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AEROSOL OVEN CLEANSER

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3 Claims. (Cl. 252—154)

This invention relates to a cleanser preparation, the contents of which are particularly designed for use in effecting cleansing of ovens and other similar surfaces on which "burnt-on" fat or other deposits of greasy, oily or other character are encountered. More particularly, this invention relates to a cleanser package in which the contents are under pressure and which package is designed to dispense the contents, in the form of a foam, to effect the desired cleansing action.

It is among the objects of the present invention to provide a cleanser package for cleansing ovens and other similar surfaces, particularly iron, steel, copper and other metal surfaces (except aluminum) and surfaces coated with vitreous porcelain or other fired-on and/or alkali-resistant coatings, which cleanser package in use is efficient in effecting ready removal of dirt and deposits including difficultly removable "burnt-on" fat deposits, which cleanser effects such removal readily, which package permits ready application of the cleanser, i.e., by the simple operation of a push button or valve button, and which cleanser can be used safely, i.e., does not involve a fire hazard when applied to an oven or other heated surface which has been cooled to room temperature or near room temperature (25°–30° C.).

In accordance with this invention, the package comprises a dispensing pressure-tight container having a typical aerosol dispensing valve controlling flow through a discharge conduit leading to the base of the container, as shown, for example, in United States Patent 1,892,750 of January 3, 1933, and having in such container a cleanser concentrate containing as the essential constituents of the concentrate, caustic alkali, an alcoholic solvent for the alkali and other constituents of the cleanser as well as for the oils and fats, an amphoteric detergent, with or without a liquid non-ionic detergent, and a foam stabilizer or flow retarder which may be wax alone or a mixture of wax with ethyl cellulose or hydroxy ethyl cellulose, and also having in such container a propellant substantially soluble in the alcoholic type solvent and chemically inert to the cleanser constituents, i.e., the propellant will not react therewith either to render these constituents ineffective or to cause the propellant to hydrolyze or otherwise decompose and lose its effectiveness as a propellant. By "concentrate" as used herein is meant all of the constituents of the package except for the propellant.

As the caustic alkali, sodium hydroxide or potassium hydroxide is used. The caustic alkali employed should be substantially anhydrous. While a small amount of water is not objectionable in the case of a cleanser to be stored in glass containers (the use of metal containers is preferred), the cleanser should be substantially, preferably completely anhydrous to avoid corrosion of metal container walls. The amount of caustic alkali used based on the weight of the concentrate is from 1% to 10%, preferably about 4% by weight.

The solvent employed in the cleanser preparation is a mixture of a lower aliphatic alcohol, i.e., an aliphatic alcohol containing from 1 to 3 carbon atoms, such as methanol, ethanol or propanol and a volatile glycol having from 2 to 20 carbon atoms or volatile glycol ether having from 4 to 20 carbon atoms. The caustic alkali dissolves in the lower boiling aliphatic alcohol; the flash point of the solution, however, is too low so that there

is a possibility of the solution flaming when applied near or over an oven pilot light. To raise the flash point, the volatile glycol or ether glycol is added. Examples of such glycols and ether glycols are butoxy ethoxy propanol, hexylene glycol, ethoxy triglycol, methoxy triglycol, diethylene glycol monobutylether (butyl carbitol) and terpinyl ethylene glycol ether (Terposol No. 8). These glycols and ether glycols not only raise the flash point of the alcoholic constituent of the solvent mixture, but also improve the solvent properties of the solvent system with respect to effecting removal of "burnt-on" fats and other oily or greasy deposits.

The solvent system comprises from 4% to 60% by weight, preferably 10% to 30% by weight, of the concentrate. Of the amount of solvent employed from 4% to 20%, preferably 5% to 10%, is a low boiling aliphatic alcohol, and the rest a volatile glycol or glycol ether; the preferred content of the volatile glycol or glycol ether is about 5% to 20% based on the weight of the concentrate.

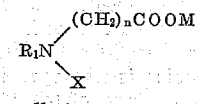
The foam stabilizer or flow retarder is wax with or without ethyl cellulose or hydroxy ethyl cellulose. The wax has a softening point of from 100° to 200° F. preferably 100° to 140° F. Any of the commercially available waxes such as crude scale wax, beeswax, microcrystalline wax, carnauba wax, and paraffin waxes may be used. The wax may be dissolved in the warm concentrate or may be added in any suitable form including pellet or powder form directly to the mixture of concentrate and propellant in the container where it will eventually dissolve.

As the ethyl cellulose, the so-called medium and standard ethoxy type ethyl cellulose sold by Dow Chemical Company and the GKN & T ethoxy type ethyl cellulose sold by the Hercules Powder Company can be used.

The amount of wax incorporated in the concentrate should be from 0.2% to 2% by weight. An amount within this range is also used when employing a mixture of wax and ethyl cellulose or hydroxy ethyl cellulose as the foam stabilizer or flow retarder. The amount of ethyl cellulose or hydroxy ethyl cellulose incorporated in the concentrate should be from 0.2% to 2% by weight preferably from 0.05% to 0.5% by weight based on the weight of the concentrate.

As the amphoteric detergent, any of the following may be used:

(1) Compounds having the formula:

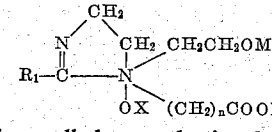


in which, R_1 is an alkyl group containing from 8 to 18 carbon atoms; n is an integer from 1 to 2; M is sodium, potassium, ammonium, monoethanolamine, diethanolamine or triethanolamine; and X is hydrogen or an ethoxylated group having from 1 to 20 carbon atoms.

These detergents are sold under the trade name Deriphat (General Mills). An example of such compounds is sodium N-lauryl β-aminopropionate.

The alkali metal salts of the ethoxylated acyl alkyl amines, in which the ethoxylated groups have from 1 to 20 carbon atoms, preferably 10 to 15, are sold under the trade name Triton QS–15 by the Rohm & Haas Co.

(2) Compounds having the formula:



in which R_1 is an alkyl group having from 8 to 18 carbon atoms; n is an integer from 1 to 2; M is sodium, po-

tassium, ammonium, monoethanolamine, diethanolamine or triethanolamine; and X is hydrogen or an ethoxylated group having from 1 to 20 carbon atoms.

Such amphoteric detergents are sold under the trade name Miranol (Miranol Chemical Company).

The non-ionic detergent employed may be any of the following, or a mixture thereof: polyoxypropylene polyoxy ethylene condensates (Pluronics), polyoxyethylene glycol esters of fatty acids (Ethofats), alkyl phenyl polyethylene glycol ethers (Tergitols), Igepals, polyoxyethylated fatty alcohols (Emulphor), Renex, fatty acid amides (Ninols), ethylene and propylene oxide addition products of ethylenediamine (Tetronics) and polyalkylene glycols (Ucons). These amphoteric and non-ionic detergents are liquid and their incorporation in the cleanser preparation can be effected without introducing any water into the system. This is important in a cleanser stored in and dispensed from metal containers.

The above noted amphoteric detergents used alone or with the non-ionic detergents improve the cleansing action in that they tend to dissolve fats and oils, to soften "burnt-on" deposits, to condition soil encountered on oven surfaces to facilitate their removal and also increase the flash point of the lower aliphatic alcohol constituent of the solvent system. The amphoteric detergent also inhibits attack on the container i.e. minimizes corrosion when employing metal containers, as customary, and also stabilizes the alkalinity of the product i.e. buffers the alkalinity.

The amount of amphoteric detergent, when used alone, incorporated in the concentrate is from 10 to 60% by weight. When used along with an non-ionic detergent, from 10 to 30% amphoteric detergent and 15 to 45% by weight based on the weight of the concentrate, of non-ionic detergent is incorporated in the concentrate. In general, the greater the amount of caustic alkali the lower the amount of detergent within the above noted ranges, and conversely, the smaller the amount of alkali the greater the amount of detergent employed within the ranges above noted.

The concentrate may also contain 2-ethoxy ethanol (Cellosolve), ethylene glycol monobutyl ether (butyl Cellosolve), or 2-phenoxyethanol (phenyl Cellosolve), in amount of from 0.2% to 40% based on the weight of the concentrate, preferably from 1% to about 25%. The Cellosolve, butyl or phenyl Cellosolve improves the solvent system and also facilitates the dissolution of the foam stabilizer or flow retarder in the cleanser. While a cleanser containing Cellosolve, butyl or phenyl Cellosolve is preferred, satisfactory results are obtained with cleansers not containing this constituent, hence the invention includes such cleansers as well as those containing Cellosolve, butyl or phenyl Cellosolve.

The propellant, which is employed in amount of from 25% to 75% of the contents of the container, preferably in amount of from 40% to 60%, the remainder being the concentrate, may be one or a mixture of the following: dichloro difluoro methane (Freon 12), tetrafluoro dichloro ethane (Freon 114), pentafluoro monochloro ethane (Freon 115), trifluoro trichloro ethane (Freon 113), cyclic hexafluoro dichloro butane (Freon C–316), octafluoropropane (Freon 218), cyclic octafluoro butane (Freon C–318), propane, butane, pentane, isobutane, hexane, heptane, octane, nonane and decane. The propellant employed should be chosen so that it has the desired vapor pressure at atmospheric temperature, i.e., generates a pressure within the container to effect dispensing of the cleanser, which pressure is within safe limits for the container in which the cleanser is disposed to produce the package. Also the propellant should not hydrolyze or otherwise react with the alkali in the system to lose its effectiveness as the propellant, nor should it react chemically with the alkali, detergent, solvent, flow retarder or other constituent of the cleanser to deleteriously affect their solvent or cleansing action.

The propellants above mentioned have been found suitable; the preferred propellant is a mixture of dichloro difluoro methane and tetrafluoro dichloro ethane in approximately equal proportions. These propellants employed in the proportions above indicated are soluble in the solvent system. Thus in the package the propellant is substantially completely dissolved in the concentrate and the contents are under the vapor pressure generated by the propellant usually of the order of from 40 to 65 pounds per square inch gauge. Upon opening the dispensing valve the contents emerge as a foam which covers the spot to be cleaned, softens the "burnt-on" deposits, reacts with the oils and fats to saponify them, emulsifies unreacted and reacted fats, oils and other soil present and in general conditions the charred fatty material and soil so that they are readily removed by a simple wiping action of the treated surface with an absorbent material such as cloth or paper. The surface to be cleaned should be wetted or moistened with water prior to spraying the cleaning mixture thereon. Water present on the surface activates the alkali and thus speeds the cleansing action.

When the cleanser mixture is stored in glass or other containers of a material not subject to corrosion by alkali, e.g., alkali resistant plastics such as polyethylene containers, the cleansing preparation may contain a small amount of water of the order of from 0.25% to 3% based on the weight of the concentrate. The presence of such amount of water aids in the cleansing action.

The following examples are illustrative of the present invention which, it will be understood, is not limited to these examples. In the examples which follow, the percentage values are on a weight basis. The propellant used in all examples was a mixture of Freon 12 and Freon 114 in equal proportions. Other propellants mentioned above can be substituted for the mixture of Freons 12 and 114 and would, of course, be selected to give the desired vapor pressure.

Group A Examples

These examples involved the use of sodium N-coco β-aminopropionate (Deriphat) as the amphoteric detergent.

Constituent	Ex. 1, percent	Ex. 2, percent
Sodium Hydroxide	2.25	2.25
Methanol	5.25	5.25
Butoxy Ethoxy Propanol	22.25	27.25
Amphoteric Detergent	10.00	20.00
Nonionic Detergent (Pluronic L–62)	15.00	
Wax (Microcrystalline M.P. 130° F.)	0.25	0.25
Propellant	45.0	45.0

Group B Examples

These examples involved the use of Triton QS–15 containing about 15 mols of ethylene oxide per mol of sodium acyl alkyl amine.

Constituent	Ex. 3, percent	Ex. 4, percent	Ex. 5, percent	Ex. 6, percent
Potassium Hydroxide	2.5	2.5	2.5	2.5
Methyl Alcohol	10.0	10.0	10.0	10.0
Butoxy Ethoxy Propanol	14.25	16.4		
Cellosolve	3.0	6.0		
Butyl Cellosolve			12.4	23.9
Ethyl Cellulose, 100 cps	0.15	0.1	0.1	0.1
Wax (Beeswax M.P. 125° F.)	0.1	1.0	0.5	0.7
Pluronic L–62	15.0	8.0	15.0	8.0
Amphoteric detergent	10.0	12.0	15.0	8.0
Water				2.5
Propellant	45.0	45.0	45.0	45.0

Other non-ionic detergents, such as those enumerated above, can be substituted for the Pluronic L–62 in the above examples; other amphoteric detergents can be substituted for those employed in the above examples; and other waxes can be used instead of the microcrystalline and the beeswax of the above examples.

In all cases the resultant products when applied, form an excellent foam, having exceptionally good cleansing action.

The above examples as well as other cleansers embodying this invention may be prepared by mixing the constituents of the concentrate at a temperature such that the wax dissolves i.e. 120–140° F., the mixture chilled to a temperature at or below the temperature at which the propellant is in the liquid phase and the chilled mixture introduced into the dispensing container.

Alternatively the constituents of the concentrate except the wax may be mixed at room temperature, the mixture chilled to a temperature at or below the temperature at which the propellant is in the liquid phase and the chilled mixture along with the wax introduced into the dispensing container. Thereafter the propellant under refrigeration and in the liquid phase is introduced into the dispensing container, dissolving in the solution of the concentrate. The container is then sealed. Upon standing, the temperature of the container rises to room temperature placing the concentrate under the vapor pressure of the propellant.

Upon opening of the valve which controls the discharge from the dispensing container, a stable foam results, which foam has little tendency to flow, blanketing the spot or spots to which it is applied and effecting softening and dissolving of "burnt-on" and other tenacious oily or greasy deposits which become emulsified and readily removable by a simple wiping treatment. After the "burnt-on" or greasy deposits become emulsified they are removed with either a damp cloth or sponge. If the deposit is heavy, a second application of the oven cleanser may be necessary or a steel wool or soap pad may be used to effect complete removal of such heavy deposits.

It will be noted that the present invention provides a cleanser particularly adapted for use in cleaning ovens and similar surfaces, which cleanser can readily be applied, is exceptionally efficient in use in effecting removal of "burnt-on" fatty deposits and is safe to use, presenting no fire hazards when applied to surfaces which are at room temeprature or near room temperature. In the case of the volatile combustible propellants mentioned (the hydrocarbons) there is a fire hazard if sprayed near or over a lighted pilot light. In the absence of a pilot light this hazard does not exist, e.g., it does not exist in the case of electric ovens, oven racks which are cleaned separately, charcoal grilles, etc.

This application is a continuation-in-part of our copending application Serial No. 769,585, filed October 27, 1958.

Since certain changes may be made in the above described cleanser and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

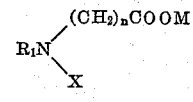
1. A package consisting of a pressure-tight container having a valve-controlled opening and containing a composition for use in cleansing ovens and similar surfaces and consisting of a substantially anhydrous cleansing concentrate and a volatile propellant dissolved in said cleansing concentrate, said package containing from 25% to 75% by weight of propellant with the rest being said concentrate, said concentrate being confined in the container under the vapor pressure of the propellant and consisting essentially of:

(1) from 1% to 10% by weight of a caustic alkali from the group consisting of sodium hydroxide and potassium hydroxide;

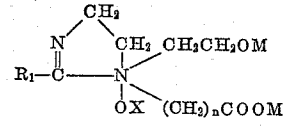
(2) from 4% to 60% by weight of an alcoholic solvent mixture, said mixture consisting of from 4% to 20% by weight of an aliphatic alcohol containing from 1 to 3 carbon atoms, and the rest of said mixture being a compound selected from the group consisting of a glycol containing from 2 to 20 carbon atoms and a glycol ether containing from 4 to 20 carbon atoms;

(3) a flow retarder compatible with the other constituents of said composition and which retards flow of said cleansing concentrate and stabilizes the foam produced by said concentrate, said flow retarder selected from the group consisting of from .2% to 2% of wax and mixtures of from .2% to 2% of wax with from .2% to 2% of a material from the group consisting of ethyl cellulose and hydroxy ethyl cellulose; and

(4) from 10% to 60% by weight of an amphoteric detergent from the group consisting of (1) detergents having the formula



in which R_1 is an alkyl group containing from 8 to 18 carbon atoms, n is an integer from 1 to 2, M is from the group consisting of sodium potassium, ammonium, monoethanolamine, diethanolamine and triethanolamine, and X is from the group consisting of hydrogen and an ethoxylated group having from 1 to 20 carbon atoms, and (2) detergents having the formula



in which R_1 is an alkyl group having from 8 to 18 carbon atoms, n is an integer from 1 to 2, M is from the group consisting of sodium, potassium, ammonium, monoethanolamine, diethanolamine and triethanolamine, and X is from the group consisting of hydrogen and an ethoxylated group having from 1 to 20 carbon atoms.

2. The package as defined in claim 1, in which said cleansing concentrate also includes from .2% to 40% by weight of a member selected from the group consisting of 2-ethoxy ethanol, ethylene glycol monobutyl ether and 2-phenoxy-ethanol.

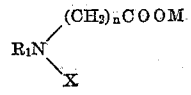
3. A package consisting of a pressure-tight container having a valve-controlled opening and containing a composition for use in cleansing ovens and similar surfaces and consisting of a substantially anhydrous cleansing concentrate and a volatile propellant dissolved in said cleansing concentrate, said package containing from 25% to 75% by weight of propellant with the rest being said concentrate, said concentrate being confined in the container under the vapor pressure of the propellant and consisting essentially of:

(1) from 1% to 10% by weight of a caustic alkali from the group consisting of sodium hydroxide and potassium hydroxide;

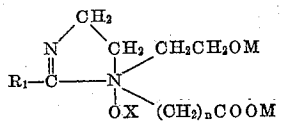
(2) from 4% to 60% by weight of an alcoholic solvent mixture, said mixture consisting of from 4% to 20% by weight of an aliphatic alcohol containing from 1 to 3 carbon atoms, and the rest of said mixture being a compound selected from the group consisting of a glycol containing from 2 to 20 carbon atoms and a glycol ether containing from 4 to 20 carbon atoms;

(3) a flow retarder selected from the group consisting of from .2% to 2% of wax and mixtures of from .2% to 2% of wax with from .2% to 2% of a member from the group consisting of ethyl cellulose and hydroxy ethyl cellulose;

(4) from 10% to 30% by weight of an amphoteric detergent from the group consisting of (1) detergents having the formula



in which R_1 is an alkyl group containing from 8 to 18 carbon atoms, *n* is an integer from 1 to 2, M is from the group consisting of sodium, potassium, ammonium, monoethanolamine, diethanolamine and triethanolamine, and X is from the group consisting of hydrogen and an ethoxylated group having from 1 to 20 carbon atoms, and (2) detergents having the formula



in which R_1 is an alkyl group having from 8 to 18 carbon atoms, *n* is an integer from 1 to 2, M is from the group consisting of sodium, potassium, ammonium, monoethanolamine, diethanolamine and triethanolamine, and X is from the group consisting of hydrogen and an ethoxylated group having from 1 to 20 carbon atoms; and

(5) from 15% to 45% by weight of a non-ionic detergent from the group consisting of polyoxypropylene polyoxyethylene condensates, polyoxyethylene glycol esters of fatty acids, alkyl phenyl polyethylene glycol ethers, polyoxyethylated fatty alcohols, fatty acid amides and ethylene and propylene oxide addition products of ethylenediamine.

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