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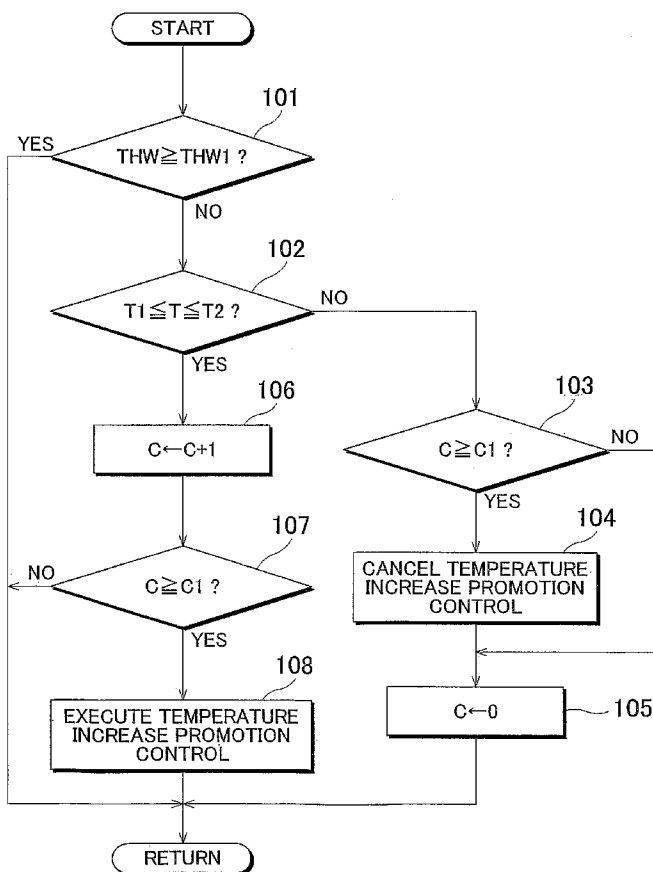
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[Continued on next page]

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(54) Title: CONTROL APPARATUS AND CONTROL METHOD OF AN INTERNAL COMBUSTION ENGINE



(57) Abstract: A control apparatus of an in-cylinder injection type spark ignition internal combustion engine provided with at least an in-cylinder fuel injection valve that injects fuel directly into a cylinder executes temperature increase promotion control that promotes an increase in temperature near a nozzle hole of the in-cylinder fuel injection valve (step 108) when a detected temperature (T) near the nozzle hole of the in-cylinder fuel injection valve is within a deposit forming temperature range (between T1 and T2, inclusive) (step 102).

WO 2007/105080 A3



PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2007/000616

A. CLASSIFICATION OF SUBJECT MATTER
INV. F02D35/02 F02D37/02

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

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 830 276 A (DAIMLER CHRYSLER AG [DE]) 4 April 2003 (2003-04-04) page 5, line 22 - line 23 -----	1, 2, 5, 6
P, X	WO 2006/038428 A (TOYOTA MOTOR CO LTD [JP]; AKITA TATSUHIKO [JP]; KURATA NAOKI [JP]; YAM) 13 April 2006 (2006-04-13) page 5, line 4 - line 18 -----	1-4, 7-10
X	JP 11 351041 A (FUJI HEAVY IND LTD) 21 December 1999 (1999-12-21) abstract -----	1-4, 7-10
A	US 4 875 451 A (EVASICK ROBERT J [US] ET AL) 24 October 1989 (1989-10-24) the whole document -----	1, 2, 5, 6

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 document but published on or after the international filing date
- *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)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *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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Jackson, Stephen

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2007/000616

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 allsearchable 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-4,7-10

Claims 1-4 and 7-10

The general concept of this group of inventions is controlling the fuel flow ratio between two injectors. The special technical features of this invention are changing the ratio of injection amounts through these two fuel injectors to enable an increase in nozzle temperature of the in-cylinder injector.

2. claims: 1,5,6

Claims 5 and 6

The general concept is controlling the ignition timing, with the special technical features of a controller which can adjust the ignition timing.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2007/000616

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
FR 2830276	A	04-04-2003	DE 10148663 A1 GB 2381872 A	10-04-2003 14-05-2003
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