

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
20 July 2006 (20.07.2006)

PCT

(10) International Publication Number  
**WO 2006/076728 A3**

(51) International Patent Classification:

**C10M 169/04** (2006.01) **B01F 3/12** (2006.01)  
**C10M 125/02** (2006.01) **D01F 9/12** (2006.01)  
**C10G 73/22** (2006.01)

(21) International Application Number:

PCT/US2006/001675

(22) International Filing Date: 17 January 2006 (17.01.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/644,042 14 January 2005 (14.01.2005) US

(71) Applicant (for all designated States except US): **ASH-LAND, INC.** [US/US]; 3499 Blazer Parkway, Lexington, Kentucky 40509 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LOCKWOOD, Frances, E.** [US/US]; 5326 Paris Pike, Georgetown, Kentucky 40324 (US). **ZHANG, Zhiqiang** [CN/US]; 3240 Sebastian Lane, Lexington, Kentucky 40513 (US). **WU, Gefei** [CN/US]; 408 Whitfield Drive, Lexington, Kentucky 40515 (US). **SMITH, Thomas, R.** [CA/US]; 145 Edgemoore Drive, Lexington, Kentucky 50503 (US).

(74) Agent: **CARRITHERS, David, W.**; CARRITHERS LAW OFFICE, PLLC, One Paragon Centre, 6060 Dutchman's Lane, Suite 140, Louisville, Kentucky 40205 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

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

21 September 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GEAR OIL COMPOSITION CONTAINING NANOMATERIAL

(57) Abstract: A novel use of nanomaterials as a viscosity modifier and thermal conductivity improver for gear oil and other lubricating oil compositions. The gear oils of the instant invention have a higher viscosity index, higher shear stability, and improved thermal conductivity compared to currently available conventional gear oils. The preferred nanoparticles also impart a reduction in the coefficient of friction, including reduced friction in the boundary lubrication regime. These properties are obtained by replacing part or all of the polymer thickener or viscosity index improver or some other part of the composition normally used in gear oils with nanomaterials of suitable shape, size, and composition.



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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/01675

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: C10M 169/04( 2006.01);125/02( 2006.01);C08L 70/08;C10G 73/22( 2006.01);B01F 3/12( 2006.01);D01F 9/12( 2006.01)

USPC: 508/113,123;208/14;516/32;423/447.1

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)

U.S. : 508/113,123;208/14;516/32;423/447.1

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)

US-PGPUB, USPAT, USOCR, EPO, JPO, DERWENT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,783,746 B1 (ZHANG et al.) 31 August 2004 (31.08.2004), column 3, lines 32-40; column 5, lines 3-4, 15-17, 40-48; column 4, lines 14-16, 25-28.	1,3-7,12- 15,34,35,39,40,42- 46,49,50 ----- 8,9,21,25,37,38,47,48,
X --- Y	US 2004/0209782 A1 (ZHANG et al.) 21 October 2004 (21.10.2004), claim 1, [0023], [0024], [0027], [0029], [0030].	1-2,10,11,16,17,19- 22,39-41 ----- 26-29,30,31
X	US 6,020,419 A (BOCK et al.) 1 February 2000 (01.02.2000), column3, lines 1-8 , 18-27, 40-47; column 6, lines 12-17, 17-19.	19,24

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Date of the actual completion of the international search

05 May 2006 (05.05.2006)

Date of mailing of the international search report

06 JUL 2006

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) 273-3201

Authorized officer

Amy T. Lang

Telephone No. 571-272-9057

Jean Proctor  
Paralegal Specialist

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US06/01675

## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	WO 03/106600 A1 (ZHANG et al.) 24 December 2003 (24.12.2003), page 2, lines 13-18; page 3, lines 7-13; page 8, lines 8-10, 24-26; claims 58-59, page 34-35; claim 61, page 35.	19,23,32,33,37 ----- 20,21,25,26- 29,30,31,37,38
Y	US 2003/0214199 A1 (HEIM et al.) 20 November 2003 (20.11.2003), [0016], [0071], [0072].	18,36
Y	US 5,560,898 A (UCHIDA et al.) 01 October 1996 (01.09.1996), column 1, lines 28-38; column 3, lines 13-15.	30,31
X,P	US 2005/0074589 A1 (PAN et al.) 07 April 2005 (07.04.2005), [0003], [0009], [0023], [0025].	18,36