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(54) **METHOD FOR PRODUCING GARMENT FABRIC**

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(57) **ABSTRACT**

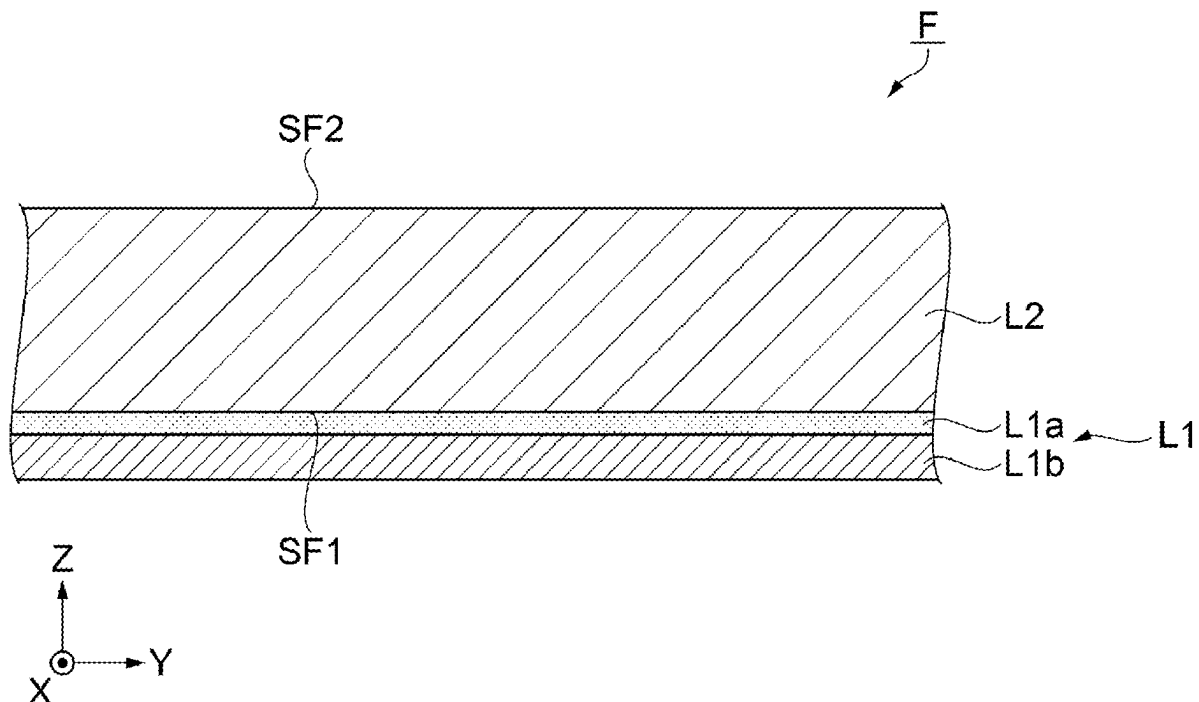
A method for manufacturing garment fabric F includes: a removal process S1 of removing a first layer L1 from a used garment fabric F having a multilayer structure with the first layer L1 and a second layer L2, the second layer L2 containing fibers; a defibrating process S3 of defibrating the second layer L2 using a dry method and of extracting the fibers; a mixing process S4 of mixing the fibers with a treatment agent to form a mixture containing no coloring agents; a depositing process S5 for creating a web W as a new second layer L2 by depositing, in air, the mixture on an air-permeable fabric N1 that becomes a new first layer L1; and a forming process S7 of forming by pressing and heating the fabric N1 and the web W.

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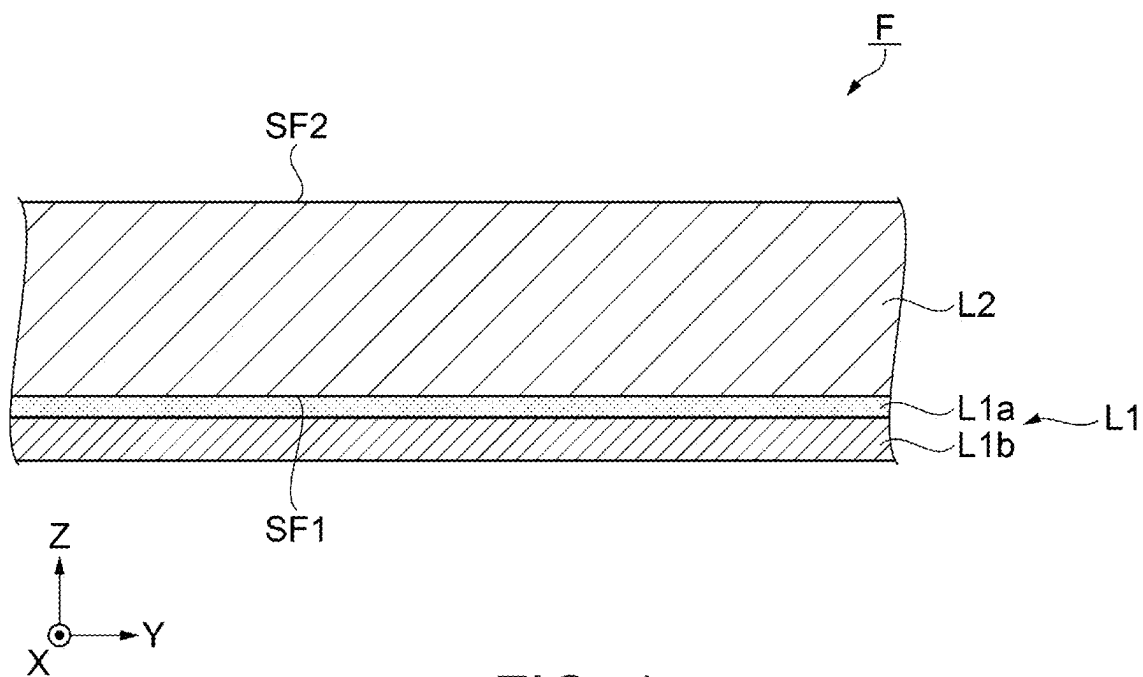


FIG. 1

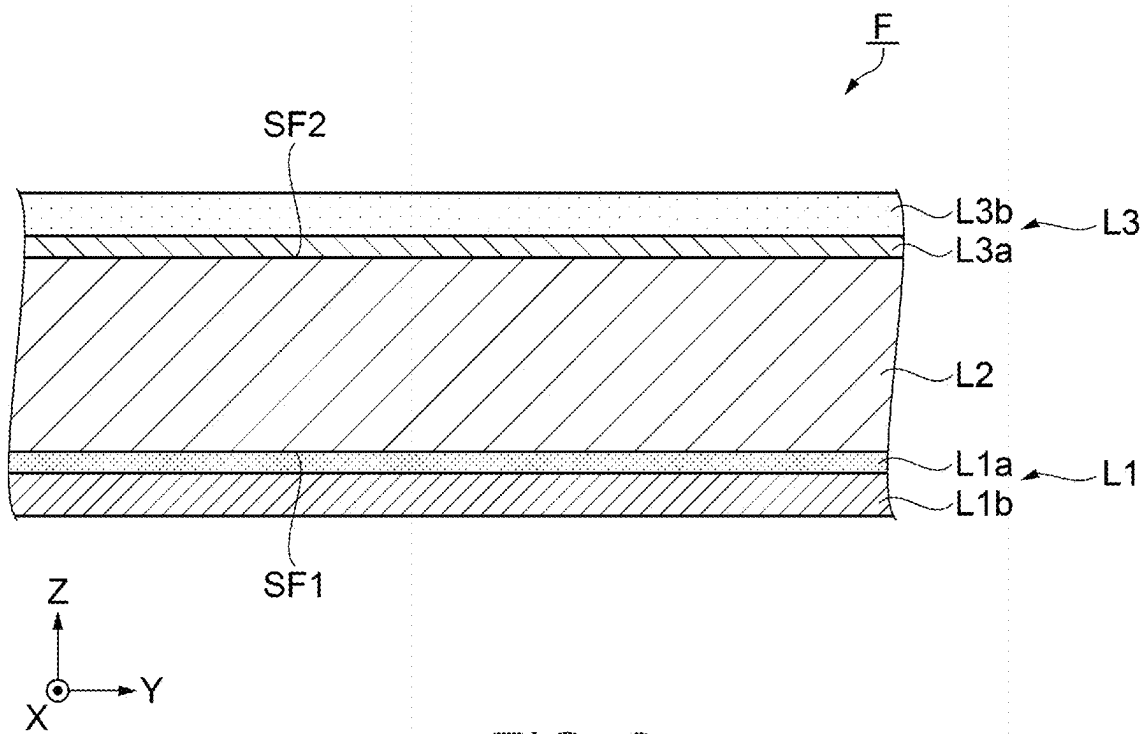


FIG. 2

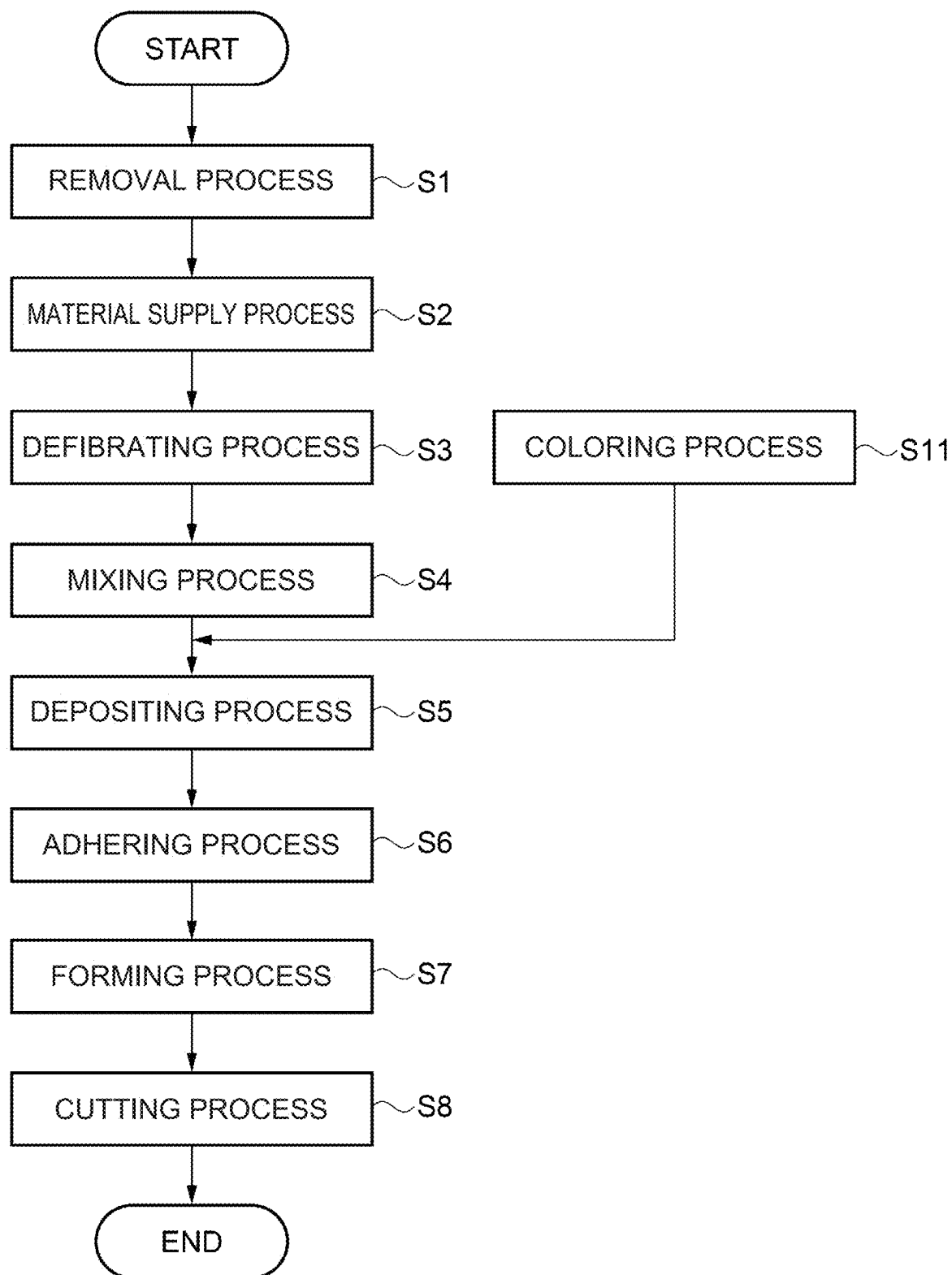
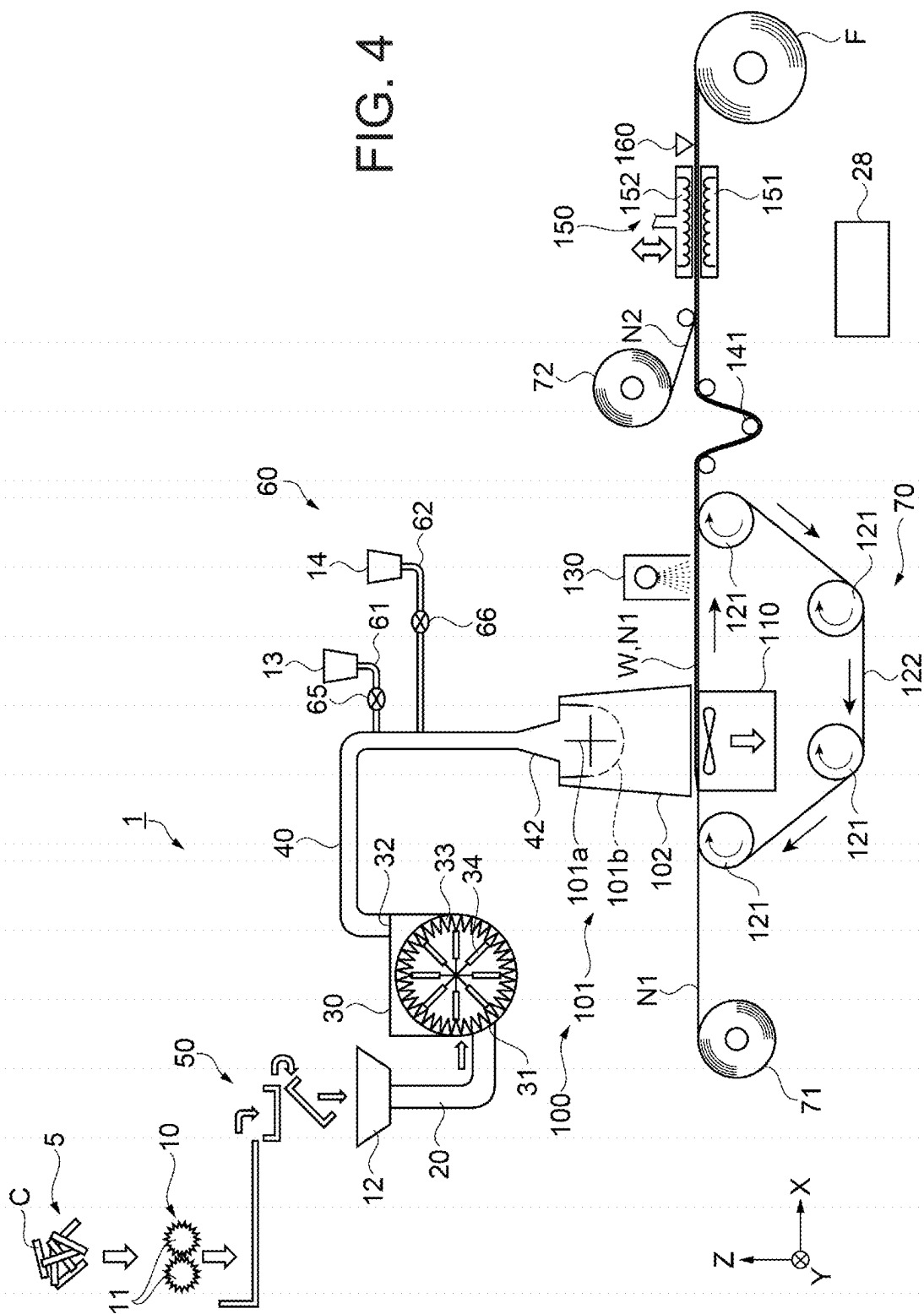


FIG. 3



		EMBODIMENTS					
		1	2	3	4	5	6
GARMENT FABRIC F0 MANU- FACTURING	LAYER STRUCTURE	2 LAYERS	2 LAYERS	2 LAYERS	2 LAYERS	2 LAYERS	3 LAYERS
	MATERIAL SUPPLY PROCESS S2	WHITE	WHITE	BLUE	RED	WHITE	WHITE
	COLORING PROCESS S11	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT
	DEPOSITING PROCESS S5	130	130	130	130	100	130
GARMENT FABRIC F1 MANU- FACTURING	REMOVAL PROCESS S1	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT
		1	2	1	2	2	3
							3
EVALUATION RESULT	PEELING METHOD / FIRST LAYER L1						
	PEELING METHOD / THIRD LAYER L3						
	PEELABILITY / REMOVAL PROCESS S1 OF F1 MANUFACTURING	B	A	B	A	A	A
	COLOR TONE / SECOND LAYER L2 OF F1	A	A	A	A	A	A
	DESIGNABILITY OF GARMENTS / GARMENTS CREATED BY F1	A	A	A	A	A	A

FIG. 5

		COMPARATIVE EXAMPLES				
		1	2	3	4	5
GARMENT FABRIC F0 MANU- FACTURING	LAYER STRUCTURE	2 LAYERS	2 LAYERS	3 LAYERS	3 LAYERS	3 LAYERS
	MATERIAL SUPPLY PROCESS S2	WHITE	BLUE	WHITE	WHITE	WHITE
	COLORING PROCESS S11	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT	IMPLE- MENT
				IMPLE- MENT	IMPLE- MENT	IMPLE- MENT
	DEPOSITING PROCESS S5	130	130	130	130	130
GARMENT FABRIC F1 MANU- FACTURING		NOT CONDUCTED	NOT CONDUCTED	ONE SIDE ONLY	ONE SIDE ONLY	NOT CONDUCTED
	REMOVAL PROCESS S1				2	
				2		
EVALUATION RESULT	PEELABILITY / REMOVAL PROCESS S1 OF F1 MANUFACTURING			A	A	
	COLOR TONE / SECOND LAYER L2 OF F1	C	C	C	C	C
	DESIGNABILITY OF GARMENTS / GARMENTS CREATED BY F1	C	C	C	C	C

FIG. 6

## METHOD FOR PRODUCING GARMENT FABRIC

[0001] The present application is based on, and claims priority from JP Application Serial Number 2024-024356, filed Feb. 21, 2024, the disclosure of which is hereby incorporated by reference herein in its entirety.

### BACKGROUND

#### 1. Technical Field

[0002] The present disclosure relates to a method for producing garment fabric.

#### 2. Related Art

[0003] In recent years, various recycling techniques have been studied in order to promote effective utilization of resources and reduction of wastes. In particular, when garments are colored, it is relatively difficult to recycle the clothes into garment fabric, and thus it is desired to establish a recycling technique. For example, JP-A-2011-94265 shows a method for producing de-inked pulp for reusing recorded matter.

[0004] However, when the technique described in JP-A-2011-94265 is applied to the recycling of clothes, there is a problem that it is difficult to recycle the garments into a nonwoven fabric. Specifically, depending on the type of the coloring agents and the degree of coloring, the de-inking performance may not be sufficient for fabric, and it may be difficult to obtain pulp suitable for garment fabric. In other words, there has been a demand for a technique for repeated recycling garment fabric.

### SUMMARY

[0005] A method for producing garment fabric includes a removal process of removing a first layer from a used garment fabric having a multilayer structure with the first layer and a second layer, the second layer containing fibers; a defibrating process of defibrating the second layer using a dry method and of extracting the fibers; a mixing process of mixing the fibers with a treatment agent to form a mixture containing no coloring agents; a depositing process for creating a web as a new second layer by depositing, in air, the mixture on an air-permeable fabric that becomes a new first layer; and a forming process of forming by pressing and heating the fabric and the web.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a schematic cross-sectional view showing a configuration of garment fabric according to a present embodiment.

[0007] FIG. 2 is a schematic cross-sectional view showing another embodiment of the garment fabric.

[0008] FIG. 3 is a flow chart showing a method for producing garment fabric.

[0009] FIG. 4 is a schematic view showing a configuration of a fabric manufacturing apparatus used for manufacturing garment fabric.

[0010] FIG. 5 is a table showing the manufacturing conditions, evaluation results, and the like for garment fabric according to embodiments.

[0011] FIG. 6 is a table showing the manufacturing conditions, evaluation results, and the like for garment fabric according to comparative examples.

### DESCRIPTION OF EMBODIMENTS

[0012] In the embodiment described below, a method for producing garment fabric which can be repeatedly reused will be exemplified and described with reference to the drawings. In each of the following drawings, XYZ axes are given as coordinate axes orthogonal to each other as necessary, a direction indicated by each arrow is set as a +direction, and a direction opposite to the +direction is set as a -direction. The Z axis is a virtual axis along the vertical direction, and the +Z direction is the upward direction and the -Z direction is the downward direction.

[0013] In a fabric manufacturing apparatus 1 applied to the garment fabric manufacturing method of the present embodiment, the destination in the transport direction of the raw material, fabric, web, garment fabric, and the like may be referred to as downstream, and the side opposite in the transport direction may be referred to as upstream. For convenience of illustration, the size of each component differs from the actual size.

#### 1. GARMENT FABRIC

[0014] As shown in FIG. 1, the garment fabric F manufactured by the garment fabric manufacturing method of the present embodiment has a multilayer structure including a first layer L1 and a second layer L2. The first layer L1 includes a substrate layer L1b and an adhesion layer L1a. In the garment fabric F, the substrate layer L1b of the first layer L1, the adhesion layer L1a of the first layer L1, and the second layer L2 are laminated in this order from the lower side to the upper side. When the garment fabric F is processed into a garment, either the first layer L1 or the second layer L2 may be used on the front side of the garment.

[0015] The thickness of the garment fabric F is appropriately set according to the use and form of the garment to which the garment fabric F is applied. The thickness of the garment fabric F is not particularly limited, but is, for example, not less than 0.30 mm and not more than 1.50 mm. According to this, flexibility and strength of the garment fabric F are improved.

[0016] The first layer L1 has air permeability. When the second layer L2 also has air permeability, since the first layer L1 does not hinder air permeability, air permeability is imparted to the garment fabric F. By this, when the garment fabric F is used for garment, stuffiness and the like during wear can be suppressed.

[0017] In the manufacture of the garment fabric F, the air permeability of the first layer L1 can be used to promote the formation of fibers and the like, which form the second layer L2, on the first layer L1. To be specific, by sucking air, in which the fibers and the like are dispersed, through the first layer L1, the formation of the web including the fibers is promoted. The manufacturing method and manufacturing processes of the garment fabric F will be described later in the section on the method for producing garment fabric.

[0018] In the present specification, air permeability is defined by the amount of air passing through a test piece according to the JIS air permeability test (L1096 2010 8.26.1 A method). The term "having air permeability" as used



herein means that the amount of air measured by the above test method is  $10 \text{ cm}^3/\text{cm}^2\cdot\text{sec}$  or more.

[0019] The thickness of the first layer L1 are not particularly limited, but is preferably, for example, not less than 0.01 mm and not more than 0.20 mm. This makes it possible to improve the flexibility and strength of the garment fabric F.

[0020] The substrate layer L1b has air permeability. The substrate layer Lib is one surface of the garment fabric F. Incidentally, the second layer L2 is the other surface of the garment fabric F.

[0021] The substrate layer L1b is a sheet such as a woven fabric, a knitted fabric, or a nonwoven fabric containing polyester. By this, since polyester is relatively excellent in strength, the thinness and strength of the garment fabric F can be further improved.

[0022] The substrate layer L1b is not limited to being made of polyester and may be a sheet containing polyester and other resins or may be a sheet made of resins other than polyester.

[0023] The adhesion layer L1a is disposed between the substrate layer L1b and the second layer L2. Since the first layer L1 and the second layer L2 are adhered to each other by the adhesion layer L1a, the adhesive strength between the first layer L1 and the second layer L2 is secured.

[0024] The adhesion layer L1a includes an adhesive. Examples of the material of the adhesive include known pressure sensitive adhesives such as polyester resins, acrylic resins, silicone resins, and urethane resins, and known adhesives such as epoxy-based, acrylic-based, cyanoacrylate-based, urethane-based, and vinyl acetate-based. The adhesive of the adhesion layer L1a may be one that is cured by heat applied in the forming process of the manufacturing process of the garment fabric F described below.

[0025] Here, when the garment fabric F is reused after use, the first layer L1 and the second layer L2 are peeled off in a removal process (to be described later). Then, the second layer L2 separated from the used garment fabric F is reused as a raw material for the second layer L2 of a new garment fabric F. Therefore, the adhesive strength between the first layer L1 and the second layer L2 is set in consideration of the reuse of the second layer L2.

[0026] Specifically, it is preferable that a part of the second layer L2 is not attached to the separated first layer L1. To be specific, it is preferable that the adhesion layer L1a and the second layer L2 undergo interfacial peeling in the removal process. In a case where an impurity other than the fibers is removed when the fibers are extracted from the second layer L2 during the manufacture, a small amount of the first layer L1 may be attached to the recycled second layer L2.

[0027] The adhesive strength between the first layer L1 and the second layer L2 is adjusted by the material of the adhesion layer L1a, the thickness as the dimensions along the Z-axis, and the like. Although not particularly limited, for example, by using polyester resins as the material of the adhesion layer L1a and setting the thickness of the adhesion layer L1a to about  $80 \mu\text{m}$ , interfacial peeling can be caused at the interface between the adhesion layer L1a and the second layer L2.

[0028] The adhesion layer L1a also has air permeability. To be specific, the adhesion layer L1a is formed so as not to inhibit the air permeability of the first layer L1. Examples of the form of the adhesion layer L1a include a form in which the pressure sensitive adhesive, the adhesive, or the like is

applied in a planar mesh shape, and a form having a plurality of holes penetrating in the direction along the Z axis.

[0029] Note that the adhesion layer L1a is not an essential component, and the first layer L1 may be formed of only the substrate layer L1b. In this case, the first layer L1 and the second layer L2 are bonded to each other by pressurization and heating at the forming process in the manufacturing process of the garment fabric F. Even when the first layer L1 does not include the adhesion layer L1a, the adhesive strength between the first layer L1 and the second layer L2 is set in consideration of the reuse of the second layer L2.

[0030] The first layer L1 may be colored. When the substrate layer L1b and the adhesion layer L1a are formed of the above-described materials, the substrate layer L1b and the adhesion layer L1a generally have a whitish color. Therefore, when the second layer L2 is colored, the color tones of the first layer L1 and the second layer L2 are relatively significantly different from each other. When the garment fabric F is processed into garment, the difference in color between the first layer L1 and the second layer L2 is likely to be conspicuous. On the other hand, when the first layer L1 is colored in a hue close to that of the second layer L2, the difference in hue can be made inconspicuous when processed into a garment. When the first layer L1 is used so as to be on the surface side of the garment, coloring the first layer in various colors improves the design. It should be noted that the coloring mentioned here includes not only coloring with a single color but also forming an image such as a text, a pattern, a picture, or a photograph by printing or the like.

[0031] The first layer L1 may be colored on one of the surfaces of the garment fabric F. The coloring of the first layer L1 is not particularly limited but known methods such as digital printing or analog printing, including inkjet methods, can be applied. The coloring of the first layer L1 may be performed at the manufacturing process of the first layer L1, or may be performed in the process of manufacturing the garment fabric F.

[0032] The second layer L2 is a nonwoven fabric that includes a plurality of defibrated fibers and a treatment agent such as a binder. In the following description, a plurality of defibrated fibers may be simply referred to as fibers. From the viewpoint of versatility of the garment fabric F to be recycled and newly manufactured, the fibers of the second layer L2 are preferably composed of white fibers.

[0033] Here, the second layer L2 may include fibers that have been pre-dyed with a dye. In order to facilitate the reuse of the second layer L2, the fibers constituting the second layer L2 may be dyed with a dye. On the other hand, the second layer L2 preferably does not contain coloring agents such as a pigment. Note that "not containing coloring agents" means "not containing coloring agents intentionally added". The second layer L2 may contain coloring agents such as pigment particles that have been unintentionally mixed in.

[0034] The basis weight of the second layer L2 is preferably not less than  $100 \text{ g/m}^2$  and not more than  $180 \text{ g/m}^2$ . The basis weight is the number of grams per square meter of the surface area along the XY plane in one sheet of the garment fabric F. When the basis weight of the second layer L2 is within the above range, it is possible to secure a balance between thinness and strength in the second layer L2. Therefore, the thinness and strength of the garment fabric F can be further improved. The basis weight of the second

layer L2 also affects the ease of peeling at the interface between the first layer L1 and the second layer L2.

[0035] The basis weight of the second layer L2 is adjusted by the deposition amount of the web to be formed, that is, the thickness of the web, in the depositing process during the manufacture of the garment fabric F.

[0036] The thickness of the second layer L2 is not particularly limited, but is preferably, for example, not less than 0.20 mm and not more than 0.80 mm. This makes it possible to improve the flexibility and strength of the garment fabric F. The thickness of the second layer L2 is adjusted not only by the thickness of the web described above but also by the pressing conditions of the web in the forming process during the manufacture of the garment fabric F.

[0037] When the thickness of the second layer L2 is less than the lower limit of the above range, unevenness is likely to occur due to variations in thickness. Therefore, when the second layer L2 is used on the surface side of the garment, the first layer L1 on the back surface may be seen through. Therefore, it is preferable to suppress variation in the thickness of the second layer L2. However, the second layer L2 may have areas with non-uniform thickness.

[0038] In the second layer L2, a first face SF1 in contact with the first layer L1 or a second face SF2 opposite to the first face SF1 may be pretreated with a surface treatment or the like. Various physical properties such as abrasion resistance are improved by the surface treatment.

[0039] The surface treatment is not particularly limited, and examples thereof include a softening treatment, a water-repellent treatment, a wrinkle-proof treatment, and an abrasion-resistant treatment. For these surface treatments, known fiber treatment agents and the like can be applied. For example, when an abrasion-resistant treatment is performed, it is possible to suppress fluffing of the surface due to rubbing of the garments and to keep the appearance of the garments good.

[0040] The surface treatment may be performed during the manufacturing process of the garment fabric F or may be performed after the garment fabric F has been manufactured. In particular, when a surface treatment is performed on the first face SF1, the second layer L2 and the first layer L1 are individually manufactured. Then, after the first face SF1 of the second layer L2 is subjected to the surface treatment, the first layer L1 and the second layer L2 may be bonded together to manufacture the garment fabric F.

[0041] The fiber is one of the main components of the second layer L2 and affects physical properties such as the mechanical strength of cushioning material together with the binder. The fibers of a second layer L2 that were separated from used garment fabric F are reused as fibers of the second layer L2. When the garment fabric F is first produced, a material obtained by defibrated cloth is used as a raw material of the fiber. From the viewpoint of recycling of resources, it is preferable to use waste clothes such as old clothes as the cloth. Fibers derived from the second layer L2 may be mixed with fibers derived from other cloth.

[0042] The cloth includes knit fabric, plain weave fabric, pile fabric, and the like. The cloth may also include a nonwoven fabric.

[0043] Examples of the fibers from natural product fibers such as cotton, hemp, wool, silk, regenerated cellulose material, and from synthetic fiber such as polypropylene, polyester, and polyurethane.

[0044] These fibers may be used alone or in combination of two or more. In particular, among the above-mentioned fiber materials, the cloth preferably contains cotton or wool from the viewpoint of easy availability of old clothes or the like, physical properties of the fiber, and the like.

[0045] The weight-average fiber length of the defibrated fibers is preferably not less than 0.5 mm or not more than 2.0 mm. According to this, since the fibers are not excessively shortened, the fibers moderately entangle with each other, and the mechanical strength of the second layer L2 is improved. The weight-average fiber length is determined by a method in accordance with ISO 16065-2:2007.

[0046] The binder bonds fibers to each other in the second layer L2. As the binder, a thermoplastic or thermosetting resin is used. Examples of resins include, in addition to thermoplastic synthetic resins such as polyester, natural resins such as shellac, pine resin, dammar, polylactic acid, polybutylene succinate from vegetable origin, plant-derived polyethylene, PHBH® (Poly (3-hydroxybutyrate-co-3-hydroxyhexanoate)) from Kaneka Corp. The binder may be used alone or in combination of two or more.

[0047] Examples of a treatment agent other than binder include various additives. Examples of the additives include flame retardant, antioxidant, ultraviolet absorbent, aggregation inhibitor, antimicrobe agent, antifungal agent, wax, and release agent.

[0048] As shown in FIG. 2, the garment fabric F may have a multilayer structure including a first layer L1, a second layer L2, and a third layer L3 as a form different from the above-described two-layer structure. The garment fabric F of the present embodiment, that has a three-layer structure, is formed by sandwiching the second layer L2 between the lower first layer L1 and the upper third layer L3. The first layer L1 and the second layer L2 have the same configuration as mentioned above. When the garment fabric F of the present embodiment is processed into a garment, either the first layer L1 or the third layer L3 may be used on the front side of the garment.

[0049] The thickness of the garment fabric F in the present embodiment is appropriately set according to the use and form of the garment to which the fabric is applied. The thickness of the garment fabric F in this embodiment is not particularly limited, but is, for example, not less than 0.30 mm and not more than 1.50 mm. This makes it possible to improve the flexibility and strength of the garment fabric F.

[0050] The third layer L3 includes an adhesion layer L3a and a substrate layer L3b. The third layer L3 is not particularly limited, and the first layer L1 may be applied. In other words, in the third layer L3, the adhesion layer L1a of the first layer L1 corresponds to the adhesion layer L3a, and the substrate layer L1b of the first layer L1 corresponds to the substrate layer L3b. The first layer L1 is turned upside down in the direction along the Z-axis with respect to the second layer L2 and is adhered as the third layer L3. Also in this case, the adhesion between the adhesion layer L3a and the second layer L2 has the same characteristics as the adhesion between the adhesion layer L1a and the second layer L2, in consideration of the separation from the second layer L2.

[0051] The third layer L3 may be colored. For example, when the color tone of the first layer L1 and the color tone of the third layer L3 are different from each other, the color tone changes between the surface side and back side of the garment, enhancing the design.

## 2. METHOD FOR PRODUCING GARMENT FABRIC

[0052] The method for producing the garment fabric F according to the present embodiment is an example of the method for producing garment fabric of the present disclosure. The method for producing the garment fabric F includes a method for separating the second layer L2 from the used garment fabric F, extracting fibers from the second layer L2, and reusing the fibers for the new second layer L2 of a new garment fabric F.

[0053] As shown in FIG. 3, the method for producing the garment fabric F according to the present embodiment includes a removal process S1, a material supply process S2, a defibrating process S3, a mixing process S4, a coloring process S11, a depositing process S5, an adhering process S6, a forming process S7, and a cutting process S8.

[0054] In the method for manufacturing the garment fabric F, the garment fabric F is manufactured through each process in the above order from the upstream removal process S1 to the downstream cutting process S8.

[0055] A specific example of the method for manufacturing the garment fabric F will be described together with the fabric manufacturing apparatus 1 for manufacturing the garment fabric F. The fabric manufacturing apparatus 1 of the present embodiment is an example and is not limited to the configuration described below.

[0056] As shown in FIG. 4, the fabric manufacturing apparatus 1 includes, from upstream to downstream, a feed section 5, a rough shredding section 10, a defibrating section 30, a mixing section 60, a depositing section 100, a web transport section 70, a forming section 150, and a cutting section 160. The fabric manufacturing apparatus 1 is also provided with a control section 28 for integrally controlling the operation of the above-described components. The fabric manufacturing apparatus 1 manufactures the garment fabric F from raw material C.

[0057] The removal process S1 is performed manually or by an apparatus (not shown) other than the fabric manufacturing apparatus 1. In the removal process S1, the first layer L1 is removed from the garment fabric F of the used clothes to obtain a second layer L2. In the removal process S1, the used garment fabric F that was tailored into garments or the like is handled. Since the clothes collected as used garments are assumed to be different in form, size, and the like, the removal process S1 may be performed manually.

[0058] To be more specific, after the sewing thread and the like is removed, the first layer L1 and the second layer L2 are separated from the end section and the like of the garment fabric F. When the garment fabric F has the third layer L3, the second layer L2 and the third layer L3 are also separated from each other.

[0059] In the removal process S1, as described above, it is preferable that the first layer L1 and the third layer L3 do not adhere to the separated second layer L2. A device having the same function as the above-described manual operation may be attached to the fabric manufacturing apparatus 1.

[0060] The separated second layer L2 becomes the raw material C for a new second layer L2. The fibers extracted from the raw material C are recycled to the new second layer L2 of the new garment fabric F. Then, the process proceeds to the material supply process S2.

[0061] The material supply process S2 is performed in the feed section 5. The feed section 5 supplies the raw material C to the rough shredding section 10. The feed section 5

includes, for example, an automatic feeding mechanism (not shown), and continuously and automatically feeds the raw material C to the rough shredding section 10.

[0062] The rough shredding section 10 shreds the raw material C supplied from the feed section 5 into small pieces in an atmosphere such as the air. The rough shredding section 10 is a shredder, a cutter mill, or the like having a rough shredding blade 11. The raw material C is shredded by the rough shredding blade 11 into small pieces of the raw material C. The shape of the surface of the small pieces is, for example, several millimeters square or irregular. The small pieces are collected in a quantitative supply section 50.

[0063] The quantitative supply section 50 weighs the small pieces and supplies them to a hopper 12 in a fixed quantity. The quantitative supply section 50 is, for example, a vibration feeder. The small pieces supplied to the hopper 12 are transported through a pipe 20 to an inlet 31 of the defibrating section 30. Then, the process proceeds to the defibrating process S3.

[0064] The defibrating process S3 is performed in the defibrating section 30. In the defibrating process S3, the small pieces derived from the second layer L2 are defibrated using a dry method to extract fibers contained in the small pieces of the material C. The defibrating section 30 includes the inlet 31, an outlet 32, a stator 33, a rotor 34, and an airflow generating mechanism (not shown). The small pieces of the raw material C are introduced into the interior of the defibrating section 30 through the inlet 31 by the airflow of the airflow generation mechanism. The term “dry method” as used herein refers to a treatment performed in air such as the atmosphere, not in a liquid such as water.

[0065] The stator 33 and the rotor 34 are arranged inside the defibrating section 30. The stator 33 has a substantially cylindrical inner side surface. The rotor 34 rotates along the inner side surface of the stator 33. The small pieces of the raw material C are sandwiched between the stator 33 and the rotor 34 and are defibrated by a shearing force generated between the stator 33 and the rotor 34.

[0066] The fibers produced by the defibrating section 30 are discharged from the outlet 32 into a pipe 40. The pipe 40 communicates with the inside of the defibrating section 30 and the inside of the depositing section 100. The fibers are transported from the defibrating section 30 to the depositing section 100 by the airflow generated by the airflow generation mechanism. The mixing section 60 is arranged at the pipe 40 between the defibrating section 30 and the depositing section 100.

[0067] Although not shown, the fabric manufacturing apparatus 1 may include a sorting mechanism for removing impurities and the like contained in the defibrated fibers between the defibrating section 30 and the mixing section 60. Examples of the sorting mechanism include known devices such as a sieve. According to the sorting mechanism, it is possible to reduce the content of impurities and supply fibers with high purity to a new second layer L2. Then, the process proceeds to the mixing process S4.

[0068] The mixing process S4 is performed in the mixing section 60. In the mixing process S4, a treatment agent or the like, which serves as a binder, is mixed with fibers to produce a mixture that does not contain any coloring agents. The mixing section 60 includes hoppers 13 and 14, supply pipes 61 and 62, and valves 65 and 66. The mixing section 60 generates a mixture by mixing fibers with a treatment agent, which is a binder, in air. The term “containing no

coloring agents” used herein means that no coloring agents are intentionally added to the mixture. Therefore, the above-mentioned coloring agents does not contain coloring agents such as dyes that penetrate the fibers or unintended coloring agents.

[0069] The hopper 13 communicates with the inside of the pipe 40 via the supply pipe 61. In the supply pipe 61, the valve 65 is arranged between the hopper 13 and the pipe 40. The hopper 13 supplies binder into the pipe 40. The valve 65 adjusts the mass of the binder supplied from the hopper 13 to the pipe 40. By this, the mixing ratio between the fibers and the binder is adjusted. The binder may be supplied in the form of powder or particles or may be supplied in a molten state.

[0070] The hopper 14 communicates with the inside of the pipe 40 via the supply pipe 62. In the supply pipe 62, the valve 66 is arranged between the hopper 14 and the pipe 40. The hopper 14 feeds the additive into the pipe 40. The valve 66 regulates the mass of additive supplied to the pipe 40 from a hopper 14. By this, the mixing ratio of the additive to the fibers and the binder is adjusted. Note that the additive may be mixed with the binder in advance and supplied from the hopper 13.

[0071] The fibers, the binder, and the like are mixed into a mixture while being transported to the depositing section 100 through the pipe 40. In order to promote the formation of the mixture in the pipe 40 and to improve the transportability of the mixture, a blower or the like for generating an air flow may be arranged in the pipe 40. The mixture is introduced into the depositing section 100 from the pipe 40 via the coupling section 42. Then, the process proceeds to the depositing process S5.

[0072] When the first layer L1 of the garment fabric F that is produced is to be colored, the coloring process S11 is performed prior to the depositing process S5. The coloring process S11 will be described later.

[0073] The depositing process S5 is performed in the depositing section 100. In the depositing process S5, the mixture is deposited, in the air, on the air-permeable fabric N1 to form a web W that becomes a new second layer L2. The fabric N1 becomes a new first layer L1 of the garment fabric F to be manufactured. In the following description, the new first layer L1 and the new second layer L2 of the garment fabric F to be manufactured are also simply referred to as the first layer L1 and the second layer L2, respectively.

[0074] The depositing section 100 deposits the mixture on the air-permeable fabric N1 serving as the first layer L1 in the air and generates the web W serving as the second layer L2. In other words, the second layer L2 is formed by depositing the mixture containing the defibrated fibers and the treatment agent on the fabric N1 serving as the first layer L1 in the air. By this, the web W of the second layer L2 can be easily formed. In addition, the basis weight can be easily changed.

[0075] The depositing section 100 includes a drum section 101, a housing section 102 that houses the drum section 101, and a fabric feed section 71 that supplies the fabric N1. The depositing section 100 takes the mixture from the pipe 40 into the drum section 101. Then, the mixture is deposited using a dry method on the fabric N1 supplied from the fabric feed section 71.

[0076] The web transport section 70 including a mesh belt 122 and a suction mechanism 110 is arranged below the depositing section 100. The suction mechanism 110 is

arranged opposite the drum section 101 with the mesh belt 122 interposed in between in the Z-axis direction.

[0077] The drum section 101 includes a blade member 101a that is rotary driven by a motor (not shown), and a substantially cylindrical sieve section 101b that primarily covers mainly the lower portion of the blade member 101a. The blade member 101a detangles the intertwined fibers while rotating. The sieve section 101b allows particles such as fibers and mixtures smaller than the size of the openings of the mesh of the sieve section to pass through from the inside to the outside. By this, the fibers of the mixture intertwined in the drum section 101 are untangled and dispersed in the air inside the housing section 102.

[0078] The fabric feed section 71 continuously feeds the roll-shaped fabric N1 onto the mesh belt 122. At this time, an adhesion layer L1a of the fabric N1 is the surface facing upward. By this, the adhesion layer L1a is brought into contact with the web W. When a release paper is attached to the adhesion layer L1a of the fabric N1, the fabric feed section 71 may include a separation mechanism that separates the release paper from the fabric N1.

[0079] Here, the coloring process S11 is performed before the depositing process S5. In the coloring process S11, the fabric N1 is colored to be the new first layer L1 with a pigment ink. By this, since the first layer L1 is colored in the manufacturing process for the garment fabric F, it is easy to cope with multi-kind and small-quantity production. The coloring process S11 is not limited to coloring the entire surface of the fabric N1 with a single color. In the coloring process S11, an image such as a text, a pattern, a picture, or a photograph may be printed.

[0080] Although not shown in the drawings, a coloring device that performs the coloring process S11 is arranged between the fabric feed section 71 and the depositing section 100. The fabric N1 is colored from the surface facing downward by the coloring device while the fabric is fed from the fabric feed section 71 and reaches the depositing section 100.

[0081] The coloring device is not particularly limited, and examples thereof include known devices such as an ink ejecting device and an ink applying device. Here, the fabric manufacturing apparatus 1 includes the ink ejecting device with an inkjet head. By this, it is possible to easily print an image such as a color pattern, text, picture, or photograph on fabric N1 with high definition.

[0082] Here, a pre-colored fabric N1 may be applied as the fabric N1. In this case, the coloring process S11 can be omitted. The coloring process S11 is not an essential step in the method for manufacturing the garment fabric F, and the coloring device may be omitted.

[0083] A pretreatment process may be performed before the coloring process S11. In the pretreatment process, the surfaces of the fabric N1 that becomes the new first layer L1 are pretreated. To be specific, a surface treatment such as a fixing process is performed on the fabric N1 as a pretreatment. By the pretreatment, the fixability of the pigment ink is improved, and the abrasion resistance and the washing fastness of the garment fabric F to be produced can be improved.

[0084] The pretreatment process may be performed on the fabric N1 before the fabric N1 is mounted on the fabric feed section 71 or may be performed on the upstream side of the coloring device after the fabric is fed from the fabric feed section 71. When the pretreatment process is performed in

the fabric manufacturing apparatus 1, a pretreatment device is arranged between the fabric feed section 71 and the coloring device.

[0085] The pretreatment device is not particularly limited, and examples thereof include known devices such as a pretreatment liquid ejecting device and a pretreatment liquid applying device.

[0086] Returning to the depositing process S5, the mixture containing the fibers is dispersed into the air in the housing section 102 from the inner side of the sieve section 101b. Then, the mixture containing the fibers is randomly deposited on the upper side of the fabric N1 transported on the mesh belt 122. Therefore, the fibers are less likely to be oriented in a specific direction in the web W.

[0087] The sieve section 101b may not have a function of sorting out large fibers and the like in the mixture. In other words, the drum section 101 may loosen the fibers of the mixture and discharge the entire mixture to the inside of the housing section 102. The mixture dispersed in the air within the housing section 102 accumulates on the upper surface of the fabric N1 by gravity and the suction force of the suction mechanism 110.

[0088] The basis weight of the garment fabric F is adjusted by the weight per unit area of the fabric N1 and the web W. The weight per unit area of the web W is adjusted by the number of rotations of the blade member 101a, the amount of the mixture supplied to the depositing section 100 per unit time, the transport speed of the fabric N1 by the mesh belt 122, and the like.

[0089] The mixing ratio of the fibers and the treatment agent is not particularly limited and is appropriately adjusted according to the type of the treatment agent. For example, when a binder is used as the treatment agent, the mass ratio of the fibers to the binder in the web W is preferably in the range of 9:1 to 5:5 (fibers vs. binder). By this, the balance of various physical properties of the garment fabric F can be secured.

[0090] The web transport section 70 includes a mesh belt 122 and the suction mechanism 110. The web transport section 70 promotes the deposition of the mixture on the fabric N1 by the suction mechanism 110. The web transport section 70 transports the web W formed from the mixture downstream by rotation of the mesh belt 122.

[0091] The suction mechanism 110 is arranged below the drum section 101. The suction mechanism 110 draws air from the housing section 102 through the plurality of holes in the mesh belt 122 and the air-permeable fabric N1. By this, the mixture discharged to the outside of the drum section 101 is sucked downward together with air and is deposited on the upper surface of the fabric N1. A known suction device such as a blower is used for the suction mechanism 110.

[0092] The plurality of holes of the mesh belt 122 allow air to pass through, but do not easily allow fibers, binder, and the like contained in the mixture to pass through. The mesh belt 122 is an endless belt and is applied with tension by four tensing rollers 121.

[0093] The upper surface of the mesh belt 122 moves toward downstream by rotation of the tensing rollers 121. In other words, the mesh belt 122 rotates clockwise in FIG. 4. As the mesh belt 122 is rotated by the tensing rollers 121, the mixture is continuously deposited to form the web W. The web W contains a relatively large amount of air and is soft

and swollen. The web W is transported downstream together with the fabric N1 as the mesh belt 122 moves.

[0094] A moistening device 130 may be arranged downstream of the depositing section 100, and the web W may be moistened by spraying water. By this, scattering of fibers, binder, and the like contained in the web W is suppressed. In addition, a water-soluble treatment agent may be contained in the water used for moistening, and the web W to become the second layer L2 may be subjected to a surface treatment in parallel with the moistening.

[0095] The web W and the fabric N1 are transported downstream by the mesh belt 122, and they are separated from the mesh belt 122, and drawn past a dancer roller 141. The dancer roller 141 is provided to secure the processing time of the downstream forming process S7. In detail, since the forming process S7 is a batch process, the dancer roller 141 is moved up and down with respect to the web W and the fabric N1 continuously supplied from the depositing section 100 to secure the processing time of the forming process S7. The web W and the fabric N1 travel downstream through the dancer roller 141.

[0096] Here, when the garment fabric F having the above-described third layer L3 is manufactured, the adhering process S6 is performed after the depositing process S5 and before the forming process S7. In the adhering process S6, a fabric N2, which become a new third layer L3, is adhered to be the upper surface of a web W. By this, it is possible to manufacture the garment fabric F of the other form described above.

[0097] The adhering process S6 is performed by a fabric feed section 72 and an adhering device (not shown). The fabric feed section 72 continuously feeds the roll-shaped fabric N2 above the web W. At this time, in a case where the fabric N2 includes the adhesion layer L3a, the adhesion layer L3a of the fabric N2 is a surface facing downward. By this, the adhesion layer L3a is brought into contact with the web W. In a case where a release paper is attached to the adhesion layer L3a of the fabric N2, the fabric feed section 72 may include a separation mechanism that separates the release paper from the fabric N2.

[0098] The adhering device adheres the upper surface of the web W to the lower surface of fabric N2. The adhering device is, for example, a pressure roller, and adheres the web W and the fabric N2 to each other while suppressing wrinkling and the inclusion of large air bubbles.

[0099] The fabric N2 may be dyed by the fabric manufacturing apparatus 1 in the same manner as the fabric N1, or pre-dyed fabric N2 may be used. When the fabric N2 is colored in the fabric manufacturing apparatus 1, a coloring device similar to that for the fabric N1 is arranged between the fabric feed section 72 and the adhering device.

[0100] When a garment fabric F having no third layer L3 is to be produced, the adhering process S6 is omitted. In this case, the fabric manufacturing apparatus 1 may omit the fabric feed section 72 and the adhering device. The adhering process S6 may be performed upstream of the dancer roller 141. Then, fabric N1, web W, and fabric N2 are integrated and proceed to forming process S7.

[0101] The forming process S7 is performed in the forming section 150. In the forming process S7, the fabrics N1, N2, and the web W are pressed and heated to form a belt-shaped garment fabric F. The forming section 150 is a heating press device and includes an upper circuit board 152 and a lower circuit board 151. The upper circuit board 152

and the lower circuit board **151** sandwich and pressurize the web W and the fabrics N1, N2, and heat the web W and the fabric N1, N2 by built-in heaters. The forming process S7 may be continuously performed using a heating roller pair or the like.

**[0102]** The web W is compressed from the vertical direction by pressurization to increase the density, and the binder is melted by heating to fluidly spread between the fibers. When the heating is finished in this state and the binder solidifies, the fibers are bound to each other by the binder. In addition, when the fabrics N1, N2 and the web W are adhered to each other, the fabric N1 becomes the first layer L1, the web W becomes the second layer L2, and fabric N2 becomes the third layer L3.

**[0103]** The pressurization and heating conditions in the forming section **150** are appropriately adjusted according to the desired density of the garment fabric F, the melting point or curing temperature of the binder, and the like. Although not particularly limited, the pressurization condition is, for example, 0.01 MPa or more, and the heating condition is, for example, 90° C. or more. By the forming section **150**, the fabrics N1, N2 and the web W are formed into a belt-shaped garment fabric F. Then, the process proceeds to the cutting process S8.

**[0104]** The cutting process S8 is performed in the cutting section **160**. The cutting section **160** adjusts the shape of the sides at both ends of the belt-shaped garment fabric F. The cutting section **160** includes a longitudinal blade (not shown).

**[0105]** The longitudinal blade cuts the belt-shaped garment fabric F in a direction along the transport direction. By this, both ends of the garment fabric F are trimmed evenly. Then, the belt-shaped garment fabric F is wound into a roll shape to form a roll of cloth. The cutting section **160** may be provided with a lateral blade for cutting in a direction intersecting with the transport direction of the garment fabric F. In this case, the garment fabric F is cut into a cut form sheet shape such as a substantially rectangular shape. Thus, the garment fabric F is produced.

**[0106]** According to the present embodiment, the following effects can be obtained.

**[0107]** The garment fabric F that can be easily reused repeatedly can be produced. More specifically, the garment fabric F to be manufactured includes a first layer L1 that can ensure design by coloring, and a non-colored second layer L2. Therefore, by separating the first layer L1 and the second layer L2, fibers that do not require de-inking treatment are obtained from the second layer L2. The obtained fibers can be easily reused for a new second layer L2. Therefore, it is possible to provide a method for manufacturing a garment fabric F that is easy to reuse repeatedly.

**[0108]** For example, it becomes easy to recreate clothes or the like which are personally cherished into new garment fabric for clothing. By this, it becomes easy to regenerate an old garment, remake it into a new garment, and continue to reuse it over generations.

### 3. EMBODIMENTS AND COMPARATIVE EXAMPLES

**[0109]** Hereinafter, the effects of the present disclosure will be described more specifically with reference to embodiments and comparative examples. FIGS. 5 and 6 show layer structures, manufacturing conditions, evaluation results, and the like of embodiments 1 to 6 and of compara-

tive examples 1 to 5. In the following description, the embodiments 1 to 6 may be collectively and simply referred to as embodiments, and the comparative examples 1 to 5 may be collectively and simply referred to as comparative examples. It should be noted that the present disclosure is not limited to the following embodiments.

#### 3.1. Making Garment Fabric for Recycling

**[0110]** As shown in FIGS. 5 and 6, in the embodiments and the comparative examples, first, a garment fabric F0 for recycling was created. Specifically, in the embodiments 1 to 5 and the comparative examples 1 and 2, the two-layer structure shown in FIG. 1 was applied as the garment fabric F0 for recycling. In the embodiment 6 and the comparative examples 3 to 5, the three-layer structure shown in FIG. 2 was applied as the garment fabric F0 for recycling. In the following description, the garment fabric F0 for recycling is also simply referred to as fabric F0.

**[0111]** In the embodiment 1, a white cotton cloth was used as the fabric C for the material of the second layer L2. To be specific, as the material supply process S2, the fabric C was roughly shredded into substantially small rectangular pieces with long sides ranging from 1 mm to 30 mm by a cutter mill manufactured by Makino Sangyo Co., Ltd. In the production of the garment fabric F0, the removal process S1 in the above embodiment was omitted, and the fabric C that had not undergone the removal process S1 was used. Next, as the defibrating process S3, the small pieces were defibrated into fibers in the same manner as the defibrating process S3 of the above embodiment.

**[0112]** Next, in the mixing process S4, the fibers and the binder were mixed at a weight ratio of 10:3 by air stirring. A thermoplastic resin was used as the binder.

**[0113]** Next, prior to the depositing process S5, the coloring process S11 was performed on the white fabric N1. As fabric N1, a 0.1 mm-thick polyester nonwoven fabric was used. The fabric N1 has a substrate layer L1b made of polyester fibers and an adhesion layer L1a containing thermo-plastic polyester. In the coloring process S11, not the entire surface of the fabric N1 was colored, but an image was printed.

**[0114]** First, the surface of the fabric N1 opposite to the adhesion layer L1a, that is, the front side of the substrate layer L1b, was pretreated. As the pretreatment liquid, a stock solution liquid of a pretreatment liquid PREGEN PCC for pigments manufactured by Epson Como Printing Technologies S.r.l. was diluted 10 times with pure water. Then, the pretreatment liquid was uniformly applied to the fabric N1 with a bar coater. This was dried at 100° C. for 10 minutes as a pretreatment.

**[0115]** Thereafter, using a textile inkjet printer ML-8000 manufactured by Seiko Epson Co., a picture of a fresh green forest was printed on the pretreated surface of the fabric N1. Then, the fabric N1 was dried at 160° C. for 3 minutes to obtain fabric N1 with the substrate layer L1b surface colored.

**[0116]** Next, as the depositing process S5, the mixture was deposited on the surfaces of the adhesion layer L1a of the fabric N1 in the air to form a web W. At this time, the deposition amount of the mixture was adjusted so that the basis weight of the second layer L2 was 130 g/m<sup>2</sup>.

**[0117]** Next, the adhering process S6 for the three-layer structure was omitted, and the forming process S7 was performed. In the forming process S7, the web W and the

fabric N1 were hot-pressed. At this time, AF-54TEN (product name) manufactured by Itsumi Co. was used as a heating press machine, and the heating condition was set to 150° C. for 1 minute, and the pressing condition was set such that the second layer L2 in the fabric F0 was 0.31 mm thick. In the embodiment 1, the second layer L2 was not subjected to surface treatment. Then, as the cutting process S8, the cloth was cut into a cut form sheet of 250 mm in length and 100 mm in width by a cutter to prepare the fabric F0 of the embodiment 1.

[0118] In the embodiment 2, a fabric F0 was prepared as in the embodiment 1.

[0119] In the embodiment 3, the fabric C serving as the material for the second layer L2 was changed from that of the embodiment 1. Specifically, a blue cotton cloth dyed with a dye was used as the fabric C. In other words, the second layer L2 was white in the embodiment 1, whereas the second layer L2 was blue in the embodiment 3. A fabric F0 of the embodiment 3 was produced in the same manner as in the embodiment 1 except for the above.

[0120] In the embodiment 4, the fabric C as the raw material for the second layer L2 was changed from that in the embodiment 3. Specifically, a red cotton cloth dyed with a dye was used as the fabric C. In other words, the second layer L2 was blue in the embodiment 3, while the second layer L2 was red in the embodiment 4. A fabric F0 of the embodiment 4 was produced in the same manner as in the embodiment 1 except for the above.

[0121] In the embodiment 5, with respect to the embodiment 1, the deposition amount of the mixture was adjusted so that the basis weight of the second layer L2 was 100 g/m<sup>2</sup>. The fabric F0 of the embodiment 5 was produced in the same manner as in the embodiment 1 except for the above.

[0122] In the embodiment 6, a three-layer structure was applied to the embodiment 1 having a two-layer structure. Specifically, after performing the steps up to the depositing process S5 as in the embodiment 1, the adhering process S6 was performed. To be specific, the fabric N1 for the first layer L1 that was used in the embodiment 1, is applied as the fabric N2 that becomes the third layer L3 to form a three-layer structure. Therefore, the surfaces of the substrate layer Lib of the first layer L1 and the surfaces of the substrate layer L3b of the third layer L3 are colored. A fabric F0 of the embodiment 6 was produced in the same manner as in the embodiment 1 except for the above.

[0123] In the comparative example 1, a fabric F0 was produced in the same manner as in the embodiment 1.

[0124] In the comparative example 2, the fabric F0 was produced as in the embodiment 3.

[0125] In the comparative examples 3, 4, and 5, the fabric F0 was produced in the same manner as in the embodiment 6.

### 3.2. Evaluation of Peelability in the Removal Process

[0126] For each fabric F0 of the embodiments and comparative examples, the ease of peeling between the second layer L2 and the other layer in the removal process S1 was evaluated as the evaluation of the peelability. To be specific, each fabric F0 was subjected to any one of the following peeling methods 1 to 3 and evaluated according to the following evaluation criteria. The evaluation results are shown in FIGS. 5 and 6. In comparative examples 1, 2, and 5, the removal process S1 was omitted, and the two-layer or three-layer garment fabric F0 was directly evaluated as

described below. In the comparative example 3, the removal process S1 was performed only on the third layer L3 of the three-layer structure, and the first layer L1 remained integrated with the second layer L2. In the comparative example 4, the removal process S1 was performed only on the first layer L1 of the three-layer structure, and the third layer L3 remained integrated with the second layer L2.

#### Peeling Method

[0127] 1: A claw was used to catch on the end section of the substrate layer L1b, and the first layer L1 and the second layer L2 were peeled off from the end portion.

[0128] 2: The surface of the substrate layer Lib was heated for 2 minutes with a dryer, and then the first layer L1 and the second layer L2 were peeled off from the end section. With respect to the fabric F0 of the comparative examples 5 and 6, the surface of the layer to be peeled was peeled by heating in the same manner as described above.

[0129] 3: The surface of the substrate layer L1b was heated for 2 minutes with a dryer, and then the first layer L1 and the second layer L2 were peeled off from the end section. Next, the surface of the substrate layer L3b was heated for 2 minutes with a dryer, and then the third layer L3 and the second layer L2 were peeled off from the end section.

#### Evaluation Criteria

[0130] A: Interfacial peeling occurred between the second layer L2 and another layer.

[0131] B: Cohesive failure did not occur in the second layer L2, but cohesive failure occurred in other layers, and a small amount of a part of the first layer L1 or the third layer L3 remained on the second layer L2.

[0132] C: Cohesive failure occurred in the second layer L2. Alternatively, cohesive failure of other layers was significant, and most of the first layer L1 and the third layer L3 remained on the second layer L2.

#### 3.3. Manufacture of Garment Fabric with Recycled Cloth

[0133] A new garment fabric F1 was produced using the second layer L2 separated as described above, the fabric F0 as it was, and the second layer L2 with the other layers left. To be specific, as the removal process S1, production was started from the material supply process S2 for both the standard at which the above evaluation was performed and the standard at which all or a part of the peeling was omitted. In each of the embodiments and the comparative examples, the method for preparing the fabric F0 was applied again to prepare garment fabric F1. In the following description, a newly produced garment fabric F1 is also referred to simply as the fabric F1.

#### 3.4. Evaluation of Color Tone

[0134] For each fabric F1 of the embodiments and the comparative examples, the color tone of the second layer L2 was evaluated. To be specific, the color tone of the second layer L2 of the fabric F1 and the color tone of the fabric C used for the second layer L2 of the fabric F0 were visually compared and evaluated according to the following evaluation criteria. The evaluation results are shown in FIGS. 5 and 6. The color tone of the fabric C is the color tone of the fibers used in the fabric C.

#### Evaluation Criteria

[0135] A: Color tones of both look the same.

[0136] C: There is a difference between the two color tones, and they do not look the same.

#### 3.5. Evaluation of Designability

[0137] Garments were produced from each fabric F1 of the embodiments and the comparative examples, and a sensory evaluation was performed on the designability of the garments at each level. Specifically, the design of the produced garments was evaluated according to the following evaluation criteria. The evaluation results are shown in FIGS. 5 and 6.

#### Evaluation Criteria

[0138] A: The color tone of the fabric and the printed image are as intended by the designer.

[0139] C: The color tone of the fabric and the printed image are not as intended by the designer.

#### 3.6. Summary of Evaluation Results

[0140] As shown in FIG. 5, all embodiments were rated B or

[0141] higher for peelability, which is considered acceptable. In particular, in the embodiments other than the embodiments 1 and 3, the evaluation was A corresponding to good, and it was shown that the garment fabric F0 for recycling has excellent peelability. In the evaluation of color tone, all embodiments were evaluated as A, which corresponds to good, and it was shown that the second layer L2 of the new garment fabric F1 maintained the color tone of the fabric C used as the starting material. In the evaluation of designability, all embodiments were rated as A, which corresponds to good, and it was shown that there was no change in the color tone of the second layer L2, and the designability and the degree of freedom thereof were improved.

[0142] On the other hand, in the evaluation of the peelability of the comparative examples, good peelability was confirmed in the comparative examples 3 and 4 as in the embodiments.

[0143] In the evaluation of color tone of the comparative examples, the evaluation was C, which corresponds to failure, at all levels. In the comparative examples 1, 2, and

5, since the layers other than the second layer L2 were reused without being removed, the colors of the printing of the other layers were mixed. Further, also in the comparative examples 3 and 4, since one of the layers was left as the second layer L2 and reused, the color of the print of the remaining layer was mixed.

[0144] In the evaluation of the designability of the comparative examples, the evaluation was C, which corresponds to failure, at all levels, and it was found that the influence of the color tone of the second layer L2 influences the designability.

What is claimed is:

1. A method for producing garment fabric comprising:
  - a removal process of removing a first layer from a used garment fabric having a multilayer structure including the first layer and a second layer, the second layer having fibers;
  - a defibrating process of defibrating the second layer using a dry method and of extracting the fibers;
  - a mixing process of mixing the fibers with a treatment agent to form a mixture containing no coloring agents;
  - a depositing process for creating a web as a new second layer by depositing, in air, the mixture on an air-permeable fabric that becomes a new first layer; and
  - a forming process of forming by pressing and heating the fabric and the web.
2. The method for producing garment fabric according to claim 1, wherein
  - the fibers are composed of white fibers.
3. The method for producing garment fabric according to claim 1, further comprising:
  - after the depositing process and before the forming process, an adhering process of adhering a fabric, which becomes a third layer, to the surface of the web.
4. The method for producing garment fabric according to claim 1, further comprising:
  - before the depositing process, a coloring process of coloring the fabric to be the new first layer with a pigment ink.
5. The method for producing garment fabric according to claim 4, further comprising:
  - before the coloring process, a pretreatment process of performing pretreatment on the fabric that becomes the new first layer.

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