A topical mosquito control product includes active and inert ingredients. The active ingredients include natural materials and may include soybean oil, citronella oil, peppermint oil, thyme oil, cinnamon oil, and cedar wood oil. The inert ingredients include natural materials and may include shea, anise oil, basil oil, bee's wax, isopropyl alcohol, avocado oil, sunflower oil, turmeric, salt, ethyl ester and water.
TOPICAL MOSQUITO CONTROL PRODUCT

CROSS-REFERENCE TO RELATED APPLICATIONS


FIELD OF THE INVENTION

[0002] The instant application is directed to a formulation for a topical mosquito repellent.

BACKGROUND OF THE INVENTION

[0003] Mosquito bites often cause annoying reactions in humans and animals. Additionally, mosquito bites are a vector for many types of disease including: malaria, Dengue Fever, Chikungunya, West Nile and Zika viruses as well as other forms of disease.

[0004] There is a need to prevent mosquitoes from biting a host to lessen the discomfort of a bite reaction and to prevent the potential spread of a disease.

[0005] Accordingly, a natural non-toxic ingredient based topical product that prevents bites to humans and animals would be desirable.

SUMMARY OF THE INVENTION

[0006] In one aspect, there is disclosed a topical mosquito control product that includes active and inert ingredients. The active ingredients include soybean oil and citronella oil and the inert ingredients include shea, anise oil, basil oil and isopropyl alcohol.

[0007] In another aspect, there is disclosed a topical mosquito control product that includes active and inert ingredients. The active ingredients include soybean oil and citronella oil and the inert ingredients include bee's wax, anise oil, basil oil and isopropyl alcohol.
In yet another aspect, there is disclosed a topical mosquito control product that includes active and inert ingredients. The active ingredients include soybean oil, citronella oil, peppermint oil and thyme oil and the inert ingredients include bee's wax, avocado oil and isopropyl alcohol.

In yet another aspect, there is disclosed a topical mosquito control product that includes active and inert ingredients. The active ingredients include soybean oil, cinnamon oil, cedar wood oil and citronella oil and the inert ingredients include bee's wax, sunflower oil, turmeric, anise oil, basil oil, salt, ethyl ester, water and isopropyl alcohol.

Also disclosed is a method of repelling insects which includes applying the lotion compositions to a body and exposing insects to the lotion.

Additional features and advantages of mosquito control products described herein will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the embodiments described herein, including the detailed description which follows, the claims, as well as the appended drawings.

It is to be understood that both the foregoing general description and the following detailed description describe various embodiments and are intended to provide an overview or framework for understanding the nature and character of the claimed subject matter. The accompanying drawings are included to provide a further understanding of the various embodiments, and are incorporated into and constitute a part of this specification. The drawings illustrate the various embodiments described herein and together with the description serve to explain the principles and operations of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a graphical representation of an experimental apparatus used for testing:
Figure 2 is a graphical depiction of an experimental apparatus positioned over a blood source;

Figure 3 is a graphical representation of an experimental apparatus including a circulating pump providing warm water to the testing apparatus.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Mosquito bites may transmit diseases and cause reactions to people that are bitten. Various repellant compositions have been utilized in prior art repellant compositions. One such repellant, DEET, is often used in mosquito repellant compositions. DEET has been questioned as to its toxicity in higher amounts for use with humans and other subjects. There is therefore a need in the art for an improved and safe topical mosquito repellant composition.

In one aspect, there is disclosed herein a formulation that may be utilized as a topical lotion or spray to repel mosquitoes. The formulation may include organic and chemical-free compositions that will protect humans and other animals from blood-seeking insects such as mosquitoes.

Example 1

In one aspect the composition may include shea, soybean oil, isopropyl alcohol, anise oil, citronella oil, and basil oil. The shea may be present in an amount of from 50 to 70% by weight. The soybean oil may be present in an amount of from 10 to 30% by weight. The isopropyl alcohol may be present from 5 to 15% by weight. The anise oil may be dispersed in a solvent such as isopropyl alcohol and may be present from 1.5 to 2.5% or at about 2% by weight. The citronella oil and basil oil may also be present in an amount of from 1.5 to 2.5% or at about 2% by weight. The weight percentages are based on a total weight of the composition.

As described above, the composition may include active ingredients and inactive ingredients. The soybean oil and citronella oil may be classified as active ingredients wherein
the shea, isopropyl alcohol, anise oil, and basil oil may be considered inert or inactive ingredients.

[0009] Example 2

[0010] In an alternate composition, the shea may be replaced by beeswax. As described above, the shea had a 3 to 1 ratio with respect to the soy oil. However, the beeswax may have an alternate ratio with respect to the soy oil. In one aspect, the beeswax may be present in a 1 to 8 ratio with respect to the soy oil.

[0011] The composition may be formed by heating the soy oil to approximately 140°F. Next, the shea or beeswax is added to the composition. Next, the citronella oil, basil oil, and anise oils are added to the composition and mixed thoroughly. The composition is then allowed to cool to room temperature forming a stiff mass. Next, the composition is blended with a lotion substrate to form a cream lotion or spray. Various ratios of the composition and substrate may be utilized, for example a ratio of 50 to 4, 48 to 6, and 50 to 8 may be utilized with respect to the composition and the substrate cream component.

[0012] Example 3

[0013] In another aspect, the composition may include bee's wax, soybean oil, edible oil such as avocado oil or sunflower oil, isopropyl alcohol, peppermint oil, citronella oil, and thyme oil. The bee's wax may be present in an amount of from 10 to 20% by weight. The soybean oil may be present in an amount of from 40 to 60% by weight. The avocado oil may be present in an amount of from 20 to 35% by weight. The isopropyl alcohol may be present from 5 to 15% by weight. The peppermint oil may be present at about 1% by weight. The citronella oil may also be present in an amount of from 1.5 to 2.5% or 2% by weight. The thyme oil may be present at about 0.5% by weight. Additionally, the composition may include powdered ingredients such as vanillin present at about 0.4% by weight and Lecithin present at about 0.1% by weight. The weight percentages are based on a total weight of the composition.
As described above, the composition may include active ingredients and inactive ingredients. The soybean oil, peppermint oil, thyme oil and citronella oil may be classified as active ingredients wherein the bee's wax, avocado oil and isopropyl alcohol may be considered inert or inactive ingredients.

The composition of example 3 was made according to the following procedure. The soybean oil and sunflower oils were heated from room temperature to 145 to 160 degrees F in a mixing vat under agitation. The vanillin, lecithin and bee's wax were added to the composition when the temperature approaches 100 F. The mixture is heated and agitated until the mixture clears. Once the mixture clears heat is removed from the composition. Isopropyl alcohol is added at the temperature of 110 F. The mixture immediately cools to 100 F. At this time the peppermint oil, citronella oil, and thyme oil are added to the composition. The composition is agitated and sheared for 30 minutes. After which time the lotion may be packaged.

Example 4

In another aspect, the composition may include the following formula:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Active Percentage by weight</th>
<th>Density</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean Oil</td>
<td>27.5</td>
<td>0.915</td>
<td>25.1625</td>
</tr>
<tr>
<td>Citronella Oil</td>
<td>4</td>
<td>0.855</td>
<td>3.42</td>
</tr>
<tr>
<td>Cinnamon Oil</td>
<td>4</td>
<td>1.04</td>
<td>4.16</td>
</tr>
<tr>
<td>Cedar Wood Oil</td>
<td>4</td>
<td>0.952</td>
<td>3.808</td>
</tr>
<tr>
<td>Sunflower Oil</td>
<td>24</td>
<td>0.924</td>
<td>22.176</td>
</tr>
<tr>
<td>Turmeric</td>
<td>4</td>
<td>0.92</td>
<td>3.68</td>
</tr>
<tr>
<td>Anise</td>
<td>3</td>
<td>0.98</td>
<td>2.94</td>
</tr>
<tr>
<td>Basil Oil</td>
<td>4</td>
<td>0.895</td>
<td>3.58</td>
</tr>
</tbody>
</table>
The composition may include bee's wax, soybean oil, edible oil such as sunflower oil, isopropyl alcohol, cinnamon oil, cedar wood oil, citronella oil, turmeric, anise, basil oil, salt, ethyl ester, and water. The bee's wax may be present in an amount of from 10 to 20% by weight. The soybean oil may be present in an amount of from 10 to 60% by weight. The sunflower oil may be present in an amount of from 20 to 35% by weight. The isopropyl alcohol may be present from 2 to 10% by weight. The cinnamon oil may be present at about 2 to 10% by weight. The citronella oil may also be present in an amount of from 2% to 10% by weight. The cedar wood oil may be present in an amount of from 2% to 10% by weight. The turmeric may be present in an amount of from 2% to 10% by weight. The anise may be present in an amount of from 2% to 10% by weight. The basil oil may be present in an amount of from 2% to 10% by weight. Salt may be present in an amount of from 1% to 3% by weight. The ethyl ester may be present in an amount of from 2% to 10% by weight. Water may be present in an amount of from 1 to 4% by weight. Additionally, the composition may include powdered ingredients such as vanillin present at about 5% by weight and Lecithin present at about 0.2% by weight. The weight percentages are based on a total weight of the composition.

As described above, the composition may include active ingredients and inactive ingredients. The soybean oil, cinnamon oil, cedar wood oil and citronella oil may be classified
as active ingredients wherein the bee's wax, sunflower oil, turmeric, anise oil, basil oil, salt, ethyl ester, water, vanillin, lecithin and isopropyl alcohol may be considered inert or inactive ingredients.

The composition of example 4 was made according to the following procedure. The soybean oil and sunflower oils were heated from room temperature to 145 to 160 degrees F in a mixing vat under agitation. The vanillin, lecithin and bee's wax were added to the composition when the temperature approaches 100 F. The mixture is heated and agitated until the mixture clears. Once the mixture clears heat is removed from the composition. Water is then added to the composition under agitation and the composition is cooled to 110 F. Isopropyl alcohol is added at the temperature of 110 F. The mixture immediately cools to 100 F. At this time the cinnamon oil, cedar wood oil, turmeric, anise oil, basil oil, ethyl ester and an emulsion of salt water and citronella oil are added to the composition. The emulsion includes a 3.5 % salt water mixture mixed at a ratio of 4 to 1 with the citronella oil. The composition is agitated and sheared for 30 minutes. After which time the lotion may be packaged.

The deterrent effect of the above-described compositions of examples 1-3 was tested in a controlled environment. *In vitro* laboratory tests were conducted and measured and compared to DEET and nontreated control groups for yellow fever mosquitos, *Aedes aegypti*. Bioassays were conducted in nine six-chambered Plexiglas K & D modules stocked with female *Aedes aegypti* mosquitos as shown in Figures 1-3. Five female mosquitos were aspirated into each of the six chambers of the nine modules. Repellent treatments were applied at 26.7 microliters with a pipette and spread with a small brush over 12 square centimeter sections of organdy cloth attached to a flat plastic template containing rectangular openings. The treated cloth covered template was fitted between the K & D module and a lower Plexiglas unit. The lower Plexiglas unit contained shallow surface wells filled with a blood substitute (CDTA and ATP) and covered with a moistened collagen membrane. The blood substitute was heated to
38°C using water pumped through hose lines attached to the lower units and a water bath supplied with a temperature controlled inversion circulator. Mosquitos were exposed to the treated surfaces by opening sliding doors beneath the modules for 90-second biting counts at five post-treatment time intervals from 1 to 6 hours. Fresh, untreated mosquitos are used for each time interval.

[0022] The bite counts were tabulated and utilized for statistical analysis. The percent repellency of the formulations as described above was more effective than DEET over the five time periods. At the initial start time of zero the repellency of the composition as described herein was 100% while DEET was 91.9%. The average for all five time periods demonstrates the repellency of 94.54% for the compositions as described herein compared to 86.52% for DEET. At the 6 hour time period the compositions as described herein included a repellency of 96.8% effective compared to DEET which was 87.1% effective.

[0023] The testing protocol including the in vitro environment provides a rigorous testing of the repellency of the composition as the mosquitos are confined with a blood meal.

[0024] An unpaired t-test was conducted on the biting counts between lotion as described herein and the control group where there was no treatment applied between the mosquito and the blood well. The results of this test showed highly significant results between the mean biting counts of 0.33 for the compositions as described herein compared to 3.44 for the control group. The statistical factors include $t = 5.8704$ where $df = 16$ and a standard error of difference is equal to 0.530. The two-tailed $p$ value is less than 0.0001. The reduction in biting pressure when using the compositions compared to the control group is significant at the 99.99 level of significance.

[0025] The experimental results demonstrate a very high effectiveness of repellency utilizing a safe and effective organic product that is both DEET and chemical free. The testing
has demonstrated that the product is effective in repelling mosquitoes and in particular the yellow fever mosquito which may potentially carry West Nile virus.

[0026] Additional testing was performed with the lotion formula of example 4 including: bee's wax, soybean oil, edible oil such as sunflower oil, isopropyl alcohol, cinnamon oil, cedar wood oil, citronella oil, turmeric, anise, basil oil, salt, ethyl ester, and water with the following protocols. Aedes aegypti mosquitoes were obtained from insecticide-susceptible reference strains held at the London School of Hygiene & Tropical Medicine, UK. All mosquitoes are reared and housed under optimal environmental conditions of 25°C ± 2°C and 80 % Relative Humidity with a 12: 12 hour photoperiod. Testing was carried out in a testing room maintained at 25±2K and 80% RH with a 12: 12 hour photoperiod. For each product, the same person carried out the arm-in-cage testing.

[0027] For each product test, three batches of 50 female mosquitoes were placed in cages 30x30x30cm inside the testing room. Before the start of each test a bare arm with gloved hand was inserted into the cage for 30 seconds to assess the biting readiness of the mosquitoes. Only cages with at least ten mosquitoes landing within 30 seconds were used in subsequent testing. The number of mosquitoes probing the untreated arm was counted at the end of the 30 second test. Following the combined fitness/control test, the product was applied onto the right arm at the WHO standard rate of 1 ml per 600 cm2 (1.67 11 per cm2) for the Mosquito Insect Repellent and DEET, and at a rate of 2 mg per cm' for the Sunscreen Repellent. The arm was then inserted into the cage for 30 seconds and the number of mosquitoes probing on the arm counted and recorded. The procedure was repeated with a total of three cages. This was repeated for each of the three cages and at hourly intervals until 8 hours post-application or until protection drops below 50%. Each product was tested on a separate test day.

[0028] Protective efficacy (PE) was calculated using the following formula:
PE = \frac{\text{Mosquitoes probing on control arm} - \text{Mosquitoes probing on treated arm}}{\text{Mosquitoes probing on control arm \times 100}}. The average probing on the control arm during testing was 16, 17 and 21 mosquitoes at the end of the 30 second exposure time, in cages used for testing the Mosquito Insect Repellent Lotion and 8% DEET respectively. The Mosquito Insect Repellent Lotion 100% protection at 0 hours, whereas the 8% DEET provided 100% protection for 1 hour after application (Table 1). The Mosquito Insect Repellent Lotion provided over 50% protection for 3 hours, whereas 8% DEET provided over 50% protection for 6 hours.

Table 1: Total Protective Efficacy of the Mosquito Insect Repellent Lotion against \textit{Aedes aegypti} mosquitoes

<table>
<thead>
<tr>
<th>Hours after Application</th>
<th>Time (h:mm)</th>
<th>Replicate</th>
<th>No. probing on bare control arm</th>
<th>No. probing on treated arm</th>
<th>% PE</th>
<th>Total % PE</th>
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<tbody>
<tr>
<td>0</td>
<td>10:44</td>
<td>1</td>
<td>13</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td>2</td>
<td>15</td>
<td>0</td>
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<td>100.00</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>12</td>
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<td>3</td>
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<td>7</td>
<td>63.16</td>
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<tr>
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<td>14:45</td>
<td>1</td>
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<td>6</td>
<td>62.50</td>
<td></td>
</tr>
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<td>18</td>
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<td>44.44</td>
<td>47.83</td>
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<td></td>
<td>3</td>
<td>21</td>
<td>13</td>
<td>30.00</td>
<td>31.03</td>
</tr>
</tbody>
</table>

[0029] Comparative Table 2: Total Protective Efficacy of 8% DEET against \textit{Aedes aegypti} mosquitoes
Additional testing

Additional field testing of the lotion formulations was performed.

Sarasota, Florida

Two years of testing in a swamp-type environment in central Sarasota, Florida from 2014 through 2016 yield 100% effectiveness in a natural environmental setting with high mosquito infestation. After application of the lotion of examples 1-4 as presented in the embodiments disclosed above, it was observed that the repellency is 100% and with no application of the product the number of bites normally exceeds 10 in a 5 minute exposure.

Company personnel camping in Myakka State Park in central Florida have tested the lotions over numerous overnight camping trips over the past 2 years (2014 to 2016). The Myakka River flows through 57 square miles of wetlands and prairies and may rival the Cagayan Region in northern Luzon in the Philippines for mosquito population densities. During these field tests the personnel report 100% success in repellency.
[0036] Tauo, Cagayan Valley, Philippines

[0037] During January of 2016 concrete workers on the edge of flooded rice fields in Tauo were given the lotion of the embodiments of examples 1-4 described above. During an 8 hour day these workers reported no bites, or 100% repellency. Other tile and wood workers at the same location working on the project were given no repellent and experienced scores of bites. For the following days of the construction project all workers were given the lotion and no workers reported bites.
CLAIMS

1. A topical mosquito repellent composition comprising:
   a lotion including active and inert ingredients, wherein the active ingredients include soybean oil and citronella oil and the inert ingredients include shea, anise oil, basil oil and isopropyl alcohol.

2. The topical mosquito repellent composition of claim 1 wherein shea is present in an amount of from 50 to 70% by weight, soy bean oil is present in an amount of from 10 to 30% by weight, isopropyl alcohol is present in an amount of from 5 to 15% by weight, anise oil is present in an amount of from 1.5 to 2.5% by weight, anise oil is present in an amount of from 1.5 to 2.5% by weight, and citronella oil is present in an amount of from 1.5 to 2.5% by weight.

3. A topical mosquito repellent composition comprising:
   a lotion including active and inert ingredients, wherein the active ingredients include soybean oil and citronella oil and the inert ingredients include bee's wax, anise oil, basil oil and isopropyl alcohol.

4. The topical mosquito repellent composition of claim 3 wherein bee's wax is present in an amount of from 10 to 20% by weight, soy bean oil is present in an amount of from 40 to 60% by weight, isopropyl alcohol is present in an amount of from 5 to 15% by weight and citronella oil is present in an amount of from 1.5 to 2.5% by weight.

5. A topical mosquito repellent composition comprising:
   a lotion including active and inert ingredients, wherein the active ingredients include soybean oil, citronella oil, peppermint oil and thyme oil and the inert ingredients include bee's wax, avocado oil and isopropyl alcohol.
6. The topical mosquito repellent composition of claim 5 wherein bee's wax is present in an amount of from 10 to 20% by weight, soy bean oil is present in an amount of from 40 to 60% by weight, avocado oil is present in an amount of from 20 to 35% by weight, isopropyl alcohol is present in an amount of from 5 to 15% by weight, citronella oil is present in an amount of from 1.5 to 2.5% by weight, peppermint oil is present in an amount of about 1% by weight, and thyme oil is present in an amount of about .5 % by weight.

7. The topical mosquito repellent composition of claim 5 wherein the inert ingredients further includes powdered ingredients including vanillin and lecithin.

8. The topical mosquito repellent composition of claim 7 wherein the vanillin is present in an amount of about 0.4% by weight and lecithin is present in an amount of about 0.1 % by weight.

9. A topical mosquito repellent composition comprising:

   a lotion including active and inert ingredients, wherein the active ingredients include soybean oil, cinnamon oil, cedar wood oil and citronella oil and the inert ingredients include bee's wax, sunflower oil, turmeric, anise oil, basil oil, salt, ethyl ester, water and isopropyl alcohol.

10. The topical mosquito repellent composition of claim 9 wherein the bee's wax is present in an amount of from 10 to 20% by weight, the soybean oil is present in an amount of from 10 to 60% by weight, the sunflower oil is present in an amount of from 20 to 35% by weight, the isopropyl alcohol is present from 2 to 10% by weight, the cinnamon oil is present in an amount of from 2 to 10% by weight, the citronella oil is present in an amount of from 2% to 10% by weight, the cedar wood oil is present in an amount of from 2% to 10% by weight, the turmeric is present in an amount of from 2% to 10% by weight, the anise oil is present in an amount of from
2% to 10% by weight, the basil oil is present in an amount of from 2% to 10% by weight, salt is present in an amount of from 1% to 3% by weight, ethyl ester is present in an amount of from 2% to 10% by weight, water is present in an amount of from 1 to 4% by weight.

11. The topical mosquito repellent composition of claim 9 wherein the inert ingredients further includes powdered ingredients including vanillin and lecithin.

12. The topical mosquito repellent composition of claim 9 wherein the vanillin is present in an amount of about 5% by weight and lecithin is present in an amount of about 0.2% by weight.

13. A method of repelling insects comprising:

applying a lotion composition to a body and exposing insects to the lotion, the lotion including active and inert ingredients, wherein the active ingredients include soybean oil and citronella oil and the inert ingredients include shea, anise oil, basil oil and isopropyl alcohol.

14. The method of claim 13 wherein shea is present in an amount of from 50 to 70% by weight, soybean oil is present in an amount of from 10 to 30% by weight, isopropyl alcohol is present in an amount of from 5 to 15% by weight, anise oil is present in an amount of from 1.5 to 2.5% by weight, and citronella oil is present in an amount of from 1.5 to 2.5% by weight.

15. A method of repelling insects comprising:

applying a lotion composition to a body and exposing insects to the lotion, the lotion including active and inert ingredients wherein the active ingredients include soybean oil and citronella oil and the inert ingredients include bee's wax, anise oil, basil oil and isopropyl alcohol.
16. The method of claim 15 wherein bee's wax is present in an amount of from 10 to 20% by weight, soy bean oil is present in an amount of from 40 to 60% by weight, isopropyl alcohol is present in an amount of from 5 to 15% by weight and citronella oil is present in an amount of from 1.5 to 2.5% by weight.

17. A method of repelling insects comprising:

applying a lotion composition to a body and exposing insects to the lotion, the lotion including active and inert ingredients, wherein the active ingredients include soybean oil, citronella oil, peppermint oil and thyme oil and the inert ingredients include bee's wax, avocado oil and isopropyl alcohol.

18. The method of claim 17 wherein bee's wax is present in an amount of from 10 to 20% by weight, soy bean oil is present in an amount of from 40 to 60% by weight, avocado oil is present in an amount of from 20 to 35% by weight, isopropyl alcohol is present in an amount of from 5 to 15% by weight, citronella oil is present in an amount of from 1.5 to 2.5% by weight, peppermint oil is present in an amount of about 1% by weight, and thyme oil is present in an amount of about .5% by weight.

19. The method of claim 17 further including vanillin present in an amount of about 0.4% by weight and lecithin present in an amount of about 0.1% by weight.

20. A method of repelling insects comprising:

applying a lotion composition to a body and exposing insects to the lotion, the lotion including active and inert ingredients, wherein the active ingredients include soybean oil, cinnamon oil, cedar wood oil and citronella oil and the inert ingredients include bee's wax, sunflower oil, turmeric, anise oil, basil oil, salt, ethyl ester, water and isopropyl alcohol.
21. The method of claim 20 wherein the bee's wax is present in an amount of from 10 to 20% by weight, the soybean oil is present in an amount of from 10 to 60% by weight, the sunflower oil is present in an amount of from 20 to 35% by weight, the isopropyl alcohol is present from 2 to 10% by weight, the cinnamon oil is present in an amount of from 2 to 10% by weight, the citronella oil is present in an amount of from 2% to 10% by weight, the cedar wood oil is present in an amount of from 2% to 10% by weight, the turmeric is present in an amount of from 2% to 10% by weight, the anise oil is present in an amount of from 2% to 10% by weight, the basil oil is present in an amount of from 2% to 10% by weight, salt is present in an amount of from 1% to 3% by weight, ethyl ester is present in an amount of from 2% to 10% by weight, water is present in an amount of from 1 to 4% by weight.

22. The method of claim 20 further including vanillin present in an amount of about 5% by weight and lecithin present in an amount of about 0.2% by weight.
INTERNATIONAL SEARCH REPORT

INTERNATIONAL APPLICATION No.
PCT/US2017/014557

CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A01N 65/22; A01N 65/00; A01N 65/08; A61K 36/00; A61K 36/53 (2017.01)
CPC - A01N 65/22; A01N 65/00; A01N 65/08; A61K 36/00; A61K 36/53 (2017.02)

According to International Patent Classification (IPC) or to both national classification and IPC

FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 424/400; 424/403; 424/405; 424/725; 424/747 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P, A</td>
<td>US 9,326,524 B1 (NANTUCKET SPIDER LLC) 03 May 2016 (03.05.2016) entire document</td>
<td>1-22</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search
09 March 2017

Date of mailing of the international search report
0 APR 2017

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