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(72) KITA, KENJIRO, JP
(72) KIMURA, TAKAYA, JP
(71) MIZUNO CORPORATION, JP

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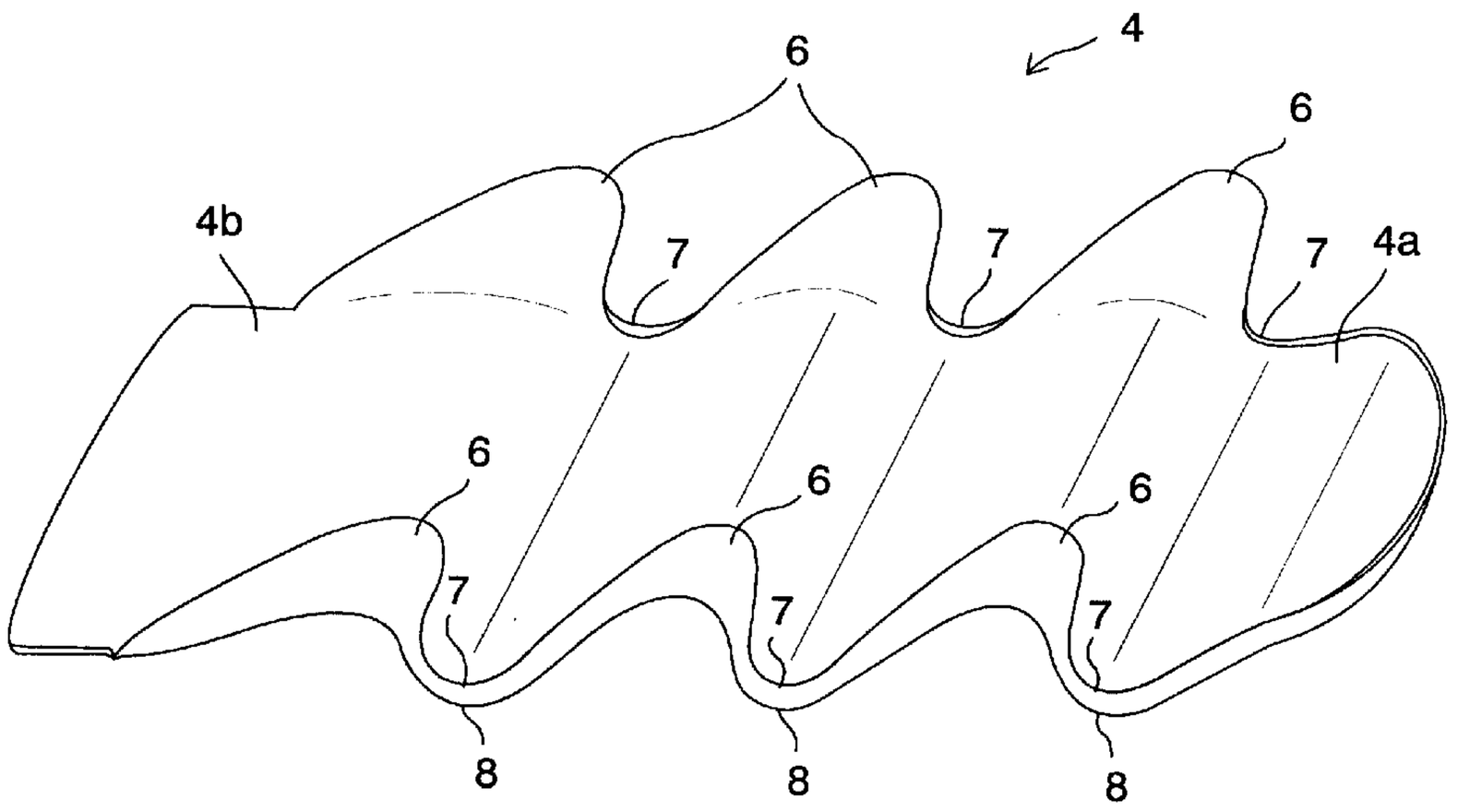
(54) **CONCEPTION ET FABRICATION DE SEMELLES INTERCALAIRES DE CHAUSSURES D'ATHLETISME**

(54) **ATHLETIC SHOE MIDSOLE DESIGN AND CONSTRUCTION**




(57) A midsole assembly for an athletic shoe comprises an upper midsole 3a and a lower midsole 3b formed of soft elastic material and a corrugated sheet 4 having a heel portion 4a formed with corrugation. The corrugated sheet 4 is interposed between the upper and lower midsoles 3a, 3b. Upwardly and downwardly extending walls 6, 7 and 8 are formed at the medial and lateral sides of the corrugated sheet 4. Thereby, transverse or lateral deformation of the heel portion of the midsole 3 can be securely prevented and running stability can be further improved.

## ABSTRACT

A midsole assembly for an athletic shoe comprises an upper midsole 3a and a lower midsole 3b formed of soft elastic material and a corrugated sheet 4 having a heel portion 4a formed with corrugation. The corrugated sheet 4 is interposed between the upper and lower midsoles 3a, 3b. Upwardly and downwardly extending walls 6, 7 and 8 are formed at the medial and lateral sides of the corrugated sheet 4. Thereby, transverse or lateral deformation of the heel portion of the midsole 3 can be securely prevented and running stability can be further improved.

## TITLE OF THE INVENTION

Athletic Shoe Midsole Design and Construction

## BACKGROUND OF THE INVENTION

The present invention relates to a midsole assembly for an athletic shoe and, more particularly, to the improvement of a midsole construction, which is comprised of a midsole and a corrugated sheet inserted into the midsole.

The sole of an athletic shoe for use in various sports is generally comprised of a midsole and an outsole. The midsole is typically formed of soft elastic material in order to ensure adequate cushioning properties. The outsole is fitted under the midsole and directly contacts with the ground.

Running stability as well as adequate cushioning properties is required in athletic shoes. There is need to prevent shoes from being deflected of deformed excessively in the lateral or transverse direction when athletes get down onto the ground.

As shown in Japanese Utility Model publication No. 61-6804, the applicant of the present invention proposes a midsole assembly having a corrugated sheet therein.

Such a midsole construction including a corrugated sheet at the heel portion of a midsole produces

resistant force, which prevents the heel portion of a midsole from being deformed laterally or transversely when an athlete gets down onto the ground. Thereby, the excessive transverse or lateral deformation of the heel portion of a shoe is prevented and running stability is secured.

On the other hand, in athletics such as tennis or basketball where rapid lateral movement is included, there has been a strong request that lateral deflection of shoes during games be more securely prevented and running stability be further improved.

An object of the present invention is to provide a midsole assembly for an athletic shoe that can more securely prevent lateral deflection or deformation after athletes' getting down onto the ground. Another object of the present invention is to provide a midsole assembly for an athletic shoe that can not only prevent lateral deflection securely but improve cushioning properties.

## SUMMARY OF THE INVENTION

The present invention provides a midsole assembly for an athletic shoe for use in various sports, such as running, track, basketball, football, baseball, soccer, tennis, golf, biking, and the like.

In one embodiment, a midsole assembly is comprised of upper and lower midsoles formed of soft elastic

material, and a corrugated sheet disposed at least at the heel portion between the upper and lower midsoles. The corrugated sheet has an upwardly and/or downwardly extending wall placed at medial and lateral sides of the heel portion.

In another embodiment, the upwardly extending wall is formed at a convex face side and/or a concave face side of corrugation of the corrugated sheet.

In yet another embodiment, the downwardly extending wall is formed at a convex face side and/or a concave face side of corrugation of the corrugated sheet.

A further embodiment provides a midsole assembly where an aperture is formed at the contact area between the upper or lower midsole and the corrugated sheet.

In a still further embodiment, the aperture is formed at a convex or concave face of corrugation of the corrugated sheet.

In an additional embodiment, the aperture is a through hole penetrating through the upper or lower midsole.

In a preferred embodiment, because the corrugated sheet is interposed between the upper and lower midsoles at least at the heel portion, lateral deflection or deformation of the heel portion of the midsoles can be prevented. Moreover, in this case, when the corrugated sheet has upwardly extending walls at its medial and lateral sides,

the medial and lateral sides of the upper midsole is sandwiched between the oppositely disposed walls. When the corrugated sheet has downwardly extending walls at its medial and lateral sides, the medial and lateral sides of the lower midsole is sandwiched between the oppositely disposed walls.

Thus, when the heel portion of the upper and lower midsoles is going to deflect in the lateral direction after an athlete's getting down onto the ground, the upwardly and/or downwardly extending walls prevent the heel portion of the upper and lower midsoles from being deformed in the lateral direction, which further improves the running stability.

In a further embodiment, because the upper or lower midsole has an aperture at the contact region with the corrugated sheet, the corrugated sheet is easy to be deformed relative to the vertical load at a region where an aperture is formed. Thereby, cushioning properties is advanced. In addition, when an aperture is a through hole, cushioning properties can be improved across the whole width of the midsole.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the invention, reference should be made to the embodiments

illustrated in greater detail in the accompanying drawings and described below by way of examples of the invention. In the drawings, which are not to scale:

FIG. 1 is a side view of an athletic shoe employing the midsole construction of the present invention.

FIG. 2 is a top plan view of the midsole construction of a left side shoe according to the present invention.

FIG. 3A is a lateral side view of the midsole construction of FIG. 2.

FIG. 3B is a medial side view of the midsole construction of FIG. 2.

FIG. 4 is a perspective view of a corrugated sheet.

FIG. 5 is a cross sectional view of the midsole construction of FIG. 2 taken along line V-V.

FIG. 6 is a cross sectional view of the midsole construction of FIG. 2 taken along line VI-VI.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Turning now to the drawings, FIG. 1 illustrates an athletic shoe incorporating a midsole construction of the present invention. The sole of this athletic shoe 1 comprises a midsole 3 attached under an upper 2, a corrugated sheet 4 disposed in the midsole 3 and an

outsole 5 attached under the midsole 3 and directly contacting with the ground.

The midsole 3 is provided in order to absorb shock load imparted on the heel portion of the shoe 1 when an athlete gets down onto the ground. The midsole 3 is comprised of an upper midsole 3a and a lower midsole 3b that are respectively disposed on the top and bottom surfaces of the corrugated sheet 4.

The midsole 3 is generally formed of soft elastic material having good cushioning properties. Specifically, thermoplastic synthetic resin foam such as ethylene-vinyl acetate copolymer (EVA), thermosetting resin foam such as polyurethane (PU), or rubber material foam such as butadiene or chloroprene rubber is used.

The corrugated sheet 4 is formed of thermoplastic resin such as thermoplastic polyurethane (TPU) of comparatively rich elasticity, polyamide elastomer (PAE), ABS resin or the like. Alternatively, the corrugated sheet 4 may be formed of thermosetting resin such as epoxy resin, unsaturated polyester resin or the like.

As shown in FIG. 2, the corrugated sheet 4 extends from the heel region to the midfoot region of the midsole 3. The corrugated sheet 4 is comprised of a heel portion 4a having corrugation and a generally planar midfoot portion 4b integrally formed with the heel portion 4a. In

FIG. 2, a broken line extending in the width direction at the heel portion 4a indicates a crest or through line of corrugation of the corrugated sheet 4.

As shown in FIGS. 3A, 3B, a plurality of upwardly extending walls 6 are formed at the inner or medial and outer or lateral sides of the corrugated sheet 4 (see FIG. 4). These walls 6 are provided at the crest or convex side of corrugation of the corrugated sheet 4. The inner and outer side faces of the upper midsole 3a is sandwiched between the oppositely disposed walls 6, shown in FIG. 5.

At the through or concave side of corrugation of the corrugated sheet 4 is formed a plurality of slightly upwardly extending walls 7 (see FIGS. 3A, 3B and 4). As shown in FIG. 6, the inner and outer side faces of the upper midsole 3a is also sandwiched between the oppositely disposed walls 7.

At the other convex side of corrugation of the corrugated sheet 4 are formed a plurality of slightly downwardly extending walls 8 (see FIGS. 3A, 3B and 4). As shown in FIG. 6, the inner and outer side faces of the lower midsole 3b is sandwiched between the oppositely disposed walls 8.

Moreover, a plurality of apertures 9 are formed at the contact area of the lower midsole 3b with the corrugated sheet 4. These apertures 9 are provided at the

concave side of corrugation of the corrugated sheet 4. As shown in FIG. 5, the apertures 9 are through holes penetrating the lower midsole 3b in the width direction. In addition, the lower midsole 3b is formed with a vertically extending through hole 10 for improvement of its cushioning properties, shown in FIGS. 5 and 6.

In this case, the heel portion 4a of the corrugated sheet 4 placed at the heel region prevents the heel region of the midsole 3 from being deflected and deformed in the lateral or transverse direction after an athlete's getting down onto the ground.

Furthermore, the deflecting movement of the heel region of the upper midsole 3a is also prevented by the upwardly extending walls 6, 7, and the deflecting movement of the heel region of the lower midsole 3b is also prevented by the downwardly extending wall 8. Thereby, transverse deformation of the heel region is more securely prevented and running stability is further improved.

Moreover, in this case, deformation of the corrugated sheet 4 relative to the vertical load is easier at the regions where the apertures 9 are formed. Thereby, cushioning properties is advanced. Additionally, because the apertures 9 are through holes, cushioning properties across the whole width of the midsole 3 is improved and the midsole 3 is lighter in weight.

In another embodiment, the upwardly extending wall of the corrugated sheet 4 is formed either at the convex side or at the concave side of corrugation of the corrugated sheet 4.

In yet another embodiment, the downwardly extending wall of the corrugated sheet 4 is formed at the concave side of corrugation of the corrugated sheet 4. Alternatively, the downwardly extending wall may be formed at both the convex side and the concave side.

In a further embodiment, the apertures 9 are formed at the upper midsole 3a. In the alternative, the apertures 9 may be formed at the convex side of corrugation of the corrugated sheet 4.

Those skilled in the art to which the invention pertains may make modifications and other embodiments employing the principles of this invention without departing from its spirit or essential characteristics particularly upon considering the foregoing teachings. The described embodiments and examples are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. Consequently, while the invention has been described with reference to particular embodiments and examples, modifications of structure, sequence, materials and the like would be

apparent to those skilled in the art, yet still fall within the scope of the invention.

**What is claimed is:**

1. A midsole assembly for an athletic shoe comprising:

an upper midsole formed of soft elastic material;

a lower midsole formed of soft elastic material, said lower midsole being placed under said upper midsole; and

a corrugated sheet having corrugation, said corrugation being disposed at least at the heel portion between said upper midsole and said lower midsole,

said corrugated sheet having an upwardly extending wall, said wall being placed at medial and lateral sides of said heel portion.

2. A midsole assembly for an athletic shoe comprising:

an upper midsole formed of soft elastic material;

a lower midsole formed of soft elastic material, said lower midsole being placed under said upper midsole; and

a corrugated sheet having corrugation, said corrugation being disposed at least at the heel portion between said upper midsole and said lower midsole,

said corrugated sheet having a downwardly

extending wall, said wall being placed at medial and lateral sides of said heel portion.

3. The midsole assembly for an athletic shoe of claim 1, wherein said upwardly extending wall is formed at a convex face side or a concave face side of said corrugation of said corrugated sheet.

4. The midsole assembly for an athletic shoe of claim 1, wherein said upwardly extending wall is formed at a convex face side and a concave face side of said corrugation of said corrugated sheet.

5. The midsole assembly for an athletic shoe of claim 2, wherein said downwardly extending wall is formed at a convex face side or a concave face side of said corrugation of said corrugated sheet.

6. The midsole assembly for an athletic shoe of claim 2, wherein said downwardly extending wall is formed at a convex face side and a concave face side of said corrugation of said corrugated sheet.

7. The midsole assembly for an athletic shoe of claim 3, wherein said upper or lower midsole has an

aperture at the contact area with said corrugated sheet.

8. The midsole assembly for an athletic shoe of claim 4, wherein said upper or lower midsole has an aperture at the contact area with said corrugated sheet.

9. The midsole assembly for an athletic shoe of claim 5, wherein said upper or lower midsole has an aperture at the contact area with said corrugated sheet.

10. The midsole assembly for an athletic shoe of claim 6, wherein said upper or lower midsole has an aperture at the contact area with said corrugated sheet.

11. The midsole assembly for an athletic shoe of claim 7, wherein said aperture is formed at a convex face side or a concave face side of said corrugation of said corrugated sheet.

12. The midsole assembly for an athletic shoe of claim 8, wherein said aperture is formed at a convex face side or a concave face side of said corrugation of said corrugated sheet.

13. The midsole assembly for an athletic shoe

of claim 9, wherein said aperture is formed at a convex face side or a concave face side of said corrugation of said corrugated sheet.

14. The midsole assembly for an athletic shoe of claim 10, wherein said aperture is formed at a convex face side or a concave face side of said corrugation of said corrugated sheet.

15. The midsole assembly for an athletic shoe of claim 7, wherein said aperture is a through hole penetrating through said upper or lower midsole.

16. The midsole assembly for an athletic shoe of claim 8, wherein said aperture is a through hole penetrating through said upper or lower midsole.

17. The midsole assembly for an athletic shoe of claim 9, wherein said aperture is a through hole penetrating through said upper or lower midsole.

18. The midsole assembly for an athletic shoe of claim 10, wherein said aperture is a through hole penetrating through said upper or lower midsole.

FIG. 1

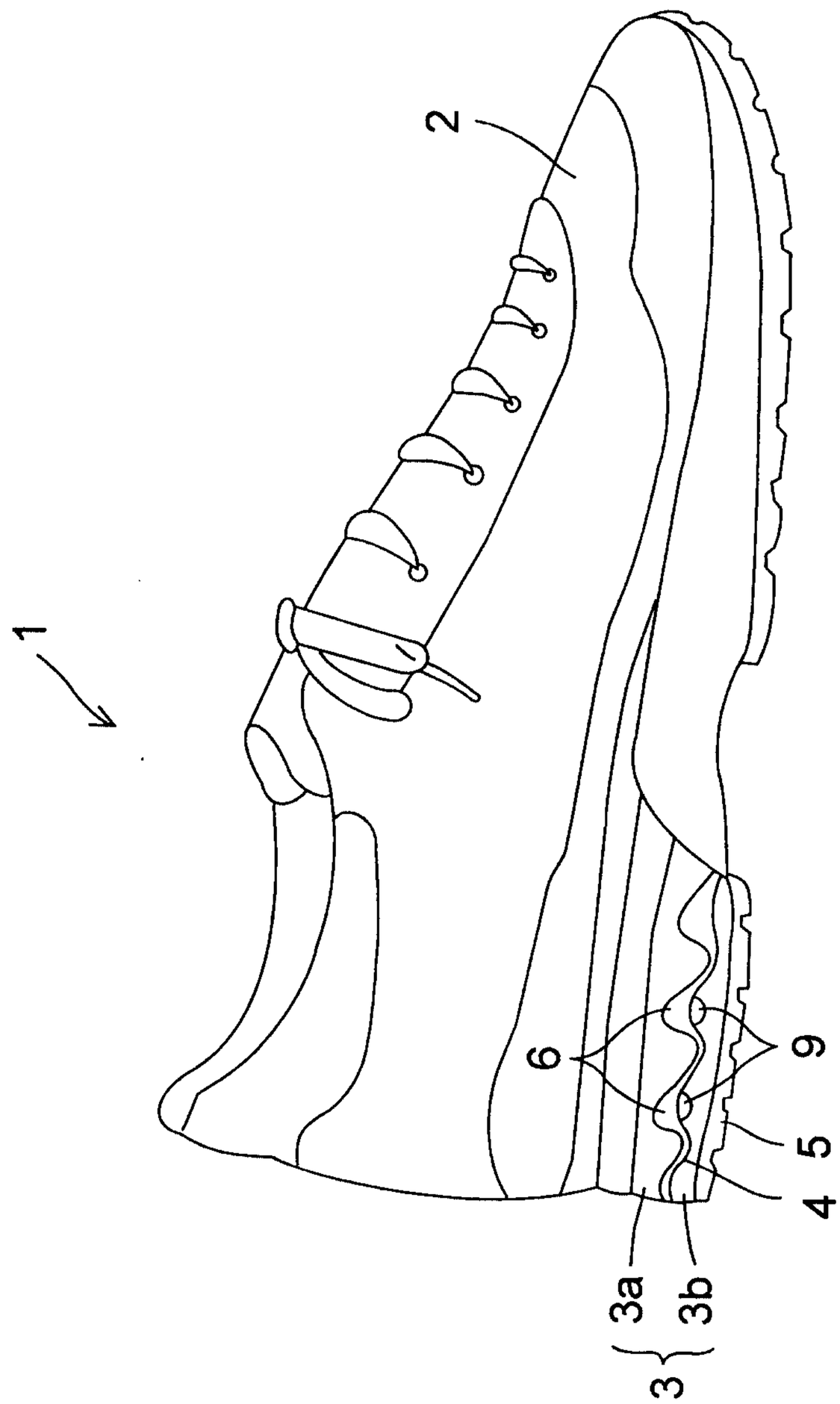


FIG. 2

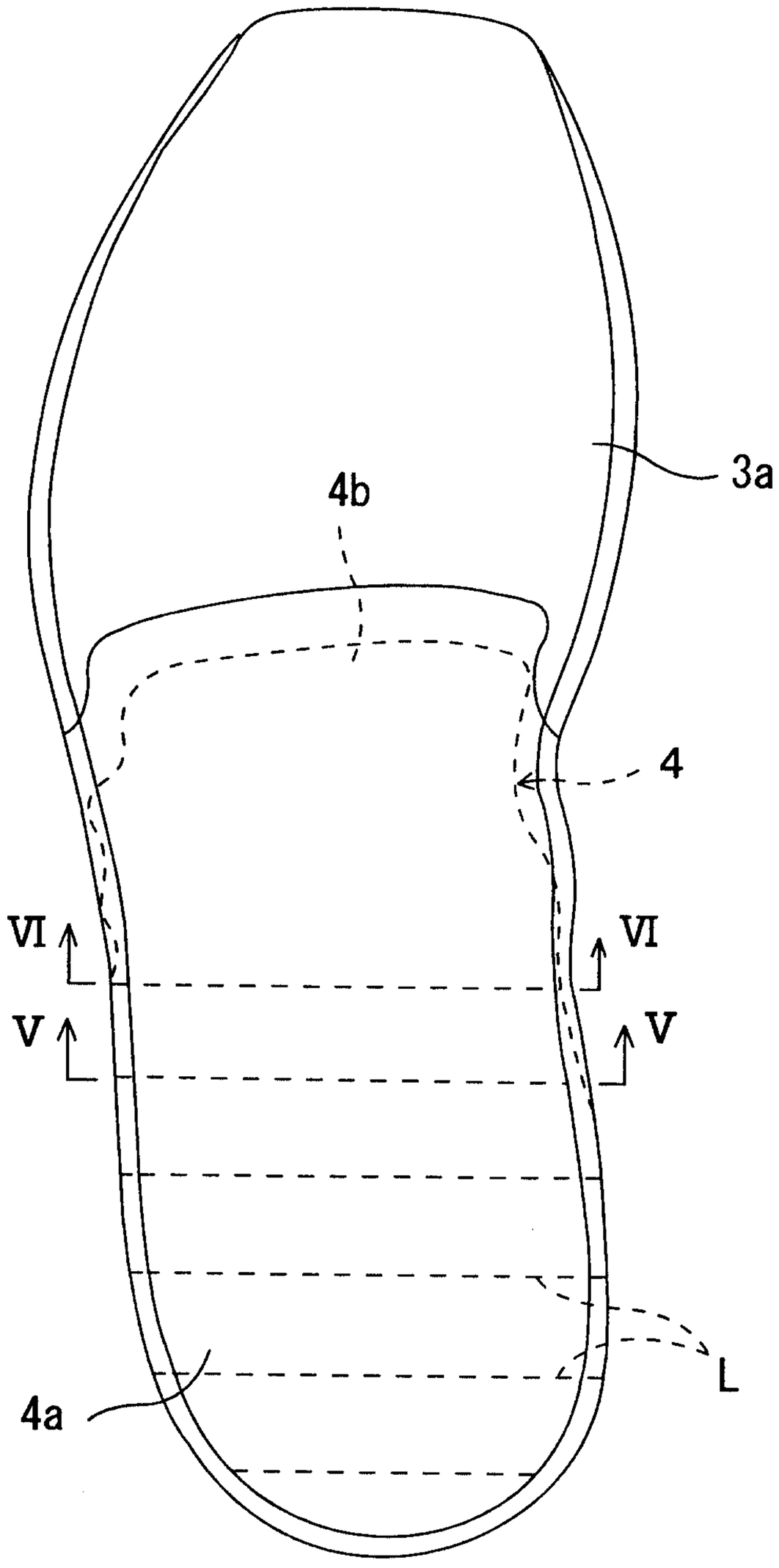


FIG. 3A

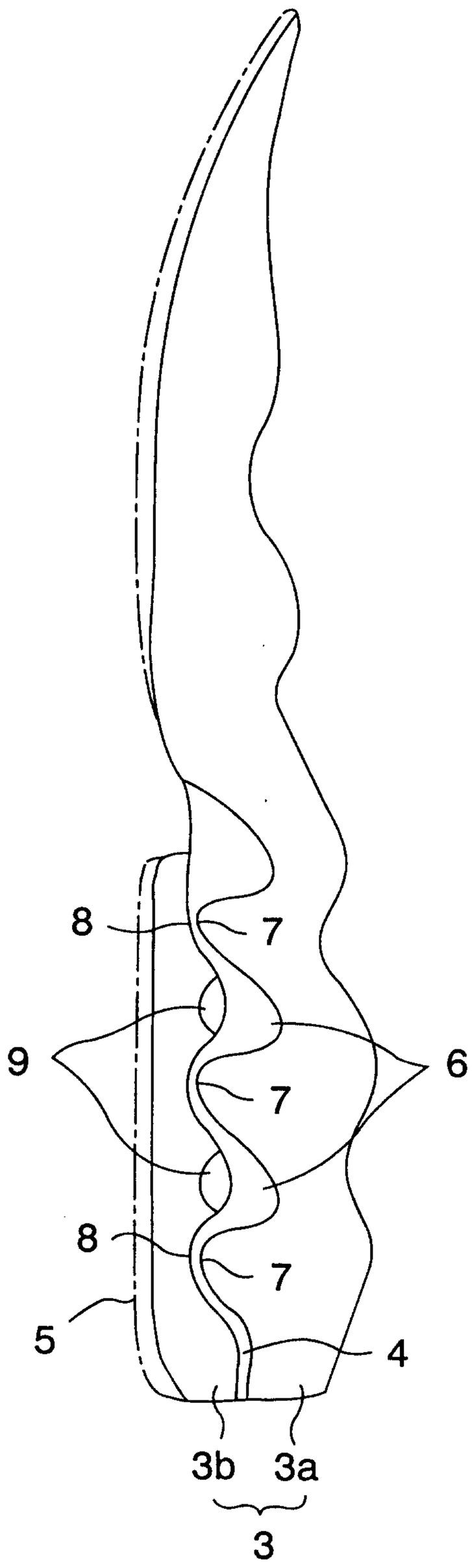



FIG. 3B

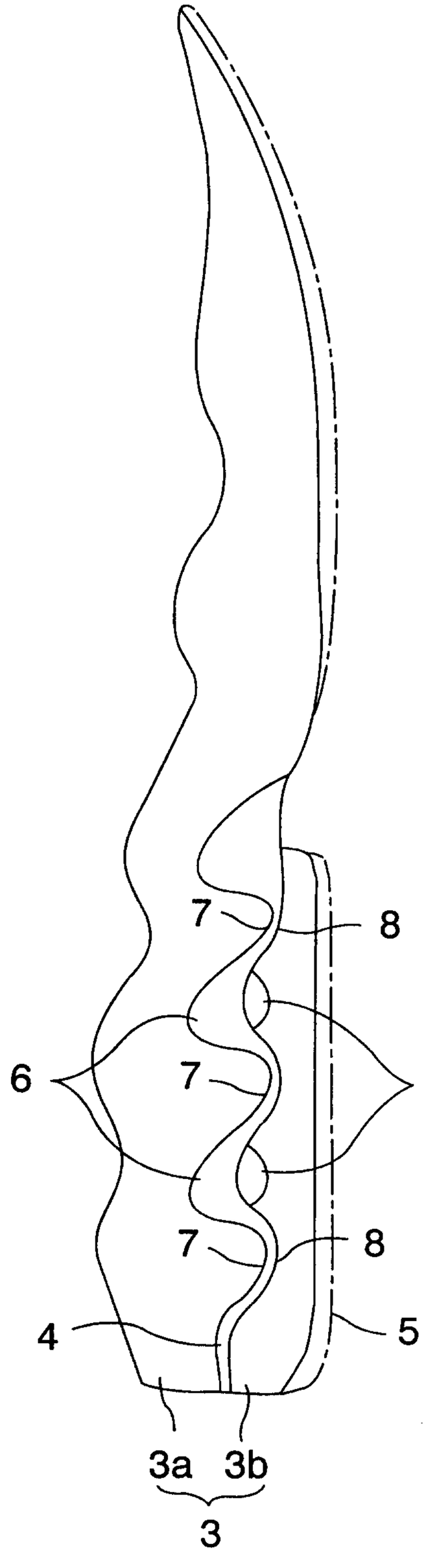


FIG. 4

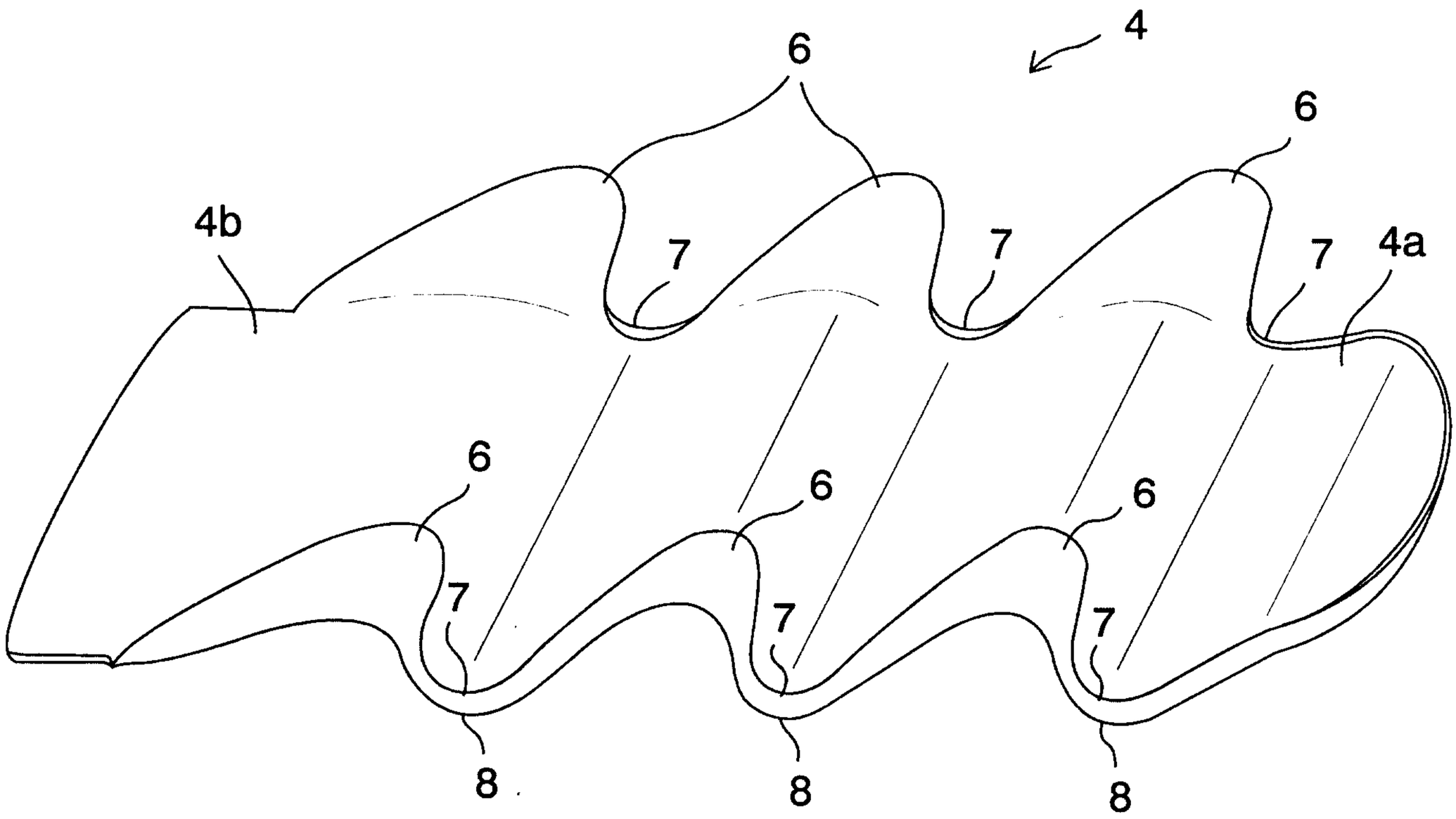


FIG. 5

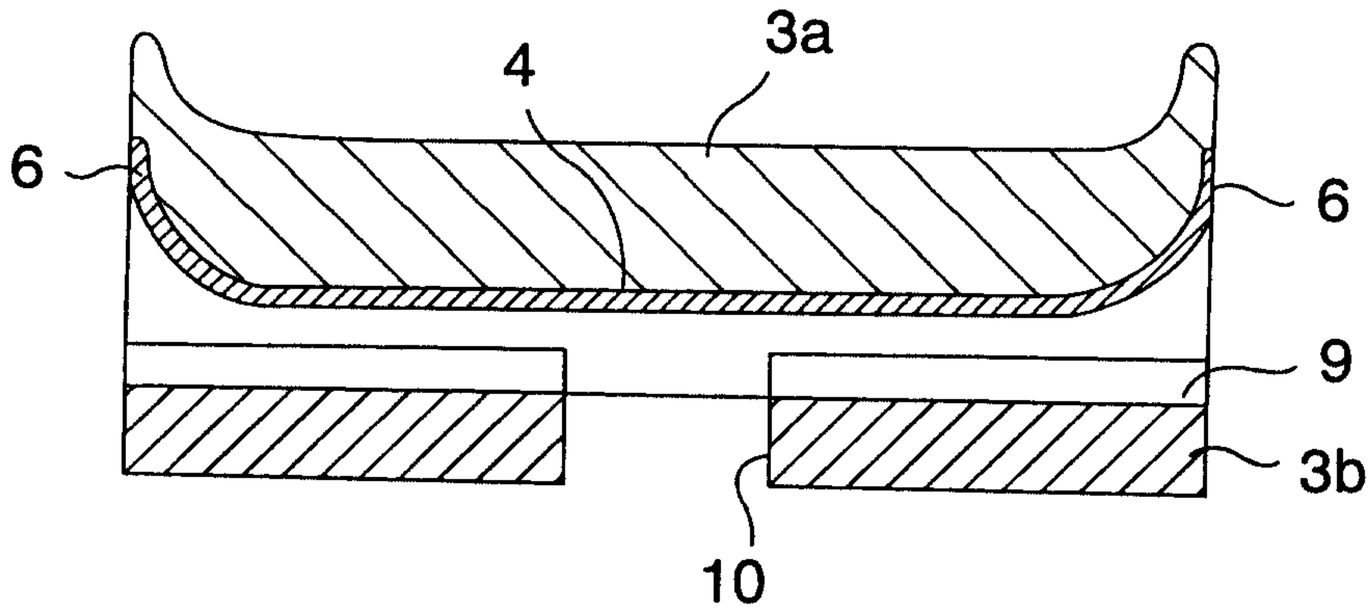
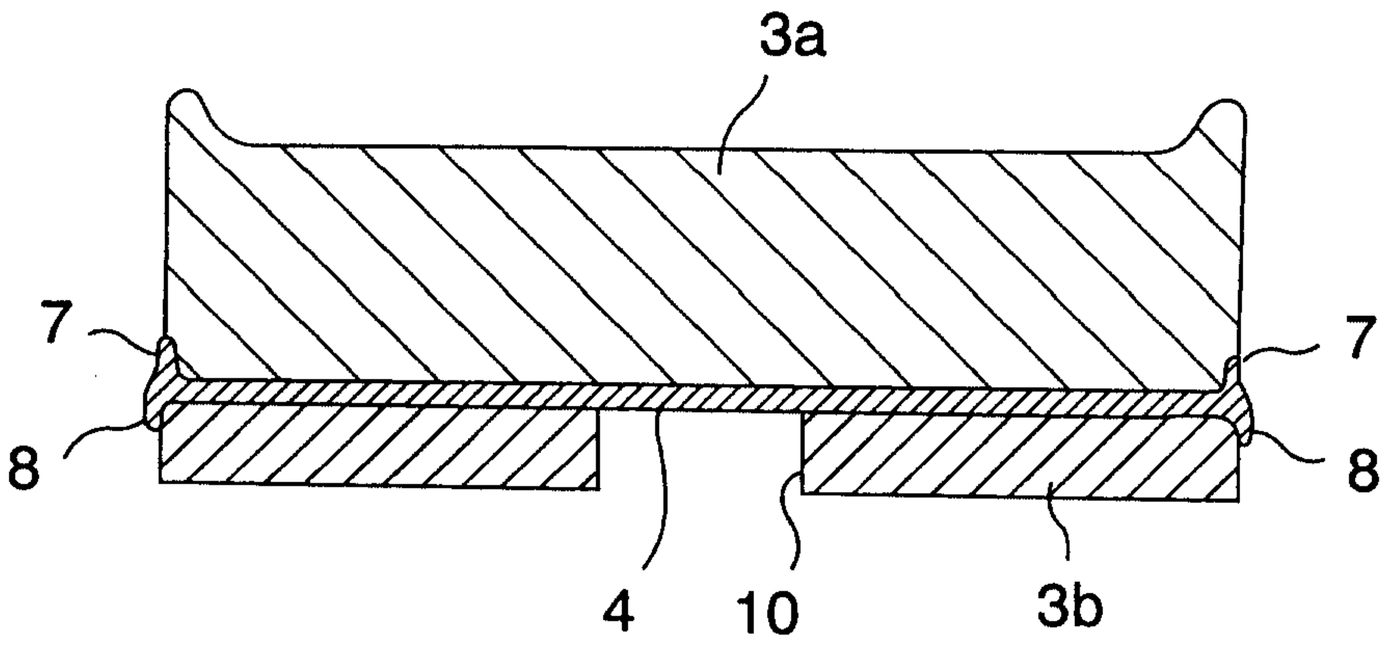
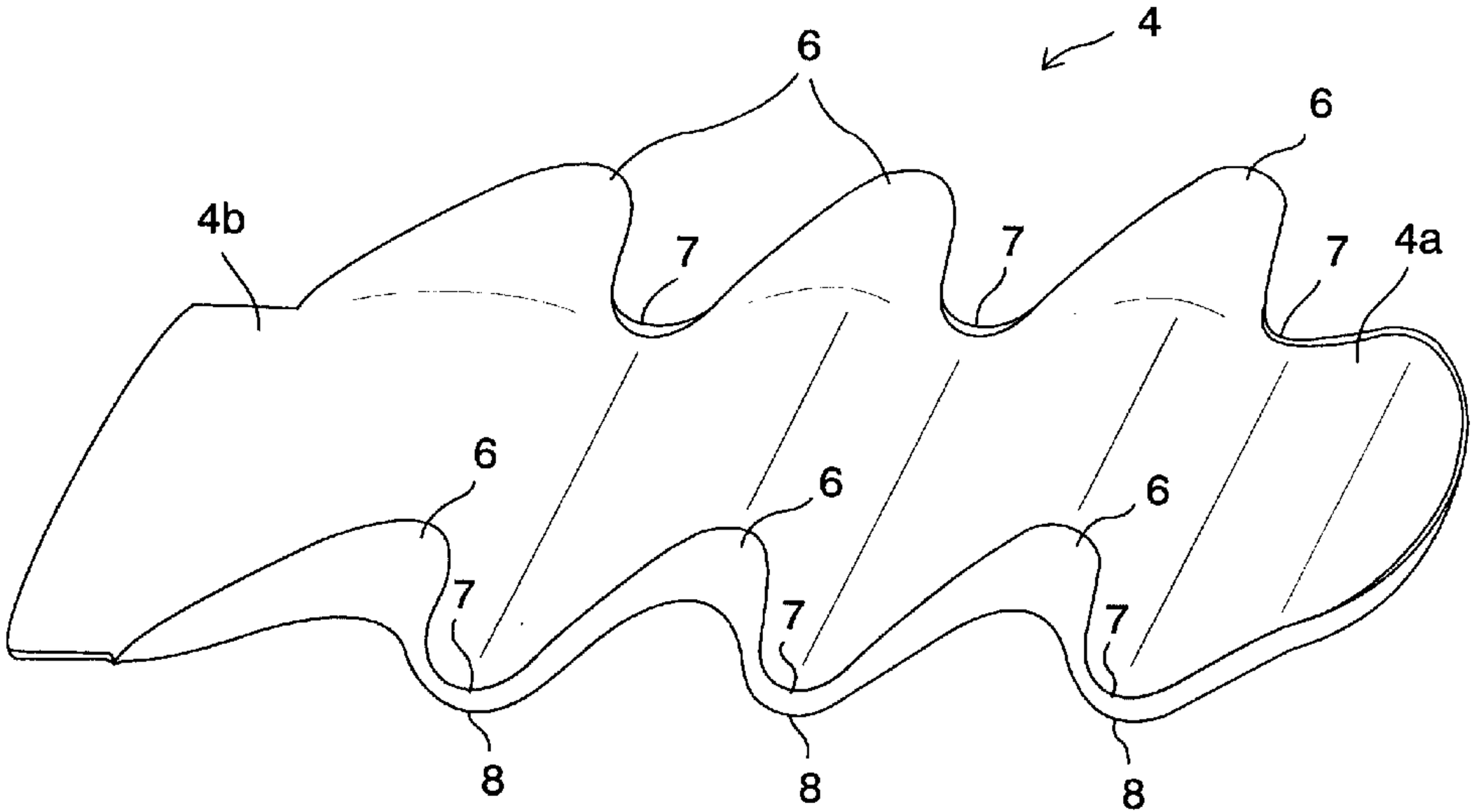



FIG. 6

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