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(54) **MIDSOLE FOR SPORT SHOE**

(57) The present invention relates to a piece (1), for example a midsole, for a sport shoe. The lower surface (21) of its front part (20) is split into two lateral parts (23, 24) by a longitudinal groove (25). The front part (20) is

delimited, on its rear side, by two side grooves (26, 27) such that a first side groove (26) delimits the rear side of the first lateral part (23) and a second side groove (27) delimits the rear side of the second lateral part (24).

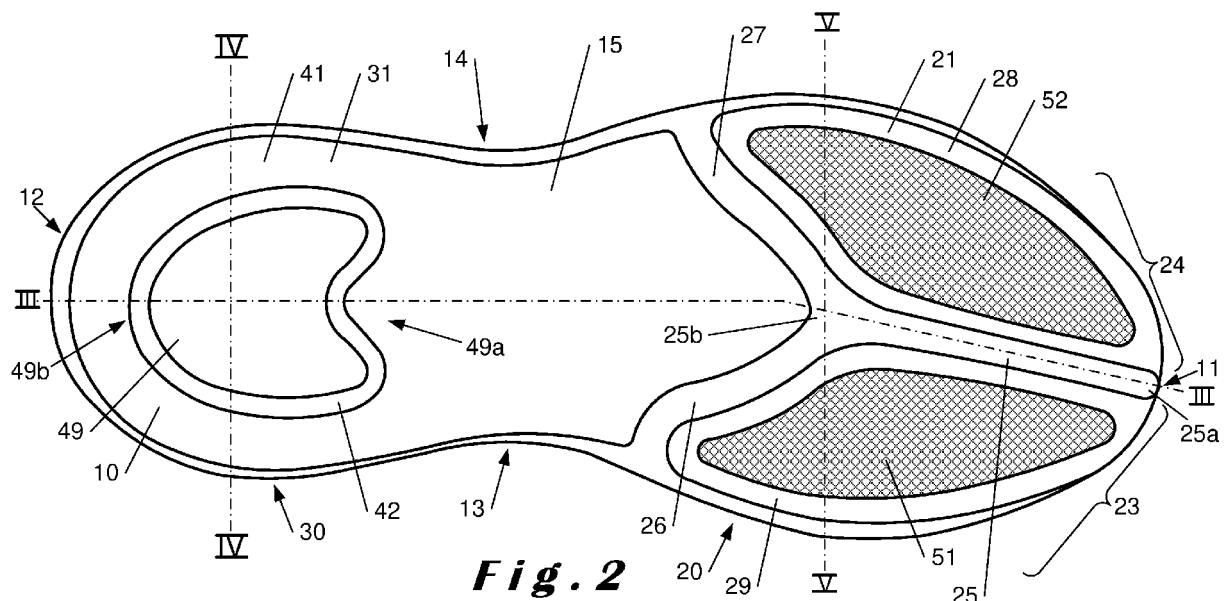


Fig. 2

Description

Field of the invention

[0001] The present invention relates to a piece for sport footwear, for example a midsole.

Background of the invention

[0002] Midsoles for sport shoe are often made of foam. Foam provides some flexibility, which, in turn, provide a good balance and a good grip to the ground to the user making sport.

Summary of the invention

[0003] An object of the present invention is to provide a piece for sport shoe providing especially good balance and grip to the ground.

[0004] The invention provides a piece for a sport footwear to be worn by a user, the piece comprising a main element comprising a front part and a rear part and having a lower surface and an upper surface, the front part having a lower surface comprising:

- a first lateral part, and
 - a second lateral part,
- the first lateral part and a second lateral part being longitudinally separated by a longitudinal groove having:
- a first end at a front end of the main element and
 - a second end connected to:
 - a first side groove ending at a first lateral side of the main element, and
 - a second side groove ending at a second lateral side of the main element.

[0005] The piece of footwear according to the invention provides especially good balance and grip to the ground because of the longitudinal groove that makes easier the side bending of the main element, and of the side grooves that make easier the longitudinal bending of the main element. The piece according to the invention is especially interesting for trail running footwear.

[0006] The longitudinal groove preferably opens on the front face of the main element. The first side groove preferably opens on the first lateral side of the main element. The second side groove preferably opens on the second lateral side of the main element. The shape made by the longitudinal and the two side grooves looks like a T, an Y or a γ . The longitudinal groove and the first side groove separate the first lateral part from the rest of the lower surface; and the longitudinal groove and the second side groove separate the second lateral part from the rest of the lower surface.

[0007] The side grooves start second end of the longitudinal groove and move away from it transversally, towards the lateral sides of the main element, and also preferably longitudinal, towards the rear part.

[0008] The longitudinal groove may have a width between 5 mm and 15 mm. The side grooves may have a width between 5 mm and 15 mm. The longitudinal groove may have a depth between 5 mm and 30 mm. The side grooves may have a width between 30 mm and 15 mm.

[0009] Transversally, the lower surface of the front part is split in only two portions, which are the first lateral part and the second lateral part. The first lateral part and the second lateral part are preferably not split transversally or longitudinally.

[0010] The front part is delimited, on its rear side, by the two side grooves: the first side groove delimits the rear side of the first lateral part and the second side groove delimits the rear side of the second lateral part.

[0011] The piece may also be called "midsole" or "middle sole". It is typically placed between an insole, which is in contact with the user's sock, and the outsole, which forms, at least partially, the external sole. Preferably, the outsole does not close the lateral openings of the lateral grooves. It may close the front opening of the longitudinal groove. The outsole may cover, or not, the longitudinal groove and the side grooves.

[0012] The piece may comprise several parts that may be integral or not. The main element is preferably one-piece. However, it may comprise several pieces (directly or indirectly attached) without departing the scope of the present invention.

[0013] The front part is located, at least partially, on the front of the instep arch, below the ball and the toes. The rear part is located, at least partially, behind the instep arch, below the heel.

[0014] The first lateral part is the lateral part corresponding to the interior side of the foot. It may be called "medial part". The second lateral part is the lateral part corresponding to the exterior side of the foot. It may be called "external lateral part".

[0015] In an embodiment, the longitudinal groove is designed to be located, at least partially, below the slot between the big toe and the second toe of the user. The longitudinal groove is designed to be parallel to the slot between the big toe and the second toe of the user.

[0016] In an embodiment, the first lateral part is designed to be located at least below the big toe and the front head of the metatarsus corresponding to the big toe.

[0017] In an embodiment, the second lateral part is designed to be located at least below the third, fourth and fifth toes and the front heads of the metatarsus of the third, fourth and fifth toes.

[0018] In an embodiment, the first lateral part and the second lateral part cover at least 15% of the lower surface of the main element.

[0019] In an embodiment, each of the longitudinal groove, the first side groove and the second side groove has the shape of a line without bifurcation. These specific

designs of the front part of the main element provides an especially good balance to the body and grip to the ground.

[0020] In an embodiment, the main element comprises keratin or a keratin-based material, or is in keratin or in a keratin-based material. Keratin is especially wear resistant. Moreover, it is cheap and sustainable. The main element may also comprise a polymer like ethylene-vinyl acetate. The main element may be in foam.

[0021] In an embodiment, the piece comprises a first plate located below the first lateral part, fixed to the first lateral part and more rigid than the first lateral part; and a second plate located below the second lateral part, fixed to the second lateral part and more rigid than the second lateral part. The first and second plates may for example be in carbon fiber or may comprise carbon fiber. The first and second plates may have a thickness between 1,0 mm and 1,5 mm. The first and second plates are preferably flat.

[0022] In an embodiment, the piece comprises a stiffening element comprising a longitudinal arm located above the longitudinal groove, a first side arm located above the first side groove, and a second side arm located above the second side groove. The stiffening element is preferably in a more rigid material than the main element. The three arms are arranged as a T, a Y or a γ . The stiffening element may for example be in carbon fiber or may comprise carbon fiber. The stiffening element may be in a polymer, like polyurethane. The upper surface of the front part preferably comprises a recess with three arms to accommodate the stiffening element.

[0023] In an embodiment, the rear part comprises a lower surface having an external part, and an internal part surrounded by the external part, the internal part extending lower than the external part. The internal part has thus the shape of a bump that improves the gripping to the ground. The bump may have a thickness of at least 1 mm over the external part. The internal part is preferably surrounded by a first rear groove.

[0024] In an embodiment, the internal part is concave at a front end and convex at a rear end.

[0025] In an embodiment, the internal part covers at least 5% of the lower surface of the main element.

[0026] In an embodiment, the piece comprises a blocking system inside the longitudinal groove, the first side groove and the second side groove. The blocking system prevents that stones enter inside the grooves. The blocking system may comprise any of the following elements or a combination of at least two of them: a net, a foam, a bent sheet or ribbon, a grid.

[0027] The invention also relates to a sole and a footwear comprising such a piece.

Brief description of the figures

[0028] For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings in which:

- Figure 1 is an exploded view of a sole according to an embodiment of the invention,
- Figure 2 is a bottom view of several elements of a sole according to an embodiment of the invention,
- Figure 3 is a sectional longitudinal view of a sole according to an embodiment of the invention,
- Figure 4 is a sectional transversal view of a rear part of a sole according to an embodiment of the invention,
- Figure 5 is a sectional transversal view of a front part of a sole according to an embodiment of the invention,
- Figure 6 is a side view of several elements of a sole according to an embodiment of the invention,
- Figure 7 is a top view of several elements of a sole according to an embodiment of the invention,
- Figure 8 is a bottom view of several elements of a sole according to an embodiment of the invention, and
- Figure 9 illustrates parts of a foot of a user.

Description of the invention

[0029] The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto. The described functions are not limited by the described structures. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes.

[0030] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. The terms are interchangeable under appropriate circumstances and the embodiments of the invention can operate in other sequences than described or illustrated herein.

[0031] Furthermore, the various embodiments, although referred to as "preferred" are to be construed as exemplary manners in which the invention may be implemented rather than as limiting the scope of the invention.

[0032] The term "comprising", used in the claims, should not be interpreted as being restricted to the elements or steps listed thereafter; it does not exclude other elements or steps. It needs to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a device comprising A and B" should not be limited to devices consisting only of components A and B, rather with respect to the present invention, the only enumerated components of the device are A and B, and further the claim should be interpreted as including equivalents of those components.

[0033] On the figures, identical or analogous elements may be referred by a same number.

[0034] Figure 1 is an exploded view of a sole 100 according to an embodiment of the invention. The sole 100 comprises a midsole (or piece 1), an outsole 200 attached (for example glued) to the lower side of the piece 1, and an insole 300 located (attached or not) on the upper side of the piece 1.

[0035] The piece 1 comprises a main element 10 comprising a front part 20 and a rear part 30 and having a lower surface 15 and an upper surface 16. The lower surface 15 of the main element 10 comprises the lower surface 21 of the front part 20 and the lower surface 31 of the rear part 30. The upper surface 16 of the main element 10 comprises the upper surface 22 of the front part 20 and the upper surface 32 of the rear part 30. The main element 10 is delimited by a front end 11, a rear end 12, a first lateral side 13 (visible Figure 2), and a second lateral side 14. The main element 10 preferably comprises keratin or a keratin-based material, or is in keratin or in a keratin-based material.

[0036] The piece 1 may comprise a stiffening element 33 comprising a longitudinal arm 35, a first side arm 36, and a second side arm 37. The main element 10 is in a more flexible material than the stiffening element 33. The three arms 35, 36, 37 are arranged as a T, a Y or a γ . The upper surface 22 of the front part 20 preferably comprises a recess 39 with three arms to accommodate the stiffening element 33.

[0037] The lower surface 15 of the main element 1 (for example the second side groove 27) will be described with more details with respect to Figure 2.

[0038] The piece 1 may comprise a first plate 51 and a second plate 52. Their location will be described with more details with respect to Figure 2.

[0039] The outsole 200 may comprise a single piece of several pieces mechanically coupled through the piece 1. In the embodiment illustrated at Figure 1, the outsole 200 does not cover the longitudinal groove 25 and the side grooves 26, 27 (visible Figure 2). The outsole 200 may be in rubber.

[0040] Figure 2 is a bottom view of the main element 10 and the first plate 51 and second plate 52 in an embodiment of the invention.

[0041] The lower surface 21 comprises a first lateral part 23 and a second lateral part 24 longitudinally separated by a longitudinal groove 25. The longitudinal groove 25 is a line, preferably without any bifurcation, that extends between a first end 25a and a second end 25b. The first end 25a is at the front end 11 of the main element 10. The second end 25b is connected, preferably directly, to a first side groove 26 and a second side groove 27. The first side groove 26 ends at the first lateral side 13 of the main element 10. The second side groove 27 ends at the second lateral side 14 of the main element 10. Preferably, the first lateral part 23 and the second lateral part 24 represent at least 15% of the lower surface 15 of the main element 10. The first side groove 26 and the

second side groove 27 have preferably the shape of a line without any bifurcation.

[0042] The first plate 51 is fixed to the lower surface of the first lateral part 23. The first lateral part 23 comprises a first surrounding part 28 that surrounds the first plate 51. The first lateral part 23 is more flexible than the first plate 51. The second plate 52 is fixed to the lower surface of the second lateral part 24. The second lateral part 24 comprises a second surrounding part 29 that surrounds the second plate 52. The second lateral part 24 is more flexible than the second plate 52. The first 51 and second 52 plates are preferably planar.

[0043] The lower surface 31 of the rear part 30 preferably comprises an external part 41 and an internal part 49. They are preferably separated by a first rear groove 42. The internal part 49 is preferably totally surrounded by the first rear groove 42. The first rear groove 42 may have a width between 1 mm and 3 mm. The internal part 49 extends further down than then external part 41. The internal part 49 may represents at least 5% of the lower surface 15 of the main element 10. In an embodiment, the front end 49a of the internal part 49 is concave, and/or the rear end 49b of the internal part 49 is convex.

[0044] Figures 3, 4 and 5 are sections views of Figure 2 (respectively sections III, IV and V), wherein a possible outsole 200 has been added. Reference 150 is the instep art of the user.

[0045] Figure 6 is a side view of the piece 1 with a possible outsole 200. It shows especially well the internal part 49 that extends below the external part 41n for example by a distance 48 of at least 1 mm.

[0046] Figure 7 is a top view of the piece 1 with an embodiment of the stiffening element 33. The longitudinal arm 35 is located above the longitudinal groove 25. The first side arm 36 is located above the first side groove 26. The second side arm 37 is located above the second side groove 27.

[0047] Figure 8 is a bottom view of the main element 10 and a blocking system 60 in an embodiment of the invention. The blocking system 60 is located at least inside the longitudinal groove 25, the first side groove 26 and the second side groove 27. It blocks stones that may enter the grooves.

[0048] Figure 8 illustrates also a variation on the rear part 30, wherein a second rear groove 44 and a ridge 43 separate the first rear groove 42 and the internal part 49.

[0049] Figure 9 illustrates parts of a foot of a user: the instep arch 150, the heel 160; the big toe 101, the second toe 102, the third toe 103, the fourth toe 104, the fifth toe 105, the slot 109 between the big toe 101 and the second toe 102; the metatarsus 111 corresponding to the big toe 101, the metatarsus 112 corresponding to the second toe 102, the metatarsus 113 corresponding to the third toe 103, the metatarsus 114 corresponding to the fourth toe 104, and the metatarsus 115 corresponding to the fifth toe 105, with their respective front heads 121, 122, 123, 124, 125.

[0050] The piece 1 is preferably designed in such a

way that the longitudinal groove 25 is above the big toe 101, the second toe 102 and/or the slot 109 between the big toe 101 and the second toe 102.

[0051] The piece 1 is preferably designed in such a way that the big toe 101 and the front head 121 of the metatarsus 111 corresponding to the big toe 101 are above the first lateral part 23.

[0052] The piece 1 is preferably designed in such a way that the third, fourth and fifth toes 103, 104, 105 and the front heads 123, 124, 125 of the metatarsus 113, 114, 115 of the third, fourth and fifth toes 103, 104, 105 are above the second lateral part 24.

[0053] The second toe 102 and the front head 122 of its metatarsus 112 may be above the longitudinal groove 25, the first lateral part 23 and/or the second lateral part 24.

[0054] In other words, the invention relates to a piece 1, for example a midsole, for a sport shoe. The lower surface 21 of its front part 20 is split into two lateral parts 23, 24 by a longitudinal groove 25. The front part 20 is delimited, on its read side, by two side grooves 26, 27 such that a first side groove 26 delimits the rear side of the first lateral part 23 and a second side groove 27 delimits the rear side of the second lateral part 24.

[0055] Although the present invention has been described above with respect to particular embodiments, it will readily be appreciated that other embodiments are also possible.

Claims

1. Piece (1) for a sport footwear to be worn by a user, the piece (1) comprising a main element (10) comprising a front part (20) and a rear part (30) and having a lower surface (15) and an upper surface (16), the front part (20) having a lower surface (21) comprising:

- a first lateral part (23), and
- a second lateral part (24),

the first lateral part (23) and a second lateral part (24) being longitudinally separated by a longitudinal groove (25) having:

- a first end (25a) at a front end (11) of the main element (10) and
- a second end (25b) connected to:
 - a first side groove (26) ending at a first lateral side (13) of the main element (10), and
 - a second side groove (27) ending at a second lateral side (14) of the main element (10).

2. Piece according to claim 1, wherein the longitudinal

groove (25) is designed to be located, at least partially, below the slot (109) between the big toe (101) and the second toe (102) of the user.

3. Piece according to any of the preceding claims, wherein the first lateral part (23) is designed to be located at least below the big toe (101) and the front head (121) of the metatarsus (111) corresponding to the big toe (101).

4. Piece according to any of the preceding claims, wherein the second lateral part (24) is designed to be located at least below the third, fourth and fifth toes (103, 104, 105) and the front heads (123, 124, 125) of the metatarsus (113, 114, 115) of the third, fourth and fifth toes (103, 104, 105).

5. Piece according to any of the preceding claims, wherein the first lateral part (23) and the second lateral part (24) cover at least 15% of the lower surface (15) of the main element (10).

6. Piece according to any of the preceding claims, wherein each of the longitudinal groove (25), the first side groove (26) and the second side groove (27) has the shape of a line without bifurcation.

7. Piece according to any of the preceding claims, wherein the main element (10) comprises keratin or a keratin-based material, or is in keratin or in a keratin-based material.

8. Piece according to any of the preceding claims, further comprising a first plate (51) located below the first lateral part (23), fixed to the first lateral part (23) and more rigid than the first lateral part (23); and a second plate (52) located below the second lateral part (24), fixed to the second lateral part (24) and more rigid than the second lateral part (24).

9. Piece according to any of the preceding claims, further comprising a stiffening element (33) comprising a longitudinal arm (35) located above the longitudinal groove (25), a first side arm (36) located above the first side groove (26), and a second side arm (37) located above the second side groove (27).

10. Piece according to any of the preceding claims, wherein the rear part (30) comprises a lower surface (31) having:

- an external part (41), and
- an internal part (49) surrounded by the external part (41), the internal part (49) extending lower than the external part (41).

11. Piece according to the preceding claim, wherein the internal part (49) is concave at a front end (49a) and

convex at a rear end (49b).

12. Piece according to claim 10 or 11, wherein the internal part (49) covers at least 5% of the lower surface (15) of the main element (10). 5
13. Piece according to any of the preceding claims, further comprising a blocking system (60) inside the longitudinal groove (25), the first side groove (26) and the second side groove (27). 10
14. Sole (100) comprising a piece (1) according to any of the preceding claims.
15. Footwear comprising a piece (1) according to any of claims 1 to 13. 15

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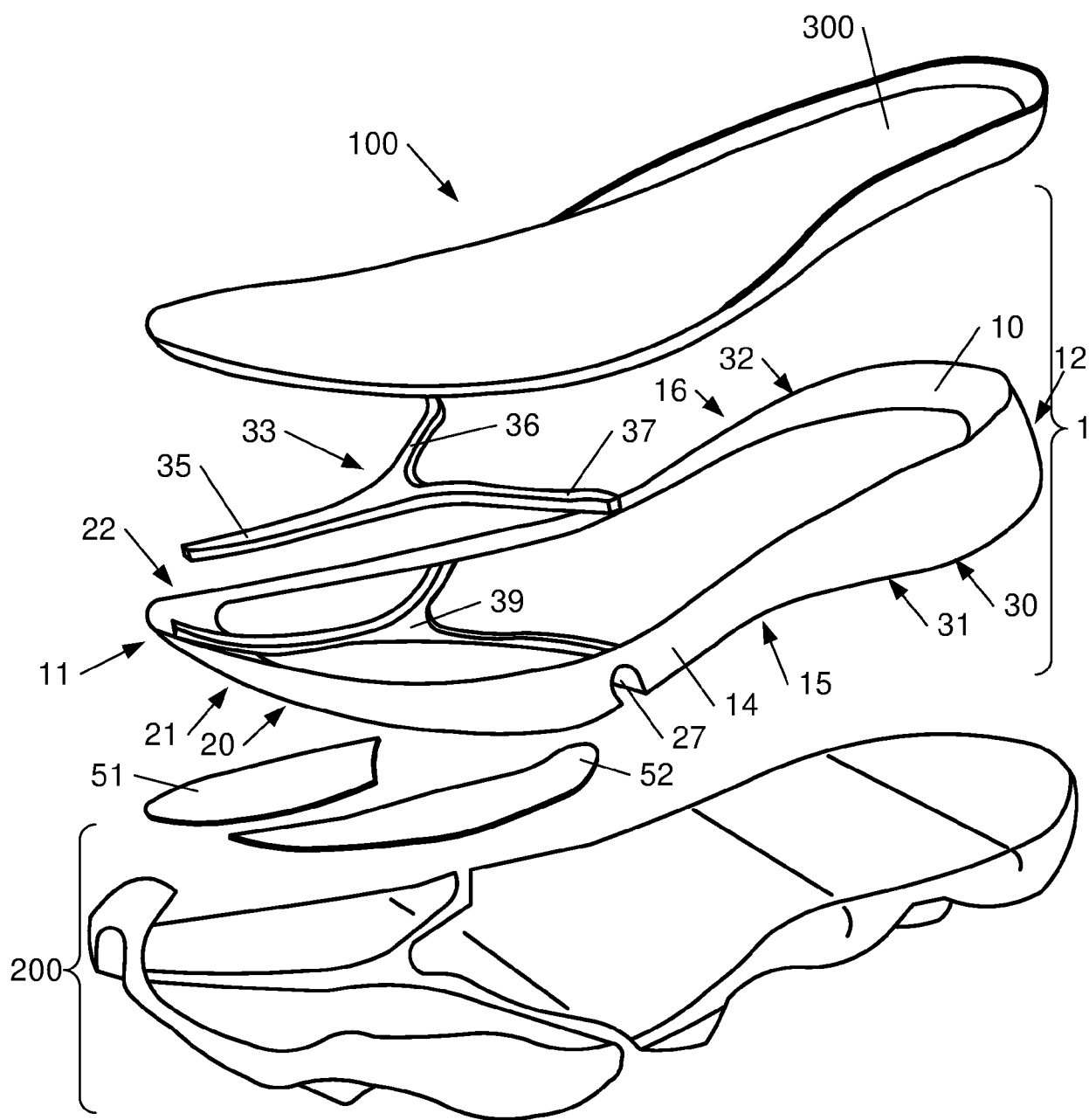


Fig. 1

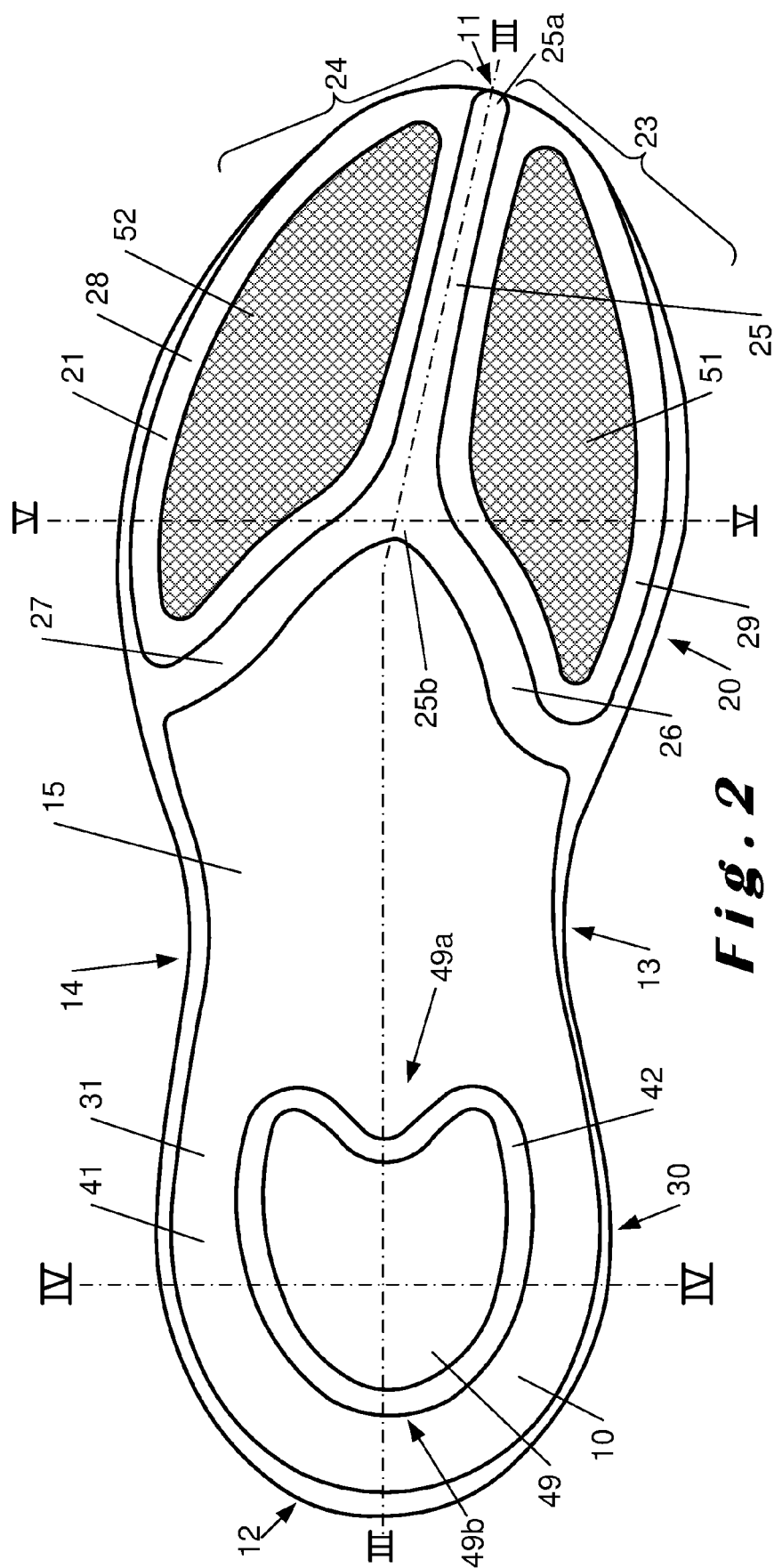
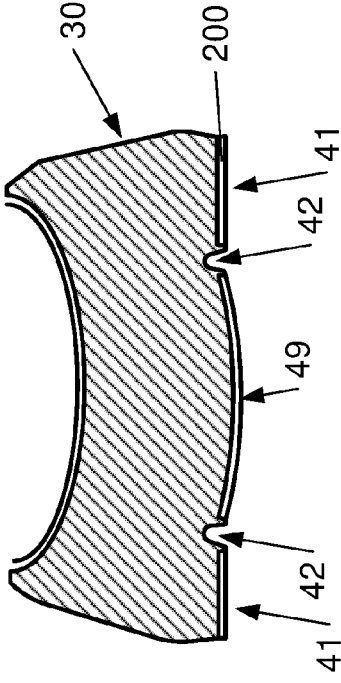
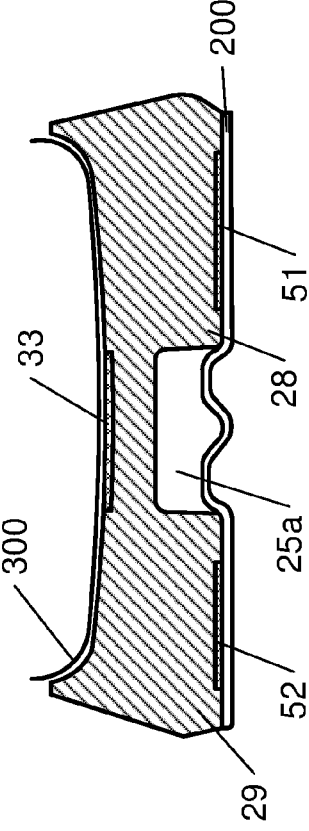
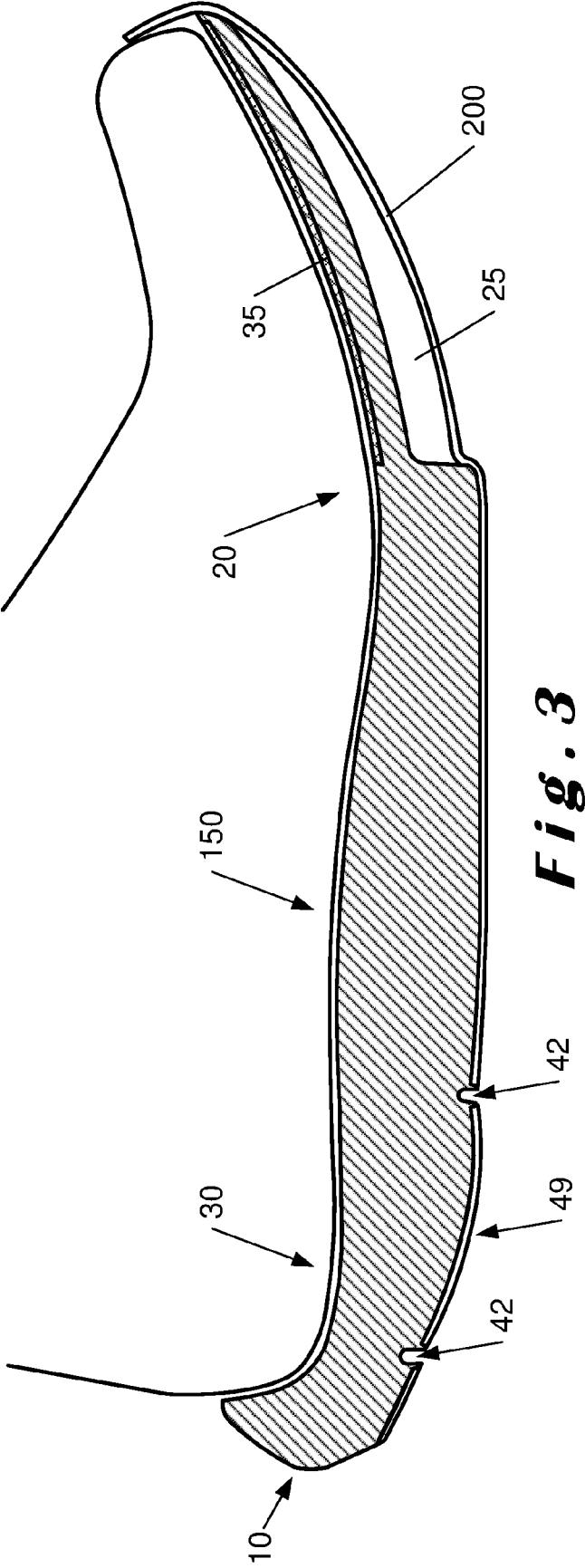


Fig. 2



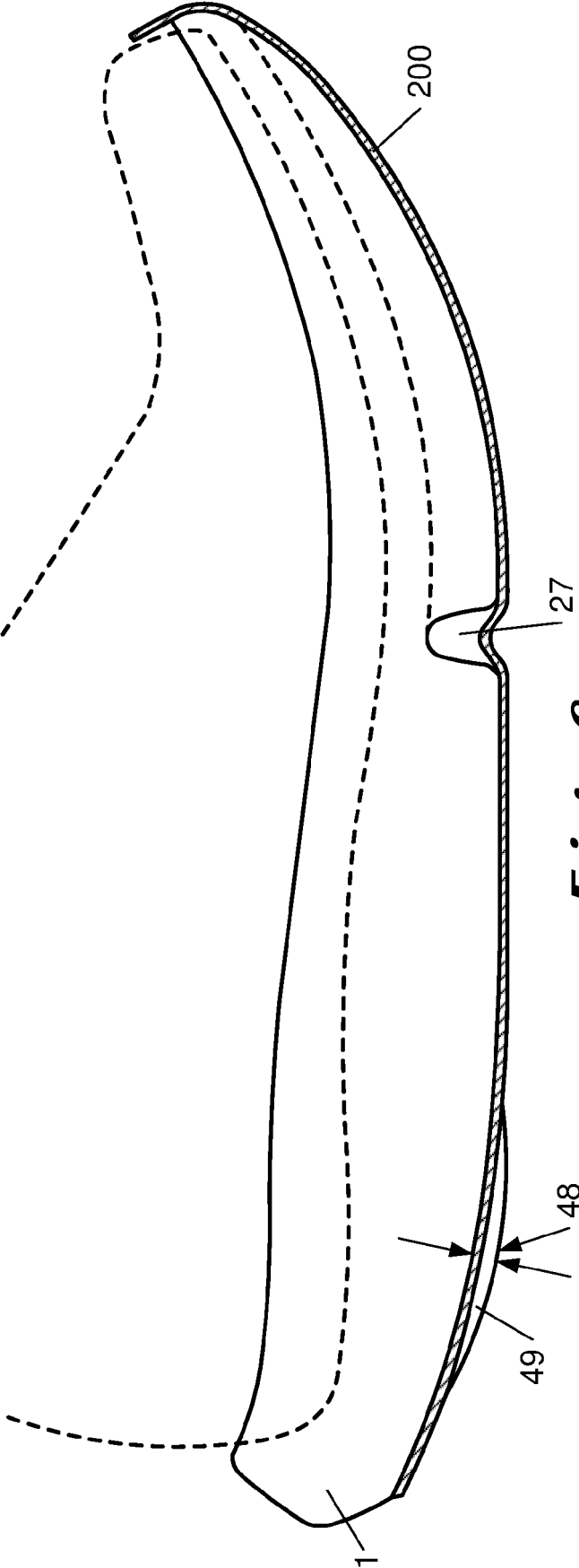


Fig. 6

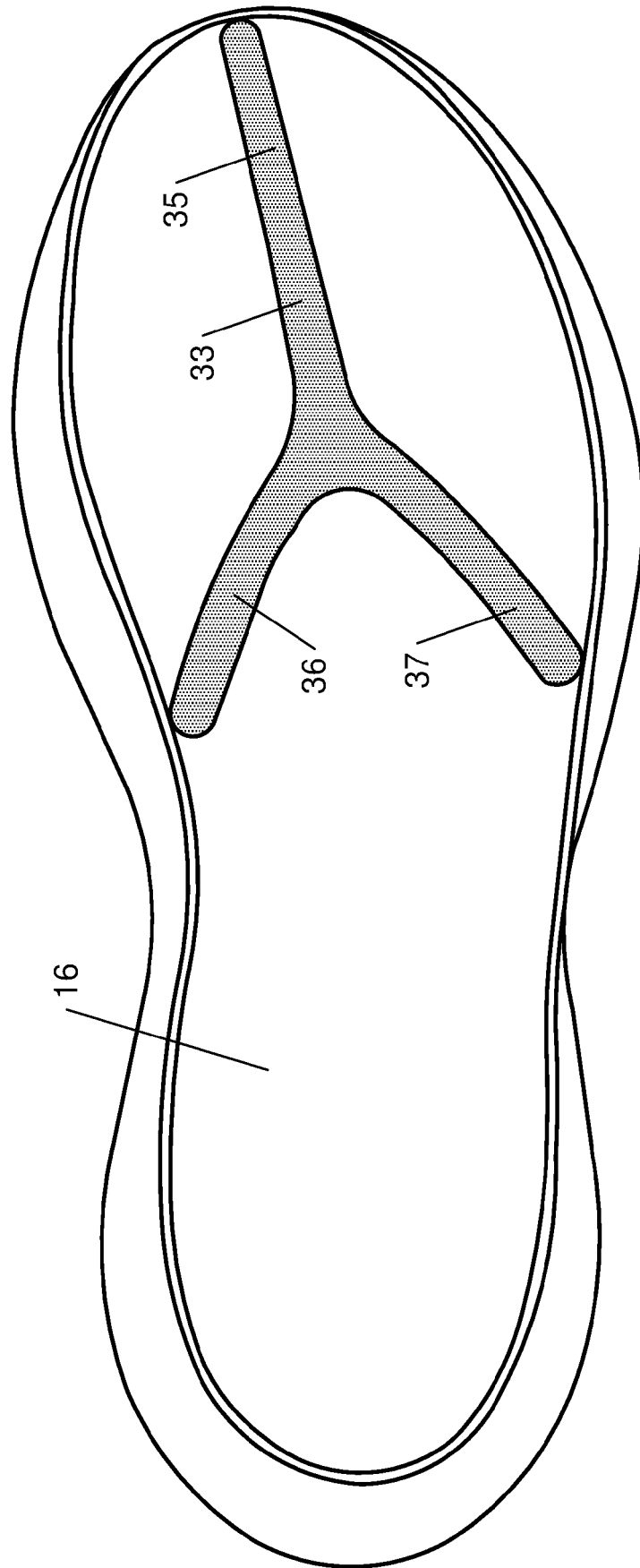


Fig. 7

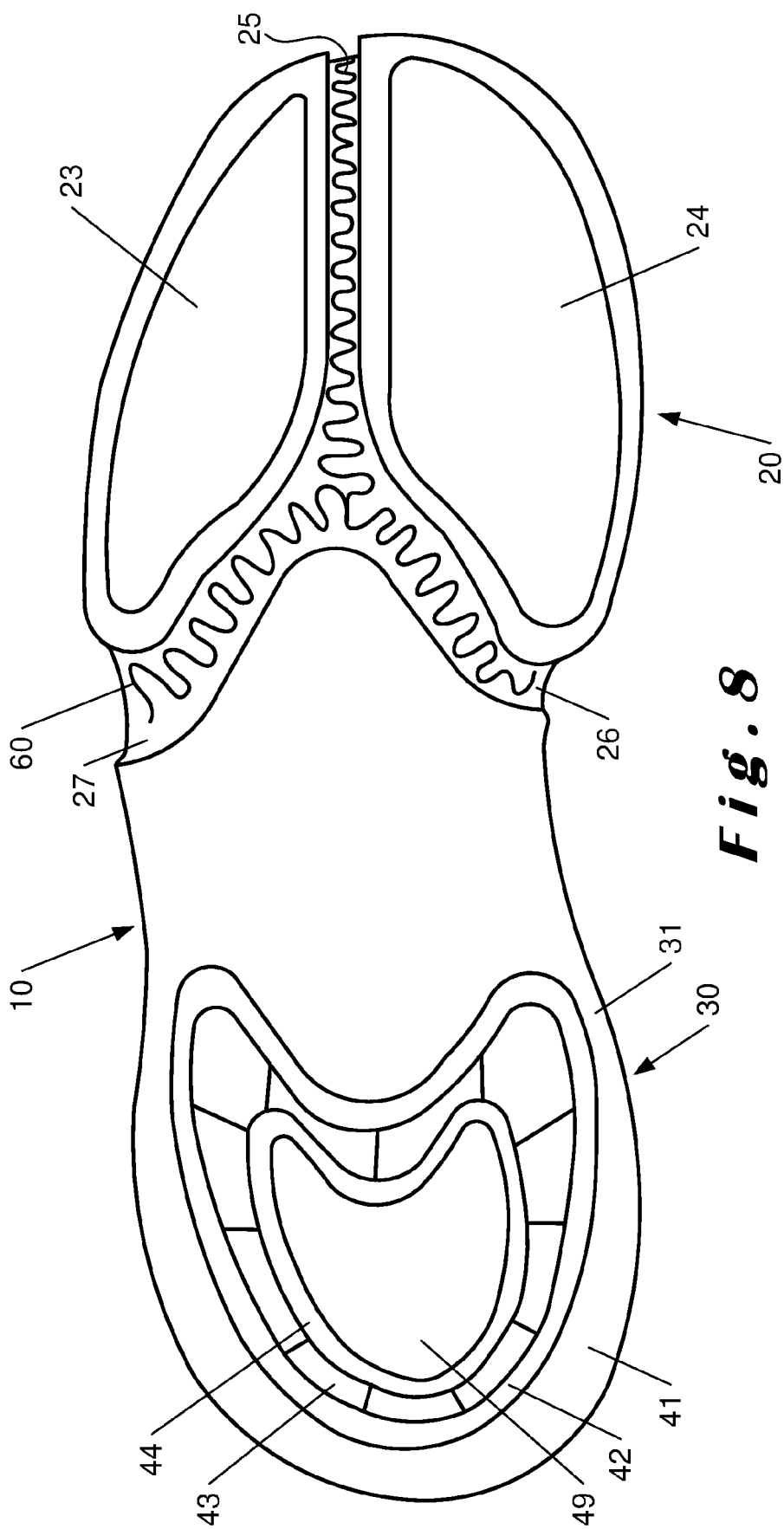


Fig. 8

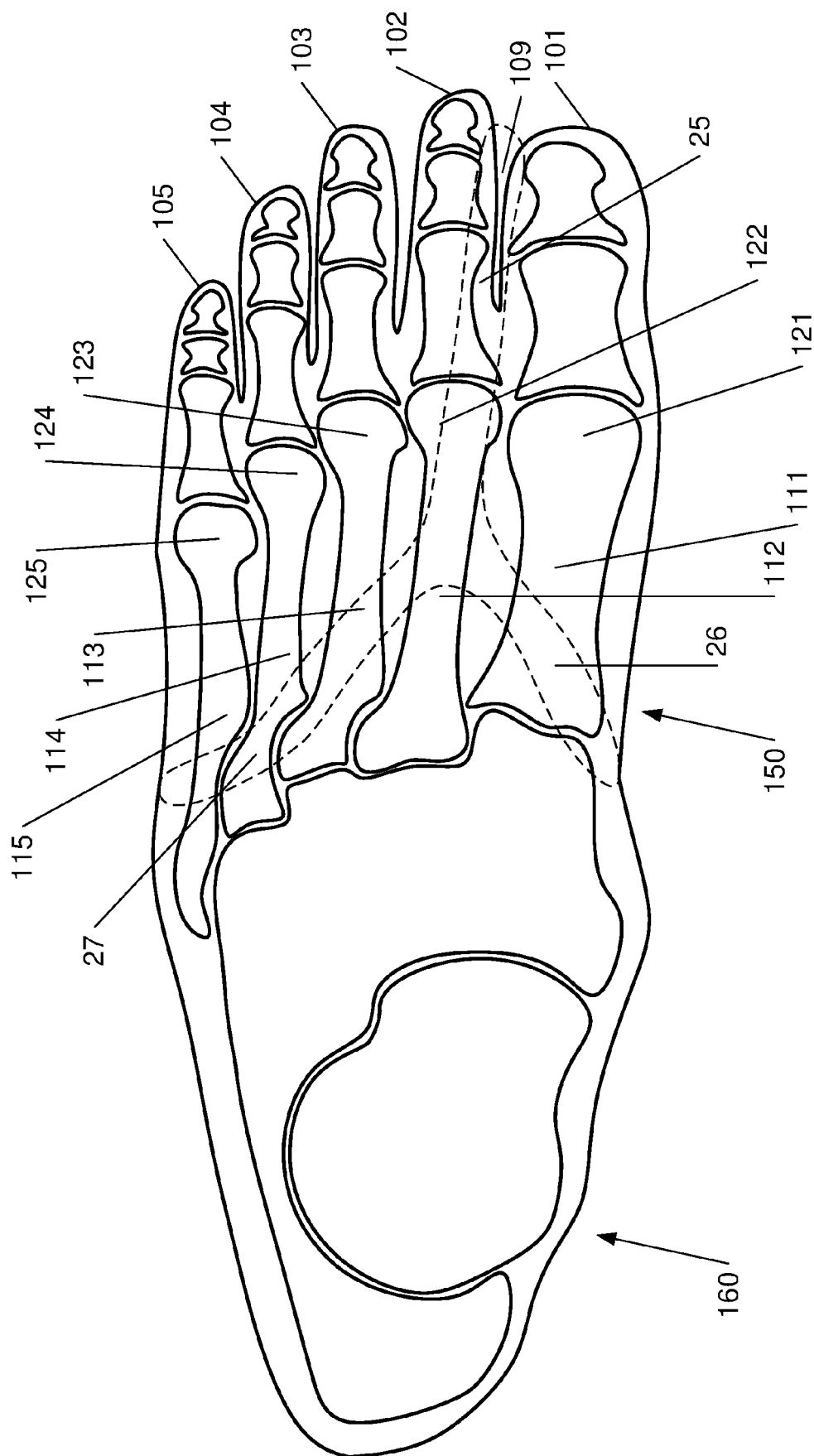


Fig. 9



EUROPEAN SEARCH REPORT

Application Number

EP 22 16 7171

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	EP 2 332 432 A1 (ASICS CORP [JP]) 15 June 2011 (2011-06-15)	1-6, 8, 10-15	INV. A43B3/00
Y	* paragraphs [0060] - [0103]; figures *	7	A43B7/1435
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			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		25 August 2022	Cianci, Sabino
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82