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(54) **ELECTRIC VEHICLE FOR MICROMOBILITY**

(57) The electric vehicle (1) for micromobility comprises:

- one supporting frame (2) provided with two lateral portions (3), arranged opposite each other;
 - two wheels (5) mounted, opposite each other, on opposite sides of the supporting frame (2);
 - one main body (7) provided with at least one seat (8) for the user of the vehicle (1) and with at least two lateral walls (9), arranged opposite each other and coupleable to the supporting frame (2);
 - coupling means (10, 11) of the main body (7) to the supporting frame (2);
- wherein the coupling means (10, 11) comprise at least a first coupling portion (10) made on one of the lateral walls (9) and at least a second coupling portion (11), coupleable to the first coupling portion (10) and made in a single body piece with one of the lateral portions (3).

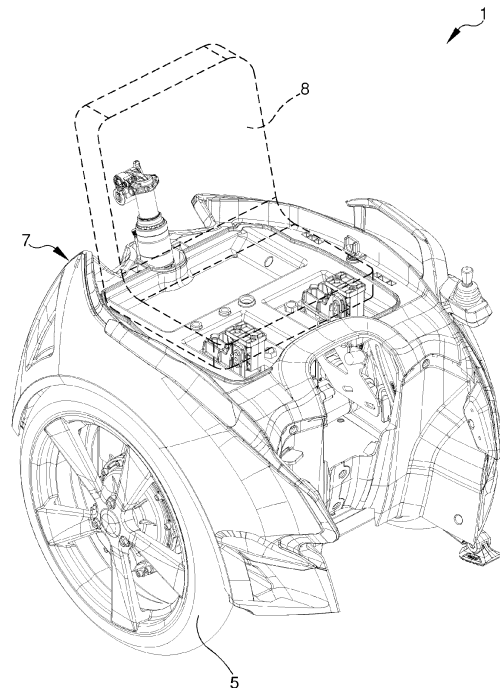


Fig.1

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Description

Technical Field

[0001] The present invention relates to an electric vehicle for micromobility.

Background Art

[0002] Various types of electric vehicles for micromobility, such as scooters and the like, are known to be commonly used by people to travel small and medium distances.

[0003] In particular, some types of electric vehicles for micromobility feature self-balancing systems which enable the user to maintain a stable position of the vehicle itself under any working condition.

[0004] These types of system are substantially similar to those employed by vehicles such as the so-called SEGWAY®.

[0005] In more detail, these systems allow the user to maneuver the vehicle by simply unbalancing the body forward or backward, for example, to make it move forward or backward automatically.

[0006] In addition, micromobility vehicles for people with mobility impairments are known.

[0007] Generally, this type of vehicle has a user seat mounted on a main body, which in turn is mounted on a supporting frame provided with at least two wheels arranged on opposite sides of the vehicle.

[0008] In this way, the mobility-impaired user can drive the vehicle while remaining seated.

[0009] However, this type of vehicle is particularly complex to assemble.

[0010] Such assembly in fact requires perfectly aligning appropriate holes that are cut on the main body and on the supporting frame and that must be engaged by corresponding threaded screws which are adapted to ensure the tightness of the assembly itself.

[0011] These operations require long lead times and are particularly delicate and complex.

[0012] Therefore, a possible solution to this drawback is given by the vehicle covered by patent application EP2606866, in which an attachment plate placed between the supporting frame and the main body is employed.

[0013] Such a plate, in fact, is mounted on the supporting frame and has appropriate protrusions adapted to receive the main body by sliding, keeping it substantially in place and facilitating its attachment to the base frame.

[0014] However, even this solution has some drawbacks.

[0015] In fact, the attachment plate has difficulties in assembly to the supporting frame comparable to those of the main body.

[0016] Notably, the attachment plate also has a plurality of holes which must be carefully aligned with the holes made on the supporting frame so that the assembly

can be finalized with the threaded screws.

[0017] In fact, a misalignment of the attachment plate causes a misalignment of the main body as well.

[0018] Therefore, the assembly operations remain complex and time-consuming.

[0019] In addition, such a plate significantly reduces the robustness of the vehicle.

[0020] In fact, the mechanical stresses to which the vehicle is subjected affect the couplings that secure the plate between the supporting frame and the main body. This increases wear and tear and the risk of vehicle malfunction, requiring more frequent maintenance and/or repair jobs.

Description of the Invention

[0021] The main aim of the present invention is to devise an electric vehicle for micromobility which can be assembled easily, quickly and safely.

[0022] A further object of the present invention is to devise an electric vehicle for micromobility which is particularly robust and little subject to wear and tear and maintenance and/or repair jobs compared to the electric vehicles of known type. Another object of the present invention is to devise an electric vehicle for micromobility which can overcome the aforementioned drawbacks of the prior art within the framework of a simple, rational, easy and effective to use as well as cost-effective solution.

[0023] The aforementioned objects are achieved by this electric vehicle for micromobility having the characteristics of claim 1.

Brief Description of the Drawings

[0024] Other characteristics and advantages of the present invention will become more apparent from the description of a preferred, but not exclusive, embodiment of an electric vehicle for micromobility, illustrated by way of an indicative, yet non-limiting example, in the accompanying tables of drawings in which:

Figure 1 is an axonometric view of the electric vehicle for micromobility according to the invention;

Figure 2 is an exploded view of the electric vehicle for micromobility according to the invention;

Figure 3 is a detailed view of some components of the electric vehicle for micromobility according to the invention;

Figure 4 is an axonometric view of a component of the electric vehicle for micromobility according to the invention;

Figure 5 is an exploded view of some parts of the component of the electric vehicle for micromobility shown in Figure 4.

Embodiments of the Invention

[0025] With particular reference to these figures, reference numeral 1 globally denotes an electric vehicle for micromobility.

[0026] The electric vehicle 1 for micromobility comprises at least one supporting frame 2 provided with two lateral portions 3 arranged opposite each other and each defining an inner side 3a and an outer side 3b substantially opposite each other. Preferably, the inner side 3a, in use, is arranged substantially vertically. According to the invention, the vehicle 1 comprises at least two wheels 5 mounted, opposite each other, on opposite sides of the supporting frame 2. Specifically, the wheels 5 are each arranged substantially where the outer side 3b of a respective lateral portion 3 is located.

[0027] Preferably, the vehicle 1 comprises only two wheels 5.

[0028] Conveniently, the supporting frame 2 comprises at least one supporting body 4 positioned between the lateral portions 3 and arranged, in use, substantially suspended from the ground by means of the wheels 5.

[0029] Preferably, the supporting body 4 defines a supporting plane 6 arranged, in use, substantially parallel to the ground.

[0030] Specifically, the lateral portions 3 are associated on opposite sides of the supporting body 4 and extend parallel to each other away from the same supporting body 4, giving the supporting frame 2 a substantially U-shaped conformation.

[0031] In addition, the vehicle 1 comprises at least one main body 7 provided with at least one seat 8 for the user of the vehicle 1 and with at least two lateral walls 9 arranged opposite each other and coupled to the supporting frame 2.

[0032] Preferably, the main body 7 is mounted on the supporting frame 2 placed between the lateral portions 3, e.g. between the inner sides 3a.

[0033] In particular, the main body 7, in use, overhangs, at least partly, the supporting body 4.

[0034] Preferably, the vehicle 1 comprises self-balancing means (not shown in the figures) and configured to balance the weight under any working condition, such as e.g. those employed by passenger transport devices of known type, e.g., such as the so-called SEGWAY®.

[0035] Specifically, the self-balancing means are configured to move the vehicle 1 forward and/or backward as a result of the front and/or front imbalance of the user's body sitting on the seat 8.

[0036] Appropriately, the self-balancing means are mounted on at least one of either the main body 7 or the supporting frame 2.

[0037] Preferably, the self-balancing means are mounted, at least partly, on the supporting frame 2, e.g., on the supporting body 4.

[0038] According to the invention, the vehicle comprises coupling means 10, 11 of the main body 7 to the supporting frame 2.

[0039] Specifically, the coupling means 10, 11 comprise at least a first coupling portion 10 made on one of the lateral walls 9 and at least a second coupling portion 11 which can be coupled to the first coupling portion 10 and made in a single body piece with one of the lateral portions 3.

[0040] In other words, the second coupling portion 11 is an integral part of the lateral portion 3 and the vehicle 1 lacks fastening means adapted to couple the second coupling portion 11 to the lateral portion 3 in a removable manner, as is the case with reference to the vehicle 1 described by patent application EP2606866. In such a patent application, in fact, the second coupling portion is made on a plate which must be screwed onto the lateral portion by means of screws.

[0041] It cannot be ruled out that the first coupling portion 10 can be made in one body piece with one of the lateral walls 9.

[0042] Preferably, the second coupling portion 11 is made on the inner side 3a of the lateral portion 3.

[0043] Advantageously, the coupling means 10, 11 comprise a first coupling portion 10 made on each lateral wall 9 and a second coupling portion 11 made on each lateral portion 3.

[0044] Conveniently, the main body 7 and the supporting frame 2 are mutually coupled movable by shifting thanks to the coupling means 10, 11.

[0045] In particular, the main body 7 can be coupled movable by shifting to the supporting frame 2, from top to bottom, e.g. with the supporting frame 2 arranged substantially resting on the ground by means of the wheels 5 and preferably with the supporting body 4 arranged substantially parallel to the ground.

[0046] Conveniently, the first and the second coupling portions 10, 11 define mutually shiftable guiding elements which are locked together with the lateral wall 9 and with the lateral portion 3, respectively. In particular, such a pair of guiding elements, preferably arranged in a substantially vertical direction, is shaped in such a way that the coupling by shifting between the main body 7 and the supporting frame 2 can take place from top to bottom, or vice versa. Advantageously, one of either the first coupling portion 10 or the second coupling portion 11 comprises at least one groove 12, and the other of either the first coupling portion 10 or the second coupling portion 11 comprises at least one abutment profile 13 conformed so as to be coupleable by shifting within the groove 12.

[0047] Specifically, the first coupling portion 10 comprises the groove 12 and the second coupling portion 11 comprises the abutment profile 13.

[0048] Preferably, the first coupling portion 10 comprises a plurality of grooves 12, and the second coupling portion 11 comprises a plurality of abutment profiles 13, each conformed so as to be coupleable by shifting within a corresponding groove 12.

[0049] Conveniently, the groove 12 and the abutment profile 13 are substantially U-shaped.

[0050] This allows not only effective and fast shift between the main body 7 and the supporting frame 2, but also prevents the main body 7 from shifting in the remaining directions in the space.

[0051] In particular, the groove and the abutment profile, considering the way they are shaped, prevent the main body 7 from shifting in the horizontal way, front and back, with respect to the supporting frame 2.

[0052] Advantageously, one of either the first coupling portion 10 or the second coupling portion 11 comprises at least one protrusion 14. In addition, the groove 12 is cut into the protrusion 14.

[0053] In particular, the protrusion 14 and the groove 12 are made in a single body piece.

[0054] Conveniently, the abutment profile 13 is made by material removal of the lateral wall 9 or of the lateral portion 3.

[0055] Appropriately, the vehicle 1 comprises securing means 13, 14 of the main body 7 and of the supporting frame 2. Specifically, the securing means 13, 14 secure, in use, the shift of the main body 7 with respect to the supporting frame 2.

[0056] In this way, the securing means 13, 14 fasten the main body 7 to the supporting frame 2 when the coupling portions 10, 11 are coupled to each other. Conveniently, the securing means 13, 14 comprise at least one threaded element 14 and at least one corresponding threaded hole 15 adapted to receive the threaded element 14.

[0057] In addition, the threaded element 14 and the threaded hole 15 are placed on at least one of the two lateral walls 9 and on at least one of the lateral portions 3, respectively.

[0058] Specifically, the securing means 13, 14 comprise a threaded element 14 or a threaded hole 15 for each lateral wall 9 and for each lateral portion 3. Conveniently, the lateral portion 3 defines a perimeter profile 16 on which at least one threaded hole 15 or at least one threaded element 14 is arranged. Preferably, the perimeter profile 16 substantially surrounds the inner side and/or the outer side 3b of the lateral portion 3.

[0059] Preferably, the threaded element 14 is mounted on the lateral wall 9 and the threaded hole 15 is made on the lateral portion 3.

[0060] Preferably, the lateral portion 3, or the part thereof on which at least one threaded hole 15 or at least one threaded element 14 is arranged, extends, in use, substantially horizontally.

[0061] Appropriately, the threaded element 14, in use, is arranged substantially vertically.

[0062] Preferably, the lateral wall 14 defines at least one through-hole which extends, in use, preferably vertically and adapted to be passed through, in use, by the threaded element 14. In this way, the threaded element 14 reinforces the lateral wall 14.

[0063] Advantageously, the vehicle 1 comprises:

- at least one electric motor 17 to move at least one of

the wheels 5;

- at least one motion driving assembly 18, placed between the motor 17 and the wheel 5, the motor 17 imparting motion to the wheel 5 by means of the driving assembly 18.

[0064] In particular, the driving assembly 18 passes through at least one of the lateral portions 3 from side to side.

[0065] In more detail, the motor 17 is spatially located between the inner sides 3a of the lateral portions 3. Each wheel 5, on the other hand, is arranged substantially facing a corresponding outer side 3b.

[0066] Therefore, the driving assembly 18 passes through the lateral portion 3 where the wheel 5 to be moved is arranged.

[0067] In particular, the lateral portion 3 defines at least one transit hole 19 traversed by the driving assembly 18.

[0068] Conveniently, the vehicle 1 comprises at least two motors 17 and at least two driving assemblies 18.

[0069] Specifically, each motor 17 is adapted to move a respective wheel 5 thanks to a corresponding driving assembly 18.

[0070] In more detail, each driving assembly 18 is adapted to pass through a corresponding lateral portion 3 from side to side to move a respective wheel 5. Appropriately, each lateral portion 3 defines a respective transit hole 19 for the corresponding driving assembly 18.

[0071] Conveniently, the supporting frame 2 defines a containment compartment 20 within which the motor 17 is arranged.

[0072] Specifically, the supporting frame 2 comprises a box-shaped body closed at the top by an enclosing body which defines the supporting plane 6.

[0073] Preferably, the supporting frame 2 defines at least one access port to the containment compartment 20 which port is arranged communicating with the transit hole 19. In this way, the motor 17 is mechanically connected to the driving assemblies 18 via the port.

[0074] Advantageously, the access port is cut laterally on the box-shaped body. Appropriately, the supporting frame 2 defines an access port for each motor 17. Conveniently, at least one of the lateral portions 3 defines at least one housing 21 which is adapted to contain, at least partly, the driving assembly 18. Specifically, the driving assembly 18 comprises at least one pair of gear wheels 22 contained within the housing 21.

[0075] Appropriately, each lateral portion 3 defines a corresponding housing 21 adapted to hold the pair of gear wheels 22 of a corresponding driving assembly 18.

[0076] According to one possible embodiment of the vehicle 1, the same is a wheelchair.

[0077] Preferably, the term wheelchair refers to a vehicle for transporting people with motor impairments, such as of the lower limbs.

[0078] It has in practice been ascertained that the described invention achieves the intended objects.

[0079] In particular, the fact is emphasized that the

coupling means allow the vehicle to be assembled easily, quickly and safely.

[0080] This is further promoted by the fact that the second coupling portion is made in a single body piece with the lateral portion.

[0081] In addition, this characteristic gives the vehicle special robustness and makes it less susceptible to wear and tear and maintenance and/or repair jobs than the electric vehicles of known type.

Claims

1. Electric vehicle (1) for micromobility comprising:

- at least one supporting frame (2) provided with two lateral portions (3), arranged opposite each other and each defining an inner side (3a) and an outer side (3b) substantially opposite each other;
- at least two wheels (5) mounted, opposite each other, on opposite sides of said supporting frame (2), each of said wheels (5) being arranged substantially where the outer side (3b) of a respective lateral portion (3) is located;
- at least one main body (7) provided with at least one seat (8) for the user of said vehicle (1) and with at least two lateral walls (9), arranged opposite each other and coupleable to said supporting frame (2);
- coupling means (10, 11) of said main body (7) to said supporting frame (2); **characterized by** the fact that said coupling means (10, 11) comprise at least a first coupling portion (10) made on one of said lateral walls (9) and at least a second coupling portion (11), coupleable to said first coupling portion (10) and made in a single body piece with one of said lateral portions (3).

2. Vehicle (1) according to claim 1, **characterized by** the fact that said main body (7) and said supporting frame (2) are mutually coupled movable by shifting thanks to said coupling means (10, 11).

3. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that:

- one of either said first coupling portion (10) or said second coupling portion (11) comprises at least one groove (12); and
- the other of either said first coupling portion (10) or said second coupling portion (11) comprises at least one abutment profile (16) conformed so as to be coupleable by shifting within said at least one groove (12).

4. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that said at least

one groove (12) and said at least one abutment profile (16) are substantially U-shaped.

5. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that one of either said first coupling portion (10) or said second coupling portion (11) comprises at least one protrusion (14) and by the fact that said at least one groove (15) is cut into said at least one protrusion (14).

6. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that said at least one protrusion (14) said at least one groove (12) are made in a single body piece.

7. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that said abutment profile (13) is made by material removal of said lateral wall (9) or of said lateral portion (3).

8. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that it comprises securing means (13, 14) of said at least one main body (7) and of said supporting frame (2), said securing means (13, 14) fastening, in use, the shift of said at least one main body (7) with respect to said supporting frame (2).

9. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that said securing means (13, 14) comprise at least one threaded element (14) and at least one corresponding threaded hole (15) adapted to receive said threaded element (14) and by the fact that said at least one threaded element (14) and said at least one corresponding threaded hole (15) are arranged on at least one of said two lateral walls (9) and on at least one of said lateral portions (3), respectively.

10. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that it comprises:

- at least one electric motor (17) to move at least one of said wheels (5);
- at least one motion driving assembly (18), placed between said at least one motor (17) and said at least one wheel (5), said at least one motor (17) imparting motion to said at least one wheel (5) by means of said at least one driving assembly (18),

said driving assembly (18) passing through at least one of said lateral portions (3) from side to side.

11. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that said supporting frame (2) defines a containment compartment (20) within which said at least one motor (17) is

arranged.

12. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that at least one of said lateral portions (3) defines at least one housing (21) which is adapted to contain, at least partly, said at least one driving assembly (18). 5
13. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that said supporting frame (2) defines at least one access port to the containment compartment (20) arranged communicating with said transit hole (18), said motor (17) being mechanically connected to said driving assemblies (18) via said port. 10 15
14. Vehicle (1) according to one or more of the preceding claims, **characterized by** the fact that it is a wheelchair. 20

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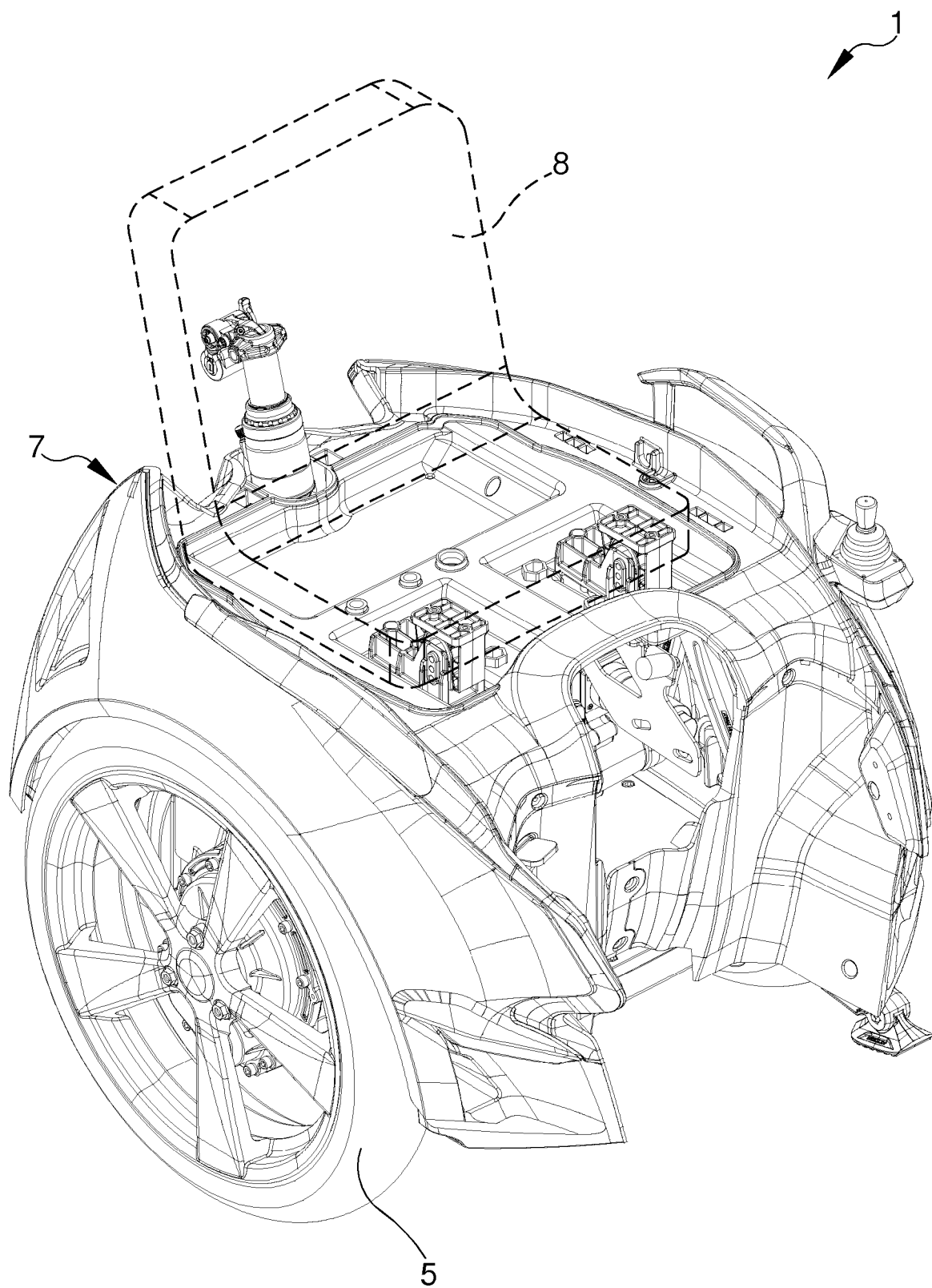
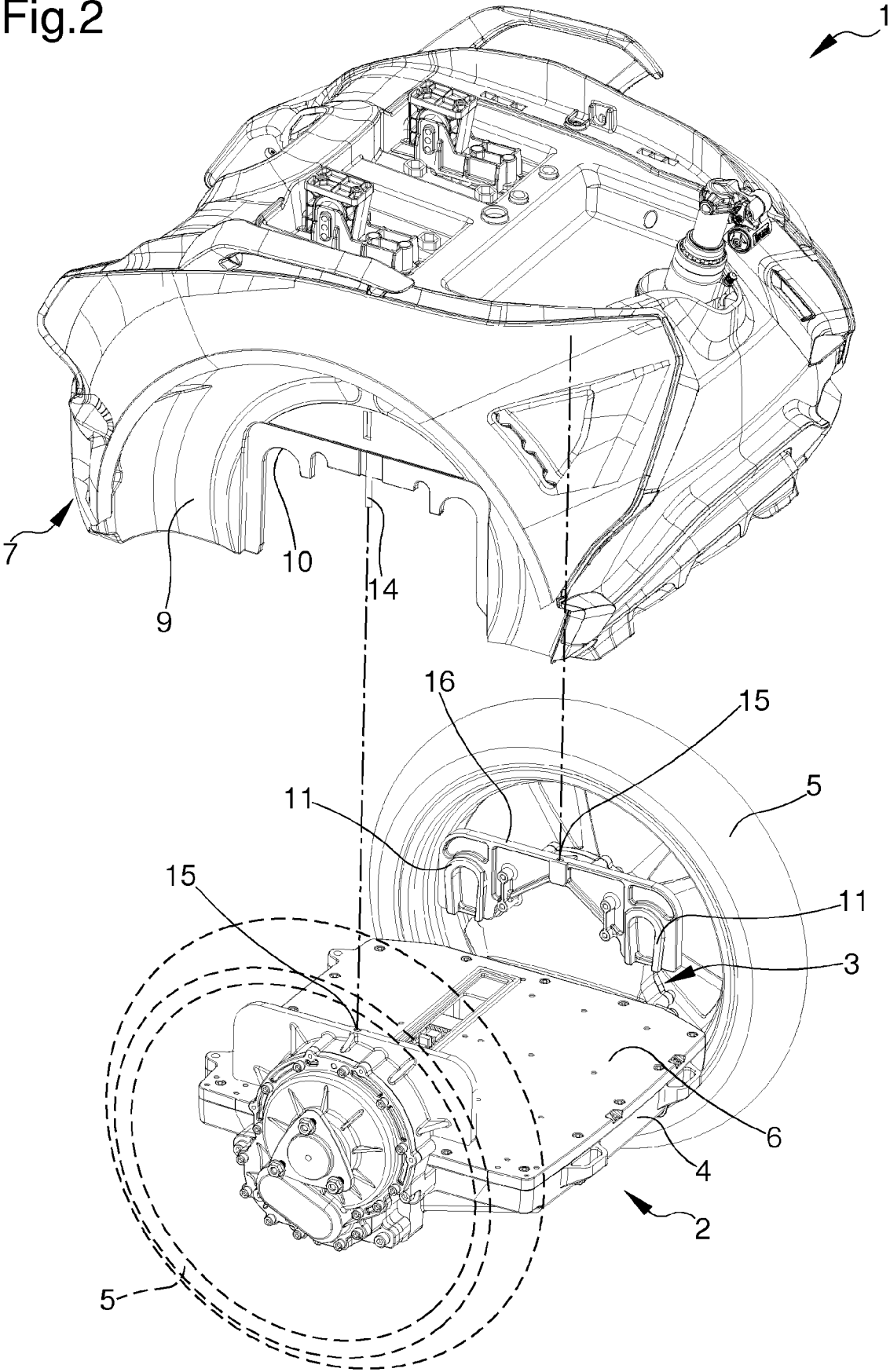


Fig.1

Fig.2



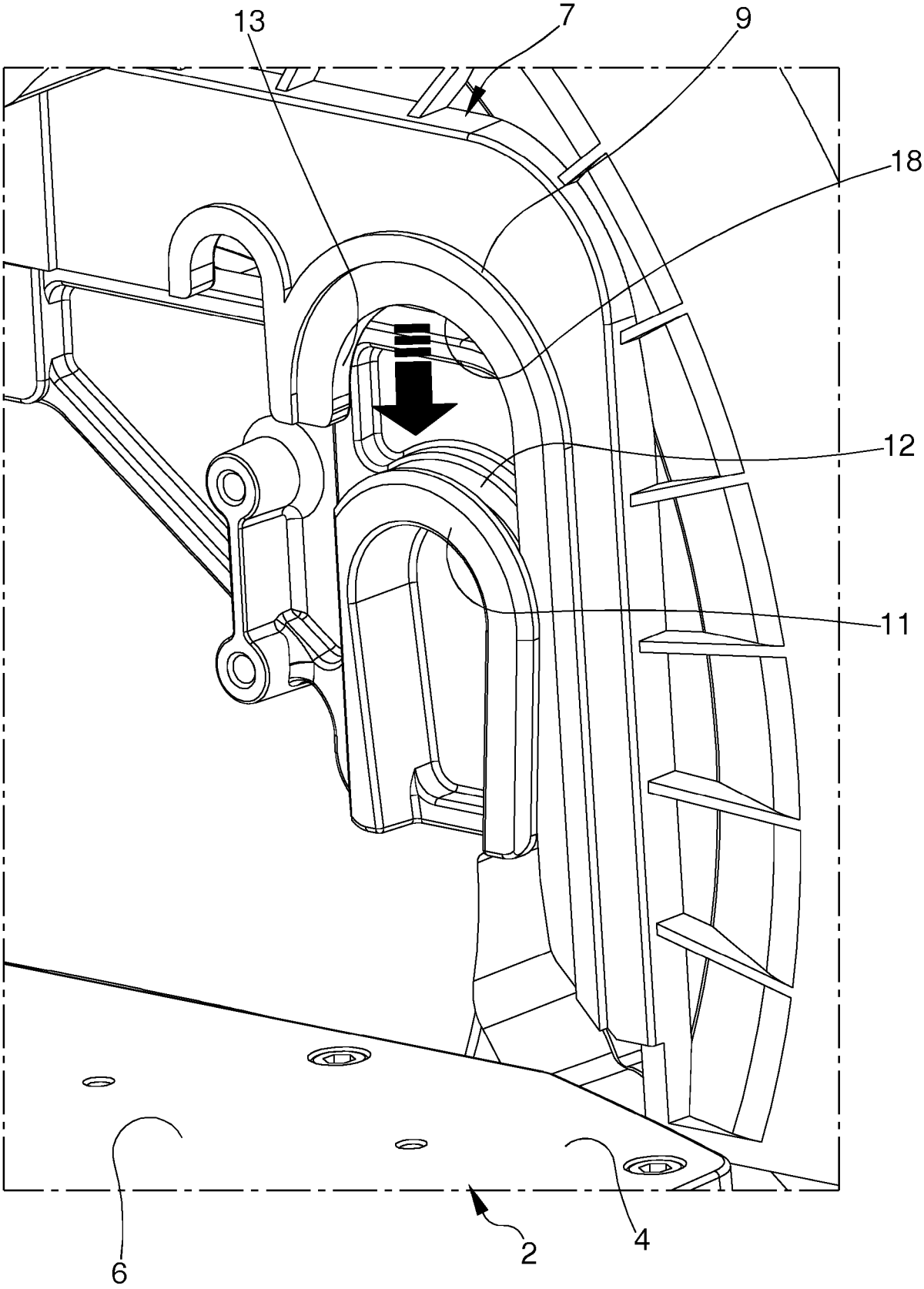


Fig.3

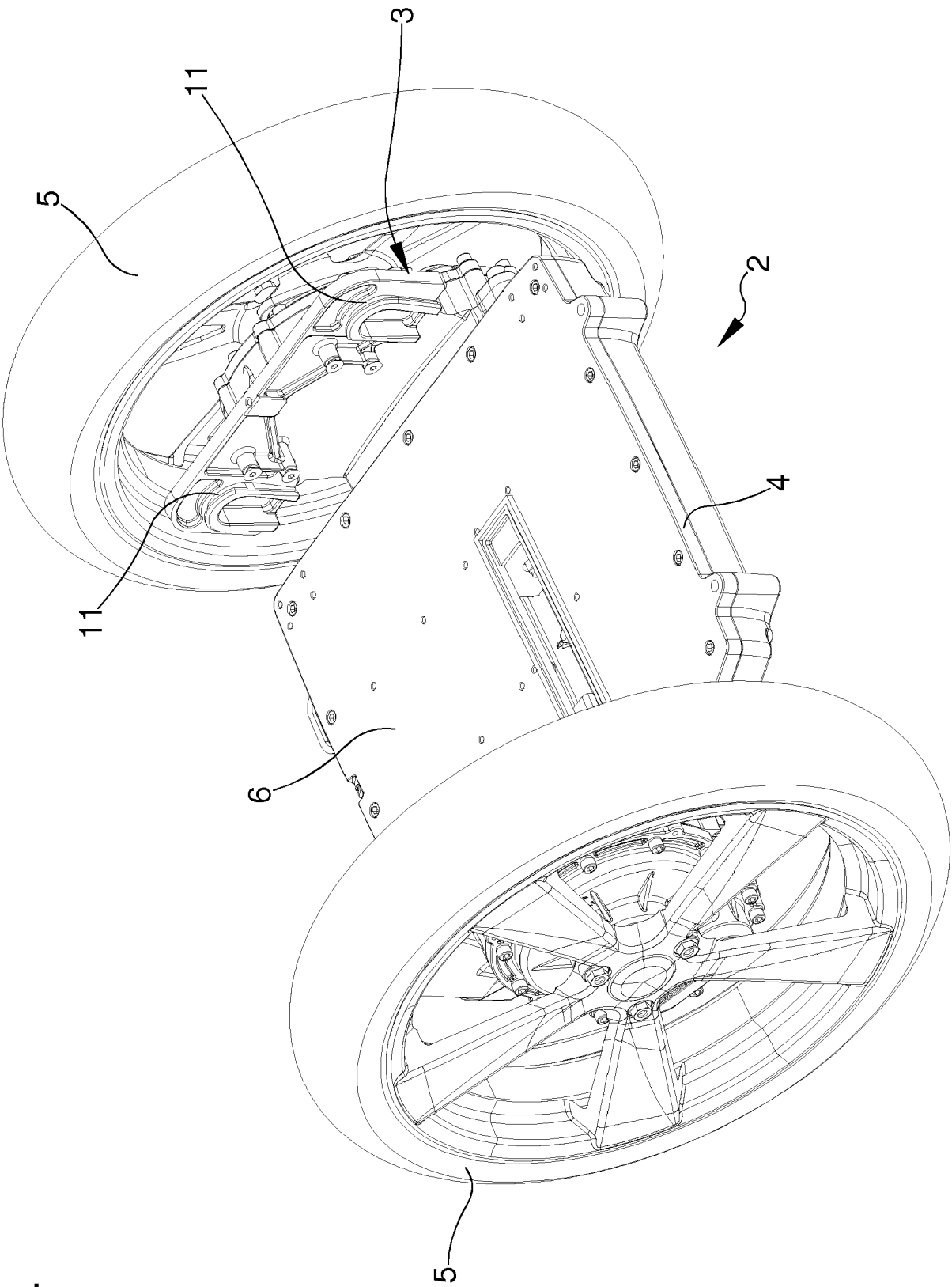


Fig.4

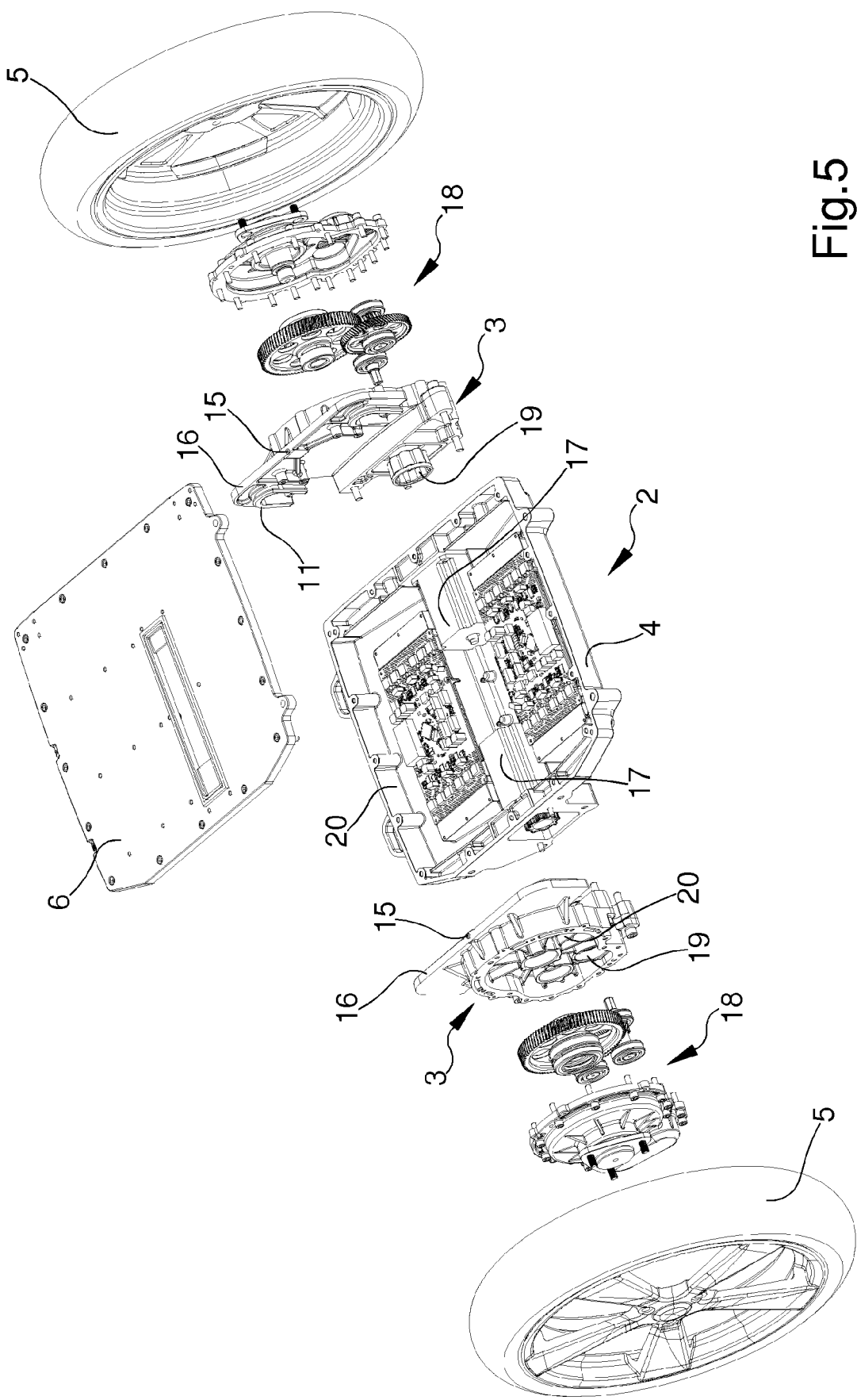


Fig.5



EUROPEAN SEARCH REPORT

Application Number

EP 23 18 2019

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 2 606 866 A2 (BRANDALE SAGL [CH]) 26 June 2013 (2013-06-26) * abstract; figures * -----	1-14	INV. A61G5/04 A61G5/10
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A	US 6 176 335 B1 (SCHAFFNER WALTER E [US] ET AL) 23 January 2001 (2001-01-23) * abstract; figures * -----	1-14	
			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		27 September 2023	Kousouretas, Ioannis
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	

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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

REFERENCES CITED IN THE DESCRIPTION

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