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3,490,948

METHOD OF APPLYING NOXIOUS
CLEANING CHEMICALS

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2 Claims

ABSTRACT OF THE DISCLOSURE

Process for cleaning by using a foamable cleaning composition containing constituents which include eye, nose, and skin irritants. The foam which contains at least 90% by volume of gas, is applied to an open surface to be cleaned and is subsequently removed by rinsing. The process eliminates hazards to personnel when the noxious compositions are used.

This invention relates to a process for applying noxious cleaning chemicals to open surfaces without the formation of mist or overspray, eliminating the usual hazards to operating personnel when the noxious compositions are used.

In summary, the process of this invention is a method for cleaning open surfaces with noxious cleaning compositions containing eye, nose, or skin irritants comprising applying an aqueous foam containing the noxious cleaning composition to the open surface to be cleaned, and rinsing the foam from the surface with water.

Spray cleaning of open surfaces such as exteriors of trucks, tractor trailers, aircraft, and the interiors of factories, storage tanks and other open areas is widely used because less labor is required to apply the cleaning liquids to the open surfaces. In general, relatively mild cleaning compositions are used in these spray cleaning operations. Many of the most active cleaning compositions, however, contain strong chemicals such as strong acids or bases, volatile irritants, or other chemicals which cannot be used in spray cleaning open surfaces because they are hazardous to operating personnel. These strong noxious chemicals, through distillation, mist, or overspray offer potential danger to the eyes, nose, and skin of the operating personnel.

It is the object of this invention to provide a process for cleaning open surfaces with cleaning compositions containing noxious chemicals which is not subject to the above hazards. This object is obtained by applying the strong cleaning compositions to the open surfaces as a stable foam, eliminating misting, over-spray, and irritating vapors, and reducing the chance of irritating contact with personnel.

Foam cleaning is effected by pumping high foam cleaning solutions in a mechanical system in which compressed gases non-reactive with the cleaning chemicals, such as air, are mixed with the cleaning solution to produce a stable, copious foam. This "dry" foam clings to the surfaces to be cleaned, increases the contact time of the liquid with the surfaces, prevents rapid drying and run-off of the liquid cleaner, splashing, over-spray, misting, and distillation of irritating vapors of the liquid solutions into the air.

Foam cleaning has been previously disclosed for cleaning closed vessels with foams containing strong acids to eliminate scale from the vessel walls in Brenner et al. U.S. Patent 3,037,887, the disclosure of which is incorporated herein by reference for background information. In the process of Brenner et al., the vessel to be treated was filled with foam containing a strong acid and other chemi-

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cals, and further foam was passed through the closed vessel until the vessel walls had been descaled. In the closed vessel, no hazards to operating personnel were present, and the foam was employed to decrease the volume of cleaning solution required since it was necessary to entirely fill the closed vessel with the cleaning solution to effect descaling.

The process of this invention is a method for cleaning exposed surfaces by spraying foamed cleaning compositions on the open surfaces. Any method for mixing gas with the cleaning solution to form a stable foam can be employed. Application Ser. No. 534,378, filed Mar. 15, 1966, discloses a suitable foam generating apparatus which feeds compressed air and the foamable liquid to a gas-liquid mixing means where the gas and liquid is mixed to form a foam, and discharges the foam through an outlet conduit. Another suitable device is shown in Patent No. 1,141,243. A variety of systems are summarized in Patent No. 2,916,855.

The method of applying the foam to the surface being cleaned is not critical, but spray application is preferred.

The process of this invention is suitable for applying a foam formed from an foamable cleaning composition containing irritating concentrations of noxious or hazardous chemicals. Since the irritating aspects of spraying liquids containing these noxious components is avoided, more concentrated and active cleaning compositions can be used to clean open surfaces.

Suitable concentrated foamable cleaning compositions containing hazardous chemicals which are suitable for cleaning open surfaces are disclosed in application Ser. No. 540,212 filed Apr. 5, 1966. The particular foamable compositions used in the process of this invention are not critical, but the compositions must be capable of forming a stable foam when mixed with air. In the concentrations applied to the soiled surface, a foam of the compositions containing 90 volume percent air should retain 25 percent of its volume and preferably at least 50 percent of its volume 10 minutes after being applied to the surface.

The method of this invention is particularly suitable for applying cleaning compositions containing mineral acids such as sulfuric and hydrochloric acids, sulfamic acid, or containing alkaline irritants such as caustic soda, potash, and highly basic amines.

The cleaning foamable composition is mixed with sufficient gas to provide a foam containing at least 90 volume percent and preferably less than 97 volume percent gas. Any suitable gas which is non-reactive with the components of the cleaning composition can be used. Examples of suitable gases include nitrogen, carbon dioxide, air, and halogenated hydrocarbon gases.

After the cleaning foam is applied to the soiled surface and when the cleaning action is complete, the residual foam and cleaning composition can be rinsed from the surface, preferably with a water wash. The rinse can contain neutralizing chemicals, defoaming compounds, and conventional rinse surfactants to promote the rinsing action and prevent deposit of residue on the cleaned surfaces.

The invention will be further illustrated by the following specific but non-limiting examples.

EXAMPLE I

A foaming assistant containing, in parts by weight as described in Ser. No. 540,212 filed Apr. 5, 1966, 21 parts water, 31 parts of a sodium salt of dodecyl benzene sulfonic acid, 33 parts of a sodium salt of sulfonated oleic acid, and 15 parts of an ethylene oxide condensate of coconut fatty acid monoethanolamide containing an average of about 5 ethoxy groups (C_2H_5O) per mole is prepared.

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A cleaning solution containing 0.5 pounds per gallon of an industrial cleaner containing, by weight, 70 parts caustic soda, 14 parts sodium metasilicate, 5 parts sodium tripolyphosphate, 5 parts tetra sodium pyrophosphate, and 4 parts soda ash is prepared. One gallon of an 80 weight percent solution of the foaming assistant is added per 50 gallons of the cleaning solution.

The foamable cleaning composition is then mixed with 90-97 volume percent air in the foaming device described in application Ser. No. 534,378 filed Mar. 15, 1966, now U.S. Pat. No. 3,337,195, and the foam is applied to a soiled surface. After 15 minutes, the remaining foam, dirt, and residual cleaning agent is rinsed from the surface.

At no time during the application of the foam cleaning composition to the surface being cleaned is the operating personnel contacted with mists, sprays, or vapors of the highly alkaline cleaner.

EXAMPLE II

The procedure of Example 1 is followed with the three following foaming compositions:

(a) a solution containing 0.5 pounds per gallon of a caustic cleaning composition containing, by weight, about 70 parts caustic soda and 28 parts soda ash is mixed with one gallon of the foaming assistant described in Example 1 per 50 gallons of solution.

(b) a solution containing about 0.25 pounds per gallon of a caustic cleaning composition comprising, by weight, 60 parts chlorinated trisodium phosphate, 23 parts soda ash, and 17 parts sodium tripolyphosphate is mixed with 0.25 gallons of the foaming assistant described in Example 1 per 50 gallons of solution.

(c) a solution containing about 0.5 pounds per gallon of an acid cleaning composition comprising about 90 parts by weight sulfamic acid is mixed with 5 gallons of the foaming assistant described in Example 1 per 50 gallons of solution.

When the foamed cleaning compounds are applied to the surface being cleaned, splash-back, misting, and irritating vapors and mists are not evident, even though each of the compounds contains hazardous chemicals.

Obviously, many modifications and variations of the invention as hereinabove set forth can be made without departing from the essence and scope thereof, and only such limitations should be applied as are indicated in the claims.

The invention claimed is:

1. A process for cleaning which comprises:

(A) mixing a foamable cleaning composition formed of:

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(1) a foaming assistant containing 21 parts by weight water, 31 parts by weight of a sodium salt of dodecyl benzene sulfonic acid, 33 parts by weight of a sodium salt of sulfonated oleic acid, and 15 parts by weight of an ethylene oxide condensate of coconut fatty acid mono-ethanolamide containing an average of about 5 ethoxy groups (C_2H_5O) per mole, and

(2) a cleaning solution consisting of about 0.25 pounds per gallon of water of a caustic cleaning composition containing 60 parts by weight of chlorinated trisodium phosphate, 23 parts by weight of soda ash, and 17 parts by weight of sodium tripolyphosphate; 50 gallons of said caustic cleaning composition combined with 0.25 gallon of an 80 weight percent solution of said foaming assistant;

(3) with at least 90 volume percent gas;

(B) applying the foam prepared in step (A) to an open surface to be cleaned, said foam characterized as a stable, copious dry foam which clings to surfaces to be cleaned, prevents rapid drying and run-off of the liquid cleaner, without splashing, over-spray, misting, and distillation of irritating vapors of the liquid cleaning solution into the air; and

(C) rinsing the foam covered surface to remove residual cleaning composition.

2. The process of claim 1 wherein the foamable cleaning composition is mixed with less than 97 volume percent gas.

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