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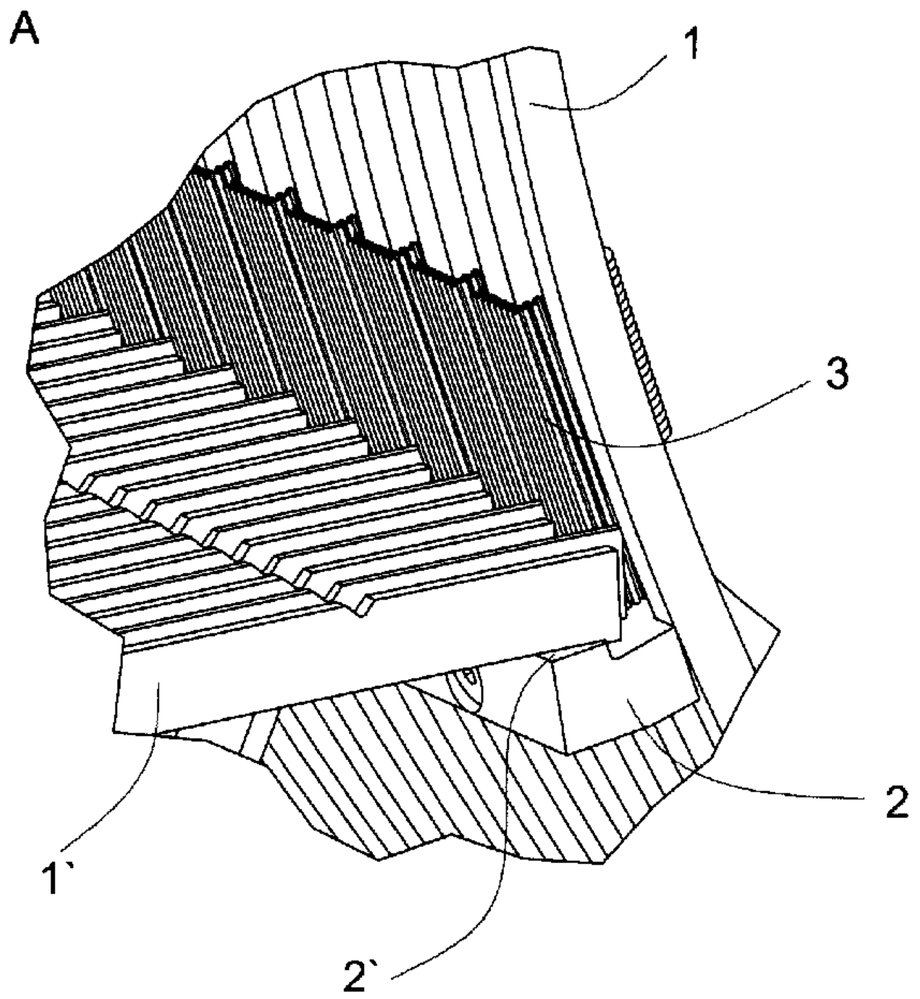
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(54) Titre : ESCALIER MECANIQUE AVEC BALAIS DE MARCHE ET DE CONTREMARCHE, ET METHODE DE MODERNISATION D'ESCALIER MECANIQUE

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



(57) **Abrégé/Abstract**:
The invention relates to an escalator with steps (1', 1) having a tread surface (6) and riser surface (7), wherein riser brushes (3) are arranged at the riser surface (7).

Abstract

The invention relates to an escalator with steps (1', 1) having a tread surface (6) and riser surface (7), wherein riser brushes (3) are arranged at the riser surface (7).

(Fig. 1)

Escalator with riser brushes, step of such an escalator and method of modernising an escalator

The invention relates to an escalator with steps, to a step of such an escalator and to a method of modernising an escalator, according to the definition of the independent patent claims.

The steps of a conventional escalator are fastened to two transport chains and form together therewith an endless, circulating step belt which runs over a respective pair of transport chainwheels at each of the two ends of the escalator, wherein one transport chainwheel pair belongs to the drive station and drives and deflects the step belt and the other chainwheel pair is part of a step belt deflecting station. The individual steps of the step belt are each equipped with two front and two rear guide rollers, at which the steps are guided by guidance and deflection curves primarily fastened to the support construction of the escalator, in an orientation defined in dependence on position.

The steps of an escalator run along a predetermined path laterally defined by the stationary base plate. A passenger located on the tread surface of a step stands opposite the riser surface of the leading step. In the outlet region the trailing step slides along the riser surface of the leading step, so that the riser surfaces of the leading and trailing steps come onto the same plane. Ribs are between two steps in order to minimise the contact area between the steps and a standing object. However, notwithstanding all this there is a gap between the ribs of two steps.

In order to provide compensation for tolerances a gap must remain between a leading step and a trailing step, since two steps bearing against one another would produce substantial friction which would lead to unacceptable heating and increase drive power as well as wear.

For this reason a space or air gap must be left between leading and trailing steps.

A space or a gap of that kind is a safety risk. Due to the play which is present the gap width can attain a greater range so that engagement therein of a shoe edge, heel, skirt hem or hand, particularly with children, is possible. As a consequence thereof the risk of squashing and other injuries for the passenger is not excluded.

The injury of persons in the riser region caused by the relative movement between the moved steps is a principal problem of conventional escalators. Beyond that, if an object located on the moved step comes into contact with the opposite riser surface the object can be drawn into the gap by friction and the simultaneous relative movement of leading and trailing steps, particularly in the case of upward travel.

Patent JP 11171462 discloses brushes which are arranged on a trailing step in order to clean the riser surface of the leading step. In the case of this device the brushes are disposed at a certain spacing below the tread surface, so that objects can jam in the gap disposed thereabove. Moreover, the brushes are in contact with the riser, damage the riser and cause noise. In addition, it has proved disadvantageous that the brushes due to the constant friction with the riser have only a very short service life. The forces exerted by the steps damage the structure of the brushes, which then have an insufficient stability of shape.

The invention therefore has the object of creating an escalator which does not have the above-mentioned disadvantages and which substantially increases operational reliability in conjunction with ease of manufacture and significantly extends service life.

According to the invention this object is fulfilled by the independent claims. Advantageous developments are evident from the subclaims.

According to the invention it is provided that riser brushes are arranged at the riser surface in an escalator with steps having a tread surface and a riser surface.

The surface of the escalator step on which the passengers stand is termed tread surface. The riser surface is the front, approximately vertical surface of the escalator step. It is often curved, rounded or convex. The riser surface of a leading step is disposed opposite the feet of the passengers during upward travel of the escalator.

Riser brushes positioned in the manner described above represent a necessary prevention of contact of objects with the riser. The riser brushes prevent contact of objects with the riser and at the same time penetration of objects into the gap between the riser and the trailing step. In addition, through the use of the riser brushes two unintended friction

partners are separated by brushing. Foreign bodies, such as, for example, shoes, umbrellas, bags, plastic bags or other objects, are brushed away from the riser by means of the riser brushes, wherein the riser brushes push or brush the objects out of the risk area, thus step gap. Consequently pinching or wedging of objects is not possible or is very strongly obstructed. The use of the escalator is thereby substantially enhanced and safety significantly increased.

The brushes eliminate any frictional contact relative to the escalator user or foreign bodies before penetration into the gap between the moved steps can take place. Particularly in the case of the transition radii where a relative movement between two adjacent steps takes place, namely when a horizontal tread approaches - in upward movement - a riser running in front of it, any frictional contact in this critical region between tread and riser is prevented by the brushes.

The device in Patent JP 11171462 does not achieve these effects, since the brushes are arranged at a spacing below the tread surface. This solution particularly has the disadvantage that rubbing of an object with the riser and penetration into the gap between the trailing and leading steps is not prevented.

In a preferred form of embodiment of the invention the riser brushes are arranged along the entire width of the riser surface in approximately parallel direction with respect to the riser surface.

The brushes according to the invention are thus so oriented, mounted or arranged that the brushes are approximately parallel to the riser surface and project, along the riser surface, above the tread surface of the trailng step and thereby do not contact the riser. Contact with the riser takes place only when an object comes into frictional contact with the riser. In this form of embodiment of the invention any frictional contact between two objects is also prevented before a penetration into the gap between the movable steps.

In a second preferred form of embodiment of the invention the riser brushes are mounted on a brush strip which is movable along guide slots or special devices of the riser surface.

It is advantageous at this form of embodiment that the position of the riser brushes relative to the riser surface can be varied depending on when the steps are disposed in a horizontal or a rising travel.

In a further preferred form of embodiment of the invention the brush strip is guidable by a brush return guide along guide slots or special devices of the riser surface back into such a position that the riser brushes during horizontal travel of the steps do not protrude beyond the riser surface. In this solution the brushes directed away from the tread surface do not contact the feet of passengers and are also invisible.

In a further preferred form of embodiment of the invention the riser brushes consist of synthetic material bristles or brass bristles or galvanised steel bristles. Prevention of frictional contact is further increased by the use of these materials. The above-mentioned materials moreover have the advantage of separating two objects, which are disposed in friction, in an easy, convenient, problem-free and reliable manner.

In a further preferred form of embodiment of the invention the riser brushes are of special colours, for example yellow or red, so that a better capability of recognition with regard to danger zones is given.

In a further preferred form of embodiment of the invention the riser brushes are fastened to the brush strip by being sprayed on, glued on, screwed together therewith, glued in or snapped in. Economic and simple, normal production methods of the brushes can thus be used.

If riser brushes are arranged at the riser surface of a step of an escalator such a step can be produced in simple and economic manner as a semi-finished product and then inserted into an escalator in quick and simple manner.

In a last form of embodiment of the invention an escalator with steps having a tread surface and a riser surface is modernised in that riser brushes are mounted at the riser surface.

Conventional travel devices can also profit from the above-described advantages in simple and quick manner by this modernisation method.

In one aspect, the present invention provides an escalator with steps, which have a tread surface and riser surface, characterised in that riser brushes are movably arranged to the riser surface of the steps.

In a further aspect, the present invention provides an escalator with steps that have a tread surface and a riser with a riser surface, characterized in that riser brushes are movably mounted to the riser of a step with an orientation approximately parallel to the riser surface to engage the riser surface of the step above a tread surface of a trailing step and that means are provided for guiding the brushes along the riser surface by the trailing step.

Examples of embodiment of the invention are illustrated in Figs. 1 to 6 and explained in more detail in the following description.

Fig. 1 shows a schematic arrangement of escalator steps with the step brushes according to the invention;

Fig. 2 shows the mechanical details of the schematic arrangement of Fig. 1;

Fig. 3 shows the detail A in Fig. 1;

Fig. 4 shows the detail B in Fig. 2;

Fig. 5 shows riser brushes with straight bristles; and

Fig. 6 shows riser brushes with wavy bristles.

In Fig. 1 there can be seen in detail two steps 1' and 1 of an escalator which has a tread surface 6 and a riser surface 7, wherein riser brushes 3 are arranged at the riser surface 7. The riser brushes 3 are preferably arranged along the entire width of the riser surface 7 in approximately parallel direction with respect to the riser surface 7. The riser brushes can be inserted at the riser edges or over the entire area of the riser and along the entire riser region.

In the case of an escalator with a balustrade, riser brushes 3 are mounted at all escalator steps 1 and 1'. The riser brushes 3 prevent, through minimisation of contact, jamming or dragging along of shoes, umbrellas, bags, plastic bags or other objects. They prevent penetration of all foreign bodies: pieces of newspaper, plastic bags, pebbles, clothing fibres and coarser dirt as well as snow and ice.

The main advantage of the riser brushes 3 lies in the fanlike and thus blocking disposition. The step gap is barricaded and reaching of the escalator step side edge is made impossible. A further advantage of the riser brushes 3 resides in the flexibility thereof relative to fixed edge elements or stationary plates. Thus, lateral contact by footwear is flexibly deflected and the space requirement, which may be needed, is freed.

The riser brushes 3 prevent, like a closed rampart of synthetic material bristles, penetration or reaching of the step gap. A sealed, hermetic, almost impermeable bristle boundary is now disposed between two escalator steps 1' and 1'

As is illustrated in Figs. 3 and 4, the riser brushes 3 are mounted on a brush strip 2. These brush strips 2 are moved and guided along guide slots 4 (see Fig. 4) of the riser of the escalator step 1. If two escalator steps 1 or 1' transition from a horizontal movement to an additional vertical movement, the two escalator steps 1 and 1' displace relative to one another along the riser region. In the case of this relative movement the trailing escalator step 1' entrains the brush strip 2 at the brush strip support 2' downwardly along a guide slot 4. If the escalator steps 1 and 1' go from an additional vertical movement into a pure horizontal movement the brush strip 2 is guided back by the brush return guide 5 (see Fig. 4) on the rear side of the escalator step 1 by a tension spring or restoring spring in the guide slot 4 or entrainer or constrained guide until abutment in the guide slot 4. The abutment in the guide slot 4 is so positioned that the riser brushes 3 during horizontal travel of the escalator step 1 do not protrude above the escalators 1 and 1' and the tread surface thereof.

The riser brushes 3 can be fastened to the brush strip 2 by being sprayed on, glued on, screwed therewith, glued in or snapped in.

Such riser brushes 3 can be, for example, yellow so as to give a clearly visible indication to the passengers that a gap is present there. A clear visibility of the risk or danger is thus given.

Riser brushes can also be used as tread limiters instead of synthetic material edges. In this embodiment the riser brushes are inserted over the entire surface of the synthetic material edges and along the risers.

The riser brushes 3 form a barrier or block to the passengers and preclude or make difficult contact with the riser. No connection with the riser gap can be produced and pinching or wedging or squeezing is impossible. The riser brushes 3 thus decouple the moved escalator steps.

Sliding together is completely avoided by the riser brushes 3. Moreover, the riser brushes 3 are of such compact construction that they withstand loading by passenger traffic. Accordingly, a permanent, resistant, insensitive brush material, such as, for example, synthetic material bristles or brass bristles or galvanised steel wire bristles, is able to be used. Sufficient dimensioning and design of the riser brushes 3 is given by way of the number of passengers and the loadings consequent thereon.

According to a preferred embodiment of the invention the end of the bristles of the riser brushes is rounded. This is advantageous, because the risk of injury of passengers on contact with the bristles is reduced.

According to a further embodiment of the invention the bristles of the brushes are wavy. This is advantageous, because such bristles have a higher degree of stability of shape and a longer service life.

Fig. 5 shows riser brushes 3 with straight bristles, whilst Fig. 6 shows riser brushes 3 with wavy bristles.

The wave structure increases the mechanical strength of the bristles and enables better distribution of the forces exerted by objects or passengers. The wave structure stabilises the bristles against bending obliquely to the longitudinal axis compared with straight bristles. When the straight bristles are pressed in the longitudinal axis, they bend and can no longer exert a counter-force. By contrast thereto, wavy bristles accept the pressure in the longitudinal axis as a spring stress, which is stored in the waves, keeps the bristles in their orientation and they are not bent.

The wave structure also reduces, by punctiform contact with the riser surface 7, the friction.

The wavy bristles, by their density, substantially reduce the space or air gap between the running, driven escalator steps 1 and 1', wherein the risk of penetration of a foot of a passenger into the space or air gap is further reduced.

It is possible to arrange, at a step 1 for an escalator having a tread surface 6 and a riser surface 7, riser brushes 3 at the riser surface 7 in problem-free manner in a factory.

This solution enables a rapid and simple mounting of the riser brushes 3 at the escalator and reduces production costs and assembly costs.

An escalator with steps 1 and 1', which have a tread surface 6 and a riser surface 7, can also be modernised in that riser brushes 3 are mounted at the riser surface 7.

This modernisation method enables, through mounting of the riser brushes 3, a quick and simple improvement of the escalator, with respect to operational reliability and passenger safety, since the risk of jamming, pinching or wedging is prevented.

We claim:

1. An escalator comprising a plurality of steps, each step comprising a tread surface and riser surface, and wherein riser brushes are arranged at the step riser surfaces, said riser brushes oriented approximately parallel to and engageable with the riser surface of the step above the tread surface of a trailing said step.

2. The escalator according to claim 1, characterised in that the riser brushes are arranged along the entire width of the riser surface.

3. The escalator according to claim 1 or 2, characterised in that the riser brushes are mounted on a brush strip which is movable along guide slots of the riser surface.

4. The escalator according to claim 3, characterised in that the brush strip can be guided along the guide slots of the riser surface by a device for brush return guidance into such a position that the riser brushes during horizontal travel of the steps do not project beyond the tread surface.

5. The escalator according to any one of claims 1 to 4, characterised in that the riser brushes comprise at least one of synthetic material bristles, brass bristles, galvanised steel bristles, yellow bristles and red bristles.

6. The escalator according to claim 3, characterised in that the riser brushes are fastened to the brush strip by being sprayed on, glued on, screwed together therewith, glued in, snapped in or clamped in.

7. Step for an escalator, which has a riser surface and a tread surface, characterised in that at least one riser brush is movably arranged in an orientation approximately parallel to and engageable with a riser surface of a next adjacent step above said tread surface.

8. Method of modernising an escalator with steps having a tread surface and riser surface, characterised in that riser brushes are mounted to the step riser surfaces in an orientation approximately parallel to and engageable with the riser surface of the step above the tread surface of a trailing said step.

9. An escalator with steps that have a tread surface and a riser with a riser surface, characterized in that riser brushes are movably mounted to the riser of a step with an orientation approximately parallel to the riser surface to engage the riser surface of the step above a tread surface of a trailing step and that means are provided for guiding the brushes along the riser surface by the trailing step.

10. The escalator according to claim 9, characterized in that the riser brushes are arranged along an entire width of the riser surface in an approximately parallel direction with respect to the riser surface.

11. The escalator according to claim 9 or 10, characterized in that the riser brushes are mounted on a brush strip which is movably mounted in guide slots in the riser surface of the step.

12. The escalator according to claim 11, characterized in that the brush strip is guided along the guide slots of the riser surface by a device for brush return guidance such that the riser brushes do not project beyond the tread surface during horizontal travel of the steps.

13. The escalator according to claim 9 or 10, characterized in that the riser brushes are at least one of a synthetic composition, a brass composition, or a galvanized steel bristle composition.

14. The escalator according to any one of claims 9, 10 or 13 wherein the riser brushes are yellow or red in color.

15. A step for an escalator, the step having a riser surface and a tread surface, characterized in that at least one riser brush is mounted to the riser surface with an orientation approximately parallel to the riser surface to engage the riser surface of the step above a tread surface of a trailing step and that means are provided on the step for guiding the brushes along the riser surface by the trailing step.

Fig. 1

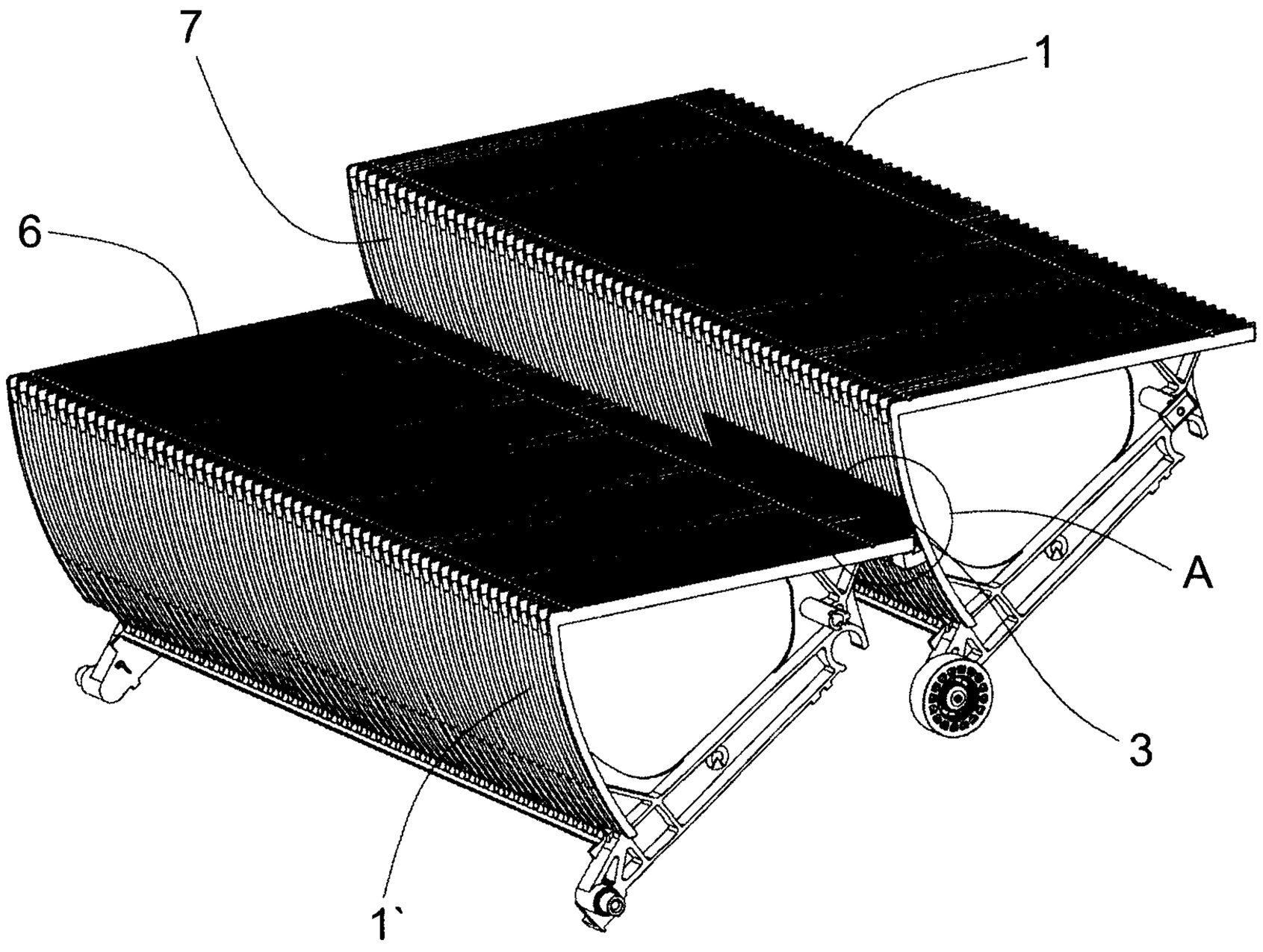


Fig. 2

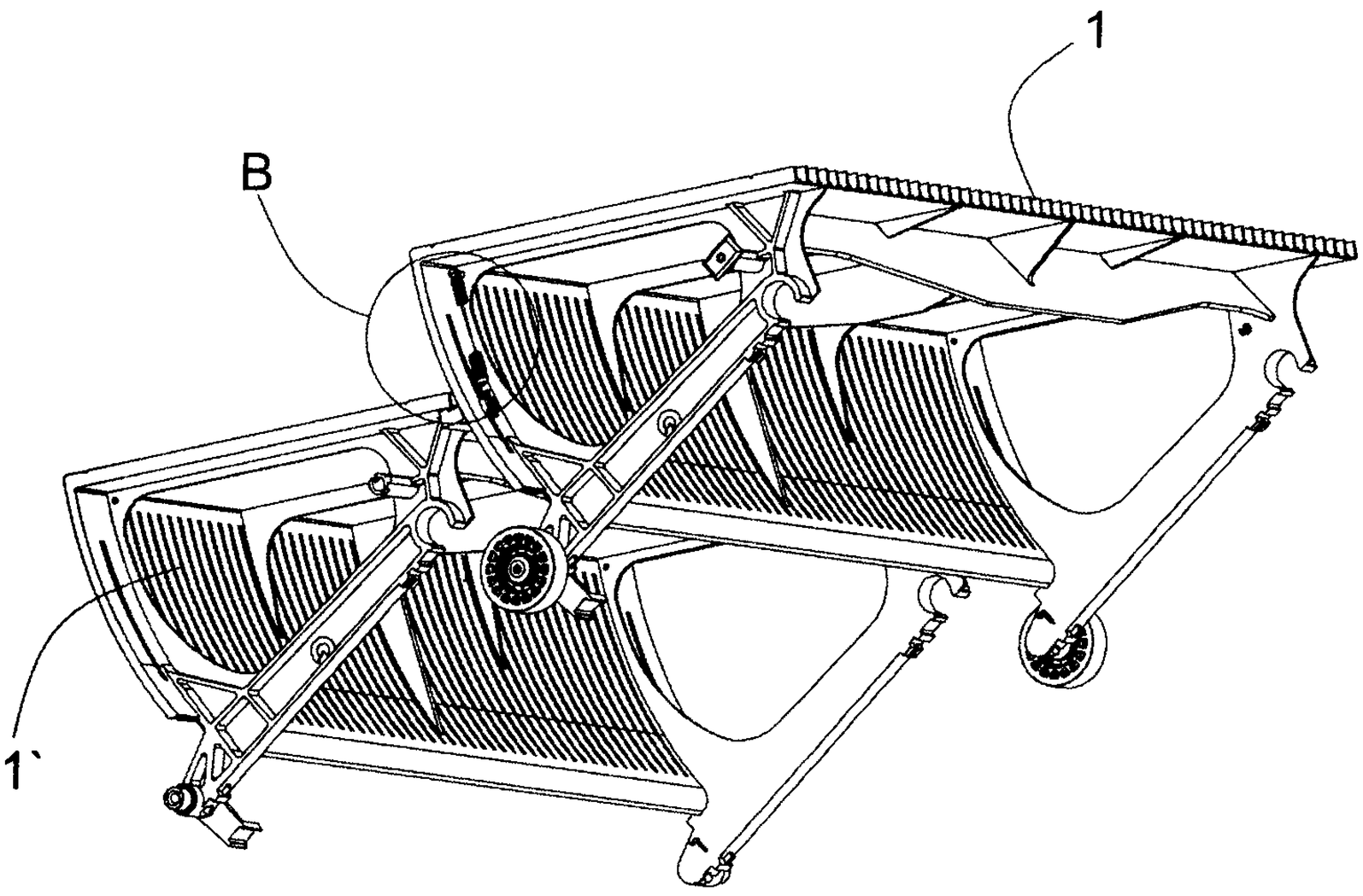


Fig. 3

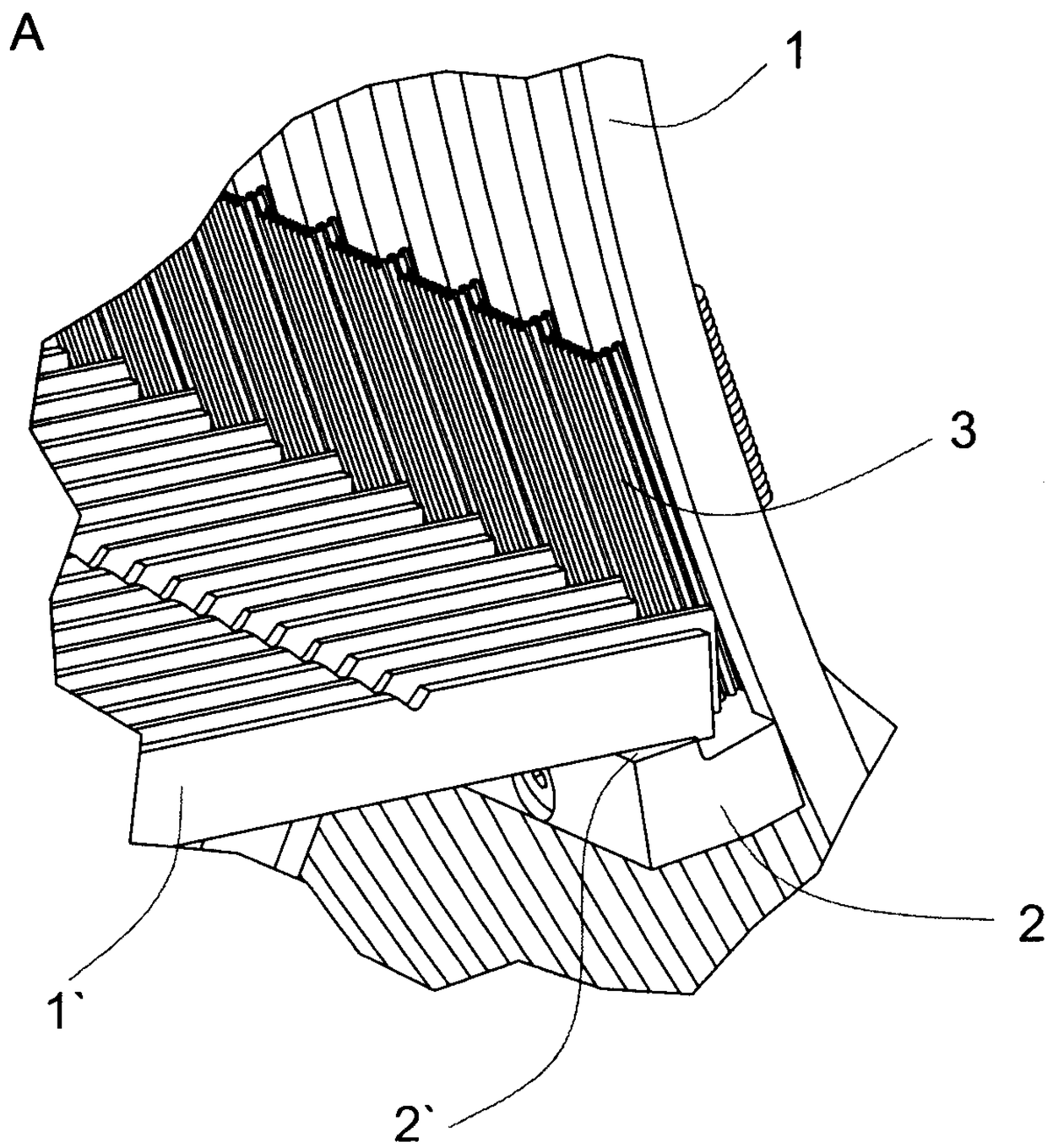


Fig. 4

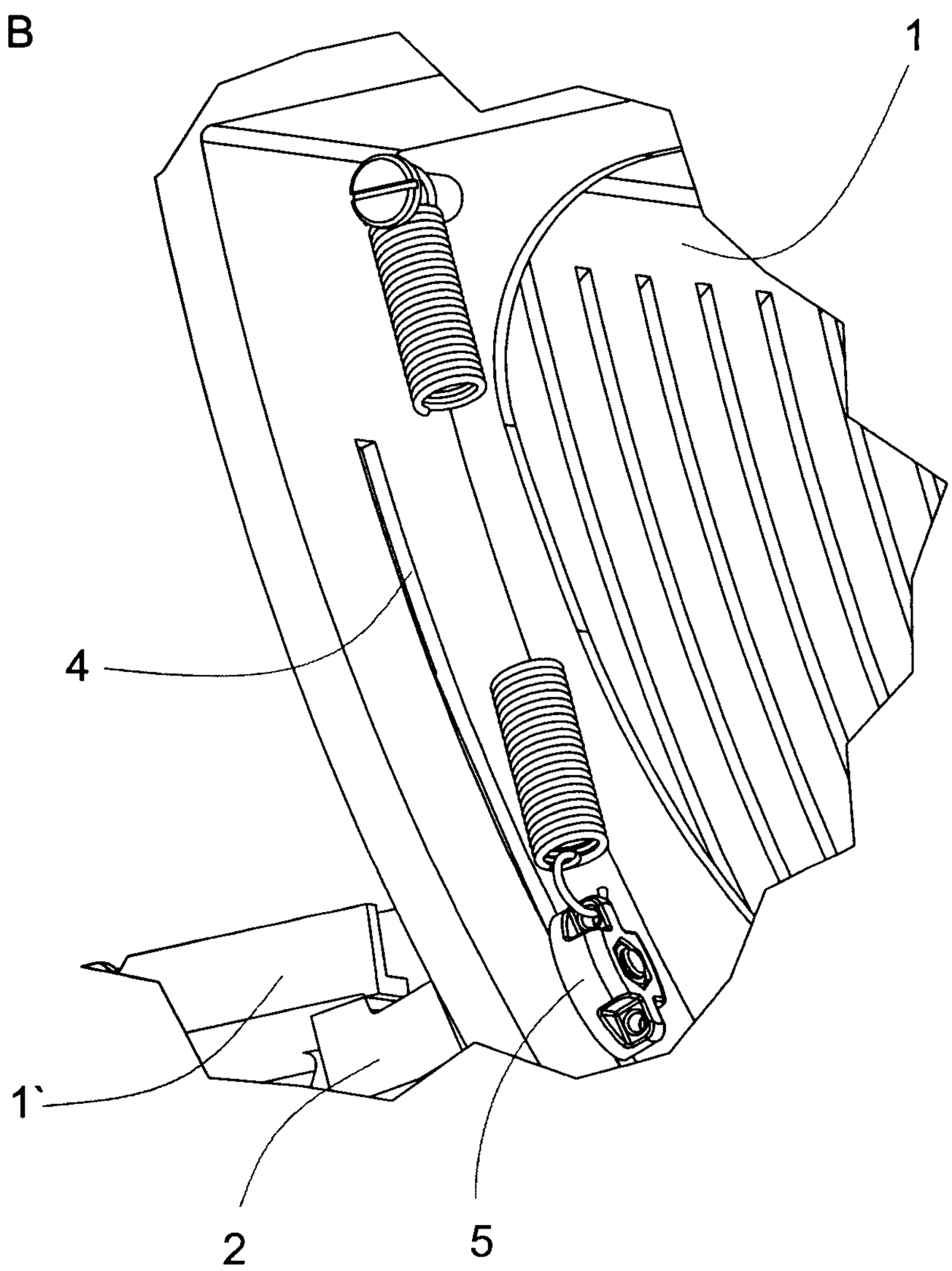


Fig. 5

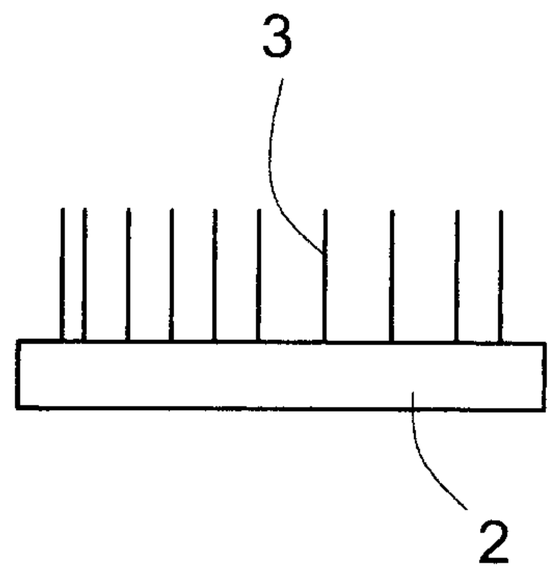
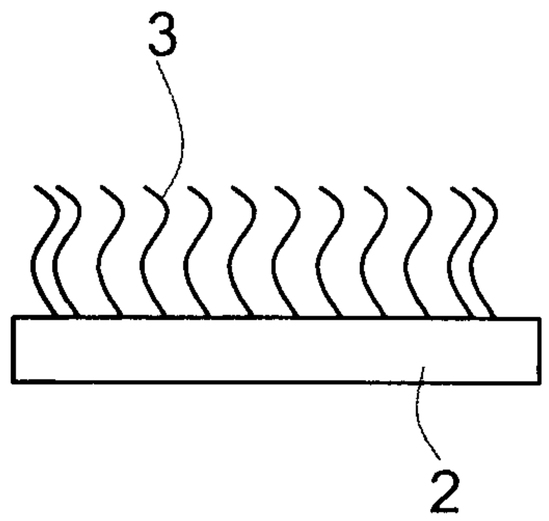
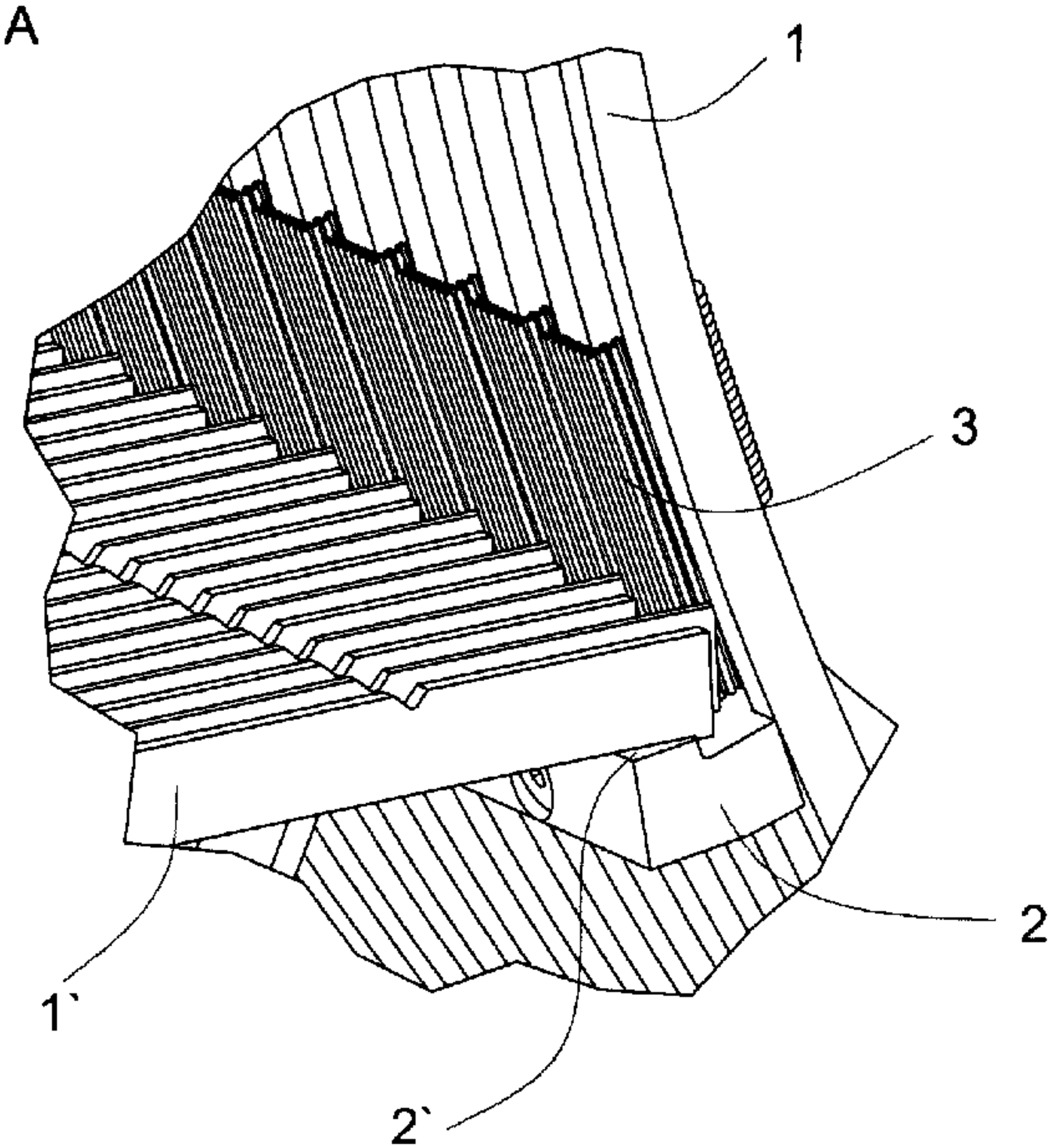


Fig. 6




A
1
3
2
1`
2`