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(72) Inventors:  
• **Fukushima, Takayuki**  
**Kariya-city,**  
**Aichi-pref., 448-8661 (JP)**  
• **Ishizuka, Kouzi**  
**Kariya-city,**  
**Aichi-pref., 448-8661 (JP)**

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(71) Applicant: **DENSO CORPORATION**  
**Kariya-city,**  
**Aichi-pref., 448-8661 (JP)**

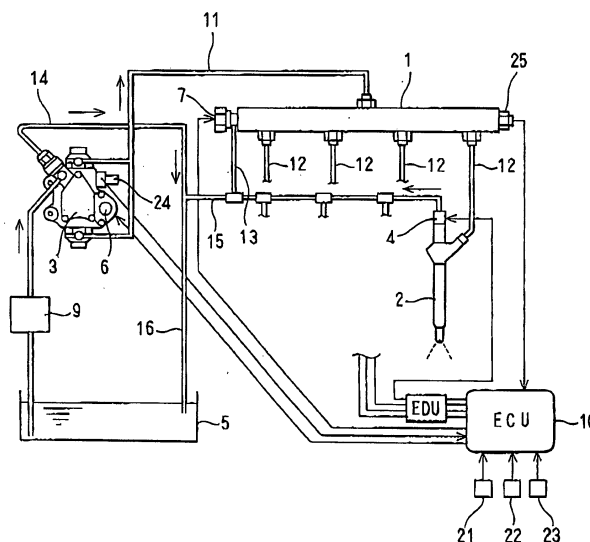
(74) Representative: **TBK-Patent**  
**Bavariaring 4-6**  
**80336 München (DE)**

(54) **Fuel injection system for internal combustion engine**

(57) An electronic control unit (ECU) (10) of a fuel injection system for an internal combustion engine performs feedback control of a fuel discharging quantity in both of normal control and learning control based on a pressure deviation between a target fuel pressure and an actual fuel pressure. In the learning control, the ECU (10) calculates a difference between first demand driving current and second demand driving current as a current

learning value for learning and correcting target driving current. The ECU (10) renews and stores the current learning value in a memory. The first demand driving current is converted from the fuel discharging quantity as a target discharging quantity calculated through the above feedback control based on a reference property. The second demand driving current is converted from a known idling fuel discharging quantity.

**FIG. 1**





## EUROPEAN SEARCH REPORT

Application Number  
EP 04 00 0881

| 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  | DE 100 44 514 A1 (DENSO CORP [JP])<br>15 March 2001 (2001-03-15)<br>* column 11, line 49 - column 16, line 15;<br>figures 1,8,10,11,14 *<br>----- | 1-7   | INV.<br>F02D41/38<br>F02D41/30<br>F02D41/14<br>F02D41/24 |
| A  | US 5 483 940 A (NAMBA TOSHIO [JP] ET AL)<br>16 January 1996 (1996-01-16)<br>* the whole document *<br>-----                                       | 1-6   |  |
| A  | DE 198 53 823 A1 (BOSCH GMBH ROBERT [DE])<br>25 May 2000 (2000-05-25)<br>* the whole document *<br>-----  | 1-6   |  |
| A  | EP 0 964 150 A2 (DENSO CORP [JP])<br>15 December 1999 (1999-12-15)<br>* paragraphs [0029], [0056] - [0058];<br>figures 1-3 *<br>-----             | 1,2,6   |  |
| The present search report has been drawn up for all claims   |   |   | TECHNICAL FIELDS SEARCHED (IPC)                          |
|  |   |   | F02D   |
| 1  | Place of search<br><b>Munich</b>  | Date of completion of the search<br><b>5 May 2010</b>   | Examiner<br><b>Aign, Torsten</b>                         |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |   | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : 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 0881

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The members are as contained in the European Patent Office EDP file on  
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05-05-2010

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date        |
|---|---------------------|----------------------------|----------------------------|
| DE 10044514                               | A1                  | 15-03-2001                 | JP 4240673 B2 18-03-2009   |
|   |                     | JP 2001082230 A            | 27-03-2001                 |
| US 5483940                                | A                   | 16-01-1996                 | JP 3060266 B2 10-07-2000   |
|   |                     |                            | JP 6147047 A 27-05-1994    |
| DE 19853823                               | A1                  | 25-05-2000                 | WO 0031398 A1 02-06-2000   |
|   |                     |                            | EP 1064456 A1 03-01-2001   |
|   |                     |                            | JP 2002530588 T 17-09-2002 |
|   |                     |                            | US 6367454 B1 09-04-2002   |
| EP 0964150                                | A2                  | 15-12-1999                 | DE 69925783 D1 21-07-2005  |
|   |                     |                            | DE 69925783 T2 11-05-2006  |
|   |                     |                            | US 6311674 B1 06-11-2001   |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82