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(54) **SKATE FRAME, ROLLER-SKI COMPRISING SAID FRAME AND METHOD FOR MANUFACTURING A SKATE FRAME**

(57) The invention refers to a skate chassis, in particular of a rollerski, comprising a beam with a supporting part for, during its utilization, supporting a user's foot, and fixing means at each beam end to connect at least a wheel. To achieve a skate chassis that absorbs more vibrations during its utilization, the beam has at least a bendable part between the supporting part and at least one of the ends, and the bendable part has a lower stiffness than the supporting part to concentrate the flexion of the beam at the at least one bendable part.

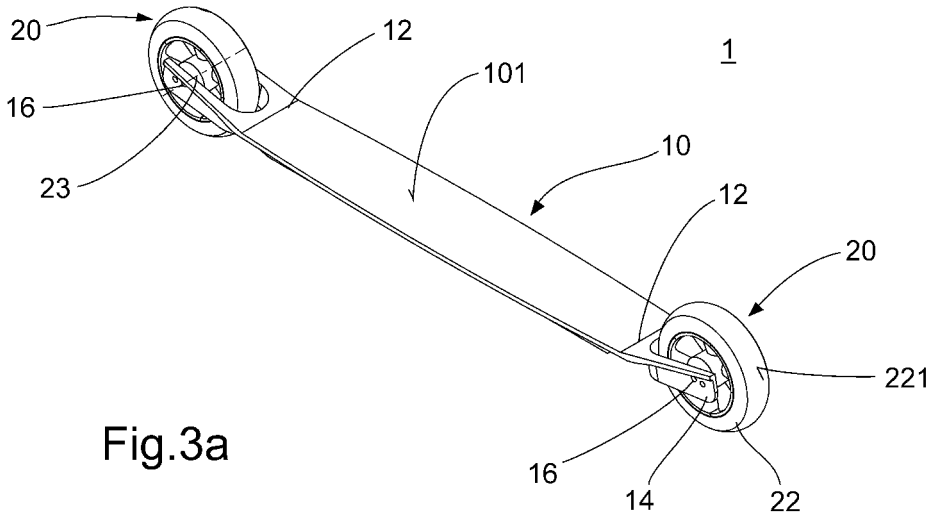

Fig.3a

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Description

[0001] The invention relates to the field of skate chassis, in particular of rollerski chassis, comprising a beam with a supporting part for, while being used, supporting a user's foot, and fixing means at each beam end to connect at least a wheel. The invention also relates to the field of skates of the rollerski type and to the field of manufacturing procedures of skate chassis.

[0002] The patent application WO 2010034695 A1 discloses a rollerski skate of wheels comprising a frame structure operatively connected to at least a rear wheel and a front wheel. The frame structure includes at least a beam member comprising an outer shell with a first non-metal material, and an inner core comprising a second non-metal material.

[0003] The patent DE 102007027002 B4 discloses a rollerski chassis with fixing means for the wheels and a shaped core having at least a glass fibre layer joined to the core, encapsulated by at least a carbon fibre layer. The glass fibre layer is arranged on the top side of the core. The glass fibre layer extends over the entire width of the core.

[0004] The patent application WO2007063068A1 discloses a rollerski having a plurality of rollers and comprising at least a main metal structure to which the rollers are associated in a rotatory manner, and a secondary structure made of non-metal material, that covers the main structure at least partially in such a manner that it absorbs possible vibration stresses.

[0005] Rollerskis are skates usually employed on paths and asphalted roads to practise all modalities of cross-country skiing in those seasons in which there is no snow, or anytime during the year, by those sportsmen who live too far away from snow. Some of these modalities are rollerskis for classical skiing or ski touring having one wheel blocked in one direction and which is also wider and, therefore, the rollerski; "mountain" rollerskis carrying a boot directly coupled with no additional ski fixation and having inflatable wheels; and Alpine rollerskis including fixation and on-slope boot.

[0006] Skis used on snow are flexible since snow is not as compact as asphalt. To achieve that a ski slides well without sinking into the snow, it needs to be adapted to the irregularities of the snow layer and this is achieved being flexible.

[0007] The aforementioned rollerski models are virtually stiff. This implies that the technique and sensations standing on rollerskis differ to a great extent from the technique of skiing on snow. Rollerski users normally suffer from tingling sensation and even knee pains after practising rollerskiing with the models from the state of the art. In addition to that, since these rollerskis are stiff, they are subject to high fatigue loads due to the continuous pushing movement of the foot against the skate towards the ground, repeatedly applying thereby considerable loads on the rollerski body.

[0008] Furthermore, when training, rollerskis with plastic wheels and solid rubber are normally used which, therefore, hardly dampen asphalt roughness and potholes. Due to this fact, high vibrations, which are distributed between the rollerski and the sportsperson's leg, as well as the consequent tingling sensation are caused.

[0009] Due to these vibrations, knee problems may occur in some sportsmen who usually train with rollerskis. Also due to these vibrations, it is more probable that the rollerski body breaks apart due to the fatigue of the materials. The wheels of rollerskis from the state of the art normally have a profile of the surface of contact with the running surface having a curvature radius similar to the width of the tread strip or tyre in such a manner that it is tangent to the main plane of the wheel at the flanges. Therefore, contact with the running surface is the least possible and the wheel turns more quickly.

[0010] It is therefore an object of the present invention to solve the problems of the mentioned state of the art by a skate chassis, in particular of a rollerski skate, having a higher ease of use.

[0011] This object is achieved according to the invention by a skate chassis, in particular of a rollerski, comprising a beam with a supporting part for, during its utilization, supporting a user's foot, and fixing means at each end of the beam to connect at least a wheel, wherein the beam has at least a bendable part between the supporting part and at least one of the ends, and the bendable part has a lower stiffness than the supporting part to concentrate the flexion of the at least one beam at the at least one bendable part.

[0012] The beam is substantially longitudinal and may be composed of a sole element or several longitudinal elements arranged in parallel being joined to one another. The beam has two ends to which fixing means are connected, to which fixing means wheels can be fixed. The beam may extend beyond the ends where the fixing means are arranged. At these extensions can be arranged stabilizing rollers or brake pads. The fixing means may be joined to the beam by means of non-positive mechanical connection elements, such as screws, clips or by welding. The fixing means can be also made in one piece at the ends of the beam. The beam has a supporting part that is substantially stiff and it is where, while using the skate, the user will place his/her foot and on which his/her weight force will be exerted. The beam can have one or several supporting part(s) on which a part of the user's foot can rest. Under the fact that the supporting part is substantially stiff, it is understood that it will not be perceivably deformed by the user's weight or those forces that will be exerted during a regular use of the skate. To absorb at least a part of the vibrations received by the beam and avoid their direct transmission to the user, the beam has at least a bendable part that is preferably a longitudinal portion of the beam or a part of a longitudinal portion of the same that can be arranged anywhere in the beam, preferably close to an end of the same and adjoining to the at least one supporting part or between two supporting parts.

[0013] The bendable part has a lower stiffness than the supporting part, i.e. the stiffness coefficient of the bendable part is lower than the stiffness coefficient of the supporting part. This difference in the stiffness coefficient between both parts of the beam can be achieved by means of a different composition of materials, either due to the fact that they are different such as metal, plastic, rubber, synthetic fibre or that, in spite of being the same material, the beam's configuration is suitable for concentrating the flexion at the bendable part. A configuration of the beam with different materials could be, for example, composed of two supporting parts of hollow aluminium with a bendable part made of rubber interposed between them. Another possibility would be with wooden and/or aluminium films having a different thickness in the bendable part. Then, a skate chassis of this type has the advantage of a higher absorption of vibrations than skate chassis from the state of the art and, besides, the fact that it can concentrate flexion on at least a desired place, providing a higher ease of use to the skate that incorporates said chassis. By means of such a chassis in a rollerski, the rollerski bends at the bendable part of the chassis when the sportsperson pushes downwards with the foot on the supporting part, to lift his/her foot again afterwards, provoking a leaf-spring effect, in the same manner as a ski does and, therefore, achieving thereby that the feeling and the technique are very similar to those when practising cross-country skiing. Another good quality of the bendable part consists in that it absorbs the hits caused by potholes while skating, thereby absorbing a part of the vibration produced by the ground's roughness.

[0014] In a preferred embodiment, the averaged cross-section of the bendable part is smaller than the averaged cross-section of the supporting part. The cross-section is a section perpendicular to the longitudinal axis of the skate chassis. Then, the averaged cross-section is an average of the cross-sections crossing any of the parts of the skate chassis. In this manner, you can localize in an easier way the flexion at the beam, both at a beam made of a sole material and at a beam made of different materials having a break-proof reinforcement on the bendable part, as an example, a beam made of synthetic fibre that has a narrowing in the bendable part and a film of aluminium or another material of a higher stiffness, longitudinally arranged at least at the bendable part and at least at a portion of the supporting part, preferably at the entire beam.

[0015] To guarantee a flexion that better absorbs vibrations, it is provided that the beam has at least a bendable part between the supporting part and each of the ends, more preferably two bendable parts in the entire beam, these bendable parts being arranged on each side of the supporting part and close to the ends of the beam. Preferably, the supporting part has a length equal to or longer than a user's foot, so that the bendable parts remain outside the footprint while using the skate. With such a rollerski skate's chassis, a flexion is achieved during its utilization which is more pronounced than in the rest of types of rollerski chassis, the footstep supporting part being maintained stiff at the same time. In this manner, a better simulation of the effect of snow under the feet is achieved, creating thereby the effect consisting in that the snow sinks when you push the skate chassis.

[0016] Alternatively, the fixing means are made in one piece at least at one of the beam ends, more preferably at both beam ends. The invention thereby provides a monocoque skate chassis in one piece to which the wheels and fixations of the boot or the boot itself, depending upon the skate model, are connected. Since the entire skate chassis is made in one piece, the possibilities of breakage of the same are reduced and screws and complex elements making its weight increase are avoided.

[0017] To guarantee that the foot better rests on the skate chassis, the top surface of the beam is substantially flat, the object of being similar to a ski and a better installation of the boot fixation being thereby achieved. Alternatively, the top surface curves upwards in a zone between the supporting part and the end of the beam. At least one of the ends of the beam curves upwards in a portion in which the bendable part is located. The skate chassis is curved at its ends in such a manner that the supporting part is placed at a lower height than the ends or than at least one of the ends. So, it is achieved that the foot sole is closer to the running surface, providing thereby more stability to the user. If only one of the ends is curved upwards, the diameter of the wheels could be different in order to maintain horizontality of the top surface of the chassis.

[0018] Furthermore, the lower surface of the beam is substantially U-shaped, in particular in the supporting part. Thus, a better support of the boot is achieved, particularly due to the larger width of the top surface without compromising the inclination of the skate chassis, since the largest width of the chassis is given on the top surface. This U-shaped section can be completely semi-circular or trapezoidal to achieve in this manner a longer durability since scraping on the lower surface is reduced, which is caused during use when the skate is laid down on the rolling axis. A lower surface of the chassis with a section of sharp edges has the drawback that, while skating, said edges constantly rub weakening the structure. With a skate chassis according to the invention, it is achieved that rubbing is reduced or distributed among different points on the lower surface so that continuous wearing on a same zone is thereby avoided.

[0019] To increase the section of the beam and, thus, its section's moment of inertia, the beam has a longitudinal element extending in the rolling direction of the skate chassis at least over a portion of the supporting part. This longitudinal element can be made of a material such as high-density foam, PVC, wood, polystyrene, thermoplastic, glass fibre or the like, providing the skate chassis with a structure. It can be of a variable section, its section being reduced in the bendable part and increased in the supporting part with a U-shaped section.

This U-shaped section, as mentioned above, provides a longer durability, since it distributes rubbing instead of concentrating it at the corners such as in chassis with edges. If the foot is localized only on the supporting part of the beam, it increases its section's moment of inertia, stiffening thereby this part while, due to the own features of the element and if it is made of high-density foam, it absorbs a part of the vibrations received by the skate during its use.

[0020] In a preferred embodiment, the skate chassis is made, at least in part, of a synthetic fibre, such as carbon fibre or aramid fibre. The fact that the flexion zone is made of synthetic fibre, in particular carbon fibre, is due to the fact that this material provides extraordinary flexion properties, having a high long-term fatigue resistance. Synthetic fibre can be present in the form of threads or strands or strips of synthetic fibre and arranged in longitudinal direction of the skate chassis. Alternatively or in combination with the fibre threads, the synthetic fibre can be present in the form of a fabric having a thickness that may vary depending upon the type of fabric.

[0021] The skate chassis is preferably made in one piece (monocoque), including the fixing means for connecting the wheels, which are preferably hairpin-shaped. In this manner, it has the advantage that the entire skate chassis is made at once in one piece, so that the entire skate consists of the skate chassis, the wheels and a system of rolling axes that can include screws, bearing, spacers and/or axis. A skate chassis made of synthetic fibre is more resistant to the passing of time.

[0022] To make a bendable part having more breaking resistance, it is proposed that the synthetic fibre is arranged in the form of stacked layers and the bendable part has more stacked layers than the supporting part, i.e. the bendable part has a higher amount of synthetic fibre per section than the supporting part. Preferably, the synthetic fibre is present in the form of fabrics that can be handled more easily while manufacturing the chassis.

[0023] Then, a skate chassis with a bendable part arranged between the supporting part and the wheel's hairpins is achieved. Thus, the bendable part is a synthetic fibre block thicker than the remaining parts of the chassis. In this manner, it is achieved that the lower inertia of the section of the bendable part is compensated and a highly fatigue-resistant bendable part is provided.

[0024] It is also possible to control the flexion of the chassis at the bendable part depending upon the amount of synthetic fibre applied and, thus, the chassis is adaptable as desired and/or to the skier's weight by variation of the number of synthetic fibre layers in the bendable part. A user of a higher weight will be able to use the skate with the bendable part being more stiff since there is more synthetic fibre in the bendable part, and a user of a lower weight will be able to use another skate with the bendable part having a lower amount of synthetic fibre and being less stiff, both of them having the same deflection.

[0025] The hairpin-shaped fixing means can be made with a U-curved synthetic fibre film perpendicular to the beam enclosing the wheel in a protecting manner and extending downwards so as to receive the positioning element for the wheel. This perpendicular film provides the hairpin with the necessary stiffness to ensure the correct fixation of the wheel and so achieve that you do not lose torsional control of the skate due to an inappropriate flexibility.

[0026] Alternatively, the synthetic fibre encloses the longitudinal element at least partially, at least in the longitudinal direction of the beam. Thus, the longitudinal element shapes a chassis core that provides more stability.

[0027] Another aspect of the present invention consists in providing a rollerski that solves the problems of rollerskis from the state of the art, which is more comfortable for the user.

[0028] This object is achieved by a rollerski comprising a skate chassis according to the invention, and in which the fixing means is preferably hairpin-shaped with a positioning element, preferably a positioning opening, to which a wheel is connected by means of a rotation axis of the wheel. The positioning element can be an opening drilled into the hairpin, to which the wheel is connected by means of a rotation axis. It can also be an additional element interposed between the hairpin and the wheel tied to the hairpin by pressure or non-positive connection. The positioning element can have at least two fixing positions of the axis spaced apart from one another in longitudinal direction of the beam, to which the rotation axis of the wheel can be connected to bring the wheels closer to the supporting part or distance them from it. The easiest manner consists in providing a hairpin with drilled openings in different positions to place the wheel at a different distance in longitudinal direction from the supporting part. This is advantageous to increase or reduce flexibility of the bendable part as the distance of the supporting force from the bendable part is increased or reduced. When the wheel axis is brought closer to the bendable part, the flexion will be lower for a same weight supported by the rollerski and vice-versa.

[0029] Another aspect of the present invention is providing a simplified manufacturing procedure of a skate chassis according to the invention. This object is achieved by a manufacturing procedure of skate chassis made of synthetic fibre comprising the steps of placing at least a first layer of synthetic fibre on a mould surface of a mould, placing a longitudinal element on the at least one first layer of synthetic fibre, covering, at least partially, the longitudinal element with at least a second layer of synthetic fibre, placing at least a third layer of synthetic fibre on the mould or on the at least one second layer or between the first or second layers, on at least the bendable part, soaking the set with resin, preferably with epoxy resin before or after closing the mould lid, and waiting until a resin drying time has expired.

[0030] The at least one first layer of synthetic fibre is the one that will shape the top surface of the skate chassis. The third layer of synthetic fibre can advantageously

be formed of several layers interposed between the first or second layers of synthetic fibre and even directly on the mould or on the second layers of synthetic fibre, i.e. it is not necessary to place the third layers together between the first and the second layers of synthetic fibre. It would be ideal to place them among the rest of layers of synthetic fibre. The longitudinal element is placed on the first layers of synthetic fibre and possibly on the end of a third layer of synthetic fibre and, after that, it is covered by the second layers of synthetic fibre and possibly by the end of a third layer of synthetic fibre.

[0031] The synthetic fibre can be present in the form of threads of synthetic fibre and arranged in longitudinal direction of the skate chassis. To form a layer, a plurality of threads arranged in parallel will cover at least a part of the surface of the skate chassis. If a first layer is formed by several first layers, the threads of synthetic fibre will accumulate on one another.

[0032] Alternatively, the synthetic fibre is present in the form of a fabric having a thickness that may vary depending upon the type of fabric. In this case, a fabric will represent a layer and has the advantage of an easier handling. As an example, if the skate chassis is manufactured with conventional fabrics of carbon fibre of a medium thickness, it is possible to place from 1 to 10 fabrics as first layers, preferably 4 fabrics of carbon fibre. The number of carbon fibre fabrics as second layers of carbon fibre may vary from 1 to 10 fabrics, preferably 4 fabrics of carbon fibre. The number of carbon fibre fabrics as third layers of carbon fibre may vary from the double to the quadruple of the sum of carbon fibre fabrics that have been arranged as first and second layers of carbon fibre varying from 1 to 80 fabrics. The thicker the fabrics are, the fewer will be needed. This type of fibres is easily soaked with a binding material of the type resin, preferably epoxy resin, providing a high compactness to the skate chassis. By such a procedure, a skate chassis according to the invention is achieved in an easier manner than a chassis from the state of the art.

[0033] Finally, once the binding material is dry, the edges of the skate chassis are profiled by, for example, machining, and the fixing means are connected if they are not made in one piece with the beam and, if they are, the positioning element is provided either by machining the bores or connecting them to the hairpins.

[0034] An element of great importance in rollerski skates is the wheel, its wheel rim, and its tread profile. The wheel consists of a wheel rim, preferably of injected plastic, this being preferably reinforced with glass fibre.

[0035] The wheel comprises a lenticular rim having an axis part for the connection to a rotation axis and a tread part for the connection to the tread strip or tyre, which are connected to one another by means of an undulated film, preferably a continuous film and preferably with no openings in axial direction. This configuration provides more stiffness due to its lower weight and a higher fatigue and tension resistance due to its low concentration of tension. Said film is curved in an undulated manner in the wheel plane to give flexural rigidity to the set. The number of undulations on the wheel rim as well as the diameter and length of the same may vary, stiffness being increased with them. The undulation can preferably be constant, i.e. for example, there is a complete undulation under a 120° angle and, therefore, the film would have 3 undulations in total, but this is not indispensable. The number of undulations may depend upon the rim radius. The larger the radius is, the more undulations it can have. On the rollerski wheel according to the invention, there are from 3 to 15 undulations, preferably 5 undulations.

[0036] This rim profile is also applicable to wheel rims in other type of vehicles (skates, cars,...) and even for pulleys.

[0037] The tread strip or tyre is preferably of rubber or the like in the wheel of the rollerski skate. It has a profile of contact with the running surface having a curvature radius larger than the width of the tread strip. In the case of the described wheel, the curvature radius of the tread strip will be larger, since it has been observed that it is how wheels look when they wear down during normal practise of this sport. The reason for this is the early wear of usual wheels until they reach a flatter profile. By directly designing the wheel with this profile, the utilization of the original rubber is optimized. On the other hand, the larger the curvature radius of the tread strip is, the larger the contact area with the ground is and the slower the rolling is, which is a desired feature in rollerskis. This profile offers a speed of rotation that is more constant along its entire lifetime, since the wheel profile remains constant while wear occurs. In this manner, going downhill is safer for the user and trainings are more homogenous.

[0038] There is less initial wear of the wheel, since its footprint is more uniform and similar to the shape it acquires as it wears down. This allows the design of a wheel either having a longer durability for the same weight of rubber than a usual wheel, or having the same durability with a lower weight, since rubber is utilized in a more efficient manner.

[0039] Other advantages derive from the following description of the figures. In the figures, an exemplary embodiment of the invention is shown. The figures, the description and the patent claims contain many features in combination. Advantageously, the expert shall also consider said features separately and join them in other appropriate combinations.

[0040] It is shown:

Figure 1 a	shows a plan view of a skate chassis according to the invention,
Figure 1b	shows a side elevation of a skate chassis according to figure 1 a,
Figure 1c	shows a bottom view of a skate chassis according to figure 1 a,
Figure 2a	shows the A-A section in figure 1 a,
Figure 2b	shows the B-B section in figure 1b,
Figure 2c	shows the C-C section in figure 1c,
Figure 3a	shows a perspective view of a rollerski ac-

cording to the invention,

Figure 3b shows a side elevation of the rollerski in figure 3a,

Figure 4 shows a perspective view of the synthetic fibre layers forming the skate chassis,

Figure 5a shows a wheel rim for the rollerski according to the invention,

Figure 5b shows a wheel rim of the rollerski according to figure 3a with a detailed section,

Figure 5c shows a wheel rim of the rollerski according to figure 3a with a detailed enlargement,

Figure 6a shows a perspective view of a wheel tread strip for a rollerski according to the invention,

Figure 6b shows a side elevation of the tread strip in figure 6a, and

Figure 6c shows the E-E section of the tread strip in figure 6a.

[0041] Figure 1 a shows a plan view of a skate chassis 10 according to the invention. Figures 1b and 1c show side and bottom elevations of the same skate. This skate chassis is made of a monocoque piece of carbon fibre, the beam 11 and hairpin-shaped fixing means 14 being integrated. The beam 11 is formed by a supporting part 13 and two bendable parts 12. The bendable parts 12 are arranged on each side of the supporting part 13 at both ends 111 and 112 of the beam 11 between the supporting part 13 and each of the hairpins 14. The hairpins 14 open over a distance sufficient to receive the wheels 20 (see figures 3a and 3b) and have a protector 17 that extends downwards enclosing a part of the wheels 20. On the top part specular to the protector, a bumper subsequently adhered with, for example, Velcro®, or by a clip-type positive-fitting fixation, can be mounted, although it can be also made in one piece of the same material.

[0042] The supporting part has a flat top surface 101 and its width suffices to support a user's foot tied to it by means of a fixation of a cross-country skiing boot (not shown). The lower surface 102 has a U-curved shape (see B-B section in fig. 2b), there being no edges at the lower part of the chassis. The top surface of the chassis curves upwards in the zone of the fixing means 14 in such a manner that the top surface 101 remains under the parallel plane that extends through the positioning elements 16 having the fixing positions 161 and 162 of the wheels. Inside the supporting part 13, there is a longitudinal element 15 in the manner of a high-density foam core.

[0043] This longitudinal element 15 can be seen more in detail in figures 2a and 2b which are sections of the skate chassis according to figures 1a and 1b, respectively. In the sections in figures 2b and 2c, it can be seen in detail that the thickness of the carbon fibre layers in the bendable part 12 is larger than the sum of them in the supporting part 13. The supporting part contains the longitudinal element 15 of high-density foam in its interior to increase its area moment of inertia and make it stiff in comparison with the bendable part 12. The fixing means 14 have a positioning element 16 that is formed by two fixing positions 161 and 162 that allow a fixation of the wheel 20 closer to the supporting part 13 in the case of fixing position 161, or further away from the supporting part 13 in the case of fixing position 162.

[0044] In figures 3a and 3b, a rollerski skate 1 with the chassis of the preceding figures is shown. Here, the wheels 20 mounted in the inner fixing positions 161 are shown. The wheels comprise a wheel rim 21 and a tread strip 22 having a profile of contact 221 with a radius larger than the width of the tread strip 22.

[0045] Figure 4 shows in an exploded view an embodiment of the arrangement of the carbon fibre fabrics 31, 32 and 33 during the manufacturing procedure of the skate chassis.

[0046] For the manufacture, carbon fibre fabrics are stacked and a longitudinal element 15 of high-density stiff foam is placed in the middle. To make said longitudinal element 15, foam sheets of 0,5 cm to 8 cm thickness are used and the desired shape is achieved by means of a milling cutter.

[0047] The mould will give the rollerski the desired shape. In this exemplary embodiment, the surface of the mould 40 on which the first layers 31 are stacked will be the top surface 101 of the skate chassis. Firstly, four fabrics of carbon fibre are placed on top of one another. All these first fabrics will cover the mould 40 entirely. Once you have the foam longitudinal element 15, the first carbon fibre fabrics 31 are stacked on the surface of the mould 40 and, subsequently, the longitudinal element 15 is stacked on them. The longitudinal element is placed on the first carbon fibre fabrics in the middle of the mould. Consecutively, the third layers 33 of carbon fibre fabric are arranged covering at least the bendable part 12. The number of these third fabrics 33 will be variable depending upon the weight of the prospective user of the skate. As an example, 12 fabrics for a 55 kg user, or 22 fabrics for a 90 kg user. To finish, approximately four second fabrics 32 of carbon fibre are applied, which will cover the entire or at least a part of the longitudinal element 15. The third fabrics 33 can be arranged between the first fabrics and the second fabrics as well as all of them or a part of them directly arranged on the mould or all or a part of them on the second fabrics. It is also possible to interpose some layer of metal, plastic, wood, glass fibre or other material or fibre in between the carbon fibre fabrics at least in the bendable part to improve the resistance to flexion.

[0048] Subsequently, the whole is covered with epoxy resin in such a manner that all carbon fibre fabrics 31, 32 and 33 and the longitudinal element 15 are impregnated. Once the resin is solidified, it will be removed from the mould and the chassis edges will be profiled to provide the desired form and make the positioning elements 16 for the wheels.

[0049] Figure 5a shows a wheel rim 21 of a wheel 20 with an axis part 211 and a tread part 212 and, joining them, a film 213 with three complete undulations equally distributed along the entire rotation amplitude of the rim, i.e. each undulation occupies 120°. Figure 5b shows another wheel rim 21 with five complete undulations of its film 213 and the D-D section of the same, where a detail of the undulation can be seen. Figure 5c shows a wheel rim of figure 5b, where the undulations of film 213 in contact with the axis part 211 and the tread part 212 are shown in dashed line.

[0050] Figure 6a shows a perspective view of a tread strip 22 having a profile of contact 221 with the running surface. Figure 6b shows a side elevation of the same tread strip and figure 6c shows the E-E section of the same, in which it can be observed that the radius of the profile of contact 221 is much larger than the width of the tread strip 22.

List of reference numerals

[0051]

1	Rollerski
10	Skate chassis
11	Beam
12	Bendable part
13	Supporting part
14	Fixing means
111, 112	Beam end
221	Profile of contact
101	Top surface
102	Lower surface
15	Longitudinal element
16	Positioning element
161, 162	Fixing positions
20	Wheel
21	Wheel rim
211	Axis part
212	Tread part
213	Film
22	Tread strip
23	Rotation axis
31	First layer
32	Second layer
33	Third layer
40	Mould

Claims

1. A skate chassis (10), in particular of a rollerski (1), comprising a beam (11) with a supporting part (13) for, during its utilization, supporting a user's foot, and fixing means (14) at each beam end (111, 112) to connect at least a wheel (20), **characterized in that** the beam (11) has at least a bendable part (12) between the supporting part (13) and at least one of the ends (111, 112), and that the bendable part (12) has a lower stiffness than the supporting part to concentrate the flexion of the beam (11) at the at least one bendable part (12).

2. The skate chassis according to claim 1, **characterized in that** the averaged cross-section of the bendable part (12) is smaller than the averaged cross-section of the supporting part (13).

3. The skate chassis according to one of the preceding claims, **characterized in that** the beam (11) has at least a bendable part (12) between the supporting part (13) and each of the ends (111, 112).

4. The skate chassis according to one of the preceding claims, **characterized in that** the fixing means (14) are made in one piece at least at one of the beam ends (111,112).

5. The skate chassis according to one of the preceding claims, **characterized in that** the top surface (101) of the beam is substantially flat and preferably curved upwards in a zone between the supporting part (13) and at least one of its ends (111, 112), and more preferably curved upwards in a zone where the bendable part (12) is located.

6. The skate chassis according to one of the preceding claims, **characterized in that** the lower surface (102) of the beam is substantially U-shaped, in particular in the supporting part (13).

7. The skate chassis according to one of the preceding claims, **characterized in that** the beam (11) has a longitudinal element (15) extending at least over a portion of the supporting part (13).

8. The skate chassis according to one of the preceding claims, **characterized in that** it is made, at least in part, of a synthetic fibre, such as carbon fibre and/or aramid fibre.

9. The skate chassis according to claim 8, **characterized in that** the synthetic fibre is arranged in the form of stacked layers (31, 32, 33), in particular in the form of stacked fabrics of synthetic fibre, and the bendable part (12) has more stacked layers than the supporting part (13) to increase its resistance.

10. The skate chassis according to claim 8 or 9, **characterized in that** the bendable part (12) has a higher amount of synthetic fibre per section than the supporting part (13).

11. The skate chassis according to one of claims 8 to 10, **characterized in that** the synthetic fibres enclose the longitudinal element (15) at least partially.

12. A rollerski (1) comprising a skate chassis (10) according to one of the preceding claims, **characterized in that** the fixing means (14) is preferably hair-pin-shaped with a positioning element (16), preferably a positioning opening, to which a wheel (20) is connected by means of a rotation axis (23) of the wheel.

13. The rollerski (1) according to claim 12, **characterized in that** the positioning element (16) has at least two fixing positions (161, 162) of the axis spaced apart from one another in longitudinal direction of the beam (11), to which the rotation axis (23) of the wheel can be connected to bring the wheels (20) closer to the supporting part (13) or distance them from it.

14. A manufacturing procedure of a skate chassis (10) according to one of claims 8 to 11, **characterized in that** it comprises the steps of:

- placing at least a first layer of synthetic fibre on a mould surface of a mould (40),
- placing a longitudinal element on the at least one first layer of synthetic fibre,
- covering, at least partially, the longitudinal element with at least a second layer of synthetic fibre,
- placing at least a third layer of synthetic fibre on at least part of the bendable part,
- soaking the set with resin, preferably with epoxy resin before or after,
- closing the mould lid, and
- waiting until a resin drying time has expired.

15. The manufacturing procedure of a skate chassis according to claim 14, **characterized in**, once the resin is dry,

- profiling the chassis edges, and
- putting the positioning element into proportion.

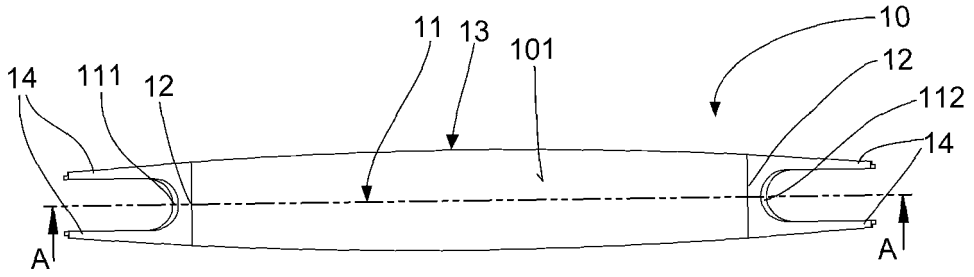


Fig.1a

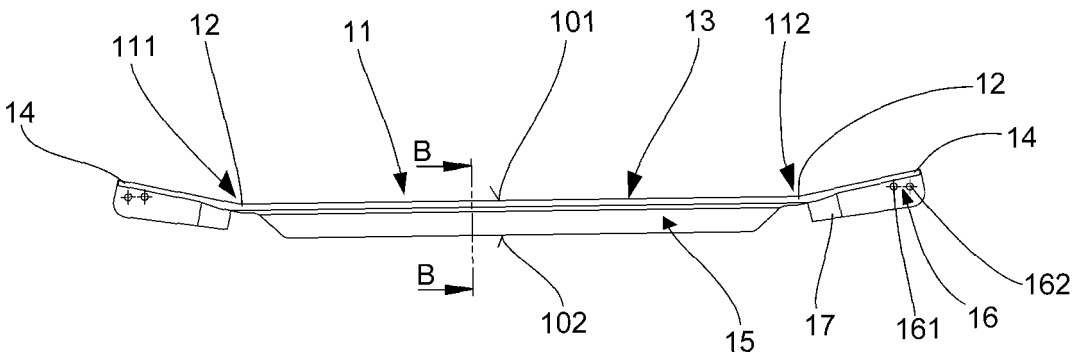


Fig.1b

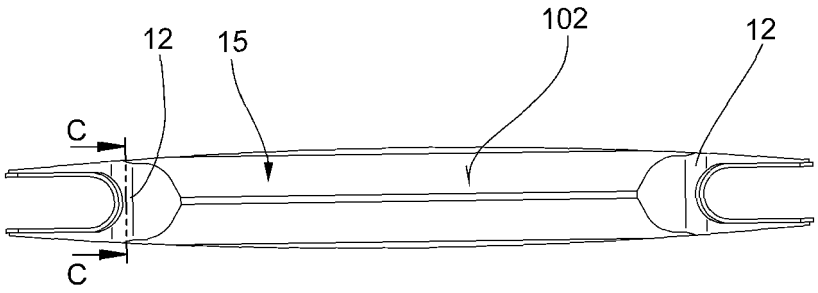


Fig.1c

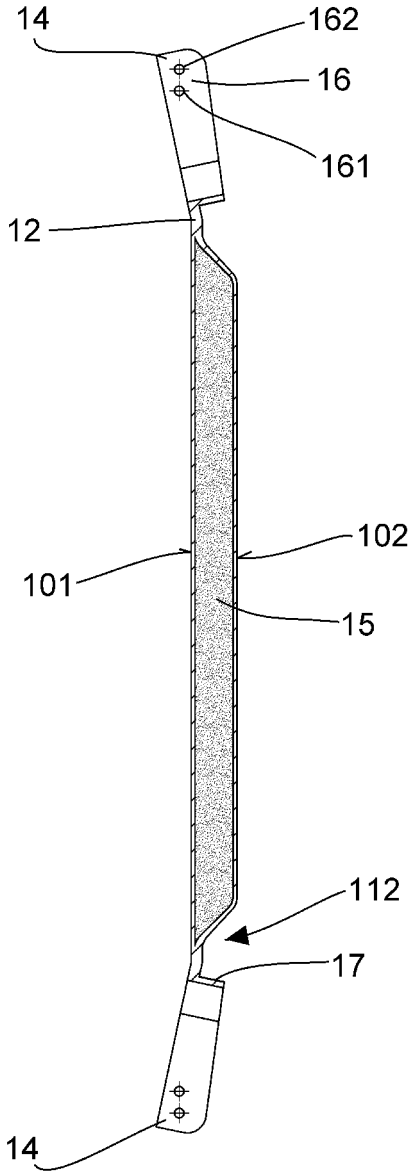


Fig.2a

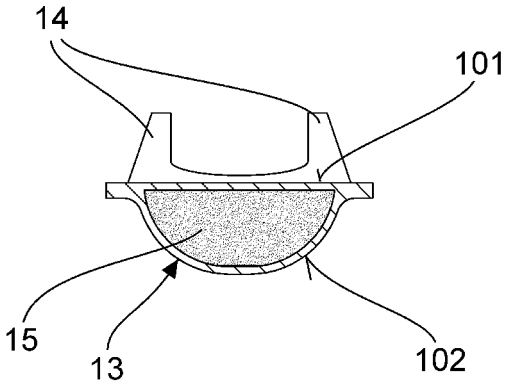


Fig.2b

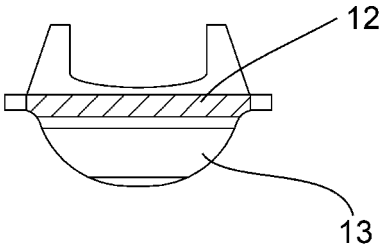
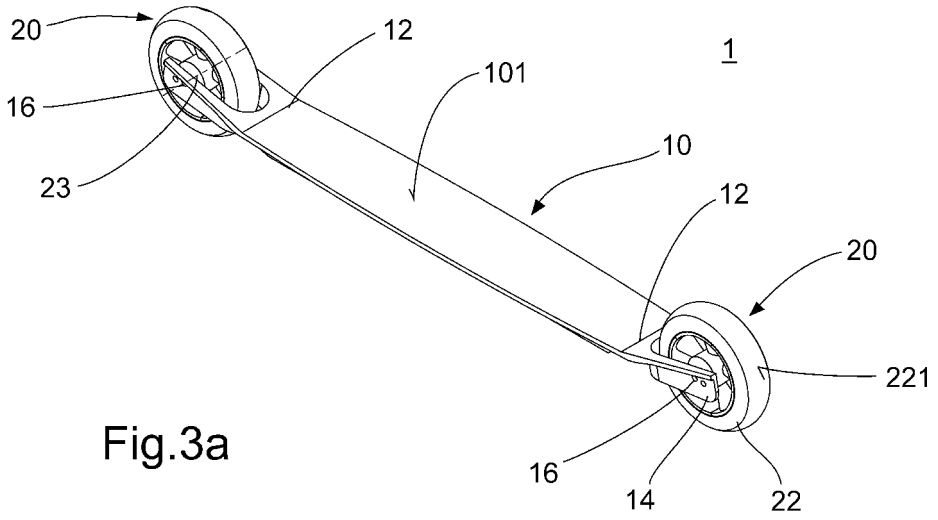


Fig.2c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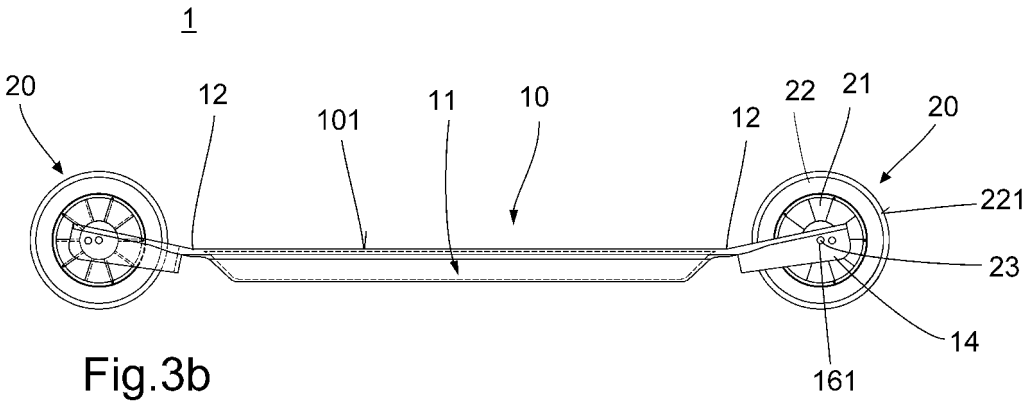
16
14
22

Fig.3a


1
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101
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221
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161

Fig.3b

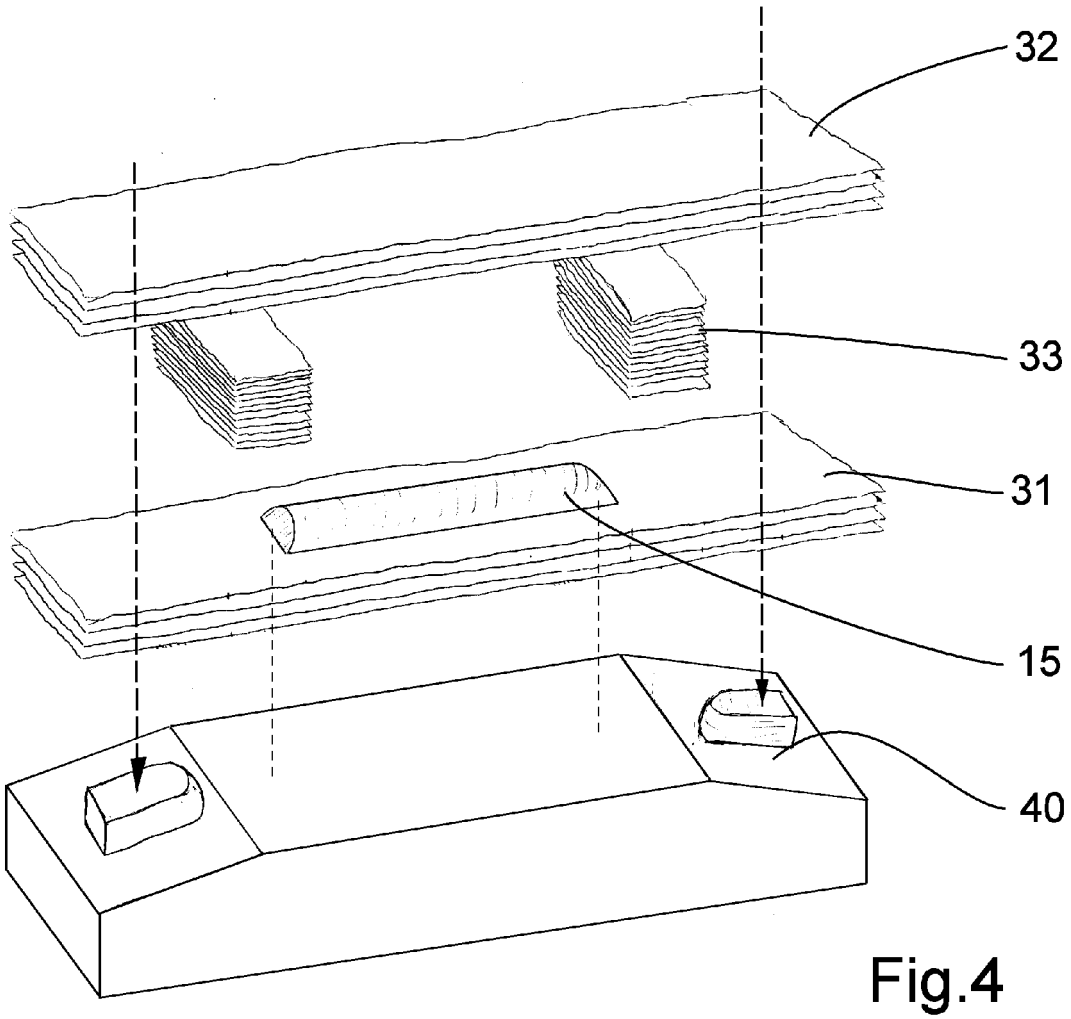

Fig.4

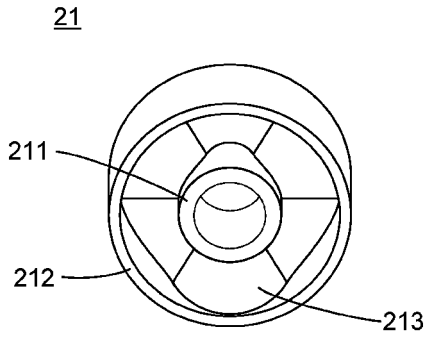

Fig.5a

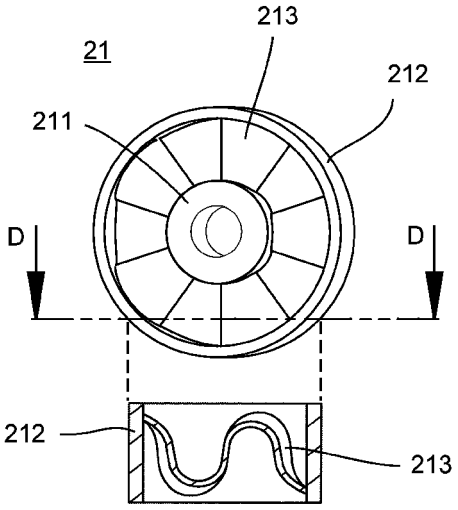

Fig.5b

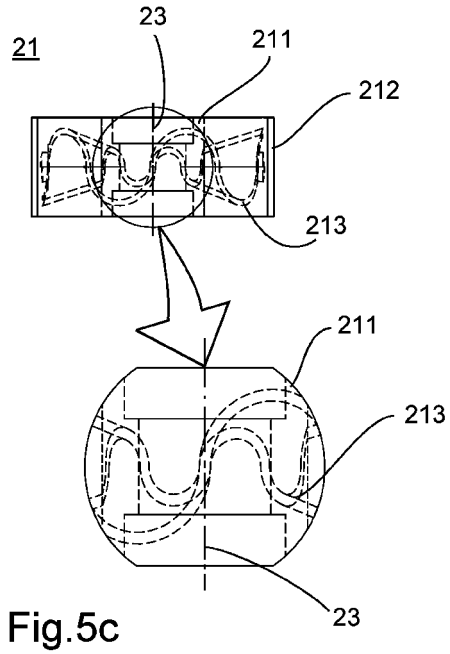

Fig.5c

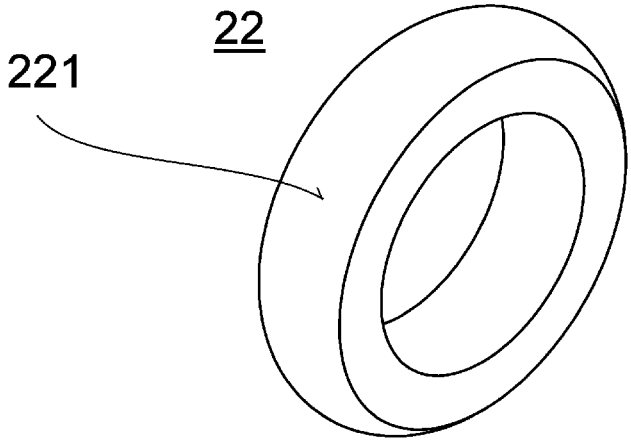

Fig.6a

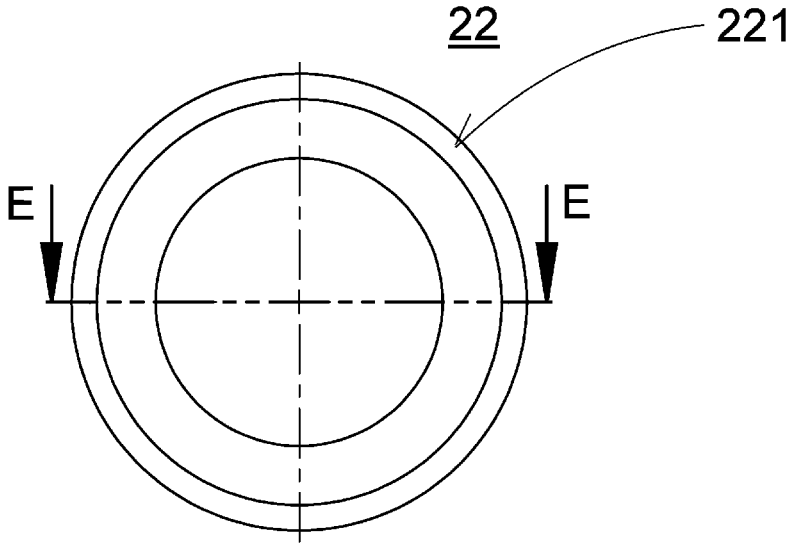

Fig.6b

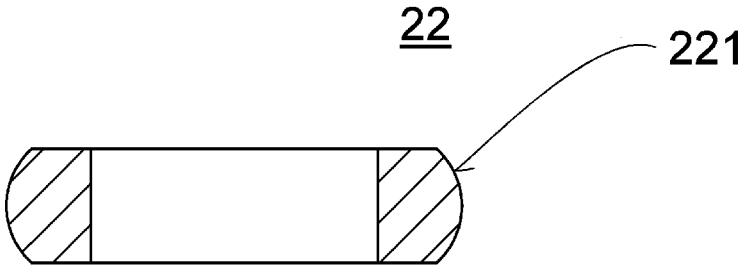

Fig.6c

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2014/070918

A. CLASSIFICATION OF SUBJECT MATTER

A63C17/04 (2006.01)
A63C5/035 (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)
A63C

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)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010143217 A1 (BOLDITALIA S R L ET AL.) 16/12/2010, page 2, lines 9 - 21; page 3, line 24 - page 5, line 2; figures 1 - 2. figures 13 - 15.	1-15
X	WO 2013134857 A1 (PARENT ALAIN ET AL.) 19/09/2013, paragraphs [1]; [6 - 7]; [13]; [30 - 31]; [34]; figures 1 - 3.	1-3, 5-15
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
13/03/2015	**(16/03/2015)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer S. De Miguel De Santos Telephone No. 91 3493270

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2014/070918

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4295656 A (MOORE ARLAN G) 20/10/1981, column 1, lines 50 - 68; column 2, lines 25 - 35; column 2, lines 44 - 46; figures 1 - 2, 4.	1,6, 8-10
A	DE 102007027002 A1 (NORDIC PRO GMBH) 18/12/2008, Abstract from DataBase WPI. Retrieved of Epoquenet. Accession Number, an: 2009-A38848. Figures 2 - 3.	6
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2014/070918

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2010034695 A1 **[0002]**
- DE 102007027002 B4 **[0003]**
- WO 2007063068 A1 **[0004]**