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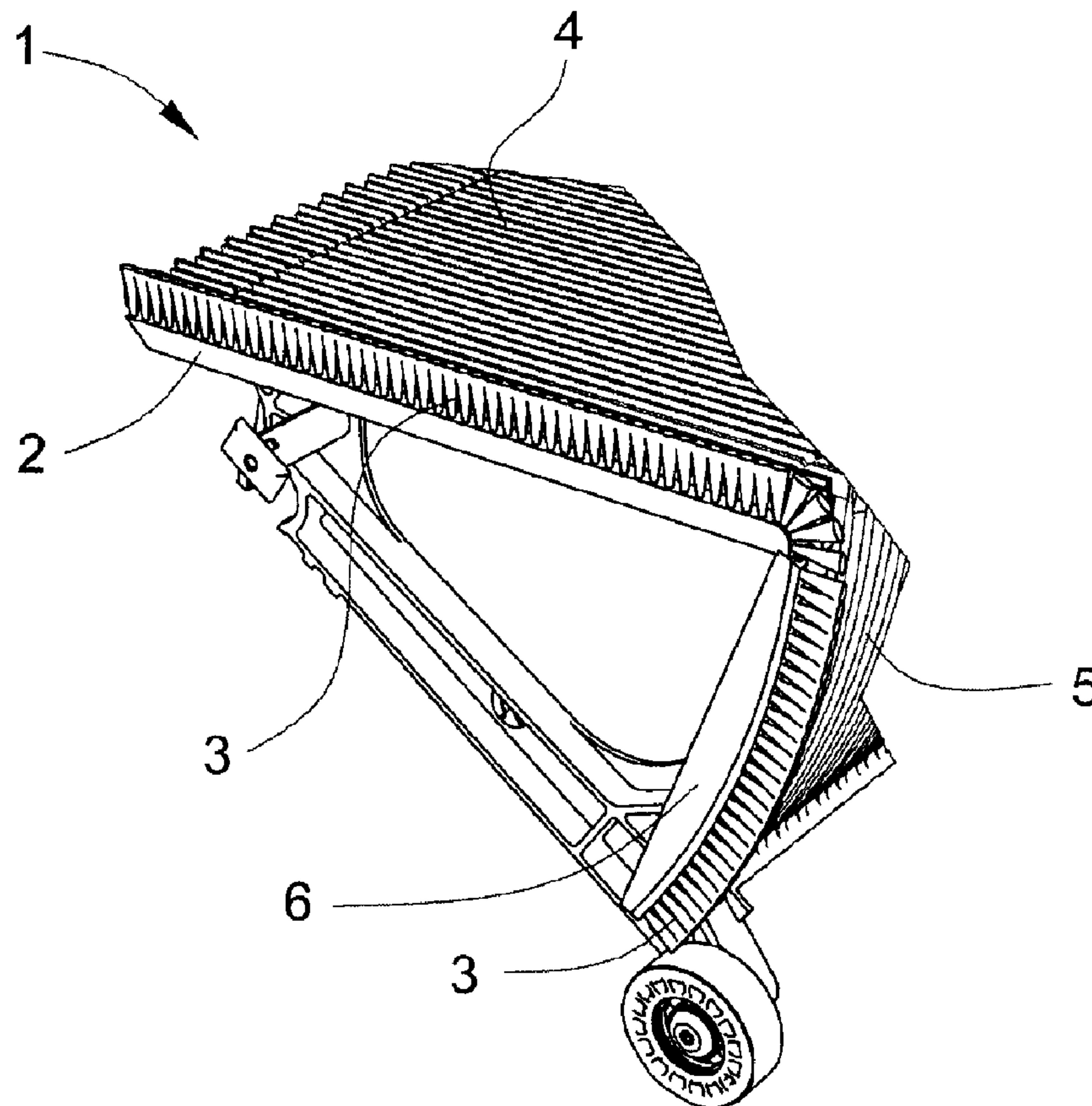
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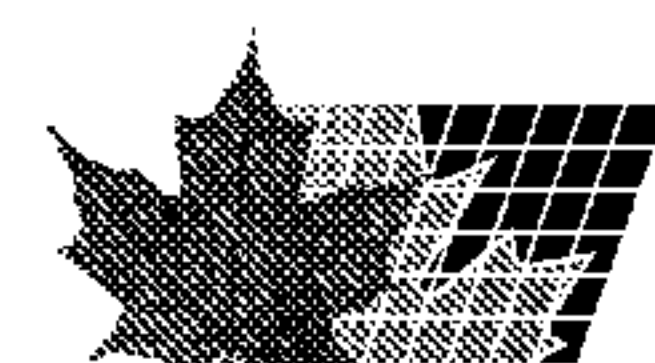
(54) Titre : ESCALIER MECANIQUE AVEC BALAIS DE MARCHE, MARCHE D'ESCALIER MECANIQUE, ET METHODE DE MODERNISATION D'ESCALIER MECANIQUE

(54) Title: ESCALATOR WITH STEP BRUSHES, STEP OF SUCH AN ESCALATOR, AND METHOD OF MODERNIZING AN ESCALATOR



(57) Abrégé/Abstract:

The invention relates to an escalator with steps (1) that have a step-tread surface (4) with a step-tread edge (2), step brushes (3) being arranged on the step-tread edge (2) perpendicularly or vertically.



Abstract

The invention relates to an escalator with steps (1) that have a step-tread surface (4) with a step-tread edge (2),
5 step brushes (3) being arranged on the step-tread edge (2) perpendicularly or vertically.

(Fig. 1)

**Escalator with Step Brushes, Step of Such an Escalator, and
Method of Modernizing an Escalator**

The invention relates to an escalator with steps, a step of
5 such an escalator, and a method of modernizing an
escalator.

The steps of a usual escalator are fastened to two
transporting chains, together with which they form an
10 endless circulating step-band that at each end of the
escalator runs over a pair of transporting-chain wheels, one
of the transporting-chain wheel pairs belonging to the drive
station, and driving and reversing the step-band, and the
other transporting-chain wheel pair being part of a step-
15 band reversing station. The individual steps of the step-
band are each equipped with two front and two back guide
rollers on which the steps are guided in defined location-
dependent positions mainly by guiding and reversing curves
fastened to the supporting construction of the escalator.

20 The steps of an escalator run along a predetermined path
that is laterally defined by the stationary skirt-panel.

To compensate for tolerances, between the skirt-panel and
25 step a gap must remain, since a step making contact there
would cause considerable friction that would lead to
unacceptable heating, as well as increasing the power
needed for driving, and the amount of wear.

30 For this reason, a gap, or air-gap, must remain between the
skirt-panel and step.

Such a gap, or air-gap, is a safety hazard. Because of the
play present on both sides, the width of the gap can attain
a larger range, so that penetration by an edge of a shoe, a
35 scarf, a high-heel, a skirt-hem, or a hand, especially of a

child, becomes possible. Consequently, for the passenger, the danger of crushing and other injuries is not ruled out.

Injury to persons by the gap between the skirt-panel and the step-tread area, as well as in the step-riser area, resulting from the relative motion between the moving steps and the stationary skirt-panel, is a major problem of conventional escalators. Furthermore, if an object that is present on the moving step comes into contact with the stationary skirt-panel, the object can be pulled into the gap by friction, especially when traveling upward.

Efforts have therefore been made to create a deflecting surface that will prevent penetration into the gap. Various deflectors for the gap between the step and the skirt-panel are to be found in the documentation.

Patent WO98/24714, for example, discloses skirt-panel brushes that are installed as deflectors on the skirt-panel but over the steps. These skirt-panel brushes divert straight objects such as, for example, a leg away from the gap between the skirt-panel and the step. In doing so, however, a foot of the leg can be so turned that the toes point in the direction of the gap and the brushes do not prevent their penetration into the gap.

Patent US5695040 discloses slits that are installed at the side of the step and in which brushes are arranged. This solution has the disadvantage that the blocking brushes are located at a certain distance below the surface of the step-tread or step-riser respectively, with the consequence that objects can become trapped in the gap situated above them. Moreover, the brushes are in contact with the skirt-panel, damage the skirt-panel, and cause noises. It has also proved disadvantageous that, through constant rubbing of the brushes against the skirt-panel, they have a very short life. The forces exerted by the steps damage the

structure of the brushes, which then have insufficient stability of form.

It is therefore the objective of the invention to create an escalator that does not possess the aforesaid disadvantages and that substantially increases operating safety while being easy to manufacture as well as substantially increasing the service life.

10 The invention envisages that on an escalator with steps that have a step-tread surface with at least one step-tread edge, step brushes are arranged on the step-tread edge.

15 "Step-tread surface" refers to the surface of the escalator step on which passengers stand. The step-tread edge comprises the geometrical line that bounds the step-tread surface, as well as the immediate vicinity of this geometrical line on the step-tread surface.

20 Step brushes positioned in the manner described above provide a necessary prevention of contact between objects and the skirt-panel. The step brushes prevent contact of objects with the skirt panels and, at the same time, penetration of objects into the gap between the skirt-panel
25 and the passing step or step-band. Furthermore, by use of step brushes, two undesired friction partners are brushed apart. Foreign objects as, for example, shoes, umbrellas, handbags, plastic bags, and other objects are brushed away from the skirt-panel by means of the step brushes, the step
30 brushes pushing, or brushing, the objects out of the hazardous area, i.e. away from the gap between the skirt-panel and step. Consequently, the possibility of pinching or wedging of objects is greatly reduced or ruled out. Use

of the escalator is thereby substantially improved and its safety substantially increased.

The brushes terminate all frictional contact before
5 penetration into the gap between the moving steps and the stationary skirt-panel can occur. Especially in the transitional radii, where there is not only relative motion between the steps and the skirt-panel but also relative motion between two adjacent steps, namely when a horizontal
10 step-tread approaches in upward direction a step-riser moving in front of it, any frictional contact in this critical area between step-tread and step-riser is prevented by the brushes.

15 The device in patent US5695040 does not achieve this effect, since the brushes are arranged at a distance from the step-edge. That solution has precisely the disadvantage that friction between the object and the skirt-panel, and penetration into the gap between the skirt-panel and the
20 step, are not prevented.

In a preferred embodiment of the invention, the step brushes are arranged along the entire step-tread edge in a direction perpendicular to the step-tread surface.

25 The brushes according to the invention are thus mounted or arranged with such orientation that the brushes are perpendicular to the step-tread surface and project along the skirt-panel and therefore do not touch the skirt-panel. Contact with the skirt-panel only occurs when an object
30 comes into frictional contact with the skirt-panel. In this embodiment of the invention, all frictional contact between two objects before penetrating into the gap between the moving step and the stationary skirt-panel is prevented.

35 In a second preferred embodiment of the invention, the steps have a step-riser surface with at least one step-

riser edge on which the step brushes are arranged.

The step-riser surface is the front, approximately vertical, surface of the escalator step. It is often
5 curved, rounded, or convex. The step-riser edge is the geometrical line that bounds the step-riser surface, and the immediate vicinity of this geometrical line on the step-riser surface.

10 Advantageous in this embodiment is that the danger of penetration of an object into the air gap is further reduced.

In a further preferred embodiment of the invention, the
15 step brushes are arranged along the entire edge of the step-riser in a direction perpendicular to the step-riser surface. In this solution, the brushes aligned away from the skirt-panel do not touch the skirt-panel, with the result that no friction occurs, and the skirt-panel and the
20 brushes have long lives.

In a further exemplary embodiment of the invention, the step brushes consist of plastic brushes or brass brushes or galvanized steel brushes. By use of these materials, the
25 prevention of frictional contact is further increased. The said materials also possess the advantage of more easily and/or more effortlessly and/or more unproblematically separating two objects that are in frictional contact.

30 In a further preferred embodiment of the invention, the step brushes are fastened onto the steps by being molded onto, or bonded onto, or screwed to, or bonded into, or snapped into them. Inexpensive and simple usual methods of manufacturing the brushes can therefore be used.

35 Advantageously, the step-tread edge is a separate mechanical plastic component of the step, and the step

brushes are fastened onto the step-tread edge by being molded around, or molded into, or bonded into it. The step brushes can therefore be made separately with the plastic component that forms the step-tread edge. The complete
5 component is then subsequently mounted on the step body in fast and simple manner. Such a step-tread edge is easily dismountable and replaceable.

In an embodiment of the invention, step brushes are
10 arranged on a step for an escalator along the entire step-tread edge and perpendicular to the step-tread surface.

Such a step can be simply and inexpensively produced semi-finished, and subsequently quickly and simply used on an
15 escalator.

In a last embodiment of the invention, an escalator that has steps which have a step-tread surface with a step-tread edge is modernized by step brushes being mounted on the
20 step-tread edge.

By means of this modernization method, conventional transportation installations can also easily and quickly benefit from the advantages described above.

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In one aspect, the present invention provides an escalator with steps that have a step-tread surface with at least one step-tread edge, characterized in that step brushes are arranged on at least one of the step-tread edge projecting
30 above the step-tread surface as a barrier to the entry of objects into a gap between the step and a skirt panel, the step brushes having waved bristles.

In a further aspect, the present invention provides a step
35 for an escalator, the step having a step-tread surface with

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a step-tread edge, characterized in that step brushes are arranged along an entirety of the step-tread edge projecting above the step-tread surface with an orientation and alignment perpendicular to a surface of the step-tread, the step brushes having waved bristles.

Exemplary embodiments of the invention are illustrated in figures 1 to 4 and explained in more detail in the description that follows below.

Fig. 1 shows diagrammatically an arrangement of an escalator step with the step brushes according to the invention.

Fig. 2 shows diagrammatically an arrangement of an escalator step with the step brushes according to the invention and with a separate plastic step-tread edge.

Fig. 3 shows step brushes with straight bristles.

Fig. 4 shows step brushes with waved bristles.

5 Fig. 1 shows in detail a step 1, for an escalator, that has a step-tread surface 4 with at least one step-tread edge 2, step brushes 3 being arranged on the step-tread edge 2. When the step 1 is installed on the escalator, there is a gap, or air gap, between the step 1 and the skirt-panel of
10 the escalator. The step brushes 3 are arranged along the entire step-tread edge 2 in a direction perpendicular to the step-tread surface 4. The step 1 also has a step-riser surface 5 with a step-riser edge 6 on which step brushes 3 are likewise arranged. The step brushes 3 are arranged
15 along the entire step-riser edge 6 in a direction perpendicular to the step-riser surface 5.

On an escalator with a balustrade, step brushes 3 are mounted on all escalator steps 1. There are step brushes 3
20 on both the step-tread and the step-riser. The step brushes 3 are installed at left and right on the escalator step 1. By minimizing contact, the step brushes 3 prevent entrapment or dragging of shoes, umbrellas, handbags, plastic bags, or other objects. They prevent penetration of
25 all foreign elements such as pieces of newspaper, plastic bags, pebbles, fibers of items of apparel, and coarser soiling matter, as well as snow and ice.

The great advantage of the step brushes 3 lies in their
30 fanlike, and thereby sealing, arrangement. The step-gap is closed off, and access to the side-edge of the escalator step is made impossible. A further advantage of the step brushes 3, relative to fixed edge-elements or stationary panels, is their flexibility. When laterally touched by
35 footwear, they yield flexibly, and the space required in the particular situation is made free.

Like a thick wall of plastic brushes, the step brushes 3 prevent access to, or penetration into, the gap between the skirt-panel and step. There is now a dense, hermetic, impenetrable boundary of bristles left and right of the
5 escalator step 1.

The step brushes 3 can be fastened onto the escalator step 1 by being molded onto, or bonded onto, or screwed to, or bonded into, or snapped into it.

10

Fig. 2 shows diagrammatically an arrangement of an escalator step 1 with step brushes 3 according to the invention, and with a separate plastic step-tread edge 2. In this special embodiment of the invention, the step-tread
15 edge 2 is a separate mechanical plastic component of the step 1, and the step brushes 3 are fastened onto the step-tread edge 2 by being molded around, or molded into, or bonded into it.

20 Such plastic edges are preferably yellow, so as to give passengers a clearly visible indication of the presence there of a gap. The danger or warning is thus made clearly visible.

25 The step brushes 3 are therefore manufactured together with the yellow plastic edges 2, and mounted or screwed along with them onto the step body 1.

The step brushes 3 form a barrier, or obstacle, to
30 passengers, and hinder, or impede, touching the skirt-panel. No access to the skirt-panel gap is possible, and pinching or wedging or crushing is impossible.

The step brushes 3 thus isolate the stationary (skirt-panel)
35 components from the moving (escalator step) components.

Sliding together is completely prevented by the step brushes 3. Furthermore, the step brushes 3 are executed so solidly that they withstand the wear and tear of passenger traffic.

5

For this reason, a durable, robust, wear-resistant brush material must be used such as, for example, plastic bristles or brass bristles or galvanized steel wire bristles.

10

The adequate dimensioning and design of the step brushes 3 is given by the number of passengers and the wear and tear resulting therefrom.

15

According to a preferred embodiment of the invention, the end of the bristles of the step brushes is rounded. This is advantageous, since the danger of injury to passengers through contact with the bristles is thereby reduced.

20

According to a further embodiment of the invention, the bristles of the brushes are waved. This is advantageous because such brushes have high stability of form and a longer life.

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Fig. 3 shows step brushes with straight bristles, while Fig. 4 shows step brushes 3 with waved bristles.

30

The waved structure increases the mechanical strength of the bristles and allows better distribution of the forces that are exerted by objects or passengers. By comparison with straight bristles, the waved structure stabilizes the bristles against bending out of line from their longitudinal axis. If the straight bristles are loaded along their longitudinal axis, they bend and can no longer exert an opposing force. By contrast, the waved bristles absorb the load along the longitudinal axis as spring

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tension that is stored in the waves, the bristles retain their alignment, and are not bent.

On account of their density, the waved bristles
5 significantly reduce the gap or air gap between the running, driven, escalator step 1 and the skirt-panel, the danger of a foot of a passenger penetrating into the gap, or air gap, being thereby further reduced.

10 At a factory, step brushes 3 can be fastened without problem onto a step 1 for an escalator, that has a step-tread surface 4 with a step-tread edge 2, along the entire step-tread edge 2 with orientation and/or alignment perpendicular to the step-tread surface.

15 This solution allows fast and simple installation of the step brushes 3 on the escalator and reduces the manufacturing costs and installation costs.

20 An escalator with steps 1 that have a step-tread surface 4 with a step-tread edge 2 can also be modernized by step brushes 3 being fastened onto the step-tread edge 2.

This method of modernization by the attachment of step
25 brushes 3 allows fast and simple improvement of the escalator with regard to operating safety and passenger safety, since the danger of being trapped, and the danger of being pinched, and the danger of being wedged, are prevented.

We Claim:

1. Escalator with steps that have a step-tread surface with at least one step-tread edge, characterized in that step brushes are arranged on at least one of the step-tread edge projecting above the step-tread surface as a barrier to the entry of objects into a gap between the step and a skirt panel, the step brushes having waved bristles.
2. Escalator according to claim 1, wherein the step brushes are arranged along the entire step-tread edge in a direction perpendicular to the step-tread surface.
3. Escalator according to claim 1 or 2, wherein the steps have a step-riser surface with at least one step-riser edge on which the step brushes are arranged.
4. Escalator according to claim 3, wherein the step brushes are arranged along the entire step-riser edge in a direction perpendicular to the step-riser surface.
5. Escalator according to any one of claims 1 to 4, wherein the step brushes comprise one of plastic bristles, brass bristles and galvanized steel bristles.
6. Escalator according to any one of claims 1 to 5, wherein the step brushes are fastened onto the steps by being one of molded onto, bonded onto, screwed to,

bonded into, and snapped into the steps.

7. Escalator according to any one of claims 1 to 6,
wherein the step-tread edge is a separate mechanical
plastic component of the step.
8. Escalator according to claim 7,
wherein the step brushes are fastened onto the step-tread
edge by being one of molded around, molded into, bonded
into, and wedged into the step-tread edge.
9. Step for an escalator, the step having a step-tread
surface with a step-tread edge,
characterized in that step brushes are arranged along an
entirety of the step-tread edge projecting above the
step-tread surface with an orientation and alignment
perpendicular to a surface of the step-tread, the step
brushes having waved bristles.

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Fig. 1

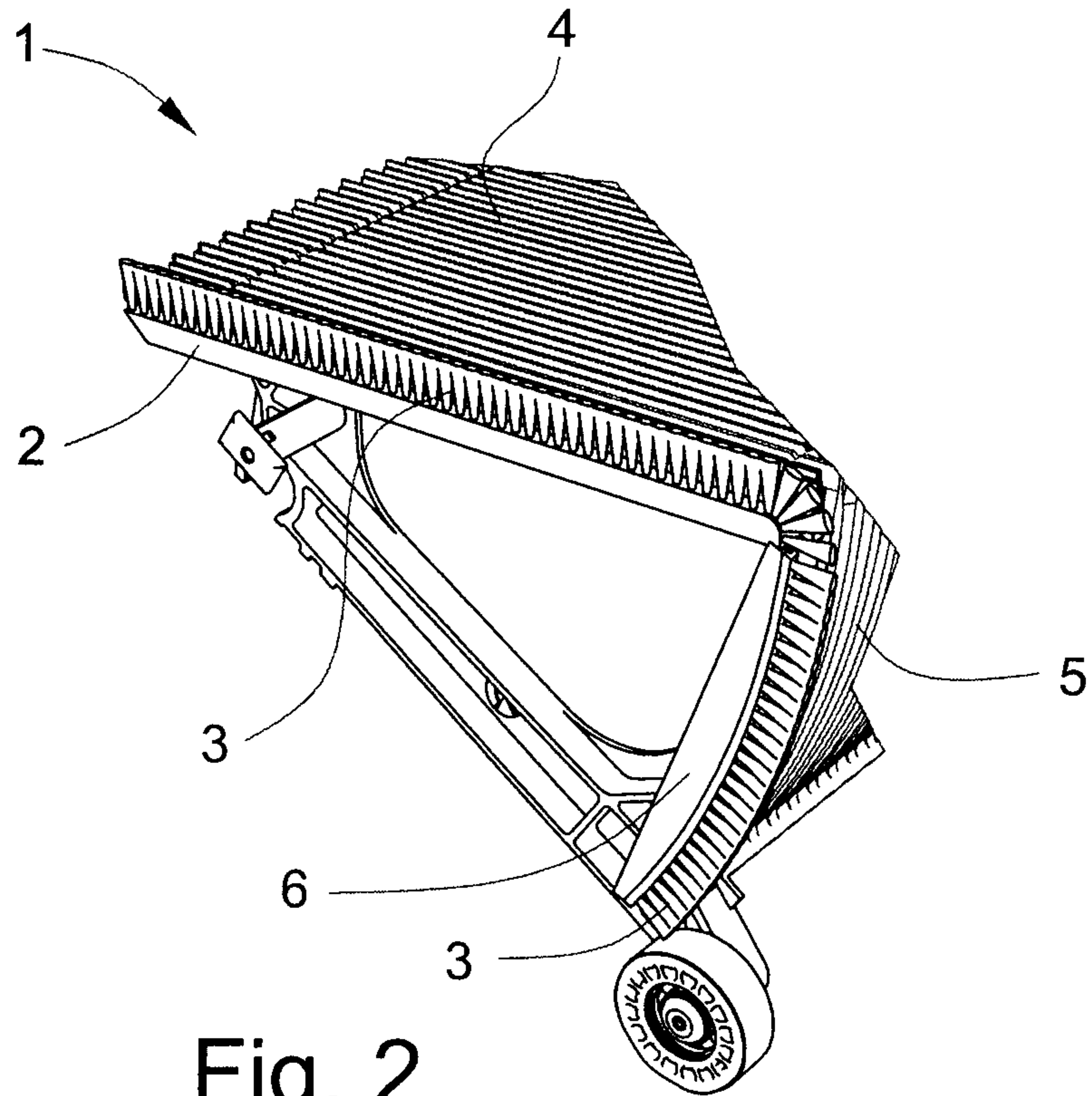
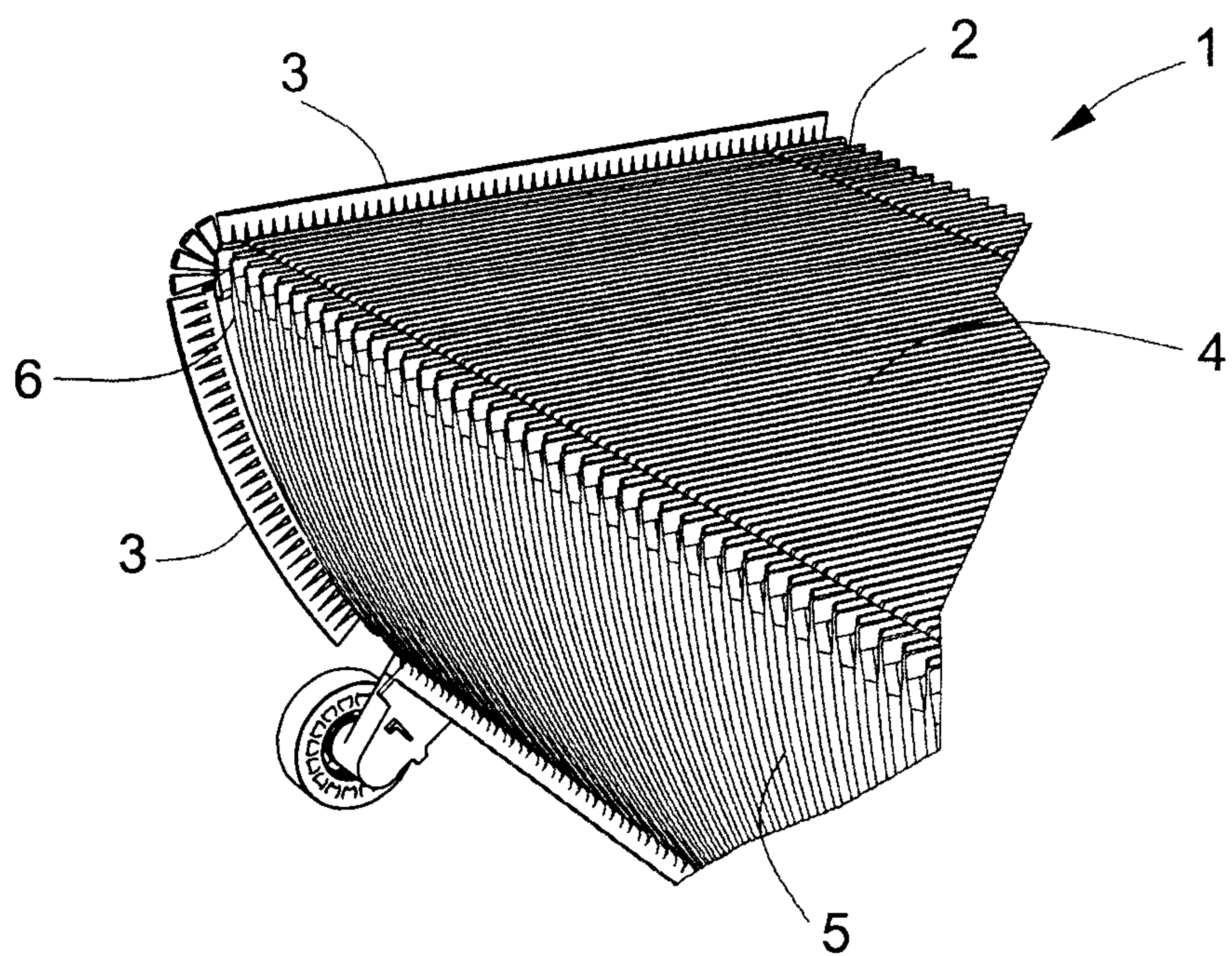


Fig. 2



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Fig. 3

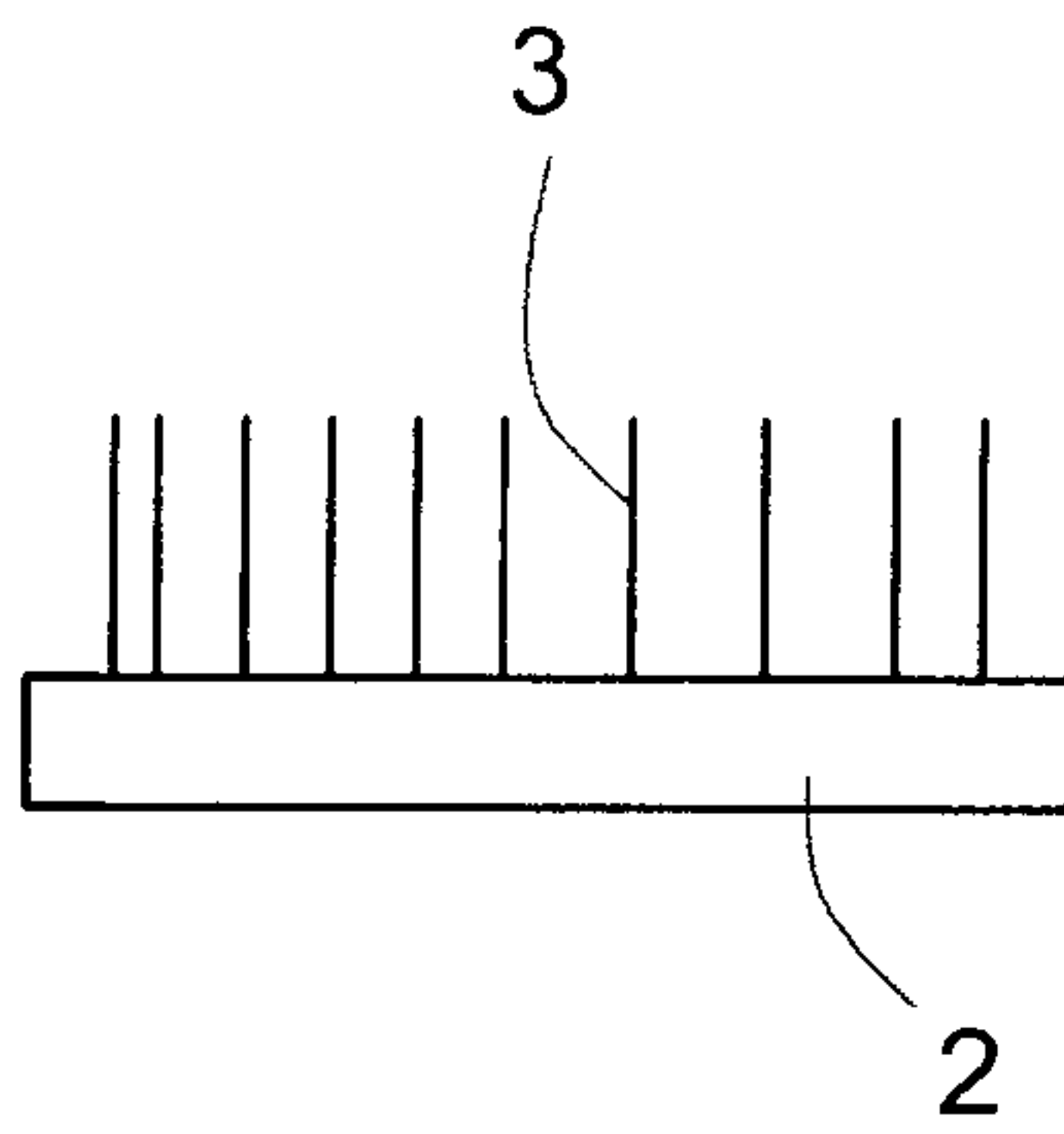


Fig. 4

