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Inventor(s)	Song; Won Ki

Battery load support structure of fuselage

Abstract

The present disclosure provides a battery load support structure of a fuselage, the battery load support structure including a battery mount support formed in a longitudinal direction of a floor frame of the fuselage, a battery unit inputted into an opened lower side of the floor frame and fastened to the battery mount support, and a joint unit configured to support the battery mount support and connected to a plurality of framework members that constitutes the floor frame.

Inventors: **Song; Won Ki (Seongnam-si, KR)**

Applicant: **Hyundai Motor Company** (Seoul, KR); **Kia Corporation** (Seoul, KR)

Family ID: **1000008749357**

Assignee: **Hyundai Motor Company (Seoul, KR); Kia Corporation (Seoul, KR)**

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Primary Examiner: Dangol; Ashesh

Attorney, Agent or Firm: Banner & Witcoff, Ltd.

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

(1) This application claims under 35 U.S.C. § 119(a) the benefit of Korean Patent Application No. 10-2023-0035572 filed on Mar. 20, 2023, the entire contents of which are incorporated herein by reference.

BACKGROUND

(a) Technical Field

(2) The present disclosure relates to a battery load support structure of a fuselage, and more particularly, to a battery load support structure of a fuselage, which is capable of improving load supporting performance of a battery mount support.

(b) Discussion of the Background

(3) Urban air mobility (UAM) vehicles have been developed as air transportation systems for addressing traffic congestion on roads.

(4) Urban air mobility vehicles are to provide transportation services capable of safely transporting occupants to designated locations. Urban air mobility vehicles may not require a separate runway because urban air mobility vehicles may take off and land vertically. Urban air mobility vehicles may not require a pilot because urban air mobility vehicles may autonomously operate. Therefore,

urban air mobility vehicles may be used at low costs in comparison with a helicopter.
(5) Because the occupant is positioned close to an interior of a fuselage of the urban air mobility vehicle, a technology for ensuring stability in the event of a collision may be most important.
(6) However, some urban air mobility vehicles may have a problem in that safety cannot be ensured because a large amount of collision load is applied to a space, in which the occupant is located, by impact applied to the fuselage in the event of a collision.
(7) The above information disclosed in this Background section is only for enhancement of understanding of the background of the disclosure and therefore it may contain information that does not form the prior art that is already known to a person of ordinary skill in the art.

SUMMARY OF THE DISCLOSURE

(8) The following summary presents a simplified summary of certain features. The summary is not an extensive overview and is not intended to identify key or critical elements.
(9) An object of the present disclosure is to provide a battery load support structure of a fuselage, in which a battery mount support is mounted on a floor frame, and a battery unit is fastened to the battery mount support extending in a longitudinal direction, such that the battery unit may be coupled from below the fuselage, and a joint unit is coupled to a plurality of positions at which the battery mount support adjoins a front bulkhead, a center bulkhead, and a rear bulkhead that constitute the fuselage, such that structural reinforcement is implemented, thereby improving load supporting performance of the battery mount support.
(10) A structure may comprise: a battery mount support formed on a floor frame of a fuselage; a battery unit inputted into an opened lower side of the floor frame and fastened to the battery mount support; and a joint unit configured to support the battery mount support and connected to a plurality of framework members that constitutes the floor frame.
(11) The joint unit may comprise: a front joint mounted at a position at which the battery mount support faces a front bulkhead that constitutes at least one of the plurality of framework members; a first center joint mounted on the battery mount support and configured to accommodate therein a first center bulkhead that constitutes at least one of the plurality of framework members; a second center joint formed as a second center bulkhead that constitutes at least one of the plurality of framework members, wherein the second center bulkhead is connected to a connection frame, and wherein the connection frame is configured to support the battery mount support and a passenger space of the fuselage; and a rear joint coupled to a rear bulkhead that constitutes at least one of the plurality of framework members.
(12) The front joint may be provided as a skid mounting bracket for fastening a front skid member mounted on the opened lower side of the floor frame.
(13) The second center joint may be formed in a hemispherical shape corresponding to a shape of a lower portion of the fuselage and formed as the battery mount support and the connection frame are respectively flange-coupled to front and rear surfaces.
(14) The battery mount support may have a coupling guide extending to correspond to a shape of a coupling flange of the second center joint.
(15) The battery unit may comprise: a battery configured to supply electric power for operating the fuselage; and a battery support extending to two opposite sides of the battery and coupled to the battery mount support.
(16) The battery support may be fixed to the battery from the floor frame by a nut and a fastening member, and wherein the fastening member penetrate the battery mount support.
(17) The structure may further comprise: a fuselage lower panel configured to constitute a bottom surface of the fuselage by being coupled to a side panel of the fuselage in a state in which the battery unit is coupled to the battery mount support.
(18) Other aspects of the present disclosure are discussed infra.
(19) It is understood that the term “vehicle” or “vehicular” or other similar term as used herein is inclusive of motor vehicles in general such as passenger automobiles including sports utility

vehicles (SUV), buses, trucks, various commercial vehicles, watercraft including a variety of boats and ships, aircraft, and the like, and includes hybrid vehicles, electric vehicles, plug-in hybrid electric vehicles, hydrogen-powered vehicles and other alternative fuel vehicles (e.g. fuels derived from resources other than petroleum). As referred to herein, a hybrid vehicle is a vehicle that has two or more sources of power, for example both gasoline-powered and electric-powered vehicles.
(20) These and other features and advantages are described in greater detail below.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The above and other features of the present disclosure will now be described in detail with reference to various examples thereof illustrated in the accompanying drawings which are given hereinbelow by way of illustration only, and thus are not limitative of the present disclosure, and wherein:
(2) FIG. **1** is a view illustrating a collision load dispersion structure of a fuselage;
(3) FIG. **2** is a view illustrating a fastening relationship of a support fitting member and a wing fitting member to the collision load dispersion structure of the fuselage;
(4) FIG. **3** is a view illustrating a rear unit with respect to the collision load dispersion structure of the fuselage;
(5) FIG. **4** is a view illustrating a connection relationship of a wing unit and the rear unit to the collision load dispersion structure of the fuselage;
(6) FIG. **5** is a view illustrating a state in which a longitudinal load and a height direction load are dispersed toward a rear side of the wing unit and a rear side of the fuselage with respect to the collision load dispersion structure of the fuselage;
(7) FIG. **6** is a view illustrating a state in which a longitudinal center load and a side load are transmitted with respect to the collision load dispersion structure of the fuselage;
(8) FIG. **7** is a view illustrating a battery load dispersion structure of a fuselage;
(9) FIG. **8** is a view illustrating a front joint with respect to the battery load dispersion structure of the fuselage;
(10) FIG. **9** is a view illustrating a first center joint with respect to the battery load dispersion structure of the fuselage;
(11) FIG. **10** is a cross-sectional view taken along line A-A in FIG. **9** and illustrating the battery load dispersion structure of the fuselage;
(12) FIG. **11** is a view illustrating a second center joint and a rear joint with respect to the battery load dispersion structure of the fuselage;
(13) FIG. **12** is a cross-sectional view taken along line B-B in FIG. **11** and illustrating the battery load dispersion structure of the fuselage;
(14) FIG. **13** is a cross-sectional view taken along line C-C in FIG. **11** and illustrating the battery load dispersion structure of the fuselage;
(15) FIG. **14** is a cross-sectional view taken along line D-D in FIG. **11** and illustrating the battery load dispersion structure of the fuselage; and
(16) FIGS. **15**A and **15**B are views illustrating a fastening member and a fuselage lower panel with respect to the battery load dispersion structure of the fuselage.
(17) It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various preferred features illustrative of the basic principles of the disclosure. The specific design features of the present disclosure as disclosed herein, including, for example, specific dimensions, orientations, locations, and shapes will be determined in part by the particular intended application and use environment.
(18) In the figures, reference numbers refer to the same or equivalent parts of the present disclosure

throughout the several figures of the drawing.

DETAILED DESCRIPTION

(19) Hereinafter reference will now be made in detail to various examples of the present disclosure, examples of which are illustrated in the accompanying drawings and described below. While the present disclosure will be described in conjunction with certain examples, it will be understood that present description is not intended to limit the scope of the disclosure to those examples. It should be understood that various alternatives, modifications, equivalents and other examples are also within the scope of the present disclosure.

(20) Hereinafter, various examples of the present disclosure will be described in more detail with reference to the accompanying drawings. The features described herein may be modified in various different forms, and it is not interpreted that the scope of the present disclosure is limited to such exemplary features.

(21) In addition, the term "part," "unit," "member," or the like, which is described in the specification, may refer to a unit that performs at least one function or operation, and the "part," "unit," "member," or the like may be implemented by software and/or hardware.

(22) In addition, when one constituent element disclosed in the specification is referred to as being "connected to" another constituent element, one constituent element can be "directly connected to" the other constituent element, and one constituent element can also be "indirectly connected to" the other constituent element. The indirect connection includes a connection through a wireless communication network.

(23) In addition, the term "upper end" disclosed in the specification may refer to a direction of an upward movement in a height direction in the drawings, and the term "lower end" may refer to a direction of a downward movement in the height direction in the drawings.

(24) In addition, in the present specification, when one component is described as being positioned "on" or "above" another component, one component can be positioned "directly on" or "directly above" another component, and one component can also be positioned on another component with other components interposed therebetween. In addition, when one component is described as being positioned "under" or "below" another component, one component can be positioned "directly under" or "directly below" another component, and one component can also be positioned on another component with other components interposed therebetween.

(25) In addition, in the present specification, the terms "height direction," "width direction," and "longitudinal direction" are defined on the basis of a fuselage.

(26) In addition, the term "fuselage" disclosed in the specification may be an urban air mobility (UAM) vehicle. The present specification describes a case in which a frontal collision occurs as the urban air mobility vehicle crashes.

(27) In addition, the term "center" disclosed in the specification may refer to a center based on a width direction of the fuselage, and the term "sides" may refer to two opposite ends based on the width direction of the fuselage.

(28) FIG. **1** is a perspective view illustrating a collision load dispersion structure of a fuselage, and FIG. **2** is a perspective side view illustrating the collision load dispersion structure of the fuselage and illustrating a fastening relationship between a support fitting member and a wing fitting member.

(29) The fuselage may include fuselage of aircrafts capable of not only taking off and landing vertically but also flying within a medium range and may be defined as advanced air mobility (AAM) to include all of manned/unmanned aircrafts and autonomous or human-driven aircrafts. Because the fuselage may have a structure similar to a typical aircraft structure, a collision load may be generated in the same direction when the fuselage takes off or lands vertically or takes off from or lands on a runway. Therefore, it is important to ensure that the fuselage needs to absorb collision energy at front and rear sides of the fuselage, and thus deformation of an occupant compartment needs to be reduced.

(30) To this end, with reference to FIGS. **1**, **2**, and **3**, the collision load dispersion structure of the fuselage may include a support unit **300** disposed between a front unit **100** and a rear unit **200** and connected to a wing unit **400**. The collision load dispersion structure may be configured to disperse a load, which may be applied to the fuselage, toward a rear side of the wing unit **400** and a rear side of the fuselage. For example, a longitudinal load and a height direction load, which may be applied to the fuselage, may be transferred through a connection structure between the front unit **100** and the support unit **300**, a connection structure between the support unit **300** and the rear unit **200**, and a connection structure between the support unit **300** and the wing unit **400**, thereby reducing a collision load to be applied to a space in which an occupant is present.
(31) The front unit **100** may be positioned at a front end based on a wing of the fuselage. The front unit **100** may include a window frame **110** on which a windshield glass may be mounted, and roof frames **120**. The roof frame **120** may be connected to a rear end of the window frame **110** and extend in a longitudinal direction (e.g., from the front unit **100** to the wing unit **400** or from the wing unit **400** to the front unit **100**) of the fuselage. The window frame **110** may be a frame that surrounds the windshield glass on the front surface of the fuselage. The roof frames **120** may be fastened to an upper end of the window frame **110**. The plurality of roof frames **120** may be spaced apart from one another in a width direction of the window frame **110**. As illustrated in FIG. **1**, two roof frames **120** may be provided at a center based on the width direction of the window frame **110**, and two roof frames **120** may be provided at sides based on the width direction of the window frame **110**. The four roof frames **120** may be provided at equal intervals. A floor frame **130** may define a fuselage floor. An interior space in the front unit **100** may be divided into a first-row passenger space at a front side and a second-row passenger space at a rear side. The floor frame **130** may be divided into the first-row passenger space and the second-row passenger space based on a rear bulkhead **132**. The rear bulkhead **132** may include a pair of connection frames **132*a*** and **132*b*** connected to a second rear frame **220** to be described below.
(32) The support unit **300** may be positioned between the front unit **100** and the rear unit **200**. The roof frame **120** may be connected to the support unit **300**. In an example, a rear end of the roof frame **120** may be connected to a front end of the support unit **300**. The support unit **300** may be connected to the front unit **100** and the rear unit **200** and configured to disperse rearward a load applied to a front side of the fuselage. In an example, the support unit **300** may include a first flange part **310**, a second flange part **320**, a plate part **330**, and support fitting members **340**.
(33) The support unit **300** may be configured such that the first flange part **310** and the second flange part **320** face each other with respect to the plate part **330**. An interior of the support unit **300** may include a space in which the first flange part **310** and the second flange part **320** are fastened while facing each other. The first flange part **310** may be connected to the rear end of the roof frame **120**. In an example, the rear end of the roof frame **120** may be fastened to a front outer surface of the first flange part **310**. The second flange part **320** may be connected to a front end of the rear unit **200**. In an example, the front end of the rear unit **200** may be fastened to a rear outer surface of the second flange part **320**.
(34) The plate part **330** may be provided between the first flange part **310** and the second flange part **320**. In an example, the plate part **330** may define a rear surface of a recessed region between the first flange part **310** and the second flange part **320** positioned at two opposite surfaces based on the longitudinal direction. The plate part **330** may be formed in a plate shape and provided between a lower end of the first flange part **310** and a lower end of the second flange part **320**. The plate part **330** may be connected to a member, which defines an external framework of the fuselage, and configured to transfer a longitudinal load and a height direction load of the fuselage.
(35) The support fitting members **340** may be provided at two opposite inner surfaces of the first flange part **310** and two opposite inner surfaces of the second flange part **320**. In an example, the support fitting members **340** may be provided inside the first flange part **310** and fastened to wing fitting members **430** disposed at positions corresponding to longitudinal ends of wing frame parts

440. In an example, as illustrated in FIG. **2**, two support fitting members **340** may be provided at each of left and right sides based on the width direction and disposed inside the first flange part **310** when it is necessary to reinforce a connection structure between a first flange **310** and a first framework part **410**. Two support fitting members **340** may be provided at each of left and right sides based on the width direction and disposed inside the second flange part **320**. One end of each of the support fitting members **340** may be provided at a position corresponding to the inside of each of the first flange part **310** and the second flange part **320**. Coupling parts may be provided at the other end of the first flange part **310** and the other end of the second flange part **320**, which correspond to two opposite ends of the support fitting members **340**, and fastened to the wing fitting member **430**.
(36) The wing unit **400** may be positioned inside the support unit **300**. The wing unit **400** may be connected to the support unit **300** and configured to disperse a load along the wing unit **400** when the load is generated in the event of a collision of the fuselage. The wing unit **400** may include the first framework part **410**, a second framework part **420**, the wing fitting member **430**, the wing frame parts **440**, and a skin part **450**. The first framework part **410** may be spaced apart from an inner side of the first flange part **310** at a predetermined interval and extend in the width direction of the fuselage. The second framework part **420** may be spaced apart from an inner side of the second flange part **320** at a predetermined interval and extend in the width direction of the fuselage. The first framework part **410** may define a transverse framework at a front end of the wing unit **400**, and the second framework part **420** may define a transverse framework at a rear end of the wing unit **400**.
(37) The wing fitting members **430** may be positioned at positions corresponding to the longitudinal direction of the support fitting members **340** and provided at an outer side of the first framework part **410** and an outer side of the second framework part **420**. The outer side of the first framework part **410** at which the wing fitting member **430** is positioned may mean a direction in which the first framework part **410** faces the first flange part **310**. The outer side of the second framework part **420** at which the wing fitting member **430** is positioned may mean a direction in which the second framework part **420** faces the second flange part **320**.
(38) The wing fitting members **430** may be connected to the support fitting members **340**. In an example, two wing fitting members **430** may be provided at each of left and right sides based on the width direction and disposed outside the first framework part **410**. Two wing fitting members **430** may be provided at each of left and right sides based on the width direction and disposed outside the second framework part **420**. One end of each of the wing fitting members **430** may be fixed to the outer side of each of the first framework part **410** and the second framework part **420**, and a coupling part may be provided at the other end of each of the first framework part **410** and the second framework part **420**. The coupling part of the support fitting member **340** and the coupling part of the wing fitting member **430** may be fastened to each other, and the wing unit **400** may be fixed to the support unit **300**.
(39) The wing frame part **440** may be provided between the first framework part **410** and the second framework part **420**. The wing fitting member **430** may be provided at a position corresponding to one longitudinal end of the wing frame part **440**. In an example, as illustrated in FIG. **1**, two wing frame parts **440** may be provided between the first framework part **410** and the second framework part **420** positioned above the plate part **330**. The wing frame parts **440** may be positioned between the first framework part **410** and the second framework part **420** and configured to transfer a load applied to the first framework part **410** and a load applied to the second framework part **420**. As illustrated in FIG. **2**, the wing fitting members **430** and the support fitting members **340** may be fastened so that the wing frame parts **440** are positioned on the same lines as the roof frames **120** facing one another, such that the wing frame parts **440** may transfer the load applied to the first framework part **410** and the load applied to the second framework part **420**.
(40) The skin part **450** (see e.g., FIG. **5**) may surround an outer side of the first framework part **410**

and an outer side of the second framework part **420**. The skin part **450** may be positioned while adjoining an upper surface of the first framework part **410** and an upper surface of the second framework part **420**. As described above, the skin part **450**, which may be positioned while adjoining the first framework part **410** and the second framework part **420**, may be configured to disperse a load applied to the first framework part **410** and a load applied to the second framework part **420** in the longitudinal direction or the width direction of the wing unit **400**. The longitudinal load (e.g., the load applied along the longitudinal direction) of the fuselage may be dispersed to the wing unit **400** through the support unit **300** via the front unit **100**.
(41) FIG. **3** illustrates the rear unit of the collision load dispersion structure of the fuselage, and FIG. **4** illustrates a connection relationship between the rear unit and the wing unit **400** of the collision load dispersion structure of the fuselage.
(42) With reference to FIGS. **3** and **4**, the rear unit **200** may be positioned at a rear end based on the wing of the fuselage. The rear unit **200** may include a first rear frame **210**, the second rear frame **220**, rear center frames **230**, and rear side frames **240**. The first rear frame **210** may be connected to the plate part **330**. In an example, the first rear frame **210** may extend in a height direction along an outer side of the fuselage and be fastened to a lower end of the second flange part **320** from the fuselage floor. In an example, an upper end of the first rear frame **210** may be positioned while adjoining the lower end of the second flange part **320**.
(43) The second rear frame **220** may be positioned at a rear end of the first rear frame **210**. The second rear frame **220** may be formed in a plate shape and disposed adjacent to the rear end of the first rear frame **210**. The second rear frame **220** may be fastened to the pair of connection frames **132***a* and **132***b* connected to the rear bulkhead **132**. The second rear frame **220** may be positioned to have a predetermined interval based on the upper end of the first rear frame **210**, for example, an interval corresponding to a length of the rear center frame **230** in FIG. **4**, such that the second rear frame **220** may be configured to transmit a load, which may be applied from a lower end of the fuselage, to an upper end of the fuselage in the height direction.
(44) The rear center frame **230** may be positioned between the second flange part **320** and the second rear frame **220**. The rear center frames **230** may be disposed in a space in which the second flange part **320** and the second rear frame **220** face each other. In an example, two rear center frames **230** may be provided at positions corresponding to the positions of the wing frame parts **440** in the longitudinal direction.
(45) The rear side frame **240** may be positioned while adjoining the first rear frame **210** and the second rear frame **220**. The rear side frame **240** may be connected to the upper end of the first rear frame **210** and an upper end of the second rear frame **220**. The rear side frame **240** may extend rearward in the longitudinal direction of the fuselage. One end of the rear side frame **240** may be connected to the first rear frame, and the other end of the rear side frame **240** may extend toward the rear side of the fuselage.
(46) FIG. **5** is a view illustrating a state in which the longitudinal load and the height direction load of the collision load dispersion structure of the fuselage are dispersed toward the rear side of the wing unit **400** and the rear side of the fuselage.
(47) With reference to FIG. **5**, the longitudinal load of the fuselage may be transferred to the first flange part **310** (see e.g., FIG. **6**) through the window frame **110** and the roof frame **120**, transferred to the first framework part **410** through the support fitting member **340** (see e.g., FIG. **2**) and the wing fitting member **430**, and dispersed through the skin part **450**. The load transferred to the first framework part **410** may be transferred to the second framework part **420** (see e.g., FIG. **1**) through the wing frame part **440** and dispersed through the skin part **450**.
(48) In an example, in case that the fuselage crashes and a collision load is applied at a predetermined angle with respect to a front end of the fuselage, the longitudinal load may be applied to the window frame **110** and transferred to a front end of the roof frame **120** connected to a rear end of the window frame **110**. The load transferred to the rear end of the roof frame **120** may

be transferred to the first flange part **310** and transferred to the support fitting member **340** and the wing fitting member **430**. The load transferred to the support fitting member **340** and the wing fitting member **430** may be transferred to the first framework part **410** and dispersed in the longitudinal direction of the first framework part **410**. The load, which is dispersed in the longitudinal direction of the first framework part **410**, may also be dispersed in the longitudinal direction of the fuselage through the skin part **450**. The load transferred to the first framework part **410** may be transferred to the second framework part **420** through the wing frame part **440** and dispersed in the longitudinal direction of the second framework part **420**. The load, which is dispersed in the longitudinal direction of the second framework part **420**, may also be dispersed in the longitudinal direction of the fuselage through the skin part **450**.

(49) The height direction load (e.g., the load applied along the height direction) of the fuselage may be transferred to the second flange part **320** (see e.g., FIG. **4**) through the first rear frame **210**, transferred to the rear side frame **240** and the rear center frame **230** of the rear unit **400** through the second rear frame **220**, transferred to the second framework part **420** through the support fitting member **340** and the wing fitting member **430**, and dispersed through the skin part **450**. The load transferred to the second framework part **420** may be transferred to the first framework part **410** through the wing frame part **440** and dispersed through the entire region of the fuselage.

(50) In an example, in case that a height direction collision load (e.g., the collision load applied along the height direction) of the fuselage is applied, the height direction load transferred to the fuselage may be applied to a lower end of the first rear frame **210** and transferred to the second flange part **320** connected to the upper end of the first rear frame **210**. A part of the height direction load applied to the fuselage may be applied to a lower end of the second rear frame **220** and transferred to the rear side frame **240** connected to the upper end of the second rear frame **220**. The collision load applied to the second rear frame **220** may be transferred to the second flange part **320** and transferred to the wing fitting member **430** through the support fitting member **340** fastened to the second flange part **320**. The load transferred to the support fitting member **340** and the wing fitting member **430** may be transferred to the second framework part **420** and dispersed in the longitudinal direction of the second framework part **420**. The load, which is dispersed in the longitudinal direction of the second framework part **420**, may also be dispersed in the longitudinal direction of the fuselage through the skin part **450**. The load transferred to the second framework part **420** may be transferred to the first framework part **410** through the wing frame part **440** and dispersed in the longitudinal direction of the first framework part **410**. The load, which is dispersed in the longitudinal direction of the first framework part **410**, may also be dispersed in the longitudinal direction of the fuselage through the skin part **450**. Therefore, the height direction load of the fuselage may be dispersed to the wing unit **400** through the support unit **300** via the rear unit **200**.

(51) FIG. **6** illustrates a state in which a longitudinal center load and a side load of the collision load dispersion structure of the fuselage are transferred.

(52) With reference to FIG. **6**, the load applied in the longitudinal direction of the fuselage may be transferred to the wing frame part **440** from the roof frame **120** through the first flange part **310** and transferred to the rear center frame **230** from the wing frame part **440** through the second flange part **320**. The longitudinal direction side load of the fuselage may be transferred to the rear side frames **240** through the first rear frame **210** along a lateral side of the plate part **330** from the roof frames **120** at the two opposite ends at the front side.

(53) In an example, the load applied in the longitudinal direction of the fuselage may be transferred from the front end to the rear end of the roof frame **120** and transferred to the support fitting member **340** and the wing fitting member **430** disposed adjacent to the first flange part **310** through the first flange part **310**. The load, which is transferred to the support fitting member **340** and the wing fitting member **430** disposed adjacent to the first flange part **310**, may be transferred to the wing frame part **440** and transferred to the support fitting member **340** and the wing fitting member

430 disposed adjacent to the second flange part **320**. The load, which is transferred to the support fitting member **340** and the wing fitting member **430** disposed adjacent to the second flange part **320**, may be transferred to the second flange part **320** and transferred to the rear center frame **230**.
(54) A load, which is transmitted to a lateral side among the longitudinal loads of the fuselage, may be transferred from the front end to the rear end of the fuselage along the two opposite ends of the roof frame **120** and transferred to the rear surface of the fuselage in the longitudinal direction of the plate part **330**. The load transferred to the rear end of the plate part **330** may be transferred to the rear side frame **240** through the first rear frame **210**.
(55) In at least some implementations, one or more features and/or structures described in the present disclosure may provide the collision load dispersion structure of the fuselage, which is capable of ensuring stability by reducing the collision load applied to the space, in which the occupant is present, by applying the support unit **300** and transferring and dispersing a crash load, which is applied to the fuselage, to the rear side of the wing unit **400** and the rear side of the fuselage.
(56) Hereinafter, FIG. **7** is a view illustrating a battery load dispersion structure of a fuselage, and FIG. **8** is a view illustrating a front joint with respect to the battery load dispersion structure of the fuselage.
(57) FIG. **9** is a view illustrating a first center joint with respect to the battery load dispersion structure of the fuselage, and FIG. **10** is a cross-sectional view taken along line A-A in FIG. **9** and illustrating the battery load dispersion structure of the fuselage.
(58) FIG. **11** is a view illustrating a second center joint and a rear joint with respect to the battery load dispersion structure of the fuselage, and FIG. **12** is a cross-sectional view taken along line B-B in FIG. **11** and illustrating the battery load dispersion structure of the fuselage.
(59) FIG. **13** is a cross-sectional view taken along line C-C in FIG. **11** and illustrating the battery load dispersion structure of the fuselage, FIG. **14** is a cross-sectional view taken along line D-D in FIG. **11** and illustrating the battery load dispersion structure of the fuselage, and FIGS. **15**A and **15**B are views illustrating a fastening member and a fuselage lower panel with respect to the battery load dispersion structure of the fuselage.
(60) As illustrated in FIG. **7**, the battery load support structure of the fuselage may include battery mount supports **500**, a battery unit **600**, and a joint unit **700**.
(61) The battery mount support **500** may be provided as a pair of battery mount supports **500** provided in the longitudinal direction of a floor frame **130** of a fuselage **10**.
(62) In at least some implementations, the floor frame **130** may define the fuselage floor. The interior space in the front unit **100** may be divided into the first-row passenger space at the front side and the second-row passenger space at the rear side.
(63) The floor frame **130** may be divided into the first-row passenger space and the second-row passenger space based on the first center bulkhead **132** among the plurality of components that constitutes a framework member for structurally supporting the fuselage **10**. A rear bulkhead **134** for supporting the second-row passenger space may include a pair of connection frames **134***a* and **134***b* connected to the second rear frame **220**.
(64) As illustrated in FIG. **15**A, the battery unit **600** may be positioned on a rear surface of the floor frame **130**, and two opposite sides of the battery unit **600** may be coupled to the pair of battery mount supports **500** mounted on the floor frame **130**.
(65) To this end, the battery unit **600** may include a battery **610** and a battery support **620**.
(66) The battery **610** may be provided to supply electric power for operating the fuselage **10**. The battery support **620** may be coupled to two opposite sides of the battery **610** and coupled to the battery mount support **500**, as illustrated in FIG. **15**B.
(67) The battery support **620** may include a first mounting member **622** and a second mounting member **624**.
(68) The first mounting member **622** may be coupled to surround the battery **610**.

(69) The second mounting member **624** may extend in a horizontal direction from the first mounting member **622** and may be coupled (see e.g., FIG. **15**B) by a fastening member **510** and a nut **520** that penetrate the battery mount support **500**, such that the battery **610** is fixed.
(70) The fastening member **510** for fixing the battery **610** may penetrate the second mounting member **624**. The fastening member **510**, which penetrates the second mounting member **624** as described above, may be fastened to the nut **520** provided on the second mounting member **624**, such that a position of the battery unit **600** may be fixed to the rear surface of the floor frame **130**. Therefore, a fuselage lower panel **800** and a side panel **12** of the fuselage **10** may be coupled in a state in which the battery unit **600** is coupled to the battery mount support **500**, thereby defining a bottom surface of the fuselage **10**.
(71) For example, a weight of the battery unit **600** may be about 800 kg (or any other weight), and the battery unit **600** may not be inputted into the interior by using a door opening portion of the fuselage **10** because of the size of the battery unit **600**. Further, there may be a problem in that aerodynamic performance inevitably deteriorates because the battery unit **600** protrudes outward when the battery unit **600** is mounted on a lower portion of the fuselage **10**.
(72) Therefore, in the present disclosure (e.g., as illustrated in FIGS. **15**A and **15**B), the battery mount supports **500**, which extend to have a length, may be mounted at the two opposite sides of the floor frame **130** that constitutes the fuselage **10**. The battery unit **600** may be sequentially fastened to the battery mount supports **500**, and the fuselage lower panel **800** may be coupled to extend from the side panel **12** of the fuselage **10** in a state in which the fastening is completed as described above, such that the bottom surface of the fuselage **10** is defined. Therefore, the battery unit **600** may be mounted on the lower portion of the fuselage **10** and disposed inside the fuselage lower panel **800**, thereby solving a problem in that aerodynamic performance deteriorates because the battery unit **600** is installed to protrude.
(73) It may be necessary to ensure performance for supporting the load as the weight of the battery unit **600** increases. Therefore, in the present disclosure, the configuration of the joint unit **700** may improve performance of the floor frame **130** that supports a load applied as the battery unit **600** is mounted.
(74) In this case, the joint unit **700** may include a front joint **710**, a first center joint **720**, a second center joint, and a rear joint **730**.
(75) As illustrated in FIG. **8**, the front joint **710** may be mounted at a position at which a front bulk head **131** and the battery mount support **500** face each other.
(76) In an example, the front joint **710** may be formed such that a first coupling region and a second coupling region, which are provided in a perpendicular direction, support the front bulkhead **131** and the battery mount support **500**.
(77) The front joint **710** may define a skid mount bracket (see e.g., FIG. **5**) for fastening a front skid member **135** mounted on a lower side of the floor frame **130** instead of simply serving to structurally support the front bulkhead **131** and the battery mount support **500**.
(78) As illustrated in FIG. **9**, the first center joint **720** may be mounted on the first center bulkhead **132** for supporting the load transferred to the floor frame **130** and applied in the height direction of the fuselage.
(79) As illustrated in FIG. **10**, the first center joint **720** may be formed in a 'U' shape to accommodate the first center bulkhead **132** therein and coupled to the battery mount support **500**, thereby defining the framework of the fuselage **10**. As the first center bulkhead **132** and the battery mount support **500**, which have closed cross-sections, are coupled, load supporting performance of the battery mount support **500** on which the battery unit **600** is mounted may be improved.
(80) The second center joint corresponds to a second center bulkhead **133**. The second center bulkhead **133** may define a joint structure for connecting the connection frames **134***a* and **134***b* for supporting the battery mount support **500** and the passenger space of the fuselage **10**, thereby supporting the battery mount support **500**.

(81) The second center joint may be formed in a hemispherical shape corresponding to a shape of the lower portion of the fuselage **10**. As illustrated in FIG. **13**, the second center joint may be formed as the battery mount supports **500** and the connection frames **134***a* and **134***b* may be respectively flange-coupled to the front and rear surfaces.
(82) In this case, the second center bulkhead **133**, which defines the second center joint, may be formed in a hemispherical shape, such that the battery mount support **500**, which is flange-coupled, may also be formed in a shape corresponding to the hemispherical shape. As illustrated in FIG. **12**, the battery mount support **500** may have a coupling guide **530** corresponding to a coupling flange shape of the second center joint, and the battery mount support **500** may be effectively supported by the second center joint by using the coupling guide **530**.
(83) The rear joint **730** may be coupled to the rear bulkhead **134**. As illustrated in FIG. **14**, the rear joint **730** may connect the rear bulkhead **134** and the rear bulk header inner **134** extending to the first rear frame **220**, thereby improving performance in supporting a structural load of the rear bulkhead **134** and improving performance in supporting the load of the connection frames **134***a* and **134***b* coupled to the rear bulkhead **134** and the load of the battery mount support **500** disposed on the same line as the connection frames **134** and **134***b*, thereby eventually supporting the battery unit **600** stably.
(84) A battery load support structure of a fuselage may include: a battery mount support formed in a longitudinal direction of a floor frame of the fuselage; a battery unit inputted into an opened lower side of the floor frame and fastened to the battery mount support; and a joint unit configured to support the battery mount support and connected to a plurality of framework members that constitutes the floor frame.
(85) The joint unit may include: a front joint mounted at a position at which the battery mount support faces a front bulkhead that constitutes the framework member; a first center joint mounted on the battery mount support and configured to accommodate therein a first center bulkhead that constitutes the framework member; a second center joint formed as a second center bulkhead, which constitutes the framework member, is connected to a connection frame that supports the battery mount support and a passenger space of the fuselage; and a rear joint coupled to a rear bulkhead that constitutes the framework member.
(86) The front joint may be provided as a skid mounting bracket for fastening a front skid member mounted on the lower side of the floor frame.
(87) The second center joint may be formed in a hemispherical shape corresponding to a shape of a lower portion of the fuselage and formed as the battery mount support and the connection frame are respectively flange-coupled to front and rear surfaces.
(88) The battery mount support may have a coupling guide extending to correspond to a shape of a coupling flange of the second center joint.
(89) The battery unit may include: a battery configured to supply electric power for operating the fuselage; and a battery support extending to two opposite sides of the battery and coupled to the battery mount support.
(90) The battery support may be fixed to the battery from the floor frame by a fastening member and a nut that penetrate the battery mount support.
(91) The battery load support structure may further include: a fuselage lower panel configured to define a bottom surface of the fuselage by being coupled to a side panel of the fuselage in a state in which the battery unit is coupled to the battery mount support.
(92) According to the present disclosure, the battery mount support may be mounted on the floor frame, and the battery unit may be fastened to the battery mount support extending in the longitudinal direction, such that the battery unit may be coupled from below the fuselage. Further, the joint unit is coupled to the plurality of positions at which the battery mount support adjoins the front bulkhead, the center bulkhead, and the rear bulkhead that constitute the fuselage, such that structural reinforcement is implemented. Therefore, it is possible to improve load supporting

performance of the battery mount support.
(93) According to one or more aspects of the present disclosure, the battery mount support may be mounted on the floor frame, and the battery unit may be fastened to the battery mount support extending in the longitudinal direction, such that the battery unit may be coupled from below the fuselage. Further, the joint unit may be coupled to the plurality of positions at which the battery mount support adjoins the front bulkhead, the center bulkhead, and the rear bulkhead that constitute the fuselage, such that structural reinforcement is implemented. Therefore, it is possible to improve load supporting performance of the battery mount support.
(94) While various examples of the present disclosure have been described above with reference to the illustrated drawings, the exemplary aspects of the present disclosure are described just for illustration, and those skilled in the art will understand that various modifications of the features may be made, and all or some of the described features may be selectively combined. Accordingly, the true technical protection scope of the present disclosure should be determined by the technical spirit of the appended claims.

Claims

1. A structure, comprising: a battery mount support coupled to a floor frame of a fuselage; a battery unit inputted into an opened lower side of the floor frame and fastened to the battery mount support; and a joint unit configured to support the battery mount support and connected to a plurality of framework members that constitutes the floor frame, wherein the joint unit comprises: a front joint mounted at a position at which the battery mount support faces a front bulkhead that constitutes at least one of the plurality of framework members; a first center joint mounted on the battery mount support and configured to accommodate therein a first center bulkhead that constitutes at least one of the plurality of framework members; a second center joint formed as a second center bulkhead that constitutes at least one of the plurality of framework members, wherein the second center bulkhead is connected to a connection frame, and wherein the connection frame is configured to support the battery mount support and a passenger space of the fuselage; and a rear joint coupled to a rear bulkhead that constitutes at least one of the plurality of framework members, wherein the front joint is provided as a skid mounting bracket for fastening a front skid member mounted on the opened lower side of the floor frame, and wherein the battery mount support has a coupling guide extending to correspond to a shape of a coupling flange of the second center joint.
2. The structure according to claim 1, wherein the second center joint is formed in a hemispherical shape corresponding to a shape of a lower portion of the fuselage and the connection frame is flange-coupled to the second center bulkhead.
3. The structure according to claim 1, wherein the battery unit comprises: a battery configured to supply electric power for operating the fuselage; and a battery support configured to support two opposite sides of the battery, wherein the battery support is coupled to the battery mount support.
4. The structure according to claim 3, wherein the battery support is fixed to the battery and to the battery mount support by a nut and a bolt, and wherein the bolt penetrates the battery mount support and the battery support.
5. The structure according to claim 1, further comprising: a fuselage lower panel configured to constitute a bottom surface of the fuselage by being coupled to a side panel of the fuselage in a state in which the battery unit is coupled to the battery mount support.
6. A vehicle, comprising: a body; a battery mount support coupled to a floor frame of the body; a battery unit inputted into an opened lower side of the floor frame and fastened to the battery mount support; and a joint unit configured to support the battery mount support and connected to a plurality of framework members that constitutes the floor frame, wherein the joint unit comprises: a front joint mounted at a position at which the battery mount support faces a front bulkhead that

constitutes at least one of the plurality of framework members; and a rear joint coupled to a rear bulkhead that constitutes at least one of the plurality of framework members, wherein the front joint is provided as a skid mounting bracket for fastening a front skid member mounted on the opened lower side of the floor frame, and wherein the battery mount support has a coupling guide extending to correspond to a shape of a coupling flange of a center joint of the joint unit.

7. The vehicle according to claim 6, wherein the joint unit further comprises: a first center joint mounted on the battery mount support and configured to accommodate therein a first center bulkhead that constitutes at least one of the plurality of framework members; and the center joint of the joint unit, wherein the center joint of the joint unit is a second center joint formed as a second center bulkhead that constitutes at least one of the plurality of framework members, wherein the second center bulkhead is connected to a connection frame, and wherein the connection frame is configured to support the battery mount support and a passenger space of the body.

8. The vehicle according to claim 7, wherein the second center joint is formed in a hemispherical shape corresponding to a shape of a lower portion of the body and the connection frame is flange-coupled to the second center bulkhead.

9. The vehicle according to claim 6, wherein the battery unit comprises: a battery configured to supply electric power for operating the body; and a battery support configured to support two opposite sides of the battery, wherein the battery support is coupled to the battery mount support.

10. The vehicle according to claim 9, wherein the battery support is fixed to the battery and to the battery mount support by a nut and a bolt, and wherein the bolt penetrates the battery mount support and the battery support.

11. The vehicle according to claim 6, further comprising: a lower panel configured to constitute a bottom surface of the body by being coupled to a side panel of the body in a state in which the battery unit is coupled to the battery mount support.