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- (71) **Applicant:** ELEVANCE RENEWABLE SCIENCES, INC. [US/US]; 2501 Davey Road, Woodridge, IL 60517 (US).
- (72) **Inventors:** TINDALL, Debra; 657 South Mechanic Street, Pendleton, SC 29670 (US). HATEGAN, Georgeta; 2501 Davey Road, Woodridge, IL 60517 (US). RIZVI, Syed, Q.; 2501 Davey Road, Woodridge, IL 60517 (US).
- (74) **Agents:** BABYCH, Eric, D. et al.; Brinks Gilson & Lione, P.O. Box 10087, Chicago, IL 60610 (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, IR, IS, JP, KE, KG, 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, SA, 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.

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**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))

[Continued on next page]

- (54) **Title:** LUBRICANT COMPOSITIONS INCLUDING ALPHA-OLEFIN COPOLYMERS

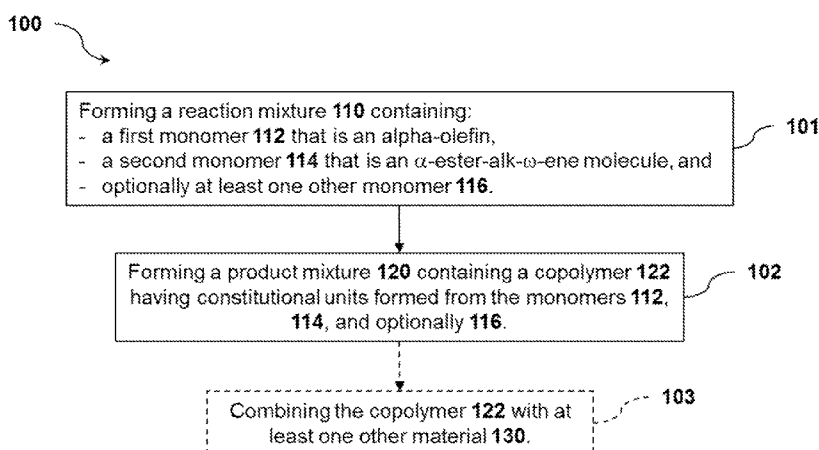


Figure 1

(57) **Abstract:** A lubricant composition may include a copolymer having constitutional units formed from monomers including an alpha-olefin and an  $\alpha$ -ester-alk- $\omega$ -ene molecule, where the composition has a kinematic viscosity at 100 °C of at most 20 centistokes, or of at least 40 centistokes. A lubricant composition may include a copolymer having constitutional units formed from monomers including an alpha-olefin, an  $\alpha$ -ester-alk- $\omega$ -ene molecule and an cc- (carboxylic acid)-alk- $\omega$ -ene molecule, where the composition has a viscosity that varies as the molar ratio of the  $\alpha$ -ester-alk- $\omega$ -ene molecule  $\alpha$ -(carboxylic acid)-alk- $\omega$ -ene molecule in the monomers varies.



**(88) Date of publication of the international search report:**  
27 November 2014

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2014/023044

A. CLASSIFICATION OF SUBJECT MATTER  
INV. C08F20/68 C08F210/14 C10M145/08  
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)  
C08F C10M

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)  
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/129479 A2 (ELEVANCE RENEWABLE SCIENCES [US]; DIBIASE STEPHEN AUGUSTINE [US]; RIZV) 27 September 2012 (2012-09-27) page 172 - page 173; example 48 -----	1-11

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  
12 June 2014

Date of mailing of the international search report  
30/09/2014

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  
Rouault, Yannick

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/023044

## 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.: 24-31(completely); 1-23, 32-49(partially)  
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:  
see FURTHER INFORMATION sheet PCT/ISA/210
  
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:

see additional sheet

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 an 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.:

1-11

### 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.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-11

A lubricant composition and a method according to claim 1 and 9

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2. claims: 12-23

A lubricant composition and a method according to claim 12 and 20

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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

Continuation of Box II.2

Claims Nos.: 24-31(completely); 1-23, 32-49(partially)

Present claim 24 encompasses compounds defined only by their desired function, condition on the monomer ratios and the kinematic viscosity, contrary to the requirements of clarity of Article 6 PCT, because the result-to-be-achieved type of definition does not allow the scope of the claim to be ascertained. The fact that any compound could be screened does not overcome this objection, as the skilled person would not have knowledge beforehand as to whether it would fall within the scope claimed. Undue experimentation would be required to screen compounds randomly.

Claims 28-31 make reference to the description and contravene Art. 6 PCT since they do not disclose explicitly all the essential technical features.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/023044

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012129479	A2	27-09-2012	
		AR 083557 A1	06-03-2013
		CA 2830657 A1	27-09-2012
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