

"A PASSENGER CONVEYOR".

This invention relates to a passenger conveyor such as an escalator or an electric moving sidewalk, otherwise known as a traveller, and, more particularly, to a balustrade supporting structure of a passenger
5 conveyor.

Passenger conveyors such as escalators and moving sidewalks should satisfy the requirements such as lightness in weight and high efficiency of assembling in addition to their fundamental requirements such as a
10 means of passenger conveyance or transport as well as design and safety.

Light weight and high efficiency of the assembly of the passenger conveyor are preferable in that the strength burden on a building where the passenger
15 conveyors are located can be reduced and in that obstacles which may be caused in a process of building the building can be reduced.

A conventional passenger conveyor, generally, comprises a plurality of steps and a pair of moving
20 handrails which circulate endlessly between a first landing area and a second landing area, and a pair of balustrades arranged at opposite sides of the steps so as to upstand and guide the moving handrais. The balustrades each includes balustrade panels, inner and
25 outer deck covers arranged at lower portions of the balustrade panels, skirt guards, and so on, and constitute

the design portion of the passenger conveyor as a whole.

The balustrade panels, the inner and outer deck covers, and the skirt guards, etc. are supported by a main body frame which is mounted on the floors of a building and supports the whole of the passenger conveyor, using a lot of structural members. An example of this construction is disclosed in Japanese Utility Model Laid-Open No. 114,281/1983, wherein a structural support member is secured to the main body frame to support the lower end portion of the balustrade panel in co-operation with a pressing plate and fastening bolts. The inner deck cover and skirt guard are mounted on the main body frame by means of other structural members. In this construction, although there is not shown a handrail guide frame located below the balustrade panel and secured to the main body frame, the handrail guide frame must be mounted on the main body frame by means of an additional structural member because the structural support member supporting the balustrade panel does not support the handrail guide frame.

In this construction, the structural support member supporting the balustrade panel is elongated in the direction of its length, and a number of support members are used, which greatly adds to the weight of the structure. The use of a number of structural support members prevents the assembly of the balustrade from increasing the assembly efficiency.

U.S. Patent Specification No. 3,989,133 also discloses a balustrade lower side portion, wherein elongated channel supports are used to receive and support the lower ends of balustrade panels. The channel supports are secured to the main body frame which consists of a truss by means of a plurality of clamp assemblies which are fastened to the main body frame in spaced relation. The clamp assembly bends the support channel to clamp the balustrade panels. The channel support is used in co-operation with a structural member with a similar groove receiving the balustrade panel. The channel support and the structural member are arranged end to end and joined by a splice member, using bolts. Since the splice member is insufficient by itself to provide the necessary support and lateral stability, the splice member is clamped by a newel clamp to provide necessary support. The newel clamp is constituted by various structural members.

As mentioned above, the balustrade lower portion structure disclosed in the U.S. Patent Specification No. 3,989,133 is provided with the elongated support channel and the various structural members for securing the balustrade panel to the main body frame. Accordingly, the structure is unnecessarily heavy and also takes a long time to assemble.

A further example of the balustrade support structure is disclosed in U.S. Patent Specification No. 3,321,059. In this structure, a structural member, fastened to a supporting

truss as a main body frame, is used for supporting a balustrade panel. The structural member has a vertical flange portion. Another structural member supports an elongated bar located around the bottom of the vertical flange portion in the direction of travel of the steps. An upstanding bracket having a stud welded thereto is provided so as to oppose the vertical flange portion of the structural member, thereby providing a space for the balustrade panel lower portion. The balustrade panel is arranged on the elongated bar in the space and clamped by pressing the balustrade panel on the vertical flange portion of the structural member by screw bolts passing through the bracket and the elongated bar and screwed in the vertical flange portion, using an elongated strap.

15 The structure disclosed in this U.S. Patent Specification also employs elongated members and various members for mounting the balustrade panel on the main body frame.

It is an object of the present invention to provide a passenger conveyor which has a balustrade panel lower support construction which is simplified, reduced in weight and having an increased precision of assembly, over the above known construction.

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It is another object of the present invention to provide a passenger conveyor which reduces

25 weight burden of the portion of a building on which the passenger conveyor is installed, and enables a rapid

assembling of a balustrade panel lower support construction.

According to a first aspect of the present invention there is provided a passenger conveyor including: a main body frame extending from one of two landing areas to the other; a plurality of steps connected together and mounted on said frame to circulate endlessly; a pair of moving handrails driven in synchronism with said steps and in the same direction as said steps; a pair of balustrades supported by said main body frame and arranged on opposite sides of said steps to form side walls for supporting said moving handrails, each of said balustrades including an upstanding balustrade panel, an inner deck cover, an outer deck cover and a skirt guard, wherein said conveyor also includes a plurality of structural support members mounted on said main body frame in spaced relation in the longitudinal direction of said main body frame, each of said structural support members being made of one piece and having a U-shaped support portion extending in the longitudinal direction of said main body frame and providing opposite two, first and second, upstanding wall portions between which a lower portion of said balustrade panel is inserted; a mounting flange portion formed on one side of said U-shaped support portion for mounting thereon said outer deck cover; a mounting projection formed on the other side of said U-shaped support portion for mounting thereon said inner deck cover; fastening means for pressing one side of said lower portion of said balustrade panel on said first upstanding wall portions of said U-shaped support portion by

repelling force produced between said second upstanding wall portion and the other side of said lower portion of said balustrade panel opposing said second upstanding wall portion.

5 According to a second aspect of the present invention these is provided a passenger conveyor including a main body frame extending in its longitudinal direction; a plurality of steps connected together and mounted on said frame to circulate endlessly; a pair of moving handrails driven in
10 synchronism with said steps and in the same direction as said steps; a pair of balustrades supported by said main body frame and arranged on opposite sides of said steps to form side walls for supporting said moving handrails, each of said balustrades including an upstanding balustrade
15 panel, an inner deck cover, an outer deck cover and a skirt guard, wherein said conveyor also includes a plurality of structural support members mounted on said main body frame in spaced relation in the longitudinal direction of said main body frame, each of said structural support members
20 being made of one piece of a casting and having a U-shaped support portion, defining a groove for receiving therein a lower end portion of said upstanding balustrade panel and supporting said balustrade panel, said U-shaped support portion including a base portion, first and second side
25 portions upstanding from opposite ends of said base portion, respectively, thereby providing said groove extending in the longitudinal direction of said main body frame; a mounting flange portion integrally formed on said first side portion

of said U-shaped support portion so as to extend substantially horizontally therefrom, and secured to said main body frame, said mounting flange portion having a pair of upper flat support portions for mounting thereon said outer deck cover; a mounting projection projecting substantially horizontally from said second side portion of said U-shaped support portion for mounting thereon said inner deck cover; a downward projection projecting downwards from the downward side of said base portion of said U-shaped support portion for mounting thereon a handrail guide for guiding said moving handrail, said downward projection being of a plate-like shape which is on a plane substantially perpendicular to the longitudinal direction of said main body frame thereby providing reinforcement of said U-shaped support portion; a plate arranged in said U-shaped support portion so as to sandwich said lower portion of said balustrade panel in co-operation with said first side portion of said U-shaped support portion; and bolts each engaged with said plate and said second side portion of said U-shaped support portion to produce a repelling force therebetween whereby said lower portion of said balustrade panel is pressed on said first side portion of said U-shaped support portion by said plate receiving the repelling force.

The present invention will now be described in greater detail by way of example with reference to the accompanying drawings, wherein:

Fig. 1 is a perspective view of a part of a passenger conveyor;

Fig. 2 is a sectional view of a balustrade according to an embodiment of the present invention, taken along a line 2-2 of Fig. 1;

Fig. 3 is a perspective view of supports employed in the passenger conveyor;

Fig. 4 is a perspective view of a support according to another embodiment of a balustrade; and

Fig. 5 is a sectional view of a part of the balustrade taken along a line 5-5 of Fig. 4.

Referring to Fig. 1, the passenger conveyor comprises a plurality of steps 1 connected together and extending from a landing area 3 to another area (not shown) to circulate therebetween. A pair of balustrades 2 are arranged on opposite sides of the steps 1 to form side walls and are supported by a main body frame which is mounted on a floor F. The balustrades 2 each have a balustrade panel 5 which may be transparent glass, a moving

handrail 4 supported by the balustrade panel 5, inner and outer deck covers 6, 7 and a skirt guard. The balustrades 2 each are supported by the main body frame as shown in Fig. 2.

5 In Fig. 2, the main body frame 9 is in the form of a truss and has an upper chord member and struts. The balustrade 2 is supported by the main body frame 9 through a structural support member 10. The support member 10 is secured to the upper chord member of the main body frame 9 by bolts 10 12 through metal sheets 11 for adjusting the height of the structural support member 10, and has a plurality of mounting portions, for the outer deck cover 7, the balustrade panel 5, the inner deck cover 6, the skirt guard 8, and the handrail 4.

15 The construction of the structural support member 10 is best shown in Fig. 3. In Fig. 3, the support member 10 is cast from one piece of cast steel. The support member 10 comprises a U-shaped support portion 100 formed by a base portion 103, first and second side portions 101, 102 upstanding from the base portion thereby 20 forming a U-shaped groove having a pair of side wall portions, and extending in the longitudinal direction of the main body frame 9.

The first side portion 101 has a mounting flange 25 portion 105 projecting substantially horizontally therefrom. The mounting flange portion comprises a base 106 with holes and a pair of flat portions 107 upstanding

from ends of the base 106. The flat portion 107 has threaded holes 108.

The second side portion 102 has threaded holes 104 provided towards the top thereof and a mounting projection 110 projecting substantially horizontally. The mounting projection 110 is arranged in order to align with the base portion 103 and has holes 111.

On the downward side of the base portion 103 of the U-shaped support portion 100, a pair of downward projections 112 with holes 113 are integrally provided so as to project downward. The downward projections 112 each are of plate like shape the surface of which is on a plane substantially perpendicular to the longitudinal direction of the main body frame 9 so that they serve to reinforce the U-shaped support member 100. The U-shaped support member 100 is provided with ribs 114 extending from parts of the downward projections 112.

Referring back to Fig. 2, the structural support member 10 is secured by the bolts 12 to the upper chord member of the main body frame 9 so as to project to one side thereby, forming a cantilever. The mounting flange portion 105 is formed with a recess defined by the base 106 and the pair of upstanding flat portions 107. The bolts 12 are submerged in the recess so that the heads of the bolts are kept below the flat portions 107. The structural support member 10 is adjusted so that the groove of the U-shaped portion 100 strictly aligns with the longitudinal

direction of the main body frame and strictly upstands.
The balustrade panel as made of transparent glass is about
2 m in length, for example. Such balustrade panel is
supported at two positions, that is, by two support
5 members 10 in a spaced relation as shown in Fig. 3.

The length of the structural support member 10 is 8%
to 15% of the length of the balustrade panel 5, so that
the support member 10 is reduced in weight, the above-
mentioned adjustment is done easily and the precision of
10 assembly can be increased.

The balustrade panel 5 is covered by a packing 14
made of plastics material around the lower portion. The plastic
packing 14 is provided with flanges in order to form a
pair of grooves 141 for receiving the ends of the inner
15 and outer deck covers 6 and 7. The balustrade panel 5 the
lower end portion of which is covered by the packing 14
is inserted into the U-shaped portion 100, and then a
metal plate 15 is inserted to sandwich the lower portion
of the balustrade panel 5 between the first side portion
20 101 and the metal plate 15. The metal plate 15 is pressed
on the panel 5 by bolts screwed in the threaded holes of
the second side portion 101, so that the panel 5 is
clamped, thereby producing a repelling force
between the metal plate 15 and the second side portion
25 102 and between the first and second side portions 101
and 102. The downward projections serve to effectively
prevent the U-shaped support portion 100 from being

deformed by the repelling force, so that the support member 100 can be reduced in size, which results in reduction in its weight.

5 The mounting projection 110 is fixed to a bar 17 by bolts 18. The bar extends in the longitudinal direction of the main body frame 9. The bar 17 is used in common to a number of the support members 10. Even if a very large force is imparted to one of the structural support members 10 by the balustrade panel, the force is shared with the others through the bar, so that the balustrade is stable. The skirt guard 8 and the inner deck cover 6 are fixed to the bar 17 by screw means. The lower portion of the skirt guard 8 is secured to the main body frame 9, using a members 21 and 22.

15 The moving handrail 4 is supported by the downward projection 112. The projection 112 has a bracket 19 secured thereto by bolts. The bracket 19 holds the handrail guide 20 by means of bolts.

20 The outer deck cover 7 is located on a bracket 13 fixed to the flat portions 107 of the mounting flange portion 105.

25 According to the embodiment described above, a large number of constituent components that have otherwise been located at the lower side portion of the balustrade in the conventional structure can all be integrated into the support member 10. Consequently, the weight and the number of components of an escalator or travelator can be

reduced and dimensional accuracy can be substantially improved in comparison with the conventional structures consisting of a large number of components. Less time is spent in assembling the balustrade.

5 A second embodiment is now described with reference to Figures 4 and 5.

10 This embodiment differs from the previous embodiment only in that a structural support member 10a has a pair of grooves 115 for receiving nuts 23 and through holes 104a, and the balustrade panel 5 is fastened by the metal plate 15 and the bolts 16 which pass through the through hole 104a and screwed into the nuts 23. The structural support member 10a comprises a mounting flange portion 105 mounted on the main body frame 9, a U-shaped support portion 100a having first and second side portions 101, 102a for supporting the balustrade panel 5, a mounting projection 110 for mounting thereon the inner deck cover 6, and a pair of downward projections 112 for mounting the handrail guide 20. This structural support member 10a supports the various parts of the balustrade as mentioned above.

20 In this embodiment, threaded holes such as holes 104 for relatively large sized bolts 16 are unnecessary. Instead, the nuts 23 and through holes 104a are provided 25 in place of the threaded holes 104. Therefore, the manufacture of the support member 10a is easier than the support member 10.

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CLAIMS.

1. A passenger conveyor including: a main body frame
extending from one of two landing areas to the other; a
5 plurality of steps connected together and mounted on said
frame to circulate endlessly; a pair of moving handrails
driven in synchronism with said steps and in the same
direction as said steps; a pair of balustrades supported
by said main body frame and arranged on opposite sides of
10 said steps to form side walls for supporting said moving
handrails, each of said balustrades including an
upstanding balustrade panel, an inner deck cover, an outer
deck cover and a skirt guard, wherein said conveyor also includes
a plurality of structural support members mounted on said
15 main body frame in spaced relation in the longitudinal direction
of said main body frame, each of said structural support
members being made of one piece and having a U-shaped support
portion extending in the longitudinal direction of said main
body frame and providing opposite two, first and second,
20 upstanding wall portions between which a lower portion of
said balustrade panel is inserted; a mounting flange
portion formed on one side of said U-shaped support
portion for mounting thereon said outer deck cover; a
mounting projection formed on the other side of said U-
25 shaped support portion for mounting thereon said inner
deck cover; fastening means for pressing one side of said
lower portion of said balustrade panel on said first



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upstanding wall portions of said U-shaped support portion by repelling force produced between said second upstanding wall portion and the other side of said lower portion of said balustrade panel opposing said second upstanding wall portion.

2. A passenger conveyor according to claim 1, wherein said fastening means includes a plate provided to sandwich said lower portion of said balustrade panel in co-operation with said first upstanding wall portion of said U-shaped support portion and bolts engaged with said second upstanding wall portion of said U-shaped support portion to press said plate through said bolts, so that said repelling force is produced.

3. A passenger conveyor according to claim 2, wherein said structural support member has at least one projection, projecting downward from the lower side of said U-shaped support portion, for mounting thereon a handrail guide for said moving handrail.

4. A passenger conveyor according to claim 2, wherein said structural support is provided with two projections in spaced relation in the longitudinal direction of said main body frame, each of said two projections being of plate-like shape the surface of which is on a plane substantially perpendicular to the longitudinal direction of

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said main body frame, whereby said projections reinforce said U-shaped support portion.

5. A passenger conveyor including a main body frame
5 extending in its longitudinal direction; a plurality of steps
connected together and mounted on said frame to circulate
endlessly; a pair of moving handrails driven in
synchronism with said steps and in the same direction as
said steps; a pair of balustrades supported by said main
10 body frame and arranged on opposite sides of said steps to
form side walls for supporting said moving handrails,
each of said balustrades including an upstanding
balustrade panel, an inner deck cover, an outer deck cover
and a skirt guard, wherein said conveyor also includes a plurality
15 of structural support members mounted on said main body
frame in spaced relation in the longitudinal direction of said
main body frame, each of said structural support members being
made of one piece of a casting and having a U-shaped
support portion, defining a groove for receiving therein
20 a lower end portion of said upstanding balustrade panel
and supporting said balustrade panel, said U-shaped
support portion including a base portion, first and second
side portions upstanding from opposite ends of said base
portion, respectively, thereby providing said groove
25 extending in the longitudinal direction of said main body frame;
a mounting flange portion integrally formed on said first
side portion of said U-shaped support portion so as to



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extend substantially horizontally therefrom, and secured to said main body frame, said mounting flange portion having a pair of upper flat support portions for mounting thereon said outer deck cover; a mounting projection
5 projecting substantially horizontally from said second side portion of said U-shaped support portion for mounting thereon said inner deck cover; a downward projection projecting downwards from the downward side of said base portion of said U-shaped support portion for mounting
10 thereon a handrail guide for guiding said moving handrail, said downward projection being of a plate-like shape which is on a plane substantially perpendicular to the longitudinal direction of said main body frame thereby providing reinforcement of said U-shaped support portion; a plate
15 arranged in said U-shaped support portion so as to sandwich said lower portion of said balustrade panel in co-operation with said first side portion of said U-shaped support portion; and bolts each engaged with said plate and said second side portion of said U-shaped support
20 portion to produce a repelling force therebetween whereby said lower portion of said balustrade panel is pressed on said first side portion of said U-shaped support portion by said plate receiving the repelling force.

25 6. A passenger conveyor according to claim 5, including a packing covering said lower portion of said balustrade panel, said lower portion of said balustrade



panel being pressed on said first side portion by said plate through said packing, and said packing having a pair of grooves for fitting therein ends of said inner and outer deck covers.

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7. A passenger conveyor according to claim 5, wherein said inner deck cover and said skirt guard are fixed to a bar and said mounting projection of each of said structural support members is connected to said bar.

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8. A passenger conveyor according to claim 5, wherein a downward projection is further provided on said downward side of said base portion of said U-shaped support portion to form a pair, said two downward projections being provided at end portions of said U-shaped support portion in the longitudinal direction of said main body frame, parts of said downward projections extending to said first and second side portions of said U-shaped support portion so that said U-shaped support portion is reinforced.

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9. A passenger conveyor according to claim 5, wherein said second side portion of said U-shaped support portion is formed with recesses for receiving nuts, said bolts are screwed in said nuts received in said recesses thereby pressing said plate so as to press said lower portion of said balustrade panel on said first side portion of said U-shaped support portion.

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10. A passenger conveyor constructed substantially as herein described with reference to and as illustrated in Figures 1 to 3 or Figures 4 and 5 of the accompanying drawings.
