



(51) International Patent Classification:

B60K 1/04 (2006.01) **H01M 2/02** (2006.01)
B60L 11/18 (2006.01) **H01M 2/10** (2006.01)

(21) International Application Number:

PCT/EP2017/078576

(22) International Filing Date:

08 November 2017 (08.11.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1619060.5 11 November 2016 (11.11.2016) GB

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: BATTERY SUPPORT ARRANGEMENT

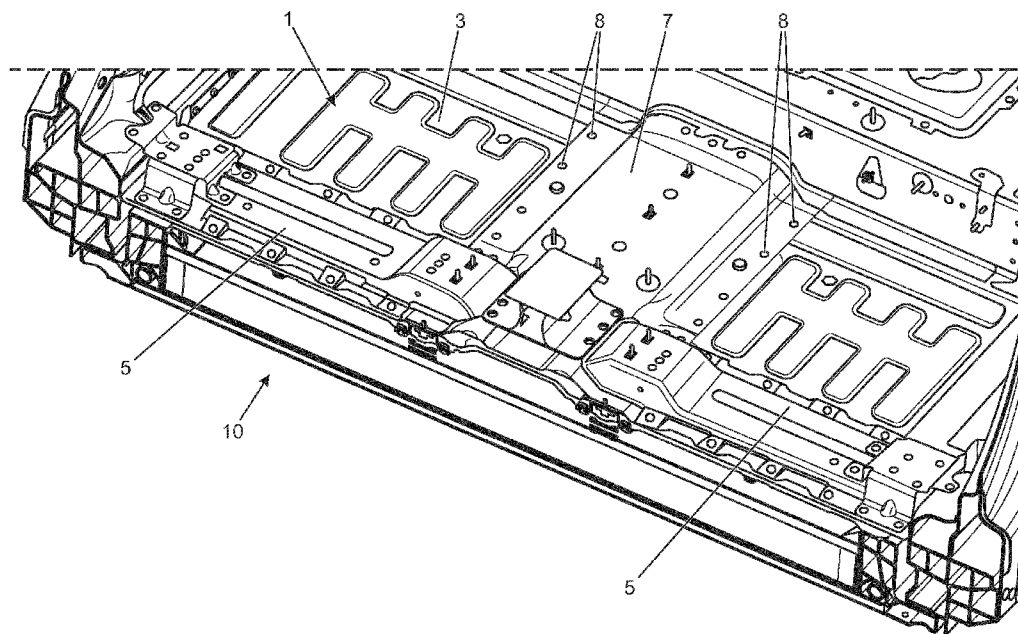


Figure 2

(57) Abstract: The present disclosure relates to a battery support arrangement (10) for electric or hybrid electric vehicles. The battery support arrangement (10) comprises a battery support frame adapted to receive a plurality of battery cells. The battery support frame comprises a top cover (12), wherein a plurality of mounting brackets (20a, 20b, 20c, 20d) are arranged on an outside surface of the top cover (12), the mounting brackets (20a, 20b, 20c, 20d) being adapted to removably connect the battery support frame to a vehicle frame, in use.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

BATTERY SUPPORT ARRANGEMENT

TECHNICAL FIELD

5 The present disclosure relates to a battery support arrangement, particularly but not exclusively, for electric or hybrid electric vehicles. The present disclosure further relates to a method of mounting a battery frame, particularly but not exclusively, to a vehicle frame of an electric or hybrid electric vehicle. Another aspect of the invention relates to a vehicle comprising the battery support arrangement.

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BACKGROUND

With ever increasing fossil fuel prices and stricter regulations on vehicle emissions, there is currently a trend in the automotive industry to replace combustion engines with electric
15 motors (electric vehicles) or at least a combination of an electric motor and a combustion engine (hybrid electric vehicles), thereby substantially reducing or eliminating vehicle emissions. Electric and hybrid electric vehicles use large amounts of electricity as a main source of power for propulsion, which has resulted in a need for batteries with high energy density, long operating lifetimes and applicability to a wide range of environmental
20 conditions. The batteries commonly comprise battery cells mounted within a battery support frame or battery pack, which is configured to be mounted to the vehicle frame. The battery support frame is electrically connected to the vehicle, allowing the vehicle's motor to draw electric energy from the battery. In some situations, such as during regenerative braking, the vehicle can feed electric energy back into the battery.

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Currently, most batteries are configured to be recharged via an external charge port for connecting an external energy source, such as the mains of a house, to the battery cells. Hybrid electric vehicles charge the battery cells via an on-board combustion engine. An alternative way to achieve energy replenishment is to exchange the entire battery pack for a
30 fully charged one, which can reduce downtime of electric vehicles significantly. Exchanging the entire battery support frame is also useful for servicing purposes, so as to allow the vehicle to continue driving.

In view of the above, it is common practice to attach the battery support frame to the vehicle
35 frame in such a way that it can be replaced for servicing or exchange with another support frame comprising fully charged battery cells. One solution is to attach the battery support

frame to the underneath of the vehicle frame, that is, to the vehicle floor. Problems with attaching the battery support frame to the underneath of the vehicle frame include limited space availability, issues with the sealing integrity of the battery support frame, noise vibration and harness issues within the vehicle frame structure, as well as small tolerances for alignment of corresponding mounting structures of the vehicle frame and the battery support frame.

In view of the above, it is an object of the present invention to provide a battery support arrangement, which is removable from the vehicle frame and addresses at least some of the issues described hereinbefore.

SUMMARY OF THE INVENTION

Aspects and embodiments of the invention provide a battery support arrangement, a vehicle comprising the battery support arrangement and a method of mounting a battery frame to a vehicle frame as claimed in the appended claims.

A battery support arrangement for electric or hybrid electric vehicles, the support arrangement comprising: a battery support frame comprising a base structure, and a top cover, the top cover being opposed to the base structure, wherein the base structure and the top cover define a cavity adapted to receive at least one battery cell; and at least one mounting bracket arranged on an outside surface of the top cover, the one or more mounting brackets being arranged to enable connection of the battery support frame to a vehicle frame, when in use.

The top cover may be substantially parallel to the base structure.

The battery support frame may comprise at least one side wall extending between the base structure and the top cover.

The one or more mounting brackets may be adapted to enable removable connection of the battery support frame to a vehicle frame, when in use.

The cavity may be arranged to receive a plurality of battery cells.

The outside surface of the base structure may be adapted to be oriented towards a driving surface, when in use.

The support arrangement may comprise a plurality of mounting brackets.

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According to an embodiment of the invention, there is disclosed a battery support arrangement for electric or hybrid electric vehicles. The battery support arrangement comprises a battery support frame comprising a base structure and a top cover, the top cover being arranged substantially parallel to the base structure. The battery support frame further comprises at least one side wall extending between the base structure and the top cover, wherein the base structure, the top cover and the at least one side wall form a cavity adapted to receive a plurality of battery cells. The outside surface of the base structure is adapted to be oriented towards a driving surface, when in use. The battery support arrangement comprises a plurality of mounting brackets arranged on an outside surface of the top cover, the mounting brackets being adapted to removably connect the battery support frame to a vehicle frame, when in use.

By virtue of the mounting bracket arranged on the outside surface of the top cover, the battery support arrangement can be removably connected to the underneath of the vehicle frame by inserting fastening members, such as bolts or screws, through the vehicle frame floor downwards into the plurality of mounting brackets. Consequently, the fastening members do not directly extend into the top cover of the battery support frame, thereby providing a means for attaching the battery frame without comprising its sealing integrity. The top cover of the battery support frame can be directly connected to the underneath of the vehicle frame via the mounting brackets, and thus smaller fastening members can be utilised. The use of smaller fastening members enables structural members within the battery frame to be reduced in size as will be described in more detail below.

Furthermore, securing the battery support frame to the underneath of the vehicle frame in this manner provides the additional advantage of increasing the stiffness of the vehicle frame floor. This helps to ensure that components, such as the mounts for vehicle seats, do not move or warp when the vehicle is in use, thereby helping to maintain the secure position of the vehicle seats.

Securing the battery support frame to the vehicle frame using mounting brackets on the outside surface of the top cover additionally provides the advantage that in order to remove

the battery support frame from the vehicle requires access to the internal vehicle cabin. This helps to improve the security of the vehicle as the battery support frame may only be removed from the vehicle when someone has gained access to the vehicle cabin.

In a further embodiment of the present invention, each mounting bracket comprises a top surface and an opposite bottom surface, the bottom surface facing towards the outside surface of the top cover of the battery support frame, wherein each mounting bracket is adapted to receive a fastening member extending through the mounting bracket via its top surface. As mentioned previously, the mounting brackets are therefore adapted to receive fastening members, which are inserted through the vehicle frame floor downwards into the top surface of the mounting bracket. Accordingly, in order to attach the battery support arrangement to the vehicle frame, it is sufficient to align the top surfaces of the mounting brackets with respective fastening bores of the vehicle frame.

In an embodiment of the invention, at least a portion of the bottom surface is distanced from the outside surface of the top cover such that a space for receiving a fastening member is provided between the bottom surface and the outside surface of the top cover. According to this embodiment, the fastening member used for connecting the battery support arrangement to the vehicle frame does not need to penetrate the top cover of the battery support frame. Rather, the fastening member is received in a dedicated space arranged between the bottom surface of the mounting brackets and the top cover of the battery support frame. This is particularly advantageous if the battery support frame has to be exchanged on a frequent basis, as this will likely result in wear of the mounting brackets rather than the top cover of the battery support frame, which is substantially unaffected by attaching and detaching the battery support arrangement to/from the vehicle frame via the mounting brackets. It should be noted that the mounting brackets may be removably attached to the top cover of the battery support frame, making the mounting brackets individually replaceable wear parts. Accordingly, in this embodiment it is only necessary to replace the mounting brackets rather than larger parts of the battery frame, such as the entire top cover, when servicing of the vehicle frame connectors is required.

In another embodiment of the present invention, a fastening nut is arranged within the space between the outside surface of the top cover and the bottom surface of the mounting bracket. The fastening nut may thus be another wear part that can be replaced individually, that is, without the need to replace the entire mounting bracket.

In yet another embodiment, the fastening nut is a floating nut, also known as floating anchor nuts or floating cage nuts. As such floating nuts comprise a fastening nut and a cage, the fastening nut being received within the cage such that the nut is slightly loose. That is, the nut is movable relative to the cage in any predetermined direction to accommodate misalignments of a corresponding fastening pin. It will be appreciated that constructing the fastening nut as a floating nut will ease alignment and allow for larger tolerances in construction of the battery support arrangement, as the floating nut will compensate for misalignments between the vehicle frame and the battery support arrangement. Of course, it is equally feasible to utilise fixed nuts, such as a nut permanently attached to the bottom surface of the mounting bracket by welding.

In another embodiment, each mounting bracket comprises a pair of side members extending below the bottom surface and adapted to form a nut cage for receiving the fastening nut. In this aspect, the fastening nut is a permanent part of the mounting bracket and can be replaced together with the mounting bracket without the need for reattaching fastening nut individually. The cage of the mounting bracket preferably serves as an anti-rotational lock for the fastening nut but may allow for a degree of translational movement if the latter is constructed as a floating nut.

According to yet another embodiment, the battery support frame comprises a plurality of reinforcement members extending inside the cavity, and wherein each mounting bracket is removably connected to one of the reinforcement members through the top cover. The reinforcement members within the battery support frame increase the structural integrity and may be utilised as ducts for cooling fluids to remove excessive heat from the battery cells.

According to this embodiment, the reinforcement members are further used as a structural support for the attachment of the mounting brackets. Attaching the mounting brackets to the reinforcement members ensures that the load of the battery support frame can be transferred to the mounting bracket without damaging the top cover of the battery support frame. A further advantage is that the mounting brackets can simultaneously be used as a means for attaching the battery support frame to the vehicle frame and as means to close, that is, attach the top cover to the remaining parts of the battery support frame.

The mounting brackets do not need to be directly connected to their respective reinforcement member; rather, other parts (such as spacers) may be located between the reinforcement members and the mounting brackets. Accordingly, in another embodiment, each mounting bracket is connected to one of the reinforcement members via a spacer

element, each spacer element being arranged between an inside surface of the top cover and a top surface of the reinforcement element. In other words, the spacer elements are advantageously arranged on top of the reinforcement members, that is between the reinforcement members of the battery support frame and an inside surface of the top cover.

5 Accordingly, the spacer elements create a cavity between the top cover and the support elements, which can be used for electric wires or cooling ducts, etc. extending within the battery support frame.

According to yet another embodiment, each spacer element has a substantially U-shaped
10 cross-section. As will be described in more detail below, the U-shaped spacer element may be used to increase a free space between the bottom surface of the mounting brackets and the outside surface of the top cover.

According to an embodiment of the U-shaped spacer elements, each spacer element may
15 comprise a base section connected to one of the reinforcement members and side wall portions extending substantially perpendicular to the base section between the reinforcement member and the inside surface of the top cover. The base section of each spacer element may be used to receive fastening members that removably attach the spacer element to the top surface of its respective reinforcement element. The side wall portions are
20 arranged to be in contact with the inside surface of the top cover and thus can be used to receive fastening members that extend through the top cover into the side wall portions of the spacer element to removably attach the mounting brackets to the battery support frame.

According to another embodiment, sections of the top cover extending between the side wall
25 portions of the spacer elements comprise a recess extending towards the base section of the spacer element. As described previously, the particular shape of the spacer element can be used to move parts of the top cover away from the bottom surface of the mounting brackets to increase the space for receiving the fastening member of the mounting bracket.

30 According to another embodiment of the invention, the battery support arrangement comprises first and second mounting brackets attached to a first reinforcement member, and third and fourth mounting brackets attached to a second reinforcement member, the first reinforcement member being longitudinally spaced from the second reinforcement member. According to this aspect, the battery support arrangement comprises at least four mounting
35 brackets to provide anti-rotational attachment of the battery support frame to the vehicle

frame. The at least four mounting brackets may be arranged in the corners of a square-shaped part of the top cover.

In another embodiment, the first reinforcement member is arranged in a rear half of the battery support arrangement, wherein the second reinforcement member is arranged in a forward half of the battery support arrangement. Consequently, the first and second mounting brackets are arranged in the rear half of the battery support arrangement, while the third and fourth mounting brackets are arranged in the forward half of the battery support arrangement. This results in a particularly stable attachment of the top cover to the remaining parts of the battery support frame, which is particularly useful to prevent the top cover from bulging due to gas pressures created by the battery cells within the support frame.

An aspect of the invention further relates to an electric or hybrid electric vehicle. In one embodiment, the vehicle comprises a vehicle frame and a battery support arrangement as described hereinbefore. The battery support arrangement is removably attached to the vehicle frame by the plurality of mounting brackets.

In another embodiment, the battery support arrangement is attached below the vehicle frame via fastening members extending through the vehicle frame and into the mounting brackets. In one example, the fastening members may therefore be removable from the inside of the vehicle, particularly through cut-outs in the carpet (or other respective floor covers of the vehicle floor).

According to another embodiment, each of the fastening members extends through a section of a centre tunnel of the vehicle frame. Accordingly, the fastening members can simultaneously be used to attach the battery support frame and the centre tunnel to the vehicle frame, thereby reducing the amount of fastening members required.

In another aspect of the present invention, a method of mounting a battery frame to a vehicle frame is provided, particularly but not exclusively for an electric or hybrid electric vehicle. The method comprises positioning the battery frame relative to the vehicle frame and attaching the battery frame to the vehicle frame by introducing fastening members through the vehicle frame into a mounting bracket arranged on a top cover of the battery frame.

An electrical storage device support arrangement for electric or hybrid electric vehicles, the support arrangement comprising: a battery support frame comprising a base structure, and a top cover, the top cover being opposed to the base structure, wherein the base structure and the top cover define a cavity adapted to receive at least one electric storage device; and at least one mounting bracket arranged on an outside surface of the top cover, the one or more mounting bracket being arranged to enable connection of the support frame to a vehicle frame, when in use.

Within the scope of this application it is expressly intended that the various aspects, embodiment, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination, unless such features are incompatible. The applicant reserves the right to change any originally filed claim or file any new claim accordingly, including the right to amend any originally filed claim to depend from and/or incorporate any feature of any other claim although not originally claimed in that manner.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figures 1a & 1b show a schematic side view of a vehicle with a battery support arrangement.

Figure 2 shows a perspective cross-section along a lateral direction of the floor section of a vehicle frame and an embodiment of the battery support arrangement;

Figure 3 shows a cross-section of the battery support arrangement shown in Fig. 2;

Figure 4 shows an enlarged view of parts of the battery support arrangement shown in Figure 3;

Figure 5 is a perspective cross-section of the bottom part of the vehicle frame and the battery support arrangement shown in Figure 2, along a longitudinal direction; and

Figure 6 shows a two-dimensional cross-section of the embodiment shown in Figure 2, along a longitudinal direction.

DETAILED DESCRIPTION

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Figures 1a and 1b show a schematic side view of a vehicle 100 (tyres omitted in Fig. 1a for clarity purposes) with an electrical storage device support arrangement which is a battery support arrangement 10. The battery support arrangement 10 in Figure 1b is removably attached to a floor section of the vehicle frame, from below. The battery support arrangement comprises a plurality of mounting brackets 20 arranged on a lid or top cover of a battery support frame 18, for connecting the battery support arrangement 10 to the vehicle frame, as will be described in more detail below.

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Figure 2 shows an embodiment of the invention in which the battery support arrangement 10 is removably connected to the floor section 1 of a vehicle frame. The floor section 1 of the vehicle frame may comprise a vehicle floor 3 and a plurality of cross members 5 extending in a lateral direction of the vehicle floor 3 for mounting of vehicle seats (not shown). A centre tunnel 7 may extend along a longitudinal direction of the vehicle floor 3 and is preferably attached to a top surface of the latter via a plurality of fastening members 8.

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The battery support arrangement 10 is attached to a bottom surface of the vehicle floor 3 via mounting brackets, which will be described in more detail below with reference to Figures 3 to 6.

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Figure 3 shows a perspective cross-section of the battery support arrangement 10 according to the embodiment of Figure 2, disconnected from the vehicle floor 3. The battery support arrangement 10 comprises a battery support frame having a base structure 11 and a top cover 12 distanced from the base structure 11. The top cover 12 is arranged substantially parallel to the base structure 11. A side wall 14 extends between the base structure 11 and the top cover 12. In particular, the side wall 14 extends along the outer perimeter of the battery support frame. A cavity 15 is formed inside the battery support frame. The cavity 15 is formed between the base structure 11, the top cover 12 and the side wall 14 of the support frame. An outside surface 111 of the base structure 11 is adapted to be oriented towards a driving surface 101 (such as a road surface not shown on figure 3), when the battery support arrangement 10 is attached to the vehicle frame.

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As will be described in more detail below with reference to Figures 5 and 6, the battery support frame is adapted to support a plurality of electrical storage devices or battery cells within a vehicle. Accordingly, the base structure 11 of the battery support frame is configured to support the weight of the required battery cells. The battery cells are received within the cavity 15 and may be arranged within a plurality of compartments separated by one or more reinforcement structures 17. Each of the base structure 11, the top cover 12, and/or the side wall 14 may comprise one or more cooling channels for conducting a cooling fluid around the battery cells in order to prevent excessive heat generation within the battery support arrangement.

The cover 12 of the battery support frame has an inside surface 122 facing the cavity 15 of the support frame and an outside surface 121 facing away from the cavity 15. A plurality of mounting brackets are arranged on the outside surface 121 of the top cover 12. In the embodiment shown in Figure 3, the battery support arrangement 10 comprises four mounting brackets 20a, 20b, 20c and 20d adapted to removably connect the battery support frame to a vehicle frame, when in use.

Figure 4 shows an enlarged view of mounting bracket 20d, which is removably attached to the outside surface 121 of top cover 12. It will be understood that the remaining mounting brackets 20a, 20b and 20c are substantially identical to the mounting bracket 20d shown in and described with reference to Figure 4. The mounting bracket 20d is shown in a lateral cross-section in Figure 4 and comprises a first flange portion 21 and a second flange portion 22. A bridging portion 23 extends between the first and second flange portions 21 and 22. The mounting bracket 20d comprises a top surface 25 and an opposite bottom surface 27. The bottom surface 27 faces towards the outside surface 121 of the top cover 12.

As can be derived from the embodiment in Figure 4, the bottom surface 27 of the flange portions 21 and 22 are in contact with the outside surface 121 of the top cover 12 in the assembled state of the mounting bracket 20d. In contrast to this, the bottom surface 27 of the bridging portion 23 is distanced from the outside surface 121 of the top cover 12. To this end, the mounting bracket 20d comprises first and second connector portions 28 and 29. The first and second connector portions 28 and 29 extend away from the outside surface 121 of top cover 12 and connect the bridging portion 23 to the first and second flange portions 21 and 22 respectively. In detail, the first connector portion 28 connects the bridging portion 23 to the first flange portion 21 such that the bridging portion 23 is distanced from the outside surface 121 of the top cover and from the first flange portion 21. The second

connector portion 29, in turn, connects the bridging portion 23 to the second flange portion 22 such that the bridging portion 23 is also distanced from the second flange portion 22 in a direction away from the outside surface 121 of the top cover 12. The first and second connector portions extend substantially perpendicular to the bridging portion 23 and to their
5 respective flange portion 21, 22.

The bottom surface 27 of the mounting bracket 20d is distanced from the outside surface 121 of the top cover 12 at least along the bridging portion 23. As a consequence, a space 30 is formed between the bottom surface 27 of the bridging portion 23 and the outside surface
10 121 of top cover 12. As is further derivable from Figure 4, the space 30 is adapted to receive a fastening member 40 for attaching the mounting bracket 20d, and therefore the battery support arrangement to the vehicle floor 3. To this end, the embodiment shown in Figure 4 further comprises a fastening nut 42 arranged within space 30. The fastening nut 42 secures
15 fastening member 40, such as depicted fastening bolt, to securely attach the battery support arrangement 10 to the vehicle frame.

In the embodiment shown in Figure 4, the fastening member 40 extends downwards through a flange portion of the centre tunnel 7, a sealing member 9 and the vehicle floor 3, and eventually into nut 42 via an opening 24 of the mounting bracket 20d. According to this
20 embodiment, the fastening member 40 acts as one of the fastening members 8 shown in Figure 2, which is used to attach the centre tunnel 7 to the vehicle floor 3 and, at the same time, connects the battery support arrangement 10 to the floor 3 of the vehicle frame.

It will be appreciated from the illustration of Figure 4 that the mounting brackets 20a, 20b, 20c and 20d are removably arranged on the outside surface 121 of the top cover 12. According to this embodiment, each mounting bracket 20a, 20b, 20c and 20d is connected
25 to one of the reinforcement members 17 extending within the cavity 15 of the vehicle support frame. To this end, the mounting bracket 20d shown in Figure 4 is removably attached to the reinforcement member 17 via a spacer element 50, which is arranged between the inside
30 surface 122 of the top cover 12 and a top surface 171 of the reinforcement member 17. The mounting bracket 20d comprises mounting holes on each of the first and second flange portions 21, 22, configured to receive fastening members 51 and 52 that extend through the top cover 12 of the battery support frame into side walls 54 of the spacer element 50. In
other words, the mounting bracket 20d is removably connected to the spacer element 50,
35 which, in turn, is removably connected to the reinforcement member 17 via another pair of fastening members 56 extending through a base portion 55 of the spacer element 50. The

mounting bracket 20d is connected to the reinforcement member 17 via spacer element 50 in such a way that the weight of the battery frame is supported by the reinforcement member 17. As such, it will be understood that the weight of the battery support arrangement 10 is not carried by the top cover 12 but the reinforcement member 17 together with the spacer element 50 and mounting bracket 20d.

The spacer element 50 in the embodiment of Figure 4 further has a U-shaped cross-section. The U-shaped spacer element comprises a base portion 55 which is connected to the top surface 171 of the reinforcement member 17 and side wall portions 54 extending substantially perpendicular to the base portion 55, that is, away from the top surface 171 of the reinforcement member 17. As a consequence of the U-shaped cross-section of the spacer element 50, a cavity 60 is formed between the side walls 54, the base portion 55 of the spacer element 50, and the inside surface 122 of the top cover 12. The cavity 60, therefore, provides a free space between the side walls 54 of the spacer element 50 into which a recessed portion of the top cover 12 extends to increase cavity 30 for receiving the fastening member 40.

Figures 5 and 6 show a longitudinal cross-section through the battery support arrangement and vehicle frame of Figure 2. As mentioned previously, the battery support frame may comprise several compartments 61, 62, 63 for holding a plurality of battery cells. The compartments 61, 62, and 63 are separated by reinforcement members 17, which extend in a substantially lateral direction of the battery support frame. As shown, the lateral reinforcement members 17 are directly connected to the base structure 11 of the battery support frame and connect with an inside surface of the top cover 12 via previously mentioned spacer element 50.

In the embodiment of Figures 5 and 6, the fastening nut 42 is constructed as a floating nut. As illustrated, the mounting bracket 20c comprises a pair of side members 26a and 26b extending below the bottom surface 23 of the mounting bracket and adapted to form a nut cage for receiving the fastening nut 42. The side members 26a and 26b are constructed to extend around and below a flange portion of the fastening nut 42 to hold the latter in a longitudinal and a vertical direction of the battery support frame. The nut cage of the mounting bracket 20c is designed to hold the fastening nut 42 with some clearance for the fastening nut 42 to move slightly in a longitudinal and/or vertical direction.

In the illustrated embodiment, the movement of the fastening nut 42 in a lateral direction of the battery support frame is restricted by the connector portions 28 and 29 shown in Figure 4, for example. Accordingly, the fastening nut 42 can move to some extent within a cage formed by the side members 26a, 26b and the connector portions 28, 29, in order to
5 compensate for misalignment between fastening members 40 and the mounting brackets 20a to 20d.

In an alternative embodiment, the mounting brackets may comprise four side members extending below the bottom surface of the mounting brackets to form a substantially cuboid-
10 shaped cage. The four side members may then retain the fastening nut in a longitudinal, a lateral and a vertical direction. In other words, the four side members of the mounting brackets may form a floating nut cage without utilising the connector portions as lateral stops. In a further alternative, the fastening nut could also be of fixed position to the bottom
15 surface of the respective mounting bracket by welding the fastening nut thereto.

CLAIMS

1. A battery support arrangement for electric or hybrid electric vehicles, the support arrangement comprising:
 - 5 a battery support frame comprising a base structure, and a top cover, the top cover being opposed to the base structure, wherein the base structure and the top cover define a cavity arranged to receive at least one battery cell; and
 - at least one mounting bracket arranged on an outside surface of the top cover, the one or more mounting bracket being adapted to enable connection of the battery support frame to a vehicle frame, when in use.
2. The battery support arrangement of claim 1, wherein the or each mounting bracket comprises a top surface and an opposite bottom surface, the bottom surface facing towards the outside surface of the top cover of the battery support frame, and wherein
15 the or each mounting bracket is adapted to receive a fastening member extending through the mounting bracket via its top surface.
3. The battery support arrangement of claim 2, wherein at least a portion of the bottom surface is distanced from the outside surface of the top cover such that a space for receiving a fastening member is provided between the bottom surface and the outside
20 surface of the top cover.
4. The battery support arrangement of claim 3, wherein a fastening nut is arranged within the space between the outside surface of the top cover and the bottom surface of the mounting bracket.
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5. The battery support arrangement of claim 4, wherein the fastening nut is a floating nut.
6. The battery support arrangement of claim 4 or 5, wherein the or each mounting bracket
30 comprises a pair of side members extending below the bottom surface and adapted to form a nut cage for receiving the fastening nut.
7. The battery support arrangement of any of claims 1 to 6, wherein the battery support frame comprises a one or more reinforcement members extending inside the cavity, and wherein the or each mounting bracket is removably connected to a reinforcement
35 member through the top cover.

8. The battery support arrangement of claim 7, wherein the or each mounting bracket is connected to a reinforcement member via a spacer element, each spacer element being arranged between an inside surface of the top cover and a top surface of the reinforcement element.
9. The battery support arrangement of claim 8, wherein each spacer element has a substantially U-shaped cross-section.
10. The battery support arrangement of claim 9, wherein the or each spacer element comprises a base section connected to a reinforcement member, and side wall portions extending substantially perpendicular to the base section between the reinforcement member and the inside surface of the top cover.
11. The battery support arrangement of claim 10, wherein the or each mounting bracket is removably connected to the side wall portions of its spacer element by means of fastening members extending through the top cover.
12. The battery support arrangement of claim 10 or 11, wherein one or more section of the top cover extending between the side wall portions of the spacer elements comprise a recess extending towards the base section of a spacer element.
13. The battery support arrangement of any of claims 7 to 12, wherein the battery support arrangement comprises first and second mounting brackets attached to a first reinforcement member, and third and fourth mounting brackets attached to a second reinforcement member, the first reinforcement member being longitudinally spaced from the second reinforcement member.
14. The battery support arrangement of claim 13, wherein the first reinforcement member is arranged in a rear half of the battery support arrangement, and wherein the second reinforcement member is arranged in a forward half of the battery support arrangement.
15. The combination of the battery support arrangement of any preceding claim and at least one battery cell within the cavity.

16. An electric or hybrid electric vehicle, comprising a vehicle frame and a battery support arrangement according to any of claims 1 to 14, the battery support arrangement being removably attached to the vehicle frame by the or each mounting bracket.

5 17. An electric or hybrid electric vehicle, comprising the combination of the battery support arrangement of claim 15, the battery support arrangement being removably attached to the vehicle frame by the or each mounting brackets.

10 18. The electric or hybrid electric vehicle of claim 16 or claim 17, wherein the battery support arrangement is attached below the vehicle frame via one or more fastening member extending through the vehicle frame and into the or each mounting brackets.

19. The electric or hybrid electric vehicle of claim 18, wherein the or each fastening members extends through a floor panel of the vehicle frame.

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20. The electric or hybrid electric vehicle of claim 18, wherein each of the or each fastening members extends through a section of a centre tunnel of the vehicle frame.

20 21. A method of mounting a battery frame to a vehicle frame of an electric or hybrid electric vehicle, the method comprising:

positioning the battery frame relative to the vehicle frame; and

attaching the battery frame to the vehicle frame by introducing fastening members through the vehicle frame into a mounting bracket arranged on a top cover of the battery frame.

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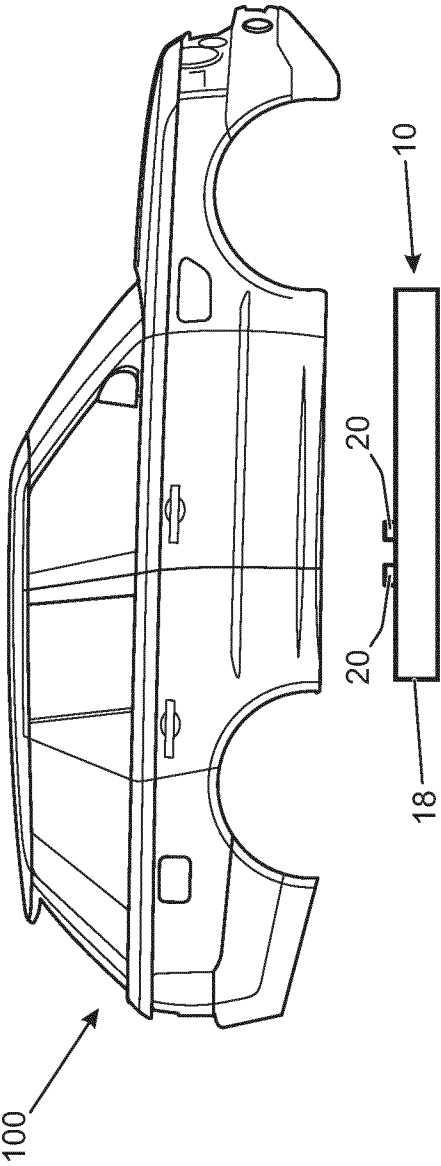


Figure 1a

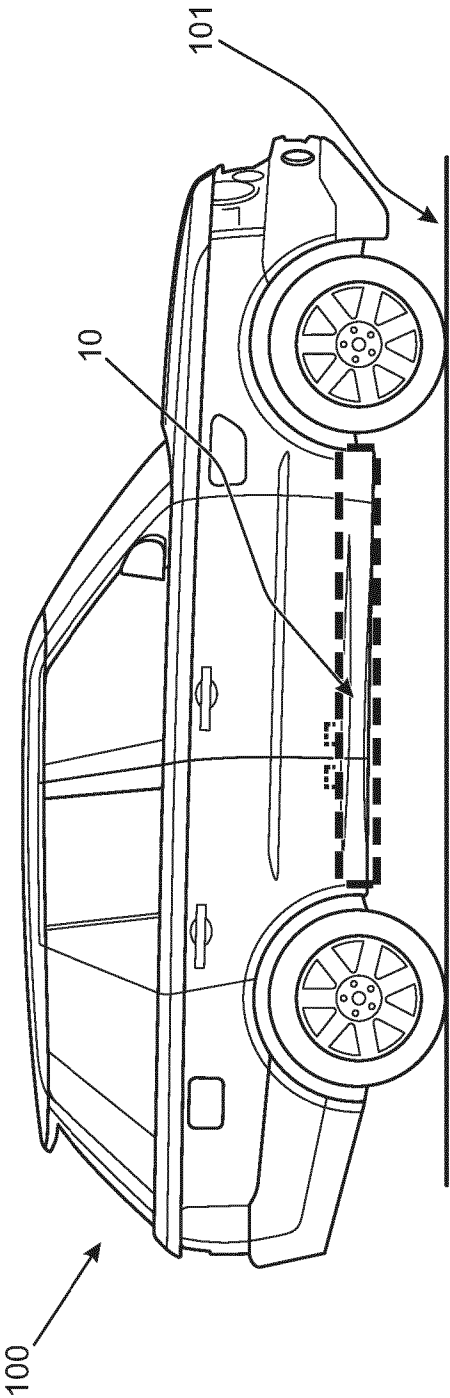


Figure 1b

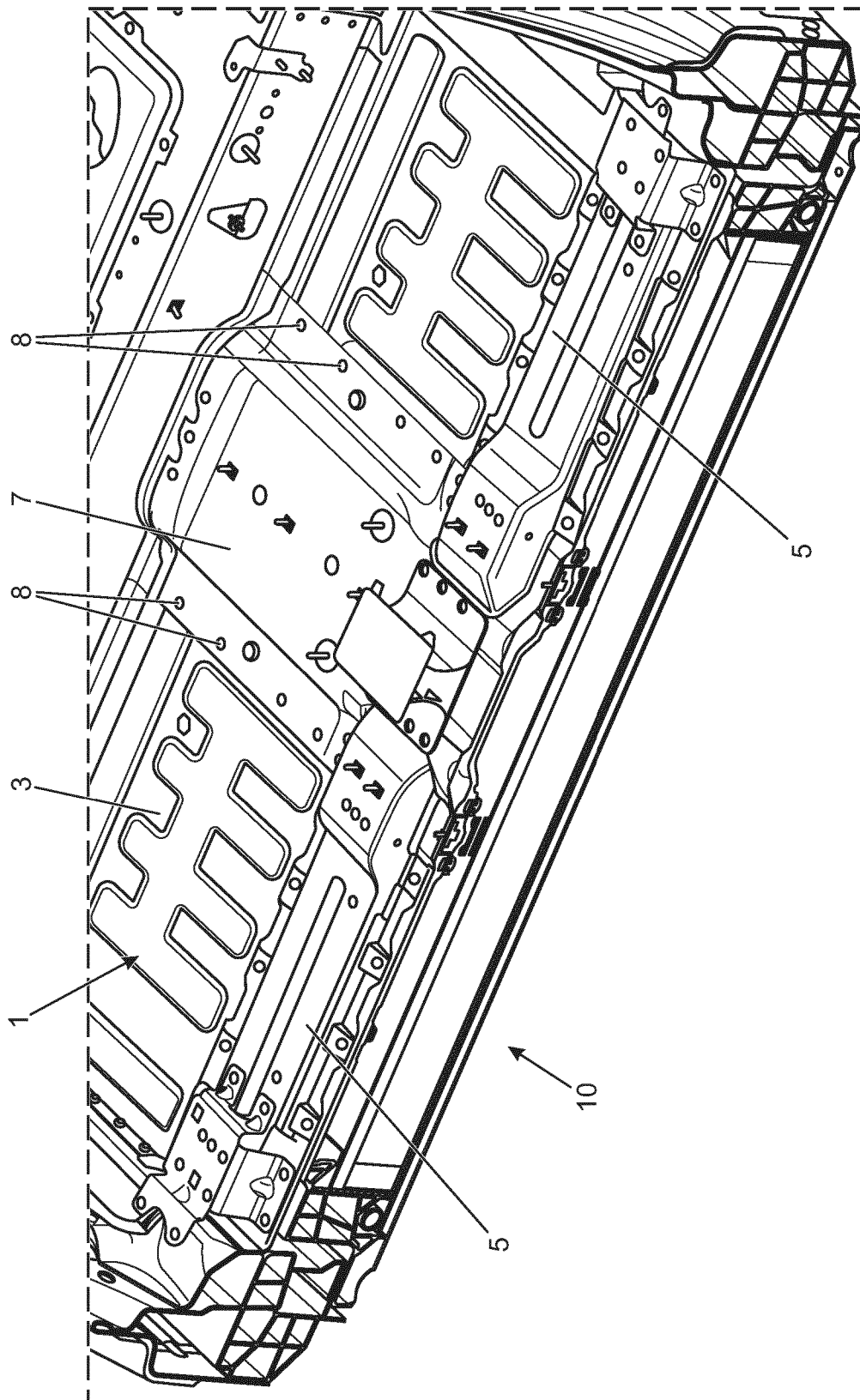


Figure 2

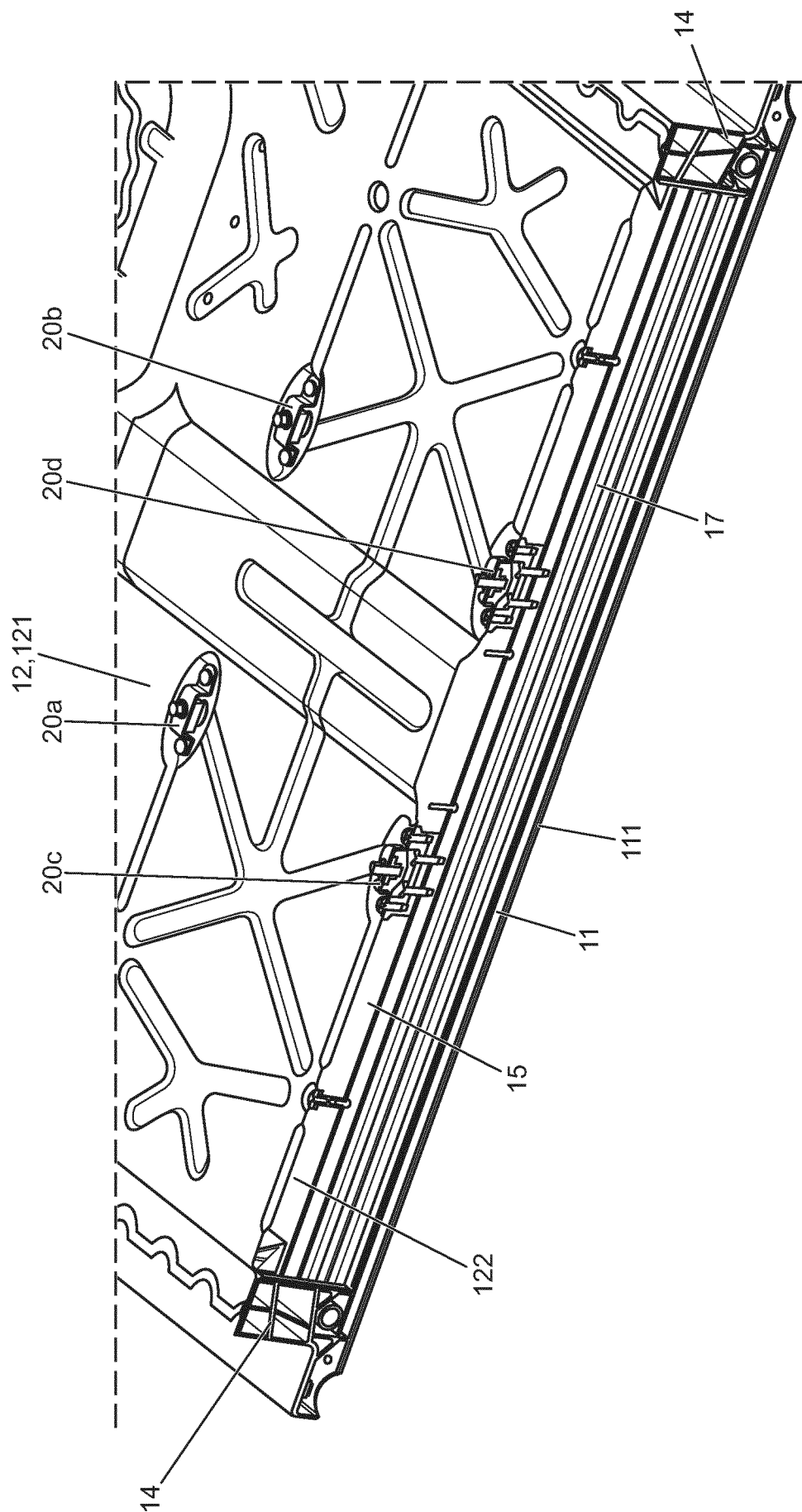


Figure 3

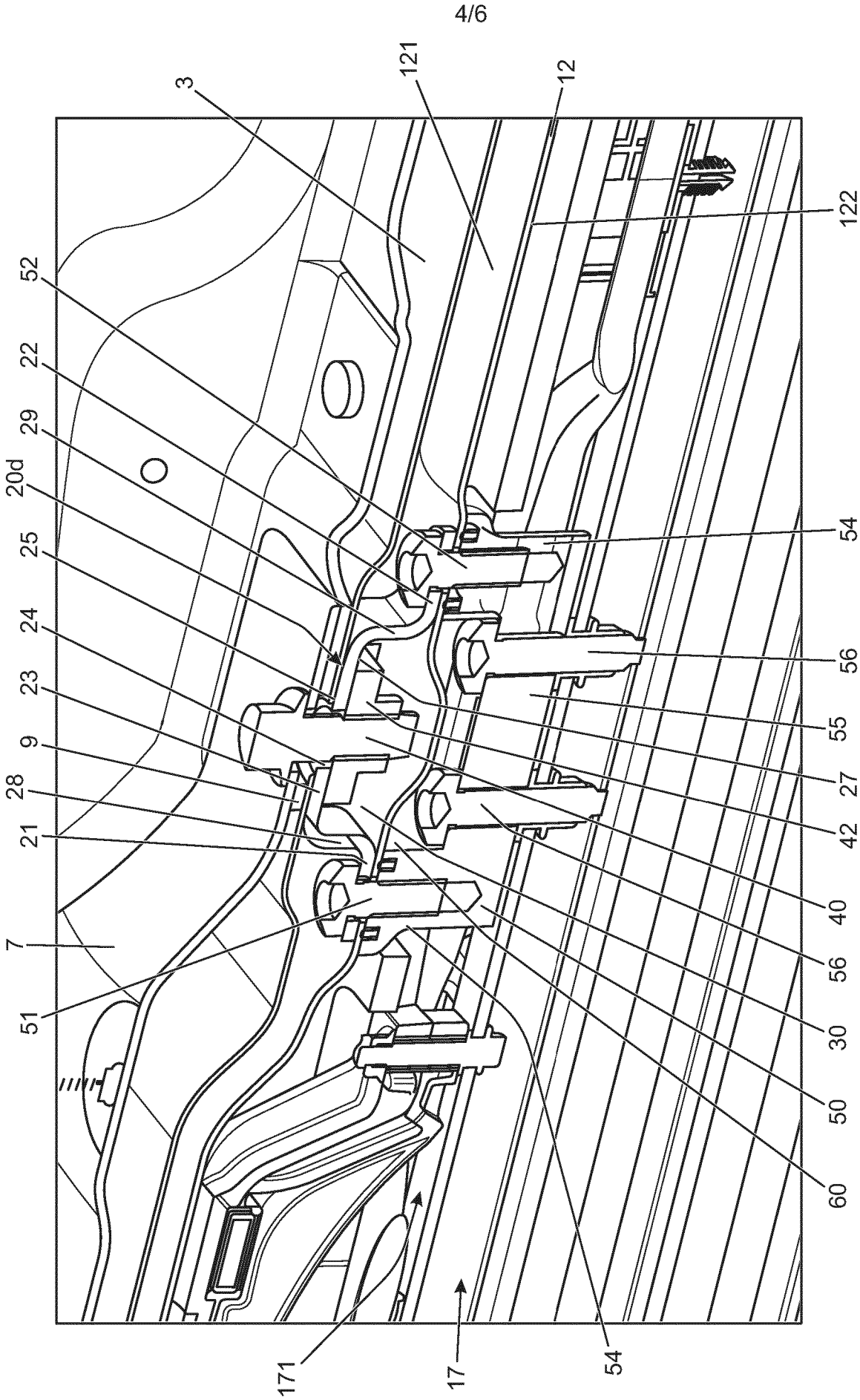


Figure 4

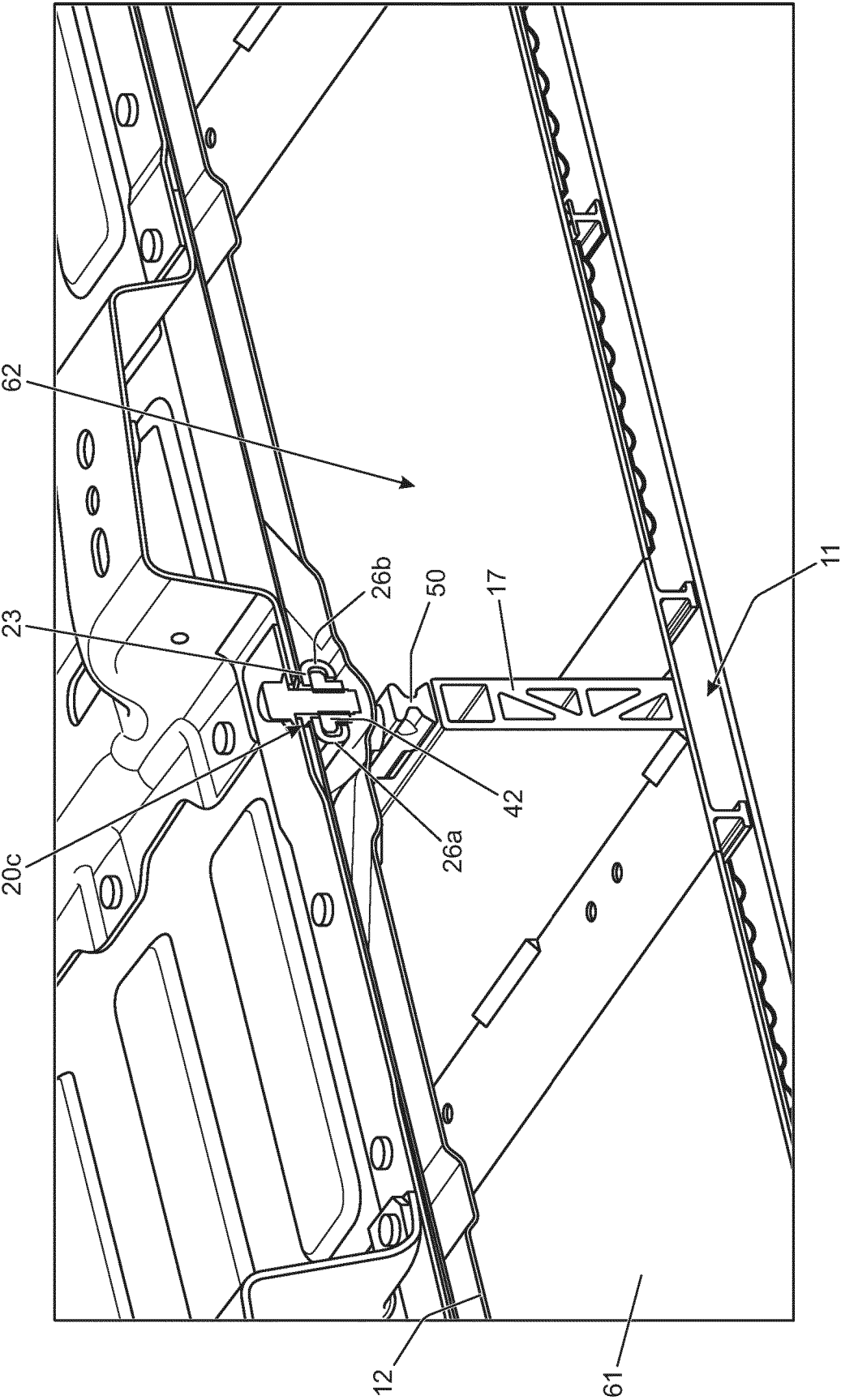


Figure 5

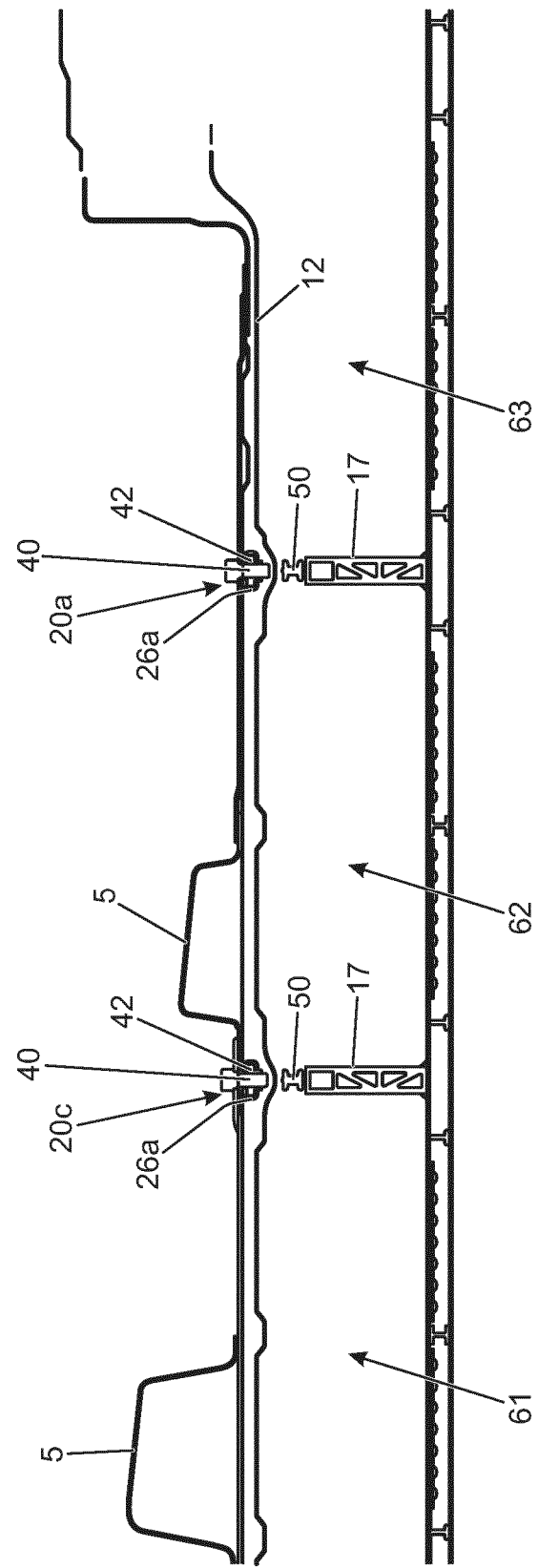


Figure 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/078576

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60K1/04 B60L11/18 H01M2/02 H01M2/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60K B60L H01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 3 015 774 A1 (COMMISSARIAT ENERGIE ATOMIQUE [FR]) 26 June 2015 (2015-06-26)	1,15-21
Y	figures 1, 2	2-5,7,
A	page 1, line 2 - line 5 page 5, line 28 - line 32 page 6, line 3 - line 6 page 6, line 10 - line 16	13,14 6,8-12
Y	US 2013/180791 A1 (LEJEUNE FRANCOIS-XAVIER [FR] ET AL) 18 July 2013 (2013-07-18)	2-5
A	figures 1-6 paragraphs [0001], [0027]	6
Y	EP 2 465 719 A1 (MITSUBISHI MOTORS CORP [JP]; MITSUBISHI MOTOR ENG [JP]) 20 June 2012 (2012-06-20)	7,13,14
A	figure 3 paragraph [0036]	8-12
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

16 January 2018

Date of mailing of the international search report

23/01/2018

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Authorized officer

Waldstein, Martin

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/078576

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	US 2013/104361 A1 (CORFITSEN STEN [SE]) 2 May 2013 (2013-05-02) figure 2 paragraphs [0001], [0028], [0029] -----	1,21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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