

SPECIFICATION

Step for a movable walkway

- 5 This invention relates to a step for a movable walkway or escalators including moving stairways, moving pathways, etc.

Movable walkways such as escalators are nowadays indispensable to buildings for business use as service facilities. With the development of a network of subways in large cities and an increase in the number of stations disposed in high buildings, escalators have in recent years been built in an increasingly large number in subway stations and elevated stations, particularly in urban communities of high population density. The escalators installed in subway and elevated stations are under stringent conditions that have not been experienced in the escalator art before, and various problems have been raised in connection with installation and operation of escalators in an environment which is entirely different from that in which their predecessors have been installed and operated.

Up to the present, escalators have mostly been installed and operated in department stores and other facilities that cater to a large number of customers. As compared with the environment in which the escalators have hitherto been operated, the environment in which the escalators are now finding themselves poses new problems including the need to increase resistance to corrosion that might be caused by the escalator structure being subjected to underground water and the need to increase the surface strength of steps to avoid damage that might be caused by contact thereof with passengers. Thus work has been carried out on steps of such walkways so that these problems arising from the new environmental conditions can be overcome.

To meet this requirement, it has been proposed in, for example, United States Patent 2,033,308, to provide steps of an escalator by bending steel sheets. Each step is formed of stainless steel of 1-3 mm thick and worked by means of a press to form a plurality of cleats and grooves arranged alternately in parallel relation.

It has been found that this type of step formed by means of a press raises a problem that should be solved to convey passengers safe and sound. More specifically, in forming about 100 cleats and grooves on a step 100 mm in width, difficulties are experienced in absorbing cumulative errors and the clearance between the edges of the step and the skirt guard becomes irregular in size. When the clearance is smaller than is necessary, noise is produced by metal-to-metal contact between the steps and the skirt guard; and when the clearance is larger than is necessary, the body of a passenger may accidentally enter the gap created by the clearance.

This invention has been developed for the purpose of obviating the aforesaid problem of the prior art. Accordingly, the invention has as its object the provision of a step for a movable walkway of a construction enabling the steps to be produced with high dimensional accuracy.

According to the present invention there is provided a step for a movable walkway comprising: a tread formed from sheet steel with a multiplicity of cleats and grooves alternately disposed and extending in the direction of movement of the steps and in alignment with teeth of comb plates mounted at embarkation and disembarkation areas of the movable walkway and with planar side edge surface portions with said cleats and grooves being located in a central portion of the tread between the planar side edge surface portions; a riser connected to one edge of said tread; a plurality of frames each attached to one of opposite ends of said tread; reinforcing members interposed between said plurality of frames, said reinforcing members being joined by spot welding to an undersurface of said tread in the region of the grooves; and a plurality of side pieces disposed on said planar side edge surface portions and extending in the direction of movement of the steps, said side pieces being adjusted in a direction transverse to the direction of movement of the steps and securable to said planar side edge surface portions by fastening means so as to enable compensation for variations in the width of the step occurring during the bending of the steel sheet.

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

Figure 1 is a schematic side view of the whole of an escalator having incorporated therein steps comprising one embodiment of the invention;

Figure 2 is a plan view, on an enlarged scale, of the two steps and the skirt guard shown in *Figure 1*;

Figure 3 is a perspective view, on an enlarged scale, of the step according to the invention;

Figure 4 is a cross-sectional view taken along the line IV-IV in *Figure 3*;

Figure 5 is a fragmentary perspective view of the step showing the construction of its side edge portion; and

Figure 6 is a fragmentary sectional view of the side edge portion of the step showing another embodiment of the invention.

The escalator comprises, as usual, a plurality of steps 1 linked in an endless belt for movement along rails 2 by the action of chains 3 between an upper floor 4 and a lower floor 5. Each chain 3 is trained over a sprocket 6 on the upper floor 4 and by another sprocket 7 on the lower floor 5. The sprockets 6 and 7 on opposite sides of the steps 1 are supported by rotary shafts 6a and 7a respectively which in turn are supported by support means and driven by drive means as is known. The chains 3 support shafts 8 disposed equidistantly from one another for supporting the steps 1, and each shaft 8 supports rotary wheels 9 which roll along the rails 2.

The rails 2 include an upper rail section A, a lower rail section B and an intermediate straight rail section C. The intermediate straight rail section C is inclined through 30 degrees with respect to the horizontal.

Each step 1 has a shaft 12 supporting a wheel 10 running along a rail 11, the wheels 10 and 9 being spaced from each other a suitable distance in the

direction of movement of the steps 1. Comb plates 15 and 16 are disposed on the upper floor 4 and the lower floor 5 respectively in positions in which they are aligned with cleats of the steps 1 presently to be described. Each step 1 has, of course, another shaft and another wheel at the other end, not shown.

Referring to Figure 3 and 4, each step 1 includes a riser 17, a tread 18 having the riser 17 connected to one end thereof, and a plurality of frames 19 each attached to one of opposite sides edges of the tread 18 which is formed by means of a press with a multiplicity of cleats 20 and grooves 21 alternately located in the central portion and extending in the direction of movement of the step 1, and a plurality of planar surface portions 27 each disposed on one of opposite sides of the central portion. A side piece 24 made of a synthetic resinous material and formed with three cleats 22 and grooves 23 is attached to each of the planar surface portions 27, the side pieces 24 being usually colored yellow. The tread 18 of each step 1 includes comb-shaped fingers 25 and 26 attached to opposite ends thereof to close openings of the cleats 20 at opposite ends thereof. When necessary, the comb-shaped fingers 25 and 26 may be made of a synthetic resinous material and colored in the same color as the side pieces 24. The side pieces 24 are each rigidly screwed in place on one of the planar surface portions 27 at opposite edge portions of the step 1 having a width W, as indicated at 28. Reinforcing members 29 are attached to the undersurface of each step 1 and extend across its width from one frame 19 to the other frame 19, the reinforcing members 29 being joined by spot welding to the undersurface of the tread 18 by utilizing the bottoms of the grooves 23. The reinforcing members 29 extend between the planar surface portions 27 of the step 1 having the side pieces secured to their undersurfaces. An outside edge 27a of each planar surface portion 27 is displaced inwardly by a distance δ of several millimeters from the outer edge W of the outermost cleat 22 of the side piece 24. The reinforcing members 29 are flush with the outside edges 27a of the planar surface portions 27 at opposite ends thereof. That is, the tread 18 and reinforcing members 29 each have a width smaller than W. Positioning of the side pieces 24 is effected as presently to be described.

Each side piece 24 is first positioned relative to an outer edge of the outermost cleat 20 of the central portion in such a manner that the step 1 has a width W by taking into consideration the tolerances with respect to the spacing interval between the outermost cleat 20 and an innermost cleat 22 of the side piece 24. Then the side piece 24 is screwed in place at 28. At this time, the width W has reserve corresponding to the tolerances with respect to the aforesaid spacing interval, so that the side piece 24 can be moved within the tolerances in the directions of arrows shown in Figure 4 before being correctly positioned.

In this fashion, cumulative errors made in the tread 18 of each step 1 when made by means of a press can be absorbed by transverse movement of the side pieces 24 across the width thereof. As a result, the gap g (See Figure, 2) between each step 1

and a skirt guard 30 can be kept at a predetermined level at all times. The arrangement whereby the side pieces 24 are superposed over the planar surface portions 27 is conducive to increased strength of the planar surface portions 27. Thus even if a passenger rides on the side pieces 24, the planar surface portions 27 would not be damaged. Even if the side pieces 24 are burned by a fire, the presence of the planar surface portions 27 prevents the step 1 from forming a gap on the tread 18. The provision of the reinforcing members 29 to the planar surface portions 27 having the side pieces secured thereto eliminates the risk of the occurrence of resonance.

In another embodiment of the invention, each planar surface portion 27 of the tread 18 may be formed with a vertical member 27a extending downwardly from its outer edge. Also, the planar surface portions 27 need not be literally planar and any deviation from a perfectly planar surface may be tolerated so long as each side piece 24 can be secured thereto without any trouble, and the cleats 22 of each side piece 24 may be slightly larger in height than the cleats 20 in the central portion of the tread 18.

CLAIMS

1. A step for a movable walkway comprising: a tread formed from sheet steel with a multiplicity of cleats and grooves alternately disposed and extending in the direction of movement of the steps and in alignment with teeth of comb plates mounted at embarkation and disembarkation areas of the movable walkway and with planar side edge surface portions with said cleats and grooves being located in a central portion of the tread between the planar side edge surface portions; a riser connected to one edge of said tread; a plurality of frames each attached to one of opposite ends of said tread; reinforcing members interposed between said plurality of frames, said reinforcing members being joined by spot welding to an undersurface of said tread in the region of the grooves; and a plurality of side pieces disposed on said planar side edge surface portions and extending in the direction of movement of the steps, said side pieces being adjusted in a direction transverse to the direction of movement of the steps and securable to said planar side edge surface portions by fastening means so as to enable compensation for variations in the width of the step occurring during the bending of the steel sheet.

2. A step as claimed in Claim 1, wherein said plurality of side pieces are each formed of a synthetic resinous material and colored, and each said side piece is formed with a plurality of cleats and grooves.

3. A step as claimed in Claim 1 or 2, wherein said planar side edge surface portions of said tread are formed at an outer edge of each said planar side edge surface portion with a vertical member extending downwardly therefrom.

4. A step as claimed in any one of the preceding claims, wherein a plurality of comb-shaped fingers are each attached to one of said opposite ends of



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2. A step as claimed in Claim 1, wherein said plurality of side pieces are each formed of a synthetic resinous material and colored, and each said side piece is formed with a plurality of cleats and grooves.

3. A step as claimed in Claim 1 or 2, wherein said planar side edge surface portions of said tread are formed at an outer edge of each said planar side edge surface portion with a vertical member extending downwardly therefrom.

4. A step as claimed in any one of the preceding claims, wherein a plurality of comb-shaped fingers are each attached to one of said opposite ends of



said tread to close open ends of said pleats.

5. A step for a movable walkway, substantially as hereinbefore described, with reference to, and as illustrated in, Figures 1 to 5, or Figure 6 of the 5 accompany drawings.

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