

(19)



(11)

EP 2 048 390 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
05.08.2009 Bulletin 2009/32

(51) Int Cl.:
F16C 32/04 (2006.01)

(43) Date of publication A2:
15.04.2009 Bulletin 2009/16

(21) Application number: **07254052.9**

(22) Date of filing: **12.10.2007**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
 HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
 SI SK TR**

Designated Extension States:
AL BA HR MK RS

(71) Applicant: **GENERAL ELECTRIC COMPANY**
Schenectady, NY 12345 (US)

(72) Inventors:
 • **Brisson, Bruce Eilliam**
Galway, New York 12074 (US)

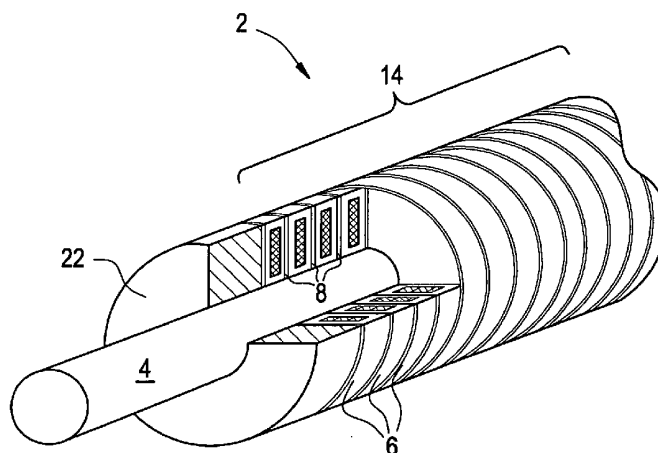
• **Weeber, Konrad Roman**
Rexford, New York 12148 (US)
 • **Morra, Martin Mathew**
Glenville, New York 12302-4606 (US)

(74) Representative: **Bedford, Grant Richard**
GE
London Patent Operation
15 John Adam Street
London WC2N 6LU (GB)

(54) **Armature with coated sheets, magnetic bearing with an armature and method for assembling an armature**

(57) Disclosed herein are magnetic bearings, armatures (2) for magnetic bearings, and methods for their production. In one embodiment, an armature (2) is disclosed. The armature (2) comprises a stack (14), having a first end and a second end, of insulating layers (8) and coated plates (6) disposed adjacent one another. A first compression collar (22) is disposed at the first end, a second compression collar (22) is disposed at the second end, and a shaft (4) is disposed through the first and

second compression collars (22) and the stack (14). The coated plates (6) comprise core plates (10) having a coating (12) disposed thereon, wherein the coating (12) comprises a material selected from the group consisting of a metal, a metal alloy, a metal oxide, an intermetallic compound, a multi-phase alloy, a solid solution, and combinations comprising at least one of the foregoing. In addition, magnetic bearings and methods for assembling armatures (2) are disclosed.

FIG. 1



EUROPEAN SEARCH REPORT

 Application Number
EP 07 25 4052

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	US 2005/034295 A1 (MEACHAM WALTER L [US] ET AL MEACHAM WALTER L [US] ET AL) 17 February 2005 (2005-02-17)	1,4-6	INV. F16C32/04
A	* paragraph [0019] - paragraph [0034]; figures 1-5 *	7-9	
Y	EP 0 571 347 A (ATLAS COPCO TOOLS AB [SE]) 24 November 1993 (1993-11-24)	1-3	
A	* the whole document *	7,9	
Y	DE 100 14 307 A1 (SIEMENS AG [DE]) 27 September 2001 (2001-09-27)	1-3	
A	* the whole document *	9	
E	US 2007/262668 A1 (BRISSON BRUCE W [US] ET AL) 15 November 2007 (2007-11-15)	1-10	
A	* the whole document *		
A	US 6 524 380 B1 (BRILES OWEN M [US] ET AL) 25 February 2003 (2003-02-25)	1,5,7-9	
A	* the whole document *		
A	DE 10 2005 032721 A1 (SIEMENS AG [DE]) 18 January 2007 (2007-01-18)	1	F16C H01F H02K
A	* the whole document *		
A	GB 864 588 A (GEN ELECTRIC) 6 April 1961 (1961-04-06)	1,7-9	
A	* the whole document *		
A	DE 761 728 C (SIEMENS AG) 16 August 1954 (1954-08-16)	1,9	
	* the whole document *		
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 June 2009	Examiner De Jongh, Cornelis
CATEGORY OF CITED DOCUMENTS		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	
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			

EPO FORM 1503 03.02 (P04001)



EUROPEAN SEARCH REPORT

 Application Number
EP 07 25 4052

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	EP 1 056 950 A (EBARA CORP [JP]; KOMATSU MFG CO LTD [JP]) 6 December 2000 (2000-12-06) * paragraph [0031] - paragraph [0045]; figures 1-7 *	5,6	
X	US 2003/019096 A1 (WEIHS TIMOTHY P [US]) 30 January 2003 (2003-01-30) * the whole document *	5,6	
X	US 2007/200443 A1 (BAUDELOCQUE LUC [FR] ET AL) 30 August 2007 (2007-08-30) * the whole document *	5,6	
A		2,3,10	
X	US 2003/170132 A1 (ENGLANDER HEINRICH [DE] ET AL) 11 September 2003 (2003-09-11) * the whole document *	5,6	
A		1-4,10	
A	EP 1 233 189 A (SEIKO INSTR INC [JP] BOC EDWARDS JAPAN LTD [JP]) 21 August 2002 (2002-08-21) * the whole document *	5,6	
A	US 6 122 817 A (MEACHAM WALTER LEE [US] ET AL) 26 September 2000 (2000-09-26) * the whole document *	7	
A	FR 643 289 A (ESSLINGEN MASCHF) 13 September 1928 (1928-09-13) * the whole document *	7	
A	GB 1 189 548 A (ACEC [BE]) 29 April 1970 (1970-04-29) * the whole document *	7	TECHNICAL FIELDS SEARCHED (IPC)
A	US 2006/070233 A1 (NEUENSCHWANDER THOMAS R [US] ET AL) 6 April 2006 (2006-04-06) * the whole document *	1,7	
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 June 2009	Examiner De Jongh, Cornelis
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			

 2
EPO FORM 1503 03.82 (P04001)



EUROPEAN SEARCH REPORT

Application Number
EP 07 25 4052

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	US 5 537 731 A (SASSI EZIO M [IT]) 23 July 1996 (1996-07-23) * the whole document *	7	
A	US 5 179 308 A (MALSKY HERBERT [US]) 12 January 1993 (1993-01-12) * the whole document *	4,5,7-9	
A	US 4 113 518 A (HENDERSON DAVID L) 12 September 1978 (1978-09-12) * the whole document *	2,8,10	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search Munich		Date of completion of the search 29 June 2009	Examiner De Jongh, Cornelis
<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>			

2
EPO FORM 1503 (3-82) (P04-001)



Application Number

EP 07 25 4052

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
EP 07 25 4052

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

an armature having insulating layers between the plates and a specified coating

2. claims: 5,6

an electromagnetic bearing whereby an armature is provided with coated plates with a specified coating

3. claims: 7-10

a process for assembling an armature whereby the coated plates and insulating layers are assembled within an assembly tube

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

EP 07 25 4052

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.

29-06-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2005034295	A1	17-02-2005	NONE	
EP 0571347	A	24-11-1993	DE 69303666 D1	22-08-1996
			DE 69303666 T2	06-03-1997
			SE 500596 C2	18-07-1994
			SE 9201406 A	06-11-1993
DE 10014307	A1	27-09-2001	NONE	
US 2007262668	A1	15-11-2007	NONE	
US 6524380	B1	25-02-2003	NONE	
DE 102005032721	A1	18-01-2007	WO 2007006696 A1	18-01-2007
GB 864588	A	06-04-1961	NONE	
DE 761728	C	16-08-1954	NONE	
EP 1056950	A	06-12-2000	DE 69907639 D1	12-06-2003
			DE 69907639 T2	11-03-2004
			WO 9942731 A1	26-08-1999
			JP 3930170 B2	13-06-2007
			JP 11303793 A	02-11-1999
			TW 426789 B	21-03-2001
			US 6464472 B1	15-10-2002
US 2003019096	A1	30-01-2003	NONE	
US 2007200443	A1	30-08-2007	EP 1830081 A1	05-09-2007
			FR 2897911 A1	31-08-2007
			JP 2007232215 A	13-09-2007
US 2003170132	A1	11-09-2003	DE 10022062 A1	08-11-2001
			WO 0186158 A1	15-11-2001
			EP 1281007 A1	05-02-2003
			JP 2005504930 T	17-02-2005
			TW 521477 B	21-02-2003
EP 1233189	A	21-08-2002	DE 60219842 T2	17-01-2008
			JP 2002242876 A	28-08-2002
			KR 20020067993 A	24-08-2002
			US 2002113509 A1	22-08-2002
US 6122817	A	26-09-2000	WO 9914839 A1	25-03-1999

EPO FORM P0459

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

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

EP 07 25 4052

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.

29-06-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 643289	A	13-09-1928	NONE	

GB 1189548	A	29-04-1970	BE 708251 A	20-06-1968
			NL 6818298 A	24-06-1969

US 2006070233	A1	06-04-2006	US 2008047131 A1	28-02-2008

US 5537731	A	23-07-1996	CA 2124227 A1	27-11-1994
			DE 69401541 D1	06-03-1997
			DE 69401541 T2	26-06-1997
			EP 0632567 A2	04-01-1995
			IT 1262275 B	19-06-1996

US 5179308	A	12-01-1993	NONE	

US 4113518	A	12-09-1978	NONE	
