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(54) UPPER PROVIDED WITH SPONGE MEMBER IN HEEL PART

(57) An upper includes an inner skin placed on a wear's skin side, and an outer skin placed on an opposite side from the inner skin, wherein a sponge member is housed between the inner skin and the outer skin in a heel portion; the sponge member includes a medial side portion covering a medial side of a calcaneal bone, and a lateral side portion covering a lateral side of the calcaneal bone; and in a developed view where the sponge member is unfolded into a planar shape, a height of a lateral first centroid of a portion corresponding to the lateral side portion is set to be higher than a height of a medial first centroid of a portion corresponding to the medial side portion.

FIG. 5A

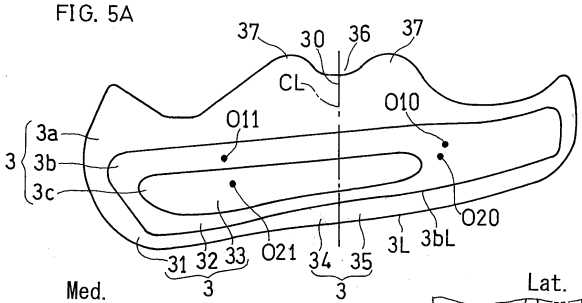


FIG. 5B

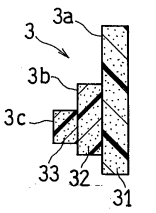


FIG. 5C

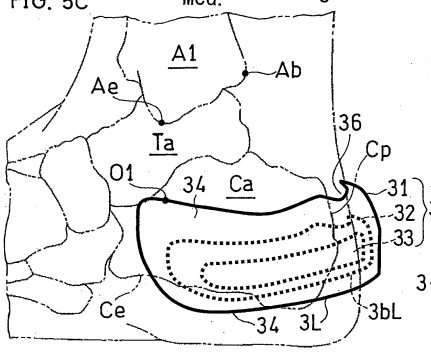
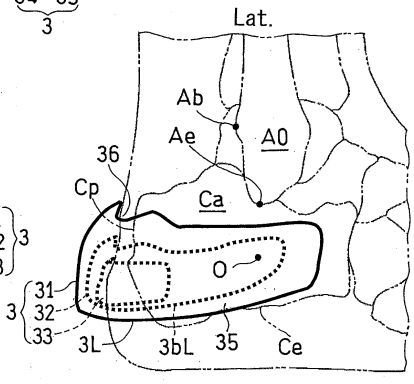


FIG. 5D



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Description

TECHNICAL FIELD

[0001] The present invention relates to an upper having a sponge member in a heel portion.

BACKGROUND ART

[0002] Shoes having a sponge member in the heel portion in order to improve the fit of the heel portion of the upper are well known in the art.

CITATION LIST

PATENT LITERATURE

[0003] First Patent Document: JP2011-041590 A (abstract) Second Patent Document: JP2010-022791 A (abstract)

SUMMARY OF INVENTION

[0004] There have been no researches in the prior art on the sponge member conducted while sufficiently taking into consideration the change in the shape of the foot. Therefore, in the prior art, the conformity of the upper to the foot (the fitting property) has not been satisfactory.

[0005] It is therefore an object of the present invention to provide an upper having a sponge member in a heel portion, with which it is possible to improve the fitting property of the upper.

Principle of the Invention

[0006] Prior to the description of the configuration of the present invention, the principle of the present invention will be presented through experiments and discussions done by the present inventors.

[0007] Referring to FIGS. **1A** and **1B,** a large number of markers **M** were attached to the foot of the subject in a five-by-five matrix pattern. FIGS. **1C** and **1D** show images of the markers **M** in a standstill position. Note that the markers **M** are connected with one another by vertical lines and horizontal lines so as to make the images easier to view.

[0008] Then, the subject ran as shown in FIGS. **2(a)** to **2(e),** and images of the markers **M** were captured at different phases, including heel contact **HC** of FIG. **2(a),** foot flat **FF** of FIG. **2(b),** mid stance **MS** of FIG. **2(c),** heel rise **HR** of FIG. **2(d),** and toe off TO of FIG. **2(e).**

[0009] FIGS. **2(f)** to **2(j)** show images on the back side, and FIGS. **2(k)** to **2(o)** show images on the lateral side. In these figures, **M1** denotes a marker attached to the medial ankle, whereas **M2** denotes a marker attached to the lateral ankle.

[0010] First, looking at FIGS. **2(f)** to **2(j)** while focusing on the medial side **Med** of the foot, one will notice that the portion below the marker **M1** of the medial ankle is narrowed increasingly toward the bottom throughout the entire motion period, and will notice that the narrowing particularly increases during toe off **TO.** Therefore, it is expected that for the medial side **Med** of the foot, the slippage off the upper will decrease by inserting a thick sponge in a lower portion **Fu.**

[0011] On the other hand, looking at FIGS. **2(f)** to **2(j)** while focusing on the lateral side **Lat** of the foot, one will notice that the portion below the marker **M2** of the lateral ankle is such that an area **Fa** immediately below the lateral ankle is narrowed throughout the entire motion period, and that the narrowing decreases during toe off **TO.** Therefore, it is expected that for the lateral side Lat of the foot, the slippage off the upper will decrease by inserting a thick sponge in an upper portion of the foot immediately below the lateral ankle.

[0012] Looking at FIGS. **2(k)** to **2(o)** while focusing on the back side of the foot, one will notice that the portion posterior to the lateral ankle, i.e., the area of the Achilles tendon, is narrowed increasingly toward the top over the period of heel contact **HC** to heel rise **HR,** but the narrowing decreases dramatically at the moment of toe off **TO.** On the other hand, one will notice that the area **Fb** at generally the same level as on the lateral side of the foot is narrowed throughout the entire period. It is assumed that this area **Fb** is behind the calcaneal tuberosity **Cp.** The lower end portion of the Achilles tendon is attached to the calcaneal tuberosity **Cp,** and a portion of the Achilles tendon that is above the calcaneal tuberosity **Cp** is substantially displaced during motion whereas the calcaneal tuberosity **Cp** itself does not substantially change during motion. Therefore, it is expected that for the back side, the slippage off the upper will decrease by inserting a thick sponge in the area of the calcaneal tuberosity **Cp** at generally the same level as on the lateral side **Lat** of the foot.

[0013] Then, the present inventors verified the hypothesis by the following method.

[0014] First, three different prototypes were provided, which had the same shoe structure with their arrangements of the sponge plate being different from one another. That is, there were provided Type 1 shown in FIGS. **3(a)** to **3(c),** Type 2 shown in FIGS. **3(d)** to **3(f),** and Type 3 shown in FIGS. **3(g)** to **3(i).** These types of shoes are basically of the same structure, only with their arrangements of the sponge plate **Sp** indicated by broken lines being different from one another. Note that reference numeral 1 denotes an upper, and reference numeral **2** a sole.

[0015] Next, while the subject ran, the amount of vertical slippage between the shoe and the foot over the tread period was measured, obtaining a measurement result indicating that Type 2 had a smaller amount of vertical slippage than Type 1 and Type 3. It is believed that this result agrees with the hypothesis, and that the hypothesis is probably right.

[0016] As the thickness of the sponge plate **Sp** was

varied from 5 mm to 10 mm to 15 mm with Type 2, the amount of slippage was particularly small when a 10 mm or 15 mm sponge plate **Sp** was installed.

[0017] An upper 1 of the present invention includes an inner skin 11 placed on a wear's skin side (a side to face a wear's skin), and an outer skin **12** placed on an opposite side from the inner skin **11,** wherein a sponge member **3** is housed between the inner skin **11** and the outer skin **12** in the heel portion **10;**

the sponge member **3** includes a medial side portion **34** covering a medial side of a calcaneal bone **Ca,** and a lateral side portion covering a lateral side of the calcaneal bone **Ca;** and

in a developed view where the sponge member **3** is unfolded into a planar shape (plane figure), a level of a lateral first centroid **O10** of a portion corresponding to the lateral side portion is set to be higher than a level of a medial first centroid **O11** of a portion corresponding to the medial side portion **34.**

[0018] In this case, the level of the lateral first centroid **O10** is higher than the level of the medial first centroid **O11.** Therefore, the sponge member **3** is placed in an area where the shape of the foot is hollowed and does not change substantially, i.e., in the lower portion directly below the medial ankle of the foot and in an area immediately below the lateral ankle of the foot, and the fit will therefore improve.

[0019] In the present invention, a sponge member refers to a member of a foamed synthetic resin or a foamed rubber that easily deforms under a load of an external force and that generally restores its original shape upon removal of the external force. A sponge member may be a member that is cut off or cut out from a sponge plate of a predetermined thickness, or may be obtained by subjecting such a member to secondary molding in a mold. Moreover, a sponge member may be a member individually foamed and molded in a mold.

[0020] Note that in the present invention, the centroid means the center of a shape.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

FIGS. **1A** and **1B** are a slant back side view and a slant lateral side view, respectively, showing a foot with markers attached thereto, and FIGS. **1C** and **1D** are a back side view and a lateral side view, respectively, showing captured positions of the markers in a standstill position.

FIG. **2** shows a test method and a test result, wherein (a) to **(e)** are schematic side views showing the running form from heel contact to toe off, **(f)** to **(j)** are images capturing the markers from the back side from heel contact to toe off, and **(k)** to **(o)** are images capturing the markers from the lateral side over the same period.

FIG. **3** shows arrangements of the sponge plate in test samples, wherein **(a), (b)** and **(c)** are a medial side view, a back side view and a lateral side view, respectively, of the heel portion of a shoe of Type 1, **(d), (e)** and **(f)** are a medial side view, a back side view and a lateral side view, respectively, of the heel portion of a shoe of Type 2, **and (g), (h)** and **(i)** are a medial side view, a back side view and a lateral side view, respectively, of the heel portion of a shoe of Type 3.

FIG. **4** is a conceptual lateral cross-sectional view of an upper according to Embodiment 1 of the present invention.

FIGS. **5A** to **5D** relate to Embodiment 1, wherein FIG. **5A** is a plan view of a sponge member, FIG. **5B** is a cross-sectional view thereof, FIG. **5C** is a medial side view showing the relationship between the sponge member and the foot, and FIG. **5D** is a lateral side view showing the same.

FIGS. **6A** to **6D** relate to Embodiment 2, wherein FIG. **6A** is a plan view of a sponge member, FIG. **6B** is a cross-sectional view thereof, FIG. **6C** is a medial side view showing the relationship between the sponge member and the foot, and FIG. **6D** is a lateral side view showing the same.

FIGS. **7A** to **7D** relate to Embodiment 3, wherein FIG. **7A** is a plan view of a sponge member, FIG. **7B** is a cross-sectional view thereof, FIG. **7C** is a medial side view showing the relationship between the sponge member and the foot, and FIG. **7D** is a lateral side view showing the same.

FIGS. **8A** to **8D** relate to Embodiment 4, wherein FIG. **8A** is a plan view of a sponge member, FIG. **8B** is a cross-sectional view thereof, FIG. **8C** is a medial side view showing the relationship between the sponge member and the foot, and FIG. **8D** is a lateral side view showing the same.

DESCRIPTION OF EMBODIMENTS

[0022] Preferably, the medial side portion **34** covers at least a portion of a lower edge **Ce** of the calcaneal bone **Ca** directly below a talus **Ta,** and the lateral side portion **35** covers an area of the calcaneal bone **Ca** directly above a point **O,** wherein the point **O** bisects a distance between a lowermost end point **Ae** of a lateral ankle **A0** and the lower edge **Ce** of the calcaneal bone **Ca.**

[0023] In this case, the medial side portion **34** of the sponge member **3** fills the narrowed portion directly below the talus **Ta.** On the other hand, the lateral side portion **35** of the sponge member **3** fills the narrowed portion directly and immediately below the lateral ankle **A0.** Therefore, narrowed portions on the medial side and the lateral side of the heel will be filled, and the upper 1 will better fit the heel.

[0024] More preferably, the sponge member **3** includes a thin portion **3a** having a small thickness, and a thick portion **3b** thicker than the thin portion **3a,** and wherein with the sponge member **3** unfolded, a perimeter of the

thick portion **3b** is surrounded by the thin portion **3a.**

[0025] In this case, the thick portion **3b** protrudes with respect to the thin portion **3a,** and the triangular narrowed portions on the medial side and the lateral side of the heel will likely be filled by the protruding area.

[0026] More preferably, in a developed view where the thick portion **3b** is unfolded into a planar shape, a level of a lateral second centroid **020** of a portion of the thick portion **3b** corresponding to the lateral side portion is set to be higher than a level of a medial second centroid **021** of a portion of the thick portion **3b** corresponding to the medial side portion **34.**

[0027] The level of the lateral second centroid **020** of the thick portion **3b** is higher than the medial second centroid **021** of the thick portion **3b.** Therefore, the thick portion **3b** is placed in an area where the shape of the foot is hollowed or narrowed and does not change substantially, i.e., in the lower portion directly below the medial ankle of the foot and in an area directly (nearly immediately) below the lateral ankle of the foot, and the fitting property will therefore further improve.

[0028] Preferably, a lower edge line **3bL** of the thick portion **3b** extends, while being upwardly slanted, from a medial side of the heel portion **10** to a lateral side thereof via a back side thereof.

[0029] In this case, the thick portion **3b** will likely fill the gap in the lower portion of the heel portion **10** on the medial side of the heel portion **10,** fill the gap behind the calcaneal tuberosity **Cp** on the back side of the heel portion 10, and fill the gap in the upper portion of the heel portion **10** on the lateral side of the heel portion **10.**

[0030] Preferably, a lower edge line **3L** of the sponge member **3** extends, while being upwardly slanted, from a medial side of the heel portion **10** to a lateral side thereof via a back side thereof.

[0031] In this case, the sponge member **3** will likely fill the gap in the lower portion of the heel portion **10** on the medial side of the heel portion **10,** fill the gap behind the calcaneal tuberosity **Cp** of the heel portion **10** on the back side of the heel portion **10,** and fill the gap in the upper portion of the heel portion **10** on the lateral side of the heel portion **10.**

[0032] Preferably, the sponge member 3 includes:

a first sponge plate **31** extending along a medial side of a heel coming from a back side of the heel and also extending along a lateral side of the heel coming from the back side of the heel; and

a second sponge plate **32** laid on a foot skin side of the first sponge plate **31,** the second sponge plate **32** having a smaller area than the first sponge plate **31,** wherein:

the second sponge plate **32** is laid on a portion of the first sponge plate **31** while being bonded, glued or welded to the first sponge plate **31;**

the thin portion **3a** is formed by a portion of the first sponge plate **31** on which the second sponge plate **32** is not laid; and

the thick portion **3b** is formed by a portion where the second sponge plate **32** is laid on the first sponge plate **31.**

[0033] In this example, the manufacturing cost will be significantly lower as compared with a case where the sponge member **3** is molded in a mold in a secondary molding process, or the like. Moreover, the sponge member **3** will not have locally dense portions.

[0034] Preferably, the second sponge plate **32** is formed by a material having a lower resilience than the first sponge plate 31.

[0035] Since the low-resilience second sponge plate **32** placed on the foot skin side maintains, with a small pressure, the shape in conformity with the surface of the foot, it is possible to achieve a desirable foot conformity. On the other hand, when the shape of the heel substantially changes instantaneously, the high-resilience first sponge plate **31** will likely follow such changes. Therefore, the fitting property of the upper will further improve.

[0036] In the present invention, "low resilience" means that the speed at which the original shape is restored upon removal of a load of an external force is low. Therefore, when a load of an external force is applied to both of the sponge plates **31** and **32,** the high-resilience first sponge plate **31** will deform quickly, and the deformation of the low-resilience second sponge plate **32** will lag behind. Upon removal of the load of the external force off both of the sponge plates **31** and **32,** the first sponge plate **31** will quickly restore its original shape, and the restoration of the second sponge plate **32** will lag behind the first sponge plate **31.**

[0037] Preferably, the second sponge plate **32** is formed by a material having a lower hardness than the first sponge plate 31.

[0038] In this case, the low-hardness second sponge plate **32** placed on the foot skin side will softly contact the skin surface of the heel. Therefore, the wearer will unlikely feel compressed.

[0039] More preferably, the second sponge plate **32** is formed by a material having a lower resilience and a lower hardness than the first sponge plate 31.

[0040] In this case, the fit will further improve, and one will unlikely feel compressed.

[0041] In the present invention, the material of the first sponge plate 31 having a high hardness and a high resilience may be, for example, an urethane foam, a silicone foam, or the like, whereas a material having a low hardness and a low resilience may be, for example, an urethane foam, a silicone foam, or the like. Although the material of the high-resilience first sponge plate 31 has a lower resilience than the sponge material used in an ordinary midsole or a sock liner (sock lining), it has a relatively higher resilience than the material of the low-resilience second sponge plate **32.**

[0042] The hardness of the first sponge plate **31** is preferably 40 to 90 degrees, more preferably 55 to 90 de-

grees, particularly preferably 70 to 90 degrees, and most preferably 75 to 85 degrees, in terms of the F hardness.

[0043] On the other hand, the hardness of the second sponge plate **32** is preferably 10 to 80 degrees, more preferably 10 to 50 degrees, particularly preferably 10 to 30 degrees, and most preferably 15 to 25 degrees, in terms of the F hardness.

[0044] The above F hardness is a value obtained through measurement using the Asker rubber hardness meter F-type (from Kobunshi Keiki Co., Ltd.). Note that the hardness of the first sponge plate **31** and the hardness of the second sponge plate **32** will be substantially zero degree if measured by using a JIS C hardness meter.

[0045] Preferably, the sponge member **3** further includes a back portion 30 covering a calcaneal tuberosity **Cp** from directly behind along a virtual line **CL** dividing the sponge member **3** into the medial side portion **34** and the lateral side portion **35,** and the sponge member **3** defines a narrowed portion **36** which is narrowed downwardly along the virtual line **CL** and which does not cover an area above the calcaneal tuberosity **Cp.**

[0046] In this case, the gap, which likely occurs between the calcaneal tuberosity **Cp** and an area of the upper behind the calcaneal tuberosity **Cp,** will be filled by the back portion **30,** thereby improving the fitting property. On the other hand, the narrowed portion **36** will accommodate substantial displacement or deformation of the Achilles tendon, and therefore the movement of the Achilles tendon will unlikely be hindered.

[0047] In another aspect of the present invention, the upper **1** includes an inner skin **11** placed on a wear's skin side, and an outer skin on an opposite side from the inner skin **11,** wherein a sponge member **3** is housed between the inner skin 11 and the outer skin in the heel portion **10;** the sponge member **3** includes a medial side portion **34** covering a medial side of a calcaneal bone **Ca,** and a lateral side portion **35** covering a lateral side of the calcaneal bone **Ca;**

the medial side portion **34** covers at least a portion of a lower edge **Ce** of the calcaneal bone **Ca** directly below the talus **Ta,** and the lateral side portion 35 covers an area of the calcaneal bone **Ca** directly above a point **O**, wherein the point **O** bisects a distance between a lower end of a lateral ankle **A0** and the lower edge Ce of the calcaneal bone **Ca;**

the sponge member 3 includes a first sponge plate 31 extending along a medial side of a heel coming from a back side of the heel and also extending along a lateral side of the heel coming from the back side of the heel, and a second sponge plate 32 laid on a foot skin side of the first sponge plate 31, the second sponge plate 32 having a smaller area than the first sponge plate 31; and the second sponge plate **32** is partially laid on the first sponge plate **31** while being bonded, glued or welded together to the first sponge plate **31.**

[0048] In this case, the medial side portion **34** of the sponge member **3** fills the narrowed portion directly below the talus **Ta.** On the other hand, the lateral side portion **35** of the sponge member **3** fills the narrowed portion directly and immediately below the lateral ankle **A0.** Therefore, narrowed portions on the medial side and the lateral side of the heel will be filled, and the upper 1 will better fit the heel.

[0049] The present invention will be understood more clearly from the following description of preferred embodiments taken in conjunction with the accompanying drawings. Note however that the embodiments and the drawings are merely illustrative and should not be taken to define the scope of the present invention. The scope of the present invention shall be defined only by the appended claims. In the accompanying drawings, like reference numerals denote like components throughout the plurality of figures.

EMBODIMENTS

[0050] Embodiments of the present invention will now be described with reference to the drawings.

[0051] FIGS. 4 to **5D** show Embodiment 1.

[0052] As shown in FIG. **4,** the upper 1 includes the inner skin **11** placed on the wear's skin side, and the outer skin **12** placed on the opposite side from the inner skin **11.** The sponge member **3** is housed between the inner skin **11** and the outer skin **12** in the heel portion **10.**

[0053] Note that although the sponge member **3** undergoes substantial compressive deformation, or the like, when manufacturing the shoe, FIG. **4** merely shows the conceptual placement of the sponge member **3.** Reference numeral **6** denotes an insole.

[0054] The inner skin 11 may be a mesh material, or the like, as well as a woven material or a knit material having desirable stretchability and air-permeability. On the other hand, the outer skin **12** may be a mesh material, or the like, as well as a plate or tape material made of a synthetic leather or a non-foamed synthetic resin having a desirable shape retention.

[0055] Note that each of the inner skin **11** and the outer skin **12** may include a single layer or multiple layers. A heel counter or a core well known in the art may be placed.

[0056] In the present embodiment, the sponge member **3** includes the first to third sponge plates **31** to **33.** The first sponge plate **31** and the second sponge plate **32** are bonded, glued or welded together, and are partially laid on each other. The second sponge plate **32** and the third sponge plate **33** are bonded, glued or welded together, and are partially laid on each other.

[0057] The first sponge plate **31** is formed by a sponge having a high resilience and a high hardness. On the other hand, the second and third sponge plates **32** and **33** are formed by a sponge having a low resilience and a low hardness.

[0058] Note that the third sponge plate **33** may be of a material having the same physical properties as that of the second sponge plate **32.**

[0059] As shown in FIGS. **5A** to **5D,** the first sponge plate **31** extends along the medial side of the heel coming from the back side of the heel and also extends along the lateral side of the heel coming from the back side of the heel. As shown in FIG. 4, the second sponge plate **32** is laid on the foot skin side of the first sponge plate **31,** and has a smaller area than the first sponge plate **31** as shown in FIG. **5A.** The third sponge plate **33** of FIG. **4** is laid on the foot skin side (the inner skin 11 side) of the second sponge plate **32,** and has an even smaller area than the second sponge plate **32** as shown in FIG. **5A.**

[0060] The sponge member **3** includes the medial side portion **34** covering the medial side of the calcaneal bone **Ca** as shown in FIG. **5C,** and the lateral side portion **35** covering the lateral side of the calcaneal bone **Ca** as shown in FIG. **5D.** The medial side portion **34** and the lateral side portion **35** of FIG. **4** are separated from each other by a medial-lateral center line (virtual line) **CL** of the heel portion **10** (FIG. 4).

[0061] Thus, as shown in FIG. **5B,** the sponge member **3** includes the thin portion **3a** having a small thickness, and the thick portion 3b thicker than the thin portion **3a.** With the sponge member 3 of FIG. **5A** unfolded, the perimeter of the thick portion **3b** is surrounded by the thin portion **3a.**

[0062] That is, the thin portion **3a** is formed by a portion of the first sponge plate **31** on which no second sponge plate **32** is laid. On the other hand, the thick portion **3b** is formed by a portion where the second sponge plate **32** is laid on the first sponge plate **31.**

[0063] Note that in the case of three layers as shown in FIG. **5B,** the sponge member **3** includes a thickest portion 3c that is even thicker than the thick portion **3b.** With the sponge member **3** of FIG. **5A** unfolded, the perimeter of the thickest portion **3c** is surrounded by the thick portion **3b.**

[0064] As shown in FIGS. **5A, 5C** and **5D,** the lower edge line **3L** of the sponge member **3** extends, while being upwardly slanted, from the medial side of the heel portion **10** to the lateral side thereof via the back side thereof. Thus, in the developed view of FIG. **5A** where the sponge member **3** is unfolded into a planar shape (plane figure), the level of the centroid of the portion corresponding to the lateral side portion **35,** i.e., the lateral first centroid **O10,** is set to be higher than the level of the centroid of the portion corresponding to the medial side portion **34,** i.e., the medial first centroid **O11.**

[0065] As shown in FIGS. **5A, 5C** and **5D,** the lower edge and upper edge line **3bL** of the thick portion **3b** extends, while being upwardly slanted, from the medial side of the heel portion **10** to the lateral side thereof via the back side thereof. Thus, in the developed view of FIG. **5A,** the level of the lateral second centroid **020** of the portion of the thick portion **3b** corresponding to the lateral side portion **35** is set to be higher than the level of the medial second centroid **021** of the portion of the thick portion **3b** corresponding to the medial side portion **34.**

[0066] The first sponge plate **31** further includes the back portion **30** covering the calcaneal tuberosity **Cp** (FIG. **5C**) from directly behind along the virtual center line **CL** of FIG. **5A**. The first sponge plate 31 has the narrowed portion 36 where the upper edge is narrowed downwardly along the center line **CL,** which is the medial-lateral center. Because of the narrowed portion **36,** the first sponge plate **31** does not cover the area above the calcaneal tuberosity **Cp,** and the first sponge plate **31** will not therefore compress the Achilles tendon during toe off of FIG. **2(o).** On the other hand, protruding portions **37** and **37** protruding upward on opposite sides of the narrowed portion **36** of FIG. **5A** will improve the fit on the medial side and the lateral side of the heel.

[0067] The first sponge plate **31** of the medial side portion **34** of FIG. **5C** covers at least a portion of the lower edge **Ce** of the calcaneal bone **Ca** directly below the talus **Ta,** and covers the majority of the lower half of the calcaneal bone **Ca** posterior to the medial ankle **A1.** The second sponge plate **32** of the medial side portion **34** covers an area of the calcaneal bone **Ca** below the point **O1** and does not cover an area above the point **01,** wherein the point **O1** bisects a distance between the lowermost end point **Ae** of the medial ankle **A1** and the lower edge **Ce** of the calcaneal bone **Ca.**

[0068] The first and second sponge plates **31** and **32** of the lateral side portion **35** cover both an area of the calcaneal bone **Ca** directly above the point **O** and an area of the calcaneal bone **Ca** directly below the point **O,** wherein the point **O** bisects a distance between the lowermost end point **Ae** of the lateral ankle **A0** and the lower edge **Ce** of the calcaneal bone **Ca.**

[0069] The first sponge plate **31** extends to a point anterior to the lowermost end point **Ae** of the medial ankle **A1** on the medial side of the foot of FIG. **5C,** and extends to a point anterior to the lowermost end point **Ae** of the lateral ankle **A0** on the lateral side of the foot of FIG. **5D.**

[0070] The second sponge plate **32** extends to a point anterior to the posterior end **Ab** of the medial ankle **A1** on the medial side of the foot of FIG. **5C,** and extends to a point anterior to the posterior end **Ab** of the lateral ankle **A0** on the lateral side of the foot of FIG. **5D.**

[0071] The areas of the first sponge plate **31,** the second sponge plate **32** and the third sponge plate **33** on the medial side portion **34** are respectively greater than those on the lateral side portion **35.** Note that for the lowermost end portion of the foot, a roll-up portion is often formed in the upper 1 itself or in the sock liner (sock lining), in which case there is no need to provide the sponge member **3** on the medial side **Med.**

[0072] In the following examples, like elements to those of Embodiment 1 will be denoted by like reference numerals and will not be further described below, and the following description will mainly focus on what is different from Embodiment 1.

[0073] Note that as in Embodiment 2 shown in FIGS. **6A** to **6D,** the area of the third sponge plate **33** on the

lateral side of the foot may be greater than that on the medial side of the foot.

[0074] FIGS. **7A** to **7D** show Embodiment 3.

[0075] In the present embodiment, the third sponge plate 33 is absent. In such a case, the thickness of the first and second sponge plates **31** and **32** is preferably made greater than that in Embodiments 1 and 2.

[0076] In various embodiments, the thickness of the sponge plates **31** and **32** is preferably about 5 to 15 mm, and more preferably about 7 to 12 mm.

[0077] As shown in FIG. **7A,** in Embodiment 3, the second sponge plate **32** has a narrowed portion **38** that is narrowed downwardly in the area of the center line **CL.** The narrowed portion **38,** in cooperation with the narrowed portion **36,** will further unlikely causes compression on the Achilles tendon.

[0078] As shown in FIGS. **7A, 7C** and **7D,** the second sponge plate **32** has a significantly larger area on the medial side portion **34** than on the lateral side portion **35.** The second sponge plate **32** extends to a point anterior to the posterior end **Ab** of the medial ankle **A1** on the medial side portion **34** of FIG. **7C,** and the second sponge plate **32** does not extend to the posterior end **Ab** of the lateral ankle **A0** on the lateral side portion **35** of FIG. **7D,** with the second sponge plate **32** not covering the anterior half of the calcaneal bone **Ca** while covering the posterior portion of the calcaneal bone **Ca.**

[0079] FIGS. **8A** to **8D** show Embodiment 4.

[0080] In this example, the medial side portion **34** and the lateral side portion **35** have shapes that are generally in line symmetry with each other about the center line **CL.**

[0081] In the present embodiment, the medial side portion **34** of the first sponge plate **31** covers at least a portion of the lower edge **Ce** of the calcaneal bone **Ca** directly below the talus **Ta.** On the other hand, the lateral side portion **35** of the first sponge plate **31** covers an area of the calcaneal bone **Ca** directly above the point **O**, wherein the point **O** is a bisector between the lower end of the lateral ankle **A0** and the lower edge **Ce** of the calcaneal bone **Ca.**

[0082] The second sponge plate **32** of FIG. **8A** includes, at its opposite ends, protruding portions **39** and **39** that coincide with the upper edge line of the first sponge plate **31.** The protruding portions 39 will be helpful in positioning the first sponge plate 31 and the second sponge plate **32** with each other.

[0083] The sponge member **3** of the present embodiment having a generally line-symmetric shape may lead to a less desirable fitting property as compared with Embodiments 1 to 3. However, the second sponge plate **32** is partially laid on the first sponge plate **31,** and the sponge member **3** can be expected to fill the gap between the foot and the upper **1** and improve the fit to some degree. Particularly, the foot conformity will improve by setting the hardness and the resilience of the second sponge plate **32** lower than those of the first sponge plate **31.**

[0084] On the other hand, Embodiment 4 having a symmetric shape can improve productivity as compared with Embodiments 1 to 3, where it is necessary to provide both a member for the left foot and a member for the right foot, and the left-foot member and the right-foot member cannot be installed incorrectly during the manufacture.

[0085] While preferred embodiments have been described above with reference to the drawings, various obvious changes and modifications will readily occur to those skilled in the art upon reading the present specification.

[0086] For example, different sponge plates may have the same hardness and the same resilience property.

[0087] The sponge member may be divided into two pieces between the medial side and the lateral side, or may be divided into three pieces between the medial side, the back side and the lateral side.

[0088] Thus, such changes and modifications are deemed to fall within the scope of the present invention.

[0089] The present invention is applicable to a heel portion of an upper.

REFERENCE SIGNS LIST

[0090]

1: Upper, 10: Heel portion, 11: Inner skin, 12: Outer skin
2: Sole
3: Sponge member, 30: Back portion, 31: First sponge plate, 32: Second sponge plate, 33: Third sponge plate, 34: Medial side portion, 35: Lateral side portion, 36: Narrowed portion, 37: Protruding portion, 38: Narrowed portion, 39: Protruding portion
3a: Thin portion, 3b: Thick portion, 3c: Thickest portion, 3bL: Lower edge line of thick portion
3L: Lower edge line of sponge member
6: Insole
A0: Lateral ankle, A1: Medial ankle, Ae: Lowermost end point, Ab: Posterior end
Ca: Calcaneal bone, Ce: Lower edge of calcaneal bone, Cp: Calcaneal tuberosity
CL: Center line
Fa: Area directly below lateral ankle, Fb: Area at same height as on lateral side of foot, Fu: Lower portion
M: Marker, M1: Marker attached to medial ankle, M2: Marker attached to lateral ankle
O, O1: Bisector point
O10: Lateral first centroid, O11: Medial first centroid, 020: Lateral second centroid
O21: Medial second centroid
Sp: Sponge plate
Ta: Talus

Claims

1. A structure of an upper for improving a fitting property

of a heel portion **10** of the upper **1** of a shoe, wherein:

the upper **1** includes an inner skin **11** placed on a wear's skin side, and an outer skin placed on an opposite side from the inner skin **11,** wherein a sponge member 3 is housed between the inner skin **11** and the outer skin in the heel portion **10;**
the sponge member **3** includes a medial side portion **34** covering a medial side of a calcaneal bone **Ca,** and a lateral side portion **35** covering a lateral side of the calcaneal bone **Ca;** and
in a developed view where the sponge member **3** is unfolded into a planar shape, a level of a lateral first centroid **O10** of a portion corresponding to the lateral side portion 35 is set to be higher than a level of a medial first centroid **O11** of a portion corresponding to the medial side portion **34.**

2. The structure according to claim 1, wherein the medial side portion **34** covers at least a portion of a lower edge **Ce** of the calcaneal bone **Ca** directly below a talus **Ta,** and the lateral side portion covers an area of the calcaneal bone **Ca** directly above a point **O,** wherein the point **O** bisects a distance between a lowermost end point **Ae** of a lateral ankle **A0** and the lower edge **Ce** of the calcaneal bone **Ca.**

3. The structure according to claim 2, wherein the sponge member **3** includes a thin portion **3a** having a small thickness, and a thick portion **3b** thicker than the thin portion **3a,** and wherein with the sponge member 3 unfolded, a perimeter of the thick portion **3b** is surrounded by the thin portion **3a.**

4. The structure according to claim 3, wherein in a developed view where the thick portion **3b** is unfolded into a planar shape, a level of a lateral second centroid **020** of a portion of the thick portion **3b** corresponding to the lateral side portion is set to be higher than a level of a medial second centroid **021** of a portion of the thick portion **3b** corresponding to the medial side portion **34.**

5. The structure according to claim 3, wherein a lower edge line **3bL** of the thick portion **3b** extends, while being upwardly slanted, from a medial side of the heel portion 10 to a lateral side of the heel portion **10** via a back side of the heel portion **10.**

6. The structure according to claim 2, wherein a lower edge line **3L** of the sponge member **3** extends, while being upwardly slanted, from a medial side of the heel portion **10** to a lateral side of the heel portion **10** via a back side of the heel portion **10.**

7. The structure according to claim 3, wherein the sponge member **3** comprises:

a first sponge plate **31** extending along a medial side of a heel coming from a back side of the heel and also extending along a lateral side of the heel coming from the back side of the heel; and
a second sponge plate **32** laid on a foot skin side of the first sponge plate **31,** the second sponge plate **32** having a smaller area than the first sponge plate **31,** wherein:

the second sponge plate **32** is laid on a portion of the first sponge plate 31 while being bonded, glued or welded to the first sponge plate **31;**
the thin portion **3a** is formed by a portion of the first sponge plate **31** on which the second sponge plate **32** is unlaid; and
the thick portion **3b** is formed by a portion where the second sponge plate **32** is laid on the first sponge plate **31.**

8. The structure according to claim 7, wherein the second sponge plate **32** is formed by a material having a lower resilience than the first sponge plate **31.**

9. The structure according to claim 7, wherein the second sponge plate **32** is formed by a material having a lower hardness than the first sponge plate **31.**

10. The structure according to claim 7, wherein the second sponge plate **32** is formed by a material having a lower resilience and a lower hardness than the first sponge plate **31.**

11. The structure according to claim 2, wherein the sponge member **3** further comprises a back portion **30** covering a calcaneal tuberosity **Cp** from directly behind along a virtual line **CL** dividing the sponge member 3 into the medial side portion **34** and the lateral side portion **35,** and the sponge member **3** defines a narrowed portion **36** that is narrowed downwardly along the virtual line **CL** without covering an area above the calcaneal tuberosity **Cp.**

12. A structure for improving a fitting property of a heel portion **10** of an upper **1** of a shoe, wherein:

the upper **1** includes an inner skin **11** placed on a wear's skin side, and an outer skin on an opposite side from the inner skin **11,** wherein a sponge member **3** is housed between the inner skin **11** and the outer skin in the heel portion **10;**
the sponge member **3** includes a medial side portion **34** covering a medial side of a calcaneal bone **Ca,** and a lateral side portion **35** covering a lateral side of the calcaneal bone **Ca;**
the medial side portion **34** covers at least a portion of a lower edge **Ce** of the calcaneal bone

Ca directly below a talus **Ta,** and the lateral side portion **35** covers an area of the calcaneal bone **Ca** directly above a point **O**, wherein the point **O** bisects a distance between a lower end of a lateral ankle **A0** and the lower edge **Ce** of the calcaneal bone **Ca;**
the sponge member **3** includes a first sponge plate **31** extending along a medial side of a heel coming from a back side of the heel and also extending along a lateral side of the heel coming from the back side of the heel, and a second sponge plate **32** laid on a foot skin side of the first sponge plate **31,** the second sponge plate **32** having a smaller area than the first sponge plate **31;** and
the second sponge plate **32** is partially laid on the first sponge plate **31** while being bonded, glued or welded together to the first sponge plate **31.**

13. The structure according to claim 12, wherein the sponge member **3** further comprises a back portion **30** covering a calcaneal tuberosity **Cp** from directly behind along a virtual line **CL** dividing the sponge member **3** into the medial side portion **34** and the lateral side portion **35,** and the sponge member **3** defines a narrowed portion **36** that is narrowed downwardly along the virtual line **CL** without covering an area above the calcaneal tuberosity **Cp.**

14. The structure according to claim 12, wherein the second sponge plate **32** is formed by a material having a lower resilience and/or a lower hardness than the first sponge plate 31.

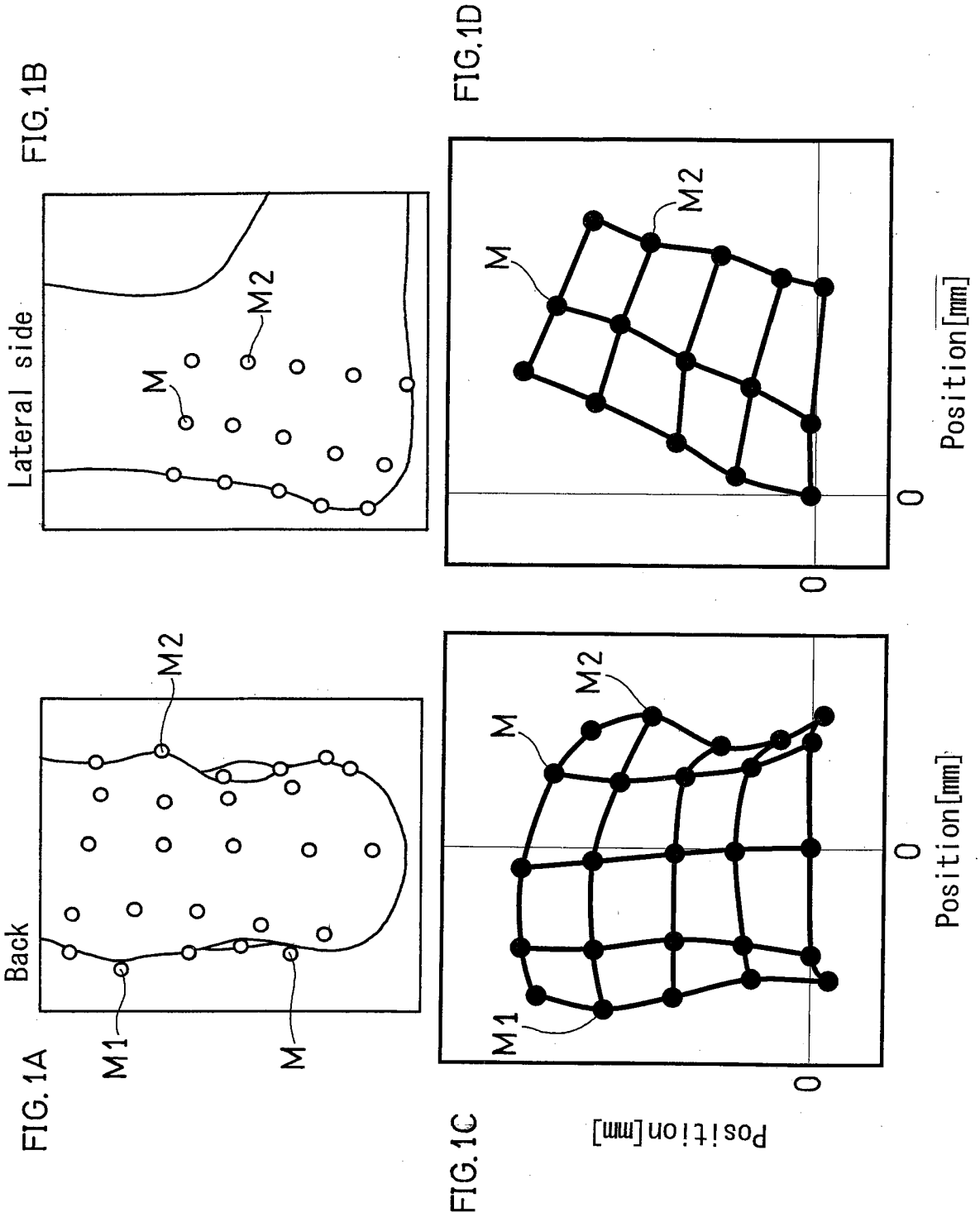


FIG. 1A

FIG. 1B

FIG. 1C

FIG. 1D

FIG. 2

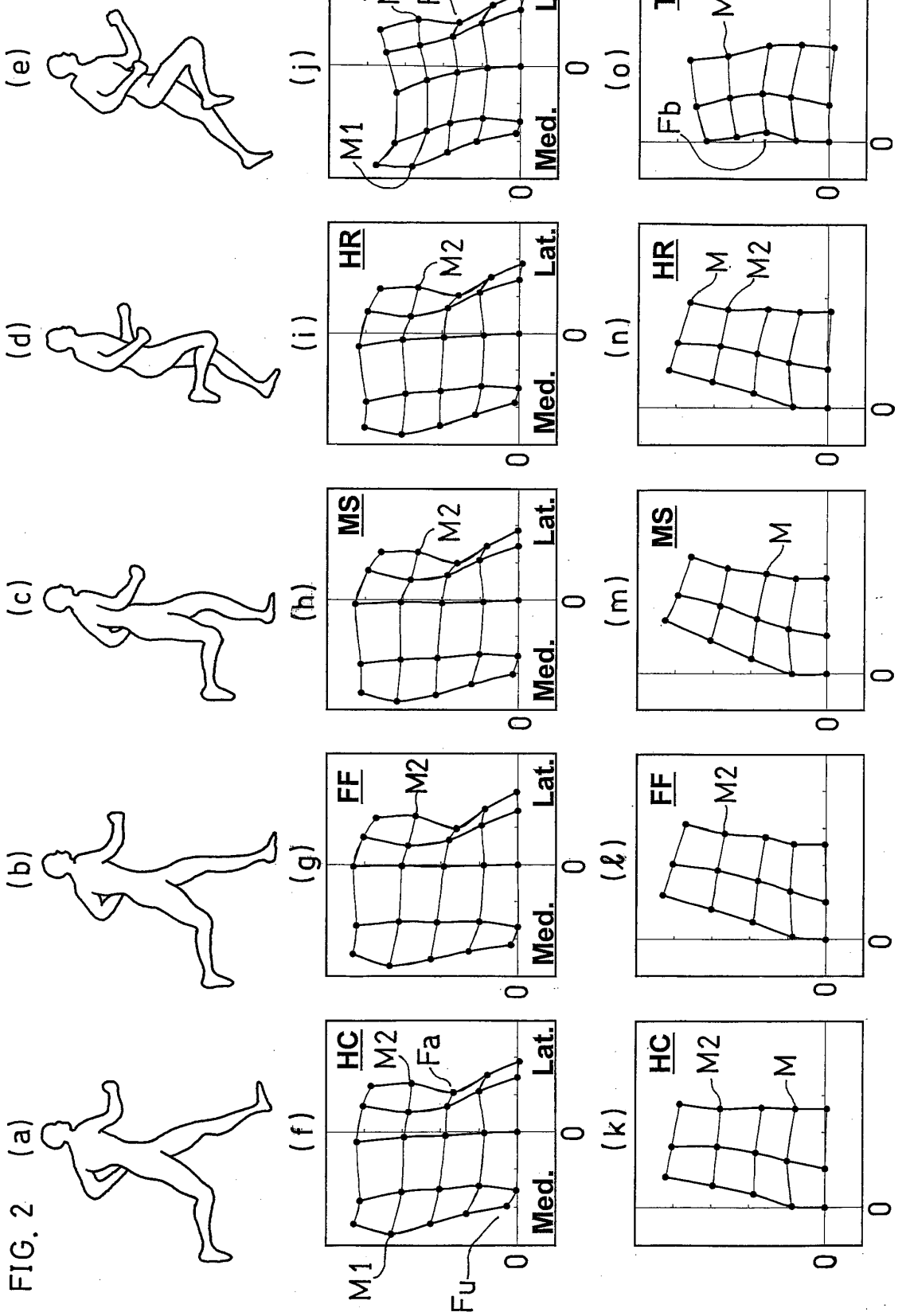

(a)
(b)
(c)
(d)
(e)
(f)
HC
M2
Fa
M1
Fu
Med.
Lat.
0
(g)
FF
M2
(h)
MS
M2
(i)
HR
M2
(j)
TO
M2
Fa
M1
(k)
HC
M2
M
(ℓ)
FF
M2
(m)
MS
M
(n)
HR
M
M2
(o)
TO
M2
Fb

FIG. 3

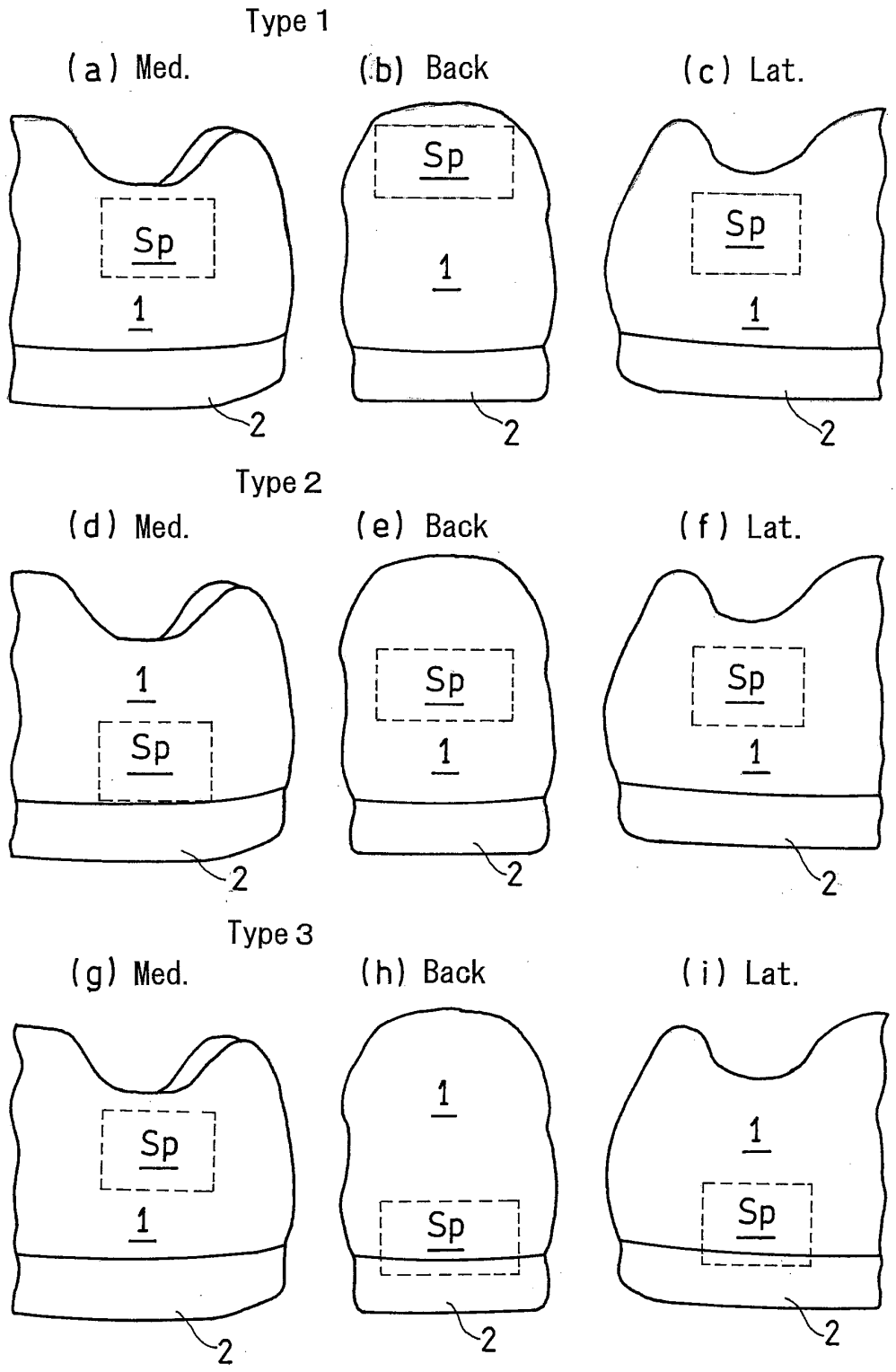

Type 1
(a) Med.
(b) Back
(c) Lat.
Sp
1
2
Type 2
(d) Med.
(e) Back
(f) Lat.
Type 3
(g) Med.
(h) Back
(i) Lat.

FIG. 4

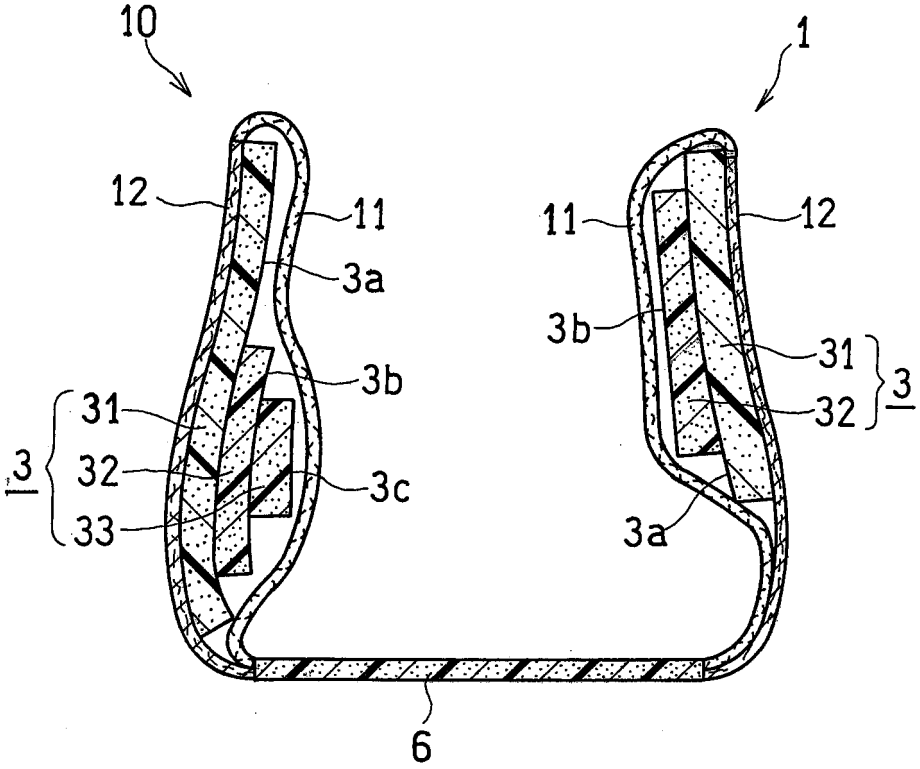


FIG. 5A

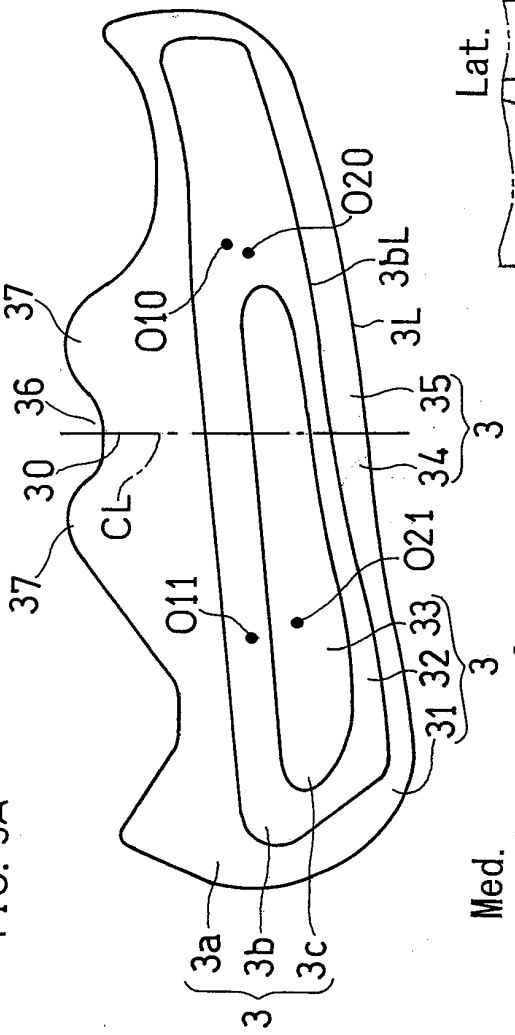


FIG. 5B

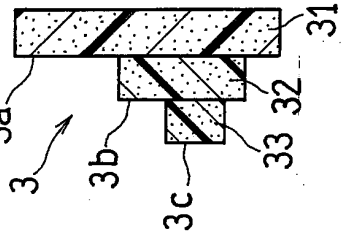


FIG. 5C

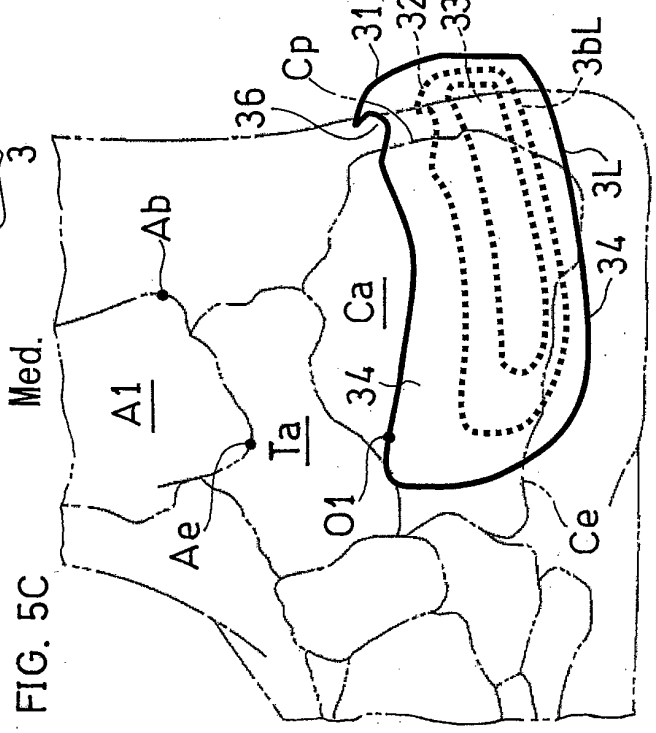
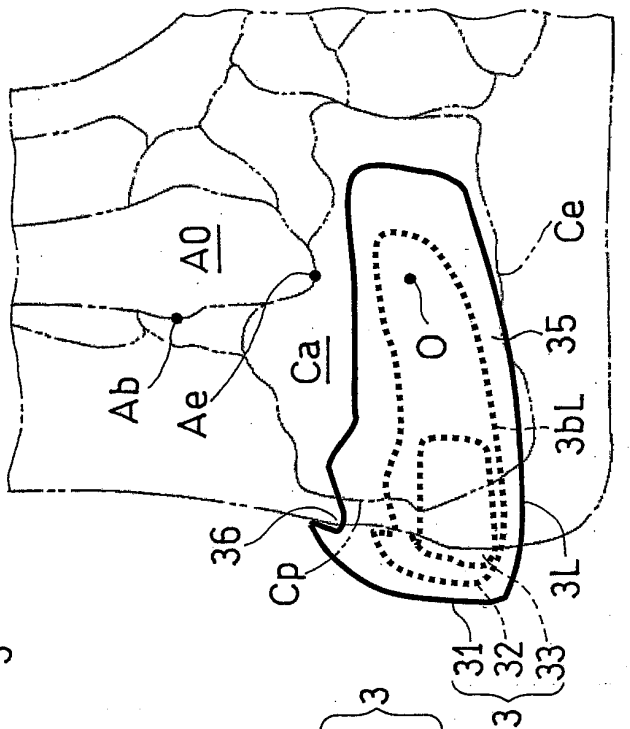


FIG. 5D



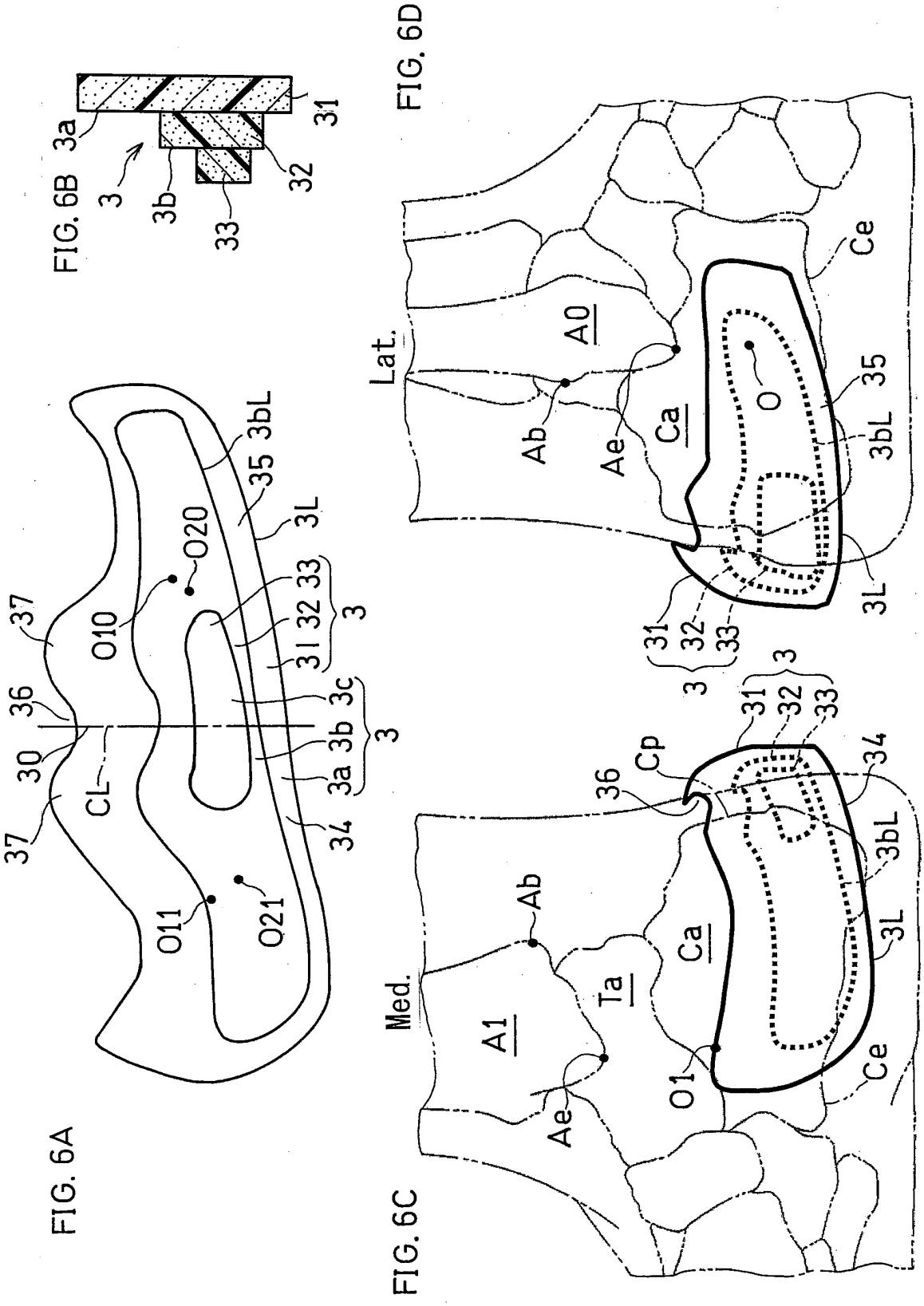


FIG. 6A
FIG. 6B
FIG. 6C
FIG. 6D
3a
3
3b
33
32
31
37
36
30
CL
O10
O20
O11
O21
35
3bL
3L
34
3c
Lat.
Med.
A0
A1
Ab
Ae
Ca
Ta
Cp
Ce
O
O1

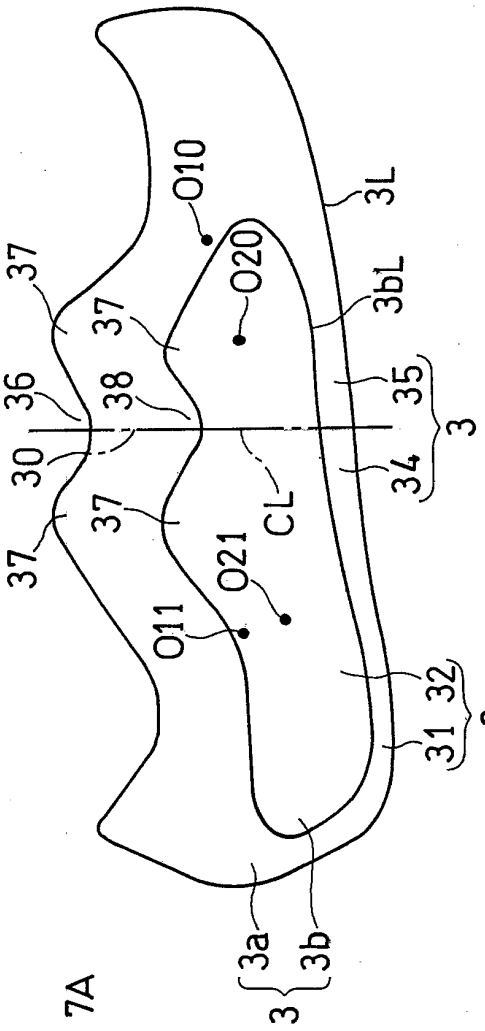


FIG. 7B

FIG. 7A

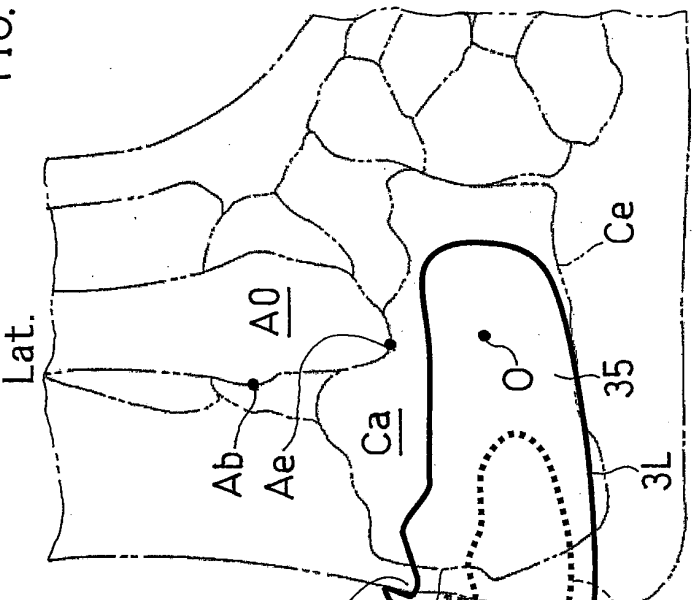


FIG. 7D

FIG. 7C

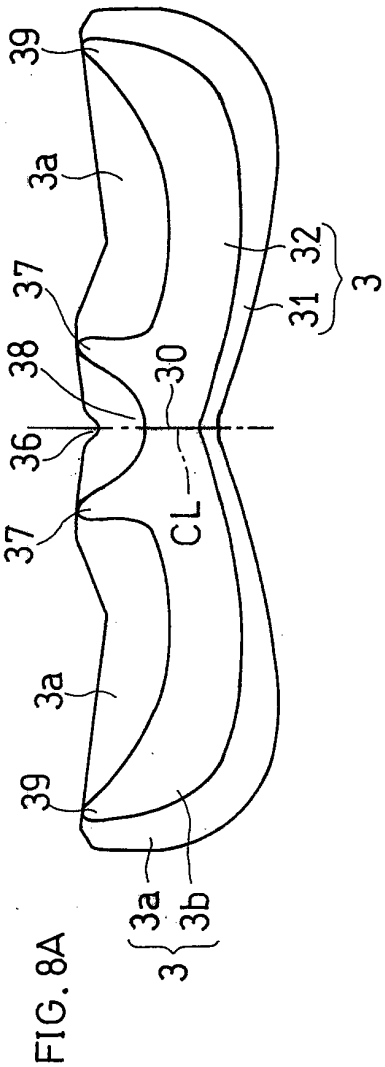


FIG. 8A

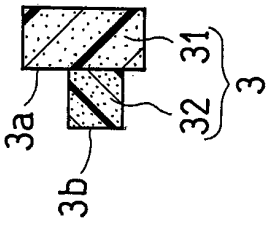


FIG. 8B

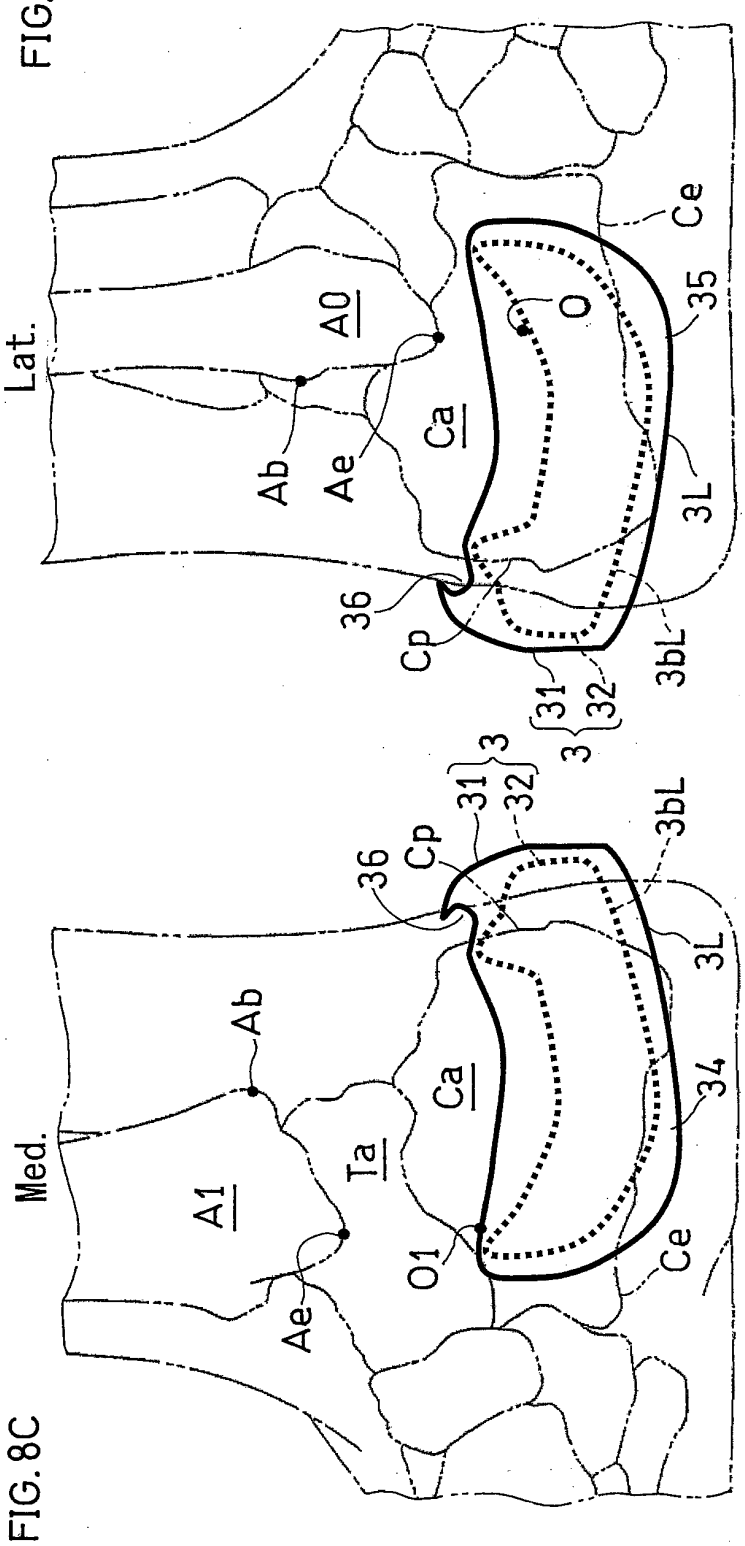


FIG. 8C

FIG. 8D

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/077471

A. CLASSIFICATION OF SUBJECT MATTER
A43B23/02(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)
A43B23/02

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.
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 73159/1990(Laid-open No. 32104/1992) (Yamaha Corp.), 16 March 1992 (16.03.1992), (Family: none)	12-14 1-11
Y	JP 5-161503 A (Suzuki Sogyo Co., Ltd.), 29 June 1993 (29.06.1993), (Family: none)	12-14
Y	JP 3067805 U (Seikichi YAMAMOTO), 11 April 2000 (11.04.2000), (Family: none)	13

☐ 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	Date of mailing of the international search report
26 November, 2012 (26.11.12)	11 December, 2012 (11.12.12)
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/JP2012/077471

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 12 have no same or corresponding special technical feature.
The following two inventions (invention groups) are involved in claims.
(Invention 1) the inventions of claims 1-11
An upper structure in which a height of an outer first centroid O10 is set at a position higher than a height of an inner first centroid O11
(Invention 2) the inventions of claims 12-14
(Continued to extra sheet)

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)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/077471

Continuation of Box No.III of continuation of first sheet(2)

An upper structure in which an inner part covers at least a part of a lower edge of a calcaneus bone directly below a talus bone, an outer part covers a part located directly above the point O which divides, in the calcaneus bone, the space between a lower end of a lateral malleolus and a lower edge of the calcaneus bone into two equal parts, and a second sponge plate is laminated on a first sponge plate

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2011041590 A **[0003]**
- JP 2010022791 A **[0003]**