

BOARDING BRIDGE

BACKGROUND OF THE INVENTION

Field of the invention

[0001] The present invention relates to a boarding bridge.

Description of the Related Art

[0002] In some cases, a boarding bridge which couples a terminal building and an aircraft is used for boarding an aircraft in an airport.

[0003] The boarding bridge includes a rotunda, a tunnel portion, and a cab. The rotunda is connected to a boarding gate of a terminal building. A base end of the tunnel portion is connected to the rotunda, and is extendable and retractable. The cab is provided to a distal end of the tunnel portion, and is connected to the aircraft. The tunnel portion includes a plurality of tunnels telescopically fitted thereinto, and the entire length of the tunnel portion is extendable and retractable in a longitudinal direction. With this, the boarding bridge can appropriately adapt to change in distance between the terminal building and the aircraft. At this time, floors of the tunnels form a passageway for passengers between the boarding gate of the terminal building in the airport and the boarding gate of the aircraft.

[0004] As described above, the boarding bridge is the passageway for passengers. Thus, electrical equipment such as interior lamps and air-conditioning units is provided inside the boarding bridge. Therefore, it is required to lay cables to the boarding bridge from the terminal building side so as to supply power. Further, during stoppage of the aircraft, power or water may be supplied from the terminal building to the inside of the aircraft through the boarding bridge.

[0005] Patent Literature 1 (see JP 2007-196958 A) describes a configuration in which a supply device which supplies power or water into the tunnel portion is mounted to a tunnel portion including first to third tunnels. The supply device includes, for example, cables for power supply as supply lines, a support device which supports the cables, and a first guide member and a second guide member which are bendable or flexible and through which the cables are inserted. The above-mentioned support device includes a first beam which is fixed to the first tunnel connected to the rotunda, and a second beam which is fixed to the second tunnel and extends along the second tunnel. In this way, both ends of the first guide member are connected to a front end portion of the first beam and the third tunnel, and both ends of the second guide member are connected to a front end portion of the second beam and the third tunnel.

SUMMARY OF THE INVENTION

[0006] In the configuration of Patent Literature 1 referred to above, the supply device is provided to the upper portion of the tunnel portion, which is one outer surface side of the

tunnel portion, and hence the configuration is preferred in that an interval between the tunnel portion and the ground is not narrow. However, when the tunnel portion is retracted, substantially the entire area above the tunnel portion in the extension and retraction direction is occupied by the supply device. Thus, a space for arranging other devices such as an air conditioner cannot be secured above the tunnel portion.

[0007] Embodiments of the present invention are made in order to solve the above-mentioned problem, and provide a boarding bridge which include a supply mechanism for power or water on one outer surface side of a tunnel portion, and can secure a space for arranging other devices such as an air conditioner on the outer surface side of the tunnel portion.

[0008] According to a first aspect of the present invention, there is provided a boarding bridge for connecting a terminal building on a base end side and an aircraft, including: a tunnel portion into which a plurality of tunnels are telescopically fitted, the tunnel portion being configured to be moved relative to each other in a longitudinal direction to be extended and retracted; a supply line which extends from the terminal building in the longitudinal direction of the tunnel portion and supplies a supply object for the tunnel closest to a distal end side; a support device which is arranged on one outer surface side of four outer surfaces of the tunnel portion which includes a top surface, a bottom surface, and two side surfaces, supports the supply line, and includes a predetermined number of support bodies which is larger than or equal to the number of the tunnels forming the tunnel portion, the predetermined number of support bodies being provided so as to be slidable in the longitudinal direction and being configured to be moved relative to each other along with extension and retraction of the tunnel portion to be extended and retracted in the longitudinal direction, wherein, regardless of extended and retracted states of the tunnel portion and the support device, longitudinal relative positions of the tunnel closest to the base end side of the tunnel portion and the support body closest to the base end side of the support device are always unchanged, and a distal end portion of the support device is always positioned on the base end side of the tunnel portion rather than a position separated by a predetermined distance from a distal end portion of the tunnel portion toward the base end side, and wherein, when the tunnel portion and the support device are extended or retracted, a moving speed of the support body closest to the distal end side is set lower than a moving speed of the tunnel closest to the distal end.

[0008a] According to a second aspect of the present invention, there is provided a boarding bridge for connecting a terminal building on a base end side and an aircraft, including: a tunnel portion into which a plurality of tunnels are telescopically fitted, the tunnel portion being configured to be moved relative to each other in a longitudinal direction to be extended

and retracted; a supply line which extends from the terminal building in the longitudinal direction of the tunnel portion and supplies a supply object for the tunnel closest to a distal end side; a support device which is arranged on one outer surface side of four outer surfaces of the tunnel portion which includes a top surface, a bottom surface, and two side surfaces, supports the supply line, and includes a predetermined number of support bodies which is larger than or equal to the number of the tunnels forming the tunnel portion, the predetermined number of support bodies being provided so as to be slidable in the longitudinal direction and being configured to be moved relative to each other along with extension and retraction of the tunnel portion to be extended and retracted in the longitudinal direction, wherein, regardless of extended and retracted states of the tunnel portion and the support device, longitudinal relative positions of the tunnel closest to the base end side of the tunnel portion and the support body closest to the base end side of the support device are always unchanged, and a distal end portion of the support device is always positioned on the base end side of the tunnel portion rather than a position separated by a predetermined distance from a distal end portion of the tunnel portion toward the base end side, wherein the tunnel portion includes two tunnels including a first tunnel and a second tunnel arranged in a stated order from the base end side to the distal end side when the tunnel portion is extended, the support device includes two support bodies including a first support body and a second support body arranged in a stated order from the base end side to the distal end side when the support device is extended, the two support bodies being fitted into the support device, and when the tunnel portion and the support device are extended or retracted, a moving speed of the second support body is set lower than a moving speed of the second tunnel.

[0008b] According to a third aspect of the present invention, there is provided a boarding bridge for connecting a terminal building on a base end side and an aircraft, including: a tunnel portion into which a plurality of tunnels are telescopically fitted, the tunnel portion being configured to be moved relative to each other in a longitudinal direction to be extended and retracted; a supply line which extends from the terminal building in the longitudinal direction of the tunnel portion and supplies a supply object for the tunnel closest to a distal end side; a support device which is arranged on one outer surface side of four outer surfaces of the tunnel portion which includes a top surface, a bottom surface, and two side surfaces, supports the supply line, and includes a predetermined number of support bodies which is larger than or equal to the number of the tunnels forming the tunnel portion, the predetermined number of support bodies being provided so as to be slidable in the longitudinal direction and being configured to be moved relative to each other along with extension and retraction of the tunnel portion to be extended and retracted in the longitudinal direction, wherein, regardless of extended and retracted states of the tunnel portion and the support device, longitudinal relative positions of the tunnel closest to the base end side of the tunnel portion and the support body closest to the base end side of the support device are

always unchanged, and a distal end portion of the support device is always positioned on the base end side of the tunnel portion rather than a position separated by a predetermined distance from a distal end portion of the tunnel portion toward the base end side, wherein the tunnel portion includes three tunnels including a first tunnel, a second tunnel, and a third tunnel arranged in a stated order from the base end side to the distal end side when the tunnel portion is extended, the support device includes three support bodies including a first support body, a second support body, and a second support body arranged in a stated order from the base end side to the distal end side when the support device is extended, the three support bodies being fitted into the support device, and when the tunnel portion and the support device are extended or retracted, a moving speed of the third support body is set lower than a moving speed of the third tunnel, and a moving speed of the second support body is set lower than a moving speed of the third support body.

Note that, "a supply object" as used in this specification and the attached claims is not limited to a tangible object such as water, but also encompasses an intangible object such as electricity.

[0009] According to the above aspects, the support device which is arranged on one outer surface side of the tunnel portion and supports the supply line includes a predetermined number of support bodies which is larger than the number of the tunnels forming the tunnel portion and is extended and retracted along with extension and retraction of the tunnel portion. Further, the distal end portion of the support device is always positioned on the base end side with respect to a position at a predetermined distance from the distal end portion of the tunnel portion toward the base end. With this, a space can be secured at a portion closer to the distal end on the one outer surface side of the tunnel portion, and other devices such as an air conditioner can be arranged in this space.

[0010] The boarding bridge may further include a travel device which supports the tunnel closest to the distal end side of the tunnel portion and travels in the longitudinal direction to extend and retract the tunnel portion, and a position at the predetermined distance may be a position at which the travel device supports the tunnel closest to the distal end side, or a position on the base end side with respect to the position at which the travel device supports the tunnel closest to the distal end side.

[0011] When the tunnel portion and the support device are extended or retracted, a moving speed of the support body closest to the distal end side may be set lower than a moving speed of the tunnel closest to the distal end. Note that, "moving speed" as used in this specification and the attached claims means absolute velocity.

[0012] The tunnel portion may include two tunnels including a first tunnel and a second tunnel arranged in a stated order from the base end side to the distal end side when the tunnel portion is extended. The support device may include two support bodies including a first

support body and a second support body in a stated order from the base end side to the distal end side when the support device is extended, the two support bodies being fitted into the support device. When the tunnel portion and the support device are extended or retracted, a moving speed of the second support body may be set lower than a moving speed of the second tunnel.

[0013] The tunnel portion may include three tunnels including a first tunnel, a second tunnel, and a third tunnel arranged in a stated order from the base end side to the distal end side when the tunnel portion is extended. The support device may include three support bodies including a first support body, a second support body, and a third support body in a stated order from the base end side to the distal end side when the support device is extended, the three support bodies being fitted into the support device. When the tunnel portion and the support device are extended or retracted, a moving speed of the third support body may be set lower than a moving speed of the third tunnel, and a moving speed of the second support body may be set lower than a moving speed of the third support body.

[0014] The entirety of a part of the supply line, the part of the supply line being present on an outer side of the tunnel portion, may be always present on the base end side of the support device rather than a distal end portion of the support device.

[0015] Embodiments of the present invention described above have an effect of being capable of providing a boarding bridge which includes a supply mechanism for power or water on one outer surface side of the tunnel portion, and can secure a space for arranging other devices such as an air conditioner on the outer surface side of the tunnel portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Figs. 1(A) and (B) are each a view for illustrating an example of a boarding bridge according to a first embodiment;

Fig. 2(A) is an enlarged side view of the boarding bridge, which focuses on protective guiding members for clear illustration, and Fig. 2(B) is a plan view of the boarding bridge, which corresponds to Fig. 2(A);

Fig. 3 is a conceptual view for illustrating an example of an extension and retraction mechanism of a support device;

Fig. 4 is a conceptual view for illustrating a supply system including the support device;

Fig. 5(A) is an enlarged side view of the boarding bridge, which focuses on the extension and retraction mechanism of the support device for clear illustration, and Fig. 5(B) is a plan view of the boarding bridge, which corresponds to Fig. 5(A) .

Fig. 6 is a schematic perspective view for illustrating specific examples of mounting positions of pulleys for a second support body on one side and wire ropes looped around the pulleys;

Fig. 7 is a schematic perspective view for illustrating specific examples of mounting positions of pulleys for the second support body on the other side and wire ropes looped around the pulleys;

Fig. 8 is a schematic perspective view for illustrating specific examples of mounting positions of two pulleys for a third support body on one side and wire ropes looped around the pulleys;

Fig. 9(A) is a sectional view taken along the line A-A of Fig. 1(A), Fig. 9(B) is a sectional view taken along the line B-B of Fig. 1(A), and Fig. 9(C) is a sectional view taken along the line C-C of Fig. 1(A);

Fig. 10(A) is a schematic view as viewed from the side, for illustrating states of a tunnel portion and the supply system when the tunnel portion of the boarding bridge in a second embodiment is extended to the maximum degree, and Fig. 10(B) is a plan view of the tunnel portion and the supply system, which corresponds to Fig. 10(A);

Fig. 11(A) is a schematic view as viewed from the side, for illustrating states of the tunnel portion and the supply system when the tunnel portion of the boarding bridge in the second embodiment is retracted to the maximum degree, and Fig. 11(B) is a plan view of the tunnel portion and the supply system, which corresponds to Fig. 11(A); and

Fig. 12 is a conceptual view for illustrating the supply system in the second embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Now, preferred embodiments of the present invention are described with reference

to the drawings. Note that, in the followings, the same or corresponding elements are denoted by the same reference symbols throughout all the drawings, and redundant description thereof is omitted. Further, the present invention is not limited to the description below.

[0018] (First Embodiment)

[0019] Figs. 1(A) and (B) are each a view for illustrating an example of a boarding bridge according to a first embodiment; Fig. 1(A) is a schematic view as viewed from the side, for illustrating a state in which a tunnel portion of the boarding bridge is extended to the maximum degree, and Fig. 1(B) is a schematic view as viewed from the side, for illustrating a state in which the tunnel portion of the boarding bridge is retracted to the maximum degree.

[0020] Now, for sake of simplicity of the description, an extension and retraction direction in which the entire length of a tunnel portion 3 of a boarding bridge 1 is extended and retracted is referred to as a front-and-rear direction, and a direction in which the gravity acts on the boarding bridge 1 is referred to as an up-and-down direction. Further, as illustrated in Figs. 1(A) and (B), an aircraft side in the boarding bridge 1 is defined as "front", and a terminal building side in the boarding bridge 1 is defined as "rear" for the description.

[0021] The boarding bridge 1 of this embodiment includes a rotunda (rear circular chamber) 2, a tunnel portion 3, a cab (not shown), a drive column 4, and a supply system 6. The rotunda 2 is connected to the boarding gate of the terminal building in the airport, and is supported so as to be rotatable about a vertical axis. A base end of the tunnel portion 3 is connected to the rotunda 2, and the tunnel portion 3 is swingable in the up-and-down direction so that a distal end is raised and lowered. The cab is provided to the distal end of the tunnel portion 3 so as to be rotatable. The drive column 4 supports the tunnel portion 3 at a portion closer to the distal end of the tunnel portion 3.

[0022] The plurality of tunnels 31 to 33 having a cylindrical shape and different cross sectional areas are telescopically fitted into the tunnel portion 3, and are moved relative to each other in the front-and-rear direction so that the tunnel portion 3 is extendable and retractable. The first tunnel 31 having the smallest cross sectional area, the second tunnel 32 having the second largest cross sectional area, and the third tunnel 33 having the largest cross sectional area are telescopically fitted into the tunnel portion 3 in the stated order from the base end side. In this manner, a passageway for passengers is formed in an internal space of the tunnel portion 3. When the tunnel portion 3 is extended, the first tunnel 31, the second tunnel 32, and the third tunnel 33 are arranged in the stated order from the base end side, and the third tunnel 33 is closest to the distal end side. In this tunnel portion 3, the adjacent tunnels have a relative relationship between the outer side and the inner side, and are fitted so that the tunnel on the outer side corresponds to the tunnel on the distal end side. That is, the tunnels are fitted so that the tunnel closer to the distal end side is located on the outer side (the tunnel closer to the base end side is located on the inner side). Therefore, the third tunnel 33 corresponds to the tunnel on the outermost side, the second tunnel 32 is fitted to the inner side

of the third tunnel 33, and the first tunnel 31 is fitted to the inner side of the second tunnel 32. Note that, the front-and-rear direction of the tunnel portion 3 matches a longitudinal direction of the tunnel portion 3 and each of the tunnels 31 to 33.

[0023] The rotunda 2 is connected to a boarding gate of a terminal building, is supported so as to be rotatable about an axis in the up-and-down direction, and is connected to a rear end portion of the first tunnel portion 31. The cab is connected to the front end of the third tunnel 33, and is provided so as to be rotatable.

[0024] The drive column 4 is provided at, for example, an appropriate portion of the tunnel portion 3 closer to the front side (specifically, an appropriate portion of the third tunnel 33 closest to the front side) so as to support the tunnel portion 3.

[0025] In addition, the drive column 4 functions as a travel device, and, when a drive wheel 4a at a lower end of the drive column 4 moves on an apron in the front-and-rear direction, power of an extension and retraction motion in the front-and-rear direction is transmitted to the tunnel portion 3. Moreover, when the entire length of the tunnel portion 3 is extended, so that the cab arranged at the front end of the tunnel portion 3 reaches a boarding gate of an aircraft, a passageway for passengers between a boarding gate of a terminal building and a boarding gate of an aircraft is formed. Further, the drive column 4 is extendable and retractable in the up-and-down direction. Through an extension and retraction motion of the drive column 4 in the up-and-down direction, the tunnel portion 3 can swing in the up-and-down direction with the rotunda 2 in the vicinity of a boarding gate of a terminal building as a reference.

[0026] Next, the supply system 6 is mounted above the tunnel portion 3. The supply system 6 is configured to supply power or water to the inside of the tunnel portion 3 or the inside of an aircraft through the tunnel portion 3. In this embodiment, the supply system 6 supplies power to the tunnel portion 3.

[0027] The supply system 6 includes cables for power supply as supply lines (see cables L1 and L2 of Fig. 4), a support device 7 configured to support the cables, and protective guiding members 81 to 83 through which the cables are inserted.

[0028] A plurality of support bodies (first to third support bodies 71 to 73) having a cylindrical shape are telescopically fitted into the support device 7, and are moved relative to each other in the front-and-rear direction so that the support device 7 is extendable and retractable. Detailed description thereof is given later.

[0029] The protective guiding members 81 to 83 are each formed of, for example, a cableveyor (trademark), and are bendable at any part. Note that, the protective guiding members 81 to 83 may not be bendable at a part as long as a position of a bending portion can be changed as appropriate.

[0030] Fig. 2(A) is an enlarged side view of the boarding bridge 1, which focuses on the protective guiding members 81 to 83 for clear illustration, and Fig. 2(B) is a plan view (partially perspective view) of the boarding bridge 1, which corresponds to Fig. 2(A).

[0031] One end 81a of the protective guiding member 81 is fixed to a distal end portion (front end portion) of the first support body 71, and the other end 81b of the protective guiding member 81 is fixed to the vicinity of the center of the inner bottom surface of the second support body 72 in the front-and-rear direction. The protective guiding member 81 extends from the one end 81a toward the base end side, bends along the inner bottom surface of the second support body 72, and further extends toward the distal end side to reach the other end 81b.

[0032] In the protective guiding member 81, a portion between the portion extending along the outer bottom surface of the first support body 71 and the portion extending along the inner bottom surface of the second support body 72 corresponds to a bending portion 81c that bends in a U-like shape in side view. In addition, along with extension and retraction of the support device 7, the position of the bending portion 81c in the protective guiding member 81 is changed. That is, when the support device 7 is extended, the position of the bending portion 81c is changed so that the portion extending along the outer bottom surface of the first support body 71 becomes shorter, and the portion extending along the inner bottom surface of the second support body 72 becomes longer. When the support device 7 is retracted, the position of the bending portion 81c is changed in the order reverse to the above-mentioned case where the support device 7 is extended.

[0033] Further, one end 82a of the protective guiding member 82 is fixed to a front portion of the inner bottom surface of the second support body 72, and the other end 82b of the protective guiding member 82 is fixed to an outer top surface of a portion closer to a base end (rear end) of the third tunnel 33. The protective guiding member 82 extends from the one end 82a into the third support body 73 toward the distal end side, bends to reach a lower side of the third support body 73, and further extends toward the base end side to reach the other end 82b.

[0034] In the protective guiding member 82, a portion between the portion extending along the inner bottom surface of the third support body 73 and the portion extending along the outer top surface of the third tunnel 33 below the third support body 73 corresponds to a bending portion 82c that bends in a U-like shape in side view. A bottom surface of a portion of the third support body 73, which is closer to the distal end, is opened so that the bending portion 82c passes through the portion of the third support body 73, which is closer to the distal end. In addition, along with extension and retraction of the support device 7, the position of the bending portion 82c in the protective guiding member 82 is changed. That is, when the support device 7 is extended, the position of the bending portion 82c is changed so that the portion extending along the inner bottom surface of the third support body 73 becomes longer, and the portion extending along the outer top surface of the third tunnel 33 becomes shorter. When the support device 7 is retracted, the position of the bending portion 81c is changed in the order reverse to the above-mentioned case where the support device 7 is extended.

[0035] Further, the protective guiding member 83 is arranged on a lateral side of the protective guiding member 82. One end 83a of the protective guiding member 83 is fixed to a portion closer to a front side of the inner bottom surface of the second support body 72, and the other end 83b of the protective guiding member 83 is fixed to a distal end (front end) of a pipe 22. Also in the protective guiding member 83, along with extension and retraction of the support device 7, the position of a bending portion 83c is changed.

[0036] Next, an example of the principle of extension and retraction of the support device 7 is described. Fig. 3 is a conceptual view for illustrating an extension and retraction mechanism of the support device 7, specifically, for describing an example of the principle of extension and retraction of the support device 7.

[0037] A support leg 11 is provided on the outer top surface of the rear end portion of the first tunnel 31. The first support body 71 is supported on the support leg 11 at a rear end portion so as to be fixed at a predetermined height.

[0038] Two pulleys P1 and P2 are mounted to the second support body 72. The pulley P1 is fixed to a predetermined position closer to a rear portion of the second support body 72. A wire rope W1 is looped around the pulley P1. One end W1a of the wire rope W1 is fixed to a front portion of the first support body 71, and the other end W1b of the wire rope W1 is fixed to a rear portion of the third support body 73. Further, the pulley P2 is fixed to a predetermined position closer to a front portion of the second support body 72. A wire rope W2 is looped around the pulley P2. One end W2a of the wire rope W2 is fixed to the first support body 71, and the other end W2b of the wire rope W2 is fixed to the rear portion of the third support body 73.

[0039] Next, two pulleys P3 and P4 are mounted to the third support body 73. The pulley P3 is fixed to a predetermined position closer to a rear portion of the third support body 73, and the pulley P4 is fixed to a predetermined position closer to a front portion of the third support body 73. An endless wire rope W3 is looped around the two pulleys P3 and P4. A predetermined connecting point W3a of the wire rope W3 is connected to a connecting portion 20 fixed to the second tunnel 32. Further, another connecting point W3b of the wire rope W3 at a portion relatively moved in a front-and-rear direction opposite to that of the connecting point W3a is connected to a connecting portion 24 fixed onto the outer top surface in the vicinity of the rear end of the third tunnel 33.

[0040] A moving mechanism M1 for moving the third support body 73 is formed through use of the two pulleys P3 and P4, the wire rope W3, and the like, which are described above. Further, a moving mechanism M2 for moving the second support body 72 is formed through use of the two pulleys P1 and P2, and the wire ropes W1 and W2, and the like. With those two moving mechanisms M1 and M2, the extension and retraction mechanism of the support device 7 is formed.

[0041] Note that, when the drive column 4 (Fig. 1) is moved (travels) in the front-and-rear direction, the third tunnel 33 is also moved in the front-and-rear direction. When the third

tunnel 33 is moved in the front-and-rear direction, the second tunnel 32 is to be moved in the same direction as that of the third tunnel 33 at half speed of that of the third tunnel 33. This is a widely-known configuration.

[0042] Now, when the tunnel portion 3 is extended through movement of the drive column 4, for example, when the third tunnel 33 is moved at a distance (x) in a front direction indicated by the arrow S1, the second tunnel 32 is moved at a distance (x/2) half of that of the third tunnel 33 in the front direction. With this, the connecting point W3b of the wire rope W3 is moved at the distance (x) in the front direction, and the connecting point W3a of the wire rope W3 is moved at the distance (x/2) in the front direction. With this, the pulley P3 is pulled by the wire rope W3, so that the third support body 73 and the pulley P4 are moved in the front direction together with the pulley P3. This moving distance is expressed by $\{x + (x/2)\} \times (1/2) = 3x/4$.

[0043] Moreover, when the third support body 73 is moved at the distance (3x/4) in the front direction, the other end W1b of the wire rope W1 which is fixed to the third support body 73 is also moved at the distance (3x/4) in the front direction. With this, the pulley P1 is pulled in the front direction, so that the second support body 72 and the pulley P2 are moved at a distance (3x/8) in the front direction together with the pulley P1.

[0044] That is, when the third tunnel 33 is moved at the distance (x) in the front direction, with the moving mechanism M1, the third support body 73 is moved at the distance (3x/4) in the front direction. Further, when the third support body 73 is moved at the distance (3x/4) in the front direction, with the moving mechanism M2, the second support body 72 is moved at the distance (3x/8) in the front direction.

[0045] Meanwhile, when the tunnel portion 3 is retracted through movement of the drive column 4, for example, when the third tunnel 33 is moved at the distance (x) in a rear direction indicated by the arrow S2, the second tunnel 32 is moved at the distance (x/2) half of that of the third tunnel 33 in the rear direction. With this, the third support body 73 is moved at the distance (3x/4) in the rear direction.

[0046] Moreover, when the third support body 73 is moved at the distance (3x/4) in the rear direction, the other end W2b of the wire rope W2 which is fixed to the third support body 73 is also moved at the distance (3x/4) in the rear direction. With this, the pulley P2 is pulled in the rear direction, so that the second support body 72 and the pulley P1 are moved at the distance (3x/8) in the rear direction together with the pulley P2.

[0047] That is, when the third tunnel 33 is moved at the distance (x) in the rear direction, with the moving mechanism M1, the third support body 73 is moved at the distance (3x/4) in the rear direction. Further, when the third support body 73 is moved at the distance (3x/4) in the rear direction, with the moving mechanism M2, the second support body 72 is moved at the distance (3x/8) in the rear direction.

[0048] As described above, the support device 7 is extended and retracted in accordance with extension and retraction of the tunnel portion 3. When those tunnel portion 3 and

support device 7 are extended or retracted, as described above, the moving mechanism M1 is formed so that the moving speed of the third support body 73 is lower than the moving speed of the third tunnel 33, and the moving mechanism M2 is formed so that the moving speed of the second support body 72 is lower than the moving speed of the third support body 73. Note that, in Fig. 3, the wire ropes W1 and W2 are provided for the two pulleys P1 and P2, respectively. However, the present invention is not limited thereto. For example, assuming that the one ends W1a and W2a of the wire ropes W1 and W2 are fixed to the same portion of the first support body 71, the other ends W1b and W2b of the wire ropes W1 and W2 are fixed to the same portion of the third support body 73, and the two pulleys P1 and P2 are arranged at the same level in the up-and-down direction and the right-and-left direction, similarly to the case of the wire rope W3 for the two pulleys P3 and P4, the wire ropes W1 and W2 can be formed of a single wireless wire rope. Conversely, the single wire rope W3 for the two pulleys P3 and P4 can also be separated into two wire ropes as in the wire ropes W1 and W2 for the two pulleys P1 and P2.

[0049] Next, Fig. 4 is a conceptual view for illustrating the supply system 6 including the support device 7. In contrast to the principle view of Fig. 3 for illustrating the extension and retraction mechanism of the support device 7, in Fig. 4, the mechanism for extending and retracting the support device 7 is illustrated in a similar manner to the examples of Figs. 1(A) and (B).

[0050] As illustrated in Fig. 4, the one end W2a of the wire rope W2 which is fixed to the first support body 71 in Fig. 3 is connected to the support leg 11 supported by the first support body 71.

[0051] Further, the connecting portion 20 to which the connecting point W3a of the wire rope W3 is connected includes a support column portion 21 fixed to the rear end of the second tunnel 32, a pipe 22 fixed to an upper end of the support column portion 21 at one end thereof, and a connecting portion 23 fixed to the other end of the pipe 22. Moreover, the connecting portion 23 is connected to the connecting point W3a of the wire rope W3.

[0052] Even when the extension and retraction mechanism of the support device 7 is changed as in Fig. 4, the principle of extension and retraction of the support device 7 is the same as in the case of Fig. 3.

[0053] Fig. 5(A) is an enlarged side view of the boarding bridge 1, which focuses on the extension and retraction mechanism of the support device 7 for clear illustration, and Fig. 5(B) is a plan view (partially perspective view) of the boarding bridge 1, which corresponds to Fig. 5(A).

[0054] Further, Fig. 6 is a schematic perspective view for illustrating specific examples of mounting positions of the pulley P1 and the wire rope W1 mounted to the second support body 72 and the like. Fig. 7 is a schematic perspective view for illustrating specific examples of mounting positions of the pulley P2 and the wire rope W2 mounted to the second support body 72 and the like. Fig. 8 is a schematic perspective view for illustrating specific

examples of mounting positions of the pulleys P3 and P4 and the wire rope W3 mounted to the third support body 73 and the like. Note that, only the outer top surface is illustrated in the tunnels 31 to 33 in Figs. 6 to 8.

[0055] As illustrated in Figs. 5(A) and (B) and Fig. 6, the pulley P1 is mounted to the rear end portion of the second support body 72 through use of an appropriate mounting member (not shown) in such a posture that a rotation axis thereof is vertical. One end W1a of the wire rope W1 is connected to the connecting portion 12 which is fixed to the front portion of the first support body 71, and the other end W1b of the wire rope W1 is connected to the connecting portion 13 which is fixed to the rear portion of the third support body 73.

[0056] Further, as illustrated in Figs. 5(A) and (B) and Fig. 7, the pulley P2 is mounted to the vicinity of the front end of the second support body 72 through use of an appropriate mounting member (not shown) in such a posture that a rotation axis thereof is horizontal. One end W2a of the wire rope W2 is connected to the support leg 11 which supports the first support body 71, and the other end W2b of the wire rope W2 is connected to the connecting portion 14 which is fixed to the rear end portion of the third support body 73.

[0057] Further, as illustrated in Figs. 5(A) and (B) and Fig. 8, the pulley P3 is mounted to the vicinity of the rear end of the third support body 73 through use of an appropriate mounting member (not shown) in such a posture that a rotation axis thereof is vertical. Further, the pulley P4 is mounted to the vicinity of the front end of the third support body 73 through use of an appropriate mounting member (not shown) in such a posture that a rotation axis thereof is vertical. One connecting point W3a of the wire rope W3 is connected to a connecting portion 23 which is fixed to the pipe 22 described above, and the other connecting point W3b of the wire rope W3 is connected to a connecting portion 24 which is fixed to the outer top surface of the third tunnel 33.

[0058] Next, as illustrated in Fig. 4, the cable L1 for power supply extends from a terminal building, and is connected to the control board 5 provided to the third tunnel 33. Specifically, the cable L1 extends from a power supply portion or the like of the terminal building, and passes through the first support body 71, the protective guiding member 81, the second support body 72 between the protective guiding members 81 and 82, and the protective guiding member 82 in the stated order. Then, the cable L1 is drawn from the other end 82b of the protective guiding member 82 into the third tunnel 33, and is connected to the control board 5. In this way, power is supplied to interior lamps and the like inside the third tunnel 33 through a cable (not shown) additionally drawn out from the control board 5.

[0059] Further, the cable L2 corresponds a cable for power supply to interior lamps and the like inside the second tunnel 32. This cables L2 is drawn out from the control board 5, passes through the protective guiding member 82, the protective guiding member 83, and the pipe 22 in the stated order, and is drawn into the second tunnel 32 from an end portion of the pipe 22 which is closer to the support column portion 21. Note that, inside the second support body 72, the cable L2 is routed between the one end 82a of protective guiding

member 82 and the one end 83a of the protective guiding member 83.

[0060] The entirety of a part of each of the above-mentioned cables L1 and L2, which is present on the outer side of the tunnel portion 3, is always present on the base end side (rear end side) of the support device 7 rather than a part of the support device 7 closest to the distal end (front end) regardless of an extension or retraction state of the support device 7. Each of the cables L1 and L2 is bendable.

[0061] Note that, power is supplied to interior lamps and the like inside the first tunnel 31 through a cable (not shown) which passes from a terminal building and is drawn into the first tunnel 31 through the rotunda 2.

[0062] Next, a sliding structure of the support device 7 and the like are described. Fig. 9(A) is a sectional view taken along the line A-A of Fig. 1(A), Fig. 9(B) is a sectional view taken along the line B-B of Fig. 1(A), and Fig. 9(C) is a sectional view taken along the line C-C of Fig. 1(A); Note that, in Figs. 9(A) to (C), cables passing through the protective guiding members 81 and 82 are not illustrated.

[0063] First, as illustrated in Fig. 9(A), rollers R1 to R4 are mounted to outer sides of four corner portions of the first support body 71, and rails G1 to G4 which extend in the front-and-rear direction and guide those rollers R1 to R4 are mounted to inner sides of the second support body 72. With such configuration, the second support body 72 is slidable relative to the first support body 71 in the front-and-rear direction.

[0064] Further, as illustrated in Fig. 9(B), rails G5 and G6 which extend in the front-and-rear direction are mounted to an outer bottom surface of the second support body 72. Moreover, rollers R5 to R8 are mounted to a roller mounting member 41 which is fixed to the top surface of the rear end of the second tunnel 32 as illustrated in the figure. With such configuration, the second support body 72 is positioned by rollers R6 and R7 in the right-and-left direction with respect to the second tunnel 32, and is slidable in the front-and-rear direction under a state of being supported by the rollers R5 and R8.

[0065] Further, as illustrated in Fig. 9(C), rails G7 to G10 which extend in the front-and-rear direction are mounted to the inner side of the third support body 73. The rails G7 to G10 guide rollers (not shown) which are mounted to outer sides of four corner portions of the second support body 72. With such configuration, the second support body 72 and the third support body 73 are slidable relative to each other in the front-and-rear direction.

[0066] Further, rails G11 and G12 which extend in the front-and-rear direction are mounted to an outer bottom surface of the third support body 73. Moreover, rollers R9 to R12 are mounted to roller mounting members 42 and 43 which are fixed to the top surface of the rear end of the third tunnel 33 as illustrated in the figure. Further, rollers R20 (Fig. 1) are mounted to both right and left sides of a front end of the third support body 73, and a pair of rails (not shown) which guides those rollers R20 is mounted to the top surface of the third tunnel 33. With such configuration, the third support body 73 is slidable in the front-and-rear direction under a state of being supported while being positioned in the right-and-left

direction with respect to the third tunnel 33.

[0067] The sliding structure when the support device 7 is extended and retracted which is described above can be modified as appropriate.

[0068] In this embodiment, as illustrated in Figs. 1(A) and (B), the longitudinal relative positions of the tunnel 31 closest to the base end side of the tunnel portion 3 and the support body 71 closest to the base end side of the support device 7 are always unchanged regardless of the extended and retracted states of the tunnel portion 3 and the support device 7.

Moreover, the distal end portion of the support device 7 is always positioned on the base end side with respect to a position at a predetermined distance SL1 from the distal end portion of the tunnel portion 3 toward the base end regardless of the extended and retracted states of the tunnel portion 3 and the support device 7. In other words, a range from the distal end portion of the tunnel portion 3 (that is, the distal end portion of the tunnel 33 which is closest to the distal end side) to a position at a predetermined distance SL1 toward the base end is defined as a limitation area, and the distal end portion of the support device 7 is always positioned on the base end side with respect to the above-mentioned limitation area regardless of the extended and retracted states of the tunnel portion 3 and the support device 7.

[0069] Note that, the extension and retraction mechanism of the support device 7 is not limited to the above-mentioned example. For example, as a configuration in which the third support body 73 is moved through movement of the third tunnel 33, two stoppers (a front stopper and a rear stopper) which are separated from each other in the longitudinal direction are provided to the third tunnel 33, and an abutment portion which is arranged between the above-mentioned two stoppers and is abutable against the above-mentioned stoppers is provided to the third support body 73. In this way, when the tunnel portion 3 is extended, and the third tunnel 33 is moved frontward, the rear stopper is brought into abutment against the abutment portion of the third support body 73 to press the abutment portion of the third support body 73 frontward, so that the third support body 73 is moved frontward.

Meanwhile, when the tunnel portion 3 is retracted, and the third tunnel 33 is moved rearward, the front stopper is brought into abutment against the abutment portion of the third support body 73 to press the abutment portion of the third support body 73 rearward, so that the third support body 73 is moved rearward. As a matter of course, conversely, two stoppers may be provided to the third support body 73, and an abutment portion may be provided to the third tunnel 33.

[0070] Further, as a configuration in which the second support body 72 is moved through movement of the third support body 73, two stoppers (a front stopper and a rear stopper) which are separated from each other in the longitudinal direction are provided to the third support body 73, and an abutment portion which is arranged between the above-mentioned two stoppers and is abutable against the above-mentioned stoppers is provided to the second support body 72. In this way, when the tunnel portion 3 is extended, and the third support body 73 is moved frontward, the rear stopper is brought into abutment against the abutment

portion of the second support body 72 to press the abutment portion of the second support body 72 frontward, so that the second support body 72 is moved frontward. Meanwhile, when the tunnel portion 3 is retracted, and the third support body 73 is moved rearward, the front stopper is brought into abutment against the abutment portion of the second support body 72 to press the abutment portion of the second support body 72 rearward, so that the second support body 72 is moved rearward. As a matter of course, conversely, two stoppers may be provided to the second support body 72, and an abutment portion may be provided to the third support body 73.

[0071] According to this embodiment, the support device 7 arranged above the tunnel portion 3 includes the support bodies 71 to 73 as many as the number of the tunnels 31 to 33 of the tunnel portion 3, and the support device 7 is extended and retracted along with extension and retraction of the tunnel portion 3. Further, the distal end portion of the support device 7 is always positioned on the base end side with respect to a position (which is referred to as a position y) at a predetermined distance SL1 from the distal end portion of the tunnel portion 3 toward the base end regardless of the extended and retracted state of the tunnel portion 3. With this, a space can be secured at an upper portion on the distal end side of the tunnel portion 3, and other devices such as an air conditioner can be arranged in this space. The above-mentioned position y separated at the predetermined distance SL1 is set to a position at which the drive column 4 supports the third tunnel 33 or a position closer to the base end side than from the support position. With this, as illustrated in Figs. 1(A) and (B), the distal end portion of the support device 7 is always positioned on the base end side with respect to the drive column 4, and a large space is secured at the upper portion on the distal end side of the tunnel portion 3.

[0072] (Second Embodiment)

[0073] In the above-mentioned first embodiment, the case where the tunnel portion includes the three tunnels is illustrated. However, in the second embodiment, a case where the tunnel portion includes two tunnels is described.

[0074] In this second embodiment, configurations other than the tunnel portion and the supply system are basically the same as those of the case of the first embodiment. In the following, configurations of the tunnel portion and the supply system in the second embodiment are mainly described.

[0075] Fig. 10(A) is a schematic view as viewed from the side, for illustrating states of the tunnel portion and the supply system when the tunnel portion of the boarding bridge in the second embodiment is extended to the maximum degree, and Fig. 10(B) is a plan view (partially perspective view) of the tunnel portion and the supply system, which corresponds to Fig. 10(A). Further, Fig. 11(A) is a schematic view as viewed from the side, for illustrating states of the tunnel portion and the supply system when the tunnel portion in the second embodiment is retracted to the maximum degree, and Fig. 11(B) is a plan view (partially perspective view) of the tunnel portion and the supply system, which corresponds to Fig.

11(A). Fig. 12 is a conceptual view for illustrating the supply system in the second embodiment.

[0076] Two tunnels 31 and 32 are telescopically fitted into a tunnel portion 3A in this embodiment, and are moved relative to each other in the front-and-rear direction so that the tunnel portion 3A is extendable and retractable.

[0077] Further, a supply system 6A includes a bendable cable L11 for power supply (Fig. 12) which is an example of a supply line, a support device 7A configured to support the cable L11, and a protective guiding member 84 through which the cable is inserted.

[0078] Two support bodies 71 and 72 having a cylindrical shape are telescopically fitted into the support device 7A, and are moved relative to each other in the front-and-rear direction so that the support device 7A is extendable and retractable.

[0079] The rear end portion of the first support body 71 is supported on the support leg 11 provided on the outer top surface of the rear end portion of the first tunnel 31, and is fixed at a predetermined height.

[0080] Two pulleys P5 and P6 are mounted to the second support body 72. The pulley P5 is fixed to a predetermined position closer to a rear portion of the second support body 72 in such a posture that a rotation axis thereof is vertical. The pulley P6 is fixed to a predetermined position closer to a front portion of the second support body 72 in such a posture that a rotation axis thereof is vertical. An endless wire rope W4 is looped around the two pulleys P5 and P6. A predetermined connecting point W4a of the wire rope W4 is connected to a connecting portion 25 fixed to the first support body 71. Further, another connecting point W4b of the wire rope W4 at a portion relatively moved in a front-and-rear opposite direction from the connecting point W4a is connected to a connecting portion 26 fixed onto the outer top surface in the vicinity of the rear end of the second tunnel 32.

[0081] The protective guiding member 84 is bendable at any part similarly to the above-mentioned protective guiding member 81 and the like. One end 84a of this protective guiding member 84 is fixed to a distal end portion (front end portion) of the first support body 71, and the other end 84b of the protective guiding member 84 is fixed to an outer top surface of a portion closer to a base end (rear end) of the second tunnel 32. Further, the protective guiding member 84 extends from the one end 84a into the second support body 72 toward the distal end side, bends to reach a lower side of the second support body 72, and further extends toward the base end side to reach the other end 84b.

[0082] In the protective guiding member 84, a portion between the portion extending along the inner bottom surface of the second support body 72 and the portion extending along the outer top surface of the second tunnel 32 below the second support body 72 corresponds to a bending portion 84c that bends in a U-like shape in side view. A bottom surface of a portion of the second support body 72, which is closer to the distal end, is opened so that the bending portion 84c passes through the portion of the second support body 72, which is closer to the distal end. In this way, along with extension and retraction of the support device 7A,

the position of the bending portion 84c in the protective guiding member 84 is changed. That is, when the support device 7A is extended, the position of the bending portion 84c is changed so that the portion extending along the inner bottom surface of the second support body 72 becomes longer, and the portion extending along the outer top surface of the second tunnel 32 becomes shorter. When the support device 7A is retracted, the position of the bending portion 84c is changed in the order reverse to the above-mentioned case where the support device 7A is extended.

[0083] Next, as illustrated in Fig. 12, the cable L11 for power supply extends from a terminal building, and is connected to a control board 5A provided to the second tunnel 32. Specifically, the cable L11 extends from a power supply portion or the like of the terminal building, and passes through the first support body 71 and the protective guiding member 84 in the stated order. Then, the cable L11 is drawn from the other end 84b of the protective guiding member 84 into the second tunnel 32, and is connected to the control board 5A. In this way, power is supplied to interior lamps and the like inside the second tunnel 32 through a cable (not shown) additionally drawn out from the control board 5A. The entirety of a part of the cable L11, which is present on the outer side of the tunnel portion 3A, is always present on the base end side (rear end side) of the support device 7A rather than a part of the support device 7A closest to the distal end (front end) regardless of an extension or retraction state of the support device 7A.

[0084] Note that, similarly to the first embodiment, power is supplied to interior lamps and the like inside the first tunnel 31 through a cable (not shown) which passes from a terminal building through the rotunda and is drawn into the first tunnel 31.

[0085] Next, an extension and retraction mechanism of the support device 7A and the like are described. The extension and retraction mechanism of the support device 7A is formed by a moving mechanism M3 for moving the second support body 72 through use of the two pulleys P5 and P6, the wire rope W4, and the like.

[0086] In the case of the second embodiment, the drive column 4 (see Fig. 1) is provided at an appropriate portion (position slightly closer to the front than to the center) of the second tunnel 32. When the drive column 4 is moved in the front-and-rear direction, the second tunnel 32 is also moved in the front-and-rear direction, and the tunnel portion 3A is extended and retracted.

[0087] In this case, when the tunnel portion 3A is extended, and, for example, the second tunnel 32 is moved at the distance (x) in the front direction indicated by the arrow S1, the connecting point W4b of the wire rope W4 is moved at the distance (x) in the front direction. With this, the pulley P5 is pulled by the wire rope W4, so that the second support body 72 and the pulley P6 are moved in the front direction together with the pulley P5. This moving distance is expressed by $(x/2)$.

[0088] Meanwhile, when the tunnel portion 3A is retracted, and, for example, the second tunnel 32 is moved at the distance (x) in the rear direction indicated by the arrow S2, the

connecting point W4b of the wire rope W4 is moved at the distance (x) in the rear direction. With this, the pulley P6 is pulled by the wire rope W4, so that the second support body 72 and the pulley P5 are moved in the rear direction together with the pulley P6. This moving distance is expressed by (x/2).

[0089] As described above, the support device 7A is extended and retracted in accordance with extension and retraction of the tunnel portion 3A. When those tunnel portion 3A and support device 7A are extended or retracted, as described above, the moving mechanism M3 is formed so that the moving speed of the second support body 72 is lower than the moving speed of the second tunnel 32.

[0090] Note that, an appropriate structure is formed through use of the roller, the rail which guides the roller, and the like in order to slide the support body 72 in the front-and-rear direction when the support device 7A is extended and retracted. The sliding structure of the second support body 72 relative to the first support body 71 may be formed, for example, similarly to the case of the first embodiment as illustrated in Fig. 9(A). Further, as illustrated in Fig. 10(A) and Fig. 11(A), a support leg with a roller R31 which rolls on the first tunnel 31 is provided at the rear end portion of the second support body 72, and a support leg with a roller R32 which rolls on the second tunnel 32 is provided at the front end portion of the second support body 72. Moreover, a roller R33 is mounted to the top surface of the rear end portion of the second tunnel 32, and a rail G33 which is held in contact with the roller R33 and extends in the front-and-rear direction is provided at the lower end of the second support body 72. Such sliding structure can be modified as appropriate.

[0091] Also in this second embodiment, similarly to the first embodiment, the longitudinal relative positions of the tunnel 31 closest to the base end side of the tunnel portion 3A and the support body 71 closest to the base end side of the support device 7A are always unchanged regardless of the extended and retracted states of the tunnel portion 3A and the support device 7A. Further, the distal end portion of the support device 7A is always positioned on the base end side with respect to a position at a predetermined distance SL2 from the distal end portion of the tunnel portion 3A toward the base end regardless of the extended and retracted states of the tunnel portion 3A and the support device 7A. In other words, a range from the distal end portion of the tunnel portion 3A (that is, the distal end portion of the tunnel 32 which is closest to the distal end side) to a position at a predetermined distance SL2 toward the base end is defined as a limitation area, and the distal end portion of the support device 7A is always positioned on the base end side with respect to the above-mentioned limitation area regardless of the extended and retracted states of the tunnel portion 3A and the support device 7A.

[0092] Note that, the extension and retraction mechanism of the support device 7A is not limited to the above-mentioned example. For example, as a configuration in which the second support body 72 is moved through movement of the second tunnel 32, two stoppers (a front stopper and a rear stopper) which are separated from each other in the longitudinal

direction are provided to the second tunnel 32, and an abutment portion which is arranged between the above-mentioned two stoppers and is abutable against the above-mentioned stoppers is provided to the second support body 72. In this way, when the tunnel portion 3A is extended, and then, the second tunnel 32 is moved frontward, the rear stopper is brought into abutment against the abutment portion of the second support body 72 to press the abutment portion of the second support body 72 frontward, so that the second support body 72 is moved frontward. Meanwhile, when the tunnel portion 3A is retracted, and then, the second tunnel 32 is moved rearward, the front stopper is brought into abutment against the abutment portion of the third support body 72 to press the abutment portion of the second support body 72 rearward, so that the second support body 72 is moved rearward. As a matter of course, conversely, two stoppers may be provided to the second support body 72, and an abutment portion may be provided to the second tunnel 32.

[0093] According to this second embodiment, the support device 7A arranged above the tunnel portion 3A includes the support bodies 71 and 72 as many as the number of the tunnels 31 and 32 of the tunnel portion 3A, and the support device 7A is extended and retracted along with extension and retraction of the tunnel portion 3A. Further, the distal end portion of the support device 7A is always positioned on the base end side with respect to a position at a predetermined distance SL2 from the distal end portion of the tunnel portion 3A toward the base end regardless of the extended and retracted state of the tunnel portion 3A. With this, similarly to the first embodiment, a space can be secured at an upper portion on the distal end side of the tunnel portion 3A, and other devices such as an air conditioner can be arranged in this space.

[0094] In the above-mentioned first and second embodiments, the number of the support bodies forming the support device 7 or 7A is set to the same as the number of the tunnels forming the tunnel portion 3 or 3A. However, the number of the support bodies may be set larger than the number of the tunnels. For example, in the case of the tunnel portion 3A including the two tunnels, the support device may include three support bodies. Note that, in consideration of the fact that, as the number of the support bodies becomes larger, the structure becomes more complicated, it is appropriate that the number of the support bodies is set to be the same as the number of the tunnels.

[0095] Further, in the second embodiment, the support device 7A has the configuration in which the two support bodies 71 and 72 are telescopically fitted so as to be slidable relative to each other in the front-and-rear direction. However, as long as the two support bodies 71 and 72 are provided so as to be slidable relative to each other in the front-and-rear direction, the two support bodies 71 and 72 may not be telescopically fitted. For example, there may be employed a configuration in which the support body 72 is provided above the support body 71 so as to be slidable relative to the support body 71 in the front-and-rear direction. In this case, the shapes of the support bodies 71 and 72 and arrangement of the protective guiding members may be changed as appropriate.

[0096] Similarly, in the first embodiment, there may be employed a configuration in which the three support bodies 71 to 73 are not telescopically fitted. For example, there may be employed a configuration in which the support body 72 is provided above the support body 71 so as to be slidable in the front-and-rear direction and the support body 73 is provided above the support body 72 so as to be slidable in the front-and-rear direction. In this case, the shapes of the support bodies 71 to 73 and arrangement of the protective guiding members may be changed as appropriate.

[0097] Further, in the first and second embodiments, the support device 7 or 7A is arranged above (on one outer surface side of) the tunnel portion 3 or 3A. However, the present invention is not limited thereto. The tunnel portion 3 or 3A only needs to include a plurality of tunnels having a cylindrical shape with a substantially quadrangular shape in cross section, and the support device 7 or 7A only needs to be arranged on an outer surface side of any one of four outer surfaces (a top surface, a bottom surface, and two side surfaces) of the tunnel portion 3 or 3A. Therefore, the support device 7 or 7A may be configured so as to be arranged above (on the top surface side of), below (on the bottom surface side of), rightward of (on the right surface side of), or leftward of (on the left surface side of) the tunnel portion 3 or 3A.

[0098] Based on the foregoing description, it is apparent for a person skilled in the art that many modifications and other embodiments may be made to the present invention. Therefore, the foregoing description should be interpreted only as an example and is provided for the purpose of teaching the best mode for carrying out the present invention to a person skilled in the art. The structures and/or functional details may be substantially modified without departing from the spirit of the present invention.

CLAIMS

1. A boarding bridge for connecting a terminal building on a base end side and an aircraft, comprising:

a tunnel portion into which a plurality of tunnels are telescopically fitted, the tunnel portion being configured to be moved relative to each other in a longitudinal direction to be extended and retracted;

a supply line which extends from the terminal building in the longitudinal direction of the tunnel portion and supplies a supply object for the tunnel closest to a distal end side;

a support device which is arranged on one outer surface side of four outer surfaces of the tunnel portion which includes a top surface, a bottom surface, and two side surfaces, supports the supply line, and includes a predetermined number of support bodies which is larger than or equal to the number of the tunnels forming the tunnel portion, the predetermined number of support bodies being provided so as to be slidable in the longitudinal direction and being configured to be moved relative to each other along with extension and retraction of the tunnel portion to be extended and retracted in the longitudinal direction,

wherein, regardless of extended and retracted states of the tunnel portion and the support device, longitudinal relative positions of the tunnel closest to the base end side of the tunnel portion and the support body closest to the base end side of the support device are always unchanged, and a distal end portion of the support device is always positioned on the base end side of the tunnel portion rather than a position separated by a predetermined distance from a distal end portion of the tunnel portion toward the base end side, and

wherein, when the tunnel portion and the support device are extended or retracted, a moving speed of the support body closest to the distal end side is set lower than a moving speed of the tunnel closest to the distal end.

2. A boarding bridge for connecting a terminal building on a base end side and an aircraft, comprising:

a tunnel portion into which a plurality of tunnels are telescopically fitted, the tunnel portion being configured to be moved relative to each other in a longitudinal direction to be extended and retracted;

a supply line which extends from the terminal building in the longitudinal direction of the tunnel portion and supplies a supply object for the tunnel closest to a distal end side;

a support device which is arranged on one outer surface side of four outer surfaces of the tunnel portion which includes a top surface, a bottom surface, and two side surfaces, supports the supply line, and includes a predetermined number of support bodies which is larger than or equal to the number of the tunnels forming the tunnel portion, the predetermined number of support bodies being provided so as to be slidable in the

longitudinal direction and being configured to be moved relative to each other along with extension and retraction of the tunnel portion to be extended and retracted in the longitudinal direction,

wherein, regardless of extended and retracted states of the tunnel portion and the support device, longitudinal relative positions of the tunnel closest to the base end side of the tunnel portion and the support body closest to the base end side of the support device are always unchanged, and a distal end portion of the support device is always positioned on the base end side of the tunnel portion rather than a position separated by a predetermined distance from a distal end portion of the tunnel portion toward the base end side,

wherein the tunnel portion includes two tunnels including a first tunnel and a second tunnel arranged in a stated order from the base end side to the distal end side when the tunnel portion is extended,

the support device includes two support bodies including a first support body and a second support body arranged in a stated order from the base end side to the distal end side when the support device is extended, the two support bodies being fitted into the support device, and

when the tunnel portion and the support device are extended or retracted, a moving speed of the second support body is set lower than a moving speed of the second tunnel.

3. A boarding bridge for connecting a terminal building on a base end side and an aircraft, comprising:

a tunnel portion into which a plurality of tunnels are telescopically fitted, the tunnel portion being configured to be moved relative to each other in a longitudinal direction to be extended and retracted;

a supply line which extends from the terminal building in the longitudinal direction of the tunnel portion and supplies a supply object for the tunnel closest to a distal end side;

a support device which is arranged on one outer surface side of four outer surfaces of the tunnel portion which includes a top surface, a bottom surface, and two side surfaces, supports the supply line, and includes a predetermined number of support bodies which is larger than or equal to the number of the tunnels forming the tunnel portion, the predetermined number of support bodies being provided so as to be slidable in the longitudinal direction and being configured to be moved relative to each other along with extension and retraction of the tunnel portion to be extended and retracted in the longitudinal direction,

wherein, regardless of extended and retracted states of the tunnel portion and the support device, longitudinal relative positions of the tunnel closest to the base end side of the tunnel portion and the support body closest to the base end side of the support device are always unchanged, and a distal end portion of the support device is always positioned on the base end side of the tunnel portion rather than a position separated by a predetermined

distance from a distal end portion of the tunnel portion toward the base end side,

wherein the tunnel portion includes three tunnels including a first tunnel, a second tunnel, and a third tunnel arranged in a stated order from the base end side to the distal end side when the tunnel portion is extended,

the support device includes three support bodies including a first support body, a second support body, and a second support body arranged in a stated order from the base end side to the distal end side when the support device is extended, the three support bodies being fitted into the support device, and

when the tunnel portion and the support device are extended or retracted, a moving speed of the third support body is set lower than a moving speed of the third tunnel, and a moving speed of the second support body is set lower than a moving speed of the third support body.

4. The boarding bridge according to any one of claims 1 to 3, further comprising a travel device which supports the tunnel closest to the distal end side of the tunnel portion and travels in the longitudinal direction to extend and retract the tunnel portion,

wherein the position at the predetermined distance is a position at which the travel device supports the tunnel closest to the distal end side, or a position closer to the base end side than the position at which the travel device supports the tunnel closest to the distal end side.

5. The boarding bridge according to any one of claims 1 to 4, wherein a part of the supply line existing on an outer side of the tunnel portion is always present on the base end side of the support device rather than a distal end portion of the support device.