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(54) **MANUFACTURING METHOD FOR UNIDIRECTIONALLY ELASTIC LAMINATED NON-WOVEN FABRIC**

(57) It is prepared to be an elastic net which is elastic in the cross machine direction and non-elastic in the machine direction. A combined sheet is obtained by joining the net and a filamentous web. The filamentous web comprises of drawn thermoplastic continuous filaments which are oriented in a machine direction. A laminated web is

obtained by laying a fibrous web of staple fibers on the combined sheet. A high-pressure liquid flow is applied to the laminated web. The staple fibers are entangled among, and with the net. A method for producing a pressure-sensitive adhesive tape or sheet

Description

[0001] A manufacturing method of a unidirectionally elastic laminated nonwoven fabric

Technical Field

[0002] The present invention relates to the manufacturing method of a unidirectionally elastic laminated nonwoven fabric. Especially, the present invention relates to the manufacturing method of the laminated nonwoven fabric which is elastic in a cross machine direction and is non-elastic in a machine direction.

Background Art

[0003] It is used as an elastic nonwoven fabric to be a laminated nonwoven fabric which is obtained by joining an elastic net to a fibrous web. The patent reference 1 discloses the elastic nonwoven fabric in the cross machine direction which is obtained by the following manufacturing method. That is, the method comprises of preparing the elastic net which is elastic in the cross machine direction and non-elastic in the machine direction, obtaining a laminated web by laying a fibrous web of staple fibers on the elastic net, applying high-pressure liquid jet flow to the laminated web. The elastic net consists of arranging non-elastic warp monofilaments and elastic weft monofilaments in a lattice pattern, and the intersections of the warp monofilaments and the weft monofilaments is heat-sealed (show Fig 1 in the patent reference 1).

[0004] The elastic nonwoven fabric is industrially manufactured by laying the fibrous web on moving elastic net to convey and by applying high-pressure liquid jet flow on moving fibrous web and moving elastic net to convey. Therefore, a load in the machine direction is given to the elastic net during the manufacture.

[0005] It is no problem, if the load is uniformly given in the cross machine direction to the elastic net. However, when the high load is given in the central part of the elastic net and the central part is drawn, the central part is distorted as showed Fig. 2 because the elastic weft monofilaments are lengthened by the elasticity of it. When the fibrous web is laid and the high-pressure liquid jet flow is applied as it is, the obtained elastic nonwoven fabric is not uniformity. Because the elastic weft monofilaments of the obtained elastic nonwoven fabric is shrunk to revert in original length.

[0006] Patent reference 1: JP10-195746(kokai) [Example in pages 5 and 6]

Description of the Invention

Problem to be solved by the invention

[0007] The invention provides the manufacturing method to obtain a uniform elastic nonwoven fabric.

Therefore, if the central part of the elastic net is drawn, the elastic weft monofilaments are difficult to be lengthened, whereby the invention provides the uniform elastic nonwoven fabric.

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Means for solving the problem

[0008] The invention adopts to use a combined sheet which is obtained by joining the elastic net to a filamentous web of drawn thermoplastic continuous filaments which are orienting. The invention relates to the manufacturing method of the unidirectionally elastic laminated nonwoven fabric comprising of: preparing a combined sheet which is obtained by joining an elastic net in a cross machine direction to a filamentous web of drawn thermoplastic continuous filaments orienting in a machine direction; preparing a laminated web by laying a fibrous web of staple fibers on a one side or both sides of the combined sheet; applying high-pressure liquid jet flow to the fibrous web of the laminated web; whereby, the staple fibers are entangled among, and with the elastic net.

[0009] Conventional products may be used as the elastic net in the cross machine direction. For example, an elastic net for wrapping by extrusion molding may be used. Furthermore, an elastic net which is loosely woven or knitted with elastic yarns may be used. Especially, it is preferable in the invention to use the elastic net which is shown in Fig 1. The elastic net in Fig. 1 consists of arranging non-elastic warp monofilaments and elastic weft monofilaments in a lattice pattern, and the intersections of the warp monofilaments and the weft monofilaments are bonded. The warp monofilament means the monofilament which arranges in the machine direction. The weft monofilament means the monofilament which arranges in the cross machine direction. Furthermore, the elastic net in the invention may consist of arranging elastic warp monofilaments and elastic weft monofilaments in a lattice pattern, and the intersections of the warp monofilaments and the weft monofilaments are bonded. A square of the lattice pattern is preferable 3-7 mm in the warp direction and 3-7 mm in the weft direction, because the staple fibers are entangled with the elastic net through the square.

[0010] The intersections of the lattice pattern are optionally bonded with an adhesive etc.. When the elastic monofilaments are made of a thermoplastic elastomeric resin such as styrene type elastomeric resin, the intersections are heat-sealed or bonded by the thermoplastic elastomeric resin. The diameter of the monofilament may be 0.1 mm to 2 mm. If the diameter is less than 0.1 mm, the monofilament tends to be cut. If the diameter is more than 2 mm, the obtained laminated nonwoven fabric tends to be bulky, and the surface of it tends to be unevenness. The cross sectional configuration of the monofilament may be optionally. However, it is preferable to be rectangle than circular. The cross sectional configuration being rectangle, the obtained laminated nonwoven fabric is not bulky and the surface is smooth. Especially,

it is preferable to use REBOUND NET which is trade name of CONWED GLOBAL NETTING SOLUTIONS COMPANY as the elastic net.

[0011] The combined sheet is obtained by joining the filamentous web to one side or both sides of the elastic net. The filamentous web consists of drawn thermoplastic continuous filaments which are oriented in a unidirectional direction. The filamentous web is joined to the elastic net as the unidirectional direction corresponds to the machine direction. Loaded in the machine direction, the drawn thermoplastic continuous filaments are difficult to be lengthened. Therefore, the drawn thermoplastic continuous filaments are used in the invention. For example, undrawn thermoplastic continuous filaments using, they are easy to be lengthened by the load, therefore they are not used in the invention. Drawn polyester continuous filaments are more difficult to be lengthened, therefore they are preferably used in the invention as the drawn thermoplastic continuous filaments.

[0012] The weight of the filamentous web may be 3 g/m² to 15 g/m². If the weight is more than 15 g/m², the openings among the continuous filaments decrease because the continuous filaments are many. Therefore, the staple fibers are difficult to be entangled with the elastic net through the openings. The filamentous web of which the weight is less than 3 g/m² is difficult to be manufactured. Especially, it is preferable to use MILIFE which is trade name of JX Nippon Oil &

Energy Corporation as the filamentous web.

[0013] The filamentous web may be joined to the elastic net with an adhesive or heat-sealing by thermoplasticity of the filamentous web or the elastic net. For example, a hot-melt adhesive is coated on the elastic net, the filamentous web is laid on the coated surface to form a laminated material, and the laminated material is heated and pressed, whereby the combined sheet is obtained. Furthermore, the filamentous web is laid on the elastic net to form the laminated material, and the laminated material is pressed under the condition that the warp monofilaments, the weft monofilament or the continuous filament are softened by heat, whereby the combined sheet is obtained.

[0014] Fig. 3 shows a plan view of the combined sheet. The drawn thermoplastic continuous filaments of the filamentous web are oriented in the machine direction. The continuous filaments which exist in each square are oriented in the machine direction. Therefore, although loaded ununiformly in the machine direction of the elastic net, the elastic net is difficult to distort for the continuous filaments. The openings exist among the continuous filaments which are oriented in the machine direction. As the openings exit, the staple fibers are easy to entangle with the elastic net through the openings.

[0015] The fibrous web is laid on the one side or both sides of the combined sheet to obtain a laminate web. The fibrous web is formed by accumulate the staple fibers

such as polyester staple fibers, cotton fibers etc. or mixture of them. The staple fibers may accumulate at random or at orienting in machine direction. The weight of the fibrous web may be optionally. However, the weight is preferable 40 g/m² to 60 g/m². If the weight is less than 40 g/m², the staple fibers are not sufficient to entangle with the elastic net because the staple fibers are few. If the weight is more than 60 g/m² the elasticity of the obtained nonwoven fabric tends to lower in the cross machine direction because the staple fibers obstruct the elasticity of the weft monofilaments. Further, the weight of the fibrous web is a total weight, laid on the both sides.

[0016] The laminated web which is obtained by laying the fibrous web on the combined sheet is carried on a conveyor net, and then a high-pressure liquid jet flow is applied to the fibrous web side of the laminated web. Therefore, when the fibrous webs are laid on the both sides, the high-pressure liquid jet flows are applied to the both sides. Applying the high-pressure liquid jet flow, the staple fibers are entangled among and with the elastic net of the combined sheet. Whereby, it is obtained the laminated nonwoven fabric which unifies the fibrous web and the combined sheet. Generally, a high-pressure water jet flow is used as the high-pressure liquid jet flow. Generally, the pressure of the jet is preferable 3 MPa to 10 MPa. The pressure decreased, the entanglement becomes weak and the surface becomes uniform in the obtained laminated nonwoven fabric. The pressure increased, the entanglement becomes strong and the surface becomes ununiform in the obtained laminated nonwoven fabric. Therefore, it is used to apply the increased pressure after applying the decreased pressure. In this way, plurally applying the high-pressure water jet flow, the obtained laminated nonwoven fabric has strong entanglement and uniform surface,

[0017] After applying the high-pressure water jet flow, the obtained laminated nonwoven fabric is dried, and the unidirectionally elastic laminated nonwoven fabric is obtained. The unidirectionally elastic laminated nonwoven fabric has a good elasticity in the cross machine direction. Therefore, the unidirectionally elastic laminated nonwoven fabric is used in many articles which need an elasticity. For example, it is used as a cloth for fixing such as a bandage, an athletic supporter or a plaster cast. Then, the longer direction of the cloth corresponds to the cross machine direction of the unidirectionally elastic laminated nonwoven fabric. Furthermore, it is used as constituent material of an underwear, a sportswear, or gathered side of a disposable diaper. Furthermore, it is used as constituent material of a wrapping bag or a wrapping container. Used on a body, the cotton fibers are preferable as the staple fibers of the fibrous web. Because the cotton fibers are superior in a faculty for absorbing sweat and liquid.

Effect of the invention

[0018] The invention is characterized by using the

combined sheet which is obtained by joining the elastic net in a cross machine direction to the filamentous web of the drawn thermoplastic continuous filaments orienting in a machine direction. The combined sheet carried on the conveyor, the fibrous web is laid on the combined sheet and the high-pressure liquid jet flow is applied. Therefore, if the load is ununiformly given to the combined sheet in the machine direction during carried, the ununiform load is difficult to be transmitted because the filamentous web absorbs the ununiform load. Therefore, the obtained unidirectionally elastic laminated nonwoven fabric is uniform because the elastic net is difficult to distort during the method process.

Description of drawings

[0019]

Figure 1 is a plan view of an elastic net which is used in the invention.

Figure 2 is a plan view of an elastic net of which the central part is distorted by an ununiformal load in a machine direction.

Figure 3 is a plan view of a combined sheet which is used in the invention.

Example

[0020] Hereinafter, the invention is described on the basis of the examples. However, the invention is not limited to the examples.

Example 1

[0021] It was prepared REBOUND NET 810345-006 which was sold by CONWED GLOBAL NETTLING SOLUTIONS COMPANY as an elastic net. The elastic net consisted of arranging warp monofilaments made of polyester and weft monofilaments made of styrene type elastomer in a lattice pattern. The diameter of the warp monofilament was 0.3 mm and the diameter of the weft monofilament is 0.8 mm. In the lattice pattern, 8 warp monofilaments existed in 25 mm of a cross machine direction and 4 weft monofilaments existed in 25 mm of a machine direction. Each intersection was heat-sealed by weft monofilament made of styrene type elastomer which was thermoplastic. Each square of the elastic net was 6 mm long and 2 mm wide.

[0022] It was prepared MILIFE which is 5 g/m² and sold by JX Nippon Oil & Energy Corporation as a filamentous web. The filamentous web consisted of drawn polyester continuous filaments which were orienting in the machine direction. The filamentous web was laid on the elastic net to form a laminated material. The laminated material was passed between a pair of rolls which were heated at 143 °C. Whereby, the laminated material was heated and pressed to form a combined sheet of which the filamentous web and the elastic net were joined by thermo-

plasticity of the weft monofilament made of styrene type elastomer. Pulled in the machine direction with a hand, the combined sheet was hardly lengthened. However, pulled in the cross machine direction, the combined sheet was lengthened more than double length and back to the original at then releasing the hand.

[0023] It was prepared a fibrous web which was 25 g/m². The fibrous web was formed as the following method. It was uniformly mixed to be 50 mass % of polyester side-by-side type conjugated fibers (sold by UNITIKA LTD. as T81 of trade name) and 50 mass% of cotton fibers. The conjugated fibers were 2.2 decitex and 44 mm in length and the cotton fibers were 25 mm in average length. The mixed fibers were opened and accumulated with a random card machine to form the fibrous web. The fibrous webs were laid on the both sides of the combined sheet to form a laminated web. The laminated web was carried on a conveyor which was made of wire netting (# 25 mesh), then high-pressure water jet flows were applied as the following. That is, the high-pressure water jet flows were applied with 4 MPa in the pressure of the jet to both sides, thereafter, the high-pressure water jet flows were three times applied with 7 MPa in the pressure of the jet to both sides. Dried at 120 °C for one minute, a unidirectionally elastic laminated nonwoven fabric was obtained. The unidirectionally elastic laminated nonwoven fabric was wholly uniform, not distorted, not elastic in the machine direction and superiorly elastic in the cross machine direction.

Example 2

[0024] Except that the weight of the filamentous web was changed to 10 g/m² and the random card machine was changed to a parallel card machine, a unidirectionally elastic laminated nonwoven fabric was obtained by the same method of the example 1. The unidirectionally elastic laminated nonwoven fabric had the same property as it of the Example 1. However, the unidirectionally elastic laminated nonwoven fabric had high elastic than it.

Example 3

[0025] Except that the polyester side-by-side type conjugated fibers (sold by UNITIKA LTD. as T81 of trade name) was changed to polyester side-by-side type conjugated fibers (sold by UNITIKA LTD. as 6080 of trade name) which were 2.2 decitex and 51 mm in length and the wire netting (# 25 mesh) was changed to wire netting (# 100 mesh), a unidirectionally elastic laminated nonwoven fabric was obtained by the same method of the example 1. The unidirectionally elastic laminated nonwoven fabric had the same property as it of the Example 1. However, the unidirectionally elastic laminated nonwoven fabric had high uniform than it.

Example 4

[0026] Except that the mixed fibers were changed to 100 mass % of cotton fibers which were 25 mm in average length, a unidirectionally elastic laminated nonwoven fabric was obtained by the same method of the example 1. The unidirectionally elastic laminated nonwoven fabric had the same property as it of the Example 1. However, the unidirectionally elastic laminated nonwoven fabric had high absorbing liquid.

Claims

1. A manufacturing method of a unidirectionally elastic laminated nonwoven fabric comprising of:

preparing a combined sheet which is obtained by joining an elastic net in a cross machine direction to a filamentous web of drawn thermoplastic continuous filaments oriented in a machine direction;
 preparing a laminated web by laying a fibrous web of staple fibers on a one side or both sides of the combined sheet;
 applying high-pressure liquid jet flow to the fibrous web of the laminated web;
 whereby, the staple fibers are entangled among, and with the elastic net.

2. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the elastic net consists of arranging elastic warp monofilaments and elastic weft monofilaments in a lattice pattern.

3. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the elastic net consists of non-elastic warp monofilaments and elastic weft monofilaments in a lattice pattern.

4. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 2 or 3 wherein the elastic weft monofilaments are made of thermoplastic elastomeric resin, and the intersections of the warp monofilaments and the weft monofilaments are heat-sealed by the thermoplastic elastomeric resin.

5. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 2 or 3 wherein each diameter of the warp monofilament and weft monofilament is 0.1mm to 2mm.

6. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the drawn thermoplastic continuous fila-

ments are drawn polyester continuous filaments.

7. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the filamentous web is thin, whereby openings are formed among the drawn thermoplastic continuous filaments.

8. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the combined sheet which is obtained by joining the elastic net to the filamentous web with heat-scaling by the thermoplastic continuous filaments.

9. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 4 wherein the combined sheet which is obtained by joining the elastic net to the filamentous web with heat-sealing by the elastic weft monofilaments consisting of thermoplastic elastomeric resin.

10. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the fibrous web is formed by mixing polyester staple fibers with cotton fibers.

11. The manufacturing method of a unidirectionally elastic laminated nonwoven fabric according to claim 1 wherein the fibrous web is consisting of cotton fibers.

Figure 1

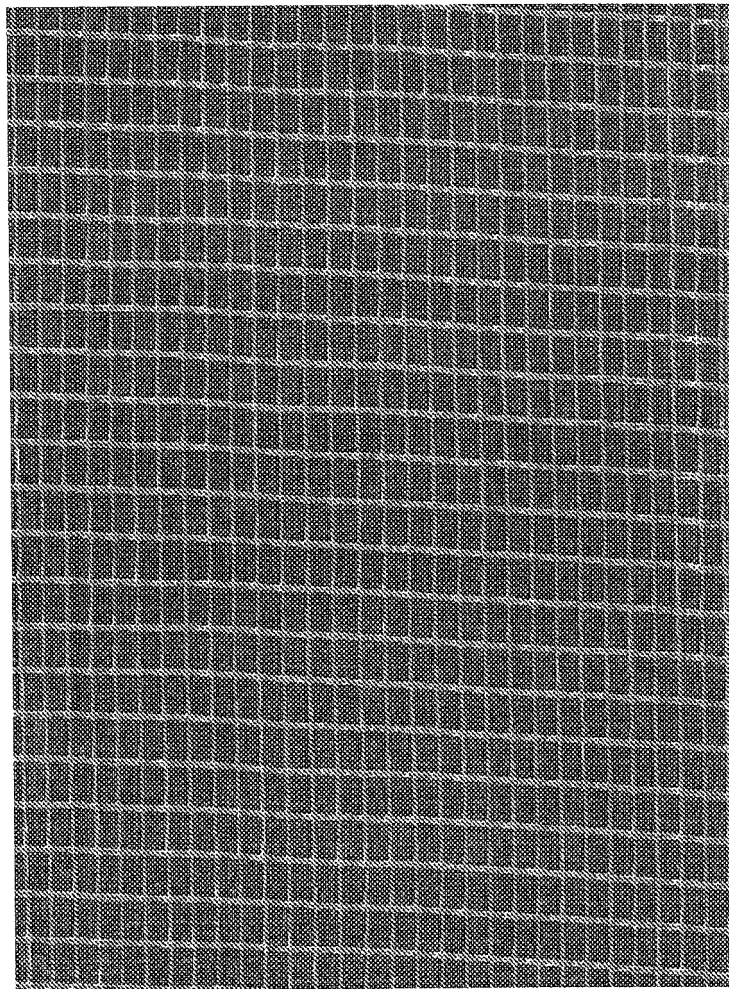


Figure 2

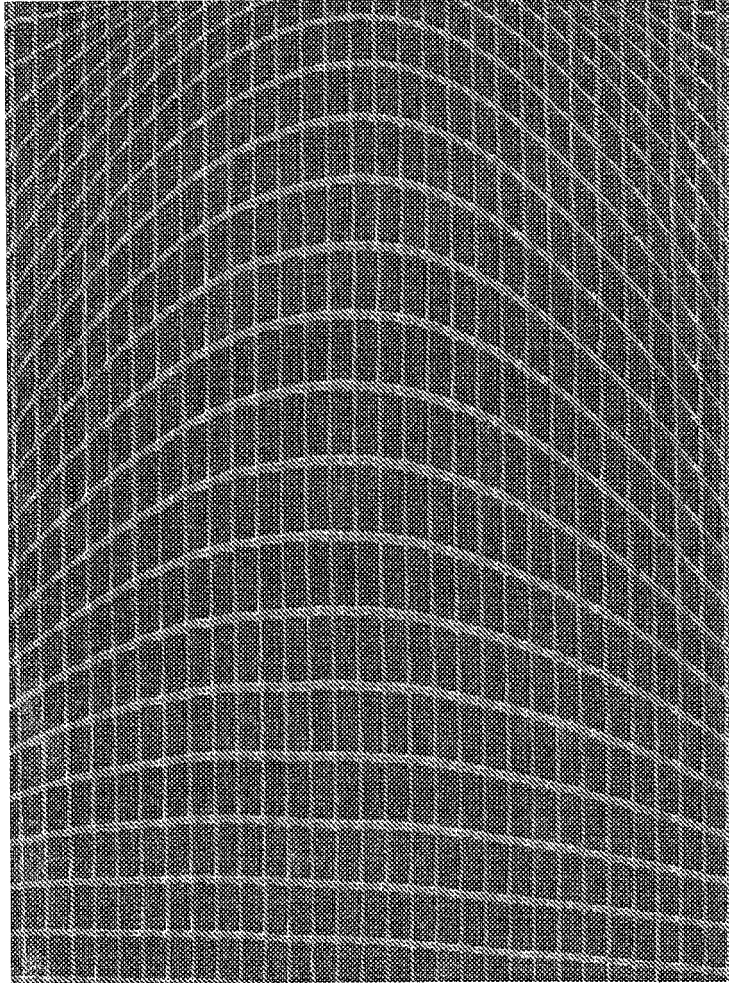
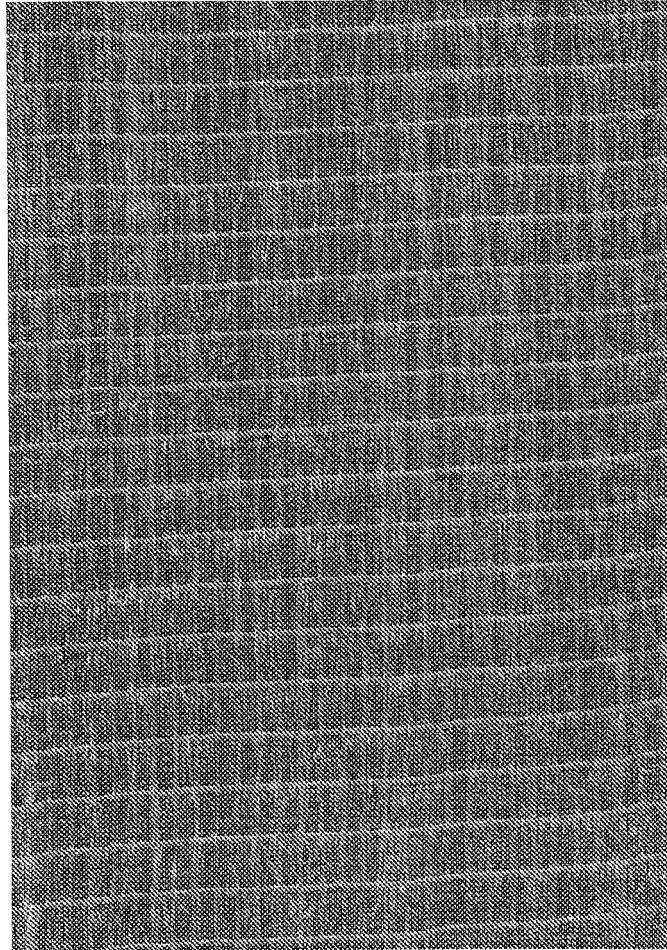


Figure 3



REFERENCES CITED IN THE DESCRIPTION

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