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

(11) **EP 4 335 422 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.03.2024 Bulletin 2024/11

(21) Application number: **23196421.4**

(22) Date of filing: **09.09.2023**

(51) International Patent Classification (IPC):
A61G 5/04 *(2013.01)* ***A61G 5/10*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A61G 5/047; A61G 5/1078

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **12.09.2022 IT 202200018573**

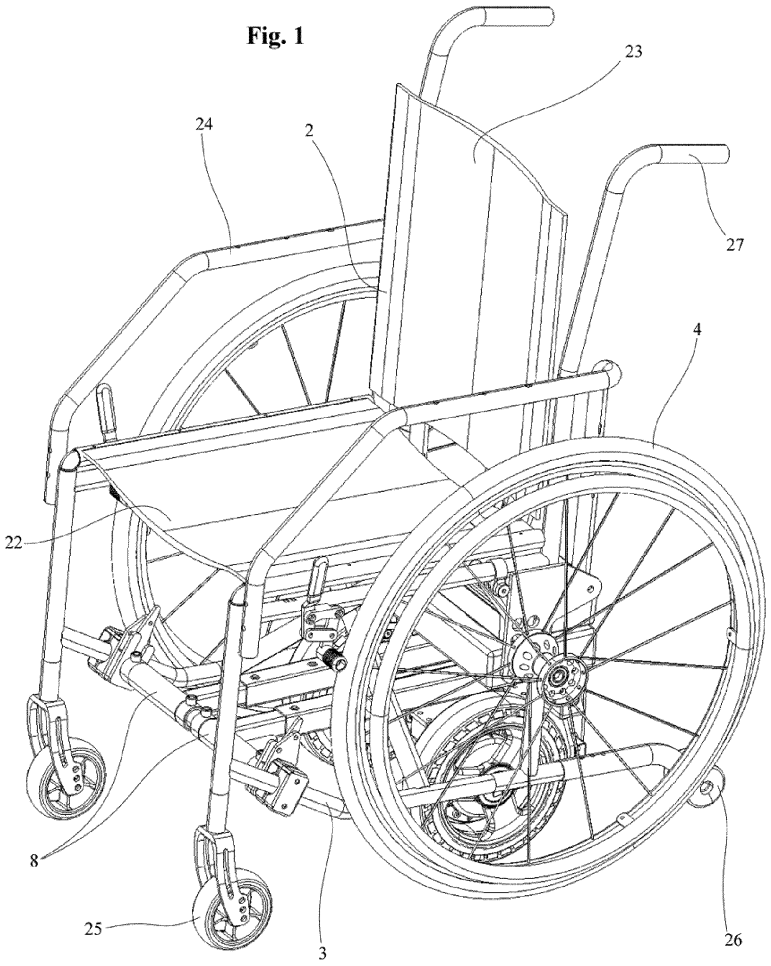
(71) Applicant: **Vassilli s.r.l.**
35020 Saonara (PD) (IT)

(72) Inventor: **Berto, Vassilli**
35020 Saonara (IT)

(54) **MANUAL WHEELCHAIR AND MOTORISATION KIT OF SAID MANUAL WHEELCHAIR**

(57) The object of the invention relates to an electric push multiplier device for manual wheelchairs, that connects to any standard manual wheelchair, turning it into a motorised wheelchair.

Fig. 1



EP 4 335 422 A1

Description

[0001] The object of the present invention relates to a manual wheelchair and an electric push multiplier device for said manual wheelchairs.

Prior art

[0002] The term "manually operated wheelchair" or "manual wheelchair" means a wheelchair equipped with a frame, or a pair of interconnected side frames, equipped with a seat supported by said frame, and equipped on its sides with a backrest and a pair of armrests. Connected laterally to said frame is a pair of manually pushed wheels and, in front of them, in relation to the seat, another pair of front side wheels.

[0003] The term "manually pushed wheels" refers to wheels that the user can push by hand or the non-motorised wheels of a wheelchair which is pushed by an accompanying person.

[0004] It is well known that many users of a manual wheelchair would like to extend their ability to move around autonomously.

[0005] This extension can refer to the maximum distance, to a longer duration of use, and to reduced physical effort.

[0006] The aforementioned possibilities of greater autonomy can be achieved through the adoption of an electric push multiplier.

[0007] In fact, very often many users initially use a manual wheelchair and only later, for various reasons, consider the possibility of a motorised wheelchair; but for many reasons, mainly economic ones, they cannot replace their manual wheelchair with a motorised wheelchair.

[0008] For this reason, a variety of possibilities have become available on the market to accessorise manual wheelchairs with devices that can turn them into motorised wheelchairs.

[0009] However, the motorisation devices currently on the market suffer from numerous drawbacks that make them impossible to use on the vast range of manual wheelchairs.

[0010] In fact, some types of motorisation devices are specifically intended to be installed only on a limited number of products from a single manufacturer or even a single specific wheelchair and cannot be adapted to other models of manual wheelchairs, let alone wheelchairs from different manufacturers. Other types of motorisation devices can be adjusted to fit a significant number of wheelchairs. However, they require specific, and sometimes costly modifications that are specific to each type of wheelchair that needs to be fitted with the device.

[0011] Some types of motorisation devices are bulky and heavy, making the motorisation of the manual wheelchairs impractical and unmanageable.

[0012] Countless motorisation devices also have a very limited performance and have such simplified features that although they motorised manual wheelchairs, they are not easy to manage and/or steer, such as devices that have a single motor or a double synchronous motor, with just an on-off command, without any ability to adjust the power level, without steerability, etc.

[0013] There are several possibilities on the market that require the manual wheels to be replaced with special wheels equipped with a hub motor, effectively preventing easily returning to manual mode.

[0014] Finally, there are also other motorisation models that make the wheelchair unsafe and unstable, raising the relative centre of gravity from the ground, since they are positioned at a higher level, such as behind the backrest of the seat or at the seat level.

[0015] One problem that affects most of the above-mentioned manual wheelchair motors that maintain manual push wheels finally, is the lack of maintained traction for the driving wheels when there is rough or uneven terrain, including also small bumps or dips.

[0016] Indeed, in the aforementioned circumstance, when the manually pushed wheel comes into contact with a small bump along the path, it causes at least one of the driving wheels to lose contact with the ground, leading to unexpected jerks, stops of the wheelchair or abrupt changes in the direction of the wheelchair.

[0017] Said drawback of this lack of contact with the ground also concerns the motorisation system of manual wheelchairs whose advancement system is completely fixed on a single support plate connected with a central push rod at the front of the wheelchair. In fact, said system that supports both the motorised wheels on the same single plate, prevents it, when there is a bump or a dip, from maintaining adequate contact with the ground, due to the considerable inertia from all the mass on said single plate or frame, considering that the mass includes the wheels, gear motors, motors, electrical power supply batteries and other elements connected to the wheelchair.

[0018] The above-mentioned lack of contact with the ground of a single motorised wheel, when the wheelchair is moving forward, can lead to an abrupt change in direction of the wheelchair, creating a serious danger for the user.

[0019] A further drawback of the motorisation systems that have a single support plate that supports all the various propulsion and advancement elements of the wheelchair, involves, when there are dips or bumps, an inclination of the motorised wheels with respect to their vertical alignment parallel to the manual wheels placed adjacent to the side frames of the wheelchair.

[0020] One more drawback of the motorisation systems that have a single point on the wheelchair where thrust is applied, usually located centrally in the front of the wheelchair, concerns the premature wear and shaking of the propulsion system at the points where it is connected to the wheelchair due to various stress forces that occur with any change in the direction of the wheelchair, or due to the lateral stress forces caused by the different

amount of force provided by each of the two motorised wheels. This can happen when only one of the wheels is in contact with the ground due to dips or bumps, or when only one of the wheels has traction with the ground and the other one slips or skids due to lack of grip.

Objects of the invention

[0021] From what has been explained above, the general purpose of the invention is, therefore, to overcome the consequences of the aforementioned drawbacks of the prior art.

[0022] A primary object of the present invention is to provide a motorisation kit for a manual wheelchair that can adapt to any manual wheelchair, without adding load to the wheelchair in use.

[0023] A further object of the present invention is to provide a motorisation kit for a manual wheelchair that can be easily installed on a manual wheelchair.

[0024] An additional object of the present invention is to provide a motorisation kit for a manual wheelchair that allows it to maintain its basic advantages and beneficial features.

[0025] An important object of the present invention is to provide a motorisation kit for a manual wheelchair that allows the wheelchair to be easily steered.

[0026] A significant object of the present invention is to provide a motorisation kit for a manual wheelchair that allows both the user and the accompanying person to actively operate it.

[0027] A not least object of the present invention is to provide a motorisation kit for a manual wheelchair that enables it to be easily removed or detached from the respective manual wheelchair where it was previously installed.

[0028] A clear object of the present invention is to provide a motorisation kit for a manual wheelchair that does not increase the overall dimensions but can increase its relative stability, and doing so without adding excessive weight on the wheelchair.

[0029] Another object of the present invention is to provide a motorisation kit for a manual wheelchair that does not have traction problems even on a path that has bumps or dips.

[0030] An important object of the present invention is to provide a motorisation kit for a manual wheelchair that avoids the use of a single frame on which all the components involved in the movement of the wheelchair are fixed, in particular avoiding the need for a single frame to which the two motors and/or gear motors and/or the motor wheels are fixed.

[0031] An equally important object of the present invention is to provide a motorisation kit for a manual wheelchair that has two independent motors, each connected to its own wheel, and mechanically separated from each other, each with its own connection to the wheelchair's frame.

[0032] A not least object of the present invention is to provide a motorisation kit for a manual wheelchair whose mechanical connection to the wheelchair allows the corresponding motorised wheel to follow the height variations of the ground, particularly over dips and/or bumps, while keeping each motorised wheel parallel to the adjacent manual wheel of the corresponding side frame of the wheelchair.

[0033] All the aforementioned objects, and others that will become clearer from the following explanation, are achieved by a motorisation kit for a manual wheelchair according to the attached claims of the current invention.

Explanation of the invention

[0034] In particular, the invention refers to a manual wheelchair and a motorisation kit of said manual wheelchair, where said manual wheelchair is equipped with a frame or two interconnected side frames that support the seat, a backrest and armrests on the sides of the seat and equipped with two side manually operated side wheels connected to said frame or said two side frames, where said kit comprises:

- two electric motors for moving the manual wheelchair;
- two motorised wheels, caused to rotate by said electric motors, possibly by means of a gear motor;
- two connecting arms between each motor and the frame of said wheelchair, for each of the two electric motors, which can be extended in length;
- two elastic devices between each of said motors and the frame of the wheelchair for each of the two electric motors,
- one or more control devices for the control of said electric motors; by means of a joystick, which can be operated by the user or by an accompanying person, and that is housed in the rear of the wheelchair;
- a control unit electrically connected to said one or more control devices and to said electric motors;
- a power supply battery;
- one or more possible support and/or connection brackets that can connect said electric motors to each other and/or to said connecting arm and/or to said independent elastic devices;

where each of said two electric motors, or gear motors or support brackets is hinged to said wheelchair by means of a length-adjustable connecting arm at the front of the wheelchair's frame,

- whose first end of the connecting arm is joined to the side frame of said wheelchair or to a side part of the frame, and where said joint is a hinge, and
- the second end of said connecting arm is fixed to said motor or to said gear motor or to a possible support bracket of the motor itself,

where said elastic devices are attached

- at a first end to the side frame or to a side part of the frame and
- at a second end to the motor or said gear motor or to a possible motor support bracket,

where the mechanical configuration of the connection between the wheelchair frame and each subassembly consists of: a motorised wheel, a motor, a possible gear motor, a possible bracket, a connecting arm and elastic devices that can allow a range of motion for the motorised wheel, allowing it to adapt to the contours of the ground and maintain traction when there are bumps or dips, with an orientation parallel to the manual wheel, and where the angle between the axis of the arm and the axis of the elastic devices is between 60 and 90,
and where said motors are positioned under the seat and preferably where the entire kit is positioned under the seat.

Advantageous characteristics of the invention.

[0035] Advantageously, the motorised wheels are positioned next to the manually moved side wheels, making the wheelchair easier to steer, with the points of contact with the ground on the same line joining the points of contact with the ground of the manually moved wheels.

[0036] Advantageously, said steerability of the wheelchair is obtained by means of a joystick control device.

[0037] Advantageously, the axis of rotation of the motorised wheels is vertically arranged beneath the rotation axis of the manually pushed wheels, preventing the sliding of the manual wheels during a change of direction. Advantageously, the two connecting arms are joined together at the first end in a way that allows the distance between them to be adjusted and they can rotate independently around a joint pin, enabling a lightweight yet sturdy construction of the rotation pin, which is connected at two end points near the opposing side walls of the frame.

[0038] Advantageously, the motorisation system is mechanically independent of the two subsystems related to each motorised wheel, where each has a motorised wheel, a motor for rotating said motorised wheel, possibly with the insertion of a gear motor, a possible support bracket for said motor and/or of said gear motor, a connecting arm of said motor and/or gear motor and/or bracket, with the frame of the wheelchair to transmit the force created by said motorised wheel, an elastic device, to keep said motorised wheel in contact with the ground, inserted between said frame of the wheelchair and said motor and/or gear motor and/or bracket; where said two subsystems are independent, namely without any mechanical interconnection between the two motors and/or gear motors and/or brackets and relative connections to the side parts of the frame. Potentially, an embodiment of the motorisation system with interconnections between the two motors or gear motors or relative fixing brackets, obtained through the connecting arms joined together and to the frame of the wheelchair and/or obtained through a connecting plate with connecting pins, allows you to achieve an optimal balance between the weight and the mechanical resistance of the kit.

[0039] Advantageously, the second end of the arms or the two motors or the motor support brackets are connected together by a connecting plate, which is capable of adjustable spacing and independent rotation, with an axis perpendicular to the hinging axis of the first end of the arms, thereby maintaining a constant distance between the motorised wheels. Advantageously, the vertical movement of the motorised wheels following the thrust from the elastic devices allows movement parallel to the manually operated wheels.

[0040] Advantageously, the vertical movement of the motorised wheels following the push of the elastic devices moves said motorised wheels as necessary with respect to the contact point of the manual wheels from +10 to -10 cm and preferably from + 5 to -5 cm and even more preferably from +3 to -3 cm. If necessary, these adjustments are to be applied in relation to the weight of the user.

[0041] Advantageously, said motors are of the type that go into a brake mode when there is no electric power, but this feature can be manually overridden in case of an emergency. This mechanism increases the safety of the user while operating said wheelchair.

[0042] Advantageously, the joystick control can easily be moved from the end of a user's armrest to a gripping handle at the back of the wheelchair for an operator to use, thereby making the device more versatile in its usage. Advantageously, the positioning of the motorised wheels inside the manually operated wheels and the vertical positioning of its axis prevents lateral friction when the direction of the wheelchair changes.

[0043] Advantageously, the positioning of the motorisation kit in the lower part of the wheelchair, and in a barycentric position underneath the seat, increases the stability of the wheelchair.

[0044] Advantageously, said elastic devices are gas pistons that keep the motorised wheels in constant contact with the ground and have a damped oscillation following a sudden change in height, or a bump, encountered during the journey, thereby preventing continued oscillations.

[0045] Advantageously, the attachments of the motorisation kit to the frame are of the snap type, holding the kit firmly against the frame during normal use, but providing easy and quick disconnection and removal of the kit from the frame when necessary.

[0046] Advantageously, the release of the gear motors results in the motorised wheel of the two motors running freely, allowing the manual wheelchair to return to its normal functionality without any further intervention.

[0047] Advantageously, the kit with its extendable tel-

escopic connecting arms and having a pin to join the front hinges of the front ends of the arms that can be set at an adjustable distance, can be fitted on wheelchair frames with adjustable dimensions from a minimum corresponding to the overall dimensions of the motorised wheel complete with engine, corresponding to about 40 cm of the seat, to a maximum of a further 15 cm which is defined solely by the extension of said joint pin, and therefore about 55cm.

Brief description of the drawings

[0048] The technical characteristics of the invention, according to the aforesaid objects, can clearly be seen in the claims below, and its advantages will become more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which illustrate a preferred embodiment, which is purely exemplary and not limiting, in which:

Fig. 1 shows a front perspective view of a manually operated wheelchair equipped with the motorisation kit of the invention.

Fig. 2 shows what is set out in fig. 1 from a rear perspective view.

Fig. 3 shows what is set out in fig. 1 according to a flat rear view that highlights the common point of contact with the ground between the manual wheels and the motorised wheels.

Fig. 4 shows what is set out in fig. 1 from a front perspective view.

Fig. 5 shows what is set out in fig. 1 according to a side flat view.

Fig. 6 shows a side sectional view along a vertical plane of the wheelchair that is equipped with the motorisation kit of the invention, and which highlights the hinged connection of the first end of the connecting arm to the front of the frame and the hinging of the elastic devices, at a first end to the frame, in the part below the seat, and at the opposite end with a bracket connected to the motor.

Fig. 7 shows a wheelchair fitted with the motorisation kit of the invention from a side flat view that highlights the extent to which the motorised wheel protrudes beyond the contact point of the manually pushed wheel.

Fig. 8 shows what is set out in fig. 7 according to a rear flat view, the small wheels of the anti-rollover system and the front support wheels hidden for clarity of presentation.

Fig. 9 shows a rear view of the wheelchair fitted with the motorisation kit with a possible flexible arrangement of the motorisation kit that keeps the motorised wheels in contact with the ground even when there are small bumps or dips along the path.

Fig. 10 shows a sectional view of what is set out in fig. 9, according to a vertical plane passing through the various hinge pivot points of the front end of the connecting arm and the upper and lower pivot points of the elastic devices.

Fig. 11 shows the same section of fig. 10 from a perspective view taken from below, highlighting the independent articulation of the motors to follow the contours of the terrain, keeping the motorised wheel in contact with the ground.

Fig. 12 shows a front perspective view of just the motorisation kit, detached from the wheelchair and without the battery and the control unit.

Fig. 13 shows what is set out in fig. 12 from a rear perspective view that highlights the hinged interconnection bracket between the two motors.

Fig. 14 shows a front perspective view of the motorisation kit, the object of the invention, highlighting the connection of the connecting arms with the motorisation system, where the interconnection bracket is hidden for clarity of presentation.

Fig. 15 shows what is set out in fig. 14 from a different perspective view.

Fig. 16 partially shows the motorisation kit of the invention in relation to a single motor, highlighting the connecting pin in the part of the first end of the connecting arm and the spacer bar for connecting the two motors.

Detailed description of an exemplary preferred embodiment

[0049] With reference to the drawings, the motorisation kit 1 is suitable for being applied to any type of manual wheelchair.

[0050] The term "manually operated wheelchair" or "manual wheelchair" means a wheelchair 2 equipped with a frame 3, or a pair of interconnected side frames, fitted with a seat 22 supported by said frame 3, and provided laterally with a backrest 23 and a pair of armrests 24. Attached to the side of said frame 3 is a pair of manually pushed wheels 4 and, in front of them, in relation to the seat, another pair of front side wheels 25.

[0051] Underneath said seat 22 and housed within the space between the two manually pushed wheels 4 is said motorisation kit 1.

[0052] The term "manually pushed wheels" refers to wheels that the user can push by hand or the non-motorised wheels of a wheelchair which is pushed by an accompanying person.

[0053] Said motorisation kit 1 comprises a pair of motorised wheels 6, driven to rotate by a pair of independent electric motors 5, possibly by means of gear motors 7.

[0054] The distinctive feature of this motorisation kit 1 is the constant maintenance of the motorised wheels 6 in contact with the ground, even when there are small bumps and/or dips that lead to a support plane other than a continuous flat lying surface, between at least one of the motorised wheels 6 and at least one of the manually pushed side wheels 4.

[0055] Another distinctive feature of the motorisation

kit consists in the fact that the constant contact of the motorised wheels with the ground is carried out independently for each motorised wheel.

[0056] Preferably, the aforementioned feature is achieved by avoiding the use of a single frame on which the two motors and/or motorised systems and/or wheels are permanently attached.

[0057] Advantageously, the vertical excursion of the motorised wheels, which is needed to maintain contact with the ground, takes place with an alignment parallel to the side wheels.

[0058] This capability is achieved through a complex system that includes a connecting arm 8 and an elastic device 9 for each motorised wheel 6.

[0059] Said connecting arm 8 is joined, at its first end 16, to the frame in a hinged or oscillated manner by means of an attachment or connection 32 fixed to said frame 3, and is fixed, at its second end 17 opposite to the first, to the motor 5 or to the gear motor 7 potentially by means of a support bracket 14.

[0060] The elastic devices 9 keep the motorised wheel 6 under constant pressure against the ground, even when small bumps or dips are encountered along the path.

[0061] The independence of the two motors 5 allows them to adapt to the ground even when there are bumps and/or dips that may affect a single motorised wheel 6 or a single manually pushed side wheel 4.

[0062] For the system to be effective, there is an angle between the axis of the connecting arm and the axis of the elastic devices, the angle between the axis of the arm connecting 8 and the axis of the elastic means 9 being between 60 and 90, with increasing effectiveness and responsiveness the closer said angle approaches the angle of 90°.

[0063] However, sometimes this 90° configuration of the hinge axis 18 of the first end 19 of the elastic devices 9 is not possible, so the device of the invention also works with the position between the connecting arm 8 and the elastic devices 9 with the above-mentioned angles.

[0064] In fact, in order to be able to adapt the motorisation kit 1 to a larger number of manual wheelchairs 2, the hinge axis 18 is placed close to a tubular part of the frame 3 that is generally closer and preferably beneath the seat 22. Potentially, the positioning of the hinge axis 18 is chosen in such a way that the motorised wheel 6 does not protrude more than 10 cm beyond the manually pushed wheel, at the point where it makes contact with the ground, and preferably does not extend more than 5 cm and even more preferably not more than 3 cm. This excursion, both positive and negative and ensured by the elastic devices in the movement of the motorised wheel with respect to a designated zero point, corresponding to the point where the manually pushed wheel is in contact with the ground, is always ready to keep the motorised wheel constantly in contact with the ground, guaranteeing its traction, even when there are bumps and/or dips, without the drawback of continuous and persistent oscillations, and being easily obtainable with elastic damping devices, such as gas springs, or pneumatic shock absorbers.

[0065] The second hinge axis 20 of the second end 21 of the elastic devices 9 is connected with the motorised wheel 6 directly on the respective motor 5 or on the corresponding gear motor 7 or on the relative support bracket 14.

[0066] Said motorisation kit 1 also includes a control unit 11, which is connected to a control device 10 (not shown) and a power supply battery 12.

[0067] Said control device 10 is of the joystick type in order to be easily operated by the user themselves and is located in a position that can be easily grasped, near the armrest 24 of the wheelchair 2. Furthermore, said control device 10 can be moved near the handle for the accompanying person 27, making the tasks of assistance and guiding the wheelchair 2 easier.

[0068] Said control unit 11 and/or said power supply battery 12 can effectively be housed and fixed on a connection plate 13 placed above the motorisation system.

[0069] This connection plate 13 is attached to a spacer 33, at an adjustable distance, which joins the two motors in a hinged manner with an axis 29 parallel to that of the connecting arms 8. The attachment of said connection plate 13 on said spacer keeps said control unit 11 and/or said power supply battery 12 mounted centrally above said motors.

[0070] Said spacer 33 makes it possible to keep the two motors suitably spaced apart, at an adjustable distance, permitting each to rotate around the hinged attachment point 29.

[0071] A similar connection of the two motors exists near the first end 15 of the connecting arms 8, joining the two hinges 15 between said first end of the arm and the frame 3 by means of a connecting pin 13.

[0072] Also in this case, the connection distance between said two hinges 15 can be adjusted on the connecting pin 13, allowing the motorisation kit 1 to adapt to the width of the manual wheelchair.

[0073] Yet another adjustment of the motorisation kit 1 can be found in the extension of the telescopic connecting arm 8.

[0074] This extension of the connecting arm allows the motorisation kit 1 to adapt to the various types of frames 3 of manual wheelchairs 2.

[0075] These aforementioned possibilities of adjustment and adaptation of the motorisation kit for manual wheelchairs, in addition to the possibility of being installed on any manual wheelchair, also allows the possibility of positioning the motorised wheels adjacent and close to the manual side wheels, and in particular to position said motorised wheels with their rotation axis below the rotation axis of the side wheels. With this arrangement and positioning, any changes in direction implemented by the motorisation kit are handled more easily and smoothly, eliminating any unwanted friction when the side wheels come into contact with the ground.

[0076] Furthermore, the way of connecting said motorisation kit to the frame using said hinge attachments 32 and the connection of the first end of the elastic devices to the frame allows both a quick and easy installation and a rapid and simple disassembly and removal of the kit from the frame, restoring the full functionality of the wheelchair. Finally, said motors, although being of the braked type, for safety reasons, provide for the possibility of being made freewheeling with a simple unlocking operation, allowing the wheelchair to be used, even with the kit installed, in manual mode, for example due to faults in the control unit or sudden battery depletion. For safety reasons, said manual wheelchair 2 fitted with the motorisation kit 1 is equipped with an anti-rollover device 28 that rests on anti-rollover wheels 26 that, if necessary, come into contact with the ground at the rear of the wheelchair beyond the point of contact with the ground of the manually pushed wheels.

Claims

1. Manual wheelchair and motorisation kit of said manual wheelchair, where said manual wheelchair (2) has a frame (3), or two interconnected side frames, which support a seat (22), a backrest (23) and armrests (24) on the sides of the seat (22) and is fitted with two manually pushed side wheels (4) connected to said frame (3) or said two side frames, where said motorisation kit (1) comprises:

- two electric motors (5) for moving the motorised wheels for moving the manual wheelchair (2);
- two motorised wheels (6), brought into rotation by said electric motors (5), possibly by means of a gear motor (7), where each motorised wheel is positioned adjacent to the corresponding manually operated side wheel and each is arranged with the corresponding position of the manually pushed side wheel;
- two possible gear motors inserted between each one of said electric motors (5) and the corresponding motorised wheel (6);
- two connecting arms (8) each positioned between each of said motors and the frame of said wheelchair for each of the two electric motors extendable in length;
- two elastic devices (9) each elastic device positioned between said motor or gear motor or support frame of said motor, or a support bracket, of said gear motor or motor, and the frame of said wheelchair for each of the two electric motors (5),
- one or more control devices (10) for controlling said electric motors (5);
- a control unit (11) electrically connected to one or more of said control devices (10) and to said electric motors (5);
- a battery power supply (12);
- one or more possible support brackets (14) and/or plate (13) connecting said electric motors (5) to each other and/or to said connecting arm (8) and/or to said elastic devices (9);

where each of said electric motors (5) or gearmotors or support brackets is joined in a hinged manner by means of a special hinge attachment (32) to said frame (3) of the wheelchair (2) using the connecting arm (8) that is adjustable in length,

- where the first end (16) of the connecting arm (8) is joined to the side frame (3) of said wheelchair or to a side part of the frame, and where said connection is of the hinged type, and
- where the second end (17) of said connecting arm (8) is fixed to said motor (5) or to said gear motor (7) or to a possible support bracket (14) of the motor itself,

where said elastic devices (9) are connected, preferably in a hinged manner

- at a first end (19) to the side frame (3) or to a side part of the frame and
- at a second end (21) to the motor (5) or to the gear motor (17) or to a possible support bracket (14) of the motor,

where the mechanical configuration of the connection between the frame of the wheelchair and each of the two subassemblies consisting of a motorised wheel, a motor, a possible gear motor, a possible support bracket, a connecting arm and elastic devices that allow movement of the motorised wheel to maintain contact with the ground when there are bumps or dips, moving in parallel to the manually operated wheel,
where the angle between the axis of the connecting arm (8) and the axis of the elastic devices (9) is between 60 and 90,
and where said motors (5) are positioned underneath the seat (22) and preferably where the entire motorisation kit (1) is positioned underneath the seat (22).

2. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that the motorised wheels (6) are located adjacent to and alongside the manually pushed side wheels (4), with the points of contact with the ground that are on the same line that connects the points of contact with the ground of the manually operated wheels.

3. Manual wheelchair and motorisation kit of said man-

ual wheelchair according to claim 1, **characterised by** the fact that the rotation axis of the motorised wheels (6) is vertically aligned below the rotation axis of the manually pushed wheels (4).

4. Motorisation kit of a manual wheelchair according to claim 1, **characterised by** the fact that the two connecting arms (8) are joined together at the first end (16) at a distance that can be adjusted and rotate independently by a joining pin (31).

5. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that the second end (17) of the arms (8) or the two motors (5) or the support brackets (14) of the motors are joined to each other by a spacer, in a manner adjustable in length and independent in rotation, with an axis perpendicular to the hinging axis of the first end of the arms.

6. Manual wheelchair and motorisation kit of said manual wheelchair wheelchair according to claim 1, **characterised by** the fact that the vertical excursion of the motorised wheels (6) following the force of the elastic devices (9) moves, when needed, said motorised wheels with respect to the support point of the manually pushed wheels (4) from +10 to -10 cm and preferably from + 5 to -5 cm and even more preferably from +3 to -3 cm.

7. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that said motors (5) have a braking system that comes into play in the event of a power failure, but which can be manually unlocked in case of an emergency.

8. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that said control device (10) is a joystick control that can easily be moved from the end of an armrest (24) to a handle (17) at the back of the wheelchair (2) so that an accompanying person can use it.

9. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that the motorisation kit (1) is in the lower part of the wheelchair and in a barycentric position, underneath the seat.

10. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that said elastic devices (9) are gas springs and keep the motorised wheels (6) constantly in contact with the ground and have a dampened oscillation following a sudden change in height, or bump, encountered along the route.

11. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that the connections (32) of the motorisation kit to the frame (3) are of the snap variety, holding the kit (1) firmly to the frame (3) during normal use, but also allowing for a quick and easy detachment if necessary.

12. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that the motorisation system has a gear motor release device (7), which allows the motorised wheel (6) of the two motors (5) to freely rotate and return the wheelchair (2) to its normal manual operation.

13. Manual wheelchair and motorisation kit of said manual wheelchair wheelchair according to claim 1, **characterised by** the fact that said connecting arms (8) are adjustable in terms of their length and are preferably of a telescopic type.

14. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that there is a pin (31) for joining the front hinges (15) of the front ends (16) of the connecting arms (8) that can be fixed at an adjustable distance.

15. Manual wheelchair and motorisation kit of said manual wheelchair according to claim 1, **characterised by** the fact that the two motors (5) and gear motors (7) are mechanically autonomous and independent, each connected only to the frame (3) by means of said connecting arm (8) and attached by means of said elastic devices (9) to said frame.

Fig. 1

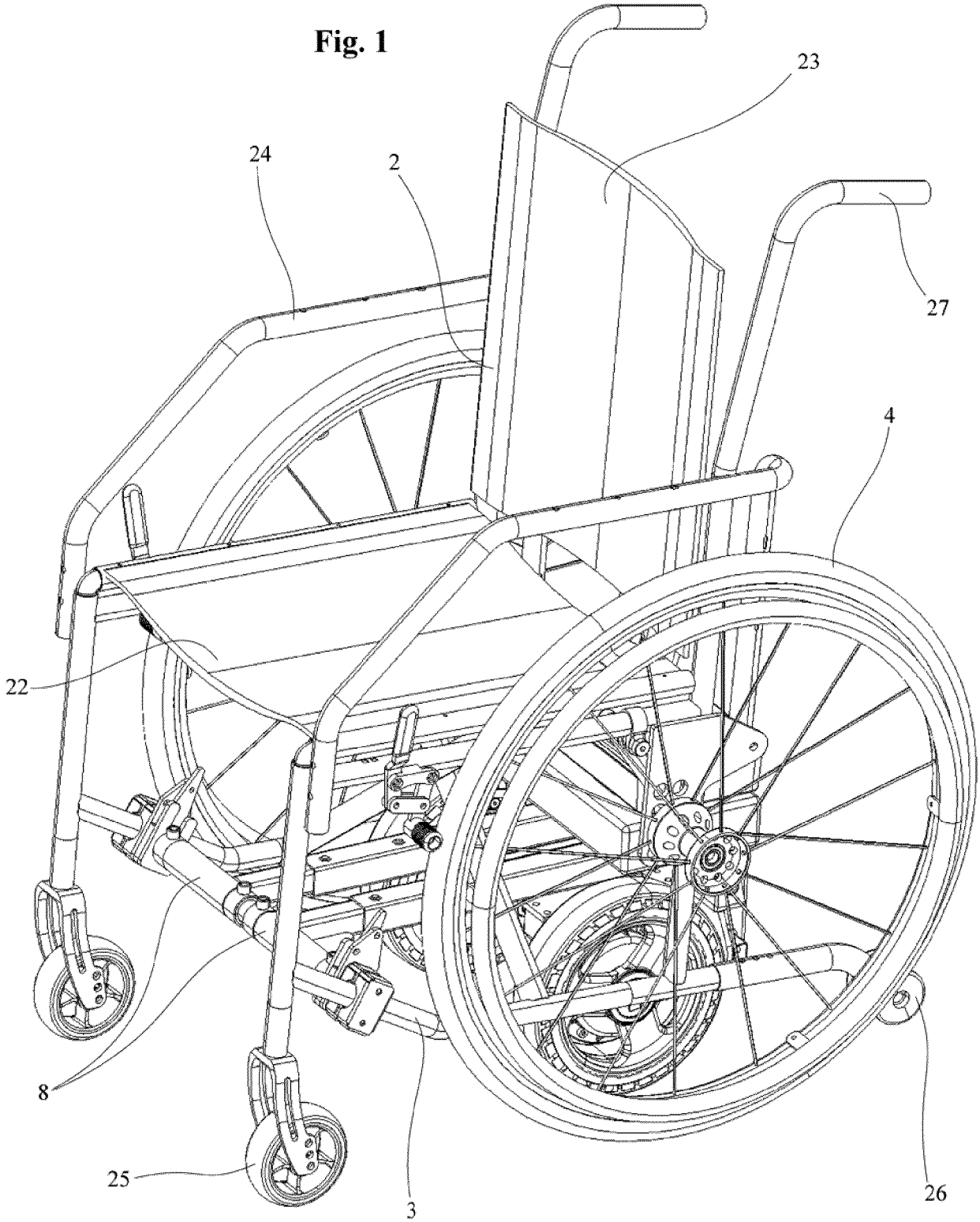


Fig. 2

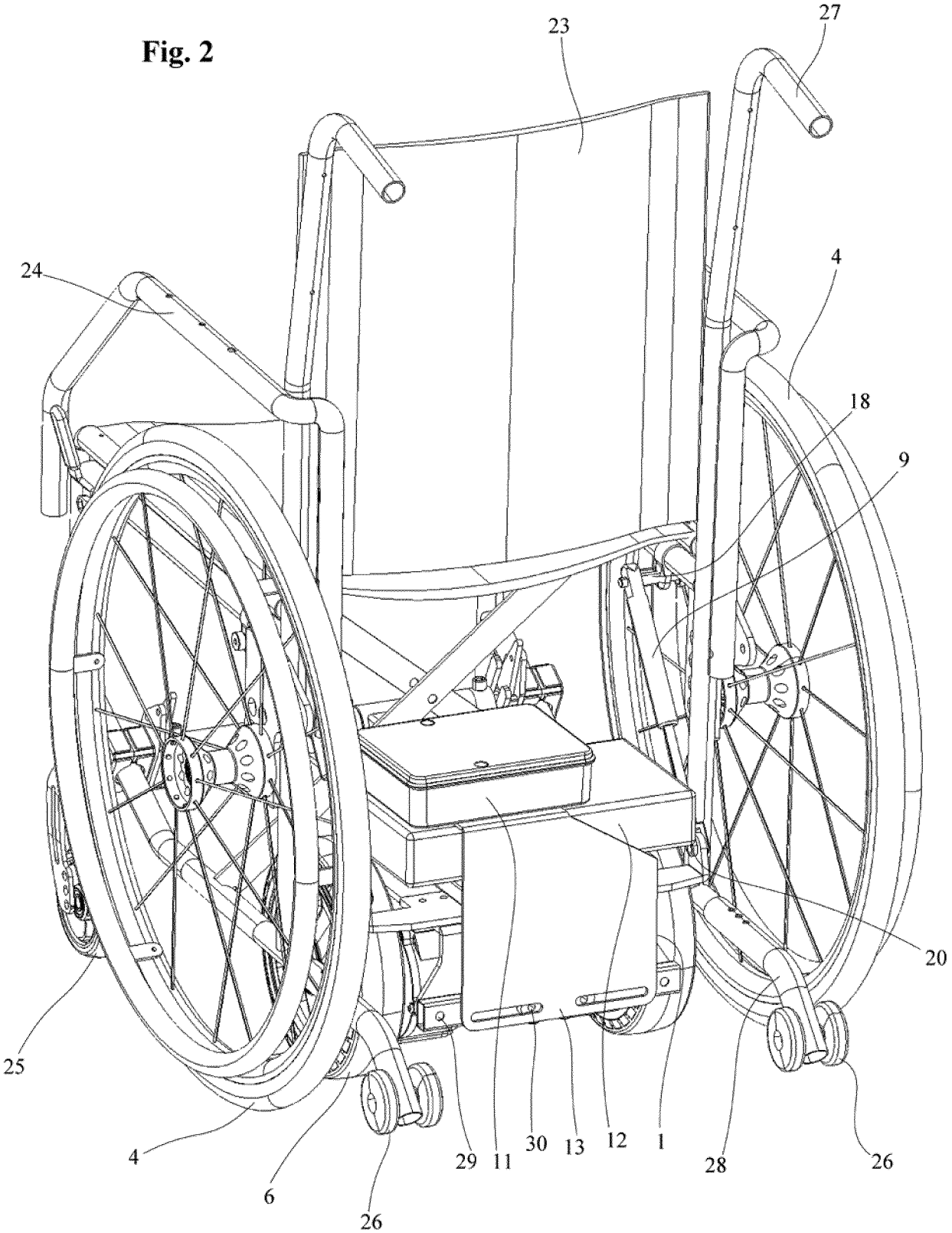


Fig. 3

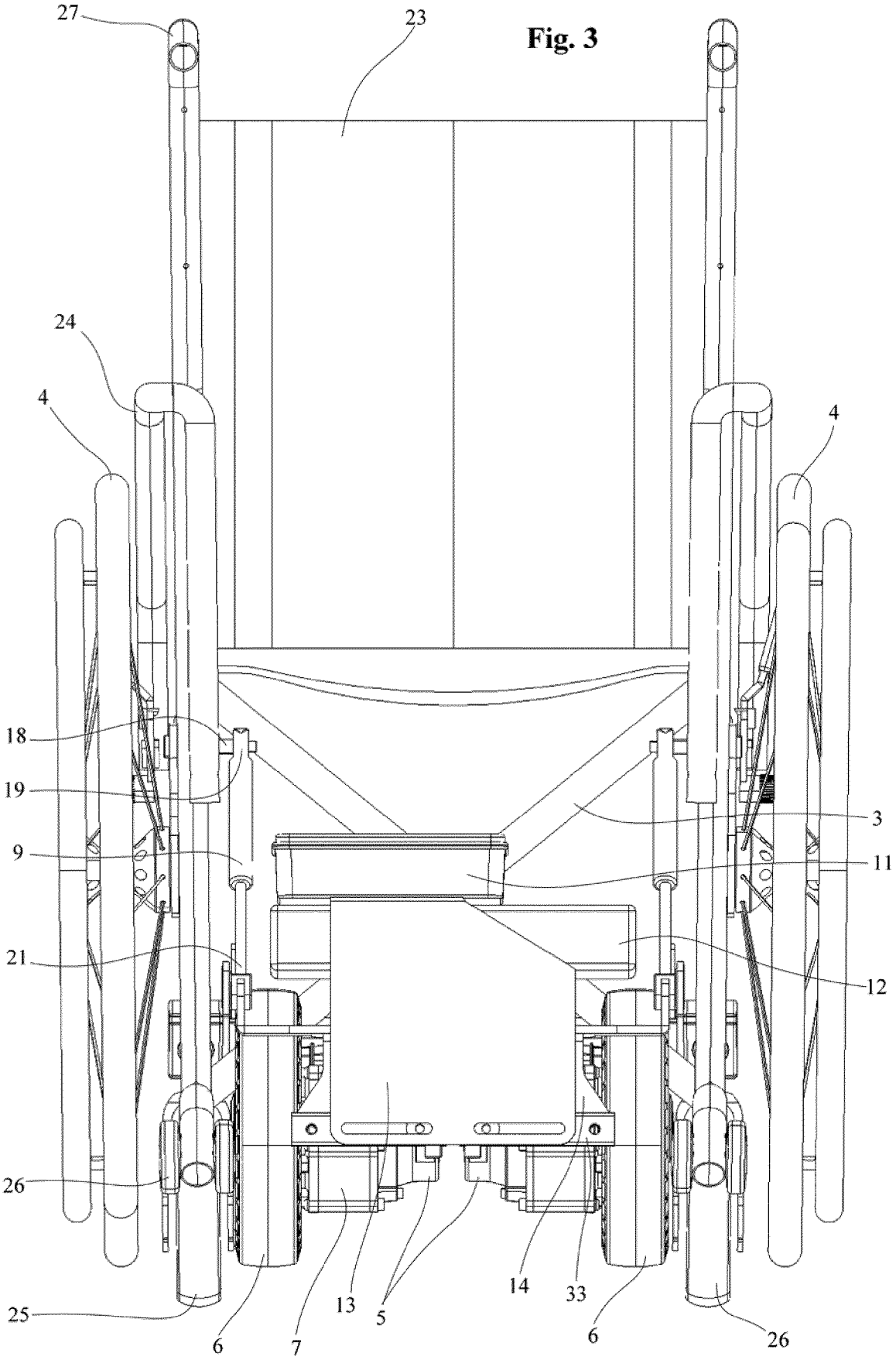


Fig. 4

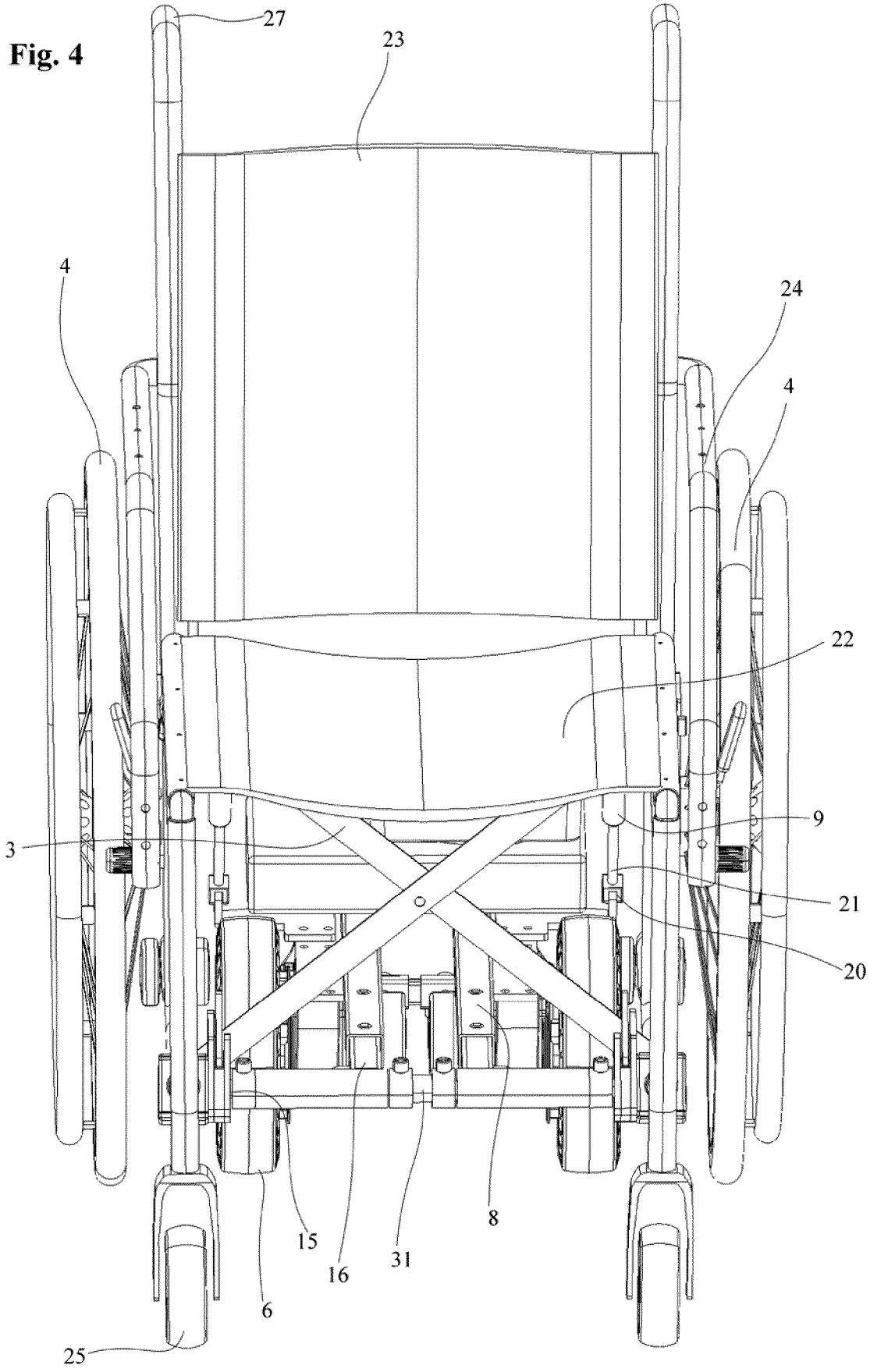


Fig. 5

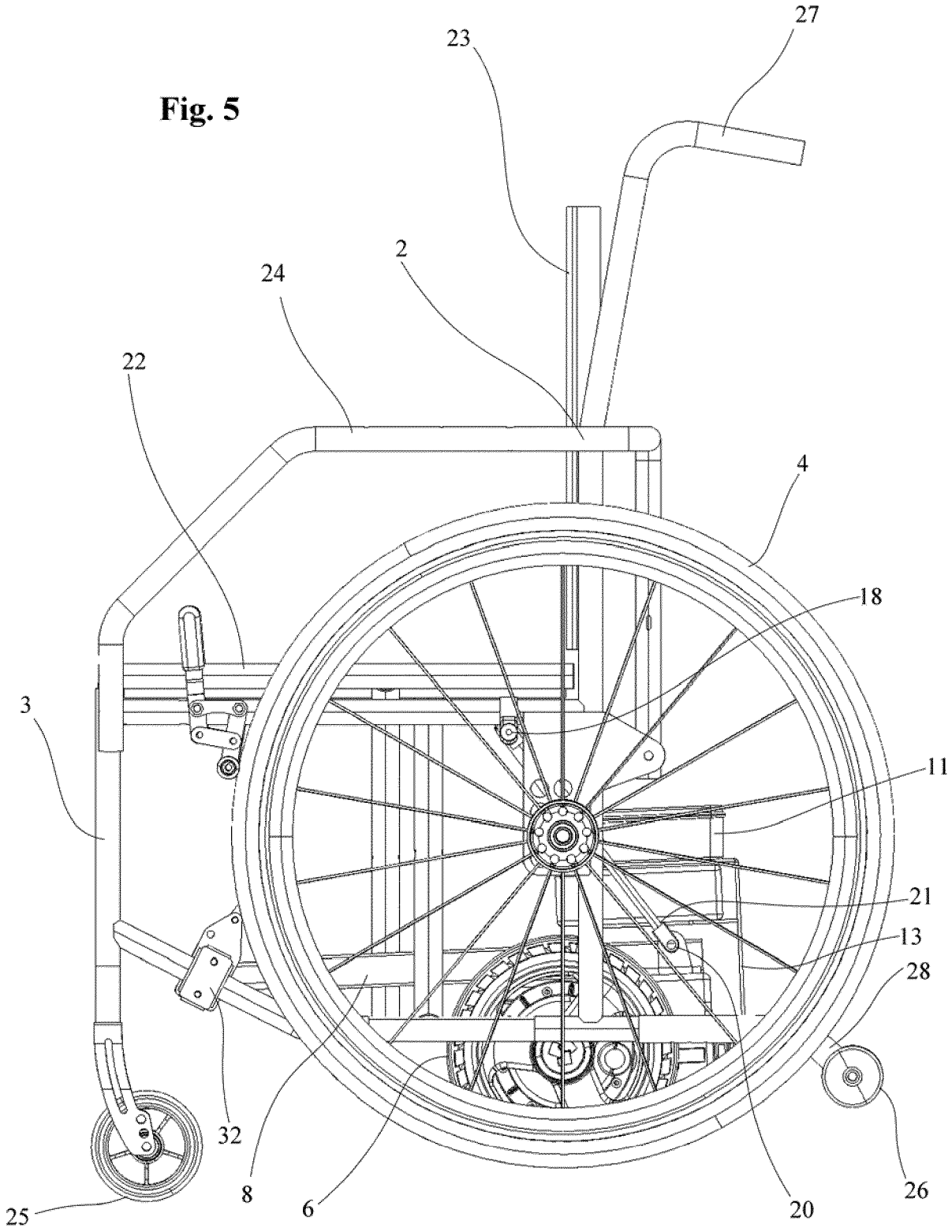


Fig. 6

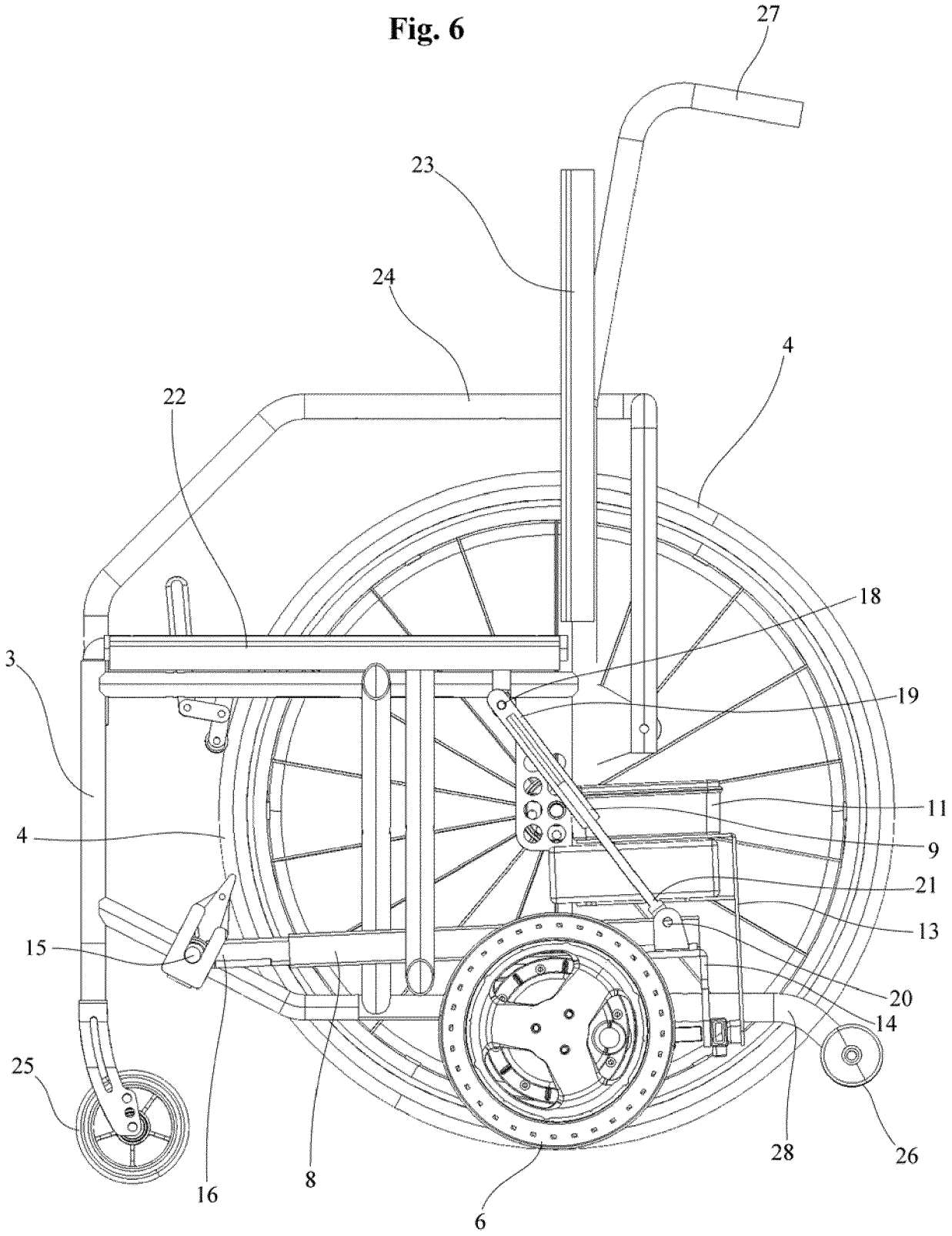


Fig. 7

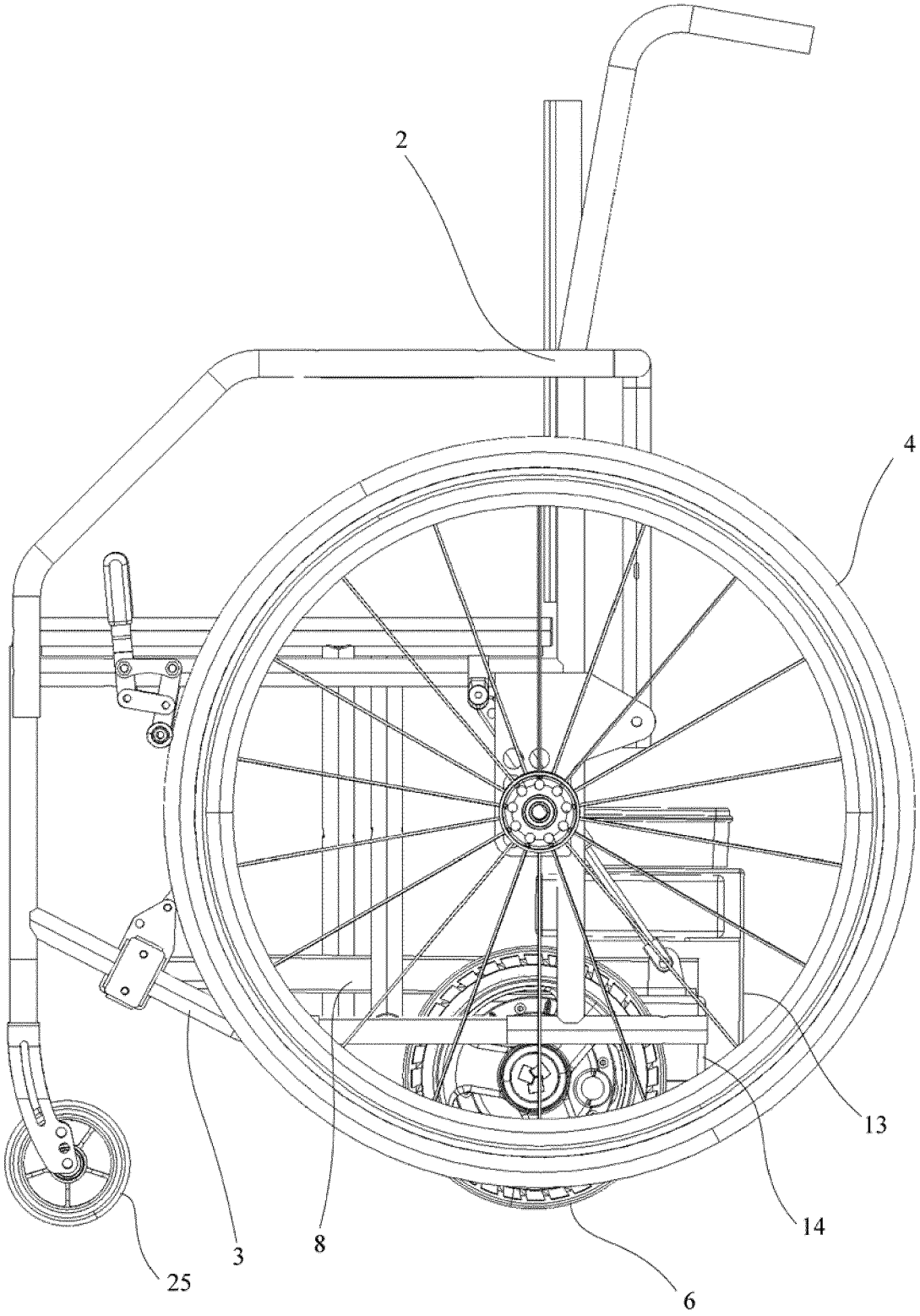


Fig. 8

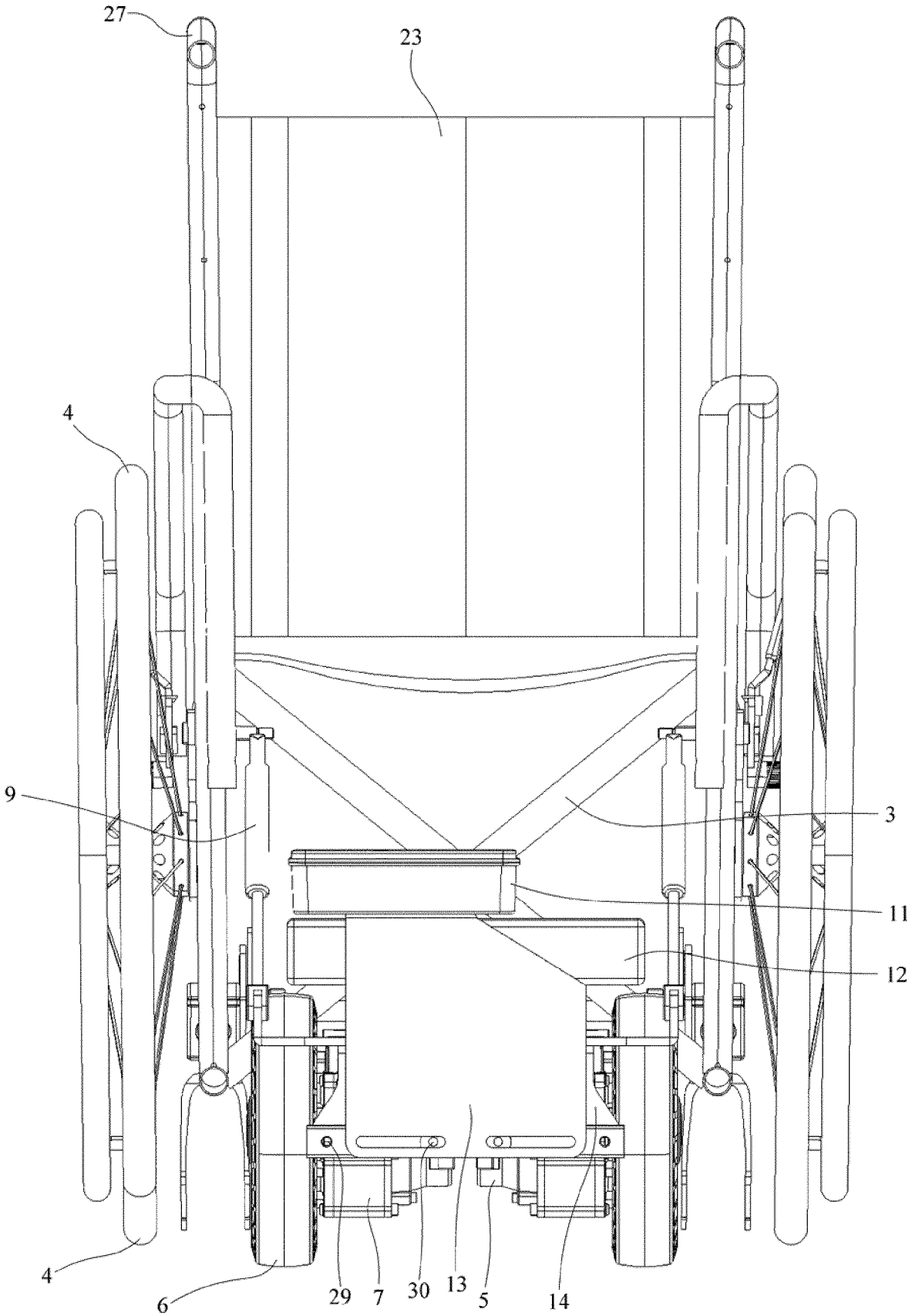


Fig. 9

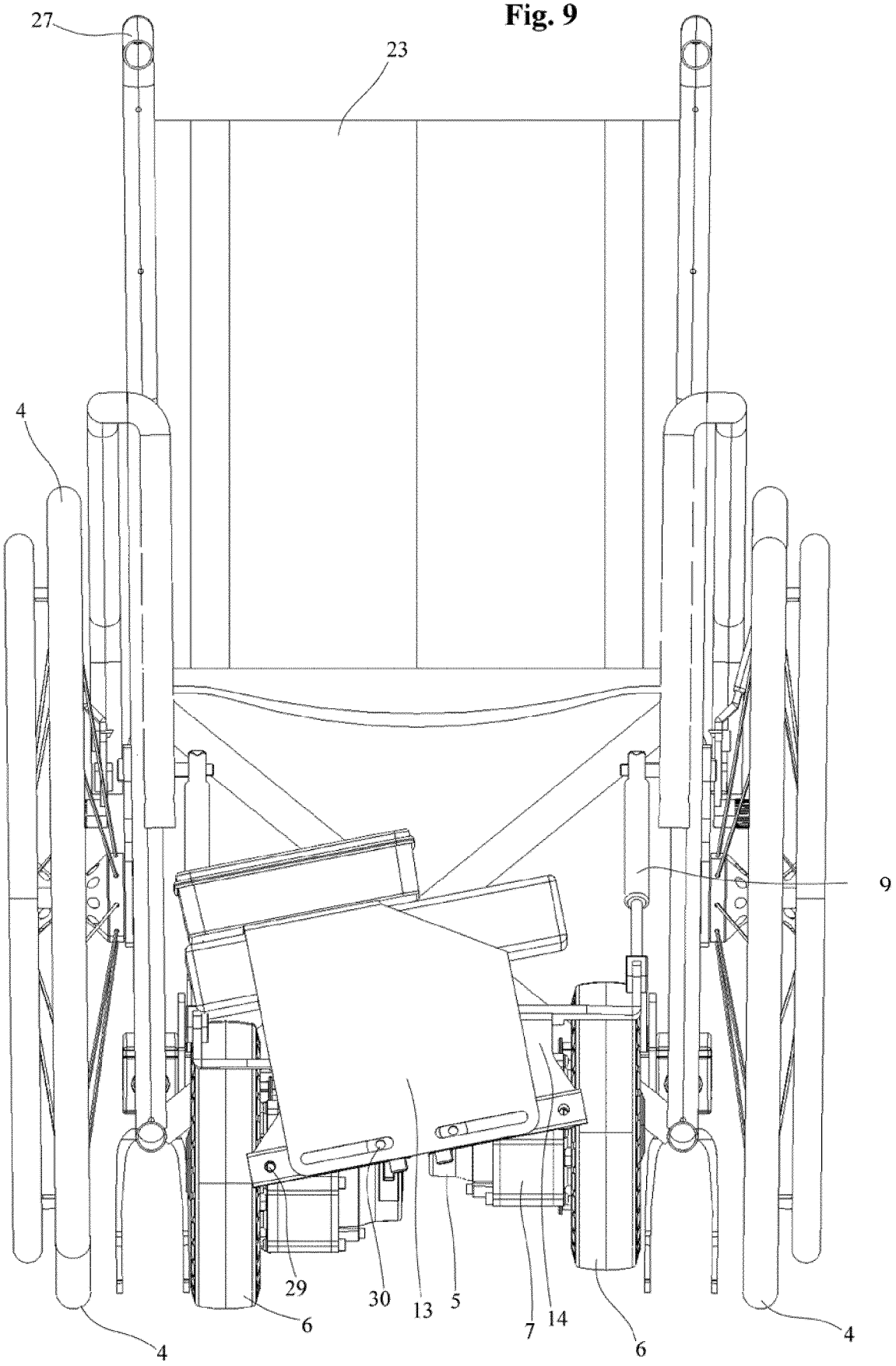


Fig. 10

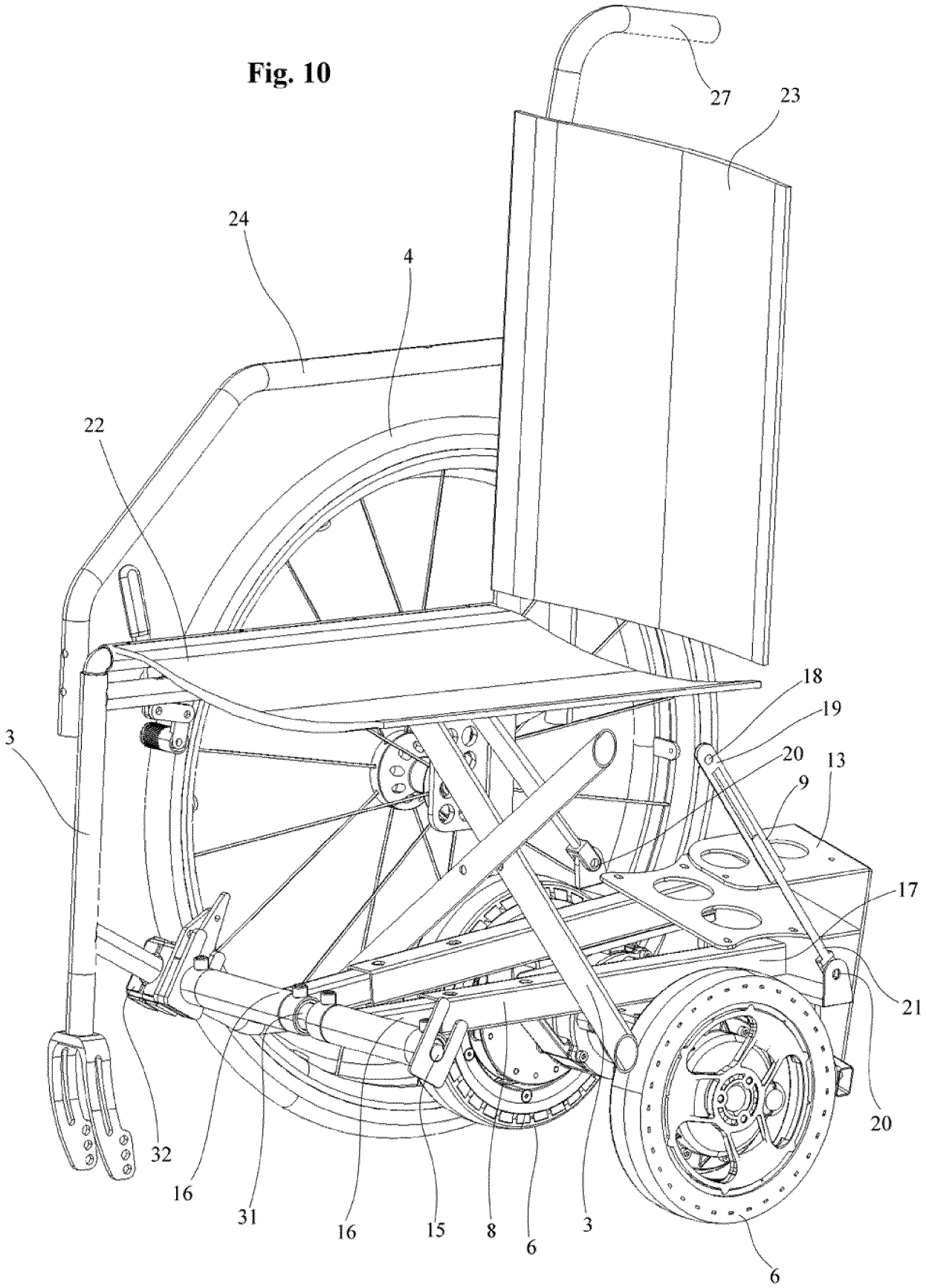


Fig. 11

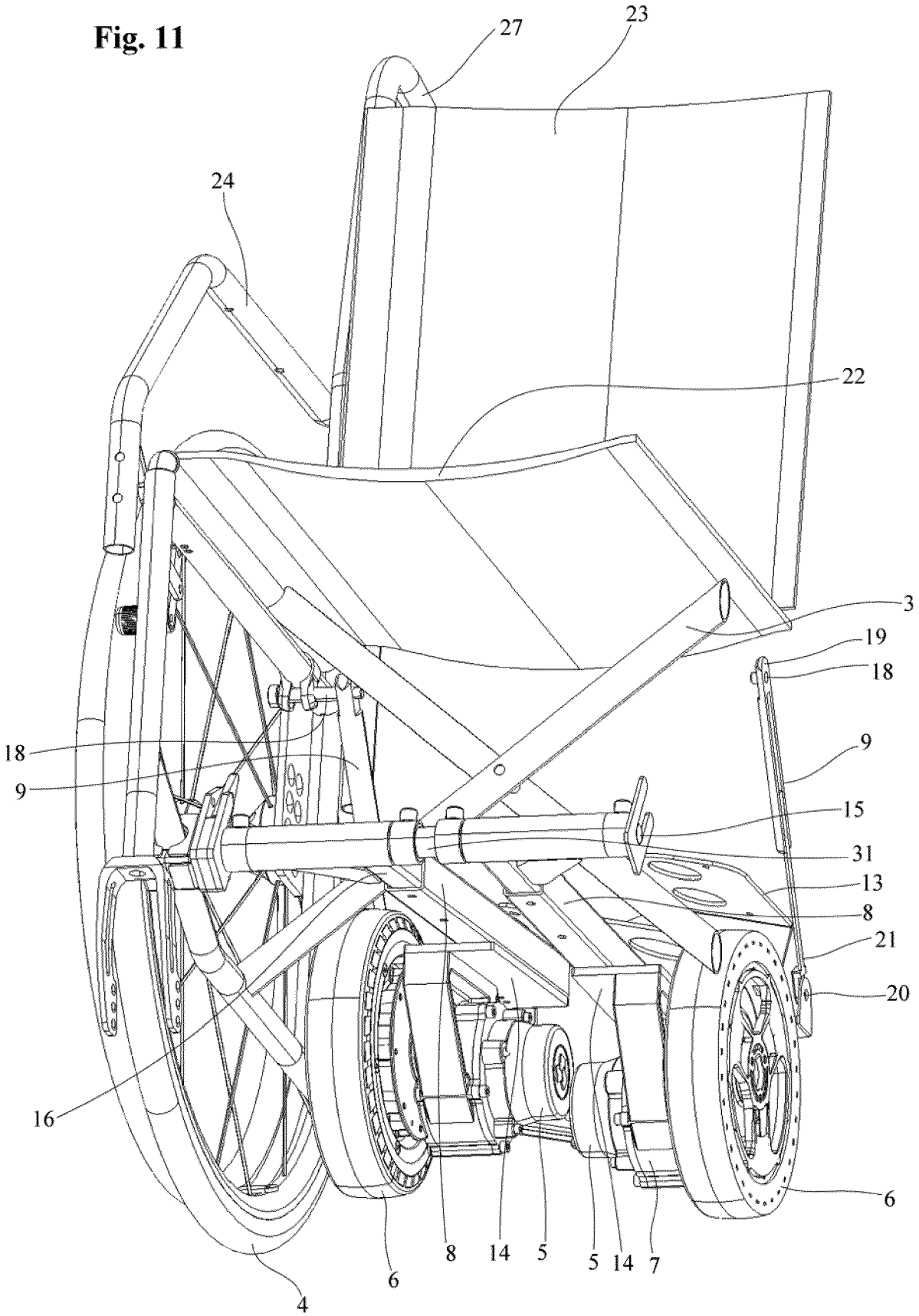


Fig. 12

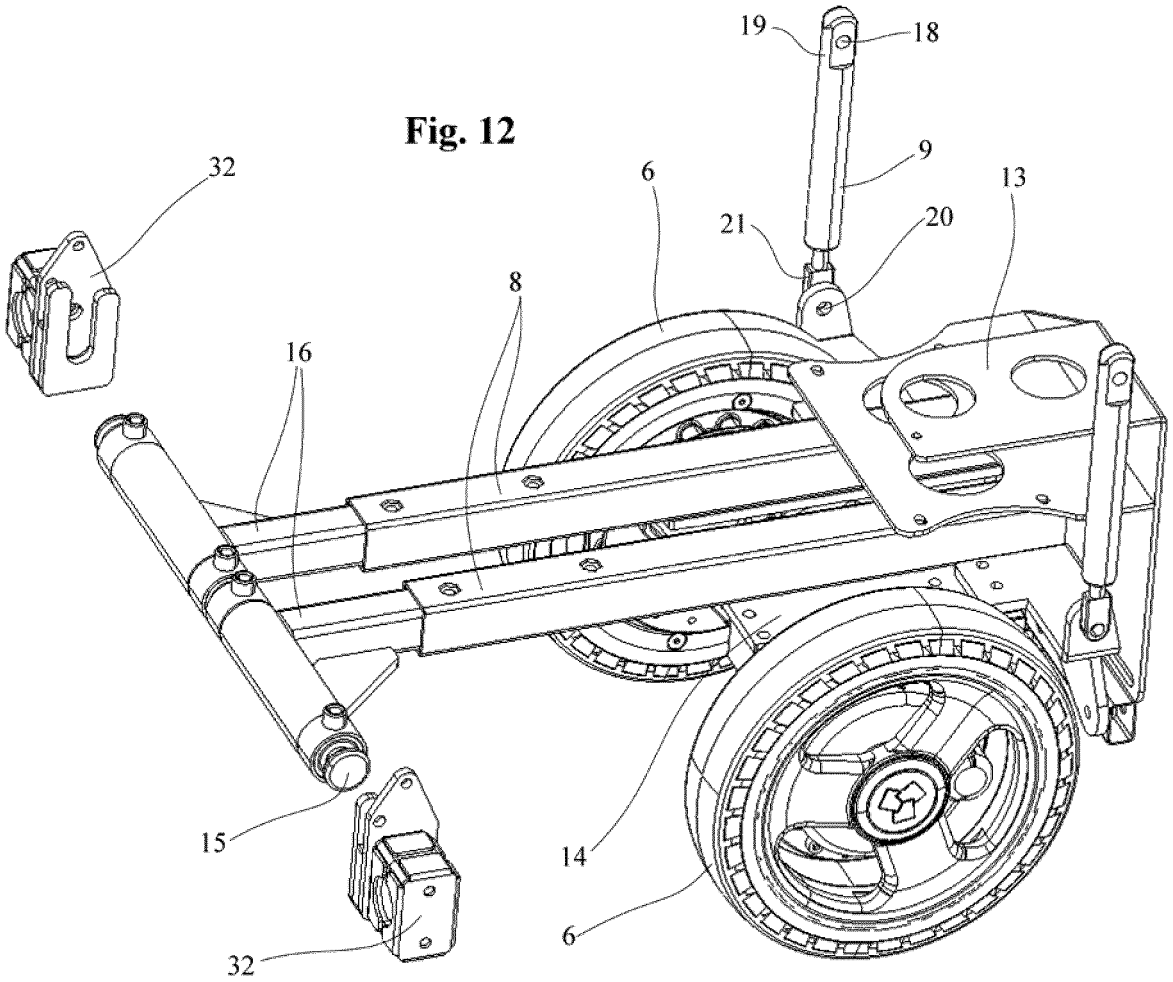


Fig. 13

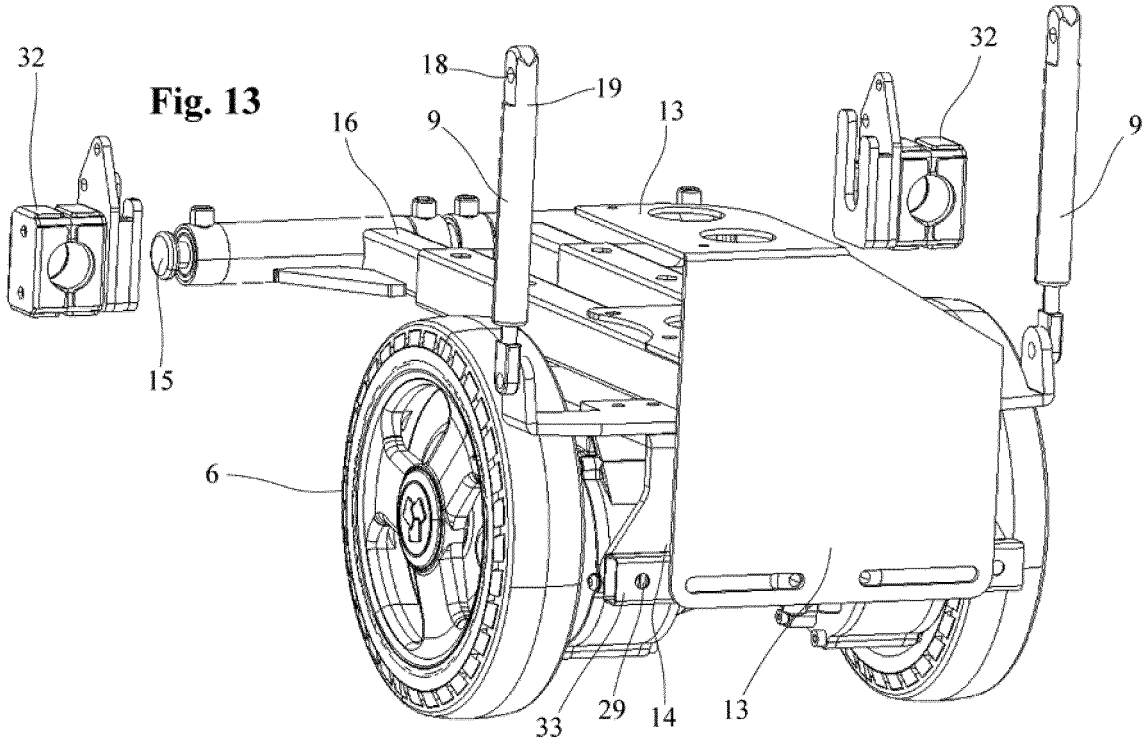


Fig. 14

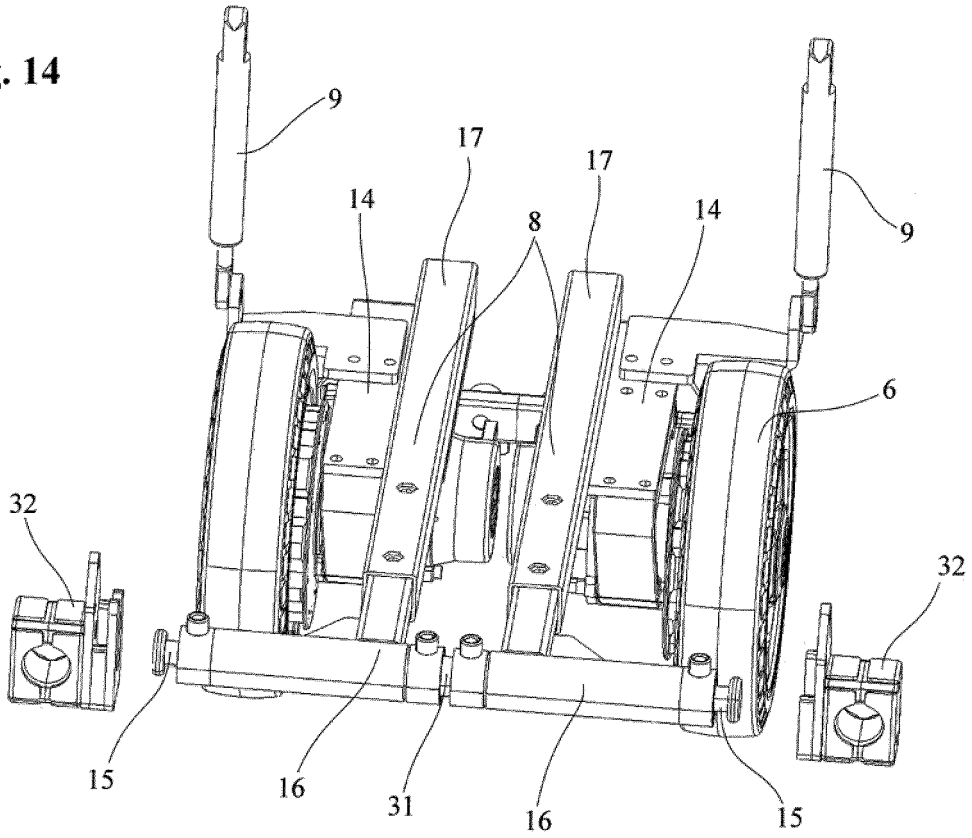

9
17
17
14
8
14
9
6
32
32
15
16
31
16
15

Fig. 15

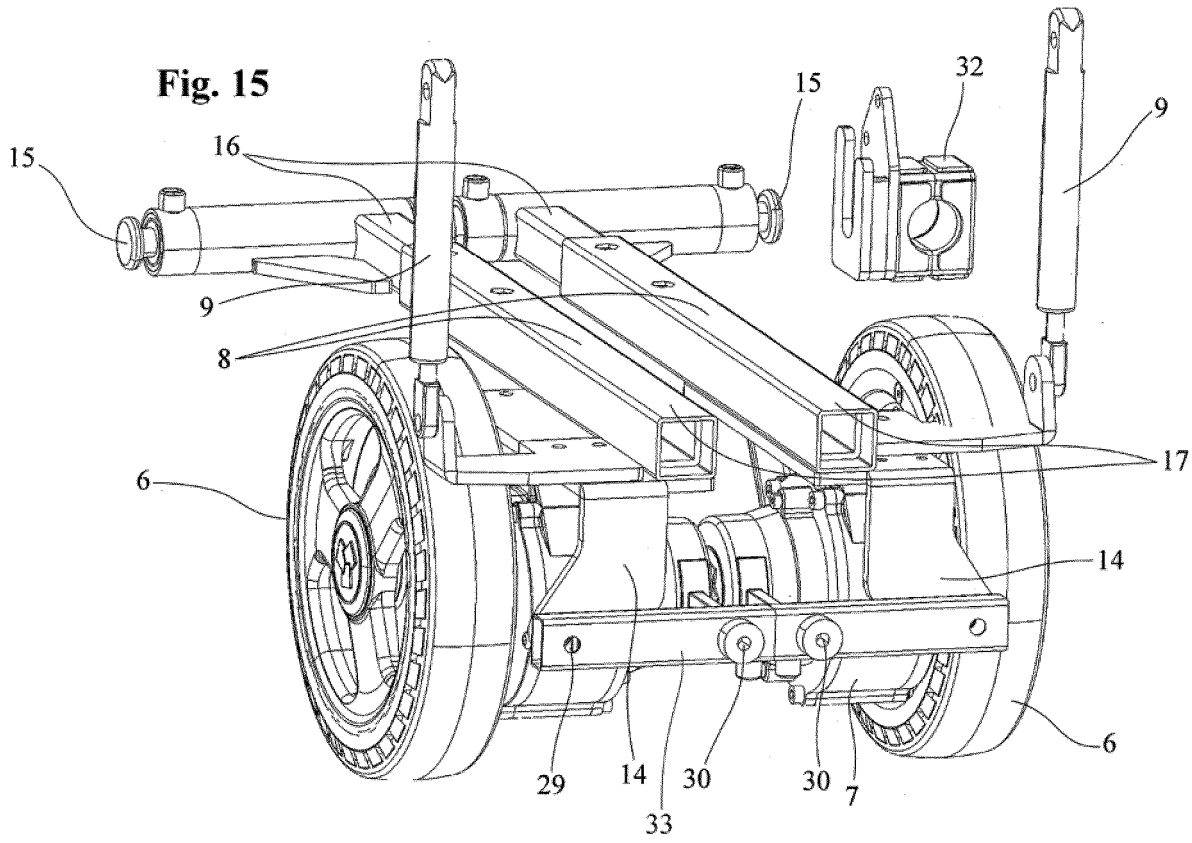
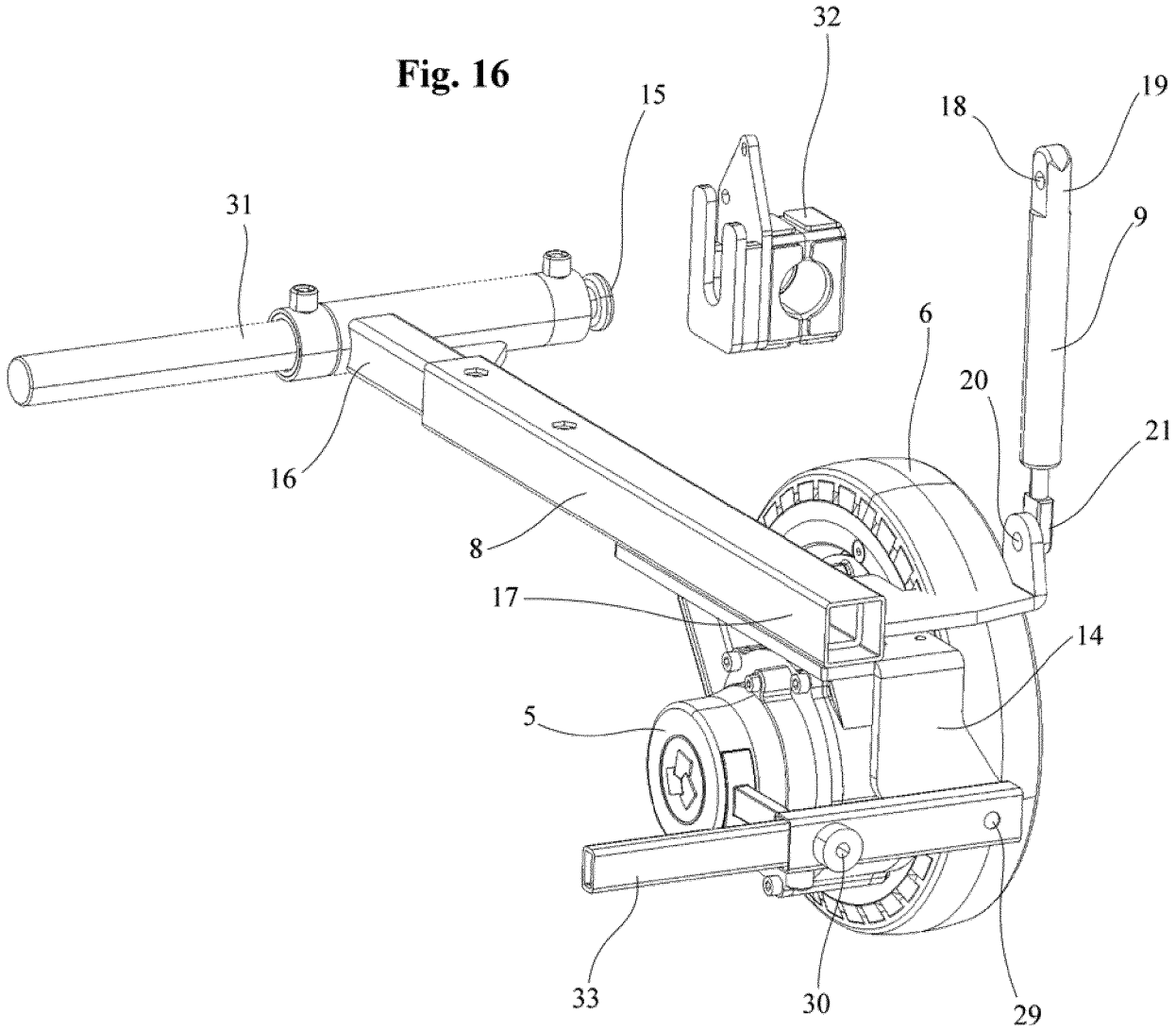

15
32
9
15
16
9
8
17
6
14
6
29
14
30
30
7
33

Fig. 16



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 19 6421

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2012/279789 A1 (BRILL BRADLEY [US] ET AL) 8 November 2012 (2012-11-08) * figures 3,5 *	1-3, 6-12,15 4,5,13, 14	INV. A61G5/04 A61G5/10
X Y	US 3 905 437 A (KAIHO YASUHARU ET AL) 16 September 1975 (1975-09-16) * figures 1, 2a-b,3,7 *	1,7, 10-12,15 4,5,13, 14	
X	EP 0 770 371 A1 (ALBER ULRICH GMBH [DE]) 2 May 1997 (1997-05-02) * figures 1-2 *	1-3,6,7, 9-12,15	
X	US 6 729 422 B2 (CHU SIMON [US] ET AL) 4 May 2004 (2004-05-04) * figure 1 *	1-3,6,7, 9-12,15	
X	NL 1 008 786 C1 (METJE EERKENS DE GRAAF [NL]; CORNELIS EERKENS [NL]) 5 October 1999 (1999-10-05) * figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (IPC) A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 January 2024	Kroeders, Marleen

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 19 6421

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-01-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012279789 A1	08-11-2012	NONE	
US 3905437 A	16-09-1975	FR 2238470 A1	21-02-1975
		GB 1472072 A	27-04-1977
		JP S5041247 A	15-04-1975
		JP S5214502 B2	22-04-1977
		US 3905437 A	16-09-1975
EP 0770371 A1	02-05-1997	AT E228810 T1	15-12-2002
		DE 19539487 A1	30-04-1997
		EP 0770371 A1	02-05-1997
		JP 2920618 B2	19-07-1999
		JP H09122184 A	13-05-1997
US 6729422 B2	04-05-2004	JP 3092255 U	07-03-2003
		TW 530644 U	01-05-2003
		US 2004007401 A1	15-01-2004
NL 1008786 C1	05-10-1999	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82