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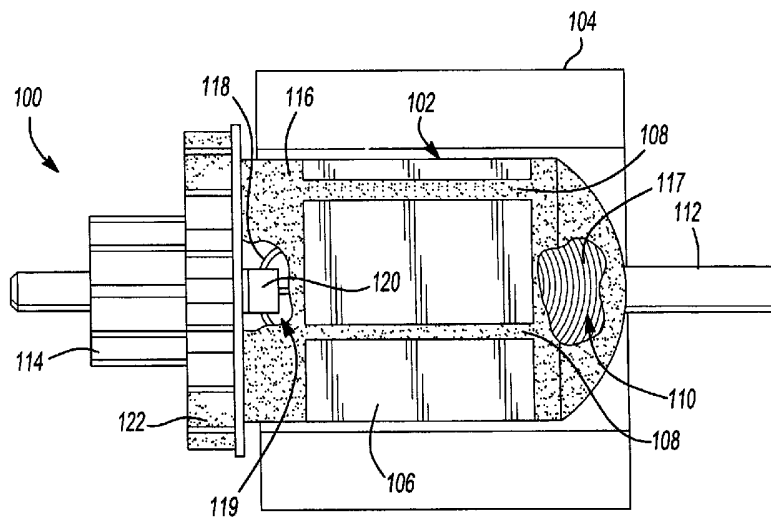
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[Continued on next page]

(54) Title: DYNAMOELECTRIC MACHINE HAVING AN ENCAPSULATED COIL STRUCTURE



(57) Abstract: Magnet wires wound in slots in a lamination stack of a dynamoelectric machine are encapsulated, in whole or in part, with plastic. The plastic may be thermally conductive and have features molded therein that enhance heat transfer. The plastic may stiffen the armature and increase its critical speed. Characteristics of the plastic, its geometry and its distribution may be varied to adjust spinning inertia and resonant frequency of the armature. The magnet wires may be compressed into the slots, by application of iso-static pressure or by the pressure of the plastic being molded around them. Larger magnet wire can then be used which increases the power of the electric motor using the armature having the larger magnet wire. A two or three plate mold may be used to mold the plastic around the armature. Balancing features can be molded in place. The plastic can have a base polymer that is a blend of two or more polymers and various thermally conductive fillings.

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UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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Declaration under Rule 4.17:

— *of inventorship (Rule 4.17(iv)) for US only*

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INTERNATIONAL SEARCH REPORT

International Application No PCT/US 03/21544

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7	H02K15/12	H02K13/00	H02K3/34	H02K1/32	H02K9/22
	H02K3/46	H02K3/48	H02K3/12	H02K1/30	H02K15/16
	H02K7/04	H02K13/04	H02K3/30		

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 H02K

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)

EP0-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 983 866 A (LOK KING K) 8 January 1991 (1991-01-08) column 2, line 33 - line 64 column 3, line 61 - column 4, line 1; figures 2,4,5 -----	5
A	PATENT ABSTRACTS OF JAPAN vol. 008, no. 029 (E-226), 7 February 1984 (1984-02-07) -& JP 58 190264 A (NIPPON RADIATOR KK), 7 November 1983 (1983-11-07) abstract; figures 8-12 -----	1
A	US 1 888 211 A (APPLE VINCENT G) 22 November 1932 (1932-11-22) page 1, line 69 - page 2, line 1; figures ----- -/--	1,5

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
- "E" earlier document but published on or after the international filing date
- "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)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "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
- "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
- "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.
- "&" document member of the same patent family

Date of the actual completion of the international search

7 January 2004

Date of mailing of the international search report

08 APR 2004

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/21544

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 008, no. 149 (E-255), 12 July 1984 (1984-07-12) -& JP 59 053064 A (NIHON SAABO KK), 27 March 1984 (1984-03-27) abstract -----	1,5
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 411 (M-1648), 2 August 1994 (1994-08-02) -& JP 06 122133 A (JUNICHI TAKASAKI), 6 May 1994 (1994-05-06) abstract; figures -----	1,5
A	FR 1 137 505 A (THOMSON HOUSTON COMP FRANCAISE) 29 May 1957 (1957-05-29) page 1, paragraph 1 - page 3, paragraph 4; figures -----	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 03/21544

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
US 4983866	A	08-01-1991	GB 2220799 A CN 1040291 A DE 3922261 A1 JP 2142346 A	17-01-1990 07-03-1990 11-01-1990 31-05-1990
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JP 06122133	A	06-05-1994	NONE	
FR 1137505	A	29-05-1957	NONE	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/21544

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.:

1-5

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. claims: 1-5

Method for molding with plastic a motor armature: means for preventing the plastic from flowing into the slots between the commutator segments.

2. claims: 6-35

Coil structure molded in thermally conductive plastic for a dynamoelectric machine: features in the plastic to enhance the heat transfer.

3. claims: 36-57

Coil structure for a dynamoelectric machine: slots lined with slots liners made of thermally conductive plastic.

4. claims: 58-97

Armature for an electric motor: magnet wires having a layer of heat activated adhesive, activated by the heat of the molten plastic molded around the magnet wires.

5. claims: 98-111, 141-174, 182-185

Coil structure for a dynamoelectric machine: plastic molded around the magnet wires at a pressure sufficient to compress and deform the magnet wires.

6. claims: 112-129

Armature, encapsulated by thermally conducting plastic, for an electric motor : an insulating sleeve is disposed on the armature shaft between the armature shaft, the lamination stack and the commutator.

7. claims: 130-140

Method for manufacturing the armature, encapsulated in molded plastic, of an electric motor: the resonant frequency and/or the critical speed of the armature are adjusted by adjusting at least one of the geometry, the physical properties or the mechanical properties of the plastic.

8. claims: 175-181, 186, 187

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Method for manufacturing the armature, at least partially encapsulated in molded plastic, of an electric motor: details of the body of plastic molded over the armature lead wires.

9. claims: 188-194, 200, 201, 204

Mold for molding plastic around the armature of an electric motor: three plate mold comprising a core plate, a cavity plate and a runner plate.

10. claims: 195-199, 202, 203, 205, 206

Mold for molding plastic around the armature of an electric motor: two-plate mold having overflow cavities.

11. claims: 207-224

Armature for an electric motor having plastic at least partially encasing the magnet wires: balancing features formed in the plastic.

12. claims: 225-231

Method for manufacturing the armature for an electric motor having plastic at least partially encasing the magnet wires: chemical composition of the plastic.
