Dec. 28, 1954

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2,697,926

PARAFFIN WAX CANDLE

Filed July 29, 1949

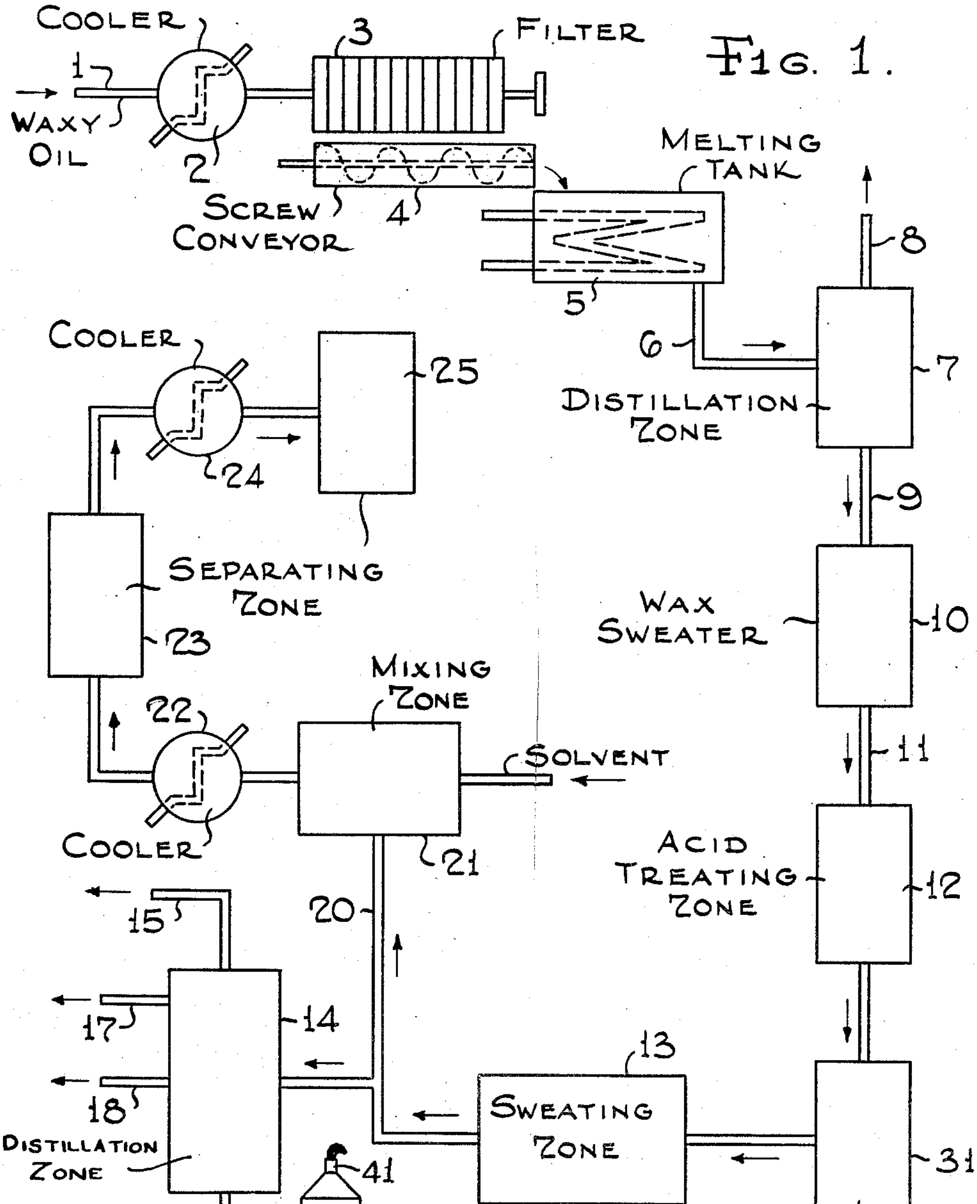

FIG. 1.

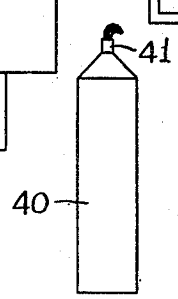

FIG. 2.

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Patented Dec. 28, 1954

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PARAFFIN WAX CANDLE

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Application July 29, 1949, Serial No. 107,513

6 Claims. (Cl. 67—22)

This invention relates to an improved type of candle. In accordance with this invention a candle is disclosed having the particular characteristic of being free of dripping tendencies. As disclosed herein, such a candle may be obtained by utilizing a paraffin wax having a narrow melting point range.

As indicated, this invention relates to a new type of candle having improved characteristics. It is generally appreciated that a candle should have two outstanding characteristics: First, it is necessary that the candle is not subject to bending, or deformation when exposed to moderate heat, or small bending forces. Secondly, it is desirable that the candle be of a character designated as "dripless." It is recognized that some consumers prefer a dripping candle for decorative purposes, but by far the largest demand is for a dripless candle. In order to provide a candle meeting the first requirement, it has been necessary heretofore to utilize comparatively high melting point wax. For this purpose waxes having a melting point above 140° F. have been used. These waxes are relatively scarce and command premium prices. Even in this case, however, candles formed from such wax may still be readily deformed by heat, or pressure due to the presence of minor proportions of low melting wax constituents. With regard to the second requirement, at the present time, in order to provide a dripless candle, it is conventional practice to add as much as 20% of stearic acid to the wax composing the candle.

It is, therefore, the principal object of this invention to provide a dripless candle of good quality as regards resistance to deformation, without necessity for employing the indicated quantities of stearic acid, or other additive and without necessity for utilizing high melting point waxes.

It has now been discovered that the tendency of a candle to drip wax on burning apparently is due to the presence of wax constituents varying widely in melting point. It is hypothesized, for example, that in the case of a candle composed of a conventional wax having a melting point range of about 100° to 150° that, as the candle burns, the low melting waxes will become liquid and tend to dissolve the high melting waxes at a rate greater than the wax is consumed, causing dripping. It is also known that the presence of low melting waxes tends to make candles which bend at relatively low temperatures. In any case, it has now been ascertained that dripping may be eliminated by preparing a candle consisting of a wax of a narrow melting point range. In particular, it is preferred in accordance with this invention that the wax have a melting point range not greater than about 10° F., and more particularly of about 5° to 6° F. The actual melting point of the wax is not critical provided it be above about 120° F., although for economical considerations it is preferred that the wax be chosen from the range of about 120° to 150° F. By utilizing a candle of this nature, dripless burning is obtained providing a longer burning life, and the indicated difficulties of deformation are avoided as the presence of low melting point wax constituents is eliminated.

In order to obtain a suitable narrow range melting point wax, for the purposes of this invention, any paraffinic wax material may be utilized. As will be disclosed, the wax from whatever source obtained is then subjected to distillation, or to re-crystallization processes, so as to obtain a wax of narrow melting range.

In order to aid in a full understanding of this invention, a description will be presented of suitable processes for obtaining the narrow range melting point wax to be used. The principal source of suitable wax is a crude oil of the paraffinic type. As is generally known, paraffinic crudes contain appreciable quantities of straight chain paraffins having molecular weights in the wax range; that is, about C_{20} to C_{60}, or higher. A crude oil of this nature is generally fractionated in crude distillation equipment so as to concentrate the waxy constituents in a distillate fraction boiling up to about 900° F. This crude material may be cooled sufficiently to precipitate the wax constituents which can then be separated by a filtering operation. Thus the waxy distillate stock is generally cooled to a temperature of about 20° to 40° F., and is then pumped to a plate and frame filter press to separate the wax from the oil constituents. A crude wax cake is obtained from the filter press, which may then be subjected to other purification or refining steps, as will be described.

An alternate method for obtaining wax material which is widely used at the present time is to separate the wax from oil by employing suitable solvents. Solvents which may be employed are numerous, but those which are most often used are propane, benzol, methyl-ethyl-ketone, toluol, acetone and a mixture of 75% of ethylene-chloride and 25% of carbon tetrachloride. In processes for separating wax from waxy distillates employing solvents of this nature, the waxy distillate is mixed with about 2 to 5 parts of solvent after which the mixture is chilled to precipitate wax, which may be separated by filtration. In this process the solvent exerts a high differential solvent power for wax and oil, permitting a good separation of the waxy constituents from the oil constituents. This separation is generally carried out in a rotary filter, or alternatively, by centrifuging, or in plate-and-frame presses. As indicated, therefore, a crude wax cake is also obtained from solvent dewaxing operations of the character indicated.

The most widely used method of refining crude waxes is a process known as sweating. Crude wax obtained as indicated may be charged directly to sweating apparatus, although if desired the wax may be subjected to an initial distillation step to eliminate a portion of oils still present in the wax. The wax to be charged to the sweaters is introduced in molten form, and is then solidified by means of cooling water passing through tubes imbedded in the wax layer. Thereafter, warmer water is passed through the tubes of the sweater, so as to gradually increase the temperature of the wax. Oil and low melting point waxes first liquefy and drain off through suitable perforations and lines provided until finally higher melting point waxes substantially free of oil are left. This refined wax may then be melted from the sweater by use of steam and may be subjected to further refining steps.

For example, in further refining wax obtained from an initial sweating operation, the wax is often subjected to acid treatment and is then generally subjected to a further sweating operation carried out with closer temperature control and better heat distribution than generally maintained in the first sweating operation. The wax obtained from the final sweating operation, which may be identified as "refined wax," has a very low oil content of about 1% or less. This wax may, if desired, be subjected to additional refining steps, such as distillation in the presence of caustic, or mild hydrogenation to improve the characteristics of the wax, although these steps are generally not required to secure suitable wax for the practice of this invention.

Refined wax of the character indicated may be processed to obtain wax of a narrow melting point range, as required by this invention, in a number of ways. One suitable method of accomplishing this is to re-crystallize the wax from a suitable solvent, closely controlling the temperature of crystallization so as to secure a wax of the desired melting point range. Alternatively, the refined wax may be subjected to a distillation operation to permit recovery of a distillate wax having the desired melting point range. As indicated, the desired melting point range is about 10° F., or preferably even a narrower range of about 5° to 6° F. Waxes having a melting point range of this magnitude may then be formed into candles in order to secure the improved candles of this invention.

While, as indicated, many alternative processes may be used, and many modifications and refinements of these processes may be adopted in securing a wax in accordance with this invention, a preferred embodiment of this invention will be given fully describing a suitable wax process as illustrated in the accompanying drawing.

In the drawing, Figure 1 diagrammatically illustrates a preferred process embodying the principles of this invention; and

Figure 2 illustrates a conventional candle of the configuration to which the invention has application.

Referring to the drawing, a waxy oil, such as a fraction obtained from the distillation of a paraffinic crude oil boiling up to about 860°, or 900° F., is passed through line **1** into a chiller **2**, where the waxy oil is cooled to a temperature of about 20° to 40° F. At this temperature, the waxy constituents precipitate from the oil in the form of crystals, so that on passing the chilled waxy oil to filter press **3**, the wax may be separated from the oil. Wax is then manually removed from filter press **3** and may be dumped into a screw conveyor **4** for carriage to a slack wax melting tank **5**. Tank **5** is provided with suitable heating coils so that the slack wax obtained from filter press **3** may be melted. The slack wax present in vessel **5** generally contains from about 25% to 40% of oil, and has a melting point of about 120° to 130° F. In order to decrease the oil content of this wax, melted slack wax is withdrawn from vessel **5** through line **6** and is passed to a still **7**. Distillation zone **7** is operated so as to drive oil overhead for removal through line **8**, while permitting recovery of a wax bottoms product through line **9** containing about 15% to 20% of oil. The bottoms of still **7**, passing through line **9** may then be charged to a suitable wax sweater, identified on the drawing by the numeral **10**. This wax sweater may be either of a pan, or tank type, as conventionally used. As formerly described, the sweating zone **10** is operated to selectively melt the wax, first maintained as a solid in zone **10**, so as to permit removal of low melting constituents and oil, leaving a residue in the sweater consisting of a purified wax having an oil content of about 2 to 6 percent and having a melting point range of about 125° to 135°. This wax may then be melted from sweating zone **10** and may be passed through line **11** for further processing. If desired, the wax as obtained from sweating zone **10** may be segregated into wax fractions having narrow melting point ranges for use in accordance with this invention. However, it is preferred to subject the wax to further refining steps in order to secure a higher quality candle.

Thus the wax of line **11** is preferably passed to an acid treating zone **12** wherein the wax is contacted in liquid state with about 0.5 to 1.0 percent of 98% sulfuric acid at 150° to 170° F. The acid treated wax may then be separated from the spent acid by phase separation in zone **12** in the absence of agitation, or in a continuous type of separator. The acid treated wax is preferably passed to a neutralization zone **31**, where the residual acidity of the wax is neutralized with slightly more than the theoretically required amount of aqueous caustic soda solution, the operation being carried out in the liquid phase at 150° to 200° F. The acid treated and neutralized wax is then preferably passed to a second sweating zone indicated by number **13** wherein the wax is subjected to carefully controlled sweating conditions to secure a highly purified wax product. Sweating zone **13** is operated essentially as zone **10**, resulting in the recovery of a wax of about 1% oil content or less having a melting point of about 130° to 140° F.

The wax obtained from sweating zone **13** may then be conducted to distillation zone **14** to secure a wax having a desired melting point range. Zone **14** preferably comprises a bubble cap tray type of distillation tower and is operated so as to permit removal of low boiling wax constituents overhead through line **15**, and of high boiling wax constituents as a bottoms product through line **16**. Side stream withdrawals **17** and **18** may be utilized to permit side stream withdrawal of wax fractions having a melting point range of about 5° to 10° F., or a boiling point range of about 7° to 15° F. For example, still **14** may be operated so as to permit removal of a side stream through withdrawal line **18** of a wax boiling in the range of about 760° F. to 775° F., having a melting point range of about 126° to 132° F.

As formerly indicated, if desired, a wax of narrow melting point range may also be secured by recrystallization operations. As illustrated in the drawing, the wax from sweating zone **13** may be passed through line **20** for admixture with a solvent in mixing zone **21**. While numerous solvents may be employed, the preferred solvent for use in this process is either propane, or a mixture of benzol and methyl-ethyl-ketone. The amount of solvent to be employed is generally from about four to eight times the volume of the wax. The temperature of the wax is maintained sufficiently high during the mixing operation to insure solution of all wax. Thereafter the wax and solvent mixture may be passed to a chilling zone **22** wherein the temperature of the wax solvent mixture is dropped to a desired point resulting in the formation of wash crystals having a melting point above the temperature to which the mixture is cooled. Separation of this wax may be made by settling, filtration, or centrifuging, in separation zone **23** diagrammatically indicated in the drawing. The remaining mixture may then be passed to subsequent chilling zone **24** wherein the mixture is dropped to a lower temperature; that is, about 7° to 15° lower to secure a wax having a melting point range of about 5° to 10°. This wax may then be recovered in an additional wax separation zone **24**, such as a centrifuge.

Referring now to Figure 2, a conventional candle is there illustrated. The body of the candle is designated by numeral **40** which, in the practice of this invention, is composed of the narrow melting point range paraffin wax of the character herein identified. A wick **41** is centrally positioned in the wax in the conventional manner.

As indicated, by obtaining a wax having a narrow melting point range, it is possible to prepare candles having improved characteristics. For comparative purposes, a refined paraffin wax, having a melting point range of 110° to 150° F., and containing .03 weight percent of oil was used to prepare a test candle. A second candle was then made utilizing a paraffin wax obtained according to the process described having a melting point range of 126° to 132° F., also having an oil content of .03 weight percent. It was found that both candles had good flames, but that the second candle prepared, using the wax having a narrow melting point range, was not subject to dripping as opposed to the first candle, which dripped moderately. Further, it was found that the second candle burned somewhat longer than the first candle, and was more resistant to deformation upon exposure to heat, or to deforming forces.

In accordance with this invention, therefore, a paraffinic wax having a melting point range of not more than 10° F., is utilized in the manufacture of candles. It is apparent that if desired, stearic acid may be used to improve the appearance of the candle, or a small percentage of other additives such as dyes, micro-crystalline waxes, or polymers may be added to the wax of narrow melting point range. As indicated while the melting point range of the wax chosen, is critical, the median melting point is not important. Thus, if desired, a suitable candle can be prepared consisting of a wax melting in the range of about 120° to 125° F., or again melting in the range of about 130° to 135° F. However, it is preferred that the wax have a melting point range of not more than 10° F., and be chosen from waxes melting in the broad range of about 120° to 150° F.

What is claimed is:

1. A process for preparing an improved candle wax which consists of segregating a crude wax cake from a waxy distillate containing paraffinic wax, sweating said crude wax to secure a refined wax substantially free of oil, segregating a narrow fraction of wax from said refined wax having a melting point of about 120° to 150° F., and consisting of wax constituents melting in a range of less than 10° F.

2. A process for preparing an improved candle wax which consists of segregating a crude wax cake from a waxy distillate containing paraffinic wax, sweating said crude wax to secure a refined wax substantially free of oil, fractionally distilling said refined wax and recovering a narrow boiling wax fraction having a boiling point spread of less than about 15° F. consisting of wax constituents melting in a range of less than about 10° F., and falling in a melting point range of about 120° to 150° F.

3. A process for preparing an improved candle wax which consists of segregating a crude wax cake from a waxy distillate containing paraffinic wax, sweating said crude wax to secure a refined wax substantially free of oil, fractionally recrystallizing said refined wax and recovering a

narrow fraction of wax having a melting point of about 120° to 150° F., and consisting of wax constituents melting in a range less than 10° F.

4. In a candle consisting essentially of a combustible wick positioned in a wax, the improvement for preventing dripping of wax during burning thereof in which said wax consists of paraffin wax constituents all of which melt within a range of not more than 10° F., and which fall within the melting point range of about 120° to 150° F.

5. The candle defined by claim 4 in which the said wax constituents have a melting point range of about 125° to 135° F.

6. The candle defined by claim 4 in which the said wax constituents all melt within a range of not more than 5° F.

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