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(71) Applicant (for all designated States except US): **BLACK & DECKER INC.** [US/US]; 1207 Drummond Plaza, Newark, DE 19711 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **WEST, Joshua, D.** [US/US]; 1629 Providence Road, Towson, MD 21286 (US). **DESHPANDE, Uday, S.** [IN/US]; 15 Montauk Court, Baltimore, MD 21234 (US).

(74) Agents: **ELCHUK, Mark, D.** et al.; Harness, Dickey & Pierce, P.L.C., P.O. Box 828, Bloomfield Hills, MI 48303 (US).

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**Declaration under Rule 4.17:**

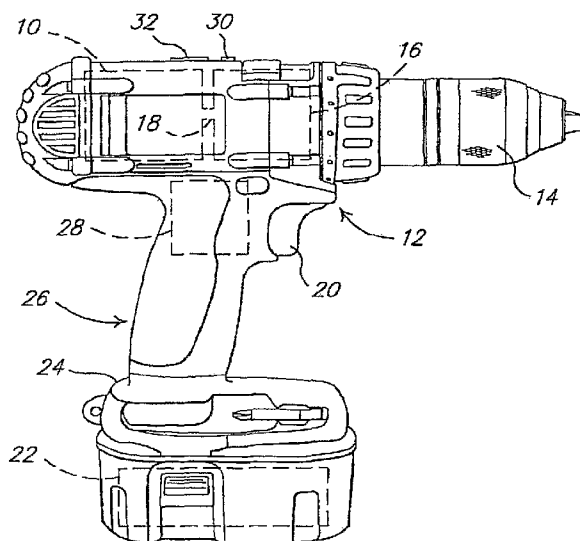
— of inventorship (Rule 4.17(iv))

**Published:**

— with international search report

[Continued on next page]

(54) Title: DC MOTOR WITH DUAL COMMUTATOR BAR SET AND SELECTABLE SERIES AND PARALLEL CONNECTED COILS



(57) Abstract: A permanent magnet, DC motor especially well adapted for use in power tools, and particularly hand-held, battery powered power tools. The motor includes two sets of armature coils, with each set of coils being coupled to separate sets of commutator bars on an armature. Separate pairs of brushes are used to interface with the two sets of commutator bars. A switching subsystem is controlled either manually by a user engageable switch or automatically by a controller, to connect the two sets of coils in either series or parallel configurations. The series configuration provides a greater efficiency, but with a lower power output than the parallel connection. The parallel connection provides a greater maximum power output from the motor. Thus, the operating characteristics of the tool can be tailored to better meet the needs of a work task, and in a manner than makes most efficient use of available battery power.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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24 April 2008

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/04541 ~

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - H02K 3/04 (2007.10) USPC - 310/206 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - H02K 3/04 (2007.10) USPC - 310/206 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 practicable, search terms used) MicroPatent, IP.com, GooglePatents		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,292,559 A (AUIINGER et al) 29 September 1981 (29.09.1981) entire document	1-4 and 9-17
A	US 2003/0127932 A1 (ISHIDA et al) 10 July 2003 (10.07.2003) entire document	1-4 and 9-17
A	US 4,408,150 A (HOLSTON et al) 04 October 1983 (04.10.1983) entire document	1-4 and 9-17
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 application or patent 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 08 November 2007		Date of mailing of the international search report <b>26 FEB 2008</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/04541

## 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 extra 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 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.:  
1-4, 9-17

### 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.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/04541

Continuation of Box III.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-4, 9-17, drawn to a power tool comprising a motor, the motor having an armature having first and second sets of armature coils wound on a lamination stack, and a switching system that connects the two sets of armature coils in either series or parallel configurations.

Group II, claims 5-8, 18-20, drawn to a method for forming a power tool comprising forming a portion of an electric motor by winding first and second groups of armature coils on an armature core, using first and second groups of commutator bars coupled to said armature coils to enable a current to be circulated through said armature coils, using first and second pairs of brushes.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a power tool comprising a motor, the motor having an armature having first and second sets of armature coils wound on a lamination stack, and a switching system that connects the two sets of armature coils in either series or parallel configurations as claimed therein is not present in the invention of Group II as a novel linking special technical feature. The special technical feature of the Group II invention: a method for forming a power tool comprising forming a portion of an electric motor by winding first and second groups of armature coils on an armature core, using first and second groups of commutator bars coupled to said armature coils to enable a current to be circulated through said armature coils, using first and second pairs of brushes as claimed therein is not present in the invention of Group I.

The limitation of "motor having an armature having first and second sets of armature coils wound on a lamination stack, and a switching system that connects the two sets of armature coils in either series or parallel configurations" is not considered a novel linking special technical feature as this limitation is clearly disclosed by US 4,292,559 A (AUINGER et al) 29 September 1981 column 4, lines 3-10, 35-66; figures 1, 2, 4.

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.