



(11) **EP 1 916 335 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.04.2008 Bulletin 2008/18

(51) Int Cl.:
D21H 27/00 (2006.01) D21H 19/50 (2006.01)

(21) Application number: **07018519.4**

(22) Date of filing: **20.09.2007**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
SI SK TR**
Designated Extension States:
AL BA HR MK RS

(30) Priority: **25.10.2006 DE 102006050324**

(71) Applicant: **SCA Hygiene Products GmbH
68305 Mannheim (DE)**

(72) Inventors:
• **Zöller, Günther
69198 Schriesheim (DE)**

• **Eichhorn, Stephan, Dr.
64579 Gernsheim (DE)**
• **Konieczna, Magdalena
68307 Mannheim (DE)**
• **Marinoni, Sarah
22070 Lurago Marinone
(Como) (IT)**

(74) Representative: **HOFFMANN EITLE
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)**

(54) **Tissue paper product with a lotion containing silk proteins**

(57) The present invention relates to a tissue paper product having one or more plies of tissue paper, of which at least one ply has a lotion, characterised in that the lotion comprises silk proteins.

The present invention is based on the realisation that the film-forming properties of silk proteins can be used

to control the paper dust formation of tissue paper products. Silk proteins furthermore have various properties which make them a valuable component of lotioned tissue paper products.

EP 1 916 335 A1

Description

[0001] The present invention relates to a lotioned tissue paper product, in particular a tissue paper product such as a paper handkerchief, which was treated with a lotion containing silk proteins.

Background of the Invention

[0002] Lotioned tissue paper products are well-known. EP 1 225 277 A1, for example, describes a lotioned tissue web, in particular a toilet paper, which was treated with an O/W emulsion comprising an oil, an O/W emulsifier or an O/W emulsifier combination and 6 to 30 % by weight of water. This lotion not only cares for the skin of the user, but a toilet paper treated therewith furthermore has an advantageous sinking behaviour in water if flushed down the toilet.

[0003] WO 02/057546 A1 relates to a tissue paper product, in particular a paper handkerchief, penetrated with a liquid, viscous W/O emulsion comprising oil, at least one non-ionic W/O emulsifier, optionally wax, humectant and 6 to 25 % by weight of water. The resulting tissue paper has excellent surface softness and bulk softness. It is furthermore possible to transfer lotion to the skin of the user.

[0004] Surface softness is described as the feeling perceived when, for example, the fingertips are moved lightly over the surface of the tissue paper. Bulk softness (sometimes also referred to as volume softness) is defined as the tactile impression perceived as resistance to mechanical deformation, for instance if a tissue paper is manually deformed by means of crumpling or folding and/or by compression.

[0005] WO 02/057546 also teaches that different cosmetic agents and/or antimicrobial agents can be added to the lotion. In the sole example of this application, methylchlorisothiazoline and methylisothiazoline are added, for example, as preservatives having an antimicrobial effect. However, more and more consumers are rejecting such "chemical" additions. It would therefore be desirable to provide a lotioned tissue product in which the lotion contains natural components that exercise as many advantageous functions as possible in this lotion.

[0006] In order to improve the surface softness and bulk softness, WO 96/08601 teaches to treat tissue papers with a lotion containing 25 to 95 parts by weight of a polyhydroxy compound, 5 to 75 parts by weight of polysiloxane, as well as 0 to 35 parts by weight of water, based on 100 parts by weight of this mixture.

[0007] In addition to softness and strength, an important property of tissue papers is that they have a low propensity for lint formation (fuzz formation), a property which is also referred to in English literature as "low lint". "Linting" occurs if individual fibres are not bound into the paper web firmly enough and they thus become loose under a slight mechanical load. Similar behaviour can be observed for inorganic solid particles such as those

present, for example, in recycled paper. This behaviour shall be generally described in the following as "paper dust formation". In the prior art, paper dust formation is normally controlled by adding binders in the wet end or wire section of the paper-making machine, i.e. still before the subsequent drying and creping step on the Yankee cylinder. An example of such a method can be found in WO 96/24719, which teaches to add a mixture of polyhydroxy compound and oil to a wet tissue web in order to achieve, *inter alia*, "low lint" properties. However, mixtures of oil and polyol do not display optimal absorption behaviour on the wet paper fibre and can therefore lead to an undesirable accumulation in the water circulation of the paper-making machine. It would therefore be desirable to provide a tissue paper product wherein paper dust formation is controlled by means of one or more additives that are added to a dry tissue paper product. This additive would ideally perform other functions at the same time.

[0008] One object of the present invention is therefore to provide a tissue paper product having a low propensity to form paper dust.

[0009] A further object of the present invention is to provide a lotioned tissue paper product in which the proportion of synthetic lotion components has been reduced.

[0010] A further object of the present invention is to provide a lotioned tissue product in which one lotion component exercises as many functions of common lotion components as possible, in particular as regards a skin-care and/or antimicrobial effect.

[0011] Further objects can be derived by the expert reader from the evaluation of the prior art and from the following description.

Summary of the Invention

[0012] The present invention relates to a tissue paper product having one or more plies of tissue paper, of which at least one ply comprises a lotion containing silk proteins.

[0013] Silk proteins are obtained by the hydrolysis of silk and contain sericin and fibroin.

[0014] The present invention is based on the realisation that the film-forming properties of silk proteins can be used to control the paper dust formation of tissue paper products.

[0015] Silk proteins furthermore display various properties which make them a valuable component of lotioned tissue paper products.

Detailed Description of the Invention

[0016] Silk proteins (INCI name: hydrolyzed silk) are produced by the hydrolysis of silk fibres. The silk fibre is extracted from the cocoon of the silkworm (*Bombyx mori* 1.). It contains approximately 18 to 30 % by weight (normally 19 to 28 % by weight) of sericin and approximately 70 to 82 % by weight (normally 72 to 81 % by weight) of

fibroin. Soluble silk peptides are produced by hydrolysis under mild conditions, normally by means of treatment with dilute acids. The resulting preparation is soluble in, for example, water, propylene glycol and glycerol. Silk proteins thus contain sericin and fibroin, and optionally hydrolysis products of the same, as the main component, preferably in amounts corresponding to those in the fibre.

[0017] Silk proteins are available for purchase, for example from Omikron GmbH Naturwaren, Neckarwestheim, Germany or NRC (Nordmann-Rassmann GmbH), Hamburg, Germany.

[0018] The present invention is based on the realisation that the film-forming properties of silk proteins can be used to reduce the propensity of the raw tissue paper web (starting material for the untreated dry ply of tissue paper) to form dust. The present inventors have furthermore discovered that the film-forming, hygroscopic, antimicrobial and antioxidative properties of sericin, as a main component of silk proteins, can advantageously also be used in lotioned tissue paper products. These properties do not just increase the storage life of the lotion containing silk proteins. The aforementioned properties make silk proteins a particularly attractive lotion component when transferred to human skin since silk proteins combine several properties which are normally fulfilled by different, mostly synthetic lotion components. Film-forming properties are typically obtained by adding synthetic polymers and antimicrobial properties are typically obtained by adding synthetic antibacterial or fungicidal agents. Furthermore, antioxidative agents, such as vitamin E, are often added to cosmetics for protection against the aging processes of the skin. With silk proteins a natural lotion component has been found, which combines this and other advantageous properties.

[0019] The antioxidative and antimicrobial properties of sericin are described, for example, in S. Sarovart et al., Res. Adv. Mater. Sci. 5, 2003, 193 - 198.

[0020] The lotion containing silk proteins is not subject to any particular restrictions. It can be an aqueous lotion, an oil-in-water (O/W) emulsion or a water-in-oil (W/O) emulsion, with the first two embodiments being preferred. The O/W emulsion can have, for example, the composition specified in EP 1 225 277 A1. As regards preferred embodiments of this lotion, reference is made to claims 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 of this European application and to the preferred embodiments of the essential and preferred lotion components as specified in the description.

[0021] However, according to a particularly preferred embodiment, the lotion containing silk proteins is an aqueous lotion. Aqueous lotions are understood as lotions which contain water as a main component and which, in contrast to O/W and W/O emulsions, only have one homogeneous phase. The proportion of water can vary greatly and can be, for example, between 5 and 99.5 % by weight. Sub-ranges of, for example, 10 to 90, 20 to 80, 30 to 70 or 40 to 60 % by weight, can be selected within this range.

[0022] The lotion preferably has a viscosity of 1 to 10000 mPa·s at 20°C, in particular of 10 to 3000 mPa·s, particularly preferred of 10 to 1000 mPa·s and especially preferred of 10 to 100 mPa·s. The viscosity is measured at 20°C using a Brookfield RVF viscometer (spindle 3, 10 rpm).

[0023] The lotion is preferably an aqueous lotion comprising at least one humectant in addition to the silk proteins.

[0024] The humectant is preferably a polyol, i.e. an organic compound having at least two hydroxy groups, which preferably consists only of carbon, hydrogen and oxygen as well as optionally nitrogen. The humectant is preferably non-ionic.

[0025] It is furthermore preferred that the humectant is completely miscible with water at room temperature (25°C). Humectants that also have a liquid consistency at room temperature are particularly preferred.

[0026] Of the liquid humectants, one having a molecular weight (weight average) of less than 1000, in particular less than 800, for instance less than 600, is preferably used.

[0027] Examples of suitable humectants are glycerol, glycols such as ethylene glycol or propylene glycol, polyalkylene glycols such as, for instance, polyethylene glycol or polypropylene glycol, for example polyethylene glycol with a weight average molecular weight of approximately 200 to 600, neopentyl alcohols such as pentaerythritol or neopentyl glycol, sugar alcohols such as threitol, erythritol, adonitol (ribitol) arabitol, xylitol, dulcitol, mannitol and sorbitol, carbohydrates such as D(+)-glucose, D(+)-fructose, D(+)-galactose, D(+)-mannose, L-gulose, saccharose, galactose or maltose, polyglycerols, polyoxypropylene adducts of glycerol, methoxypolyethylene glycol, polyethylene glycol ethers of sugar alcohols such as sorbitol, polyethylene glycol ethers of glycerol and combinations of the same. Hyaluronic acid can also be used as a humectant.

[0028] A preferred humectant is glycerol. Humectants or combinations of humectants which, together with the other components of the lotion (in particular water and silk proteins), lead to the viscosity values given above are preferably used. A preferred combination of humectants is a mixture of glycerol and propylene glycol, in particular in a weight ratio of 2:1 to 1:1, preferably 1.7:1 to 1.3:1.

[0029] As regards the ratio of water to humectant, it is preferred for the equilibrium water concentration to be taken as a basis, i.e. that percentage of the water content which the humectant or the combination of humectants absorbs from the air under standard conditions (25 °C, 50 % humidity). It is possible, for example, to deviate from this equilibrium concentration by +/- 5 absolute percentage points, however it is generally advantageous as regards this equilibrium concentration to work with an excess of water in order to prevent the lotion taking moisture from the skin.

[0030] The lotion used according to the invention pref-

erably contains 0.5 to 20 % by weight of silk proteins, more preferred 1 to 10 % by weight, and in particular 2 to 5 % by weight.

[0031] According to an embodiment of this lotion, it contains

- a) 0.5 to 20 % by weight of silk proteins,
- b) 4.5 to 95 % by weight of humectant, more preferred 10 to 90 % by weight, in particular 30 to 85 % by weight and especially preferred 60 to 80 % by weight,
- c) optionally 0.01 to 10 % by weight of other additives, and
- d) water (preferably as the remainder).

[0032] The other additives can be present in a preferred amount of 0.1 to 5 % by weight and include, in particular, cosmetic agents, preferably from natural sources (plant extracts), having, for example, a skincare, skin-irritation-relieving, wound-healing, cell-regenerating, anti-inflammatory and/or anti-itch effect, for example allantoin; aloe vera extract; camomile extract containing azulene and α -bisabolol, α -bisabolol; echinacea; dragosanol; panthenol; liquorice root extract containing 18- β -glycyrrhizinic acid; lime tree extract containing quercetin and/or glycorutin; marigold (calendula oil); urea; phytosterols that may possibly be ethoxylated (available from Henkel under the name "Generol"); chitosan (acetylated chitin); anthocyanidin; ginko leaf extract containing quercetin and rutin; chestnut extract containing quercetin and camphor; vitamins or provitamins such as provitamin B5 or vitamin E; avocado oil, birch extract; arnica; St. John's wort extract; cucumber, hops or hamamelis extract; extracts from horse chestnut seeds or birch; ethoxylated quaternary amines; or components of the aforementioned natural extracts, the use of α -bisabolol, allantoin or panthenol or of extracts containing these being preferred. Further suitable active ingredients are described on page 22 of WO 96/08601.

[0033] The lotion can furthermore contain perfume as an additive, for example those described in DE 199 06 081 or WO 96/08601 (page 23), or cosmetically suitable colorants and pigments, for example those mentioned in "Kosmetische Färbemittel" [Cosmetic Colorants], Verlag Chemie, Weinheim, 1984, pages 81 to 106, published by the Farbstoffkommission der deutschen Farbstoffgemeinschaft [Colorants Commission of the German Colorant Association]. Use of the polysiloxane disclosed in WO 96/08601 is also possible, however it is not preferred.

[0034] In addition to the silk proteins, the lotion can furthermore contain other additives with an antimicrobial effect in the amounts specified above, even if this is not necessary.

[0035] According to the invention, the lotioned tissue paper product can have one or more plies of creped or uncreped tissue paper. Owing to the compatibility of the production processes (wet laying), tissue production is classed as a paper-making technique. The production of

tissue paper differs from the production of paper owing to the low basis weight of normally less than 65g/m² that is obtained and to the much higher tensile energy absorption index. The tensile energy absorption index arises from the tensile energy absorption by relating the tensile energy absorption to the test sample volume prior to testing (length, width, thickness of the sample between the clamps prior to tensile load). Paper and tissue paper furthermore generally differ as regards the modulus of elasticity which characterises the stress-strain behaviour of these planar products as a material parameter.

[0036] The high tensile energy absorption index of tissue papers arises from the outer or inner creping. The former is produced by compressing the paper web adhering to a drying cylinder (Yankee cylinder) owing to the action of a crepe doctor or in the latter case owing to a difference in speed between two fabrics. In the later technique, which is often referred to as "(wet) rush transfer" in English language literature, the forming fabric of the paper-making machine moves, for example, at a greater speed than the fabric to which the formed paper web is transferred, for instance a transfer fabric or a TAD fabric (through air drying), so that the still wet, plastically deformable paper web is broken up internally by compression and shearing. Many prior art documents (for example EP-A-0 617 164, WO 94/28244, US-5,607,551, EP-A-0 677 612, WO 96/09435) refer to this "inner creping" when describing the production of "uncreped" tissue paper by means of "rush transfer" techniques. Owing to the inner or outer creping, the paper web is broken up internally by compression and shearing, and is therefore more stretchable under load than uncreped paper. The majority of the functional properties typical of tissue and tissue products result from the high tensile energy absorption index (see DIN EN 12625-4 and DIN EN 12625-5).

[0037] Typical properties of tissue papers are the good ability to absorb tensile stress energy, their drapability, good textile-like flexibility, properties that are often referred to as bulk softness, a high surface softness, a high specific volume with a perceptible thickness, as high a liquid absorbency as possible and, depending on the use, a suitable wet or dry strength as well as an interesting visual appearance of the outer surface of the product.

[0038] The tissue paper product according to the invention can be single-ply or multi-ply. Multi-ply tissue paper products normally have 2 to 6, in particular 2 to 4 plies. The present invention can be used particularly advantageously in multi-ply tissue paper products, in particular in paper handkerchiefs. The individual plies of tissue paper can be homogeneous or can have layering. Each ply can be composed of one or more plies which differ, for example, as regards the fibre composition or their pre-treatment in the wet end.

[0039] The starting material used for production of the tissue paper plies is normally a fibrous, cellulosic material, in particular chemical pulp or mechanical pulp. However, if linters or cotton are used as the raw material for the production of the tissue paper, no further pulping

steps are normally required. Owing to the morphological structure, the cellulose already exists in an open state.

[0040] The pulps used can be primary fibrous materials (raw pulp) or secondary fibrous materials, with a secondary fibrous material being defined as a fibrous raw material recovered from a recycling process. The primary fibrous materials can be both pulp produced using a chemical pulping process and mechanical pulp such as thermo-refiner mechanical pulp (TMP), chemithermo-refiner mechanical pulp (CTMP) or high temperature chemithermo-mechanical pulp (HTCTMP). Synthetic cellulose-containing fibres can also be used. However, the use of chemical or mechanical pulps from plant materials, in particular wood-forming plants, is preferred. Fibres from softwoods (usually originating from conifers), hardwoods (usually originating from deciduous trees) or cotton linters can be used, for example. Fibres from esparto (alfa) grass, bagasse (cereal straw, rice straw, bamboo, hemp), fibres known under the German term *Stichelhaar*, flax and other woody and cellulosic fibre sources can also be used as raw materials. The corresponding fibre source is selected subject to the desired properties of the end product in a manner known in this field. For example, the fibres present in hardwood, which are shorter than those in softwood, give the end product greater stability owing to the higher diameter/length ratio. If the softness of the product is to be promoted, which is important for tissue papers, eucalyptus wood is particularly suitable as a fibre source, for example as the outer layer of a tissue paper ply facing the user.

[0041] As regards the softness of the products, the use of chemical raw pulps is preferred, with it being possible to use completely bleached, partially bleached and unbleached fibres. Suitable chemical raw pulps according to the invention include, *inter alia*, sulphite pulps and kraft pulps (sulphate process).

[0042] Before a raw chemical or mechanical pulp is used in a tissue-making process, it may also be advantageous to carry out further delignification in a separate process step or to introduce a bleaching process so as to achieve a more extensive removal of lignin after the pulping process and to obtain a completely pulped chemical or mechanical pulp.

[0043] A preferred process for producing tissue paper uses

- a) formation, which includes the headbox and the wire section,
- b) the drying section (TAD pre-drying ("through air drying")) or conventional drying on the Yankee cylinder, which generally also includes the creping process essential for tissue, preferably followed by
- c) the so-called winding area.

[0044] The paper can be formed by placing the fibres in an oriented or random manner on one or between two

continuously revolving wires of the paper-making machine whilst at the same time removing the main quantity of dilution water until dry-solids contents of normally between 12 and 35 % are obtained.

[0045] Drying of the formed primary fibrous web occurs in one or more steps by mechanical and thermal means until a final dry-solids content of typically about 93 to 97 % is obtained. In tissue production, this is followed by the creping process which, in conventional processes, decisively influences the properties of the finished tissue product. In the dry creping process which is predominantly used today, creping occurs by means of a crepe doctor on a drying cylinder having a diameter of normally 4.5 to 6 m, i.e. the so-called Yankee cylinder, with the aforementioned final dry-solids content of the raw tissue paper (wet creping can be used if there are lower demands on the tissue quality). In the following step, the creped, finally dry raw tissue paper (raw tissue) is then normally wound onto a supporting core to form a so-called reel drum or is wound in a longitudinally cut manner onto tubes to form master rolls and is available in this form for further processing into the tissue paper product according to the invention.

[0046] Instead of the conventional tissue-making process as described above, it is possible according to the invention to use a modified technique wherein owing to a special kind of drying within process step (b), an improvement in the specific volume, and by this means an improvement in the bulk softness of the tissue paper produced in this manner is achieved. This process, which exists in a variety of subtypes, is referred to as the TAD (through air drying) method. It is characterised by the fact that before the final contact drying on the Yankee cylinder, the "primary" fibrous web (which is like a non-woven) leaving the sheet-forming stage is pre-dried to a dry-solids content of approximately 80 % by blowing hot air through the fibrous web. The fibrous web is thereby supported by an air-permeable fabric or belt, and during transport, it is guided over the surface of an air-permeable rotating cylinder drum. By structuring the supporting fabric or belt, it is possible to thereby produce any pattern of compressed and, owing to deformation in the wet state, broken up zones, which leads to increased mean specific volumes and consequently to an increase in the bulk softness without decisively decreasing the strength of the fibrous web. Another possible influence on the softness and strength of the raw tissue lies in the production of a layering in which the primary fibrous web to be formed is built up by a specially constructed headbox in the form of materially different layers of fibrous material, which are jointly supplied as a material strand to the sheet-forming stage.

[0047] When processing the raw tissue paper into the final product, the following process steps are normally used individually or in combination: cutting to size (longitudinal and/or cross cutting), connecting a plurality of plies, producing mechanical or chemical (adhesive) ply bonding, volumetric and structural embossing, folding,

imprinting, perforating, smoothing, stacking, rolling up.

[0048] In order to produce multi-ply tissue papers such as, for example, handkerchiefs, toilet paper, paper towels or kitchen towels, an intermediate step with so-called doubling is preferably carried out, in which the raw tissue is normally unwound in a reel drum number corresponding to the desired number of plies in the finished product and is wound to a common multi-ply master roll. This processing step often includes smoothing or calendaring in two-roll or multi-roll smoothing apparatus. Smoothing (calendaring) can, however, also be carried out in the tissue-making machine following drying and creping and immediately before rolling up.

[0049] The procedure of processing the raw tissue that has already been optionally wound up in several plies into the finished tissue product takes place in the so-called converting area of special, purpose-built processing machines, which includes operations such as repeated smoothing of the tissue, edge embossing, combined to some extent with large-area and/or point contact application of adhesive to create ply bonding of the individual plies (raw tissue) that are to be combined together, as well as longitudinal cut, folding, cross cut, deposition and bringing together of a plurality of individual tissues and their packaging as well as bringing them together to form larger surrounding packaging or bundles. Instead of edge embossing, ply bonding can also be created by knurling, as is common, for example, in cosmetic tissues. The individual paper ply webs can also be pre-embossed and then combined in a roll gap according to the foot-to-foot method or the so-called "nested" method.

[0050] In multi-ply tissue paper products such as the preferred paper handkerchiefs, the individual plies can be combined by embossing, possibly also in combination with an adhesive. In order to ensure that the lotion does not reduce ply bonding, it is also possible not to treat the embossed areas with the lotion. Furthermore, it is known from US 4,867,831 to use melted thermoplastic polymers to achieve ply bonding in lotioned tissue papers. Preferred tissue paper products according to the invention are sanitary products (for example toilet paper), paper handkerchiefs or cosmetic wipes (facials). It is particularly preferred for the tissue paper product according to the invention to be converted into a paper handkerchief.

[0051] According to the invention, the tissue paper to be provided with lotion preferably has a basis weight per ply of 10 to 40 g/m², more preferred 12 to 20 g/m², in particular 13 to 17 g/m², and a total basis weight (all plies without lotion) of normally 10 to 80 g/m².

[0052] The lotion is preferably applied to a dry tissue paper. A suitable time for this is, for example, directly after drying of the web and before combining the individual tissue webs to form multiple plies or before converting the multi-ply web into the final tissue paper product. However, it is preferred to first of all combine at least two or more individual tissue webs into a multi-ply web and to then apply the lotion. In tissue papers having two or more plies, the lotion composition may, for example, be applied

to each ply or preferably to one or both outer plies. In a preferred process for producing lotioned four-ply tissue products, two-ply webs are each provided with lotion on only one side, and then the untreated sides of said two-ply webs are joined together, thereby obtaining a four-ply paper. It is generally preferred to apply the lotion composition to at least one, preferably both outer plies of the multi-ply tissue web since then use can be made of the advantageous penetration behaviour of the lotion composition. By adjusting the viscosity of the lotion, it is possible to influence the extent to which the lotion penetrates into the interior of the tissue paper product. The invention includes both products in which the outer plies comprise more lotion than the inner plies as well as tissue paper products in which there is a largely homogeneous distribution of the lotion over all of the plies.

[0053] Suitable techniques for applying the lotion include spraying, printing methods such as rotogravure printing or flexographic printing and application by means of rollers having a smooth surface. The lotion composition is preferably sprayed on, optionally following slight heating.

[0054] The lotion is preferably applied in an amount of 0.1 to 5 g/m² of the treated surface, in particular 0.2 to 3 g/m² of the treated surface and particularly preferred 0.3 to 1 g/m² of the treated surface.

[0055] This results in a weight ratio of lotion to dry weight of the tissue paper ply (plies) of preferably 1:500 to 1:10, more preferred 1:300 to 1:15, in particular 1:250 to 1:20, with the dry weight being determined in accordance with DIN EN 20638 (1993).

Example

[0056] 2 % by weight of silk protein solution (solids content 20 %) in the form of a transparent, yellowish liquid with water as the solvent - available from the firm Mani GmbH, Dusseldorf - was added to a base lotion having 45 % by weight of glycerol, 30 % by weight of propylene glycol and 25 % by weight of water. Two 2-ply webs of raw tissue paper web were then prepared by doubling. The individual plies had a basis weight of 15 g/m² and were produced according to the conventional drying method. One ply of each of these two-ply webs was treated with 0.3 g/m² of this lotion. A WEKO spraying device was used to apply the lotion. The respective untreated ply of one of the two-ply webs was then brought into contact with the untreated ply of the second two-ply web, the plies were combined by means of conventional edge embossing in the edge area of the paper handkerchief to be produced and they were then trimmed to the size of paper handkerchiefs. The obtained product had surface softness and bulk softness. Paper dust formation was not observed.

Claims

1. Tissue paper product having one or more plies of tissue paper, of which at least one ply has a lotion, **characterised in that** the lotion comprises silk proteins. 5
2. Tissue paper product according to claim 1, which comprises 2 to 4 plies. 10
3. Tissue paper product according to claim 1 or 2, which is a paper handkerchief.
4. Tissue paper product according to one of claims 1 to 3, which can be obtained by applying the lotion to one or both outer plies. 15
5. Tissue paper product according to one of claims 1 to 4, wherein the weight ratio of lotion relating to the dry weight of the tissue paper ply (plies) in accordance with EN 20638 is 1:500 to 1:10. 20
6. Tissue paper product according to one of claims 1 to 5, wherein the lotion is an aqueous lotion or an oil-in-water (O/W) emulsion. 25
7. Tissue paper product according to one of claims 1 to 6, wherein the lotion has a viscosity of 1 to 10000 mPa·s. 30
8. Tissue paper product according to one of claims 1 to 7, wherein the lotion is an aqueous lotion additionally comprising at least one humectant.
9. Tissue paper product according to claim 8, wherein the humectant comprises one or more water-soluble polyols. 35
10. Tissue paper product according to one of claims 1 to 9, wherein the lotion contains 0.5 to 20 % by weight of silk proteins. 40
11. Tissue paper product according to one of claims 1 to 10, wherein the lotion contains (a) 0.5 to 20 % by weight of silk proteins, (b) 4.5 to 95 of humectant, (c) optionally 0.01 to 10 % by weight of other additives and (d) water. 45
12. Tissue paper product according to one of claims 9 or 11, wherein the humectant consists of a mixture of glycerol and propylene glycol. 50
13. Tissue paper product according to claim 12, wherein glycerol and propylene glycol are in a weight ratio of 2:1 to 1:1, in particular of 1.7:1 to 1.3:1. 55



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 8519

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 09 143876 A (KANEBO LTD; KONO SEISHI KK) 3 June 1997 (1997-06-03) * the whole document *	1-4,10	INV. D21H27/00 D21H19/50
Y	* abstract *	1-12	
X	JP 11 050397 A (HAKUSAN SANGYO KK) 23 February 1999 (1999-02-23) * abstract *	1-4,6	
X	JP 11 305352 A (FUJI PHOTO FILM CO LTD; FUJI PHOTO OPTICAL CO LTD) 5 November 1999 (1999-11-05) * abstract *	1-4,10	
X	JP 11 081185 A (HAKUSAN SANGYO KK) 26 March 1999 (1999-03-26) * abstract *	1,4,6	
X	JP 2000 354608 A (CRECIA CORP) 26 December 2000 (2000-12-26) * abstract *	1,4	
X	EP 1 306 073 A (KAWANO PAPER CO LTD [JP]) 2 May 2003 (2003-05-02) * page 2, paragraph 1 * * page 3, paragraph 11 - paragraph 20 *	1,4,6,8,9,12	D21H
Y	EP 1 225 276 A (SCA HYGIENE PROD GMBH [DE]) 24 July 2002 (2002-07-24) * page 2, paragraph 1 * * page 3, paragraph 19 - paragraph 21 * * page 7, paragraph 53 - paragraph 59 * * page 8, paragraph 69 *	1-12	
A	EP 1 659 218 A (PROCTER & GAMBLE [US]) 24 May 2006 (2006-05-24) * the whole document *	1-13	
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		21 February 2008	Beins, Ulrika
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 01 8519

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-02-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 9143876	A	03-06-1997	JP 3323720 B2	09-09-2002
JP 11050397	A	23-02-1999	NONE	
JP 11305352	A	05-11-1999	NONE	
JP 11081185	A	26-03-1999	NONE	
JP 2000354608	A	26-12-2000	NONE	
EP 1306073	A	02-05-2003	JP 3950400 B2	01-08-2007
			JP 2003199685 A	15-07-2003
			US 2003097102 A1	22-05-2003
EP 1225276	A	24-07-2002	BR 0116805 A	27-01-2004
			CN 1483099 A	17-03-2004
			WO 02057546 A1	25-07-2002
			MX PA03005148 A	22-09-2003
			PL 362393 A1	02-11-2004
EP 1659218	A	24-05-2006	AU 2005306416 A1	26-05-2006
			CA 2588618 A1	26-05-2006
			US 2006108082 A1	25-05-2006
			WO 2006055789 A1	26-05-2006

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1225277 A1 [0002] [0020]
- WO 02057546 A1 [0003]
- WO 02057546 A [0005]
- WO 9608601 A [0006] [0032] [0033] [0033]
- WO 9624719 A [0007]
- DE 19906081 [0033]
- EP 0617164 A [0036]
- WO 9428244 A [0036]
- US 5607551 A [0036]
- EP 0677612 A [0036]
- WO 9609435 A [0036]
- US 4867831 A [0050]

Non-patent literature cited in the description

- **S. SAROVART et al.** *Res. Adv. Mater. Sci.*, 2003, vol. 5, 193-198 [0019]
- Kosmetische Färbemittel. Farbstoffkommission der deutschen Farbstoffgemeinschaft. Verlag Chemie, 1984, 81-106 [0033]