TITLE OF INVENTION: COOLING DEVICE FOR HIGH VOLTAGE BATTERY

BACKGROUND

1. Technical Field

[0001] The present disclosure relates to a cooling device for a high voltage battery, and more particularly, to a cooling device for a high voltage battery, which efficiently cools heat generated in the high voltage battery.

2. Related Art

[0002] In order to prepare for an environmental conservation problem and fossil fuel depletion worldwide, development of an eco-friendly vehicle, such as a hybrid electric vehicle (HEV), a plug-in hybrid electric vehicle (PHEV), a fuel cell electric vehicle (FCEV), or an electric vehicle (EV), has been in the limelight.

[0003] In order to manage the performance and the lifespan of a battery mounted on an eco-friendly vehicle, it is required to maintain the temperature of the battery at a predetermined level, the battery being necessarily mounted on the eco-friendly vehicle and to minimize the temperature difference between batteries, and thus thermal management of the vehicle battery is very important.

[0004] Meanwhile, the above-described eco-friendly vehicle has the drawback in that its driving distance is shorter than the driving distance of an existing internal combustion engine vehicle.

[0005] In order to overcome this, battery capacity increase and fast charging are required, which may cause an increase in a heating value generated in the battery, and higher cooling performance is necessary for battery thermal management.

[0006] For such battery thermal management, various cooling methods, such as air-cooled, water-cooled, and refrigerant methods, have been applied.

[0007] In case of the water-cooled or refrigerant method, a cooling plate or a cooling tube is disposed on a lower part of a battery module to cool the battery.

[0008] In case of the cooling tube, a refrigerant flow path is constructed by using a jumping pipe and a baffle in order to minimize the temperature difference between the batteries.

[0009] In the related art, in order to maintain the temperature of the battery at a proper level, the cooling tube is disposed on the lower part of the battery to cool the battery module.

[0010] Accordingly, since an upper part of the battery is exposed as it is, and thus is not cooled, there is a problem with minimization of the temperature difference between the upper part and the lower part of the battery.

[0011] In order to lower the heating level that is increased during fast charging and discharging, more cooling performance is required, but single sided cooling has limitations.

[0012] For the above-described reasons, schemes for efficiently cooling both one side and the other side of the battery at the same time have been sought in the corresponding field, but up to now, satisfactory results have not yet been obtained.

SUMMARY

[0013] In order to solve the above problems, the present disclosure provides a cooling device for a high voltage battery, which can efficiently cool one side and the other side of the high voltage battery at the same time.

[0014] The above-described objects of the present disclosure and other objects, advantages, features, and methods for achieving them will become clear with reference to embodiments to be described later in detail with the accompanying drawings.

[0015] According to an embodiment of the present disclosure to achieve the above objects, a cooling device for a high voltage battery includes: a plurality of battery coolers mounted on the high voltage battery and configured to cool the high voltage battery through a cooling fluid; and a fluid distributor configured to receive the cooling fluid transferred from an outside and distribute the cooling fluid to the battery coolers, wherein the battery coolers are composed of a pair of battery coolers disposed on an upper part and a lower part of the high voltage battery, respectively.

[0016] The battery coolers include: a first cooler unit disposed on the lower part of the high voltage battery; and a second cooler unit disposed on the upper part of the high voltage battery.

[0017] The first cooler unit includes: a first cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows; a second cooling channel spaced apart at a distance in one direction from the first cooling channel and configured to receive the cooling fluid transferred from the outside; a third cooling channel spaced apart at a distance in one direction from the second cooling channel and configured to receive the cooling fluid transferred from the outside; and a fourth cooling channel spaced apart at a distance in one direction from the third cooling channel and configured to receive the cooling fluid transferred from the outside.

[0018] The first cooler unit further includes a first header disposed at one ends of the first to fourth cooling channels; and a second header spaced apart at a distance from the first header and disposed at the other ends of the first to fourth cooling channels.

[0019] The first cooler unit further includes: a first partition disposed between the second cooling channel and the third cooling channel inside the first header; a second partition disposed between the first cooling channel and the second cooling

channel inside the second header; and a third partition disposed between the third cooling channel and the fourth cooling channel inside the second header.

[0020] The first cooling channel is configured to receive the cooling fluid transferred from the fluid distributor, the second cooling channel is configured to receive the cooling fluid transferred from the first cooling channel through the first header, the third cooling channel is configured to receive the cooling fluid transferred from the second cooling channel through the second header, and the fourth cooling channel is configured to receive the cooling fluid transferred from the third cooling channel through the first header.

[0021] The second cooler unit includes: a fifth cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows; a sixth cooling channel spaced apart at a distance in one direction from the fifth cooling channel and configured to receive the cooling fluid transferred from the outside; a seventh cooling channel spaced apart at a distance in one direction from the sixth cooling channel and configured to receive the cooling fluid transferred from the outside; and an eighth cooling channel spaced apart at a distance in one direction from the seventh cooling channel and configured to receive the cooling fluid transferred from the outside.

[0022] The second cooler unit further includes: a third header disposed at one end of the fifth to eighth cooling channels; and a fourth header spaced apart at a distance from the third header and disposed at the other end of the fifth to eighth cooling channels.

[0023] The second cooler unit further includes a fifth partition disposed between the sixth cooling channel and the seventh cooling channel inside the third header; a sixth partition disposed between the fifth cooling channel and the sixth cooling channel inside the fourth header; and a seventh partition disposed between the

seventh cooling channel and the eighth cooling channel inside the fourth header.

[0024] The fifth cooling channel is configured to receive the cooling fluid transferred from the fluid distributor, the sixth cooling channel is configured to receive the cooling fluid transferred from the fifth cooling channel through the third header, the seventh cooling channel is configured to receive the cooling fluid transferred from the sixth cooling channel through the fourth header, and the eighth cooling channel is configured to receive the cooling fluid transferred from the seventh cooling channel through the third header.

[0025] When viewed from a plane, the first cooling channel overlaps the eighth cooling channel, the second cooling channel overlaps the seventh cooling channel, the third cooling channel overlaps the sixth cooling channel, and the fourth cooling channel overlaps the fifth cooling channel.

[0026] According to another embodiment of the present disclosure, a cooling device for a high voltage battery includes: a pair of battery coolers disposed on an upper part and a lower part of the high voltage battery, respectively, and configured to cool the upper part and the lower part of the high voltage battery, respectively, through a cooling fluid; a fluid distributor configured to receive the cooling fluid transferred from an outside and distribute the cooling fluid to the battery coolers; and a jump pipe combined with the battery coolers and configured to guide a flow of the cooling fluid.

[0027] The battery coolers include: a first cooler unit disposed on the lower part of the high voltage battery; and a second cooler unit disposed on the upper part of the high voltage battery, wherein the first cooler unit includes: a first cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows; a second cooling channel spaced apart at a distance in one direction from the first cooling channel and configured to receive the cooling

fluid transferred from the outside; a third cooling channel spaced apart at a distance in one direction from the second cooling channel and configured to receive the cooling fluid transferred from the outside; a fourth cooling channel spaced apart at a distance in one direction from the third cooling channel and configured to receive the cooling fluid transferred from the outside; a first header disposed at one end of the first to fourth cooling channels; a second header spaced apart at a distance from the first header and disposed at the other end of the first to fourth cooling channels; a first partition disposed between the first cooling channel and the second cooling channel inside the first header; a second partition disposed between the first cooling channel and the second cooling channel inside the second header; a third partition disposed between the third cooling channel and the fourth cooling channel inside the first header; and a fourth partition disposed between the second cooling channel and the third cooling channel inside the second header.

[0028] The second cooler unit includes: a fifth cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows; a sixth cooling channel spaced apart at a distance in one direction from the fifth cooling channel and configured to receive the cooling fluid transferred from the outside; a seventh cooling channel spaced apart at a distance in one direction from the sixth cooling channel and configured to receive the cooling fluid transferred from the outside; an eighth cooling channel spaced apart at a distance in one direction from the seventh cooling channel and configured to receive the cooling fluid transferred from the outside; a third header disposed at one end of the fifth to eighth cooling channels; a fourth header spaced apart at a distance from the third header and disposed at the other end of the fifth to eighth cooling channels; a fifth partition disposed between the sixth cooling channel and the seventh cooling channel inside the third header; a sixth partition disposed between the fifth cooling channel and the

sixth cooling channel inside the fourth header; a seventh partition disposed between the seventh cooling channel and the eighth cooling channel inside the fourth header; and an eighth partition disposed between the seventh cooling channel and the eighth cooling channel inside the third header.

[0029] The jump pipe includes: a lower jump pipe combined with the first header; and an upper jump pipe combined with the third header.

[0030] The lower jump pipe has one end combined between the first cooling channel and the first partition, and the other end combined between the third partition and the fourth cooling channel.

[0031] The lower jump pipe has one end configured to communicate with the first cooling channel, and the other end configured to communicate with the fourth cooling channel.

[0032] The first cooling channel is configured to receive the cooling fluid transferred from the fluid distributor through the second header, the second cooling channel is configured to receive the cooling fluid transferred from the third cooling channel through the first header, the third cooling channel is configured to receive the cooling fluid transferred from the fourth cooling channel through the second header, and the fourth cooling channel is configured to receive the cooling fluid transferred from the first cooling channel through the lower jump pipe.

[0033] The upper jump pipe has one end combined between the sixth partition and the fifth cooling channel, and the other end combined between the eighth cooling channel and the eighth partition.

[0034] The upper jump pipe has one end configured to communicate with the fifth cooling channel, and the other end configured to communicate with the eighth cooling channel.

[0035] The fifth cooling channel is configured to receive the cooling fluid transferred

from the sixth cooling channel through the fourth header, the sixth cooling channel is configured to receive the cooling fluid transferred from the seventh cooling channel through the third header, the seventh cooling channel is configured to receive the cooling fluid transferred from the fluid distributor through the fourth header, and the eighth cooling channel is configured to receive the cooling fluid transferred from the fifth cooling channel through the upper jump pipe.??

[0036] According to the present disclosure, it is possible to uniformly cool the upper part and the lower part of the high voltage battery and to minimize the temperature deviation between the upper part and the lower part of the high voltage battery, thereby effectively improving the battery performance and increasing the lifespan of the battery.

[0037] Further, it is possible to uniformly cool one directional area and the other directional area of the high voltage battery.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] FIG. 1 is a perspective view illustrating a cooling device for a high voltage battery according to an embodiment of the present disclosure.

[0039] FIG. 2 is a perspective view illustrating a first cooler unit of the cooling device for a high voltage battery according to an embodiment of the present disclosure.

[0040] FIG. 3 is a plan view indicating a flow order of a cooling fluid that flows inside the first cooler unit according to an embodiment of the present disclosure.

[0041] FIG. 4 is a perspective view illustrating a second cooler unit of the cooling device for a high voltage battery according to an embodiment of the present disclosure.

[0042] FIG. 5 is a plan view indicating a flow order of a cooling fluid that flows inside the second cooler unit according to an embodiment of the present disclosure.

[0043] FIG. 6 is a perspective view illustrating a cooling device for a high voltage battery according to another embodiment of the present disclosure.

[0044] FIG. 7 is a perspective view illustrating a first cooler unit of the cooling device for a high voltage battery according to another embodiment of the present disclosure.

[0045] FIG. 8 is a plan view indicating a flow order of a cooling fluid that flows inside the first cooler unit according to another embodiment of the present disclosure.

[0046] FIG. 9 is a perspective view illustrating a second cooler unit of the cooling device for a high voltage battery according to another embodiment of the present disclosure.

[0047] FIG. 10 is a plan view indicating a flow order of a cooling fluid that flows inside the second cooler unit according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

[0048] Embodiments of the present disclosure are provided to more completely explain the present disclosure to those of ordinary skill in the art to which the present disclosure pertains, and the following embodiments may be modified in various different forms, but the scope of the present disclosure is not limited to the following embodiments. Rather, these embodiments are provided to make the present disclosure more thorough and complete, and to completely transfer the subject matter of the present disclosure to those skilled in the art. Further, in the following drawings, respective configurations are exaggerated for convenience and accuracy of explanation, and the same reference numerals refer to the same elements in the drawings. As being used in the description, the term “and/or” includes any one of corresponding enumerated items and all combinations of one or more of the items.

[0049] Terms used in the description are to explain specific embodiments, but are

not intended to limit the present disclosure.

[0050] As used in the description, unless clearly indicated as another case on the context, a singular expression form may include a plural expression form. Further, as used in the description, the term “comprise” and/or “comprising” is to specify the existence of mentioned shapes, figures, steps, operations, constituent elements, and/or these groups, but not to exclude the existence or addition of one or more other shapes, figures, steps, operations, constituent elements, and/or groups.

[0051] Hereinafter, preferred embodiments of the present disclosure will be described in detail with reference to the accompany8ing drawings.

[0052] FIG. 1 is a perspective view illustrating a cooling device for a high voltage battery according to an embodiment of the present disclosure, and FIG. 2 is a perspective view illustrating a first cooler unit of the cooling device for a high voltage battery according to an embodiment of the present disclosure.

[0053] Referring to FIGS. 1 and 2, a cooling device for a high voltage battery according to an embodiment of the present disclosure, which cools the high voltage battery, includes a fluid distributor 100 and a battery cooler 200.

[0054] The fluid distributor 100 receives a cooling fluid transferred from an outside and distributes the cooling fluid to the battery cooler 200.

[0055] For this, the fluid distributor 100 includes a first inflow pipe 110 and a second inflow pipe 130 through which the cooling fluid flows from the outside to the battery cooler 200, and a first discharge pipe 120 and a second discharge pipe 140 through which the cooling fluid is discharged from the battery cooler 200 to the outside.

[0056] Further, the first inflow pipe 110 and the second inflow pipe 130 communicate with one ends of a second header 222 and a fourth header 252, respectively, to be described below, and the first discharge pipe 120 and the second discharge pipe 140 communicate with the other ends of the second header 222 and

the fourth header 252, respectively, to be described below.

[0057] Accordingly, the cooling fluid flows from the fluid distributor 100 to the battery cooler 200 through the first inflow pipe 110 and the second inflow pipe 130, and is discharged from the battery cooler 200 to the fluid distributor 100 through the first discharge pipe 120 and the second discharge pipe 140.

[0058] The battery cooler 200, in which the cooling fluid flows, is mounted on the high voltage battery, and cools heat generated during charging or discharging of the high voltage battery through the cooling fluid.

[0059] According to an embodiment of the present disclosure, the battery cooler 200 is composed of a pair of battery coolers 200 disposed on an upper part and a lower part of the high voltage battery.

[0060] Through this, the cooling device for a high voltage battery according to an embodiment of the present disclosure can uniformly cool an upper side and a lower side of the high voltage battery, thereby effectively improving the battery performance through minimization of a temperature deviation between the lower part and the upper part of the high voltage battery.

[0061] Further, the battery coolers 200 are made of an aluminum alloy, carbon fiber, silicone, or copper so as to efficiently absorb the generated heat of the high voltage battery.

[0062] Meanwhile, in the present disclosure, the cooling fluid may be any one of air, cooling water, and a refrigerant that flows through the battery cooler 200 in accordance with an output required by the high voltage battery. However, the following description will be made on the assumption that the cooling fluid in the present disclosure is the refrigerant.

[0063] The battery cooler 200 includes a first cooler unit 210 and a second cooler unit 240.

[0064] The first cooler unit 210 is disposed on the lower part of the high voltage battery.

[0065] Further, the first cooler unit 210 cools the lower part of the high voltage battery through the cooling fluid that flows inside the first cooler unit 210.

[0066] That is, the first cooler unit 210, in which the cooling fluid flows, has an upper surface that comes into direct contact with a lower surface of the high voltage battery, and thus can effectively cool the heat generated from the lower surface of the high voltage battery.

[0067] The first cooler unit 210 includes first to fourth cooling channels 211 to 214 in which the cooling fluid flows and each of which has an upper surface that comes into direct contact with the lower surface of the high voltage battery, a first header 221 and the second header 222 each of which is preferably formed in a cylindrical shape and which are respectively disposed at one ends and the other ends of the first to fourth cooling channels 211 to 214, and first to third partitions 231 to 233 configured to block the cooling fluid, which flows inside the first and second headers 221 and 222, from flowing to a specific area.

[0068] The first cooling channel 211 receives the cooling fluid transferred from the outside, and the cooling fluid flows inside the first cooling channel 211.

[0069] Specifically, the cooling fluid having flowed from the outside through the fluid distributor 100 flows inside the first cooling channel 211.

[0070] The second cooling channel 212 is spaced apart at a distance in one direction from the first cooling channel 211, and receives the cooling fluid transferred from the outside, so that the cooling fluid flows inside the second cooling channel 212.

[0071] Specifically, the cooling fluid having flowed from the first cooling channel 211 through the first header 221 flows inside the second cooling channel 212.

[0072] The third cooling channel 213 is spaced apart at a distance in one direction from the second cooling channel 212, and receives the cooling fluid transferred from the outside, so that the cooling fluid flows inside the third cooling channel 213.

[0073] Specifically, the cooling fluid having flowed from the second cooling channel 212 through the second header 222 flows inside the third cooling channel 213.

[0074] The fourth cooling channel 214 is spaced apart at a distance in one direction from the third cooling channel 213, and receives the cooling fluid transferred from the outside, so that the cooling fluid flows inside the fourth cooling channel 214.

[0075] Specifically, the cooling fluid having flowed from the third cooling channel 213 through the first header 221 flows inside the fourth cooling channel 214.

[0076] The first header 221 is formed preferably in a cylindrical shape, and is disposed at one end of each of the first to fourth cooling channels 211 to 214.

[0077] Further, the first header 221 communicates with one end of each of the first to fourth cooling channels 211 to 214.

[0078] The second header 222 is formed preferably in a cylindrical shape, is spaced apart at a distance from the first header 221, and is disposed at the other end of each of the first to fourth cooling channels 211 to 214.

[0079] Further, the second header 222 communicates with the other end of each of the first to fourth cooling channels 211 to 214.

[0080] Accordingly, the cooling fluid discharged from the first and third cooling channels 211 and 213 flows into the second and fourth cooling channels 212 and 214, respectively, through the first header 221, and the cooling fluid discharged from the second cooling channel 212 flows into the third cooling channel 213 through the second header 222.

[0081] The first partition 231 is disposed inside the first header 221 that is formed in the cylindrical shape.

[0082] Specifically, the first partition 231 is disposed between the second cooling channel 212 and the third cooling channel 213 inside the first header 221.

[0083] That is, the first partition 231 partitions the inside of the first headers 221 into one directional area in which the second cooling channel 212 is disposed and the other directional area in which the third cooling channel 213 is disposed.

[0084] Through this, the first partition 231 can effectively block the cooling fluid from flowing between the second cooling channel 212 and the third cooling channel 213 inside the first header 221.

[0085] The second partition 232 is disposed inside the second header 222 that is formed in the cylindrical shape.

[0086] Specifically, the second partition 232 is disposed between the first cooling channel 211 and the second cooling channel 212 inside the second header 222.

[0087] That is, the second partition 232 can effectively block the cooling fluid from flowing between the first cooling channel 211 and the second cooling channel 212 inside the second header 222.

[0088] The third partition 233 is disposed at a location spaced apart in one direction from the second partition 232 inside the second header 222 formed in the cylindrical shape.

[0089] Specifically, the third partition 233 is disposed between the third cooling channel 213 and the fourth cooling channel 214 inside the second header 222.

[0090] That is, the third partition 233 can effectively block the cooling fluid from flowing between the third cooling channel 213 and the fourth cooling channel 214 inside the second header 222.

[0091] Accordingly, the first cooling channel 211 receives the cooling fluid transferred from the fluid distributor 100 through the second header 222, and the second cooling channel 212 receives the cooling fluid transferred from the first

cooling channel 211 through the first header 221.

[0092] Further, the third cooling channel 213 receives the cooling fluid transferred from the second cooling channel 212 through the second header 222, and the fourth cooling channel 214 receives the cooling fluid transferred from the third cooling channel 213 through the first header 221.

[0093] The flow order of the cooling fluid of the first cooler unit 210 having the above structure will be described with reference to FIG. 3.

[0094] FIG. 3 is a plan view indicating a flow order of a cooling fluid that flows inside the first cooler unit according to an embodiment of the present disclosure.

[0095] Referring to FIG. 3, if the cooling fluid flows from the outside of the fluid distributor 100, the cooling fluid of the first cooler unit 210 mounted on the lower part of the high voltage battery flows into the second header 222 through the first inflow pipe 110 that communicates with one end of the second header 222.

[0096] Further, flowing of the cooling fluid in a direction of the second cooling channel 212 is blocked by the second partition 232, and the cooling fluid flows into the first cooling channel 211 and is then discharged to the first header 221.

[0097] Then, flowing of the cooling fluid that is discharged to the first header 221 in a direction of the third cooling channel 213 is blocked by the first partition 231, and the cooling fluid flows into the second cooling channel 212 and is then discharged to the second header 222.

[0098] Then, flowing of the cooling fluid that is discharged to the second header 222 in a direction of the fourth cooling channel 214 is blocked by the third partition 233, and the cooling fluid flows into the third cooling channel 213 and is then discharged to the first header 221.

[0099] Then, flowing of the cooling fluid that is discharged to the first header 221 in a direction of the second cooling channel 212 is blocked by the first partition 231,

and the cooling fluid flows into the fourth cooling channel 214 and is then discharged to the second header 222.

[00100] The cooling fluid described above is discharged to the fluid distributor 100 through the first discharge pipe 120 that communicates with the other end of the second header 222.

[00101] To sum up, if the cooling fluid flows from the fluid distributor 100 through the first inflow pipe 110, the first cooler unit 210 according to an embodiment of the present disclosure discharges the cooling fluid to the fluid distributor 100 through the first discharge pipe 120 via the second header 222, the first cooling channel 211, the first header 221, the second cooling channel 212, the second header 222, the third cooling channel 213, the first header 221, the fourth cooling channel 214, and the second header 222.

[00102] Hereinafter, a preferred embodiment of the second cooler unit 240 will be described in detail with reference to the accompanying drawings.

[00103] FIG. 4 is a perspective view illustrating the second cooler unit of the cooling device for a high voltage battery according to an embodiment of the present disclosure.

[00104] Referring to FIG. 4, the second cooler unit 240 is disposed on the upper part of the high voltage battery in a direction opposite to the direction in which the first cooler unit 210 is disposed.

[00105] Further, the second cooler unit 240 cools the upper part of the high voltage battery through the cooling fluid that flows inside the second cooler unit 240.

[00106] That is, the second cooler unit 240, in which the cooling fluid flows, has the lower surface that comes into direct contact with an upper surface of the high voltage battery, and thus can effectively cool the heat generated from the upper surface of the high voltage battery.

[00107] The second cooler unit 240 described above includes fifth to eighth cooling channels 241 to 244 in which the cooling fluid flows and each of which has an upper surface that comes into direct contact with the lower surface of the high voltage battery, a third header 251 and the fourth header 252 each of which is preferably formed in a cylindrical shape and which are disposed at one ends and the other ends of the fifth to eighth cooling channels 241 to 244, respectively, and fifth to seventh partitions 261 to 263 configured to block the cooling fluid, which flows inside the third and fourth headers 251 and 252, from flowing to a specific area.

[00108] The fifth cooling channel 241 receives the cooling fluid transferred from the outside, and the cooling fluid flows inside the fifth cooling channel 241.

[00109] Specifically, the cooling fluid having flowed from the outside through the fluid distributor 100 flows inside the fifth cooling channel 241.

[00110] The sixth cooling channel 242 is spaced apart at a distance in one direction from the fifth cooling channel 241, and receives the cooling fluid transferred from the outside, so that the cooling fluid flows inside the sixth cooling channel 242.

[00111] Specifically, the cooling fluid having flowed from the fifth cooling channel 241 through the third header 251 flows inside the sixth cooling channel 242.

[00112] The seventh cooling channel 243 is spaced apart at a distance in one direction from the sixth cooling channel 242, and receives the cooling fluid transferred from the outside, so that the cooling fluid flows inside the seventh cooling channel 243.

[00113] Specifically, the cooling fluid having flowed from the sixth cooling channel 242 through the fourth header 252 flows inside the seventh cooling channel 243.

[00114] The eighth cooling channel 244 is spaced apart at a distance in one direction from the seventh cooling channel 243, and receives the cooling fluid transferred from the outside, so that the cooling fluid flows inside the eighth cooling channel 244.

[00115] Specifically, the cooling fluid having flowed from the seventh cooling channel 243 through the third header 251 flows inside the eighth cooling channel 244.

[00116] The third header 251 is formed preferably in a cylindrical shape, and is disposed at one end of each of the fifth to eighth cooling channels 241 to 244.

[00117] Further, the third header 251 communicates with one end of each of the fifth to eighth cooling channels 241 to 244.

[00118] The fourth header 252 is formed preferably in a cylindrical shape, is spaced apart at a distance from the third header 251, and is disposed at the other end of each of the fifth to eighth cooling channels 241 to 244.

[00119] Further, the fourth header 252 communicates with the other end of each of the fifth to eighth cooling channels 241 to 244.

[00120] Accordingly, the cooling fluid discharged from the fifth and seventh cooling channels 241 and 243 flows into the sixth and eighth cooling channels 242 and 244 through the third header 251, and the cooling fluid discharged from the sixth cooling channel 242 flows into the seventh cooling channel 243 through the fourth header 252.

[00121] The fifth partition 261 is disposed inside the third header 251 that is formed in the cylindrical shape.

[00122] Specifically, the fifth partition 261 is disposed between the sixth cooling channel 242 and the seventh cooling channel 243 inside the third header 251.

[00123] That is, the fifth partition 261 partitions the inside of the third header 251 into one directional area in which the sixth cooling channel 242 is disposed and the other directional area in which the seventh cooling channel 243 is disposed.

[00124] Through this, the fifth partition 261 can effectively block the cooling fluid from flowing between the sixth cooling channel 242 and the seventh cooling channel 243

inside the third header 251.

[00125] The sixth partition 262 is disposed inside the fourth header 252 that is formed in the cylindrical shape.

[00126] Specifically, the sixth partition 262 is disposed between the fifth cooling channel 241 and the sixth cooling channel 242 inside the fourth header 252.

[00127] That is, the sixth partition 262 can effectively block the cooling fluid from flowing between the fifth cooling channel 241 and the sixth cooling channel 242 inside the fourth header 252.

[00128] The seventh partition 263 is disposed at a location spaced apart in one direction from the sixth partition 262 inside the fourth header 252 formed in the cylindrical shape.

[00129] Specifically, the seventh partition 263 is disposed between the seventh cooling channel 243 and the eighth cooling channel 244 inside the fourth header 252.

[00130] That is, the seventh partition 263 can effectively block the cooling fluid from flowing between the seventh cooling channel 243 and the eighth cooling channel 244 inside the fourth header 252.

[00131] Accordingly, the fifth cooling channel 241 receives the cooling fluid transferred from the fluid distributor 100 through the fourth header 252, and the sixth cooling channel 242 receives the cooling fluid transferred from the fifth cooling channel 241 through the third header 251.

[00132] Further, the seventh cooling channel 243 receives the cooling fluid transferred from the sixth cooling channel 242 through the fourth header 252, and the eighth cooling channel 244 receives the cooling fluid transferred from the seventh cooling channel 243 through the third header 251.

[00133] The flow order of the cooling fluid of the second cooler unit 240 having the above structure will be described with reference to FIG. 5.

[00134] FIG. 5 is a plan view indicating a flow order of a cooling fluid that flows inside the second cooler unit according to an embodiment of the present disclosure.

[00135] Referring to FIG. 5, if the cooling fluid flows from the outside of the fluid distributor 100, the cooling fluid of the second cooler unit 240 mounted on the upper part of the high voltage battery flows into the fourth header 252 through the second inflow pipe 130 that communicates with one end of the fourth header 252.

[00136] Further, flowing of the cooling fluid in a direction of the sixth cooling channel 242 is blocked by the sixth partition 262, and the cooling fluid flows into the fifth cooling channel 241 and is then discharged to the third header 251.

[00137] Then, flowing of the cooling fluid that is discharged to the third header 251 in a direction of the seventh cooling channel 243 is blocked by the fifth partition 261, and the cooling fluid flows into the sixth cooling channel 242 and is then discharged to the fourth header 252.

[00138] Then, flowing of the cooling fluid that is discharged to the fourth header 252 in directions of the fifth cooling channel 241 and the eighth cooling channel 244 is blocked by the sixth partition 262 and the seventh partition 263, and the cooling fluid flows into the seventh cooling channel 243 and is then discharged to the third header 251.

[00139] Then, flowing of the cooling fluid that is discharged to the third header 251 in a direction of the sixth cooling channel 242 is blocked by the fifth partition 261, and the cooling fluid flows into the eighth cooling channel 244 and is then discharged to the fourth header 252.

[00140] The cooling fluid described above is discharged to the fluid distributor 100 through the second discharge pipe 140 that communicates with the other end of the fourth header 252.

[00141] To sum up, if the cooling fluid flows from the fluid distributor 100 through the

second inflow pipe 130, the second cooler unit 240 according to an embodiment of the present disclosure discharges the cooling fluid to the fluid distributor 100 through the first discharge pipe 120 via the fourth header 252, the fifth cooling channel 241, the third header 251, the sixth cooling channel 242, the fourth header 252, the seventh cooling channel 243, the third header 251, the fourth cooling channel 214, and the fourth header 252.

[00142] Meanwhile, as the cooling device for a high voltage battery according to the present disclosure is viewed from a plane, the first cooling channel 211 overlaps the eighth cooling channel 244, and the second cooling channel 212 overlaps the seventh cooling channel 243.

[00143] Further, the third cooling channel 213 overlaps the sixth cooling channel 242, and the fourth cooling channel 214 overlaps the fifth cooling channel 241.

[00144] That is, the cooling fluid that flows from the first cooler unit 210 flows from the one directional area on the lower surface of the high voltage battery, and the cooling fluid that flows from the second cooler unit 240 flows from the other directional area on the upper surface of the high voltage battery.

[00145] Accordingly, the cooling device for a high voltage battery according to the present disclosure can effectively and uniformly cool the one directional area and the other directional area on the upper part and the lower part of the high voltage battery.

[00146] As described above, since the battery cooler 200 is composed of the first cooler unit 210 and the second cooler unit 240 respectively disposed on the lower part and the upper part of the high voltage battery, it is possible to uniformly cool the upper surface and the lower surface and the one directional area and the other directional area of the high voltage battery.

[00147] Accordingly, the battery cooler 200 composed of the first cooler unit 210 and

the second cooler unit 240 can effectively improve the performance of the battery by minimizing the temperature deviation between the lower part and the upper part of the high voltage battery.

[00148] Through this, the lifespan of the high voltage battery can be increased through effective improvement of the performance of the high voltage battery, and the safety of the high voltage battery can be secured through effective prevention of the thermal runaway of the battery in both conditions of extreme environment and driving.

[00149] Meanwhile, in an embodiment of the present disclosure, the one directional area and the other directional area can be easily cooled, the one directional area being on the lower part of the high voltage battery which comes into first contact with the cooling fluid by the first cooling channel 211, the other directional area being on the upper part of the high voltage battery which comes into first contact with the cooling fluid by the fifth cooling channel 241.

[00150] However, the temperature of the cooling fluid has already been increased in the process of moving the cooling fluid from the one directional area to the other directional area on the lower part of the high voltage battery and moving the cooling fluid from the other directional area to the one directional area on the upper part of the high voltage battery.

[00151] Accordingly, the cooling efficiency may deteriorate in the other directional area on the lower part of the high voltage battery which comes into late contact with the cooling fluid by the fourth cooling channel 214, and in the one directional area on the upper part of the high voltage battery which comes into late contact with the cooling fluid by the eighth cooling channel 244.

[00152] To prevent such deterioration in cooling efficiency, another embodiment of the present disclosure may further include a jump pipe 300'.

[00153] Hereinafter, the cooling device for a high voltage battery according to another embodiment will be described in detail with reference to the accompanying drawings.

[00154] FIG. 6 is a perspective view illustrating a cooling device for a high voltage battery according to another embodiment of the present disclosure, and FIG. 7 is a perspective view illustrating a first cooler unit of the cooling device for a high voltage battery according to another embodiment of the present disclosure.

[00155] Referring to FIGS. 6 and 7, the cooling device for a high voltage battery according to another embodiment of the present disclosure, which cools the high voltage battery, includes a fluid distributor 100', a battery cooler 200', and a jump pipe 300'.

[00156] The battery cooler 200' according to another embodiment of the present disclosure, in which the cooling fluid flows, is composed of a pair of battery coolers disposed on an upper part and a lower part of the high voltage battery, respectively.

[00157] The battery cooler 200' includes a first cooler unit 210' and a second cooler unit 240'.

[00158] The first cooler unit 210' is disposed on the lower part of the high voltage battery, and cools the lower part of the high voltage battery through the cooling fluid.

[00159] The first cooler unit 210' includes first to fourth cooling channels 211' to 214' in which the cooling fluid flows and each of which has a lower surface that comes into direct contact with the upper surface of the high voltage battery, first and second headers 221' and 222' each of which is preferably formed in a cylindrical shape and which are disposed at one ends and the other ends of the first to fourth cooling channels 211' to 214', respectively, and first to fourth partitions 231' to 234' configured to block the cooling fluid, which flows inside the first and second headers 221' and 222', from flowing to a specific area.

[00160] The first partition 231’ according to another embodiment of the present disclosure is disposed inside the first header 221’, and is disposed between the first cooling channel 211’ and the second cooling channel 212’ inside the first header 221’.

[00161] That is, the first partition 231’ can effectively block the cooling fluid from flowing between the first cooling channel 211’ and the second cooling channel 212’ inside the first header 221’.

[00162] The second partition 232’ is disposed inside the second header 222’, and is disposed between the first cooling channel 211’ and the second cooling channel 212’ inside the second header 222’.

[00163] That is, the second partition 232’ can effectively block the cooling fluid from flowing between the first cooling channel 211’ and the second cooling channel 212’ inside the second header 222’.

[00164] The third partition 233’ is disposed inside the first header 221’, and is disposed between the third cooling channel 213’ and the fourth cooling channel 214’ inside the first header 221’.

[00165] That is, the third partition 233’ can effectively block the cooling fluid from flowing between the third cooling channel 213’ and the fourth cooling channel 214’ inside the first header 221’.

[00166] The fourth partition 234’ is disposed inside the second header 222’, and is disposed between the second cooling channel 212’ and the third cooling channel 213’ inside the second header 222’.

[00167] That is, the fourth partition 234’ can effectively block the cooling fluid from flowing between the second cooling channel 212’ and the third cooling channel 213’ inside the second header 222’.

[00168] The jump pipe 300’ is combined with the battery cooler 200’, and guides the

flow of the cooling fluid.

[00169] Specifically, the jump pipe 300’ includes a lower jump pipe 310’ combined with the first cooler unit 210’ and an upper jump pipe 320’ combined with the second cooler unit 240’.

[00170] The lower jump pipe 310’ is combined with the first header 221’ constituting the first cooler unit 210’.

[00171] The lower jump pipe 310’ has one end combined between the first cooling channel 211’ and the first partition 231’ on an outer circumferential surface of the first header 221’, and the other end combined between the third partition 233’ and the fourth cooling channel 214’ on the outer circumferential surface of the first header 221’.

[00172] Further, the one end of the lower jump pipe 310’ communicates with the first cooling channel 211’, and the other end thereof communicates with the fourth cooling channel 214’.

[00173] Accordingly, the first cooling channel 211’ according to another embodiment of the present disclosure receives the cooling fluid transferred from the fluid distributor 100’ through the second header 222’, and the second cooling channel 212’ receives the cooling fluid transferred from the third cooling channel 213’ through the first header 221’.

[00174] Further, the third cooling channel 213’ receives the cooling fluid transferred from the fourth cooling channel 214’ through the second header 222’, and the fourth cooling channel 214’ receives the cooling fluid transferred from the first cooling channel 211’ through the lower jump pipe 310’.

[00175] The flow order of the cooling fluid of the first cooler unit 210’ having the above structure according to another embodiment of the present disclosure will be described with reference to FIG. 8.

[00176] FIG. 8 is a plan view indicating a flow order of a cooling fluid that flows inside the first cooler unit according to another embodiment of the present disclosure.

[00177] Referring to FIG. 8, if the cooling fluid flows from the outside of the fluid distributor 100', the cooling fluid of the first cooler unit 210' mounted on the lower part of the high voltage battery according to another embodiment of the present disclosure flows into the second header 222' through a first inflow pipe 110' that communicates with one end of the second header 222'.

[00178] Further, flowing of the cooling fluid in a direction of the second cooling channel 212' is blocked by the second partition 232', and the cooling fluid flows into the first cooling channel 211' and is then discharged to the first header 221'.

[00179] Then, flowing of the cooling fluid that is discharged to the first header 221' in a direction of the second cooling channel 212' is blocked by the first partition 231', and the cooling fluid flows into the lower jump pipe 310'.

[00180] Through this, the cooling fluid discharged from the first cooling channel 211' to the first header 221' is discharged from the first header 221' between the third partition 233' and the fourth cooling pipe through the lower jump pipe 310'.

[00181] Then, flowing of the cooling fluid that is discharged to the first header 221' in a direction of the third cooling channel 213' is blocked by the third partition 233', and the cooling fluid flows into the fourth cooling channel 214' and is then discharged to the second header 222'.

[00182] Then, flowing of the cooling fluid that is discharged to the second header 222' in a direction of the second cooling channel 212' is blocked by the fourth partition 234', and the cooling fluid flows into the third cooling channel 213' and is then discharged to the first header 221'.

[00183] Then, flowing of the cooling fluid that is discharged to the first header 221' in directions of the first cooling channel 211' and the fourth cooling channel 214' is

blocked by the first partition 231’ and the third partition 233’, and the cooling fluid flows into the second cooling channel 212’ and is then discharged to the second header 222’.

[00184] The cooling fluid described above is discharged to the fluid distributor 100’ through a second discharge pipe 140’ that communicates with the second header 222’.

[00185] To sum up, if the cooling fluid flows from the fluid distributor 100’ through the first inflow pipe 110’, the first cooler unit 210’ according to another embodiment of the present disclosure discharges the cooling fluid to the fluid distributor 100’ through a first discharge pipe 120’ via the second header 222’, the first cooling channel 211’, the first header 221’, the lower jump pipe 310’, the first header 221’, the fourth cooling channel 214’, the second header 222’, the third cooling channel 213’, the first header 221’, the second cooling channel 212’, and the second header 222’.

[00186] Hereinafter, a preferred embodiment of the second cooler unit 240’ according to another embodiment of the present disclosure will be described in detail with reference to the accompanying drawings.

[00187] FIG. 9 is a perspective view illustrating the second cooler unit of the cooling device for a high voltage battery according to another embodiment of the present disclosure.

[00188] Referring to FIG. 9, the second cooler unit 240’ according to another embodiment of the present disclosure is disposed on the upper part of the high voltage battery, and cools the upper part of the high voltage battery through the cooling fluid.

[00189] The second cooler unit 240’ described above includes fifth to eighth cooling channels 241’ to 244’ in which the cooling fluid flows and each of which has a lower

surface that comes into direct contact with the upper surface of the high voltage battery, third and fourth headers 251’ and 252’ each of which is preferably formed in a cylindrical shape and which are disposed at one ends and the other ends of the fifth to eighth cooling channels 241’ to 244’, respectively, and fifth to eighth partitions 261’ to 264’ configured to block the cooling fluid, which flows inside the third and fourth headers 251’ and 252’, from flowing to a specific area.

[00190] The fifth partition 261’ according to another embodiment of the present disclosure is disposed inside the fourth header 252’, and is disposed between the sixth cooling channel 242’ and the seventh cooling channel 243’ inside the fourth header 252’.

[00191] That is, the fifth partition 261’ can effectively block the cooling fluid from flowing between the sixth cooling channel 242’ and the seventh cooling channel 243’ inside the fourth header 252’.

[00192] The sixth partition 262’ is disposed inside the third header 251’, and is disposed between the fifth cooling channel 241’ and the sixth cooling channel 242’ inside the third header 251’.

[00193] That is, the sixth partition 262’ can effectively block the cooling fluid from flowing between the fifth cooling channel 241’ and the sixth cooling channel 242’ inside the third header 251’.

[00194] The seventh partition 263’ is disposed inside the fourth header 252’, and is disposed between the seventh cooling channel 243’ and the eighth cooling channel 244’ inside the fourth header 252’.

[00195] That is, the seventh partition 263’ can effectively block the cooling fluid from flowing between the seventh cooling channel 243’ and the eighth cooling channel 244’ inside the fourth header 252’.

[00196] The eighth partition 264 is disposed inside the third header 251’, and is

disposed between the seventh cooling channel 243’ and the eighth cooling channel 244’ inside the third header 251’.

[00197] That is, the eighth partition 264’ can effectively block the cooling fluid from flowing between the seventh cooling channel 243’ and the eighth cooling channel 244’ inside the third header 251’.

[00198] The upper jump pipe 320’ has one end combined between the fifth cooling channel 241’ and the sixth partition 262’ on an outer circumferential surface of the third header 251’, and the other end combined between the eighth cooling channel 244’ and the eighth partition 264’ on the outer circumferential surface of the third header 251’.

[00199] Further, the one end of the upper jump pipe 320’ communicates with the fifth cooling channel 241’, and the other thereof communicates with the eighth cooling channel 244’.

[00200] Accordingly, the fifth cooling channel 241’ according to another embodiment of the present disclosure receives the cooling fluid transferred from the sixth cooling channel 242’ through the fourth header 252’, and the sixth cooling channel 242’ receives the cooling fluid transferred from the seventh cooling channel 243’ through the third header 251’.

[00201] Further, the seventh cooling channel 243’ receives the cooling fluid transferred from the fluid distributor 100’ through the fourth header 252’, and the eighth cooling channel 244’ receives the cooling fluid transferred from the fifth cooling channel 241’ through the upper jump pipe 320’.

[00202] The flow order of the cooling fluid of the second cooler unit 240’ having the above structure according to another embodiment of the present disclosure will be described with reference to FIG. 10.

[00203] FIG. 10 is a plan view indicating a flow order of a cooling fluid that flows

inside the second cooler unit according to another embodiment of the present disclosure.

[00204] Referring to FIG. 10, if the cooling fluid flows from the outside of the fluid distributor 100', the cooling fluid of the second cooler unit 240' mounted on the upper part of the high voltage battery according to another embodiment of the present disclosure flows into the fourth header 252' through a second inflow pipe 130' that communicates with one end of the fourth header 252'.

[00205] Further, flowing of the cooling fluid in directions of the sixth cooling channel 242' and the eighth cooling channel 244' is blocked by the fifth partition 261' and the seventh partition 263', and the cooling fluid flows into the seventh cooling channel 243' and is then discharged to the third header 251'.

[00206] Then, flowing of the cooling fluid that is discharged to the third header 251' in a direction of the fifth cooling channel 241' is blocked by the sixth partition 262', and the cooling fluid flows into the sixth cooling channel 242' and is then discharged to the fourth header 252'.

[00207] Then, flowing of the cooling fluid that is discharged to the fourth header 252' in a direction of the seventh cooling channel 243' is blocked by the first partition 261', and the cooling fluid flows into the fifth cooling channel 241' and is then discharged to the third header 251'.

[00208] Then, flowing of the cooling fluid that is discharged to the third header 251' to the seventh cooling channel 243' is blocked by the sixth partition 262', and the cooling fluid flows into the upper jump pipe 320'.

[00209] Through this, the cooling fluid discharged from the fifth cooling channel 241' to the third header 251' is discharged from the third header 251' between the eighth cooling channel 244' and the eighth partition 264' through the upper jump pipe 320'.

[00210] Then, flowing of the cooling fluid that is discharged to the third header 251'

in the direction of the seventh cooling channel 243’ is blocked by the eighth partition 264’, and the cooling fluid flows into the eighth cooling channel 244’ and is then discharged to the fourth header 252’.

[00211] The cooling fluid described above is discharged to the fluid distributor 100’ through the second discharge pipe 140’ that communicates with the fourth header 252’.

[00212] To sum up, if the cooling fluid flows from the fluid distributor 100’ through the second inflow pipe 130’, the second cooler unit 240’ according to another embodiment of the present disclosure discharges the cooling fluid to the fluid distributor 100’ through the second discharge pipe 140’ via the fourth header 252’, the seventh cooling channel 243’, the third header 251’, the sixth cooling channel 242’, the fourth header 252’, the fifth cooling channel 241’, the third header 251’, the upper jump pipe 320’, the third header 251’, the eighth cooling channel 244’, and the fourth header 252’.

[00213] As described above, since the battery cooler 200’ is composed of the first cooler unit 210’ and the second cooler unit 240’ respectively disposed on the lower part and the upper part of the high voltage battery, the cooling device for a high voltage battery according to another embodiment of the present disclosure can uniformly cool the upper surface and the lower surface of the high voltage battery.

[00214] Further, the cooling device for a high voltage battery according to another embodiment of the present disclosure can minimize the temperature deviation between the one directional area and the other directional area of the high voltage battery since the cooling fluid, which flows through the first cooler unit 210’ and the second cooler unit 240’, flows from the one directional area corresponding to the directions of the first cooling channel 211’ and the fifth cooling channel 241’ of the high voltage battery, the fourth cooling channel 214’ and the eighth cooling channel

244’ to the areas of the second cooling channel 212’ and the third cooling channel 213’.

[00215] Through this, the cooling device for a high voltage battery according to another embodiment of the present disclosure can uniformly cool the one directional area and the other directional area of the high voltage battery.

[00216] As described above, the embodiments disclosed in the description should be considered not from a limited viewpoint, but from an exemplary viewpoint for explanation. The scope of the present disclosure is not presented in the above-described explanation, but is presented in the claims, and it should be interpreted that all differences present in the equivalent range are included in the present disclosure.

WHAT IS CLAIMED IS:

[Claim 1] A cooling device for a high voltage battery, which cools a high voltage battery, the cooling device comprising:

a plurality of battery coolers mounted on the high voltage battery and configured to cool the high voltage battery through a cooling fluid; and

a fluid distributor configured to receive the cooling fluid transferred from an outside and distribute the cooling fluid to the battery coolers,

wherein the battery coolers are composed of a pair of battery coolers disposed on an upper part and a lower part of the high voltage battery, respectively.

[Claim 2] The cooling device of claim 1, wherein the battery coolers comprise:

a first cooler unit disposed on the lower part of the high voltage battery; and

a second cooler unit disposed on the upper part of the high voltage battery.

[Claim 3] The cooling device of claim 2, wherein the first cooler unit comprises:

a first cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows;

a second cooling channel spaced apart at a distance in one direction from the first cooling channel and configured to receive the cooling fluid transferred from the outside;

a third cooling channel spaced apart at a distance in one direction from the second cooling channel and configured to receive the cooling fluid transferred from the outside; and

a fourth cooling channel spaced apart at a distance in one direction from the third cooling channel and configured to receive the cooling fluid transferred from the outside.

[Claim 4] The cooling device of claim 3, wherein the first cooler unit further comprises:

a first header disposed at one end of the first to fourth cooling channels; and

a second header spaced apart at a distance from the first header and disposed at the other end of the first to fourth cooling channels.

[Claim 5] The cooling device of claim 4, wherein the first cooler unit further comprises:

a first partition disposed between the second cooling channel and the third cooling channel inside the first header;

a second partition disposed between the first cooling channel and the second cooling channel inside the second header; and

a third partition disposed between the third cooling channel and the fourth cooling channel inside the second header.

[Claim 6] The cooling device of claim 4, wherein the first cooling channel is configured to receive the cooling fluid transferred from the fluid distributor,

the second cooling channel is configured to receive the cooling fluid transferred from the first cooling channel through the first header,

the third cooling channel is configured to receive the cooling fluid transferred from the second cooling channel through the second header, and

the fourth cooling channel is configured to receive the cooling fluid transferred from the third cooling channel through the first header.

[Claim 7] The cooling device of claim 3, wherein the second cooler unit comprises:

a fifth cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows;

a sixth cooling channel spaced apart at a distance in one direction from the fifth cooling channel and configured to receive the cooling fluid transferred from the outside;

a seventh cooling channel spaced apart at a distance in one direction from the sixth cooling channel and configured to receive the cooling fluid transferred from the outside; and

an eighth cooling channel spaced apart at a distance in one direction from the seventh cooling channel and configured to receive the cooling fluid transferred from the outside.

[Claim 8] The cooling device of claim 7, wherein the second cooler unit

further comprises:

a third header disposed at one end of the fifth to eighth cooling channels; and

a fourth header spaced apart at a distance from the third header and disposed at the other end of the fifth to eighth cooling channels.

[Claim 9] The cooling device of claim 8, wherein the second cooler unit further comprises:

a fifth partition disposed between the sixth cooling channel and the seventh cooling channel inside the third header;

a sixth partition disposed between the fifth cooling channel and the sixth cooling channel inside the fourth header; and

a seventh partition disposed between the seventh cooling channel and the eighth cooling channel inside the fourth header.

[Claim 10] The cooling device of claim 9, wherein the fifth cooling channel is configured to receive the cooling fluid transferred from the fluid distributor,

the sixth cooling channel is configured to receive the cooling fluid transferred from the fifth cooling channel through the third header,

the seventh cooling channel is configured to receive the cooling fluid transferred from the sixth cooling channel through the fourth header, and

the eighth cooling channel is configured to receive the cooling fluid transferred from the seventh cooling channel through the third header.

[Claim 11] The cooling device of claim 10, wherein, when viewed from a plane, the first cooling channel overlaps the eighth cooling channel, the second cooling channel overlaps the seventh cooling channel, the third cooling channel overlaps the sixth cooling channel, and the fourth cooling channel overlaps the fifth cooling channel.

[Claim 12] A cooling device for a high voltage battery, which cools the high voltage battery, the cooling device comprising:

a pair of battery coolers disposed on an upper part and a lower part of the high voltage battery, respectively, and configured to cool the upper part and the lower part of the high voltage battery, respectively, through a cooling fluid;

a fluid distributor configured to receive the cooling fluid transferred from an outside and distribute the cooling fluid to the battery coolers; and

a jump pipe combined with the battery coolers and configured to guide a flow of the cooling fluid.

[Claim 13] The cooling device of claim 12, wherein the battery coolers comprise:

a first cooler unit disposed on the lower part of the high voltage battery; and

a second cooler unit disposed on the upper part of the high voltage battery,

wherein the first cooler unit includes:

a first cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows;

a second cooling channel spaced apart at a distance in one direction from

the first cooling channel and configured to receive the cooling fluid transferred from the outside;

a third cooling channel spaced apart at a distance in one direction from the second cooling channel and configured to receive the cooling fluid transferred from the outside;

a fourth cooling channel spaced apart at a distance in one direction from the third cooling channel and configured to receive the cooling fluid transferred from the outside;

a first header disposed at one end of the first to fourth cooling channels;

a second header spaced apart at a distance from the first header and disposed at the other end of the first to fourth cooling channels;

a first partition disposed between the first cooling channel and the second cooling channel inside the first header;

a second partition disposed between the first cooling channel and the second cooling channel inside the second header;

a third partition disposed between the third cooling channel and the fourth cooling channel inside the first header; and

a fourth partition disposed between the second cooling channel and the third cooling channel inside the second header.

[Claim 14] The cooling device of claim 13, wherein the second cooler unit comprises:

a fifth cooling channel which is configured to receive the cooling fluid transferred from the outside and in which the cooling fluid flows;

a sixth cooling channel spaced apart at a distance in one direction from the fifth cooling channel and configured to receive the cooling fluid transferred from the outside;

a seventh cooling channel spaced apart at a distance in one direction from the sixth cooling channel and configured to receive the cooling fluid transferred from the outside;

an eighth cooling channel spaced apart at a distance in one direction from the seventh cooling channel and configured to receive the cooling fluid transferred from the outside;

a third header disposed at one end of the fifth to eighth cooling channels;

a fourth header spaced apart at a distance from the third header and disposed at the other end of the fifth to eighth cooling channels;

a fifth partition disposed between the sixth cooling channel and the seventh cooling channel inside the third header;

a sixth partition disposed between the fifth cooling channel and the sixth cooling channel inside the fourth header;

a seventh partition disposed between the seventh cooling channel and the eighth cooling channel inside the fourth header; and

an eighth partition disposed between the seventh cooling channel and the eighth cooling channel inside the third header.

[Claim 15] The cooling device of claim 14, wherein the jump pipe comprises:

a lower jump pipe combined with the first header; and

an upper jump pipe combined with the third header.

[Claim 16] The cooling device of claim 15, wherein the lower jump pipe has one end combined between the first cooling channel and the first partition, and the other end combined between the third partition and the fourth cooling channel.

[Claim 17] The cooling device of claim 15, wherein the lower jump pipe has one end configured to communicate with the first cooling channel, and the other end configured to communicate with the fourth cooling channel.

[Claim 18] The cooling device of claim 16, wherein the first cooling channel is configured to receive the cooling fluid transferred from the fluid distributor through the second header,

the second cooling channel is configured to receive the cooling fluid transferred from the third cooling channel through the first header,

the third cooling channel is configured to receive the cooling fluid transferred from the fourth cooling channel through the second header, and

the fourth cooling channel is configured to receive the cooling fluid transferred from the first cooling channel through the lower jump pipe.

[Claim 19] The cooling device of claim 15, wherein the upper jump pipe has one end combined between the sixth partition and the fifth cooling channel, and the other end combined between the eighth cooling channel and the eighth partition.

[Claim 20] The cooling device of claim 18, wherein the upper jump pipe has one end configured to communicate with the fifth cooling channel, and the other end configured to communicate with the eighth cooling channel.

[Claim 21] The cooling device of claim 18, wherein the fifth cooling channel is configured to receive the cooling fluid transferred from the sixth cooling channel through the fourth header,

the sixth cooling channel is configured to receive the cooling fluid transferred from the seventh cooling channel through the third header,

the seventh cooling channel is configured to receive the cooling fluid transferred from the fluid distributor through the fourth header, and

the eighth cooling channel is configured to receive the cooling fluid transferred from the fifth cooling channel through the upper jump pipe.