Claims

[Claim 1]

A power supply device provided in an automatic steering vehicle having a vehicle body, and a bogie including a running wheel allowing the vehicle body to run on a track and a steering device capable of automatically steering the running wheel, the power supply device comprising:

a primary power supply system that supplies power to a motor that rotationally drives the running wheel;

a voltage converter unit that converts a voltage by supplying a part of the power of the primary power supply system;

a secondary power supply system that supplies the power converted by the voltage converter unit to the steering device; and

a primary backup power supply capable of supplying the power to the voltage converter unit when the voltage of the power detected by the primary power supply system is smaller than a predetermined value,

the primary backup power supply supplies power, which is required until the automatic steering vehicle makes a stop, to the voltage converter unit.

[Claim 2]

The power supply device according to claim 1, further comprising:

a secondary backup power supply that is provided in the secondary power supply system to supply the power to the steering device,

wherein the secondary backup power supply is capable of supplying the power to the steering device when the voltage of the power detected by the voltage converter unit is smaller than a predetermined value.

[Claim 3]

The power supply device according to claim 2,

wherein the secondary backup power supply has a battery management system that manages a state of the secondary backup power supply.

[Claim 4]

The power supply device according to claim 3,

wherein the battery management system operates a safety brake device provided on the bogie to apply a braking force to the running wheel when a voltage of the power capable of being supplied from the secondary backup power supply to the steering device is smaller than a predetermined value.

[Claim 5]

The power supply device according to any one of claims 2 to 4,

wherein the steering device includes an actuator that steers the running wheel and a sensor for determining an amount of operation of the actuator,

the secondary power supply system includes a steering system that supplies the power to the actuator and a sensor system that supplies the power to the sensor, and

the secondary backup power supply is provided in each of the steering system and the sensor system.

[Claim 6]

The power supply device according to claim 5,

wherein the power is capable of being supplied in parallel from the voltage converter unit to the steering system and the sensor system.

[Claim 7]

The power supply device according to claim 5 or 6,

wherein the secondary backup power supply is provided on the bogie.

[Claim 8]

The power supply device according to any one of claims 5 to 7,

wherein the secondary backup power supply provided in the steering system is provided so as to be capable of absorbing

an external force applied to the actuator as regenerative power.

[Claim 9]

The power supply device according to any one of claims 5 to 8,

wherein the steering system and the sensor system are provided in a pair in correspondence with the bogie provided at a front portion of the vehicle body in a running direction and the bogie provided at a rear portion of the vehicle body in the running direction,

the secondary backup power supply provided in each of the pair of steering systems is capable of supplying the power to any of the pair of steering systems, and

the secondary backup power supply provided in each of the pair of sensor systems is capable of supplying the power to any of the pair of sensor systems.

[Claim 10]

The power supply device according to any one of claims 1 to 9,

wherein the voltage converter unit has a relay that operates a safety brake device that is provided on the bogie to apply a braking force to the running wheel when the voltage of the power detected by the voltage converter unit is smaller than a predetermined value.

[Claim 11]

The power supply device according to any one of claims 1 to 10,

wherein the primary power supply system has a relay that operates a safety brake device that is provided on the bogie to apply a braking force to the running wheel when the voltage of the power detected by the primary power supply system is smaller than a predetermined value.

[Claim 12]

An automatic steering vehicle comprising:

the power supply device according to any one of claims 1 to 11;

a bogie having a running wheel capable of being rotationally driven by power from the power supply device and a steering device capable of automatically steering the running wheel by the power; and

a vehicle body provided with the bogie.

[Claim 13]

A power supply method to an automatic steering vehicle having a vehicle body, and a bogie including a running wheel allowing the vehicle body to run on a track and a steering device capable of automatically steering the running wheel, the power supply method comprising:

a step of supplying power to a motor that rotationally drives the running wheel, by a primary power supply system;

a step of converting a voltage with a voltage converter unit by supplying a part of the power of the primary power supply system;

a step of supplying the power converted by the voltage converter unit to the steering device; and

a step of supplying power to the voltage converter unit by a primary backup power supply when the voltage of the power detected by the primary power supply system is smaller than a predetermined value,

in the step of supplying power to the voltage converter unit by the primary backup power supply, the primary backup power supply supplies power, which is required until the automatic steering vehicle makes a stop, to the voltage converter unit.

[Claim 14]

The power supply method according to claim 13, further comprising:

a step of supplying power from a secondary backup power supply to the steering device when the voltage of the power detected by the voltage converter unit is smaller than a predetermined value.

[Claim 15]

The power supply method according to claim 14, further comprising:

a step of applying a braking force to the running wheel when a voltage of the power capable of being supplied from the secondary backup power supply to the steering device is smaller than a predetermined value.