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**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

**Published:**

- with international search report (Art. 21(3))  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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WO 2016/033437 A3

(54) Title: POLYETHERS, POLYAMINES, POLYTHIOETHERS, AND METHODS FOR MAKING SAME

(57) Abstract: The invention relates to polyethers, polyamines, and polythioethers, as well as to processes for synthesizing them, e.g., using olefins as starting material.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/47397

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - C07C 41/02 (2016.01) CPC - C08G 2650/26, C08G 65/2609, C08G 18/283 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - C07C 41/02 (2016.01) CPC - C08G 2650/26, C08G 65/2609, C08G 18/283 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 568/679 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Patbase, Google Patent, Google Web Search terms used - olefinic alcohol homopolymer polyethers citronellol thioethers Rhodinol methanesulfonic acid alkenol isoprenol Pubchem substructure search		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,381,416 A1 (Kyo et al.) 26 April 1983 (26.04.1983); col 4, ln 36-37	1-2
A	Nagai, "The Formation of Ethers from dl-Citronellol in the Presence of Boron TriFluoride Etherate", Bulletin of the Chemical Society of Japan. 23 June 1975 (23.06.1975), vol. 49, pg. 265-269; entire document	1-2
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 07 March 2016 (07.03.2016)		Date of mailing of the international search report <b>12 MAY 2016</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/47397

**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.: 9-10; 15-19  
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:  
--see supplemental pagoo

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.:  
1-2

**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.

--continued from Box No. III--

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.

Group I+: Claims 1-8, directed to compounds having the general formula (I). The compound of formula (I) will be searched to the extent that it encompasses the first species of claim 1, represented by the formula of claim 1, wherein R1 is a bond; X is O; one of the dashed bonds is a double bond and the other dashed bond is a single bond; and n is an integer 1. It is believed that claim 1-2 read on this first named invention, and thus these claims will be searched without fee. Applicant is invited to elect additional compounds of claim 1, wherein each additional compound elected will require one additional invention fee. Applicants must specify the claims that encompass any additionally elected compound. Applicants must further indicate, if applicable, the claims which encompass the first named invention, if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the '+' group(s) will result in only the first claimed invention to be searched. Additionally, an exemplary election wherein different actual variables are selected is suggested. An exemplary election would be a compound of claim 1, represented by the first formula of claim 1, wherein, R1 is C1 alkyl; X is O; one of the dashed bonds is a double bond and the other dashed bond is a single bond; and n is 2 (i.e., claims 1-2, 5-6).

Group II: Claims 11-14, directed to a method of producing a compound of claim 1, or a salt thereof, comprising reacting a compound of Formula II or Formula III with methanesulfonic acid to obtain a compound of Formula I.

The group of inventions listed above 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 I+ includes the technical feature of a unique compound of formula I in claim 1.

Group II includes the technical feature of a method of producing a compound of claim 1, or a salt thereof, comprising reacting a compound of Formula II or Formula III with methanesulfonic acid to obtain a compound of Formula I, not required by Group I+.

**Common technical features:**

Groups I+ and II share the technical feature of a compound having the general formula i of claim 1.

These shared technical features, however, do not provide a contribution over the prior art, as being anticipated by US 4,381,416 A1 to Kyo et al. (hereinafter Kyo). Kyo discloses a compound according to Formula I: or a salt thereof, wherein, R1 is C1 alkyl; X is O; the terminal dashed bond is a double bond and the internal dashed bond is a single bond; and n is an integer 1 (col 4, ln 36-37: 3(3-methyl-3-butenyloxy)-3,3-dimethylpropan-1-ol).

As said compound and compositions were known in the art at the time of the invention, these cannot be considered special technical features that would otherwise unify the inventions of Groups I+ and II. The inventions of Group I+ and II thus lack unity under PCT Rule 13.

Note: claims 9-10 and 15-19 determined unsearchable because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).