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22 November 2018 (22.11.2018)

(54) Title: LUBRICATING OIL COMPOSITIONS AND METHOD FOR PREVENTING OR REDUCING LOW SPEED PRE-IGNITION IN DIRECT INJECTED SPARK-IGNITED ENGINES

(57) Abstract: A lubricant composition for a direct injected, boosted, spark ignited internal combustion engine that contains at least one potassium and/or lithium-containing compound is disclosed. This disclosure also relates to a method for preventing or reducing low speed pre-ignition in an engine lubricated with a formulated oil. The formulated oil has a composition comprising at least one oil soluble or oil dispersible potassium and/or lithium compound.



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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/013976

A. CLASSIFICATION OF SUBJECT MATTER
INV. C10M141/12
ADD.
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)
C10M C10N

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KAZUO TAKEUCHI ET AL: "Investigation of Engine Oil Effect on Abnormal Combustion in Turbocharged Direct Injection - Spark Ignition Engines", SAE INTERNATIONAL JOURNAL OF FUELS AND LUBRICANTS, vol. 5, no. 3, 30 January 2012 (2012-01-30), pages 1017-1024, XP055203823, ISSN: 1946-3960, DOI: 10.4271/2012-01-1615 paragraph [2.3.]; figure 7; tables 1,3	1-28
A	WO 2015/042340 A1 (LUBRIZOL CORP [US]) 26 March 2015 (2015-03-26) cited in the application claim 1; tables 1,2,4 ----- -/--	1-28

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	"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
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 1 October 2018	Date of mailing of the international search report 17/10/2018
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Pöllmann, Klaus
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/013976

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.:
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:

see additional sheet

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 fees, this Authority did not invite payment of additional fees.
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

International application No PCT/US2018/013976

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2016/148708 A1 (LUBRIZOL CORP [US]) 22 September 2016 (2016-09-22) claims 1,6 -----	1-28
X	WO 2016/043333 A1 (IDEMITSU KOSAN CO [JP]) 24 March 2016 (2016-03-24)	1-14
A	paragraphs [0009], [0026], [0175], [0242], [0279]; claims 1,6,13,18 & US 2017/298287 A1 (TAMURA KAZUSHI [JP]) 19 October 2017 (2017-10-19) paragraphs [0009], [0026], [0175], [0242], [0279]; claims 1,6,13,18 -----	15-28
X	US 2010/210493 A1 (TOBIAS MELANIE F [US] ET AL) 19 August 2010 (2010-08-19)	10-12
A	example 2 -----	1-9, 13-28
X	US 2007/129263 A1 (BOFFA ALEXANDER B [US] ET AL) 7 June 2007 (2007-06-07)	23-26
A	claims 1-4,8-11 -----	1-22,27, 28

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2018/013976

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
WO 2015042340	A1	26-03-2015	BR 112016006109 A2	01-08-2017
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			EP 1792969 A1	06-06-2007
			JP 2007154199 A	21-06-2007
			SG 132648 A1	28-06-2007
			US 2007129263 A1	07-06-2007

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14

method for reducing low speed pre-ignition in a direct injected spark ignited internal combustion engine comprising lubricating the engine with a composition comprising 300 to 3500 ppm potassium from a potassium compound/detergent and lubricant for this method.

2. claims: 15-28

method for reducing low speed pre-ignition in a direct injected spark ignited internal combustion engine comprising lubricating the engine with a composition comprising 100 to 900 ppm lithium from a lithium compound/detergent and lubricant for this method.
