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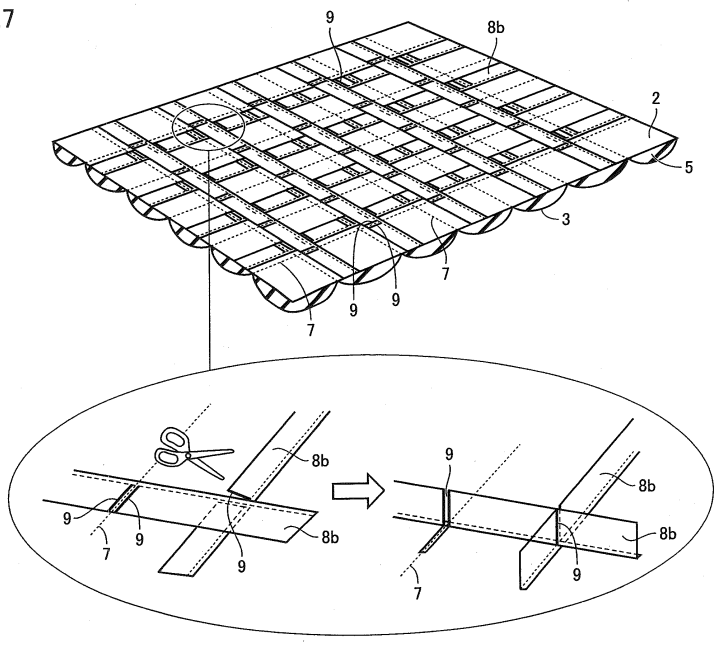
(54) **MULTI-LAYER-TYPE BED COVERING AND MANUFACTURING METHOD FOR SAME**

(57) Provided is a multilayer-type comforter having at least three fabrics as first to third fabrics. A first raw material (4) is interposed between the first fabric (1) and the second fabric (2). A second raw material (5) is interposed between the second fabric (2) and the third fabric (3). The first fabric (1) and the second fabric (2) are joined by a baffle-box quilting (6). The second fabric (2) and the third fabric (3) are joined by a sewn-through quilting (7). The baffle-box quilting (6) and the sewn-through quilting (7) are different in arrangement. A baffle (8b) of the baffle-box quilting (6) formed on the second fabric (2) is sewn to the second fabric (2) by the sewn-through quilting (7) and then cut to stand up from the second fabric (2).

FIG.7



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Description

TECHNICAL FIELD

[0001] The present invention relates to a multilayer-type comforter and a method for manufacturing the same.

BACKGROUND ART

[0002] Examples of this type of multilayer-type comforter are described in Patent Documents 1 to 4. In the case of a two-layer-type feather comforter, for example, these conventional comforters have three fabrics, namely, an outer fabric, an interlining and a backing fabric. Feathers are disposed between the outer fabric and the interlining. A filling material is disposed between the interlining and the backing fabric. The outer fabric and the interlining are joined by baffle-box quilting, and the interlining and the backing fabric are joined by sewn-through quilting.

CITATION LIST

PATENT DOCUMENT

[0003]

PTD 1: Japanese Patent Laying-Open No. 60-190914
PTD 2: Japanese Patent Laying-Open No. 7-275100
PTD 3: Japanese Patent Laying-Open No. 10-155623
PTD 4: Utility Model Registration No. 3138780

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0004] In the comforters described in Patent Documents 1 to 4, when it is intended to displace the sewn-through quilting and the baffle-box quilting, baffles should be spaced apart widely or a large slit has to be formed in each baffle in advance so as to prevent the sewn-through quilting from sewing the baffles of the baffle-box quilting to lay them down.

[0005] Therefore, the operation of arranging baffles takes time and effort, and airtight independency of quilt boxes is impaired because the baffles are spaced apart substantially widely in advance.

SOLUTION TO PROBLEM

[0006] An object of the present invention is to solve the above-described problems of the conventional technique, and a multilayer-type comforter having at least three fabrics as first to third fabrics, a first raw material being interposed between the first fabric and the second fabric, a second raw material being interposed between the second fabric and the third fabric, the first fabric and the second fabric being joined by a baffle-box quilting with a baffle interposed therebetween, the second fabric and the third fabric being joined by a sewn-through quilting, the baffle-box quilting and the sewn-through quilting being different in arrangement is characterized in that the baffle formed on the second fabric is sewn to the second fabric by the sewn-through quilting and then cut to stand up from the second fabric.

[0007] Preferably, the first raw material is a blown filling, and the second raw material is a sheet-like filling material.

[0008] Preferably, the first fabric and the third fabric are different in air permeability.

[0009] Preferably, stitches of the sewn-through quilting reach the periphery of the third fabric by quilting on a comforter sewing machine.

[0010] Preferably, at least part of the sewn-through quilting can be made curvilinear.

[0011] Preferably, the horizontal interval of the sewn-through quilting is made wider at the right and left sides and narrower at the center, and the horizontal interval of the baffle-box quilting is made wider at the center and narrower at the right and left sides.

[0012] Preferably, the blown filling is a short fibrous raw material, such as feathers, granulated wool, or polyester.

[0013] Preferably, the sheet-like filling material is one of a sheet-like cotton material obtained by bringing short fiber cotton into the state where cotton fibers are entangled together by carding, needle punch or the like and a filling material obtained by shaping long fibers, such as floss silk fibers or polyester long fibers, into the form of a sheet.

[0014] A fourth fabric is disposed on the outside of the first fabric, the second raw material is interposed between the first fabric and the fourth fabric, and the first fabric and the fourth fabric can be joined by the sewn-through quilting.

[0015] The first raw material and the second raw material can be a blown filling.

[0016] A method for manufacturing a multilayer-type comforter of the present invention having at least three fabrics as first to third fabrics, a first raw material being interposed between the first fabric and the second fabric, a second raw material being interposed between the second fabric, and the third fabric, the first fabric and the second fabric being joined by a baffle-box quilting with a baffle interposed therebetween, the second fabric and the third fabric being joined by a sewn-through quilting, the baffle-box quilting and the sewn-through quilting being different in arrangement is characterized in that the baffle formed on the second fabric is sewn to the second fabric by the sewn-through quilting and then cut to stand up from the second fabric.

[0017] The sewn-through quilting can be sewn on a comforter sewing machine.

ADVANTAGEOUS EFFECTS OF INVENTION

[0018] According to the present invention, the operation of arranging baffles of a baffle-box quilting is facilitated, and airtight independency of quilt boxes is not impaired.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

Fig. 1 is a perspective view of a two-layer-type comforter showing an embodiment of the present invention.

Fig. 2 is a transverse cross sectional view of the comforter shown in Fig. 1.

Fig. 3 is a longitudinal sectional view of the comforter shown in Fig. 1.

Fig. 4 is a perspective view of the step of attaching a baffle tape to a second fabric.

Fig. 5 is a perspective view showing the step of overlapping the second fabric, a second raw material and a third fabric.

Fig. 6 is a perspective view of a semi-finished product obtained by subjecting the article in which the second fabric, the second raw material and the third fabric overlap one another to sewn-through quilting on a comforter sewing machine and cutting the periphery.

Fig. 7 shows a perspective view of the step of cutting a baffle tape and an enlarged view of its principal part.

Fig. 8 is a perspective view showing the state in which baffles are raised.

Fig. 9 is an exploded perspective view showing the step of joining a first baffle and a second baffle.

Fig. 10 is a perspective view of a principal part showing formation of filling openings for blowing.

Fig. 11 is a perspective view showing the step of filling a first raw material into boxes between a first fabric and the second fabric.

Fig. 12 is a plan view of a third fabric having a curvilinear sewn-through quilting showing another embodiment of the present invention.

Fig. 13 is a sectional view of the two-layer-type comforter showing another embodiment of the present invention.

Fig. 14 shows a wearing state of the comforter shown in Fig. 13.

Fig. 15 is a sectional view of a three-layer-type comforter showing another embodiment of the present invention.

Fig. 16 is a flowchart showing another embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0020] Embodiments of the present invention will be described hereinafter with reference to the drawings. It is noted that the drawings are schematic.

[0021] Fig. 1 shows a two-layer-type comforter shown as an example of a multilayer-type comforter. Figs. 2 and 3 show cross sections of the two-layer-type comforter.

[0022] The two-layer-type comforter has three fabrics, namely, first to third fabrics 1, 2 and 3. First fabric 1 is an outer fabric, second fabric 2 is an interlining, and third fabric 3 is used as a backing fabric. Therefore, third fabric 3 is generally in contact with a human body. However, first fabric 1 can also be used in a manner contacting a human body depending on the season. A first raw material 4 is disposed between first fabric 1 and second fabric 2. A second raw material 5 is disposed between second fabric 2 and third fabric 3. First fabric 1 and second fabric 2 are joined by a baffle-box quilting 6. Second fabric 2 and third fabric 3 are joined by a sewn-through quilting 7. Baffle-box quilting 6 and sewn-through quilting 7 are different in arrangement.

[0023] The above-mentioned "sewn-through quilting 7" directly sews fabrics. The above-mentioned "baffle-box quilting 6" joins fabrics with a baffle 8 interposed therebetween, and can leave a wide space between first fabric 1 and second fabric 2. A first baffle 8a sewn or adhered to the rear surface of first fabric 1 and a second baffle 8b sewn or adhered to the upper surface of second fabric 2 are sewn or adhered to each other to join first fabric 1 and second fabric 2. Second baffle 8b of the baffle-box quilting formed on second fabric 2 is sewn to second fabric 2 by sewn-through quilting 7 and then cut to stand up from second fabric 2.

[0024] It is noted that a well-known technique described in Japanese Patent Laying-Open No. 7-136052 can be used for adhesion of baffles.

[0025] First raw material 4 is a blown filling. Second raw material 5 is a sheet-like filling material. However, second raw material 5 can also be a blown filling similar to the first raw material.

[0026] The blown filling is a short fibrous raw material, such as feathers, granulated wool, or polyester. More specifically, the sheet-like filling material is a sheet-like cotton material obtained by bringing short fiber cotton into the state where cotton fibers are entangled together by carding, needle punch or the like, or a filling material obtained by shaping long fibers, such as floss silk fibers or polyester long fibers, into the form of a sheet.

[0027] In this embodiment, first raw material 4 shall be feathers. For example, it is composed of 85% down and 15% feathers. Second raw material 5 is absorbent, heat-releasable cotton composed of 50% polyester and 50% cellulosic fiber, for example, and is formed in the form of carded filling.

[0028] First fabric 1 and third fabric 3 shall be different in air permeability. For example, first fabric 1 has an air permeability of 1.5 $cm^3/cm^2 \cdot s$, and third fabric 3 has an air permeability of 3.5 $cm^3/cm^2 \cdot s$.

[0029] Thus setting the air permeability of first fabric 1 at 1.5 $cm^3/cm^2 \cdot s$ plays a role to prevent the feathers as first raw material 4 from being blown off and to prevent

heat from escaping from the upper part of the comforter. By setting the air permeability of third fabric 3 at 3.5 $cm^3/cm^2 \cdot s$, insensible perspiration from a human body is likely to pass through third fabric 3, which improves second raw material 5 in absorbency and heat release capability. Thus, the effect of reducing humidity in a bed can be obtained.

[0030] It is noted that the above-described air permeabilities are merely examples, and fabrics of the same air permeability can be used for first fabric 1 and third fabric 3. When first fabric 1 and third fabric 3 should be different in air permeability, it is preferable to set first fabric 1 at 0.5 to 3.0 $cm^3/cm^2 \cdot s$, third fabric 3 at 2.0 to 5.0 $cm^3/cm^2 \cdot s$, and the difference in air permeability between first fabric 1 and third fabric 3 at more than or equal to 1.0 $cm^3/cm^2 \cdot s$.

[0031] Figs. 4 to 11 are drawings showing manufacturing steps of the above-described two-layer-type comforter.

[0032] As shown in Fig. 4, baffle tape 8b is attached to the upper surface of the interlining which is second fabric 2. Baffle tape 8b is sewn lengthwise and crosswise such that 5×6 boxes are formed, for example. This baffle tape 8b constitutes above-described second baffle 8b. Similarly, baffle tape 8a is also sewn on the rear surface side of first fabric 1 such that 5×6 boxes are formed (see Fig. 9).

[0033] It is noted that boxes are not limited to 5 × 6, but can be patterned infinitely as, for example, 3 × 5.

[0034] As shown in Fig. 5, absorbent, heat releasable carded filling as second raw material 5 is disposed between second fabric 2 and third fabric 3, so that three overlap one another.

[0035] Although not shown, second fabric 2, second raw material 5 and third fabric 3 overlapping one another are affixed on a sewing table of a comforter sewing machine. This affixing is accomplished by holding the peripheries of the fabrics with clips provided around the sewing table. For a grip margin of the clips, second fabric 2 and third fabric 3 have been cut out to be slightly larger than the dimensions of a comforter product. For example, if product dimensions are 150 × 210 cm, fabrics 2 and 3 are cut out into 160 × 221 cm.

[0036] Next, sewn-through quilting 7 is made on a comforter sewing machine. That is, 6 × 7 boxes are quilted. This sewn-through quilting 7 is made at a position displaced from the arrangement of baffle tape 8b. Therefore, stitches of sewn-through quilting 7 will sew baffle tape 8b.

[0037] It is noted that boxes of the sewn-through quilting are not limited to the above-described 6 × 7 pattern, but can be patterned infinitely.

[0038] Then, the fabrics are removed from the sewing table, and the grip-margin portion on the peripheries of the fabrics is cut away.

[0039] Fig. 6 shows a semi-finished product from which the peripheries have been cut away. In this state, baffle tape 8b is laid down on the upper surface of second fabric 2, since baffle tape 8b has been sewn by sewn-through quilting 7. Moreover, since the grip margin has been cut away, the stitches of sewn-through quilting 7 reach the peripheries of fabrics 2 and 3.

[0040] As shown in Fig. 7, overlapping portions of baffle tapes 8b and 8b as well as portions sewn by sewn-through quilting 7 are cut with scissors, a cutter knife, or the like to form incised parts 9. Baffles 8b can stand up from the surface of second fabric 2 by way of these incised parts 9.

[0041] Since incised parts 9 are formed after sewing of sewn-through quilting 7, the spacing between incised parts 9 can be narrowed as much as possible, which ensures airtight independency of quilt boxes. Baffle tape 8b is cut to raise baffles after forming sewn-through quilting 7, which means the arrangement and sewing of baffle tape 8b can be carried out freely without being restricted by sewn-through quilting 7. This facilitates the operation of arranging baffles of the baffle-box quilting.

[0042] Fig. 8 shows the state in which second baffles 8b are raised. Baffles 8b of baffle-box quilting 6 formed on second fabric 2 are sewn to second fabric 2 by sewn-through quilting 7, and then cut to stand up from second fabric 2.

[0043] As shown in Fig. 9, first baffle 8a formed on the lower surface of first fabric 1 and second baffle 8b are sewn together.

[0044] As shown in Fig. 10, the outer peripheries of first fabric 1, second fabric 2 and third fabric 3 are sewn together. On this occasion, the outer peripheries are partly not sewn to form filling openings 10 at which the first raw material is to be blown.

[0045] As shown in Fig. 11, a nozzle 11 is inserted into above-described filling opening 10, and a given amount of feathers as first raw material 4 is blown to fill the boxes formed between first fabric 1 and second fabric 2. Finally, filling openings 10 are sewn to complete the two-layer-type feather comfort shown in Fig. 1.

[0046] It is noted that although the sewn-through quilting is made on a comforter sewing machine in the above-described embodiment, this is not a limitation, but it may be made on a lock stitch sewing machine. It is also possible to make only longitudinal lines of the sewn-through quilting on a comforter sewing machine and to make horizontal lines of the sewn-through quilting on a lock stitch sewing machine.

[0047] Fig. 12 shows another embodiment of the present invention in which sewn-through quilting 7 formed on third fabric 3 has a curvilinear shape unlike the linear quilting of the above-described embodiment. This sewn-through quilting 7 is made in a curvilinear shape or the shape of a broken line extending from the circumference of the comforter to the inner side toward the center but not reaching the center. As the shape of this sewn-through quilting 7, the shape described in Japanese Patent Laying-Open No. 2003-339501 can be adopted. The remaining configuration is the same as that of the above-described embodiment.

[0048] The fit to the body is improved by shaping sewn-

through quilting 7 to at least partially include a curve.

[0049] Also in this embodiment, baffles of the baffle-box quilting formed on the second fabric is sewn to the second fabric by sewn-through quilting 7, and then cut to stand up from the second fabric. Therefore, even if sewn-through quilting 7 of any shape is adopted, the operation of arranging baffles will not become difficult. That is, regardless of the shape of sewn-through quilting 7, baffles of the baffle-box quilting can be arranged easily.

[0050] Fig. 13 shows another embodiment of the present invention. The horizontal interval of sewn-through quilting 7 formed on third fabric 3 is made wider at the right and left sides and narrower at the center than at the right and left sides. The horizontal interval of above-described baffle-box quilting 6 is made wider at the center and narrower at the right and left sides than at the center. More specifically, sewn-through quilting 7 is formed to provide 5 $\times$ 7 boxes, and baffle-box quilting 6 is formed to provide 5 $\times$ 6 boxes.

[0051] In this manner, the quilting on the lower layer part to be in contact with the human body is arranged to be wider on both the sides and narrower toward the center, and in contrast, the quilting on the upper layer part is arranged to be narrower on both the sides and wider toward the center. Accordingly, as shown in Fig. 14, the effect of increasing the likelihood that the comforter fits the human's body because the quilting is narrow at the center of the lower layer part while not impairing the warmth retaining property of the part just above the body because the quilting is narrow at the center of the upper layer part where a relatively large amount of filling is filled can be obtained.

[0052] Fig. 15 shows a three-layer-type feather comforter. A fourth fabric 12 is disposed on the outside of first fabric 1 of the two-layer-type comforter shown in Fig. 1. Second raw material 5 is interposed between this first fabric 1 and fourth fabric 12. First fabric 1 and fourth fabric 12 are joined by sewn-through quilting 7. The remaining configuration is the same as that of the above-described embodiment.

[0053] Fig. 16 shows flowcharts in the case of using a blown filling for the second raw material.

[0054] As shown in Fig. 16 at (a), second fabric 2 and third fabric 3 are aligned to each other. As shown in Fig. 16 at (b), vertical lines of sewn-through quilting 7 are made on a comforter sewing machine or a lock stitch sewing machine. A single horizontal line of sewn-through quilting 7 is made at the section near the center. In order to blow a filling from the upper and lower sides toward the center, respectively, filling openings 10 are left open at the upper and lower sides. The horizontal sides at which filling is not carried out are sewn together. The filling is blown from both the upper and lower sides with blowing nozzle 11. As shown in Fig. 16 at (c), filling openings 10 are closed after filling. After leveling the filling uniformly, horizontal lines of sewn-through quilting 7 are made.

[0055] Thereafter, steps similar to those shown in and after Fig. 7 are performed.

[0056] In this embodiment, although the first raw material and the second raw material are the same blown filling, specific examples thereof can be different. For example, the first raw material can be feathers, and the second raw material can be a short fibrous raw material, such as polyester.

[0057] It should be understood that the embodiments disclosed herein are illustrative and non-restrictive in every respect. The scope of the present invention is defined by the claims not by the description of the embodiments above, and is intended to include any modification within the meaning and scope equivalent to the claims.

REFERENCE SIGNS LIST

[0058] 1 first fabric; 2 second fabric; 3 third fabric; 4 first raw material; 5 second raw material; 6 baffle-box quilting; 7 sewn-through quilting; 8 baffle (baffle tape); 8a first baffle; 8b second baffle; 12 fourth fabric.

Claims

1. A multilayer-type comforter having at least three fabrics as first to third fabrics, a first raw material (4) being interposed between said first fabric (1) and said second fabric (2), a second raw material (5) being interposed between said second fabric (2) and said third fabric (3), said first fabric (1) and said second fabric (2) being joined by a baffle-box quilting with a baffle (8) interposed therebetween, said second fabric (2) and the third fabric (3) being joined by a sewn-through quilting (7), said baffle-box quilting (6) and said sewn-through quilting (7) being different in arrangement, **characterized in that**
said baffle (8b) formed on said second fabric (2) is sewn to said second fabric (2) by said sewn-through quilting (7) and then cut to stand up from said second fabric (2).

2. The multilayer-type comforter according to claim 1, **characterized in that** said first raw material (4) is a blown filling, and said second raw material (5) is a sheet-like filling material.

3. The multilayer-type comforter according to claim 1, **characterized in that** said first fabric (1) and said third fabric (3) are different in air permeability.

4. The multilayer-type comforter according to claim 1, **characterized in that** stitches of said sewn-through quilting (7) reach the periphery of said third fabric (3) by quilting on a comforter sewing machine.

5. The multilayer-type comforter according to claim 1, **characterized in that** at least part of said sewn-through quilting (7) is made curvilinear.

6. The multilayer-type comforter according to claim 1, **characterized in that** the horizontal interval of said sewn-through quilting (7) is made wider at the right and left sides and narrower at the center, and the horizontal interval of said baffle-box quilting (6) is made wider at the center and narrower at the right and left sides.

7. The multilayer-type comforter according to claim 2, **characterized in that** said blown filling is a short fibrous raw material, such as feathers, granulated wool, or polyester.

8. The multilayer-type comforter according to claim 2, **characterized in that** said sheet-like filling material is one of a sheet-like cotton material obtained by bringing short fiber cotton into the state where cotton fibers are entangled together by carding, needle punch or the like and a filling material obtained by shaping long fibers, such as floss silk fibers or polyester long fibers, into the form of a sheet.

9. The multilayer-type comforter according to claim 1, **characterized in that** a fourth fabric (12) is disposed on the outside of said first fabric (1), said second raw material (5) is interposed between the first fabric (1) and the fourth fabric (12), and the first fabric (1) and the fourth fabric (12) are joined by the sewn-through quilting (7).

10. The multilayer-type comforter according to claim 1, **characterized in that** said first raw material (4) and said second raw material (5) are a blown filling.

11. A method for manufacturing a multilayer-type comforter having at least three fabrics as first to third fabrics, a first raw material (4) being interposed between said first fabric (1) and said second fabric (2), a second raw material (5) being interposed between said second fabric (2), and said third fabric (3), said first fabric (1) and said second fabric (2) being joined by a baffle-box quilting (6) with a baffle (8) interposed therebetween, said second fabric (2) and the third fabric (3) being joined by a sewn-through quilting (7), said baffle-box quilting (6) and said sewn-through quilting (7) being different in arrangement, **characterized in that**
said baffle (8b) formed on said second fabric (2) is sewn to said second fabric (2) by said sewn-through quilting (7) and then cut to stand up from said second fabric (2).

12. The method for manufacturing a multilayer-type comforter according to claim 11, **characterized in that** said sewn-through quilting (7) is sewn on a comforter sewing machine.

FIG.1

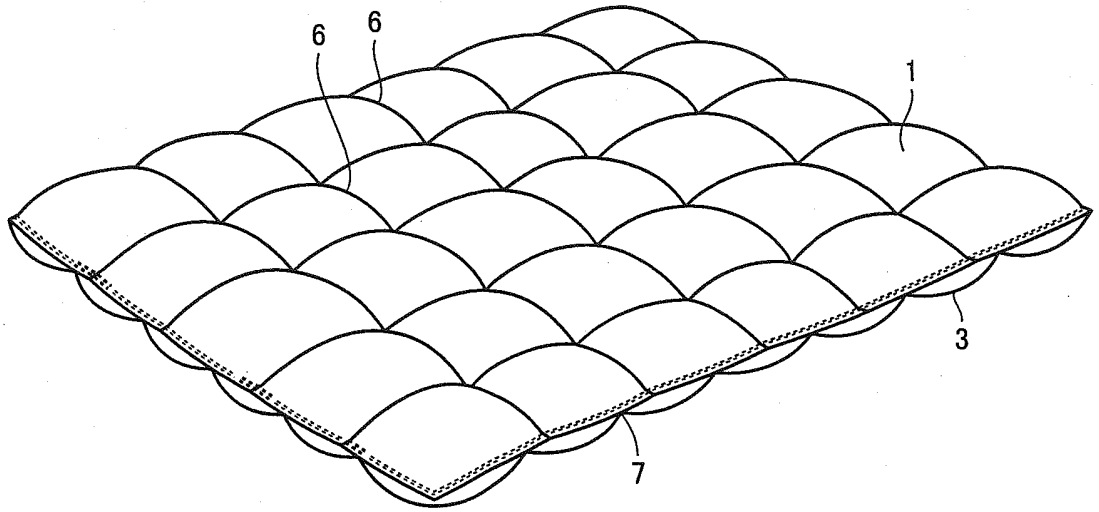


FIG.2

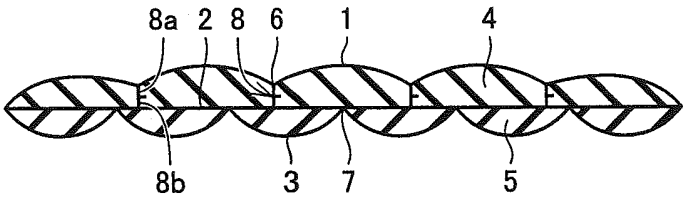


FIG.3

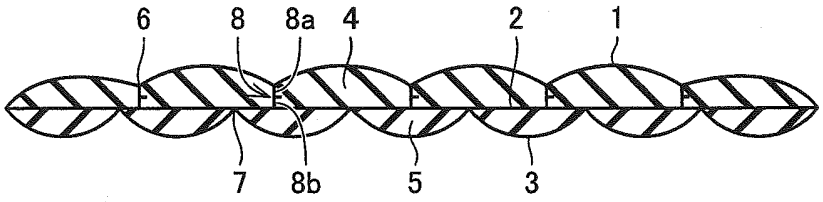


FIG.4

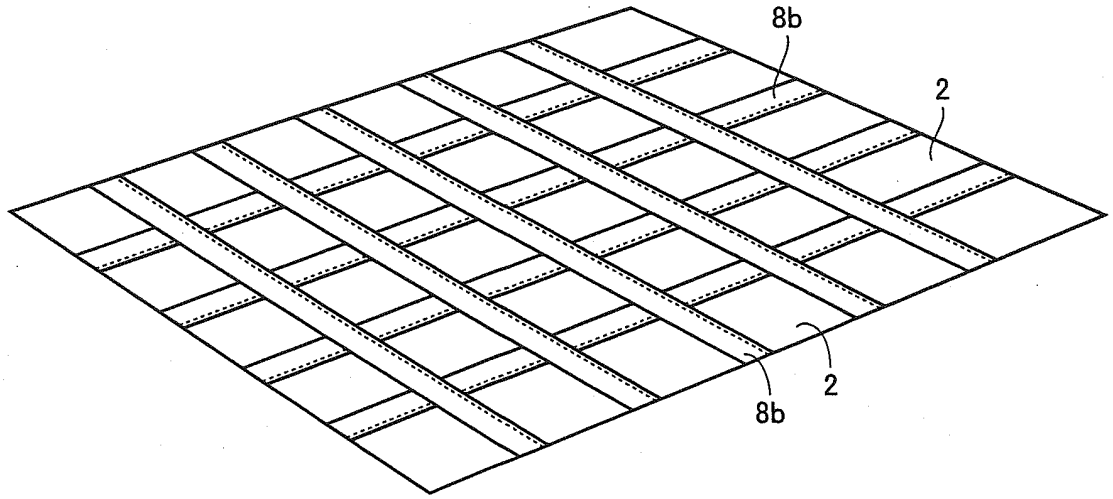


FIG.5

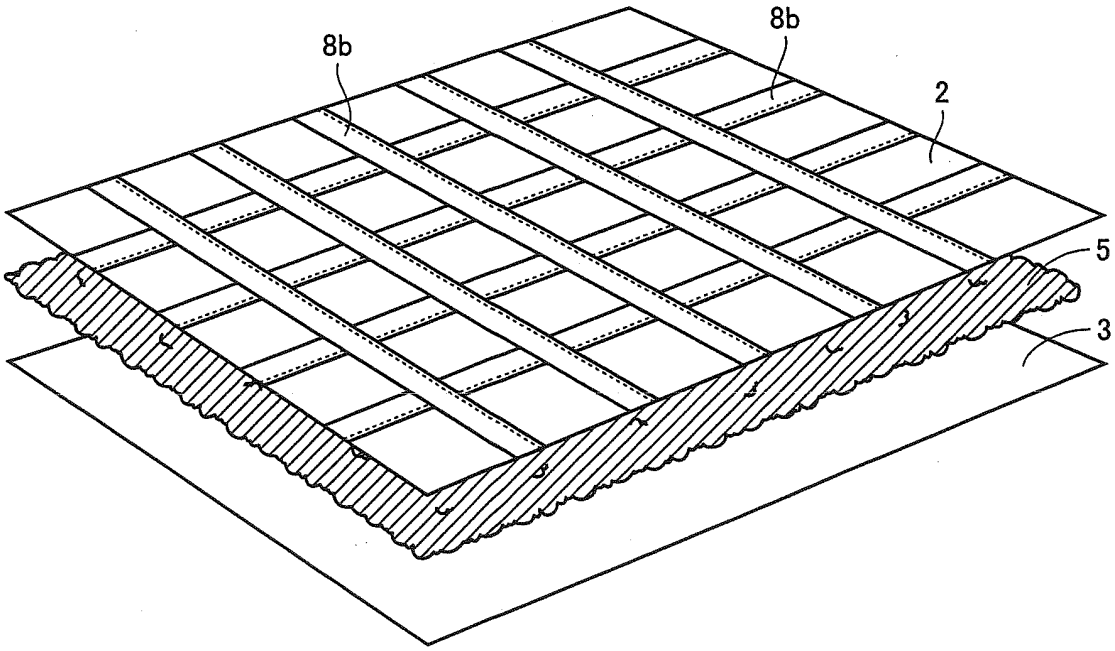
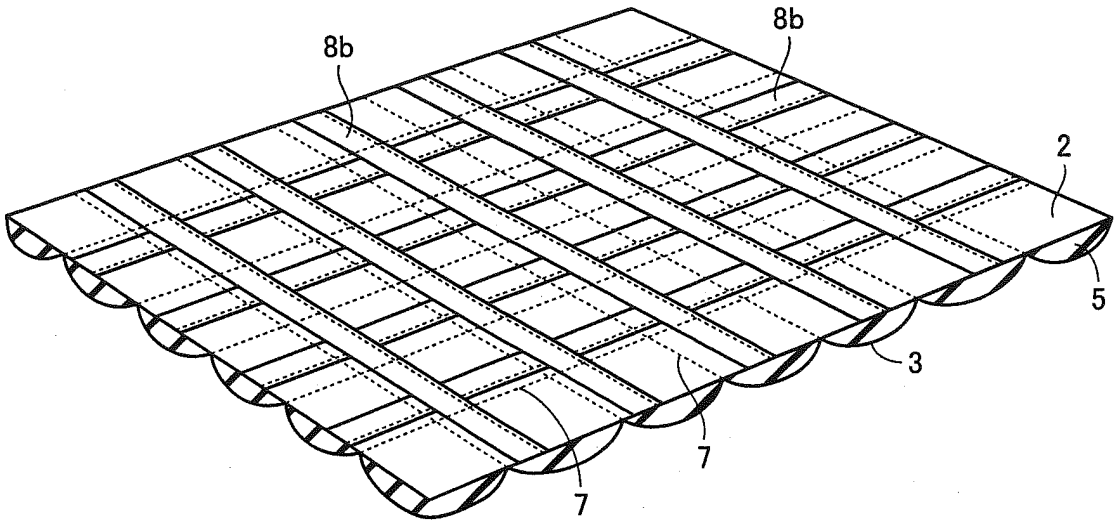


FIG.6



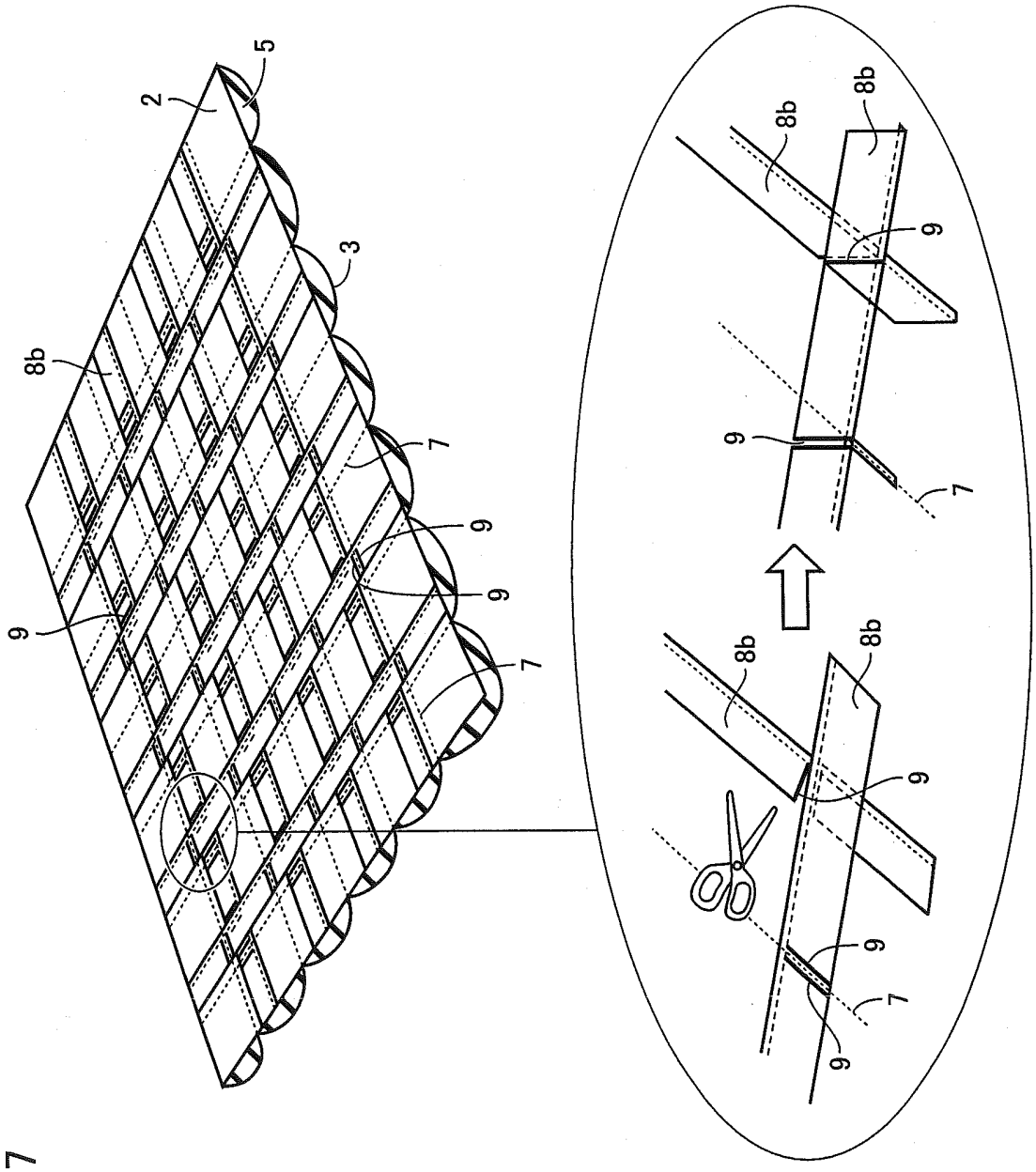


FIG.7

FIG.8

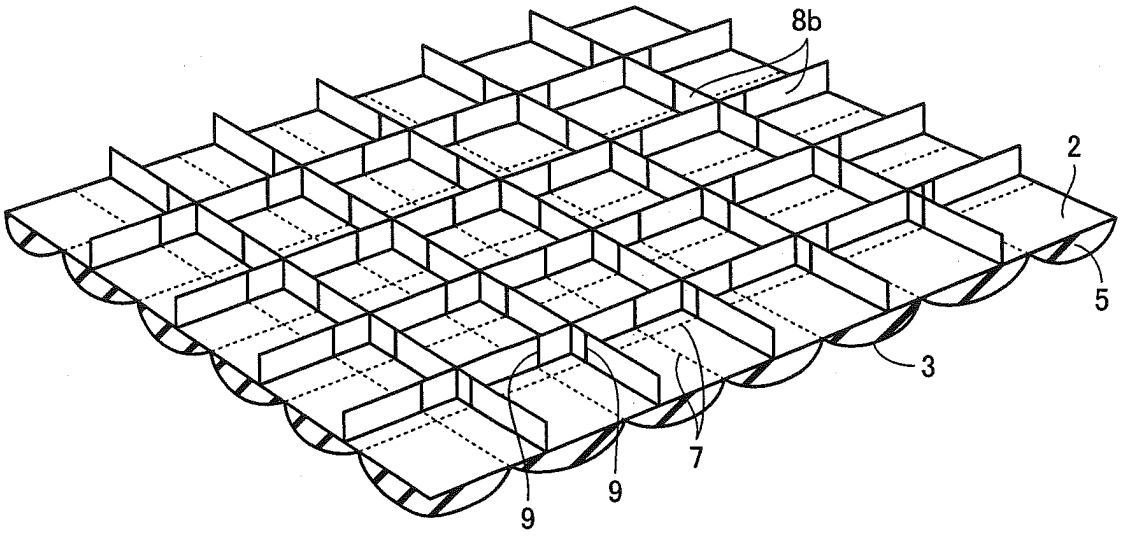


FIG.9

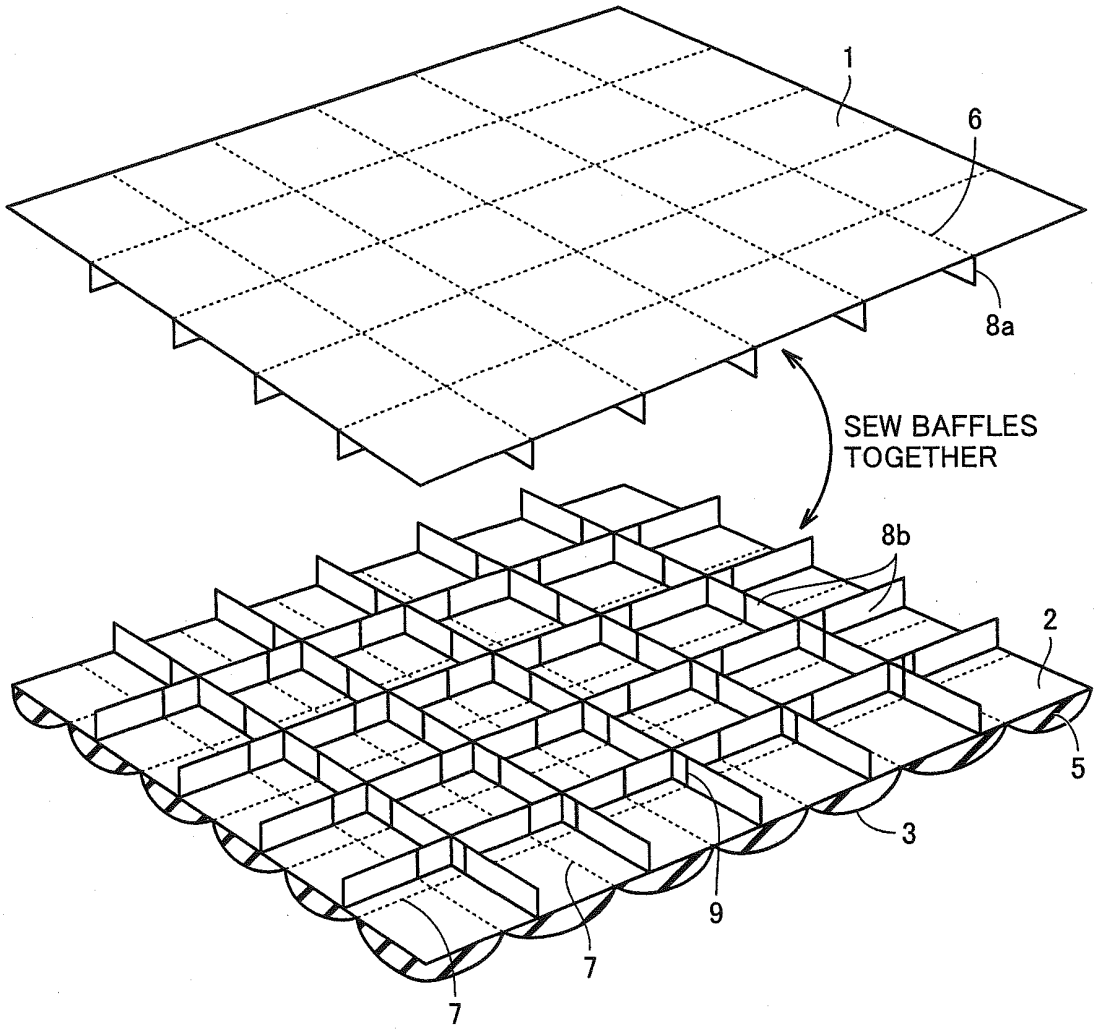
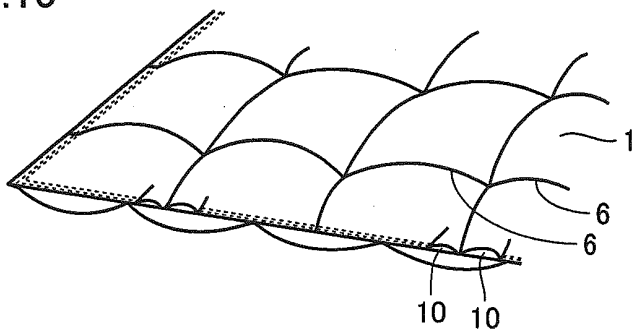


FIG.10



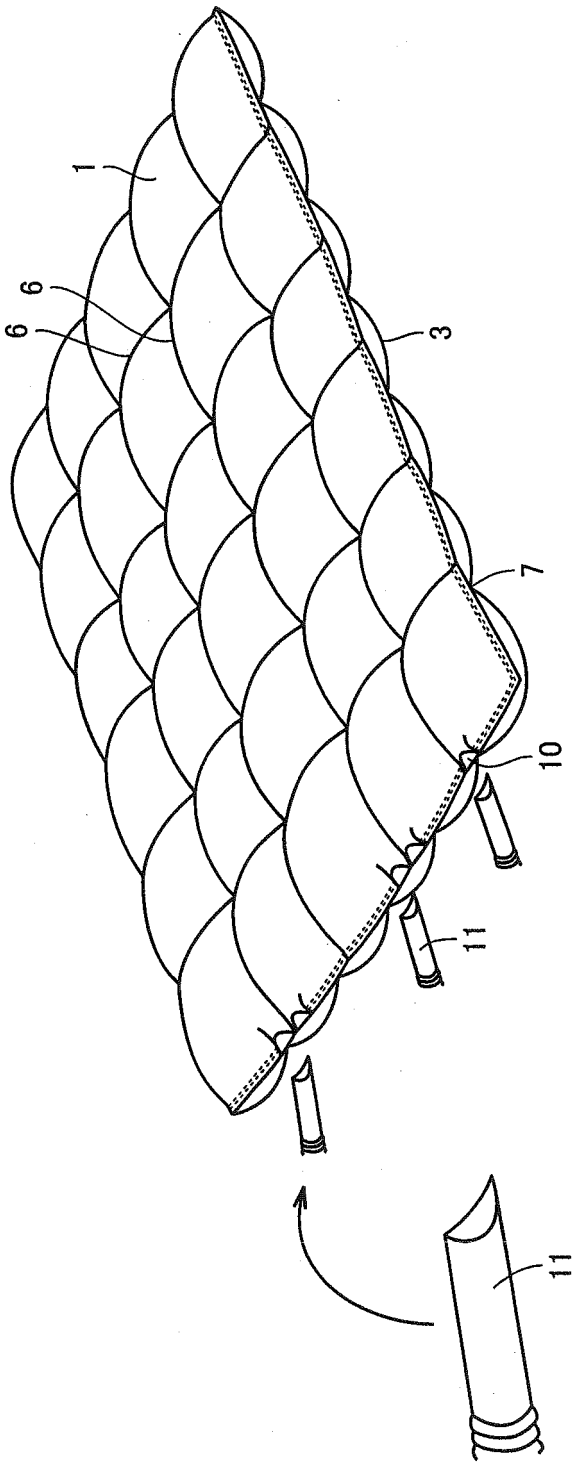


FIG.11

FIG.12

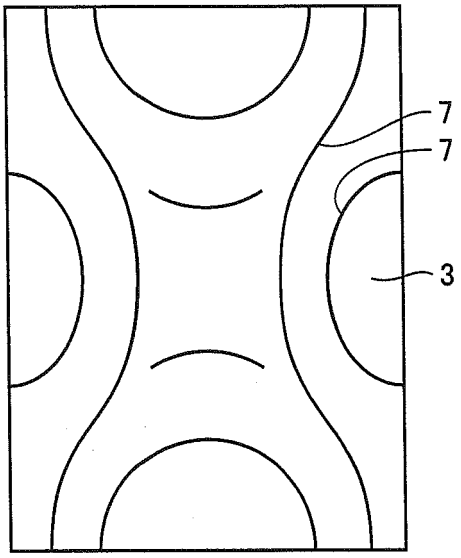


FIG.13

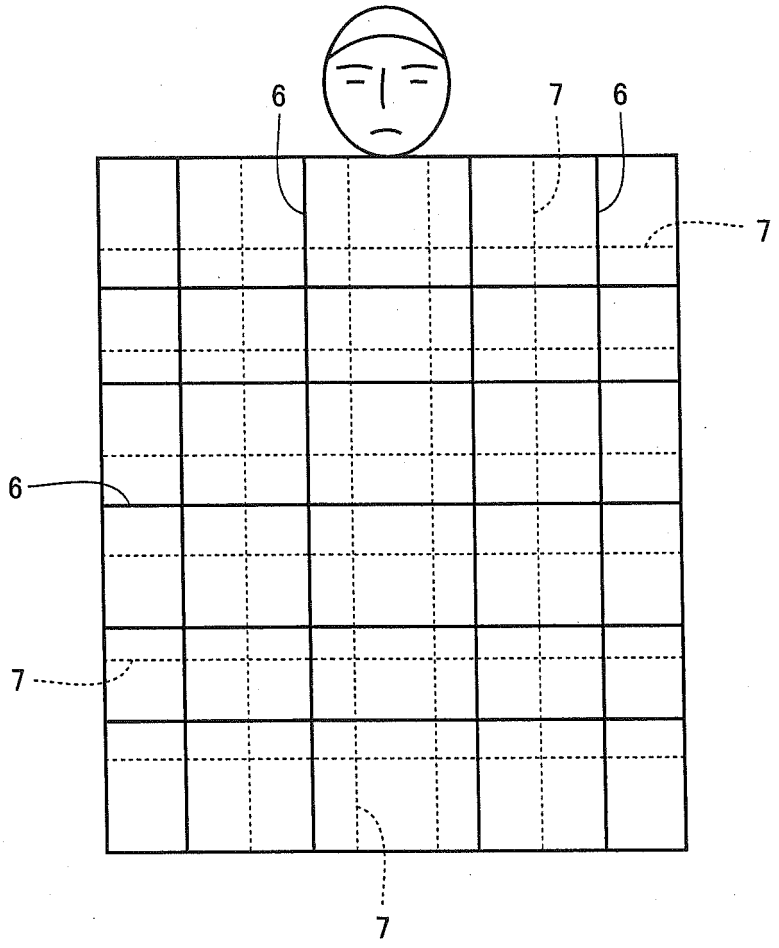


FIG.14

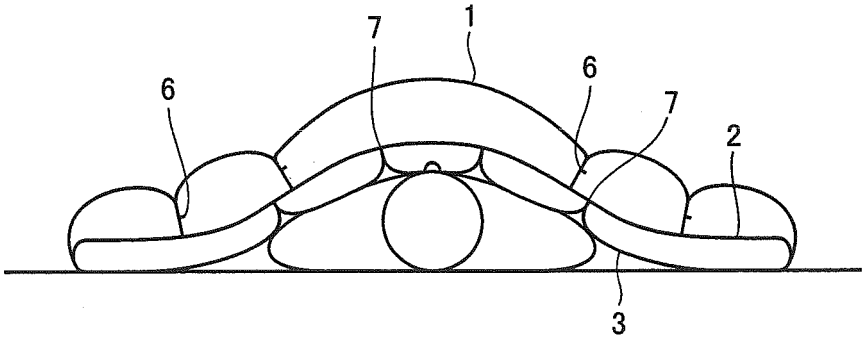


FIG.15

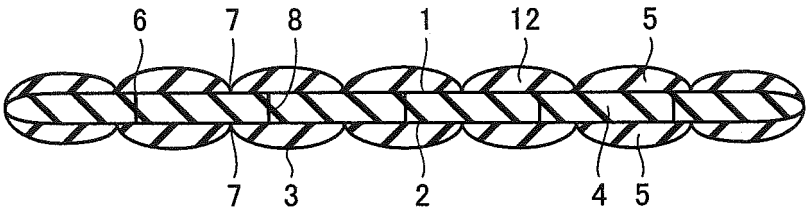
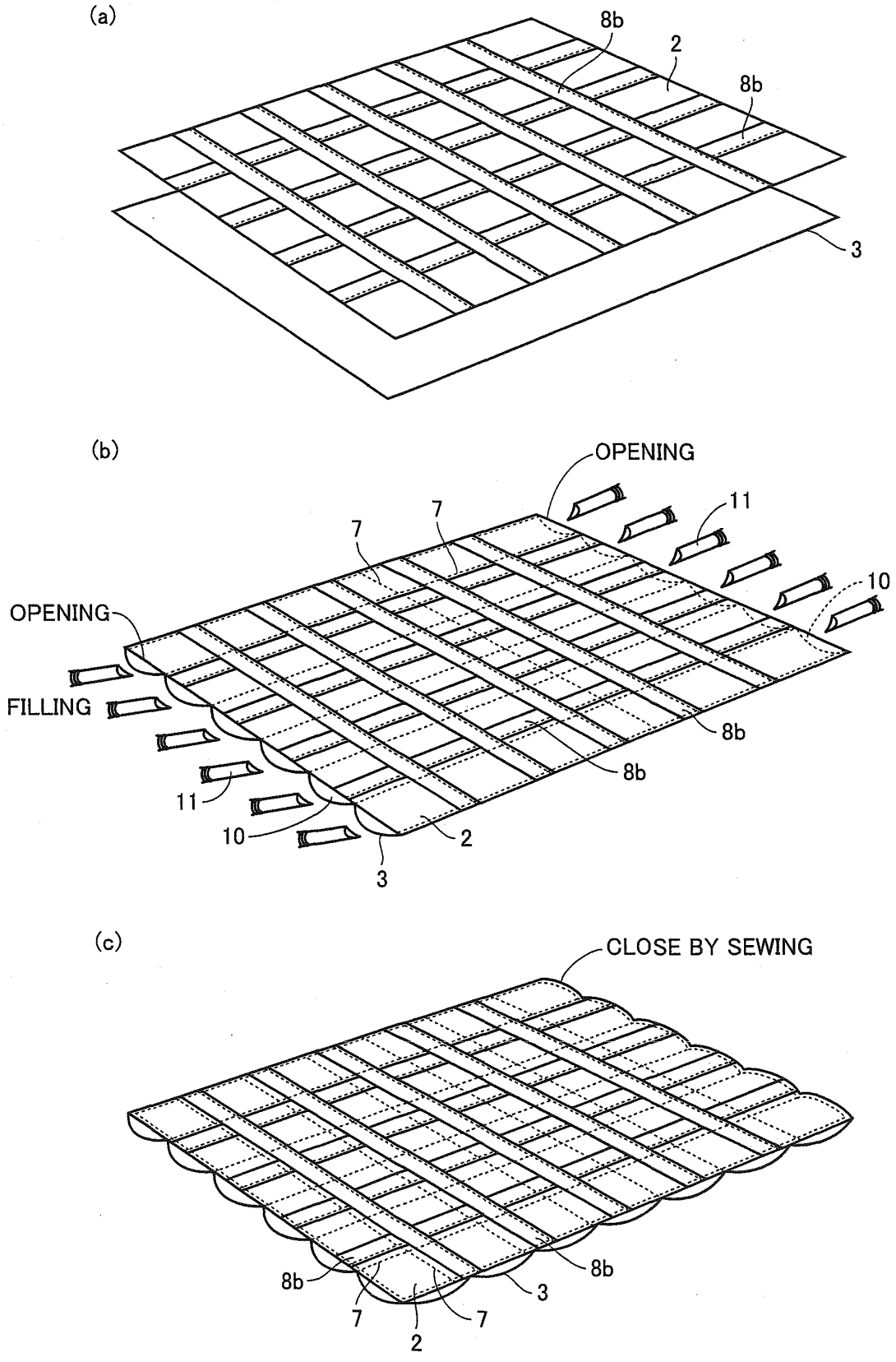


FIG.16


(a)
8b
2
8b
3
(b)
OPENING
7
7
11
10
OPENING
FILLING
8b
8b
11
10
2
3
(c)
CLOSE BY SEWING
8b
8b
3
7
7
2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/058325

A. CLASSIFICATION OF SUBJECT MATTER
A47G9/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47G9/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-348845 A (Wadatetsu Kabushiki Kaisha), 22 December 2005 (22.12.2005), entire text; all drawings (Family: none)	1-12
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 39391/1985(Laid-open No. 156564/1986) (Kabushiki Kaisha Yodai), 29 September 1986 (29.09.1986), entire text; all drawings (Family: none)	1-12

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

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 June, 2012 (07.06.12)	19 June, 2012 (19.06.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/058325

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-60707 A (Kabushiki Kaisha Aiwa), 29 February 2000 (29.02.2000), entire text; all drawings (Family: none)	1-12
A	JP 3138780 U (Nishikawa Rebekkusu Kabushiki Kaisha), 17 January 2008 (17.01.2008), entire text; all drawings (Family: none)	2,7-8
A	JP 11-299589 A (Kabushiki Kaisha Nishizaki), 02 November 1999 (02.11.1999), paragraph [0028] (Family: none)	4,12
A	JP 6-30830 A (Maruhachi Mawata Co., Ltd.), 08 February 1994 (08.02.1994), paragraph [0013] (Family: none)	4,12
A	JP 2003-339501 A (Kabushiki Kaisha Osaka Nishikawa), 02 December 2003 (02.12.2003), entire text; all drawings & CN 1461620 A & HK 1059717 A1	5
A	JP 10-155623 A (Ando Converter Kabushiki Kaisha), 16 June 1998 (16.06.1998), entire text; all drawings (Family: none)	9

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- JP 7275100 A **[0003]**
- JP 10155623 A **[0003]**
- JP 3138780 B **[0003]**
- JP 7136052 A **[0024]**
- JP 2003339501 A **[0047]**