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VARNISH OIL

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This invention relates to improvements in varnish oils, and particularly to the production of air blown, heat bodied oils which are quick drying, of high waterproofness, toughness of film and adhesion to metals, and of pale color, from drying and semi-drying oils of the linseed type.

It has been found that when blown oils are subjected to heating at varnish cooking temperatures they develop a dark red to brown color. Inasmuch as one of the quality characteristics of varnish is light color so that it may be used for light colored woods and white enamels, the qualities and uses to which air blown oils can be put is limited at least for such purposes. Thus although air blown drying oils of high viscosity have been used in the manufacture of light colored varnishes, it is necessary to use them in the uncooked or substantially uncooked state if light color is to be retained. Such use of course prevents the incorporation of the other qualities requisite in a good varnish which result from heat bodying.

It is therefore an object of this invention to provide an air blown, heat bodied oil of light color suitable for use in the formulation of pale varnishes and light colored or white enamels.

A further object is to provide an air blown, heat bodied varnish oil which is quick drying, of high water-proofness and film toughness, which has good adhesion to metal and other surfaces, and which has a pale color, similar in character to the qualities and color of heat bodied China-wood oil, and which can be substituted therefor more generally than has hitherto been possible, and in many instances even to greater advantage, irrespective of economic considerations, which in itself is of great importance at present.

In the preparation of oils for varnish making it is well known that even with oils which apparently have been refined, further treatment is required to prevent precipitation of "break" at varnish cooking temperatures, "break" being a mucilaginous impurity composed of part of the protein non-oily material in the oil-bearing seed, which is carried into the oil in dispersed condition during the process of removing oil from seed. Ordinarily, refining the oil comprises either removing the "break" by filtering it with or without chemical treatment, or more completely dissolving the "break" by slight oxidation or other means, so as to produce an oil which does not precipitate "break" at varnish cooking temperatures. The most highly refined oils used in the varnish industry are the so-called alkaline and acid re-

fined oils, having been chemically treated, washed and filtered. However, even this class of oils which are called "break free" have been found to give dark colored end products, when blown and heat bodied.

As a result of extensive investigation it has been found that the greater portion of the coloration resulting on heat bodying blown drying oils is not, as has been believed, characteristic of blown oils, but is due to this mucilaginous impurity in the apparently refined oil, and as hereinbefore set forth, merely rendering the oil "break free" for standard varnish use by chemical treatment is not sufficient for my purpose. However, in accordance with my invention, if the drying oil to be treated is a so-called "mechanically refined oil," that is, one having had little or no chemical treatment prior to filtration through absorptive earth, and where the ash content thereof, which is roughly in proportion to the "break," has been reduced to below about .01% by weight of the oil, I am enabled to produce a varnish oil much lighter in color than has hitherto been possible by cooking a blown oil or simultaneously blowing and cooking an oil of the linseed type.

Base metals, such as iron, copper, lead, etc. which might be introduced by contact with processing equipment must also be substantially absent, as small traces of them have a disproportionate effect on the color of the final oil. What is required is therefore an oil selectively pure with respect to mucilaginous protein and inorganic material, as well as having had a minimum of heat and chemical treatment.

Thus, in accordance with the process of the present invention, I subject to treatment a drying or semi-drying oil of the linseed oil type, and select for such treatment one which has been "mechanically refined," that is, the ash content thereof has been reduced to about .01% by weight or less and which prior to such ash content reduction has had little or no chemical or heat treatment for purification. The oil so selected and refined may thereafter be further chemically treated to remove any last traces of "break" if necessary. This ash content may be carried even as low as .001% and results in the production of varnish oils of extremely pale color.

These drying oils which are slow drying and of the non-conjugated type are after such proper treatment and selection for ash content, subjected to blowing. This blowing is preferably carried out in accordance with the limited low temperature treatment taught by my Patent No. 2,178,604, issued November 7, 1939. Thus

these straight-chain non-conjugated drying oils are treated with an oxygen containing gas at a temperature between 25° C. and 70° C. for a period of time sufficient to convert the original oil to one having a conjugated system soluble in synthetic resin and petroleum solvents but insoluble in alcohol, after which the reaction is stopped, the resultant oil being liquid at 25° C. This treatment results in an oil having characteristics similar to and in many respects superior to oils of the China-wood oil type, and of more definitely controlled and reproducible properties. Oils blown at substantially higher temperatures and then heat bodied have poor drying properties, the air dried films remaining tacky for long periods.

As set forth in my aforementioned patent, I have adopted as a measure of the index of conjugation which parallels the other characteristic conjugation effects, the rise of refractive index during the blowing treatment. This rise should be generally at least 40 points, that is a rise of .0040 over the original index of refraction by the Abbé refractometer.

For the purpose of preparing the varnish oils of my present invention I have found that some variation upward and downward from the limits of refractive index rise as aforementioned, may be satisfactory. Thus with linseed oil blown somewhat less than 40 points of refractive index change, the end products of cooking are lighter in color, slower in drying, less waterproof and somewhat less soluble. Oils blown further than 40 points show darker color, equal drying, and more solubility than the product blown to the mean of 40 points. This variation also varies with the different drying oils, so that, for example, with soya bean oil the optimum final properties are evident when the oil has been blow to 50 points of refractive index change.

In addition to linseed and soya bean oil other oils of the linseed oil type which may be utilized and similarly air blown are pilchard, hempseed, perilla and menhaden. The so-called "semi-drying" oils such as soya bean oil are intended to be included in the expression "drying oils" as used in the claims and specification.

After the selected low ash content, break-free, drying oil has been subjected to limited low temperature blowing, as previously described, it is subjected to cooking. This is preferably done in an aluminum or stainless steel varnish kettle to avoid metal contamination and undesirable coloration therefrom, at a temperature of from about 500° F. to about 600° F. until the desired finished viscosity is obtained, and preferably by heating the blown oil gradually to a temperature of about 560° F. to 580° F.

As distinguished from the sharp frothing, gas evolution, exothermic reaction, and commencement of deep red coloration on the upheat between 250° F. and 350° F. characteristic of blown oil containing in excess of .01% ash, by utilizing an oil refined mechanically before substantial chemical treatment to an ash content of from about .01% to .001% by weight and substantially free from undesirable base metals, there is very little froth during this period and very little color change up to 560° F. Thereafter, although the color darkens slowly, the change is to amber, not red, and very pale in comparison to previous types of heat bodied blown oils.

In carrying out the heat bodying or cooking step, it is also essential to remove vapors formed in the process. It has been found that if the

vapors are not removed as formed, and are permitted to oxidize and condense on the sides of the cooking vessel, or otherwise fall back into the oil, a staining effect is produced resulting in a darkened product. Therefore, a suitable removal system to prevent refluxing should be provided for these oxidized vapors. Oxidation of the oil during cooking, as by vigorous stirring, should also be avoided for the same reason.

Thus as previously stated, although light colored high viscosity blown oils have been used in varnishes in the uncooked state, and oils are frequently cooked and oxidized or blown during the cooking which takes place above any range of air blowing set forth in my aforementioned patent neither of such prior methods or formulations lead to the production of a varnish oil which has the specific properties of paleness of color, quick hard drying, film toughness, high waterproofness, high durability, and good adhesion to metal, when incorporated in a varnish with commercial gums, solvents and driers, unless the drying oil has first been selected for low ash content and thereafter subjected to limited low temperature oxidation followed by cooking at a varnish temperature, as herein set forth.

I claim as my invention:

1. A process for producing a relatively pale, amber colored, heat bodied, air blown varnish oil further characterized by being quick drying, of high waterproofness, tough film formation, good adherability to metals, and suitable for use in the formulation of pale varnishes and white enamels, which comprises subjecting a drying oil of the non-conjugated type to filtration through absorptive earth, prior to or without appreciable chemical treatment thereof, to reduce its ash content to about .01% to .001% by weight thereof, thereafter subjecting it to controlled low temperature air blowing to form an oil of conjugated system fluid at 25° C., and heating said conjugated oil at a temperature of from about 500° F. to about 600° F., to form a varnish oil of desired finished viscosity.

2. As a new product, an oil of the China-wood oil type comprising a blown drying oil of the linseed oil type, said blown oil being insoluble in alcohol and soluble in petroleum solvents having an ash content of less than .01% and characterized by substantial absence of frothing and development of red color on heating above 250° F.

3. As a new product, a blown drying oil of the non-conjugated type, said blown oil having a conjugated system and being liquid at 25° C. and soluble in synthetic resin, said oil having an ash content less than .01% by weight and characterized by substantial absence of frothing and development of red color on heating above 250° F.

4. A conjugated drying oil derivative of an oil of the linseed oil type and similar in viscosity, density, color and odor to the natural oil from which it was derived but having an increased refractive index and greater solution power for resins, said oil having an ash content less than .01% and characterized by substantial absence of frothing and development of red color on heating above 250° F.

5. As a new product, an oil of the conjugated type comprising a blown drying oil of the non-conjugated type, said oil being insoluble in alcohol, soluble in petroleum solvents and liquid at 25° C., said oil having an ash content less than .01% and characterized by substantial absence of frothing and development of red color on heating above 250° F.

6. As a new product, an oil of the China-wood oil type comprising a blown drying oil of the linseed oil type, said oil being insoluble in alcohol, soluble in petroleum solvents and synthetic resin, liquid at 25° C., having an ash content less than .01% and characterized by substantial absence of frothing and development of red color on heating above 250° F.

7. An oil as set forth in claim 6 which has been heat bodied to varnish oil viscosity.

8. The process of treating drying oils of the linseed oil type, which comprises, subjecting an oil of said type which has an ash content of less than .01% and which has had little or no chemical refining, to treatment with an oxygen containing gas at a temperature between approximately 25° and 70° C. until said oil becomes soluble in synthetic resin, stopping said treatment before said oil has lost its fluidity, and recovering a treated oil characterized by substantial absence of frothing and development of red color on heating above 250° F.

9. The process in accordance with claim 8 in which said treated oil is subjected to heating at a varnish cooking temperature to a desired varnish oil viscosity.

10. The process in accordance with claim 8 in which said treated oil is subjected to heating at temperatures between 500° and 600° F. to convert the treated oil to an oil having the desired varnish oil viscosity without substantial frothing or development of red color.

11. The process in accordance with claim 8 in which said oil is subjected to heating at a var-

nish cooking temperature to produce a desired varnish oil viscosity therein and in which substantial reflux of condensed vapor is prevented during said heating.

12. The process of converting drying oils of the non-conjugated type, into drying oils having a conjugated system, which comprises, subjecting an oil of said type which has an ash content of less than .01% and which has had little or no chemical refining, to treatment with an oxygen containing gas at a temperature between approximately 25° and 70° C. until said oil becomes soluble in synthetic resin, stopping said treatment before said oil has been rendered soluble in alcohol and insoluble in petroleum solvents and recovering a treated oil characterized by substantial absence of frothing and development of red color on heating above 250° F.

13. The process of treating drying oils of the linseed oil type, which comprises, subjecting an oil of said type to filtration through absorptive earth, prior to or without substantial chemical treatment thereof, to reduce its ash content below approximately .01%, thereafter subjecting said oil to treatment with an oxygen containing gas at a temperature between approximately 25° and 70° C. to convert said oil into a drying oil of the China-wood oil type, stopping said treatment with an oxygen containing gas before said oil has lost its fluidity and recovering a drying oil of the China-wood oil type characterized by substantial absence of frothing and development of red color on heating above 250° F.

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