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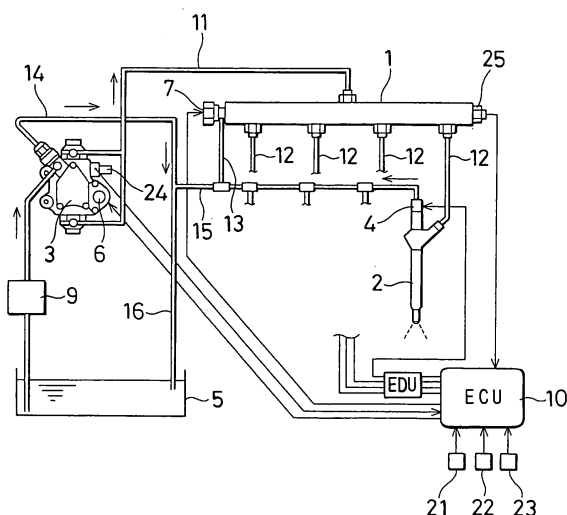
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(54) **Operating condition learning control device for internal combustion engine**

(57) Learning control is carried out to learn and correct degradation in the functionality of a fuel supply pump (3) having a solenoid coil (6) for an engine. During the learning control, a temporary present learned value (ITL) to be utilized in the calculation of a target value of driving current applied to the solenoid coil is calculated. Thereafter, a final present learned value (IFL) is calculated by

adding up a previous learned value (IPL) and the temporary present learned value (ITL). The final present learned value (IFL) is not immediately utilized in the calculation of the target value of driving current. Instead, the final present learned value is just stored in a memory in place of the previous learned value when the engine is stopped.

**FIG. 1**





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 04 00 0996

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 269 028 A (FUJI HEAVY IND LTD [JP]) 26 January 1994 (1994-01-26) * page 25, last line - page 26, paragraph 4; figures *	1,2,7,8 9,10	INV. F02D41/04 F02D41/24 F02D41/14
X	DE 100 44 514 A1 (DENSO CORP [JP]) 15 March 2001 (2001-03-15) * column 12, line 56 - column 19, line 13; figures *	1-6	
X	US 6 367 454 B1 (REMBOLD HELMUT [DE] ET AL) 9 April 2002 (2002-04-09) * the whole document *	1-6	
X	GB 2 227 338 A (FUJI HEAVY IND LTD [JP]) 25 July 1990 (1990-07-25) * page 22, line 15 - page 26, line 18; figures *	1,2,7,8 9,10	
A	EP 1 026 384 A (DENSO CORP [JP]) 9 August 2000 (2000-08-09) * paragraphs [0074], [0077] *	7,8	TECHNICAL FIELDS SEARCHED (IPC)
A	US 5 497 330 A (ISHIDA YASUHIKO [JP]) 5 March 1996 (1996-03-05) * the whole document *	1	F02D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 April 2008	Examiner Aign, Torsten
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 00 0996

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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09-04-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2269028 A	26-01-1994	DE 4322700 A1 US 5465703 A	13-01-1994 14-11-1995
DE 10044514 A1	15-03-2001	JP 2001082230 A	27-03-2001
US 6367454 B1	09-04-2002	WO 0031398 A1 DE 19853823 A1 EP 1064456 A1 JP 2002530588 T	02-06-2000 25-05-2000 03-01-2001 17-09-2002
GB 2227338 A	25-07-1990	DE 4001494 A1 US 4977881 A	02-08-1990 18-12-1990
EP 1026384 A	09-08-2000	DE 60011484 D1 DE 60011484 T2 JP 3487207 B2 JP 2000220508 A	22-07-2004 11-08-2005 13-01-2004 08-08-2000
US 5497330 A	05-03-1996	NONE	