

SPECIFICATION

Step for Passenger Conveyor

5 The present invention relates generally to passenger conveyors such as escalators and moving sidewalks and, more particularly, to the steps of the passenger conveyors.

10 In general, an escalator, which is one type of passenger conveyors, has an endless series of steps each comprising a tread, a pair of side frame members supporting the tread and a riser. On the other hand, the steps of moving sidewalks each comprise, in general, a tread and a pair of side frame members.

15 As disclosed in Japanese Utility Model Publication No. 40-16984(16984/65), for example, it has been a conventional technique in connecting a tread and side frame members together that through-holes are formed in the tread through the bottoms of grooves between
20 cleats of the tread, similar through-holes are formed in the side frame members and bolts of a small diameter (usually 3 mm) are inserted into aligned through-holes in the tread and side frame members and screwed into nuts placed on the
25 undersurfaces of the side frame members.

30 As such, the diameter of the bolts used is limited by the width of each of the grooves formed between the cleats on the tread. As a consequence, a large number of bolts (usually 20—30 bolts) are required to provide the necessary mechanical strength, with a result that the manufacture of a passenger conveyor step involves a large number of troublesome drilling and bolting steps.

35 It is, therefore, an object of the present invention to provide a passenger conveyor step which needs a reduced number of connecting bolts and thus can be manufactured by reduced number of drilling steps and simplified mounting
40 operation.

45 According to the present invention there is provided a step for a passenger conveyor, comprising a tread formed with a plurality of cleats defining grooves therebetween and arranged to mesh with comb-shaped teeth provided on step-on and step-off landings of the passenger conveyor, the tread being formed with substantially planar mounting sections having no
50 cleats and extending longitudinally in the direction of movement of the step in the region of the opposite side edges of the tread, frame means on which the tread is mounted, a first set of fastener means for removably mounting the tread on the frame means via the substantially planar
55 mounting sections, the first set of fastener means being disposed so as to be freely accessible from above the mounting sections, a plurality of covering members for covering, respectively, the mounting sections, each of the cover members being provided with at least two cleats defining a
60 groove therebetween, and a second set of fastener means for removably mounting the respective covering members on the substantially planar mounting sections, the second set of

65 fastener means being freely accessible from above the covering members.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

70 Figure 1 is a schematic side elevational view of an escalator incorporating steps in accordance with the present invention;

Fig. 2 is an enlarged fragmentary top plan view of two steps and skirt guards shown in Fig. 1;

75 Fig. 3 is a perspective view of one step;

Fig. 4 illustrates, in an exploded sectional view, the structural components of the step to show the connection between a tread and side frame members;

80 Fig. 5 is an enlarged fragmentary perspective view of the step showing the connection between the tread and a side frame member;

85 Fig. 6 is an enlarged fragmentary sectional view of a modified step showing a modified connection between the tread and the side frame member;

90 Fig. 7 is a fragmentary sectional view of a second embodiment of the invention comprising a tread including a corrugated top plate of steel sheet and a reinforcement member or base through which the top plate is mounted on side frame members; and

95 Fig. 8 is a perspective view of a third embodiment of the conveyor step of the invention employed for moving sidewalk.

100 Referring now to Figure 1 to 4 there is shown an escalator comprises an endless series of steps 1 moved by endless chains 3 along a track 2 between an upper landing 4 and a lower landing 5. Each endless chain 2 extends around a sprocket wheel 6 at the upper landing 4 and also around a second sprocket wheel 7 at the lower landing 5. The upper and lower sprocket wheels 6 and 7 are secured to shafts 6a and 7a, respectively, which are rotatably supported in conventional manner. The chains 3 support shafts 8 which support steps 1 at equal intervals. Each shaft 8 rotatably supports a wheel 9 which is moved on the track 2.

110 The track 2 comprises an upper section A, a lower section B and an intermediate section C which is inclined at an angle of 30° to the horizontal.

115 Each step 1 includes a shaft 12 supporting a wheel 10 which is moved along a track 11. The wheels 10 and 9 are spaced a distance in the direction of movement of the step 1. Similar shafts and wheels are provided in the opposite sides of each step 1.

120 Referring to Figs. 2 and 3, each step 1 comprises a riser 17, a tread 18 and side frame members 19 which are secured together to form a unitary structure. The tread 18 includes a plurality of cleats 20 formed in the central zone of the tread and extending in the direction of movement of the step. The cleats 20 are laterally spaced one from another to define grooves 21 therebetween. At the opposite side edge zones of the tread 18, there are provided side edge

members 24 of a plastic material (normally of yellow color) formed with two cleats 22 which are laterally spaced by a groove 23. The tread 18 is also provided with a comb-shaped front end member 25 of a similar colored plastic material. The side edge members 24 are intended principally to cover the side edge sections or mounting sections 26 of the tread 18, as will be discussed later, but the side edge members 24 are also operative to warn passengers to keep out of skirt guards 50 when the side edge members 24 are colored. Namely, the colored side edge members 24 are effective to draw passengers' attention to the dangerous gap between the skirt guards 50. The front end member 25 is provided with cleats 25a which are adapted to mesh with grooves 17b formed between cleats 17a of the riser 17 to avoid entrance of objects between the riser 17 and the tread 18.

Figs. 4 and 5 illustrate how to connect a tread 18 to a side frame member 19. The tread 18 is made of die-cast aluminium and includes integral mounting sections 26 formed along the opposite side edges. The mounting sections 26 are recessed and do not have cleats thereon. Through-holes 28 for bolts 27 are formed in the mounting sections 26. The mounting sections are also provided with threaded holes 30 for threadable engagement with screws 29 extending through the side edge members 24 to be fitted onto the recessed mounting sections 26. The reason why the through-holes 28 are employed for the bolts 27 is because, even if the holes 28 are not precisely correctly positioned relative to the threaded screw holes 30, the screws 29 and the bolts 27 can all be tightened. Each side frame member 19 is formed with threaded holes 31 which are aligned with the through-holes 28. The holes 31 may alternatively be mere through-holes and nuts (not shown) may be secured to the underside of the side frame section 19 by welding, for example, so that the nuts thus secured function as threaded holes.

In order to mount the tread 18 on the side frame members 19, bolts 27 are inserted into the through-holes 28 and screwed into the threaded holes 31 to tighten the tread 18 onto the side frame members 19 (see Fig. 5). Then, the side edge members 24 are placed in the recessed mounting sections 26 of the tread 18 and secured thereto by screws 29 inserted into through-holes 32 in the side edge members 24 and screwed into the screw holes 30 formed in the mounting sections 26. The side edge members 24 placed over the mounting sections 26 not only prevent the bolts 27 from being loosened out of their holes but also assure safety which the tread 18 would lack if the tread were not provided with cleats 22 along the side edges thereof. In addition the side edge members 24 of the illustrated embodiment of the invention are colored for the sake of safety, as described above, but the side edge members 24 may be made of the same material and color as those of the tread 18 in the case where the side edge members 24 are

intended solely to cover the mounting sections 26 of the tread 18. The places of the mounting sections 26 are not limited to the side edges of the tread 18 and, in fact, the mounting sections may alternatively be positioned at areas slightly laterally inwardly of the side edge sections of the tread 18.

In the illustrated embodiment of the invention, the bolts 27 used to mount the treads 18 on side frame members 19 are of diameters as large as approximately 8 mm. Thus, the number of bolts 27 required to mount a tread 18 onto a pair of side frame members 19 is considerably reduced as compared with the prior art (In the illustrated embodiment of the invention, a total of six bolts 27, three for each side edge of a tread 18, are used to secure a tread 18 onto a pair of side frame members 19). The reduction in the number of the bolts 27 used to mount treads 18 onto side frame members 19 assures decrease in the number of steps required for drilling holes in the treads 18 and the side frame members 19 and, accordingly, facilitates simplified and easy assembly of these members. In addition, since the operation to mount a tread 18 onto side frame members 19 or to remove the tread therefrom can be made from above the tread, the described embodiment of the invention provides an additional advantage to be discussed hereunder.

Conventional treads and side frame members are secured together by means of bolts and nuts. Thus, when some of the cleats of a tread are broken, the operation to remove this tread cannot be done from above the tread. Namely, the first step to remove the broken tread is to move the step from the endless chains. More specifically, a workman is required to enter an upper machine room, to move thereto the step having the broken tread, to disconnect this step from the chains, to transfer the disconnected step onto the ground surface and to remove the broken tread from the step. According to the illustrated embodiment of the invention, however, the removal of a tread 18 from associated side frame members 19 can simply be effected from above the tread.

In the illustrated embodiment of the invention, the side edge members 24 are designed to have cleats 22 so as to match the appearance of the side edge members with that of the associated treads 18. However, in the case where the side edge members 24 are solely intended to cover the mounting sections 26 of treads 18 (in this case, the side edge members may be called "covering members"), the side edge members are not required to have the cleats 22 thereon. In addition, cleats, even if provided on side edge members 24, are not necessarily required to extend in the direction of movement of steps.

Fig. 6 shows a modification in which bolts (one of which is shown at 27') are preliminarily secured to the undersurfaces of each side frame member 19 and extend upwardly through the through-holes 28 in the tread 18. A nut 27a is screwed over each bolt 27' to secure the tread 18 to the side frame member 19. The modification

provides advantages similar to those obtained from the embodiment previously described.

Fig. 7 shows a second embodiment of the invention in which the tread 18 of die-cast

5 aluminium is replaced by a modified tread 40 consisting of a corrugated top plate 41 of stainless steel sheet and a reinforcement plate or base 42 (which may consist of a single plate or a plurality of plates). The two members 42 and 41 are secured together by welding. The base 42 has a widthwise dimension which is greater than that of the corrugated top plate 41 to provide mounting sections 43 along the opposite side edges of the top plate 41. The tread 40 thus formed is secured to a side frame member 19 by bolts (one of which is shown by 44) which extend through the mounting section 43 and screwed into threaded holes formed in the side frame member 19. The mounting section 43 is covered with a side edge member 47 having a pair of cleats 45 defining a groove 46 therebetween. The side edge member 47 is secured to the mounting section 43 by means of screws (one of which is shown by 48) extending through holes formed in the bottom of the groove 46 and screwed into threaded holes formed in the mounting section 43. The embodiment illustrated in Fig. 7 provides advantages similar to those provided by the first embodiment of the invention.

Fig. 8 shows a step 50 of a moving sidewalk. The step 50 comprises a tread 51, side frame members 52, wheels 53 and 54 and side edge members 55. The tread 51, the side frame members 52 and the side edge members 55 are assembled and connected together in a manner similar to that in the preceding embodiments.

In general, moving sidewalks move in a substantially horizontal plane. Thus, each step 50 is not required to have riser and comb-shaped front edge member. In addition, in the case of moving sidewalks, no person will be pinched between steps 50 and skirt guards. Thus, the side edge members 55 are not required to be colored. The side edge members 55, however, may be colored in order to improve their design and outer appearance and/or to provide their interchangeability with the side edge members for use with escalator steps.

The embodiment shown in Fig. 8 also provides advantages similar to those of the preceding embodiments so long as the mounting and replacement of the treads are concerned.

As described, the present invention provides an advantage that, since each of the treads is connected to associated side frame members by bolts extending through holes formed in mounting sections of the tread where no cleat is formed, the bolts may be of a large diameter and thus the necessary number of the bolts can be reduced compared with the prior art.

In addition, since the steps of passenger conveyor according to the present invention are constructed such that the mounting and removal of the tread of each step can be effected from

65 above the tread, the replacement of a tread with broken cleats therein can be simplified.

Claims

1. A step for a passenger conveyor, comprising a tread formed with a plurality of cleats defining grooves therebetween and arranged to mesh with comb-shaped teeth provided on step-on and step-off landings of the passenger conveyor, the tread being formed with substantially planar mounting sections having no cleats and extending longitudinally in the direction of movement of the step in the region of the opposite side edges of the tread, frame means on which the tread is mounted, a first set of fastener means for removably mounting the tread on the frame means via the substantially planar mounting sections, the first set of fastener means being disposed so as to be freely accessible from above the mounting sections, a plurality of covering members for covering, respectively, the mounting sections, each of the cover members being provided with at least two cleats defining a groove therebetween, and a second set of fastener means for removably mounting the respective covering members on the substantially planar mounting sections, the second set of fastener means being freely accessible from above the covering members.

2. A step as claimed in Claim 1, wherein the covering members are made of a colored plastic material.

3. A step as claimed in Claim 1 or 2, wherein the tread is provided with holes formed in the planar mounting sections, the frame means are provided with threaded holes aligned respectively with the holes in the planar mounting sections, and the first set of fastener means comprise bolts extending through the holes in the planar mounting sections and screwed into the threaded holes in the frame means to secure the tread and frame means together.

4. A step as claimed in Claim 1 or 2, wherein the covering members are provided with holes formed in the bottoms of the grooves therein and having diameters smaller than those of the holes in the planar mounting sections of the tread, the tread is provided with threaded holes formed in the planar mounting sections thereof and aligned respectively with the smaller-diameter holes in the covering members, and the second set of fastener means comprising screws extending through the smaller-diameter holes in the covering members and are screwed into the threaded holes in the tread to removably secure the small covering members and the tread together.

5. A step as claimed in any one of the preceding claims, wherein the mounting sections are located inwardly of the side edges of the tread.

6. A step for a passenger conveyor substantially as hereinbefore described with reference to Figures 1 to 5, or Figure 6, or Figure 7 or Figure 8 of the accompanying drawings.



provides advantages similar to those obtained from the embodiment previously described.

Fig. 7 shows a second embodiment of the invention in which the tread 18 of die-cast aluminium is replaced by a modified tread 40 consisting of a corrugated top plate 41 of stainless steel sheet and a reinforcement plate or base 42 (which may consist of a single plate or a plurality of plates). The two members 42 and 41 are secured together by welding. The base 42 has a widthwise dimension which is greater than that of the corrugated top plate 41 to provide mounting sections 43 along the opposite side edges of the top plate 41. The tread 40 thus formed is secured to a side frame member 19 by bolts (one of which is shown by 44) which extend through the mounting section 43 and screwed into threaded holes formed in the side frame member 19. The mounting section 43 is covered with a side edge member 47 having a pair of cleats 45 defining a groove 46 therebetween. The side edge member 47 is secured to the mounting section 43 by means of screws (one of which is shown by 48) extending through holes formed in the bottom of the groove 46 and screwed into threaded holes formed in the mounting section 43. The embodiment illustrated in Fig. 7 provides advantages similar to those provided by the first embodiment of the invention.

Fig. 8 shows a step 50 of a moving sidewalk. The step 50 comprises a tread 51, side frame members 52, wheels 53 and 54 and side edge members 55. The tread 51, the side frame members 52 and the side edge members 55 are assembled and connected together in a manner similar to that in the preceding embodiments.

In general, moving sidewalks move in a substantially horizontal plane. Thus, each step 50 is not required to have riser and comb-shaped front edge member. In addition, in the case of moving sidewalks, no person will be pinched between steps 50 and skirt guards. Thus, the side edge members 55 are not required to be colored. The side edge members 55, however, may be colored in order to improve their design and outer appearance and/or to provide their interchangeability with the side edge members for use with escalator steps.

The embodiment shown in Fig. 8 also provides advantages similar to those of the preceding embodiments so long as the mounting and replacement of the treads are concerned.

As described, the present invention provides an advantage that, since each of the treads is connected to associated side frame members by bolts extending through holes formed in mounting sections of the tread where no cleat is formed, the bolts may be of a large diameter and thus the necessary number of the bolts can be reduced compared with the prior art.

In addition, since the steps of passenger conveyor according to the present invention are constructed such that the mounting and removal of the tread of each step can be effected from

above the tread, the replacement of a tread with broken cleats therein can be simplified.

Claims

1. A step for a passenger conveyor, comprising a tread formed with a plurality of cleats defining grooves therebetween and arranged to mesh with comb-shaped teeth provided on step-on and step-off landings of the passenger conveyor, the tread being formed with substantially planar mounting sections having no cleats and extending longitudinally in the direction of movement of the step in the region of the opposite side edges of the tread, frame means on which the tread is mounted, a first set of fastener means for removably mounting the tread on the frame means via the substantially planar mounting sections, the first set of fastener means being disposed so as to be freely accessible from above the mounting sections, a plurality of covering members for covering, respectively, the mounting sections, each of the cover members being provided with at least two cleats defining a groove therebetween, and a second set of fastener means for removably mounting the respective covering members on the substantially planar mounting sections, the second set of fastener means being freely accessible from above the covering members.

2. A step as claimed in Claim 1, wherein the covering members are made of a colored plastic material.

3. A step as claimed in Claim 1 or 2, wherein the tread is provided with holes formed in the planar mounting sections, the frame means are provided with threaded holes aligned respectively with the holes in the planar mounting sections, and the first set of fastener means comprise bolts extending through the holes in the planar mounting sections and screwed into the threaded holes in the frame means to secure the tread and frame means together.

4. A step as claimed in Claim 1 or 2, wherein the covering members are provided with holes formed in the bottoms of the grooves therein and having diameters smaller than those of the holes in the planar mounting sections of the tread, the tread is provided with threaded holes formed in the planar mounting sections thereof and aligned respectively with the smaller-diameter holes in the covering members, and the second set of fastener means comprising screws extending through the smaller-diameter holes in the covering members and are screwed into the threaded holes in the tread to removably secure the small covering members and the tread together.

5. A step as claimed in any one of the preceding claims, wherein the mounting sections are located inwardly of the side edges of the tread.

6. A step for a passenger conveyor substantially as hereinbefore described with reference to Figures 1 to 5, or Figure 6, or Figure 7 or Figure 8 of the accompanying drawings.



7. A passenger conveyor substantially as
hereinbefore described with reference to Figures

1 to 5, or Figure 6, or Figure 7 or Figure 8 of the
accompanying drawings.

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