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[Continued on next page]

(54) Title: MICROORGANISMS FOR PRODUCING VOLATILE ORGANIC COMPOUNDS AND METHODS USING SAME

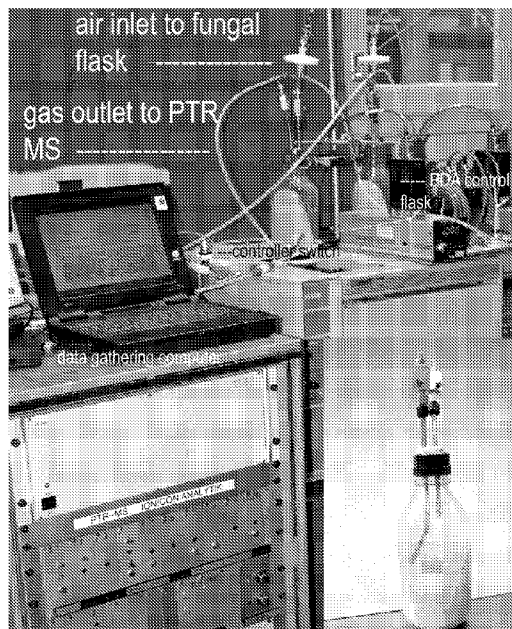


FIGURE 1

(57) Abstract: An isolated fungus having the imperfect stage of Nodulisporium is described. The isolated fungus produces at least one compound selected from the group consisting of 1, 8-cineole, and 1 -methyl- 1,4-cyclohexadiene. A method for producing at least one compound selected from the group consisting of 1, 8-cineole, and 1 -methyl- 1,4-cyclohexadiene is also described. The method includes culturing a microorganism on or within a culturing media in a container under conditions sufficient for producing the at least one compound.



— *with sequence listing part of description (Rule 5.2(a))*

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29 January 2015

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/24650

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C12N 1/00 (2014.01)

CPC - C12R 1/645; C12N 1/14

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)
CPC - C12R 1/645; C12N 1/14Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 435/125, 161, 254.1 (see search terms below)Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, PubWest, ProQuest Dialog, Google Scholar, Google, ScienceDirect

Search Terms: Fungus, cineole, cyclohexadiene, Nodulisporium, Hypoxylon, propagated, Annulohypoxylon, Daldinia, Xylaria, alcohol, ethanol, imperfect stage, volatile, organic

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---	US 2011/0287471 A1 (Strobel et al.) 24 November 2011 (24.11.2011) abstract, para [0035], [0046], [0048], [0055], [0061]	1-3, 5, 7-12
Y		4, 6, 15, 17-18, 20
X ---	WO 2012/0159161 A1 (Mann et al.) 29 November 2012 (29.11.2012) pg3, ln18; pg5, ln6; pg6, ln5-8; pg23, ln18;	13
Y		14-20
Y	Quang et al. Cohaeirins C-F, four azaphilones from the xylariaceous fungus Annulohypoxylon cohaerens. Tetrahedron. 2006. 62, pp6349-6354, title	4
Y	US 2003/0186425 A1 (Strobel et al.) 02 October 2003 (02.10.2003) para [0051]	6
Y	US 2010/0272690 A1 (Gandhi et al.) 28 October 2010 (28.10.2010) para [0044]	14-20
X/P	US 2013/0252289 A1 (Strobel et al.) 26 September 2013 (26.09.2013) abstract, para [0011]-[0012], [0055]	1-20

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

* 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

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/24650

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

—please see continuation in supplemental box ---

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-20

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Box III: lack of unity

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-20, directed to a an isolated fungus

Group II: claims 21-41, directed to a method for producing at least one compound selected from the group consisting of 1, 8-cineole and 1-methyl-1,4-cyclohexadiene

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Special technical features

Group II includes the special technical feature of a method for producing a compound comprising culturing an organism on or within a culturing media in a container under conditions sufficient for producing the compound, which is not required by Group I

Shared technical features

Groups I-II share the common technical feature of isolated fungus having the imperfect stage of *Nodulisporium*, wherein the fungus produces at least one compound selected from the group consisting of 1, 8-cineole and 1-methy 1-1, 4-cyclohexadiene

However, this shared technical features does not represent a contribution over prior art, because these shared technical feature is being anticipated by US 2011/0287471 A1 to Strobel et al. (hereinafter 'Strobel'). Strobel teaches an isolated fungus (abstract) having the imperfect stage (para [0046]) of *Nodulisporium* (para [0046]), wherein the fungus produces at least one compound selected from the group consisting of 1, 8-cineole (abstract) and 1-methy 1-1, 4-cyclohexadiene (abstract)

As the technical features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups. Therefore, Groups I-II lack unity of invention under PCT Rule 13.