US009410107B2

(12) **United States Patent**
Aida et al.

(10) **Patent No.: US 9,410,107 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **GREASE COMPOSITION AND GREASE-PACKED ROLLING BEARING**

(75) Inventors: **Ryo Aida**, Suzuka (JP); **Yutaka Imai**, Fujisawa (JP); **Kenta Sakaguchi**, Anjo (JP)

(73) Assignees: **KYODO YUSHI CO., LTD.**, Kanagawa (JP); **NTN CORPORATION**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 13 days.

(21) Appl. No.: **14/001,368**

(22) PCT Filed: **Mar. 5, 2012**

(86) PCT No.: **PCT/JP2012/055569**

§ 371 (c)(1),
(2), (4) Date: **Aug. 23, 2013**

(87) PCT Pub. No.: **WO2012/121212**

PCT Pub. Date: **Sep. 13, 2012**

(65) **Prior Publication Data**

US 2013/0331306 A1 Dec. 12, 2013

(30) **Foreign Application Priority Data**

Mar. 4, 2011 (JP) 2011-047242
Apr. 4, 2011 (JP) 2011-082624

(51) **Int. Cl.**

C10M 169/02	(2006.01)
C10M 169/04	(2006.01)
C10M 169/06	(2006.01)
C10M 135/10	(2006.01)
C10M 129/74	(2006.01)
F16C 33/66	(2006.01)
F16C 33/78	(2006.01)
F16C 19/06	(2006.01)
F16C 33/44	(2006.01)

(52) **U.S. Cl.**

CPC ***C10M 169/04*** (2013.01); ***C10M 169/02*** (2013.01); ***C10M 169/06*** (2013.01); ***F16C 33/6633*** (2013.01); *C10M 2207/026* (2013.01); *C10M 2207/283* (2013.01); *C10M 2207/2835* (2013.01); *C10M 2215/064* (2013.01); *C10M 2215/1026* (2013.01); *C10M 2217/0456* (2013.01); *C10M 2219/044* (2013.01); *C10M 2223/045* (2013.01); *C10N 2210/02* (2013.01); *C10N 2220/022* (2013.01); *C10N 2230/12* (2013.01); *C10N 2230/76* (2013.01); *C10N 2240/02* (2013.01); *C10N 2250/10* (2013.01); *F16C 19/06* (2013.01); *F16C 33/44* (2013.01); *F16C 33/7856* (2013.01)

(58) **Field of Classification Search**

CPC C10M 169/02; C10M 169/04; C10M 169/06; C10M 2207/026; C10M 2207/283; C10M 2207/2835; C10M 2215/064; C10M 2215/1026; C10M 2219/044; C10M 2223/045; C10N 2210/02; C10N 2220/022; C10N 2230/12; C10N 2230/76; C10N 2240/02; C10N 2250/10; F16C 33/44; F16C 33/6633; F16C 33/7856; F16C 19/06

USPC 508/409, 506, 528

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,059,336	A	10/1991	Naka et al.	
6,196,720	B1	3/2001	Nozaki et al.	
6,251,841	B1	6/2001	Koizumi et al.	
6,417,143	B1	7/2002	Mikami et al.	
7,150,565	B1 *	12/2006	Koyama et al.	384/450
8,153,568	B2	4/2012	Sato et al.	
2002/0072477	A1 *	6/2002	Ikejima et al.	508/181
2008/0026963	A1 *	1/2008	Sakamoto et al.	508/218
2008/0196995	A1 *	8/2008	Mikami et al.	192/41 R
2009/0136172	A1 *	5/2009	Egami et al.	384/589
2010/0093567	A1 *	4/2010	Endo et al.	508/100
2011/0046030	A1	2/2011	Imai et al.	

FOREIGN PATENT DOCUMENTS

CN	101273117	A	9/2008
CN	101321851	A	12/2008

(Continued)

OTHER PUBLICATIONS

Chinese Office Action and Search Report dated Jun. 5, 2014, issued by the Chinese Patent Office in corresponding Chinese Patent Application No. 201280011298.5. (7 pages).

(Continued)

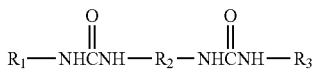
Primary Examiner — James Goloboy

(74) *Attorney, Agent, or Firm* — Buchanan, Ingersoll & Rooney PC

(57) **ABSTRACT**

A grease composition for a rolling bearing for a motor to support a rotor of the motor, containing a pentaerythritol ester base oil with a kinematic viscosity at 40° C. of 20 to 55 mm^2/s; 7 to 13 mass % of a diurea thickener represented by formula (A) where each R group is defined; and a rust inhibitor mixture selected from the group consisting of polyol ester type rust inhibitors and organic sulfonate type rust inhibitors. The grease composition can prevent a peculiar noise from being produced at low temperatures, satisfy the low torque performance over a wide temperature range, extend the bearing lubrication life even under the circumstances of high temperature, and exhibit excellent rust inhibiting effect on varnish.

Formula (A)



9 Claims, 2 Drawing Sheets