SPECIFICATION

TITLE OF THE INVENTION

ESCALATOR STEP

CROSS-REFERENCE TO RELATED APPLICATION

This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2012-216435 filed on September 28, 2012, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to an escalator step.

BACKGROUND

There are many accidents such that people fall down an escalator. Particularly, collision of their bodies with a corner where the tread and the riser of a step intersect (hereinafter referred to as a "step corner") may cause major injuries. Therefore, there is need for a safe escalator to absorb the collision energy generated when

people fall down and hit their heads against the step corner, thereby avoiding serious injuries. While the escalator prevents the passengers from suffering serious injuries when they fall down, it should not have a structure that causes the passengers to fall down in a normal use state.

Some conventional methods have been proposed as means for preventing the passengers from suffering serious injuries when their bodies collide with the step corners. For example, JP2008-254873A (Patent Document 1) proposes an escalator step provided with a tread board having a plurality of cleats and a riser, wherein each of a plurality of cushioning materials is provided between the cleats of riser mounting side end parts of the tread board. This step is also provided with an energizing body for energizing the plurality of cushioning materials to project upward from upper surfaces of the cleats when the surface of the tread board comes out of a platform on which passengers get, and for accepting the plurality of cushioning materials at withdrawing positions between the cleats of the tread board by being pushed down by comb teeth of the other platform when the step enters the platform.

Although it is not a primary object to avoid serious injuries, there are proposed some methods related to avoiding serious injuries. For example, JP11-292441A (Patent Document 2) proposes a tread board of an escalator composed of a tread-board base plate and a comb-tooth plate provided on the surface thereof. The tread-board base plate is composed of an aluminum die-cast or stainless steel. The comb-tooth plate is composed of a material having a friction coefficient larger than that of flat metal, e.g., rubber or synthetic resin.

Furthermore, JP06-156960A (Patent Document 3) proposes a step for an escalator having a tread board of metal carried on a frame made from metal. The tread board is completely isolated from vibrations imparted to the frame by means of an elastomeric vibration damping material such as rubber which prevents the tread board from directly contacting the frame.

SUMMARY

The method proposed by Patent Document 1 requires a mechanism for upwardly projecting the cushioning materials by spring tension and a mechanism for causing the cushioning materials to withdraw by being pushed down

by the comb teeth when a step enters the platform. These mechanisms are required for every step, causing a problem such that the cost of the entire escalator becomes very high. In addition, malfunction of the mechanisms causes damages on the comb teeth of the platforms. This causes a high possibility of damages on all the steps. Furthermore, since the comb teeth are rubbed by receiving a force every time a step passes, fatigue breakdowns or wear are also concerned. Thus, this method has a problem of higher cost and lower reliability.

In the method proposed by Patent Document 2, the comb-tooth plate is composed of rubber or synthetic resin. This causes problems such that the comb-tooth plate is easier to get worn, it is easier to get dirty and have a stain, and its lifetime is shorter than a conventional comb-tooth plate. In particular, the center of a tread is a portion where passengers get on and off frequently. Therefore, using rubber or synthetic resin for this portion causes a high possibility of reaching the end of its lifetime for a short period of time. In addition, the replacement of the comb-tooth plate that has reached the end of its lifetime requires the replacement of the entire tread. This causes a problem such that the replacement

requires a lot of time and becomes expensive. Furthermore, if the comb-tooth plate is composed of rubber, the weight of passengers may act on the comb-tooth plate such that the comb-tooth plate is deformed. This causes the steps of the passengers to become unstable and may encourage falling of the passengers.

In the method proposed by Patent Document 3, since the primary object of the proposal is to prevent vibrations from being transmitted, there is a problem such that any measures are not taken for the step corner which is the most dangerous from a viewpoint of avoiding serious injuries. There is also a problem such that the elastomeric vibration damping material arranged between the tread board and the frame is insufficient for absorbing the energy of a collision, and thus is ineffective in avoiding serious injuries. In addition, covering a large portion of the bottom of the tread with the elastomeric vibration damping material causes another problem such that the material and assembly costs increase and as a consequence the entire cost becomes very high.

The present invention is made to solve such problems. An object of the present invention is to provide a safe escalator, without using an expensive device therefor,

that can prevent passengers from suffering serious injuries even when they fall down and hit their heads against a step corner and that does not encourage falling of the passengers even in a normal use state.

In an escalator step according to an embodiment of the present invention, a shock absorbing cleat is provided at a corner where a tread and a riser of the escalator step intersect. Metallic materials, such as aluminum and stainless steel, are used for a tread body section. Elastomers including at least natural rubber, synthetic rubber, urethane rubber, silicone rubber, and fluorocarbon rubber are used for the shock absorbing cleat.

In an escalator step according to another embodiment of the present invention, a shock absorbing cleat is provided at a corner where a tread and a riser of the escalator step intersect. Metallic materials including aluminum and stainless steel are used for a tread body section. Elastomers including natural rubber, synthetic rubber, urethane rubber, silicone rubber, and fluorocarbon rubber are used for the shock absorbing cleat. Two or more kinds of elastomers having different hardness are used for the shock absorbing cleat.

Furthermore, in an escalator step according to another embodiment of the present invention, a material having relatively high hardness is used for convex sections of the shock absorbing cleat, and a material having relatively lower hardness than that of the convex sections is used for a base section.

Furthermore, in an escalator step according to another embodiment of the present invention, the shock absorbing cleat has the convex sections and the base section colored in different colors.

Furthermore, in an escalator step according to another embodiment of the present invention, a plurality of shock absorbing cleats are arranged in a width direction of the step.

Furthermore, in an escalator step according to another embodiment of the present invention, a shock absorbing cleat has short convex sections, each having a rear end surface being the same flat surface as a concave section of the riser, and long convex sections, each having a rear end surface projecting so as to be the same flat surface as a convex section of the riser, arranged alternately. A material having relatively low hardness is used only for peak sections of the long convex sections, and a material

having relatively higher hardness than that of the peak sections is used for the base section and peak sections of the short convex sections.

Furthermore, in an escalator step according to another embodiment of the present invention, the shock absorbing cleat has the peak sections of the long convex sections, and the base section and the peak sections of the short convex sections colored in different colors.

Furthermore, in an escalator step according to another embodiment of the present invention, a plurality of shock absorbing cleats are arranged in a width direction of the step.

Furthermore, in an escalator step according to another embodiment of the present invention, a shock absorbing cleat has short convex sections, each having a rear end surface being the same flat surface as a concave section of the riser, and long convex sections, each having a rear end surface projecting so as to be the same flat surface as a convex section of the riser, arranged alternately. A material having relatively low hardness is used only for a vicinity of each rear end surface of peak sections of the long convex sections, and a material having relatively higher hardness than that of the vicinity of each rear end

surface of the peak sections is used for the other portions.

Furthermore, in an escalator step according to another embodiment of the present invention, the shock absorbing cleat has a portion in the vicinity of each rear end surface of the peak sections of the long convex sections and the other portions colored in different colors.

Furthermore, in an escalator step according to another embodiment of the present invention, a plurality of shock absorbing cleats are arranged in a width direction of the step.

Furthermore, an escalator step according to another embodiment of the present invention includes: a tread in which a plurality of convex sections are arranged in parallel on an upper surface of a body, and a step-shaped notch is formed at a rear end section; a riser which is provided so as to intersect the rear end section of the tread, and in which a plurality of convex sections and concave sections are alternately formed on a surface; and a shock absorbing cleat which is provided at the step-shaped notch formed at the rear end section of the tread, and in which short convex sections and long convex sections are arranged alternately on a base section. A rear

end surface of each short convex section is the same flat surface as a concave section of the riser, and a front end surface thereof is consistent with a rear end surface of a convex section of the tread. A rear end surface of each long convex section projects so as to be the same flat surface as a convex section of the riser, and a front end surface thereof is consistent with a rear end surface of a convex section of the tread.

In the escalator step, metallic materials, such as aluminum and stainless steel, are used for the tread body section, and elastomers including at least natural rubber, synthetic rubber, urethane rubber, silicone rubber, and fluorocarbon rubber are used for the shock absorbing cleat.

Furthermore, in an escalator step according to another embodiment of the present invention, a material having relatively high hardness is used for the convex sections of the shock absorbing cleat, and a material having relatively lower hardness than that of the convex sections is used for the base section.

Furthermore, in an escalator step according to another embodiment of the present invention, the shock absorbing

cleat has the convex sections and the base section colored in different colors.

Furthermore, in an escalator step according to another embodiment of the present invention, a plurality of shock absorbing cleats are arranged in a width direction of the step.

Furthermore, in an escalator step according to another embodiment of the present invention, a material having relatively low hardness is used only for peak sections of the long convex sections of the shock absorbing cleat, and a material having relatively higher hardness than that of the peak sections is used for the base section and peak sections of the short convex sections.

Furthermore, in an escalator step according to another embodiment of the present invention, the shock absorbing cleat has the peak sections of the long convex sections, and the base section and the peak sections of the short convex sections colored in different colors.

A plurality of shock absorbing cleats are arranged along the step-shaped notch formed at the rear end section of the tread.

Furthermore, in an escalator step according to another embodiment of the present invention, a material having

relatively low hardness is used only for a vicinity of each rear end surface of peak sections of the long convex sections, and a material having relatively higher hardness than that of the vicinity of each rear end surface of the peak sections is used for the other portions.

Furthermore, in an escalator step according to another embodiment of the present invention, a plurality of the shock absorbing cleats are arranged along the step-shaped notch formed at the rear end section of the tread.

An escalator step according to such embodiments of the present invention makes it possible to provide a safe escalator, without using an expensive device therefor, that can prevent passengers from suffering serious injuries even when they fall down and hit their heads against a step corner and that does not encourage falling of the passengers even in a normal use state.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view illustrating an escalator step of the present invention.

FIG. 2 is an exploded perspective view partially illustrating a vicinity of a corner thereof.

FIG. 3 is an exploded perspective view illustrating by decomposing the vicinity of the corner thereof.

FIG. 4 is a top view of a shock absorbing cleat according to Embodiment 1 of the present invention.

Fig. 5 is a front view thereof.

Fig. 6 is a bottom view thereof.

Fig. 7 is a cross-sectional view along A-A in FIG. 5 of the shock absorbing cleat according thereto.

Fig. 8 is a cross-sectional view along B-B in FIG. 5 of the shock absorbing cleat according thereto.

Fig. 9 is a cross-sectional view along C-C in FIG. 4 of the shock absorbing cleat according thereto.

Fig. 10 is a cross-sectional view along A-A in FIG. 5 of a shock absorbing cleat according to Embodiment 2 of the present invention.

Fig. 11 is a cross-sectional view along B-B in FIG. 5 of the shock absorbing cleat according thereto.

Fig. 12 is a cross-sectional view along C-C in FIG. 4 of the shock absorbing cleat according thereto.

Fig. 13 is a cross-sectional view along A-A in FIG. 5 of a shock absorbing cleat according to Embodiment 3 of the present invention.

Fig. 14 is a cross-sectional view along B-B in FIG. 5 of the shock absorbing cleat according thereto.

Fig. 15 is a cross-sectional view along C-C in FIG. 4 of a shock absorbing cleat according thereto.

DETAILED DESCRIPTION

An escalator step according to the embodiments of the present invention will be described below with reference to the accompanying drawings.

(Embodiment 1)

The structure of Embodiment 1 will be described by referring to FIGS. 1 through 9.

FIG. 1 is a side view of a step 1 of an escalator. The step 1 has a tread 2 at a top thereof, on which passengers ride to go up or down. The following description will be made by defining a travelling direction (right-hand side in FIG. 1) as a front side when the step 1 of FIG. 1 goes up, and defining the opposite direction (left-hand side in FIG. 1) as a back side. A riser 3 is provided at a rear end of the step 1. A top thereof intersects a rear end of the tread 2 to form a corner (section A of the drawing).

FIG. 2 and FIG. 3 are partial perspective views illustrating a state in which the corner (section A of FIG.

1) is seen from the vicinity of a center of the step 1 toward a skirt guard 4. FIG. 2 illustrates a state in which a shock absorbing cleat 5 is mounted on a body section 6 of the tread 2. FIG. 3 illustrates a state before the shock absorbing cleat 5 is mounted thereon.

The riser 3 is connected to a rear end of the body section 6 of the tread 2. A step-shaped notch 7 is provided at an upper surface side of the rear end of the body section 6. A plurality of convex sections 8 of the body section are provided at equal intervals on the upper surface of the body section 6. The convex sections 8 are herein a plurality of elongated flat boards provided perpendicular to the upper surface of the body section 6. These boards are arranged roughly in parallel with the travelling direction of the step 1, and roughly at equal intervals. Accordingly, a concave section is formed between two adjoining convex sections 8, and a cross section at right angle to the travelling direction of the step 1 has a comb-tooth shape in which convex sections 8 and concave sections are alternately repeated.

At the riser 3, a plurality of convex sections 9 and concave sections 10 are alternately provided at equal intervals by bending a board. It should be noted that

metallic materials, such as aluminum and stainless steel, are used for the body section 6 of the tread 2 and for the riser 3.

In the shock absorbing cleat 5, short convex sections 11, each having a rear end surface being the same flat surface as a concave section 10 of the riser 3, and long convex sections 12, each having a rear end surface projecting so as to be the same flat surface as a convex section 9 of the riser, are provided alternately on an upper surface of a base section 13, roughly at equal intervals. The short convex sections 11 and the long convex sections 12 are herein a plurality of elongated boards provided perpendicular to the upper surface of the base section 13, as with the convex sections 8 provided on the upper surface of the body section 6 of the step 1 described above. These boards are arranged roughly in parallel with a travelling direction of the step 1. Each front end surface of the short convex sections 11 and the long convex sections 12 is configured to be coupled with each rear end surface of the convex sections 8 of the body section 6 of the tread 2. The base section 13 is provided at bottoms of the short convex sections 11 and the long convex sections 12. The base section 13 at each bottom of the

long convex sections 12 is provided with a protruding section 15 which plugs a hole 14 of each convex section 9 of the riser 3.

Although only one shock absorbing cleat 5 is illustrated in FIG. 2 and FIG. 3, a plurality of the same shock absorbing cleats are practically arranged and fixed along the step-shaped notch 7 of the body section 6.

FIG.4 through FIG. 9 each illustrate the shock absorbing cleat 5. FIG. 4 is a plan view seen from the top. FIG. 5 is a front view. FIG. 6 is a bottom view seen from the bottom. FIG. 7 is a cross-sectional view illustrating a cross section AA of FIG. 5. FIG. 8 is a cross-sectional view illustrating a cross section BB of FIG. 5. FIG. 9 is a cross-sectional view illustrating a cross section CC of FIG. 4.

A hollow section 16 is provided at a back side of the base section 13 of the shock absorbing cleat 5. A bottom section 17 in contact with the notch 7 is provided around the hollow section 16. That is to say, the base section 13 is a box having an opening bottom, and the hollow section 16 is formed therein. It should be noted that, as described above, each back side of the protruding sections 15 is

arranged so as to plug each hole 14 of the convex sections 9 of the riser 3.

Next, materials used for the shock absorbing cleat 5 having the above-described structure will be described. Urethane rubber having significantly lower rigidity than metals, such as aluminum and stainless steel, and the resin used for demarcation is used for the shock absorbing cleat 5. In this embodiment, two kinds of urethane rubber are used, which are urethane rubber having relatively high hardness and urethane rubber having relatively low hardness.

That is to say, in FIG. 7 illustrating a cross section of one of the short convex sections 11 and the base section 13 at the bottom thereof (cross section AA of FIG. 5), different materials are used for the short convex section 11 and the base section 13. A material having relatively high hardness is used for the short convex section 11. A material having relatively lower hardness than that of the short convex section 11 is used for the base section 13.

FIG. 8 illustrates a cross section of one of the long convex sections 12 and the base section 13 at the bottom thereof (cross section BB of FIG. 5). A material having relatively high hardness is used for the long convex

section 12. A material having relatively lower hardness than that of the long convex section 12 is used for the base section 13.

FIG. 9 illustrates a cross section of the short convex sections 11, the long convex sections 12, and the base section 13 at the bottoms thereof (cross section CC of FIG. 4). As described above, materials having relatively high hardness are used for the short convex sections 11 and the long convex sections 12. A material having relatively lower hardness than that of the short convex sections 11 and the long convex sections 12 is used for the base section 13.

It should be noted that, since the shock absorbing cleat 5 is manufactured by two-color molding, boundary surfaces between the above-described different materials are stably connected. The two-color molding is herein a well-known molding method of combining different materials to mold them in a uniformed manner. Specifically, the short convex sections 11 and the long convex sections 12 are molded with the base section 13 in a uniformed manner by creating the base section 13 by injection molding using a first metallic mold, and by injection molding using a

second metallic mold which includes the base section 13 inside.

When molding the shock absorbing cleat 5 by such two-color molding, a red coloring agent is mixed for molding the base section 13 for which a material having relatively low hardness is used, and a yellow coloring agent is mixed for molding the short convex sections 11 and the long convex sections 12 for which materials having relatively high hardness are used.

The following will describe the operation and advantages of a shock absorbing cleat configured in this manner according to Embodiment 1. Firstly, when a passenger falls down and hit the passenger's head against the corner of the step 1 (the section A of FIG. 1), the head collides with the shock absorbing cleats 5 as the shock absorbing cleats 5 are mounted on the corner of the step 1. Since the urethane rubber having significantly lower rigidity than that of the metals, such as aluminum and stainless steel, and the resin used for demarcation is used for the shock absorbing cleats 5, they are deformed significantly upon a collision to absorb the collision energy, compared to the collision with a corner of a conventional metallic

or plastic step. Therefore, even when a passenger's head collides with it, serious injuries can be avoided.

More specifically, escalator passengers use an escalator, in a normal use state, by placing their feet on the convex sections 8 of the body section of the tread 2. However, they may place their feet on the shock absorbing cleats 5. In this case, even if the shock absorbing cleats 5, for which the urethane rubber is used, are elastically deformed to some extent, the passengers may feel strange but will not fall down. However, if the short convex sections 11 or the long convex sections 12 are buckled due to the load from the passengers and are significantly deformed, the passengers will have an elevated risk of falling. Therefore, the shock absorbing cleats 5 are required to have a function for preventing passengers from suffering serious injuries even when they fall down and hit their heads against the step corner, by absorbing the collision energy, and to have convex portions (the short convex sections 11 or the long convex sections 12) which are not buckled due to the load from the passengers in a normal use state.

In response to the requirements, the shock absorbing cleat according to Embodiment 1 described above is

designed so as not to be buckled due to the load from the passengers by using materials having relatively higher hardness than the base section 13 for the short convex sections 11 and the long convex sections 12. On the other hand, the base section 13 has significantly large buckling load due to its box-shaped structure. Accordingly, there is no concern of buckling. Thus, the base section 13, for which a material having relatively low hardness is used, can efficiently absorb the collision energy even when a passenger's head collides with the corner. That is to say, when a passenger falls down and hit the passenger's head against the corner, the head firstly collides with the short convex sections 11 or the long convex sections 12 of the shock absorbing cleats 5. The shock is transmitted to the base sections 13 having relatively low hardness via the short convex sections 11 or the long convex sections 12 having relatively high hardness. Accordingly, it will be absorbed there.

In addition, if passengers use an escalator in a normal state, urethane rubber is, generally, easier to get worn and dirty than metal. However, metallic materials are used for the body section 6 of the tread 2, including the convex sections 8, which the passengers frequently get on and off.

Therefore, the convex sections 8 of the body section have wear or dirtiness not more than the conventional steps. Although the urethane rubber is used for the shock absorbing cleats 5, their lifetimes will not come to the end by getting worn or dirty in a short period of time because passengers do not frequently step their feet on this portion. When the shock absorbing cleats 5 significantly get worn or dirty and their lifetimes come to the end, it is not required to replace the entire tread 2, but required to replace the shock absorbing cleats 5 only. In addition, since a plurality of shock absorbing cleats 5 are mounted in a width direction of the step 1, when only one of them comes to the end of its lifetime, it is required to replace the dead one only. Thus, maintenance costs can be reduced to the requisite minimum.

The base section 13 of each shock absorbing cleat 5 is colored red and the short convex sections 11 and the long convex sections 12 are colored yellow. Thus, each shock absorbing cleat 5 has a different color tone from the body section 6 of the tread 2. Accordingly, the shock absorbing cleats 5 can also serve as demarcation to clarify an edge of the tread 2 for users, thereby reducing the possibility of falling. They can also call the attention of the users

thereto so that they do not step their feet thereon as much as possible. In addition, the base section 13, for which a material having relatively low hardness is used, is colored red. This enables the users to be informed of that the portion has low rigidity, thereby calling their attention thereto.

Although the urethane rubber is used for the shock absorbing cleats 5 in the above description, the material of the shock absorbing cleats 5 is not limited to the urethane rubber. It may be an elastomer, such as natural rubber, synthetic rubber, silicone rubber, or fluorocarbon rubber.

Although materials having different hardness are used for the short convex sections 11 or the long convex section 12, and the base section 13, such materials may be distinguished using an index for evaluating the rigidity, such as Young's modulus, instead of the hardness. Accordingly, in this specification, the term "hardness" shall be used in meanings including "Young's modulus."

Although the base section 13 of each shock absorbing cleat 5 is colored red, and the short convex sections 11 and the long convex section 12 are colored yellow, any

colors can be used as long as they have different color tones from the body section 6 of the tread 2.

In the above description, modifying the material of the short convex sections 11 or the long convex sections 12 improves the buckling load thereof. However, when structural modification can be made, for example, the thickness, height, and width of the short convex sections 11 or the long convex sections 12 can be increased from the conventional steps, it is not required to use different materials for the short convex sections 11 or the long convex sections 12, and the base section 13. However, when such structural modification is made as described above, it is required to modify the structures of the convex sections 8 of the body section, the riser 3, and a comb (not shown) provided at a platform, in accordance with the above-described modification. It changes, according to the occasional situation, whether it is advantageous to modify the material of the short convex sections 11 or the long convex section 12, or whether it is advantageous to modify the structures. Therefore, it may be judged depending on the circumstances of the time.

As described above, by using an escalator step according to Embodiment 1, it is made possible to provide a safe

escalator, without using an expensive device therefor, that can prevent passengers from suffering serious injuries even when they fall down and hit their heads against a step corner and that does not encourage falling of the passengers even in a normal use state.

(Embodiment 2)

Embodiment 2 will be described by referring to FIG. 10 through FIG. 12.

Embodiment 2 is different from Embodiment 1 in that the materials of the portions each constituting a shock absorbing cleat 20 are different from those in Embodiment 1. Their shapes are substantially the same in both the embodiments. Accordingly, different portions will be described below, and the description of the other portions will be omitted.

For the shock absorbing cleat 20 in Embodiment 2, two kinds of urethane rubber are used, which are urethane rubber having relatively high hardness and urethane rubber having relatively low hardness.

FIG. 10 illustrates a cross section of a short convex section 21 and a base section 23 at a bottom thereof (cross section AA of FIG. 5). Materials having relatively high

hardness are used for the short convex section 21 and the base section 23.

FIG. 11 illustrates a cross section of a long convex section 22 and the base section 23 at a bottom thereof (cross section BB of FIG. 5). A material having relatively lower hardness than that of the short convex section 21 and that of the base section 23 at the bottom thereof illustrated in FIG. 10 is used for the long convex section 22. A material having relatively higher hardness than that of the long convex section 22 is used for the base section 23.

FIG. 12 illustrates a cross section of the short convex sections 21, the long convex sections 22, and the base section 23 at the bottoms thereof (cross section CC of FIG. 4). As described above, materials having relatively high hardness are used for the short convex sections 21 and the base section 23. A material having relatively lower hardness than that of the short convex sections 21 and that of the base section 23 is used for the long convex sections 22.

It should be noted that, since the shock absorbing cleat 20 is manufactured by the two-color molding, boundary surfaces between the above-described different materials

are stably connected. Upon the two-color molding, a red coloring agent is mixed for molding the long convex sections 22 for which a material having relatively low hardness is used, and a yellow coloring agent is mixed for molding the short convex sections 21 and the base section 23 for which materials having relatively high hardness are used.

Next, the operation and advantages of Embodiment 2 will be described.

Since the urethane rubber having significantly lower rigidity than that of the metals, such as aluminum and stainless steel, and the resin used for demarcation is used for the shock absorbing cleats 20 according to Embodiment 2, they are deformed significantly upon a collision to absorb the collision energy, compared to the collision with a corner of a conventional metallic or plastic step. Therefore, even when a passenger's head collides with it, serious injuries can be avoided.

When a passenger falls down and hit the passenger's head against the shock absorbing cleats 20, the head collides with the shock absorbing cleats 20 not from right above them but from behind at a given angle. Since the long convex sections 22 are backwardly longer than the short convex

sections 21 at this time, the passenger's head collides with the long convex sections 22. The long convex sections 22, for which a material having relatively low hardness is used, can efficiently absorb the collision energy.

In addition, given that the passengers stand on the shock absorbing cleats 20 or they step and walk on the shock absorbing cleats 20, their shoe soles act on a plurality of convex sections because the long convex sections 22 and the short convex sections 21 are alternately arranged at short intervals. That is to say, the load from the passengers is shared by the long convex sections 22 and short convex sections 21. The short convex sections 21 are designed so as not to be buckled due to the load from the passengers by using a material having relatively high hardness therefor. Accordingly, the long convex sections 22 and the short convex sections 21 are not buckled together due to the load from the passengers, thereby not encouraging falling of the passengers.

Each shock absorbing cleat 20 has a different color tone from the body section 6. Accordingly, the shock absorbing cleats 20 can also serve as demarcation to clarify an edge of the tread 2 for users, thereby reducing the possibility of falling. They can also call the attention of the users

thereto so that they do not step their feet thereon as much as possible.

In addition, the long convex sections 22 for which a material having relatively low hardness is used are colored red. This enables the users to be informed of that these portions have low rigidity, thereby calling their attention thereto.

In this manner, by using an escalator step according to Embodiment 2, it is made possible to provide a safe escalator, without using an expensive device therefor, that can prevent passengers from suffering serious injuries even when they fall down and hit their heads against a step corner and that does not encourage falling of the passengers even in a normal use state.

(Embodiment 3)

Embodiment 3 will be described by referring to FIG. 13 through FIG. 15.

Embodiment 3 is different from Embodiment 1 in that, as with Embodiment 2, the materials of the portions each constituting a shock absorbing cleat 30 are different from those in Embodiment 1. Their shapes are substantially the same in both the embodiments. Accordingly, different

portions will be described below, and the description of the other portions will be omitted.

For the shock absorbing cleat 30 in Embodiment 3, two kinds of urethane rubber are used, which are urethane rubber having relatively high hardness and urethane rubber having relatively low hardness.

FIG. 13 illustrates a cross section of a short convex section 31 and a base section 33 at a bottom thereof (cross section AA of FIG. 5). Materials having relatively high hardness are used for the short convex section 31 and the base section 33.

FIG. 14 illustrates a cross section of a long convex section 32 and the base section 33 at a bottom thereof (cross section BB of FIG. 5). A material having relatively low hardness is used for a rear end corner 38 of the long convex section 32. Materials having relatively high hardness are used for the convex portions other than the rear end corner 38 and the base section 33.

FIG. 15 illustrates a cross section of the short convex sections 31, the long convex sections 32, and the base section 33 at the bottoms thereof (cross section CC of FIG. 4). As described above, since a material having relatively low hardness is used only for each rear end corner

38 of the long convex sections 32, it is understood that materials having relatively high hardness are used for all the portions illustrated in the cross section of this drawing.

It should be noted that, since the shock absorbing cleat 30 is manufactured by the two-color molding, boundary surfaces between the above-described different materials are stably connected. In addition, upon the two-color molding, a red coloring agent is mixed for molding the rear end corners 38 of the long convex sections 32 for which a material having relatively low hardness is used, and a yellow coloring agent is mixed for molding the portions other than the rear end corners 38 of the long convex sections 32, for which materials having relatively high hardness are used.

Next, the operation and advantages of Embodiment 3 will be described.

Since the urethane rubber having significantly lower rigidity than that of the metals, such as aluminum and stainless steel, and the resin used for demarcation is used for the shock absorbing cleats 30 according to Embodiment 3, they are deformed significantly upon a collision to absorb the collision energy, compared to the collision

with a corner of a conventional metallic or plastic step. Therefore, even when a passenger's head collides with it, serious injuries can be avoided.

When a passenger falls down and hit the passenger's head against the shock absorbing cleats 30, the head collides with the shock absorbing cleats 30 not from right above them but from behind at a given angle. Since the long convex sections 32 are backwardly longer the short convex sections 31 at this time, the passenger's head collides with the rear end corners 38 of the long convex sections 32. The rear end corners 38 of the long convex sections 32, for which a material having relatively low hardness is used, can efficiently absorb the collision energy.

Given that the passengers stand on the shock absorbing cleat 30 or they step and walk on the shock absorbing cleat 30, the load from the passengers act on the portions other than the rear end corners 38 of the long convex sections 32. However, the portions other than the rear end corners 38 are designed so as not to be buckled due to the load from the passengers by using materials having relatively high hardness therefor. Accordingly, the long convex sections 32 and the short convex sections 31 are

not buckled due to the load from the passengers, thereby not encouraging falling of the passengers.

Each shock absorbing cleat 30 has a different color tone from the body section 6. Accordingly, the shock absorbing cleats 30 can also serve as demarcation to clarify an edge of the tread 2 for users, thereby reducing the possibility of falling. They can also call the attention of the users thereto so that they do not step their feet thereon as much as possible.

In addition, the rear end corners 38 of the long convex sections 32 for which a material having relatively low hardness is used are colored red. This enables the users to be informed of that these portions have low rigidity, thereby calling their attention thereto.

In this manner, by using an escalator step according to Embodiment 3, it is made possible to provide a safe escalator, without using an expensive device therefor, that can prevent passengers from suffering serious injuries even when they fall down and hit their heads against a step corner and that does not encourage falling of the passengers even in a normal use state.

WHAT IS CLAIMED IS:

1. An escalator step comprising: a tread, a riser intersecting the tread and a shock absorbing cleat provided at a corner where a tread and a riser of the escalator step intersect,

wherein the escalator step having metallic materials, such as aluminum and stainless steel, used for a tread body section, and

wherein the escalator step having elastomers including at least natural rubber, synthetic rubber, urethane rubber, silicone rubber, and fluorocarbon rubber used for the shock absorbing cleat.

2. An escalator step comprising: a tread, a riser intersecting the tread and a shock absorbing cleat provided at a corner where a tread and a riser of the escalator step intersect,

wherein the escalator step having metallic materials, such as aluminum and stainless steel, used for a tread body section,

wherein the escalator step having elastomers including at least natural rubber, synthetic rubber, urethane rubber, silicone rubber, and fluorocarbon rubber used for the shock absorbing cleat, and

wherein two or more kinds of elastomers having different hardness are used for the shock absorbing cleat.

3. The escalator step according to claim 2, wherein a material having relatively high hardness is used for convex sections of the shock absorbing cleat, and a material having relatively lower hardness than that of the convex sections is used for a base section.

4. The escalator step according to claim 3, wherein the shock absorbing cleat has the convex sections and the base section colored in different colors.

5. The escalator step according to claim 4, wherein a plurality of shock absorbing cleats are arranged in a width direction of the step.

6. The escalator step according to claim 2, wherein a shock absorbing cleat has short convex sections, each having a rear end surface being the same flat surface as a concave section of the riser, and long convex sections, each having a rear end surface projecting so as to be the same flat surface as a convex section of the riser, arranged

alternately, and wherein a material having relatively low hardness is used only for peak sections of the long convex sections, and a material having relatively higher hardness than that of the peak sections is used for the base section and peak sections of the short convex sections.

7. The escalator step according to claim 6, wherein the shock absorbing cleat has the peak sections of the long convex sections, and the base section and the peak sections of the short convex sections colored in different colors.

8. The escalator step according to claim 7, wherein a plurality of shock absorbing cleats are arranged in a width direction of the step.

9. The escalator step according to claim 2, wherein a shock absorbing cleat has short convex sections, each having a rear end surface being the same flat surface as a concave section of the riser, and long convex sections, each having a rear end surface projecting so as to be the same flat surface as a convex section of the riser, arranged alternately, and wherein a material having relatively low hardness is used only for a vicinity of each rear end

surface of peak sections of the long convex sections, and a material having relatively higher hardness than that of the vicinity of each rear end surface of the peak sections is used for the other portions.

10. The escalator step according to claim 9, wherein the shock absorbing cleat has a portion in the vicinity of each rear end surface of the peak sections of the long convex sections and the other portions colored in different colors.

11. The escalator step according to claim 10, wherein a plurality of shock absorbing cleats are arranged in a width direction of the step.

12. An escalator step comprising:

a tread having a plurality of convex sections arranged in parallel on an upper surface of a body, the tread having a step-shaped notch formed at a rear end section;

a riser provided so as to intersect the rear end section of the tread, the riser having a plurality of

convex sections and concave sections alternately formed on a surface; and

a shock absorbing cleat provided at the step-shaped notch formed at the rear end section of the tread, the shock absorbing cleat having short convex sections and long convex sections arranged alternately on a base section, the short convex sections each having a rear end surface being the same flat surface as a concave section of the riser and a front end surface consistent with a rear end surface of a convex section of the tread, the long convex sections each having a rear end surface projecting so as to be the same flat surface as a convex section of the riser and a front end surface consistent with a rear end surface of a convex section of the tread,

wherein, metallic materials, such as aluminum and stainless steel, are used for the tread body section, and elastomers including at least natural rubber, synthetic rubber, urethane rubber, silicone rubber, and fluorocarbon rubber are used for the shock absorbing cleat.

13. The escalator step according to claim 12, wherein a material having relatively high hardness is used for the

convex sections of the shock absorbing cleat, and a material having relatively lower hardness than that of the convex sections is used for the base section.

14. The escalator step according to claim 13, wherein the shock absorbing cleat has the convex sections and the base section colored in different colors.

15. The escalator step according to claim 14, wherein a plurality of shock absorbing cleats are arranged in a width direction of the step.

16. The escalator step according to claim 12, wherein a material having relatively low hardness is used only for peak sections of the long convex sections of the shock absorbing cleat, and a material having relatively higher hardness than that of the peak section is used for the base section and peak sections of the short convex sections.

17. The escalator step according to claim 16, wherein the shock absorbing cleat has the peak sections of the long convex sections, and the base section and the peak sections of the short convex sections colored in different colors.

18. The escalator step according to claim 17, wherein a plurality of shock absorbing cleats are arranged along the step-shaped notch formed at the rear end section of the tread.

19. The escalator step according to claim 12, wherein a material having relatively low hardness is used only for a vicinity of each rear end surface of peak sections of the long convex sections, and a material having relatively higher hardness than that of the vicinity of each rear end surface of the peak sections is used for the other portions.

20. The escalator step according to claim 6, wherein a plurality of the shock absorbing cleats are arranged along the step-shaped notch formed at the rear end section of the tread.