United States Patent Office

3,493,320
Patented Feb. 3, 1970

3,493,320

TEXTILE TREATMENT

John William Case and Wilfred Arthur Stephen White, Runcorn, England, assignors to Imperial Chemical Industries Limited, London, England, a corporation of Great Britain

No Drawing. Filed Nov. 4, 1966, Ser. No. 591,989
Claims priority, application Great Britain, Nov. 9, 1965, 34,007/65
Int. Cl. D06l *1/02*
U.S. Cl. 8—137 12 Claims

ABSTRACT OF THE DISCLOSURE

There is provided an improvement in the process of scouring textile materials with halogenated solvents wherein the textile is enclosed in a vessel and the halogenated solvent is circulated through the textile material. Suitably the textile is carried on a perforated hollow mandrel which is closed at one end and which is mounted within the vessel. Optionally the solvent is circulated through the mandrel and then through the textile material, but the direction of circulation may be reversed. After solvent scouring the textile is rinsed, preferably with warm water.

This invention relates to a textile treatment process, and more particularly to a process for the scouring of textile materials.

It is known to remove oily and greasy matter from textile materials by scouring with aqueous alkaline solutions or by extraction with organic solvents, particularly chlorinated hydrocarbon solvents. This latter process may be termed "solvent-scouring."

Among the various techniques available for the treatment of texitle materials, there is the so-called "beam dyeing" method. This involves placing a hollow mass of textile material (e.g. a roll of cloth or a spool of wound yarn) in a closed vessel and circulating a liquid through the mass either towards the centre or outwards from the centre. The liquid used may be an aqueous dye-liquor or an aqueous scouring solution.

We have now found that this "beam dyeing" technique can be used to achieved scouring of textile materials by means of organic solvents.

According to the present invention we provide a process for scouring textile materials which comprises enclosing the textile material in a vessel and circulating an organic solvent through the textile material.

The textile material which may be any natural or synthetic textile material, including for example cotton, wool, nylon, polyester, cellulose acetates or mixtures thereof, may be conveniently in woven, knitted, or yarn form, but alternative forms such as carded webs may be treated. The material may be made up into any hollow form (e.g. rolls, spools or bobbins) which permits liquid to be circulated through it. The circulation is usually effected by way of a hollow perforated tube which is closed at one end and which is positioned within the textile material, and through which the liquid can be fed in or drawn out.

The organic solvent can be used at room temperature or at an elevated temperature for example up to the boiling point, depending upon the particular solvent and textile material employed, but in order to minimise the risks of sudden variations in pressure, care should be taken when hot solvent and water are together within the vessel. For example, if the textile material contains any natural moisture (and most textile materials do unless they are specially and rigorously dried) contact with hot

solvent will cause a sudden range of vapours to form. Accordingly, we prefer to pump the hot solvent so that it flows outwards first, until the water content of the textile material has been vaporised and removed from the system, and after that the direction of flow of the solvent can be in either direction, or in alternate directions, as desired. Similar precautions and direction of flow should be employed when subsequently displacing the solvent from the textile materials by contact with hot water or steam. A convenient procedure in this case comprises introducing the water at a temperature of from room temperature to about 60° C., but preferably not greater than 70° C., and to raise the temperature of the water during its circulating to 90° C. to 95° C., for example by including a heat exchanger in the circulating system.

The apparatus used can be any conventional form of beam-dyeing apparatus, the materials of construction being chosen to minimise corrosion risks. Such apparatus will normally incorporate a pressure relief valve. In addition, for economic and safe working, the apparatus will usually be provided with a vapour duct of sufficient capacity to lead off solvent/water vapour mixtures from the vessel to a condenser system in which the solvent is recovered; this should also incorporate conventional devices such as a distillation unit for separating solvent liquid from water so that the solvent can be recovered for re-use.

During use of the apparatus, the water/solvent vapour mixtures are led off to the condenser until no more water is evolved, and then the system can be operated in the same way as conventional beam-dyeing apparatus, the solvent being circulated through the textile material as long as is required. Following the main solvent treatment, a rinsing treatment with clean solvent may be employed.

The organic solvent may be in particular a chlorinated hydrocarbon solvent, for example trichloroethylene or perchloroethylene, or a chlorofluoro-hydrocarbon for example 1:1:2-trichloro-1:2:2-trifluoroethane. Mixtures of organic solvents may be employed.

The particular solvent and operating temperatures may be chosen to suit the particular textile material concerned, and to avoid any damage to it. The solvent treatment can conveniently be carried out at room temperature, and the solvent can be removed by a subsequent treatment with warm or hot water, or steam, to flash off the solvent.

The invention is illustrated by the following example.

EXAMPLE

A sample of a cellulose acetate knitted fabric was wound on a hollow perforated mandrel having a closed end. The mandrel was then enclosed in a conventional beam-dyeing machine adapted to circulate trichloroethylene at room temperature. Trichloroethylene at room temperature was circulated through the fabric from the inside to the outside for about 8 minutes. The resulting contaminated trichloroethylene was then withdrawn from the machine and was replaced by clean trichloroethylene, which was circulated through the fabric for 2 minutes to rinse the fabric. This rinse liquor was then removed and was replaced by water at 60° C. The water was circulated through a heat exchanger until the temperature within the vessel increased to 95° C. The solvent/water vapour mixture so formed was withdrawn to a condenser and distillation system wherein the solvent was recovered for re-use. When this temperature had been attained, the water was withdrawn from the vessel and the fabric was removed and examined. The fabric was substantially free from trichloroethylene.

A small weighed sample of the fabric was extracted

with 1:1:2 - trichloro - 2:2:1 - trifluoroethane for 4 hours in a Soxhlet extractor. The residue, after removal of entrained 1:1:2-trichloro-2:2:1-trifluoroethane was weighed, and the percentage by weight of contaminants (mainly wax) in the fabric was then determined. For purposes of comparison a weighed sample of the fabric prior to the treatment with trichloroethylene was extracted as above to determine the percentage by weight of contaminants in this sample. The results are shown in the table below.

The above procedure was then repeated five times except that the cellulose acetate fabric was replaced respectively by the following knitted fabrics:

Expt. No.:	Fabric
2	Polyester (Dacron).
3	Viscose rayon (Avril)—55 denier.
4	Nylon—15 denier.
5	Nylon—30 denier.
6	Nylon—40 denier.

The results are shown in the table below:

TABLE

Expt. No.	Percent wax content (untreated fabric)	Percent wax content (treated fabric)
1	2.5	0.04
2	0.94	0.09
3	2.4	0.05
4	0.36	0.05
5	1.0	0.13
6	0.5	0.09

These results show that the various fabrics were effectively scoured by the treatment.

What we claim is:

1. In a process for scouring textile materials with an organic solvent selected from the group consisting of chlorinated and chlorofluorinated lower hydrocarbons, the improvement which comprises enclosing the textile material in a vessel and circulating the said organic solvent through the textile material.

2. A process as claimed in claim **1** wherein the textile material is carried on a perforated hollow mandrel which is closed at one end and which is mounted within the vessel.

3. A process as claimed in claim **1** wherein the treatment with organic solvent is followed by a rinse with clean organic solvent.

4. A process as claimed in claim **1** wherein the organic solvent is used at room temperature.

5. A process as claimed in claim **1** wherein water is circulated through the textile material subsequent to the treatment with organic solvent.

6. A process as claimed in claim **2** wherein the organic solvent is initially circulated outwards from the mandrel through the textile material.

7. A process as claimed in claim **6** wherein the direction of circulation of the organic solvent is reversed at predetermined intervals of time.

8. A process as claimed in claim **3** wherein the organic solvent used to rinse the textile material is the same as the organic solvent used in the initial treatment.

9. A process as claimed in claim **5** wherein warm water is used.

10. A process as claimed in claim **9** wherein the temperature of the water is not greater than 70° C.

11. A process as claimed in claim **9** wherein the temperature of the water is raised during circulation to 90° C. to 95° C.

12. A process as claimed in claim **11** wherein the temperature of the water is raised by circulating the water through a heat exchanger incorporated in the system.

References Cited

UNITED STATES PATENTS

3,404,943 10/1968 Morris ..... 8—142

MAYER WEINBLATT, Primary Examiner

U.S. Cl. X.R.

8—139, 139.1, 142