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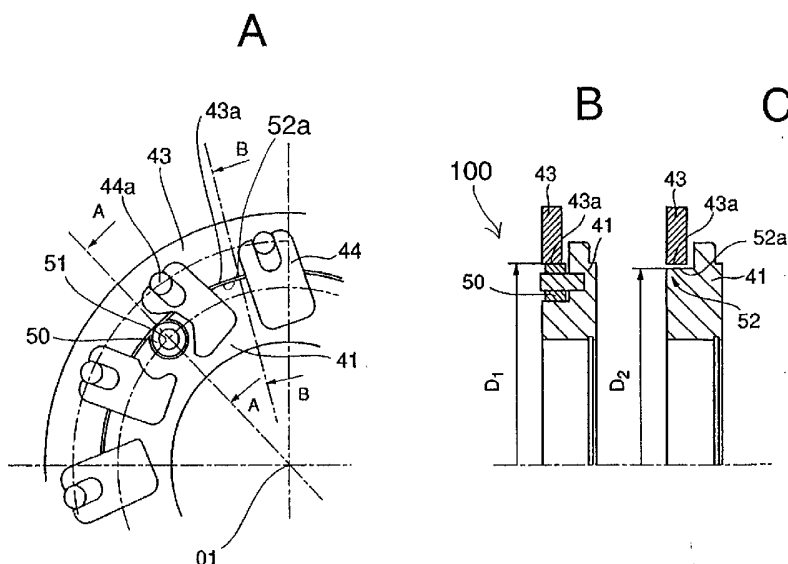
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[Continued on next page]

(54) Title: VARIABLE NOZZLE TURBOCHARGER AND MANUFACTURING METHOD



(57) Abstract: An exhaust gas turbocharger with a fail-safe variable-nozzle mechanism. Even if wear of the drive ring supporting part increases, the drive ring can be supported on the nozzle mount on a second supporting part. The second supporting part enables the drive ring to be always supported rightly on the nozzle mount, and to prevent the occurrence of eccentric rotation or dropping out of the drive ring due to excessive wear of the drive ring supporting part. It also prevents the occurrence of reduction in engine performance due to malfunctions of the variable-nozzle mechanism and the occurrence of breakage of the variable-nozzle mechanism as has been experienced in prior art. In another embodiment, the variable-nozzle mechanism assembly is constructed as a cartridge which can be easily incorporated in or removed from the turbocharger.

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RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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INTERNATIONAL SEARCH REPORT

International Application No  
PCT/JP 03/13332

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 F01D17/16

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)  
IPC 7 F01D F02C

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 practical, search terms used)  
EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 226 444 A (GARRETT CORP) 24 June 1987 (1987-06-24) cited in the application the whole document ----	1
X	US 2 428 830 A (RUDOLPH BIRMANN) 14 October 1947 (1947-10-14) column 5, line 29 - line 53; figures 3,4 ----	1
A	US 2002/098081 A1 (SCHACHERER ROLAND ET AL) 25 July 2002 (2002-07-25) the whole document ----- -/--	1

Further documents are listed in the continuation of box C.       Patent family members are listed in annex.

° Special categories of cited documents :

*A* document defining the general state of the art which is not considered to be of particular relevance	*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
*E* earlier document but published on or after the international filing date	*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
*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)	*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.
*O* document referring to an oral disclosure, use, exhibition or other means	*&* document member of the same patent family
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  28 May 2004	Date of mailing of the international search report  18. 06. 2004
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  de Rooij, M
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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 03/13332

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 679 984 A (SWIHART WILLIAM R ET AL) 14 July 1987 (1987-07-14)	1
X	abstract; claims 24-28; figures 2-7 column 2, line 57 - line 68 column 3, line 23 -column 4, line 26 column 4, line 49 - line 65	2,8-12
X	EP 1 236 867 A (MITSUBISHI HEAVY IND LTD) 4 September 2002 (2002-09-04) paragraph '0025! - paragraph '0032!; figures 1,7	2,7,9,10
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X	US 5 146 752 A (BRUESTLE CLAUS) 15 September 1992 (1992-09-15) column 2, line 43 -column 3, line 18; figures 1,4,5	2,9-12
X	EP 1 120 547 A (MITSUBISHI HEAVY IND LTD) 1 August 2001 (2001-08-01) paragraph '0026! - paragraph '0029!; figures 2-5	2,9
E	EP 1 394 363 A (BORG WARNER INC) 3 March 2004 (2004-03-03) abstract; figures 1-4 paragraph '0019! - paragraph '0022! paragraphs '0029!, '0032!	2,3,7,9, 11,12

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/JP 03/13332

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.
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.
- No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. Claim : 1

A variable nozzle mechanism in an exhaust gas turbocharger in which a second supporting part is provided on the nozzle mount for supporting a drive ring for rotation when the wear/abrasion of a supporting part reaches a predetermined amount.

2. Claims: 2-12

A variable nozzle mechanism in an exhaust gas turbocharger which is constructed like a kind of cartridge.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 03/13332

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