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(54) **Sliding vane vacuum pump with an oil relief valve**

(57) A sliding vane vacuum pump includes a casing (10) having a cover which together define a cavity (12), a rotor and a vane slidably mounted to said rotor. The pump further includes an inlet passage (24) extending from the exterior of the pump to the cavity (12) and an outlet passage (20) extending from the cavity (12) to the exterior of the pump. The pump further includes an oil relief arrangement operable to vent lubricating oil to the exterior of the pump in the event of reverse rotation of the rotor and vane.

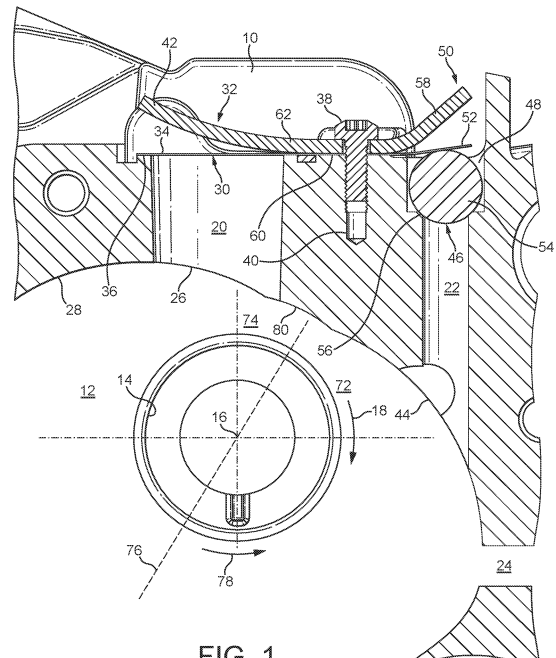


FIG. 1



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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 (IPC)
X	DE 100 00 755 A1 (HITACHI LTD [JP]; SANWA SEIKI LTD [JP]) 20 July 2000 (2000-07-20)	1-9,11	INV.
Y	* the whole document *	12,13	F04C18/344
	-----		F04C28/28
Y	EP 0 255 920 A2 (BARMAG BARMER MASCHF [DE]) 17 February 1988 (1988-02-17)	1-9, 11-13	F04C29/02
	* the whole document *		F04C28/06

Y	WO 2008/069789 A1 (CARRIER CORP [US]; FLANIGAN PAUL J [US]; PILESKEI PETER J [US]) 12 June 2008 (2008-06-12)	1-9,11	
	* the whole document *		
	* figure 6 *		

Y	JP 2002 013654 A (SEIKO INSTR INC) 18 January 2002 (2002-01-18)	1-9,11	
	* abstract *		
	* figures 3-7 *		

A	WO 2004/044431 A2 (LUK AUTOMOBILTECH GMBH & CO KG [DE]; OTTO DIETER [DE]; HILTEMANN ULRIC) 27 May 2004 (2004-05-27)	1-11	TECHNICAL FIELDS SEARCHED (IPC)
	* the whole document *		F04C
	-----		F01C
Y	US 5 775 894 A (KOSCO JR JOHN [US]) 7 July 1998 (1998-07-07)	12,13	F16K
	* the whole document *		
	* figures 2,3 *		
	* column 2, line 47 - column 3, line 27 *		

Y	WO 03/083321 A1 (DANA CORP [US]; YOSHIOKA JUN [US]) 9 October 2003 (2003-10-09)	12,13	
	* the whole document *		
	* figures 2,3,6 *		
	* page 1, line 17 - line 20 *		

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		4 July 2014	Sbresny, Heiko
CATEGORY OF CITED DOCUMENTS			
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 Application Number
 EP 10 16 0926

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP S62 186089 A (MATSUSHITA REFRIGERATION) 14 August 1987 (1987-08-14) * abstract * * figures 1,2 *	1,12-16	
A	US 2006/099098 A1 (LEE BYEONG-CHUL [KR] ET AL) 11 May 2006 (2006-05-11) * the whole document * * paragraph [0045] - paragraph [0046] *	1,12-16	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search		Date of completion of the search	Examiner
Munich		4 July 2014	Sbresny, Heiko
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			



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-11

A sliding vane vacuum pump with an oil relief passage provided with a drain channel orthogonal to the direction of the oil relief passage.

2. claims: 1, 12-16

A sliding vane vacuum pump with an oil relief passage having a valve provided with a combination of a movable valve member and a resilient member comprising a flexible planar member.

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

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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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04-07-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10000755 A1	20-07-2000	DE 10000755 A1	20-07-2000
		JP 2000205159 A	25-07-2000
EP 0255920 A2	17-02-1988	NONE	
WO 2008069789 A1	12-06-2008	CN 101548065 A	30-09-2009
		EP 2089609 A1	19-08-2009
		HK 1138050 A1	06-07-2012
		US 2010047103 A1	25-02-2010
		WO 2008069789 A1	12-06-2008
JP 2002013654 A	18-01-2002	JP 4015803 B2	28-11-2007
		JP 2002013654 A	18-01-2002
WO 2004044431 A2	27-05-2004	AU 2003287863 A1	03-06-2004
		DE 10393279 D2	02-06-2005
		EP 1563190 A2	17-08-2005
		EP 1890040 A2	20-02-2008
		WO 2004044431 A2	27-05-2004
US 5775894 A	07-07-1998	BR 9705424 A	14-09-1999
		CA 2218971 A1	05-05-1998
		FR 2755477 A1	07-05-1998
		US 5775894 A	07-07-1998
WO 03083321 A1	09-10-2003	AU 2003258435 A1	13-10-2003
		BR 0308657 A	09-02-2005
		CN 1701187 A	23-11-2005
		EP 1490604 A1	29-12-2004
		US 2004214678 A1	28-10-2004
		WO 03083321 A1	09-10-2003
JP S62186089 A	14-08-1987	NONE	
US 2006099098 A1	11-05-2006	CN 1773119 A	17-05-2006
		KR 20060044220 A	16-05-2006
		US 2006099098 A1	11-05-2006

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