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(54) **Fuel injector**

(57) A fuel injector for an internal combustion engine includes a valve needle (14) having a first surface which is engageable with a valve needle seating to control fuel flow between a delivery chamber (20) and an outlet and a high pressure supply passage (22) for supplying fuel at high pressure to the delivery chamber (20). A thrust surface of the valve needle (14) is exposed to fuel pressure within the delivery chamber (20) such that a force is applied to the valve needle (14) to urge the needle away from the valve seating. The injector also includes a pressure chamber (32) in communication with the high pressure supply passage (22) which is defined, in part, by a surface associated with the valve needle (14) at an end thereof remote from the outlet, and means (34, 40; 22, 56, 48, 54) for generating a variable difference in fuel pressure between the delivery chamber (20) and the pressure chamber (32) in dependence upon the rate of increase of fuel pressure within the high pressure supply passage (22), thereby to provide a variable nozzle opening pressure at which the valve needle is caused to lift from the valve needle seating to initiate injection.

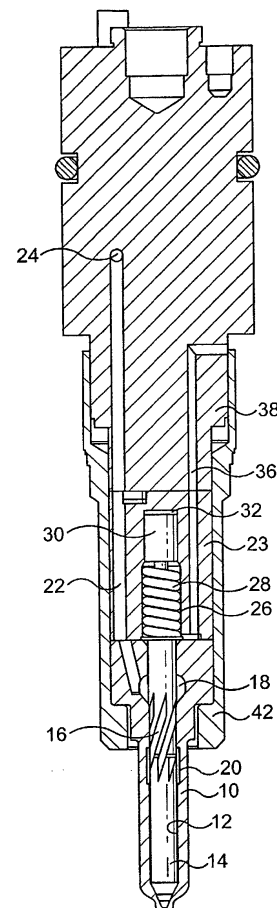


FIG. 1



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 2437

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 6 269 795 B1 (WAGNER WERNER ET AL) 7 August 2001 (2001-08-07)	1-4,6,7, 10-12,14	F02M61/20
Y	* column 3, line 19 - column 4, line 14; figure *	13	
D,Y	----- EP 0 767 304 A (LUCAS IND PLC) 9 April 1997 (1997-04-09) * abstract *	13	
X	----- EP 0 239 259 A (GEN MOTORS CORP) 30 September 1987 (1987-09-30) * column 7, line 44 - column 9, line 31; figure 1 *	1-4,6,7, 10,14	
P,X	----- WO 02/075149 A (BOSCH GMBH ROBERT ; POTSCHIN ROGER (DE); ALBRECHT WOLFGANG (US)) 26 September 2002 (2002-09-26) * page 6, line 11 - page 9, line 14; figures *	1-4,6,7, 10	
X	----- EP 1 067 284 A (BOSCH GMBH ROBERT) 10 January 2001 (2001-01-10) * the whole document *	1-3,6,7	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	----- WO 00/15959 A (NAVISTAR INT CORP) 23 March 2000 (2000-03-23) * abstract; figure 4 *	8,14	F02M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 September 2004	Examiner Torle, E
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

EPO FORM 1503 03/02 (p04C01)

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

EP 03 25 2437

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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16-09-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6269795	B1	07-08-2001	DE 19752496 A1 02-06-1999
			WO 9928616 A1 10-06-1999
			EP 0977942 A1 09-02-2000
			JP 2001509858 T 24-07-2001
EP 0767304	A	09-04-1997	DE 69605168 D1 23-12-1999
			DE 69605168 T2 20-04-2000
			EP 0767304 A1 09-04-1997
			ES 2140794 T3 01-03-2000
			JP 9112379 A 28-04-1997
			US 5832899 A 10-11-1998
EP 0239259	A	30-09-1987	US 4684067 A 04-08-1987
			EP 0239259 A1 30-09-1987
			JP 62228663 A 07-10-1987
WO 02075149	A	26-09-2002	DE 10112426 A1 19-09-2002
			WO 02075149 A1 26-09-2002
			EP 1370766 A1 17-12-2003
			JP 2004518880 T 24-06-2004
			US 2003164404 A1 04-09-2003
EP 1067284	A	10-01-2001	DE 19930832 A1 11-01-2001
			EP 1067284 A1 10-01-2001
			JP 2001027166 A 30-01-2001
WO 0015959	A	23-03-2000	AT 266808 T 15-05-2004
			AU 6245999 A 03-04-2000
			BR 9911127 A 20-02-2001
			DE 69917298 D1 17-06-2004
			EP 1112445 A1 04-07-2001
			JP 2002525477 T 13-08-2002
			WO 0015959 A1 23-03-2000
			US 6604507 B1 12-08-2003