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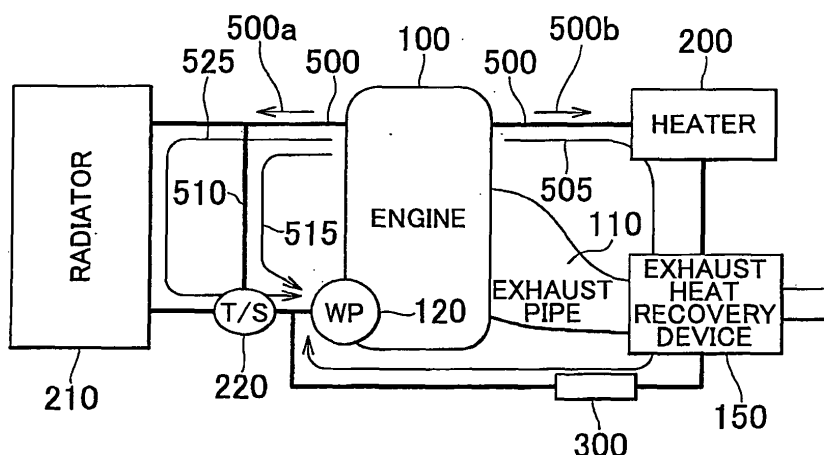
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(54) **Cooling apparatus for internal combustion engine**

(57) A flow control mechanism (300) is disposed downstream of an exhaust heat recovery device (150) on a cooling water circuit (500b) between the exhaust heat recovery device (150) and a water pump (120). The flow control mechanism (300) controls a flow rate of cooling water in accordance with a cooling water temperature around the flow control mechanism (300). When the cooling water temperature is low, the flow control mechanism

(300) does not limit the flow rate of the cooling water to perform exhaust heat recovery. When the cooling water temperature is increased, the flow control mechanism (300) limits the flow rate of the cooling water to stop the exhaust heat recovery. Further, the flow control mechanism (300) again increases the flow rate of the cooling water when the cooling water temperature is increased to around the boiling point of the cooling water while the exhaust heat recovery is stopped.

**FIG. 5**





## EUROPEAN SEARCH REPORT

Application Number  
EP 08 00 4783

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
E	EP 1 903 193 A1 (TOYOTA MOTOR CO LTD [JP]) 26 March 2008 (2008-03-26) * paragraphs [0022], [0025] - [0030]; figures 1,2,4-6 * * paragraph [0038] - paragraph [0045] * -----	1,8, 10-11	INV. F01P3/12 F01P7/16
X	EP 1 055 813 A2 (BAYERISCHE MOTOREN WERKE AG [DE]) 29 November 2000 (2000-11-29)	1,9,11	
Y	* paragraphs [0016] - [0023]; figure * -----	3-6,8	
X	EP 1 143 124 A2 (BAYERISCHE MOTOREN WERKE AG [DE]) 10 October 2001 (2001-10-10)	1,9-11	
Y	* paragraph [0008] - paragraph [0019]; figure * -----	8	
Y	JP 59 023717 A (TOYO KOGYO CO) 7 February 1984 (1984-02-07)	8	
A	* abstract; figure * -----	1,9-11	
Y	GB 2 271 412 A (BEHR THOMSON DEHNSTOFFREGLER [DE]) 13 April 1994 (1994-04-13) * abstract; figures 1,2 * -----	3-6,8	TECHNICAL FIELDS SEARCHED (IPC)  F01P
A	EP 1 295 740 A1 (BEHR GMBH & CO [DE] BEHR GMBH & CO KG [DE]) 26 March 2003 (2003-03-26) * paragraphs [0016], [0017], [0021]; figure 1 * -----	1-2, 10-11	
A	DE 100 47 810 A1 (VOLKSWAGEN AG [DE]) 18 April 2002 (2002-04-18) * paragraph [0016] - paragraph [0020]; figure 1 * -----	1,9-11	
A	DE 10 2004 048338 A1 (EBERSPAECHER J GMBH & CO [DE]) 13 April 2006 (2006-04-13) * paragraphs [0021], [0026], [0027]; figures 1,3,4 * -----	1,9-11	
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>18 August 2009</b>	Examiner <b>Luta, Dragos</b>
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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EPO FORM 1503 03.82 (P04C01)

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

EP 08 00 4783

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  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-08-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1903193	A1	26-03-2008	CN 101218422 A 09-07-2008
			JP 2007016718 A 25-01-2007
			WO 2007007775 A1 18-01-2007
EP 1055813	A2	29-11-2000	DE 19924398 A1 30-11-2000
			ES 2187408 T3 16-06-2003
EP 1143124	A2	10-10-2001	DE 10017434 A1 31-10-2001
JP 59023717	A	07-02-1984	NONE
GB 2271412	A	13-04-1994	DE 4233913 A1 14-04-1994
			FR 2696783 A1 15-04-1994
			JP 2788596 B2 20-08-1998
			JP 6207685 A 26-07-1994
			US 5385296 A 31-01-1995
EP 1295740	A1	26-03-2003	AT 292023 T 15-04-2005
			DE 10146346 A1 10-04-2003
			ES 2239186 T3 16-09-2005
			US 2003070427 A1 17-04-2003
DE 10047810	A1	18-04-2002	NONE
DE 102004048338	A1	13-04-2006	NONE