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(54) **STABILIZING ELEMENT FOR A SHOE, IN PARTICULAR A MOUNTAINEERING SHOE**

STABILISIERUNGSELEMENT FÜR EINEN SCHUH, INSBESONDERE EINEN BERGSCHUH

ÉLÉMENT DE STABILISATION POUR UNE CHAUSSURE, EN PARTICULIER UNE CHAUSSURE
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Description

1. Technical Field

[0001] The present invention relates to a stabilizing element for a shoe, in particular a mountaineering shoe, and to a shoe comprising such stabilizing element.

2. Prior Art

[0002] Mountaineering shoes are required to support a wearer's foot in steep and rough terrain, to protect it from injuries caused by stones and ice, and to allow for the attachment of crampons if needed. Therefore, mountaineering shoes usually have very stiff soles, i.e. the force and / or torque needed to bend the soles to a certain degree is high compared to other types of shoes, such as e.g. running shoes. To this end, typical mountaineering shoes include a sandwich construction with a rigid plate directly above a rubber outsole and a cushioning midsole above the rigid plate.

[0003] For example, US RE40,474 E relates to a multilayer sole for sport shoes. The sole comprises three layers, including an outer or ground contact sole having flexibility, ground-gripping, and abrasion resistance properties, an upper or comfort layer positioned directly beneath the foot and having elastic shock-absorption properties, and an intermediate layer or rib positioned directly between the upper portion of the contact layer and the lower portion of the comfort layer and having torsional rigidity properties which provide both for the distribution of shocks sensed by the contact layer and for their diffusion over the comfort layer before they come into contact with the foot.

[0004] EP 0981973 A1 relates to an inner sole for a sports shoe, in particular a mountain-climbing or hiking boot, having an anatomically shaped body made of plastic material, and a strengthening insert embedded in the body; the insert has a longitudinally ribbed structure, and includes a main portion extending along the sole of the foot and wide enough to provide a high degree of torsional rigidity of the inner sole, and a narrow front appendix extending from the main portion and connected to the main portion substantially at the metatarsus.

[0005] However, such prior art soles have several disadvantages. First, rigid plates used to increase the stiffness of the soles tend to become brittle especially at low temperatures (as typically experienced at high altitudes) and, thus, require reinforcement and insulation. Such measures, however, increase the weight of such soles. Second, a rigid plate arranged above a rubber outsole decreases adaptability of the outsole to the ground which in turn decreases traction.

[0006] It is therefore the object of the present invention to provide a stabilizing element for a shoe, in particular a mountaineering shoe, which is able to provide a high degree of stiffness to the shoe, is durable especially at low temperatures, yet lightweight, and does not impair

traction.

[0007] US 5,881,478 relates to a midsole construction having a rockable member. A cavity is formed in the forefoot portion of a sole. The cavity substantially spans the width of the forefoot portion of the sole. It has a curved concave portion and a flat portion. The concave and flat portions are configured to receive a curved convex portion and flat portion of the bottom of a rockable (or rotatable) member. The rockable member may be made of a relatively rigid solid elastomer, e.g., polyurethane, polyvinylchloride, or other thermoplastic. Alternatively, the rockable member may be made of layered flexible thermoplastics and synthetic foams such as EVA or PU foam so that the rockable member has a rigid core and a soft upper surface.

[0008] A flexible coupling element is positioned between the concave portion of the sole cavity and the convex curved portion of the rockable member. The coupling element may be made of an elastomeric solid, a gel, or a membrane containing a liquid, solid or gas. Preferably, the coupling element is of a soft, elastic PU or other material that has relatively low shear resistance and deforms when a load is applied to its surface.

[0009] Further prior art is mentioned US 2014/0075779 A1.

3. Summary of the Invention

[0010] According to a first aspect of the present invention, this problem is solved by a stabilizing element for a shoe sole, in particular for a mountaineering shoe, comprising (a.) a first plate, comprising at least one opening; (b.) a second plate arranged at least partially in the opening; and (c.) a third plate arranged at least partially in the opening and arranged at least partially above the second plate, wherein the third plate comprises a substantially higher stiffness than the second plate.

[0011] In the stabilizing element according to the invention, the third plate has a substantially (i.e. within manufacturing tolerances) higher stiffness than the second plate and is arranged above the second plate, i.e. nearer to a foot of a wearer. The arrangement of the stiff third plate above (i.e. closer to the foot) the more flexible second plate provides a high degree of stiffness to the stabilizing element, and thus the shoe sole into which it is to be integrated.

[0012] Furthermore, the stiff and rigid third plate is insulated between the foot and the second plate (and the outsole and midsole in the finished shoe). This arrangement on the one hand avoids or at least reduces the risk of fracture of the stiff and rigid third plate due to the impact of e.g. rocks or ice. On the other hand, the insulating arrangement maintains the temperature of the stiff and rigid third plate in acceptable ranges, thus avoiding or at least reducing the risk that it becomes brittle. Due to this arrangement, no additional reinforcement or insulation of the stiff and rigid third plate is required, which would otherwise increase the weight of the shoe sole into which

the stabilizing element is to be integrated.

[0013] Thus, the third plate can have a much higher stiffness because of the insulation due to its placement by the foot and, owing to this placement, it experiences little bending.

[0014] Furthermore, since in the shoe sole into which the stabilizing element is to be integrated, the stiff and rigid third plate is spaced apart from the outsole (by the second plate between), the shoe sole is more adaptable to the ground and traction is increased, because the second plate closer to the outsole is less stiff than the third plate. Moreover, by the arrangement of plates according to the invention, a balance is achieved between the required stiffness for the mountaineering shoe while allowing flexibility for walking.

[0015] Finally, the second plate and the third plate are housed in an opening of the first plate. In this way, the first plate protects the second plate and in particular the stiff and rigid third plate from the outside, for example from rocks and ice. Furthermore, the first plate provides for insulation and helps maintaining the temperature of the rigid and stiff third plate within acceptable ranges, thus avoiding or at least reducing the risk that the third plate becomes brittle.

[0016] The second plate comprises a substantially higher stiffness than the first plate. In this way, the second plate adds to the overall stiffness of the stabilizing element. However, since the stiffness of the second plate is substantially lower than the stiffness of the third plate, low temperatures are not as critical for the second plate (which is arranged closer to the outsole and farther from the foot) than for the more stiff and rigid third plate. Furthermore, due to the lower stiffness of the second plate, the outsole is more adaptable to the ground and traction is improved.

[0017] The base material of the second plate and the base material of the third plate may be reinforced with fibers. Fiber reinforcement is a very effective measure for increasing the stiffness of materials. Furthermore by varying the degree, i.e. the fiber density, of fiber reinforcement, stiffness and elasticity of the plates can easily and precisely be adjusted.

[0018] The second plate may comprise 5% to 20% fiber reinforcement and the third plate may comprise 20% to 50% fiber reinforcement. In a preferred embodiment, the second plate may comprise approximately 15% fiber reinforcement and the third plate may comprise approximately 50% fiber reinforcement. These degrees of fiber reinforcement have shown to result in sufficient stiffness of the stabilizing element, while at the same time limiting the risk that the plates become brittle at low temperatures.

[0019] The fibers may be glass fibers. Glass fibers are readily available, rather simple to handle and may easily be applied to suitable base materials.

[0020] The base material of the first plate may not be reinforced with fibers. Thus, the risk that the first plate (which forms a kind of frame for the second and third plates) becomes brittle at low temperatures is at least

reduced.

[0021] The first plate, the second plate and the third plate may be made from the same base material. The use of the same base material makes bonding between the materials easier than if the materials were different. This eases manufacturing of the stabilizing element and adds to its durability.

[0022] The base material of the first plate, the second plate and the third plate may be polyamide. Polyamide is much more durable than the nylon used in conventional mountaineering shoes. The construction of the stabilizing element according to the invention allows the more brittle polyamide to be used instead of nylon. Moreover, polyamide does not experience any kind of permanent deformation after multiple uses.

[0023] Furthermore, the base material of the first plate, the second plate and the third plate may be TPU or polyether block amide (PEBA). Furthermore, the base material of the third plate may comprise carbon, as the third plate can experience a very high stiffness owing to its placement.

[0024] The third plate may be approximately 1 to 3 mm thick. Such a thickness has shown to result in a sufficiently stiff stabilizing element which at the same time is rather lightweight.

[0025] The bending stiffness of the third plate may be at least two times higher than the bending stiffness of the second plate. In this way, the third plate adds the required stiffness to the stabilizing element, while its insulating arrangement between the foot and the second plate avoids or at least reduces the risk that it becomes brittle at low temperatures. Furthermore, since the less stiff second plate is arranged near the outsole, the shoe sole into which the stabilizing element is to be integrated, remains more adaptable to the ground.

[0026] The bending stiffness of the second plate may be at least two times higher than the bending stiffness of the first plate. The second plate adds to the overall stiffness of the stabilizing element, while the first plate may safely extend to the outside without the risk of becoming brittle at low temperatures and with sufficient ductility to withstand snow, ice and rocks.

[0027] The modulus of elasticity of the first plate may be 600 to 1500 MPa. The modulus of elasticity of the second plate may be 2000 to 4000 MPa. The modulus of elasticity of the third plate may be 9000 to 13000 MPa. In a preferred embodiment, the modulus of elasticity of the first plate may be approximately 1100 MPa, the modulus of elasticity of the second plate may be approximately 3000 MPa, and the modulus of elasticity of the third plate may be approximately 11500 MPa. These moduli of elasticity have shown to provide a stabilizing element being sufficiently stiff, yet lightweight and durable.

[0028] The third plate may comprise ribs arranged in a longitudinal direction of the stabilizing element. Furthermore, the second plate may comprise ribs arranged in a longitudinal direction of the stabilizing element. Ribs save weight by decreasing material used. Furthermore,

ribs in the longitudinal direction (i.e. in the direction from a heel portion to a toe portion of a shoe into which the stabilizing element is to be integrated) increase the bending stiffness by prevention or at least restriction of bending.

[0029] The ribs of the third plate may coincide with the ribs of the second plate. In this arrangement high stiffness can be achieved because the ribs in the third plate engage with corresponding ribs in the second plate.

[0030] The ribs of the third plate may have a height of approximately 1 to 3 mm. The ribs of the second plate may have a height of 1 to 5 mm. Such heights have shown to provide sufficient bending stiffness while at the same time keeping the strain in the ribs sufficiently low when the stabilizing element is bent.

[0031] The material of the third plate may have 4 % strain at break at 0° C. With the advantageous arrangement of plates in the stabilizing element according to the invention, strain of the third plate is well below this limit even at extreme bending angles.

[0032] The stabilizing element may be adapted to essentially cover the entire foot of a wearer of a shoe into which the stabilizing element is to be integrated. In this way, a high bending stiffness is achieved over the entire length of the foot.

[0033] The opening in the first plate may be arranged such that the second plate and the third plate do not extend to the outside of a shoe into which the stabilizing element is to be integrated. Thus, the second plate and in particular the stiff and rigid third plate are protected from the outside, in particular from low temperatures, rocks or ice.

[0034] A further aspect of the present invention relates to a shoe, in particular a mountaineering shoe, comprising (a.) an outsole; (b.) an upper; and (c.) a stabilizing element as described above arranged between the outsole and the upper.

[0035] The shoe may comprise a midsole arranged between the outsole and the stabilizing element. The midsole may provide cushioning to the shoe. Furthermore, the midsole may further insulate the second plate and in particular the stiff and rigid third plate.

[0036] The outsole may be made from rubber. Rubber is readily available, durable, and provides for very good traction.

4. Short Description of the Drawings

[0037] In the following, further aspects of the present invention are explained in detail referring to the drawings. These drawings show:

Fig. 1A: An exemplary embodiment of a stabilizing element according to the invention;

Fig. 1B: A cross-sectional view of the embodiment of Fig. 1A;

Fig. 1C: The third plate of the stabilizing element of figures 1A and 1B in more detail;

Fig. 2A: A finite element analysis of an exemplary embodiment of a stabilizing element according to the invention regarding the strain at a bending angle of 15°;

Fig. 2B: A finite element analysis of an exemplary embodiment of a stabilizing element according to the invention regarding the strain at a bending angle of 60°;

Fig. 3: A finite element analysis of an exemplary embodiment of a stabilizing element according to the invention regarding the stress at a bending angle of 30°;

Fig. 4: A finite element analysis of an exemplary embodiment of a stabilizing element according to the invention regarding the strain at a bending angle of 30°; and

Fig. 5: An exemplary embodiment of a shoe according to the invention.

5. Detailed Description of Preferred Embodiments

[0038] In the following, embodiments and variations of the present invention are described in detail.

[0039] Figures 1A, 1B and 1C show an exemplary embodiment of a stabilizing element 10 according to the present invention, wherein Fig. 1B shows a cross-sectional view of the stabilizing element 10 and Fig. 1C shows the third plate 14 of the stabilizing element 10 in more detail. The stabilizing element 10 comprises a first plate 11, a second plate 13, and a third plate 14. The first plate 11 comprises at least one opening 12 as shown in Fig. 1C. The second plate 13 is arranged at least partially in the opening 12. Also the first plate 14 is arranged at least partially in the opening 12. For example, as can be seen in Fig. 1B, the border of the second plate 13 and of the third plate 14 overlap a corresponding border of the opening 12 in the first plate 11. However, the most part of the second plate 13 and of the third plate 14 is fully arranged in the opening 12 of the first plate 11.

[0040] Furthermore, the third plate 14 is arranged at least partially above the second plate 13. This means that the third plate 14 is arranged closer to a foot of a wearer of a shoe into which the stabilizing element 10 according to the invention is to be integrated. Likewise, the second plate 13 is arranged closer to an outsole of a shoe into which the stabilizing element 10 is to be integrated.

[0041] Furthermore, the third plate 14 comprises a substantially higher stiffness than the second plate 13. Stiffness can be measured by bending the plates and/or the stabilizing element while at the same time measuring the

force and / or torque needed to bend the plate and/or the stabilizing element to a certain angle. Stiffness is higher if a higher force and / or torque is needed to achieve the same bending angle.

[0042] The base material of the first plate 11, the second plate 13, and the third plate 14, may for example be polyamide. Other materials are possible as well, such as TPU or polyether block amide (PEBA). The material of the third plate 14 may be based on carbon. The first plate 11, the second plate 13, and the third plate 14 may be made from the same base material. Alternatively, different base materials may be used. Generally, the material of the third plate 14 may have e.g. a 4% strain at break at 0° C. The construction of the stabilizing element according to the invention guarantees that the strain of the third plate 14 even in extreme situations is well below this level.

[0043] The material of the second plate 13 and the material of the third plate 14 may be reinforced with fibers, such as for example glass or carbon fibers. For example, the second plate 13 may comprise approximately 15% fiber reinforcement and the third plate 14 may comprise approximately 50% fiber reinforcement. The first plate 11 may not be reinforced with fibers at all. Consequently, the stiffness of the second plate 13 is higher than the stiffness of the first plate 11. For example, the bending stiffness of the second plate 13 may be at least two times higher than this bending stiffness of the first plate 11. Furthermore, due to the different degrees fiber reinforcement, the bending stiffness of third plate 14 may at least be two times higher than the bending stiffness of the second plate 13. The desired degree of stiffness may also be achieved by other means than fiber reinforcement, for example by using different materials for the plates.

[0044] The modulus of elasticity of the first plate may be 600 to 1500 MPa. The modulus of elasticity of the second plate may be 2000 to 4000 MPa. The modulus of elasticity of the third plate may be 9000 to 13000 MPa. Specifically, the modulus of elasticity of the first plate 11 may be approximately 1100 MPa. The modulus of elasticity of the second plate 13 may be approximately 3000 MPa and the modulus of elasticity of the third plate 14 may be approximately 11500 MPa.

[0045] In the exemplary embodiment of figures 1A, 1B and 1C the third plate 14 is approximately 1 mm thick. Due to the arrangement of plates according to the invention, this thickness is sufficient to achieve the desired high stiffness of the entire stabilizing element 10.

[0046] In the exemplary embodiment of figures 1A, 1B and 1C the third plate 14 comprises ribs, two of which are denoted by the reference numeral 15. The ribs 15 are arranged in a longitudinal direction of the stabilizing element 10, i.e. in a direction from a heel portion to a toe portion of a shoe into which the stabilizing element 10 is to be integrated. The ribs 15 of the third plate 14 have a height of approximately 1 to 3 mm.

[0047] Also in the exemplary embodiment of figures 1A, 1B and 1C, the second plate 13 comprises ribs, two

of which are denoted by the reference numeral 16. The ribs 16 are arranged in a longitudinal direction of the stabilizing element 10 and have a height of approximately 1 to 5 mm. As shown in Fig. 1B, the ribs 15 of the third plate 14 coincide with the ribs 16 of the second plate 13. However, it is also possible that the ribs do not coincide.

[0048] As shown in figure 1A, the stabilizing element 10 essentially covers the entire foot of a wearer of a shoe into which the stabilizing element is to be integrated. Thus, the stabilizing element extends from a heel portion 17a over a midfoot portion 17b to a toe portion 17c.

[0049] Furthermore, as shown in figures 1A, 1B and 1C, the opening 12 in the first plate 11 is arranged such that the second plate 13 and the third plate 14 do not extend to the outside of a shoe into which the stabilizing element 10 is to be integrated. Thus, the first plate 11 provides for a rim 18 which protects the second plate 13 and the third plate 14 from the outside, for example from rocks and ice.

[0050] As shown in figures 1A and 1C, the first plate 11 of the stabilizing element 10 may comprise a second opening 19 in the heel portion. A cushioning or shock-absorbing member (not shown in the figures) may be arranged in the opening 19.

[0051] Furthermore, as shown in figures 1A and 1C, the stabilizing element 10 may optionally comprise in the heel portion 17a a heel support member 110. In the exemplary embodiment of figures 1A and 1C the heel support member 110 is cup-shaped and entirely surrounds the heel of a foot of a wearer of a shoe into which the stabilizing element 10 is to be integrated. However, it is also possible that the heel support member 110 only covers a part of the heel. Furthermore, in the exemplary embodiment of figures 1A and 1C, the heel support member 110 is integrally formed with the first plate 11. This adds overall strength and stability, and gives a simpler construction. However, it is also possible that the heel support member 110 is attached to the first plate 11, for example by gluing or welding.

[0052] Fig. 2A shows a finite element analysis of a stabilizing element 10 according to the invention. In particular, the strain level in percent at a bending angle of 15° is shown. The strain in the third plate 14 is at approximately 0% meaning that there is no risk of breaking the plate, even at very low temperatures. The finite element analysis also shows that the plate stiffness at a bending angle of 15° is at approximately 27 Nm.

[0053] Fig. 2B shows a finite element analysis of a stabilizing element 10 according to the invention. In particular, the strain level in percent at a bending angle of 60° is shown. The strain in the third plate 14 is between 0% and approximately 1% meaning that there is almost no risk of breaking the plate, even at very low temperatures. As shown in Fig. 2B, the strain in the second plate 13 is higher, namely about 4%. However, as the second plate 13 comprises a substantially lower stiffness than the third plate 14, it is less brittle, especially at low temperatures, and the risk of breaking the second plate 13 is low.

[0054] Fig. 3 shows a finite element analysis of a stabilizing element 10 according to the invention. In particular, the stress level in percent at a bending angle of 30° is shown. As can be seen, the stress in the first plate 11 and the second plate 13 is rather low, whereas the third plate 14 experiences a medium stress level. Accordingly, the third plate 14 is mostly responsible for the stiffness of the entire stabilizing element 10.

[0055] Fig. 4 shows a finite element analysis of a stabilizing element 10 according to the invention. In particular, the strain level in percent at a bending angle of 30° is shown for almost the entire bending element 10. The strain level is moderate and at most approximately 1% for the third plate 14. Also in the region of the heel support member 110, the strain level does not exceed 4% and is for the most part at approximately 2%. This means that the risk of breaking the heel support member 110 is rather low.

[0056] Fig. 5 shows an exemplary embodiment of a shoe 50 according to the invention. The shoe 50 is a mountaineering shoe comprising an outsole 51, an upper 52, a midsole 53 and a stabilizing element 10 as described above arranged between the midsole 53 and the upper 52. The stabilizing element 10 may be glued, sewn, welded or otherwise be fixed to other components of the shoe 50, e.g. the outsole 51, upper 52, midsole 53 etc. The outsole 51 may be made from rubber and the upper 52 may be made from conventional materials like polyester, etc.

[0057] The shoe 50 also comprises a midsole 53 arranged between the outsole 51 and the stabilizing element 10. However, such a midsole is an optional element and may be omitted in certain embodiments.

Claims

1. Stabilizing element (10) for a shoe sole, in particular for a mountaineering shoe, comprising:
 - a. a first plate (11), comprising at least one opening (12);
 - b. a second plate (13) arranged at least partially in the opening (12), wherein the second plate (13) comprises a substantially higher stiffness than the first plate (11); and
 - c. a third plate (14) arranged at least partially above the second plate (13), wherein the third plate (14) comprises a substantially higher stiffness than the second plate (13).
2. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the base material of the second plate (13) and the base material of the third plate (14) is reinforced with fibers.
3. Stabilizing element (10) for a shoe sole according to

claim 3, wherein the second plate (13) comprises 5% to 20% fiber reinforcement and the third plate (14) comprises 20% to 50% fiber reinforcement.

4. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the base material of the first plate (11) is not reinforced with fibers.
5. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the first plate (11), the second plate (13) and the third plate (14) are made from the same base material.
6. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the bending stiffness of the third plate (14) is at least two times higher than the bending stiffness of the second plate (13).
7. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the bending stiffness of the second plate (13) is at least two times higher than the bending stiffness of the first plate (11).
8. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the modulus of elasticity of the first plate (11) is 600 to 1500 MPa.
9. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the modulus of elasticity of the second plate (13) is 2000 to 4000 MPa.
10. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the modulus of elasticity of the third plate (14) is 9000 to 13000 MPa.
11. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the third plate (14) comprises ribs (15) arranged in a longitudinal direction of the stabilizing element (10).
12. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the second plate (13) comprises ribs (16) arranged in a longitudinal direction of the stabilizing element (10).
13. Stabilizing element (10) for a shoe sole according to claims 11 and 12, wherein the ribs (15) of the third plate (14) coincide with the ribs (16) of the second plate (13).
14. Stabilizing element (10) for a shoe sole according to one of the preceding claims, wherein the stabilizing element (10) essentially covers the entire foot of a wearer of a shoe into which the stabilizing element

(10) is to be integrated.

15. Shoe, in particular a mountaineering shoe, comprising:

- a. an outsole;
- b. an upper; and
- c. a stabilizing element (10) according to one of the preceding claims arranged between the outsole and the upper.

Patentansprüche

1. Stabilisierende Komponente (10) für eine Schuhsohle, insbesondere für einen Bergsportschuh, aufweisend:

- a. eine erste Platte (11), die mindestens eine Öffnung (12) aufweist;
- b. eine zweite Platte (13), die zumindest teilweise in der Öffnung (12) angeordnet ist; wobei die zweite Platte (13) eine im Wesentlichen höhere Steifheit als die erste Platte (11) aufweist; und
- c. eine dritte Platte (14), die zumindest teilweise in der Öffnung (12) und zumindest teilweise über der zweiten Platte (13) angeordnet ist, wobei die dritte Platte (14) eine wesentlich höhere Steifheit als die zweite Platte (13) aufweist.

2. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei das Grundmaterial der zweiten Platte (13) und das Grundmaterial der dritten Platte (14) mit Fasern verstärkt ist.

3. Stabilisierende Komponente (10) für eine Schuhsohle gemäß Anspruch 3, wobei die zweite Platte (13) 5% bis 20% Faserverstärkung aufweist und die dritte Platte (14) 20% bis 50% Faserverstärkung aufweist.

4. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei das Grundmaterial der ersten Platte (11) nicht mit Fasern verstärkt ist.

5. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei die erste Platte (11), die zweite Platte (13) und die dritte Platte (14) aus demselben Grundmaterial hergestellt sind.

6. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei die Biegesteifheit der dritten Platte (14) mindestens zweimal höher als die Biegesteifheit der zweiten Platte (13) ist.

7. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei die Biegesteifheit der zweiten Platte (13) mindestens zweimal höher als die Biegesteifheit der ersten Platte (11) ist.

8. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei das Elastizitätsmodul der ersten Platte (11) 600 bis 1500 MPa beträgt.

9. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei das Elastizitätsmodul der zweiten Platte (13) 2000 bis 4000 MPa beträgt.

10. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei das Elastizitätsmodul der dritten Platte (14) 9000 bis 13000 MPa beträgt.

11. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei die dritte Platte (14) Rippen (15) aufweist, die in einer Längsrichtung der stabilisierenden Komponente (10) angeordnet sind.

12. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei die zweite Platte (13) Rippen (16) aufweist, die in einer Längsrichtung der stabilisierenden Komponente (10) angeordnet sind.

13. Stabilisierende Komponente (10) für eine Schuhsohle gemäß Ansprüchen 11 und 12, wobei die Rippen (15) der dritten Platte (14) sich mit den Rippen (16) der zweiten Platte (13) decken.

14. Stabilisierende Komponente (10) für eine Schuhsohle gemäß einem der vorhergehenden Ansprüche, wobei die stabilisierende Komponente (10) im Wesentlichen den gesamten Fuß eines Trägers eines Schuhs, in welchen die stabilisierende Komponente (10) integriert werden soll, bedeckt.

15. Schuh, insbesondere ein Bergsportschuh, aufweisend:

- a. eine Außensohle;
- b. ein Schuhoberteil; und
- c. eine stabilisierende Komponente (10) gemäß einem der vorhergehenden Ansprüche, die zwischen der Außensohle und dem Oberteil angeordnet ist.

Revendications

1. Élément de stabilisation (10) pour une semelle de chaussure, en particulier pour une chaussure de randonnée, comprenant :
 - a. une première plaque (11), comprenant au moins une ouverture (12) ;
 - b. une seconde plaque (13) agencée au moins partiellement dans l'ouverture (12), la seconde plaque (13) présentant une raideur substantiellement supérieure à celle de la première plaque (11) ; et
 - c. une troisième plaque (14) agencée au moins partiellement dans l'ouverture (12) et agencée au moins partiellement au-dessus de la seconde plaque (13), la troisième plaque (14) présentant une raideur substantiellement supérieure à celle de la seconde plaque (13).
2. Élément de stabilisation (10) pour une semelle de chaussure selon la revendication précédente, dans lequel le matériau de base de la seconde plaque (13) et le matériau de base de la troisième plaque (14) sont renforcés de fibres.
3. Élément de stabilisation (10) pour une semelle de chaussure selon la revendication 2, dans lequel la seconde plaque (13) comprend 5 % à 20 % de renfort de fibres et la troisième plaque (14) comprend 20 % à 50 % de renfort de fibres.
4. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel le matériau de base de la première plaque (11) n'est pas renforcé de fibres.
5. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel la première plaque (11), la seconde plaque (13) et la troisième plaque (14) sont réalisées à partir du même matériau de base.
6. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel la raideur à la courbure de la troisième plaque (14) est au moins deux fois supérieure à la raideur à la courbure de la seconde plaque (13).
7. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel la raideur à la courbure de la seconde plaque (13) est au moins deux fois supérieure à la raideur à la courbure de la première plaque (11).
8. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel le module d'élasticité de la première plaque (11) est de 600 à 1500 MPa.
9. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel le module d'élasticité de la seconde plaque est de 2000 à 4000 MPa.
10. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel le module d'élasticité de la troisième plaque (14) est de 9000 à 13 000 MPa.
11. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel la troisième plaque (14) comprend des nervures (15) agencées dans une direction longitudinale de l'élément de stabilisation (10).
12. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel la seconde plaque (13) comprend des nervures (16) agencées dans une direction longitudinale de l'élément de stabilisation (10).
13. Élément de stabilisation (10) pour une semelle de chaussure selon les revendications 11 et 12, dans lequel les nervures (15) de la troisième plaque (14) coïncident avec les nervures (16) de la seconde plaque (13).
14. Élément de stabilisation (10) pour une semelle de chaussure selon l'une des revendications précédentes, dans lequel l'élément de stabilisation (10) recouvre essentiellement la totalité du pied d'un porteur d'une chaussure dans laquelle l'élément stabilisateur (10) est destiné à être intégré.
15. Chaussure, en particulier une chaussure de randonnée, comprenant :
 - a. une semelle extérieure ;
 - b. une tige ; et
 - c. un élément de stabilisation (10) selon l'une des revendications précédentes agencé entre la semelle extérieure et la tige.

FIG 1A

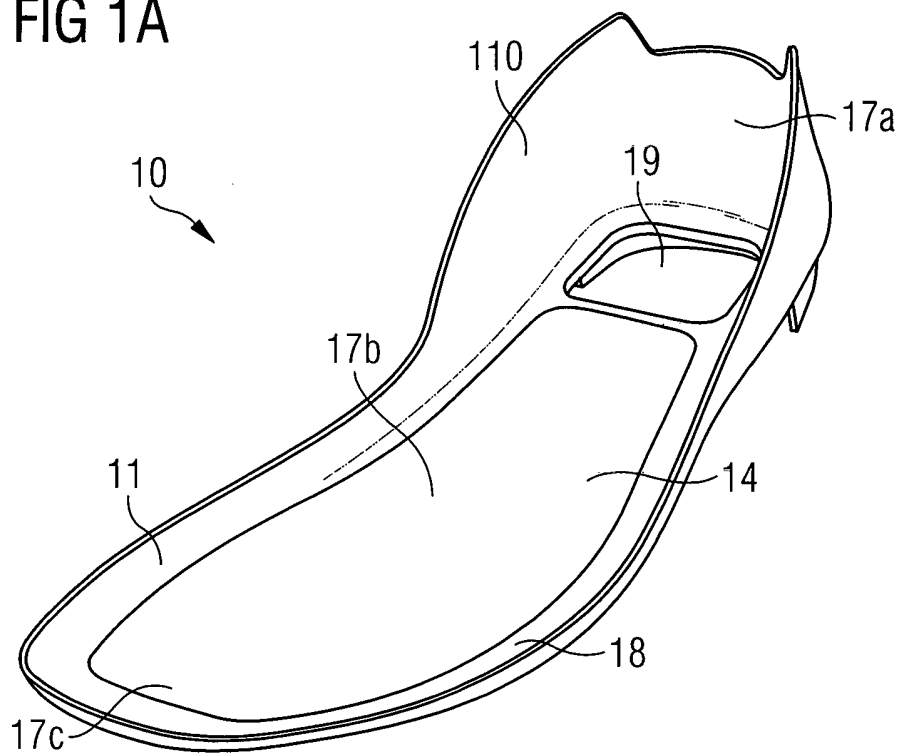


FIG 1B

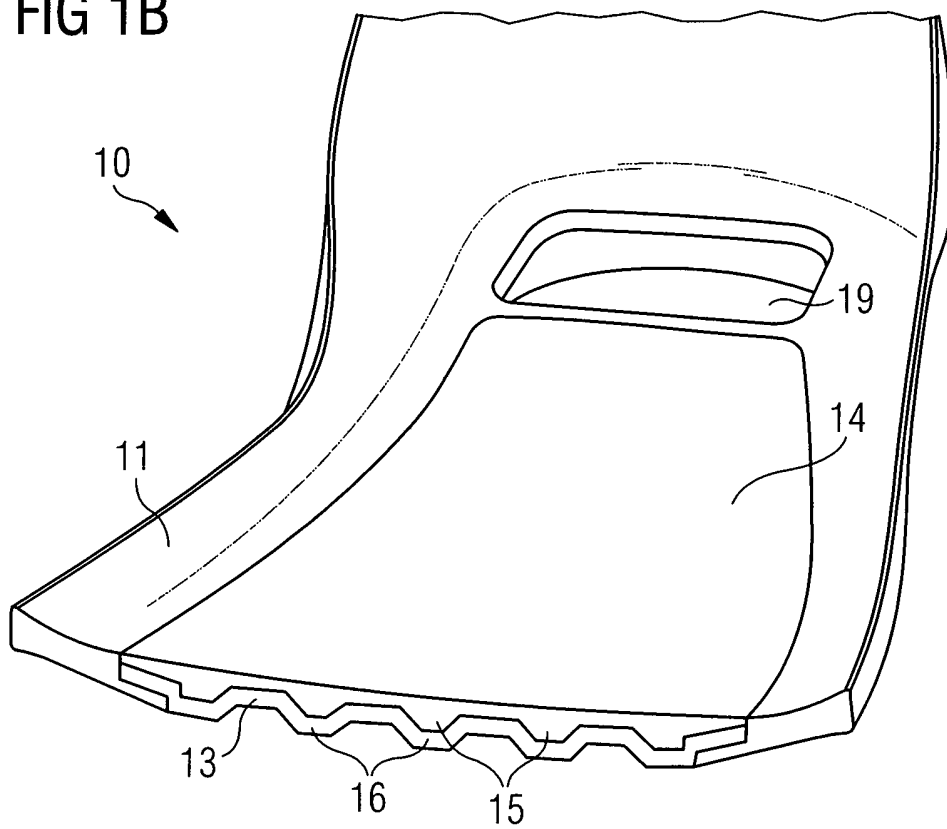


FIG 1C

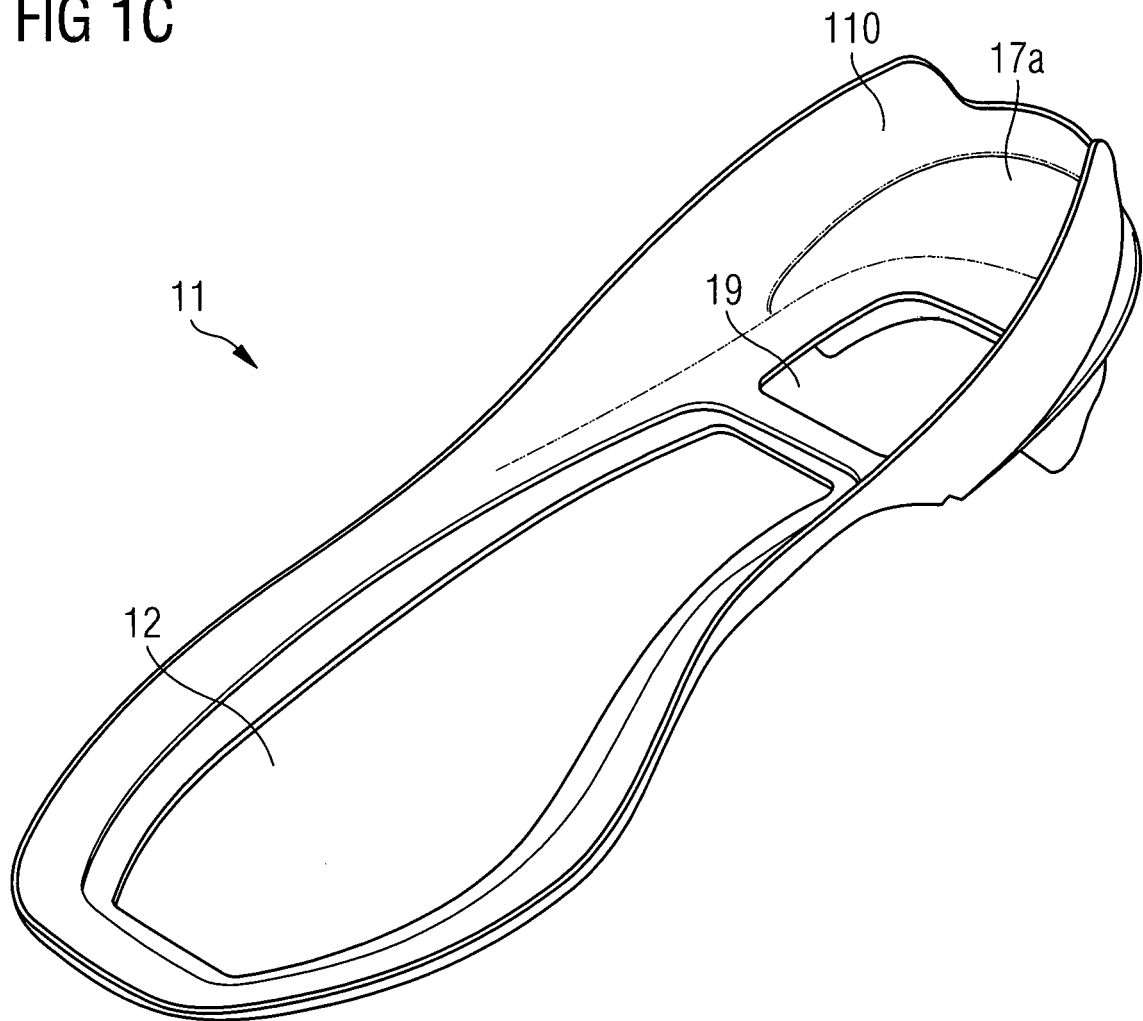
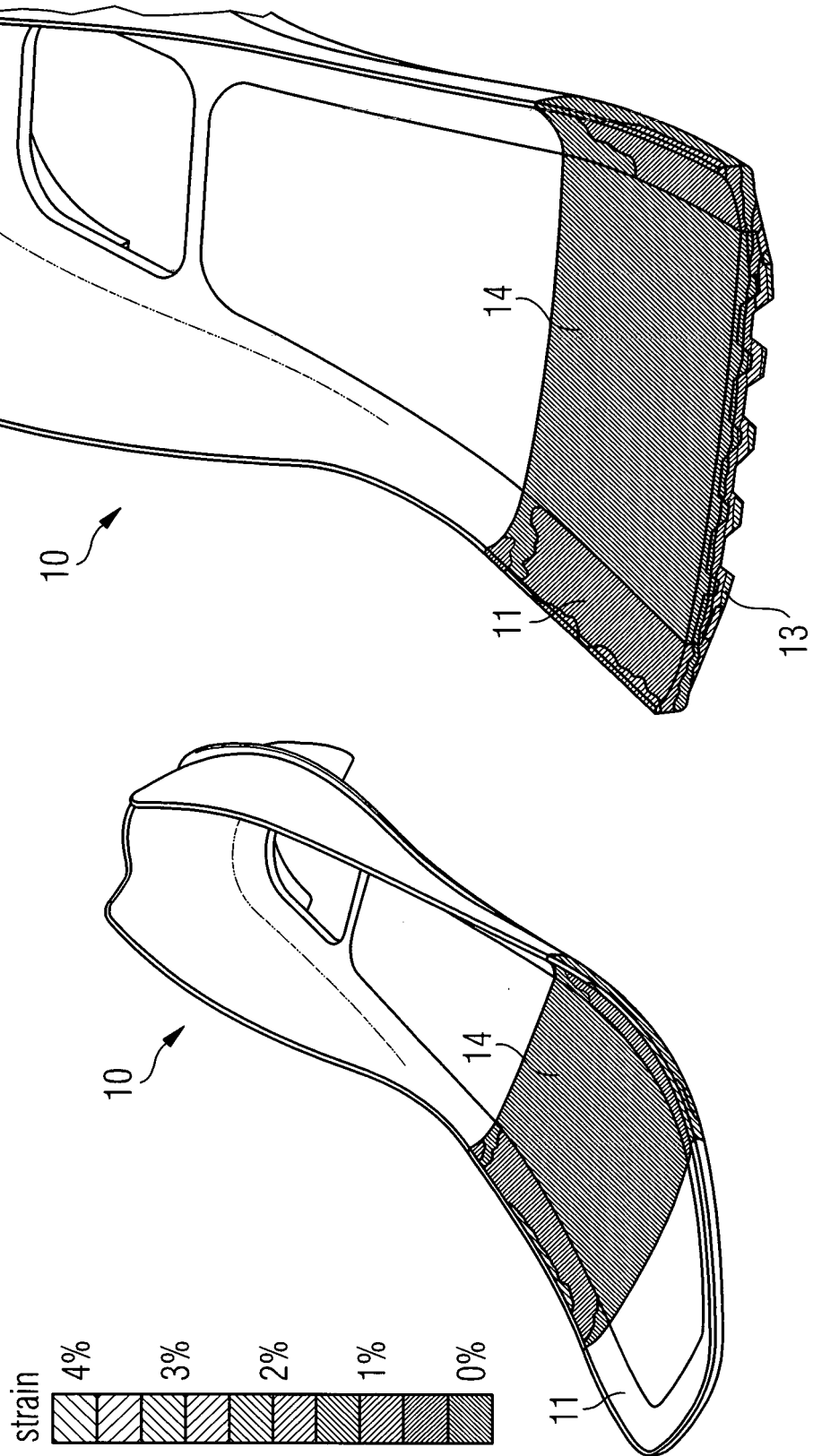


FIG 2A



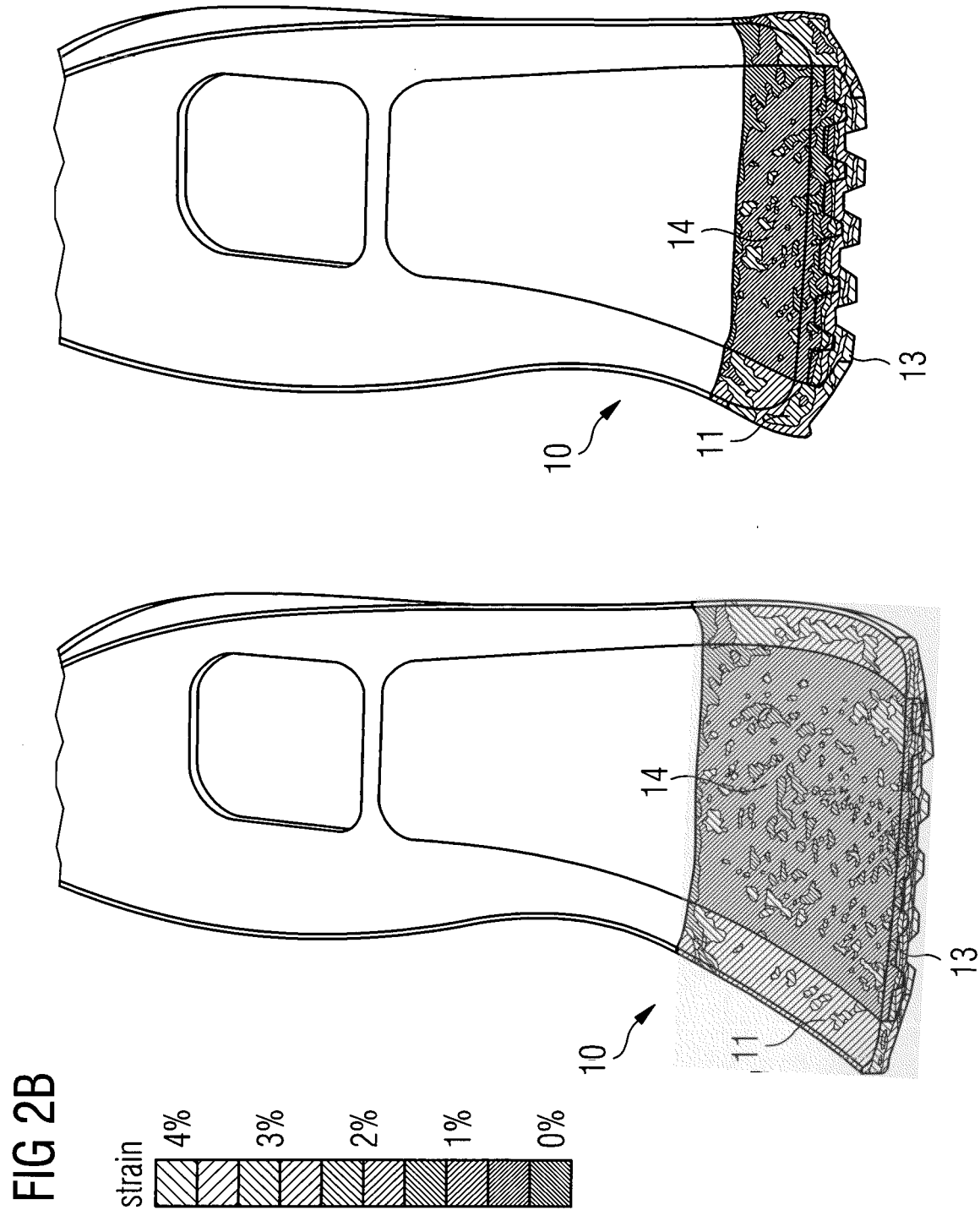


FIG 3

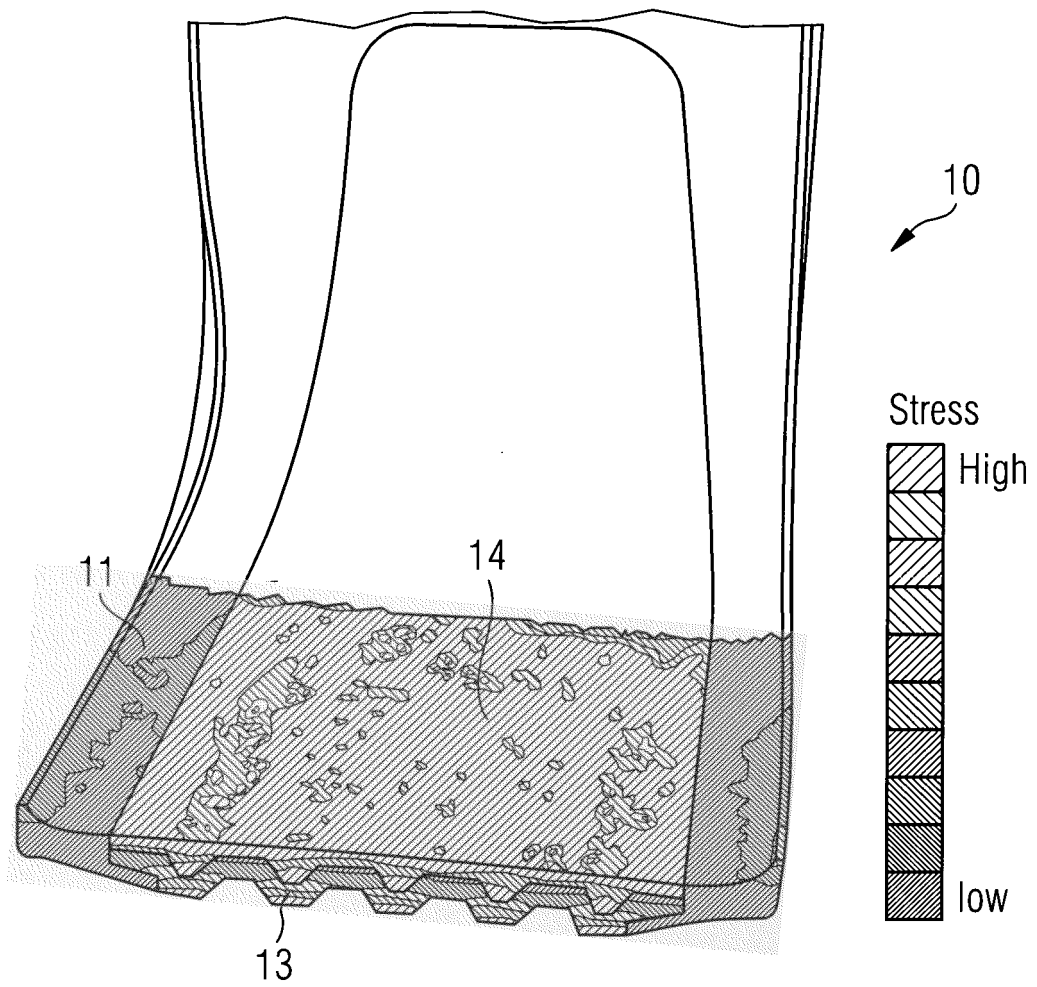


FIG 4

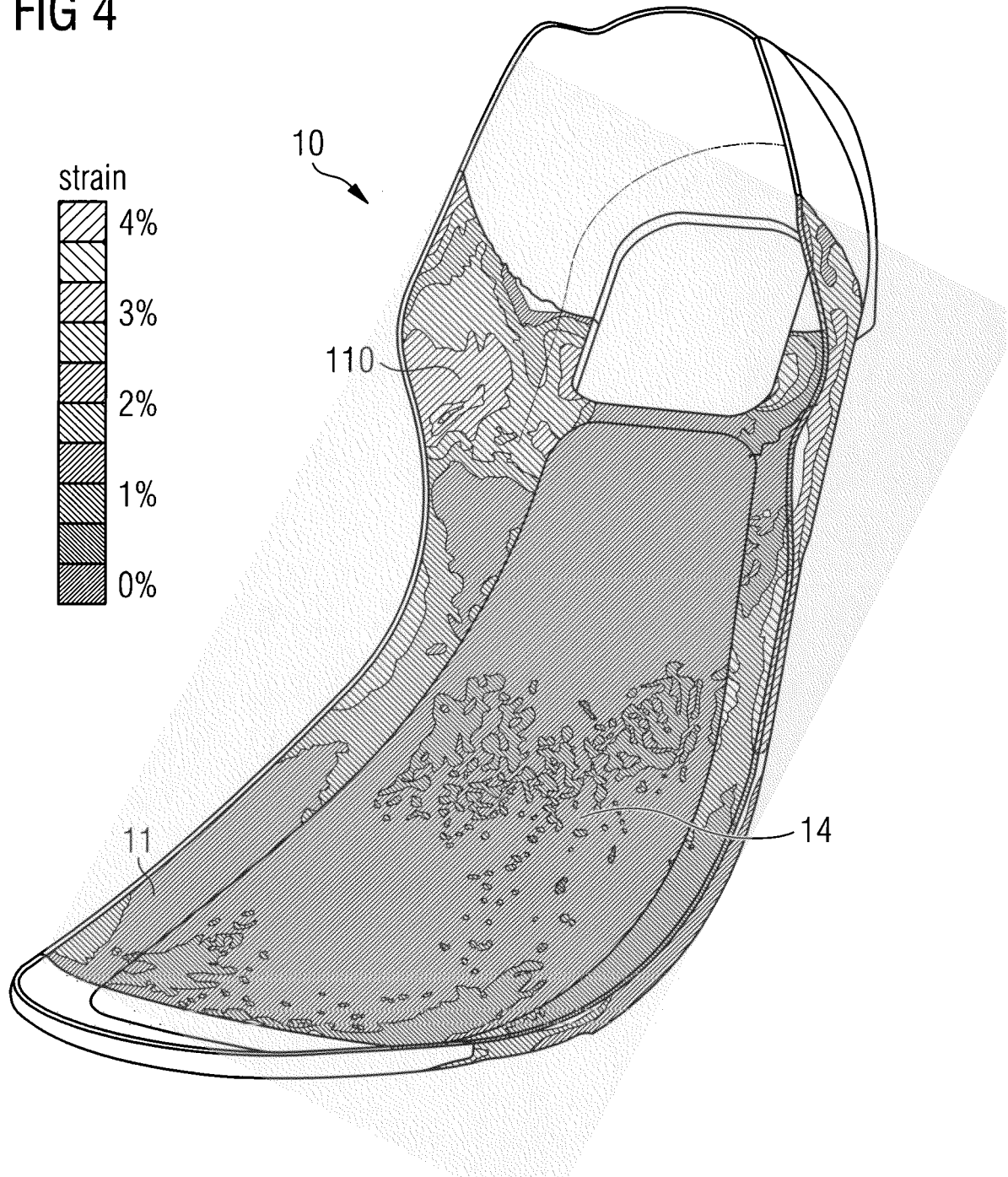
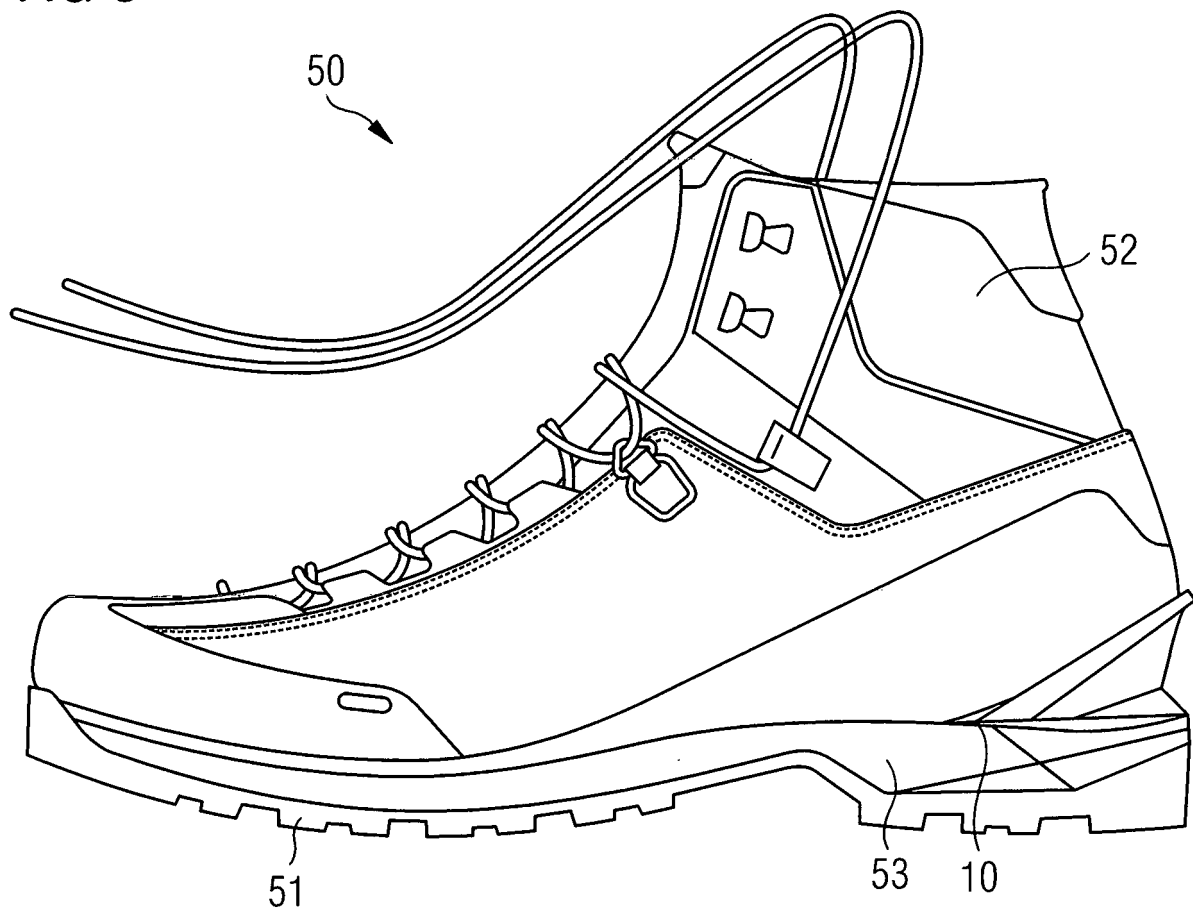


FIG 5



REFERENCES CITED IN THE DESCRIPTION

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