TITLE OF INVENTION: BATTERY MODULE FOR VEHICLE AND METHOD OF MANUFACTURING THE SAME

BACKGROUND

1. Technical Field

[0001] The present disclosure relates to a battery module for a vehicle and a method of manufacturing the same.

2. Related Art

[0002] In general, to cool a battery module, an L-shaped aluminum plate, which is an intermediate member, is inserted between battery cells each having a cross-sectional structure.

[0003] However, a separate plastic injection-molded product is required to this end, and the L-shaped aluminum plate needs to be inserted between each pair of battery cells, which inevitably causes an additional increase in material costs.

[0004] In addition, because the L-shaped aluminum plate is inserted between each pair of battery cells, there is a structural problem in that the capacity for mounting a battery inevitably decreases.

SUMMARY

[0005] Various embodiments are directed to provide a battery module for a vehicle and a method of manufacturing the same, in which double-sided cooling, which is different from single-sided cooling in the related art, is applied to shorten the time for high-speed charging of a battery without installing a separate member between battery cells, thereby providing more efficient cooling.

[0006] Technical problems to be solved by the present disclosure are not limited to the above-mentioned technical problems, and other technical problems, which are not mentioned above, may be clearly understood by those skilled in the art from the following descriptions.

[0007] A battery module for a vehicle according to an embodiment of the present disclosure includes: a cell assembly including a plurality of battery cells disposed at predetermined intervals; a gap filler made of a heat dissipation material and applied between the plurality of battery cells; and heat dissipation plates disposed at upper and lower ends of the cell assembly and each having one or more identification holes formed to identify the amount of application of the gap filler.

[0008] The identification holes of the heat dissipation plate may be disposed at intervals and formed at positions corresponding positions between the plurality of battery cells.

[0009] The identification holes of the heat dissipation plate may be arranged along an end edge of the heat dissipation plate.

[0010] The identification holes of the heat dissipation plate may be formed in the heat dissipation plate and arranged in a predetermined pattern with a predetermined interval.

[0011] The identification holes of the heat dissipation plate may be formed in a pattern in which the identification holes are concentratedly distributed at one side or the other side of the heat dissipation plate.

[0012] The identification holes of the heat dissipation plate may be arranged side by side in at least one matrix at a center position based on a longitudinal or transverse direction of the heat dissipation plate.

[0013] The identification holes of the heat dissipation plate may be arranged side by side in

one or more matrices at one or more points among points that are 0.1 to 0.9 with respect to a transverse or longitudinal length of the heat dissipation plate.

[0014] The gap filler may be applied onto entire two opposite surfaces of each of the battery cells to allow the battery cells to exchange heat with a cooling fluid passing between the battery cells.

[0015] A method of manufacturing a battery module for a vehicle according to another embodiment of the present disclosure includes: a gap filler application step of applying a gap filler, which is made of a heat dissipation material, between a plurality of battery cells disposed in a cell assembly; a heat dissipation plate attachment step of attaching heat dissipation plates to upper and lower ends of the cell assembly to which the gap filler is applied; and a gap filler application identifying step of identifying a state of the gap filler applied onto the battery cell with the naked eye through identification holes formed in the heat dissipation plate.

[0016] In the gap filler application step, the gap filler may be applied onto entire two opposite surfaces of each of the battery cells to allow the battery cells to exchange heat with a cooling fluid passing between the battery cells.

[0017] In the heat dissipation plate attachment step, the identification holes of the heat dissipation plate may be arranged side by side in one or more matrices at one or more points among points that are 0.1 to 0.9 with respect to a transverse or longitudinal length of the heat dissipation plate.

[0018] According to the battery module for a vehicle and method of manufacturing the same according to the present disclosure, the manufacturing costs may be reduced because no separate member is installed between the battery cells. Further, the application state of the gap filler may be identified with the naked eye through the heat dissipation plates installed at

the upper and lower ends of the battery cell.

[0019] In particular, according to the present disclosure, because an L-shaped cooling fin (aluminum plate) is not used, it is possible to increase the capacity for mounting the battery. Further, because the double-sided cooling is used, it is possible to improve the reliability of the battery by reducing a vertical temperature deviation of the battery without using the L-shaped cooling fin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 is a perspective view schematically illustrating a battery module for a vehicle according to an embodiment of the present disclosure.

[0021] FIGS. 2 to 5 are exemplified views a state in which identification holes of heat dissipation plates of the battery module for a vehicle according to the embodiment of the present disclosure are arranged in various shapes.

[0022] FIG. 6 is a flowchart illustrating a method of manufacturing the battery module for a vehicle according to the embodiment of the present disclosure.

[0023] FIGS. 7A to 7C are views sequentially illustrating processes of the method of manufacturing the battery module for a vehicle according to the embodiment of the present disclosure.

[0024] FIG. 8 is a view exemplarily illustrating a process of identifying the application of a gap filler in the method of manufacturing the battery module for a vehicle according to the embodiment of the present disclosure.

DETAILED DESCRIPTION

[0025] Advantages and features of the present disclosure and methods of achieving the advantages and features will be clear with reference to embodiments described in detail below together with the accompanying drawings. However, the present disclosure is not limited to the embodiments disclosed herein but will be implemented in various forms. The embodiments of the present disclosure are provided so that the present disclosure is completely disclosed, and a person with ordinary skill in the art to which the present disclosure pertains can fully understand the scope of the present disclosure. The present disclosure will be defined by the disclosure of the appended claims. Meanwhile, the terms used in the present specification are for explaining the embodiments, not for limiting the present disclosure. Unless particularly stated otherwise in the present specification, a singular form also includes a plural form. The terms "comprise (include)" and/or "comprising (including)" used in the specification are intended to specify the presence of the mentioned constituent elements, steps, operations, and/or elements, but do not exclude presence or addition of one or more other constituent elements, steps, operations, and/or elements.

[0026] Hereinafter, embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

BATTERY MODULE FOR VEHICLE

[0027] FIG. 1 is a perspective view schematically illustrating a battery module for a vehicle according to an embodiment of the present disclosure, and FIGS. 2 to 5 are exemplified views a state in which identification holes of heat dissipation plates of the battery module for a vehicle according to the embodiment of the present disclosure are arranged in various shapes.

[0028] Referring to FIGS. 1 to 5, a battery module 100 for a vehicle according to the embodiment of the present disclosure includes a cell assembly 110, gap fillers 120, and heat

dissipation plates 130.

[0029] The cell assembly 110 is configured by combining a plurality of battery cells 111 into a single group, and the plurality of battery cells 111 is disposed at predetermined intervals. The cell assembly 110 serves as a housing and includes the plurality of battery cells 111, and separate fixing members (not illustrated) configured to arrange the plurality of battery cells 111 side by side at predetermined intervals. The cell assembly 110 provides a space to the plurality of battery cells 111 and the fixing members.

[0030] The gap filler 120 is a heat dissipation material applied onto the entire two opposite surfaces of each of the battery cells 111 to allow the plurality of battery cells 111 to exchange heat with a cooling fluid passing between the battery cells 111.

[0031] The heat dissipation from the battery cell 111 is important for improving battery performance. The heat dissipation is one of the essential factors for preventing a safety accident such as explosion.

[0032] For example, in the case of an electric vehicle, the high-speed charging time is being decreased due to the recent development of technologies. To shorten the high-speed charging time, a large amount of charging current needs to be applied to the battery. For this reason, the heat generated from the battery is proportional to the square of the current. As a result, the decrease in high-speed charging time for the battery means that the amount of heat generated from the battery increases doubly, which also means that the heat dissipation performance is important to that extent.

[0033] The type of battery cell 111 is classified into a cylindrical battery cell and an angular pouch type battery cell. In the case of the pouch-type battery cell, a separate gap filler 120 is necessarily provided between a cooling cooler and the battery cell 111 to cool upper and

lower ends of the battery cell.

[0034] However, in the related art, there is a structural problem in that this structure makes it difficult to identify the appropriate amount of application of the gap filler 120.

[0035] As a solution for solving this problem, in the present disclosure, the heat dissipation plates 130 are disposed at upper and lower ends of the cell assembly 110. In the case of some models, the battery cell 111 and the gap filler 120 may be connected directly to each other without applying the heat dissipation plate 130 to a lower portion of the battery cell. In this case, because an upper portion of the pouch-type battery cell structurally has a folded surface, the heat dissipation plate 130 may be used to protect the folded surface. In this case, the gap filler 120 is used when the heat dissipation plate 130 is used. This is because it is necessary to smoothly transfer heat before the heat dissipation plate 130 is applied as a structure for protecting the folded surface.

[0036] The heat dissipation plate 130 includes one or more identification holes 131, 132, 133, 134, and 135 formed to identify the amount of application of the gap filler 120.

[0037] The identification holes 131, 132, 133, 134, and 135 of the heat dissipation plate 130 may be formed at intervals and disposed at positions corresponding to positions between the plurality of battery cells 111.

[0038] The identification holes 131 of the heat dissipation plate 130 illustrated in FIG. 1 may be arranged side by side in at least one matrix at a center position based on a longitudinal or transverse direction of the heat dissipation plate 130.

[0039] For example, assuming that a transverse length A of the heat dissipation plate 130 is 10, a position B of the identification hole 131 may be a point that is 1 to 9 with respect to the transverse length A of the heat dissipation plate 130. At the point B, the identification holes

131 may be arranged at intervals in the longitudinal direction of the heat dissipation plate 130.

[0040] In summary, a value of the position B of the identification hole 131 with respect to the length A of the heat dissipation plate 130 may be 0.1 to 0.9. In this case, the unit and numerical value of B/A may be determined based on a preset length of the heat dissipation plate 130, and the corresponding unit and numerical value may be values proportional to the length.

[0041] The identification holes 132 of the heat dissipation plate 130 illustrated in FIG. 2 may be arranged at respective end corners of the heat dissipation plate 130.

[0042] The identification holes 133 of the heat dissipation plate 130 illustrated in FIG. 3 may be formed in the heat dissipation plate 130 and arranged in a predetermined pattern with a predetermined interval.

[0043] The identification holes 134 of the heat dissipation plate 130 illustrated in FIG. 4 may be formed in a pattern in which the identification holes 134 are concentratedly distributed at one side or the other side of the heat dissipation plate 130.

[0044] The identification holes 135 of the heat dissipation plate 130 illustrated in FIG. 5 may be arranged along an end edge of the heat dissipation plate 130.

[0045] In this case, the identification holes 135 of the heat dissipation plate 130 may be formed at one or more of the illustrated four sides.

[0046] The reason why the identification holes 131, 132, 133, 134, and 135 are disposed in the heat dissipation plates 130 having various shapes as described above is to identify whether the amount of application of the gap filler 120 is appropriate in the structure in which the heat dissipation plate 130 is disposed on the portion of the battery cell 111 where the folded portion

is present, and an additional cooling block (or cooling plate) is disposed to adjoin the heat dissipation plate 130.

METHOD OF MANUFACTURING BATTERY MODULE FOR VEHICLE

[0047] FIG. 6 is a flowchart illustrating a method of manufacturing the battery module for a vehicle according to the embodiment of the present disclosure, FIG. 7 is a view sequentially illustrating processes of the method of manufacturing the battery module for a vehicle according to the embodiment of the present disclosure, and FIG. 8 is a view exemplarily illustrating a process of identifying the application of the gap filler.

[0048] Referring to FIGS. 6 to 8, a method of manufacturing the battery module for a vehicle according to the embodiment of the present disclosure includes a gap filler application step S110, a heat dissipation plate attachment step S120, and a gap filler application identifying step S130.

[0049] Referring to FIG. 7A, in the gap filler application step S110, the gap filler 120, which is made of a heat dissipation material, is applied between the plurality of battery cells 111 disposed in the cell assembly 110. The gap filler 120 may be applied onto the entire two opposite surfaces of each of the battery cells 111 to allow the plurality of battery cells 111 to exchange heat with the cooling fluid passing between the battery cells 111.

[0050] Referring to FIG. 7B, in the heat dissipation plate attachment step S120, the heat dissipation plates 130 are attached(assembled) to the upper and lower ends of the cell assembly 110 to which the gap filler 120 is applied. The heat dissipation plate 130 includes the one or more identification holes 131 formed to identify the amount of application of the gap filler 120.

[0051] In this case, the value of position B of the identification hole 131 with respect to the

length A of the heat dissipation plate 130 may be 0.1 to 0.9. In this case, the unit and numerical value of B/A may be determined based on a preset length of the heat dissipation plate 130, and the corresponding unit and numerical value may be values proportional to the length.

[0052] Referring to FIG. 7C, in the gap filler application identifying step S130, a state of the gap filler 120 applied onto the battery cell 111 may be identified with the naked eye through the identification holes 131 formed in the heat dissipation plate 130.

[0053] In case that the gap filler 120 is sufficiently applied when the battery module 100 is assembled, the gap filler 120 flowing out may be identified as illustrated in FIG. 8.

[0054] The present disclosure is not limited to the above-mentioned embodiment but may be variously changed and carried out within the range accepted by the technical spirit of the present disclosure.

WHAT IS CLAIMED IS:

[CLAIM 1]

A battery module for a vehicle, the battery module comprising:

a cell assembly including a plurality of battery cells disposed at predetermined intervals;

a gap filler made of a heat dissipation material and applied between the plurality of battery cells; and

heat dissipation plates disposed at upper and lower ends of the cell assembly and each having one or more identification holes formed to identify the amount of application of the gap filler.

[CLAIM 2]

The battery module of claim 1, wherein the identification holes of the heat dissipation plate are disposed at intervals and formed at positions corresponding positions between the plurality of battery cells.

[CLAIM 3]

The battery module of claim 1, wherein the identification holes of the heat dissipation plate are arranged along an end edge of the heat dissipation plate.

[CLAIM 4]

The battery module of claim 1, wherein the identification holes of the heat dissipation plate are formed in the heat dissipation plate and arranged in a predetermined pattern with a predetermined interval.

[CLAIM 5]

The battery module of claim 1, wherein the identification holes of the heat dissipation plate are formed in a pattern in which the identification holes are concentratedly distributed at one side or the other side of the heat dissipation plate.

[CLAIM 6]

The battery module of claim 1, wherein the identification holes of the heat dissipation plate are arranged side by side in at least one matrix at a center position based on a longitudinal or transverse direction of the heat dissipation plate.

[CLAIM 7]

The battery module of claim 1, wherein the identification holes of the heat dissipation plate are arranged side by side in one or more matrices at one or more points among points that are 0.1 to 0.9 with respect to a transverse or longitudinal length of the heat dissipation plate.

[CLAIM 8]

The battery module of claim 1, wherein the gap filler is applied onto entire two opposite surfaces of each of the battery cells to allow the battery cells to exchange heat with a cooling fluid passing between the battery cells.

[CLAIM 9]

A method of manufacturing a battery module for a vehicle, the method comprising:

a gap filler application step of applying a gap filler, which is made of a heat dissipation material, between a plurality of battery cells disposed in a cell assembly;

a heat dissipation plate attachment step of attaching heat dissipation plates to upper and lower ends of the cell assembly to which the gap filler is applied; and

a gap filler application identifying step of identifying a state of the gap filler applied onto the battery cell with the naked eye through identification holes formed in the heat dissipation plate.

[CLAIM 10]

The method of claim 9, wherein in the gap filler application step, the gap filler is applied onto entire two opposite surfaces of each of the battery cells to allow the battery cells to exchange heat with a cooling fluid passing between the battery cells.

[CLAIM 11]

The method of claim 9, wherein in the heat dissipation plate attachment step, the identification holes of the heat dissipation plate are arranged side by side in one or more matrices at one or more points among points that are 0.1 to 0.9 with respect to a transverse or longitudinal length of the heat dissipation plate.