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

(11) **EP 3 641 715 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
21.09.2022 Bulletin 2022/38

(21) Application number: **18762391.3**

(22) Date of filing: **31.07.2018**

(51) International Patent Classification (IPC):
A61G 5/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A61G 5/023; A61G 5/02; A61G 5/024

(86) International application number:
PCT/IB2018/055737

(87) International publication number:
WO 2019/025976 (07.02.2019 Gazette 2019/06)

(54) WHEELCHAIR HAVING A FLEXIBLE TENSION ELEMENT AS TRACTION DRIVE ELEMENT AND RETROFIT METHOD THEREOF

ROLLSTUHL MIT EINEM FLEXIBLEN SPANNELEMENT ALS ZUGANTRIEBSELEMENT UND NACHRÜSTVERFAHREN DAFÜR

FAUTEUIL ROULANT AYANT UN ÉLÉMENT DE TENSION FLEXIBLE EN TANT QU'ÉLÉMENT D'ENTRAÎNEMENT DE TRACTION ET SON PROCÉDÉ DE MODERNISATION

(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

(30) Priority: **02.08.2017 IT 201700089007**

(43) Date of publication of application:
29.04.2020 Bulletin 2020/18

(73) Proprietor: **Politecnico di Torino**
10129 Torino (IT)

(72) Inventors:
- **QUAGLIA, Giuseppe**
  10129 Torino (IT)
- **BONISOLI, Elvio**
  10129 Torino (IT)

(74) Representative: **Mola, Edoardo**
Praxi Intellectual Property S.p.A.
Corso Vittorio Emanuele II, 3
10125 Torino (IT)

(56) References cited:
CN-A- 106 176 070
US-A- 5 826 897
US-B1- 7 946 963

EP 3 641 715 B1

Description

TECHNICAL FIELD

[0001] The present invention refers to a wheelchair for the disabled for promenading or sports or other. In particular, the wheelchair according to the present invention comprises a manual traction device which can be operated directly by a user seated on the wheelchair without the support of an attendant and whose purpose is to provide the wheelchair's advancement and to control its trajectory. Such a wheelchair is known from US 7 946 963 B1.

STATE OF THE ART

[0002] A wheelchair is normally pushed by an accompanying person or travels because the owner grabs appropriate traction rings arranged on the wheels and exerts an action with the arms. This configuration has a number of disadvantages. For example, the traction rings have a diameter slightly smaller than that of the corresponding wheel of the wheelchair and for this reason they are subject to become dirty since they are close to the road pavement. Furthermore, the wheelchair's traction requires, in the absence of an accompanying person, that the user uses both arms to proceed in a straight line. This implies a limitation to the sociality of the user who cannot hold accompanying hands or hold other objects such as a leash for a pet or similar. It is also necessary to consider that some users can fully dispose of the mobility of one of the two upper limbs and, in this case, a traditional wheelchair requires the presence of an accompanying person to proceed in a straight line and to change direction.

SCOPE AND BRIEF SUMMERY OF THE INVENTION

[0003] The scope of the present invention is to provide a wheelchair that increases the feeling of independence of its user and, in case of sports activities, to provide high speed performance and control of the direction without excessively impacting the overall dimensions and weight.

[0004] The scope of the present invention is achieved by means of a wheelchair according to claim 1. In particular, the recovery spring is angular and acts on the recovery pulley and the flexible tension element rewinds for a variable working angle, which has a value maximum of one revolution, around the recovery pulley. In this way, it is possible to limit possible damages caused by spikes or protrusions on the road. Moreover, the overall configuration of the wheelchair is extremely compact and this is important to make the wheelchair's visual impact less cumbersome and to increase the portability of the wheelchair. It is therefore possible to improve the user's quality of life as the numerous functionalities possible through a cable traction, or other flexible traction elements, have a minimal impact on the structure and weight of the wheelchair.

[0005] The method according to claim 10 allows the traction device with a tension flexible element to be applied to a wheelchair already in circulation, by means of a retrofit operation.

[0006] Further relevant features are specified in the dependent claims and in the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The invention will now be described on the basis of non-limiting examples shown for explanatory purposes in the accompanying drawings, in which:

- Figure 1 is a lateral sketch of a wheelchair according to the present invention;
- Figure 2 is an enlarged perspective view with a partial section of a module of the wheelchair of Figure 1;
- Figure 3 is an exploded perspective view of Figure 2;
- Figure 4 is a lateral sketch of the wheelchair of Figure 1 in a position where the wheels start to move;
- Figure 5 is a plan view of the wheelchair of Figure 1 during wheel traction;
- Figures 6 a-c are respective lateral schematic views of traction positions during uphill use of a wheelchair according to a further embodiment of the present invention;
- Fig. 7 is a schematic side view of a third embodiment of the present invention;
- Figures 8 a-b are respective perspective views of a fourth embodiment of the present invention with arms in a retracted position to act as armrests and arms in an extracted position;
- Figures 9 a-b are respective sketches of a free wheel mounted on a wheelchair according to a fifth embodiment of the present invention

DETAILED DESCRIPTION OF THE INVENTION

[0008] Figure 1 shows as a whole a wheelchair 1 comprising a frame 2, at least a front or rear pivoting wheel 3 and traction wheels 4. The frame 2 connects to the wheels 3 and 4 a seat 5 and a backrest 6, which define a seat for a wheelchair user 1.

[0009] The frame of the wheelchair 1 can be configured in a very different way from that illustrated in Figure 1, for example in the case where the wheelchair is a wheelchair for sporting purposes, in particular for competitions. In this case, the wheelchair 1 assumes a functionality similar to that of a hand-bike.

[0010] According to the present invention, the wheelchair 1 further comprises a traction device 8 with a flexible tension element connected to the traction wheels 4 and comprising a cable 9 tensioned by the user in a reciprocating way to advance the wheelchair 1.

[0011] Figures 2 and 3 show respective perspective views in partial and exploded section of a module 10

mounted on the frame 2 of the wheelchair 1. The module 10 comprises a fastening element 11 configured to rigidly couple to the frame 2, a recovery pulley 12 for rewinding the cable 9 when the latter is released, an interface unit 13 adapted to be connected to drive wheel 4 and a freewheel 14 for connecting the pulley 12 to interface unit 13 and allowing traction of the traction wheels 4 through the interface unit 13 and the cable 9 when the latter is tensioned and letting the drive wheels 4 roll freely when the cable 9 is not tensioned by the user. According to the embodiment of Figure 2, interface unit 13 comprises a pin 15 projecting from free wheel 14 and being surrounded by a hub 16 of driving wheel 4. Furthermore, pin 15 is rigidly fixed to fastening element 11, for example by means of a threaded coupling, and supports as a cantilever hub 16 of driving wheel 4. Pulley 12, an angular recovery spring M acting on the pulley 12 and the hub 16 are coaxial. Return spring M is not shown in FIG. 2 to visualize the components and is illustrated in a preferred embodiment as a helical cylindrical spring in FIG. 3. Alternatively, the recovery angular spring may be a spiral or conical helix spring or the like. According to the embodiment of Figure 2, an inner ring of freewheel 14 is rigidly connected to hub 16 and an outer ring of freewheel 14 is rigidly connected to pulley 12. In addition, frame 2 comprises a lower cross member 17 which has a cylindrical end portion 18 and, according to such embodiment, fastening element 11 comprises a bush 19 which can be housed inside the end portion 18 via shape fitting so that the latter defines a rigid radial support to module 10. It is however possible that frame 2 is different from what is illustrated in figure 2, in particular lower crosspiece 17 could have a cross-section different from the circular one or lower crosspiece 17 could be absent and the frame could comprise a right and left trust to which module 10 is appropriately connected via fastening element 11.

[0012] Preferably, interface unit 13 comprises a first and a second bearing 20, 21 for radially supporting hub 16 via pin 15. In particular, bearings 20, 21 are rigidly connected to pin 15 along the axial direction, for example keyed onto the latter, and hub 16 is mounted with a transition fitting or with play on bearings 20, 21. A cover 22 rigidly fixed to hub 16, for example by means of a plurality of screws, interferes axially with bearings 20, 21 and prevents therefore that hub 16 approaches or exerts an excessive axial action in the direction of the frame 2. Bearings 20, 21 are also spaced by means of a spacer 23 which transfers any axial actions from one bearing to the other.

[0013] Preferably pulley 12 is hollow and houses freewheel 14, which radially supports pulley 12. In particular, the outer ring of freewheel 14 is rigidly connected to rotation to pulley 12 and a circular crown 24 is concentric with pin 15 and axially closes freewheel 14 inside pulley 12. Preferably circular ring 24 is rigidly connected to a flange 25 of freewheel 14 in a dismountable manner, for example by means of a plurality of screws.

[0014] The pulley 12 further defines an annular recess 26 within which the cable 9 of the traction device 8 is wound for a variable working angle which preferably has a maximum value greater than a revolution. According to the embodiment depicted in the figure 2, annular recess 26 is located opposite to circular crown 24 with respect to freewheel 14 along the axial direction.

[0015] Module 10 further comprises an anti-friction material bush 27 arranged radially between pin 15 and hub 16 and pulley 12. Bush 27 comprises a flange 28 rigidly connected to bush 19. Flange 28 is axially located between bush 19 and pulley 12, in particular between bush 19 and annular recess 26. Bush 27 also has an axial extension such as to project outwardly of freewheel 14 and of pulley 12 and to be housed in hub 16. In this way, bush 27 can protect pin 15 from dirt and atmospheric agents.

[0016] According to the embodiment of Figure 2, hub 16 comprises an end portion 29 (Figure 3) modified with respect to the hub of a conventional wheel for the wheelchair. End portion 29 has in fact an outer diameter smaller than that of the inner ring of freewheel 14 and extends axially beyond the inner ring of freewheel 14 towards flange 28. In this way, hub 16 is axially fixed to freewheel 14 through an elastic ring 30 when module 10 is mounted. End portion 29 is rigidly connected in rotation to the inner ring of freewheel 14 for example by keying, and end portion 29 is delimited by a shoulder 31 on an axially opposite side to that of elastic ring 30. Shoulder 31 abuts against the inner ring of freewheel 14 when elastic ring 30 is mounted and, in this way, freewheel 14 defines the axial position of pulley 12 relative to hub 16. End portion 29 protrudes with respect to bearings 20, 21. The latter are suitably spaced in axial direction to withstand the cantilevered loads generated by cable 9 acting on pulley 12 and on freewheel 14.

[0017] According to the embodiment of Figure 2, module 10 optionally comprises a brake disk 32 rigidly connected to hub 16, for example by means of a plurality of screws. Brake disc 32 preferably surrounds end portion 29 and is disposed on the opposite side of annular recess 26 with respect to circular crown 24. The brake disc 32 has a radial dimension greater than that of the circular crown 24 and free wheel 14. Module 10 further comprises a not-shown brake caliper mounted on a bracket 33 fixed to fastening element 11. In particular, bracket 33 is fixed between the flange 28 and the bush 19, preferably by means of a plurality of screws which simultaneously fasten these components.

[0018] In use, Figures 4 and 5, a user of wheelchair 1 can travel on a road by reciprocatingly tensioning cable 9 by means of a relative handle 34, arranged at one end of cable 9. To travel in a straight direction, a right cable 9 and a left cable 9 must have the same tension and a substantially equal stroke for each activation cycle. Freewheel 14 allows the transmission of torque to the relative hub 16 when the relative cable 9 is tensioned by the user; recovery pulley 12, via the freewheel 14, recovers cable 9 to rewind into annular recess 26 when the user releases

the cable 9 by increasing the working angle around the return pulley 12.

[0019] The user can also change the direction of the wheelchair 1 by acting on brake disc 32 by means of the relative caliper. This allows both small adjustments of direction while wheelchair 1 travels and to perform real curves with a very small radius of curvature. Brake disc 32 is optionally used to obtain the traditional parking function of the wheelchair 1 in combination or as an alternative to a conventional parking brake of a wheelchair.

[0020] Actuation device of the brake caliper can be either attached to the frame 2 in the traditional way to obtain what has been specified in the previous paragraph. Or, alternatively, according to the embodiment illustrated schematically in Figures 6a, the actuation device of the brake caliper is applied to each handle 34 of the relative cable 9. In this way it is possible to operate the brake during an upward movement while the cable 9 is rewound from pulley 12 (figure 6b), and release the brake caliper immediately before starting a new tensioning of cable 9 (figure 6c). Such actuation of the brake caliper can be for example provided by a Bowden cable having an end portion fixed to frame 2 and another end portion fixed to the relative handle 34. The length of the Bowden cable, not shown, is suitable to allow all the movements required for the advancement of the wheelchair 1 by means of handle 34.

[0021] As shown in Figures 1 to 6, traction device 8 comprises front idle pulleys 35, mounted on suitable arms 36 carried by the frame 2. In this way, the tension of cable 9 is obtained as a result of a movement similar to that of rowing, i.e. with a movement of handles 34 towards the user's chest. Preferably, transmission pulleys 35 are located at the shoulders of the user and are spaced from the latter to allow a complete flexion-extension of the arms. However, further embodiments are possible in which idle pulleys 35 are rearward and arms 36 are consequently arranged so that idle pulleys 35 are located either at the back of the user or at the rear of the latter. For example, arms 36 protrude rearwardly from the backrest. According to this embodiment, the tensioning of cable 9 is obtained by means of a movement whereby the user moves handles 34 away from his own chest. Moreover, in this case, freewheel 14 is oriented as described previously.

[0022] It is also possible to configure module 10 to combine both the aforementioned configurations so as to advantageously obtain a traction as continuous as possible following the reciprocating movement of handles 34 both during the departure of handles 34 from the chest and during the approach of the handles to the chest. This is particularly of interest for a wheelchair 1 for sports or competition use. In this case, as shown in Figure 7, traction device 8 comprises return pulleys 35 arranged both at the front and at the back of the user's body. Moreover, for each wheel 4, module 10 is provided with two free wheels 14 each of which is associated with a relative recovery pulley 12. In this case, each recovery pulley 12 has a relative recovery spring acting as follows: when a recovery angular spring wraps a pulley 12 since the relative cable 9 is released, the other recovery angular spring unwraps, i.e. is loaded, because the associated cable 9 is tensioned by the user. Moreover, in this case, cable 9 presents, for each wheel 4, a length about twice that of the configurations shown in Figures 1 to 6, and the relative handle 34 is arranged in an idle position of cable 9, whose ends are respectively fixed to the respective pulley 12. Alternatively, two cables 9 for each drive wheel 4 reach the relative handle 34 on opposite sides.

[0023] According to the alternative embodiment of Figure 8, arms 36 are movable between an extracted position in which pulleys 35 are in a position suitable for tensioning the cable 9 according to one of the aforementioned alternatives and a retracted position providing of minimum overall size. Preferably, in the retracted position, arms 36 are arranged from opposite side portions of seat 5 and have a longitudinal support having a vertical dimension suitable to act as armrests for seat 5 and backrest 6. For example, arms 36 are hinged to pivot between the extracted position and the retracted position, or they can be removed, in particular they are telescopic. In both cases, the position of use of pulley 35 when the relative arm 36 is in the extracted position can be adjusted. This is done by adjusting and fixing the extension or the angle of the arm.

[0024] Figure 9 shows an equivalent linear scheme of an embodiment of freewheel 14 which can be disengaged to allow the wheelchair 1 to be retracted without freewheel 14 and cables 9 being obstructive. In particular, a pawl 37 of the freewheel 14 is arranged on a movable base 38 which has a delimited stroke in a radial direction. In particular, in a backward radial position of movable base 38 pawl 37 does not mate with a toothed wheel 39 of freewheel 14 and therefore the wheel 4 is completely idle, and in an advanced radial position, pawl 37 is coupled with gear wheel 39 of freewheel 14 to provide the torque transmission function from pulley 12 to hub 16. To move from the backward radial position to the forward radial position, movable base 38 follows an inclined guide 40 suitably arranged so that the advanced radial position is reached within the initial part or centimeters of the traction stroke of cable 9. The retracted radial position is instead reached by the action of return spring M of pulley 12 acting on movable base 38 and, through it, on cable 9.

[0025] It is also possible to apply changes or variations to the wheelchair according to the present invention without thereby departing from the scope of protection defined by the appended claims.

[0026] For example, cable 9 may be replaced by a chain or a toothed belt or by a flexible tension element comprising one or more sections of a cable, a belt and a chain.

[0027] The presence of idle pulleys 35 is not strictly necessary, although in this case the traction movement is less instinctive for the user.

[0028] It is possible to mount module 10, pulleys 35 and arms 36 on wheelchairs already in use by a retrofit operation. In this case, arms 36 are rigidly but releasably connected to frame 2.

Claims

1. Wheelchair (1) comprising a first and a second traction wheel (4) and a traction device (8) having a freewheel (14), a recovery pulley (12) angularly connected to the traction wheels (4) via the freewheel (14), a tension flexible element (9) manually operable via a handle (34) by a user sitting on the wheelchair (1) and connected to the recovery pulley (12) to provide a traction torque to the traction wheels (4) when tensioned by the user, a recovery angular spring (M) acting on the recovery pulley (12) to wind the released flexible element (9) along a variable working angle about the recovery pulley (12), **characterised by** a module (10) having said recovery pulley (12), said freewheel (14), an attaching element (11) for rigidly connecting the module (10) to a frame (2) of the wheelchair (1) and an interface unit (13) for rigidly connecting said freewheel (14) to at least one of the said traction wheels (4).

2. Wheelchair according to claim 1, wherein the recovery angular spring (M) is housed within the recovery pulley (12).

3. Wheelchair according to claims 1 or 2, wherein each traction wheel (4) comprises a hub (16) having an end portion (29) rigidly connected to a first ring of the freewheel (14) to radially support the recovery pulley (12) via the freewheel (14).

4. Wheelchair according to one of the preceding claims, wherein each traction wheel (4) comprises a hub (16) and wherein a brake disk (32) is rigidly connected to the hub (16) so that the brake disk (32) is between the hub (16) and the recovery pulley (12).

5. Wheelchair according to claim 1, wherein the attaching element (11) comprises a boss (19) rigidly attached to the frame (2) and wherein the module (10) comprises a pin (15) rigidly connected to the boss (19) and housed inside the recovery pulley (12) and inside a hub (16) of the traction wheels (4), a first and a second rolling bearing (20, 21) being provided to radially support the hub (16) via the pin (15).

6. Wheelchair according to claims 4 and 5, wherein the module (10) further comprises a bracket (33) rigidly attached to the attaching element (11) to support a brake caliper for the brake disk (12).

7. Wheelchair according to any of the preceding claims, comprising at least an arm (36) and at least one idle pulley (35) supported by the at least one arm (36) for contacting the tension flexible element (9) to bring the handle (34) in a suitable position so that the user holding the handle (34) tensions the flexible element (9) to move the wheelchair (1) and wherein the arm (36) is movable between an extracted position where the idle pulley (35) is in position for traction of traction wheels (4) by the user via the handle (34) and a retracted position.

8. Wheelchair according to claim 7, comprising the at least one arm and a further arm (36) located at respective lateral sides of a seat (5) of the wheelchair (1) so that, when in the retracted position, the arms (36) are respective armrests of the seat (5).

9. Wheelchair according to any of claims 7 or 8, wherein the idle pulley (35) is attached such that the position of the idle pulley (35) is adjustable when the arm (36) is in the extracted position.

10. Method of providing with a traction device (8) a wheelchair (1) according to claim 1, comprising the steps of:

    - Rigidly attaching said attaching element (11) of the module (10) to said frame (2) of the wheelchair (1);
    - Rigidly attaching the traction wheel (4) to the freewheel (14) via said interface unit (13) of the module (10).

11. Method according to claim 10, further comprising the step of attaching to the frame (2) idle pulleys (35) suitable for contacting the tension flexible element (9) to bring the handle (34) in a suitable position so that the user holding the handle (34) tensions the traction flexible element (9) to move the wheelchair (1).

Patentansprüche

1. Rollstuhl (1) umfassend ein erstes und ein zweites Traktionsrad (4) und eine mit einem Freilauf (14) versehene Traktionsvorrichtung (8), eine Rückstellrolle (12) winklig mit den Traktionsrädern (4) mittlels des Freilaufs (14) verbunden, ein flexibles Zugelement (9), das mittels eines Handgriffs (34) von einem auf dem Rollstuhl (1) sitzenden Benutzer manuell bedienbar und mit der Rückstellrolle (12) verbunden ist und nach innen um den Traktionsrädern (4) ein Traktionsmoment bereitzustellt, wenn sie vom Benutzer gespannt wird, eine winkelförmige Rückstellfeder (M), die auf die Rückstellrolle (12) einwirkt, um das flexible befreite Element (9) entlang eines variablen Arbeitswinkels um die Rückstellrolle Reinheit (12)

aufzuwickeln, **gekennzeichnet durch** ein Modul (10), das mit der Rückstellrolle (12), dem Freilauf (14), einem Befestigungselement (11) zum starren Verbinden des Moduls (10) mit einem Rahmen (2) des Rollstuhls (1) starr zu verbinden, und eine Schnittstelleneinheit (13) zum starren Verbinden des Freilaufs (14) mit mindestens einem der Traktionsräder (4).

2. Rollstuhl nach Anspruch 1, bei dem die winkelförmige Rückstellfeder (M) innerhalb der Rückstellrolle (12) untergebracht ist.

3. Rollstuhl nach Anspruch 1 oder 2, bei dem jedes Traktionsrad (4) eine Nabe (16) mit einem Endteil (29) umfasst, das starr mit einem ersten Ring des Freilaufs (14) verbunden ist, um die Rückstellrolle (12) durch den Freilauf (14) radial zu unterstützen.

4. Rollstuhl nach einem der vorhergehenden Ansprüche, bei dem jedes Traktionsrad (4) eine Nabe (816) aufweist und bei dem eine Bremsscheibe (32) starr mit der Nabe (16) verbunden ist, wobei die Bremsscheibe (32) angeordnet ist zwischen der Nabe (16) und der Rückstellrolle (12).

5. Rollstuhl nach Anspruch 1, bei dem das Befestigungselement (11) einen starr am Rahmen (2) befestigten Vorsprung (19) umfasst und bei dem das Modul (10) einen starr mit dem Vorsprung (19) verbundenen Stift (15) umfasst. und innerhalb der Rückstellrolle (12) und innerhalb einer Nabe (16) der Traktionsräder (4) ein erstes und ein zweites Wälzlager (20, 21) untergebracht sind, die vorgesehen sind, um die Nabe (16) durch den Stift (15) radial zu unterstützen.

6. Rollstuhl nach den Ansprüchen 4 und 5, bei dem das Modul (10) außerdem eine Halterung (33) umfasst, die starr an dem Befestigungselement (11) befestigt ist, um einen Bremszange für die Bremsscheibe (12) zu tragen.

7. Rollstuhl nach einem der vorangehenden Ansprüche, umfassend mindestens einen Arm (36) und mindestens eine Leerlaufrolle (35), die mittels mindestens eines Arms (36) zum Kontakt mit dem flexiblen Spannelement (9) gehalten wird, um den Handgriff (34) in eine geeignete Position derart zu bringen, dass der Benutzer, der den Griff (34) hält, das flexible Element (9) spannt, um den Rollstuhl (1) zu bewegen, und bei dem der Arm (36) zwischen einer herausgezogenen Position, in der sich die Leerlaufriemenscheibe (35) in einer Traktionsposition der Antriebsräder (4) durch den Benutzer durch den Griff (34) befindet, und einer zurückgezogenen Position bewegt werden kann.

8. Rollstuhl nach Anspruch 7, umfassend mindestens einen Arm und einen weiteren Arm (36), die an den jeweiligen seitlichen Seiten eines Sitzes (5) des Rollstuhls (1) angeordnet sind, wodurch in einer zurückgezogenen Position sind die Arme (36) jeweilige Armlehnen des Sitzes (5).

9. Rollstuhl nach einem der Ansprüche 7 oder 8, bei dem die Leerlaufrolle (35) derart befestigt ist, dass die Position der Leerlaufrolle (35) einstellbar ist, wenn sich der Arm (36) in der herausgezogenen Position befindet.

10. Verfahren zur Bereitstellung von einem Rollstuhl (1) mit einer Traktionsvorrichtung (8) nach Anspruch 1, umfassend die folgenden Schritte:

- starres Befestigen des Befestigungselements (11) des Moduls (10) an dem Rahmen (2) des Rollstuhls (1);
- starres Befestigen des Antriebsrads (4) an dem Freilauf (14) mittels der Schnittstelleneinheit (13) des Moduls (10).

11. Verfahren nach Anspruch 10, ferner umfassend den Schritt der Befestigung von Leerlaufrollen (35) am Rahmen (2), die geeignet sind, mit dem flexiblen Spannelement (9) in Kontakt zu kommen, um den Griff (34) in eine geeignete Position zu bringen, wobei der Benutzer, der den Griff (34) hält, das flexible Zugelement (9) spannt, um den Rollstuhl (1) zu bewegen.

Revendications

1. Fauteuil roulant (1) comprenant une première et une deuxième roue de traction (4) et un dispositif de traction (8) pourvu d'une roue libre (14), une poulie de rappel (12) reliée angulairement aux roues de traction (4) par des moyens de la roue libre (14), un élément tendeur flexible (9) actionnable manuellement au moyen d'une poignée (34) par un utilisateur assis sur le fauteuil roulant (1) et relié à la poulie de rappel (12) afin de fournir un couple de traction aux roues de traction (4) lorsqu'elles sont mises en tension par l'utilisateur, un ressort de rappel angulaire (M) agissant sur la poulie de rappel (12) pour enrouler l'élément flexible (9) libéré selon un angle de travail variable autour de la poulie de rappel (12), **caractérisé par** un module (10) pourvu de ladite poulie de rappel (12), ladite roue libre (14), un élément de fixation (11) pour relier rigidement le module (10) à un châssis (2) du fauteuil roulant (1) et une unité d'interface (13) pour relier rigidement ladite roue libre (14) à au moins une desdites roues de traction (4).

2. Fauteuil roulant selon la revendication 1, dans lequel

le ressort de rappel angulaire (M) est logé à l'intérieur de la poulie de rappel (12).

3. Fauteuil roulant selon les revendications 1 ou 2, dans lequel chaque roue de traction (4) comprend un moyeu (16) avec une partie d'extrémité (29) solidaire d'un premier anneau de la roue libre (14) pour supporter radialement la poulie de rappel (12) au moyen de la roue libre (14).

4. Fauteuil roulant selon l'une des revendications précédentes, dans lequel chaque roue de traction (4) comprend un moyeu (16) et dans lequel un disque de frein (32) est relié rigidement au moyeu (16), le disque de frein (32) étant agencé entre le moyeu (16) et la poulie de rappel (12).

5. Fauteuil roulant selon la revendication 1, dans lequel l'élément de fixation (11) comprend un bossage (19) fixé rigidement au châssis (2) et dans lequel le module (10) comprend un pivot (15) solidaire du bossage (19) et logé à l'intérieur de la poulie de rappel (12) et à l'intérieur d'un moyeu (16) des roues de traction (4), un premier et un deuxième palier à roulement (20, 21) prévus pour supporter radialement le moyeu (16) à travers le pivot (15).

6. Fauteuil roulant selon les revendications 4 et 5, dans lequel le module (10) comprend également un support (33) fixée rigidement à l'élément de fixation (11) pour supporter un étrier de frein pour le disque de frein (12).

7. Fauteuil roulant selon l'une quelconque des revendications précédentes, comprenant au moins un bras (36) et au moins une poulie folle (35) supportée par au moins un bras (36) pour le contact avec l'élément de tension flexible (9) afin d'amener la poignée (34) dans une position appropriée, de telle sorte que l'utilisateur tenant la poignée (34) tende l'élément flexible (9) de manière à déplacer le fauteuil roulant (1) et dans lequel le bras (36) est déplaçable entre une position extraite, dans laquelle la poulie folle (35) est dans une position d'entraînement en traction des roues de traction (4) par l'utilisateur au travers de la poignée (34), et une position rentrée.

8. Fauteuil roulant selon la revendication 7, comprenant au moins un bras et un autre bras (36) situés sur les côtés latéraux respectifs d'un siège (5) du fauteuil roulant (1), de sorte qu'en position rétractée, les bras (36) sont des accoudoirs respectifs du siège (5).

9. Fauteuil roulant selon l'une quelconque des revendications 7 ou 8, dans lequel la poulie folle (35) est fixée de manière à ce que la position de la poulie folle (35) soit réglable lorsque le bras (36) est en position extraite.

10. Procédé pour former avec un dispositif de traction (8) un fauteuil roulant (1) selon la revendication 1, comprenant les opérations consistant à :

- fixer rigidement ledit élément de fixation (11) du module (10) audit châssis (2) du fauteuil roulant (1) ;
- fixer rigidement la roue de traction (4) à la roue libre (14) au moyen de ladite unité d'interface (13) du module (10).

11. Procédé selon la revendication 10, comprenant en outre l'opération de fixation au châssis (2) de poulies folles (35) aptes à venir en contact avec l'élément flexible de tension (9), de manière à amener la poignée (34) dans une position appropriée, dans laquelle l'utilisateur tenant la poignée (34) tend l'élément flexible de traction (9) de manière à déplacer le fauteuil roulant (1).

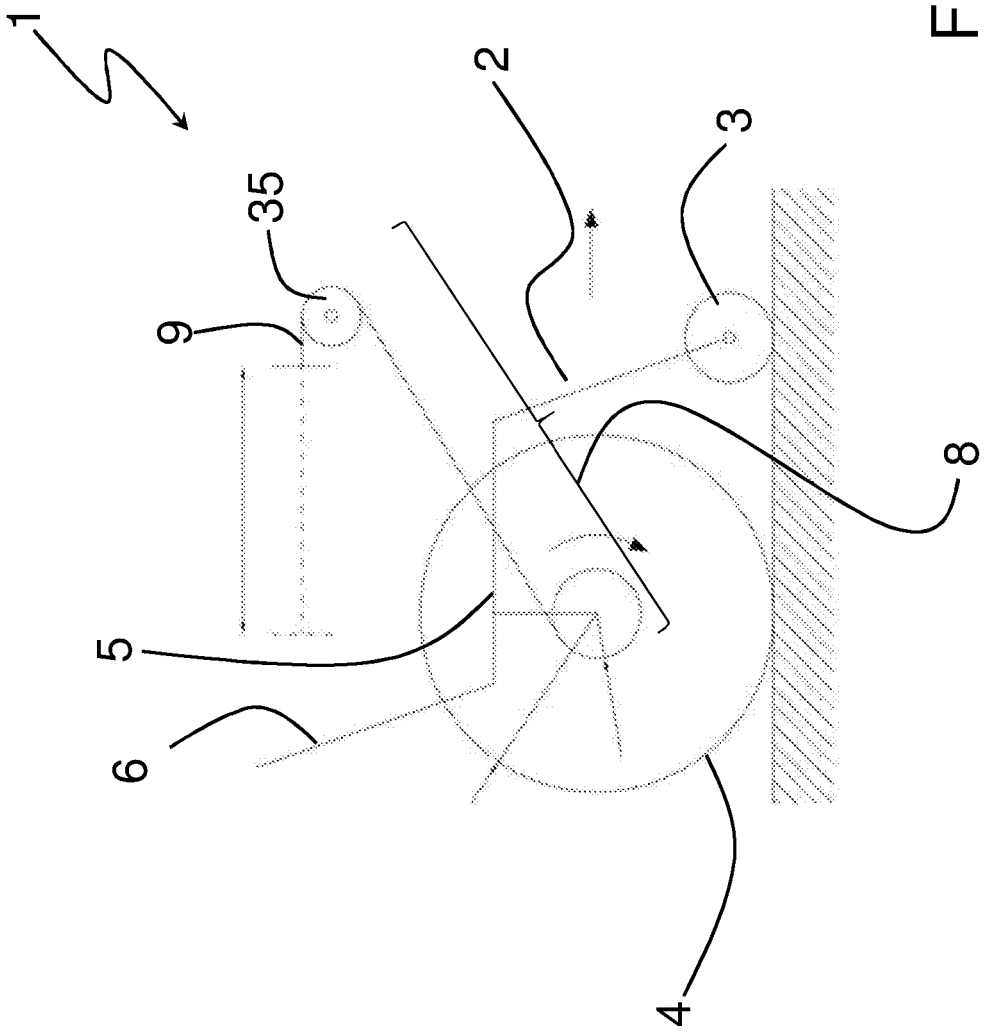

Fig. 1

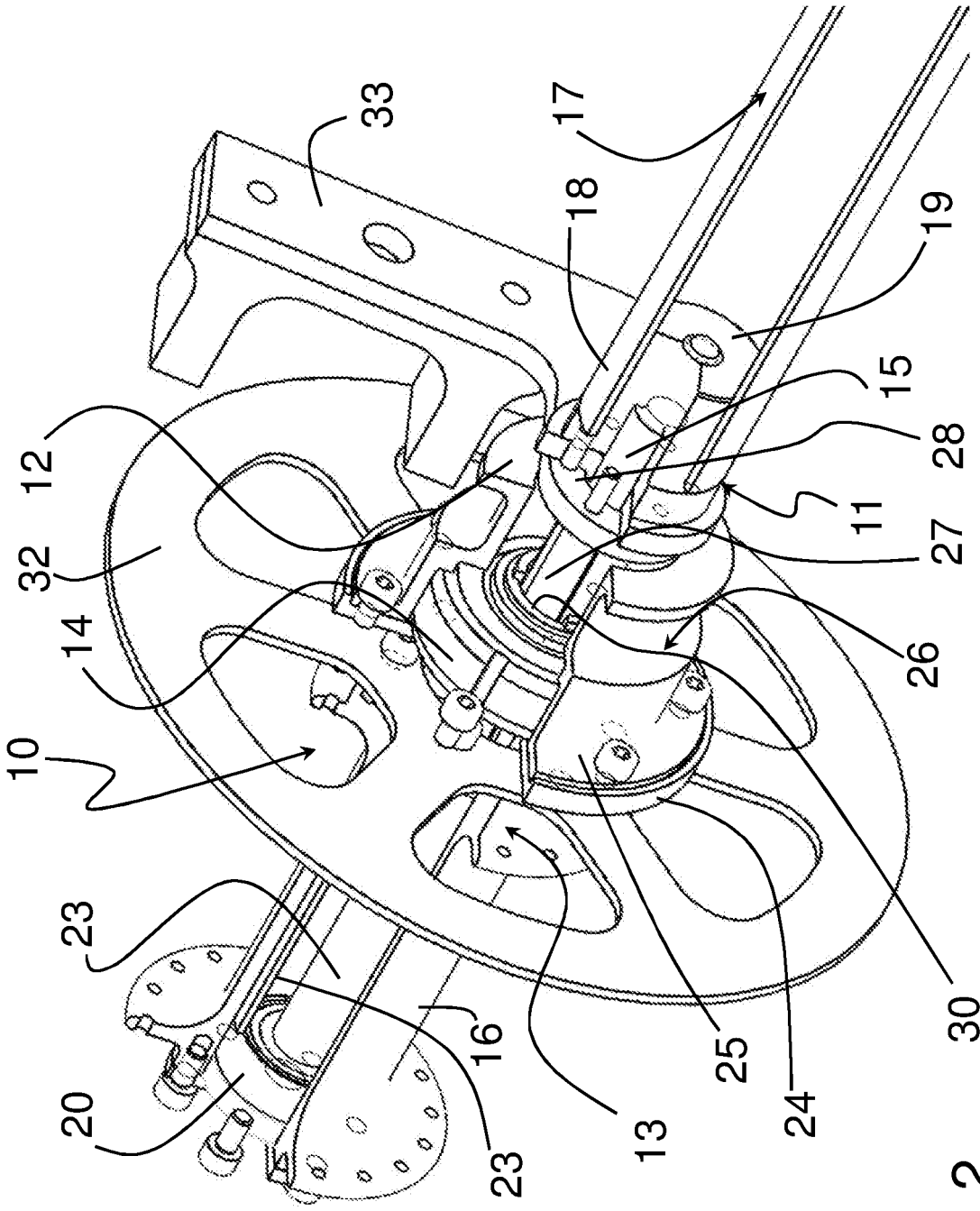

Fig. 2

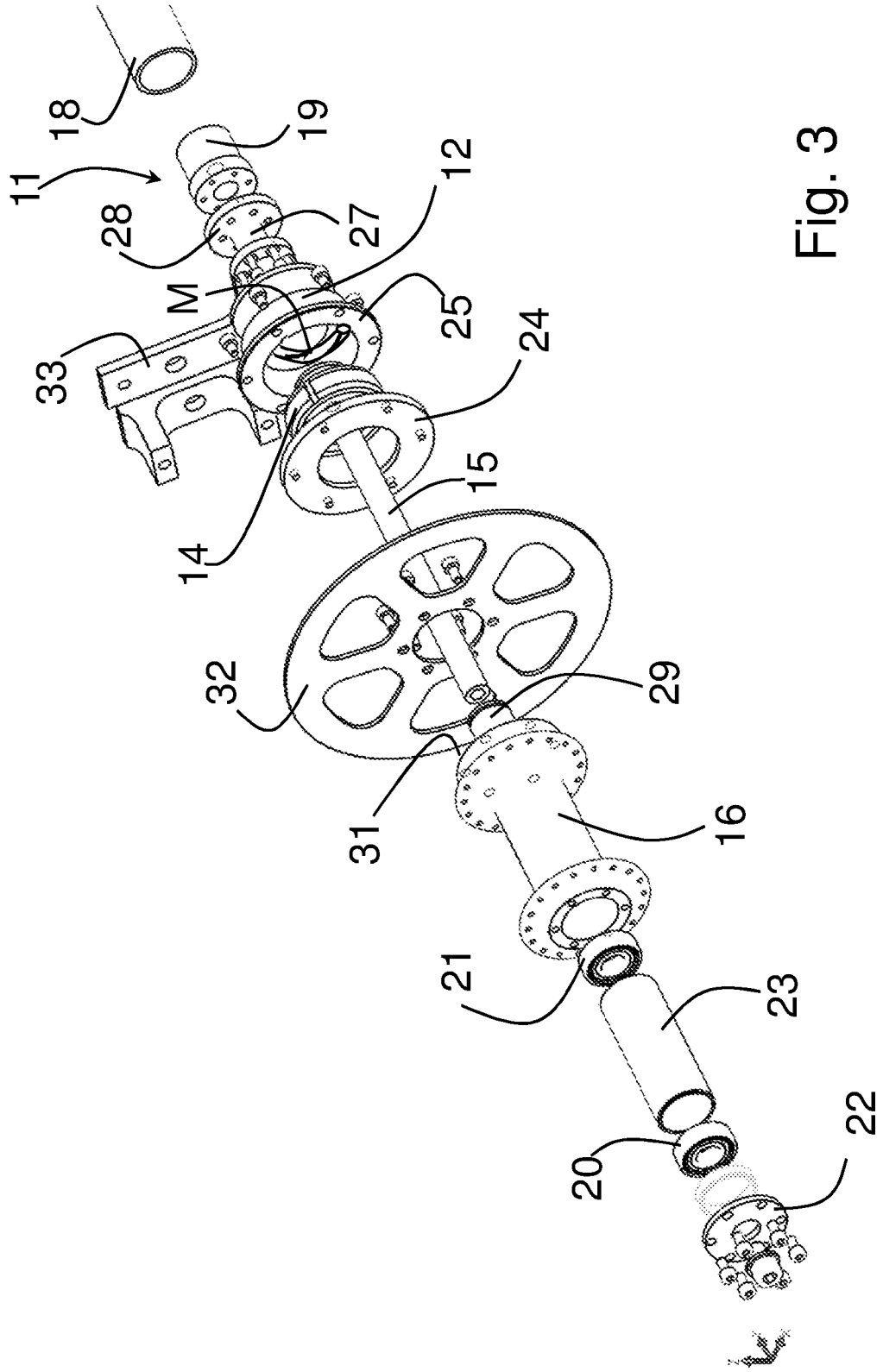

Fig. 3

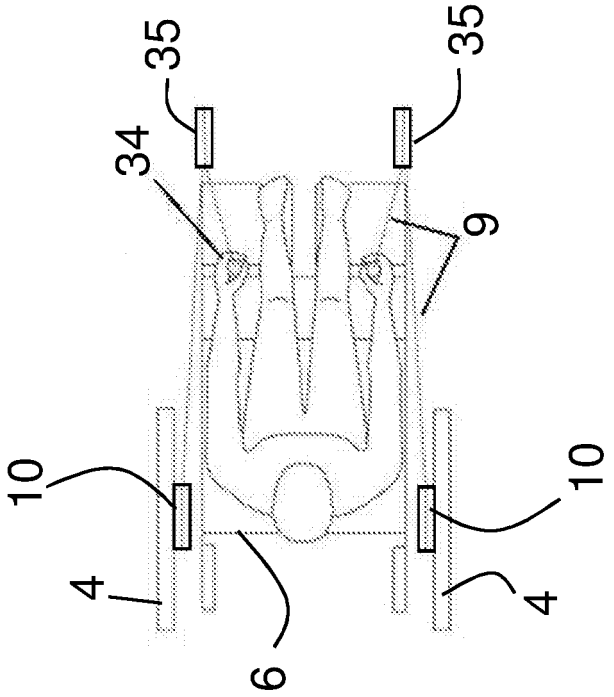

Fig. 5

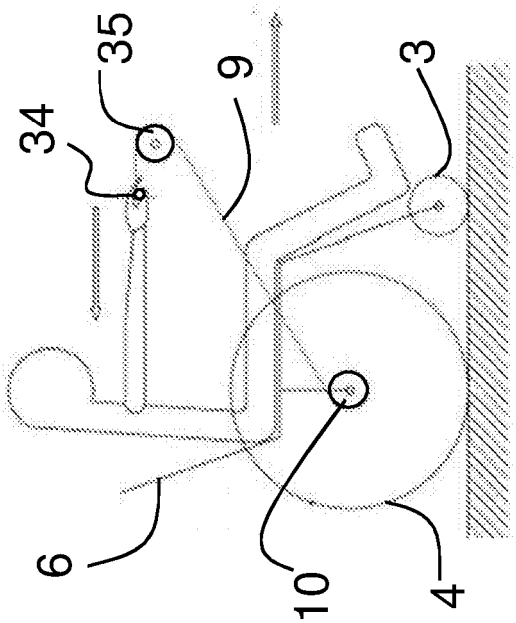

Fig. 4

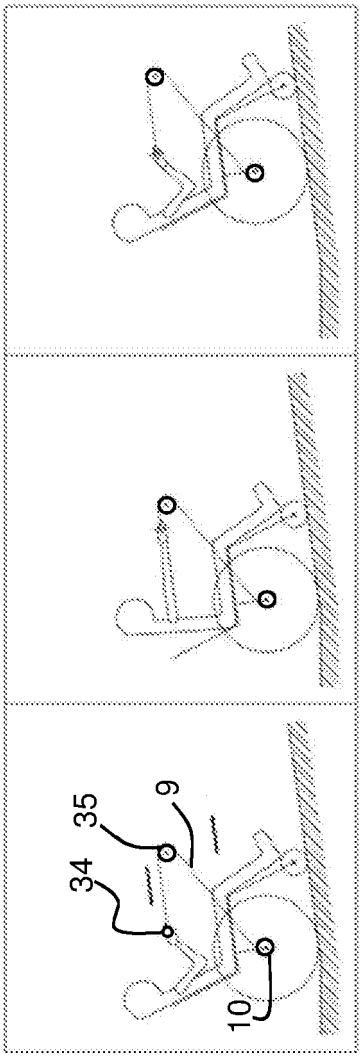

Fig. 6

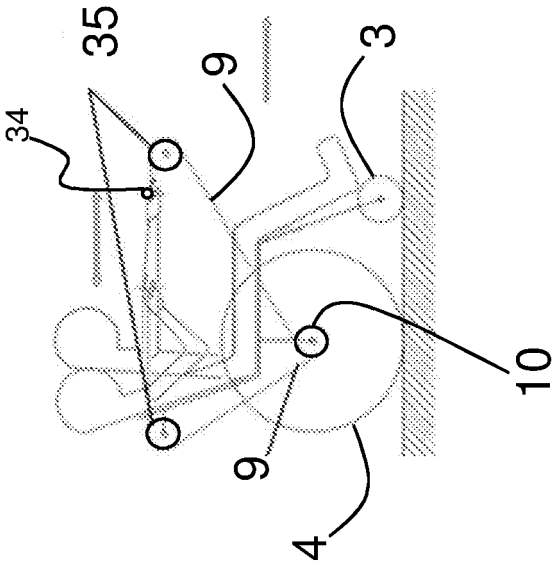

Fig. 7

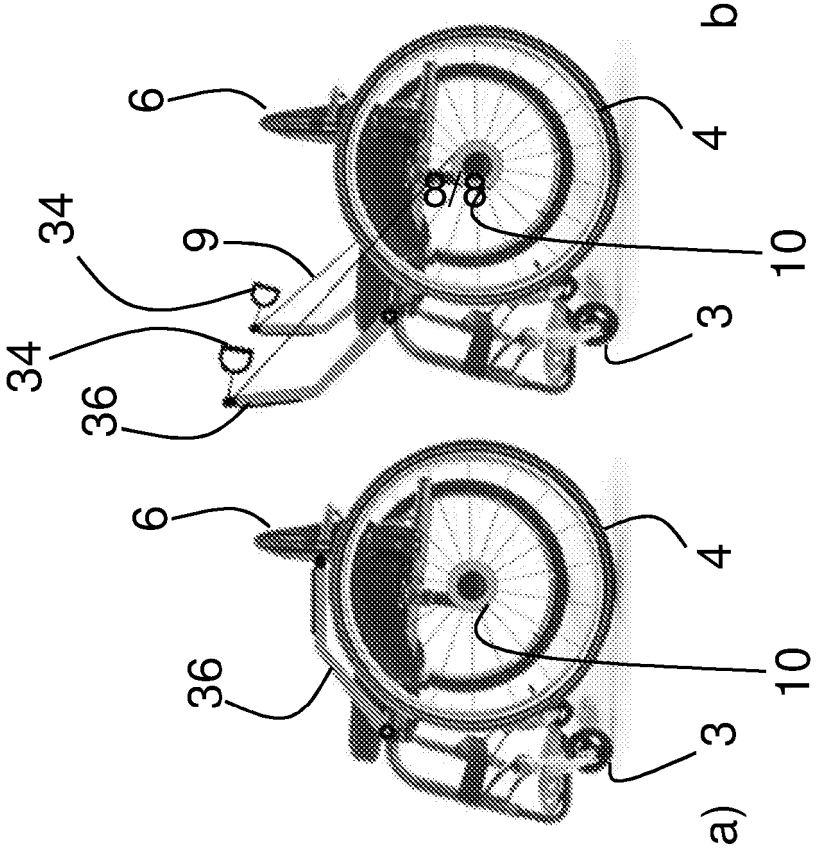

Fig. 8

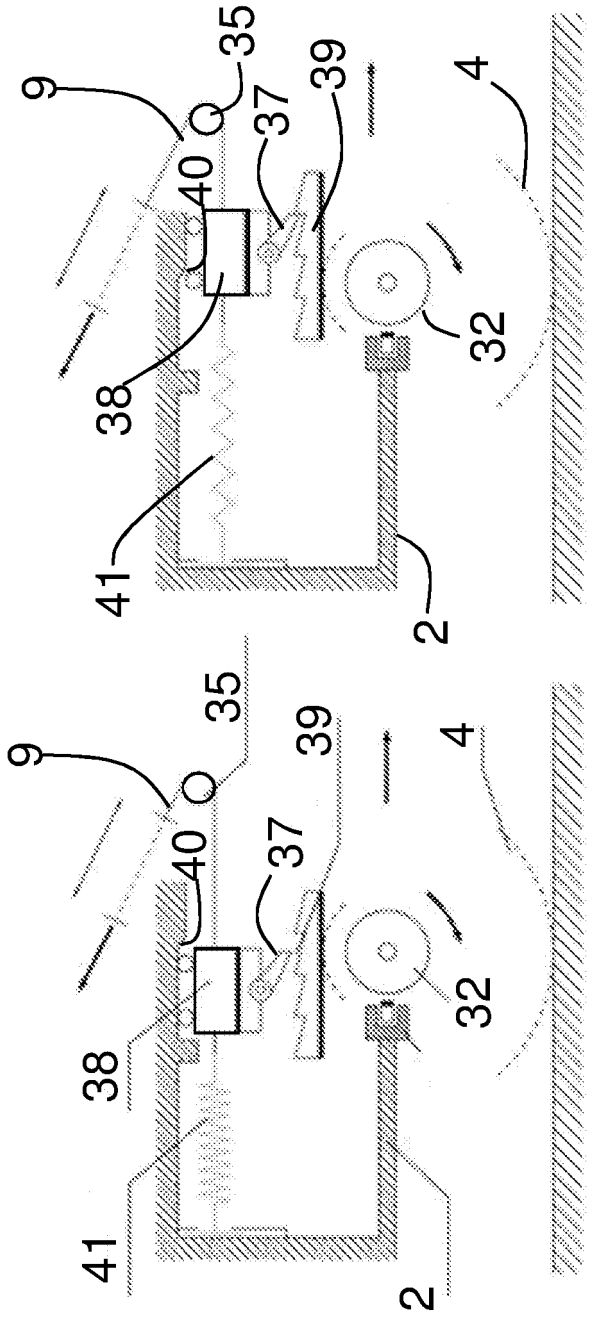

Fig. 9

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 7946963 B1 **[0001]**