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(54) **FUEL CELL ELECTRIC VEHICLE**

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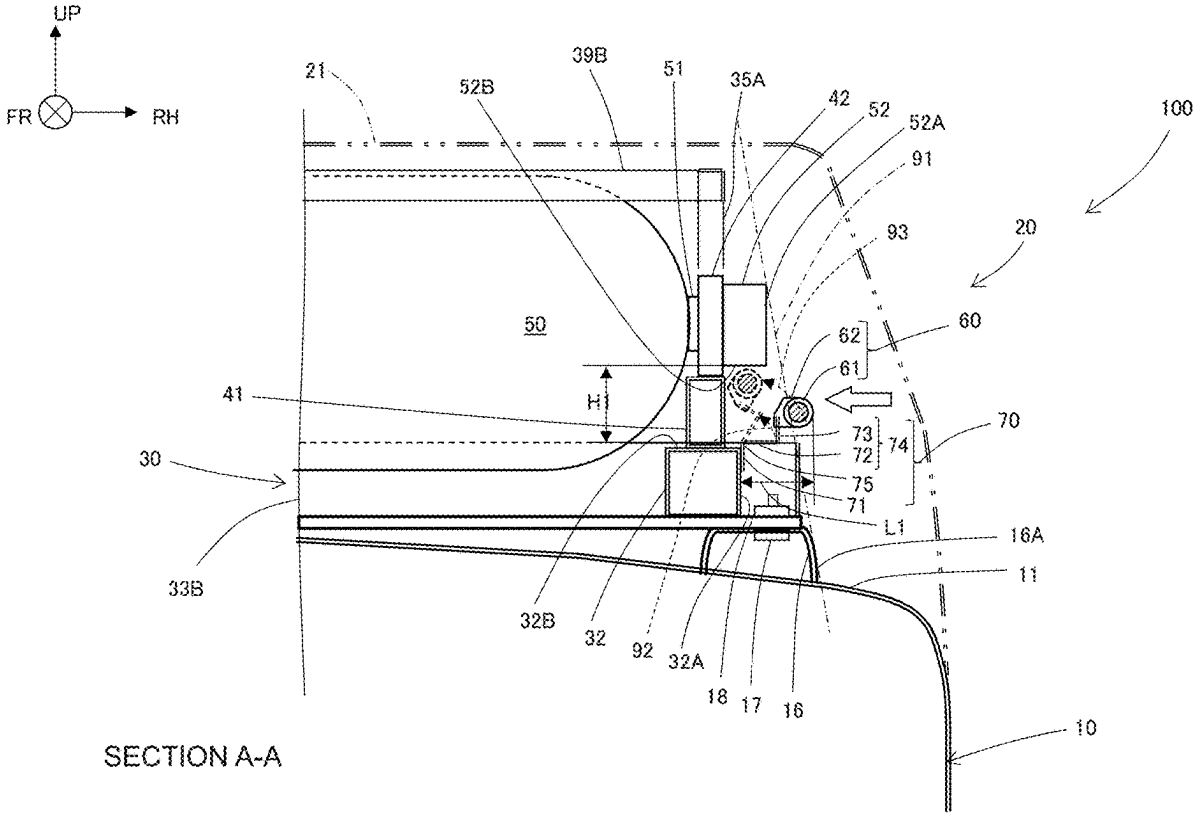
(57) **ABSTRACT**

In an electric vehicle including a frame fixed on a roof, a high-voltage cable, a bracket, and a hydrogen tank, the hydrogen tank is mounted on the frame so that the valve unit protrudes outward from the frame, and the bracket is bent and deformed inward when an impact force is applied from the outside, and stores the high-voltage cable **60** in a region located inside the outer end surface of the valve unit.



SECTION A-A

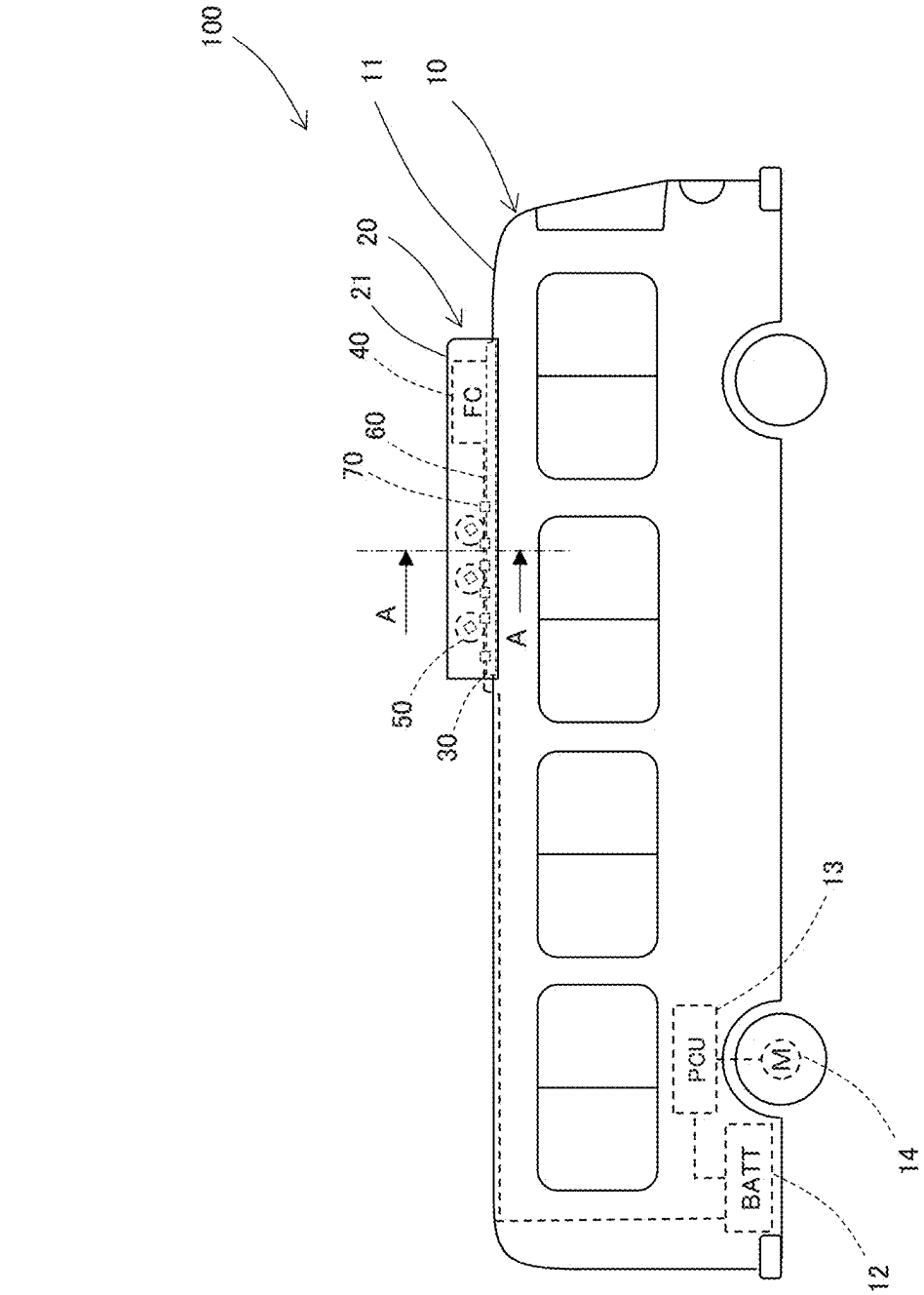


FIG. 1

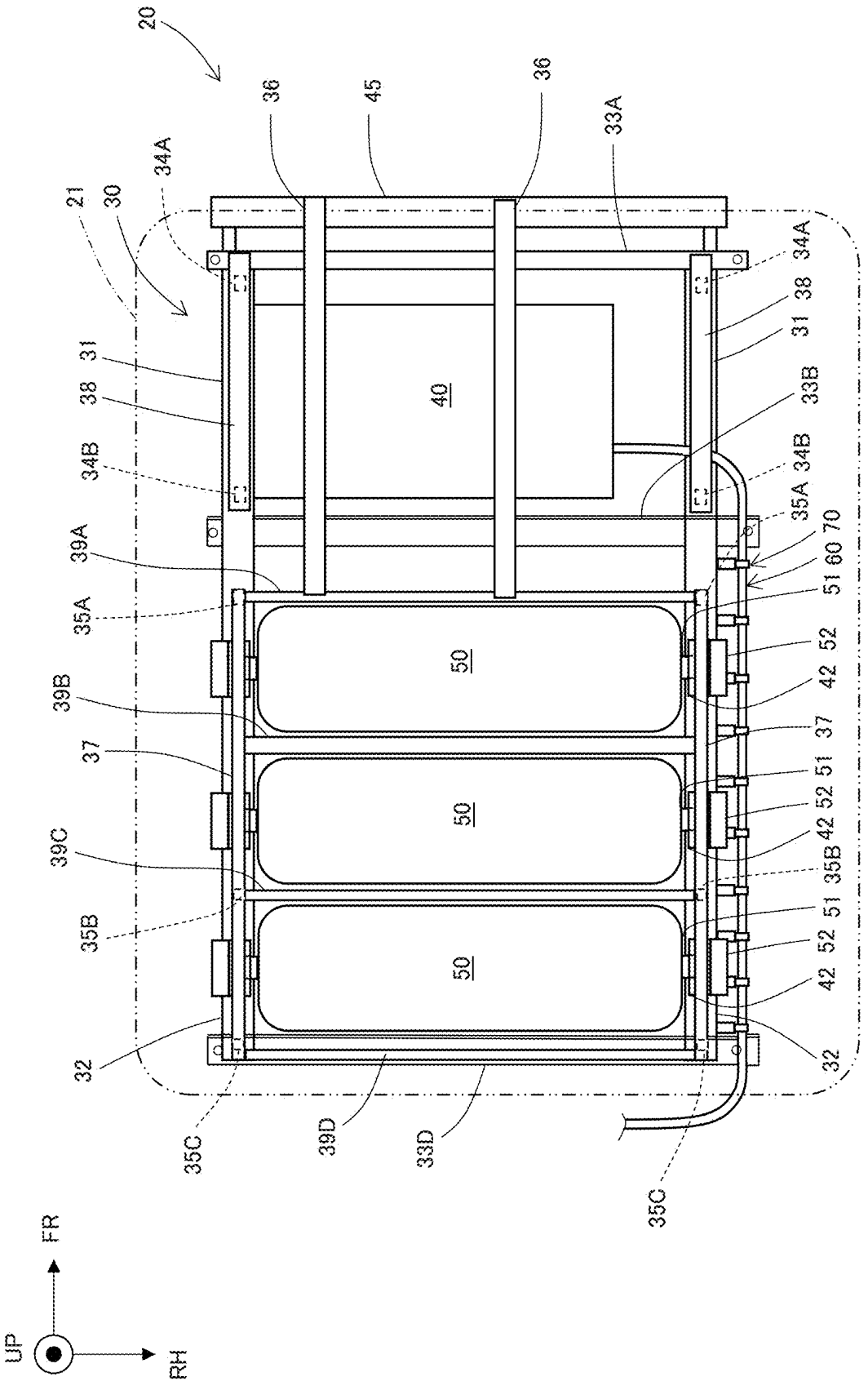

20
36
45
36
33A
34A
21
30
34A
38
31
31
38
33B
34B
34B
35A
70
60
51
39A
35A
52
42
50
39B
37
37
51
52
42
50
39C
35B
51
52
42
50
35B
32
32
35C
39D
33D
35C
FR
UP
RH

FIG. 2

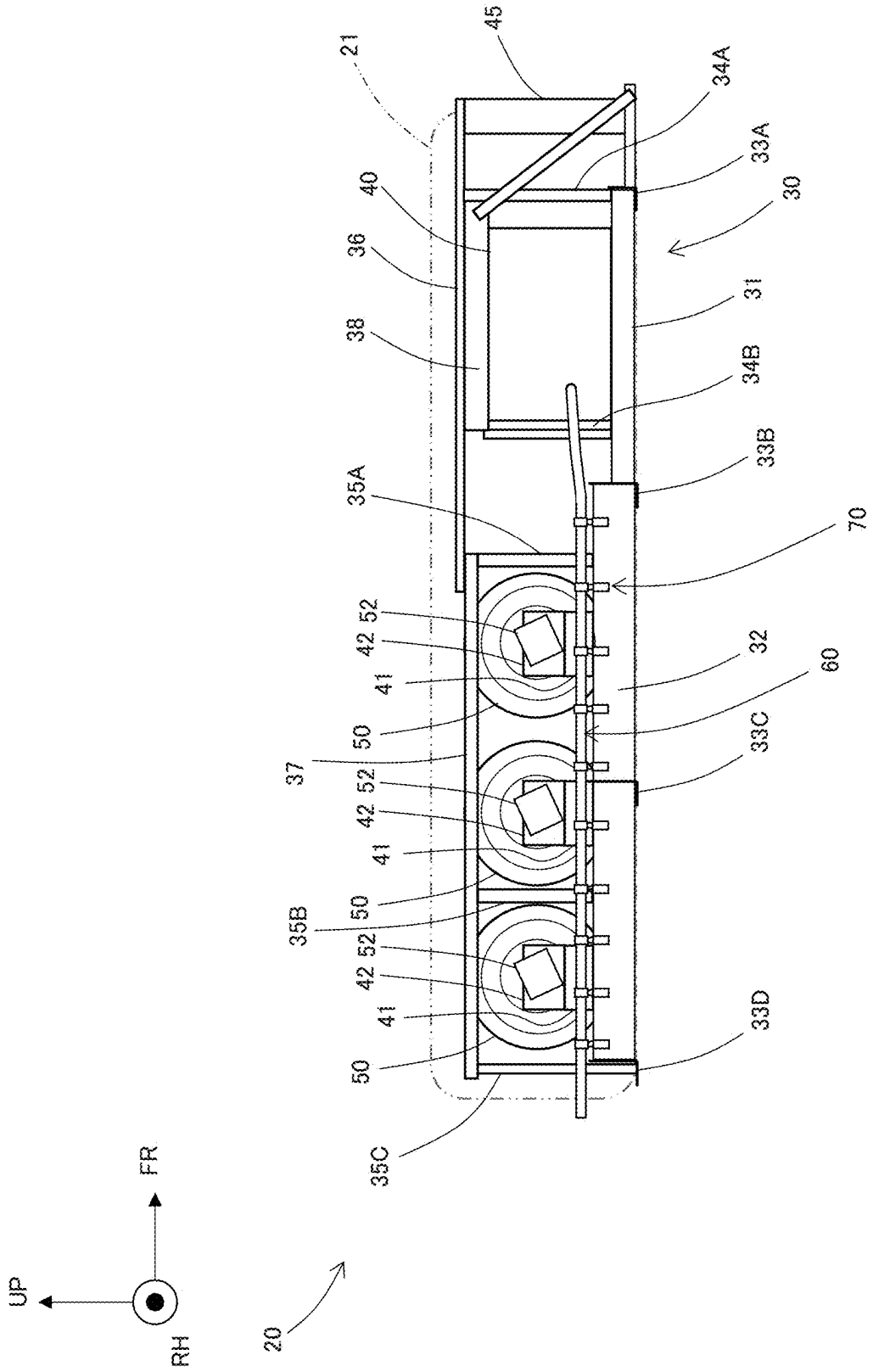

45
21
34A
33A
40
30
36
31
38
34B
33B
35A
70
52
42
41
50
32
60
37
33C
35B
35C
33D
20
FR
UP
RH

FIG.3

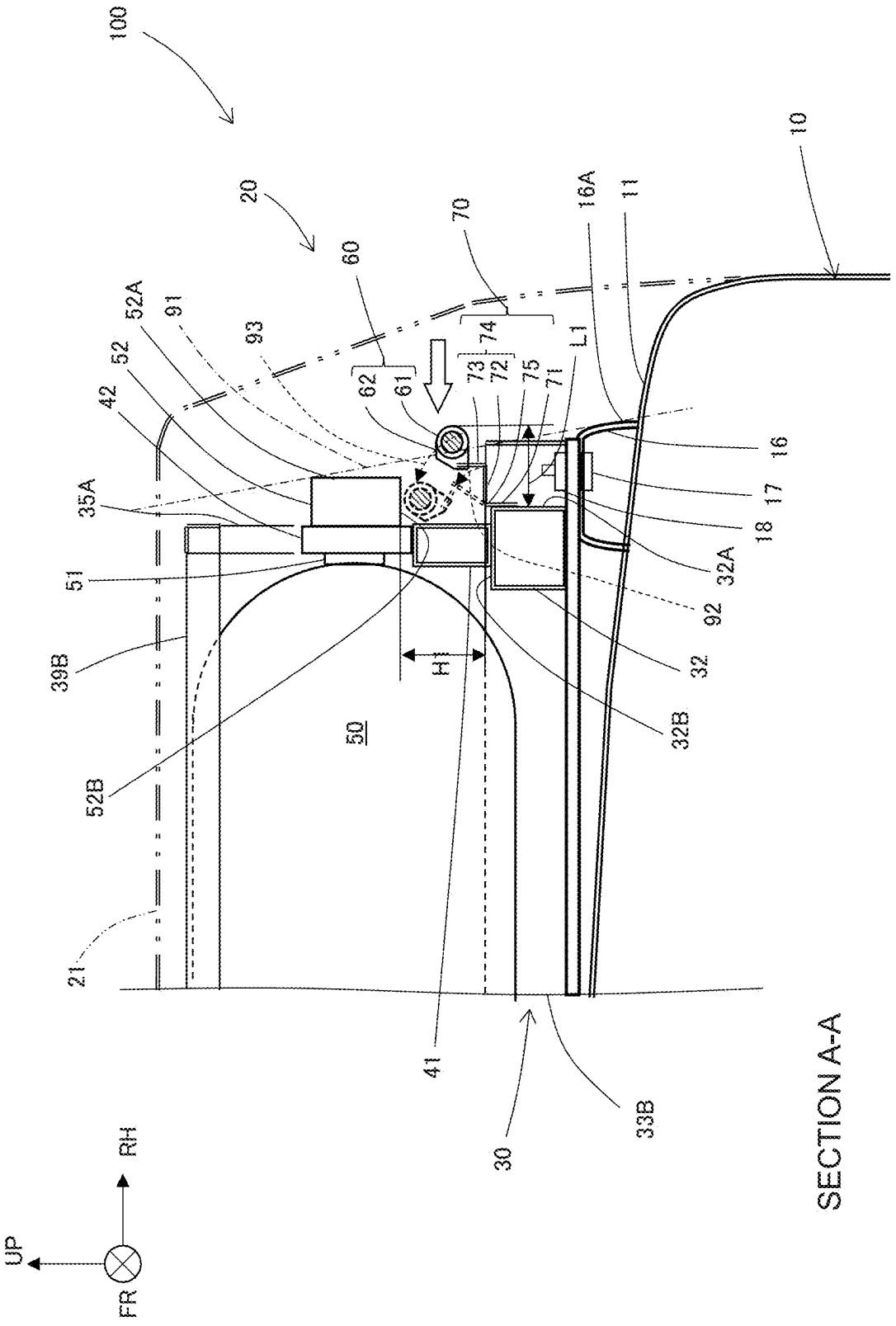

100
20
60
70
16A
11
10
52A
91
93
74
52
73
72
75
71
L1
42
62
61
16
35A
17
18
51
32A
92
39B
H1
32
50
32B
52B
21
41
30
33B
SECTION A-A
RH
UP
FR

FIG. 4

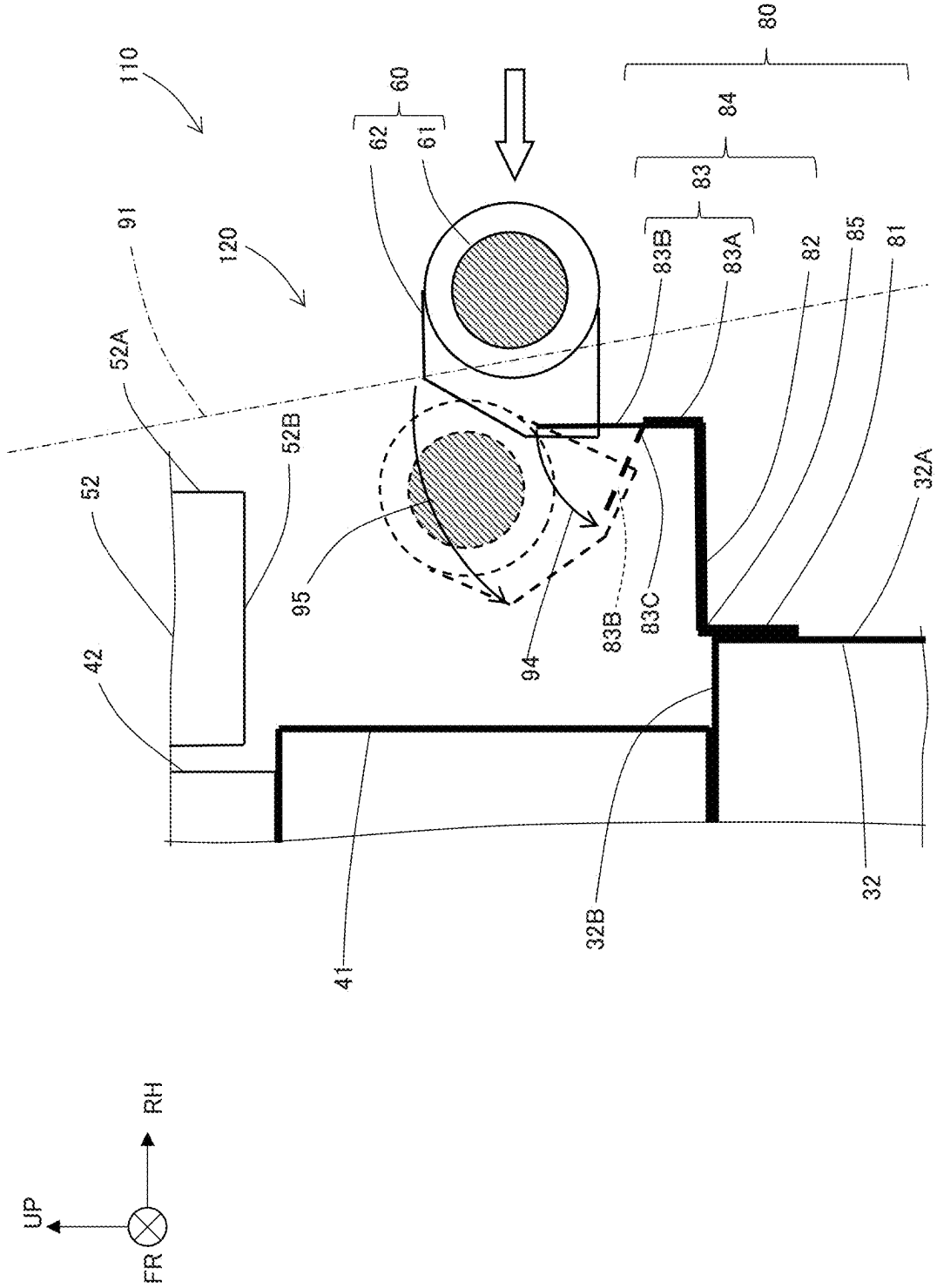

110
120
91
52A
52B
52
42
95
94
60
62
61
80
84
83
83B
83A
82
85
81
32A
83B
83C
h
41
32B
32
RH
UP
FR

FIG. 5

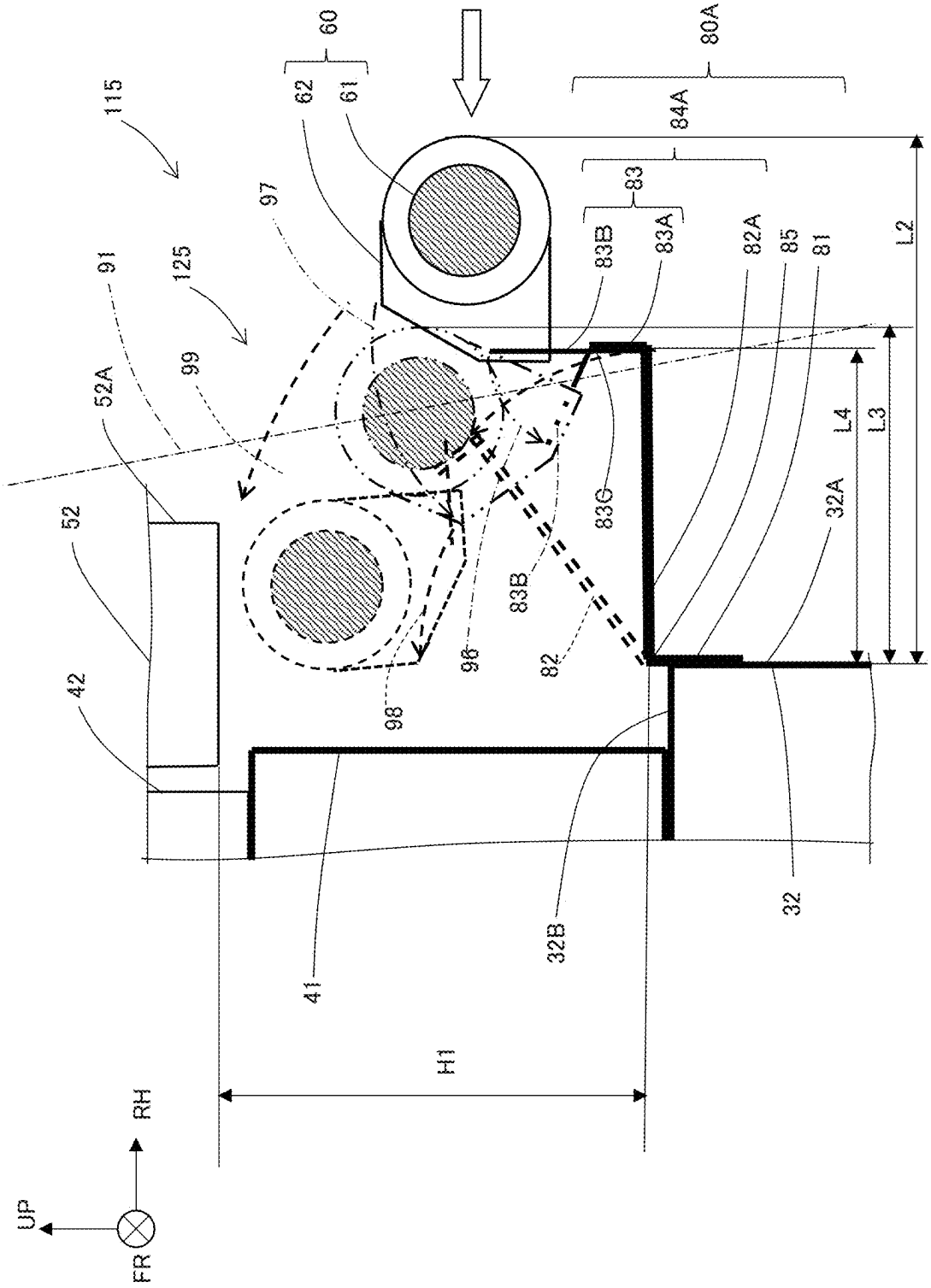

60
62
61
80A
84A
83
83B
83A
82A
85
81
L2
115
97
125
91
99
52A
52
42
L4
L3
32A
83C
83B
96
82
98
41
32B
32
H1
RH
UP
FR

FIG. 6

FUEL CELL ELECTRIC VEHICLE

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Japanese Patent Application No. 2024-017800 filed on Feb. 8, 2024, which is incorporated herein by reference in its entirety including the specification, claims, drawings, and abstract.

TECHNICAL FIELD

[0002] The present disclosure relates to a structure of a fuel cell electric vehicle in which a high voltage cable is routed on a roof.

BACKGROUND

[0003] In recent years, fuel cell electric vehicles using hydrogen as fuel have been used. For example, JP 2009-18803A discloses a fuel cell mounting bus in which a hydrogen gas tank is mounted on a roof and a fuel cell is disposed in a rear portion of a vehicle.

SUMMARY

[0004] Electric vehicles in which a gas fuel tank and high-voltage equipment are mounted on a roof have been studied. In such an electric vehicle, a high-voltage cable may be routed to a side portion on a roof. In this case, when the electric vehicle rolls, the high-voltage cable may come into contact with the ground and be damaged.

[0005] Therefore, an object of the present disclosure is to suppress damage to a high-voltage cable when an electric vehicle in which the high-voltage cable is routed on a roof rolls.

[0006] A fuel cell electric vehicle includes a frame fixed on a roof, and a high voltage cable routed along the frame in the vehicle longitudinal direction, and a bracket attached to the frame, the bracket extending outward in the vehicle width direction from the frame and configured to support the high voltage cable at the outside of the frame, and a gas fuel tank mounted on the frame such that a longitudinal direction of the gas fuel tank lies along the vehicle width direction, the gas fuel tank having a valve unit which is attached to an end, in the longitudinal direction, of the gas fuel tank. The gas fuel tank is mounted on the frame such that the valve unit protrudes further outward in the vehicle width direction than the frame. The bracket is bent and deformed toward the inside in the vehicle width direction when an impact force is applied from the outside in the vehicle width direction, to store the high-voltage cable in a region located inward of an outer end surface of the valve unit in the vehicle width direction.

[0007] Accordingly, when the fuel cell electric vehicle rolls, the high-voltage cable is stored in a region located inside the outer end surface of the valve unit due to bending deformation of the bracket, and the valve unit having high rigidity comes into contact with the ground surface, so that damage of the high-voltage cable due to contact with the ground surface can be suppressed.

[0008] In the fuel cell electric vehicle according to the present disclosure, the bracket may support the high voltage cable between an upper surface of the frame and a lower end of the valve unit and outside the outer end surface of the valve unit in the vehicle width direction, and the bracket may be bent and deformed toward the inside in the vehicle width direction when an impact force is applied from the outside in the vehicle width direction, to store the high voltage cable between the upper surface of the frame and the lower end of the valve unit and in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

[0009] According to this configuration, when the fuel cell electric vehicle rolls over, the high-voltage cable is stored between the upper surface of the high-rigidity frame and the lower end of the high-rigidity valve unit, so that a high-voltage cable survival space at the time of rolling over is secured. Therefore, damage to the high-voltage cable when the fuel cell electric vehicle rolls can be suppressed.

[0010] In the fuel cell electric vehicle according to the present disclosure, the bracket may include a fixing portion fixed to an outer surface of the frame in the vehicle width direction, and a bent portion may be bent outwardly in the vehicle width direction from an upper end of the fixing portion, and an L-shaped cable support portion that is connected to an outer side of the bent portion in the vehicle width direction, may extend upward, and may be configured to hold the high-voltage cable on an outer side, in the vehicle width direction, of an upper portion. When an impact force is applied from the outside in the vehicle width direction, the cable support portion may be pivoted inwardly in the vehicle width direction about the bent portion, to store the high voltage cable in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

[0011] With this configuration, when the fuel cell electric vehicle rolls and an impact force is input to the outside of the high voltage cable from the outside in the vehicle width direction, a rotation moment is input to the bent portion. As a result, the cable support portion rotates inward about the bent portion. And the cable support portion stores the high-voltage cable in a region located inside the outer end surface of the valve unit. As a result, damage to the high-voltage cable when the fuel cell electric vehicle rolls over can be suppressed.

[0012] In the fuel cell electric vehicle according to the present disclosure, the bracket may include a fixing portion fixed to an outer surface of the frame in the vehicle width direction, and a bent portion may be bent outwardly in the vehicle width direction from an upper end of the fixing portion, and an L-shaped cable support portion connected to an outer side of the bent portion in the vehicle width direction, extending upward, and may configured to hold the high voltage cable on an outer side, in the vehicle width direction, of an upper portion. The cable support portion may include a lateral plate connected to the bent portion and extending in the vehicle width direction, and a vertical plate extending upward from the lateral plate and configured to hold the high-voltage cable on an outer side of an upper portion in a vehicle width direction. The thickness of the upper half of the vertical plate may be smaller than the thickness of the lower half, and when an impact force is applied from the outside in the vehicle width direction, the upper half portion mat be pivoted inwardly in the vehicle width direction about a boundary between the upper half portion and the lower half portion, to store at least a portion of the high-voltage cable between the upper surface of the frame and the lower end of the valve unit and in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

[0013] In this way, the cable support portion rotates inward at the boundary between the upper half portion and the lower half portion of the cable support portion, and stores the high-voltage cable inside the landing ground entering line in the vehicle width direction. As a result, damage to the high-voltage cable when the fuel cell electric vehicle rolls over can be suppressed.

[0014] In the fuel cell electric vehicle according to the present disclosure, after the upper half portion rotates inward about a boundary between the upper half portion and the lower half portion when an impact force is applied from an outer side in a vehicle width direction, a frame support portion including the lower half portion and the horizontal plate may rotate inward about the bent portion, and the high voltage cable may be stored in a region located between an upper surface of the frame and a lower end of the valve unit and inside the outer end surface of the valve unit in the vehicle width direction.

[0015] In this way, the cable support portion can be stored in the gap between the upper surface of the frame and the lower end of the valve unit so as to fold the cable support portion by rotating the cable support portion inward about the two portions of the curved portion and the boundary between the upper half portion and the lower half portion of the cable support portion.

[0016] According to the present disclosure, it is possible to suppress damage to the high-voltage cable when the fuel cell electric vehicle in which the high-voltage cable is wired on the roof rolls.

BRIEF DESCRIPTION OF DRAWINGS

[0017] FIG. **1** is a right side view of an electric vehicle according to an embodiment;

[0018] FIG. **2** is a plan view of a power generation unit mounted on the electric vehicle according to the embodiment;

[0019] FIG. **3** is a right side view of the power generation unit mounted on the electric vehicle according to the embodiment;

[0020] FIG. **4** is a cross-sectional view of the electric vehicle according to the embodiment, and is a cross-sectional view taken along line A-A shown in FIG. **1**, illustrating deformation of the bracket when the electric vehicle rolls over;

[0021] FIG. **5** is a cross-sectional view of a bracket and a high-voltage cable of an electric vehicle according to another embodiment of the present disclosure, illustrating deformation of the bracket when the electric vehicle rolls;

[0022] FIG. **6** is a cross-sectional view of a bracket and a high-voltage cable of an electric vehicle according to another embodiment of the present disclosure, illustrating deformation of the bracket when the electric vehicle rolls.

DESCRIPTION OF EMBODIMENTS

[0023] Hereinafter, an electric vehicle **100** according to an embodiment will be described with reference to the drawings. As shown in FIG. **1**, an electric vehicle **100** includes a body **10**, a power generation unit **20**, a high-voltage battery **12**, a power control device (hereinafter referred to as a PCU) **13**, and a driving motor **14**. In the following description, the electric vehicle **100** will be described as an electric bus that is a fuel cell electric vehicle. Note that FR, UP, and RH shown in the drawings indicate a front side, an upper side, and a right side of the electric vehicle **100**, respectively. The opposite directions of FR, UP, and RH indicate the rear side, the lower side, and the left side, respectively. Hereinafter, in the case where the front-rear direction, the left-right direction, and the up-down direction are simply used, the front-rear direction, the left-right direction, and the up-down direction of the electric vehicle **100** are indicated unless otherwise specified.

[0024] The power generation unit **20** includes a frame **30**, an FC module **40**, a hydrogen tank **50**, a high-voltage cable **60**, a bracket **70**, and a casing **21**. The frame **30** is fixed on the roof **11**. The FC module **40** and the hydrogen tank **50** are mounted on the frame **30**. The high-voltage cable **60** is routed along the frame **30** in the vehicle front-rear direction. The bracket **70** is attached to the frame **30** to support the high-voltage cable **60**. The power generation unit **20** is covered by a casing **21**.

[0025] The hydrogen tank **50** is a gas fuel tank that stores hydrogen gas as gas fuel. The FC module **40** is a fuel cell module that generates power using hydrogen gas supplied from the hydrogen tank **50** as fuel. The electric power generated by the FC module **40** charges the high-voltage battery **12** at the rear portion of the electric vehicle **100** by the high-voltage cable **60**, and is supplied from the PCU **13** to the driving motor **14**. The driving motor **14** drives wheels to drive the electric vehicle **100**.

[0026] Next, a detailed structure of the power generation unit **20** will be described with reference to FIGS. **2** to **4**. As shown in FIGS. **2** to **4**, the frame **30** includes left and right front rails **31**, left and right rear rails **32**, first to fourth cross members **33**A to **33**D, left and right first and second columns **34**A and **34**B, left and right third to fifth columns **35**A, **35**B, and **35**C, left and right front upper rails **38**, left and right rear upper rails **37**, an upper connecting member **36**, and upper first to upper fourth cross members **39**A, **39**B, **39**C and **39**D.

[0027] The left and right front rails **31** and the left and right rear rails **32** are connected to each other in the vehicle front-rear direction. The height of the rear rail **32** is greater than the height of the front rail **31**. As shown in FIG. **4**, the rear rail **32** is a quadrangular closed cross-sectional member. Similarly to the rear rail **32**, the front rail **31** is also a quadrangular closed cross-sectional member.

[0028] The first cross member **33**A is an L-shaped cross-sectional member that connects the left and right front rails **31** in the vehicle width direction. The second cross member **33**B is an L-shaped cross-sectional member that connects the front ends of the left and right rear rails **32** in the vehicle width direction. The third and fourth cross members **33**C and **33**D are L-shaped cross-sectional members that connect the left and right rear rails **32** in the vehicle width direction at the center and the rear end of the rear rail **32**. The left and right front rails **31**, the left and right rear rails **32**, and the first to fourth cross members **33**A to **33**D form a square grid frame. As shown in FIG. **4**, left and right mounting rails **16** are fixed on the roof **11**, and left and right end portions of the first to fourth cross members **33**A to **33**D are fixed to the left and right mounting rails **16** by bolts **17** and nuts **18**.

[0029] The left first column **34**A stands on a front end portion of the left front rail **31**. The left second column **34**B stands on the rear end portion of the left front rail **31**. The upper ends of the first and second columns **34**A and **34**B are connected by a left front upper rail **38**. The left third to fifth columns **35**A, **35**B, and **35**C are erected on the front portion, the center portion, and the rear portion of the left rear rail **32**.

The upper ends of the third to fifth columns **35**A, **35**B, and **35**C are connected by a left rear upper rail **37**. The right first column **34**A, second column **34**B, front upper rail **38**, third to fifth columns **35**A, **35**B, and **35**C, and rear upper rail **37** have the same structures as the left columns and rails. The upper first to upper fourth cross members **39**A, **39**B, **39**C and **39**D connect the left and right rear upper rails **37**.

[0030] The FC module **40** is mounted in a region surrounded by the left front rail **31**, the right front rail **31**, the first cross member **33**A, and the second cross member **33**B. A radiator **45** is mounted in front of the left and right front rails **31**. The two upper connecting members **36** connect the upper first cross member **39**A and the upper portion of the radiator **45** in the vehicle front-rear direction. Three hydrogen tanks **50** are mounted in a region surrounded by the left rear rail **32**, the right rear rail **32***t*, the second cross member **33**B, and the fourth cross member **33**D so that the longitudinal direction thereof is along the vehicle width direction.

[0031] The hydrogen tank **50** is a cylindrical elongated member having hemispherical end plates attached to both ends thereof. A nozzle **51** protruding in the longitudinal direction is attached to the center of the end plates at both ends. The nozzle **51** communicates with the inside of the hydrogen tank **50**. A valve unit **52** is attached to a longitudinal end of the nozzle **51**. As described above, the valve unit **52** is attached to the end portion of the hydrogen tank **50** in the longitudinal direction and protrudes outward in the vehicle width direction from the end portion of the hydrogen tank **50**. The hydrogen gas stored in the hydrogen tank **50** is supplied to the FC module **40** through the nozzle **51** and the valve unit **52**. The hydrogen gas is filled into the hydrogen tank **50** through the valve unit **52** and the nozzle **51**.

[0032] Left and right pedestals **41** are fixed to upper portions of the left and right rear rails **32**. Left and right fixing clamps **42** for fixing the nozzle **51** of the hydrogen tank **50** by sandwiching the nozzle from above and below are attached to the left and right pedestals **41**. The hydrogen tank **50** is fixed on the left and right rear rails **32** by fixing the left and right nozzles **51** to the left and right fixing clamps **42**. In this manner, the hydrogen tank **50** is fixed to the left and right rear rails **32** so that the longitudinal direction thereof is disposed along the vehicle width direction.

[0033] As shown in FIG. **4**, when the hydrogen tank **50** is fixed to the left and right rear rails **32**, the outer end surfaces **52**A of the valve units **52** protrude further outward in the vehicle width direction than the outer surfaces **32**A of the left and right rear rails **32**.

[0034] The high-voltage cable **60** includes a cable main body **61** and a clamp **62** fixed to the outer periphery of the cable main body **61**. The high-voltage cable **60** is routed along the frame **30** in the vehicle front-rear direction.

[0035] The bracket **70** is attached to the frame **30** and extends outward from the frame **30** to support the high-voltage cable **60** outside the frame **30**. The bracket **70** is a strip-shaped bent plate member including a fixing portion **71**, a bent portion **75**, and a cable support portion **74**. The fixing portion **71** is a flat plate portion fixed to the outer surface **32**A of the rear rail **32**. An upper end of the fixing portion **71** protrudes slightly upward from the upper surface **32**B of the rear rail **32**. The bent portion **75** is a portion bent outward from the upper end of the fixing portion **71**. Since the upper end of the fixing portion **71** protrudes slightly upward from the upper surface **32**B of the rear rail **32**, the bent portion **75** is located slightly upward from the upper surface **32**B of the rear rail **32**. The cable support portion **74** is an L-shaped portion formed by the horizontal plate **72** and the vertical plate **73**. The horizontal plate **72** is connected to the bent portion **75** and extends in the vehicle width direction. The vertical plate **73** extends upward from the horizontal plate **72**. An inner portion of the clamp **62** of the high-voltage cable **60** is attached to an upper portion of the vertical plate **73**. Therefore, the high-voltage cable **60** is attached to the vertical plate **73** so that the cable main body **61** is located outside the vertical plate **73**.

[0036] As described above, since the bent portion **75** is located slightly above the upper surface **32**B of the rear rail **32**, the horizontal plate **72** is also located slightly above the upper surface **32**B of the rear rail **32**. The horizontal plate **72** extends from the bent portion **75** to the outside of the outer end surface **52**A of the valve unit **52**. Thus, the bracket **70** supports the high-voltage cable **60** between the upper surface **32**B of the rear rail **32** and the lower end **52**B of the valve unit **52** and outside the outer end surface **52**A of the valve unit **52** in the vehicle width direction.

[0037] As shown in FIG. **4**, the length L**1** between the bent portion **75** and the vehicle width direction outer end of the high-voltage cable **60** is shorter than the length H**1** between the bent portion **75** and the lower end **52**B of the valve unit **52**.

[0038] Next, deformation of the bracket **70** when the electric vehicle **100** configured as described above rolls and the power generation unit **20** comes into contact with the ground will be described. When the electric vehicle **100** rolls over, the ground enters a rollover ground entering line **91** (indicated by a one-dot chain line in FIG. **4**) connecting the outer surface **16**A of the mounting rail **16** fixed to the roof **11** and the upper end of the outer end surface **52**A of the valve unit **52**. At this time, a lateral impact force is applied to the high-voltage cable **60** from the vehicle width direction outer side toward the vehicle width direction center as indicated by a white arrow in FIG. **4**. Since the high-voltage cable **60** is connected to the vertical plate **73** above the horizontal plate **72** of the bracket **70**, a counterclockwise rotation moment is applied to the bent portion **75** by the impact force. Due to this rotation moment, the L-shaped cable support portion **74** is bent and deformed counterclockwise toward the vehicle width direction inner side about the bent portion **75** as indicated by broken line arrows **92** and **93** in FIG. **4**.

[0039] As described above, the length L**1** between the bent portion **75** and the outer end of the high-voltage cable **60** is shorter than the length H**1** between the bent portion **75** and the lower end **52**B of the valve unit **52**. Therefore, when the cable support portion **74** is bent and deformed toward the vehicle width direction inner side about the bent portion **75**, the high-voltage cable **60** is stored between the upper surface **32**B of the rear rail **32** and the lower end **52**B of the valve unit **52** and inside the outer end surface **52**A of the valve unit **52**, as indicated by the broken line in FIG. **4**. Since the outer end surface **52**A of the valve unit **52** having high rigidity comes into contact with the ground, the ground does not enter the vehicle width direction inner side of the rollover ground entering line **91**. Therefore, a region located between the upper surface **32**B of the rear rail **32** and the lower end **52**B of the valve unit **52** and inside the outer end surface **52**A of the valve unit **52** serves as a living space of the high-voltage cable **60** when the electric vehicle **100** rolls.

Therefore, it is possible to prevent the high-voltage cable **60** from coming into contact with the ground and being damaged when the electric vehicle **100** rolls.

[0040] Next, an electric vehicle **110** according to another embodiment will be described with reference to FIG. **5**. The same parts as those of the electric vehicle **100** described with reference to FIGS. **1** to **4** are denoted by the same reference numerals, and description thereof will be omitted.

[0041] As shown in FIG. **5**, in the electric vehicle **110**, a power generation unit **120** is mounted on a roof **11**. The power generation unit **120** has the same configuration as the power generation unit **20** except that the high-voltage cable **60** is supported by a bracket **80** instead of the bracket **70** described with reference to FIGS. **1** to **4**.

[0042] As illustrated in FIG. **5**, the bracket **80** is a strip-shaped bent plate member including a fixing portion **81**, a bent portion **85**, and a cable support portion **84**. The cable support portion **84** is an L-shaped portion formed by the horizontal plate **82** and the vertical plate **83**. Since the configurations of the fixing portion **81**, the bent portion **85**, and the horizontal plate **82** are the same as those of the fixing portion **71**, the bent portion **75**, and the horizontal plate **72** of the bracket **70**, description thereof will be omitted.

[0043] The vertical plate **83** includes a lower half portion **83**A having the same thickness as that of the horizontal plate **82** and an upper half portion **83**B having a thickness smaller than that of the lower half portion **83**A. An inner portion of the clamp **62** of the high-voltage cable **60** is attached to an upper portion of the upper half portion **83**B. Therefore, the high-voltage cable **60** is attached to the upper half portion **83**B such that the cable main body **61** is located outside the vertical plate **83**.

[0044] When the electric vehicle **110** configured as described above rolls over, a lateral impact force is applied to the high-voltage cable **60** from the vehicle width direction outer side toward the vehicle width direction center as indicated by a white arrow in FIG. **5**. Since the high-voltage cable **60** is connected to the upper portion of the upper half portion **83**B, a counterclockwise rotation moment is applied to the upper half portion **83**B by the impact force. This rotational moment concentrates on the boundary **83**C between the upper half portion **83**B and the lower half portion **83**A where the thickness has changed. Therefore, the upper half portion **83**B is bent and deformed counterclockwise toward the vehicle width direction inner side about the boundary **83**C by the impact force as indicated by arrows **94** and **95** in FIG. **5**. Accordingly, as indicated by a broken line in FIG. **5**, a part of the high-voltage cable **60** is stored in a region located between the upper surface **32**B of the rear rail **32** and the lower end **52**B of the valve unit **52** and inside the outer end surface **52**A of the valve unit **52**. In addition, the high-voltage cable **60** as a whole is stored on the inner side of the rollover ground entering line **91**. Accordingly, it is possible to prevent the high-voltage cable **60** from coming into contact with the ground and being damaged when the electric vehicle **110** rolls.

[0045] Next, an electric vehicle **115** according to another embodiment will be described with reference to FIG. **6**. The same parts as those of the electric vehicle **110** described with reference to FIG. **4** are denoted by the same reference numerals, and description thereof will be omitted.

[0046] As shown in FIG. **6**, in an electric vehicle **115**, a power generation unit **125** is mounted on a roof **11**. The power generation unit **125** has the same configuration as the power generation unit **120** except that the high-voltage cable **60** is supported by a bracket **80**A instead of the bracket **80** described with reference to FIG. **4**.

[0047] The bracket **80**A has a horizontal plate **82**A and a vertical plate **83**. The length of the horizontal plate **82**A is longer than the length of the horizontal plate **82** of the bracket **80**. Therefore, the position of the high-voltage cable **60** supported by the bracket **80**A is located outside the position of the high-voltage cable **60** supported by the bracket **80**. Here, the length L**4** of the horizontal plate **82** is shorter than the length H**1** between the bent portion **85** and the lower end **52**B of the valve unit **52**. The length L**2** between the bent portion **85** and the outer end of the high-voltage cable **60** is longer than the length H**1** between the bent portion **85** and the lower end **52**B of the valve unit **52**. The configuration of other parts of the bracket **80**A is the same as the configuration of the bracket **80** described with reference to FIG. **4**.

[0048] When the electric vehicle **115** configured as described above rolls over, as in the case of the rollover of the electric vehicle **110** described with reference to FIG. **5**, the upper half portion **83**B bends and deforms counterclockwise inward about the boundary **83**C as indicated by the arrows **96** and **97** of the one-dot chain line in FIG. **6** by the impact force. However, since the length of the horizontal plate **82**A is longer than that of the horizontal plate **82**, a part of the high-voltage cable **60** is stored in a region located inward of the rollover ground entering line **91**, but the other part of the high-voltage cable **60** is not stored in a region located inward of the rollover ground entering line **91**. For this reason, a part thereof remains on the outer side of the rollover ground entering line **91**, and an impact force toward the inner side continues to be applied to the high-voltage cable **60**. Then, as with the bracket **70** described with reference to FIG. **4**, the L-shaped cable support portion **84**A is bent and deformed counterclockwise inward about the bent portion **85** as indicated by the broken arrows **98** and **99** in FIG. **6** by the impact force.

[0049] As shown in FIG. **6**, the length between the bent portion **85** and the outer end of the high-voltage cable **60** when the upper half portion **83**B is bent and deformed is a length L**3** shorter than the initial length L**2**. The length L**3** is shorter than the length H**1** between the bent portion **85** and the lower end **52**B of the valve unit **52**. As described above, since the length L**3** is shorter than the length H**1**, when the cable support portion **84**A is bent and deformed counterclockwise toward the vehicle inner side about the bent portion **85**, the high-voltage cable **60** is stored in a region located between the upper surface **32**B of the rear rail **32** and the lower end **52**B of the valve unit **52** and further inward than the outer end surface **52**A of the valve unit **52**. Accordingly, it is possible to prevent the high-voltage cable **60** from coming into contact with the ground and being damaged when the electric vehicle **115** rolls.

[0050] In the above description, the gas fuel tank is the hydrogen tank **50** that stores the hydrogen gas, and the FC module **40** is a fuel cell module that generates power using the hydrogen gas supplied from the hydrogen tank **50** as fuel. However, a configuration other than this embodiment may be employed. For example, the FC module **40** may generate electric power by a fuel cell using natural gas as fuel, and the gas fuel tank may be configured by a natural gas tank.

[0051] In addition, in the above description, the electric vehicle **100** has been described as an electric bus, but is not limited thereto, and may be, for example, an electric truck, an electric SUV, an electric commercial vehicle, or the like as long as it is a fuel cell electric vehicle in which the power generation unit **20** is mounted on the roof **11**.

1. A fuel cell electric vehicle comprising:

a frame fixed on a roof;

a high voltage cable routed along the frame in the vehicle longitudinal direction;

a bracket attached to the frame, the bracket extending outward in the vehicle width direction from the frame and configured to support the high voltage cable at the outside of the frame; and

a gas fuel tank mounted on the frame such that a longitudinal direction of the gas fuel tank lies along the vehicle width direction, the gas fuel tank having a valve unit which is attached to an end, in the longitudinal direction, of the gas fuel tank; wherein

the gas fuel tank is mounted on the frame such that the valve unit protrudes further outward in the vehicle width direction than the frame, and

the bracket is bent and deformed toward the inside in the vehicle width direction when an impact force is applied from the outside in the vehicle width direction, to store the high-voltage cable in a region located inward of an outer end surface of the valve unit in the vehicle width direction.

2. The fuel cell electric vehicle according to claim **1**, wherein

the bracket supports the high voltage cable between an upper surface of the frame and a lower end of the valve unit and outside the outer end surface of the valve unit in the vehicle width direction, and

the bracket is bent and deformed toward the inside in the vehicle width direction when an impact force is applied from the outside in the vehicle width direction, to store the high voltage cable between the upper surface of the frame and the lower end of the valve unit and in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

3. The fuel cell electric vehicle according to claim **1**, wherein

the bracket comprises;

a fixing portion fixed to an outer surface of the frame in the vehicle width direction,

a bent portion bent outwardly in the vehicle width direction from an upper end of the fixing portion, and

an L-shaped cable support portion that is connected to an outer side of the bent portion in the vehicle width direction, extends upward, and is configured to hold the high-voltage cable on an outer side, in the vehicle width direction, of an upper portion, wherein

when an impact force is applied from the outside in the vehicle width direction, the cable support portion is pivoted inwardly in the vehicle width direction about the bent portion, to store the high voltage cable in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

4. The fuel cell electric vehicle according to claim **2**, wherein

the bracket comprises;

a fixing portion fixed to an outer surface of the frame in the vehicle width direction,

a bent portion bent outwardly in the vehicle width direction from an upper end of the fixing portion, and

an L-shaped cable support portion that is connected to an outer side of the bent portion in the vehicle width direction, extends upward, and is configured to hold the high-voltage cable on an outer side, in the vehicle width direction, of an upper portion, wherein

when an impact force is applied from the outside in the vehicle width direction, the cable support portion is pivoted inwardly in the vehicle width direction about the bent portion, to store the high voltage cable in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

5. The fuel cell electric vehicle according to claim **1**, wherein

the bracket comprises,

a fixing portion fixed to an outer surface of the frame in the vehicle width direction,

a bent portion bent outwardly in the vehicle width direction from an upper end of the fixing portion, and

an L-shaped cable support portion connected to an outer side of the bent portion in the vehicle width direction, extending upward, and configured to hold the high voltage cable on an outer side, in the vehicle width direction, of an upper portion,

the cable support portion comprises,

a lateral plate connected to the bent portion and extending in the vehicle width direction, and

a vertical plate extending upward from the lateral plate and configured to hold the high-voltage cable on an outer side of an upper portion in a vehicle width direction,

the thickness of the upper half of the vertical plate is smaller than the thickness of the lower half, and

when an impact force is applied from the outside in the vehicle width direction, the upper half portion is pivoted inwardly in the vehicle width direction about a boundary between the upper half portion and the lower half portion, to store at least a portion of the high-voltage cable between the upper surface of the frame and the lower end of the valve unit and in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

6. The fuel cell electric vehicle according to claim **2**, wherein

the bracket comprises,

a fixing portion fixed to an outer surface of the frame in the vehicle width direction,

a bent portion bent outwardly in the vehicle width direction from an upper end of the fixing portion, and

an L-shaped cable support portion connected to an outer side of the bent portion in the vehicle width direction, extending upward, and configured to hold the high voltage cable on an outer side, in the vehicle width direction, of an upper portion,

the cable support portion comprises,

a lateral plate connected to the bent portion and extending in the vehicle width direction, and

a vertical plate extending upward from the lateral plate and configured to hold the high-voltage cable on an outer side of an upper portion in a vehicle width direction,

the thickness of the upper half of the vertical plate is smaller than the thickness of the lower half, and

when an impact force is applied from the outside in the vehicle width direction, the upper half portion is pivoted inwardly in the vehicle width direction about a boundary between the upper half portion and the lower half portion, to store at least a portion of the high-voltage cable between the upper surface of the frame and the lower end of the valve unit and in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

7. The fuel cell electric vehicle according to claim **5**, wherein

after the upper half portion is pivoted inwardly in the vehicle width direction about the boundary between the upper half portion and the lower half portion when an impact force is applied from the outside in the vehicle width direction,

the cable support portion including the lower half portion and the lateral plate is pivoted inwardly in the vehicle width direction about the bent portion, and

the high voltage cable is stored between the upper surface of the frame and the lower end of the valve unit in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

8. The fuel cell electric vehicle according to claim **6**, wherein

after the upper half portion is pivoted inwardly in the vehicle width direction about the boundary between the upper half portion and the lower half portion when an impact force is applied from the outside in the vehicle width direction,

the cable support portion including the lower half portion and the lateral plate is pivoted inwardly in the vehicle width direction about the bent portion, and

the high voltage cable is stored between the upper surface of the frame and the lower end of the valve unit in the region located inward of the outer end surface of the valve unit in the vehicle width direction.

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