(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 205 320 A1**

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

(43) Date of publication:
16.08.2017 Bulletin 2017/33

(21) Application number: **15797369.4**

(22) Date of filing: **08.10.2015**

(51) Int Cl.:
A61G 5/02 *(2006.01)* ***A61G 5/04*** *(2013.01)*

(86) International application number:
PCT/ES2015/070734

(87) International publication number:
WO 2016/055685 (14.04.2016 Gazette 2016/15)

(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

(30) Priority: **10.10.2014 ES 201431492 P**

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(54) TRACTIVE MECHANISM FOR AN AUXILIARY MOBILITY SYSTEM FOR A WHEELCHAIR

(57) A traction mechanism (1) for an auxiliary mobility system for a wheelchair, comprising two rotating plates, separated and being able to be coupled to each other integrally in a first position, each of these rotating plates being linked to a corresponding upper limb of a user through a connecting rod, a first driving plate (2) being linked to a drive chain for transmitting movement to a wheel and a second driven plate receiving movement from the first driving plate (2). Furthermore, it includes coupling/decoupling means linking the driving plate to the connecting rod associated to said driving plate (2), and means for detecting motion linked to the activation of an electric motor and with the movement of the connecting rod, such that it is possible to obtain three different operating positions of the auxiliary system.

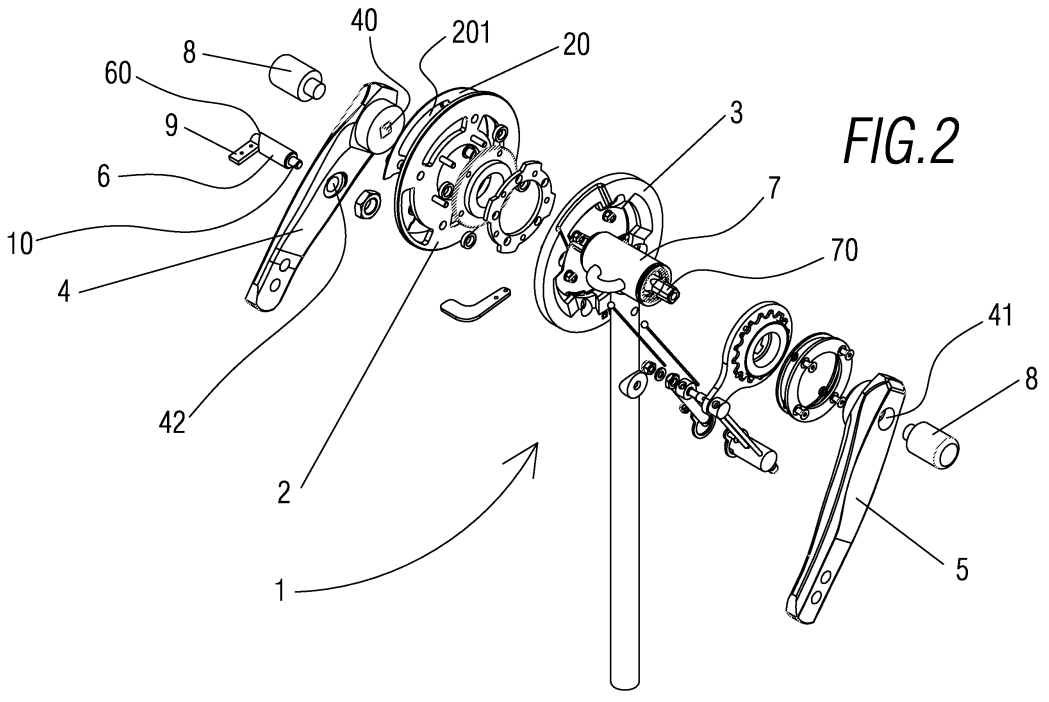

FIG.2

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Description

OBJECT OF THE INVENTION

[0001] The present invention patent application aims to register a traction mechanism for an auxiliary mobility system for a wheelchair incorporating remarkable innovations and advantages.

[0002] More specifically, the invention focuses on traction or drive mechanisms for motor accessories intended to be mounted on wheelchairs for physically handicapped people, particularly accessories consisting of a wheel, a directional means, such as for example a handlebar, and means of impulsion in order to move the chair.

BACKGROUND OF THE INVENTION

[0003] Wheelchairs intended for use by people with a disability of the lower extremities are well known in the state of the art.

[0004] Furthermore, the arrangement of auxiliary mobility systems to be coupled to wheelchairs, facilitating the use of these wheelchairs, such as the one described in Spanish Patent no. ES 2425316 and shown in Figure 1 as a reference, are also known in the state of the art. The operation of such systems may be essentially mechanical, based on the use of a rotating plate associated to a fully electric drive chain through the use of electric batteries and a hybrid operation, in which there may be a manual drive and an electric drive through the use of driving means associated to the shaft of the wheel. Such drive means transmit movement to a rotating wheel for driving its rotation.

[0005] In the case of mobility systems based on hybrid operation, they have numerous controls that must be included for their use, since it requires performing a series of actions such as manual propulsion of the system, directionality, braking, actuation of the motor as well as power regulation, gear change, etc. All of this is complicated given that the controls have to be mounted on mobile connecting rods and actuating the controls must be combined with the movement of the connecting rods during use.

[0006] This degree of complexity of the mechanical assembly becomes even greater when the chair has to be maneuvered, the motion of the wheel of the auxiliary system causing the connecting rods to move, making it possible to even brake the system if a coaster brake is mounted.

[0007] All of this makes it difficult to use the mechanical assembly, especially for those users that have significant disability in their upper extremities.

[0008] Therefore, in practice, known maneuverability systems or assemblies are cumbersome, unmanageable and complicated to use, so there is still a need to obtain a traction assembly or mechanism.

DESCRIPTION OF THE INVENTION

[0009] The present invention has been developed with the aim of providing a traction mechanism that constitutes a novelty within the field of application, and solves the drawbacks mentioned above while also contributing other additional advantages, which will become evident from the description provided below.

[0010] Therefore, an object of the present invention is to provide a traction mechanism for an auxiliary mobility system for a wheelchair, specifically of the type comprising two rotating plates, separated and being able to be coupled to each other, integrally in a first position, each of these rotating plates being linked to a corresponding upper limb of a user through a connecting rod, a first driving plate being linked to a drive chain for transmitting the movement to a wheel and a second driven plate which receives movement from the first driving plate.

[0011] Due to these characteristics, it is possible to disconnect the driving rotating plate that supports the drive chain, such that it enables better maneuvering with the wheelchair and the coupled auxiliary system, since it enables the movement of the connecting rods to become independent with respect to the wheel of the auxiliary system.

[0012] More particularly, the invention is characterized in that it comprises coupling/decoupling means which link the driving plate to the connecting rod associated to said driving plate, and a means for detecting motion linked to the activation of an electric motor, such that in a first position of movement transmission to the wheel, the connecting rod is coupled to the driving plate; in a second position disconnected from movement, the connecting rod is decoupled from the driving plate, and wherein the electric motor can be activated after receiving a signal from the means for detecting when the connecting rod is rotated. And a third operating position in which the connecting rod is decoupled and the coupling/decoupling means (explained below) are unlocked.

[0013] According to another aspect of the invention, the coupling/decoupling means comprise a retractable pin, which is coupled to the connecting rod linked to the driving plate, the driving plate having a coupling region for joining to the retractable pin.

[0014] Additionally, the coupling/decoupling means include resilient means linked to the retractable pin.

[0015] Preferably, the retractable pin may be housed inside a bushing fixed to the connecting rod linked to the driving plate, the bushing having positioning means for adjusting the position of the retractable pin.

[0016] In a particularly preferred embodiment of the invention, the positioning means consist of a flange at the end of the bushing with an oblique cut with respect to the longitudinal axis of the bushing itself.

[0017] According to the invention, one end of the retractable pin includes an integral lever, which is rotatably displaceable over the oblique cut.

[0018] According to another characteristic of the mech-

anism of the invention, the coupling region in the driving plate consists of a protruding portion parallel to a meshing region for the drive chain in the driving plate, the protruding portion having an arcuate trajectory slit.

[0019] Advantageously, the two connecting rods are integrally joined to each other by means of a hub that passes through the two rotating plates, and which is axially aligned with the rotating plates. The hub may include a motion sensor, which depending on the detected motion starts the motor.

[0020] Therefore, it is an advantage of the present invention the combination of the described transmission disconnection mechanism and the sensor located in the hub, which enables the motor to be activated through the movement of the connecting rods without actuating the driving plate of the auxiliary system, constituting an advantage that greatly simplifies the use of the auxiliary system for users, especially those with movement limitations in their upper limbs.

[0021] This previously described mechanism is especially intended to be used with a conventional brake handle, i.e., like the handles provided on a bicycle, although it should be mentioned that it can be replaced by a coaster brake system when the user has certain hand movement limitations.

[0022] Therefore, an advantage of the invention is the fact that it enables a wheelchair for the disabled with a coupled auxiliary mobility system to be moved, such that the movement of the wheels of the wheelchair themselves and the wheel of the auxiliary system is not transmitted to the connecting rods, nor does it interfere with the operation of a coaster brake, should it be incorporated into the drive assembly.

[0023] In addition, the mechanism described above enables the wheelchair with the coupled auxiliary system to be moved both forward and backward, without the movement of the wheel moving the connecting rods and interfering with the coaster brake (should it be installed), thus improving the maneuverability and safety of the wheelchair.

[0024] Other characteristics and advantages of the traction mechanism, object of the present invention, will become clear in light of the description of a preferred, though non-exclusive, embodiment, which, by way of a non-limiting example, is illustrated in the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Figure 1 is a perspective view of an auxiliary mobility system for a wheelchair from the prior art;

Figure 2 is an exploded perspective view of the traction mechanism according to the present invention, which is intended to form part of an auxiliary mobility system.

Figure 3 is a perspective view of the assembled traction mechanism.

Figure 4 is a perspective view of the assembled traction mechanism of the invention from another perspective point.

Figures 5A and 5B are elevation views of the traction mechanism in a first operating position.

Figures 6A and 6B are elevation views of the traction mechanism in a second operating position; and,

Figures 7A and 7B are elevation views of the traction mechanism in a third operating position.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0026] In view of the aforementioned figures and, in accordance with the numbering adopted, an example of a preferred embodiment of the invention can be observed therein, which comprises the parts and elements indicated and described in detail below.

[0027] Thus, as shown in the figures, the traction mechanism indicated generally under reference (1), is intended to form part of an auxiliary mobility system for a wheelchair (not shown) comprising two rotating plates (2, 3) separated and capable of being coupled to each other in a first position, each of these rotating plates (2, 3) being linked to a corresponding upper limb of a user through a respective connecting rod (4, 5). In this case, the two connecting rods (4, 5) are identical to each other and are made of any suitable material commonly used in the manufacture of connecting rods for bicycles.

[0028] A first driving plate (2) is linked to a drive chain (12) through a cogwheel that enables the transmission of the movement to a wheel forming part of the auxiliary mobility system and a second driven plate (3), which receives movement from the first driving plate (2).

[0029] Such traction mechanism (1) comprises means for coupling/decoupling (to be explained in more detail below), which link the driving plate (2) to the connecting rod (4) associated to said driving plate (2), such that in a first position of movement transmission to the wheel, the connecting rod (4) is coupled to the driving plate (2) while in a second position disconnected from movement, said connecting rod (4) is decoupled with respect to the driving plate (2).

[0030] Now, referring specifically to the means for coupling/decoupling, they comprise a retractable pin (10), which is coupled to the connecting rod (4) linked to the driving plate (2), the driving plate (2) having a coupling region for joining to the retractable pin; and resilient means linked to the retractable pin (10).

[0031] As can be seen more clearly in Figure 1, the coupling region in the driving plate (2) consists of a protruding section (20) which is parallel to a meshing region for the drive chain in the driving plate (2), the protruding section (20) having an elongated slit (201) with an arcuate trajectory.

[0032] This retractable pin (10) is housed inside a bushing (6) fixed to the connecting rod linked to the driving plate (2), the retractable pin (10) passing through a

hole (42) carried out in the connecting rod (4), the bushing (6) having positioning means for adjusting the position of the retractable pin (10).

[0033] As can be seen, the positioning means consist of a flange (60) on the end of the bushing (6) with an oblique cut with respect to the longitudinal axis of the bushing (6) itself.

[0034] During operation, the retractable pin can adopt three different operating positions, dud to the geometry defined by the oblique cut of the bushing (6).

[0035] In order to facilitate changing the three operating positions, an ergonomic lever (9) is provided at one end of the retractable pin (10) and integral to said retractable pin (10), which is rotatably displaceable on the oblique cut, such operating positions being as follows:

- A first manually actuated coupling position (Figures 5A and 5B) in which the retractable pin (10) enables the rotating movement of the connecting rods, carried out by the user's hands, to be transmitted to the driving plate (2), the retractable pin (10) being coupled to the elongated slit (201) at the same time as the lever (9) is located in the lowermost region of the oblique cut of the flange (60). In this position, a motion sensor arranged inside the hub (7) detects the movement and propulsion is done manually and electronically at the same time, although manual movement is actuated from the first moment;
- A second decoupling position (Figures 6A and 6B), which is executed when the user wishes to mechanically and independently separate the movement of the connecting rods (4, 5) and the driving plate (2) associated to the drive chain. In this second position, the user can cause the wheelchair to move backwards without moving the connecting rods (nor actuating the coaster brake, if provided on such connecting rods). If the connecting rods (4, 5) are moved in forward direction, the motion sensor provided in the mechanism detects forward rotating movement and activates the electric motor (not shown). In this case, the lever (9) is at the top of the oblique cut of the flange (60); and
- And a third automatic coupling position (Figures 7A and 7B) in which the user manually holds the lever (9) in a position of the flange (60) between the two previously described positions, placing the connecting rods (4, 5) such that the retractable pin is outside the arcuate trajectory slit. In this position, when the user starts rotating the connecting rods (4, 5) in forward direction, the electric motor is automatically activated after detection of the motion sensor in the hub (7) until it passes again through the arcuate trajectory slit and the traction is automatically connected, due to the effects of the resilient means linked to the retractable pin (10), such that it operates like a support or assistance system in order to start the drive.

[0036] It should be mentioned that this second position is especially useful in situations where the user is physically tired, the chair is on a steep slope, in narrow places or in traffic situations with other vehicles since the user does not have to make an effort, he only has to move the connecting rods.

[0037] It should be mentioned that the third operating position is particularly useful for starting to move with very little effort, in the case of users with reduced strength, in case of fatigue or having to move the wheelchair on a slope.

[0038] The two connecting rods (2, 3) are integrally joined to each other by means of a hub (7) that passes through the two rotating plates (2, 3), each of the ends of the hub (7) having extensions (70) with a rectangular cross section that are coupled to holes (40) in each of the connecting rods (4). The motion sensor is arranged in said hub (7).

[0039] The details, shapes, dimensions and other accessory elements used to manufacture the traction mechanism of the invention may be suitably substituted for others which do not diverge from the scope defined by the claims included below.

Claims

1. A traction mechanism (1) for an auxiliary mobility system, comprising two rotating plates, separated and being able to be coupled to each other integrally in a first position, each of these rotating plates being linked to a corresponding upper limb of a user through a connecting rod, a first driving plate (2) being linked to a drive chain for transmitting movement to a wheel and a second driven plate receiving movement from the first driving plate (2), **characterized in that** it comprises coupling/decoupling means linking the driving plate to the connecting rod associated to said driving plate (2), and means for detecting motion linked to the activation of an electric motor and with the movement of the connecting rod,
said coupling/decoupling means comprising a retractable pin (10), which is coupled to the connecting rod linked to the driving plate (2), the driving plate having a coupling region for joining to the retractable pin (10), the coupling region in the driving plate consisting of a protruding portion parallel to a meshing region for the drive chain in the driving plate (2), the protruding portion having an arcuate trajectory slit.

2. The traction mechanism (1) according to claim 1, **characterized in that** the coupling/decoupling means include resilient means linked to the retractable pin (10).

3. The traction mechanism (1) according to claim 1, **characterized in that** the retractable pin is housed inside a bushing fixed to the connecting rod linked

to the driving plate (2), the bushing having positioning means for adjusting the position of the retractable pin (10).

4. The traction mechanism (1) according to claim 3, **characterized in that** the positioning means consist of a flange at the end of the bushing with an oblique cut with respect to the longitudinal axis of the bushing itself.

5. The traction mechanism (1) according to claims 1 and 4, **characterized in that** one end of the retractable pin (10) includes an integral lever, which is rotatably displaceable over the oblique cut.

6. The traction mechanism (1) according to claim 1, **characterized in that** the two connecting rods (4, 5) are integrally joined to each other by means of a hub (7) passing through the two rotating plates.

7. The traction mechanism (1) according to claims 1 and 6, **characterized in that** the means for detecting motion consist of at least one motion sensor arranged in the hub (7).

FIG.1

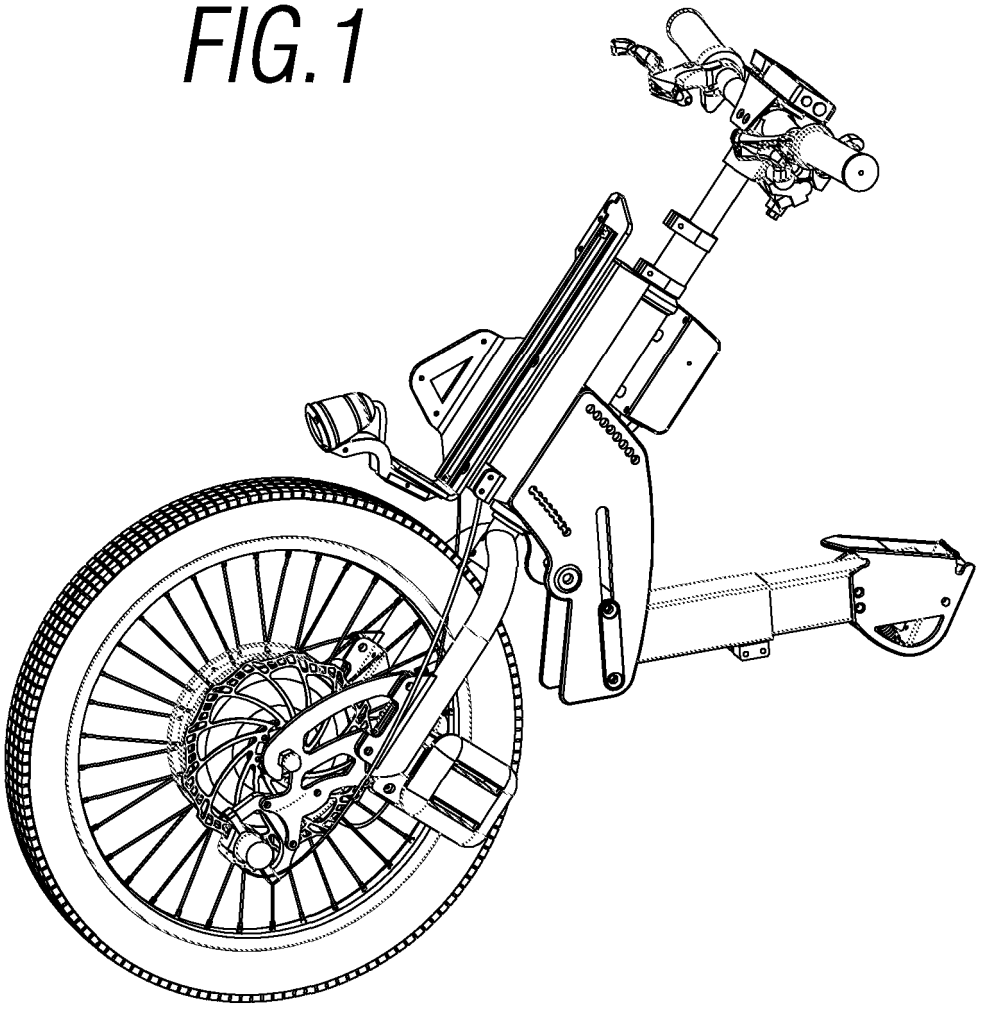


FIG.2

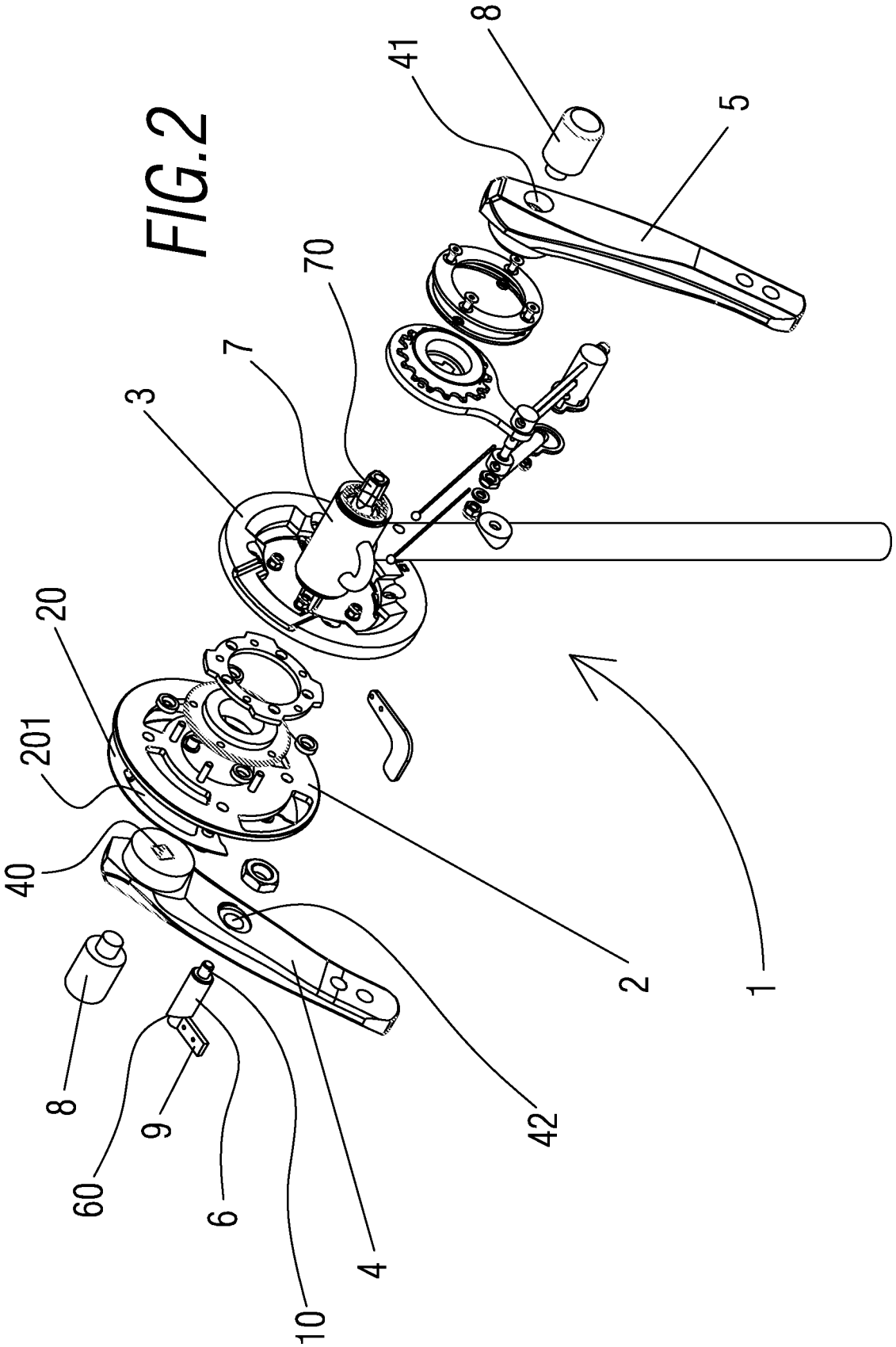
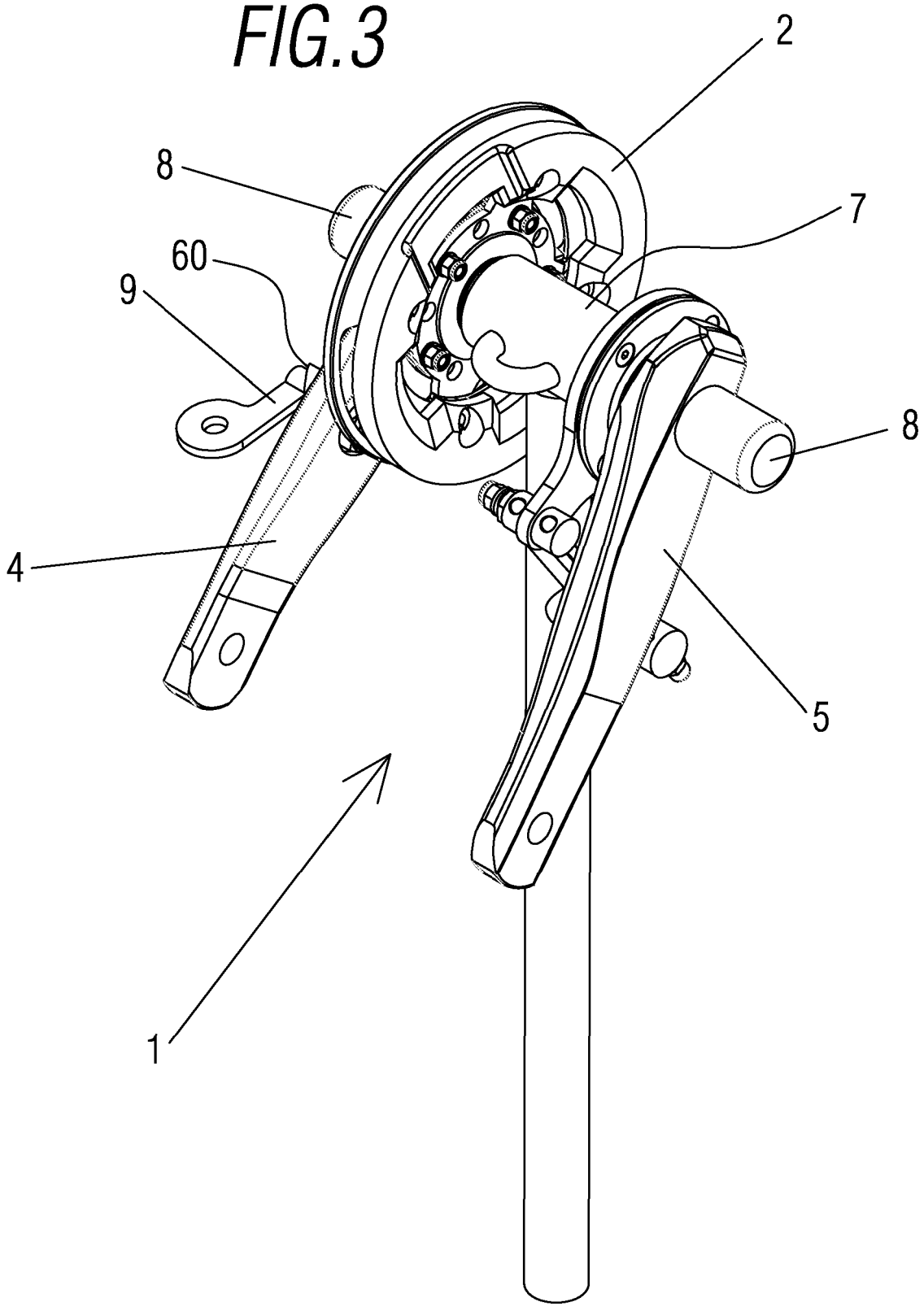


FIG.3



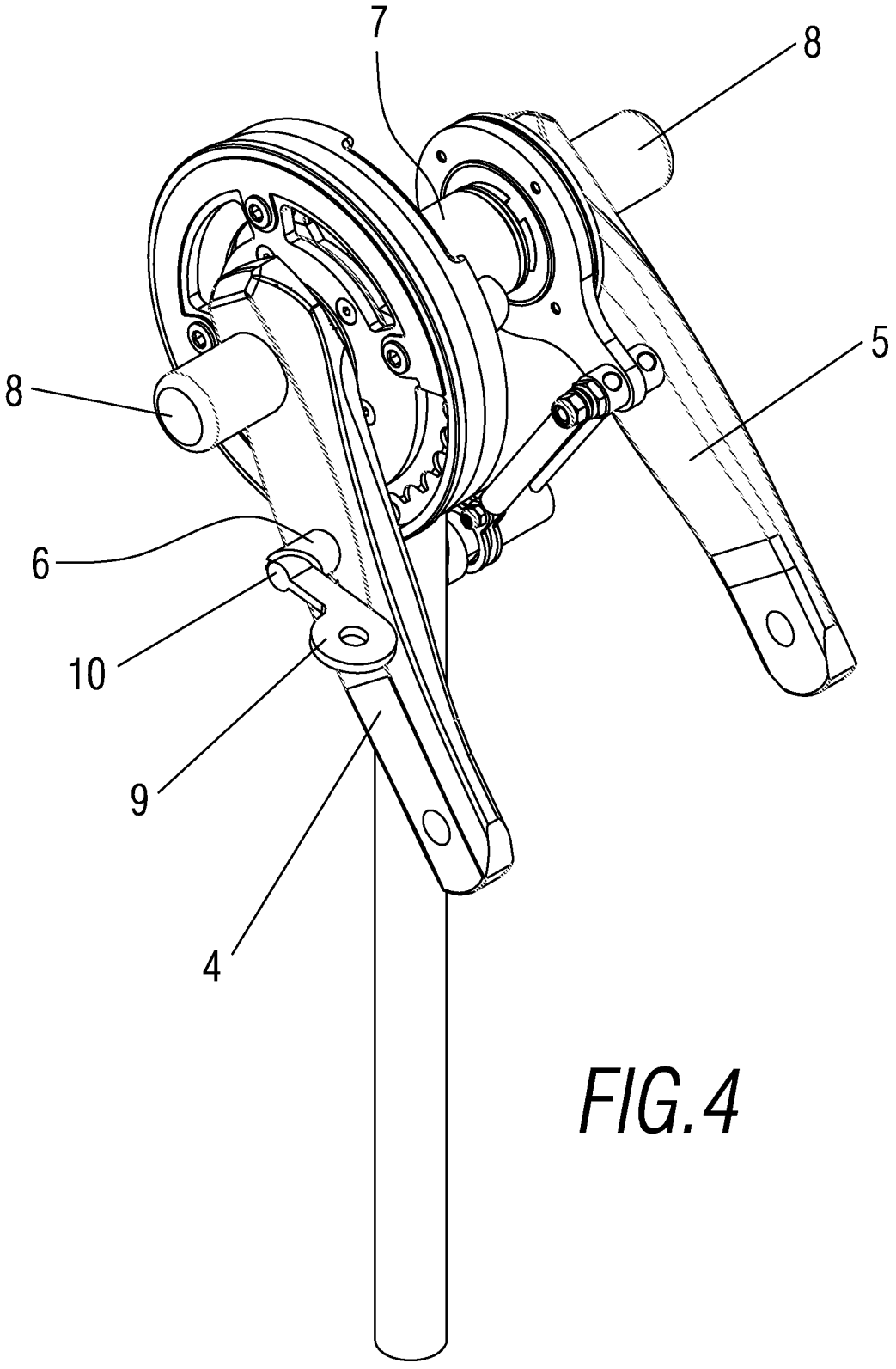
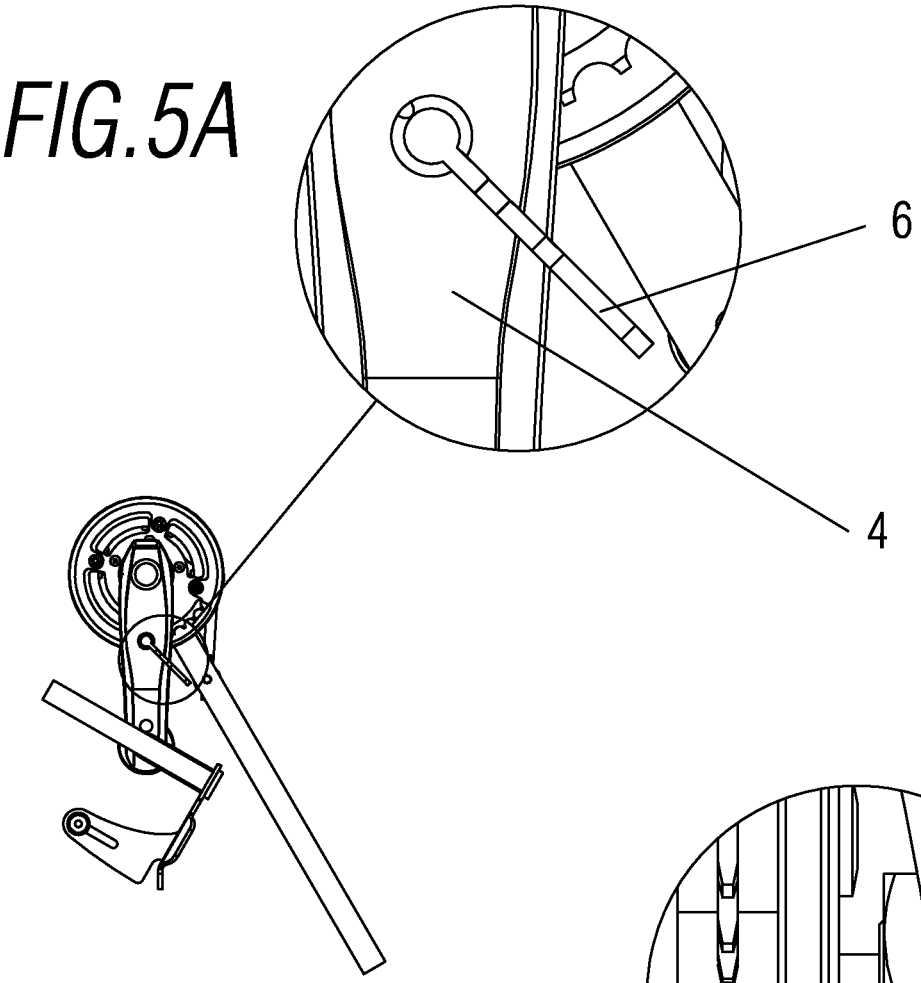


FIG.4

FIG.5A



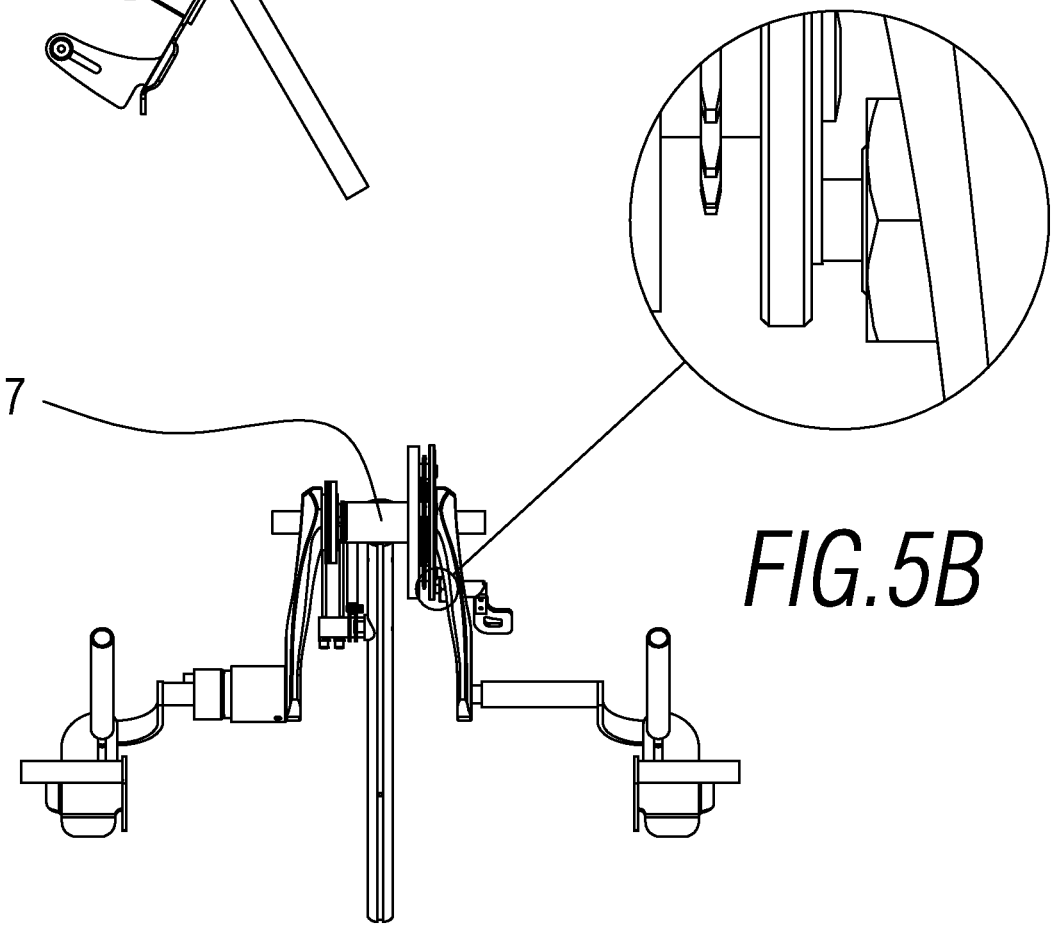


FIG.5B

FIG.6A

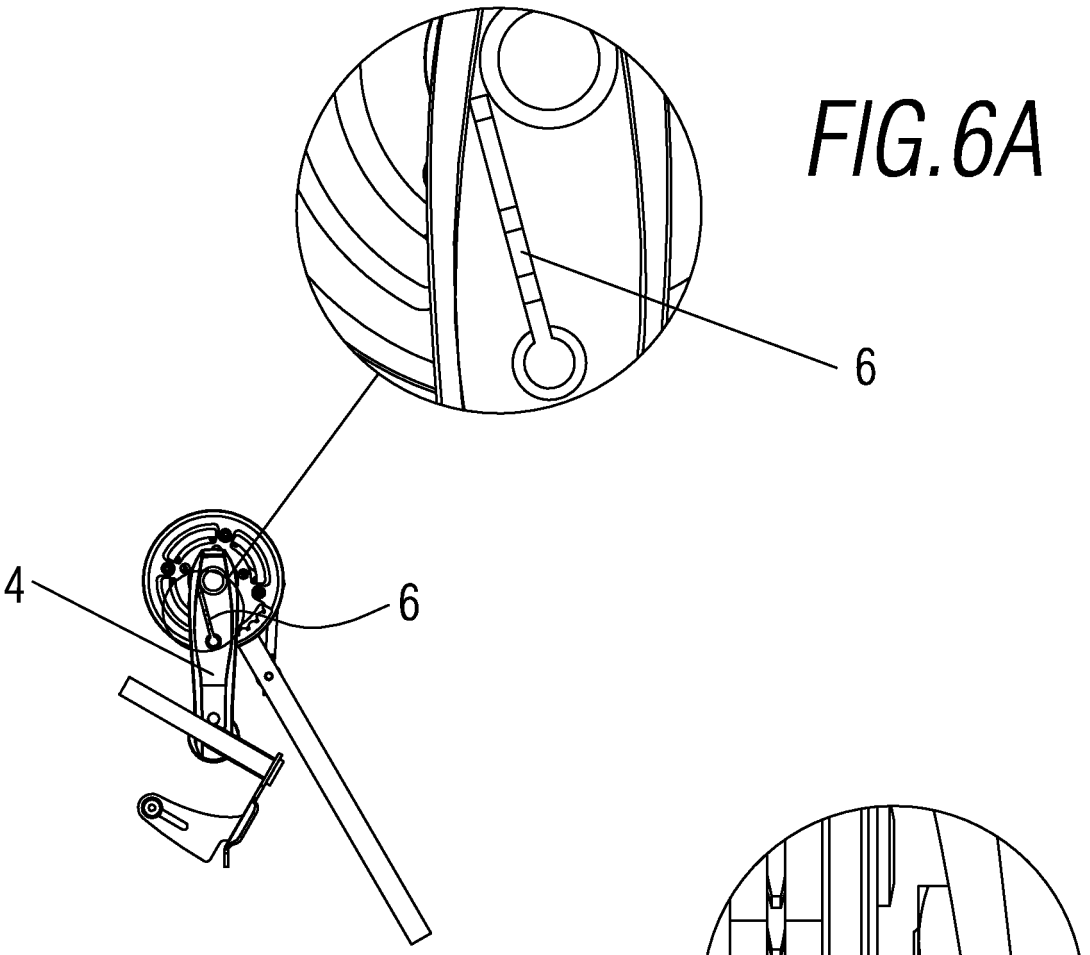
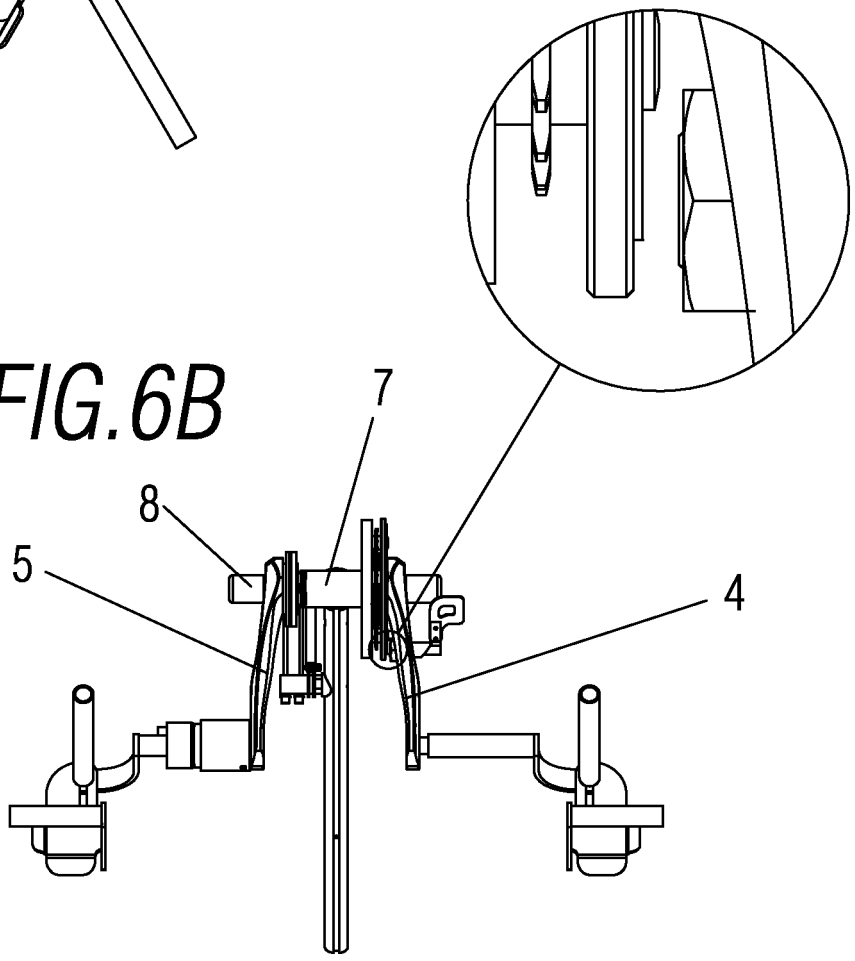


FIG.6B



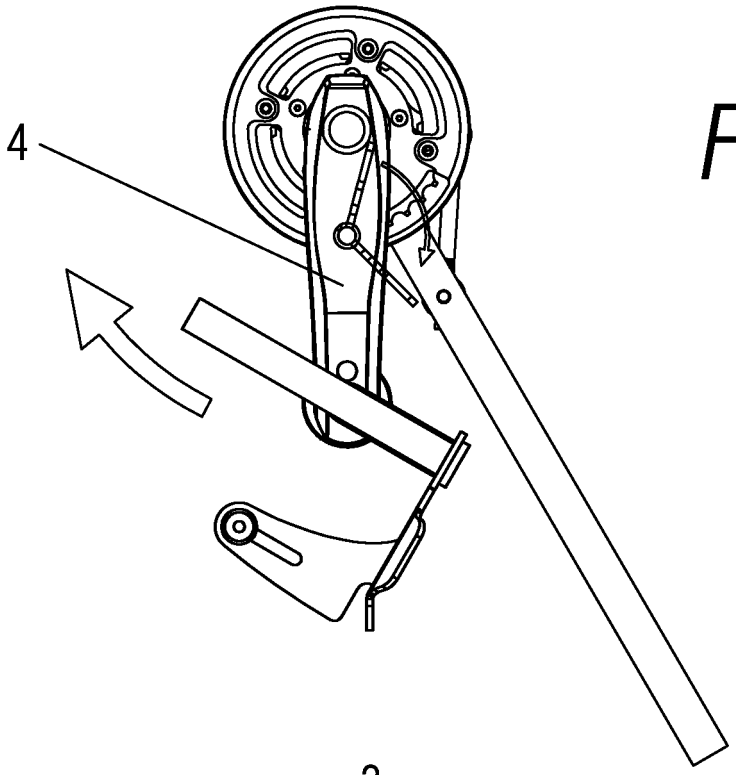


FIG.7A

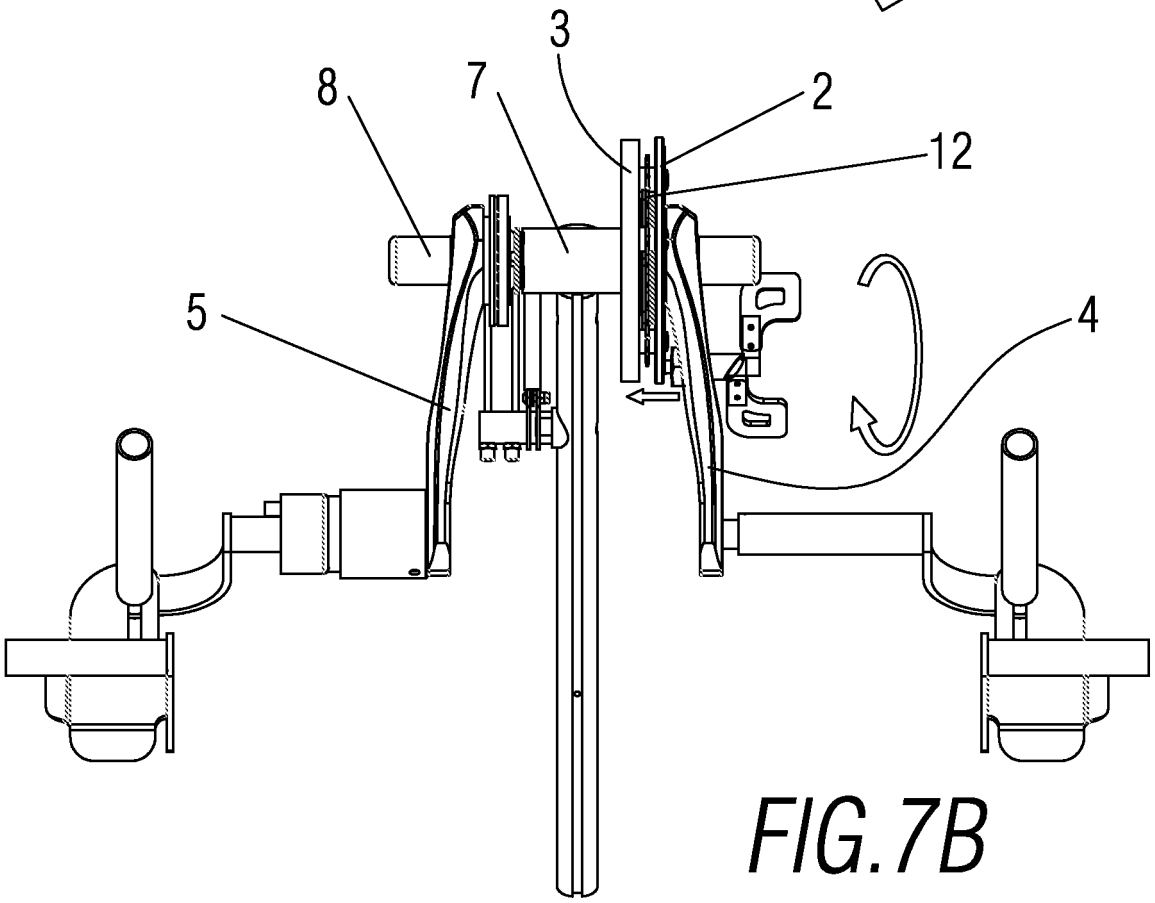


FIG.7B

INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2015/070734

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61G5/02 A61G5/04
ADD.

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)
A61G

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 501 480 A (ORDELMAN HENDRIK J [NL] ET AL) 26 March 1996 (1996-03-26) the whole document	1-7
A	US 2008/246246 A1 (DIX ROLLIN C [US] ET AL) 9 October 2008 (2008-10-09) the whole document	1-7
A	US 2003/000748 A1 (MCHARDY LANG J [US] ET AL) 2 January 2003 (2003-01-02) the whole document	1-7
A	US 5 899 476 A (NOYOLA RUFINO [US]) 4 May 1999 (1999-05-04) the whole document	1-7
A	FR 1 540 324 A (LERAY GERARD) 27 September 1968 (1968-09-27) the whole document	1-7

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☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 January 2016	09/02/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Edlauer, Martin

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/ES2015/070734

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5501480	A	26-03-1996	NONE
US 2008246246	A1	09-10-2008	NONE
US 2003000748	A1	02-01-2003	NONE
US 5899476	A	04-05-1999	NONE
FR 1540324	A	27-09-1968	NONE

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- ES 2425316 **[0004]**