

PASSENGER CONVEYER

Background of the Invention

The present invention relates to an installation of a passenger conveyer typified by an escalator and a moving walk.

A passenger conveyer may be renewed, for example, by dismantling an existing
5 passenger conveyer which has become obsolete and installing a new one in the same place. A known renewal method is a method of construction in which when an existing passenger conveyer is dismantled, its main frame (hereinafter, called an "existing main frame") is left as it is and a passenger conveyer body (hereinafter, called a "new conveyer body") is built into the existing main frame. This method of construction has advantages that it is easy to install a
10 passenger conveyer, and a cost is reduced, and so on.

If a new conveyer body is built into an existing main frame, a known method is such that the new conveyer body is divided into an upper frame situated on the side of an upper floor, a lower frame situated on the side of a lower floor and an intermediate portion frame situated between the upper frame and the lower frame, and these frames are in turn carried inside
15 of the existing main frame while utilizing the existing main frame (see JP-A-2008-230727).

A known method for carrying in and out the frames is a method that each of the upper frame and the lower frame is further divided into a horizontal unit and a folding unit, respectively, the intermediate portion frame is further divided into a plurality of units, and these units are then carried in and out using a carrier device (see JP-A-09-40338 and JP-A-2000-
20 63066).

Further, a known method for renewing a passenger conveyer is a method that an interior truss having a variety of components built thereinto is divided into an upper frame situated on the side of an upper floor, a lower frame situated on the side of a lower floor and an intermediate portion frame situated between the upper frame and the lower frame, the
25 intermediate portion frame is further divided plurally, and these frames are then removably attached inside of a main frame (see JP-A-2009-184771).

Brief Summary of the Invention

However, according to the methods disclosed in JP-A-2008-230727 and JP-A-2009-184771, because there may be not a sufficient space to carry in a new frame of a new
30 conveyer body to be built into an existing main frame depending on a carry-in route or a carry-in

entrance in a building, a passenger conveyer cannot be renewed. Especially, in the case of renewal of a passenger conveyer in a station yard of a subway railroad, it is difficult to employ the methods disclosed in JP-A-2008-230727 and JP-A-2009-184771 because of severe limitation of a carry-in space.

Also, according to the methods described in JP-A-09-40338 and JP-A-2000-63066, while an upper frame of a plurality of frames constituting a new conveyer body to be built into an existing main frame is divided into a horizontal unit without an oblique portion and a folding unit with an oblique portion, these units cannot be often carried, for example, in a railroad station where a carry-in space is limited. Especially, a plurality of components for drive or control such as a driving machine, a terminal gear and the like are generally built into a horizontal unit, so that it is difficult for the horizontal unit to have a size and weight suitable for being easily conveyed.

The above problems may arise when a passenger conveyer is newly installed by installing a main frame newly and building a new conveyer body into the main frame, not limited to the case of renewal of a passenger conveyer.

The present invention can allow a passenger conveyer body to be easily carried in.

According to the invention, a passenger conveyer comprises a main frame and a plurality of components to be arranged in the main frame, wherein the main frame has a first frame to be arranged at one of longitudinal ends of the main frame, a second frame to be arranged at the other ones of the longitudinal ends of the main frame, and at least one third frame arranged between the first and second frame, so that the first, second and third frames are connected in series along a longitudinal direction of the main frame in a detachable manner, the first frame includes at least first and second units connected in series along a longitudinal direction of the first frame in a detachable manner, a driving machine and a control panel as a part of the components being arranged on the first unit, a terminal gear and a rail as another part of the components being arranged on the second unit, and the terminal gear is connected to the driving machine by a chain so that the terminal gear is driven by the driving machine through the chain.

According to the invention, the passenger conveyer body can be easily carried in.

Brief Description of the Several Views of the Drawings

Fig. 1 is a side view illustrating a configuration of a passenger conveyer according to an embodiment;

Fig. 2 is a cross-sectional view taken along Line B-B in Fig. 1;

Fig. 3 is a side view illustrating a detailed configuration of an upper frame in Fig. 1;

Fig. 4 is a view illustrating a state in which the upper frame in Fig. 3 is divided into a plurality of units; and

Fig. 5 is a side view illustrating a detailed configuration of a lower frame in Fig. 1.

Detailed Description of the Invention

A passenger conveyer according to an embodiment will be described hereinafter with reference to the drawings. In the following description, an escalator will be described as one example of the passenger conveyer, but the passenger conveyer may be a passenger conveyer for carrying passengers by moving, in circles, many steps endlessly coupled to each other, and the passenger conveyer is not limited to an escalator. For example, the passenger conveyer may be a moving walk and the like. In the case of the moving walk, an oblique portion is not needed. Furthermore, in the following description, renewal of the passenger conveyer will be described as an example, but the passenger conveyer may be a newly installed one, not renewed, and in that case, an existing main frame is not needed.

Now, a configuration of an escalator after renewal will be described with reference to Figs. 1-5.

Fig. 1 is a side view of the escalator after renewal. Fig. 2 is a cross-sectional view taken along Line B-B in Fig. 1.

In the example shown, the escalator after renewal includes a main frame 1 of an escalator before renewal (existing main frame) and a new escalator body to be installed utilizing the existing main frame 1. In Fig. 1, the existing main frame 1 is shown by the two-dot chain line and a new main frame 11 which is a main frame of the new escalator body is shown by the solid line.

The escalator before renewal has the existing main frame 1, and the existing main frame 1 is provided with a plurality of components. The plurality of components provided in the existing main frame 1 include, for example, a driving machine such as a motor or a speed reducer, a control panel, a drive wheel (terminal gear), a terminal rail, a moving handrail, a handrail driving machine, a handrail and the like (none of them are not shown in Fig. 1). The driving machine, the control panel, the drive wheel and the like are components, for example, to be housed inside the existing main frame 1 (hereinafter, called a "housed component"). Also,

the moving handrail, the handrail driving machine, the handrail, a step and the like are components, for example, to be disposed inside or in the upper portion of the existing main frame 1(hereinafter, called a "disposed component"). That is, the escalator before renewal includes the existing main frame 1, and the housed component and the disposed component which are provided in the existing main frame 1.

On renewal, the plurality of components (the housed component and the disposed component) are removed other than the existing main frame 1, and only the existing main frame 1 remains. Here, it is noted that the escalator before renewal includes the existing main frame 1 and the plurality of components, but it may be configured so that an inner main frame not shown as the escalator body and the components (the housed component and the disposed component) are provided inside the existing main frame 1. In this case, on renewal, the inner main frame and the components (the housed component and the disposed component) provided inside the existing main frame 1 are removed, and only the existing main frame 1 remains.

After renewal, as shown in Fig. 1, the existing main frame 1 is provided with a new escalator body. The new escalator body is an escalator body which is newly provided in the existing main frame 1, instead of the components that the escalator before renewal has included. The new escalator body includes a new main frame 11 and a component not shown which is provided inside (and/or in the upper portion of) the new main frame 11 (the housed component and the disposed component).

First, the existing main frame 1 will be described.

The existing main frame 1 is, for example, a framework body having a truss structure. The existing main frame 1 is an integrated structure body including an upper portion 3 situated on the side of one end of the existing main frame 1 (on the side of an upper floor), a lower portion 2 situated on the side of the other end (on the side of a lower floor) and an intermediate portion 4 situated between the upper portion 3 and the lower portion 2. The lower portion 2, the upper portion 3 and the intermediate portion 4 are connected with each other in series in a longitudinal direction of existing main frame 1. Inside the existing main frame 1, a first housing space is formed. Symbols X_1 and X_2 shown represent positions by which the existing main frame 1 is separated. That is, the intermediate portion 4 is a portion between the separating position X_1 and the separating position X_2 , the lower portion 2 is located below the separating position X_1 , and the upper portion 3 is located above the separating position X_2 .

In the first housing space, the new main frame 11 is housed. Accordingly, the new main frame 11 is formed smaller in its longitudinal and lateral directions than the existing main frame 1.

Referring to Fig. 2, the existing main frame 1 includes a pair of side frameworks 7A and 7B on either side of the existing main frame 1, and a base member 8 coupled to the pair of side frameworks 7A and 7B in their lower portions. These side frameworks 7A and 7B and the base member 8 form the existing main frame 1 in a near "U" shape in the cross-section.

5 Further, the side framework 7A is configured so that an upper cord member 9a, a lower cord member 9b situated below this upper cord member 9a at a distance, and a longitudinal member 9c situated between the upper cord member 9a and the lower cord member 9b are coupled to each other. The side framework 7B opposing to the side framework 7A is configured similarly to the side framework 7A. The lower cord member 9b of the side framework 7A and the lower
10 cord member 9b of the side framework 7B are coupled to respective ends of the base member 8, respectively. In this way, a first housing space S1 is formed. The first housing space S1 is set to have a lateral length W_1 and a height H_1 of the existing main frame 1.

Next, the new main frame 11 will be described.

The new main frame 11 includes a pair of side frameworks 15A and 15B on either
15 side of the new main frame 11, a base member 16 coupled to the pair of side frameworks 15A and 15B in their lower portions, and a cross beam 17 coupled to the side frameworks 15A and 15B at their nearly intermediate portions in their height direction.

The side framework 15A is configured so that an upper cord member 18a, a lower
cord member 18b situated below the upper cord member 18a at a distance and a longitudinal
20 member 18c situated between the upper cord member 18a and the lower cord member 18b are coupled to each other. The side framework 15B opposing to the side framework 15A is configured similarly to the side framework 15A. The lower cord member 18b of the side framework 15A and the lower cord member 18b of the side framework 15B are coupled to respective ends of the base member 16, respectively. In this way, a second housing space S2 is
25 formed. In the second housing space S2, a length W_2 of the outside of the new main frame 11 in its lateral direction (hereinafter, called an "outer lateral width") is set to be shorter than a length W_1 of the inside of the existing main frame 1 in its lateral direction (hereinafter, called an "inner lateral width"). Note that the outer lateral width W_2 is preferably set to be equal to, or shorter than 1,410 mm. The outer lateral width W_2 is set to be shorter than the inner lateral
30 width W_1 , which can allow the new main frame 11 to be housed in the first housing space S1 formed by the existing main frame 1.

Returning to Fig. 1, the new main frame 11 includes a plurality of detachable frames, and the plurality of detachable frames are coupled to each other at their predetermined coupling positions in their longitudinal direction. In particular, the new main frame 11 includes

an upper frame 13 separably coupled in its longitudinal direction and disposed on the side of one end (on the side of an upper floor) of the existing main frame 1, a lower frame 12 disposed on the side of the other end (on the side of a lower floor) inside the existing main frame 1, and an intermediate portion frame 14 disposed between the upper frame and the lower frame. The
5 frames 12-14 are connected with each other in series in their longitudinal direction. The upper frame 13 is housed in the upper portion 3 of the existing main frame 1, and the lower frame 12 is housed in the lower portion 2 of the existing main frame 1, and the intermediate portion frame 14 is housed in the intermediate portion 4 of the existing main frame 1, respectively.

At least any one of the upper frame 13 and the lower frame 12 includes three or
10 more units separably coupled to each other in their longitudinal direction. In the example shown, the upper frame 13 includes three units 131-133, and the lower frame 12 includes two units. However, the upper frame 13 may include two units, and the lower frame 12 may include three units. Also, both of the upper frame 13 and the lower frame 12 may include three or more units, respectively.

Each of the upper frame 13 and the lower frame 12 includes an oblique portion
15 most or all of which is inclined, and a horizontal portion which is not inclined. At least a horizontal portion of the oblique portion and the horizontal portion includes a plurality of units. In the example shown, the horizontal portion of the upper frame 13 is provided with a first upper horizontal unit 131 and a second upper horizontal unit 132, and the oblique portion of the upper
20 frame 13 is provided with an upper oblique unit 133. Further, the horizontal portion of the lower frame 12 is provided with a first lower horizontal unit 121, and the oblique portion of the lower frame 12 is provided with a lower oblique unit 122. Note that the above units 131, 132, 133, 121 and 122 have their longitudinal lengths preferably set to be equal to, or shorter than 2,000 mm, respectively. Furthermore, their weights are preferably equal to, or smaller than
25 1,800 kg, respectively. In this way, a decrease in length and weight through separation into smaller pieces than conventional can allow each of the units to be easily carried in.

The intermediate portion frame 14 is configured so that a plurality of intermediate units are separably coupled to each other. In the example shown, the intermediate portion frame 14 includes three intermediate units 141-143, but it may include the intermediate units as
30 many as needed. A length of each of the intermediate units 141-143 (along their longitudinal direction) is preferably equal to, or shorter than that of a unit of any one of the first upper horizontal unit 131, the second upper horizontal unit 132 and the oblique unit 133. At least any one, or preferably all of the units 131-133 have the lengths, for example, equal to, or shorter than 2,000 mm.

In the example shown, the new main frame 11 includes eight units 121, 122, 131, 132, 133, 141, 142 and 143, and each of the units 121, 122, 131, 132, 133, 141, 142 and 143 is coupled at respective separating positions Y_1 - Y_7 , respectively. The number of the units included by the escalator body may be determined based on a length of the new main frame 11 of the escalator body in its longitudinal direction. Also, the separating positions for separating respective units from the horizontal portion and the number of the units (the number of the separating positions) are determined based on a length of the horizontal portion in its longitudinal direction. In the example shown, because in the upper horizontal portion, the horizontal unit (unit without the oblique portion) is set to include two units 131, 132 (conventionally zero or one unit), the length in the longitudinal direction and the weight can be decreased. Note that in the upper horizontal portion, the horizontal unit may include three or more units (unit without the oblique portion).

Fig. 3 is a side view illustrating a detailed configuration of the upper frame 13.

The units 131-133 of the upper frame 13 have a plurality of components built thereinto, respectively. In the example shown, the first upper horizontal unit 131 has a driving machine 21 (for example, a motor, a speed reducer and the like), and a control panel 22 built thereinto as the component. The second upper horizontal unit 132 has an upper terminal gear (upper drive wheel) 23 and an upper terminal rail 24 built thereinto as the component. The upper oblique unit 133 has a straight rail 25 built thereinto as the component. As each of the units 131-133 has the components built thereinto in this way, the weight and size of the units can be distributed more evenly than conventionally. Especially, the driving machine 21 and the upper terminal gear 23 which are heavy are separated from each other, which can prevent each of the units from becoming too heavy.

Also, the driving machine 21 in the first upper horizontal unit 131 and the upper terminal gear 23 in the second upper horizontal unit 132 are wound by a chain to link the driving machine 21 and the upper terminal gear 23. Accordingly, a drive force of the driving machine 21 can be transmitted to the upper terminal gear 23. The chain straddles the boundary between the units 131 and 132. Further, the upper terminal gear 23 in the second upper horizontal unit 132 and the straight rail 25 in the upper oblique unit 133 are connected with each other by a curved rail 27. Furthermore, a handrail driving machine 26 is built into to drive a moving handrail. The curved rail 27 straddles the boundary between the units 132 and 133. Also, the handrail driving machine 26 is installed to straddle the boundary between the units 132 and 133.

Fig. 4 is a view illustrating a state in which the upper frame 13 is divided into the plurality of the units 131-133.

In the state in which the first upper horizontal unit 131 and the second upper horizontal unit 132 are separated from each other, the chain to link the driving machine 21 and the upper terminal gear 23 is removed. Further, in the state in which the second upper horizontal unit 132 and the upper oblique unit 133 are separated from each other, the curved rail 27 for linking the terminal gear 23 and the straight rail 25 and the handrail driving machine 26 are removed.

Fig. 5 is a side view illustrating a detailed configuration of the lower frame 12.

Each of the units 121, 122 has a plurality of components built thereinto. In the example shown, the first lower horizontal unit 121 has a lower terminal gear 28 and a lower terminal rail 29 built thereinto as the component. Further, the lower oblique unit 122 has a straight rail 31 built thereinto as the component. A lower curved rail 30 is installed to straddle the boundary between the units 121 and 122.

Also, intermediate units 141-143 have a straight rail built thereinto as a component.

Next, a method for renewing an escalator will be described.

A component is built into each of the units 121, 122, 131, 132, 133, 141, 142 and 143 beforehand (before each of the units is carried to the actual place where the escalator is installed) at a predetermined place such as a factory site. At this time, the upper frame 13 is temporarily assembled by coupling all the units 131-133 to each other, positioning portions are provided at the separating positions to indicate positioning, and then the upper frame 13 is disassembled into the units 131-133 again before carried to the actual place. The positioning portions may be a component of any one of the units 131-133, they may be a member which is to be removed after the units 131-133 are coupled to each other at the actual place, or they may be a mere mark which is to remain after renewal. Also, the lower frame 12 is temporarily assembled by coupling all the units 121 and 122 to each other, positioning portions are provided at the separating positions to indicate positioning, and then the lower frame 12 is disassembled into the units 121 and 122 again before carried to the actual place. Furthermore, the intermediate portion frame 14 is temporarily assembled by coupling the intermediate units 141-143 to each other, positioning portions are provided at the separating positions to indicate positioning, and then the intermediate portion frame 14 is disassembled into the units 131-133 again before carried to the actual place.

Each of the units 121, 122, 131, 132, 133, 141, 142 and 143 is coupled to each other by a coupling member such as a reamer bolt at the actual place after the units are separately carried in. Because for each of the frames 12, 13 and 14, the units are temporarily coupled to

each other at the factory, and what is substantially needed at the actual place is only to couple the units to each other at the separating positions indicated by the positioning portions, it is easy to couple them at the actual place. Furthermore, as described above, because for each of the frames 12, 13 and 14, the units are temporarily coupled to each other at the factory, each of the frames 12-14 has a high dimensional accuracy and it is easy to center each of the components and make fine adjustments to each of the components at the actual place.

More particularly, in the case of the upper frame 13, it is necessary to mount the chain for linking the driving machine 21 and the upper terminal gear 23, the handrail driving machine 26 and the curved rail 27 at the actual place. Also, in the case of the lower frame 12, it is necessary to mount the lower curved rail 30 at the actual place. However, on assembling at the factory, all the units 121, 122, 131, 132 and 133 constituting the upper frame 13 and the lower frame 12 are temporarily coupled to each other, all components after being built in are centered, and the frames 13, 12 are disassembled into each of the units 121, 122, 131, 132 and 133, respectively, before delivered to the actual place. At the actual place, after the units 131, 132 and 133 of the upper frame 13 are coupled to each other, the chain is fixed to link the driving machine 21 and the upper terminal gear 23, the handrail driving machine 26 is fixed by a fixing member such as a bolt at a predetermined mounting position in the upper frame 13, and the curved rail 27 is mounted to the upper frame 13 to match the terminal rail and the straight rail which have been built into each unit. Therefore, this can allow for easy centering and fine adjustment of each component at the actual place. Also, in the lower frame 12, at the actual place, after the units 121 and 122 of the lower frame 12 are coupled to each other, the lower curved rail 30 is mounted to the lower frame 12. Similarly to the upper frame 13, this can allow for easy centering and fine adjustment of each component.

The straight rail may be built into the units 141-143 of the intermediate portion frame 14 beforehand on assembling at the factory so that its length matches the dimensions of the units 121, 122, 131, 132 and 133 of the lower frame 12 and the upper frame 13.

According to this embodiment described above, the new main frame 11 can be carried to even a place where a carry-in entrance and a carry-in route are narrow and there is not a sufficient carry-in space, for example, a subway station. Therefore, renewal can be achieved using each of the unitized frames without an increase in difficult field work.

Also, each of the units is made smaller and the weight of each of the units is controlled, so that each of the units can be carried in using an elevator. Accordingly, it can be expected to expand the range of renewal application largely. Especially, the horizontal portion of the upper frame 13 into which heavy components such as the driving machine 21 and the

terminal gear 23 are built is divided into the plurality of the units 131 and 132, and the plurality of the components built into the horizontal portion of the upper frame 13 are divided into the plurality of the units 131 and 132 to be dispersedly disposed. Accordingly, transportability is improved, and it is easy to carry in the frames.

5 The embodiments described above illustrates by an example for describing the present invention, and the range of the present invention is not intended to be limited to only the embodiments. Persons skilled in the art may implement the present invention in various, other aspects without departure from the spirit and range of the present invention.

10 For example, in this embodiment, the components involving a drive and control function such as the driving machine (heavy components) are built into each of the units of the upper frame 13, but these components may be built into the lower frame.

15 Further, in the case of a passenger conveyer in which the length of a lower horizontal portion of an existing main frame is longer than that of the lower horizontal portion in the embodiment described above, for example, the number of units may be increased. For example, in the case of three units, a separating position may be added between a lower support portion (for example, a lower beam receiving portion for supporting an escalator that is a beam in a building) and the lower terminal gear.

20 Also, a passenger conveyer is not limited to an escalator. For example, the passenger conveyer may be a moving walk and the like. In the case of the moving walk, the oblique portion is not needed.

 Furthermore, a passenger conveyer may be a new passenger conveyer, not renewed, and in this case, the existing main frame is not needed.

Claims:

1. A passenger conveyer comprising a main frame and a plurality of components to be arranged in the main frame,
wherein the main frame has a first frame to be arranged at one of longitudinal ends of the main frame, a second frame to be arranged at the other ones of the longitudinal ends of the main frame, and at least one third frame arranged between the first and second frame, so that the first, second and third frames are connected in series along a longitudinal direction of the main frame in a detachable manner,
the first frame includes at least first and second units connected in series along a longitudinal direction of the first frame in a detachable manner, a driving machine and a control panel as a part of the components being arranged on the first unit, a terminal gear and a rail as another part of the components being arranged on the second unit, and the terminal gear is connected to the driving machine by a chain so that the terminal gear is driven by the driving machine through the chain.
2. The passenger conveyer according to claim 1, wherein the second unit extends horizontally, and the first frame includes a third unit which is connectable to the third frame and has an inclined part.
3. The passenger conveyer according to claim 1 or 2, wherein the third frame includes a plurality of intermediate units connected in series along a longitudinal direction of the third frame in a detachable manner, and a longitudinal length of each of the intermediate units is not longer than a length of at least one of the first and second units.
4. The passenger conveyer according to claim 1 or 2, wherein the first frame has a horizontally extending part and an inclined part, the horizontally extending part is capable of being divided into units including at least the first and second units, and each of at least one position at which the horizontally extending part is divided into the units and a total number of the units including at least the first and second units is determined in accordance with a longitudinal length of the horizontally extending part.
5. The passenger conveyer according to claim 1 or 2, wherein a positioning portion is arranged on at least one position at which the first frame is capable of being divided into the at least first and second units so that the at least first and second units are capable of being positioned at the at least one position by the positioning portion.
6. The passenger conveyer according to claim 1 or 2, wherein each of the first and second units has a longitudinal length not more than 2000 mm, a height not more than 2100 mm, and a weight not more than 1800 kg.

7. The passenger conveyer according to claim 1 or 2, wherein the main frame is capable of being arranged in an existing main frame used in an existing passenger conveyer to be renewed.

8. The passenger conveyer according to claim 1 or 2, wherein the third frame forms an inclined part of the passenger conveyer.