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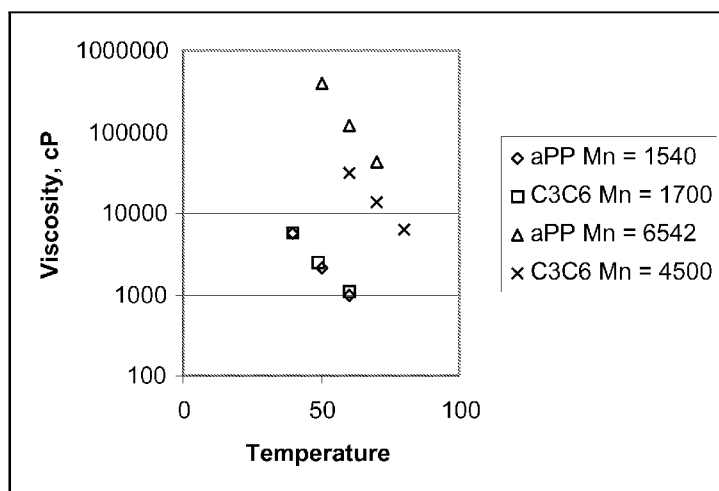
(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, 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, 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.

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[Continued on next page]

(54) **Title:** VINYL TERMINATED HIGHER OLEFIN POLYMERS AND METHODS TO PRODUCE THEREOF

Figure 1: Viscosity of Higher Olefin Vinyl Terminated Polymers As a Function Of
Temperature



(57) **Abstract:** This invention relates to a vinyl terminated higher olefin copolymer having an Mn of 300 g/mol or more (measured by ¹H NMR) comprising: (i) from about 20 to about 99.9 mol% of at least one C₅ to C₄₀ higher olefin monomer; and (ii) from about 0.1 to about 80 mol% of propylene; wherein the higher olefin copolymer has at least 40% allyl chain ends. The copolymer may also have an isobutyl chain end to allyl chain end ratio of less than 0.7:1 and/or an allyl chain end to vinylidene chain end ratio of greater than 2:1.



GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, 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).

Declarations under Rule 4.17:

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

- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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))*

(88) Date of publication of the international search report:

22 November 2012

A. CLASSIFICATION OF SUBJECT MATTER*C08F 210/14(2006.01)i, C08F 210/06(2006.01)i, C08L 23/18(2006.01)i, C08F 4/64(2006.01)i, C10M 107/10(2006.01)i*

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 210/14; C08F 290/04; C08F 4/12; C08F 4/80; C07F 17/00; C08F 118/02; C08F 210/16; C08F 297/08; C08F 110/06; C08F 4/44; C08F 210/08

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)

eKOMPASS(KIPO internal) & Keywords: higher olefin copolymer, propylene-higher olefin copolymer, propylene-butene copolymer, vinyl chain end, allyl chain end

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0318644 A1 (BRANT, P. et al.) 24 December 2009 See abstract, paragraphs [0024]-[0052], [0073]-[0081], [0100].	1-3,7-9,12-19
X	US 2009-0318647 A1 (HAGADORN, J. R. et al.) 24 December 2009 See abstract, paragraphs [0065]-[0088], [0108]-[0116], [0144].	1-3,7-9,12-19
X	US 2006-0052553 A1 (RESCONI, L. et al.) 09 March 2006 See abstract, paragraphs [0047]-[0066].	16-19
X	US 6897261 B1 (MACHIDA, S. et al.) 24 May 2005 See columns 34-41.	1-3,7-9
A	US 2008-0281060 A1 (RESCONI LUIGI et al.) 13 November 2008 See the whole document.	1-3,7-9,12-19



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

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

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"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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Date of mailing of the international search report

24 SEPTEMBER 2012 (24.09.2012)

Name and mailing address of the ISA/KR

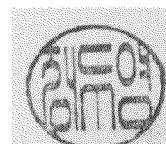
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/027682**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.: 4-6,10,11,20-23
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:

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 fee, this Authority did not invite payment of any additional fee.
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.:

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.

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