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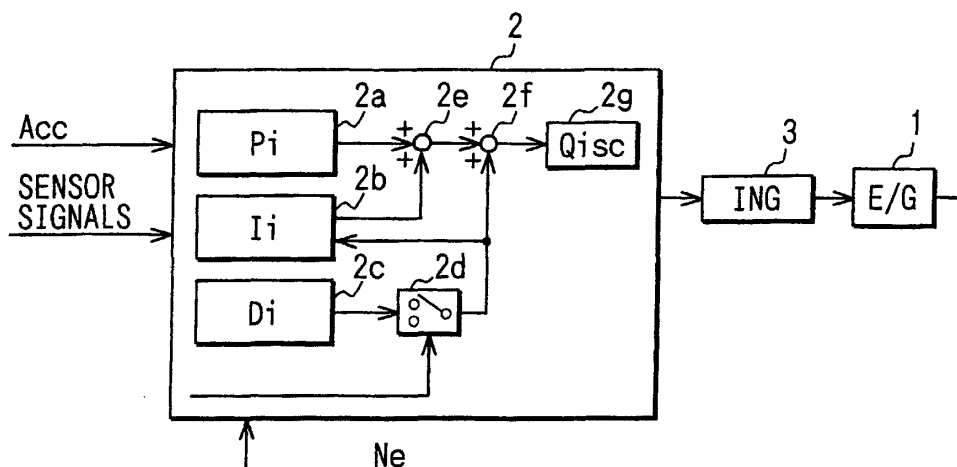
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(54) **Method for controlling idling speed of internal combustion engine**

(57) If the driver takes foot off the accelerator while the running condition of the vehicle, an engine speed decreases to a target engine speed for an idling condition. A corrective injection amount is calculated and added on a base injection amount when the engine speed is in a vicinity of the target engine speed ( $Ne_{isc} + \Delta N2 \leq Ne < Ne_{isc} + \Delta N1$ ). The corrective injection amount is calculated based on a decreasing speed  $dNe/dt$  of the

$Ne$ . The corrective amount is gradually increased by an affecting ratio coefficient  $Kdl$  so that 100 % of the corrective amount is fully effective when the engine speed  $Ne$  coincides with the target engine speed  $Ne_{isc}$ . As a result, it is possible to suppress a decreasing speed of the engine speed. It is possible to prevent the engine speed from an excessive drop with respect to the target engine speed. It is possible to approach the engine speed smoothly to the target engine speed.

**FIG. 1**





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# EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 251 598 A (WIETELMANN JUERGEN) 12 October 1993 (1993-10-12) * figures 1,2 * * column 1, lines 36-51 * * column 1, line 62 - column 2, line 2 * * column 2, line 46 - column 5, line 42 * -----	1-10	F02D31/00 F02D41/16 F02D41/12
X	US 5 642 707 A (CERF PATRICE ET AL) 1 July 1997 (1997-07-01) * figures 2,3 * * column 1, lines 9-27 * * column 2, lines 1-46 * * column 6, line 39 - column 8, line 55 * -----	1-10	
X	US 4 471 735 A (COLLONIA HARALD) 18 September 1984 (1984-09-18) * figure 1 * * column 1, lines 5-60 * * abstract * -----	1,2 3-10	
A	US 4 520 778 A (SATOU HIROO ET AL) 4 June 1985 (1985-06-04) * column 1, lines 8-42 * * column 1, line 59 - column 3, line 13 * * column 7, line 10 - column 8, line 36 * * column 13, lines 17-21 * -----	1-10	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F02D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 September 2004	Examiner Parmentier, H
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 02 00 7155

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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10-09-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5251598      A	12-10-1993	DE      4112848 A1	22-10-1992
		FR      2675541 A1	23-10-1992
		JP      5106488 A	27-04-1993
US 5642707      A	01-07-1997	FR      2707347 A1	13-01-1995
		DE      69411011 D1	16-07-1998
		DE      69411011 T2	19-11-1998
		EP      0707684 A1	24-04-1996
		JP      8512378 T	24-12-1996
		WO      9502121 A1	19-01-1995
		ES      2118426 T3	16-09-1998
US 4471735      A	18-09-1984	DE      3226283 A1	19-01-1984
		DE      3371824 D1	02-07-1987
		EP      0098909 A2	25-01-1984
US 4520778      A	04-06-1985	NONE	