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(54) Title: METHOD AND CIRCUITRY FOR IMPROVING THE MAGNITUDE AND SHAPE OF THE OUTPUT CURRENT OF SWITCHING POWER CONVERTERS

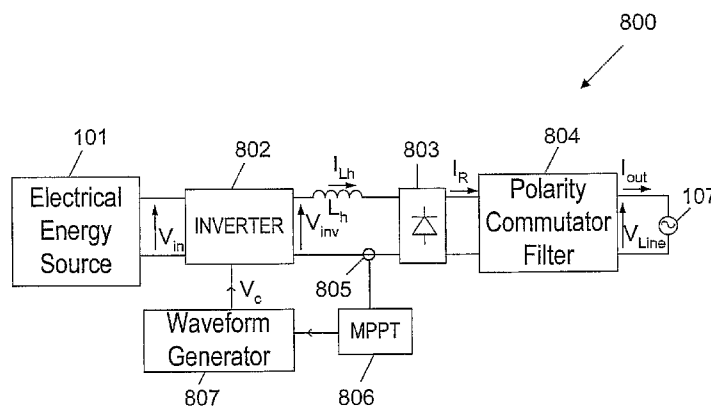


Fig. 8

(57) Abstract: Apparatus of a grid-connected switching inverter for injecting a current into a power line comprises an electrical energy source for providing DC voltage to apparatus, a switching inverter connected to the electrical energy source for converting DC voltage of the source to a high frequency alternating voltage; a waveform generator for controlling the magnitude and shape of the alternating high frequency voltage; an inductor connected to an output of the switching inverter for generating AC from the alternating high frequency voltage, wherein magnitude of the AC depends on frequency of alternating high frequency voltage; a rectifier connected in series with the inductor for outputting a rectified unipolar alternating current; and a polarity commutator connected to the rectifier for converting the rectified unipolar AC into bipolar AC, and injecting bipolar AC into a power line, wherein the bipolar AC is in phase with and of shape of the power line voltage.

WO 2009/004613 A3

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/IL 08/00897

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC(8) - H02M 7/00 (2009.01)  
USPC - 327/531  
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)  
USPC - 327/531

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
USPC - 327/85, 104, 128, 330, 531; 363/16 ,37, 40, 76, 109 (keyword limited - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
PubWEST(PGPB,USPT,EPAB,JPAB), Google Scholar  
Terms - grid, power line, electrical energy, waveform generator, alternating voltage, high frequency, DC voltage, convert, switch, inverter, inductor, rectifier, polarity, bipolar, phase, shape, mppt, half-bridge, soft switching.

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/0180175 A1 (Torrey et al.) 18 August 2005 (18.08.2005); Fig. 6; para [0006], [0009], [0010], [0015], [0016], [0019], [0018], [0033], [0035], [0036], [0038]-[0040], [0050], [0051]	1-10, 12, 14-23, 25-34, 36, 38-42
Y	US 5,625,539 A (Nakata et al.) 29 April 1997 (29.04.1997); Abstract; col 2, ln 66-67; col 3, ln 1-9, 20-67; col 4, ln 1-6; col 5, ln 7-35; col 12, ln 46-67; col 13, ln 1-37; col 16, ln 51-66	1-10, 12, 14-23, 25-34, 36, 38-42
Y	Serway, "Physics for Scientist and Engineers" Third Ed., 1990; Pg. 931-932, Sec. 33.3 Eq. 33.11	1-10, 12, 14-23, 26-34, 36, 38-42
Y	US 2003/0102818 A1 (Shen) 05 June 2003 (05.06.2003); para.[0004], [0034], [0035], [0044].	4, 5, 23, 29, 30
Y	US 6,021,052 A (Unger et al.) 01 February 2000 (01.02.2000); col 5, ln 58-67; col 6, ln 1-3; col 21, ln 36-54; col 29, ln 61-67; con 34, ln 13-50	8, 10, 34
Y	US 7,158,395 B2 (Deng et al.) 02 January 2007 (02.01.2007); col 15, ln 38-55	15, 39
Y	US 2006/0109694 A1 (Peng) 25 May 2006 (25.05.2006); para para [0003], [0006], [0025]	18, 41

Further documents are listed in the continuation of Box C.

\* 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 application or patent 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	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 24 May 2009 (24.05.2009)	Date of mailing of the international search report <b>04 JUN 2009</b>
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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: Lee W. Young  PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 08/00897

**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.: 24  
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:  
Claim 24 is indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention.
  
3.  Claims Nos.: 11, 13, 35, 37, 43-46  
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:

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.:

**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.