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Inventor(s)

BAE; Jae Hyeon

Battery Pack

Abstract

The present disclosure relates to a battery pack including: a plurality of battery cells; an accommodating body including an opening on one surface and accommodating the plurality of battery cells therein through the opening; an accommodating cover coupled with the accommodative body to close the opening; a body bottom face forming a bottom of the accommodating body; a partition portion extending from the body bottom face toward the accommodating cover to separate the interior of the accommodating body into a plurality of accommodating spaces; a protruding portion extending from the accommodating cover toward the partition portion; and a blocking portion positioned between the partition portion and the protruding portion and connecting the partition portion to the protruding portion.

Inventors: BAE; Jae Hyeon (Daejeon, KR)

Applicant: SK On Co., Ltd. (Seoul, KR)

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Background/Summary

CROSS-REFERENCE TO RELATED PATENT APPLICATION

[0001] The present application claims priority under 35 U.S.C. § 119(a) to Korean patent application number 10-2024-0021023 filed on Feb. 14, 2024 in the Korean Intellectual Property Office, the entire disclosure of which is incorporated by reference herein.

BACKGROUND OF THE INVENTION

1. Field

[0002] The present disclosure relates to a battery pack. Specifically, it relates to a battery pack for mitigating thermal propagation (TP) during thermal runaway of a battery cell.

2. Description of the Related Art

[0003] Recently, due to fires and explosions that occurred when using lithium secondary batteries, there are increasing social concerns about the safety of battery use. Based on these social concerns, one of the major development tasks of lithium secondary batteries recently is to remove instability such as fire and explosion due to thermal runaway of battery cells.

[0004] Conventional battery packs focus on design that considers securing space for battery cells or battery modules in consideration of energy density. Therefore, conventional battery packs have a problem in that the design considering heat transfer is not sufficiently reflected. To solve this problem, a pack cover that considers additional design that can prevent or minimize thermal propagation (TP) and thermal runaway inside the pack in case of fire is required in replacement of existing flat-shaped pack covers (or accommodating covers).

SUMMARY OF THE INVENTION

[0005] First, according to one aspect of the present disclosure, a technical problem is to mitigate or prevent fire that occurs in a battery cell or battery module provided inside a battery pack from propagating to the entire interior of the battery pack.

[0006] Second, according to another aspect of the present disclosure, a technical problem is to increase the lifetime and stability of a battery pack.

[0007] Third, according to still another aspect of the present disclosure, a technical problem is to improve the fire safety of electric vehicles including a battery pack.

[0008] Meanwhile, a battery pack or battery assembly according to the present disclosure can be widely applied in the field of electric vehicles, battery charging stations, and green technology, such solar power generation, and wind power generation using batteries. In addition, the present disclosure can be used in eco-friendly electric vehicles, hybrid vehicles, and others to prevent air pollution and climate change by suppressing greenhouse gas emissions.

[0009] To solve the above-described technical problems, a battery pack according to the present disclosure includes: a plurality of battery cells; an accommodating body including an opening on one surface and accommodating the plurality of battery cells therein through the opening; an accommodating cover coupled with the accommodative body to close the opening; a body bottom face forming a bottom of the accommodating body; a partition portion extending from the body bottom face toward the accommodating cover to separate the interior of the accommodating body into a plurality of accommodating spaces; a protruding portion extending from the accommodating cover toward the partition portion; and a blocking portion positioned between the partition portion and the protruding portion and connecting the partition portion to the protruding portion.

[0010] The battery pack may further includes: a body side face forming a side face of the

accommodating body including a first body portion extending from the body bottom face toward the accommodating cover with a first predetermined thickness and a second body portion extending from the first body portion toward the accommodating cover with a second predetermined thickness smaller than the first thickness; an extending portion extending from the accommodating cover toward the first body portion; and a sealing portion positioned between the extending portion and the first body portion and being in contact with the extending portion and with the first body portion.

[0011] In addition, an outer surface of the extending portion may face an inner surface of the second body portion.

[0012] When the accommodating cover and the accommodating body are coupled, the extending portion may be positioned inside the accommodating body.

[0013] The accommodating cover may include a fire extinguishing portion positioned between the extending portion and the protruding portion.

[0014] In addition, the battery pack may further include a flange portion bent from the second body portion to the outside of the accommodating body, and the accommodating cover may be coupled with the flange portion.

[0015] In addition, at least a part of the fire extinguishing portion may be positioned below the flange portion.

[0016] Meanwhile, the partition portion may include a first partition frame separating the interior of the accommodating body along a first direction perpendicular to the height direction of the accommodating body, the protruding portion may include a first protruding portion protruding from the accommodating cover toward the first partition frame, and the blocking portion may include a first blocking portion connecting the first partition frame and the first protruding portion.

[0017] In addition, the partition portion may further include a second partition frame separating the interior of the accommodating body along a second direction perpendicular to the height direction of the accommodating body and the first direction, the protruding portion may further include a second protruding portion protruding from the accommodating cover toward the second partition frame, and the blocking portion may further include a second blocking portion connecting the second partition frame and the second protruding portion.

[0018] Meanwhile, the accommodating cover may further include: a cover plate of a planar cover plate; and a fire extinguishing portion positioned on an upper portion of each of the plurality of accommodating spaces in a direction from the cover plate toward the accommodating body.

[0019] The fire extinguishing portion may include: a storing space for storing a fire extinguishing agent; and a storing cover positioned between the storing space and the accommodating space to form the storing space, wherein, based on the temperature of the storing cover, the storing cover is deformed so that the fire extinguishing agent is discharged from the storing space.

[0020] The storing cover may include: a planar storing plate; and a recessed groove provided in a shape of a groove on one surface of the storing plate facing the plurality of accommodating spaces.

[0021] The recessed groove may have a notch shape.

[0022] Meanwhile, the recessed groove may be ruptured when the temperature of the storing cover is higher than or equal to a preset allowable temperature, and the fire extinguishing agent may be discharged from the storing space through the recessed groove at a temperature higher than or equal to the allowable temperature.

[0023] The partition portion may include a communicating groove formed to be recessed toward the body bottom face.

[0024] Meanwhile, the battery pack may further include a connecting busbar electrically connecting the plurality of battery cells separately accommodated in the plurality of accommodating spaces, through the communicating groove.

[0025] Meanwhile, the blocking portion may be made of a heat-resistant material.

[0026] In addition, the shape of the blocking portion may be deformed when the accommodating

cover and the accommodating body are coupled.

[0027] Meanwhile, the sealing portion may be made of a heat-resistant material.

[0028] A battery pack according to the present disclosure may include: a plurality of battery cells; an accommodating body including an opening on one surface and accommodating the plurality of battery cells therein through the opening; an accommodating cover coupled with the accommodative body to close the opening; a body bottom face forming a bottom of the accommodating body; a side face of the accommodating body including a first body portion extending from the body bottom face toward the accommodating cover with a first predetermined thickness and a second body portion extending from the first body portion toward the accommodating cover with a second predetermined thickness smaller than the first thickness; an extending portion extending from the accommodating cover toward the first body portion; and a sealing portion positioned between the extending portion and the first body portion and being in contact with the extending portion and the first body portion.

[0029] First, according to one embodiment of the present disclosure, fire that occurs in a battery cell or battery module provided inside a battery pack may be mitigated or prevented from propagating to the entire interior of the battery pack.

[0030] Second, according to another embodiment of the present disclosure, the lifetime and stability of a battery pack may be increased.

[0031] Third, according to still another embodiment of the present disclosure, the fire safety of electric vehicles including a battery pack may be improved.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] FIG. 1 shows an example of a battery module according to the present disclosure.

[0033] FIG. 2 shows an example of a battery pack according to the present disclosure.

[0034] FIG. 3 shows a top view of a battery pack according to the present disclosure.

[0035] FIG. 4 shows a cross-sectional view of a battery pack taken along line A-A' of FIG. 3.

[0036] FIG. 5 shows an example of a protruding portion and an extending portion according to the present disclosure.

[0037] FIG. 6 shows another example of a protruding portion and an extending portion according to the present disclosure.

[0038] FIG. 7 shows a cross-sectional view of a battery pack according to the present disclosure.

[0039] FIG. 8 shows another cross-sectional view of a battery pack according to the present disclosure.

[0040] FIG. 9A and FIG. 9B show cross-sectional views of a storing cover according to the present disclosure.

[0041] FIG. 10 shows a cross-sectional view of a recessed groove being closed according to the present disclosure.

[0042] FIG. 11 shows an example of a recessed groove according to the present disclosure being opened to allow a fire extinguishing agent to move toward a battery cell or a battery module.

[0043] FIG. 12 shows another example of a sealing portion according to the present disclosure.

[0044] FIG. 13 shows a communicating groove according to the present disclosure.

[0045] FIG. 14 shows an example of a connecting busbar settled in a communicating groove according to the present disclosure.

DETAILED DESCRIPTION

[0046] Hereinafter, the present disclosure will be described in detail with reference to the attached drawings. The configuration or control method of the apparatus described below is only for explaining the embodiments of the present disclosure and is not intended to limit the scope of the

present disclosure, and the same reference numerals used throughout the specification indicate the same components.

[0047] FIG. 1 shows an example of a battery module **200** according to the present disclosure.

[0048] Referring to FIG. 1, the battery module **200** may include a plurality of battery cells **110**; a bus bar **150** electrically connected to the plurality of battery cells **110**; and a module case **215** and **219** accommodating the plurality of battery cells **110** and the busbar **150**.

[0049] The plurality of battery cells **110** may be stacked along a preset stacking direction. The plurality of battery cells **110** may be electrically connected by the busbar **150**, and a form in which the plurality of battery cells **110** and the busbar **150** are assembled may be referred to as a cell stack **100**.

[0050] The module case **215** and **219** may include an input opening **2198** on one surface and may include: a module body **219** accommodating the plurality of battery cells **110** through the input opening **2198**; and a module cover **215** coupled with the module body **219** to close the opening **2198**.

[0051] The module body **219** may form a module accommodating space **2198** for accommodating the plurality of battery cells **110**. The module body **219** may include: a module bottom face **2194** forming a bottom of the module accommodating space **2198**; and a module side face **2191** and **2192** extending from a pair of opposing edges of the module bottom face **2194** toward the module cover **215**.

[0052] Therefore, the module body **219** may be formed in a U-shape or a channel shape. Therefore, when the module cover **215** is coupled with the module body **219**, a pair of side faces facing each other may have an open form. The battery module **200** may further include an end plate **212** and **213** coupled with the module body **219** at the pair of open side faces.

[0053] The module case **215** and **219** may include a terminal portion **212a** and **212b** for electrically connecting the busbar **150** to the outside. Referring to FIG. 1, the terminal portion **212a** and **212b** may be provided on any one of the end plate **212** and **213**. However, alternatively, the terminal portion may be positioned on other parts of the module case **215** and **219**.

[0054] The battery pack **300** (see FIG. 2) according to the present disclosure may accommodate battery modules **200** in a plural number. The plurality of battery modules **200** may be electrically connected to each other through the terminal portion **212a** and **212b**.

[0055] The position of the busbar **150** may vary depending on the position of each tab portion of the plurality of battery cells **110**. For example, referring to FIG. 1, since each tab portion of the plurality of battery cells **110** protrudes in different directions, the busbar **150** may include a first busbar **151** and a second busbar **152** positioned with the plurality of battery cells **110** interposed therebetween.

[0056] Meanwhile, the battery module **200** may further include a heat dissipating portion **295** for stably maintaining the positions of the plurality of battery cells **110** and discharging heat generated from the plurality of battery cells **110** to the outside. The heat dissipating portion **295** may be formed of a heat-conductive and adhesive material.

[0057] FIG. 2 shows an example of a battery pack **300** according to the present disclosure.

[0058] Referring to FIG. 2, the battery pack **300** includes: a plurality of battery cells **110**; an accommodating body **39** including an opening **371** on one side and accommodating the plurality of battery cells **110** therein through the opening **371**; an accommodating cover **38** (see FIG. 4) coupled with the accommodating body **39** to close the opening **371**; and a partition portion **330** (see FIG. 3) separating the interior of the accommodating body **39** into a plurality of accommodating spaces **37**.

[0059] The plurality of battery cells **110** may be disposed in each of the plurality of accommodating spaces **37** in the form of a cell stack **100** or a battery module **200**. Alternatively, only the plurality of battery cells **110** may be disposed in the plurality of accommodating spaces **37** and connected to a busbar (not shown) provided in each of the plurality of accommodating spaces.

[0060] In other words, the plurality of battery cells **110** may be accommodated separately in a predetermined number in the plurality of accommodating spaces **37**.

[0061] The accommodating body **39** may include an opening **371** on one surface. Preferably, the accommodating body **39** may include an opening on an upper portion.

[0062] The accommodating body **39** may include: a body bottom face **35** forming a bottom of the accommodating body **39**; and a body side face **31**, **32**, **33**, and **34** extending from an edge of the body bottom face **35** toward the accommodating cover **38** to form a side face of the accommodating body **39**.

[0063] In addition, the body bottom face **35** may form a bottom of the plurality of accommodating spaces **37** and support the plurality of battery cells **110** disposed in the plurality of accommodating spaces **37**.

[0064] The partition portion **330** may include a first partition frame **331** separating the interior of the accommodating body **39** along a first direction perpendicular to the height direction of the accommodating body **39**.

[0065] In addition, the partition portion **330** may further include a second partition frame **335** separating the interior of the accommodating body **39** along a second direction perpendicular to the height direction of the accommodating body **39** and the first direction.

[0066] FIG. **3** shows a top view of a battery pack **300** according to the present disclosure.

[0067] The partition portion **330** may divide the interior space formed by the accommodating cover **38** and the accommodating body **39** into a plurality of accommodating spaces. In addition, the partition portion **330** can minimize deformation or torsion of the accommodating body **39**, thereby increasing the structural rigidity of the accommodating body **39**.

[0068] The first partition frame **331** and the second partition frame **335** may be provided in a plural number according to the number of the plurality of accommodating spaces **37**.

[0069] Referring to FIG. **3**, an example where the plurality of accommodating spaces **37** are disposed in two rows and two columns along the X-and Y-directions is illustrated. However, when the number of the first partition frame **331** and the second partition frame **335** is different, the number of the plurality of accommodating spaces **37** or the arrangement of the plurality of accommodating spaces **37** along the X- and Y-directions may also be different. Therefore, the arrangement of the battery modules **200** disposed in the plurality of accommodating spaces **37**, the arrangement of the cell stacks **100**, or the arrangement of the plurality of battery cells **110** may be different.

[0070] Meanwhile, the accommodating body **39** may further include a control portion **336** positioned between the accommodating body **39** and the plurality of accommodating spaces **37** to control the plurality of battery cells. The control portion **336** may detect the voltage or temperature of the plurality of battery cells **110** to check whether the plurality of battery cells **110** are abnormal and may also control the output of the plurality of battery cells **110**.

[0071] Meanwhile, the accommodating body **39** may further include flange portions **31f** and **32f** formed by bending one end of the body side faces **31**, **32**, **33**, and **34** (see FIG. **2**). The accommodating cover **38** may be coupled with the accommodating body **39** at the flange portions **31f** and **32f**.

[0072] For convenience, the flange portions **31f** and **32f** are indicated as being on a pair of opposing body side faces **31** and **32**, but with reference to FIG. **3**, the flange portion may also be formed on another pair of opposing body side faces **33** and **34**.

[0073] FIG. **4** shows a cross-sectional view of a battery pack **300** taken along line A-A' of FIG. **3**.

[0074] In a typical battery pack, an accommodating cover is provided in a planar shape. Therefore, an empty space may be formed between the plurality of battery cells and the accommodating cover. Through the empty space, high-temperature gas and flames generated during thermal runaway of a battery cell may quickly propagate into the interior of a battery pack.

[0075] To solve this problem, a battery pack **300** according to the present disclosure includes: a

plurality of battery cells **110** (see FIG. 1); an accommodating body **39** (see FIG. 2) including an opening **371** (see FIG. 2) on one surface and accommodating the plurality of battery cells **110** therein through the opening **371**; an accommodating cover **38** coupled with the accommodating body **39** to close the opening **371**; and a body bottom face **35** (see FIG. 2) forming a bottom of the accommodating body **39**. In addition, the battery pack **300** further includes: a partition portion **330** extending from the body bottom face **35** toward the accommodating cover **38** to separate the interior of the accommodating body **39** into a plurality of accommodating spaces **37** (see FIG. 10); a protruding portion **389** extending from the accommodating cover **38** toward the partition portion **330**; and a blocking portion **388** positioned between the partition portion **330** and the protruding portion **389** to connect the partition portion **330** and the protruding portion **389**.

[0076] In other words, the partition portion **330** and the protruding portion **389** may extend toward each other from the body bottom face **35** and the accommodating cover **38**, respectively, so as to face each other at the same position.

[0077] Preferably, the partition portion **330** and the protruding portion **389** may be formed of a metallic material. Therefore, when the accommodating cover **38** and the accommodating body **39** are coupled, a gap may be generated between the partition portion **330** and the protruding portion **389**. When thermal runaway of any one battery cell **110** occurs through the gap in any one accommodating space **37**, flame or high-temperature gas may escape through the gap and propagate to another adjacent accommodating space **37**. Ultimately, the flame or high-temperature gas may propagate throughout the interior of the accommodating body.

[0078] The battery pack **300** according to the present disclosure may include the blocking portion **388** to prevent a gap from forming between the partition portion **330** and the protruding portion **389**.

[0079] Considering that the busbar **150** is formed of an electrically conductive material, the blocking portion **388** may be formed of an electrically insulating material.

[0080] In addition, the blocking portion **388** can minimize or prevent the propagation of high-temperature gas or flame through the gap. In other words, the blocking portion **388** may serve as a sealing portion material. To this end, the material of the blocking portion **388** may be a heat-resistant material.

[0081] In addition, when the partition portion **330** and the protruding portion **389** are coupled, the blocking portion **388** may be compressed by an external force between the partition portion **330** and the protruding portion **389**. In other words, the blocking portion **388** may be deformed when the accommodating cover **38** and the accommodating body **39** are coupled.

[0082] In particular, the shape of one end of the blocking portion **388** may be deformed to correspond to the shape of one end of the partition portion **330**.

[0083] In other words, in order to correspond to the shape of one end of the partition portion **330**, the shape of one end of the blocking portion **388** may be deformed.

[0084] Ultimately, high-temperature gas or flame generated in one accommodating space may be mitigated or blocked from propagating to another adjacent accommodating space by the partition portion **330**, the protruding portion **389**, and the blocking portion **388**.

[0085] Meanwhile, the battery pack **300** may include a body side face **31** and **32** extending from the body bottom face **35** toward the accommodating cover **38** and forming a side face of the accommodating body **39**.

[0086] The body side faces **31** and **32** may include a first body portion **31b** and **32b** extending toward the accommodating cover **38** with a preset first thickness and a second body portion **31a** and **32a** extending toward the accommodating cover **38** with a preset second thickness smaller than the first thickness from the first body portion **31b** and **32b**, respectively.

[0087] The first body portions **31b** and **32b** and the second body portions **31a** and **32a** may be stepped along the height direction of the accommodating body **39**. The step may be formed by the inner surface of the body side face **31** and **32**. In other words, the outer surface of the body side

face **31** and **32** may form a single smooth plane, since the outer surface of the first body portion **31b** and **32b** and the outer surface of the second body portion **31a** and **32a** are formed integrally. [0088] Therefore, when the accommodating cover **38** and the accommodating body are joined, the extending portion **385** may be positioned so as to face one end **31c** and **32c** of the first body portion **31b** and **32b**. As a result, the outer surface **385a** of the extending portion may face the inner surface **31d** and **32d** of the second body portion.

[0089] Therefore, when the accommodating cover **38** and the accommodating body are coupled, the extending portion **385** will be positioned inside the accommodating body **39**.

[0090] In addition, the accommodating cover **38** may further include: an extending portion **385** extending from the accommodating cover **38** toward the first body portion **31b** and **32b**; and a sealing portion **387** positioned between the extending portion **385** and the first body portion **31b** and **32b** and being in contact with the extending portion **385** and the first body portion **31b** and **32b**.

[0091] When the accommodating cover **38** is coupled with the accommodating body **39**, the sealing portion **387** may be in contact with one end **31c** and **32c** of the first body portion **31b** and **32b**.

[0092] Considering that the busbar **150** is formed of an electrically conductive material, the sealing portion **387** may be formed of an electrically insulating material, similarly to the blocking portion **388**.

[0093] When the accommodating cover **38** is coupled with the accommodating body **39**, a gap may be formed between the extending portion **385** and the first body portion **31b** and **32b**. The sealing portion **387** can minimize or prevent high-temperature gas or flame from being discharged to the outside through the gap. In other words, the sealing portion **387** may serve as a sealing portion material. To this end, the sealing portion **387** may be formed of a heat-resistant material, similar to the blocking portion **388**.

[0094] In addition, when the first body portion **31b** and **32b** and the extending portion **385** are coupled, the sealing portion **387** may be compressed by an external force between the extending portion **385** and the first body portion **31b** and **32b**. In other words, the sealing portion **387** may be deformed when the accommodating cover **38** and the accommodating body **39** are coupled.

[0095] In particular, the shape of one end of the sealing portion **387** may be deformed to correspond to the shape of one end of the sealing portion **387**. Therefore, unintentional discharge of high-temperature gas or flame generated in any one accommodating space to the outside may be mitigated or blocked by the sealing portion **387**. In addition, supply of oxygen from the outside to the inside of the battery pack **300** may be mitigated or blocked.

[0096] Meanwhile, the battery pack **300** may further include a flange portion **31f** and **32f** formed by bending the second body portions **31a** and **32a** to the outside of the accommodating body **39**. The accommodating cover **38** may be coupled with the flange portion **31f** and **32f** to close the opening **371** (see FIG. 2).

[0097] To this end, the flange portion **31f** and **32f** may include a flange through-hole penetrating the flange portion **31f** and **32f**. Similarly, the accommodating cover **38** may include an accommodating cover through-hole at a position corresponding to the flange through-hole so as to communicate with the flange through-hole. In addition, the accommodating cover **38** and the accommodating body **39** may be coupled using a fastening member **90** at the flange through-hole and the accommodating cover through-hole.

[0098] Meanwhile, the accommodating cover **38** may include: a cover plate **381** having a planar shape; and a cover frame **383** coupled with a surface of the cover plate **381** facing the plurality of accommodating spaces **37**.

[0099] The extending portion **385** and the protruding portion **389** may extend from the cover frame **383** toward the first body portion **31b** and **32b** and the partition portion **330**, respectively.

Alternatively, while the cover frame **383** may be omitted, the extending portion **385** and the protruding portion **389** may extend from the cover plate **381** toward the first body portion **31b** and

32b and the partition portion **330**, respectively.

[0100] FIG. **4** illustrates the first body portion **31b** and **32b**, the second body portion **31a** and **32a**, the sealing portion **387**, and the flange portion **31f** and **32f** using a cross-section taken along line A-A' of FIG. **3**. Therefore, although FIG. **4** illustrates a pair of body side faces **31** and **32** facing each other, the same description may be applied to the other pair of body side faces **33** and **34** (see FIG. **2**).

[0101] FIG. **5** shows an example of a protruding portion **389** and an extending portion **385** according to the present disclosure, and FIG. **6** shows another example of a protruding portion **389** and an extending portion **385** according to the present disclosure.

[0102] To help understand the cover frame **383**, the protruding portion **389**, and the extending portion **385**, FIGS. **5** and **6** illustrate a battery pack **300** according to the present disclosure when viewed from above, where the battery pack overlaps with a battery module **200** or cell stack **100** accommodated in the plurality of accommodating spaces **37**.

[0103] Referring to FIGS. **5** and **6**, the partition portion **330** may include: a first partition frame **331** separating the interior of the accommodating body **39** along a first direction perpendicular to the height direction of the accommodating body **39**; and a second partition frame **335** separating the interior of the accommodating body **39** along a second direction perpendicular to the height direction of the accommodating body **39** and the first direction.

[0104] At a position overlapping the first partition frame **331** and the second partition frame **335** along the height direction of the accommodating body **39**, the protruding portion **389** may include: a first protruding portion **3891** protruding from the accommodating cover **38** toward the first partition frame **331**; and a second protruding portion **3892** protruding from the accommodating cover **38** toward the second partition frame **335**.

[0105] Similarly, the blocking portion **388** may further: include a first blocking portion (not shown) connecting the first partition frame **331** and the first protruding portion **3891**; and a second blocking portion (not shown) connecting the second partition frame **335** and the second protruding portion **3892**.

[0106] FIG. **5** shows an example where the cover frame **393** (see FIG. **4**) is positioned to face each of the plurality of accommodating spaces **37** (see FIG. **10**). Therefore, the cover frame **383** may be provided in a plural number, and may be the same number as the plurality of accommodating spaces **37**.

[0107] Therefore, each of the plurality of cover frames **383** may include the protruding portion **389** and the extending portion **385**.

[0108] Alternatively, FIG. **6** shows an example where the cover frame **383** is provided as one piece. Therefore, referring to FIG. **6**, both the protruding portion **389** and the extending portion **385** may be connected at a position corresponding to the partition portion **330**.

[0109] FIG. **7** shows a cross-sectional view of a battery pack **300** according to the present disclosure.

[0110] The accommodating cover **38** may include a fire extinguishing portion **382** positioned between the extending portion **385** and the protruding portion **389**. In addition, the fire extinguishing portion **382** may be provided on each of the plurality of accommodating spaces **37**.

[0111] When a fire occurs in a battery cell **110**, a battery module **200**, or a cell stack **100** positioned in any one accommodating space **37** (see FIG. **10**), in order to quickly extinguish the fire, the fire extinguishing portion **382** may spray a fire extinguishing agent stored in the fire extinguishing portion **382** into the accommodating space **37** where the fire has occurred.

[0112] Since the accommodating space **37** where the fire occurred can be separated from other spaces by the blocking portion **388** and the sealing portion **387**, it will be possible to block or mitigate the propagation of the fire to other adjacent accommodating spaces **37**.

[0113] Referring to FIG. **7**, the accommodating cover **38** may further include a fire extinguishing portion **382** positioned at each upper portion of the plurality of accommodating spaces **37** in a

direction from the cover plate **381** toward the accommodating body **39**. More specifically, the fire extinguishing portion **382** may be positioned inside the cover frame **383**.

[0114] Therefore, referring to FIG. 7, at least a part of the fire extinguishing portion **382** may be positioned below the flange portions **31f** and **32f**.

[0115] FIG. 8 shows another cross-sectional view of a battery pack **300** according to the present disclosure.

[0116] The fire extinguishing portion **382** (see FIG. 7) may include: a storing space **384** storing a fire extinguishing agent G (see FIG. 10); and a storing cover **386** positioned between the storing space **384** and the accommodating space **37** to form the storing space **384**.

[0117] The storing cover **386** may be a surface of the cover frame **383** (see FIG. 7) positioned in a direction toward the plurality of accommodating spaces **37**.

[0118] The storing space **384** may be formed between the cover plate **381** and the storing cover **386**.

[0119] In addition, the fire extinguishing agent G may be discharged from the storing space **384** based on the temperature of the storing cover **386** by deforming the storing cover **386**.

[0120] FIG. 9A and FIG. 9B show cross-sectional views of a storing cover **386** according to the present disclosure.

[0121] As described above, the fire extinguishing agent G may be discharged from the storing space **384** based on the temperature of the storing cover **386** by deforming the storing cover **386**.

[0122] To this end, referring to FIG. 9A, the storing cover **386** may include a storing plate **3861** having a planar shape and a recessed groove **3862** formed in a groove shape on one surface of the storing plate **3861** facing the plurality of accommodating spaces **37**.

[0123] The recessed groove **3862** may be extended in the form of a line from one edge of the storing plate **3861** to the other edge facing the edge. In addition, the recessed groove **3862** extending in the form of a line may be provided in a plural number. This is intended to better discharge the fire extinguishing agent G.

[0124] Specifically, when the temperature of the storing cover **386** is higher than or equal to a preset allowable temperature, the recessed groove **3862** is ruptured, and at a temperature higher than or equal to the allowable temperature, the fire extinguishing agent may be discharged from the storing space **384** through the ruptured recessed groove **3862**.

[0125] Referring to FIG. 9B, the cross-section of the recessed groove **3862** may be a notch shape. However, the present invention is not limited thereto, and it may have other shapes as long as the recessed groove **3862** may be ruptured when the temperature is higher than or equal to a preset allowable temperature.

[0126] FIG. 10 shows a cross-sectional view of a recessed groove **3862** being closed according to the present disclosure. FIG. 11 shows an example of a recessed groove **3862** according to the present disclosure being opened to allow a fire extinguishing agent G to move toward a battery cell **110** (see FIG. 2) or a battery module **200**.

[0127] A storing cover **386** positioned above an accommodating space **37** (see FIG. 10) where a fire has occurred will be heated by the fire. Therefore, as the temperature of the storing cover **386** increases, the heat is concentrated at the recessed groove **3862**, and the storing plate **3861** may be deformed so that the recessed groove **3862** is widened. Through this, the storing plate **3861** may be subjected to thermal stress centered on the recessed groove **3862**, and ultimately the recessed groove **3862** may be ruptured. In other words, a hole penetrating the storing plate **3861** may be formed.

[0128] Therefore, the fire extinguishing agent G may move to the accommodating space **37** where a fire has occurred, through the ruptured recessed groove **3862**. Therefore, the fire extinguishing agent G may move toward a battery module **200**, a cell stack **100**, or a battery cell **110** positioned in the accommodating space **37** where the fire has occurred.

[0129] Therefore, the battery pack **300** according to the present disclosure can mitigate or suppress

TP from a battery cell **110** where thermal runaway has occurred to another adjacent battery cell **110**, or from a cell stack **100** or battery module **200** including a battery cell **110** where thermal runaway has occurred to another adjacent cell stack **100** or battery module **200**, through the fire extinguishing portion **382**. Therefore, by mitigating or blocking TP at the level of a battery cell **110**, a cell stack **100**, or a battery module **200**, the battery pack **300** according to the present disclosure can mitigate or block the propagation of heat or flame within each battery pack. In other words, the battery pack **300** according to the present disclosure can improve the stability of the battery pack **300** by mitigating or blocking the propagation of thermal runaway of the battery cell **110** or thermal runaway of the battery module **200** through the fire extinguishing portion **382**.

[0130] FIG. **12** shows another example of a sealing portion **387** according to the present disclosure. [0131] The cross-section of the sealing portion **387** may be circular. Therefore, unlike the sealing portion **387** illustrated in FIG. **4**, the surface in contact with the extending portion **385** and the first body portions **31b** and **32b** is wider, so that the high-temperature gas or flame generated in the accommodating space **37** may be more effectively prevented or mitigated from being discharged to the outside.

[0132] Similarly, the cross-section of the blocking portion **388** may be circular. Therefore, unlike the blocking portion **388** illustrated in FIG. **4**, the surface in contact with the protruding portion **389** and the partition portion **330** is wider, so that the high-temperature gas or flame generated in the accommodating space **37** may be more effectively prevented or mitigated from being discharged to the outside.

[0133] Referring to FIG. **4** and FIG. **12**, the blocking portion **388** and the sealing portion **387** may have the same shape and size. Alternatively, the blocking portion **388** and the sealing portion **387** may have different shapes and different sizes.

[0134] FIG. **13** shows a communicating groove **33G** according to the present disclosure.

[0135] The partition portion **330** may include a communicating groove **33G** formed by being recessed toward the body bottom face **35**. More specifically, the communicating groove **33G** may be formed on the first partition frame **331** and the second partition frame **335**.

[0136] In addition, the plurality of accommodating spaces **37** may communicate with each other through the communicating groove **33G**.

[0137] In addition, the battery pack **300** according to the present disclosure may further include a connecting busbar **390** electrically connecting the plurality of battery cells **110**, which are grouped into a predetermined number of groups and accommodated in the plurality of accommodating spaces **37**, through the communicating groove **33G**.

[0138] The connecting busbar **390** may be formed of a flexible material, so that the grouped battery cells **110** may be connected to each other.

[0139] Meanwhile, the connecting busbar **390** may be coated with an electrically insulating material, so that it may be inserted into the communicating groove **33G** and come into contact with the partition portion **330** made of a metal material.

[0140] When a battery module **200** (see FIG. **1**) is disposed in the plurality of accommodating spaces **37**, the connecting busbar **390** may be electrically connected to the terminal portion **212a** and **212b** (see FIG. **1**).

[0141] FIG. **14** shows an example of a connecting busbar settled in a communicating groove according to the present disclosure.

[0142] Since the connecting busbar **390** is inserted and positioned in the communicating groove **33G**, when the accommodating cover **38** is coupled with the accommodating body **39**, interference with each other may be avoided. Through this, when the accommodating cover **38** is coupled with the accommodating body **39**, the plurality of accommodating spaces **37** may be isolated from the outside through the sealing portion **387**. In addition, the plurality of accommodating spaces **37** may be separated from each other through the blocking portion **388** without a gap generated by the connecting busbar **390**.

[0143] The present disclosure may be modified and implemented in various forms, and its scope is not limited to the embodiments described above. Therefore, if a modified embodiment includes components of the present disclosure, it should be regarded as falling within the scope of the rights of the present disclosure.

Claims

1. A battery pack comprising: a plurality of battery cells; an accommodating body including an opening on one surface and accommodating the plurality of battery cells therein through the opening; an accommodating cover coupled with the accommodative body to close the opening; a body bottom face forming a bottom of the accommodating body; a partition portion extending from the body bottom face toward the accommodating cover to separate the interior of the accommodating body into a plurality of accommodating spaces; a protruding portion extending from the accommodating cover toward the partition portion; and a blocking portion positioned between the partition portion and the protruding portion and connecting the partition portion to the protruding portion.
2. The battery pack according to claim 1, further comprising: a body side face forming a side face of the accommodating body including a first body portion extending from the body bottom face toward the accommodating cover with a first predetermined thickness and a second body portion extending from the first body portion toward the accommodating cover with a second predetermined thickness smaller than the first thickness; an extending portion extending from the accommodating cover toward the first body portion; and a sealing portion positioned between the extending portion and the first body portion and being in contact with the extending portion and with the first body portion.
3. The battery pack according to claim 2, wherein an outer surface of the extending portion faces an inner surface of the second body portion.
4. The battery pack according to claim 2, wherein, when the accommodating cover and the accommodating body are coupled, the extending portion is positioned inside the accommodating body.
5. The battery pack according to claim 2, wherein the accommodating cover includes a fire extinguishing portion positioned between the extending portion and the protruding portion.
6. The battery pack according to claim 5, further comprising: a flange portion bent from the second body portion to the outside of the accommodating body; wherein the accommodating cover is coupled with the flange portion.
7. The battery pack according to claim 6, wherein at least a part of the fire extinguishing portion is positioned below the flange portion.
8. The battery pack according to claim 1, wherein the partition portion includes a first partition frame separating the interior of the accommodating body along a first direction perpendicular to the height direction of the accommodating body, the protruding portion includes a first protruding portion protruding from the accommodating cover toward the first partition frame, and the blocking portion includes a first blocking portion connecting the first partition frame and the first protruding portion.
9. The battery pack according to claim 8, wherein the partition portion further includes a second partition frame separating the interior of the accommodating body along a second direction perpendicular to the height direction of the accommodating body and the first direction, the protruding portion further includes a second protruding portion protruding from the accommodating cover toward the second partition frame, and the blocking portion further includes a second blocking portion connecting the second partition frame and the second protruding portion.
10. The battery pack according to claim 1, wherein the accommodating cover further includes: a cover plate of a planar shape; and a fire extinguishing portion positioned on an upper portion of

each of the plurality of accommodating spaces in a direction from the cover plate toward the accommodating body.

11. The battery pack according to claim 10, wherein the fire extinguishing portion includes: a storing space for storing a fire extinguishing agent; and a storing cover positioned between the storing space and the accommodating space to form the storing space, wherein, based on the temperature of the storing cover, the storing cover is deformed so that the fire extinguishing agent is discharged from the storing space.

12. The battery pack according to claim 11, wherein the storing cover includes: a planar storing plate; and a recessed groove provided in a shape of a groove on one surface of the storing plate facing the plurality of accommodating spaces.

13. The battery pack according to claim 12, wherein the recessed groove has a notch shape.

14. The battery pack according to claim 12, wherein the recessed groove is ruptured when the temperature of the storing cover is higher than or equal to a preset allowable temperature, and the fire extinguishing agent is discharged from the storing space through the recessed groove at a temperature higher than or equal to the allowable temperature.

15. The battery pack according to claim 1, wherein the partition portion includes a communicating groove formed to be recessed toward the body bottom face.

16. The battery pack according to claim 15, further comprising: a connecting busbar electrically connecting the plurality of battery cells separately accommodated in the plurality of accommodating spaces, through the communicating groove.

17. The battery pack according to claim 1, the blocking portion is made of a heat-resistant material.

18. The battery pack according to claim 17, wherein the shape of the blocking portion is deformed when the accommodating cover and the accommodating body are coupled.

19. The battery pack according to claim 2, the sealing portion is made of a heat-resistant material.

20. A battery pack comprising: a plurality of battery cells; an accommodating body including an opening on one surface and accommodating the plurality of battery cells therein through the opening; an accommodating cover coupled with the accommodative body to close the opening; a body bottom face forming a bottom of the accommodating body; a side face of the accommodating body including a first body portion extending from the body bottom face toward the accommodating cover with a first predetermined thickness and a second body portion extending from the first body portion toward the accommodating cover with a second predetermined thickness smaller than the first thickness; an extending portion extending from the accommodating cover toward the first body portion; and a sealing portion positioned between the extending portion and the first body portion and being in contact with the extending portion and the first body portion.
