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C08F 4/16 (2006.01) *C07F 7/00* (2006.01)

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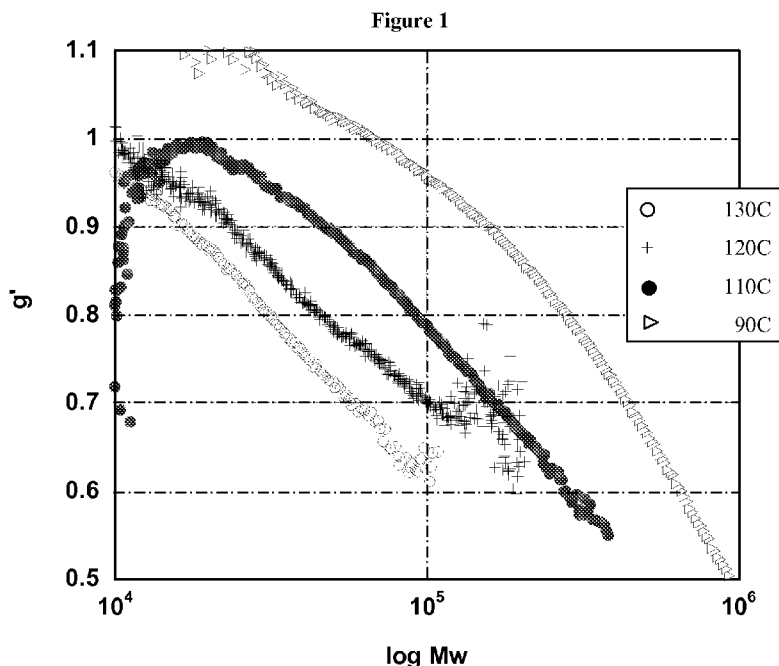
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, 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: BRANCHED VINYL TERMINATED POLYMERS AND METHODS FOR PRODUCTION THEREOF



(57) Abstract: This invention relates to a process for polymerization, comprising (i) contacting, at a temperature greater than 35°C, one or more monomers comprising ethylene and/or propylene, with a catalyst system comprising a metallocene catalyst compound and an activator, (ii) converting at least 50 mol% of the monomer to polyolefin; and (iii) obtaining a branched polyolefin having greater than 50% allyl chain ends, relative to total unsaturated chain ends. The invention also relates to the branched polyolefins and functionalized branched polyolefins.

**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))*

(88) Date of publication of the international search report:
17 January 2013

A. CLASSIFICATION OF SUBJECT MATTER***C08F 10/06(2006.01)i, C08F 4/16(2006.01)i, C07F 17/00(2006.01)i, C07F 7/00(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 10/06; C08F 290/04; C07F 17/00; C08F 297/08; C08F 110/06; C08F 4/44

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: branched polyolefin, vinyl terminated polyolefin, branched polypropylene, bis(indenyl) zirconium catalyst

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WENG, W. et al. 'Long Chain Branched Isotactic Polypropylene.' In: Macromolecules, 2002, Vol. 35, pp. 3838-3843.	1-3, 18, 19, 26, 27
A	See abstract, experimental section, tables 1, 2.	20-22
A	US 6897261 B1 (MACHIDA, S. et al.) 24 May 2005 See the whole document.	1-3, 18-22, 26, 27
A	US 6197910 B1 (WENG, W. et al.) 06 March 2001 See the whole document.	1-3, 18-22, 26, 27
A	US 2006-0052553 A1 (RESCONI, L. et al.) 09 March 2006 See the whole document.	1-3, 18-22, 26, 27



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 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

20 SEPTEMBER 2012 (20.09.2012)

Date of mailing of the international search report

20 SEPTEMBER 2012 (20.09.2012)

Name and mailing address of the ISA/KR

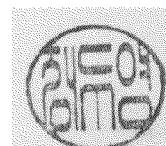
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INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2012/027675**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

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.: 5,33
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:

Claims 5 and 33 are in reference to multiple dependent claims 4 and 32, which are not subjected to the meaningful search in accordance with the second and the third sentence of Rule 6.4(a).
3. ☒ Claims Nos.: 4, 6-17, 23-25, 28-32, 34
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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/027675

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6897261 B1	24.05.2005	CN 1245423 C0 CN 1364174 A0 EP 1209173 A1 EP 1209173 A4 JP W001-007493 A1 KR 10-0699623 B1 KR 10-2006-0116870 A TW 254715 B WO 01-07493 A1	15.03.2006 14.08.2002 29.05.2002 16.04.2003 01.02.2001 23.03.2007 15.11.2006 11.05.2006 01.02.2001
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