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(54) **Lubricant formulations and methods**

(57) The embodiments described herein relate to particular formulations and methods that may provide improved fuel economy characteristics for an engine lubricant. The compositions and methods include a (a) a base oil; (b) a zinc dialkyldithiophosphate compound; and (c) a hydrocarbon soluble metal compound. The hydrocarbon soluble metal compound is devoid of phosphorus and sulfur atoms and the metal is selected from the group consisting essentially of selected from the group consist-

ing essentially of cobalt, nickel, zinc, zirconium, manganese, vanadium, scandium, yttrium, tungsten, gold, platinum, and iron. A weight ratio of total metal in the lubricant composition from the zinc dialkyl- dithiophosphate compound and the hydrocarbon soluble metal compound to phosphorus in the lubricant composition ranges from greater than 1.5 to 1 to 15 to 1.

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## EUROPEAN SEARCH REPORT

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                      |                                                      |                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                                        | Relevant to claim                                    | CLASSIFICATION OF THE APPLICATION (IPC)                                                                                                |
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| -----<br>-/--                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                      |                                                      |                                                                                                                                        |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                      |                                                      |                                                                                                                                        |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                      | Date of completion of the search<br>30 November 2010 | Examiner<br>Renoth, Heinz                                                                                                              |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                                                                                                      |                                                      |                                                                                                                                        |

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                               |                                                             |                                         |
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| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                 | Relevant to claim                                           | CLASSIFICATION OF THE APPLICATION (IPC) |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                               |                                                             | TECHNICAL FIELDS SEARCHED (IPC)         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                               | Date of completion of the search<br><b>30 November 2010</b> | Examiner<br><b>Renoth, Heinz</b>        |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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