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VEGETABLE WAX

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This invention pertains to a process for manufacturing vegetable waxes and deals, more specifically, with a process for manufacturing those raw material vegetable waxes which are or can be obtained from the plants in the form of a wax powder.

By way of approach, it may be desirable to briefly explain the prior process for manufacturing the commercial raw material wax from the crude wax powder. This old process is well illustrated with the typical commercially available carnauba wax which is obtained in its initial state as a crude powder from the carnauba palm leaves. The methods heretofore employed in manufacturing wax cakes from this crude powder have not changed appreciably from the somewhat primitive methods originally introduced in that small area of Brazil which is the sole commercial source of carnauba wax, and comprise the following procedure.

The natives cut the leaves from the tall palm trees with knives attached to the end of long poles and place them on the ground of the drying fields. Under an intensely hot sun the leaves are thoroughly dried in about three days. Although the wax on the surface is thereby loosened, the greater portion nevertheless remains enclosed in the shrunken fan-like leaf and must be removed therefrom by a mechanical slitting and beating of the leaves. This beating of the thoroughly dried brittle leaves takes place in a small closed shed and is accomplished by manually beating the suspended leaves with a stick.

The powdery wax falls to the floor together with a great deal of leafy matter composed largely of particles comparable in size, shape and weight to the wax powder particles from which it can scarcely be distinguished. The leafy matter and other non-waxy matter in this crude wax powder may equal as much as 20 per cent of the total mass of the powder.

The natives manufacture wax cakes by melting the crude wax powder in cans over open fires and crudely filtering the molten wax through a cloth to substantially remove the leafy matter and other insoluble solid impurities. The filtrate, upon cooling, forms the commercial raw material wax cakes of dark grey, greenish-brown or brownish-black color. This undesirable deep coloration of the wax precludes its use in most, if not all, commercial wax products.

In this specification and in the following claims, we use the term wax powder to identify the powdery substance which is removed as such from the vegetable matter and which is composed of both wax and non-waxy particles. The term crude powder refers to the wax powder prior to any removal of the fine non-waxy material, and the term raw material wax refers to the solid wax cakes which are manufactured from the wax powder.

Raw material wax, such as carnauba wax, is highly colored and its commercial use necessitates the refinement of the wax primarily for the purpose of decreasing its coloration, but also in some instances for the purpose of removing non-waxy matter and increasing the uniformity of the wax composition.

Many processes have been proposed to obtain the above results. One large group of these processes employs adsorbents and produces a product of unaltered wax components, but the decolorizing thereby effected has not proven entirely satisfactory. These processes require a re-melting of the raw material wax cakes and have proven costly by virtue of the large amount of wax retained in the adsorbent.

Another large group of processes, which also require a re-melting of the raw material wax cakes, employs chemical means to effect a bleaching of the wax. The products of these processes are of satisfactory lightness of color, but the chemical action which is sufficient to bleach the wax will also change the chemical and structural nature of the wax components to an extent which prohibits the use of these products as a wax in many commercial manufactures.

To recapitulate, the light colored wax which has been obtained from the raw material wax by means of chemical bleaching contains chemically and/or structurally altered wax components, and the chemically and structurally unaltered wax which has been obtained from the raw material wax by means of adsorbent decolorizing methods is not entirely satisfactory in lightness of color and is obtained only at considerable cost.

An object of our invention is to obtain a raw material wax of satisfactory lightness of color. Another object of our invention is to obtain a raw material wax from crude wax powder which is of satisfactory lightness of color, of uniform composition, and contains the chemically and structurally unaltered original wax components. It is still another object of our invention to provide means for removing the coloring matter which is released from the leafy matter in the crude wax powder during the melting process of this wax powder. Still another object of our invention is to manufacture a light colored raw

material wax using the crude wax powder as the initial material.

This invention turns on the discovery of the nature and cause of the coloration in the raw material wax. In order that this discovery may be appreciated, it is believed desirable to examine the coloration from a theoretical standpoint.

It has long been recognized that the coloration of the raw material wax depends upon the age of the leaves from which the wax is obtained. For example, the wax obtained from the "palhas," or open carnauba leaves, is of a very dark color, whereas the wax obtained from the "olhos," or young unopened carnauba leaves, is of a very light yellow color. We have discovered by experimentation that the wax formed by melting the very small pure wax particles obtained from the old or the young leaves is practically colorless and that the greatly differing color of the raw material wax which is prepared from the crude wax powder obtained from these different leaves must be introduced during the manufacture of the raw material wax. Following this line of reasoning, we further discovered that the coloration is introduced during the melting of the crude wax powder. Part of this coloration is obtained from sources other than the leafy matter, such as sand, clay, dirt and humus material, but this coloration can readily be satisfactorily removed from the wax cake by means of subsequent remelting and filtration. The leafy matter, however, contains difficultly removable high coloring substances, such as chlorophyll and xanthophyll, which, together with their decomposition products and the decomposition products of other color-forming substances, are extracted by the hot molten wax to form the greater part of the undesirable deep coloration of the crude raw material wax cakes. This coloration is thereby so thoroughly incorporated within the wax that its subsequent complete removal has not been attained by any known process whereby the product produced retains the components of the original wax unchanged.

The unopened yellow "olhos" leaves therefore produce the yellow colored wax because the leafy material in the crude powder obtained therefrom contains no chlorophyll or other deep coloring substances incident to the more mature open leaves, and the hot molten wax extracts only the light yellow coloration composed largely of carotin. Crude powder which is obtained from the green opened "palhas" leaves contains the fine leafy matter beaten from these leaves whereby the deep coloring substances, such as chlorophyll and xanthophyll, are introduced into the powder and are subsequently extracted by the hot molten wax to form the deep-coloration of the raw material wax cakes.

Contrary to the teachings of the prior art, we have discovered that the coloration of wax is not dependent on the living plant leaves or the age thereof; that the coloration is incorporated into the wax during the melting of the crude powder; and that the coloring matter released from the leafy matter during the melting process can be removed before it is incorporated into the molten wax. Although adsorbents have been used in the prior art of remelting and decolorizing the wax cakes, no one has heretofore recognized the cause of the coloration of the wax and the desirability of adding an adsorbent to the wax powder at the initial melting of such powder.

Our invention comprises the removal of the undesirable coloring substances before they can be incorporated within the molten wax. We accomplish this result by adding suitable adsorbents to the wax powder at its initial melting so that the resinous and coloring constituents are removed by the adsorbent before they are incorporated into the wax. Any adsorbents heretofore used to purify molten wax may be used in our process, such as activated carbons, activated clays, aluminum oxides and silicas. The adsorbent may be mixed with the powder before melting takes place, or it may be added as the wax powder melts. The former is the preferred method.

The amount of adsorbent depends, of course, on the particular adsorbent used and on the character and amount of impurities present in the crude wax powder. We have found that the use of about 5% of a suitable activated clay, such as "Tonsil," based on the weight of the powder, gives good results with the average crude carnauba wax powder. This amount of adsorbent may be reduced or increased with a corresponding decrease in quality or quantity of the final product. The optimum amount of other adsorbents intended for use in this process may be calculated on the basis of their comparison with a suitable activated adsorbent clay which is used in an amount equal to about 5% of the weight of the powder.

The crude wax powder containing the thoroughly mixed adsorbent is heated until all the wax is molten, care being taken to avoid excessive heating. The molten mass is then filtered to remove the adsorbent, leafy material, and other insoluble solid impurities. Any suitable filter press, such as a steam heated plate and frame press, may be employed. The resulting wax filtrate, upon cooling, forms light colored wax cakes containing the original chemically and structurally unaltered wax components.

The addition of the adsorbent has the further advantage of increasing large scale filtration economy as a result of the formation of a filter bed within the filter press. Filtration is impeded on the other hand by the formation of a film composed of the gummy resinous exudations of the leafy matter which are insoluble in the molten wax. The removal or substantial reduction of leafy matter in the crude wax powder is therefore most desirable for the purpose of increasing filtration economy as well as for the further purpose of removing, to that extent, the source of the harmful coloring matter.

The amount of leafy matter in the crude powder may be reduced by screening the powder through one or more screens of from 20 to about 60 mesh per inch. A series of screenings through screens of increasing fineness of mesh is the preferred method. The crude powder may also be purified by subjecting it to an air flotation separation adapted to remove the fine leafy matter from the wax powder particles. Centrifugal air flotation separation wherein the air velocity is adjusted for the size and mass of the wax powder particles is the preferred type of air flotation separation. A combination of both screening and air flotation separation gives the maximum mechanical separation of the non-waxy matter present in the crude wax powder and to the same extent decreases the source of both the resinous matter and the harmful high coloring substances which are otherwise present during the initial melting of the wax. The mechanical separation of non-waxy matter from crude vegetable wax powder is described more fully in the application

for a patent entitled "Wax powder refining" which was filed in the United States Patent Office on even date herewith. A crude vegetable wax powder which is purified according to the above mechanical refining process and then melted with the addition of a suitable adsorbent according to this invention will provide a raw material wax of a very satisfactory composition and lightness of color for all commercial purposes.

Example 1

One hundred pounds of crude carnauba wax powder is placed in a kettle together with a suitable adsorbent such as "Tonsil" clay or "Darco G60" adsorbent carbon. After the adsorbent and wax powder have been thoroughly mixed, heat is applied with continued agitation until all the wax is in the molten state. The temperature is not allowed to exceed about 220° F. The molten mass is then filtered through a suitable filter press, such as a steam heated plate and frame press, and the filtrate, upon cooling, forms light colored wax cakes.

Example 2

One hundred and twenty pounds of crude carnauba wax powder is screened through a screen of about 30 mesh per inch followed by another screen of about 60 mesh per inch in a "Gyro Whip" screen of the type described in United States Patent No. 2,159,549. The fines of the screening operation are subjected to further purification in a Raymond centrifugal air flotation separator. This separator is described in United States Patent No. 1,783,357. The fines from the air flotation separation are treated according to Example 1 and the product obtained yields very pure and light colored wax cakes.

The herein described process has not been employed in any process known to the authors for manufacturing raw material wax from crude vegetable wax powder and, although the process has been set forth with reference to carnauba wax, no limitation is thereby imposed upon the process in that it is applicable to all vegetable waxes which are obtained from the plant fibers in the form of a powder. Wax powders so obtained include, among others, esparto grass wax, ouricury wax and sugar cane wax.

It is evident that our process offers many advantages over prior methods for manufacturing raw material wax from crude vegetable wax powder. It is highly flexible and may be carried out in many ways without departing from the spirit or scope of our invention which is not to be regarded by the details of operation or by the theories advanced in the explanation of the improved results obtained, but only by the terms of the accompanying claims in which it is our intention to claim all novelty inherent therein as broadly as possible in view of the prior art.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent of the United States, is:

1. In the manufacture of wax from crude vegetable wax powder, which has not been melted in the production thereof, the method which comprises adding to the said crude vegetable wax powder a solid adsorbent adapted to adsorb chlorophyl and like coloring matter, heating the resulting mixture until the wax therein becomes molten, and filtering the molten mass.

2. In the manufacture of wax from crude carnauba wax powder, which has not been melted in the production thereof, the method which comprises adding to the said crude carnauba wax powder a solid adsorbent adapted to adsorb chlorophyl and like coloring matter, heating the resulting mixture until the wax therein becomes molten, and filtering the molten mass.

3. In the manufacture of wax from crude vegetable wax powder, which has not been melted in the production thereof, the method which comprises subjecting the said crude vegetable wax powder to a centrifugal air flotation purification adapted to separate wax from non-wax particles, adding to the refined wax portion of the powder, which is carried from the separator by the air current, a solid adsorbent adapted to remove chlorophyl and like coloring matter, heating the resulting mixture until the wax therein becomes molten, and separating the molten wax from the non-wax material.

4. In the manufacture of wax from the crude vegetable wax powder, which has not been melted in the production thereof, the method which comprises screening the said crude vegetable wax powder through a series of screens of increasing fineness of mesh the final screen being of about 60 mesh; subjecting the fines of the screening operation which contains the wax particles to further purification in a centrifugal air flotation separator adapted to remove fine leafy material of powder particle size and other non-waxy matter from particles of the size, shape and mass of the wax powder particles; adding to the refined powder, which contains the wax and is carried from the separator by the air current, a solid adsorbent adapted to adsorb chlorophyl and like coloring matter, heating the resulting mixture of powder and adsorbent until the wax therein becomes molten, and separating the molten wax from the non-wax material.

5. In the manufacture of carnauba wax from its crude powder, which has not been melted in the production thereof, the method which comprises screening the said crude carnauba wax powder through screens of about 40 to 60 mesh, adding to the fines, which contain the wax, a solid adsorbent adapted to adsorb chlorophyl and like coloring matter, heating the resulting mixture until the wax therein becomes molten, and filtering the molten mass.

6. In the manufacture of carnauba wax from its crude wax powder, which has not been melted in the production thereof, the method which comprises subjecting the said crude carnauba wax powder to a centrifugal air flotation separation adapted to remove the fine leafy material, of powder particle size, adding to the refined powder, which is carried from the separator by the air current, a solid adsorbent adapted to adsorb chlorophyl and like coloring matter, heating the resulting mixture until the wax therein becomes molten, and filtering the molten mass to obtain the pure wax filtrate.

7. In the manufacture of carnauba wax from its crude powder, which has not been melted in the production thereof, the method which comprises screening the said crude carnauba wax powder through a series of screens of increasing fineness of mesh, the final screen being about 60 mesh, subjecting the powder which passes through the screens to a centrifugal air flotation separation adapted to separate the fine leafy material, of powder particle size from wax particles of like size, adding to the refined powder, which contains the wax and is carried from the separator by the air current, a solid adsorbent adapted to adsorb chlorophyl and like coloring

matter, heating the resulting mixture of powder and adsorbent until the wax therein becomes molten, and filtering the molten mass to obtain the pure wax filtrate.

8. In the manufacture of wax from crude wax powder which is removed from vegetable matter in the form of a powder, the method which comprises substantially reducing the amount of the non-waxy constituent of powder particle size in the crude wax powder, adding to the refined powder an adsorbent adapted to adsorb chlorophyl, heating the resulting mixture until the wax therein becomes molten, and separating the molten wax from the non-waxy matter.

9. In the manufacture of carnauba wax from the crude powder which is obtained from the carnauba palm leaves in the form of a powder, the method which comprises substantially reducing the amount of the non-waxy constituent of powder particle size in the crude wax powder, adding to the refined powder an adsorbent adapted to adsorb chlorophyl, heating the resulting mixture until the wax becomes molten, and separating the molten wax from the non-waxy matter.

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