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(54) **MODULAR WHEEL ASSEMBLY FOR A WHEELCHAIR**

(57) The invention relates to a modular wheel assembly for a wheelchair, comprising a frame member; and at least one castor wheel attached to the frame member, and at least one drive wheel attached to the frame member, wherein the frame member comprises at least one

first connection member for connecting the modular wheel assembly to a connection point on a modular power chair base of the wheelchair. The invention also relates to a wheelchair comprising two modular wheel assemblies.

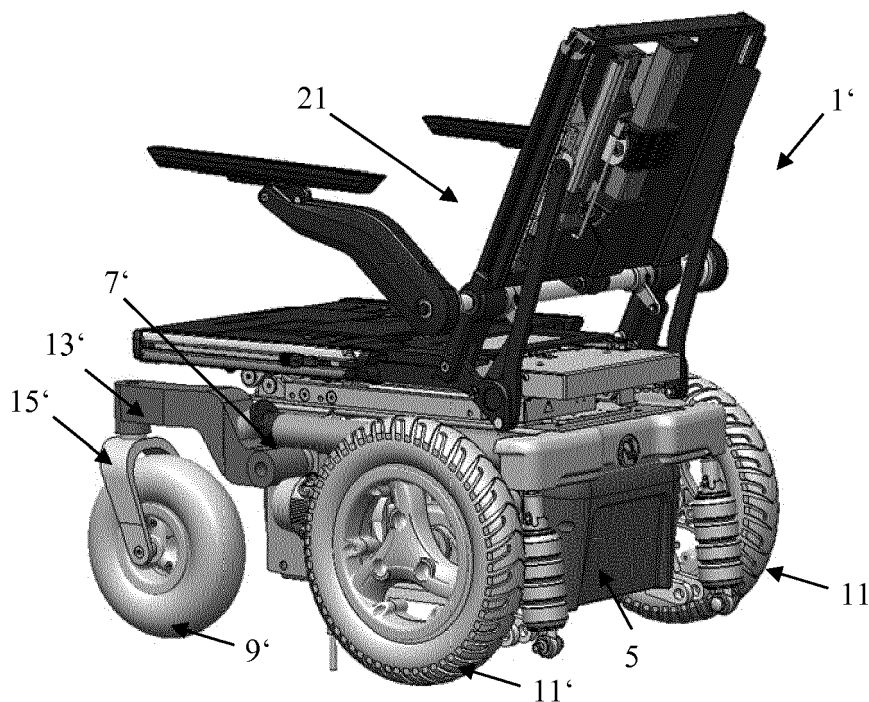


Fig. 1b

Description

[0001] The present invention relates to a modular wheel assembly for a wheelchair. The present invention also relates to a wheelchair comprising two modular wheel assemblies.

[0002] Power wheelchairs or motorized wheelchairs, power chairs, or electric wheelchairs, are traditionally equipped with an energy source, such as batteries, to power the wheelchair. Many different styles of power chair drive systems exist, among them four-wheeled power chairs that have a front wheel drive or a rear wheel drive.

[0003] Converting a power chair from front wheel drive to rear wheel drive is usually done by rotating the seat around relative to the power chair base to create either a front wheel driven power chair, or a rear wheel driven power chair. For example, US 6,290,011 B1 describes a front wheel/rear wheel drive convertible wheelchair, where a seat assembly is adapted to be reversed in direction relative to a seat support. Here, the user either faces forward with the drive wheels at the front or at the rear. To reverse this, the seat is rotated 180° and then re-fixed.

[0004] However, converting a wheelchair from front wheel drive to rear wheel drive by rotating the seat has several disadvantages. As for example, the center of gravity is never optimized for each of both cases, since the relationship between the user and seat mass to wheel position remains similar between front wheel drive and rear wheel drive. This 'compromise' results in reduced stability and drive traction.

[0005] Also, where the seat has powered options such as recline, tilt and lift, the obvious location for the wiring connections between the seating and powerbase would be near the rear of the seat. This is where the actuators are generally located and where the tilt 'hinge' point is. Therefore, rotation of the seat through 180° requires the re-routing of the connecting wires. In one configuration of the seat, this requires the wires to run across the top of the batteries from the rear of the seat to the front of the base. Therefore, different wires of different lengths are required when converting between front wheel drive and rear wheel drive.

[0006] Therefore, there is need for an improved wheel assembly for a wheelchair and a wheelchair that overcome the above mentioned disadvantages.

[0007] This need is achieved according to the invention by a modular wheel assembly for a wheelchair, comprising a frame member; and at least one castor wheel attached to the frame member, and at least one drive wheel attached to the frame member, wherein the frame member comprises at least one first connection member for connecting the modular wheel assembly to a connection point on a modular power chair base of the wheelchair.

[0008] In one example, the modular wheel assembly comprises at least one castor arm adapted to carry the castor wheel, preferably the castor arm comprises at

least one castor fork for supporting the castor wheel.

[0009] In the example above, the drive wheel is arranged offset to a first side of the frame member out of alignment of a centerline of the frame member in a first configuration, and the drive wheel is arranged offset to the second side of the frame member out of alignment of the centerline of the frame member in a second configuration, wherein the second side is opposite to the first side.

[0010] Also, in the above example, in the first configuration, the castor arm is spaced to the second side to carry the castor wheel out of alignment of the centerline of the frame member, and

in the second configuration, the castor arm is spaced to the first side to carry the castor wheel out of alignment of the centerline of the frame member.

[0011] In another example, the frame member comprises at least one second connection member for connecting the modular wheel assembly to the connection point on the modular power chair base of the wheelchair.

[0012] In the example above, the position of the second connection member is offset essentially in the same horizontal plane from the position of the first connection member, preferably offset by a distance ranging from 20mm to 100mm, preferably offset by a distance of 40mm, and wherein a connection of the first connection member to the connection point corresponds to a front wheel drive mode configuration of the wheelchair, and a connection of the second connection member to the connection point corresponds to a rear wheel drive mode configuration of the wheelchair.

[0013] Also, in the example above, the first connection member is arranged on the frame member so that the drive wheel is positioned away from the center of the modular power chair base when the modular wheel assembly is connected to the connection point on the modular power chair base of the wheelchair, and wherein the second connection member is arranged on the frame member so that the drive wheels are positioned towards the centre of the modular power chair base when the modular wheel assembly is connected to the connection point on the modular power chair base of the wheelchair.

[0014] In yet another example, the modular wheel assembly comprises at least one suspension member, wherein the frame member is adapted to support the suspension member.

[0015] In another example, the modular wheel assembly comprises at least one motor mount arm adapted to carry at least one motor and the drive wheel.

[0016] Furthermore, the invention provides a wheelchair, comprising at least one modular power chair base comprising at least one connection point on each side of the modular power chair base for connecting at least one modular wheel assembly to each side of the modular power chair base; and at least two modular wheel assemblies according to the invention, wherein one modular wheel assembly is connected to each side of the modular power chair base.

[0017] In one example, the two modular wheel assemblies comprise one modular wheel assembly of the first configuration, and one modular wheel assembly of the second configuration.

[0018] In the above example, the wheelchair is adapted to be converted between the front wheel drive mode configuration and the rear wheel drive mode configuration by swapping the two modular wheel assemblies on the sides of the of the modular power chair base.

[0019] In one example, the wheelchair comprises a seat mounted on top of the modular power chair base, preferably the seat is rigidly fixed to the modular power chair base.

[0020] In another example, the wheelchair comprises at least one leg support and/or at least one foot support.

[0021] In yet another example, the modular power chair base comprises at least one further connection point on each side of the modular power chair base for connecting the first connection member or the second connection member of the modular wheel assemblies to each side of the modular power chair base.

[0022] Thus, the invention is based on the surprising finding that by keeping the orientation of the seat to power chair base constant, the wiring connections between the seat and the power chair base remains also constant. Advantageously, the wiring looms are always the same whether the chair is configured front wheel drive or rear wheel drive. Therefore, only one design of looms needs to be utilized. Also, the location of the seat height adjustment posts and seat interface remains constant to the battery box as well as the location of the controller within the battery box, and the location of the rear lights relative to the battery box. Hence, the design of the chair can be simplified. Also, since the arrangement of the key components is always the same, training and documentation as regards spares and maintenance is simplified. This also reduces the amount of spare parts needed for the design.

[0023] In a further advantage, the frame member comprises at least one first connection member and a second connection member for connecting the modular wheel assembly to a connection point on the base of the wheelchair. Here, the first connection member can be arranged on the frame member so that the drive wheels are positioned towards the centre of the power chair base, and the second connection member can be arranged on the frame member so that the drive wheels are positioned away from the power chair base.

[0024] This allows to compensate for different relationships between the drive wheels and the base structure of the wheelchair so that the centre of gravity can be optimized for front wheel drive and rear wheel drive. In particular, when rear wheel drive is chosen, it is important for good traction between the drive wheels and the ground that the rear wheels are located in a forward direction, i.e. towards the wheelchair centre. If the wheels are located towards the rear of the structure, i.e. towards the battery box, then the traction will be limited. The seat

location on the rear wheel drive wheelchair base will be towards the front of the base to accommodate the footrests protruding down from the seat structure in front of the base structure. Because the seat has to be located in a forward location, i.e. due to physical space then the centre of gravity will be between the centre of the wheelchair structure and a little forward of this. Whereas, when forward wheel drive is chosen, traction is rarely an issue as the center of gravity position is always towards the front, i.e. to accommodate the footrest as described above, near to where the drive wheels are located. However, forward wheel drive wheelchairs suffer from stability issues, because the center of gravity is near to the front of the chair there is a tendency for the chairs to tip forward when stopping quickly or going down slopes.

[0025] Therefore, by using the first and second connection members for connecting the modular wheel assembly to the connection point on the power chair base improves 'tipping' stability.

[0026] Also, by using modular wheel assemblies, the modular wheel assemblies can be located onto the power chair base in both a front wheel drive and rear wheel drive configuration by swapping the two modular wheel assemblies from the left hand side to the right hand side of the power chair base and vice versa.

[0027] Further, by providing the modular wheel assemblies in a first configuration, and in a second configuration allows to achieve a small lateral width between the castor wheel when used in a front wheel drive configuration, which provides a more stable driving performance, and a larger lateral width between the castor wheels when used in a rear wheel drive configuration which provides more space to accommodate the castor wheels and footrest.

[0028] Further advantages and features of the invention are presented in the following description in which a preferred embodiment of the invention is shown by the help of the enclosed figures, in which

Figures 1a, 1b are perspective views of a wheelchair according to embodiments of the invention configured in a front wheel drive mode and in a rear wheel drive mode;

Figure 2 is a side view of a modular wheel assembly according to one embodiment of the invention;

Figures 3a, 3b are top views of a wheelchair according to embodiments of the invention configured in a front wheel drive mode and in a rear wheel drive mode; and

Figures 4a, 4b are side views of a wheelchair according to embodiments of the invention configured in a front wheel drive mode and in a rear wheel drive mode, and having foot supports installed.

[0029] Figures 1a, 1b show perspective views of a

wheelchair 1, 1' according to embodiments of the invention configured in a front wheel drive mode and in a rear wheel drive mode.

[0030] As shown in figure 1a, the wheelchair 1 comprises two modular wheel assemblies 3, 3', where one of the modular wheel assemblies 3, 3' is connected to each side of the wheelchair 1 at a modular power chair base 5. The modular wheel assemblies 3, 3' comprise a frame member 7, 7' comprising a castor wheel 9, 9' and a drive wheel 11, 11' each. In the shown example, the modular wheel assemblies 3, 3' also comprise a castor arm 13, 13' with a castor fork 15, 15' each for supporting the respective castor wheel 9, 9'. Also, as it can be seen from figure 1a, the wheelchair 1, 1' comprises a motor mount arm 17, 17' that carries a motor 19, 19' and the drive wheel 11, 11'.

[0031] The wheelchair 1, 1' shown in figures 1a, 1b comprises a seat 21 mounted on top of the modular power chair base 5.

[0032] Modular wheel assemblies 3, 3' according to a first configuration and of a second configuration are mounted on the modular power chair base 5. In the first configuration, the drive wheel 11 is arranged offset to a first side of the frame member 7 out of alignment of a centerline of the frame member 7 so that the drive wheel 11 sticks out to the side of the wheelchair 1. In the second configuration the drive wheel 11' sticks out to the opposite side of the wheelchair 1 as it can be best seen from figure 1b. However, the skilled person would know that the invention could be also carried out when two identical wheels assemblies are installed on both sides of the modular power chair base, where the drive wheels are essentially arranged in alignment with the centerline of the frame member.

[0033] As it can be seen from figure 1a, the wheelchair 1 has the larger drive wheels 11, 11' at the front. In this mode, the centre of gravity is more forward of the centre of the modular power chair base 5, i.e. near the drive wheels 11, 11' to ensure traction between the tires and ground. When such a wheelchair 1 is driven on an uneven surface or at higher speeds, the wheelchair 1 tends to 'fish tail'. This is an unintended motion of the rear of the wheelchair 1 oscillating left/right. Small directional corrections at the drive wheels 11, 11' or changes in direction caused by the road surface are exaggerated at the rear extremity of the wheelchair 1. Also often associated with this is castor flutter; castor flutter is the rapid and uncontrolled oscillation of the castor wheels 9, 9'.

[0034] This is initiated by the 'fish tailing' and caused by the relatively low downward load on the castor wheels 9, 9', i.e. due to the forward centre of gravity, and relatively heavy mass of the castor wheels 9, 9'. This phenomenon gets worse at higher speeds. Therefore, small lateral dimensions between the castor wheels 9, 9' provides a better (more stable) driving performance.

[0035] Figure 1b essentially shows the arrangement of figure 1a, however, the the two modular wheel assemblies 3, 3' are swapped on the sides of the of the modular

power chair base 5. Thus, the wheelchair 1' is adapted to be converted from a front wheel drive mode to a rear wheel drive mode (and vice versa) by swapping the two modular wheel assemblies 3, 3' on the sides of the of the modular power chair base 5. In the rear wheel drive mode configuration that is shown in figure 1b, the larger drive wheels 11, 11' are at the rear. Therefore the castor wheels 9, 9' and their support are located at the front of the wheelchair 1', in the same area where the footrests (not shown in figures 1a, 1b) could be located.

[0036] Figure 2 shows a side view of a modular wheel assembly 3 according to one embodiment of the invention. The shown modular wheel assembly could be one of the modular wheel assemblies 3 shown in figures 1a, 1b.

[0037] As it can be seen from the figure, the modular wheel assembly 3 comprises a first connection member 23a, and a second connection member 23b. The position of the second connection member 23b is offset from the position of the first connection member 23a. For example, the connection members 23a, 23b could be offset in the same horizontal plane by a distance ranging from 20mm to 100mm, preferably offset by a distance of 20mm. Both connection members 23a, 23b are suitable to be connected to the connection point on the modular power chair base 5 of the wheelchair. However, depending on whether a front wheel drive mode or a rear wheel drive mode is desired by the user, only one of the connection members 23a, 23b is connected to the connection point. Therefore, the first connection member 23a is arranged on the frame member 7 so that the drive wheel 11 is positioned away from the center of the modular power chair base 5 when the modular wheel assembly 3 is connected to the connection point on the modular power chair base 5 of the wheelchair by the first connection member 23a, and the second connecting 23b member is arranged on the frame member 7 so that the drive wheel 11 is positioned towards the centre of the modular power chair base 5 when the modular wheel assembly 3 is connected to the connection point on the modular power chair base 5 of the wheelchair by the second connection member 23b.

[0038] Therefore, in the shown embodiment, a connection of the first connection member 23a to the connection point on the modular power chair base 5 corresponds to a front wheel drive mode of the wheelchair, and a connection of the second connection member 23b to the connection point corresponds to a rear wheel drive mode of the wheelchair. However, in another embodiment, which is not shown in the figures, there could be alternatively, i.e. to achieve the same effect, two connection points arranged on each side of the modular power base 5 that connect to one connection member on the modular power chair base.

[0039] Figures 3a, 3b are top views of a wheelchair 1, 1' according to embodiments of the invention configured in a front wheel drive mode and in a rear wheel drive mode. The shown wheelchairs 1, 1' and modular wheel

assemblies 3, 3' could be the wheelchairs and modular wheel assemblies that are shown in the previous figures. Figure 3a shows the wheelchair 1 in a front wheel drive mode as also shown in figure 1a, and figure 3b shows the wheelchair 1' in a rear wheel drive mode as also shown in figure 1b. Both figures 3a, 3b show that the castor arms 13, 13' could be also spaced, e.g. bend, to a side of the frame members 7, 7' to carry the respective castor wheel 9, 9' out of alignment of the centerline of the respective frame member 7, 7'.

[0040] Advantageously, by having the castor arms 13, 13' shaped as shown in figures 3a, 3b allows to achieve small lateral dimensions between the castor wheels 11, 11' when the wheelchair 1 is configured in the front wheel drive mode to provide a better, i.e. more stable, driving performance. On the other hand, when the modular wheel assemblies 3, 3' are swapped around on the modular power base of the wheelchair 1' as shown in figure 3b, i.e. the wheelchair 1' is configured in the rear wheel drive mode, larger lateral dimensions between the castor wheels 11, 11' provides more space to accommodate the castors and footrests (not shown in figures 3a, 3b).

[0041] Figures 4a, 4b are side views of a wheelchair 1, 1' according to embodiments of the invention configured in a front wheel drive mode and in a rear wheel drive mode, and having a foot support 25 installed.

[0042] Wheelchairs normally provide a leg/foot support, these come in two general formats:

Individual footrests - one left, one right of the centerline. These can be fixed or swing away to aid user access. They come in various leg angles and can be electrical operated.

Centre Mount footrest - one single device located on the wheelchair centerline (not shown in figures 4a, 4b).

[0043] As it can be seen from the figures, the foot supports 25 are located on the front edge of the wheelchair seat 21, the clinical aim is to provide a 90° knee angle, i.e. the angle between the thigh and lower leg. To minimize the overall length of the wheelchair 1, 1', i.e. to minimize the turning circle, and to provide a stable chair, i.e. one that does not tip forward, the seat front edge and the drive wheels usual coincide. Therefore the usual footrest used on front wheel drive wheelchairs 1 are Centre mount version as these avoid collisions with the drive wheels. However, the design according to the invention allows to use one common foot support 25 that can be used for both modes.

[0044] The features disclosed in this specification, the claims and the figures maybe important for the claimed invention, taken separately or in any combination, for the respective different embodiments.

Reference sign list

[0045]

1, 1'	wheel chair
3, 3'	modular wheel assembly
5	modular power chair base
7, 7'	frame member
9, 9'	castor wheel
11, 11'	drive wheel
13, 13'	castor arm
15, 15'	castor fork
17, 17'	motor mount arm
19, 19'	motor
21	seat
23a, 23b	first and second connection member
25	foot support

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Claims

1. A modular wheel assembly (3, 3') for a wheelchair (1, 1'), comprising:

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a frame member (7, 7'); and
at least one castor wheel (9, 9') attached to the frame member (7, 7'), and at least one drive wheel (11, 11') attached to the frame member (7, 7'),

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characterized in that

the frame member (7, 7') comprises at least one first connection member (23a) for connecting the modular wheel assembly (3, 3') to a connection point on a modular power chair base (5) of the wheelchair (1, 1').

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2. The modular wheel assembly (3, 3') according to claim 1, **characterized in that** the modular wheel assembly (3, 3') comprises:

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at least one castor arm (13, 13') adapted to carry the castor wheel (9, 9'), preferably the castor arm (13, 13') comprises at least one castor fork (15, 15') for supporting the castor wheel (9, 9').

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3. The modular wheel assembly (3, 3') according to claim 2, **characterized in that** in a first configuration, the drive wheel (11, 11') is arranged offset to a first side of the frame member (7, 7') out of alignment of a centerline of the frame member (7, 7'), and in a second configuration, the drive wheel (11, 11') is arranged offset to the second side of the frame member (7, 7') out of alignment of the centerline of the frame member (7, 7'), wherein the second side is opposite to the first side.

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4. The modular wheel assembly (3, 3') according to claim 3, **characterized in that** in the first configuration, the castor arm (13, 13') is spaced to the second side to carry the castor wheel (9, 9') out of alignment of the centerline of the frame member (7, 7'), and in the second configuration, the

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castor arm (13, 13') is spaced to the first side to carry the castor wheel (9, 9') out of alignment of the centerline of the frame member (7, 7').

5. The modular wheel assembly (3, 3') according to one of the preceding claims,

characterized in that

the frame member (7, 7') comprises at least one second connection member (23b) for connecting the modular wheel assembly (3, 3') to the connection point on the modular power chair base (5) of the wheelchair (1, 1').

6. The modular wheel assembly (3, 3') according to claim 5, **characterized in that**

the position of the second connection member (23b) is offset essentially in the same horizontal plane from the position of the first connection member (23a), preferably offset by a distance ranging from 20mm to 100mm, preferably offset by a distance of 40mm, and wherein a connection of the first connection member (23a) to the connection point corresponds to a front wheel drive mode configuration of the wheelchair (1, 1'), and a connection of the second connection member (23b) to the connection point corresponds to a rear wheel drive mode configuration of the wheelchair (1, 1').

7. The modular wheel assembly (3, 3') according to claims 5 or 6, **characterized in that**

the first connection member (23a) is arranged on the frame member (7, 7') so that the drive wheel (11, 11') is positioned away from the center of the modular power chair base (5) when the modular wheel assembly (3, 3') is connected to the connection point on the modular power chair base (5) of the wheelchair (1, 1'), and wherein

the second connection member (23b) is arranged on the frame member (7, 7') so that the drive wheels (11, 11') are positioned towards the centre of the modular power chair base (5) when the modular wheel assembly (3, 3') is connected to the connection point on the modular power chair base (5) of the wheelchair (1, 1').

8. The modular wheel assembly (3, 3') according to one of the preceding claims,

characterized in that

the modular wheel assembly (3, 3') comprises:

at least one suspension member, wherein the frame member (7, 7') is adapted to support the suspension member.

9. The modular wheel assembly (3, 3') according to one of the preceding claims,

characterized in that

the modular wheel assembly (3, 3') comprises:

at least one motor mount arm (17, 17') adapted to carry at least one motor (19, 19') and the drive wheel (11, 11').

10. A wheelchair (1, 1'), comprising:

at least one modular power chair base (5) comprising at least one connection point on each side of the modular power chair base (5) for connecting at least one modular wheel assembly (3, 3') to each side of the modular power chair base (5); and

at least two modular wheel assemblies according to claims 1 to 9, wherein one modular wheel assembly (3, 3') is connected to each side of the modular power chair base (5).

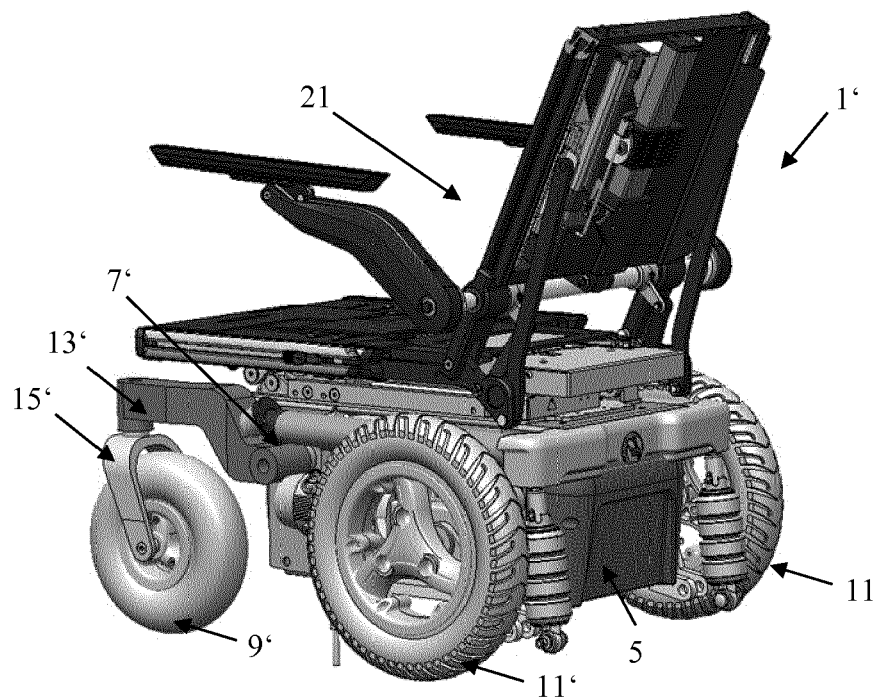
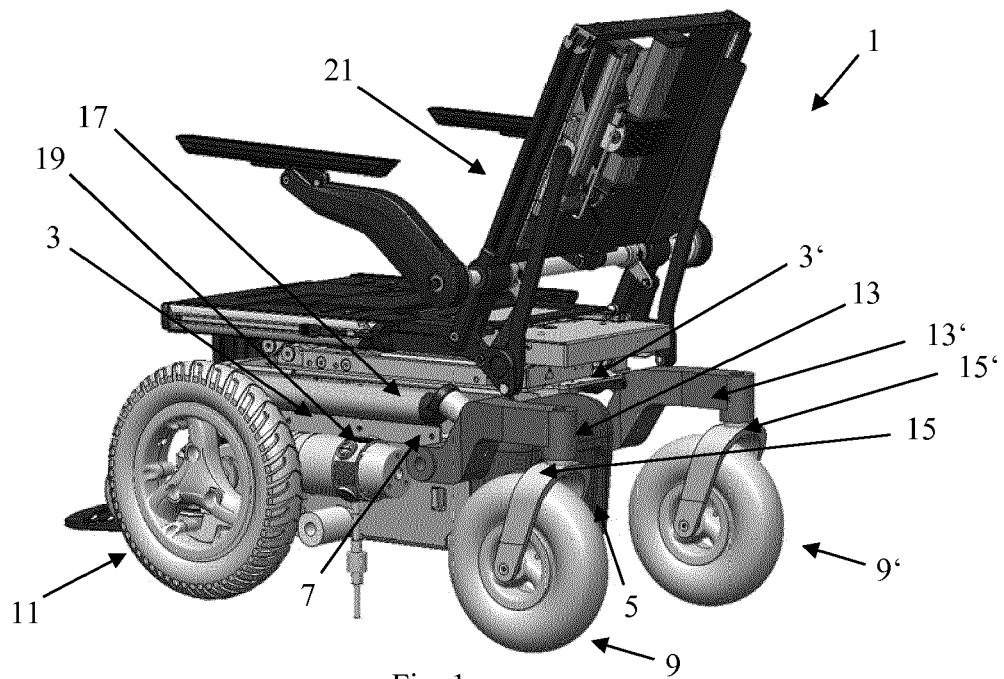
11. The wheelchair (1, 1'), according to claim 10, **characterized in that** the two modular wheel assemblies comprise one modular wheel assembly (3, 3') of the first configuration, and one modular wheel assembly (3, 3') of the second configuration.

12. The wheelchair (1, 1'), according to claims 10 or 11, **characterized in that** the wheelchair (1, 1') is adapted to be converted between the front wheel drive mode configuration and the rear wheel drive mode configuration by swapping the two modular wheel assemblies on the sides of the of the modular power chair base (5).

13. The wheelchair (1, 1'), according to one of claims 10 to 12, **characterized in that** the wheelchair (1, 1') comprises a seat (21) mounted on top of the modular power chair base (5), preferably the seat (21) is rigidly fixed to the modular power chair base (5).

14. The wheelchair (1, 1'), according to one of claims 10 to 13, **characterized in that** the wheelchair (1, 1') comprises at least one leg support and/or at least one foot support (25).

15. The wheelchair (1, 1'), according to one of claims 10 to 14, **characterized in that** the modular power chair base (5) comprises at least one further connection point on each side of the modular power chair base (5) for connecting the first connection member (23a) or the second connection member (23b) of the modular wheel assemblies (3, 3') to each side of the modular power chair base (5).



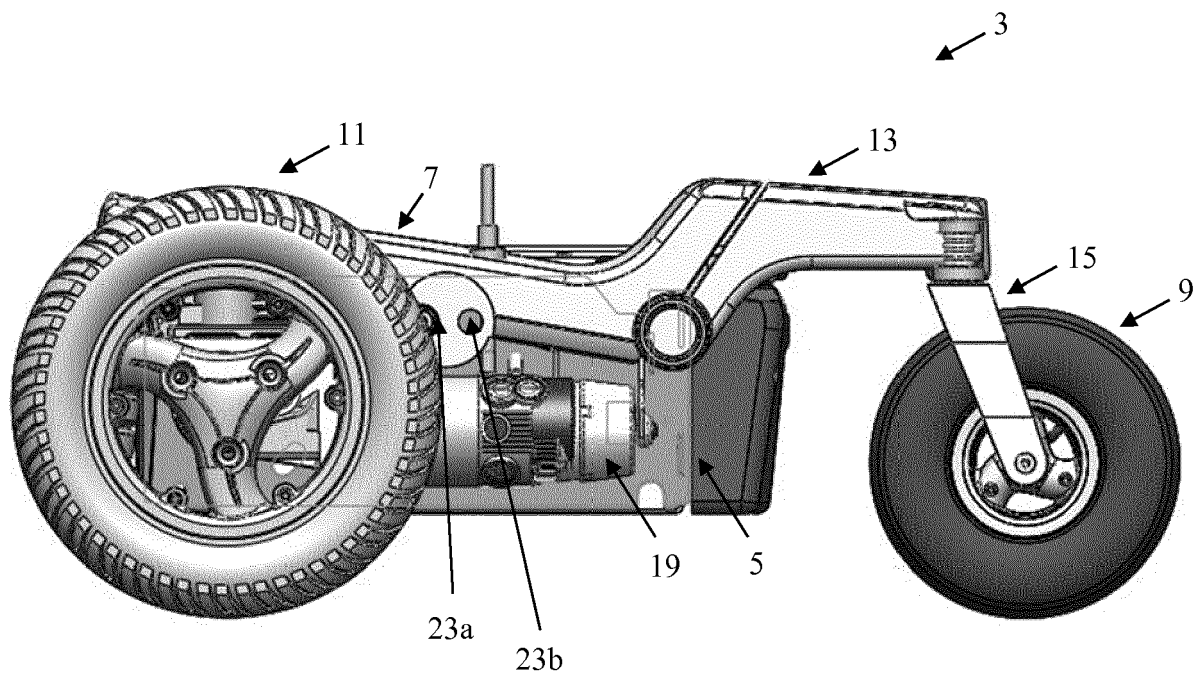


Fig. 2

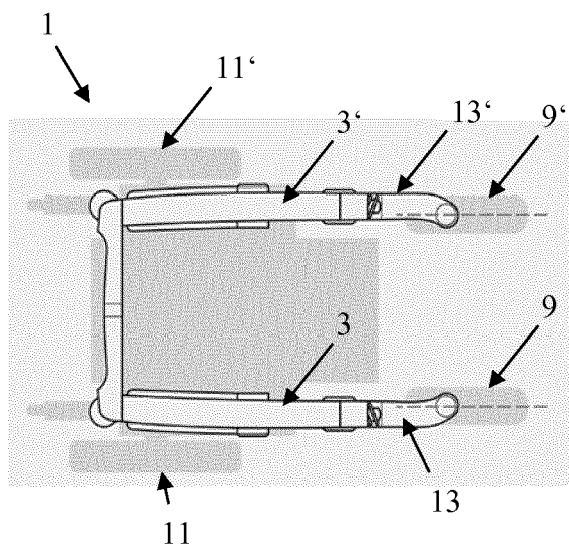


Fig. 3a

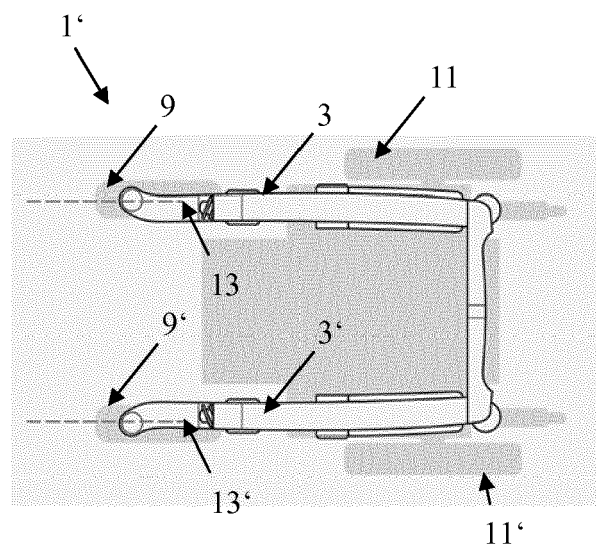


Fig. 3b

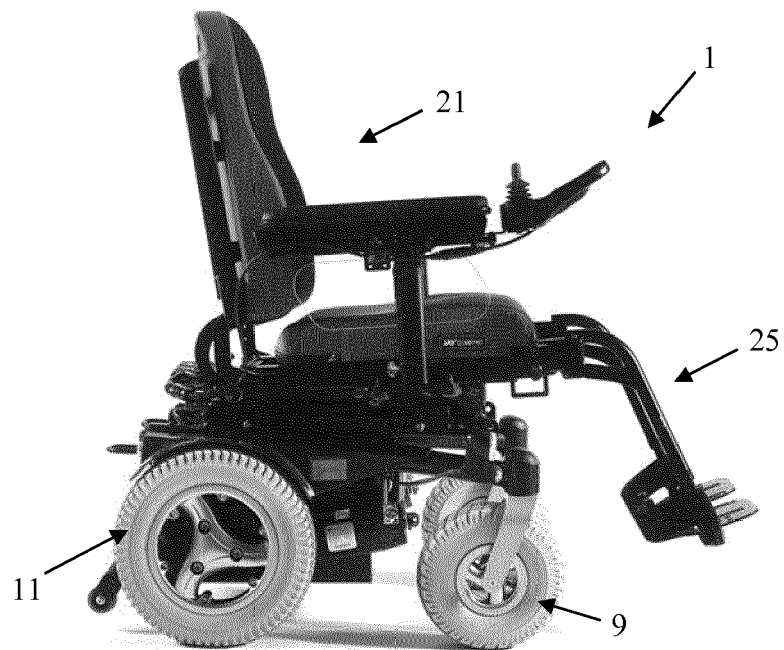


Fig. 4a



Fig. 4b



EUROPEAN SEARCH REPORT

Application Number
EP 17 20 5230

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EPO FORM 1503 03.82 (P04C01)

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 A	US 5 156 226 A (BOYER RONALD G [US] ET AL) 20 October 1992 (1992-10-20) * column 4, line 46 - column 6, line 3; figures *	1-11, 13-15 12	INV. A61G5/04
X A	US 2015/175227 A1 (CHANG MIN-HSIUNG [TW] ET AL) 25 June 2015 (2015-06-25) * paragraph [0029] - paragraph [0041]; figures *	1-11, 13-15 12	
X A	EP 1 522 293 A2 (PRIDE MOBILITY PRODUCTS CORP [US]) 13 April 2005 (2005-04-13) * abstract; figures *	1-11, 13-15 12	
A,D	US 6 290 011 B1 (LANGAKER JOHN T [US] ET AL) 18 September 2001 (2001-09-18) * abstract; figures *	1,10	
			TECHNICAL FIELDS SEARCHED (IPC)
			A61G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 June 2018	Examiner Kousouretas, Ioannis
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 20 5230

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12-06-2018

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5156226 A	20-10-1992	NONE	
US 2015175227 A1	25-06-2015	NONE	
EP 1522293 A2	13-04-2005	CA 2484343 A1	08-04-2005
		EP 1522293 A2	13-04-2005
		US 2005077698 A1	14-04-2005
US 6290011 B1	18-09-2001	NONE	

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Patent documents cited in the description

- US 6290011 B1 [0003]