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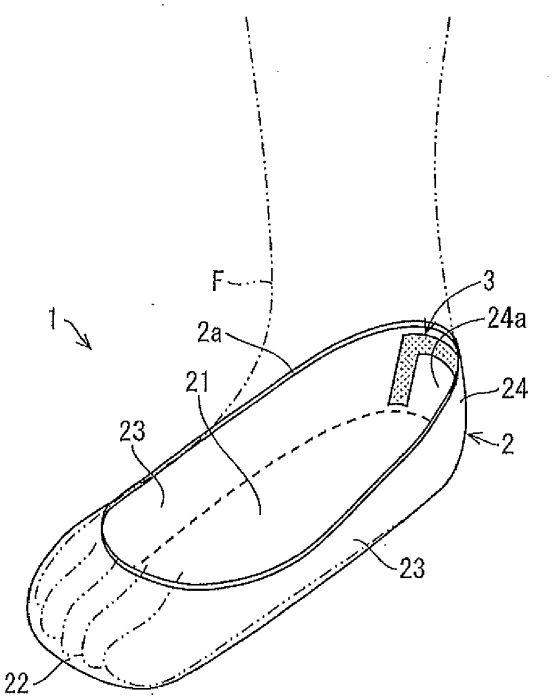
(54) LEGWEAR

(57) A foot cover (1) in accordance with an embodiment includes: a main body part (2) including a sole part (21) which covers a sole and a heel part (24) which covers a heel; and a nonslip part (3) provided on an inside of the heel part which inside faces a back surface of the heel, the nonslip part having elasticity lower than that of a cloth of the heel part. The nonslip part includes strip-shaped parts which prevent the cloth of the heel part from expanding and contracting in a vertical direction and a horizontal direction.

FIG. 1



EP 3 053 460 A1

Description

Technical Field

[0001] The present invention relates to legwear to be worn by a leg. More specifically, the present invention relates to legwear which prevents displacement or prevents a foot from being out of the legwear due to motions such as walking.

Background Art

[0002] Conventionally, legwear such as socks has been used for the purpose of preventing a user from feeling discomfort, fatigue, coldness etc. when the user wears shoes directly on the user's bare legs. For example, in a case of wearing shoes on legwear, there occurs friction between the legwear and the shoes. When the friction between the shoes and the legwear exceeds friction between the legs and the legwear, the legwear follows a motion of the shoes instead of a motion of the legs, so that the legwear is displaced or a foot is out of the legwear. In a case where the legwear is displaced or a foot is out of the legwear due to a motion such as walking while the user wears the legwear, comfort in wearing shoes is deteriorated. Accordingly, legwear which is less likely to be displaced or less likely to allow a foot to be out of the legwear has been requested. In particular, since a foot cover is designed to be hidden in shoes when a user wears the shoes, the foot cover covers only a small area of a user's foot, so that the foot cover is likely to be displaced or a foot is likely to be out of the foot cover while the user wears the foot cover.

[0003] In order to prevent the legwear from being displaced or a foot from being out of the legwear, Patent Literatures 1 to 6 propose legwear having respective types of nonslip parts on insides of heel parts which cover heels.

[0004] For example, Patent Literatures 1 and 2 each propose legwear in which a nonslip part having a strip shape is provided horizontally on an inside of a heel part. Patent Literatures 3 and 4 each propose legwear in which a plurality of nonslip parts having a protrusion shape or a fragment shape are provided incontinuously on an inside of a heel part. Patent Literatures 5 and 6 each propose legwear in which a nonslip part having a planar shape is provided on an inside of a heel part.

Citation List

[Patent Literature]

[0005]

[Patent Literature 1]
Japanese Publication of Unexamined Utility Model Application Jitsukaihei No. 5-19304 (Publication date: March 9, 1993)
[Patent Literature 2]
Japanese Patent Application Publication Tokukaihei No. 9-59804
(Publication date: March 04, 1997)
[Patent Literature 3]
Japanese Patent Application Publication Tokukaihei No. 10-292206
(Publication date: November 04, 1998)
[Patent Literature 4]
Japanese Patent Application Publication Tokukaihei No. 11-335905
(Publication date: December 07, 1999)
[Patent Literature 5]
Japanese Publication of Unexamined Utility Model Application Jitsukaihei No. 6-51207 (Publication date: July 12, 1994)
[Patent Literature 6]
Japanese Publication of Registered Utility Model Application No. 3182636 (Registration date: March 13, 2013)

Summary of Invention

Technical Problem

[0006] One cause for a foot cover being displaced or a foot getting out of the foot cover is that cloth of a heel part of the foot cover is pulled forward due to contact and friction between the ground and a foot in motions such as walking, so that a nonslip part is displaced. That is, the nonslip part provided on an inside of the cloth of the heel part is moved

by following expansion and contraction of the cloth of the heel part. Furthermore, since a mechanism of walking includes not only a bending and stretching motion of an ankle in a vertical direction but also a motion of the ankle in a horizontal direction (extraversion direction or inversion direction), the cloth of the heel part is pulled in a horizontal direction, too. Consequently, the nonslip part cannot stay at a predetermined position and cannot yield a sufficient nonslip effect. As a result, the foot cover is more likely to be displaced or a foot is more likely to get out of the foot cover.

[0007] The above conventional techniques do not consider the displacement of the nonslip part caused by following expansion and contraction of the cloth of the heel part, so that the nonslip part cannot yield a sufficient nonslip effect.

[0008] For example, in the configurations of Patent Literatures 1 and 2, since a nonslip part having a strip shape is provided horizontally, expansion and contraction of the cloth of the heel part in a horizontal direction is subdued, but expansion and contraction of the cloth of the heel part in a vertical direction cannot be subdued. Consequently, in Patent Literatures 1 and 2, the displacement of the nonslip part in a vertical direction is likely to occur, so that the nonslip part cannot yield a sufficient nonslip effect.

[0009] In the configurations of Patent Literatures 3 and 4, since nonslip parts having a protrusion shape or fragment shape are scattered, it is impossible to subdue expansion and contraction of the cloth of the heel part in vertical and horizontal directions. Consequently, in Patent Literatures 3 and 4, the displacement of the nonslip part in vertical and horizontal directions is likely to occur, so that the nonslip part cannot yield a sufficient nonslip effect.

[0010] In the configurations of Patent Literatures 5 and 6, since a nonslip part having a planar shape is provided so as to cover a back surface of a heel, it is possible to subdue expansion and contraction of the cloth of the heel part in vertical and horizontal directions. However, the nonslip part does not fit the heel, and a gap appears. Consequently, the configurations of Patent Literatures 5 and 6 cannot yield a sufficient nonslip effect. Furthermore, in the configurations of Patent Literatures 5 and 6, since the nonslip part having a planar shape covers the back surface of the heel, skin is sensitive to sweat etc., so that comfort in wearing the legwear is deteriorated, which is a new problem.

[0011] The present invention was made in view of the foregoing problems. An object of the present invention is to provide legwear capable of suitably subduing the legwear from being displaced or a foot from being out of the legwear without decreasing comfort in wearing the legwear.

Solution to Problem

[0012] In order to solve the foregoing problems, legwear of the present invention includes: a main body part including a sole part which covers a sole and a heel part which covers a heel, the main body part having elasticity; and a nonslip part provided on an inside of the heel part, the nonslip part having elasticity lower than that of a cloth of the heel part, the nonslip part including strip-shaped parts which prevent the cloth of the heel part from expanding and contracting in a vertical direction and a horizontal direction, where the vertical direction is a direction perpendicular to the sole part and the horizontal direction is a width direction of the sole part.

Advantageous Effects of Invention

[0013] With the present invention, it is possible to realize legwear capable of suitably subduing the legwear from being displaced or a foot from being out of the legwear without decreasing comfort in wearing the legwear.

Brief Description of Drawings

[0014]

Fig. 1 is a perspective view illustrating an outline configuration of a foot cover for a right foot, in accordance with an embodiment of the present invention.

Fig. 2 is a schematic view illustrating the shape of a nonslip part illustrated in Fig. 1. (a) of Fig. 2 is a rear view of the nonslip part.

(b) of Fig. 2 is a side view of the nonslip part.

(a) through (m) of Fig. 3 are rear views illustrating respective variations of the nonslip part in accordance with the present embodiment.

Fig. 4 is a rear view illustrating another variation of the nonslip part in accordance with the present embodiment. (a) through (f) of Fig. 5 are rear views illustrating nonslip parts tested in Examples.

Fig. 6 is a schematic view illustrating a test method carried out in Examples.

(a) through (c) of Fig. 7 are graphs of the results of the tests carried out in Examples.

(a) through (c) of Fig. 8 are schematic views illustrating a configuration of the nonslip part included in the legwear of the present invention.

Description of Embodiment

[0015] The following description will discuss an embodiment of the present invention with reference to Figs. 1 through 4. The present embodiment will describe an example in which the present invention is applied to a foot cover (legwear).

[0016] It should be noted that the present invention is applicable not only to a foot cover exposing an instep and an ankle of a foot but also to various types of legwear designed to cover an instep and an ankle of a foot.

[Configuration of foot cover 1]

[0017] Fig. 1 is a perspective view illustrating an outline configuration of a foot cover 1 for a right foot, in accordance with the present embodiment. As illustrated in Fig. 1, the foot cover 1 includes a main body part 2 to be worn by a foot F and a nonslip part 3 for preventing (i) the main body part 2 from being displaced and/or (ii) the heel from being out of the main body part 2.

(Main body part 2)

[0018] The main body part 2 includes a sole part 21 which covers a sole, a toe part 22 which covers toes, side parts 23 which cover respective sides of the foot F, and a heel part 24 which covers a heel. The main body part 2 further includes an opening part2a via which the foot F is inserted into or is taken off the foot cover 1. The opening part 2a is positioned oppositely in upward and downward directions to the sole part 21.

[0019] The opening part 2a is widely opened so that an instep and an ankle are exposed in the opening part 2a. Consequently, when a shoe is worn, the main part 2 is hidden entirely in the shoe.

[0020] The main body part 2 is made of highly elastic cloth. The cloth of the main body part 2 is preferably one with excellent air-permeability and moisture-absorption property. Preferable examples of the cloth include (i) a natural fiber such as cotton, linen, wool, or silk and (ii) a chemical fiber such as rayon, nylon, acrylic, or polyester.

[0021] Note that, in the present embodiment, the main body part 2 is knitted by a knitting machine, however, the main body part 2 can be formed by sewing pieces of cloth which have been weaved by a weaving machine.

(Nonslip part 3)

[0022] The nonslip part 3 is a strip-shaped member made of a material having lower elasticity and a higher friction coefficient than the cloth of the main body part 2. The nonslip part 3 is provided inside of the heel part 24 so as to be on a region which is located lower than a malleolus (lateral malleolus and medial malleolus) and behind the malleolus. The nonslip part 3 contacts the heel, so as to prevent (i) the main body part 2 from being displaced and/or (ii) the foot F from being out of the main body part 2.

[0023] The material of the nonslip part 3 is not particularly limited, provided that it has lower elasticity and a higher friction coefficient than the cloth of the main body part 2. Various materials can be employed as the material of the nonslip part 3. Examples of the material include resins having relatively large friction resistance to skin ((i) a natural resin such as natural rubber and (ii) a synthesized resin such as silicon gum or urethane gum).

[0024] In the present embodiment, the nonslip part 3 is formed by attaching (applying) a resin etc. to a nonslip part forming cloth (base material) so as to have a sheet shape and is then attached to the heel part 24 of the main body part 2. By thus forming the nonslip part 3 so as to have a sheet shape, it is possible to easily attach the nonslip part 3 to an inside of the heel part 24 of the main body part 2 which inside has a three-dimensional curve.

[0025] The shape of the resin etc. to be attached to the nonslip part forming cloth is not required to match the nonslip part forming cloth, and can therefore be any pattern such as a particulate pattern or a floral pattern. It is further preferable to provide minute roughness on a surface of the resin etc. so as to increase a friction coefficient.

[0026] The nonslip part forming cloth (base material) is preferably cloth having certain elasticity. By employing cloth having certain elasticity as the base material, it is possible for the cloth of the heel part 24 to be further effectively prevented from being expanded and contracted in vertical and horizontal directions without preventing the cloth of the heel part 24 from suitably fitting the shape of the heel, as compared with a case of directly applying or attaching a resin etc. to the cloth of the heel part 24 (main body part 2).

[0027] The nonslip part forming cloth (base material) is preferably cloth having roughness. For example, in a case where the nonslip part forming cloth is knitted cloth or woven cloth etc. which has roughness caused by a knitted pattern or a weave pattern, it is possible to easily provide a surface of the resin etc. with minute roughness, by thinly applying resin etc. to the nonslip part forming cloth. This allows an increase in friction coefficient.

[0028] Alternatively, for example a resin can be directly applied or attached to the cloth of the heel part 24 of the main body part 2.

[0029] Fig. 2 is a schematic view illustrating the shape of the nonslip part 3 (see Fig. 1). (a) of Fig. 2 is a rear view of the nonslip part 3. (b) of Fig. 2 is a side view of the nonslip part 3. Note that Achilles' tendon A is not illustrated in (a) of Fig. 2.

[0030] As illustrated in (a) of Fig. 2 and (b) of Fig. 2, the nonslip part 3 has a shape obtained by combining a plurality of strip-shaped parts extending in different directions so that the cloth of the heel part 24 is subdued from expanding and contracting in a vertical direction (x-direction in the drawings) and a horizontal direction (y-direction in the drawings). The vertical direction is defined as a direction perpendicular to the sole part 21, and the horizontal direction is defined as a width direction of the sole part 21 (in the drawings, a direction from a heel to toes is indicated as z-direction).

[0031] Specifically, the nonslip part 3 includes a horizontal strip-shaped part (first strip-shaped part) 31 which extends in a substantially horizontal direction across the Achilles' tendon A and two vertical strip-shaped parts (second strip-shaped parts) 32a and 32b which extend in a substantially vertical direction. The two vertical strip-shaped parts 32a and 32b are provided so that a calcaneus B (or calcaneal tuber C) is sandwiched therebetween. Note that, in the present embodiment, the two vertical strip-shaped parts 32a and 32b are provided so as to have a slight angle with a vertical direction. This causes a distance, between the two vertical strip-shaped parts 32a and 32b, to become larger as closer to the sole part 21.

[0032] By thus combining the horizontal strip-shaped part 31 with the two vertical strip-shaped parts 32a and 32b in a substantially horseshoe shape in which a sole part 21 side is opened, it is possible to subdue the cloth of the heel part 24 from expanding and contracting in vertical and horizontal directions.

[0033] Note that it is preferable to provide the nonslip part 3 such that a center portion of a back surface of the calcaneus B (e.g. calcaneal tuber C) is located within a rectangular region R. The rectangular region R is defined by (i) two sides which abut on respective end portions of the nonslip part 3 in a vertical direction (i.e. an upper end portion of the horizontal strip-shaped part 31 and lower end portions of the vertical strip-shaped parts 32a and 32b) and which are parallel to each other in a horizontal direction and (ii) two sides which abut on respective end portions of the nonslip part 3 in a horizontal direction (i.e. a left end portion of the vertical strip-shaped part 32a and a right end portion of the vertical strip-shaped part 32b) and which are parallel to each other in a vertical direction. This allows suitably subduing expansion and contraction, in vertical and horizontal directions, of a portion of the heel part 24 at which portion the cloth of the heel part 24 is easy to move.

[0034] Furthermore, as in the present embodiment, the nonslip part 3 is preferably designed such that (i) the horizontal strip-shaped part 31 and the vertical strip-shaped part 32a are connected with each other and (ii) the horizontal strip-shaped part 31 and the vertical strip-shaped part 32b are connected with each other, so that the horizontal strip-shaped part 31, the vertical strip-shaped part 32a, and the vertical strip-shaped part 32b are continuous one another. This causes a partial displacement of the nonslip part 3 to become difficult to occur. It is therefore possible to further effectively subdue the cloth of the heel part 24 from expanding and contracting in vertical and horizontal directions.

[Effect of foot cover 1]

[0035] The cloth of the heel part 24 is pulled in a vertical direction, in a case where the cloth of the heel part 24 does not follow, during walking, a motion of a neighborhood portion of the Achilles' tendon A. The cloth of the heel part 24 is also pulled in a horizontal direction, because a mechanism of walking includes not only a bending and stretching motion of an ankle in a vertical direction but also a motion of the ankle in a horizontal direction (extraversion direction or inversion direction). It is therefore not possible to subdue the displacement of the nonslip part 3 caused by expansion and contraction of the cloth of the heel part 24, merely by subduing only one of (i) expansion and contraction of the cloth of the heel part 24 in a vertical direction and (ii) expansion and contraction of the cloth of the heel part 24 in a horizontal direction.

[0036] In view of the circumstances, the foot cover 1 is provided such that the horizontal strip-shaped part 31 and the two vertical strip-shaped parts 32a and 32b are combined with one another in a substantially horseshoe shape in which the sole part 21 side is opened. This allows for subdual of expansion and contraction of the cloth of the heel part 24 in vertical and horizontal directions.

[0037] According to the foot cover 1, (i) the horizontal strip-shaped part 31 is provided above that portion, (ii) the vertical strip-shaped part 32a is provided on a left side of that portion, and (iii) the vertical strip-shaped part 32b is provided on a right side of that portion, so as to surround a portion of the heel part 24 at which portion the cloth of the heel part 24 is easy to move (i.e., so as to surround a portion of the heel part 24 which portion corresponds to a center of a back surface of the calcaneus B). Consequently, the nonslip part 3 can suitably subdue the cloth of the heel part 24 from expanding and contracting in vertical and horizontal directions.

[0038] Furthermore, since the main body part 2 is made of highly elastic cloth, the cloth itself of the heel part 24 suitably fits the shape of the heel. Accordingly, the foot cover 1 is not displaced even when a shoe etc. move. It is therefore possible to obtain a sufficient nonslip effect.

[0039] Furthermore, the nonslip part 3 is provided so that a plurality of strip-shaped parts are continuous each other.

Since the nonslip part 3 is easy to fit the heel, a sufficient nonslip effect can be obtained. Since it is further possible to sufficiently secure air-permeability, skin is not sensitive to sweat etc.

[0040] It is known that the shape of the circumference of calcaneonavicular which circumscribes a foot via a heel and an instep does not change greatly in walking. Accordingly, even if the nonslip part 3 subdues expansion and contraction of the cloth of the heel part 24, discomfort during wearing the foot cover 1 is difficult to occur. On the other hand, since the sole part 21 (width of midfoot etc.) expands and contracts in response to extension of an arch of a sole, discomfort in wearing the foot cover 1 is easy to occur in a case of subduing expansion and contraction of the cloth of the sole part 21. By thus providing the heel part 24 with the nonslip part 3, it is possible to prevent a decrease in comfort in wearing the foot cover 1.

[0041] According to the present embodiment, it is possible to realize the foot cover 1 capable of suitably subduing the foot cover 1 from being displaced or a foot from being out of the foot cover 1 without decreasing comfort in wearing the foot cover 1.

[Variation 1]

[0042] (a) through (m) of Fig. 3 are rear views illustrating respective variations of the nonslip part 3 in accordance with the present embodiment.

[0043] The nonslip part 3 is not limited to the aforementioned shape, provided that it can subdue the cloth of the heel part 24 from expanding and contracting in vertical and horizontal directions.

[0044] For example, as illustrated in (a) of Fig. 3, the nonslip part 3 can have a substantially H-shape in which the horizontal strip-shaped part 31 is provided so as to be connected with center portions of the two vertical strip-shaped parts 32a and 32b.

[0045] Alternatively, as illustrated in (b) of Fig. 3, the nonslip part 3 can have a substantially T-shape in which a center portion of the horizontal strip-shaped part 31 is connected with an upper end portion of a vertical strip-shaped part 32c which extends in a vertical direction. Alternatively, as illustrated in (c) of Fig. 3, the nonslip part 3 can have a substantially reverse T-shape in which a center portion of the horizontal strip-shaped part 31 is connected with a lower end portion of a vertical strip-shaped part 32c which extends in a vertical direction.

[0046] Alternatively, as illustrated in (d) of Fig. 3, the nonslip part 3 can have a substantially horseshoe shape in which an opening part 2a side is opened and in which the horizontal strip-shaped part 31 is connected with lower end portions of two vertical strip-shaped parts 32c and 32d which extend parallel in a substantially vertical direction.

[0047] Alternatively, as illustrated in (e) of Fig. 3, the nonslip part 3 can have a substantially square shape in which upper end portions of two vertical strip-shaped parts 32c and 32d which extend parallel in a substantially vertical direction are connected with a horizontal strip-shaped part 31 a which extends in a substantially horizontal direction, and lower end portions of the two vertical strip-shaped parts 32c and 32d are connected with a horizontal strip-shaped part 31b which extends in a substantially horizontal direction.

[0048] Alternatively, as illustrated in (f) of Fig. 3, the nonslip part 3 can have a substantially X-shape consisting of two oblique strip-shaped parts (third strip-shaped parts) 33a and 33b which extend in oblique directions different from a substantially vertical direction and a substantially horizontal direction and which cross each other at respective center portions thereof.

[0049] Alternatively, as illustrated in (g) of Fig. 3, the nonslip part 3 can have a substantially V-shape consisting of an oblique strip-shaped part 33a and an oblique strip-shaped part 33b which are connected with each other at respective lower end portions thereof. Alternatively, as illustrated in (h) of Fig. 3, the nonslip part 3 can have a reverse V-shape consisting of an oblique strip-shaped part 33a and an oblique strip-shaped part 33b which are connected with each other at respective upper end portions thereof.

[0050] Alternatively, as illustrated in (i) of Fig. 3, the nonslip part 3 can have a substantially M-shape in which upper end portions of two vertical strip-shaped parts 32c and 32d which extend parallel in a substantially vertical direction are respectively connected with oblique strip-shaped parts 33a and 33b which are connected with each other to form a substantially V-shape.

[0051] Alternatively, as illustrated in (j) and (k) of Fig. 3, the nonslip part 3 can have a curved shape in which a curved strip-shaped part (fourth strip-shaped part) 34 is provided so as to surround a center portion of a back surface of the calcaneus B (e.g. calcaneal tuber C).

[0052] Alternatively, as illustrated in (1) and (m) of Fig. 3, the nonslip part 3 can be designed so as to include two curved strip-shaped parts 34a and 34b which cross each other and which surround a center portion of a back surface of the calcaneus B (e.g. calcaneal tuber C).

[0053] Note, in any of the configurations illustrated in (a) of Fig. 3 through (m) of Fig. 3, that it is preferable to provide the nonslip part 3 such that a center portion of a back surface of the calcaneus B (e.g. calcaneal tuber C) is located at a center of the rectangular region R. This allows the nonslip part 3 to be subdued from being displaced while suitably subduing expansion and contraction of the heel part 24 in vertical and horizontal directions.

[0054] Note also that the shape of the nonslip part 3 is not limited to any of the aforementioned shapes. The nonslip part 3 can have any shape obtained by appropriately combining the horizontal strip-shaped parts 31, 31a, and 31b, the vertical strip-shaped parts 32a, 32b, 32c, and 32d, the oblique strip-shaped parts 33a and 33b, and the curved strip-shaped parts 34, 34a, and 34b so that expansion and contraction of the cloth of the heel part 24 can be subdued in vertical and horizontal directions.

[Variation 2]

[0055] Fig. 4 is a rear view illustrating another variation of the nonslip part 3 in accordance with the present embodiment. As illustrated in Fig. 4, the nonslip part 3 is not necessarily configured such that (i) the horizontal strip-shaped part 31 and the vertical strip-shaped part 32a are connected with each other and (ii) the horizontal strip-shaped part 31 and the vertical strip-shaped part 32b are connected with each other.

[0056] Even in a case of such a configuration, the horizontal strip-shaped part 31 can also subdue the cloth of the heel part 24 from expanding and contracting, in a horizontal direction, in response to a motion of an ankle in a horizontal direction (in an extraversion direction or inversion direction). Even in a case of such a configuration, the vertical strip-shaped parts 32a and 32b can also subdue the cloth of the heel part 24 from expanding and contracting in a vertical direction in response to a bending and stretching motion of the ankle in a vertical direction.

[0057] Note, however, that in the case where (i) the horizontal strip-shaped part 31 is connected with the vertical strip-shaped part 32a and (ii) the horizontal strip-shaped part 31 is connected with the vertical strip-shaped part 32b so that the horizontal strip-shaped part 31, the vertical strip-shaped part 31a, and the vertical strip-shaped part 31b are continuous one another, the strip-shaped part 3 becomes difficult to be partially displaced. Accordingly, connecting the horizontal strip-shaped part 31 with the vertical strip-shaped part 32a and connecting the horizontal strip-shaped part 31 with the vertical strip-shaped part 32b is preferable since such connection allows effectively subduing expansion and contraction of the cloth of the heel part 24 in a vertical direction and a horizontal direction.

[0058] The present invention is not limited to the present embodiment and its variations, but can be altered by a skilled person in the art within the scope of the claims. An embodiment derived from a proper combination of technical means each disclosed in the embodiment and its variations is also encompassed in the technical scope of the present invention.

[Examples]

[0059] The following description will discuss Examples of the present invention with reference to Figs. 5 through 7. In the Examples, a nonslip effect of legwear of the present invention was verified.

[0060] (a) of Fig. 5 through (f) of Fig. 5 are rear views illustrating nonslip parts tested in the respective Examples. As illustrated in (a) of Fig. 5 and (b) of Fig. 5, in the Examples, as the nonslip part of the present invention, there were prepared a nonslip part 3a and a nonslip part 3b each having a substantially horseshoe shape in which the sole part 21 side was opened. A difference between the nonslip part 3a and the nonslip part 3b lies in that a width between two vertical strip-shaped parts 32a' and 32b' of the nonslip part 3b is smaller than a width between two vertical strip-shaped parts 32a and 32b of the nonslip part 3a.

[0061] Furthermore, as illustrated in (c) of Fig. 5 through (f) of Fig. 5, there were prepared, as comparison targets, a nonslip part 103a which was obtained by removing the horizontal band part 31 from the nonslip part 3a and which consisted of the vertical strip-shaped parts 32a and 32b; a nonslip part 103b which consisted of a vertical strip-shaped part 32c extending in a substantially vertical direction; a nonslip part 103c which consisted of a horizontal strip-shaped part 31c extending in a substantially horizontal direction; and a nonslip part 103d which consisted of a horizontal strip-shaped part 31d whose width (width in vertical direction) was larger than that of the horizontal strip-shaped part 31 c.

[Test Method]

[0062] Fig. 6 is a schematic view illustrating a test method carried out in the Examples.

(1) In each of (i) a case where a female standard foot mannequin wore foot covers having respective nonslip parts, (ii) a case where a female standard foot mannequin wore panty stockings and further wore, on the panty stockings, foot covers having respective nonslip parts, and (iii) a case where a stockingless foot wore foot covers having respective nonslip parts, tensility (stress) at a time when the foot cover was pulled from a heel toward toes was measured with use of a tensile tester (digital force gauge ZP50N) 41, as illustrated in Fig. 6.

(2) Each sample was measured five times, and an average of tensility at a time when the foot cover slipped off was calculated.

[Test Result]

[Table 1]

	Example 1	Example 2	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4
Area of nonslip part (mm^2)	1006	958	750	275	275	572
Mannequin (N/mm^2)	- (-)	- (-)	0.51±0.03 (0.00068)	0.46+0.03 (0.00167)	0.57±0.02 (0.00207)	1.51±0.02 (0.00264)
Mannequin+stocking (N/mm^2)	2.59±0.22 (0.00257)	2.53±0.03 (0.00264)	0.56±0.02 (0.00074)	0.60±0.01 (0.00218)	0.64±0.03 (0.00232)	1.08±0.03 (0.00189)
Stockingless leg (N/mm^2)	2.94±0.09 (0.00292)	2.60±0.09 (0.00271)	0.38±0.01 (0.00050)	0.37±0.03 (0.00134)	0.42±0.01 (0.00152)	0.74±0.02 (0.00129)

[0063] Table 1 shows the results of the tests carried out in the respective Examples. Fig. 7 shows graphs of the results of the tests carried out in the respective Examples. (a) of Fig. 7 shows the result of the test in the case where a female standard foot mannequin wore foot covers having respective nonslip parts. (b) of Fig. 7 shows the result of the test in the case where a female standard foot mannequin wore panty stockings and further wore, on the panty stockings, foot covers having respective nonslip parts. (c) of Fig. 7 shows the result of the test in the case where a stockingless foot wore foot covers having respective nonslip parts.

[0064] In Table 1 and (a) through (c) of Fig. 7, the foot cover having the nonslip part 3a is referred to as Example 1, the foot cover having the nonslip part 3b is referred to as Example 2, the foot cover having the nonslip part 103a is referred to as Comparative Example 1, the foot cover having the 103b is referred to as Comparative Example 2, the foot cover having the nonslip part 103c is referred to as Comparative Example 3, and the foot cover having the nonslip part 103d is referred to as Comparative Example 4. A numeral value in parentheses in Table 1 is a value obtained by dividing tensility (N/mm^2) by an area (mm^2) of the nonslip part, and is an index indicative of a nonslip ability of individual nonslip part per unit area.

[0065] As shown in Table 1 and (a) of Fig. 7, in the case where a female standard foot mannequin wore foot covers having respective nonslip parts, the foot cover of Example 1 and the foot cover of Example 2 did not allow the foot to be out of the foot cover even when the foot cover was pulled at a limit value beyond which the cloth of the foot cover would break.

[0066] In contrast, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 1 was 0.51 ± 0.03, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 2 was 0.46 ± 0.03, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 3 was 0.57 ± 0.02, and an average of tensility at a time when the foot got out of the foot cover of Comparative Example 4 was 1.51 ± 0.02.

[0067] As shown in Table I and (b) of Fig. 7, in the case where a female standard foot mannequin wore panty stockings and further wore, on the panty stockings, foot covers having respective nonslip parts, an average of tensility at a time when the foot got out of the foot cover of Example 1 was 2.59 ± 0.22, and an average of tensility at a time when the foot got out of the foot cover of Example 2 was 2.53 ± 0.03.

[0068] In contrast, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 1 was 0.56 ± 0.02, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 2 was 0.60 ± 0.01, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 3 was 0.64 ± 0.03, and an average of tensility at a time when the foot got out of the foot cover of Comparative Example 4 was 1.08 ± 0.03.

[0069] As shown in Table 1 and (c) of Fig. 7, in the case where a stockingless foot wore foot covers having respective nonslip parts, an average of tensility at a time when the foot got out of the foot cover of Example 1 was 2.94 ± 0.09, and an average of tensility at a time when the foot got out of the foot cover of Example 2 was 2.60 ± 0.09.

[0070] In contrast, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 1 was 0.38 ± 0.01, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 2 was 0.37 ± 0.03, an average of tensility at a time when the foot got out of the foot cover of Comparative Example 3 was 0.42 ± 0.01, and an average of tensility at a time when the foot got out of the foot cover of Comparative Example 4 was 0.74 ± 0.02.

[0071] As described above, in each of the case where a female standard foot mannequin wore foot covers having respective nonslip parts, the case where a female standard foot mannequin wore panty stockings and further wore, on the panty stockings, foot covers having respective nonslip parts, and the case where a stockingless foot wore foot covers having respective nonslip parts, the foot covers of Examples 1 and 2 were difficult to allow the foot to get out of the foot covers and had a higher nonslip effect as compared with the foot covers of Comparative Examples 1-4.

[0072] This is because in the foot covers of Examples 1 and 2, the horizontal strip-shaped part 31 and the vertical strip-shaped parts 32a and 32b or the horizontal strip-shaped part 31 and the vertical strip-shaped parts 32a' and 32b' subdue expansion and contraction of the cloth of the heel part 24 in a vertical direction and a horizontal direction, so that displacement of the nonslip part due to the expansion and contraction of the cloth of the heel part 24 was subdued, and consequently the nonslip part yielded a sufficient nonslip effect.

[0073] In contrast, in the foot covers of Comparative Examples 1-4, the cloth of the heel part 24 expanded and contracted in a vertical direction or a horizontal direction. For example, in the foot cover of Comparative Example 1, the two vertical strip-shaped parts 32a and 32b of the nonslip part 103a were not connected with each other, so that the cloth of the heel part 24 expanded and contracted in a horizontal direction. Consequently, in the foot covers of Comparative Examples 1-4, the nonslip part was displaced due to expansion and contraction of the cloth of the heel part 24, so that the nonslip part could not yield a sufficient nonslip effect.

[0074] As above, it was confirmed from these Examples that the legwear of the present invention has a high nonslip effect.

[Conclusion]

[0075] Legwear of the present invention includes: a main body part including a sole part which covers a sole and a heel part which covers a heel, the main body part having elasticity; and a nonslip part provided inside of the heel part, the nonslip part having elasticity lower than that of a cloth of the heel part, the nonslip part including strip-shaped parts which prevent the cloth of the heel part from expanding and contracting in a vertical direction and a horizontal direction, where the vertical direction is a direction perpendicular to the sole part and the horizontal direction is a width direction of the sole part.

[0076] In walking, the cloth of the heel part is pulled in a vertical direction due to a bending and stretching motion of an ankle in a vertical direction, so that the main body part is displaced or a foot gets out of the main body. Furthermore, since a mechanism of walking includes not only a bending and stretching motion of an ankle in a vertical direction but also a motion of the ankle in a horizontal direction (extraversion direction or inversion direction), the cloth of the heel part is pulled in a horizontal direction, too, so that the main body part may be displaced or the foot gets out of the main body.

[0077] In order to deal with this, in the above arrangement, the nonslip part includes strip-shaped parts which prevent the cloth of the heel part from expanding and contracting in vertical and horizontal directions. The nonslip part prevents the main body part from slipping by subduing, with use of the strip-shaped parts, expansion and contraction of the cloth of the heel part in vertical and horizontal directions.

[0078] For example, by providing the strip-shaped parts extending in two or more different directions, the cloth of the heel part is subdued from expanding and contracting in ranges of vertical and horizontal directions in which the strip-shaped parts are provided. This can subdue the nonslip part from being displaced due to expansion and contraction of the cloth of the heel part which is caused by motions such as walking.

[0079] Furthermore, in the arrangement, the nonslip part consists of the strip-shaped parts. This allows yielding a sufficient nonslip effect because the nonslip part is easy to fit a heel, and this also allows skin to be not sensitive to sweat etc.

[0080] Therefore, with the arrangement, it is possible to realize legwear capable of suitably subduing the legwear from being displaced or a foot from being out of the legwear without decreasing comfort in wearing the legwear.

[0081] The legwear of the present invention may be arranged such that the strip-shaped parts include: a first strip-shaped part which extends in a substantially horizontal direction; and one or more second strip-shaped parts each of which extends in a substantially vertical direction.

[0082] With the arrangement, the first strip-shaped part can subdue the cloth of the heel part from expanding and contracting in a horizontal direction due to a motion of an ankle in a horizontal direction (extroversion direction or inversion direction), and the one or more second strip-shaped parts can subdue the cloth of the heel part from expanding and contracting in a vertical direction due to a bending and stretching motion of the ankle in a vertical direction.

[0083] Therefore, with the arrangement, the nonslip part can subdue the cloth of the heel part from expanding and contracting in vertical and horizontal directions.

[0084] In the present specification, "extend in a substantially horizontal direction" indicates extending in a horizontal direction and extending in a virtually horizontal direction. Accordingly, the first strip-shaped part may extend in a direction having a slight angle with a horizontal direction. Similarly, "extend in a substantially vertical direction" indicates extending in a vertical direction and extending in a virtually vertical direction. Accordingly, the one or more second strip-shaped parts may extend in a direction having a slight angle with a vertical direction.

[0085] The legwear of the present invention may be arranged such that said one or more second strip-shaped parts are two second strip-shaped parts, and the two second strip-shaped parts are provided such that a calcaneus is sandwiched therebetween.

[0086] With the arrangement, by providing two second strip-shaped parts such that a calcaneus is sandwiched therebetween, it is possible to suitably subdue expansion and contraction, in a vertical direction, of a portion of the heel part at which portion the cloth of the heel part is easy to move (portion of the heel part which portion corresponds to a center of a back surface of the calcaneus).

[0087] Therefore, with the arrangement, it is possible to effectively subdue the cloth of the heel part from expanding and contracting in a vertical direction.

[0088] The legwear of the present invention may be arranged such that the first strip-shaped part is provided across an Achilles' tendon, and the two strip-shaped parts extend from both ends of the first strip-shaped part toward the sole part.

[0089] In the arrangement, the first strip-shaped part is provided above a portion of the heel part at which portion the cloth of the heel part is easy to move (portion of the heel part which portion corresponds to a center of a back surface of the calcaneus). Accordingly, it is possible to suitably subdue that portion from expanding and contracting in vertical and horizontal directions.

[0090] Therefore, with the arrangement, it is possible to effectively subdue the cloth of the heel part from expanding and contracting in vertical and horizontal directions.

[0091] The legwear of the present invention may be arranged such that the strip-shaped part includes a plurality of third strip-shaped parts which extend in respective directions, each direction being different from a substantially vertical

direction and a substantially horizontal direction, and the plurality of third strip-shaped parts cross each other.

[0092] In the arrangement, the strip-shaped part includes a plurality of third strip-shaped parts which extend in respective directions, each direction being different from a substantially vertical direction and a substantially horizontal direction, and the plurality of third strip-shaped parts cross each other. Also with the arrangement, it is possible to subdue the cloth of the heel part from expanding and contracting in ranges of vertical and horizontal directions in which the plurality of third strip-shaped parts are provided.

[0093] Therefore, with the arrangement, by combining the plurality of third strip-shaped parts extending in respective directions each of which is different from a substantially vertical direction and a substantially horizontal direction, it is possible to realize a nonslip part capable of subduing the cloth of the heel part from expanding and contracting in vertical and horizontal directions.

[0094] The legwear of the present invention may be arranged such that the strip-shaped part includes a fourth strip-shaped part which extends in a curved manner.

[0095] With the arrangement, with use of the fourth strip-shaped part which has a curved shape and whose direction of extension changes continuously, it is possible to subdue the cloth of the heel part from expanding and contracting in vertical and horizontal directions.

[0096] For example, by providing the fourth strip-shaped part in such a manner that the fourth strip-shaped part surrounds a portion of the heel part at which portion the cloth of the heel part is easy to move (portion of the heel part which portion corresponds to a center of a back surface of the calcaneus), it is possible to effectively subdue the cloth of the heel part from expanding and contracting in vertical and horizontal directions.

[0097] The legwear of the present invention may be arranged such that the strip-shaped parts are provided so as to be continuous each other.

[0098] With the arrangement, the strip-shaped parts are provided so as to be continuous each other, so that the strip-shaped parts are less likely to be partially displaced. This allows further effectively subduing the cloth of the heel part from expanding and contracting in vertical and horizontal directions.

[0099] The legwear of the present invention may be arranged such that the nonslip part is a sheet-like member obtained by applying a resin having a friction coefficient higher than that of cloth of the main body part to a base material.

[0100] With the arrangement, it is possible to easily and evenly apply, to the base material as a whole, the resin having a friction coefficient higher than that of the cloth of the main body part.

[0101] With the arrangement, it is possible to further effectively subdue the cloth of the heel part from expanding and contracting in vertical and horizontal directions. Furthermore, since the sheet-shaped nonslip part obtained by applying the resin to the base material is provided on the inside of the heel part, it is possible to effectively subdue the legwear from being displaced or a foot from being out of the legwear.

[Supplementary]

[0102] The present invention can be expressed as follows. (a) through (c) of Fig. 8 are schematic views illustrating a configuration of the nonslip part 3 included in the legwear of the present invention. Specifically, (a) of Fig. 8 is a conceptual view illustrating a virtual spherical triangle T in a sphere (heel) S. (b) of Fig. 8 is a rear view illustrating the nonslip part 3. (c) of Fig. 8 is a rear view illustrating another nonslip part 3.

[0103] As illustrated in (a) and (b) of Fig. 8, the legwear of the present invention is legwear made of elastic cloth, and includes the nonslip part 3 having lower elasticity and higher friction than the elastic cloth. The nonslip part 3 may be a combination of narrow strip-shaped parts which pass through apexes P1, P2, and P3 (or extend from the apexes P1, P2, and P3) of the virtual spherical triangle T at the heel when a user wears the legwear.

[0104] Alternatively, the legwear of the present invention may be arranged such that one of the apexes of the virtual spherical triangle T (apex P1 in (b) of Fig. 8) is provided at a position corresponding to a calcaneus.

[0105] Alternatively, the legwear of the present invention may be arranged such that one of the apexes of the virtual spherical triangle T (apex P1 in (b) of Fig. 8) is provided so that a part of the narrow strip-shaped parts is positioned along Achilles' tendon.

[0106] Alternatively, as illustrated in (c) of Fig. 8, the legwear of the present invention may be arranged such that the narrow strip-shaped part passes through a point P4 which is positioned outside the virtual spherical triangle T.

[0107] As described above, the nonslip part 3 may be a combination of narrow strip-shaped parts which pass through the apexes P1, P2, and P3 (or extend from the apexes P1, P2, and P3) of the virtual spherical triangle T. By three-dimensionally covering a heel with the nonslip part 3 as above, it is possible to suitably subdue the nonslip part 3 from being displaced due to expansion and contraction of the cloth of the heel part 24 which is caused by motions such as walking.

[0108] Therefore, with the arrangement, it is possible to realize legwear capable of suitably subduing the legwear from being displaced or a foot from being out of the legwear without decreasing comfort in wearing the legwear.

Industrial Applicability

[0109] The present invention is applicable to various types of legwear including socks.

Reference Signs List

[0110]

1 Foot cover (legwear)
2 Main body part
3 Nonslip part
21 Sole part
24 Heel part
31, 31a, 31b Horizontal strip-shaped part (first strip-shaped part)
32a, 32a', 32b, 32b', 32c, 32d Vertical strip-shaped part (second strip-shaped part)
33 Oblique strip-shaped part (third strip-shaped part)
34, 34a, 34b Curved strip-shaped part (fourth strip-shaped part)
A Achilles' tendon
B Calcaneus
C Calcaneal tuber
F Foot
R Rectangular region
x Vertical direction
y Horizontal direction

Claims

1. Legwear comprising:

a main body part including a sole part which covers a sole and a heel part which covers a heel, the main body part having elasticity; and
a nonslip part provided inside of the heel part, the nonslip part having elasticity lower than that of cloth of the heel part,
the nonslip part including strip-shaped parts which prevent the cloth of the heel part from expanding and contracting in a vertical direction and
a horizontal direction, where the vertical direction is a direction perpendicular to the sole part and the horizontal direction is a width direction of the sole part.

2. The legwear as set forth in claim 1, wherein the strip-shaped parts include:

a first strip-shaped part which extends in a substantially horizontal direction; and
one or more second strip-shaped parts each of which extends in a substantially vertical direction.

3. The legwear as set forth in claim 2, wherein
said one or more second strip-shaped parts are two second strip-shaped parts, and
the two second strip-shaped parts are provided such that a calcaneus is sandwiched therebetween.

4. The legwear as set forth in claim 3, wherein
the first strip-shaped part is provided across an Achilles' tendon, and the two strip-shaped parts extend from both ends of the first strip-shaped part toward the sole part.

5. The legwear as set forth in claim 1, wherein
the strip-shaped part includes a plurality of third strip-shaped parts which extend in respective directions, each direction being different from a substantially vertical direction and a substantially horizontal direction, and
the plurality of strip-shaped parts cross each other.

6. The legwear as set forth in claim 1, wherein the strip-shaped part includes a fourth strip-shaped part which extends

in a curved manner.

7. The legwear as set forth in any one of claims 1 through 6, wherein the strip-shaped parts are provided so as to be continuous each other.

8. The legwear as set forth in any one of claims 1 through 7, wherein the nonslip part is a sheet-like member obtained by applying a resin having a friction coefficient higher than that of cloth of the main body part to a base material.

FIG. 1

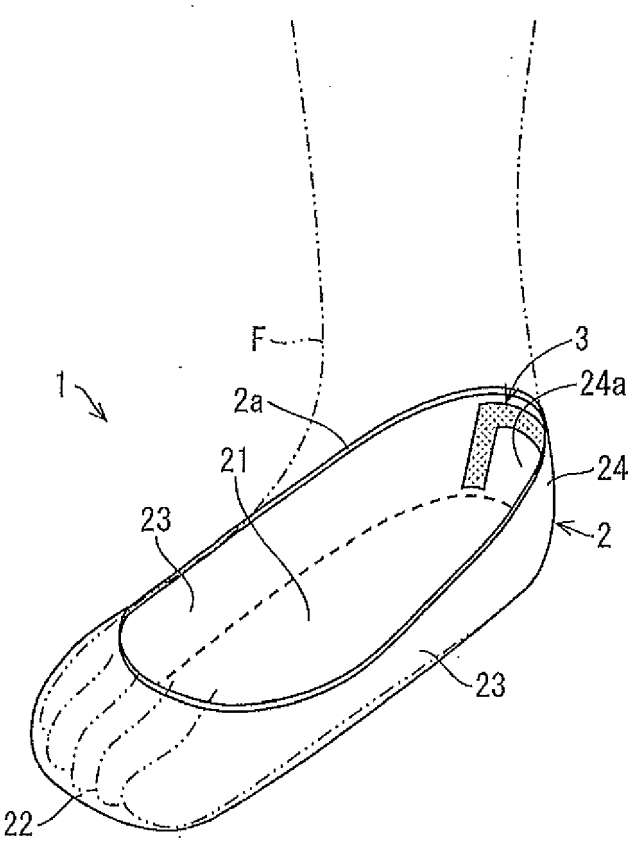


FIG. 2

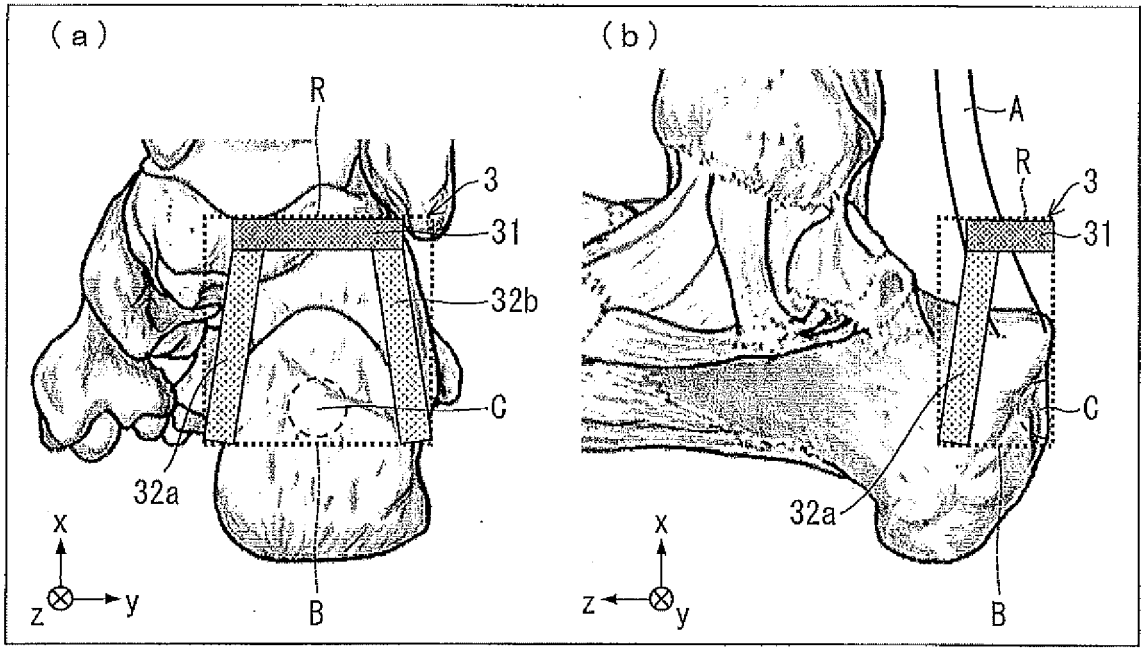
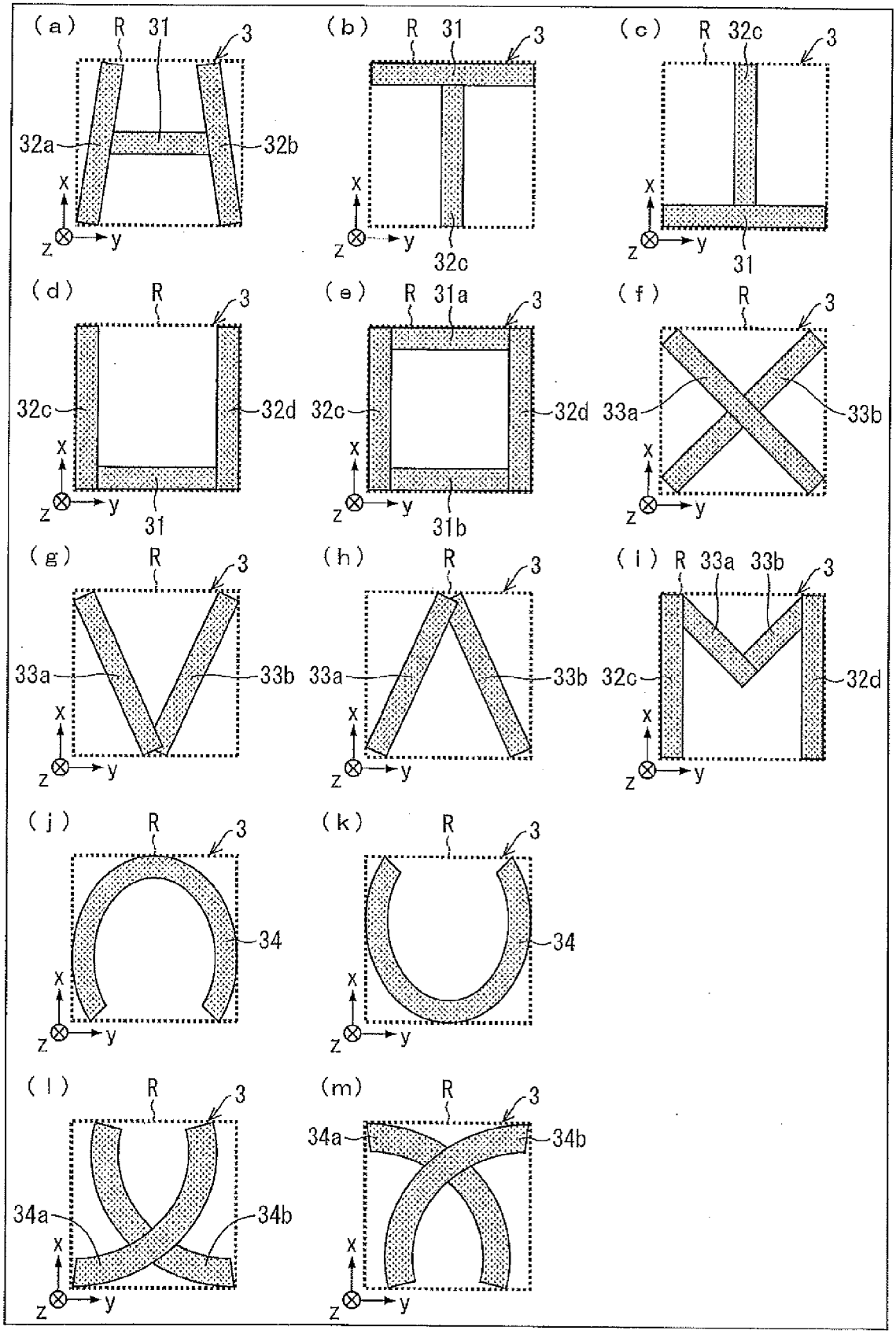


FIG. 3


(a)
R
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3
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32b
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(b)
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(d)
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34b

FIG. 4

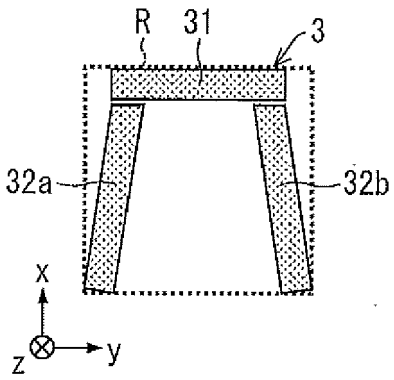

FIG. 5

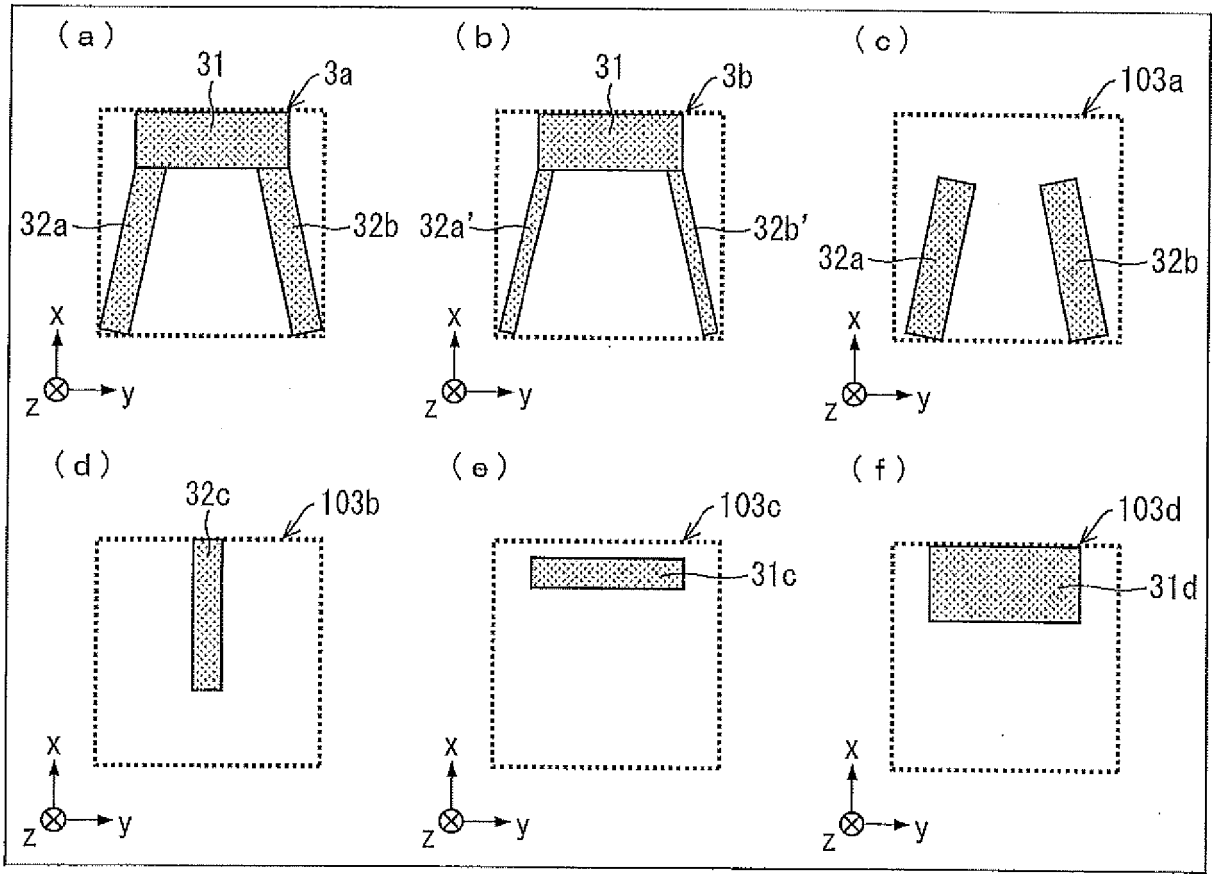
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FIG. 6

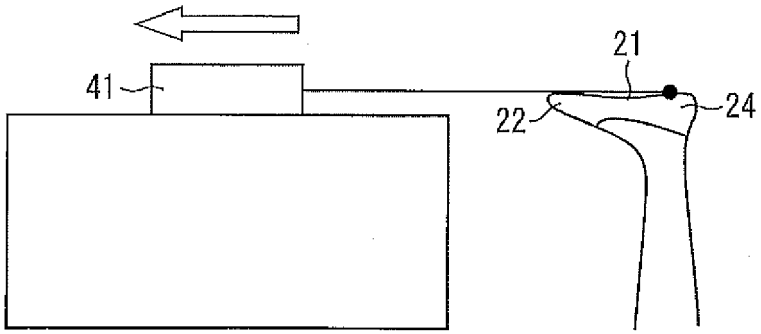
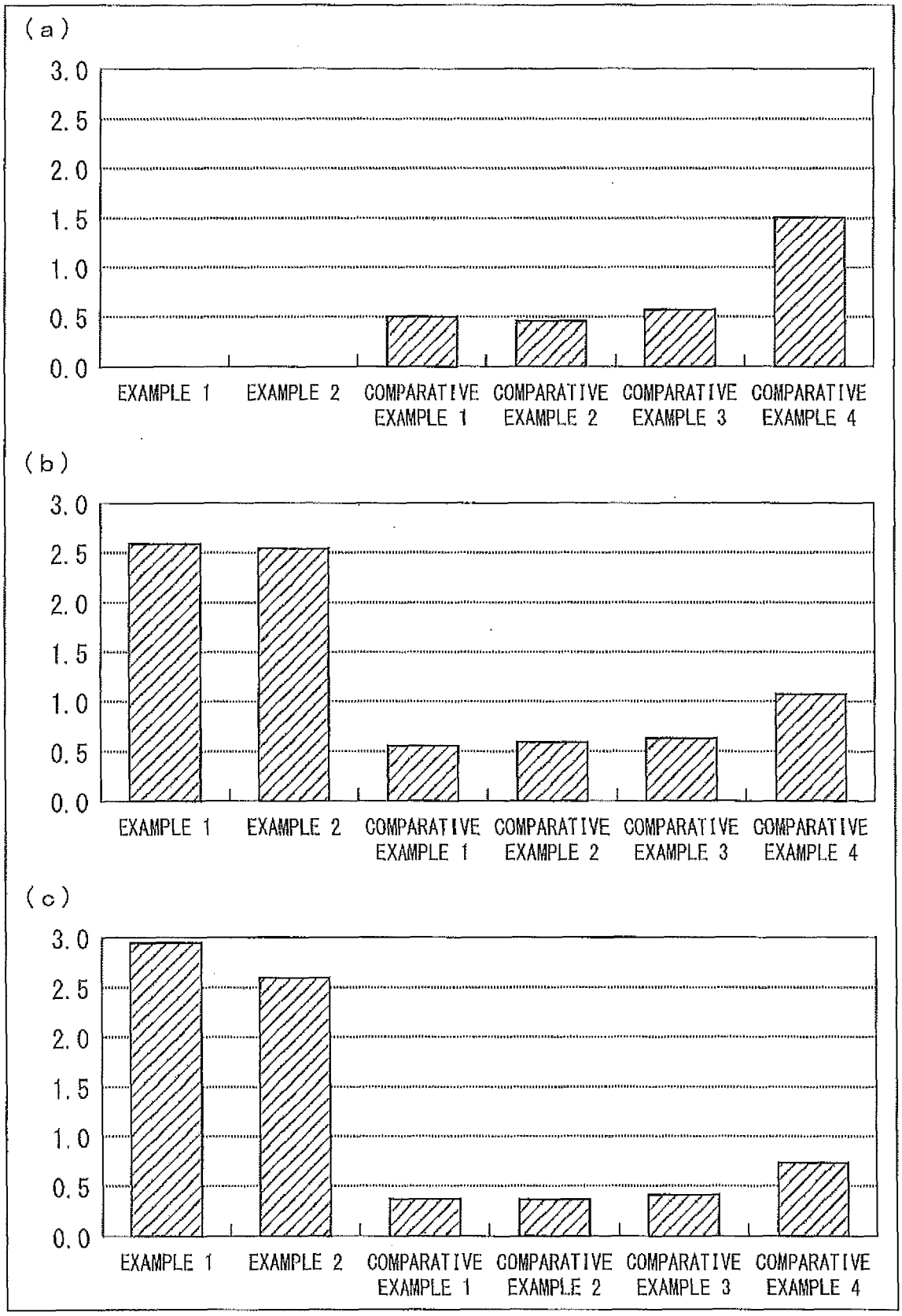


FIG. 7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EXAMPLE 1
EXAMPLE 2
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COMPARATIVE EXAMPLE 2
COMPARATIVE EXAMPLE 3
COMPARATIVE EXAMPLE 4
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2.0
1.5
1.0
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EXAMPLE 2
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COMPARATIVE EXAMPLE 2
COMPARATIVE EXAMPLE 3
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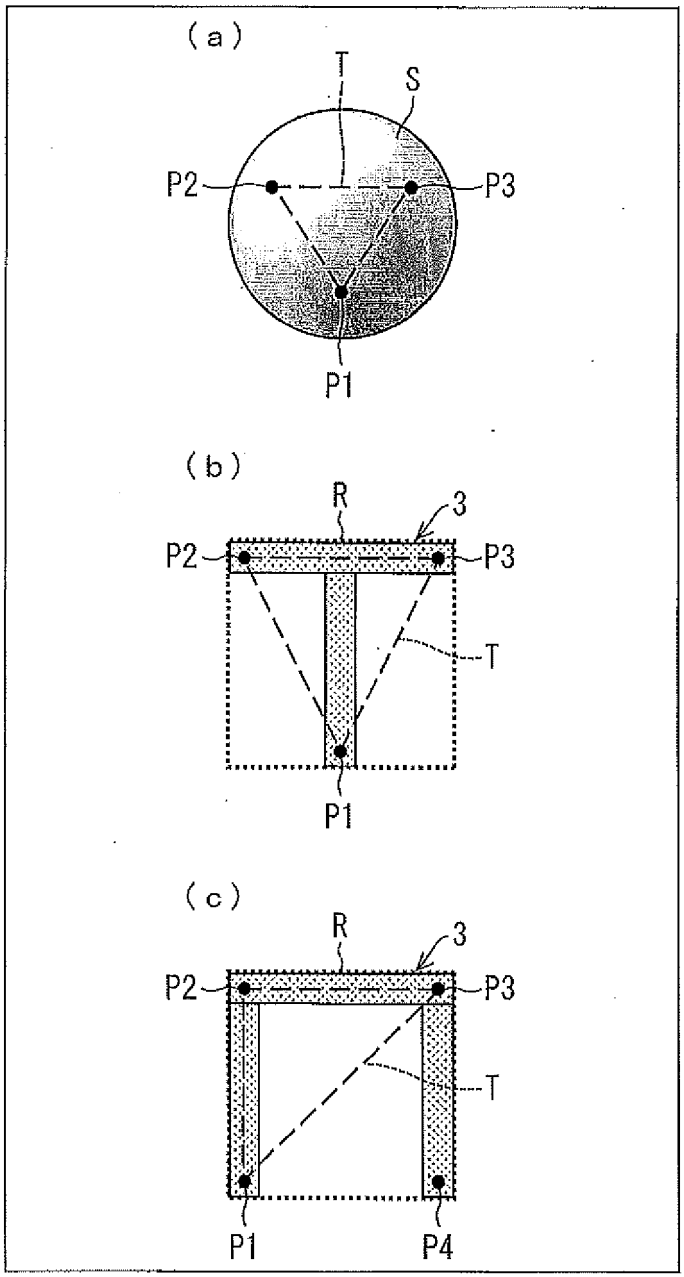
COMPARATIVE EXAMPLE 3
COMPARATIVE EXAMPLE 4

FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 16 15 3218

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 2012/180195 A1 (SHULL JAMES TROY [US] ET AL) 19 July 2012 (2012-07-19) * figure 4 * -----	1-8	

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A41B
A43B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 June 2016	Debard, Michel

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28-06-2016

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