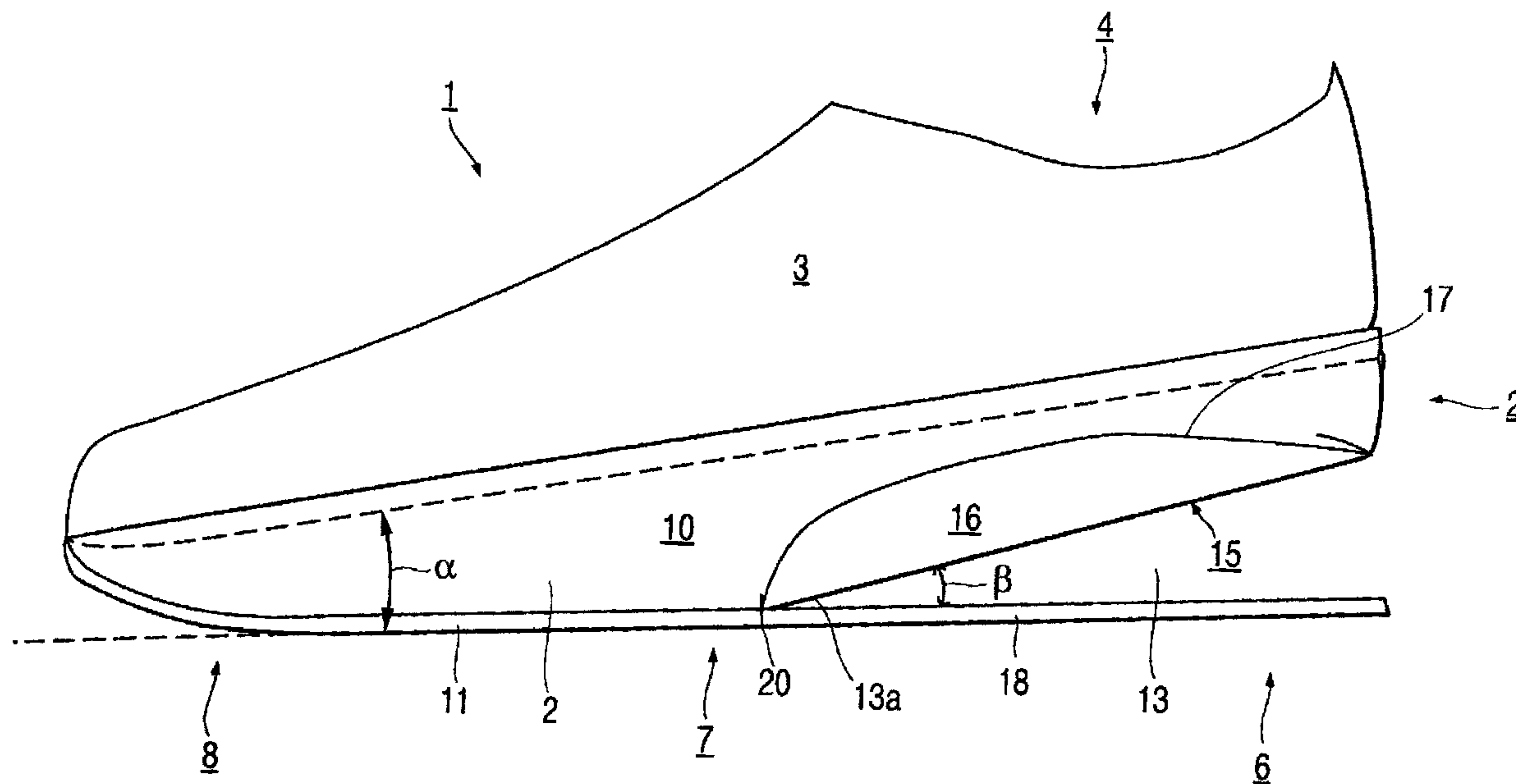




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(54) Titre : CHAUSSURE
 (54) Title: SHOE



(57) **Abrégé/Abstract:**

The inventive shoe has a sole which extends from a rear heel area, through a middle foot area to a front ball or toe area. Said sole consists of a sole body and a sole covering, said sole covering being arranged on the underside of the sole body. The shoe also has a cavity extending approximately from the middle foot area to the heel area, between the sole body and the sole covering. The area of the sole covering associated with the cavity forms a pivoting element. Said pivoting element is configured in such a way that it can pivot around a pivot axis located in the end area of the cavity facing towards the middle foot area.



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<p>(54) Title: SHOE</p>		
<p>(54) Bezeichnung: SCHUH</p>		
<p>(57) Abstract</p>		
<p>The inventive shoe has a sole which extends from a rear heel area, through a middle foot area to a front ball or toe area. Said sole consists of a sole body and a sole covering, said sole covering being arranged on the underside of the sole body. The shoe also has a cavity extending approximately from the middle foot area to the heel area, between the sole body and the sole covering. The area of the sole covering associated with the cavity forms a pivoting element. Said pivoting element is configured in such a way that it can pivot around a pivot axis located in the end area of the cavity facing towards the middle foot area.</p>		

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SHOE

The present invention relates to a shoe.

Shoes consist of a sole and an upper which surrounds the foot resting on the sole. The soles of shoes often have damping means by which the load exerted on the foot or on the entire body of the runner is eased when running. Known damping means for example are air cushions or gel-filled cavities.

A sole with a plurality of damping elements is known (EP 0 695 514 A1). This sole has, in the heel area, the metatarsal area, and the ball of the foot, a plurality of holes extending in the transverse direction and intended to serve as damping cushions. These holes are given a variety of shapes and sizes and have a correspondingly hard or soft damping effect. In one embodiment, a recess is made in the sole from the rear end which is open at the sides so that the area of the sole beneath forms a plate that projects freely to the rear. Such a sole has a very soft damping characteristic in the heel area.

A sole is also known for an exercise shoe (DE 94 13 496 U1) by which running on the level is made more difficult for training purposes. This sole is cut away in the area associated with the shoe heel so that the wearer of the shoe can run essentially only in the vicinity of the balls of the feet. As a result, an effect like that obtained running uphill on a 15° slope or when climbing stairs is achieved. A shoe of this kind that promotes running on the balls of the feet is unsuited from the health standpoint since, when running on the balls of the feet, the foot or shoe is placed on the ground with the leg extended and the impact load is transferred directly to the knee and hip joints and the spinal column.

In view of the above disadvantages and shortcomings of the shoe known from the prior art, the goal of the present invention is to provide a shoe with which the shock loads that occur when running are transmitted only to a very slight degree, if at all, to the knee and hip joints and to the spinal column.

This goal is achieved by a shoe having a sole that extends from a rear heel area through a metatarsal area to a front ball or toe area, said sole being made of a sole body and a sole covering located on the underside of the sole body and a recess that extends approximately from the metatarsal area to the heel area and is provided between the sole body and the sole covering; the area of the sole covering associated with the recess forms a pivoting element that is designed to pivot around a pivot axis that is located in the end area of the recess and facing the metatarsal area.

The shoe according to the present invention has a sole composed of a sole body and a sole covering, with a recess extending approximately from the metatarsal area to the heel area, said recess being provided between the sole body and the sole covering so that the area of the sole covering associated with the recess, when placed on a support, is pivoted away upward around a pivot axis so that the shoe is placed very softly on the support.

When the shoe is placed on the support in the vicinity of the pivot axis, it tilts around the pivot axis with the ball or toe area on the support. As a result, the foot and the lower leg are displaced slightly forward and the knee is automatically bent slightly. A leg bent at the knee accepts the impact load through the bones of the skeleton and the surrounding musculature without the impact load being transmitted to the joints or the spinal column.

The shoe according to the present invention therefore produces a rounding effect, in other words a rolling action as it is placed on the support so that the

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impact load exerted on the sensitive joints or on the spinal column is considerably reduced.

In the standing phase, the wearer of the shoe is also placed in a therapeutic posture, in other words a posture with the knees forced to bend at an angle so that the spinal column is also relieved of a load when standing.

Hence, the invention is based on the knowledge that in conventional shoes, despite costly and cumbersome damping elements, the impact load is transmitted directly to the joints and the spinal column since, with these shoes, the foot or the shoe can be placed on the support with the leg extended.

In accordance with an aspect of the present invention, there is provided a shoe comprising a sole that extends from a heel area through a metatarsal area to a front ball or toe area, said sole being composed of a sole body and a sole covering formed on an underside of the sole body and a recess extending approximately from the metatarsal area to the heel area, said recess being provided between the sole body and the sole covering, with the sole covering forming a pivoting element in an area associated with the recess, said pivoting element designed to pivot around a pivot axis located in an end area of the recess facing the metatarsal area, the end area of the recess facing the metatarsal area being defined by a tip, the pivot axis being located in an area between a lengthwise center of the shoe and the heel area, with the heel area extending over approximately one-third of the length of the shoe, at least one material element being located in the recess, said at least one material element being made of a flexible, soft material and being made approximately wedge-shaped or approximately in a shape of a circular section.

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In accordance with another aspect of the present invention, there is provided a shoe comprising a sole that extends from a heel area through a metatarsal area to a front ball or toe area, said sole being composed of a sole body and a sole covering formed on an underside of the sole body and a recess extending approximately from the metatarsal area to the heel area, said recess being provided between the sole body and the sole covering, with the sole covering forming a pivoting element in an area associated with the recess, said pivoting element designed to pivot around a pivot axis located in an end area of the recess facing the metatarsal area, the end area of the recess facing the metatarsal area being defined by a tip, the pivot axis being located in an area between a lengthwise center of the shoe and the heel area, with the heel area extending over approximately one-third of the length of the shoe, at least one material element being located in the recess, said at least one material element being made of a flexible, soft material and being made approximately wedge-shaped or approximately in a shape of a circular section wherein the sole covering is made flexible in the vicinity of the pivot axis.

In accordance with yet another aspect of the present invention, there is provided a shoe comprising a sole that extends from a heel area through a metatarsal area to a front ball or toe area, said sole being composed of a sole body and a sole covering formed on the underside of the sole body and a recess extending approximately from the metatarsal area to the heel area, said recess being provided between the sole body and the sole covering, with the sole covering forming a pivoting element in an area associated with the recess, said pivoting element designed to pivot around a pivot axis located in an end area of the recess

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facing the metatarsal area, the end area of the recess facing the metatarsal area being defined by a tip, the pivot axis being located in an area between a lengthwise center of the shoe and the heel area, with the heel area extending
5 over approximately one-third of the length of the shoe, at least one material element being located in the recess, said material element being made of a flexible, soft material and being made approximately wedge-shaped or approximately in a shape of a circular section wherein the sole covering has a
10 taper in a vicinity of the pivot axis.

Preferred embodiments of the present invention are described in the dependent claims.

In the following, additional designs, features, and advantages of the present invention will be discussed in
15 greater detail with reference to four embodiments that are shown schematically with reference to Figures 1 to 6 as examples.

Figure 1 is a side view of a first embodiment of a shoe according to the present invention;

20 Figure 2 is a side view of the shoe in Figure 1 while being subjected to a load on the heel area while setting down or rolling away the foot;

Figure 3 is a side view of a second embodiment of a shoe according to the present invention;

25 Figure 4 is a side view of a third embodiment of a shoe according to the present invention;

Figure 5 is a side view of a fourth embodiment of a shoe according to the present invention; and

Figure 6 is a side view of the shoe in Figure 5 with the heel area being subjected to a load as the foot is set down or rolled away.

Identical reference numbers in Figures 1 to 6 refer to the same or similar parts of the shoe according to the present invention.

Shoe 1 according to the present invention has a sole 2 and an upper 3 located thereon, said material surrounding a foot (not shown in Figures 1 to 6) of a runner. Upper 3 can be closed by shoelaces, hook and loop fasteners, or the like and has an opening 4 through which the foot extends upward in the area of the ankle.

Sole 2 extends from a rear heel area 6 through a metatarsal area 7 to a front ball or toe area 8, with each of these areas 6, 7, 8 extending over approximately one-third of the length of shoe 1.

Sole 2 is made of a voluminous sole body 10 and a sole covering 11 located at its underside. Sole body 10 consists of a material with good damping properties such as a polyester-urethane (PU) foam for example, and sole covering 11 consists of an abrasion-resistant material that is preferably profiled on its underside, hard rubber for example.

The entire sole 2 has a thickness that increases from ball and toe area 8 to heel area 6 so that sole 2 forms a wedge in a side view. The sole top forms an angle α with the underside of the sole and this angle is in the range of approximately 8° to approximately 20° .

Between sole body 10 and sole covering 11 is a recess 13 that expands in a wedge shape from metatarsal area 7 to heel area 6. Sole body 10 forms a stop surface 15 adjacent to recess 13.

Sole covering 11 projects freely rearward adjacent a point 13a of recess 13 that points toward ball and toe area 8, with this area of sole covering 11 projecting freely rearward to form a pivoting element 18 which can be pivoted upward against stop surface 15 of sole body 10 around the pivoting area, adjacent recess point 13a, between pivoting element 18 and the rest of sole covering 11. A pivot axis 20 extends pivotably relative to pivoting element 18 through sole covering 11 in the transverse direction adjacent to recess tip 13a.

A pivot angle β between stop surface 15 and pivoting element 18 is in the range of approximately 10° to approximately 30° , especially in the range from approximately 15° to approximately 20° . The tip 13a of recess 13 and hence pivot axis 20 are located in the area between the lengthwise center of shoe 1 and heel area 6 which extends over approximately one-third of the length of shoe 1.

Sole covering 11, especially in the area of pivot axis 20 and pivoting element 18, has considerable dimensional stability and/or flexural strength and is fiber-reinforced, so that sole covering 11 has considerable intrinsic stiffness.

As shown in Figure 2, shoe 1, because of the wedge shape of the entire sole 2, when placed on a support when running, contacts a support by its sole covering 11 in heel area 6 and thus support 22 by its pivoting element 18. Pivoting element 18 of sole covering 11 is pressed around pivot axis 20 against stop surface 15.

This pivoting movement of pivoting element 18, despite the considerable dimensional stability of sole covering 11, results in a very gentle, yielding placement of shoe 1 on support 22. The restoring force of sole covering 11 is

chosen so that no more than 30% and if possible only 10% of the weight of the runner (65 to 75 kg for example) for which shoe 1 is designed is sufficient to press pivoting element 18 against stop surface 15.

When pivoting element 18 strikes stop surface 15 (see Figure 2), the area of sole 2 or of sole covering 11 that extends from pivot axis 20 to ball or toe area 8 is inclined upward and forward relative to support 22 around pivot angle β . Sole covering 11, when pivoting element 18 is bent away, has an obtuse angle of nearly 180° in the vicinity of pivot axis 20.

When pivoting element 18 strikes stop surface 15, the gentle placement process in heel area 6 is terminated and the load exerted on sole 2 by the foot of the runner is distributed approximately uniformly over the entire length of sole 2. As a result, and because of the momentum of the runner directed in the running direction, shoe 1 tips forward around pivot axis 20 and rests its forward area of sole covering 11 on support 22.

This tilting of shoe 1 causes the foot and lower leg of the runner to be displaced slightly forward in the running direction and the knee is bent slightly between the lower leg and upper leg. The maximum load on the foot or on sole 2 appears only after shoe 1 has tilted or after the runner's knee has bent so that the recoil produced by the impact on support 22 encounters a leg that is already bent at the knee and which can accept the impact load in a gentle manner with elastic flexibility by means of the knee joint with its skeleton and muscles,

Shoe 1 according to the present invention thus causes automatic rolling of the foot when running so that by comparison with conventional shoes, a considerably more protective transmission of the impact load to the body is produced.

A second embodiment of the shoe according to the present invention is shown in Figure 3. This shoe 1 essentially corresponds to the shoe 1 described above;

accordingly, the same or similar components have been given identical reference numbers.

Shoe 1 according to Figure 3, in wedge-shaped recess 13, has a material element in the form of a material wedge 25 made of an open-pored foam. This material wedge 25 is mounted on stop surface 15 of sole body 10 and on pivoting element 18 by means of a glued connection.

Sole covering 11 is divided by a slit 27 in the area of pivot axis 20. The framework of the invention, of course, includes an embodiment without a slit (see for example the fourth embodiment of the present invention shown in Figures 5 and 6).

Advantageously, sole covering 11 is flexible in the vicinity of pivot axis 20 and formed by a taper since, in this embodiment of shoe 1, it is advantageous that during the setting down phase of shoe 1 on support 22 in heel area 6, the restoring force of pivoting element 18 is applied if possible only by material wedge 25 in order to ensure that shoe 1 is set down on support 22 as softly as possible.

A reinforcing plate 29 is placed in sole body 10 that extends from the lengthwise center of shoe 1 to rear heel area 6. The reinforcing plate 29 consists of a metal plate or a fiber-reinforced plastic plate and is located at a distance above a pressure distribution part 16, with reinforcing plate 29 being adapted to the curvature of pressure distributing part 16. The reinforcing plate 29 extends in the transverse direction over nearly three-fifths to four-fifths of the width of shoe 1 and during the set-down phase during which pivoting element 18 is pressed against stop surface 15, that sole body 10 cannot be tilted downward by the heel.

A third embodiment of the invention is shown in Figure 4. This shoe 1 has essentially the same structure as shoe 1 described above; accordingly, the same or similar components have identical reference numerals.

The wedge-shaped recess between stop surface 15 and pivoting element 18 is enclosed by an air bellows 31. Two holes 32 are made in sole body 10, said holes terminating at one end at stop surface 15 and at the other end externally on sole body 10.

A valve 33 is placed in each of the two holes 32 which limits the escape of air from air bellows 31 to the outside so that when pivoting element 18 is pressed toward stop surface 15 by the limited escape of air during the pivoting movement of pivoting element 18, a predetermined relatively gentle resistance is offered in opposition.

When the pressure by which pivoting element 18 is pressed against stop surface 15 is released, pivoting element 18 again pivots into the initial position which runs as a straight line extension of the rest of sole covering 11, whereupon valves 33 open and permit a rapid flow of air into air bellows 31.

Pivoting element 18 of sole covering 11 is made in one piece with the rest of sole covering 11 and has a certain degree of dimensional stability or flexural strength so that it automatically pivots back into the initial position following compression of air bellows 31.

The fourth embodiment according to Figure 5 essentially corresponds to the second embodiment according to Figure 3, with the only difference being that recess 13 is not wedge-shaped but essentially in the form of a circular section and is filled with a material element 25 made of open-pored plastic.

According to a feature essential to the invention, sole 2 is raised laterally or provided with a very thin lateral covering in the form of side walls made of rubber which cover the plastic core externally for protection and can readily be compressed like a bellows.

In the present invention, therefore, the action of recess 13 is so designed that when rolling on pivot axis 20, recess 13 or its filling does not exert an elastically flexible effect through material element 25 but yields with practically zero force up to the stop when sole covering 11 comes to rest against a hard unyielding area of shoe 1.

Shoe 1 according to the four embodiments described above, is characterized by the fact that when running, a rolling of shoe 1 or the foot on the support is automatically produced. This is effected by wedge-shaped recess 13 between sole body 10 and sole covering 11, since sole covering 11 deflects upward with its pivoting element 18 when subjected to a load in heel area 6 and forms in a gently yielding fashion an obtuse angle at sole 2 whose point is located in the vicinity of pivot axis 20.

Shoe 1 tilts around this obtuse angle in a forward direction so that the knee of the runner is bent and the impact load is received by the runner with a bent knee. The impact load is not transmitted to the sensitive joints and spinal column but is received by the skeleton and the corresponding musculature.

The invention is not limited to the above four embodiments described earlier; the individual skilled in the art can readily devise additional modifications of the invention. For example, the scope of the invention also covers an embodiment in which sole body 10 and sole covering 11 are made in one piece and/or of one part.

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CLAIMS:

1. A shoe comprising a sole that extends from a heel area through a metatarsal area to a front ball or toe area, said sole being composed of a sole body and a sole covering formed on an underside of the sole body and a recess extending approximately from the metatarsal area to the heel area, said recess being provided between the sole body and the sole covering, with the sole covering forming a pivoting element in an area associated with the recess, said pivoting element designed to pivot around a pivot axis located in an end area of the recess facing the metatarsal area, the end area of the recess facing the metatarsal area being defined by a tip, the pivot axis being located in an area between a lengthwise center of the shoe and the heel area, with the heel area extending over approximately one-third of the length of the shoe, at least one material element being located in the recess, said at least one material element being made of a flexible, soft material and being made approximately wedge-shaped or approximately in a shape of a circular section.

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2. The shoe according to claim 1 wherein an area of the sole body that faces the recess forms a stop surface for delimiting a pivoting movement of the pivoting element.

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3. The shoe according to claim 2 wherein at least one hole is provided in the sole body, said at least one hole extending from the stop surface to an exterior of the sole body.

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4. The shoe according to claim 3 wherein at least one valve that limits air opening from the recess is located in at least one of the holes.

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5. The shoe according to claim 1 wherein the pivot axis is located in the plane of the sole covering.

6. The shoe according to claim 1 wherein the pivot axis is oriented approximately perpendicularly to a running direction.

7. The shoe according to claim 1 wherein the sole covering has at least one slit in a vicinity of the pivot axis.

8. The shoe according to claim 1 wherein the recess delimits a pivot angle (β) which is in a range from approximately 10° to approximately 30° .

9. The shoe according to claim 8 wherein the pivot angle (β) lies in a range from approximately 15° to approximately 20° .

10. The shoe according to claim 1 wherein the recess is made so that it expands in a lengthwise section of the shoe toward the heel area.

11. The shoe according to claim 1 wherein the recess is made approximately wedge-shaped.

12. The shoe according to claim 1 wherein the recess is made approximately lens-shaped or approximately in a form of a circular section.

13. The shoe according to claim 1 wherein the sole covering is designed to be resistant to bending over the whole area of the sole covering with the exception of the vicinity of the pivot axis.

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14. The shoe according to claim 1 wherein the sole covering is fiber-reinforced.

15. The shoe according to claim 1 wherein the sole covering
5 is made in one piece.

16. The shoe according to claim 1 wherein the at least one material element is an open-pored foam.

10 17. The shoe according to claim 1 wherein the at least one material element is covered externally.

18. The shoe according to claim 17 wherein the at least one material element is covered by at least one part of the sole
15 covering.

19. The shoe according to claim 18 wherein the sole covering is pulled upward laterally in a direction of the sole body.

20

20. The shoe according to claim 1 wherein the recess is delimited by an air bellows.

21. The shoe according to claim 1 wherein a reinforcing
25 plate is provided in the sole body.

22. The shoe according to claim 21 wherein the reinforcing plate extends approximately from a lengthwise center of the shoe to the heel area.

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23. The shoe according to claim 21 wherein the reinforcing plate extends in a transverse direction of the shoe over approximately three-fifths to approximately four-fifths of a width of the shoe.

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24. The shoe according to claim 21 wherein the reinforcing plate is made of metal.

5 25. The shoe according to claim 21 wherein the reinforcing plate is made of plastic.

26. The shoe according to claim 25 wherein the plastic is fiber-reinforced.

10

27. The shoe according to claim 1 wherein a pressure-distributing element is located between the sole body and the recess.

15 28. The shoe according to claim 27 wherein the convexity of reinforcing plate is adapted to the convexity of the pressure-distributing element.

20 29. The shoe according to claim 1 wherein the sole, in a ball or toe area between its top and bottom, encloses an angle (α) in a range from approximately 8° to approximately 20° .

30. A shoe comprising a sole that extends from a heel area through a metatarsal area to a front ball or toe area, said
25 sole being composed of a sole body and a sole covering formed on an underside of the sole body and a recess extending approximately from the metatarsal area to the heel area, said recess being provided between the sole body and the sole covering, with the sole covering forming a pivoting element in
30 an area associated with the recess, said pivoting element designed to pivot around a pivot axis located in an end area of the recess facing the metatarsal area, the end area of the recess facing the metatarsal area being defined by a tip, the pivot axis being located in an area between a lengthwise

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center of the shoe and the heel area, with the heel area extending over approximately one-third of the length of the shoe, at least one material element being located in the recess, said at least one material element being made of a flexible, soft material and being made approximately wedge-shaped or approximately in a shape of a circular section wherein the sole covering is made flexible in the vicinity of the pivot axis.

10 31. A shoe comprising a sole that extends from a heel area through a metatarsal area to a front ball or toe area, said sole being composed of a sole body and a sole covering formed on the underside of the sole body and a recess extending approximately from the metatarsal area to the heel area, said
15 recess being provided between the sole body and the sole covering, with the sole covering forming a pivoting element in an area associated with the recess, said pivoting element designed to pivot around a pivot axis located in an end area of the recess facing the metatarsal area, the end area of the
20 recess facing the metatarsal area being defined by a tip, the pivot axis being located in an area between a lengthwise center of the shoe and the heel area, with the heel area extending over approximately one-third of the length of the shoe, at least one material element being located in the
25 recess, said material element being made of a flexible, soft material and being made approximately wedge-shaped or approximately in a shape of a circular section wherein the sole covering has a taper in a vicinity of the pivot axis.

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32. The shoe according to claim 1 or claim 13 wherein the sole covering is designed to be dimensionally stable.

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FIG. 1

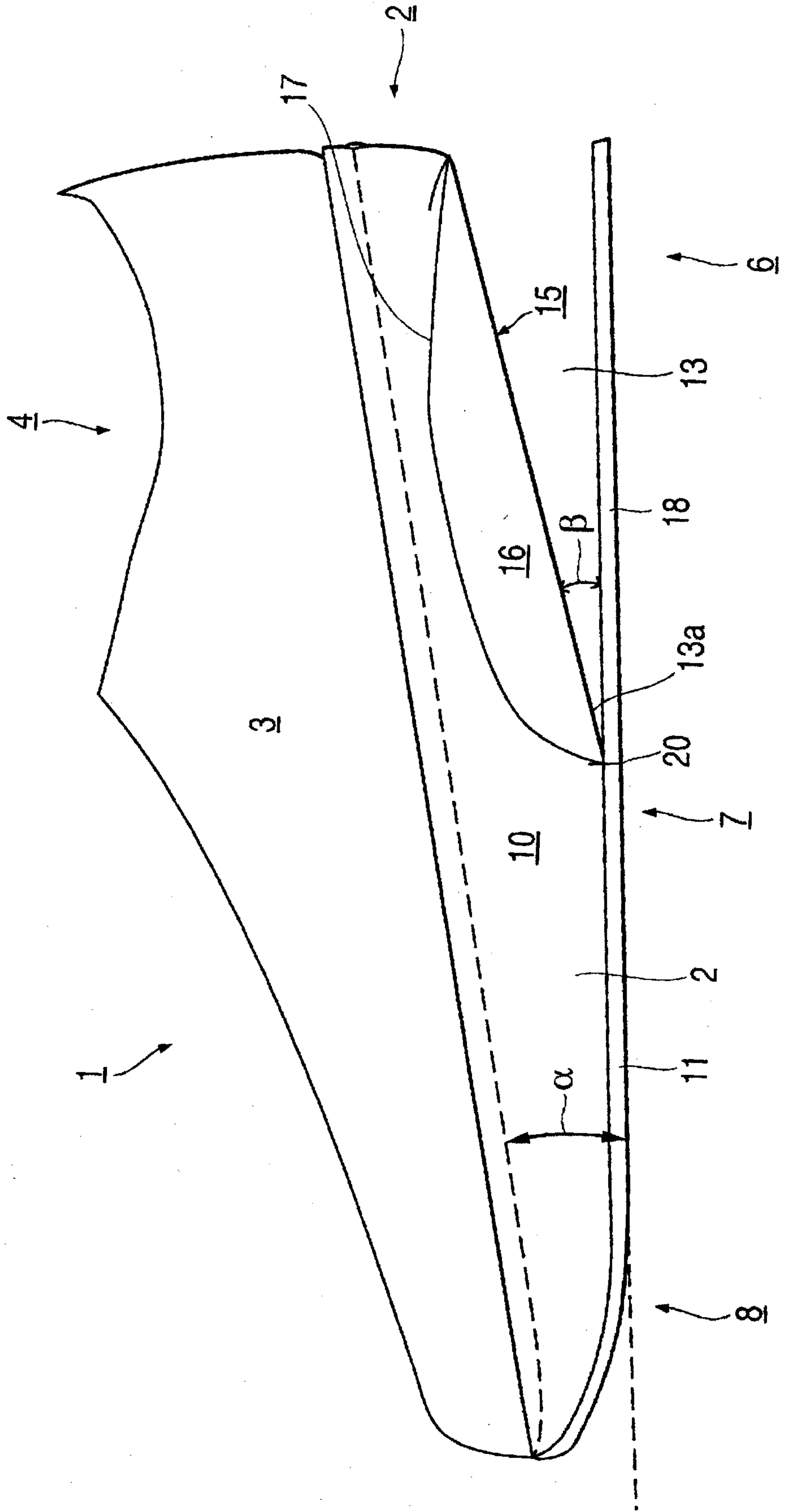


FIG. 2

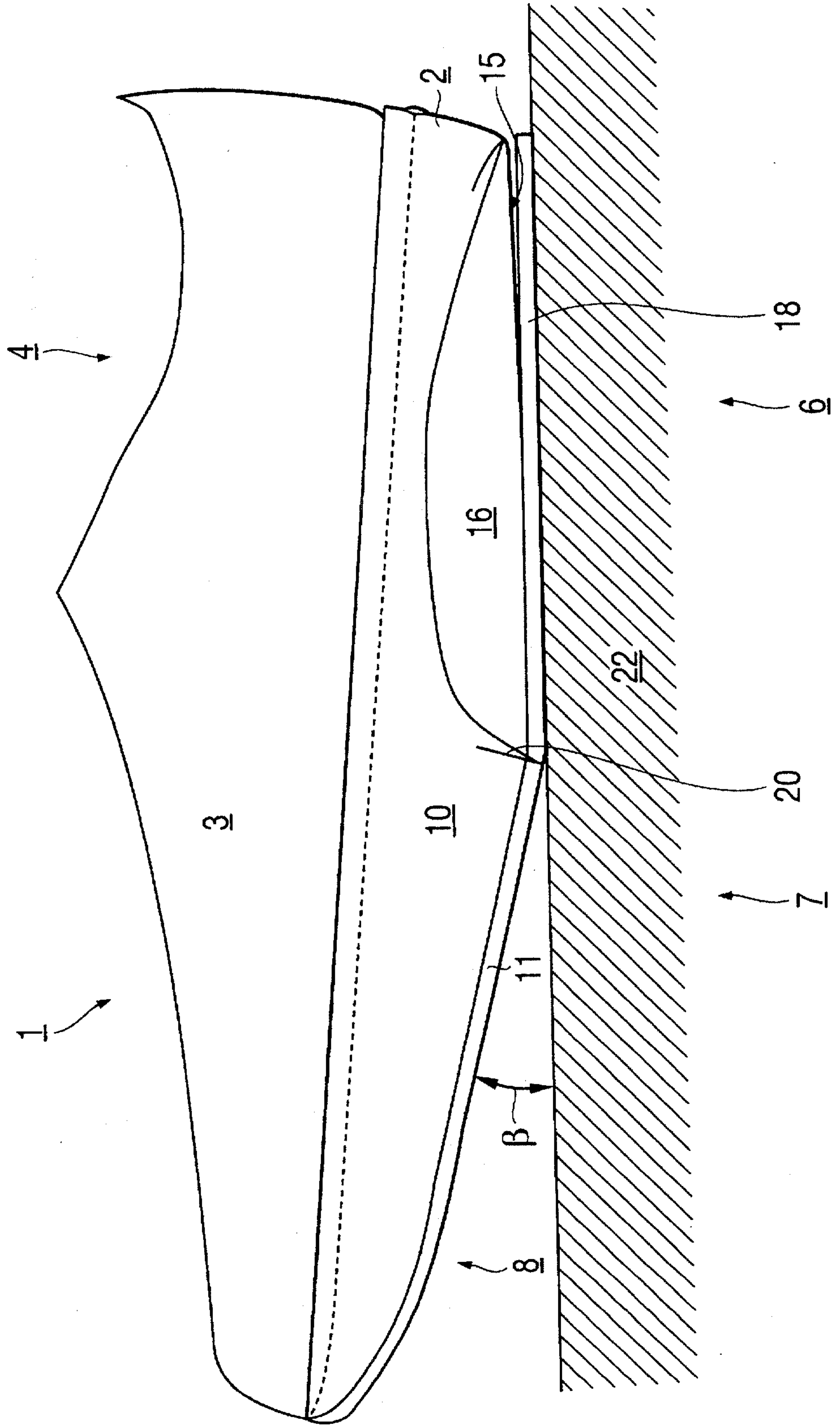


FIG. 4

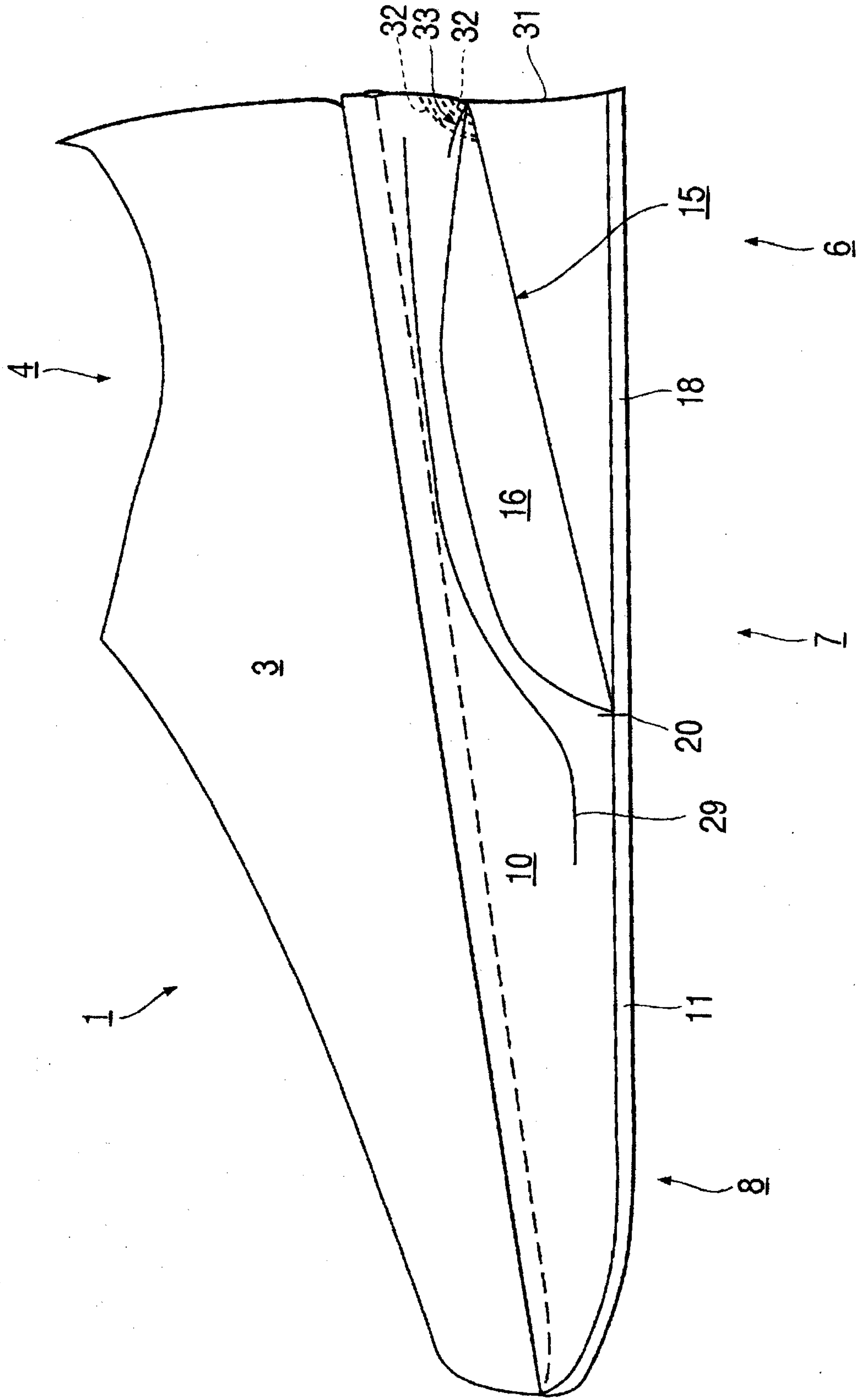


FIG. 5

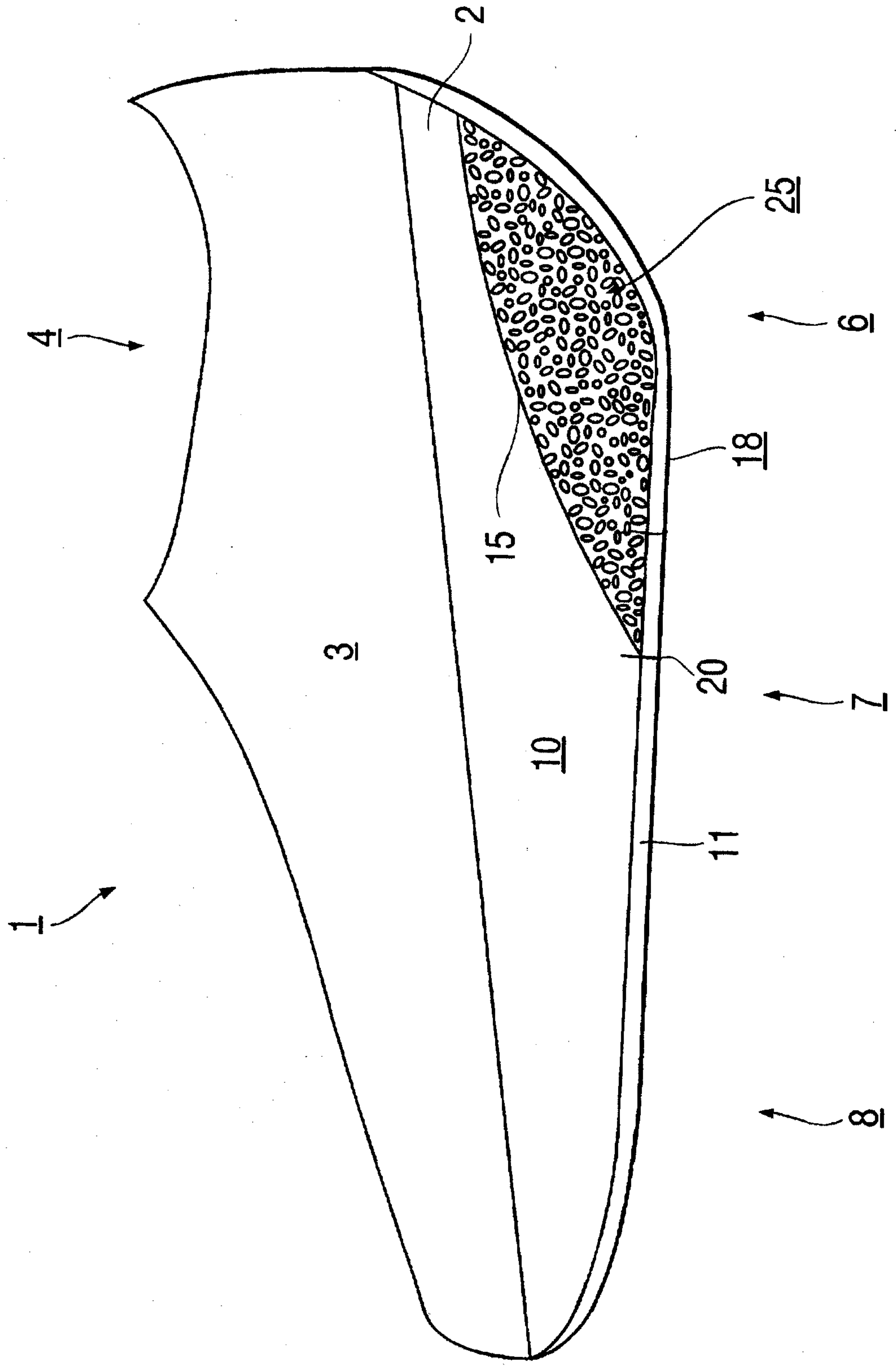


FIG. 6

