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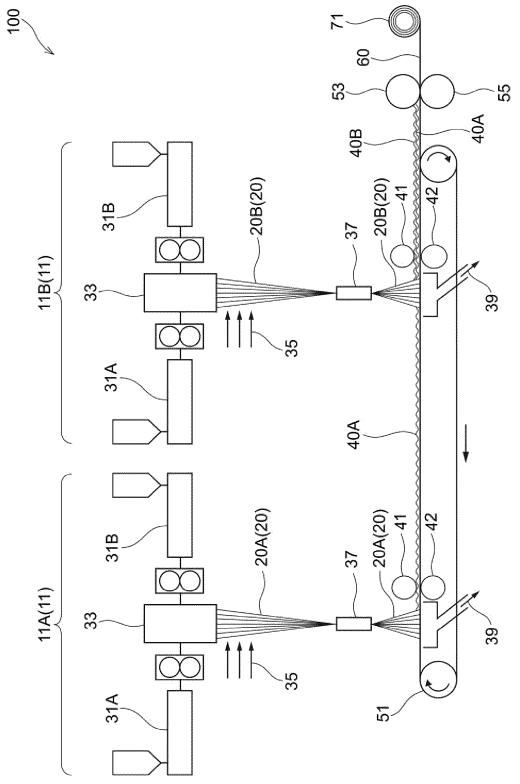
(54) **METHOD FOR PRODUCING SPUN-BONDED NONWOVEN FABRIC AND SPUN-BONDED NONWOVEN FABRIC**

(57) A method of manufacturing a spunbonded non-woven fabric includes a step of melt-spinning a thermoplastic polymer to form a crimped fiber, and a step of collecting the crimped fiber and pressing the collected crimped fiber at a linear pressure of 5 N/mm or more by a compaction roll.

FIG.1



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Description

Technical Field

[0001] The present disclosure relates to a method of manufacturing a spunbonded non-woven fabric, and to a spunbonded non-woven fabric.

Background Art

[0002] In recent years, non-woven fabrics have been widely used in various applications because the non-woven fabrics have been excellent in air permeability and flexibility. In the non-woven fabrics, therefore, various characteristics depending on the applications have been demanded, and improvement in the characteristics has been required.

[0003] In particular, long-fiber non-woven fabrics obtained by spunbonding have been applied to, for example, absorbent articles (paper diapers, sanitary napkins, and the like), medical materials (operating gowns, drapes, sanitary masks, bed sheets, medical gauze, base fabrics for fomentation materials, and the like), and the like. Applications such as absorbent articles and medical materials have had portions coming in direct contact with the skin and, therefore, have especially required high flexibility.

[0004] For example, Patent Document 1 proposes a method of manufacturing a spunbonded high-loft non-woven web including crimped multicomponent fibers excellent in flexibility.

Citation List

Patent Document

[0005] Patent Document 1: Japanese Patent Application Laid-Open (JP-A) No. 2018-24965

SUMMARY OF INVENTION

Technical Problem

[0006] Applications such as absorbent articles and medical materials require resistance to fuzz, i.e., excellent fuzz resistance, as well as high flexibility. The manufacturing method described in Patent Document 1 has room for improvement in fuzz resistance.

[0007] An object of the present disclosure is to provide a spunbonded non-woven fabric without deteriorated flexibility and with excellent fuzz resistance, and a method of manufacturing the spunbonded non-woven fabric.

Solution to Problem

[0008] The present disclosure relates to the following aspects.

[0009]

<1> A method of manufacturing a spunbonded non-woven fabric, the method comprising: a step of melt-spinning a thermoplastic polymer to form a crimped fiber; and a step of collecting the crimped fiber and pressing the collected crimped fiber at a linear pressure of 5 N/mm or more by a compaction roll.

<2> The method of manufacturing a spunbonded non-woven fabric according to <1>, wherein a temperature of the compaction roll while pressing the crimped fiber is from 80°C to 120°C.

<3> The method of manufacturing a spunbonded non-woven fabric according to <1>, wherein a temperature of the compaction roll while of pressing the crimped fiber is lower than a melting point of the crimped fiber.

<4> The method of manufacturing a spunbonded non-woven fabric according to any one of <1> to <3>, wherein the linear pressure is 10 N/mm or less.

<5> The method of manufacturing a spunbonded non-woven fabric according to any one of <1> to <4>, wherein the thermoplastic polymer comprises an olefinic polymer.

<6> The method of manufacturing a spunbonded non-woven fabric according to <5>, wherein the olefinic polymer comprises a propylene-based polymer.

<7> The method of manufacturing a spunbonded non-woven fabric according to any one of <1> to <6>, further comprising a step of layering a crimped fiber formed by melt-spinning a thermoplastic polymer on a non-woven web that is formed in the pressing step, and then pressing the non-woven web, on which the crimped fiber is layered, at a linear pressure of 5 N/mm or more by the compaction roll, to manufacture a non-woven fabric layered body

comprising a plurality of spunbonded non-woven fabric layers.

<8> A spunbonded non-woven fabric satisfying at least one of the following (1) or (2) in a case in which a region of 150 mm × 150 mm on a surface is subjected to a rubbing test in conformity with a rubbing fastness test method of JIS L 0849 (2013) using a Gakushin-type rubbing fastness test machine:

(1) in the region, a number of fluffs having an equivalent circle diameter of 2.0 mm or more is 0, and a number of fluffs having an equivalent circle diameter of from 0.8 mm to less than 2.0 mm is one or less; and
(2) in the region, the number of fluffs having an equivalent circle diameter of 2.0 mm or more is 0, and a number of fluffs having an equivalent circle diameter of from 0.1 mm to less than 0.8 mm is nine or less.

Advantageous Effects of Invention

[0010] In accordance with the present disclosure, a spunbonded non-woven fabric without deteriorated flexibility and with excellent fuzz resistance, and a method of manufacturing the spunbonded non-woven fabric are provided.

BRIEF DESCRIPTION OF DRAWINGS

[0011]

Fig. 1 is a schematic view illustrating an example of an apparatus for manufacturing a non-woven fabric layered body of the present disclosure.
Fig. 2 is a schematic view illustrating another example of the apparatus for manufacturing a non-woven fabric layered body of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0012] An example of a preferred embodiment in the present disclosure will be described in detail below. Such descriptions and Examples are intended to exemplify embodiments, and are not intended to limit the scope of the embodiments.

[0013] In the present disclosure, any numerical value range indicated by the term "to" represents any range including the numerical values described before and after the term "to" as the lower limit value and the upper limit value, respectively.

[0014] In the present disclosure, the term "step" encompasses not only an independent step but also a step of which the object is achieved even in a case in which the step is incapable of being definitely distinguished from another step.

[0015] In the present disclosure, in a case in which plural kinds of substances corresponding to each constituent are present, the content of each constituent in a composition means the total amount of the plural kinds of the substances unless otherwise specified.

[0016] In the present disclosure, an MD (machine direction) direction refers to the direction of travel of a non-woven web in an apparatus of manufacturing a non-woven fabric. A CD (cross direction) direction refers to a direction that is perpendicular to the MD direction and parallel to a principal face (a face orthogonal to the thickness direction of a non-woven fabric).

<Method of Manufacturing Spunbonded Non-Woven Fabric>

[0017] A method of manufacturing a spunbonded non-woven fabric of the present disclosure includes a step of melt-spinning a thermoplastic polymer to form a crimped fiber, and a step of collecting the crimped fiber and pressing the collected crimped fiber at a linear pressure of 5 N/mm or more by a compaction roll (hereinafter also referred to as "step (1) of pressing crimped fiber").

[0018] The manufacturing method of the present disclosure includes the step of pressing the collected crimped fiber at a linear pressure of 5 N/mm or more by the compaction roll, thereby enabling a spunbonded non-woven fabric without deteriorated flexibility and with excellent fuzz resistance to be manufactured.

[Step of Forming Crimped Fiber]

[0019] The manufacturing method of the present disclosure includes the step of melt-spinning the thermoplastic polymer to form the crimped fiber. The step of forming the crimped fiber is not particularly limited as long as the step enables the crimped fiber to be formed. The step may also include a known process of cooling and drawing the thermoplastic polymer.

[0020] The thermoplastic polymer used in the manufacturing method of the present disclosure is as described below.

[Step (1) of Pressing Crimped Fiber]

[0021] The manufacturing method of the present disclosure includes the step of collecting the crimped fiber and pressing the collected crimped fiber at a linear pressure of 5 N/mm or more by the compaction roll.

[0022] The temperature of the compaction roll while pressing the crimped fiber may be from 80°C to 120°C, may be from 85°C to 115°C, may be from 90°C to 110°C, and may be from 95°C to 105°C.

[0023] The temperature of the compaction roll while pressing the crimped fiber is preferably lower than the melting point of the crimped fiber.

[0024] The linear pressure at which the crimped fiber is pressed is preferably 5.1 N/mm or more, and more preferably 5.2 N/mm or more, from the viewpoint of fuzz resistance.

[0025] The linear pressure at which the crimped fiber is pressed is preferably 10 N/mm or less, more preferably 7.0 N/mm or less, still more preferably 6.5 N/mm or less, and particularly preferably 6.0 N/mm or less, from the viewpoint of flexibility.

[0026] A non-woven fabric layered body of the present disclosure may include a pressure bonding portion and a non-pressure bonding portion from the viewpoint of excellent flexibility. The area rate of the pressure bonding portion is preferably from 7% to 20%. The area rate of the pressure bonding portion is more preferably 8% or more and 18% or less. The area rate of the pressure bonding portion is set at the rate of the area of a thermocompression bonding portion with respect to the area of an observed non-woven fabric in a case in which a test piece having a size of 10 mm $\times$ 10 mm is sampled from the non-woven fabric layered body, and a surface of the test piece, which has come into contact with the embossing roll, is observed with an electron microscope (magnification: 100 times).

(Thermoplastic Polymer)

[0027] The thermoplastic polymer is not particularly limited as long as the thermoplastic polymer can form a spunbonded non-woven fabric. Examples of the thermoplastic polymer include an olefinic polymer, a polyester-based polymer, a polyamide-based polymer, and a polymer composition of such polymers. The olefinic polymer is a polymer including an olefin as a structural unit. The polyester-based polymer is a polymer including an ester as a structural unit, and the polyamide-based polymer is a polymer including an amide as a structural unit. In the present disclosure, the thermoplastic polymer is a concept encompassing a thermoplastic polymer composition.

[0028] Of these, the thermoplastic polymer preferably includes an olefinic polymer, and more preferably includes a propylene-based polymer as the olefinic polymer.

[0029] Such propylene-based polymers are preferably, for example, a homopolymer of propylene, and a propylene/a-olefin random copolymer (for example, a random copolymer of propylene and one or two or more α-olefins having from 2 to 8 carbon atoms). Specific examples of preferred α-olefins include propylene as well as ethylene, 1-butene, 1-pentene, 1-hexene, 1-octene, and 4-methyl-1-pentene, from the viewpoint of excellent flexibility. The content of α-olefin in the propylene/a-olefin random copolymer is not particularly limited, and is, for example, preferably from 1% by mol to 10% by mol, and more preferably from 1% by mol to 5% by mol.

[0030] The melting point (Tm) of the propylene-based polymer may be 125°C or more, and may be from 125°C to 165°C. The melt flow rate (MFR) (ASTM D-1238, 230°C, a load of 2160 g) may be from 10 g/10 minutes to 100 g/10 minutes, and may be from 20 g/10 minutes to 70 g/10 minutes.

[0031] The crimped fiber used in the manufacturing method of the present disclosure may be a fiber including one thermoplastic polymer, or may be a composite fiber including two or more thermoplastic polymers. The composite fiber may be, for example, a side-by-side type, a concentric core-sheath type, or an eccentric core-sheath type. The eccentric core-sheath type composite fiber may be an exposure type in which a core is exposed to a surface, or may be a non-exposure type in which a core is not exposed to a surface.

[0032] Of these, the crimped fiber is preferably a crimped composite fiber including a propylene-based polymer, and more preferably an eccentric core-sheath type crimped composite fiber including a propylene-based polymer.

[0033] In a similar viewpoint, it is still more preferable that in the crimped composite fiber, the propylene-based polymer is included in a side with much exposure to the surface of the crimped composite fiber, and the propylene-based polymer is a propylene/a-olefin copolymer or a mixture of a propylene homopolymer and a propylene/a-olefin copolymer. The side with much exposure to the surface represents a side to which a larger amount of thermoplastic polymer is exposed in the crimped composite fiber. In the present disclosure, the side with much exposure to the surface is generically referred to as a sheath portion. A side with less exposure to the surface is generically referred to as a core portion.

[0034] In a case in which the crimped composite fiber is a core-sheath type, examples of a preferred embodiment of a mass ratio between a sheath portion and a core portion (core portion/sheath portion) include from 90/10 to 60/40 (more preferably from 85/15 to 40/60).

[0035] The crimped fiber may include a commonly used additive, if necessary. Examples of the additive include an antioxidant, a weathering stabilizer, a light stabilizer, a dispersant, an antistatic agent, an anti-fogging agent, an anti-

blocking agent, a lubricant, a nucleating agent, a pigment, a penetrant, and a humectant.

[0036] The spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure preferably has a tensile load of from 10 N/25 mm to 30 N/25 mm, and more preferably from 15 N/25 mm to 25 N/25 mm, in the MD direction of the spunbonded non-woven fabric.

[0037] The spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure preferably has a tensile load of from 5 N/25 mm to 20 N/25 mm, and more preferably from 10 N/25 mm to 15 N/25 mm, in the CD direction of the spunbonded non-woven fabric.

[0038] The spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure preferably has a tensile strength of 2.0 N/25 mm or more, and more preferably 3.0 N/25 mm or more, in the case of stretching the spunbonded non-woven fabric in the MD direction at 5%.

[0039] The spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure preferably has a tensile strength of 0.5 N/25 mm or more, and more preferably 0.8 N/25 mm or more, in the case of stretching the spunbonded non-woven fabric in the CD direction at 5%.

[0040] The tensile load and tensile strength in the case of stretching at 5% of the spunbonded non-woven fabric may be measured according to JIS L 1913 (2010). Specifically, a test piece of 25 mm in width $\times$ 200 mm in length may be collected from the spunbonded non-woven fabric, five points in MD may be measured at a distance between chucks of 100 mm and a head speed of 100 mm/min using a tensile testing machine, and an average value may be calculated to determine the tensile load (N/25 mm). A strength recorded in the case of stretching at 5% (between chucks: 105 mm) by a measurement program may be regarded as a load (5% load) in the case of stretching at 5%.

[0041] The basis weight of the spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure is not particularly limited, and, for example, the basis weight of the spunbonded non-woven fabric may be from 5 g/m^2 to 30 g/m^2, may be from 20 g/m^2 to 30 g/m^2, and may be from 25 g/m^2 to 30 g/m^2.

[0042] The tensile load of the spunbonded non-woven fabric in the MD direction, the tensile load of the spunbonded non-woven fabric in the CD direction, the tensile strength of the spunbonded non-woven fabric in the case of stretching at 5% in the MD direction, the tensile strength of the spunbonded non-woven fabric in the case of stretching at 5% in the CD direction, and the basis weight of the spunbonded non-woven fabric can be determined by methods described in Examples.

[0043] The average fiber diameter of the crimped fiber is not particularly limited, and may be, for example, from 5 μm to 25 μm. The average fiber diameter may be 20 μm or less, may be 18 μm or less, or may be 15 μm or less. The average fiber diameter may be 7 μm or more, or may be 10 μm or more. In the present disclosure, the average fiber diameter can be determined in the following manner. Ten test pieces of 10 mm $\times$ 10 mm are collected from the obtained spunbonded non-woven fabric, and the diameters of fibers are read to one decimal place in a unit of μm using an ECLIPSE E400 manufactured by NIKON CORPORATION at a magnification of 20 times. The diameters of optional 20 places in each test piece are measured, and the average value thereof is determined.

[0044] The spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure may be a single-layered non-woven fabric, or may be a multilayered non-woven fabric (non-woven fabric layered body) in which plural layers are layered one on another. The non-woven fabric layered body may be, for example, a layered body in which two or more spunbonded non-woven fabric layers are layered one on another.

[Step (2) of Pressing Crimped Fiber]

[0045] The manufacturing method of the present disclosure may include a step of layering a crimped fiber formed by melt-spinning a thermoplastic polymer on a non-woven web formed in the step (1) of pressing the crimped fiber, and then pressing the non-woven web, on which the crimped fiber is layered, at a linear pressure of 5 N/mm or more by a compaction roll. As a result, a non-woven fabric layered body including two spunbonded non-woven fabric layers can be manufactured. The preferred conditions of the step (2) of pressing the crimped fiber are similar to the preferred conditions of the step (1) of pressing the crimped fiber, and therefore, the descriptions thereof are omitted.

[0046] A non-woven fabric layered body including three or more spunbonded non-woven fabric layers may be manufactured by repeating the step (2) of pressing the crimped fiber.

[Step of Entangling Non-Woven Web]

[0047] The manufacturing method of the present disclosure may include a step of subjecting a non-woven web to heating and pressurization treatment to entangle the non-woven web after the step (1) of pressing the crimped fiber. In a case in which the spunbonded non-woven fabric obtained by the manufacturing method of the present disclosure is a non-woven fabric layered body, the step of subjecting the non-woven web to the heating and pressurization treatment to entangle the non-woven web may be included after the step (2) of pressing the crimped fiber.

[0048] The method of manufacturing the non-woven fabric layered body of the present disclosure is described with

reference to Fig. 1. Fig. 1 is a schematic view illustrating an example of an apparatus for manufacturing the non-woven fabric layered body of the present disclosure. The non-woven fabric manufacturing apparatus 100 illustrated in Fig. 1 includes a first spinning unit 11A and a second spinning unit 11B. The first spinning unit 11A and the second spinning unit 11B include the same component portions. The same component portions in the first spinning unit 11A and the second spinning unit 11B are denoted by the same reference characters, and the descriptions thereof are omitted.

[0049] The non-woven fabric manufacturing apparatus 100 includes first extruders 31A configured to extrude a thermoplastic polymer, second extruders 31B configured to extrude a thermoplastic polymer, spinnerets 33 that melt-spin melted thermoplastic polymers, ejectors 37 that draw continuous fiber assemblies 20 (20A, 20B) melt-spun from the spinnerets 33, a movable collecting member 51 configured to collect the drawn continuous fiber assemblies 20, suction units 39 configured to efficiently collect the continuous fiber assemblies 20 on the movable collecting member 51, compaction rolls 41 and 42 that press the continuous fiber assemblies 20, an embossing roll 53 and a flat roll 55 for thermocompression bonding, and a winder 71 that winds a non-woven fabric layered body 60 subjected to the thermocompression bonding. The compaction rolls 41 and 42 are rollers for performing pretreatment for integrating light fibers with each other to allow the fibers to endure a post-step (for example, thermocompression bonding by the embossing roll 53).

[0050] First, the thermoplastic polymer is melt-spun from the spinneret 33, to form the continuous fiber assembly 20A, in the first spinning unit 11A. The continuous fiber assembly 20A which is a crimped fiber is obtained by extruding a first thermoplastic polymer from the first extruder 31A, extruding a second thermoplastic polymer from the second extruder 31B, and performing composite spinning. Then, the continuous fiber assembly 20A is cooled by cooling air 35, and is drawn by the ejector 37. The drawn continuous fiber assembly 20A is efficiently collected on the movable collecting member 51 by the suction unit 39 disposed in the lower portion of the collecting face of the movable collecting member 51. A first non-woven web 40A is formed by pressing the collected continuous fiber assembly 20A at a linear pressure of 5 N/mm or more by the compaction roll 41 in a vertically upper side and the compaction roll 42 in a vertically lower side.

[0051] In the second spinning unit 11B, the continuous fiber assembly 20B is also formed in a similar manner. The continuous fiber assembly 20B is layered on the first non-woven web 40A. The first non-woven web 40A on which the continuous fiber assembly 20B is layered is pressed at a linear pressure of 5 N/mm or more by the compaction rolls 41 and 42, whereby a second non-woven web 40B is formed to form a non-woven web having a layered structure. The first non-woven web 40A is a lower-layer non-woven web layer, and the second non-woven web 40B is an upper-layer non-woven web layer. The non-woven web having the layered structure is thermocompression-bonded by the embossing roll 53, to obtain the non-woven fabric layered body 60 including two spunbonded non-woven fabric layers. Then, the non-woven fabric layered body 60 is wound by the winder 71.

[0052] In the method of manufacturing the non-woven fabric layered body of the present disclosure, a manufacturing apparatus including a spinning unit 12 in which a cooling chamber illustrated in Fig. 2 has a closed-type structure may be used. Fig. 2 is a schematic view illustrating another example of the apparatus for manufacturing the non-woven fabric layered body of the present disclosure. Fig. 2 illustrates the apparatus in which the spinning units 11 (the spinning unit 11A and the spinning unit 11B) in the non-woven fabric manufacturing apparatus 100 illustrated in Fig. 1 are replaced with the spinning unit 12. In other words, the apparatus configuration other than the spinning units 11 is identical to that of the manufacturing apparatus illustrated in Fig. 1. The same component portions as those of the manufacturing apparatus illustrated in Fig. 1 are denoted by the same reference characters, and the descriptions thereof are omitted. The compaction rolls 41 and 42 are omitted in Fig. 2.

[0053] The spinning unit 12 includes a first extruder 32A configured to extrude a first thermoplastic polymer, a second extruder 32B configured to extrude a second thermoplastic polymer, a spinneret 34 that melt-spins the melted first thermoplastic polymer and second thermoplastic polymer, a cooling chamber 38C that cools a continuous fiber assembly 22 melt-spun from the spinneret 34, cooling air supply units 38A and 38B configured to supply cooling air 36, and a drawing unit 38D configured to draw the continuous fiber assembly 22.

[0054] In the spinning unit 12, the first thermoplastic polymer and the second thermoplastic polymer are extruded and introduced into the spinneret 34. Then, the melted first thermoplastic polymer and second thermoplastic polymer are melt-spun from the spinneret 34. The melt-spun continuous fiber assembly 22 is introduced into the cooling chamber 38C. The continuous fiber assembly 22 is cooled by the cooling air 36 supplied from either or both of the cooling air supply unit 38A and the cooling air supply unit 38B. The cooled continuous fiber assembly 22 is introduced into the drawing unit 38D included downstream of the cooling chamber 38C. The drawing unit 38D is disposed in a bottleneck shape. The continuous fiber assembly 22 introduced into the drawing unit 38D is drawn by increasing the velocity of the cooling air in the bottleneck. The drawn continuous fiber assembly 22 is dispersed and collected on a movable collecting member 51. The dispersed continuous fiber assembly 22 is efficiently collected on the movable collecting member 51 by a suction unit 39 included in the lower portion of the collecting face of movable collecting member 51, to form a non-woven web 43.

<Spunbonded Non-Woven Fabric>

[0055] The spunbonded non-woven fabric of the present disclosure satisfies at least one of the following (1) or (2) in a case in which a region of 150 mm × 150 mm on a surface is subjected to a rubbing test in conformity with the rubbing fastness test method of JIS L 0849 (2013) using a Gakushin-type rubbing fastness test machine.

(1) In the region, the number of fluffs having an equivalent circle diameter of 2.0 mm or more is 0, and the number of fluffs having an equivalent circle diameter of from 0.8 mm to less than 2.0 mm is one or less.
(2) In the region, the number of fluffs having an equivalent circle diameter of 2.0 mm or more is 0, and the number of fluffs having an equivalent circle diameter of from 0.1 mm to less than 0.8 mm is nine or less.

[0056] The spunbonded non-woven fabric of the present disclosure has excellent fuzz resistance without the deterioration of flexibility. The spunbonded non-woven fabric of the present disclosure can be manufactured by, for example, the above-described manufacturing method of the present disclosure. The preferred conditions of the spunbonded non-woven fabric of the present disclosure are similar to those of the spunbonded non-woven fabric obtained by the above-described manufacturing method of the present disclosure, and therefore, the descriptions thereof are omitted. The method of the rubbing test will be described in detail with reference to the following Examples.

<Layered Body>

[0057] The spunbonded non-woven fabric of the present disclosure may be a layered body including the spunbonded non-woven fabric of the present disclosure. In other words, the layered body may be a structure in which the spunbonded non-woven fabric of the present disclosure and another layer except the spunbonded non-woven fabric of the present disclosure are layered one on another. The other layer may be one layer, or may be two or more layers.

[0058] Examples of the other layer include fiber aggregates such as knitted fabrics, woven fabrics, and non-woven fabrics (short-fiber non-woven fabrics and long-fiber non-woven fabrics) other than the spunbonded non-woven fabric of the present disclosure. Examples of the non-woven fabrics other than the spunbonded non-woven fabric of the present disclosure include various known non-woven fabrics (spunbonded non-woven fabrics, melt-blown non-woven fabrics, wet-laid non-woven fabrics, dry-laid non-woven fabrics, dry-laid pulp non-woven fabrics, flash-spun non-woven fabrics, open non-woven fabrics, and the like). Such a fiber aggregate may be a sheet-like article with natural fibers such as cotton. Examples of the other layer also include resin films such as polyolefin, polyester, and polyamide. These may be layered in combination. For example, the spunbonded non-woven fabric of the present disclosure, a resin film, and a fiber aggregate with natural fibers such as cotton may be layered in the order mentioned above.

[0059] In a case in which the layered body requires air permeability, an air-permeable film or a moisture-vapor-permeable film is preferred as a film layered with the spunbonded non-woven fabric of the present disclosure.

[0060] Examples of the air-permeable film include various known air-permeable films. Examples thereof include a film with a thermoplastic elastomer such as a polyurethane-based elastomer, a polyester-based elastomer, or a polyamide-based elastomer, having moisture vapor permeability, and a porous film formed by drawing a thermoplastic resin film including inorganic particles or organic particles and allowing the thermoplastic resin film to be porous. Examples of the thermoplastic resin used in the porous film include polyolefins such as high-pressure low-density polyethylenes, linear low-density polyethylenes (so-called LLDPEs), high-density polyethylenes, polypropylenes, polypropylene random copolymers, and combinations thereof.

[0061] In a case in which the layered body does not require air permeability, a thermoplastic resin film, which is not allowed to be porous, with one or more selected from a polyolefin (a polyethylene, a polypropylene, or the like), a polyester, or a polyamide may be used.

[0062] A method of further layering (affixing) the other layer on the spunbonded non-woven fabric of the present disclosure is not particularly limited, and examples thereof include various methods such as a thermal fusion method such as hot embossing, and ultrasonic wave fusion, a mechanical entanglement method such as a needle punch or a water jet, a method using an adhesive such as a hot-melt adhesive or a urethane-based adhesive, and extrusion lamination.

Examples

[0063] The invention will be further specifically described with reference to Examples. However, the invention is not limited to these Examples. In the following Examples, "%" represents "% by mass".

[0064] Physical property values and the like in Examples and Comparative Example were measured by the following methods.

(1) Basis Weight [g/m^2]

[0065] Ten test pieces of 100 mm (machine direction: MD) × 100 mm (direction orthogonal to machine direction: CD) were collected from an obtained non-woven fabric layered body. Places at which the test pieces were collected were set at ten places in the CD direction. Then, the mass [g] of each collected test piece was measured using an electronic balance scale (manufactured by Kensei Co., LTD.). The average value of the masses of the test pieces was determined. The determined average value was converted into a mass [g] per m^2, which was rounded off to one decimal place to obtain a value, which was regarded as the basis weight [g/m^2] of each non-woven fabric layered body sample.

[0066] The results are set forth in Table 1.

(2) Thickness [mm]

[0067] Ten test pieces of 100 mm (MD) × 100 mm (CD) were collected from the obtained non-woven fabric layered body. Places at which the test pieces were collected were set at places similar to the test pieces for measuring the basis weight. Then, the thickness [mm] of each collected test piece was measured by a method described in JIS L 1096: 2010, using a load-type thickness gauge (manufactured by OZAKI MFG. CO., LTD.). The average value of the thicknesses of the test pieces was determined, and rounded off to one decimal place to obtain a value, which was regarded as the thickness [mm] of each non-woven fabric layered body sample.

[0068] The results are set forth in Table 1.

(4) Bending Resistance (Cantilever Method)

[0069] The bending resistance [mm] of the non-woven fabric layered body was measured by conducting a cantilever test by the following method.

[0070] Specifically, in accordance with 8.19.1 [A method (45-degree cantilever method)] of JIS-L1096: 2010, the bending resistance was measured in each of the MD direction and the CD direction, and the average value thereof was regarded as the bending resistance of the non-woven fabric layered body.

[0071] The results are set forth in Table 2.

(5) Evaluation of Fuzz

[0072] Two CD test pieces of 150 mm (MD) × 150 mm (CD) were collected from each non-woven fabric. Collection places were set at optional two places. Then, each collected test piece was subjected to a rubbing test according to a rubbing fastness test method of JIS L 0849 using a Gakushin-type rubbing fastness test machine (New Type of NR-100, manufactured by DAIEI KAGAKU SEIKI MFG. CO., LTD.). A fabric tape (No. 1532, manufactured by TERAOKA SEISAKUSHO CO., LTD.) was affixed to a rubbing block side, a non-embossment surface was rubbed in 100 to-and-fro movements in the MD direction in the state of the application of a load of 300 g, the fuzz state of the rubbed surface of each test piece was graded based on the following criteria, and a worse grade was regarded as the fuzz [evaluation point] of each non-woven fabric sample.

[0073] The results are set forth in Table 2.

[0074] The criteria for the evaluation of the fuzz are as follows. An evaluation point of 3 or more (Grade 3 or more) exhibits excellent fuzz resistance.

-Evaluation of Fuzz-

[0075]

Grade 1: A fiber is stripped off, and a hole is opened, whereby a test piece is damaged.
Grade 2: In a case in which a test piece is a layered body, a surface layer is peeled, and the test piece is thinned, whereby it is possible to see a back layer, or in a case in which the test piece is a single-layered body, a fiber is considerably stripped off.
Grade 2.5: It is possible to clearly see a large fluff (diameter: 2 mm or more), and fibers begin to rise at plural spots.
Grade 3: A clear fluff (diameter: 0.8 mm or more) begins to be generated, or plural small fluffs (diameter: less than 0.8 mm) are seen.
Grade 3.5: Fuzz occurs, whereby a small fluff (diameter: from 0.1 mm to less than 0.8 mm) begins to be generated at one place.
Grade 4: No fuzz

<Example 1>

[0076] A thermoplastic polymer as the following core component and a thermoplastic polymer as the following sheath component were compositely melt-spun by spunbonding. Eccentric core-sheath type crimped composite fibers having a core component/sheath component mass ratio of 15/85 were deposited on a movable collecting surface. The crimped composite fibers were pressed at a linear pressure of 5.5 N/mm using a compaction roll at 100°C, to form a first spunbonded non-woven web (first layer). Then, eccentric core-sheath type crimped composite fibers obtained under conditions similar to such conditions described above were deposited on the first spunbonded non-woven web, and the first spunbonded non-woven web on which the crimped composite fibers were deposited was pressed at a linear pressure of 5.5 N/mm using a compaction roll at 100°C, to form a second spunbonded non-woven web (second layer). A layered structure having a two-layer structure was thermocompression-bonded at 150°C so that a flat roll came into contact with a side closer to the first spunbonded non-woven web, and an embossing roll came into contact with a side closer to the second spunbonded non-woven web, to obtain a non-woven fabric layered body (spunbonded non-woven fabric layer/spunbonded non-woven fabric layer). The total basis weight of the non-woven fabric layered body was 27.0 g/m^2, and the area rate of a pressure bonding portion was 12.9%.

-Core Component-

[0077] Propylene homopolymer having an MFR of 60 g/10 minutes and a melting point of 162°C

-Sheath Component-

[0078] Propylene-ethylene random copolymer having an MFR of 60 g/10 minutes, a melting point of 142°C, and an ethylene content of 4% by mass

<Example 2>

[0079] A non-woven fabric layered body was obtained in a manner similar to the manner of Example 1 except that a linear pressure at which crimped composite fibers, a first spunbonded non-woven web in which the crimped composite fibers were deposited, and a layered structure in which the crimped composite fibers were deposited were pressed using a compaction roll was changed from 5.5 N/mm to 5.8 N/mm. The total basis weight of the non-woven fabric layered body was 27.0 g/m^2, and the area rate of a pressure bonding portion was 12.9%.

<Comparative Example 1>

[0080] A non-woven fabric layered body was obtained in a manner similar to the manner of Example 1 except that a linear pressure at which crimped composite fibers, a first spunbonded non-woven web in which the crimped composite fibers were deposited, and a layered structure in which the crimped composite fibers were deposited were pressed using a compaction roll was changed from 5.5 N/mm to 4.8 N/mm. The total basis weight of the non-woven fabric layered body was 27.0 g/m^2, and the area rate of a pressure bonding portion was 12.9%.

[Table 1]

	Basis Weight	Thickness
	g/m^2	mm
Example 1	27.0	0.41
Example 2	27.0	0.42
Comparative Example 1	27.0	0.44

[Table 2]

	Bending Resistance Cantilever Method	Fuzz
	mm	Evaluation
Example 1	47	3.5
Example 2	47	3.5
Comparative Example 1	47	2

[0081] On the basis of the results, the non-woven fabric layered bodies obtained in Examples 1 and 2 exhibited the evaluations of the fuzz, superior to that of the non-woven fabric layered body obtained in Comparative Example 1, and were superior in fuzz resistance. The non-woven fabric layered bodies obtained in Examples 1 and 2 had flexibility similar to the flexibility of the non-woven fabric layered body obtained in Comparative Example 1, and fuzz was able to be suppressed without deteriorating flexibility in Examples 1 and 2.

[0082] All documents, patent applications, and technical standards described in this specification are herein incorporated by reference to the same extent as if each individual document, patent application, or technical standard was specifically and individually indicated to be incorporated by reference.

Claims

1. A method of manufacturing a spunbonded non-woven fabric, the method comprising:

   a step of melt-spinning a thermoplastic polymer to form a crimped fiber; and
   a step of collecting the crimped fiber and pressing the collected crimped fiber at a linear pressure of 5 N/mm or more by a compaction roll.

2. The method of manufacturing a spunbonded non-woven fabric according to claim 1, wherein a temperature of the compaction roll while pressing the crimped fiber is from 80°C to 120°C.

3. The method of manufacturing a spunbonded non-woven fabric according to claim 1, wherein a temperature of the compaction roll while of pressing the crimped fiber is lower than a melting point of the crimped fiber.

4. The method of manufacturing a spunbonded non-woven fabric according to any one of claims 1 to 3, wherein the linear pressure is 10 N/mm or less.

5. The method of manufacturing a spunbonded non-woven fabric according to any one of claims 1 to 4, wherein the thermoplastic polymer comprises an olefinic polymer.

6. The method of manufacturing a spunbonded non-woven fabric according to claim 5, wherein the olefinic polymer comprises a propylene-based polymer.

7. The method of manufacturing a spunbonded non-woven fabric according to any one of claims 1 to 6, further comprising a step of layering a crimped fiber formed by melt-spinning a thermoplastic polymer on a non-woven web that is formed in the pressing step, and then pressing the non-woven web, on which the crimped fiber is layered, at a linear pressure of 5 N/mm or more by the compaction roll, to manufacture a non-woven fabric layered body comprising a plurality of spunbonded non-woven fabric layers.

8. A spunbonded non-woven fabric satisfying at least one of the following (1) or (2) in a case in which a region of 150 mm $\times$ 150 mm on a surface is subjected to a rubbing test in conformity with a rubbing fastness test method of JIS L 0849 (2013) using a Gakushin-type rubbing fastness test machine:

   (1) in the region, a number of fluffs having an equivalent circle diameter of 2.0 mm or more is 0, and a number of fluffs having an equivalent circle diameter of from 0.8 mm to less than 2.0 mm is one or less; and
   (2) in the region, the number of fluffs having an equivalent circle diameter of 2.0 mm or more is 0, and a number

of fluffs having an equivalent circle diameter of from 0.1 mm to less than 0.8 mm is nine or less.

FIG.1

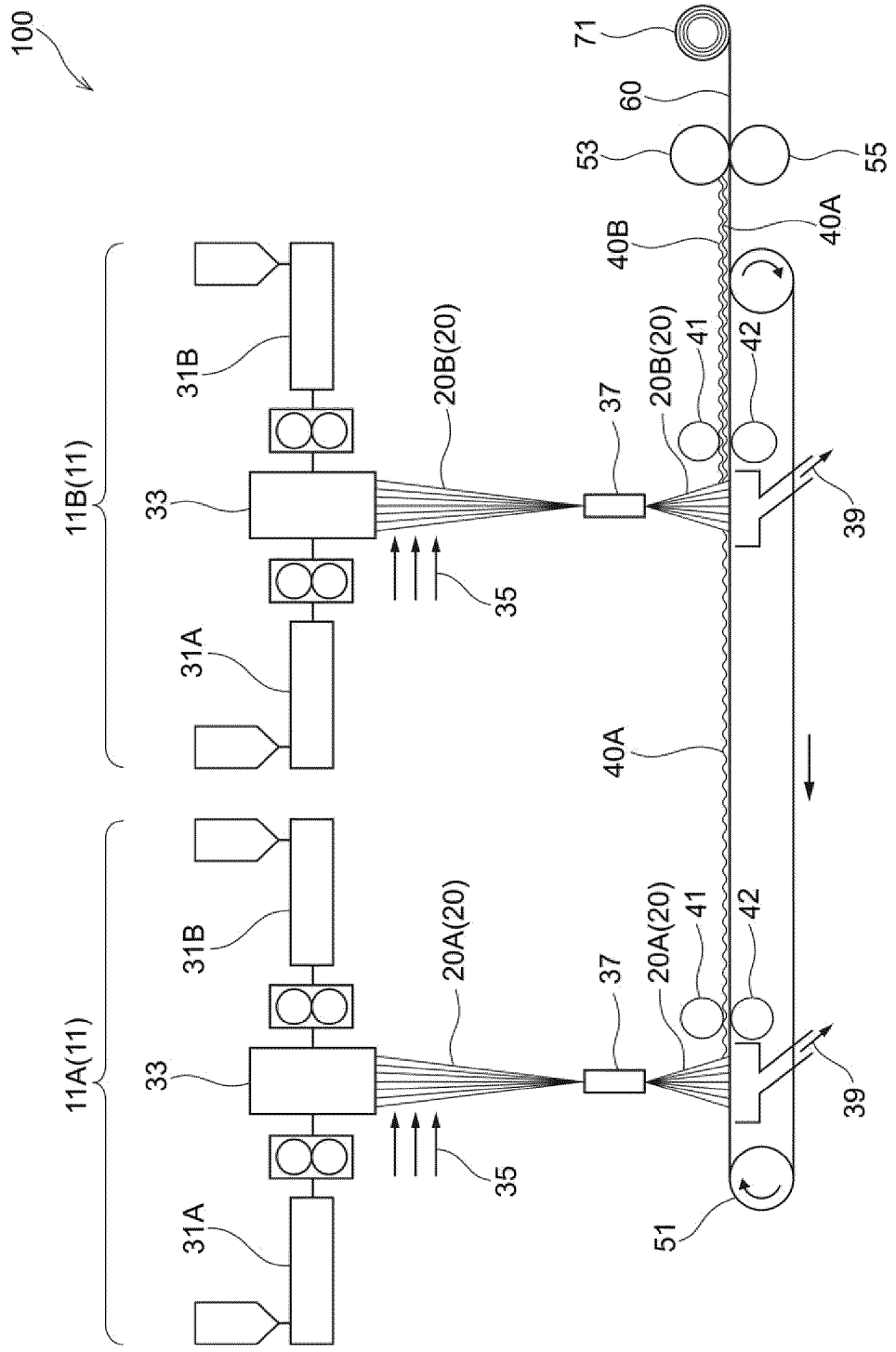
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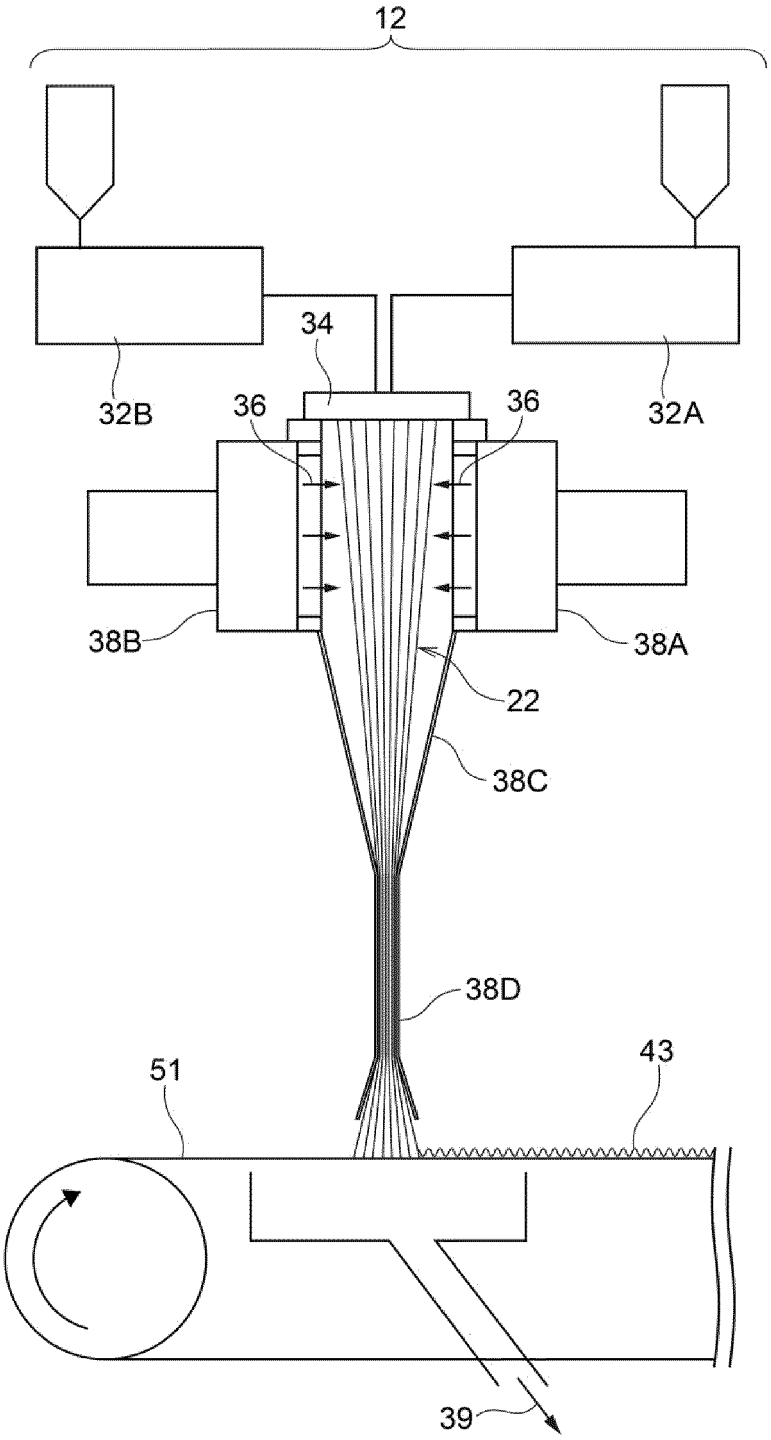
FIG.2



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/005885

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. D04H3/033(2012.01)i, D04H3/007(2012.01)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)
Int. Cl. D04H1/00-18/04

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2019
Registered utility model specifications of Japan	1996-2019
Published registered utility model applications of Japan	1994-2019

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.
Y	JP 2003-147671 A (KOBE STEEL, LTD.) 21 May 2003, paragraphs [0031]-[0033], example 1, fig. 1 (Family: none)	1-8
Y	JP 2016-141929 A (REIFENHAEUSER GMBH & CO KG MASCHF) 08 August 2016, paragraphs [0034]-[0039], fig. 2 & US 2016/0221300 A1, SPECIFIC DESCRIPTION OF THE DRAWING, fig. 2 & EP 3054042 A1 & CN 105839298 A & KR 10-2016-0096043 A & MX 2016001075 A & AR 103533 A & DK 3054042 T & ES 2676305 T & PL 3054042 T	1-8

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

* Special categories of cited documents:
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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
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22.03.2019	02.04.2019
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/005885

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97/31145 A1 (KIMBERLY-CLARK WORLDWIDE, INC.) 28 August 1997, page 13, line 16 to page 14, line 12, fig. 1 & US 5810954 A & EP 882147 A1 & DE 69726263 T & AU 1853597 A & BR 9707617 A & AU 703521 B & CA 2242606 A & ZA 9700727 A & TW 499522 B & ID 16553 A & CN 1212032 A & MX 9806662 A & CO 4820419 A & KR 10-0453473 B & AR 5894 A	1-8
A	JP 2018-24965 A (FIBERTEX PERSONAL CARE A/S) 15 February 2018, claims, all drawings & EP 3246444 A1, claims, figures & US 2018/0002850 A1 & WO 2017/198336 A1 & CN 107400990 A & KR 10-2017-0130302 A & IL 252331 D & BR 102017010299 A & AR 108522 A & RU 2017117155 A & CN 109072513 A & IL 252331 D0	1-8
A	WO 2008/099823 A1 (TOYOBO CO., LTD.) 21 August 2008, example 1, all drawings & JP 2008-223209 A	1-8

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2018024965 A **[0005]**