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

(11) **EP 4 335 421 A1**

(12) **EUROPEAN PATENT APPLICATION**

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

(21) Application number: **22194576.9**

(22) Date of filing: **08.09.2022**

(51) International Patent Classification (IPC):
A61G 3/06 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A61G 3/062

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Autolift S.r.l.**
46020 Pegognaga (MN) (IT)

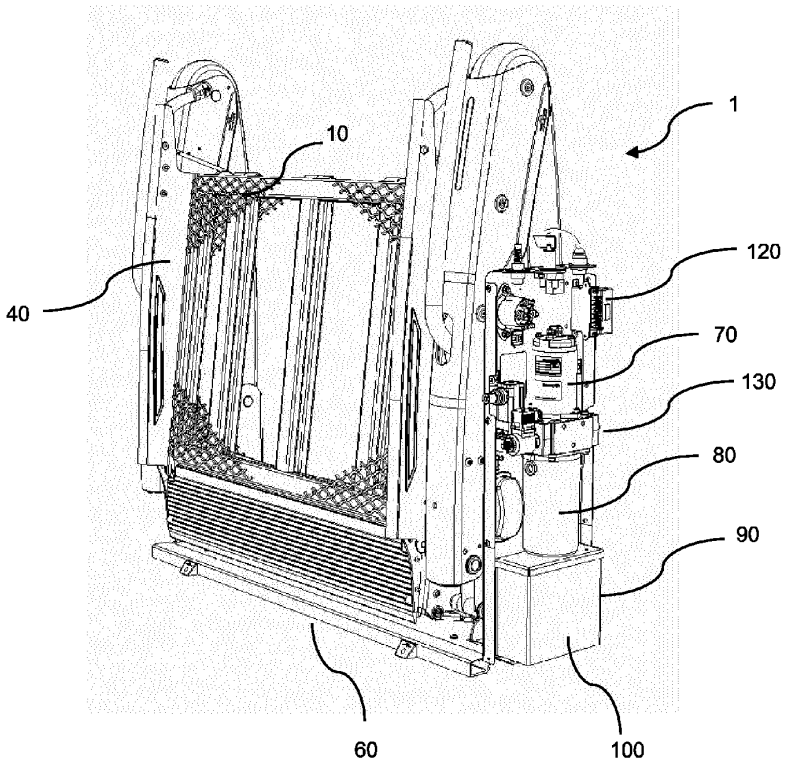
(72) Inventor: **Gallingani, Marco**
42124 Reggio Emilia (IT)

(74) Representative: **Epping - Hermann - Fischer**
Patentanwaltsgesellschaft mbH
Schloßschmidstraße 5
80639 München (DE)

(54) **WHEELCHAIR LIFT FOR OPERATION IN AN ELECTRIC VEHICLE**

(57) A wheelchair lift (1) for operation in an electric vehicle comprises a platform assembly (10) being configured to support a wheelchair, and an electric motor (70) to move the platform assembly (10) between an entry level position (L1) and a ground level position (L2). The entry level position (L2) is above the ground level position (L3). The wheelchair lift (1) comprises a battery (100) to provide the electric motor (70) with a power supply for operating the electric motor.

FIG 3A



EP 4 335 421 A1

Description

Technical Field

[0001] The disclosure relates to a wheelchair lift for operation in an electric vehicle that has to be supplied with power to raise a platform for supporting a wheelchair.

Background

[0002] Vehicular wheelchair lifts are utilized to facilitate lifting of wheelchairs into a vehicle. The wheelchair lift comprises a platform assembly to load a wheelchair. The platform assembly may be moved by an electric motor between a stowed position in which the platform assembly and other components of the wheelchair lift are collapsed, an entry level position in which the platform assembly is in an unfolded configuration so that the wheelchair placed in a vehicle can be loaded from the floor of the vehicle onto the platform assembly, and a ground level position in which the platform assembly is still unfolded and coplanar to the ground outside the vehicle so that the wheelchair placed on the platform assembly can be unloaded from the platform assembly.

[0003] The wheelchair lift is mounted in the vehicle by means of a mounting device which allows to fix the wheelchair lift to the floor of the vehicle. The electric motor of the wheelchair lift is usually electrically connected to a battery of the vehicle to provide the power supply for operating the electric motor. Regarding the increasing spread of electric mobility, the operation of a wheelchair lift mounted in an electric vehicle and driven by an electric motor consumes electric energy provided by the battery of the electric vehicle so that the cruising range of the vehicle will be reduced.

[0004] In some vehicles it is necessary to add a heavy battery to drive the lift, if it is not possible or not allowed to couple the electric motor of the wheelchair lift to the vehicle's battery. The disadvantages of this approach are the costs for the external battery, the time to install the external battery, and the space used for the external battery.

[0005] There is a need to provide a wheelchair lift for operation in an electric vehicle without significantly discharging the battery of the vehicle so that the cruising range of an electric vehicle is almost independent from the operation of the wheelchair lift is specified in claim 1.

Summary

[0006] An embodiment of a wheelchair lift for operation in an electric vehicle, wherein the charging state of the battery of the electric vehicle is not influenced or at least insignificantly influenced by the energy consumption of the electric motor of the wheelchair lift is specified in claim 1.

[0007] A wheelchair lift for operation in an electric vehicle comprises a platform assembly being configured to support a wheelchair, and an electric motor to move the platform assembly between an entry level position and a ground level position, wherein the entry level position is above the ground level position. The wheelchair lift comprises a battery to provide the electric motor with a power supply for operating the electric motor.

[0008] The wheelchair lift may comprise a hydraulic drive system comprising a hydraulic cylinder to raise the platform assembly from the ground level position to the entry level position, a tank to provide a hydraulic fluid, and a pump. The electric motor is configured to drive the pump to pump the hydraulic fluid from the tank to the hydraulic cylinder.

[0009] Due to its own battery, the wheelchair lift is equipped with an autonomous power supply, which allows the lift to be operated independently of an external power supply. Since no energy is taken from the vehicle battery to operate the wheelchair lift, the vehicle battery is not discharged when the platform is raised by the wheelchair lift's electric motor. Especially with an electric vehicle, the range achieved with one battery charge can thus be increased compared to a wheelchair lift that receives its energy supply from the vehicle battery.

[0010] According to a possible embodiment of the wheelchair lift, the lift comprises a casing for accommodating the battery. The casing comprises an insertion device having a cavity for receiving the battery. In particular, the casing may be configured for inserting the battery into the insertion device and for removing the battery from the insertion device.

[0011] The battery for providing the power supply for the electric motor of the wheelchair lift is a small battery compared to the vehicle battery, especially a battery of an electric vehicle. The battery can therefore be inserted into an opening of the insertion device. In addition, the battery is also significantly lighter than the heavy vehicle battery, so that it can be easily removed again from the slide-in compartment of the insertion device, for example, in order to be charged or replaced by a full battery. In addition, the lightweight battery causes only an insignificant increase in weight compared to a wheelchair lift without own power supply.

[0012] Another advantage is that the electric motor of the wheelchair lift no longer has to be connected to the vehicle battery by long cables that have to be laid in the vehicle especially for this purpose. Instead, the electric motor is connected via short cables to the battery, which is located in the immediate vicinity of the electric motor. In addition to the long cable that otherwise leads from the electric motor of the wheelchair lift to the vehicle battery, there is also no need for a fuse that is usually connected in a wheelchair lift without an integrated power supply between the electric motor of the wheelchair lift and the vehicle battery.

[0013] The power supply of the wheelchair lift can be very compact due to the small battery size. For example, the electric motor and the battery can be housed in a common housing. The cables connecting the battery to

the electric motor are also located within this housing. These cables are already installed by the manufacturer. The user can therefore put the wheelchair lift into operation immediately. The wheelchair lift only needs to be mechanically installed in the vehicle. On the other hand, cables for the power supply to the vehicle battery no longer need to be laid. Since an electrical installation, i.e. the connection of the electric motor of the lift to the vehicle battery or the installation of an external battery in the vehicle and the connection of the motor of the lift to the external vehicle battery, is no longer necessary after the lift has been mechanically installed in the vehicle, time can be saved for the installation and putting into operation of the lift.

[0014] According to a possible embodiment, the wheelchair lift comprises a charging port for externally charging the battery. The charging port may be fixed to the housing encasing the battery and the electric motor. The charging port can be used to charge the battery to operate the electric motor without the need to remove the battery from the housing and the slide-in compartment/cavity of the casing.

[0015] According to another possible embodiment, the wheelchair lift comprises a charging controller to control a charging process of the battery of the wheelchair lift. The charging controller is configured for receiving communication signals from the vehicle representing a status of the vehicle and components of the vehicle. The charging controller is configured for evaluating the communication signals and to control the charging process of the battery in dependence on the status of the vehicle and/or the status of the components of the vehicle.

[0016] The charging controller may thus activate the charging process of the battery, when the evaluation of the communication signals reveals that the battery of the vehicle is charged. While charging the vehicle battery of an electric vehicle at a charging station, the battery of the wheelchair lift can thus also be charged at the same time. One charging process can thus be used to charge both batteries.

[0017] According to another possible embodiment, the wheelchair lift may comprise an energy recovering system. The energy recovering system may be configured to provide a charging voltage to charge the battery of the wheelchair lift, when the platform of the wheelchair lift is lowered from the entry level position to the ground level position. Through the charging cycles during normal operation of the wheelchair lift, the battery of the wheelchair lift can be recharged again and again.

[0018] According to another possible embodiment of the wheelchair lift, the charging controller is configured to monitor the charging status of the battery. The charging controller is configured to operate the electric motor of the wheelchair lift by an external power supply, when it is detected by the charging controller that the charging status of the battery is below a threshold value. This means that the wheelchair lift battery can also be recharged while the vehicle is in motion, thus ensuring that the wheelchair lift is ready for operation, at least for emergencies, until the battery can be regularly recharged via the external charging port or can be replaced by a spare battery.

[0019] It is to be understood that both the forgoing general description and the following detailed description present embodiments and are intended to provide an overview or a framework for understanding the nature and character of the disclosure. The accompanying drawings are included to provide further understanding, and are incorporated into, and constitute a part of, this specification. The drawings illustrate various embodiments and, together with the description, serve to explain the principles and operation of the disclosed concepts.

Brief Description of the Drawings

[0020]

Figure 1 shows a transverse view of a wheelchair lift between an entry level position and a ground level position;

Figure 2 shows an electrical connection of an electric motor of a wheelchair lift to a vehicle battery;

Figure 3A shows a perspective view of a wheelchair lift with integrated power supply;

Figure 3B shows a side view of a wheelchair lift with integrated power supply;

Figure 4A shows a battery for providing power to a wheelchair lift mounted to the wheelchair lift;

Figure 4B shows a casing with an insertion device for receiving a battery to provide an integrated power supply for a wheelchair lift mounted to the wheelchair lift;

Figure 4C shows a casing with a cover for accommodating a battery to provide an integrated power supply for a wheelchair lift mounted to the wheelchair lift;

Figure 5A shows a casing with a cover, an insertion device for receiving a battery and a battery for providing an integrated power supply for a wheelchair lift;

Figure 5B shows an assembly of a casing and a battery encased in the casing to provide an integrated power supply for a wheelchair lift;

Figure 6A shows a wheelchair lift with a housing for accommodating an assembly of a casing and battery for providing an integrated power to a wheelchair lift;

Figure 6B shows a housing for accommodating an assembly of a casing and a battery to provide an integrated power supply for a wheelchair lift mounted to a wheelchair lift;

Figure 6C shows a transverse view of a wheelchair lift with a housing for accommodating an assembly of a casing and a battery to provide an integrated power supply for a wheelchair lift;

Figure 6D shows a perspective view of a wheelchair lift with a housing for accommodating an assembly of a casing and a battery to provide an integrated power supply for a wheelchair lift.

Detailed Description

[0021] Figure 1 shows an embodiment of a wheelchair lift 1 to be mounted on a floor of a vehicle by a mounting device 60. The wheelchair lift 1 is configured to lower a wheelchair from an entry level position L1 to a ground level position L2, and to raise a wheelchair from ground level position L2 into a vehicle at an entry level position L1. The wheelchair lift 1 comprises a platform assembly 10 to load the wheelchair. The platform assembly 10 comprises at least one plate having a platform to support the wheelchair. The platform assembly 10 may comprise a single plate being constructed as a component in one piece. According to the exemplified embodiment of the wheelchair lift 1 illustrated in Figure 1, the platform assembly 10 comprises an inner plate 11 and an outer plate 12 to support the wheelchair. The outer and inner plates 11, 12 are pivotably arranged at a hinge between the plates.

[0022] The wheelchair lift 1 further comprises an electric motor 70 which is housed in a housing 30. The electric motor 70 is configured to move the platform assembly 10 between the ground level position L1 and the entry level position L2. The platform assembly 10 is mechanically coupled to the electric motor 70 by a lifting assembly 20 and a holding device 40. The lifting assembly 20 is configured to raise and lower the holding device 40 and the platform assembly 10 between the entry level position L1 and the ground level position L2. The holding device 40 is configured to hold the platform assembly 10 in a horizontal position during movement of the platform.

[0023] The lifting device 20 comprises may comprise a parallelogram actuating linkage structure having a top actuating arm 21 and a bottom actuating arm 22 which are located substantially parallel to each other. The top actuating arm 21 and the bottom actuating arms 22 may be coupled by a hydraulic cylinder 23 to lower and raise the top and bottom actuating arms 21, 22. The top and bottom actuating arms may be pivotally coupled to the holding device 40 and a frame 50 of the wheelchair lift.

[0024] The holding device 40 comprises a holding arm having an upper and a lower portion. The upper portion of the holding arm is pivotably coupled to the lifting assembly 20. The lower portion of the holding arms is formed as a substantially vertical arm that is pivotably coupled to the platform assembly 10, particularly to the inner plate 11 of the platform assembly 10.

[0025] Figure 1 shows the wheelchair lift 1 in an unfolded configuration between the entry level position L1, for example a position having the same height as the floor of a vehicle/car in which the wheelchair lift is mounted and the ground level position L2 which is below the entry level position, for example a level outside the vehicle being planar to the ground to load the wheelchair onto the platform assembly 10 or to unload the wheelchair lift from the platform assembly. In the entry level position the inner and outer plates 11, 12 are unfolded and the upper surfaces of the inner and outer plates form a continuous area to contact a floor in a vehicle to load/unload the wheelchair. In the ground level position, the inner and outer plates 11, 12 of the platform assembly are planar with the ground.

[0026] In order to raise a wheelchair loaded on the platform from the ground level position L2 to the entry level position L1, the top actuating arm 21 and the bottom actuating arm 22 of the lifting assembly 20 are slanted so that the unfolded platform assembly 10 is moved by the holding device 40 from the ground level position L2 to the entry level position L1. The platform assembly can be moved beyond the entry position L1 to a stowed position in which the inner and outer plates 11, 12 of the platform assembly are folded/collapsed. The stowed/state of the wheelchair lift is illustrated, for example in Figure 3A.

[0027] The movement of the top and bottom actuating arms is controlled by the hydraulic cylinder 23 which is part of a hydraulic drive system. The hydraulic drive system of the wheelchair lift 1 comprises a fluid circuit being embodied to transport a hydraulic fluid, for example a hydraulic oil, from a tank to the hydraulic cylinder 23 to raise the platform assembly 10 from the ground level position L2 to the entry level position L1. The hydraulic fluid flow between the tank and the hydraulic cylinder 23 is effected by the electric motor 70, which drives a pump in the hydraulic drive system for this purpose.

[0028] A conventional wheelchair lift must thus be connected mechanically to the vehicle chassis and electrically to the vehicle battery of the vehicle in which the lift is installed. For the power supply of the electric motor 70, a long cable often has to be pulled from the rear area of the vehicle, for example the tailgate of the vehicle in the vicinity of which the wheelchair lift is installed, to the front to the engine compartment in which the vehicle battery 2 is located. In addition, the electrical connection between the vehicle battery 2 and the electric motor 70 must be protected by a fuse 4. The installation of the wheelchair lift in a vehicle is therefore associated with increased effort.

[0029] A further disadvantage is that the electric motor 70 draws energy from the vehicle battery 2. Particularly in the case of an electrically powered vehicle, this short-

ens the range until the vehicle battery has to be next charged. In the worst case, the power supply of the wheelchair lift via the vehicle battery is not permitted at all by the manufacturer of the electric vehicle.

[0030] Figure 3A and 3B shows a perspective view and a side view of a wheelchair lift 1 in a stowed position/state. The wheelchair lift 1 comprises a platform assembly 10 being configured to support a wheelchair. The wheelchair lift 1 further comprises an electric motor 70 to move the platform assembly 10 between an entry level position and a ground level position which is below the entry level position. The wheelchair lift 1 comprises a battery 100 to provide the electric motor 70 with a power supply for operating the electric motor.

[0031] The wheelchair lift comprises a mounting device 60 for mounting the wheelchair lift 1 to a vehicle. The vehicle usually has a vehicle battery 2, as illustrated in Figure 2, and at least one electrical load which is power supplied by the vehicle battery 2. If the vehicle is constructed as an electric vehicle, the electrical load can be, for example, an electric motor for driving the vehicle, which is supplied with energy from the vehicle battery. The battery 100 of the wheelchair lift 1 is different from a battery 2 of the vehicle for providing power supply to the at least one electrical load. The wheelchair lift is thus equipped with an integrated power supply, i.e. an own power supply, to operate the electric motor 70.

[0032] The battery 100 may be specifically designed to power the electric motor 70. This may provide a lightweight battery compared to the vehicle battery. For example, lithium type battery cells, such as Lithium 20A 2500 mAh or Lithium FE PO 20A 2500 mAh, may be used. The battery may be designed to provide a voltage of 3.8V/3.3V. Regarding the battery package, a 3S3P or 4S4P type battery pack can be used.

[0033] Since no power needs to be drawn from the vehicle battery to operate the wheelchair lift 1, the operation of the wheelchair lift, especially when installed in an electric vehicle, does not negatively affect the range of the vehicle battery. Since the wheelchair lift can be operated independently from the vehicle with its own power supply, the wheelchair lift can be installed in an electric vehicle, even if a manufacturer prohibits a power draw from the vehicle battery.

[0034] Moreover, since an electrical connection to the vehicle battery does not have to be installed, the wheelchair lift can still be installed in a vehicle at a later date without much effort. Only a relatively short cable has to be provided for the electrical connection between the motor 70 and the vehicle frame. The electrical connection of the electric motor 70 to the vehicle battery 100 is already included in the scope of delivery of the wheelchair lift, so that an end user only has to install the wheelchair lift mechanically in his vehicle.

[0035] Figure 4A shows an example of the battery 100 being mounted on a frame 50 of the lift below oil tank 80. However, the battery 100 can also be mounted at another location on the frame 50 of the wheelchair lift. The battery 100 comprises terminals 101 and 102 to electrically connect the battery 100 to the electric motor. In contrast to a vehicle battery, the battery 100 can be designed to be very compact specifically for supplying energy to the electric motor 70. For example, the battery can have a length of 350mm-360mm, a width of 170mm to 180mm and a height of 180mm to200 mm. According to one possible embodiment, the battery has the dimensions 353mm (length) × 175mm (width) × 190mm (height). The weight of the battery may be between 15kg - 30kg, for example.

[0036] Figure 4B shows a possible embodiment of the wheelchair lift 1 comprising a casing 90 for accommodating the battery 100. The casing 90 may comprises an insertion device/slide-in device 91 having a cavity for receiving the battery 100. The casing 90 is configured for inserting the battery 100 into the insertion device 91 and for removing the battery 100 from the insertion device 91. In the embodiment shown, the battery 100 may be housed in the casing 90 attached to the frame 50 of the wheelchair lift. The battery can thus be easily removed from the casing's insertion/slide-in device 91, for example, to replace an empty battery with a fully charged battery.

[0037] Figure 4C shows the casing 90 comprising a cover 92 for closing the cavity of the insertion device 91. In this way, the casing 90 is closed around the battery 100 and thus protects the battery 100 located inside the casing from contamination. The battery 100 is thus protected if, for example, oil should leak from the oil tank 80.

[0038] Figure 5A shows the cover 92, the battery 100 and the insertion device 91 of the casing 90 with a flange 93 for attaching the insertion device 91 to the frame of the wheelchair lift. The wheelchair lift with integrated power supply may comprises a cable 111 to provide an electrical connection between the electric motor 70 and terminal 101 of the battery 100 to provide a supply potential. The wheelchair lift further comprises a cable 112 to provide an electrical connection between the electric motor 70 and a terminal 102 of the battery to provide a ground potential.

[0039] According to a possible embodiment, wheelchair lift may comprise a charging port 110 for externally charging the battery 100. 10. The wheelchair lift 1 comprises a cable 113 for electrically connecting the battery 100 to the charging port 110. In the embodiment shown, the battery 100 can be charged via the charging port without the need to remove the battery from the casing 90.

[0040] Figure 5B shows a battery assembly of the battery 100 arranged inside the casing 90. The cover 92 has a respective opening for each of the cables 111, 112 and 113 to pass through.

[0041] Figure 6A shows a housing 30 for housing the electric motor 70 and the battery 100 or an assembly of the casing 90 and battery 100 for providing integrated power to the electric motor 70. The charging port 110 is fixed to the housing 30, and is thus accessible from the outside for charging purposes of the battery 100.

[0042] Figure 6B illustrates the assembly of the battery unit comprising casing 90 and battery 100 to the frame 50 of the wheelchair lift. The casing 90 can be attached to the frame 50 of the wheelchair lift by means of the side flanges of the casing. Then the motor unit, the hydraulic drive system and the battery unit comprising casing 90 and battery 100 are covered by the outer housing 30.

[0043] Figure 6C and 6D show a transverse view and a perspective view of the wheelchair lift 1 with the housing 30 for accommodating the electric motor, the hydraulic drive system and the battery 100 or an assembly of the casing 90 and the battery 100 to provide an integrated power supply for operating the electric motor or the hydraulic drive system of the wheelchair lift.

[0044] The use of the concept of an autonomous, own energy supply for a wheelchair lift with integrated battery is not limited to the embodiment of the wheelchair lift as shown in figures 6A-6D. The concept of an integrated energy supply with its own battery can also be used for wheelchair lifts of other configurations, for example wheelchair lifts configured as cassette lifts or bus lifts.

[0045] Referring to Figures 3A and 3B, the wheelchair lift 1 may comprise a charging controller 120 to control a charging process of the battery 100. The charging controller 120 is configured for receiving communication signals from the vehicle representing a status of the vehicle and/or components of the vehicle. For this purpose, the controller may be connected to the vehicle or a control unit of the vehicle, for example, via wiring or a can bus or via Bluetooth. The controller can, for example, receive communication signals via such a connection, which provide information about vehicle function, such as the application of a brake, the speed of the vehicle or a battery charge of the vehicle battery. The charging controller 120 may be configured for evaluating the communication signals and to control the charging process of the battery 100 in dependence on the status of the vehicle and/or the status of the components of the vehicle.

[0046] According to a possible embodiment of the wheelchair lift, the charging controller 120 may be configured to activate the charging process of the battery 100, when the evaluation of the communication signals reveals that the battery 2 of the vehicle is charged.

[0047] Referring again to Figures 3A and 3B, according to another possible embodiment, the wheelchair lift 1 may comprise an energy recovering system 130 being configured to provide a charging voltage to charge the battery 100, when the platform 10 is lowered from the entry level position to the ground level position.

[0048] According to another embodiment of the wheelchair lift, the charging controller 120 may be configured to monitor the charging status of the battery 100. The charging controller 120 is configured to operate the electric motor 70 by an external power supply, when it is detected by the charging controller 120 that the charging status of the battery 100 is below a threshold value. If the charging controller 70 determines that the battery 100 is already far discharged, a vehicle power system may act as a backup system to provide the missing power to operate the electric motor 70. In this embodiment, the battery 100 or electric motor 70 would need to be electrically connected to the vehicle power system, for example, the vehicle battery.

List of reference signs

[0049]

1	wheelchair lift
L1	entry level position
L2	ground level position
2	vehicle battery
3, 4	cable
5	fuse
10	platform assembly
11	inner plate
12	outer plate
20	lifting assembly
21	top actuating arm
22	bottom actuating arm
23	hydraulic cylinder
30	housing
40	holding device
50	frame
60	mounting device
70	electric motor
80	tank
90	casing
91	insertion device
92	cover
93	flange
100	battery
101, 102	terminal
110	charging port
120	charging controller
121	impeller wheel
130	energy recovering system

Claims

1. A wheelchair lift for operation in an electric vehicle, comprising:

- a platform assembly (10) being configured to support a wheelchair
- an electric motor (70) to move the platform assembly (10) between an entry level position (L1) and a ground level position (L2), wherein the entry level position (L2) is above the ground level position (L3),
- a battery (100) to provide the electric motor (70) with a power supply for operating the electric motor.

2. The wheelchair lift of claim 1, comprising:

a mounting device (60) for mounting the wheelchair lift (1) to a vehicle having a least one electrical load, wherein the battery (100) of the wheelchair lift (1) is different from a battery (2) of the vehicle for providing power supply to the at least one electrical load.

3. The wheelchair lift of claim 1 or 2, comprising:

- a first cable (111) to provide an electrical connection between the electric motor (70) and a first terminal (101) of the battery (100) to provide a supply potential,
- a second cable (112) to provide an electrical connection between the electric motor (70) and a second terminal (102) of the battery to provide a ground potential.

4. The wheelchair lift of any of the claims 1 to 3, comprising:
a housing (30) for housing the battery (100) and the electric motor (70).

5. The wheelchair lift of any of the claims 1 to 4, comprising:

- a casing (90) for accommodating the battery (100),
- wherein the casing (90) comprises an insertion device (91) having a cavity for receiving the battery (100).

6. The wheelchair lift of claim 5,
wherein the casing (90) is configured for inserting the battery (100) into the insertion device (91) and for removing the battery (100) from the insertion device (91).

7. The wheelchair lift of claim 5 or 6,
wherein the casing (90) comprises a cover (92) for closing the cavity.

8. The wheelchair lift of any of the claims 5 to 7,
wherein the casing (90) is housed in the housing (30).

9. The wheelchair lift of any of the claims 3 to 8, comprising:

- a charging port (110) for externally charging the battery (100),
- a third cable (113) for electrically connecting the battery (100) to the charging port (110),
- wherein the charging port (110) is fixed to the housing (30) .

10. The wheelchair lift of claim 9,
wherein the cover (92) has a respective opening for each of the first, second and third cable (111, 112, 113) to pass through.

11. The wheelchair lift of any of the claims 1 to 10, comprising:

- a hydraulic cylinder (23) to raise the platform assembly (10) from the ground level position (L2) to the entry level position (L1),
- a tank (80) to provide a hydraulic fluid,
- a pump (130),
- wherein the electric motor (70) is configured to drive the pump to pump the hydraulic fluid from the tank (80) to the hydraulic cylinder (23).

12. The wheelchair lift of any of the claims 1 to 11, comprising:

- a charging controller (120) to control a charging process of the battery (100),
- wherein the charging controller (120) is configured for receiving communication signals from the vehicle representing a status of the vehicle and components of the vehicle,
- wherein the charging controller (120) is configured for evaluating the communication signals and to control the charging process of the battery (100) in dependence on the status of the vehicle and/or the status of the components of the vehicle.

13. The wheelchair lift of the claims 12,
wherein the charging controller (120) is configured to activate the charging process of the battery (100), when the evaluation of the communication signals reveals that the battery (2) of the vehicle is charged.

14. The wheelchair lift of any of the claims 1 to 13, comprising:
an energy recovering system (130) being configured to provide a charging voltage to charge the battery (100), when the platform (10) is lowered from the entry level position (L1) to the ground level position (L2).

15. The wheelchair lift of any of the claims 1 to 14,

- wherein the charging controller (120) is configured to monitor the charging status of the battery (100),
- wherein the charging controller (120) is configured to operate the electric motor (70) by an external power supply, when it is detected by the charging controller (120) that the charging status of the battery (100) is below a threshold value.

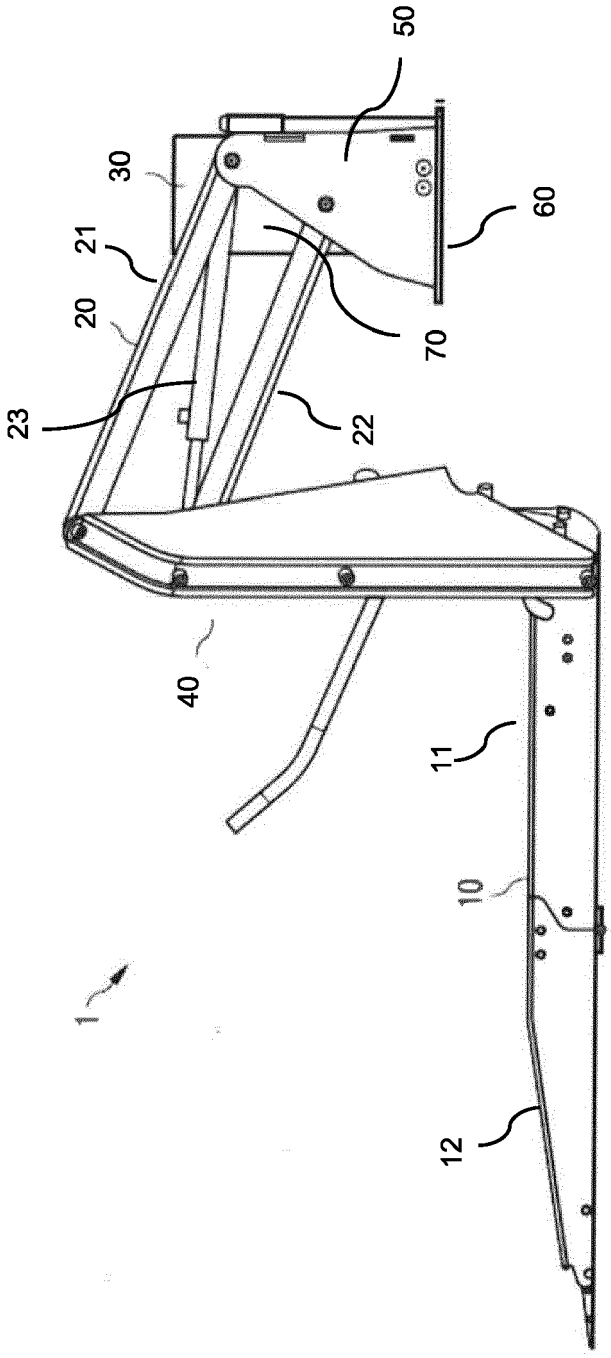


FIG 1

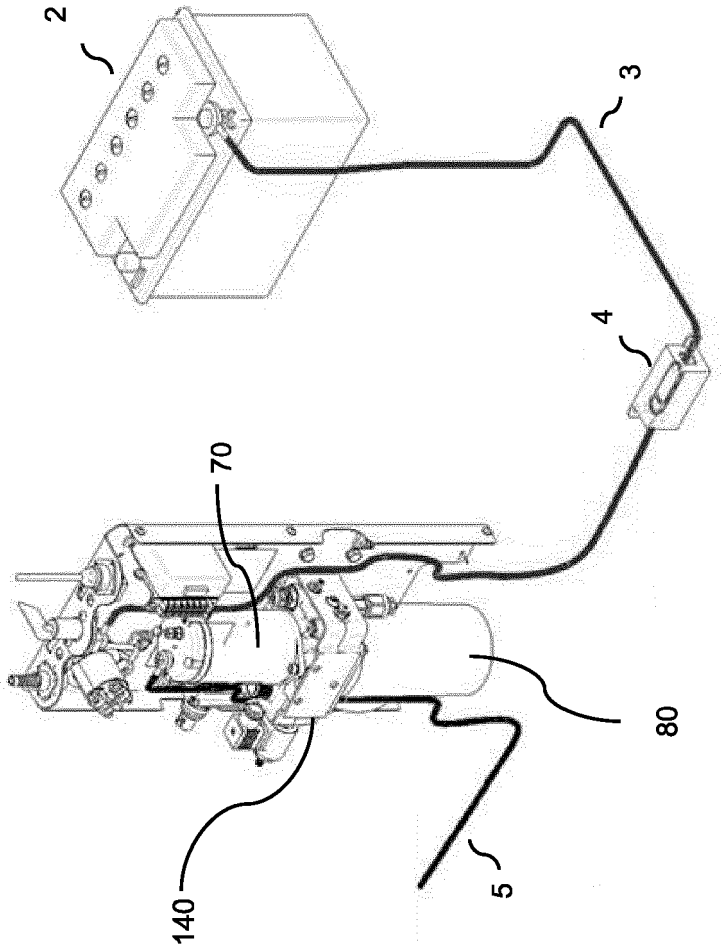


FIG 2

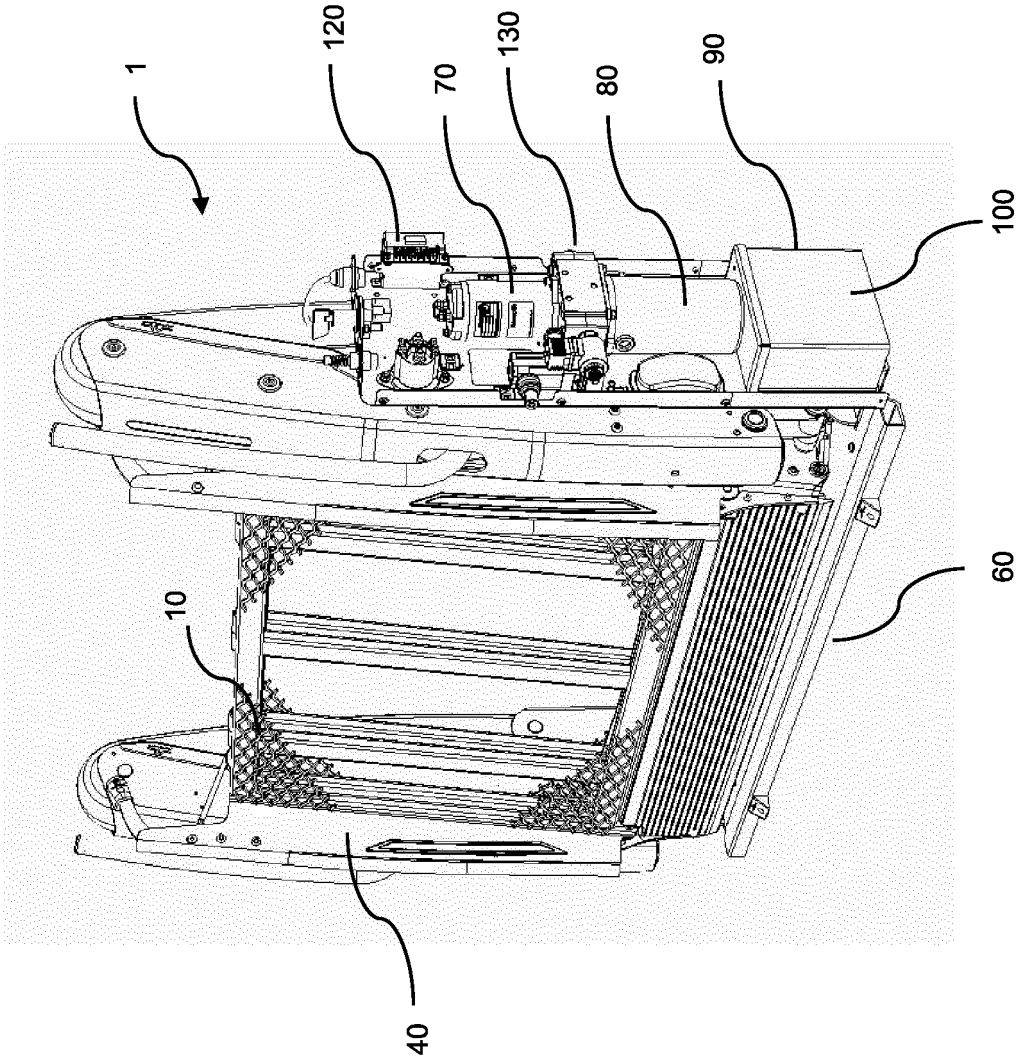


FIG 3A

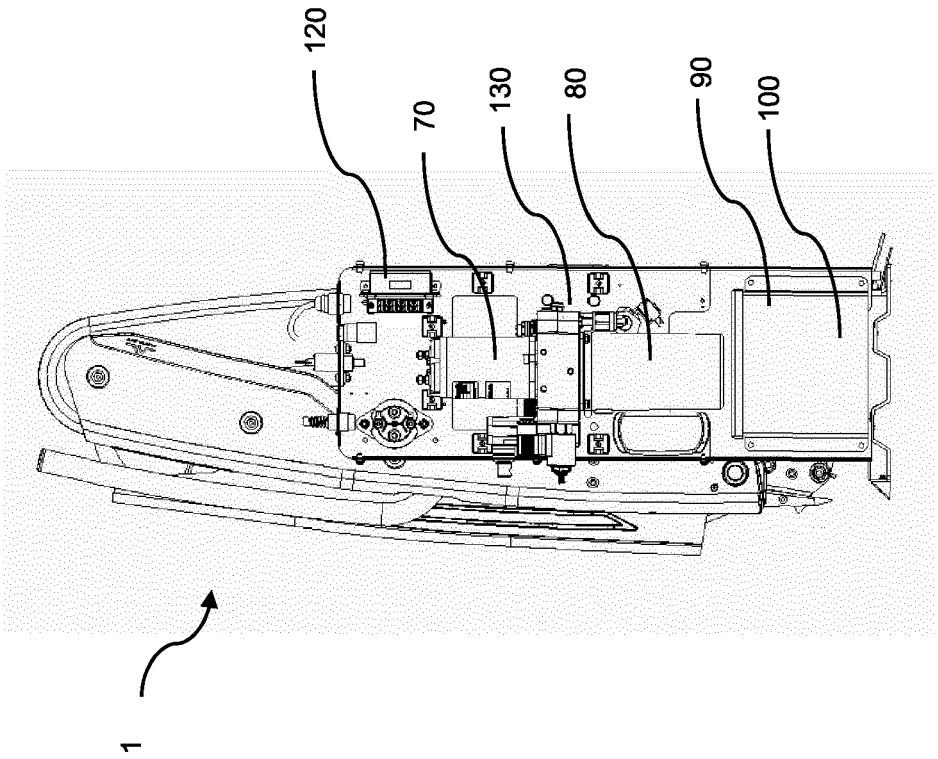


FIG 3B

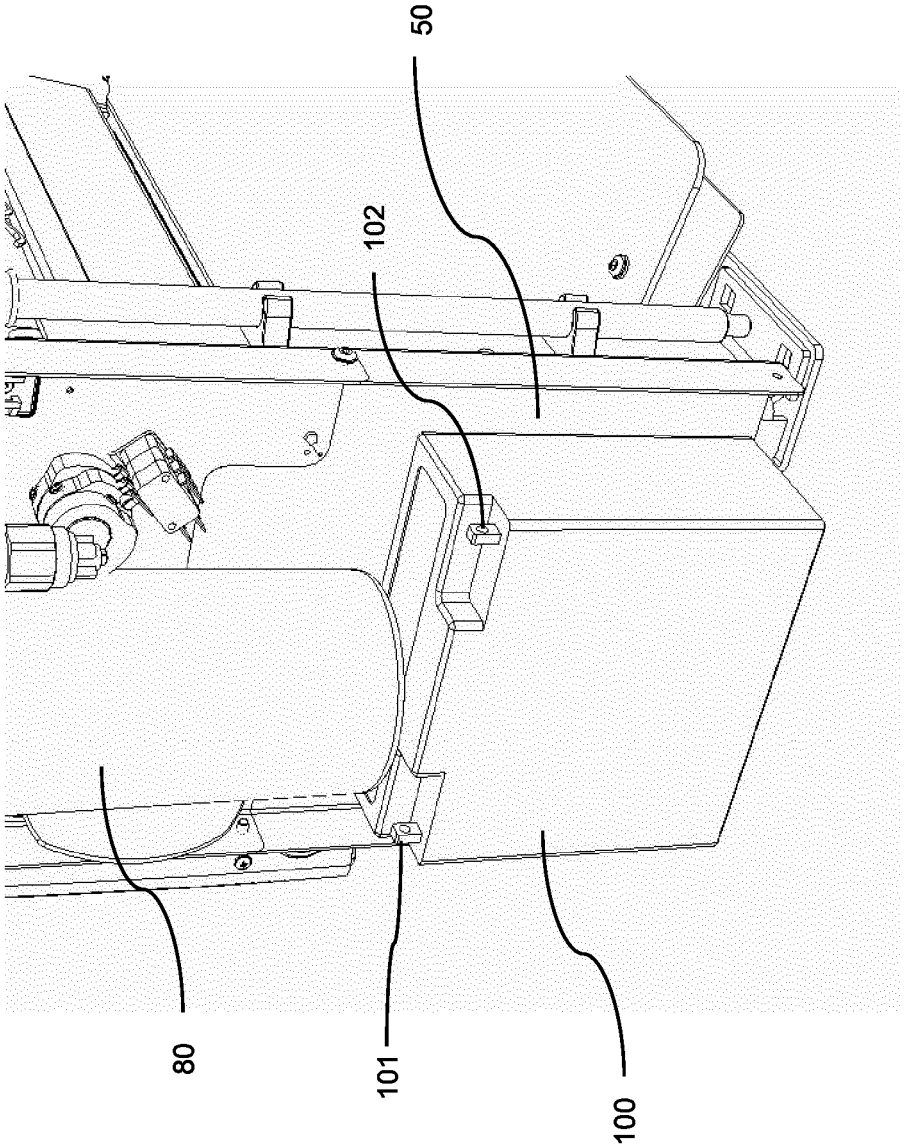


FIG 4A

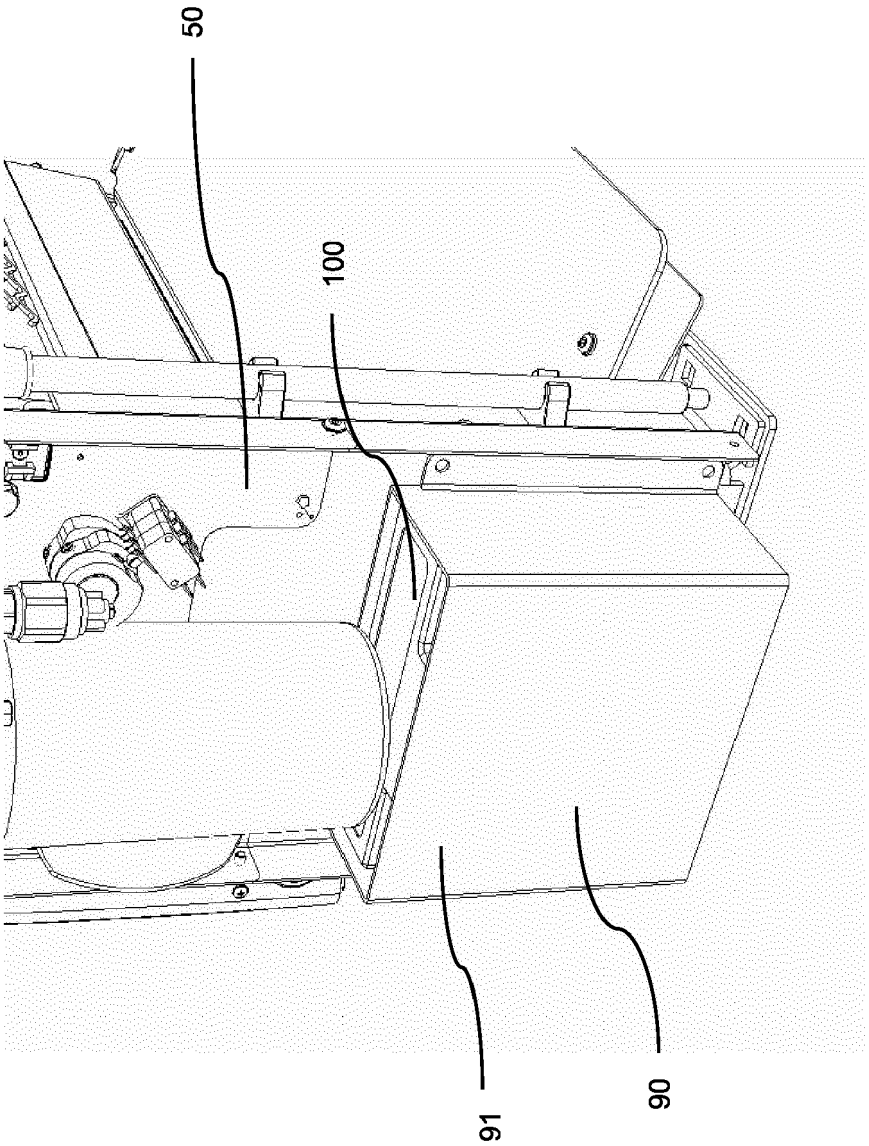


FIG 4B

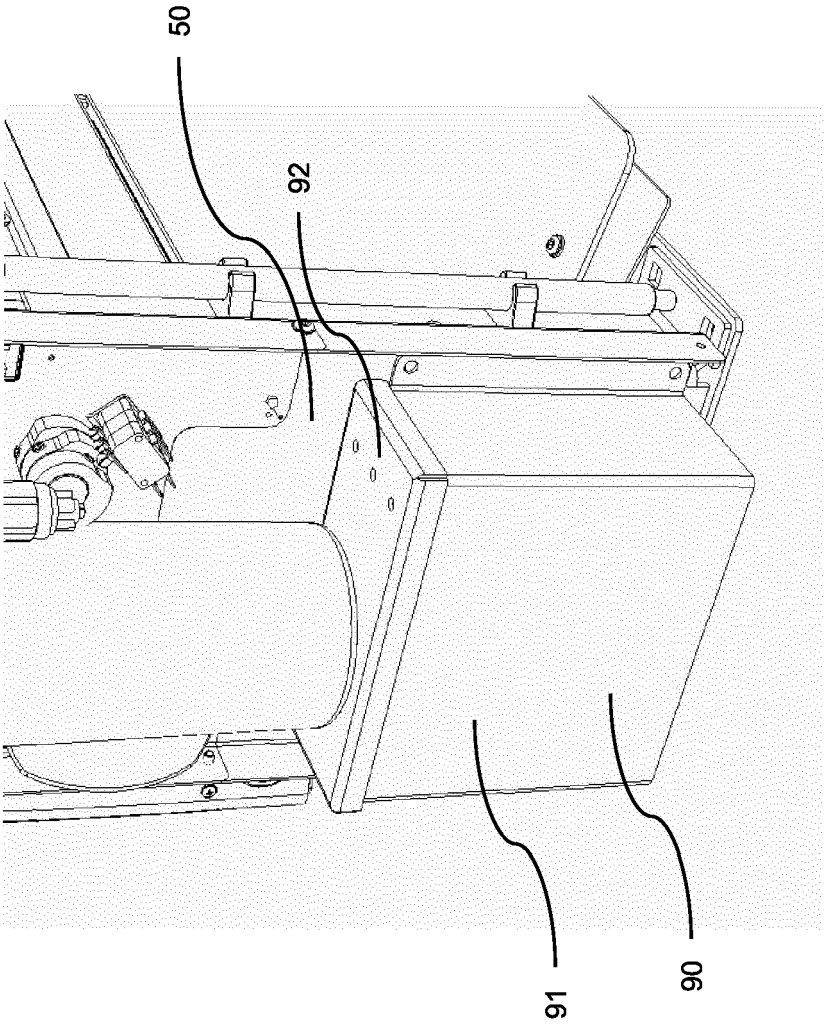


FIG 4C

FIG 5B

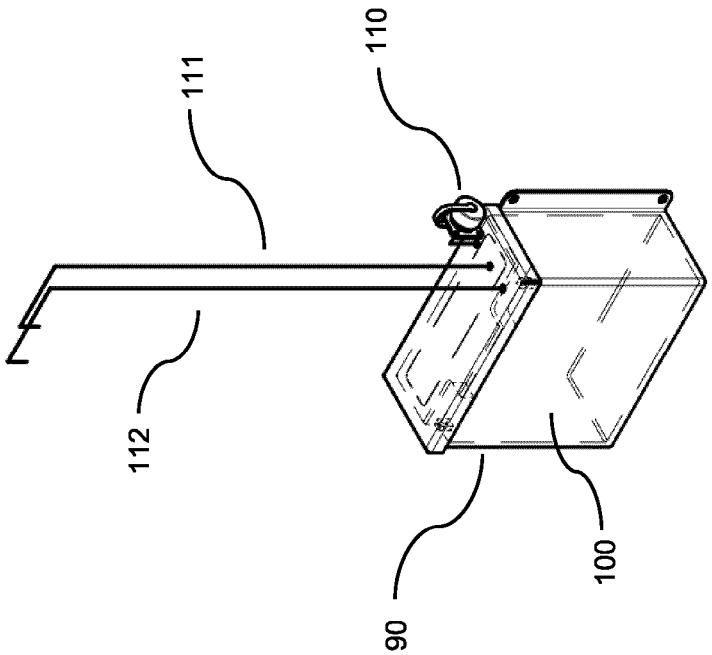
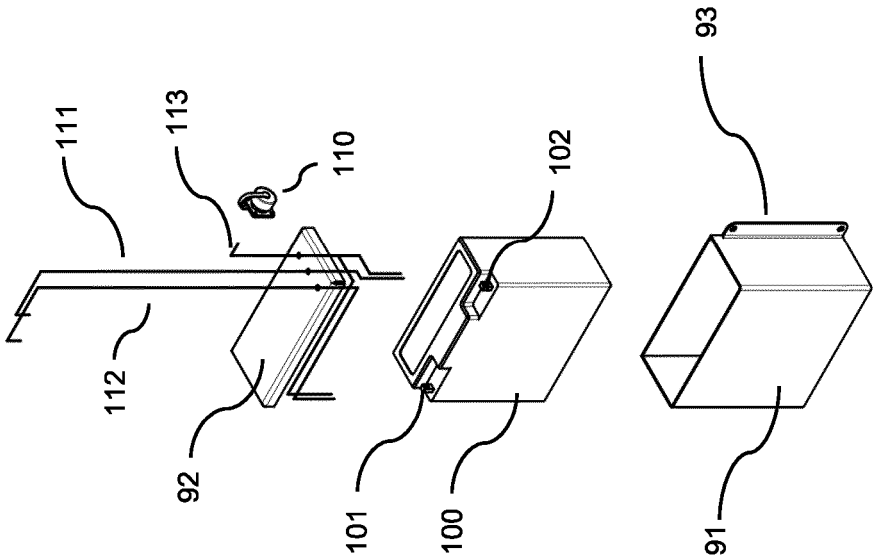


FIG 5A



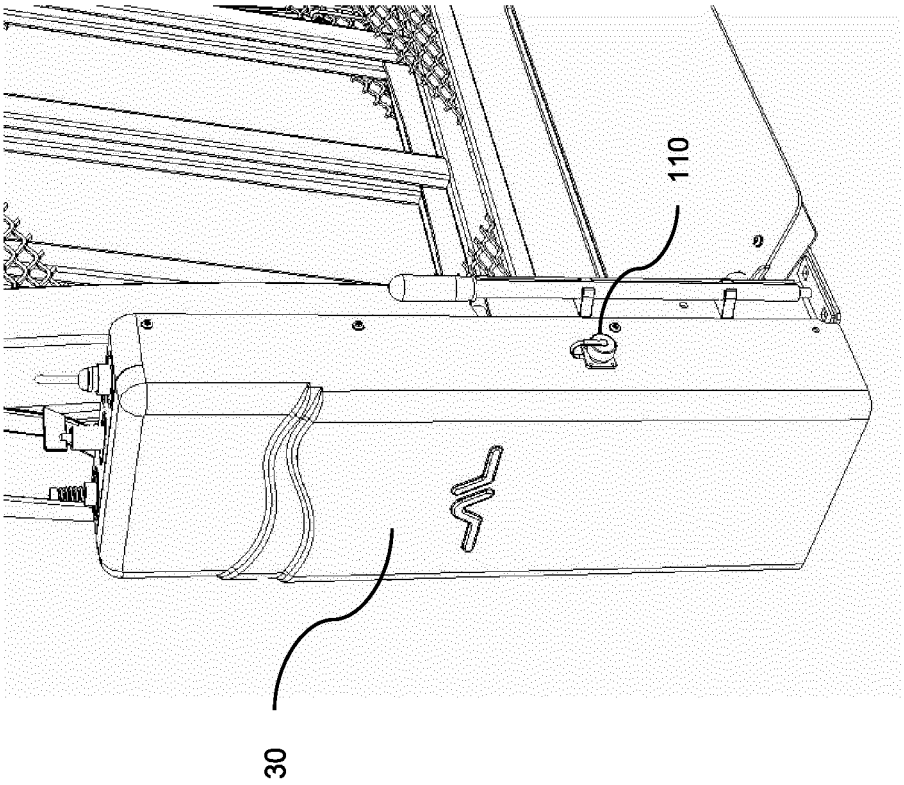


FIG 6A

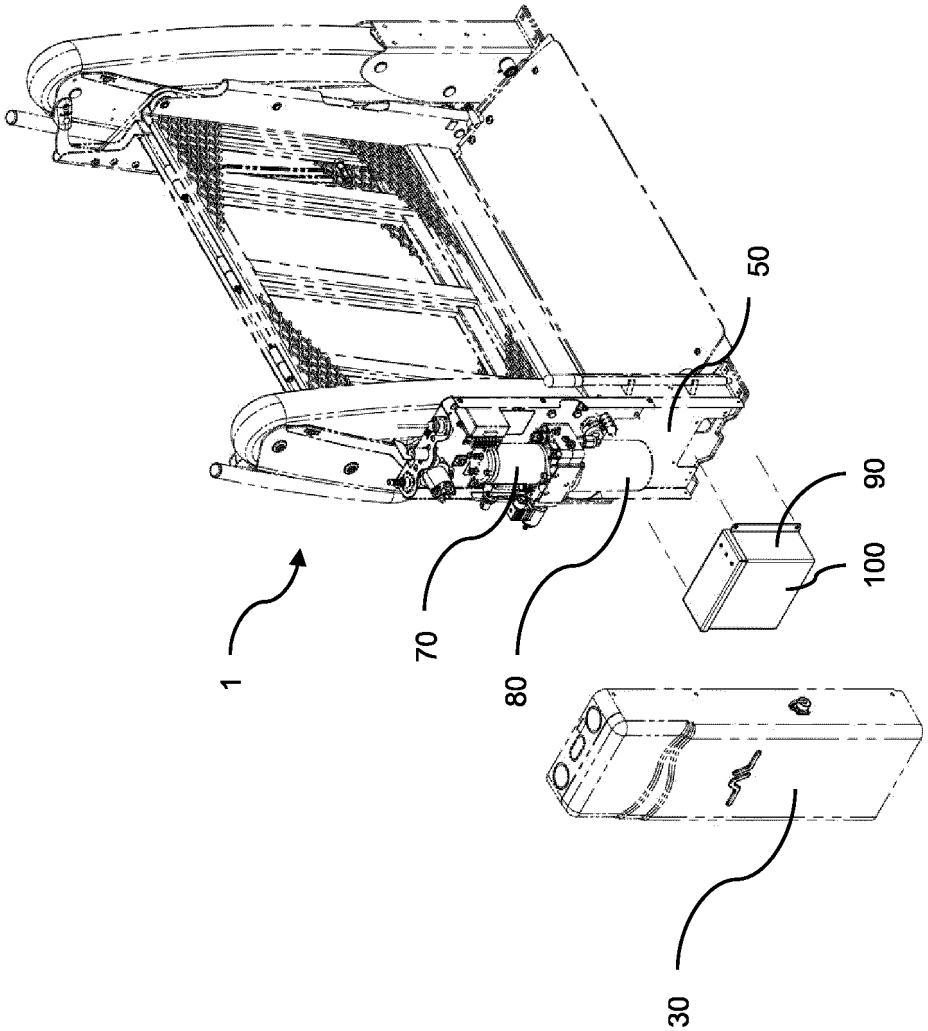


FIG 6B

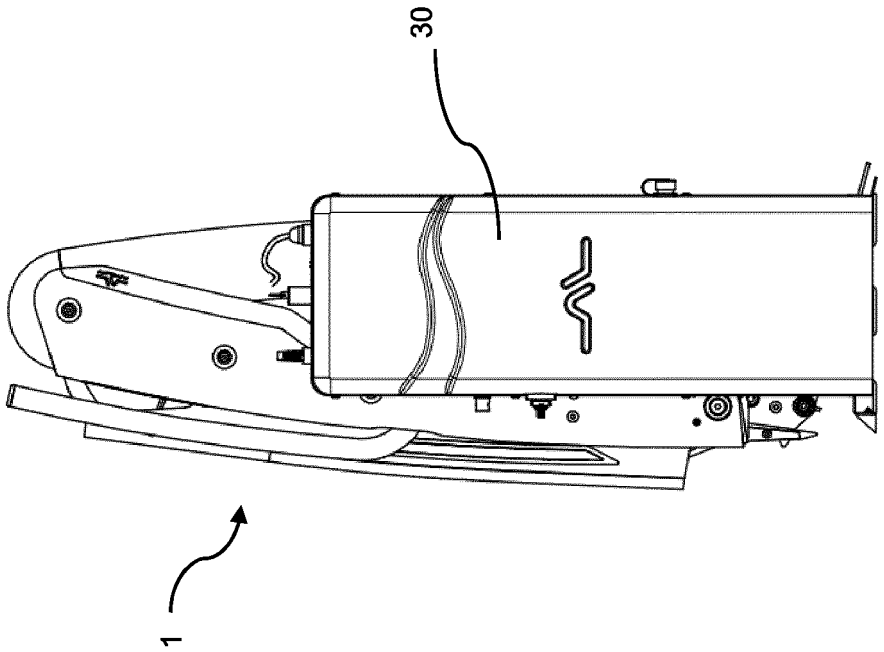


FIG 6C

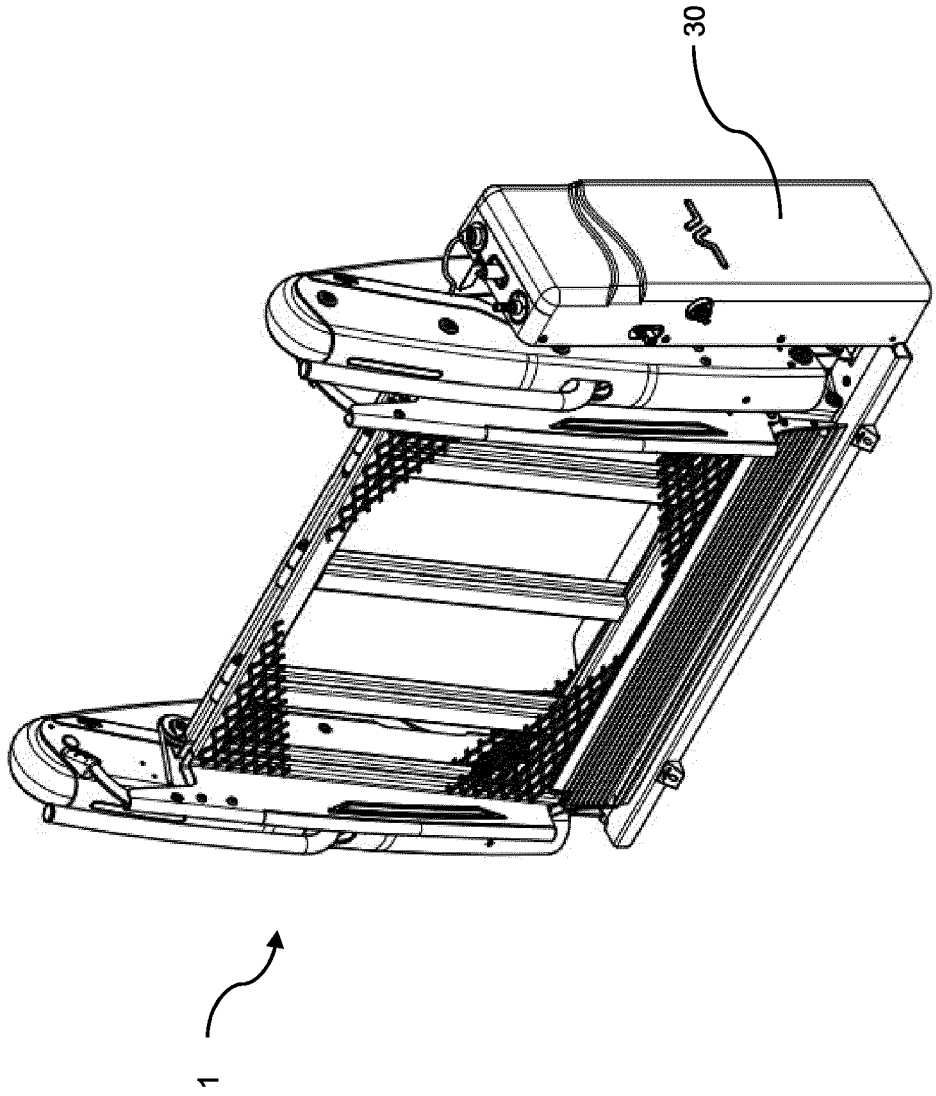


FIG 6D

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 22 19 4576

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	US 7 396 202 B1 (PANZARELLA THOMAS A [US] ET AL) 8 July 2008 (2008-07-08)	1-6, 8-10,12, 14,15	INV. A61G3/06
Y	* figures 5-7 *	11	
X	GB 2 570 443 A (MOBILITY NETWORKS HOLDINGS LTD [GB]) 31 July 2019 (2019-07-31)	1-7, 9-12,14, 15	
	* figures 1-2 *		
X	US 2006/104775 A1 (KASTEN MICHAEL E JR [US] ET AL) 18 May 2006 (2006-05-18)	1-4, 11-15	
Y	* paragraph [0036]; figure 2 *	11	
X	US 2004/076500 A1 (COPPERSMITH RICHARD LOY [US]) 22 April 2004 (2004-04-22)	1-3,9,10	
A	* figures 1-4 *	12,13,15	
T	US 2021/161738 A1 (AKERS JR URIAH S [US]) 3 June 2021 (2021-06-03) * paragraph [0040] *		

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	25 January 2023	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 22 19 4576

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.

25-01-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7396202 B1	08-07-2008	NONE	
GB 2570443 A	31-07-2019	NONE	
US 2006104775 A1	18-05-2006	AU 2003202922 A1	02-09-2003
		CA 2475082 A1	14-08-2003
		EP 1478317 A2	24-11-2004
		MX PA04007619 A	19-04-2005
		US 2006104775 A1	18-05-2006
		WO 03065960 A2	14-08-2003
US 2004076500 A1	22-04-2004	NONE	
US 2021161738 A1	03-06-2021	US 2021161738 A1	03-06-2021
		WO 2019028194 A1	07-02-2019

EPO FORM P0459

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