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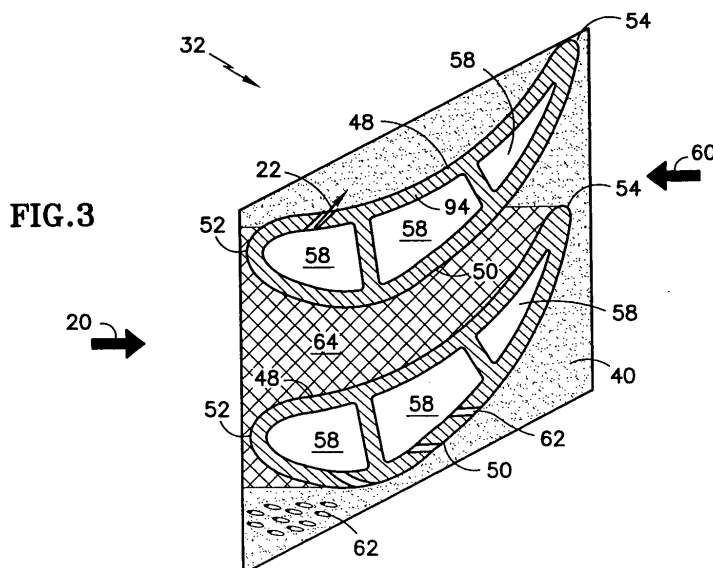
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(54) **Cooled vane cluster**

(57) A cast vane cluster (32) with enhanced cooling contains an inner and an outer platform (34, 36) and at least two airfoils (38) for directing a primary fluid stream axially rearward. A duct (56) is bounded by inner and outer endwall surfaces (40, 44), and adjacent airfoil fluid directing surfaces. One or more cooling holes (62) in the duct are drilled using an electrodischarge machine

(EDM) method without a line of sight from the drilling equipment to the cooling hole location. One or more cooling holes (62), located in portions of the duct, may not be visible when viewed from an external location. Additionally, one or more cooling holes (62) may only have an outlet cross sectional area (66) visible when viewed along a longitudinal axis from an external location.





EUROPEAN SEARCH REPORT

Application Number
EP 04 25 7975

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	WO 01/12382 A (CHROMALLOY GAS TURBINE CORP [US]) 22 February 2001 (2001-02-22) * page 14, line 25 - page 15, line 2; figure 6 *	1-11	INV. F01D9/04 F01D5/18
X	EP 1 176 284 A (GEN ELECTRIC [US]) 30 January 2002 (2002-01-30) * paragraphs [0013], [0014], [0027], [0038]; figures 1,2 *	1-11	
X	US 2003/002979 A1 (KOSCHIER ANGELO VON [US]) 2 January 2003 (2003-01-02) * paragraphs [0042], [0044]; figure 3 *	1-3,5, 7-11	
X	EP 1 262 634 A (GEN ELECTRIC [US]) 4 December 2002 (2002-12-04) * paragraph [0014]; figure 3 *	1-3,5, 7-11	
X	US 4 693 667 A (LENZ HERMAN N [US] ET AL) 15 September 1987 (1987-09-15) * column 4, lines 29-55 * * column 5, lines 24-35; figure 4 *	1,2,4, 10,11	TECHNICAL FIELDS SEARCHED (IPC)
X	US 3 529 903 A (SCALZO AUGUSTINE J ET AL) 22 September 1970 (1970-09-22) * column 3, lines 3-42; figure 4 *	1,2,10, 11	F01D
X	US 5 813 832 A (RASCH L TIMOTHY [US] ET AL) 29 September 1998 (1998-09-29) * column 3, lines 13-38; figure 1 *	1,2,10, 11	
X	JP 59 180006 A (HITACHI LTD) 12 October 1984 (1984-10-12) * abstract; figure 2 *	1,2	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 October 2008	Examiner Steinhauser, Udo
<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>			

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

EP 04 25 7975

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The members are as contained in the European Patent Office EDP file on
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07-10-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0112382 A	22-02-2001	AT 265287 T	15-05-2004
		AU 6517200 A	13-03-2001
		CA 2383404 A1	22-02-2001
		DE 60010288 D1	03-06-2004
		DE 60010288 T2	04-05-2005
		EP 1212167 A1	12-06-2002
		JP 2003507614 T	25-02-2003
		MX PA02001456 A	21-07-2003
		US 6173491 B1	16-01-2001

EP 1176284 A	30-01-2002	JP 2002138802 A	17-05-2002
		US 6354797 B1	12-03-2002

US 2003002979 A1	02-01-2003	NONE	

EP 1262634 A	04-12-2002	DE 60216184 T2	11-10-2007
		JP 4130321 B2	06-08-2008
		JP 2002364306 A	18-12-2002
		US 2002182057 A1	05-12-2002

US 4693667 A	15-09-1987	NONE	

US 3529903 A	22-09-1970	NONE	

US 5813832 A	29-09-1998	WO 9964724 A1	16-12-1999

JP 59180006 A	12-10-1984	NONE	

EPO FORM P0459

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