Title: UNIVERSAL POWER CONVERTER

Abstract: Methods and systems for transforming electric power between two or more portals. Any or all portals can be DC, single phase AC, or multi-phase AC. Conversion is accomplished by a plurality of bi-directional conducting and blocking semiconductor switches which alternate connect an inductor and parallel capacitor between said portals, such that energy is transferred into the inductor from one or more input portals and/or phases, then the energy is transferred out of the inductor to one or more output portals and/or phases, with said parallel capacitor facilitating "soft" turn-off, and with any excess inductor energy being returned back to the input Soft turn-on and reverse recovery is also facilitated. Said bi-directional switches allow for two power transfers per inductor/capacitor cycle, thereby maximizing inductor/capacitor utilization as well as providing for optimum converter operation with high input/output voltage ratios. Control means coordinate the switches to accomplish the desired power transfers.
### INTERNATIONAL SEARCH REPORT

**International application No.**
PCT/US2007/013552

**A. CLASSIFICATION OF SUBJECT MATTER**

<table>
<thead>
<tr>
<th>IPC(8)</th>
<th>H02M 3/24 (2008.04)</th>
</tr>
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<tr>
<td>USSC</td>
<td>383/98</td>
</tr>
</tbody>
</table>

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(8) - H02M 3/24 (2008.04)
  - USSC - 383/98

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>US 6,984,965 B2 (VINCIARELLI) 10 January 2006 (10.01.2006) entire document</td>
<td>5, 8, 13-14, 17, 38, 39a, 43-50, 56, 85, 91-98,100</td>
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<tr>
<td>A</td>
<td>US 2006/0103341 A1 (STEIGERWALD et al) 18 May 2006 (18.05.2006) paragraph 0025; figure 2</td>
<td>8, 17, 43-50, 85, 91-98, 100</td>
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<td>1-18, 34-58, 76A-80A, 81-85, 91-101</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

- "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
- "R" 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:
28 April 2008

Date of mailing of the international search report:
19 MAY 2008

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

Form PCT/ISA/210 (second sheet) (April 2005)
**INTERNATIONAL SEARCH REPORT**

**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.: 1-18, 34-58, 76A, 77A, 78A, 79A, 80A, 81-85, 81-101

**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.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2003)