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(54) PROTECTION DEVICE FOR TECHNICAL CLOTHING, IN PARTICULAR FOR MOTORCYCLING CLOTHING

(57) A protection device (10) for technical clothing, in particular motorcycle clothing, comprising a complex honeycomb structure, which covers two planes or levels (2A, 2B) corresponding, respectively, to an outer side (11 A) and to an inner side (11 B) of the protection device (10). Each plane or level (2A, 2B) is composed of a plurality of base modules (1) formed by a plurality of polygons, in particular drilled irregular heptagons (1A, 1 B, 1 C), and said base modules (1) are repeated on each plane or level (2A, 2B) and are overlapped and staggered with respect to the planes (2A, 2B).

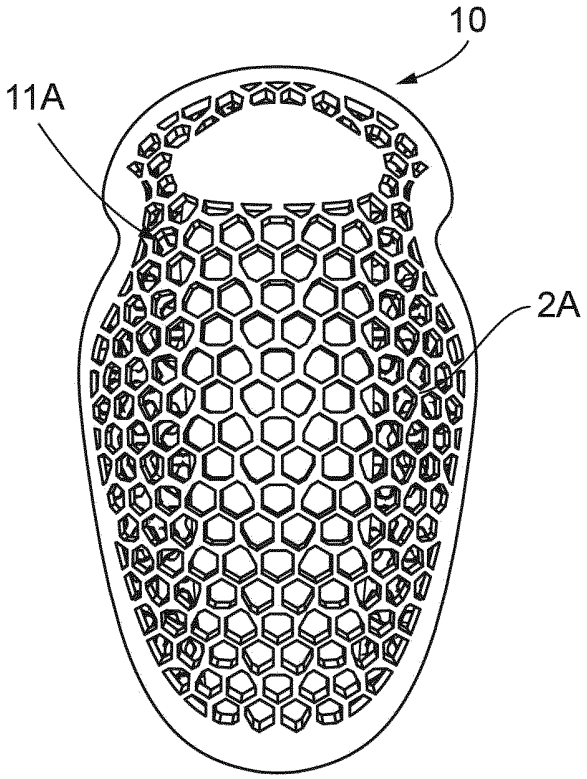

Fig. 4A

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Description

[0001] The present invention generally relates to a protection device (IPD) for protecting the shoulder and/or the elbow and/or the knee of a user, which is capable to be inserted in technical clothing, in particular for motorcyclists, or other protective garments.

[0002] More particularly, the invention relates to a protection device having a complex honeycomb structure and which is made of cross-linked polymers.

[0003] There are currently on the market many protection devices for protecting the shoulder and/or the elbow and/or the knee of a user (IPD) for technical clothing, in particular for motorcycle clothing, which are made of different materials, such as polyurethane foam, PVC and other materials, such as EVA.

[0004] The above known protection devices are inserted into internal suitable pockets, which are provided in the technical garments for sports and, in particular, for motorcyclists, such as jackets, vests, pants, etc.

[0005] Said protection devices are practically composed of a single plane or level of material, with consequences of poor light weight, minimum flexibility and poor softness, without breathability and with substantial thickness which do not allow an excellent distribution of the impacts, as required, on the contrary, by the regulations on the IPD devices.

[0006] Other limbs protectors, which can be positioned on the outside of the technical garments, in particular for motorcyclists, such as jackets, vests, suits, etc., are also known; they are usually made of semi-rigid polyurethane.

[0007] Many of the above mentioned protection devices have internal geometric structures with an alveolar-type geometry configured to disperse and absorb the energy from impacts and/or shocks; however, said structures do not allow performances comparable to the performances obtained with the geometric structure of the present invention.

[0008] Finally, protection devices for the spine, called "back protector", are also known; they are made from various plastic materials and include honeycomb-type geometric structures which are configured to disperse and absorb the energy from impacts and/or shocks; however, also the above structures do not achieve the performances reached by the structure of the present invention.

[0009] An object of the present invention is therefore to obviate the above mentioned technical drawbacks and, in particular, to provide a protection device for technical clothing (IPD) and, in particular, for motorcycle clothing (such as a protector for the shoulder, the elbow, the knee, etc.), which is able to absorb and disperse, more quickly with respect to the prior art, the energy developed by impacts and/or shocks, in the event of road accidents.

[0010] Another object of the present invention is to provide a protection device for technical clothing, in particular motorcycle clothing, which, thanks to the use of a particular geometric structure (a perforated honeycomb-type structure) and thanks to the material which is used (cross-linked polymers), shows more lightweight, with respect to the prior art, thus allowing a greater comfort for the user, as well as a great breathability and an extreme flexibility and softness.

[0011] These and other objects are achieved by a protection device for technical clothing, in particular motorcycle clothing, according to the enclosed claim 1.

[0012] More detailed features are given in the subsequent dependent claims.

[0013] Advantageously, the protection device according to the present invention has a complex alveolar structure, which is spread over two planes or levels and which is composed of base modules of polygons and, in particular, of perforated irregular heptagons, which are repeated and superimposed.

[0014] Said complex alveolar structure is made of polyurethane, expanded polyurethane or PVC and the entire protective device (IPD) is obtained by molding cross-linked polymers, starting from a metal mold (made of aluminum or steel) which is composed so that the geometrical figures provided on a first plane or level (corresponding to the outer side of the protection device) are obtained on a first side of the mold, while the geometric figures provided on a second plane or level (corresponding to the inner side of the protection device) are obtained on the other side of the mold.

[0015] The production process takes place with a single injection of a particular type of plastic polymer and the device is shaped and printed.

[0016] Further characteristics and advantages of the present invention will become more clear from the following description, relating to a preferred embodiment of the protection device for technical clothing, in particular motorcycle clothing, and from the enclosed drawings, in which:

- figure 1 shows a schematic top view of the three irregular heptagons, which form the base module of the protection device for technical clothing, in particular motorcycle clothing, according to the present invention;
- figure 2 shows a schematic top plan view of the two planes or levels of the protection device for technical clothing, according to the present invention, with staggered base modules, according to the present invention;
- figure 3A shows a schematic top plan view of a portion of the protection device for technical clothing, according to the present invention, in which the two planes or levels overlapping and staggered are shown;
- figure 3B shows a schematic longitudinal section view of the portion of the protection device shown in figure 3A, according to the present invention;
- figure 3C shows a schematic plan view of the portion of the protection device shown in figure 3A, accord-

ing to the invention;

- figure 4A shows a top plan view of the protection device for technical clothing, in particular motorcycle clothing, according to the present invention;
- figure 4B shows a plan view of the protection device for technical clothing, in particular motorcycle clothing, according to the present invention.

[0017] With reference to the mentioned figures, the protection device 10 for technical clothing, in particular motorcycle clothing, which is the object of the present invention, is basically composed of a complex honeycomb structure, which includes a base module 1, consisting of a series and, in particular, of three drilled irregular polygons 1 A, 1B, 1C, each of which, according to the preferred embodiments, has seven sides (an irregular heptagon).

[0018] Each polygon or irregular heptagon 1 A, 1 B, 1C has, as mentioned above, seven sides, with a first side having a length equal to 3.4 mm, two other sides having equal length (equal to 2 mm) and four other sides having equal length (equal to 3.9 mm), while the distance D between the parallel sides of each irregular heptagon 1 A, 1 B, 1C is 6.8 mm.

[0019] The base module 1 of the structure which constitutes the protection device 10, according to the invention, is obtained by duplicating a polygon or an irregular heptagon 1 A or 1B or 1C; in practice, a polygon or an irregular heptagon 1 A or 1B or 1C is repeated for two times by rotating it in the space of 120° with respect to a vertical axis passing through the center C of the three polygons or heptagons 1 A, 1 B, 1C and so that the distance D1 between the adjacent sides of two polygons or heptagons 1 A, 1 B or 1 A, 1C or 1 B, 1C is 1.8 mm.

[0020] Furthermore, the base module 1 (composed of said three irregular heptagons 1 A, 1 B, 1 C) is repeated on the whole volume of the protection device 10, in correspondence of an outer surface 11 A of said volume, thus making a first plane or layer 2A composed by duplicating, for a first predetermined number of times, the base module 1, along the X axis, at a distance D2 of 25.7 mm, and by also duplicating, for a second predetermined number of times, the base module 1, along the Y axis, at a distance D3 of 15 mm.

[0021] In practice, the base module 1 is moved along the X axis of a distance D4 equal to a value of 12,85 mm (which is the half of the distance D2 equal to 25.7 mm), approximated to 12.8 mm, and, at the same time, is moved along the Y axis of a distance D5 equal to 2.4 mm and then rotated of 180° with respect to the center C of said base module; the new position of the base module 1 is repeated for a predetermined number of times along the X axis at the distance D2 of 25.7 mm and, subsequently, the new position of the base module 1 is repeated for a predetermined number of times along the Y axis at a distance D3 of 15 mm.

[0022] Therefore, a first plane or level 2A with the base modules 1 equidistant to each other is obtained.

[0023] A second plane or level 2B corresponding to an inner surface 11 B of the protection device 10 is also placed below said first plane or level 2A (corresponding to an external surface of the protection device 10) and said second plane or level 2B is formed from a plurality of base modules 1 which are made as follows.

[0024] A base module 1 which is equal to the base module of the first level 2A is moved along the Y axis at a distance D6 equal to 14.3 mm and, simultaneously, is rotated of 180° with respect to the center C of the same base module 1.

[0025] Afterwards, the base module 1 is replicated for a predetermined number of times along the X axis at a distance D2 of 25.7 mm and then said base module 1 is replicated for a predetermined number of times along the Y axis at a distance D3 equal to 15 mm.

[0026] Therefore, the same base module 1 is moved along the X axis at a distance D4 equal to 12,85 mm (which is half the distance D2 of 25.7 mm), approximated to 12.8 mm, and, simultaneously, is moved along the Y axis at a distance D5 equal to 2.4 mm and rotated of 180° with respect to the center C of said base module 1.

[0027] In practice, the protection device 10 according to the invention has an outer surface 11 A and an inner surface 11 B, which have respective planes or levels 2A, 2B composed of particular geometric shapes or figures, which are made of modules consisting of three drilled polygons or irregular heptagons 1 A, 1 B, 1C and which are staggered one relative to another, so as to obtain through holes only in correspondence of some of the sides of each polygon, in order to absorb the energy from shocks and/or impacts. The above-mentioned geometric figures, so positioned, constitute base modules, which are repeated for the whole volume of the protection device 10 over two planes or levels 2A, 2B.

[0028] The above two-levels structure allows to significantly absorb and disperse the energy produced as a result of impacts and/or shocks, thus allowing the protection device 10 (which can be used in particular as a shoulder protector, an elbow protector and/or a knee protector) to comply with the homologation rules of PPE (UNI EN 1621-2 of 2012) with a level of performance equal to 1.

[0029] The features of the protection device for technical clothing, in particular motorcycle clothing, according to the present invention, are clear from the above description, as well as the related advantages.

[0030] In particular, the structure is approved as an IPD for shoulders, elbows and/or knees and can be used on technical clothing and particularly for motorcycle clothing; the structure is also more lightweight, breathable and soft with respect to the prior art and has a high dissipation capacity and energy absorption due to impacts and/or shocks (in case of road accidents).

[0031] The invention thus described and shown herein is able to have different modifications and variations according to what is claimed in the appended claims.

[0032] Moreover, all the technical details may be replaced with other equivalent elements and, finally, the

materials, if compatible with the specific use, as well as the dimensions, may be any according to requirements and the state of the art.

[0033] Where the features and techniques mentioned in any claim are followed by reference signs, said reference signs have been included for the sole purpose of increasing the intelligibility of the claims and, accordingly, said reference signs do not have any limiting effect on the interpretation of each element identified by way of example by said reference signs.

Claims

1. A protection device (10) for technical clothing, in particular for motorcycling clothing, comprising a complex honeycomb structure, **characterized in that** said honeycomb structure is composed of two planes or levels (2A, 2B), which respectively correspond to an outer side (11A) and to an inner side (11 B) of said protection device (10), each of said planes or levels (2A, 2B) being composed of a plurality of base modules (1) formed by two or more drilled polygons (1 A, 1 B, 1 C).

2. A protection device (10) according to claim 1, **characterized in that** said base modules (1) are repeated on each of said planes or levels (2A, 2B) and are superimposed one over the other in a staggered position with respect to said planes (2A, 2B).

3. A protection device (10) according to claim 1, **characterized in that** said honeycomb structure is made of polyurethane or expanded polyurethane or PVC.

4. A protection device (10) according to claim 1, **characterized in that** said device (10) is made by molding cross-linked polymers, through a metallic mold so that on one side of the mold said polygons (1 A, 1 B, 1 C) are formed on a first plane or level (2A) corresponding to said outer side (11 A) of the protective device (10) and on the other side of the mold said polygons (1A, 1B, 1C) are formed on a second plane or level (2B) corresponding to said inner side (11 B) of the protection device (10).

5. A protection device (10) as claimed in at least one of the preceding claims, **characterized in that** said device (10) is made according to the UNI-EN regulations as an IPD with a 1-level protecting performance for shoulders, elbows and/or knees, said device (10) being usable on technical clothing and, in particular, on motorcycling clothing.

6. A protection device (10) as claimed in at least one of the preceding claims, **characterized in that** each of said polygons is constituted by a drilled irregular heptagon (1 A, 1 B, 1 C), which has one side with a length equal to 3.4 mm, two sides with a same length equal to 2 mm and four sides with a same length equal to 3.9 mm, while the parallel sides of each drilled irregular heptagon (1 A, 1 B, 1 C) are placed at a distance equal to 6.8 mm.

7. A protection device (10) as claimed in at least one of the preceding claims, **characterized in that** said base module (1) comprises three of said polygons (1 A, 1B, 1C) and each of said base modules (1) is repeated throughout the volume of said protection device (10) over said two planes or levels (2A, 2B).

8. A protection device (10) according to claim 7, **characterized in that** at least one of said polygons (1 A, 1 B, 1 C) is repeated twice by turning it in the space of 120° with respect to an axis passing through the center (C) of said three polygons (1 A, 1 B, 1C) and so that the adjacent sides of two of said polygons (1 A, 1 B; 1 A, 1C, 1 B, 1 C) are placed at a distance of 1.8 mm.

9. A protection device (10) according to claim 7, **characterized in that** said base module (1) consisting of said polygons (1 A, 1B, 1C) is repeated throughout the volume of said protection device (10), in correspondence with said outer side (11 A) of the protective device (10), thus realizing a first plane or level (2A) by reproducing, for a determined number of times, said base module (1), along a first axis (X) of said first plane or level (2A), at a first determined distance (D2), and by further reproducing, for a determined number of times, said base module (1), along a second axis (Y) of said first plane or level (2A), which is placed at 180° with respect to said first axis (X), at a second determined distance (D3), said first plane or level (2A) having a plurality of said base modules (1) which are placed at a same distance.

10. A protection device (10) according to claim 9, **characterized in that**, below said first plane or level (2A), placed in correspondence with said outer side (11 A) of the protection device (10), is positioned a second plane or level (2B), which is placed at said inner side (11 B) of the protection device (10) and which is formed by a plurality of base modules (1), which are identical to each other and each of which is identical to the base modules (1) of the first level (2A), each of said base modules (1) of said second level (2B) being moved along a first axis (Y) of a determined distance (D6) and, simultaneously, being rotated of 180° with respect to the center (C) of the base module (1) and reproduced for a determined number of times along said first axis (Y) at a determined distance (D3) and along a second axis (X), which is perpendicular to said first axis (Y), at a determined distance (D2).

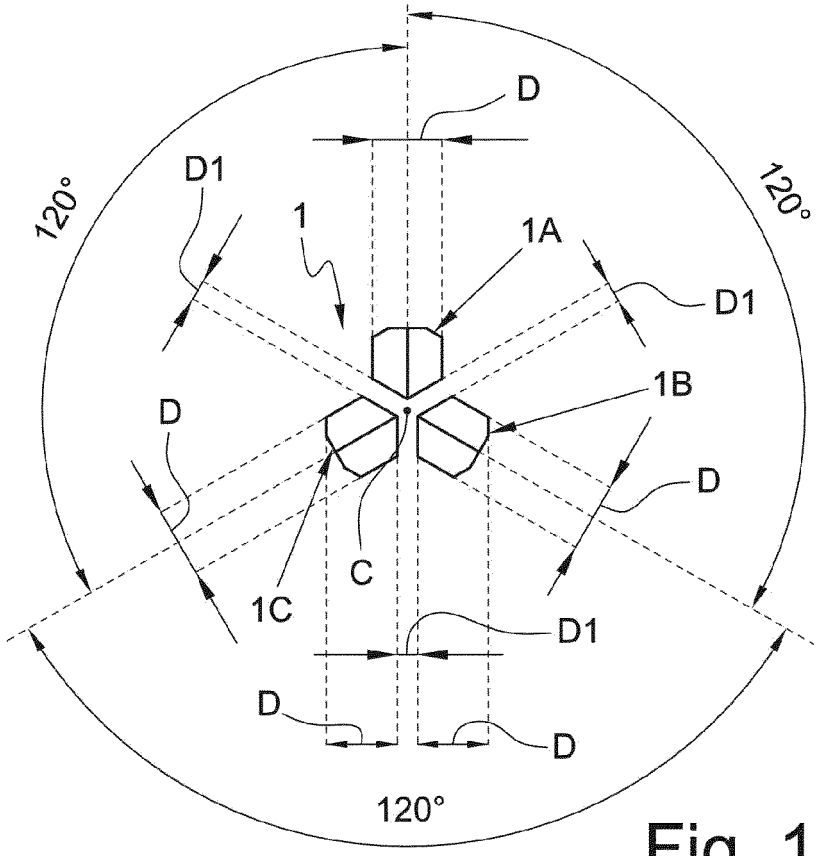
D
D1
120°
120°
1
1A
D1
1B
D
D
C
1C
D1
D
D
120°

Fig. 1

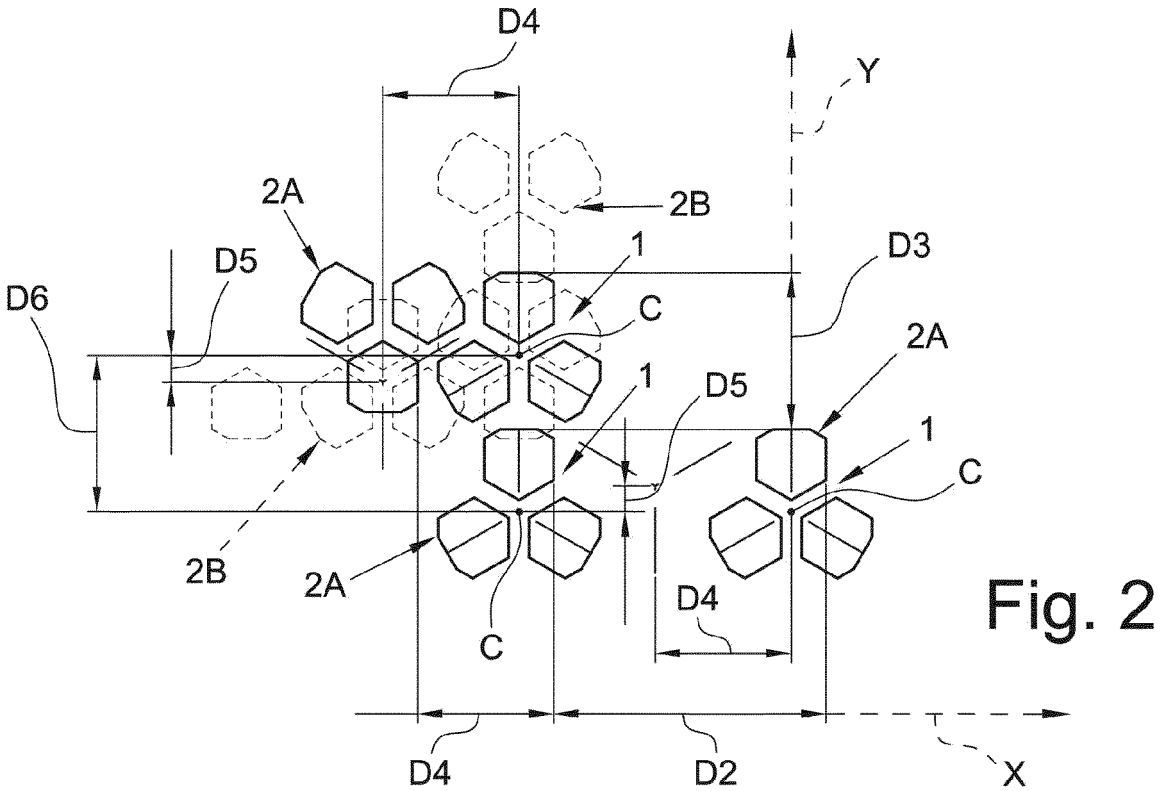
D4
Y
2A
2B
D5
D6
1
D3
C
2A
1
D5
1
C
2B
2A
C
D4
D4
D2
X

Fig. 2

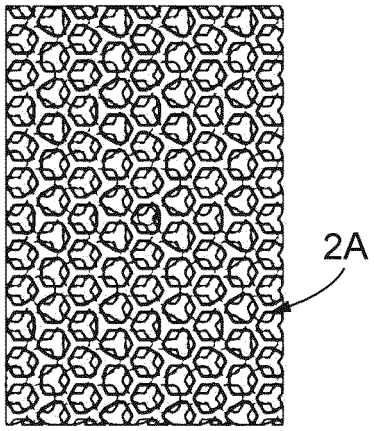

Fig. 3A

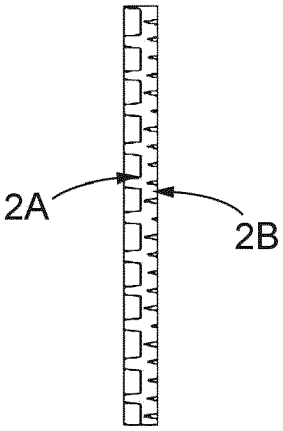

Fig. 3B

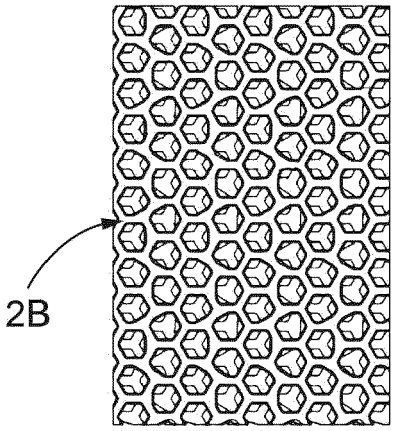

Fig. 3C

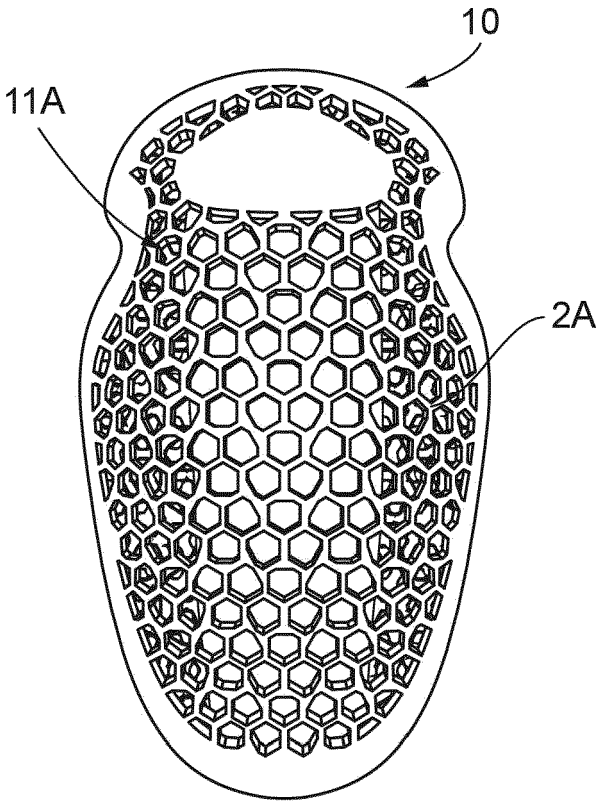

Fig. 4A

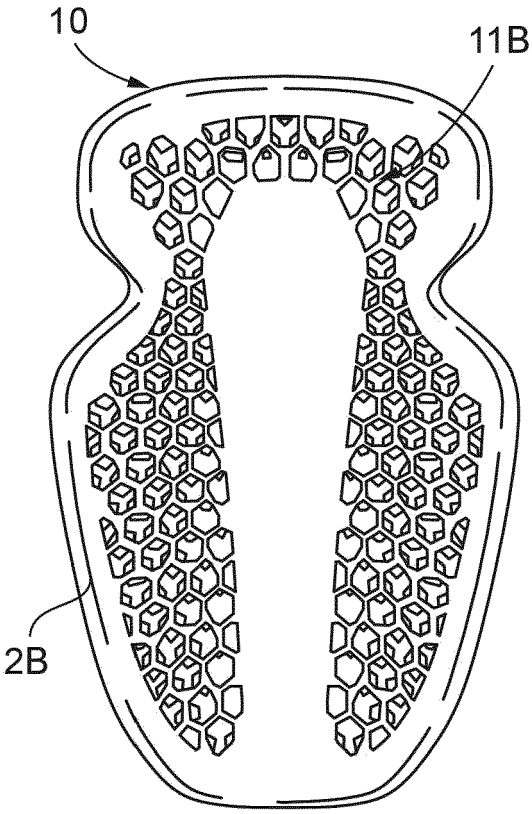

Fig. 4B

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EUROPEAN SEARCH REPORT

Application Number
EP 16 15 3555

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2009/041907 A1 (JONSSON CARINA [SE]) 2 April 2009 (2009-04-02) * page 3, line 18 - line 28; figures 3,5,6 * * page 4, line 11 - page 5, line 10 *	1-10	INV. A41D13/015 ADD. A41D13/06 A41D13/08
A	US 5 273 702 A (NELSON DONALD E [US] ET AL) 28 December 1993 (1993-12-28) * column 4, line 23 - column 9, line 2; figures 7,8,9,10,11 *	4	
X	EP 2 710 909 A1 (KOMPERDELL SPORTARTIKEL GES M B H [AT]) 26 March 2014 (2014-03-26) * paragraph [0010] - paragraph [0035]; figures 1,2,3,8,9 * * paragraphs [0061], [0077] *	1-10	
X	WO 2013/026077 A1 (KARALL GERHARD [AT]) 28 February 2013 (2013-02-28) * page 3 - page 9; figure 5 *	1	

TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 June 2016	Thielgen, Robert

CATEGORY OF CITED DOCUMENTS

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