



- (51) **International Patent Classification:**
F02D 41/00 (2006.01) F02D 41/14 (2006.01)
F02D 41/12 (2006.01)
- (21) **International Application Number:**
PCT/IB2013/000355
- (22) **International Filing Date:**
11 March 2013 (11.03.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
2012-080961 30 March 2012 (30.03.2012) JP
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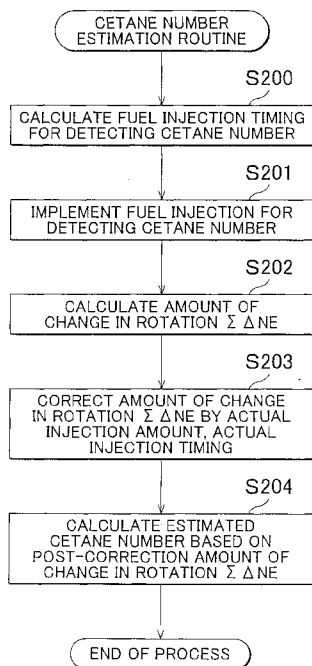
- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

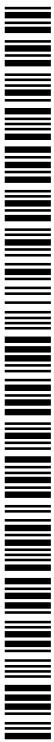
[Continued on next page]

(54) Title: ENGINE FUEL PROPERTY ESTIMATION APPARATUS

FIG. 7



(57) **Abstract:** In the fuel property estimation apparatus of the invention, when fuel of an engine is cut, an upper-limit rotation speed NEmax is set based on vehicle speed SPD. When the engine rotation speed NE becomes equal to or less than the upper-limit rotation speed NEmax (YES in S102), the fuel injection for estimation of the cetane number of the fuel that is an index value the ignition quality of the fuel is implemented. The cetane number is estimated from the magnitude of engine torque produced by combustion of the injected fuel. By setting the upper-limit rotation speed NEmax to a smaller value as the vehicle speed SPD is higher, the apparatus restrains variations of the ignition delay time, and heightens the accuracy of the estimation of the cetane number.





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

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

Published:

— with international search report (Art. 21(3))

(88) Date of publication of the international search report:

23 January 2014

INTERNATIONAL SEARCH REPORT

International application No PCT/IB2013/000355

A. CLASSIFICATION OF SUBJECT MATTER INV. F02D41/00 F02D41/12 F02D41/14 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		
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.
X	WO 2005/119034 A1 (TOYOTA MOTOR CO LTD [JP]; AOYAMA TARO [JP]) 15 December 2005 (2005-12-15) abstract page 16, line 6 - page 18, line 17 figures 2,3	1-3,6,7
A	----- US 2009/198456 A1 (TSUTSUMI KOJI [JP] ET AL) 6 August 2009 (2009-08-06) abstract figure 11	1-3,6,7
A	----- JP 2010 024870 A (TOYOTA MOTOR CORP) 4 February 2010 (2010-02-04) cited in the application abstract -----	1-3,6,7
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search	Date of mailing of the international search report	
1 November 2013	08/11/2013	
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 Trotureau, Damien	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2013/000355

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
WO 2005119034	A1	15-12-2005	CN 1906390 A	31-01-2007
			JP 4075858 B2	16-04-2008
			JP 2005344557 A	15-12-2005
			US 2007079647 A1	12-04-2007
			WO 2005119034 A1	15-12-2005

US 2009198456	A1	06-08-2009	JP 4600484 B2	15-12-2010
			JP 2009180174 A	13-08-2009
			US 2009198456 A1	06-08-2009

JP 2010024870	A	04-02-2010	NONE	
