

STORAGE BATTERY MODULE

[TECHNICAL FIELD]

[0001] The present disclosure relates to storage battery
5 modules and in particular to storage battery modules
containing a plurality of storage battery cells.

[BACKGROUND ART]

[0002] There is a need for battery packs with high
capacity, high voltage, high output, and high safety. On the
10 other hand, if a battery is placed under abnormal conditions
causing blowout of high-temperature combustible gas from the
inside, the housing of the battery pack that contains the
battery may be damaged, melted, or overheated, or the blown
out combustible gas may leak out of the battery pack.
15 Furthermore, the heat emitted by the combustible gas can
cause adjacent batteries to become hot one after another,
causing all the batteries inside the battery pack to
malfunction or the housing of the battery pack to melt due to
the heat. In order to prevent this, battery packs are
20 provided with openings for releasing combustible gas to the
outside (see, for example, Patent Literature 1).

[0003] [Patent Literature 1] Japanese Unexamined Patent
Application Publication No. 2009-135088

[SUMMARY OF INVENTION]

25 [TECHNICAL PROBLEM]

[0004] When a battery pack is downsized, the distance

between a battery where the combustible gas is blown out and an opening becomes shorter. As a result, there is a risk that high-temperature and high-pressure gas may be released from the opening of the battery pack to the outside without
5 being cooled.

[0005] In this background, a purpose of the present disclosure is to provide a technology for preventing high-temperature and high-pressure gas blown out from a battery cell in thermal runaway from spreading to burn other battery
10 cells in a storage battery pack, and to cool the gas to the extent that adverse effects on the surroundings can be reduced so as to safely release the gas.

[SOLUTION TO PROBLEM]

[0006] A storage battery module according to an aspect
15 of the present disclosure includes: a plurality of storage battery cells; an inner case that houses the plurality of storage battery cells; an outer case that houses the inner case; and an outer exhaust port that connects a space between the inner case and the outer case to the outside of the outer
20 case. The inner case has a first surface, a second surface, and a third surface facing the outer case where the first surface and the second surface face opposite directions and where the third surface is arranged between the first surface and the second surface, and the inner case has a first inner
25 exhaust port provided on the first surface and a second inner exhaust port provided on the second surface. Provided in a

space between the inner case and the outer case are a first exhaust route from the first inner exhaust port to the flow path direction conversion position on the third surface, a second exhaust route from the second inner exhaust port to the flow path direction conversion position, and a third exhaust route from the flow path direction conversion position to the outer exhaust port, and provided in the flow path direction conversion position is a guide unit for directing gas from the first exhaust route and gas from the second exhaust route to the third exhaust route.

[ADVANTAGEOUS EFFECTS OF INVENTION]

[0007] According to the present disclosure, high-temperature and high-pressure gas blown out from a battery cell in a thermal runaway can be prevented from spreading to burn other battery cells in a storage battery pack, and the gas can be cooled to the extent that adverse effects on the surroundings can be reduced so that the gas can be safely released.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0008] FIGS. 1A-1C are perspective views showing the structure of a storage battery module according to the present embodiment;

FIGS. 2A-2B are perspective views showing the structure of the storage battery module of FIGS. 1A-1C;

FIG. 3 is a perspective view showing an exhaust route in the storage battery module of FIGS. 1A-1C;

FIG. 4 is a perspective view showing an exhaust route in the storage battery module of FIGS. 1A-1C; and

FIG. 5 is a perspective view showing an exhaust route in the storage battery module of FIGS. 1A-1C.

5 [DESCRIPTION OF EMBODIMENTS]

[0009] Before a specific explanation of the embodiment of the present disclosure is given, an overview of the embodiment will be given. The present embodiment relates to a storage battery module in which a plurality of storage
10 battery cells are contained. When each storage battery cell is a lithium-ion secondary battery, gas is generated in the storage battery cell when an internal short circuit or the like occurs. Although the pressure inside the storage battery cell increases due to the gas generation, a safety
15 mechanism causes the gas to be released from the cathode or both the cathode and the anode to the outside of the storage battery cell. Such gas has high temperature and high pressure, and if combustion by the gas occurs, other storage battery cells in the storage battery module may also
20 experience thermal runaway (burning from a spreading fire). This burning from a spreading fire may cause the entire storage battery module or the entire product to burn. To suppress burning from a spreading fire caused by gas, it is effective, for example, to provide an exhaust port in the
25 storage battery module and to release gas from the exhaust port to the outside of the storage battery module. However,

when the storage battery module is downsized, the distance between each storage battery cell and the exhaust port becomes shorter. As a result, high-temperature and high-pressure gas is released directly from the exhaust port without being cooled, creating a hazardous situation around the storage battery module.

[0010] In the storage battery module according to the present embodiment, a plurality of storage battery cells are housed in an inner case, and the inner case is housed in an outer case. The inner case is provided with an inner exhaust port, and the outer case is provided with an outer exhaust port. Between the inner case and the outer case, an exhaust route through which high-temperature and high-pressure gas can pass and a heat sink that comes into contact with the exhaust route are provided. With this structure, the high-temperature and high-pressure gas blown out from the storage battery cells moves inside the inner case and is released from the inner exhaust port to the outside of the inner case. Further, the high-temperature and high-pressure gas released to the outside of the inner case is released from the outer exhaust port to the outside of the outer case through the exhaust route. As a result, as the route for the high-temperature and high-pressure gas inside the storage battery module becomes longer, the contact area of the outer case, the inner case, and the heat sink with the high-temperature and high-pressure gas becomes larger. This cools the high-

temperature and high-pressure gas in the storage battery module. Furthermore, in the present embodiment, by providing a guide unit in the exhaust route, the high-temperature and high-pressure gas is easily directed from the inner exhaust port to the outer exhaust port. In the following explanation, "parallel" and "perpendicular" include not only a case of perfect parallelism and perfect perpendicularity but also a case of being deviated from parallelism and perpendicularity within the margin of error. In addition, "approximately" means being the same in an approximate range.

[0011] FIGS. 1A-1C are perspective views showing the structure of a storage battery module 1000. As shown in FIGS. 1A-1C, an orthogonal coordinate system including an x-axis, a y-axis, and a z-axis is defined. The x-axis and the y-axis are orthogonal to each other in the bottom surface of the storage battery module 1000. The z-axis is perpendicular to the x-axis and the y-axis and extends in the height (vertical) direction of the storage battery module 1000. The positive direction of each of the x-axis, the y-axis, and the z-axis is defined as the direction of arrows in FIGS. 1A-1C, and the negative direction is defined as the opposite direction of the arrows. Also, the positive side of the x-axis is sometimes referred to as "front side" or "frontal side", the negative side of the x-axis as "back side" or "rear side", the positive side of the z-axis as "top side" or "top surface side", and the negative side of the z-axis as

"bottom side" or "bottom surface side". Furthermore, the positive side of the y-axis direction is sometimes referred to as "right side", and the negative side of the y-axis direction as "left side".

5 **[0012]** FIG. 1A shows the exterior appearance of a storage battery module 1000. The storage battery module 1000 includes a first outer case 100a and a second outer case 100b. The first outer case 100a includes a front plate 110 on the front side, a front side left plate 112 on the left
10 side, a front side right plate 114 on the right side, and a front side top plate 116 on the top side, while the second outer case 100b includes a back plate 120 on the back side, a back side left plate 122 on the left side, a back side right plate 124 on the right side, and a back side top plate 126.

15 The first outer case 100a and the second outer case 100b are formed, for example, of resin. The first outer case 100a and the second outer case 100b are connected by connecting the back end of the front side left plate 112 to the front end of the back side left plate 122, the back end of the front side
20 right plate 114 to the front end of the back side right plate 124, and the back end of the front side top plate 116 to the front end of the back side top plate 126. The first outer case 100a and the second outer case 100b in the assembled state have a box shape long in the vertical direction and are
25 also called an outer case 100.

[0013] The opening of the front plate 110 and the

opening of the front side top plate 116 are connected as a through hole, and the front upper portion of the first outer case 100a forming the through hole is a handle 130. In order to increase the strength of the handle 130, a frame-shaped handle cover 132 is mounted inside the through hole. The user lifts the storage battery module 1000 by inserting his/her hand through the opening in the front side top plate 116 into the through hole and grasping the handle 130. On the front side top plate 116 of the first outer case 100a, a display 140 is disposed that is for displaying the status of a plurality of storage battery cells (not shown) housed inside the outer case 100. The display 140 includes, for example, a light emitting diode (LED). On the other hand, the second outer case 100b does not have a display 140.

[0014] FIG. 1B shows a structure obtained by removing the first outer case 100a and the second outer case 100b from the structure in FIG. 1A. A synthetic resin bag 200 is housed in the outer case 100. The synthetic resin bag 200 is a bag made of synthetic resin such as polyethylene and polypropylene. The synthetic resin bag 200 covers the inner case described later. The synthetic resin bag 200 covering the inner case is housed in the first outer case 100a. The opening of the first outer case 100a in which the synthetic resin bag 200 is housed is covered by the second outer case 100b. In other words, the first outer case 100a houses the inner case, and the second outer case 100b covers the opening

of the first outer case 100a, thereby allowing the outer case 100 to house the inner case 300. A terminal assembly 250 and one or more terminals 252 are arranged at the bottom part of the synthetic resin bag 200. A hole is formed at the mounting position of a terminal 252 in the outer case 100, and a terminal part is mounted in the hole. Thus, a gap between the hole and the terminal 252 serves as an outer exhaust port described below. The terminal assembly 250 and the terminals 252 are described later.

[0015] FIG. 1C shows a structure obtained by removing the synthetic resin bag 200 from the structure in FIG. 1B. As mentioned above, the inner case 300 covered by the synthetic resin bag 200 is a combination of the first inner case 300a and the second inner case 300b, which houses a battery holder 400. The heat sink 310 covers the inner case 300, which houses the battery holder 400, from the front side. The terminal assembly 250 in FIG. 1B is connected to the bottom side of the battery holder 400, and one or more terminals 252 are connected to the terminal assembly 250. The terminals 252 are, for example, universal serial bus (USB) (registered trademark) ports to which USB (registered trademark) connectors can be connected. The storage battery cell 410 supplies electric power to a device (not shown) connected via the terminals 252.

[0016] FIGS. 2A-2B are perspective views showing the structure of a storage battery module 1000. FIG. 2A shows

the structure obtained by removing the heat sink 310 from the structure in FIG. 1C, and FIG. 2B shows a structure obtained by removing the first inner case 300a and the second inner case 300b from the structure in FIG. 2A. The battery holder 400 has a box shape long in the vertical direction, with the left side z-x plane being a battery holder first surface 402 and the right side z-x plane being a battery holder second surface 404. The battery holder 400 houses a plurality of storage battery cells 410 inside.

10 **[0017]** The storage battery cells 410 are, for example, cylindrical lithium-ion secondary batteries. A cathode (not shown) and an anode (not shown) facing opposite to each other are arranged at respective ends of the cylindrical shape of a storage battery cell 410. For the storage battery cells 410, publicly-known technology can be used. The storage battery cells 410 are provided with a safety mechanism that releases high-temperature and high-pressure gas to the outside in the event of an increase in internal pressure due to the occurrence of an internal short circuit or the like. Some of the plurality of storage battery cells 410 are arranged in the battery holder 400 such that the cathode faces the battery holder first surface 402, and the rest of the plurality of storage battery cells 410 are arranged in the battery holder 400 such that the cathode faces the battery holder second surface 404. For example, the number of storage battery cells 410 arranged as in the former case is

the same as the number of storage battery cells 410 arranged as in the latter case. The battery holder 400 is formed of an insulating material, e.g., resin.

[0018] The first inner case 300a includes a first

5 surface 330, a left side third surface 332, and a left side protective wall 334. The first surface 330 has a plate shape that extends in the z-x plane, and the left side third surface 332 has a plate shape that extends in the y-z plane. The left side third surface 332 is arranged so as to extend
10 from the front end of the first surface 330 to the right side. Furthermore, the left side protective wall 334 is arranged so as to extend from the upper end of the first surface 330 to the right side. In the left-right direction, the left side protective wall 334 is shorter than the left
15 side third surface 332.

[0019] The second inner case 300b includes a second

surface 340, a right side third surface 342, and a right side protective wall 344. The second surface 340 has a plate shape that extends in the z-x plane, and the right side third
20 surface 342 has a plate shape that extends in the y-z plane. The right side third surface 342 is arranged so as to extend from the front end of the second surface 340 to the left side. Furthermore, the right side protective wall 344 is arranged so as to extend from the upper end of the second
25 surface 340 to the left side. In the left-right direction, the right side protective wall 344 is shorter than the right

side third surface 342.

[0020] The first surface 330 of the first inner case 300a faces the battery holder first surface 402 of the battery holder 400, and the second surface 340 of the second
5 inner case 300b faces the battery holder second surface 404 of the battery holder 400. In such a state, the left side third surface 332 and the right side third surface 342 become connected such that the right side end of the left side third surface 332 is in contact with the left side end of the right
10 side third surface 342. As a result, the left side third surface 332 and the right side third surface 342 form one surface, which is referred to as "third surface". In other words, the inner case 300 has a first surface 330, a second surface 340, and a third surface, the first surface 330 and
15 the second surface 340 face opposite directions, and the third surface is arranged between the first surface 330 and the second surface 340. The inner case 300 stores the battery holder 400 with three surfaces: the first surface 330; the second surface 340; and the third surface.

20 **[0021]** The heat sink 310 includes a heat sink front plate 320, a heat sink left plate 322, and a heat sink right plate 324. The heat sink front plate 320 has a rectangular plate shape that extends in the y-z plane. The heat sink left plate 322 has a plate shape that extends in the z-x
25 plane and is arranged from the left end of the heat sink front plate 320 toward the back side. The heat sink right

plate 324 has a plate shape that extends in the z-x plane and is arranged from the right end of the heat sink front plate 320 toward the back side. The heat sink 310 is attached from the front side with respect to the first inner case 300a and the second inner case 300b, which store the battery holder 400. At that time, the heat sink left plate 322 and the first surface 330 face each other, the heat sink right plate 324 and the second surface 340 face each other, and the heat sink front plate 320 and the third surface face each other.

The first inner case 300a, the second inner case 300b, and the heat sink 310 are formed, for example, of metal.

[0022] A space formed between the inner case 300 and the heat sink 310 will now be explained. A second inner exhaust port 346 is provided on the second surface 340 of the second

inner case 300b. The second inner exhaust port 346 penetrates the second inner case 300b, therefore connecting the space between the battery holder second surface 404 and the second inner case 300b and the space between the inner case 300 and the heat sink 310. A second exhaust route 372

is a route that heads upward along the second surface 340 from the second inner exhaust port 346, then turns toward the third surface, and then heads to the flow path direction conversion position 360 located at the center part of the third surface in the left-right direction.

[0023] A first inner exhaust port 336 is provided on the first surface 330 of the first inner case 300a. The first

inner exhaust port 336 penetrates the first inner case 300a, therefore connecting the space between the battery holder first surface 402 and the first inner case 300a and the space between the inner case 300 and the heat sink 310. A first
5 exhaust route 370 is a route that heads upward along the first surface 330 from the first inner exhaust port 336, then turns toward the third surface, and then heads to the flow path direction conversion position 360.

[0024] Furthermore, a third exhaust route 374 is a route
10 that heads downward from the flow path direction conversion position 360 toward an exhaust position 362. The exhaust position 362 leads to the previously-described terminals 252. Since the terminals 252 are also referred to as outer exhaust ports, it can be considered that the third exhaust route 374
15 heads from the flow path direction conversion position 360 toward the outer exhaust ports. The details will be described later.

[0025] At the flow path direction conversion position 360, a left side guide unit 338 is provided on the left side
20 third surface 332 and a right side guide unit 348 is provided on the right side third surface 342. The combination of the left side guide unit 338 and the right side guide unit 348 is also referred to as "guide unit" and protrudes downwardly. The guide unit corresponds to a portion of wall portions
25 provided to surround the first exhaust route 370, the second exhaust route 372, and the third exhaust route 374 at the

first surface 330, the second surface 340, and the third surface.

[0026] The left side protective wall 334 covers the space between the battery holder first surface 402 and the first inner case 300a from above. The right side protective wall 344 covers the space between the battery holder second surface 404 and the second inner case 300b from above. Since the plurality of storage battery cells 410 are arranged horizontally in the battery holder 400, it can be considered that the left side protective wall 334 and the right side protective wall 344 cover at least a portion of the lateral side of the plurality of storage battery cells 410.

[0027] Since the combination of inner case 300, the heat sink 310, and the battery holder 400 shown in FIG. 1C is covered by the synthetic resin bag 200 as shown in FIG. 1B, the plurality of storage battery cells 410 can be considered to be covered by the synthetic resin bag 200 inside the outer case 100. Further, since the synthetic resin bag 200 is stored in the outer case 100, it can be considered that the first surface 330, the second surface 340, and the third side surface face the outer case 100 via the heat sink 310.

Furthermore, it can be considered that the outer exhaust ports, which are the terminals 252, connect the space between the inner case 300 and the outer case 100 to the outside of the outer case 100.

[0028] In the following, an explanation will be given

regarding the route through which high-temperature and high-pressure gas blown out from the storage battery cell 410 is exhausted from the storage battery module 1000 in the case of a thermal runaway of one of the storage battery cells 410.

5 FIG. 3 is a perspective view showing an exhaust route in the storage battery module 1000. The storage battery module 1000 is shown left side up. In order to explain the inside of the storage battery module 1000, the front side left plate 112, the back side left plate 122, the synthetic resin bag 200,
10 the heat sink left plate 322, and the first surface 330 are omitted. As mentioned above, in the battery holder 400, some of the plurality of storage battery cells 410 are arranged such that the cathode faces the battery holder first surface 402, and the rest of the plurality of storage battery cells
15 410 are arranged such that the anode faces the battery holder first surface 402.

[0029] In the case of a thermal runaway of the storage battery cells 410, the storage battery cells 410 blows out high-temperature and high-pressure gas from at least one of
20 the cathode and the anode or from both ends in some cases. As a result, for example, the high-temperature and high-pressure gas is blown out into a space between the battery holder first surface 402 and the first surface 330 (FIG. 2B) and a space between the battery holder second surface 404 and
25 the second surface 340 (FIG. 2B). Since the space between the battery holder first surface 402 and the first surface

330 opens at the first inner exhaust port 336 (FIG. 2A), the high-temperature and high-pressure gas heads toward the first inner exhaust port 336 while being in contact with the first surface 330. At that time, the temperature of the high-temperature and high-pressure gas is reduced by being in contact with the first surface 330. The route from the storage battery cell 410 to the first inner exhaust port 336 is the inner exhaust route 420. The same applies to high-temperature and high-pressure gas blown out into the space between the battery holder second surface 404 and the second surface 340. Thus, the explanation thereof is omitted.

[0030] FIG. 4 is a perspective view showing an exhaust route in the storage battery module 1000. This is shown in the same orientation as FIG. 4. In order to explain the inside of the storage battery module 1000, the front side left plate 112, the back side left plate 122, and the synthetic resin bag 200 are omitted. Although the heat sink left plate 322 is also omitted in the figure, the heat sink left plate 322 is arranged on the upper surface in FIG. 4 in reality. The high-temperature and high-pressure gas is released from the first inner exhaust port 336 into the space between the first surface 330 and the first outer plate 110a (FIG. 2B) and heads to a first pass-through position 350 while being in contact with the first surface 330 and the first outer plate 110a. Since the heat sink left plate 322 is provided between the first surface 330 and the first outer

plate 110a, it can be considered that the high-temperature and high-pressure gas also heads to the first pass-through position 350 while being in contact with the heat sink left plate 322. As a result, the temperature of the high-

5 temperature and high-pressure gas is reduced. The first pass-through position 350 is a portion leading to the third surface from the first surface 330. The route from the first inner exhaust port 336 to the first pass-through position 350 is included in the first exhaust route 370 described above.

10 **[0031]** FIG. 5 is a perspective view showing an exhaust route in the storage battery module 1000. The storage battery module 1000 is shown front side up. In order to explain the inside of the storage battery module 1000, the front plate 110 and the synthetic resin bag 200 are omitted.

15 Although the heat sink 310 is also omitted in the figure, the heat sink front plate 320 is arranged on the upper surface in FIG. 5 in reality. The high-temperature and high-pressure

gas proceeding along the first exhaust route 370 moves from the first pass-through position 350 to the third surface and

20 then heads to the flow path direction conversion position

360. On the other hand, the previously-described high-temperature and high-pressure gas blown out into the space

between the battery holder second surface 404 and second surface 340 moves from the second pass-through position 352

25 to the third surface via the second inner exhaust port 346 and the second surface 340 and then heads to the flow path

direction conversion position 360. The second pass-through position 352 is a portion leading to the third surface from the second surface 340.

[0032] As mentioned above, at the flow path direction

5 conversion position 360, a guide unit formed by the combination of the left side guide unit 338 and the right side guide unit 348 protrudes downward. Thus, the high-temperature and high-pressure gas proceeding along the first exhaust route 370 and the second exhaust route 372 is bent
10 downward near the flow path direction conversion position 360. The high-temperature and high-pressure gas that has reached the flow path direction conversion position 360 proceeds along the third exhaust route 374 to the exhaust position 362. At that time, since the high-temperature and
15 high-pressure gas comes into contact with the third surface and the heat sink front plate 320, the temperature is reduced.

[0033] If no guide unit is provided at the flow path

direction conversion position 360, the high-temperature and
20 high-pressure gas entering the third surface from the first pass-through position 350 is less likely to turn downward near the flow path direction conversion position 360 and heads toward the second pass-through position 352 while proceeding straight. This makes it difficult for the high-
25 temperature and high-pressure gas to head to the exhaust position 362. As a result, the temperature of the space

between the third surface and the heat sink front plate 320 rises. The same applies to the high-temperature and high-pressure gas entering the third surface from the second pass-through position 352, and the gas is less likely to turn
5 downward near the flow path direction conversion position 360 and heads toward the first pass-through position 352 while proceeding straight. In other words, the guide unit is provided for directing the high-temperature and high-pressure gas from the first exhaust route 370 and the high-temperature
10 and high-pressure gas from the second exhaust route 372 toward the third exhaust route 374. The gas (high-temperature and high-pressure gases) breaks through the synthetic resin bag 200 from the exhaust position 362, passes through the terminal assembly 250, and are discharged from
15 the terminals 252 to the outside. Therefore, as mentioned above, the terminals 252 can be considered to be external exhaust ports.

[0034] According to the present embodiment, since the

high-temperature and high-pressure gas blown out from the
20 storage battery cell 410 is released from the terminals 252 through the first exhaust route 370 and the third exhaust route 374, the route through which the high-temperature and high-pressure gas passes in the storage battery module 1000 can be made longer. The high-temperature and high-pressure
25 gas that has passed through the second exhaust route 372 is released from the terminals 252 through the third exhaust

route 374 in the same manner. Since the route through which the high-temperature and high-pressure gas passes in the storage battery module 1000 can be made longer, the cooling effect of the high-temperature and high-pressure gas is

5 enhanced, and the high-temperature and high-pressure gas can be sufficiently cooled. Since the high-temperature and high-pressure gas is sufficiently cooled, the high-temperature and high-pressure gas blown out from the battery in a thermal runaway can be prevented from being released to the outside
10 while the high-temperature and high-pressure gas is still hot, and the thermal effect on the surroundings of the storage battery module 1000 can be reduced. Further, since the flow path direction conversion position 360 is provided with a guide unit for directing the high-temperature and
15 high-pressure gas from the first exhaust route 370 and the high-temperature and high-pressure gas from the second exhaust route 372 to the third exhaust route 374, the high-temperature and high-pressure gas can be directed to the third exhaust route 374 efficiently.

20 **[0035]** Further, since the plurality of storage battery cells 410 are covered with a synthetic resin bag 200 inside the outer case 100, the waterproof performance of the storage battery module 1000 can be improved. Also, inside the outer case 100, the plurality of storage battery cells 410 are
25 covered with the synthetic resin bag 200, and the high-temperature and high-pressure gas released from the exhaust

position 362 dissolves a part of the synthetic resin bag 200 creating a hole, allowing the gas to be released mainly through the through hole to the outside. Since most of the high-temperature and high-pressure gas blown out from the storage battery cell 410 can be released to the outside through the through hole created in the synthetic resin bag 200, an increase in the air supply to the storage battery cell 410 blowing out high-temperature and high-pressure gas can be suppressed. Since the increase in the air supply to the storage battery cell 410 blowing out the high-temperature and high-pressure gas is suppressed, the occurrence of ignition can be suppressed.

[0036] Since the left side protective wall 334 and the right side protective wall 344 are provided, an increase in the air supply to the storage battery cell 410 blowing out high-temperature and high-pressure gas can be suppressed. Further, since the first outer case 100a houses the inner case 300 and the second outer case 100b does not house the inner case 300, the structure can be simplified. Further, since the first outer case 100a has a display 140 and the second outer case 100b does not have a display 140, the structure can be simplified.

[0037] The outline of one aspect of the present disclosure is as follows. A storage battery module (1000) of an aspect of the present disclosure includes: a plurality of storage battery cells (410); an inner case (300) that houses

the plurality of storage battery cells (410); an outer case (100) that houses the inner case (300); and an outer exhaust port (252) that connects a space between the inner case (300) and the outer case (100) to the outside of the outer case (100). The inner case (300) has a first surface (330), a second surface (340), and a third surface facing the outer case (100) where the first surface (330) and the second surface (340) face opposite directions and where the third surface is arranged between the first surface (330) and the second surface (340), and the inner case (300) has a first inner exhaust port (336) provided on the first surface (330) and a second inner exhaust port (346) provided on the second surface (340). Provided in a space between the inner case (300) and the outer case (100) are a first exhaust route (370) from the first inner exhaust port (336) to the flow path direction conversion position (360) on the third surface (332, 342), a second exhaust route (372) from the second inner exhaust port (346) to the flow path direction conversion position (360), and a third exhaust route from the flow path direction conversion position (360) to the outer exhaust port (252), and provided in the flow path direction conversion position (360) is a guide unit (338, 348) for directing gas from the first exhaust route (370) and gas from the second exhaust route (372) to the third exhaust route (374).

[0038] The plurality of storage battery cells (410) are

covered by a synthetic resin bag (200) inside the outer case (100).

[0039] The inner case (300) may further include a protective wall (334, 344) covering at least a portion of the lateral side of the plurality of storage battery cells 410.

[0040] The outer case (100) may include a first outer case (100a) and a second outer case (100b). The first outer case (100a) houses the inner case (300), and the second outer case (100b) covers an opening of the first outer case (100a).

[0041] The first outer case (100a) may have a display (140) for displaying the status of the plurality of storage battery cells (410). The second outer case (100b) does not have a display (140).

[0042] Some of the plurality of storage battery cells (410) are arranged in the inner case (300) such that a cathode face the first surface (330), and the rest of the plurality of storage battery cells (410) are arranged in the inner case (300) such that the cathode faces the second surface (340).

[0043] Described above is an explanation on the present disclosure based on the embodiment. Described above is an explanation on the present disclosure based on the embodiment. The embodiment is intended to be illustrative only, and it will be understood by those skilled in the art that various modifications to constituting elements and processes of the embodiment could be developed and that such

modifications are also within the scope of the present disclosure.

[INDUSTRIAL APPLICABILITY]

[0044] According to the present disclosure, high-

5 temperature and high-pressure gas blown out from a battery cell in thermal runaway can be prevented from spreading to burn other battery cells in a storage battery pack, and the gas can be cooled to the extent that adverse effects on the surroundings can be reduced so that the gas can be safely
10 released.

[REFERENCE SIGNS LIST]

[0045] 100 outer case, 110 front plate, 112
front side left plate, 114 front side right plate,
116 front side top plate, 120 back plate, 122 back
15 side left plate, 124 back side right plate, 126 back
side top plate, 130 handle, 132 handle cover, 140 display,
200 synthetic resin bag, 250 terminal assembly, 252
terminal (outer exhaust port), 300 inner case, 310
heat sink, 320 heat sink front plate, 322 heat
20 sink left plate, 324 heat sink right plate, 330 first
surface, 332 left side third surface, 334 left side
protective wall (protective wall), 336 first inner exhaust
port, 338 left side guide unit (guide unit), 340 second
surface, 342 right side third surface, 344 right side
25 protective wall (protective wall), 346 second inner exhaust
port, 348 right side guide unit (guide unit), 350 first

pass-through position, 352 second pass-through position,
360 flow path direction conversion position, 362 exhaust
position, 370 first exhaust route, 372 second
exhaust route, 374 third exhaust route, 400 battery
5 holder, 402 battery holder first surface, 404 battery holder
second surface, 410 storage battery cell, 420 inner
exhaust route, 1000 storage battery module

[CLAIMS]

1. A storage battery module comprising:

a plurality of storage battery cells;

an inner case that houses the plurality of storage battery cells;

an outer case that houses the inner case; and

an outer exhaust port that connects a space between the inner case and the outer case to the outside of the outer case, wherein

the inner case has a first surface, a second surface, and a third surface facing the outer case where the first surface and the second surface face opposite directions and where the third surface is arranged between the first surface and the second surface,

the inner case has a first inner exhaust port provided on the first surface and a second inner exhaust port provided on the second surface,

provided in a space between the inner case and the outer case are a first exhaust route from the first inner exhaust port to a flow path direction conversion position on the third surface, a second exhaust route from the second inner exhaust port to the flow path direction conversion position, and a third exhaust route from the flow path direction conversion position to the outer exhaust port, and

provided in the flow path direction conversion position

is a guide unit for directing gas from the first exhaust route and gas from the second exhaust route toward the third exhaust route.

2. The storage battery module according to claim 1, wherein

the plurality of storage battery cells are covered by a synthetic resin bag inside the outer case.

3. The storage battery module according to claim 1 or 2, wherein the inner case further include a protective wall covering at least a portion of the lateral side of the plurality of storage battery cells.

4. The storage battery module according to any one of claim 1 through claim 3, wherein

the outer case includes a first outer case and a second outer case,

the first outer case houses the inner case, and

the second outer case covers an opening of the first outer case.

5. The storage battery module according to claim 4, wherein

the first outer case has a display for displaying the status of the plurality of storage battery cells, and

the second outer case does not have the display.

6. The storage battery module according to any one of claim 1 through claim 5, wherein

some of the plurality of storage battery cells are arranged in the inner case such that a cathode faces the first surface, and

the rest of the plurality of storage battery cells are arranged in the inner case such that the cathode faces the second surface.