TITLE OF INVENTION: COOLING DEVICE FOR BATTERY SYSTEM OF VEHICLE AND METHOD OF MANUFACTURING SAME

BACKGROUND

1. Field of the Invention

[0001] The present invention relates to a cooling device for a battery system of a vehicle and a method of manufacturing the same.

2. Discussion of Related Art

[0002] In recent years, the spread of electric vehicles that drive motors using batteries is increasing. The battery is an important component that determines the lifetime and mileage of an electric vehicle. Such a battery generates heat during charging and discharging and requires cooling to a predetermined temperature.

[0003] Currently, an air cooling type using air, a water cooling type using cooling water, and a refrigerant type using a refrigerant are used as such cooling methods.

[0004] In a cooling method using a cooling fluid, such as a water cooling method or a refrigerant method, a battery block having a cooling flow path is mounted on a lower surface of a battery pack to cool a battery that is charged or discharged. Among this, since the airtightness performance of a water cooling flow path is directly related to the safety of the battery, strict management is important.

[0005] According to the related art, a thickness of the cooling flow path is minimized to reduce a weight, and accordingly, a separate additional structure such as a washer ring is applied to a portion having weak rigidity (hereinafter, a weak-rigidity portion) to reinforce the cooling flow path.

[0006] However, since the number of welded portions inevitably increases in a process of performing additional reinforcement using the washer ring, it is difficult to guarantee safety, manufacturing costs also increase, and thus structural improvement is required.

[0007] Thus, it is necessary to derive an improvement plan that can minimize the number of welded portions while reinforcing the weak-rigidity portion.

SUMMARY OF THE INVENTION

[0008] The present invention has been proposed to solve the above problem and is directed to providing a cooling device for a battery system of a vehicle and a method of manufacturing the same, which can minimize the number of welded portions while reinforcing a weak-rigidity portion.

[0009] The aspects of the present invention are not limited to the aspects described above, and those skilled in the art will clearly understand other aspects not described herein from the following description.

[0010] According to an aspect of the present invention, there is provided a cooling device for a battery system of a vehicle, the cooling device including a cooling block that is disposed below a battery module while having a cooling flow path between an upper plate and a lower plate and has a welding hole formed in an inlet or an outlet of the cooling flow path, and a pipe socket which is welded at one point while a portion thereof is inserted into the welding hole of the cooling block and is positioned in the inlet or the outlet of the cooling flow path,

[0011] The pipe socket may include a hollow body in which a size of an outer circumferential surface thereof corresponds to a size of the welding hole, and a flange extending outward from a lower end of the hollow body and welded at one point between the flange and the upper plate of the cooling block.

[0012] The upper plate and the lower plate of the cooling block may be welded at one point of mutually contacting ends thereof.

[0013] The one point at which the upper plate and the lower plate of the cooling block are welded may have a length with at least a ratio of 2 to 1 relative to the one point at which the upper plate of the cooling block and the flange are welded.

[0014] A length of a welded portion of the flange may be formed at a ratio of 3 to 1 relative to a thickness of the flange.

[0015] A length of a welded portion of the flange may be formed at a ratio of 3 to 1 relative to a thickness of the upper plate of the cooling block.

[0016] According to another aspect of the present invention, there is provided a cooling device for a battery system of a vehicle, the cooling device including a cooling block that is disposed below a battery module while having a cooling flow path between an upper plate and a lower plate and has a welding hole formed in an inlet or an outlet of the cooling flow path, a pipe socket partially inserted into the welding hole of the cooling block, and a welded portion that fixes the upper plate of the cooling block and a partial section of a lower end of the pipe socket and fixes ends of the upper plate and the lower plate of the cooling block,

[0017] Each fixed portion fixed by the welded portion may be welded at one point.

[0018] The pipe socket may be welded while a portion thereof is inserted into the welding hole of the cooling block and is positioned in the inlet or the outlet of the cooling flow path.

[0019] The pipe socket may include a hollow body in which a size of an outer circumferential surface thereof corresponds to a size of the welding hole, and a flange extending outward from a lower end of the hollow body and fixed at one point between the flange and the upper plate of the cooling block by the welded portion.

[0020] A length of the welded portion positioned between the flange and the upper plate of

the cooling block may be formed at a ratio of 3 to 1 relative to a thickness of the upper plate of the cooling block.

[0021] A length of the welded portion positioned between the flange and the upper plate of the cooling block may be formed at a ratio of 3 to 1 relative to a thickness of the flange.

[0022] According to still another aspect of the present invention, there is provided a method of manufacturing a cooling device for a battery system of a vehicle, the method including (a) inserting a pipe socket into a welding hole formed in an inlet or an outlet of an upper plate of a cooling block that is to be disposed below a battery module, (b) welding the upper plate of the cooling block and the pipe socket at one point, and (c) welding, at one point, an end of a lower plate of the cooling block, which is in contact with the upper plate of the cooling block to have a cooling flow path, and an end of the upper plate of the cooling block.

[0023] In (b), an upper surface of the flange in which a lower end of the pipe socket protrudes outward and a lower surface of the upper plate of the cooling block may be welded at one point.

[0024] In (c), after the end of the lower plate of the cooling block is inclined upward, an upper surface of the end of the lower plate and a lower surface of the end of the upper plate of the cooling block may be welded at one point.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

[0025] FIG. 1 is a schematic perspective view illustrating a partial section of a cooling device for a battery system of a vehicle according to an embodiment of the present invention;

[0026] FIG. 2 is a cross-sectional view along line A-A’ illustrated in FIG. 1;

[0027] FIG. 3 is an exemplary view illustrating the dimensions of some components through the cross section along line A-A’ illustrated in FIG. 1; and

[0028] FIG. 4 is a flowchart illustrating a method of manufacturing the cooling device for a battery system of a vehicle according to the embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0029] Advantages and features of the present invention and a method of achieving the advantages and the features will become apparent with reference to embodiments described below in detail in conjunction with the accompanying drawings. However, the present invention is not limited to the embodiments described below but will be implemented in various forms, and the present embodiments merely make the invention of the present invention complete, are provided to completely inform the scope of the present invention to those skilled in the art to which the present invention belongs, and are defined by the description of the appended claims. Meanwhile, terms used in the present specification are intended to describe the embodiments and are not intended to limit the present invention. In the present specification, a singular form also includes a plural form unless specifically mentioned in a phrase. The term “comprise” or “comprising” used herein does not exclude the presence or addition of one or more other components, steps, operations, and/or elements in addition to the mentioned components, steps, operations, and/or elements. In the present specification, the term “and/or” includes any one or all possible combinations of the listed items.

[0030] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0031] FIG. 1 is a schematic perspective view illustrating a partial section of a cooling device for a battery system of a vehicle according to an embodiment of the present invention, FIG. 2 is a

cross-sectional view along line A-A’ illustrated in FIG. 1, and FIG. 3 is an exemplary view illustrating the dimensions of some components through the cross section along line A-A’ illustrated in FIG. 1.

[0032] Referring to FIGS. 1 to 3, a cooling device 100 for a battery system of a vehicle according to an embodiment of the present disclosure is disposed below a battery system (not illustrated) and serves to promote the safety of the system by lowering a heating temperature of the battery system.

[0033] In the present invention, a description of widely-known configurations for cooling will be omitted, and structures of an inlet and an outlet of a cooling flow path through which cooling water flows will be mainly described.

[0034] The cooling device 100 for a battery system of a vehicle has a structural feature which can reinforce a weak-rigidity portion while minimizing the number of welded portions in the structures of the inlet or the outlet of the cooling flow path.

[0035] The cooling device 100 for a battery system of a vehicle includes a cooling block 110 and a pipe socket 120.

[0036] The cooling block 110 is formed in a shape in which ends of an upper plate 111 and a lower plate 112 are coupled and has a cooling flow path between the upper plate 111 and the lower plate 112.

[0037] The upper plate 111 and the lower plate 112 of the cooling block 110 are welded at one point of mutually contacting ends thereof.

[0038] The upper plate 111 has a welding hole 111a communicating with the inlet or the outlet of the cooling flow path.

[0039] The pipe socket 120 is welded at one point while a portion of the pipe socket 120 is inserted into the welding hole 111a of the upper plate 111 and is thus positioned in the inlet or

the outlet of the cooling flow path.

[0040] The pipe socket 120 includes a hollow body 121 and a flange 122.

[0041] The hollow body 121 has a hollow pipe shape, and the size (diameter) of an outer circumferential surface thereof corresponds to the size (diameter) of the welding hole 111a.

[0042] An inclined catching step 121a protrudes upward from the outer circumferential surface of the hollow body 121. An upper end 121b of the hollow body 121 is inclined upward, and thus the pipe socket 10 is easily inserted into the welding hole 111a.

[0043] The flange 122 extends and protrudes outward from a lower end of the hollow body 121. An upper surface of the flange 122 and the lower surface of the upper plate 111 are welded at one point.

[0044] In the present invention, for convenience of description, a welded portion between the upper plate 111 of the cooling block 110 and the flange 122 is indicated as a first welded portion 130, and a welded portion between the mutually contacting ends of the upper plate 111 and the lower plate 112 of the cooling block 110 is indicated as a second welded portion 140.

[0045] A length L1 of the first welded portion 130 may be formed at a ratio of 3 to 1 relative to a thickness t1 of the upper plate 111 of the cooling block 110 of the flange 122.

[0046] For example, when the length L1 of the first welded portion 130 is 3 mm, the thickness t1 of the upper plate 111 of the cooling block 110 may be 1 mm. Here, the values of the length L1 of the welded portion 130 and the thickness t1 of the upper plate 111 of the cooling block 110 are merely examples, and the present invention is not limited to these values.

[0047] However, the ratio of the length L1 of the first welded portion 130 to the thickness t1 of the upper plate 111 of the cooling block 110 is significant in that rigidity may be maintained while a portion welded to the weak-rigidity portion is minimized.

[0048] Meanwhile, the length L1 of the first welded portion 130 may be formed at a ratio of 3

to 1 relative to a thickness t2 of the flange 122.

[0049] For example, when the length L1 of the first welded portion 130 is 3 mm, the thickness t2 of the flange 122 may be 1 mm. Here, the values of the length L1 of the first welded portion 130 and the thickness t2 of the flange 122 are merely examples, and the present invention is not limited to these values.

[0050] However, the ratio of the length L1 of the first welded portion 130 to the thickness t2 of the flange 122 is significant in that rigidity may be maintained while a portion welded to the weak-rigidity portion is minimized.

[0051] One point at which the upper and lower plates 111 and 112 of the cooling block 110 are welded, that is, one point of the second welded portion 140, may have a length with at least a ratio of 2 to 1 relative to one point welded between the upper plate 111 of the cooling block 110 and the flange 122. The corresponding ratio is significant in that rigidity is added to the portion welded to the weak-rigidity portion.

[0052] FIG. 4 is a flowchart illustrating a method of manufacturing the cooling device for a battery system of a vehicle according to the embodiment of the present invention. Prior to describing the corresponding drawing, reference numerals of FIGS. 1 to 3 are also written together to help understanding.

[0053] Referring to FIG. 4, the method of manufacturing a cooling device for a battery system of a vehicle according to an embodiment of the present invention includes a pipe socket insertion operation S100, a first one-point welding operation S200, and a second one-point welding operation S300.

[0054] In the pipe socket insertion operation S100, the pipe socket 120 is inserted into the welding hole 111a formed in the inlet or the outlet of the upper plate 111 of the cooling block 110 to be disposed below the battery module.

[0055] In the first one-point welding operation S200, the upper plate 111 of the cooling block 110 and the pipe socket 120 are welded at one point.

[0056] That is, in the first one-point welding operation S200, an upper surface of the flange 122 in which a lower end of the pipe socket 120 protrudes outward and a lower surface of the upper plate 111 of the cooling block 110 are welded at one point.

[0057] In this case, the rigidity of the weak-rigidity portion between the upper plate 111 of the cooling block 110 and the pipe socket 120 may be secured without separate additional components.

[0058] In the second one-point welding operation S300, an end of the lower plate 112 of the cooling block 110, which is in contact with the upper plate 111 of the cooling block 110 to form the cooling flow path, and an end of the upper plate 111 of the cooling block 110 are welded at one point.

[0059] In the second one-point welding operation S300, after the end of the lower plate 112 of the cooling block 110 is formed to be inclined upward, an upper surface of the end of the lower plate 112 and a lower surface of the end of the upper plate 111 of the cooling block 110 are welded at one point.

[0060] Through this process, in the present invention, while the safety of the battery is secured by enhancing the airtight performance, the welded portions 130 and 140 are reduced to one place, and thus, costs can be reduced, and convenience in management can be also provided.

[0061] According to the present invention, in a cooling device for a battery system of a vehicle and a method of manufacturing the same, the number of welded portions can be minimized while a weak-rigidity portion is reinforced.

[0062] Therefore, the prevent invention can secure stable airtight performance, and at the same time, reduce manufacturing costs.

[0063] The present invention is not limited to the above-described embodiments and can be variously modified and implemented without departing from the allowable scope of the technical spirit of the present invention.

WHAT IS CLAIMED IS:

[CLAIM 1] A cooling device for a battery system of a vehicle, the cooling device comprising:

a cooling block that is disposed below a battery module while having a cooling flow path between an upper plate and a lower plate and has a welding hole formed in an inlet or an outlet of the cooling flow path; and

a pipe socket which is welded at one point while a portion thereof is inserted into the welding hole of the cooling block and is positioned in the inlet or the outlet of the cooling flow path,

wherein the pipe socket includes:

a hollow body in which a size of an outer circumferential surface thereof corresponds to a size of the welding hole; and

a flange extending outward from a lower end of the hollow body and welded at one point between the flange and the upper plate of the cooling block.

[CLAIM 2] The cooling device of claim 1, wherein the upper plate and the lower plate of the cooling block are welded at one point of mutually contacting ends thereof.

[CLAIM 3] The cooling device of claim 2, wherein the one point at which the upper plate and the lower plate of the cooling block are welded has a length with at least a ratio of 2 to 1 relative to the one point at which the upper plate of the cooling block and the flange are welded.

[CLAIM 4] The cooling device of claim 1, wherein a length of a welded portion of the flange is formed at a ratio of 3 to 1 relative to a thickness of the flange.

[CLAIM 5] The cooling device of claim 1, wherein a length of a welded portion of the flange is formed at a ratio of 3 to 1 relative to a thickness of the upper plate of the cooling block.

[CLAIM 6] A cooling device for a battery system of a vehicle, the cooling device comprising:

a cooling block that is disposed below a battery module while having a cooling flow path between an upper plate and a lower plate and has a welding hole formed in an inlet or an outlet of the cooling flow path;

a pipe socket partially inserted into the welding hole of the cooling block; and

a welded portion configured to fix the upper plate of the cooling block and a partial section of a lower end of the pipe socket and fix ends of the upper plate and the lower plate of the cooling block,

wherein each fixed portion fixed by the welded portion is welded at one point.

[CLAIM 7] The cooling device of claim 6, wherein the pipe socket is welded while a portion thereof is inserted into the welding hole of the cooling block and is positioned in the inlet or the outlet of the cooling flow path.

[CLAIM 8] The cooling device of claim 6, wherein the pipe socket includes:

a hollow body in which a size of an outer circumferential surface thereof corresponds to

a size of the welding hole; and

a flange extending outward from a lower end of the hollow body and fixed at one point between the flange and the upper plate of the cooling block by the welded portion.

[CLAIM 9] The cooling device of claim 6, wherein a length of the welded portion positioned between the flange and the upper plate of the cooling block is formed at a ratio of 3 to 1 relative to a thickness of the upper plate of the cooling block.

[CLAIM 10] The cooling device of claim 6, wherein a length of the welded portion positioned between the flange and the upper plate of the cooling block is formed at a ratio of 3 to 1 relative to a thickness of the flange.

[CLAIM 11] A method of manufacturing a cooling device for a battery system of a vehicle, the method comprising:

(a) inserting a pipe socket into a welding hole formed in an inlet or an outlet of an upper plate of a cooling block that is to be disposed below a battery module;

(b) welding the upper plate of the cooling block and the pipe socket at one point; and

(c) welding, at one point, an end of a lower plate of the cooling block, which is in contact with the upper plate of the cooling block to have a cooling flow path, and an end of the upper plate of the cooling block.

[CLAIM 12] The method of claim 11, wherein in (b), an upper surface of the flange in which a lower end of the pipe socket protrudes outward and a lower surface of the upper plate of the cooling block are welded at one point.

[CLAIM 13] The method of claim 11, wherein in (c), after the end of the lower plate of the cooling block is formed to be inclined upward, an upper surface of the end of the lower plate and a lower surface of the end of the upper plate of the cooling block are welded at one point.