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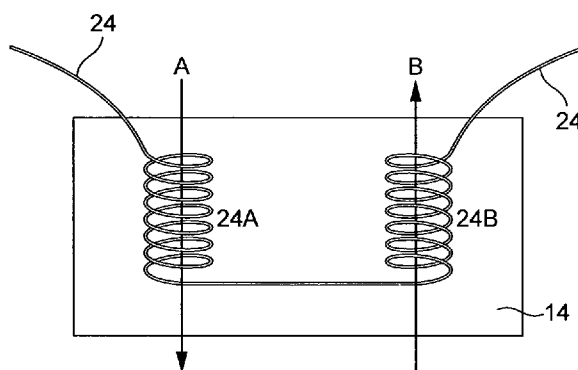
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(54) Title: ELECTRIC MOTORS



(57) Abstract: An electric motor includes one or more separate coil sets arranged to produce a magnetic field of the motor. The electric motor also includes a plurality of control devices coupled to respective sub-sets of coils for current control. A similar arrangement is proposed for a generator. A coil mounting system for an electric motor or generator includes one or more coil teeth for windably receiving a coil for the motor and a back portion for attachably receiving a plurality of the coil teeth. A traction control system and method for a vehicle having a plurality of wheels independently powered by a respective motor. A suspension control system and method for a vehicle having a plurality of wheels, each wheel being mounted on a suspension arm of the vehicle and being independently powered by a respective motor.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER					
INV.	H02K1/14	H02K5/20	H02K7/00	H02K11/00	H02K3/28
	H02K16/04	B60G17/016	B60K7/00	B60K28/16	B60L3/00
	B60L7/16	B60L7/22	H02P3/18	H02P6/08	H02P29/02
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)					
H02K B60G B60K B60L H02P					
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					
C. DOCUMENTS CONSIDERED TO BE RELEVANT					
Category*	Citation of document, with indication, where appropriate, of the relevant passages			Relevant to claim No.	
X	US 2004/021437 A1 (MASLOV BORIS A [US] ET AL) 5 February 2004 (2004-02-05)			1-4, 7-22,27, 28,43	
Y	paragraph [0026] - paragraph [0046] paragraph [0060] - paragraph [0065] paragraph [0135] - paragraph [0139] paragraph [0206] - paragraph [0233] paragraph [0259] - paragraph [0264]; figures 5-8,13-15,19-21			5,6	
A	WO 99/57795 A (COMAIR ROTRON INC [US]) 11 November 1999 (1999-11-11)			1-3, 20-22	
Y	page 4, line 22 - page 7, line 7; figures ----- -/--			5,6	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family 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		*Z* document member of the same patent family			
P document published prior to the international filing date but later than the priority date claimed					
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 434 389 A (LANGLEY LAWRENCE W [US] ET AL) 28 February 1984 (1984-02-28) column 1, line 33 - column 5, line 60; figures 1-4 -----	1-4, 8-11, 15-22, 27,28
X	US 6 042 349 A (ITO MOTOYA [JP] ET AL) 28 March 2000 (2000-03-28) column 2, line 49 - column 4, line 27; figures 1-3 -----	1,8-12, 20,27
A	US 2004/145323 A1 (MASLOV BORIS A [US] ET AL) 29 July 2004 (2004-07-29) paragraph [0011] -----	14

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 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 fees, this Authority did not invite payment of additional fees.
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.:

1-22, 27, 28, 43 (when depending on claims 1-22, 27)

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- 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: 1-22, 27, 28, 43(when depending on claims 1-22,27)

1.1. claims: 1, 43

An electric motor (or a vehicle comprising it) comprising one or more separate coil sets arranged to produce the moving magnetic field of the motor, the coils in each coil set forming a common phase, wherein each coil set comprises a plurality of coil sub-sets.

The motor further comprising a plurality of control devices, each coupled to a respective coil sub set, each control device being operable, for independently controlling a current in the coils of said respective coil sub-set, without an input synchronisation signal.

1.2. claims: 2,3,5,6

The motor of claim 1: sensors details

1.3. claims: 4,8-11,14-19

The motor of claim 1: control device operational details.

1.4. claim: 7

The motor of claim 1: coils details

1.5. claims: 12, 13

The motor of claim 1: control device structural details

1.6. claims: 20-22

The motor of claim 1: details of the connection of the control device to a dc power supply

1.7. claim: 27

The motor of claim 1: rotor details

1.8. claim: 28

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

An electric generator comprising one or more separate coil sets arranged to produce an induced current due to a magnetic field produced within the generator, the current produced in the coils of each coil set having a common phase, wherein each coil set comprises a plurality of coil sub-sets.

The generator further comprising a plurality of power outputs each coupled to a respective coil sub set for outputting current produced in the coils of said respective coil sub set.

2. claims: 23-26, 43 (when depending on claims 1-27), 84

An electric motor comprising a plurality of coil subsets, each coil subset being controlled by a respective control device, each control device being coupled to receive power generated by coils of the motor, whereby each control device continues to receive power in the event of failure of a common DC power supply.

3. claims: 29-42, 43 (when depending on claim 38), 44-46, 52, 56, 57 (the latter three claims when depending on claim 46)

A coil mounting system (or the corresponding manufacturing method, or a vehicle comprising such a coil mounting system), for an electric motor or generator.

4. claims: 47-51, 52, 56, 57 (the latter three claims when depending on claims 47-51), 58-62, 65 (the latter claim when depending on claims 58-62)

A traction control system for a vehicle (or a vehicle comprising such a traction control system, or the corresponding traction control method, or the corresponding computer program performing such a method).

5. claims: 53-55, 56, 57 (the latter two claims when depending on claim 55), 63, 64, 65 (the latter claim when depending on claims 63, 64)

A suspension control system for a vehicle (or a vehicle comprising such a suspension control system, or the corresponding suspension control method, or the corresponding computer program performing such a method).

6. claims: 66-71

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

An electric motor for mounting in a wheel for a road vehicle comprising a stator having a radial wall with a central region for mounting to the vehicle and for connection to a bearing block and a rotor having a radial wall with a central region for mounting a wheel on the outside and the bearing block on the inside.

7. claims: 72-75

A seal arrangement in an electric motor comprising a seal attached at one side to a circumferential wall of a rotor housing, said seal having at least one resilient deflectable portion arranged to abut a stator wall thereby providing a seal, and being deflectable by centrifugal force due to rotation of the rotor away from the stator wall.

8. claims: 76-82

An electric motor operable in a regenerative braking mode comprising one or more separate coil sets arranged to produce the moving magnetic field of the motor, wherein each coil set comprises a plurality of coil sub-sets. The motor further comprising a plurality of control devices, each coupled to a respective coil sub set, for independently controlling a current in the coils of said respective coil sub-set:
details of the control device inner architecture.

9. claim: 83

An electric motor operable in a braking mode comprising one or more separate coil sets arranged to produce the moving magnetic field of the motor, the coils in each coil set forming a common phase, each coil set comprising a plurality of coil sub-sets. The motor further comprising a plurality of control devices connected to a dc supply each coupled to a respective coil sub-set for independently controlling a current in the coils of said respective coil sub-set, wherein, in the braking mode, the control devices apply voltages to all the coil sets in a common phase.

10. claim: 85

An electric motor of the type comprising a plurality of coils circumferentially mounted around a stator and a plurality of magnets mounted on a rotor, wherein the motor includes a cooling plate, and channels are so arranged as to cool the coils on three sides.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

11. claim: 87

A magnet mounting arrangement for a rotor of a motor in which magnets are mounted in a circumferential wall of the rotor, comprising a plurality of slots in the rotor for receipt of individual magnets.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2004021437	A1	05-02-2004	US 2005046375 A1	03-03-2005
			US 2005127856 A1	16-06-2005
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