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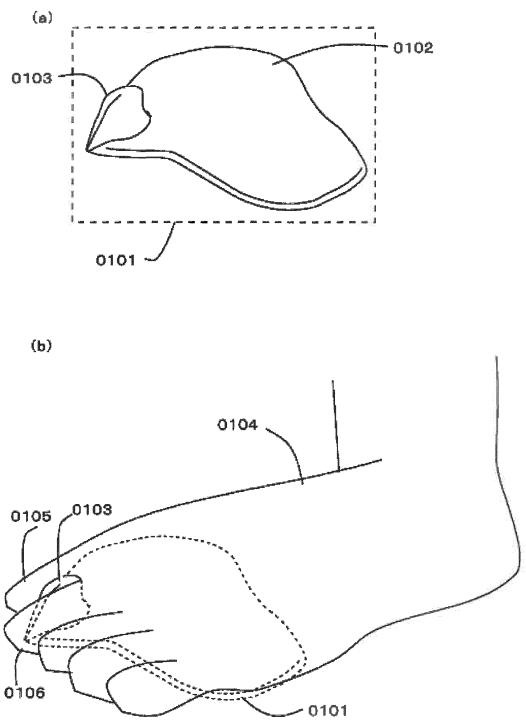
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(54) SHOE INSOLE FOR PREVENTING FOOT FROM SLIPPING FORWARD

(57) [Problem] A need exists for an insole that has the versatility of being used in various shoes and that is provided with a projection for preventing forward slipping, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use can be decreased.

[Solution] Proposed is an insole that includes a base that contacts at least a part of the bottom of the foot, and a projection that can be used by being held between the great toe and the second toe of the foot. The projection as observed in a cross section substantially parallel with the base has a longitudinally extended and droplet-like main shape with a length in a left-right direction of the foot shorter than a length in a longitudinal direction connecting the heel side and the toe side of the foot, the shape becoming thinner toward the toe side.

FIG. 1



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Description

[Technical Field]

[0001] The present invention relates to an insole used in a shoe, the insole including a projection that can be used by being held between the great toe and the second toe of a foot.

[Background Art]

[0002] When a high-heeled shoe is used, the foot may slip forward toward the toes due to the slope extending from the heel toward the toes on the inner bottom surface of the shoe. As a result, the toes may become constricted by the front end of the shoe, or a gap may be formed on the heel side.

[0003] As a means of preventing the forward slipping, a shoe with a sandal-strap type partition has been proposed, as described in Patent Document 1, for example.

[0004] As a product for alleviating hallux valgus, an insole provided with an elliptic cylindrical projection exists ("Hallux Valgus Fit" from Kowa Company, Ltd.), as described in Non-Patent Document 1.

[Prior Art Documents]

[Patent Document]

[0005] [Patent Document 1] JP-A-10-155505

[Non-Patent Document]

[0006] [Non-Patent Document 1] http://hc.kowa.co.jp/beautien/gaihanboshi.php

[Disclosure of the Invention]

[Problem to be Solved by the Invention]

[0007] However, when the shoe itself is provided with the sandal-strap type partition, the user's options for shoe selection are limited. In the case of the insole provided with the elliptic cylindrical projection, the great toe and the second toe of the foot are stretched apart from the viewpoint of alleviating the hallux valgus. As a result, the shape of the insole does not conform to the gap of the toes, causing a sense of discomfort during use.

[0008] Thus, there is a need for an insole that has the versatility of being used in various shoes and that is provided with a projection for preventing forward slipping, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is decreased.

[Means for Solving the Problem]

[0009] In order to solve the problem, the applicant proposes the following insole.

[0010] As a first invention, there is proposed an insole including: a base that contacts at least a part of the bottom of a foot; and a projection that can be used by being held between the great toe and the second toe of the foot, characterized in that the projection as observed in a cross section substantially parallel with the base has a longitudinally extended and droplet-like main shape with a length in a left-right direction of the foot shorter than a length in a longitudinal direction connecting the heel side and the toe side of the foot, the shape becoming thinner toward the toe side.

[0011] As a second invention, there is proposed the insole according to the first invention, characterized in that, when the projection is used by being held between the great toe and the second toe of the foot, a toe-side front edge of the base in the vicinity of the third toe, the fourth toe, and the fifth toe is disposed at a position corresponding to the vicinity of the middle of each of the proximal phalanges from the third proximal phalanx to the fifth proximal phalanx.

[0012] As a third invention, there is proposed the insole according to the first or the second invention, characterized in that: the base is relatively thin in the vicinity of a portion corresponding to the heads of the second and third metatarsal bones; and the base is relatively thick in the vicinity of a portion corresponding to the middle between the heads of the first and second metatarsal bones.

[0013] As a fourth invention, there is proposed the insole according to any one of the first to third inventions, wherein the projection as viewed from the side has a lateral shape corresponding to the shape of the dorsal fin of the dolphin with gradually increasing height from the front of the foot toward the rear of the foot.

[0014] As a fifth invention, there is proposed the insole according to any one of the first to fourth inventions, wherein: the base includes an anti-slipping pattern for particularly increasing the frictional force between the bottom of the foot and an insole contact surface in a direction substantially opposite to a direction in which the bottom of the foot tends to slip along a line of movement of the center of pressure during walking, and/or a direction in which the bottom of the foot tends to slip while standing still.

[0015] As a sixth invention, there is proposed an insole including an anti-slipping pattern having a substantially parallel arrangement for particularly increasing the frictional force between the bottom of a foot and an insole contact surface in a direction substantially opposite to a direction in which the bottom of the foot tends to slip along a line of movement of the center of pressure during walking, and/or a direction in which the bottom of the foot tends to slip while standing still.

[Effect of Invention]

[0016] The insole according to the present invention is an insole that has the versatility of being used in various

shoes, and that can prevent forward slipping with a projection, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is decreased.

[Best Mode of Carrying Out the Invention]

[0017] In the following, embodiments of the present invention will be described with reference to the attached drawings. The present invention is not limited to any of the embodiments, and may be implemented in various modes without departing from the gist of the invention. Embodiment 1 mainly relates to claim 1 and the like. Embodiment 2 mainly relates to claim 2 and the like. Embodiment 3 mainly relates to claim 3 and the like. Embodiment 4 mainly relates to claim 4 and the like. Embodiment 5 mainly relates to claims 5 and 6 and the like.

<<Embodiment 1>>

<Embodiment 1: Outline>

[0018] FIG. 1 is a conceptual perspective view of an example of the insole according to the present embodiment.

[0019] As illustrated in FIG. 1(a), the insole (0101) according to the present embodiment includes a base (0102) and a projection (0103).

[0020] FIG. 1(b) illustrates the insole according to the present embodiment in use. As illustrated, the insole (0101) according to the present embodiment is used with the projection (0103) held between the great toe (0105) and the second toe (0106) of a foot (0104), with the heel side of the projection abutting on the crotch of the toes.

[0021] The insole according to the present embodiment is an insole that, when fixed on the inner bottom surface of a shoe, can prevent the forward slipping of the foot by the projection held between the great toe and the second toe of the foot, with the heel side of the projection abutting on the crotch of the toes.

<Embodiment 1: Configuration>

[0022] The insole according to the present embodiment includes the base and the projection.

<Insole>

[0023] The "insole" may include both a so-called inner sole and a sole insert.

[0024] In the present specification, the "inner sole" refers to a component of a completed article of footwear, which component is assembled during the footwear manufacturing process and cannot be detached.

[0025] Further, in the present specification, the "sole insert" refers to that which can be attached as a component of footwear during the footwear manufacturing process, or that which may be attached to the completed article of footwear afterward as an additional component and which may be then detached.

[0026] Namely, the "insole" according to the present invention may be sold in the form of the "inner sole" as an integral part of the footwear, or in the form of the "sole insert" attached to, or separate from, the footwear.

<Configuration of base>

[0027] The base is a substantially plate-like member that contacts at least a part of the bottom of the foot. The base includes a face on the side contacting the bottom of the foot, and a ground-side face. The ground-side face of the base contacts the inner bottom surface of the shoe. The bottom of the foot or the inner bottom surface of the shoe may have concave or convex portions. Thus, the term "substantially plate-like" is intended to include convex or concave portions corresponding to the concave or convex portions on the inner bottom surface of the shoe or the bottom of the foot. The base of the insole according to the present embodiment needs to be fixed on the inner bottom surface of the shoe. The term "fixed" refers to a state in which the insole remains at an appropriate position on the inner bottom surface of the shoe without moving in the shoe during use.

(Planar shape of base)

[0028] The base as viewed from the top may have a planar shape identical to the shape of the inner bottom surface of the shoe. In this case, the likelihood of the base moving in the shoe is small even when the base is not strongly and intimately attached to the shoe, so that the base can be fixed on the inner bottom surface of the shoe. Further, because the bottom of the foot as a whole contacts the base, improved foot comfort may be achieved by forming the base with a material with a cushioning effect or with a sweat absorbing material. In addition, because the bottom of the foot as a whole contacts the base, slipping of the base and the bottom of the foot on each other can be better suppressed. Thus, the load born by the projection can be relatively decreased.

[0029] Alternatively, the base may lack at least a part on the toe side. In this case, even when the gap between the toes and the upper leather of a shoe is small, the likelihood of the toes being constrained due to the thickness of the base can be eliminated.

[0030] Alternatively, the base may lack at least a part on the heel side. Specifically, a heel side rear-half portion may be lacking. In this case, when the shoe with the upper leather is removed, the likelihood of the insole becoming visible is decreased, whereby the likelihood of the appearance of the shoe being spoiled by the insole, which may be conspicuous in the removed shoe, can be decreased.

[0031] When both the toe side and the heel side are lacking, the insole can be used in various shoes regardless of their size. However, the base needs to have an

area such that the base can be fixed in place and does not move in the shoe.

(Material of base)

[0032] The material of the base is not particularly limited, and may be the same as the material of the projection which will be described below. In this case, by forming the base and the projection integrally, the likelihood of the projection becoming broken, such as becoming separated, during use can be decreased. By using a transparent material, the insole can be made less visible, so that the design of the shoe is marred less.

[0033] The base may be formed of a single layer. In this case, the step of stacking multiple layers can be eliminated, thus facilitating manufacture. In this case, preferably, the material of the base may be such that the slipping between the base and the bottom of the foot or the shoe that contacts the base can be prevented by frictional force or the like.

[0034] The base may be formed of multiple layers. In an example of multiple layers, the base may have two layers on the side of the bottom of the foot and two layers on the side of the ground.

[0035] The layers on the side of the bottom of the foot may be made of cloth material, non-woven fabric, natural leather, synthetic leather, or the like, so that good comfort can be obtained when in contact with the bottom of the foot. Particularly, when worn on a bare foot, a material with good ventilation may be preferable. In another example of the layers on the side of the bottom of the foot, a material that produces large frictional force against the bottom of the foot may be used. In this case, the force applied to the projection, which will be described below, can be decreased. By decreasing the force applied to the projection, the likelihood of breakage of the projection, such as by separation, or the likelihood of causing pain in the crotch of the toes holding the projection can be decreased.

[0036] The layers on the side of the shoe bottom may include a layer of a highly adhesive material or a layer coated with adhesive agent, so that the insole per se does not move when used in the shoe. The shoe and the insole may be affixed to each other with a double-sided tape so as to prevent the movement of the shoe or the insole per se.

(Hardness of base)

[0037] Preferably, the hardness of the base may be in the range of from 30 degrees to 70 degrees (numerical values as measured by the rubber hardness tester ASKER Durometer Type C, which complies with JIS K7312 standard; the same applies in the following whenever hardness is indicated in the present specification). When the hardness is greater than 70 degrees, cushioning properties may be insufficient. Conversely, when the hardness is less than 30 degrees, the foot may tend to feel like sinking when the base is thick, and the foot comfort may be lowered. More preferably, the hardness may be in the range of from 35 degrees to 65 degrees, in which case particularly enhanced foot comfort may be obtained.

(Shape of base surface)

[0038] The base surface may be embossed or grooved. In this case, the frictional force between the bottom of the foot and the base can be increased, whereby the forward slipping of the bottom of the foot with respect to the insole can be better prevented. Specific shapes of the embossment or grooves will be described below.

<Configuration of projection>

[0039] The projection is a portion protruding from the base that can be used by being held between the great toe and the second toe of the foot. Thus, the projection is configured to be held between the great toe and the second toe with the heel side of the projection abutting on the crotch of the toes. The projection has the function of preventing the forward slipping of the foot by supporting the foot that tends to slip forward.

(Planar shape of projection)

[0040] FIGS. 2A, 2B, and 2C illustrate an example of the insole according to the present embodiment. FIG. 2A(a) is a plan view. FIG. 2A(b) is a side view. FIG. 2A(c) is a lateral cross sectional view of sections taken as illustrated in FIG. 2A(a). FIG. 2B(d) is a plan view. FIG. 2B(e) is a rear view observed from the heel side. FIG. 2B(f) is a longitudinal cross sectional view of cross sections taken as illustrated in FIG. 2B(d). FIG. 2C is a partial contour view indicating the height of portions with contour lines except for the projection portion. A color hard copy of FIG. 2C is submitted herewith via a written submission of evidence. With reference to the drawings, a "main shape of the projection of the insole according to the present embodiment as observed in a cross section substantially parallel with the base" will be described.

[0041] The projection of the insole according to the present embodiment is used by being held between the great toe and the second toe. Thus, the sense of discomfort that may be caused in the toes can be better alleviated by configuring the shape of the projection in conformity to the shape between the great toe and the second toe. The planar shape of the gap between the great toe and the second toe as viewed from above is a droplet-like shape, with the middle portion between the toes, i.e., the crotch portion of the toes, curving and becoming gradually thinner toward the toe side. Thus, the projection of the insole according to the present embodiment as observed in a cross section substantially parallel with the base may have a similar droplet-like main shape. The

"cross section substantially parallel with the base" refers to each of cross sections of the projection taken in planes parallel with a plane constituting a major portion of the base surface, with the insole placed on a flat desk or the like. The "shape observed in a cross section substantially parallel with the base" refers to the shape of each of the cross sections as viewed from above.

[0042] The "main" shape of the projection as observed in the cross section substantially parallel with the base is intended to indicate that not all of the cross sections need to have the droplet-like shape, and that many of the cross sections may have the droplet-like shape. For example, the projection has the droplet-like cross section in the vicinity of a middle portion thereof and above in the height of the toes (including the vicinity of the middle portion in the height of the toes; The same also applies in the following description in the specification), while the projection does not have the droplet-like cross section below the vicinity of the middle portion in the height of the toes (not including the vicinity of the middle portion in the height of the toes; the same applies in the following description of the specification). This is because, from the viewpoint of obtaining the operational effect of the present embodiment, the shape in the vicinity of the middle portion in the height of the toes plays an important role in whether a sense of discomfort is caused in the toes. The "planar shape of the gap between the great toe and the second toe of the foot as viewed from above" is the shape observed of the portion above a portion with the minimum gap between the great toe and the second toe in the vicinity of the middle portion in the height of the toes. Thus, preferably, in order to suppress the sense of discomfort when the projection is held between the great toe and the second toe, the projection of the insole according to the present embodiment may have a shape similar to the gap between the great toe and the second toe in the vicinity of the middle portion in the height of the toes. However, in order to prevent the projection and the base from being separated and broken, it is preferable to maximize the area in which the projection and the base are joined. Thus, the shape of the projection as observed in the cross section substantially parallel with the base in the vicinity of the middle portion and below in the height of the toes may include various shapes other than a droplet-like shape.

[0043] The main shape of the projection of the insole according to the present embodiment as observed in the cross section substantially parallel with the base is a "longitudinally extended and droplet-like shape with a length in the left-right direction of the foot shorter than a length in the longitudinal direction connecting the heel side and the toe side, the droplet-like shape becoming thinner toward the toe side". The shape will be described. In FIG. 2A(a), the shape of the projection designated 0203 in the vicinity of the middle portion thereof in the height of the toes as observed in the cross section substantially parallel with the base is a longitudinally extended and droplet-like shape, as illustrated in FIG. 2A(a'), with the length (0204) in the left-right direction of the foot being shorter than the length (0205) in the longitudinal direction connecting the heel side and the toe side, the shape becoming thinner toward the toe side. The portion of the projection "in the vicinity of the middle portion in the height of the toes" refers to the portion positioned in the vicinity of the height of the middle portion in the height of the great toe when the insole according to the present embodiment is used in a shoe; specifically, the portion refers to the vicinity of a portion 0210 indicated by a broken line in FIG. 2A(b). While FIG. 2A(a') illustrates the shape observed in the cross section substantially parallel with the base in the vicinity of the middle portion in the height of the toes as a representative example, many of the shapes of the projection of the insole according to the present embodiment as observed in the cross section substantially parallel with the base are similar to the "longitudinally extended and droplet-like shape with the length in the left-right direction of the foot being shorter than the length in the longitudinal direction connecting the heel side and the toe side of the foot, the shape becoming thinner toward the toe side".

[0044] The longitudinally extended shape of the projection of the insole provides the following effect. When the insole according to the present embodiment is used in a shoe, the projection is subjected to strong force toward the toes. Thus, the projection needs to have a length in the longitudinal direction such that the projection can support the load without falling on the toe side. On the other hand, the length in the left-right direction needs to be short enough that no sense of discomfort is caused when the projection is held between the great toe and the second toe. In view of the above, the projection may preferably have the longitudinally extended shape.

[0045] Further, the longitudinally extended shape of the projection of the insole provides the following effect. In the longitudinally extended configuration, the area of contact between the projection and the great and second toes of the foot is increased. Thus, the frictional resistance between the toes and the projection is increased, and the foot can be supported in a greater area. Accordingly, the force applied to the crotch portion of the toes can be decreased, so that pain is not readily caused in the crotch of the toes. Further, when the area of contact is large, the frictional resistance is increased, whereby the forward slipping of the bottom of the foot with respect to the insole can be decreased.

[0046] Next, the droplet-like shape will be described. As described above, the planar shape of the gap between the great toe and the second toe of the foot as viewed from above is the droplet-like shape curving at the middle portion between the toes, i.e., the crotch portion of the toes, and becoming gradually thinner toward the toe side. Thus, when the shape of the projection conforms to the shape of the crotch of the toes, the sense of discomfort caused in the toes can be decreased.

[0047] Further, when the insole according to the present embodiment is used in a shoe, the crotch of the

toes between the great toe and the second toe of the foot strongly contacts the projection. Thus, if the heel side of the projection that contacts the crotch of the toes is too thin, a large force is applied to a small area, whereby the foot comfort is lowered by, for example, a pain caused in the crotch of the toes. Accordingly, preferably the heel side of the projection may have a relatively large radius of curvature.

[0048] Meanwhile, in the case of a foot accustomed to wearing a shoe, there is usually no gap between the great toe and the second toe of the foot, and the toes adjoin each other. Thus, if the great toe and the second toe are forcibly stretched apart, a sense of discomfort may be caused. Accordingly, preferably the projection may be made thinner toward the toe side.

(Lateral shape of projection)

[0049] The lateral shape of the projection according to the present embodiment as viewed from the side is not particularly limited. Preferably, the height of the projection as a whole may not exceed the height of the toes greatly. More preferably, the height of the projection may be lower than the height of the toes. Even more preferably, the end of the projection may not be observable from the outside when the toes are closed.

[0050] The reason for the above is as follows.

[0051] First, in the case of a shoe that exposes the toes, such as mules or sandals that do not cover the top of the foot with the upper leather, if the projection exceeds the height of the toes greatly, the projection jutting from between the toes becomes conspicuous, thus marring the appearance of the foot with the shoe on.

[0052] In the case of a shoe that covers the top of the foot with the upper leather, if the height of the projection as a whole is too large, the projection may become caught by the upper leather and become unusable, or the projection may push up the upper leather and create an unnatural bulge on the shoe, thereby marring the design.

[0053] On the other hand, when the height of the projection as a whole does not exceed the height of the toes greatly, the likelihood of spoiling the design can be decreased even in the case of the shoe with the toe-exposing design or the shoe with the upper leather, whereby increased versatility can be obtained. Further, when the height of the projection is lower than the height of the toes, the likelihood of spoiling the design can be further decreased. When the end of the projection is not visible from the outside with the toes closed, the likelihood of spoiling the design can be even more decreased.

(Material of projection)

[0054] The material of the projection is not particularly limited. For example, the same material as the material of the base is used.

[0055] When a transparent material is used, the projection becomes less conspicuous, so that the design of the shoe may be marred less. When a transparent material is used for both the projection and the base, the design of the shoe may be marred even less.

(Hardness of projection)

[0056] Preferably, the hardness of the projection may be in the range of from 30 degrees to 70 degrees, as in the case of the base. When the hardness is greater than 70 degrees, the likelihood of causing a sense of discomfort when the projection is held between the toes may be increased. Conversely, when the hardness is less than 30 degrees, the projection may not be able to sufficiently bear the force applied to the projection, and may become bent. More preferably, the range may be from 35 degrees to 65 degrees, in which case a particularly enhanced foot comfort may be obtained. When the projection is soft in the vicinity of the surface contacting the toes and hard at other portions, the projection can maintain a strength such that the projection is not bent while the likelihood of causing a sense of discomfort in the toes is reduced.

<Embodiment 1 Effect>

[0057] The insole according to the present embodiment is an insole that has the versatility of being used in various shoes and that can prevent forward slipping with the projection, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is decreased.

«Embodiment 2»

<Embodiment 2: Outline>

[0058] The insole according to the present embodiment is based on the insole according to Embodiment 1 and characterized by the configuration of the front edge on the toe side of the base. The base according to the present embodiment lacks a part on the toe side that contacts the third toe, the fourth toe, and the fifth toe. This configuration eliminates the likelihood of the toes being constrained by the thickness of the base even when there is little gap between the toes and the upper leather of the shoe. However, if the toes and the edge of the base contact each other strongly, a sense of discomfort may be caused in the bottom of the foot by the bottom of the foot contacting the step formed between the base and the inner bottom surface of the shoe. Thus, in the insole according to the present embodiment, the toe-side front edge and the foot have a relative positional relationship such that a sense of discomfort is not readily caused in the bottom of the foot.

<Embodiment 2: Configuration>

[0059] The insole according to the present embodiment includes the base and the projection. The insole,

the base, and the projection are similar to those described with reference to Embodiment 1 with the exception of the following.

[0060] The relative positional relationship between the toe-side front edge of the base of the insole according to the present embodiment and the foot will be described.

[0061] FIG. 3 illustrates the positional relationship between the insole according to the present embodiment and the foot. A "case in which the projection is used by being held between the great toe and the second toe of the foot" refers to the case in which, as illustrated in FIG. 3(a), the projection (0303) of the insole (0301) is used by being held between the great toe and the second toe of the foot (0304) with the heel side of the projection abutting on the crotch of the toes. FIG. 3(a) illustrates the insole according to the present embodiment and the foot overlapping each other as observed in such a state of use.

[0062] The base (0302) of the insole according to the present embodiment is configured such that the toe-side front edge in the vicinity of the third toe, the fourth toe, and the fifth toe is positioned in the vicinity of the middle of each of the proximal phalanges from the third proximal phalanx to the fifth proximal phalanx. The "toe-side front edge in the vicinity of the third toe, the fourth toe, and the fifth toe" refers to the toe-side front edge that overlaps a portion of the foot in the vicinity of the third toe, the fourth toe, and the fifth toe, the portion being in the vicinity of an area enclosed by broken lines 0305 in FIG. 3(a).

[0063] The "position in the vicinity of the middle of each of the proximal phalanges from the third proximal phalanx to the fifth proximal phalanx" will be described. FIG. 3(b) is an anatomical diagram of the foot. As illustrated, the toes of the foot from the great toe to the fifth toe include the first proximal phalanx (0351), the second proximal phalanx (0352), the third proximal phalanx (0353), the fourth proximal phalanx (0354), and the fifth proximal phalanx (0355), respectively. The position in the vicinity of the middle of each of the proximal phalanges from the third proximal phalanx to the fifth proximal phalanx corresponds to a portion 0361 enclosed by broken lines.

[0064] The portion in the vicinity of the middle of each of the proximal phalanges corresponds to the roots of the toes. The roots form a concave shape with respect to the ground, and therefore never touch the ground strongly. Thus, when the front edge of the base is positioned in the vicinity of the middle of each proximal phalanx, the front edge of the base can be positioned in such a way as not to readily contact the bottom of the foot, even when the shape of the base is not identical to the overall shape of the inner bottom surface of the shoe but is lacking a part on the toe side. Accordingly, the likelihood of the step formed between the base and the inner bottom surface of the shoe causing a sense of discomfort in the bottom of the foot can be reduced, whereby enhanced foot comfort can be obtained.

<Embodiment 2: Effect>

[0065] The insole according to the present embodiment is an insole that has the versatility of being used in various shoes, and that can prevent forward slipping with the projection, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is reduced. Further, the likelihood of the step formed between the base and the inner bottom surface of the shoe causing a sense of discomfort in the bottom of the foot is reduced, whereby enhanced foot comfort can be obtained.

«Embodiment 3»

<Embodiment 3: Outline>

[0066] The insole according to the present embodiment is based on Embodiment 1 or 2 and further characterized by the configuration of the thickness of the base.

<Embodiment 3: Configuration>

[0067] Referring again to FIG. 3(a), the insole according to the present embodiment (0301) includes the base (0302) and the projection (0303). The insole, the base, and the projection are similar to those described with reference to Embodiment 1 or 2 with the exception of the following.

[0068] The base is <1> relatively thin in the vicinity of a portion corresponding to the heads of the second and third metatarsal bones, and <2> relatively thick in the vicinity of a portion corresponding to the middle between the heads of the first and second metatarsal bones.

(<1> Configuration in the vicinity of the portion corresponding to the heads of the second and third metatarsal bones)

[0069] The "heads of the second and third metatarsal bones" will be described with reference to FIG. 3(b). As illustrated in the diagram, the foot includes the first metatarsal bone (A) to the fifth metatarsal bone (E). The toe side of the metatarsal bones (A to E) is called the head of the metatarsal bone, as in the head of the first metatarsal bone (0356), the head of the second metatarsal bone (0357), the head of the third metatarsal bone (0358), the head of the fourth metatarsal bone (0359), and the head of the fifth metatarsal bone (0360).

[0070] The "vicinity of the portion corresponding to the heads of the second and third metatarsal bones" refers to an area in the vicinity of the portion corresponding to the head of the second metatarsal bone and the head of the third metatarsal bone of the foot, specifically to a portion enclosed by broken lines 0362. This portion forms a convex shape that strongly contacts the ground when the heel of the foot during walking or running is lifted away

from the ground and then the toes kick the ground.

[0071] As illustrated in FIG. 3(a), in the insole according to the present embodiment, the base is relatively thin in the vicinity of the portion corresponding to the heads of the second and third metatarsal bones. Specifically, a shaded portion 0306 is relatively thin, for example.

[0072] With reference to FIGS. 2A and 2B, the relatively thin configuration will be further described. In (a) and (d) of these diagrams, a shaded portion 0207 has a concave shape and is relatively thin. Preferably, the portion may have a gently curved concave cross section so as not to cause a sense of discomfort in the bottom of the foot. Thus, the boundary between the thin portion and the other portions may not be clear.

[0073] When the base is relatively thin in the vicinity of the portion corresponding to the heads of the second and third metatarsal bones, the convex shape of the bottom of the foot and the base can closely contact each other during walking or running, whereby the frictional force between the bottom of the foot and the base is relatively increased. Thus, the force applied to the projection can be decreased, and the likelihood of the projection becoming broken, such as by separation, or the likelihood of causing pain in the crotch of the toes holding the projection can be decreased. Because the convex shape of the bottom of the foot and the concave shape of the base have a corresponding relationship, the friction between the bottom of the foot and the base can be increased. As a result, the bottom of the foot can be prevented from readily slipping with respect to the base.

(<2> Configuration in the vicinity of the portion corresponding to the middle between the heads of the first and second metatarsal bones)

[0074] The "vicinity of the portion corresponding to the middle between the heads of the first and second metatarsal bones" will be described with reference to FIG. 3(b). The "vicinity of the portion corresponding to the middle between the heads of the first and second metatarsal bones" refers to an area in the vicinity of a portion corresponding to the middle between the head of the first metatarsal bone (0356) and the head of the second metatarsal bone (0357) of the foot, specifically to a portion 0363 enclosed by broken lines in FIG. 3(b). This portion corresponds to the peripheral edge of the bulge in the vicinity of the root of the great toe on the bottom of the foot, and is a portion that form a concave shape with respect to the ground. The bulge in the vicinity of the root of the great toe refers to a portion 0506 in FIG. 5(b).

[0075] As illustrated in FIG. 3(a), in the insole according to the present embodiment, the base is relatively thick in the vicinity of the portion corresponding to the middle between the heads of the first and second metatarsal bones. Specifically, a shaded portion 0307 is relatively thick, for example.

[0076] With reference to FIGS. 2A and 2B, the relatively thick configuration will be further described. In (a) and (d) of these diagrams, a shaded portion 0208 has a convex shape and is relatively thick. Preferably, as illustrated in these diagrams, the convex cross section is gently curved so as not to cause a sense of discomfort in the bottom of the foot. Thus, the boundary between the thick portion and the other portions may not be clear. The thick portion may not necessarily be thick relative to a gently curved surface formed in a portion of the base corresponding to the concave part at the root of the great toe, as will be described below.

[0077] When the base is relatively thick in the vicinity of the portion corresponding to the middle between the heads of the first and second metatarsal bones, the concave shape of the bottom of the foot and the base can closely contact each other, whereby the frictional force between the bottom of the foot and the base is relatively increased. Thus, the force applied to the projection can be decreased, whereby the likelihood of the projection becoming broken, such as by separation, and the likelihood of causing pain in the crotch of the toes holding the projection can be decreased.

[0078] Further, as illustrated in FIG. 3(a), the insole according to the present embodiment may be configured such that a portion of the base corresponding to the concave part at the root of the great toe is relatively thick. Specifically, an area in the vicinity of a portion 0308 indicated by a broken line may be thick. The concave part at the root of the great toe refers to a portion 0507 in FIG. 5(b).

[0079] With reference to FIGS. 2A and 2B, the relatively thick configuration will be further described. In (a), (d), and (f) of these diagrams, the portion of the base corresponding to the concave part at the root of the great toe has a convex shape with an apex located at a portion 0209 indicated by a broken line, and is relatively thick. Preferably, as illustrated in FIG. 2B(f), the convex portion is gently curved so as not to cause a sense of discomfort in the bottom of the foot. Thus, the boundary between the thick portion and the other portions may not be clear.

[0080] When the portion of the base corresponding to the concave part at the root of the great toe is relatively thick, the concave shape on the bottom of the foot and the base can contact each other even more closely, whereby the frictional force between the bottom of the foot and the base is relatively increased. Thus, the force applied to the projection can be decreased, whereby the likelihood of the projection becoming broken, such as by separation, and the likelihood of causing pain in the crotch of the toes holding the projection can be further decreased.

[0081] Because of the elevation formed serving as a wall against the direction of shift in foot pressure, the bottom of the foot is prevented from easily slipping with respect to the base in this respect, too. The direction of shift in foot pressure is the direction in which the center of pressure moves, as will be described below. Specifically, the direction is from the heel side toward the toe side on a line of movement 0403 of the center of pressure

during walking, as illustrated in FIG. 4A.

<Embodiment 3: Effect>

[0082] The insole according to the present embodiment is an insole that has the versatility of being used in various shoes, and that can prevent forward slipping with the projection, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is decreased.

[0083] Because the base has thicknesses conforming to the concave or convex shape on the bottom of the foot, the bottom of the foot and the base can closely contact each other. Thus, the frictional force between the bottom of the foot and the base is relatively increased, whereby the force applied to the projection can be decreased. As a result, the likelihood of the projection becoming broken, such as by separation, or the likelihood of causing pain in the crotch of the toes holding the projection can be decreased. Further, the friction between the bottom of the foot and the base can be increased, so that the bottom of the foot is prevented from readily slipping with respect to the base.

«Embodiment 4»

<Embodiment 4: Outline>

[0084] The insole according to the present embodiment is based on any one of Embodiments 1 to 3 and further characterized by the lateral shape of the projection which corresponds to the shape of the dorsal fin of the dolphin.

<Embodiment 4: Configuration>

[0085] Reference is made to FIG. 2A again. The insole according to the present embodiment includes the base and the projection. The insole, the base, and the projection are similar to those described with reference to Embodiments 1 to 3 with the exception of the following.

[0086] As illustrated in FIG. 2A(b), the projection (0203) as viewed from the side has a lateral shape corresponding to the shape of the dorsal fin of the dolphin, with the height gradually increasing from the front of the foot toward the rear of the foot. In the diagram, the direction from the front of the foot toward the rear of the foot is indicated by an arrow 0206.

(Shape conforming to the shape of gap between great toe and second toe of foot)

[0087] The shape of the dorsal fin of the dolphin conforms to the shape of the gap between the great toe and the second toe of the foot. The "shape of the gap between the great toe and the second toe of the foot" will be described. Because the toes are shaped like columns, a triangular gap is formed between the toes, with the ground providing the base of the triangle.

[0088] FIG. 5 illustrates the gap formed between the foot and the ground. FIG. 5(a) is a plan view, FIG. 5(b) is a side view of the foot as viewed from the great toe side, and FIG. 5(c) is a cross sectional view of the great toe and the second toe of the foot as observed in a cross section taken perpendicular to the direction of travel by walking.

[0089] The great toe (0502) in particular of the foot (0501) is thick in the vicinity of the interphalangeal joint (IP joint, 0504), the shape becoming gradually thinner toward the rear from the interphalangeal joint (IP joint) of the great toe of the foot. In addition, as illustrated in FIG. 5(b), the roots of the toes are recessed from the ground. Thus, when the gap formed between the ground and the toes (the great toe and the second toe) of the foot placed on the ground is observed in a cross section perpendicular to the direction of travel by walking, the gap has a triangular shape (the shaded portions in the diagram) formed by the ground (0505), the great toe (0502), and the second toe (0503), the height of the triangle gradually increasing toward the rear, as illustrated in FIG. 5(c).

[0090] The projection according to the present embodiment has a shape closely matching this space. Namely, the projection of the insole according to the present embodiment has a lateral shape corresponding to the shape of the dorsal fin of the dolphin, with the height gradually increasing from the front of the foot toward the rear of the foot in conformity to the shape of the gap.

[0091] When the shape conforms to the gap between the toes, the likelihood of causing a sense of discomfort can be decreased when the projection is held between the toes. Further, the area of contact between the toes and the projection is increased, whereby the foot can be supported not just by the crotch of the toes but in larger areas, so that the likelihood of causing pain in the crotch of the toes can be decreased.

(Shape that does not easily cause sense of discomfort in toes while ensuring strength)

[0092] Unless the projection has a certain length toward the front of the foot, the projection may be bent and fail to support the foot without forward slipping. Furthermore, in order to prevent the projection and the base from being separated from each other and becoming broken, the projection may be joined to the base in as large an area as possible.

[0093] If the projection has a uniform cross section from top to bottom, the following inconvenience may arise. The space formed between the great toe and the second toe of the foot becomes gradually narrower from the ground toward the top and then becomes wider again. Thus, in the case of a columnar structure projection with a uniform droplet-like shape from top to bottom, for example, the projection held between the great toe and the second toe does not conform to the variation in the width

of the space between the great toe and the second toe, thus tending to cause a sense of discomfort in the toes.

[0094] In order to maximize the area in which the projection and the base are joined, and to prevent the sense of discomfort between the toes, the width of the projection is gradually decreased from the ground side (base side) toward the top. Further, the space formed between the great toe and the second toe becomes narrower toward the front of the toes. Thus, the projection may have a droplet-like shape with the width gradually decreasing from the ground side (base side) toward the top, and with the height decreased toward the front of the foot.

[0095] This is because of the fact that the toes are shaped like columns and have a gap between the toes on the side contacting the ground, so that a part of the projection may be positioned in the gap without much likelihood of causing a sense of discomfort in the toes.

[0096] When the height of the projection is gradually increased toward the rear of the foot, the insole does not easily cause a sense of discomfort in the toes while the projection is strong enough not to be bent.

[0097] The "shape of the orsal fin of the dolphin" expresses the state in which the projection protrudes substantially vertically on the side toward the rear of the foot, the height gradually increasing from the front of the foot toward the rear of the foot. "Substantially vertically" is intended to include the case in which the projection is inclined slightly toward the front or rear of the foot. The rear portion of the projection as viewed from the side may be curved in keeping with the shape of the crotch of the toes.

<Embodiment 4: Effect>

[0098] The insole according to the present embodiment is an insole that has the versatility of being used in various shoes, and that can prevent forward slipping with the projection, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is further decreased.

<<Embodiment 5»

<Embodiment 5: Outline>

[0099] The insole according to the present embodiment is based on any one of Embodiments 1 to and is further characterized in that the base is provided with an anti-slipping pattern.

[0100] The insole may be provided with the anti-slipping pattern irrespective of the configurations according to Embodiments 1 and 4.

<Embodiment 5: Configuration>

[0101] The insole according to the present embodiment includes the base and the projection, and the base includes the "anti-slipping pattern". The insole, the base, and the projection are similar to those described with reference to Embodiments 1 and 4 with the exception of the following. However, in a sixth invention, the configuration including the base and the projection is not essential, and the "base of the insole" described in the following in the present specification will be interpreted as being the "insole".

(Anti-slipping pattern)

[0102] The anti-slipping pattern has the function of particularly increasing the frictional force between the bottom of the foot and an insole contact surface in a direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and/or to the direction in which the bottom of the foot tends to slip while standing still.

(Line of movement of the center of pressure during walking)

[0103] The "line of movement of the center of pressure during walking" will be described.

[0104] The "line of movement of the center of pressure during walking" refers to the trajectory of the center of pressure (COP) during walking.

[0105] The "center of pressure" will be described. When the bottom of the foot is observed during walking, (1) the heel touches ground; (2) the entire bottom surface of the foot makes contact; (3) the entire weight is placed on the entire bottom surface of the foot; and (4) the heel rises and the foot kicks ground. In this process of walking, the center of load applied from the bottom of the foot onto the inner bottom surface of the shoe is varied. The load is referred to as the foot bottom pressure, and the foot bottom pressure calculated on the assumption that the force from the bottom of the foot in contact with the ground is concentrated at the center of gravity of the foot is referred to as "the center of pressure". This may be considered as the movement of the center of gravity at the bottom of the foot. The line of movement of the center of pressure during walking varies depending on the walking speed. Thus, the shoe may be designed based on the assumed line of movement of the center of pressure in accordance with the main mode of use of the shoe, such as a shoe for normal walking as the main purpose, or a shoe for running as the main purpose.

[0106] FIG. 4A illustrates the relationship between the line of movement of the center of pressure during walking and the anti-slipping pattern on the base of the insole.

[0107] FIG. 4A(a) illustrates how the bottom of the foot (0401) and the insole (0404) overlap each other. In the diagram, shaded portions 0402 indicate the areas of the bottom of the foot that contact the inner bottom surface of the shoe during walking. The line 0403 is the line of movement of the center of pressure during walking.

[0108] As illustrated, the line of movement of the center

of pressure during walking exhibits a gradual curve which: (1) extends slightly outward after the heel touches ground; (2) proceeds as is; (3) and advances substantially in the direction of the gap between the great toe and the second toe while curving.

[0109] Thus, on the base (referring to the area in the vicinity of the portion enclosed by broken lines 0405; the same applies hereafter in the present specification) of the insole (0404), the anti-slipping pattern for suppressing the slipping of the bottom of the foot may be formed in accordance with the position relative to the foot. The anti-slipping pattern suppresses the slipping of the bottom of the foot by particularly increasing the frictional force between the bottom of the foot and the insole contact surface in a direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking. The pattern may be formed by embossing or grooving, for example.

[0110] An example of the pattern is illustrated in FIG. 4A(a). In the illustrated example, as seen in the cross sectional view shown in FIG. 4A(b), ridges (0406) with a gently sloping mountain-shaped cross section are formed perpendicular to the line of movement of the center of pressure during walking. Only some of the ridges are designated with the sign (specific configurations of the anti-slipping pattern will be described below).

[0111] Thus, the anti-slipping pattern for particularly increasing the frictional force between the bottom of the foot and the insole contact surface is formed by embossment, grooves, or the like in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, the line exhibiting the "gradual curve" as a whole which: (1) extends slightly outward after the heel touches ground; (2) proceeds as is; (3) and advances substantially in the direction of the gap between the great toe and the second toe while curving. Accordingly, the contact between the bottom of the foot and the base can be ensured, and the walking stability can be increased.

(Direction in which bottom of foot tends to slip while standing still)

[0112] Next, the "direction in which the bottom of the foot tends to slip while standing still" will be described.

[0113] FIG. 4B is a diagram for describing the relationship between the direction in which the bottom of the foot tends to slip while standing still and the anti-slipping pattern on the base (0405) of the insole (0404). In the diagram, the shaded portions designated with the sign 0402 indicate the areas in which the bottom of the foot (0401) contacts the inner bottom surface of the shoe during walking. When a high-heeled shoe is used and the wearer is standing still, a force that tends to cause the bottom of the foot to slip toward the toe side, and an opposing frictional force between the bottom of the foot and the insole contact surface are present. Namely, while standing still, the direction of the force that tends to cause the bottom of the foot to slip toward the toe side corresponds to the direction of a straight line connecting substantially the center of the heel of the foot and the distal end of the second toe. Specifically, the direction in which the bottom of the foot tends to slip while standing still is the direction, indicated by an arrow 0407, from the heel of the foot toward the toe, as illustrated in FIG. 4B. The direction substantially opposite to the direction in which the bottom of the foot tends to slip while standing still is the direction of the frictional force between the bottom of the foot and the insole contact surface that opposes the force causing the bottom of the foot to slip.

(Particularly increase the frictional force between the bottom of foot and the insole contact surface)

[0114] "Particularly increase" is intended to indicate that there may be a case in which the frictional force may be decreased in a direction other than a specific direction. A conventional anti-slipping pattern may be formed by embossing such that polka dot-like raised portions are formed on the base at uniform intervals. In this case, the effect of particularly increasing the frictional force with respect to one or two directions is not obtained. On the other hand, the base of the insole according to the present embodiment is characterized in that the frictional force between the bottom of the foot and the insole contact surface is particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and/or the direction in which the bottom of the foot tends to slip while standing still.

[0115] In the insole according to the present embodiment, the anti-slipping pattern is formed to catch the bottom of the foot that tends to slip during walking and/or while standing still. Thus, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased, whereby the foot can be prevented from slipping forward.

(Examples of specific configuration of anti-slipping pattern)

[0116] As illustrated in FIG. 4A(a), a plurality of ridges (0406) perpendicular to the line of movement (0403) of the center of pressure during walking may be disposed at substantially equal intervals. In this case, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking. The cross sectional shape of the ridges taken along the line of movement of the center of pressure during walking may include a semicircular or triangular shape. Alternatively, the cross sec-

tional shape may include a gently sloping hill shape, as illustrated in FIG. 4A(b) and (c). In this case, the likelihood of dirt entering the boundary between the ridges and the base may be decreased. Alternatively, the cross sectional shape may be asymmetric between the front and rear in the direction in which the bottom of the foot tends to slip, as illustrated in FIG. 4A(d), with a steep slope on the heel side surface and a gradual slope on the toe side surface. In this case, the steeply sloped surface is disposed on the side that catches the bottom of the foot as the foot tends to slip along the line of movement of the center of pressure during walking. Thus, the effect that the bottom of the foot that tends to slip at this portion can be firmly caught is obtained. Furthermore, because the toe side surface is a gradual slope, the effect that the resistance felt when putting off the shoe can be reduced is obtained. It is also possible to achieve a similar configuration with grooves, as illustrated in FIG. 4A(e), instead of with ridges.

[0117] As illustrated in FIG. 4B, a plurality of ridges (0408) perpendicular to the direction (0407) in which the bottom of the foot tends to slip while standing still may be disposed at substantially equal intervals. In this case, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip while standing still. The cross sectional shape of the ridges taken along the direction in which the bottom of the foot tends to slip while standing still may include a semicircular shape, a triangular shape, or a gently sloping hill shape, as in the case in which the ridges are perpendicular to the line of movement of the center of pressure during walking. In the case of the gently sloping hill shape, the likelihood of dirt entering the boundary between the ridges and the base may be decreased. Also similarly, the cross sectional shape may be asymmetrical between the front and rear in the direction in which the bottom of the foot tends to slip, with a steep slope on the heel side surface and a gradual slope on the toe side surface. In this case, the steeply sloped surface is disposed on the side that catches the bottom of the foot that tends to slip while standing still. Thus, the effect that the bottom of the foot that tends to slip at this portion can be firmly caught is obtained. Furthermore, because the toe side surface is a gradual slope, the effect that the resistance felt when putting off the shoe can be decreased is obtained. A similar configuration may be obtained with grooves instead of with the ridges.

[0118] FIG. 4C illustrates an example of the insole in which the frictional force between the bottom of the foot and the insole contact surface is particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and the direction in which the bottom of the foot tends to slip while standing still. The shaded portions designated with the sign 0402 in the diagram indicate the areas of contact of the bottom of the foot (0401) with the inner bottom surface of the shoe during walking. As illustrated, a plurality of ridges (0406) perpendicular to the line of movement (0403) of the center of pressure during walking may be disposed at substantially equal intervals while, at portions away from the line of movement of the center of pressure during walking, a plurality of ridges (0408) perpendicular to the direction (0407) in which the bottom of the foot tends to slip while standing still may be disposed at substantially equal intervals. In this case, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in directions substantially opposite to both the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and the direction in which the bottom of the foot tends to slip while standing still. The cross sectional shape of the ridges taken along the line of movement of the center of pressure during walking and/or the direction in which the bottom of the foot tends to slip while standing still may include a semicircular shape, a triangular shape, or a gently sloping hill shape. Alternatively, the cross sectional shape may be asymmetrical between the front and rear in the direction in which the bottom of the foot tends to slip, with a steep slope on the heel side surface and a gradual slope on the toe side surface. It is also possible to obtain a similar configuration with grooves instead of with ridges.

(Another example of specific configuration of anti-slipping pattern)

[0119] FIGS. 6A to 6C illustrate another example of the specific configuration of the anti-slipping pattern. As illustrated in these diagrams, the anti-slipping pattern may have a wavy configuration.

[0120] FIG. 6A illustrates an example of the insole in which the frictional force between the bottom of the foot and the insole contact surface is particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking. The shaded portions designated with the sign 0602 indicate the areas of contact of the bottom of the foot (0601) with the inner bottom surface of the shoe during walking (the same applies in the following with reference to FIGS. 6B and 6C). In the diagram, the line indicated by the sign 0603 is the line of movement of the center of pressure during walking. On the base (0605) of the insole (0604), wavy ridges (0606) are disposed perpendicular to the line of movement of the center of pressure during walking. Thus, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking. With the wavy ridges, particularly the lateral wobbling of the foot can be decreased, whereby the walk-

ing comfort can be further improved.

[0121] FIG. 6B illustrates an example of the insole in which the frictional force between the bottom of the foot and the insole contact surface is particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip while standing still. On the base (0605) of the insole (0604), wavy ridges (0608) are disposed perpendicular to the direction (0607) in which the bottom of the foot tends to slip while standing still. Thus, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip while standing still. With the wavy ridges, particularly the lateral wobbling of the foot can be decreased, whereby the walking comfort can be further improved.

[0122] FIG. 6C illustrates an example of the insole in which the frictional force between the bottom of the foot and the insole contact surface is particularly increased in the directions substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and the direction in which the bottom of the foot tends to slip while standing still. As illustrated in the diagram, a plurality of wavy ridges (0606) perpendicular to the line of movement (0603) of the center of pressure during walking may be disposed at substantially equal intervals while, at portions away from the line of movement of the center of pressure during walking, a plurality of wavy ridges (0608) perpendicular to the direction (0607) in which the bottom of the foot tends to slip while standing still may be disposed at substantially equal intervals. In this case, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in the directions substantially opposite to both the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and the direction in which the bottom of the foot tends to slip while standing still.

(Another example of specific configuration of anti-slipping pattern)

[0123] FIGS. 7A to 7C illustrate another example of the specific configuration of the anti-slipping pattern. As illustrated in the diagrams, the anti-slipping pattern may include a plurality of convex shapes that provides a particularly high frictional force between the bottom of the foot and the insole contact surface with respect to a specific direction. An example of the convex shapes will be described. FIG. 7A(b) illustrates a crescent-shaped convex shape as an example of the convex shapes, as viewed from above. As illustrated in the diagram, the convex shapes may include a shape similar to a crescent shape. FIG. 7A(c) illustrates a lateral shape of the convex shapes. FIG. 7A(d) illustrates a cross sectional shape of the convex shapes taken along a left-right line of symmetry (0709), which will be described below. As illustrated in FIG. 7A(d), of the two arcs forming the crescent shape, the inner arc (on the side of arrow A in FIG. 7A(b)) has a slope angle α greater than a slope angle β of the outer arc (on the side of arrow B in FIG. 7A(b)). FIG. 7A(e) illustrates the convex shape as viewed from the side of arrow A.

[0124] In FIG. 7A(a), the shaded portions designated with the sign 0702 indicate the areas of contact of the bottom of the foot (0701) with the inner bottom surface of the shoe during walking (the same applies hereafter with reference to FIGS. 7B and 7C). The line designated with the sign 0703 is the line of movement of the center of pressure during walking. On the base (0705) of the insole (0704), a plurality of crescent-shaped convex shapes (0706) may be disposed with the left-right line of symmetry parallel with the line of movement (0703) of the center of pressure. The "left-right line of symmetry" of the crescent-shaped convex shape refers to a broken line 0709 indicated in FIG. 7A(b). Of the two arcs forming the crescent shape, the inner arc (on the side of arrow A in FIG. 7A(b)) is disposed on the heel side. In this case, the frictional force between the bottom of the foot and the insole contact surface can be particularly increased in the direction substantially opposite to the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, while the lateral wobbling of the foot can be decreased by the side portions of the crescent-shaped convex shapes. Thus, walking comfort can be even more improved.

[0125] Alternatively, as illustrated in FIG. 7B, a plurality of crescent-shaped convex shapes (0708) may be disposed with the left-right line of symmetry parallel with the direction (0707) in which the bottom of the foot tends to slip while standing still. Furthermore, as illustrated in FIG. 7C, as in the ridge arrangement described above, a plurality of the crescent-shaped convex shapes (0706) may be disposed with the left-right line of symmetry parallel with the line of movement of the center of pressure during walking (0703) while, in portions away from the line of movement of the center of pressure during walking, a plurality of the crescent-shaped convex shapes (0708) may be disposed with the left-right line of symmetry parallel with the direction (0707) in which the bottom of the foot tends to slip while standing still. In the diagram, there are portions in which gaps exist between the crescent-shaped convex shapes. In these portions, the crescent-shaped convex shapes (0706) with the left-right line of symmetry parallel with the line of movement of the center of pressure during walking (0703), or the crescent-shaped convex shapes (0708) with the left-right line of symmetry parallel with the direction (0707) in which the bottom of the foot tends to slip while standing still may be disposed as needed.

[0126] It is also possible to obtain similar configurations with openings instead of with the convex shapes.

(Substantially parallel arrangement of anti-slipping pattern)

[0127] The anti-slipping pattern may have a substantially parallel arrangement. The "substantially parallel arrangement" refers to the fact that there may be gaps between the ridges and the like (such as embossing, grooves, or openings) of the anti-slipping pattern, as will be described in the following with reference to FIG. 8.

[0128] FIGS. 8A and 8B are diagrams for describing the substantially parallel arrangement of the anti-slipping pattern. FIG. 8A(a) illustrates a case in which the ridges of the anti-slipping pattern (0802a) on the insole (0801 a) overlap each other and have no gaps. In this case, the skin on the bottom of the foot does not enter the areas between the ridges. Instead, only the bottom of the foot and the ridge portions contact each other. Thus, the operational effect of the insole according to the present embodiment that the frictional force between the bottom of the foot and the insole contact surface can be particularly increased by the ridges cannot be obtained. On the other hand, as illustrated in FIG. 8A(b), when there are gaps between the ridges of the anti-slipping pattern (0802b) on the insole (0801b), the skin on the bottom of the foot can enter the areas between the ridges, whereby the frictional force between the bottom of the foot and the insole contact surface can be particularly increased. While the diagram also shows the projection (0806), the projection is not an essential configuration of the sixth invention.

[0129] The anti-slipping pattern may include a wavy anti-slipping pattern of wavy ridges rather than linear ridges. In this case, the wavy ridges may be arranged as in the linear ridges. Namely, as illustrated in FIG. 8B(d), the wavy anti-slipping pattern (0802d) may be located within the frame of a rectangle (0803d) indicating the arrangement of the anti-slipping pattern on the insole (0801d). Meanwhile, FIG. 8B(c) illustrates a case in which the rectangles (0803c) indicating the arrangement of the wavy anti-slipping pattern (0802c) on the insole (0801c) overlap each other (i.e., the anti-slipping pattern does not have the parallel arrangement). When the anti-slipping pattern does not have the parallel arrangement, the frictional force between the bottom of the foot and the insole contact surface is not "particularly" increased in a specific direction (such as the direction substantially opposite to the direction, designated with 0804 in the diagram, in which the bottom of the foot tends to slip while standing still) by the anti-slipping pattern, as will be described in detail below.

[0130] FIG. 8B(c) illustrates the case in which the rectangles (0803c) indicating the arrangement of the wavy anti-slipping pattern (0802c) on the insole (0801c) overlap each other and do not have gaps. In this case, frictional forces for preventing the slipping of the bottom of the foot in various directions are produced by the wavy anti-slipping pattern between the bottom of the foot and the insole contact surface. Thus, the frictional force between the bottom of the foot and the insole contact surface is not "particularly" increased in the specific direction (such as the direction substantially opposite to the direction, designated with 0804 in the diagram, in which the bottom of the foot tends to slip while standing still).

[0131] On the other hand, in the case of FIG. 8B(d), there are gaps between the rectangles (0803b) indicating the arrangement of the wavy anti-slipping pattern (0802d) on the insole (0801d). With respect to the longitudinal direction (indicated by arrows 0805) of the gaps, the frictional force produced by the anti-slipping pattern between the bottom of the foot and the insole contact surface may be decreased compared with the case of FIG. 8B(c). However, the frictional force between the bottom of the foot and the insole contact surface can be "particularly" increased in the specific direction (such as the direction substantially opposite to the direction, designated with 0804 in the diagram, in which the bottom of the foot tends to slip while standing still). While the diagram also illustrates the projection (0806), the projection is not an essential configuration of the sixth invention.

<Embodiment 5: Effect>

[0132] The insole according to the present embodiment is an insole that has the versatility of being used in various shoes, and that can prevent forward slipping with the projection, the projection having a shape such that the likelihood of causing a sense of discomfort in the foot during use is decreased.

[0133] Furthermore, in the insole according to the present embodiment, the anti-slipping pattern for catching the bottom of the foot that tends to slip during walking and/or while standing still is formed, whereby the frictional force between the bottom of the foot and the insole contact surface can be particularly increased. Thus, the contact between the bottom of the foot and the base can be ensured, whereby the forward slipping of the foot can be further prevented, and walking stability can be increased.

[0134] Regardless of the configurations according to Embodiments 1 to 4, when the insole is provided with the anti-slipping pattern, the contact between the bottom of the foot and the base can be ensured, the forward slipping of the foot can be further prevented, and walking stability can be increased.

Brief Description of Drawings

[0135]

FIG. 1 is a conceptual perspective view of an example of the insole according to Embodiment 1.

FIG. 2A illustrates an example of the insole according to Embodiment 1.

FIG. 2B illustrates an example of the insole according to Embodiment 1.

FIG. 2C is a partial contour view of an example of

the insole according to Embodiment 1.
FIG. 3 is a diagram for describing the positional relationship between an example of the insole according to Embodiment 2 and the foot.
FIG. 4A is a diagram for describing the relationship between the line of movement of the center of pressure during walking and an anti-slipping pattern on the base of the insole according to Embodiment 5.
FIG. 4B is a diagram for describing the relationship between the direction in which the bottom of the foot tends to slip while standing still and the anti-slipping pattern on the base of the insole according to Embodiment 5.
FIG. 4C illustrates an example of the insole according to Embodiment 5 in which the frictional force between the bottom of the foot and the insole contact surface is particularly increased in the directions substantially opposite to both the direction in which the bottom of the foot tends to slip along the line of movement of the center of pressure during walking, and the direction in which the bottom of the foot tends to slip while standing still.
FIG. 5 is a diagram for describing a gap produced between the foot and the ground.
FIG. 6A illustrates another example of a specific configuration of the anti-slipping pattern of the insole according to Embodiment 5.
FIG. 6B illustrates another example of the specific configuration of the anti-slipping pattern of the insole according to Embodiment 5.
FIG. 6C illustrates another example of the specific configuration of the anti-slipping pattern of the insole according to Embodiment 5.
FIG. 7A illustrates another example of the specific configuration of the anti-slipping pattern of the insole according to Embodiment 5.
FIG. 7B illustrates another example of the specific configuration of the anti-slipping pattern of the insole according to Embodiment 5.
FIG. 7C illustrates another example of the specific configuration of the anti-slipping pattern of the insole according to Embodiment 5.
FIG. 8A is a diagram for describing a substantially parallel arrangement of the anti-slipping pattern.
FIG. 8B is a diagram for describing the substantially parallel arrangement of the anti-slipping pattern.

Reference Signs List

[0136]

0101	Insole
0102	Base
0103	Projection
0104	Foot
0105	Great toe of foot
0106	Second toe of foot

Claims

1. An insole comprising:

a base that contacts at least a part of the bottom of a foot; and
a projection that can be used by being held between the great toe and the second toe of the foot,
characterized in that:

the projection as observed in a cross section substantially parallel with the base has a longitudinally extended and droplet-like main shape with a length in a left-right direction of the foot shorter than a length in a longitudinal direction connecting the heel side and the toe side of the foot, the main shape becoming thinner toward the toe side.

2. The insole according to claim 1, **characterized in that**, when the projection is used by being held between the great toe and the second toe of the foot, a toe-side front edge of the base in the vicinity of the third toe, the form toe, and the fifth toe is disposed at a position corresponding to the vicinity of the middle of each of the proximal phalanges from the third proximal phalanx to the fifth proximal phalanx.

3. The insole according to claim 1 or 2, **characterized in that**:

the base is relatively thin in the vicinity of a portion corresponding to the heads of the second and third metatarsal bones; and
the base is relatively thick in the vicinity of a portion corresponding to the middle between the heads of the first and second metatarsal bones.

4. The insole according to any one of claims 1 to 3, wherein the projection as viewed from the side has a lateral shape corresponding to the shape of the dorsal fin of the dolphin with gradually increasing height from the front of the foot toward the rear of the foot.

5. The insole according to any one of claims 1 to 4, wherein:

the base includes an anti-slipping pattern for particularly increasing the frictional force between the bottom of the foot and an insole contact surface in a direction substantially opposite to a direction in which the bottom of the foot tends to slip along a line of movement of the center of pressure during walking, and/or a direction in which the bottom of the foot tends to

slip while standing still.

6. An insole comprising:

a base includes an anti-slipping pattern for particularly increasing the frictional force between the bottom of the foot and an insole contact surface in a direction substantially opposite parallel to a direction in which the bottom of the foot tends to slip along a line of movement of the center of pressure during walking, and/or a direction in which the bottom of the foot tends to slip while standing still.

FIG. 1

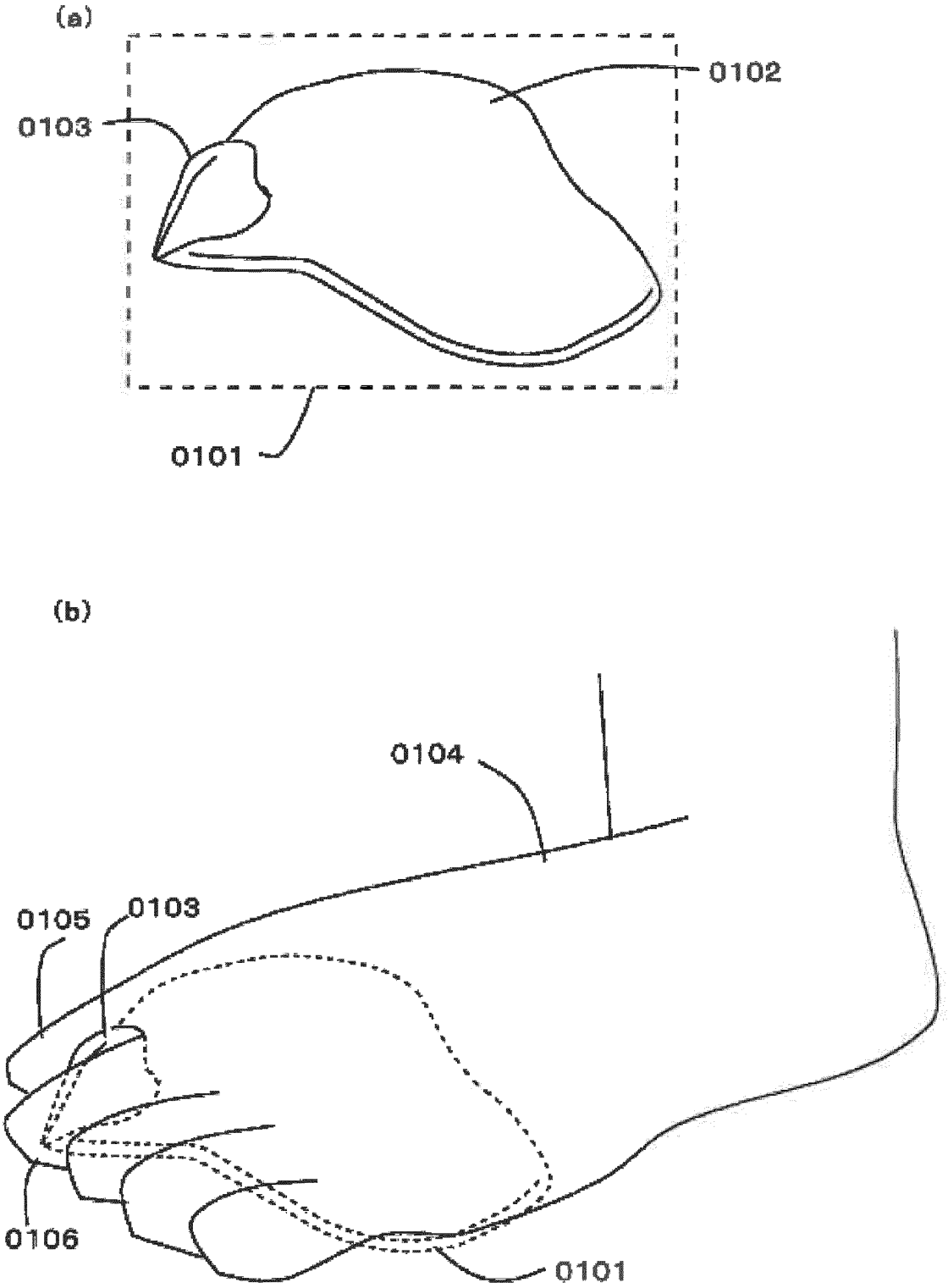


FIG. 2A

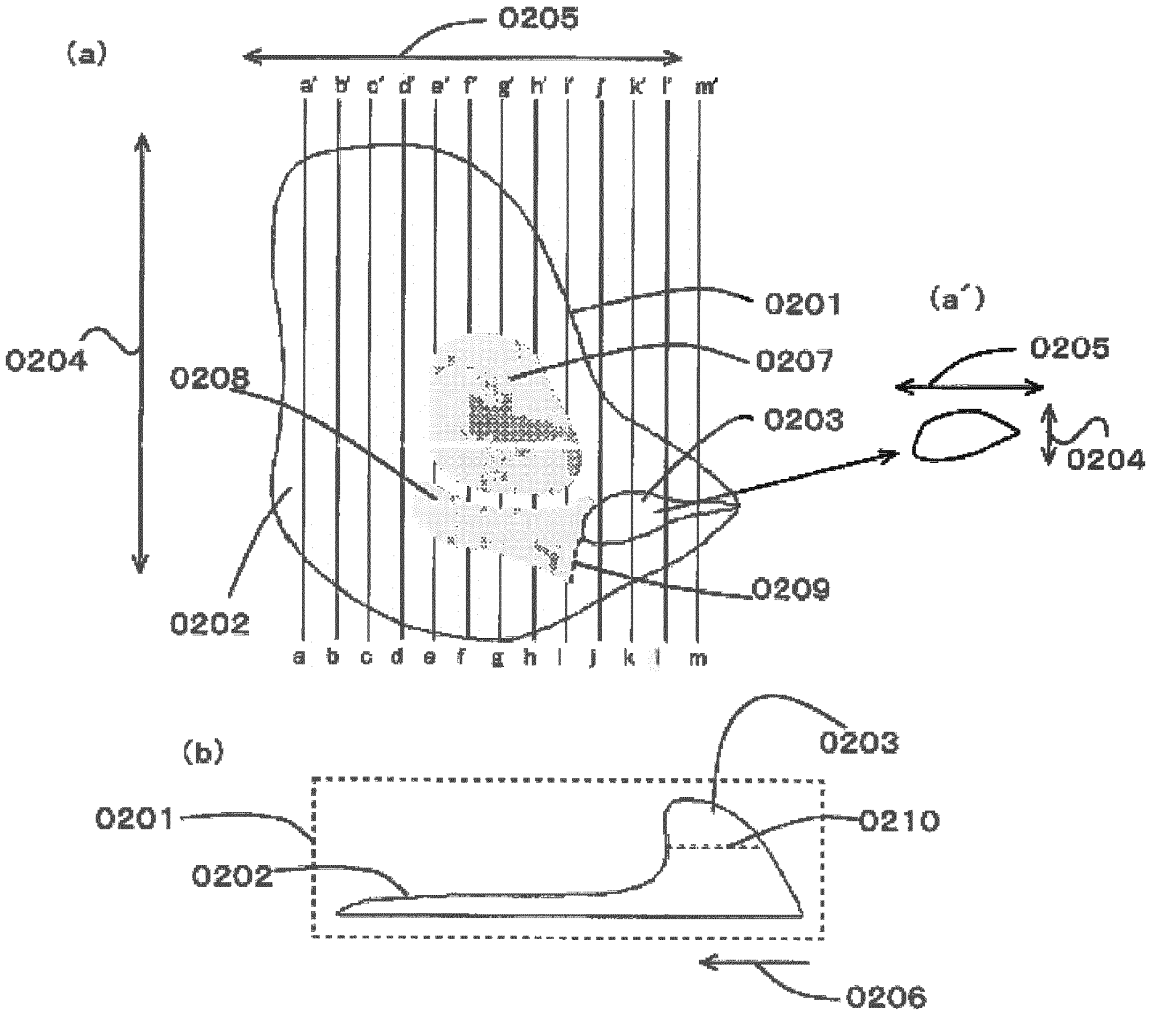

(a)
0205
a' b' c' d' e' f' g' h' i' j' k' l' m'
0204
0208
0201
0207
0203
0209
0202
a b c d e f g h i j k l m
(a')
0205
0204
(b)
0203
0201
0210
0202
0206
(c)
CROSS SECTION a-a'
CROSS SECTION b-b'
CROSS SECTION c-c'
CROSS SECTION d-d'
CROSS SECTION e-e'
CROSS SECTION f-f'
CROSS SECTION g-g'
CROSS SECTION h-h'
CROSS SECTION i-i'
CROSS SECTION j-j'
CROSS SECTION k-k'
CROSS SECTION l-l'
CROSS SECTION m-m'

FIG. 2B

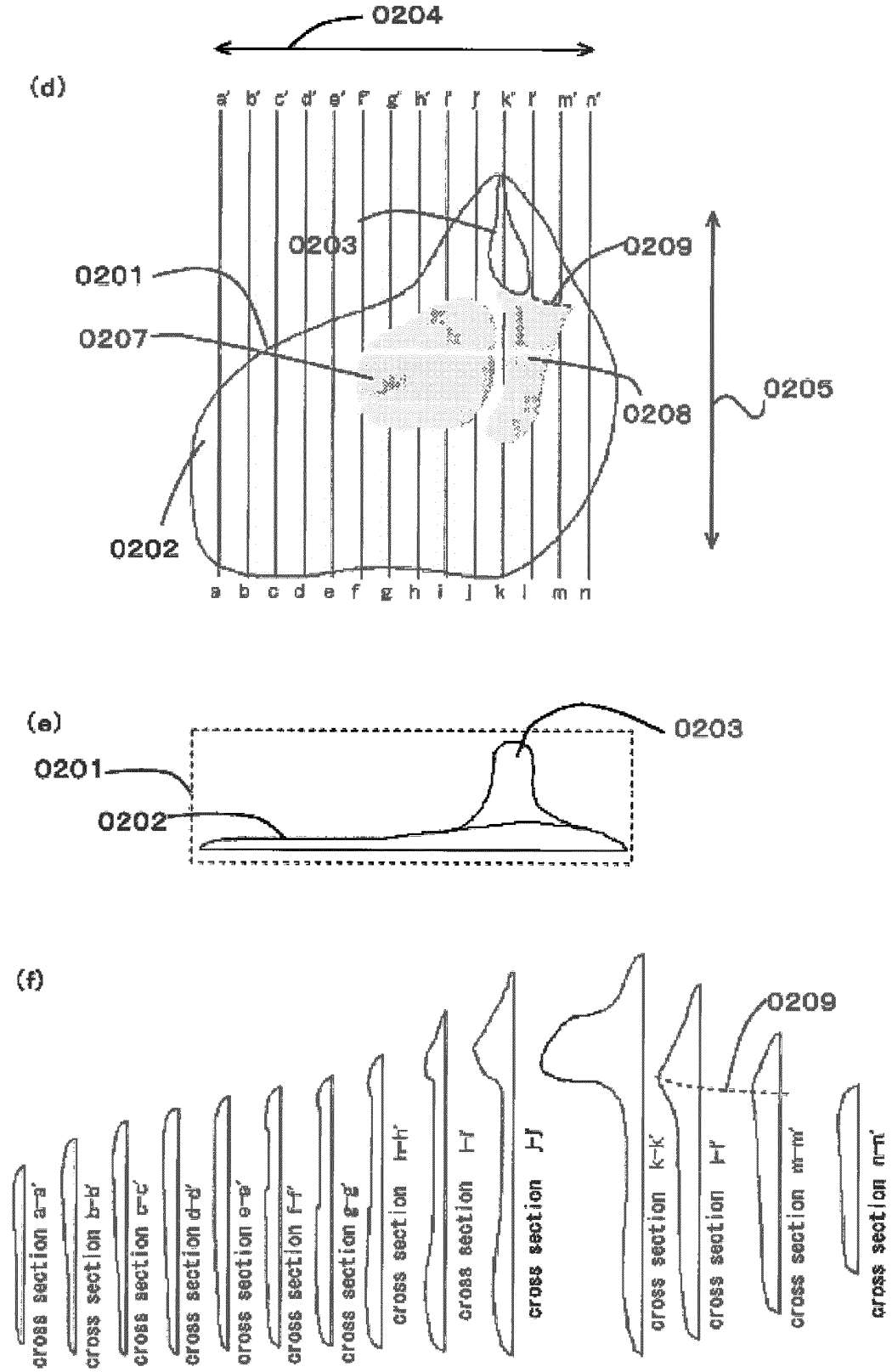

0204
(d)
a' b' c' d' e' f' g' h' i' j' k' l' m' n'
0203
0209
0201
0207
0208
0205
0202
a b c d e f g h i j k l m n
(e)
0203
0201
0202
(f)
0209
cross section a-a'
cross section b-b'
cross section c-c'
cross section d-d'
cross section e-e'
cross section f-f'
cross section g-g'
cross section h-h'
cross section i-i'
cross section j-j'
cross section k-k'
cross section l-l'
cross section m-m'
cross section n-n'

FIG. 2C

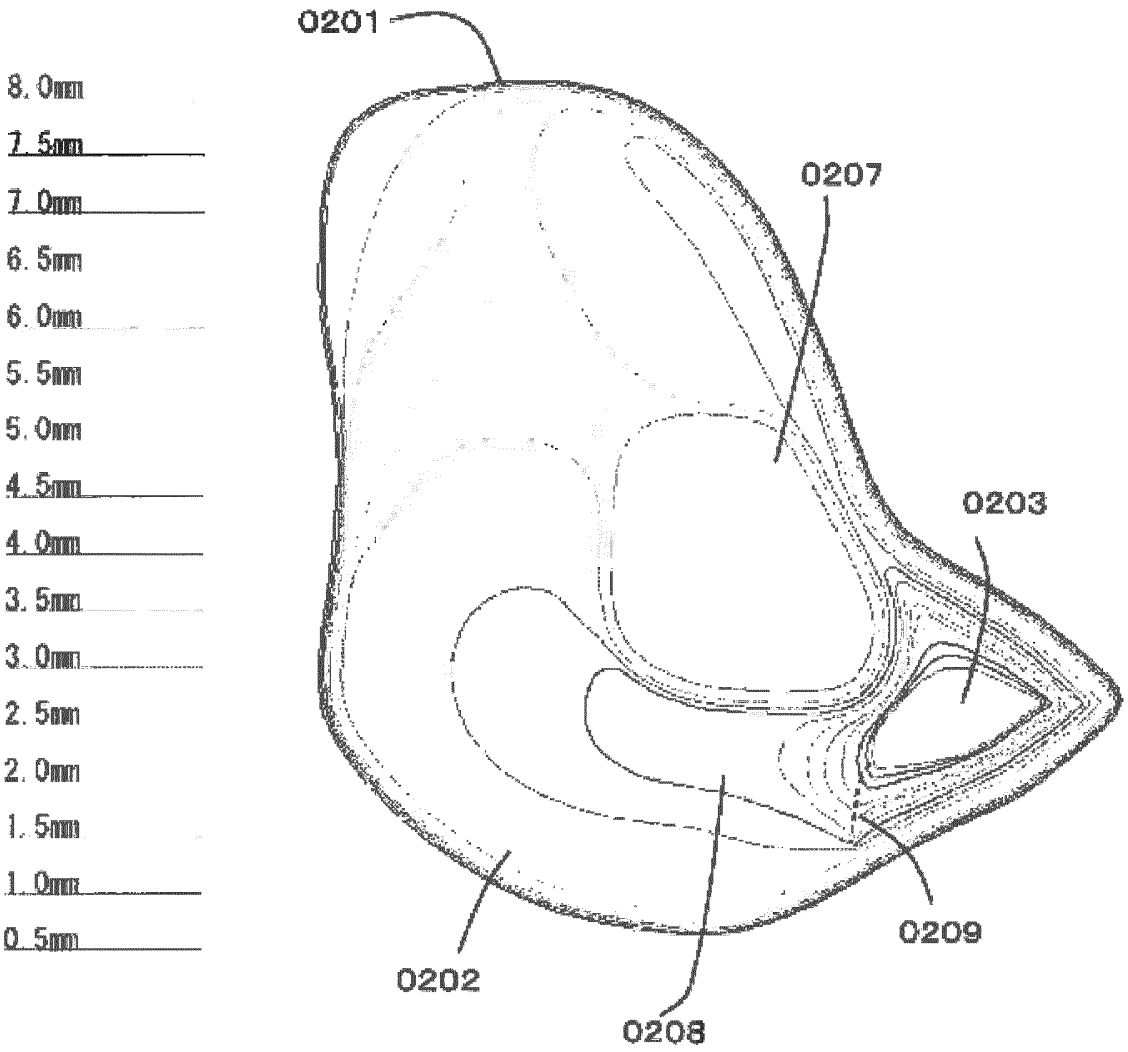

8.0mm
7.5mm
7.0mm
6.5mm
6.0mm
5.5mm
5.0mm
4.5mm
4.0mm
3.5mm
3.0mm
2.5mm
2.0mm
1.5mm
1.0mm
0.5mm
0201
0207
0203
0209
0202
0208

FIG. 3

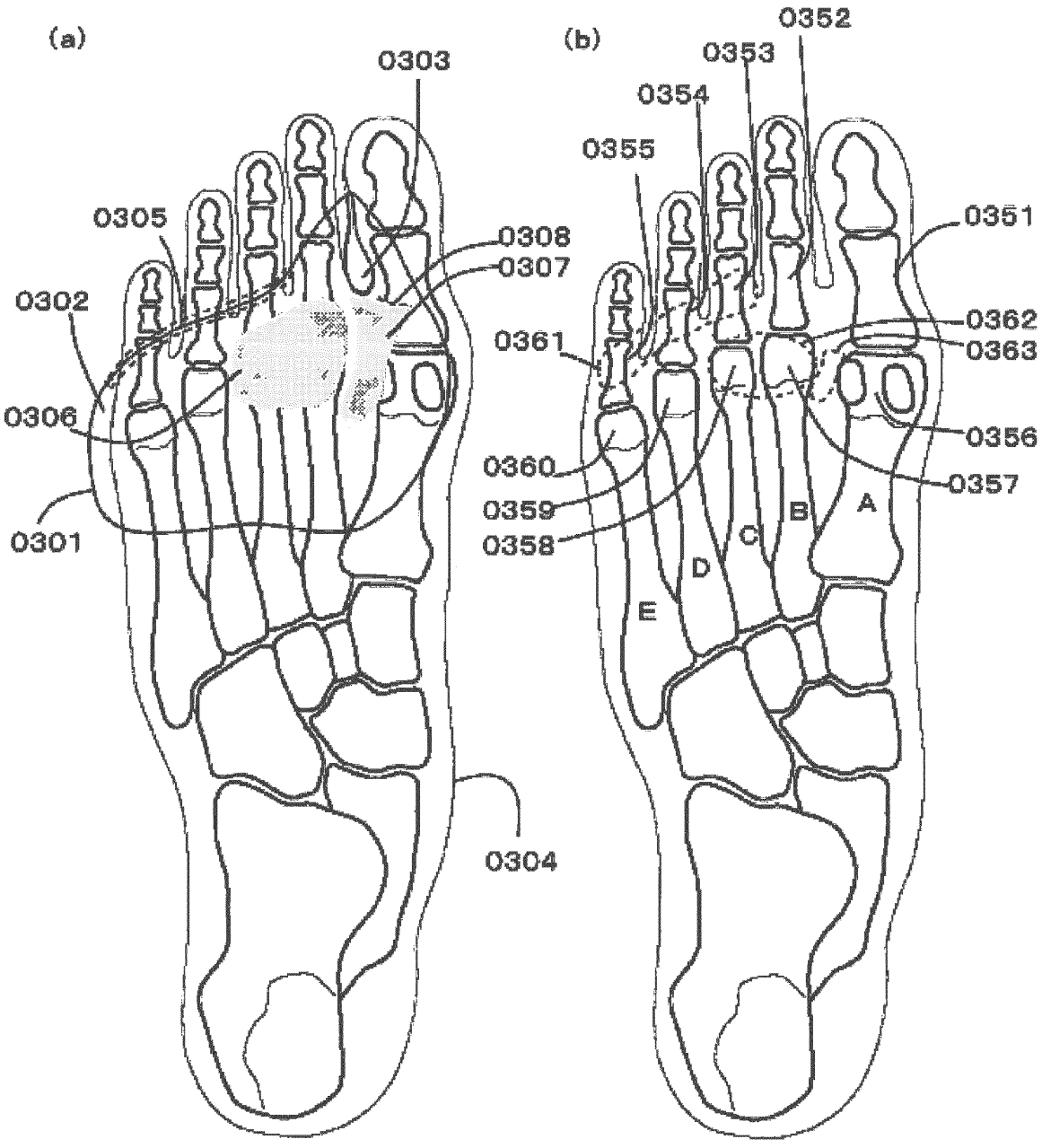

(a)
0303
0305
0308
0307
0302
0306
0301
0304
(b)
0352
0353
0354
0355
0351
0362
0363
0361
0356
0360
0357
0359
0358
A
B
C
D
E

FIG. 4A

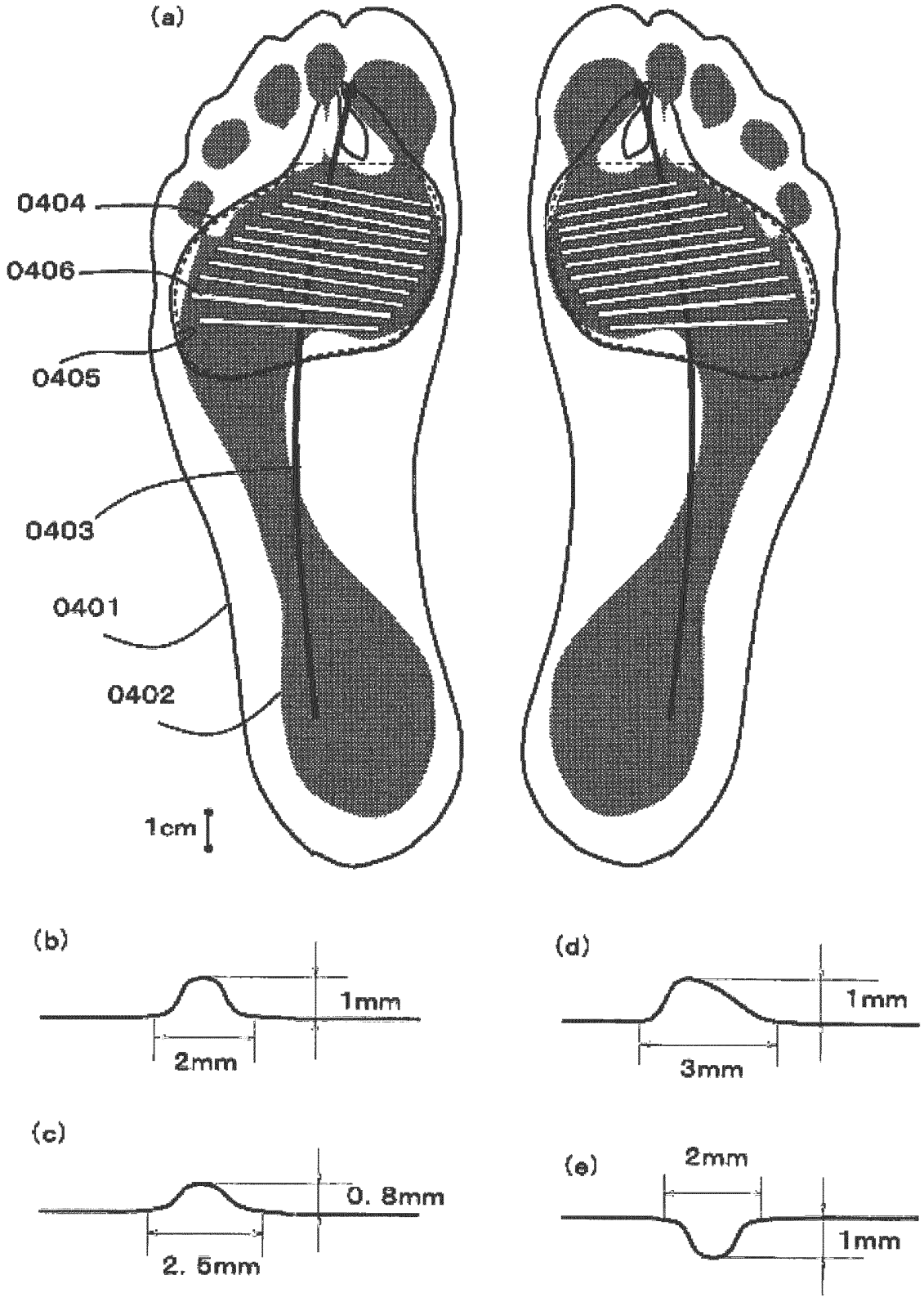

(a)
0404
0406
0405
0403
0401
0402
1cm
(b)
1mm
2mm
(c)
0. 8mm
2. 5mm
(d)
1mm
3mm
(e)
2mm
1mm

FIG. 4B

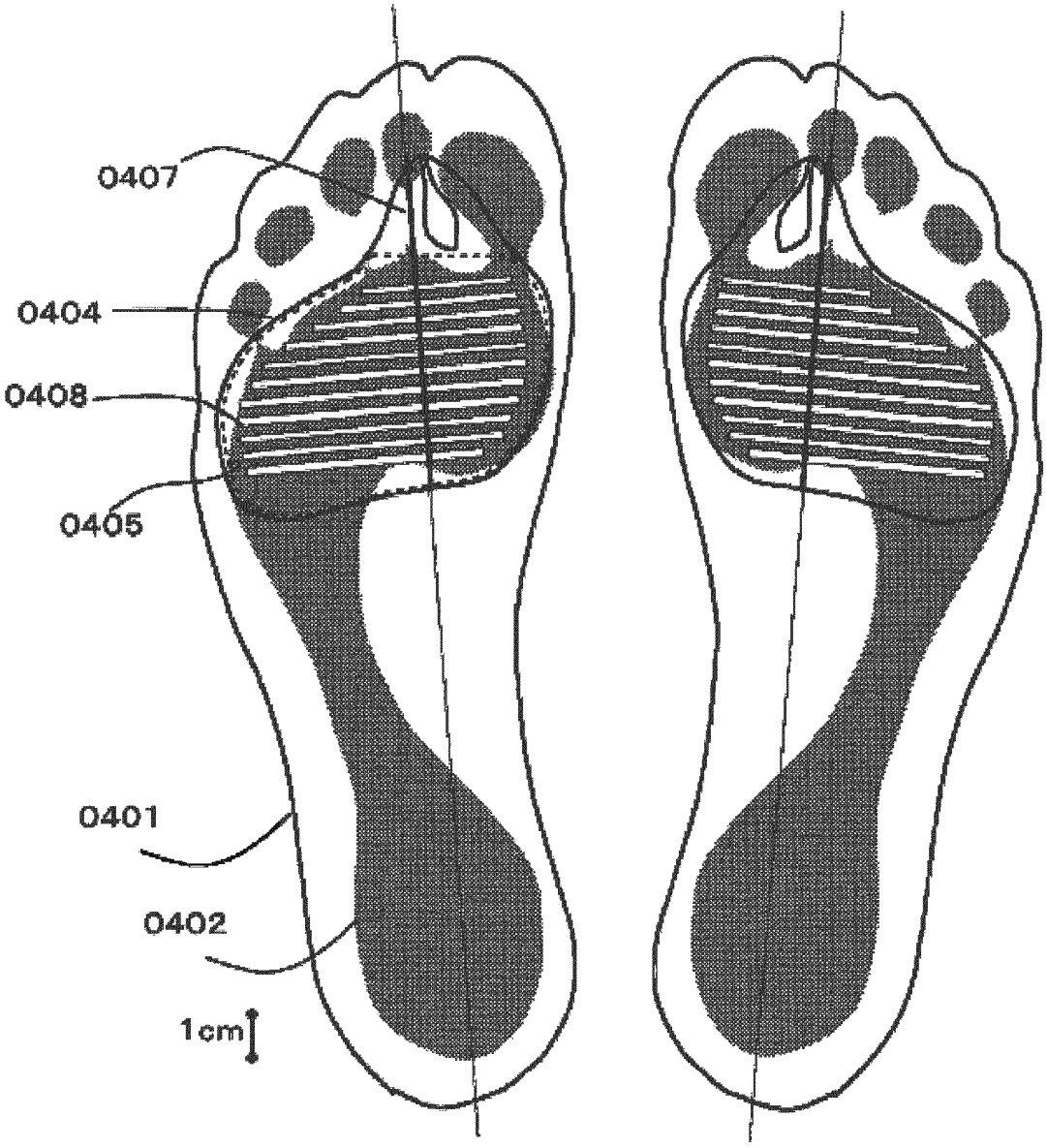
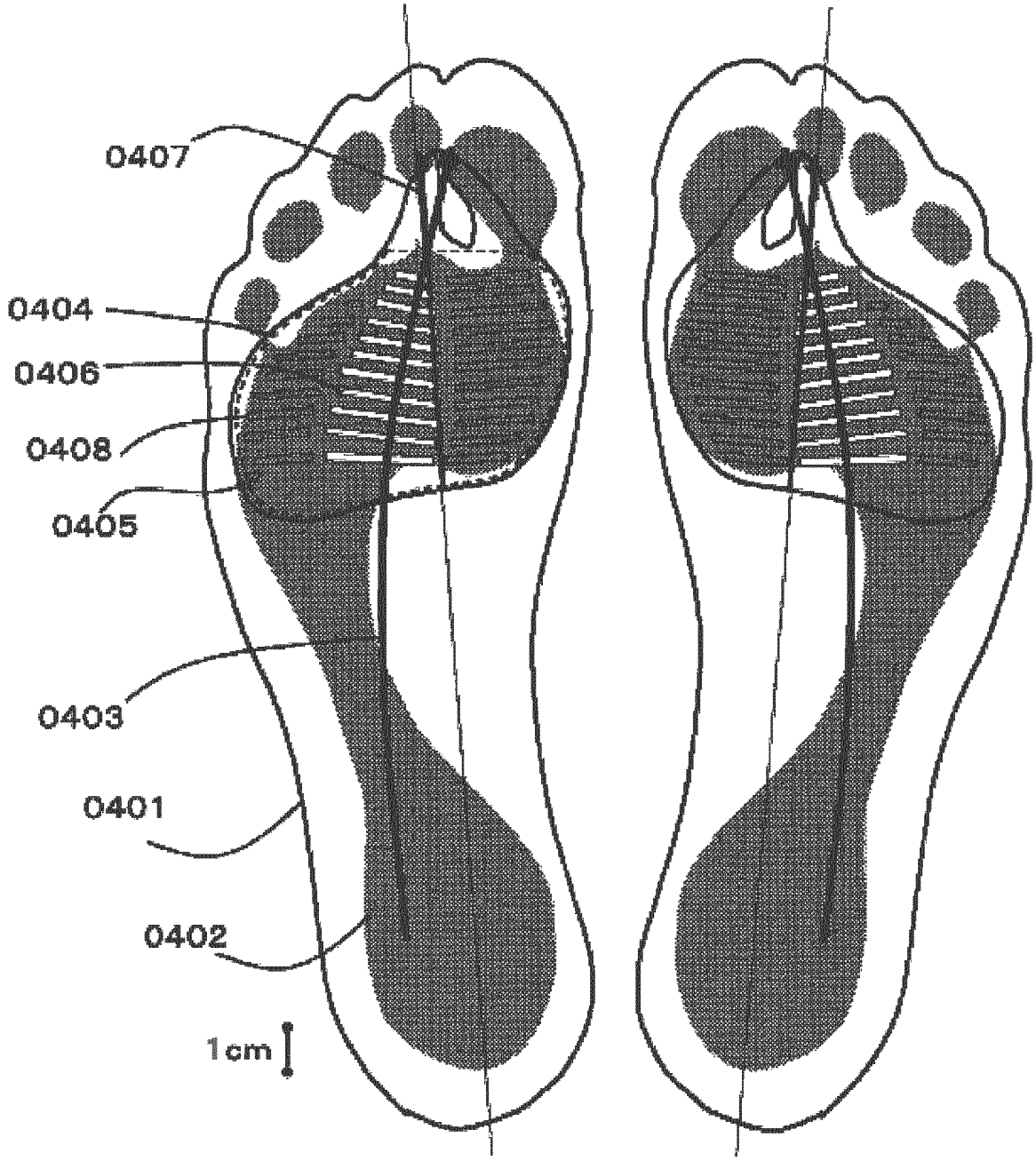


FIG. 4C



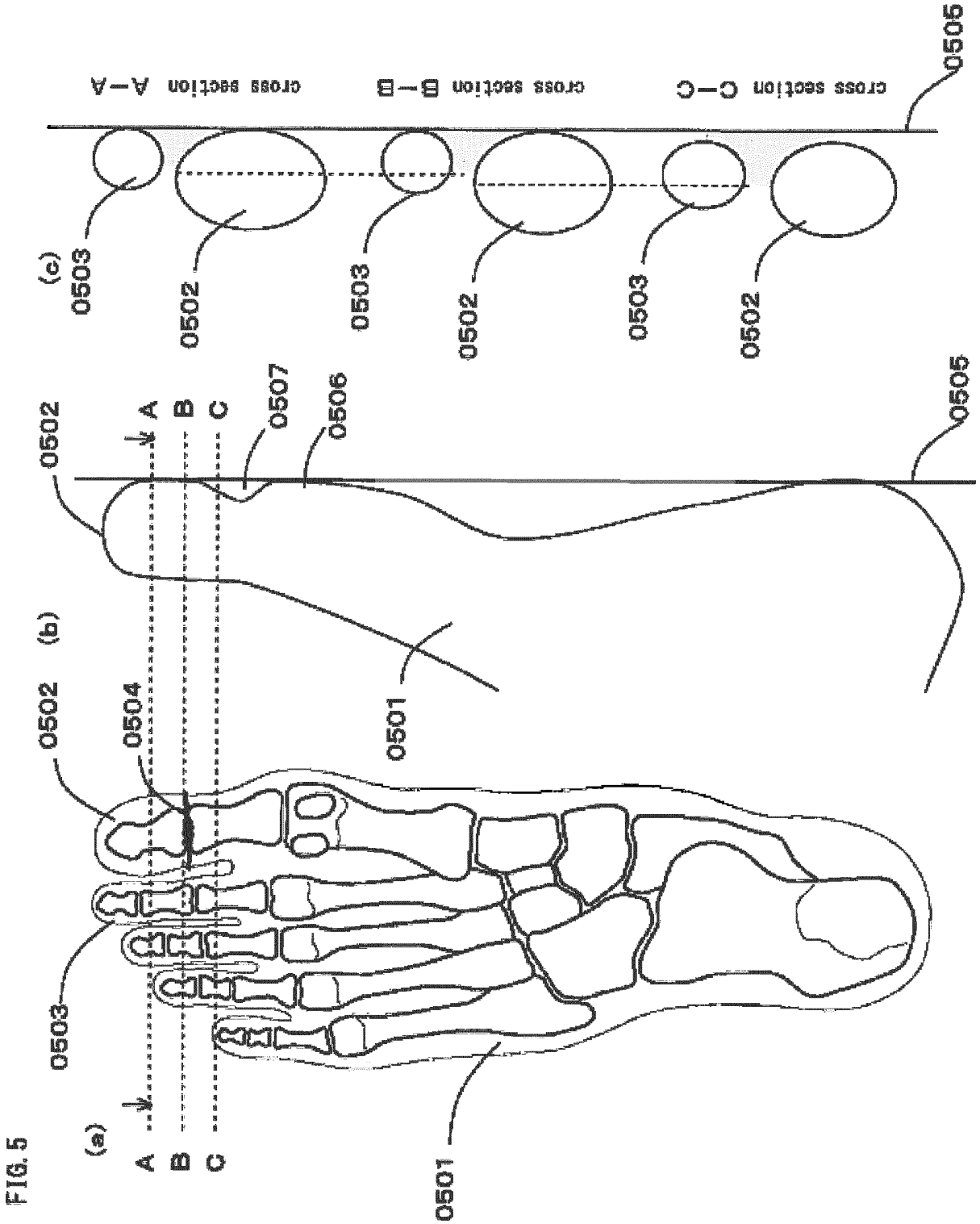

(a)
A
B
C
0501
0503
0502
0504
(b)
0502
A
B
C
0507
0506
0505
0501
(c)
cross section A—A
cross section B—B
cross section C—C
0505
0503
0502
0503
0502
0503
0502

FIG. 5

FIG. 6A

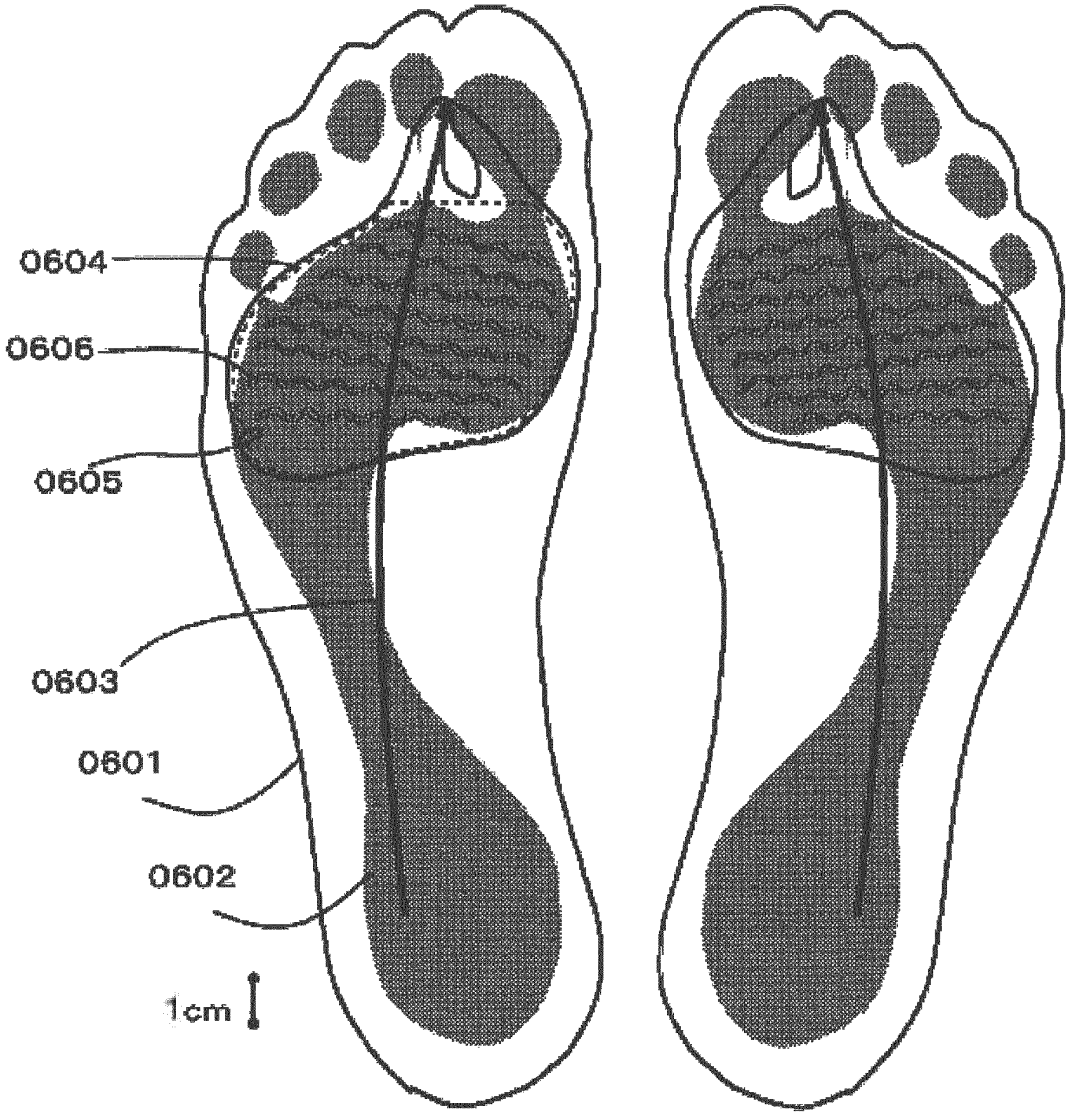


FIG. 6B

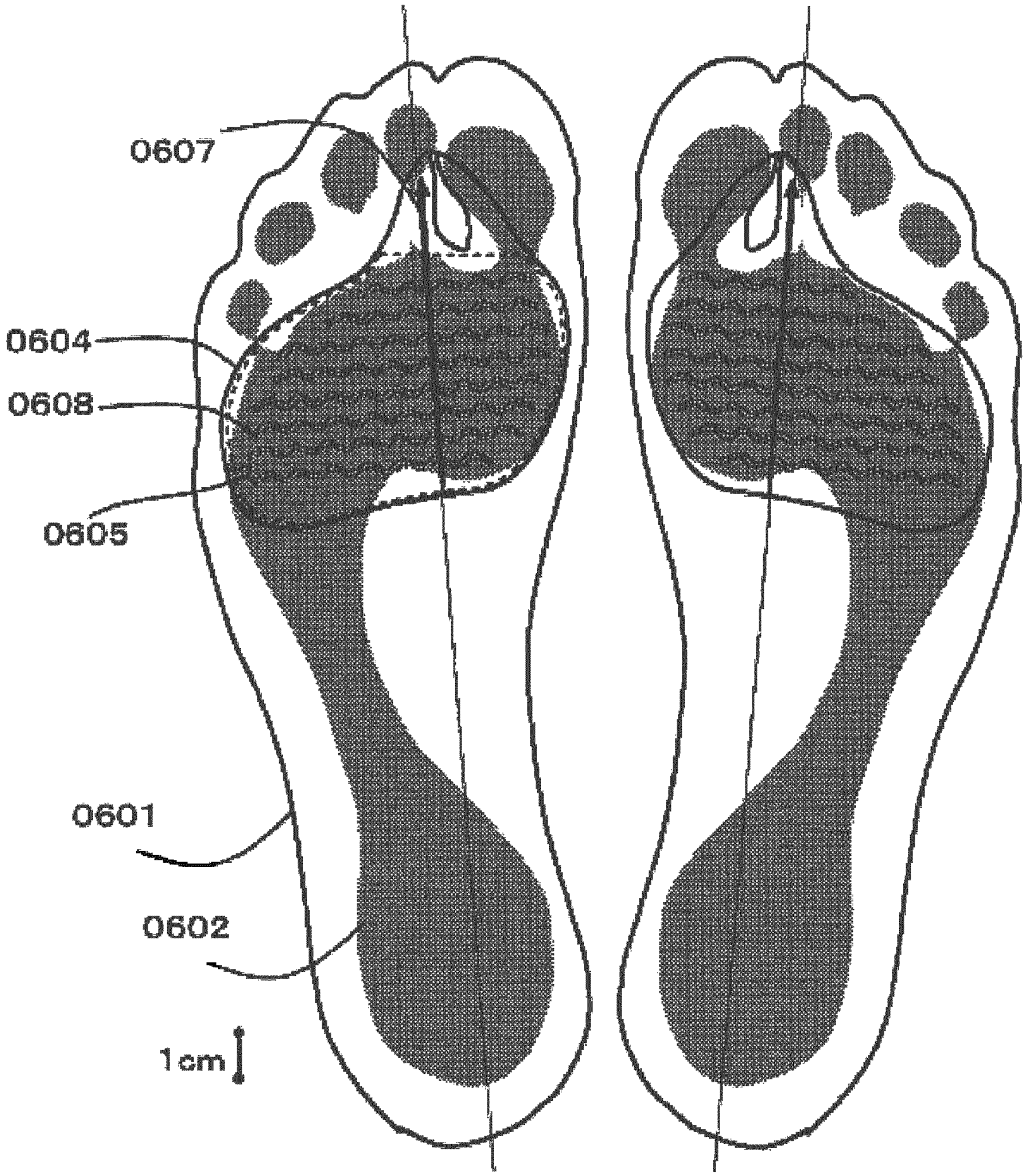


FIG. 6C

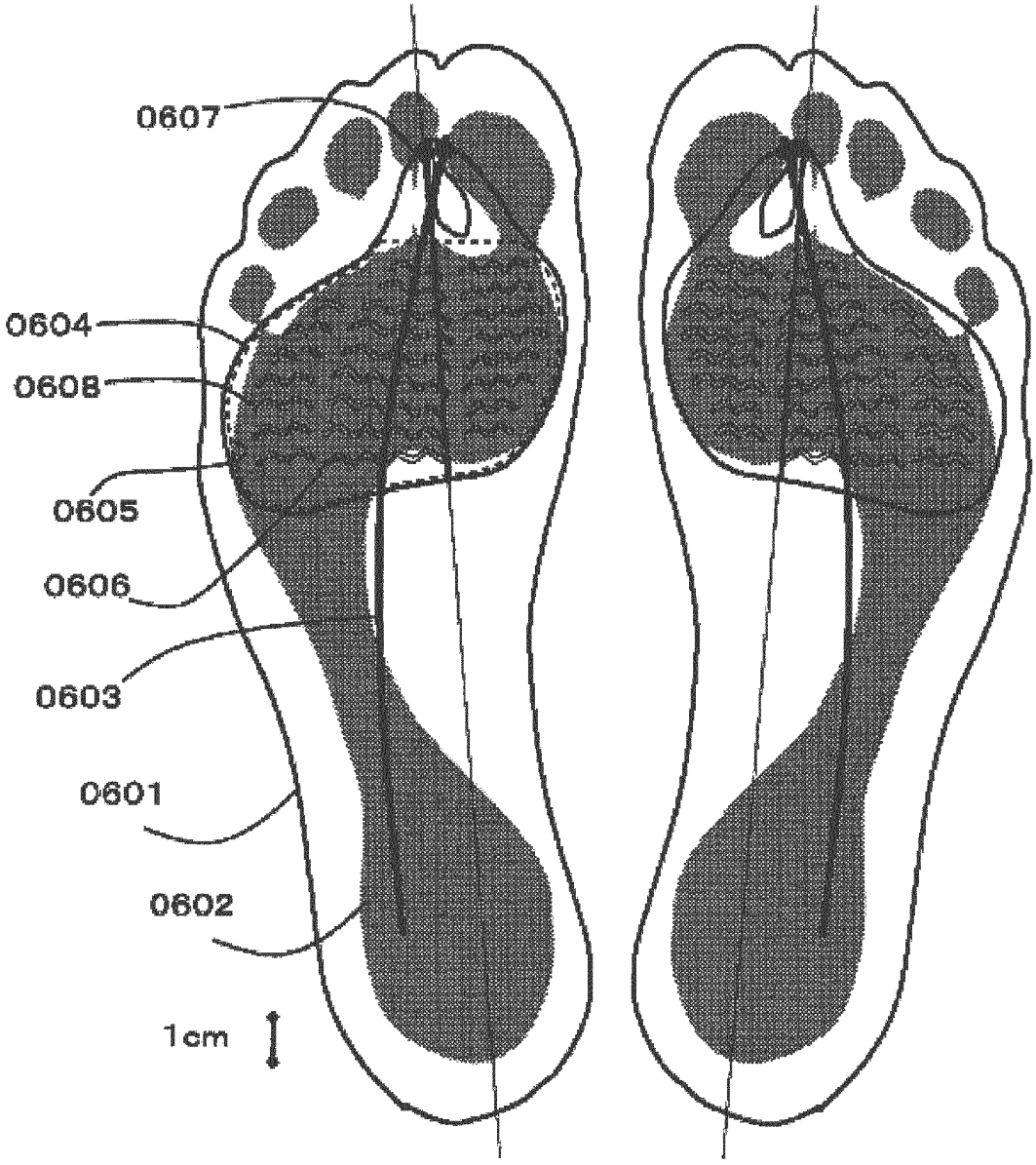


FIG. 7A

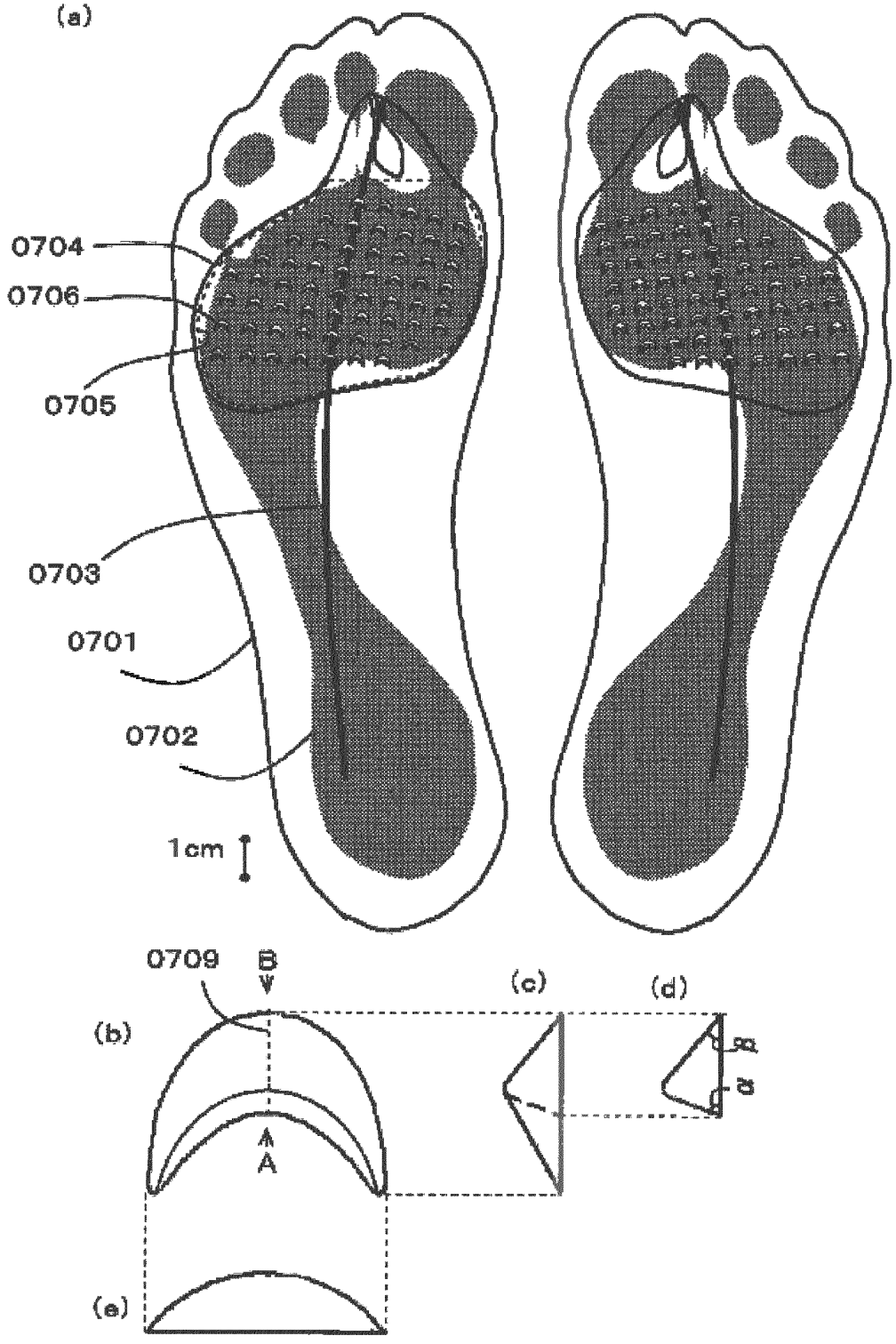


FIG. 7B

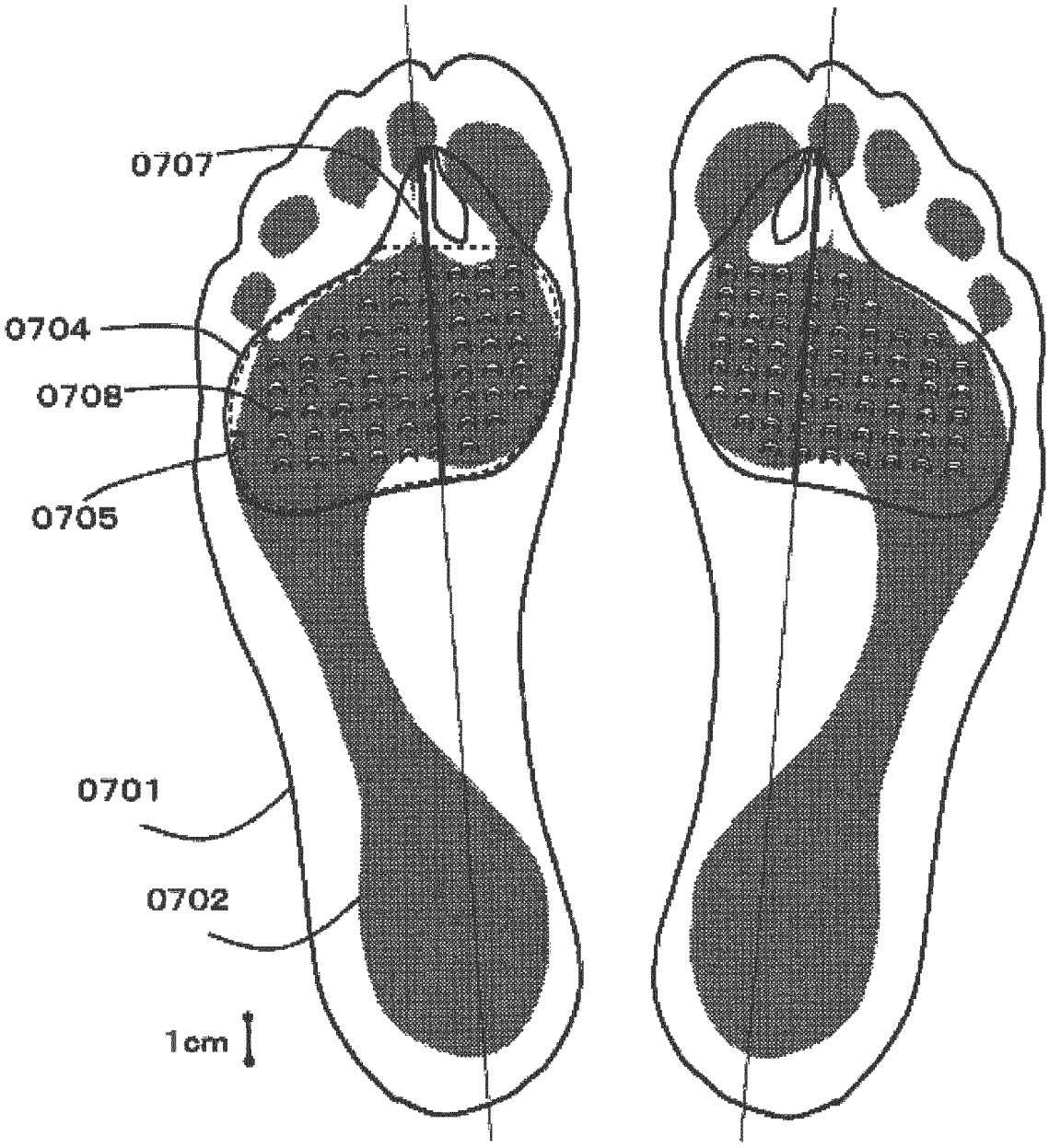


FIG. 7C

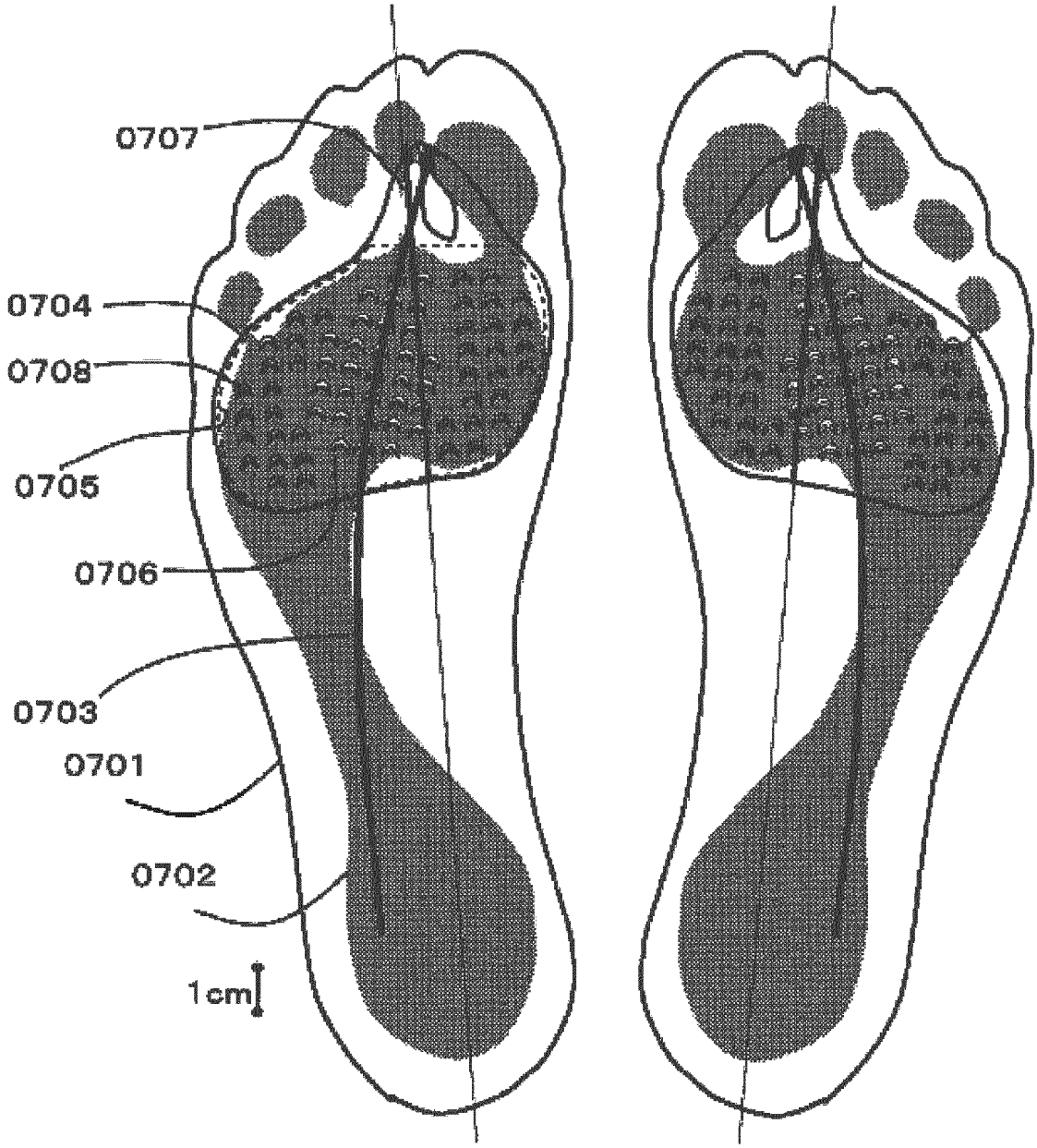


FIG. 8A

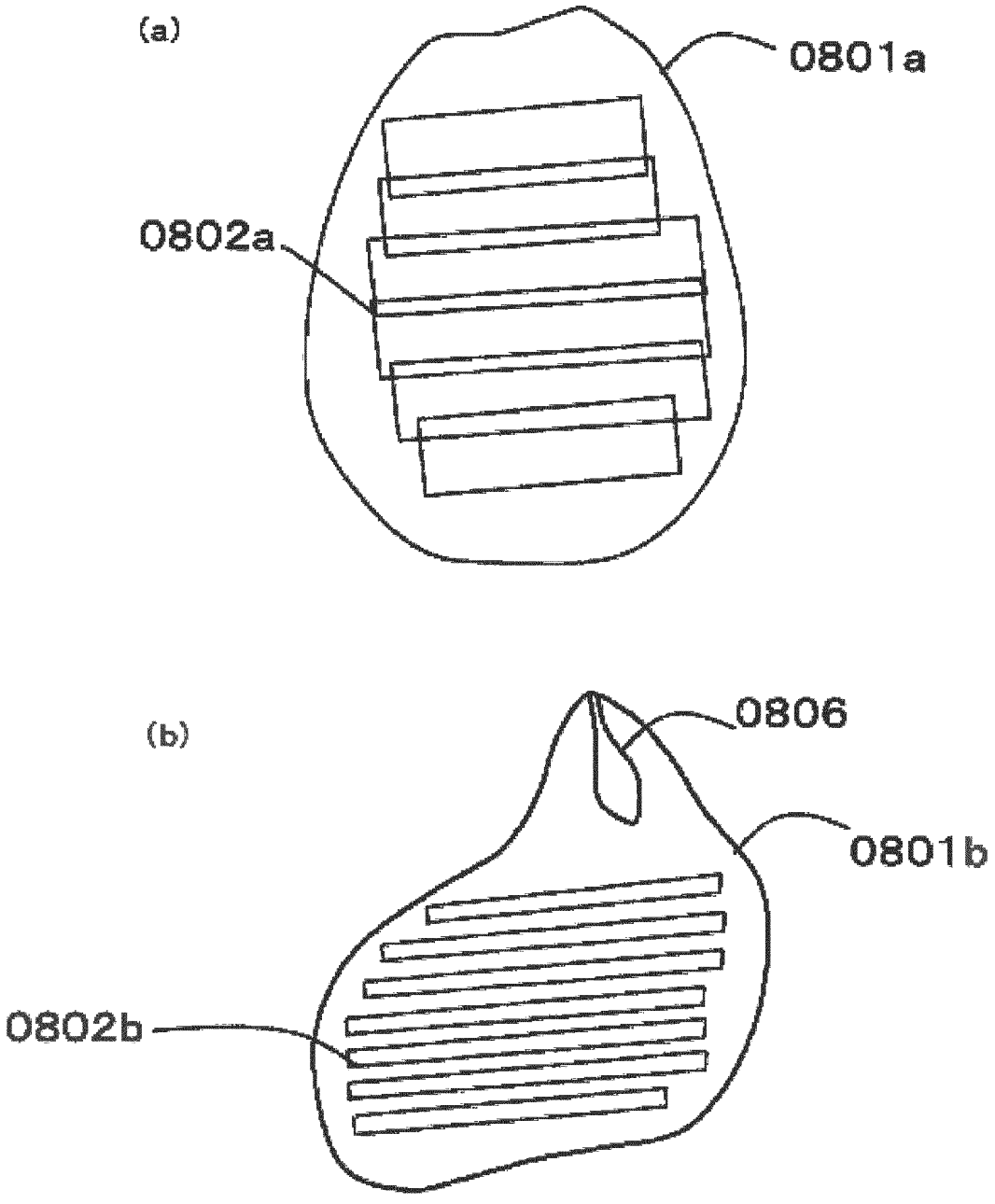
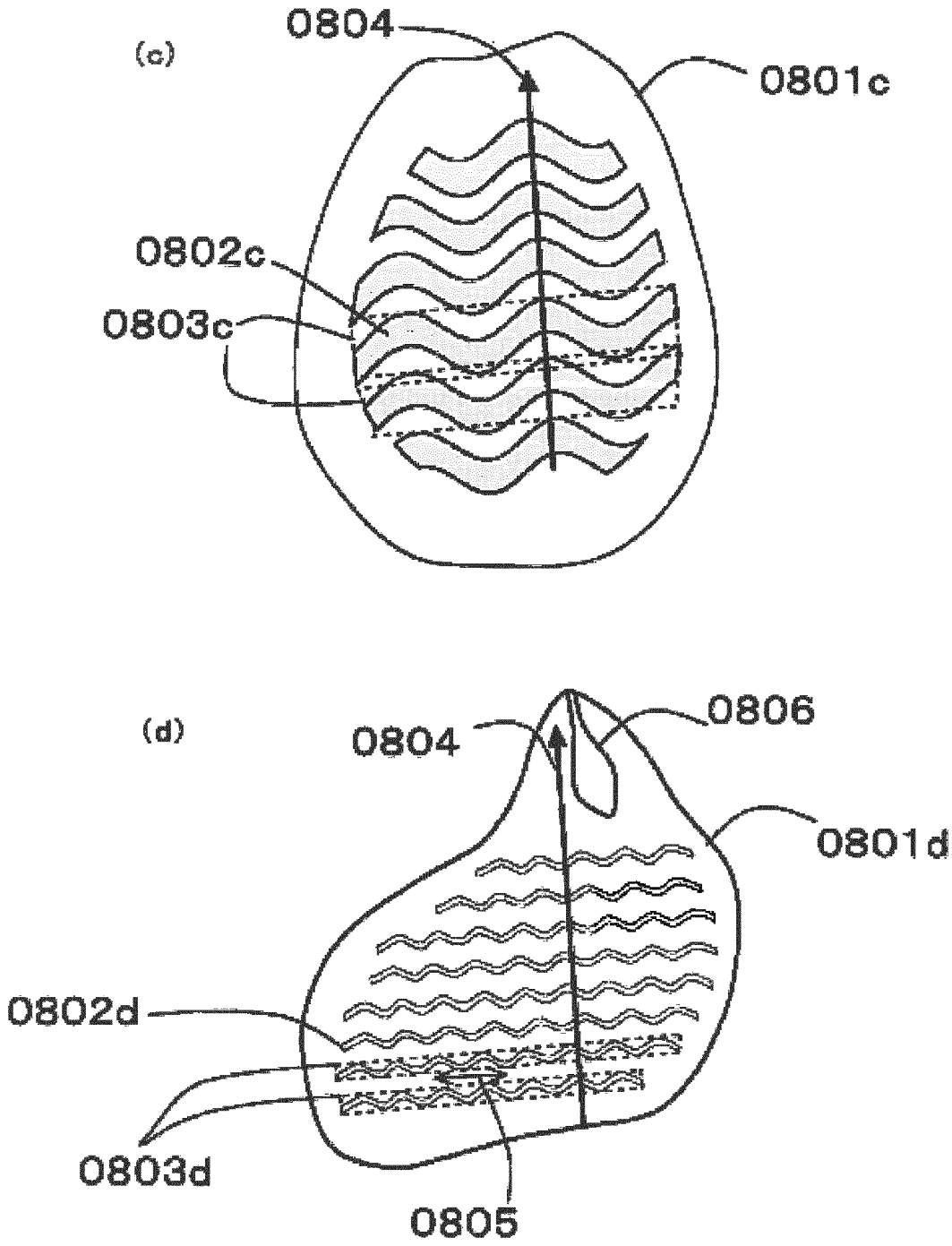


FIG. 8B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/067560

A. CLASSIFICATION OF SUBJECT MATTER
A43B17/00(2006.01)i, *A43B13/38*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A43B17/00, A43B13/38

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2012
Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 118567/1990(Laid-open No. 75517/1992) (San Furekkusu Kabushiki Kaisha), 01 July 1992 (01.07.1992), fig. 3 to 4 (Family: none)	1 2-5
Y	JP 2011-78641 A (Momoko HOSONO), 21 April 2011 (21.04.2011), (Family: none)	2-3

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search 01 October, 2012 (01.10.12)	Date of mailing of the international search report 16 October, 2012 (16.10.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/067560

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-254867 A (Aprica Kasai Kabushiki Kaisha), 16 September 2004 (16.09.2004), fig. 18 (Family: none)	4
X Y	JP 2010-264141 A (Kobayashi Pharmaceutical Co., Ltd.), 25 November 2010 (25.11.2010), (Family: none)	6 5

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/067560

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The invention of claim 1 and the invention of claim 6 have no same or corresponding special technical feature.
The following two inventions (invention groups) are involved in claims.
(Invention 1) the inventions of claims 1-5
A shoe insole having a projection in a drop-like shape.
(Invention 2) the invention of claim 6
A shoe insole having a non-slip pattern.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 10155505 A **[0005]**