

UNITED STATES PATENT OFFICE

2,166,476

MATERIAL FOR CLEANING AND PREPARING
METAL FOR PAINT

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8 Claims. (Cl. 148—8)

This invention relates to improved compositions and methods for cleaning metals preparatory to coating the same with paint, lacquer, enamel, oils, or other decorative, rust-proofing or finishing material.

Metal cleaning compositions of the acid type generally employ rust removing and metal etching acids, oil and grease solvents, wetting agents, and body building constituents, the latter being used when the cleaning composition is to be applied to other than horizontally disposed surfaces. Acid cleaning compositions are usually applied in the form of dilute water solutions and many such compositions, in practice, fail to wet uniformly the metal surfaces to which they are applied. In many instances, cleaning compositions of this character which have contained effective oil and grease solvents that normally lower surface tension of a water solution, do not have such action to a sufficient degree in the presence of high concentrations of metal etching acids. This prevents uniform distribution of the cleaning compositions over all parts of the metal surfaces to be cleaned with the result that rust aiding or rust promoting agents are not destroyed and rusting is not sufficiently inhibited. High surface tension characteristics of cleaning compositions cause the liquid to collect on metal surfaces in globules or in stringy, vein-like streaks which result in stains and non-uniform cleaning of the metal surfaces and prevent proper penetration into rust formations. Reduction of the high surface tension characteristics of a water solution of oil and grease solvents and acid constituents has been effected by the addition of surface tension reducing and wetting agents in instances where the concentration of metal etching acid was not too high. A high concentration of phosphoric acid in the working solution is often desirable in order to remove heavy rust and scale formations, destroy the more active rusting agents left by soldering compounds and to etch the metal sufficiently to produce a roughness or "tooth" on the surface of the metal so that prime coats or other finishing materials will more permanently adhere thereto.

The principal object of the invention is to improve the art of preparing metals for a coating material in such a manner as to inhibit rusting of the metal beneath the coating material.

Another object of the invention is to provide an improved metal cleaning composition having rust removing, rust inhibiting and oil dissolving properties, and which when applied in the form of a dilute water solution, forms a uniform film-

like coating on the surface of the metal irrespective of whether or not such metal surfaces are horizontally disposed.

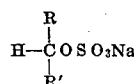
Another object is to provide a composition of this character which may be marketed in concentrated form and diluted with water to the desired extent prior to use.

A further object is to provide surface in a cleaning composition for reducing surface tension of the solution employed for cleaning and preparing metals for paint and especially in compositions employing high concentrations of acids.

Another object is to provide surface tension reducing agents in concentrated compositions of this character which function satisfactorily under various degrees of dilution of the compositions.

A still further object is to provide surface tension reducing agents in cleaning compositions which do not unduly increase the viscosity of the ultimate solution in which the cleaning materials are carried, but rather aid in causing the compositions to spread uniformly over the surfaces to be cleaned, to wet all parts of such surfaces and to assist in penetrating completely through rust or rust and grease or oil formations.

It has been found that when a water solution of certain sodium salts of the acid sulphates of multiple carbon saturated branched chain secondary alcohols having the general formula—



in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17 are added to cleaning compositions including rust removing, rust inhibiting and metal etching acids, such as orthophosphoric acid, and oil and grease solvent, such as an ethylene glycol mono-alkyl ether, or similar ether or acetate derivative of ethylene glycol, that the surface tension of a water solution of the composition is materially reduced. The water solutions of these salts are employed, such solutions containing approximately 25 per cent by weight, of the sodium salts of the acid sulphates of multiple carbon saturated branched chain secondary alcohols of the general formula given above. The water solutions of these salts are generally soluble in acid or alkaline solutions, are neutral and nonoxidizing, and possess remarkable wetting out properties which makes them applicable for speeding pene-

tration of aqueous solutions of acid cleaning compositions into porous materials or formations such as rust or other corrosion products on the surface of metals. The detergent properties of the water solutions of these salts compare favorably with those of the fatty alcohol sulphates, and the fatty acid amide sulphonates.

Two of these salts having 14 and 17 carbon atoms to the molecule, respectively, are wetting agents and detergents of general utility in textile paper and leather processing. The salt containing 17 carbon atoms to the molecule possesses very strong wetting qualities at low concentrations. The salt containing 14 carbon atoms to the molecule is generally similar to that containing 17 carbon atoms per molecule but is not quite as effective a wetting agent in neutral solutions. Its action as a wetting agent, however, is superior in solutions containing high concentrations of acid, which property makes this the preferred material for the present purpose. From one-eighth per cent to two per cent, by weight, of the above described sodium salts, preferably the sodium salt having 7 to 18 carbon atoms per molecule, has been found satisfactory.

Concentrated metal cleaning compositions which readily dissolve in water and form solutions having comparatively low surface tension characteristics, and which when applied to metal surfaces form uniform and continuous films, may be produced by combining the following ingredients in the proportions specified, although it is to be understood that the proportions may be further varied without departing from the invention:

	Per cent by volume
75% orthophosphoric acid.....	15 to 70
Mono-butyl ether of ethylene glycol....	15 to 30
Sodium salts of the acid sulphates of multiple carbon saturated branched chain secondary alcohols having the above stated general formula.....	1/8 to 2
Water.....	Balance

A sufficient quantity of a sugary substance such as molasses may be substituted for a part of the water to build up the viscosity to the desired degree when the material is to be employed on other than horizontally disposed surfaces.

The sodium salts are dissolved in the water together with the sugary substance, when the latter is employed, and then added to the phosphoric acid and thoroughly mixed. The mono-butyl ether of ethylene glycol is then added to the mixture.

Up to 75 to 80 per cent of the mono-butyl ether of ethylene glycol may be replaced by methyl ethyl ketone or similar oil and grease solvents. Ethyl methyl ketone aids the spreading action of the cleansing composition, is a considerably cheaper material than the above mentioned ether derivatives of ethylene glycol, and while not very soluble in water, is a good oil and grease solvent, and is easily rendered miscible in water by using in conjunction therewith another oil solvent which is miscible in water, such as one or more of the mentioned ether derivatives.

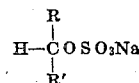
Part, or all of the mono-butyl ether of ethylene glycol and part of the water may be replaced by mono-ethyl ether of ethylene glycol, or other desired ether derivative of ethylene glycol in such proportions as to leave sufficient grease solvents to do the work required. Mono-ethyl ether of ethylene glycol is a cheaper material than the mono-butyl ether of ethylene glycol and affords

the further advantages of being more miscible in water and equally as good a solvent for vegetable oils. Where the oils to be dissolved and removed from the metal surfaces treated in order that the rust removing, rust inhibiting and metal etching acids may act on the metal, are mainly vegetable in nature, it is advantageous to replace at least a part of the mono-butyl ether of ethylene glycol with the mono-ethyl ether of ethylene glycol. In practice, two forms of the cleaning composition are generally employed; one of which is to be washed from the metal surface that is prepared for painting; and the other which is adapted to be wiped off with dry cloths or other absorbent material. It is preferred to employ the mono-butyl ether of ethylene glycol as the oil solvent in the first form and to employ at least a part of mono-ethyl ether of ethylene glycol in the second form.

Although several embodiments of the invention have been above indicated, it is understood that various changes in the proportions of the ingredients and in the ingredients themselves may be made without departing from the spirit and scope of the invention, as defined by the appended claims.

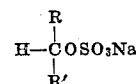
What is claimed is:

1. A metal cleaning composition including a rust removing acid, an oil dissolving agent and a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain, secondary alcohols, having the general formula



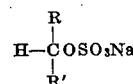
in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17.

2. A metal cleaning composition including as the major constituent thereof a water solution comprising a rust removing and rust inhibiting acid and an oil and grease solvent, and a comparatively small quantity of a water solution of a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain secondary alcohols having the general formula



in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17.

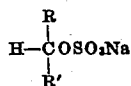
3. A metal cleaning composition including an oil and grease solvent, a rust removing and metal etching acid, water, and a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain, secondary alcohols having the general formula



in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17, the composition being free of oil, waxes and greases.

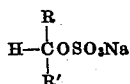
4. A metal cleaning composition including a rust removing and metal etching acid, an oil and grease solvent, water, and a surface tension reducing and wetting agent including a water solution of a sodium salt of the acid sulphates of

multiple carbon, saturated, branched chain, secondary alcohols having the general formula



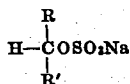
in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17.

5. A metal cleaning composition including orthophosphoric acid, water, ethylene glycol monobutyl ether and a water solution of a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain, secondary alcohols, having the general formula



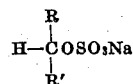
in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17.

6. A metal cleaning composition including orthophosphoric acid, water, and an ether derivative of ethylene glycol, and a water solution of a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain, secondary alcohols, having the general formula



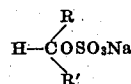
in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17.

7. A metal cleaning composition including as the major constituent therefor a water solution comprising a metal etching and rust removing and inhibiting acid, water, and an oil and grease solvent, and approximately one half of one percent of a water solution consisting of approximately 25%, by weight, of a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain, secondary alcohols, having the general formula



in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17.

8. A metal cleaning composition comprising a metal etching acid, an oil and grease solvent, and a wetting agent consisting of a water solution of a sodium salt of the acid sulphates of multiple carbon, saturated, branched chain, secondary alcohols, having the general formula



in which R and R' represent aliphatic hydrocarbon radicals containing a total number of carbon atoms ranging from 6 to 17, said wetting agent being compatible with aqueous solutions containing high concentrations of acids.

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