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PAINT AND VARNISH REMOVERS

(Also known as "Stripping Compounds", "Enamel Strippers", "Brush Cleaners", Etc.)

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I. INTRODUCTION

The Bureau receives numerous requests from the public for information on paint and varnish removers. The purpose of this letter circular is to present this information in one publication, so that it will be readily available to answer inquiries of a general nature.

Some of the "solvent" type paint and varnish removers to be described contain materials that are toxic, and therefore when using them adequate ventilation is necessary. The Bureau is not qualified to answer inquiries concerning the relative toxicity of various solvents. Questions of this nature should be directed to the U. S. Public Health Service, Federal Security Agency, Washington 25, D. C.

II. GENERAL METHODS OF REMOVING PAINT, VARNISH, ETC.

The general methods used to remove paint, varnish and lacquer coatings may be broadly divided into two groups:

A - Methods requiring no solvents.

B - Methods requiring solvents.

Group A may be further classified thus:

A-1.- Chipping tools, steel scrapers, wire brushes (power-driven rotary wire brushes are particularly useful), sandpaper, etc., are widely used on metal surfaces. Sandblasting and shot blasting are also used to remove paint from metal. Sandblasting is also used to remove paint from exterior masonry (brick, concrete, etc.). Sanding machines are used widely on wood floors to remove old shellac and varnish.

A-2.- The gasoline blow torch paint burner or specially designed gas torches and broad steel scrapers are used widely by painters to remove old, cracked and scaled paint from the exterior of wood houses. This is called "burning off" the old paint by the painter. Actually the paint is not "burned off" but the flame softens the paint, and it is then removed with the steel scraper. It is used occasionally but not often on interior surfaces.

Under Group B there are various solvent mixtures designed to soften and remove old coatings of paint, varnish, lacquer, etc. The materials are known as Paint and Varnish Removers. These materials are the subject of this letter circular.

### III. PAINT AND VARNISH REMOVERS

B-1. Alkaline Type Removers.- These consist of alkaline sodium compounds such as caustic soda, soda ash, washing soda, trisodium phosphate dissolved in water, and are used widely, particularly for iron and steel objects that can be immersed in the hot solutions. These should not be used on aluminum, brass, zinc and similar non-ferrous metals. They are useful in removing old paint from a great variety of materials but the alkali darkens most woods, attacks some metals and unless entirely removed or neutralized will be likely to destroy subsequently applied paint or varnish. In factories where rooms can be specially ventilated, paint and varnish coatings on iron and steel (for example automobiles) can be easily removed by spraying on this type of solution boiling hot, and the old paint blown off with steam before it dries. All cracks and crevices of the automobile must be blown with high-pressure steam. Then the surface is washed thoroughly with water to remove all traces of alkali.

These hot alkaline solutions should be handled with care and not allowed to come in contact with the skin, clothing or surfaces other than the one being treated. Rubber gloves should be worn. The caustic soda or lye may be dissolved in water and the solution applied while hot, but better results will be obtained if the caustic soda is mixed with a starch solution, such as is used in starching clothes. About 3 or 4 tablespoons of caustic soda are generally added to one quart of the starch solution.

This mixture is applied while hot to the surface, using a cotton swab, a fiber (not bristle) brush, or a long-handled scrubbing brush. After a few minutes the softened paint or varnish may be scraped or rubbed off. The surface should then be washed several times with clear water, allowed to dry thoroughly, sandpapered or rubbed smooth, and dusted before it is refinished. Bolted whiting, sawdust, etc., is sometimes added in place of starch to the caustic soda solution. The purpose of this is to thicken the solution so that it can be used on vertical surfaces without running down.

Strong, hot solutions of trisodium phosphate (2 to 3 pounds of the salt dissolved in one gallon of water) are also used for removing paint and varnish coatings. This chemical is safer to handle than caustic soda.

Paint, varnish and lacquer coatings are easily stripped from aluminum and aluminum alloys, without attack on the aluminum, by immersing for a few minutes to a few hours in a hot (190° F) water solution of a mixture (4 ounces per gallon of water) of sodium metasilicate, sodium trisilicate and sodium resinate, complying with Navy-Aeronautical Specification, "Compound, Paint Stripping (Silicate Type)", C-67d, March 4, 1943.

#### B-2. "Solvent Type" Removers (Not water thinned).-

(a) Denatured Alcohol - Formula No. 1.- This is the only reasonably satisfactory "solvent" type remover for shellac varnish and similar coatings such as Federal Specification TT-V-130, Varnish; Spirit (Shellac Varnish Replacement). Small areas of the surface to be cleaned are flooded with the denatured alcohol, and after standing for a short time are cleaned by scraping or rubbing with steel wool. Sometimes shellac, specially bleached shellac, becomes so insoluble that abrasion is the only way of removing it. Denatured alcohol is not comparable with any of the other removers for any coatings except shellac or some shellac varnish replacement. Mechanical methods previously mentioned, (sanding machines, etc.) are very desirable to remove old shellac coatings.

#### (b) "Solvent" Type Removers Based on Mixed Solvents.-

(1) Flammable.- The most widely used flammable paint and varnish remover is covered by Federal Specification TT-R-251a, Type 1. Class A, thin liquid, is for use on horizontal surfaces, and Class B, semipaste, is for use on vertical and overhead surfaces.

Removing paint or varnish with "solvent" type paint and varnish removers must be done carefully so as not to damage adjacent finished parts. Commercial "solvent type" paint and varnish removers should be labeled with instructions for using, including "Shake Well". A paint and varnish remover of this type

(Federal Specification TT-R-251a, Type I) may be prepared as follows: Dissolve 3 parts of paraffin (in shavings) in 50 parts of benzol, then add 25 parts of denatured alcohol and 25 parts of acetone.

After this mixture has been applied to the surface with a brush and allowed to stand for 15 or 20 minutes, (or according to the manufacturer's directions), the paint or varnish will be soft so that it can be scraped off with a putty knife or steel scraper, or rubbed off with steel wool or excelsior. When a putty knife is used as a scraper it will prove more effective if the end of the blade is ground to a sharp edge. By holding the putty knife in a vertical position and scraping across the grain of the wood, there is no danger of splintering the wood. This paint and varnish remover and others of this type should be used only where there is good ventilation and no open flame of any kind, as they are toxic and contain highly flammable materials. This type of remover is used widely outdoors and indoors on wood, plaster, metal, etc.

(2) "Nonflammable".- This type of remover is covered by several Government specifications including Federal Specification TT-R-251a, Type II; Navy Department Specification 52R12, and Navy Aeronautical Specification C-113.

Because of the great fire risk in using the flammable type remover, the use of the nonflammable type will certainly increase. Samples of this type examined at the National Bureau of Standards and found to conform to the Federal Specification have proved very efficient in removing old paint and varnish. While the composition varies, a typical good remover of this type consists chiefly of dichloromethane (methylene chloride), blended with trichlorethylene and ethylene dichloride together with a small amount of alcohol and ethyl cellulose or cellulose acetate, with or without a very small amount of paraffin wax. Another blend consists of 95 percent of ethylene dichloride and 5 percent of alcohol with ethyl cellulose.

Doubtless mixtures of numerous other solvents that have been developed in the last few years may produce equally good removers of this type.

Caution.- Since the volatile constituents of these removers are more or less toxic, proper ventilation at all times is imperative.

Many removers in the flammable and nonflammable types just described contain paraffin wax. It is very essential that this be entirely washed off the surface with alcohol or benzine; otherwise the subsequent paint coating will not dry and adhere properly.

(c) "Solvent Type Removers That Do Not Have To Be Washed Off." Manufacturers make "solvent" type removers (both flammable and nonflammable) that do not leave a waxy residue, thus eliminating after-washing. All that is needed is to wipe the surface clean with rags or steel wool. These removers contain the usual organic solvents, in which cellulose acetate, ethyl cellulose, etc., are used instead of paraffin wax, to retard the evaporation of the solvent.

B-3. "Solvent" Type Removers (To Be Water Thinned). These removers may be modifications of Type B-2 with an emulsifier present, so that when the remover is diluted with water an emulsion of the water and remover is obtained. Other kinds consist of cresylic acid or paracresol, potassium oleate and 5 to 10 percent water. For example, U. S. Patent 2,242,106 describes a blend of about 80 percent cresylic acid, 10 percent potassium oleate and 10 percent water. Trichlorethylene, hydrogenated naphtha and similar solvents may be added (2 to 40 percent). Before use the mixture is diluted by the user with water (for example 3 parts of water to one of the mixture), and an emulsion forms that is particularly effective in the stripping operation.

This type of remover is used particularly for stripping synthetic enamels and baked enamels from anodized aluminum, etc.

#### IV. CLEANER FOR PAINT BRUSHES

Closely related to the subject of paint and varnish removers is the subject of brush cleaners. Paint and varnish removers are successfully used to reclaim brushes that contain hard and dry paint or varnish. Products for this purpose can be purchased under proprietary brand names in paint stores. Some are dry powders (for example trisodium phosphate) to be mixed with water. The brush is allowed to soak in the solution, and it is then washed thoroughly (lathered) with soap and water. Proprietary brush cleaners in liquid form are also available. These generally consist of blends of the solvents mentioned under paint and varnish removers and it is advisable to purchase the materials under brand names. Good brush cleaners of this type can be made as follows:

- |                  |                  |
|------------------|------------------|
| <u>a</u>         | <u>b</u>         |
| 2 volumes benzol | 1 volume acetone |
| 1 volume alcohol | 1 volume toluene |
| 1 volume acetone |                  |

- c
- 5 volumes methylene chloride
  - 1 volume denatured alcohol

The brush should be immersed in one of these liquids to just cover the bristles. Occasional working of the brush in the liquid will hasten the action of the cleaner. Generally the brush should be immersed for 24 hours. Then all loose paint should be removed from the brush, preferably with a steel comb. If the cleaning has been thorough, the bristles will remain soft when dry.

It is not good practice to keep paint brushes in water. The water will make the bristles soft and flabby, and is liable to swell and crack the wood handle and break the ferrule. If the brushes are to be used often, it is suggested that they be hung in a mixture of raw linseed oil and turpentine (keeping the bristles off the bottom of the container). If not, it is recommended that the brushes be cleaned of all paint immediately after using, by washing in turpentine, followed by a thorough washing with yellow laundry soap and water, making certain that all the paint is washed out of the bristles up next to the ferrule.

#### V. REFERENCES

Federal Specification TT-R-251a may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., for 5 cents (do not send stamps).

Navy Aeronautical Specifications C-113 and C-67d may be obtained upon application to the Manager, Naval Aircraft Factory, Navy Yard, Philadelphia, Pa.

Navy Department Specification 52R12 may be obtained upon application to the Bureau of Supplies and Accounts, Navy Department, Washington 25, D. C.