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(71) Applicant: **Fabinno Co., Ltd.**
Seoul 137-787 (KR)

(72) Inventors:
• **CHANG, Dong-Ho**
Seongnam-si
Gyeonggi-do 463-863 (KR)
• **CHANG, Kyu-Hee**
Seoul 135-837 (KR)

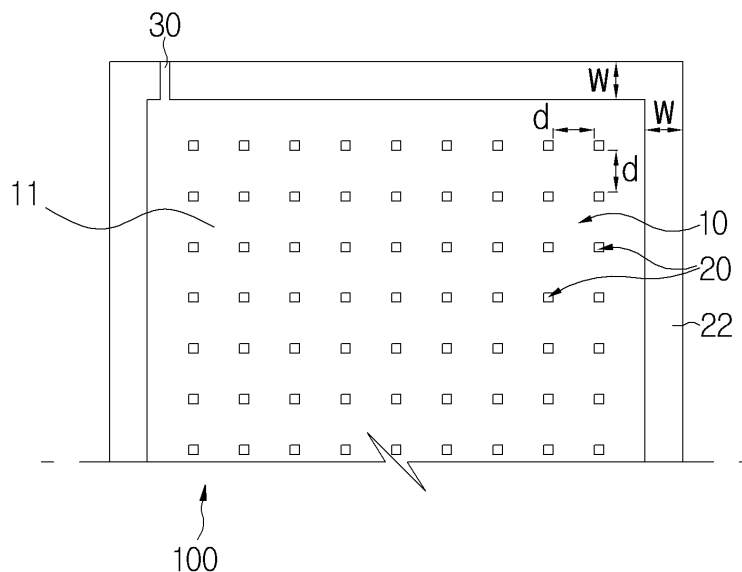
(74) Representative: **Habermann, Hruschka & Schnabel**
Montgelasstrasse 2
81679 Munich (DE)

(54) **AIR PAD USING TWO-LAYER FABRIC**

(57) The air pad according to the present invention can be used in the manufacture of a thermo-keeping and heat insulation material, an air mat, an air bed, a floating cover, etc. since double weave can have air therein which

has an excellent thermo-keeping property, and the manufacturing process of the products can be simplified by the present invention.

FIG. 2



Description**Technical Field**

5 **[0001]** The present invention relates to an air pad, and more particularly, to an air pad having a double weave which provides good thermo-keeping and soundproof efficiencies due to the air contained therein, whereupon the air pad may be used in manufacturing a thermo-keeping and heat insulation material, a soundproof material, an air mat, an air bed, a floating cover, etc..

10 **Background Art**

[0002] In general, air has good heat insulation and soundproof property. And, air provides a predetermined cushioning effect since it contracts and expands in response to an external pressure. In order to use the heat insulation and soundproof property of the air, the thermo-keeping and heat insulation material and soundproof material may include
15 air layers in the inside thereof. And, the product, for example, the air mat, the air bed, etc. inflates as air is injected into the inner space, thus providing a space wherein a user can lie or sit.

[0003] In order to manufacture a product having air in the inside thereof, for example, the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, etc., it should have a sealed space into which air can be injected, and the air injected into the sealed space should be maintained therein for a predetermined time without
20 being discharged to the outside.

[0004] The configuration will be described using the air mat as an example. As illustrated in Figure 1, the air mat 1 includes a sealed space covered by an upper sheet 2, a lateral sheet 3 and a lower sheet 4. Compressed air is injected into the space. The configuration of the air mat 1 is described in the Korean utility model registration number 295894 etc..

[0005] In order to make the space, it needs to manufacture the upper sheet 2, the lateral sheet 3, and the lower sheet
25 4 and cut the sheets, after which it needs to adhere or 'melt and adhere' the cut sheets, which inevitably entails complicated manufacturing processes and a long time in the manufacture.

[0006] Moreover, the air mat has a problem in that threads (a connection thread 5) should be installed in the inner space so as to connect the upper and lower sheets 2, 4 to prevent the middle portions of the upper and lower sheets
30 2,4 from inflation due to the compressed air.

[0007] The thermo-keeping and heat insulation material, the soundproof material, the floating cover, etc. which each have air in the insides thereof may have the above-mentioned problems.

Disclosure of Invention35 **Technical Goals**

[0008] The present invention is designed to solve the above mentioned problems. It is an object of the present invention to provide an air pad which has a sealed space into which air can be injected.

[0009] Especially, the present invention has another object of providing an air pad which can simplify the process of
40 manufacturing a thermo-keeping and heat insulation material, a soundproof material, a floating cover, an air mat, an air bed, etc. which each contain air in the insides thereof.

Technical Solutions

45 **[0010]** To achieve the objects, there is provided an air pad which uses a double weave.

[0011] As known in the industry, double weave is used in manufacture of an air bag. The double weave employed to manufacture the air bag includes an expansion part, a non-expansion part, and a seam pattern part. The surface of the double weave is coated with a silicon resin, etc.. Since the expansion part expands by the input of compressed air, it can protect passengers from impact. The non-expansion part supports the expansion part. And, the seam pattern part
50 is formed between the expansion part and the non-expansion part and can prevent the discharge of the compressed air to the outside and can withstand the instant impact caused by the expansion.

[0012] And, the compressed air stays in the expansion part for a short time period (for example, over about 5~6 seconds), and thereafter the compressed air discharges to the outside so as to provide a visual field for the passenger (a driver) and prevent a secondary damage (impact). In order to satisfy the air tightness mentioned above and a durability
55 to withstand a strong expansion force during the expansion, the double weave is made of a thick nylon thread of about 420 denier and has a heavy weight (350g/m²~450g/m²), and the coating layer is formed to satisfy the above requirements.

[0013] The double weave for manufacturing the air bag can contain air in the inside thereof, but it cannot be used to manufacture the thermo-keeping and heat insulation material, the sound proof material, the air mat, the floating cover,

etc. because the thermo-keeping and heat insulation material, etc. should keep the air for a relatively longer time in the insides thereof.

[0014] Further, since the double weave for manufacturing the air bag is heavy and the silicon coating has a high air permeability and a high friction coefficient, the double weave is not suitable to be used in manufacturing the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, the floating cover, etc..

[0015] Since the double weave for manufacturing the air bag has the expansion part, the non-expansion part, and the seam pattern part, we should use Jacquard loom for manufacturing the double weave, which inevitably entails much more increased manufacturing cost.

[0016] The double weave employed in the present invention is manufactured by a weaving, and air can be filled in the inside thereof. In this respect, it may be same as the double weave for manufacturing the air bag. However, the double weave for the present invention has the air tightness, the material and diameter of the thread, the coating, the weight, the touch feeling, etc. which are suitable for the thermo-keeping and heat insulation material, the sound proof material, the air mat, the air bed, etc. The air pad of the present invention can be manufactured without using the expensive Jacquard loom.

[0017] In this way, the air pad according to the present invention has a completely different technical field as compared to the air bag, and the configuration and effects are distinguished from the air bag. Accordingly, the present invention should not be considered a use invention which can be invented by simply changing the use.

[0018] More specifically, the air pad according to the present invention has an expansion part 10, a non-expansion part 20, and a coating layer 40.

[0019] The expansion part 10 is formed of an upper woven fabric layer 11 and a lower woven fabric layer 13 and can be expanded by the compressed air injected into the space 15 formed by the upper woven fabric layer 11 and the lower woven fabric layer 13. And, the non-expansion part 20 is formed integral between the expansion parts 10 and continuous from the expansion parts 10 and is formed of a single layer.

[0020] The coating layer 40 is formed on the surfaces of the expansion part 10 and the non-expansion part 20 so as to prevent the compressed air in the space 15 from being discharged to the outside.

[0021] The expansion part 10 and the non-expansion part 20 are repeatedly formed, wherein the expansion part 10 is manufactured by a plain weave, and the non-expansion part 20 is manufactured by a basket weave. And, the air pad has a cover factor value of 2000 to 2200 which is calculated by the following formula.

[Formula]

$$\text{Cover Factor(CF)} = (\text{warp density}) \times \sqrt{(\text{denier of warp})} + (\text{weft density}) \times \sqrt{(\text{denier of weft})}$$

in which warp density = number of warp / inch and weft density = number of weft / inch

[0022] The double weave raw fabric of the air pad may be formed of a polyester thread of 50 denier to 120 denier, or a polypropylene thread of 100 denier to 300 denier. In this configuration, a seam pattern part between the expansion part 10 and the non-expansion part 20 may be removed.

[0023] The expansion part 10 and the non-expansion part 20 may be formed of a polyester, and the coating layer 40 may be formed of a thermoplastic polyurethane (TPU). It is preferred that the coating amount of the coating is 60g/m² to 150g/m². The polyester mesh may be adhered to the coating layer 40 in order to protect the air pad.

[0024] The expansion part 10 and the non-expansion part 20 may be formed of polypropylene, and the coating layer 40 may be formed of polypropylene. It is preferred that the coating amount of the coating is 140g/m² to 200g/m². The polypropylene mesh may be adhered to the coating layer 40 in order to protect the air pad.

[0025] The non-expansion part 22 formed of the single layer may be formed at a rim of the double weave raw fabric according to the present invention. The non-expansion part 22 may be formed of a basket weave. The expansion part 10 and the non-expansion part 20 may be repeatedly formed at the inner side of the rim, and the non-expansion part 20 may be formed at a constant interval (d)(s).

[0026] As an alternative of the double weave raw fabric, the expansion part 10 may be formed at the rim of the double weave raw fabric. The upper woven fabric layer 11 and the lower woven fabric layer 13 both of which form the expansion part 10 at the rim may be sealed as they are adhered each other by means of an adhesive 55.

[0027] The air pad may be used as the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, the floating cover, etc..

[0028] It is preferred that the double weave raw fabric is ironed in a state of being heated up to 70°C to 100°C before the coating layer 40 is formed. The double weave raw fabric which has been subjected to the pre-heat treatment process

may have a lowered thermal shrinkage ratio and a higher stability in the shape in the following coating layer formation process.

[0029] The method for manufacturing an air pad according to another aspect of the present invention may include (a) a step wherein a double weave raw fabric is prepared, which has an expansion part 10 which can expand by the compressed air; and a non-expansion part 20 which is continuously formed from the expansion part 10 and between the expansion parts 10 and is formed of a single layer, and (b) a step wherein a coating layer 40 is formed on the double weave raw fabric after the step (a).

[0030] The coating layer 40 is provided to prevent the discharge of the compressed air of the space 15 to the outside, and the expansion part 10 is formed of a plain weave, and the non-expansion part 20 is formed of a basket weave. And, the double weave raw fabric has the cover factor value of 2000~2200 calculated by the following formula.

[Formula]

$$\text{Cover Factor (CF)} = (\text{warp density}) \times \sqrt{(\text{denier of warp})} + (\text{weft density}) \times \sqrt{(\text{denier of weft})}$$

in which warp density = number of warp / inch and weft density = number of weft / inch

[0031] It is preferred that a pre-heat treatment step is included between the step (a) and the step (b). In the pre-heat treatment step, the double weave raw fabric is ironed in such a way that the double weave raw fabric is passed through rolls in a state of being heated up to 70°C to 100°C.

Effects of Invention

[0032] The present invention has the following effects.

[0033] First, the present invention provides the air pad which has a sealed space in the inside thereof, into which compressed air can be injected. The manufacturing process of the thermo-keeping and heat insulation material, the soundproof material, the floating cover, the air mat, the air bed, etc. can be simplified by using the air pad.

[0034] For example, all required processes for manufacturing the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, the floating cover, etc. are only cutting the double weave raw fabric used in the present invention and forming the coating layer and injecting the compressed air.

[0035] Second, since the expansion part and the non-expansion part are repeatedly formed in the air pad according to the present invention, it is possible to prevent the center portions of the upper 11 and lower woven fabric layers 13 from inflating when the compressed air has been injected, whereby a flat surface can be obtained.

[0036] Third, since the pre-heat treatment process is carried out for the double weave raw fabric before the coating layer is formed, the shrinkage ratio due to the heat process can be lowered and the stability in the shape can be enhanced. In other words, twists and wrinkles formation can be prevented by lowering the shrinkage ratio, whereby a flat surface can be obtained when the compressed air is injected.

[0037] Fourth, since the double weave raw fabric used in the present invention can be manufactured without using the expensive loom such as Jacquard loom, the manufacturing cost is very low.

Brief Description of Drawings

[0038]

Figure 1 is a partially cut-away perspective view illustrating a conventional air mat.

Figure 2 is a plane view illustrating an air pad according to an exemplary embodiment of the present invention.

Figure 3 is a cross sectional view illustrating the air pad of Figure 2 being expanded by compressed air.

Figure 4 is an enlarged view of a portion "A" in Figure 3.

Figure 5 is a plane view illustrating an air pad according to another exemplary embodiment of the present invention.

Figure 6 is a cross sectional view taken along line B-B' in Figure 5.

Figure 7 is a perspective view illustrating the air pad of Figure 5 being expanded by compressed air.

Figure 8 is a cross sectional view taken along line C-C' in Figure 7.

Figure 9 is a plane view illustrating an air pad according to another exemplary embodiment of the present invention.

Figure 10 is a cross sectional view taken along line D-D' in Figure 9.

Figure 11 is a plane view illustrating a double weave raw fabric used in manufacturing the air pad in Figure 9.

Figure 12 is a view illustrating a pre-heat treatment process for manufacturing the air pad according to the present

invention.

[Legend of Reference Symbols]

10: Expansion part	11: Upper woven fabric layer
13: Lower woven fabric layer	15: Inner space
20, 22: Non-expansion part	30: Injection port
35: Valve	40: Coating layer
50: Adhering part	51: Dotted line
53: Outline	71: Unwinding roll
72: Winding roll	73: Heating drum
75: Roll	d: Distance between non-expansion parts
h: Height when the expansion part has expanded	
w: Width of the non-expansion part formed at a rim	
s: Distance between non-expansion parts 20, distance between the non-expansion part 20 and the non-expansion part 22	
100, 200, 300: Air pads	

Best modes for carrying out the invention

[0039] The present invention will be described with reference to the accompanying drawings. The terms or words used in the specification and claims should not be interpreted as being limited to typical or dictionary meanings, but should be interpreted as having the meanings and concepts well matching with the technical concepts of the present invention based on a principle wherein the inventor can define the concepts of the terms properly so as to explain his inventions to the best. For this reason, the embodiments recited in the present specification and the configuration illustrated in the drawings are just exemplary embodiments, not representing all the technical concepts of the present invention, whereupon it should be understood that there may be many equivalents and modifications which may substitute the above at the time the present application is filed.

[0040] Figure 2 is a plane view illustrating the air pad according to an exemplary embodiment of the present invention, Figure 3 is a cross sectional view illustrating the air pad of Figure 2 being expanded by compressed air, and Figure 4 is an enlarged view of a portion "A" in Figure 3.

[0041] Referring to the drawings, the air pad 100 may include the double weave raw fabric, and the coating layer 40 which is formed on the surface of the double weave raw fabric.

[0042] The double weave raw fabric may have the expansion part 10 and the non-expansion part 20, 22. The expansion part 10 may be formed of the upper woven fabric layer 11 and the lower woven fabric layer 13. For easier understanding, the expansion part 10 is separated from the non-expansion parts 20, 22 by lines. More specifically, the portions except for the non-expansion parts 20, 22 correspond to the expansion part 10. The lines are formed on the double weave raw fabric since the weaving methods for the expansion part and the non-expansion parts are different.

[0043] The upper woven fabric layer 11 and the lower woven fabric layer 13 expand by the compressed air injected into a space 15 formed between the upper woven fabric layer 11 and the lower woven fabric layer 13. The upper woven fabric layer 11 and the lower woven fabric layer 13 are manufactured by a plain weave.

[0044] The compressed air is injected into the expansion part 10 through an injection port 30. The injection port 30 passes through the rim in order to inject the compressed air. A valve and/or a stopper (not illustrated in drawings) may be installed at the injection port 30 so as to prevent the injected compressed air from being discharged to the outside after the compressed air is injected into the expansion part 10.

[0045] The non-expansion parts 20, 22 are formed of a single layer, respectively. The non-expansion parts 20, 22 are formed by basket weave. More preferably, the non-expansion parts 20, 22 are formed by a 2x2 basket weave or a 3x3 basket weave. Among the non-expansion parts, the non-expansion part 22 is formed at the rim, and the non-expansion part 20 is formed between the expansion parts 10 at the inner side of the rim.

[0046] When the expansion part 10 expands by the compressed air, the non-expansion parts 20, 22 do not expand, but support the expansion part 10 while preventing the compressed air from being discharged to the outside.

[0047] In the drawings, it is shown that the non-expansion part 20 is a square. However, the non-expansion part 20 may be formed in various shapes, for example, a circular shape, a rectangular shape, a pentagonal shape, a triangular shape, a straight line shape, etc.. The non-expansion parts 20 are repeatedly formed. It is preferred that the distance "d" between the non-expansion parts 20 is constant. If the distance "d" between the non-expansion parts 20 is constant, the height "h" can be uniform throughout the air pad when the expansion part 10 expands, for which the air pad of the

present invention may be well used for the air mat, the air bed, etc..

[0048] Meanwhile, it is preferred that the non-expansion part 22 formed at the rim of the double weave raw fabric has a width "w" wider than that of the non-expansion part 20 so as to increase the air tightness.

[0049] The air pad 100 according to the present invention can keep the compressed air in the expansion part 10 for a relatively long time. For this, the double weave raw fabric has a cover factor of 2000 to 2200. The cover factor is calculated by the following formula I.

Formula I

$$\text{Cover Factor(CF)} = (\text{warp density}) \times \sqrt{(\text{denier of warp})} + (\text{weft density}) \times \sqrt{(\text{denier of weft})}$$

in which warp density = number of warp / inch and weft density = number of weft / inch

[0050] If the cover factor value is less than 2000, the air tightness is low, which means that such a cover factor value is not good for the manufacture of the air pad. And, it is practically very difficult to manufacture the double weave raw fabric having the cover factor value exceeding 2200.

[0051] The compressed air injected in the air pad can be maintained for 10 days to 25 days while maintaining the gauge pressure of about 0.18 bar to 0.25 bar. For this reason, the air pad can be used for the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, etc.. The pressure maintenance (air tightness) is obtained by the cooperation of the double weave raw fabric and the coating layer 40.

[0052] And, the expansion part 10 and the non-expansion parts 20, 22 of the air pad 100 may be made of polyester or polypropylene.

[0053] If the expansion part 10 and the non-expansion parts 20, 22 are made of polyester, and the coating layer 40 is made of thermoplastic polyurethane (TPU), it is preferred that the air pad has weight of 220g/m² to 330g/m². If the expansion part 10 and the non-expansion parts 20, 22 are made of polypropylene, and the coating layer 40 is made of polypropylene, it is preferred that the air pad 100 has weight of 400g/m² to 480g/m².

[0054] If the weight of the air pad 100 is less than the lower limit, it is difficult to satisfy the physical properties (elongation resistance during expansion, tensile strength, durability, etc.) required for the products. If the weight thereof exceeds the upper limit, the product may be overweight, and the diameter of thread becomes bigger than that of required. In this case, the seam pattern part may be required undesirably.

[0055] Meanwhile, if the expansion part 10 and the non-expansion parts 20, 22 are made of a polyester thread, it is preferred that the diameter of the thread is 50 denier to 120 denier. More preferably, the diameter thereof is 75 denier.

[0056] And, if the expansion part 10 and the non-expansion parts 20, 22 are made of a polypropylene thread, it is preferred that the diameter of the thread is 100 denier to 300 denier, and more preferably, the diameter thereof is 250 denier.

[0057] If the diameter of the thread is over the upper limit, the product becomes over weighted, and the air tightness become lowered, which result in undesirable quality. If the diameter of the thread is less than the lower limit, it is not preferred since the elongation resistance is lowered when the compressed air is injected.

[0058] The double weave raw fabric according to the present invention has the expansion part 10 and non-expansion parts 20, 22 and does not have the seam pattern part. As mentioned above, the seam pattern part is formed between the expansion part and the non-expansion part in the double weave used for the manufacture of air bag, and can prevent the compressed air from being quickly discharged to the outside while withstanding the impact when the air bag expands suddenly.

[0059] Because of the seam pattern part, the double weave for the air bag is manufactured only by Jacquard loom. It cannot be manufactured by using a common loom. For this reason, the manufacturing cost is very high, which is disadvantageous.

[0060] The seam pattern part is not required in the double weave raw fabric used in the present invention because the compressed air is injected very slowly compared to air bag and the double weave raw fabric is manufactured densely throughout the whole portions with the polyester thread of 50 to 120 denier or the polypropylene thread of 100 to 300 denier. For this reason, the double weave raw fabric can be manufactured by using the common loom such as Rapier loom. The manufacturing cost is about 1/4 as compared to the double weave used in the air bag, which is very advantageous.

[0061] The coating layer 40 is formed on the surfaces of the expansion part 10 and the non-expansion parts 20, 22 so as to maintain the air tightness. The coating may be formed by any of knife coating method, doctor blade method, spray coating method, etc., but extrusion method is preferred.

[0062] The coating layer 40 is preferably made of thermoplastic polyurethane (TPU) or polypropylene.

[0063] The coating layer 40 made of TPU has good soft touch feeling and good scratch resistance. As compared to this, the silicon coating mainly used for the double weave of the air bag has high air permeability and extremely high friction coefficient. For this reason, it is not good for the air mat and the air bed, etc..

[0064] If the double weave raw fabric (the expansion part and the non-expansion part) is made of polyester, it is preferred that the coating amount of TPU is 60g/m² to 150g/m². And, if the double weave raw fabric (the expansion part and the non-expansion part) is made of polypropylene, it is preferred that the coating amount of the polypropylene is 140g/m² to 200g/m².

[0065] If the coating amount is less than the lower limit, the air tightness become bad, and if the coating amount exceeds the upper limit, it is not preferred since the product become thick and heavy. The product which uses the polyester thread for the air pad 100 according to the present invention has a thickness of about 0.42mm to 0.52mm after the coating, and the product which uses the polypropylene thread has a thickness of about 0.6mm to 0.85mm.

[0066] Meanwhile, the air pad 100 may further have a mesh raw fabric (not illustrated in drawings). The mesh raw fabric can be adhered to the product by being placed on the coating layer 40 and by being pressed against the product before the coating is hardened.

[0067] The mesh raw fabric can prevent damage caused by stone, protruded things, etc. when the air pad 100 is spread on the ground or the lawn, etc.. The mesh raw fabric may be provided at both sides of the air pad 100. However, it is preferred to have the mesh raw fabric on the surface only which contacts with the ground or the lawn, thus reducing weight and saving the manufacturing cost.

[0068] If the expansion part 10 and the non-expansion parts 20, 22 are made of polyester, and the coating layer 40 is made of TPU, it is preferred that the mesh raw fabric is polyester mesh. In this case, since the polyester mesh has a weight of below 40g/cm², the whole weight of the product may be 260g/m² to 370g/m².

[0069] If the expansion part 10 and the non-expansion parts 20, 22 are made of polypropylene, and the coating layer 40 is made of polypropylene, it is preferred that the mesh raw fabric is polypropylene mesh. In this case, since the polypropylene mesh has a weight of below 40g/cm², the whole weight of the product may be 440g/m² to 520g/m².

[0070] The polyester mesh and the polypropylene mesh are mesh-shaped raw fabrics. Since they are easily available in the market, the description thereon will be omitted.

[0071] Figure 5 is a plane view illustrating an air pad according to another exemplary embodiment of the present invention, Figure 6 is a cross sectional view taken along line B-B' in Figure 5, Figure 7 is a perspective view illustrating the air pad of Figure 5 expanded by compressed air, and Figure 8 is a cross sectional view taken along line C-C' in Figure 7. The reference numbers in Figures 5 to 8 which are same as in Figures 1 to 4 represent the same components.

[0072] The air pad 200 may include a double weave raw fabric, and a coating layer 40 formed on the surface of the double weave raw fabric.

[0073] The double weave raw fabric is the same as the double weave raw fabric in Figure 2 except that the expansion part 10 and the non-expansion parts 20, 22 are longitudinally formed in the longitudinal direction of the air pad 200.

[0074] More specifically, the non-expansion part 22 is formed in the whole rim except for the air injection port 30 in the double weave raw fabric. The compressed air injected in the expansion part 10 can be prevented from being discharged to the outside by the non-expansion part 22. Meanwhile, the reference number 35 represents a valve (or a stopper) installed at the air injection port 30.

[0075] A plurality of the non-expansion parts 20 are formed at a predetermined interval in the widthwise direction in the inner side of the non-expansion part 22 and are longitudinally formed in the longitudinal direction of the air pad 200. Here, it is preferred that both ends of the non-expansion part 20 are spaced apart from the non-expansion part 22, which is provided so as to diffuse the compressed air efficiently injected via the air injection port 30 into the inside of the air pad 200 and to give enough space wherein the expansion part 10 can expand as illustrated in Figure 7.

[0076] It is preferred that the distance "s" between the non-expansion parts 20 and the distance "s" between the non-expansion part 22 and the non-expansion part 20 are same. If the distances "s" are uniform, the height "h" may become uniform when the expansion part 10 has expanded. For this reason, the air pad of the present invention can be employed to manufacture the air mat or the air bed etc..

[0077] Meanwhile, since the coating layer 40 has the material, coating amount, coating thickness, etc. which are same as the coating layer 40 of the air pad 100, the description thereon will be omitted.

[0078] Moreover, the air pad 200 may further include a mesh raw fabric (not illustrated in drawings). The mesh raw fabric is same as the mesh raw fabric of the air pad 100, and the method for attaching it to the air pad is same as well.

[0079] Figure 9 is a plane view illustrating an air pad according to another exemplary embodiment of the present invention, and Figure 10 is a cross sectional view taken along line D-D' in Figure 9. The reference numbers in Figures 9 and 10, which are same as the reference numbers in Figures 1 to 8, represent same components.

[0080] The air pad 300 may include a double weave raw fabric, and a coating layer 40 formed on the surface of the double weave raw fabric. Among the components, the coating layer 40 is same as the coating layer 40 of the air pads 100, 200.

[0081] The double weave raw fabric is the same as the above-mentioned double weave raw fabric except that it is cut for the expansion part 10 to be positioned at the rim thereof.

[0082] Figure 11 shows the double weave raw fabric. In the double weave raw fabric, the expansion part 10 and the non-expansion 20 are repeatedly formed, and the non-expansion part 20 is longitudinally formed in the longitudinal direction of the air pad 300, and the expansion part 10 is positioned at the rim thereof.

[0083] And, the upper woven fabric layer 11 and the lower woven fabric layer 13 which form the expansion part 10 at the rim thereof are adhered each other by the adhesive 55, thus preventing the inner air from being discharged to the outside. In Figure 9, the portion between the dotted line 51 and the outline 53 represents an adhered portion 50.

[0084] The air discharge occurs mostly at the rim in the air pad made of the double weave raw fabric. The air discharge can be very effectively prevented by adhered portion 50.

[0085] Then, the manufacturing processes of the air pad 300 according to the present invention will be described.

[0086] First, the double weave raw fabric is manufactured (S10). As mentioned in the above, the expansion part 10 and the non-expansion 20 are repeatedly formed in the double weave raw fabric, and the non-expansion part 20 is longitudinally formed in the longitudinal direction of the air pad 300. A person having ordinary skill in this art may easily manufacture the double weave raw fabric using a conventional loom (for example, a Rapier loom) by referring to the present invention.

[0087] As illustrated in Figure 11, the double weave raw fabric is cut for the expansion part 10 to be positioned at the rim of the double weave raw fabric (S20).

[0088] The double weave raw fabric being cut as mentioned above passes through the rolls in a state of being heated up to 70°C to 100°C (S30). More specifically, as illustrated in Figure 12, the double weave raw fabric is unwound from the unwinding roll 71 and moves in the direction indicated by the arrow and is heated up to about 70°C to 100°C by heating drum 73. In the heated state as above, any wrinkles, twists, etc. of the double weave raw fabric are removed (an ironing effect) while it passes through the rollers 75, and then it is wound around the winding rolls 72.

[0089] If the pre-heat treatment process is carried out before the formation of the coating layer, a thermal shrinkage ratio may be lowered during the formation of the coating layer, and the stability in the shape can be enhanced. If the coating layer is formed without the pre-heat treatment process, the polypropylene double weave raw fabric may have about 12% shrinkage ratio when the heat treatment occurs for about 15 minutes at 109°C, and the stability in the shape may become unstable. Meanwhile, the stability in the shape represents the degree of twists or wrinkles, etc. in the coated product (air pad). If the stability in the shape is poor, a flat surface cannot be obtained by the injection of the compressed air, which results in twisted surfaces.

[0090] In comparison, if the coating layer 40 is formed after the pre-heat treatment, the thermal shrinkage ratio may be about 8% thus enhancing the stability in the shape. The air pad 300 which has been subjected to the pre-heat treatment can have the flat surface by the injection of the compressed air.

[0091] Meanwhile, after the pre-heat treatment is finished, the adhesive 55 is spread on the upper woven fabric layer 11 and the lower woven fabric layer 13 which form the rim of the double weave raw fabric, and the layer 11, 13 are adhered each other by the adhesive 55. After the adhesion, the coating layer 40 is formed by the heat treatment process.

[0092] The formation process of the coating layer 40 may be carried out in such a way that the coating material (TPU, polypropylene mentioned above) is coated on (spread on) the double weave raw fabric and heat-treated for about 15 minutes at about 109°C.

[0093] Meanwhile, only the manufacturing process of the air pad 300 has been described as a representative example in the above, but a person having ordinary skill in this art may easily know the manufacturing processes of the air pads 100, 200. For this reason, the descriptions on the manufacturing processes of the air pads 100, 200 will be omitted.

[0094] Since the air pads 100, 200 according to the present invention can maintain the compressed air injected into the inner space 15 for a long time, the air pads are suitable in manufacturing the product such as the thermo-keeping and heat insulation material, the soundproof material, the floating cover, the air mat, the air bed, etc.. In particular, in the present invention, the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, the floating cover, etc. can be easily manufactured by simply cutting the double weave raw fabric, forming a coating layer and then injecting compressed air. For this reason, it is possible to reduce the manufacturing process and time of the product.

Modes for carrying out the invention

[0095] The exemplary embodiments will be described for the sake of easier understanding of the present invention. The exemplary embodiments of the present invention may be modified into various types, and the scopes of the present invention are not limited to the disclosed exemplary embodiments. The exemplary embodiments are provided for easy understanding of the present invention for a person having ordinary skill in this art.

Exemplary embodiment 1

[0096] The expansion part 10 and the non-expansion part 20 are repeatedly formed by using a polyester filament thread of 75 denier as a warp and a weft, and a double weave raw fabric as illustrated in Figures 2, 3 is prepared, wherein the expansion part 10 is formed of a plain weave, and the non-expansion part 20 is formed of a 2x2 basket weave. The warp density and the weft density are 116/inch respectively, and the cover factor is 2,010.

[0097] Both sides of the double weave raw fabric are coated by thermoplastic polyurethane (TPU) with the coating amount of 100g/m², and the double weave raw fabric is heat-treated for 15 minutes at 109°C, thus forming the coating layer 40.

Exemplary embodiment 2

[0098] The expansion part 10 and the non-expansion part 20 are repeatedly formed by using a polypropylene filament thread of 210 denier as a warp and a weft, and a double weave raw fabric as illustrated in Figures 2, 3 is prepared, wherein the expansion part 10 is formed of a plain weave, and the non-expansion part 20 is formed of a 2x2 basket weave. The warp density and the weft density are 62/inch respectively, and the cover factor was 2,200.

[0099] As illustrated in Figure 12, the double weave raw fabric is subjected to the pre-heat treatment process wherein wrinkles, twisted shapes, etc. are removed by being heated to 80°C by the heating drum 73 and by being passed through the rolls 75 in the heated state.

[0100] After the pre-heat treatment process, both sides of the double weave raw fabric are coated by the polypropylene with the coating amount of 150g/m², and the double weave raw fabric is heat-treated for 15 minutes at 109°C, thus forming a coating layer 40.

Exemplary embodiment 3

[0101] The expansion part 10 and the non-expansion part 20 are repeatedly formed by using a polyester filament thread of 75 denier as a warp and a weft, and a double weave raw fabric as illustrated in Figures 2, 3 is prepared, wherein the expansion part 10 is formed of a plain weave, and the non-expansion part 20 is formed of a 2x2 basket weave. The warp density and the weft density are 127/inch respectively, and the cover factor is 2,200.

[0102] As illustrated in Figure 12, the double weave raw fabric is subjected to the pre-heat treatment process wherein wrinkles, twisted shapes, etc. are removed by being heated to 80°C by the heating drum 73 and by being passed through the rolls 75 in the heated state.

[0103] After the pre-heat treatment process, both sides of the double weave raw fabric are coated by TPU with the coating amount of 150g/m², and the double weave raw fabric is heat-treated for 15 minutes at 109°C, thus forming the coating layer 40.

[0104] At this time, before the coating layer is completely hardened, the polyester mesh raw fabric having the weight of 30g/cm² is positioned on the coating layer and pressurized and engaged thus manufacturing an air pad.

Comparison example 1

[0105] The polyester filament thread of 30 denier is used as a warp and a weft. At this time, the air pad is manufactured in the same method as the exemplary embodiment 1 except that the warp density and the weft density are 116 /inch respectively, and the cover factor is about 1,270.

Evaluation for maintenance of air pressure(air tightness)

[0106] The compressed air is injected up to the pressure of about 0.20 bar into the air pads manufactured in the exemplary embodiments 1 to 3 and the comparison example 1, and the lapsed time for which the initial air pressure is maintained is evaluated, and the result of the evaluation is shown in Table 1.

Table 1

	Time for which the initial air pressure is maintained (days)
Exemplary embodiment 1	17
Exemplary embodiment 2	20
Exemplary embodiment 3	21

(continued)

	Time for which the initial air pressure is maintained (days)
Comparison example 1	1

[0107] Referring to Table 1, compared to the air pad of the comparison example 1, the initial air pressure of about 0.20 bar is maintained for a long time i.e. 17 days or more in the air pads of the exemplary embodiments 1 to 3 according to the present invention.

[0108] Due to the excellent air tightness, the air pad according to the present invention is suitable in manufacturing the thermo-keeping and heat insulation material, the soundproof material, the air mat, the air bed, etc..

Claims

1. An air pad, comprising:

an expansion part (10) which is formed of an upper woven fabric layer (11) and a lower woven fabric layer (13), which are separable, and can be expanded by compressed air injected into a space (15) between the upper woven fabric layer (11) and the lower woven fabric layer (13);

a non-expansion part (20) which is continuously formed between the expansion parts (10) and formed from the expansion part (10) and formed of a single layer; and

a coating layer (40) which is formed on the expansion part (10) and the non-expansion part (20) and is provided so as to prevent the compressed air in the space (15) from being discharged to the outside,

wherein the expansion part (10) and the non-expansion part (20) are repeatedly formed, and the expansion part (10) is formed of a plain weave, and the non-expansion part (20) is formed of a basket weave, and the cover factor value calculated by the following formula is 2000 to 2200,

[Formula]

$$\text{Cover Factor (CF)} = (\text{warp density}) \times \sqrt{(\text{denier of warp})} + (\text{weft density}) \times \sqrt{(\text{denier of weft})}$$

in which warp density = number of warp / inch and weft density = number of weft / inch

2. The air pad of claim 1, wherein the double weave raw fabric of the air pad is formed of a polyester thread of 50 denier to 120 denier or a polypropylene thread of 100 denier to 300 denier, and a seam pattern part is not required between the expansion part (10) and the non-expansion part (20).

3. The air pad of claim 2, wherein the expansion part (10) and the non-expansion part (20) are made of polyester, and the coating layer (40) is made of a thermoplastic polyurethane (TPU), and the coating amount of the coating is 60g/m² to 150g/m².

4. The air pad of claim 3, wherein a polyester mesh is adhered to the coating layer 40 in order to protect the air pad.

5. The air pad of claim 2, wherein the expansion part (10) and the non-expansion part (20) are made of polypropylene, and the coating layer (40) is made of polypropylene, and the coating amount of the coating is 140g/m² to 200g/m².

6. The air pad of claim 5, wherein a polypropylene mesh is adhered to the coating layer (40) in order to protect the air pad.

7. The air pad of any one of claims 1 to 6, wherein a non-expansion part (22) made of a single layer is formed at a rim of the air pad, and the non-expansion part (22) is made of a basket weave, and the expansion part (10) and the non-expansion part (20) are repeatedly formed at an inner side of the rim, and the non-expansion part (20) is formed at constant interval d, s.

8. The air pad of any one of claims 1 to 6, wherein the expansion part (10) is formed at the rim of the air pad, and the upper woven fabric layer (11) and the lower woven fabric layer (13) which form the expansion part (10) of the rim are adhered airtightly to each other by an adhesive (55).

9. The air pad of any one of claims 1 to 6, wherein the air pad can be used in manufacturing at least one of a thermo-keeping and heat insulation material, a soundproof material, an air mat, an air bed, a floating cover.

10. The air pad of any one of claims 1 to 6, wherein the double weave raw fabric formed of the expansion part and the non-expansion part is subjected to an ironing process in a state of being heated up to 70 to 100°C before the coating layer (40) is formed.

11. A method for manufacturing an air pad, the method comprising the steps of:

- (a) preparing a double weave raw fabric which includes an expansion part (10) being expanded by compressed air, and a non-expansion part (20) being continuously formed between the expansion parts (10) and being formed from the expansion part (10) and being formed of a single layer; and
- (b) forming a coating layer (40) on the double weave raw fabric after the step (a),

wherein the coating layer (40) is provided to prevent the compressed air in the space (15) from being discharged to the outside, and the expansion part (10) is formed of a plain weave, and the non-expansion part (20) is formed of a basket weave, and the cover factor value calculated by the following formula is 2000 to 2200,

[Formula]

$$\text{Cover Factor (CF)} = (\text{warp density}) \times \sqrt{(\text{denier of warp})} + (\text{weft density}) \times \sqrt{(\text{denier of weft})}$$

in which warp density = number of warp / inch and weft density = number of weft / inch

12. The method of claim 11, wherein the method comprises (a1) a pre-heat treatment step between the step (a) and the step (b) to iron the double weave raw fabric while passing between rolls in a state that the double weave raw fabric is heated up to 70°C to 100°C.

13. The method of claim 11, wherein a non-expansion part (22) formed of a single layer is formed at a rim of the double weave raw fabric, and the non-expansion part (22) is formed of a basket weave, and the expansion part (10) and the non-expansion part (20) are repeatedly formed at an inner side of the rim, and the non-expansion part (20) is formed at constant interval d, s.

14. The method of claim 11, wherein an expansion part (10) is formed at a rim of the double weave raw fabric, and the upper woven fabric layer (11) and the lower woven fabric layer (13) which form the expansion part (10) of the rim are adhered airtightly to each other by the adhesive (55).

FIG. 1

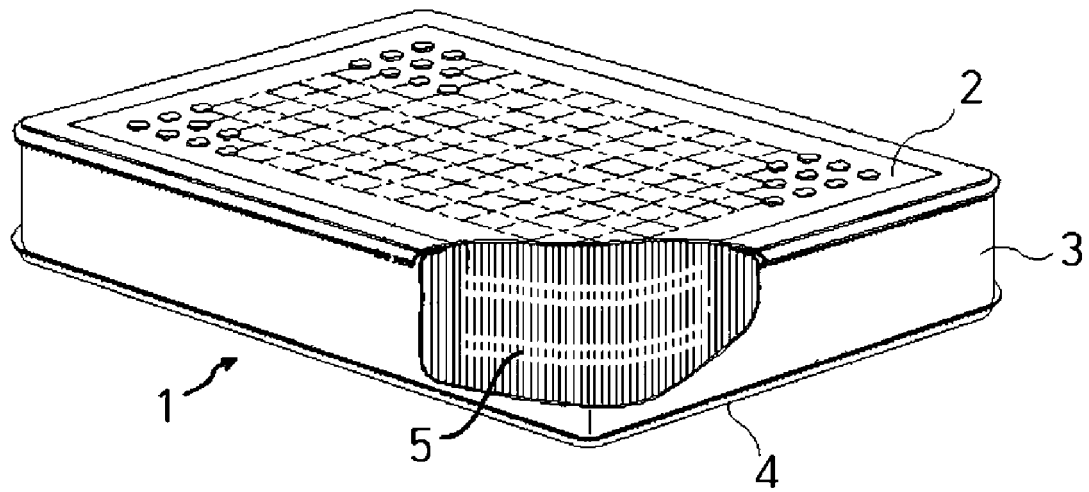


FIG. 2

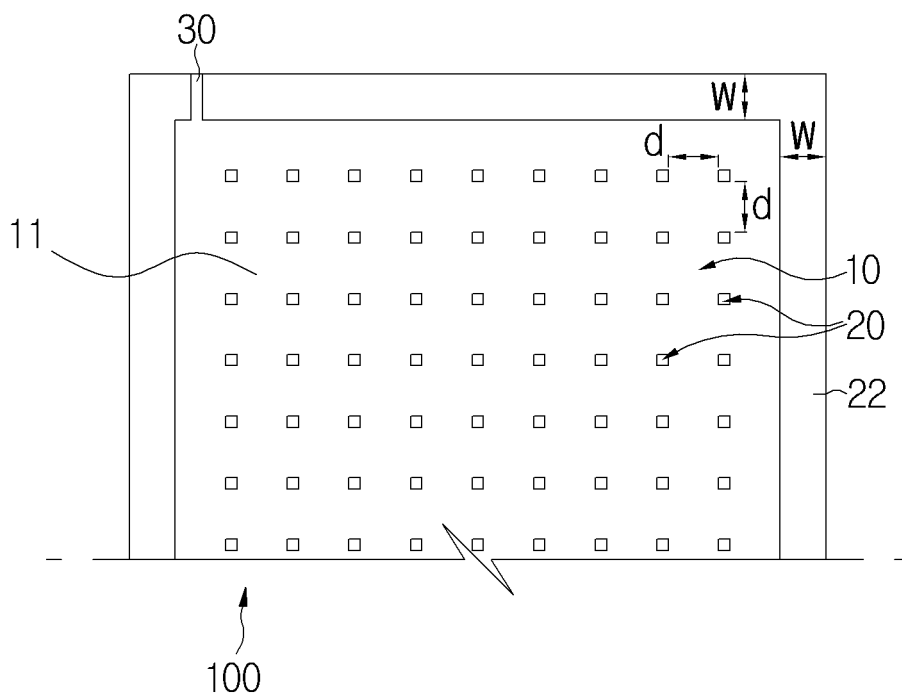


FIG. 3

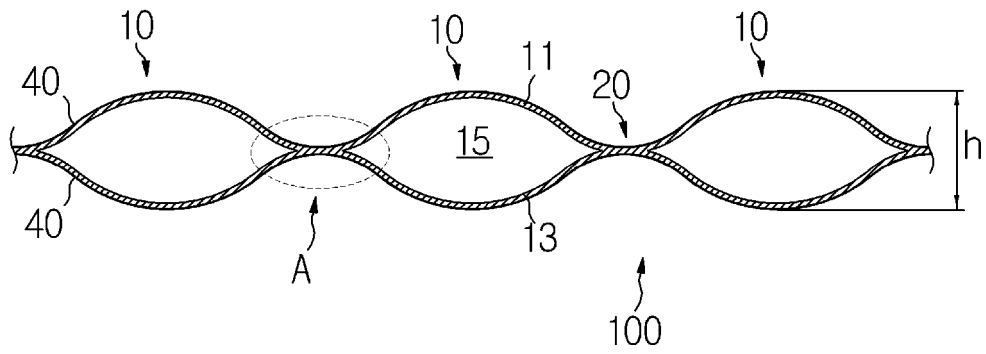


FIG. 4

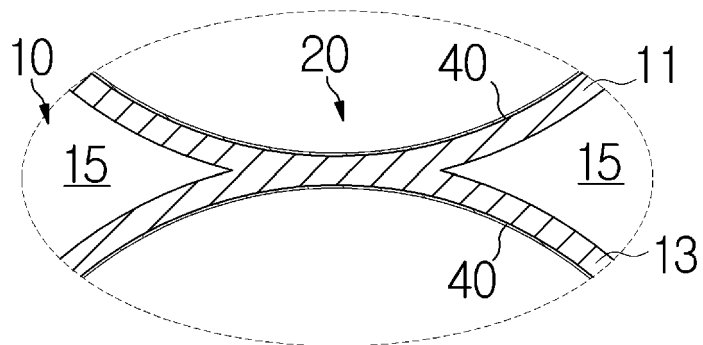


FIG. 5

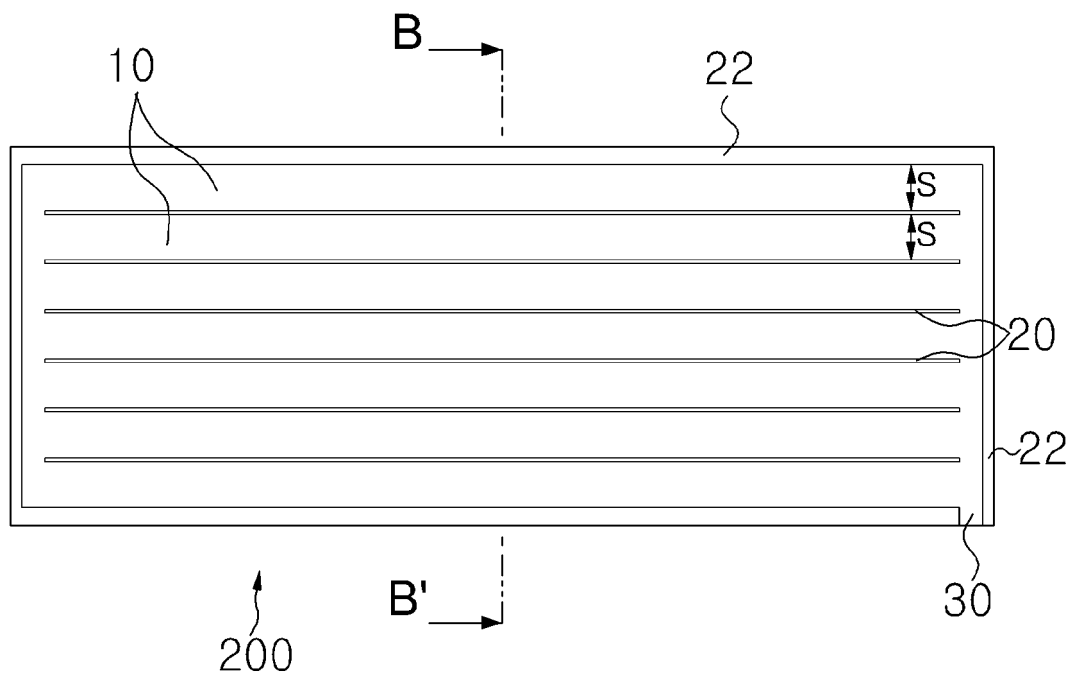


FIG. 6

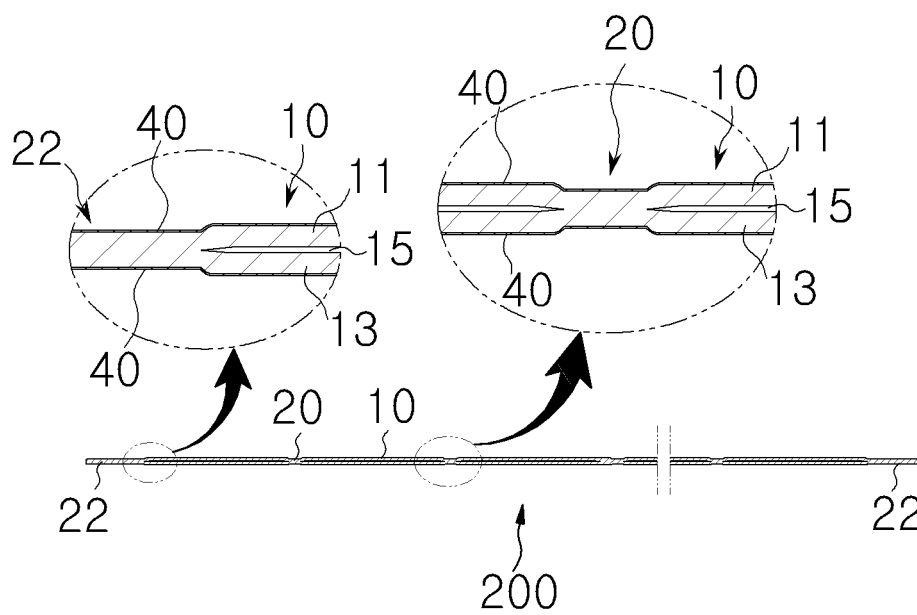


FIG. 7

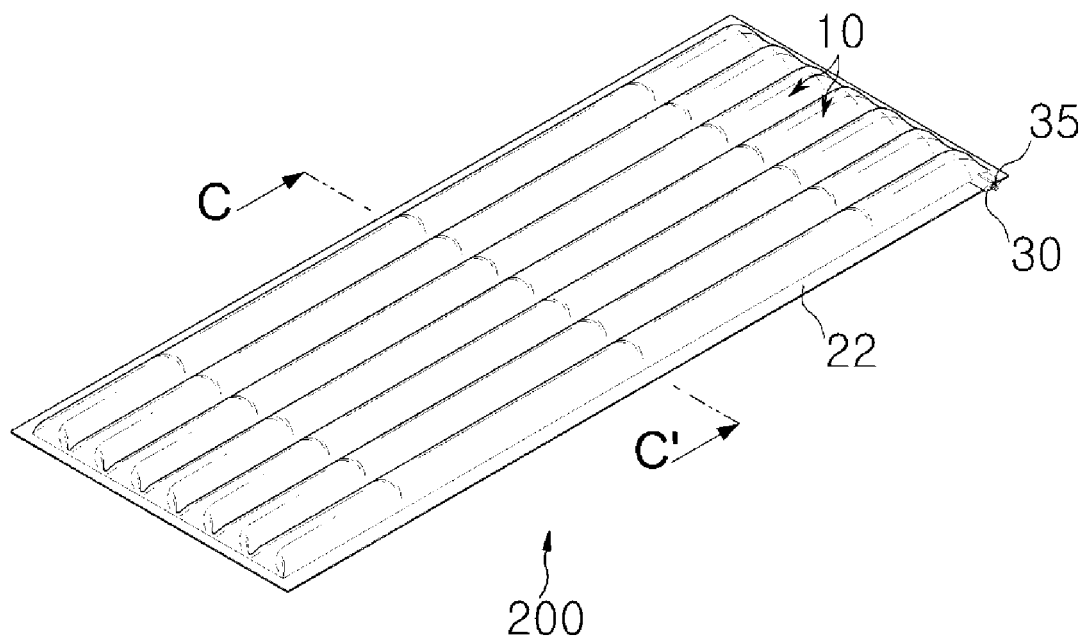


FIG. 8

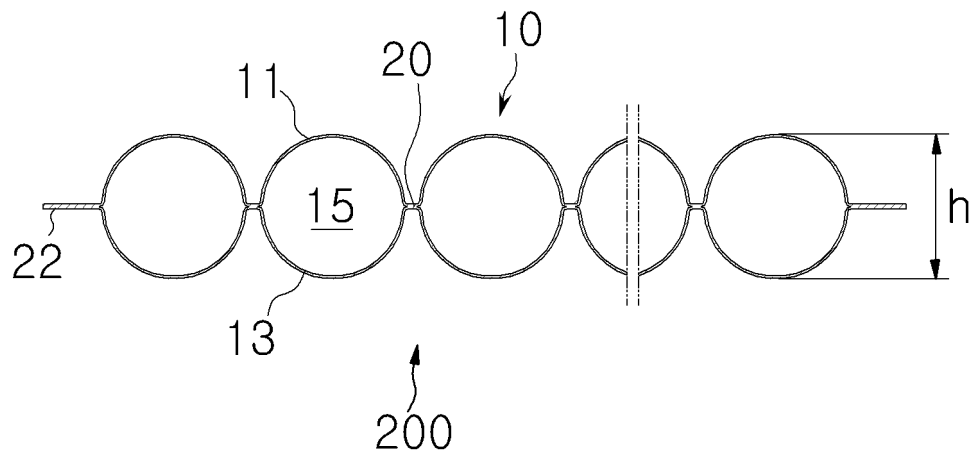


FIG. 9

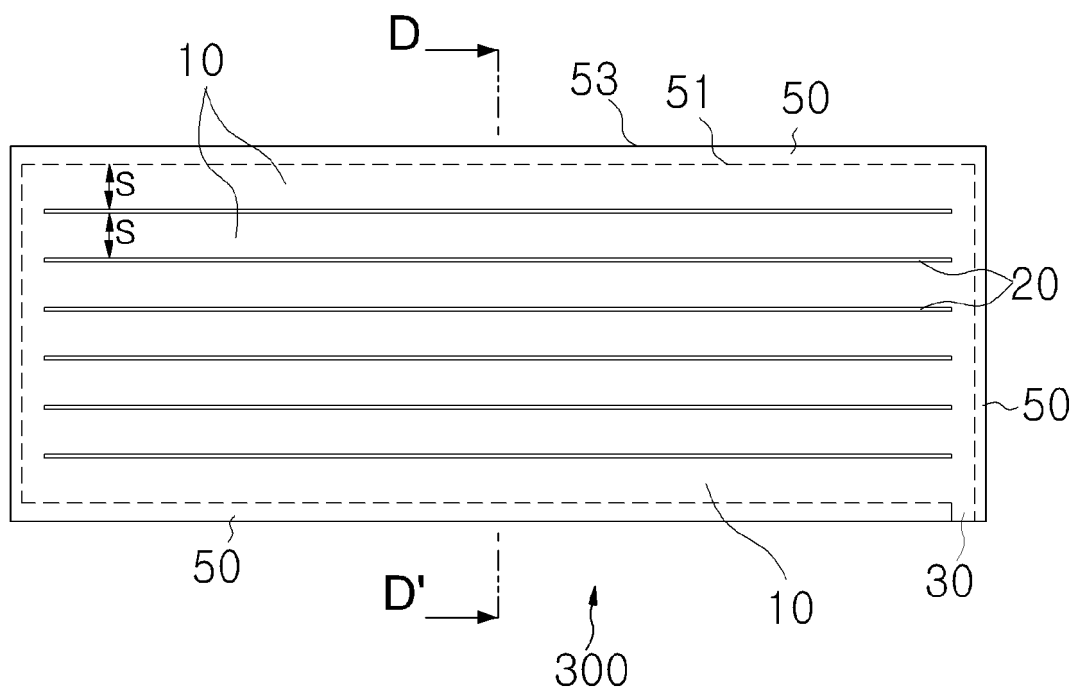


FIG. 10

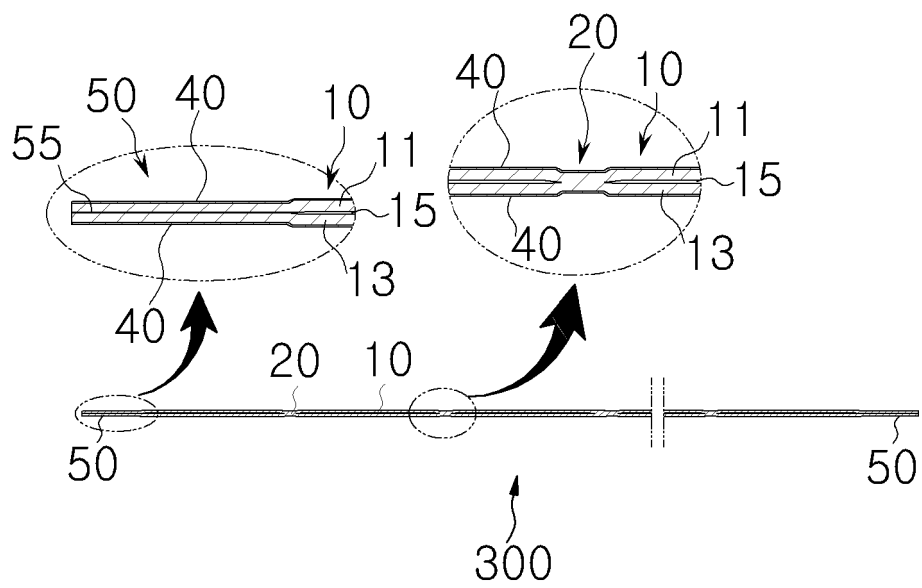


FIG. 11

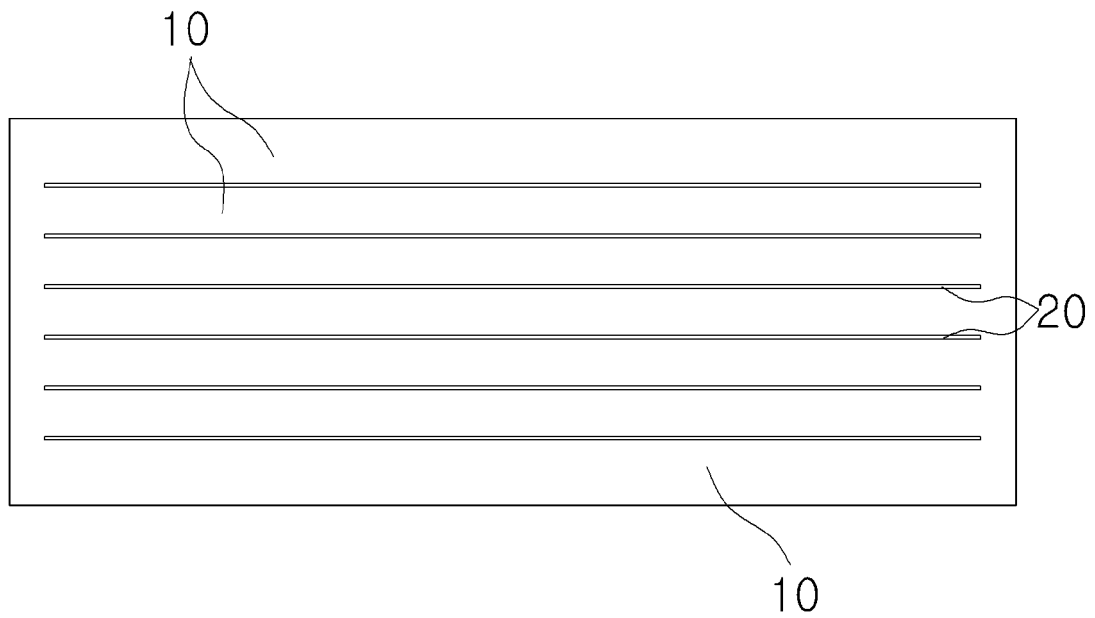
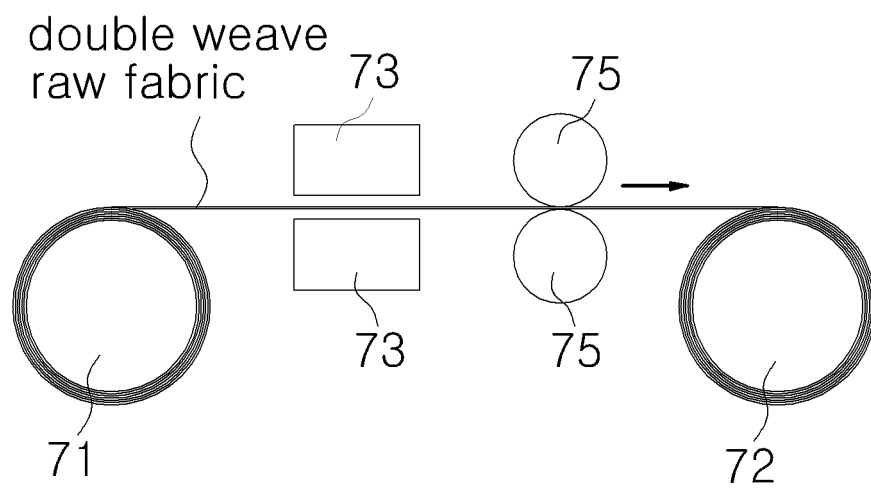


FIG. 12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2015/002317

A. CLASSIFICATION OF SUBJECT MATTER

A47B 27/10(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)

A47B 27/10; A47C 27/08; A47C 27/08; A47C 27/00; A47C 27/08

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: air, mat, pad, incline, weft thread, cover factor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2002-028056 A (KITAMORI YOSHIYUKI et al.) 29 January 2002 See claims 1, 2, figures 1-5 and abstract.	1-14
A	JP 2000-232923 A (OHTSU TIRE & RUBBER CO., LTD.) 29 August 2000 See claims 1-11, figures 1-14 and abstract.	1-14
A	KR 20-0442795 Y1 (PARK, Hae Chung) 11 December 2008 See claims 1, 2, figures 1-5 and abstract.	1-14
A	KR 20-0295894 Y1 (CHOI, Chang Hwan) 29 November 2002 See claims 1-4, figures 1-4 and abstract.	1-14

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

* Special categories of cited documents:

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Date of the actual completion of the international search

21 MAY 2015 (21.05.2015)

Date of mailing of the international search report

21 MAY 2015 (21.05.2015)

Name and mailing address of the ISA/KR


 Korean Intellectual Property Office
 Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701,
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2015/002317

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Patent document cited in search report	Publication date	Patent family member	Publication date
JP 2002-028056 A	29/01/2002	NONE	
JP 2000-232923 A	29/08/2000	NONE	
KR 20-0442795 Y1	11/12/2008	NONE	
KR 20-0295894 Y1	29/11/2002	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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