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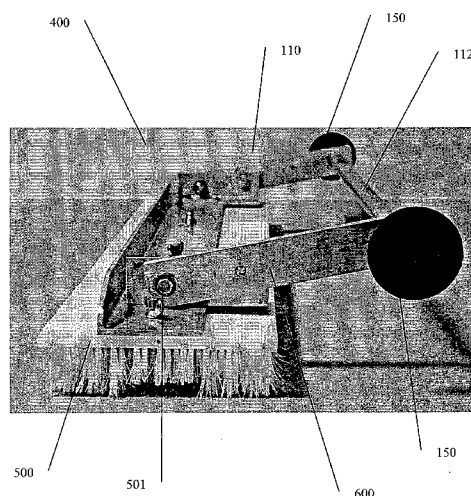


Figure 4A

(57) Abstract: A cleaning-apparatus is adapted to clean standing-surfaces of platform-components of an escalator or a moving walkway. The apparatus has a brush which cleans incoming standing- surfaces that move towards the apparatus. The brush is supported by an angled support arrangement. In use, the brush is positioned on the incoming standing-surfaces that move towards the cleaning-apparatus such that the angled support, in reaction to movement of the incoming standing-surfaces, is able to contribute a substantial downward force that presses the brush onto the standing-surfaces of the incoming platform-components.



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Improved Cleaning Apparatus & Method For Escalator Or Moving Walkway

5 Field of Invention

The present invention relates exclusively to escalators and moving walkways (travelators), and relates particularly to a method and apparatus used to clean standing-surfaces on existing escalators or moving walkways.

10

Background of the Invention

Escalators are mechanised, moving stairs. These mechanisms include a plurality of platform-components that are connected in an endless loop. The platform-components are
15 arranged to circulate so as to resemble moving stairs. People stand on the platform-components, and thus are transported either up or down the moving stairs by the movement of the platform-components. Prior Art Figure 1 shows an illustration of part of a conventional escalator.

Another variety of such mechanisms are moving walkways which are based on a similar concept, except that the platform-components are arranged to resemble moving, elongated
20 platforms which are actually made up of a loop of connected platform-components. These moving walkways are also known as travelators.

When such escalators and moving walkways are used, the people stand on the upper surface (tread plate) on the platform-components, and hence, the upper surfaces on which people stand, during such use, will be referred to in this specification as standing-surfaces of the
25 platform-components.

Prior art Figure 2 shows a conventional platform-component 20 which has an upper surface comprising an alternating series of elongate, parallel valleys and peaks that, in operation, generally align axially with the travel direction of the platform-components.

30 Cleaning

Over a period of time, it becomes necessary to clean the standing-surfaces because, over long periods of operation, the standing-surfaces become soiled particularly from contact with

shoes of people standing or stepping on the standing-surfaces, and from other sources such as spillage of food and drink, and lubricants from the other parts of the mechanised apparatus.

Australian Patent No. 199668086 (Brennan) describes a known apparatus for cleaning escalators and travelators. The Brennan device provides a brush that is placed on moving surfaces of an escalator for cleaning the surfaces, however, a problem with the Brennan device is that, to achieve a greater degree of contact of the brush and the moving surfaces, heavy weights are placed on the brush. The heavy weights cause the brush to press down harder on the moving surfaces of the escalator. Page 4 of the Brennan specification indicates that weights of up to 30 kg can be used to enable the brush bristles to penetrate the longitudinal grooves that are typically found on the surfaces of the standing-surfaces of escalators. Practically, this presents a disadvantage for the user if he or she is required to carry 30 kg of weights for optimal use of the Brennan device.

An object of the present invention is to overcome or at least ameliorate one or more of the problems in the prior art, or to provide an improved alternative.

Discussion of prior art herein is not to be taken as an admission of common general knowledge of the skilled addressee of this specification.

Summary of Invention

According to the present invention, there is provided an incoming-standing-surfaces-cleaning-apparatus adapted to clean standing-surfaces of platform-components of an escalator or a moving walkway which, in operation, is able to move in a continuous loop of a plurality of mutually connected platform-components,

the apparatus comprising:

incoming-standing-surfaces-cleaning-means adapted to clean incoming standing-surfaces that move towards the cleaning-apparatus during use of the incoming-standing-surfaces-cleaning-apparatus; and

downwards-force-support-means adapted to support the incoming-standing-surfaces-cleaning-means, during use, on the incoming standing-surfaces that move towards the cleaning-apparatus such that the downwards-force-support-means, in use in reaction to movement of the incoming standing-surfaces, is able to contribute a substantial downwards force that presses the incoming-standing-surfaces-cleaning-means onto the standing-surfaces of the incoming platform-components,

wherein the downwards-force-support-means comprises:

position-maintenance-means adapted to maintain the cleaning-apparatus in a constant position relative to the escalator or moving walkway such that, in use, all the standing-surfaces of the platform-components are able to pass under the cleaning-apparatus one followed by another as a result of movement of the continuous loop of the mutually connected platform-components;

5 and

a support structure that connects the incoming-standing-surfaces-cleaning-means to the position-maintenance-means such that the support structure, in use, is able to be arranged at an angle with respect to the standing-surfaces.

10 Preferably, the support structure, in use, is able to be arranged at said angle with respect to the standing-surfaces such that, in reaction to the incoming standing-surfaces, the support structure is able to transmit a force, having a substantial vertical force component and a horizontal force component, to the incoming-standing-surfaces-cleaning-means where the substantial vertical force component presses the incoming-standing-surfaces-cleaning-means onto the

15 incoming standing-surfaces.

Preferably, the support structure is arranged and adapted to support the incoming-standing-surfaces-cleaning-means, in use, at an inclined orientation that comprises said angle with respect to the standing-surfaces such that the inclined orientation is instrumental in enabling the downwards-force-support-means to contribute a downwards force component in reaction to

20 movement of the incoming standing-surfaces.

Preferably, the support structure comprises support arms that are able to be held, in use, at said angle with respect to the standing-surfaces.

Preferably, the position-maintenance-means includes swivel pads that are adapted, in use, to press against opposing upright side-panels of the escalator or moving walkway in order to

25 brace the cleaning-apparatus between the opposing side-panels.

Preferably, the incoming-standing-surfaces-cleaning-means includes a brush with bristles where the bristles of the brush include shorter bristles adapted, in use, to clean peaks on the standing-surfaces, and longer bristles adapted, in use, to clean valleys on the standing-surfaces.

The incoming-standing-surfaces-cleaning-means may include mechanised portions that

30 contribute motion to facilitate cleaning.

Preferably, the support structure is adapted to position the incoming-standing-surfaces-cleaning-means to clean incoming standing-surfaces at a location on the escalator or moving walkway where each incoming platform-component, in combination with platform-components immediately before and after, form a surface-arrangement that is a substantially, continuous

horizontal surface such that the incoming-standing-surfaces-cleaning-mean is able to be in constant, non-interrupted contact with upper surfaces of the platform-components one after another.

In a preferred embodiment, the support structure is a support frame.

5

According to another aspect of the present invention, there is provided a method of cleaning standing-surfaces of platform-components of an escalator or a moving walkway which, in operation, is able to move in a continuous loop of a plurality of mutually connected platform-components,

10

the method comprising:

15

using downwards-force-support-means of an incoming-standing-surfaces-cleaning-apparatus to support incoming-standing-surfaces-cleaning-means of the apparatus on the incoming standing-surfaces that move towards the cleaning-apparatus such that the downwards-force-support-means, in reaction to movement of the incoming standing-surfaces, contributes a substantial downwards force that presses the incoming-standing-surfaces-cleaning-means onto the standing-surfaces of the incoming platform-components;

20

using position-maintenance-means of the downwards-force-support-means to maintain the cleaning-apparatus in a constant position relative to the escalator or moving walkway at a location where each incoming platform-component, combined with platform-components immediately before and after, form a surface-arrangement that is a substantially, continuous horizontal surface, such that all the standing-surfaces of the platform-components are able to pass under the cleaning-apparatus one followed by another as a result of movement of the continuous loop of the mutually connected platform-components; and

25

using a support structure of the downwards-force-support-means to connect the incoming-standing-surfaces-cleaning-means to the position-maintenance-means such that the support structure is at an angle with respect to the standing-surfaces.

30

Preferably, the method includes arranging the support structure at said angle with respect to the standing-surfaces such that, in reaction to the incoming standing-surfaces, the support structure transmits a force, having a substantial vertical force component and a horizontal force component, to the incoming-standing-surfaces-cleaning-means where the substantial vertical force presses the incoming-standing-surfaces-cleaning-means onto the incoming standing-surfaces.

Preferably, the method includes arranging the support structure to support the incoming-standing-surfaces-cleaning-means at said angle with respect to the standing-surfaces such that the inclined orientation is instrumental in enabling the downwards-force-support-means to contribute a downwards force component in reaction to movement of the incoming standing-surfaces.

5 Preferably, the method includes using the support structure to support the incoming-standing-surfaces-cleaning-mean in constant, non-interrupted contact with upper surfaces of the platform-components one after another.

Preferably, the support structure comprises support arms that are held at said angle with respect to the standing-surfaces.

10 Preferably, in the method, the position-maintenance-means includes two swivel pads that are pressed against opposing upright side-panels of the escalator or moving walkway in order to brace the cleaning-apparatus between the opposing side-panels.

Preferably, in the method, the incoming-standing-surfaces-cleaning-means includes a brush with bristles where the bristles of the brush include shorter bristles that clean peaks on
15 upper surfaces of the standing-surfaces, and longer bristles that clean valleys on the upper surfaces of the standing-surfaces.

Preferably, in the method, the incoming-standing-surfaces-cleaning-means includes mechanised portions that contribute motion to facilitate cleaning.

In the method, in a preferred embodiment, the support structure is a support frame.
20

According to a further aspect of the present invention, there is provided a standing-surfaces-cleaning-apparatus adapted to clean standing-surfaces of platform-components of an escalator or a moving walkway which, in operation, is able to move in a continuous loop of a plurality of mutually connected platform-components,

25 and in which the standing-surface of each platform-component has an alternating series of elongate, parallel valleys and peaks that generally align axially with the travel direction of the platform-components,

the apparatus comprising:

incoming-standing-surfaces-cleaning-means adapted to clean incoming standing-surfaces
30 that move towards the cleaning-apparatus during use of the incoming-standing-surfaces-cleaning-apparatus;

wherein the incoming-standing-surfaces-cleaning-means includes a brush with bristles including shorter bristles adapted, in use, to clean peaks on the standing-surfaces, and longer bristles adapted, in use, to clean valleys on the standing-surfaces.

Drawings

In order that the present invention might be more fully understood, embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 relates to prior art, and is an illustration of part of a known escalator;

Figure 2 relates to prior art, and is a perspective view of part of a standing-surface on a platform-component of a known escalator, such as shown in Figure 1;

Figure 3 relates to prior art, and is a schematic diagram that represents a cross-sectional front view of a standing-surface of a known platform-component;

Figure 4A is a side perspective view of an embodiment of an incoming-standing-surfaces-cleaning-apparatus shown with its support arm arranged at an in-use angle;

Figure 4B is a side perspective view of the embodiment of Figure 4A shown with its support arm folded down when in its non-use arrangement;

Figure 4C shows the embodiment of Figure 4B here shown with end panels installed;

Figure 4D shows a rear perspective view of the embodiment of Figure 4C;

Figure 4E shows a rear perspective, end view of the embodiment of Figure 4C;

Figure 4F shows a front perspective view of the embodiment of Figure 4C;

Figure 4G shows the embodiment of Figures 4A to 4F shown here with the brush flipped over to reveal the undersurface of the brush;

Figure 4H is a simplified, schematic diagram showing an in-use arrangement of an embodiment of the invention relative to the direction of incoming platform-components; and

Figures 4I and 4J show swivel-pads used to maintain the embodiment in constant location during use.

Embodiments of the invention will be described in relation to escalators for the sake of illustration, however, other embodiments or modifications can be applied equally to moving walkways or travelators.

Description of Embodiments

Referring to the accompanying drawings, Figure 1 is an illustration of a conventional escalator 10.

In prior art Figure 1, the escalator 10 includes a mutually-connected loop of platform-components 20. The platform-components 20 are able to move in a continuous loop during operation.

5 In Figure 1, users stand on top of the platform-components 20. In Figure 1, the uppermost, flat part 21 of each platform-component 20 acts as a standing-surface on which the users can stand. The standing-surfaces are in the form of tread-plates 21. The users stand on the tread-plates 21 and are thereby conveyed by the escalator, thus avoiding having to climb up or down the stairs.

10 In Figure 1, the moving tread-plates 21 are bordered on either side by upright side-panels 11 which may be vertical or at a slight incline.

Figure 2 shows a perspective view of a tread-plate 21 of a conventional platform-component 20. The tread-plate 21 has an alternating series of elongate, parallel valleys and peaks that, in operation, generally align axially with the travel direction of the platform-components. In terms of appearance, the peaks 22 separated by valleys 23, in Figure 3, are in the form that
15 resembles rows of parallel ribs.

In conventional escalators, the tops of the peaks can be curved, flat, peaked, cut or serrated, however, embodiments of the invention are able to clean the peaks with all of these surface variations.

20 In Figure 1, the travel direction A-A of the escalator is shown with an arrow 12 which indicates that the escalator is able to act as a moving stairway that has its tread-plates 21 moving either upwards or downwards in order to convey the users either up or down the stairway.

Cleaning Apparatus

25 Figure 4A show a view of an embodiment of an incoming-standing-surfaces-cleaning-apparatus in the form of a surface-cleaner 400.

The surface-cleaner 400 is adapted to clean the top surfaces of the tread-plates 21 of the platform-components 20 that are part of an escalator or a moving walkway. The escalator or moving walkway, in operation, is able to move in a continuous loop of a plurality of mutually
30 connected platform-components.

As an overview, the surface-cleaner 400, in use, is positioned and maintained in a constant position between the side-panels 11 that are on either side of the moving tread-plates 21. Thus, when the escalator or walkway is in operation, a continuous procession of tread-plates 21

moves towards and then underneath the surface-cleaner 400 which is kept in a constant location relative to the escalator.

The surface-cleaner 400 is provided with incoming-standing-surfaces-cleaning-means which, in the embodiment, is in the form of a brush 500. As the continuous procession of tread-plates 21 moves towards and then underneath the brush 500, the upper surfaces of the plates 21 are cleaned by the brush.

In the embodiment shown in Figures 4A to 4G, the brush 500 is a single piece that can span substantially the full width of a typical escalator. Hence, in Figure 1, the brush 500 is able to fit substantially in the gap between the two end-panels 11. In other modifications, the size of the brush and even its bristles can be modified. For instance, smaller brushes can be attached to the surface-cleaner 400 such that an overall brush portion is provided by a combination of several smaller brushes attached to the apparatus 400 to cover the desired width.

In other modifications, rather than having one brush or brush portion that cleans the entire width of the escalator or moving walkway, the modification may provide one, or preferably two or more smaller brushes that only clean certain portions of the escalator or moving walkway. For example, a modified embodiment may only have brushes at the peripheral ends for cleaning only both the extreme sides the escalator or moving walkway close to the two side-panels 11.

In the embodiment of Figures 4A to 4G, the surface-cleaner 400 has a support structure in the form of a support frame 110. The frame 110 includes two optional end-panels 111 that are supported at either end of a strut 112. (In Figures 4A and 4B, and also Figures 4I and 4J, the optional end panels 111 are not shown).

Cleaner Position Maintenance

In the embodiment of Figures 4A to 4G, the surface-cleaner 400 is provided with position-maintenance-means in a form which includes swivel-pads 150.

In operation, the platform-components of the escalator are in continuous movement. The position-maintenance-means is able to hold fast the surface-cleaner 400 to an object that is not moving, relative to the moving platform-components, in order that the overall surface-cleaner 400 is maintained in a constant position relative to the moving platform-components. In the embodiment, the frame 110 of the surface-cleaner 400 is held firmly or braced between the non-moving, upright side-panels 11, seen in Figure 1.

In Figures 4I and 4J, each of the ends of the strut 112 fits in a hole that is at an end of each of the support arms 600 of the support structure. The swivel-pads 150 have threaded stems

113 which screw into tapped holes at the ends of the strut 112. In each, screwing the stem 113, either inwards or outwards, allows the swivel-pad 150 to be positioned either closer or further away from its respective support arm 600.

Each of the swivel-pads 150 is connected to its stem 113 by a ball-and-socket mechanism that allows the pad 150 to swivel at the end of the stem 113, and to have a restricted degree of freedom. In the range of different escalators, the angle of orientation of the side-panels 11 can vary, hence, the slight degree of freedom of the swivel-pads 150 allows the surface-cleaner 400 to be used with a wide variety of side-panels 11 which can vary in their angles of inclination or configurations, as can be found in existing escalators or walkways.

In use of the embodiment, the surface-cleaner 400 is positioned in between the upright side-panels 11 of the escalator. Both of the swivel-pads 150, at either side of the surface-cleaner 400, are rotated so as to move outwardly until each of the pads 150 presses against one of the side-panels 11 of the escalator, thus bracing the support frame 110 of the surface-cleaner 400 therebetween. The support frame 110 of the surface-cleaner 400 is thus able to be maintained in this constant position relative to the escalator, until it is later removed by loosening the pads 150.

The swivel-pads 150 maintain the support frame 110 of the surface-cleaner 400 in a constant location relative to the moving parts of the escalator or moving walkway.

In use, all the tread-plates of the platform-components are able to pass under the support frame 110 of the surface-cleaner 400, one followed by another, as a result of movement of the continuous loop of the mutually connected platform-components of the escalator. (Even if the frame 110 were to be positioned above the flat surface 17 of the cone plate, the fact remains, by definition, that all the tread-plates still pass under the frame 110).

In the embodiment, the position-maintenance-means enables the surface-cleaner 400 to be fitted to a wide range of known walkways, and of escalators particularly at their points of entry or exit. The operator of the apparatus would stand on the ground surface 9 that is adjacent to the entry or exit of the escalator.

Downwards Vector Force Component

In the embodiment, the surface-cleaner 400 is provided with downwards-force-support-means in the form of a downward-angle-support-arm 600.

In Figure 4A, the downward-angle-support-arm 600 is connected to the strut 112. The strut 112 is connected to the swivel-pads 150, as shown in Figure 4D.

The angle-arm 600 is adapted to support the brush 500, during use, to enable the brush 500 to be positioned on the incoming standing-surfaces of the tread-plates 21 that move towards the surface-cleaner 400.

In Figure 4A, the brush 500 is connected to the downward-angle-support-arm 600 by a pivotal arrangement 501 that can be locked in place at a selected angle using a nut and bolt arrangement 501. Also, the downward-angle-support-arm 600 is able to pivot on the swivel-pads 150 about an axis that passes through the strut 112. This enables the user to arrange the downward-angle-support-arm 600 at a selected angle that is suitable for the prevailing conditions, for instance, taking into account the speed of the particular escalator or moving walkway.

A feature of the downward-angle-support-arm 600 is that the arm 600 is adapted and able to be arranged such that the arm 600 is at an angle with respect to the standing-surfaces.

When the arm 600 is arranged at an angle relative to the standing surfaces, in use in reaction to movement of the incoming standing-surfaces, the arm 600 is able to contribute a substantial downwards force that presses the brush 500 onto the standing-surfaces of the incoming platform-components.

Figure 4H shows a simplified, rough vector diagram (not drawn to scale). As the incoming platform-components move in a direction towards the surface-cleaner 400 (the direction shown by arrow 12A), the incoming movement of the standing-surfaces generates an oncoming force 610 that acts on the brush 500, and thereby acts on the overall surface-cleaner 400. The reaction 620 to this oncoming force 610 is transmitted through the downward-angle-support-arm 600.

This reactionary force 620, in the downward-angle-support-arm 600, which is arranged at an angle, has a substantial vertical force component 620V and a horizontal force component 620H. This force is transmitted by the arm 600 to the brush 500. Thus, the effect of the downwards, vertical force component 620V – that is in reaction to the force of the incoming standing-surfaces – causes the downward-angle-support-arm 600 to press the brush 500 down onto the standing-surfaces of the incoming platform-components.

This substantial downward pressure on the brush 500 aids the effectiveness of the brush to clean the standing-surfaces of the platform-components.

Thus, a substantial downwards force 620V is obtained by harnessing the force of the incoming motion of the incoming platform-components. Therefore, in contrast to the Brennan prior art, mentioned in the preamble, there is no need to create a downwards force by supplying separate heavy weights. An advantage, therefore, is that the person using an embodiment of the present invention is not required to lug additional heavy weights when transporting the equipment

to the location of the escalator or moving walkway. For example, if an escalator is situated inside a large shopping centre, the user does not have to carry heavy weights as part of the required equipment. Hence, the present embodiment is at least an improvement over the prior art, for instance, because the surface-cleaner 400 of the present embodiment is easier to transport and
5 operate than the prior art apparatus.

In use, the embodiment is adapted to be used on a portion of the surface where each incoming platform-component, combined with platform-components immediately before and after, form a surface-arrangement that is a substantially, continuous horizontal surface. In use with an escalator, this nature of surface arrangement is found at the entry or exit of the escalator.

10 Figure 1 shows a portion of an escalator where the flat parts 21 of each platform-component 20 combined with platform-components immediately before and after, form a surface-arrangement that is substantially, continuous horizontal surface. As a consequence, the brush 500 is able to be held in constant, non-interrupted contact with the upper surface parts 21 of the platform-components one after another. The upper surface parts 21 include the peaks and valleys that are in
15 these upper surfaces. Hence, as the platform components move under the brush, one after the other, the brush progressively traps and accumulates dirt from all the platform components. The operator of the apparatus can periodically stop the escalator or walkway, and remove the accumulated dirt.

Hence, the surface-cleaner 400 may be used either at the entry or exit of the escalator,
20 provided that the downward-angle-support-arm 600 is arranged, in use, to slope towards and against the incoming platform-components, as indicated in the schematic diagram of Figure 4H.

In a moving walkway, this nature of surface-arrangement is found throughout the length of the upper surface of the moving walkway.

It is appreciated that, if the surface-cleaner 400 were to be used in the middle of the
25 escalator, where the platform-components form a staircase-like structure, then in use, the surface-cleaner 400 would jam into the vertical facia of each incoming platform-component. Moreover, if the cleaner 400 were to be used at the location where the platform-components form a staircase-like structure, the brush 500 would not be able to progressively trap and accumulate dirt from all the platform components. For this reason, the surface-cleaner 400 may be used either at the entry
30 or exit of the escalator.

In Figure 4H, the downward-angle-support-arm 600 is arranged to support the brush 500, during use, at an inclined orientation that comprises an angle 630 with respect to the standing-surface. The inclined orientation is instrumental in enabling the downward-angle-support-arm 600

to contribute a downwards force component in reaction to movement of the incoming standing-surfaces.

Since the relevance of the downward-angle-support-arm 600 is its ability to transmit force, the relevant angle 630 may be defined as the angle that is included between (i) the force vector 620 that acts through the arm 600 and (ii) the horizontal force component 620H. Since the relevant angle is defined with respect to the direction of force components acting in the support structure, such an angle can still be identified even if the support structure or support frame of the brush is modified to have a different visual appearance. Hence, herein, where there is a reference, for example, to a support structure being arranged at an angle with respect to the standing surfaces, this includes within its scope a reference to the angle that is included between (i) the force vector that acts through the support structure and (ii) the standing surface. (The horizontal standing surface is understood to be parallel to the horizontal force component of the force in the support structure).

Specifically, it is not advisable to use the surface-cleaner 400 with the downward-angle-support-arm 600 is arranged, in use, as indicated in the schematic diagram of Figure 4K. In the inadvisable arrangement of Figure 4K, there is an insubstantial downwards force pressing on the brush 500, and whatever insubstantial downwards force there is comes mostly from gravitational force of the combined mass of the brush 500 and the downward-angle-support-arm 600. In other words, in the arrangement of Figure 4K, there is no substantial degree of harnessing of force from the moving platform-components.

The provision of the optional side panels 111 in the embodiment is to provide support for the arms 600 when the apparatus is not in use, such as show in Figures 4C to 4F. When the apparatus is in use, with the arms 600 are raised at an angle 630, these side panels 111 do not play a role in the in-use, angled arrangement.

Brush Bristle Length Variation

In the embodiment in Figures 4C and 4G, the bristles of the brush 500 include shorter bristles 510 adapted, in use, to clean the peaks 22 on the standing-surfaces, and longer bristles 520 adapted, in use, to clean valleys 23 on the standing-surfaces. Preferably, the difference in length between the longer and shorter bristles correlates to approximately the depth of the valleys, i.e. the distance between the peaks 22 and the valleys 23, found on typical escalator standing-surfaces.

In the embodiment, the shorter bristles 510 are grouped together at the centre of the arrangement of bristles, while the longer bristles 520 are arranged proximate either longitudinal edge of the arrangement of bristles. This arrangement enables the brush to sit flat on a surface, as shown in Figure 4C. It is also easier to manufacture when the regions of bristles, of different
5 lengths, are separated rather than having the differently sized bristles combined.

Other Variations

In other modifications, there are other ways of maintaining the surface-cleaner 400 in a
10 constant position relative to the escalator, which may be achieved by fastening the apparatus to other parts of the escalator environment that are not moving.

In the embodiment of Figures 4A to 4G, the surface-cleaner 400 is held firmly between the upright, non-moving sides-panels 11 of the escalator. The functional requirement, however, is that the cleaning apparatus is maintained in a constant position relative to the moving platform
15 components 20, hence, this could conceivably be achieved by a mechanism that holds the enhancement apparatus to another object or surface that is not moving, for instance, to the ground surface.

The visual appearance of the frame 110 of the surface-cleaner 400 can be varied while maintaining similar mechanical and functional capabilities of the invention in its broadest aspect.
20 For instance, the support arms 600 can be modified to be in the form having a different visual appearance, for example, a form that has a connecting panel or tube which, nevertheless, still has the function of transmitting an inclined reaction force that has a vertical and horizontal force components, of which the vertical component presses the brush downwards onto the incoming standing surfaces.

25 The width of the surface-cleaner 400 apparatus, and the widths of the brush portions, can be modified to be shorter or longer to cater for variations in the widths of escalators or moving walkways around the world.

In other modifications, the incoming-standing-surfaces-cleaning-means may have a form, apart from brushes, that includes mechanised portions that contribute motion to facilitate
30 cleaning, for example, wiping pads or wiping implements. In other variations, the incoming-standing-surfaces-cleaning-means may comprise moving parts, such as rotating brushes, rotating abrasive surfaces, or vibrating cleaning or scouring pads. In such modifications, the rotation or vibration motion can come from small motors, or alternatively the apparatus can have a

mechanism that harnesses the motion of the escalator to create any such movement in the modified cleaning-means.

The embodiments have been advanced by way of example only, and modifications are possible within the scope of the invention as defined by the appended claims.

5 In this specification, where the words comprise or comprises or derivatives thereof are used in relation to elements, integers, steps or features, this is to indicate that those elements, integers, steps or features are present but it is not to be taken to preclude the possibility of other elements, integers, steps or features being present.

10 The specification and its appended claims specifically exclude from its scope any matter that does not pertain to the field of escalators and moving walkways.

CLAIMS:

1. Incoming-standing-surfaces-cleaning-apparatus adapted to clean standing-surfaces of platform-components of an escalator or a moving walkway which, in operation, is able to move in a continuous loop of a plurality of mutually connected platform-components,

the apparatus comprising:

incoming-standing-surfaces-cleaning-means adapted to clean incoming standing-surfaces that move towards the cleaning-apparatus during use of the incoming-standing-surfaces-cleaning-apparatus; and

downwards-force-support-means adapted to support the incoming-standing-surfaces-cleaning-means, during use, on the incoming standing-surfaces that move towards the cleaning-apparatus such that the downwards-force-support-means, in use in reaction to movement of the incoming standing-surfaces, is able to contribute a substantial downwards force that presses the incoming-standing-surfaces-cleaning-means onto the standing-surfaces of the incoming platform-components,

wherein the downwards-force-support-means comprises:

position-maintenance-means adapted to maintain the cleaning-apparatus in a constant position relative to the escalator or moving walkway such that, in use, all the standing-surfaces of the platform-components are able to pass under the cleaning-apparatus one followed by another as a result of movement of the continuous loop of the mutually connected platform-components; and

a support structure that connects the incoming-standing-surfaces-cleaning-means to the position-maintenance-means such that the support structure, in use, is able to be arranged at an angle with respect to the standing-surfaces.

2. Incoming-standing-surfaces-cleaning-apparatus of claim 1 wherein the support structure, in use, is able to be arranged at said angle with respect to the standing-surfaces such that, in reaction to the incoming standing-surfaces, the support structure is able to transmit a force, having a substantial vertical force component and a horizontal force component, to the incoming-standing-surfaces-cleaning-means where the substantial vertical force component presses the incoming-standing-surfaces-cleaning-means onto the incoming standing-surfaces.

3. Incoming-standing-surfaces-cleaning-apparatus of either claims 1 or 2 wherein the support structure is arranged and adapted to support the incoming-standing-surfaces-cleaning-

means, in use, at an inclined orientation that comprises said angle with respect to the standing-surfaces such that the inclined orientation is instrumental in enabling the downwards-force-support-means to contribute a downwards force component in reaction to movement of the incoming standing-surfaces.

4. Incoming-standing-surfaces-cleaning-apparatus of any one of the preceding claims wherein the support structure comprises support arms that are able to be held, in use, at said angle with respect to the standing-surfaces.

5. Incoming-standing-surfaces-cleaning-apparatus of any one of the preceding claims where the position-maintenance-means includes swivel pads that are adapted, in use, to press against opposing upright side-panels of the escalator or moving walkway in order to brace the cleaning-apparatus between the opposing side-panels.

6. Incoming-standing-surfaces-cleaning-apparatus of any one of the preceding claims wherein the incoming-standing-surfaces-cleaning-means includes a brush with bristles where the bristles of the brush include shorter bristles adapted, in use, to clean peaks on the standing-surfaces, and longer bristles adapted, in use, to clean valleys on the standing-surfaces.

7. Incoming-standing-surfaces-cleaning-apparatus of any one of the preceding claims wherein the incoming-standing-surfaces-cleaning-means includes mechanised portions that contribute motion to facilitate cleaning.

8. Incoming-standing-surfaces-cleaning-apparatus of any one of the preceding claims wherein the support structure is adapted to position the incoming-standing-surfaces-cleaning-means to clean incoming standing-surfaces at a location on the escalator or moving walkway where each incoming platform-component, in combination with platform-components immediately before and after, form a surface-arrangement that is a substantially, continuous horizontal surface such that the incoming-standing-surfaces-cleaning-mean is able to be in constant, non-interrupted contact with upper surfaces of the platform-components one after another.

9. Incoming-standing-surfaces-cleaning-apparatus of any one of the preceding claims wherein the support structure is a support frame.

10. A method of cleaning standing-surfaces of platform-components of an escalator or a moving walkway which, in operation, is able to move in a continuous loop of a plurality of mutually connected platform-components,

the method comprising:

using downwards-force-support-means of an incoming-standing-surfaces-cleaning-apparatus to support incoming-standing-surfaces-cleaning-means of the apparatus on the incoming standing-surfaces that move towards the cleaning-apparatus such that the downwards-force-support-means, in reaction to movement of the incoming standing-surfaces, contributes a substantial downwards force that presses the incoming-standing-surfaces-cleaning-means onto the standing-surfaces of the incoming platform-components;

using position-maintenance-means of the downwards-force-support-means to maintain the cleaning-apparatus in a constant position relative to the escalator or moving walkway at a location where each incoming platform-component, combined with platform-components immediately before and after, form a surface-arrangement that is a substantially, continuous horizontal surface, such that all the standing-surfaces of the platform-components are able to pass under the cleaning-apparatus one followed by another as a result of movement of the continuous loop of the mutually connected platform-components; and

using a support structure of the downwards-force-support-means to connect the incoming-standing-surfaces-cleaning-means to the position-maintenance-means such that the support structure is at an angle with respect to the standing-surfaces.

11. A method of claim 10 wherein the method includes arranging the support structure at said angle with respect to the standing-surfaces such that, in reaction to the incoming standing-surfaces, the support structure transmits a force, having a substantial vertical force component and a horizontal force component, to the incoming-standing-surfaces-cleaning-means where the substantial vertical force presses the incoming-standing-surfaces-cleaning-means onto the incoming standing-surfaces.

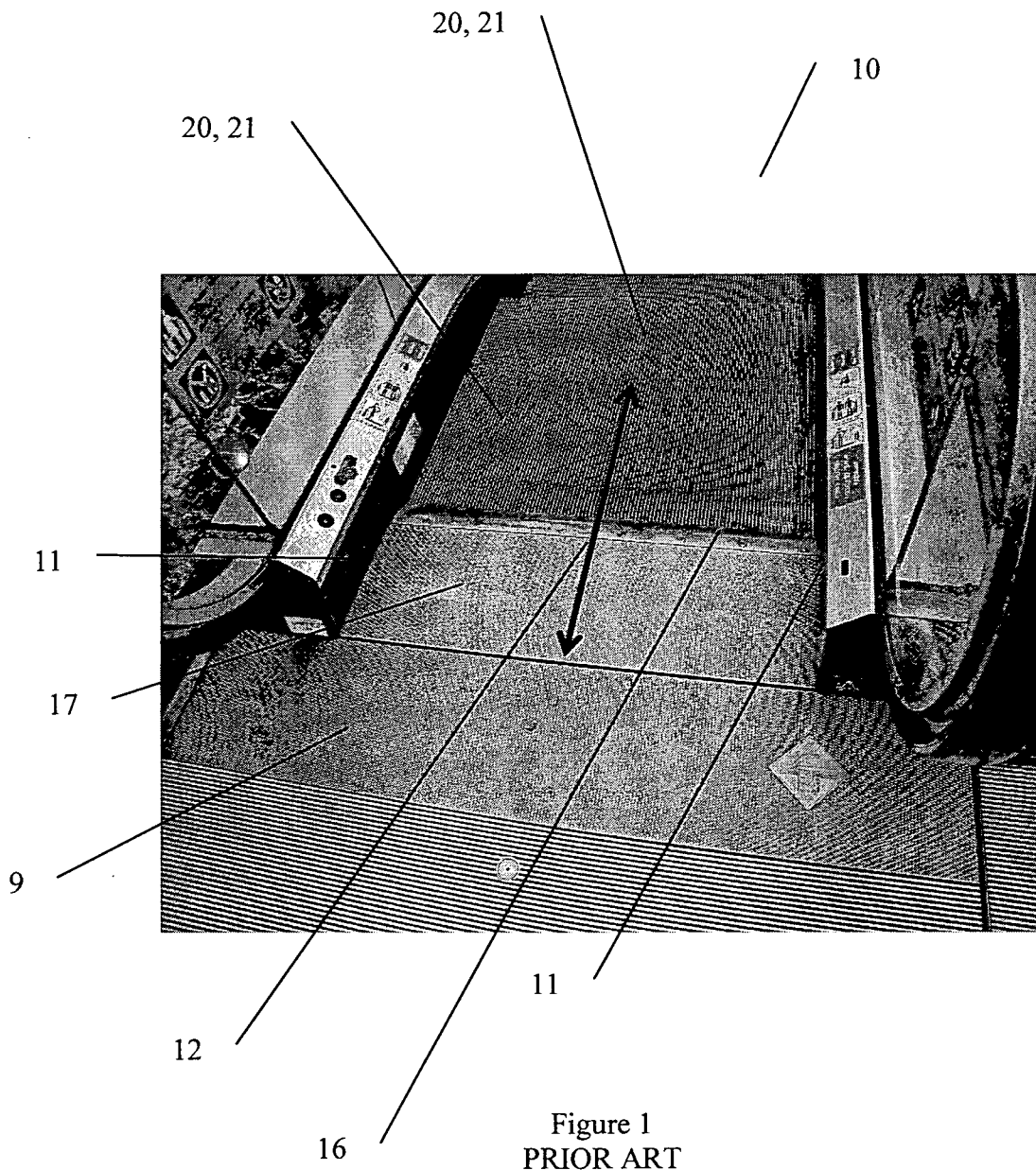
12. A method of claim 10 or 11 wherein the method includes arranging the support structure to support the incoming-standing-surfaces-cleaning-means at said angle with respect to the standing-surfaces such that the inclined orientation is instrumental in enabling the downwards-force-support-means to contribute a downwards force component in reaction to movement of the incoming standing-surfaces.

13. A method of any one of claims 10 to 12 wherein the method includes using the support structure to support the incoming-standing-surfaces-cleaning-mean in constant, non-interrupted contact with upper surfaces of the platform-components one after another.
14. A method of any one of claims 10 to 13 wherein the support structure comprises support arms that are held at said angle with respect to the standing-surfaces.
15. A method of any one of claims 10 to 14 wherein the position-maintenance-means includes two swivel pads that are pressed against opposing upright side-panels of the escalator or moving walkway in order to brace the cleaning-apparatus between the opposing side-panels.
16. A method of any one of claims 10 to 15 wherein the incoming-standing-surfaces-cleaning-means includes a brush with bristles where the bristles of the brush include shorter bristles that clean peaks on upper surfaces of the standing-surfaces, and longer bristles that clean valleys on the upper surfaces of the standing-surfaces.
17. A method of any one of claims 10 to 16 wherein the incoming-standing-surfaces-cleaning-means includes mechanised portions that contribute motion to facilitate cleaning.
18. A method of any one of claims 10 to 17 wherein the support structure is a support frame.
19. A method of any one of the preceding method claims 10 to 18 wherein the incoming-standing-surfaces-cleaning-apparatus is in accordance with any one of claims 1 to 9.
20. Standing-surfaces-cleaning-apparatus adapted to clean standing-surfaces of platform-components of an escalator or a moving walkway which, in operation, is able to move in a continuous loop of a plurality of mutually connected platform-components,
and in which the standing-surface of each platform-component has an alternating series of elongate, parallel valleys and peaks that generally align axially with the travel direction of the platform-components,
the apparatus comprising:

incoming-standing-surfaces-cleaning-means adapted to clean incoming standing-surfaces that move towards the cleaning-apparatus during use of the incoming-standing-surfaces-cleaning-apparatus;

wherein the incoming-standing-surfaces-cleaning-means includes a brush with bristles including shorter bristles adapted, in use, to clean peaks on the standing-surfaces, and longer bristles adapted, in use, to clean valleys on the standing-surfaces.

21. An apparatus of claim 20 wherein the apparatus is in accordance with any one of claims 1 to 9.



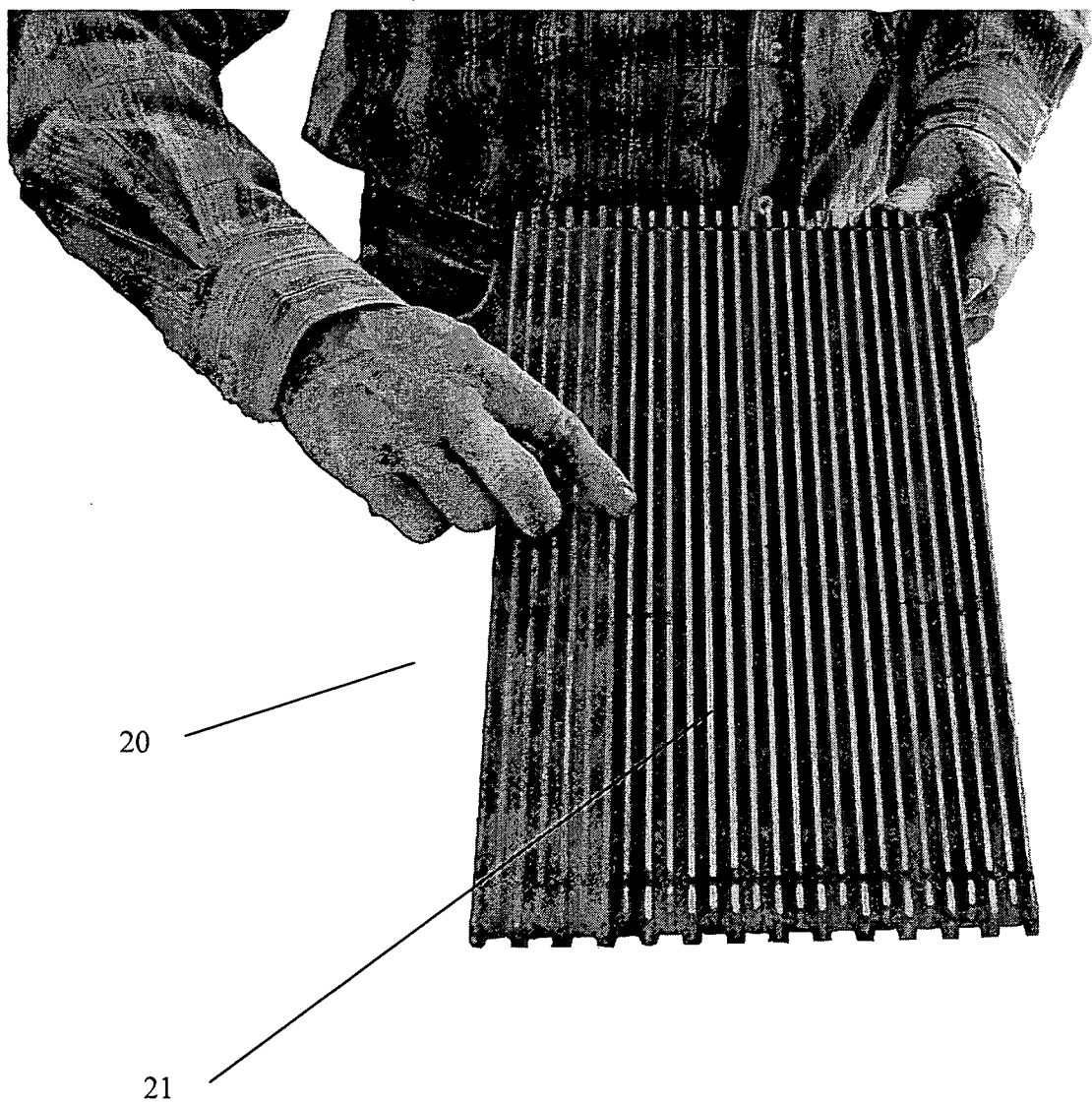


Figure 2
PRIOR ART

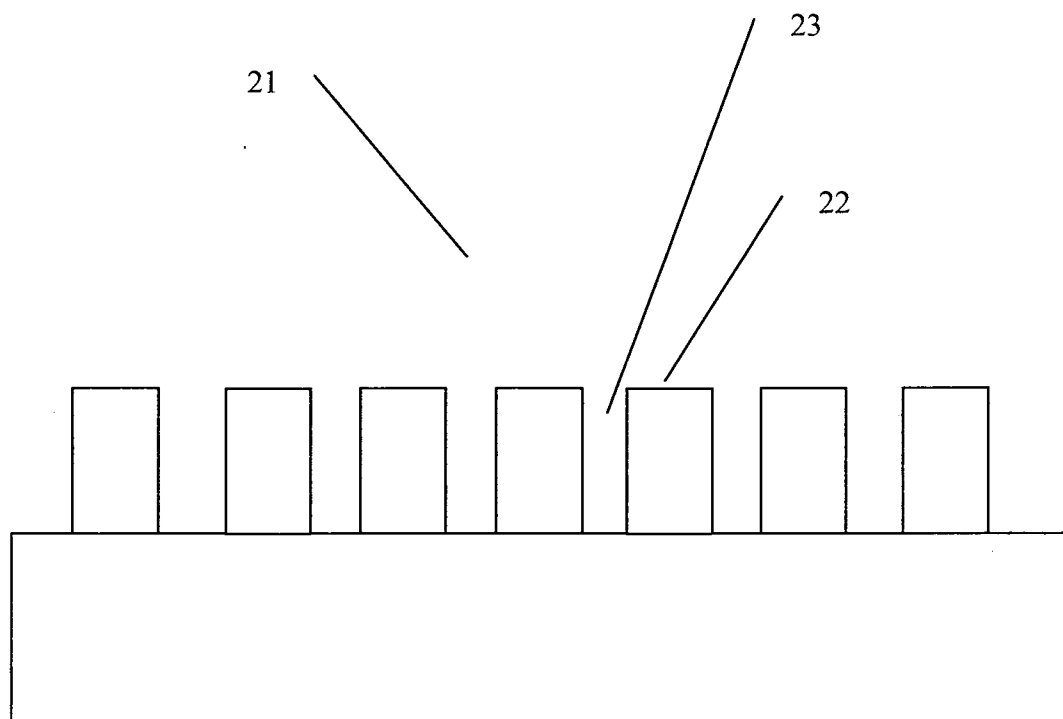


Figure 3
PRIOR ART

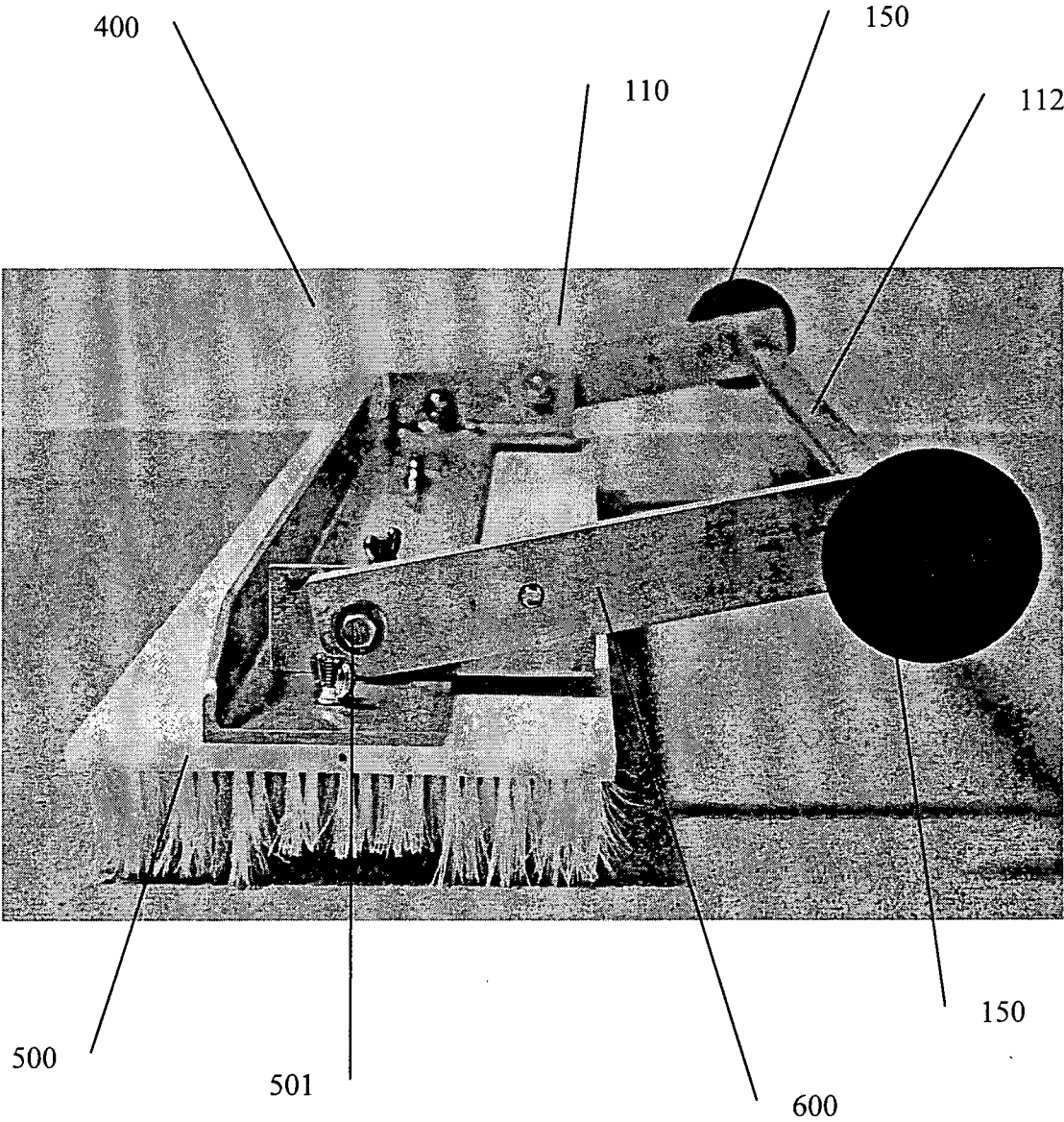


Figure 4A

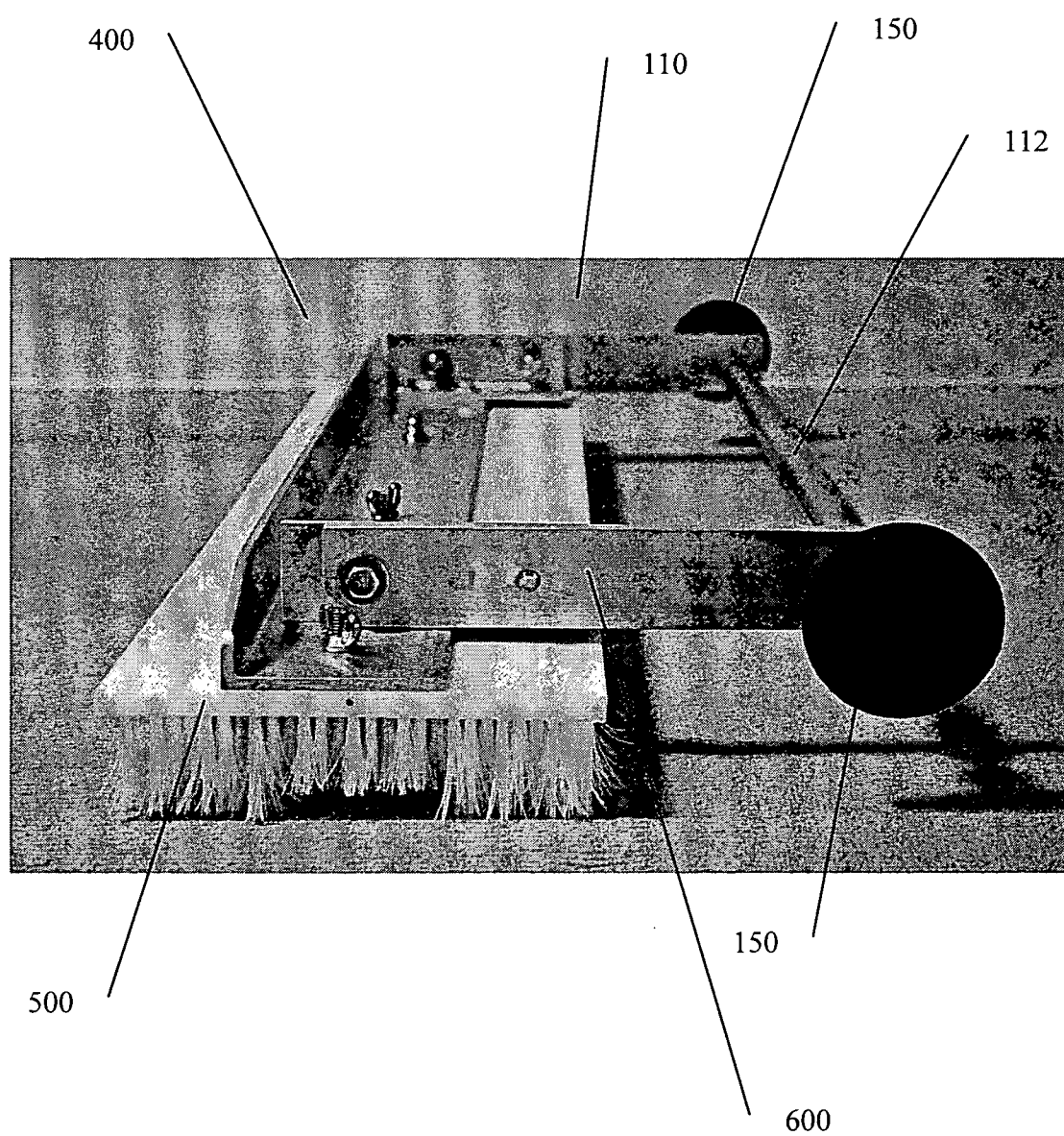
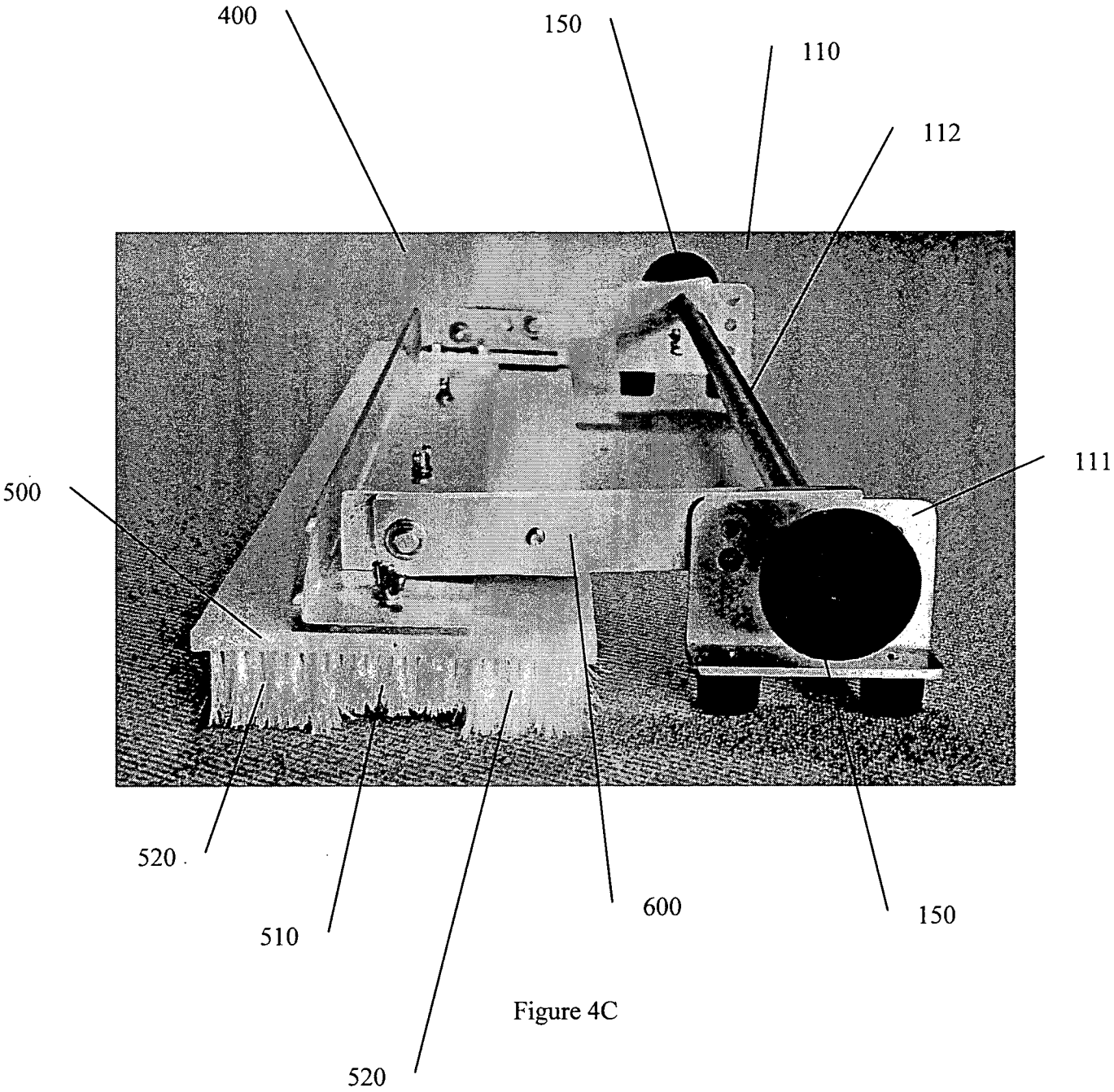


Figure 4B



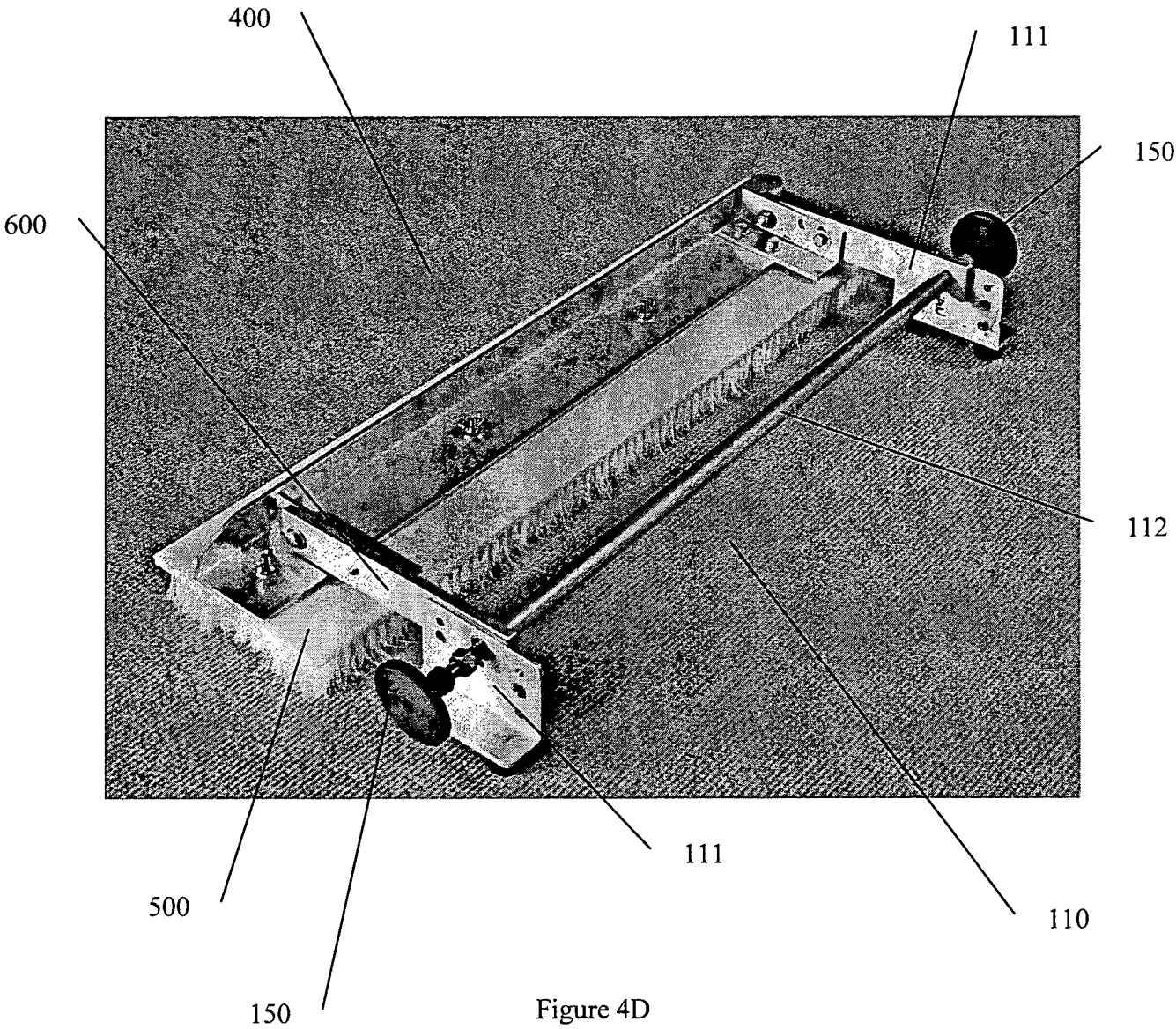


Figure 4D

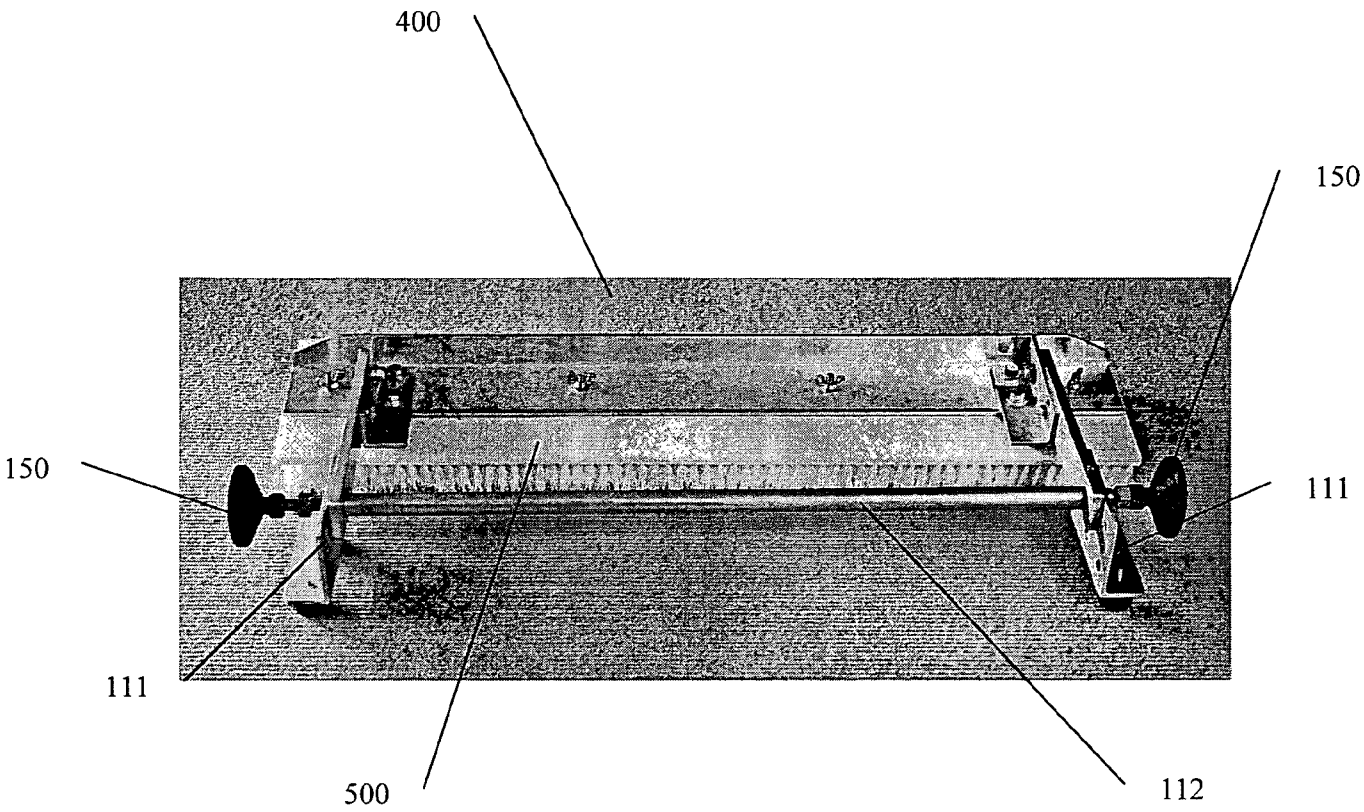


Figure 4E

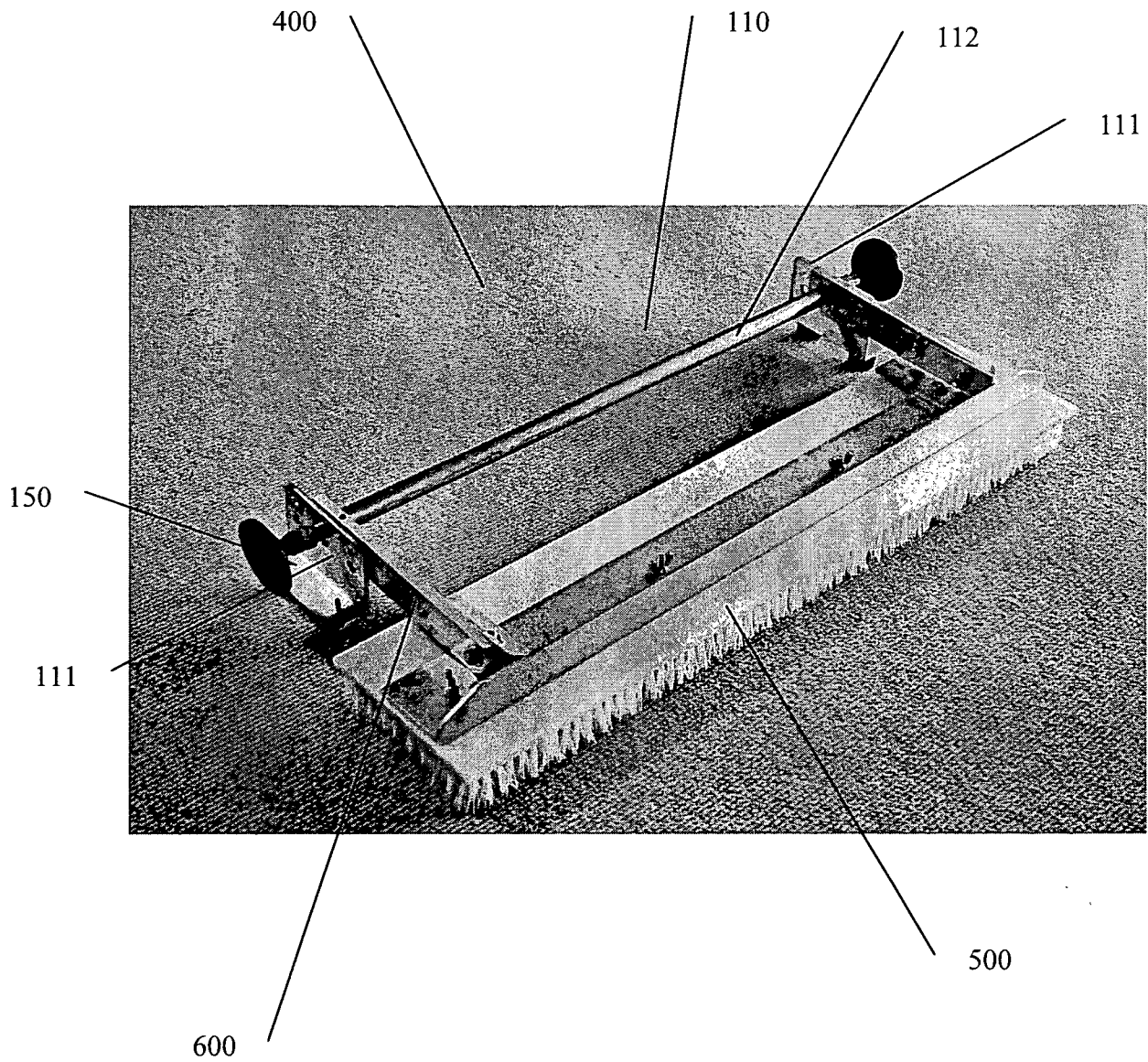


Figure 4F

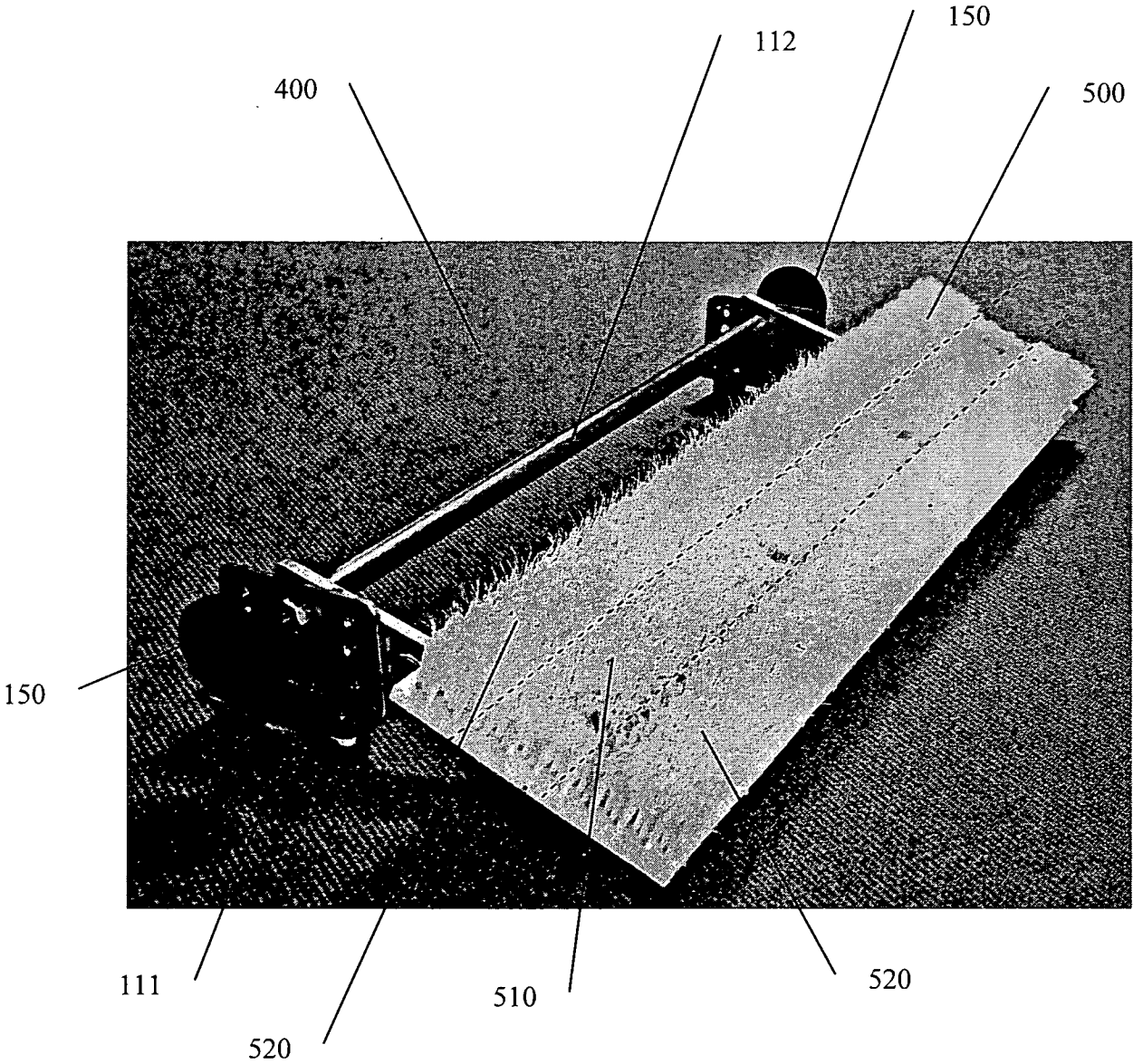


Figure 4G

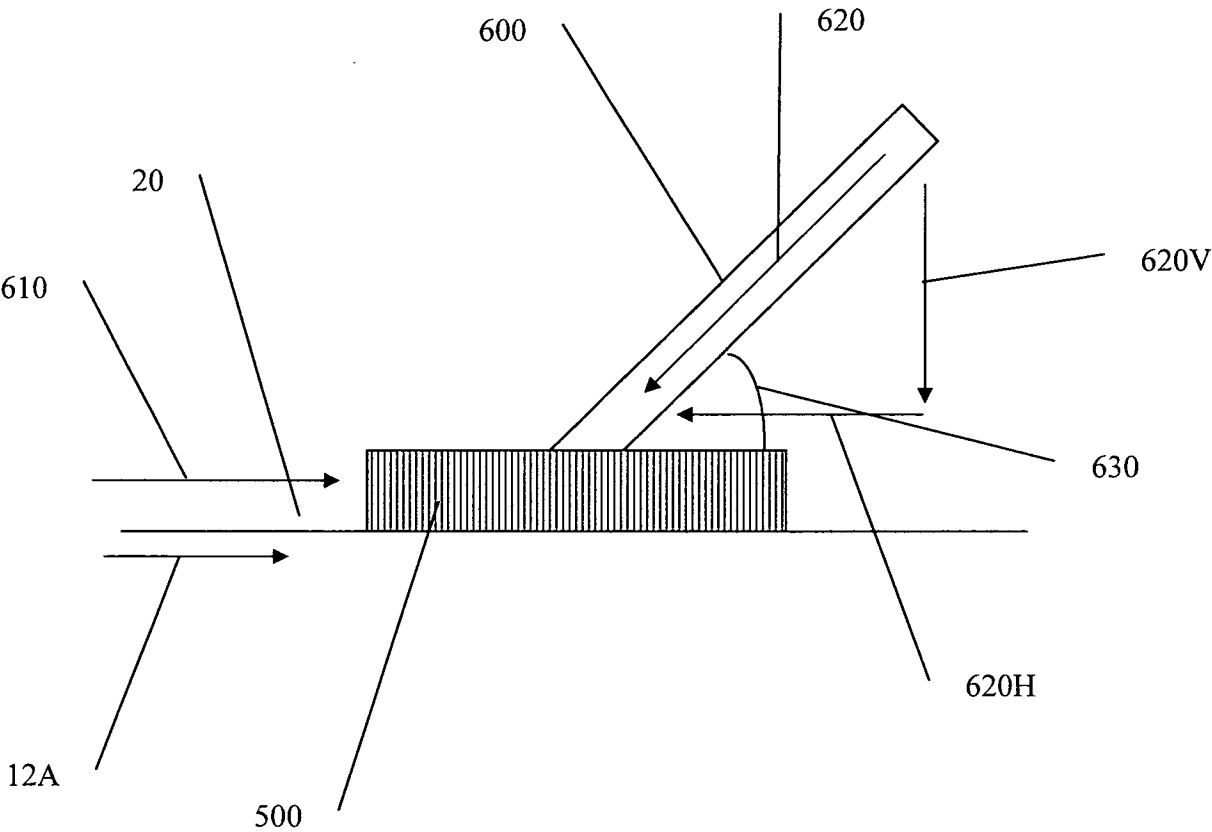


Figure 4H

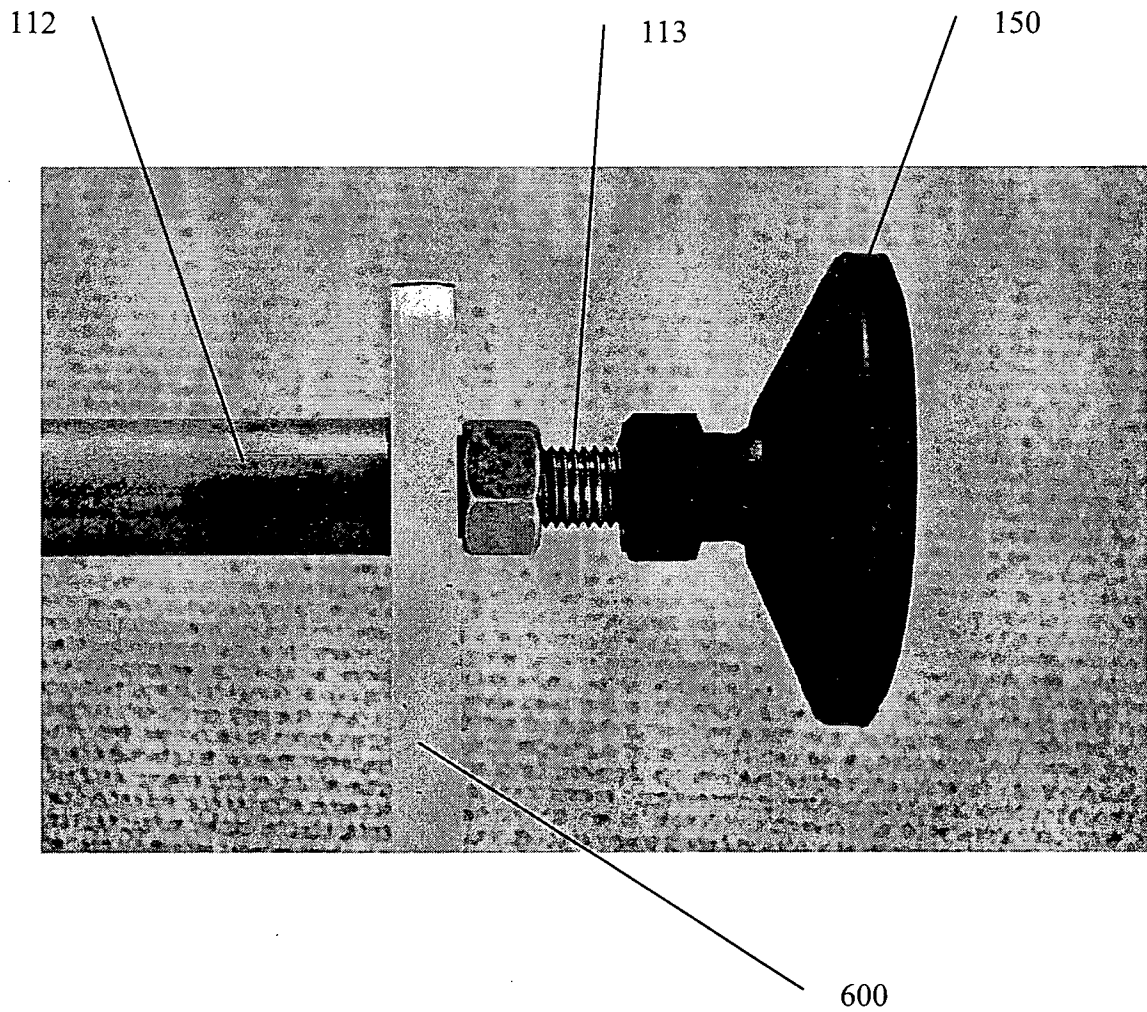


Figure 4I

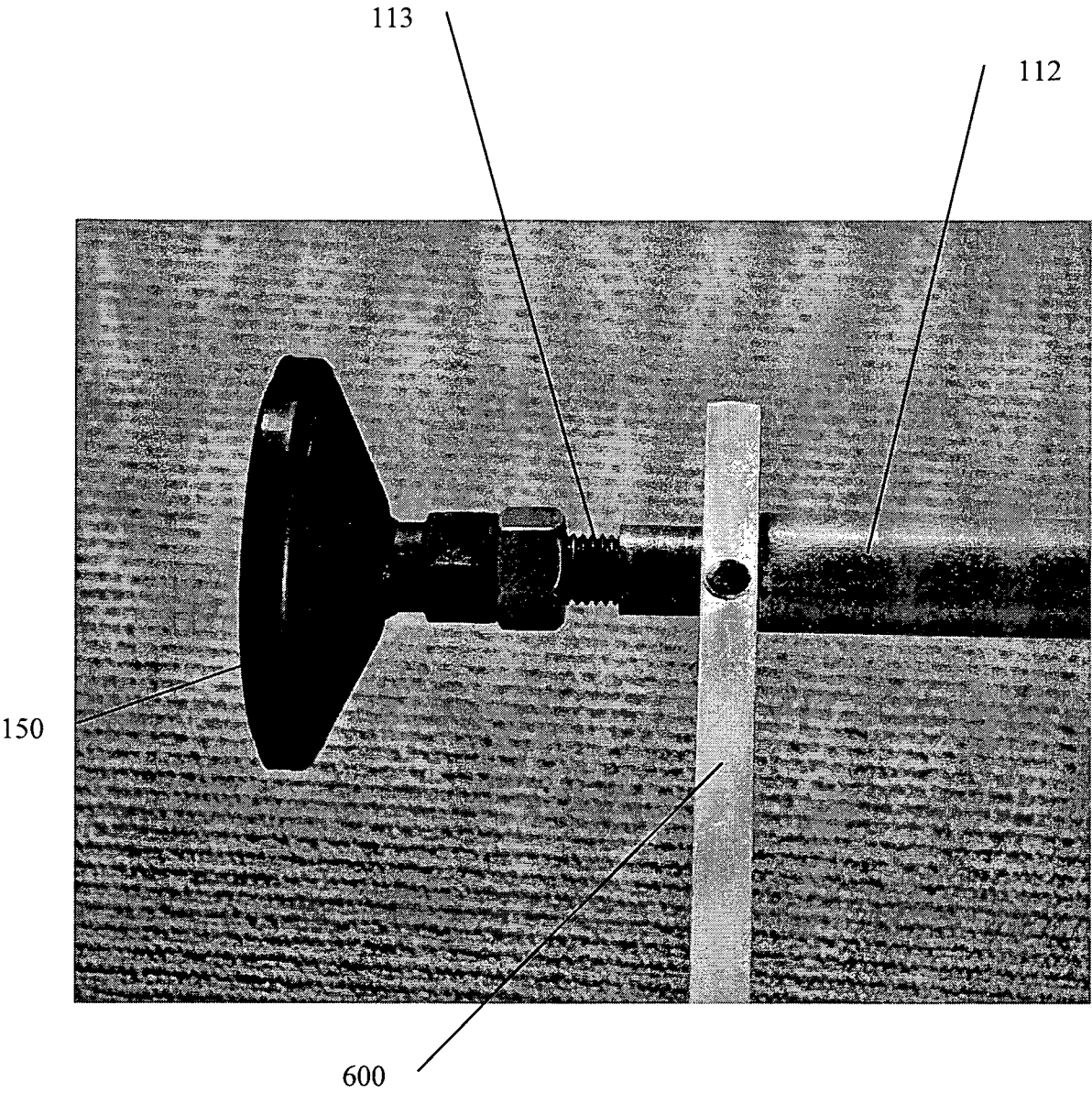


Figure 4J

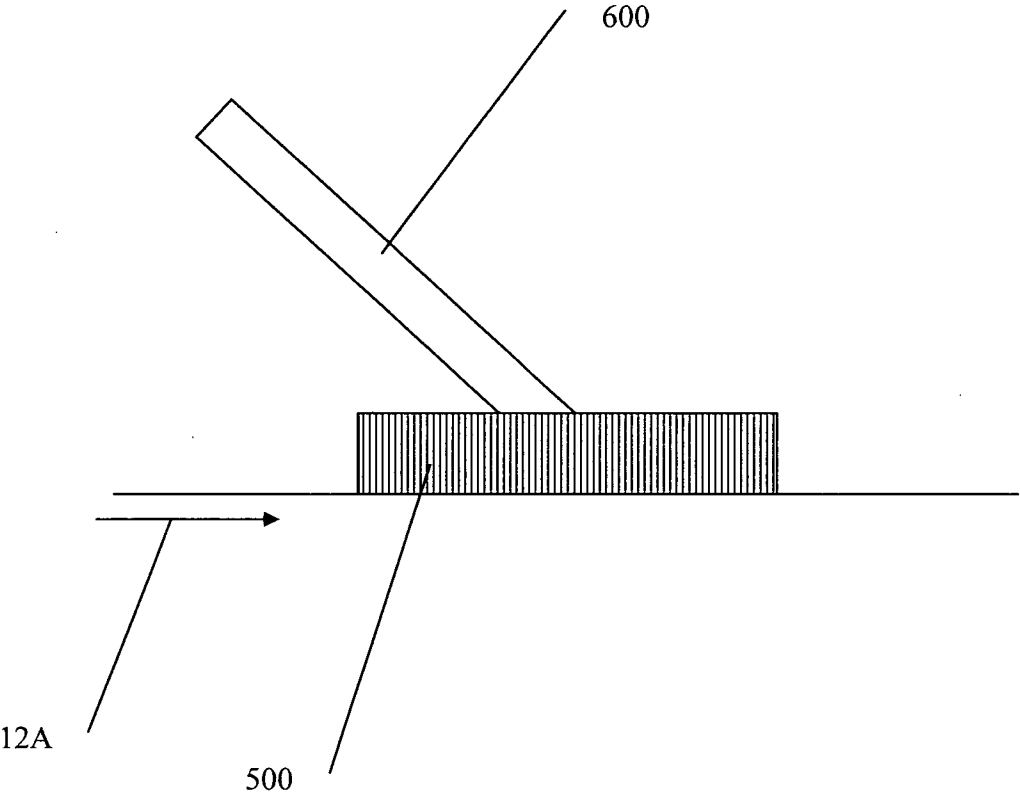


Figure 4K

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2010/000479

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

B66B 31/00 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC: IPC, ECLA, B66B 31/00, B65G 45, B08B & keywords (clean, condition, scrap, brush, sweep, broom, sterilise, force, urge, spring, sprung, bias) and the like.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CH 681368 A5 (WERNER) 15 March 1993 Figure 1-2, description lines 24-26, description lines 48-50, description lines 65-67, description lines 95-96	1-5, 7-15, 17-19
Y	Figure 1-2	6, 16, 20-21
X	GB 2132965 A (ISS DARENAS UK LIMITED) 18 July 1984 Figure 1-2, page 1 lines 76-79, page 1 lines 115-118, page 2 lines 6-11	1-2, 4-5, 7-11, 13-15, 17-19
Y	Figure 1-2	6, 16, 20-21
X	JP 59-12070 A (HITACHI LTD et al) 21 January 1984 Figure 1, 4	1, 4-5, 8, 10, 13-15, 19
Y	Figure 1 and 4	6, 16, 20-21
Y	US 4514872 A (HOPKINS) 7 May 1985 Figure 1 and 3, column 3 lines 10-12, column 3 lines 15-16	6, 16, 20-21



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"E" earlier application or patent but published on or after the international filing date

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"O" document referring to an oral disclosure, use, exhibition or other means

"&"

document member of the same patent family

"P" document published prior to the international filing date but later than the priority date claimed

Date of the actual completion of the international search
07 July 2010

Date of mailing of the international search report - 9 JUL 2010

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2010/000479

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member	
CH	681368	NONE		
GB	2132965	NONE		
JP	59012070	JP	2001068	JP 1576085
US	4514872	NONE		
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.				
END OF ANNEX				