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(54) **Gripping surface, system and method**

(57) The invention provides a gripping surface (1) comprising a plurality of sharp protrusions (2) arranged in a gripping area (3) of said gripping surface (1), each of them comprising a tip (4). For each sharp protrusion (2) there is a predetermined direction of resistance (5) defined as the projection over the gripping area (3) of the direction defined by the orientation of the tip (4) of said sharp protrusion (2), such that there can be different pre-

determined directions of resistance (5) throughout the gripping area (3). Each sharp protrusion (2) is intended for providing sliding resistance against a sliding element which slides in contact with the gripping area (3) in the direction opposite the predetermined direction of resistance (5) of said sharp protrusion (2). The invention additionally provides a separation method for separating the gripping area (3) and the sliding element (11).

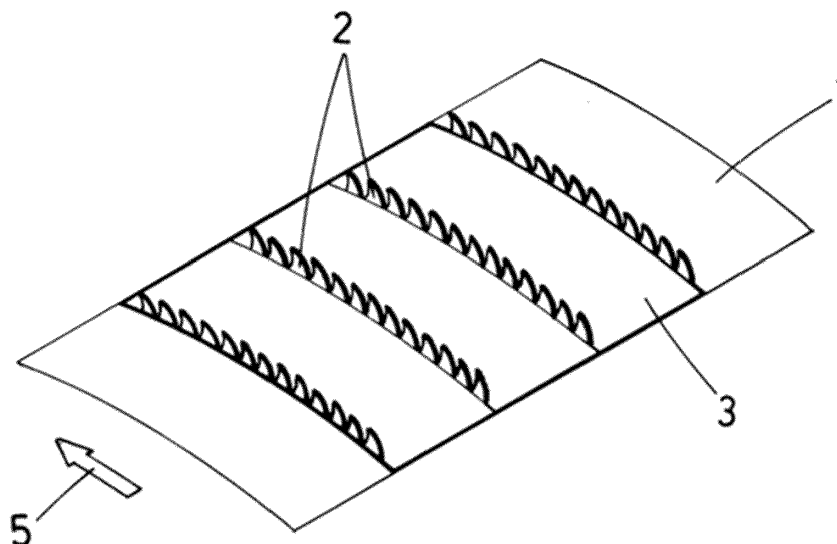


FIG.1

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Description

Object of the Invention

[0001] The present invention is comprised in the technical field for fastening elements, particularly in the field of the grip between elements without adhesives.

[0002] The present invention relates to a gripping surface and a system for providing gripping and sliding between said gripping surface and a sliding element, such that the possibility of separating said surfaces without damaging them is provided.

Background of the Invention

[0003] In the field of fastening elements, there are multiple solutions which provide a solution for fixing at least two elements in a resistant and durable manner.

[0004] There are multiple adhesives in the state of the art, such as white glue or cyanoacrylate, for example, which when applied on one or several surfaces allow reciprocal fixing thereof. The problem with this solution is that once they are fixed, the elements cannot be separated without damaging them. Other drawbacks are toxicity and the precautions that must be taken when using them, particularly in the case of cyanoacrylate and similar products.

[0005] Another type of solution in the state of the art is clasps and belt-type buckles. This solution allows fastening and separating two elements. The problem with this solution is the use of moving portions, and that it is based on fastening by means of perforating one of the materials to be joined, which weakens the joining in response to high stresses and entails the materials being damaged over time. Another example of clasp is the cable tie type, but the drawback of this solution is that the clasp must be broken when the elements are to be separated, rendering the clasp useless for a second use.

[0006] Document US3009235A relates to a fastening system known on the market as Velcro®. This solution comprises two fabric tapes that must be fixed on surfaces to be joined by means of sewing or gluing. One of the tapes has small flexible teeth ending in the shape of a hook which, when simply pressed, engage the other tape covered with tangled fibers which form loops and allow gripping. This solution allows easily fastening and separating both surfaces, the problem is that it does not allow strong fastening and both surfaces easily become damaged over time, entailing a fastening that is not suitable for supporting heavy weights. Furthermore, it does not allow sliding between the surfaces under any operating condition.

[0007] Therefore, the solutions present in the state of the art do not solve the problem of how to provide durable fastening of at least two elements capable of withstanding large forces and resistances, which allows sliding under certain conditions and which can in turn be separated without damaging the elements forming it and be used

by anyone.

Description of the Invention

[0008] The present invention provides a solution to the problems mentioned in the preceding section by means of a gripping surface according to claim 1, a gripping system according to claim 10, a control method for controlling movement according to claim 14 and a separation method according to claim 15. The dependent claims define preferred embodiments of the invention.

[0009] In a first inventive aspect, the invention has a gripping surface comprising a plurality of sharp protrusions arranged in a gripping area of said gripping surface, each of them comprising a tip, there being for each sharp protrusion a predetermined direction of resistance which is defined as the projection over the gripping area of the direction defined by the orientation of the tip of said sharp protrusion, such that there can be different predetermined directions of resistance throughout the gripping area, and each sharp protrusion being configured to provide sliding resistance against a sliding element which slides in contact with the gripping area in the direction opposite the predetermined direction of resistance of said sharp protrusion.

[0010] Throughout the document, it will be considered that the profile plane is the plane defined by the main curve and by the projection of this main curve with respect to the gripping surface. Therefore, a profile view of the sharp protrusion will be a view in which the sharp protrusion is seen in a direction perpendicular to said profile plane.

[0011] As has already been indicated, the predetermined direction of resistance of each sharp protrusion is always parallel to the plane tangent to the gripping area in said sharp protrusion and consists of the projection over said gripping area of the direction defined by the orientation of its tip.

[0012] This surface advantageously allows fastening with a sliding element arranged in contact with it, without the use of adhesives and in a durable manner in one direction and a separation without damaging the surface. It also allows sliding of the sliding element when it is performed in the opposite direction, without resistance. Additionally, since the fastening strength depends on the number of the plurality of sharp protrusions, it allows greater freedom of configuration according to the needs of the application, providing more or less resistance to fastening.

[0013] Another advantage of the present invention is that it does not require any special precaution for use as in the case of adhesives mentioned in the state of the art.

[0014] Another advantage of this surface is that it has selective resistance, such that resistance against the sliding of the sliding element over the gripping surface is much greater when the element attempts to slide over

the surface in the direction opposite to the predetermined direction of resistance than when attempting to slide in the same direction as the predetermined direction of resistance, since said resistance is negligible in the latter case.

[0015] The sliding element is suitable for mechanically interacting with the sharp protrusions because the surface of the sliding element intended for being in contact with the sharp protrusions is suitable for providing resistance against the advancement of the sharp protrusions when the latter are made to slide in contact with this surface of the sliding element in the predetermined direction of resistance. This means that the surface of the sliding element which is in contact with the gripping surface has a texture allowing the sharp protrusions to deform it in a non-permanent manner or to be introduced in small gaps, without breaking it. Therefore, this cooperation is not produced by protuberances or protrusions comprised in the surface of the sliding element.

[0016] In a particular embodiment, at least one sharp protrusion is a solid body the outer surface of which is continuous and generated from a main curve, such that the intersection of the outer surface of the sharp protrusion with a plane perpendicular to the main curve at a point has circular symmetry with respect to said point or bilateral symmetry with respect to an axis of symmetry contained in said plane.

[0017] In a particular embodiment, the tip of a sharp protrusion has a substantially spherical cap shape with a radius of curvature at most 5 times less than a characteristic dimension of said sharp protrusion. In other embodiments, said radius of curvature is at most 10 times less than a characteristic dimension of said sharp protrusion. In other embodiments, said radius of curvature is at most 20 times less than a characteristic dimension of said sharp protrusion. The proportion between the radius of curvature of the spherical cap of the tip and the characteristic dimension of the sharp protrusion will depend on the material of the sharp protrusion and of the sliding element. In this sense, a characteristic dimension of the sharp protrusion is one of the following: the shortest distance from the tip to the gripping surface or the length of the largest straight segment inscribed in the orthogonal projection of the sharp protrusion over the gripping area.

[0018] This embodiment advantageously allows performing fastening and release operation repetitively over time assuring optimal fixing.

[0019] In another embodiment of the invention, the distance between the tip and the gripping area measured in perpendicular is less than four times the length of the largest segment inscribed in the orthogonal projection of the sharp protrusion over the gripping area.

[0020] In another embodiment of the invention, a gripping surface according to the first aspect of the invention is implemented, in which the direction of resistance is the same for all the sharp protrusions comprised in the gripping surface.

[0021] This embodiment advantageously allows fas-

tening said surface against a rectilinear movement of a sliding element attempting to slide in the direction opposite to the predetermined direction of resistance of the gripping surface.

5 **[0022]** In another embodiment of the invention, a gripping surface according to the first aspect of the invention is implemented, in which the direction of resistance is not the same for all the sharp protrusions comprised in the gripping surface.

10 **[0023]** This embodiment advantageously allows fastening said surface against circular movement of a sliding element attempting to slide in a circular manner such that the direction of rotation corresponds to the direction opposite that defined by the gripping system. For example, if the gripping surface defines a counter-clockwise direction of resistance, it will provide resistance to any attempt of the sliding element to move in the clockwise direction.

15 **[0024]** This embodiment advantageously allows using the gripping surface in geometric elements and allowing the longitudinal and/or circular movement of said surface, increasing versatility of the invention.

20 **[0025]** In another embodiment of the invention, the gripping area is arranged either helically around a cylindrical gripping surface or with circular symmetry with respect to a point of the planar gripping surface.

25 **[0026]** In another embodiment of the invention, a gripping surface according to the first aspect of the invention is implemented, in which the sharp protrusions have a substantially conoid shape in which the vertex of the conoid is oriented in a direction the projection of which over the gripping area constitutes the predetermined direction of resistance of said sharp protrusion.

30 **[0027]** In another embodiment of the invention, a gripping surface according to the first aspect of the invention is implemented, in which the sharp protrusions have a pyramid shape the base of which is comprised in the gripping surface, the vertex of which is oriented in a direction the projection of which over the gripping area constitutes the predetermined direction of resistance of said sharp protrusion such that each of its faces comprises one side of the base and the vertex. In particular embodiments, the edges of the pyramid are rounded or beveled.

35 **[0028]** These embodiments advantageously allow implementing the plurality of sharp protrusions in a specific manner and direction, which allows implementing the invention in different types of materials, allowing great versatility.

40 **[0029]** In a second aspect of the invention, a gripping system is provided comprising:

50 a gripping surface according to the first aspect of the invention,
a sliding element adapted for mechanically interacting with the sharp protrusions of the gripping surface.

55 **[0030]** This second aspect advantageously allows selective fastening of a sliding element without adhesives in a durable manner over time.

[0031] In one embodiment of the invention a gripping system according to the second aspect of the invention is provided, additionally comprising a separating part adapted for being introduced between the gripping surface and the sliding element when the gripping surface and the sliding element are gripping one another, such that the presence of the separating part between the gripping surface and the sliding element prevents the gripping of both elements.

[0032] In one embodiment of the invention a gripping system according to the second aspect of the invention is provided, in which the separating part is attached in at least one point to the gripping surface or to the sliding element.

[0033] These embodiments advantageously allow fixing and releasing the surface in a comfortable and reliable manner, without having to exert enormous effort to perform this operation. Furthermore, they allow performing the fastening and release operation repetitively over time with optimal fixing. Another advantage provided by this system is the possibility of partially separating the gripping surface and the sliding element, such that in a configuration where they completely grip one another, sliding in two different directions is blocked due to the action of elements in two different gripping areas, each of them with a group of sharp protrusions oriented in one direction, and upon separating the sliding element from the gripping surface in only one of the two gripping areas, one direction is released but the other is not.

[0034] In a third aspect of the invention, a control method for controlling the sliding of a sliding element according to a desired blocking direction is provided, the method comprising the steps of:

arranging a gripping surface according to the first aspect of the invention,
moving the gripping surface closer to the sliding element until the gripping surface comes into contact with the sliding element, such that the predetermined direction of resistance of a sharp protrusion of the gripping surface is oriented according to the desired blocking direction.

[0035] This method advantageously allows using a gripping surface such as that described in the first aspect of the invention for selectively fastening a sliding element in a durable manner in a specific direction.

[0036] In a fourth inventive aspect, a separation method for separating a sliding element gripping a surface according to the first inventive aspect is provided, the method comprising the steps of:

introducing a separating part between the gripping surface and the sliding element, and
sliding the separating part until it covers the extension of the gripping area in which both elements are gripping one another until the physical separation thereof occurs.

[0037] This method advantageously allows separating a sliding element from a gripping surface in a comfortable and reliable manner, without having to exert enormous effort for performing this operation.

[0038] All the features and/or steps of the methods described in this specification (including the claims, description and drawings) can be combined in any combination, except for combinations of such mutually exclusive features.

Description of the Drawings

[0039] The foregoing and other features and advantages of the invention will be more clearly understood based on the following detailed description of a preferred embodiment provided only by way of illustrative and non-limiting example in reference to the attached drawings.

Figure 1 shows an example of a gripping surface according to the invention.

Figures 2a-2b illustrate the geometry of the so-called reference conoids.

Figure 3 shows the geometry of a particular embodiment of a sharp protrusion contained in a gripping surface according to the invention.

Figure 4 shows a profile view of a particular embodiment of sharp protrusions according to the invention, arranged adjacent to one another, with the two flanks curved.

Figure 5 shows a profile view of a particular embodiment of sharp protrusions according to the invention, arranged adjacent to one another, with both flanks planar.

Figure 6 shows a profile view of a particular embodiment of sharp protrusions according to the invention, with curved flanks.

Figure 7 shows an embodiment of the placement of the sharp protrusions comprised in a substantially planar gripping surface according to the invention.

Figure 8 shows an embodiment of the placement of the sharp protrusions according to the invention comprised in a gripping surface running over a cylindrical surface.

Figure 9 shows an embodiment of the placement of the sharp protrusions comprised in a disc-shaped gripping surface according to the invention.

Figure 10 illustrates a first step of a method for separating the gripping surface and the sliding element according to the invention.

Figure 11 illustrates a second step of a method for separating the gripping surface and the sliding element according to the invention.

Figure 12 illustrates a third step of a method for separating the gripping surface and the sliding element according to the invention.

Detailed Description of the Invention

[0040] After having explained the object of the invention in broad terms, specific non-limiting embodiments will be described below.

[0041] Figure 1 shows an example of a gripping surface (1) comprising a plurality of sharp protrusions (2) arranged in a gripping area (3) of said gripping surface (1). The gripping area (3) is therefore comprised in the gripping surface (1). In a particular embodiment, the gripping area (3) corresponds to the entire gripping surface (1).

[0042] The tip (not identified in this drawing) of each sharp protrusion (2) is oriented in a predetermined direction of resistance (5), such that there can be different predetermined directions of resistance (5) throughout the entire gripping area (3).

[0043] The sharp protrusions (2) are intended for providing sliding resistance against a sliding element (not depicted in this drawing) which, when put in contact with the gripping surface (1), attempts to slide with respect to the gripping area (3) in a direction opposite one of the predetermined directions of resistance (5). In the particular embodiment, the predetermined direction of resistance (5) of the sharp protrusions (2) is the same, and it will therefore be considered that the gripping area (3) has a single predetermined direction of resistance (5).

[0044] In particular examples of the invention, each sharp protrusion has a conoid shape, there being a main curve by way of a directrix from which said protrusion develops, following a type of symmetry, as will be explained below. This main curve is planar. Throughout this document, a conoid is understood as a figure limited by an outer surface which is defined from a planar main curve by way of a directrix, such that the outer surface of said conoid is continuous and is formed, for each point P of the main curve, by a circle having a center at said point P and contained in the plane perpendicular to the main curve at said point P.

[0045] These concepts are shown in Figure 2a. Figure 2a shows a main curve (20) and a surface of a conoid (21), which is the outer surface of a particular example of a sharp protrusion (2) according to the invention. A section plane (22) sections the main curve at a section point (23) and also sections the surface of the conoid (21), the intersection between the section plane (22) and the conoid (21) defining a section curve (24). The section plane (22) is perpendicular to the main curve (20) at the section point (23).

[0046] One end of the main curve (20) coincides with the tip (4) of the sharp protrusion (2) and defines a direction which is not perpendicular to the gripping area (3). In a particular embodiment, this occurs because the main curve is a straight line not perpendicular to the gripping area (3). In other particular embodiments, such as that shown in Figure 2a, it occurs because the main curve (20) is a curve the end of which is not perpendicular to the gripping area (3).

[0047] As regards the symmetry of the section curve (24), in some embodiments, such as that of Figure 2a, any section curve (24) obtained by the intersection of the conoid (21) with the section plane (22) has circular symmetry with respect to said section point (23). In other embodiments, such as that of Figure 2b, any section curve (24) obtained by the intersection of the conoid (21) with the section plane (22) has bilateral symmetry, such that the section curve (24) has at least one axis of symmetry (25) contained in the section plane (22).

[0048] In other particular embodiments, as seen in Figure 3, all the points of the outer surface of the sharp protrusion (2) are contained in the space comprised between two different virtual limiting conoids, a larger virtual limiting conoid (26) and a smaller virtual limiting conoid (27), such that the directrix of both virtual limiting conoids (26, 27) coincides with the main curve (20) of the sharp protrusion (2), the radius of the base of the larger virtual limiting conoid (26) being less than twice the radius of the base of the smaller virtual limiting conoid (27). As in the rest of the document, the main curve (20) is planar. In a particular embodiment, this main curve is not a straight line, but rather the final end thereof, located at the tip (4) of the sharp protrusion (2), has a direction different from that which said main curve (20) has at its initial end, located in the gripping area (3). The direction of the main curve (20) at the tip (4) of the sharp protrusion (2) defines the orientation of the tip (4), and the predetermined direction of resistance (5) of the sharp protrusion (2) consists of the projection over the gripping area (3) of the direction defined by the orientation of its tip (4). In these embodiments, the projection of this main curve (20) with respect to the gripping area (3) is a straight line. This makes the profile view of the sharp protrusion similar to a shark fin. The person skilled in the art understands that the invention also refers to any shape which deviates slightly from the aforementioned shapes, and which also fulfills its function.

[0049] Figure 4 shows a particular embodiment of the sharp protrusions (2). This figure shows how the sharp protrusions (2), seen in profile, comprise two curved flanks (14, 15) that are joined at the tip (4) of the sharp protrusion (2), such that said tip (4) is oriented according to a direction, the projection of which over the gripping area (3) constitutes the predetermined direction of resistance (5) of that sharp protrusion (2). In this particular embodiment, the sharp protrusions (2) are adjacent to and in contact with one another, such that the first flank (14) of a protrusion is joined with the gripping area (3) at the same point as the second flank (15) of the adjacent sharp protrusion (2). This allows having a gripping area (3) with the highest possible density of sharp elements (2), this configuration being suitable for the case of having to withstand large loads in the direction opposite the predetermined direction of resistance (5).

[0050] The predetermined direction of resistance (5) of each sharp protrusion (2) is always parallel to the plane tangent to the gripping area (3) in said sharp protrusion

(2) and consists of the projection over said gripping area (3) of the direction defined by the orientation of its tip (4).

[0051] Figures 5 and 6 show the profile view of other possible embodiments of the sharp protrusions (2). In the example shown in Figure 5, the two flanks (14, 15) are straight, although they have a different length, such that the tip (4) of the sharp protrusion is still oriented according to a predetermined direction of resistance (5). In the example shown in Figure 6, the two flanks joining the tip of the sharp protrusion (2) with the gripping area (3) are curved and have a different length, such that the tip (4) of the sharp protrusion is still oriented according to a predetermined direction of resistance (5). In Figure 5, the sharp protrusions (2) are adjacent to and in contact with one another, as in the case of Figure 4, whereas in Figure 6, the sharp protrusions (2) are not in contact with one another.

[0052] In other particular embodiments, the profile section of the sharp protrusions (2) is that which is seen in any of Figures 4, 5 or 6, whereas the three-dimensional shape of said sharp protrusions (2) is the shape of a conoid in which the vertex is oriented in a direction, such that the orthogonal projection of said direction over the gripping area (3) constitutes the predetermined direction of resistance (5). In other particular embodiments, the profile section of the sharp protrusions (2) is that which is seen in any of Figures 4, 5 or 6, whereas the three-dimensional shape of said sharp protrusions (2) is the shape of a pyramid in which the base is polygonal and is comprised in the gripping surface (3), and in which the vertex is oriented in the predetermined direction of resistance (5), such that the faces of the pyramid join the sides of the base with the vertex. In other particular embodiments, the profile of the sharp protrusions (2) is that which is seen in any of Figures 4, 5 or 6, but in some embodiments said sharp protrusions (2) are adjacent to and in contact with one another, whereas in other embodiments, the sharp protrusions (2) are not in contact with one another.

[0053] Although the drawings do not allow seeing measurements, in a particular embodiment, the curve resulting from sectioning the outer surface of the sharp protrusion (2) with the profile plane has at the tip (4) a radius of curvature which is 5 times less than a characteristic dimension of the sharp protrusion (2). In other embodiments, said radius of curvature is at most 10 times less than a characteristic dimension of said sharp protrusion. In other embodiments, said radius of curvature is at most 20 times less than a characteristic dimension of said sharp protrusion. The proportion between this radius of curvature and the characteristic dimension of the sharp protrusion will depend on the material of the sharp protrusion and of the sliding element. This characteristic dimension is one of the following: the shortest distance from the tip (4) to the gripping surface (3) or the length of the largest straight segment inscribed in the orthogonal projection of the sharp protrusion (2) over the gripping area (3).

[0054] In another particular example, the gripping area (3) comprises sharp protrusions (2) the tips of which are all oriented in the same direction, preferably forming a 45 degree angle with the gripping area (3).

[0055] Figures 7 to 9 show embodiments of the placement of the sharp protrusions (2) comprised in the gripping area (3).

[0056] It can be seen in Figure 7 that the gripping surface (1) is substantially a plane, and the sharp protrusions (2) are regularly located in rows throughout the gripping area (3) such that the direction of resistance (5) is the same for all the sharp protrusions (2) comprised in the gripping area (3). In other embodiments, another arrangement is possible, even with part of the sharp protrusions (2) being oriented according to a predetermined direction of resistance and other sharp protrusions being oriented according to another different predetermined direction of resistance.

[0057] It can be seen in Figure 8 that the gripping surface (1) has the shape of an outer surface of a circular cylinder. In this embodiment, the sharp protrusions (2) are arranged in helical strips running over the surface of the gripping area (3). In this case, the direction of resistance (5) is not the same for all the sharp protrusions (2) comprised in the gripping area (3) since each helical strip follows a path, and the predetermined direction of resistance (5) corresponds to a direction tangential to said helical strip at all times.

[0058] It can be seen in Figure 9 that the gripping surface (1) is arranged in a disc. In this embodiment, the sharp protrusions are arranged in concentric circles, such that the direction of resistance (5) is not the same for all the sharp protrusions (2) comprised in the gripping area (3), since each circle follows a path, and the predetermined direction of resistance (5) has the direction tangential to the circle and is counter-clockwise. In another particular embodiment, the direction is clockwise.

[0059] In other embodiments, the arrangement of the sharp protrusions (2) in the gripping area (3) is random.

[0060] The dimensions of the sharp protrusions (2) vary according to the application in which the gripping surface (1) is going to be used.

[0061] Figures 10, 11 and 12 show a gripping system (10) according to the invention, comprising a gripping surface (1) according to the invention and a sliding element (11) according to the invention. A specific gripping surface (1) and a specific sliding element (11) will be chosen depending on the application for which the gripping system (10) is intended. Gripping systems (10) according to the invention can be used in control methods for controlling sliding according to a desired blocking direction. Basically, the control methods for controlling sliding according to the invention always comprise the steps of arranging a gripping surface (1) according to the invention and moving the gripping surface (1) closer to a sliding element (11) until the gripping surface (1) comes into contact with the sliding element (11), such that a predetermined direction of resistance (5) of a sharp pro-

trusion (2) of the gripping surface (1) is oriented according to the desired blocking direction.

[0062] In different embodiments, the materials used for the gripping surface (1) and for the sliding element (11) comprise plastic, nylon, polyester, polypropylene, vinyl, rope, cotton fabric or hide. In turn, the materials used for the sharp protrusions comprise plastic or metal.

[0063] In systems intended for being used in applications in which it is necessary for the sliding element to be able to, at a certain time, slide over the gripping surface in the direction opposite the predetermined direction of resistance, such as various tensioning devices or nautical ropes, the gripping system additionally comprises a separating part. This separating part has at least the extension of the gripping area and is adapted for being arranged in two positions: a retracted position and another extended position, such that it covers the gripping area in its extended position, preventing the interaction of said gripping area with the sliding element, therefore allowing free sliding between the gripping surface and the sliding element.

[0064] In some embodiments, this separating part comprises a sheet fixed to the gripping surface on one of its sides and wound onto a metal roller or cylinder such that the sheet is adapted for being held by a handle and moved throughout the gripping area, a movement which causes the sheet to unwind and to be extended over the gripping area, such that as the sheet passes, the separation between the gripping surface and the sliding element occurs gradually. To carry out this separation easily and without creating stresses in the sliding element, the area in which the sheet is joined to the gripping surface must be located at the origin of the predetermined direction of resistance of the gripping area on which said separating part must act.

[0065] Figures 10, 11 and 12 also show the steps of a particular embodiment of a method according to the invention for separating the gripping surface (1) and the sliding element (11). The gripping surface (1) comprises a gripping area (3) in which sharp protrusions (2) oriented according to a predetermined direction of resistance (5) are located. Figure 8 illustrates the first step of this method which consists of introducing the separating part (12) between the gripping surface (1) and the sliding element (11). This separating part can be held by a handle (13), thus facilitating its movement. Figure 9 shows the separating part (12) in an intermediate position, leaving part of the surface separated and part of the surface joined. Finally, Figure 10 shows the separating part (12) in the final position, leaving the gripping surface (1) and the sliding element (11) separated.

[0066] The length and dimension of the gripping area (3) vary depending on the resistance they must exert against the forces applied thereon. The same is indicated for materials from which the two sections will be made, they will depend on the same parameter: the resistance they must exert. An example of the functions in which the invention can be used are fastening or dragging func-

tions, whichever is appropriate.

[0067] For carrying out any of these functions, the sharp protrusions are blunt enough so as to never perforate the surface of the sliding element in contact with the gripping surface. The function of the sharp protrusions is to grip, fasten or drag, not perforate, since this would be detrimental to the sliding element adapted for cooperating with the sharp protrusions of the gripping surface which, over time, would become damaged and end up losing their resistance capacity against the action of the sharp protrusions. This is important when choosing the materials from which both elements are made, for example, and as an extreme case, in the event that the gripping surface is manufactured from metal and the sliding element is manufactured from hide, the service life of the gripping system will be noticeably shortened.

[0068] Control methods for controlling sliding according to a desired blocking direction can be used in various real-life applications. The following is described by way of example:

Fastening ropes or pulleys

[0069] In this example, the gripping surface adopts a cylindrical shape, with the sharp protrusions arranged on the inner face thereof, such that all the sharp protrusions are oriented according to the same predetermined direction of resistance, going from a first base of the cylindrical gripping surface to a second base thereof. The gripping system comprises this gripping surface and a pulley rope or cord intended for being introduced on the gripping surface through the first base, such that the gripping surface does not provide resistance while the rope or cord is introduced, but does so when an object, such as a boat or the weight to be hoisted by the pulley, pulls on the rope or cord and attempts to remove it from the inside of the gripping surface. When the time is right, a separating part is used to remove the rope, which part would be introduced through the first base and it would gradually slide thereon until the rope is separated from the gripping surface.

Belt closures

[0070] In this example, the system is comprised in a belt buckle, for example, and comprises two rectangular gripping surfaces facing one another, with the sharp protrusions arranged on each of the inner faces thereof, such that all the sharp protrusions are oriented according to the same predetermined direction of resistance, going from a first end of the rectangular gripping surface to a second end thereof. The gripping system is a belt comprising these gripping surfaces by way of a buckle, such that the gripping surface does not provide resistance while the free end of the belt is introduced, but does so when body pressure is exerted on the belt once it is buckled. A separating part is used to remove the belt.

Dragging

[0071] In this example, the system comprises a gripping surface arranged on the outer surface of a drive cylinder, such that the sharp protrusions are oriented according to directions contained in circles contained in said surface. The gripping system is formed by this gripping surface and by a transmission belt, such that the gripping surface drags the transmission belt without the need of the dragging to occur due to excessive stress in the belt.

Fastening in a disc

[0072] In this example, the system comprises a gripping surface arranged on the surface of a disc, such that the sharp protrusions are arranged along circles contained in said surface, the predetermined direction of resistance of each sharp protrusion being tangential to the circle containing the sharp protrusion. The gripping system is formed by this gripping surface and by a disc associated with a vehicle accelerator, such that when the disc moves closer to the gripping surface, said gripping surface prevents the disc from rotating freely.

Claims

1. A gripping surface (1) comprising a plurality of sharp protrusions (2) arranged in a gripping area (3) of said gripping surface (1), each of them comprising a tip (4), there being for each sharp protrusion (2) a predetermined direction of resistance (5), which is defined as the projection over the gripping area (3) of the direction defined by the orientation of the tip (4) of said sharp protrusion (2), such that there can be different predetermined directions of resistance (5) throughout the gripping area (3), and each sharp protrusion (2) being configured to provide sliding resistance against a sliding element which slides in contact with the gripping area (3) in the direction opposite the predetermined direction of resistance (5) of said sharp protrusion (2).
2. The gripping surface (1) according to claim 1, wherein at least one sharp protrusion (2) is a solid body the outer surface of which is continuous and generated from a main curve (20), such that the intersection of the outer surface of the sharp protrusion (2) with a plane perpendicular to the main curve (20) at a point (23) has circular symmetry with respect to said point (23) or bilateral symmetry with respect to an axis of symmetry (25) contained in said plane.
3. The gripping surface (1) according to any of the preceding claims, wherein at least one of the tips (4) of the sharp protrusions (2) has a substantially spherical cap shape with a radius of curvature at most 5

times less than a characteristic dimension of said sharp protrusion (2), the characteristic dimension being between the shortest distance from the tip to the gripping surface and the length of the largest segment inscribed in the orthogonal projection of the sharp protrusion (2) over the gripping area (3).

4. The gripping surface (1) according to any of the preceding claims, wherein the distance between the tip (4) and the gripping area (3) measured in perpendicular is less than four times the length of the largest segment inscribed in the orthogonal projection of the sharp protrusion (2) over the gripping area (3).
5. The gripping surface (1) according to any of the preceding claims, wherein the predetermined direction of resistance (5) is the same for all the sharp protrusions (2) comprised in the gripping surface (1).
6. The gripping surface according to any of claims 1 to 4, wherein the predetermined direction of resistance (5) is not the same for all the sharp protrusions (2) comprised in the gripping surface (1).
7. The gripping surface (1) according to the preceding claim, wherein the gripping area (3) is arranged either helically around a cylindrical gripping surface (1) or with circular symmetry with respect to a point of the planar gripping surface (1).
8. The gripping surface (1) according to any of the preceding claims, wherein the sharp protrusions (2) have a substantially conoid shape in which the vertex of the conoid is oriented in a direction the projection of which over the gripping area (3) constitutes the predetermined direction of resistance (5) of said sharp protrusion (2).
9. The gripping surface (1) according to any of claims 1 to 7, wherein the sharp protrusions (2) have a pyramid shape the base of which is comprised in the gripping surface (3), the vertex of which is oriented in a direction the projection of which over the gripping area (3) constitutes the predetermined direction of resistance (5) of said sharp protrusion (2) such that each of its faces comprises a side of the base and the vertex.
10. A gripping system (10) comprising:
 - a gripping surface (1) according to any of the preceding claims,
 - a sliding element (11) adapted for mechanically interacting with the sharp protrusions (2) of the gripping surface (1).
11. The gripping system (10) according to the preceding claim, additionally comprising a separating part (12)

adapted for being introduced between the gripping surface (1) and the sliding element (11) when the gripping surface (1) and the sliding element (11) are gripping one another, such that the presence of the separating part (12) between the gripping surface (1) and the sliding element (11) prevents the gripping of both elements. 5

12. The gripping system (10) according to any of claims 10 or 11, wherein the separating part (12) is attached in at least one point to the gripping surface (1) or to the sliding element (11). 10

13. The gripping system according to any of claims 10 to 12, wherein the separating part (12) allows a retracted position inside the gripping surface (1) and an extracted position of use outside the gripping surface (1). 15

14. A control method for controlling the sliding of a sliding element (11) according to a desired blocking direction, the method comprising the steps of: 20

arranging a gripping surface (1) according to any of claims 1 to 9, 25
moving the gripping surface (1) closer to the sliding element (11) until the gripping surface (1) comes into contact with the sliding element (11), such that the predetermined direction of resistance (5) of a sharp protrusion (2) of the gripping surface (1) is oriented according to the desired blocking direction. 30

15. A separation method for separating two elements gripping one another, one of them being a gripping surface (1) according to any one of claims 1 to 9 and the other one being a sliding element (11), the method comprising the steps of: 35

introducing a separating part (12) between the gripping surface (1) and the sliding element (11), and 40
sliding the separating part (12) until it covers the extension of the gripping area (3) in which both elements are gripping one another until the physical separation thereof occurs. 45

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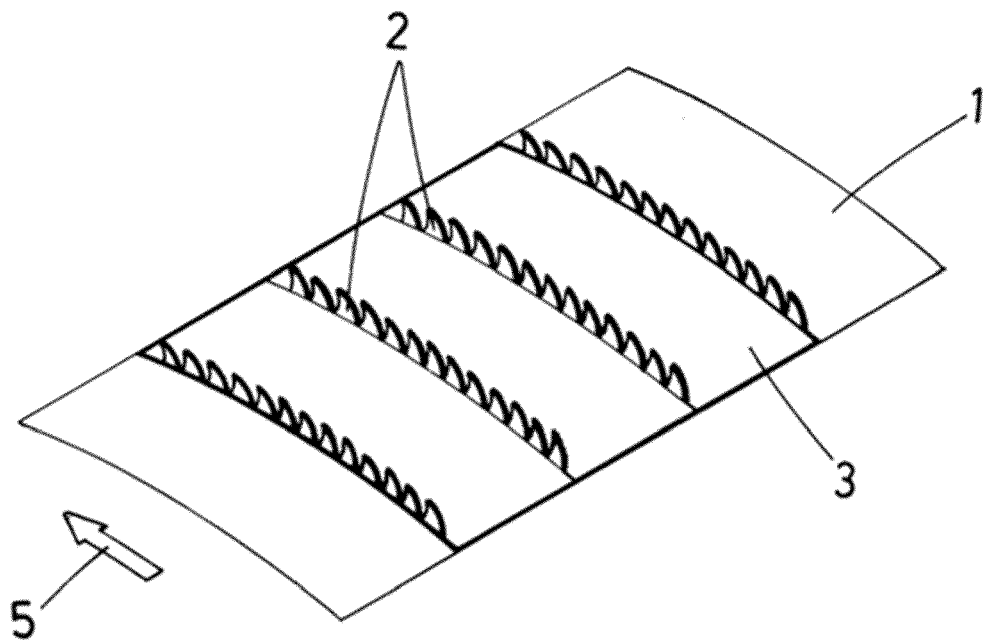


FIG.1

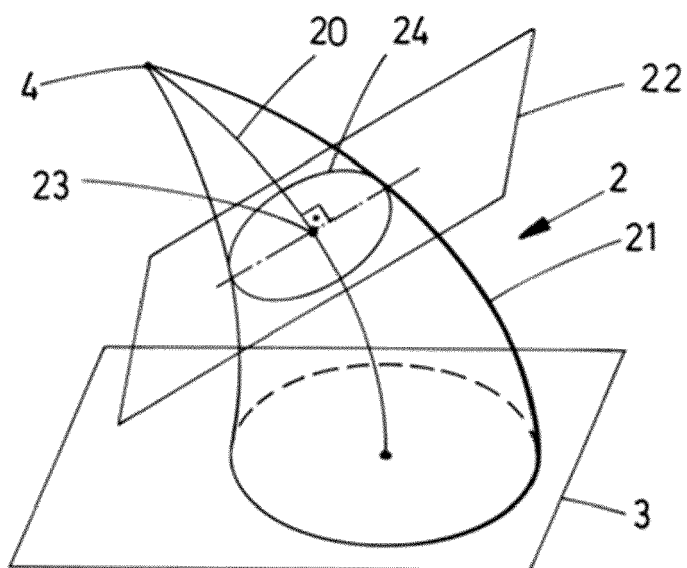


FIG. 2a

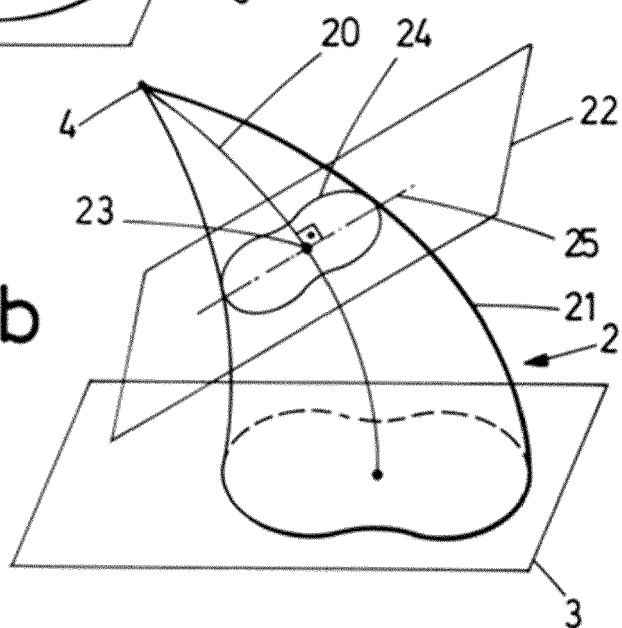


FIG. 2b

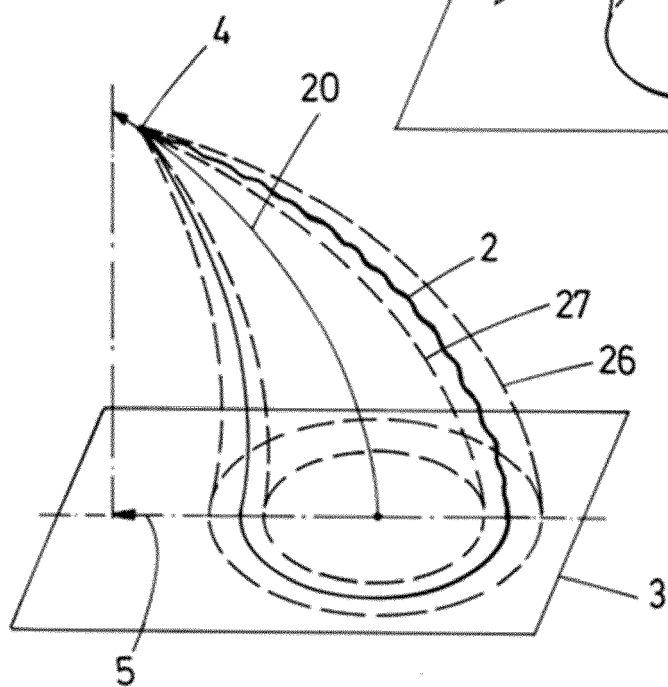


FIG. 3

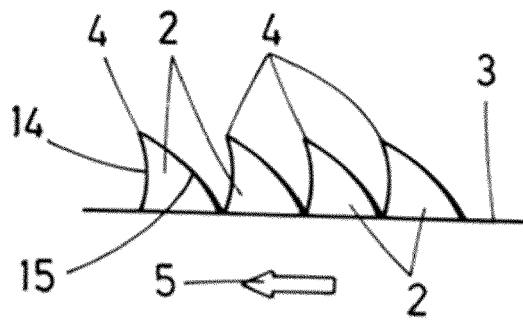


FIG. 4

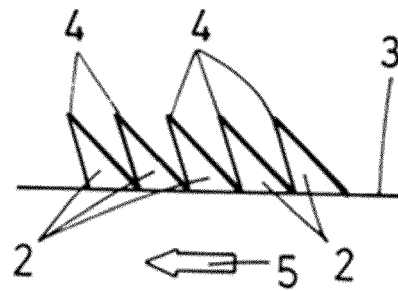


FIG. 5

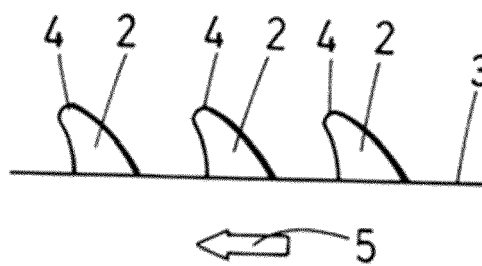
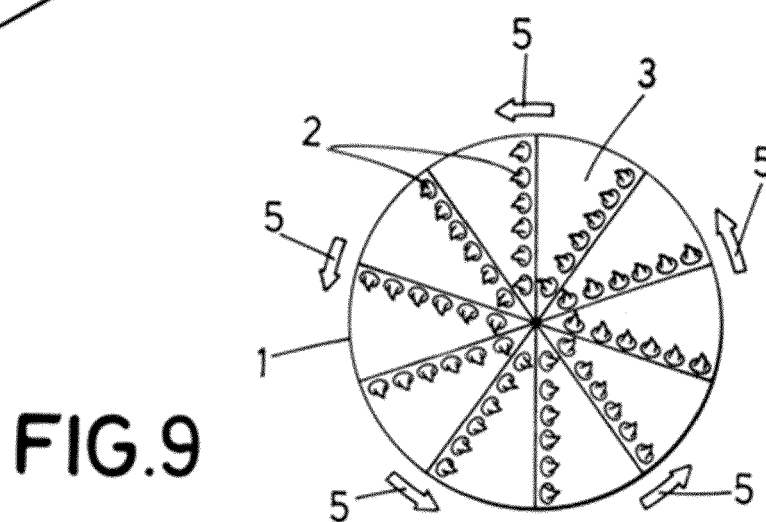
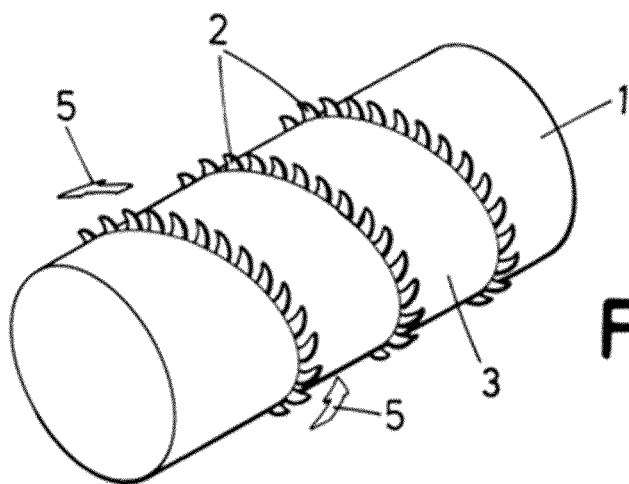
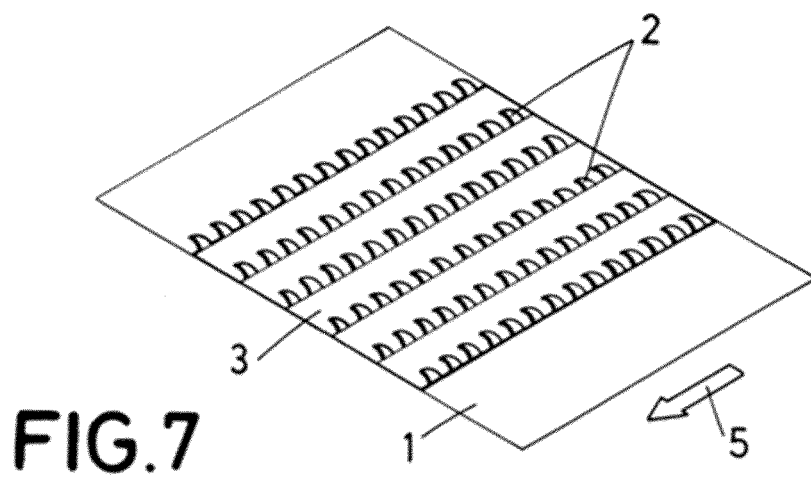


FIG. 6



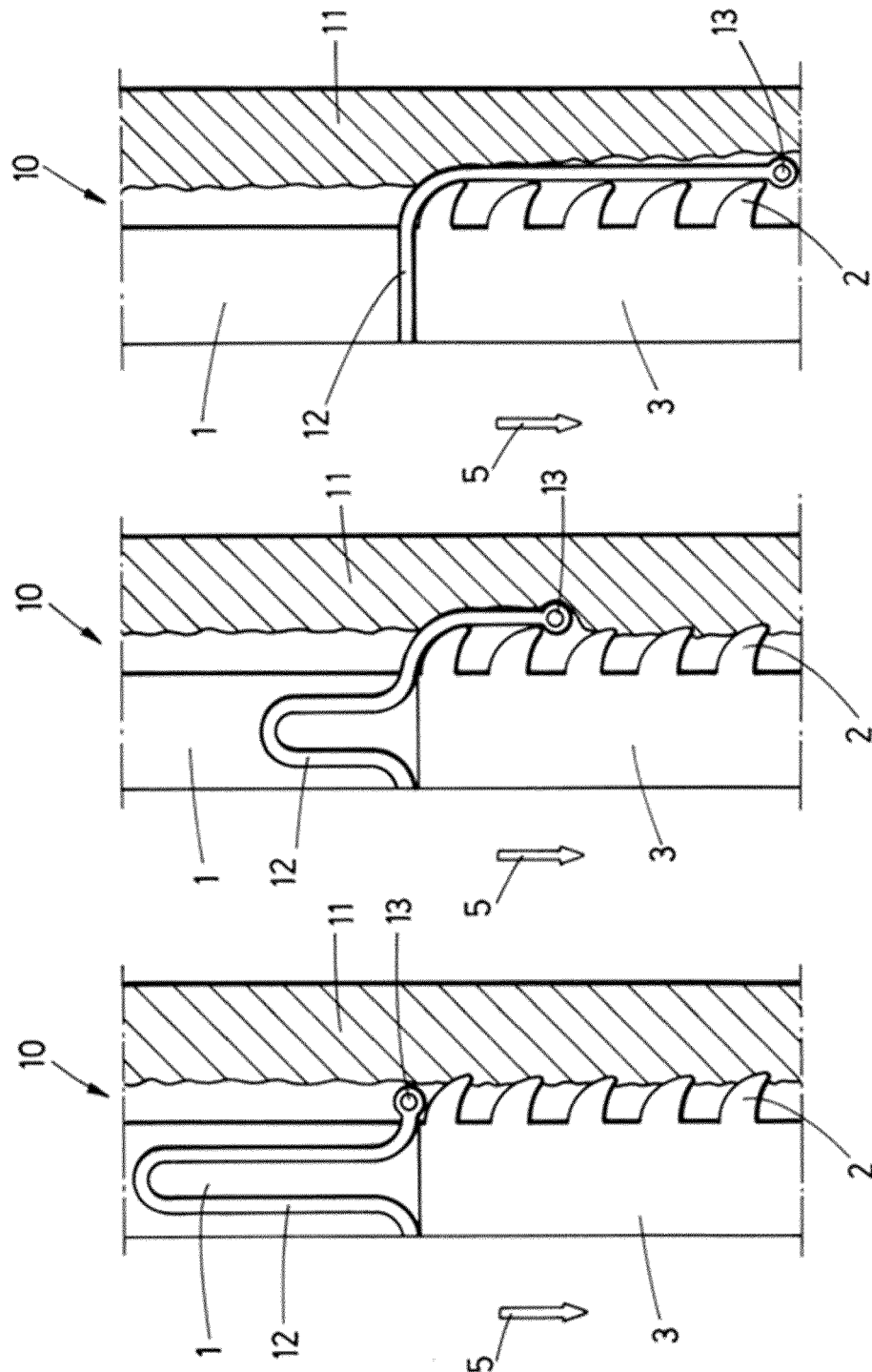


FIG.12

FIG.11

FIG.10



EUROPEAN SEARCH REPORT

Application Number
EP 14 38 2395

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 2012/159747 A1 (FENNELL MICHAEL P [US]) 28 June 2012 (2012-06-28) * the whole document *	1,4-7,9, 10,14 11-13,15	INV. A44B18/00
X	US 2014/102050 A1 (LAMPER ALAN [US]) 17 April 2014 (2014-04-17) * the whole document *	1,9,10, 14	
X	US 3 214 816 A (MATHISON ROBERT V) 2 November 1965 (1965-11-02) * the whole document *	1-5,8, 10,14	
X	DE 32 44 410 A1 (PAFILIS MICHAIL) 13 October 1983 (1983-10-13) * the whole document *	1,7	
X	US 2006/090307 A1 (MCDANIEL MARY L [US] ET AL MCDANIEL MARY LOU [US] ET AL) 4 May 2006 (2006-05-04) * the whole document *	1,2,8-10	
X A	US 3 696 472 A (PERINA JOSEPH ET AL) 10 October 1972 (1972-10-10) * the whole document *	1 10-15	TECHNICAL FIELDS SEARCHED (IPC) A44B F16G F16B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 April 2015	Examiner Debard, Michel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 38 2395

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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16-04-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012159747 A1	28-06-2012	US 2012159747 A1	28-06-2012
		WO 2012092357 A1	05-07-2012
US 2014102050 A1	17-04-2014	NONE	
US 3214816 A	02-11-1965	GB 1022715 A	16-03-1966
		US 3214816 A	02-11-1965
DE 3244410 A1	13-10-1983	NONE	
US 2006090307 A1	04-05-2006	CA 2627362 A1	03-05-2007
		EP 1940335 A1	09-07-2008
		KR 20080063478 A	04-07-2008
		US 2006090307 A1	04-05-2006
		WO 2007050195 A1	03-05-2007
US 3696472 A	10-10-1972	JP S5034982 B1	12-11-1975
		US 3696472 A	10-10-1972

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3009235 A [0006]