CLAIMS

1. A passenger boarding bridge comprising:

a rotunda connected to a terminal building ~~and supported in a horizontally rotatable manner~~;

a tunnel unit whose proximal end is connected to the rotunda, the tunnel unit being extendable and retractable, the tunnel unit being rotated about the rotunda;

a travel device that supports the tunnel unit and includes travel wheels configured to travel forward and backward, the travel device being configured such that a travel direction of forward travel of the travel wheels and a travel direction of backward travel of the travel wheels are changeable;

a cab provided at a distal end of the tunnel unit, the cab being configured to be docked with an aircraft; and

a determiner configured to, at a time before undocking the cab docked with the aircraft from the aircraft, perform determination whether or not the travel direction of the backward travel of the travel wheels at the time is a direction within a smooth undocking range.

2. The passenger boarding bridge according to claim 1, wherein

in a case where,

in a plan view, an angle formed by an axis of the travel wheels, the angle being calculated clockwise with respect to a center line of the tunnel unit before undocking the cab from the aircraft, is an angle Wr, and

in the plan view, an angle obtained by adding 90 degrees to an angle that is formed by a tangent line and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft is an angle Wt, the tangent line extending horizontally and touching a cab-docked part of the aircraft,

the determiner is configured to perform the determination whether or not the travel direction of the backward travel of the travel wheels is a direction within the smooth undocking range based on whether or not the angle Wr is within an angle range that is set based on predetermined information within a range less than the angle Wt.

3. The passenger boarding bridge according to claim 1, wherein

in a case where,

in a plan view, an angle formed by an axis of the travel wheels, the angle being calculated clockwise with respect to a center line of the tunnel unit before undocking the cab

from the aircraft, is an angle Wr, and

in the plan view, an angle obtained by adding 90 degrees to an angle that is formed by a straight line and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft is an angle Wt, the straight line extending along a distal end edge of the cab,

the determiner is configured to perform the determination whether or not the travel direction of the backward travel of the travel wheels is a direction within the smooth undocking range based on whether or not the angle Wr is within an angle range that is set based on predetermined information within a range less than the angle Wt.

4. The passenger boarding bridge according to claim 1, wherein

in a case where,

in a plan view, an angle formed by an axis of the travel wheels, the angle being calculated clockwise with respect to a center line of the tunnel unit before undocking the cab from the aircraft, is an angle Wr, and

in the plan view, an angle obtained by adding 90 degrees to an angle that is formed by a fuselage guide line on an apron and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft is an angle Wt,

the determiner is configured to perform the determination whether or not the travel direction of the backward travel of the travel wheels is a direction within the smooth undocking range based on whether or not the angle Wr is within an angle range that is set based on predetermined information within a range less than the angle Wt.

5. The passenger boarding bridge according to claim 1, wherein

in a case where,

in a plan view, an angle formed by an axis of the travel wheels, the angle being calculated clockwise with respect to a center line of the tunnel unit before undocking the cab from the aircraft, is an angle Wr, and

in the plan view, an angle obtained by adding 90 degrees to an angle that is formed by an aircraft axis line of the aircraft and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft is an angle Wt,

the determiner is configured to perform the determination whether or not the travel direction of the backward travel of the travel wheels is a direction within the smooth undocking range based on whether or not the angle Wr is within an angle range that is set based on

predetermined information within a range less than the angle Wt.

6. The passenger boarding bridge according to any one of claims 2 to 5, wherein

the predetermined information is information about an angle range that is excluded from the range less than the angle Wt and that is preset in accordance with an aircraft type of the aircraft.

7. The passenger boarding bridge according to claim 1, wherein

the smooth undocking range is an angle range that is, in a plan view, not less than 90 degrees as calculated clockwise with respect to a center line of the tunnel unit before undocking the cab from the aircraft, and is, in the plan view, set based on predetermined information within a range less than an angle that is obtained by adding 180 degrees to one of the following angles:

an angle that is formed by a tangent line and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft, the tangent line extending horizontally and touching a cab-docked part of the aircraft;

an angle that is formed by a straight line and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft, the straight line extending along a distal end edge of the cab;

an angle that is formed by a fuselage guide line on an apron and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft; and

an angle that is formed by an aircraft axis line of the aircraft and that is calculated clockwise with respect to the center line of the tunnel unit before undocking the cab from the aircraft.

8. The passenger boarding bridge according to any one of claims 1 to 7, wherein

the determiner is configured to perform the determination when an undocking command is inputted,

the travel device is configured to:

in a case where a result of the determination performed by the determiner indicates that the travel direction of the backward travel of the travel wheels is a direction within the smooth undocking range, perform automatic travel in which the travel device travels backward by a predetermined distance without changing a facing direction of the travel wheels and then travels backward to a predetermined standby position; and

in a case where the result of the determination performed by the determiner indicates that the travel direction of the backward travel of the travel wheels is not a direction within the smooth undocking range, not perform the automatic travel, and

the passenger boarding bridge further comprises a warning unit configured to perform warning in the case where the result of the determination performed by the determiner indicates that the travel direction of the backward travel of the travel wheels is not a direction within the smooth undocking range.