

A BALUSTRADE OF A PASSENGER CONVEYOR

BACKGROUND OF THE INVENTION

The present invention relates to a balustrade of a passenger conveyor, and more particularly, to a guide means for slidably attaching a movable handrail to the balustrade.

In a conventional balustrade of a passenger conveyor such as that shown in Japanese Patent Publication No. 55-1224, a balustrade panel made of tempered glass, etc. is disposed on the main frame of the passenger conveyor in the longitudinal direction thereof. A channel-shaped fitting member of a rigid material is fitted on the edge of the balustrade panel through a channel-shaped packing member made of an elastic material. The fitting member has an extension projecting on each side thereof and the extension is covered by a C-shaped guide rail made of a material having a low frictional coefficient such as nylon to guide thereon a moving handrail of rubber having a C-shaped cross section. The handrail is slidably fitted on the guide rails covering said extensions of the fitting member, and the open portion of the C-shaped handrail is positioned below the guide rails and the outer surface of each guide rail engages the inner surface of each side of the handrail in the longitudinal direction thereof.

However, the above-described conventional balustrade has disadvantages in that when the fitting member is press-fitted onto the balustrade panel edge through the packing member, the packing member may be damaged so that a complicated and carefully-performed operation is necessary to properly fit the fitting member onto the balustrade panel. Furthermore, since the balustrade panel is not always uniform in thickness, the fitting member may not firmly fit onto the balustrade panel, and the elastic force of the packing member for attaching the fitting member to the balustrade panel may be reduced by deterioration of the packing member due to aging even when the fitting member has originally been properly fitted on the balustrade panel.

In another conventional balustrade of a passenger conveyor of the type shown in Japanese Laid-Open Patent Publication No. 57-180583, a channel-shaped fitting member is press-fitted at its fitting groove onto a balustrade panel edge through a channel-shaped packing member, and has extensions extending on both sides of the fitting member for supporting a handrail thereon. The fitting member is attached to the balustrade panel by tightly press-fitting side wall members defining the fitting groove against the edge of the balustrade panel by bolts and nuts. The use of the bolts and nuts requires through holes in the side walls of the fitting member and notches in the packing and the panel edge. Alternatively, the pair of side wall members

(13)

of the fitting member may be separated by a distance smaller than the thickness of the balustrade panel edge so that they are press-fit on the edge by the elasticity of the material.

However, with the structure using tightening bolts, since the above-mentioned through holes and the notches must be provided in the fitting member, the packing member and the balustrade panel plate, the balustrade has disadvantage that it is difficult to manufacture and assemble the fitting member, the packing member, and the balustrade panel. A balustrade of the latter type has disadvantages that the packing member may be damaged when the fitting member with side walls is press-fit onto the balustrade panel, and the press-fitting accuracy is very severe and that the differing thickness of the balustrade panel edge and the aging of the elastic material make the balustrade less reliable.

SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide a balustrade of passenger conveyor in which a guide rail for guiding a handrail thereon can be easily and reliably mounted on an edge of the balustrade panel.

Another object of the present invention is to provide a balustrade of a passenger conveyor in which when a guide rail for guiding a handrail thereon is fitted onto an edge of

the balustrade panel through a packing member, the packing member is not damaged and the complicated processing of the guide means, the packing member and the balustrade plate is not necessary to attach the guide rail onto the balustrade panel.

With the above objects in view, the present invention resides in a balustrade of a passenger conveyor comprising a balustrade panel disposed along a main frame of the passenger conveyor, a handrail guide attached on an edge of said balustrade panel, said handrail guide including a channel member having a substantially U-shaped cross section having a pair of spaced side wall members with a predetermined distance therebetween and a bottom wall member between said side wall members these side wall members and bottom wall member forming a channel fitted over the panel edge, an extension wall member extending from each of said side wall members in the direction generally opposite to the direction of extension of said side wall members with respect to said bottom wall member to define a space between said extension wall members and said bottom wall member, and a guide rail disposed on said extension wall members, a moving handrail supported and guided by said guide rail of said handrail guide for movement along the edge of said balustrade panel, and separating means disposed in said space between said extension wall

(15)

members of said handrail guide for further separating, when extended, said extension wall members from each other, thereby urging said side wall members against the edge of said balustrade panel, said handrail guide having a rigidity suitable for allowing said handrail guide to deform to decrease said distance between said side wall members when said extension wall members are separated, thereby firmly gripping the edge of said balustrade by said side wall members.

The invention will become more readily apparent from the following description of the preferred embodiments thereof taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a side view of a passenger conveyor;

Fig. 2 is a sectional view showing one embodiment of a balustrade of passenger conveyor according to the present invention;

Fig. 3 is a sectional view showing a state in which a fitting member is bent by an extension member; and

Fig. 4 is a sectional view showing another embodiment of a balustrade of passenger conveyor according to the present invention.

Referring now to Figs. 1 and 2, a balustrade panel 2 made of, e.g., transparent tempered glass is disposed

on the main frame 1 of a passenger conveyor in the longitudinal direction thereof. A handrail guide ~~or a~~^{and} fitting member 4, which is preferably formed by a relatively thin plate made by the extrusion molding of a material such as aluminum, stainless steel or synthetic resin, has a bottom wall 4e and a pair of inner side walls 4d forming a fitting groove 4a for fitting the fitting member 4 onto the upper ~~end~~^{edge} of the balustrade panel 2. In other words, the handrail guide 4 may be said to include a channel member of a substantially U-shaped cross section. The channel member includes the pair of separated side walls 4d and the bottom wall 4e between them. The inner side walls 4d are connected with the bottom wall 4e, the upper surface of which is located at a distance h from the open end of the fitting groove 4a. The fitting member 4 also has a pair of outer side walls 4f, the lower ends of which are respectively connected to the lower ends of the inner side wall 4d by lowermost walls 4l. The outer side walls 4f are located outside the inner side walls 4d. The lower ends thereof are flush with the lower ends of the inner side walls 4d, and the upper ends extend a distance H from the lower ends, which is greater than the distance h. Thus, the outer side walls 4f and the lower walls 4l may be referred to as extension wall members. A longitudinal groove 4g which extends along the longitudinal direction of the balustrade panel 2 is formed by the bottom wall 4e, the inner side walls 4d, the lowermost walls

(17)

7

4l, and the outer side walls 4f. Engaging portions 4c extend outwards from the upper ends of the outer side walls 4f with the length of the engaging portions 4c being such as not to prevent their outward movement when the outer side walls are to be bent outwards. A guide rail 4b has a C-shaped cross section and is supported by the fitting member 4 where the curved ends of the guide rail 4b are engaged with the engaging portions 4c of the fitting member 4.

An extending member 6 which is extendable in the axial direction thereof within the longitudinal groove 4g preferably comprises a bolt 6a and a nut 6b screwed thereon with the bolt 6a pointing in the widthwise direction of the longitudinal groove 4g. The head portion of the bolt 6a abuts against the inner surface of one of the outer side walls 4f, and the shank portion of the bolt 6a preferably lies flat against the upper surface of the bottom wall 4e. The nut 6b abuts against the inner surface of the other outer side wall 4f. A handrail 5 made of rubber has a C-shaped cross section and is slidably fitted onto the guide rail 4b so that the edges^{5a} of the handrail 5 are positioned below the guide rail 4b and the curved ends of the guide rail 4b can engage with the respective inner surfaces of the curved ends of the handrail 5. The fitting member 4 and the guide rail 4b disposed thereon form a guide means which is fitted onto the balustrade panel 2 and slidably guides the handrail thereon. In addition, the fitting member 4 ^{flexes so that} ~~is made of a guide panel member which allows~~

the width of the fitting groove 4a ~~to~~ becomes ^{or} smaller when the outer side walls 4f of the fitting member 4 are bent ^{outwards} outside.

In the operation of the present balustrade, the fitting member 4 is positioned on the balustrade panel 2 by fitting the ^{edge} end of the balustrade panel 2 into the fitting groove 4a through a packing member 3 made of an elastic material, and the extending member 6 disposed widthwise across the longitudinal groove 4g is then extended by rotating the nut 6b with respect to the bolt 6a so as to bend the outer side walls 4f outwards in the directions shown by arrows L in Fig. 3. Accordingly, by the bending of the fitting member 4, the width of the longitudinal groove 4g becomes larger while the width of the fitting groove 4a becomes narrower, as shown by arrows M in Fig. 3. Thus, the edge of the balustrade panel 2 is held by the inner side walls 4d so that the fitting member 4 is firmly secured to the balustrade panel 2. Since the fitting member 4 is fitted onto the balustrade panel 2 in this manner, the packing member 3 is not damaged at all, and the fitting member 4 is reliably secured to the balustrade panel 2 by making the width of the fitting groove 4a narrow even when the thickness of the balustrade panel 2 is not uniform, obtaining a balustrade having no disadvantages caused by the guide means being imperfectly secured to the balustrade panel end. Accordingly, the fitting member 4 can be firmly secured to the balustrade ^{panel edge} ~~plate end~~ at all times irrespective of the aging of the packing member 3.

(19)

9

In the above embodiment, it is clear that the same effects can be obtained when the fitting member 4 is formed by the extrusion molding of a synthetic resin.

Fig. 4 illustrates another embodiment of a balustrade according to the present invention, where the same reference numerals as the ones in Fig. 2 show portions corresponding to the ones in Fig. 2. A pair of engaging portions 4c' extend outside from the outer side walls 4f at the upper ends thereof with the length of the engaging portions 4c' being such as not to prevent their outward movement when the outer side walls are to be bent outwards, and have C-shaped cross sections to guide the handrail 5 thereon. The engaging portions 4c' therefore perform the functions of both the engaging portions 4c and the guide rail 4b in Fig. 2. It is to be understood that effects similar to those stated with respect to Figure 2 are obtained, since an extending member 6 is also disposed widthwise within the longitudinal groove 4g as mentioned above.

As stated above, a balustrade of a passenger conveyor according to the present invention comprises guide means having a fitting groove for fitting the guide means onto an end of a balustrade panel and a longitudinal groove formed by the bottom wall and inner and outer side walls of the guide means, the guide means being formed from a material which allows the width of the fitting groove to become small when said outer side walls are bent outwards, and an extending member which is extendable

within the longitudinal groove to bend said outer side walls outwards so as to enlarge the width of the longitudinal groove. Accordingly, the width of the fitting groove can be made narrow by the action of the extending^{ing} member so that the balustrade panel can be held by the inner side walls of the guide means. Thus, the fitting member is reliably secured to the balustrade panel even when these members are not precisely manufactured, thereby obtaining a balustrade of a passenger conveyor having no disadvantages caused by the fitting member being imperfectly secured to the balustrade panel.

(21)



CLAIMS

1. A balustrade for a passenger conveyor, comprising:

a balustrade panel disposed along a main frame of the passenger conveyor;

a handrail guide attached on an edge of said balustrade panel, said handrail guide including:

a channel member having a substantially U-shaped cross section having a pair of spaced side wall members with a predetermined distance therebetween and a bottom wall member between said side wall members these side wall members and bottom wall member forming a channel fitted over the panel edge;

an extension wall member extending from each of said side wall members in the direction generally opposite to the direction of extension of said side wall members with respect to said bottom wall member to define a space between said extension wall members and said bottom wall member; and

a guide rail disposed on said extension wall members;

said balustrade further comprising:

a moving handrail supported and guided by said guide rail of said handrail guide for movement along the edge of said balustrade panel; and



22

separating means disposed in said space between said extension wall members of said handrail guide for further separating, when extended, said extension wall members from each other, thereby urging said side wall members against the edge of said balustrade panel,

said handrail guide having a rigidity suitable for allowing said handrail guide to deform to decrease said distance between said side wall members when said extension wall members are separated, thereby firmly gripping the edge of said balustrade panel by said side wall members.

2. A balustrade for a passenger conveyor as claimed in claim 1, wherein the handrail guide is formed by the extrusion moulding of aluminum, stainless steel, or synthetic resin.

3. A balustrade for a passenger conveyor comprising:

a balustrade panel disposed along a side of the main frame of the conveyor in the longitudinal direction thereof;

guide means having a fitting groove formed by the bottom and inner side walls thereof for fitting the guide means onto an end of the balustrade panel, and a longitudinal groove formed by said bottom and inner side walls and outer side walls of the guide means outside said inner side walls, the opening ends of the outer

(23)



side walls extending beyond said bottom wall on the side opposite the balustrade panel, said guide means allowing the width of the fitting groove to be reduced when the outer side walls are bent outwards;

a movable handrail having a C-shaped cross section, the open portion of which is disposed to oppose the edge of the balustrade panel, the movable handrail being slidably disposed on a said guide means for guiding the handrail along the balustrade panel end; and

extending means being extendable in the longitudinal groove for bending outwards the outer side walls of the guide means so as to reduce the width of the fitting groove.

4. A balustrade for a passenger conveyor as claimed in claim 3, wherein the guide means comprises:

a fitting member having said fitting groove and said longitudinal groove; and

a guide rail disposed on the fitting member to guide the handrail and having a C-shaped cross section, both sides of the guide rail engaging portions of the fitting member and extending outside the fitting member so as to allow the outer side walls of the fitting member to be bent outwards.

5. A balustrade for a passenger conveyor as claimed in claim 3, wherein the guide means comprises a fitting



member having said fitting groove and said longitudinal groove, the fitting member having C-shaped extensions thereof for guiding the handrail which extend on both sides of the fitting member so as to allow the outer side walls of the fitting member to be bent outwards.

6. A balustrade for a passenger conveyor as claimed in claim 4 or 5, wherein the fitting member is formed by the extrusion moulding of aluminum, stainless steel, or synthetic resin.

7. A balustrade for a passenger conveyor as claimed in claim 3, 4, 5 or 6 wherein the extension means comprises a bolt and a nut screwed thereon, and the two ends of the extension means are disposed to face respective inner surfaces of said outer side walls of the guide means, and the shank portion of the bolt is disposed on the bottom wall of the guide means.

8. A balustrade for a passenger conveyor as claimed in any of claims 3 to 7 wherein the guide means is fitted onto the end of the balustrade panel through a buffer member made of an elastic material.

9. A balustrade for a passenger conveyor, substantially as herein described with reference to Figures 2 and 3 or Figure 4 of the accompanying drawings.
