United States Patent Office 3,701,627 Patented Oct. 31, 1972

3,701,627

PROCESS FOR THE CHEMICAL CLEANING OF TEXTILES

Werner Grunewalder, Dusseldorf-Holthausen, Germany, assignor to Henkel & Cie G.m.b.H., Holthausen, Germany

No Drawing. Filed Jan. 27, 1971, Ser. No. 110,345
Claims priority, application Germany, Jan. 30, 1970, P 20 04 232.4
Int. Cl. D06l 1/00
U.S. Cl. 8—142 4 Claims

ABSTRACT OF THE DISCLOSURE

A process for the chemical cleaning of textiles which comprises treating soiled textiles with a clear water-containing organic solvent mixture consisting essentially of (A) from 20% to 40% by volume of a halogenated hydrocarbon having from 1 to 2 carbon atoms, (B) from 55% to 70% by volume of a monohydric alcohol having from 2 to 5 carbon atoms selected from the group consisting of alkanols and ethylene glycol monoalkyl ethers, and (C) from 5% to 12% by volume of water and recovering cleaned textiles.

THE PRIOR ART

The wet washing of very dirty textiles by means of solvent-containing washing compositions in an aqueous bath is known. The content of organic solvents enables obstinate fatty contamination also to be removed relatively well from the textile material. Extremely heavily soiled textile clothing, however, such as for example, mechanics working clothes, mops or cleaning rags, working clothes from varnish or lacquer works and so on, cause difficulties. With these articles the cleaning results are not satisfactory, since such heavy and obstinate soiling is frequently not completely removed. Moreover, in the case of such washing processes an extremely heavyily contaminated waste water is obtained, which cannot be passed into the main sewer without expensive clarification.

On the other hand, a customary chemical dry cleaning with halogenated hydrocarbons or petroleum hydrocarbons with use of cleaning intensifiers and relatively small additions of water, which are generally of the order of up to 1% by volume, does make possible a good removal of the fat-containing dirt. The removal of water-soluble dirt particles, however, is frequently insufficient owing to the relatively small amounts of water, when very heavily contamimnated pieces of clothing are present.

OBJECTS OF THE INVENTION

An object of the invention is to free heavily soiled textiles from water-soluble and solvent-soluble dirt satisfactorily and with avoidance of waste water problems.

Anoher object of the invention is the development of a process for the chemical cleaning of textiles which comprises treating soiled textile with a clear water-containing organic solvent mixture consisting essentially of (A) from 20% to 40% by volume of a halogenated hydrocarbon having from 1 to 2 carbon atoms, (B) from 55% to 70% by volume of a monohydric alcohol having from 2 to 5 carbon atoms selected from the group consisting of alkanols and ethylene glycol monoalkyl ethers, and (C) from 5% to 12% by volume of water and recovering cleaned textiles.

These and other objects of the invention will become more apparent as the description thereof proceeds.

DESCRIPTION OF THE INVENTION

According to the invention, these objects are achieved by a process for the chemical cleaning of textiles with a water-containing mixture of organic solvents, in which a clear solvent mixture comprising (A) 20% to 40% by volume of a halogenated hydrocarbon having 1 or 2 carbon atoms, (B) 55% to 70% by volume of an aliphatic alcohol or a glycol monoether having 2 to 5 carbon atoms and (C) 5% to 12% by volume of water, is used. In order to intensify the cleaning action, the usual surface-active cleaning intensifiers may be co-employed, if desired.

Preferably, the clear water-containing solvent mixture utilized in the invention consists essentially of (A) from 20% to 40% by volume of a halogenated hydrocarbon having from 1 to 2 carbon atoms selected from the group consisting of chlorinated hydrocarbons, fluorinated hydrocarbons and chlorofluorinated hydrocarbons, (B) from 55% to 70% by volume of a monohydric alcohol selected from the group consisting of alkanols having 2 to 4 carbon atoms and ethylene glycol monoalkyl ethers having from 3 to 5 carbon atoms, (C) from 5% to 12% by volume of water and (D) from 3 to 10 g./liter of surface-active cleaning intensifiers.

The chlorinated hydrocarbons used as component (A) in the solvent combination are those customary in chemical cleaning, as for example, perchlorethylene, trichlorethane, trichloroethylene or carbon tetrachloride, and also fluorinated chloro-hydrocarbons, as for example, trifluorotrichloroethane, monofluorotrichloromethane and so on. The fraction of halogenated hydrocarbons or mixtures thereof in the cleaning bath preferably amounts to about 25% to 30% by volume.

Lower, primary or secondary aliphatic monohydric alkanols with 2 to 4 carbon atoms, such as ethanol, propanol, isopropanol, primary or secondary butyl alcohols, as well as ethylene glycol monoethers with 3 to 5 carbon atoms, such as ethylene glycol methyl ether, ethylene glycol ethyl ether or ethylene glycol propyl ether, may be used as component (B). The fraction of these alcohols or glycol ethers or mixtures thereof in the solvent combination preferably amoumnts to about 60% to 65% by volume.

The chlorinated hydrocarbons and the alcohols are admixed and to this mixture, as component (C), is added the desired quantity of water, preferably about 10% by volume. The solvent combination gives an optically clear liquid which has no tendency to cloudiness or separation into phases. For the improvement of its cleaning action, surface-active cleaning intensifiers may suitable be used, such as such as higher alkyl sulfonates or alkylaryl sulfonates, such as higher alkylphenyl sulfonates, higher fatty alcohol sulfates, adducts of ethylene oxide or propylene oxide to higher fatty alcohols or higher alkylphenols and the like. Usually, the amount of cleaning intensifiers in the mixture is about 3 to 10 g./liter.

Since the solvent combination may be distilled off from contaminated cleaning baths without difficulty, the cleaning process can be carried out in the usual chemical dry cleaning machines after removal of or on bypassing of

the water separator. The dirty liquor is only cleaned by distillation. Filtration is not needed. Following on the actual cleaning process, rinsing with clean solvent mixture or with a pure halogenated hydrocarbon, to which may be added the usual additives according to the kind of textiles cleaned and the result desired for the goods, such as brighteners, finishing auxiliaries, antistatic agents, water-repellent treatment substances and the like, is suitable carried out. In the cleaning of white textiles, optical brighteners can be used in the rinsing bath with particular advantage. The rinsing liquor, if it is the solvent mixture of the invention, usually serves as a first washing liquor for the next cleaning charge.

The solvent combinations of the invention have an excellent cleaning action even in the case of the heaviest contaminations. It is, however, to be noted that the solvent mixture of the invention is not suitable for cleaning textiles sensitive to moisture, since owing to its relatively high water content, it may cause damage such as shrinking.

The following examples are illustrative of the practice of the invention without being deemed limitative in any respect.

EXAMPLE 1

9 kg. of working clothes soiled with lacquer were cleaned in a closed and explosion-proof airtight cleaning machine in a solvent mixture which consisted of 20 liters of trichloroethylene, 70 liters of ethylene glycol ethyl ether and 10 liters of water. After a cleaning time of 15 minutes, after pumping off the liquor into the distillation apparatus, the clothes were centrifuged and dried in the usual way. The cleaning effect on the working clothes so treated was excellent and distinctly better than in the case of clothes wet washed or cleaned by a normal chemical dry cleaning process used for comparison.

EXAMPLE 2

5 kg. of oil- and fat-contaminated white overalls of a cotton-polyester mixed fabric were cleaned in the cleaning plant mentioned in Example 1, with a solvent which consisted of 25 liters of perchloroethylene, 70 liters of ethanol and 5 liters of water. After a cleaning time of 15 minutes with the addition of 3 g. per liter of a product of addition of 9 mols of ethylene oxide to nonylphenol, the cleaned goods were centrifuged. The dirty solvent recovered was distilled. The cleaned goods were then treated for 5 minutes with 80 liters of clean solvent of the same composition with addition of 0.2 g. per liter of bath liquor of an optical brightener ["Uvitex" (registered trademark) ERN conc.]. This liquor was pumped back into the tank and used as prewashing liquor for the next charge.

In order to make a comparison possible, 5 kg. of the dirty overalls were washed in a domestic washing machine at the boiling temperature with addition of a commercial full washing composition. A further experiment was carried out in a normal chemical dry cleaning plant with addition of a solution, consisting of 0.2 g. of the above-mentioned optical brightener, 2 cc. of water and 5 g. of an adduct of 5 mols of ethylene oxide to nonylphenol per liter of perchlorethylene, for 15 minutes at 20° C. with constant filtration of the liquor.

To determine the brightening, the overalls were measured at 10 different places with a photoelectric device for measuring the degree of whiteness (Elrepho device of Zeiss), and these measurements were repeated at the marked places after the cleaning or washing. To obtain the percentage brightening, a portion of fabric was, at the same time, measured in the clean state. The following average values were obtained.

Cleaning:	Reflectometer measurement percent brightening
After the process of the invention	66
After the domestic wash	62
After the usual chemical cleaning	58

The comparative values show that, according to the invention, better cleaning results can be obtained than by a usual chemical dry cleaning or boiling wash.

EXAMPLE 3

In the cleaning plant mentioned in Example 1, 7 kg. of cleaning clothes from a printing shop were cleaned in a bath which consisted of 30 liters of perchlorethylene, 60 liters of isopropanol and 10 liters of water. The dirty liquor was distilled after centrifuging, and the solvent mixture distilled over completely in a temperature range from 77° to 81° C.

The cleaned clothes, after centrifuging, were rinsed for 5 minutes with clean solvent mixture, and, after centrifuging again, were dried with warm air as usual. A satisfactory cleaning effect was obtained.

A further experiment was carried out in the same way, but with the difference that 2 g. per liter of sodium dodecylbenzenesulfonate and 1 g. per liter of the adduct of 5 mols of ethylene oxide to nonylphenol were added to the cleaning bath liquor. A further clearly visible improvement of the cleaning effect was attained.

EXAMPLE 4

In the cleaning plant mentioned in Example 1, 6 kg. of mechanics' clothing of material made of polyamide fiber were cleaned in a bath which consisted of 35 liters of trifluorotrichloroethane, 60 liters of ethylene glycol methyl ether and 5 liters of water, for 20 minutes at a temperature of 20° C. Then, after centrifuging, the cleaning liquor was distilled off and the goods being cleaned were rinsed for 5 minutes. The rinsing liquor consisted of the same combination of solvents, but it also contained 2 g. per liter of a phosphated fatty alcohol-ethylene oxide adduct as an antistatic agent. At the end of the rinsing operation, the liquor was pumped back into the tank and the cleaned charge was centrifuged and dried in the usual way.

The clothes so treated were satisfactory as regards the cleaning effect and the antistatic action.

EXAMPLE 5

In the cleaning plant mentioned in Example 1, 6 kg. of nylon protective clothing were cleaned in a bath which consisted of 40 liters of carbon tetrachloride, 55 liters of ethylene glycol ethyl ether and 5 liters of water, with addition of 10 g. per liter of lauric acid diethanolamide for 20 minutes. After centrifuging, the liquor was distilled off and the cleaned goods were finished with a further solvent bath of the same composition also containing 3 g. per liter of a ketone-allehyde resin condensate for 5 minutes. Then, the liquor was pumped back into the tank and the textiles were centrifuged in the usual way and dried with warm air.

The protective clothing treated was clean and had a uniform and good finish.

The preceding specific embodiments are illustrative of the practice of the invention. It is to be understood, however, that other expedients known to those skilled in the art may be employed without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A process for the chemical cleaning of textiles which comprises treating soiled textiles with a clear water-containing organic solvent mixture consisting essentially of (A) from 20% to 40% by volume of a halogenated hydrocarbon having from 1 to 2 carbon atoms selected from the group consisting of chlorinated hydrocarbons, fluorinated hydrocarbons and chlorofluorinated hydrocarbons, (B) from 55% to 70% by volume of a monohydric alcohol having from 2 to 5 carbon atoms selected from the group consisting of alkanols and ethylene glycol monoalkyl ethers, and (C) from 5% to 12% by volume of water and recovering cleaned textiles.

2. The process of claim 1 wherein said solvent mixture contains 3 to 10 gm. per liter of surface-active cleaning intensifier selected from the group consisting of higher

alkyl sulfonates, higher alkylphenyl sulfonates, higher fatty alcohol sulfates and adducts of ethylene oxide and propylene oxide to higher fatty alcohols and higher alkylphenols.

3. The process of claim 1 wherein said cleaned textiles are rinsed with said clear water-containing organic solvent mixture.

4. The process of claim 1 wherein said water-containing organic solvent mixture is recovered after treating said soiled textiles and thereafter distilled.

References Cited

UNITED STATES PATENTS

3,163,493 12/1964 Hess ..... 8—142

MAYER WEINBLATT, Primary Examiner

U.S. Cl. X.R.

8—137, 139, 139.1; 252—170, 171