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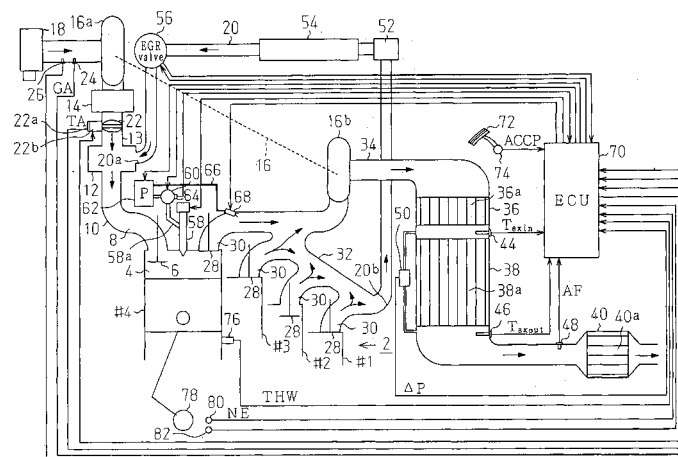
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(54) **Catalyst deterioration determination apparatus of internal combustion engine**

(57) In an internal combustion engine (2), during sulfur release control for permitting an exhaust purification catalyst to recover from a sulfur poisoned state, a richening period, in which fuel is supplied to exhaust gas, and a non richening period, in which no fuel is supplied to exhaust, are repeated. The ratio of the duration of the

richening period to the duration of the non-richening period is changed according to the deterioration degree of the exhaust purification catalyst. Thus, even if the deterioration degree of the exhaust purification catalyst changes, an excessive increase in the catalyst bed temperature and a lowered accuracy of the sulfur release control are reliably suppressed.

**Fig.1**





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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	EP 1 225 323 A (TOYOTA JIDOSHA KABUSHIKI KAISHA) 24 July 2002 (2002-07-24)	11-13	F02D41/02 F02D41/14
Y	* paragraphs [0006], [0051], [0071] - [0077]; figures 1,2 *	1,2,4,5,7-10	
Y	----- US 6 463 733 B1 (ASIK JOSEPH RICHARD ET AL) 15 October 2002 (2002-10-15) * paragraphs [0045] - [0047]; figures 1,2,3a *	1,2,4,5,7-10	
A	----- DE 199 26 148 A1 (VOLKSWAGEN AG) 14 December 2000 (2000-12-14) * column 2, line 65 - column 3, line 27; figure 1 *	1	
A	----- US 6 161 377 A (BOEGNER ET AL) 19 December 2000 (2000-12-19) * column 4, line 46 - column 4, line 66 *	1	
A	----- US 2002/092297 A1 (HERTZBERG ANDREAS) 18 July 2002 (2002-07-18) * paragraphs [0036], [0065] *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F02D F01N
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 May 2005	Examiner Pileri, P
CATEGORY OF CITED DOCUMENTS		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	
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 02 3104

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-05-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1225323	A	24-07-2002	JP 2002221028 A	09-08-2002
			DE 60203201 D1	21-04-2005
			EP 1225323 A1	24-07-2002
-----				
US 6463733	B1	15-10-2002	NONE	
-----				
DE 19926148	A1	14-12-2000	WO 0077371 A1	21-12-2000
			EP 1198666 A1	24-04-2002
			JP 2003502554 T	21-01-2003
-----				
US 6161377	A	19-12-2000	DE 19747222 C1	04-03-1999
			EP 0911498 A2	28-04-1999
			ES 2152733 T3	01-02-2001
			JP 3209516 B2	17-09-2001
			JP 11218018 A	10-08-1999
-----				
US 2002092297	A1	18-07-2002	DE 10054005 A1	08-05-2002
			FR 2815885 A1	03-05-2002
			IT RM20010642 A1	30-04-2003
-----				