



(51) International Patent Classification:

A01N 25/18 (2006.01) *A01N 49/00* (2006.01)
A01N 53/00 (2006.01)

(21) International Application Number:

PCT/US2013/041523

(22) International Filing Date:

17 May 2013 (17.05.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

13/486,325 1 June 2012 (01.06.2012) US

(71) Applicant: **S. C. JOHNSON & SON, INC.** [US/US];
1525 Howe Street, Racine, WI 53403 (US).

(72) Inventors; and

(71) Applicants: **LONG, Lina** [US/US]; 149 E. Anita Avenue, Mount Prospect, IL 60056 (US). **ANDERSON, Brian, W.** [US/US]; 4240 North Main Street, #335, Racine, WI 53402 (US). **CUMMINGS, Gerald, W.** [US/US]; 4257 - 94th Place, Pleasant Prairie, WI 53158 (US). **RANDALL, Francis, J.** [US/US]; 724 Hialeah Drive, Racine, WI 53402 (US). **HUYNH, Jamie, T.** [US/US]; 3206 West Yorkshire Circle, Franklin, WI 53132 (US). **SHI, Deliang** [US/US]; 6127 - 115th Avenue, Kenosha, WI 53142 (US).

(74) Agent: **MEIER, Linda, Blair**; S. C. Johnson & Son, Inc., 1525 Howe Street, Racine, WI 53403 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, 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, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- with amended claims (Art. 19(1))

(54) Title: CLOG RESISTANT INSECT CONTROL FORMULATIONS CONTAINING PYRETHRIN, AN ACETYLENIC COMPOUND, AND A HYDROCARBON DIENE

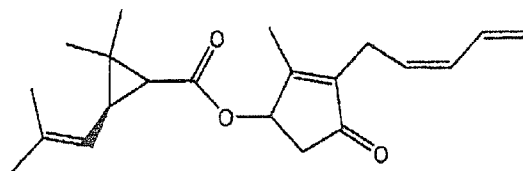


FIG. 1

Pyrethrin I

(57) Abstract: Disclosed are pyrethrin-based insect control formulations which have been formulated to reduce wick clogging in dispensers which use heaters to drive an insect control active from the wick. Pyrethrum extract is mixed with an acetylenic compound, such as prallethrin or 3,5-dimethylhex-1-yn-3-ol, and a terminal diene compound such as myrcene or 1,3 hexadiene. Wick clogging side effects from using the pyrethrum are thereby suppressed.

CLOG RESISTANT INSECT CONTROL FORMULATIONS CONTAINING
PYRETHRIN, AN ACETYLENIC COMPOUND, AND A HYDROCARBON
DIENE

CROSS-REFERENCE TO RELATED APPLICATIONS

5 [0001] Not applicable

STATEMENT REGARDING FEDERALLY SPONSORED
RESEARCH/DEVELOPMENT

[0002] Not applicable

BACKGROUND OF THE INVENTION

10 [0003] The present invention relates to devices that dispense a pyrethrin-based insect control formulation from a porous wick. More particularly, it relates to providing formulations (and formulation impregnated wicks) for use with such devices, where the formulations include a mix of pyrethrin, an acetylenic compound, and a hydrocarbon diene, and as a result reduce the tendency of pyrethrin-based
15 formulations to clog the wick.

[0004] Pyrethrum is an insecticide obtainable from a natural plant source. It is typically extracted from a chrysanthemum plant in a form that contains pyrethrin I (see FIG. 1), pyrethrin II, cinerin I, cinerin II, jasmolin I and jasmolin II, usually with some impurities. In some cases one or more of pyrethrin I or II is isolated from the
20 extract, and used separately. More often, the overall pyrethrum extract is used.

[0005] Chrysanthemum plants can be grown and harvested in an environmentally friendly (e.g. sustainable) manner, and pyrethrum extract can be obtained from them at relatively low cost. Also, because it is obtained from an essentially natural source, pyrethrum extract has a somewhat wider regulatory and public perception acceptance
25 than a number of more synthetic insect control ingredients do.

[0006] To dispense pyrethrum/pyrethrins one typically dissolves the extract in a solvent (e.g. an isoparaffinic hydrocarbon material such as an Isopar), places the resulting solution in a reservoir such as a bottle, extends a porous wick through a cap of the bottle into the liquid, slowly attracts the active/solvent mix out of the reservoir
30 via the wick to an exposed end of the wick, and then drives an active/solvent mix off the exposed end of the wick into the environment (e.g. most typically using a heater system such as that of U.S. patent 5,647,053). The heater system could be supplemented with a blower if desired (e.g. compare the fan system of U.S. patent 7,444,833).

[0007] Unfortunately, pyrethrum extract impurities tend to react (largely through oxidation and polymerization reactions) to form materials that can clog a dispensing wick. This is in part due to impurities typically found in the extract being oxidized and/or polymerized to clogging materials, and in part because some pyrethrum extract core active components are susceptible to unwanted oxidation/polymerization, again leading to formation and deposition of nonvolatile components in the evaporation zone of the wick that cause wick clogging.

[0008] Wick clogging reduces the effectiveness of this type of dispensing device over time, eventually reducing the air release rate of pyrethrin from device, and consequently reducing mosquito repellency. As a result, some consumers may not be satisfied with the performance of conventional pyrethrum-impregnated wicks absent further improvements.

[0009] Prallethrin (a/k/a ETOC) has a structure as depicted in FIG. 2. It is a synthetically produced pyrethroid-based insecticide. It has previously been used in wick dispensers for mosquito and other insect control products.

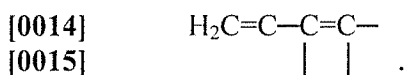
[0010] Myrcene has a formula as depicted in FIG. 3. It is a component of a number of essential oils.

[0011] Surfynol 61 has a formula as depicted in FIG. 4. It is a surfactant widely used in paints. Both prallethrin and surfynol 61 are acetylenic in nature in that they have a terminal $\text{HC}\equiv\text{C}$ moiety.

[0012] In any event, a need exists to address the pyrethrin-related wick clogging concern, without introducing other unacceptable disadvantages (while maintaining the advantages of using pyrethrum).

BRIEF SUMMARY OF THE INVENTION

[0013] In one aspect the invention provides an insect control formulation. It contains an insect control ingredient comprising pyrethrin (e.g. a pyrethrum extract containing one or more of pyrethrin I and II), a solvent that the pyrethrin is carried in (e.g. an isoparaffinic hydrocarbon such as Isopar), a compound having a $\text{C}\equiv\text{C}$ moiety (most preferably the compound has a terminal $\text{HC}\equiv\text{C}$ - moiety), and a hydrocarbon having the following moiety:



[0016] The hydrocarbon may be linear or branched, and may have more than one such moiety (e.g. such a group at opposed terminal ends). The term "diene" is being

used hereafter with respect to such hydrocarbons to mean a compound having at least two carbon-carbon double bonds in the specified arrangement, even if there are more than two. By "hydrocarbon" it is intended that the compound only have hydrogen and carbon. 1,3 conjugated dienes are particularly preferred such as myrcene and 1,3
5 hexadiene. Prallethrin and 3,5-dimethylhex-1-yn-ol are suitable acetylenic compounds. Other suitable acetylenic compounds preferably have less than twenty hydrocarbons.

[0017] It is most preferred that the pyrethrin containing ingredient be about 1 to 10% by weight of the formulation (e.g. about 4%), the diene be about .1 to 4% by
10 weight of the formulation, the solvent be about 80 to 95% by weight of the formulation, the acetylenic compound be about .1 to 2% by weight of the formulation, and other ingredients (e.g. an antioxidant) be the remainder.

[0018] In some forms the pyrethrin containing ingredient is pyrethrum extract, and the diene has between 5 and 20 carbons (and is a fragrance). For example, the diene
15 may be an acyclic monoterpene such as myrcene, and the formulation may include an antioxidant or radical chain stopper such as dilauryl thiodipropionate, butylated hydroxytoluene or 2,2'-methylenebis(6-tert-butyl-4-methylphenol).

[0019] In other aspects the invention provides a wick for dispensing such an insect control formulation. There is a porous wick body and such an insect control
20 formulation positioned in pores of the wick body. One can use a sintered glass material for the wick body (e.g. available from Porex). Alternatively, other inert porous wick substrates can be used for the body such as nylons. While it is also possible to use wicks made from wood material, that is not preferred as wood wicks are exposed to conditions during manufacture that may produce oxygenated species
25 that could accelerate the degradation of the active.

[0020] By combining such an acetylenic compound (particularly those with a terminal carbon/carbon triple bond moiety), and a diene of the present invention, side reactions responsible for creating clogging compounds from pyrethrum extract can be synergistically suppressed. This suppression effect can be further enhanced where an
30 antioxidant or radical chain stopper is also used.

[0021] The insect control formulations of the present invention can be initially positioned in pores of a porous wick by causing the wick to attract the formulation from a reservoir (by capillary attraction). The wick can project down into the insecticidal formulation in the reservoir, and also extend externally upward/outward.

The external portion of the wick can then be positioned next to a means for driving the active off the wick (e.g. most preferably a heater).

[0022] The invention thereby renders the use of pyrethrin (especially natural extract pyrethrum containing pyrethrins) more practical as a substitute for synthetic pyrethroids when controlling mosquitoes, and also thereby opens up the possibility of providing a more natural insect control formulation.

[0023] The foregoing and other advantages of the present invention will be apparent from the following description. As these embodiments are merely illustrative, they are not intended to represent the full scope of the invention. Thus, reference should therefore be made to the claims herein for interpreting the scope of the invention.

DRAWINGS

[0024] FIG. 1 depicts the structure of pyrethrin I, a preferred component of the formulations of the present invention;

[0025] FIG. 2 depicts the structure of prallethrin, one of the preferred acetylenic components of the present invention;

[0026] FIG. 3 depicts the structure of myrcene, one of the preferred diene components of the present invention;

[0027] FIG. 4 depicts the structure of surfynol 61, another of the preferred acetylenic components of the present invention;

[0028] FIG. 5 is a graph comparing the emission rates of a standard pyrethrin-based formulation with that of a formulation of the present invention, over time;

[0029] FIG. 6 is a graph showing emission rates of similar formulations (but with only one of prallethrin or myrcene), over time; and

[0030] FIG. 7 is a graph, among other things, confirming suitability of surfynol 61 plus myrcene.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] A test formulation contained 8% of a 50% solution of pyrethrum extract (4% active), 1% dilauryl thiodipropionate antioxidant, .5% prallethrin/ETOC (see FIG. 1), .5% myrcene (see FIG. 1) and 90% Isopar V isoparaffinic hydrocarbon. This was compared, as shown in FIG. 5, with a similar formulation, but with the LTDP only.

[0032] In other formulations we evaluated .5% of surfynol 61 instead of .5% prallethrin, and evaluated the effectiveness of an alternative antioxidant.

[0033] We have also successfully tested use of surfynol 61 in combination with 1,3 hexadiene.

[0034] In our tests, a sintered glass wick (or a nylon wick) was used and the resulting test showed similar results (as compared to the control) for about 200 hours, followed by a drop off in effectiveness in the standard control thereafter. Note that even after 200 hours air emission rates remained stable for the formulation of the present invention.

[0035] As shown in FIG. 6, when one creates a formulation similar to the FIG. 5 formulation of the present invention, but with only one of myrcene or prallethrin, wick clogging becomes significant after 200 hours. Thus, the combination of the diene and acetylenic compounds were important in creating the synergistic result.

[0036] Standard formulations were also tested for repellency against with those in which myrcene, prallethrin (or surfynol 61), and pyrethrin were used and it was noted that relative knockdown times improved with the addition of the diene and acetylenic compounds of the present invention.

[0037] Without being limited to any particular theory, it is believed that the combination of the diene (particularly conjugated terminal diene) and acetylenic (particularly terminal acetylenic) compounds inhibits the oxidation of the impurities in pyrethrum and also minimizes degradation of pyrethrins. Both mechanisms lead to the creation of fewer materials capable of clogging a wick.

[0038] Because only small amounts of the acetylenic compounds and dienes are needed for this effect, the present invention efficiently reduces pyrethrin degradation, extends wick life and effectiveness, and also renders the formulation more "natural". This is achieved without compromising insect control effectiveness.

[0039] While preferred embodiments of the present invention have been described above, it should be appreciated that there are numerous other embodiments within the spirit and scope of this disclosure. For example, it is also proposed that one or more of the following dienes replace myrcene or 1, 3 hexadiene: 1, 3 heptadiene, 1, 3 octadiene and 1, 3 decadiene. Also, the diene need not be linear, and may have a similar moiety at more than one or two locations. Regardless, the invention is not to be limited to just the specific embodiments shown or described.

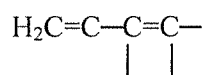
[0040] Industrial Applicability

[0041] Provided herein are improved insect control formulations, and wicks for delivering them.

[0042] All documents cited in this document are, in relevant part, incorporated herein by reference. The citation of any document is not to be construed as an admission that it is prior art with respect to the present invention.

Claims

1. An insect control formulation comprising:
an insect control ingredient comprising pyrethrin;
a solvent that the ingredient is carried in;
5 a compound having a C≡C moiety; and
a hydrocarbon having the following moiety



2. The insect control formulation of claim 1, wherein the compound has a
10 terminal HC≡C- moiety.

3. The insect control formulation of claim 2, wherein the compound is selected from the group consisting of prallethrin and 3,5-dimethylhex-1-yn-3-ol.

4. The insect control formulation of claim 1, wherein the ingredient is pyrethrum extract.

- 15 5. The insect control formulation of claim 1, wherein the hydrocarbon has between 5 and 20 carbons.

6. The insect control formulation of claim 1, wherein the hydrocarbon is a fragrance.

7. The insect control formulation of claim 1, wherein the hydrocarbon is a
20 monoterpene.

8. The insect control formulation of claim 1, wherein the hydrocarbon is myrcene.

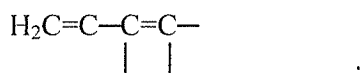
9. The insect control formulation of claim 1, wherein the hydrocarbon is 1,3 hexadiene.

- 25 10. The insect control formulation of claim 1, wherein the solvent is an isoparaffinic hydrocarbon solvent.

11. The insect control formulation of claim 1, further comprising a material selected from the group consisting of dilauryl thiodipropionate, butylated hydroxytoluene and 2,2'-methylenebis(6-tert-butyl-4-methylphenol).

12. A wick for dispensing an insect control formulation, comprising:
a porous wick body;
an insect control formulation positioned in pores of the wick body, the
formulation comprising:

5 an insect control ingredient comprising pyrethrin;
a solvent that the ingredient is carried in;
a compound having a C≡C moiety; and
a hydrocarbon having the following moiety



13. The wick of claim 12, wherein the compound has a terminal HC≡C-
moiety.

14. The wick of claim 12, wherein the hydrocarbon has between 5 and 20
carbons.

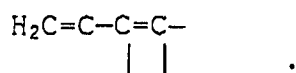
15 15. The wick of claim 12, wherein the porous wick body comprises sintered
glass and/or nylon.

AMENDED CLAIMS

received by the International Bureau on 22 July 2013 (22.07.2013).

What is claimed is:

1. An insect control formulation comprising:
an insect control ingredient comprising pyrethrin;
a solvent that the ingredient is carried in;
a compound having a $C\equiv C$ moiety; and
a hydrocarbon which is at least .1% by weight of the formulation, said hydrocarbon having the following moiety

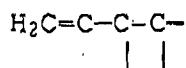


2. The insect control formulation of claim 1, wherein the compound has a terminal $HC\equiv C$ - moiety.
3. The insect control formulation of claim 2, wherein the compound is selected from the group consisting of prallethrin and 3,5-dimethylhex-1-yn-3-ol.
4. The insect control formulation of claim 1, wherein the ingredient is pyrethrum extract.
5. The insect control formulation of claim 1, wherein the hydrocarbon has between 5 and 20 carbons.
6. The insect control formulation of claim 1, wherein the hydrocarbon is a fragrance.
7. The insect control formulation of claim 1, wherein the hydrocarbon is a monoterpene.
8. The insect control formulation of claim 1, wherein the hydrocarbon is myrcene.
9. An insect control formulation comprising:
an insect control ingredient comprising pyrethrin;
a solvent that the ingredient is carried in;
a compound having a $C\equiv C$ moiety; and
a hydrocarbon having the following moiety
 $H_2C=C-C=C-$;
wherein the hydrocarbon is 1,3 hexadiene.

10. The insect control formulation of claim 1, wherein the solvent is an isoparaffinic hydrocarbon solvent.

11. The insect control formulation of claim 1, further comprising a material selected from the group consisting of dilauryl thiodipropionate, butylated hydroxytoluene and 2,2'-methylenebis(6-tert-butyl-4-methylphenol).

12. A wick for dispensing an insect control formulation, comprising:
 a porous wick body;
 an insect control formulation positioned in pores of the wick body, the formulation comprising:
 an insect control ingredient comprising pyrethrin;
 a solvent that the ingredient is carried in;
 a compound having a $C\equiv C$ moiety; and
 a hydrocarbon which is at least .1% by weight of the formulation, said hydrocarbon having the following moiety



13. The wick of claim 12, wherein the compound has a terminal $\text{HC}\equiv\text{C}-$ moiety.

14. The wick of claim 12, wherein the hydrocarbon has between 5 and 20 carbons.

15. The wick of claim 12, wherein the porous wick body comprises sintered glass and/or nylon.

1/4

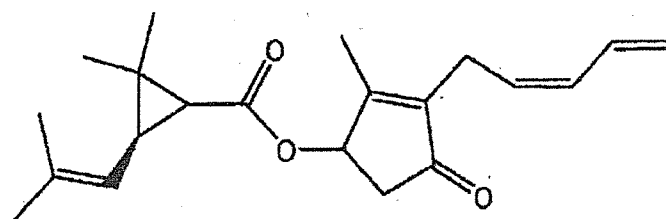


FIG. 1

Pyrethrin I

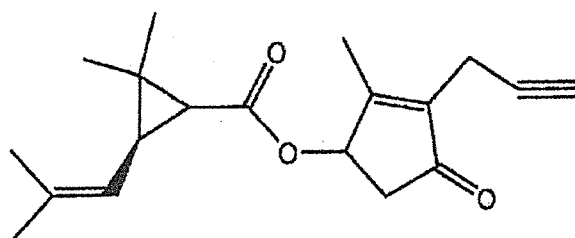


FIG. 2

Prallethrin

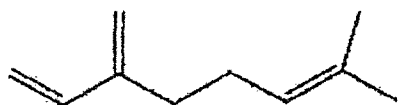


FIG. 3

Myrcene

2/4

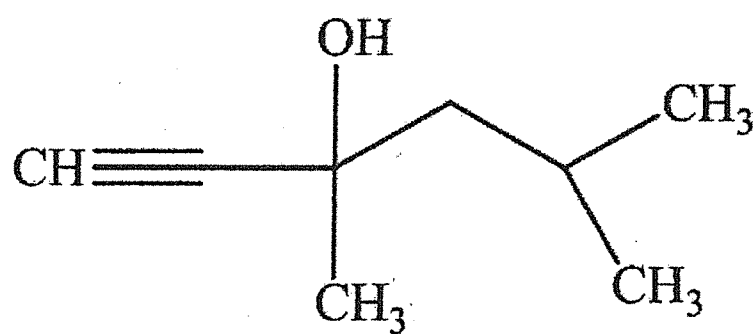


FIG. 4

Surfynol 61

3 / 4

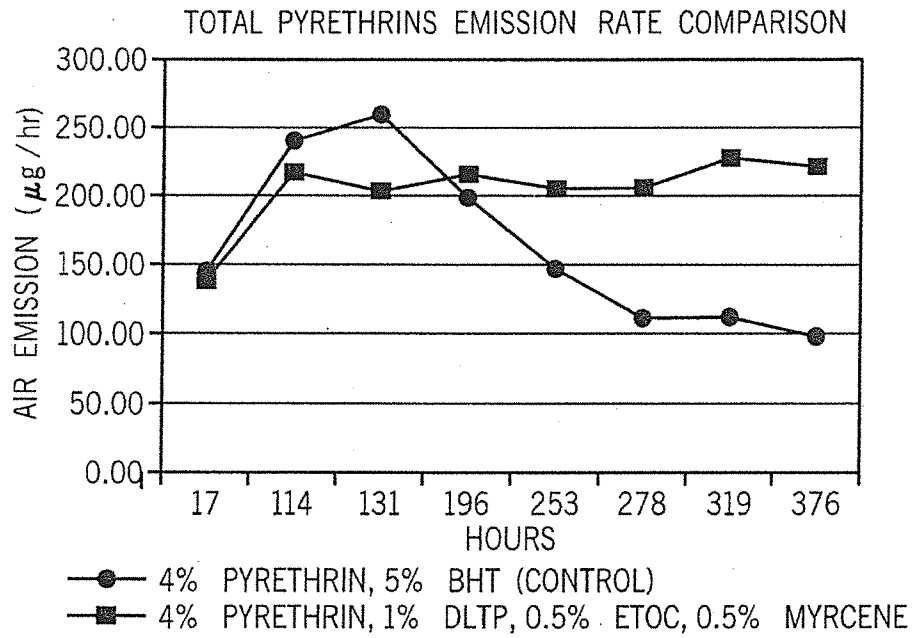


FIG. 5

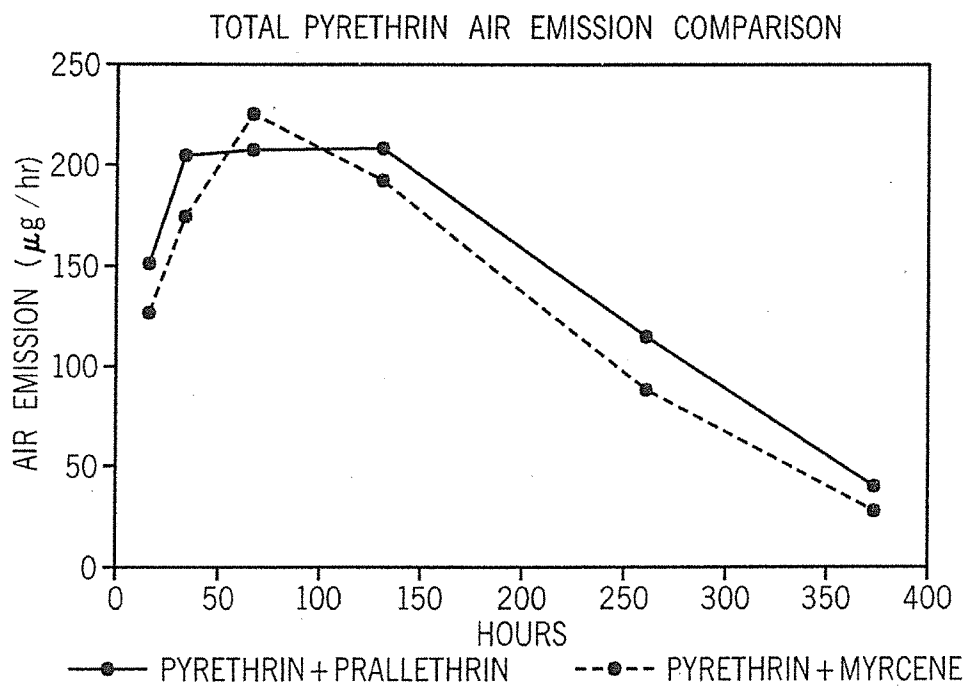


FIG. 6

4 / 4

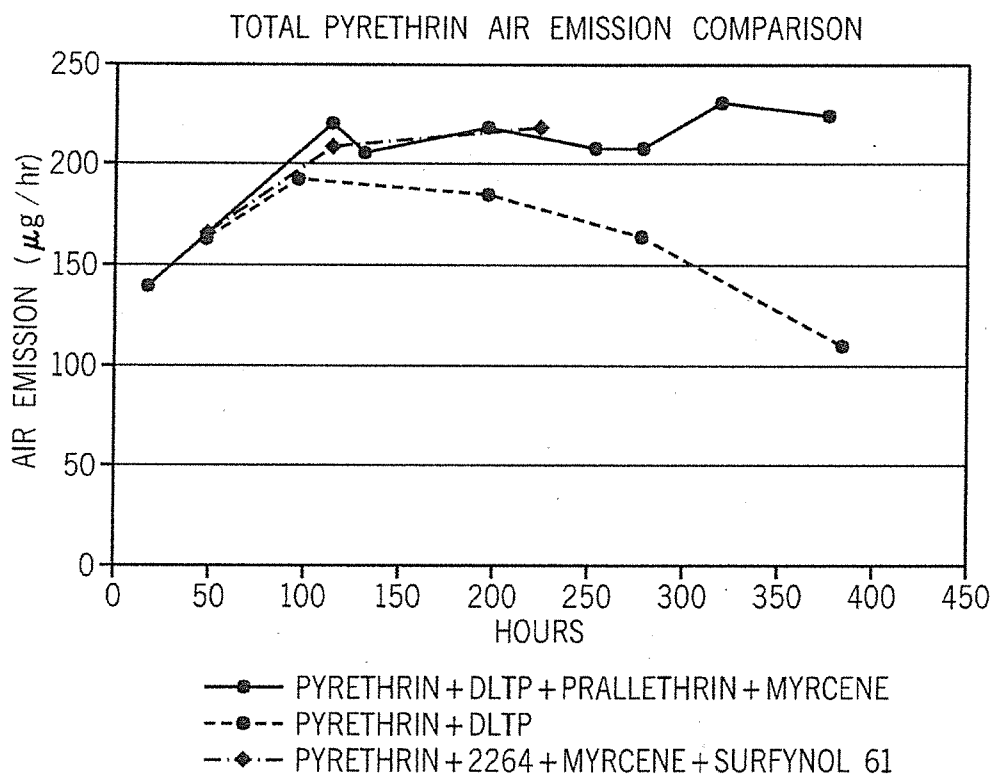


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/041523

A. CLASSIFICATION OF SUBJECT MATTER

INV. A01N25/18 A01N53/00 A01N49/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EP0-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/158353 A1 (WELCH KENNETH J [US] ET AL) 21 July 2005 (2005-07-21)	1-8, 10-15
Y	paragraphs [0014], [0015], [0017], [0018], [0069]	1-15
A	----- PHILIP E. SHAW ET AL: "Quantitative composition of cold-pressed orange oils", JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY, vol. 22, no. 5, 1 May 1974 (1974-05-01), pages 785-787, XP055066765, ISSN: 0021-8561, DOI: 10.1021/jf60195a039 table I	1
A	----- WO 00/05964 A1 (ECOSMART TECHNOLOGIES INC [US]; BESSETTE STEVEN M [US]; BEIGLER MYRON) 10 February 2000 (2000-02-10) example 15	1-15
	----- -/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

17 June 2013

Date of mailing of the international search report

24/06/2013

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Habermann, Jörg

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/041523

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ALEXANDRE PORTE ET AL: "Chemical composition of Thymus vulgaris L. (Thyme) essential oil from the Rio de Janeiro state, Brazil", JOURNAL OF THE SERBIAN CHEMICAL SOCIETY, vol. 73, no. 3, 1 January 2008 (2008-01-01), pages 307-310, XP055066620, ISSN: 0352-5139, DOI: 10.2298/JSC0803307P table I	1
A	----- WO 2008/035029 A2 (LIVIE BIOPESTICIDES LTD [GB]; SHAH SUJAY ANIL [GB]; HORSLER CHRISTOPHE) 27 March 2008 (2008-03-27) examples 1-4	1-15
A	----- Valeria Radulescu ET AL: "CHEMICAL COMPOSITION OF THE VOLATILE OIL FROM DIFFERENT PLANT PARTS OF ANETHUM GRAVEOLENS L. (UMBELLIFERAE) CULTIVATED IN ROMANIA", FARMACIA, 1 May 2010 (2010-05-01), pages 594-599, XP055066617, Romania Retrieved from the Internet: URL: http://www.revistafarmacia.ro/20105/issue52010art06-594-600.pdf [retrieved on 2013-06-13] table I	1
A	----- EP 0 188 845 A1 (DENKA CHEMIE BV [NL]) 30 July 1986 (1986-07-30) example 1 tables 1-6	1-15
A	----- US 3 839 562 A (CHODNEKAR M ET AL) 1 October 1974 (1974-10-01) tables 1, 2	1-15
A	----- US 3 652 741 A (MONTGOMERY RONALD EUGENE ET AL) 28 March 1972 (1972-03-28) tables 2-5	1-15
Y	----- US 2004/151747 A1 (DAVIS BRIAN T [US] ET AL) 5 August 2004 (2004-08-05) paragraphs [0004], [0050], [0084] example 5 table 1 ----- -/--	1-15

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/041523

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"7964. Pyrethrins" In: "The Merck Index, 14th edition", 1 January 2006 (2006-01-01), Merck & Co., Whitehouse Station, NJ, U.S.A., XP055066859, ISBN: 978-0-91-191000-1 pages 1369-1370, paragraphs [7964], [7966] -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/041523

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005158353	A1	21-07-2005	AR 048061 A1 29-03-2006
			AT 336167 T 15-09-2006
			AU 2005206834 A1 04-08-2005
			BR PI0506896 A 12-06-2007
			CA 2553262 A1 04-08-2005
			CN 1925745 A 07-03-2007
			DE 602005000073 T2 07-12-2006
			EP 1608221 A1 28-12-2005
			ES 2267088 T3 01-03-2007
			JP 4589340 B2 01-12-2010
			JP 2007517903 A 05-07-2007
			KR 20070039475 A 12-04-2007
			US 2005158353 A1 21-07-2005
			WO 2005070203 A1 04-08-2005
			ZA 200605943 A 28-05-2008
-----	-----	-----	-----
WO 0005964	A1	10-02-2000	AT 306190 T 15-10-2005
			AU 5237999 A 21-02-2000
			BR 9912691 A 09-10-2001
			CA 2338361 A1 10-02-2000
			CN 1322110 A 14-11-2001
			CN 101317589 A 10-12-2008
			CN 101317590 A 10-12-2008
			CN 101317591 A 10-12-2008
			CZ 20010304 A3 12-12-2001
			DE 69928672 D1 05-01-2006
			DE 69928672 T2 20-04-2006
			EP 1102540 A1 30-05-2001
			EP 1779728 A2 02-05-2007
			EP 1779729 A2 02-05-2007
			EP 1779730 A2 02-05-2007
			ES 2247823 T3 01-03-2006
			HU 0103024 A2 28-01-2002
			ID 28727 A 28-06-2001
			JP 2002521406 A 16-07-2002
			KR 100912554 B1 19-08-2009
			MX PA01000697 A 08-04-2002
			NO 20010466 A 27-03-2001
			PL 345684 A1 02-01-2002
			TR 200100151 T2 21-05-2001
			WO 0005964 A1 10-02-2000
			ZA 200100754 A 28-01-2002
-----	-----	-----	-----
WO 2008035029	A2	27-03-2008	GB 2446889 A 27-08-2008
			WO 2008035029 A2 27-03-2008
-----	-----	-----	-----
EP 0188845	A1	30-07-1986	EP 0188845 A1 30-07-1986
			IL 77412 A 12-07-1990
			JP S61172804 A 04-08-1986
			US 4925657 A 15-05-1990
-----	-----	-----	-----
US 3839562	A	01-10-1974	BE 764979 A1 30-09-1971
			CA 949449 A1 18-06-1974
			DD 95485 A5 05-02-1973
			DE 2115673 A1 21-10-1971
			ES 389704 A1 16-03-1974
			FR 2083684 A1 17-12-1971
			GB 1356018 A 12-06-1974

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/041523

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		HU 165358 B	28-08-1974
		NL 7104293 A	04-10-1971
		RO 63813 A1	15-12-1978
		SE 7413482 A	25-10-1974
		SU 428589 A3	15-05-1974
		US 3839562 A	01-10-1974
		ZA 7102023 A	29-12-1971

US 3652741	A	28-03-1972	NONE

US 2004151747	A1	05-08-2004	AR 042987 A1 13-07-2005
			AR 052095 A2 28-02-2007
			AR 052096 A2 28-02-2007
			AR 055024 A2 01-08-2007
			AT 380469 T 15-12-2007
			AT 493884 T 15-01-2011
			AU 2004209908 A1 19-08-2004
			BR PI0407063 A 17-01-2006
			CA 2513404 A1 19-08-2004
			CN 1756479 A 05-04-2006
			CN 101243788 A 20-08-2008
			CN 101305706 A 19-11-2008
			CN 101305707 A 19-11-2008
			DE 602004010614 T2 10-04-2008
			EP 1583418 A1 12-10-2005
			EP 1825748 A2 29-08-2007
			ES 2294465 T3 01-04-2008
			ES 2359165 T3 19-05-2011
			JP 5068995 B2 07-11-2012
			JP 2006517585 A 27-07-2006
			KR 20050118163 A 15-12-2005
			KR 20110016953 A 18-02-2011
			MX PA05008195 A 30-09-2005
			US 2004151747 A1 05-08-2004
			US 2005181002 A1 18-08-2005
			US 2005186140 A1 25-08-2005
			US 2006039945 A1 23-02-2006
			WO 2004068945 A1 19-08-2004
			ZA 200505739 A 27-09-2006
