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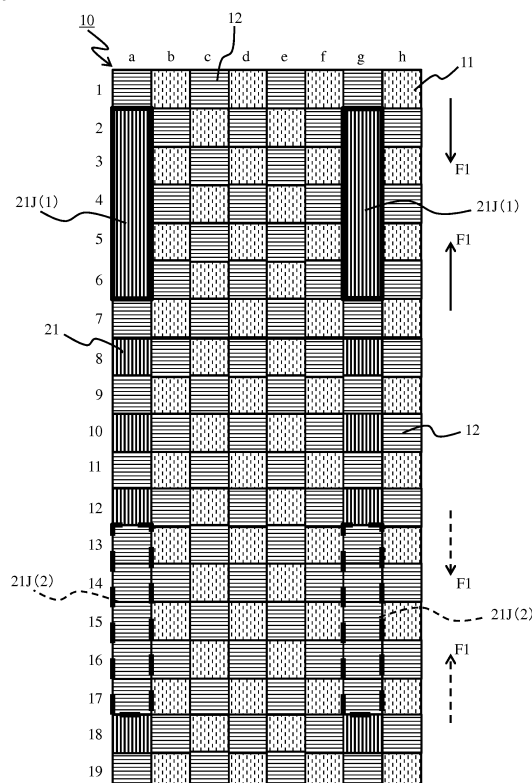
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(54) **WOVEN FABRIC AND METHOD FOR MANUFACTURING WOVEN FABRIC**

(57) A woven fabric is provided, which is configured to be able to form embellishments such as pleats.

A woven fabric 10 has a plurality of strands of warp yarn 11 and a plurality of strands of weft yarn 12 interlaced with the plurality of strands of warp yarn, wherein some of the plurality of strands of warp yarn are strands of shrinkable warp yarn 21 that shrink in a lengthwise direction thereof more than the other strands of warp yarn when subjected to a specific process, the strands of shrinkable warp yarn 21 have, at least in one section in the lengthwise direction, a first leap portion 21J leaping over a first predetermined number of adjacent strands of weft yarn 12, and
a plurality of the first leap portions 21J are positioned in a first predetermined pattern. Strands of shrinkable weft yarn 22 that shrink in a lengthwise direction thereof more than the other strands of weft yarn when subjected to the specific process can be used in some of the plurality of strands of weft yarn 12.

【Fig. 2】



Description

[Technical Field]

[0001] This invention relates to a woven fabric and a method for manufacturing the same.

[Background Art]

[0002] Some garments such as skirts, dresses, gowns, jackets, and pants have pleats and other types of embellishments. There is known a method for interweaving a yarn suitable for easy formation of a pleat and a yarn not suitable for easy formation of a pleat into a fabric and then creating a pleat using this woven fabric (PTL 1, PTL 2).

[Citation List]

[Patent Literature]

[0003]

[PTL 1]

Japanese Patent Application Publication No. 2008-7879

[PTL 2]

Japanese Patent Application Publication No. 2004-339671

[Summary of Invention]

[Technical Problem]

[0004] According to the conventional technique described in PTL 1, the entire garment includes the pleated area with a high percentage of thermoplastic fiber and the non-pleated area with a low percentage of thermoplastic fiber. PTL 1, therefore, can make the seam between the pleated area and the non-pleated area less noticeable.

[0005] According to the conventional technique described in PTL 2, either warp yarn or weft yarn is taken as appropriate for forming a pleat while the other is taken as inappropriate for forming a pleat, and a woven fabric is produced using these yarn. This woven fabric is folded along a predetermined fold line into a pleat, which is then selected. This process can accentuate the borderline between the pleated area and the non-pleated area.

[0006] Both of these conventional techniques mix the yarn suitable for easy formation of a pleat and the yarn not suitable for easy formation of a pleat. In either technique, a predetermined section of the woven fabric is thermally or mechanically treated in order to forcibly create a fold line at a second stage. Therefore, the created pleats are likely to wear out or disappear after repeated wear or after getting wet in the rain or washed. This is because the conventional woven fabrics are merely man-

ufactured in a way that embellishments such as pleats can easily be formed afterwards, and do not have the structure for forming embellishments themselves.

[0007] The present invention was contrived in view of the foregoing problems, and an object thereof is to provide a woven fabric and a method for manufacturing the same, which are configured to be able to form embellishments such as pleats.

[Solution to Problem]

[0008] A woven fabric according to one aspect of the present invention has: a plurality of strands of warp yarn; and a plurality of strands of weft yarn interlaced with the plurality of strands of warp yarn, wherein some of the plurality of strands of warp yarn are strands of shrinkable warp yarn that shrink in a lengthwise direction thereof more than the other strands of warp yarn when subjected to a specific process, the strands of shrinkable warp yarn have, at least in one section in the lengthwise direction, a first leap portion where a first predetermined number of adjacent strands of weft yarn are leaped over, and a plurality of the first leap portions are positioned in a first predetermined pattern.

[0009] In a preferred embodiment, some of the plurality of strands of weft yarn are strands of shrinkable weft yarn that shrink in a lengthwise direction thereof more than the other strands of weft yarn when subjected to the specific process, the strands of shrinkable weft yarn have, at least in one section in the lengthwise direction, a second leap portion where a second predetermined number of adjacent strands of warp yarn are leaped over, and a plurality of the second leap portions are positioned in a second predetermined pattern.

[0010] The woven fabric according to a preferred embodiment further has a base weave that is obtained by interlacing the other strands of warp yarn and the other strands of weft yarn, wherein the first predetermined number is set to be greater than the number of the other strands of weft yarn leaped over by the other strands of warp yarn in the base weave.

[0011] In a preferred embodiment, the second predetermined number is set to be greater than the number of the other strands of warp yarn leaped over by the other strands of weft yarn in the base weave.

[0012] In a preferred embodiment, the first leap portion is either a front-side first leap portion passing across the front side of the woven fabric or a rear-side first leap portion passing across the rear side of the woven fabric, the second leap portion is either a front-side second leap portion passing across the front side of the woven fabric or a rear-side second leap portion passing across the rear side of the woven fabric, the front-side first leap portion is positioned in a predetermined front-side first pattern included in the first predetermined pattern, the rear-side first leap portion is positioned in a predetermined rear-side first pattern included in the first predetermined pattern, the front-side second leap portion is positioned

in a predetermined front-side second pattern included in the second predetermined pattern, and the rear-side second leap portion is positioned in a predetermined rear-side second pattern included in the second predetermined pattern.

[0013] In a preferred embodiment, the predetermined front-side first pattern and the predetermined rear-side first pattern are set in such a manner that the front-side first leap portion and the rear-side first leap portion are close to each other, and the predetermined front-side second pattern and the predetermined rear-side second pattern are set in such a manner that the front-side second leap portion and the rear-side second leap portion are close to each other.

[0014] In a preferred embodiment, the strands of shrinkable warp yarn are positioned between a plurality of the other strands of warp yarn in a third predetermined pattern, and the strands of shrinkable weft yarn are positioned between a plurality of the other strands of weft yarn in a fourth predetermined pattern.

[0015] In a preferred embodiment, the strands of shrinkable warp yarn form a constant first shrunk portion by shrinking in the lengthwise direction thereof more than the other strands of warp yarn when subjected to the specific process, and the strands of shrinkable weft yarn form a constant second shrunk portion by shrinking in the lengthwise direction thereof more than the other strands of weft yarn when subjected to the specific process.

[0016] In a preferred embodiment, a first fold line portion is formed along a weft direction by arranging a plurality of the first shrunk portions in a continuous manner, a second fold line portion is formed along a warp direction by arranging a plurality of the second shrunk portions in a continuous manner, and a third fold line portion is formed along an oblique direction between the weft direction and the warp direction by arranging the plurality of first shrunk portions and the plurality of second shrunk portions in a predetermined direction.

[0017] In a preferred embodiment, the first shrunk portions and the second shrunk portions are stretchable in response to external force.

[0018] A method for manufacturing a weave fabric according to another aspect of the present invention has the steps of: positioning, between a plurality of strands of warp yarn and in a first predetermined pattern, shrinkable warp yarn that shrinks more than the other strands of warp yarn when subjected to a specific process, in such a manner as to form at least one first leap portion where a first predetermined number of adjacent strands of weft yarn are leaped over; and positioning, between a plurality of strands of weft yarn and in a second predetermined pattern, shrinkable weft yarn that shrinks more than the other strands of weft yarn when subjected to the specific process, in such a manner as to form at least one second leap portion where a second predetermined number of adjacent strands of warp yarn are leaped over.

[0019] A woven fabric according to yet another aspect

of the present invention has: a first structure woven with a plurality of strands of warp yarn and a plurality of strands of weft yarn interlaced with the plurality of strands of warp yarn; and a second structure formed of a plurality of strands of shrinkable warp yarn and a plurality of strands of shrinkable weft yarn and stacked by being weaved into the first structure, wherein the strands of shrinkable warp yarn have a first leap portion where a first predetermined number of adjacent strands of the weft yarn are leaped over, the first leap portion being positioned in a first pattern, the strands of shrinkable weft yarn have a second leap portion where a second predetermined number of adjacent strands of the warp yarn are leaped over, the second leap portion being positioned in a second pattern, **[0020]** the strands of shrinkable warp yarn form a first shrunk portion against resilience of the first structure by shrinking in a lengthwise direction thereof more than the warp yarn when subjected to a specific process, and the strands of shrinkable weft yarn form a second shrunk portion against the resilience of the first structure by shrinking in a lengthwise direction thereof more than the weft yarn when subjected to the specific process.

[0021] In a preferred embodiment, the strands of shrinkable warp yarn are positioned between the plurality of strands of warp yarn in a third predetermined pattern, and the strands of shrinkable weft yarn are positioned between the plurality of strands of weft yarn in a fourth predetermined pattern.

[0022] In a preferred embodiment, the first leap portion and the second leap portion are formed so as to be located on the front side and/or the rear side of the first structure.

[Advantageous Effects of Invention]

[0023] According to the present invention, when a specific process is performed on the woven fabric, the shrinkable warp yarn shrinks significantly, in which the side with the first leap portion forms a valley, while the other side of the first leap portion protrudes to form a mountain. As a result, an embellishment is formed in the woven fabric. In addition, by positioning the shrinkable weft yarn that has the second leap portion in at least one section thereof, more embellishments can be formed in the woven fabric. Because embellishments are incorporated in the woven fabric, embellishments that are resistant to wearing and washing can be formed.

[Brief Description of Drawings]

[0024]

[Fig. 1]

Fig. 1 is a front view of a garment with embellishments such as pleats and linear patterns.

[Fig. 2]

Fig. 2 shows an example of a weave diagram of a woven fabric.

[Fig. 3]

Fig. 3 is an explanatory diagram showing schematic structures and the like of normal warp yarn, normal weft yarn, shrinkable warp yarn, and shrinkable weft yarn.

[Fig. 4]

Fig. 4 is a cross-sectional diagram showing how shrinkage of the shrinkable yarn forms a mountain and a valley as physical embellishments in the woven fabric.

[Fig. 5]

Fig. 5 is a cross-sectional diagram showing how the mountains and valleys are formed on the front and rear sides of the woven fabric.

[Fig. 6]

Fig. 6 is an explanatory diagram showing the relationship among formation patterns A to C of the embellishments to be formed in the woven fabric, information on which one of the warp yarn or the weft yarn to use to form the leap portions, and the shapes of the embellishments obtained with the leap portions.

[Fig. 7]

Fig. 7 is an explanatory diagram showing the relationship between the shapes of the embellishments and a method for positioning the shrinkable yarn for realizing the shapes.

[Fig. 8]

Fig. 8 is a weave diagram of an area A where an oblique embellishment is formed.

[Fig. 9]

Fig. 9 is a weave diagram of an area B where a vertical embellishment is formed.

[Fig. 10]

Fig. 10 is a weave diagram of an area C where a horizontal embellishment is formed.

[Fig. 11]

Fig. 11 is an explanatory diagram showing a schematic configuration of a weaving machine.

[Fig. 12]

Fig. 12 is a flowchart showing the method for manufacturing the woven fabric.

[Fig. 13]

Fig. 13 is an explanatory diagram showing the relationship between the shapes of embellishments and the formation patterns for realizing the shapes, according to a second example.

[Fig. 14]

Fig. 14 is an explanatory diagram showing an example of making the embellishment formation patterns finer, according to a third example.

[Description of Embodiments]

[0025] Embodiments of the present invention are described hereinafter with reference to the accompanying drawings. However, these embodiments are merely exemplary of the present invention, and it should be noted

that these embodiments are not intended to limit the technical scope of the present invention.

[0026] As will be described hereinafter in detail, these embodiments use shrinkable warp yarn that shrinks in a lengthwise direction more significantly than the other warp yarn when subjected to a specific process, and shrinkable weft yarn that shrinks in the lengthwise direction more significantly than the other weft yarn when subjected to a specific process. The shrinkable warp yarn and shrinkable weft yarn each leap over a predetermined number strands of yarn in a different direction, at one or more sections in the lengthwise direction. These leap portions may be provided on the front side or the rear side of the woven fabric. A plurality of the leap portions can be provided on the front side and the rear side. Subjecting the woven fabric to heat or other specific processes results in shrinkage of the shrinkable warp yarn, the shrinkable weft yarn and hence the leap portions, forming shrunk portions. Making the shrunk portions continuous can create linear embellishments such as straight lines and curved lines. The shrunk portions keep the shapes thereof constant. By "constant," it means that the shrunk portions do not disappear by normal wear or washing and therefore can always be recognized by a user. Although the shrunk portions can keep the shape thereof constant against the resilience of a base weave, the shrunk portions can shrink when applied with a certain level of external force.

[Example 1]

[0027] A first example is now described with reference to Figs. 1 to 12. Fig. 1 is a front view of a garment 1 made of a woven fabric according to the present embodiment. The garment 1 is one application example of a woven fabric 10 (see Fig. 2 and the like) according to the present embodiment, such as a dress, a skirt, a jacket, a pair of pants, a shirt, an apron, a glove, a sock, and the like. The woven fabric 10 according to the present embodiment can be applied to materials other than the garment 1, such as bags, wrapping cloths, tablecloths, handkerchiefs, various covers, ties, ribbons, wallets, card holders, cushions, and umbrellas.

[0028] The garment 1 is produced by joining, for example, a front piece 2, a back piece 3, and sleeves 4. The front piece 2, the back piece 3, and the sleeves 4 may be formed separately and then stitched together. Alternatively, as is known as a seamless manufacturing process, the front piece 2, the back piece 3, and the sleeves 4 may be woven at the same time while having these pieces connected to one another, and at the end the parts that let the human body parts pass through out of the connected parts may be cut out.

[0029] The garment 1 has a plurality of embellishment elements 5A to 5F. Similarly to embroidered patterns or paint, these embellishment elements 5A to 5F are not provided to the garment 1 afterwards, but these are physical embellishments that are provided in the woven fabric

10 from the beginning, the material for the garment 1. In the present embodiment, examples of such physical embellishments that are prepared in the woven fabric 10 from the beginning include linear patterns and pleats. The embellishment elements 5A to 5F are generically referred to as "embellishment elements 5," hereinafter, if they are not to be discriminated from one another. The embellishment elements 5 are linear patterns, pleats and the like. The linear patterns here do not mean planar patterns such as base patterns, but are three-dimensional linear patterns that are obtained by changing the shape of a part of a weave into a three-dimensional concave or convex shape. The shapes and locations of the embellishment elements 5 displayed in the garment 1 are merely exemplary; thus, the scope of the present invention is not limited to the configuration shown in Fig. 1.

[0030] The embellishment element 5A extending horizontally is formed in each shoulder portion of the garment 1. The wavelike embellishment element 5B is formed in the section from the chest to the waistline of the garment 1. The grid-like embellishment element 5C is formed in the section from the waist down of the garment 1. The arc-shaped embellishment element 5D is formed in the hem of the garment 1. The circular embellishment element 5E and the linear embellishment element 5F are formed in each sleeve of the garment 1.

[0031] Fig. 2 shows an example of the weaves of the woven fabric 10, the material for the garment 1. Fig. 2 shows an example of incorporating a stretchy texture only in the vertical direction of the woven fabric 10. An example of incorporating the stretchy texture in the horizontal direction of the woven fabric 10 is described hereinafter with reference to Figs. 8 and 9.

[0032] First of all, yarns used in the woven fabric 10 are described with reference to Fig. 3. A base weave, an example of the "first structure," is formed by interlacing normal warp yarn 11 and normal weft yarn 12 by a predetermined rule. Examples of the base weave include a variety of weaves such as a plain weave and a twill weave. The normal warp yarn 11 and the normal weft yarn 12 are made of, for example, polyester. The normal warp yarn 11 is an example of the "other strands of warp yarn" or "strands of warp yarn," and the normal weft yarn 12 is an example of the "other strands of weft yarn" or "strands of weft yarn." Note that the material for the normal yarns is not limited to polyester. Yarns made of other materials may be used as well.

[0033] The stretchy texture, an example of the "second structure," is stacked on the base weave. The stretchy texture is a weave that is formed from a yarn that shrinks when subjected to a specific process. Therefore, the stretchy texture is formed from a shrinkable warp yarn 21 and/or a shrinkable weft yarn 22. The direction in which the stretchy texture shrinks and the method for forming the stretchy texture are described hereinafter with reference to Fig. 6.

[0034] The shrinkable warp yarn 21 is configured with, for example, a core 211 and a covering yarn 212 wrapped

around the outer circumference of the core 211. Similarly, the shrinkable weft yarn 22 is configured with, for example, a core 221 and a covering yarn 222 wrapped around the outer circumference of the core 221. A material that shrinks significantly in the lengthwise direction when heated at a predetermined temperature, such as polyurethane, is used for the cores 211, 221. A material similar to that of the normal yarns, such as polyester, is used for the covering yarns 212, 222. The same material can be used for the covering yarns 212, 222 and for the yarns 11, 12 used in the base weave, to eliminate the sense of disharmony, resulting in a natural base pattern.

[0035] In the present embodiment, however, the material for the normal yarns 11, 12 and the material for the shrinkable yarns 21, 22 do not have to be the same and may be different from each other. In addition, the material for the normal warp yarn 11 and normal weft yarn 12 may be changed, and the material for the core 211 of the shrinkable warp yarn 21 and the core 221 of the shrinkable weft yarn 22 may be changed. The material for the covering yarn 212 of the shrinkable warp yarn 21 and the covering yarn 222 of the shrinkable weft yarn 22 may be changed as well. Moreover, the thicknesses and colors of the yarns 11, 12, 21, 22 can be changed.

[0036] The shrinkable yarns 21, 22 may be made of a plurality of different materials or a single material, as described above. The shrinkable yarns 21, 22 may have the property of shrinking more significantly than a yarn configuring the base weave, when subjected to the "specific process," such as a heat treatment. Conversely, the shrinkable yarns 21, 22 do not shrink before subjected to the specific process. Such property enables stable and accurate weaving of the woven fabric 10 using both the normal yarns 11, 12 and the shrinkable yarns 21, 22. Note that the materials, the thicknesses, the configuration of the base weave, and the like can be determined accordingly.

[0037] Returning to Fig. 2, the base weave of the woven fabric 10 shown in Fig. 2 is a plain weave in which the normal warp yarn 11 and the normal weft yarn 12 are aligned. Some of a plurality of strands of warp yarn configuring the plain weave are strands of the shrinkable warp yarn 21. In the example shown in Fig. 2, the shrinkable warp yarn 21 is used in place of the normal warp yarn 11 at six-strand intervals. Thus, the stretchy texture formed from the shrinkable warp yarn 21 is stacked by being woven into the base texture.

[0038] The shrinkable warp yarn 21 leaps over a predetermined number of strands of weft yarn 12 at predetermined positions in accordance with a first pattern defined based on the design of the garment 1. Leaping over the other intersecting yarn is also called "to slide a yarn." In Fig. 2, the parts where the shrinkable warp yarn 21 leaps over the weft yarns 12 are leap portions 21J described as "first leap portions."

[0039] The number of strands of the weft yarn 12 that are leaped over by the shrinkable warp yarn 21 (the first predetermined number) is set to be greater than the

number of strands of the weft yarns 12 that are continuously leaped over by the warp yarn 11 in the base weave. The number of these strands of yarn can be set in accordance with the sizes or strengths of the embellishments. When the number of the strands of the weft yarn 12 that are continuously leaped over by the warp yarn 11 in the base weave is referred to as a first reference number, the first predetermined number can be set to be several times greater than the first reference number.

[0040] The leap portions 21J include a front-side leap portion 21J(1) passing across the front side of the woven fabric 10 and a rear-side leap portion 21J(2) passing across the rear side of the woven fabric 10. A single strand of the shrinkable warp yarn 21 has at least one leap portion 21J. Usually, one strand of shrinkable warp yarn 21 has at least one front-side leap portion 21J(1) and at least one rear-side leap portion 21J(2) (a plurality of each of the leap portions, in actuality).

[0041] When heated, the shrinkable warp yarn 21 shrinks significantly in the lengthwise direction, as shown by the arrows F1. When the front-side leap portion 21J(1) shrinks, the rear side of the front-side leap portion 21J(1) protrudes. Such shrinkage of a plurality of adjacent front-side leap portions 21J(1) results in the formation of a fold line resembling a horizontal groove.

[0042] Similarly, when the rear-side leap portion 21J(2) shrinks as a result of being heated, the front side of the rear-side leap portion 21J(2) protrudes. Such shrinkage of a plurality of adjacent rear-side leap portions 21J(2) results in the formation of a fold line resembling a horizontal ridgeline. When the fold lines resembling horizontal ridgelines and the fold lines resembling horizontal grooves are formed adjacent to each other in the woven fabric 10, the woven fabric 10 deforms three-dimensionally, bringing about a three-dimensional appearance.

[0043] For the purpose of providing specific explanation, numbers for identifying the yarns of the weave are provided. Alphabets are used for the columns and Arabic numerals for the lines. The shrinkable warp yarn 21 is used in columns a and g. Cells a2 to a6 and cells g2 to g6 represent the front-side leap portions 21J(1). Shrinkage of the plurality of adjacent front-side leap portions 21J(1) results in the formation of a fold line (a line connecting a4, b4, c4, d4, e4, f4, g4, and h4), with, for example, the weft yarn 12 in the 4th line configuring the bottom of the valley.

[0044] Cells a13 to a17 and cells g12 to g17 represent the rear-side leap portions 21J(2). Shrinkage of the plurality of adjacent rear-side leap portions 21J(2) results in the formation of a fold line (a line connecting a15, b15, c15, d15, e15, f15, g15, and h15), with, for example, the weft yarn 12 in the 15th line configuring the peak.

[0045] Fig. 4 schematically shows changes that occur when the shrinkable yarns shrink. Fig. 4(a) is a cross-sectional diagram of an enlargement of the leap portion 21J of the shrinkable yarn 21, showing a state prior to a heat treatment. For convenience, the direction of the warp yarn is the horizontal direction of Fig. 4. In Fig. 4,

the front-side leap portion and the rear-side leap portion are not discriminated from each other.

[0046] Fig. 4(b) shows a state that results after the heat treatment. In the figure, shrinkage of the leap portion 21J results in downward protrusion of the weft yarn 12 in the vicinity of the center of the leap portion 21J, forming a shrunk portion 23.

[0047] Fig. 5 shows how the front-side leap portion 21J(1) and the rear-side leap portion 21J(2) shrink. Because the leap portion 21J(1) forming a valley and the leap portion 21J(2) forming a mountain are located relatively close to each other, as shown in this Fig. 5 the areas where the leap portions 21J(1), 21J(2) are located change significantly in a three-dimensional manner. As a result, a three-dimensional appearance beyond a simple pattern can be achieved.

[0048] A method for forming the embellishment elements 5 in different directions in the woven fabric 10 is now described with reference to Fig. 6. The upper part of Fig. 6 shows formation patterns A, B, C for the embellishment elements 5. The formation pattern A is for forming an oblique embellishment element 5, the formation pattern B for a vertical (Y-direction) embellishment element 5, and the formation pattern C for a horizontal (X-direction) embellishment element 5.

[0049] The lower part of Fig. 6 shows a table of the relationship between the locations of the leap portions and the shapes of the embellishment elements 5 obtained by shrinkage of the leap portions, with respect to the formation patterns A to C of different directions. In regard to the oblique formation patterns A, the locations where the leap portions are formed vary depending on the angles of the formation patterns A. However, due to its rotational symmetry, the formation patterns A are illustrated as a single formation pattern A.

[0050] In order to form an oblique embellishment element 5, a plurality of leap portions are positioned vertically (the direction of the warp yarn) and horizontally (the direction of the weft yarn), as shown by the formation pattern A. The angle of the embellishment element 5 (e.g., the angle with respect to the warp yarn 11 or the weft yarn 12) can be changed by adjusting the number of vertical leap portions and the number of horizontal leap portions.

[0051] In order to form a vertical embellishment element 5, a plurality of leap portions 22J extending along the weft yarn are positioned, as shown by the formation pattern B. The embellishment element 5 extending vertically can be obtained by vertically arranging the leap portions 22J that slide horizontally.

[0052] In order to form a horizontal embellishment element 5, a plurality of leap portions 21J extending along the direction of the warp yarn are positioned, as shown by the formation pattern C. The embellishment element 5 extending in the horizontal can be obtained by horizontally arranging the leap portions 22J that slide vertically. In Fig. 6, the formation patterns are associated with eight areas that are divided every 45 degrees, but the angles

of the areas do not have to be equal. As will be described in the other examples hereinafter, various oblique embellishments can be created only with the formation pattern A used for forming an oblique embellishment, or various embellishments can be created with a more detailed formation pattern.

[0053] Fig. 7 shows a method for forming embellishments in various shapes by combining a plurality of embellishment elements 5 of different formation patterns. In order to generate a rectangular embellishment as shown in Fig. 7(a), a plurality of embellishment elements 5 are formed in the upper and lower sides extending horizontally based on the horizontal formation pattern C. As a result, embellishment elements configuring the upper and lower sides can be obtained. Furthermore, a plurality of embellishment elements 5 are formed in the right and left sides extending vertically based on the vertical formation pattern B. As a result, embellishment elements configuring the right and left sides can be obtained.

[0054] In order to generate a triangular embellishment as shown in Fig. 7(b), a plurality of embellishment elements 5 are formed in the base extending horizontally based on the horizontal formation pattern C. A plurality of embellishment elements 5 are formed in the right and left sides extending obliquely toward the apex are formed based on the oblique formation pattern A. Because the angles of the right side and the left side are different, the locations where the leap portions are formed vary; however, the explanation thereof is omitted.

[0055] In order to generate a circular embellishment as shown in Fig. 7(c), a circular shape can be simulated by properly arranging the formation patterns A to C. For instance, an embellishment element in substantially a circular shape can be obtained by positioning embellishment elements of the horizontal formation pattern C on the top and bottom of the circle, embellishment elements of the vertical formation pattern B on the left and right sides of the circle, and embellishment elements of the oblique formation pattern A in diagonal positions.

[0056] Fig. 8 shows a weave of the oblique formation pattern A. Fig. 8(a) shows a mountain weave 10A1, and Fig. 8(b) a valley weave 10A2. Note that that Fig. 8(a) and Fig. 8(b) correspond to each other to some extent but not completely. The same applies to Figs. 9 and 10.

[0057] The "mountain" here means the shape of a part protruding from the surrounding areas of the weave. In case of Fig. 8(a), the "mountain" means a convex shape in which the weave 10A1 protrudes toward the observer. The "valley" here means the shape of a part depressing from the surrounding areas of the weave. In case of Fig. 8(b), the "valley" means a concave shape in which the weave 10A2 depresses toward the page space (the side opposite to the observer).

[0058] Because the formation pattern A is used to form an oblique embellishment element, the vertical leap portion 21J and the horizontal leap portion 22J are positioned in the weave 10A2, depending on the angle (orientation) of the embellishment element. An oblique embellishment

element is obtained in accordance with the combination of the vertical leap portion 21J and the horizontal leap portion 22J.

[0059] As shown in Fig. 8(a), although the shrinkable yarns 21, 22 are partially exposed in parts of the mountain weave 10A1, these exposed parts are not the leap portions 21J, 22J. The leap portions 21J, 22J are designed to shrink when heated and are the areas in which a predetermined number of strands of yarn in a different direction are leaped over.

[0060] The partially exposed shrinkable yarns 21, 22 (a1, a4, g1, g4, h1) do not leap over a predetermined number of strands of yarn of a different direction, but are pressed down by the normal yarns 11, 12. Taking the shrinkable warp yarn 21 passing across the column a as an example, the yarn 21 is interlaced with the normal weft yarn 12 (a2, a3, a5, a6) and therefore is prevented from deforming when heated. Therefore, the shrinkable warp yarn 21 passing across the column a does not have the leap portion 21J, as far as Fig. 8(a) shows.

[0061] Fig. 9 shows a weave of the vertical formation pattern B. Fig. 9(a) shows a mountain weave 10B1, and Fig. 9(b) shows a valley weave 10B2. Fig. 9(a), showing the mountain weave 10B1, does not have any leap portion 22J, as described with reference to Fig. 8(a). The leap portions are formed in the valley weave. Partially exposed shrinkable yarns 21, 22 are interlaced with the normal yarns 11, 12 and therefore are prevented from deforming when heated. For instance, in the column a, the shrinkable warp yarn 21 equivalent to a pair of strands of the weft yarn is exposed in a continuous manner at a1 and a2, as well as at a4 and a5, but is interlaced with the weft yarn 12 passing across the third line and the weft yarn 12 passing across the sixth line, and therefore is prevented from deforming when heated.

[0062] As shown in Fig. 9(b), a plurality of horizontal leap portions 22J are positioned vertically in the valley weave 10B2. In other words, Fig. 9(b) shows a leap portion 22J containing a1, b1, c1, a leap portion 22J containing e1, f1, g1, h1, and a leap portion 22J containing b4, c4, d4, e4, f4. Each of these leap portions 22J leaps over five strands of the warp yarn. The plurality of leap portions 22J shown in the first line are shown only partially for the convenience of illustration.

[0063] Fig. 10 shows a weave of the horizontal formation pattern C. Fig. 10(a) shows a mountain weave 10C1, and Fig. 10(b) shows a valley weave 10C2. As shown in Fig. 10(b), a leap portion 21J that leaps over at least six strands of the weft yarn 12 and at least six strands of the shrinkable weft yarn 22 is formed in the column f.

[0064] The oblique, vertical, and horizontal embellishment elements can be obtained by configuring the weaves in which the leap portions are positioned in a predetermined pattern, as described with reference to Figs. 8 to 10. Then, various shapes such as rectangular shapes, triangular shapes, and circular shapes can be expressed by using a plurality of combination elements of the embellishments formed in the different directions.

[0065] Moreover, as described with reference to Fig. 5, the woven fabric 10 can be deformed significantly by positioning the front-side leap portions and the rear-side leap portions close to each other. Accordingly, embellishments such as pleats can be realized.

[0066] A method for manufacturing the woven fabric 10 is schematically explained with reference to Figs. 11 and 12. A woven fabric generation system for generating the woven fabric 10 can be configured with, for example, a design data generating device 110, an automatic weaving machine 120 connected to the design data generating device 110 by a communication network CN, and a heating device 130.

[0067] The design data generating device 110 is a computer that determines the configurations (weaves) of the woven fabric 10 based on the design of the garment 1 and outputs the configurations in the form of design data. The design data generating device 110 may be connected to the automatic weaving machine 120 without having the communication network CN therebetween. The automatic weaving machine 120 may be provided with, for example, a function for generating the design data.

[0068] The automatic weaving machine 120 is configured with, for example, a warp yarn feeder 121, a weft yarn feeder 122, a shrinkable warp yarn feeder 123, a shrinkable weft yarn feeder 124, and a weaving machine controller 125. The warp yarn feeder 121 feeds the warp yarn 11. The weft yarn feeder 122 feeds the weft yarn 12. The shrinkable warp yarn feeder 123 feeds the shrinkable warp yarn 21. The shrinkable weft yarn feeder 124 feeds the shrinkable weft yarn 22.

[0069] The weaving machine controller 125 controls the feeders 121 to 124. The weaving machine controller 125 controls the feeders 121 to 124 based on the data received through the communication network CN. Note that the data generated by the design data generating device 110 can be input to the weaving machine controller 125 without using the communication network CN. For instance, the data can be stored in a storage medium such as a flash memory device, and then the data can be input to the weaving machine controller 125 by connecting the storage medium to the weaving machine controller 125.

[0070] The heating device 130 is a device for performing a heat treatment, an example of the "specific process," on the woven fabric 10. The heating device 130 may be installed in the vicinity of the automatic weaving machine 120 or away from the automatic weaving machine 120. The embellishment elements 5 emerge as a result of heating the woven fabric that physically incorporates the embellishment structures with the heating device 130. In a case where the woven fabric in which the embellishment elements 5 have not yet emerged (the woven fabric prior to a heat treatment) can be distributed as it is, the heating device 130 can be considered as not being included in the woven fabric generation system.

[0071] Note that the specific process is not limited to

a heat treatment. For example, a cooling treatment, a pressure treatment, a decompression treatment, a process for irradiating light or an electric wave of a specific wavelength, a process for applying an ultrasonic wave, a process for applying vibrations, a process for exposing the woven fabric to gas or liquid having a specific component, or any other processes that can cause the shrinkable yarns 21, 22 to shrink more than the normal yarns may be performed. When using a heat treatment as the specific process, any method can be used to heat the woven fabric. The woven fabric may be heated with, for example, high-temperature steam, an infrared ray, warm air, and the like.

[0072] Schematic operations of the woven fabric generation system are now described with reference to the flow diagram shown in Fig. 12. A designer determines the design of the garment 1 (S1). In so doing, the designer can also determine embellishments such as pleats and linear patterns.

[0073] Once the embellishments are determined, as explained with reference to Fig. 7 the locations for the formation patterns A to C are calculated in order to realize the determined embellishments, and weaves are determined in view of the locations of the formation patterns and the other considerations such as a base pattern (S2). The configurations of the weaves can automatically be determined using the design data generating device 110. The data representing the determined configurations of the weaves are transmitted from the design data generating device 110 to the weaving machine controller 125 of the weaving machine 120 through the communication network CN.

[0074] The weaving machine controller 125 generates the woven fabric 10 by controlling the feeders 121 to 124 based on the received data (S3). The woven fabric 10 is manufactured by weaving the normal warp yarn 11 and weft yarn 12, a plurality of strands of the shrinkable warp yarn 21 that configure the first leap portions 21J in the first predetermined pattern and are positioned between strands of the normal warp yarn 11 in the third predetermined pattern, and a plurality of strands of shrinkable weft yarn 22 that configure the second leap portion 22J in the second predetermined pattern and are positioned between strands of the normal weft yarn 12 in the fourth predetermined pattern.

[0075] The first predetermined pattern defines the number of strands of weft yarn to be leaped over by the vertical leap portion 21J and a location where the leap portion 21J emerges. The second predetermined pattern defines the number of strands of warp yarn to be leaped over by the horizontal leap portion 22J and a location where the leap portion 22J emerges. The third predetermined pattern defines a location where the shrinkable warp yarn 21 passes across. The fourth predetermined pattern defines a location where the shrinkable weft yarn 22 passes across. These patterns can automatically be generated based on the design data.

[0076] The woven fabric 10 is heated by the heating

device 130 (S4). As a result, the leap portions 21J, 22J shrink, generating the embellishment elements 5 such as pleats (S5). Note that step S5 demonstrates a woven state of the finished woven fabric but is not exactly a manufacturing step. For this reason, step S5 is shown by a two-dot chain line. The three-dimensional appearance of the woven fabric 10 is produced by generating the embellishment elements 5 with a heat treatment and by connecting the embellishment elements 5 such as pleats.

[0077] According to the present example configured as described above, the embellishment elements that emerge by being heated are provided in the woven fabric 10. Therefore, unlike the conventional techniques of using highly shrinkable yarns and mechanically and thermally forming pleats by means of an iron or the like, stable embellishments resistant to wearing and washing can be obtained.

[0078] In the present example, the mountain weave and the valley weave can be positioned close to each other as shown in Fig. 5, bringing about a greater deformation in the woven fabric 10. The effects of the desired three-dimensional embellishments can be achieved by adjusting the configurations of the mountain and valley.

[Example 2]

[0079] A second example is now described with reference to Fig. 13. The following examples, including the present example, correspond to modifications of the first example. Therefore, the differences with the first example are mainly described. In the present example, various shapes of embellishment elements are formed using only the formation pattern A which is used for forming an oblique embellishment element as described with reference to Figs. 6 and 8.

[0080] In Fig. 13(a), weaves for forming the embellishment elements of the formation pattern A are arranged into a rectangular shape to obtain a rectangular embellishment. In the formation pattern A, the shrinkable yarns 21, 22 are positioned vertically and horizontally, as shown in Fig. 8. Therefore, basically the embellishment elements are formed obliquely in accordance with a resultant force of the force of shrinkage of the shrinkable warp yarn 21 and the force of shrinkage of the shrinkable weft yarn 22. However, continuously positioning weaves corresponding to the formation pattern A in the base weave as shown in Fig. 13 results in the formation of embellishment elements along the direction in which the weaves are positioned. A certain weave corresponding to the formation pattern A shrinks to form an embellishment element that extends along the direction of another adjacent weave (a weave corresponding to the formation pattern A). For convenience, the weaves corresponding to the formation pattern A are referred to as "weaves(A)" hereinafter.

[0081] In a case where the weaves (A) are arranged vertically, the weaves(A) shrink both vertically and hori-

zontally. In this case, the vertical shrinkable warp yarn 21 extends in a continuous manner, has a way out so to speak, and therefore does not shrink much. On the other hand, the horizontal shrinkable weft yarn 22 is not related directly to the shrinkable weft yarn 22 of another adjacent vertical weave(A), and therefore shrink significantly almost as expected. Therefore, even by simply arranging vertically the weaves(A) for forming the oblique embellishment elements, the weaves(A) can be shrunk horizontally, resulting in a vertical embellishment.

[0082] The same applies to when arranging the weaves (A) horizontally. In each of the horizontally arranged weaves(A), the shrinkable weft yarn 22 has a way out and therefore does not shrink much. The shrinkable warp yarn 21, on the other hand, shrinks significantly almost as expected. Therefore, even by simply arranging the weaves(A) horizontally, the weaves(A) can be shrunk vertically, resulting in a horizontal embellishment.

[0083] Even by simply arranging the weaves(A) corresponding to the oblique embellishment elements into a rectangular shape, a rectangular embellishment can be generated. However, because the vertical sides slightly shrink horizontally while the horizontal sides slightly shrink vertically, the embellishment might lack clarity. In spite of its lack of clarity, the rectangular embellishment can also be said to exert a new design effect by itself.

[0084] In Fig. 13(b), the weaves(A) are arranged into a triangular shape. Therefore, each of the weaves(A) shrinks in such a manner as to generate an embellishment element along the direction of the other adjacent weave(A). In Fig. 13(c), the weaves(A) are arranged into a circular shape. Therefore, each of the weaves (A) shrinks in such a manner as to generate an embellishment element along the direction of the other adjacent weave(A).

[0085] The present example configured as described above also provides the same operational effects as the first example. The present example can also obtain any shapes of embellishments only by using the formation pattern A used for forming an oblique embellishment element.

[Example 3]

[0086] A third example is now described with reference to Fig. 14. The first example has described obtaining any shapes of embellishments by using the three types of formation patterns A to C. The second example has described obtaining any shapes of embellishments by using the formation pattern A alone. The third example (the present example) obtains any shapes of embellishments by using more formation patterns.

[0087] In the present example, as shown in Fig. 14, in order to form a vertical (Y-direction) embellishment, weaves corresponding to the formation pattern B are arranged vertically. The weaves corresponding to the formation pattern B are referred to as "weaves(B)." As explained with reference to Fig. 9, the weaves(B) each have

only the second leap portion 22J in which the shrinkable weft yarns 22 slide across a predetermined number of strands of warp yarns 11, 21. The weaves(B) that only have the leap portions 21J of the shrinkable warp yarn 21 but do not have the leap portions 22J of the shrinkable weft yarn 22 are each expressed as "warp 0, weft 100." Such expression represents the composition of a leap portion of a weave with a stretchy texture. The numerical values are expressed in percent. A vertical embellishment can be obtained by arranging a plurality of weaves(B) vertically in a continuous manner.

[0088] In order to form a horizontal (X-direction) embellishment, weaves corresponding to the formation pattern C are arranged horizontally. The weaves corresponding to the formation pattern C are referred to as "weaves(C)." The weaves(C) each have the first leap portion 21J in which the shrinkable warp yarn 21 leaps over a predetermined number of strands of the weft yarns 12, 22, as described with reference to Fig. 10. The weaves (C) that only have the leap portions 22J of the shrinkable weft yarn 22 but do not have the leap portions 21J of the shrinkable warp yarn 21 are each expressed as "warp 100, weft 0." A horizontal embellishment can be obtained by arranging a plurality of weaves(C) horizontally in a continuous manner.

[0089] In an intermediate area between the vertical direction and the horizontal direction, the weaves(A) are used in which the vertical leap portions 21J and the horizontal leap portions 22J are positioned in a dispersed manner in accordance with the direction in which an embellishment is formed. For the purpose of illustration, in Fig. 14, the angle of the direction heading straight up represents a reference angle of 0 degrees, the angle of the right lateral direction is 90 degrees, the angle of the direction heading straight down is 180 degrees, and the angle of the left lateral direction is 270 degrees.

[0090] When the range is between an angle greater than 0 degrees (> 0) and an angle less than 90 degrees (< 90), the weaves (A) having both the vertical leap portions 21J and the horizontal leap portions 22J are used. In a case where the angle of the direction in which an embellishment is formed is 45 degrees, the compositions of the leap portions of the weaves (A) are (warp 50, weft 50). In the present example, the compositions of the leap portions of the weaves (A) gradually change between (warp 0, weft 100) and (warp 100, weft 0) in accordance with the angle of the direction in which an embellishment is formed.

[0091] The compositions of the leap portions of the weaves (A) may be changed at every predetermined angle of, for example, 1 degree, 5 degrees, 10 degrees, or the like. Alternatively, the compositions of the leap portions of the weaves (A) may be changed with respect to each basic pattern of the base weaves 11, 12. For example, the compositions of the leap portions of the weaves(A) can be changed in the following manner: (warp 1, weft 99), (warp 2, weft 98), (warp 3, weft 97), (warp 4, weft 96) ... (warp 97, weft 3), (warp 98, weft 2),

(warp 99, weft 1). The compositions may be changed more roughly, such as (warp 10, weft 90), (warp 20, weft 80), (warp 30, weft 70).

[0092] When the range is between an angle greater than 90 degrees (> 90) and an angle less than 180 degrees (< 180), between an angle greater than 180 degrees (> 180) and an angle less than 270 degrees (< 270), and between an angle greater than 270 degrees (> 270) and an angle less than 0 degrees ($< 0 = 360$), the compositions of the leap portions of the weaves(A) are gradually changed in the same manner as described above.

[0093] The present example configured as described above provides the same operational effects as the first example. Moreover, in the present example, finer embellishments can be generated because the compositions of the leap portions of the weaves with a stretchy function are changed gradually in a stepwise manner in accordance with the direction in which an embellishment is formed. As described in the first example, the woven fabric 10 incorporates, as a component thereof, embellishments that emerge when subjected to the specific process. Therefore, even when the compositions of the leap portions are controlled in detail in accordance with the direction in which an embellishment is formed as in the present embodiment, a constant embellishment can be generated promptly, in comparison to forming an embellishment afterwards by mechanically compressing or ironing the woven fabric.

[0094] Note that the present invention is not limited to the foregoing examples. Those skilled in the art can make various additions, modifications, and the like within the scope of the present invention. For instance, the types of the shrinkable yarns, the method for shrinking the shrinkable yarns, the method for forming the leap portions, and the like can be changed accordingly. Although the present embodiment has described mixing the shrinkable yarns in a base weave, a stretchy texture composed of the shrinkable yarns may be provided in the base weave in a stacked manner. In addition, the various characteristics described in the scope of claims can be combined, if necessary, in a manner other than as described above.

[Reference Signs List]

[0095]

1	Garment
5	Embellishment element
10	Woven fabric
10A, 10B, 10C	Weave
11	Warp yarn
12	Weft yarn
21	Shrinkable warp yarn
21J	Leap portion
22	Shrinkable weft yarn
22J	Leap portion

23	Shrunk portion
110	Design data generating device
120	Automatic weaving machine

Claims

1. A woven garment, comprising:

a plurality of strands of warp yarn; and
a plurality of strands of weft yarn interlaced with the plurality of strands of warp yarn, wherein some of the plurality of strands of warp yarn are strands of shrinkable warp yarn that shrink in a lengthwise direction thereof more than the other strands of warp yarn when subjected to a specific process,
the strands of shrinkable warp yarn have, at least in one section in the lengthwise direction, a first leap portion where a first predetermined number of adjacent strands of weft yarn are leaped over, and
a plurality of the first leap portions are positioned in a first predetermined pattern.

2. The woven fabric according to claim 1, wherein some of the plurality of strands of weft yarn are strands of shrinkable weft yarn that shrink in a lengthwise direction thereof more than the other strands of weft yarn when subjected to the specific process, the strands of shrinkable weft yarn have, at least in one section in the lengthwise direction, a second leap portion where a second predetermined number of adjacent strands of warp yarn are leaped over, and a plurality of the second leap portions are positioned in a second predetermined pattern.

3. The woven fabric according to claim 2, further comprising a base weave that is obtained by interlacing the other strands of warp yarn and the other strands of weft yarn, wherein the first predetermined number is set to be greater than the number of the other strands of weft yarn leaped over by the other strands of warp yarn in the base weave.

4. The woven fabric according to claim 3, wherein the second predetermined number is set to be greater than the number of the other strands of warp yarn leaped over by the other strands of weft yarn in the base weave.

5. The woven fabric according to claim 4, wherein the first leap portion is either a front-side first leap portion passing across the front side of the woven fabric or a rear-side first leap portion passing across the rear side of the woven fabric, the second leap portion is either a front-side second

leap portion passing across the front side of the woven fabric or a rear-side second leap portion passing across the rear side of the woven fabric, the front-side first leap portion is positioned in a predetermined front-side first pattern included in the first predetermined pattern, the rear-side first leap portion is positioned in a predetermined rear-side first pattern included in the first predetermined pattern, the front-side second leap portion is positioned in a predetermined front-side second pattern included in the second predetermined pattern, and the rear-side second leap portion is positioned in a predetermined rear-side second pattern included in the second predetermined pattern.

6. The woven fabric according to claim 5, wherein the predetermined front-side first pattern and the predetermined rear-side first pattern are set in such a manner that the front-side first leap portion and the rear-side first leap portion are close to each other, and the predetermined front-side second pattern and the predetermined rear-side second pattern are set in such a manner that the front-side second leap portion and the rear-side second leap portion are close to each other.

7. The woven fabric according to any one of claims 1 to 6, wherein the strands of shrinkable warp yarn are positioned between a plurality of the other strands of warp yarn in a third predetermined pattern, and the strands of shrinkable weft yarn are positioned between a plurality of the other strands of weft yarn in a fourth predetermined pattern.

8. The woven fabric according to any one of claims 2 to 6, wherein the strands of shrinkable warp yarn form a constant first shrunk portion by shrinking in the lengthwise direction thereof more than the other strands of warp yarn when subjected to the specific process, and the strands of shrinkable weft yarn form a constant second shrunk portion by shrinking in the lengthwise direction thereof more than the other strands of weft yarn when subjected to the specific process.

9. The woven fabric according to claim 8, wherein a first fold line portion is formed along a weft direction by arranging a plurality of the first shrunk portions in a continuous manner, a second fold line portion is formed along a warp direction by arranging a plurality of the second shrunk portions in a continuous manner, and a third fold line portion is formed along an oblique direction between the weft direction and the warp direction by arranging the plurality of first shrunk por-

tions and the plurality of second shrunk portions in a predetermined direction.

10. The woven fabric according to claim 9, wherein the first shrunk portions and the second shrunk portions are stretchable in response to external force.

11. A method for manufacturing a woven fabric, comprising:

positioning, between a plurality of strands of warp yarn and in a first predetermined pattern, shrinkable warp yarn that shrinks more than the other strands of warp yarn when subjected to a specific process, in such a manner as to form at least one first leap portion where a first predetermined number of adjacent strands of weft yarn are leaped over; and positioning, between a plurality of strands of weft yarn and in a second predetermined pattern, shrinkable weft yarn that shrinks more than the other strands of weft yarn when subjected to the specific process, in such a manner as to form at least one second leap portion where a second predetermined number of adjacent strands of warp yarn are leaped over.

12. A woven fabric, comprising:

a first structure woven with a plurality of strands of warp yarn and a plurality of strands of weft yarn interlaced with the plurality of strands of warp yarn; and

a second structure formed of a plurality of strands of shrinkable warp yarn and a plurality of strands of shrinkable weft yarn and stacked by being weaved into the first structure, wherein the strands of shrinkable warp yarn have a first leap portion leaping over a first predetermined number of adjacent strands of the weft yarn, with the first leap portion being positioned in a first pattern,

the strands of shrinkable weft yarn have a second leap portion leaping over a second predetermined number of adjacent strands of the warp yarn, with the second leap portion being positioned in a second pattern,

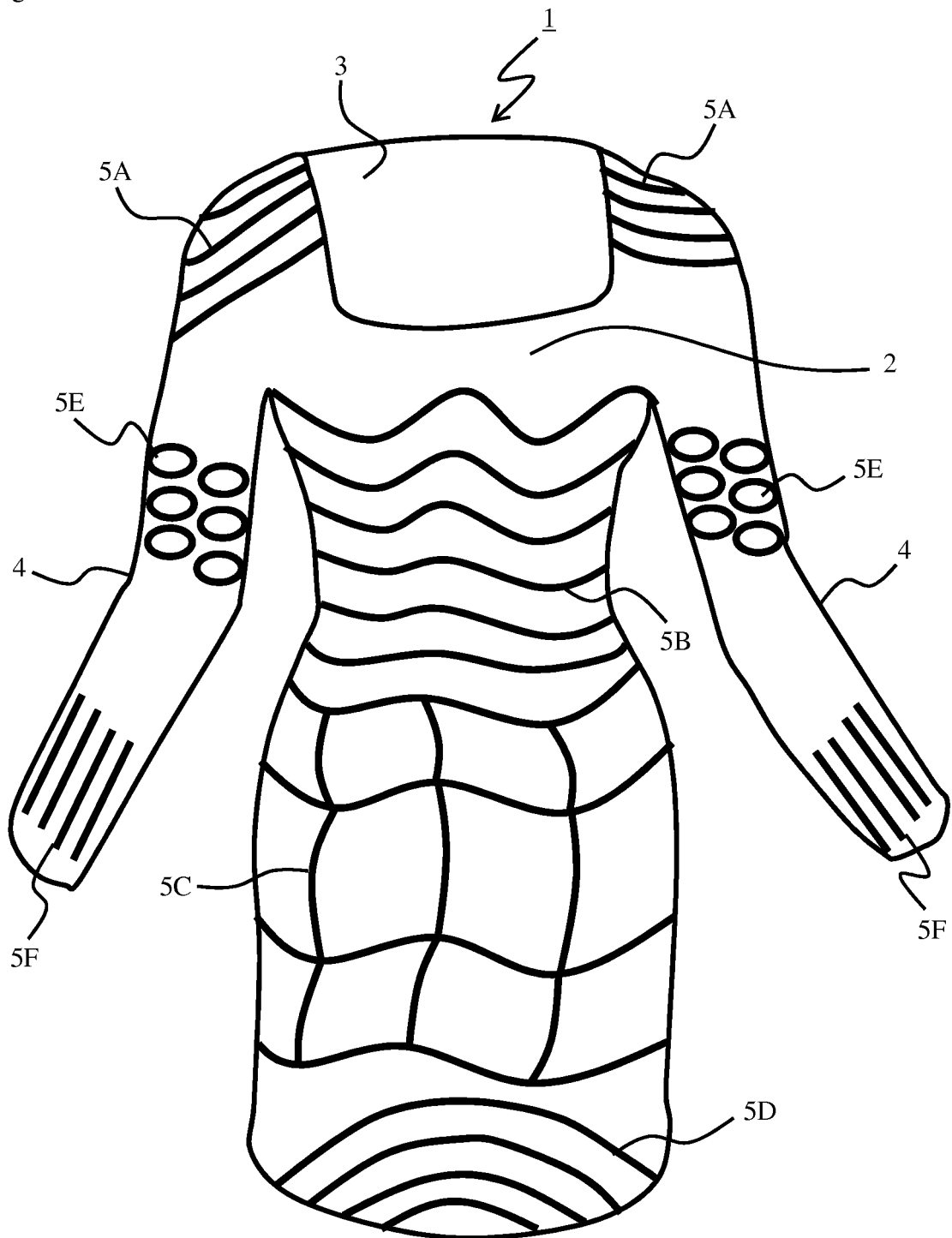
the strands of shrinkable warp yarn form a first shrunk portion against resilience of the first structure by shrinking in a lengthwise direction thereof more than the warp yarn when subjected to a specific process, and

the strands of shrinkable weft yarn form a second shrunk portion against the resilience of the first structure by shrinking in a lengthwise direction thereof more than the weft yarn when subjected to the specific process.

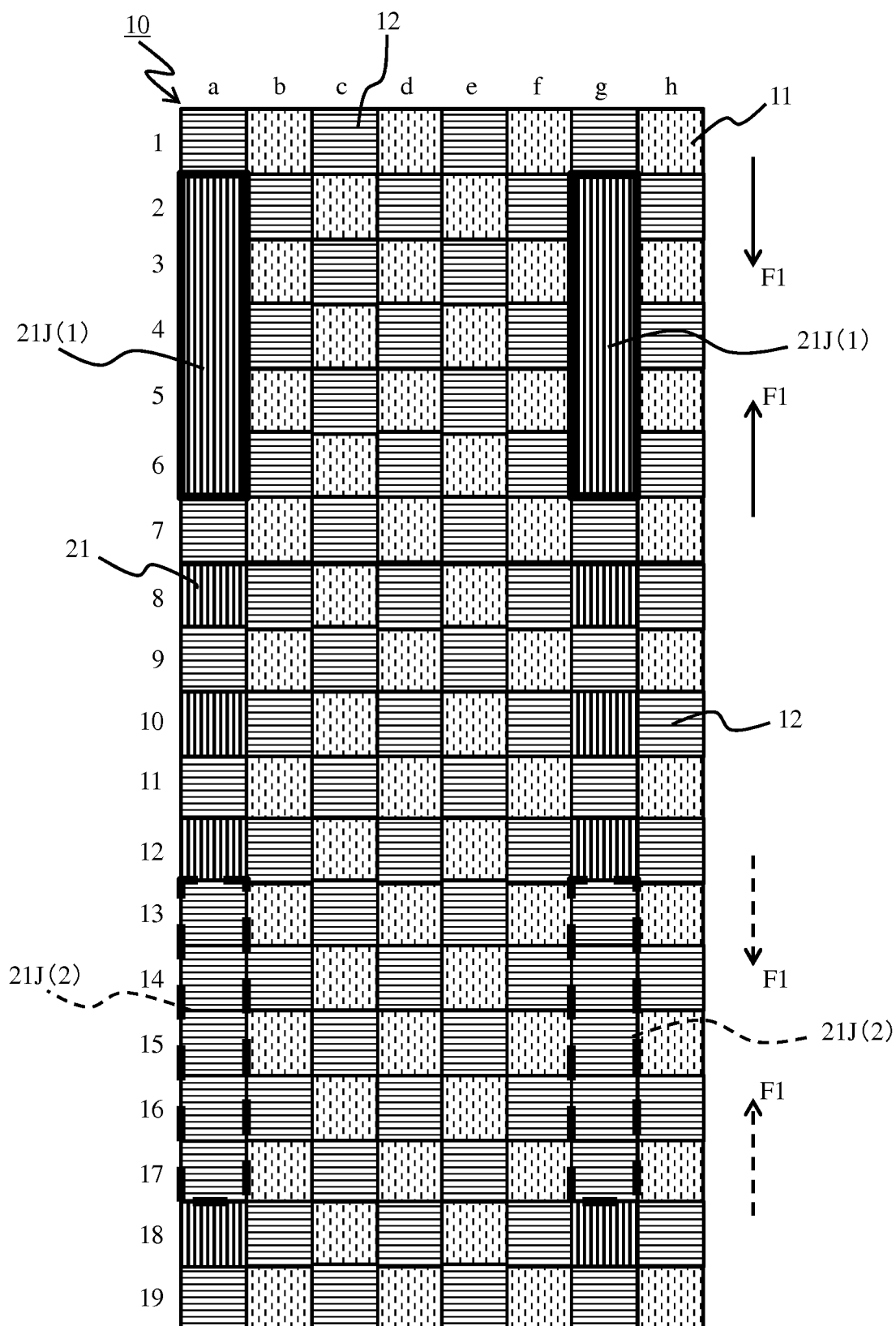
13. The woven fabric according to claim 12, wherein the strands of shrinkable warp yarn are positioned between the plurality of strands of warp yarn in a third predetermined pattern, and the strands of shrinkable weft yarn are positioned between the plurality of strands of weft yarn in a fourth predetermined pattern.

14. The woven fabric according to claim 13, wherein the first leap portion and the second leap portion are formed so as to be located on the front side and/or the rear side of the first structure.

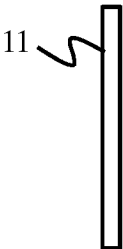
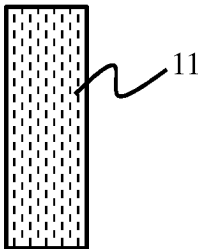
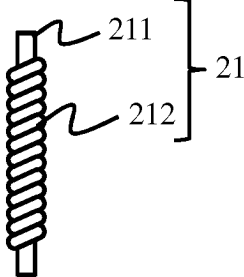
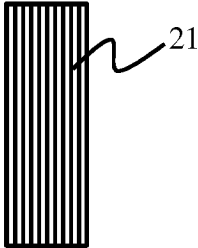

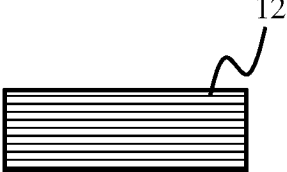
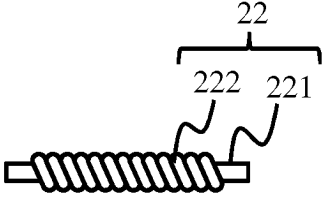
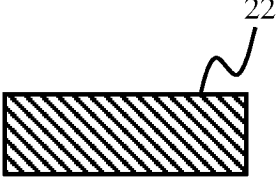
【Fig. 1】



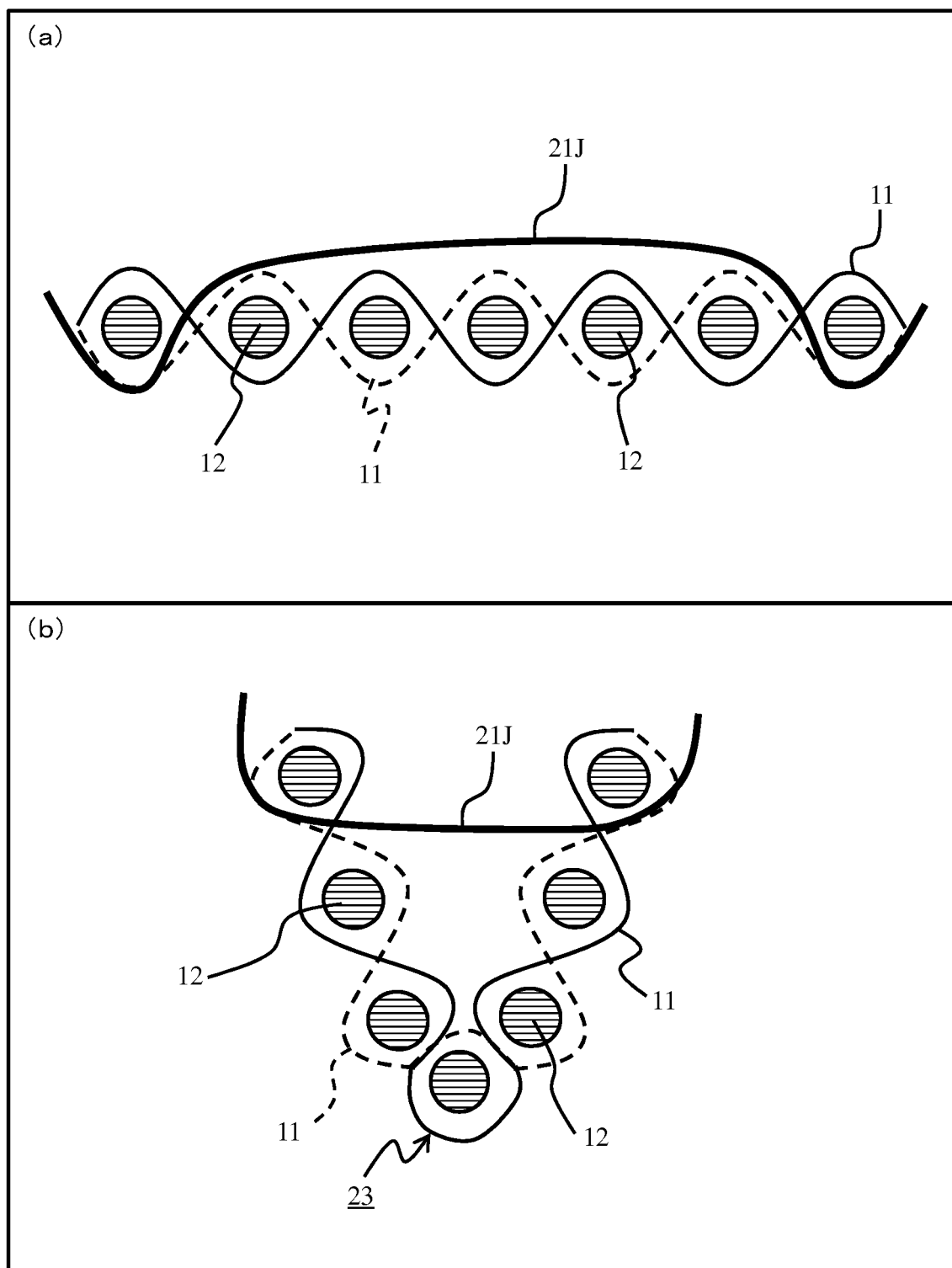
【Fig. 2】



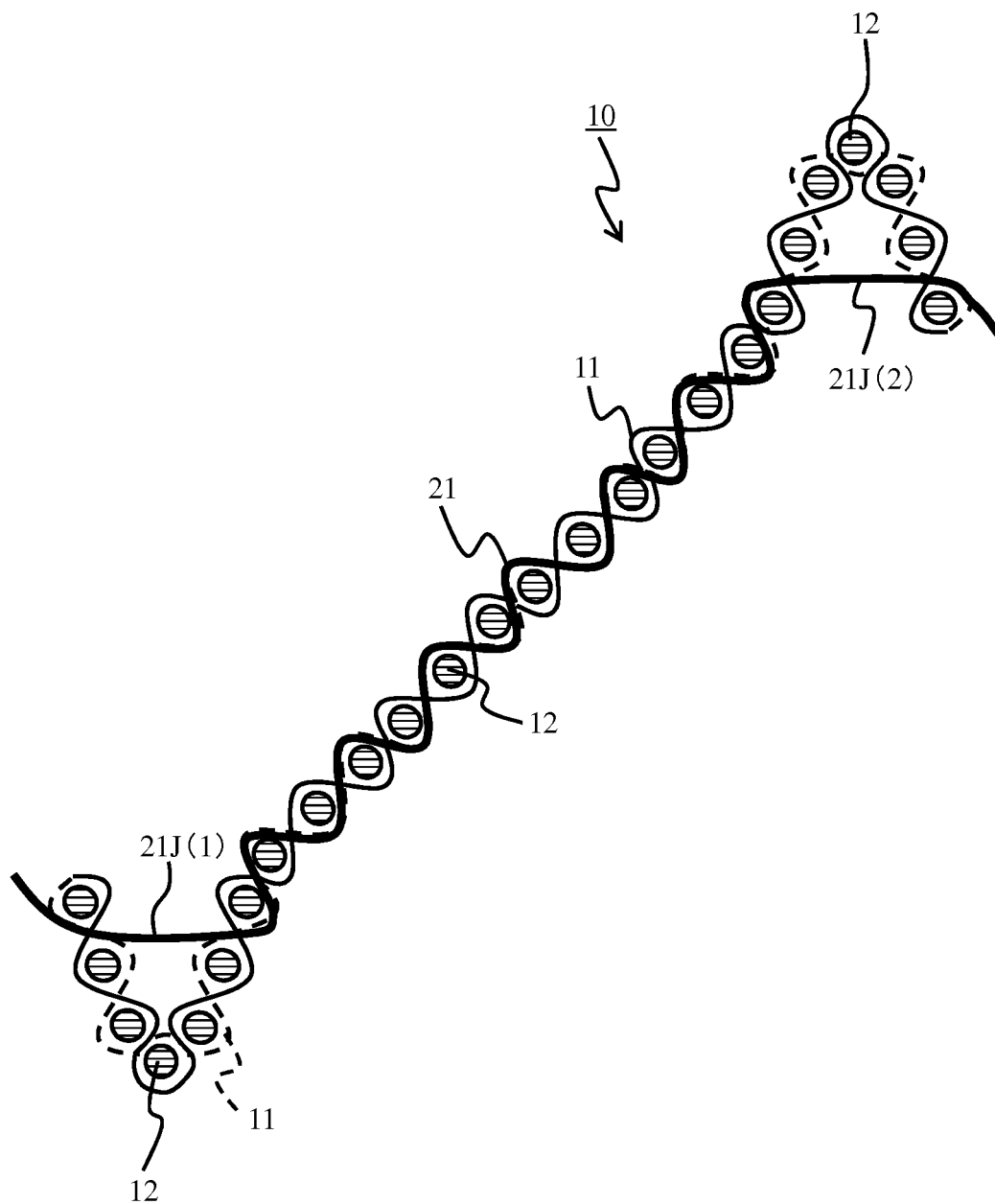
【Fig. 3】

	Schematic structure of yarn	Display in weave diagram
Warp yarn (normal)		
Warp yarn (shrinkable)		
Weft yarn (normal)		
Weft yarn (shrinkable)		

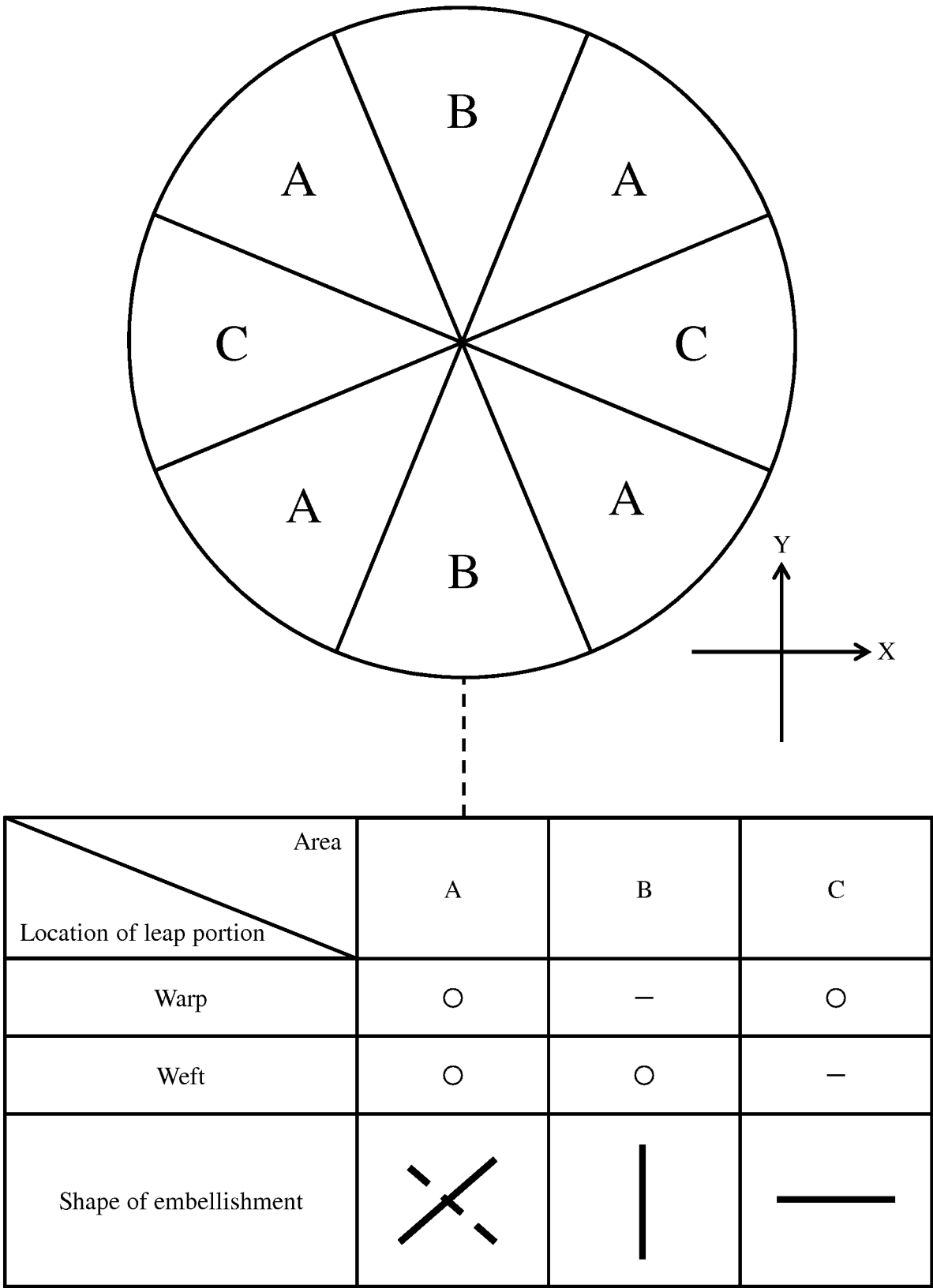
【Fig. 4】



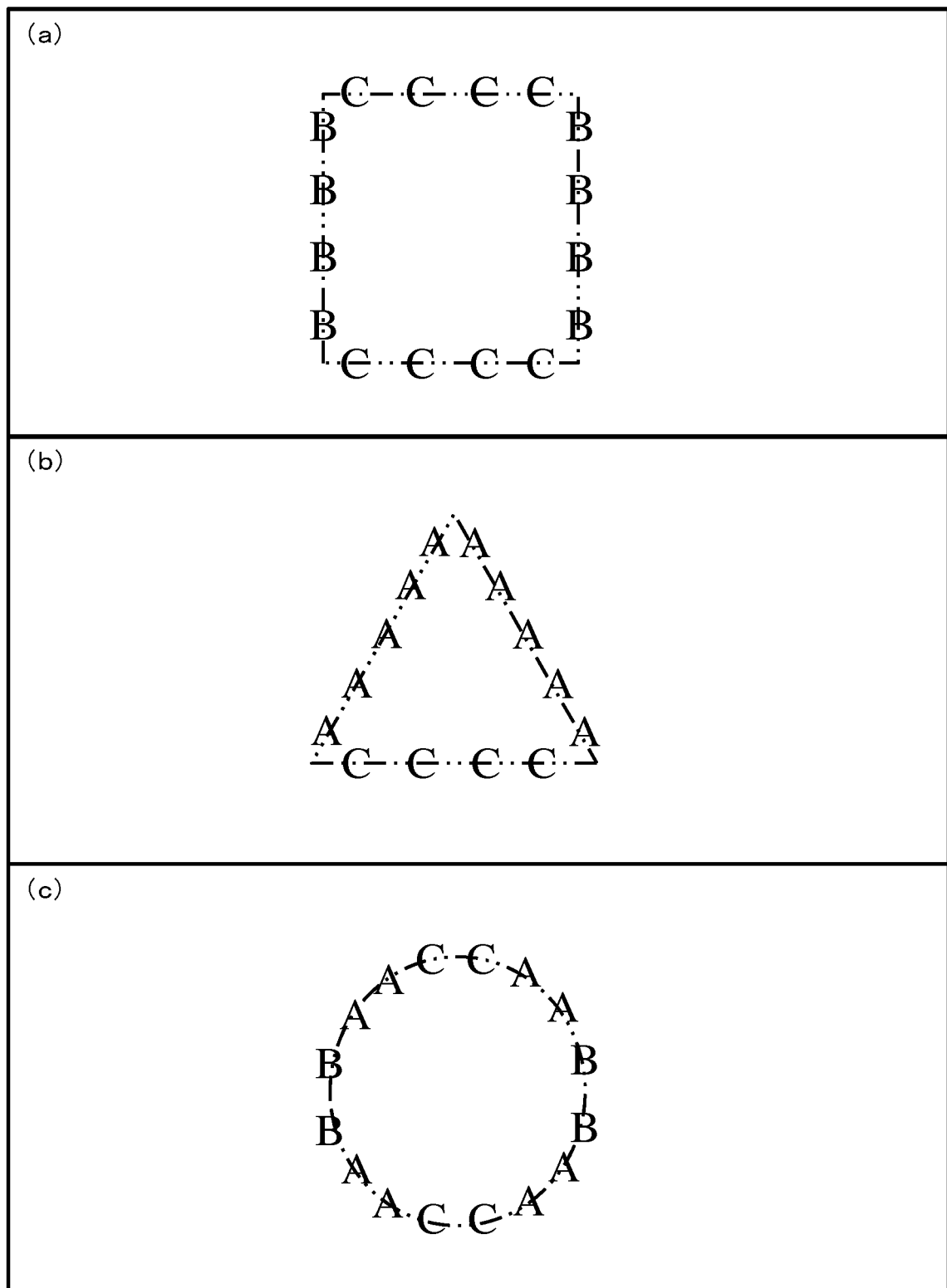
【Fig. 5】



【Fig. 6】

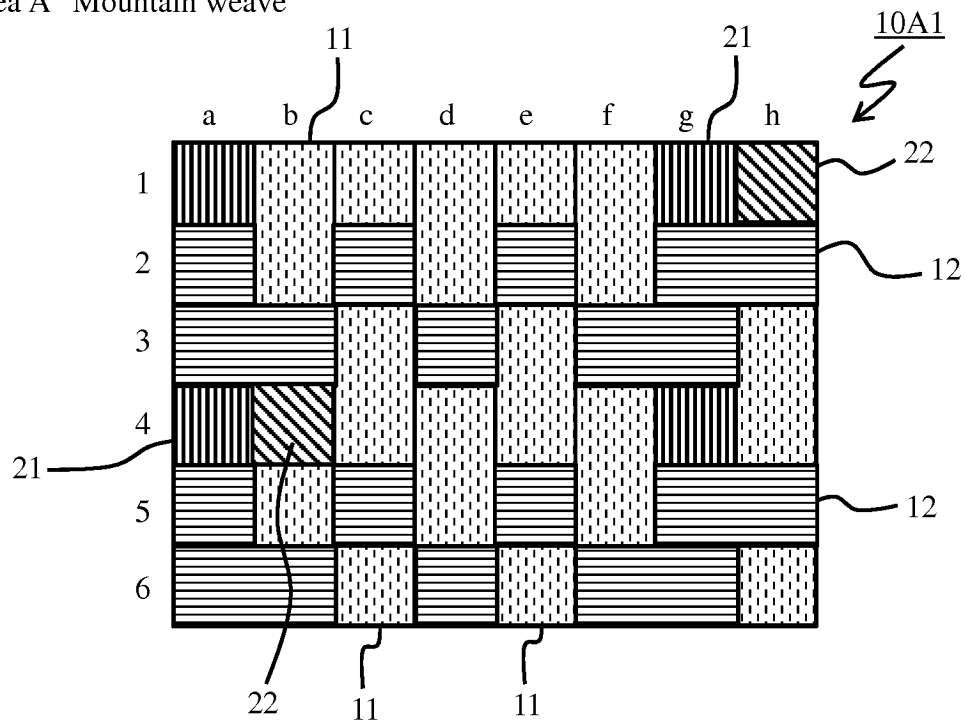


【Fig. 7】

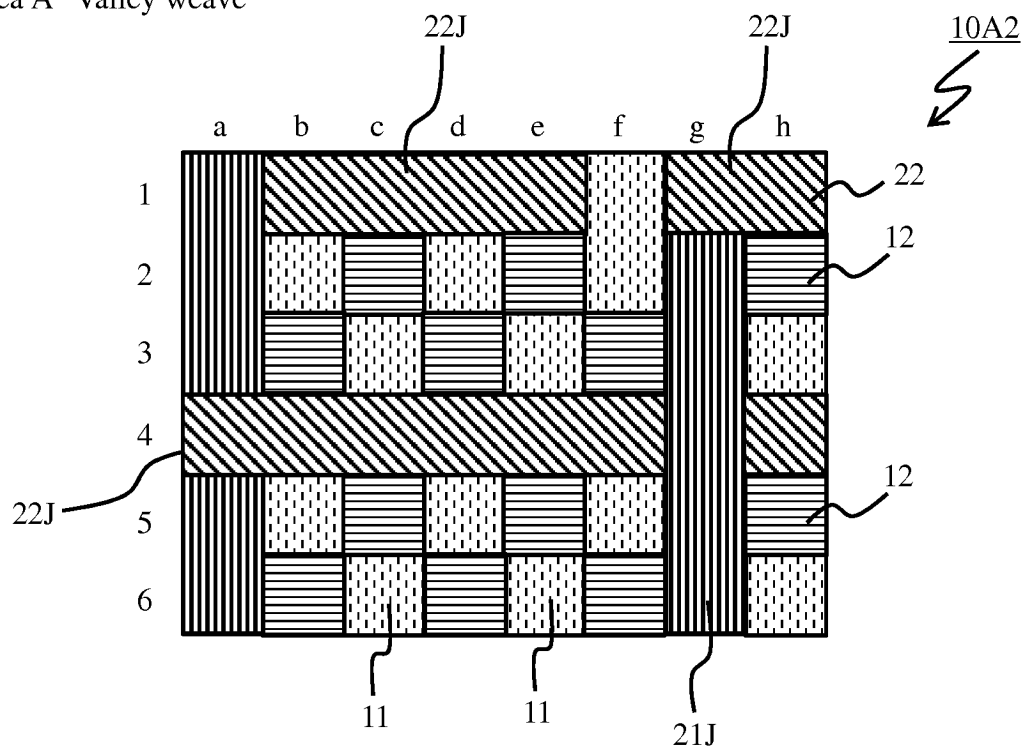


【Fig. 8】

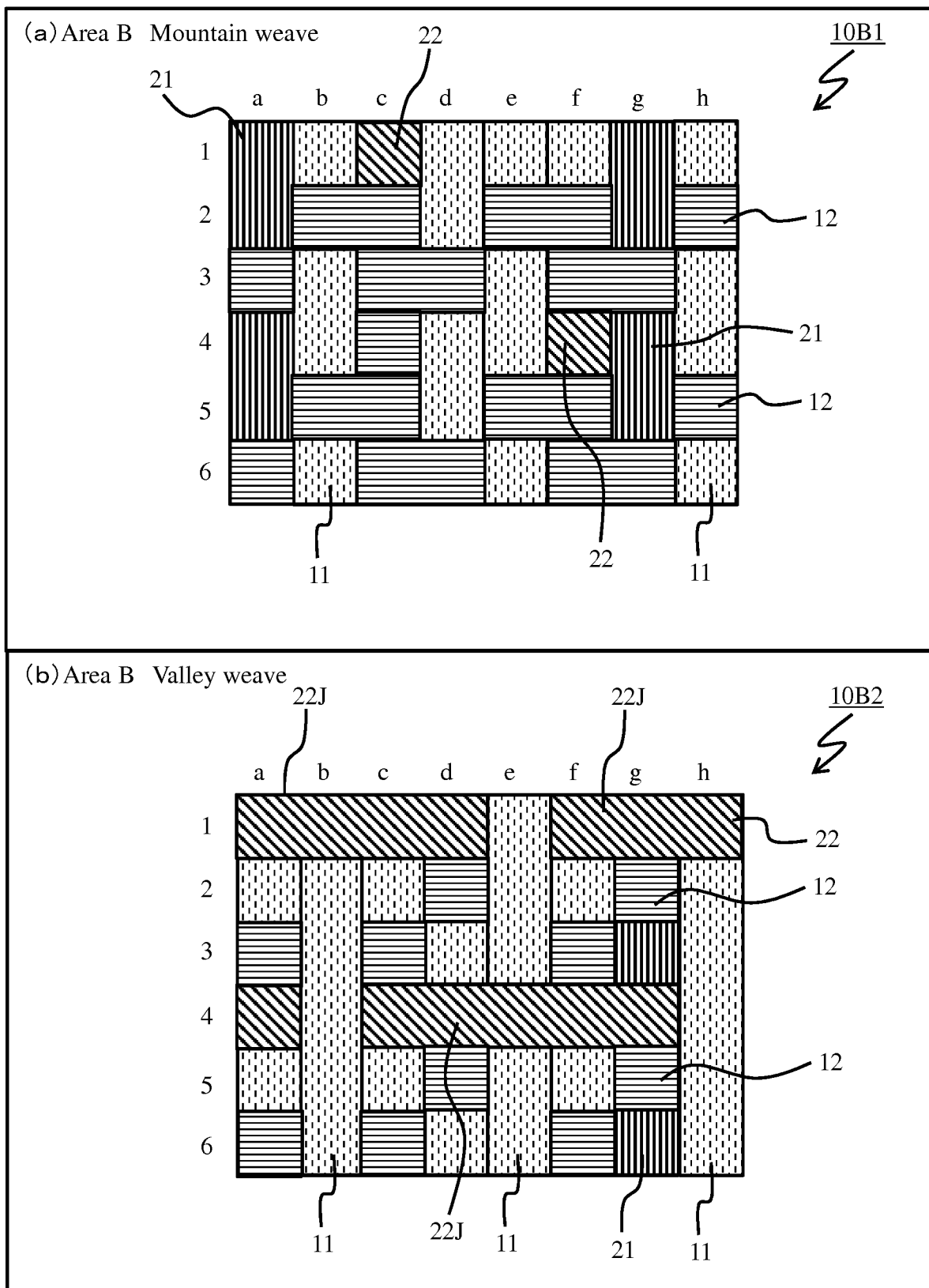
(a) Area A Mountain weave



(b) Area A Valley weave

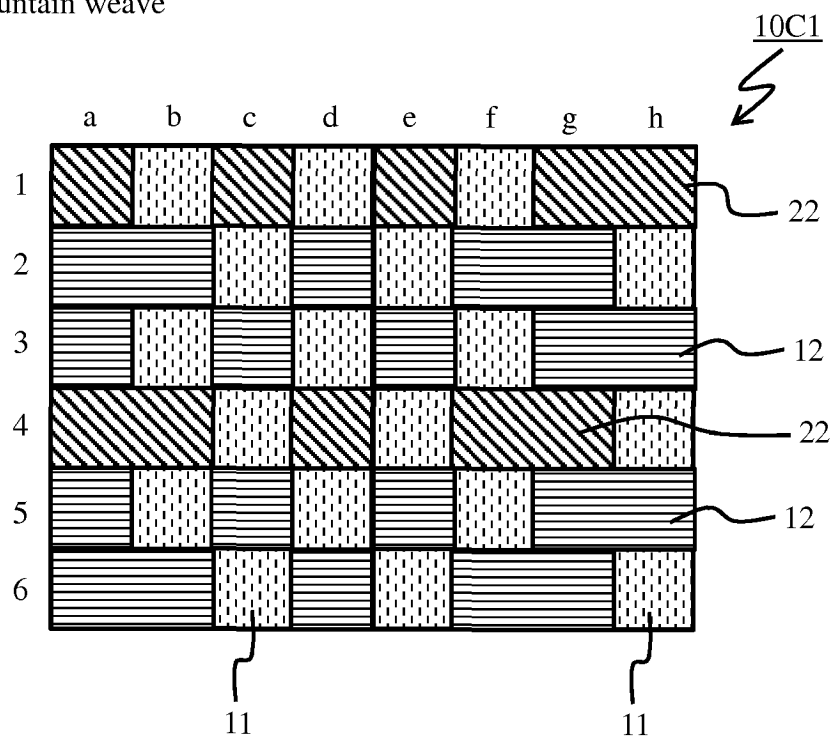


【Fig. 9】

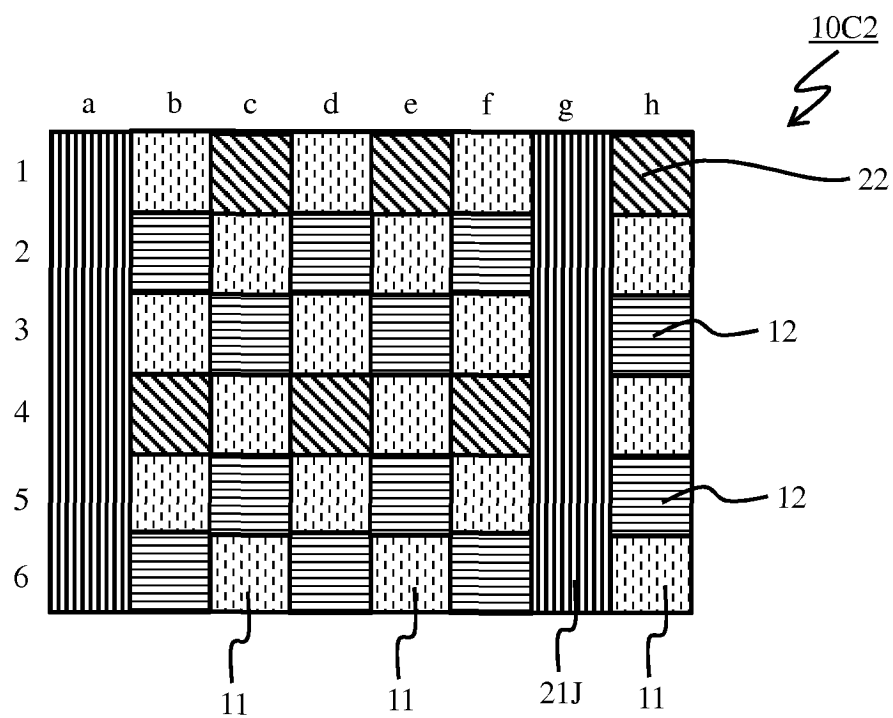


【Fig. 10】

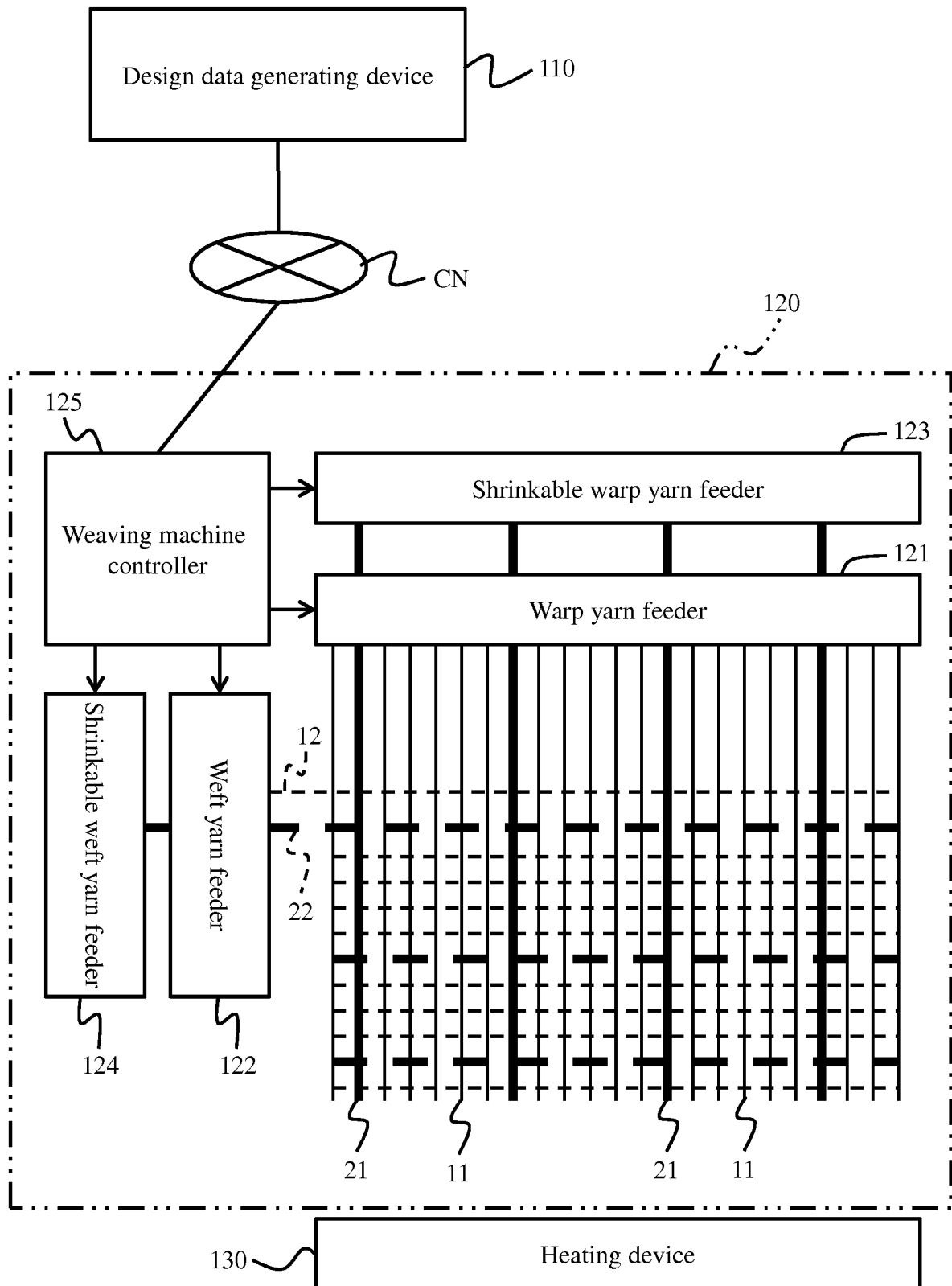
(a) Area C Mountain weave



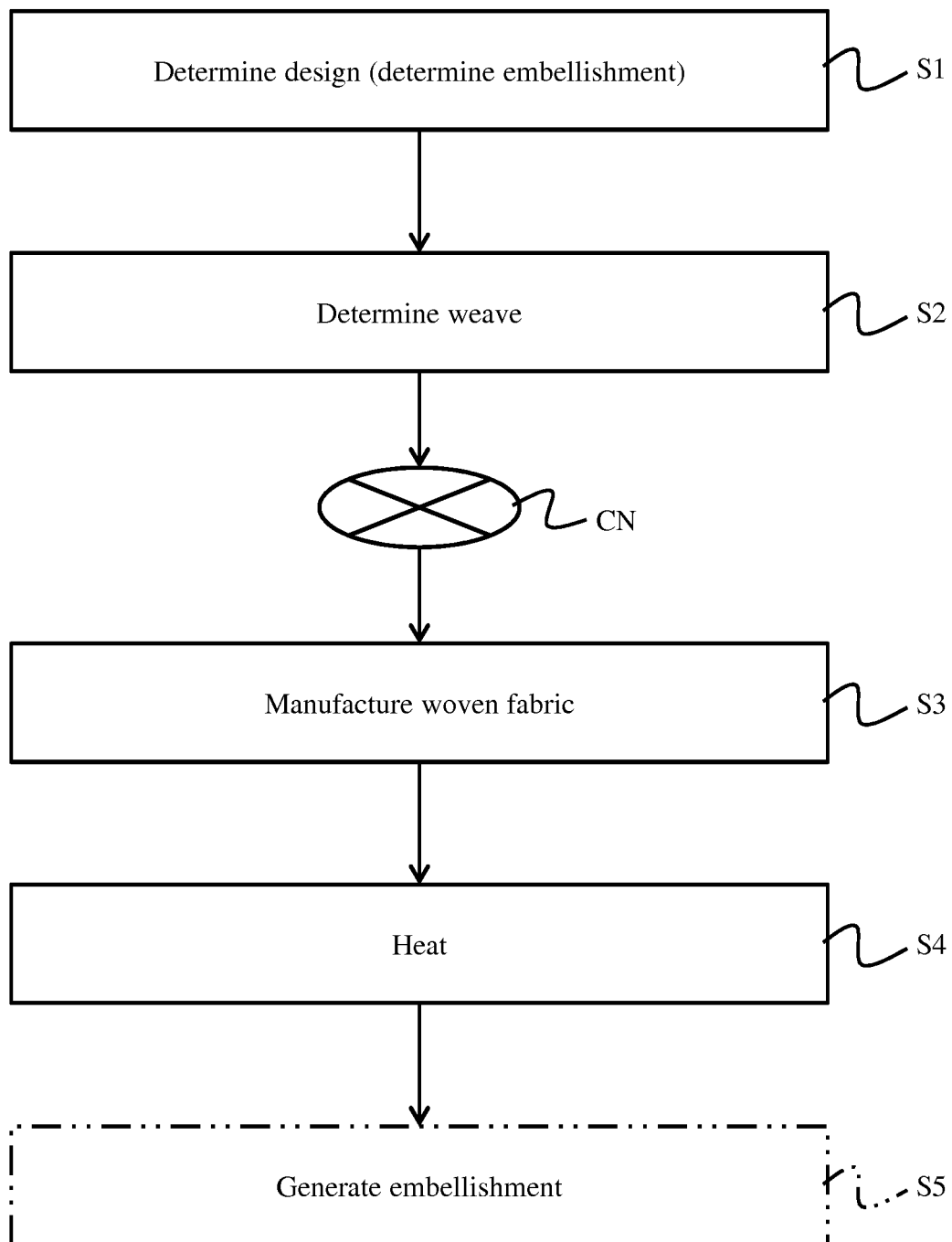
(b) Area C Valley weave



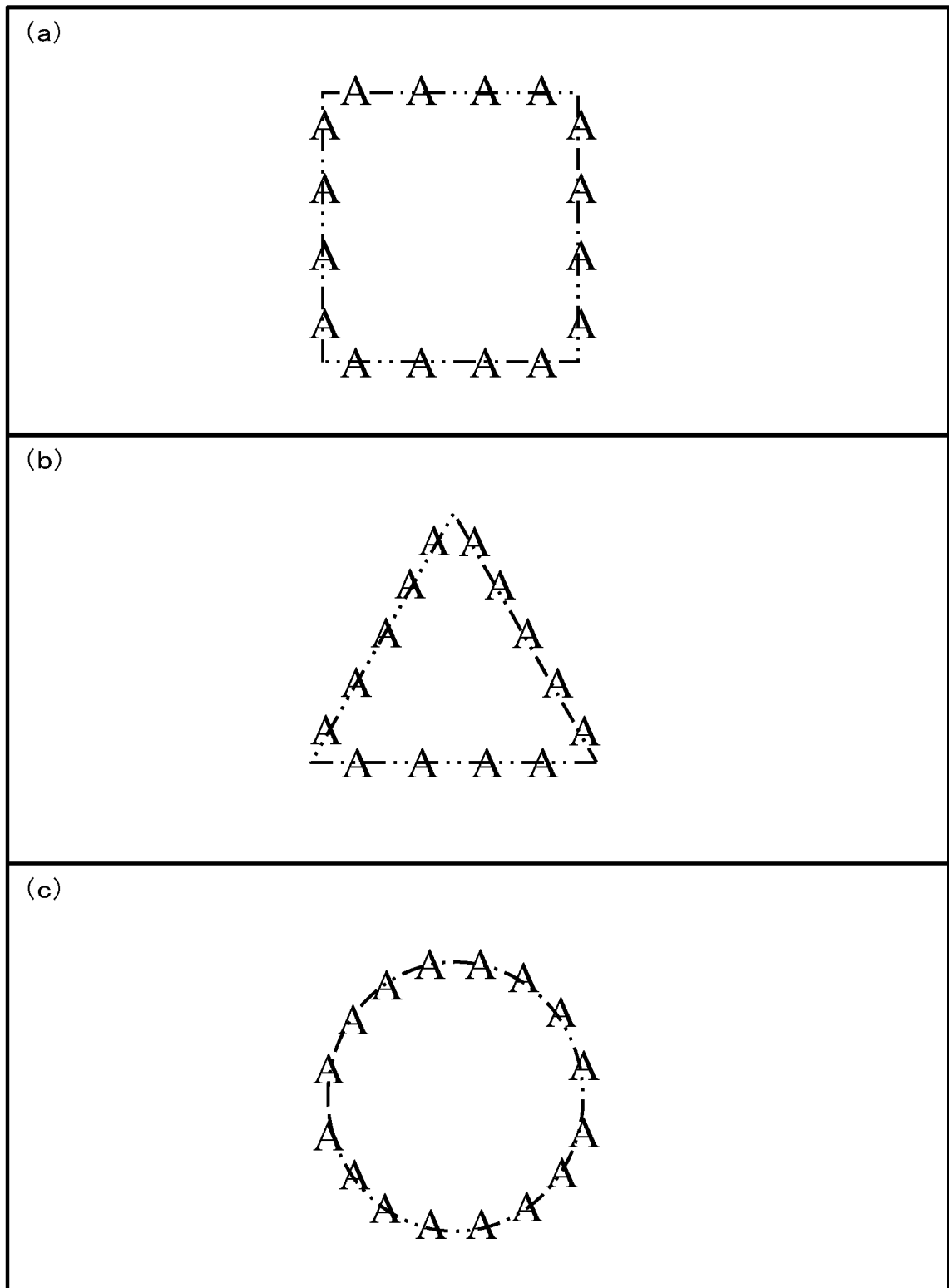
【Fig. 11】



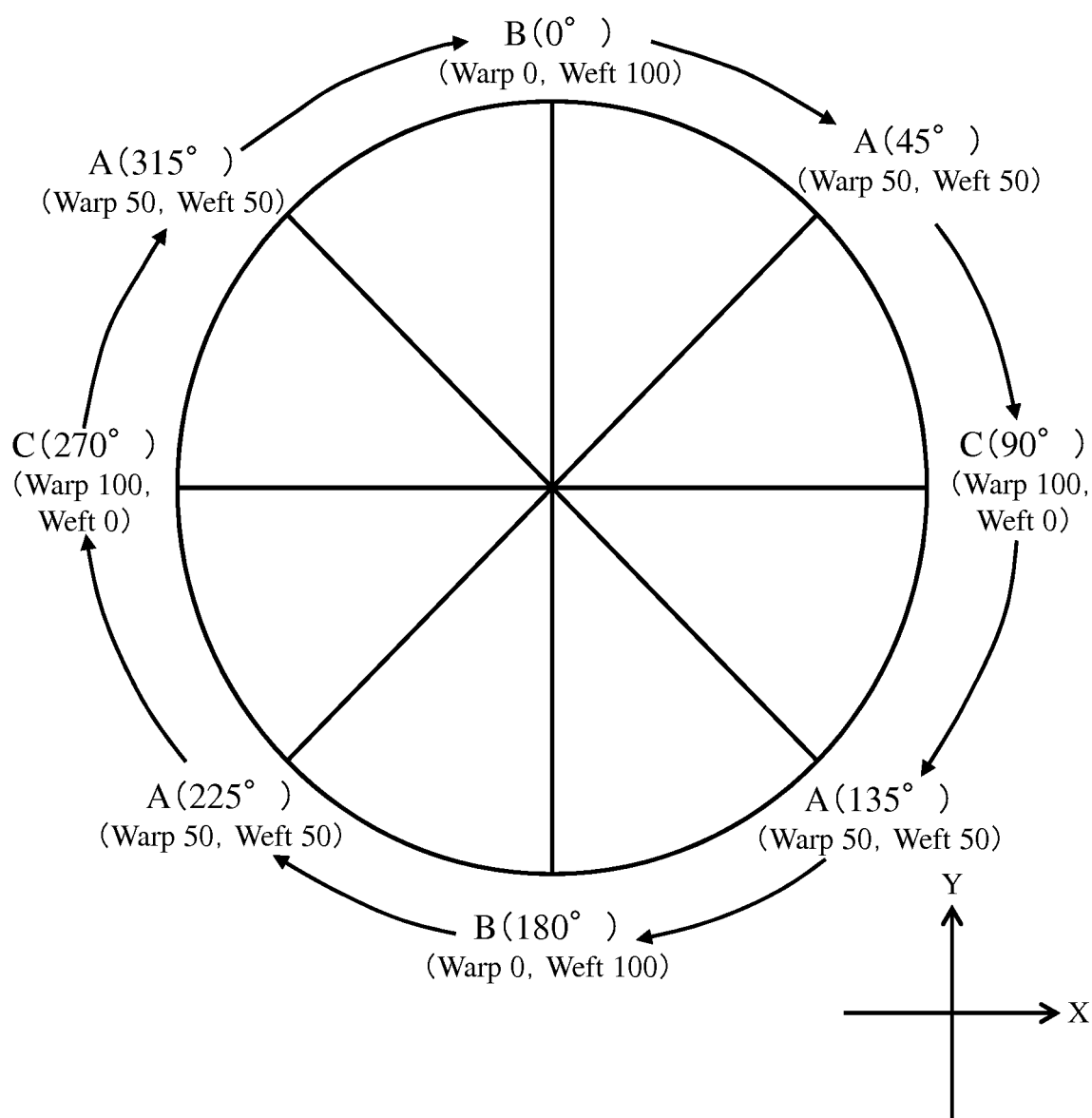
【Fig. 12】



【Fig. 13】



【Fig. 14】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/063207

A. CLASSIFICATION OF SUBJECT MATTER

D03D15/04(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D03D1/00-27/18

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2006-525434 A (Ludvig Svensson B.V.), 09 November 2006 (09.11.2006), claims 1 to 3, 6; paragraphs [0022], [0026] to [0029]; fig. 1, 3 & WO 2004/099478 A1 & US 2006/0237086 A1 & EP 1620587 A1 & KR 10-2006-0009901 A & KR 10-0963546 B1 & CN 1784518 A	1-14
X	JP 01-321948 A (Motomi Cloth Kogyo Kabushiki Kaisha), 27 December 1989 (27.12.1989), claim 1; page 2, upper right column to lower left column; fig. 1 to 2 (Family: none)	1-14

☒ 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

01 August, 2014 (01.08.14)

Date of mailing of the international search report

12 August, 2014 (12.08.14)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/063207

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 14-015242 Y1 (Kunikazu DOBASHI), 29 September 1939 (29.09.1939), entire text (Family: none)	1 2-14
A	JP 2011-153394 A (Kabushiki Kaisha Nuno), 11 August 2011 (11.08.2011), claim 1; paragraphs [0009], [0029] to [0030]; fig. 2, 4 (Family: none)	1-14
A	JP 38-021669 Y1 (Kanagawa-Ken), 17 October 1963 (17.10.1963), entire text (Family: none)	1-14

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2008007879 A [0003]
- JP 2004339671 A [0003]