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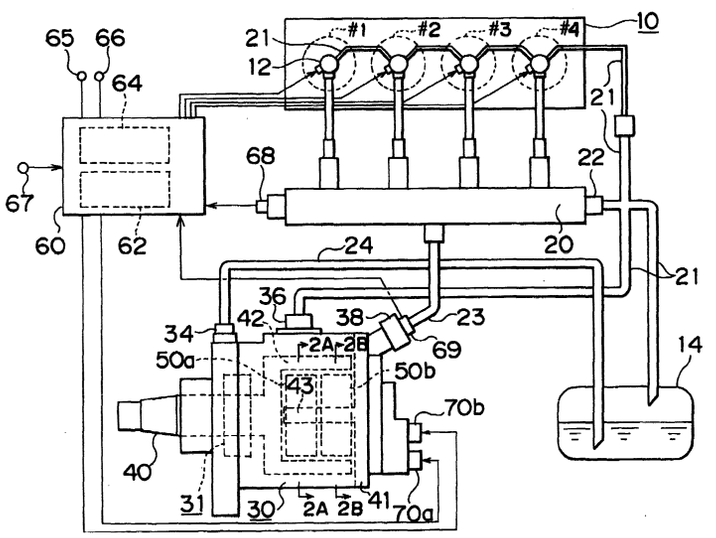
(54) Method of determining abnormality in high-pressure fuel injection device

(57) The present invention provides a method of determining abnormality, which is capable of specifying a fuel force-feed system subject to an abnormality without causing fluctuations of a fuel pressure in an accumulator line. A fuel pump (30) is provided with a first supply pump (50a) and a second supply pump (50b), and these supply pumps (50a, 50b) alternately force-feed fuel to a common rail (20). Respective fuel injection valves (12) carry out fuel injection based on a fuel pressure (rail pressure) in the common rail (20). An ECU (60) detects a rail pressure rise amount during a fuel force-feed period and calculates an estimated value of rail pressure rise amount based on a force-feed command value for the fuel pump (30). The ECU (60) determines which one of the supply pumps (50a, 50b) is in the process of force-feeding fuel in a certain fuel force-feed period, and determines individually the occurrence of an abnormality in the respective supply pumps (50a, 50b) based on the detected value and the estimated value of rail pressure rise amount.

FIG. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 00 10 4931

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)
P,A	US 5 937 826 A (OLSON DAVID ET AL) 17 August 1999 (1999-08-17) * figure 1 * * abstract *	1,2	F02B77/08
A	EP 0 501 459 A (NIPPON DENSO CO) 2 September 1992 (1992-09-02) * figure 1 * * abstract * * claims 1-9 *	1	
A	US 5 241 933 A (MORIKAWA KOJI) 7 September 1993 (1993-09-07) * figure 1 * * abstract *	1	
A	EP 0 860 600 A (TOYOTA MOTOR CO LTD) 26 August 1998 (1998-08-26) * figure 1 * * abstract *	1,2	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F02B
F02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 May 2001	Wassenaar, G

CATEGORY OF CITED DOCUMENTS

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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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28-05-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5937826 A	17-08-1999	DE 19980564 T	31-05-2000
		GB 2339032 A	12-01-2000
		JP 2000511992 T	12-09-2000
		WO 9945260 A	10-09-1999
EP 0501459 A	02-09-1992	JP 3033214 B	17-04-2000
		JP 4272472 A	29-09-1992
		DE 69202878 D	20-07-1995
		DE 69202878 T	08-02-1996
		US 5201294 A	13-04-1993
US 5241933 A	07-09-1993	NONE	
EP 0860600 A	26-08-1998	JP 10238392 A	08-09-1998
		JP 10238391 A	08-09-1998

EPO FORM P0459

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