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(54) **PERSONAL PROTECTION DEVICE**

(57) A protection device (100) for protecting a portion of a user's body, a garment including said device and a protection method are described. The protection device (100) comprises an inflatable element (1) and at least

one spacer (2) positioned on a surface (10) of said inflatable element (1) intended to face, during use, the body of the user.

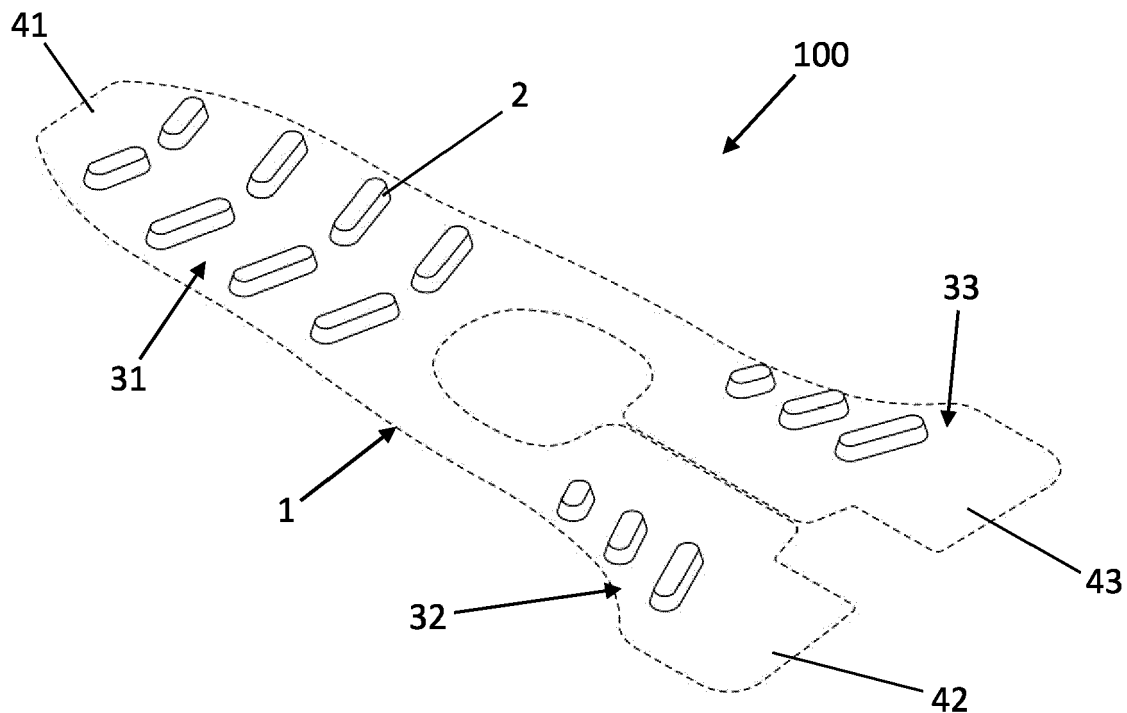


FIG. 1

Description

[0001] The present disclosure relates in general to the sector of providing protection by means of an inflatable element for protecting a user from falls and/or impacts, for example during use of a vehicle or other means of transport, or during any other activity, including activities without means of transport.

[0002] It is known in many sectors, for example in the motorcycling sector, to use personal protection devices which include an inflatable element. A personal protection device normally includes an inflatable element or inflatable bag, an inflation device, sensors for detecting the fall or the impact, and at least one control unit for managing activation of the inflation device in order to inflate the inflatable element. The inflatable element is placed in fluid communication with the inflation device, which is configured to inflate the inflatable element in the event of an impact or fall.

[0003] Normally the personal protection device is positioned so as to cover partially the body of a user. In particular, the inflatable element is arranged in zones of the user's body to be protected in the event of a fall and/or impact. For this reason, the inflatable element is generally arranged in the close proximity of the user's body.

[0004] However, this type of configuration has the drawback that the inflatable element is located in close contact with the user's body, preventing it from being adequately ventilated. In fact, an adequate flow of air between the user's body and the inflatable element is not ensured and this may be uncomfortable or bothersome for the user, for example because of the generation of excessive heat.

[0005] The inflatable element, in fact, is usually made of a material which is impermeable or able to contain hermetically a fluid, in order to retain inside it the gas released following an impact and/or falling of the user.

[0006] In view of the aforementioned drawback it is known to design the inflatable element with through-holes or openings in two opposite sides or surfaces of the same inflatable element in order to allow air to pass through said surfaces. An example of an inflatable element of this type is disclosed in Italian patent application No. 102018000010820.

[0007] However, the presence of holes creates zones which are not protected and therefore not suitable for ensuring protection.

[0008] The underlying problem of the following invention is therefore that of providing a personal protection device which ensures sufficient ventilation of the body portion of a user which is covered or protected by the inflatable element, without adversely affecting the safety and protection standards and which is able to provide further technical advantages.

[0009] This is obtained by means of a personal protection device, a garment and a method according to the respective independent claims. Secondary characteristics of the subject of the present invention are defined in

the corresponding dependent claims.

[0010] In particular, according to the present disclosure, a personal protection device for protecting a body portion of a user is provided. The protection device comprises an inflatable element and at least one spacer positioned on a surface of said inflatable element intended to face, during use, the user's body. This surface may also be called inner surface of the personal protection device, namely a surface facing a zone intended to receive the user's body when the personal protection device is worn. It therefore consists of a personal protection device of the wearable type.

[0011] Expressed in other words, the inflatable element defines by means of its configuration a zone for receiving, or zone for association with, or zone for exposure to, or zone directed towards the user's body, and said surface is a surface facing said zone.

[0012] The present invention is based on the recognition by the inventor that it is possible to use one or more spacers for maintaining a separation or spaced relationship between the body of the user and the inflatable element. In other words, one or more spacers are associated with the inflatable element and allow the user's body and inflatable element to be spaced from each other, thereby improving the ventilation inside the space between these two elements. The spacers constitute kinds of bearing lugs and act as supporting elements for the inflatable element on the user's body and in fact, during use when the device is worn, are arranged between the user's body and the inflatable element.

[0013] As a result, it is possible to avoid or to reduce as far as possible close contact between the inflatable element and the user's body, which could otherwise be particularly bothersome and adversely affect the ventilation of the body portion which is covered or protected by the inflatable element.

[0014] The protection device according to the present disclosure may therefore guarantee the protection of the user in the event of falls and/or impacts in the manner of a normal inflatable element, but at the same time the comfort of the user when the inflatable element is in the deflated condition, compared to the devices which are generally used. This is possible owing to better ventilation of the user's body in the vicinity of the inflatable element, when this is in the deflated condition, as a result of the separation and spacing ensured by the one or more spacers.

[0015] Consequently, the one or more spacers are configured to create ventilation channels or air through-flow zones, on the inner side of the inflatable element. For example, in the case of a single spacer element, it can be understood that it may be designed with dimensions smaller than the surface of the inflatable element facing the inner side of the inflatable element or, in the case of a plurality of spacers, they are distributed so as to be in turn spaced from each other on the aforementioned inner surface.

[0016] The inflatable element of the protection device

according to the present disclosure does not necessarily include through-holes or openings for allowing the passage of air. In other words, the inflatable element may be made so that its opposite sides or faces or opposite surfaces are uninterrupted, namely do not have interruptions or through-holes or openings. Consequently, the protection device according to the present disclosure, while ensuring ventilation, provides a greater protective surface area.

[0017] The personal protection device according to the present invention is therefore able to achieve an optimum compromise between functionality, in terms of ventilation offered to the user, and protection. In addition, the personal protection device offers simplicity in productive and structural terms.

[0018] In particular, it is possible to provide a continuous inflatable element without ventilation through-holes or cavities and at the same time ensure ventilation for the person. Moreover, this ventilation method based on spacers is able to ensure ventilation without altering the structure of the inflatable element, for example without ventilation through-holes and other constraints imposed by the structure of the inflatable element.

[0019] The one or more spacers may be directly fixed onto one side of the inflatable element or onto an external casing which houses the inflatable element.

[0020] Further characteristic features and modes of use forming the subject of the present disclosure will become clear from the following detailed description of preferred embodiments provided by way of a non-limiting example. It is nevertheless evident that each embodiment may have one or more of the advantages listed above; in any case it is nevertheless not necessary that each embodiment should have simultaneously all the advantages listed.

[0021] It is also understood that the scope of the present disclosure includes all the possible combinations of the embodiments indicated above and of those described with reference to the following detailed description.

[0022] Reference will be made to the figures of the attached drawings in which:

- Figure 1 shows a perspective view of a personal protection device according to the present disclosure;
- Figure 2 shows a side view of a personal protection device according to the present disclosure;
- Figure 3 shows a top plan view of a personal protection device according to the present disclosure;
- Figure 4 shows a view of a garment which comprises a personal protection device according to the present disclosure.

[0023] With reference to the attached figures, the number 100 denotes overall a personal protection device according to the present disclosure. The device comprises an inflatable element 1 which is configured to pass from a deflated condition into an inflated condition follow-

ing falls and/or impacts, and one or more spacers indicated by the number 2.

[0024] The term "inflatable element" is understood as meaning any body, member, device (also formed by several units) which may be inflated if necessary between a deflated condition and an inflated condition. The inflatable element may be realized using any technology known to the person skilled in the art.

[0025] The inflatable element 1 has in fact a form such that, when it is worn or placed on a table, it has a first surface 10 or first side and a second surface 20 or second side. The first surface 10 is situated opposite to the second surface 20. Preferably, the first surface 10 faces the portion of a user's body to be protected when the protection device 100 is in use.

[0026] In the embodiment shown, the inflatable element 1 has a rear portion 31, which terminates in a rear end 41, and two front portions 32 and 33, which terminate in two front ends 42 and 43, respectively. In particular, when the protection device 100 is in use, the rear position 31 of the inflatable element 1 is situated in the region of the user's back, and the two front portions 32, 33 of the inflatable element are located in the chest region of the user. In other words, according to this embodiment, the inflatable element 1, during use, covers at least partially the back region and the chest region of a user wearing the protection device 100,

[0027] In particular, according to one aspect of the present invention, one or more spacers 2 are positioned on the first surface 10 of the inflatable element, which surface 10, as mentioned above, is intended to face the portion of a user's body to be protected when the protection device 100 is in use. In other words, the one or more spacers 2 are positioned so that they are located between the inflatable element 1 and the portion of a user's body to be protected when the device 100 is in use.

[0028] As already mentioned above, the inflatable element 1 is configured to assume an inflated condition and a deflated condition. In the deflated condition, the spacers 2 form a kind of bridge on a user's body and a free zone is created between the inflatable element 1 and the user.

[0029] According to a preferred embodiment, the inflatable element 1 does not have interruptions or openings or holes passing through the first surface 10 or first side and the second surface 20 or second side. In other words, the first surface 10 and the second surface 20 are continuous or uninterrupted.

[0030] According to a preferred embodiment shown in the attached figures, the device 100 comprises a plurality of spacers 2. In particular, the spacers 2 are distributed (at a distance from each other) along the first surface 10, namely so as to allow separation between the user's body and the inflatable element 1 over most of the first surface 10. More preferably, the spacers 2 are uniformly distributed along the first surface 10.

[0031] The spacers 2 may therefore be regarded as being ventilation elements which are independent of the

structure of the inflatable element 1.

[0032] Preferably, the spacers 2 are arranged aligned on the first surface 10 of the inflatable element 1 along two lines, namely a first line and a second line, which extend respectively from the end 41 to the end 42 and from the end 41 to the end 43 of the inflatable element 1. In other words, the spacers 2 are positioned on the first surface 10 in the vicinity of or along two lines, the first one of which is situated on the rear portion 31 and on the front portion 32, and the second one of which is situated on the rear portion 31 and on the front portion 33. In other words, at least one pair of spacers 2 is arranged aligned along a first line which extends between the rear portion 31 and a front portion 32 and at least one different pair of spacers is arranged aligned along a second line which extends between the rear portion and the other front portion 33.

[0033] Preferably, the inflatable element 1 has an axis of symmetry and the spacers 2 are arranged in a heringbone pattern with respect to the axis of symmetry.

[0034] According to a preferred embodiment, the spacers 2 are made of a material able to cushion the impacts and therefore only minimally harmful for a user in the event of an impact or switching from the deflated condition into the inflated condition. In particular, this material may be an expanded material, for example solid foam, or may be a gel. Even more particularly, this material is polyurethane or polystyrene.

[0035] According to a preferred embodiment, the spacers 2 have a prismatic shape or have the shape of a prism. With this shape it is possible to minimize the portion making bearing contact while continuing to obtain the technical advantages described above. In particular, the different spacers 2 may have the shape of prisms which differ in terms of dimensions and/or cross-section. For example, the spacers may have the shape of a prism with an elliptical base or rectangular base with bevelled vertices or may have dimensions and proportions which are different depending on their position along the first surface 10.

[0036] The prismatic shape with bevelled corners of the spacers is preferable because it reduces the area of contact with the user, but it is quite possible for the spacers to have also a "right-angled parallelepiped" shape.

[0037] Preferably, the spacers are shaped so that the distance between the inflatable element 1 and the body portion of a user to be protected is homogeneous over the whole of the first surface 10. In other words, the height of the different spacers 2 with respect to the first surface 10 is as similar as possible to a single value. With this configuration it is possible to obtain ventilation in the space situated between the inflatable element 1 and the user's body when the inflatable element 1 is in the deflated condition.

[0038] The configurations described hitherto therefore allow the inflatable element 1, at least when it is in the deflated condition, to be kept at a distance from the body portion of a user to be protected, owing to the presence

of the spacers 2. In other words, the inflatable element 1 acts as a bridge with the spacers on the body portion of the user to be protected.

[0039] The device 100 may be provided separately or may form part of a wearable garment or article, as can be seen in Figure 4.

[0040] It should be noted that the personal protection device described hitherto is completed in a known manner by gas generators, sensors and an electronic control unit, not shown in the drawings.

[0041] The gas generators are placed in fluid communication with the inflatable element 1 which convey immediately, once activated, inflation fluid into the inflatable element 1 and allow inflation thereof. The gas generators, as mentioned, are connected to the control unit by means of which inflation may be activated. In order to perform inflation of the inflatable element 1, in the event of a fall and/or sliding and/or a sudden impact involving a user or a vehicle being ridden/driven, the protection device 1 is adapted to cooperate with special activation means (normally consisting of the aforementioned control unit and sensors) which are for example operatively connected to the gas generators.

[0042] It should also be noted that the activation modes, although being an aspect of particular importance for effective operation of the device, will not be further described in greater detail since they are methods which are essentially already known to a person skilled in the art of protection of an individual from sudden impacts.

[0043] With reference to the embodiments described a method for protecting a user of the device 100 may be carried out based on the steps described below. Preferably, in the protection method a device 100, as described hitherto, is used. Therefore, In the description of this method, the elements of the device 100 involved in the method and having the same function and the same structure as the elements described above retain the same reference number and are not described again in detail.

[0044] Initially, the user wears the device 100 so that the one or more spacers 2 are directed towards the user; then the inflatable element 1 assumes the inflated condition, for example following an impact; therefore the spacers 2 keep the inflatable element 1 at a distance from the body portion of the user to be protected. Essentially, the inflatable element 1, in the deflated condition, maintains the distance from the user's body owing to the presence of the one or more spacers 2 and the latter ensure ventilation thereof. In other words, the centre of mass of the inflatable element 1 is at a distance from the user's body portion to be protected when the inflatable element 1 is in the deflated condition, favouring the ventilation thereof.

[0045] Consequently in the deflated condition the passage of air along said surface on one side of said at least one spacer is allowed.

[0046] Preferably a plurality of spacers are provided

on said surface in a mutually spaced relationship so as to form channels between said surface and said user's body.

Claims

1. Personal protection device (100) for protecting a portion of the body of a user, wherein said protection device (100) comprises an inflatable element (1) and at least one spacer (2) positioned on a surface (10) of said inflatable element (1) intended to face, during use, the body of the user. 10
2. Personal protection device (100) according to claim 1, wherein said surface (10) of said inflatable element (1) is a first surface and said inflatable element (1) comprises a second surface (10), opposite to said first surface, and wherein said inflatable element (1) does not have any interruptions or openings or holes passing through said first surface (10) and said second surface (20). 15
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3. Personal protection device (100) according to any one of the preceding claim, wherein the inflatable element (1) comprises a rear portion (31), which terminates in a rear end (41), and two front portions (32, 33), which terminate in two front ends (42, 43), respectively, and wherein said rear portion (31) and said two front portions (32, 33) are configured to be in fluid communication. 25
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4. Personal protection device (100) according to any one of the preceding claims, wherein said at least one spacer (2) is associated in a fixed manner with the inflatable element (1). 35
5. Personal protection device (100) according to any one of the preceding claims, wherein said at least one spacer (2) is made of a soft material, for example a foam or a gel. 40
6. Personal protection device (100) according to any one of the preceding claims, wherein said at least one spacer (2) is shaped as a prism. 45
7. Personal protection device (100) according to claim 6, wherein the prismatic shape of said at least one spacer (2) has bevelled or rounded vertices. 50
8. Personal protection device (100) according to any one of the preceding claims, comprising a plurality of spacers (2) positioned on said surface (10) of said inflatable element (1) in a spaced relationship with each other. 55
9. Personal protection device (100) according to the preceding claim in combination with claim 8, wherein said spacers (2) are positioned along two lines lying on said surface (10), one of said lines extending from said rear end (41) to one of said two front ends (42, 43) and the other line extending from said rear end (41) to the other of said two front ends (42, 43). 5
10. Personal protection device (100) according to claim 8, wherein said inflatable element (1) comprises an axis of symmetry and said plurality of spacers (2) are arranged in a herringbone pattern with respect to said axis of symmetry. 10
11. Personal protection device (100) according to any one of the preceding claims, wherein said inflatable element (1) can assume a deflated condition and an inflated condition, and wherein said inflatable element (1), when it is in a deflated condition, is configured to be kept at a distance from the body of a user of the device (100) owing to the presence of said at least one spacer (2). 15
12. Wearable garment or article comprising a personal protection device (100) according to any one of the preceding claims. 20
13. Method for protecting a user of a personal protection device (100), wherein said device (100) comprises an inflatable element (1), capable of assuming a deflated condition and an inflated condition, and at least one spacer (2), positioned on a surface (10) of said inflatable element (1), said method comprising various steps where: 25
 - the protection device (100) is worn by a user so that said surface (10) with said at least one spacer (2) faces said user,
 - the at least one spacer (2) maintains a distance between the user's body and the inflatable element (1), at least when the latter is in a deflated condition.30
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14. Method for protecting a user according to the preceding claim, wherein in the deflated condition the passage of air along said surface (10) on a side of said at least one spacer is allowed. 45
15. Method for protecting a user according to claim 13 or 14, wherein a plurality of spacers are provided on said surface in a spaced relationship with each other, so as to form channels between said surface and said body of a user. 50
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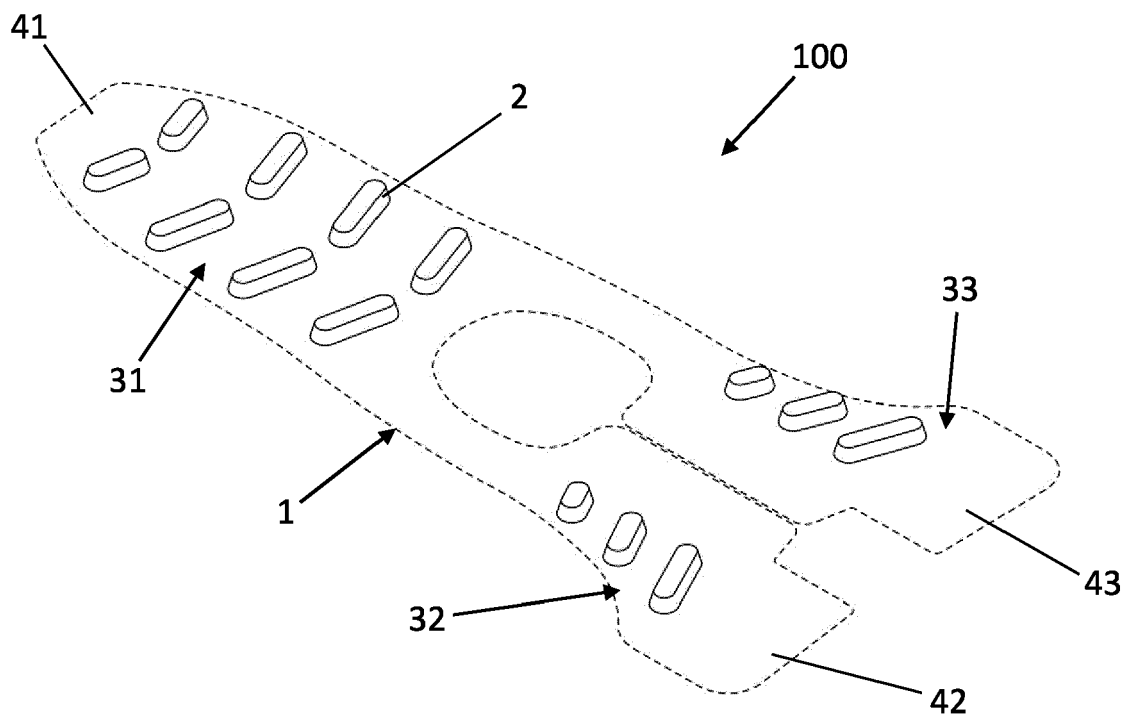


FIG. 1

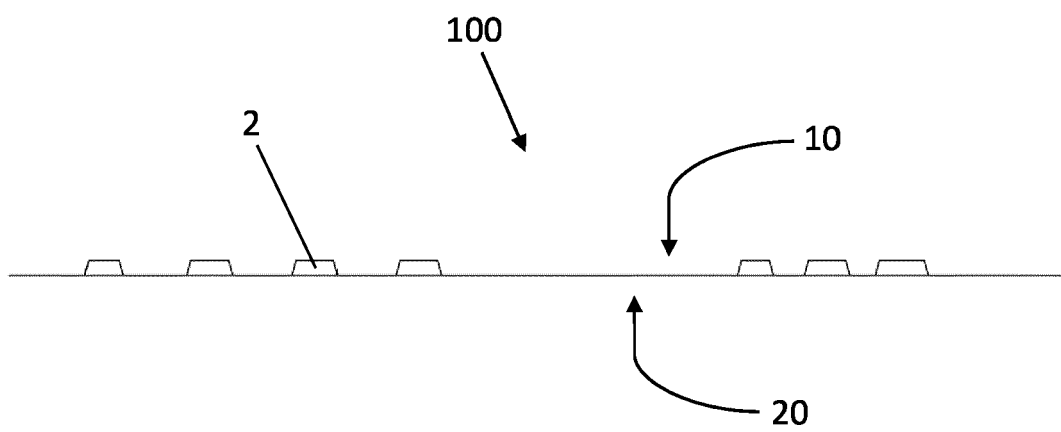


FIG. 2

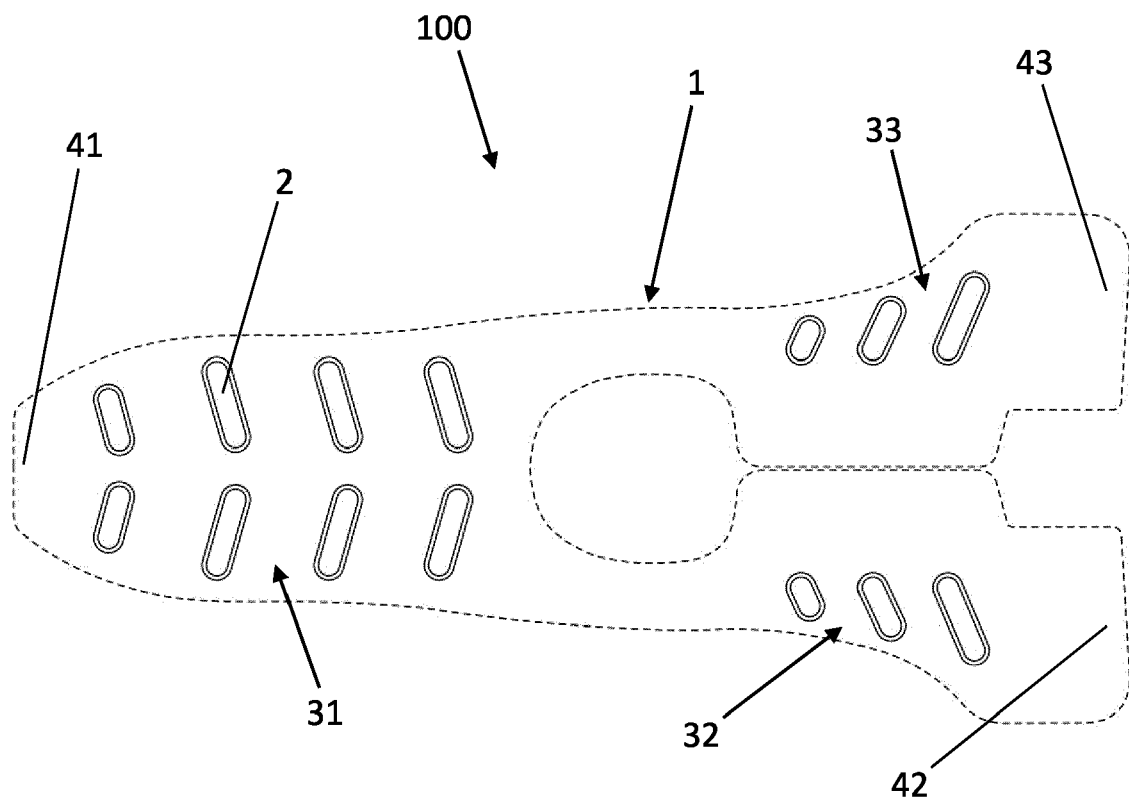


FIG. 3



FIG. 4



EUROPEAN SEARCH REPORT

Application Number

EP 22 17 5375

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	IT 2018 0001 0820 A1 (ALPINESTARS RES SRL [IT]) 5 June 2020 (2020-06-05) * figures 1-3 *	1-15	INV. A41D13/015 A41D13/018 A41D27/28
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			TECHNICAL FIELDS SEARCHED (IPC)
			A41D
The present search report has been drawn up for all claims			

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EPO FORM 1503 03.82 (P04C01)

Place of search	Date of completion of the search	Examiner
The Hague	15 September 2022	da Silva, José
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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