CLAIMS

1. A charging device comprising:

a charging unit configured to charge a power storage functional unit provided in a vehicle stopping in a rectangular predefined area;

a measuring unit capable of measuring a vertical distance to a point in a first plane that is provided in a first position serving as a roof or a bottom of the vehicle, and that has a gradient of a first angle with respect to a horizontal plane toward an orthogonal direction orthogonal to a traveling direction of the vehicle; and

a detecting unit configured to detect an angle of inclination of the vehicle with respect to a longitudinal direction of the predefined area based on a first difference, a distance, and the first angle, the first distance being a distance between a first vertical distance to a first point in the first plane and a second vertical distance to a second point in the first plane having a position in the traveling direction different from that of the first point, the distance being a distance between the first point and the second point.

2. The charging device according to claim 1, wherein

the measuring unit is capable of measuring a vertical distance to a point in a second plane that is provided on a fore side in the traveling direction than the first plane in the first position, and that has no gradient, and

the detecting unit is configured to detect a positional deviation of the vehicle with respect to a lateral direction of the predefined area based on a second difference, a reference value, and the first angle, the second difference being a difference between a vertical

distance to a point in the second plane and a vertical distance to a point in the first plane having the same position in the orthogonal direction as that of the point in the second plane, the reference value being a reference value of the second difference in a case where the vehicle has stopped in the predefined area.

3. The charging device according to claim 2, wherein

the measuring unit is capable of measuring vertical distances to points in a third plane and in the first plane, the third plane being provided on an aft side in the traveling direction than the first plane in the first position, and that is parallel to the first plane,

a third difference of the third plane relative to the first plane in a vertical direction from the first position is larger than an upper limit of the first difference, and

the detecting unit is configured to determine that the positional deviation of the vehicle with respect to the longitudinal direction has been eliminated when the third difference is reached by a difference between the vertical distance to the point in the first plane measured by the measuring unit and a vertical distance measured by the measuring unit after the vertical distance has been measured.

4. The charging device according to claim 3, wherein

the measuring unit comprises a first measuring unit capable of measuring vertical distances to points in the third plane and the first plane and a second measuring unit that is provided closer than the first measuring unit to an entrance side of the predefined area, and that is capable

of measuring vertical distances to points in the first plane and the third plane, and

the detecting unit is configured to determine that a position of the vehicle with respect to the longitudinal direction have come close to a position where the charging unit is allowed to perform the charging when the third difference is reached by a difference between a vertical distance to a point in the first plane measured by the second measuring unit and a vertical distance measured by the second measuring unit after the vertical distance has been measured, and is configured to determine that the positional deviation of the vehicle with respect to the longitudinal direction has been eliminated when the third difference is reached by a difference between a vertical distance to a point in the first plane measured by the first measuring unit and a vertical distance measured by the first measuring unit after the vertical distance has been measured.

5. The charging device according to claim 4, wherein

the second measuring unit is capable of measuring a vertical distance to a point in a fourth plane that is provided on an aft side in the traveling direction than the third plane in the first position, and that is parallel to the first plane,

the fourth plane differs from the third plane at least in position in the vertical direction from the first position, and

the detecting unit is configured to detect the positional deviation of the vehicle with respect to the longitudinal direction when the detecting unit detects that no positional deviation of the vehicle is present with

respect to the longitudinal direction and then the vertical distance measured by the second measuring unit changes before the charging unit charges the power storage functional unit.

6. The charging device according to any one of claims 1 to 5, wherein the detecting unit is configured to detect the positional deviation of the vehicle with respect to the predefined area when the detected inclination of the vehicle exceeds a predetermined angle.

7. The charging device according to claim 5, wherein the detecting unit is configured to transmit information on the angle of inclination of the vehicle with respect to the longitudinal direction of the predefined area, the positional deviation of the vehicle with respect to the lateral direction of the predefined area, and the positional deviation of the vehicle with respect to the longitudinal direction of the predefined area, to a display unit of the vehicle through wireless communication.

8. The charging device according to claim 5, wherein

the first measuring unit and the second measuring unit are provided in the first position in an order of the second plane, the first plane, the third plane, the fourth plane, and a fifth plane from a front side of the vehicle along the traveling direction, and

the fifth plane is provided closer than the fourth plane to an exit side of the predefined area in the longitudinal direction of the predefined area, and has no gradient with respect to the horizontal plane.

9. A charging device comprising:

a charging unit configured to charge a power storage functional unit provided in a vehicle stopping in a rectangular predefined area;

a measuring unit that is provided on a roof of the vehicle, and that is configured to measure a vertical distance to a point in a first plane that is provided above the vehicle stopping in the predefined area, and that has a gradient of a first angle with respect to a horizontal plane toward a lateral direction of the predefined area; and

a detecting unit configured to detect an angle of inclination of the vehicle with respect to a longitudinal direction of the predefined area based on a first difference, a distance, and the first angle, the first difference being a difference between a first vertical distance to a first point in the first plane and a second vertical distance to a second point in the first plane having a position in the longitudinal direction of the predefined area different from that of the first point, the distance being a distance between the first point and the second point.

10. A positional deviation detection method comprising:

measuring a vertical distance to a point in a first plane that is provided in a first position serving as a roof or a bottom of a vehicle stopping in a rectangular predefined area and being charged, and that has a gradient of a first angle with respect to a horizontal plane toward an orthogonal direction orthogonal to a traveling direction of the vehicle; and

detecting an angle of inclination of the vehicle with respect to the longitudinal direction based on a first difference, a distance, and the first angle, the first difference being a difference between a first vertical distance to a first point in the first plane and a second vertical distance to a second point in the first plane having a position in the traveling direction different from that of the first point, the distance being a distance between the first point and the second point.