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(54) Spacer fabric knitting method and spacer fabric

(57) Configuration: A spacer fabric (2) is knitted, including: a front knitted fabric (4); a rear knitted fabric (6); and a connecting yarn (22, 24) that connects the front knitted fabric (4) and the rear knitted fabric (6); wherein one of the front and the rear knitted fabrics (4, 6) is convex and the other knitted fabric is flat. Tuck stitches are repeatedly formed with the connecting yarn (22, 24) alternately on stitches in the front knitted fabric (4) caught on a needles (20) and stitches in the rear knitted fabric (6) caught on a needles (20) such that the tuck stitches are formed at a pitch of a plurality of stitches both on the front knitted fabric (4) and on the rear knitted fabric (6), but are not formed on mutually opposing stitches, while stitches to be tucked are changed such that the tuck stitches are formed on each stitch of the front knitted fabric (4) and the rear knitted fabric (6). Subsequently, next stitches are knitted at a pitch of a plurality of stitches on the stitches of the front knitted fabric (4) on which the tuck stitches have been formed, and next stitches are knitted at a pitch of a plurality of stitches on the stitches of the rear knitted fabric (6) on which the tuck stitches have been formed. The next stitches are knitted on each stitch of the front knitted fabric (4) and the rear knitted fabric (6) on which the tuck stitches have been formed, while changing stitches for forming the next stitches. The next stitches are knitted firstly on the knitted fabric on the side that is to be made flat, and the next stitches are knitted lastly on the tuck stitches in the knitted fabric on the side that is to be made convex, which is connected via the connecting yarn (22, 24) to the tuck stitches on which the next stitches has been firstly knitted.

Effects: The present invention provides a spacer fabric (2) in which one of the front and the rear knitted fabrics (4, 6) is convex and the other knitted fabric is flat and in which knitted fabrics may be convex at desired positions.

FIG. 8

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Description

Technical Field

[0001] The present invention relates to knitting of a spacer fabric, and particularly relates to knitting of a spacer fabric in which one side of the spacer fabric is convex at desired positions and the other side is flat.

Background Art

[0002] Patent Literature 1 (JP 2004-107800A) discloses knitting of a thick spacer fabric in which tuck stitches are formed to insert connecting yam made of woolly nylon or the like into a gap between a front knitted fabric and a rear knitted fabric. However, this spacer fabric is formed such that not only one side of, but both sides of the spacer fabric are convex. Patent Literature 2 (JP S52-108377U) discloses knitting in which a front knitted fabric and a rear knitted fabric are made of different materials, and another yam is inserted by inlay into a gap between the front and the rear knitted fabrics thereby making one of the front and the rear knitted fabrics convex. However, according to Patent Literature 2, the front and the rear knitted fabrics have to be made of mutually different materials.

Citation List

Patent Literature

[0003]

[Patent Literature 1] JP 2004-107800A
[Patent Literature 2] JP S52-108377U

Summary of the Invention

Technical Problem

[0004] It is an object of the present invention to provide a spacer fabric in which one side is convex and the other side is flat at desired positions, and a method for knitting the spacer fabric.

Means for Solving Problem

[0005] The present invention is directed to a knitting method for knitting a spacer fabric having a front knitted fabric, a rear knitted fabric, and a connecting yam that connects the front knitted fabric and the rear knitted fabric, using a knitting machine provided with at least a pair of needle beds each having a plurality of needles, and a carriage, the method characterized by,
in order to knit the spacer fabric in which one side of the space fabric is convex and the other side is flat:

a step (a) of repeatedly forming tuck stitches with the connecting yam alternately on stitches in the front knitted fabric caught on the needles and stitches in the rear knitted fabric caught on the needles such that the tuck stitches are formed at a pitch of a plurality of stitches along the needle beds both on the front knitted fabric and on the rear knitted fabric but are not formed on mutually opposing stitches, while changing stitches to be tucked such that the tuck stitches are formed on each stitch of the front knitted fabric and the rear knitted fabric;
a step (b) of knitting next stitches at a pitch of a plurality of stitches on the stitches of the front knitted fabric on which the tuck stitches have been formed; and
a step (c) of knitting next stitches at a pitch of a plurality of stitches on the stitches of the rear knitted fabric on which the tuck stitches have been formed;

wherein the next stitches are knitted on each stitch of the front knitted fabric and the rear knitted fabric on the stitches where the tuck stitches have been formed on, by repeating the step (b) and the step (c), while changing stitches for forming the next stitches, and
in the step (b) and the step (c), the next stitches are knitted firstly on the knitted fabric to be made flat, and the next stitches are knitted lastly on the tuck stitches in the knitted fabric to be made convex, which are connected via the connecting yam to the tuck stitches on which the next stitches have been firstly knitted.

[0006] The present invention has the following aspects.

- Tuck stitches is repeatedly formed with the connecting yam alternately on stitches in the front knitted fabric caught on the needles and stitches in the rear knitted fabric caught on the needles such that the tuck stitches are formed at a pitch of a plurality of stitches both on the front knitted fabric and on the rear knitted fabric but are not formed on mutually opposing stitches, while stitches to be tucked are changed such that the tuck stitches are formed on each stitch of the front knitted fabric and the rear knitted fabric.
- Next stitches are knitted at a pitch of a plurality of stitches on the stitches of the front knitted fabric on which the tuck stitches have been formed, and next stitches are knitted at a pitch of a plurality of stitches on the stitches of the rear knitted fabric on which the tuck stitches have been formed, wherein stitches for forming the next stitches are changed, so that the next stitches are knitted on each stitch of the front knitted fabric and the rear knitted fabric on which the tuck stitches have been formed.
- One side of the spacer fabric is made convex and the other side is made flat, using the order in which the next stitches are knitted on the stiches on which the tuck stitches have been formed.
- The tuck stitches on which the next stitches are firstly knitted is connected via the connecting yam to the

tuck stitches on which the next stitches are knitted last, and the knitted fabric on the side of the tuck stitches on which the next stitches are knitted first relatively shrinks and becomes flat, and the knitted fabric on the side of the tuck stitches on which the next stitches are knitted last becomes relatively convex.

[0007] According to the present invention, a spacer fabric may be knitted in which one side of the spacer fabric is convex, without a difference in material between the front knitted fabric and the rear knitted fabric. Furthermore, the convex side has convexities about twice as large as those in the case where both sides are convex. The stitch loop length, the number of courses, or the like does not have to be made different between the front and the rear knitted fabrics. The convexities may be formed at desired positions on the front knitted fabric and the rear knitted fabric, and the portions opposite the convexities become flat, and, thus, a spacer fabric having a shape suitable for various applications is obtained.

[0008] It is preferable that plain portion and rib portion are formed in the step (b) and the step (c), thereby connecting the front knitted fabric and the rear knitted fabric to each other at the rib portion, and making the spacer fabric thicker at the plain portion and thinner at the rib portion. Accordingly, due to the contrast between the convex portions and the thin portions surrounding the convex portions, the spacer fabric may be emphasized with recesses and protrusions.

[0009] It is particularly preferable that the plain portions and the rib portions are each formed at a plurality of positions in the step (b) and the step (c), thereby connecting the front knitted fabric and the rear knitted fabric to each other at the plurality of positions, and shifting positions of the rib stitches along a wale direction of the spacer fabric such that the positions of the rib portions are arranged oblique with respect to the wale direction and cross each other. Accordingly, a quilt-like knitted fabric is obtained in which the convex portions are in the shape of a parallelogram.

[0010] Furthermore, it is preferable that the next stitches are knitted on every other stitch in both the step (b) and the step (c), and, when repeating the step (b) and the step (c), the next stitches are knitted lastly on the stitches with the tuck stitches opposing the next stitches that have been firstly knitted. Accordingly, the side on which the next stitches are lastly knitted becomes convex, and the side on which the next stitches are firstly knitted on the opposite side becomes flat.

[0011] Also, the present invention is directed to a spacer fabric, characterized by:

a front knitted fabric:

a rear knitted fabric; and
a connecting yam that connects the front knitted fabric and the rear knitted fabric;

wherein one side of the spacer fabric is convex and the other side is flat,
tuck stitches are formed with the connecting yam alternately on stitches of the front knitted fabric and stitches of the rear knitted fabric such that the tuck stitches are formed at a pitch of a plurality of stitches both on the front knitted fabric and on the rear knitted fabric but are not formed on mutually opposing stitches, while stitches to be tucked are changed such that the tuck stitches are formed on each stitch of the front knitted fabric and the rear knitted fabric,
next stitches are knitted at a pitch of a plurality of stitches on the stitches of the front knitted fabric on which the tuck stitches have been formed, and the stitches for forming the next stitches are changed, so that the next stitches are knitted in a plurality of courses on each stitch on which the tuck stitches have been formed in the front knitted fabric,
next stitches are knitted at a pitch of a plurality of stitches on the stitches of the rear knitted fabric on which the tuck stitches have been formed, and the stitches for forming the next stitches are changed, so that the next stitches are knitted in a plurality of courses on each stitch on which the tuck stitches have been formed in the rear knitted fabric, and
the next stitches are knitted firstly on the knitted fabric on the side that is to be made flat, the next stitches are knitted lastly on the tuck stitches in the knitted fabric on the side that is to be made convex, which is connected via the connecting yam to the tuck stitches on which the next stitches are firstly knitted, and an interval between next stitches in the knitted fabric on the side that is to be made flat is made smaller than that in the knitted fabric on the side that is to be made convex.

[0012] A connecting yam extends from a tuck stitch A on which the next stitches are knitted last, to a tuck stitch B, in the knitted fabric on the opposite side facing the a tuck stitch A, on which the next stitches are knitted first. Immediately before the next stitches are knitted on the tuck stitch A, the tuck stitch B has already been released from the needles on the needles bed and is pulled toward the tuck stitch A, a prolongation between stitches knitted after the tuck stitches is placed on a prolongation between the tuck stitches A and B, the tuck stitch A is tensioned, the connecting yarn is pulled from the tuck stitch B toward the tuck stitch A, and, thus, the tuck stitch B shrinks. In this state, if next stitches are knitted on the tuck stitch A, and the tuck stitch A is released from the needles, the knitted fabric to which the tuck stitch B belongs relatively shrinks and becomes flat, and the knitted fabric to which the tuck stitch A belongs becomes relatively convex. Note that the interval between the stitches

in the knitted fabric to which the tuck stitch B belongs becomes relatively smaller, and the interval between the stitches in the knitted fabric to which the tuck stitch A belongs becomes relatively larger.

[0013] With the spacer fabric according to the present invention, convexities may be formed without a difference in material between the front knitted fabric and the rear knitted fabric. Furthermore, the convexities when only one of the front and rear knitted fabrics is convex are about twice as large as those when both the front and the rear knitted fabrics are convex. The convexities may be formed at desired positions on the front knitted fabric and the rear knitted fabric, and the portions opposite the convexities become flat. Thus, this spacer fabric is suitable for supporters, shoe soles, and the like, when it is used such that the flat side is in contact with the person's body. Furthermore, this spacer fabric is suitable for cushions, chair seats, chair backrests, back pads of backpacks, and the like, when it is used such that the convex side is in contact with the person's body. The spacer fabric according to the present invention may be convex at desired positions, and, thus, it may have a shape suiting various applications. Note that, in this specification, the description regarding the spacer fabric knitting method is directly applicable to the spacer fabric. Although the front knitted fabric is convex and the rear knitted fabric is flat in the embodiment below, a spacer fabric may be knitted that has convex portions in the front knitted fabric and flat portions in the rear knitted fabric, and, conversely, flat portions in the front knitted fabric and convex portions in the rear knitted fabric.

Brief Description of the Drawings

[0014]

FIG. 1 is a cross-sectional view of a main portion of a quilt-like fabric according to an embodiment.

FIG. 2 is a cross-sectional view of a main portion of a fabric in which both the front and the rear knitted fabrics have recesses and protrusions according to the embodiment.

FIG. 3 is a process chart showing a knitting method according to the embodiment.

FIG. 4 is a diagram showing the arrangement of a tuck stitch According to the embodiment.

FIG. 5 is a diagram schematically showing the arrangement of a tuck stitch and knit stitches caught on needles.

FIG. 6 is a photograph showing a front side of the quilt-like fabric according to the embodiment.

FIG. 7 is a photograph showing a back side of the quilt-like fabric according to the embodiment.

FIG. 8 is a photograph showing an enlarged front side of the quilt-like fabric according to the embodiment.

FIG. 9 is a photograph showing a front side of the fabric in which both the front and the rear knitted fabrics have recesses and protrusions according to the embodiment.

FIG. 10 is a photograph showing a back side of the fabric in which both the front and the rear knitted fabrics have recesses and protrusions according to the embodiment.

FIG. 11 is a photograph showing an enlarged front side of the fabric in which both the front and the rear knitted fabrics have recesses and protrusions according to the embodiment.

Description of Embodiments

[0015] Hereinafter, an optimal embodiment for carrying out the present invention will be described.

Embodiment

[0016] FIGS. 1 to 11 show the embodiments. FIG. 1 shows a quilt-like spacer fabric 2 in which one of the front and the rear knitted fabrics has recesses and protrusions and the other knitted fabric is flat, where 4 denotes a front knitted fabric that has recesses and protrusions, 6 denotes a rear knitted fabric that is flat, and 8 denotes a cushion layer that is filled with a connecting yam made of woolly nylon, silk gut, aramid yarn, or the like between the knitted fabrics 4 and 6. In order to connect the knitted fabrics 4 and 6, stitches of the knitted fabrics 4 and 6 are linked to each other by tuck stitches. Furthermore, 10 denotes a link portion in which the front knitted fabric 4 and the rear knitted fabric 6 are knitted by rib stitches. In this portion, a knitting yam that has been used for knitting the front knitted fabric 4 is then used for knitting the rear knitted fabric 6, and a knitting yam that has been used for knitting the rear knitted fabric 6 is then used for knitting the front knitted fabric 4, thereby causing the knitting yarns of the front and the rear knitted fabrics to cross each other. Furthermore, the front knitted fabric 4 and the rear knitted fabric 6 are knitted, for example, by plain stitches in the portions other than the link portions 10. Since the link portions 10 are thin, convexities in the other portions of the front knitted fabric 4 are denoted. Note that the left and the right end portions of the front knitted fabric 4 are linked to the left and the right end portions of the rear knitted fabric 6, for example, making the whole front knitted fabric 4 and the rear knitted fabric 6 tubular.

[0017] FIG. 2 shows a spacer fabric 12 in which both the front and the rear knitted fabrics alternately have con-

vexities. In FIG. 2, the same constituent components as those in FIG. 1 are denoted by the same reference numerals. In the spacer fabric 12, the link portions 10 do not denote recesses and protrusions, but merely connect the knitted fabrics 4 and 6. Accordingly, the link portions 10 may not be provided.

[0018] FIG. 3 shows a method for knitting the spacer fabrics 2 and 12, where FB denotes a front needles bed of a flat knitting machine used for knitting, and BB denotes a rear needles bed. Each of the needle beds FB and BB has a large number of needles, and a spacer fabric is knitted by causing a carriage (not shown) to travel back and forth on the needle beds FB and BB and operate the needles. Furthermore, a connecting yarn and a knitting yam, which is used to knit stitches, are fed from carriers (not shown) of the flat knitting machine. In FIG. 3, numerals 1 to 4 indicate the course number when knitting next stitches on tuck stitches. For example, "1" indicates knitting of the next stitches in the course S 1. In FIG. 3, 10 in the lowermost portion indicates an area that will be formed into the link portion 10. The number of carriers that feed the connecting yam and the knitting yam may be freely selected, and, for example, one carrier may be allocated to each yam type, or four carriers may be allocated to each yam type, for example.

[0019] After stitches for one row are knitted both in the front and the rear knitted fabrics, a connecting yarn is inserted into a gap between the front and the rear knitted fabrics by forming tuck stitches with the connecting yam on each stitch of the front and the rear knitted fabrics. For example, the tuck stitches are formed on every four stitches alternately on the front and the rear knitted fabrics, that is, as a whole, the tuck stitches are formed in an eight stitch cycle such that tuck stitches is formed on a knitted fabric on the same side on every eight stitches. Tuck courses are repeatedly knitted such that, for example, one to three tuck stitch are formed on each stitch. Note that, in this specification, a "course" refers to one travel of a carriage. When the tuck courses are completed, one next stitches are formed by performing a knit on each of the stitches on which tuck stitches have been formed, and, thus, the tuck stitches are released from the needles. The next stitches are knitted, for example, in four courses. For example, next stitches are knitted in the first knit course S1 on stitches with the reference numeral 1 attached thereto, next stitches are knitted in the course S2 on stitches with the reference numeral 2 attached thereto, next stitches are knitted in the course S3 on stitches with the reference numeral 3 attached thereto, and next stitches are knitted in the last knit course S4 on stitches with the reference numeral 4 attached thereto. The knitted fabrics are knitted by plain stitches in the portions other than the link portions 10. In the courses S1 to S4, in the portions other than the link portions 10, stitches are knitted on every other stitch in the same knitted fabric, for example. Here, the next stitches may be knitted, for example, in six courses.

[0020] The state after the course S4 in FIG. 3 is the same as the state after stitch formation in the lowermost portion in FIG. 3. The cycle from the tuck courses to the course S4 is repeated such that tuck courses are performed first, and the courses S 1 to S4 are then knitted. In each cycle, for example, one next stitch and two tuck stitches are formed on each stitch.

[0021] First stitches knitted in the course S1 and last stitches knitted in the course S4 face each other on the needle beds, and tuck stitches are formed so as to connect these stitches. Furthermore, second stitches knitted in the course S2 and third stitches knitted in the course S3 face each other on the needle beds, and the tuck stitches are formed so as to connect these stitches.

[0022] FIG. 4 shows a state in which the tuck courses have been completed in FIG. 3. The stitches knitted before the tuck stitches are caught on the needles, but are not shown in this drawing. Respective needles 20 have caught, for example, two tuck stitches t1 to t4. Note that each needle may have one tuck stitch, three tuck stitches, or the like, instead of two tuck stitches. The tuck stitches t1 and the tuck stitches t4 face each other, and the tuck stitches t2 and the tuck stitches t3 face each other. The connecting yarns 22 and 24make tuck stitches, for example, on every four stitches alternately on the front and the rear knitted fabrics, but may make tuck stitches on every two stitches, every six stitches, or the like.

[0023] FIG. 5 shows a state immediately before the last knit course S4 in FIG. 3, where 26 denotes stitches knitted in the course S1, 27 denotes stitches knitted in the course S2, and 28 denotes stitches knitted in the course S3. Two tuck stitches t4 are caught together with one stitch on the needles 20, but, in this drawing, only one tuck stitch is shown. Furthermore, p3 denotes a prolongation between the stitches 28,28, and this prolongation is over the stitches 26 because they were formed after the stitches 26.

[0024] The tuck stitch t1 and the tuck stitch t4 are connected to each other via the connecting yam, and the tuck stitch t2 and the tuck stitch t3 are connected to each other via the connecting yam. In the steps of knitting stiches on tuck stitches (S1 to S4 in FIG. 3), first, the first stitches 26 are knitted on tuck stitches t1, and then the stitches 27 and 28 are respectively formed on the tuck stitches t2 and t3. At the point of time shown in FIG. 5, the tuck stitches t4 are caught on the needles 20, and, thus, the tuck stitches t1 connected thereto are pulled toward the tuck stitches t4. Furthermore, on the prolongation between the tuck stitches t1 and the tuck stitches t4, prolongations p2 between the stitches 27,27 knitted on the tuck stitches t2 and prolongations p3 between the stitches 28,28 knitted on the tuck stitches t3 are placed. Accordingly, the tuck stitches t4 are tensioned, the connecting yarns are pulled into the tuck stitches t4 from the tuck stitches t1 that have been already released from the needles due to formation of the stitches 26, and, thus, the tuck stitches t1 shrink. In this state, if stitches are knitted on the tuck stitches t4, and the tuck stitches t4 are released from the needles, the knitted fabric to which

the tuck stitches t1 belong relatively shrinks and becomes flat, and the knitted fabric to which the tuck stitches t4 belong becomes relatively convex. The knitted fabric having the tuck stitches t4 is made greatly convex as follows. When knitting stitches on tuck stitches in the courses S1 to S4 in FIG. 3, pairing the mutually connected tuck stitches t1 and tuck stitches t4 and the mutually connected tuck stitches t2 and tuck stitches t3, knitting stitches firstly on the tuck stitches t1, and knitting stitches lastly on the tuck stitches t4.

[0025] Which knitted fabric of the front and the rear knitted fabrics is to be made convex is determined based on the arrangement of the tuck stitches t1 and t4, in particular, the tuck stitches t4, and, thus, a knitted fabric on a desired side is convex at desired positions. Furthermore, convexities are about twice as large when one side of the spacer fabric is convex, as those when both the knitted fabrics are convex. The front and the rear knitted fabrics may be, for example, knitted using knitting yarns made of the same material according to the same knitting conditions such as the same loop length and the same number of stitch rows. Note that, however, the front and the rear knitted fabrics may be knitted using knitting yarns made of different materials according to different knitting conditions.

[0026] FIGS. 6 to 8 show a spacer fabric having the structure in FIG. 1. The front side shown in FIG. 6 is provided with recesses and protrusions, and convexities of the recesses and the protrusions are emphasized by the thin link portions, whereas the back side shown in FIG. 7 is flat. FIG. 8 shows an enlarged front side of the spacer fabric shown in FIG. 6. Note that, in FIGS. 6 and 7, the lower edge portion of the spacer fabric is a knit starting portion, which is to be removed later. The positions of the link portions 10 are shifted obliquely along the wale direction of the spacer fabric such that the link portions 10 cross each other and thus define rhombic convexities, and, thus, a quilt-like spacer fabric is formed. This spacer fabric is suitable, for example, for cushions, backrests, soles, supporters, and the like.

[0027] FIGS. 9 to 11 show a spacer fabric having the structure in FIG. 2, where both of the front and the rear knitted fabrics are provided with convex portions and flat portions, and the convex portions and the flat portions extend parallel to the wale direction. The spacer fabric in FIGS. 9 to 11 also may be used for supporters, cushions, backrests, and the like, but is most suitable for back pads of backpacks and the like because it has a high cushioning performance and a high air permeability.

List of Reference Numerals

[0028]

2, 12	Spacer fabric
4	Front knitted fabric
6	Rear knitted fabric
8	Cushion layer
10	Link portion
20	Needles
22, 24	Connecting yam
26-28	Stitch
t1-t4	Tuck stitch
p3	Prolongation

Claims

1. A knitting method for knitting a spacer fabric (2) having a front knitted fabric (4), a rear knitted fabric (6), and a connecting yam (22, 24) that connects the front knitted fabric (4) and the rear knitted fabric (6), using a knitting machine provided with at least a pair of needle beds (FB, BB) each having a plurality of needles (20), and a carriage, the method **characterized by**,

in order to knit the spacer fabric (2) in which one side of the space fabric (4, 6) is convex and the other side is flat:

a step (a) of repeatedly forming tuck stitches with the connecting yam (22, 24) alternately on stitches in the front knitted fabric (4) caught on the needles (20) and stitches in the rear knitted fabric (6) caught on the needles (20) such that the tuck stitches are formed at a pitch of a plurality of stitches along the needle beds (FB,BB) both on the front knitted fabric (4) and on the rear knitted fabric (6) but are not formed on mutually opposing stitches, while changing stitches to be tucked such that the tuck stitches are formed on each stitch of the front knitted fabric (4) and the rear knitted fabric (6);

a step (b) of knitting next stitches at a pitch of a plurality of stitches on the stitches of the front knitted fabric (4) on which the tuck stitches have been formed; and

a step (c) of knitting next stitches at a pitch of a plurality of stitches on the stitches of the rear knitted fabric (6) on which the tuck stitches have been formed;

wherein the next stitches are knitted on each stitch of the front knitted fabric (4) and the rear knitted fabric (6) on the stitches where the tuck stitches have been formed on, by repeating the step (b) and the step (c), while changing stitches for forming the next stitches, and

in the step (b) and the step (c), the next stitches are knitted firstly on the knitted fabric on the side that is to be made flat, and the next stitches are knitted lastly on the tuck stitches in the knitted fabric to be made convex, which are connected via the connecting yam (22, 24) to the tuck stitches on which the next stitches have been firstly knitted.

2. The knitting method for knitting a spacer fabric (2) according to claim 1, **characterized in that** plain portion and rib portion are formed in the step (b) and the step (c), thereby connecting the front knitted fabric (4) and the rear knitted fabric (6) to each other at the rib portion, and making the spacer fabric (2) thicker at the plain portion and thinner at the rib portion.

3. The knitting method for knitting a spacer fabric (2) according to claim 2, **characterized in that** the plain portions and the rib portions are each formed at a plurality of positions in the step (b) and the step (c), thereby connecting the front knitted fabric (4) and the rear knitted fabric (6) to each other at the plurality of positions, and shifting the positions of the rib portion along a wale direction of the spacer fabric (2) such that the positions of the rib portions are arranged oblique with respect to the wale direction and cross each other.

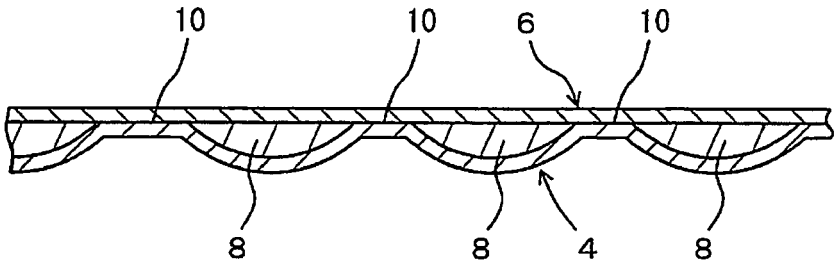
4. The knitting method for knitting a spacer fabric (2) according to any one of claims 1 to 3, **characterized in that** the next stitches are knitted on every other stitch in both the step (b) and the step (c), and, when repeating the step (b) and the step (c), the next stitches are knitted lastly on the stitches the tuck stitches opposing the next stitches that have been firstly knitted.

5. A spacer fabric (2), **characterized by**:

a front knitted fabric (4):

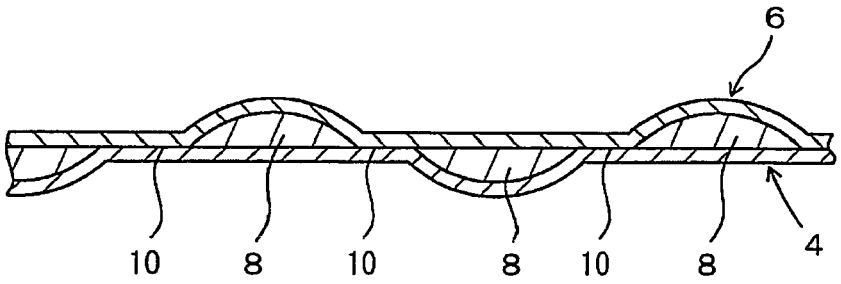
a rear knitted fabric (6); and
a connecting yam (22, 24) that connects the front knitted fabric (4) and the rear knitted fabric (6);
wherein one side of the space fabric (4, 6) is convex and the other side is flat,
tuck stitches are formed with the connecting yam (22, 24) alternately on stitches of the front knitted fabric (4) and stitches of the rear knitted fabric (6) such that the tuck stitches are formed at a pitch of a plurality of stitches of both on the front knitted fabric (4) and on the rear knitted fabric (6) but are not formed on mutually opposing stitches, while stitches to be tucked are changed such that the tuck stitches are formed on each stitch of the front knitted fabric (4) and the rear knitted fabric (6),
next stitches are knitted at a pitch of a plurality of stitches on the stitches of the front knitted fabric (4) on which the tuck stitches have been formed, and the stitches for forming the next stitches are changed, so that the next stitches are knitted in a plurality of courses on each stitch on which the tuck stitches have been formed in the front knitted fabric (4),
next stitches are knitted at a pitch of a plurality of stitches on the stitches of the rear knitted fabric (6) on which the tuck stitches have been formed, and the stitches for forming the next stitches are changed, so that the next stitches are knitted in a plurality of courses on each stitch on which the tuck stitches have been formed in the rear knitted fabric (6), and
the next stitches are knitted firstly on the knitted fabric to be made flat, the next stitches are knitted lastly on the tuck stitches in the knitted fabric to be made convex, which are connected via the connecting yam (22, 24) to the tuck stitches on which the next stitches are firstly knitted, and an interval between next stitches in the knitted fabric to be made flat is made smaller than that in the knitted fabric to be made convex.

FIG. 1



2

FIG. 2



12

FIG. 3

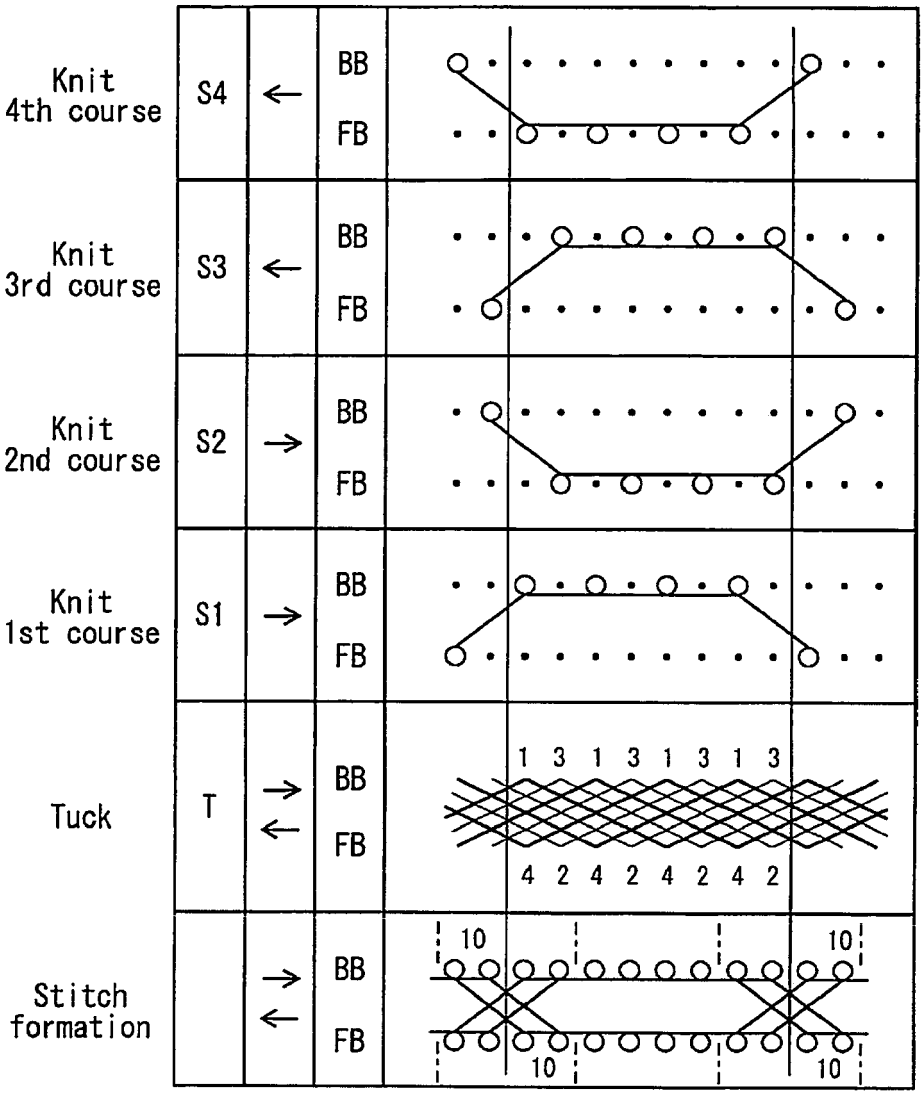
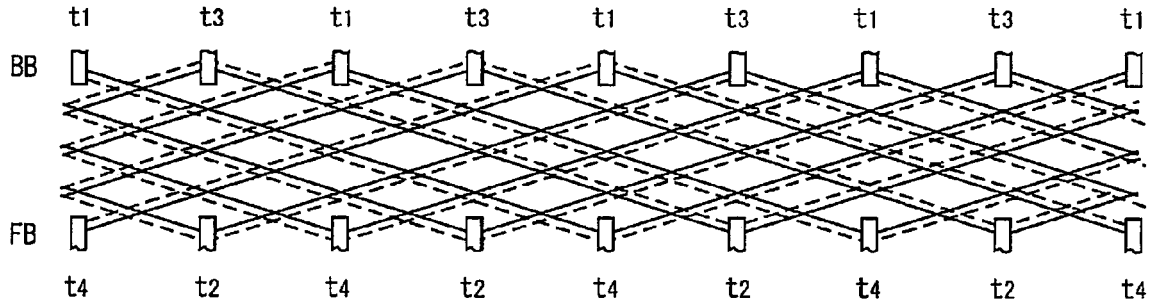

Knit
4th course
S4
BB
FB
Knit
3rd course
S3
BB
FB
Knit
2nd course
S2
BB
FB
Knit
1st course
S1
BB
FB
Tuck
T
BB
FB
1 3 1 3 1 3 1 3
4 2 4 2 4 2 4 2
Stitch
formation
BB
FB
10
10
10
10

FIG. 4



: 20 Needle

t1 ~ t4 : Tuck portion

——— : 22 Connecting yarn

---- : 24 Connecting yarn

FIG. 5

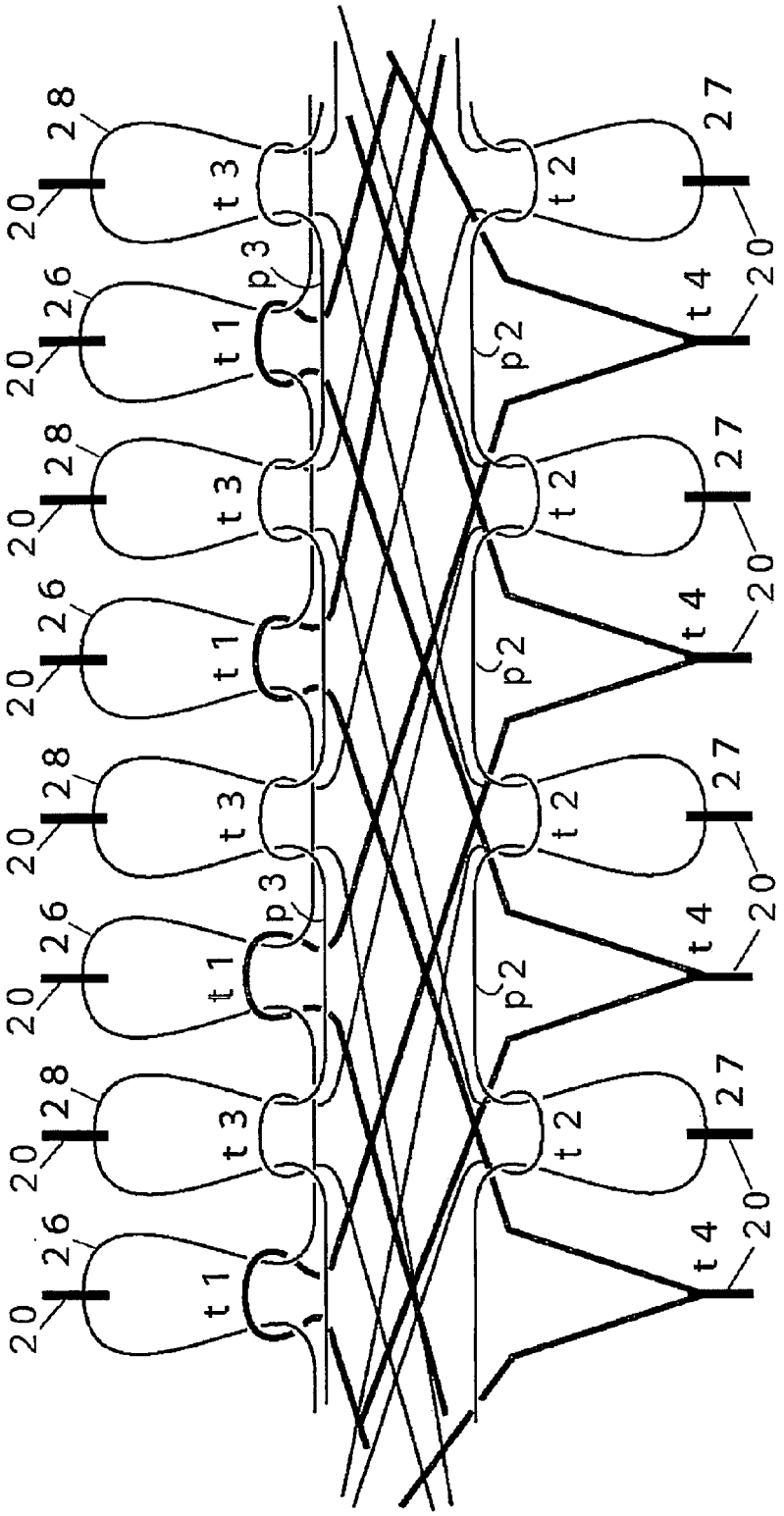


FIG. 6

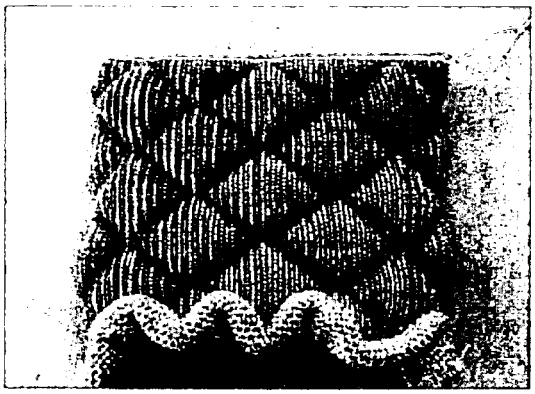


FIG. 7

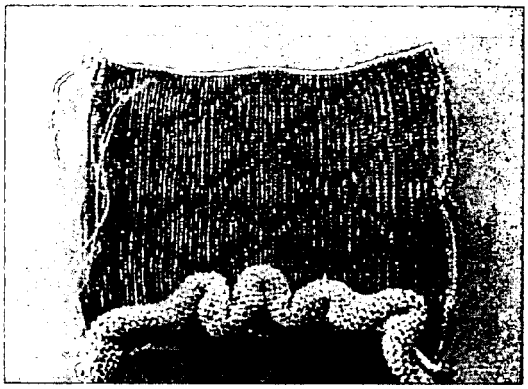


FIG. 8

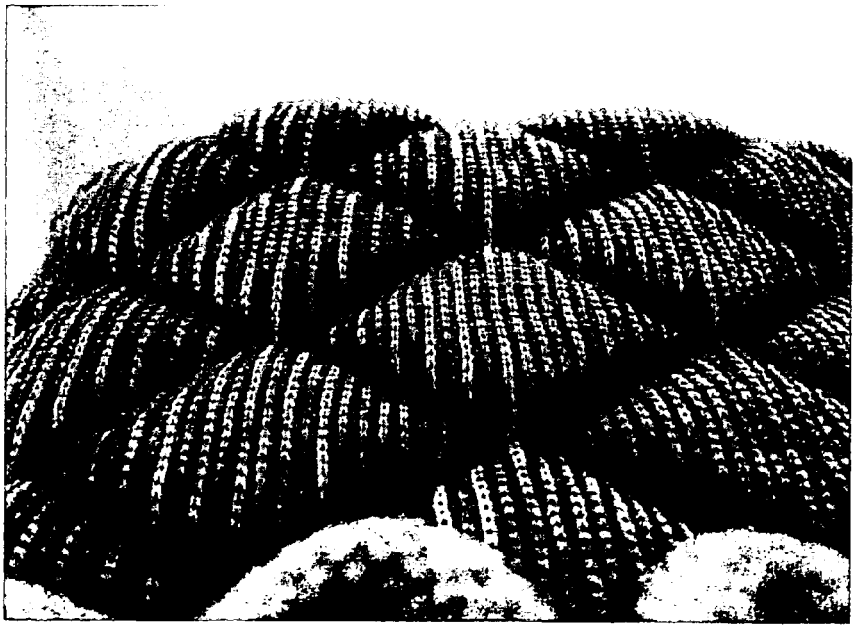


FIG. 9

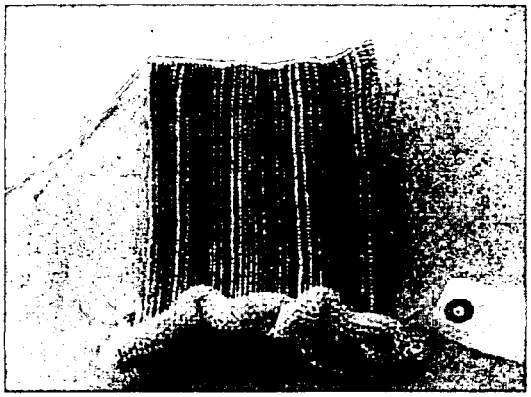


FIG. 10

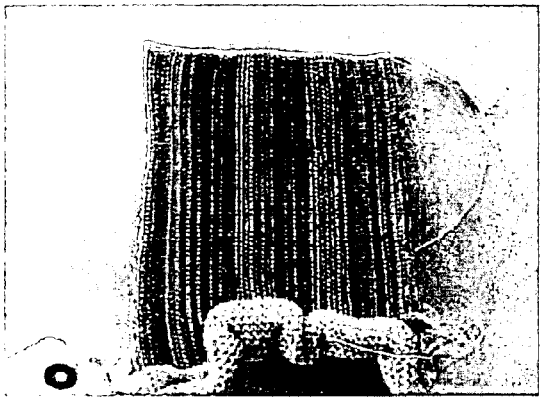
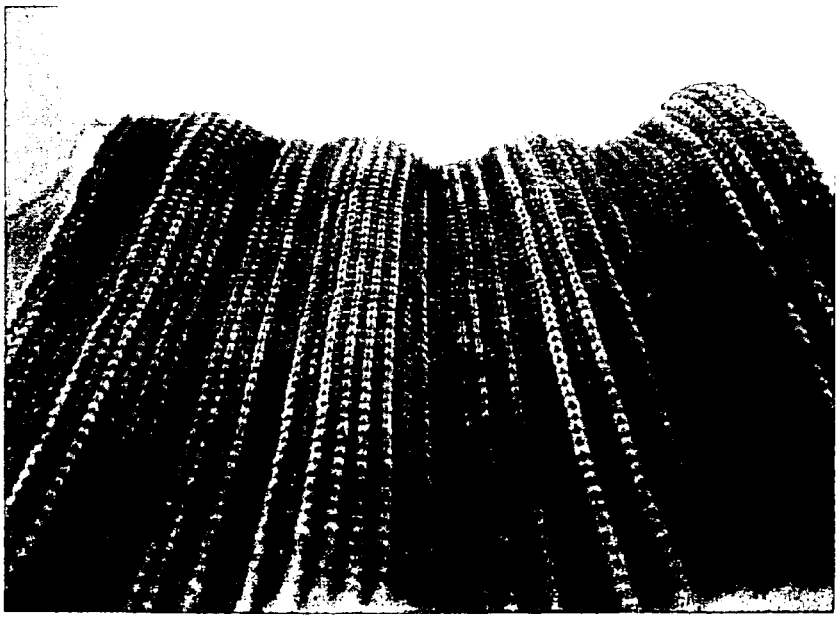


FIG. 11



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004107800 A **[0002] [0003]**
- JP S52108377 U **[0002] [0003]**