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(54) STAPLE FIBER TREATMENT AGENT, STAPLE FIBER, AND METHOD FOR MANUFACTURING SPUN-LACE NON-WOVEN CLOTH

(57) This staple fiber treatment agent includes: the fatty acid derivative described below; at least one selected from the fatty acid described below and the fat/oil described below; and the polyhydric alcohol described below (excepting polyoxyethylene (number of oxyethylene units is 20) polyoxypropylene (number of oxypropylene units is 30) glycol). Fatty acid derivative: A derivative manufactured by adding alkylene oxide in a ratio of 0.1-30 mol per mol of C12-24 fatty acid. Fatty acid: A C12-24 fatty acid. Fat/oil: At least one selected from vegetable oils, animal oils, and hydrogenated oils of the vegetable oils and the animal oils. Polyhydric alcohol: A polyhydric alcohol having 2-6 hydroxyl groups per molecule.

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Description

TECHNICAL FIELD

[0001] The present invention relates to a short fiber treatment agent, a short fiber to which the short fiber treatment agent is attached, and a method for manufacturing a spunlace nonwoven fabric using short fibers to which the short fiber treatment agent is attached.

BACKGROUND ART

[0002] Natural fibers such as cotton fibers, regenerated fibers such as rayon, and synthetic fibers such as polyolefin are generally used as raw material fibers for nonwoven fabrics. A treatment of applying a nonwoven fabric treatment agent containing a surfactant and the like to surfaces of raw material fibers is performed in some cases to impart, to the raw material fibers, various characteristics such as lubricity and bundling properties required in manufacturing of nonwoven fabrics.

[0003] In the related art, nonwoven fabric treatment agents disclosed in Patent documents 1 and 2 are known. Patent document 1 discloses a configuration of a nonwoven fabric treatment agent containing a mineral oil, a fatty acid ester, and a polyoxyalkylene polyhydric alcohol fatty acid ester. Patent document 2 discloses a configuration of a fiber treatment agent for hydroentanglement through highly pressurized water jets containing a polyhydric alcohol fatty acid ester sulfate salt, a mineral oil, and a polyoxyalkylene polyhydric alcohol fatty acid ester.

PRIOR ART LITERATURE

PATENT LITERATURE

[0004]

Patent document 1: International Publication No. WO 2016/104106
Patent document 2: Japanese Patent No. 6096061

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] The nonwoven fabric treatment agents of the related art, however, have a problem of frequent bubble formation in water used for hydroentanglement in a step of manufacturing nonwoven fabrics, that is, a problem of foaming when the treatment agent dropped from raw material fibers is mixed into water.

[0006] The present invention has been made in view of these circumstances, and an object thereof is to provide a short fiber treatment agent that can inhibit foaming of water used for hydroentanglement. Another object of the present invention is to provide a short fiber to which the short fiber treatment agent is attached. Still another object of the present invention is to provide a method for manufacturing a spunlace nonwoven fabric using short fibers to which the short fiber treatment agent is attached.

MEANS FOR SOLVING THE PROBLEM

[0007] As a result of study to solve the problem, the inventors of the present invention have found that a short fiber treatment agent including a specific fatty acid derivative, a specific fatty acid or oil or fat, and a specific polyhydric alcohol is definitely suitable.

[0008] A short fiber treatment agent for solving the above-mentioned problem contains a fatty acid derivative, at least one selected from fatty acids and oils and fats, and a polyhydric alcohol excluding polyoxyethylene polyoxypropylene glycol that includes 20 oxyethylene units and 30 oxypropylene units. The fatty acid derivative has a structure in which an alkylene oxide is added, at a ratio of 0.1 to 30 mol, to 1 mol of a fatty acid having 12 to 24 carbon atoms. The fatty acids have 12 to 24 carbon atoms. The oils and fats are at least one selected from vegetable oils, animal oils, and hardened oils thereof. The polyhydric alcohol has 2 to 6 hydroxy groups in the molecule.

[0009] It is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, and the polyhydric alcohol in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 99.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, and the content of the polyhydric alcohol be 0.1 to 90 parts by mass.

[0010] The short fiber treatment agent preferably further contains at least one lubricant selected from a hydrocarbon compound, an ester excluding the oils and fats, and a silicone.

[0011] In this case, it is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, and the lubricant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 98.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, the content of the polyhydric alcohol be 0.1 to 90 parts by mass, and the content of the lubricant be 1 to 20 parts by mass.

[0012] The short fiber treatment agent preferably further contains an anionic surfactant.

[0013] In this case, it is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, and the anionic surfactant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 98.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, the content of the polyhydric alcohol be 0.1 to 90 parts by mass, and the content of the anionic surfactant be 1 to 20 parts by mass.

[0014] The short fiber treatment agent may have a configuration including both an anionic surfactant and at least one lubricant selected from a hydrocarbon compound, an ester excluding the oils and fats, and a silicone.

[0015] In this case, it is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, the anionic surfactant, and the lubricant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 97.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, the content of the polyhydric alcohol be 0.1 to 90 parts by mass, the content of the anionic surfactant be 1 to 20 parts by mass, and the content of the lubricant be 1 to 20 parts by mass.

[0016] A short fiber to be treated with the short fiber treatment agent is preferably viscose rayon.

[0017] A short fiber for solving the above-mentioned problem is a short fiber to which the short fiber treatment agent is attached.

[0018] A method for manufacturing a spunlace nonwoven fabric for solving the above-mentioned problem includes a first step and a second step. The first step is a step of carding the short fibers to manufacture a web. The second step is a step of entangling the web obtained in the first step through water jets. That is, the method includes carding short fibers to which the short fiber treatment agent is attached to manufacture a web, and entangling the obtained web through water jets.

EFFECT OF THE INVENTION

[0019] The present invention succeeds in inhibiting foaming of water used for hydroentanglement when short fibers to which a short fiber treatment agent is attached are hydroentangled.

MODES FOR CARRYING OUT THE INVENTION

(First embodiment)

[0020] A first embodiment will now be described that embodies a short fiber treatment agent according to the present invention. The short fiber treatment agent contains the following fatty acid derivative, at least one selected from the following fatty acids and the following oils and fats, and the following polyhydric alcohol.

[0021] The fatty acid derivative has a structure in which an alkylene oxide is added to 1 mol of a fatty acid having 12 to 24 carbon atoms at a ratio of 0.1 to 30 mol. Specific examples of fatty acid derivatives include (1) polyoxyalkylene alkyl (or alkylene) esters obtained by addition reaction of an alkylene oxide to saturated or unsaturated fatty acids, such as polyoxyethylene (in which the number n of oxyethylene units (= the number of moles of ethylene oxide added) is 20, that is, n = 20) oleate, polyoxyethylene (n = 10) oleate, polyoxyethylene (n = 30) oleate, polyoxyethylene (n = 5) stearate, polyoxyethylene (n = 10) stearate, polyoxyethylene (n = 10) lauryl esters, and polyoxyalkylene (n = 10, in which the number m of oxypropylene units (= the number of moles of propylene oxide added) is 10, that is, m = 10) stearyl esters; (2) polyalkylene glycol alkyl (or alkylene) esters obtained by addition reaction of a polyalkylene glycol to saturated or unsaturated fatty acids, such as polyethylene glycol (molecular weight: 400) monooleate, polyethylene glycol (molecular weight: 600) dioleate, polyethylene glycol (molecular weight: 1,000) monostearate, polyethylene glycol (molecular weight: 400) dilaurate, and polyethylene glycol (molecular weight: 1,000) distearate; and (3) esters of oils and fats of polyoxyalkylene obtained by addition reaction of an alkylene oxide to oils and fats, such as polyoxyethylene (n = 30) castor oil esters, polyoxyalkylene (n = 10, m = 10) castor oil esters, polyoxyethylene (n = 10) hardened castor oil esters, and a reaction product of a coconut fatty acid and 10 moles of ethylene oxide. The components may be used alone or in a combination of two or more kinds thereof. In addition, an addition form of ethylene oxide and propylene oxide is not particularly limited and may be any form of block addition, random addition, and a combination of block addition and

random addition in a case where ethylene oxide and propylene oxide are contained as an alkylene oxide.

[0022] The fatty acids have 12 to 24 carbon atoms. Specific examples of fatty acids having 12 to 24 carbon atoms include lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, arachidic acid, behenic acid, lignoceric acid, and coconut fatty acids. The components may be used alone or in a combination of two or more kinds thereof.

[0023] The oils and fats are at least one selected from vegetable oils, animal oils, and hardened oils thereof. Specific examples of oils and fats include castor oil, sesame oil, tall oil, palm oil, palm kernel oil, coconut oil, rapeseed oil, lard, beef tallow, whale oil, and hardened oils thereof. The components may be used alone or in a combination of two or more kinds thereof.

[0024] The polyhydric alcohol has 2 to 6 hydroxy groups in the molecule. The polyhydric alcohol used in the present embodiment is selected from polyhydric alcohols excluding polyoxyethylene (in which the number of oxyethylene units is 20) polyoxypropylene (in which the number of oxypropylene units is 30) glycol. Specific examples of the polyhydric alcohol include ethylene glycol, propylene glycol, pentanediol, hexanediol, glycerin, pentaerythritol, sorbitol, sorbitan, polyethylene glycol, polypropylene glycol, and a reaction product of propylene glycol and an alkylene oxide. The components may be used alone or in a combination of two or more kinds thereof.

[0025] The ratio among the contents of the fatty acid derivative, the fatty acids, the oils and fats, and the polyhydric alcohol in the short fiber treatment agent of the present embodiment is not limited. It is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, and the polyhydric alcohol in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 99.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, and the content of the polyhydric alcohol be 0.1 to 90 parts by mass. The effects of the present invention can be further improved with this configuration.

[0026] The short fiber treatment agent of the present embodiment preferably further contains at least one lubricant selected from a hydrocarbon compound, an ester excluding the oils and fats, and a silicone. The effects of the present invention can be further improved by blending the lubricant. The lubricant components may be used alone or in a combination of two or more kinds thereof.

[0027] Specific examples of hydrocarbon compounds include mineral oils and paraffin wax.

[0028] Specific examples of esters include butyl stearate, stearyl stearate, glycerin monooleate, glycerin trioleate, sorbitan monolaurate, sorbitan trilaurate, sorbitan monooleate, sorbitan trioleate, sorbitan monostearate, and sorbitan tristearate.

[0029] Specific examples of silicones include dimethyl silicone, amino-modified silicones, and polyoxyalkylene-modified silicones.

[0030] The ratio among the contents of the fatty acid derivative, the fatty acids, the oils and fats, the polyhydric alcohol, and the lubricant in the short fiber treatment agent of the present embodiment is not limited. It is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, and the lubricant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 98.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, the content of the polyhydric alcohol be 0.1 to 90 parts by mass, and the content of the lubricant be 1 to 20 parts by mass, . The effects of the present invention can be further improved with this configuration.

[0031] The short fiber treatment agent of the present embodiment preferably further contains an anionic surfactant. The effects of the present invention can be further improved by blending the anionic surfactant. The type of anionic surfactant is not particularly limited, and examples thereof include (1) alkali metal salts of phosphoric acid esters of aliphatic alcohols, such as alkali metal salts of lauryl phosphoric acid esters, alkali metal salts of cetyl phosphoric acid esters, alkali metal salts of oleyl phosphoric acid esters, and alkali metal salts of stearyl phosphoric acid esters; (2) alkali metal salts of phosphoric acid esters in which at least one alkylene oxide selected from ethylene oxide and propylene oxide is added to aliphatic alcohols, such as alkali metal salts of polyoxyethylene (n = 5) lauryl ether phosphoric acid esters, alkali metal salts of polyoxyethylene (n = 5) oleyl ether phosphoric acid esters, and alkali metal salts of polyoxyethylene (n = 10) stearyl ether phosphoric acid esters; (3) alkali metal salts of sulfonic acid esters of aliphatic alcohols, such as alkali metal salts of lauryl sulfonic acid esters, alkali metal salts of oleyl sulfonic acid esters, alkali metal salts of stearyl sulfonic acid esters, and alkali metal salts of tetradecane sulfonic acid; (4) alkali metal salts of sulfuric acid esters of aliphatic alcohols, such as alkali metal salts of lauryl sulfuric acid esters, alkali metal salts of oleyl sulfuric acid esters, and alkali metal salts of stearyl sulfuric acid esters; (5) alkali metal salts of sulfuric acid esters in which at least one alkylene oxide selected from ethylene oxide and propylene oxide is added to aliphatic alcohols, such as alkali metal salts of polyoxyethylene (n = 3) lauryl ether sulfuric acid esters, alkali metal salts of polyoxyethylene (n = 5) lauryl ether sulfuric acid esters, alkali metal salts of polyoxyalkylene (n = 3, m = 3) lauryl ether sulfuric acid esters, alkali metal salts of polyoxyethylene (n = 3) oleyl ether sulfuric acid esters, and alkali metal salts of polyoxyethylene (n = 5) oleyl ether sulfuric acid esters; (6) alkali metal salts of sulfuric acid esters of fatty acids, such as alkali metal salts of sulfuric acid

esters of fatty acids of castor oil, alkali metal salts of sulfuric acid esters of fatty acids of sesame oil, alkali metal salts of sulfuric acid esters of fatty acids of tall oil, alkali metal salts of sulfuric acid esters of fatty acids of soybean oil, alkali metal salts of sulfuric acid esters of fatty acids of rapeseed oil, alkali metal salts of sulfuric acid esters of fatty acids of palm oil, alkali metal salts of sulfuric acid esters of fatty acids of lard, alkali metal salts of sulfuric acid esters of fatty acids of beef tallow, and alkali metal salts of sulfuric acid esters of fatty acids of whale oil; (7) alkali metal salts of sulfuric acid esters of oils and fats, such as alkali metal salts of sulfuric acid esters of castor oil, alkali metal salts of sulfuric acid esters of sesame oil, alkali metal salts of sulfuric acid esters of tall oil, alkali metal salts of sulfuric acid esters of soybean oil, alkali metal salts of sulfuric acid esters of rapeseed oil, alkali metal salts of sulfuric acid esters of palm oil, alkali metal salts of sulfuric acid esters of lard, alkali metal salts of sulfuric acid esters of beef tallow, and alkali metal salts of sulfuric acid esters of whale oil; (8) alkali metal salts of fatty acids, such as alkali metal salts of lauric acid, alkali metal salts of oleic acid, and alkali metal salts of stearic acid; and (9) alkali metal salts of sulfosuccinic acid esters of aliphatic alcohols, such as alkali metal salts of dioctyl sulfosuccinic acid. The components may be used alone or in a combination of two or more kinds thereof.

[0032] The ratio among the contents of the fatty acid derivative, the fatty acids, the oils and fats, the polyhydric alcohol, and the anionic surfactant in the short fiber treatment agent of the present embodiment is not limited. It is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, and the anionic surfactant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 98.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, the content of the polyhydric alcohol be 0.1 to 90 parts by mass, and the content of the anionic surfactant be 1 to 20 parts by mass. The effects of the present invention can be further improved with this configuration.

[0033] The ratio among the contents of the fatty acid derivative, the fatty acids, the oils and fats, the polyhydric alcohol, the anionic surfactant, and the lubricant in the short fiber treatment agent of the present embodiment is not limited. It is preferable that when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, the anionic surfactant, and the lubricant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative be 5 to 97.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats be 0.01 to 10 parts by mass, the content of the polyhydric alcohol be 0.1 to 90 parts by mass, the content of the anionic surfactant be 1 to 20 parts by mass, and the content of the lubricant be 1 to 20 parts by mass. The effects of the present invention can be further improved with this configuration.

[0034] The short fiber treatment agent of the present embodiment preferably further contains a nonionic surfactant other than the above-mentioned components as another component. Specific examples of nonionic surfactant other than the above-mentioned components include (1) polyoxyalkylene alkyl (or alkenyl) ethers obtained by addition reaction of an alkylene oxide to saturated or unsaturated aliphatic monohydric alcohols, such as polyoxyethylene (n = 10) lauryl ethers, polyoxyethylene (n = 20) stearyl ethers, polyoxyethylene (n = 30) oleyl ethers, polyoxyethylene (n = 10) alkyl (having 12 or 13 carbon atoms) ethers, and polyoxyalkylene (n = 10, m = 10) lauryl ethers; (2) polyoxyalkylene polyhydric alcohol ethers obtained by addition reaction of an alkylene oxide to aliphatic polyhydric alcohols, such as polyoxyethylene (n = 10) sorbitan monolaurate, polyoxyethylene (n = 20) sorbitan monooleate, polyoxyethylene (n = 20) sorbitan monostearate, and polyoxyethylene (n = 20) sorbitan tristearate; (3) polyoxyalkylene alkylphenol ethers obtained by addition reaction of an alkylene oxide to an alkylphenol, such as polyoxyethylene (n = 10) octylphenol ethers and polyoxyethylene (n = 10) nonylphenol ethers; and (4) polyoxyalkylene amino ethers obtained by addition reaction of an alkylene oxide to saturated or unsaturated aliphatic amines, such as polyoxyethylene (n = 5) octyl amino ethers, polyoxyethylene (n = 8) lauryl amino ethers, and polyoxyethylene (n = 20) stearyl amino ethers. The nonionic surfactants may be used alone or in a combination of two or more kinds thereof. The content of the nonionic surfactant is not limited.

[0035] Short fibers to which the short fiber treatment agent of the present embodiment is attached are generally called staple fibers, and include no long fiber generally called filament fiber. The length of the short fibers in the present embodiment is not particularly limited as long as the short fibers correspond to short fibers in the art of the present invention, but the length is, for example, preferably 100 mm or shorter and more preferably 51 mm or shorter. Examples of fibers include natural fibers, such as cotton fibers and cotton fibers treated by exposure; regenerated fibers, such as viscose rayon fibers, high-tenacity rayon fibers, super high-tenacity rayon fibers, high-wet-modulus rayon fibers, solvent-spun rayon fibers, polynosic fibers, cupra fibers, and acetate fibers; and synthetic fibers, such as polyolefin fibers, polyester fibers, polyamide fibers, acrylic fibers, polyvinyl chloride fibers, and composite fibers composed of two or more kinds of thermoplastic resins. Among the examples, viscose rayon fibers, high-tenacity rayon fibers, super high-tenacity rayon fibers, high-wet-modulus rayon fibers, and solvent-spun rayon fibers are preferable, and viscose rayon fibers are particularly preferable.

[0036] According to the first embodiment, the following effects can be obtained.

[0037] (1) The short fiber treatment agent of the present embodiment contains a specific fatty acid derivative, at least one selected from specific fatty acids and specific oils and fats, and a specific polyhydric alcohol. Accordingly, when short fibers to which the short fiber treatment agent is attached are hydroentangled, it is possible to curb bubble formation

due to mixing of the short fiber treatment agent that has dropped from the short fibers into water, that is, inhibit foaming of water used for hydroentanglement. Thereby, operation efficiency can be improved in a step of manufacturing a nonwoven fabric.

(Second embodiment)

[0038] A second embodiment will now be described that embodies a short fiber according to the present invention. The short fiber of the present embodiment is a short fiber to which the short fiber treatment agent of the first embodiment is attached. As a method of applying the short fiber treatment agent, a known method such as an immersion method, a spray method, or a roller method may be applied. The step in which the short fiber treatment agent is applied is not particularly limited, and examples thereof include a step after a refining step, and a spinning step.

[0039] The above-mentioned short fibers can be adopted as short fibers to be treated with the short fiber treatment agent of the present embodiment.

[0040] The form of the short fiber treatment agent of the first embodiment when applied to the short fibers may be, for example, an organic solvent solution or an aqueous liquid. In a method of treating short fibers, it is preferable that the short fiber treatment agent of the first embodiment be diluted with water to obtain an aqueous liquid having a concentration of 0.5% to 20% by mass, and that the aqueous liquid be applied to short fibers such that the ratio of the short fiber treatment agent of the first embodiment which does not contain a solvent is 0.1% to 1% by mass relative to the short fibers.

(Third embodiment)

[0041] A third embodiment will now be described that embodies a method for manufacturing a spunlace nonwoven fabric according to the present invention.

[0042] A spunlace nonwoven fabric is manufactured by sequentially performing a web formation step (first step) and a hydroentanglement step (second step).

(Web formation step)

[0043] The web formation step is a step of carding short fibers to which the above-mentioned short fiber treatment agent is attached, and thereby manufacturing a web. The carding can be performed using a known carding machine. Examples thereof include a flat card, a combination card, and a roller card.

(Hydroentanglement step)

[0044] The hydroentanglement step is a step of entangling the web obtained in the web formation step through water jets. Fibers can be formed into a sheet shape when the web is subjected to highly pressurized water jets and thereby the fibers are entangled with each other due to the pressure of the water jets. A drying step or a winding step may be appropriately performed after performing the hydroentanglement step.

[0045] According to the second and third embodiments, the following effects can be obtained in addition to the effects of (1).

[0046] (2) Since it is possible to inhibit foaming of water used in hydroentanglement, the hydroentanglement can be suitably performed in the case of circulating water used in the hydroentanglement. Accordingly, texture of a spunlace nonwoven fabric can be favorable.

[0047] (3) It is possible to reduce cotton odor of a short fiber to which the short fiber treatment agent is attached can be reduced.

[0048] The first to third embodiments may be modified as follows. The first to third embodiments and the following modifications can be implemented in combination with each other within a technically consistent range.

[0049] - A component generally used in treatment agents such as an antioxidant or an ultraviolet absorbent may be further added to the treatment agent of the embodiments described above for maintaining quality of the treatment agent as long as the effects of the present invention are not impaired.

EXAMPLES

[0050] Examples will now be given below to described the features and effects of the present invention more specifically, but the present invention is not limited to these examples. In the following description of working examples and comparative examples, "part" means "part by mass," and "%" means "% by mass."

Experimental Part 1 (preparation of short fiber treatment agent)

(Example 1)

[0051] The following materials were used as raw materials for the short fiber treatment agent. A numerical value of each component indicates the content thereof in the short fiber treatment agent.

[0052]

Fatty acid derivative: polyoxyethylene (n = 20) oleate (A-1) 20%
Oils and fats: beef tallow (B-1) 5%
Polyhydric alcohol: ethylene glycol (C-1) 70%
Lubricant: stearyl stearate (D-1) 2%
Anionic surfactant: potassium salts of lauryl phosphoric acid ester (E-1) 3%
900 parts of water was added to 100 parts of the short fiber treatment agent prepared such that the mixing ratios was as described above, the mixture was stirred at 50°C, and thereby an aqueous liquid containing 10% of the short fiber treatment agent was prepared.

(Examples 2 to 15 and Comparative Examples 1 to 6)

[0053] A short fiber treatment agent was prepared in the same procedure as in Example 1 except that materials and mixing ratios shown in Table 1 were adopted. In addition, an aqueous liquid containing 10% of a short fiber treatment agent was obtained by the same procedure as in Example 1. In Table 1, the type of each component used in the respective examples and the content (%) of each component in the treatment agent are shown in the column of "Fatty acid derivative," the column of "Fatty acids, or oils and fats," the column of "Polyhydric alcohol," the column of "Lubricant," the column of "Anionic surfactant," and the column of "Other."

Experimental Part 2 (applying short fiber treatment agent to viscose rayon fibers (short fibers))

[0054] The aqueous liquid of the short fiber treatment agent of each of the examples shown in Table 1 was further diluted, and thereby a 0.2% emulsion of the short fiber treatment agent was prepared. The emulsion was applied to viscose rayon fibers having a fineness of 1.3×10^{-4} g/m (1.2 deniers) and a fiber length of 38 mm by a spray lubrication method such that an amount attached (excluding a solvent) to the fibers was 0.2% by mass. Thereafter, humidity was controlled overnight in an atmosphere of 25°C x 40% RH using a hot air dryer at 80°C, and thereby viscose rayon fibers to which the short fiber treatment agent was attached were obtained.

Experimental Part 3 (evaluation of short fiber treatment agent)

(Evaluation test)

[0055] A foaming property test and a cotton odor test were conducted using the viscose rayon fibers to which the short fiber treatment agents of Examples 1 to 15 and Comparative Examples 1 to 6 were attached. The procedure of each test is shown below. Table 1 shows test results in the column of "Foaming property test" and the column of "Cotton odor test."

(Foaming property test)

[0056] First, 20 g of the viscose rayon fibers was put into 150 g of water. The viscose rayon fibers were taken out after 15 minutes and squeezed using a hand juicer. 10 g of the squeezed liquid was put in a 25 ml graduated cylinder equipped with a stopper, shaken vigorously for 30 seconds, allowed to stand still for 30 seconds, and then shaken vigorously again for 30 seconds. After being allowed to stand still for 5 minutes, the height from the liquid surface to the top surface of foam was measured.

Evaluation criteria of foaming property test

[0057]

oo (excellent): the height from the liquid surface to the top surface of foam was less than 1 mm.
○ (good): the height from the liquid surface to the top surface of foam was 1 mm or more and less than 2 mm.

× (poor): the height from the liquid surface to the top surface of foam was 2 mm or more.

(Cotton odor test)

[0058] 20 g of the viscose rayon fibers was put into 150 g of water. After it was sealed for 30 minutes, 10 testers each checked it for odor.

Evaluation criteria of cotton odor test

[0059]

○○ (excellent): 2 or fewer testers judged that there was odor.
○ (good): 3 to 6 testers judged that there was odor.
× (poor): 7 or more testers judged that there was odor.

Table 1

	Fatty acid derivative		Fatty acid, or oil or fat		Polyhydric alcohol		Lubricant		Anionic surfactant		Other		Foaming property test	Cotton odor test
	Type	Ratio (parts by mass)	Type	Ratio (parts by mass)	Type	Ratio (parts by mass)	Type	Ratio (parts by mass)	Type	Ratio (parts by mass)	Type	Ratio (parts by mass)		
Ex. 1	A-1	20	B-1	5	C-1	70	D-1	2	E-1	3			○○	○○
Ex. 2	A-2	10	B-2	5	C-2	5	D-2	9	E-2	1			○○	○○
	A-3	70												
Ex. 3	A-4	45	B-3	9	C-3	40	D-3	1	E-3	5			○○	○○
Ex. 4	A-5	50	B-4	0.5	C-4	19.5	D-4	15	E-4	15			○○	○○
Ex. 5	A-2	65	B-2	5	C-5	5	D-2	10					○○	○○
					C-6	15								
Ex. 6	A-6	20	B-5	5	C-7	70	D-5	5					○○	○○
Ex. 7	A-7	40	B-6	10	C-8	40	D-6	10					○○	○○
Ex. 8	A-2	9	B-1	21	C-2	2	D-7	15	E-1	4			○○	○
	A-8	40							E-5	9				
Ex. 9	A-6	80	B-6	5	C-5	5			E-3	10			○	○
Ex. 10	A-3	45.5	B-7	4	C-3	49.5			E-2	1			○	○
Ex. 11	A-7	80	B-2	2	C-5	10			E-2	5			○	○
			B-8	3										
Ex. 12	A-9	50	B-9	6	C-9	40			E-6	4			○	○
Ex. 13	A-6	90.8	B-14	0.05	C-2	0.15			E-3	9			○	○

Ex. 14	A-7	87	B-10	3	C-5	10							○	○
Ex. 15	A-8	30	B-11	9	C-10	61					F-1	40	○	○
Comp. Ex. 1	A-10	43					D-7	21	E-5	21	F-2	43	×	×
							D-8	15						
Comp. Ex. 2							D-9	60			F-3	60	×	×
							D-10	20			F-4	240		
							D-11	20						
Comp. Ex. 3	A-3	95	B-3	5									×	×
Comp. Ex. 4	A-2	25	B-12	4					E-2	20			×	×
	A-3	51												
Comp. Ex. 5	A-10	79			C-2	10	D-4	1	E-3	10			×	×
Comp. Ex. 6			B-13	1	C-1	64	D-8	15	E-3	20			×	×

[0060] In Table 1, the following symbols are used:

A-1: polyoxyethylene (n = 20) oleate;
A-2: polyoxyethylene (n = 5) stearate;
A-3: polyoxyethylene (n = 10) stearate;
A-4: polyethylene glycol (molecular weight: 400) dilaurate;
A-5: polyethylene glycol (molecular weight: 1,000) distearate;
A-6: a reaction product of a coconut fatty acid and 10 moles of ethylene oxide;
A-7: polyethylene glycol (molecular weight: 600) dioleate;
A-8: polyoxyethylene (n = 10) oleate;
A-9: polyoxyethylene (n = 30) oleate;
A-10: polyethylene glycol (molecular weight: 400) monooleate;
B-1: beef tallow;
B-2: stearic acid;
B-3: palmitic acid;
B-4: coconut oil;
B-5: palm oil;
B-6: behenic acid;
B-7: hardened palm oil;
B-8: hardened castor oil;
B-9: castor oil;
B-10: oleic acid;
B-11: lard;
B-12: tall oil;
B-13: lauric acid;
B-14: coconut fatty acid;
C-1: ethylene glycol;
C-2: polyethylene glycol (molecular weight: 400);
C-3: polypropylene glycol (molecular weight: 600);
C-4: propylene glycol;
C-5: polyethylene glycol (molecular weight: 600);
C-6: a reaction product of propylene glycol and an alkylene oxide (average molecular weight: 3,000);

C-7: polyethylene glycol (molecular weight: 2,000);
C-8: sorbitan;
C-9: sorbitol;
C-10: glycerin;
D-1: stearyl stearate;
D-2: mineral oil (viscosity: 500 seconds);
D-3: dimethyl silicone;
D-4: mineral oil (viscosity: 180 seconds);
D-5: amino silicone;
D-6: paraffin wax;
D-7: mineral oil (viscosity: 60 seconds);
D-8: glycerin monooleate;
D-9: mineral oil (viscosity: 80 seconds);
D-10: sorbitan tristearate;
D-11: sorbitan monostearate;
E-1: potassium salt of lauryl phosphoric acid;
E-2: sodium salt of dioctyl sulfosuccinate;
E-3: sodium salt of tetradecane sulfonate;
E-4: sodium oleate;
E-5: sodium salt of sulfuric acid ester of beef tallow;
E-6: potassium stearate;
F-1: polyoxyethylene (n = 5) stearyl ether;
F-2: polyoxyethylene (n = 20) sorbitan monostearate;
F-3: polyoxyethylene (n = 20) sorbitan tristearate;
F-4: polyoxyethylene (n = 20) sorbitan monostearate.

[0061] As can be clearly seen from the results in Table 1, the present invention succeeds in inhibiting foaming of water used for hydroentanglement. In addition, there is the effect in which it is possible to reduce cotton odor of a fiber to which the short fiber treatment agent is attached.

Claims

1. A short fiber treatment agent comprising:

   a fatty acid derivative;
   at least one selected from fatty acids and oils and fats; and
   a polyhydric alcohol excluding polyoxyethylene polyoxypropylene glycol that includes 20 oxyethylene units and 30 oxypropylene units, wherein
   the fatty acid derivative has a structure in which an alkylene oxide is added, at a ratio of 0.1 to 30 mol, to 1 mol of a fatty acid having 12 to 24 carbon atoms,
   the fatty acids have 12 to 24 carbon atoms,
   the oils and fats are at least one selected from vegetable oils, animal oils, and hardened oils thereof, and
   the polyhydric alcohol has 2 to 6 hydroxy groups in the molecule.

2. The short fiber treatment agent according to claim 1, wherein when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, and the polyhydric alcohol in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative is 5 to 99.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats is 0.01 to 10 parts by mass, and the content of the polyhydric alcohol is 0.1 to 90 parts by mass.

3. The short fiber treatment agent according to claim 1, further comprising at least one lubricant selected from a hydrocarbon compound, an ester excluding the oils and fats, and a silicone.

4. The short fiber treatment agent according to claim 3, wherein when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, and the lubricant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative is 5 to 98.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats is 0.01 to 10 parts by mass,

the content of the polyhydric alcohol is 0.1 to 90 parts by mass, and the content of the lubricant is 1 to 20 parts by mass.

5. The short fiber treatment agent according to claim 1, further comprising an anionic surfactant.

6. The short fiber treatment agent according to claim 5, wherein when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, and the anionic surfactant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative is 5 to 98.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats is 0.01 to 10 parts by mass, the content of the polyhydric alcohol is 0.1 to 90 parts by mass, and the content of the anionic surfactant is 1 to 20 parts by mass.

7. The short fiber treatment agent according to claim 3, further comprising an anionic surfactant.

8. The short fiber treatment agent according to claim 7, wherein when the total content of the fatty acid derivative, the at least one selected from the fatty acids and the oils and fats, the polyhydric alcohol, the anionic surfactant, and the lubricant in the short fiber treatment agent is taken as 100 parts by mass, the content of the fatty acid derivative is 5 to 97.89 parts by mass, the content of the at least one selected from the fatty acids and the oils and fats is 0.01 to 10 parts by mass, the content of the polyhydric alcohol is 0.1 to 90 parts by mass, the content of the anionic surfactant is 1 to 20 parts by mass, and the content of the lubricant is 1 to 20 parts by mass.

9. The short fiber treatment agent according to any one of claims 1 to 8, wherein a short fiber to be treated is viscose rayon.

10. A short fiber to which the short fiber treatment agent according to any one of claims 1 to 9 is attached.

11. A method for manufacturing a spunlace nonwoven fabric, the method comprising a first step and a second step, wherein

the first step is a step of carding short fibers according to claim 10 to manufacture a web, and
the second step is a step of entangling the web obtained in the first step through water jets.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/050497

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. D06M13/224(2006.01)i, D04H1/4258(2012.01)i, D04H1/492(2012.01)i, D06M13/02(2006.01)i, D06M13/148(2006.01)i, D06M13/184(2006.01)i, D06M15/53(2006.01)i, D06M15/643(2006.01)i, D06M101/04(2006.01)n
FI: D06M13/224, D06M13/184, D06M13/148, D06M15/53, D06M15/643, D06M13/02, D04H1/4258, D04H1/492, D06M101:04

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. D06M13/00-15/715, 101/04

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	1971-2020
Registered utility model specifications of Japan	1996-2020
Published registered utility model applications of Japan	1994-2020

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2018-071013 A (TAKEMOTO OIL & FAT CO., LTD.) 10 May 2018, claims, example 18	1-11
A	JP 2014-105396 A (TAKEMOTO OIL & FAT CO., LTD.) 09 June 2014, claims, paragraph [0014], examples	1-11
A	JP 2014-240530 A (MATSUMOTO YUSHI SEIYAKU KK) 25 December 2014, claims, paragraphs [0018]-[0025], examples	1-11
P, X	JP 6454047 B1 (TAKEMOTO OIL & FAT CO., LTD.) 16 January 2019, claims, examples	1-11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06.03.2020	17.03.2020

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2019/050497

Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
JP 2018-071013 A	10.05.2018	(Family: none)	
JP 2014-105396 A	09.06.2014	EP 2735644 A1 claims, paragraph [0013], examples CN 103835128 A	
JP 2014-240530 A	25.12.2014	(Family: none)	
JP 6454047 B1	16.01.2019	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2016104106 A **[0004]**
- JP 6096061 B **[0004]**