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Inventor(s)	XIE; Hongyao

BATTERY PACK EXPLOSION-PROOF STRUCTURE, BATTERY PACK, AND ELECTRIC VEHICLE

Abstract

Provided are a battery pack explosion-proof structure, a battery pack, and an electric vehicle. The battery pack explosion-proof structure includes a bottom cover plate and an explosion-proof valve. The bottom cover plate includes a cover plate body and an exhaust pipe that are integrally formed. The exhaust pipe is disposed on a side of the cover plate body and extends in a direction away from the cover plate body. The gas inlet of the exhaust pipe is opened in the cover plate body. The explosion-proof valve is connected to a side of the cover plate body away from the exhaust pipe. A valve port of the explosion-proof valve is directly opposite to the gas inlet or is connected into the exhaust pipe.

Inventors: **XIE; Hongyao (Huizhou, CN)**

Applicant: **EVE ENERGY CO., LTD.** (Huizhou, CN)

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application claims priority to Chinese Patent Application No. 202420330743.4 filed on Feb. 21, 2024, and International Patent Application No. PCT/CN2024/120390 filed on Sep. 23, 2024, the disclosure of which is incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The present application relates to the field of battery technologies, for example, a battery pack explosion-proof structure, a battery pack, and an electric vehicle.

BACKGROUND

[0003] An explosion-proof valve for a battery pack is an important safety component in the battery pack. For an electric vehicle, if the explosion-proof valve in the related art is mounted at the bottom of a battery housing, the battery pack needs to be assembled to the chassis of the vehicle, and an exhaust member of the explosion-proof valve is connected to the chassis of the vehicle. For example, the exhaust member is engaged with the chassis, the explosion-proof valve is typically assembled blindly (an engaging structure of the chassis is not visible during the assembly). An operator roughly locates the engaging structure and fixes the exhaust member and the engaging structure inserted into the chassis.

[0004] In the preceding related art, most exhaust members are made of plastic. Therefore, during the assembly, the exhaust member is very prone to be bumped and even damaged. Additionally, in transportation, transferring, and loading processes, the exhaust member is also prone to be damaged. Besides, the position of the exhaust member is concealed and is less prone to be noticed, so a failure of the explosion-proof valve easily leads to a safety hazard.

SUMMARY

[0005] An embodiment of the present application provides a battery pack explosion-proof structure. The battery pack explosion-proof structure includes a bottom cover plate and an explosion-proof valve.

[0006] The bottom cover plate includes a cover plate body and an exhaust pipe, the cover plate body and the exhaust pipe are integrally formed, the exhaust pipe is disposed on a side of the cover plate body and extends in a direction away from the cover plate body, and a gas inlet of the exhaust pipe is opened in the cover plate body.

[0007] The explosion-proof valve is connected to a side of the cover plate body away from the exhaust pipe, and a valve port of the explosion-proof valve is directly opposite to the gas inlet or is connected to the exhaust pipe.

[0008] An embodiment of the present application further provides a battery pack. The battery pack includes the battery pack explosion-proof structure in any embodiment, and the battery pack explosion-proof structure is located at a lower portion of the battery pack.

[0009] An embodiment of the present application further provides an electric vehicle. The electric vehicle includes a chassis and the battery pack in any embodiment, the battery pack is mounted to the chassis, and a free end of an exhaust pipe is inserted through the chassis and disposed on a side of the chassis away from the battery pack.

[0010] Some embodiments of the present application provide the battery pack explosion-proof structure. The exhaust pipe and the cover plate body are integrally formed into the bottom cover plate, which means that a relatively long exhaust structure mounted to the explosion-proof valve in the related art is integrated into the bottom cover plate. That is, the exhaust pipe and the cover plate

body are made of the same material, generally a metal material. In the mounting process of the battery pack explosion-proof structure, the explosion-proof valve is mounted on the cover plate body first so that the valve port of the explosion-proof valve is directly opposite to or is connected into the exhaust pipe. Then, the bottom cover plate mounted with the explosion-proof valve is mounted to the chassis of the vehicle. In the mounting process, the exhaust pipe is made of a harder material and therefore is less prone to deformation when bumping against the chassis. Thus, the exhaust pipe is less prone to be damaged in the mounting process, thereby improving mounting reliability. In addition, it can be ensured that the explosion-proof valve discharges gas smoothly after failing, thereby improving safety performance.

[0011] Some embodiments of the present application further provide the battery pack. The battery pack includes the battery pack explosion-proof structure in any embodiment, and the battery pack explosion-proof structure is located at a lower portion of the battery pack. The battery pack adopts the preceding battery pack explosion-proof structure so that an exhaust structure is less prone to be damaged in the mounting process. When the gas overflows in the battery pack, it is ensured that the gas is discharged smoothly, thereby improving the safety performance.

[0012] Some embodiments of the present application further provide the electric vehicle. The electric vehicle includes the chassis and the battery pack in any embodiment, the battery pack is mounted to the chassis, and the free end of the exhaust pipe in the battery pack explosion-proof structure passes through the chassis and disposed on the side of the chassis away from the battery pack. The electric vehicle adopts the preceding battery pack so that when the battery pack is in danger, for example, on fire, the explosion-proof valve can open to discharge the gas from the lower part of the chassis. Additionally, the exhaust structure of the battery pack is less prone to be damaged, thereby ensuring the safety performance of the electric vehicle during the gas overflow in the battery pack.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. **1** is a structural view one of a battery pack explosion-proof structure according to some implementations of the present application;

[0014] FIG. **2** is a structural view two of a battery pack explosion-proof structure according to some implementations of the present application;

[0015] FIG. **3** is a sectional view taken along A-A in FIG. **2** according to some implementations of the present application;

[0016] FIG. **4** is a sectional view of the structure in FIG. **3** with a first sealing member added;

[0017] FIG. **5** is a structural view one of an explosion-proof valve according to some implementations of the present application;

[0018] FIG. **6** is a structural view two of an explosion-proof valve according to some implementations of the present application; and

[0019] FIG. **7** is a schematic view showing the connection between a battery pack and an electric vehicle according to some implementations of the present application.

REFERENCE LIST

[0020] **10** bottom cover plate [0021] **11** cover plate body [0022] **12** exhaust pipe [0023] **121** gas inlet [0024] **122** first channel [0025] **1221** step surface [0026] **123** second channel [0027] **124** third channel [0028] **20** explosion-proof valve [0029] **21** valve body assembly [0030] **211** valve body [0031] **2111** engaging hole [0032] **2112** accommodating groove [0033] **2113** threaded hole [0034] **212** support [0035] **2121** body [0036] **21211** valve port [0037] **2122** engaging portion [0038] **213** elastic sheet [0039] **22** explosion-proof film [0040] **23** second sealing member [0041] **30** first sealing member [0042] **40** retaining member [0043] **100** battery pack explosion-proof structure

[0044] **200** printed circuit board (PCB) [0045] **300** battery pack [0046] **400** electric vehicle [0047] **410** chassis

DETAILED DESCRIPTION

[0048] The present application is described below in conjunction with drawings and embodiments. The embodiments described herein are intended to illustrate the present application. For ease of description, part of structures related to the present application are illustrated in the drawings.

[0049] In the description of the present application, the terms “joined”, “connected”, and “fixed” are to be understood in a broad sense unless otherwise expressly specified and limited. For example, the term “connected” may refer to “fixedly connected”, “detachably connected”, or “integrated”, may refer to “mechanically connected” or “electrically connected”, or may refer to “connected directly”, “connected indirectly through an intermediary”, “connected inside two components”, or an interaction relation between two components. For those of ordinary skill in the art, meanings of the preceding terms in the present application may be understood based on situations.

[0050] In the present application, unless otherwise expressly specified and limited, when a first feature is described as “on” or “under” a second feature, the first feature and the second feature may be in direct contact or may be in indirect contact via another feature between the two features instead of being in direct contact. Moreover, when the first feature is described as “on”, “above”, or “over” the second feature, the first feature is right on, above, or over the second feature, the first feature is obliquely on, above, or over the second feature, or the first feature is at a higher level than the second feature. When the first feature is described as “under”, “below”, or “underneath” the second feature, the first feature is right under, below, or underneath the second feature, the first feature is obliquely under, below, or underneath the second feature, or the first feature is at a lower level than the second feature.

[0051] In the description of this embodiment, orientations or position relations indicated by terms such as “upper”, “lower”, “left”, and “right” are based on the drawings. These orientations or position relations are intended to facilitate description and simplify operations and not to indicate or imply that a device or element referred to must have such particular orientations or must be configured or operated in such particular orientations. In addition, the terms “first” and “second” are used for distinguishing between descriptions and have no special meanings.

[0052] This embodiment provides a battery pack explosion-proof structure. As shown in FIGS. **1** to **3**, the battery pack explosion-proof structure includes a bottom cover plate **10** and an explosion-proof valve **20**. The bottom cover plate **10** includes a cover plate body **11** and an exhaust pipe **12**. The cover plate body **11** and the exhaust pipe **12** are integrally formed. The exhaust pipe **12** is disposed on a side of the cover plate body **11** and extends in a direction away from the cover plate body **11**. A gas inlet **121** of the exhaust pipe **12** is opened in the cover plate body **11**. The explosion-proof valve **20** is connected to a side of the cover plate body **11** away from the exhaust pipe **12**. A valve port **21211** of the explosion-proof valve **20** is directly opposite to the gas inlet **121** or is connected into the exhaust pipe **12**.

[0053] In the battery pack explosion-proof structure in the preceding embodiment, the exhaust pipe **12** and the cover plate body **11** are integrally formed into the bottom cover plate **10**, which means that a relatively long exhaust structure mounted to the explosion-proof valve **20** in the related art is integrated into the bottom cover plate **10**. That is, the exhaust pipe **12** and the cover plate body **11** are made of the same material, generally a metal material. In a mounting process of the battery pack explosion-proof structure, the explosion-proof valve **20** is mounted on the cover plate body **11** so that the valve port **21211** of the explosion-proof valve **20** is directly opposite to or is connected into the exhaust pipe **12**. Then, the bottom cover plate **10** mounted with the explosion-proof valve **20** is mounted to the chassis of a vehicle. In the mounting process, the exhaust pipe **12** is made of a harder material and therefore is less prone to deformation when bumping against the chassis. Thus, the exhaust pipe **12** is less prone to be damaged in the mounting process, thereby improving

mounting reliability. In addition, it can be ensured that the explosion-proof valve **20** discharges the gas smoothly after failing, thereby improving safety performance.

[0054] In some embodiments, the bottom cover plate **10** is formed through die casting to have higher strength.

[0055] In some embodiments, the cover plate body **11** is connected to the periphery of the chassis through screws. Thus, without any snap or similar structure on the exhaust pipe **12**, the exhaust pipe **12** can be prevented from being damaged due to the connection of the exhaust pipe **12** to the chassis.

[0056] In some embodiments, as shown in FIGS. **3** and **4**, the battery pack explosion-proof structure further includes a first sealing member **30**. The exhaust pipe **12** is configured to pass through the chassis of the vehicle. The first sealing member **30** is configured to seal the exhaust pipe **12** with the chassis. With the preceding configuration, the sealing property between the cover plate body **11** and the chassis can be ensured. Once the valve port **21211** of the explosion-proof valve **20** opens and gas overflows from the exhaust pipe **12**, it is ensured that the gas is discharged and prevented from entering the upper space of the chassis through a gap between the exhaust pipe **12** and the chassis. Furthermore, hazardous gases are prevented from entering the inside of the vehicle and harming human bodies.

[0057] In some embodiments, as shown in FIGS. **3** and **4**, the exhaust pipe **12** includes a first channel **122** and a second channel **123**. The first channel **122** is connected to the cover plate body **11**. The second channel **123** communicates with an end of the first channel **122** facing away from the cover plate body **11**. The outer diameter of the first channel **122** is greater than the outer diameter of the second channel **123** so that an end surface of the first channel **122** forms a step surface **1221**. The battery pack explosion-proof structure further includes the first sealing member **30**. The first sealing member **30** is annular and encircles the outside of the second channel **123**. A first end of the first sealing member **30** is connected to the step surface **1221**. A second end of the first sealing member **30** is configured to abut against the chassis. With the preceding configuration, the first sealing member **30** abuts against the step surface **1221** instead of a flat surface of the cover plate body **11**. Thus, the deformation of the cover plate body **11** after mounting is reduced.

[0058] In another embodiment, the first sealing member **30** may be arranged in a sealing manner between the exhaust pipe **12** and the sidewall of a through hole opened in the chassis. That is to say, an end surface of the first sealing member **30** may not abut against the flat surface of the cover plate body **11** or a flat surface of the chassis, yet a sealing effect can also be achieved.

[0059] In some embodiments, the first sealing member **30** is made of ceramic foam that is resistant to high temperatures. The ceramic foam is relatively lightweight, prone to deformation, greatly airtight, and resistant to high temperatures.

[0060] In some embodiments, as shown in FIGS. **3** and **4**, the end surface of the first sealing member **30** is bonded to the step surface **1221**. The step surface **1221** is a finished surface. With the preceding configuration, the roughness of the step surface **1221** is reduced so that the step surface **1221** is bonded more easily through an adhesive. In some embodiments, the adhesive is a highly viscous back adhesive with a thickness of 0.15 millimeters (mm). In other embodiments, another material that can bond the first sealing member **30** may be used as the adhesive. The adhesive may have another thickness, and the user may flexibly set the thickness of the adhesive as appropriate.

[0061] After the cover plate body **11** is properly connected to the chassis, due to the elasticity of the first sealing member **30**, the first sealing member **30** can act a better sealing function only if the first sealing member **30** is compressed. Referring to FIG. **4**, after being compressed, the first sealing member **30** is subjected to a certain amount of deformation in the radiation direction. If the first sealing member **30** is excessively deformed outwards, the bonded end surface of the first sealing member **30** may be shifted relative to the step surface **1221**, which is prone to a reduction in a local adhesive effect.

[0062] In some embodiments, as shown in FIGS. **3** and **4**, the exhaust pipe **12** further includes a

third channel **124** that communicates with the second channel **123**. The outer diameter of the third channel **124** is less than the outer diameter of the second channel **123**. The third channel **124** is partially located within the inner ring of the first sealing member **30**. The first sealing member **30**, the second channel **123** and the third channel **124** are spaced apart from one another. With the preceding configuration, referring to FIG. **4**, after the first sealing member **30** is compressed and deformed, a sufficiently large gap exists between the inner side of the first sealing member **30** and the outer side of the outer wall of the second channel **123** and between the inner side of the first sealing member **30** and the outer side of the outer wall of the third channel **124**. Thus, the space is sufficient for the first sealing member **30** to expand inwards. The extent to which the outer side of the first sealing member **30** expands outwards is minimized, thereby reducing the amount of the relative displacement between the first sealing member **30** and the step surface **1221** and ensuring the firmness of the adhesive between the two.

[0063] Additionally, the exhaust pipe **12** is provided with multiple sub-channels so that the overall strength of the exhaust pipe **12** can be improved, thereby preventing the exhaust pipe **12** from being damaged due to a bump in the mounting process.

[0064] In some embodiments, as shown in FIG. **3**, corners of the inner wall of the exhaust pipe **12** are all chamfers. With the preceding configuration, the gas ejected from the explosion-proof valve **20** can be prevented from passing bending angles, thereby ensuring a smooth gas flow.

[0065] As shown in FIGS. **4** to **6**, the explosion-proof valve **20** includes a valve body assembly **21** and an explosion-proof film **22**. The valve body assembly **21** is provided with the valve port **21211**. The valve body assembly **21** is connected to the cover plate body **11** through a retaining member **40**. The explosion-proof film **22** covers the valve port **21211** and is directly opposite to or located in the exhaust pipe **12**. With the preceding configuration, the explosion-proof valve **20** and the cover plate body **11** can be connected to each other conveniently. When the gas pressure to which the explosion-proof valve **20** is subjected reaches a certain value, the explosion-proof film **22** is broken through, and the gas is ejected from the valve port **21211** into the exhaust pipe **12**.

[0066] For example, the retaining member **40** is a screw. The cover plate body **11** is provided with a through hole. A threaded hole **2113** is provided on a side of the valve body assembly **21** facing the cover plate body **11**. The screw is inserted through the through hole and threadedly connected to the threaded hole **2113**. With this configuration, when viewed from the top of the cover plate body **11**, no connecting member such as a screw exists on the appearance of the explosion-proof valve **20** so that the explosion-proof valve **20** is more aesthetic.

[0067] In other embodiments, the screw may be replaced with a combination of a bolt and a nut.

[0068] In some embodiments, as shown in FIGS. **4** to **6**, the valve body assembly **21** includes a valve body **211**, a support **212**, and an elastic sheet **213**. The valve body **211** is connected to the cover plate body **11** through the retaining member **40** and is provided with an engaging hole **2111**. The support **212** includes a body **2121** and at least two engaging portions **2122** connected to the body **2121**. The at least two engaging portions **2122** are inserted into the engaging hole **2111** and engaged with the valve body **211**. The valve port **21211** is opened on the body **2121**. The explosion-proof film **22** is configured to fit snugly on the body **2121**. The elastic sheet **213** is annular. The inner periphery of the elastic sheet **213** encircles the support **212**. The outer periphery of the elastic sheet **213** abuts against the valve body **211**. With the preceding configuration, during the assembly of the explosion-proof valve **20**, the at least two engaging portions **2122** are inserted into the engaging hole **2111**. Under the action of the elasticity of the engaging portions **2122**, side surfaces of the engaging portions **2122** abut against the sidewall of the engaging hole **2111** so that the position of the support **212** is fixed radially. Protrusions of the engaging portions **2122** abut against the upper side of the valve body **211**, and the outer edge of the elastic sheet **213** abuts against the lower side of the valve body **211**, thereby fixing the support **212** axially.

[0069] In this embodiment, three engaging portions **2122** are provided. A respective valve port **21211** is provided for a connecting end between each engaging portion **2122** and the body **2121**. In

other embodiments, two, four, or more engaging portions **2122** may be provided.
[0070] The elastic sheet **213** has elasticity and can be deformed to a certain extent to ensure the sealing property between the outer edge of the elastic sheet **213** and the valve body **211**. Thus, it is ensured that the gas pressure can only act on the explosion-proof film **22** through the valve port **21211**. In some embodiments, the elastic sheet **213** is made of silica gel. In other embodiments, the elastic sheet **213** may be made of another elastic material.
[0071] In some embodiments, as shown in FIGS. **4** and **5**, the valve body assembly **21** or the cover plate body **11** is provided with an accommodating groove **2112**. The accommodating groove **2112** is configured to accommodate a second sealing member **23** located between the valve body assembly **21** and the cover plate body **11**. With the preceding configuration, the sealing property between the explosion-proof valve **20** and the bottom cover plate **10** can be ensured, and the gas is prevented from overflowing through a gap between the explosion-proof valve **20** and the bottom cover plate **10**. In addition, the case where the explosion-proof film **22** is still not broken through even with an excessively large amount of gas in the battery pack is also prevented.
[0072] For example, the accommodating groove **2112** and the threaded hole **2113** are each opened on the valve body **211**. In other embodiments, the accommodating groove **2112** may be opened on the cover plate body **11**.
[0073] In some embodiments, the second sealing member **23** is made of soft silica gel, which has a longer service life, better corrosion resistance, and an excellent deformation property and ensures a sealing property.
[0074] In some embodiments, the valve body **211** is made of an aluminum alloy so that the weight of the explosion-proof valve **20** can be reduced.
[0075] This embodiment further provides a battery pack **300**. As shown in FIG. **7**, the battery pack **300** includes the battery pack explosion-proof structure **100** in the preceding embodiment. The battery pack explosion-proof structure **100** is located in a lower portion of the battery pack **300**. The battery pack **300** adopts the preceding battery pack explosion-proof structure **100** so that an exhaust structure is less prone to be damaged in the mounting process. When the gas overflows in the battery pack **300**, it is ensured that the gas is discharged smoothly, thereby improving the safety performance.
[0076] As shown in FIG. **1**, the battery pack **300** further includes a PCB **200** disposed above the bottom cover plate **10**. The spacing between the PCB **200** and the cover plate body **11** is denoted by H, and $H \leq 12$ mm. The explosion-proof valve **20** is a flat explosion-proof valve. With the preceding configuration, the explosion-proof valve **20** can still be mounted in a relatively confined space required by a customer. The use of the space within the battery pack **300** is not affected, thereby meeting a customer requirement.
[0077] This embodiment further provides an electric vehicle **400**. As shown in FIG. **7**, the electric vehicle **400** includes the battery pack **300** in the preceding embodiment and the chassis **410**. The battery pack **300** is mounted to the chassis **410**. A free end (that is, the gas outlet end of the exhaust pipe **12**) of the exhaust pipe **12** passes through the chassis **410** and disposed on a side of the chassis **410** away from the battery pack **300**. The electric vehicle **400** adopts the preceding battery pack **300** so that when the battery pack **300** is in danger, for example, on fire, the explosion-proof valve **20** can open and the gas can be discharged from the lower portion of the chassis **410**. Additionally, the exhaust structure of the battery pack **300** is less prone to be damaged, thereby ensuring the safety performance of the electric vehicle **400** during the gas overflow in the battery pack **300**.

Claims

1. A battery pack explosion-proof structure, comprising: a bottom cover plate comprising a cover plate body and an exhaust pipe, wherein the cover plate body and the exhaust pipe are integrally formed, the exhaust pipe is disposed on a side of the cover plate body and extends in a direction

away from the cover plate body, and a gas inlet of the exhaust pipe is opened in the cover plate body; and an explosion-proof valve connected to a side of the cover plate body away from the exhaust pipe, wherein a valve port of the explosion-proof valve is directly opposite to the gas inlet or is connected into the exhaust pipe.

2. The battery pack explosion-proof structure according to claim 1, further comprising a first sealing member, wherein the exhaust pipe is configured to pass through a chassis of a vehicle, and the first sealing member is configured to seal the exhaust pipe with the chassis.

3. The battery pack explosion-proof structure according to claim 2, wherein the exhaust pipe comprises: a first channel connected to the cover plate body; and a second channel communicating with an end of the first channel away from the cover plate body, wherein an outer diameter of the first channel is greater than an outer diameter of the second channel so that an end surface of the first channel forms a step surface; wherein the first sealing member is annular and encircles an outside of the second channel, a first end of the first sealing member abuts against the step surface, and a second end of the first sealing member is configured to abut against the chassis.

4. The battery pack explosion-proof structure according to claim 3, wherein an end surface of the first sealing member is bonded to the step surface, and the step surface is a finished surface.

5. The battery pack explosion-proof structure according to claim 3, wherein the exhaust pipe further comprises a third channel that communicates with the second channel, an outer diameter of the third channel is less than the outer diameter of the second channel, the third channel is partially located within an inner ring of the first sealing member, and the first sealing member, the second channel and the third channel are spaced apart from one another.

6. The battery pack explosion-proof structure according to claim 5, wherein each corner of an inner wall of the exhaust pipe is configured to be a chamfer.

7. The battery pack explosion-proof structure according to claim 1, wherein the explosion-proof valve comprises: a valve body assembly, wherein the valve port is opened on the valve body assembly, and the valve body assembly is connected to the cover plate body through a retaining member; and an explosion-proof film configured to cover the valve port and be directly opposite to or located in the exhaust pipe.

8. The battery pack explosion-proof structure according to claim 7, wherein the valve body assembly or the cover plate body is provided with an accommodating groove, and the accommodating groove is configured to accommodate a second sealing member located between the valve body assembly and the cover plate body.

9. The battery pack explosion-proof structure according to claim 7, wherein the valve body assembly comprises: a valve body, wherein the valve body is connected to the cover plate body through the retaining member and provided with an engaging hole; a support, wherein the support comprises a body and at least two engaging portions connected to the body, the at least two engaging portions are inserted into the engaging hole and engaged with the valve body, the valve port is opened on the body, and the explosion-proof film is configured to attach to the body; and an elastic sheet which is annular, wherein an inner periphery of the elastic sheet encircles the support, and an outer periphery of the elastic sheet abuts against the valve body.

10. A battery pack, comprising a battery pack explosion-proof structure, wherein the battery pack explosion-proof structure is located at a lower portion of the battery pack, and the battery pack explosion-proof structure comprises: a bottom cover plate comprising a cover plate body and an exhaust pipe, wherein the cover plate body and the exhaust pipe are integrally formed, the exhaust pipe is disposed on a side of the cover plate body and extends in a direction away from the cover plate body, and a gas inlet of the exhaust pipe is opened in the cover plate body; and an explosion-proof valve connected to a side of the cover plate body away from the exhaust pipe, wherein a valve port of the explosion-proof valve is directly opposite to the gas inlet or is connected into the exhaust pipe.

11. The battery pack according to claim 10, further comprising a printed circuit board disposed

above the bottom cover plate, wherein a spacing between the printed circuit board and the cover plate body is denoted by H, H≤12 mm, and the explosion-proof valve is a flat explosion-proof valve.

12. The battery pack according to claim 10, wherein the battery pack explosion-proof structure further comprises a first sealing member, wherein the exhaust pipe is configured to pass through a chassis of a vehicle, and the first sealing member is configured to seal the exhaust pipe with the chassis.

13. The battery pack according to claim 12, wherein the exhaust pipe comprises: a first channel connected to the cover plate body; and a second channel communicating with an end of the first channel away from the cover plate body, wherein an outer diameter of the first channel is greater than an outer diameter of the second channel so that an end surface of the first channel forms a step surface; wherein the first sealing member is annular and encircles an outside of the second channel, a first end of the first sealing member abuts against the step surface, and a second end of the first sealing member is configured to abut against the chassis.

14. The battery pack according to claim 13, wherein an end surface of the first sealing member is bonded to the step surface, and the step surface is a finished surface.

15. The battery pack according to claim 13, wherein the exhaust pipe further comprises a third channel that communicates with the second channel, an outer diameter of the third channel is less than the outer diameter of the second channel, the third channel is partially located within an inner ring of the first sealing member, and the first sealing member, the second channel and the third channel are spaced apart from one another.

16. The battery pack according to claim 15, wherein each corner of an inner wall of the exhaust pipe is configured to be a chamfer.

17. The battery pack according to claim 10, wherein the explosion-proof valve comprises: a valve body assembly, wherein the valve port is opened on the valve body assembly, and the valve body assembly is connected to the cover plate body through a retaining member; and an explosion-proof film configured to cover the valve port and be directly opposite to or located in the exhaust pipe.

18. The battery pack according to claim 17, wherein the valve body assembly or the cover plate body is provided with an accommodating groove, and the accommodating groove is configured to accommodate a second sealing member located between the valve body assembly and the cover plate body.

19. The battery pack according to claim 17, wherein the valve body assembly comprises: a valve body, wherein the valve body is connected to the cover plate body through the retaining member and provided with an engaging hole; a support, wherein the support comprises a body and at least two engaging portions connected to the body, the at least two engaging portions are inserted into the engaging hole and engaged with the valve body, the valve port is opened on the body, and the explosion-proof film is configured to attach to the body; and an elastic sheet which is annular, wherein an inner periphery of the elastic sheet encircles the support, and an outer periphery of the elastic sheet abuts against the valve body.

20. An electric vehicle, comprising a chassis and a battery pack, wherein the battery pack is mounted to the chassis, and a free end of the exhaust pipe is inserted through the chassis and disposed on a side of the chassis away from the battery pack; the battery pack comprises a battery pack explosion-proof structure, the battery pack explosion-proof structure is located at a lower portion of the battery pack, and the battery pack explosion-proof structure comprises: a bottom cover plate comprising a cover plate body and an exhaust pipe, wherein the cover plate body and the exhaust pipe are integrally formed, the exhaust pipe is disposed on a side of the cover plate body and extends in a direction away from the cover plate body, and a gas inlet of the exhaust pipe is opened in the cover plate body; and an explosion-proof valve connected to a side of the cover plate body away from the exhaust pipe, wherein a valve port of the explosion-proof valve is directly opposite to the gas inlet or is connected into the exhaust pipe.