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LOWER VEHICLE BODY FRAME ASSEMBLY AND VEHICLE

Abstract

A lower vehicle body frame assembly includes a frame body; a footrest plate coupled to a side of the frame body; and a rear cross beam coupled to a side of the frame body away from the footrest plate. The frame body, the footrest plate and the rear cross beam are integrally formed.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is a national stage entry under 35 U.S.C. § 371 of International Application No. PCT/CN2023/087379, filed on Apr. 10, 2023, which claims priority to Chinese Patent Application No. 202210400700.4, filed on Apr. 17, 2022, the entire disclosures of which are hereby incorporated herein by reference.

FIELD
[0002] The present application relates to the technical field of vehicle manufacturing, and in particular to a lower vehicle body frame assembly and a vehicle.
BACKGROUND
[0003] With the increasing popularity of vehicles, people's requirements for vehicle safety are getting higher and higher. A front floor module, as a core member of the vehicles, together with a front engine compartment module and the rear floor module, forms a lower body structure of the vehicles.
SUMMARY
[0004] The present disclosure relates to the technical field of vehicle manufacturing, and in particular to a lower vehicle body frame assembly and a vehicle.
[0005] Embodiments of a first aspect of the present disclosure provide a lower vehicle body frame assembly for a vehicle. The lower vehicle body frame assembly includes: a frame body; a footrest plate coupled to a side of the frame body; and a rear cross beam coupled to a side of the frame body away from the footrest plate. The frame body, the footrest plate and the rear cross beam are integrally formed.
[0006] Embodiments of a second aspect of the present disclosure also provide a vehicle, which includes a lower vehicle body frame assembly of any of embodiments of the first aspect.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0007] Other features, objects and advantages of the present disclosure will become more apparent by reading the following detailed description of non-limiting embodiments with reference to the accompanying drawings, in which the same or similar reference numerals indicate the same or similar features.
[0008] FIG. **1** is a structural schematic diagram of a lower vehicle body frame assembly provided by an embodiment of the present disclosure;
[0009] FIG. **2** is a schematic structural view of a lower vehicle body frame assembly provided by an embodiment of the present disclosure from another perspective;
[0010] FIG. **3** is a schematic structural view of a lower vehicle body frame assembly provided by another embodiment of the present disclosure;
[0011] FIG. **4** is a structural schematic diagram of a lower vehicle body frame assembly provided by yet another embodiment of the present disclosure;
[0012] FIG. **5** is a partially enlarged structural diagram of FIG. **4**;
[0013] FIG. **6** is an enlarged structural diagram of FIG. **4** in another embodiment;
[0014] FIG. **7** is an enlarged structural diagram of FIG. **4** in yet another embodiment;
[0015] FIG. **8** is a schematic structural view of a lower vehicle body frame assembly provided by an embodiment of the present disclosure from yet another perspective;
[0016] FIG. **9** is a schematic structural view of a lower vehicle body frame assembly provided by an embodiment of the present disclosure from still another perspective;
[0017] FIG. **10** is a partially enlarged structural diagram of FIG. **1**; and

[0018] FIG. **11** is an exploded schematic diagram of FIG. **3**.

DETAILED DESCRIPTION

[0019] Features and example embodiments of various aspects of the present disclosure will be described in detail below. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. However, it will be apparent to one skilled in the art that the present disclosure may be practiced without some of these specific details. The following description of embodiments is only to provide a better understanding of the present disclosure by showing examples of the present disclosure. In the drawings and the following description, at least some well-known structures and techniques are not illustrated in order to avoid unnecessarily obscuring the present disclosure. Moreover, for clarity, the dimensions of some structures may be exaggerated. Furthermore, the features, structures or characteristics described below may be combined in one or more embodiments in any suitable manner.

[0020] In the description of the present disclosure, it should be noted that unless otherwise specified, “a plurality of” means more than two. The orientation or positional relationship indicated by the terms such as “upper”, “lower”, “left”, “right”, “inner” and “outer” are only for the convenience of describing the present disclosure and simplifying the description, and do not indicate or imply that the devices or elements referred to must have a specific orientation, be constructed and operated in a specific orientation, which thus cannot be understood as limitations of the present disclosure. In addition, the terms “first”, “second” and so on are only used for descriptive purposes and cannot be understood as indicating or implying relative importance.

[0021] The directional words appearing in the following description are all directions illustrated in the figures, and are not intended to limit the specific structure of embodiments of the present disclosure. In the description of the present disclosure, it should also be noted that unless otherwise specified and limited, the terms “mount” and “couple” should be broadly understood, for example, they may be fixed connection, detachable connection or integrated connection; or may direct connection or indirect connection. For those skilled in the art, the specific meanings of the above terms in the present disclosure may be understood according to the specific circumstances.

[0022] With the rapid development of automobile industry, automobile has become one of the indispensable means of transportation for people to travel. The number of automobiles is increasing year by year. With the increasing popularity of automobiles, the manufacturing and design of automobile parts have brought rapid development.

[0023] With the increasing popularity of electric vehicles in people's lives, people pay more and more attention to the performance of electric vehicle parts.

[0024] In the front floor module of the related art, a main longitudinal beam, a main cross beam and an internal beam usually adopt a split-type design, so that when the vehicle is in a collision, the integrity of the front floor module is weak, which is easy to deform or even disintegrate, resulting in defects in safety performance.

[0025] Based on the above considerations, in order to improve the resistance stress of the lower vehicle body frame assembly when it is subjected to a side impact, the inventor designs a lower vehicle body frame assembly through in-depth research, and by increasing the thickness of the rear torsion box, the lower vehicle body frame assembly may generate stronger resistance stress when the vehicle collides, to resist an external impact force, which has higher safety performance.

[0026] In the traditional fuel vehicle, because of the large layout space of the vehicle body, the loads of frontal collision, side collision and rear collision may be borne by different parts. In the electric vehicle, because a battery pack needs to be arranged under the front floor of the electric vehicle, the lower vehicle body frame assembly has become the most important stress structure on the vehicle body and plays an important role in the performance of the vehicle body.

[0027] Based on the above considerations, in order to improve the stress stability of the front floor and the performance of the vehicle body, the inventor designs a lower vehicle body frame assembly through in-depth research. By configuring the footrest plate, the rear cross beam and the frame body into an integral structure, the overall strength of the lower vehicle body frame assembly is improved, so that the lower vehicle body frame assembly may better withstand the impact force transmitted by frontal collision, side collision and rear collision, thus improving the structural stability and safety performance of the vehicle body.

[0028] The lower vehicle body frame assembly and the vehicle disclosed in embodiments of the present disclosure may be applied to but not limited to electric vehicles, and may be also applied to new energy vehicles such as hydrogen energy vehicles and fuel vehicles. The following description is based on an example that the vehicle is an electric vehicle.

[0029] In order to better understand the present disclosure, the lower vehicle body frame assembly and the vehicle according to embodiments of the present disclosure will be described in detail with reference to FIGS. **1** to **11**.

[0030] FIG. **1** is a structural schematic diagram of a lower vehicle body frame assembly provided by an embodiment of the present disclosure.

[0031] As illustrated in FIG. **1**, the lower vehicle body frame assembly provided by an embodiment of the present disclosure is used for a vehicle. The lower vehicle body frame assembly includes a frame body **10**, a footrest plate **20** and a rear cross beam **30**. The footrest plate **20** is coupled to a side of the frame body **10**. The rear cross beam **30** is coupled to a side of the frame body **10** away from the footrest plate **20**. The frame body **10**, the footrest plate **20** and the rear cross beam **30** are integrally formed.

[0032] In the lower vehicle body frame assembly provided by embodiments of the present disclosure, the lower vehicle body frame assembly includes the frame body **10**, the footrest plate **20** and the rear cross beam **30**. When the vehicle is involved in a collision, the frame body **10** is used to resist an external impact force. In embodiments of the present disclosure, the footrest plate **20** and the rear cross beam **30** are integrally formed on the frame body **10**, and the footrest plate **20** and the rear cross beam **30** are respectively arranged at two sides of the frame body **10**. When the frame body **10** resists the external impact force, the footrest plate **20** and the rear cross beam **30** may assist the frame body **10** to resist a certain impact force, thus improving the resistance to the impact force of the lower vehicle body frame assembly, reducing the deformation of the lower vehicle body frame assembly, and improving the safety of the lower vehicle body frame assembly.

[0033] In some embodiments, the frame body **10** may be a part configured to bear a side-impact load of the vehicle. The footrest plate **20** and the rear cross beam **30** are arranged at two sides of the frame body **10** along a length direction of the frame body **10** (which is Y direction in FIG. **1**), and the length direction is a forward and/or backward direction of the vehicle. The footrest plate **20** and the rear cross beam **30** may assist the frame body **10** to bear the load in a front-rear direction, so that the frame body **10** is not easily deformed when bearing the front-rear load, improving the safety of the lower vehicle body frame assembly.

[0034] The footrest plate **20** is a plate-like structure in the lower vehicle body frame assembly, which is configured for the driver and passenger in the automobile to put their feet on, to make the driver and passenger in a more comfortable posture to improve the driving comfort.

[0035] The rear cross beam **30** is a cross beam configured for assembly of a rear seat, and the rear seat may be arranged on the rear cross beam **30**. The rear seat may include a second-row seat and/or a third-row seat.

[0036] In some embodiments, please continue to refer to FIG. **1**, the frame body **10** includes a side-impact cross beam **11** and a front cross beam **12** arranged side by side and spaced along the length direction of the frame body **10**. The footrest plate **20** is coupled to a side of the side-impact cross beam **11** away from the front cross beam **12**, and the rear cross beam **30** is coupled to a side of the front cross beam **12** away from the side-impact cross beam **11**.

[0037] In some embodiments, the frame body **10** includes a side-impact cross beam **11** and a front cross beam **12**, so that a front seat (i.e., a first-row seat) may be mounted on the frame body **10**.

When the frame body **10** includes the side-impact cross beam **11** and the front cross beam **12**, the footrest plate **20** is arranged close to the side-impact cross beam **11**, and the rear cross beam **30** is arranged close to the front cross beam **12**, so that the distance between the front seat and the rear seat may be reduced.

[0038] In order to mount the seat, a set of seat cross beams usually includes two cross beams in the front-rear direction. For example, a front-seat cross beam **12** includes a first front cross beam **121** and a second front cross beam **122**, and the front seat is mounted on the first front cross beam **121** and the second front cross beam **122**.

[0039] In some embodiments, the first front cross beam **121** and the side-impact cross beam **11** are integrated, and the rear cross beam **30** is coupled to a side of the second front cross beam **122** away from the side-impact cross beam **11**. In these embodiments, the first front cross beam **121** and the side-impact cross beam **11** are a same cross beam. On the one hand, the side-impact cross beam **11** may bear the side-impact load, and on the other hand, the front seat may also be mounted on the side-impact cross beam **11**, which may reduce the overall occupied space of the side-impact cross beam **11** and the front cross beam **12** to save the space.

[0040] In some embodiments, please continue to refer to FIG. **1**, the side-impact cross beam **11** is provided with a coupling projection **111** configured to couple to a seat. The coupling projection **111** is integrally formed with the side-impact cross beam **11** and protrudes from an upper surface of the side-impact cross beam **11**.

[0041] In these embodiments, the coupling projection **111** configured to couple to the front seat is integrated on the side-impact cross beam **11**, which, compared with detachably mounting a bracket configured to couple to the front seat on the side-impact cross beam **11**, may not only improve the mounting efficiency of the lower vehicle body frame assembly, but also improve the stability of the relative position of the coupling projection **111** and the side-impact cross beam **11**, thus improving the stability of the relative position of the front seat and the side-impact cross beam **11**.

[0042] In the present disclosure, “up” and “down” are defined when the lower vehicle body frame assembly of the vehicle is in use, that is, “up” and “down” in the present disclosure are the relative positional relationship when the vehicle is on the ground, where “up” is the side relatively facing away from the ground, and “down” is the side relatively close to the ground.

[0043] A plurality of coupling projections **111** may be provided, and the plurality of coupling projections **111** are spaced along the width direction (that is, X direction in FIG. **1**) of the frame body **10** on the side-impact cross beam **11** for mounting a plurality of front seats. The width direction of the frame body **10** may be a left-right direction of the vehicle.

[0044] The rear cross beam **30** may be arranged in various ways. When the vehicle includes two rows of seats, the rear cross beam **30** may be a second-row cross beam, which includes a second-row front cross beam **31** and a second-row rear cross beam **32**. The second-row front cross beam **31** and the second-row rear cross beam **32** are configured to mount a second row seat.

[0045] In other embodiments, the vehicle includes three rows of seats, then the rear cross beam **30** may include a second-row cross beam and a third-row front cross beam **33**.

[0046] In these embodiments, the second-row cross beam and the third-row front cross beam **33** are integrally formed on the frame body **10**, which may further improve the structural stability of the frame body **10**, enable the lower vehicle body frame assembly to bear a large impact force, and further improve the safety performance of the lower vehicle body frame assembly.

[0047] In some embodiments, the rear cross beam **30** further includes a third-row front cross beam **33**, and a second-row seat cross beam includes a second-row front cross beam **31** and a second-row rear cross beam **32** arranged side by side and spaced along the length direction, and the second-row rear cross beam **32** and the third-row front cross beam **33** are integrated.

[0048] In these embodiments, the second-row rear cross beam **32** and the third-row front cross beam **33** are integrated, that is, the second-row rear cross beam **32** and the third-row front cross beam **33** are the same cross beam, which may reduce the space occupied by the lower vehicle body frame assembly.

[0049] In some embodiments, please continue to refer to FIG. **1**, the lower vehicle body frame assembly further includes a side longitudinal beam **40** coupled to at least one side of the side-impact cross beam **11** in the width direction. For example, the side longitudinal beam **40** includes a first side longitudinal beam **41** and a second side longitudinal beam **42**, and the first side longitudinal beam **41** and the second side longitudinal beam **42** are coupled to two sides of the side-impact cross beam **11** in the width direction. In some embodiments, the side longitudinal beam **40** is also coupled to the rear cross beam **30**. In some embodiments, the side longitudinal beam **40** is also coupled to the second front cross beam **122**. In these embodiments, the side longitudinal beam **40**, the side-impact cross beam **11**, the second front cross beam **122** and the rear cross beam **30** are combined to form a frame structure, which may bear a large impact force of a collision.

[0050] Please refer to FIG. **2**, and FIG. **2** is a schematic structural view of the lower vehicle body frame assembly provided by an embodiment of the present disclosure from another perspective.

[0051] As illustrated in FIGS. **1** and **2**, in some embodiments, the lower vehicle body frame assembly further includes a front torsion box **72**. The front torsion box **72** is coupled to at least one side of the footrest plate **20** in the width direction of the frame body **10**, and the front torsion box **72** and the footrest plate **20** are integrally formed. For example, when the frame body **10** includes the side longitudinal beam **40**, the front torsion box **72** is coupled between the footrest plate **20** and the side longitudinal beam **40**.

[0052] In these embodiments, the front torsion box **72** is a structure configured to transmit a front collision force in the lower vehicle body frame assembly, and is mainly configured to associate with the side longitudinal beam **40**, the footrest plate **20** and other structural members. Upon a collision accident of the vehicle, the front torsion box **72** bears a large impact force and transmits the acting force to the surrounding parts such as the footrest plate **20**. The front torsion box **72** and the footrest plate **20** are integrally formed, so that the lower vehicle body frame assembly has higher overall strength, and the front torsion box **72** may better transmit the acting force, so that the lower vehicle body frame assembly may better bear the impact force transmitted by the frontal collision and the side collision, and has better structural stability, which is beneficial to improving the safety performance of the vehicle body. In addition, due to the integrally formed structure, the assembly between parts is reduced, and the instability of assembly tolerance between parts is reduced, which is beneficial to improving the overall dimensional accuracy of the lower vehicle body frame assembly.

[0053] In some embodiments, please continue to refer to FIGS. **1** and **2**, the side longitudinal beam **40** includes a first side longitudinal beam **41** and a second side longitudinal beam **42**. The front torsion box **72** includes a first front torsion box **721** and a second front torsion box **722** coupled to two sides of the footrest plate **20** in the width direction. The first front torsion box **721** is coupled between the first side longitudinal beam **41** and the footrest plate **20**, and the second front torsion box **722** is coupled between the second side longitudinal beam **42** and the footrest plate **20**.

[0054] Through the above arrangement, the first front torsion box **721** and the second front torsion box **722** are symmetrically arranged at two sides of the footrest plate **20** in the width direction, so that the first front torsion box **721** and the second front torsion box **722** may be located at a position where the lower vehicle body frame assembly is greatly deformed, and may better transmit the acting force, reduce the relative displacement between the first side longitudinal beam **41** and the second side longitudinal beam **42**, which is beneficial to maintaining the structural stability of the lower vehicle body frame assembly.

[0055] In some embodiments, as illustrated in FIGS. **2** and **3**, the lower vehicle body frame assembly further includes a coupling structure **80** and a front longitudinal beam **101**. The coupling structure **80** is arranged on a side of the footrest plate **20** facing away from the frame body of the lower vehicle body frame assembly, and the coupling structure **80** and the footrest plate **20** are integrally formed. The coupling structure **80** is configured to couple the front longitudinal beam

101. For example, the front longitudinal beam **101** is inserted on a side of the coupling structure **80** facing away from the footrest plate **20**.

[0056] In these embodiments, when the vehicle is subjected to a front collision force, the acting force may be transmitted to the footrest plate **20** through the front longitudinal beam **101** and the coupling structure **80**. Because the coupling structure **80** and the footrest plate **20** are integrally formed, the transmission speed of the acting force may be improved, and the front collision force may be transmitted to the frame body **10** from the footrest plate **20**, that is, the front collision force is shared by the front longitudinal beam **101**, the footrest plate **20** and the frame body **10**, so that the ability of the lower vehicle body frame assembly to bear the front collision force may be improved and the deformation of the lower vehicle body frame assembly may be improved. In addition, the front longitudinal beam **101** is inserted on the coupling structure **80**, which may improve the mounting efficiency of the front longitudinal beam **101** and the coupling structure **80**.

[0057] In some embodiments, please continue to refer to FIGS. **2** and **3**, the coupling structure **80** is arranged at a coupling position of the front torsion box **72** and the footrest plate **20**, so that the force applied to the coupling structure **80** by the front longitudinal beam **101** may be transmitted to the footrest plate **20** and the front torsion box **72** at the same time, further improving the ability of the lower vehicle body frame assembly to bear the front collision force and improving the deformation of the lower vehicle body frame assembly.

[0058] In some embodiments, please continue to refer to FIGS. **2** and **3**, the coupling structure **80** includes a first coupling structure **81** and a second coupling structure **82**. The front longitudinal beam **101** includes a first front longitudinal beam **101***a* and a second front longitudinal beam **101***b*. The first coupling structure **81** is arranged at a coupling position of the footrest plate **20** and the first front torsion box **721**, and the second coupling structure **82** is arranged at a coupling position of the footrest plate **20** and the second front torsion box **722**. The first front longitudinal beam **101***a* is inserted on the first coupling structure **81**, and the second front longitudinal beam **101***b* is inserted on the second coupling structure **82**. By arranging two groups of coupling structures **80** and front longitudinal beams **101**, the stress of the lower vehicle body frame assembly is more balanced.

[0059] In some embodiments, please continue to refer to FIGS. **2** and **3**, the lower vehicle body frame assembly further includes a front-row small longitudinal beam **91**, and the front-row small longitudinal beam is coupled between the footrest plate **20** and the frame body **10** to improve the stability of the relative position between the footrest plate **20** and the frame body **10**. In some embodiments, more than two front-row small longitudinal beams **91** may be provided, and the more than two front-row small longitudinal beams **91** are spaced in the width direction. When the frame body **10** includes the side-impact cross beam **11**, the front-row small longitudinal beam **91** may be coupled between the side-impact cross beam **11** and the footrest plate **20**.

[0060] In some embodiments, please continue to refer to FIGS. **2** and **3**, the front longitudinal beam **101** and the front-row small longitudinal beam **91** are at least partially aligned in the length direction, that is, a projection of the front longitudinal beam **101** and a projection of the front-row small longitudinal beam **91** in the length direction are at least partially aligned, so that the acting force on the front longitudinal beam **101** may be directly transmitted to the small longitudinal beam through the footrest plate **20**, the deformation of the front torsion box **72** may be improved, and the ability of the lower vehicle body frame assembly to bear the acting force may be enhanced.

[0061] In some embodiments, please continue to refer to FIGS. **2** and **3**, the front-row small longitudinal beam **91** includes a first front-row small longitudinal beam **911** and a second front-row small longitudinal beam **912**. The first front-row small longitudinal beam **911** and the first front longitudinal beam **101***a* are at least partially aligned in the length direction, and the second front longitudinal beam **912** and the second front longitudinal beam **101***b* are at least partially aligned in the length direction to further improve the structural strength of the lower vehicle body frame assembly.

[0062] In some embodiments, as illustrated in FIG. **4**, the lower vehicle body frame assembly further includes a sill beam **50**. The sill beam **50** includes a first portion **51** and a second portion **52**. The first portion **51** is coupled to the side longitudinal beam **40** and integrally formed with the side longitudinal beam **40**, the side-impact cross beam **11** and the rear cross beam **30**, and the second portion **52** is detachably coupled to a side of the first portion **51** away from the side longitudinal beam **40**.
[0063] In these embodiments, the first portion **51** of the sill beam **50** is integrally arranged on the frame body **10**, which may further improve the structural strength of the frame body **10** and improve the ability of the lower vehicle body frame assembly to resist the impact force of side collision. The first portion **51** integrally formed into the frame body **10** may also avoid the gap between the first portion **51** and the frame body **10**. When the battery is arranged on the frame body **10**, the frame body **10** may provide a more closed, safer and more stable environment for the battery.
[0064] In addition, the second portion **52** of the sill beam **50** is detachably coupled to the first portion **51**. When the vehicle is impacted on the side, the second portion **52** bears the collision force first, so that the first portion **51** and the frame body **10** may be protected. The second portion **52** is detachably coupled with the first portion **51**, so that only the second portion **52** needs to be replaced when the second portion **52** is damaged and the first portion **51** is not damaged, which greatly saves the maintenance cost.
[0065] In some embodiments, there are two sill beams **50**, and the two sill beams **50** are respectively arranged on two sides of the side-impact cross beam **11**.
[0066] In some embodiments, as illustrated in FIGS. **1** to **5**, the first portion **51** is provided with a first upper flange **511** and a first lower flange **512** on two sides in the height direction (that is Z direction in FIG. **1**), and the second portion **52** is provided with a second upper flange **521** on at least one side in the height direction. The first upper flange **511** is fixed with the second upper flange **521**, and the second sill body is fixed with the first lower flange **512**.
[0067] The height direction is defined by the position of the lower vehicle body frame assembly of the vehicle when the lower vehicle body frame assembly of the vehicle is in use, and the height direction in the present disclosure is the direction perpendicular to the ground.
[0068] In these embodiments, a side of the first portion **51** along its own height direction is fixed with the second upper flange **521** of the second portion **52** through the first upper flange **511**, and the other side is fixed with the second sill body of the second portion **52** through the second lower flange. Two sides of the first portion **51** along its own height direction are fixed with the second portion **52**, thus achieving more stable connection.
[0069] In some embodiments, a side of the second portion **52** facing away from the second upper flange **521** may also be provided with a second lower flange (not illustrated in the figure) configured to coupling to the first lower flange **512**, so that the first upper flange **511** is fixed to the second upper flange **521**, and the second lower flange is fixed to the first lower flange **512**, to realize the fixation of the first portion **51** and the second portion **52**, with simpler operation.
[0070] In some embodiments, as illustrated in FIG. **5**, a thickness b**1** of the first portion **51** along an arrangement direction of the first portion **51** and the second portion **52** is 2.5 mm to 5 mm. A thickness b**2** of the second portion **52** along the arrangement direction of the first portion **51** and the second portion **52** is 2 mm to 3 mm.
[0071] In these embodiments, the thickness b**1** of the first portion **51** is set to 2.5 mm to 5 mm, and the thickness b**2** of the second portion **52** is set to 2 mm to 3 mm, so that the supporting performance and weight of the sill beam **50** component may be balanced, that is, the lightweight of the vehicle is balanced while satisfying the supporting performance, which makes the overall comprehensive performance more superior.
[0072] In some embodiments, please continue to refer to FIG. **5**, at least one of the first portion **51** and the second portion **52** includes a body **53** and a reinforcing rib component **54** arranged on the

body **53**. The body **53** includes an accommodating cavity **55**, and the reinforcing rib component **54** is arranged in the accommodating cavity **55** and integrally formed with the body **53**.
[0073] In these embodiments, the weight of the body **53** may be reduced by provision of the accommodating cavity **55**, and the structural strength of the body **53** may be improved by arranging the reinforcing rib component **54** in the accommodating cavity **55**. The reinforcing rib component **54** integrally formed with the body **53** may further improve the strength and enhance the integration of the lower vehicle body frame assembly.
[0074] In some embodiments, the second portion **52** includes a second body **532** and a second reinforcing rib component. The second body **532** includes a second accommodating cavity **552**, the second reinforcing rib component is arranged in the second accommodating cavity **552**, and the second body **532** and the second reinforcing rib component are integrally formed.
[0075] In some embodiments, please continue to refer to FIG. **5**, the first portion **51** includes a first body **531** and a first reinforcing rib component. The first body **531** has a first accommodating cavity **551**, and an opening of the first accommodating cavity **551** faces the side facing away from the frame body **10**. The first reinforcing rib component is arranged in the first accommodating cavity **551** and integrally formed with the first body **531**.
[0076] In these embodiments, the first body **531** has the first accommodating cavity **551**, and the first reinforcing rib component is arranged in the first accommodating cavity **551**, so that the overall strength of the first portion **51** may be increased by the first reinforcing rib component while reducing the weight. The opening of the first accommodating cavity **551** in the first body **531** is located at the side facing away from the frame body **10**, and the opening may be covered by the second portion **52**, thus the aesthetics may be balanced while reducing the weight. The first reinforcing rib component integrally formed with the first body **531** may further enhance the strength and enhance the integration of the lower vehicle body frame assembly.
[0077] In some embodiments, as illustrated in FIGS. **5** and **6**, the reinforcing rib component **54** includes a plurality of first reinforcing ribs **541** and a plurality of second reinforcing ribs **542**, and the plurality of first reinforcing ribs **541** and the plurality of second reinforcing ribs **542** are crossed.
[0078] In these embodiments, by arranging the first reinforcing ribs **541** and the second reinforcing ribs **542** in a crossed manner, the structural strength of the body **53** may be strengthened in more directions, so that the overall strength is higher.
[0079] In some embodiments, please continue to refer to FIGS. **5** and **6**, the first reinforcing rib **541** extends along the length direction to improve the structural strength of the body **53** in the length direction. One or a plurality of first reinforcing ribs **541** may be provided. For example, the plurality of the first reinforcing ribs **541** are distributed and spaced along the height direction to further improve the structural strength of the body **53**.
[0080] In some embodiments, the body **53** includes a side wall enclosing the accommodating cavity **55**. When the second reinforcing rib **542** may be coupled between the side wall and the first reinforcing rib **541**, and/or, the second reinforcing rib **542** may be coupled between two adjacent first reinforcing ribs **541**, thus the structural strength of the body **53** may be further improved.
[0081] In some embodiments, the second reinforcing rib **542** and the first reinforcing rib **541** are arranged perpendicular to each other, so that the second reinforcing rib **542** and the first reinforcing rib **541** may be enclosed to form a rectangle, so that the second reinforcing rib **542** and the first reinforcing rib **541** and/or the side wall support each other and form a relatively stable structure, to enhance the structural strength of the body **53**.
[0082] In other embodiments, the second reinforcing rib **542** intersects with the first reinforcing rib **541**, and the second reinforcing rib **542** and the first reinforcing rib **541** and/or the side wall are enclosed to form a quadrilateral other than the rectangle, such as a rhombus or a trapezoid.
[0083] In some embodiments, referring to FIGS. **5** and **7**, the first reinforcing rib **541** and the second reinforcing rib **542** are sequentially coupled end to end to form a triangle, so that a

relatively stable structure may be formed to enhance the structural strength of the body **53**.
[0084] In some embodiments, please continue to refer to FIGS. **1** to **4**, the lower vehicle body frame assembly further includes a sliding rail box **61** arranged on the first portion **51** and integrally formed with the first portion **51**, the side-impact cross beam **11** and the front cross beam **12**. The sliding rail box **61** is configured to bear a sliding door driver.
[0085] In these embodiments, the sliding rail box **61** is configured to carry the sliding door driver, and the sliding door driver is configured to realize the sliding of a sliding door in the vehicle. The sliding rail box **61** is integrally formed with the first portion **51**, the side-impact cross beam **11** and the front cross beam **12**, which may reduce the number of parts in the lower vehicle body frame assembly of the vehicle, improve the efficiency of manufacturing parts, omit the mounting steps and reduce the production time; on the other hand, when the sliding rail box **61** is an independent structure, the sliding rail box **61** has a coupling edge configured to couple to other parts, and the part configured to mount sliding rail box **61** (such as the first portion **51** and the frame body **10**) needs to reserve an mounting space for the coupling edge, so the size of the part will be increased, while the integrated design may omit the above mounting space, thus saving materials, further saving production costs, reducing weight and helping to save energy of the vehicle.
[0086] In some embodiments, please continue to refer to FIG. **4**, the lower vehicle body frame assembly further includes an avoidance channel **62** configured to avoid the sliding door driver, and the avoidance channel **62** is formed by a recess of the sill beam **50**. In some embodiments, when the sill beam **50** includes the first portion **51** and the second portion **52**, the avoidance channel **62** includes a first channel **621** formed by a recess of the first portion **51** and a second channel **622** formed by a recess of the second portion **52**.
[0087] In these embodiments, an avoidance channel **62** configured to avoid the sliding door driver is formed in an area of the sill beam **50** corresponding to the sliding rail box **61**. The avoidance channel **62** passes through the sill beam **50** from the side of the sill beam **50** facing away from the frame body **10** to the side facing the frame body **10** (that is, the X direction in FIG. **1**), and the avoidance channel **62** is formed by recessing an upper surface of the sill beam **50** downwards.
[0088] In some embodiments, a depth of the avoidance channel **62** is 25 mm to 55 mm, so that the sliding door driver may be fully accommodated. At the same time, controlling the depth in the range of 25 mm to 55 mm may facilitate the mounting of the sliding door and the sliding door driver, and avoid the situation that the sliding door driver is far away from the sliding door due to an excessive depth. The depth of the avoidance channel **62** is a depth of the avoidance channel **62** in the height direction.
[0089] In some embodiments, please continue to refer to FIG. **4**, the sill beam **50** has a first surface **56** facing the avoidance channel **62** and parallel to the upper surface of the sliding rail box **61**, and the first surface **56** is flush with, or, lower than the upper surface of the sliding rail box **61**. Therefore, the sliding door driver may be in good contact with the upper surface of the sliding rail box **61**, and the sliding door and the sliding door driver may be better fitted.
[0090] In these embodiments, the first surface **56** being lower than the upper surface of the sliding rail box **61** means that when the lower vehicle body frame assembly of the vehicle is in use, the first surface **56** is closer to the ground than the sliding rail box **61**.
[0091] In some embodiments, as illustrated in FIGS. **4** and **8**, the sill beam **50** has a second surface **57** facing away from the avoidance channel **62** and parallel to the first surface **56**, and a distance between the second surface **57** and the first surface **56** is greater than a distance between the upper surface and the lower surface of the sliding rail box **61**.
[0092] In these embodiments, on the premise of ensuring the bearing performance of the sliding rail box **61**, setting the thickness of the sliding rail box **61** (that is, the distance between the upper surface and the lower surface of the sliding rail box **61**) to be small may realize the lightweight of the lower vehicle body frame assembly, and further save the manufacturing cost and energy.
[0093] In some embodiments, please continue to refer to FIGS. **1** to **4**, the lower vehicle body

frame assembly further includes a rear-row small longitudinal beam **92**, the rear-row small longitudinal beam **92** is coupled between the frame body **10** and the rear cross beam **30**, and the sliding rail box **61** is integrally formed with the rear-row small longitudinal beam **92**. For example, the frame body **10** includes a side-impact cross beam **11** and a second front cross beam **122**, and the rear-row small longitudinal beam **92** is coupled between the second front cross beam **122** and the rear cross beam **30**. The sliding rail box **61** is integrally formed with the second front cross beam **122**, the rear cross beam **30** and the rear-row small longitudinal beam **92**. In some embodiments, the sliding rail box **61** is integrally formed with the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92**. Moreover, the sliding rail box **61** is arranged in an avoiding cavity enclosed by the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92**.
[0094] In these embodiments, after the rear-row small longitudinal beam **92** are coupled to the second front cross beam **122** and the rear cross beam **30**, the overall structure is more stable and the anti-collision ability is stronger. The sliding rail box **61** is integrally formed with the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92**, so that the sliding rail box **61** receive more support, to provide better support for the sliding door driver.
[0095] In some embodiments, as illustrated in FIGS. **1** to **4**, the upper surface of the sliding rail box **61** is lower than the upper surfaces of the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92**.
[0096] In these embodiments, the upper surface of the sliding rail box **61** being lower than the upper surfaces of the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92** means that the upper surface of the sliding rail box **61** is closer to the ground than the upper surfaces of the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92** when the lower vehicle body frame assembly of the vehicle is in use.
[0097] In some embodiments, the distance between the upper surface of the sliding rail box **61** and the upper surfaces of the second front cross beam **122**, the second-row front cross beam **31** and the rear-row small longitudinal beam **92** is the same as the thickness of the sliding door driver, to facilitate the mounting of the sliding door and the sliding door driver while reducing the influence of the sliding door driver on the total thickness of the lower vehicle body frame assembly.
[0098] In some embodiments, please continue to refer to FIG. **8**, in a direction approaching the footrest plate **20**, the rear-row small longitudinal beam **92** includes a first section **921** and a second section **922** which are successively divided, and the second section **922** is obliquely arranged to form an avoiding portion configured to arrange the sliding rail box **61** between the second section **922** and the side longitudinal beam **40**. In these embodiments, the second section **922** is arranged obliquely, which may make room for the arrangement of the sliding rail box **61**.
[0099] In some embodiments, continue to refer to FIG. **8**, the frame body **10** further includes a reinforcing rib **13**. The reinforcing rib **13** is arranged on the footrest plate **20**, the side-impact cross beam **11**, the front cross beam **12** and the rear cross beam **30** to improve the structural strength of the frame body **10**.
[0100] In some embodiments, the reinforcing rib **13** includes a main reinforcing rib **131** and an auxiliary reinforcing rib **132**. The main reinforcing rib **131** has the same extension path as the side-impact cross beam **11**, the front cross beam **12** or the rear cross beam **30** on which the main reinforcing rib is located, and the auxiliary reinforcing rib **132** intersects with the main reinforcing rib **131**.
[0101] For example, the side-impact cross beam **11**, the front cross beam **12** or the rear cross beam **30** are formed by extending in the width direction, and the main reinforcing rib **131** arranged on the side-impact cross beam **11**, the front cross beam **12** or the rear cross beam **30** is formed by extending in the width direction, so that the main reinforcing rib **131** may strengthen the structural

strength of the side longitudinal beam **40**, the side-impact cross beam **11**, the front cross beam **12** or the rear cross beam **30** where the main reinforcing rib **131** is located in their own extension direction, and may transmit the acting force along the extension path of the part where the main reinforcing rib **131** is located. The auxiliary ribs **132** may strengthen the structural strength of the structure where the auxiliary rib is located in other directions.
[0102] In some embodiments, as illustrated in FIG. **9**, the lower vehicle body frame assembly further includes a rear torsion box **71**, and the rear torsion box **71** is coupled between the side longitudinal beam **40** and the rear cross beam **30** and is integrally formed with the side longitudinal beam **40** and the rear cross beam **30**. When the rear cross beam **30** includes the third-row front cross beam **33**, the rear torsion box **71** may be coupled between the third-row front cross beam **33** and the side longitudinal beam **40**. When the rear cross beam **30** includes the second-row rear cross beam **32**, the rear torsion box **71** may be coupled between the second-row rear cross beam **32** and the side longitudinal beam **40**.
[0103] The rear torsion box **71** is a structure configured to transmit the acting force in the lower vehicle body frame assembly. The rear torsion box **71** is coupled between the side longitudinal beam **40** and the third-row front cross beam **33**, and is integrally formed with the side longitudinal beam **40** and the third-row front cross beam **33**. When the vehicle is involved in a collision, the rear torsion box **71** bears a huge external impact force, and transmits the impact force to the third-row front cross beam **33**, side longitudinal beam **40** and other members coupled to the rear torsion box **71**, to generate a counter stress for resisting the impact force and ensure the integrity of the vehicle.
[0104] Arranging the rear torsion box **71** to be coupled between the side longitudinal beam **40** and the third-row front cross beam **33** may improve the integrity of the lower vehicle body frame assembly, and further greatly improve the side collision performance of the vehicle.
[0105] In some embodiments, the rear torsion box **71** includes a body portion **711** and a protruding portion **712** extending from the body portion **711**, and the protruding portion **712** protrudes from the cross beam in the height direction. The arrangement of the protruding portion **712** strengthens the structural strength of the rear torsion box **71**, so that it may generate greater counter stress when dealing with the side collision, and further makes up for the defect of insufficient side collision performance of the vehicle.
[0106] In some embodiments, the rear torsion box **71**, the side-impact cross beam **11** and the side longitudinal beam **40** may be made of aluminum alloy, and the aluminum alloy may make the lower vehicle body frame assembly absorb the energy brought by the impact force through collapse and deformation when the lower vehicle body frame assembly is subjected to the impact force, which is beneficial to improving the safety performance of the lower vehicle body frame assembly.
[0107] In some embodiments, in the height direction, the protruding portion **712** extends from the body portion **711** toward a direction close to and/or away from an interior space of the vehicle. The body portion **711** is oriented in the direction close to the interior space of the vehicle, that is, the body portion **711** is oriented in the direction close to the vehicle body in the height direction, that is, the protruding portion **712** may extend towards the interior of the vehicle body. The body portion **711** is oriented in a direction away from the interior space of the vehicle, that is, the body portion **711** is oriented in a direction close to a suspension and a wheel in the height direction, that is, the protruding portion **712** may extend in the direction of the suspension and the wheel.
[0108] However, in order to prevent the protruding portion **712** from occupying an interior space of the vehicle body and affecting the mounting of a control system and a drive system of the vehicle, the protruding portion **712** extends in a direction away from the interior space of the vehicle.
[0109] In some embodiments of the present disclosure, the side longitudinal beam **40**, the side-impact cross beam **11** and the rear cross beam **30** together enclose a storage space, and the storage space is configured to place a battery. The protruding portion **712** protrudes from the surface of the side-impact cross beam **11** without protruding beyond a bottom surface of the battery.
[0110] As described in previous embodiments, the storage space may also be configured to place

more than just the battery, but also may be configured to place the driving system and the control system of the vehicle.

[0111] The bottom surface of the battery is a side surface of the battery close to the suspension and wheel of the vehicle in the height direction. In these embodiments of the present disclosure, by controlling an extension size of the protruding portion **712**, the strength of the rear torsion box **71** may be improved without reducing the ground clearance of the lower vehicle body frame assembly, and the reliability of the lower vehicle body frame assembly may be improved.

[0112] In some embodiments, a surface of the protruding portion **712** protruding from the cross beam may be arranged to be flush with the bottom surface of the battery.

[0113] In some embodiments, the extension height of the protruding portion **712** is 60 mm to 0 mm.

[0114] In some embodiments, setting the extension height of the protruding portion **712** as 60 mm to 0 mm may balance the strength of the rear torsion box **71** and the ground clearance of the lower vehicle body frame assembly, so that the overall comprehensive performance is more superior.

[0115] In some embodiments, the side longitudinal beam **40** includes a first side longitudinal beam **41** and a second side longitudinal beam **42**, and the first side longitudinal beam **41** and the second side longitudinal beam **42** are respectively arranged at two ends of the side-impact cross beam **11** in the width direction. There are two rear torsion boxes **71**, one of the two rear torsion boxes **71** is coupled between the first side longitudinal beam **41** and the rear cross beam **30**, and the other is coupled between the second side longitudinal beam **42** and the rear cross beam **30**. In these embodiments of the present disclosure, two ends of the rear cross beam **30** in the width direction are respectively coupled to the side longitudinal beam **40** through the respective rear torsion boxes **71**, and the arrangement of the two rear torsion boxes **71** further improves the safety performance of the lower vehicle body frame assembly.

[0116] Meanwhile, in some embodiments of the present disclosure, the number of side longitudinal beams **40** may also be set to three, four, five, etc. to strengthen the structural strength of the lower vehicle body frame assembly, which may be selected according to the actual situation.

[0117] In some embodiments, along a direction from a center of the rear cross beam **30** in the width direction to the side longitudinal beam **40**, the height of the protruding portion **712** protruding from the rear cross beam **30** gradually increases.

[0118] The center of the rear cross beam **30** in the width direction refers to a midpoint of the rear cross beam **30** in its own extension direction. The direction from the center of the rear cross beam **30** in the width direction to the side longitudinal beam **40** may also be understood as a direction from the midpoint of the rear cross beam **30** to two ends of the rear cross beam **30** in its own extension direction.

[0119] The height of the protruding portion **712** protruding from the rear cross beam **30** gradually increases, which means that a surface of the protruding portion **712** away from the body portion **711** has a certain slope. It may be understood that a portion of the protruding portion **712** close to the side longitudinal beam has the largest thickness, so that the protruding portion **712** may bear the huge impact force generated when the collision of the vehicle, and may generate enough counter stress to resist this impact force. A portion of the protruding portion **712** away from the side longitudinal beam **40** has the smallest thickness, which may save material cost, reduce vehicle weight and save vehicle space.

[0120] In these embodiments, along a direction from the center of the rear cross beam **30** in the width direction to a longitudinal beam, the thickness variation of the protruding portion **712** may first increase and then decrease. That is to say, the thickness of the protruding portion **712** varies greatly at the portion close to the center of the rear cross beam **30**, and the thickness varies slowly at the end close to the side longitudinal beam **40**. In this way, the protruding portion **712** may form an arched structure, which further improves the performance of the protruding portion **712** in resisting side collision.

[0121] In some embodiments, the protruding portions **712** of the two rear torsion boxes **71** are coupled to each other. Accordingly, the body portions **711** of the two rear torsion boxes **71** may also be coupled to each other.
[0122] In these embodiments, it is possible that after the body portions **711** of the two rear torsion boxes **71** are coupled to form an integrally formed structure, the protruding portions **712** of the two rear torsion boxes **71** extend from the two body portions **711** respectively, and the opposite ends of the protruding portions **712** naturally transition and are integrally formed.
[0123] It is also possible that the body portions **711** of the two rear torsion boxes **71** are arranged in a split manner, the two protruding portions **712** extend from the two body portions **711** respectively and are coupled to the cross beam, and the opposite ends of the two protruding portions **712** naturally transition and are integrally formed.
[0124] In these embodiments, the two protruding portions **712** are coupled to each other, which may further increase the integration degree of the lower vehicle body frame assembly. When the vehicle collides on the side, the impact force may be conducted in a wider range through the two protruding portions **712**, so that more parts in the lower vehicle body frame assembly may jointly resist the impact force, further improving the safety and reliability of the lower vehicle body frame assembly.
[0125] In some embodiments, as illustrated in FIG. **10**, the rear torsion box **71** further includes a plurality of reinforcing portions **713** embedded in the protruding portion **712**, and the plurality of reinforcing portions **713** are crossed in the protruding portions **712**.
[0126] The reinforcing rib **13** may be in the form of a steel bar, a plate or a block. The reinforcing portion **713** is configured to increase the structural strength of the protruding portion **712**. Because the reinforcing portions **713** are crossed in the protruding portion **712**, the plurality of reinforcing portions **713** interact when a collision occurs, so that the protruding portion **712** may be prevented from being deformed and displaced too much, and the structural stability of the lower vehicle body frame assembly is improved.
[0127] In some embodiments, the reinforcing portion **713** may be embedded in the protruding portion **712** or may be exposed.
[0128] In some embodiments, as illustrated in FIGS. **9** and **10**, the lower vehicle body frame assembly further includes a coupling beam **102** integrally formed with the rear torsion box **71**, and the coupling beam **102** extends from the rear cross beam **30** in a direction away from the side longitudinal beam **40**, and is configured to couple a rear floor assembly.
[0129] The coupling beam **102** is a coupling member between the lower vehicle body frame assembly and the rear floor assembly, and may also play the role of force transmission. The coupling beam **102** is coupled to the cross beam through the rear torsion box **71**, and when the vehicle has a frontal collision, the impact force received by the rear floor assembly is transmitted to the lower vehicle body frame assembly through the coupling beam **102**, and finally the impact force is dispersed by the rear torsion box **71** and resisted by the cross beam, longitudinal beam and other members, thus improving the safety performance of the vehicle.
[0130] In some embodiments, as illustrated in FIGS. **9** to **11**, the lower vehicle body frame assembly further includes a rear longitudinal beam **103**, and the rear longitudinal beam **103** is coupled to the coupling beam **102**. When the vehicle bears the rear impact force, the rear impact force may be transmitted to the rear longitudinal beam **103**, the coupling beam **102**, the rear torsion box **71** and the side longitudinal beam **40** through the rear floor assembly, to improve the ability of the lower vehicle body frame assembly to bear the rear impact.
[0131] In some embodiments, the rear longitudinal beam **103** and the coupling beam **102** are detachably coupled. When the rear longitudinal beam **103** is damaged due to the rear impact force of the vehicle, only the rear longitudinal beam **103** may be repaired or replaced, thus reducing the maintenance cost of the vehicle.
[0132] In some embodiments, as illustrated in FIGS. **3** and **11**, the lower vehicle body frame

assembly further includes a heat dissipation component **104** configured to dissipate heat from a battery of the vehicle, and the heat dissipation component **104** is mounted on the lower surface of the frame body **10** to reduce the gap between the heat dissipation component **104** and the frame body **10**, leaving enough space for the battery. In some embodiments, the heat dissipation component **104** may be directly welded to the lower surface of the frame body **10**. The heat dissipation component **104** includes, for example, a first heat dissipation plate and a second heat dissipation plate, at least one of the first heat dissipation plate and the second heat dissipation plate is recessed to form a heat dissipation recess, and the first heat dissipation plate and the second heat dissipation plate are attached to each other so that the heat dissipation recess forms a heat dissipation channel. The lower surface of the front floor refers to a side facing the ground during use.

[0133] In these embodiments, because the footrest plate **20** and the rear cross beam **30** are integrally formed on the frame body **10**, the structural strength of the frame body **10** may be greatly improved, and the frame body **10** may provide sufficient protection for the heat dissipation component **104**, which may solve the problem that the heat dissipation component **104** is easily trampled and deformed when directly arranged on the front floor.

[0134] In some embodiments, when the lower vehicle body frame assembly includes the front-row small longitudinal beam **91**, a portion of the heat dissipation component **104** may also be arranged on the lower surface of the front-row small longitudinal beam **91**, and the heat dissipation component **104** may also be protected by the front-row small longitudinal beam **91**.

[0135] In some embodiments, when the lower vehicle body frame assembly includes the side-impact cross beam **11** (i.e., a first front cross beam **121** configured to mount a first-row seat), a second front cross beam **122**, a second-row front cross beam **31** and a third-row front cross beam **33** (i.e., a second-row rear cross beam), the heat dissipation component **104** may be mounted on lower surfaces of the side-impact cross beam **11**, the second front cross beam **122**, the second-row front cross beam **31** and the third-row front cross beam **33**, so that the side-impact cross beam **11**, the second front cross beam **122**, the second-row front cross beam **31** and the third-row front cross beam **33** may provide protection for the heat dissipation component **104**.

[0136] In any of the above-mentioned embodiments, the integrally formed process may choose casting one-piece molding, stamping one-piece molding or turning one-piece molding. The materials of all parts may be aluminum alloy and other materials with high hardness and light weight.

[0137] Embodiments of a second aspect of the present disclosure also provide a vehicle, which includes the lower vehicle body frame assembly of any embodiments of the first aspect. Since the vehicle of embodiments of the present disclosure includes the lower vehicle body frame assembly described above, the vehicle of embodiments of the present disclosure has the beneficial effects of the lower vehicle body frame assembly of embodiments described above, which will not be described here.

[0138] In some embodiments, the vehicle further includes a front engine compartment assembly arranged on a side of the footrest plate **20** facing away from the frame body **10**. In some embodiments, the vehicle further includes a rear floor assembly arranged on a side of the rear cross beam **30** facing away from the frame body **10**.

[0139] Embodiments of a first aspect of the present disclosure provide a lower vehicle body frame assembly for a vehicle. The lower vehicle body frame assembly includes: a frame body; a footrest plate coupled to a side of the frame body; and a rear cross beam coupled to a side of the frame body away from the footrest plate. The frame body, the footrest plate and the rear cross beam are integrally formed.

[0140] According to implementations of the first aspect of the present disclosure, the frame body includes a side-impact cross beam and a front cross beam arranged side by side and spaced along a length direction of the frame body, the footrest plate is coupled to a side of the side-impact cross beam away from the front cross beam, and the rear cross beam is coupled to a side of the front cross beam away from the side-impact cross beam.

[0141] According to any of the foregoing implementations of the first aspect of the present disclosure, the front cross beam includes a first front cross beam and a second front cross beam, the first front cross beam and the side-impact cross beam are integrated, and the rear cross beam is coupled to a side of the second front cross beam away from the side-impact cross beam.

[0142] According to any of the foregoing implementations of the first aspect of the present disclosure, the first front cross beam and the side-impact cross beam are a same cross beam, and the side-impact cross beam is configured to bear a side-impact load.

[0143] According to any of the foregoing implementations of the first aspect of the present disclosure, the side-impact cross beam is provided with a coupling projection configured to couple to a seat, and the coupling projection is integrally formed with the side-impact cross beam and protruded from an upper surface of the side-impact cross beam.

[0144] According to any of the foregoing implementations of the first aspect of the present disclosure, the rear cross beam includes a second-row front cross beam, a second-row rear cross beam and a third-row front cross beam arranged side by side and spaced along the length direction, and the second-row rear cross beam and the third-row front cross beam are integrated.

[0145] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes: a side longitudinal beam coupled to at least one side of the side-impact cross beam in a width direction of the lower vehicle body frame assembly; and a sill beam including a first portion and a second portion. The first portion is coupled to the side longitudinal beam and is integrally formed with the side longitudinal beam, the side-impact cross beam and the rear cross beam, and the second portion is detachably coupled to a side of the first portion away from the side longitudinal beam.

[0146] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes: a sliding rail box arranged at the first portion and is integrally formed with the first portion, the side-impact cross beam and the front cross beam. The sliding rail box is configured to bear a sliding door driver.

[0147] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes an avoidance channel configured to avoid the sliding door driver. The avoidance channel is formed by a recess of the sill beam.

[0148] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes a rear torsion box coupled between the side longitudinal beam and the rear cross beam and is integrally formed with the side longitudinal beam and the rear cross beam.

[0149] According to any of the foregoing implementations of the first aspect of the present disclosure, the rear torsion box includes a body portion and a protruding portion formed by extending from the body portion, and the protruding portion is arranged to protrude from the cross beam in a height direction.

[0150] According to any of the foregoing implementations of the first aspect of the present disclosure, the rear torsion box further includes a plurality of reinforcing portions embedded in the protruding portion, and the plurality of reinforcing portions are crossed in the protruding portion.

[0151] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes a front torsion box coupled to at least one side of the footrest plate in a width direction of the frame body, and the front torsion box and the footrest plate are integrally formed.

[0152] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes a coupling structure arranged at a side of the footrest plate facing away from the frame body of the lower vehicle body frame

assembly and is integrally formed with the footrest plate; and a front longitudinal beam inserted on a side of the coupling structure facing away from the footrest plate.
[0153] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes a front-row small longitudinal beam coupled between the footrest plate and the frame body. The front longitudinal beam and the front-row small longitudinal beam are at least partially aligned along a length direction of the lower vehicle body frame assembly.
[0154] According to any of the foregoing implementations of the first aspect of the present disclosure, the frame body includes a side-impact cross beam, and the front-row small longitudinal beam is coupled between the side-impact cross beam and the footrest plate.
[0155] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes a rear-row small longitudinal beam coupled between the frame body and the rear cross beam, and the sliding rail box and the rear-row small longitudinal beam are integrally formed.
[0156] According to any of the foregoing implementations of the first aspect of the present disclosure, the lower vehicle body frame assembly further includes a heat dissipation component configured to dissipate heat from a battery of the vehicle, and mounted on a lower surface of the frame body.
[0157] Embodiments of a second aspect of the present disclosure also provide a vehicle, which includes a lower vehicle body frame assembly of any of embodiments of the first aspect.
[0158] According to any of the foregoing implementations of the second aspect of the present disclosure, the vehicle further includes a front engine compartment assembly arranged at a side of the footrest plate facing away from the frame body; and/or, the vehicle further includes a rear floor assembly arranged at a side of the rear cross beam facing away from the frame body.
[0159] Although the present disclosure has been described with reference to preferred embodiments, various improvements may be made thereto and equivalents may be substituted for parts thereof without departing from the scope of the present disclosure. In particular, as long as there is no structural conflict, all the technical features mentioned in each embodiment may be combined in any way. The present disclosure is not limited to the specific embodiments disclosed herein, but includes all technical solutions falling within the scope of the claims.

Claims

1. A lower vehicle body frame assembly for a vehicle, wherein the lower vehicle body frame assembly comprises: a frame body; a footrest plate coupled to a side of the frame body; and a rear cross beam coupled to a side of the frame body away from the footrest plate, the frame body, the footrest plate and the rear cross beam being integrally formed.
2. The lower vehicle body frame assembly according to claim 1, wherein the frame body comprises a side-impact cross beam and a front cross beam arranged side by side and spaced along a length direction of the frame body, the footrest plate is coupled to a side of the side-impact cross beam away from the front cross beam, and the rear cross beam is coupled to a side of the front cross beam away from the side-impact cross beam.
3. The lower vehicle body frame assembly according to claim 2, wherein the front cross beam comprises a first front cross beam and a second front cross beam, the first front cross beam and the side-impact cross beam are integrated, and the rear cross beam is coupled to a side of the second front cross beam away from the side-impact cross beam.
4. The lower vehicle body frame assembly according to claim 3, wherein the first front cross beam and the side-impact cross beam are a same cross beam, and the side-impact cross beam is configured to bear a side-impact load.
5. The lower vehicle body frame assembly according to claim 3, wherein the side-impact cross

beam is provided with a coupling projection configured to couple to a seat, and the coupling projection is integrally formed with the side-impact cross beam and protruded from an upper surface of the side-impact cross beam.

6. The lower vehicle body frame assembly according to claim 2, wherein the rear cross beam comprises a second-row front cross beam, a second-row rear cross beam and a third-row front cross beam arranged side by side and spaced along the length direction, and the second-row rear cross beam and the third-row front cross beam are integrated.

7. The lower vehicle body frame assembly according to claim 2, further comprising: a side longitudinal beam coupled to at least one side of the side-impact cross beam in a width direction of the lower vehicle body frame assembly; and a sill beam comprising a first portion and a second portion, wherein the first portion is coupled to the side longitudinal beam and is integrally formed with the side longitudinal beam, the side-impact cross beam and the rear cross beam, and the second portion is detachably coupled to a side of the first portion away from the side longitudinal beam.

8. The lower vehicle body frame assembly according to claim 7, further comprising a sliding rail box arranged at the first portion and is integrally formed with the first portion, the side-impact cross beam and the front cross beam, wherein the sliding rail box is configured to bear a sliding door driver.

9. The lower vehicle body frame assembly according to claim 8, further comprising an avoidance channel configured to avoid the sliding door driver, wherein the avoidance channel is formed by a recess of the sill beam.

10. The lower vehicle body frame assembly according to claim 8, further comprising a rear torsion box coupled between the side longitudinal beam and the rear cross beam and is integrally formed with the side longitudinal beam and the rear cross beam.

11. The lower vehicle body frame assembly according to claim 10, wherein the rear torsion box comprises a body portion and a protruding portion formed by extending from the body portion, and the protruding portion is arranged to protrude from the rear cross beam in a height direction.

12. The lower vehicle body frame assembly according to claim 11, wherein the rear torsion box further comprises a plurality of reinforcing portions embedded in the protruding portion, and the plurality of reinforcing portions are crossed in the protruding portion.

13. The lower vehicle body frame assembly according to claim 1, further comprising a front torsion box coupled to at least one side of the footrest plate in a width direction of the frame body, and the front torsion box and the footrest plate are integrally formed.

14. The lower vehicle body frame assembly according to claim 1, further comprising: a coupling structure arranged at a side of the footrest plate facing away from the frame body of the lower vehicle body frame assembly and is integrally formed with the footrest plate; and a front longitudinal beam inserted on a side of the coupling structure facing away from the footrest plate.

15. The lower vehicle body frame assembly according to claim 14, further comprising a front-row small longitudinal beam coupled between the footrest plate and the frame body, wherein the front longitudinal beam and the front-row small longitudinal beam are at least partially aligned along a length direction of the lower vehicle body frame assembly.

16. The lower vehicle body frame assembly according to claim 15, wherein the frame body comprises a side-impact cross beam, and the front-row small longitudinal beam are coupled between the side-impact cross beam and the footrest plate.

17. The lower vehicle body frame assembly according to claim 10, further comprising a rear-row small longitudinal beam coupled between the frame body and the rear cross beam, and the sliding rail box and the rear-row small longitudinal beam are integrally formed.

18. The lower vehicle body frame assembly according to claim 1, further comprising a heat dissipation component configured to dissipate heat from a battery of the vehicle, and mounted on a lower surface of the frame body.

19. A vehicle, comprising: a lower vehicle body frame assembly comprising: a frame body; a footrest plate coupled to a side of the frame body; and a rear cross beam coupled to a side of the frame body away from the footrest plate, the frame body, the footrest plate and the rear cross beam being integrally formed.

20. The vehicle according to claim 19, further comprising at least one of: a front engine compartment assembly arranged at a side of the footrest plate facing away from the frame body; or a rear floor assembly arranged at a side of the rear cross beam facing away from the frame body.