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[54] SOFT TISSUE ACHIEVED BY APPLYING A
SOLID HYDROPHILIC LOTION

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ABSTRACT

A superior soft tissue product, such as facial tissue, bath tissue or paper towels and the like, can be made applying, on the surface(s) of the tissue, large numbers of individual deposits of a melted hydrophilic composition comprising a high molecular weight polyethylene glycol, a fatty alcohol (C₁₄-C₂₀) and a petroleum wax. The composition is applied in a uniform distribution, of solid deposits on the surface(s) of the tissue. Because the composition is a solid at room temperature and rapidly solidifies after deposition, it has less tendency to penetrate and migrate into the sheet. These solid deposits are characterized by a penetration hardness of from about 5 to about 360 millimeters.

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5,869,075

SOFT TISSUE ACHIEVED BY APPLYING A
SOLID HYDROPHILIC LOTION

BACKGROUND OF THE INVENTION

Abstracted tissue products such as facial tissue and bath tissue have been used to absorb body fluids and leave the skin dry. Absorbent tissues, in addition to absorbing fluids, also leave the skin completely dry and free of the body fluid the tissue is trying to absorb. During frequent nose-blowing or perianal wiping, the skin can become so abraded as to appear red and be sore to the touch. To reduce skin abrasion, tissue additive formulations can be applied to the tissue such that, in use, the additive formulation either provides lubricity causing the tissue to glide across the surface of the skin, or leaves the tissue and is deposited on the skin. To date, these formulations have been based on oil-based (petroleum wax) or water-based semi-solids or lipid based solids at room temperature. The liquid or lipid-based semi-solid type of formulations require a high amount of formulation added to the tissue to deliver the benefit of reduced skin irritation and redness because these formulations absorb into a tissue, leaving less on the surface to provide the benefit. The lipid based solid formulations can be applied heated (slightly above the melting point of the formulation) to the surface of a tissue or (4) of the tissue where the formulation is readily available for transfer to the user's skin to protect the skin from or prevent further irritation and redness in an efficient cost-effective manner. However, since these formulations are lipophilic it is sometimes difficult to incorporate hydrophilic or water soluble surfactants, cosmetic materials or active ingredients. Thus, there is a need for a formulation that is basically hydrophilic and can be applied to a tissue which will remain readily available for transfer to the user's skin to protect the skin from or further irritation and redness in an efficient cost-effective manner.

SUMMARY OF THE INVENTION

It has now been discovered that a superior soft tissue product can be made applying, on the surface(s) of the tissue, large numbers of individual deposits of a melted hydrophilic composition comprising a high molecular weight polyethylene glycol, a fatty alcohol (C₁₄-C₂₀) and a petroleum wax. The composition is applied in a uniform distribution, of solid deposits on the surface(s) of the tissue. Because the composition is a solid at room temperature and rapidly solidifies after deposition, it has less tendency to penetrate and migrate into the sheet. Compared to tissues treated with liquid formulations, this leaves a greater percentage of the added composition on the surface of the tissue where it can contact and transfer to the user's skin to provide a benefit. Furthermore, a lower add-on amount can be used to deliver the same benefit at a lower cost because of the efficient placement of the composition substantially at the surface of the product.

Hence in one aspect, the invention resides in a softening composition consisting of from about 10 to about 50 percent hydrophilic solid from about 10 to about 50 weight percent high molecular weight polyethylene glycol having a molecular weight of about 720 or greater, and from about 5 to about 40 weight percent of a C₁₄ to C₂₀ fatty alcohol, said composition having a melting point from about 30° C. to about 700° C. and a penetration hardness of from about 5 millimeters to 360 millimeters.

2

In another aspect, the invention resides in a tissue product wherein one or both of the outer surfaces of the product have a composition comprising a hydrophilic solvent, from about 30 to about 90 weight percent hydrophilic solvent, from about 10 to about 50 weight percent of a high molecular weight polyethylene glycol, a fatty alcohol, and from about 5 to about 40 weight percent fatty alcohol, said composition having a melting/freezing point from about 10° C. to about 700° C. and a penetration hardness of from about 5 millimeters to 360 millimeters of penetration.

In another aspect, the invention resides in a method of making a soft tissue or towel product comprising: (a) heating a composition comprising a hydrophilic solvent, high molecular weight polyethylene glycol and a fatty alcohol, to a temperature above the melting point of the composition, (b) applying the heated composition to the tissue in a uniform layer of from about 30° C. to about 70° C., (b) uniformly applying the melted composition to one or both surfaces of the tissue web in spaced-apart deposits; and (c) resolidifying the deposits of the melted composition. Resolidification of the deposits can occur almost instantaneously, and the solid deposits can be heated to a temperature only slightly above or at the melting point of the composition. However, external means such as chill rolls, either before or after the application of melt, can be used if desired to accelerate resolidification. Such instantaneous resolidification tends to impede penetration of the composition into the tissue. The solid deposits are readily available for transfer to the user's skin to protect the skin from or prevent further irritation and redness in an efficient cost-effective manner. For example, the temperature of the melted composition can advantageously be above the melting point of the composition, more specifically about 5° C. or less and still more specifically about 2° C. or less. As the temperature of the melted composition approaches the melting point, the tendency of the composition to penetrate the tissue, which further reduces the tendency of the melted composition to be retained on the surface.

For purposes herein, "melting point" is the temperature at which the majority of the melting occurs, it being recognized that melting actually occurs over a range of temperatures. The melting point of the compositions of this invention can be from about 10° C. to about 700° C. and more specifically from about 40° C. to about 70° C. and still more specifically from about 50° C. to about 60° C.

In addition, for purposes herein, "penetration hardness" is the needle penetration in millimeters according to ASTM D 1321. "Needle Penetration of Petroleum Waxes. Lower needle penetration hardness values correspond to harder materials. The penetration hardness of the compositions of this invention can be from about 5 to 360 millimeters, more specifically from about 5 to about 150 millimeters and still more specifically from about 5 to about 100 millimeters. (Formulations having a needle penetration hardness greater than 360 millimeters cannot be measured using ASTM method D 1321). The hardness of the formulations of this invention is important for two reasons. First, the softer the formulation the more mobile the formulation will be, making the formulation more likely to migrate to the inner plies of the tissue, which is not desirable. Secondly, softer formulations are also less desirable. In general, formulations having a needle penetration hardness of from about 200 to 360 millimeters feel creamy to slightly greasy with less smoothness (depending on additives). Formulations that have needle penetration hardness values of from about 5 to about 200 millimeters feel silky to creamy and very smooth (depending on additives).

5,869,075

3 The amount of hydrophilic solvent, including water if present, can be from about 30 to about 70 weight percent, more specifically from about 50 to about 60 weight percent. As used herein, suitable hydrophilic solvents include, but are not limited to, the following materials: water, propylene glycol, low molecular weight polyethylene glycols (molecular weights of less than 720 and liquid at room temperature), methoxypropylol, PPG-2 propyl ether, PPG-2 butyl ether, PPG-2 methyl ether, PPG-2 ethyl ether, dipropylene glycol, methyl parabenol, propylene carbonate, water soluble dispersible polypropylene glycols, ethoxylated polypropylene glycol, glycerin, sorbitol, hydrogenated starch hydrolysate, and silicone glycols.

4 In addition, to these classes of ingredients, from about 0.01 to about 20 weight percent of oil soluble/dispersible or lipophilic materials can be easily emulsified into the formulation using anionic, amphoteric, cationic, nonionic and/or zwitterionic surfactants. Lipophilic materials without limitation include, silicones/organomodified silicones (protection, tissue water resistance, lubricity, tissue softness), oils (mineral, vegetable, and animal), fatty acids and the like. Powders to enhance lubricity, oil adsorption, provide skin protection, astringency, opacity, etc. and micronized ingredients can also be dispersed into the formulation.

5 The total tissue add-on of the composition can be from about 0.5 to about 40 weight percent, more specifically from about 5 to about 30 weight percent, and more specifically from about 10 to about 15 weight percent, based on the weight of the tissue. The add-on amount will depend upon the desired effect of the composition on the product, attributes and the specific composition. A preferred method to uniformly apply the heated composition to the surface of the tissue was roto-gravure printing, either direct or indirect (offset), because it is the most exact printing process and it can be used to print the composition onto the tissue and transfer rate. However, other suitable methods, such as flexographic printing or spraying such as WEKO, can be used.

6 As used herein, all recited ranges of amounts, temperatures, molecular weights and penetration hardnesses are intended to include all sub-ranges within the recited ranges, even though not specifically stated.

7 Also as used herein, a "tissue product" can be a facial tissue, bath tissue, paper towel, dinner napkin or the like. The tissue products of this invention can be one-ply, two-ply, three-ply or more. In all cases, the composition is applied to one or both outer surfaces of the product after the product has been dried. The composition can be applied after the plies are brought together or prior to bringing the plies together. The individual plies can be uncoated, coated (homogeneous) creped or uncreped, throughdried or wet-pressed. Surprisingly, it had been found that bleached tissue base sheets provide equivalent performance to layered base sheets, hence fiber layering is unnecessary.

EXAMPLES

Example 1

8 A tissue softening formulation (soft, semi-solid jelly) having a penetration hardness greater than 360 millimeters and a melting point about 28° C. was prepared having the following composition:

	Weight Percent
1) Propylene Glycol	40.00
2) Stearalkonium Chloride (85%)	4.00
3) Polyethylene Glycol 1000	4.00
4) Glycerin	19.00

9 The formulation was prepared by heating the propylene glycol to 45°-50° C., adding the stearalkonium chloride and polyethylene glycol 1000 and mixing until melted. Glycerin was then added and mixed until uniform. At this point the formulation was ready to use and apply to a tissue or towel base sheet via roto-gravure printing. This formulation is a soft semi-solid. It was too soft to sit on the surface of the tissue or towel base sheet after printing. Glycerin was added in this formulation to provide a moisturization (humectancy) benefit to the skin.

Example 2

10 A tissue softening formulation (soft, semi-solid jelly) having a penetration hardness of greater than 360 millimeters and a melting point about 29° C. was prepared having the following composition:

	Weight Percent
1) Propylene Glycol	20.00
2) Stearalkonium Chloride (85%)	4.00
3) Polyethylene Glycol 1000	4.00
4) Glycerin	38.00

11 The formulation was prepared by heating the propylene glycol to 45°-50° C., adding the stearalkonium chloride (Mackernium SDC-85 from Melanline) and polyethylene glycol 1000 and mixing until melted. Glycerin was then added and mix until uniform. At this point the formulation was ready to use and apply to tissue or towel base sheet. This formulation is a soft semi-solid. It was too soft to sit on the surface of the tissue or towel base sheet after printing. Glycerin was added in this formulation to provide a moisturization (humectancy) benefit to the skin.

Example 3 (Invention)

12 A tissue softening formulation (soft solid) having a penetration hardness of approximately 170 millimeters and a melting point about 44° C. was prepared having the following composition:

	Weight Percent
1) Propylene Glycol	15.00
2) Stearalkonium Chloride (85%)	1.00
3) Polyethylene Glycol 1000	50.00
4) Polyethylene Glycol 8000	2.00
5) Hydrogenated Starch Hydrolysate	24.00

13 The formulation was prepared by heating the propylene glycol to 45°-50° C., adding the stearalkonium chloride, polyethylene glycol 1000 and cetyl alcohol and mixing until melted. Hydrogenated starch hydrolysate was then added and mixed until uniform. At this point the formulation was ready to use and apply to tissue or towel base sheet via roto-gravure printing. The formulation was a soft solid and

5,869,075

14 sal on the surface of the base sheet when applied. The hydrogenated starch hydrolysate was used in this formulation to provide moisturization (humectancy) benefits to the skin and as a low cost alternative to glycerin. It also is not considered to be a volatile organic compound (VOC) like propylene glycol and can be used as a partial replacement for the propylene glycol.

Example 4 (Invention)

15 A tissue softening formulation (soft solid) having a penetration hardness of approximately 130 millimeters and a melting point about 45° C. was prepared having the following composition:

	Weight Percent
1) Propylene Glycol	15.00
2) Stearalkonium Chloride (85%)	25.00
3) Polyethylene Glycol 1000	25.00
4) Polyethylene Glycol 8000	10.00
5) Glycerin	25.00
6) Hydrogenated Starch Hydrolysate	24.00

16 The formulation was prepared by heating the propylene glycol to 45°-50° C., adding the stearalkonium chloride, polyethylene glycols 1000 and 3350 and cetyl alcohol, mixing until melted. Hydrogenated starch hydrolysate was then added and mixed until uniform. At this point the formulation was ready to use and apply to the surface of a tissue or towel base sheet via roto-gravure printing. This formulation is a harder solid than those of the foregoing examples due to the use of propylene glycol 3350.

Example 5 (Invention)

17 A tissue softening formulation (solid) having a penetration hardness of approximately 135 millimeters and a melting point about 57° C. was prepared having the following composition:

	Weight Percent
1) Propylene Glycol	20.00
2) Stearalkonium Chloride (85%)	5.00
3) Polyethylene Glycol 1000	25.00
4) Polyethylene Glycol 8000	25.00
5) Hydrogenated Starch Hydrolysate	25.00

18 The formulation was prepared by heating the propylene glycol to 50°-55° C., adding the propylene glycol 1000 and 8000, mixing until melted. Hydrogenated starch hydrolysate was then added and mixed until uniform. At this point the formulation was ready to use and apply to the surface of a tissue or towel base sheet via roto-gravure printing. This formulation is a harder solid than the above examples due to the use of polyethylene glycol 8000.

Example 6 (Invention)

19 A tissue softening formulation (solid) having a penetration hardness of approximately 94 millimeters and a melting point about 55° C. was prepared having the following composition:

Examples 11 to 13 (Invention)

Tissue softening formulations containing moisturizing ingredients and feel modifiers having a penetration hardness range of 20 to 65 millimeters and an approximate melting point range of 53°-60° C. were prepared having the following compositions:

	11 Wt. %	12 Wt. %	13 Wt. %
Phase A			
1) Propylene Glycol	34.00	38.00	35.00
2) Polyethylene Glycol 8000	20.00	15.00	20.00
3) Behenyl Alcohol	10.00	10.00	10.00
4) Stearyl Alcohol	10.00	10.00	10.00
5) Hydroxyethyl Starch	—	10.00	—
Phase B			
6 A) Hissagel 200	10.00	—	—
6 B) Carbopol	—	10.00	—
6 C) Osmar Arcteen PG25	—	—	10.00
Phase C			
7) Dimethicone 100 cS	10.00	10.00	10.00
8) Myristyl Myristate	5.00	5.00	5.00

"Hissagel 200" is a mixture of glyceryl and glyceryl polyacrylate manufactured by Hispano Quimica S.A. "Lubrasil" is a mixture of glyceryl polyethacrylate, propylene glycol, cyclomethicone, dimethiconol and polysorbate 20 manufactured by United Gardian, Inc. "Osmar Arcteen PG25" is a mixture of propylene glycol and oat extract manufactured by Channabio, Inc.

Phase A was prepared by heating the propylene glycol to 60°-65° C., adding the polyethylene glycol, and mixing until melted. Behenyl alcohol, stearyl alcohol and stearalcohol chloride are added and mixed until melted. Hydrogenated starch hydrolyzate is added and mixed until uniform. Hissagel 200, Lubrasil, or Arcteen PG25 were added (depending on the formulation) and the formulation was mixed until uniform.

Phase B was prepared by mixing dimethicone and myristyl myristate together and heating until uniform. Phase B was added to Phase A slowly under vigorous agitation. At this point the emulsion was ready to use and apply to the surface of a tissue or towel base sheet via rotagrature printing.

Examples 14 and 15 (Invention)

Anti-bacterial formulations having a penetration range of 190 to 220 and a melting point range of 50°-55° C. were prepared having the following compositions:

	14 Wt. %	15 Wt. %
Phase A		
1) Propylene Glycol	64.00	57.00
2) MPDol Glycol	5.00	10.00
3) Polyethylene Glycol 6000	20.00	22.00
4) Stearyl Alcohol	1.00	1.00
5) Nipsode PX	—	1.00

The propylene glycol and MPDol glycol were heated to 60°-65° C., adding the polyethylene glycol 6000 and stearyl alcohol, and mixing until melted. The Nipsode PX, an anti-bacterial agent manufactured by Nipa Laboratories, was added and mixed until dissolved. These anti-bacterial formulations were added to double re-entred base sheets via rotagrature printing to make a anti-bacterial level.

The foregoing examples, given for purposes of illustration, are not to be construed as limiting the scope of

this invention, which is defined by the following claims and all equivalents thereof.

1. Claim:
a) an issue or towel product having two outer surfaces, wherein one or both outer surfaces of the product have solidified deposits of a composition comprising from about 30 to about 90 weight percent hydrophilic solvent, from about 10 to about 50 weight percent high molecular weight polyethylene glycol having a molecular weight of from 720 or greater, and from about 5 to about 40 weight percent of a C₁₂ to C₁₈ fatty alcohol, said composition having a melting point from about 50° C. to about 70° C. and a penetration hardness of from about 5 millimeters to about 50 millimeters.

2. The product of claim 1 wherein the composition is present in an amount of from about 0.5 to about 30 weight percent based on the weight of the product.

3. The product of claim 1 wherein the hydrophilic solvent comprises water.

4. The product of claim 1 wherein the hydrophilic solvent comprises propylene glycol.

5. The product of claim 1 wherein the hydrophilic solvent comprises polyethylene glycol.

6. The product of claim 1 wherein the hydrophilic solvent comprises glycerin.

7. The product of claim 1 wherein the hydrophilic solvent comprises hydrogenated starch hydrolyzate.

8. The product of claim 1 wherein the fatty alcohol is cetyl alcohol.

9. The product of claim 1 wherein the fatty alcohol is stearyl alcohol.

10. The product of claim 1 wherein the fatty alcohol is behenyl alcohol.

11. The product of claim 1 wherein the fatty alcohol is a mixture of stearyl alcohol and behenyl alcohol.

12. The product of claim 1 wherein the molecular weight of the high molecular weight polyethylene glycol is from about 720 to about 1,840,000.

13. The product of claim 1 wherein the molecular weight of the high molecular weight polyethylene glycol is from about 720 to about 1,840,000.

14. A method of making a soft, issue or towel product comprising: (a) heating a composition comprising a hydrophilic solvent, a high molecular weight polyethylene glycol and a fatty alcohol, to a temperature above the melting point of the composition, causing the composition to melt, said composition having a melting point of from about 50° C. to about 70° C.; (b) applying the melted composition to one or both surfaces of a tissue web in spaced-apart deposits; and (c) resolidifying the deposits of the melted composition, said deposits having a penetration hardness of from about 5 to about 50 millimeters.

15. The method of claim 14 wherein the melted composition is applied by printing.

16. A softening composition comprising from about 30 to about 90 weight percent hydrophilic solvent, from about 10 to about 50 weight percent high molecular weight polyethylene glycol having a molecular weight of about 720 or greater, and from about 5 to about 40 weight percent of a C₁₂ to C₁₈ fatty alcohol, said composition having a melting point from about 50° C. to about 70° C. and a penetration hardness of from about 5 millimeters to about 50 millimeters.

17. The composition of claim 16 comprising one or more hydrophilic solvents selected from the group consisting of water, propylene glycol, low molecular weight polyethylene glycol, glycerin, sorbitol, hydrogenated starch hydrolyzate and silicone glycol.

18. The composition of claim 16 wherein the fatty alcohol is selected from the group consisting of cetyl alcohol, stearyl alcohol, behenyl alcohol and a mixture of stearyl alcohol and behenyl alcohol.

19. The composition of claim 16 wherein the amount of hydrophilic solvent is from about 40 to about 70 weight percent.

20. The composition of claim 16 wherein the amount of hydrophilic solvent is from about 50 to about 60 percent.

21. The composition of claim 16 wherein the amount of high molecular weight polyethylene glycol is from about 10 to about 30 weight percent.

22. The composition of claim 16 wherein the amount of high molecular weight polyethylene glycol is from about 15 to about 25 weight percent.

23. The composition of claim 16 comprising about 15 weight percent propylene glycol, about 50 weight percent high molecular weight polyethylene glycol, about 10 weight percent cetyl alcohol, and about 25 weight percent hydrogenated starch hydrolyzate.

24. The composition of claim 16 comprising about 20 weight percent propylene glycol, about 50 weight percent high molecular weight polyethylene glycol, and about 20 weight percent behenyl alcohol.

25. The composition of claim 16 comprising about 10 weight percent propylene glycol, about 10 weight percent low molecular weight polyethylene glycol, about 50 weight percent high molecular weight polyethylene glycol, about 20 weight percent hydrogenated starch hydrolyzate, and about 10 percent dimethicone copolyol.

26. The composition of claim 16 comprising about 55 weight percent propylene glycol, about 20 weight percent high molecular weight polyethylene glycol, and about 20 weight percent stearyl alcohol.

27. The composition of claim 16 comprising about 55 weight percent low molecular weight polyethylene glycol, about 20 weight percent methyl propanediol, about 20 weight percent high molecular weight polyethylene glycol, and about 20 weight percent stearyl alcohol.

28. The composition of claim 16 comprising about 55 weight percent methyl propanediol, about 20 weight percent high molecular weight polyethylene glycol, and about 20 weight percent stearyl alcohol.

29. The composition of claim 16 comprising about 35 weight percent propylene glycol, about 20 weight percent high molecular weight polyethylene glycol, about 10 weight percent behenyl alcohol, about 10 weight percent stearyl alcohol, about 10 weight percent of a mixture of glyceryl and glyceryl polyacrylate, and about 10 weight percent dimethicone.

30. The composition of claim 16 comprising about 30 weight percent propylene glycol, about 15 weight percent high molecular weight polyethylene glycol, about 10 weight percent behenyl alcohol, about 10 weight percent stearyl alcohol, about 15 weight percent hydrogenated starch hydrolyzate, about 5 weight percent of a mixture of glyceryl polyacrylate, propylene glycol, cyclomethicone, dimethiconol, and polysorbate 20, and about 10 weight percent dimethicone.

31. The composition of claim 16 comprising about 35 weight percent propylene glycol, about 20 weight percent high molecular weight polyethylene glycol, about 10 weight percent behenyl alcohol, about 10 weight percent stearyl alcohol, about 10 weight percent of a mixture of propylene glycol and oat extract, and about 10 weight percent dimethicone.

32. The composition of claim 16 comprising about 65 weight percent propylene glycol, about 5 weight percent

5,869,075

11

methyl propanediol, about 20 weight percent high molecular weight polyethylene glycol, and about 10 weight percent stearic alcohol.
33. The composition of claim 14 comprising about 55 weight percent propylene glycol, about 10 weight percent

12

methyl propanediol, about 20 weight percent high molecular weight polyethylene glycol, and about 10 weight percent stearic alcohol.

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