(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 721 735 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.10.2020 Bulletin 2020/42

(51) Int Cl.:
A41D 13/05 *(2006.01)*

(21) Application number: **20168623.5**

(22) Date of filing: **08.04.2020**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **12.04.2019 IT 201900005718**

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(54) **WEARABLE PROTECTION DEVICE**

(57) The present disclosure concerns a personal protection device (1) for protecting at least one portion of a user's body, said device (1) comprising a tank element (3), intended in use for the containment of a liquid, and a back protector (2), coupled or joined with said tank element (3). In particular, said back protector (2) can act as support for said tank element (3).

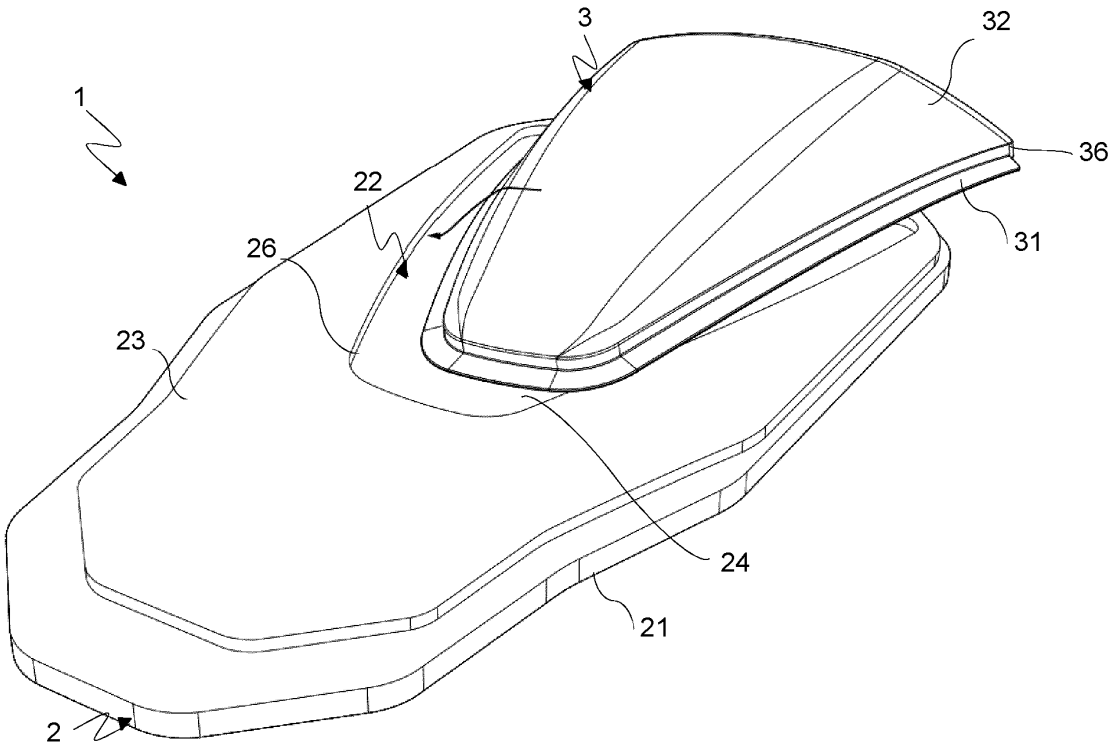

Fig.1

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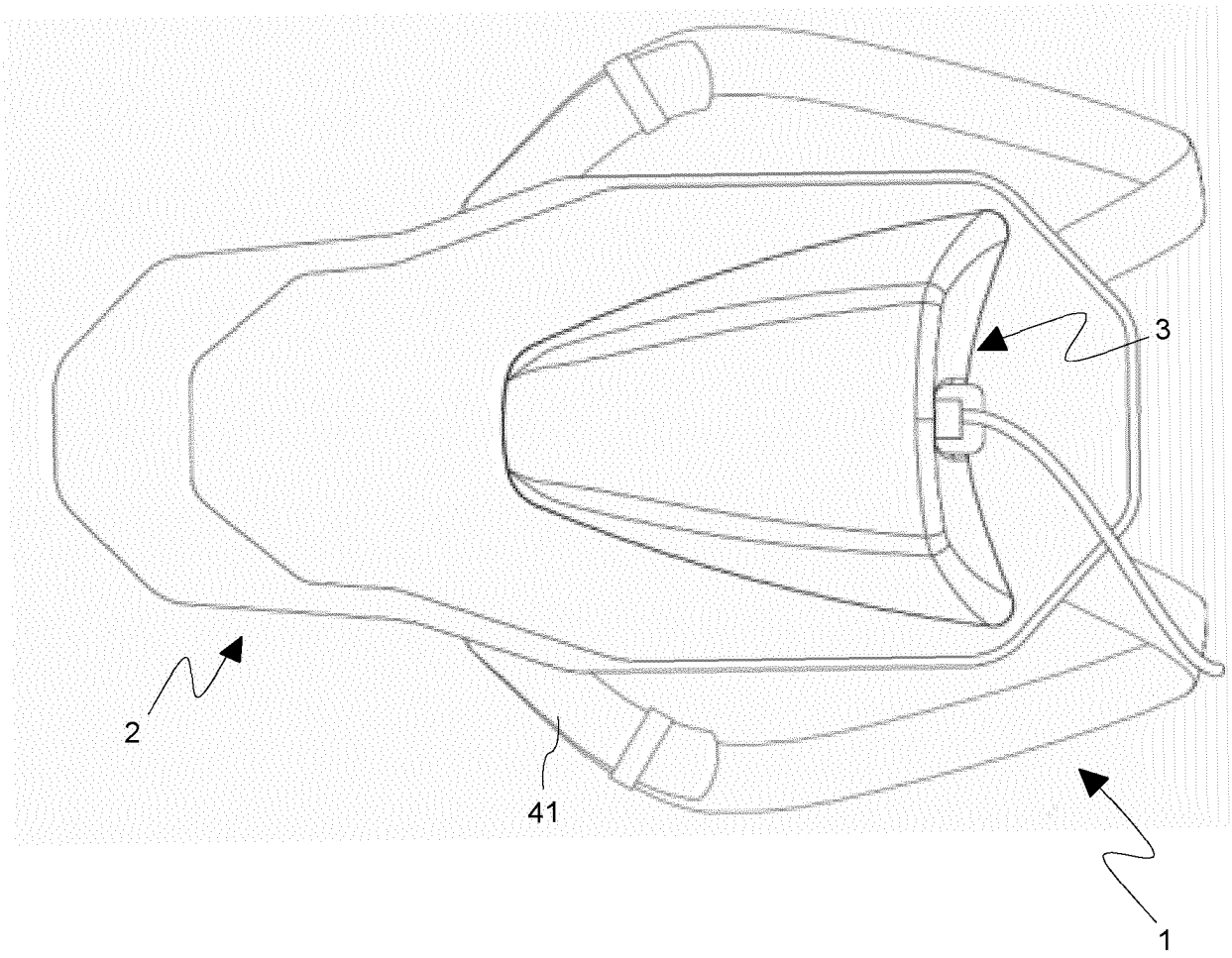

Fig. 11

Description

[0001] The present disclosure generally refers to a protection device for a protection of a user. More particularly, the present disclosure relates to a wearable protection device to protect a user's body from an impact or fall during the practice of a sport or activity of dynamic type. For example, said device is used to protect a passenger or a driver of a motor vehicle, or a biker, or a skier, or a person during the execution of a work activity exposed to the danger of impacts.

[0002] Wearable protection devices are known, such as for example a back protector for biking use, which comprises one or more substantially rigid or semi-rigid plates, or shields. The back protector is worn in close contact with the user's body, in order to protect the back and spine in the event of an impact.

[0003] The ongoing need to improve the functions offered by prior art wearable protection devices is also known, so as to provide a wearable protection device that offers not only high protection, but also allows to perform additional functions.

[0004] The present disclosure therefore starts from the position of the technical problem of providing a wearable device for the protection of a user's body from impacts which allows to offer high protection and, at the same time, satisfies further user's needs, and has greater functionality.

[0005] In order to solve said technical problem, a personal protection device, a clothing article or garment comprising said personal protection device, a method of making said personal protection device, and a use as defined in the respective independent claims are made available. Secondary features of the object of the present disclosure are defined in the corresponding dependent claims.

[0006] In particular, the protection device according to the present disclosure allows meeting one of the user's greatest needs, while performing a sport or dynamic activity, namely that of taking liquids to keep an adequate level of hydration.

[0007] Unlike the state of the art where this need was addressed separately, providing on one side protectors, in particular for the back, and on the other side soft bags having the function of a tank to be arranged, one or the other, individually within pockets provided in a clothing article or garment.

[0008] The idea of solution underlying the present disclosure lies in associating a back protector, also called spinal protector, with a tank element, and improving the association and combination of these two elements as much as possible in order to allow their combined use by a user, for example on a clothing article, or garment, or integrated within the clothing article or garment. In other words, the idea of solution behind the present disclosure consists in providing a personal protection device that guarantees the user's personal protection, against impacts or falls, and the chance to hydrate.

[0009] In particular, the back protector acts as a support for the tank element. The tank element is therefore firmly coupled and/or connectable with the back protector. That is to say, i.e., that the tank element is associated and/or associable in a firm manner with the back protector. The result is a personal protection device that can be individually manipulated and structurally independent and having at least two functions. In other words, in the personal protection device, the back protector and the tank element can be manipulated together as if they were a single body, and can be worn with a single action by a user with no need of wearing the tank element and the back protector at different times.

[0010] The personal protection device for the protection of at least one portion of the body of a user according to the present disclosure comprises a tank element which in use is apt to contain a liquid, and a back protector, coupled with or joined with said tank element, and/or wherein said back protector acts as a support for said tank element. It follows that the personal protection device allows to simultaneously guarantee protection and hydration to a user. In addition, the protection device according to the present invention is therefore configured so that the back protector can act as a support for said tank element. For example, the back protector and the tank element can be fixed or coupled in a removable way, that is, permanently or constantly, such that it is necessary to break a link between said two objects in order to separate them. Alternatively, for example, the personal protection device can be made as a single piece or "one-piece".

[0011] According to a preferred aspect of the present disclosure, the back protector of the personal protection device for protection is configured to define a coupling seat apt to allow the coupling of at least one portion of the tank element with the back protector. In other words, the protector has a designated seat or housing configured to be coupled or associated with said tank element. In other words, the back protector is configured to form a seat to allow the association or coupling of a portion or region of the tank element with the same back protector. The back protector therefore has or is equipped with a seat to which a portion or region of the tank element can be coupled, associated or connected.

[0012] Furthermore, according to a further preferred aspect of the present disclosure, the coupling of at least one portion of the tank element to the back protector is reversible. Therefore, this means that unlike a permanent coupling, where it is necessary to break or violate the integrity of the product to separate the components thereof, the tank element and the back protector can easily be firmly joined with each other or not according to the user's needs. This means that the tank element and the back protector can be made as objects that can be individually manipulated. In other words, the back protector and the tank can be separated or decoupled if necessary. Advantageously, this entails the possibility of separately using the back protector alone, for example during short-

term activities, and of being able to wash and fill the tank element with greater convenience.

[0013] According to another preferred aspect of the personal protection device according to the present disclosure, the tank element is rigidly connected or connectable, with a shape coupling, to said back protector to form a single body with said back protector and/or the tank element can be moved together with the back protector and/or it does not hang or swing with respect to the latter. In other words, the geometry of the tank element and the geometry of the back protector are such as to ensure that the shape coupling of said two objects is rigid. In fact, when these two objects are coupled, the tank element does not hang, swing or dangle, with respect to the back protector. In other words, when coupled, the tank element and the back protector form a single body. This is particularly advantageous during the execution of a dynamic activity, during which the protection device can be subjected to sudden movements, such as jumps, or execution of severe inclinations. In fact, since the tank element cannot move with respect to the back protector, it cannot prevent or hinder a user's movement, for example, by leaning sideways with respect to the back protector or, for example, by tapping or bouncing with respect to the back protector. Furthermore, according to this same preferred aspect, the tank element, when coupled with the back protector, can be uniquely movable, that is to say manipulable, jointly with the latter. It follows that, advantageously, the coupling of the back protector and the tank element is a secure coupling, i.e. not slack or loose. In this way, during dynamic activity, the risk of accidental detachment of the back protector and the tank element is minimized. According to a further preferred aspect, the tank element forms an appendage on said back protector on one side of said back protector opposite to the user. In other words, the tank element does not project or protrude from the side of the protection device facing, or in contact with, the user. In this way, the tank element does not represent an hindrance to the user's movements. In addition, according to another preferred aspect, the tank element also has an aerodynamic shape. In this way, the tank element does not represent an element of aerodynamic resistance and therefore does not hinder the advancement of the user's body during a dynamic activity.

[0014] Another preferred aspect of the present disclosure relates to the fact that the back protector includes an outer layer intended to be arranged on an outer side of the personal protection device opposite to the user, and a first base layer or support layer opposite to said outer layer and intended, in use, to face the user and wherein said at least one portion of the tank element is intended to be interposed or contained between the outer layer and the first base layer. That is to say that the back protector is a multi-layered object or element. The outer layer of the back protector does not face the user; on the contrary, said first base or support layer, being opposite to the outer layer faces the user. Furthermore, according to this preferred aspect, the at least one portion of the tank element is intended to be interposed or contained between the outer layer and the first base layer of the back protector. This means that the coupling seat, if present as mentioned before with reference to one of the preferred aspects, is between said first support, or base, layer and said outer layer.

[0015] More specifically, according to a further preferred aspect, the outer layer and the first base, or support, layer of the back protector are firmly joined with each other and the coupling seat comprises a recess surrounded, at least partially, by at least one slot, pocket or slit, made between said two layers. That is to say, that said coupling seat comprises a recess surrounded, at least partially, by a slot, pocket or slit. Consequently, the coupling and decoupling of the back protector and the tank element is facilitated. A sort of shape coupling is obtained for the back protector with the tank element. Said slot, pocket or slit is configured to receive or house at least part of the tank element. Therefore, to couple the tank element with the back protector, it is sufficient to lean the tank element inside said recess and insert, or fit, said portion of the tank element in the slot, or pocket, between the first support, or base, layer and the outer layer of the protector element; vice versa, to decouple the tank element and the back protector, it is only necessary to slide the portion of the tank element out of said slot or pocket or slit.

[0016] According to another preferred aspect of the present disclosure, the back protector is made of semi-rigid or flexible material while the tank element is made of rigid material. In this way, greater comfort for the user is advantageously ensured. In fact, the back protector being flexible, or semi-rigid, allows better accompanying the anatomy and movements of the user. Furthermore, being the first base layer and the outer layer flexible, it is easier for the user to manipulate the back protector at the coupling seat and facilitate the extraction or insertion of the tank element. In addition, the tank element being made of rigid material allows limiting the user's unbalance due to the deformation of the tank element due to the displacement of the volume of liquid contained therein following jumps and/or curves.

[0017] According to another preferred aspect of the present personal protection device, the tank element comprises a substantially closed container defining an inner cavity and having a perimetric rim and wherein the portion of the tank element comprises a flap extending along at least part of said perimetric rim and protrudes radially outwards with respect to the inner cavity of the container. That is to say that the portion of the tank element includes a flap or tab projecting outwards with respect to said inner cavity of the container and surrounding the container around the perimeter. In other words, the portion of the tank element comprises a flap, or tab, which creates a protrusion, outer to said inner cavity, along at least one part of a perimetric rim of the substantially closed container. This simplifies the coupling or housing of the tank element with the back protector. More specif-

ically, said preferred aspect allows facilitating the insertion of the portion inside the slot or pocket of the coupling seat made between the outer layer and the first support, or base, layer of the protector.

[0018] According to a preferred aspect of the personal protection device according to the present disclosure, the outer layer of the back protector has or is equipped with an opening at which it can enclose said perimetric rim of the tank element. This means that when the tank element is coupled with the back protector, said perimetric rim of the tank element touches, or is in contact with or matches with, the perimeter of the outer layer at the opening. Furthermore, according to this preferred aspect, an edge, or a portion of an edge, of the outer layer around the opening is not fixed to the first support, or base, layer to form at least one slit between the outer layer and the first support, or base, layer. That is to say, that the outer layer along the entire edge around the opening, or in one or more spots around said opening, is not made integral with the first base or support layer. To put it another way, an edge or a portion of the edge of the outer layer around the opening is free with respect to the first support layer, or base, so as to form said at least one slit between the two layers. It follows, that a slit, slot or pocket is formed where the outer layer and the first base or support layer are not firmly joined or fixed with one another.

[0019] In particular, the flap of the tank element allows forming a shape coupling with the slot, pocket or slot between the outer layer and the first base layer, or support layer. In addition, according to the preferred aspect just illustrated, said flap of the tank element is configured to be inserted inside said slit between the outer layer and the first support layer and/or, vice versa, said slit between the outer layer and the first support, or base, layer is configured to house said flap of the tank element.

[0020] In addition, according to a further aspect of the personal protection device object of the present disclosure, the container of the tank element comprises a concave inner wall, apt to face the first base layer or support layer of the back protector, i.e having an inward curvature with respect to the inner cavity. In other words, the tank element is made in such a way as to have an ergonomic curvature at the wall facing the first base support layer or support and therefore consequently, in use, towards the user's back. Stated with different words, the inner wall of the container of the tank element has an inward curvature suitable to accommodate the natural curvature of a user's back. Furthermore, advantageously, when the tank element is coupled with the flexible back protector, the first base layer or support of the flexible protector adjusts to follow the curvature of the tank element and, overall, to create a highly ergonomic protection device.

[0021] Furthermore, according to a further aspect of the present disclosure, the personal protection device comprises one or more belts or straps in order to be directly worn or fixed on a user's body. By means of said belts or straps the protection device can be worn by the user, for example, on a jacket or another garment.

[0022] Finally, according to another preferred aspect of the present disclosure, the personal protection device comprises a second base layer or support layer. In particular, according to said preferred aspect, the second base layer or support layer is intended, in use, to face the user and be closer to the user than the first base or support layer. In other words, the first base, or support, layer, is interposed between the second base, or support layer, and the outer layer. The presence of the second base layer represents a reinforcement of the structure of the personal protection device and also allows increasing the response, in terms of energy absorption of the protector, in the event of impacts. That is to say that the second base, or support, layer advantageously allows improving the shock absorption capacity of the personal protection device.

[0023] The present disclosure also relates to a clothing article, or garment, such as a suit or jacket, a waistcoat, a vest or similar garment, preferably for dynamic activities such as biking, skiing or the like, comprising the personal protection device according to what has been illustrated so far. For example, the article of clothing, or garment, can comprise a pocket or other seat where to lodge the personal protection device. Preferably said pocket or seat is accessible from the outside of the clothing article, or garment, to allow a user to reach, extract or insert said personal protection device.

[0024] In addition, the present disclosure also refers to a method of manufacturing a personal protection device as illustrated heretofore. The manufacturing method involves:

- providing a tank element, intended in use to contain a liquid,
- providing a back protector and defining a coupling seat in the back protector,
- coupling, preferably in a reversible way, at least one portion of the tank element with the back protector at the coupling seat.

[0025] In particular, according to this method, the provision of a back protector and the definition of a coupling seat in the latter provides for:

- providing a first base layer or support layer intended to face the user when the back protector is worn;
- providing an outer layer, having an opening and intended to be arranged on an outer side of the back protector opposite the user,
- fixing said first base layer or support layer and said outer layer to each other so as to form at least one slit, around said opening, to accommodate or house at least said portion of the tank element.

[0026] Finally, the present disclosure also concerns the use of a back protector 2 to support a tank element 3.

[0027] Further advantages, characteristics and meth-

ods of use of the object of the present disclosure will become evident from the following detailed description of embodiments thereof, presented as non-limiting examples.

[0028] It is however evident that each embodiment of the object of the present disclosure can have one or more of the advantages listed above; in any case it is not required that each embodiment has all the listed advantages simultaneously.

[0029] Reference will be made to the figures of the attached drawings, wherein:

- Figure 1 represents a first view of a coupling step of a tank element and a back protector of a first embodiment of the protection device according to the present disclosure;
Figure 2 represents a second view of a coupling step of a tank element and a back protector of a first embodiment of the protection device according to the present disclosure;
- Figure 3 shows a perspective view of a first embodiment of the protection device according to the present disclosure;
- Figure 4 shows a top view of a first embodiment of the protection device according to the present disclosure;
- Figure 5 shows a longitudinal section view along the line I-I of Figure 4;
- Figure 6 shows a cross-sectional view along the line II-II of Figure 4;
- Figure 7 shows an enlarged view of a detail III of Figure 6 relating to a coupling seat and a portion of the tank element of a first embodiment of the protection device according to the present disclosure;
- Figure 8 shows a side view of a first embodiment of the protection device according to the present disclosure;
- Figure 9 shows an enlarged view of a detail relating to a coupling seat and a portion of the tank element of a second embodiment of the protection device according to the present disclosure;
Figure 10 shows a side view of a second embodiment of the protection device according to the present disclosure;
- Figure 11 a top view of a protection device according to a third embodiment of the present disclosure;
- Figure 12 a top view of a protection device according to a fourth embodiment of the present disclosure.

[0030] With reference to the attached figures, the reference number 1 indicates an embodiment of a protection device according to the present disclosure as a whole.

[0031] The personal protection device 1 comprises a tank element 3 and a back protector 2, coupled or joined together, preferably in a reversible way. The back protector 2 represents or acts as a support for said tank element 3.

[0032] The term "back protector" 2 refers within the scope of the present disclosure to a spinal protector. Said back protector 2 is apt to be arranged at the user's back, and in particular along his backbone or a portion of it, to protect it from impacts or impacts that can damage it. It follows that in the back protector 2 a long side direction can be identified which, in use, extends in the direction of the user's spine. That is to say that this back protector 2 extends mainly in a main development direction which coincides with said long side direction.

[0033] Preferably, the back protector 2 is configured to define a coupling seat 22 apt to house therein, preferably in a reversible way, at least one portion of the tank element 3. The back protector 2 is therefore configured to form a seat coupling 22 apt to allow the coupling or association or connection of the tank element 3 with the same back protector 2. In other words, the back protector 2 is apt to receive, or in general to allow the association of, also in a non-permanent way, or according to the user's desire, at least part of the tank element 3. It follows that the back protector 2 and the tank element 3 can be joined together and manipulated together as if they were a single body, or, or if necessary, they can be decoupled from each other and therefore can be individually manipulated. In other words, when coupled together, the back protector 2 and the tank element 3 form a single body or single object, and therefore can only be handled together.

[0034] In particular, the tank element 3 can be rigidly connected, with a shape coupling, with said back protector 2. Then, in the personal protection device 1, the tank element 3 is rigidly connected to the back protector 2. The element tank 3, when housed in said back protector 2, or supported by said back protector 2 or associated with said back protector 2, forms a single body with the latter. Therefore, in the coupling condition the tank element 3 is movable, or can be manipulated or handled, together with said back protector 2 and in this condition, the tank element 3 does not hang, dangle or swing from the back protector 2 or with respect to said back protector 2. Preferably, the tank element forms an appendage on said back protector 2 on one side thereof opposite to the user. In other words, the tank element 3 forms a protrusion or bulge not facing the user's body, so as not to hinder the movements thereof and make the wearing of the protection device 1 more comfortable. Furthermore, preferably, the tank element 3 has an aerodynamic shape. The tank element 3 has aerodynamic conformation when coupled with the back protector 2. The tank element can be completed with a cannula or straw long enough to reach the mouth of a user when the back protector 2 is worn.

[0035] According to a preferred aspect of the present disclosure, the back protector 2 includes a first base layer, or support layer, 21 and an outer layer 23. The outer layer 23 is intended to be arranged on an outer side of the back protector 2 which is an opposite side to the user. Instead, the first base layer, or support layer, 21 is opposite with respect to said outer layer 23 and, therefore,

is intended to face the user. In other words, with respect to the outer layer 23, the first base layer or support layer 21 faces the user's back when the back protector 2 is worn. The first base layer or support layer 21 faces, in use, towards the user's back.

[0036] Preferably, the first base layer, or support layer 21, and the outer layer 23 form the coupling seat 22 apt to receive or house between them, even in a reversible way, at least one portion of the tank element 3. That is to say that said portion is intended to be interposed, contained, or housed between said two layers, 21 and 23. In other words, this portion is configured to be received between said first base layer 21 and said outer layer 23.

[0037] According to an aspect of the present disclosure, the first support layer, or base layer, 21 has a greater extension than the outer layer 23 and therefore defines a larger protection surface than the latter. The first support layer, or base layer, 21 has thus a greater surface extension than the outer layer 23.

[0038] The first base layer, or support layer, 21 and the outer layer 23 of the back protector 2 are stably coupled, i.e., fixed or joined together. The first base layer, or support layer, 21 and the outer layer 23 cannot be separated from each other without breaking a link between said two layers 21, 23 in order to separate them. That is to say that it is necessary to break or violate the integrity of the back protector 2 to separate the layers. The first base layer or support 21 and the outer layer 23 are therefore firmly joined with each other. The first base layer, or support layer, 21 and the outer layer 23 can be fixed to each other in a way known to the person skilled in the art, such as for example by mechanical fixing means or gluing. Preferably, the outer layer 23 is permanently coupled with the first base layer, or support layer, 21 at almost the entire contact surface between the two layers, 21 and 23.

[0039] Furthermore, preferably, said first base or support layer 21 and said outer layer 23 are coupled so as to form among them said coupling seat 22. The coupling seat 22 comprises a recess 24 surrounded, at least partially, by at least one slit 25 arranged or created between the outer layer 23 and the first base layer 21. In other words, the coupling seat comprises a recess 24 surrounded, at least partially, by a slit 25 made or obtained between the outer layer 23 and the first base layer 21

[0040] In particular, the outer layer 23 is shaped so as to present an opening 26. Preferably, said opening 26 of the outer layer 23 is apt to receive the tank element 3. Even more preferably, the outer layer 23, at the opening 26, is apt to enclose the perimetric rim 36 of the tank element 3. Substantially therefore, the perimetric rim 36 of the tank element 3 is configured to be in contact with the perimetric rim or free rim of the outer layer 23 at the opening 26. In other words, when the tank element 3 is inserted in said opening 26 of the outer layer 23, the perimetric rim of the tank element 3 and the perimetric rim of the outer layer 23 at the opening 26 face to one other. Said opening 26, together with the portion of the first base or support layer 21 accessible through it, represents the recess 24 of the back protector 2. The hollow or recess 24 of the coupling seat 22 is thus represented by the space between said opening 26 and the first base or support layer 21. The hollow or recess 24 of the coupling seat 22 is, in other words, delimited by or enclosed between the first base or support layer 21 and the perimetric rim or free rim of the outer layer 23 at the opening 26.

[0041] In addition, only an edge, or a portion of edge, of the outer layer 23 around the opening 26 is not fixed to, i.e. is free with respect to, the first support, or base, layer 21. Said free edge, or a portion of the free edge, not coupled or fixed with the first base layer, or support 21, is arranged at the perimetric rim of the opening 26. In such a way, the at least one slit 25 is formed between the two layers, 21 and 23. In other words, the slit 25 represents a pocket between said two layers 21 and 23. stated differently, the recess 24 is surrounded, at least in part, by at least one slit 25 arranged between the outer layer 23 and the first base layer 21. The slit or pocket 25 is created thanks to the fact that the first base layer 21 and the outer layer 23 are not completely joined around said opening 26. The slit or pocket 25 is thus made by a free edge of the outer layer 23 around said opening 26 and first base layer 21.

[0042] The tank element 3 is intended in use to contain a liquid.

[0043] In other words, the tank element 3 comprises a substantially closed container 30 which defines an inner cavity 33. When the inner cavity 33 is filled with a liquid, for example water, the tank element 3 acts as a water reserve for the user.

[0044] The tank element 3 comprises at least one portion, apt to be coupled, inserted or housed inside the back protector 2. Preferably, said portion comprises a flap 31 which protrudes or project radially outwards with respect to the entire cavity 33 of the substantially closed container 30 of the tank element 3. In other words, the flap 31 represents a tab which protrudes outwards with respect to the inner cavity 33 of the substantially closed container 30 of the tank element 3 with respect to the inner cavity 33. Furthermore, said flap 31 extends outwards along at least part of the perimetric rim 36 of the substantially closed container 30 of the tank element 3. The flap or tongue 31 surrounds at least partially along the perimeter the substantially closed container outside the inner cavity 33.

[0045] In particular, said flap 31 of the tank element 3 is configured to be inserted within the at least one slit 25 between the outer layer 23 and the first support layer 21. Under a different point of view, the slit 25 between the outer layer 23 and the first support layer 21 is configured to house said flap 31 of the tank element 3. In other words, the geometry of the flap 31 and the geometry of the slit 25 allow to form a shape coupling with each other.

[0046] Preferably, the container of the tank element 3 comprises an inner wall 34, apt in use to face the first

base layer or support layer 21 of the back protector 2 and one or more outer walls 32. The inner wall 34 is joined with the outer wall(s) 32 so as to define said container 30. In other words, the inner wall 34 and one or more outer walls 32 are coupled together to define said container 30. That is to say that the container comprises at least said inner wall 34 and one or more outer walls 32. The tank element 3 further comprises a perimetric rim 36. The inner wall 34 is joined with the outer wall(s) 32 along a so-called perimetric rim 36. This perimetric rim 36 is therefore the perimetric rim of the container 30. Preferably, the inner wall 34 is concave, i.e. it has an inward curvature with respect to the inner cavity 33. Even more preferably, to ensure maximum comfort, the radius of curvature of the inner wall 34 substantially coincides with the natural radius of curvature of the back of a user.

[0047] Preferably, the back protector 2 further comprises a third layer 27. The back protector 2 can therefore comprise a second base layer or support layer 27 which is intended to face the user and be closer to the user than the first base or support layer 21. In other words, according to this preferred aspect, the first base or support layer 21 is interposed, or interposed or contained between, the second base or support layer 27 and the outer layer 23. In other words, the back protector 2 is a multilayer element having a sandwich structure. The second base layer or support layer 27 is fixed to the first base layer, or support layer, 21. Preferably, the second base layer, or support layer, 27 is only partially fixed to the first base layer or support layer 21. Even more preferably, to ensure greater flexibility of the structure of the back protector 2, the second base layer or support layer 27 is partially fixed to the first base layer, or support layer, 21 only at a central zone or region of said first base layer, or support layer, 21 and said second base layer or support layer 27.

[0048] Preferably, the back protector 2 is made of semi-rigid or flexible material, such as 100% nitrile rubber, while the tank element 3 is made of rigid material.

[0049] Furthermore, preferably, the tank element 3 comprises an opening 35. Said opening 35 allows the insertion of the liquid inside the inner cavity 33 and also allows the insertion inside the same inner cavity 33 of a cannula or straw, as shown in figures 11-12. Even more preferably, the opening 35 is surrounded by a threaded wall suitable for coupling with a cap, provided with a counter thread. The cap may in turn include a hole that allows the insertion of a small tube or straw inside.

[0050] Furthermore, the personal protection device 1 can comprise one or more belts 42 or straps 41 to be directly worn or fixed on a user's body. In particular, these belts 42 or straps 41 are coupled with the back protector 2. Preferably, the belts 42 or straps 41 can be of the adjustable type so as to allow a better adaptation to the size of the user's body.

[0051] In addition, an article of clothing, or garment, comprising the personal protection device 1 as described in detail heretofore, is the subject of the present disclosure. For example, this article of clothing, or garment, is a suit or jacket, a waistcoat, a vest or similar garment, preferably for dynamic activities such as biking, skiing or the like. The article of clothing, or garment, can be provided with a pocket, or another seat, to contain, house, insert the personal protection device. Preferably, this pocket or seat is accessible from the outside of the garment, or garment, to allow a user to reach, extract or insert said personal protection device.

[0052] Furthermore, the present disclosure also refers to a method of manufacturing a personal protection device 1 as described heretofore in detail. In describing this process, elements and parts of the personal protection device involved in the method and having the same function and the same structure as the elements and parts of the embodiment of structure previously described maintain the same reference number and are not again described in detail.

[0053] In particular, the manufacturing method involves the following steps:

- providing a tank element 3, intended in use to contain a liquid,
- providing a back protector 2 and define a coupling seat 22 in the back protector 2,
- coupling at least one portion of the tank element 3 with the back protector 2 at the coupling seat 22.

[0054] Preferably, the step of coupling at least one portion of the tank element 3 with the back protector 2 at the coupling seat 22 is performed in a reversible way. That is, the tank element 3 can be decoupled or separated, if necessary, from the back protector 2.

[0055] In particular, according to this method, the provision of a back protector and the definition of a coupling seat in the latter provides for:

- providing a first base layer, or support layer, 21 intended to face the user when the back protector 2 is worn;
- providing an outer layer 23, having an opening 26, and intended to be arranged on an outer side of the back protector 2 opposite the user,
- fixing said first base layer or support layer 21 and said outer layer 23 to each other so as to form at least one slit 25, around said opening 26, to accommodate or house at least said portion of the tank element 3.

In fact, according to an aspect of the present method, the outer layer 23 is coupled or permanently fixed with the first base layer, or support layer, 21 at almost the entire contact surface between the two layers, 21 and 23. Only an edge, or a portion of the edge, of the outer layer 23 around the opening 26 is not fixed to the first support, or base, layer 21. In other words, only an edge, or a portion of the edge, of the outer layer 23 around the opening 26 is free with respect to the first support layer, or base, 21. In this way, at least one slit or slot 25 is

formed between the two layers, 21 and 23, suitable to receive a portion of the tank element 3, in particular a flap 31.

Finally, the present disclosure also concerns the use of a back protector 2 to support a tank element 3.

The object of the present disclosure has been so far described with reference to its embodiments. It is to be understood that there may exist other embodiments pertaining to the same inventive core, all of which are within the scope of protection of the claims set out below.

Claims

1. Personal protection device (1) for protecting at least one portion of a user's body, said device (1) comprising a tank element (3), intended in use for the containment of a liquid, and a back protector (2), coupled or joined with said tank element (3), and/or wherein said back protector (2) acts as support for said tank element (3).

2. Personal protection device (1) for the protection of at least one portion of a user's body according to claim 1, wherein the back protector (2) is configured for defining a coupling seat (22) apt to allow the coupling of at least one portion of the tank element (3) with the back protector (2).

3. Personal protection device (1) for the protection of at least one portion of a user's body according to claim 1 or 2, wherein the coupling of at least one portion of the tank element (3) with the back protector (2) is reversible.

4. Personal protection device (1) according to any one of the preceding claims, wherein said tank element (3) is rigidly connected with shape coupling with said back protector (2) to form a single body with said back protector and/or wherein said tank element (3) is movable together with said back protector and/or wherein said tank element (3) does not hang or swing with respect to said back protector.

5. Personal protection device (1) according to any one of the preceding claims, wherein said tank element (3) forms an appendix on said back protector (2) on a side of said back protector (2), intended in use to be opposite to the user.

6. Personal protection device (1) according to claim 2 or to any one of the preceding claims in combination with claim 2, wherein the back protector (2) includes an outer layer (23) intended, in use, to be arranged on an outer side of the personal protection device (1) opposite to the user, and a first base layer or support layer (21) opposite to said outer layer (3) and intended, in use, to be faced towards the user, and wherein said at least one portion (31) of the tank element (3) is intended to be interposed or contained between the outer layer (23) and the first base layer (21).

7. Personal protection device (1) according to claim 6, wherein the first base layer or support layer (21) and the outer layer (23) are firmly joined with each other and wherein the coupling seat (22) comprises a recess (24) surrounded, at least in part, by at least one slot (25) arranged or made between the outer layer (23) and the first base layer (21).

8. Personal protection device (1) according to anyone of the preceding claims, wherein the back protector (2) is made of semi-rigid or flexible material and wherein the tank element (3) is made of rigid material.

9. Personal protection device (1) according to anyone of the preceding claims, wherein the tank element (3) comprises a substantially closed container defining an inner cavity (33) and having a perimetric rim (36) wherein the portion of the tank element (3) comprises a flap (31) extending along at least part of said perimetric rim (36) and protrudes radially towards of the container (30).

10. Personal protection device (1) according to claim 9, wherein the outer layer (23) of the back protector (2) is shaped so as to present an opening (26) and wherein the outer layer (23), at the opening (26), is apt to surround said perimetric rim (36) of the container (30) of the tank element (3).

11. Personal protection device (1) according to claim 10, wherein a flap, or a flap portion, of the outer layer (23) around the opening (26) is not attached to, or is free with respect to, the first support, or base, layer (21) so as to form said at least one slot (25) between the outer layer (23) and the first support, or base, layer (21).

12. Personal protection device (1) according to anyone of the preceding claims in combination with claim 9 and claim 7, wherein said flap (31) of the tank element (3) is configured to be inserted inside said slot (25) between the outer layer (23) and the first support layer (21) and/or said slot (25) between the outer layer (23) and the first support layer (21) is configured to house said flap (31) of the tank element (3).

13. Personal protection device (1) according to anyone of the preceding claims in combination with claim 9, wherein the container (30) of the tank element (3) comprises an inner wall (34), apt in use to face the first base layer or support layer (21) of the back protector (2), and wherein said inner wall (34) is concave

i.e. has an inward curvature with respect to the inner cavity (33).

14. Personal protection device (1) according to anyone of the preceding claims, wherein the tank element (3) has an aerodynamic shape.

15. Personal protection device (1) according to anyone of the preceding claims, wherein the back protector (2) comprises a second base or support layer (27) and wherein said first base layer or support layer (21) is interposed between the outer layer (23) and the second base or support layer (21).

16. Personal protection device (1) according to anyone of the preceding claims comprising one or more belt (42) or strap (41) to be directly worn or fixed to a user's body.

17. Clothing article or garment comprising a personal protection device according to anyone the claims from 1 to 16.

18. Clothing article or garment according to claim 17, wherein said clothing article or garment is for dynamic activities, such as biking or skiing.

19. Manufacturing method of a personal protection device (1) according to anyone of the claims from 1 to 16 comprising the steps of:

- providing a tank element (3), intended in use for the containment of a liquid,
- providing a back protector (2) and defining a coupling seat (22) in the back protector (2),
- coupling at least one portion of the tank element (3) with the back protector at the coupling seat (22).

20. Manufacturing method of a personal protection device (1) according to claim 19, wherein the step of coupling at least one portion of the tank element (3) with the back protector (2) at the coupling seat (22) occurs in a reversible way.

21. Manufacturing method of a personal protection device (1) according to claim 19 or 20, wherein providing a back protector (2) and defining a coupling seat (22) in the back protector (2) provides for:

- providing a first base layer or support layer (21) intended to face the user when the back protector (2) is worn;
- providing an opposite outer layer (23) of the back protector (2), having an opening (26), and intended to be arranged on an outer side opposite the user,
- fixing said first base layer or support layer (21) and said outer layer (23) with each other so as to form at least one slot (25), around said opening (26), for receiving or housing at least said portion of the tank element (3).

22. Use of a back protector (2) for supporting a tank element (3) and forming with the tank element a single wearable device.

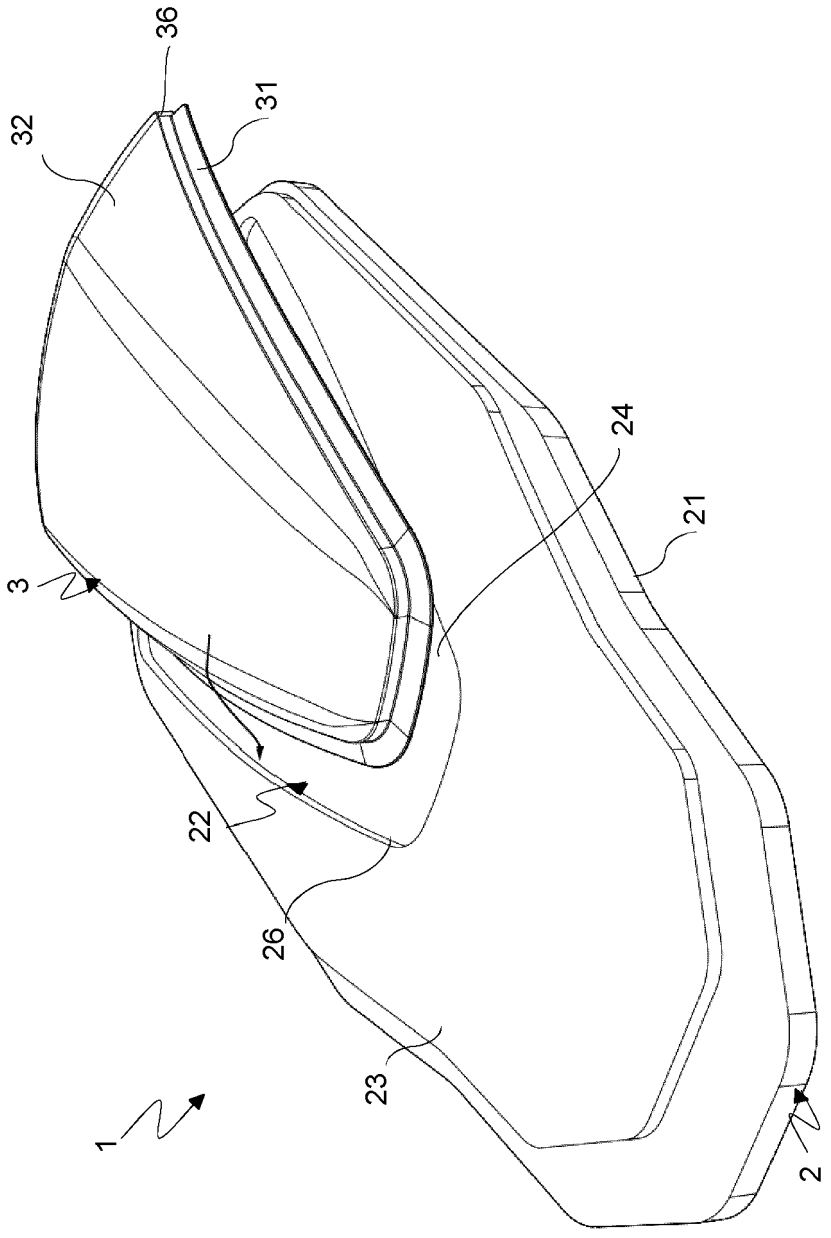

Fig.1

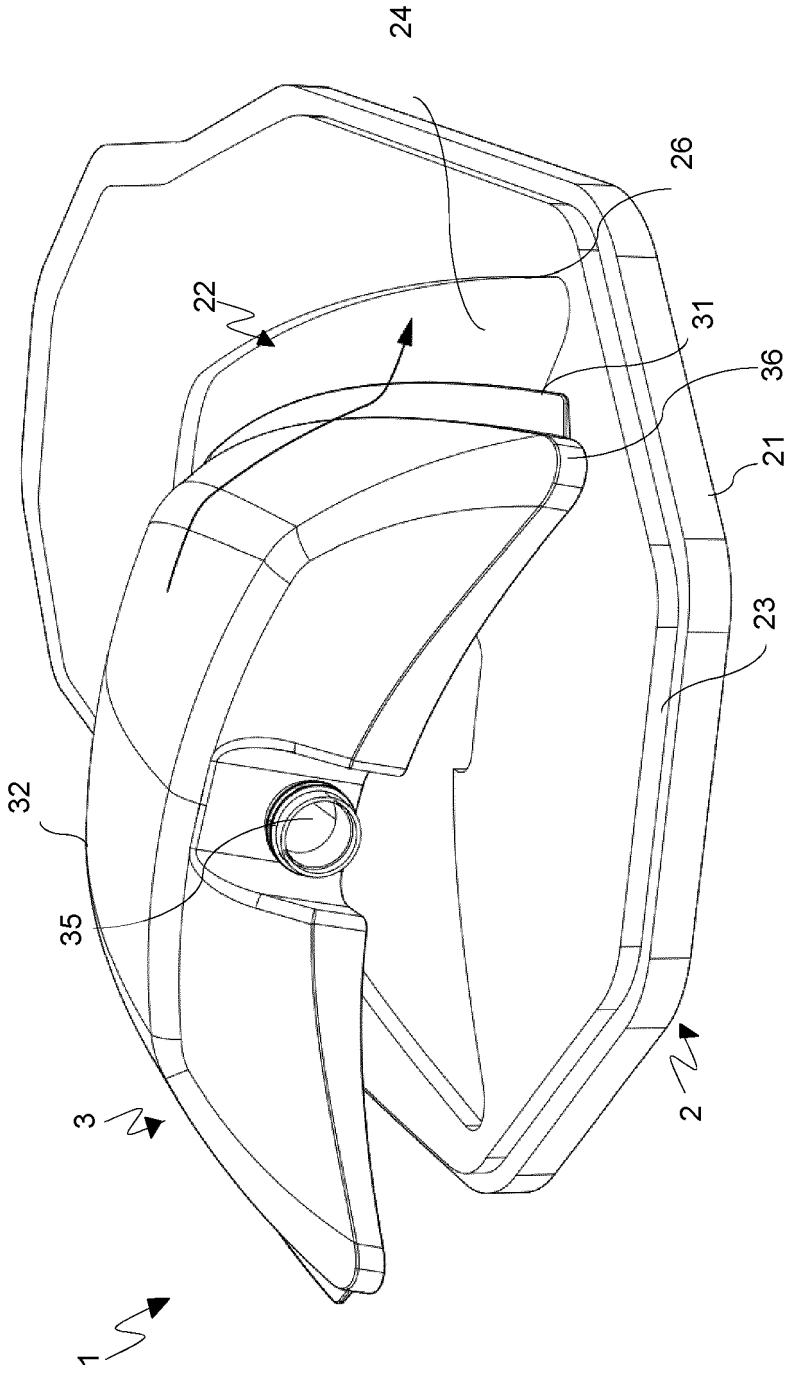

Fig.2

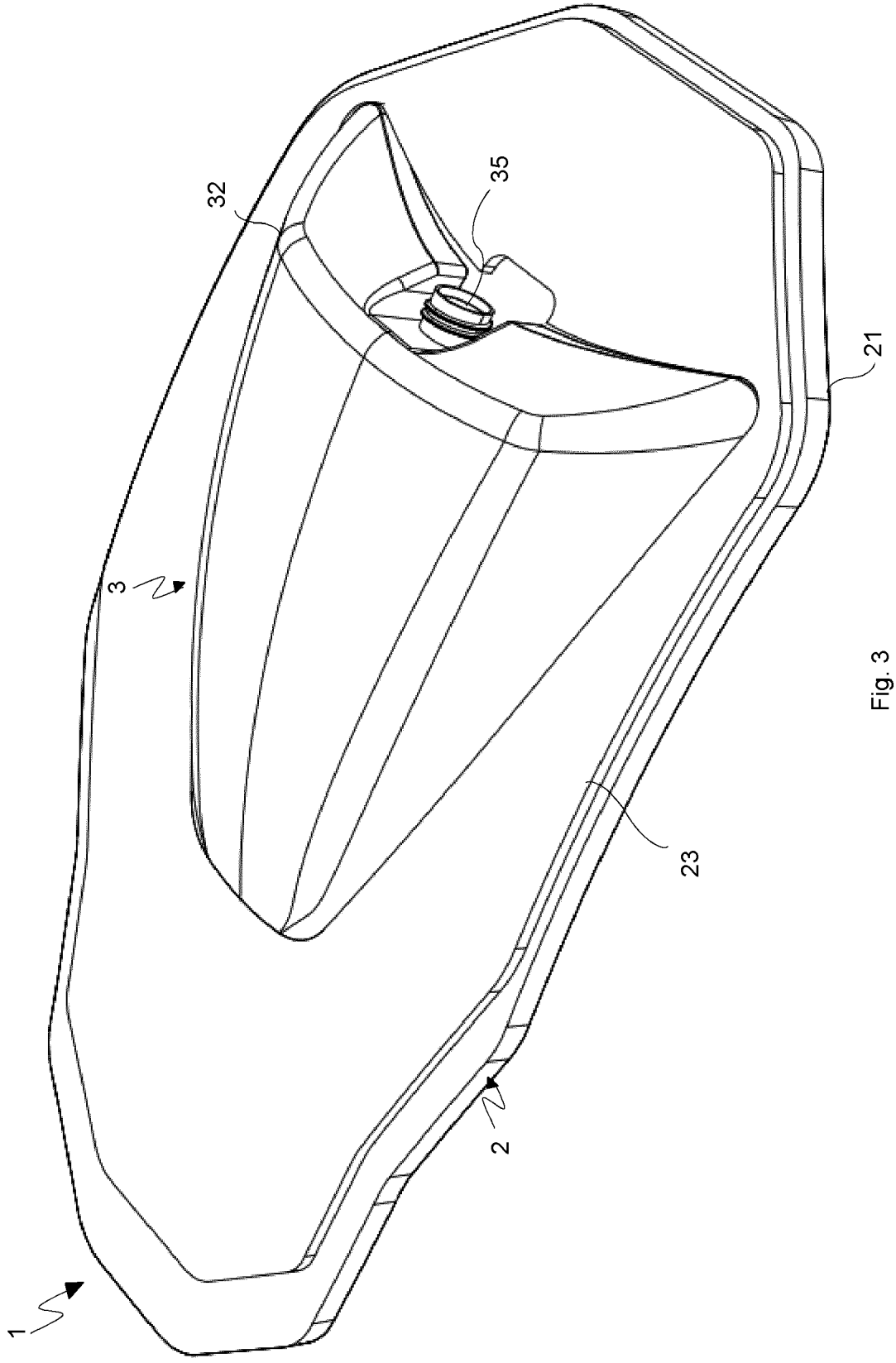

Fig. 3

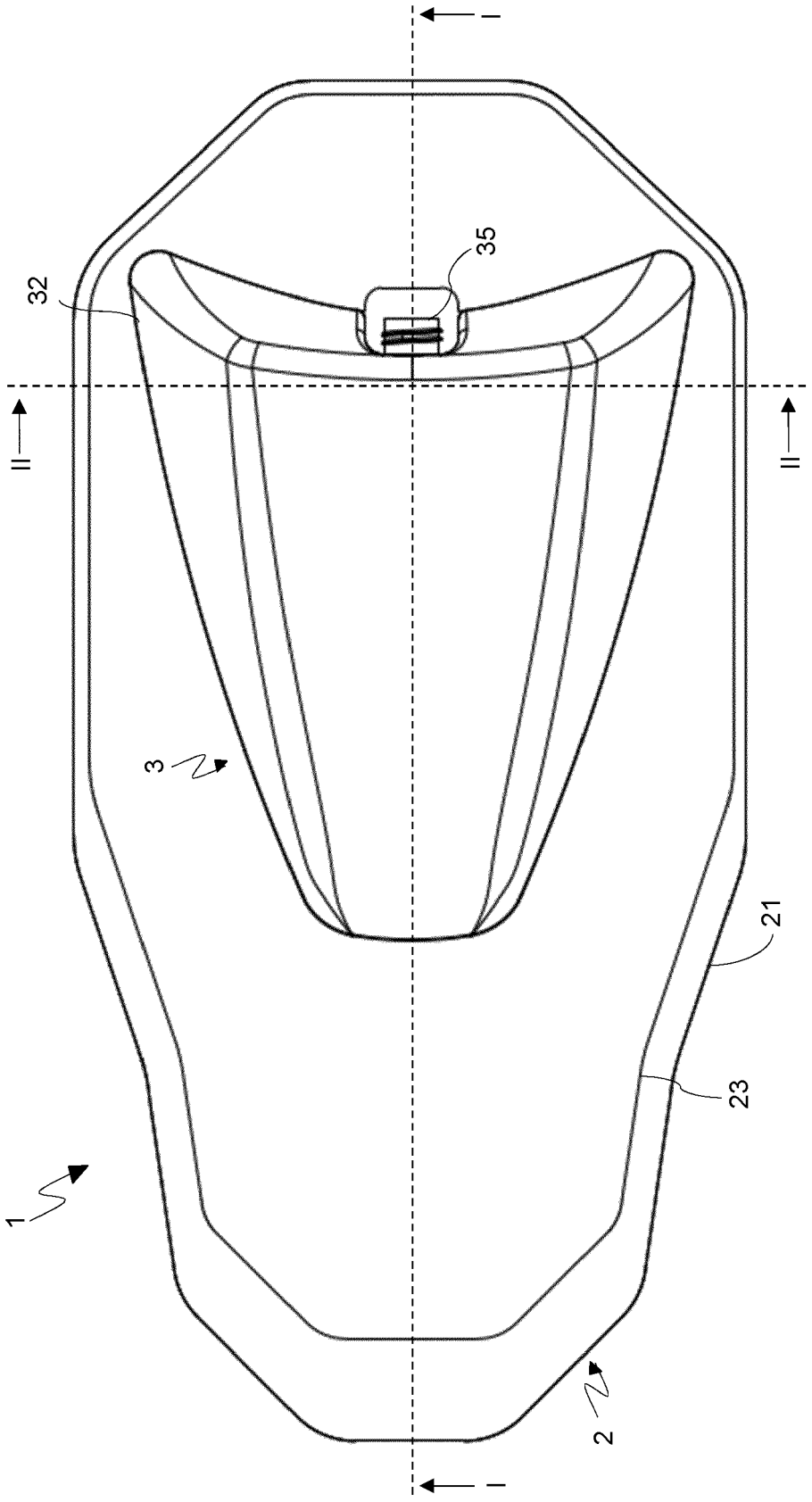

Fig. 4

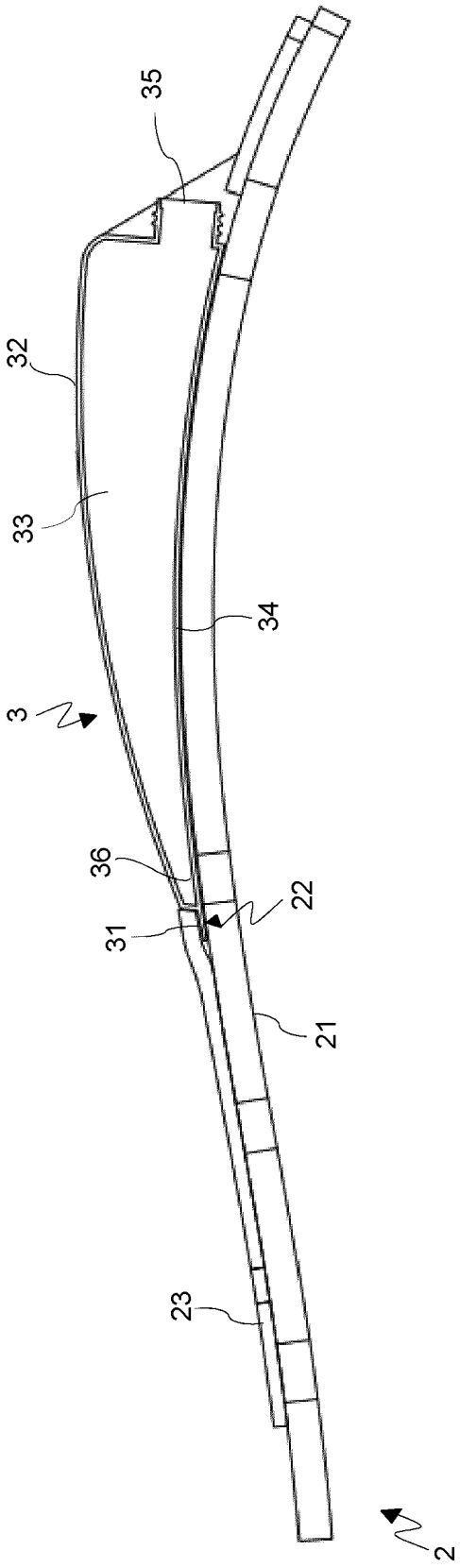

Fig. 5

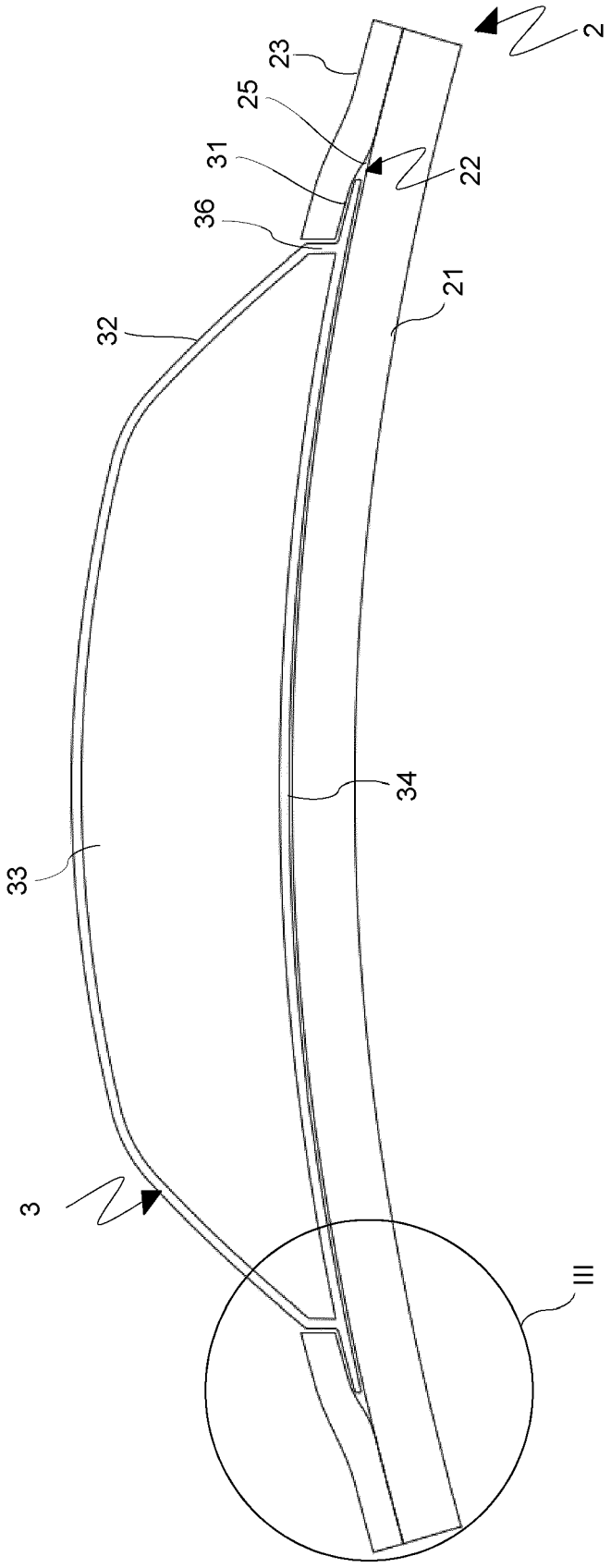

Fig. 6

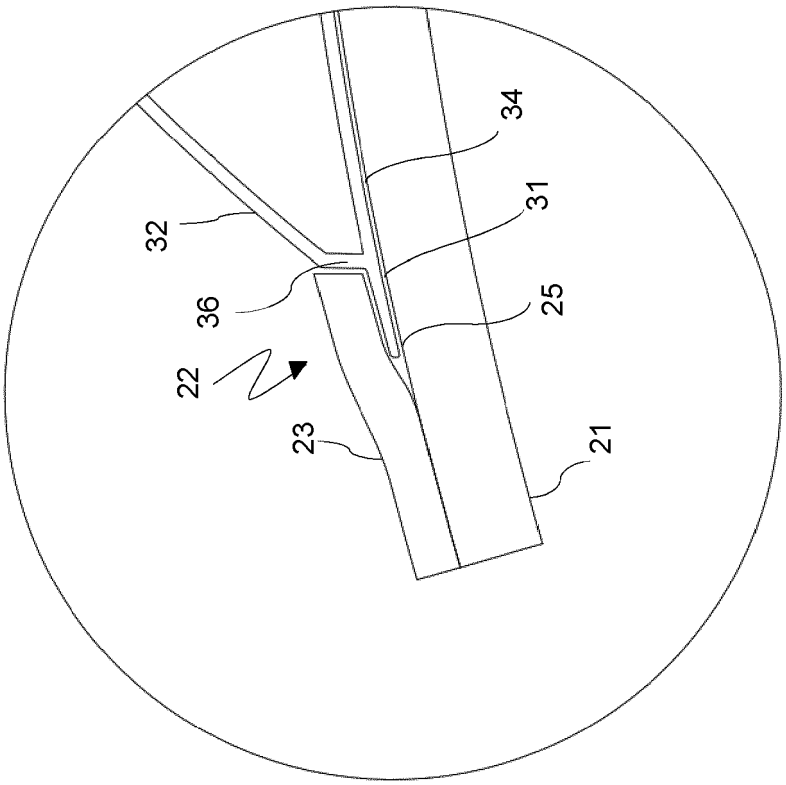

Fig. 7

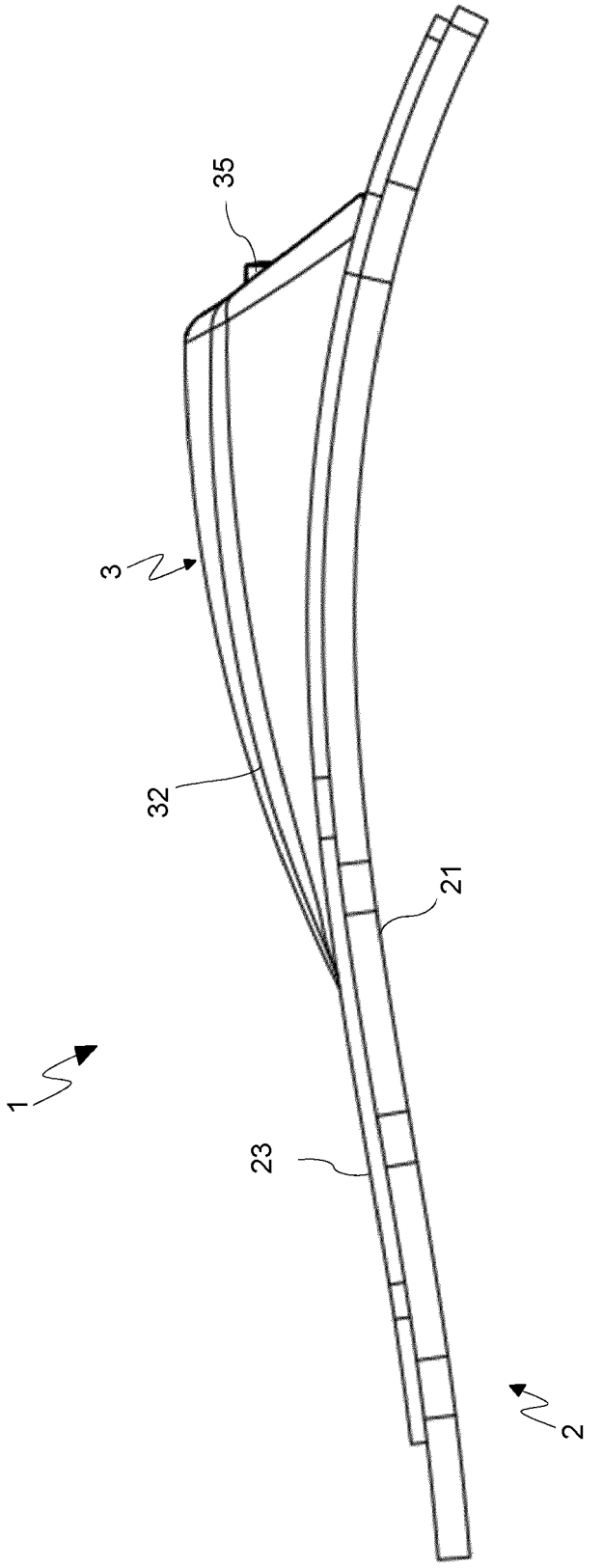

Fig. 8

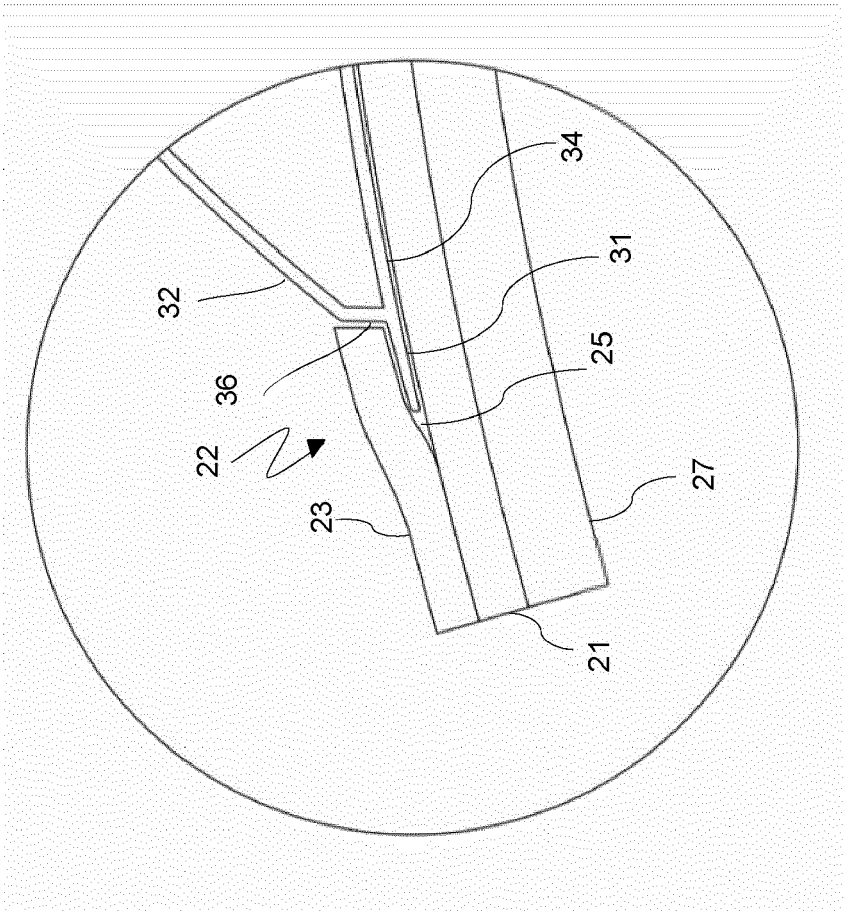

Fig. 9

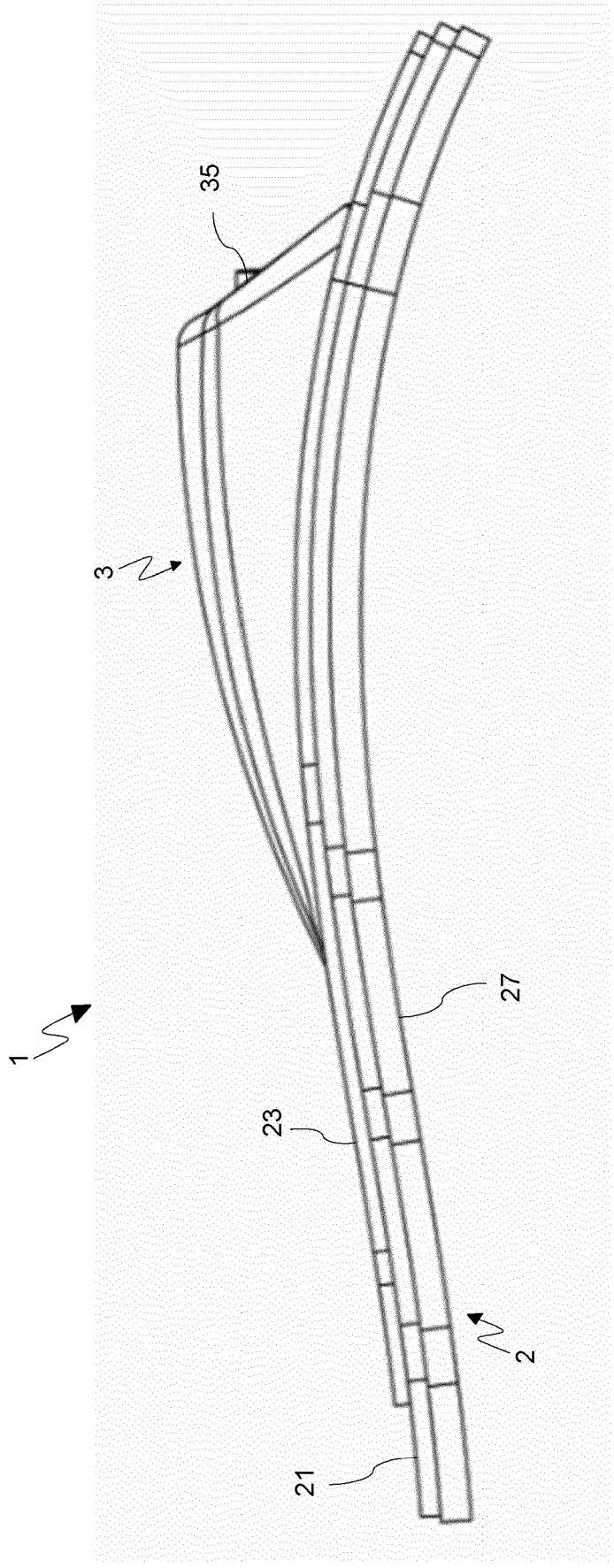

Fig. 10

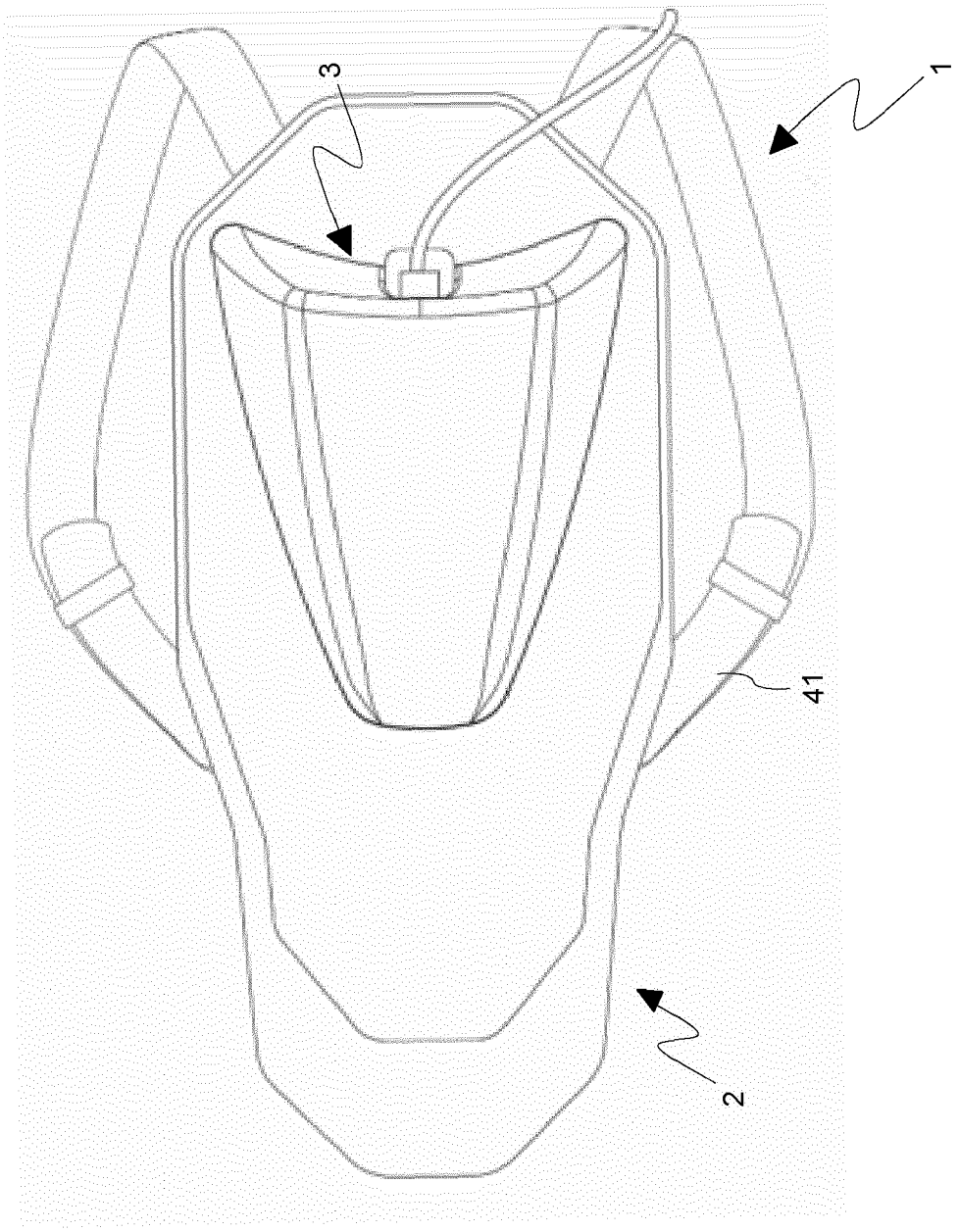

Fig. 11

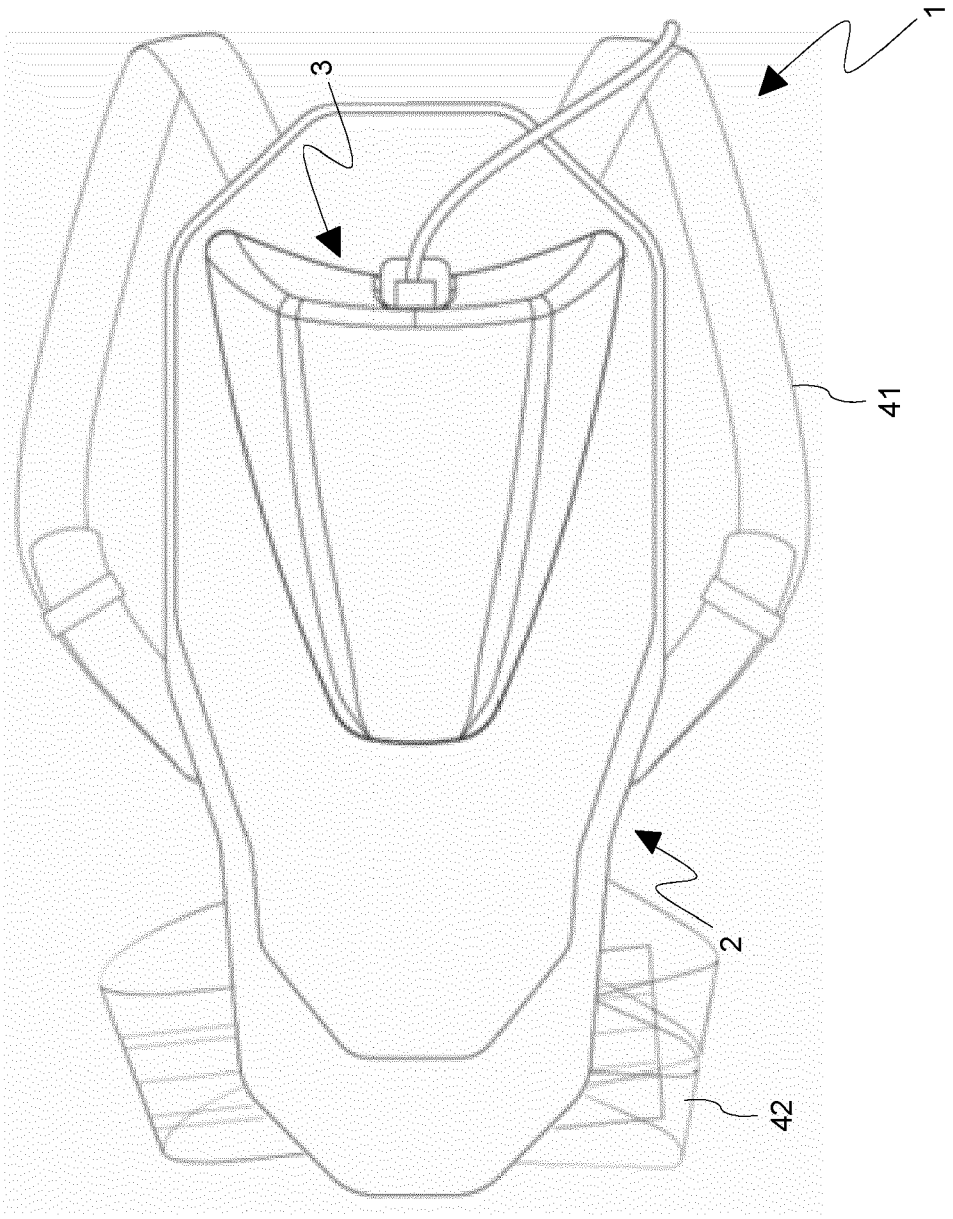

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 8623

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 7 665 156 B1 (HEWITT PAUL B [US]) 23 February 2010 (2010-02-23)	1,3,5,6, 8,14-17, 22	INV. A41D13/05
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TECHNICAL FIELDS SEARCHED (IPC)

A41D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 September 2020	Krüger, Sophia

CATEGORY OF CITED DOCUMENTS

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