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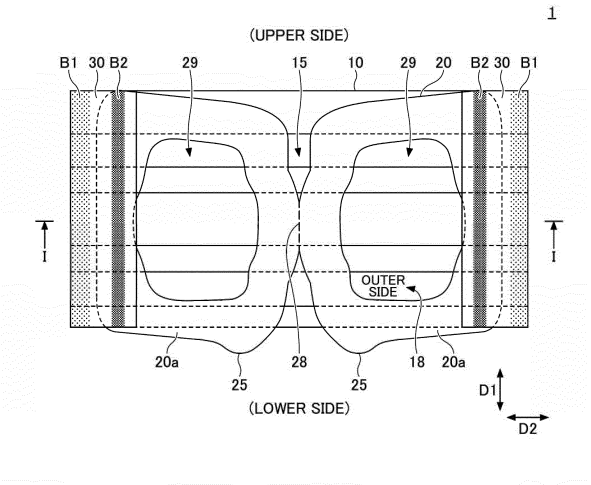
(54) MASK AND METHOD FOR MANUFACTURING MASK

(57) The mask includes a mask body and ear hook portions, constituting a pair, coupled to both end portions of the mask body in a left-and-right direction, wherein the ear hook portions, constituting the pair, are formed in a single sheet shape, and in a state before start of use, the ear hook portions, constituting the pair, are disposed to be superposed on the mask body so as not to protrude from the mask body at least in the left-and-right direction, the ear hook portion includes a stretchable member and a surface material coupled to at least one of surfaces of the stretchable member in such a state that the stretchable member is stretched at a predetermined rate with respect to a natural length, and each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction.

FIG.1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a mask and a method for manufacturing a mask.

BACKGROUND OF THE INVENTION

[0002] A known configuration of a mask to be worn on the face includes: a mask body that at least partially covers the face of a wearer; and ear hook materials, constituting a pair, each being coupled to the mask body, i.e., a pair of members that can be hung on the ears of the wearer in order to hold the mask body at a wearing position.

[0003] Conventionally, ear hook portions used for masks are often in the form of a string. In recent years, however, sheet-shaped ear hook portions have been studied in order to reduce the load on the ears. For example, a mask disclosed in PTL 1 includes ear hook portions having coupling portions and an annular portion formed integrally with a single sheet-shaped nonwoven fabric, and the coupling portions are coupled to end region areas of the mask body. Furthermore, PTL 1 discloses a stretch spunbond nonwoven fabric or the like as a material of the ear hook portions.

[0004] A single sheet-shaped ear hook portion (ear hook portion sheet) as disclosed in PTL 1s is superposed on the mask body in a state before start of use, and is used upon being separated from each other at the center in the left-and-right direction and opened outward in the left-and-right direction at the start of use. In this type of mask, in order to facilitate handling in continuous manufacturing, the single sheet-shaped ear hook portions have such a size that the ear hook portions fit within the outline of the mask body at least in the left-and-right direction in a plan view.

RELATED-ART DOCUMENT

Patent Literature

[0005] PTL 1: Japanese Patent No. 5762802

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0006] In recent years, masks have been manufactured in various sizes depending on the application and/or the size of the user's face. For example, in addition to normal size masks, smaller size masks for women or children have been manufactured. In the case of a mask of a smaller size, the size of the mask body is reduced, and accordingly, it is necessary to reduce the size of the sheet-shaped ear hook portions superposed on the mask body.

[0007] However, when designing a sheet-shaped ear hook portion of a smaller size, there are cases where it is not possible to obtain a good fit simply by reducing the shape of the ear hook portion of a normal-size mask in accordance with the overall reduction ratio of the mask body. For example, when the ear hook portion is reduced in accordance with the reduction ratio of the outer shape of the mask body, the width of the ring of the ear hook portion is reduced, so that the fit of the ear hook portion to the ear may be impaired. In contrast, if the ear hook portion is designed without changing the width of the ring of the ear hook portion in order to maintain the fit, the length of the portion of the ear hook portion that contributes greatly to the extension in the left-and-right direction is shortened, and the ear hook portion is difficult to extend in the left-and-right direction. Accordingly, the user may feel discomfort while wearing the mask, and the user is likely to feel inconvenience while when putting on the mask. Therefore, it is necessary to study the design of the ear hook portion so as to provide a mask of various sizes that is excellent in the fit.

[0008] In view of the above, it is an object of one aspect of the present invention to provide a mask of various sizes that is excellent in the fit.

Means for Solving the Problem

[0009] An aspect according to the present invention is a mask that includes: a mask body; and ear hook portions, constituting a pair, coupled to both end portions of the mask body in a left-and-right direction, wherein the ear hook portions, constituting the pair, are formed in a single sheet shape, and in a state before start of use, the ear hook portions, constituting the pair, are disposed to be superposed on the mask body so as not to protrude from the mask body at least in the left-and-right direction, the ear hook portion includes a stretchable member and a surface material coupled to at least one of surfaces of the stretchable member in such a state that the stretchable member is stretched at a predetermined rate with respect to a natural length, and each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction.

Effects of the Invention

[0010] According to an aspect of the present invention, a mask of various sizes that is excellent in the fit can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a plan view of a mask according to an embodiment of the present invention as seen from the

outside.

FIG. 2 is a plan view of the mask illustrated in FIG. 1 as seen from the inside (face side).

FIG. 3 is a cross-sectional view taken along line I-I of FIG. 3.

FIG. 4 is a drawing for explaining an example of a method for using the mask as illustrated in FIG. 1, and is a plan view after ear hook portions, constituting a pair, are opened sideways.

FIG. 5 is a cross-sectional view taken along line II-II of FIG. 4.

FIG. 6 is an enlarged view of a portion III of FIG. 5, and is a view for explaining a configuration of an ear hook portion.

FIG. 7 is a schematic diagram of a manufacturing apparatus of ear hook portions for masks and a manufacturing apparatus of masks according to an embodiment of the present invention.

FIG. 8 is a diagram for explaining manufacturing of masks by the apparatuses as illustrated in FIG. 7.

FIG. 9 is a plan view of masks of different sizes.

FIG. 10 is a plan view of a mask of a smaller size (the mask on the lower side of FIG. 9 is illustrated again).

FIG. 11 is a diagram illustrating evaluation results of Examples.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Hereinafter, embodiments of the present invention are described in detail with reference to the drawings. In each of the drawings, unless otherwise explained, the same or corresponding components may be denoted with the same reference numerals and the description thereof may be omitted. The drawings are schematic for helping understanding of the invention.

(Basic Configuration of Mask)

[0013] A mask according to an embodiment may be a mask capable of covering the face of a wearer, more specifically, covering at least the nose and the mouth of a wearer. The mask according to this embodiment can have a function of preventing foreign matter from reaching the face and preventing droplets generated by the wearer from being scattered, and is also referred to as a sanitary mask or surgical mask. The mask may be disposable or reusable by washing.

[0014] FIG. 1 is a plan view of a mask 1 according to the present embodiment. FIG. 1 is a view of the mask 1 as seen from the outside (or an outer surface side), i.e., from the side exposed to the outside and facing away from the face when the mask 1 is worn. FIG. 2 is a plan view of the mask as seen from the inside (face side). FIG. 3 is a cross-sectional view taken along line I-I of FIG. 1.

[0015] As illustrated in FIG. 1, the mask 1 according to the present embodiment includes: a mask body 10 which is disposed in front of the face of the wearer when the mask is worn and can mainly cover the nose and mouth of the wearer; and ear hook portions 20a, 20a, constituting the pair, coupled to the mask body 10. The mask body 10 has a height direction D1 corresponding to the height direction of the wearer's face when wearing the mask and a left-and-right direction D2 corresponding to the left-and-right direction of the face of the wearer when being worn. The height direction D1 is orthogonal to the left-and-right direction D2. In the form of FIG. 1, the mask body 10 has a rectangular shape in a plan view having long sides in the left-and-right direction D2, but the shape of the mask body 10 in a plan view is not limited to the shape as illustrated in the drawings.

[0016] As illustrated in FIGs. 1 and 2, the mask body 10 has a pleated structure 15 formed by multiple pleats arranged side by side in the height direction D1. The pleats of the pleated structure 15 are formed by folding a sheet constituting the body 10 at fold lines along the left-and-right direction D2. In a state in which multiple pleats are formed, both side portions (both ends in the left-and-right direction D2) of the mask body 10 are joined and fixed by heat sealing or the like. Therefore, when the mask 1 is used, the pleats of the pleated structure 15 are extended in the height direction D1, so that the center of the mask body 10 in the left-and-right direction D2 is curved so as to protrude toward the outer surface side of the mask 1, and can be deformed into a shape adapted to the three-dimensional shape of the face. The specific configuration of the pleated structure 15 is not particularly limited and may be a conventional configuration formed in a mask body.

[0017] The mask body 10 may have a multilayer structure formed by laminating multiple layers. For example, the structure may include at least three layers sandwiched between an outer layer and an inner layer of an intermediate layer having an enhanced function of collecting a foreign matter (dust, pollen, bacteria, viruses, and the like). Each layer constituting the body 10 preferably includes a fiber-containing layer such as a nonwoven fabric, a woven fabric, a knitted fabric, and the like, and more preferably includes a nonwoven fabric. Examples of the nonwoven fabric include a spunbond nonwoven fabric, a spunlace nonwoven fabric, a meltblown nonwoven fabric, an air through nonwoven fabric, a point bond nonwoven fabric, and the like. A meltblown nonwoven fabric which can contain fine fibers is preferably used for the intermediate layer. The fibers constituting the fiber-containing layer are preferably resin fibers, and the resin types of the resin fibers include polyethylene, polypropylene, polyethylene terephthalate, nylon, and the like. The basis weight of the outer and inner layers may be 10 to 50 g/m^2, preferably 15 to 50 g/m^2. The basis weight of the intermediate layer having a high foreign matter collecting property is preferably 10 to 100 g/m^2 and more preferably 15 to 50 g/m^2.

[0018] The ear hook portions 20a, 20a, constituting the pair, may be in an annular shape (or in a closed belt shape), or may have a shape that includes an annulus

in a plan view. When being worn, the ear hook portions 20a can be hung on the ears by allowing the ears of the wearer to enter the inside of the ring of each ear hook portion 20a, i.e., an opening 29 at the center of each ear hook portion 20a.

[0019] As illustrated in FIG. 1 and FIG. 2, the ear hook portions 20a, 20a, constituting the pair, is formed as a single sheet-shaped or a continuous ear hook portion sheet 20 in which the ear hook portions 20a, 20a are separably coupled to each other at the center in the left-and-right direction D2. The term "single sheet" herein refers to a form composed of one continuous sheet. The "single sheet" may be a single layer or a stacked body in which multiple layers are stacked. The ear hook portions 20a, 20a, constituting the pair, are in a sheet form, and therefore, when the ear hook portion 20a is hung on the ear, the ear hook portion 20a can be brought into surface contact with the back surface behind the ear or the back of the earlobe, so that the load on the ear can be reduced. Accordingly, even when used for a long period of time, discomfort can be reduced. Furthermore, because the ear hook portions 20a, 20a, constituting the pair, are in a sheet form (i.e., constituted by the ear hook portion sheet 20), the ear hook portions 20a, 20a, constituting the pair, can be positioned at the same time during manufacturing, and therefore, the mask can be easily manufactured.

[0020] The ear hook portions 20a, 20a (the ear hook sheet 20) have stretchability (to be described in detail later), and the user can easily pull the ear hook portions 20a, 20a to behind the ears and then hang them on the ears while putting on the mask.

[0021] The ear hook portion sheet 20 is configured so as to be able to form the ear hook portions 20a, 20a, constituting the pair, separated from each other by breaking the ear hook portion sheet 20 at a predetermined position. Specifically, in the form of FIG. 1, the ear hook portions 20a, 20a, constituting the pair, are coupled by a coupling portion 28. The type of coupling at a separable coupling portion 28 between the ear hook portions 20a, 20a constituting the pair is not particularly limited, but is preferably separable by pulling with a usual force of the user. For example, it may be formed as perforations as illustrated in FIG. 1. The coupling portion 28 may also be formed by reducing the thickness of the sheet or by other means to weaken the border between the ear hook portions 20a, 20a constituting the pair or to increase stress.

[0022] As illustrated in FIGs. 1 to 3, the ear hook portions 20a, 20a, constituting the pair, or the ear hook portion sheet 20 in a single sheet shape are superposed on the mask body 10. The ear hook portion sheet 20 may have a shape and a size that does not protrude from the mask body 10 at least in the left-and-right direction D1 in a plan view. With this configuration, masks can be continuously manufactured by superposing and coupling the mask body 10 and the ear hook portion sheet 20 without requiring complicated processes such as folding and bending of the ear hook portion sheet 20.

[0023] The ear hook portions 20a, 20a, constituting the pair, are coupled to side portions (end portions in the left-and-right direction D2) of the outer surface of the body 10. Specifically, the portions on the outer sides of the ear hook portions 20a, 20a, constituting the pair, in the left-and-right direction D2 are coupled to the body 10, and the other portions are not coupled to the body 10. To start to use the mask 1 according to the present embodiment, before putting on the mask 1, the user releases the coupling between the ear hook portions 20a, 20a, constituting the pair, separates the ear hook portions 20a, 20a from each other (also referred to as a separation operation), and opens, sideways in the left-and-right direction D2, the portions of the ear hook portions 20a, 20a that are not coupled to the body 10 (also referred to as an expansion operation).

[0024] As illustrated in FIGs. 1 and 3, the ear hook portions 20a, 20a, constituting the pair, may be coupled to both side portions of the mask body 10 via sheet-shaped auxiliary materials 30, 30, respectively. By interposing the auxiliary material 30 in the coupling between the ear hook portion 20a and the mask body 10, the mask 1 can be formed without directly coupling the ear hook portion 20a and the mask body 10. Therefore, the coupling between the ear hook portion 20a and the auxiliary material 30 and the coupling between the mask body 10 and the auxiliary material 30 can be formed separately in appropriate forms. In addition, it is possible to avoid using a portion of the ear hook portion 20a for fixation with the mask body 10. Therefore, by using the auxiliary material 30, the ear hook portion 20a can be moved more freely relative to the mask body 10 than in the case where the ear hook portion 20a is directly coupled to the mask body 10, so that the position of the ear hook portion 20a relative to the ear can be set more freely when the ear hook portion 20a is attached to the ear.

[0025] In the form illustrated in FIGs. 1 to 3, the sheet-shaped ear hook portion 20a and the sheet-shaped auxiliary material 30 are superposed and coupled at a first coupling portion B1. The mask body 10 and the sheet-shaped auxiliary material 30 are superposed and coupled at a second coupling portion B2. Thus, by using the auxiliary material 30, a bond between the ear hook portion 20a and the mask body 10 that is not easily broken can be indirectly formed without impairing the function and mounting feeling of the respective members, and the robust mask can be obtained.

[0026] The auxiliary material 30 may be a sheet-shaped member extending in the height direction D1 of the mask 1. The length (width) W of the auxiliary material 30 in the left-and-right direction D2 is preferably 15 to 35 mm, depending on the size and configuration of the entire mask 1 and the sizes, shapes, and materials of the body 10 and the ear hook portions 20a. The basis weight of the auxiliary material 30 may be 5 to 100 g/m2. The thickness of the auxiliary material 30 may be 100 to 1,000 μm.

[0027] The auxiliary material 30 may be formed of a non-stretchable material or a material with small stretch-

ability, or may be formed of a material having a certain degree of stretchability. The auxiliary material 30 may include, for example, a stretchable nonwoven fabric. In this case, the auxiliary material 30 is preferably stretchable at least in the left-and-right direction D2, but the stretchability of the auxiliary material 30 is preferably smaller than that of the ear hook portion 20a. The auxiliary material 30 may be formed of a material whose shape can be irreversibly deformed when a force is applied.

[0028] For example, the first coupling portion B1 and the second coupling portion B2 can be formed by means of coupling the opposing surfaces of the members by applying pressure and/or heat, such as heat sealing, ultrasonic sealing, non-heating embossing, and the like. Among them, it is preferable to use heat sealing because reliable bonding is possible.

[0029] When the auxiliary material 30 is provided, the length in the left-right direction D2 of the ear hooking portion sheets 20 constituting the pair of ear hook portions 20a, 20a is shorter than the length in the left-right direction D2 of the mask 1. As a result, an outer end 21 of the ear hook portion 20a in the left-right direction D2 and an outer end 11 of the body 10 in the left-right direction D2 can be shifted, and the auxiliary material 30 can be pasted to a position in proximity to the end portion of the main body 10 in the left-right direction D2 that is not covered with the ear hook portion 20a.

(Separation and expansion operation of ear hook portion)

[0030] At the start of use, the user can pull the ear hook portions 20a, 20a constituting the pair in the opposite directions by pinching or holding them with their respective hands. As a result, the separable coupling portion 28 can be first uncoupled. If the coupling portion 28 includes perforations formed along the border line between the ear hook portions 20a, 20a constituting the pair, the perforations can be broken to separate the ear hook portions 20a, 20a along the border line. Thereafter, the user can open the ear hook portions 20a, 20a constituting the pair outward (as indicated by arrows) in the left-and-right direction D2 toward the sides indicated by the arrows in FIG. 3 while holding the ear hook portions 20a, 20a, constituting the pair.

[0031] FIG. 4 illustrates a state in which the ear hook portions 20a, 20a, constituting the pair, are opened outward in the left-and-right direction D2 from the state illustrated in FIG. 1. FIG. 5 is a cross-sectional view taken along line II-II of FIG. 4. As illustrated in FIGs. 4 and 5, when the ear hook portions 20a, 20a constituting the pair are opened, the ear hook portions 20a, 20a are turned over, i.e., the surface of the ear hook portions 20a, 20a constituting the pair facing the body 10 in the state before start of use is exposed.

[0032] After the user holds the ear hook portions 20a, 20a, constituting the pair, and opens them outward in the left-and-right direction D2, the mask body 10 is placed on the face of the wearer so that the surface on the face side of the mask body 10 faces the face of the wearer, and the ear hook portions 20a, 20a are hung on the respective ears of the wearer.

[0033] In the state before start of use (FIGs. 1 to 3), the ear hook portions 20a, 20a, constituting the pair, (the ear hook portion sheet 20) in the form of a single sheet are superposed on the mask body 10. The ear hook portions 20a, 20a, constituting the pair, may be superposed on any of the surfaces of the mask body 10, but it is preferable that they are superposed on the outer surface of the mask body 10 as illustrated in the drawing. Thus, when the mask 1 is worn, the contact with the inner surface (surface on the face side) of the mask body 10 can be reduced or substantially eliminated.

[0034] For example, when the user puts the mask 1 on himself/herself, the mask 1 is placed on his/her face so that the inner surface of the mask body 10 faces his/her face, and while pressing the outer surface of the mask body 10 with one hand, the coupling of the ear hook portions 20a, 20a at the coupling portion 28 is released by the other hand, and one ear hook portion 20a is hung on the ear. After switching the hand holding the mask body 10 to the other hand, the other ear hook portion 20a can be hung on the ear with the hand that was originally holding the mask body 10.

[0035] Also, while the mask 1 is placed with the outside of the mask 1 facing upward (with the outer surface of the body 10 facing upward), the user opens the ear hook portions 20a, 20a, constituting the pair, outwardly in the left-and-right direction D2 by holding them with hands. Thereafter, the mask 1 is moved to the face of another wearer while the ear hook portions 20a, 20a constituting the pair are held, and the mask body 10 is arranged at a desired position of the wearer's face, and at this occasion, the ear hook portions 20a, 20a constituting the pair can be hung on the ears of the wearer while the way of holding the mask 1 is not changed. Therefore, the mask 1 according to the present embodiment can be suitably used when the mask is worn by a person who has difficulty wearing the mask by himself or herself, such as a child or a sick person.

[0036] A mark 18 that allows front and back (the outer and inner surfaces) of the body 10 to be distinguished from each other may be formed on the outer surface and/or the inner surface of the body 10 by embossing, printing, sewing, or the like. The form of the mark 18 is not limited as long as it can be visually recognized by the user. As illustrated in FIGs. 1 and 2, the mark 18 may be letters, numbers, a symbol, a figure, a logo, or the like. If the mark 18 includes characters, the side on which the user can read the characters correctly can be recognized as the outer surface.

(Ear hook portion and material of ear hook portion sheet)

[0037] The ear hook portion 20a or the ear hook portion sheet 20 according to the this embodiment has stretchability or elasticity as described above. FIG. 6 (a) illus-

trates an enlarged view of a portion III of FIG. 5, i.e., a cross-sectional view obtained by cutting the ear hook portion 20a (the ear hook portion sheet 20) in the left-and-right direction D2. As illustrated in FIG. 6 (a), the ear hook portion sheet 20 (or the ear hook portion 20a) may be a laminated sheet formed by laminating multiple layers. In the example of FIG. 6 (a), the ear hook portion 20a includes a stretchable film (stretchable member) 5, with a first surface material 2 being disposed on a first surface, which is one surface of the stretchable film 5, and a second surface material 3 being disposed on a second surface, which is a surface on the opposite side to the first surface. Note that the ear hook portion 20a (the ear hook portion sheet 20) may have a structure in which the surface material is provided on only one side, instead of the structure in which the surface materials are provided on both sides of the stretchable film 5 as illustrated in FIG. 6 (a).

[0038] The stretchability of the ear hook portion 20a is mainly caused by the stretchable film (stretchable member) included in the ear hook portion 20a. The stretchable member can be stretched in at least one direction by applying a tensile force, and has a property of returning to an original length (natural length) by releasing the applied tensile force (i.e., not applying an external force). Furthermore, in the case where the stretchable film 5 is used, i.e., in the case where a form of a film which is a continuous flat molded body having a substantially uniform thickness, it can have higher stretchability or extensibility and high stress as compared with a fiber structure (a sheet-shaped body formed by aggregating fibers) or the like, so that the range of the design of the ear hook portion 20a is expanded. In particular, the degree of freedom in designing the stretching characteristics of the ear hook portion 20a is increased.

[0039] Examples of materials of the stretchable film 5 include polyolefin such as polyethylene and polypropylene, polyurethane, and the like. With respect to the stretchability of the stretchable film 5, it is preferable that the maximum stretch rate (stretch rate at tensile fracture) is 3.5 to 4.0, as measured by a tensile testing machine. The stretchable film 5 may have a function of allowing moisture to pass through.

[0040] In the example illustrated in FIG. 6, the stretchable film 5 is used as a stretchable member, but the stretchable member is not limited to a film-like member. For example, in place of the stretchable film, the ear hook portion 20a may include a thread-like stretchable body aggregate formed by arranging side by side multiple thread-like stretchable bodies (or thread-like elastic bodies) such as yarn rubber, or may include a stretchable hot-melt adhesive. The stretchable hot melt adhesive may be arranged in a linear shape or in a planar shape. However, the stretchable member in the form of a film is preferable in that it is easy to handle during manufacture.

[0041] As illustrated in FIG. 6 (a), when surface materials are provided on both surfaces of the stretchable member 5, the first surface material 2 and the second surface material 3 may be the same or different. The first surface material 2 and the second surface material 3 preferably have a fiber structure. Examples of the fiber structures include a nonwoven fabric, a woven fabric, a knitted fabric, and the like. Among them, a nonwoven fabric is preferably used because of its good touch and breathability, and it contributes to the fit. Examples of nonwoven fabric include an air-through nonwoven fabric, a spunbond nonwoven fabric, a spunlace nonwoven fabric, a needle punch nonwoven fabric, a chemical bond nonwoven fabric, and the like. Among them, a spunbond nonwoven fabric having no pilling and high strength, an air-through nonwoven fabric having softness, and the like can be suitably selected. The fibers contained in the nonwoven fabric are preferably resin fibers, and the resin types of the resin fibers include polyethylene, polypropylene, polyethylene terephthalate, nylon, and the like. In a case where the first surface material 2 or the second surface material 3 is nonwoven fabric, the basis weight of the nonwoven fabric may be 5 to 50 g/m^2, and more particularly, preferably 8 to 25 g/m^2.

[0042] In many cases, the stretchable member such as the stretchable film 5 is more likely to cause irritation or discomfort when directly touching the wearer's face (skin) as compared with the non-stretchable member. Therefore, it is preferable to configure the ear hook portion 20a so as to avoid direct contact of the stretchable member with the wearer's skin as much as possible. In contrast, in the ear hook portion 20a according to the present embodiment, the stretchable film 5 is covered with the first surface material 2 and the second surface material 3 (FIG. 7), and therefore, direct contact between the stretchable film 5 and the skin can be avoided when the mask is worn, and the fit can be improved.

[0043] The ear hook portion 20a (the ear hook portion sheet 20) as illustrated in FIG. 6 (a) is obtained as follows. Specifically, as illustrated in FIG. 6 (b), a tensile external force T is applied to the stretchable film 5 to extend the stretchable film 5 from its natural length, and the first surface material 2 and the second surface material 3 in the natural state, which are not shrunk, are intermittently coupled to the respective surfaces at multiple interlayer coupling portions m. Thereafter, by releasing the tensile external force T, the ear hook portion 20a (the ear hook portion sheet 20) in the natural state illustrated in FIG. 6 (a) is obtained. The interlayer coupling portions m may be portions for coupling the layers together with little change in the state of the layers (the stretchable film 5, the surface materials 2, 3). The interlayer coupling portions m may be welded portions, and the layers may be welded to each other at the welded portions to be integrated with less thickness.

[0044] The ear hook portion 20a (ear hook portion sheet 20) illustrated in FIG. 6 (a) is in a natural state, i.e., in a state where no external force is applied. Therefore, the stretchable film 5 is also in a natural state and has a natural length. In contrast, the first surface material 2 and second surface material 3 that are coupled are reduced

in length in the left-and-right direction D2 as a whole. This shortening of the length is due to the fact that the portions other than the portions coupled by the multiple interlayer coupling portions m are raised away from the stretchable film 5 to be made into pleats (wrinkles). The first surface material 2 and the second surface material 3 are formed with multiple wrinkles extending approximately along the height direction D1 of the mask 1, and are wavy in the cross section.

[0045] As described above, a large number of pleats are formed on the surface of the ear hook portion 20a, and therefore, when the surface of the ear hook portion 20a comes into contact with the skin, the material of the ear hook portion 20a does not come into contact with the entire surface of the skin, and a space is formed between the ear hook portion 20a and the skin, so that the feeling of sticking to the skin can be reduced, and the fit can be improved.

[0046] When the mask 1 is used, the ear hook portion 20a is pulled and extended mainly in the left-and-right direction D2. In this case, the stretching characteristic of the ear hook portion 20a greatly affects the fit of the ear hook portion 20a. For example, if the ear hook portion 20a can be extended to a sufficient length with a small force, it becomes easy to hang the ear hook portion 20a on the ear, and the stress generated when the ear hook portion 20a is worn becomes appropriate, so that the ear hook portion 20a can be fitted to the ear without pain or discomfort. The stretching characteristic of the ear hook portion 20a (the ear hook portion sheet 20) having the structure illustrated in FIG. 6 may depend on the multiplicative factor by which the original length of the stretchable film 5 is stretched by the tensile external force T, i.e., a stretch ratio k of the stretchable film (stretchable member) 5, when the surface material is coupled during manufacturing of the ear hook portion 20a (ear hook portion sheet 20) . The stretch ratio k of the stretchable member in a certain ear hook portion 20a (ear hook portion sheet 20) is a length in the extended state where the length in the natural state (natural length) of the stretchable member is defined as 1. For example, when the surface material is coupled in a state where the stretchable member is extended to twice the natural length at the time of manufacturing of the ear hook portion 20a or the ear hook portion sheet 20, the stretch ratio k is 2. In other words, the stretch ratio k may be a ratio of the length L1 of the stretchable member in the extended state, to which the surface material is coupled, to the natural length L0 of the stretchable member. Specifically, the stretch ratio k is L1/L0. The stretch ratio k is a value that is more than 1.

(Production of ear hook portion or ear hook portion sheet and mask)

[0047] Hereinafter, manufacturing of the ear hook portions 20a, 20a or the ear hook portion sheet 20 is explained. FIG. 7 is a schematic view of a manufacturing apparatus 300 of masks. The manufacturing apparatus 300 of the masks is provided with a manufacturing apparatus 100 of ear hook portions on the upstream thereof. A mask member combining apparatus 200 for combining the manufactured ear hook portion for the mask with other members of the mask is provided subsequently to the manufacturing apparatus 100 of the ear hook portions.

[0048] The manufacturing apparatus 100 of the ear hook portions is provided with a stretchable film band supply means 123 for supplying a stretchable film band (stretchable member band) 5A for forming a stretchable film 5, a first surface material band supply means 121 for supplying a first surface material band 2A for forming a first surface material 2, and a second surface material band supply means 122 for supplying a second surface material band 3A for forming a second surface material 3. A long material, i.e., a stretchable film band 5A, a first surface material band 2A, and a second surface material band 3A are supplied from each supply means, and then the first surface material band 2A and the second surface material band 3A are placed on one surface (first surface) and the other surface (second surface) of the stretchable film band 5A, respectively, to form a multilayer structure 6A. The multilayer structure 6A is conveyed in a conveying direction Dt.

[0049] In this case, the stretchable film band 5A is conveyed in a state of being extended in the conveying direction Dt, i.e., in a state of applying a tensile force (tension) in the conveying direction Dt. The degree of stretching of the stretchable film band 5A is controlled by the feeding speed of the stretchable film band supply means 123 and conveying means (not illustrated). The degree that the stretchable film band 5A is stretched is preferably, for example, about 1.5 to 4 times, preferably about 2 to 3 times, of the natural length. Specifically, the stretch ratio k of the ear hook portion sheet 20 is preferably 1.5 to 4, and is more preferably 2 to 3. In contrast, the first surface material band 2A and the second surface material band 3A are conveyed in a state having a natural length (a state in which they are not pulled, or in a state in which they are not stretched even though a tensile force is applied). Therefore, the surfaces of the first surface material band 2A and the second surface material band 3A laid on the respective surfaces of the stretchable film band 5A are in a state without wrinkles.

[0050] Subsequently, the multilayer structure 6A is fed to the welding means 140, so that discontinuous interlayer coupling portions are formed over the entire multilayer structure 6A between the stretchable film band 5A and the first surface material band 2A and between the stretchable film band 5A and the second surface material band 3A. In the present embodiment, the interlayer coupling portions are welded portions. The welding means 140 is preferably an ultrasonic welding unit, but other means such as thermal welding may be used. For example, multiple discontinuous welded portions can be formed intermittently in a form of dots in a plan view. They may also be formed in a linear shape separated in the

conveying direction Dt. The stacked body 8A can be obtained by coupling the layers of the multilayer structure 6A with the welding means 140.

[0051] FIG. 7 also illustrates an enlarged cross-sectional view of the portion IV. Multiple interlayer coupling portions (welded portions) m are intermittently formed between the stretchable film band 5A and the first surface material band 2A, and between the stretchable film band 5A and the second surface material band 3A. A reference diameter of a welded portion m in a plan view may be 0.2 to 1.0 mm. The area of the welded portion m in a plan view may be 1.8 to 19.1% of the sheet area.

[0052] Furthermore, the stacked body 8A is fed to relaxing means 160. In the relaxing means 160, the tension applied to the stretchable film band 5A in the conveying direction Dt is loosened. Although the degree to which the tension is loosened by the relaxing means 160 is not limited, it is preferable that the tension is loosened until the stretchable film band 5A returns to its natural length. When the stretchable film band 5A is loosened, the stretchable film band 5A is contracted. In this case, the stretchable film band 5A and the first surface material band 2A are coupled by the welded portions m, and the stretchable film band 5A and the second surface material band 3A are also coupled by the welded portions m. Therefore, the first surface material band 2A and the second surface material band 3A are contracted together with the stretchable film band 5A, i.e., their lengths are reduced. However, the portions which are not coupled to the stretchable film band 5A by the welding portions m are loosened because these portions do not follow the stretchable film band 5A, and therefore these portions rise from the surface. Therefore, the first surface material band 2A and the second surface material band 3A are formed with a large number of small pleats (wrinkles) extending along a direction orthogonal to the conveying direction Dt. When the pleats are formed, the first surface material band 2A and the second surface material band 3A have no or almost no force to return to the original length. Therefore, the stretchable film 5 is maintained in its natural length.

[0053] FIG. 7 also illustrates an enlarged cross-sectional view of the portion V. As illustrated in the drawing, in the ear hook portion sheet band 20A, the stretchable film band 5A is flat, but the first surface material band 2A and the second surface material band 3A are contracted to form wrinkles. In the ear hook portion sheet band 20A, continuous irregularities are formed along the conveying direction Dt as seen in a cross section obtained by cutting the first surface material band 2A and the second surface material band 3A along the conveying direction Dt.

[0054] Subsequently, the ear hook portion sheet band 20A is fed to punching means 180. In the punching means 180, the ear hook portion sheet band 20A is punched by a punching die so as to obtain the shape of each ear hook portion sheet 20. In any case, multiple ear hook portion sheets 20, 20, and ... can be obtained by the punching means 180.

[0055] In this manner, the ear hook portion sheet 20 is manufactured by performing: while the stretchable film band 5A including a first surface and a second surface on a side opposite to the first surface is stretched in the predetermined direction (the conveying direction Dt), placing the first surface material band 2A and the second surface material 3A on the first surface and the second surface, respectively; coupling the stretchable film band 5A with the first surface material band 2A and the second surface material band 3A to obtain the stacked body 8A; causing the stacked body 8A to contract in the predetermined direction (the conveying direction Dt); and cutting the stacked body 8A to form multiple ear hook portion sheets 20 constituting a pair of ear hook portions separably coupled to each other.

[0056] In place of the stretchable film band 5A, a long material of a thread-like stretchable body aggregate formed by arranging side by side multiple thread-like stretchable bodies (thread rubber, and the like) may be used. In this case, as described above, multiple thread-like stretchable body aggregates can be supplied while they are stretched and tensioned at a stretch ratio k in the conveying direction Dt, and the first surface material band 2A and the second surface material band 3A can be laid on the respective surfaces of the assembly. Thereafter, in the welding means 140, the thread-like stretchable body and the first surface material band 2A may be welded together and the thread-like stretchable body and the second surface material band 3A may be welded together, or the first surface material band 2A and the second surface material band 3A may be welded together so as to sandwich the thread-like stretchable body.

[0057] The ear hook portion sheets 20, 20, ... are fed to the mask member combining apparatus 200. In the mask member combining apparatus 200, an auxiliary material band 30A is provided on one surface of the ear hook portion sheet 20. The mask member combining apparatus 200 includes a mask body band supply means 221 for supplying a mask body band 10A for forming a mask body. The mask body band supply means 221 supplies the mask body band 10A to a surface of the ear hook portion sheet 20 that is opposite to the surface where the auxiliary material band 30A is provided.

[0058] After the ear hook portion sheet 20, the auxiliary material band 30A, and the mask body band 10A are combined, the first coupling portion B1 and the second coupling portion B2 (FIGs. 1 and 3 and the like) described above are formed, and are coupled at predetermined positions by heat sealing or the like by a coupling and cutting unit 240. Subsequently to the coupling or at the same time as the coupling, cutting is performed. Thus, each of the masks 1 can be obtained.

[0059] FIG. 8 schematically illustrates a process by which members are combined in the mask member combining apparatus 200. Specifically, a mask is manufactured by performing: (a) forming the ear hook portion sheet 20 and bonding the auxiliary material band 30A with side portions of two spaced-apart two ear hook por-

tions sheets 20, 20; (b) bonding the auxiliary material band 30A with an outer surface of the mask body band 10A to indirectly couple the ear hook portion sheet 20 to the mask body band 10A; and (c) cutting the auxiliary material band 30A and the mask body band 10A to form the mask 1.

(Design of ear hook portion)

[0060] In recent years, masks of various sizes have been provided according to the applications and/or the sizes of the users' faces. However, in the configuration in which the ear hook portions 20a, 20a, constituting the pair, are formed in a single sheet shape and are superposed on the mask body 10 so as not to protrude from the mask body 10 at least in the left-and-right direction D2, the ear hook portion 20a needs to be designed in order to improve the fit of the mask.

[0061] FIG. 9 is a plan view of two masks of different sizes. The mask illustrated on the upper side in FIG. 9 is the mask 1 described with reference to FIGs. 1 to 5. On the other hand, a mask 1S having a size smaller than that of the mask 1 is illustrated below in FIG. 9. The mask 1S can be provided as a mask for a woman or a child, for example. In FIG. 9, a detailed configuration of the mask is omitted.

[0062] As illustrated in FIG. 9, in the mask 1S, a length w_m of the mask body 10 in the left-and-right direction D2 is smaller than that in the mask 1. In the present embodiment, the length w_m of the mask body 10 in the left-and-right direction D2 is equal to the length of the mask in the left-and-right direction D2. On the other hand, the mask 1 and the mask 1S are the same in the length (height) h of the mask in the vertical direction D1. As described above, when designing a mask of a small size, only the length w_m in the left-and-right direction D2 is often reduced, but depending on the application of the mask, both the vertical direction D1 and the left-and-right direction D2 may be reduced.

[0063] In the case of changing the size of a mask in which the ear hook portions 20a, 20a (the ear hook portion sheet 20) in the form of a single sheet are stacked on the mask body 10 as in the present embodiment, it is necessary to change the length w_e of the ear hook portion 20a in the left-and-right direction D2. As illustrated in FIG. 9, in order to reduce the length w_m of the mask body 10 in the left-and-right direction D2, it is necessary to reduce the length w_e of the ear hook portion 20a in the left-and-right direction D2.

[0064] In the case of reducing the size of the ear hook portion 20a, there may be a problem if the ear hook portion 20a is simply formed into a shape reduced in accordance with the reduction ratio of the mask body 10. For example, if the ear hook portion 20a is simply reduced in accordance with the reduction ratio of the mask body, the width of the ring of the ear hook portion 20a becomes small, which results in insufficient fit of the ear hook portions for the ears. In particular, when only the length of the mask body 10 in the left-and-right direction D2 is reduced, the width of the ring of the ear hook portion 20a is reduced in some places, and the width is not changed in other places, which may cause problems in the robustness of the ear hook portion. Therefore, instead of designing the shape that is reduced in accordance with the reduction ratio, it is necessary to design the shape of the ring of the ear hook portion 20a according to the changed size of the mask (the size of the mask to be obtained).

[0065] As illustrated in FIG. 9, the ring of the ear hook portion 20a may include a fixing portion 22 including an end portion in the left-right direction D2 that is directly or indirectly fixed to the mask body 10, a hook portion 24 that is positioned behind the wearer's ear when being worn, an upper transition portion 23 that transitions from the fixing portion 22 to the hook portion 24 on the upper side of the ring, and a lower transition portion 26 that transitions from the fixing portion 22 to the hook portion 24 on the lower side of the ring. Among these segments of the ring, the upper transition portion 23 and the lower transition portion 26 extending generally in the left-and-right direction D2 are mainly stretched in the left-and-right direction D2 when the ear hook portion 20a is stretched in the left-and-right direction D2 due to pulling by the user while the user puts on the mask. In this specification, a section that is easily stretched by tension (the upper transition portion 23 and the lower transition portion 26) is referred to as a high stretch portion, and a section that is not easily stretched by tension (the fixing portion 22 and the hook portion 24) is referred to as a low stretch portion.

[0066] The size of the mask 1S illustrated in FIG. 9 is changed so that the size of the mask 1S in the left-and-right direction D2 is smaller than that of the mask 1. The mask 1S is obtained by reducing the length w_e of the ear hook portion 20a in the left-and-right direction D2 without substantially changing the width d of the ring of the ear hook portion 20a from the mask 1, with respect to the shape of the ear hook portion 20a of the mask 1. Therefore, a length w_{e1} of the high stretch portion (the upper transition portion 23 and the lower transition portion 26) of the ring of the ear hook portion 20a is greatly reduced as compared with lengths w_{e2}, w_{e2}' of the low stretch portion in the left-and-right direction D2. Specifically, in the mask 1S, the ratio of the length w_{e1} of the high stretch portion to the length w_e of the ear hook portion 20a is smaller as compared with the mask 1. Therefore, the ear hook portion 20a of the small-sized mask 1S becomes less easily stretched than in the mask 1. Therefore, in designing the ear hook portion 20a, it is necessary to study the characteristics of the material of the ear hook portion 20a and the like so as to conform to the size and shape.

[0067] The inventors of the present application have found a relationship between the configuration of the mask 1 or the configuration of the ear hook portion 20a and the stretch characteristics of the ear hook portion 20a, which can provide an excellent fit. According to the

present embodiment, it has been found that when the stretch ratio k (k>1) at the time of manufacturing of the ear hook portion 20a is made to be approximately inversely proportional to the length w_{e1} (length in the state of natural length that is not stretched) of the above-described high stretch portion in the left-and-right direction D2, a mask capable of providing comfort to the user not only while the user is putting on the mask but also when the user wears the mask (while the user is wearing the mask) can be obtained. Specifically, the value obtained by multiplying the stretch ratio k at the time of manufacturing of the ear hook portion 20a by the length w_{e1} (unit mm) of the above-described high stretch portion in the left-and-right direction D2 can be set to 75 to 145. That is, $k \times w_{e1}$ can be set to 75 to 145. The $k \times w_{e1}$ is preferably 88 to 117, more preferably 90 to 115, and more preferably 92 to 113. When the value $k \times w_{e1}$ is 85 or more, the ear hook portion 20a can be easily extended while putting on the mask, and the mask can be worn continuously without any burden on the ears. Furthermore, when the value $k \times w_{e1}$ is 120 or less, a gap is less likely to occur between the mask body 10 and the face, so that a better fit can be obtained. Therefore, according to the sizes of the mask 1 and the ear hook portion 20a, the ear hook portion 20a having appropriate stretch characteristics can be obtained, and the mask that is excellent in fit can be obtained.

[0068] The length w_{e1} of the high stretch portion is a length of a section of the ear hook portion 20a extending mainly in the left-and-right direction D2, but more specifically, it may be the longest length of the opening 29 in the left-and-right direction D2. Thus, the length w_{e1} of the high stretch portion can be easily obtained. However, the longest length of the opening 29 in the left-and-right direction D2 does not include a length that does not contribute to stretch. For example, in a case where: the opening 29 is superposed on the auxiliary material 30; the second coupling portion B2 is formed to the upper side or lower side of the superposed portion; and the ear hook portion 20a is fixed to the auxiliary material 30, then, the length from the edge of the opening 29 in the left-right direction D2 to the inner edge of the second coupling portion B2 in the left-right direction D2 is not included in the length w_{e1} of the high stretch portion.

[0069] Thus, according to the present embodiment, the ear hook portions 20a, 20a having stretch characteristics corresponding to the size of the mask 1 can be manufactured, and a mask having an excellent fit can be provided.

[0070] The length w_m of the mask body 10 in the left-and-right direction D2 may be 120 to 190 mm. The length h of the mask body 10 in the vertical direction D1 may be 60 to 100 mm. The length w_e of the ear hook portion 20a in the left-and-right direction D2 may be 55 to 90 mm, preferably 65 to 85 mm. In particular, according to the present embodiment, even in the case of manufacturing of a mask that is generally referred to as a smallish mask in which the length w_m of the mask body 10 in the left-and-right direction D2 is 165 mm or less and is particularly 160 mm or less, the ear hook portion 20a having optimum stretch characteristics can be obtained. Furthermore, even in the case of manufacturing a mask in which the length w_e of the ear hook portion 20a in the left-and-right direction D2 is about 55 to 75 mm, the ear hook portion 20a having an excellent fit can be easily obtained.

[0071] In the ear hook portion 20a, the value of the ratio (w_{e1}/w_e) of the length w_e of the high stretch portion in the left-right direction D2 to the length w_{e1} of the ear hook portion in the left-right direction D2 is preferably 0.45 to 0.7, and is more preferably 0.5 to 0.65. The present embodiment can provide a particularly excellent fit for a mask in which the ear hook portion is configured such that the value (w_{e1}/w_e) is 0.65 or less, preferably 0.6 or less.

[0072] For example, in a case where the length w_m of the mask body 10 in the left-and-right direction D2 is 155 mm, it is preferable to manufacture the ear hook portion 20a with an stretch ratio of 2.35 to 2.65, although it depends on the configuration (shape) of the ear hook portion 20a.

[0073] Furthermore, in order to improve the stability of the structure of the ear hook portion 20a and the fit, it is preferable that the width d of the ring of the ear hook portion 20a is approximately constant, and in particular, it is preferable that the widths of the upper transition portion 23, the hook portion 24, and the lower transition portion 26 are approximately equal. Even if the width of the ring of the ear hook portion 20a is substantially constant, the ear hook portion 20a having the optimum stretch characteristics can be obtained.

[0074] An aspect of the present invention is a method for manufacturing a mask that includes (a) while a stretchable member is stretched at a predetermined rate in a predetermined direction, superposing a surface material on at least one of surfaces of the stretchable member, intermittently coupling the stretchable member and the surface material to obtain a stacked body, loosening the stacked body in the predetermined direction, and cutting the stacked body to form a plurality of ear hook portion sheets in a single sheet shape including ear hook portions, constituting a pair; (b) superposing a mask body band for forming a mask body on two ear hook portion sheets, spaced apart in the predetermined direction, of the plurality of ear hook portion sheets to bond the two ear hook portion sheets to the mask body band such that the ear hook portions, constituting the pair, are coupled to both end portions of the mask body in a left-and-right direction; and (c) cutting the mask body band to form the mask, wherein each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction. According to this method of manufacturing, the mask that has the ear hook portions having optimum stretch characteristics according to the size and that is excellent in fit can be manu-

factured easily.

[0075] According to this method of manufacturing, a value obtained by multiplying the predetermined rate by a length, in unit of mm, of the high stretch portion in the left-and-right direction is preferably 75 to 145. Specifically, where the predetermined rate is denoted as k, and a length of the high stretch portion in the left-and-right direction is denoted as w_{e1}, in unit of mm, $k \times w_{e1}$ is preferably 75 to 145.

[0076] In the above-described method of manufacturing, after (a) the ear hook portion sheets are formed and before or after (b) the ear hook portion sheets are coupled to the mask body band, the auxiliary material band that is made into the auxiliary material can be coupled to the ear hook portion sheets so as to be superposed on the ear hook portion sheets adjacent to each other. Furthermore, when (c) the mask body band is cut, the mask body band and the auxiliary material band can be cut together.

[Examples]

[0077] Ear hook portions having different stretch ratios were manufactured, and masks using the ear hook portions were manufactured to evaluate fit.

(Example 1)

[0078] A mask having the structure illustrated in FIG. 10 was fabricated. For manufacturing, a mask body having a nonwoven fabric three-layer structure having a length w_m of 155 mm in the left-and-right direction D2 and pleats (FIG. 10) was prepared. An ear hook portion sheet including two ear hook portions having a length w_e of 67.5 mm in the left-and-right direction D2 was superposed on the mask body. The ear hook portion sheet was formed of a material obtained by coupling a spunbond nonwoven fabric (basis weight: 15g/m^2) to both surfaces of a stretchable film (made of polyolefin resin, maximum stretch rate: 4 times) by substantially the same method as the method described with reference to FIGs. 7 and 8. The stretch ratio k of the material of the ear hook portion sheet was 2.7. The length w_{e1} of the high stretch portion in the ear hook portion was 37.6 mm. The value obtained by multiplying the stretch ratio k by the length w_{e1} of the high stretch portion was $2.7 \times 37.6 = 101.52$.

[0079] The auxiliary material was formed of a spunbonded nonwoven fabric (basis weight: 30g/m^2). The ear hook portion and the auxiliary material were coupled by heat sealing, and a coupling portion over a range of 3 to 5 mm was formed in the left-and-right direction D2. Both the mask body and the auxiliary material were coupled by heat sealing, and a coupling portion over a range of 3 to 10 mm was formed in the left-and-right direction D2.

(Example 2)

[0080] A mask having substantially the same shape and size as in Example 1 was manufactured in the same manner as in Example 1 except that an ear hook portion having a stretch ratio k of 2.5 was used. The value obtained by multiplying the stretch ratio k by the length w_{e1} of the high stretch portion was $2.5 \times 37.6 = 94$.

(Example 3)

[0081] A mask having substantially the same shape and size as in Example 1 was manufactured in the same manner as in Example 1 except that an ear hook portion having a stretch ratio k of 2.3 was used. The value obtained by multiplying the stretch ratio k by the length w_{e1} of the high stretch portion was $2.3 \times 37.6 = 86.48$.

[0082] Nine evaluators were asked to evaluate each of the masks according to Examples 1 to 3. The evaluation items include "ease of putting on the mask", "ease of stretching of the ear hook portion", "overall fit", and "fit with the ear", all of which were rated on a five level scale. The results of the evaluations by the nine evaluators were calculated by deriving an arithmetic average for each item. The evaluation criteria were as follows.

1: Bad
2: Poor
3: Fair
4: Good
5: Excellent

[0083] The results are illustrated in FIG. 11. In all of Examples, it was found that relatively good evaluation of 3.5 or higher were obtained with respect to all of the items. In particular, Example 2 was found to have the highest evaluation in the items of "fit" and "fit to ear".

[0084] Hereinafter, specific aspects of the present invention are supplementarily explained below.

(Supplementary Note 1)

[0085] An aspect according to Supplementary Note 1 is a mask that includes: a mask body; and ear hook portions, constituting a pair, coupled to both end portions of the mask body in a left-and-right direction, wherein the ear hook portions, constituting the pair, are formed in a single sheet shape, and in a state before start of use, the ear hook portions, constituting the pair, are disposed to be superposed on the mask body so as not to protrude from the mask body at least in the left-and-right direction, the ear hook portion includes a stretchable member and a surface material coupled to at least one of surfaces of the stretchable member in such a state that the stretchable member is stretched at a predetermined rate with respect to a natural length, and each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction.

[0086] According to the above-described aspect according to the Supplementary Note 1, the ear hook por-

tions, constituting the pair, are formed in a single sheet shape (made of one sheet), and are disposed to be superposed on the mask body without protruding from the mask body at least in the left-and-right direction. Therefore, the main body and the sheet-shaped ear hook portion can be coupled by superposing the main body and the sheet-shaped ear hook portion, and continuous manufacturing can be performed easily.

[0087] Furthermore, in this aspect, the ear hook portion includes the high stretch portion that is easily stretched in the left-and-right direction and the low stretch portion that is not easily stretched in the left-and-right direction. Therefore, it is possible to obtain the ear hook portions which exhibit good stretch characteristics in the left-right direction which is the main direction in which the ear hook portions are stretched not only while the mask being put on but also when the mask is worn (while the mask is worn). Furthermore, in this aspect, the ear hook portions are constituted by coupling the surface material with the stretchable member stretched at a predetermined rate, and therefore, the stretch characteristics of the ear hook portions can be easily adjusted by changing the degree of stretch of the stretchable member when the ear hook portions are manufactured. Thus, the ear hook portions having appropriate stretch characteristics according to the size of the mask and the size of the ear hook portions can be easily obtained, and the mask excellent in fit can be manufactured.

(Supplementary Note 2)

[0088] In an aspect according to the Supplementary Note 2, where the predetermined rate is denoted as k, and a length of the high stretch portion in the left-and-right direction is denoted as w_{e1}, in unit of mm, $k \times w_{e1}$ is 75 to 145.

[0089] According to the above-described aspect according to the Supplementary Note 2, in the manufacturing of the ear hook portions, the value obtained by multiplying the rate (stretch ratio) k, by which the stretchable member is stretched, by the length w_{e1} (unit: mm) in the left-and-right direction of the high stretch portion of the ear hook portion that is easily stretched in the left-and-right direction is set to 75 to 145. Thus, even when the size of the mask is changed or the size of the ear hook portions is changed, the ear hook portions having more appropriate stretch characteristics according to the size can be obtained, and the mask excellent in fit can be manufactured.

(Supplementary Note 3)

[0090] In an aspect according to the Supplementary Note 3, the stretchable member includes a first surface and a second surface on a side opposite to the first surface, and the surface material includes a first surface material coupled to the first surface and a second surface material coupled to the second surface.

[0091] According to the above-described aspect according to the Supplementary Note 3, the ear hook portion in the single sheet shape has a structure in which the stretchable member is sandwiched between the first surface material and the second surface material. Specifically, both of the surfaces of the stretchable member are covered with the surface materials, and the stretchable member is not exposed. Some of stretchable members may cause irritation or discomfort to the skin when they are stretched in direct contact with the skin of the user. Therefore, by appropriately selecting the material of the surface material, contact between the stretchable member and the skin of the wearer can be avoided, and the fit when the ear hook portion comes into contact with the skin of the user can be improved.

(Supplementary Note 4)

[0092] In an aspect according to the Supplementary Note 4, the stretchable member is a stretchable film.

[0093] According to the above-described aspect according to the Supplementary Note 4, the stretchable member is formed in the form of a film, so that the ear hook portions can be more easily manufactured and the shape of the ear hook portions can be easily maintained.

(Supplementary Note 5)

[0094] In an aspect according to the Supplementary Note 5, the first surface material and the second surface material are made of a nonwoven fabric.

[0095] According to the above-described aspect according to the Supplementary Note 5, the first surface material and the second surface material which can directly contact the skin of the user are a nonwoven fabric, it is possible to impart softness to the surfaces of the ear hook portions and to improve the fit of the ear hook portions.

(Supplementary Note 6)

[0096] In an aspect according to the Supplementary Note 6, the ear hook portion is provided on an outer surface of the mask body.

[0097] According to the above-described aspect according to the Supplementary Note 6, at the start of use, the ear hook portions, constituting the pair, formed in the single sheet shape can be separated from each other and opened in the left-and-right direction with little contact with the inner surface of the mask body (the surface facing the face side when putting on the mask). Therefore, the mask having good hygiene can be put on.

(Supplementary Note 7)

[0098] In an aspect according to the Supplementary Note 7, auxiliary materials in a sheet shape are further included, wherein the ear hook portions are coupled to

the mask body via the auxiliary materials.

[0099] According to the above-described aspect according to the Supplementary Note 7, the ear hook portions are coupled to the mask body via the auxiliary materials. Specifically, the mask can be formed without directly coupling the ear hook portions and the mask body. Therefore, the coupling portions between the ear hook portions and the auxiliary materials, and the coupling portions between the mask body and the auxiliary materials can be formed separately in appropriate coupling forms. Thus, a bond which is not easily broken can be formed between the ear hook portions and the mask body without impairing the function and fit of the member, and the robust mask can be obtained. Also, it is possible to avoid using a portion of the ear material for adhesion to the mask body. Therefore, the ear hook portions can be moved more freely with respect to the mask body than in the case where the ear hook portions are directly coupled to the mask body, so that the degree of freedom in the wearing positions of the ear hook portions is increased.

(Supplementary Note 8)

[0100] An aspect according to the Supplementary Note 8 includes (a) while a stretchable member is stretched at a predetermined rate in a predetermined direction, superposing a surface material on at least one of surfaces of the stretchable member, intermittently coupling the stretchable member and the surface material to obtain a stacked body, loosening the stacked body in the predetermined direction, and cutting the stacked body to form a plurality of ear hook portion sheets in a single sheet shape including ear hook portions, constituting a pair; (b) superposing a mask body band for forming a mask body on two ear hook portion sheets, spaced apart in the predetermined direction, of the plurality of ear hook portion sheets to bond the two ear hook portion sheets to the mask body band such that the ear hook portions, constituting the pair, are coupled to both end portions of the mask body in a left-and-right direction; and (c) cutting the mask body band to form the mask, wherein each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction.

[0101] According to the above-described aspect according to the Supplementary Note 8, the method for manufacturing which exhibits substantially the same effects as those described with regard to the above-described aspect of the Supplementary Note 1 can be provided.

(Supplementary Note 9)

[0102] In an aspect according to the Supplementary Note 9, where the predetermined rate is denoted as k, and a length of the high stretch portion in the left-and-right direction is denoted as w_{e1}, in unit of mm, $k \times w_{e1}$ is 75 to 145.

[0103] According to the above-described aspect according to the Supplementary Note 9, the method for manufacturing which exhibits substantially the same effects as those described with regard to the above-described aspect of the Supplementary Note 2 can be provided.

[0104] This application claims the priority to Basic Application No. 2020-130069 filed with the Japan Patent Office on July 31, 2020, the entire contents of which are incorporated herein by reference.

DESCRIPTION OF THE REFERENCE NUMERALS

[0105]

1, 1S	mask
2	first surface material
2A	first surface material band
3	second surface material
3A	second surface material band
5	stretchable film (stretchable member)
5A	stretchable film band (stretchable member band)
6A	multilayer structure
8A	stacked body
10	mask body
10A	mask body band
15	pleats
20	ear hook portion sheet
20a	ear hook portion
20A	ear hook portion sheet band
22	fixing portion
23	upper transition portion
24	hook portion
26	lower transition portion
28	separable coupling portion
29	opening
30	auxiliary material
30A	auxiliary material band
100	manufacturing apparatus of ear hook portions
121	first surface material band supply means
122	second surface material band supply means
123	stretchable film band supply means
140	welding means
160	relaxing means
180	punching means
200	mask member combining apparatus
221	mask body band supply means
240	coupling and cutting unit
300	manufacturing apparatus of masks
B1	first coupling portion
B2	second coupling portion
D1	height direction of mask
D2	left-and-right direction of mask
Dt	conveying direction

Claims

1. A mask comprising:

   a mask body; and
   ear hook portions, constituting a pair, coupled to both end portions of the mask body in a left-and-right direction,
   wherein the ear hook portions, constituting the pair, are formed in a single sheet shape, and in a state before start of use, the ear hook portions, constituting the pair, are disposed to be superposed on the mask body so as not to protrude from the mask body at least in the left-and-right direction,
   the ear hook portion includes a stretchable member and a surface material coupled to at least one of surfaces of the stretchable member in such a state that the stretchable member is stretched at a predetermined rate with respect to a natural length, and
   each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction.

2. The mask according to claim 1, wherein where the predetermined rate is denoted as k, and a length of the high stretch portion in the left-and-right direction is denoted as w_{e1}, in units of mm, $k \times w_{e1}$ is 75 to 145.

3. The mask according to claim 1 or 2, wherein the stretchable member includes a first surface and a second surface on a side opposite to the first surface, and
   the surface material includes a first surface material coupled to the first surface and a second surface material coupled to the second surface.

4. The mask according to claim 3, wherein the stretchable member is a stretchable film.

5. The mask according to claim 3 or 4, wherein the first surface material and the second surface material are made of a nonwoven fabric.

6. The mask according to any one of claims 1 to 5, wherein the ear hook portion is provided on an outer surface of the mask body.

7. The mask according to any one of claims 1 to 6, further comprising:

   auxiliary materials in a sheet shape,
   wherein the ear hook portions are coupled to the mask body via the auxiliary materials.

8. A method for manufacturing a mask, comprising:

   (a) while a stretchable member is stretched at a predetermined rate in a predetermined direction, superposing a surface material on at least one of surfaces of the stretchable member,

      intermittently coupling the stretchable member and the surface material to obtain a stacked body,
      loosening the stacked body in the predetermined direction, and
      cutting the stacked body to form a plurality of ear hook portion sheets in a single sheet shape including ear hook portions, constituting a pair;

   (b) superposing a mask body band for forming a mask body on two ear hook portion sheets, spaced apart in the predetermined direction, of the plurality of ear hook portion sheets to bond the two ear hook portion sheets to the mask body band such that the ear hook portions, constituting the pair, are coupled to both end portions of the mask body in a left-and-right direction; and
   (c) cutting the mask body band to form the mask,
   wherein each of the ear hook portions includes a high stretch portion that is easily stretched in the left-and-right direction and a low stretch portion that is not easily stretched in the left-and-right direction.

9. The method for manufacturing the mask according to claim 8, wherein where the predetermined rate is denoted as k, and a length of the high stretch portion in the left-and-right direction is denoted as w_{e1}, in units of mm, $k \times w_{e1}$ is 75 to 145.

FIG.1

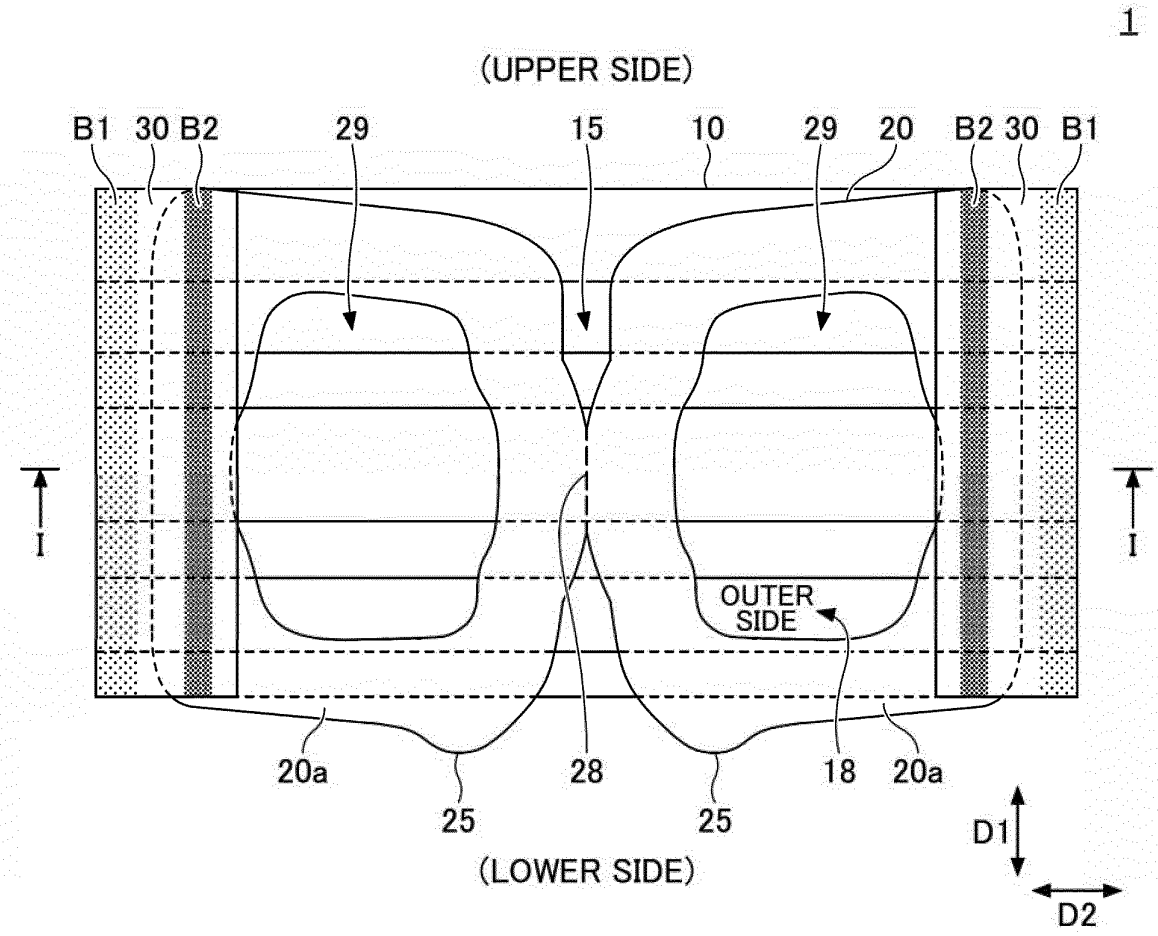

1
(UPPER SIDE)
B1
30
B2
29
15
10
29
20
B2
30
B1
I
I
OUTER SIDE
20a
25
28
25
18
20a
(LOWER SIDE)
D1
D2

FIG.2

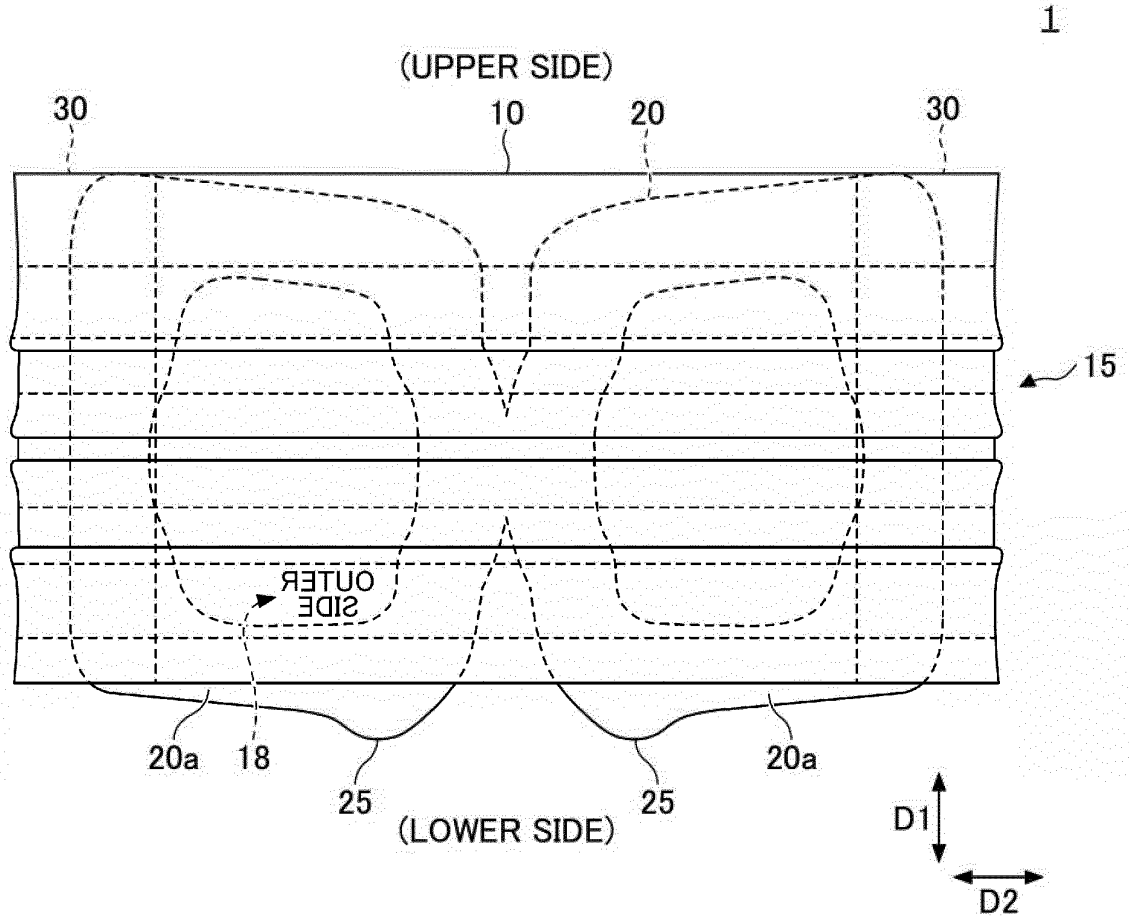
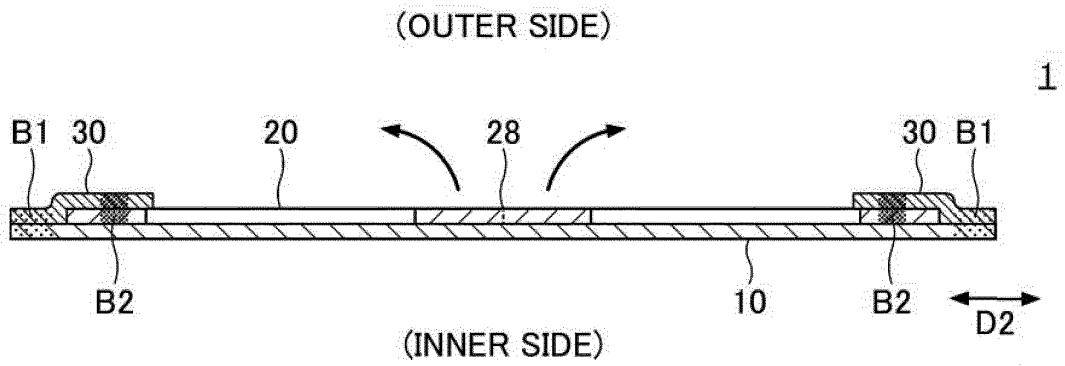

1
(UPPER SIDE)
30
10
20
30
15
OUTER SIDE
20a
18
25
25
20a
(LOWER SIDE)
D1
D2

FIG.3


(OUTER SIDE)
1
B1
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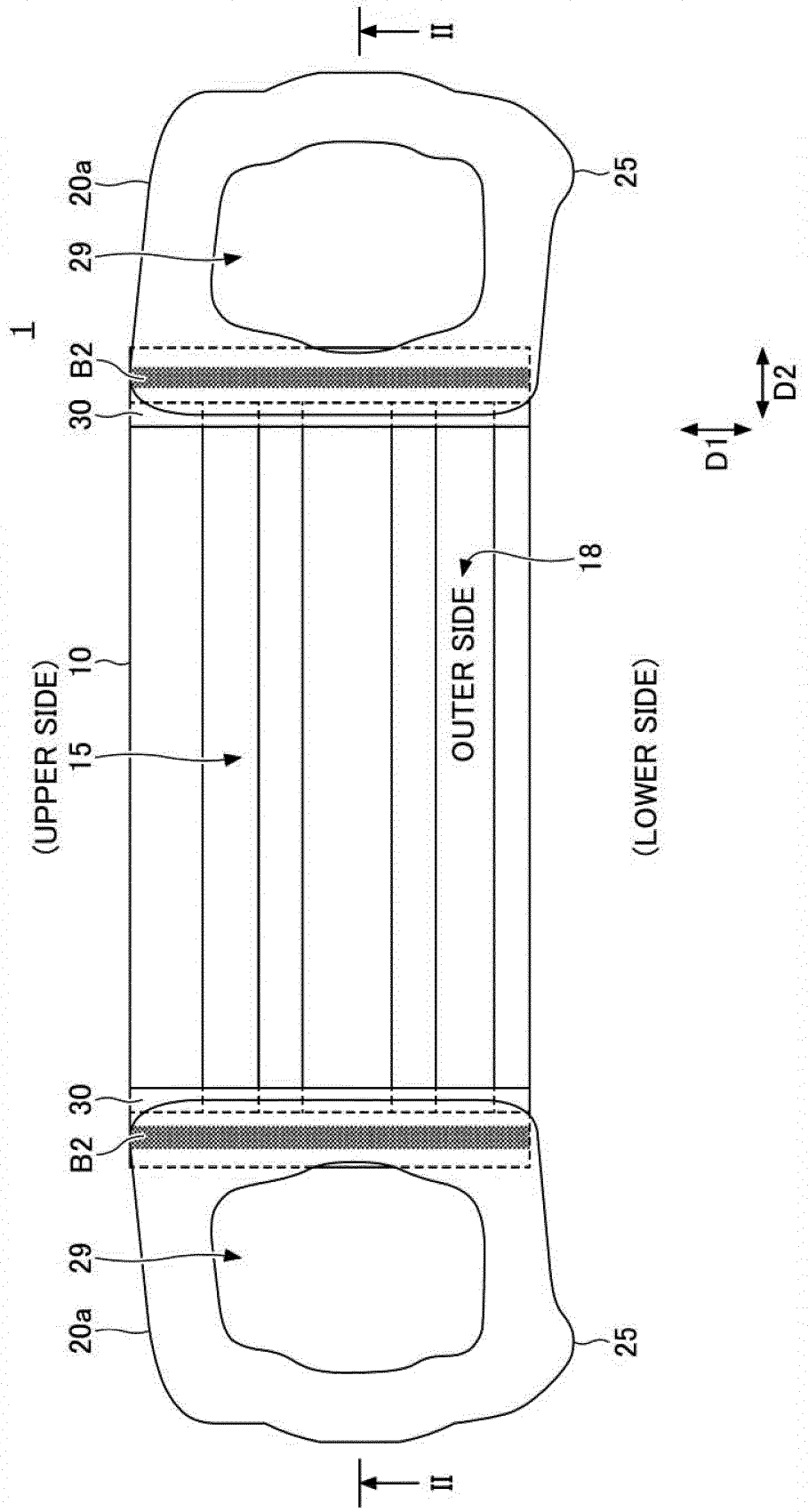
20
28
30
B1
B2
10
B2
D2
(INNER SIDE)

FIG.4


II
20a
29
1
B2
30
25
D2
D1
18
OUTER SIDE
(UPPER SIDE)
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15
(LOWER SIDE)
30
B2
29
20a
25
II

FIG.5

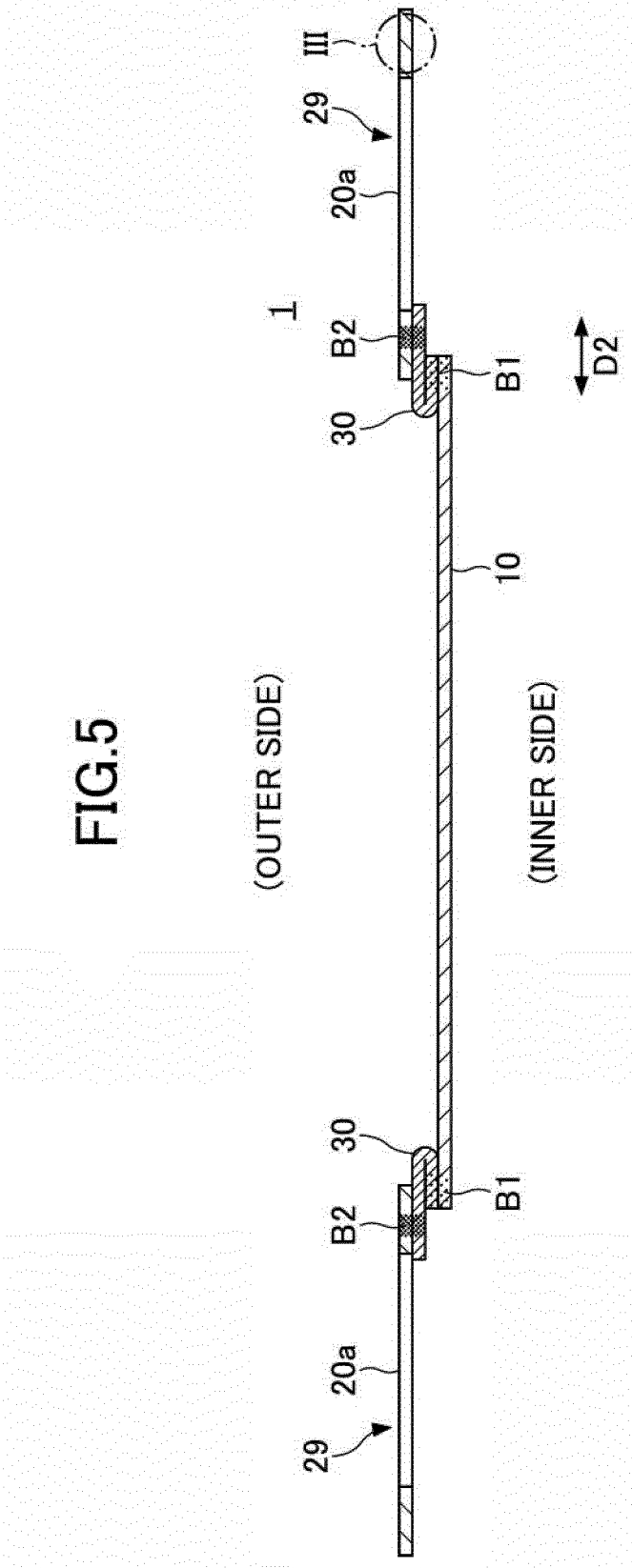


FIG.6

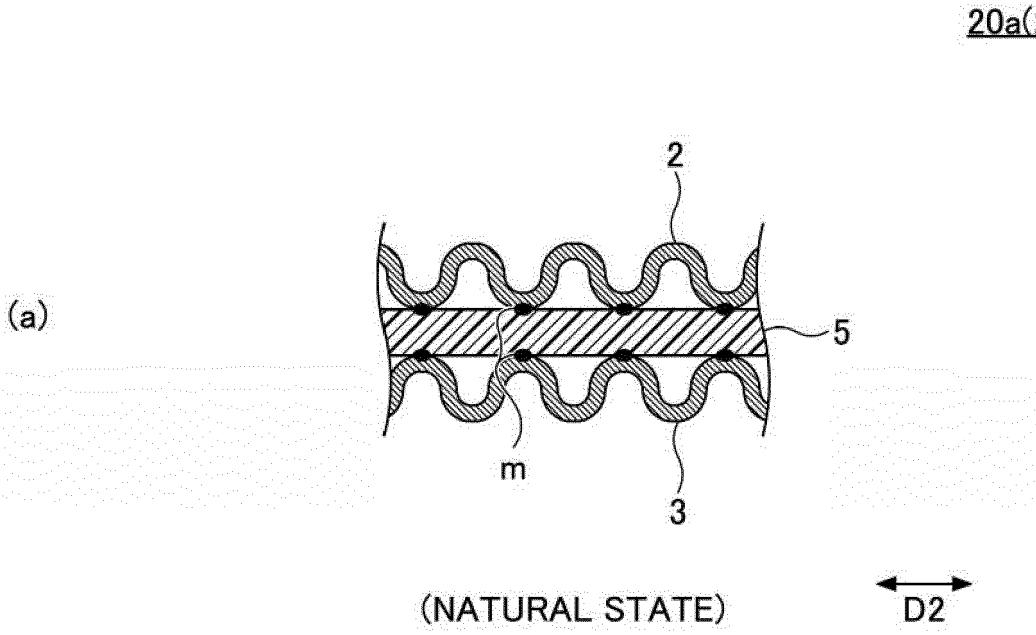

20a(20)
(a)
2
5
m
3
(NATURAL STATE)
D2
20a(20)
(b)
T
T
2
5
m
3
(STRETCHED STATE)
D2

FIG.7

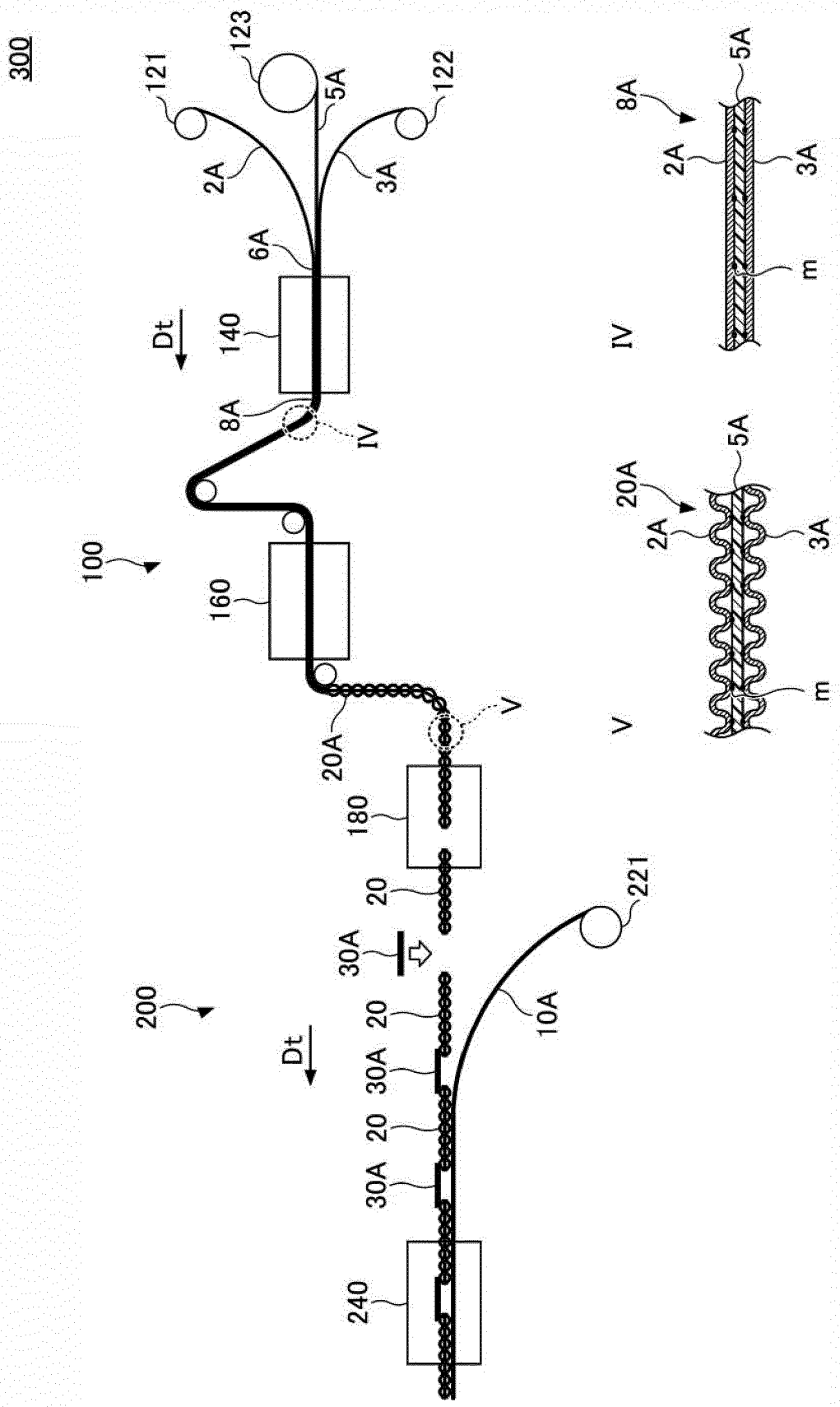

300
121
123
122
5A
2A
3A
6A
Dt
140
8A
IV
100
160
20A
V
180
20
30A
200
Dt
20
30A
20
30A
240
221
10A
8A
5A
2A
3A
m
IV
20A
5A
2A
3A
m
V

FIG.8

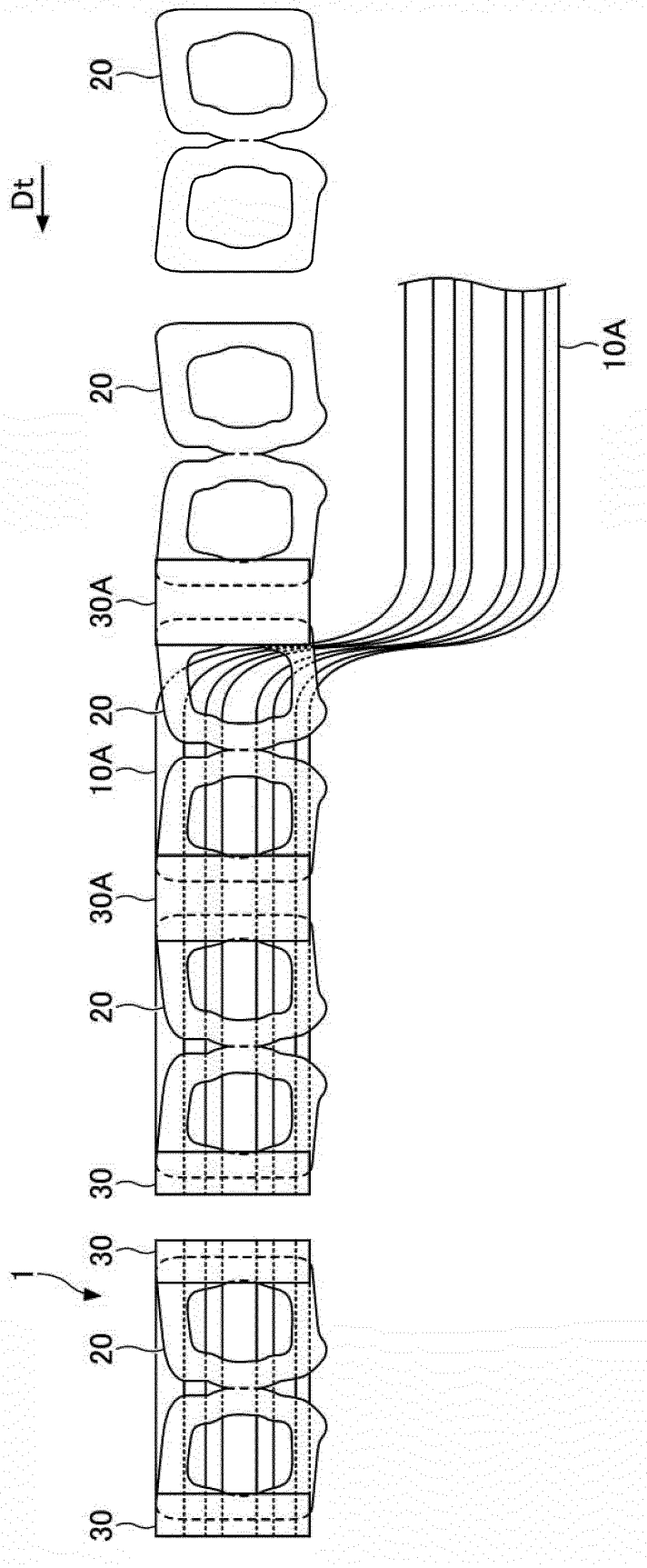
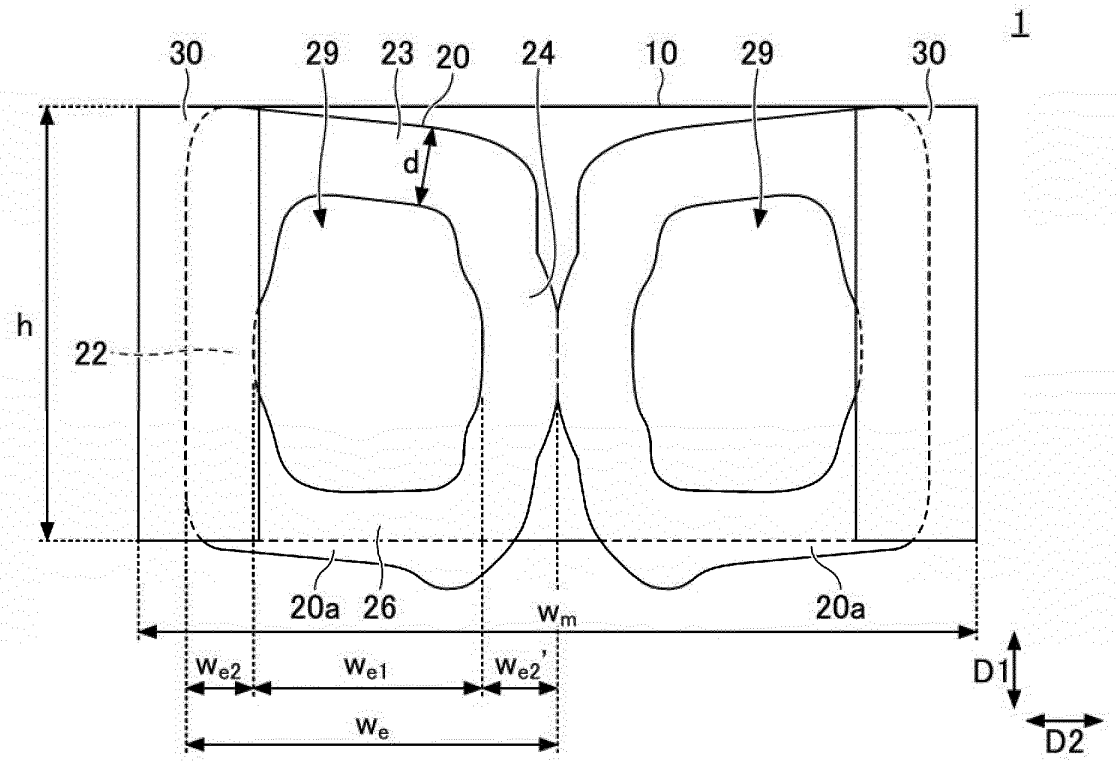
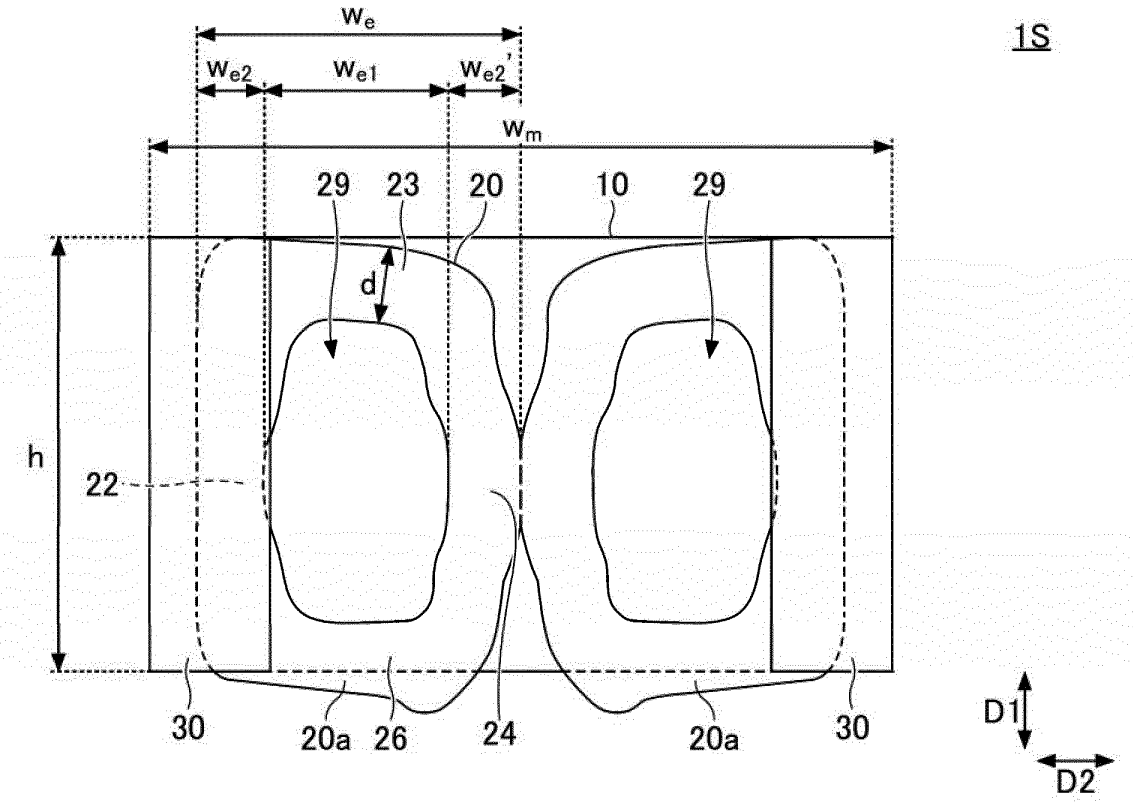


FIG.9


1
30
29
23
20
24
10
29
30
d
h
22
20a
26
w_m
20a
w_{e2}
w_{e1}
w_{e2}'
w_e
D1
D2


1S
w_e
w_{e2}
w_{e1}
w_{e2}'
w_m
29
23
20
10
29
d
h
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20a
26
24
20a
30
D1
D2

FIG.10

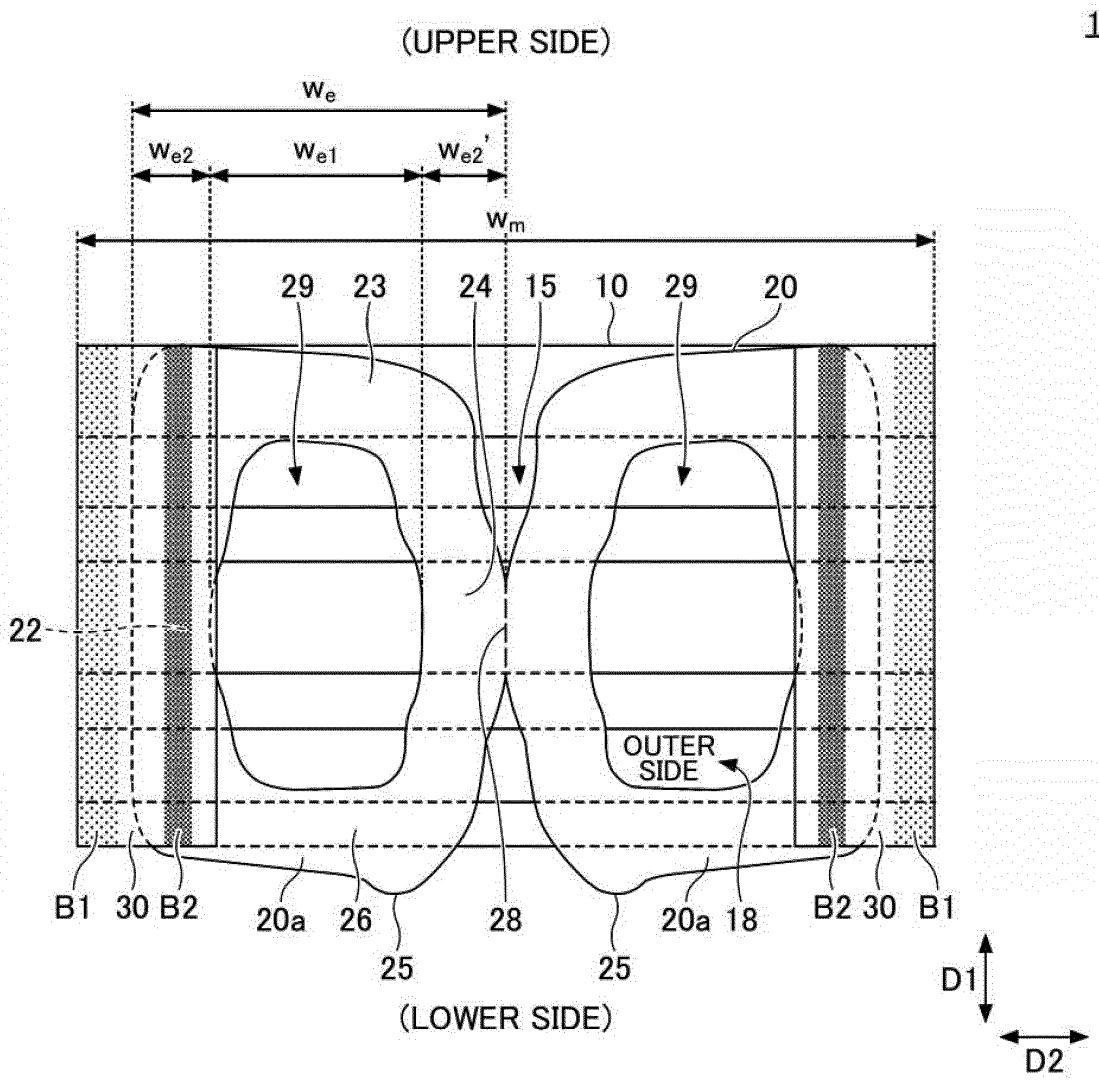
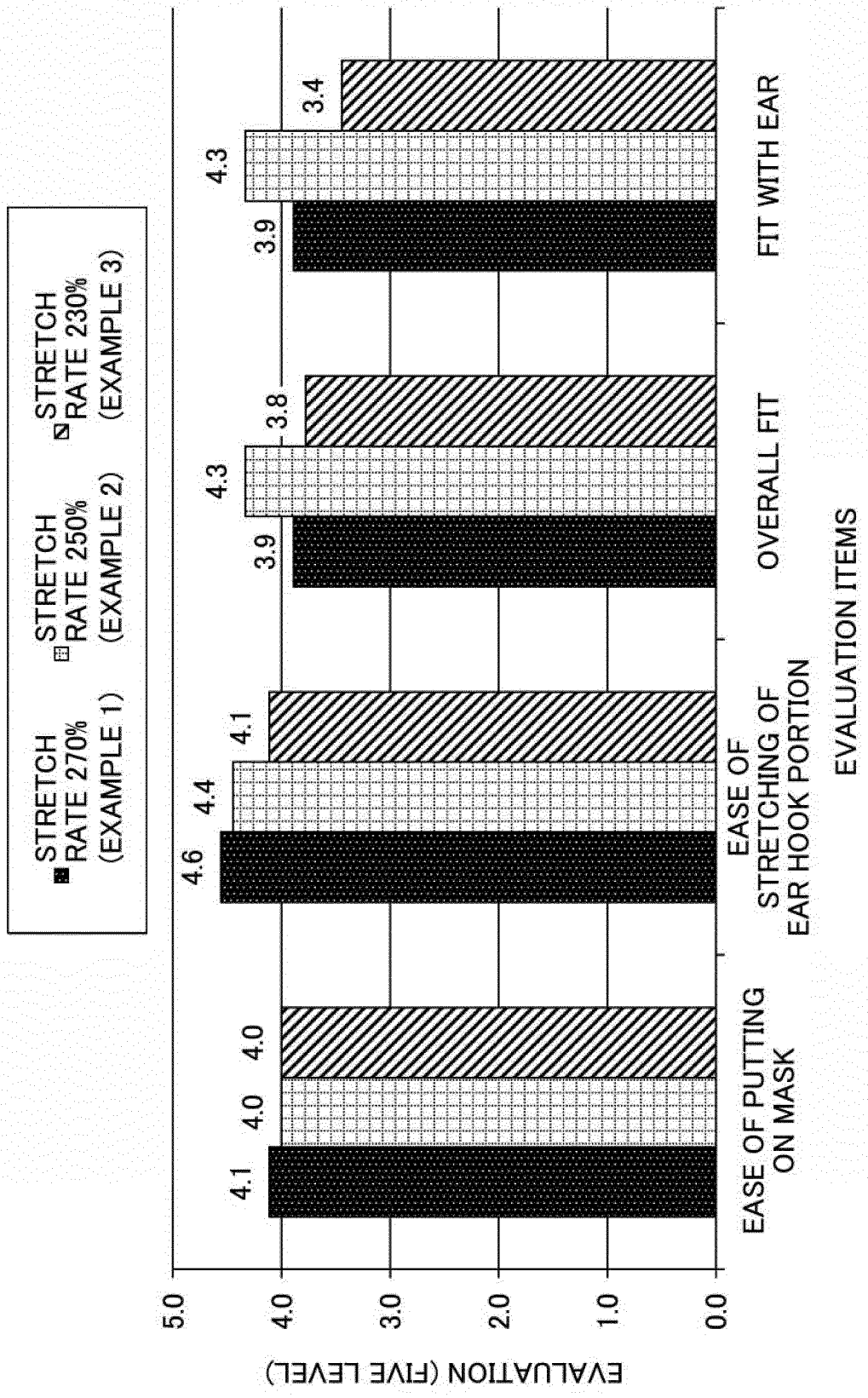

1S
(UPPER SIDE)
We
We2
We1
We2'
Wm
29
23
24
15
10
29
20
22
OUTER SIDE
B1
30
B2
20a
26
25
28
25
20a
18
B2
30
B1
(LOWER SIDE)
D1
D2

FIG.11


STRETCH RATE 270% (EXAMPLE 1)
STRETCH RATE 250% (EXAMPLE 2)
STRETCH RATE 230% (EXAMPLE 3)
EVALUATION (FIVE LEVEL)
5.0
4.0
3.0
2.0
1.0
0.0
4.1
4.0
4.0
4.6
4.4
4.1
4.3
3.9
3.8
4.3
3.9
3.4
EASE OF PUTTING ON MASK
EASE OF STRETCHING OF EAR HOOK PORTION
OVERALL FIT
FIT WITH EAR
EVALUATION ITEMS

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/024757

A. CLASSIFICATION OF SUBJECT MATTER
A41D 13/11(2006.01)i
FI: A41D13/11 H
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)
A41D13/11

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2021
Registered utility model specifications of Japan	1996-2021
Published registered utility model applications of Japan	1994-2021

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	JP 2012-217650 A (UNI-CHARM CORP.) 12 November 2012 (2012-11-12) paragraphs [0014]-[0020], fig. 1-2	1-9
Y	JP 2007-21029 A (DAIO PAPER CORP.) 01 February 2007 (2007-02-01) paragraphs [0031]-[0044]	1-9
Y	JP 3159977 U (MEILYJAPAN CO., LTD.) 10 June 2010 (2010-06-10) paragraphs [0008]-[0016], fig. 1-8	6-7
Y	JP 3128583 U (EBUNO CO., LTD.) 18 January 2007 (2007-01-18) paragraph [0050], fig. 6	6-7
Y	JP 3213582 U (TAIWAN COMFORT CHAMP MANUFACTURING CO., LTD.) 16 November 2017 (2017-11-16) paragraphs [0008]-[0015], fig. 1-5	8-9

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 September 2021 (02.09.2021)	21 September 2021 (21.09.2021)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/024757

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2012-217650 A	12 Nov. 2012	WO 2012/137943 A1 CN 103533989 A KR 10-2014-0034170 A	
JP 2007-21029 A	01 Feb. 2007	(Family: none)	
JP 3159977 U	10 Jun. 2010	(Family: none)	
JP 3128583 U	18 Jan. 2007	(Family: none)	
JP 3213582 U	16 Nov. 2017	KR 20-0488303 Y1	

Form PCT/ISA/210 (patent family annex) (January 2015)

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Patent documents cited in the description

- JP 5762802 B **[0005]**