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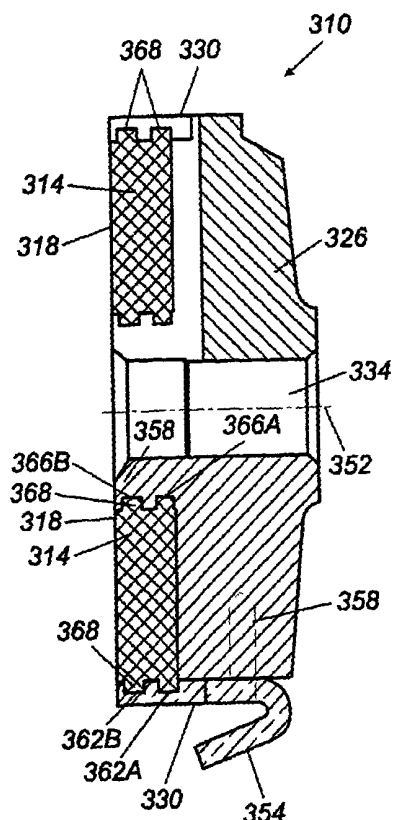
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[Continued on next page]

(54) Title: METHODS AND RESULTS OF MANUFACTURING COMMUTATORS

(57) Abstract: Addressed herein are commutators and methods of manufacturing them. The methods permit the carbonaceous material and core of a commutator to be molded simultaneously, rather than in a two-step process, and can eliminate one of two curing procedures used in connection with other manufacturing techniques. The necessity of machining the inner surface of the commutator shell to remove undesired excess phenolic or other material additionally is avoided by use of the techniques detailed herein. Commutators formed according to these methods may have increased useful lives and provide better performance than others presently available. An alternative commutator design addressed herein incorporates a system for anchoring its conductive segments. One or more undercuts in either or both of the metal shell and insulating core of the commutator receive protruding portions of the conductive material to prevent its axial displacement. The metal shell, which for protective purposes may extend above the face of the conductive material during some or all of the manufacturing process, minimizes radial displacement of the segments formed of the conductive material. Differing or non-concentric curvature of the inner surface of the shell and the outer surface of a portion of the insulating core restrict undesired circumferential movement of the segments.



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INTERNATIONAL SEARCH REPORT

Intern 1al Application No

PCT/US 00/04899

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01R39/06 H01R43/06

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 H01R

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)

WPI Data, EPO-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 Y A	DE 197 13 936 A (SUGIYAMA SEISAKUSHO CO) 13 November 1997 (1997-11-13) column 1, line 47-52; figure 8B ---	1,3,12, 13 9 2
X A	FR 2 633 781 A (CARBONE AG ;BOSCH GMBH ROBERT (DE)) 5 January 1990 (1990-01-05) abstract; figure 2 ---	14 15
X A A Y	DE 40 26 951 A (NETTELHOFF FRIEDRICH FA) 27 February 1992 (1992-02-27) figure 3 --- US 5 760 518 A (YAMAGUCHI MITSUHIKO ET AL) 2 June 1998 (1998-06-02) cited in the application column 1, line 47-50 -column 2, line 39-48 --- -/--	14 15 1 9



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
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- "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

3 October 2000

Date of mailing of the international search report

19.10.00

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

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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.
A	US 5 552 652 A (SHIMOYAMA SHUJI ET AL) 3 September 1996 (1996-09-03) figure 2 -----	14,15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/04899

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.:

14, 15
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. Claims: 1-9,12,13

Commutator and method of manufacturing it, providing a shell, positioning a electrically-conductive material within the shell and molding it together with an electrically-insulating core.

2. Claims: 10,11

Method for manufacturing a flat-type commutator comprising a shell height A1, retaining a electrically-insulating core at least partially within the shell to a depth A2, retaining wholly within the shell an electrically-conductive material having height A3. Such that $A1 > A2 + A3$.

3. Claims: 14,15

Commutator and method of manufacturing, comprising a shell and a core, one of the last having an undercut therein. Such that if the undercut is in the shell this one has depth less than the thickness of the wall of the shell.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/04899

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