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SPINNING

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This invention relates to spinning and relates more particularly to the treatment of a spinning jet at the start of a spinning operation.

In the production of filamentary materials by the dry spinning process, a heated dope comprising a solution of a filament-forming material in a volatile solvent is pumped or otherwise forced through the apertures of a spinnerette into a spinning cabinet. Air or other evaporative medium flowing through the spinning cabinet removes the major portion of the solvent from the filamentary materials, following which the said materials are drawn from the spinning cabinet and may be taken up in package form or otherwise treated. The solvent vapors are recovered for reuse. Examples of such dry spinning processes are the spinning of a solution in acetone of secondary cellulose acetate having an acetyl value of the order of 54.5% by weight, calculated as acetic acid, and the spinning of a solution in methylene chloride, either alone or in admixture with a lower aliphatic alcohol, of cellulose triacetate having an acetyl value of at least 59% by weight, calculated as acetic acid.

When spinning is first started, there is a considerable tendency for certain apertures of the spinnerette not to spin uniformly and for the spinning dope to spread over the surface of the spinnerette and interrupt the continuity of the spinning operation. To overcome these faults, it has previously been proposed to wipe the surface of the spinnerette with a liquid which is a solvent or partial solvent for the filament-forming material, or with a liquid which leaves on the surface of the spinnerette a film of a material that tends to repel the spinning dope. Examples of liquids that have been suggested for this purpose are acetone, mineral oil and certain mixtures containing both mineral oil and acetone. None of these liquids has been found fully satisfactory for wiping the surface of a spinnerette through which it is desired to spin a solution in methylene chloride, either alone or in admixture with a lower aliphatic alcohol, of cellulose triacetate. Acetone, whether used alone or as a component of the wiping liquid, evaporates and passes to the solvent recovery system where it contaminates the recovered methylene chloride. Mineral oil tends to accumulate in excess on certain areas of the face of the spinnerette and will frequently interrupt the continuity of spinning.

It is an important object of this invention to provide a spinning process which will be free from the foregoing and other disadvantages.

A further object of this invention is to provide a spinning process in which the surface of the spinnerette is wiped with an aqueous emulsion of a mineral oil at the start of the spinning operation.

Other objects of this invention will be apparent from the following detailed description and claims.

According to the present invention, spinning is begun without difficulty when the spinnerette is wiped at the start of spinning operations with an aqueous emulsion of a mineral oil. The use of the aqueous emulsion for this purpose involves no danger of contaminating the recovered solvent. Furthermore, there is no tendency for an excess of mineral oil to accumulate on certain areas of the spinnerette and interrupt the continuity of spinning. The aqueous emulsion of mineral oil presents no dermatological or toxicity problems and is accordingly widely useful in connection with the spinning of many varied types of spinning dope. It is, however, especially useful in spinning dopes comprising a solution in methylene chloride, either alone or in admixture with a lower aliphatic alcohol, of cellulose triacetate, since the use of other wiping liquids in this case presents a number of difficult problems.

The aqueous emulsion of a mineral oil may be readily prepared by blending together water and mineral oil in the presence of a suitable emulsifying agent, of which there are many known in the art. The mineral oil should be highly purified and free from acidic and other substances of a corrosive nature that will attack the surface of the spinnerette to which it is applied. A paraffin base oil is preferred for this use. The mineral oil should have a viscosity of between 40 and 150 SUS at 100° F. For best results, the proportion of mineral oil should range between 5 and 40% by weight, based on the weight of the emulsion.

While it is possible to achieve good results by wiping the surface of the spinnerette with a simple emulsion of the mineral oil in water, even better results are achieved when there is employed as the wiping liquid an emulsion in water of a yarn lubricant containing mineral oil. In addition to the mineral oil, the yarn lubricants normally contain one or more additional substances such as animal, vegetable or fish oils or fats, bodied or unbodied, to reduce the frictional properties of the lubricant; antistatic agents such as alkyl phosphates; surface active agents; blending agents and the like. The reasons for the improved results obtained when an emulsion of a yarn lubricant is employed as the wiping liquid are not understood, but are readily apparent in the greater ease with which spinning can be started and also in the greater freedom from interruptions during the spinning process. Many yarn lubricants are readily emulsifiable in water and require no further additions to prepare a stable aqueous emulsion. Other yarn lubricants are not themselves emulsifiable in water so that an emulsifying agent must be added thereto to prepare a stable aqueous emulsion. The amount of yarn lubricant should be such as to bring the proportion of mineral oil in the emulsion within the range specified above.

The following example is given to illustrate this invention further.

Example

A yarn lubricant is prepared by mixing together (*a*) 35 parts by weight of a white paraffinic mineral oil having a viscosity of 50 seconds; (*b*) 20 parts by weight of the bodied sperm oil known as "Polysperm 300" and having a viscosity of about 300 seconds; (*c*) 18 parts by weight of a 50–50 mixture of a mixed partial alkyl phosphate and mineral oil, prepared by reacting 1.88 parts by weight of phosphorus pentoxide dispersed in 9 parts by weight of white mineral oil having a viscosity of 50 seconds with 7.12 parts by weight of a mixture of one mole of n-decanol and one mole of mixed alkanols containing an average of 13 carbon atoms obtained by the oxo process for making primary alcohols; (*d*) 7 parts by weight of di-n-butyl ethanolamine; and (*e*) 20 parts by weight of a mixture of equal proportions by weight of the polyethylene oxide monoether of sperm oil alcohol containing 3 mols of ethylene oxide per mol of sperm oil alcohol and the monoester of oleic acid with a polyethylene glycol, which polyethylene glycol has a molecular weight of about 300, said ester being known as "Lipal 30W."

There are then mixed together 20% by weight of this yarn lubricant and 80% by weight of water to produce a stable emulsion. This emulsion is employed for wiping the surface of a spinnerette through which there is spun a dope comprising a solution of cellulose triacetate having an acetyl value of 61.5% by weight, calculated as acetic acid, in a mixture of 91 parts of methylene chloride and 9 parts of methanol. Spinning starts smoothly and continues without interruption for extended periods of time.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In a dry spinning process for the production of filamentary material by forcing a dope comprising a solution of cellulose triacetate having an acetyl value of at least 59% by weight in a member of the group consisting of methylene chloride and mixtures of methylene chloride and lower aliphatic alcohols through the apertures in a spinnerette into an evaporative medium, the improvement which comprises wiping the face of the spinnerette with an emulsion of mineral oil, water and emulsifying agent, the mineral oil having a Saybolt Universal viscosity of between 40 and 150 seconds at 100° F. to improve the starting up of the spinning operation and the uniformity of spinning.

2. In a dry spinning process for the production of filamentary material by forcing a dope comprising a solution of cellulose triacetate having an acetyl value of at least 59% by weight in a member of the group consisting of methylene chloride and mixtures of methylene chloride and lower aliphatic alcohols through the apertures in a spinnerette into an evaporative medium, the improvement which comprises wiping the face of the spinnerete with an aqueous emulsion containing mineral oil having a Saybolt Universal viscosity of between 40 and 150 seconds at 100° F., there being present in the emulsion between 5 and 40% by weight of mineral oil, to improve the starting up of the spinning operation and the uniformity of spinning.

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