



PCT



(43) International Publication Date
31 July 2008 (31.07.2008)

(10) International Publication Number
WO 2008/091027 A3

- (51) **International Patent Classification:**
F01P 7/16 (2006.01) **F01P 11/02** (2006.01)

(21) **International Application Number:**
PCT/JP2008/051609

(22) **International Filing Date:** 25 January 2008 (25.01.2008)

(25) **Filing Language:** English

(26) **Publication Language:** English

(30) **Priority Data:**
2007-014692 25 January 2007 (25.01.2007) JP

(71) **Applicants (for all designated States except US):** **TOYOTA JIDOSHA KABUSHIKI KAISHA** [JP/JP]; 1, Toyota-cho, Toyota-shi, Aichi, 4718571 (JP). **DENSO CORPORATION** [JP/JP]; 1-1, Showa-cho, Kariya-shi, Aichi, 4488661 (JP).

(72) **Inventors; and**

(75) **Inventors/Applicants (for US only):** **SHINTANI, Osamu** [JP/JP]; c/o TOYOTA JIDOSHA KABUSHIKI KAISHA, 1, Toyota-cho, Toyota-shi, Aichi, 4718571 (JP). **TAKAHASHI, Eizou** [JP/JP]; c/o DENSO CORPORATION, 1-1, Showa-cho, Kariya-shi Aichi, 4488661 (JP).

(74) **Agent:** **ONDA, Hironori**; 12-1, Ohmiya-cho 2-chome, Gifu-shi, Gifu 5008731 (JP).

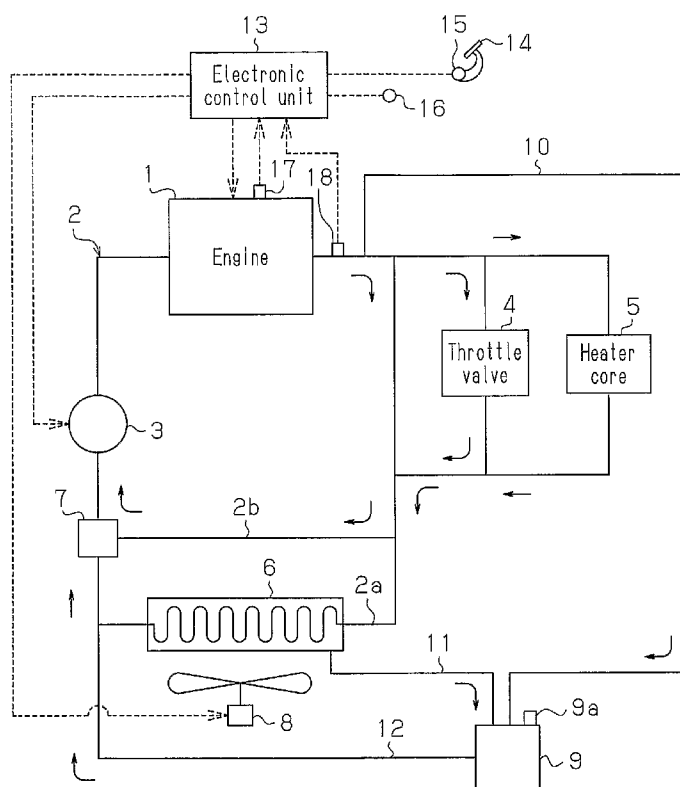
(81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: COOLING APPARATUS

Fig.1



(57) Abstract: A cooling apparatus that cools with coolant a subject of cooling, which is a heat source. The cooling apparatus includes a cooling circuit, an electric pump, a switching section, and a control section. Through circulation of the coolant, air in the cooling circuit is caused to flow to an air bleeding portion and is discharged from the cooling circuit through the air bleeding portion. The switching section is capable of switching the operation mode of the electric pump between a normal mode and an air bleeding mode for collecting air in the cooling circuit to the air bleeding portion. During the air bleeding mode, the control section is capable of controlling the electric pump to change a coolant displacement from the electric pump according to a change pattern that allows stagnant air in sections of the cooling circuit to flow to the air bleeding portion.



European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
23 October 2008

Published:

— *with international search report*

INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2008/051609

A. CLASSIFICATION OF SUBJECT MATTER
INV. F01P7/16 F01P11/02

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)
F01P

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	US 6 776 126 B2 (LE LIEVRE ARMEL [FR] ET AL) 17 August 2004 (2004-08-17) abstract	1-10
X	US 5 241 926 A (SATO MASAOKI [JP] ET AL) 7 September 1993 (1993-09-07) column 7, line 19 - line 36	1-10
X	US 4 577 594 A (HAYASHI YOSHIMASA [JP] ET AL) 25 March 1986 (1986-03-25) column 12, line 61 - column 13, line 28	1,8
X	US 4 648 357 A (HAYASHI YOSHIMASA [JP]) 10 March 1987 (1987-03-10) column 10, line 28 - line 30	1,8
X	US 4 677 942 A (HAYASHI YOSHIMASA [JP]) 7 July 1987 (1987-07-07) column 7, line 53 - column 8, line 7	1,2

☐ 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.

Z document member of the same patent family

Date of the actual completion of the international search

15 July 2008

Date of mailing of the international search report

30/07/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Yates, John

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2008/051609

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6776126	B2	17-08-2004	EP 1409856 A1 FR 2804722 A1 WO 0157373 A1 JP 2003529703 T US 2003177986 A1	21-04-2004 10-08-2001 09-08-2001 07-10-2003 25-09-2003
US 5241926	A	07-09-1993	NONE	
US 4577594	A	25-03-1986	DE 3575451 D1 EP 0153694 A2	22-02-1990 04-09-1985
US 4648357	A	10-03-1987	NONE	
US 4677942	A	07-07-1987	DE 3476242 D1 EP 0134006 A1	23-02-1989 13-03-1985