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(54) **Smokeless candle**

(57) There is described a smokeless candle which contains insect or Chinese wax, in addition to paraffin wax, to prevent generation of soot, when the burning flame of the candle flares.

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Description

[0001] The present invention relates to a candle, and more particularly a smokeless candle which generates no or almost no soot during burning thereof and which may contain a perfume to enjoy its fragrance during burning period of time.

[0002] Hitherto, bees wax and Japan wax had been used as raw material for preparing illuminating candles, but in the present time, a petroleum wax of paraffin wax and a mixture thereof with polyethylene wax or stearic acid have mainly been used.

[0003] Among candles including Japanese type candles, a candle called as "smokeless" one has been marketed, which shows perfect burning or combustion and certainly recognizes no generation of soot under windless condition, but momentary generation of soot can not be avoided, even if its amount is only small, when burning flame shall flare e.g. by the wind.

[0004] As a so-called "aroma candle" for enjoying fragrance during burning period of time, Japanese Patent 9-188893(A) discloses a candle composed of a perfume precursor in a wax mixture of paraffin wax as a main component as well as polyethylene wax and higher fatty carboxylic acids, as additional components, said candle generates fragrance by decomposition of the perfume precursor, during burning of the candle. In recent years, various candles containing perfume have been marketed for the purpose of aroma therapies and since light or burning flame of the candle has an effect for softening human mentality.

[0005] A candle made of paraffin wax only or a candle containing paraffin wax as main component thereof burns near state of perfect combustion and almost no generation of soot, if the circumference is maintained in windless condition, but has following drawbacks.

(1) When the burning flame flares e.g. by the wind, soot momentary generates to make worse environment in the room,

(2) The burning flame is somewhat long and thus there is some problem in safety and total burning period of time becomes shorter,

(3) Somewhat strong inherent smell (offensive smell) generates, when the flame of the candle is blown out, and

(4) When a liquid perfume is used and the amount thereof shall be set higher, hardness of the wax becomes low and thus configuration of the candle is limited to a stick type one, if the candle shall be manufactured by a molding process. This means that the wax should be poured into a glass or the like receptacle with various configuration for obtaining a candle with configuration other than stick type one, which candle product must be merchandised together with the receptacle.

[0006] A main object of the invention, therefore, is to provide a smokeless candle which contains paraffin wax as one of wax components thereof, but generation of soot is remarkably inhibited or soot does not generate.

[0007] Another object of the invention is to provide a smokeless candle showing a burning flame shorter than that in a conventional candle, so that total burning period of time is relatively longer than that of the conventional candle.

[0008] Other object of the invention is to provide a smokeless candle which can be easily demolded, even if a liquid perfume is composed into the wax component in somewhat large amount, whereby the candles with various configuration can be manufactured by utilizing a molding process known *per se*.

[0009] A still other object of the invention is to provide a smokeless candle having delicate light color tone with no irregular color tone to give transparent feeling, since some of marketed aroma candles have heavy color tones, although it seems to be that the paraffin wax has low affinity with various coloring matters, more particularly liquid type coloring matters and thus the coloring matter has been used in large amounts to avoid generation of irregularity in color tone of the aroma candle.

[0010] According to the invention, the main object is attained by a smokeless candle comprising paraffin wax and an insect wax (also called "Chinese wax"), as wax components thereof.

[0011] Among the wax components for the smokeless candle according to the invention, the insect wax is that secreted by a secondary larva of *Ericerus pela* and adhered on the trunk and branches of *Fraxinus chinensis* and *Ligustrum lucidum*, which wax shows a color tone near pure white by purification thereof and a relatively high melting point of 80 - 83°C. The inventors have unexpectedly found following facts on a candle which was prepared by composing the insect wax into paraffin wax to establish the invention.

(a) Generation of soot is remarkably restrained.

(b) Burning flame is short (about 1cm which is a half of or more less than that of the candle made of paraffin wax) and thus the burning period of time becomes longer (the essential object of the invention lies in providing not an illuminating candle, but an aroma candle, so that the short burning flame is not a drawback but forms an advantage, in view of safety in use).

(c) The offensive smell inherent to the candle made of paraffin wax does not generate, when the flame of candle is blown out.

(d) Even if a liquid perfume is added by about 10% by weight to the wax components, the molten wax allows production of candles with good hardness through a molding process, whereby each of the candles generates fragrance with different intensity during burning thereof.

(e) A molten mixture of the waxes shows good affinity with various liquid coloring agents, which allows production of candles having a delicate light color tone with no irregularly colored portion to give a transparent color feeling.

(f) The tip end of the burning flame in a conventional candle points and almost continuously flares by ascending current due to burning of the candle but in case of the candle according to the invention, burning flame shows a somewhat roundish tip and is stable as a whole to give a mild or restful feeling.

[0012] In the smokeless candle according to the invention, it is preferable that the insect wax occupies 5 - 60% by weight among the wax components. Because, the frequency of soot generation is remarkably reduced by composing the insect wax by about 5% by weight, in case of that the burning flame is forcedly flared by a hand and even if the soot possibly and momentary generates due to flaring or swaying of the burning flame, generating soot is very slight amount, since length of the burning flame is shorter than about 1cm. In connection with this, please note that length of the burning flame in commercially available aroma candles is 2cm or more, and if composing the insect wax by about 60% by weight or more, the wax mixture solidified in a mold shows too high a hardness, so that a crack or breakage may occur at the time of demolding of the candle product, when the mold has a delicate or complicate configuration, and it is not preferable from its production cost.

[0013] Although depending on its kind, the perfume may give an unpleasant feeling if its concentration in the aroma candle is too high. In the aforesaid Japanese Patent 9-188893(A), paragraph No. 0007 discloses that "as an amount of a perfume precursor in a candle, the precursor is composed so as to occupy to 0.01 - 20% by weight, more preferably 0.05 - 10% by weight, and further preferably 0.1 - 5% by weight, although it depends on the kind of perfume namely it is recommended there to set the amount of perfume to be relatively low and in the Example, the amount of the precursor is only 1% by weight of the wax components called as "burning materials".

[0014] In case of the smokeless candle of the present invention, however, there is such a tendency that the release of fragrance is suppressed, since the burning flame is shorter, and thus it is necessary to set the amount of the perfume in somewhat higher level. In case of the conventional aroma candle made of paraffin wax or containing the paraffin wax as main wax component which contains no insect wax, the hardness thereof reduces, when a liquid perfume is composed in a large amount, to cause the problem during demolding procedure. For manufacturing the candle of the invention, on the contrary thereto, the insect wax having a relatively high melting point of 80 - 83°C is composed and as a result, deformation of the smokeless candle does not occur in the step of demolding. According to the smokeless candle of the invention, the amount of melting and flowing wax during burning time is small, so that the degree of crumbling is little, when burning of the candle completely terminates to cause natural burning out. Namely, in case of the candle according to the invention, the shell portion thereof remains in a state retaining substantially its original form. Please note that in case of the commercial aroma candle made of paraffin wax, the unburned wax remains in a state having no trace of its original form.

[0015] The invention will now be further explained with reference to Test Examples and Manufacturing Examples.

[0016] Followings are raw materials used in the Test Examples and Manufacturing Examples.

(1) Waxes

(a) Paraffin Wax: Commercially available purified product having a melting point of 135° F.

(b) Insect wax: Purified product sold by Cera Rica Noda Co., Ltd. of Kanagawa-ken, Japan.

(2) Coloring matters

(a) Red coloring matter: R-225 (Concentration in use; 0.3mg/ml).

(b) Blue coloring matter: B-403 (Concentration in use; 0.3mg/ml).

(c) Green coloring matter: G-202 (Concentration in use; 0.3mg/ml).

(d) Yellow coloring matter: Y-204 (Concentration in use; 0.1mg/ml).

Please note that "R-225" and so on are symbols for identifying pigments.

Test Example 1 (Soot generation test)

[0017] Various candles having different ratio in composition of paraffin and insect waxes were prepared with use of

a cylindrical mold so as to make demolding of the candle product easy. Each of the candles were lit to cause burning thereof under windless condition, a white paper was put near the burning flame of the candle, and then flaring of the burning flame was forcedly caused by fanning the flame by a hand to check the frequency of soot generation through visual observation. Results are shown in following Table 1.

Table 1

Raw material	(% by weight)	Frequency of soot generation
Paraffin wax	Insect wax	
0	100	○ ○ ○ ○ ○
20	80	○ ○ ○ ○ ○
40	60	○ ○ ○ ○ ○
60	40	○ ○ ○ ○
80	20	○ ○ ○
83	17	○ ○
85	15	○ ○
88	12	○ ○
90	10	○ ○
93	7	○
95	5	○
97	3	X
100	0	X

[0018] In Table 1,

○ ○ ○ ○ ○ : No soot generation was recognized in trials of more than 100 times,
 ○ ○ ○ ○ : Soot generation was recognized by 1 - 2 times in trials of 100 times,
 ○ ○ ○ : Soot generation was recognized by 1 - 2 times in trials of 50 times,
 ○ ○ : Soot generation was recognized by 1 - 2 times in trials of 25 times,
 ○ : Soot generation was recognized by 1 - 2 times in trials of 10 times, and
 X : Soot generation was recognized in every or substantially every trials.

Consideration:

[0019] As apparently seen from the results shown in Table 1, the frequency of soot generation remarkably or sharply decreases by composing the insect wax into the paraffin wax, when the candles are manufactured. The lower limit revealing the effect is less than 5% by weight and it seems to be that a practical upper limit thereof is about 60% by weight by taking this and other factors into consideration. It has further been unexpectedly found that in case of the candle consisting of paraffin wax only as its wax component, strong and offensive smell inherent to the wax generates, when the burning flame is blown out. However, in the candles prepared by adding the insect wax to the paraffin wax, such a smell does not generate or is very weak.

Test Example 2 (Demolding ability and hardness of candle)

[0020] Raw material waxes were used in a ratio shown in Table 2 (given later), put into a beaker and heated to melt in a water-bath. Meanwhile, a cotton core for candles was dipped into molten paraffin wax, pulled out the same, and the wax component was solidified to prepare a wax soaked cotton core which was attached to a pedestal. The pedestal is an aluminum disc with a small central opening, into which the wax soaked cotton core is passed to attach the same to the pedestal. The wax soaked cotton core with the pedestal was attached to a mold having a substantially semi-spherical configuration and having a small hole at the top portion thereof. In this case, the wax soaked cotton core was

inserted into the hole of the mold, so that its free end somewhat projects from the hole for forming the lightening portion of the candle to be prepared. Then, molten bees wax was adhered to the portion contacting the wax soaked cotton core and the opening of the hole in the mold and solidified the bees wax to fix the wax soaked cotton core with the pedestal to the mold.

[0021] After possibly adding a rose perfume to said molten wax mixture and stirring the resulting mixture, the mold was reversed and the molten wax was poured into the reversed mold. In this case, the pouring amount of the molten wax was set in such way that the surface level of the molten wax becomes somewhat higher than the bottom surface of the pedestal. At the time when the surface of the molten wax poured into the mold caused solidification, the mold was transferred into a refrigerator (inside temperature: -5°C) to cool and cause complete solidification of the wax in the mold.

[0022] Thereafter, the mold was taken out from the refrigerator and the resulting candle was demolded to evaluate the demolding ability thereof, namely to show if the candle can easily be demolded or not. Results are shown in Table 2 given later.

[0023] Further, penetration of the resulting candle samples was measured by a method described in JIS K-2235 to check the hardness thereof. Results are shown in following Table 2.

Table 2

Wax & perfume (% by weight)			Demolding ability	Penetration (25°C)
Paraffin	Insect	Perfumery		
40	60	0	○	8.8
40	60	6	○	11.6
40	60	10	○	12.8
100	0	0	△	12.1
Marketed product A			△	18.8
Marketed product B			X	31.0

[0024] In Table 2,

○ : Demolding is easy,

△ : Demolding is somewhat difficult, and

X : Candle cannot be drawn out from the mold.

Conclusion:

[0025] The wax mixture prepared by adding the insect wax has a low penetration and sufficient hardness to allow an easy molding operation and an easy subsequent drawing or pulling out operation to obtain the desired candle product, even if a liquid perfume is contained in an amount of 10% by weight in the wax components. The demolding ability of the wax containing the insect wax is more excellent than that of the paraffin wax and the wax composition in commercially available aroma candles.

[0026] Further, It has been confirmed through other tests that if an aroma candle should be prepared by using the paraffin wax solely, also comprising a liquid perfume, and by utilizing a molding process, the amount of the perfume is limited to about 5 - 6% by weight of the paraffin wax. Furthermore, the hardness of the wax becomes too low causing deformation in the candle to be formed, or a part of the wax remains on the inner surface of the mold, and in any event, the desired aroma candle product cannot be obtained. This means that the paraffin wax containing liquid perfume in large amounts is not suitable for manufacturing aroma candles by a molding process, so that it has to be poured into a glass or ceramic receptacle or bottle to commercialise the same together with the receptacle.

Test Example 3 (Continuous burning test)

[0027] Various candles different in composing ratio between paraffin wax and insect wax were prepared (weight of each candle sample: 20g, configuration: semi-spheroid). Each of the candles was lit and continuously burned to observe the time-lapsing change in the configuration and to measure the total continuous burning period of time until its core is burned out (when the candle is naturally burned out, it is re-lit immediately). The composing ratio of the waxes and cumulative burning periods of time are shown in the following Table 3.

Table 3

Raw material (% by weight)		Cumulative burning period of time (min.)
Paraffin wax	Insect wax	
0	100	260
20	80	240
40	60	230
60	40	190
80	20	170
100	0	160

Conclusion:

[0028] The cumulative burning period of time becomes longer, as the candle contains the insect wax in a larger amount. In case of using the candle sample containing no insect wax, it presents itself in a state of retaining molten wax in small amounts and shows no trace of its original form, when the test was finished. On the other hand, in the candle samples containing the insect wax, their shell portions show a tendency of remaining as such without melting, and more particularly, in case of the candle sample containing no paraffin wax, their shell portion substantially retains in its original form to present a configuration like a bowl.

Example 1

[0029] Paraffin wax (60g) and insect wax (40g) were taken, the waxes were put in a beaker and heated to cause melting thereof in a water-bath. Meanwhile, cotton cores for the candles were dipped into molten paraffin wax and then as in Test Example 2, a wax soaked cotton core was prepared. The wax soaked cotton core was cut into several pieces, each of the core pieces was attached to a pedestal, and the core piece was fixed with the pedestal to a stainless steel mold having a substantial semi-spherical configuration.

[0030] To the molten wax mixture, a rose perfume (3 or 6g) and red coloring matter (3.2ml) or blue coloring matter (6.4ml) were added to stir the same, and the resulting mixture was poured into each of the molds. The molds were transferred into a refrigerator to cause complete solidification of the wax in the molds and then demolded to obtain the desired semi-spherical candles containing the rose perfume (weight of each candle: 15g).

[0031] Each of the candles has a delicate light pinky or blue color tone with no portion of irregular color tone to give transparent feeling.

Example 2

[0032] The procedures described in Example 1 were repeated except that a lavender perfume (3 or 6g) and violet coloring matter (5.13ml, prepared by mixing 2.37ml of the red coloring matter with 2.76ml of blue coloring matter but in case of using 3g of the perfume, no coloring matter was added) were selected, to prepare the desired candles containing lavender perfume. The resulting candles have pure white color tone or light purple color tone.

Example 3

[0033] The procedures described in Example 1 were repeated except that rose or lavender perfume (each 10g) and green or yellow coloring matter (each 3.2ml) were selected to prepare the desired candles containing rose or lavender perfume. The resulting candles have light greenish or yellowish color tone.

Claims

1. A smokeless candle comprising paraffin wax and insect wax, as wax components thereof.
2. A smokeless candle as claimed in Claim 1, wherein an amount of said insect wax occupies 5 - 60% by weight in

the wax components.

3. A smokeless candle as claimed in Claim 1, further comprising 3 - 10g of a perfume to 100g of the wax components.

5 4. A smokeless candle as claimed in Claim 1, further comprising a coloring matter.

5. A smokeless candle as claimed in Claim 3, wherein said perfume is a liquid one.

6. Use of insect wax as a wax component in smokeless candles.

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7. Use according to claim 6, wherein the candle further comprises a perfume.

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