



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
16.11.2016 Bulletin 2016/46

(51) Int Cl.:
F01L 9/02 (2006.01)

(43) Date of publication A2:
20.07.2016 Bulletin 2016/29

(21) Application number: **15200820.7**

(22) Date of filing: **11.02.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **16.02.2012 FI 20125181**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
13712817.9 / 2 815 088

(71) Applicant: **Wärtsilä Finland Oy**
65380 Vaasa (FI)

(72) Inventors:
• **NYNÄS, Håkan**
65280 Vaasa (FI)
• **HYÖTY, Ilari**
65200 Vaasa (FI)

(74) Representative: **Genip Oy**
Heikinkatu 7
48100 Kotka (FI)

(54) **A HYDRAULIC VALVE ARRANGEMENT FOR CONTROLLABLY OPERATING A GAS EXCHANGE VALVE OF AN INTERNAL COMBUSTION PISTON ENGINE**

(57) Invention relates to a hydraulic valve arrangement (10) for controllably operating a gas exchange valve of an internal combustion piston engine, the arrangement comprising a body part (12) in which body part a first fluid chamber (14.1) is arranged bordered by radial surfaces (16.1', 16.2') of first and second piston parts and having a volume that increases in response to the piston parts (16.1, 16.2) moving relative to the body part in a first direction, and a second fluid chamber (14.2) is arranged bordered by radial surface (16.2'') of the second piston part having a volume that decreases in response to the second piston part moving relative to the body part in a first direction. The first and the second piston parts are arranged slidably in respect to each other and that the movement of the second piston (16.2) part relative to the body part (12) is arranged controllable by a fluid control system (24) arranged in connection with the hydraulic valve arrangement (10).

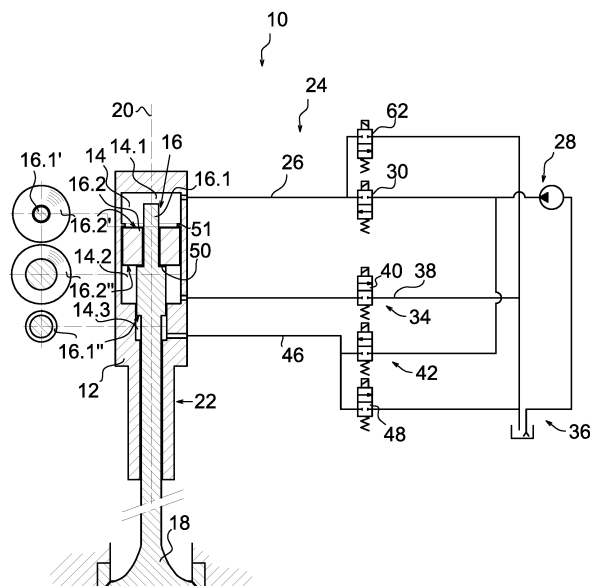


FIG. 1



EUROPEAN SEARCH REPORT

 Application Number
 EP 15 20 0820

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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 (IPC)
X	DE 103 10 300 A1 (BOSCH GMBH ROBERT [DE]) 23 September 2004 (2004-09-23) * abstract; figures 2,4 *	1,4,5	INV. F01L9/02
A	-----	2,3,6-10	
X	DE 101 27 205 A1 (BOSCH GMBH ROBERT [DE]) 5 September 2002 (2002-09-05) * abstract; figures *	1	
X	WO 99/66178 A1 (BOSCH GMBH ROBERT [DE]; DIEHL UDO [DE]; MISCHKER KARSTEN [DE]; WALTER) 23 December 1999 (1999-12-23) * abstract; figure 1 *	1,4,5	
X	EP 1 731 771 A2 (BOSCH GMBH ROBERT [DE]) 13 December 2006 (2006-12-13) * abstract; figure 1 *	1,4,5	
X	WO 03/027450 A1 (BOSCH GMBH ROBERT [DE]; DIEHL UDO [DE]; MISCHKER KARSTEN [DE]; ROSENAU) 3 April 2003 (2003-04-03) * abstract; figure 1 *	1,4,5	
X	WO 03/008770 A1 (BOSCH GMBH ROBERT [DE]; DIEHL UDO [DE]; HAMMER UWE [DE]; BEUCHE VOLKER) 30 January 2003 (2003-01-30) * abstract; figure 1 *	1,4,5	TECHNICAL FIELDS SEARCHED (IPC)
X	WO 03/027449 A1 (BOSCH GMBH ROBERT [DE]; DIEHL UDO [DE]; ROSENAU BERND [DE]; HAMMER UWE) 3 April 2003 (2003-04-03) * abstract; figure 1 *	1,4,5	F01L
X	DE 10 2004 022447 A1 (BOSCH GMBH ROBERT [DE]) 1 December 2005 (2005-12-01) * abstract; figure 1 *	1,4,5	
----- -/-			
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 October 2016	Examiner Paulson, Bo
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			

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 15 20 0820

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2007 025619 A1 (BOSCH GMBH ROBERT [DE]) 4 December 2008 (2008-12-04) * abstract; figure 1 *	1,4,5	
X	DE 100 24 268 A1 (BOSCH GMBH ROBERT [DE]) 22 November 2001 (2001-11-22) * abstract; figure 2 *	1,4,5	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 October 2016	Examiner Paulson, Bo
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			

EPO FORM 1503 03/02 (P04C01)

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

EP 15 20 0820

5

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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07-10-2016

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10310300 A1	23-09-2004	DE 10310300 A1 EP 1618291 A1 JP 4500168 B2 JP 2006514206 A US 2006241846 A1 WO 2004081350 A1	23-09-2004 25-01-2006 14-07-2010 27-04-2006 26-10-2006 23-09-2004
DE 10127205 A1	05-09-2002	NONE	
WO 9966178 A1	23-12-1999	DE 19826045 A1 EP 1029156 A1 JP 2002518625 A US 6321702 B1 WO 9966178 A1	13-01-2000 23-08-2000 25-06-2002 27-11-2001 23-12-1999
EP 1731771 A2	13-12-2006	DE 102005025879 A1 EP 1731771 A2	07-12-2006 13-12-2006
WO 03027450 A1	03-04-2003	DE 10143959 A1 EP 1427917 A1 JP 2005504206 A US 2004055547 A1 WO 03027450 A1	27-03-2003 16-06-2004 10-02-2005 25-03-2004 03-04-2003
WO 03008770 A1	30-01-2003	DE 10134644 A1 EP 1412620 A1 JP 2004521275 A KR 20040019329 A US 2004035388 A1 WO 03008770 A1	06-02-2003 28-04-2004 15-07-2004 05-03-2004 26-02-2004 30-01-2003
WO 03027449 A1	03-04-2003	DE 10147299 A1 WO 03027449 A1	24-04-2003 03-04-2003
DE 102004022447 A1	01-12-2005	DE 102004022447 A1 FR 2869946 A1	01-12-2005 11-11-2005
DE 102007025619 A1	04-12-2008	DE 102007025619 A1 JP 5291385 B2 JP 2008298078 A US 2009014672 A1	04-12-2008 18-09-2013 11-12-2008 15-01-2009
DE 10024268 A1	22-11-2001	BR 0102023 A CN 1323947 A DE 10024268 A1 JP 2002039037 A	18-12-2001 28-11-2001 22-11-2001 06-02-2002

EPO FORM P0459

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

07-10-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2001054411 A1	27-12-2001

EPO FORM P0459

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