



(43) International Publication Date
16 August 2012 (16.08.2012)

(51) International Patent Classification:

F02M 55/00 (2006.01) F02M 55/04 (2006.01)
F02M 55/02 (2006.01) F02M 63/02 (2006.01)

(21) International Application Number:

PCT/FI2012/050059

(22) International Filing Date:

24 January 2012 (24.01.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

20115126 9 February 2011 (09.02.2011) FI

(71) Applicant (for all designated States except US): **WÄRTSILÄ FINLAND OY** [FI/FI]; Tarhaajantie 2, FI-65380 Vaasa (FI).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **EKLUND, Kjell** [FI/FI]; Pihlajatie 29, FI-65370 Vaasa (FI). **TROBERG, Mikael** [FI/IT]; c/o Wärtsilä Italia S.p.A., Bagnoli della Rosandra 334, I-34018 Trieste (IT). **WINTERSTELLER, Anton** [IT/IT]; c/o Wärtsilä Italia S.p.A., Bagnoli della Rosandra 334, I-34018 Trieste (IT). **VOUTILAINEN, Vesa** [FI/FI]; Vaasanpuistikko 19 51, FI-65100 Vaasa (FI).

(74) Agent: **BERGGREN OY AB**; P.O. Box 16, FI-00101 Helsinki (FI).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

21 March 2013

(54) Title: FUEL INJECTION SYSTEM

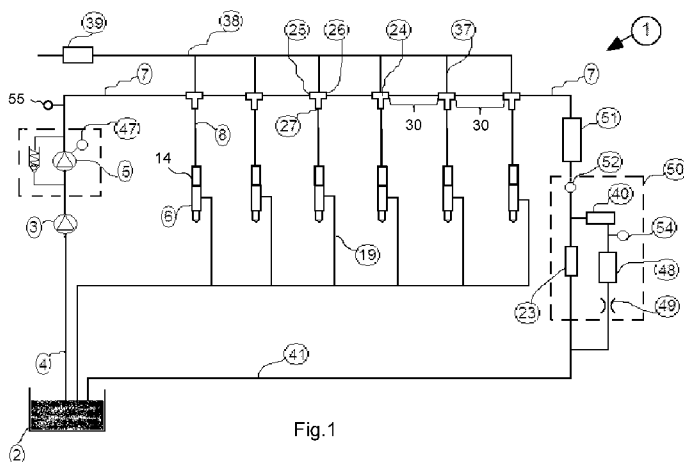


Fig.1

(57) Abstract: A fuel injection system (1) for a reciprocating engine, comprising injectors (6) for injecting pressurized fuel into the cylinders (13) of the engine, a high pressure pump (5) for pressurizing fuel to be injected, a supply pipe (7) for feeding fuel from the high pressure pump (5) toward the injectors (6) and feed pipes (8) for feeding fuel from the supply pipe (7) to the injectors (6). The first ends of the feed pipes (7) are connected to the injectors (6) and the second ends to the supply pipe (7). Each fuel injector (6) is provided with a pressure accumulator (14).



INTERNATIONAL SEARCH REPORT

International application No PCT/FI2012/050059

A. CLASSIFICATION OF SUBJECT MATTER		
INV. F02M55/00	F02M55/02	F02M55/04
ADD.	F02M63/02	
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) F02M		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/076794 A1 (BOSCH GMBH ROBERT [DE]; HLOUSEK JAROSLAW [AT]) 18 September 2003 (2003-09-18)	1, 3, 4
Y	claim 1; figures 3, 7-9 -----	2, 5-7, 12
X	EP 1 612 405 A1 (FIAT RICERCHE [IT]) 4 January 2006 (2006-01-04) paragraphs [0018], [0019], [0050], [0051]; figures 1-4 paragraphs [0060] - [0066] -----	1
X	DE 198 42 067 A1 (DAIMLER CHRYSLER AG [DE]) 16 March 2000 (2000-03-16)	1
A	figures 2, 6 -----	3, 4
Y	GB 2 013 822 A (MASCHF AUGSBURG NUERNBERG AG) 15 August 1979 (1979-08-15) claim 1; figure 1 -----	2
-/--		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search	Date of mailing of the international search report	
14 January 2013	23/01/2013	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Boye, Michael	

INTERNATIONAL SEARCH REPORT

International application No PCT/FI2012/050059

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 199 31 282 C1 (MTU FRIEDRICHSHAFEN GMBH [DE]) 11 January 2001 (2001-01-11) claims 1-4; figures 1-3 -----	2
Y	EP 1 314 883 A2 (MAN B & W DIESEL AG [DE] MAN DIESEL SE [DE]) 28 May 2003 (2003-05-28) paragraphs [0027], [0040]; claim 1; figures 1,7 -----	5-7,12
X,P	WO 2011/060477 A1 (BOSCH GMBH ROBERT [DE]; GRASPEUNTNER CHRISTIAN [AT]; UNTERBERGER GERHA) 26 May 2011 (2011-05-26) claim 1; figure 1 -----	1
A	GB 2 310 892 A (BOSCH GMBH ROBERT [DE]) 10 September 1997 (1997-09-10) claim 1; figure 1 -----	2,8-11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/F12012/050059

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No

PCT/FI2012/050059

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03076794	A1	18-09-2003	AT 308677 T 15-11-2005
			CN 1507538 A 23-06-2004
			DE 10210282 A1 25-09-2003
			DE 50301551 D1 08-12-2005
			EP 1485609 A1 15-12-2004
			JP 4404640 B2 27-01-2010
			JP 2005519233 A 30-06-2005
			US 2004187848 A1 30-09-2004
			WO 03076794 A1 18-09-2003
EP 1612405	A1	04-01-2006	AT 413528 T 15-11-2008
			EP 1612405 A1 04-01-2006
			JP 4403098 B2 20-01-2010
			JP 2006017105 A 19-01-2006
			US 2006000451 A1 05-01-2006
DE 19842067	A1	16-03-2000	DE 19842067 A1 16-03-2000
			FR 2783284 A1 17-03-2000
			GB 2341637 A 22-03-2000
			IT RM990556 A1 06-03-2001
			IT RM990557 A1 06-03-2001
GB 2013822	A	15-08-1979	CH 634634 A5 15-02-1983
			DE 2804331 A1 09-08-1979
			FI 790334 A 03-08-1979
			FR 2416353 A1 31-08-1979
			GB 2013822 A 15-08-1979
			JP 54120313 A 18-09-1979
			PL 213120 A1 24-09-1979
			YU 15379 A 31-08-1982
			DE 19931282
EP 1192352 A1 03-04-2002			
JP 2003504552 A 04-02-2003			
US 6604509 B1 12-08-2003			
WO 0104488 A1 18-01-2001			
EP 1314883	A2	28-05-2003	AT 437303 T 15-08-2009
			CN 1420266 A 28-05-2003
			DE 10157135 A1 12-06-2003
			EP 1314883 A2 28-05-2003
			JP 4253175 B2 08-04-2009
			JP 2003193937 A 09-07-2003
			KR 20030041822 A 27-05-2003
			NO 20025565 A 22-05-2003
			US 2003094158 A1 22-05-2003
WO 2011060477	A1	26-05-2011	AT 509177 A1 15-06-2011
			CN 102667133 A 12-09-2012
			EP 2504560 A1 03-10-2012
			KR 20120084813 A 30-07-2012
			US 2012234296 A1 20-09-2012
			WO 2011060477 A1 26-05-2011
GB 2310892	A	10-09-1997	DE 19608572 A1 11-09-1997
			FR 2745850 A1 12-09-1997
			GB 2310892 A 10-09-1997
			JP 9242642 A 16-09-1997

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 3, 4

Fuel injection system having a supply pipe and feed pipes supplying fuel injectors, each injector being provided with a pressure accumulator

2. claim: 2

Double-walled fuel supply pipe with inner flow space supplying the pressurized fuel to the injectors and outer flow space for possibly leaking fuel

3. claims: 5-7, 12

Safety valve and fuel circulation valve and combined valve module

4. claims: 8-11

Connector with means for detection of fuel leakage in single fuel supply line compartments where the position of a closure member indicates fuel leakage and the position being detectable from outside the connector
