

UNITED STATES PATENT OFFICE

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PREPARATION FOR CLEANING METAL PRE-
PARATORY TO PAINTING

Clete L. Boyle, Detroit, Mich.

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1 Claim. (Cl. 148—8)

This invention relates broadly to the art of preparing metals for painting, lacquering, and enameling, and specifically to an improvement in a composition adapted to carry out such process.

5 Heretofore it has been commonly the practice to clean the metal with a rust removing acid, such as sulphuric or phosphoric, in combination with a suitable oil solvent such as ethyl alcohol, butyl alcohol, ethyl methyl ketone, or an ether
10 derivative of a dihydric alcohol, such as the monobutyl ether of ethylene glycol. At times viscosity or adhesive producing ingredients such as sugar solutions, gelatine, glue, and similar ingredients have been used to modify the physical
15 properties of the solution. These materials, however, have very little modifying influence on the regular acid solvent mixture for any worthwhile purpose.

In order that the acid may reach and attack
20 the rust on the metal, it is necessary that the oil be removed from the surface of the metal. In order for the oil to be penetrated and dissolved for removal it is essential that the solution containing the oil solvent wet the oil covered surface
25 of the metal. It is therefore desirable that a solution be provided which will function to thoroughly wet the oil covered surface under any and all working conditions. It is understood that a concentrated mixture of the rust removing or
30 etching acid and the suitable oil solvent is what is sold to the manufacturer who then mixes the same with water in the desired proportions for the cleaning operations to be carried on. It is highly desirable that this concentrated mixture
35 be miscible with water in varying proportions and that the solution so resulting be capable of satisfactorily performing its intended function.

While a relatively strong solution, such as not to exceed two parts of water to one part of the
40 mixture of the etching acid and the oil solvent, functions satisfactorily to thoroughly wet the oil covered surface of the metal, weaker solutions flow over the oil surface without adhering or wetting the same and do not penetrate and dis-
45 solve the oil film.

It is also desirable that a true solution as distinguished from a colloidal solution be formed as there is a tendency in colloidal solutions, more pronounced in some than in others, toward instability and when this breaking down occurs on
50 the surface of the metal, the cleaning solution is very difficult to remove. It is to be understood that in these so called "wet processes" of cleaning metal, that the cleaning solution, following
55 the cleaning operation, is either rinsed off by the

application of water to the surface of the metal or wiped off by the operator, and a true solution is removed more easily by rinsing or wiping easily as against the difficulty which attends the removal of the colloidal solutions.

I have found that the addition of a certain class of wetting agents to the rust attacking acid oil solvent mixture will provide a solution which will thoroughly wet the oil film and penetrate the same and will disperse the solution over the
10 entire surface of the metal and will insure that the oil solvent and the acid carry out their intended functions. Furthermore, the mixture containing wetting agents of this class may be
15 mixed with water in proportions which vary substantially and still function satisfactorily.

Various sulphonated hydrocarbons have been suggested for use as wetting agents in cleaning compounds. Certain of these sulphonated products, such as sulphonated mineral oils or sul-
20 phonated vegetable oils may function in certain cleaning compounds, such as alkaline or water solutions, but do not function satisfactorily in metal cleaning acid solutions. Such sulphonated products are not, in the metal cleaning acid so-
25 lutions, in such a state as to properly perform their wetting function. The environment is not such that a true solution is produced. The cleaning solution so constituted may separate into distinct strata or assume a colloidal character and the result is unsatisfactory. Some of these
30 sulphonated products may function fairly well in a very weak acid solution, but in cleaning compounds where the acid concentration is high, these wetting agents lose most of their effective-
35 ness.

In the group of wetting agents, derivatives of nitrogenous hydrocarbons or amines serve with unusual effectiveness as wetting agents in acid
40 solutions and particularly in acid solutions of high concentration. These amines dissolve completely in the other ingredients of the cleaning solution, namely, mono butyl ether of ethylene glycol, water and acid, to form a true solution
45 therewith. When the acid solution containing such an amine is applied to the surface of the metal it spreads over and acts uniformly upon such surface. Such a solution will function to
50 thoroughly wet the surface of the metal and will disperse thereover into crevices or joints which might not be well covered by a workman in applying the solution to the surface of the metal.

It is not only desirable that the solution thoroughly wet the surface uniformly with a continuous film but that this characteristic of wet-

ness be not only uniform over the surface of the metal but that it retain such uniformity of distribution. If the cleaning operation is for any reason temporarily halted it is desirable that when the more volatile ingredients evaporate that the cleaning solution which remains on the surface of the metal be uniformly distributed thereover and does not form in streaks or spots where it is dispersed thereon.

Of the amine compounds the group of amino acids has been found to be particularly suitable as wetting agents in the metal cleaning acid solutions. These amino acids have an unusually great stability even in cleaning solutions of high acid content retaining their efficiency therein. Amino acids which have been found to be particularly suitable are the sulfanilic acids, which are also known as aminobenzenesulfonic acids, when they are further sulfonated with fuming sulphuric acid (known commercially as "Oleum") to form aniline 2:4 disulphonic acid and this disulphonic acid is then alkylated by condensation with cetyl chloride to form dicetyl aniline 2:4 disulphonic acid. The structural formula for this compound is $(C_{16}H_{33})_2NC_6H_3(SO_3H)_2$, in which the sulfonic acid groups are in the 2 and 4 positions in the benzene nucleus with reference to the substituted amino group. Following this condensation it is preferable to convert this disulphonic acid into some soluble salt such as sodium dicetyl aniline disulphonate. Various other soluble salts such as the soluble salt of potassium or ammonium may be used.

A mixture comprising orthophosphoric acid 60% by volume; monobutyl ether of ethylene glycol 30% by volume; and 10% by volume of a water solution of sodium dicetyl alkaline disulphonate (six ounces per gallon of water) answers, when mixed with water in the desired proportions, very satisfactorily the requirements of a good metal cleaning compound.

Instead of the above specifically referred to amino acid, toluidine disulphonic acids may be condensed with dicetyl chloride to form cetyl

toluidine disulphonic acid from which soluble salts may be obtained as above described and employed in the same manner in the acid oil solvent formula.

This concentrated mixture is mixed with water as desired by the user, and it has been found that it will function satisfactorily with as much as five parts of water to one part of the mixture. It is apparent that the strength or weakness of the solution may be varied as required by the cleaning operation to be performed.

It is understood that while the ingredients above specified in the proportions there set forth, represent a preferred formula that the relative percentages of these ingredients may be widely varied. Depending upon the character of the work to be encountered and the amount of water used, the amount of rust attacking acid used may be varied substantially. It might be reduced to 30% by volume in the solution set forth above. The amount of oil solvent and the proportion of the wetting agent employed may each be proportionately changed to make up the concentrated mixture.

Though orthophosphoric acid is here listed as the preferred metal etching acid because of its known desirable characteristics for the use in question, other well known rust removing or metal etching acids may be employed in its stead; likewise other well known oil solvents, certain ones having been heretofore set forth in patents issued to myself and James D. Klinger jointly; i. e., 1,545,498; 1,665,465; and 1,700,739; may be used in place of the mono-butyl ether of ethylene glycol.

What I claim is:

A solution to be used for cleaning sheet metal preparatory to painting comprising a mixture of phosphoric acid, mono butyl ether of ethylene glycol, and a water solution of a sulphonated aniline in which the hydrogens of the amino group have been replaced by a long straight chain alkyl radicals such as are found in soap.

CLETE L. BOYLE.