An illustrative list of polyurethane forming polyisocyanates is given in British Patent No. 892,137, pages 11 and 12. Particularly suitable are, for instance, 2,4-tolylenediisocyanate, hexamethylene diisocyanate, triphenylmethane triisocyanate naphthylene 1,5-diisocyanate, and others.

Suitable polyesters are those of aliphatic polyols such as ethylene glycol, diethylene glycol, hexamethylene glycol, glycerol, and many others with one or more polycarboxylic acids such as adipic acid, sebacic acid, isosorbide acid, phthalic acids and others.

In order to ensure homogeneous distribution of the binder and to prevent or reduce the risk that binder is carried away by the water during formation of the fiber sheet, the binder and lubricant have been added in form of filaments; this has been done by converting the binder to a filament and then coating the filamentary binder with the lubricant. This method has the drawback to require several process steps to produce the coated filaments.

In said earlier application, it has also been proposed to mix lubricant and binder to a homogeneous mixture and to add said mixture in form of filaments to the slurry of the synthetic fibers.

Said binder-lubricant filaments, however, are quite brittle and lack the flexibility desired for the purpose. We have now found that very flexible binder-lubricant filaments can be obtained by adding to the binder-lubricant mixture an alkyd resin and extruding the homogeneous binder-lubricant-alkyd resin mixture to filaments. The thus obtained filaments are cut to staple fibers of the desired length; said staple fibers are added to the paper stock, which is then processed to a sheet on a conventional paper-making machine. The temperature of the heated rolls of the dryer part of the machine is adjusted to a temperature suitable for curing the liquefied binder which has collected at the intercrossings of the textile fibers. After washing out the lubricant film formed on the synthetic textile fibers, the desired surface properties of said fibers are maintained. The initial wet strength of the web is also essentially maintained.

By adjusting the amount of synthetic textile fibers and binder-lubricant filaments, the number of bonded intercrossings, and thereby the elasticity of the final sheet, can be varied. Generally, the lubricant-binder fibers will be employed in an amount of 30 to 50 percent by weight of the weight of the dry textile fibers.

In the lubricant-binder filaments, the lubricant may be present in amounts of 10 to 100 percent by weight, calculated on the binder, and the amount of alkyd resin may be in the range of 5 to 25 percent, calculated on the lubricant-binder mixture.

A wide range of alkyd resins may be used, for instance glycerol or pentaerythritol esters of phthalic anhydride, short oil alkyls modified with linseed oil or other vegetable oils or with saturated lower fatty acids, medium oil alkyls based on dehydrated castor oil, styrene modified alkyls, and others.

Conventional driers such as cobalt or rare earth salts of naphthenic acid, 2-ethylhexonic acid, and other acids used for this purpose may be added to shorten the curing time of the binder after the web has been formed.

The following example is given to illustrate and to limit the invention.

Example

Polyester fibers were beaten in water, and the fibrous mass was introduced into the headbox of a paper forming machine. At the same time, binder-lubricant filaments cut to staple length were added, and the fiber mixture was slurried with water to a dispersion containing a solids concentration of about 0.01. Said highly dilute fiber...
Dispersions was then passed onto the Fourdrinier wire where the desired web was formed and the major part of the water was separated from the fibers.

The lubricant-binder films had been prepared by extruding the following mixture, all percentages being given by weight:

<table>
<thead>
<tr>
<th>Material</th>
<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>Desmodur AP stable</td>
<td>33</td>
</tr>
<tr>
<td>Desmophen 1200</td>
<td>18</td>
</tr>
<tr>
<td>Alkydal RD-18</td>
<td>10</td>
</tr>
<tr>
<td>Alkydal BG</td>
<td>5</td>
</tr>
<tr>
<td>Wax E</td>
<td>30</td>
</tr>
<tr>
<td>Soligen cobalt (Gebr. Borchers AG.)</td>
<td>4</td>
</tr>
</tbody>
</table>

Desmodur AP stable is toluylene diisocyanate whose isocyanate groups are blocked by phenol.

Desmophen 1200 is a polyester of adipic acid with a mixture of diols and triols, dissolved in acetone and methylglycol acetate.

Alkydal RD-18 is prepared from phthalic acid and trimethylolpropane and modified with 25% saturated low molecular fatty acid.

Alkydal BG is an unmodified phthalic acid resin.

Wax E is an ester wax marketed by Badische Anilin- & Soda-Fabrik. It is a montan wax (C, number 28) esterified with ceryl and myrcyl alcohol and has a melting point of 79-82°C, a setting point of 73-75°C, an acid number of 17-25 and a saponification number of 158-178.

Soligen cobalt is cobalt napthenate.

After passage through the wire section of the paper- or rolling machine, the binder-lubricant films were distributed throughout the web. In the drying section, the web passed over a plurality of heated rolls, the first of which had a surface temperature of 120°C. The web was passed through a heating zone of a total length of about 150 m, within about 15 minutes and was then rewound.

In the heating zone, the lubricant-binder films melted and formed individual droplets which run on a thin layer of the liquid wax, formed on the textile fibers, to the intercrossing points of the fibers, where they started being cured. Due to the presence of the drier catalyst, the cure was completed within 3 to 5 minutes at 150°C.

For the manufacture of the web, all synthetic fibers can be used which, due to their preparation from a melt, by extrusion or spinning, and by the subsequent treatments, have a smooth non-fibrillated surface; stretched, cramped, or hollow fibers may be used. Examples of such synthetic fibers are regenerated cellulose fibers from viscose or cuproammonium; polyamides as obtained by the condensation of hexamethylene diamine salt with adipic acid (nylon 66) or e-caprolactam (nylon 6); polymers from dicarboxylic acid, such as terephthalic or isophthalic acid, with diols or polyols (Diolene, Terylene, Ducon); polyvinyls, e.g. from vinyl chloride, vinyl acetate, styrene, vinylene chloride, and copolymers thereof; polycarboxylics from acrylonitrile (e.g. Dralon); copolymers of vinyl compounds and/or styrene and acrylonitrile; polyelefin, for instance polyethylene and polypropylene. Also glass fibers may be used.

The synthetic fibers may be substituted up to 50 percent by natural fibers without requiring modification of the described procedure.

We claim:

1. A method of preparing an unwoven web material consisting to at least 50 percent by weight of synthetic textile fibers, the balance being natural textile fibers, on a conventional paper- or rolling machine comprising adding to said textile fibers, prior to their passage through the paper- or rolling machine, about 30 to 50 percent, calculated on the dry weight of said textile fibers, of fibers consisting essentially of a homogeneous mixture of

(a) a polyurethane forming mixture of a polyester having at least one free hydroxyl group and a polyisocyanate whose isocyanate groups are block by a member of the group consisting of alcohols and phenols but are reactive at a temperature of about 100°C,
(b) a wax having a melting point below the melting point of said polyurethane, and
(c) an alkyl resin,

the proportion of said polyurethane forming mixture to said wax being about 1:0-1:1, and the amount of said alkyl resin being about 5 to 25 percent by weight of the total polyurethane-wax mixture.

2. A filamentary composition, suitable as addition in the manufacture of unwoven web material, consisting essentially of a homogeneous mixture of

(a) a polyurethane forming mixture of a polyester having at least one free hydroxyl group and a polyisocyanate whose isocyanate groups are block by a member of the group consisting of alcohols and phenols but are reactive at a temperature of about 100°C,
(b) a wax having a melting point below the melting point of said polyurethane, and
(c) an alkyl resin,

the proportion of said polyurethane forming mixture to said wax being about 1:0-1:1, and the amount of said alkyl resin being about 5 to 25 percent by weight of the total polyurethane-wax mixture.

3. The filamentary composition of claim 2 containing, in addition, a drier in an amount efficient to cure said polyurethane-forming mixture on heating.

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DONALL H. SYLVESTER, Primary Examiner.