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Published:

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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 (Rule 48.2(h))

(88) Date of publication of the international search report:
25 August 2011

(54) Title: POWER FACTOR CORRECTOR WITH HIGH POWER FACTOR AT LOW LOAD OR HIGH MAINS VOLTAGE CONDITIONS

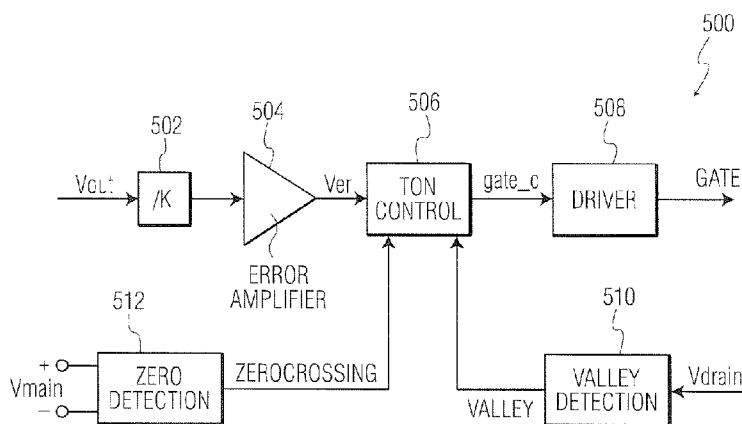


FIG. 5

(57) Abstract: A power factor corrector raises power factor at low loads or high mains voltages by modifying the switch timing or the current received by the power converter. It achieves this by increasing the switch -on time of a control switch during the falling time so that the majority of the switch -on time during a mains period occurs during the falling time, to thereby control the current received by the converter to compensate for current received by the intermediate filter. Some embodiments may employ a feedback system to produce one or more error signals that modify the operation of the converter. Various embodiments may also include additional stages that limit the compensation range of the error signal.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/056097

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02M1/42
ADD.

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)
H02M G05F

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, WPI Data, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X | US 2008/246444 A1 (SHAO YUNQI [CN] ET AL) 9 October 2008 (2008-10-09) paragraph [0047] - paragraph [0090]; figures 2,4,5,7-9 | 1,5 |
| X | ----- KIM J W ET AL: "Variable On-time Control of the Critical Conduction Mode Boost Power Factor Correction Converter to Improve Zero-crossing Distortion", POWER ELECTRONICS AND DRIVES SYSTEMS, 2005. PEDS 2005. INTERNATIONAL C ONFERENCE ON KUALA LUMPUR, MALAYSIA 28-01 NOV. 2005, PISCATAWAY, NJ, USA, IEEE, vol. 2, 28 November 2005 (2005-11-28), pages 1542-1546, XP010909892, DOI: DOI:10.1109/PEDS.2005.1619933 ISBN: 978-0-7803-9296-0 the whole document ----- -/-- | 1,5 |

Further documents are listed in the continuation of Box C.

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

"E" earlier document 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

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"&" document member of the same patent family

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| Date of the actual completion of the international search 23 March 2011 | Date of mailing of the international search report 30/06/2011 |
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| Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016 | Authorized officer Braccini, Roberto |
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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/056097

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|--|-----------------------|
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | <p>LAI J-S ET AL: "Design consideration for power factor correction boost converter operating at the boundary of continuous conduction mode and discontinuous conduction mode", PROCEEDINGS OF THE ANNUAL APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION (APEC). SAN DIEGO, MAR. 7 - 11, 1993; [PROCEEDINGS OF THE ANNUAL APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION (APEC)], NEW YORK, IEEE, US, vol. CONF. 8, 7 March 1993 (1993-03-07), pages 267-273, XP010111214, DOI: DOI:10.1109/APEC.1993.290621 ISBN: 978-0-7803-0983-8 page 270 - page 271</p> <p style="text-align: center;">-----</p> | 1,5 |
| X | <p>US 7 295 452 B1 (LIU KWANG-HWA [US]) 13 November 2007 (2007-11-13) abstract column 3, line 9 - line 3; figure 4 column 5, line 1 - line 14</p> <p style="text-align: center;">-----</p> | 1,4,5,8 |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2010/056097

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.:

1-27

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2010/056097

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|-------------------------|------------------|
| US 2008246444 | A1 | CN 101282079 A | 08-10-2008 |
| | | US 2009212756 A1 | 27-08-2009 |
| ----- | | | |
| US 7295452 | B1 | NONE | |
| ----- | | | |

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-27

Power factor correction circuit (method thereof) having asymmetrical PWM pulses distribution over first and second half periods of a mains cycle.

2. claims: 28-38

Power factor correction circuit comprising feed-forward control with a desired mains current reference signal for actively compensating current of a filter stage by drawing an antiphase current.
