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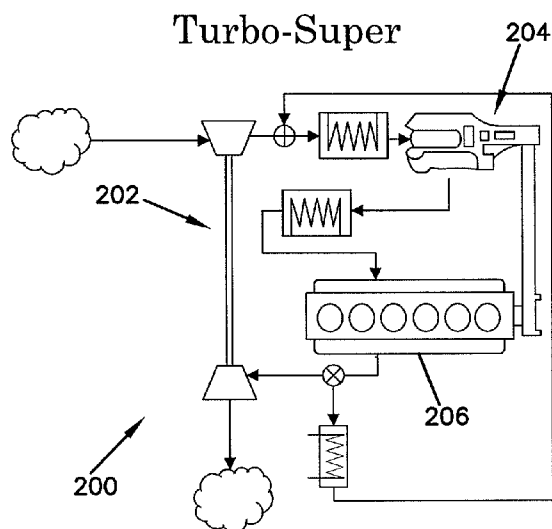
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[Continued on next page]

(54) Title: SUPERCHARGER-BASED TWIN CHARGING SYSTEM FOR AN ENGINE

FIG. 2



(57) Abstract: The present disclosure relates to dual compression engine boosting systems utilizing both a turbocharger and a supercharger and control systems relating to relative activation and deactivation of the boosting devices. Various Exhaust Gas Recirculation (EGR) configurations are also disclosed for the dual compression engine boosting systems.



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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/039625

A. CLASSIFICATION OF SUBJECT MATTER

INV. F02B39/12 F02B37/16 F02B37/04 F02M25/07
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)

F02D F02B F02M

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)

EP0-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.
X	JP 11 082085 A (NISSAN MOTOR) 26 March 1999 (1999-03-26)	1,5,26
Y	abstract; figures 3-5 claim 1	2-4,6-14
X	JP 61 101622 A (TOYOTA MOTOR CORP) 20 May 1986 (1986-05-20)	1,5,26
Y	abstract; figures 3,4	
	US 2010/132355 A1 (MICHELS KARSTEN [DE] ET AL) 3 June 2010 (2010-06-03)	2-4,9, 10,12,13
	figures 2,3 paragraphs [0003], [0004], [0030] - [0034]	
	- / - -	

☒ 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

"E" earlier application or patent but published on or after the international filing date

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"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 10 2006 058150 A1 (FORD GLOBAL TECH LLC [US]) 12 June 2008 (2008-06-12) paragraphs [0005] - [0016] page 1; figure 1 -----	6-8
Y	WO 96/30635 A1 (CUMMINS ENGINE CO INC [US]) 3 October 1996 (1996-10-03) figures 2,6 -----	11,14
A	WO 2007/083131 A1 (RICARDO UK LTD [GB]; COOPER BRIAN GORMAN [GB]; CORNWELL RICHARD CHARLE) 26 July 2007 (2007-07-26) figure 1 -----	2-14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/039625

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.:

1-14, 26

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.

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, 26

Engine boosting system and method of using a supercharger wherein the engagement and disengagement of a supercharger is timed during a transmission shift event

2. claims: 15-20, 27-30

A system and method wherein the actuation of a supercharger is controlled at least in part based on a current gear of the vehicle and a desired boost pressure of a supercharger

3. claims: 21-25, 31

An engine boosting system and a method of using a supercharger wherein a bypass valve for routing air around the supercharger is at least partially opened when a slippage of a drive belt is sensed

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/039625

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