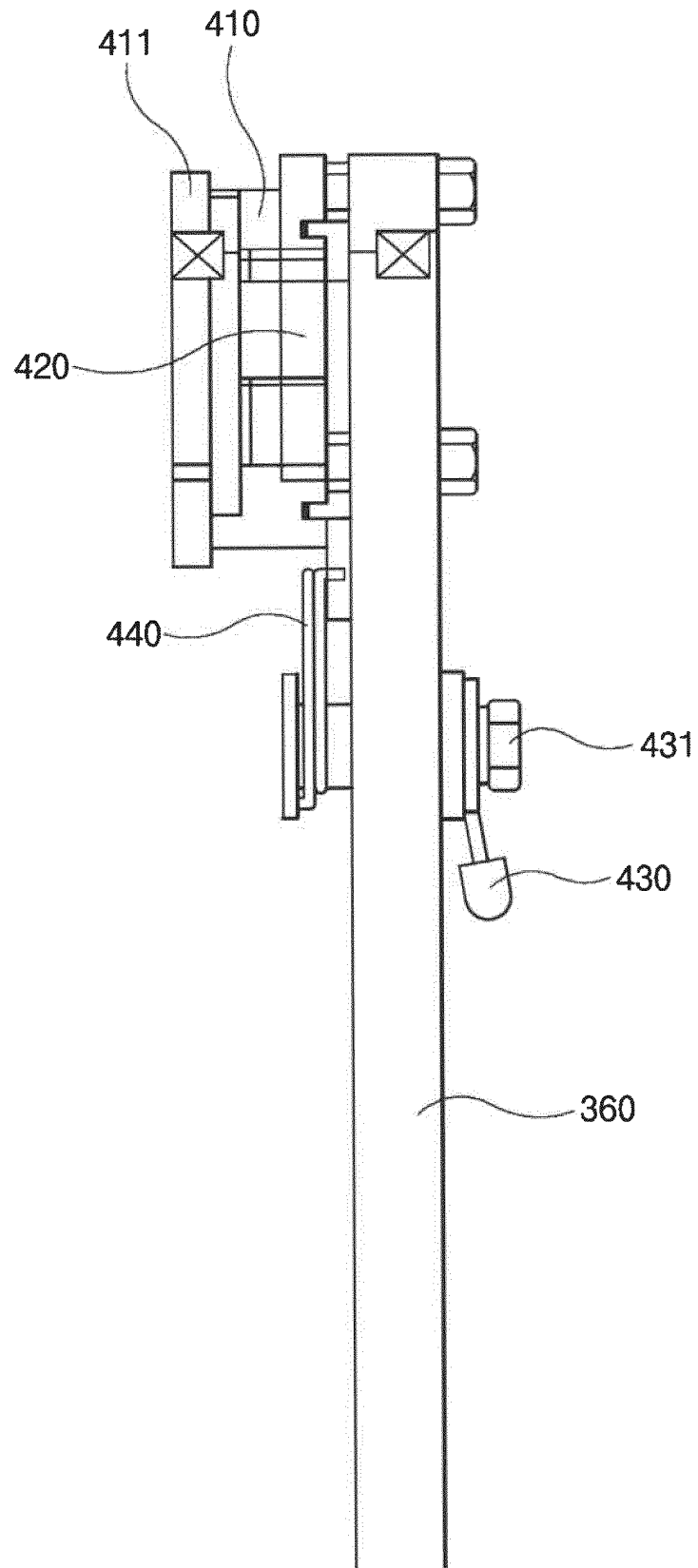


FIG. 10

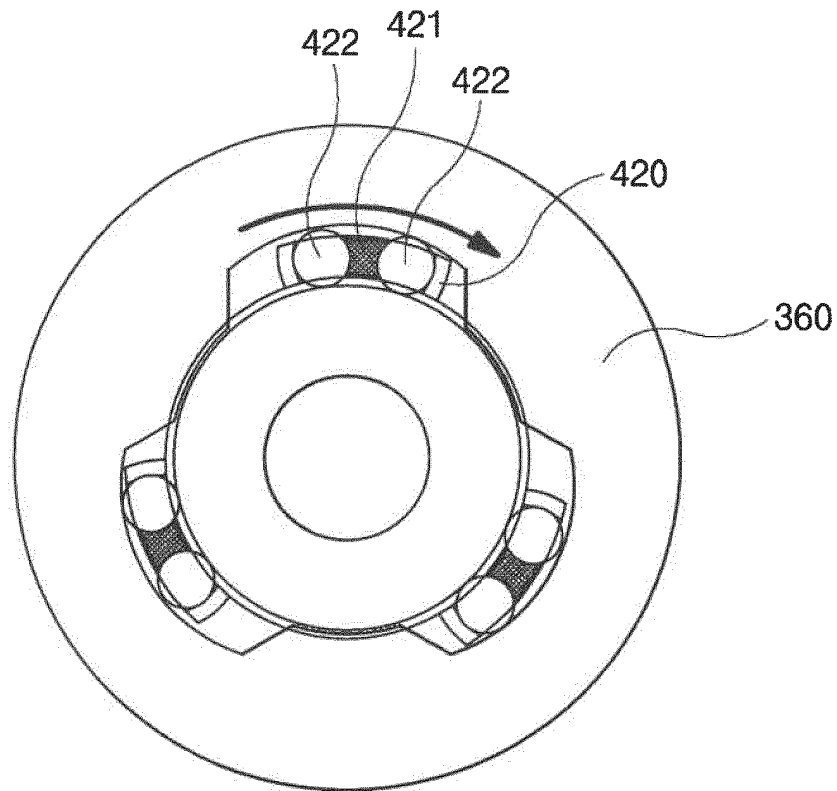


FIG. 11A

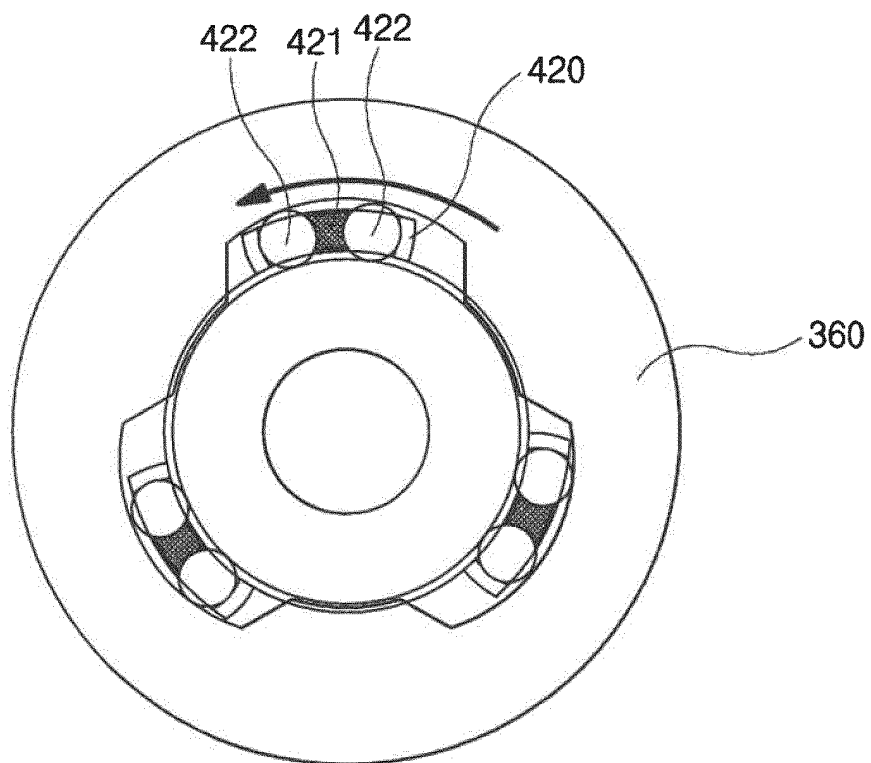


FIG. 11B

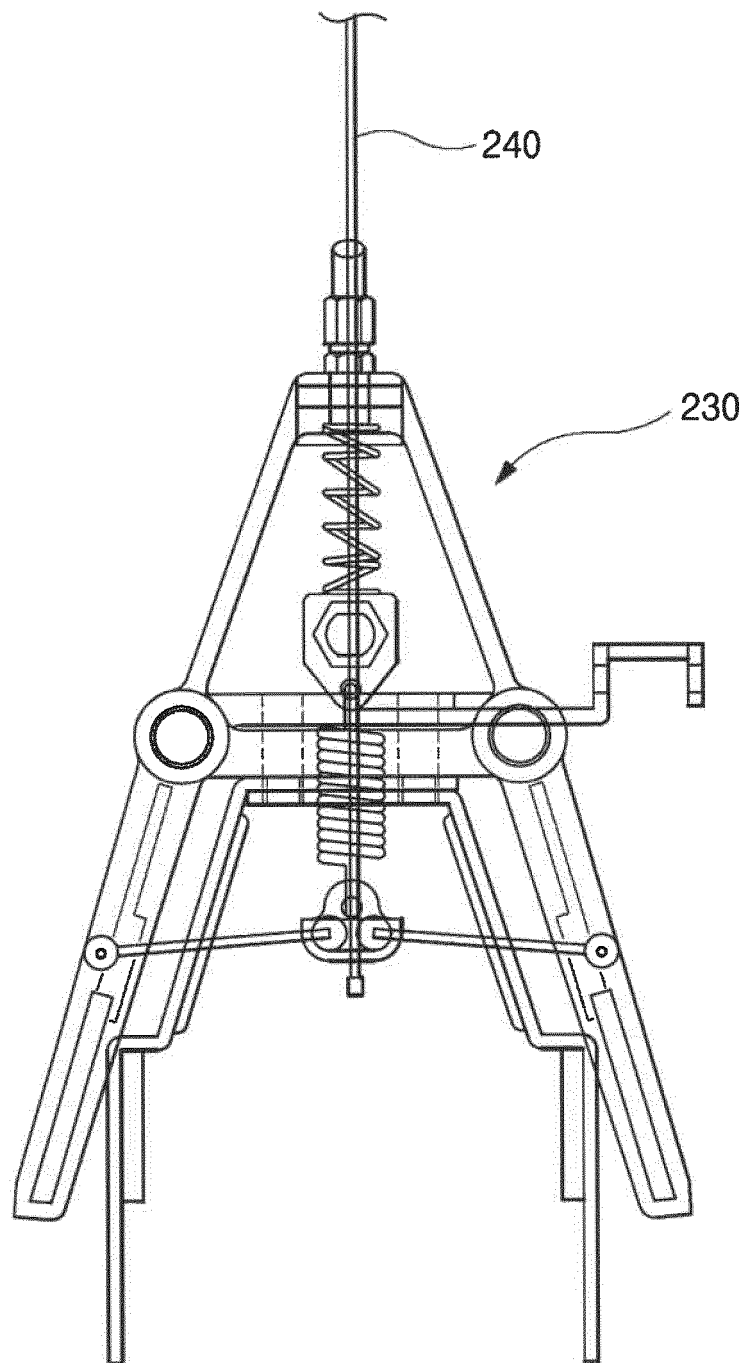


FIG. 12

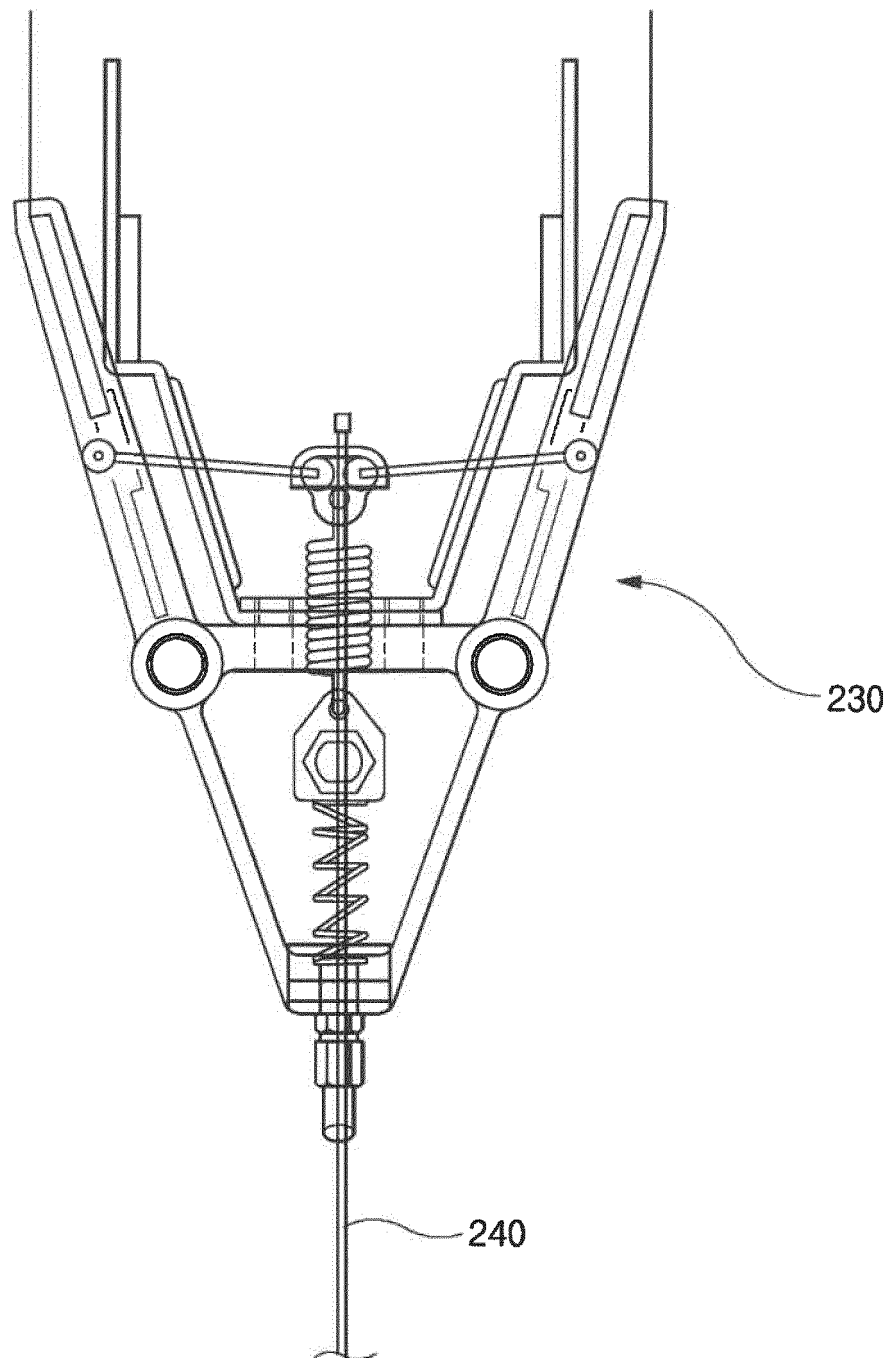


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2015/013387

A. CLASSIFICATION OF SUBJECT MATTER

A63B 22/12(2006.01)i, A63B 23/035(2006.01)i, A61H 1/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63B 22/12; A63B 22/06; A63B 21/005; B62M 1/36; B62M 1/24; A63B 21/00; A63B 23/035; A61H 1/00

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: bicycle, sporting apparatus, health, arm exercise, flywheel, power control

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2011-0094922 A (PARK, Hun Geun) 24 August 2011 See abstract; claim 1; paragraphs [0020], [0039]-[0043]; and figures 1-10.	1,7-10
A		2-6
Y	JP 2000-140153 A (OMRON CORP.) 23 May 2000 See abstract; claims 1-5; paragraphs [0012]-[0015]; and figures 1-4.	1,7-10
Y	KR 20-0462643 Y1 (CHONG, Ok Yeo) 21 September 2012 See abstract; paragraphs [0030]-[0034]; and figures 4 and 5.	9
A	US 6039676 A (CLIVE) 21 March 2000 See the entire document.	1-10
A	US 5906563 A (PITTARI) 25 May 1999 See the entire document.	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 MARCH 2016 (10.03.2016)

Date of mailing of the international search report

11 MARCH 2016 (11.03.2016)

Name and mailing address of the ISA/KR


 Korean Intellectual Property Office
 Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701,
 Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2015/013387

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-2011-0094922 A	24/08/2011	US 2012-0322625 A1 WO 2011-102671 A2 WO 2011-102671 A3	20/12/2012 25/08/2011 02/02/2012
JP 2000-140153 A	23/05/2000	NONE	
KR 20-0462643 Y1	21/09/2012	KR 20-2008-0004854 U	23/10/2008
US 6039676 A	21/03/2000	NONE	
US 5906563 A	25/05/1999	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5088340 A [0004] [0006]
- KR 200414309 [0007]
- KR 200462643 [0010] [0013] [0034] [0036]