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(11) **EP 2 161 325 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
07.04.2010 Bulletin 2010/14

(43) Date of publication A2:
10.03.2010 Bulletin 2010/10

(21) Application number: **09168516.4**

(22) Date of filing: **24.08.2009**

(51) Int Cl.:
C10M 137/10 *(2006.01)*

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(30) Priority: **28.08.2008 US 199968**

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(54) **Lubricant formulations and methods of lubricating a combustion system to achieve improved emissions catalyst durability**

(57) Different zinc dialkyldithiophosphate (ZDDPs) exhibit different volatilities and have different effects on automotive emissions control catalysts. The ZDDPs and their respective decomposition fragments that have low volatility will have a correspondingly lower detrimental effect on combustion emissions control systems, because there are simply fewer phosphorous atoms that will pass through the combustion system to reach the emissions control system. Specifically, it has been discovered that ZDDPs that contain a significant fraction of MIBC ZDDP exhibit significantly lower volatility than other ZDDPs.

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EUROPEAN SEARCH REPORT

Application Number
EP 09 16 8516

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 03/104620 A (LUBRIZOL CORP [US]; WILK MELODY A [US]; CHAMBERLIN WILLIAM B III [US];) 18 December 2003 (2003-12-18) * page 20 - page 24; figure 1; table 1 * & EP 1 513 915 B (LUBRIZOL CORP [US]) 13 August 2008 (2008-08-13) * paragraph [0071] - paragraph [0077] *	1-13	INV. C10M137/10
X	SELBY, BOSCH, FEE: "Phosphorus Additive Chemistry and Its Effect on the Phosphorus Volatility of Engine Oils" ELEMENTAL ANALYSIS SYMPOSIUM, ASTM D02 MEETING, 8 December 2004 (2004-12-08), pages 1-14, XP002553881 Tampa, Fl * page 9 - page 12; table 6 *	1-13	
A	EP 1 520 904 A (CHEVRON ORONITE CO [US]) 6 April 2005 (2005-04-06) * paragraphs [0070] - [0103]; table 1 *		
A	US 5 919 740 A (BLOCH RICARDO A [US] ET AL) 6 July 1999 (1999-07-06) * example #2; table 1 *	1-13	TECHNICAL FIELDS SEARCHED (IPC) C10M
A	WO 2008/011339 A (LUBRIZOL CORP [US]; AL-AHMAD SALEEM [US]; WILK MELODY A [US]; KELLEY J) 24 January 2008 (2008-01-24) * claims 1,14,15,21; examples 2,4; table 1 *	1-13	

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	5 November 2009	Pöllmann, Klaus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

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☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1 - 13

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 09 16 8516

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-13

   A lubricant composition comprising a base oil and an additive composition comprising zinc dialkyldithiophosphate

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2. claims: 14-15

   A method for evaluating the catalyst poisoning effect of zinc dialkyldithiophosphate additives used in engine lubricants

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 16 8516

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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05-11-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82