

DESCRIPTION

PASSENGER CONVEYOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of and priority to Japanese Patent Application No. 2022-199127 filed on December 14, 2022, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

An embodiment of the present invention relates to a passenger conveyor.

2. Description of Related Art

In a recent passenger conveyor, such as an escalator and a moving walk, it has been a mainstream that a lighting device which illuminates a left-and-right pair of balustrades is an LED light of a tape type, but not a fluorescent light.

SUMMARY OF THE INVENTION

When a tape-type LED light is used in a passenger conveyor with a high floor height, two tape-type LED lights are used, in which the first tape-type LED light is

installed from an upper-floor side toward a lower-floor side along a handrail provided to an upper-end portion of a balustrade, and the second tape-type LED light is installed from the lower-floor side toward the upper-floor side along the handrail. The two tape-type LED lights contact each other at an intermediate portion of the balustrade.

However, there is a limit to a length of the tape-type LED light, and when a floor height which is a difference in height between the upper-floor side and the lower-floor side, is at or larger than a certain value, the two tape-type LED lights may cause a missing portion, and thus the floor height with which the tape-type LED light can be installed also has a limit.

Therefore, in view of the above-described problem, one object of an embodiment of the present invention is to provide a passenger conveyor in which a tape-type LED light can be installed even with a floor height with which a tape-type LED light cannot conventionally be installed in a passenger conveyor.

One embodiment of the invention is a passenger conveyor including a truss, a plurality of steps coupled to each other in an endless manner and which travel along a front-and-rear direction of the truss, a balustrade provided upright from each of left and right sides of the steps, and a handrail belt that travels at an upper portion of the

balustrade. The balustrade includes a panel supporting member fixed to the truss, a panel supported by the panel supporting member, a handrail provided to an upper-end portion of the panel, and at which the handrail belt travels, a plurality of tape-shaped LED lights provided along a lower portion of the handrail, an exterior deck provided to an exterior lower portion of the panel, a tube-shaped balustrade lighting pole provided upright from the exterior deck toward the handrail, and a wiring case provided between the handrail and the balustrade lighting pole. An upper surface of the wiring case is fixed to a lower surface of the handrail. A front insertion port for insertion of one of the LED lights from the front side opens at a front-surface upper portion of the wiring case. A rear insertion port for insertion of another one of the LED lights from the rear side is opened at a rear-surface upper portion of the wiring case. A lower insertion port which engages with the balustrade lighting pole is opened at a lower portion of the wiring case. One of the one LED light and the another LED light is guided to the balustrade lighting pole through inside of the wiring case.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view in which an escalator presenting one embodiment of the present invention is seen from a left

side;

FIG. 2 is a perspective view in which a balustrade of the escalator is seen from an outer side;

FIG. 3 is an exploded perspective view of a wiring case;

FIG. 4 is a vertical sectional view in which the wiring case and an upper portion of a balustrade lighting pole are seen from a right side; and

FIG. 5 is a vertical sectional view in which the wiring case and the balustrade lighting pole are seen from a front side.

DESCRIPTION OF EMBODIMENT

A passenger conveyor according to one embodiment of the present invention is described with reference to FIGS. 1 to 5. In this embodiment, an escalator 10 is described as an example of the passenger conveyor.

(1) Escalator 10

The entire structure of the escalator 10 is described with reference to FIG. 1. FIG. 1 is an explanatory view in which the escalator 10 is seen from a left side. In order to make understanding of an internal structure of the escalator 10 easier, illustration of left-side members of the escalator 10 when a lower floor is seen from an upper floor is omitted. Note that when a front-and-rear direction

of the escalator 10 is described, the lower floor is the front side, and the upper floor is the rear side when the lower floor is looked down from the upper floor.

A truss 12 which is a framework of the escalator 10 is supported to be bridged between the upper floor and the lower floor of a building 1 in the front-and-rear direction, by using support angles 2 and 3.

Inside an upper-floor machine room 14 located at an upper-end portion of the truss 12, a drive unit 18 which causes a step 30 to travel, a left-and-right pair of step sprockets 24 and 24, and a left-and-right pair of belt sprockets (not illustrated) are provided. The drive unit 18 is provided with a motor 20 and a small drive sprocket 19. A large drive sprocket (not illustrated) is coaxially attached to the left-and-right pair of step sprockets 24 and 24, and an endless drive chain 22 is passed over between the large drive sprocket and the small drive sprocket 19. Moreover, inside the upper-floor machine room 14, a control device 50 which controls the motor 20 etc., is provided.

Inside a lower-floor machine room 16 located at a lower-end portion of the truss 12, a left-and-right pair of driven sprockets 26 and 26 is provided. A left-and-right pair of endless step chains 28 and 28 is passed over between the left-and-right pair of upper-floor step sprockets 24 and 24, and the left-and-right pair of lower-floor driven

sprockets 26 and 26. Between the left-and-right pair of step chains 28 and 28, left-and-right pairs of first wheels 301 and 301 of a plurality of steps 30 are coupled to each other at a certain interval. When the motor 20 rotates, the first wheel 301 of the step 30 travels on a first wheel guide rail (not illustrated) fixed to the truss 12, and a second wheel 302 of the step 30 travels on a second-wheel guide rail 25 fixed to the truss 12.

A left-and-right pair of balustrades 36 and 36 are provided upright at an upper portion of the truss 12 at both left and right sides. A handrail 39 is provided to an upper portion of each balustrade 36 (seen the enlarged view in FIG. 1), and an endless handrail belt 38 moves along the handrail 39.

An upper-floor front skirt guard 40 is provided to a front lower portion of the left-and-right pair of balustrades 36 at the upper floor side, and a lower-floor front skirt guard 42 is provided to a front lower portion of the left-and-right pair of balustrades 36 at the lower floor side. Inlet parts 46 and 48 from which the handrail belt 38 enters and exits protrude from the front skirt guards 40 and 42, respectively. A skirt guard (interior deck) 44 is provided to a side lower portion of each of the left-and-right pair of balustrades 36, and the step 30 travels between the left-and-right pair of skirt guards 44

and 44.

The handrail belt 38 moves synchronously with the step 30 by the belt sprocket (not illustrated) rotating together with the step sprocket 24.

At a ceiling surface of the machine room 14, which is a landing section between the left-and-right pair of skirt guards 44 and 44 at the upper floor side, an upper-floor landing plate 32 is provided horizontally. At a ceiling surface of the machine room 16, which is a landing section between the left-and-right pair of skirt guards 44 and 44 at the lower floor side, a lower-floor landing plate 34 is provided horizontally. A comb 60 having a comb shape is provided to a tip end of the upper-floor landing plate 32, and the step 30 goes in or out from the comb 60. Moreover, also a tip end of the lower-floor landing plate 34 is provided with a comb 62 having a comb shape.

(2) Structure of Balustrade 36

Next, a structure of the left-and-right pair of balustrades 36 and 36 is described with reference to FIGS. 1 to 5. Below, although the balustrade 36 at the right side is described, the balustrade 36 at the left side also has a structure similar to that of the balustrade 36 at the right side, while being symmetrical to each other. As illustrated in FIGS. 2 and 5, the balustrade 36 at the right side is provided with a glass panel 70 in a vertical direction along

the front-and-rear direction of the escalator 10.

As illustrated in FIGS. 2 and 5, a base board 72 is horizontally fixed, using a bolt, to an upper surface of the truss 12 along the front-and-rear direction. A panel supporting plate 74 is vertically fixed, using a bolt, to the base board 72 along the left-and-right direction. An upper surface of the panel supporting plate 74 is provided with a panel groove 76 in the vertical direction, and the glass panel 70 is inserted into the panel groove 76, thus being fixed thereto. The base board 72 and the panel supporting plate 74 are collectively referred to as a "panel supporting member". This panel supporting member fixes the glass panel 70 which is the panel of the balustrade 36, to the truss 12.

As illustrated in FIG. 5, a left surface of a lower portion of the glass panel 70 is provided with the skirt guard 44. The skirt guard 44 includes an oblique skirt guard panel 44a and a vertical skirt guard panel 44b. The oblique skirt guard panel 44a is disposed to incline downward to the left side, and a right-end portion thereof is in contact with the glass panel 70. A left-end portion of the oblique skirt guard panel 44a is bent downwardly, and is connected to the vertical skirt guard panel 44b with a connection member 44c interposed therebetween. The step 30 travels on the left side of the vertical skirt guard

panel 44b.

As illustrated in FIGS. 2 and 5, the handrail 39 is attached to an upper-end portion of the glass panel 70. The handrail 39 is made by a metal plate being bent. A concave part 78 with which the upper-end portion of the glass panel 70 engages, is formed at an intermediate portion of the handrail 39 in the left-and-right direction. Horizontal parts 80 are provided to extend from lower-end portions of the concave part 78, vertical parts 82 are provided to extend upward from both left-and-right end portions of the horizontal parts 80, and belt supporting parts 84 project from upper-end portions of the vertical parts 82 toward left and right sides, respectively. The handrail belt 38 having a C-shaped cross section is covered on the left-and-right pair of belt supporting parts 84.

As illustrated in FIG. 2, a balustrade lighting pole 100 is provided to an outer side of the glass panel 70 of the right balustrade 36, at a substantially middle portion between the upper floor and the lower floor. A wiring case 104 is disposed between an upper portion of the balustrade lighting pole 100 and the handrail belt 38. The balustrade lighting pole 100 and the wiring case 104 will be described later.

As illustrated in FIG. 5, among the left-and-right pair of horizontal parts 80 and 80, below the horizontal

part 80 at the right side which is opposite from the left side where the step 30 is positioned, an LED light 90 of a tape-type is attached by using a member which is not illustrated. As illustrated in FIG. 4, the tape-type LED light 90 includes a plurality of LEDs 94 provided at a given interval to a bottom surface of an elongated and flat tape-shaped tape part 92 which becomes a wiring base.

A cable 96 projects from one-end portion of the tape part 92 of the LED light 90 (see FIG. 5), and is connected to a power supply 98 as illustrated in FIG. 1. The power supply 98 is connected to the control device 50 by wiring (not illustrated) disposed inside the truss 12.

The escalator 10 of this embodiment is provided, along the balustrade 36 as illustrated in FIG. 1, with three LED lights including an upper-floor-side LED light 90a, a lower-floor-side LED light 90b, and an intermediate LED light 90c disposed between the upper-floor side and the lower-floor side.

An upper-end portion of the upper-floor-side LED light 90a is connected through a cable (not illustrated) to a power supply 98a provided inside the skirt guard 44 at the vicinity of the upper-floor landing section.

A lower-end portion of the lower-floor-side LED light 90b is connected through a cable (not illustrated) to a power supply 98b provided inside the skirt guard 44 at the

vicinity of the lower-floor landing section.

One-end portion of the intermediate LED light 90c goes through inside the balustrade lighting pole 100, and is connected through the cable 96 (illustrated in FIG. 5, but not illustrated in FIG. 1) to a power supply 98c provided inside the skirt guard 44.

As illustrated in FIG. 4, a lower-end portion of the upper-floor-side LED light 90a is disposed inside the wiring case 104 of the balustrade lighting pole 100. As illustrated in FIG. 1, an upper-end portion of the lower-floor-side LED light 90b and a lower-end portion of the intermediate LED light 90c are disposed to have close distance without contact therebetween at an intermediate portion of the balustrade 36.

Note that the upper-floor-side LED light 90a, the lower-floor-side LED light 90b, and the intermediate LED light 90c may collectively be referred to as the LED light 90, and the power supply 98a, the power supply 98b, and the power supply 98c may collectively be referred to as the power supply 98.

(3) Balustrade Lighting Pole 100

Next, a structure of the balustrade lighting pole 100 provided to the balustrade 36 at the right side is described. Note that the balustrade lighting pole 100 at the left side also has a structure similar to that of the balustrade

lighting pole 100 at the right side, while being symmetrical to each other. As illustrated in FIG. 3, the balustrade lighting pole 100 at the right side has a quadrilateral-cylindrical shape, and has a front surface, a rear surface, and left-and-right side surfaces.

As illustrated in FIG. 5, a support member 77 is horizontally fixed to an upper surface of the panel supporting plate 74 which is fixed in the vertical direction. An exterior deck 64 stepped downward from an inner side toward an outer side is disposed above the support member 77. The exterior deck 64 is supported by a first fixing member 66 fixed to an upper surface of the support member 77 and a second fixing member 68 fixed to an upper portion of the base board 72.

As illustrated in FIG. 5, a lower-end portion of the balustrade lighting pole 100 is inserted between the glass panel 70 and the exterior deck 64. A notch part 102 is provided to a right surface of the lower-end portion of the balustrade lighting pole 100.

(4) Wiring Case 104

Next, a structure of the wiring case 104 at the right side is described with reference to FIGS. 3 and 4. As described above, the wiring case 104 is disposed between the upper portion of the balustrade lighting pole 100 at the right side and the handrail belt 38 which travels at

the handrail 39. The wiring case 104 includes a case body 106, and a cover 108 which is covered attachably and detachably onto the case body 106. Note that the wiring case 104 provided to the balustrade lighting pole 100 at the left side also has a structure similar to that of the wiring case 104 at the right side, while being symmetrical to each other.

As illustrated in FIGS. 3 and 4, the case body 106 includes a rectangular top plate 110 elongated along the front-and-rear direction so that an upper portion of the case body 106 is attached to the horizontal part 80 of the handrail 39. The top plate 110 has a bolt hole 116 opened for the upper portion of the case body 106 being attached to the horizontal part 80 of the handrail 39.

As illustrated in FIGS. 3 and 4, a case plate 112 is provided to extend downward from a left-end portion of the top plate 110. The case plate 112 includes a case upper part 112a, a case intermediate part 112b, and a case lower part 112c. The case upper part 112a has a rectangular shape elongated in the horizontal direction. The case intermediate part 112b is provided to extend downward from a lower end of the case upper part 112a, and has a trapezoid shape in which a width in the front-and-rear direction becomes narrower. The case lower part 112c is provided to extend downward from a lower end of the case intermediate

part 112b, and has a rectangular shape elongated in the up-and-down direction. The case lower part 112c can be inserted into the balustrade lighting pole 100.

As illustrated in FIG. 3, a rectangular attachment part 114 elongated in the front-and-rear direction is provided to extend downward from a right-end portion of the top plate 110, and an extending distance thereof is shorter than half a length of the case upper part 112a in the vertical direction.

As illustrated in FIG. 3, a flange part 118 projects in the right direction along a front-end portion of a lower portion of the case upper part 112a, a front-end portion of the case intermediate part 112b, and a front-end portion of the case lower part 112c. At a lower portion of this flange part 118, a bolt hole 122 elongated in the vertical direction opens. Similarly, the flange part 118 projects in the right direction along a rear-end portion of the lower portion of the case upper part 112a, a rear-end portion of the case intermediate part 112b, and a rear-end portion of the case lower part 112c. At a lower portion of this flange part 118, the bolt hole 122 elongated in the vertical direction opens.

As illustrated in FIGS. 3 and 4, at a vicinity of a boundary between the case upper part 112a and the case intermediate part 112b, two bolt holes 120 are provided to

align in the front-and-rear direction.

As illustrated in FIG. 3, the cover 108 is formed to cover from the lower portion of the case upper part 112a to the case lower part 112c of the case plate 112 of the case body 106. The cover 108 includes a cover 124 having a cover upper part 124a, a cover intermediate part 124b, and a cover lower part 124c, and a side plate 126. When the cover upper part 124a is seen from the side surface of the escalator 10, the cover upper part 124a has a rectangular shape same as the shape of the lower portion of the case upper part 112a. The cover intermediate part 124b is provided to extend from the cover upper part 124a, and has a trapezoid shape same as the shape of the case intermediate part 112b. The cover lower part 124c is provided to extend from the cover intermediate part 124b, and has a rectangular shape elongated in the vertical direction same as the shape of the case lower part 112c.

As illustrated in FIGS. 3 and 4, the side plate 126 is provided from a front-end portion of the cover upper part 124a to a front-end portion of the cover lower part 124c so as to cover the flange part 118. The side plate 126 is similarly provided from a rear-end portion of the cover upper part 124a to a rear-end portion of the cover lower part 124c. At a lower portion of the side plate 126, a bolt hole 128 elongated vertically corresponding to the bolt hole

122 of the case body 106 opens. The bolt hole 122 and the bolt hole 128 correspond to a bolt hole 101 which opens at each of the front plate and the rear plate of the balustrade lighting pole 100 at the upper-end portion. Moreover, an upper-end portion of the side plate 126 is notched in an arc shape. A light cover 88 of the LED light 90 is fitted to this arc-shaped notched portion 130.

As illustrated in FIG. 3, a tab 132 to be inserted into a lower end of the attachment part 114 projects upward along the front-and-rear direction at the upper-end portion of the cover upper part 124a.

As illustrated in FIGS. 3 and 4, a wiring guide member 134 is attached to the bolt hole 120 of the case plate 112. The wiring guide member 134 is made of synthetic resin, and includes a curved plate 136 and a flange part 138 provided on an inner side of the curve formed by the curved plate 136. This flange part 138 is provided with a bolt hole 140 elongated vertically. The bolt hole 140 and the bolt hole 120 are matched to each other and fastened by a bolt 142, and thus the wiring guide member 134 is fixed to the case plate 112. On an outer side of the curve formed by the curved plate 136, three guide pins 144 each having a circular-cylindrical shape oriented in the left-and-right direction are provided at a given interval.

As illustrated in FIG. 4, in a state where the cover

108 is covered onto the case body 106, between the top plate 110 of the case body 106 and the notched portion 130 of the side plate 126 of the cover 108, a front-and-rear pair of a front insertion port 146 and a rear insertion port 148, into which the LED light 90 is inserted, are formed. Moreover, a lower insertion port 150 is formed at a lower end of the case lower part 112c and a lower end of the cover lower part 124c.

(5) Installation Method of Balustrade Lighting Pole 100 and Wiring Case 104

Next, an installation method of the balustrade lighting pole 100 and the wiring case 104 is described.

First, as illustrated in FIGS. 3 and 4, the wiring guide member 134 is attached to the front-side bolt hole 120 of the case body 106. In this case, the wiring guide member 134 is attached such that an upper-end portion of the curved plate 136 curves to the front side, and a lower end is positioned at the lower side.

Next, as illustrated in FIG. 4, the bolt hole 86 which opens at the horizontal part 80 of the handrail 39, and the bolt hole 116 which opens at the top plate 110 of the case body 106 are matched with each other, and the top plate 110 of the case body 106 is fixed by a bolt 154. Therefore, the case body 106 is fixed to the right surface of the glass panel 70.

Next, as illustrated in FIGS. 1 and 4, the intermediate LED light 90c is inserted, from the position where the front insertion port 146 of the case body 106 is formed, downward of the horizontal part 80 of the handrail 39 which goes toward the lower floor. At this time, as illustrated in the enlarged view in FIG. 1, the lower-end portion of the intermediate LED light 90c is brought to be close to the upper-end portion of the lower-floor-side LED light 90b as much as possible.

Next, the upper-end portion of the intermediate LED light 90c is pulled out from the case lower part 112c of the case body 106 while the intermediate LED light 90c is disposed along the guide pins 144 of the wiring guide member 134.

Next, as illustrated in FIG. 4, the lower-end portion of the upper-floor-side LED light 90a located below the horizontal part 80 of the handrail 39 from the upper floor is disposed at the position where the rear insertion port 148 of the wiring case 104 is formed.

Next, as illustrated in FIG. 4, the light cover 88 is attached to the notched portion 130 of the front insertion port 146, and the light cover 88 is attached to the notched portion 130 of the rear insertion port 148.

Next, as illustrated in FIGS. 3 and 4, the cover 108 is covered onto the case body 106. At this time, the tab

132 at the upper-end portion of the cover 108 is engaged with the lower end of the attachment part 114.

Next, as illustrated in FIG. 4, the upper end of the intermediate LED light 90c is inserted from the upper-end portion of the balustrade lighting pole 100, and as illustrated in FIG. 5, the cable 96 projecting from the upper end of the intermediate LED light 90c is brought to project from the notch part 102 at the lower end of the balustrade lighting pole 100.

Next, as illustrated in FIGS. 3 and 4, the case lower part 112c and the cover lower part 124c located at the lower-end portion of the wiring case 104 are inserted into the upper-end portion of the balustrade lighting pole 100, and the bolt hole 101, the bolt hole 122, and the bolt hole 128 are matched, thus being fixed by a bolt 152.

At last, as illustrated in FIG. 5, the balustrade lighting pole 100 is fixed to the support member 77. Therefore, as illustrated in FIG. 4, the intermediate LED light 90c is inserted from the front insertion port 146 and passes inside the wiring case 104, and then is guided into the balustrade lighting pole 100 from the lower insertion port 150.

(6) Effects

In this embodiment, the LED light 90 can use the three LED lights including the upper-floor-side LED light, the

intermediate LED light, and the lower-floor-side LED light. Therefore, the LED light 90 can be installed in the escalator 10 whose floor height is at or larger than a given value which is conventionally considered as a limit.

Moreover, the upper-end portion of the intermediate LED light 90c is inserted inside the skirt guard 44 through inside the wiring case 104 and the balustrade lighting pole 100, thus not being recognized by a passenger.

Moreover, inside the wiring case 104, the LED light 90 is guided along the wiring guide member 134, and thus the tape-shape LED light 90 is not caused to be damaged at its intermediate portion. Particularly, since the portion where the LED light 90 contacts is the guide pin 144 having a circular-cylindrical shape, breaking of wiring is not caused.

(7) Modifications

In the embodiment, the number of each of the balustrade lighting pole 100 and the wiring case 104 is one. However, in a case where three or more LED lights are installed, the number of each of the balustrade lighting pole 100 and the wiring case 104 may be two or more.

In the embodiment, the balustrade lighting pole 100 is provided to the balustrade 36 of the escalator 10. However, the configuration is not limited to this example, but one or a plurality of balustrade lighting poles 100 may

be provided to a balustrade of a moving walk.

In the embodiment, the wiring guide member 134 is attached to the bolt hole 120 at the front side. However, when the LED light 90 is pulled out to the rear side, the wiring guide member 134 is attached to the bolt hole 120 at the rear side.

Although in the embodiment the escalator 10 is described as one example of the passenger conveyor, alternatively, the embodiment may be practiced by a moving walk.

Although one embodiment of the invention is described above, the embodiment is merely illustration, and is not intended to limit the scope of the invention. The new embodiments can be embodied in various other forms, and various omissions, replacements, and changes are applicable thereto without departing from the spirit of the invention. These embodiments and modifications are included in the scope and the subject matter of the invention, and are also included in the invention recited in the claims and the equivalent thereof.

CLAIMS

1. A passenger conveyor comprising:

a truss;

a plurality of steps coupled to each other in an endless manner, and configured to travel along a front-and-rear direction of the truss;

a balustrade provided upright from each of left and right sides of the steps; and

a handrail belt configured to travel at an upper portion of the balustrade, wherein

the balustrade includes:

a panel supporting member fixed to the truss;

a panel supported by the panel supporting member;

a handrail provided to an upper-end portion of the panel, and at which the handrail belt travels;

a plurality of tape-shaped LED lights provided along a lower portion of the handrail;

an exterior deck provided to an exterior lower portion of the panel;

a tube-shaped balustrade lighting pole provided upright from the exterior deck toward the handrail; and

a wiring case provided between the handrail and the balustrade lighting pole,

an upper surface of the wiring case is fixed to a lower surface of the handrail,

a front insertion port for insertion of one of the LED lights from the front side opens at a front-surface upper portion of the wiring case,

a rear insertion port for insertion of another one of the LED lights from the rear side opens at a rear-surface upper portion of the wiring case,

a lower insertion port configured to engage with the balustrade lighting pole opens at a lower portion of the wiring case, and

one of the one LED light and the another LED light is guided to the balustrade lighting pole through inside of the wiring case.

2. The passenger conveyor according to Claim 1, wherein the wiring case includes a wiring guide member curved in a vertical direction from the front-and-rear direction to guide the LED light to the balustrade lighting pole.

3. The passenger conveyor according to Claim 1, wherein a cable configured to be connected to a power supply projects from a lower-end portion of the LED light inside the balustrade lighting pole.

4. The passenger conveyor according to Claim 1, wherein the balustrade lighting pole includes a plurality of balustrade lighting poles provided upright at a given interval.