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PROCESS OF SIZING CELLULOSE ACETATE YARNS

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This invention relates to the sizing of textile yarns in general and in particular to the sizing of yarns composed of or containing cellulose organic acid esters such as cellulose acetate, cellulose propionate, cellulose acetate propionate, cellulose acetate butyrate, and the like. The invention relates particularly to the preparation of compositions for sizing such yarns.

As is well known, textile yarns are sized to adapt them for a rather wide variety of textile operations. A great many different sizing agents are employed for this purpose among which may be mentioned starch, gelatin, resins and various other substances which are adapted to form a thin protective film on the yarns when deposited from solution or suspensions thereof.

This invention has as an object to provide substances which are particularly adapted for the sizing of textile yarns, particularly those composed of or containing organic derivatives of cellulose such as cellullose acetate and similar cellulose organic acid esters. A further object is to provide a means of employing certain oxidized substances as yarn sizes which are normally insoluble in water and various organic solvents. A still further object is to provide an improved type of emulsion suitable for the sizing of yarns. Another object is to provide an improved process for the sizing of textile yarns, particularly those composed of or containing organic derivatives of cellulose. Other objects will appear hereinafter.

These objects are accomplished by the following invention which, in its broader aspects, comprises the preparation of a gel which is normally insoluble in water or organic solvents by rather drastically oxidizing a non-drying or semi-drying oil or liquid wax until a gel is formed and subsequently solubilizing the gel by heating it to its melting point and thereafter adding a higher aliphatic acid and a soap-producing base. Upon the addition of water, an emulsion is formed which may be used with a high degree of success in the sizing of textile yarns.

In the following examples and description I have set forth several of the preferred embodiments of my invention but they are merely for purposes of illustration and not as a limitation thereof.

As indicated above, the first step in producing the compositions of my invention is to oxidize or "blow" the selected oil. It is of course well-known that when a non-drying or semi-drying oil or liquid wax is subjected to oxidation and the oxidizing action is carried on for a longer period than is customary in the production of the ordinary types of oxidized oils, a soft, rubbery mass or gel is produced which is insoluble or non-emulsifiable in ordinary solvents, such as water, acetone, chloroform, carbon tetrachloride, alcohol, or ether and this mass cannot be dispersed in water with the aid of common dispersing agents. I have found, however, that when such normally insoluble gels are melted and a suitable amount of a fatty acid such as oleic, or stearic acid and a liquid soap-producing base are added, contrary to what would be expected from the known behavior of such gels, they are rendered soluble in or emulsifiable by soaps or soap-forming ingredients. The soap-producing base may be an aliphatic alkoxy amine such as mono-, di-, or triethanolamine or an inorganic base such as potassium, sodium, or ammonium hydroxides.

A typical composition prepared in accordance with my invention has the following composition:

	Parts
Blown neat's-foot oil gel	35
Oleic acid	10
Triethanolamine	5
Water	50

In the preparation of this composition the blown neat's-foot oil gel is melted, the oleic acid component is added, together with an equivalent amount of triethanolamine while the mixture is still hot. The oleic acid and triethanolamine are added slowly with vigorous stirring. The fluid mass is then cooled to approximately 100° C. and the water component is added. Another typical composition in accordance with my invention is composed of the following ingredients:

	Parts
Blown neat's-foot oil gel	51
Oleic acid	6
Triethanolamine	3
Water	40

Instead of blown neat's-foot oil gel, the gels obtained by the oxidation or blowing of other non-drying and semi-drying oils and waxes such as olive, castor, cottonseed, corn, sesame, rapeseed, peanut, sperm, teaseed, arachis, and kapok seed oil may be employed.

Example 1

500 gm. of neat's-foot oil having an iodine value of approximately 70–80 and a specific gravity of 0.918 is blown in a 2-liter round-bottom flask at 150° for sixty hours. Wet air is passed into the oil by means of a copper air stirrer at a pressure of 10–20 mm. of mercury. The oil is seeded with blown neat's-foot oil. The gel thus obtained is heated to a melt at 200° C. and 70 gm. of oleic acid, 35 gm. of triethanolamine added in the order named. Then with vigorous stirring 600 gm. of distilled water are added. The emulsion thus obtained has exceptional value as a composition for the sizing of cellulose acetate and other cellulose organic acid ester yarns.

Example 2

500 gm. of sperm oil having an iodine value of 60–80 is blown in a 2-liter round-bottom flask at 150° C. for 60 hours. Wet air is passed into the oil by means of a copper air stirrer at a pressure of 10–20 mm. of mercury. The oil is seeded with blown rapeseed oil. The gel thus obtained is heated to a melt at 200° C. and 35 gm. of oleic acid and 18 gm. of triethanolamine stirred in. Then 1090 gm. of distilled water are added with vigorous stirring. This emulsion is passed through a colloid mill and then filtered through cheesecloth.

Example 3

500 gm. of rapeseed oil is blown in a 2-liter flask at 110° for 100 hours. Oxygen is passed into the oil by means of a copper air stirrer at a pressure of 20–30 mm. of mercury. Five gm. of cobalt oxide are added as catalyst. The gel thus obtained is heated to melt at 200° C. and 70 gm. of oleic acid and 35 gm. of triethanolamine added. Then with vigorous stirring 600 gm. of distilled water are added. The emulsion is passed through a colloid mill and filtered through a cheesecloth.

Example 4

500 gm. of teaseed oil is blown in a 2-liter round-bottom flask at 200° C. for 75 hours. A 50–50 mixture of air and oxygen is passed into the oil by means of an iron stirrer at a pressure of 30–40 mm. of mercury. Five-tenths gm. of nickel erucate are added as catalyst. The gel thus obtained is heated to a melt at 250° C., cooled to 200° C. and 35 gm. of oleic acid and 7 gm. of powdered potassium hydroxide are added. Then 1000 gm. of water are stirred in, the emulsion passed through a colloid mill, and filtered through cheesecloth.

Example 5

500 gm. of castor oil is blown in a 2-liter round-bottom flask at 200° C. for 75 hr. Ozonized air is passed into the oil by means of a glass air stirrer at a pressure of 25 mm. of mercury. Ten gm. of strontium oxide are added as catalyst. The gel thus obtained is heated to a melt at 200° C. and 70 gm. of oleic acid and 12 gm. of sodium hydroxide stirred in. Then 1000 gm. of distilled water are added with vigorous stirring, the emulsion ground in a colloid mill, and filtered.

Example 6

500 gm. of sesame oil is blown in a round-bottom flask at 150° for 35 hours. Dry air is passed into the oil by means of a copper air stirrer at a pressure of 30 mm. of mercury. The gel thus obtained is heated to a melt at 200° C., 50 gm. of stearic acid and 20 gm. of triethanolamine added. One liter of distilled water is stirred in and the resulting emulsion ground in a colloid mill and filtered.

Example 7

1000 gm. of olive oil is blown in a copper bath at 200° C. for 200 hours. The oil is seeded with 50 gm. of blown rapeseed oil. Dry air is passed into the oil by means of a copper air stirrer at a pressure of 25 mm. of mercury. The gel is heated to 250° C., 100 gm. of oleic acid and 50 gm. of triethanolamine added, the mixture cooled, and 1500 gm. of distilled water stirred in. The emulsion is ground and filtered.

The solubilized gels produced as indicated by the above examples are especially useful for the production of abrasion-resisting coatings or sizes for textile yarns. Although these gels are applicable to the sizing of textile yarns in general, they have been found to be particularly effective in the sizing of yarns composed of or containing organic derivatives of cellulose, such as cellulose acetate, cellulose propionate, cellulose acetate propionate and cellulose acetate butyrate, and other single and mixed organic acid esters of cellulose.

Examples of the treatment of yarns with the compositions of my invention are the following:

Example 8

A skein of viscose type rayon yarn is immersed in an aqueous bath containing equal parts of water and the solubilized neat's-foot oil gel described in Example 1. After thorough soaking, the skein is removed and dried. By this process a tough surface coating is applied to the yarn which facilitates the subsequent use of the yarn in weaving or knitting operations.

Example 9

Cellulose acetate yarn is treated with a solution of blown sperm oil prepared as in Example 2 above while being transferred from one package to another. The excess water is evaporated leaving a protective coating on the yarn, which is suitable for warp yarn in weaving.

Example 10

A warp of cellulose acetate yarn is treated on a slashing machine with a mixture of equal parts of the gel described in Example 3 and of water. After drying on the slasher, the warp is ready for weaving.

It will be seen that my invention provides a valuable means of sizing textile yarns and of making available as sizing agents certain gels which have heretofore been regarded as unsuitable for such use. One of the outstanding features of my invention is the fact that when the solubilized gels are deposited on the surface of the yarn and the yarn subjected to a heat treatment, the heat not only dries off the water or solvent, but also melts the gel, thus causing the gel to spread more effectively over the fiber surface and giving rise to a more uniform size coating.

What I claim and desire to secure by Letters Patent of the United States is:

1. The process of sizing cellulose acetate rayon yarn which comprises depositing on the yarn an emulsion of blown sperm oil gel dispersed in an aqueous medium by means of a water-soluble reaction product of a higher aliphatic acid and a soap-producing base.

2. The process of sizing cellulose acetate rayon yarn which comprises depositing on the yarn an aqueous emulsion of sperm oil gel dispersed in an aqueous medium by means of triethanolamine oleate and thereafter removing the water content of the emulsion deposited on the yarn.

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