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(71) Applicant: **W+R GmbH**
72555 Metzingen (DE)

(72) Inventors:
- **Bouckaert, Luc**
  7646 Paarl (ZA)
- **Junger, Hannes**
  72555 Metzingen (DE)

(74) Representative: **Kohler Schmid Möbus Patentanwälte Partnerschaftsgesellschaft mbB**
Kaiserstrasse 85
72764 Reutlingen (DE)

(54) **Covering for the absorption of pressure**

(57) The invention relates to a covering for the absorption of pressure. The covering comprises a plurality of projections (62) having a micro crater (64) at the top. The projections (62) are preferably built in such a way that the wall(s) (68) of the micro crater (64) bend(s) inwards under pressure and fills the recess (70) of the micro crater (64). In order to achieve this effect, the projections (62) are preferably built in a pyramidal tapered shape with an average outer angle of the outer surface of more than 97° with respect to a base surface of the projection (62). The projections (62) preferably have a jagged outer and/or inner surface. The invention further relates to a garment, in particular a glove, with such a covering.

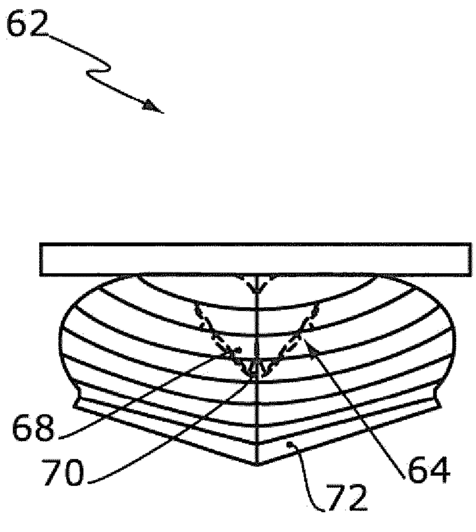

Fig. 3d

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Description

[0001] The invention relates to a covering, in particular for a garment, comprising a plurality of projections projecting from a base surface of the covering, the projections being made of an elastically deformable material, whereby the projections have a micro crater with a recess at the top of the projections.

[0002] Such a covering is known from WO 2008/113816 A2. The disclosed covering is used for a garment in form of a glove. The disclosed projections thereby function as suction cups in order to improve the grip of the glove.

[0003] Other gloves with projections to improve the grip of the glove are disclosed in US 5,983,395 A, JP 1 216 778 A, US 2012/0167274 A1, US 4,497 072 A and DE 101 31 355 A1.

[0004] In contrast thereto, the object of the invention at hand is to provide a covering that is capable of absorbing pressure on the covering.

[0005] This object is solved by a covering, in particular for a garment, comprising a plurality of projections projecting from a base surface of the covering, the projections being made of an elastically deformable material, whereby the projections have a micro crater with a recess at the top of the projections, whereby in order to absorb pressure on the covering, an average outer surface of the projections has an outer angle of more than 97° with respect to the base surface, whereby the average outer surface is a surface between the bottom of the outer surface and the top of the outer surface of the projections.

[0006] Thereby, the outer angle is the angle outside the projection. This outer angle is measured between the base surface and the average outer surface. The average outer surface follows substantially the outer surface of the projections. However, the average outer surface is a fictional, i.e. an artificial outer surface, which is determined by drawing a surface between the intersection of the outer surface with the base surface and the top of the outer surface. In other words, the projections are tapered with an outer angle of more than 97°, having a wider base area and taper towards their tip.

[0007] Due to the outer angle of more than 97°, the micro crater collapses inwards into the recess of the micro crater, when the top of the projections is squeezed. In other words, the projections according to the invention are built in such a way that they do not bend outwardly, when the projections are pressurized. Hence, pressure on the projections can be effectively damped.

[0008] The micro crater may have an ellipsoidal, a circular or an angular formed opening. In a preferred embodiment, the opening of the micro crater corresponds to the form of the base area of the projections. For example, if the base area is circular, the opening will be circular, too. In these cases, the production of the projections can be performed very costeffective.

[0009] The covering may comprise a carrier material, the top surface of the carrier material forming the base surface, whereby at least some projections are attached to the carrier material. In this case, the covering can be attached directly onto a carrier, such as a fabric or as a patch in a designated area to improve the dexterity, contact and specific operational movement and control issues. The projections can be coated, injected, moulded, cast or centrifugally injection moulded directly or indirectly onto the product, such as a textile or a carrier.

[0010] In a preferred embodiment, the average outer surface of the projections have an outer angle of 105°-109° with respect to the base surface. The wall(s) of the micro crater can then implode very controlled and fold inwards into the recess of the micro crater, when squeezed.

[0011] The projections may have a smooth outer surface. In case the outer surface is built straight, i.e. without a slope between the bottom of the outer surface and the top of the outer surface, the outer surface coincides with the average outer surface.

[0012] Preferably, the outer surface of the projections is built as a jagged surface with a plurality of edges, which run substantially parallel to the base surface. The implosion of the micro crater of the projections then occurs "stepwise", so the damping of pressure can be performed in a controlled manner.

[0013] The edges of the outer surface may define steps of the outer surface, whereby the top surfaces of the steps run substantially parallel to the base surface and the side surfaces of the outer surface run substantially perpendicular to the base surface. In this case, both the absorption of pressure and the grip of the covering are improved.

[0014] The flexibility of the projections to bend inwards into the micro crater is improved, when an average inner surface of the micro crater has an outer angle of less than 115° with respect to a plane parallel to the base surface, whereby the average inner surface is a surface between the bottom of the micro crater and the top of the micro crater, i.e. between the bottom of the micro crater's recess and the top of the micro crater's recess.

[0015] In a preferred embodiment the average inner surface has an outer angle of less than 101° with respect to the plane parallel to the base surfaces. The micro crater, i.e. the recess of the micro crater, may have a smooth inner surface. In case the inner surface is built straight, i.e. without a slope between the bottom of the inner surface and the top of the inner surface, the inner surface coincides with the average inner surface.

[0016] "Stepwise" inward bending of the micro crater can be achieved, when an inner surface of the micro crater is built as a jagged surface with a plurality of edges, which run substantially parallel to the base surface.

[0017] The edges of the inner surface may thereby define steps of the inner surface, whereby the top surfaces of these steps run substantially parallel to the base surface and the side surfaces run substantially perpendicular to the base surface. This improves producibility of the covering.

[0018] Within the course of the invention it was found out that best damping results can be achieved, when the projections are built substantially as pyramids with a micro crater on the top.

[0019] Preferably the pyramids have a rectangular base area.

[0020] In order to provide substantially equal damping results in transverse directions of the projections, the pyramids preferably have a quadratic base area.

[0021] Both stability and flexibility of the projections are achieved, when the ratio of the biggest width of the base area of the projections to the height of the projections is in the range of 0.5-3.5, preferably in the range of 1-3. The biggest width of the base area can be seen as the diameter of the base area. For example, the biggest width of the base area can be 1.25 mm and the height of the projections can be 1.00 mm. This would lead to an aspect ratio of 1.25. Other preferred seizes of the projections are (1.00 mm/0.80 mm), (0.75 mm/0.55 mm), (0.6 mm/0.45 mm), (0.45 mm/0.30 mm), (0.28 mm/0.15 mm) and (0.15 mm/0.05 mm) with the biggest width of the base area in first place and the height of the projections in second place within the brackets.

[0022] In a preferred embodiment, at most 75% of the top of the projections comprises the recess of the micro crater. In other words, the projections have preferably a solid stub. After bending the micro crater inwards the pressure applied on the projections is then be damped with increased damping force by the solid stub.

[0023] The covering can comprise regions having projections of different size and/or height and/or form and/or different densities of projections. The covering can then form a surface 3D-structure. When using a covering on a garment, preferably on a glove, the covering comprising projections of different heights, the sensitivity can be improved. Spacing of the projections allows for air ventilation, moisture wicking and assists with cooling.

[0024] In one preferred embodiment, some projections may be arranged to form ridges. For example, the projections may be arranged to form circular, oval or oblong ridges. Circular ridges may be formed around a central point, to which a specific pressure needs to be applied, balancing out multidirectional pressure.

[0025] In an alternative embodiment, some in particular smaller projections for sensitivity may be arranged particularly to imitate epidermal ridges. Thus, the projections can be used to simulate or enhance a finger's contact, adhesive properties and touch.

[0026] The projections may be made of a polymer. The shore hardness and the strength of the polymer may thereby determine the grip of the covering. The softer, more flexible or elastic the polymer is, the softer is the reaction to pressure on the covering.

[0027] In an advantageous embodiment, some projections may comprise carbon and/or metal particles. In particular, the elastically deformable material may be a polymer mixed with carbon particles and/or carbon nanotubes, which transfer electrical impulses through the projections and in particular the covering. In particular, the transfer can be from a user's skin to the outside of the covering. By using carbon particles and/or carbon nanotubes, the covering may be used to operate touch screens.

[0028] In a further embodiment, some projections may comprise gas bubbles, in particular air bubbles. By incorporating gas bubbles into the projections, the elasticity of the projections can be modified and engineered.

[0029] The invention also relates to a garment, in particular a glove, having a covering described before. The covering can be used for glove insides and insoles or at the outside of gloves, elbow or knee pads, on grips, handlebars etc.

[0030] Other advantages and features of the invention will be appreciated from the following description of embodiments with reference to the figures of the drawings, which show significant details and from the claims. The individual features may each be carried out individually or carried out together in any combination in variants of the invention.

Fig. 1a-1d	shows a first projection under increasing pressure;
Fig. 2	shows a cross section of a second projection;
Fig. 3a-3d	shows a third projection under increasing pressure;
Fig. 4a	shows a first covering with a plurality of projections; and
Fig. 4b	shows a second covering with a plurality of projections.

[0031] Fig. 1a shows in a perspective view a first projection 10 according to the invention. The first projection 10 has the form of a pyramid. It is made out of an elastically deformable material. The pyramid has a quadratic base area 12 and a quadratic top 14. The top 14 is formed as a micro crater, i.e. the top 14 has a recess 16. The recess 16 is shown in Fig. 1a with dashed lines. The first projection 10 is built to absorb pressure on its top 14.

[0032] Fig. 1b shows the first projection 10 under slight pressure on the top 14. The pressure is applied along the longitudinal axis of the first projection 10, i.e. in direction of an arrow 18.

[0033] Fig. 1c shows the first projection 10 under increased pressure on the top 14. As can be seen from Fig. 1c, the recess 16 is built only in the upper half of the first projection 10. The lower half of the first projection 10 is made out of solid material. The lower half of the first projection 10 is built as a stump 20. The stump 20 becomes less deformed under pressure than the upper half of the first projection 10. Hence, the resisting force of the first projection 10 against the applied pressure increases significantly with increasing applied pressure.

[0034] Fig. 1d shows the first projection 10 under even higher pressure. As can be seen from Fig. 1d, the upper half of the first projection 10 is substantially even, i.e. the recess 16 (see e.g. Fig. 1a) is vanished.

[0035] Fig. 2 shows a cross sectional view of a second projection 22. For clarity reasons, hatching of the figure is omitted. The second projection 22 is built on a base surface 24, which is the top surface of a carrier material 25. The second projection 22 has a tapered and jagged outer surface 26. An average outer surface 28 can be derived from the outer surface 26 by drawing the average outer surface from the bottom 30 of the outer surface 26, i.e. from the intersection of the outer surface 26 with the base surface 24, and the top 32 of the outer surface 26. The second projection 22 is built in such a way that an outer angle α between the average outer surface 28 and the base surface 24 is bigger than 97°. In the case at hand, the outer angle α is 107°. This outer angle α avoids the outward folding of a micro crater 34.

[0036] The micro crater 34 has a tapered jagged inner surface 36. An average inner surface 38 can be derived from the inner surface 36 by drawing the average inner surface from a bottom 40 of the micro crater 34 to a top 42 of the micro crater 34. In the case at hand, the top 42 of the micro crater coincides with the top 32 of the outer surface 26. The second projection 22 is built in such a way that an outer angle β between the average inner surface 38 and a plane 44, which is parallel to the base surface 24 and cuts the bottom 40, is less than 115°. In the case at hand the outer angle β is 100°.

[0037] The outer surface 26 and the inner surface 36 have a plurality of edges. For clarity reasons only two edges 46, 48 are denoted with a reference sign. The first edge 46 defines a first step 50, with a top surface 52 running substantially parallel to the base surface 24. The first step 50 further has a side surface 54 running substantially perpendicular to the base surface 24. The second edge 48 defines a second step 56, with a top surface 58 running substantially parallel to the base surface 24. The second step 56 further has a side surface 60 running substantially perpendicular to the base surface 24.

[0038] The aspect ratio of the biggest width W of the second projection 22 to its height H is preferably between 0.5 and 3.5, in the case at hand it is 0.9. By selecting the aspect ratio, the damping properties of the second projection 22 can be adjusted appropriately.

[0039] Fig. 3a shows in a perspective view a third projection 62 without application of pressure. The third projection 62 corresponds to the first projection 10 according to Fig. 1a. However, an average outer surface (see average outer surface 28 in Fig. 2) and an average inner surface (see average inner surface 38 in Fig. 2) of the third projection 62 are chosen in such a way that the walls of a micro crater 64 of the third projection 62 not only collapses but folds inwardly under pressure.

[0040] Fig. 3b shows the third projection 62 under the pressure of a plate 66. As one can see from Fig. 3b, walls 68 of the micro crater 64 are everted.

[0041] Fig. 3c shows the third projection 62 under more pressure. As can be seen from Fig. 3c, the micro crater 64 is built in such a way that under high pressure on the top of the micro crater 64 the walls 68 of the micro crater 64 fill a recess 70 of the micro crater 64.

[0042] Fig. 3d shows the third projection 62 under even more pressure. At this stage, the recess 70 is substantially completely filled with the walls 68 of the micro crater 64. In case of further pressure, mainly a stump 72 absorbs this further stress on the third projection 62.

[0043] Fig. 4a shows a first covering 74 with a plurality of projections. For clarity reasons only two projections 76, 78 are denoted with a reference sign. The first covering 74 has regions with projections (e.g. the projections 76, 78) of different size and height. The first covering 74 is adapted to an application, where one expects high pressure in the center of the first covering 74. Therefore, the projections (e.g. the projections 76, 78) are formed and distributed in a substantially convex manner.

[0044] Fig. 4b shows a second covering 80. For clarity reasons only two projections 82, 84 are denoted with a reference sign. The second covering 80 has regions with projections (e.g. the projections 82, 84) of different size and height. The second covering 80 is adapted to an application, where one expects high pressure in the outer parts of the second covering 80. Therefore, the projections (e.g. the projections 82, 84) are formed and distributed in a substantially concave manner. In conclusion, the invention relates to a covering for the absorption of pressure. The covering comprises a plurality of projections having a micro crater at the top. The projections are preferably built in such a way that the wall(s) of the micro crater bend(s) inwards under pressure and fills the recess of the micro crater. In order to achieve this effect, the projections are preferably built in a pyramidal tapered shape with an average outer angle of the outer surface of more than 97° with respect to a base surface of the projection. The projections preferably have a jagged outer and/or inner surface. The invention further relates to a garment, in particular a glove, with such a covering.

Claims

1. Covering (74, 80), in particular for a garment, comprising a plurality of projections (10, 22, 62) projecting from a base surface (24) of the covering (74, 80), the projections (10, 22, 62) being made of an elastically deformable material, whereby the projections (10, 22, 62) have a micro crater (34, 64) with a recess (16) at the top (14) of the projections (10, 22, 62),
characterized in that
in order to absorb pressure on the covering (74, 80), an average outer surface (28) of the projections (10, 22, 62) has an outer angle (α) of more than 97° with respect to the base surface (24), whereby the average outer surface (28) is a surface between the bottom (30) of the outer surface (26) and the top (32)

of the outer surface (26) of the projections (10, 22, 62).

2. Covering according to claim 1, wherein the covering (74, 80) comprises a carrier material (25), the top surface of the carrier material (25) forming the base surface (24), whereby at least some projections (10, 22, 62) are attached to the carrier material (25).

3. Covering according to claim 1 or 2, wherein the average outer surface (28) of the projections (10, 22, 62) has an outer angle (α) of 105°-109° with respect to the base surface (24).

4. Covering according to any of the preceding claims, wherein the outer surface (26) of the projections (10, 22, 62) is built as a jagged surface with a plurality of edges (46, 48), which run substantially parallel to the base surface (24).

5. Covering according to claim 4, wherein the edges (46, 48) of the outer surface (26) define steps (56) of the outer surface (26), whereby the top surfaces (58) of the steps (56) run substantially parallel to the base surface (24) and the side surfaces (60) of the outer surface (26) run substantially perpendicular to the base surface (24).

6. Covering according to any of the preceding claims, wherein an average inner surface (38) of the micro crater (34, 64) has an outer angle (β) of less than 115° with respect to a plane (44) parallel to the base surface (24), whereby the average inner surface (38) is a surface between the bottom (40) of the recess (16) and the top (42) of the recess (16) of the micro crater (34, 64).

7. Covering according to claim 6, wherein the average inner surface (38) has an outer angle (β) of less than 101° with respect to the plane (44) parallel to the base surface (24).

8. Covering according to one of the preceding claims, wherein an inner surface (36) of the micro crater (34, 64) has a jagged surface with a plurality of edges (46), which run substantially parallel to the base surface (24).

9. Covering according to claim 8, wherein the edges (24) of the inner surface (36) define steps (50) of the inner surface (36), whereby the top surfaces (52) of these steps (50) run substantially parallel to the base surface (24) and the side surfaces (54) run substantially perpendicular to the base surface (24).

10. Covering according to one of the preceding claims, wherein the projections (10, 22, 62) are built substantially as pyramids with a micro crater (34, 64) on the top (14).

11. Covering according to claim 10, wherein the pyramids have a rectangular base area.

12. Covering according to claim 11, wherein the pyramids have a quadratic base area.

13. Covering according to one of the preceding claims, wherein the ratio of the biggest width (W) of the base area (12) of the projections (10, 22, 62) to the height (H) of the projections (10, 22, 62) is in the range of 0.5-3.5, preferably in the range of 1-3

14. Covering according to one of the preceding claims, wherein the covering (74, 80) comprises regions having projections (10, 22, 62) of different size and/or height and/or form and/or different densities of projections (10, 22, 62).

15. Garment, in particular a glove, having a covering (74, 80) according to any of the preceding claims.

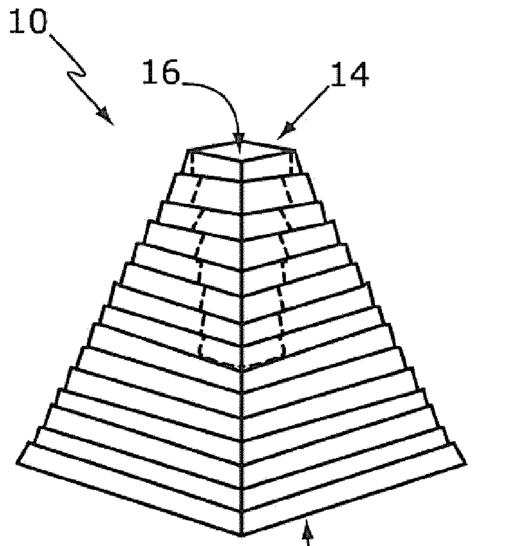

Fig. 1a

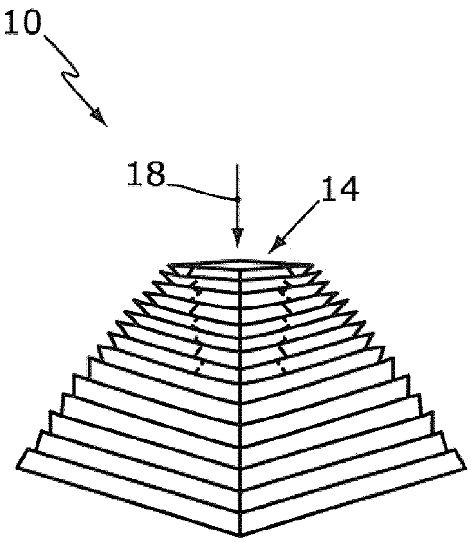

Fig. 1b

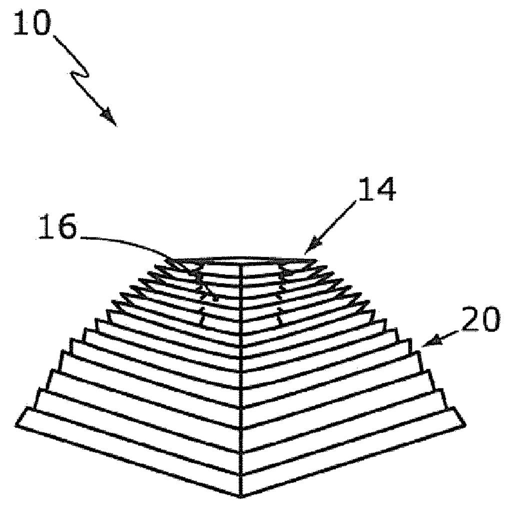

Fig. 1c

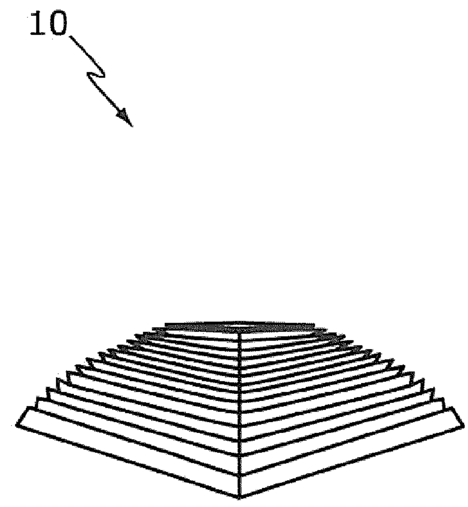

Fig. 1d

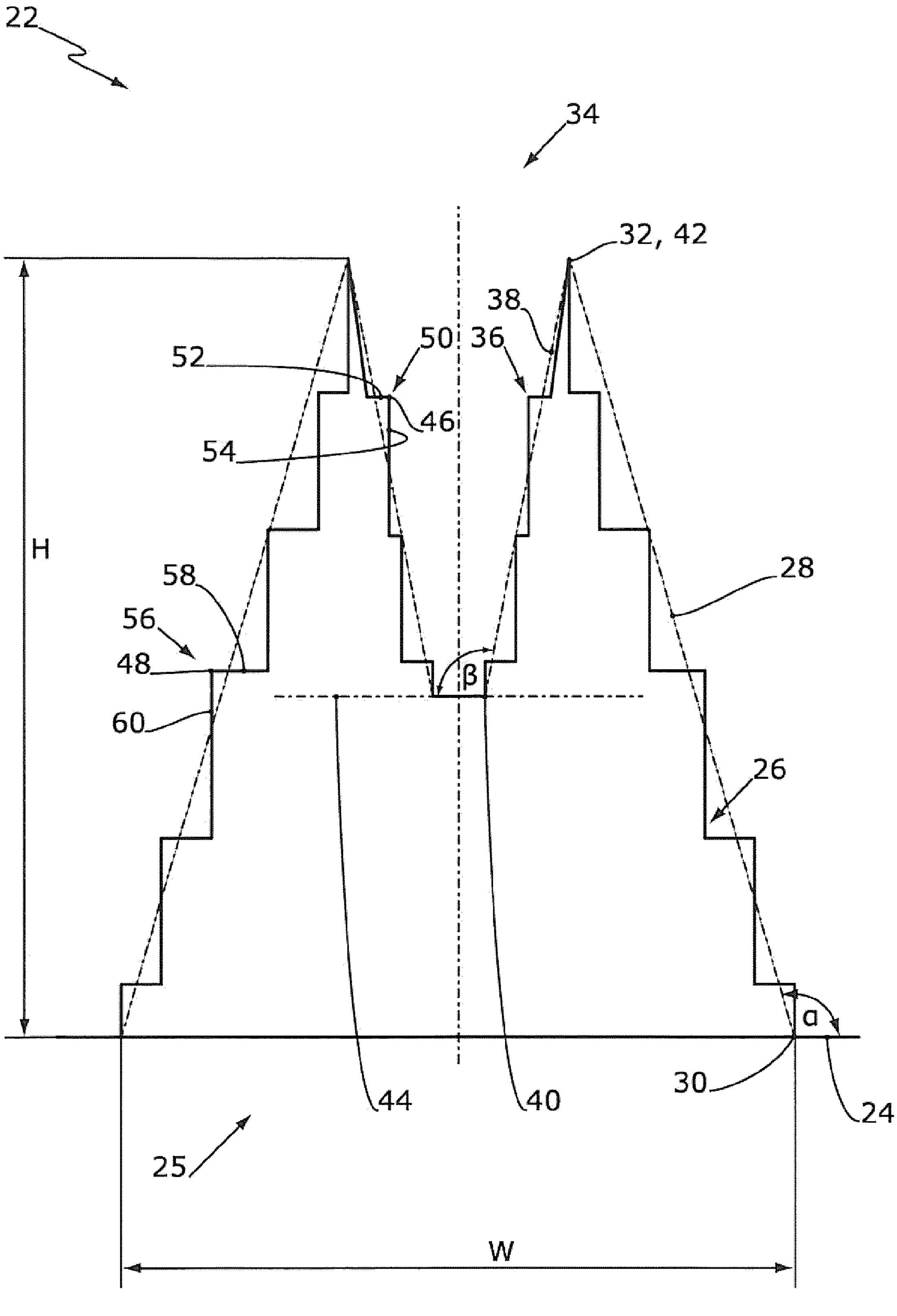

Fig. 2

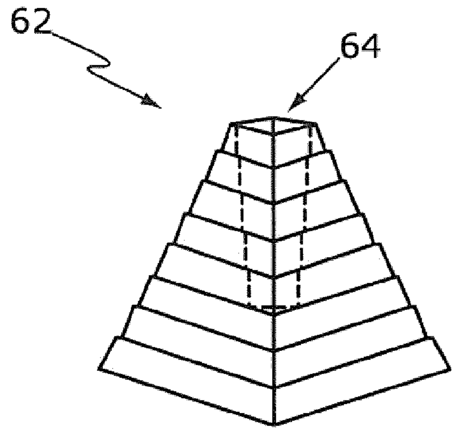

Fig. 3a

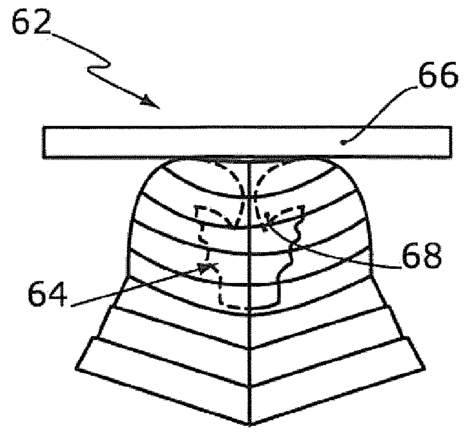

Fig. 3b

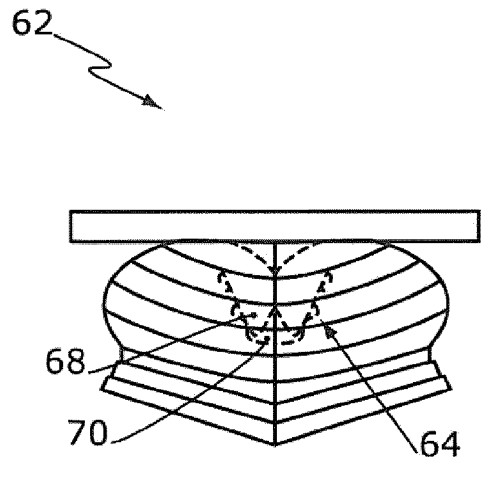

Fig. 3c

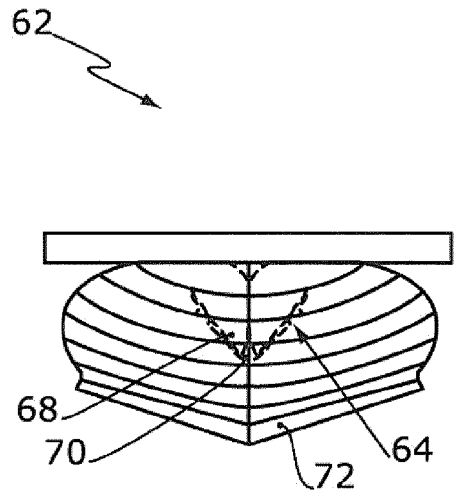

Fig. 3d

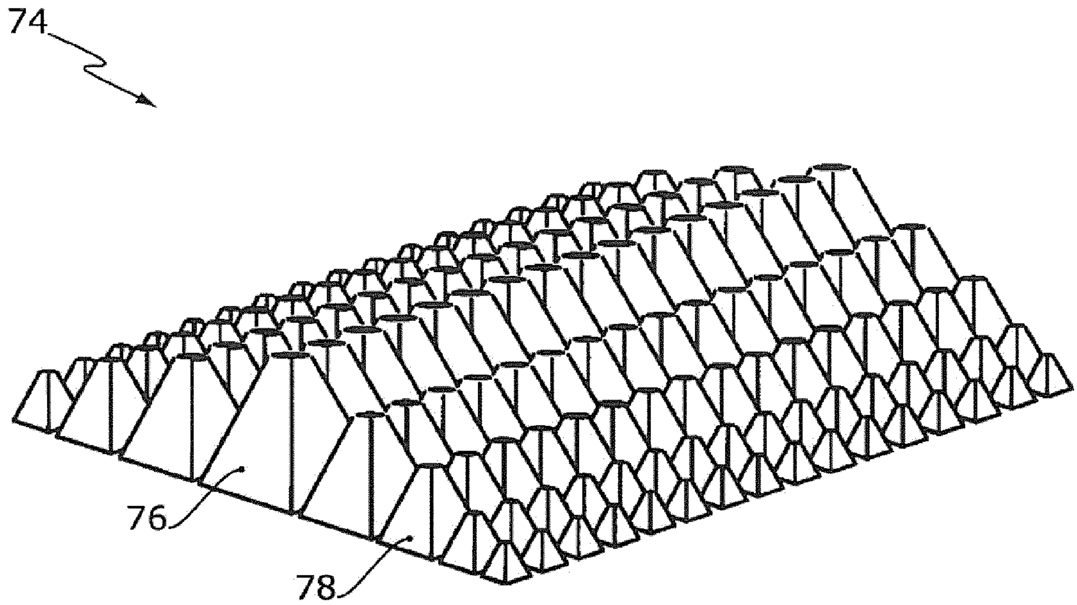

Fig. 4a

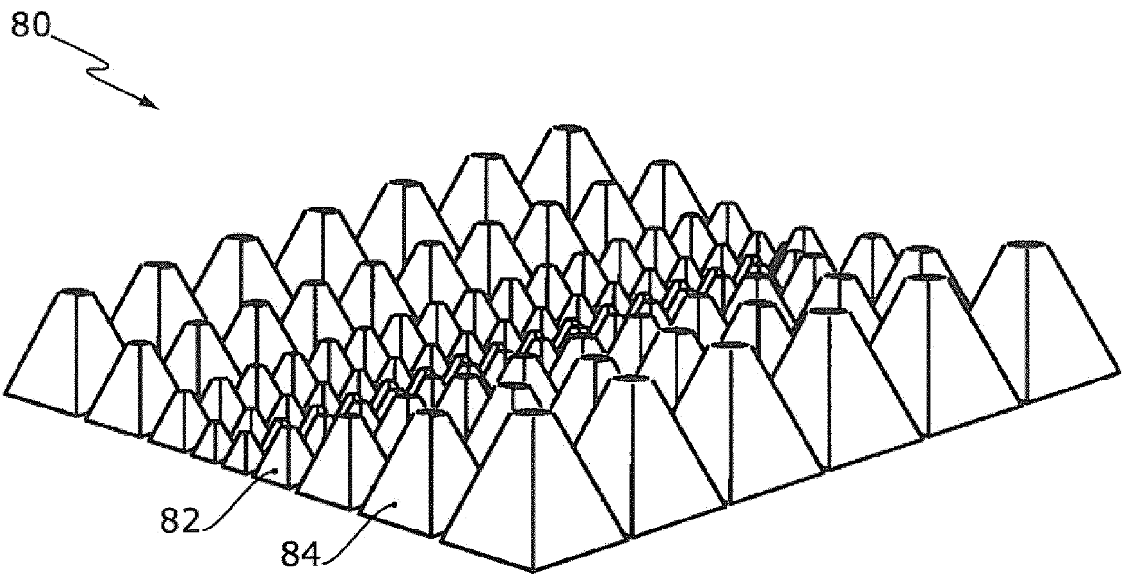

Fig. 4b

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EUROPEAN SEARCH REPORT

Application Number
EP 14 15 3620

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	WO 2008/113816 A2 (SPARCO S P A [IT]; BOUCKAERT LUC [BE]) 25 September 2008 (2008-09-25) * abstract; figures 1-7 * * page 2, line 21 - page 6, line 12 * -----	1-15	INV. A41D19/015 A41D31/00 G06F3/01 G06F3/033 G06F3/044 H04M1/23 ADD. A41D13/015
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X A	US 2005/196592 A1 (TAO XIAOMING [CN] ET AL) 8 September 2005 (2005-09-08) * abstract; figures 1a-4 * * paragraphs [0002], [0045] - [0065] * -----	1-5, 10-15 6-9	
X A	US 2010/299812 A1 (MADDUX LARRY E [US] ET AL) 2 December 2010 (2010-12-02) * abstract; figures 1-13 * * paragraphs [0001], [0041] - [0061] * -----	1-3, 10-15 4-9	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	16 June 2014	Contreras Aparicio

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
EP 14 15 3620

DOCUMENTS CONSIDERED TO BE RELEVANT

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			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

1

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 15 3620

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