

DESCRIPTION

STRUCTURE FOR ATTACHING FRONT SKIRT OF PASSENGER CONVEYOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of and priority to Japanese Patent Application No. 2022-106902 filed on July 1, 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 structure for attaching a front skirt of a passenger conveyor.

2. Description of Related Art

In escalators and moving walkways, a front skirt is provided to a lower portion of each of a front end portion and a rear end portion of a balustrade at a landing. A passenger detection sensor for detecting a passenger, a display device for displaying a moving direction of steps, or the like is attached to this front skirt.

SUMMARY OF THE INVENTION

The passenger conveyor as described above has such a

problem that it is not easy to attach the front skirt having a necessary device, such as the passenger detection sensor or the display device, to a truss.

In view of the above, an embodiment of the invention has a purpose of providing a structure for attaching a front skirt of a passenger conveyor, the structure allowing easy attachment of the front skirt.

An embodiment of the invention is a structure for attaching a front skirt of a passenger conveyor, and the structure has: a truss that extends in a front-rear direction and on which a step runs; a right and left pair of balustrades that is vertically provided to both right and left portions of an upper portion of the truss; and a front skirt member that forms a front skirt between a lower portion of a semi-circular end portion in each of a front portion and a rear portion of the balustrade and the upper portion of the truss. The front skirt member is attached to an attachment member, which is provided to the upper portion of the truss, in a freely detachable manner.

According to the embodiment of the invention, the front skirt can easily be attached.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a simplified explanatory view of a vertical cross section in which an escalator in a first embodiment

of the invention is seen from a right side and in which members on the right side are not illustrated;

FIG. 2 is a perspective view of a left front skirt on an upper floor;

FIG. 3 is a perspective view of the left front skirt on the upper floor and illustrates a state where a front skirt member and a back-side front skirt member are removed;

FIG. 4 is a perspective view of a first type of the front skirt member;

FIG. 5 is a perspective view of a second type of the front skirt member;

FIG. 6 is a perspective view of a third type of the front skirt member;

FIG. 7 is a perspective view of a left front skirt on an upper floor side of an escalator in a second embodiment;

FIG. 8 is a perspective view of the front skirt on the upper floor side in the second embodiment and illustrates a state where a front skirt member and a back-side front skirt member are removed;

FIG. 9 is a perspective view of a first type of the front skirt member in the second embodiment;

FIG. 10 is a perspective view of a second type of the front skirt member in the second embodiment; and

FIG. 11 is a perspective view of a third type of the front skirt member in the second embodiment.

DESCRIPTION OF EMBODIMENTS

A description will be made on an escalator 10 as one of passenger conveyors in an embodiment of the invention with reference to the drawings.

[First Embodiment]

A description will be made on the escalator 10 in a first embodiment with reference to FIGS. 1 to 6. In a description of a front-rear direction of the escalator 10, an upper floor side is set as a rear side, and a lower floor side is set as a front side when a lower floor is looked down from an upper floor.

(1) Escalator 10

A description will be made on an overall structure of the escalator 10 with reference to FIG. 1. FIG. 1 is a simplified explanatory view of a vertical cross section in which the escalator 10 is seen from a right side and in which members on the right side are not illustrated.

As illustrated in FIG. 1, a truss 12 as a framework of the escalator 10 is supported along the front-rear direction by using support angles 2, 3 across an upper floor and a lower floor of a building 1.

Inside the truss 12, plural steps 14 that are coupled endlessly ascend or descend by a drive unit, which is not illustrated.

A right and left pair of balustrades 20, 20 is vertically provided on both right and left sides on top of the truss 12. A handrail 24 is provided on top of this balustrade 20, an endless handrail belt 22 is attached to this handrail 24 in a manner to run freely, and the handrail belt 22 synchronously moves with the steps 14.

Front skirts 26, 26 on the upper floor side are respectively provided to lower front portions on the upper floor side of the right and left pair of the balustrades 20, 20. Front skirts 28, 28 on the lower floor side are respectively provided to lower front portions on the lower floor side thereof. Inlets 32, 34 as entry/exit points of the handrail belt 22 are respectively projected from upper portions of the front skirts 26, 28. A plate-shaped skirt guard 30 is provided to a lower portion of an inner lateral surface (a lateral surface on the step 14 side) of each of the balustrades 20, 20 as the right and left pair, and the steps 14 run between a right and left pair of the skirt guards 30, 30.

A landing board 16 is horizontally provided at a landing on the upper floor side. A landing board 18 is horizontally provided at a landing on the lower floor side.

(2) Structures of Front Skirts 26, 28

Next, a description will be made on structures of the right and left pair of the front skirts 26, 26 on the upper

floor side and the right and left pair of the front skirts 28, 28 on the lower floor side. Here, a description will firstly be made on the left front skirt 26 of the right and left pair of the front skirts 26, 26 on the upper floor side and surroundings thereof.

(2-1) Structure Around Left Front Skirt 26

A description will be made on the structure around the left front skirt 26.

As illustrated in FIG. 1, a rear end portion 38 of the balustrade 20 at the landing on the upper floor side bulges rearward in a semi-circular shape, and this portion will hereinafter be referred to as a "semi-circular end portion" 38. The handrail 24, which is provided in the front-rear direction along the top of the balustrade 20, runs around an outer periphery of the semi-circular end portion 38 of this balustrade 20 and reaches a lower portion of the balustrade 20.

As illustrated in FIG. 3, the left balustrade 20 that is provided on an upper left side of the truss 12 is fixed to plural support columns 36, each of which is provided on an upper surface of a left portion of the truss 12. The lower portion of the balustrade 20 is located slightly above the truss 12, and a space is formed between the truss 12 and the lower portion of the balustrade 20. Along the front-rear direction of an inner lateral surface of the

space between the lower portion of the balustrade 20 and the truss 12 (a lateral surface on the step 14 side), the skirt guard 30 that is formed of a metal plate is provided in an up-down direction. An inner deck 42, which is formed of a metal plate, is provided between an upper end portion of the skirt guard 30 and an inner lateral surface of the balustrade 20, and the inner deck 42 is provided to be inclined upward toward the balustrade 20 from the upper end portion of the rectangular skirt guard 30, which is arranged in the up-down direction. A plate-shaped inner fin 44 is attached to a rear end portion of the inner deck 42, that is, a portion thereof at the landing on the upper floor side. In a plan view, a rear right portion of the inner fin 44 is curved. A column 68 is vertically provided in the up-down direction between the inner deck 42 and the truss 12, and a rear side of the skirt guard 30 is fixed to this column 68.

As illustrated in FIGS. 2 and 3, at a position below the semi-circular end portion 38 of the balustrade 20, the cylindrical inlet 32 is provided in a freely movable manner in the front-rear direction so as to cover the handrail 24 and the handrail belt 22. While this inlet 32 has a cylindrical shape, an upper portion thereof is cut along the front-rear direction (an axial direction) so as not to contact the lower portion of the balustrade 20. Brush bristles 46 are provided to a rear end portion of the inlet

32 and cover a lower portion and both right and left portions of the handrail belt 22. A limit switch, which is not illustrated, is provided to a front end portion of the inlet 32. When a person or baggage hits the brush bristles 46 of the inlet 32 and the inlet 32 sequentially moves forward, the limit switch detects such movement and outputs an inlet warning signal. When receiving the inlet warning signal, an unillustrated controller of the escalator 10 determines that, with the handrail belt 22, a foreign object (a hand or the baggage) possibly enters the inlet 32, stops the escalator 10, and stops movement of the steps 14 and the handrail belt 22.

As illustrated in FIG. 3, on an upper surface of the truss 12 located below the inlet 32, an attachment member 48, which is formed of a metal plate, is provided vertically upward and along a right-left direction. Notches (elongated holes in the vertical direction) 50, 52, each of which is opened upward, are respectively provided in both right and left end portions of an upper portion of this attachment member 48.

In the present specification, a term "front" means the rear at the time when the space between a lower portion of the semi-circular end portion 38 of the balustrade 20 and the upper portion of the truss 12 is seen from a rear side of the landing on the upper floor side, or means the front

at the time when the space thereof on the lower floor side is seen from a front side of the landing on the lower floor side.

(2-2) Structure of Front Skirt 26

As illustrated in FIGS. 2 and 3, the left front skirt 26 on the upper floor side is arranged in the space between the lower portion of the semi-circular end portion 38 of the left balustrade 20 and the upper portion of the truss 12. The front skirt 26 is formed to include: a front skirt member 56 that covers the front and the lateral surface on the step 14 side to the right of the inlet 32; and a back-side front skirt member 54 that covers the front and a lateral surface on an opposite side (an outer deck side) of the step 14 to the left of the inlet 32. A description will be made on the front skirt member 56 and the back-side front skirt member 54.

As illustrated in FIGS. 3 and 4, the front skirt member 56 is formed to include: a front plate 62; and a lateral plate 64 that extends forward from a right side of the front plate 62. As illustrated in FIG. 4, an upper portion of the front plate 62 is notched with a notch 66 that is provided along a laterally long rectangle in a manner to match shapes of a lower portion and a right portion of the inlet 32. A lower portion 65 of the front plate 62 that is located on a lower outer periphery of the notch 66 has a

substantially square shape when seen from the rear, with a screw hole 70 and a screw hole 72 being respectively opened at a lower left end and a lower right end, and a screw hole 74 and a screw hole 76 being respectively opened at a left end and a right end under the outer periphery of the notch 66. An intermediate portion 67 of the front plate 62 that is located on a right outer periphery of the notch 66 extends upward from an upper right end of the lower portion 65 of the front plate 62, and is a vertically long rectangle when seen from the rear. An upper portion 69 of the front plate 62 that is located on an upper right outer periphery of the notch 66 extends upward from an upper end of the intermediate portion 67 of the front plate 62. This upper portion 69 is formed to have an inclined right side and has a triangular shape when seen from the rear. The right side of this upper portion 69 matches an inner side of the inclined inner fin 44. A screw hole 78 is opened in the upper portion 69.

As illustrated in FIG. 4, the lateral plate 64 is rectangular when seen from the right side, with a rectangular opening 80 being opened in a central portion thereof. A receiving portion 82 is formed in the up-down direction on each of an inner side of a front side and an inner side of a rear side of the opening 80, and screw holes 88, 88 are respectively formed in an upper portion and a

lower portion of each of these receiving portions 82. A rectangular lid body 86 is fitted into the opening 80, and screw holes 84 are opened at four corners of the lid body 86. The lid body 86 is screwed to the lateral plate 64 by placing the lid body 86 in the opening 80 and tightening four screws 90 into the four screw holes 84 and the four screw holes 88, respectively.

As illustrated in FIG. 2, a frame material 40 is attached to the outer periphery of the notch 66 in the front plate 62. This frame material 40 covers the lower portion and both of the right and left portions of the inlet 32, and a flange 92 is provided to an outer periphery of the frame material 40. At two positions in a lower portion of the flange 92, which is provided to this frame material 40, screw holes corresponding to the screw holes 74, 76 (see FIG. 4) of the front plate 62, are provided. A screw hole corresponding to the screw hole 78 is also provided at an upper right end of the flange 92.

There are three types of the front skirt member 56 as follows.

As illustrated in FIG. 4, a first type of the front skirt member 56 is formed only of a metal plate material, and neither a passenger detection sensor 94 nor a display device 96 is attached to the front plate 62. In this first type of the front skirt member 56, the front plate 62 and

the lateral plate 64 are integrated.

As illustrated in FIG. 5, in a second type of the front skirt member 56, the passenger detection sensor 94 is attached to the front plate 62 thereof.

As illustrated in FIG. 6, in a third type of the front skirt member 56, the display device 96 is attached to the front plate 62 thereof.

As illustrated in FIGS. 5 and 6, in each of the second type and the third type of the front skirt members 56, the front plate 62 is divided into a first front plate 62a and a second front plate 62b.

As illustrated in FIGS. 5 and 6, the first front plate 62a is a plate material that constitutes a left portion of the lower portion 65 of the front plate 62 and has a rectangular shape when seen from the rear. The passenger detection sensor 94 or the display device 96 is provided to a central portion of the plate material. The screw hole 70 is opened at a lower left end of the first front plate 62a. A projection piece 81 is projected from an upper end of a right side of the first front plate 62a, and a screw hole 83 is opened in the projection piece 81.

As illustrated in FIGS. 5 and 6, the second front plate 62b is formed to include a right portion of the lower portion 65, the intermediate portion 67, and the upper portion 69 of the front plate 62, and extends leftward from

a rear side of the lateral plate 64. In the right portion of the lower portion 65 of the front plate 62, that is, in the second front plate 62b, the screw hole 72 is opened at a lower end, and the screw hole 76 is opened at an upper end.

Then, the second front plate 62b is arranged on a right side of the first front plate 62a in a manner to cover the projection piece 81, and the screw hole 83 and the screw hole 76 are aligned to put the first front plate 62a and the second front plate 62b together with a screw 77.

As illustrated in FIGS. 2 and 3, the back-side front skirt member 54 is formed by folding a metal plate and includes: a back-side front plate 58; and a back-side lateral plate 60 that extends forward from a left side of the back-side front plate 58. The back-side front plate 58 is arranged to partially overlap a back side of the front plate 62 of the front skirt member 56, and the back-side lateral plate 60 is arranged to the lateral surface on the opposite side (the outer deck side) of the step 14.

The above description has been made on the left front skirt 26 on the upper floor side. Here, the right front skirt 26 on the upper floor side has a bilaterally symmetrical structure to the left front skirt 26.

The right and left pair of the front skirts 28, 28 on the lower floor side has a similar structure to the right

and left pair of the front skirts 26, 26 on the upper floor side.

(3) Method for Attaching Back-Side Front Skirt Member 54 and Front Skirt Member 56

Next, a description will be made on a method for attaching the front skirt member 56 and the back-side front skirt member 54.

First, as illustrated in FIGS. 2 and 3, the back-side front skirt member 54 is arranged to the lower portion of the semi-circular end portion 38 of the balustrade 20. At this time, the back-side front plate 58 is arranged in a space that is located behind the attachment member 48 and between the inlet 32 and the upper surface of the truss 12, and the back-side lateral plate 60 is arranged to the lateral surface on the opposite side (the outer deck side) of the step 14.

Next, as illustrated in FIG. 2, the front skirt member 56 is arranged to the lower portion of the semi-circular end portion 38 of the balustrade 20. At this time, the front plate 62 is attached to a front side of the back-side front plate 58 in a manner to cover an end portion on an inner side (the step 14 side) of the back-side front plate 58. In addition, the lateral plate 64 is arranged to the lateral surface on the step 14 side, an upper portion of the lateral plate 64 is covered with the inner fin 44, and

a front side of the lateral plate 64 is inserted in and fixed to a rear portion of the column 68. Here, the first type of the front skirt member 56 is arranged as is while each of the second type and the third type of the front skirt members 56 is arranged by combining the first front plate 62a and the second front plate 62b in advance.

Next, as illustrated in FIG. 2, a screw 71 is threaded and tightened into the screw hole 70 at the lower left end of the front plate 62, an unillustrated screw hole in the back-side front plate 58, and the notch 50 of the attachment member 48.

Next, as illustrated in FIG. 2, a screw 73 is threaded and tightened into the screw hole 72 at the lower right end of the front plate 62 and the notch 52 of the attachment member 48. In this way, the back-side front skirt member 54 and the front skirt member 56 are fixed together to the truss 12.

Next, as illustrated in FIG. 2, the frame material 40 is arranged on the outer periphery of the notch 66 in the front skirt member 56. Then, the screw hole at the lower left end of the flange 92 in the frame material 40 is aligned with the screw hole 74 of the front plate 62, and a screw 75 is tightened thereinto.

Next, as illustrated in FIG. 2, the screw hole at the lower right end of the flange 92 in the frame material 40

is aligned with the screw hole 76 of the front plate 62, and the screw 77 is tightened thereinto. With this screwing, in each of the second type and the third type of the front plates 62, the first front plate 62a and the second front plate 62b are completely integrated with each other.

Finally, the screw hole provided at the upper right end of the flange 92 in the frame material 40 is aligned with the screw hole 78 of the upper portion 69, and a screw, which is not illustrated, is tightened thereinto.

When the passenger detection sensor 94 or the display device 96 is wired, the lid body 86 is removed, and wiring work can be performed through the opening 80.

(4) Effects

According to this embodiment, each of the three types of the front skirt members 56 can easily be screwed into the space between the inlet 32 and the upper surface of the truss 12.

In addition, since each of the three types of the front skirt members 56 is freely attachable/detachable with the screws, any one of the three types of the front skirt members 56 can easily be replaced with another one.

In the case where the second type of the front skirt member 56, to which the passenger detection sensor 94 is attached, is replaced with the third type of the front skirt member 56 having the display device 96, only the first front

plate 62a has to be replaced.

[Second Embodiment]

Next, a description will be made on an escalator 10 in a second embodiment with reference to FIGS. 7 to 11.

In the first embodiment, the description has been made on the wide front skirt 26 in regard to a width (a dimension in the right-left direction) of the front skirt 26. In this embodiment, a description will be made on a narrower front skirt 26 than the front skirt 26 in the first embodiment.

This embodiment differs from the first embodiment in the structure of the front skirt member 56. As described above, since the front skirt 26 has the small width, a width of the front plate 62 is also small, and thus the intermediate portion 67 of the front plate 62 as in the first embodiment does not exist. Accordingly, as illustrated in FIG. 7, when the frame material 40 is attached, the frame material 40 is attached from the front plate 62 to the lateral plate 64. In addition, neither the opening 80 nor the lid body 86 is provided to the lateral plate 64. The other difference is that, as illustrated in FIG. 8, in the attachment member 48 that is provided on the upper surface of the truss 12, a screw hole 51 and a screw hole 53 are opened instead of the elongated holes, and the front plate 62 is put together with the attachment member 48 with the screw 71 and the screw 73.

As illustrated in FIG. 9, the first type of the front skirt member 56 is a type that is formed only of the metal plate material without the passenger detection sensor 94 or the display device 96, and the front plate 62 and the lateral plate 64 are integrated as in the first embodiment. The frame material 40 is put together with the front plate 62 with the screw 75, the screw 77, and a screw 79.

In regard to each of the second type of the front skirt member 56 having the passenger detection sensor 94 and the third type of the front skirt member 56 having the display device 96, as illustrated in FIGS. 10 and 11, similar to the first embodiment, the front plate 62 is divided into the first front plate 62a and the second front plate 62b.

As illustrated in FIGS. 10 and 11, the first front plate 62a is the left portion of the lower portion 65 of the front plate 62 and has the rectangular shape when seen from the rear. The passenger detection sensor 94 or the display device 96 is provided to the central portion of the first front plate 62a. The screw hole 70 is opened at the lower left end of the first front plate 62a. The projection piece 81 is projected from the right side of the first front plate 62a, the screw hole 83 is opened in an upper portion of the projection piece 81, and a screw hole 85 is opened in a lower portion of the projection piece 81.

As illustrated in FIGS. 10 and 11, the second front plate 62b is formed to include the right portion of the lower portion 65 and the upper portion 69 of the front plate 62, and extends leftward from the rear side of the lateral plate 64. The screw hole 72 is opened at the lower end of the right portion of the lower portion 65 in the front plate 62, and the screw hole 76 is opened at the upper end thereof.

Then, the second front plate 62b is arranged on the right side of the first front plate 62a in the manner to cover the projection piece 81. The first front plate 62a and the second front plate 62b are put together with unillustrated screws by aligning the screw hole 72 with the screw hole 85 of the projection piece 81 and aligning the screw hole 76 with the screw hole 83 of the projection piece 81.

Also, in this embodiment, each of the three types of the front skirt members 56 can easily be screwed into the space between the inlet 32 and the upper surface of the truss 12.

In addition, since each of the three types of the front skirt members 56 is freely attachable/detachable with the screws, any one of the three types of the front skirt members 56 can easily be replaced with another one.

In the case where the second type of the front skirt member 56, to which the passenger detection sensor 94 is

attached, is replaced with the third type of the front skirt member 56 having the display device 96, only the first front plate 62a has to be replaced.

[Modified Examples]

In the above embodiment, the description has been made on the case where the invention is applied to the front skirt of the escalator 10. However, instead thereof, the invention may be applied to the moving walkway.

The above description has been made on the embodiment of the invention. However, this embodiment is merely provided as the example and thus is not intended to limit the scope of the invention. These novel embodiments can be implemented in any of various other aspects, and various types of elimination, replacement, and changes can be made thereto within the scope that does not depart from the gist of the invention. These embodiments and the modifications thereof are included in the scope and the gist of the invention and are also included in the invention described in the claims and the equivalent scope thereof.

CLAIMS

1 A structure for attaching a front skirt of a passenger conveyor, the structure comprising:

a truss that extends in a front-rear direction and on which a step runs;

a right and left pair of balustrades that is vertically provided to both right and left portions of an upper portion of the truss; and

a front skirt member that forms a front skirt between a lower portion of a semi-circular end portion in each of a front portion and a rear portion of the balustrade and the upper portion of the truss, wherein

the front skirt member is attached to an attachment member in a freely detachable manner, the attachment member being provided to the upper portion of the truss.

2. The structure for attaching the front skirt of the passenger conveyor according to claim 1, wherein

the front skirt member includes a front plate covering the front and a lateral plate covering a lateral surface on the step side, and

in regard to the front plate, a passenger detection sensor is attached to a plate material forming the front plate, a display device is attached to the plate material,

or neither the passenger detection sensor nor the display device is attached thereto, and, in such a case, the front plate is formed only of the plate material.

3. The structure for attaching the front skirt of the passenger conveyor according to claim 2 further comprising:

a handrail that is formed on top of the balustrade and an outer peripheral portion of the semi-circular end portion;

an endless handrail belt that runs on the handrail; and

an inlet that is a cylinder body elongated in a front-rear direction and arranged to the lower portion of the semi-circular end portion of the balustrade, the handrail belt running on the handrail that is arranged along an inner periphery of the cylinder body, wherein

a frame material that surrounds an outer periphery of the inlet is attached to an upper portion of the front plate, and the inlet can advance/retract from an inner periphery of the frame material.