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## (54) Finish composition for polypropylene fibres.

(57) Finish composition for polypropylene fibres containing a condensation product of a fatty acid with a polyalkylenamine and a condensation product of a hydrogenated fatty acid with an aminoethylethanolamine.

This composition gives a good processability (antistatic effect) to the fibres and a good adhesion of adhesive labels to the non-woven fabric manufactured articles produced from the treated fibres.

EP 0 576 896 A2

The present invention relates to a finish composition, particularly for polyolefine fibres. It relates also to a fiber finish process which uses the above mentioned composition.

Thermosealing polypropylene fibres are widely used in the hygienic-sanitary field in the manufacture of calendered non-woven fabrics for coverstocks, overalls, monouse sheets. In many cases a marked hydrophobic characteristic is requested to the non-woven fabric: for example, it is requested to be possible to manufacture non-woven fabrics having a high barrier capacity towards aqueous liquids.

The measure of the hydrophobic capacity is carried out on fiber staples measuring the "sinking time", that is the time necessary so that the staple, placed in water in a wide mesh basket, sinks under the liquid surface of a little tank filled with water (ASTM method D 1117-58).

The polypropylene fiber, in that wholly olefinic, is as such hydrophobic.

However, the industrial processes for producing the fiber and for transfiorming it into finished manufactured product involve necessarily the addition, on the fiber surface, of surface active agents, slipping agents, antistatic agents, in the step of the process named finish.

The presence of the agents substantially modifies the surface characteristics of the fiber and therefore the "sinking time" also.

Consequently, the hydrophilic/hydrophobic degree of the fiber is, as a matter of fact, industrially adjusted by the use of specific surface active agents.

In order to produce polypropylene fibres having a high hydrophobic capacity (sinking time 24 hours), the present state of the art is to finish the fiber with a mixture of silicone products, which give hydrophobic capacity and lubrication, and surface active antistatic agents, such as for example, esters such as alkyl phosphates, which give antistatic capacity without interferring with the hydrophobic degree.

These formulations give the required hydrophobic capacity, but show the drawback of a very poor adhesion of labels and adhesive tapes on the non-woven fabric.

In fact, it is well known that silicone compounds are used as release-agents.

As in the production of manufactured articles to be used in the hygienic-sanitary field adhesive tapes and labels are generally used, the finish with silicone products gives rise to problems of poor adhesion of these labels. Think, for example, to the adsorbent knikers for babies (napkins) which are kept tied on waist by adhesive tapes.

Object of the present invention is to provide a finish composition free of silicone additives, and which allows to solve the above mentioned problem relating to the insufficient adhesion without compromising in any way the hydrophobic capacity and the processability of the fiber.

According to the invention, this object is reached owing to the fact that the finish composition comprises, in mixture or separated each from the other, a condensation product (A) of a fatty acid with a polyalkylenamine, quaternized with the condensation product of a chlorhydrin with polyethylene glycol, and a condensation product (B) of a hydrogenated fatty acid and an aminoalkylalkanolamine (also named hydroxyalkylenediamine), neutralized with an alpha-hydroxycarboxylic acid, added with a polyoxyethylated fatty alcohol.

It has been ascertained that the use of one of the two components (A) and (B) alone does not give the desired set of characteristics: the component (A) alone gives the maximum hydrophobic capacity but poor antistatic characteristics, so that the fiber shows processability difficulties.

The component (B) alone shows better antistatic characteristics but not sufficient hydrophoby.

If components (A) and (B) are used in mixture each other, their weight ratio is preferably comprised between 35/65 and 60/40. The level or total concentration of finishing agents on the fiber is preferably comprised between 0.3 and 0.6% by weight, more preferably between 0.4 and 0.5% by weight.

The fatty acid used in the condensation to obtain the component (A) is preferably a saturated $C_{16}$-$C_{20}$, more preferably stearic acid. The saturated fatty acid is preferably condensed with tetraethylpentamine. The chlorohydrin used to obtain the condensation product with polyethylene glycol able to act as crosslinking and quaternizing agent in the preparation of the component (A) is preferably bis-chlorohydrin ether. The condensation product between the polyethylene glycol and the chlorohydrin is present, in the component (A) in a small concentration preferably comprised between 0.5 and 5% by weight.

The fatty acid used in the condensation reaction to obtain the component (B) is preferably a fatty acid obtained by hydrolysis of tallow, whereas the aminoalkylakanolamine is preferably aminoethylethanolamine. The alpha-hydroxycarboxylic acid used to neutralize the condensation product of the hydrogenated fatty acid with the aminoalkylalkanolamine is preferably selected from the group which consists of glycolic acid, mandelic acid, lactic acid, hydroxybutyric acid and mixtures thereof. More preferably glycolic acid is used.

The polyoxyethylated fatty acid used in the preparation of the component (B) as emulsifier is preferably a fatty alcohol deriving from tallow, con-

densed with ethylene oxide; for each mol of fatty alcohol 15 mols of ethylene oxide are preferably used.

The method to carry out the condensations to obtain components (A) and (B) is not critic in any way and it is that well known to the skilled in the art; therefore, it is not probed here.

The present invention has as object also a fiber finish process which compises the treatment of the fiber with the product (A) only as above defined in aqueous solution at a concentration preferably comprised between 5 and 30 g/l in such a way to leave on the fibres an active residue comprised between 0.005 and 0.05% by weight, and the subsequent treatment of the fiber with a mixture of the products (A) and (B) as above defined in a weight ratio (A)/(B) comprised between 30/70 and 60/40 and at a such concentration to leave on the fiber an active residue comprised between 0.1 and 0.8% by weight.

Further advantages and characteristics of the present invention will be clear by examining the following examples, which have not to be intended in any way as limitative of the invention.

**EXAMPLE 1**

A polypropylene fiber obtained by spinning on an industrial plant has been subjected to finish on a pilot plant.

The addition points of the finish were two:

- before the stretching
- after stretching and crimping, before the drying.

In the first finish step a product (A) obtained from the condensation of stearic acid with tetraethylenepentamine, with about 1% by weight of polyethylene bis-chlorohydrin as quaternizing and crosslinking agent has been applied. The concentration of the product (A) in aqueous bath was equal to 15 g/l, in such a way to leave an active residue on the fiber equal to 0.02% .

In the second step a mixture of the product (A) and of a product (B) obtained from the condensation of fatty acids deriving from hydrogenated tallow with aminoethanolamine, neutralized with glycolic acid and alcohols deriving from tallow condensed with about 15 mols of ethylene oxide as emulsifier agent has been applied. A weight ratio (A)/(B) equal to 38/62, in aqueous bath, has been used, in such a way to leave on the fiber an active residue equal to 0.43%.

The total "finish" on the fiber resulted equal to 0.45%; the ratio A/B = 40/60.

The "sinking time" on the staple resulted about 24 hours; the processability of the fiber on textile machines for opening, carding and calendering has resulted good.

**EXAMPLE 2**

By the modalities described in Example 1, in the first finish step the finishing (A) as defined in the example 1 in aqueous bath at 20 g/l has been applied, in such a way to leave on the fiber 0.03% of active residue.

In the second step a mixture of (A) and (B) as defined in example 1 in a 44/56 ratio has been applied, in such a way to leave on the fiber 0.42% of active residue.

The total finish on the fiber has resulted 0.45%; the ratio A/B = 49/51.

The sinking time on the staple has resulted higher than 48 hours; the processability and adhesion of labels to the non-woven fabric were good.

**EXAMPLE 3 (comparison)**

By the modalities described in the Example 1, in the first step of the finish an alkylphosphonate has been applied in an amount equal to 0.02% of active on the fiber.

In the second step a 45/55 mixture of:

- alkylphosphonate
- dimethylpolysiloxane having a viscosity of 100 cts at 20 °C, in such a way to leave on the fiber an active residue equal to 0.40% has been applied.

The total finish on the fiber has resulted 0.42%; the ratio alkylphosphonate/silicone compound = 50/50.

The sinking time on the staple has resulted higher than 48 hours; the processability acceptable (slight problems due to the static electricity at the highest working speeds).

The adhesion of labels to the non-woven fabric has resulted unsatisfactory.

**Claims**

1. Finish composition for fibres, particularly for polyolefine fibres, characterized by the fact that comprises, in mixture or separated each from other:
   - (A) a condensation product of a fatty acid with a polyalkyleneamine, quaternized with the condensation product of a chlorohydrin with polyethyleneglycol, and
   - (B) a condensation product of a hydrogenated fatty acid with aminoalkylalcanolamine, neutralized with a alpha-hydroxycarboxylic acid, added with a polyoxyethylated fatty alcohol.

2. Composition according to claim 1, characterized by the fact that the weight ratio between the components (A) and (B) is comprised be-

tween 36/65 and 60/40.

3. Composition according to claim 1 or 2, characterized by the fact that the final concentration of the finish composition on the fiber is comprised between 0.3 and 0.6% by weight.

4. Composition according to claim 1, characterized by the fact that the component (A) is a condensation product of stearic acid with tetraethylenepentamine, said condensation being carried out in the presence of polyethylene glycol bis-chlorohydrin ether.

5. Composition according to claim 4, characterized by the fact that the polyethyleneglycol bis-chlorohydrin ether is comprised between 0.5 and 5% by weight on the total.

6. Composition according to claim 1, characterized by the fact that the component (B) is a condensation product of fatty acids deriving from hydrogenated tallow, with aminoethylethanolamine, neutralized with glycolic acid and alcohols deriving from fatty acids obtained from tallow condensed with ethylene oxide.

7. Finish process of fibres, particularly of polyolefine fibres, characterized by the fact that comprises the following steps:
   - to treat the fibres in an aqueous bath of a condensation product (A) of a fatty acid with a polyalkyleneamine, quaternized with the condensation product of a chlorohydrin with polyethylene glycol, in such a way to leave on the fibres an active residue comprised between 0.005 and 0.5% by weight, and to treat subsequently the fibres with an aqueous mixture of the above mentioned product (A) and of a condensation product (B) of a a hydrogenated fatty acid with aminoalkylalkanolamine, neutralized with a polyoxyethylated fatty alcohol, in a weight ratio (A)/(B) comprised between 30/70 and 60/40 in such a way to leave on the fiber an active residue comprised between 0.1 and 0.8% by weight.