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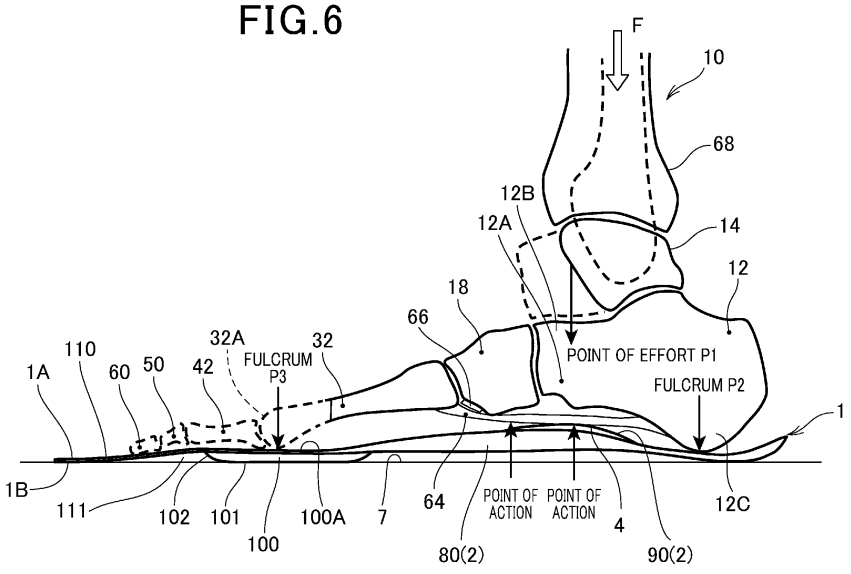
(54) **SHOE INSOLE**

(57) There is provided a shoe insole that facilitates a movement to grasp the ground with toes while ensuring stability and motility. A shoe insole 1 includes, in order to maintain an inner longitudinal arch 121, an outer longitudinal arch 122, and a transverse arch 120 of a foot, a calcaneal anterior-part support protrusion 90 that abuts a calcaneal anterior part 12A of the foot, and a toe ball support part 100 that supports a thenar 26A and a hypothenar 34A of the foot, with the calcaneal anterior-part support protrusion 90 maintaining the inner longitudinal arch 121, the outer longitudinal arch 122, and the transverse arch 120, wherein an insole front part 110 thinner than the toe ball support part 100 is provided in front of the toe ball support part 100.

FIG.6



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Description

Technical Field

[0001] The present invention relates to a shoe insole.

Background Art

[0002] Conventionally, there is known a configuration in which a shoe insole includes a calcaneal anterior-part support protrusion that supports a calcaneal anterior part from a sole of a foot (see, for example, Patent Literature 1) .

[0003] In Patent Literature 1, the calcaneal anterior-part support protrusion stabilizes a calcaneus and maintains arches of the sole of the foot in their natural shapes to support the foot in a well-balanced manner. The conventional shoe insole makes it easier to balance the foot and generate propulsive force during walking and running, so that both stability and mobility are achieved.

Citation List

Patent Literature

[0004] Patent Literature 1:WO 2014/203399 A1

Summary of Invention

Technical Problem

[0005] However, although the above-described conventional insole can achieve both the stability and the motility, there is a problem that it is difficult to obtain an exercise effect during walking.

[0006] Therefore, an object of the present invention is to provide a shoe insole that ensures the stability and the motility and makes it easier to obtain the exercise effect.

Solution to Problem

[0007] A shoe insole of the present invention includes, in order to maintain an inner longitudinal arch, an outer longitudinal arch, and a transverse arch of a foot, a calcaneal anterior-part support protrusion that abuts a calcaneal anterior part of the foot, and a toe ball support part that supports a thenar and a hypothenar of the foot, with the calcaneal anterior-part support protrusion maintaining the inner longitudinal arch, the outer longitudinal arch, and the transverse arch, wherein an insole front part thinner than the toe ball support part is provided in front of the toe ball support part.

[0008] According to the present invention, the toe ball support part supports the thenar and the hypothenar of the foot with the calcaneal anterior-part support protrusion maintaining the inner longitudinal arch, the outer longitudinal arch, and the transverse arch of the foot, and thus toes in front of first to fifth proximal phalanxes of the foot are released from restraint while states of the arches of the foot are maintained. Therefore, during walking or running, the toes are freed while the states of the arches of the foot are maintained, and it is possible to perform a walking motion of grasping the ground with the toes.

[0009] Furthermore, according to the present invention, since the insole front part is thinner than the toe ball support part, the degree of freedom of the toes further increases, the walking motion to grasp the ground with the toes can be easily performed, and an exercise effect can be enhanced.

Advantageous Effects of Invention

[0010] According to the present invention, it is possible to facilitate a movement of grasping the ground with toes and enhance an exercise effect while shapes of arches of a sole of a foot are maintained to ensure stability and motility of a body.

Brief Description of Drawings

[0011]

Fig. 1 is a perspective view illustrating an insole according to an embodiment of the present invention.

Fig. 2 is a bottom view illustrating the insole in which a skeleton of a foot is overlapped.

Figs. 3A to 3H are transverse sectional views illustrating the insole, in which Fig. 3A is a cross sectional view taken along a line S0-S0 of Fig. 2, Fig. 3B is a cross sectional view taken along a line S1-S1 of Fig. 2, Fig. 3C is a cross sectional view taken along a line S2-S2 of Fig. 2, Fig. 3D is a cross sectional view taken along a line S3-S3 of Fig. 2, Fig. 3E is a cross sectional view taken along a line S4-S4 of Fig. 2, Fig. 3F is a cross sectional view taken along a line S5-S5 of Fig. 2, Fig. 3G is a cross sectional view taken along a line S6-S6 of Fig. 2, and Fig. 3H is a cross sectional view taken along a line S7-S7 of Fig. 2.

Figs. 4A to 4E are longitudinal sectional views illustrating the insole, in which Fig. 4A is a cross sectional view taken along a line S10-S10 of Fig. 2, Fig. 4B is a cross sectional view taken along a line S11-S11 of Fig. 2, Fig. 4C is a cross sectional view taken along a line S12-S12 of Fig. 2, Fig. 4D is a cross sectional view taken along a line S13-S13 of Fig. 2, and Fig. 4E is a cross sectional view taken along a line S14-S14 of Fig. 2.

Fig. 5 is an explanatory view of arches of a sole of the foot.

Fig. 6 is a longitudinal sectional view illustrating a relationship between the insole and the foot, and the insole is the same as the cross sectional view taken along the line S13-S13 of Fig. 2.

Description of Embodiments

[0012] Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

[0013] In the drawings of the present embodiment, one of left and right insoles 1 and a skeleton of one of left and right feet are illustrated. The other insole 1 and a skeleton of the other foot are in a mirror-image symmetry.

[0014] Fig. 1 is a perspective view illustrating the insole 1 according to the present embodiment.

[0015] The insole (shoe insole) 1 includes an insole body 160, and the insole body 160 has a shape along an inner contour of a shoe in a plan view, and includes an outer edge contour 70 that is housed inside the shoe. By adapting the outer edge contour 70 to the inner contour of the shoe, the insole 1 is fitted at a predetermined position in the shoe when the insole 1 is inserted. Since the shape of a foot of a user who uses the insole 1 varies from person to person and is not constant, the overall size of the insole 1 is selected according to the size of the foot of the user.

[0016] Fig. 2 is a bottom view illustrating the insole 1 in which the skeleton of the foot is overlapped. Note that this drawing is seen from below and bones are partially hidden due to overlapping of the bones. A plan view seen from a top of the foot differs from the bottom view of Fig. 2 in the way the bones overlap.

[0017] As illustrated in Fig. 2, a skeletal structure 10 of the foot includes a calcaneus 12, a talus 14, a navicular bone 16, a cuboid bone 18, first to third cuneiform bones 20, 22, and 24, first to fifth metatarsal bones 26, 28, 30, 32, and 34, first to fifth proximal phalanxes 36, 38, 40, 42, and 44, second to fifth middle phalanxes 46, 48, 50, and 52, and first to fifth distal phalanxes 54, 56, 58, 60, and 62. Front end parts of the first to fifth metatarsal bones 26, 28, 30, 32, and 34 are first to fifth metatarsal bone head parts 26A (also called thenar 26A), 28A, 30A, 32A, and 34A (also called hypothenar 34A). A stepped part positioned at a front part of the calcaneus 12 is a calcaneal anterior part (also called calcaneal tubercle) 12A. Note that, in Fig. 2, only in the navicular bone 16, a part hidden due to the overlapping of the bones is indicated by a dotted line.

[0018] In this configuration, as illustrated in Figs. 1 and 2, on a front surface (upper surface) 1A of the insole body 160, a cuboid bone support protrusion 80 and a calcaneal anterior-part support protrusion 90 configuring a protrusion 2 are formed. The cuboid bone support protrusion 80 is provided in a portion corresponding to the cuboid bone 18, and the calcaneal anterior-part support protrusion 90 is provided in a region corresponding to the calcaneal tubercle 12A. The cuboid bone support protrusion 80 and the calcaneal anterior-part support protrusion 90 are solidly formed.

[0019] The calcaneal anterior-part support protrusion 90 is provided on the cuboid bone support protrusion 80, and a front surface of the calcaneal anterior-part support protrusion 90 overlaps a front surface of the cuboid bone support protrusion 80 to form one protrusion 2. The cuboid bone support protrusion 80 and the calcaneal anterior-part support protrusion 90 may be integrated with each other, or may be separate bodies, and may be formed separately from a flat insole. Note that, in Fig. 2, the calcaneal anterior-part support protrusion 90 is schematically illustrated together with a contour line indicating the height of the calcaneal anterior-part support protrusion 90.

[0020] On a back surface (lower surface) 1B of the insole body 160, toe ball support part (hereinafter called as bulging part) 100 that supports the first metatarsal bone head part (thenar) 26A and the second to fifth metatarsal bone head parts (hypothenar) 28A to 34A of the foot is formed. The bulging part 100 bulges downward from the back surface (lower surface) 1B of the insole body 160. The bulging part 100 has an anterior edge extending on a line connecting from the first proximal phalanx 36 to the fifth proximal phalanx 44 in a bottom view. An insole front part 110 of the insole body 160 is formed in front of the bulging part 100, and the thickness of the insole front part 110 is thinner than the thickness of the bulging part 100.

[0021] Figs. 3A to 3H are transverse sectional views illustrating the insole 1, and Figs. 4A to 4E is a longitudinal sectional view illustrating the insole 1. Note that, in Figs. 3A to 3H and 4A to 4E, (S0-S0) to (S7-S7) and (S10-S10) to (S14-S14) corresponds to (S0-S0) to (S7-S7) and (S10-S10) to (S14-S14) in Fig. 2.

[0022] A cross section taken along a line S0-S0 is a cross section that crosses the vicinity of the first distal phalanx 54 and the second and third middle phalanxes 46 and 48, and the insole body 160 on the cross section, that is, the insole front part 110 is flat.

[0023] A cross section taken along a line S1-S1 is a cross section that crosses the vicinity of the first to fourth proximal phalanxes 36 to 42 and the fifth distal phalanx 62, and the back surface 1B of the insole body 160 includes the bulging part 100.

[0024] On the bulging part 100, a thenar part 103 that supports the thenar 26A of the foot and an other-toe ball part 104 that supports the second to fourth metatarsal bone head parts 28A to 32A and the hypothenar 34A are formed, and a V-shaped recess 105 is formed between the thenar part 103 and the other-toe ball part 104. An outer peripheral part 102 gradually decreases in thickness toward an outer side of the bulging part 100 and is upwardly inclined.

[0025] A cross section taken along a line S2-S2 is a cross section that crosses the first and fifth metatarsal bone head parts 26A and 34A. The insole body 160 of this portion includes a flat surface part 100A on the front surface 1A and the bulging part 100 bulging downward on the back surface 1B. The bulging part 100 includes a flat body part 101 and the outer peripheral part 102 whose thickness gradually decreases.

[0026] A cross section taken along a line S3-S3 is a cross section that crosses the metatarsal bones 26 to 34. The insole body 160 of this portion includes the flat surface part 100A on the front surface 1A and the bulging part 100 on the back surface 1B. On a trailing edge of the bulging part 100, an arc recess 106 is formed in which

a central part in a width direction is recessed forward in an arc shape in a bottom view.

[0027] A cross section taken along a line S4-S4 is a region corresponding to a transverse arch that crosses the metatarsal bones 26 to 34, and the insole body 160 has a large thickness in a region corresponding to an arch of a foot to correspond to a general foot, and a front surface side of the insole body 160 is downwardly inclined toward an outer side of a right foot to gradually decrease the thickness. Furthermore, on the back surface of left and right inner and outer sides, lightened parts 72 and 74 are formed on both sides of a flat part, so that it is possible to permit a slight deformation in a left-and-right direction on the cross section taken along the line S4-S4.

[0028] A cross section taken along a line S5-S5 is a region corresponding to the cuboid bone 18, and the insole body 160 includes the cuboid bone support protrusion 80 having the maximum thickness. A front surface 80A of the cuboid bone support protrusion 80 including an area from a region corresponding to the cuboid bone 18 to a region 3 (Fig. 2) corresponding to the navicular bone 16 is downwardly inclined toward both left and right side edges 76 to gradually decrease the thickness. The insole body 160 includes a raised edge 78 at the outermost edge on the cross section taken along the line S5-S5.

[0029] A cross section taken along a line S6-S6, which crosses the calcaneal tubercle 12A, is a region corresponding to a backward end point of a longitudinal arch. The insole body 160 of this portion includes the calcaneal anterior-part support protrusion 90 having the maximum thickness, and a front surface 90A thereof including an area from a region corresponding to the calcaneal tubercle 12A to the region 3 (Fig. 2) corresponding to the navicular bone 16 is downwardly inclined toward both the left and right side edges 76 to gradually decrease the thickness.

[0030] A cross section taken along a line S7-S7, which crosses a rear part of the calcaneus 12, is the region corresponding to the backward end point of the longitudinal arch. A side of the front surface 1A of the insole body 160 is relatively flat so as to support a heel to correspond to a general foot. Furthermore, the side of the front surface 1A of the insole body 160 is upwardly inclined toward both sides, so that the thickness of the insole body 160 gradually increases, and the insole body 160 includes the raised edge 78 at the outermost edge. On the back surface of the left and right inner and outer sides, the lightened parts 72 and 74 are formed, so that it is possible to permit a slight deformation in a left-and-right direction on the cross section taken along the line S7-S7.

[0031] On a cross section taken along a line S10-S10 and a cross section taken along a line S11-S11, the front surface is raised in regions corresponding to the cuneiform bones 20 to 24 and the navicular bone 16 configuring an inner longitudinal arch.

[0032] The insole 1 of the present invention supports not only the regions corresponding to the cuboid bone 18 and the calcaneal tubercle 12A, but also other portions in consideration of stability. However, such a configuration does not restrain a foot movement. Therefore, on the cross sections, the insole body 160 is provided with the lightened part 72, and can subside inside the cuboid bone support protrusion 80. Therefore, even when force is exerted on the regions corresponding to the cuneiform bones 20 to 24 and the navicular bone 16, the insole body 160 is deformed by the lightened part 72 to alleviate a stress.

[0033] Each of the cross section taken along the line S11-S11 to a cross section taken along a line S13-S13 is the region corresponding to the cuboid bone 18 and the cuboid bone support protrusion 80 having the maximum thickness is provided at each of the cross section taken along the line S11-S11 to the cross section taken along the line S13-S13. The front surface 80A of the cuboid bone support protrusion 80 is downwardly inclined from the region corresponding to the cuboid bone 18 in a forward-and-backward direction to gradually decrease the thickness. In other words, when the foot is put in the shoe fitted with the insole 1 and then an upright standing posture is maintained, the cuboid bone support protrusion 80 corresponding to the cuboid bone 18 exerts the maximum stress on a foot sole surface. The insole 1 has a configuration in which the stress slowly and gradually decreases as apart from the cuboid bone support protrusion 80 in the forward-and-backward direction.

[0034] Furthermore, as a configuration on a bottom surface side of the insole 1, a region in contact with the shoe is flat in the region corresponding to the cuboid bone 18, that is, a back side of the cuboid bone support protrusion 80. With this configuration, a reaction force is constantly exerted on the cuboid bone 18 from the shoe.

[0035] Each of the cross section taken along the line S12-S12 and the cross section taken along the line S13-S13 is also the region corresponding to the calcaneal tubercle 12A and the calcaneal anterior-part support protrusion 90 having the maximum thickness is provided at each of the cross section taken along the line S12-S12 and the cross section taken along the line S13-S13. The front surface 90A of the calcaneal anterior-part support protrusion 90 is downwardly inclined from the region corresponding to the calcaneal tubercle 12A in the forward-and-backward direction to gradually decrease the thickness. In other words, the insole 1 has a configuration in which the stress slowly and gradually decreases as apart from the calcaneal anterior-part support protrusion 90 in the forward-and-backward direction. Furthermore, the region in contact with the shoe is flat in the region corresponding to the calcaneal tubercle 12A, that is, a back side of the calcaneal anterior-part support protrusion 90. With this configuration, the reaction force is constantly exerted on the calcaneal tubercle 12A from the shoe.

[0036] On a cross section taken along a line S14-S14, the front surface is raised in a region corresponding to the fifth metatarsal bone 34 configuring an outer longitu-

dinal arch.

[0037] The region is located outside the cuboid bone support protrusion 80 and the calcaneal anterior-part support protrusion 90, and has slight swelling in consideration of the stability. However, such a configuration does not restrain the foot movement. The lightened part 74 is provided in a region corresponding to the outer longitudinal arch, and the insole 1 can subside even outside the cuboid bone support protrusion 80 and the calcaneal anterior-part support protrusion 90. Even when force is exerted on the fifth metatarsal bone 34 of the outer longitudinal arch, the insole body 160 is deformed by the lightened part 74 to alleviate the stress.

[0038] In this configuration, when the insole 1 is fitted, the cuboid bone 18 is supported with the cuboid bone support protrusion 80 as an apex. Since the cuboid bone 18 is supported from below, the foot maintains a neutral position relative to left-right and front-back directions, and at the same time, with the cuboid bone 18 being a fulcrum, evagination is permitted in pronation and inversion is permitted in supination.

[0039] As a result, the insole 1 does not disturb a normal motion of a joint, there is little need for compensation in other regions, and a travel of a center of gravity in the front-back and left-right directions is facilitated. That is, unlike a plaster cast, the insole 1 does not fixedly restrain the foot, but alleviates the stress by having the front surface thereof being downwardly inclined in radial directions from the cuboid bone support protrusion 80, and furthermore, is provided with the lightened parts 72 and 74 to facilitate deformation of the insole 1 itself, whereby a movement is permitted. The insole 1 is formed to support from below the region corresponding to the cuboid bone 18 so as to smoothly guide the pronation and the supination while correcting and preventing an excessive distortion of the skeleton of the foot.

[0040] Fig. 5 illustrates arches of a sole of the foot.

[0041] Arches (schematically indicated by a dotted line) 119 are formed on a sole of a human foot during walking or running, if the sole of the foot is in a natural state.

[0042] The arches 119 include an inner longitudinal arch 121 and an outer longitudinal arch 122 formed in a longitudinal direction of the foot and a transverse arch 120 formed in a short-length direction of the foot. The transverse arch 120 is formed straddling the first to fifth metatarsal bones 26 to 34, as illustrated in Fig. 2. The inner longitudinal arch 121 is formed straddling the calcaneus 12, the talus 14, the navicular bone 16, the three cuneiform bones 20 to 24, and the first to third metatarsal bones 26 to 30. The outer longitudinal arch 122 is formed straddling the calcaneus 12, the cuboid bone 18, and the fourth and fifth metatarsal bones 32 and 34.

[0043] Fig. 6 is a cross sectional view illustrating a principle by which a weight F of the user is exerted on the calcaneus 12 from a tibia 68 via the talus 14 when the insole 1 is fitted.

[0044] This calcaneus 12 acts as an important part to support the weight F of the user. In the calcaneus 12, a calcaneal front-side upper end 12B acts as a point of effort P1 and a calcaneal lower end (calcaneal rear part) 12C acts as a fulcrum P2, and thus, a moment around the fulcrum P2 is exerted on the calcaneus 12.

[0045] In this configuration, the calcaneal anterior-part support protrusion 90 can stabilize the calcaneus 12 by supporting the calcaneal tubercle 12A substantially directly below the point of effort P1. Furthermore, the calcaneal tubercle 12A is distant from the calcaneal lower end 12C as the fulcrum P2, and thus, when the calcaneal anterior-part support protrusion 90 is provided in the region corresponding to the calcaneal tubercle 12A, it is possible to efficiently support the calcaneus 12 with small force.

[0046] The weight F of the user is exerted also on the cuboid bone 18 via the calcaneus 12. In the cuboid bone 18, the first to fifth metatarsal bone head parts 26A to 34A act as a fulcrum P3, and thus, a moment around the fulcrum P3 is exerted on the cuboid bone 18.

[0047] In this configuration, the cuboid bone support protrusion 80 can stabilize the cuboid bone 18 by supporting the cuboid bone 18 substantially immediately below the point of effort P1.

[0048] Furthermore, the cuboid bone 18 is distant from the first to fifth metatarsal bone head parts 26A to 34A as the fulcrum P3, and thus, when the cuboid bone support protrusion 80 is provided in the region corresponding to the cuboid bone 18, it is possible to efficiently support the cuboid bone 18 with small force.

[0049] Incidentally, the calcaneus 12 is difficult to stabilize just by supporting the cuboid bone 18, and the cuboid bone 18, the calcaneus 12, and a joint (calcaneocuboid joint) may be distorted.

[0050] The calcaneus 12 configures simultaneously both the inner longitudinal arch 121 and the outer longitudinal arch 122, and thus, when the calcaneus 12 is not stabilized, it is not possible to maintain the longitudinal arch at a normal position. In particular, the calcaneal tubercle 12A at the front part of the calcaneus 12 is positioned so that a long plantar ligament 64 linking an intermediate part of the calcaneus 12 and the second to fifth metatarsal bones 28 to 34 overlaps, as illustrated in Fig. 6. This long plantar ligament 64 also functions to maintain the longitudinal arch.

[0051] In this configuration, since the calcaneal anterior-part support protrusion 90 supports the calcaneal tubercle 12A via the long plantar ligament 64, the calcaneus 12 is stabilized, which can reduce the distortion of the calcaneocuboid joint and locate the longitudinal arch at a normal position. This configuration allows the longitudinal arch to function more effectively as a spring. In particular, as compared to mid-day, the function of maintaining the longitudinal arch of the long plantar ligament 64 decreases at night, and thus, it is effective to support the long plantar ligament 64. The calcaneal anterior-part support protrusion 90 includes a region 4 corresponding to the calcaneal tubercle 12A at a position where the long

plantar ligament 64 overlaps.

[0052] The calcaneal anterior-part support protrusion 90 supports the long plantar ligament 64 not only to promote passive stability of the arches of the foot but also to support a tendon of insertion 66 of a long fibular muscle, which is important in actively stabilizing the outer longitudinal arch, via the long plantar ligament 64. Here, the passive stability is achieved by a ligament, and the active stability is achieved by a muscle (tendon). As illustrated in Fig. 2, the tendon of insertion 66 of the long fibular muscle extends along the cuboid bone 18, then crosses the sole of the foot from an outer edge of the foot, and reaches bottoms of the first cuneiform bone 20 and the first metatarsal bone 26. Furthermore, a part of the calcaneal anterior-part support protrusion 90 is located beneath the cuboid bone 18, and supports the navicular bone 16 via the cuboid bone 18. As a result, a tendon of insertion 67 of a posterior tibial muscle, which is a main active stabilization structure of the inner longitudinal arch, is indirectly supported.

[0053] The tendon of insertion 67 of the posterior tibial muscle allows a fascia to extend to the first to third cuneiform bones 20 to 24, the second and third metatarsal bones 28 and 30, and the navicular bone 16. The two muscles, that is, the long fibular muscle and the posterior tibial muscle, extend diagonally, so that the longitudinal arch is held in addition to the transverse arch.

[0054] Furthermore, since the calcaneus 12 also configures the joint, a movement function is inhibited if the calcaneus 12 is only fixedly supported. Thus, it is necessary to permit a movement.

[0055] Since the insole body 160 is configured so that the front surface is downwardly inclined in the radial directions around the cuboid bone support protrusion 80 to alleviate the stress, it is possible to permit a movement of the joint configured by the calcaneus 12. More specifically, the calcaneal anterior-part support protrusion 90 is formed of a relatively soft material, and a portion having the maximum thickness is sunk by the weight of the user so that the calcaneal tubercle 12A is supported. When the calcaneal anterior-part support protrusion 90 is sunk, the insole 1 is downwardly inclined in front-back and left-right radial directions around the cuboid bone support protrusion 80, whereby the foot is supported with the cuboid bone 18 being a fulcrum and a foot movement is permitted around the cuboid bone support protrusion 80.

[0056] In this configuration, the calcaneal anterior-part support protrusion 90 abuts the calcaneal tubercle (calcaneal anterior part of the foot) 12A to maintain the inner longitudinal arch 121, the outer longitudinal arch 122 and the transverse arch 120 of the foot.

[0057] The calcaneal anterior-part support protrusion 90 can stably support the calcaneus 12, and the transverse arch 120, the inner longitudinal arch 121, and the outer longitudinal arch 122 of the sole of the foot can be maintained in their natural shapes, and the stability and motility of the foot can be improved.

[0058] Furthermore, in this state, that is, in a state where the calcaneal anterior-part support protrusion 90 maintains the inner longitudinal arch 121, the outer longitudinal arch 122, and the transverse arch 120, the bulging part 100 is configured to support the first metatarsal bone head part (thenar) 26A and the second to fifth metatarsal bone head parts (hypothenar) 28A to 34A of the foot.

[0059] In this configuration, as illustrated in Fig. 6, the bulging part 100 comes into contact with an inner sole 7 of the shoe, and thus the surface part 100A of the bulging part 100 is held upward. The surface part 100A holds upward the first to fifth metatarsal bone head parts 26A to 34A such as the thenar 26A and the hypothenar 34A, that is, a side of the base of toes.

[0060] Therefore, the calcaneal anterior-part support protrusion 90 is in a state where restraint of the toes is released while the states of the arches of the foot are maintained.

[0061] Generally, an inner sole of a shoe has a high heel side and a low toe side to make walking easier, but since the toe side is low, force is easily applied to the toe side when the weight is applied, and the entire toes are easily pressed against the inner sole 7 of the shoe. Therefore, the toes may be difficult to move, a natural movement of the toes may be hindered, and it is difficult for the toes to obtain a stimulus of the natural movement.

[0062] On the other hand, in this configuration, since the bulging part 100 holds the thenar 26A and the hypothenar 34A at a high position with respect to the inner sole 7 of the shoe, the foot supported by the insole 1 tends to be approximately horizontal in the shoe, and it is difficult for the weight to be applied to the toe side in front of the fulcrum P3 (see Fig. 6), which makes it easier to move tips of the toes.

[0063] In this configuration, the insole body 160 includes the calcaneal anterior-part support protrusion 90. For this reason, the user of the insole 1 keeps the toe side high while the arches 120 to 122 of the sole of the foot are maintained in their natural shapes, and it is easy to move so that the toes naturally grab the ground during walking or running. Therefore, when the user goes up and down a slope or stairs, it is easy to apply force to the toe side, and it is easy for the toes to obtain an ideal stimulus of a movement. Using the insole 1 having this configuration makes it easy to suppress deterioration of a physical function of the foot.

[0064] Just walking with the shoe fitted with the insole 1 of this configuration makes it possible to train the toes. In particular, in this configuration, since the insole 1 also includes the cuboid bone support protrusion 80, a skeletal balance of the foot is adjusted, which further improves the stability and the motility, and facilitates the training.

[0065] In this configuration, the insole front part 110 is thinner than the bulging part 100, which further increases the degree of freedom of the toes in front of the first to fifth distal phalanxes 54 to 62 of the foot.

[0066] The movement of the toes to grab the ground

is easily performed in a case where the insole front part 110, on which the so-called toes including the proximal phalanxes 36 to 44, the middle phalanxes 46 to 52, and the distal phalanxes 54 to 62 in Fig. 2 rest, is softer than the bulging part 100, on which the thenar 26A and the hypothenar 34A rest.

[0067] In the present embodiment, the insole front part 110 is thinner and softer than the bulging part 100, so that the toes can be easily moved.

[0068] Therefore, it is possible to easily perform a walking motion to grasp the ground with the toes, and it is possible to enhance an exercise effect. It is possible to enhance the exercise effect while the shapes of the arches of the sole of the foot are maintained to ensure the stability and the motility of a body.

[0069] In this configuration, since the bulging part 100 is formed on the back surface 1B, as illustrated in Fig. 6, a gap 111 is generated between a close part of the bulging part 100 and the inner sole 7 of the shoe. Therefore, it is easy to push the insole front part 110 of the insole 1 toward the gap 111 from above. In addition, the V-shaped recess 105 is also formed in the bulging part 100, so that a portion between the thenar part 103 and the other-toe ball part 104 is thin, and the insole front part 110 can be easily pushed toward the gap 111 by a hallux.

[0070] As described above, in the present embodiment, the toes can be easily bent and force can be easily applied to the toes, and the motion of grasping the ground with the toes can be easily performed.

[0071] Furthermore, since the flat surface part 100A of the bulging part 100 is in contact with the sole of the foot, it is less likely to hinder the movement of the foot as compared with a case where an uneven shape is in contact with the sole of the foot.

[0072] On the other hand, since it is less likely to hinder the movement of the foot, positions of the thenar 26A and the hypothenar 34A may shift during walking or exercising, but the bulging part 100 is formed wide in a front-back direction, so that the bulging part 100 can support the thenar 26A and the hypothenar 34A.

[0073] As described above, the shoe insole 1 of the present embodiment includes, in order to maintain the inner longitudinal arch 121, the outer longitudinal arch 122, and the transverse arch 120 of the foot, the calcaneal anterior-part support protrusion 90 that abuts the calcaneal anterior part 12A of the foot, and the bulging part 100 that supports the thenar 26A and the hypothenar 34A of the foot, with the calcaneal anterior-part support protrusion 90 maintaining the inner longitudinal arch 121, the outer longitudinal arch 122, and the transverse arch 120, wherein the insole front part 110 thinner than the bulging part 100 is provided in front of the bulging part 100. Therefore, it is possible to facilitate the movement of grasping the ground with the toes and to train the toes while the shapes of the arches 120 to 122 of the sole of the foot are maintained in their natural states to ensure the stability and the motility of the body.

[0074] In the present embodiment, the front surface 1A is flat from the insole front part 110 to the bulging part 100, and the bulging part 100 bulges downward. Therefore, the bulging part 100 is in contact with the inner sole 7 of the shoe, and the surface part 100A forming the front surface 1A of the bulging part 100 is in contact with the sole of the foot on a flat surface, so that the toes can be easily moved.

[0075] Furthermore, in the present embodiment, the anterior edge of the bulging part 100 extends on a line connecting from the first proximal phalanx 36 to the fifth proximal phalanx 44 of the foot, and a portion of the anterior edge between the first proximal phalanx 36 and the second proximal phalanx 38 is formed with the V-shaped recess 105, and recessed backward. Therefore, it is easy to push downward the insole 1 of a region corresponding to the hallux, that is, the first proximal phalanx 36 and the first distal phalanx 54, and it is possible to facilitate the movement of grasping the ground with the hallux.

[0076] Furthermore, in the present embodiment, the trailing edge of the bulging part 100 is formed with the arc recess 106, in which the central portion in the width direction is recessed forward. Therefore, it is less likely to feel boundary of the bulging part 100 on the sole of the foot, so that discomfort can be reduced.

[0077] Furthermore, in the present embodiment, the thickness of the outer peripheral part of the bulging part 100 gradually decreases. Therefore, the outer peripheral part 102 of the bulging part 100 can be gradually deformed according to the weight, and thus it is possible to reduce the discomfort to the foot.

[0078] Furthermore, in the present embodiment, the cuboid bone support protrusion 80 is arranged so as to overlap the calcaneal anterior-part support protrusion 90, and the cuboid bone support protrusion 80 including an area from a region corresponding to the cuboid bone 18 of the foot to a region corresponding to the navicular bone 16 of the foot is downwardly inclined toward both left and right side edges to gradually decrease the thickness, and downwardly inclined from the region corresponding to the cuboid bone 18 in a forward-and-backward direction to gradually decrease the thickness, so that the thickness in front-back and left-right radial directions gradually decreases. Therefore, since the cuboid bone support protrusion 80 is provided, the cuboid bone 18 and the calcaneus 12 are stabilized while an arch shape including the calcaneocuboid joint between the cuboid bone 18 and the calcaneus 12 is maintained and the movement of the foot is permitted. Thus, the distortion of the calcaneocuboid joint is reduced, and a whole of a tarsal bone including the cuboid bone 18 and the calcaneus 12 is stabilized in a natural state. As a result, joints of the foot can move freely, so that the function of the foot can be enhanced.

[0079] However, the above-described embodiment is one aspect of the present invention, and it goes without saying that the above-described embodiment can be appropriately changed without departing from the spirit of the present invention.

[0080] For example, in the above-described embodiment, the insole body 160 is integrally molded, but the protrusion 2 or the bulging part 100 as separate bodies may be detachably fitted to a flat insole material. Furthermore, if the insole body 160 is formed as a plurality of layers and the protrusion 2 and the bulging part 100 are fitted to an intermediate layer, it is possible to form unevenness on a surface material.

[0081] The cuboid bone support protrusion 80, the calcaneal anterior-part support protrusion 90, and the bulging part 100 are formed solidly, but insides of the front surfaces 80A, 90A, and 101 of the cuboid bone support protrusion 80, the calcaneal anterior-part support protrusion 90, and the bulging part 100 may be hollow.

[0082] An object of an shoe insole of the present invention is to improve an upright standing posture and enhance a movement function, and it is suitable to widely apply the shoe insole not only to a shoe used daily, but also to various types of shoes such as a shoe for sports, which seeks for functionality, such as ski or soccer, a medical shoe having a purpose of treatment or rehabilitation, and a training shoe having a purpose of promoting a health. Reference Signs List

[0083]

1	Insole (shoe insole)
1A	Front surface (upper surface)
12A	Calcaneal tubercle (calcaneal anterior part)
18	Cuboid bone
26A	Thenar
34A	Hypothenar
36	First proximal phalanx
38	Second proximal phalanx
44	Fifth proximal phalanx
76	Both side edges
80	Cuboid bone support protrusion
90	Calcaneal anterior-part support protrusion
100	Bulging part (toe ball support part)
102	Outer peripheral part
110	Insole front part
120	Transverse arch
121	Inner longitudinal arch
122	Outer longitudinal arch

Claims

1. A shoe insole comprising: in order to maintain an inner longitudinal arch, an outer longitudinal arch, and a transverse arch of a foot, a calcaneal anterior-part support protrusion that abuts a calcaneal anterior part of the foot; and a toe ball support part that supports a thenar and a hypothenar of the foot, with the calcaneal anterior-part support protrusion maintaining the inner longitudinal arch, the outer longitudinal arch, and the transverse arch, wherein an insole front part thinner than the toe ball support part is provided in front of the toe ball support part.

2. The shoe insole according to claim 1, wherein an upper surface is flat from the insole front part to the toe ball support part, and the toe ball support part bulges downward.

3. The shoe insole according to claim 1 or 2, wherein an anterior edge of the toe ball support part extends on a line connecting from a first proximal phalanx to a fifth proximal phalanx of the foot, and a portion of the anterior edge between the first proximal phalanx and a second proximal phalanx is recessed backward.

4. The shoe insole according to any one of claims 1 to 3, wherein a trailing edge of the toe ball support part has a central portion in a width direction recessed forward.

5. The shoe insole according to any one of claims 1 to 4, wherein a thickness of an outer peripheral part of the toe ball support part gradually decreases.

6. The shoe insole according to any one of claims 1 to 5, wherein a cuboid bone support protrusion is arranged so as to overlap the calcaneal anterior-part support protrusion, and the cuboid bone support protrusion including an area from a region corresponding to a cuboid bone of the foot to a region corresponding to a navicular bone of the foot is downwardly inclined toward both left and right side edges to gradually decrease a thickness, and downwardly inclined from the region corresponding to the cuboid bone in a forward-and-backward direction to gradually decrease the thickness, so that the thickness in front-back and left-right radial directions gradually decreases.

FIG.1

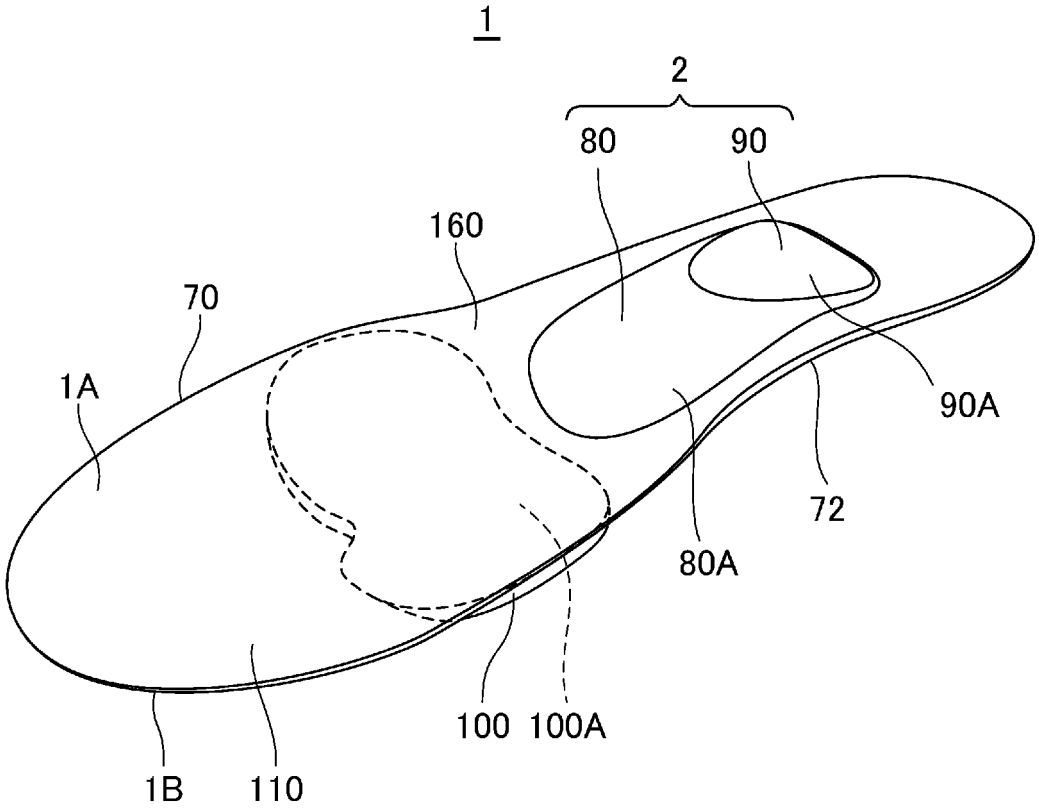


FIG.2

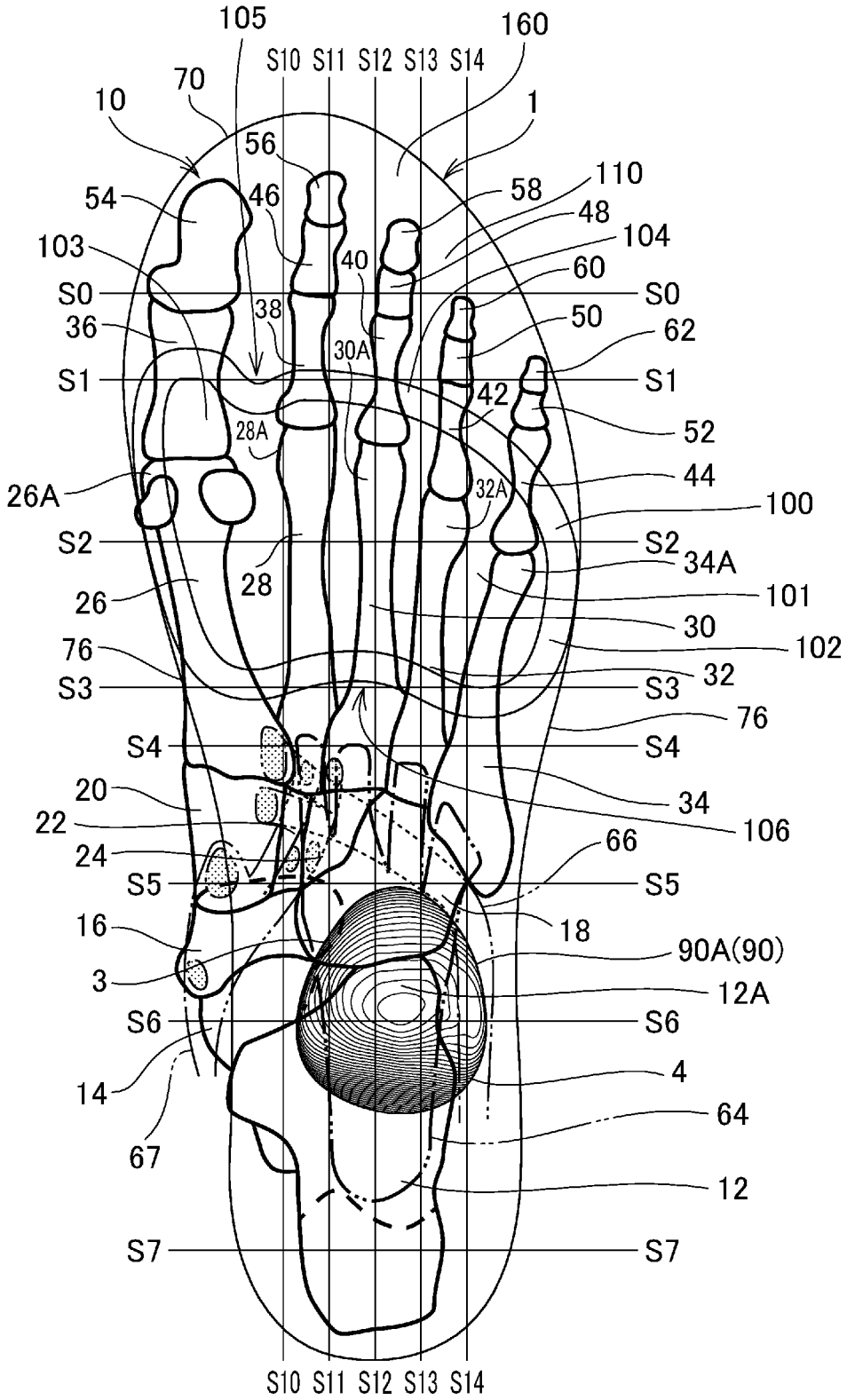

105
160
S10 S11 S12 S13 S14
70
10
1
56
110
58
54
46
48
104
103
40
60
S0
S0
38
50
36
62
30A
S1
S1
42
28A
52
44
26A
32A
100
S2
S2
34A
28
26
101
30
102
76
32
S3
S3
76
S4
S4
20
34
22
106
66
24
S5
S5
16
18
90A(90)
3
12A
S6
S6
4
14
64
67
12
S7
S7
S10 S11 S12 S13 S14

FIG.3A S0-S0

FIG.3B S1-S1

FIG.3C S2-S2

FIG.3D S3-S3

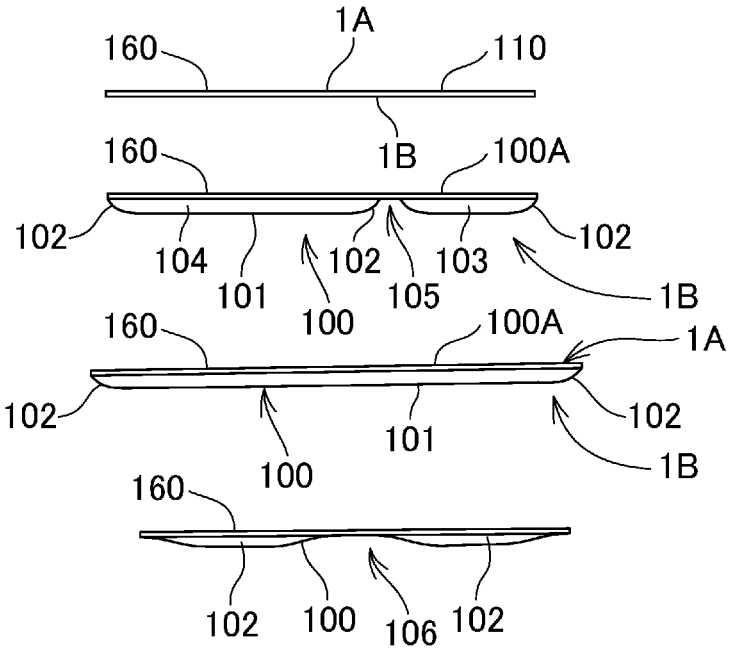


FIG.3E S4-S4

FIG.3F S5-S5

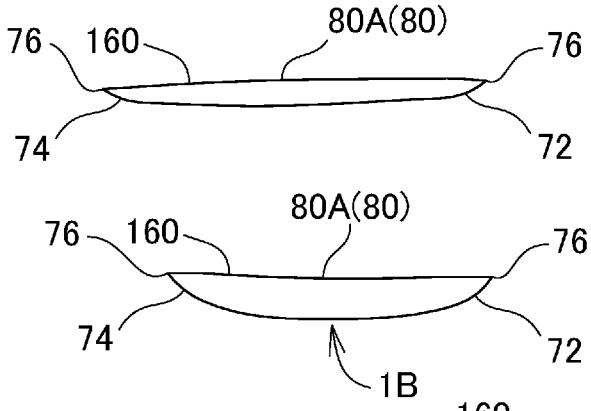


FIG.3G S6-S6

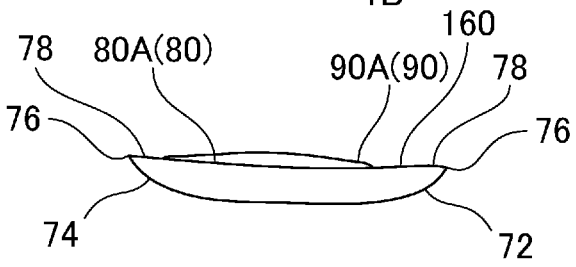
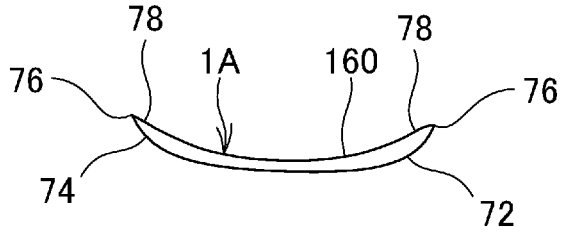


FIG.3H S7-S7



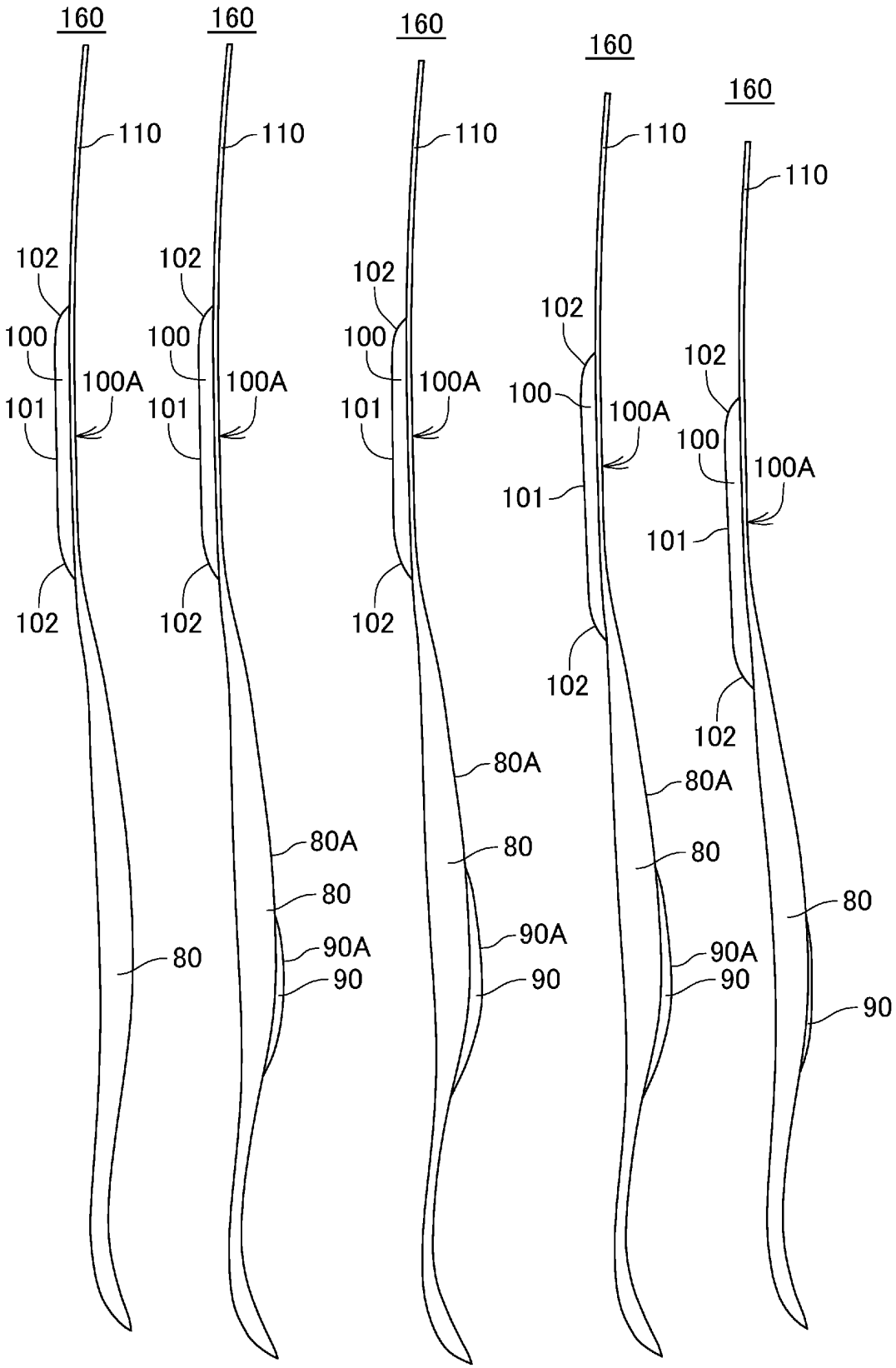


FIG.4A FIG.4B FIG.4C FIG.4D FIG.4E

FIG.5

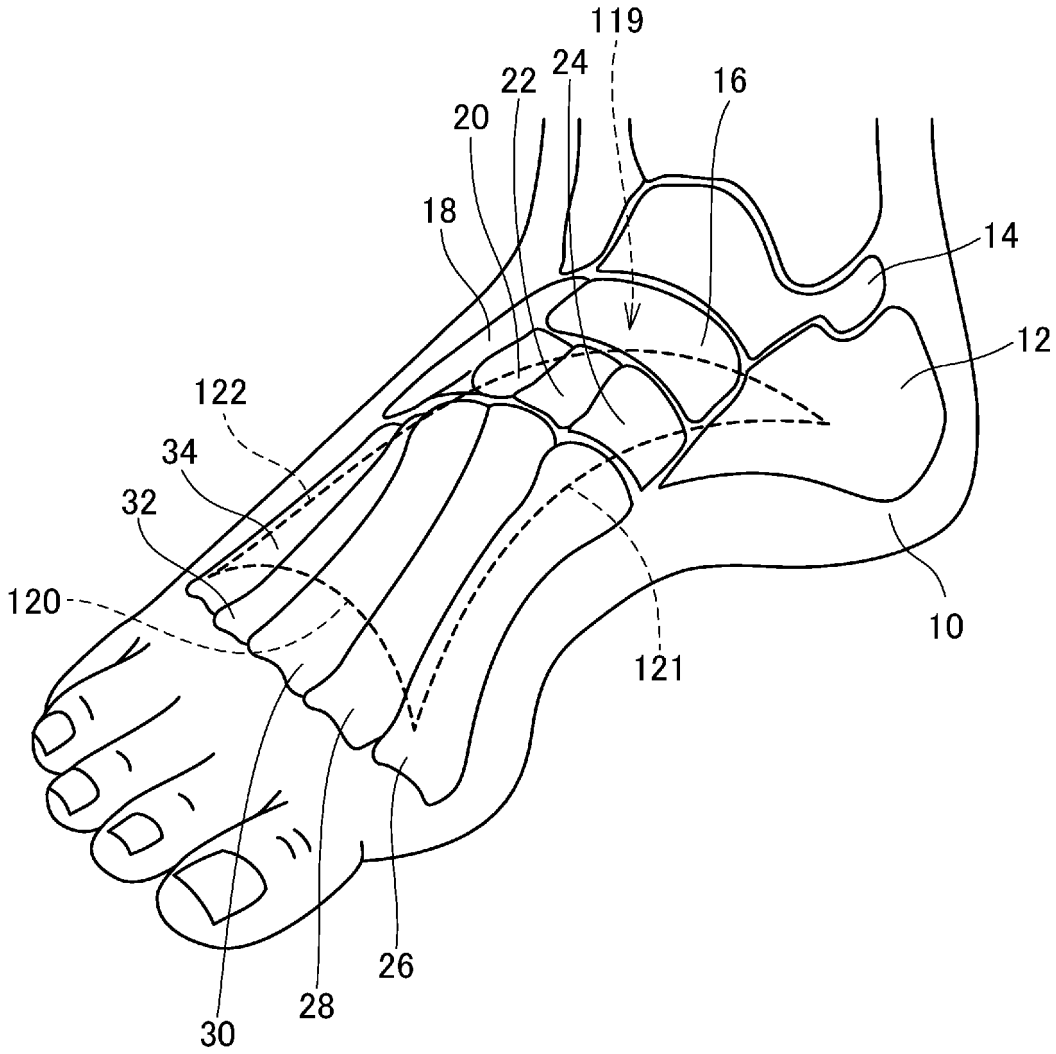
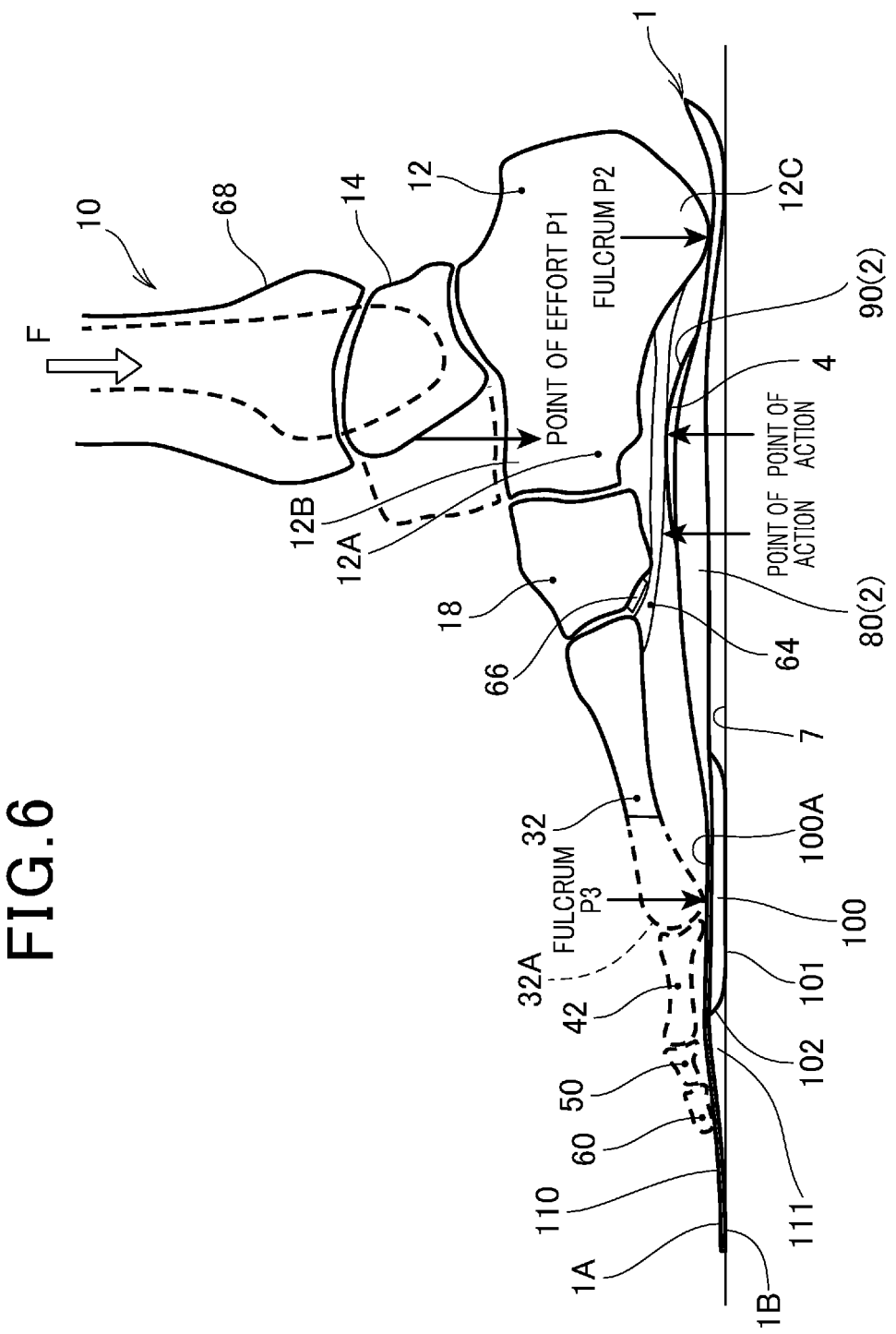


FIG.6


1
10
68
14
12
12C
F
POINT OF EFFORT P1
FULCRUM P2
90(2)
4
POINT OF ACTION
POINT OF ACTION
12B
12A
18
66
64
80(2)
7
32
FULCRUM P3
100A
100
32A
42
101
102
50
60
110
111
1A
1B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/027656

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A43B17/00(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)
Int. Cl. A43B17/00

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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	JP 64-83201 A (KUMAI, Sanji) 29 March 1989, page 2, upper left column, line 2 to upper right column, line 6, page 4, upper right column, line 6 to lower right column, line 14, fig. 2-7 (Family: none)	1, 4-5 2-3, 6
X	JP 2010-17514 A (SEKIGUCHI, Masahiko) 28 January 2010, paragraphs [0003], [0004], [0019]-[0036], [0045]-[0052], [0055]-[0058], fig. 1-5, 11, 14 (Family: none)	1
Y	JP 2018-23691 A (MEDICA SATO CO., LTD.) 15 February 2018, paragraphs [0049]-[0059], fig. 8 (Family: none)	2-3, 6

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10.09.2018	25.09.2018
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/027656

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2014/203399 A1 (BMZ LTD.) 24 December 2014, paragraphs [0024]-[0029], fig. 1 & US 2016/0095382 A1, paragraphs [0040]-[0048], fig. 1 & EP 3011853 A1 & KR 10-2016-0005043 A & CN 105338847 A	6
A	US 2004/0118017 A1 (MARTINEZ, Jacob A.) 24 June 2004, entire text, all drawings & WO 2004/060095 A1 & EP 16619972 A1 & EP 2829189 A1 & EP 2829190 A1 & DE 203021738 U1 & AU 2003279214 A1 & ES 2521617 T3 & DK 1619972 T3 & PT 1619972 E & HK 1079060 A1 & HK 1205886 A1 & HK 1205887 A1	1-6
A	JP 2002-282012 A (MOON STAR CO.) 02 October 2002, entire text, all drawings (Family: none)	1-6

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Patent documents cited in the description

- WO 2014203399 A1 **[0004]**