

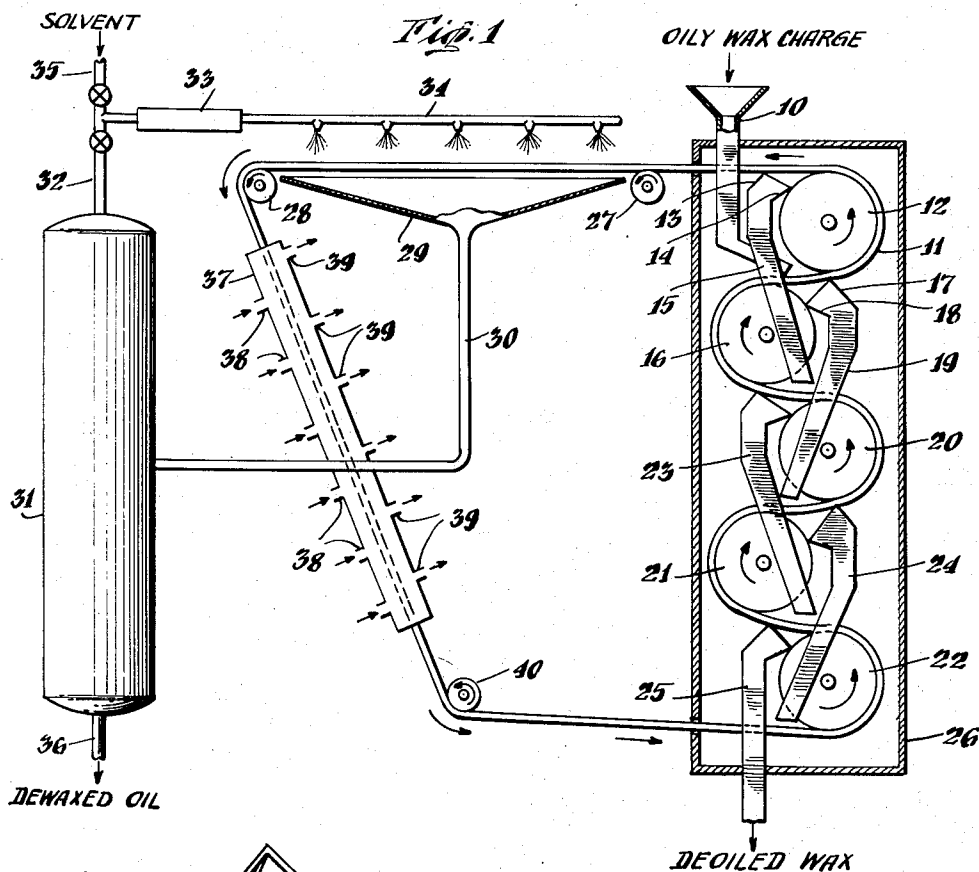
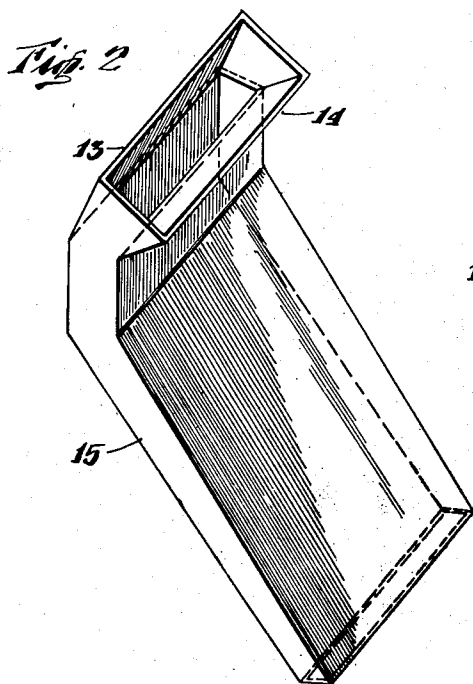
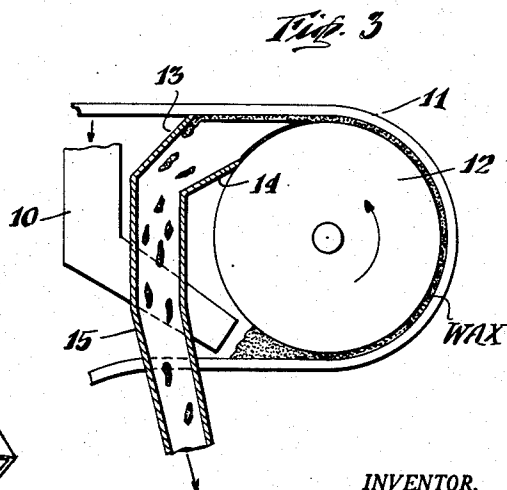
Nov. 10, 1953

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2,658,855

DEOILING WAX

Filed June 27, 1951



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2,658,855

DEOILING WAX

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Application June 27, 1951, Serial No. 233,819

4 Claims. (Cl. 196—20)

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This invention relates to a method and apparatus for deoiling normally solid waxy hydrocarbons. More particularly, the present invention is concerned with an improved process for the removal of oil from petroleum waxes to afford products of higher melting point.

The present process and apparatus are broadly applicable to the problem of separating wax and/or petrolatum and the like from hydrocarbon oils in the form of products of reduced oil content. The method and apparatus described herein are particularly directed to the deoiling of crystallizable wax present in high waxy stocks such as slack wax.

A process heretofore commonly employed for accomplishing deoiling of wax is the well known sweating process wherein the slack wax is chilled in pans to effect congealing of the wax, after which the mass is slowly heated to cause sweating out of the liquid oil. The efficiency of this process is low as compared with other methods from the standpoint of wax yields. Moreover, the process is conducted batchwise and requires a considerable length of time and delicate temperature control during the heating period.

Another process employed is the solvent deoiling process in which a suitable solvent, as for example, a liquified normally gaseous hydrocarbon, benzol, acetone, and the like, is used. In these processes, the solvent is usually added to the waxy charge and the resulting mixture is then chilled to dewaxing temperature. The waxy constituents which separate out are ordinarily removed from the dewaxed oil by filtration. The resulting wax cake is then customarily washed with a suitable washing solvent, such as naphtha, in order to reduce the amount of oil in the wax. These processes have not been satisfactory for economically producing substantially oil-free wax without the necessity of a subsequent sweating stage. Such methods, moreover, are complicated by the necessity of solvent recovery.

Still another process currently practiced is the emulsion deoiling process in which the waxy charge is mixed with a non-viscous non-solvent while in the molten state, after which it is cooled to congeal the wax. The congealed wax is then separated from the oil in non-solvent emulsion by means of a basket-type centrifuge lined with a filter material. Such processes involve extensive wax recycle to obtain high yield of low oil content wax. Further disadvantages of such methods are the need for refrigeration and the practical necessity of carrying out the operation on a batch basis.

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It is an object of the present invention to provide a process and apparatus for deoiling wax wherein the disadvantages inherent in the procedures and equipment of the prior art are overcome. A further object is the provision of a method for deoiling hydrocarbon waxes which is amenable to continuous operation. A still further object is to afford a deoiling process capable of being carried out at ambient temperatures. A very important object is to provide a continuous commercially attractive deoiling process and apparatus in which the waxy charge undergoing treatment is continually "on-stream" during the period of oil removal.

The above and other objects which will be apparent to those skilled in the art are attained in accordance with the present invention. Broadly, the process of this invention comprises intimate contact of oily wax with a sheet of adsorbent material at temperatures below the melting point of the wax. Oil is sorbed by the adsorbent material. The adsorbent material is subsequently freed of oil by solvent washing followed by drying, after which it is ready for re-use.

In particular, the present invention is directed to passage of an oily wax charge through a series of rollers countercurrent to the movement of an endless flexible adsorbent belt passing between and around said rollers. The relative position of the rollers and belt is such that the moving belt fits rather loosely around the rollers during initial operation. Upon the introduction of the oily wax charge onto the moving belt, wax, in the form of a thin cake, passes through the small clearance space between the roller and the adsorbent belt. During the course of such passage, wax is pressed both onto the surface of the roller and also onto the surface of the adsorbent belt adjacent to the roller, while oil is sorbed from the oily wax charge into the pores of the adsorbent belt. The wax picked up on the roller and on the belt is subsequently scraped therefrom and transferred through a chute to the adjacent roller where the pressing step is repeated. The upper edges of the transfer chute suitably act as scraper blades for effecting removal of said wax. The wax proceeds through this cycle for each of the rollers constantly being brought into contact with the belt of adsorbent material which had previously contacted less oily wax. The final contacting of the wax with the belt takes place with an oil-free adsorbent surface, and deoiled wax is discharged after passage through the last roller. The continuous adsorbent belt emerging from the rollers is freed

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of oil by washing with a suitable oil solvent, such as naphtha. The moving belt is then passed through a drying zone, after which it is ready for re-use. The solution of oil and washing solvent is suitably separated, yielding dewaxed oil and solvent. The latter may be recycled to the washing zone.

The process and apparatus of the invention may be readily understood by reference to the attached drawing wherein:

Figure 1 illustrates the process, in schematic form, and an elevational view, partly in section, of suitable apparatus for carrying out the process.

Figure 2 is a detailed isometric view of the transfer chute employed in the present apparatus.

Figure 3 shows in detail the manner of introduction of the oily wax charge and the subsequent removal of pressed wax from the surfaces of the belt and the roller.

Referring more particularly to Figure 1, oily wax charge is introduced through conduit 10 onto the surface of a moving adsorbent belt 11 at a point just prior to the contact of said belt with the uppermost roller 12, revolving in a counter-clockwise direction. Wax collects in the clearance space between belt 11 and roller 12, being picked up on the surface of both belt and roller during the course of revolution while oil is sorbed by the adsorbent material comprising the endless belt. The wax so collected is removed from the belt and roller on the discharge side by means of scrapers 13 and 14 which scrape off the wax accumulated on the belt and roller respectively. The wax thus removed falls through transfer chute 15 to the surface of moving belt 11 at a point just prior to the contact of the belt with the next lower roller 16, which is revolving in a clockwise direction. Wax collects in the spacing between belt 11 and roller 16 and is again pressed, being picked up on both belt and roller while additional oil is removed from the pressed wax cake by sorption of the same on the adsorbent moving belt. The adhering wax is again removed from the belt and roller 16 on the discharge side by contact with scrapers 17 and 18 respectively. The wax thus removed falls through transfer chute 19 to the surface of moving belt 11 for passage through the next lower roller 20 which moves in a counter-clockwise direction similar to that of roller 12.

The cycle may be repeated any desired number of times by passing the wax through additional alternately revolving rollers, such as 21 and 22 and subsequently scraping the accumulated wax, freed of additional oil from the surfaces of the rollers and adsorbent belt for transfer to the next lower roller through chutes such as 23 and 24. The deoiled wax product emerges, after passage through the last roller, by way of chute 25. The roller section is suitably enclosed in a casing 26. The adsorbent belt, emerging from casing 26 after passage over roller 12, contains an appreciable quantity of oil sorbed from the wax during the course of movement through the roller section. The sorbed oil is removed from the belt by washing with an oil solvent, such as naphtha, as the belt passes between pulleys 27 and 28. The resulting solution of solvent and oil is collected in trough 29 and conducted through pipe 30 to a fractionating column 31. There, the solvent passes overhead through outlet conduit 32 and flows through condenser 33 and then into pipe 34 from which it is again sprayed onto moving belt 11. Initial and any required make-up solvent

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is introduced through pipe 35. Dewaxed oil is removed as a bottoms product from fractionating column 33 through conduit 36.

The moving belt passing over pulley 28 is substantially freed of oil but is wet with solvent. The wet belt is accordingly conducted through a drying zone comprising a tube 37 surrounding said belt and pierced by a plurality of inlet openings 38 for the introduction of warm air or other drying gas and a plurality of outlets 39 for the withdrawal of discharge gases. The belt now freed of oil and solvent passes over pulley 40 and enters casing 26 wherein it is brought into further contact with oil-containing wax.

In Figure 2, one of the wax transfer chutes is shown in greater detail. A particular feature of the chutes is the application of the upper edges thereof, for example, edges 13 and 14 of chute 15, as means for scraping accumulated wax from the surfaces of the belt and the roller. It is also possible, although not usually quite so convenient, to affix separate scraping blades to the upper edges of the chute in those instances where it is not feasible or desirable to employ the edges of the chute directly for scraping.

Figure 3 shows, in detail, the pick-up of wax by the roller and adsorbent belt and the subsequent removal of adhering wax from the surface of the belt and the roller upon contact with the scraping edges of the transfer chute. Wax, in the form of thin cake-like flakes, passes down the chute for contact with the next lower roller.

It is apparent that in the deoiling process of this invention, the adsorbent belt passes through three distinct stages in completing a cycle. In the first stage, the belt contacts the charge of oily wax. In the second stage, the belt is subjected to washing with an oil solvent to remove sorbed oil therefrom. In the third stage, the belt is dried to remove the washing solvent and place the belt in condition for re-use. The dimension and number of rollers and auxiliary pulleys are such as to afford a suitable contacting period in each of the aforementioned stages. The position of the rollers and belt is suitably subject to adjustment in order to maintain requisite pressure between the belt and rollers to effect removal of oil from the wax cake passing therebetween. In some instances, it is desirable to adjust the relative positions of rollers and adsorbent belt so that the pressure between the same gradually increases as the wax charge proceeds downwardly through the roller section. Since the wax, after passage through each successive roller, contains less and less oil, the gradual increase in pressure under such circumstances serves to effect a more complete removal of oil from the wax. The particular temperature and pressure employed in the present deoiling process will depend on the melting point desired in the final wax product, as well as upon the characteristics of the wax charge being treated. As a general rule, the pressures developed between the revolving rollers and the counter-moving adsorbent belt will be in the range of about 1 to about 100 pounds per square inch. The temperature at which contacting is carried out is necessarily below the melting point of the wax undergoing treatment. By suitable adjustment in operating temperature, low melting point waxes are feasibly separated from oily wax charge mixtures. Usually, the contacting temperature will be in the approximate range 0 to 150° F.

The adsorbent belt used in the instant process

may be composed of any material which adsorbs oil and which is capable of being fabricated into a continuous belt. Typical examples of suitable materials are various textiles and papers including cotton duck, heavy blotter-type paper, and the like. Any oil solvent which does not detrimentally affect the adsorbent belt may be employed in washing the same. The choice of solvent will generally be governed by economic considerations consistent with its oil dissolving properties and, in this regard, naphtha may be considered as a preferred solvent.

The following example, while carried out on a batch basis, will serve to illustrate the results capable of attainment with the process of this invention:

Example

A quantity of paraffin wax containing 19.4% by weight of oil was cut into small pieces and conducted between two sheets of adsorbent blotter-type paper under a pressure of approximately 10 p. s. i. and at a temperature of about 70° F. The resulting wax cake of approximately $\frac{1}{8}$ inch thickness was found to contain 10.2% by weight of oil. This is equivalent to a reduction of 47.5% in oil content of the wax treated.

The method of this invention is applicable to all types of waxy hydrocarbons whether obtained from petroleum oils, shale oils, mineral oils, or from coal tar, pitches, bitumens or other carbonaceous materials.

The process and apparatus described herein are advantageous over procedures and equipment heretofore employed in that no refrigeration is ordinarily required in achieving separation of a low oil content wax. A further advantage of the present method lies in the continuous counter-current operation which does not require an "off-stream" period for hot washing such as is a necessary step with the use of dewaxing filters. Moreover, solvent recovery requirements in the present process are very small as compared with those in conventional solvent deoiling processes.

It is to be understood that the above description is merely illustrative of preferred embodiments of the invention, of which many variations may be made within the scope of the following claims by those skilled in the art without departing from the spirit thereof.

I claim:

1. A continuous method for deoiling an oily hydrocarbon wax, which comprises continuously and intimately contacting an oily wax charge with a counter-currently moving adsorbent belt at a temperature below the melting point of said wax, continuously pressing the wax contained on said adsorbent belt by passing said belt together with said wax around and over a revolving roller surface whereby wax, in the form of a thin cake, collects in the clearance space between said belt and said roller surface while oily components are simultaneously sorbed from said wax into the pores of said moving adsorbent belt, continuously releasing the resulting wax cake from said pressing, continuously scraping adhering wax from said belt and said roller surface, continuously transferring the wax so scraped to further contact with said counter-currently moving adsorbent belt, continuously passing said belt together with said wax around and over a second roller surface revolving in a direction opposite to that of the aforementioned roller surface whereby wax is again subjected to pressing in

the space between said belt and said second roller surface, continuously releasing the resulting wax cake from said pressing, continuously scraping adhering wax from said belt and said second roller surface, repeating the cycle of above steps until a wax product of predetermined oil content is obtained, continuously washing said moving belt emerging from contact with said roller surfaces with an oil solvent, continuously passing the moving belt through a drying zone and thereafter recycling the resulting dry revived adsorbent belt to further contact with said oily wax charge.

2. A continuous method for deoiling an oily hydrocarbon wax, which comprises intimately contacting an oily wax charge with an endless counter-currently moving adsorbent belt at a temperature below the melting point of said wax, passing said belt containing said oily wax around and between a series of revolving rollers, consecutive rollers of which revolve in opposite directions, whereby wax is pressed, in the form of a thin cake, in the clearance space between said belt and each of said rollers with simultaneous sorption of oily components from the wax into the pores of said adsorbent belt, scraping the resulting wax cake from the surface of said belt and each of said rollers before conducting the same to a successive roller, discharging a deoiled wax product from contact with said rollers, spraying said moving adsorbent belt emerging from contact with said rollers with an oil solvent, passing said moving belt through a drying zone and recycling the dried revived adsorbent belt to further contact with said oily wax charge.

3. A continuous method for de-oiling an oily hydrocarbon wax, which comprises continuously and intimately contacting an oily wax charge with a counter-moving adsorbent belt at a temperature below the melting point of said wax, continuously pressing the wax contained on said adsorbent belt by passing said belt together with said wax around and over a revolving roller surface whereby wax, in the form of a thin cake, collects in the clearance space between said belt and said roller surface while oily components are simultaneously sorbed from said wax into the pores of said moving adsorbent belt, continuously releasing the resulting wax cake from said pressing, continuously scraping adhering wax from said belt and said roller surface, continuously transferring the wax so scraped to further contact with said counter-currently moving adsorbent belt, continuously passing said belt together with said wax around and over a second roller surface revolving in a direction opposite to that of the aforementioned roller surface whereby wax is again subjected to pressing in the space between said belt and said second roller surface, continuously releasing the resulting wax cake from said pressing, continuously scraping adhering wax from said belt and said second roller surface, repeating the cycle of above steps until a wax product of predetermined oil content is obtained, continuously removing said wax product from contact with said roller surfaces, continuously washing said moving belt emerging from contact with said roller surfaces with an oil solvent, continuously passing the moving belt through a drying zone, continuously recycling the dried revived adsorbent belt to further contact with said oily wax charge, continuously collecting the solution of oil and solvent resulting from the aforementioned washing, continuously separating said solution into dewaxed oil and solvent

and continuously recycling said solvent for use in the aforesaid washing operation.

4. A continuous method for deoiling an oily hydrocarbon wax, which comprises intimately contacting an oily wax charge with an endless counter-currently moving adsorbent belt at a temperature below the melting point of said wax, passing said belt containing said oily wax around and between a series of revolving rollers, consecutive rollers of which revolve in opposite directions, whereby wax is pressed in the form of a thin cake in the clearance space between said belt and each of said rollers with simultaneous sorption of oily components from the wax into the pores of said adsorbent belt, scraping the resulting wax cake from the surface of said belt and each of said rollers before conducting the same to a successive roller, discharging a deoiled wax product from contact with said rollers, withdrawing said adsorbent belt from contact with said rollers, spraying said moving adsorbent belt with

an oil solvent, passing said moving belt through a drying zone, recycling the dried revived adsorbent belt to further contact with said oily charge, collecting the solution of oil and solvent resulting from said spraying, fractionating said solution to yield a dewaxed oil and recovered solvent and recycling said recovered solvent to said spraying operation.

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