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(54) Title: A SNOWBOARD BINDING AND A SNOWBOARD

(57) Abstract: The invention concerns a snowboard binding (1) comprising a snowboard anchor element (2), a boot anchor element (3) and at least one pivot mechanism (4) pivotally coupling the snowboard anchor element (2) and the boot anchor element (3) to allow pivoting of the boot anchor element (3) with respect to the snowboard anchor element (2). It also concerns a snowboard adapted for this binding.

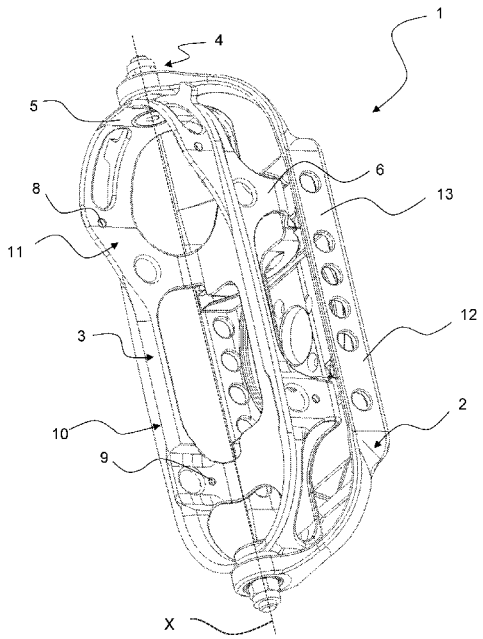

Figure 1

A SNOWBOARD BINDING AND A SNOWBOARD

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FIELD OF THE INVENTION

The present disclosure relates to a binding for holding a boot securely attached to a snowboard as well as to a snowboard suitable for improving fun and entertainment when using said snowboard binding.

STATE OF THE ART

Snowboarding is an activity and sport enjoyed throughout the world. The equipment used for snowboarding includes a snowboard, snowboard boots and snowboard bindings mounted on the snowboard and used to secure the snowboarding boots worn by a snowboarder.

The snowboard bindings are direct connection to the snowboard and their task is to transfer energy of the rider's body and his/her muscle movements to the snowboard in order to help the rider to control his/her board. The bindings are key component of the snowboard and can enhance the riding experience or ruin it if a wrong binding is used. When choosing the bindings, a rider has to consider his riding style and preferences.

The most of the known snowboard binding designs provide a stiff connection between the boot and the snowboard thereby making it uncomfortable to ride. The common soft binding is also uncomfortable on the ski lift.

US 5,855,390 discloses a laterally flexible snowboard binding system that enables the rider to have good rotation of the body toward the front of the board. The snowboard binding system comprises a snowboard anchor plate, a boot anchor plate, a biasing unit and a locking unit. The snowboard anchor plate is attached on one side to the biasing unit and on the other side to the locking unit. The biasing unit is made up of a hinge and coil spring. The locking unit is releasable by the snowboard rider for maintaining the snowboard anchor plate and the boot anchor plate in a substantially parallel relationship, except when the locking means is released by the snowboard rider. This snowboard binding provides a certain freedom for the rider with respect to the board and allows the rider to adjust the pitch of the binding so that the front and rear legs

are more parallel with the snowboard.

This known pivoting snowboard binding has the pivot, i.e., the biasing unit, at the level of the top of the board to the side of the foot. The mechanism cannot support weight and also pivot. Furthermore, the existing pivot works in an on/off mode such that the pivot is only active during jumps or on the ski lift. Most of the time it acts like a normal snowboard without any pivoting means. Since the pivot is provided on the side of the foot, the pivot does not provide a natural rotation point thus it is uncomfortable. In addition, the pivot of this known snowboard binding allows the rotation of only one foot at a time due to the nature of the hinges on the outside of each foot.

Another drawback of the known traditional bindings is that in case of riding in deep powder snow, the rider must lean back and it is tiring on the rear leg.

Therefore, it is an object of the present invention to overcome the problems of the known snowboard bindings and to provide a new snowboard binding with increased freedom of movement of the boot anchor plate with respect to the snowboard anchor plate and to the body of the snowboard.

A further object of the present invention is to provide a snowboard binding with a comfortable pivoting for the feet of the rider that allows the rider to carry out different snowboarding tricks as well as an easy riding in deep powder snow.

It is a further object of the present invention to provide a snowboard binding that allows pivoting both feet of the rider and the pivot is always active. This allows the rider to always have a most natural foot position and achieve body positions with respect to the board not possible with traditional bindings..

It is a further object of the present invention to provide an adapted snowboard which is suitable for the snowboard binding of the present invention to allow for more tricks and create a different way to ride a snowboard.

These and other objects are achieved by the snowboard binding and snowboard according to the present invention.

SUMMARY OF THE INVENTION

The present invention provides a snowboard binding with a boot anchor element which is pivotably arranged with respect to the snowboard anchor

plate and the body of the snowboard. In a first aspect of the present invention, a snowboard binding comprises a snowboard anchor element, a boot anchor element and at least one pivot mechanism. The boot anchor element is pivotally connected to the snowboard anchor element. The at least one pivot mechanism comprises at least one pivot and/or at least one sliding guide.

According to an aspect of the present invention, the snowboard binding comprises two pivot mechanisms pivotally coupling both to the snowboard anchor element and the boot anchor element to allow pivoting of the boot anchor element with respect to the snowboard anchor element. In particular, according to an aspect of the invention, the snowboard anchor element and the boot anchor element are pivotally connected at their respective front and rear portions by means of the pivot mechanism to suspend the boot anchor element at its front and rear portions with respect to the snowboard anchor element.

It has to be noted that the terms “front portion” and “rear portion” are used herein to indicate portions of the snowboard anchor element and/or of a boot anchor element that in use are in the direction the foot of the user is pointing. In other words, the front portion is substantially the area where in use the toes of the user are arranged, while the rear portion is substantially the area where in use the heel of the user is arranged.

The terms “to pivot”, “pivot mechanism”, “pivoting” and “pivotally” are used herein to also refer to “rotate” or “swivel” or tilt”, which words are suitable to describe a turning or revolving movement around a pivot or rotation axis.

In other words, according to the present disclosure, for example the wording “at least one pivot mechanism pivotally coupling a snowboard anchor element and a boot anchor element” is used herein also with the meaning of “at least one tilting mechanism rotationally coupling a snowboard anchor element and a boot anchor element".

It has to be noted that the pivot or rotation axis can be a real axis or an imaginary axis. For example, as discussed in greater detail here below, in the embodiment shown in figures 1 – 9 the pivot or rotation axis is provided by two

pivots (e.g., comprising a shaft or pin and a nut) arranged substantially at both the rear and front portion of the binding. It has to be noted that according to an aspect the rotation or pivot axis passes through the at least one pivot.

Additionally, according to possible embodiments, the pivot mechanism comprises one or more sliding guide intended to provide a rotation about a pivot or rotation axis, that in this case is an imaginary pivot or rotation axis, defined for example by the curvature of the sliding guide.

In the embodiment shown in figures 10 – 16, the pivot mechanism comprises a pivot (e.g., comprising a shaft or pin and a nut) substantially at the rear portion of the binding thus providing a real pivot or rotation axis, and also comprises a sliding guide intended to provide a rotation about a pivot or rotation axis, that in this case is an imaginary pivot or rotation axis, defined for example by the curvature of the sliding guide. In this embodiment the pivot or rotation axis of the pivot at the rear portion of the binding (that is a real pivot or rotation axis) corresponds to the pivot or rotation axis of the sliding guide (that is an imaginary rotation axis).

It has to be also noted that, even if not shown in the figures, embodiments wherein the pivot mechanism comprises two sliding guides (without pivot), e.g., the pivot at the rear portion of the embodiment of figures 10 -16 is replaced by another sliding guide, are also possible and fall within the scope of the present invention. In this case, the two or more sliding guides provides a pivot or rotation axis that is an imaginary rotation axis.

Advantageously, the presence of at least one pivot mechanism, preferably at least two pivot mechanisms, allow pivoting movement of the feet of the wearer, preferably above the plane of the snowboard.

According to an aspect, the snowboard binding of the present invention has two pivot mechanisms at the height of the ankle, or close to the height of the ankle, preferably with a horizontal axis of rotation in the direction of the foot is pointing.

According to an aspect of the present invention, both the snowboard anchor element and the boot anchor element have a substantially cage-like shape or

they are substantially shell-shaped. The term “substantially cage-like” shape is used in the present disclosure to describe an open work structure, which has a hollow or concave shape. The term substantially shell-shaped also refers to a hollow and concave shape.

According to an aspect the snowboard anchor element comprises a bottom plate, i.e. it is provided with a bottom surface, at least partially or preferably completely flat, that can be arranged on the flat surface of the snowboard. According to an embodiment the snowboard anchor element comprises two side walls in its longitudinal direction. Advantageously, each of the side walls are bent upwards at their front and rear extremities in a manner to join said side walls at the respective front and rear portions.

According to an embodiment, the side walls of the snowboard anchor element is tapered to end in respective front and rear portions.

According to an aspect each of said front and rear portions of the cage-like shaped or shell-shaped snowboard anchor element has a through-hole for accommodating the pivot mechanism in order to connect the snowboard anchor element with the boot anchor element.

According to an aspect the boot anchor element has front and rear portions and each of them is provided with a through-hole for accommodating therein a pivot mechanism and to pivotally connect the boot anchor element to the snowboard anchor element.

The at least one pivot mechanism, preferably the at least two pivot mechanisms, comprise a pivot axis allowing rotation of the boot anchor element with respect to the snowboard anchor element that is arranged at a distance from the bottom of the binding, preferably from the bottom plate of the snowboard anchor element. This distance is such that it enables the boot anchor element to swing, preferably freely swing, around the pivot axis and above the side walls of the snowboard anchor element.

According to an aspect, the pivot or rotation axis is arranged close to the rider’s ankle height and preferably along the direction of the rider’s foot.

According to an aspect the pivot or rotation axis is arranged within the width of

the binding, preferably within the width of the rider's foot. Advantageously, this position of the pivot or rotation axis, that is not arranged outside the width of the binding (preferably is not arranged outside the width of the rider's foot), allows tilting (rotational) movement of the feet of the rider, preferably above the plane of the snowboard.

According to an aspect, the pivot axis of the pivot mechanisms is preferably parallel or only slightly inclined with respect to the bottom plate of the snowboard anchor element.

It has to be noted that the term "slightly inclined" is used herein to indicate that the pivot axis of the pivot mechanism may be inclined with an angle up to 5° or preferably less than 3° with respect to the bottom plate of the snowboard anchor element.

Furthermore, according to an aspect, the pivot axis of the pivot mechanism passes through the front and rear portions both of the boot anchor element and snowboard anchor element. In particular, the two pivot mechanisms comprise two pivots: a pivot that passes through through-holes formed on the respective front portions, i.e., front extremities, of the snowboard anchor element and boot anchor element as well as another pivot passing through holes formed on the respective rear portions, i.e., rear extremities, of the snowboard anchor element and boot anchor element.

According to an aspect, the boot anchor element comprises a heel holder, a bottom plate and side walls. The heel holder may be integral with the boot anchor element or may be attached thereto. The heel holder fits around the boot of the snowboarder above the point where it expands for the heel of a foot. According to an embodiment the heel holder protrudes upwardly from the rear portion of the boot anchor element.

The bottom plate of the snowboard anchor element has an inner surface and an outer surface, wherein the inner surface refers to the surface that faces toward the bottom plate of the boot anchor element, while the outer surface of the bottom plate indicates the surface that faces toward the snowboard once the snowboard binding is attached thereto.

The bottom plate of the boot anchor element has an inner surface and an outer surface, wherein the inner surface indicates the surface on which the user's boot will rest, while the outer surface indicates the surface of the bottom plate that faces toward the inner surface of the bottom plate of the snowboard anchor element.

According to another aspect, the boot anchor element, preferably on the outer surface of the bottom plate, is provided with at least one transversally protruding element that can be engaged with a sliding guide provided transversally on the snowboard anchor element (preferably on the inner surface of its bottom plate), or vice versa the boot anchor element is provided with at least one sliding guide and the snowboard anchor element is provided with at least one transversally protruding element cooperating with the sliding guide. Said sliding guide has such a shape, preferably a complementary shape, with said protruding element that allows a free sliding of said transversally protruding element of the boot anchor element in said guide of the snowboard anchor element.

According to possible embodiments, wherein more than one sliding guide are provided, each of said sliding guides interacts with a corresponding element, preferably transversally protruding from the outer surface of the bottom plate of the boot anchor element, or vice versa.

In a further aspect of the present invention, said at least one pivot mechanism comprises one pivot and at least one sliding guide.

According to an embodiment, said one pivot passes through at least one hole formed on the rear portion of the snowboard anchor element and on the rear portion of the boot anchor element, and said at least one sliding guide is provided on the snowboard anchor element and interacts with said element that transversally protrudes from the outer surface of the bottom plate of the boot anchor element in order to allow a pivot coupling between the boot anchor element and the snowboard anchor element.

In an exemplary embodiment the snowboard anchor element may comprise one sliding guide substantially at the front portion and another sliding guide at

the rear portion of the snowboard anchor element, and, accordingly, two corresponding protruding elements that transversally protrudes from the front portion and rear portion of the outer surface of the bottom plate of the boot anchor element.

According to another aspect of the present invention, the snowboard binding comprises a pivot at the rear portion of both the boat anchor element and the snowboard anchor element, and a sliding guide at least at the front portion of the snowboard anchor element. Preferably, there are sliding guides both at the front and rear portions of the outer surface of the bottom wall of the snowboard anchor element.

When the snowboard binding comprises one pivot rotatably connecting the rear portion of both the boot anchor element and the snowboard anchor element, the substantially cage-like shape or substantially shell shape of the snowboard anchor element and the boot anchor element is open at the front portion, preferably the front portion of the bottom plate of the snowboard anchor element and/or the front portion of the bottom plate of the boot anchor element is freely exposed.

This construction of the snowboard binding allows for different boot sizes to be inserted. In addition, in this embodiment of the invention the pivot point is at the rear portion of both the boot anchor element and the snowboard anchor element while allowing to provide a sliding connection at the front portions between the boot anchor element and the snowboard anchor element, thus cooperating also at the front portion in pivotally coupling the boot anchor element and the snowboard anchor element. In particular, there is a capture feature, such as for example a sliding guide having a substantially "L-shaped" cross section, which supports the front of the boot anchor element in the vertical and horizontal directions while still allowing sliding around the rotation axis.

This embodiment of the present invention, wherein the at least one pivot mechanism comprises a pivot in combination with at least one sliding guide, provides a larger range of boot sizes accommodated by the binding.

Preferably, said protruding elements of the boot anchor element have a shape complementary to the shape of the corresponding sliding guide, provided on the snowboard anchor element, in order to allow free rotation of the boot anchor element around the rotation axis of the snowboard binding.

As mentioned, according to possible embodiments, it is not excluded that the protruding elements is provided on the snowboard anchor element and the sliding guide is arranged on the boot anchor element.

In a preferred embodiment of the present invention the sliding guide has the shape of a channel, i.e., it has a bottom wall and two side walls which form a cavity wherein the protruding element of the boot anchor element can freely slide due to its complementary shape. Thereby the sliding guide controls the direction of the movement of the boot anchor element within the snowboard anchor element.

According to an embodiment, the snowboard binding comprises two sliding guides and two protruding elements, wherein said protruding elements have a shape complementary to the shape of the corresponding sliding guide.

According to an aspect, the rider's boot can be attached to the boot anchor element by means of fastening methods known in the art, such as binding or ratcheting (safety) straps, laces, clips, step-in systems etc. Any fastening means can be used for this scope in addition to or in place of the herein mentioned fastening means. According to an aspect of the present invention, the fastening means can be attached to the boot anchor element by connecting apertures, preferably by being bolted through holes. Advantageously, the connecting apertures or through holes are provided on the side walls and/or on the heel holder of the boot anchor element.

In another aspect of the present invention, the snowboard anchor element, and preferably its bottom plate, is provided with an angle set plate having slots or holes or bores for fixing the angle set plate to the snowboard, e.g., by screws, bolts, etc., as is known in the art. Preferably, the angle set plate is arranged in the plane of the bottom plate of the snowboard anchor element. The angle set plate may be attached to the snowboard by means of a traditional toothed disk

and screws.

Advantageously, the angle set plate is connected to the snowboard anchor element by means of an elastic element, such as springs or an elastomer. The angle set plate having this element allows a stiff and limited rotation about a vertical axis located in the middle of the foot when the rider is wearing the snowboard binding of the present invention but it does not allow translation of the angle set plat relative to the board.

A further embodiment of the present invention is a snowboard binding wherein the pivot mechanism comprises only sliding guides, in particular two or more sliding guides. Therefore, no pivot is foreseen in this embodiment.

In addition, in order to enhance the stability of the boot anchor element, slidably connected to the snowboard anchor element, the outer surface of the bottom plate of the boot anchor element is provided with two transversally protruding auxiliary elements which can slidably engage respectively with a guide or channel, having a complementary shape with said auxiliary protruding elements, and being transversally provided in the inner surface of the bottom plate of the snowboard anchor element.

The snowboard binding according to this embodiment has an open structure, i.e., it has an open front and rear portions.

Advantageously, the angle set plate of the snowboard binding of the present invention comprises structural elements acting as a torsional spring mechanism that allows rotation or twist of the boot anchor element with respect to the snowboard anchor element and to the snowboard itself around axis Y passing vertically and, in particular, perpendicularly through the angle set plate provided in the bottom surface of the snowboard anchor element.

The torsional spring mechanism of the angle set plate comprises a mini disc, an inner mount and an intermediary mount. The mini disc is provided with holes or slots through which screws or bolts are driven into the snowboard, as is standard practice for fixing the snowboard anchor element of the snowboard binding to the snowboard. The inner mount surrounds the mini disc and is oriented and fastened thereto. The intermediary mount is connected to the

snowboard anchor element by means of elastic element(s), such as elastomer element(s), The intermediary mount can rotate relative to the inner mount and to the bottom plate of the snowboard anchor element. Accordingly, the intermediary mount is able to further rotate with respect to the snowboard.

Therefore, the snowboard binding of the present invention, comprising the angle set plate having said torsional spring mechanism, allows both a rotating (pivoting) movement of the snowboard binding about a longitudinal axis (X) and a rotating or twisting movement of the snowboard anchor element about a vertical axis (Y) which is perpendicular to the upper surface of the bottom wall snowboard anchor element.

The twisting around a vertical axis (Y) obtainable by the torsional spring mechanism of the present invention in combination with the rotation of the boot anchor element with respect to the snowboard anchor element about a longitudinal axis (X) of the snowboard binding is novel in the state of the art of the present invention.

All embodiments of the snowboard binding of the present invention can comprise a torsional spring mechanism. In particular, the snowboard anchor element of the snowboard binding of the present invention can incorporate a torsional spring mechanism in its mounting to the snowboard allowing a limited rotation (twisting) about an axis (Y) perpendicular to the longitudinal upper surface of the snowboard. Specifically, said axis (Y) is perpendicular to the surface of the snowboard anchor element or to the surface of the angle set plate.A further aspect of the present invention is a snowboard, preferably for attaching a snowboard binding of the present invention. The snowboard has a longitudinal shape with a length and width such to allow the fixing of a pair of said binding on its longitudinal upper surface, where the snowboard binding is fixed.

The longitudinal upper surface terminates in a tip and a tail. The tip and /or the tail are upwards bent at an angle comprised between 30° and 80° with respect to the upper longitudinal surface of the snowboard.

The bent tip and/or tail portions of the board should preferably have a length

such to allow the rider to exploit the advantageous of the snowboard binding of the present invention and to do many tricks, which are not implementable by the known snowboard bindings. In particular, with the tilting of the binding and the bent sections on the tip and tail of the board, the rider is able to ride stably on the tip or tail of the board. This length preferably has a flat portion, but it may also have a continual curve.

It is possible for only the tip or only the tail to be bent upwards, while the other side may resemble a traditional snowboard.

The tip or tail may have a handle which the rider may hold when riding the board in the inclined position.

Advantageously, the length of each of the bent tip and bent tail is comprised between 50 mm and 700 mm determined for the entire length of a snowboard comprised between 1000 mm and 2000 mm.

The ratio between the length of each of said bent tip or bent tail with respect to the entire length of the snowboard is comprised between 1/20 and 1/3.

This arrangement of the snowboard binding and the shape of the snowboard permit the rider to be more comfortable with respect to known bindings and to do more interesting tricks.

BRIEF DESCRIPTION OF THE FIGURES

The structure and characteristics of the snowboard binding of the present invention will be more apparent from the ensuing description of a preferred embodiment thereof given with reference to the accompanying drawings, in which:

- Figures 1 and 2 are schematic perspective view of a possible embodiment of the snowboard binding according to the present invention wherein the boot anchor plate is not pivoted with respect to the snowboard anchor element;
- Figures 3 and 4 are schematic perspective view of a possible embodiment of the snowboard binding according to the present invention wherein the boot anchor plate is pivoted with respect to the snowboard anchor element;

- Figure 5 is a schematic perspective rear view of a possible embodiment of the snowboard binding according to the present invention;
- Figures 6 and 7 are schematic perspective rear views of a possible embodiment of the snowboard binding of showing the binding from the bottom wall of the snowboard anchor element;
- Figure 8 is a schematic perspective view of a possible embodiment of the snowboard biding according to the present invention equipped with the binding straps and rear backing;
- Figure 9 is a schematic perspective view of a possible embodiment of the snowboard binding according to an aspect of the present invention showing the bottom plate of the boot anchor element equipped with the binding straps and rear backing;
- Figure 10 is a schematic perspective view of a further possible embodiment of the snowboard binding according to the present invention showing a snowboard binding equipped with binding straps and rear backing and having open extremities at the respective front portions of the boot anchor element and the snowboard anchor element;
- Figures 11 and 12 are a partial top view of the snowboard binding shown in Figure 10 without the binding straps and rear backing;
- Figure 13 shows the snowboard binding shown in Figure 10 illustrating a cooperation of the element transversally protruding from the outer surface of the bottom plate of the boot anchor element with the corresponding sliding guides of the snowboard anchor element;
- Figure 14 is a partial bottom view of the snowboard binding shown in Figure 10 exposing the outer surface of the bottom plate of the snowboard anchor element;
- Figure 15 shows the snowboard binding shown in Figure 10 without the binding straps and rear backing wherein the boot anchor element is inclined to show the inner surface of the bottom plate of the snowboard anchor element;
- Figure 16 is a perspective cross-sectional view of the snowboard binding shown in Figure 10;

- Figures 17 and 18 are schematic views of the snowboard of the present invention;
- Figure 19 shows the binding according to the invention and the snowboard according to the invention in a possible ride position;
- Figure 20 shows a rider using the binding according to the invention and the snowboard according to the invention in a possible ride position.
- Figure 21 is a schematic perspective view of a further embodiment of the present invention showing a snowboard biding equipped with binding straps and rear backing, wherein the pivot mechanism includes only a plurality of sliding guides;
- Figure 22 is a perspective cross-sectional view of the snowboard binding of Figure 21;
- Figure 23 is a schematic perspective view of the embodiment of the snowboard binding of Figure 21 in a tilted position about the pivot axis X;
- Figures 24 and 25 are schematic perspective rear views of the embodiment of the snowboard binding represented in Figure 21 and show the snowboard binding from the bottom wall of the snowboard anchor element exposing the angle set plate;
- Figure 26 is a perspective cross-sectional view of the bottom wall of the snowboard anchor element of the snowboard binding of Figure 21 exposing in detail the structural construction of the angle plate.

DETAILED DESCRIPTION OF THE DRAWINGS

Described herein is a snowboard binding configured to secure a wearer to a snowboard, which allows the wearer to transfer torques and forces from his or her legs to the snowboard in order to control the snowboard and/or to provide comfortable riding stances. In addition, the snowboard binding of the present invention is configured to allow a snowboarder to transfer a variety of his or her leg/foot movements to the snowboard for the generation of a range of varying torque forces to the snowboard thereby providing a snowboarder with greater flexibility of his or her body with respect to the board.

Accordingly, the snowboard binding of the present invention provides a

mobility relative to the board and allows the wearer to adjust his or her foot position relative to the snowboard because the binding is configured to pivot relative to the snowboard. This allows the wearer to assume a comfortable riding stance.

Figures 1-9 show a possible embodiment of the snowboard binding of the present invention. The illustrated snowboard binding (1) (also referred to herein as the binding) comprises a snowboard anchor element (2), a boot anchor element (3) and two pivot mechanisms (19, 20).

The snowboard anchor element (2) is pivotally connected to the boot anchor element (3) by means of the pivot mechanisms (4) comprising two pivots or pivot (rotational) joints. This arrangement of the binding (1) allows pivoting or tilting of the boot anchor element (3) with respect to the snowboard anchor element (2), as for example shown in figures 3, 4 and 9.

In particular, the snowboard anchor element (2) and the boot anchor element (3) are pivotally connected at their respective front and rear portions (10, 11, 12, 13) by means of the two pivots, i.e., two pivoting joints used as pivot mechanisms .

In particular, the snowboard binding (1) illustrated in Figures 1-9 comprises a pivot mechanism including two pivots (19, 20). The pivot axis of said mechanism passes through holes in the respective front portions (10, 12) of the snowboard anchor element (2) and boot anchor element (3) as well as through holes in the respective rear portions (11, 13) of the snowboard anchor element (2) and boot anchor element (3).

This arrangement of the two pivots (19, 20) in the snowboard binding of the present invention allow suspension of the boot anchor element (3) at two pivot points (19, 20), i.e. at its front (10, 12) and rear portions (11, 13) with respect to the snowboard anchor element (2).

According to a possible embodiment, as for example shown in the attached figures, the snowboard anchor element (2) comprises a bottom plate (14) and two side walls (15) in the longitudinal direction of the snowboard anchor element (12). The boot anchor element (3) is formed by a bottom plate (7),

side walls (6) and a heel holder (6).

The bottom plate (14) of the snowboard anchor element (2) has an inner surface and an outer surface, wherein the inner surface refers to the surface that faces toward the bottom plate (7) of the boot anchor element (3), while the outer surface of the bottom plate (14) indicates the surface that faces toward the snowboard once the snowboard binding is attached thereto.

The bottom plate (7) of the boot anchor element (3) has an inner surface and an outer surface, wherein the inner surface indicates the surface on which the user's boot will rest, while the outer surface indicates the surface of the bottom plate (7) that faces toward the inner surface of the bottom plate (14) of the snowboard anchor element (2).

According to an embodiment, as for example shown in the illustrated embodiment, the pivot (20), and thus also the rotation axis X, passes through a hole formed in the rear portion (11) of the boot anchor element (3) thus the snowboard binding (1) has a pivot (20) which is located at the height, or close to the height, of the ankle of the wearer with a horizontal axis of rotation in the direction of the foot is pointing.

Both the snowboard anchor element (2) and the boot anchor element (3) are made preferably from a strong plastic or light metal and comprise recesses in order to reduce the weight of the binding.

The two pivot mechanisms, including two pivots (19, 20), comprise a pivot axis (X) allowing rotation or tilting of the boot anchor element (3) with respect to the snowboard anchor element (2). The pivot or rotation axis (X) is arranged at a distance from the bottom plate (14) of the snowboard element (2) that allows the tilting/swinging, preferably a free tilting/swinging, of the boot anchor element (3) with respect to the snowboard anchor element (2), preferably above the edge of the side walls (15) of the snowboard anchor plate (2).

In the embodiment shown in the Figures 1-9, the pivot axis (X) connects the through holes formed on the front and rear portions (10, 11, 12, 13) of the respective snowboard anchor element (2) and boot anchor element (3).

The illustrated embodiment of Figures 1-9 shows that each pivot mechanism

is formed by a pivot comprising a shaft or pin and a nut. Other types of pivots are equally suitable for obtaining the same result. One or more bearing(s), preferably ball bearing(s), can be provided at the pivot.

The shaft is inserted into the respective through-holes formed on the front and rear portions (10, 12, 11, 13) of both the snowboard anchor element (2) and boot anchor element (3) and obtaining thereby two pivoting points, i.e., pivots (19, 20), one connecting the respective front portions (10, 12) and another connecting the respective rear portions (11, 13) of the snowboard anchor element (2) and boot anchor element (3) as shown in Figures 2 and 4. The shafts are fixed by nuts in the two pivoting points (19, 20).

The pivot axis (X) is preferably parallel but may be slightly inclined with respect to the bottom plate (14) of the snowboard anchor element (2). The inclination of the pivot axis with respect to the bottom plate of the snowboard anchor element may be up to 5° but is preferred to be less than 3°.

Since the snowboarder is supported by the pivoting boot anchor element (3), which is pivotally joined at its front and rear portions (10, 11) to the respective front and rear portions (12, 13) of the snowboard anchor element (2), the rotational freedom provided by the two pivot joints, i.e., pivots, allows the snowboarder to generate new flexibility that enhances the snowboarder's ability to achieve new body positions and perform new tricks. In addition, this pivoting arrangement of the snowboard binding of the present invention, which provides a swivelling/tilting of the rider's foot, is less tiring and less stressful on the legs over a long day of riding as well as while sitting on ski lifts.

In the illustrated embodiment, both the snowboard anchor element (2) and the boot anchor element (3) have a substantially cage-like shape or are substantially shell-shaped. Accordingly, the snowboard and boot anchor elements (2, 3) have an open work structure having a hollow or concave shape.

Figures 2-5 show the snowboard binding (1) wherein the outer surface of the bottom plate (7) of the boot anchor element (3), which is facing toward the inner surface of the bottom plate (14) of the snowboard anchor element (2), is

provided with two transversally protruding elements (21a, 21b) that can be engaged respectively with a sliding guide (22) provided transversally on the inner surface of the bottom plate (14) of the snowboard anchor element (2). Advantageously, each of the sliding guides (22a, 22b) has a complementary shape with the respective protruding element (21a, 21b) and is arranged transversally on the inner surface of the bottom plate (14) of the snowboard anchor element (2) in a manner that each protruding element (21) can slide in the respective sliding guide (22a, 22b) during pivoting of the boot anchor element (3) around the pivot axis (X).

According to the embodiment shown in Figures 1-9, the sliding guide (22a, 22b), formed on the inner surface of the bottom plate (14) of the snowboard anchor element (2), has the shape of a channel, i.e. it has a bottom wall and two side walls which form a cavity wherein the protruding element (21a, 21b) of the boot anchor element (3) can freely slide due to its complementary shape. Thereby the sliding guide (22a, 22b) controls the direction of the movement of the boot anchor element (3) with respect to the snowboard anchor element (2).

The snowboard binding of the present invention is mounted to the snowboard (not illustrated) by means of using mechanical fasteners, such as bolts, screws, etc. In detail, according to an embodiment, the snowboard anchor element (2) is fastened to the snowboard by means of an angle set plate (16) provided with holes or slots (17) through which screws or bolts are driven into the snowboard, as is standard practice.

According to an embodiment, as for example illustrated in the figures, the angle set plate (16) is connected to the bottom plate (14) of the snowboard anchor element (2) by means of elastic elements (18), e.g., by springs. In the illustrated embodiment, Figures 1-9 show the snowboard binding wherein the angle set plate (16) is accommodated in the plane of the bottom plate (14) of the snowboard anchor element (2). This arrangement of the snowboard binding (1) of the present invention allows a limited rotation of the snowboard binding (1) about a vertical axis passing through the centre point of the angle set plate (16). This kind of rotation of the snowboard binding also contributes

to further enhancement of the snowboarder's comfort during riding.

Advantageously, in order to better exploit the above-said rotation of the snowboard anchor element (2), the vertical axis of the angle set plate (16) may pass through the middle of the rider's foot accommodated in the boot anchor element (3).

Figure 1 - 7 illustrate some connecting apertures (8, 9) on the boot anchor element (3), particularly on the heel holder (5) and on the side walls (6). These apertures serve for inserting fastening means or binding straps (23) for the boot and rear backing (24) into the boot anchor element (3) as for example shown in Figures 8 and 9. Any fastening means can be used in addition or in place of binding straps, such as binding, laces, clips, etc.

A further embodiment is illustrated for example in Figures 10-16, wherein the snowboard binding comprises one pivot (20) and two sliding guides (21a, 22b) operating as pivot mechanisms.

Said one pivot (20) passes through at least one hole formed on the rear portion (13) of the snowboard anchor element (2) and on the rear portion (11) of the boot anchor element (3) to allow a pivot coupling between the boot anchor element (3) and the snowboard anchor element (2).

Said sliding guides (21a, 21b) are provided transversally on the inner surface of the bottom plate (14) of the snowboard anchor element (2). Each of said sliding guides cooperates with a corresponding element (22a, 22b) transversally protruding from the outer surface of the bottom plate (7) of the boot anchor element (3) in order to allow lateral sliding movement, along a curved surface (thus providing a pivot coupling about the pivot axis (X) of the boot anchor element (3) over the snowboard anchor element (2).

In the embodiment represented in Figures 10-16 one of said two guides (22a) is arranged on the rear portion (13) of the inner surface of the bottom wall (14) of the snowboard anchor element (2) and, accordingly, the corresponding element (21a), transversally protruding from the outer surface of the bottom wall (7) of the boot anchor element (3), is located at the rear portion (11) of said boot anchor element (3) in a manner that said transversally protruding

element (21a) of the boot anchor element (3) is allowed to slide in said sliding guide (22a) and provide thereby a pivoting movement of the snowboard binding around the pivot axis (X).

As shown in Figures 13 and 15, according to an embodiment, the other sliding guide (22b) is provided at the front portion (12) of the inner surface of the bottom plate (14) of the snowboard anchor element (2) and, accordingly, the corresponding elements (21b), transversally protruding from the outer surface of the bottom plate (7) of the boot anchor element (3), are located at the front portion (10) of the boot anchor element (3). Analogously to the transversally protruding element (22a), also the other transversally protruding element (21b) is arranged in such a manner to be able to cooperate with the corresponding sliding guide (22b) and to provide a pivoting movement to the snowboard binding around the pivot axis (X).

Each of said protruding elements (21a, 21b) has a shape complementary to the shape of the corresponding sliding guide (22a, 22b).

Figures 10, 13, 14 and 16 show the snowboard binding according to said further embodiment, which is equipped with binding straps (23) and rear backing (24).

Figures 11 and 12 show a partial top view of the snowboard binding of Figure 10 without binding straps (23) and rear backing (24), wherein the internal surface of the bottom plate of the boot anchor element (3) is exposed. Figures 11 and 12 show that the substantially cage-like shape or substantially shell shape of both the snowboard anchor element (2) and the boot anchor element (3) is open at their front portions (10, 12) where the sliding guide (21b) is located. This “open” shape of the front portion (25, 30) of the bottom plate (7, 14) of both the boot anchor element (3) and the snowboard anchor element (2) allows to adapt the snowboard binding to different sizes of boots.

Furthermore, Figures 11, 12 and 15 show the internal surface of the bottom plate (14) of the snowboard anchor element (2) of the binding according to this further embodiment, wherein the bottom plate (14) of the snowboard anchor element (2) is provided with an angle set plate (16) which is connected to the

snowboard anchor element (2) by means of an elastomer material.

According to a further embodiment of the present invention shown in Figures 21-26, the snowboard binding (1) has only a plurality of sliding guides (21a, 21b, 21c), preferably at least two or more sliding guides as pivot mechanism, i.e., no pivot is provided for the snowboard binding of this embodiment.

Figures 21-26 show the snowboard binding with two sliding guides (21a, 21b).

In order to enhance the stability of the boot anchor element (3), slidably connected to the snowboard anchor element (2), the outer surface of the bottom plate (7) of the boot anchor element (3) is provided with two transversally protruding auxiliary elements (31a, 31b) which can slidably engage respectively with a guide or channel (32a, 32b) of the snowboard anchor element (2). The guide or channel (32a, 32b) has a complementary shape with said auxiliary protruding elements (31a, 31b) and is transversally provided on the inner surface of the bottom plate (14) of the snowboard anchor element (2). The snowboard binding according to this embodiment has an open structure, i.e., it has an open front (33) and rear (34) portions.

In the embodiment shown in Figures 21-26 the angle set plate (16) has structural elements acting as a torsional spring mechanism (35, 36, 37) that allows rotating or twisting of the boot anchor element (3) with respect to the snowboard anchor element (2) and to the snowboard itself around axis Y. Figure 25 shows axis Y passing vertically and, in particular, perpendicularly through the angle set plate(16) provided in the bottom surface of the snowboard anchor element (2).

The torsional spring mechanism of the angle set plate (16) comprises a mini disc (35), an inner mount (36) and an intermediary mount (37) as illustrated by Figures 24-26. The mini disc (35) is provided with holes or slots (17) through which screws or bolts are driven into the snowboard, as is standard practice for fixing the snowboard anchor element (2) of the snowboard binding (1) to the snowboard. The inner mount (36) surrounds the mini disc (35) and is oriented and fastened thereto. The intermediary mount (37) is connected to the snowboard anchor element (2) by means of elastic element(s) (18), such

as elastomer element(s), The intermediary mount (37) can rotate relative to the inner mount (36) and to the bottom plate (14) of the snowboard anchor element (2). Accordingly, the intermediary mount (37) is able to further rotate with respect to the snowboard.

The angle plate having the torsional spring mechanism described in connection with the embodiment represented by Figures 21-26 can also be used in the other embodiments of the present invention shown in Figures 1-16 which include pivots or the combination of pivot with one or more sliding guide(s) as pivot mechanism.

Therefore, the snowboard binding (1) of the present invention represented in Figures 21-26 allows both a rotating (pivoting) movement of the snowboard binding about a longitudinal axis (X) and a twisting movement of the snowboard anchor element (2) about a vertical axis (Y) which is perpendicular to the upper surface of the bottom wall (14) snowboard anchor element (2).

The twisting around a vertical axis (Y) obtainable by the torsional spring mechanism (35, 36, 37) of the present invention in combination with the rotation of the boot anchor element (3) with respect to the snowboard anchor element (2) about a longitudinal axis (X) of the snowboard binding (1) is novel in the state of the art of the present invention.

A further aspect of the present invention is a snowboard (26) which is particularly suitable for the snowboard binding of the present invention in order to further improve fun and entertainment of the rider.

The snowboard (26) of the present invention is shown in a perspective view in Figure 17 and has a longitudinal shape with a length and width such to allow the fixing of a pair of said snowboard binding, preferably snowboard binding of the present invention, on its longitudinal upper surface (27).

Said longitudinal upper surface (27) of the snowboard (26) terminates in a tip (28) and a tail (29), which are upwards bent at an angle α comprised between 30° and 80° with respect to said upper longitudinal surface (27) of the snowboard (26). Figure 18 shows the high grade of bending of the tip and tail with respect to the upper surface of the snowboard.

It has to be noted that the wording “longitudinal upper surface terminates in a tip (28) and/or a tail (29)” is used herein to indicate that the snowboard base comprises a tip and/or a tail that can be made in one piece with the snowboard base or can be a separate portion that is constrained to the snowboard base.

As already mentioned above, it is possible for only the tip or only the tail to be bent upwards, while the other side may resemble a traditional snowboard.

In particular, it has to be noted that even if in Figure 17-18 a snowboard having both a bent tip (28) and a bent tail (29) is shown, according to the invention are also possible embodiments wherein the snowboard has only a bent tip and only a bent tail having bending angle and lengths disclosed herein.

With the tilting of the binding and the bent sections on the tip and tail of the board, the rider is able to ride stably on the tip or tail of the board while the board is at extreme angles (more than 30°) respect to the ground.

Figure 19 shows the binding according to the invention and the snowboard according to the invention in a possible use position wherein the rider is able to ride stably on the tail (29) of the board. Also Figure 20 shows a rider using the binding according to the invention and the snowboard according to the invention having only a bent tail 29 according to the invention and a standard tip in a possible ride position wherein the rider is able to ride stably on the tail (29) of the board.

In view of above, the snowboard according to the invention, preferably combined with the binding according to the invention, allows to reach riding positions that cannot be reach with known snowboard.

For example, with standard snow board it is not possible to reach riding position, as the one shown in figure 19 and in figure 20, wherein the snowboard is stably riding in the bent tail portion while the board is at extreme angles (more than 30°) respect to the ground.

Additionally, the combination with the snowboard binding according to the invention also allows that in the riding position on the tail or on the tip of the snowboard the bottom of the rider’s foot reduce their inclination with respect to the ground (e.g. they can be arranged parallel or closely parallel with respect

to the ground) due to the pivot (rotation) of the boot anchor portion with respect to the snowboard anchor element about at the pivot (rotation axis) (X) or pivot (rotation axis) (X) and twisting axis (Y) of the snowboard binding.

The ratio between the length L1 of each of said bent tip (28) and bent tail (29) with respect to the entire length (L) of the snowboard (26), that is corresponding to the length of the flat portion of the snowboard base, is comprised between 1/20 and 1/3. The advantages of the bindings described herein are numerous. The tilting action provided by the snowboard binding introduces a wide range of flexibility that enhances comfort of the rider during riding as well as while sitting on the ski lift. The flexibility allows also for a greater range of snowboarding tricks.

According to different possible embodiments of the invention, the bent tip (28) and/or the bent tail (29) has a flat portion, but it may also comprise a continual curve and in general a curved surface. In the case of a curve, or curved shape, the length L1 of the bent tip and/or bent tail portion is measured by a straight line (laying on a longitudinal cross-section plane of the snowboard), the straight line extending between the two extremities of the bent tail and the bent tip, (i.e. extending between the end of the snowboard flat base from which the tail and/or the tip is extending and the end of the bent tail and/or the bent tip).

The binding for snowboard according to the present invention has standardised mounting system, therefore, it is compatible with the majority of boards. However, it may also be adapted to attach to boards with other mounting systems Furthermore, the binding of the present invention does not require specific boots to ride.

CLAIMS

1. A snowboard binding (1) comprising:

a snowboard anchor element (2) and a boot anchor element (3);

at least one pivot mechanism (4) pivotally coupling the snowboard anchor element (2) and the boot anchor element (3) to allow pivoting of the boot anchor element (3) with respect to the snowboard anchor element (2).

2. The snowboard binding of claim 1, wherein said at least one pivot mechanism comprises at least one pivot 19, 20) and/or at least one sliding guide (22a, 22b).

3. The snowboard binding of claim 1 or claim 2, wherein said at least one pivot mechanism pivotally couples the snowboard anchor element (2) and the boot anchor element (3) at their respective front (10, 12) and/or rear portions (11, 13).

4. The snowboard binding of any of preceding claims, wherein the at least one pivot mechanism (4) comprises a pivot axis (X) allowing rotation of the boot anchor element (3) with respect to the snowboard anchor element (2).

5. The snowboard binding of claim 4, wherein the pivot axis (X) is arranged at a distance from the bottom plate (14) of the snowboard anchor element (2).

6. The snowboard binding of claim 4 or 5, wherein the pivot axis (X) is arranged close to the rider's ankle height and preferably along the direction of the rider's foot.

7. The snowboard binding of any claim 4-6, wherein the pivot axis (X) is arranged within the width of the binding, preferably within the width of the rider's foot.

8. The snowboard binding of any claim 4 - 7, wherein the pivot axis (X) is parallel or slightly inclined with respect to the bottom of the binding.

9. The snowboard binding of any claim 4 - 8, wherein the pivot axis (X) is parallel or slightly inclined with respect to the bottom plate (14) of the snowboard anchor element (2), preferably in the direction the foot is pointing.

10. The snowboard binding of any of claims 4 - 9, wherein the pivot axis (X) passes through the front and/or rear portions (10, 11; 12, 13) of at least one

of, or both the snowboard anchor element (2) and boot anchor element (3).

11. The snowboard binding of any of preceding claims, wherein the at least one pivot mechanism (4) comprises at least one pivot (19) arranged substantially at the front portion (10) of the boot anchor element (3), preferably said pivot passing through at least one hole formed on the front portion (10) of the boot anchor element (3) and/or at least one pivot (20) arranged substantially at the rear portion (11) of the boot anchor element (3), preferably said pivot passing through at least one hole formed on the rear portion (11) of the of the boot anchor element (3).

12. The snowboard binding of any of claims 2-11, wherein said at least one sliding guide (22a, 22b) has a complementary shape with at least one protruding element (21a, 21b).

13. The snowboard binding of any of preceding claims, wherein said at least one pivot mechanism comprises one pivot (20) and at least one sliding guide (22b).

14. The snowboard binding of claim 13, wherein said one pivot (20) is arranged substantially at the rear portion (13) of the snowboard anchor element (2), preferably said pivot passes through at least one hole formed on the rear portion (13) of the snowboard anchor element (2) and said at least one sliding guide (22b) interacts with an at least one protruding element (21b), preferably transversally protruding from the outer surface of the bottom plate (7) of the boot anchor element (3) to allow a pivot coupling between the boot anchor element (3) and the snowboard anchor element (2).

15. The snowboard binding of claims 1-14, wherein the at least one pivot mechanism (4) comprises at least two pivots (19, 20) suspending the boot anchor element (2) at its front and, respectively, rear portions (10, 11) with respect to the snowboard anchor element (3).

16. The snowboard binding of any of claims 2-10 and 12, wherein the pivot mechanism is at least two sliding guides (22a, 22b) provided transversally on the inner surface of the bottom plate (14) of the snowboard anchor element (2).

17. The snowboard binding of claim 16, wherein each of said at least two sliding guides (22a, 22b) interacts with a protruding element (21a, 21b), preferably transversally protruding from the outer surface of the bottom plate (7) of the boot anchor element (3) to allow a pivot coupling between the boot anchor element (3) and the snowboard anchor element (2).

18. The snowboard binding of claim 16 or 17, wherein the outer surface of the bottom plate of the boot anchor element (3) is provided with two transversally protruding auxiliary elements (31a, 31b) which can slidably engage respectively with a guide or channel (32a, 32b) provided transversally in the inner surface of the bottom plate (14) of the snowboard anchor element (2) and having a complementary shape with said auxiliary protruding elements (31a, 31b).

19. The snowboard binding of any of the preceding claims, wherein the snowboard anchor element (2) is provided with an angle set plate (16) having holes (17) for fixing the angle set plate (16) to a snowboard.

20. The snowboard binding of any of preceding claims, wherein the snowboard anchor element incorporates a torsional spring mechanism in its mounting to the snowboard allowing the limited rotation about an axis (Y) perpendicular to the longitudinal upper surface of the snowboard.

21. The snowboard binding of claim 20, wherein the angle set plate (16) comprises the torsional spring mechanism including a mini disc (35), an inner mount (36) which is oriented and fastened to said mini disc (35), and an intermediary mount (37), wherein the mini disc (35) is provided with holes or slots (16).

22. A snowboard (26) for attaching a binding, preferably a binding according to of any of preceding claims, characterised by being formed as a board having a longitudinal shape with a length and width such to allow the fixing of a pair of said binding on its longitudinal upper surface (27) wherein said longitudinal upper surface terminates in a tip (28) and/or a tail (29), said tip (28) and/or said tail (29) being bent upwards at an angle (α) comprised between 30° and 80° with respect to the upper longitudinal surface (27) of the

snowboard.

23. The snowboard of claim 22, wherein the length (L1) of said bent tip (28) and/or said bent tail (29) is comprised between 50 mm and 800 mm.

24. The snowboard of claim 22 or 23, wherein the ratio between length (L1) of each of said bent tip (28) and/or of said bent tail (29) with respect to the entire length (L) of the snowboard base (26) is comprised between 1/20th and 1/3.

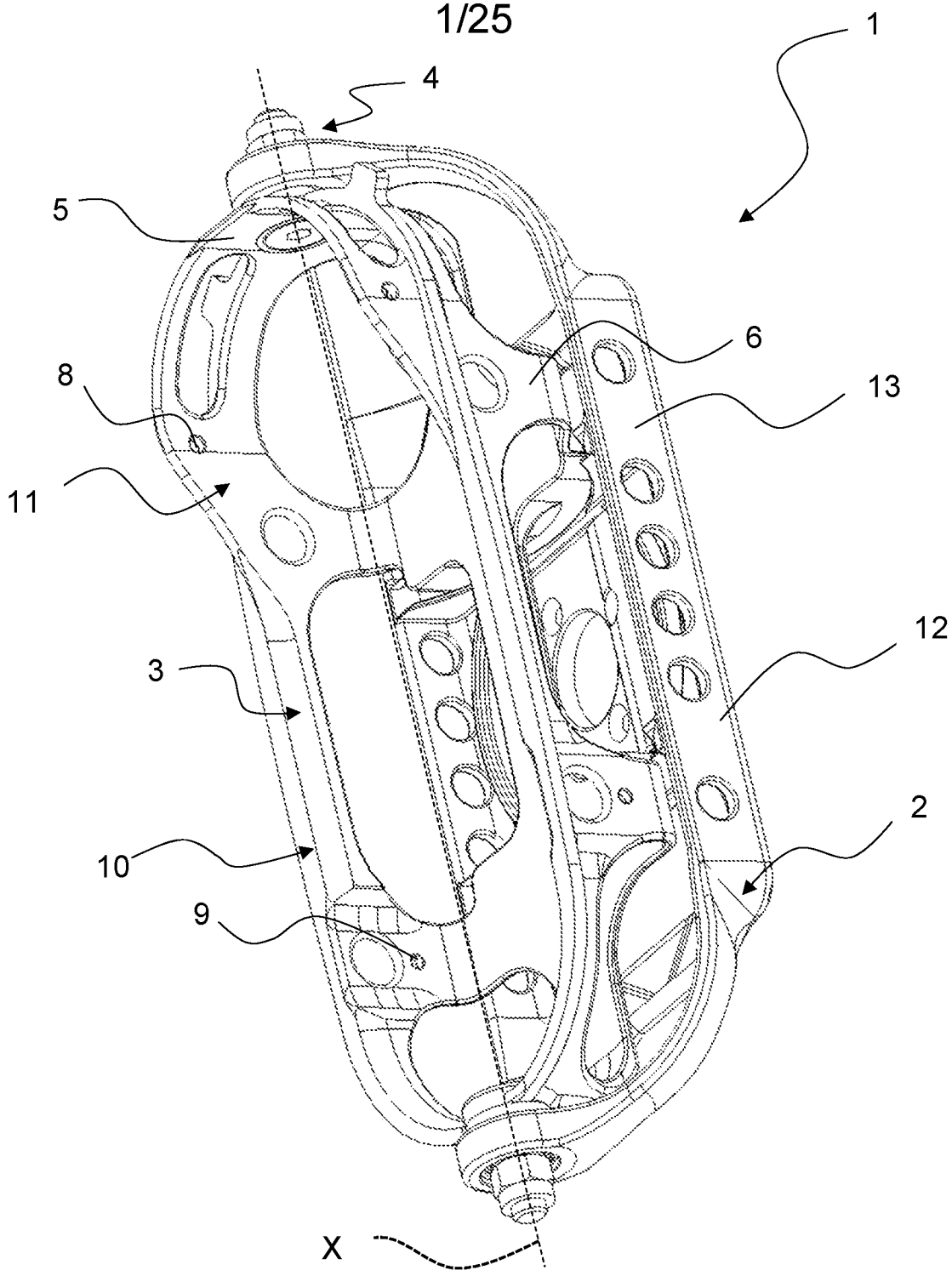

Figure 1

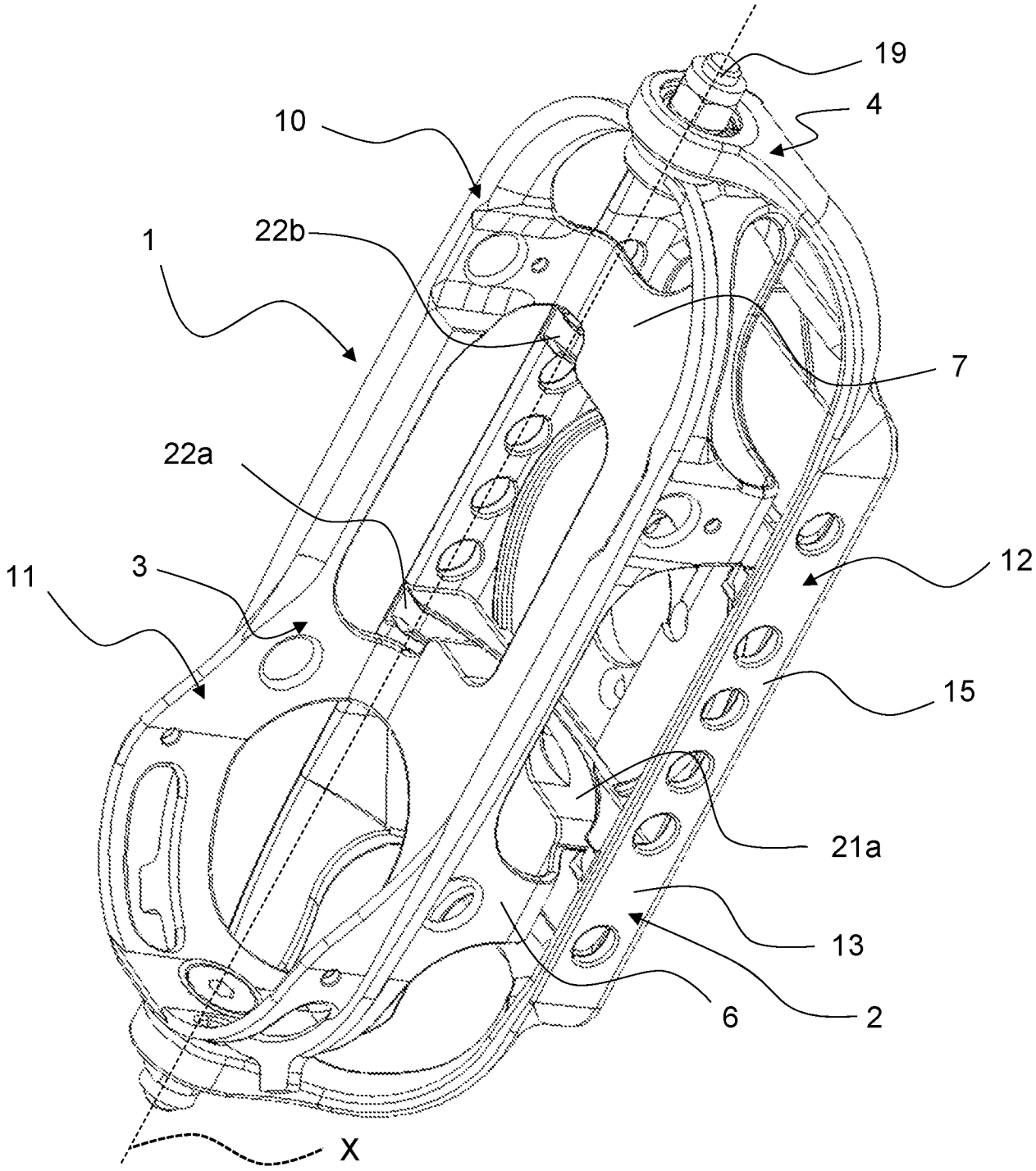

Figure 2

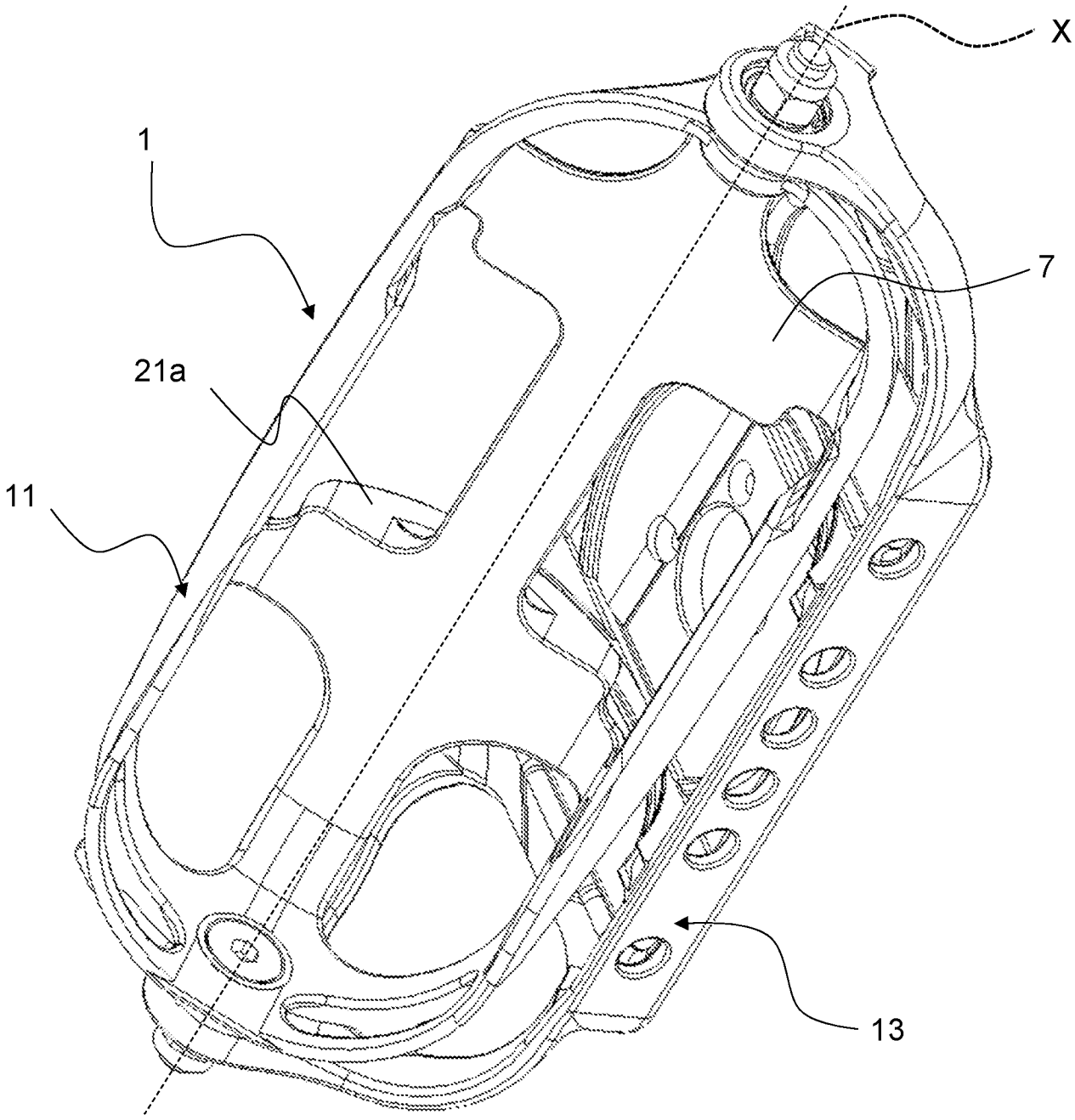

Figure 3

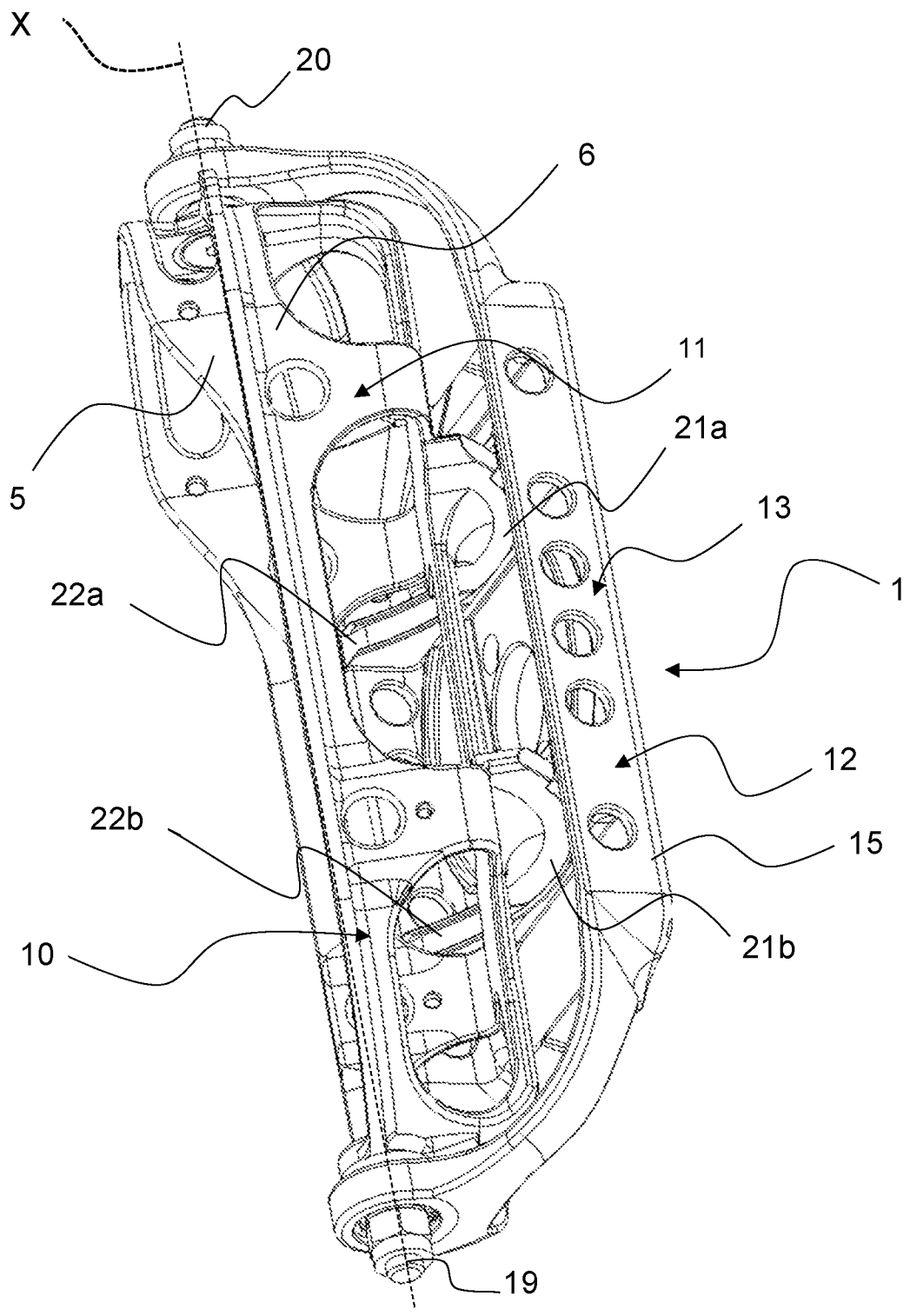

Figure 4

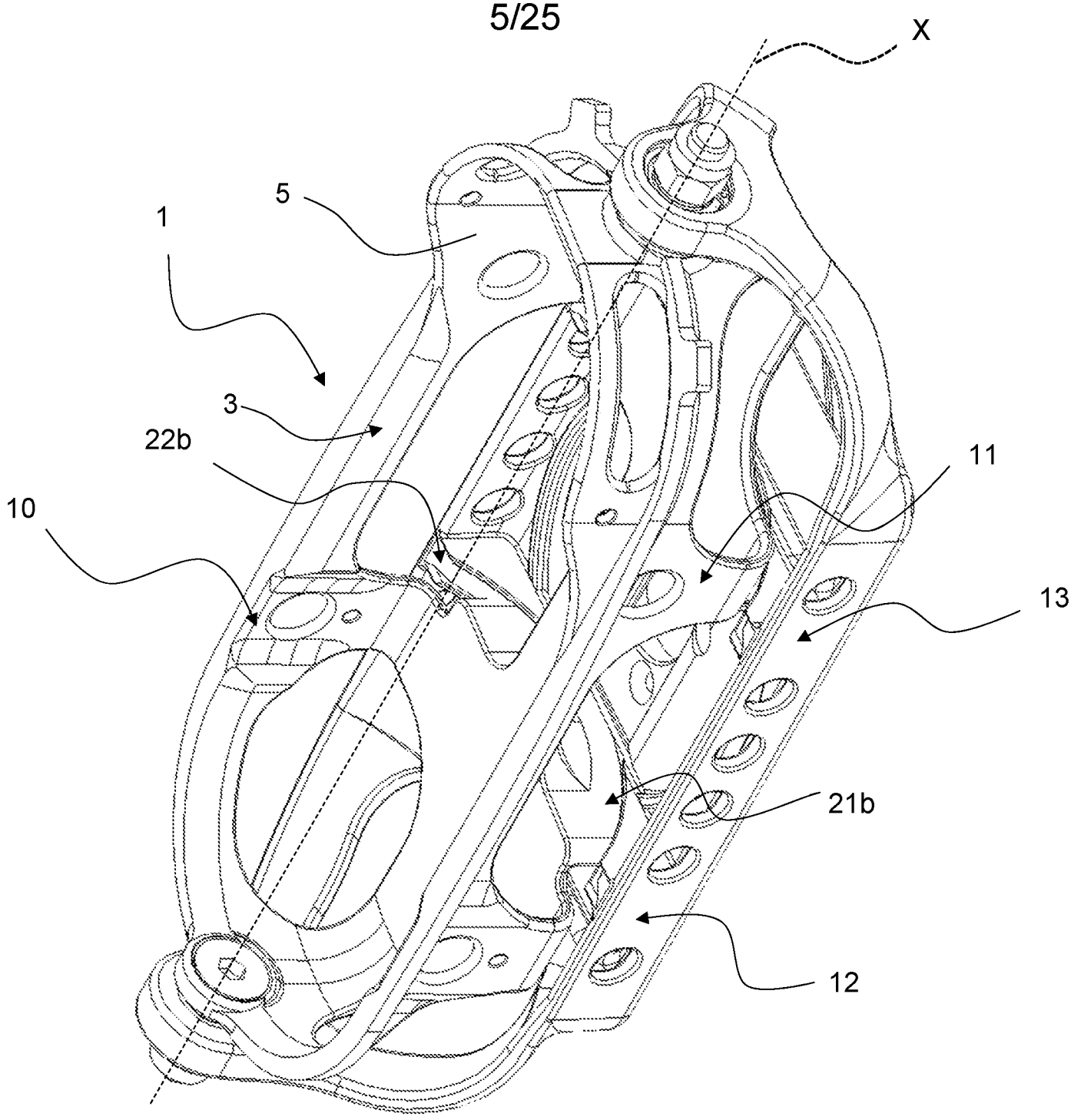

Figure 5

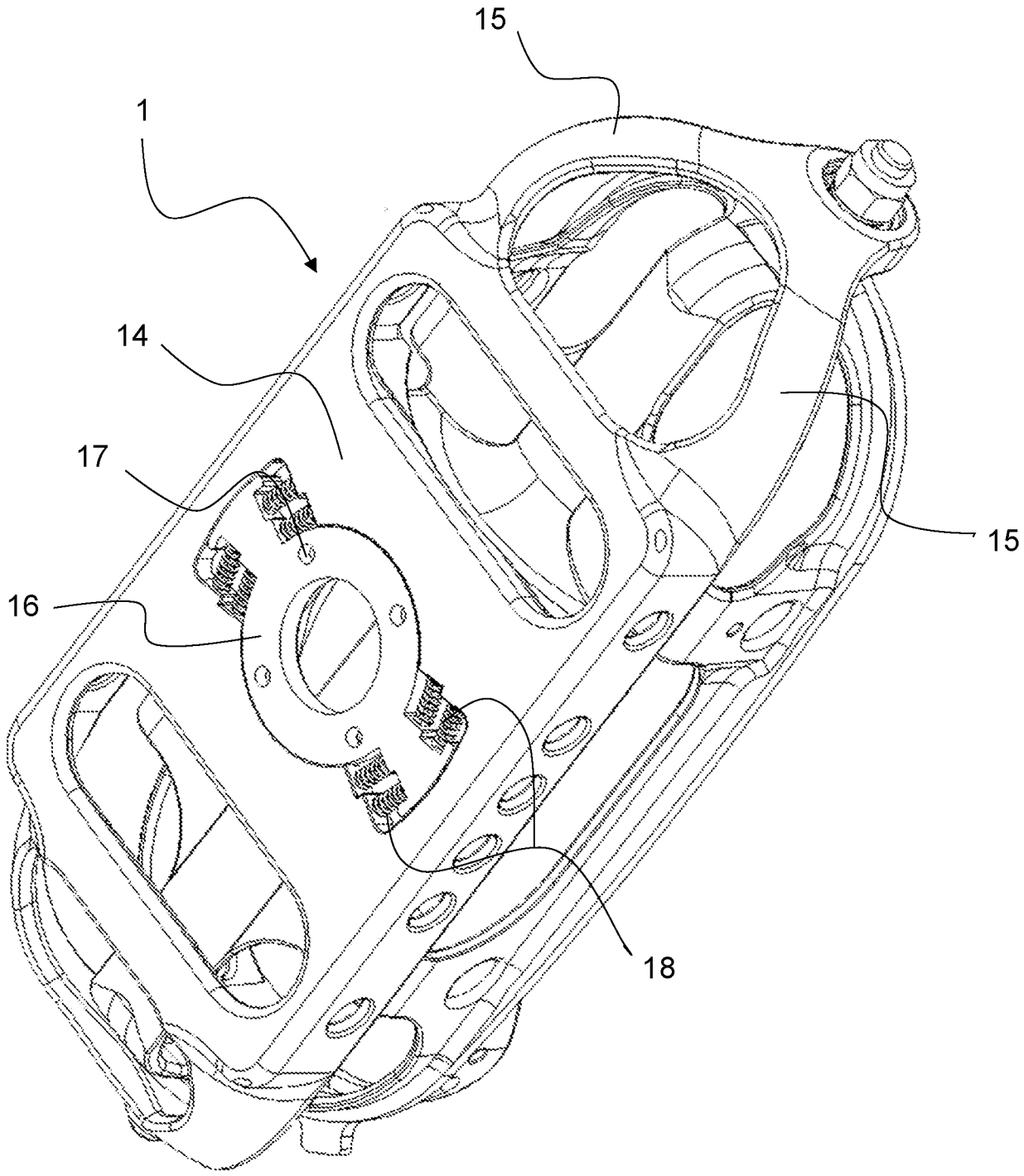

Figure 6

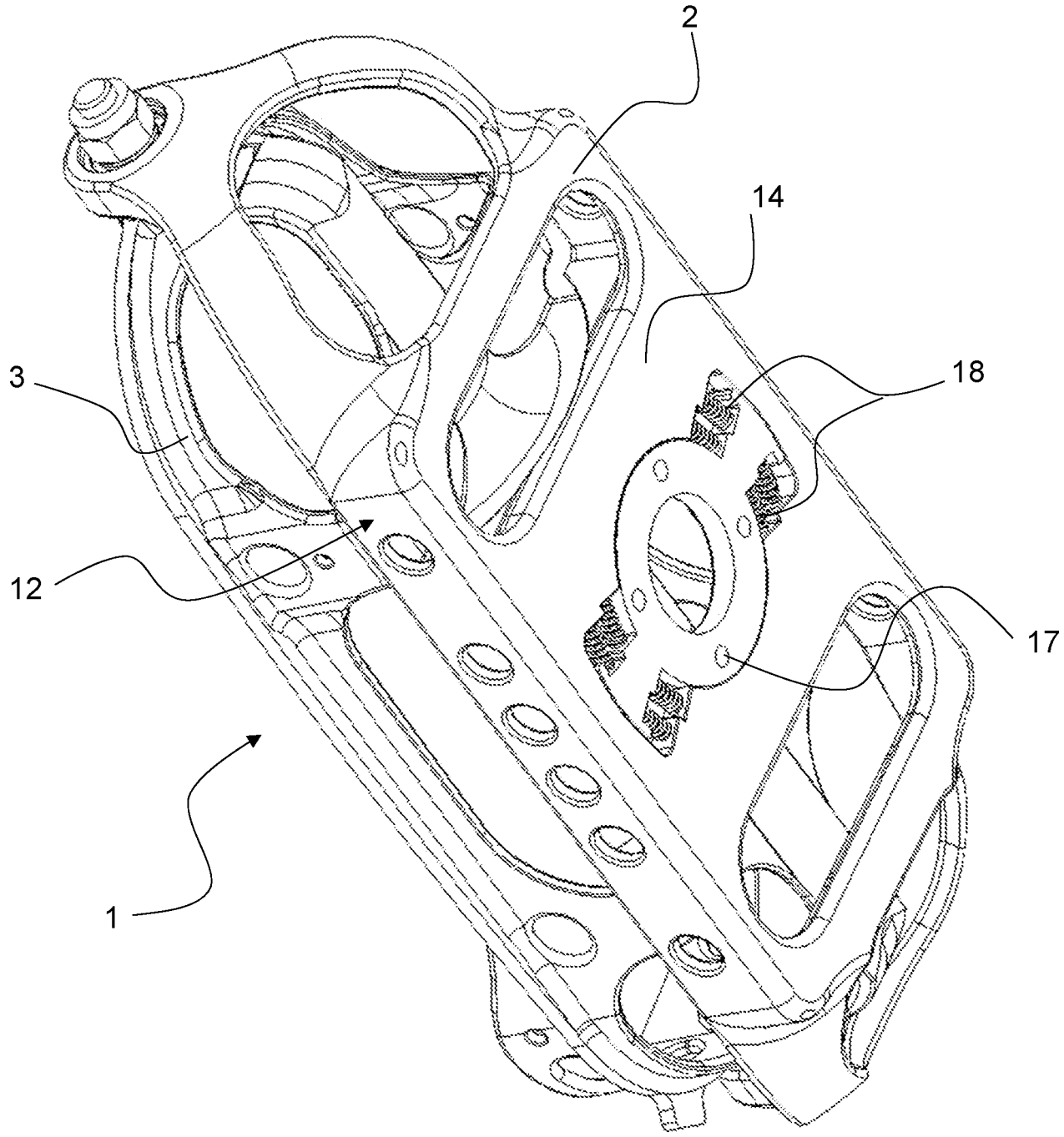

Figure 7

Figure 8

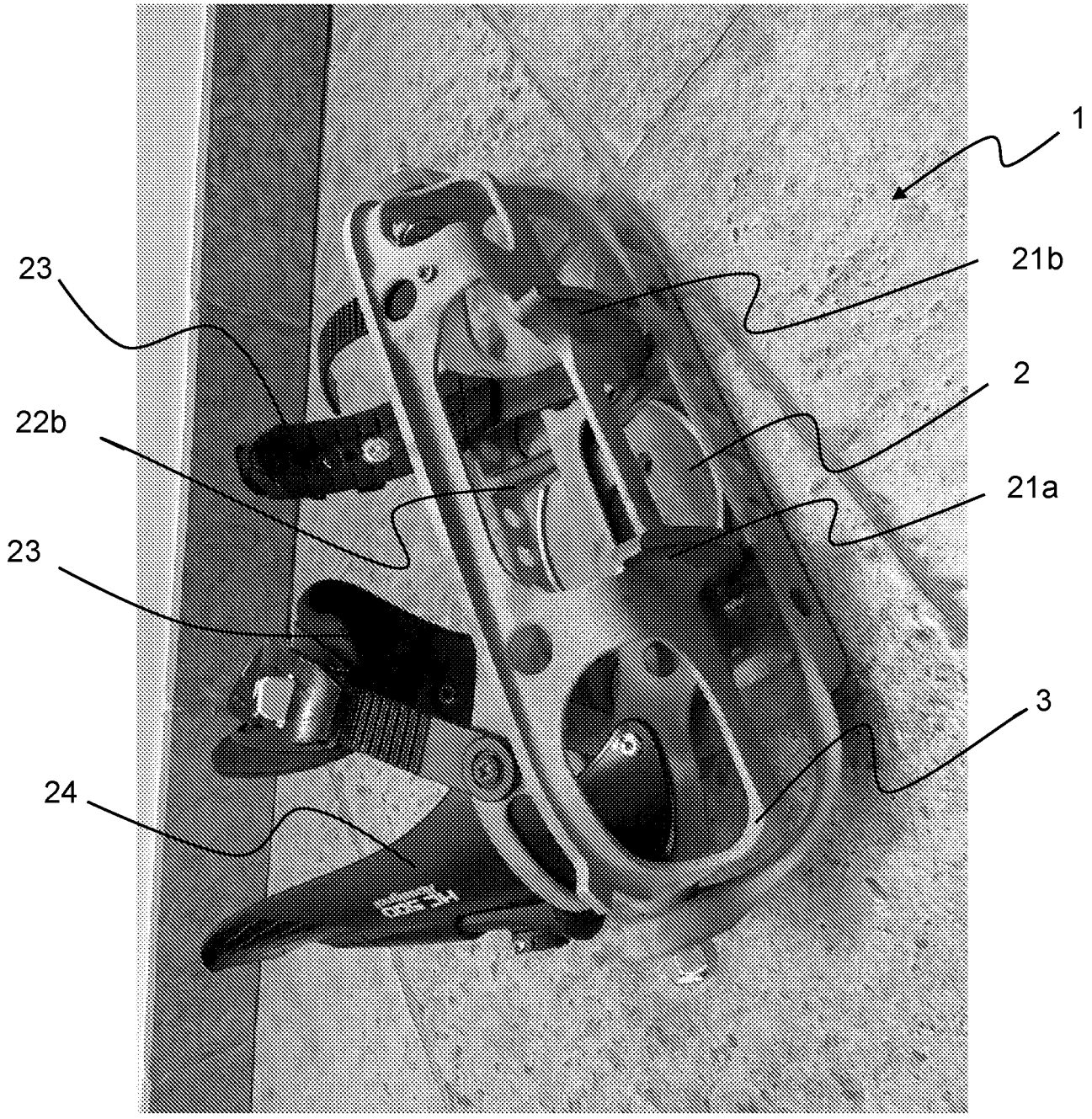

Figure 9

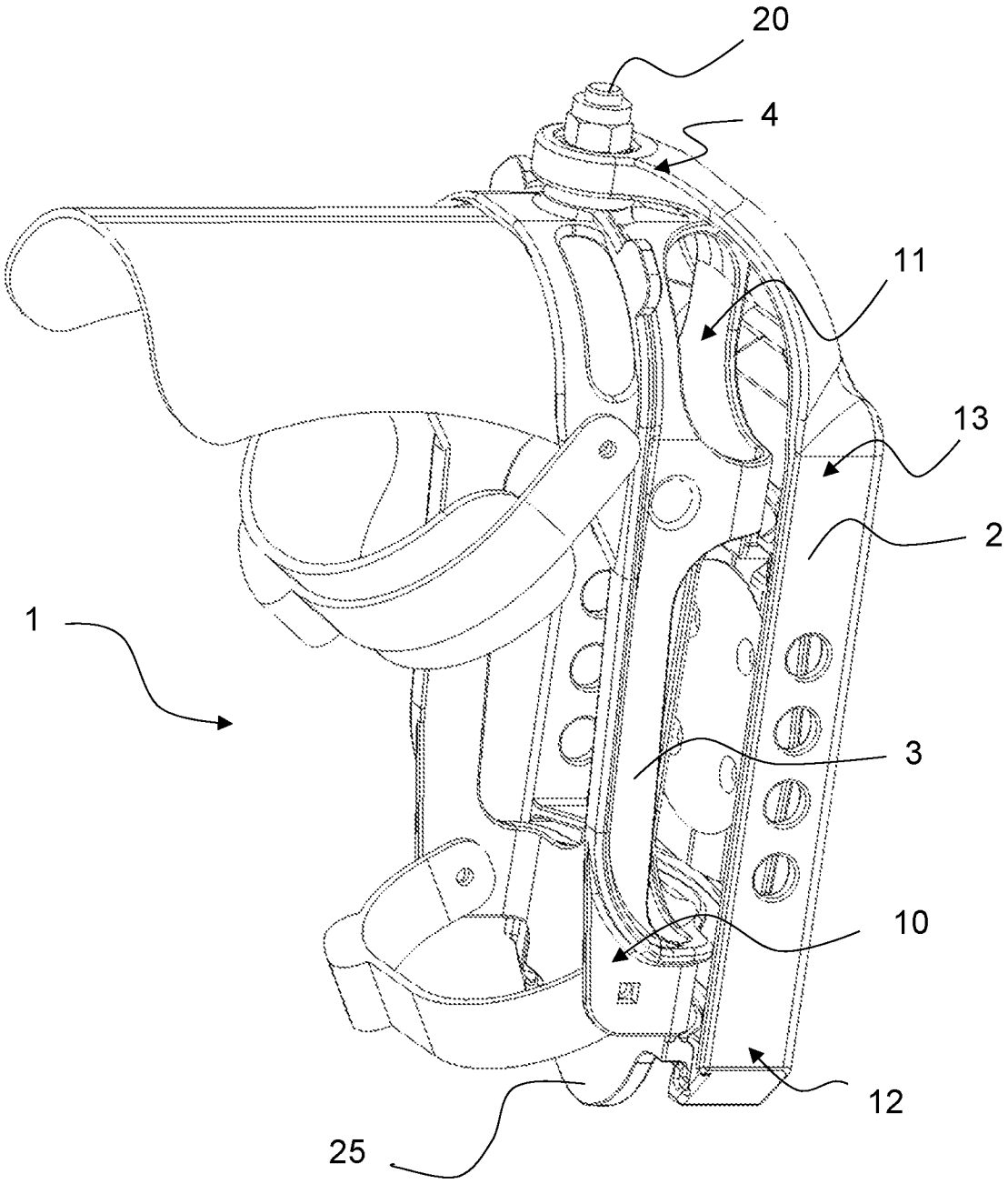

Figure 10

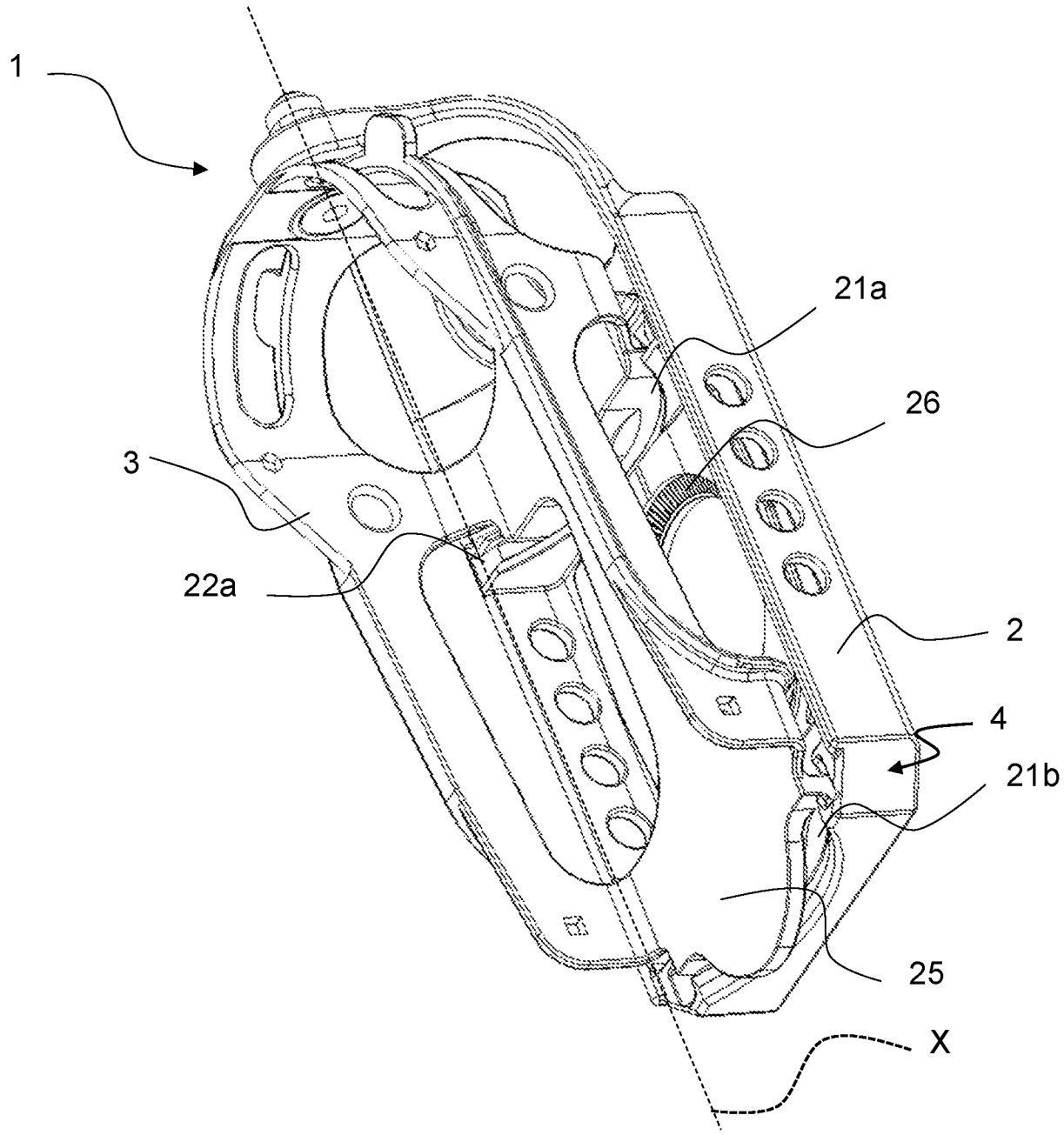

Figure 11

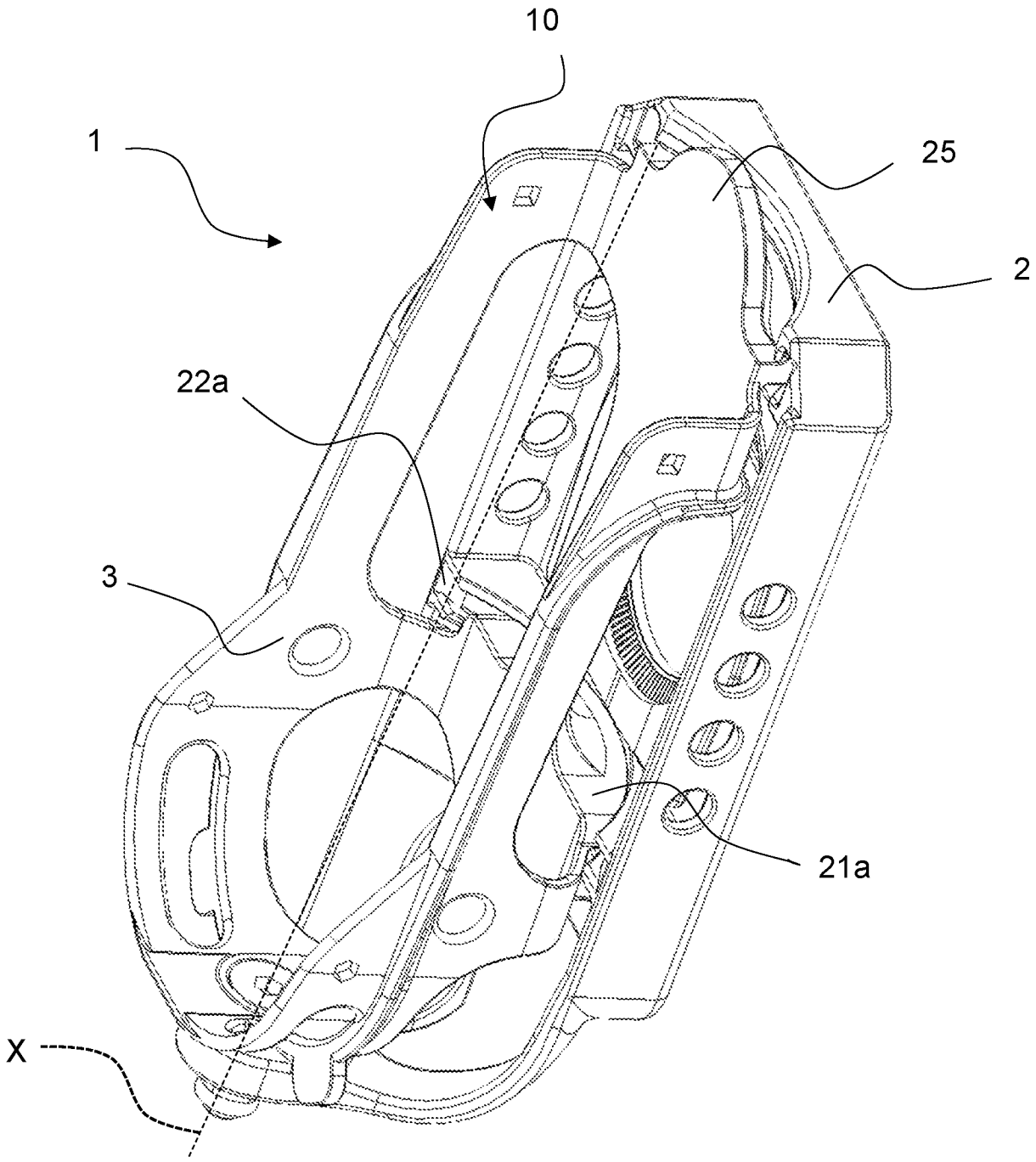

Figure 12

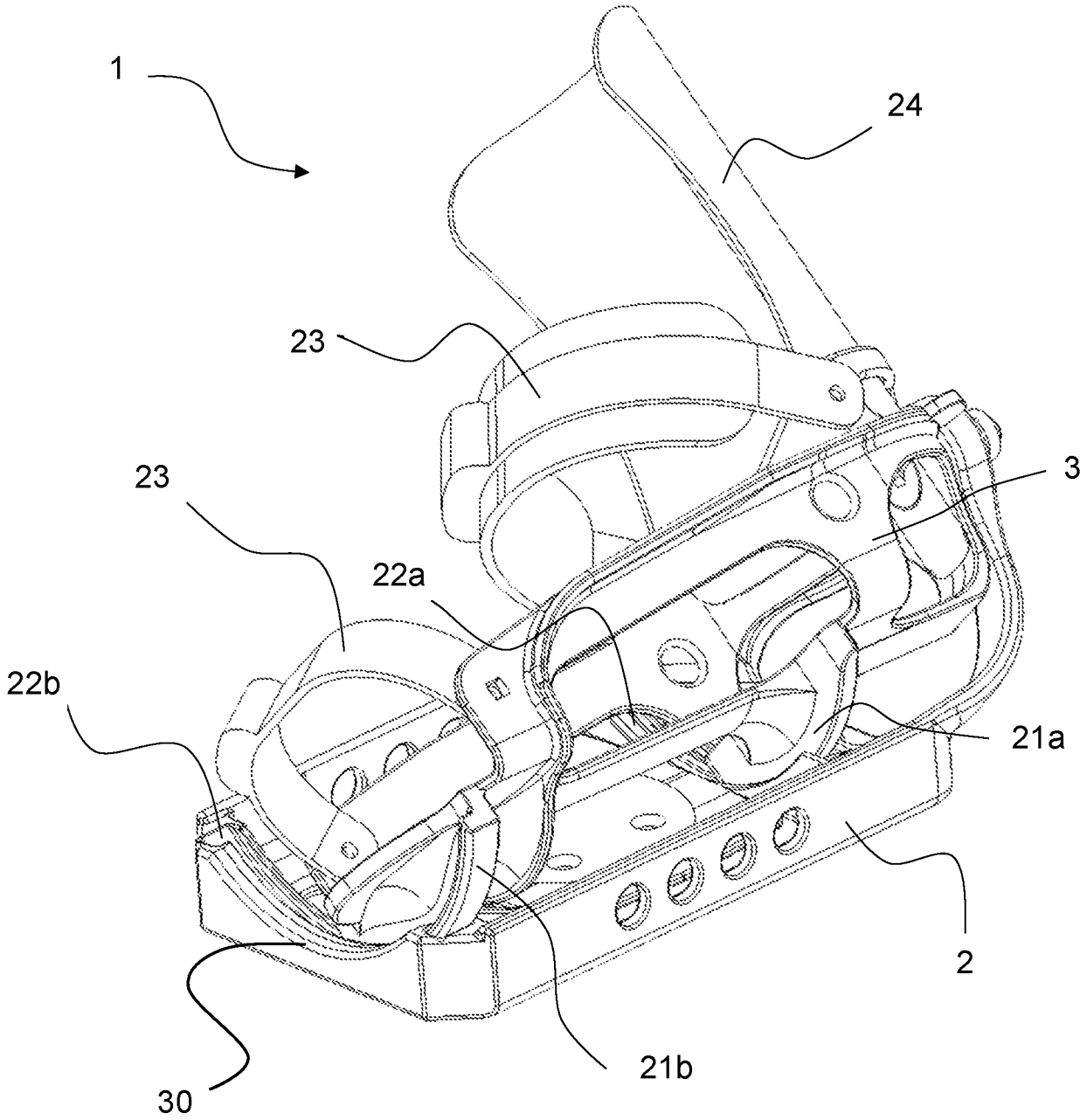

Figure 13

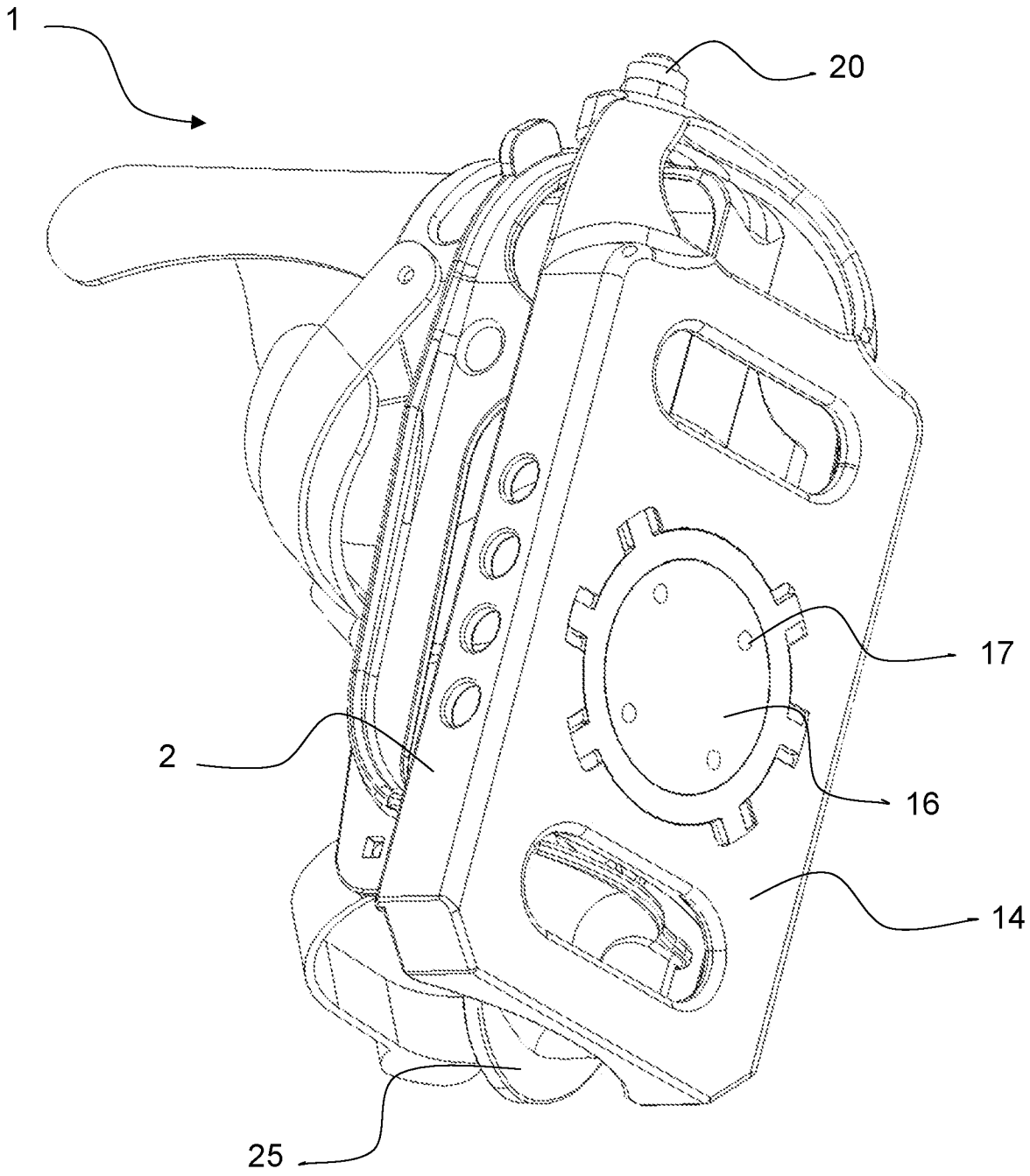

Figure 14

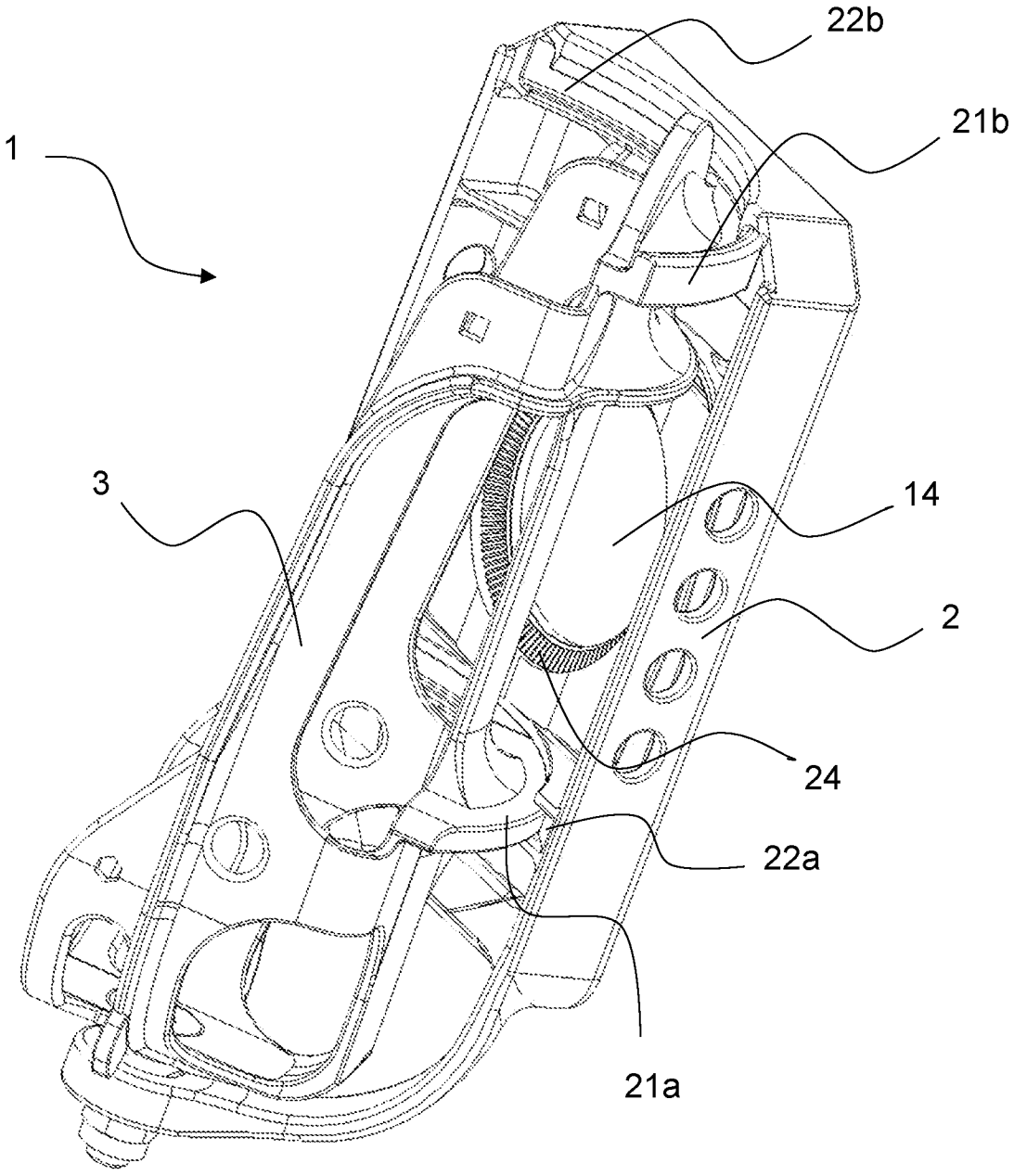

Figure 15

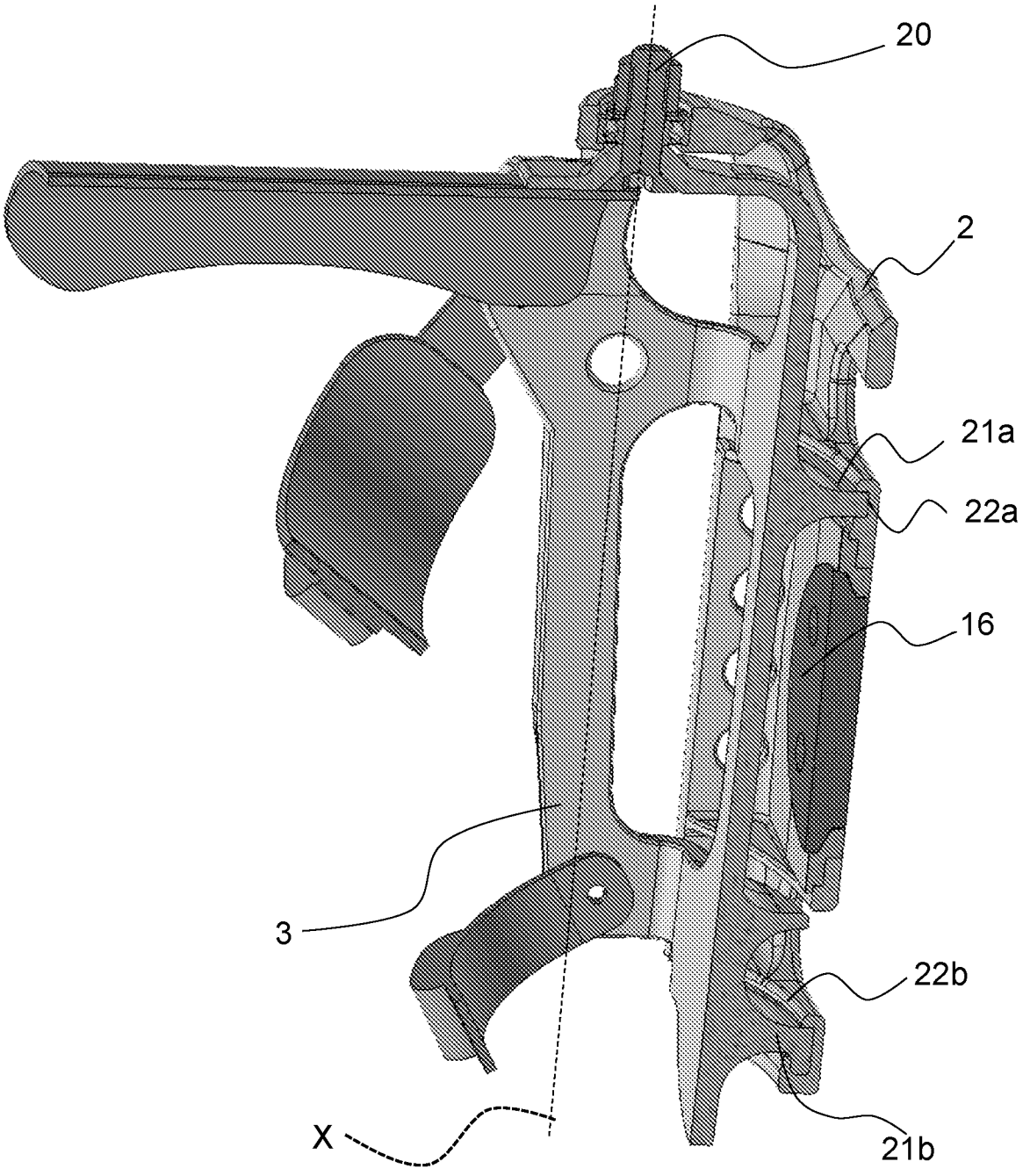

Figure 16

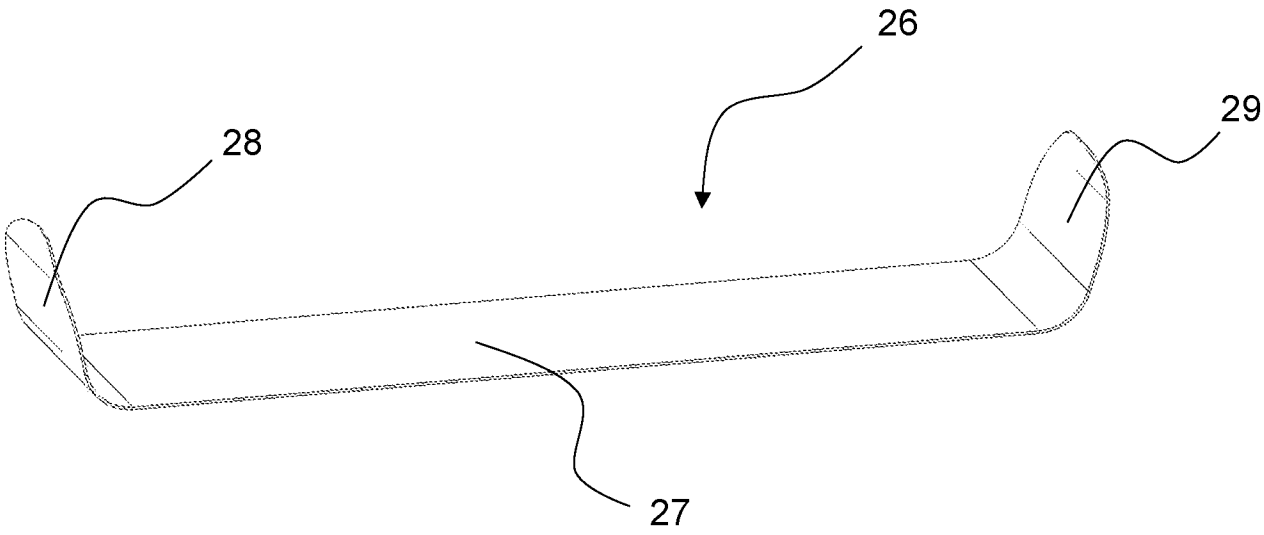

Figure 17

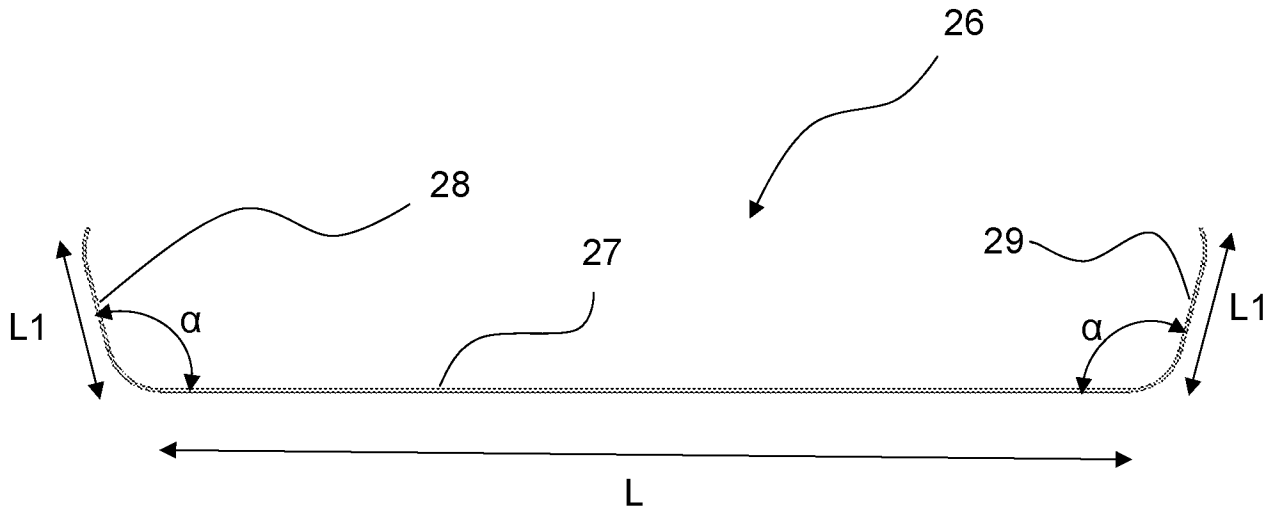

Figure 18

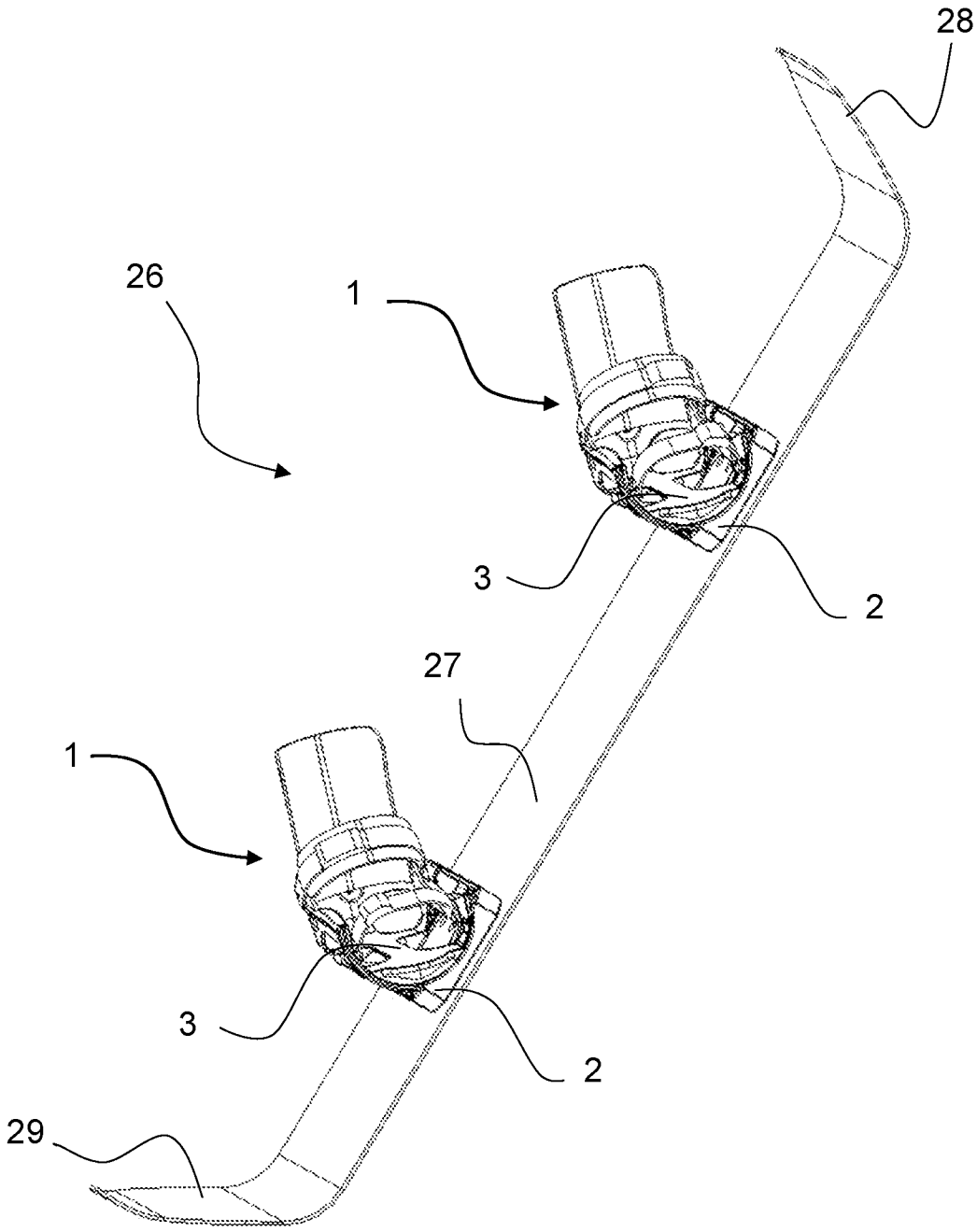

Figure 19

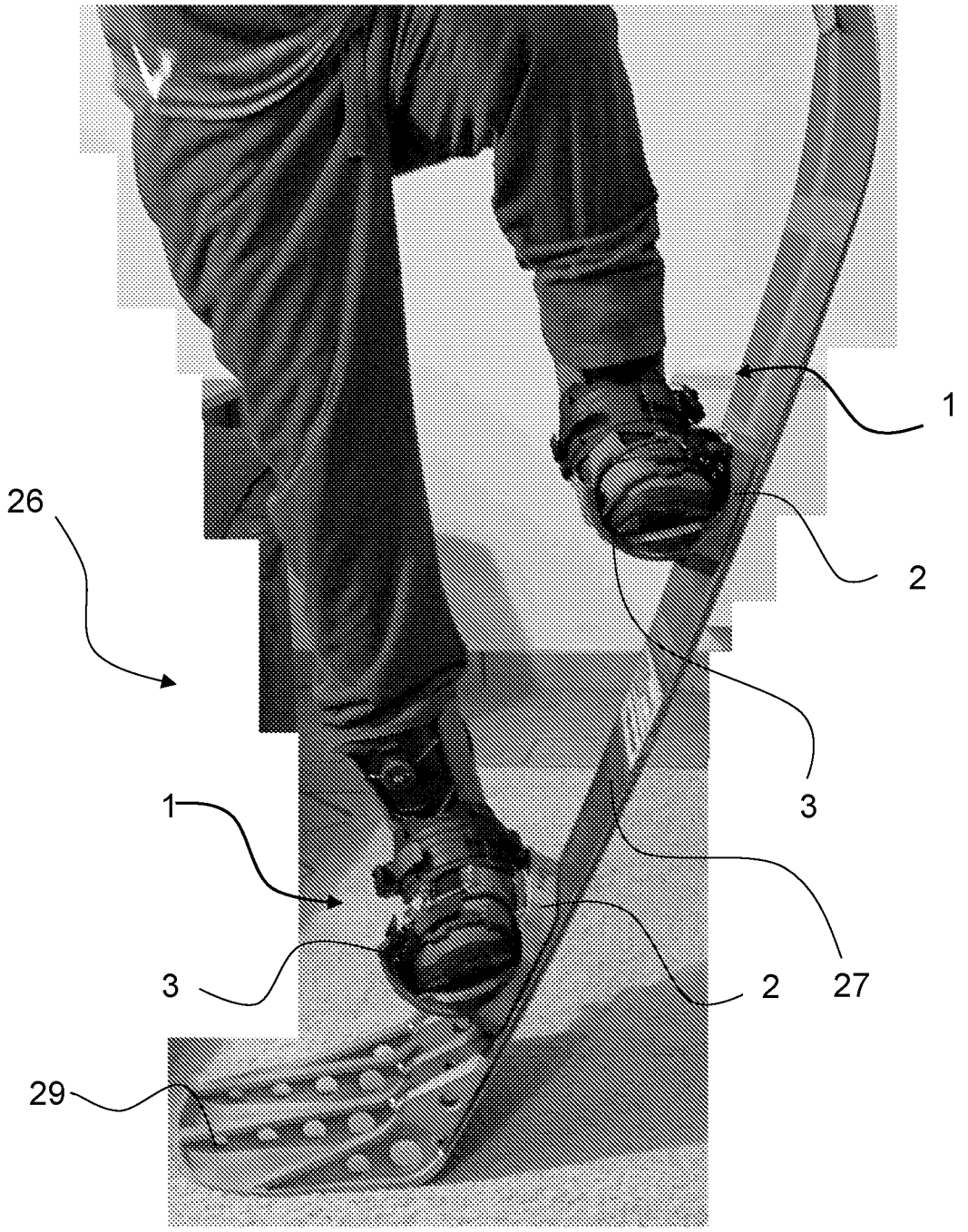

Figure 20

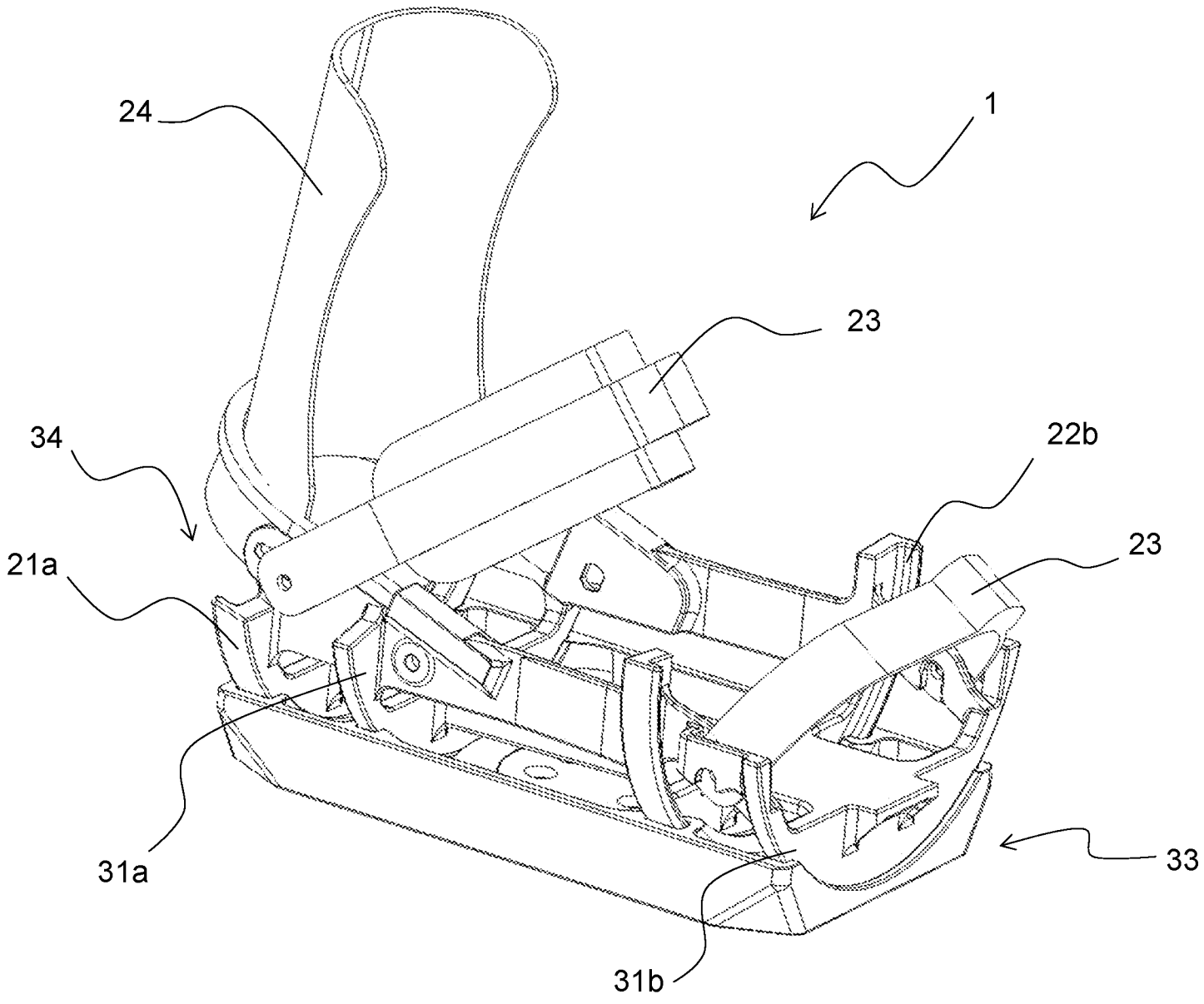

Figure 21

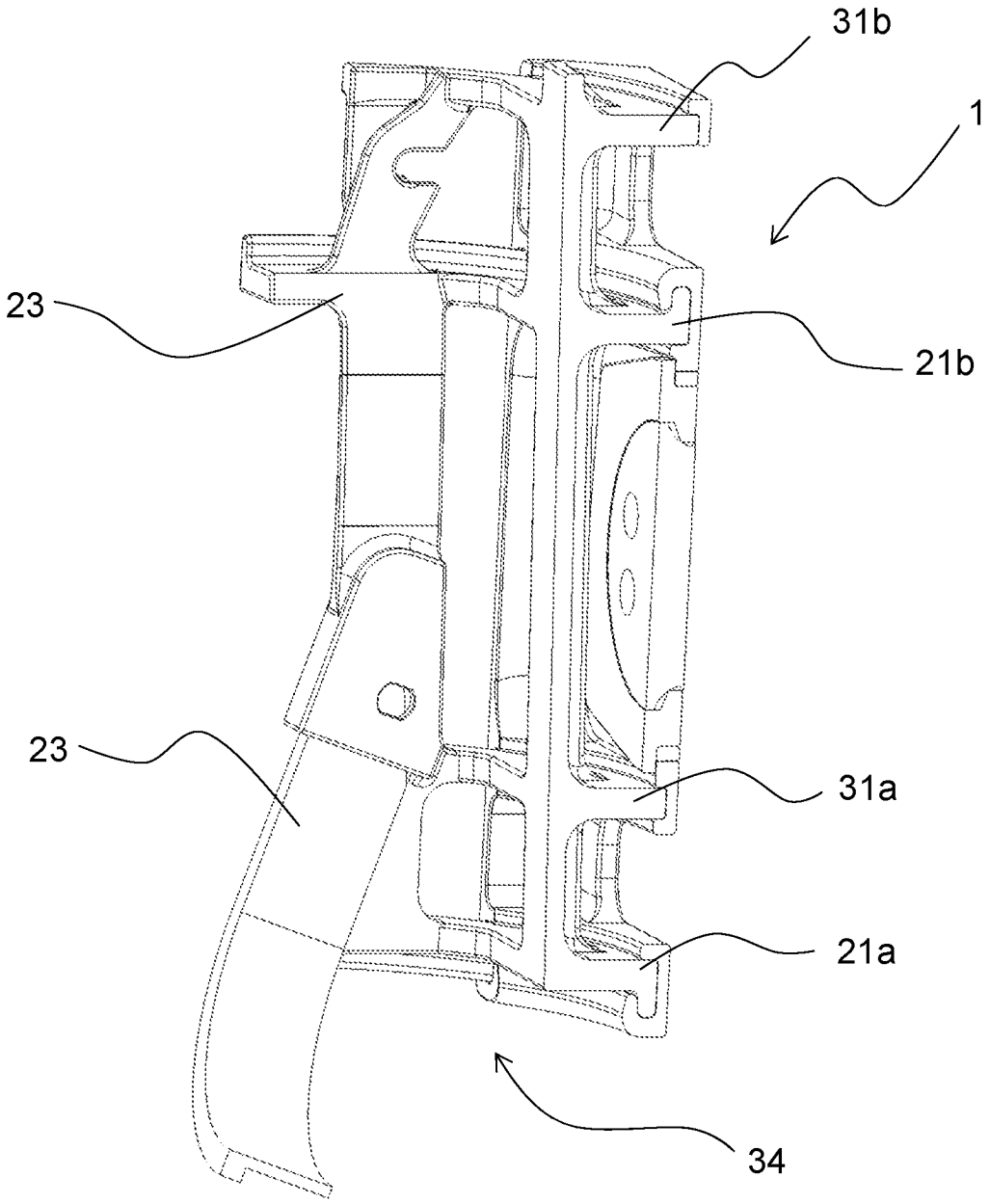

Figure 22

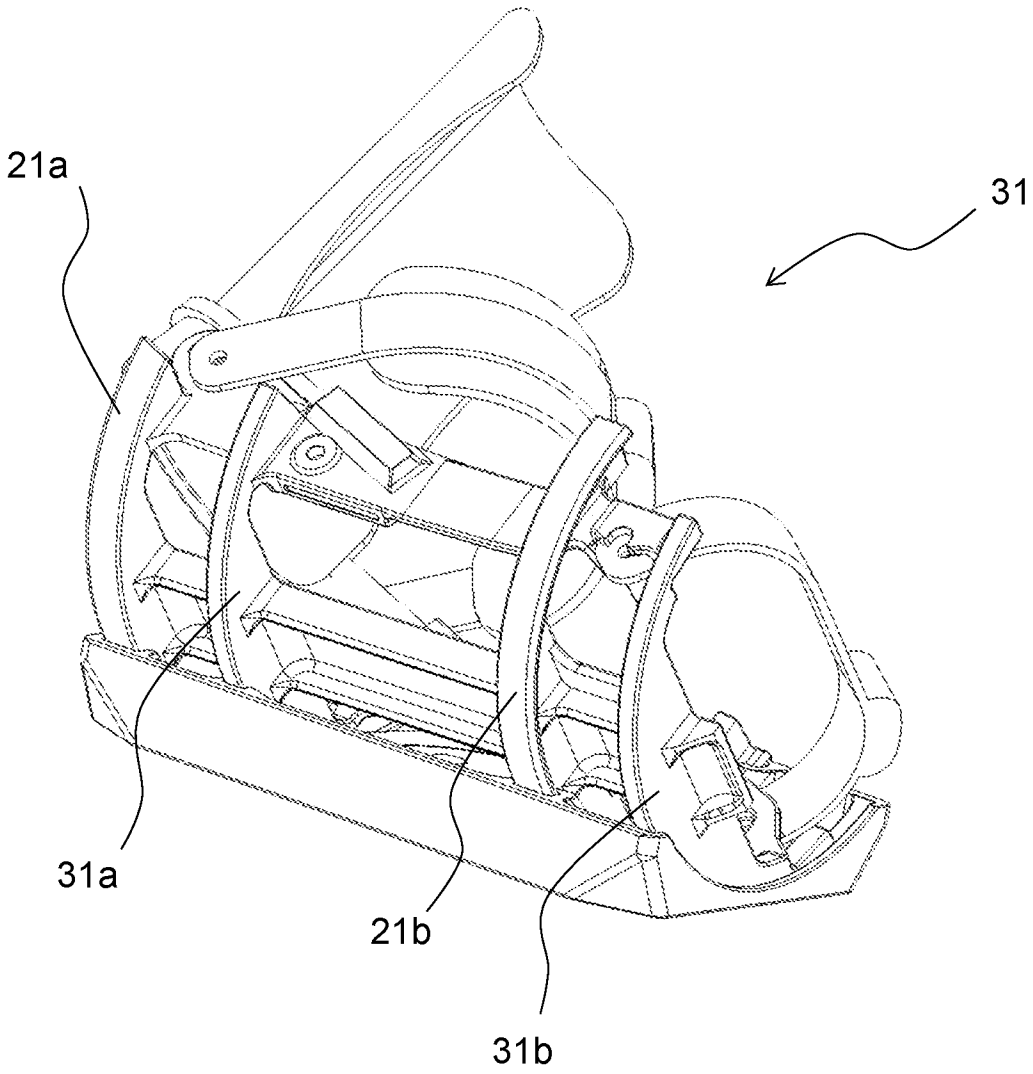

Figure 23

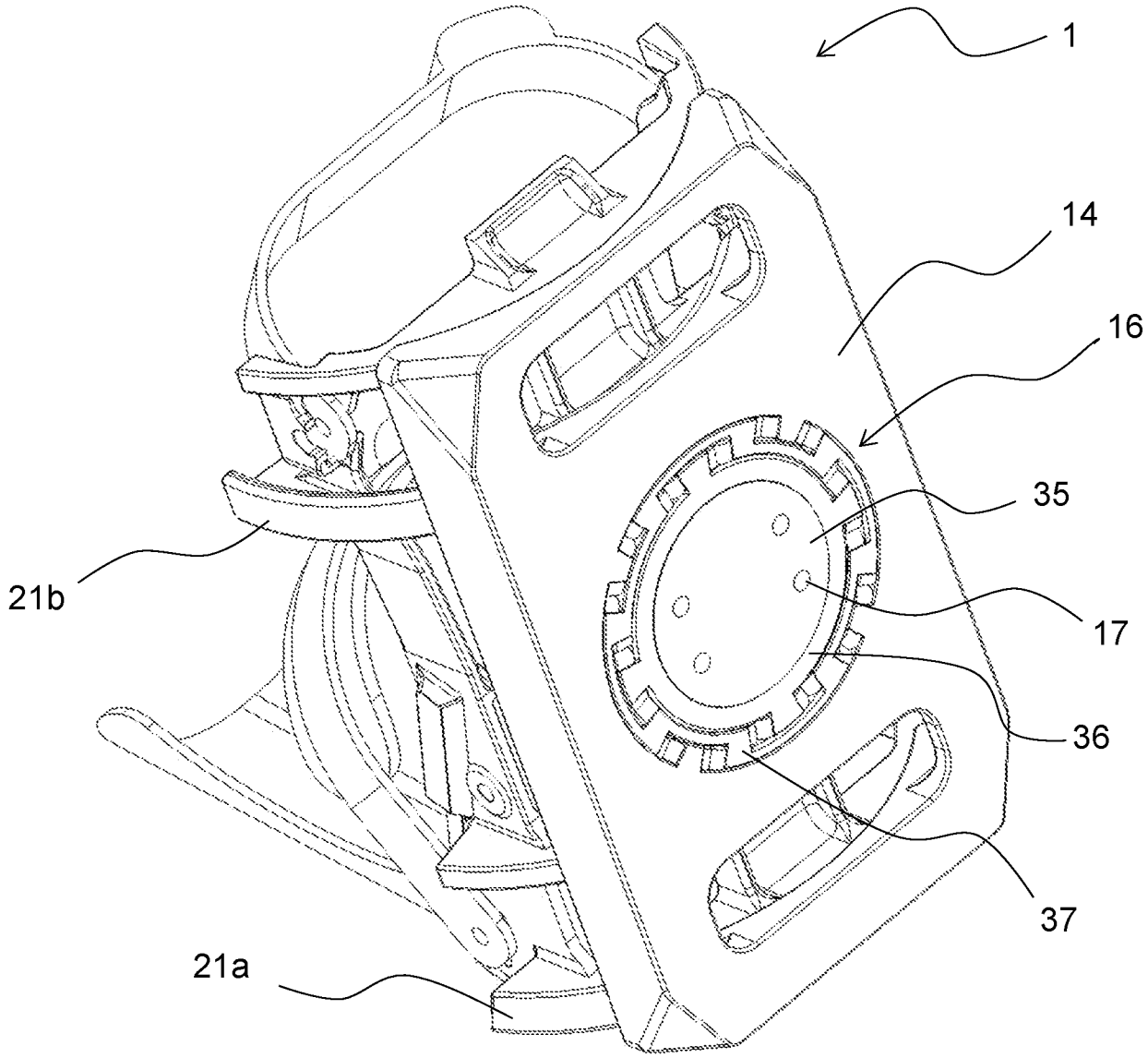

Figure 24

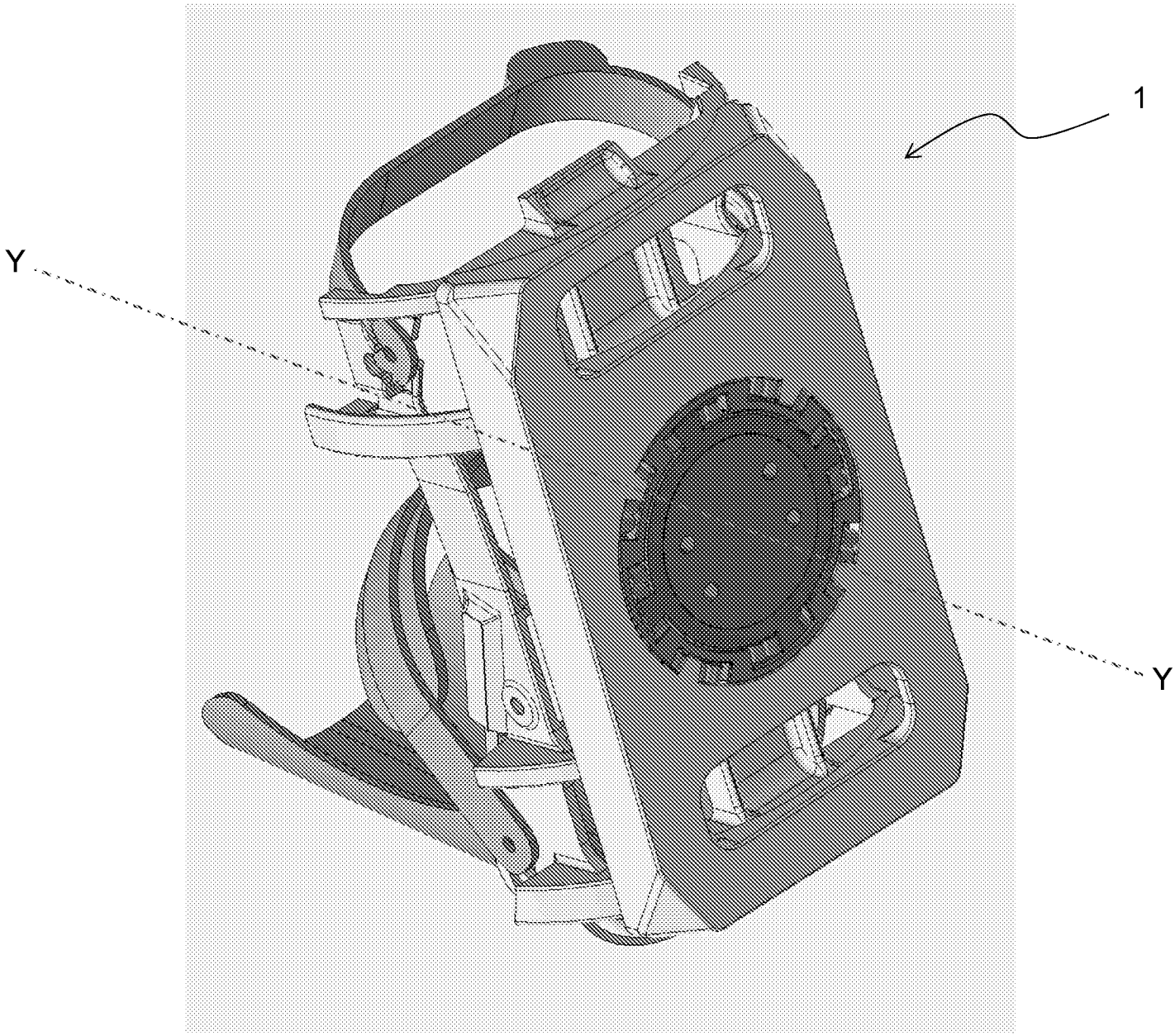

Figure 25

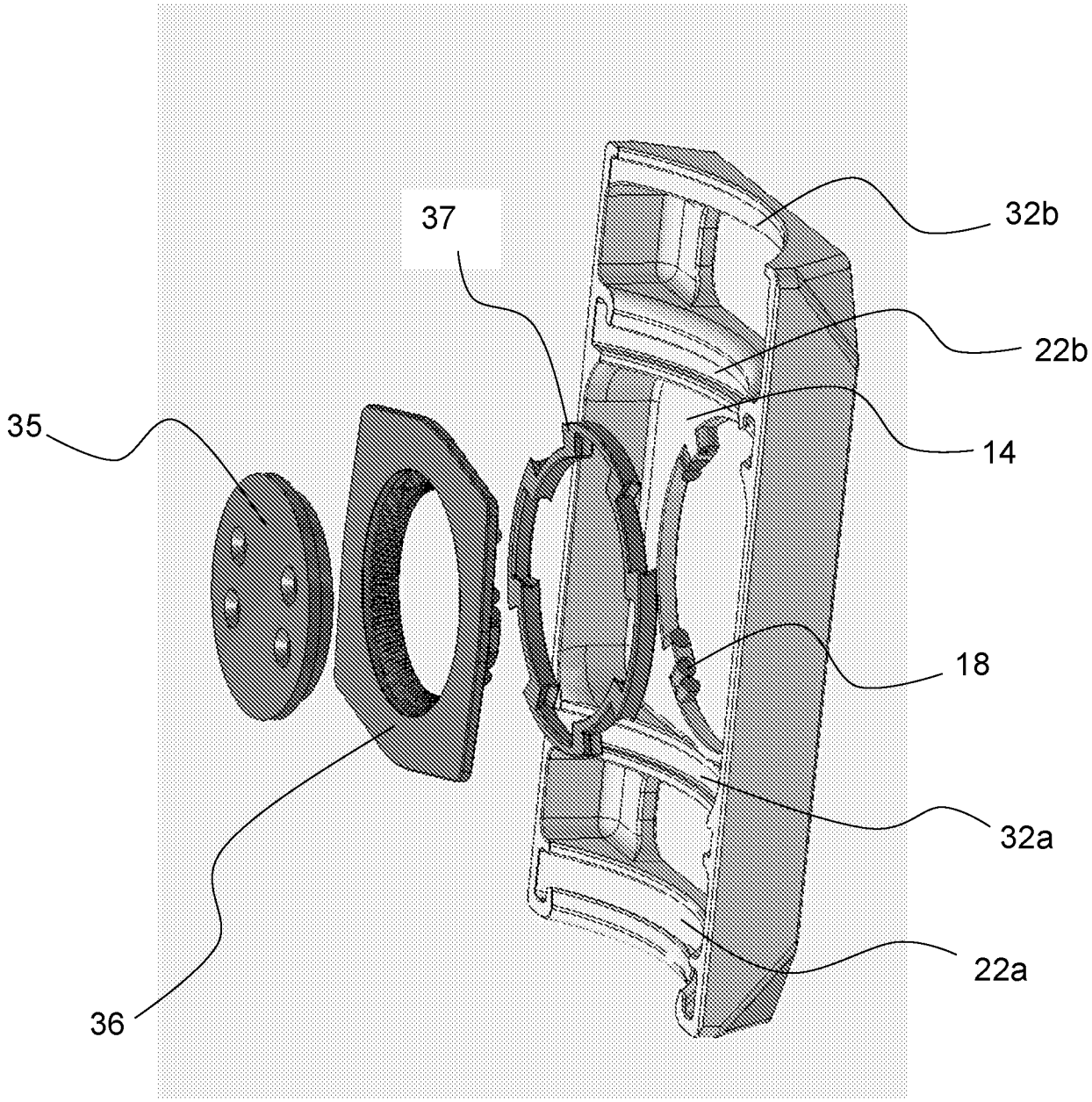

Figure 26

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2023/056423

A. CLASSIFICATION OF SUBJECT MATTER
INV. A63C10/18 A63C10/20 A63C10/16
ADD.

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/212513 A1 (WEISSENBERGER DIRK [DE]) 27 August 2009 (2009-08-27)	1-17
Y	paragraphs [0001] - [0021]; figures	19,20
A	1,2a,2b	18,21-24
	paragraph [0001] - paragraph [0021]	

Y	US 2007/007735 A1 (STEFANIC DANIEL M [US]) 11 January 2007 (2007-01-11)	19,20
	paragraph [0033]; figure 2	

X	WO 2011/044067 A1 (BENDER JACOB [US]) 14 April 2011 (2011-04-14)	1,2
	page 9, line 25 - page 9, line 30; figures 90-93	

X	US 9 044 664 B1 (CANADAY TIM [US] ET AL) 2 June 2015 (2015-06-02)	22-24
	column 8, line 50 - column 8, line 59; figure 2b	

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 October 2023	03/11/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Murer, Michael

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2023/056423

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		DE 112006003428 A5	18-09-2008
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		EP 1962977 A2	03-09-2008
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US 9044664 B1	02-06-2015	US 9044664 B1	02-06-2015
		US 2015290522 A1	15-10-2015