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PROCESS OF OIL-PROOFING MATERIAL AND PRODUCT THEREOF

Benjamin H. Thurman, Bronxville, Arthur W. Thomas, New York, and Morris Mattikow, Brooklyn, N. Y., assignors, by mesne assignments, to Refining, Inc., Reno, Nev., a corporation of Nevada

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This invention relates to the production of articles that are impervious to mineral and other oils and to the production of coating compounds or compositions which are suitable for rendering articles impervious to oil. By this invention porous materials such as paper, for example, and other objects can be treated or coated so as to render them oil-proof and at the same time their mechanical strength is usually increased, while still usually permitting the materials to be bent or flexed without causing leaks.

Heretofore, many and various attempts have been made to make porous materials satisfactorily oil-proof by spreading films of different substances on the materials or applying such substances to the surfaces thereof. For example, proteins, waxes, resins, varnishes, etc. have been tried but have not been found to be satisfactory as they do not form a permanent continuous film or they dry out and crack or do not adhere to the surfaces sufficiently well. When casein is employed it becomes brittle on ageing and cracks when the moisture dries out. This is true of either solubilized casein or sulphuric acid precipitated casein. The same faults occur with certain other materials. The addition of glycerine to casein is not satisfactory as it sweats out and ceases to act as a plasticizer. The use of solubilizers for the casein such as sodium or potassium hydroxide or borax weakens the casein.

By the present invention such materials as cottonseed, rapeseed, linseed, olive, peanut, sesame, castor and other vegetable oils, and rosin and shellac, for example, can be treated with soluble alkalies such as sodium, potassium and ammonium so as to form compounds that can be spread out into films that are oil impervious. These compounds, which are soaps, can be dissolved in water to make concentrated solutions and the solutions can be applied to surfaces in films, thus oil-proofing the same. Paper containers may be coated, preferably on the inside, with the solution or solutions and will then hold oil indefinitely. Soaps made from liquid fats are generally preferable to those from solid fats. Soaps made from cottonseed oil, soya bean oil, and sulphonated olive and castor oils have been found to be especially satisfactory.

The aqueous solution used to form the coating should be entirely free from foam when applied, otherwise when the water dries out air pockets will be left which make holes in the film. The solution should also be free from a tendency to jel as this would interfere with the formation of a proper coating or film. Solutions of soaps of sulphonated oils have very little tendency to foam or jel and the addition of a small amount of alcohol to the solutions also aids in preventing foaming or jelling.

It has also been found that mixtures of two or more such soaps not only form good oil-proof films, but are also useful as adhesives. For example rosin soap and sulphonated castor oil soap make an oil-proof film that securely binds together paper laminations, and is free from odor and is inexpensive. The same sort of result is produced when the sodium soap of shellac, for example, is mixed with the soap of sulphonated castor oil either with or without casein being present. Other mixtures may also be used.

An excellent oil impervious film or coating can also be formed by using casein and the sodium soap of castor oil or olive oil, as these soaps are very suitable for adding body and giving film-forming properties, and at the same time the film or coating is practically colorless.

We have found that when triethanolamine and shellac, or shellac that has been solubilized with a weak alkali such as borax or ammonium, and casein, that has been solubilized with an alkali, are mixed, a plastic compound like a gum is formed. The shellac may be solubilized by boiling the shellac in water containing borax in the proportion of 50 grams of shellac to 283 cc. of water containing 25 grams of borax. The solution is filtered and the filtrate is added preferably to an equal part of a casein solution prepared by introducing 100 grams of casein into 500 cc. of water containing 10 cc. of triethanolamine. The proportions of shellac and casein solutions may be varied greatly. However, if a sulphonated vegetable oil soap in proportions from about one fourth to three fourths is added to the mixture of triethanolamine, shellac and casein a product is formed that is not a gum. This material can be flowed or spread on paper or other materials to form an oil-proof coating. Ethylene glycol may be added as a plasticizer, but glycerine is not suitable to be added.

The following are given for illustrative purposes as specific examples of producing compounds or compositions that are suitable for forming oil-proof coatings or films that can be applied to porous materials or other surfaces as by dipping, painting or spraying or otherwise so as to make them oil impervious. It is to be understood that the proportions, materials and time of treatment, etc. can be varied without departing from the spirit or scope of the invention.

Example I.—Olive oil is treated with sufficient potassium hydroxide or sodium hydroxide to saponify it and 30 parts by weight of the resulting product is dissolved in 100 cc. of warm water and the solution is applied to the surface to be coated. Other vegetable oils may be used instead of, or with, olive oil.

Example II.—The fatty acids from a vegetable oil, such as olive oil, for example, are treated with a sufficient amount of triethanolamine to saponify the fatty acids and the resulting product is dissolved in water in approximately the proportions given in Example I and the solution is applied to the surface to be oil-proofed.

Example III.—Sulphonated vegetable oil, such as castor oil, for example, is treated with a sufficient amount of sodium or potassium hydroxide to produce a soluble soap and the resulting product is dissolved in water and used as the oil-proofing coat or film.

Example IV.—Instead of a vegetable oil, rosin may be used and saponified by means of sodium or potassium hydroxide or triethanolamine. When using triethanolamine about 100 parts by weight of rosin is saponified with 45 parts of triethanolamine and 300 grams of water is added. The boiling is continued for about four hours, the product is then filtered and the filtrate concentrated by evaporation until it contains about 20% of water.

Example V.—Shellac is saponified with potassium or sodium hydroxide and about 30 parts by weight of the resulting product is dissolved in 100 parts of water and the solution is used for coating purposes, or about 50 parts by weight of triethanolamine may be used to saponify 100 parts of shellac and 300 parts of water added. The mixture is heated until it boils, is filtered and is then ready for use.

Instead of using the vegetable oils and saponifying them with the sodium or potassium hydroxide or triethanolamine the fatty acids may be extracted from the oils and saponified, or the fatty acids after extraction may be first sulphonated and then saponified. Also, mixtures of the alkali resinates or triethanolamine resinate with saponified sulphonated vegetable oils may be used.

Example VI.—100 parts by weight of casein are dissolved in 500 parts of water containing about 2% by weight of triethanolamine and 40 parts by weight of the approximately 15% casein solution thereby formed is mixed with 10 parts of sulphonated vegetable oil to make an oil-proof film for the inside or outside of containers or a flexible oil-proof coating for braided insulated wire, for example. The film or coating is pale and substantially colorless and is free from tackiness. This product is especially useful in making colored varnishes for insulated wire as pigments can be ground into the sulphonated oil and impart the desired color to the film or coating. In this way a coating for an insulated wire can be formed that is very attractive in appearance by adding calcium carbonate and lead carbonate ground in sulphonated castor oil to triethanolamine and the casein solution to which glycerine may also be added if desired. The presence of the lead carbonate makes the coating fire resistant. Other coloring pigments can be added to differentiate between different wires to which the respective coatings are applied. The triethanolamine acts as a solubilizer to cause the casein to go into solution in water and at the same time it combines with the casein and acts as a permanent plasticizer even after the coating hardens.

In carrying out this invention the mixtures or compositions mentioned above can be dissolved in water to produce a solution of a total high solid concentration, which may be as much as 80% total solids. The presence of the large amount of dissolved solids in the solutions reduces the tendency to foam and the consequent danger of holes or pores being left in the films after the material has been applied to surfaces.

The combination of casein and triethanolamine and sulphonated oil soap is also good for oil proofing paper as a film. Also casein and sulphonated oil and glycerine is a good coating for insulated wire.

A mixture of soap of sulphonated vegetable oils and casein solubilized with triethanolamine produces a very flexible oil-proof coating for fabrics and textiles and insulated wire which is very adherent. The coating can be colored with colors and pigments by grinding the colors or pigments in a soap, such as sulphonated castor oil, and then dissolving the soap in a water solution of casein and triethanolamine, glycerine, or ethylene glycol.

The following is given as a specific example for a very satisfactory oil-proof film made by mixing two soaps:

A resinate soap is prepared by saponifying powdered rosin with 11.6° Bé. sodium hydroxide in the proportion of 50 grams of rosin to 27 cc. of sodium hydroxide in 280 cc. of water by boiling for two hours, filtering, and concentrating by evaporation until the solid content is about 70%. Four parts by volume of the resinate soap is mixed with 1 to 2 parts by volume of sulphonated vegetable oil soap. When one part by volume of triethanolamine resinate soap is added to the above mixture the film is kept more flexible and the addition of a small amount of alcohol is advisable when it is desired to spray the solution on the surfaces to be coated.

An oil-impervious impregnating or coating material may also be formed by mixing 10 cc. of an aqueous solution containing 30% dextrine with 10 cc. of an aqueous solution containing 30% of sodium or potassium resinate and 10 cc. of sulphonated castor oil soap.

We claim:

1. The process of rendering paper oil-proof, which consists in applying to a surface thereof a film of a composition consisting essentially of a solution of a water soluble soap.

2. The process of rendering paper oil-proof, which consists in applying to a surface thereof a film of a composition consisting essentially of a solution of a water soluble soap free from bubbles.

3. The process of rendering paper containers oil proof, which consists in applying to a surface thereof a film of a composition consisting essentially of a solution of a water soluble soap.

4. As an article of manufacture, an oil-proof paper having as an oil-proofing material on a surface thereof a film of a composition consisting essentially of water soluble soap.

5. As an article of manufacture, an oil-proof paper container having as an oil-proofing material on a surface thereof a film of a composition consisting essentially of water soluble soap.

BENJAMIN H. THURMAN.
ARTHUR W. THOMAS.
MORRIS MATTIKOW.