



(86) Date de dépôt PCT/PCT Filing Date: 2007/01/29
(87) Date publication PCT/PCT Publication Date: 2008/08/02
(85) Entrée phase nationale/National Entry: 2009/07/10
(86) N° demande PCT/PCT Application No.: GB 2007/000287
(87) N° publication PCT/PCT Publication No.: 2007/085856
(30) Priorité/Priority: 2006/01/27 (GB0601712.3)

(51) Cl.Int./Int.Cl. *D06M 23/12* (2006.01),
A01N 25/28 (2006.01), *D06M 13/144* (2006.01),
D06M 13/148 (2006.01), *D06M 13/415* (2006.01)
(71) Demandeur/Applicant:
INTELLIGENT FABRIC TECHNOLOGIES PLC, GB
(72) Inventeur/Inventor:
COSTA, GEORGE, GB
(74) Agent: BORDEN LADNER GERVAIS LLP

(54) Titre : TISSU REPOUSSANT LES INSECTES
(54) Title: INSECT REPELLENT FABRIC

(57) **Abrégé/Abstract:**

An insect repellent fabric. The fabric comprises a fabric base and an active insect repellent ingredient. The active ingredient is contained within microcapsules and the fabric base is impregnated with the microcapsules. The preferred active ingredient is a Citronella extract or DEET.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 August 2007 (02.08.2007)

PCT

(10) International Publication Number
WO 2007/085856 A1

(51) International Patent Classification:

D06M 23/12 (2006.01) *D06M 13/148* (2006.01)
A01N 25/28 (2006.01) *D06M 13/415* (2006.01)
D06M 13/144 (2006.01)

(21) International Application Number:

PCT/GB2007/000287

(22) International Filing Date: 29 January 2007 (29.01.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

0601712.3 27 January 2006 (27.01.2006) GB

(71) Applicant (for all designated States except US): **INTELLIGENT FABRIC TECHNOLOGIES PLC** [GB/GB];
The Melon Ground, Hatfield Park, Hatfield AL9 5NB (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **COSTA, George** [GB/GB]; 39 Brookmans Avenue, Brookmans Park, Herts AL9 7QH (GB).

(74) Agents: **REES, David, Christopher** et al.; Kilburn & Strode, 20 Red Lion Street, London WC1R 4PJ (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: INSECT REPELLENT FABRIC

(57) Abstract: An insect repellent fabric. The fabric comprises a fabric base and an active insect repellent ingredient. The active ingredient is contained within microcapsules and the fabric base is impregnated with the microcapsules. The preferred active ingredient is a Citronella extract or DEET.

WO 2007/085856 A1

1

Insect Repellent Fabric

The present invention relates to an insect-repellent fabric.

5 In order to render a fabric insect-repellent, one method, particularly adopted by the military, is to soak combat clothing in an insecticide, such as permethrin. However, this tends to make the garments uncomfortable and causes an unpleasant odour. Also, it has a limited period of effectiveness. It is also
10 known to impregnate the heel and toe portions of socks with a scented material and to impregnate socks and certain sports clothing with natural remedies, such as Aloe Vera extract.

Currently, mosquitoes are one of the greatest causes of death in humans. One in 17 people alive today will be killed by mosquito bites. Worldwide, over 700
15 million people are infected by mosquitoes each year, with over 3 million dying. Even in the United Kingdom, biting insects generally spoil holidays and can be a serious concern for parents with sensitive or allergic children.

It is an object of the invention to provide a textile article which is effective in
20 repelling biting insects and which has a long lasting effect. It is a further object to provide a delivery mechanism which eliminates the need for sticky and malodorous, directly applied chemicals, which tend to be neither safe nor particularly effective. It is a further object to provide a safe and hypoallergenic insect repellent for children.

25 According to the invention, there is provided an insect-repellent fabric which comprises a fabric base and an active insect repellent ingredient, in which the active ingredient is contained within micro-capsules, and the fabric base is impregnated with the micro-capsules.

Preferably, the microcapsules are in the size range 1 μm to 7 μm , more preferably 2 μm to 4 μm , and would typically have a mean diameter of 3 μm .

5 Preferably, the fabric base is knitted (weft or warp), woven or spun-bonded from a spun yarn made from non-continuous short filaments and/or yarn made from continuous filaments. The material is preferably selected from polyester, nylon, cotton, or any suitable material.

10 The fabric base is subjected to binding and finishing. The binding process may selectively bind the micro-capsules to the fibres and consists of heating to a temperature in a range 40°C to 160°C, preferably 80°C to 120°C, for a period of at least 20 seconds but the precise parameters will be determined by the particular process and machinery being used. The binding process is preferably
15 an ion-exchange process.

The active ingredient may be selected from an extract of Citronella and DEET. The preferred material is para-menthane-3,8-diol; conveniently, this is isolated from a natural source (lemon eucalyptus oil), and then added to a non-reactive
20 base oil. During this synthesis process, the plant extracts Limonene and Linalool, which are known sensitisers, are removed. The invention also extends to the preferred composition *per se* and in its encapsulated form.

Preferably, the impregnated fabric is then cut to size for use in clothing
25 manufacture or for use as an impregnated cloth for topical application of the micro-capsules. Alternatively the fabric can be formed into a finished article first and then impregnated.

3

It will be appreciated that the invention provides a unique chemical repelling agent which provides a comparative level of efficacy to military specification DEET products. It also provides a chemical repelling agent specifically designed to eliminate allergens and sensitizers to ensure hypoallergenicity and safety for children. The delivery system of a microencapsulated active agent bound to a fabric at a molecular level, ensures effectiveness, consistency and durability.

Fragrance can also be incorporated, either in the same microcapsules as the active ingredient or in separate microcapsules.

The detection of the fragrance in use can serve as an indicator that the active ingredient is still present and effective.

The invention may be carried into practice in various ways and some specific embodiments will now be described by way of example.

A fabric is first prepared by knitting from non-continuous short filament synthetic spun yarn. Whilst microencapsulated chemicals can be bound to other fibres, this has been found to be the most efficacious. This fabric is then sent to a binding shop for dyeing and micro-encapsulation.

The binding process uses an ionic based process to selectively bind the microcapsules to the fabric. The process heats the ends of the fibre filaments to a point where they 'open' (like a flower). An ion-exchange process then drives the encapsulated active component into the open fabric pore, which then closes around it, binding it in place.

4

The active ingredient or component is para-menthane-3,8-diol. It is a modified natural extract of *Eucalyptus Maculata Citriodora*. It is dissolved in isopropyl myristate and subjected to a micro-encapsulation process, using a Melamine based polymer in an aqueous solution at a mean micron size of 3. The resultant product is then combined with a soft acrylic binder in anionic form and applied to the fabric base by means of a paddling mangle, and is then dried at 140°C. The application can also be made via an exhaust process using a non-ionic soft acrylic binder or a spraying or foaming process using a soft acrylic binder in anionic form.

Claims

1. An insect-repellent fabric which comprises a fabric base and an active insect-repellent ingredient, in which the active ingredient is contained within microcapsules, and the fabric base is impregnated with the micro-capsules.
5
2. A fabric as claimed in Claim 1, in which the microcapsules are in the size range 1 μm to 7 μm .
- 10 3. A fabric as claimed in Claim 1 or Claim 2, in which the fabric base is made from a spun yarn made from non-continuous short filaments and/or yarn made from continuous filaments.
- 15 4. A fabric as claimed in Claim 3, in which the fabric base is knitted, woven, or spun-bonded.
5. A fabric as claimed in any preceding Claim, in which the fabric base is one or more of polyester, nylon or cotton.
- 20 6. A fabric as claimed in any preceding Claim, in which the active ingredient is selected from a Citronella extract and DEET.
7. A fabric as claimed in any of Claims 1 to 5, in which the active ingredient is para-menthane-3,8-diol.
25
8. A method of producing an insect repellent fabric, which comprises impregnating a fabric base with microcapsules, the microcapsules containing an active-insect repellent ingredient.

6

9. A method as claimed in Claim 8, in which the fabric base is subjected to binding and finishing.

5 10. A method as claimed in Claim 8 or Claim 9, in which the binding process binds the microcapsules to the fibres in the fabric base and consists of heating to a temperature in the range 40°C to 160°C, for a period of at least 20 seconds.

10 11. A method as claimed in any of Claims 8 to 10, in which the binding process comprises an ion-exchange process.

12. An insect repellent material comprising an active insect repellent ingredient contained within microcapsules.

15 13. A material as claimed in Claim 12, in which the microcapsules are in the size range 1 µm to 7 µm.

14. A material as claimed in Claim 12 or Claim 13, in which the active ingredient is selected from a Citronella extract and DEET.

20

15. A material as claimed in any of Claims 12 to 14, in which the active ingredient is para-menthane-3,8-diol.