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Published:

— *with international search report (Art. 21(3))*

— *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))*

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26 September 2013

(54) Title: APPARATUS AND METHOD FOR GENERATING A METERING VOLTAGE OUTPUT FOR A VOLTAGE REGULATOR USING A MICROPROCESSOR

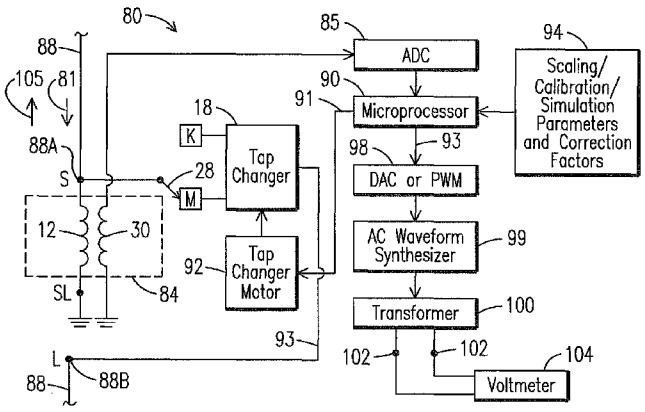


FIG. 5

(57) Abstract: A voltage regulator (10) for regulating a power distribution system voltage during forward or reverse power flow. The voltage regulator (10) accommodates multiple configurations of a tertiary winding (30) and a potential transformer (36) connected across source-side bushings (S/SL) or load-side bushings (L/SL). The invention simulates operation of a potential transformer (36), and the output voltage therefrom, connected across the source-side (S/SL) or load-side bushings (L/SL). The invention also produces a corrected voltage compensating a non-standard turns ratio of the tertiary winding (30). The regulator (10) controls a tap changer (18) to regulate the system voltage according to a digital value representing the voltage across the source-side (S/SL) or load-side bushings (L/SL), comprising a measured voltage, the corrected voltage or the simulated voltage. The digital value is converted to an analog voltage and supplied to external terminals (102) for measuring by a service technician using a voltmeter (104).

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/024588

A. CLASSIFICATION OF SUBJECT MATTER
INV. G05F1/14
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)
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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 5 550 459 A (LAPLACE CARL J [US]) 27 August 1996 (1996-08-27) abstract; figures 3-5	1-11 12-21
Y	WO 2004/114041 A1 (SIEMENS ENERGY INC) 29 December 2004 (2004-12-29) abstract; figures 3,4	12-21
A	GB 2 109 960 A (MC GRAW EDISON CO) 8 June 1983 (1983-06-08) figures 2q,2b,3b	1-21
A	US 2005/104567 A1 (BECKWITH ROBERT W [US]) 19 May 2005 (2005-05-19) figure 2	1-21

☐ 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 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	Date of mailing of the international search report
28 March 2013	01/08/2013

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/024588

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.:

1-21

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-21

   Voltage regulator having a second apparatus for converting a corrected digital value to a corrected analog voltage.

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2. claims: 22-26

   Voltage regulator having a microprocessor simulating the value of a potential transformer based on the value of a second potential transformer and the position of the tap changer.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/024588

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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