

PASSENGER CONVEYER

BACKGROUND OF THE INVENTION

The present invention relates to a passenger conveyer.

When a passenger conveyer whose lifetime has expired is renovated, rail components presently mounted within its frame are removed, and novel rail components are
5 mounted in the frame.

Rails are mounted along the circulating path of movement for steps (also known as stairsteps or step treads) in order to guide rolling motion of the front and rear wheels of the steps. Turning over rails permitting the steps to convert their direction are mounted in the top and bottom portions of the staircase. The turning over rails are connected to ends of rear-wheel
10 rails, for example, via coupling members and secured using bolts or the like (see JP-A-2005-225600).

SUMMARY OF THE INVENTION

If the turning over rails are not mounted accurately, the direction of motion of the staircase could not be inverted smoothly. Where the ends of the rear-wheel rails in the going
15 and returning paths are bolted or otherwise secured to the turning over rails via the coupling members, it is necessary to align the rolling surfaces of the rear-wheel rails and of the rear wheels of the turning over rails in height. Accordingly, it is laborious to mount the turning over rails at the renovation work site.

In the case of a renovation work, operations for mounting and positioning various
20 components must be performed at the location where a passenger conveyer is mounted. At this work site, not all tools and dedicated jigs for positioning are arranged unlike in a manufacturing plant. Therefore, installation dimensions deviate from designated values and so the mounting positions may be readjusted. That is, a long time has been taken to place the turning over rails in position.

25 It is an object of the present invention to provide a passenger conveyer permitting turning over rails to be mounted and placed in position with ease.

A passenger conveyer associated with one embodiment of the present invention has a frame mounted along the direction of transport of passengers, nose-wheel rails mounted in the frame along the direction of transport of passengers and acting to guide nose wheels of steps
30 circularly moving endlessly, and rear-wheel rails mounted in the frame along the direction of

transport of passengers and acting to guide rear wheels of the steps. The rear-wheel rails include a going path rear-wheel rail for guiding the rear wheels of the steps to an exit side as viewed in the direction of transport of passengers and a returning path rear-wheel rail for returning the rear wheels of the steps to an entrance side as viewed in the direction of transport
5 of passengers. A turning over rail for inverting the direction of motion of the steps is rotatably mounted via a rotary member to an end of the going path rear-wheel rail or to an end of the returning path rear-wheel rail.

In a passenger conveyer associated with a preferred embodiment of the invention, the turning over rail is built as a rail member which assumes a form like the letter U as viewed
10 from a side. The rail member has a going path end corresponding to the end of the going path rear-wheel rail and a returning path end corresponding to the end of the returning path rear-wheel rail. The going path end of the turning over rail and the end of the going path rear-wheel rail may be rotatably coupled together via the rotary member. Alternatively, the returning path end of the turning over rail and the end of the returning path rear-wheel rail may be rotatably coupled
15 together via the rotary member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic vertical cross section of an escalator being one example of passenger conveyer, showing its configuration.

FIG. 2 is a side elevation of rail end portions near the top staircase portion of the
20 escalator.

FIG. 3 is a cross-sectional view of rails in the top staircase portion of the escalator.

FIG. 4 is a side elevation of a going path rear-wheel rail and a returning path rear-wheel rail, and in which these rails are connected together by a turning over rail.

FIG. 5 is a side elevation of the top staircase portion of an escalator associated
25 with a second embodiment.

DESCRIPTION OF THE EMBODIMENTS

A passenger conveyer according to the preferred embodiments of the present invention has steps (stairsteps or step treads) including rear-wheel rollers which are guided by rear-wheel rails respectively laid in going and returning paths. Any one of the rear-wheel
30 rollers is previously connected to a turning over rail by a rotary member such as a hinge. The turning over rail is used to invert the direction of motion of the rear-wheel rollers. The embodiments of the present invention are hereinafter described with reference to the drawings.

Embodiment 1

FIG. 1 schematically shows the structure of an escalator being one example of passenger conveyer. The escalator has a frame 1 composed of a top staircase portion 1a, a bottom staircase portion 1b, and an intermediate staircase portion 1c. The top staircase portion 1a has a top staircase frame support member 2a in its one end. The bottom staircase portion 1b has a bottom staircase frame support member 2b in its one end. The top staircase frame support member 2a and the bottom staircase frame support member 2b are brought into engagement with a top staircase portion building beam 3a and a bottom staircase portion building beam 3b, respectively, so that the frame 1 is mounted in a building.

Mounted within the frame 1 are steps (step treads) 4 arranged endlessly and moving circularly, step guide rails 5 for guiding the steps 4, a drive gear 7 driven by means of a driving machine 6, a following gear 8, and other components. The steps 4 are arranged between the drive gear 7 and the following gear 8.

Railings 10 are supported to the frame 1. Handrails 9 moving in synchronism with the steps 4 are supported to fringes of the railings 10.

FIG. 2 is an enlarged side elevation of the top staircase portion 1a, showing its structure. One end 19a of a turning over rail 19 has been previously rotatably mounted to an end 16d of a going path rear-wheel rail 16 via a rotary member such as a hinge 20.

FIG. 3 is a cross-sectional view showing the relationship between the step 4 near the top staircase portion 1a and the rails. The structure around each top staircase portion 1a of the escalator is described below by referring to FIGS. 2 and 3.

The step 4 has a nose-wheel roller 13 and a rear-wheel roller 14. The nose-wheel roller 13 is integral with a step chain (not shown) that is wound around a driver sprocket 7b. The drive gear 7 is composed of a drive gear shaft 7a and the driver sprocket 7b. The drive gear 7 is rotated by rotating force coming from the driving machine 6. Thus, the step chain is rotated, so that the step 4 is moved in a given direction.

The nose-wheel rail 15 in the going path guides motion of the nose-wheel roller 13 in the going path. The nose-wheel rail 15 in the going path is configured including a rolling department 15a permitting the nose-wheel roller 13 to move while rotating and a hold-down portion 15b for holding down the nose-wheel roller 13 from the upper side. The rolling department 15a and the hold-down portion 15b are coupled together by welding, using screws, or other method via a coupling member 15c.

The rear-wheel rails of the step guide rails 5 include the going path rear-wheel rail 16 for guiding the rear wheels of the step 4 to the exit side as viewed in the direction of transport

of passengers and a returning path rear-wheel rail 17 for returning the rear wheels of the step 4 to the entrance side as viewed in the direction of transport of passengers.

The going path rear-wheel rail 16 guides the motion of the going path rear-wheel roller 14. The going path rear-wheel rail 16 is composed of a rolling department 16a for
5 rotating and moving the rear-wheel roller 14 and a hold-down portion 16b for holding down the rear-wheel roller 14 from the upper side. The rolling department 16a and the hold-down portion 16b are coupled together using a coupling member 16c by welding, using screws, or by other means.

The returning path rear-wheel rail 17 has only a rolling department. Similarly, a
10 returning path nose-wheel rail 18 has only a rolling department.

The turning over rail 19 is rotatably joined to an end of the hold-down portion 16b of the going path rear-wheel rail 16 via the hinge 20. Consequently, the going path rear-wheel rail 16 and turning over rail 19 are made into one unit. For example, in a well-equipped environment such as a factory, the turning over rail 19 is mounted via the hinge 20 such that the
15 rolling surface of the going path rear-wheel rail 16 becomes flush with the rolling surface of the turning over rail 19. The going path rear-wheel rail 16 and the turning over rail 19 are conveyed as a unit into a work site, where the turning over rail 19 is rotated in a clockwise direction as viewed in the figure about the axis of rotation of the hinge 20 such that the hinge side end 19a of the turning over rail 19 and the end 16d of the going path rear-wheel rail 16 meet
20 each other. Consequently, the other end 19b of the turning over rail 19 is made to face the end 17a of the returning path rear-wheel rail 17 and coupled to this end 17a.

The going path rear-wheel rail 16, the turning over rail 19, and the hinge 20 may be detachably coupled together using bolts or the like. Alternatively, they may be non-detachably coupled together by welding or other method.

25 FIG. 4 is a side elevation of the top staircase portion 1a, and in which the turning over rail 19 has been already coupled to the returning path rear-wheel rail 17. A beam member 21 for mounting of the frame has an L-shaped cross section and extends across the left and right side frame members. More specifically, the beam member 21 is mounted to the inner side surfaces of the top staircase portions 1a of the frame 1. A support member 22 is mounted to the
30 beam member 21 for mounting of the frame via fixing means such as bolts.

The support member 22 is configured including a going path support member 22a, returning path support members 22b, and bolts 22c. The support member 22a in the going path acts to support one end of the going path rear-wheel rail 16, one end of the returning path rear-wheel rail 17, and the going path end 19a of the turning over rail 19. One end of the

support member 22a is affixed to the frame-mounting beam member 21 using bolts or the like. The support members 22b in the returning path act to support the returning path end 19b of the turning over rail 19. One end of each support member 22b is held to the going path support member 22a by the bolts 22c, while the other end of each support member 22b is secured to the returning path end 19b of the turning over rail 19 by bolts 23. The turning over rail 19, the going path rear-wheel rail 16, and the returning path rear-wheel rail 17 are detachably coupled together by the support member 22.

A coupling member 24 mounted to the end 17a of the returning path rear-wheel rail 17 is bolted or otherwise secured to the returning path support member 22a of the support member 22. The returning path rear-wheel rail 17 is supported by the coupling member 24.

The going path rear-wheel rail 16 and the turning over rail 19 have projecting portions that are so located that rolling motion of the rear-wheel rollers 14 is not hindered. The projecting portions extend toward the midway between the left and right side frame members. The projecting portions have parts which are tightened to the returning path support members 22a by the bolts 23, respectively. Consequently, the going path rear-wheel rail 16 and the turning over rail 19 are coupled together.

The turning over rail 19 is secured in the manner described now. The support member 22 has the going path support member 22a for securing the going path end 19a of the turning over rail 19 and the returning path support members 22b for securing the returning path end 19b of the turning over rail 19. The support member 22a is mounted between the frame-mounting beam member 21 and the going path rear-wheel rail 16. The support members 22b are mounted between the frame-mounting beam member 21 and the returning path rear-wheel rail 17.

According to the present embodiment, the turning over rail 19 and the going path rear-wheel rail 16 are fabricated as a unit. The rail 19 is mounted so as to be rotatable via the hinge 20. Accordingly, only if the turning over rail 19 is rotated and the ends 19a and 19b of the rail 19 are brought into engagement with the ends 16d and 17a of the going path rear-wheel rail 16 and returning path rear-wheel rail 17, respectively, the going path rear-wheel rail 16 and the turning over rail 19 can be mounted such that the rolling surface of the going path rear-wheel rail 16 and the rolling surface on the going path side of the turning over rail 19 are made flush with each other. That is, the work for determining the heightwise positions of the rolling surfaces of the going path rear-wheel rail 16 and turning over rail 19 can be done easily.

According to the present embodiment, the rolling surface of the going path rear-wheel rail 16 and the rolling surface of the turning over rail 19 in the going path which contact

the rear-wheel roller 14 can be joined at the same widthwise position (i.e., the same horizontal position) only with the above-described work. That is, the operation for placing the rolling surface of the going path rear-wheel rail 16 and the rolling surface of the turning over rail 19 in position widthwise (horizontally) can be carried out easily.

5 Furthermore, in the present embodiment, an operation performed subsequently to make adjustments such that the rolling surface of the returning path rear-wheel rail 17 in contact with the rear-wheel roller 14 is made flush with and coupled to the rolling surface of the turning over rail 19 in the returning path can be carried out easily, because the going path rear-wheel rail 16 and the turning over rail 19 have been already accurately coupled together.

10 Embodiment 2

A second embodiment is described by referring to FIG. 5. Since the second embodiment is equivalent to a modification of the first embodiment, the following description centers on the differences of the second embodiment with the first embodiment. FIG. 5 is a side elevation showing the manner in which the turning over rail 19 has been previously coupled to the returning path rear-wheel rail 17. The present embodiment is different from the first
15 embodiment in that the turning over rail 19 is rotatably mounted to the returning path rear-wheel rail 17 via the hinge 20.

In a general escalator construction work, the returning path rear-wheel rail 17 and returning path noise-wheel rail 18 are mounted after mounting the going path noise-wheel rail 15 and going path rear-wheel rail 16. However, in a refurbishment work reusing the presently
20 existing frame, if the returning path rear-wheel rail 17 is mounted earlier, better workability and higher work efficiency may be obtained, because operations of this refurbishment work are done within the frame already mounted. In this case, as shown in FIG. 5, the returning path rear-wheel rail 17 and the turning over rail 19 have been previously coupled together via the hinge 20
25 into a unit. In this unit, the turning over rail 19 is rotated in a counterclockwise direction as viewed in the figure up to a given position about the axis of rotation of the hinge 20 and then coupled to the support member 22 using bolts in the same way as for the unit shown in FIG. 2.

Consequently, the height and horizontal position of the rolling surface of the returning path rear-wheel rail 17 can be made identical with the height and horizontal position of
30 the rolling surface of the turning over rail 19, in the same way as in the first embodiment.

It is to be understood that the above-described embodiments of the present invention are merely exemplary for the purpose of illustrating the invention and that the scope of the present invention is not restricted to those embodiments. Those skilled in the art can implement the present invention in various other aspects without departing from the gist of the

present invention.

For example, in the above embodiments, the top staircase portion of the escalator is exemplified. If the top and bottom staircase portions are similar in structure, the present invention is also applicable to the bottom staircase portion. In addition, the present invention
5 may be applied to both or any one of the top and bottom staircase portions.

Additionally, in the above embodiments, an escalator is given as one example of passenger conveyer. The present invention may also be applied to a moving walk.

CLAIMS:

1. A passenger conveyer comprising:
a frame (1) mounted along a direction of transport of passengers;
nose-wheel rails (15) mounted in the frame (1) along the direction of transport of passengers and acting to guide nose wheels of steps (4) which circularly move endlessly; and
rear-wheel rails (16, 17) mounted in the frame along the direction of transport of passengers and acting to guide rear wheels of the steps;
wherein the rear-wheel rails (16, 17) include a going path rear-wheel rail (16) for guiding the rear wheels of the steps toward an exit side as viewed in the direction of transport of passengers and a returning path rear-wheel rail (17) for returning the rear wheels of the steps to an entrance side as viewed in the direction of transport of passengers; and
wherein a turning over rail (19) for inverting a direction of motion of the steps is rotatably mounted via a rotary member (20) to an end (16d) of the going path rear-wheel rail (16) or to an end (17a) of the returning path rear-wheel rail (17).
2. The passenger conveyer of claim 1, wherein the turning over rail (19) is configured as a rail member assuming a form like the letter U as viewed from a side and has a going path end (19a) corresponding to the end (16d) of the going path rear-wheel rail (16) and a returning path end (19b) corresponding to the end (17a) of the returning path rear-wheel rail (17), and wherein the going path end (19a) of the turning over rail (19) and the end (16d) of the going path rear-wheel rail (16) are rotatably coupled together or the returning path end (19b) of the turning over rail (19) and the end (17a) of the returning path rear-wheel rail (17) are rotatably coupled together via the rotary member (20).
3. The passenger conveyer of claim 2, wherein the turning over rail (19) can be rotated in a given direction about the axis of rotation of the rotary member (20) such that the returning path end (19b) or the going path end (19a) of the turning over rail (19) which is not rotatably coupled by the rotary member (20) is made to face and come contact with a corresponding one of the end (17a) of the returning path rear-wheel rail (17) and the end (16d) of the going path rear-wheel rail (16), and wherein there is provided a support member (22) to couple and secure together the going path end (19a) of the turning over rail (19) and the end (16d) of the going path rear-wheel rail (16) and to couple and secure together the returning path end (19b) of the turning over rail (19) and the end (17a) of the returning path rear-wheel rail (17).
4. The passenger conveyer of claim 3, wherein the support member (22) is mounted to a mounting member (21) mounted within the frame (1), and wherein the support

member (22) is configured including a going path support member (22a) for securing the going path end (19a) of the turning over rail (19) and a returning path support member (22b) for securing the returning path end (19b) of the turning over rail (19), the going path support member (22a) being mounted between the mounting member (21) and the going path rear-wheel rail (16), the returning path support member (22b) being mounted between the mounting member (21) and the returning path rear-wheel rail (17).