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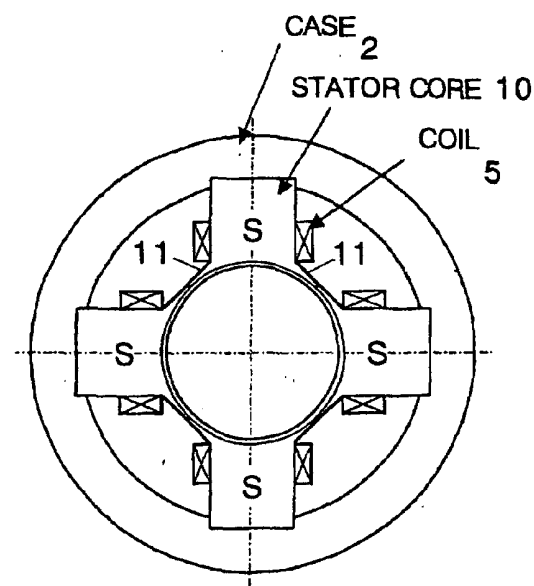
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(54) **Stator core for a magnetic bearing and method of manufacturing the same**

(57) Stator cores for a homo-polar magnetic bearing, wherein toothed ends of stator cores around a rotor form N poles and S poles adjacent in the axial direction, and the method of manufacturing them. The stator core 10 is provided with protrusions 11 of adjacent N and S poles extended circumferentially so as to be in contact with or in close proximity to each other, and is composed of U-shaped laminated steel sheets interleaved with an insulating material, of which the center side is open when viewed from the centerline side. In addition, the core is composed of a first yoke, a second yoke and a stem unit that is a magnetic body placed and fixed between the yokes, and at least the stem unit is composed of a magnetic material powder, solidified in resin.

Fig.6A



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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 9027

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 10, 17 November 2000 (2000-11-17) & JP 2000 205260 A (NSK LTD), 25 July 2000 (2000-07-25)	1	F16C32/04 F16C39/06
Y	* abstract *	2-6,8	
P,D, X	--- PATENT ABSTRACTS OF JAPAN vol. 2002, no. 02, 2 April 2002 (2002-04-02) & JP 2001 271836 A (ISHIKAWAJIMA HARIMA HEAVY IND CO LTD), 5 October 2001 (2001-10-05)	1	
Y	* abstract * * paragraph '0019! *	2-4	
X	--- US 5 767 597 A (GONDHALEKAR VIJAY) 16 June 1998 (1998-06-16)	1	
Y	* column 4, line 53 * * column 5, line 36 - line 50 *	2-4	
P,Y	--- PATENT ABSTRACTS OF JAPAN vol. 2002, no. 05, 3 May 2002 (2002-05-03) & JP 2002 031135 A (ISHIKAWAJIMA HARIMA HEAVY IND CO LTD), 31 January 2002 (2002-01-31) * abstract *	2-4	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F16C H02K H01F
A	--- PATENT ABSTRACTS OF JAPAN vol. 011, no. 247 (M-615), 12 August 1987 (1987-08-12) & JP 62 056618 A (MARUWA DENKI KK;OTHERS: 01), 12 March 1987 (1987-03-12) * abstract *	1-4	
-/--			
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 17 March 2003	Examiner Mayer-Martin, E-M
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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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 9027

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
E	JP 2002 174237 A (ISHIKAWAJIMA HARIMA HEAVY IND CO LTD) 21 June 2002 (2002-06-21) * the whole document *	1-4	
A	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 07, 31 July 1996 (1996-07-31) & JP 08 061365 A (NAMIKI PRECISION JEWEL CO LTD;KITAMORI TERUAKI), 8 March 1996 (1996-03-08) * abstract *	1-4	
Y	EP 0 869 517 A (TDK CORP) 7 October 1998 (1998-10-07) * page 2, line 3 - line 14 * * page 2, line 47 - page 3, line 10 * * page 3, line 32 - line 48 * * page 6, line 4 - line 5 * * page 6, line 28 - line 31 * * page 6, line 44 - line 48 *	5,6,8	
Y	EP 0 419 124 A (GEN MOTORS CORP) 27 March 1991 (1991-03-27) * page 2, line 7 - line 14 * * page 2, line 49 - page 3, line 56 *	5,6,8	
Y	GB 290 655 A (LANDIS & GYR. S.A.) 27 June 1929 (1929-06-27) * the whole document *	5,6,8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search MUNICH		Date of completion of the search 17 March 2003	Examiner Mayer-Martin, E-M
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 more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims 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 the first ten claims.

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:



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**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: 1-4

The first invention is related to a magnetic bearing having u-shaped laminated stator cores with circumferentially extending protrusions.

2. Claims: 5-7

The second invention is related to a magnetic bearing having a stator core with a stem unit and two yokes. The stem unit is sandwiched between the yokes and comprises a magnetic material powder solidified in resin. The bearing is homopolar.

3. Claim : 8

The third invention is related to a magnetic bearing having a stator core made of magnetic material powder solidified in resin.

**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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17-03-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000205260 A	25-07-2000	NONE	
JP 2001271836 A	05-10-2001	NONE	
US 5767597 A	16-06-1998	NONE	
JP 2002031135 A	31-01-2002	NONE	
JP 62056618 5 A		NONE	
JP 2002174237 A	21-06-2002	NONE	
JP 08061365 5 A		NONE	
EP 0869517 A	07-10-1998	JP 11195520 A	21-07-1999
		CN 1198579 A	11-11-1998
		DE 69808363 D1	07-11-2002
		EP 0869517 A1	07-10-1998
		JP 10335128 A	18-12-1998
		US 6102980 A	15-08-2000
EP 0419124 A	27-03-1991	US 4947065 A	07-08-1990
		DE 69008979 D1	23-06-1994
		DE 69008979 T2	01-09-1994
		EP 0419124 A1	27-03-1991
		JP 2019539 C	19-02-1996
		JP 3203536 A	05-09-1991
		JP 7059136 B	21-06-1995
GB 290655 A		NONE	