

## CONTINUOUS DYEING OR PRINTING PROCESS

## CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of application Ser. No. 390,478, filed Aug. 22, 1973, which is a continuation of application Ser. No. 266,819, filed June 27, 1972, which is a continuation-in-part of application Ser. No. 15,911, filed Mar. 2, 1970, now all abandoned.

It is known that dyeing liquors and printing pastes can be thickened in two ways, namely, by dissolving therein substances of high molecular weight containing long-chain molecules or by the addition of an emulsion consisting of white spirit and an aqueous phase, the organic solvent not being recoverable on account of its flammability.

This invention provides a continuous dyeing or printing process, wherein a textile material, preferably consisting at least in part of synthetic fibres, is impregnated or printed with an emulsion of water and a halogenated aliphatic hydrocarbon preferably containing at least one water-insoluble dyestuff free from sulphonic acid groups, it being essential that at least one of the phases contains a thickener of high molecular weight, and the dyestuff thus applied is fixed by steaming or heating.

The emulsion-forming organic phase is a halogenated aliphatic hydrocarbon, for example, carbon tetrachloride, chloroform, methylene chloride, trichloroethylene, trichloroethane, tetrachloroethane, dibromoethylene and, in particular perchloroethylene.

The emulsion can be an oil-in-water emulsion or preferably a water-in-oil emulsion.

As a rule, the aqueous phase contains the high-molecular thickener, the latter being present in an amount less than 1% of the total weight of the emulsion, preferably less than 0.6%. In the process of the invention, there is no need for a washing operation after the fixation, because the amount of auxiliary left on the textile material is negligible and has no noticeable effect on the textile properties of the dyed or printed material, particularly when only disperse dyestuffs are used.

The following are examples of water-soluble viscous solids having a high intrinsic viscosity which, on dissolution, increase the viscosity of the aqueous phase; natural substances, for example, tragacanth, alginates, dextrans, dextrans, vegetable gums, for example, British gum, cellulose derivatives, for example, methyl cellulose, hydroxyethyl cellulose and carboxymethyl cellulose, starches and starch derivatives, for example, wheat starch or hydroxyethylated starch, and locust bean flour, and also synthetic polymers, for example, polyvinyl alcohol, and copolymers of free acrylic or methacrylic acid.

In order to render subsequent washing of the printed material unnecessary, the amount of high-molecular thickener used should not be more than 1% by weight per unit of weight, referred to the dry substance.

However, the additive used to increase viscosity can also be added to the organic phase, preferably in an amount of less than 1% of the total weight of the emulsion; in this case, resins soluble in organic solvents, selected cellulose esters and ethers, for example, ethyl cellulose or hydroxypropyl cellulose must be used.

The process can be used for textile materials consisting at least in part of synthetic fibres, for example, acrylic or acrylonitrile fibres, polyacrylonitrile fibres and fibres made from copolymers of acrylonitrile and

other vinyl compounds, for example, acrylic esters, acrylic amides, vinylpyridine, vinyl chloride or vinylidene chloride, copolymers made from dicyanoethylene and vinyl acetate and also from acrylonitrile block copolymers, fibres made from polyurethanes, cellulose triacetate and secondary acetate, fibres made from polyamides, for example, nylon 6, nylon 6.6 or nylon 12, and especially fibres made from aromatic polyesters, for example, from terephthalic acid and ethylene glycol or 1,4-dimethylolcyclohexane, and copolymers of terephthalic and isophthalic acid and ethylene glycol, and also fibres made from unmodified polypropylene, basified polypropylene or polypropylene modified with nickel.

The material may be made entirely of synthetic fibres or it may consist of a mixture of natural and synthetic fibres, for example a mixture of synthetic fibre and wool, or a mixture of synthetic fibre and cellulosic fibre, for example, cotton or a regenerated cellulose fibre.

The textile material can be in the form of woven fabrics, knitted fabrics, non-woven fabrics, needle-tufted carpets, flock carpets and needle felt carpets.

The choice of dyestuff depends on the nature of the substratum to be coloured. For example, textile materials made from polyester fibres are dyed or printed with disperse dyestuffs, materials made from polypropylene with selected disperse dyestuffs, polyamide materials with acid, metal-complex, disperse or fibre-reactive disperse dyestuffs, acrylonitrile materials with basic or quaternated dyestuffs, wool materials with acid or metal-complex dyestuffs and cellulosic materials with substantive or fibre-reactive water-soluble dyestuffs. When the organic and/or aqueous phase contain dyestuffs having fibre-reactive groups, an agent capable of binding acid must be added to the dye liquor either at the commencement or during the dyeing process when cellulosic fibres are being dyed. The common agents are used, for example, sodium or potassium bicarbonate, ammonia, sodium carbonate, potassium carbonate, alkali metal hydroxide or alkaline earth metal hydroxides or sodium acetate, or, when dyeing union fabrics made from cellulosic fibres and linear polyesters, particularly sodium trichloroacetate and the like.

In some circumstances it can be advantageous to use compounds that increase the capacity of the dyestuffs to react with the cellulose ("catalysts"). Examples of such compounds are, in particular, tertiary amines or hydrazines. The adjuvants commonly used in dyeing, for example, urea, can also be present in the dye liquor.

In a preferred embodiment of the invention, the emulsion must contain at least one water-insoluble dyestuff, especially a disperse dyestuff, and the dyestuff must be at least partially dissolved in a halogenated hydrocarbon.

Of special interest are systems that additionally contain a water-soluble dyestuff which is dissolved in the aqueous phase, the said dyestuff preferably being an acid wool dyestuff or a substantive cotton dyestuff, or particularly a fibre-reactive dyestuff. Of special value are systems that contain a normal disperse dyestuff at least partially dissolved in the organic phase and a water-soluble fibre-reactive dyestuff dissolved in the aqueous phase. With these dyestuffs it is possible to dye union fabrics consisting of cellulosic fibres, especially cotton, and hydrophobic fibres, especially polyester fibres.

Suitable disperse dyestuffs are, for example, azo dyestuffs of the formula