



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/196,869	11/14/2017	9819190	CU-72846 HV	2408

26530 7590 10/25/2017
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

DYNAPOWER COMPANY LLC, South Burlington, VT;
Apurva SOMANI, South Burlington, VT;
John C. PALOMBINI, South Burlington, VT;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or **Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

26530 7590 07/17/2017
 LADAS & PARRY LLP
 224 SOUTH MICHIGAN AVENUE
 SUITE 1600
 CHICAGO, IL 60604

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Hermine Valizadeh	(Depositor's name)
<i>Hermine Valizadeh</i>	(Signature)
October 16, 2017	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/196,869	06/29/2016	Apurva SOMANI	CU-72846 HV	2408

TITLE OF INVENTION: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	10/17/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
WILLOUGHBY, TERRENCE RONIQUE	2836	307-072000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. LADAS & PARRY LLP

2. _____

3. _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

DYNAPOWER COMPANY LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

South Burlington, Vermont US

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee \$960

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reuply any previously paid issue fee shown above)

☐ A check is enclosed.

☐ Payment by credit card, Form PTO-2038 is attached.

☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 12-0400 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature

Hermine Valizadeh

Date

October 16, 2017

Typed or printed name

Registration No.

64696

Electronic Patent Application Fee Transmittal				
Application Number:		15196869		
Filing Date:		29-Jun-2016		
Title of Invention:		ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		
First Named Inventor/Applicant Name:		Apurva SOMANI		
Filer:		Hermine Valizadeh/christine sconce		
Attorney Docket Number:		CU-72846 HV		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

Electronic Acknowledgement Receipt	
EFS ID:	30664547
Application Number:	15196869
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS
First Named Inventor/Applicant Name:	Apurva SOMANI
Customer Number:	26530
Filer:	Hermine Valizadeh/christine sconce
Filer Authorized By:	Hermine Valizadeh
Attorney Docket Number:	CU-72846 HV
Receipt Date:	16-OCT-2017
Filing Date:	29-JUN-2016
Time Stamp:	14:18:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$960
RAM confirmation Number	101717INTEFSW00000316120400
Deposit Account	120400
Authorized User	Christine Sconce
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)
 37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	2017-10-16_CU72846_Issue_Fee_Transmittal.pdf	136812 bfb6576313fa7547843731f9749ee50368092955	no	1

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30809 490cf410b0e5741962ea3c99ef7c70d92c675af9	no	2
---	----------------------	--------------	---	----	---

Warnings:

Information:

Total Files Size (in bytes):	167621
-------------------------------------	--------

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

26530 7590 07/17/2017
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER

WILLOUGHBY, TERRENCE RONIQUE

ART UNIT

PAPER NUMBER

2836

DATE MAILED: 07/17/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

15/196,869

06/29/2016

Apurva SOMANI

CU-72846 HV

2408

TITLE OF INVENTION: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	10/17/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
 or **Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

26530 7590 07/17/2017
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/196,869	06/29/2016	Apurva SOMANI	CU-72846 HV	2408

TITLE OF INVENTION: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	10/17/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
WILLOUGHBY, TERRENCE RONIQUE	2836	307-072000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/196,869	06/29/2016	Apurva SOMANI	CU-72846 HV	2408
26530	7590	07/17/2017	EXAMINER	
LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1600 CHICAGO, IL 60604			WILLOUGHBY, TERRENCE RONIQUE	
			ART UNIT	PAPER NUMBER
			2836	

DATE MAILED: 07/17/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/196,869	Applicant(s) SOMANI ET AL.	
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836	AIA (First Inventor to File) Status Yes

-- **The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**
All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 6/15/17.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 22-25. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some *c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. ☐ Notice of References Cited (PTO-892) | 5. ☒ Examiner's Amendment/Comment |
| 2. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. ☒ Examiner's Statement of Reasons for Allowance |
| 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. ☐ Other _____. |
| 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/TERRENCE WILLOUGHBY/
Examiner, Art Unit 2836

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Adam V. Littken on June 15, 2017.

The application has been amended as follows:

Please cancel withdrawn claims 1-21 and 26-29.

REASONS FOR ALLOWANCE

Claims 22-25 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claims 22-25, the prior art references of record failed to teach or suggest setting the microgrid voltage and frequency commands of the power converters to the last known grid voltage and grid frequency; ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency; applying a voltage droop to the microgrid voltage command of the power converters to facilitate sharing of reactive power; and applying a frequency droop to the frequency commands of the power converters to facilitate sharing of active power in combination with other limitations recited in the claimed invention.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TERRENCE WILLOUGHBY whose telephone number is (571)272-2725. The examiner can normally be reached on 10-6pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford Barnie can be reached on 571-272-7492. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TERRENCE WILLOUGHBY/
Examiner, Art Unit 2836
7/7/17

/HAL KAPLAN/
Primary Examiner, Art Unit 2836

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	0	somani-apurva.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 12:06
S2	2	palombini near2 john.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 12:06
S3	0	somani near2 apurva.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 12:07
S4	946	converter same ((load adj shar\$3) parallel) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same (series serial) same grid	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:15
S5	153	converter same ((load adj shar\$3) parallel) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same (series serial) same grid same (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3) same signal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:18
S6	24	((plural\$5 several multiple cluster array second) adj2 converter) same ((load adj shar\$3) parallel) same (output terminal node load) and (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with (series serial) with (utility grid) and (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:24
S7	279	((plural\$5 several multiple cluster array second) adj2 converter) with (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with (AC adj source alternating adj current adj source utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:58

S8	61	S7 and (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3) with (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with (AC adj source alternating adj current adj source utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:00
S9	860	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:12
S10	509	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid) and load	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:13
S11	0	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid) and load and synchron\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:14
S12	251	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid) and load and synchron\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:14
S13	39	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) and (synchron\$5 with (inverter converter))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:24
S14	399	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) with ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) and (synchron\$5 with (inverter converter))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:45
S15	685	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) same ((grid (electric\$4 near utility)) near\$5 (outage abnormal fault disconnect loss absent))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:51
S16	233	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) same	US-PGPUB; USPAT; USOCR;	OR	ON	2016/11/04 16:53

		((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) same ((grid (electric\$4 near utility)) near\$5 (outage abnormal fault disconnect loss absent)) and (synchron\$5 with (inverter converter grid utility))	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S17	49	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) same ((grid (electric\$4 near utility)) near\$5 (outage abnormal fault disconnect loss absent)) and (synchron\$5 with (inverter converter grid utility)) and ((plural\$5 several multiple cluster array second) adj2 (inverter converter))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 17:05
S18	13	"196869".apn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 11:57
S19	12632	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:09
S20	5022	S19 and (converter inverter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:09
S21	2104	S20 and (grid (electric\$4 near utility))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:10
S22	435	S21 and synchron\$5 with (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:12
S23	234	S22 and (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (fault abnormal\$5 voltage frequenc\$3) with (utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:15
S24	44	S22 and (main master) adj2 (cpu processor control\$4)	US-PGPUB; USPAT;	OR	ON	2016/11/07 14:38

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S25	50	S22 and (main master primary) adj (cpu processor control\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:40
S26	28	S25 and reactive adj (current power)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:41
S27	318	(converter inverter) with (parallel (shar\$3 near4 (load output))) and (utility grid) and (reactive) near3 (current power) and (real) near3 (current power) and synchron\$7 and voltage and frequenc\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 11:58
S28	154	(converter inverter) with (parallel (shar\$3 near4 (load output))) and (utility grid) and (reactive) near3 (current power) and (real) near3 (current power) and synchron\$7 and (voltage frequenc\$3) same (history stor\$3 record\$3 past "prior") same (utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 12:43
S29	419	(converter inverter) with (parallel (shar\$3 near4 (load output))) and (utility grid) same (switch\$3 circuit adj breaker circuit adj interrupter contactor) and synchron\$7 and (voltage frequenc\$3) same (save history stor\$3 record\$3 past "prior") same (utility grid) and (utility grid) with (island\$3 outage abnormal loss damage fault fail\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 13:52
S30	0	(converter inverter) with (parallel (shar\$3 near4 (load output))) with (utility grid) with (switch\$3 circuit adj breaker circuit adj interrupter contactor) and (voltage frequenc\$3) with (sav\$3 stor\$3 record\$3) with (previous history past "prior") with (utility grid) and synchron\$7 with (inverter converter) with (droop\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:25
S31	0	(converter inverter) same (parallel (shar\$3 near4 (load output))) same (utility grid) same (switch\$3 circuit adj breaker circuit adj interrupter contactor) and (voltage frequenc\$3) with (sav\$3 stor\$3 record\$3) with (previous history past "prior") with (utility grid) and synchron\$7 with (inverter converter) and (droop\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:28
S32	23	(converter inverter) same (parallel (shar\$3 near4 (load output))) same (utility grid) same (switch\$3 circuit adj breaker circuit	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/23 14:29

		adj interrupter contactor) and (voltage frequenc\$3) near4 (previous history past "prior") with (utility grid) and synchron\$7 with (inverter converter)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S33	213	(converter inverter) and (utility grid) and (voltage frequenc\$3) with (sav\$3 stor\$3 record\$3) with (previous history past "prior") and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:38
S34	327	(converter inverter) and (utility grid) and (voltage frequenc\$3) with (set\$3 sav\$3 stor\$3 record\$3) with ("last adj known" previous history past "prior") and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:40
S35	42	(converter inverter) and (utility grid) and (voltage frequenc\$3) near4 (set\$3 sav\$3 stor\$3 record\$3) near3 ("last adj known" previous history past "prior") and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 15:37
S36	58	((("20060208574") or ("20080212343") or ("20080298103") or ("20090326724") or ("20100138066") or ("20100198421") or ("20100274407") or ("20100292853") or ("20110043160") or ("20110082598") or ("20110248569") or ("20110257956") or ("20120029720") or ("20120063039") or ("20120101639") or ("20120143385") or ("20120146587") or ("20120150679") or ("20120175955") or ("20120215368") or ("20120267952") or ("20120271470") or ("20120283890") or ("20120290145") or ("20120299386") or ("20130015703") or ("20130035802") or ("20130049471") or ("20130073109") or ("20130079943") or ("20130099565") or ("20130110296") or ("20130166043") or ("20130166084") or ("20130204443") or ("20130342131") or ("20130345884") or ("20130345888") or ("20130346011") or ("20130346768") or ("20140018969") or ("20140129040") or ("20140229031") or ("20140277788") or ("20140304025") or ("20140310243") or ("20150188415") or ("6819087") or ("6882904") or ("7081684") or ("7116010") or ("7880337") or ("8164217") or ("8180999") or ("8421270") or ("8447435") or ("8583520") or ("8588991")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/03/23 16:15
S37	3264	(converter inverter) with (voltage frequenc\$3) near3 (track\$3 log\$4 stor\$3) and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:14
S38	1371	(converter inverter) with (voltage	US-PGPUB;	OR	ON	2017/03/27

		frequenc\$3) near3 (track\$3 log\$4 stor\$3) and synchron\$7 near3 (inverter converter utility grid)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			14:16
S39	35	(converter inverter) with (voltage frequenc\$3) near3 (track\$3 log\$4 stor\$3) and synchron\$7 near3 (inverter converter utility grid) and (droop\$3) near4 (voltage frequenc\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:18
S40	3835	((converter inverter) with ((load adj shar\$3) parallel)) and (synchron\$7 near4 (inverter converter grid utility)) and (voltage frequenc\$3) near3 (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:38
S41	208	((plural multiple several different multi third) near (converter inverter)) with ((load adj shar\$3) (parallel)) and (synchron\$7 near4 (inverter converter grid utility)) and (voltage frequenc\$3) near3 (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:42
S42	3618	(converter inverter) with ((load adj shar\$3) (parallel)) and (synchron\$7 near5 (inverter converter grid)) and (inverter converter grid) with (voltage frequenc\$3 phase adj angle phase-angle) with (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:44
S43	3398	(converter inverter) with ((load adj shar\$3) (parallel)) and (synchron\$7 near5 (inverter converter grid)) and (inverter converter grid) with (voltage frequenc\$3 phase adj angle phase-angle) with (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT	OR	ON	2017/03/27 16:45
S44	365	(307/45.ccls. 307/45.ccls. 307/82.ccls)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:49
S45	18784	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:51
S46	19113	(S44 S45)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/03/27 16:56

			DERWENT; IBM_TDB			
S47	230	S42 and S46	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:56
S48	2418	(converter inverter) with ((load adj shar\$3) (parallel)) and (synchron\$7 near5 (inverter converter grid)) and (inverter converter grid) with (voltage frequenc\$3 phase adj angle phase-angle) near3 (sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4 detect\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:46
S49	365	(307/45.ccls. 307/45.ccls. 307/82.ccls)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S50	18791	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S51	19120	(S49 S50)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S52	176	S51 and S48	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S53	14	"196869".apn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 15:10
S54	171	renewable near2 (source resources) with (stor\$3 stored) with (threshold limit value)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 15:37
S55	6	S54 and (H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc.	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/30 15:38

		H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S56	4342	renewable near2 (source resources) and battery and (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:44
S57	202	S56 and (H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:44
S58	3424	renewable near2 (source resources) and ((battery power) near4 (storing stored storage)) and (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:48
S59	206	S58 and (H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:49
S60	5	somani-apurva.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 11:50
S61	5	S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 11:50
S62	5	S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 11:53
S63	154	converter same ((load adj shar\$3) parallel) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same (series serial) same grid same (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3) same signal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 11:53
S64	154	S63	US-PGPUB;	OR	ON	2017/07/07

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			11:53
S65	15215	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. Y02P80/14.cpc. Y02P80/152.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 12:01
S66	290	S65 and renewable near2 (source resources) and battery and (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 12:02
S67	681	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. Y02P80/14.cpc. Y02P80/152.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.) and (utility grid) near4 (voltage) and (utility grid) near5 (frequenc\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 12:03
S68	371	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. Y02P80/14.cpc. Y02P80/152.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.) and (utility grid) near4 (voltage) and (utility grid) near5 (frequenc\$3) and (reactive active) near3 power	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 12:05
S71	126	(utility grid) and (converter inverter) and (utility grid) near5 (voltage) and (utility grid) near5 (frequenc\$3) and (reactive active) near3 power and (voltage frequenc\$3) near3 droop\$3 and (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 13:19
S72	1	(utility grid) and (converter inverter) and (storing set setting stored saving) near5 (last adj known previous threshold\$3 predetermin\$4 select\$3 limit) near5 ((grid utility) near3 (voltage frequenc\$4)) near5 (converter inverter) and (voltage frequenc\$3) near4 droop	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 14:38
S73	25	(utility grid) and (converter inverter) and (storing set setting stored saving) near5 (last adj known previous threshold\$3 predetermin\$4 select\$3 limit) with ((grid utility) near3 (voltage frequenc\$4)) with (converter inverter) and (active reactive re-active) near3 (power energy voltage current)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/07/07 14:45

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S69	163	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. Y02P80/14.cpc. Y02P80/152.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.) and (utility grid) near4 (voltage) and (utility grid) near5 (frequenc\$3) and (reactive active) near3 power.clm.	US-PGPUB; USPAT	OR	ON	2017/07/07 12:05
S70	13	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. Y02P80/14.cpc. Y02P80/152.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.) and (utility grid) near4 (voltage) and (utility grid) near5 (frequenc\$3) and (reactive active) near3 power and (voltage frequenc\$3) near3 droop\$3.clm.	US-PGPUB; USPAT	OR	ON	2017/07/07 12:05

7/7/2017 5:08:21 PM

C:\Users\twilloughby\Documents\EAST\Workspaces\15196869.wsp

Issue Classification 	Application/Control No. 15196869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.	
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836	

CPC					
Symbol				Type	Version
H02J	3	381		F	2013-01-01
H02J	2003	388		A	2013-01-01
Y02P	80	152		A	2015-11-01
Y02P	80	14		A	2015-11-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

/TERRENCE WILLOUGHBY/ Examiner.Art Unit 2836 (Assistant Examiner)	7/7/17 (Date)	Total Claims Allowed: 4	
/HAL KAPLAN/ Primary Examiner.Art Unit 2836 (Primary Examiner)	07/10/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 3

Issue Classification 	Application/Control No. 15196869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION									
CLASS		SUBCLASS				CLAIMED					NON-CLAIMED				
						H	0	2	J	3 / 38 (2006.01.01)					
CROSS REFERENCE(S)															
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)														

/TERRENCE WILLOUGHBY/ Examiner.Art Unit 2836	7/7/17 (Date)	Total Claims Allowed: 4	
/HAL KAPLAN/ Primary Examiner.Art Unit 2836	07/10/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 3

Issue Classification 	Application/Control No. 15196869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		17												
	2		18												
	3		19												
	4		20												
	5		21												
	6	1	22												
	7	2	23												
	8	3	24												
	9	4	25												
	10		26												
	11		27												
	12		28												
	13		29												
	14														
	15														
	16														

/TERRENCE WILLOUGHBY/ Examiner.Art Unit 2836 (Assistant Examiner)	7/7/17 (Date)	Total Claims Allowed: 4	
/HAL KAPLAN/ Primary Examiner.Art Unit 2836 (Primary Examiner)	07/10/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 3

Search Notes 	Application/Control No. 15196869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836

CPC- SEARCHED		
Symbol	Date	Examiner
H02J3/83	3/30/17	TW
H02J2003/388	3/30/17	TW
H02J3/42	3/30/17	TW
H02J3/48	3/30/17	TW
H02J3/40	3/30/17	TW
Y02P80/14	7/7/17	TW
Y02P80/152	7/7/17	TW

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors search conducted	3/30/17	TW
PLUS search conducted	3/30/17	TW
Text search in EAST using all databases	3/30/17	TW
Keyword search in CPC search areas listed above	3/30/17	TW
Updated search history in EAST. Please see the attached search notes	7/7/17	TW

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
H02	J3/38	7/7/17	TW

--	--

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 15/196,869	Filing Date 06/29/2016	☐ To be Mailed
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO							
APPLICATION AS FILED – PART I							
(Column 1)		(Column 2)					
FOR	NUMBER FILED	NUMBER EXTRA			RATE (\$)	FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A			N/A		
☐ SEARCH FEE (37 CFR 1.16(k), (j), or (m))	N/A	N/A			N/A		
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A			N/A		
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*			X \$ =		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*			X \$ =		
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.					TOTAL		
APPLICATION AS AMENDED – PART II							
(Column 1)		(Column 2)		(Column 3)			
AMENDMENT	06/15/2017	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 29	Minus	** 29	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X \$420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0
(Column 1)		(Column 2)		(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.							

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Apurva Somani, et al.	]	Art Unit: 2836
		]	
Serial No:	15/196,869	]	Ex.: Wolloughby, Terrence Ronique
		]	
Filed:	June 29, 2016	]	
For:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

RESPONSE UNDER 37 CFR 1.111

The Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

In response to the non-final office action dated April 10, 2017, setting a 3-month shortened statutory period for reply ending on July 10, 2017, the Applicant submits the following reply. The Applicant hereby authorizes the Commissioner to charge any deficiency of fees and credit any overpayments to Deposit Account Number 12-0400.

A Listing of the Claims begins on page 2 of this paper.

Remarks begin on page 12 of this paper.

1. (withdrawn) A power system comprising:

a plurality of power converters coupled together at a point of common coupling (PCC), wherein the power converters are configured to be coupled to a load at the PCC and the power converters are configured to provide a combined power converter output to the load;

a switch coupled to the PCC, wherein the switch is configured to be coupled in series between the PCC and an external grid such that when the switch is closed the power system is in a grid-tied configuration and such that when the switch is open the power system is in an microgrid configuration;

a control system comprising one or more controllers coupled to the plurality of power converters, the control system being configured to:

enable the switch to open and close in response to a signal received from one or more sensors for monitoring the external grid;

enable the power converters to operate in a current control mode when the switch is closed and when the power system is in the grid-tied configuration

transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load.

2. (withdrawn) The power system of claim 1, wherein the PCC is a shared AC bus.

3. (withdrawn) The power system of claim 1, further comprising:

a proximate sensor coupled between the PCC and the switch; and

a distal sensor coupled between the switch and the external grid,
wherein the control system enables the switch to open and close in response to signals received from the proximate sensor and the distal sensor.

4. (withdrawn) The power system of claim 3, wherein:

the control system is configured to receive a distal sensor signal to measure an external grid input, and

the control system is configured to enable the switch to open when the control system determines that the external grid input is in an abnormal state.

5. (withdrawn) The power system of claim 4, wherein

the control system is configured to receive a proximate sensor signal to measure a combined power converter output, and

the control system is configured to enable the switch to close when the control system determines that the external grid input is in a normal state and when the combined power converter output substantially matches the external grid input.

6. (withdrawn) The power system of claim 5, wherein

the control system is configured to, after enabling the switch to close, synchronize each of the power converters to the external grid voltage, wherein in synchronizing each of the power converters to the grid the control system changes the frequency of each of the power converters together so that the power converters remain synchronous with each other.

7. (withdrawn) The power system of claim 5, wherein

the external grid is in the abnormal state when at least one of a voltage amplitude or frequency is outside of lower or upper bounds.

8. (withdrawn) The power system of claim 1, wherein the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes the control system being configured to:

transition one or more of the plurality of power converters from the current control mode to a voltage control mode in which the one or more of the plurality of power converters establishes the voltage of the microgrid.

9. (withdrawn) The power system of claim 1, wherein the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes the control system being configured to:

record the grid phase angle prior to transitioning to microgrid mode; and
set the initial microgrid phase angle according to the recorded grid phase angle.

10. (withdrawn) The power system of claim 1, wherein:

the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that

the power converters share the load includes the control system being configured to implement droop control on each of the plurality of power converters.

11. (withdrawn) The power system of claim 10, wherein the control system being configured to implement droop control on each of the plurality of power converters includes the control system being configured to, for each power converter, apply voltage droop to a voltage setpoint and frequency droop to a frequency setpoint in accordance to

$$U_set = U_nom - KQV * Q_{out}$$

wherein U_set corresponds to a voltage setpoint amplitude,

U_nom corresponds to a nominal voltage amplitude,

KQV corresponds to a droop voltage slope (V/kVAR), and

Q_{out} corresponds to a measured output reactive power, and

$$F_set = F_nom - KPF * P_{out}$$

wherein F_set corresponds to a frequency setpoint of the CI output,

F_nom corresponds to a nominal frequency,

KPF corresponds to a droop frequency slope (Hz/kW), and

P_{out} corresponds to a measured output active power.

12. (withdrawn) The power system of claim 10, wherein the control system comprises a plurality of controllers each controlling one of the power converters, and each of the

controllers implements the droop control on the one of the power converters.

13. (withdrawn) The power system of claim 1, wherein:

the control system comprises a plurality of controllers each controlling one of the plurality of power converters, wherein one of the plurality of controllers is a master controller and the remaining one or more controllers are slave controllers, and

the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes:

the master controller being configured to:

enable its power converter to operate in voltage control mode by
controlling the microgrid voltage amplitude and frequency; and
generate active and reactive current command for the slave
controllers to follow; and

the one or more slave controller being configured to

receive the active and reactive current commands from the master
controller; and

enable their power converters to operate in current control mode.

14. (withdrawn) The power system of claim 1, wherein:

the control system comprises a plurality of slave controllers each controlling one of the plurality of power converters and a master controller coordinating the plurality of

slave controllers, and

the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes:

the master controller being configured to:

operate in voltage control mode by controlling the microgrid voltage amplitude and frequency; and

generate active and reactive current commands for the slave controllers to follow; and

the one or more slave controller being configured to

receive the active and reactive current commands from the master controller; and

enable their power converters to operate in current control mode during which the output current of a power converter coupled to a slave controller of the one or more slave controllers is controlled using the active and reactive current commands from the master controller.

15. (withdrawn) The power system of claim 1, further comprising a plurality of power resources coupled to the inverters.

16. (withdrawn) The power system of claim 15, wherein the power resources are selected from the group consisting of battery power resources, photovoltaic power resources, fuel cell power resources, compressed air storage power resources,

capacitor power resources, wind turbine power resources, microturbine power resources, hydro power resources, wave power resources, thermal power resources, flywheel power resources, and biomass power resources.

17. (withdrawn) The power system of claim 15, wherein the plurality of resources include a battery power resource and a renewable power resource, and the control system is further configured to:

after transitioning the plurality of power converters from grid-tied mode to microgrid mode, compare a battery storage of the battery power resource to a high limit threshold of the battery power resource, and if the battery storage exceeds the high limit threshold, command the renewable power resource to curtail power generation.

18. (withdrawn) The power system of claim 15, further comprising one or more DC/DC converters each serially coupled between one of the power resources and one of the power converters.

19. (withdrawn) The power system of claim 1, wherein the switch is one of a contactor, a motorized switch, and a semiconductor AC switch.

20. (withdrawn) The power system of claim 1, wherein when in an islanding microgrid configuration the power converters equally contribute to the combined output to the load.

21. (withdrawn) The power system of claim 1, wherein when in an islanding microgrid configuration the power converters do not equally contribute to the combined output to the load.

22. (original) A method of transitioning a plurality of power converters that are coupled together at a point of common coupling (PCC) from a grid-tied mode to a microgrid mode, the method comprising:

- opening an islanding switch coupled in series between the PCC and an external grid;

- setting the microgrid voltage and frequency commands of the power converters to the last known grid voltage and grid frequency;

- ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency;

- applying a voltage droop to the microgrid voltage command of the power converters to facilitate sharing of reactive power; and

- applying a frequency droop to the frequency commands of the power converters to facilitate sharing of active power.

23. (original) The method of claim 22, further comprising:

- setting the initial microgrid phase angle according to the last known grid phase angle.

24. (original) The method of claim 22, further comprising:

monitoring an external grid voltage amplitude and frequency to determine whether the external grid voltage amplitude and frequency fall outside of upper or lower bounds and the islanding switch should be opened.

25. (original) The method of claim 22, wherein the power converters are coupled to a battery power resource and a renewable power resource, the method further comprising:

comparing a battery storage of the battery power resource to a highlimit threshold of the battery power resource, and if the battery storage exceeds the highlimit threshold commanding the renewable power resource to curtail power.

26. (withdrawn) A method of transitioning a plurality of power converters that are coupled together at a point of common coupling (PCC) from a grid-tied mode to a microgrid mode using a master controller and one or more slave controllers coupled to the power converters, the method comprising:

opening an islanding switch coupled in series between the PCC and the external grid;

setting, by the master controller, the microgrid voltage and frequency commands to the last known grid voltage and grid frequency;

ramping, by the master controller, the microgrid voltage and frequency commands from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency;

generating, by the master controller, active and reactive current commands for the one or more slave controllers to follow;

operating the one or more slave controllers in current control mode during which the output current of a power converter coupled to a slave controller of the one or more slave controllers is controlled using the active and reactive current commands from the master controller.

27. (withdrawn) The method of claim 26, further comprising:

setting, by the master controller, the microgrid initial phase angle according to the last known grid phase angle.

28. (withdrawn) The method of claim 26, further comprising:

monitoring an external grid voltage amplitude and frequency to determine whether the external grid voltage amplitude and frequency fall outside of upper or lower bounds and the islanding switch should be opened.

29. (withdrawn) The method of claim 26, wherein the power converters are coupled to a battery power resource and a renewable power resource, the method further comprising:

comparing, by the master controller, a battery storage of the battery power resource to a highlimit threshold of the battery power resource, and if the battery storage exceeds the highlimit threshold commanding the renewable power resource to curtail power.

REMARKS

Status of Claims

Claims 1-29 are pending in the present application (claims 1, 22, and 26 are independent claims). Claims 1-21 and 26-29 have been withdrawn because of a restriction requirement.

No claim amendments are made in this response. Reconsideration in light of the following comments is respectfully requested.

Claim Rejections - 35 U.S.C. §102

In the office action (page 3), claims 22-24 stand rejected under 35 U.S.C. §102(a)(1) as being anticipated by U.S. Patent Publication No. 2011/0115301 (Bhavaraju).

The Applicant respectfully traverses.

Claim 22 recites, in part:

--setting the microgrid voltage and frequency commands of the power converters to the last known grid voltage and grid frequency--

and

--ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency--

The applicant respectfully submits that Bhavaraju fails to disclose at least these features of claim 22.

The Bhavaraju reference in general is related to the detection of an islanding condition by a power inverter and disconnecting the power inverter from a utility grid in the case that an islanding condition is detected. Bhavaraju is not concerned with --a method of transitioning a plurality of power converters from a grid-tied mode to a microgrid mode-- in which a voltage droop and frequency droop are applied to share power in microgrid mode.

The office action (page 3) points to paragraph [0044-0048], [0005-0007] in Bhavaraju as allegedly disclosing the above-quoted features of claim 22, and asserts that "[t]he inverter uses the grid voltage as its reference 'last known' grid voltage and grid frequency right before the inverter is disconnected from the grid." The applicant respectfully disagrees.

In paragraphs [0004-0005], Bhavaraju explains an island condition caused by a grid outage. Paragraph [0005] discusses more detail of this islanding condition, the performance of an inverter and an extra DC power source when the islanding condition occurs, and the safety and performance implications of an islanding condition. The paragraph explains how the inverter works as below:

When an inverter is electrically connected to the utility grid, it is necessary to match the inverter frequency and voltage amplitude with that of the grid. The inverter uses the grid as its reference and generates an output voltage that is synchronized with the grid. If the grid becomes disconnected, then the inverter does not see any change in frequency or voltage and will continue to supply power if the output power of the inverter matches with the local load demand on the grid. Such a condition is known as islanding, which can have substantial safety and performance implications.

In short, when an inverter is electrically connected to the utility grid, the inverter frequency and voltage amplitude is matched with those of the grid. And the inverter generates an output voltage synchronized with the grid using the connected grid frequency and voltage as a reference. Thus, the inverter of Bhavaraju uses the currently connected grid frequency and voltage as a reference to generate output voltage, but does not use any type of last known grid voltage and grid frequency.

In addition to the feature of --setting the microgrid voltage and frequency commands of the power converters to the last known grid voltage and grid frequency-- claim 22 calls for --ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency--. Thus, claim 22 clearly sets for a last known voltage and frequency, a nominal voltage and frequency and a ramping operation from the last known voltage and frequency to the nominal voltage and frequency. Bhavaraju fails to even mention a ramping operation, let alone ramping from the last known voltage and

frequency to the nominal voltage and frequency.

The office action (page 3) alleges that paragraphs [0005] and [0014] disclose --ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency--. The Applicant respectfully disagrees.

As discussed above, paragraph [0005] of Bhavaraju merely explains that an inverter's frequency and voltage are synchronized to the grid, when the grid is disconnected the inverter no longer sees the grid voltage and frequency, and that there are safety and performance implications when this occurs. There is no mention of ramping from a last known voltage and frequency to a nominal voltage and frequency when transferring to a microgrid mode.

Paragraph [0014] of Bhavaraju relates to detection of abnormal conditions and responsively disconnecting the inverters of the system when an abnormal condition is detected. Paragraph [0014] describes a particular method of doing this, in which detection of an islanding condition is facilitated by limiting and controlling the inverter output frequency to 59 Hz or the inverter output voltage to not exceed 110% of nominal rated voltage (further discussion of this is in example 5, which begins on paragraph [0050] of Bhavaraju). There is no discussion in Bhavaraju of any ramping operation let alone ramping from the last known voltage and frequency to a nominal voltage and frequency.

In sum, the claimed method of transitioning from a grid-tied mode to a microgrid mode, includes two steps to output nominal voltage and frequency in microgrid mode: a) setting microgrid voltage and frequency to last known values, and b) ramping from the last known values to nominal values. As explained in the specification paragraph [0078], the ramping operation aids in minimizing transients and smoothens the transition to the microgrid mode. Bhavaraju does not disclose this microgrid voltage and frequency adjustment.

Accordingly, Bhavaraju fails to disclose each and every element of claim 22; and therefore, claim 22 is patentable over Bhavaraju. See *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Claims 23-24 depend from claim 22 are also allowable at least by virtue of their dependencies as well

as the additional patentable elements they recite.

Claim Rejections - 35 U.S.C. §103

In the office action (page 5), claim 25 stands rejected under 35 U.S.C. §103 as being obvious over Bhavaraju in view of U.S. Patent Publication No. 2016/0181809 (Chiang). Chiang does not cure the deficiencies of Bhavaraju. Accordingly, claim 25 is also allowable at least by virtue of its dependency and for the additional patentable elements recited therein.

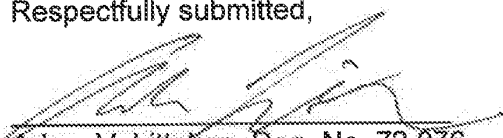
Conclusion

For at least the foregoing reasons, all pending claims are in condition for allowance. Accordingly, the Applicant respectfully requests reconsideration and withdrawal of the rejections.

This amendment is considered to be responsive to all points raised in the office action. When issuance of a Notice of Allowance is proper in the next action, the Examiner is asked to rejoin all eligible, withdrawn claims and is further authorized to cancel the remaining, withdrawn claims. The Applicant reserves the right to pursue the original claims and other claims in this and other applications. Should the Examiner have any remaining questions or concerns, the Examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

Dated: June 15, 2017


Adam V. Litteken, Reg. No. 72,076
Ladas & Parry
224 South Michigan Avenue
Chicago, Illinois 60604
(312) 427-1300

Electronic Acknowledgement Receipt	
EFS ID:	29513822
Application Number:	15196869
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS
First Named Inventor/Applicant Name:	Apurva SOMANI
Customer Number:	26530
Filer:	Adam Vincent Litteken/Lauren Coppinger
Filer Authorized By:	Adam Vincent Litteken
Attorney Docket Number:	CU-72846 HV
Receipt Date:	15-JUN-2017
Filing Date:	29-JUN-2016
Time Stamp:	17:48:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	72846-OA.pdf	676204	no	15
			d6c630e7370b42a79432ea4e68cbe6bf855f8647		

Warnings:

Information:	
Total Files Size (in bytes):	676204
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

PRESORTED
FIRST-CLASS MAIL
U.S. POSTAGE PAID
POSTEDIGITAL
NNNNN

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604



**Courtesy Reminder for
Application Serial No: 15/196,869**

Attorney Docket No: CU-72846 HV

Customer Number: 26530

Date of Electronic Notification: 04/10/2017

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

ChicagoUSPTO@ladas.net

To view your correspondence online or update your email addresses, please visit us anytime at **<https://sportal.uspto.gov/secure/myportal/privatepair>**. If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/196,869	06/29/2016	Apurva SOMANI	CU-72846 HV	2408
26530 7590 04/10/2017 LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1600 CHICAGO, IL 60604			EXAMINER WILLOUGHBY, TERRENCE RONIQUE	
			ART UNIT 2836	PAPER NUMBER
			NOTIFICATION DATE 04/10/2017	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on December 8, 2016 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Election/Restrictions

3. Claims 1-21 and 26-29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Invention and Species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on January 18, 2017.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

5. Claim(s) 22-24 is/are rejected under 35 U.S.C. 102 (a) (1) as being anticipated by Bhavaraju et al. (hereinafter "Bhavaraju") (US 2011/0115301).

6. Regarding claim 22, Bhavaraju in (Fig. 4) discloses a method of transitioning a plurality of power converters (see Fig. 3 and paragraphs [0011] in addition to Fig. 4, 36 and see paragraphs [0042] and [0065]) that are coupled together at a point of common coupling (PCC) from a grid-tied mode to a microgrid mode (see paragraphs [0024], [0042] and [0065]), the method comprising:

opening an islanding switch (see 40 and 48) coupled in series between the PCC (36 and see paragraphs [0024], [0042-0045] and [0065]) and an external grid (42);

setting the microgrid voltage and frequency commands of the power converters (36) to the last known grid voltage and grid frequency (such that the voltages and frequencies of any one of the inverters is monitored with an inverter controller (46) or protection relay (44) and the island switch (40) is opened to disconnect the inverter (36) from the grid (42) when an abnormal voltage or frequency is occurs (see paragraphs [0044-0048]). The inverter uses the grid as its reference "last known" grid voltage and grid frequency right before the inverter is disconnected from the grid, see paragraphs [0005-0007] and [0025]);

ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency (see paragraphs [0005] and [0014]);

applying a voltage droop to the microgrid voltage command of the power converters to facilitate sharing of reactive power (see paragraphs [0013-0016] and [0043] and [0055-0056]); and

applying a frequency droop to the frequency commands of the power converters to facilitate sharing of active power (see paragraphs [0052-0055]).

7. Regarding claim 23, Bhavaraju in (Fig. 4) discloses the method of claim 22, further comprising: setting the initial microgrid phase angle according to the last known ("last known" phase angle is included in the tracking of the phase angle via the inverter controller 46 (see paragraphs [0007] and [0051-0052] and [0066-0067].))

8. Regarding claim 24, Bhavaraju in (Fig. 4) discloses the method of claim 22, further comprising: monitoring an external grid voltage amplitude and frequency to determine whether the external grid voltage amplitude and frequency fall outside of upper or lower bounds and the islanding switch (40) should be opened [0024], [0042-0048] and [0065]).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Bhavaraju et al. (hereinafter "Bhavaraju") (US 2011/0115301) and in view of Chiang et al. (hereinafter "Chiang") (US 2016/0181809).

11. Regarding claim 25, Bhavaraju in (Fig. 4) discloses the method of claim 22, wherein the power converters are coupled to a battery power resource (34) and a renewable power resource (34 and see paragraph [0071]), except for the method further comprising: comparing a battery storage of the battery power resource to a highlimit threshold of the battery power resource, and if the battery storage exceeds the highlimit threshold commanding the renewable power resource to curtail power.

However, Chiang in (Fig. 1) discloses at least one renewable energy module (10) as a storage battery capable of charging and discharging, whereas the other renewable energy modules (10) are solar modules, such that the storage battery discharges to supplement the power level of the load device (40) whenever the solar module generates less power than is required to meet the power requirement of the load device (see paragraph [0020]).

Therefore, it would have been obvious to one of ordinary skill in the art prior to the filling date of the invention to combine the teachings of Chiang in the power system of Bhavaraju in order to supplement the power level of the load device to meet the power requirement of the load.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Choi (US 2011/0144822) discloses a grid-connected energy storage system capable of increasing the efficiency of a converter and a method of controlling the system are disclosed. The grid-connected energy storage system can increase the efficiency of a converter by measuring generated power of a plurality of power generation modules and selectively operating the converter based on the measurements. Deng et al. (US 2005/0105306) discloses a power converter system that monitors the voltage phase and amplitude information from the power converter and from the power grid for accurate synchronization. Deboy et al. (2013/0181531) discloses a plurality of power converters in parallel and synchronization of the power converters.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TERRENCE WILLOUGHBY whose telephone number is (571)272-2725. The examiner can normally be reached on 10-6pm.

14. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

15. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford Barnie can be reached on 571-272-7492. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TERRENCE WILLOUGHBY/
Examiner, Art Unit 2836
3/30/17

/REXFORD BARNIE/
Supervisory Patent Examiner, Art Unit 2836

Notice of References Cited	Application/Control No. 15/196,869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.	
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2011/0115310 A1	05-2011	Dong; Le-Ping	H02K33/16	310/28
*	B	US-2016/0181809 A1	06-2016	CHIANG; HSUANG-CHANG	H02J3/383	307/82
*	C	US-2011/0144822 A1	06-2011	Choi; Loo-Ney	H02J3/32	700/297
*	D	US-2005/0105306 A1	05-2005	Deng, Duo	H02M5/4585	363/37
*	E	US-2013/0181531 A1	07-2013	Deboy; Gerald	H02J3/385	307/82
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes 	Application/Control No. 15196869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836

CPC- SEARCHED		
Symbol	Date	Examiner
H02J3/83	3/30/17	TW
H02J2003/388	3/30/17	TW
H02J3/42	3/30/17	TW
H02J3/48	3/30/17	TW
H02J3/40	3/30/17	TW

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors search conducted	3/30/17	TW
PLUS search conducted	3/30/17	TW
Text search in EAST using all databases	3/30/17	TW
Keyword search in CPC search areas listed above	3/30/17	TW

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

--	--



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 2408

SERIAL NUMBER 15/196,869	FILING or 371(c) DATE 06/29/2016 RULE	CLASS 307	GROUP ART UNIT 2836	ATTORNEY DOCKET NO. CU-72846 HV		
APPLICANTS DYNAPOWER COMPANY LLC, South Burlington, VT; INVENTORS Apurva SOMANI, South Burlington, VT; John C. PALOMBINI, South Burlington, VT; ** CONTINUING DATA ***** This appln claims benefit of 62/188,278 07/02/2015 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 07/13/2016						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /TERRENCE RONIQUE WILLLOUGHBY/ Acknowledged Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY VT	SHEETS DRAWINGS 5	TOTAL CLAIMS 29	INDEPENDENT CLAIMS 3
ADDRESS LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1600 CHICAGO, IL 60604 UNITED STATES						
TITLE ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS						
FILING FEE RECEIVED 1090	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees		
				☐ 1.16 Fees (Filing)		
				☐ 1.17 Fees (Processing Ext. of time)		
				☐ 1.18 Fees (Issue)		
				☐ Other _____		
			☐ Credit			

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	14	"196869".apn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 15:10
L15	171	renewable near2 (source resources) with (stor\$3 stored) with (threshold limit value)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 15:37
L16	6	15 and (H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 15:38
L17	4342	renewable near2 (source resources) and battery and (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:44
L18	202	17 and (H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:44
L19	3424	renewable near2 (source resources) and ((battery power) near4 (storing stored storage)) and (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:48
L20	206	19 and (H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/30 16:49
S1	0	somani-apurva.in.	US-PGPUB;	OR	ON	2016/11/03

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			12:06
S2	2	palombini near2 john.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 12:06
S3	0	somani near2 apurva.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 12:07
S4	946	converter same ((load adj shar\$3) parallel) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same (series serial) same grid	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:15
S5	153	converter same ((load adj shar\$3) parallel) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same (series serial) same grid same (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3) same signal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:18
S6	24	((plural\$5 several multiple cluster array second) adj2 converter) same ((load adj shar\$3) parallel) same (output terminal node load) and (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with (series serial) with (utility grid) and (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:24
S7	279	((plural\$5 several multiple cluster array second) adj2 converter) with (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with (AC adj source alternating adj current adj source utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 16:58
S8	61	S7 and (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (voltage frequenc\$3) with (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with (AC adj source alternating adj current adj source utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:00
S9	860	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2016/11/03 17:12

		same(grid)	EPO; JPO; DERWENT; IBM_TDB			
S10	509	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid) and load	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:13
S11	0	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid) and load and synchron\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:14
S12	251	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid) and load and synchron\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/03 17:14
S13	39	((plural\$5 several multiple cluster array second) adj2 (inverter converter)) same (switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) same(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) and (synchron\$5 with (inverter converter))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:24
S14	399	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) with ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) and (synchron\$5 with (inverter converter))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:45
S15	685	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) same ((grid (electric\$4 near utility)) near\$5 (outage abnormal fault disconnect loss absent))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:51
S16	233	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage)) same ((grid (electric\$4 near utility)) near\$5 (outage abnormal fault disconnect loss absent)) and (synchron\$5 with (inverter converter grid utility))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/04 16:53
S17	49	(switch\$3 relay transistor contactor interrupter circuit adj breaker FET mosfet) with(grid (electric\$4 near utility)) same ((detect\$3 monitor\$3 sens\$3 determin\$3 measur\$5) with (frequenc\$3 voltage))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/11/04 17:05

		same ((grid (electric\$4 near utility)) near5 (outage abnormal fault disconnect loss absent)) and (synchron\$5 with (inverter converter grid utility)) and ((plural\$5 several multiple cluster array second) adj2 (inverter converter))	DERWENT; IBM_TDB			
S18	13	"196869".apn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 11:57
S19	12632	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02M5/00.cpc. H02M5/40.cpc. 307/45.ccls. 307/72.ccls. 307/82.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:09
S20	5022	S19 and (converter inverter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:09
S21	2104	S20 and (grid (electric\$4 near utility))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:10
S22	435	S21 and synchron\$5 with (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:12
S23	234	S22 and (sens\$3 monitor\$3 detect\$3 measur\$5 determin\$4) with (fault abnormal\$5 voltage frequenc\$3) with (utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:15
S24	44	S22 and (main master) adj2 (cpu processor control\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:38
S25	50	S22 and (main master primary) adj (cpu processor control\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/11/07 14:40

			IBM_TDB			
S26	28	S25 and reactive adj (current power)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/11/07 14:41
S27	318	(converter inverter) with (parallel (shar\$3 near4 (load output))) and (utility grid) and (reactive) near3 (current power) and (real) near3 (current power) and synchron\$7 and voltage and frequenc\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 11:58
S28	154	(converter inverter) with (parallel (shar\$3 near4 (load output))) and (utility grid) and (reactive) near3 (current power) and (real) near3 (current power) and synchron\$7 and (voltage frequenc\$3) same (history stor\$3 record\$3 past "prior") same (utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 12:43
S29	419	(converter inverter) with (parallel (shar\$3 near4 (load output))) and (utility grid) same (switch\$3 circuit adj breaker circuit adj interrupter contactor) and synchron\$7 and (voltage frequenc\$3) same (save history stor\$3 record\$3 past "prior") same (utility grid) and (utility grid) with (island\$3 outage abnormal loss damage fault fail\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 13:52
S30	0	(converter inverter) with (parallel (shar\$3 near4 (load output))) with (utility grid) with (switch\$3 circuit adj breaker circuit adj interrupter contactor) and (voltage frequenc\$3) with (sav\$3 stor\$3 record\$3) with (previous history past "prior") with (utility grid) and synchron\$7 with (inverter converter) with (droop\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:25
S31	0	(converter inverter) same (parallel (shar\$3 near4 (load output))) same (utility grid) same (switch\$3 circuit adj breaker circuit adj interrupter contactor) and (voltage frequenc\$3) with (sav\$3 stor\$3 record\$3) with (previous history past "prior") with (utility grid) and synchron\$7 with (inverter converter) and (droop\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:28
S32	23	(converter inverter) same (parallel (shar\$3 near4 (load output))) same (utility grid) same (switch\$3 circuit adj breaker circuit adj interrupter contactor) and (voltage frequenc\$3) near4 (previous history past "prior") with (utility grid) and synchron\$7 with (inverter converter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:29
S33	213	(converter inverter) and (utility grid) and (voltage frequenc\$3) with (sav\$3 stor\$3 record\$3) with (previous history past "prior") and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:38

S34	327	(converter inverter) and (utility grid) and (voltage frequenc\$3) with (set\$3 sav\$3 stor\$3 record\$3) with ("last adj known" previous history past "prior") and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 14:40
S35	42	(converter inverter) and (utility grid) and (voltage frequenc\$3) near4 (set\$3 sav\$3 stor\$3 record\$3) near3 ("last adj known" previous history past "prior") and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/23 15:37
S36	58	((("20060208574") or ("20080212343") or ("20080298103") or ("20090326724") or ("20100138066") or ("20100198421") or ("20100274407") or ("20100292853") or ("20110043160") or ("20110082598") or ("20110248569") or ("20110257956") or ("20120029720") or ("20120063039") or ("20120101639") or ("20120143385") or ("20120146587") or ("20120150679") or ("20120175955") or ("20120215368") or ("20120267952") or ("20120271470") or ("20120283890") or ("20120290145") or ("20120299386") or ("20130015703") or ("20130035802") or ("20130049471") or ("20130073109") or ("20130079943") or ("20130099565") or ("20130110296") or ("20130166043") or ("20130166084") or ("20130204443") or ("20130342131") or ("20130345884") or ("20130345888") or ("20130346011") or ("20130346768") or ("20140018969") or ("20140129040") or ("20140229031") or ("20140277788") or ("20140304025") or ("20140310243") or ("20150188415") or ("6819087") or ("6882904") or ("7081684") or ("7116010") or ("7880337") or ("8164217") or ("8180999") or ("8421270") or ("8447435") or ("8583520") or ("8588991"))).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/03/23 16:15
S37	3264	(converter inverter) with (voltage frequenc\$3) near3 (track\$3 log\$4 stor\$3) and synchron\$7 with (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:14
S38	1371	(converter inverter) with (voltage frequenc\$3) near3 (track\$3 log\$4 stor\$3) and synchron\$7 near3 (inverter converter utility grid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:16
S39	35	(converter inverter) with (voltage frequenc\$3) near3 (track\$3 log\$4 stor\$3) and synchron\$7 near3 (inverter converter utility grid) and (droop\$3) near4 (voltage frequenc\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/03/27 14:18

			DERWENT; IBM_TDB			
S40	3835	((converter inverter) with ((load adj shar\$3) parallel)) and (synchron\$7 near4 (inverter converter grid utility)) and (voltage frequenc\$3) near3 (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:38
S41	208	((plural multiple several different multi third) near (converter inverter)) with ((load adj shar\$3) (parallel)) and (synchron\$7 near4 (inverter converter grid utility)) and (voltage frequenc\$3) near3 (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 14:42
S42	3618	(converter inverter) with ((load adj shar\$3) (parallel)) and (synchron\$7 near5 (inverter converter grid)) and (inverter converter grid) with (voltage frequenc\$3 phase adj angle phase-angle) with (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:44
S43	3398	(converter inverter) with ((load adj shar\$3) (parallel)) and (synchron\$7 near5 (inverter converter grid)) and (inverter converter grid) with (voltage frequenc\$3 phase adj angle phase-angle) with (set\$3 sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4)	US-PGPUB; USPAT	OR	ON	2017/03/27 16:45
S44	365	(307/45.ccls. 307/45.ccls. 307/82.ccls)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:49
S45	18784	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:51
S46	19113	(S44 S45)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:56
S47	230	S42 and S46	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/27 16:56
S48	2418	(converter inverter) with ((load adj shar\$3) (parallel)) and (synchron\$7 near5	US-PGPUB; USPAT;	OR	ON	2017/03/29 13:46

		(inverter converter grid)) and (inverter converter grid) with (voltage frequenc\$3 phase adj angle phase-angle) near3 (sav\$3 stor\$3 record\$3 track\$3 log\$4 monitor\$3 sens\$3 measur\$4 detect\$3)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S49	365	(307/45.ccls. 307/45.ccls. 307/82.ccls)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S50	18791	(H02J3/38.cpc. H02J2003/388.cpc. H02J3/42.cpc. H02J3/46.cpc. H02J3/48.cpc. H02J3/40.cpc. H02M5/00.cpc. H02M5/40.cpc. H02J1/00.cpc. H02M7/538.cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S51	19120	(S49 S50)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49
S52	176	S51 and S48	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/29 13:49

EAST Search History (Interference)

< This search history is empty >

3/ 30/ 2017 5:17:02 PM**C:\ Users\ twilloughby\ Documents\ EAST\ Workspaces\ 15196869.wsp**

Receipt date: 12/08/2016

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.R.W/

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0851-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15196869
	Filing Date	2016-06-29
	First Named Inventor	Apurva SOMANI et al.
	Art Unit	2836
	Examiner Name	WILLOUGHBY, Terrence Ronique
	Attorney Docket Number	CU-72846

U.S.PATENTS								
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Patent citation information please click the Add button.								
U.S.PATENT APPLICATION PUBLICATIONS								
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Published Application citation information please click the Add button.								
FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button								
NON-PATENT LITERATURE DOCUMENTS								
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.						T ⁵

Receipt date: 12/08/2016

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.R.W/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15196869
	Filing Date		2016-06-29
	First Named Inventor	Apurva SOMANI et al.	
	Art Unit	2836	
	Examiner Name	WILLOUGHBY, Terrence Ronique	
	Attorney Docket Number	CU-72846	

1	MD NAYEEN ARAFAT, et al; "An Effective Smooth Transition Control Strategy using Droop Based Synchronization for Parallel Inverters", Published in: Energy Conversion Congress and Exposition (ECCE), 2014 IEEE; Date of Conference: 14-18 Sept. 2014; pages 2443-2454	☐
2	ALFRED ENGLER; "Control of parallel operating battery inverters; Available from: Alfred Engler, Retrieved on: 30 August 2016, 3 pages	☐
3	WANG CHENG SHAN, et al; "A Seamless Operation Mode Transition Control Strategy for A Microgrid Based on Master-Slave Control", Proceedings of the 31st Chinese Control Conference, July 25-27, 2012; Hefei China, 4 pages	☐
4	International Search Report and Written Opinion dated 9 September 2016; PCT/US2016/039963	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/TERRENCE R WILLOUGHBY/	Date Considered	03/30/2017
--------------------	-------------------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

<i>Index of Claims</i> 	Application/Control No. 15196869	Applicant(s)/Patent Under Reexamination SOMANI ET AL.
	Examiner TERRENCE WILLOUGHBY	Art Unit 2836

✓	Rejected
=	Allowed

-	Cancelled
÷	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

☒ Claims renumbered in the same order as presented by applicant			☐ CPA		☐ T.D.		☐ R.1.47		
CLAIM		DATE							
Final	Original	03/30/2017							
	1	N							
	2	N							
	3	N							
	4	N							
	5	N							
	6	N							
	7	N							
	8	N							
	9	N							
	10	N							
	11	N							
	12	N							
	13	N							
	14	N							
	15	N							
	16	N							
	17	N							
	18	N							
	19	N							
	20	N							
	21	N							
	22	✓							
	23	✓							
	24	✓							
	25	✓							
	26	N							
	27	N							
	28	N							
	29	N							

PLUS Search Results for S/N 15196869, Searched Tue Mar 14 11:54:07 EDT 2017
 The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

6414837 99	9148019 99	20110068627 99
6819087 99	9158294 99	20110077792 99
7116010 99	9172245 99	20110082596 99
7521825 99	9172249 99	20110082597 99
7983799 99	9188109 99	20110068627 99
7991512 99	9190846 99	20110077792 99
8019697 99	9200621 99	20110082596 99
7932637 99	9201411 99	20110082597 99
7983799 99	9225173 99	20110106322 99
7991512 99	9240687 99	20110118885 99
8019697 99	9246335 99	20110118886 99
8140194 99	9263894 99	20110231028 99
8159178 99	9348381 99	20110248569 99
8164217 99	9366704 99	20110282507 99
8321194 99	9367108 99	20110291483 99
8364609 99	9373965 99	20110295635 99
8401712 99	9407133 99	20120032507 99
8421270 99	9411389 99	20120080942 99
8447435 99	9413195 99	20120083935 99
8452462 99	9425696 99	20120101639 99
8483885 99	9431672 99	20120143385 99
8498752 99	9442165 99	20120146587 99
8543248 99	9444257 99	20120150361 99
8571955 99	9450516 99	20120150679 99
8606424 99	9454137 99	20120175955 99
8649914 99	9455578 99	20120191439 99
8680838 99	9459643 99	20120191440 99
8682495 99	9472954 99	20120193984 99
8706650 99	9477248 99	20120197450 99
8731729 99	9489701 99	20120215368 99
8736100 99	9535481 99	20120232709 99
8751036 99	9552029 99	20120245744 99
8766474 99	9555753 99	20120259477 99
8781640 99	9563224 99	20120283887 99
8816531 99	9563248 99	20120299386 99
8860247 99	9568903 99	20130015703 99
8862279 99	20020036430 99	20130024014 99
8896151 99	20030218549 99	20130024042 99
8918225 99	20040051387 99	20130035802 99
9020649 99	20040124812 99	20130041516 99
9026259 99	20070124026 99	20130046668 99
9026260 99	20070129110 99	20130076140 99
9026411 99	20080143304 99	20130079939 99
9035492 99	20090062969 99	20130079943 99
9042141 99	20100179704 99	20130080138 99
9086691 99	20100191996 99	20130099565 99
9106098 99	20100222934 99	20130110296 99
9118205 99	20110035073 99	20130166043 99
9146547 99	20110043160 99	20130188396 99

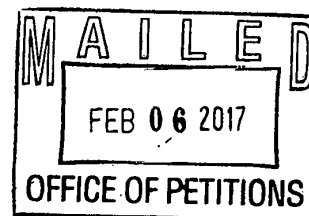
20130190938 99
20130213038 99
20130218355 99
20130218548 99
20130238150 99
20130238151 99
20130253718 99
20130253898 99
20130274947 99
20130282194 99
20130286697 99
20130309592 99
20130342020 99
20130346011 99
20140005846 99
20140005852 99
20140028090 99
20140049229 99
20140084817 99
20140088778 99
20140091622 99
20140097683 99
20140100705 99
20140129040 99
20140139191 99
20140148963 99
20140156101 99
20140174080 99
20140176026 99
20140183949 99
20140188300 99
20140198371 99
20140200722 99
20140203077 99
20140218985 99
20140233620 99
20140233662 99
20140236365 99
20140249686 99
20140252855 99
20140288722 99
20140292259 99
20140297051 99
20140300182 99
20140306531 99
20140306534 99
20140319911 99
20140324235 99
20140330538 99
20140336960 99
20150010093 99
20150039145 99



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO IL 60604



In re Application of :
Apurva SOMANI et al. :
Application No. 15/196,869 : NOTICE UNDER 37 CFR. 1.28(c)
Filing Date: June 29, 2016 :
Attorney Docket No. CU-72846 HV :

This is a notice regarding your request for acceptance of a fee deficiency submission under 37 CFR 1.28(c), filed July 25, 2016.

The Office no longer investigates or rejects original or reissue applications under 37 CFR 1.56. **1098 Off. Gaz. Pat. Office 502 (January 3, 1989)**. Therefore, nothing in this Notice is intended to imply that an investigation was done.

Your fee deficiency submission under 37 CFR 1.28(c) is hereby **ACCEPTED**.

Applicant is reminded that pursuant to 37 CFR 1.28(c)(2)(i) "where a fee paid in error as a small entity was subject to a fee decrease between the time the fee was paid in error and the time the deficiency is paid in full, the deficiency owed is equal to the amount (previously) paid in error." If the itemization submitted with the present request does not comply with 37 CFR 1.28(c)(2)(i) because a fee has decreased, applicant should, within ONE MONTH of the date of this Notice, submit a renewed request for acceptance of a fee deficiency under 37 CFR 1.28(c) along with balance of the correct fee deficiency in compliance with 37 CFR 1.28(c)(2)(i) and a replacement itemized listing of each fee erroneously paid as a small entity in compliance with 37 CFR 1.28(c)(2)(ii). **NO EXTENSION OF TIME UNDER 37 CFR 1.136 IS PERMITTED.**

Status a small entity has been removed. Accordingly, all future fees paid in this patent must be paid at the undiscounted entity rate.

Inquiries related to this communication should be directed to the undersigned at (571) 272-4231.

/Michelle R. Eason/
Michelle R. Eason
Paralegal Specialist
Office of Petitions

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Apurva Somani, et al.	]	Art Unit: 2836
		]	
Serial No:	15/196,869	]	Ex.: Wolloughby, Terrence Ronique
		]	
Filed:	June 29, 2016	]	
		]	
For:	Islanding A Plurality of Grid Tied Power Converters		

The Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO RESTRICTION REQUIREMENT

In the office action dated November 18, 2016, setting a two-month shortened statutory period for a reply ending on January 18, 2017, the pending claims 1-18 and 22-29 were restricted as follows:

Group I: Claims 1-18, drawn to a power system/apparatus for islanding multiple grid-tied storage energy inverters to form a microgrid; and

Group II: Claims 22-29, drawn to a method of transitioning and synchronizing a plurality of converters.

Group IIA: Species I, Figure 3

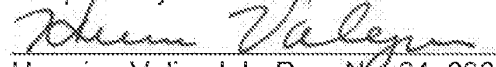
Group IIB: Species II, Figure 4

Applicant hereby elects **Group II, Claims 22-29**, drawn to a method of transitioning and synchronizing a plurality of converters. Further, Applicant hereby elects **Group IIA: Species I, Figure 3**. Applicant retains the right to present the non-elected in a divisional application.

Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Dated: January 18, 2017

Respectfully submitted,


Hermine Valizadeh, Reg. No. 64, 696
Ladas & Parry
224 South Michigan Avenue
Chicago, Illinois 60604
(312) 427-1300

Electronic Acknowledgement Receipt	
EFS ID:	28101268
Application Number:	15196869
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS
First Named Inventor/Applicant Name:	Apurva SOMANI
Customer Number:	26530
Filer:	Hermine Valizadeh
Filer Authorized By:	
Attorney Docket Number:	CU-72846 HV
Receipt Date:	18-JAN-2017
Filing Date:	29-JUN-2016
Time Stamp:	20:31:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Response to Election / Restriction Filed	Filed_RR.pdf	70167 abcbe50d02268da44b9bb7628cad0b27320c73e7	no	1

Warnings:

Information:	
Total Files Size (in bytes):	70167
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/196,869	06/29/2016	Apurva SOMANI	CU-72846 HV

CONFIRMATION NO. 2408

PUBLICATION NOTICE



26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

Title: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

Publication No. US-2017-0005473-A1

Publication Date: 01/05/2017

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0851-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15196869
	Filing Date		2016-06-29
	First Named Inventor	Apurva SOMANI et al.	
	Art Unit	2836	
	Examiner Name	WILLOUGHBY, Terrence Ronique	
	Attorney Docket Number	CU-72846	

U.S.PATENTS								
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Patent citation information please click the Add button.								
U.S.PATENT APPLICATION PUBLICATIONS								
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Published Application citation information please click the Add button.								
FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button								
NON-PATENT LITERATURE DOCUMENTS								
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.						T ⁵

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15196869
Filing Date	2016-06-29
First Named Inventor	Apurva SOMANI et al.
Art Unit	2836
Examiner Name	WILLOUGHBY, Terrence Ronique
Attorney Docket Number	CU-72846

1	MD NAYEEN ARAFAT, et al; "An Effective Smooth Transition Control Strategy using Droop Based Synchronization for Parallel Inverters", Published in: Energy Conversion Congress and Exposition (ECCE), 2014 IEEE; Date of Conference: 14-18 Sept. 2014; pages 2443-2454	☐
2	ALFRED ENGLER; "Control of parallel operating battery inverters; Available from: Alfred Engler, Retrieved on: 30 August 2016, 3 pages	☐
3	WANG CHENG SHAN, et al; "A Seamless Operation Mode Transition Control Strategy for A Microgrid Based on Master-Slave Control", Proceedings of the 31st Chinese Control Conference, July 25-27, 2012; Hefei China, 4 pages	☐
4	International Search Report and Written Opinion dated 9 September 2016; PCT/US2016/039963	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature

Date Considered

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15196869
Filing Date	2016-06-29
First Named Inventor	Apurva SOMANI et al.
Art Unit	2836
Examiner Name	WILLOUGHBY, Terrence Ronique
Attorney Docket Number	CU-72846

CERTIFICATION STATEMENT

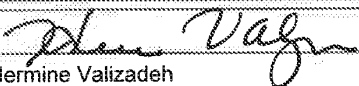
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.
- ☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ *******IF any fees are due in connection with this submission, please charge requisite fees to deposit account No. 12-0400*******
- ☐ A certification statement is not submitted herewith.

Signature		Date (YYYY-MM-DD)	2016-12-07
Name/Print	Hermine Valizadeh	Registration Number	64,696

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

From the INTERNATIONAL SEARCHING AUTHORITY

PCTNOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

To:

Valizadeh, Hermine
LADAS & PARRY LLP
224 S. Michigan Avenue
Chicago, IL 60604
ETATS-UNIS D'AMERIQUE

(PCT Rule 44.1)

Date of mailing
(day/month/year)

9 September 2016 (09-09-2016)

Applicant's or agent's file reference
188278**FOR FURTHER ACTION** See paragraphs 1 and 4 belowInternational application No.
PCT/US2016/039963International filing date
(day/month/year)
29 June 2016 (29-06-2016)

Applicant

DYNAPOWER COMPANY LLC

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.**How?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70**For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 - 9.011.**

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.**4. Reminders**

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **19 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the International Searching Authority

European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel: (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorized officer

ROSSWAG, Isabella
Tel: +49 (0)89 2399-5206

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 188278	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2016/039963	International filing date (day/month/year) 29 June 2016 (29-06-2016)	(Earliest) Priority Date (day/month/year) 2 July 2015 (02-07-2015)
Applicant DYNAPOWER COMPANY LLC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 2
☒ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention
b. ☐ none of the figures is to be published with the abstract

A. CLASSIFICATION OF SUBJECT MATTER

INV. H02J3/38

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)

H02J

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WANG CHENG SHAN ET AL: "A seamless operation mode transition control strategy for a microgrid based on master-slave control", CONTROL CONFERENCE (CCC), 2012 31ST CHINESE, IEEE, 25 July 2012 (2012-07-25), pages 6768-6775, XP032289574, ISBN: 978-1-4673-2581-3 the whole document	1-5, 7-11, 13-21
Y		6,12
A		22-29

☒ 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

30 August 2016

Date of mailing of the international search report

09/09/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5618 Patentlaan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Tille, Daniel

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	A Engler: "CONTROLOFPARALLELOPERATINGBATTERYINVERTER S", January 2000 (2000-01), XP055298709, Retrieved from the Internet: URL:https://www.researchgate.net/profile/A lfred_Engler/publication/228948978_Control _of_parallel_operating_battery_inverters/l inks/5440f54d0cf228087b69e51c.pdf?origin=p ublication_detail [retrieved on 2016-08-30] the whole document	6,12
X	ARAFAT MD NAYEEM ET AL: "An effective smooth transition control strategy using droop based synchronization for parallel inverters", 2013 IEEE ENERGY CONVERSION CONGRESS AND EXPOSITION, IEEE, 15 September 2013 (2013-09-15), pages 2317-2324, XP032516171, DOI: 10.1109/ECCE.2013.6646997 [retrieved on 2013-10-24] the whole document	1-5, 8-11, 13-21
A		22-29

Information on Search Strategy - Pilot phase (see OJ 2015, A86)

The type of information contained in this sheet may change during the pilot for improving the usefulness of this new service.

Application Number

PCT/US2016/039963

TITLE: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

APPLICANT: DYNAPOWER COMPANY LLC

IPC CLASSIFICATION: H02J3/38

EXAMINER: Tille, Daniel

CONSULTED DATABASES: NPL, IEEE XPLORE, EPODOC

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: H02J2003/388, H02J3/381

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:

EPC FORM P04A42

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2016/039963

International filing date (day/month/year)
29.06.2016

Priority date (day/month/year)
02.07.2015

International Patent Classification (IPC) or both national classification and IPC
INV. H02J3/38

Applicant
DYNAPOWER COMPANY LLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0
Fax: +49 89 2399 - 4465

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Tille, Daniel

Telephone No. +49 89 2399-0



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2016/039963

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2016/039963

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>6, 7, 9, 12, 20, 22-29</u>
	No: Claims	<u>1-5, 8, 10, 11, 13-19, 21</u>
Inventive step (IS)	Yes: Claims	<u>22-29</u>
	No: Claims	<u>1-21</u>
Industrial applicability (IA)	Yes: Claims	<u>1-29</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 WANG CHENG SHAN ET AL: "A seamless operation mode transition control strategy for a microgrid based on master-slave control", CONTROL CONFERENCE (CCC), 2012 31ST CHINESE, IEEE, 25 July 2012 (2012-07-25), pages 6768-6775, XP032289574, ISBN: 978-1-4673-2581-3
- D2 A Engler:
"CONTROLOFPARALLELOPERATINGBATTERYINVERTERS",
, 1 January 2000 (2000-01-01), XP055298709,
Retrieved from the Internet:
URL:https://www.researchgate.net/profile/Alfred_Engler/publication/228948978_Control_of_parallel_operating_battery_inverters/links/5440f54d0cf228087b69e51c.pdf?origin=publication_detail
[retrieved on 2016-08-30]
- D3 ARAFAT MD NAYEEM ET AL: "An effective smooth transition control strategy using droop based synchronization for parallel inverters", 2013 IEEE ENERGY CONVERSION CONGRESS AND EXPOSITION, IEEE, 15 September 2013 (2013-09-15), pages 2317-2324, XP032516171,
DOI: 10.1109/ECCE.2013.6646997
[retrieved on 2013-10-24]

1 INDEPENDENT CLAIM 1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.

1.1 The document D1 (fig. 1, 2) discloses:

A power system comprising:
a plurality of power converters (DG,DG1,DG2) coupled together at a point of common coupling (AC Bus),

wherein the power converters are configured to be coupled to a load at the AC Bus and the power converters are configured to provide a combined power converter output to the load;

a switch (STS) coupled to the AC Bus, wherein the switch is configured to be coupled in series between the AC Bus and an external grid (Utility Grid) such that when the switch is closed the power system is in a grid-tied configuration and such that when the switch is open the power system is in an microgrid configuration (fig. 1) ;

a control system (fig. 1, Master Controller, PQ Control) comprising one or more controllers coupled to the plurality of power converters, the control system being configured to:

- enable the switch to open and close in response to a signal received from one or more sensors for monitoring the external grid (page 2, paragraph 2);
- enable the power converters to operate in a current control mode when the switch is closed and when the power system is in the grid-tied configuration
- transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load (page 2, paragraph 3)

The subject matter of claim 1 is therefore not new.

1.2 The subject matter of claim 1 is also known from the document D3 (fig. 1)

2 INDEPENDENT CLAIMS 22, 26

The combination of the features of claims 22, 26 are neither known from, nor rendered obvious by, the available prior art.

The document D3 (fig. 1), which is considered to represent the most relevant state of the art, discloses a power system, from which the subject-matter of claims 22, 26 differs in that the transition to microgrid mode is smoothed by ramping the microgrid voltage and frequency from the last known grid values to the nominal values.

The solution proposed in claims 22 and 26 of the present application is considered as involving an inventive step (Article 33(3) PCT) because there is no hint in the available prior art of the above mentioned solution.

3 DEPENDENT CLAIMS

- 3.1 Dependent claims 2-21 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty and/or inventive step.

The features are either known from the prior art or are one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without exercise of inventive skill, in order to solve the problem posed.

The corresponding passages are mentioned in the search report.

- 3.2 Dependent claims 23-24, 26-29 are dependent on claims 22, 25 respectively and as such also meet the requirements of the PCT with respect to novelty and inventive step.

4 Re Item VII

Certain defects in the international application

- 4.1 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art D1 being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 4.2 The features of all claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 4.3 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 is not mentioned in the description, nor are these documents identified therein.

Bitte beachten Sie, dass angeführte Nichtpatentliteratur (wie z. B. wissenschaftliche oder technische Dokumente) je nach geltendem Recht dem Urheberrechtsschutz und/oder anderen Schutzarten für schriftliche Werke unterliegen könnte. Die Vervielfältigung urheberrechtlich geschützter Texte, ihre Verwendung in anderen elektronischen oder gedruckten Publikationen und ihre Weitergabe an Dritte ist ohne ausdrückliche Zustimmung des Rechtsinhabers nicht gestattet.

Veuillez noter que les ouvrages de la littérature non-brevets qui sont cités, par exemple les documents scientifiques ou techniques, etc., peuvent être protégés par des droits d'auteur et/ou toute autre protection des écrits prévue par les législations applicables. Les textes ainsi protégés ne peuvent être reproduits ni utilisés dans d'autres publications électroniques ou imprimées, ni rediffusés sans l'autorisation expresse du titulaire du droit d'auteur.

Please be aware that cited works of non-patent literature such as scientific or technical documents or the like may be subject to copyright protection and/or any other protection of written works as appropriate based on applicable laws. Copyrighted texts may not be copied or used in other electronic or printed publications or re-distributed without the express permission of the copyright holder.

Electronic Acknowledgement Receipt	
EFS ID:	27730721
Application Number:	15196869
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS
First Named Inventor/Applicant Name:	Apurva SOMANI
Customer Number:	26530
Filer:	Hermine Valizadeh
Filer Authorized By:	
Attorney Docket Number:	CU-72846 HV
Receipt Date:	08-DEC-2016
Filing Date:	29-JUN-2016
Time Stamp:	10:02:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IDS-CU72846.pdf	220986	yes	3
			7709e0051b64177ae807acda25083eec928a7ea7		

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Information Disclosure Statement (IDS) Form (SB08)		2	3	
	Transmittal Letter		1	1	
Warnings:					
Information:					
2	Non Patent Literature	NPL_ARAFAT.pdf	861269	no	4
			3ff3f49068b7b225c71bb5ea6ae74714dbaff3e8b		
Warnings:					
Information:					
3	Non Patent Literature	NPL_ENGLER.pdf	943807	no	3
			b9a80fde2d9baddb3fdd99feca4b79ca7fd470fd		
Warnings:					
Information:					
4	Non Patent Literature	NPL_SHAN.pdf	1419617	no	4
			f5fb4c76a904369d4d37e87475f32a38beb3e715		
Warnings:					
Information:					
5	Other Reference-Patent/App/Search documents	ISR_WO.pdf	1190496	no	12
			39147a118bb499e4c1f26e4a36fe334837d6f702		
Warnings:					
Information:					
Total Files Size (in bytes):			4636175		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/196,869	06/29/2016	Apurva SOMANI	CU-72846 HV	2408
26530 7590 11/18/2016 LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1600 CHICAGO, IL 60604			EXAMINER WILLOUGHBY, TERRENCE RONIQUE	
			ART UNIT 2836	PAPER NUMBER
			NOTIFICATION DATE 11/18/2016	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Election/Restrictions

2. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-18, drawn to a power system/apparatus for islanding multiple grip-tied energy storage in inverters to form a microgrid, Group I, classified in class 307, subclasses 82 and 86 along with class 700/293.

II. Claims 22-29, drawn to a method of transitioning and synchronizing a plurality of converters, Group II, classified in class 307, subclasses 42 and 45.

3. Inventions I and II are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product. See MPEP § 806.05(h). In the instant case the method for using the product as claimed can be practiced with other known power system apparatus in the art.

4. Restriction for examination purposes as indicated is proper because all the inventions listed in this action are independent or distinct for the reasons given above

and there would be a serious search and/or examination burden if restriction were not required because one or more of the following reasons apply:

-the inventions have required a separate status in the art in view of their different classification.

-the inventions require a different field of search (e.g. searching different classes/subclasses or electronic resources, or employing different search strategies or search queries).

5. **Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.**

6. The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

7. Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is

the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other invention.

8. The examiner has required restriction between product or apparatus claims and process claims. Where applicant elects claims directed to the product/apparatus, and all product/apparatus claims are subsequently found allowable, withdrawn process claims are subsequently found allowable, withdrawn process claims that include all the limitations of the allowable product/apparatus claims should be considered for rejoinder. All claims directed to a nonelected process invention must include all the limitations of an allowable product/apparatus claim for that process invention to be rejoined.

9. **If applicant elects Group II, applicant must also elect one of the following:**

10. This application contains claims directed to the following patentably distinct species:

Species 1, Figure 3, Group IIA.

Species 2, Figure 4, Group IIB.

11. The species are independent or distinct because Species 1 discloses a method in which a voltage and frequency droop is implemented to synchronize a plurality of power converters, while Species 2 discloses a method in which a master/slave configuration is implemented to synchronize a plurality of power converters.

12. In addition, these species are not obvious variants of each other based on the current record.

13. Applicant is required under 35 U.S.C. 121 to elect a single disclosed species, or a single grouping of patentably indistinct species, for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable.

14. There is a search and/or examination burden for the patentably distinct species as set forth above because at least the following reason(s) apply:

-the inventions have required a separate status in the art in view of their different classification.

-the inventions require a different field of search (e.g. searching different classes/subclasses or electronic resources, or employing different search strategies or search queries).

15. **Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species to be examined** even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected species or grouping of patentably indistinct species**, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

16. The election may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after

the election, applicant must indicate which of these claims are readable on the elected species or grouping of patentably indistinct species.

17. Should applicant traverse on the ground that the species, or groupings of patentably indistinct species from which election is required, are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing them to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other species.

18. Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TERRENCE WILLOUGHBY whose telephone number is (571)272-2725. The examiner can normally be reached on 10-6pm.

20. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford Barnie can be reached on 571-272-7492. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

21. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

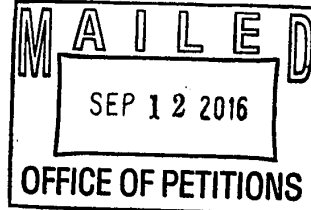
/TERRENCE WILLOUGHBY/
Examiner, Art Unit 2836
11/8/16

/REXFORD BARNIE/
Supervisory Patent Examiner, Art Unit 2836



UNITED STATES PATENT AND TRADEMARK OFFICE

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO IL 60604



Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Doc Code:
TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 15/196,869		
1. THE REQUEST FILED <u>06/29/16</u> IS GRANTED. The above-identified application has met the requirements for prioritized examination A. ☒ for an original nonprovisional application (Track I). B. ☐ for an application undergoing continued examination (RCE). 2. The above-identified application will undergo prioritized examination. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs: A. filing a <u>petition for extension of time</u> to extend the time period for filing a reply; B. filing an <u>amendment to amend the application to contain more than four independent claims, more than thirty total claims</u>, or a multiple dependent claim; C. filing a <u>request for continued examination</u>; D. filing a notice of appeal; E. filing a request for suspension of action; F. mailing of a notice of allowance; G. mailing of a final Office action; H. completion of examination as defined in 37 CFR 41.102; or I. abandonment of the application. Telephone inquiries with regard to this decision should be directed to Terri Johnson at 571-272-2991. In his/her absence, calls may be directed to Brian Brown at 571-272-5338. <table><tr><td>/Terri Johnson/ _____ [Signature]</td><td>Paralegal Specialist _____ (Title)</td></tr></table>		/Terri Johnson/ _____ [Signature]	Paralegal Specialist _____ (Title)
/Terri Johnson/ _____ [Signature]	Paralegal Specialist _____ (Title)		



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
15/196,869	06/29/2016	DYNAPOWER COMPANY LLC	CU-72846 HV	21991

Acknowledgement of Loss of Entitlement to Entity Status Discount

The entity status change request below filed through Private PAIR on 07/25/2016 has been accepted.

CERTIFICATIONS:

Change of Entity Status: ☒ Applicant changing to regular undiscounted fee status. NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.
--

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Hermine Valizadeh/
Name:	Hermine Valizadeh
Registration Number:	64696

07/25/2016 12:07 FAX 312 427 6668

LADAS & PARRY LLP

0001/0002

RECEIVED
CENTRAL FAX CENTER

Application Serial No. 15/196,869
Payment Of Fee Deficiencies

JUL 25 2016

PATENT
Docket: CU-72846

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

APPLICANT: Apurva SOMANI et al.
SERIAL NO: 15/196,869
FILED: June 29, 2016
TITLE: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BY FAX: (571) 273-8300

**CORRECTION OF ERROR IN SMALL ENTITY STATUS
& PAYMENT OF FEE DEFICIENCIES (37 CFR 1.28)**

PAGE 1/2 * RCVD AT 7/25/2016 12:50:02 PM [Eastern Daylight Time] * SVR:W-PTOFAX-001/26 * DNIS:2738300 * CSID:312 427 6668 * DURATION (mm-ss):01-11

07/28/2016 DALLEN 00000011 120400 15196869
01 FC:1461 3300.00 DA

BEST AVAILABLE COPY

Application Serial No. 15/196,869
Payment Of Fee Deficiencies

PATENT
Docket: CU-72846

Request for Prioritized Examination 06/29/2016	2817	2000	4000	2000
Processing Fee 06/29/2016	2830	70	140	70
Total		\$3160	\$6460	\$3300

The Commissioner is authorized to charge our Deposit Account No. 12-0400 in the amount of the fee deficiencies owed, as outlined above, in the total amount of \$3300.

Should any additional fee be deemed necessary, the Commissioner is authorized to charge our Deposit Account No. 12-0400.

Respectfully submitted,

July 25, 2016
Date

Hermine Valizadeh
Attorney for Applicant

Hermine Valizadeh, Reg. 64696
c/o Ladas & Parry LLP
224 South Michigan Avenue
Chicago, Illinois 60604
(312) 427-1300

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/196,869				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	29	minus 20 = *	9	x 40 = 360	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *		x 210 = 0.00						
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL				
				1090						
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/196,869	06/29/2016		1090	CU-72846 HV	29	3

CONFIRMATION NO. 2408

FILING RECEIPT



0000000084350803

26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

Date Mailed: 07/15/2016

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Apurva SOMANI, South Burlington, VT;
John C. PALOMBINI, South Burlington, VT;

Applicant(s)

DYNAPOWER COMPANY LLC, South Burlington, VT;

Power of Attorney: The patent practitioners associated with Customer Number 26530

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/188,278 07/02/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 07/13/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/196,869**

Projected Publication Date: 01/05/2017

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

**CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION
UNDER 37 CFR 1.102(e) (Page 1 of 1)**

First Named Inventor:	Apurva SOMANI et al	Nonprovisional Application Number (if known):	
Title of invention:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

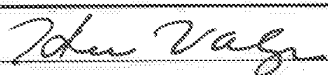
1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently \$0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.
2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.
3. The applicable box is checked below:

I. ☒ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

- i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.
---OR---
- (b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.
- ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, or the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

- i. A request for continued examination has been filed with, or prior to, this form.
- ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
- iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
- iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
- v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature 	Date June 29, 2016
Name (Print/Typed) Hermine Valizadeh	Practitioner Registration Number 64696
Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.*	
☐ *Total of _____ forms are submitted.	

Our Case No. CU-72846

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

INVENTORS: Apurva SOMANI
John C. PALOMBINI

TITLE: Islanding a Plurality of Grid Tied Power
Converters

ATTORNEY: Hermine Valizadeh (Reg. No. 64,696)
Ladas & Parry LLP
224 SOUTH MICHIGAN AVE., SUITE 1600
CHICAGO, ILLINOIS 60604
(312) 427-1300

ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

RELATED APPLICATIONS

[0001] The present patent document claims the benefit of the filing date under 35 U.S.C. §119(e) of Provisional U.S. Patent Application Serial No. 62/188,278, filed July 2, 2015, which is hereby incorporated by reference.

DESCRIPTION

FIELD OF THE INVENTION

[0002] The present invention relates generally to power converters; and more specifically, to systems and methods for islanding a plurality of grid-tied power converters to form a microgrid.

BACKGROUND OF THE INVENTION

[0003] A power system may include distributed power sources (e.g., distributed generators, battery banks, and/or renewable resources such as solar panels or wind turbines to provide power supply to a grid (e.g., a microgrid having local loads and/or a utility grid). The power system may include a power converter, such as a power inverter, for converting power between a power source and a grid. Such power conversion may include AC/DC, DC/DC, AC/AC and DC/AC.

[0004] A microgrid system can include a variety of interconnected distributed energy resources (e.g., power generators and energy storage units) and loads. The microgrid system may be coupled to the main utility grid through switches such as circuit breakers, semiconductor switches (such as thyristors and IGBTs) and/or contactors. In the event that the microgrid system is connected to the main utility grid, the main utility grid may supply power to the local loads of the microgrid system. The main utility grid itself may power the local loads, or the main utility grid may be used in combination with the power sources of the microgrid to power the local loads.

[0005] A controller comprising hardware and software systems may be employed to control and manage the microgrid system. Furthermore, the

controller may be able to control the on and off state of the switches so that the microgrid system can be connected to or disconnected from the main grid accordingly. The grid connected operation of the microgrid system is commonly referred to as “grid tied” mode, whereas the grid disconnected operation is commonly referred to as “islanded” or “stand alone” mode. A microgrid system in grid-tied mode should be capable of being disconnected from the main grid and transitioning to islanded mode in the case of a grid event in which abnormal operation conditions, such as a power outage, occur at the main utility grid.

[0006] When the microgrid includes a battery bank, a battery energy storage system may be used to provide power to, or to receive power from, the microgrid. The battery energy storage system can be used as an energy storage unit in a smart grid system. Renewable energy sources such as photovoltaic/solar panels and wind turbines are intermittent sources subject to unpredictable and inconvenient weather patterns. The generation source rarely matches the load needs; and therefore, it is desirable to provide energy storage units. The use of energy storage units, which can both store and supply power, allows the microgrid system to provide reliable and stable power to local loads.

[0007] The energy storage units can also store excess energy from the renewable sources (and potentially the grid). For example, renewable energy generation may exceed load demand of the microgrid. Without energy storage capability, the extra generation is lost. If energy storage units are employed in the microgrid, the extra generation can be captured by storing it in the batteries. The energy storage units can then supply this power to local loads and even the main utility grid where appropriate.

[0008] Unfortunately, existing implementation do not enable multiple units to be seamlessly transitioned between grid-tied and stand-alone mode.

BRIEF SUMMARY OF THE INVENTION

[0009] In accordance with the present disclosure, a combination of renewable energy sources and energy storage units may be used to form self-sustaining

microgrids. Such self-sustaining microgrids may be used for critical loads that cannot afford downtime and in remote areas.

[0010] Embodiments of the present invention include a plurality of power converters coupled together and configured to provide a combined power converter output to the load.

[0011] In one aspect, a power system having a plurality of power converters may be coupled together at a point of common coupling (PCC). The power converters may be configured to be coupled to a load at the PCC and provide a combined power converter output to the load. A switch may be coupled to the PCC and configured to be coupled in series between the PCC and an external grid in such a way that when the switch is closed, the power system is in a grid-tied configuration, and when the switch is open, the power system is in a microgrid configuration. A control system, comprising one or more controllers coupled to the plurality of power converters, may be configured to enable the switch to open and close in response to a signal received from one or more sensors monitoring the external grid, enable the power converters to operate in a current control mode when the switch is off and when the system is in the grid-tied configuration, transition the plurality of power converters from grid-tied mode to microgrid mode, and synchronize the power converters such that the converters share the load.

[0012] The PCC may be a shared AC bus.

[0013] The power system may further comprise a proximate sensor coupled between the PCC and the switch and a distal sensor coupled between the switch and the external grid. The control system may enable the distal switch to open and close in response to signals received from the proximate and distal sensors.

[0014] The control system may be further configured to receive a distal sensor signal to measure an external grid input and enable the switch to open when the control system determines that the external grid input is in an abnormal state.

[0015] The control system may be configured to receive a proximate sensor signal to measure a combined power converter output. The control system may further be configured to enable the switch to close when the system determines

that the external grid input is in a normal state and when the combined power converter output substantially matches the external grid input.

[0016] After enabling the switch to close, the control system may be further configured to synchronize the power converters to the external grid voltage. With the synchronization of the converters to the grid, the control system may simultaneously change the frequency of each of the power converters to remain synchronous with each other.

[0017] The power system in which the external grid may be in the abnormal state when at least one of the voltage amplitude or frequency is outside the lower or upper bounds.

[0018] The power system in which the control system is further configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters in such a way that the converters share the load. This synchronization may include the control system being configured to transition one or more of the plurality of converters from the current control mode to a voltage control mode, in such a way that one or more of the converters establishes the voltage of the microgrid.

[0019] The power system in which the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes the control system being configured to record the grid phase angle prior to transitioning to microgrid mode and set the microgrid phase angle according to the recorded grid phase angle.

[0020] The power system in which the control system is further configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the converters in such a way that the converters share the load, may also include the control system being configured to implement droop control on each of the plurality of power converters.

[0021] The power system in which the control system being configured to implement droop control on each of the plurality of power converters may also include the control system being configured to, for each power converter, apply voltage and frequency droop to their respective set points in accordance with

$$U_{set} = U_{nom} - KQV * Q_{out}$$

wherein U_{set} corresponds to a voltage setpoint amplitude,

U_{nom} corresponds to a nominal voltage amplitude,

KQV corresponds to a droop voltage slope (V/kVAR), and

Q_{out} corresponds to a measured output reactive power, and

$$F_{set} = F_{nom} - KPF * P_{out}$$

wherein F_{set} corresponds to a frequency setpoint of the CI output,

F_{nom} corresponds to a nominal frequency,

KPF corresponds to a droop frequency slope (Hz/kW), and

P_{out} corresponds to a measured output active power.

[0022] The power system in which the control system may further comprise a plurality of controllers, each controlling one of the converters that implement droop control on their respective converter.

[0023] The power system in which the control system further comprises a plurality of controllers each controlling one of the plurality of converters, wherein one of the plurality of controllers may be a master controller and the remaining controllers may be slave controllers. The control system that is configured to transition the plurality of converters from grid-tied mode to microgrid mode and synchronize the converters so that the converters share the load may also have a master controller being configured to: enable its power converter to operate in voltage control mode by controlling the voltage amplitude and frequency; and generate active and reactive current commands for the slave controllers to follow. One or more of the slave controllers may be configured to receive the active and reactive current commands from the master controller and enable their power converters to operate in current control mode.

[0024] The power system in which the control system comprises a plurality of slave controllers, each one controlling one of the power converters, and a master controller coordinating the slave controllers being configured to transition the converters from grid-tied mode to microgrid mode and synchronize the converters so that the converters share the load, may also include a master controller being configured to operate in voltage control mode by controlling the microgrid voltage, amplitude, and frequency, and generate active and reactive current commands for the slave controllers to follow. Within this command, the slave controllers may also be configured to receive the active and reactive current commands from the master controller and enable their power converters to operate in current control mode. During this, the output of the converter coupled to one or more of the slave controllers may be controlled using the active and reactive commands from the master controller.

[0025] The power system may further comprise a plurality of power resources coupled to the inverters.

[0026] The power system in which the power sources may be selected from the group consisting of battery power resources, photovoltaic power resources, fuel cell power resources, compressed air storage power resources, capacitor power resources, wind turbine power resources, microturbine power resources, hydro power resources, wave power resources, thermal power resources, flywheel power resources, and biomass power resources.

[0027] The power system in which the plurality of resources includes a battery power resource and a renewable power resource. The control system may be further configured to compare the storage of the battery power resource to a highlimit threshold, and if it exceeds the highlimit threshold, command the renewable power resource to curtail power generation.

[0028] The power system may further comprise one or more DC/DC converters, each serially coupled between one of the power resources and one of the power converters.

[0029] The power system in which the switch may be a contactor, a motorized switch, or a semiconductor AC switch.

[0030] The power system that during an islanded microgrid configuration, the power converters equally contribute to the combined output to the load.

[0031] The power system that during an islanding microgrid configuration, the power converters do not equally contribute to the combined output of the load.

[0032] In another aspect, a method of transitioning a plurality of power converters coupled together at a PCC from a grid-tied mode to a microgrid mode, includes: opening an island switch, coupled in series between the PCC and an external grid; setting the microgrid voltage and frequency commands of the converters to the last known grid voltage and frequency; ramping the microgrid voltage and frequency commands of the converters from the last known grid voltage and frequency to a nominal voltage and frequency; applying a voltage droop to the microgrid voltage command of the converters to facilitate sharing of reactive power; and applying frequency droop to the frequency commands of the converters to facilitate sharing of active power.

[0033] The method may further comprise setting the initial microgrid phase angle according to the last known grid phase angle.

[0034] The method may further comprise monitoring an external grid voltage, amplitude, and frequency to determine whether the islanding switch should be opened if one or more of the external grid voltage, amplitude, or frequency fall outside of the upper or lower bounds.

[0035] The method in which the power converters are coupled to a battery power resource and a renewable power resource that may further comprise comparing a battery storage of the battery power resource to a highlimit threshold, and if the storage exceeds the threshold, commanding the renewable power resource to curtail power.

[0036] In still another aspect, a method of transitioning a plurality of power converters that are coupled together at a PCC from a grid-tied mode to a microgrid mode using a master controller and one or more slave controllers coupled to the power converters, the method may further comprise: opening an islanding switch coupled in series between the PCC and the external grid; setting, by way of master controller, the microgrid voltage and frequency commands from the last known grid voltage and frequency; ramping, by way of

master controller, the microgrid voltage and frequency commands from the last known grid voltage and frequency to nominal voltage and frequency; generating, by way of master controller, active and reactive current commands for one or more slave controllers to follow; operating the one or more slave controllers in current control mode, during which, the output of a power converter coupled to a slave controller is controlled using the active and reactive current commands from the master controller.

[0037] The method may further comprise the master controller setting the initial microgrid phase angle according to the last known grid phase angle.

[0038] The method may further comprise monitoring an external grid voltage, amplitude, and frequency, and opening the islanding switch when the external grid voltage, amplitude, and frequency fall outside the upper or lower bounds.

[0039] The method in which the power converters are coupled to a battery power source and a renewable power resource, that may further comprise comparing, by way of master controller, battery storage of the battery power resource to a highlimit threshold, and commanding the renewable power resource to curtail power if the battery storage exceeds the threshold.

[0040] It should be noted that this disclosure should not be limited to the embodiments described in this disclosure. Numerous other embodiments are also possible using the concepts enclosed herein.

BRIEF DESCRIPTION OF THE FIGURES (NON-LIMITING EMBODIMENTS OF THE DISCLOSURE)

[0041] Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

[0042] Figs. 1A and 1B are exemplary embodiments of a system for islanding multiple grid-tied energy storage inverters to form a microgrid;

[0043] Fig. 2 illustrates an exemplary embodiment for controlling the transition and synchronization of power converters between the grid-tied and microgrid modes;

[0044] Fig. 3 illustrates a method in which a droop method is implemented to synchronize a plurality of power converters;

[0045] Fig. 4 illustrates a method in which a master/slave configuration is implemented to synchronize a plurality of power converters; and

Fig. 5 illustrates a method of controlling the power system according to an embodiment of the present invention in which the power system transitions from microgrid mode to grid-tied mode.

DETAILED DESCRIPTION

[0046] Reference will now be made to the accompanying drawings, which form a part hereof, and which show, by way of illustration, specific exemplary embodiments. The principles described herein may, however, be embodied in many different forms. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like referenced numerals may be placed to designate corresponding parts throughout the different views.

[0047] In the following description of the invention, certain terminology is used for the purpose of reference only, and is not intended to be limiting. For example, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. As used in the description of the invention and the appended claims, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed terms. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps operations, elements, components, and/or groups thereof.

[0048] Embodiments of the present invention include systems and methods for islanding a plurality of power converters to form a microgrid. Power converters

(e.g., a bi-directional power inverter, DC/DC converter, AC/DC converter, etc.) are used in microgrid applications to convert power between a power source and a grid. When it is desired to switch from a grid-tied mode, in which the power converters are connected to an external grid such as a utility grid, to a microgrid mode, it is necessary to disconnect the power converters from the grid and set the voltage of the grid. Embodiments of the present invention utilize inter-unit synchronization and /or control signal communication to seamlessly transition a plurality of power converters from a grid-tied mode to an islanded mode to continue to power the critical loads of the microgrid. Communication between the various components of the power system may be accomplished over a power bus using, for example, X10 protocol.

[0049] When the power converters are connected to the external grid, the power converters may operate in current control (or source) mode under control of a control system. The control system may include the power converter's own controller as well as a site controller that coordinates the various distributed energy resources of the microgrid. The power converter's own controller may be housed within the cabinet of the power converter in an environment protected from the power electronics of the power converter, or an external environment. In a grid-tied mode, the phase of the grid voltage is defined by the grid. The power converters operate in synchronism with the grid frequency and phase.

[0050] When transitioning to microgrid mode, one or more of the power converters may transition to voltage control mode in which the power converter sets the voltage of the microgrid. The power converters may then share the load equally, both in steady state and during transients. In another embodiment, the microgrid may implement unequal load sharing based, for example, on remaining battery energy (state of charge) of individual power converters. Such unequal load sharing may be implemented by a site controller that coordinates the various distributed energy resources of the microgrid or autonomously by the distributed energy resources based on their respective available energies.

[0051] The decision on whether to disconnect from the external grid may be based on the conditions of the external grid. For example, if the external grid voltage or frequency is outside of upper and lower bounds, the control system

may decide to disconnect from the external grid. Exemplary values for the voltage bounds are: Lower bound = -12%, Upper bound = + 10%. Example values for the frequency bounds are: Lower bound = 57 Hz, Upper bound = 60.5 Hz. When the grid voltage is within bounds again, the power converters will automatically synchronize the output voltage with the grid voltage and seamlessly transition to grid-tied operation. In certain cases, disconnection from the external grid may be requested by a grid operator anticipating problems with the grid. In such cases, the microgrid may disconnect from the external grid while still powering local loads.

[0052] Figures 1A and 1B are exemplary embodiments of a system for islanding multiple grid-tied power converters to form a microgrid. In the embodiments shown in figures 1A and 1B, the plurality of power converters 130 and 140 are connected in parallel, and the plurality of power converters 130 and 140 are coupled to a load at a point of common coupling (PCC).

[0053] Referring to Figure 1A, a power system 100 according to an embodiment of the present invention may include power resources 110 and 120, power converters 130 and 140, external grid/AC source 150, disconnect/islanding switch 160, load 170, AC bus 180, and control system 200.

[0054] In the embodiment illustrated in Figure 1A, the power resources 110 and 120 are batteries (or battery banks) and the power converters 130 and 140 are bi-directional power inverters 130 and 140. The bi-directional power converters convert between DC and AC. The battery 110 or 120 and the power inverter 130 or 140 can together be referred to as an energy storage system. Such energy storage systems can be used in numerous applications including, but not limited to, renewable firming, ramp rate control, peak shaving and frequency regulation.

[0055] External grid/source 150 may be the main utility grid, a separate grid segment of the microgrid, or another AC or DC source connected to the microgrid. Disconnect 160 may be the means by which to separate the microgrid from AC Source 150. Disconnect 160 may be an islanding switch that disconnects the external grid 150 from the microgrid. The disconnect 160 may

be, for example, a static disconnect switch, a motorized breaker, contactor, semiconductor AC switch, etc.

[0056] Load 170 represents the load that is actually consuming the energy. Load 170 is represented in Figure 1A on the AC side but may also be a DC load. In an alternative embodiment, the load 170 may not be present.

[0057] The power converters are coupled together at a point of common coupling (PCC) to share the load 170. In the embodiment illustrated in Fig. 1A, the PCC is an AC bus. AC bus 180 interfaces with local load 170 on the microgrid.

[0058] In one example of an implementation based on Figure 1A, two energy storage inverters, 130 and 140 and batteries 110 and 120 are installed adjacent to a building load 170. The building load 170 may be powered by external grid/AC source 150. In this example, the AC source 150 is the utility grid. During normal operation, the batteries 110 and 120 may provide other value streams such as participating in an ancillary services market, providing peak reduction, providing renewables integration, etc. Upon failure of the utility 150 such as a blackout, disconnect 160 is opened by the control system 200. The control system may then transition the power system 100 to microgrid mode. In this mode one or both of inverters 130 and 140 transition from current control (or source) mode to voltage control (or source) mode to continue to supply load 170 with energy during the utility 150 outage. It should be noted that two inverters are shown in Figures 1A and 1B only for exemplary purposes. Any number of inverters may be used within the scope of this invention.

[0059] Once the utility 150 is restored, control system 200 directs the AC voltage of the microgrid to be synchronized with the AC voltage of the utility 150 and directs disconnect 160 to close. Once disconnect 160 is closed with respect to all inverters, inverters 130 and 140 re-synchronize to utility 150 and transition back to current control (or source) operation mode.

[0060] Figure 1B is another exemplary embodiment of a system for transitioning multiple grid-tied power converters between grid-tied and microgrid modes. In the embodiment shown in Figure 1B, solar array 190 replaces battery 120 as one of the power resources. In the embodiment shown in Fig. 1B, power

converter 130 is a bi-directional power inverter that provides energy from or to battery 110, and power converter 140 is a power inverter that converts DC energy from solar array 190 to AC energy suitable for load 170 and/or external grid 150. Similar to the embodiment shown in Fig. 1A, the power system of Fig. 1B transitions between a grid-tied mode to a microgrid mode.

[0061] In another example, with reference to the embodiment of Figure 1B, a battery energy storage inverter 130 may be coupled with battery 110 and installed adjacent to building load 170. A photovoltaic (PV) system comprising of inverter 140 and solar array 190 may also be installed. Solar inverter 140 may or may not be manufactured by the same supplier or even the same type as inverter 130. The PV system may be installed before, at the same time, or after installation of the energy storage system (inverter 130 and battery 110).

[0062] In one example of an implementation based on Figure 1B, the load 170 may be powered by external grid/AC source 150 and solar power from inverter 140. Upon failure of the utility 150, such as a blackout, disconnect 160 is opened via commands from control system 200. Control system 200 may be programmed to transition the system to microgrid mode. In this mode, energy storage inverter 130 transitions from current source mode to voltage source mode to continue to supply load 170 with energy during the utility outage. By energy storage inverter 130 transitioning to voltage source mode, solar inverter 140 may stay in PV production mode and continue to supply load 170 with energy. If the solar production is greater than the power needed by the load, the additional energy may be used, for example, to charge battery 110. If the solar production is below the demand of the load 170, battery 110 may discharge to provide the additional power needed for operation. Once the utility 150 is restored, the AC voltage of the microgrid is synchronized with the AC voltage of the utility grid 150 and the disconnect 160 is closed. Once disconnect 160 is closed power converters 130 and 140 transition back to current control source operation mode.

[0063] In the embodiments illustrated in Figures 1A and 1B, the power converters 130 and 140 are power inverters coupled to DC power sources 110 and 120. However, it should be understood that the invention is not limited to

power inverters or DC sources. For example, the power source 110 may be an AC source such as a wind turbine, and the power converter 130 or 140 may include an AC/DC converter coupled in series to an AC/DC power inverter between the wind turbine and the AC bus 180. Moreover, the microgrid equipment such as battery energy storage inverters, PV and wind systems, diesel generators, etc. may be directly coupled to the bus 180 or through isolation or autotransformers. Furthermore, some distributed assets, such as a wind turbine, may be an AC source and have an AC/AC converter where the input AC is from the turbine to the converter and the output AC connection is to the grid. Power sources 110 and 120 may be any DC source or combination of DC sources and AC sources. Examples of such other sources that may be used are generator(s), wind, PV (photovoltaic), fuel cell, compressed air storage, etc. Power converters 130 and 140 may thus be AC/DC, DC/DC, AC/AC or DC/AC.

[0064] Figure 2 illustrates an exemplary embodiment for controlling the transition and synchronization of the power converters 130 and 140 between the grid-tied and microgrid modes. Control system 200 may include a plurality of controllers. The plurality of controllers may, for example, be field-programmable gate arrays (FPGA) and/or a digital signal processing based controller capable of being updated both locally and remotely.

[0065] Control system 200 may include a plurality of controllers and sensors that communicate with each other for synchronization and transition between grid-tied and microgrid modes. The control system may include a plurality of individual power converter controllers 230 and 240 each controlling one of the power converters of the power system 100. The control system 200 may also include a master controller 210 that is configured to coordinate between individual inverter controllers 230 and 240. The master controller may be a separate site controller, may be one of the individual controllers of one of the power converters, or may be housed within one of the power inverters along with the power converter's individual controller. The controller of one of the individual power converters 230 or the master controller 210 may be configured to monitor voltages on either side of islanding switch 160, i.e. sensing point A and sensing point B using proximal (point A) and distal (point B) sensors. Commercially

available transducers may be used at sensing points A and B to provide a voltage signal to the control system for monitoring the voltage on both sides of islanding switch 160.

[0066] In accordance with some embodiments, AC voltage and frequency of AC source 150 may be monitored by control system 200 at point B. The voltage and frequency may be compared to voltage and frequency boundaries. If either, or both, of the voltage and/or frequency violate the permitted range, the system may transition from grid-tied to microgrid mode. This transition may include at least one of the power converters transitioning from current control (or source) mode to voltage control (or source) mode. Alternatively, a master site controller can operate in voltage control mode to set the voltage of the microgrid, and the power converters may receive current commands from the master site controller and operate in current control mode.

[0067] When operating in a grid-tied mode, islanding switch 160 is closed and energy from energy sources 110 and 190 are coupled with the grid 150. Energy may be used from energy sources 110 and 190 to provide power to the load 170 or additional generation to the utility/grid 150 to support other loads. While islanding switch 160 is closed, the voltage at sensing points A and B should be equal in magnitude, frequency, and phase.

[0068] The connections between inverters 130 and 140 may be made from a conductive material such as copper or aluminum. Islanding switch 160 is preferably a fast acting switch such as a contactor, static switch (semiconductor based), or a motorized breaker. Power converter 130, islanding switch 160, sensor point A and sensor point B may be located close to one another but proximity is not required. In one example, they may be within 50ft apart while in other examples they are 500ft apart or more. For example, disconnect 160 may be located a substantial distance away in a distribution substation. In this case it may be preferred to use a fiber optic link or other high speed link between power converter 130, power converter 140, and disconnect 160. In this embodiment, the entire distribution feeder which may include loads that are not collocated with the inverter, miles of medium voltage distribution line, and step down

transformers to service loads at the load site, may now be islanded from AC source 150.

[0069] If control system 200 senses the voltage or frequency of the voltage are out of bounds, the control system enables the islanding switch 160 to open. The signal from control system 200 may be sent for example, as a relay signal, a fiber optic link, or through other digital communication methods. The voltage and frequency bounds may be settable and can be set and configured based on specific needs such as the load requirements. For example, values for voltage bounds may be set as follows: Lower bound = -12%, Upper bound = +10%. Example values for frequency bounds may be: Lower bound = 57Hz, Upper bound = 60.5Hz. It should be clear to a person of ordinary skill in the art that numerous other voltage and frequency bounds are possible.

[0070] When disconnected from the grid, control system 200 transitions the plurality of power converters from grid-tied mode to microgrid mode and synchronizes the power converters such that the power converters share the load. The power converters transition together using a single disconnect 160 on the same microgrid. In this mode, the power converters may define the phase of the microgrid voltage. During the transition to microgrid mode from grid-tied mode, a snapshot of the phase angle of the grid voltage may be taken along with the last known voltage and frequency. The power converters on the microgrid may then initialize their phase calculations based on this last phase information from the grid. One benefit in preserving the phase is that this allows multiple power converters to be initialized with the same phase value, thereby allowing the transition to microgrid/islanded mode with an initially synchronized condition. Further, the load does not experience a phase jump which may help with smoother transients. A grid voltage waveform has three main attributes. The amplitude is the magnitude of the grid voltage. For example, a 480V system will have a peak amplitude of $480 \times 1.414 = 678\text{V}$. The frequency is the number of voltage sinewaves during a 1s period of time. For example, if there are 60 cycles per second, the frequency is 60Hz. The phase denotes where in the sinewave the voltage waveform is at any given point of time.

[0071] In an embodiment, to facilitate the transition and synchronization, the power system 200 saves the last known grid voltage, grid frequency, and grid phase angle. Thus, when disconnect 160 disconnects from grid 150, the control system has a snapshot of the sine wave of grid 150 at the time the plurality of power converters disconnected from grid 150. Through the control system 200, the power converters can know where the sine wave is at the point where the islanding switch is commanded by power system 200 to open, and the power converters can pick up the sine wave from that spot so the critical loads do not see much of a transient, if any, as they transition from grid-tied mode to microgrid mode.

[0072] In an embodiment, it is possible that one or more of the power converters is unaware of the change of state of disconnect 160. For example, in one case in which the microgrid includes a photovoltaic system comprising a PV inverter 140 and solar array 190 and an energy storage system comprising a storage inverter 130 and a battery 110, it may be unnecessary for the photovoltaic system to be notified of the change of state. For example, when transitioning from grid-tied to microgrid mode, the storage inverter 130 may transition to voltage source mode while PV inverter 140 continues to operate in current source and remains synchronized to the voltage source inverter 130. In this case the PV inverter 140 may be unaware that disconnect 160 is open, i.e. there is no connection to the external grid 150. In this exemplary embodiment, the logic of control system 200 may be housed in controller 230 of inverter 130. In another embodiment, the logic may be implemented by a master controller external to any power converter.

[0073] Upon obtaining the last known grid voltage, frequency, and phase angle, power system 100 may implement different methods to synchronize the plurality of power converters. For example, in an embodiment, the power system may implement a droop control method when transitioning the plurality of power converters to microgrid mode and synchronizing the plurality of inverters. In the droop control method, the control system comprises a plurality of individual power controllers each controlling a power converter. Each of the individual controllers may implement the droop control method on its power converter.

Droop control changes the output frequency of the power converter based on load active power and output voltage amplitude based on load reactive power. In implementing the droop control method, the individual controllers of the power converters do not necessarily have to have direct communication between each other. If the individual controller of the power converter recognizes excess load on itself, the controller reduces the power converter frequency and facilitates sharing the load between the power converters even through there is not necessarily direct communication between the power converters.

[0074] Figure 3 illustrates a method in which power system 100 implements a droop method to synchronize a plurality of power converters. The power converters receive power commands from control system 200. While the power system 100 is running in grid-tied mode, control system 200 regularly checks the grid frequency and grid voltage and determines whether these values are acceptable (step 310). If the grid frequency and grid voltage are not acceptable, control system 200 stores the grid voltage, frequency, and phase angle at the time power system 200 determines that the grid voltage and/or frequency are out of bounds (step 320) and opens the islanding switch (step 330). Steps 340 – 370 are performed by each of the individual power converter controllers. First, the microgrid voltage and frequency are set to the last known grid voltage, frequency, and phase angle (at step 340). Next, the output voltage amplitude and frequency of each power converter is ramped by its corresponding power converter controller from the last known voltage amplitude and frequency to the nominal voltage amplitude and frequency (step 350). Next, each power converter controller applies a voltage droop to the microgrid voltage command, which facilitates the sharing of reactive power (step 360). Finally, each power converter controller applies a frequency droop to the microgrid frequency command which facilitates the sharing of active power among the power converters.

[0075] The following control logic illustrates an embodiment in which the control system includes a plurality of controllers each controlling one power converter. The plurality of power converters each implement a droop control method. In the below embodiment, each of the power converters transitions from a current control mode to a voltage control mode when the power system

transitions from grid-tied to microgrid mode. Each of the power converters may operate independently when transitioning from grid-tied mode to microgrid mode and synchronizing the power converters. Thus, the below control logic is implemented on each of the power converters of the power system.

```
while(state=runPQ and grid_ok=1)
    controlP(Pcmd_usr);
    controlQ(Qcmd_usr);
    check_grid(grid_ok);

    if (grid_ok != 1)
        state = transition_uf;
        last_volt = grid_volt;
        last_freq = grid_freq;
        last_ph = grid_ph;
    else if
        state = runPQ;
    endif

endwhile
```

[0076] In the above control logic, the power system is running in grid-tied mode prior to transitioning to microgrid mode. `while(state=runPQ and grid_ok=1)` is where the power converters of the power system are running in grid-tied mode and the grid conditions are within bounds. In this case, the power converters may receive active power (P) and reactive power (Q) commands `Pcmd_usr` and `Qcmd_usr` from a site master controller (user). `'controlP(Pcmd_usr)'` and `'controlQ(Qcmd_usr)'` are routines to control the active and reactive power of the power converter to be the power command. `check_grid(grid_ok)` is a routine to check the external grid. This routine monitors the grid voltage amplitude and frequency. `if (grid_ok != 1)` refers to the situation in which grid conditions are abnormal. `state = transition_uf` initiates transition to microgrid mode. `last_volt = grid_volt`, `last_freq = grid_freq`, and `last_ph = grid_ph` store the last known grid voltage, frequency, and phase angle, which may be a grid voltage or frequency that is out of bounds and is considered abnormal. `state = runPQ` continues to run the power system in grid-tied mode when the grid is normal.

[0077] The following control logic illustrates the transition of the power system from grid-tied mode to microgrid mode. Similar to the above control logic, this control logic is implemented by each of the power converters.

```
while(state=transition_uf)
    open_Kext();
    wait(Kext_open_tm);
    Pha = Pha + freq*dt;

    ramp(U_set, last_volt, volt_nom, ramprate_U)
    ramp(F_set, last_freq, freq_nom, ramprate_F)

    U_set = U_nom - KQV * Qout;
    F_set = F_nom - KPF * Pout;

    controlU(U_set);
    controlF(F_set);

    if (U_set=U_nom and F_set=F_nom and Kext=open)
        state = runUF;
    elseif
        state = transitionUF;
    endif

endwhile
```

[0078] During the transition state (i.e., transition_uf), the output voltage amplitude and the frequency of the power converter is ramped from the last known voltage amplitude and frequency (which may be a voltage or frequency that is out of bounds and considered abnormal) to the nominal voltage amplitude and frequency. The nominal (or normal) voltage and frequency may, for example, be 480V, 60 Hz. open_Kext() commands the islanding switch to open. wait(Kext_open_tm) is a command to wait for the amount of time that it takes the islanding switch to open. In some embodiments, this wait may not be applied, in which the time is 0. Pha=PHA +freq*dt is a routine that conducts the phase calculation. dt is the loop time for the calculations. When transitioning to microgrid mode, the phase for microgrid mode is initialized with the phase from the last known grid phase angle. ramp(U_set, last_volt, volt_nom, ramprate_U) and ramp(F_set, last_freq, freq_nom, ramprate_F) ramp the microgrid voltage and frequency commands/setpoints from the last known grid voltage and

frequency to the nominal voltage and frequency. This initialization is performed to minimize transients and to have a smooth transition to microgrid mode. In the ramp routines, the output is U_set and F_set . The inputs are the initial conditions of the last grid voltage and frequency and the ramp rate to be applied. $U_set = U_nom - KQV * Qout$ applies a voltage droop to the voltage command to facilitate sharing of reactive power. U_nom is the nominal voltage. KQV (V/kVAR) is the droop slope. The droop slope may be set to minimize the voltage excursion while, at the same time, having high speed sharing between the power converters. For example, a value of $Kdrp = 20\%RatedKVA/Volt$ may cause a drop of 1V when a power converter is outputting 20% of its rated reactive output. For a 480V system this may be acceptable. If the system is set to a lower voltage than 480V, this value may be reduced. $Qout$ is the measured output reactive power and is measured by each power converter using for example, internal voltage and current sensors. $controlU(U_set)$ is a routine to control the microgrid voltage to the voltage command/setpoint, and $controlF(F_set)$ is a routine to control the microgrid frequency to the frequency command/setpoint. if ($U_set=U_nom$ and $F_set=F_nom$ and $Kext=open$) checks if ramping of voltage and frequency is finished and if the islanding switch is open, and if so the transition is finished and microgrid mode is running (state - runUF). Otherwise the power system remaining in the transition state (state _ transition UF). [0079] The following control logic illustrates the power systems operation in microgrid mode (state=runUF). Similar to the above control logic, this control logic is implemented by each of the power converters.

```
while(state=runUF)
    U_set = U_nom - KQV * Qout;
    F_set = F_nom - KPF * Pout;

    if (storage_SOC > SOC_highlimit)
        curtail_generation();
    elseif
        unconstrained_generation();
    endif

    controlU(U_set);
    controlF(F_set);
endwhile
```

[0080] In the above control logic, each of the power converters continues to apply the frequency and voltage droop. In addition, when the power converter is coupled to a battery power resource, its controller may monitor the charge of the battery power resource to determine whether renewable generation should be curtailed. $U_{set} = U_{nom} - K_{QV} * Q_{out}$ and $F_{set} = F_{nom} - K_{PF} * P_{out}$ are the voltage and frequency droop, which are continued to be applied to the voltage and frequency commands/set points in microgrid mode. if (storage_SOC > SOC_highlimit) checks whether battery storage is getting overcharged. curtail_generation() curtails generation of the renewable power resource, which may be accomplished by, for example, by turning off the generation, commanding the renewable resource to produce less, increasing the microgrid frequency to signal the resource to produce less, or tripping the renewable resource offline by changing the microgrid frequency beyond the nominal frequency. unconstrained_generation() allows the renewable resource to generate power unconstrained. controlU(U_{set}) and controlF(F_{set}) are routines to control the microgrid voltage and microgrid frequency to the voltage and frequency setpoints/commands.

[0081] In another embodiment, a master/slave configuration may be implemented on the plurality of power converters. In a master/slave configuration, one of the power converters can act as a microgrid master which attempts to control the output voltage amplitude and frequency. Alternatively, the site controller may act as a master controller. In this case, the power converters may all be slave devices.

[0082] The master power converter or master controller commands the slave power converters to output a certain level of active and reactive currents by sending active and reactive current commands to the slave power converters. The amplitude of these current references may be calculated in a closed-loop fashion based on microgrid voltage control. That is, one master inverter may control the voltage, and the other slave inverters may receive a command from the master inverter regarding the current they should supply into the microgrid so that the load can be shared between multiple inverters.

[0083] Once in microgrid mode, fast communication signals may be required between the master and slave devices to make sure that all of the devices are aligned and operating at the same frequency as the frequency of the microgrid, for example, at 60Hz. These signals may include the current references and synchronization signals. The synchronization signals may be, for example, electrical or fiber optic carried pulses that are sent at regular intervals. In another embodiment, the synchronization signals may be time based synchronization signals based on a standard protocol such as IEEE 1588.

[0084] In an embodiment in which the power system comprises a plurality of energy storage inverters, the master controller or master power converter may issue real and reactive current commands to the slave power inverters based on the remaining energy available in the individual storage devices. For example, the master controller may issue a current command that is greater in value to a slave storage inverter coupled to a storage device with more energy, while also issuing a current command that is less in value to a slave storage inverter coupled to a storage device with less energy.

[0085] When the power system includes an energy storage system comprising a battery and a power converter and a renewable energy storage system, surplus renewable energy may exist. This surplus energy may be used to charge the battery. In this case, there is the possibility of overcharging storage devices and creating an unstable situation on the microgrid. To counter this, the master controller device may send power curtail commands to renewable generation sources, send shutdown commands to generation sources or adjust the microgrid frequency to trip the generation sources offline. When the storage devices are sufficiently depleted to be able to accept charge again, the renewable devices may be brought back online by restoring the microgrid frequency to nominal values and allowing the generation devices to reconnect to the microgrid.

[0086] Figure 4 illustrates a method in which a master/slave configuration is implemented. Control system 200 checks the grid voltage and grid frequency (step 410). If the grid voltage and/or the grid frequency are out of bounds, the control system 200 stores the grid voltage and frequency at the time power system 200 determines that the grid voltage and/or frequency are out of bounds

(step 420). The master controller and each of the plurality of slave controllers then perform a series of steps. The master controller opens the islanding switch (step 430). Next, the master controller sets the microgrid voltage, initial phase angle, and frequency to the last known grid voltage and frequency (i.e., the stored grid voltage, frequency, and phase angle) (step 440). The master controller ramps the microgrid voltage and frequency commands from the last known grid voltage and frequency to the nominal grid voltage and frequency (step 450). The master controller generates active and reactive power commands and transmits these commands to the slave power converters (step 460). The slave power converters receive the active and reactive power commands and operate in current control mode according to the received commands (step 480).

[0087] The following control logic illustrates an embodiment in which a master-slave setup is implemented. The control system includes a master controller operating in voltage control mode and one or more slave controllers operating in current control mode. The master controller may be one of the individual controllers that controls its respective power converter, in which case the power converter may be referred to as a master power converter. In another embodiment, the master controller may be a site-wide controller that coordinates the distributed energy resources of the overall system. The slave controllers each may be an individual controller that controls its respective slave power converter. The master controller controls the transition to microgrid mode and commands the slave power converters to follow the current command.

```
while(state=runPQ and grid_ok=1)
    controlP(Pcmd_usr);
    controlQ(Qcmd_usr);
    check_grid(grid_ok);

    if (grid_ok != 1 and is_master)
        state = transition_uf;
        last_volt = grid_volt;
        last_freq = grid_freq;
        last_ph = grid_ph;
        command_slave(transition_uf);
    else if
        state = runPQ;
```

```
endif  
endwhile
```

[0088] In the above control logic, the power system is running in grid-tied mode (PQ) prior to transitioning to microgrid mode (UF). while(state=runPQ and grid_ok=1) is where the power converters of the power system are running in grid-tied mode and the grid conditions are within bounds. In this case, the power converters may receive active power (P) and reactive power (Q) commands Pcmd_usr and Qcmd_usr from a site master controller (user). These may also be referred to as the setpoints of the power converter. 'controlP(Pcmd_usr)' and 'controlQ(Qcmd_usr)' are routines to control the active and reactive power of the power converter to be the power command. check_grid(grid_ok) is a routine to check the external grid. This routine monitors the grid voltage amplitude and frequency. if (grid_ok != 1 and is_master) applies to the master controller and refers to the situation in which grid conditions are abnormal. state = transition_uf initiates transition to microgrid mode. last_volt = grid_volt and last_freq = grid_freq store the last known grid voltage and frequency, which may be a grid voltage or frequency that is out of bounds and is considered abnormal. state = runPQ continues to run the power system in grid-tied mode when the grid is normal.

[0089] The following control logic illustrates an embodiment of the transition of the power system from grid-tied mode to microgrid mode when the controller is the master controller. As noted above, the below control logic may be implemented by the controller of a master inverter, or alternatively, may be implemented by the site master controller.

```
while(state=transition_uf)  
    open_Kext();  
    wait(Kext_open_tm);  
    Pha = Pha + freq*dt;  
    ramp(U_set, last_volt, volt_nom, ramprate_U)  
  
    ramp(F_set, last_freq, freq_nom, ramprate_F)  
    U_set = U_nom - KQV * Qout;  
    F_set = F_nom - KPF * Pout;  
  
    controlU(U_set);
```

```
controlF(F_set);  
  
if (U_set=U_nom and F_set=F_nom and Kext=open)  
    state = runUF;  
elseif  
    state = transitionUF;  
endif  
endwhile
```

[0090] During the transition state (i.e., transition_uf), the microgrid voltage amplitude and frequency are ramped from the last known voltage amplitude and frequency (which may be a voltage or frequency that is out of bounds and considered abnormal) to the nominal voltage amplitude and frequency by the master controller. The nominal (or normal) voltage and frequency may, for example, be 480V, 60 Hz. open_Kext() commands the islanding switch to open. wait(Kext_open_tm) is a command to wait for the amount of time that it takes the islanding switch to open. In some embodiments, this wait may not be applied, in which the time is 0. Pha=PHA +freq*dt is a routine that conducts the phase calculation. dt is the loop time for the calculations. When transitioning to microgrid mode, the phase for microgrid mode is initialized with the phase from the last known grid phase angle. ramp(U_set, last_volt, volt_nom, ramprate_U) and ramp(F_set, last_freq, freq_nom, ramprate_F) ramp the microgrid voltage and frequency commands/setpoints from the last known grid voltage and frequency to the nominal voltage and frequency. This initialization is performed to minimize transients and to have a smooth transition to microgrid mode. In the ramp routines, the output is U_set and F_set. The inputs are the initial conditions of the last grid voltage and frequency and the ramp rate to be applied. controlU(U_set, F_set, Id_cmd, Iq_cmd) is a routine to control the microgrid voltage to the microgrid voltage command/setpoint and the microgrid frequency to the microgrid frequency command/setpoint. In addition to controlling the microgrid voltage and frequency, the master controller generates active and reactive current commands (Ild_cmd and Iq_cmd) for the slave controllers operating in current control mode to follow. if (U_set=U_nom and F_set=F_nom and Kext=open) checks if ramping of voltage and frequency is finished and if the islanding switch is open, and if so the transition is finished and microgrid mode is

running (state = runUF). Otherwise the power system remains in the transition state (state = transition UF).

[0091] The following control logic illustrates the transition of the power system from grid-tied mode to microgrid mode when the controller is a slave controller.

```
while(state=transition_uf and is_slave)
    control_current(ld_cmd, lq_cmd);
endwhile
```

[0092] control_current(ld_cmd, lq_cmd) is the slave power converter's routine when transitioning to microgrid mode. The slave power converter is operating in current control mode, and the slave controller of the slave power converter receives the real and reactive current commands ld_cmd, lq_cmd from the master controller.

[0093] The following control logic illustrates an embodiment of the power systems operation in microgrid mode (state=runUF) when the controller is a master controller.

```
while(state=runUF and is_master)
    controlU(U_set, F_set, ld_cmd, lq_cmd);
    if (storage_SOC > SOC_highlimit)

        curtail_generation();
    elseif
        unconstrained_generation();
    endif
endwhile
```

[0094] In the above control logic, the master controller continues the routine to control the microgrid voltage to the microgrid voltage command/setpoint and the microgrid frequency to the microgrid frequency command/setpoint. In addition to controlling the microgrid voltage and frequency, the master controller generates active and reactive current commands (lld_cmd and lq_cmd) for the slave controllers operating in current control mode to follow. if (storage_SOC > SOC_highlimit) checks whether battery storage is getting overcharged.

curtail_generation() curtails generation of the renewable power resource.
unconstrained_generation() allows the renewable resource to generate power unconstrained.

[0095] The following control logic illustrates an embodiment of the power systems operation in microgrid mode (state=runUF) when the controller is a slave controller controlling one of the power converters.

```
while(state=runUF and is_slave)
    control_current(ld_cmd, lq_cmd);
endwhile
```

[0096] In the above control logic, the slave controller continues to operate in current control mode, and the slave controller of the slave power converter receives the real and reactive current commands ld_cmd, lq_cmd from the master controller to control the output current to the real and reactive current commands ld_cmd, lq_cmd.

[0097] Figure 5 illustrates a method of controlling the power system according to an embodiment of the present invention in which the power system transitions from microgrid mode to grid-tied mode. Generally, while operating in microgrid mode, control system 200 may continuously check the voltage and frequency of the grid side of disconnect 160 and determine if the measured voltage and frequency are within the boundaries defined. These boundaries may be defined, for example, by regulatory compliance requirements for inverters.

[0098] Control system 200 may be configured to check the voltage and frequency periodically by using a countdown timer. In some implementations, once acceptable voltage and frequency are measured, a preset amount time may need to pass prior to reconnecting to the grid to help ensure that the voltage and frequency are stable.

[0099] Referring to Figure 5 in more detail, the control system 200 may perform an analysis to determine whether it is safe to transition to grid-tied mode (step 510). The analysis may include determining whether the grid frequency is within bounds (step 520), whether the grid voltage (step 530) is within bounds and whether the grid reconnect timer has expired (step 540). If any of steps 520, 530, or 540 fail, the process restarts at step 510. Otherwise, when the grid

frequency and voltage are within bounds and the reconnect timer expires, the voltage source is synchronized to the grid voltage at step 550.

[00100] The synchronization of the voltage source to the grid voltage may comprise adjusting the frequency of the microgrid gradually, to align the phase of the microgrid with the grid voltage and lock in to the grid voltage. For example, in an embodiment, there is a voltage source on both sides of disconnect 160, one voltage source may be the grid while the other voltage source is the microgrid. Once control system 200 determines that the synchronization has occurred, disconnect 160 may be closed (step 560) because the voltages on either side of disconnect 160 are the same or nearly the same. Thus, any large transience is avoided as disconnect 160 is closed. After a preset period of time (step 570), the power converters will transition to current source mode and the operation will resume to grid-tied mode. The preset time period may be based on the amount of time it will take for the disconnect 160 to close once control system 200 issues a close command.

[00101] Instead of having voltage sensors B going back to the control system 200, a commercially available synchronizing relay may be used. The relay may send a signal to the control system once the phase of the microgrid is matched to the phase of the utility grid. Based upon this signal the control system 200 could close disconnect 160.

[00102] The above described embodiments are described as a microgrid connected to a utility grid as the external grid. However, it should be understood that the external grid is not limited to a utility grid. For example, the microgrid could be further segmented into multiple microgrids. Each of the microgrids would have an energy source (renewable, generators, storage) and a load. The microgrids could then re-connect and disconnect from/to each other as needed.

[00103] The disclosed embodiments provide power systems and methods in which a plurality of power converters connected in parallel seamlessly transition from grid-tied mode to microgrid mode. In embodiments of the present invention, by way of inter-unit synchronization and/or control signal communication, upon detection of abnormal grid voltage and/or frequency conditions, a plurality of

power converters may seamlessly transition to islanded mode, form a microgrid and continue powering the critical island load.

[00104] It will be apparent to those skilled in the art that various modifications and variations can be made to the disclosed power system without departing from the scope of the disclosure. Other embodiments of the present disclosure will be apparent to those skilled in the art from consideration of the specification and practice of the present disclosure. It is intended that the specification and examples be considered as exemplary only, with a true scope of the present disclosure being indicated by the following claims and their equivalents.

CLAIMS

1. A power system comprising:

a plurality of power converters coupled together at a point of common coupling (PCC), wherein the power converters are configured to be coupled to a load at the PCC and the power converters are configured to provide a combined power converter output to the load;

a switch coupled to the PCC, wherein the switch is configured to be coupled in series between the PCC and an external grid such that when the switch is closed the power system is in a grid-tied configuration and such that when the switch is open the power system is in an microgrid configuration;

a control system comprising one or more controllers coupled to the plurality of power converters, the control system being configured to:

enable the switch to open and close in response to a signal received from one or more sensors for monitoring the external grid;

enable the power converters to operate in a current control mode when the switch is closed and when the power system is in the grid-tied configuration

transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load.

2. The power system of claim 1, wherein the PCC is a shared AC bus.

3. The power system of claim 1, further comprising:

a proximate sensor coupled between the PCC and the switch; and
a distal sensor coupled between the switch and the external grid,
wherein the control system enables the switch to open and close in response
to signals received from the proximate sensor and the distal sensor.

4. The power system of claim 3, wherein:

the control system is configured to receive a distal sensor signal to measure
an external grid input, and

the control system is configured to enable the switch to open when the control
system determines that the external grid input is in an abnormal state.

5. The power system of claim 4, wherein

the control system is configured to receive a proximate sensor signal to
measure a combined power converter output, and

the control system is configured to enable the switch to close when the control
system determines that the external grid input is in a normal state and when the
combined power converter output substantially matches the external grid input.

6. The power system of claim 5, wherein

the control system is configured to, after enabling the switch to close,
synchronize each of the power converters to the external grid voltage, wherein in
synchronizing each of the power converters to the grid the control system changes
the frequency of each of the power converters together so that the power converters
remain synchronous with each other.

7. The power system of claim 5, wherein

the external grid is in the abnormal state when at least one of a voltage amplitude or frequency is outside of lower or upper bounds.

8. The power system of claim 1, wherein the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes the control system being configured to:

transition one or more of the plurality of power converters from the current control mode to a voltage control mode in which the one or more of the plurality of power converters establishes the voltage of the microgrid.

9. The power system of claim 1, wherein the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes the control system being configured to:

record the grid phase angle prior to transitioning to microgrid mode; and
set the initial microgrid phase angle according to the recorded grid phase angle.

10. The power system of claim 1, wherein:

the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes the control system

being configured to implement droop control on each of the plurality of power converters.

11. The power system of claim 10, wherein the control system being configured to implement droop control on each of the plurality of power converters includes the control system being configured to, for each power converter, apply voltage droop to a voltage setpoint and frequency droop to a frequency setpoint in accordance to

$$U_set = U_nom - KQV * Qout$$

wherein U_set corresponds to a voltage setpoint amplitude,

U_nom corresponds to a nominal voltage amplitude,

KQV corresponds to a droop voltage slope (V/kVAR), and

$Qout$ corresponds to a measured output reactive power, and

$$F_set = F_nom - KPF * Pout$$

wherein F_set corresponds to a frequency setpoint of the CI output,

F_nom corresponds to a nominal frequency,

KPF corresponds to a droop frequency slope (Hz/kW), and

$Pout$ corresponds to a measured output active power.

12. The power system of claim 10, wherein the control system comprises a plurality of controllers each controlling one of the power converters, and each of the controllers implements the droop control on the one of the power converters.

13. The power system of claim 1, wherein:

the control system comprises a plurality of controllers each controlling one of the plurality of power converters, wherein one of the plurality of controllers is a master controller and the remaining one or more controllers are slave controllers, and

the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes:

the master controller being configured to:

enable its power converter to operate in voltage control mode by controlling the microgrid voltage amplitude and frequency; and

generate active and reactive current command for the slave controllers to follow; and

the one or more slave controller being configured to

receive the active and reactive current commands from the master controller; and

enable their power converters to operate in current control mode.

14. The power system of claim 1, wherein:

the control system comprises a plurality of slave controllers each controlling one of the plurality of power converters and a master controller coordinating the plurality of slave controllers, and

the control system being configured to transition the plurality of power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the power converters share the load includes:

the master controller being configured to:

operate in voltage control mode by controlling the microgrid voltage amplitude and frequency; and

generate active and reactive current commands for the slave controllers to follow; and

the one or more slave controller being configured to

receive the active and reactive current commands from the master controller; and

enable their power converters to operate in current control mode during which the output current of a power converter coupled to a slave controller of the one or more slave controllers is controlled using the active and reactive current commands from the master controller.

15. The power system of claim 1, further comprising a plurality of power resources coupled to the inverters.

16. The power system of claim 15, wherein the power resources are selected from the group consisting of battery power resources, photovoltaic power resources, fuel cell power resources, compressed air storage power resources, capacitor power resources, wind turbine power resources, microturbine power resources, hydro power resources, wave power resources, thermal power resources, flywheel power resources, and biomass power resources.

17. The power system of claim 15, wherein the plurality of resources include a battery power resource and a renewable power resource, and the control system is further configured to:

after transitioning the plurality of power converters from grid-tied mode to microgrid mode, compare a battery storage of the battery power resource to a highlimit threshold of the battery power resource, and if the battery storage exceeds the highlimit threshold, command the renewable power resource to curtail power generation.

18. The power system of claim 15, further comprising one or more DC/DC converters each serially coupled between one of the power resources and one of the power converters.

19. The power system of claim 1, wherein the switch is one of a contactor, a motorized switch, and a semiconductor AC switch.

20. The power system of claim 1, wherein when in an islanding microgrid configuration the power converters equally contribute to the combined output to the load.

21. The power system of claim 1, wherein when in an islanding microgrid configuration the power converters do not equally contribute to the combined output to the load.

22. A method of transitioning a plurality of power converters that are coupled together at a point of common coupling (PCC) from a grid-tied mode to a microgrid mode, the method comprising:

- opening an islanding switch coupled in series between the PCC and an external grid;

- setting the microgrid voltage and frequency commands of the power converters to the last known grid voltage and grid frequency;

- ramping the microgrid voltage and frequency commands of the power converters from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency;

- applying a voltage droop to the microgrid voltage command of the power converters to facilitate sharing of reactive power; and

- applying a frequency droop to the frequency commands of the power converters to facilitate sharing of active power.

23. The method of claim 22, further comprising:

- setting the initial microgrid phase angle according to the last known grid phase angle.

24. The method of claim 22, further comprising:

- monitoring an external grid voltage amplitude and frequency to determine whether the external grid voltage amplitude and frequency fall outside of upper or lower bounds and the islanding switch should be opened.

25. The method of claim 22, wherein the power converters are coupled to a battery power resource and a renewable power resource, the method further comprising:

comparing a battery storage of the battery power resource to a highlimit threshold of the battery power resource, and if the battery storage exceeds the highlimit threshold commanding the renewable power resource to curtail power.

26. A method of transitioning a plurality of power converters that are coupled together at a point of common coupling (PCC) from a grid-tied mode to a microgrid mode using a master controller and one or more slave controllers coupled to the power converters, the method comprising:

opening an islanding switch coupled in series between the PCC and the external grid;

setting, by the master controller, the microgrid voltage and frequency commands to the last known grid voltage and grid frequency;

ramping, by the master controller, the microgrid voltage and frequency commands from the last known grid voltage and grid frequency to a nominal voltage and a nominal frequency;

generating, by the master controller, active and reactive current commands for the one or more slave controllers to follow;

operating the one or more slave controllers in current control mode during which the output current of a power converter coupled to a slave controller of the one or more slave controllers is controlled using the active and reactive current commands from the master controller.

27. The method of claim 26, further comprising:

setting, by the master controller, the microgrid initial phase angle according to the last known grid phase angle.

28. The method of claim 26, further comprising:

monitoring an external grid voltage amplitude and frequency to determine whether the external grid voltage amplitude and frequency fall outside of upper or lower bounds and the islanding switch should be opened.

29. The method of claim 26, wherein the power converters are coupled to a battery power resource and a renewable power resource, the method further comprising:

comparing, by the master controller, a battery storage of the battery power resource to a highlimit threshold of the battery power resource, and if the battery storage exceeds the highlimit threshold commanding the renewable power resource to curtail power.

ABSTRACT OF THE DISCLOSURE

A power system having a plurality of power converters coupled together at a point of common coupling (PCC). The power converters are coupled to a load and provide a combined power converter output to the load. A switch is coupled in series between the PCC and an external grid. When the switch is closed, the power system is in a grid-tied configuration and when the switch is open, the power system is in a microgrid configuration. A control system coupled to the power converters enables the switch to open and close in response to a signal received from one or more sensors monitoring the external grid, enables the power converters to operate in a current control mode when the switch is closed, and transitions the power converters from grid-tied mode to microgrid mode and synchronize the power converters such that the converters share the load.

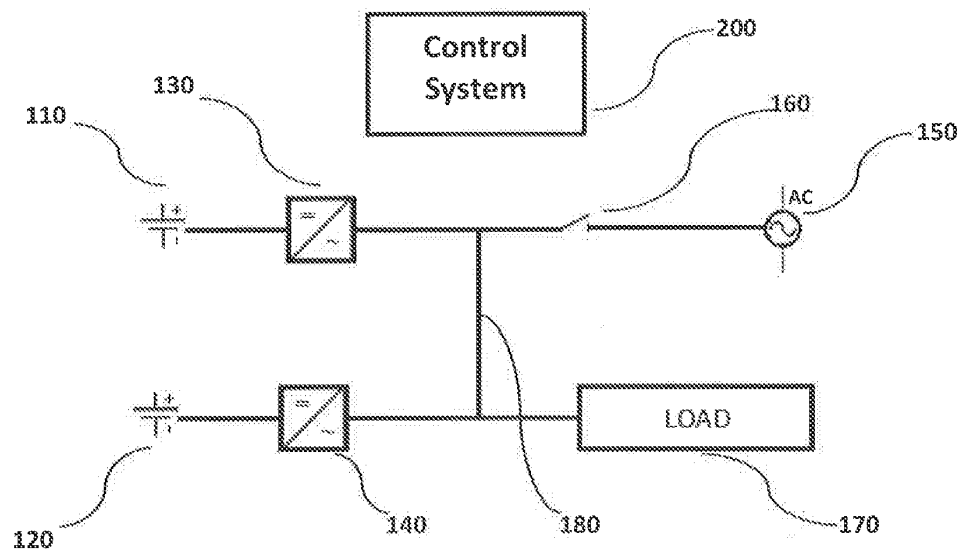


FIG. 1A

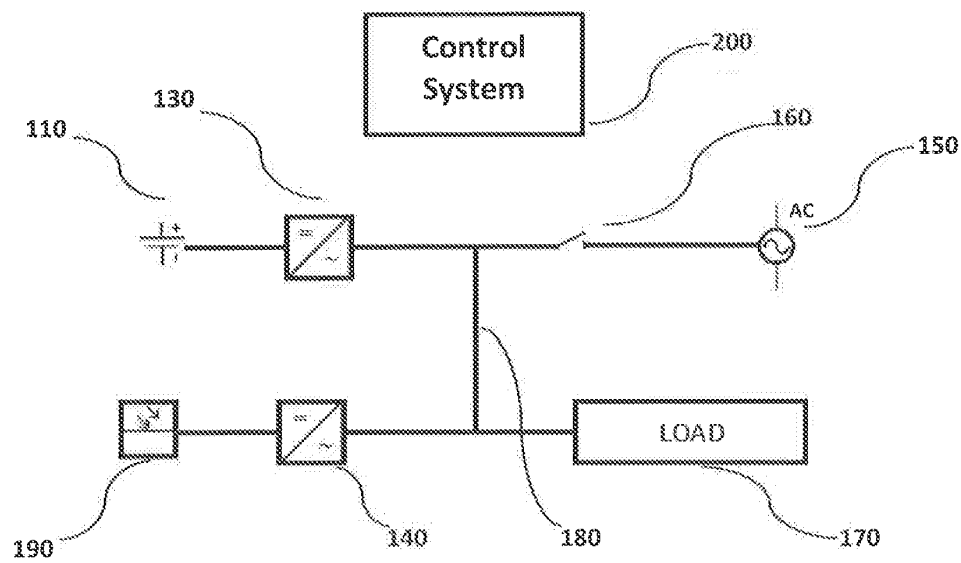


FIG. 1B

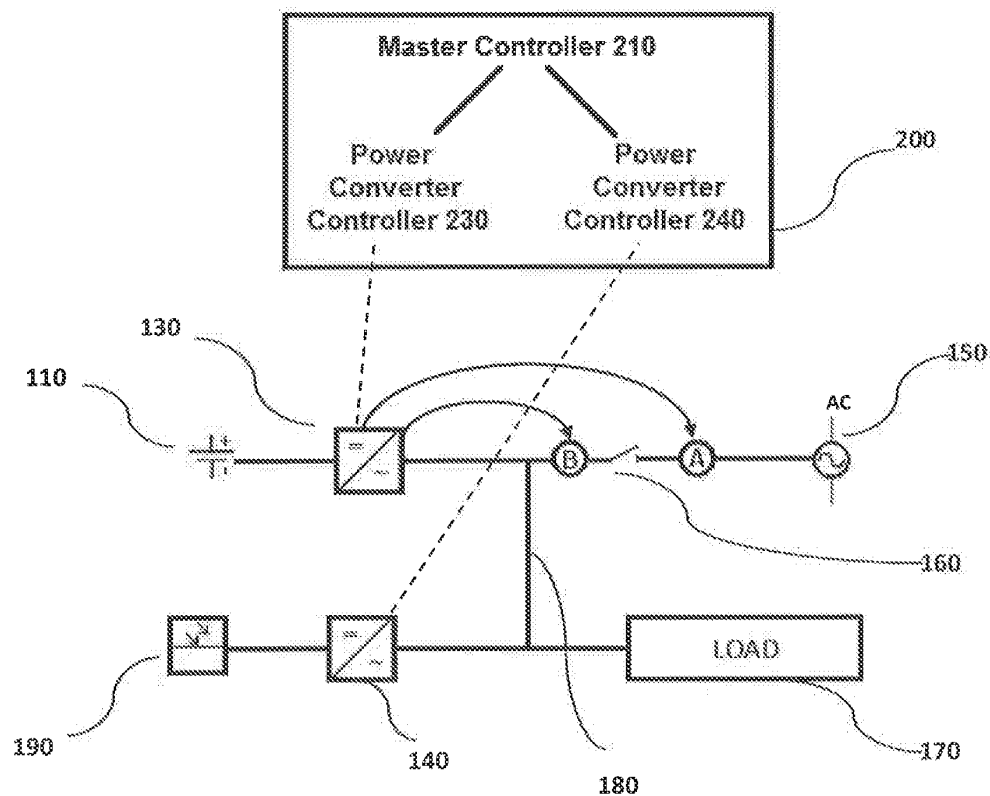


FIG. 2

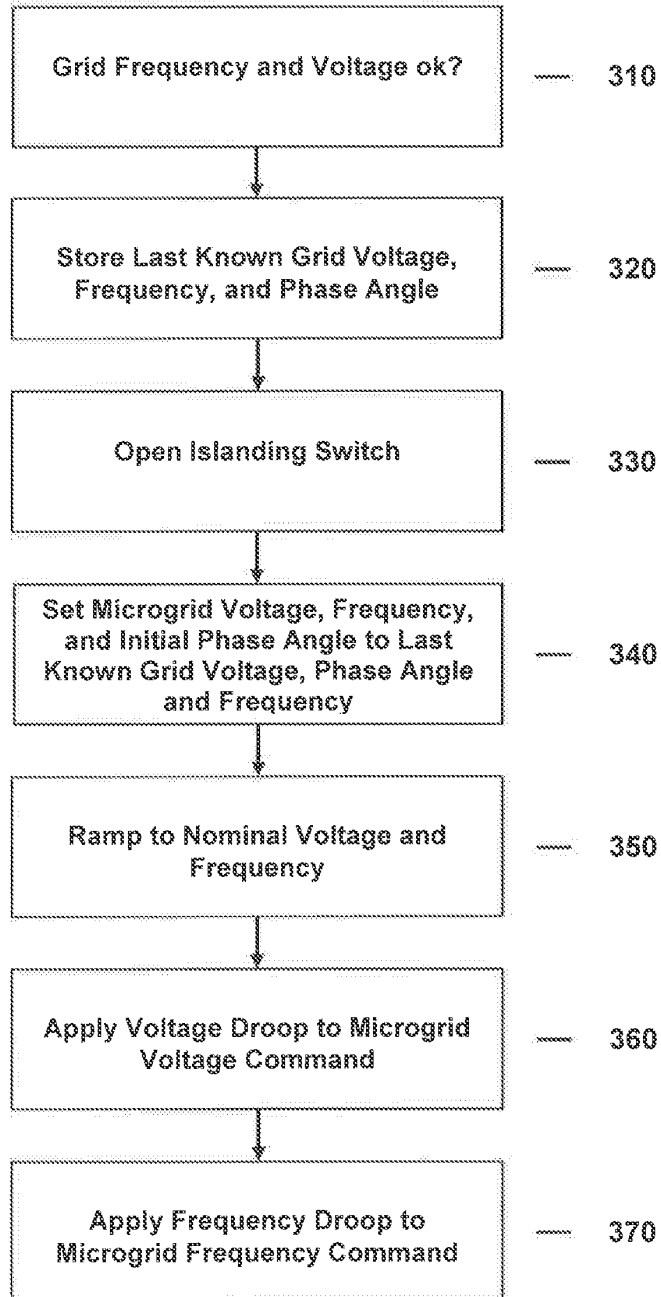


FIG. 3

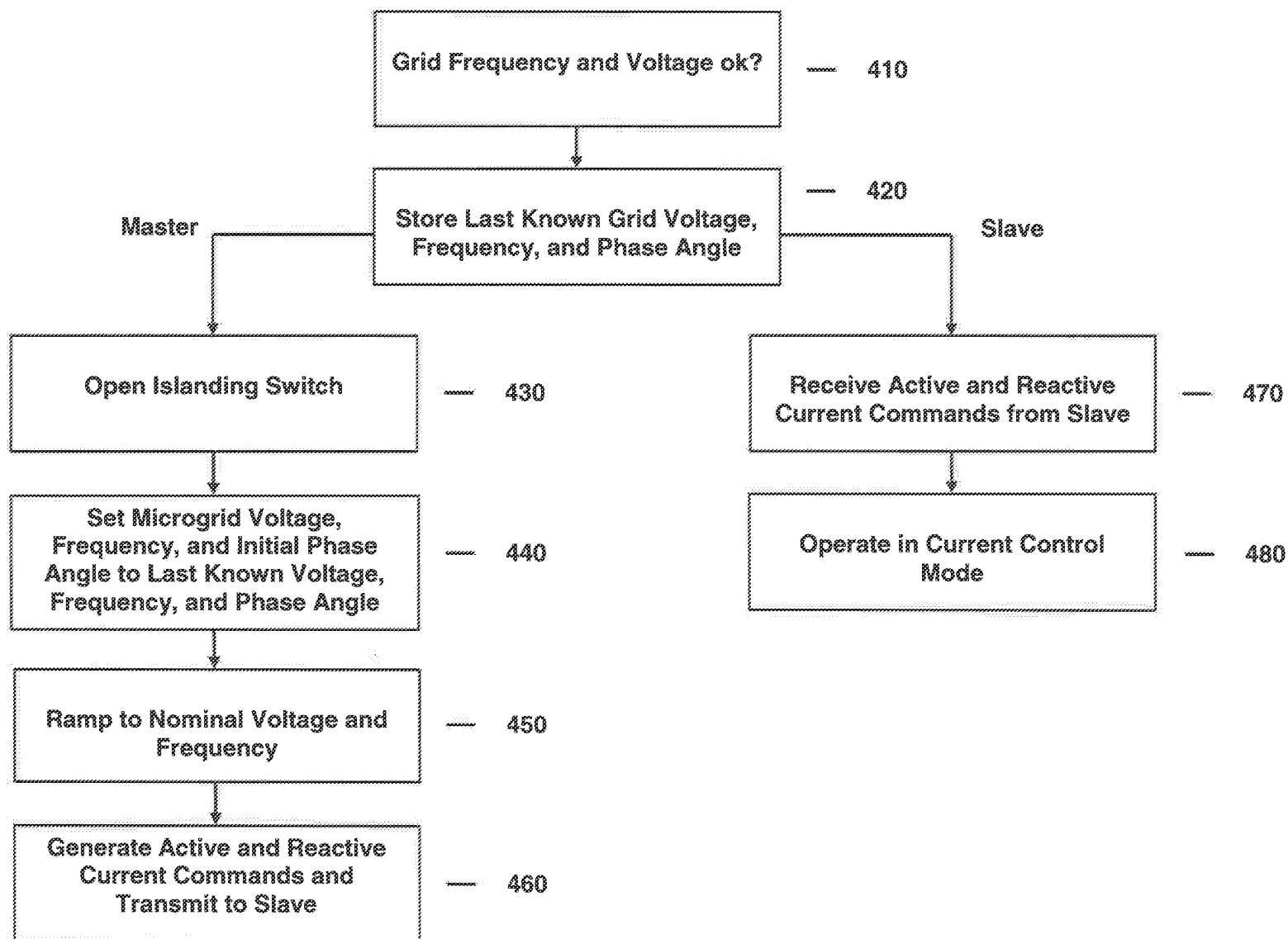


FIG. 4

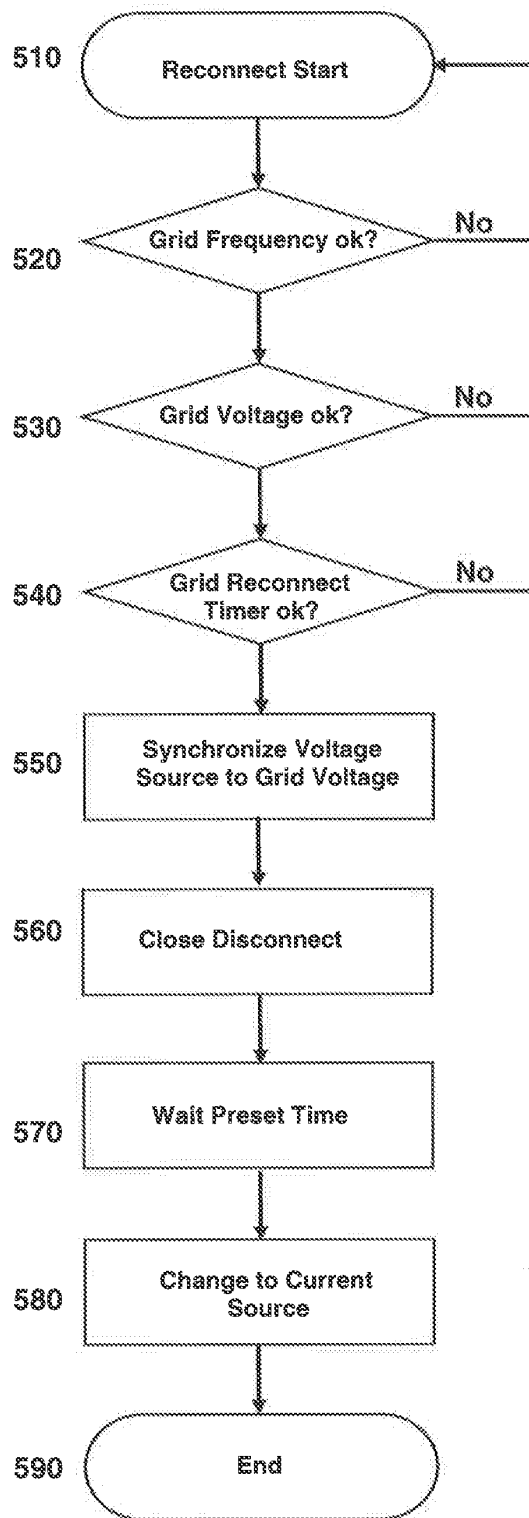


FIG. 5

DOCKET: CU-72846

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION
USING AN APPLICATION DATA SHEET (37 CFR 1.76)**

TITLE OF INVENTION:

ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS

As the below named inventor, I hereby declare that:

This declaration is directed to:

(check one applicable item below)

☒ The attached application, or

☐ United States application or PCT international application

Number _____ filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

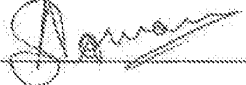
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

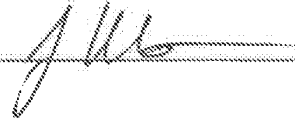
WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Page 1 of 2

LEGAL NAME OF INVENTOR:

Inventor: Apurva SOMANI Date (Optional): 6/27/16
Signature: 

Inventor: John C. PALOMBINI Date (Optional): 6/27/16
Signature: 

Note: An Application Data Sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form.

Separate forms may be used for each inventor.

For applications entering US national phase where PCT application was filed prior to September 16, 2012, use former Declaration pre-AIA provisions

L&P 09/2012 (From Form PTO/AIA/01)

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:



Practitioners associated with Customer Number:

26530

OR



Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:



The address associated with Customer Number:

26530

OR

☐	Firm or Individual Name			
	Address			
	City	State	Zip	
	Country			
	Telephone	Email		

Assignee Name and Address: DYNAPOWER COMPANY LLC
85 Meadowland Drive
South Burlington, Vermont 05403

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	June 27, 2016
Name	Adam M. Knudsen	Telephone	802-860-7200
Title	President		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: DYNAPOWER COMPANY LLC

Application No./Patent No.: _____ Filed/Issue Date: _____

Titled: ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERSDYNAPOWER COMPANY LLC

, a _____

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose one of options A or B below):

- A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form *and/or* suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
 Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
 Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
 Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
 Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature

Hermine Valizadeh

Printed or Typed Name

June 29, 2016

Date

Reg. 64696

Title or Registration Number

(Page 2 of 2)

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Apurva		SOMANI			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	South Burlington	State/Province	VT	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	c/o Dynapower Company LLC					
Address 2	85 Meadowland Drive					
City	South Burlington	State/Province	VT			
Postal Code	05403	Country	US			
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	John C.		PALOMBINI			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	South Burlington	State/Province	VT	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	c/o Dynapower Company LLC					
Address 2	85 Meadowland Drive					
City	South Burlington	State/Province	VT			
Postal Code	05403	Country	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add						

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

☐ An Address is being provided for the correspondence information of this application.

Customer Number	26530		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		
Attorney Docket Number	CU-72846 HV	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:
☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	26530		

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62/188278	2015-07-02
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)	Remove
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

- ☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
- NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant 1		Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
		Clear	
☒ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	DYNAPOWER COMPANY LLC		
Mailing Address Information For Applicant:			
Address 1	35 Meadowland Drive		
Address 2			
City	South Burlington	State/Province	VT
Country	US	Postal Code	05403
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:[Remove](#)

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet must be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Hermine Valizadeh/		Date (YYYY-MM-DD)	2016-06-29
First Name	Hermine	Last Name	Valizadeh	Registration Number
				64696
Additional Signature may be generated within this form by selecting the Add button. Add				

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CU-72846 HV
		Application Number	
Title of Invention	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

- 1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
- 3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS		
First Named Inventor/Applicant Name:		Apurva SOMANI		
Filer:		Hermine Valizadeh/Debbie Szumowski		
Attorney Docket Number:		CU-72846 HV		
Filed as Small Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Request for Prioritized Examination	2817	1	2000	2000
Pages:				
Claims:				
Claims in excess of 20	2202	9	40	360
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Publ. Fee- Early, Voluntary, or Normal	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				3160

Electronic Acknowledgement Receipt	
EFS ID:	26213333
Application Number:	15196869
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ISLANDING A PLURALITY OF GRID TIED POWER CONVERTERS
First Named Inventor/Applicant Name:	Apurva SOMANI
Customer Number:	26530
Filer:	Hermine Valizadeh/Debbie Szumowski
Filer Authorized By:	Hermine Valizadeh
Attorney Docket Number:	CU-72846 HV
Receipt Date:	29-JUN-2016
Filing Date:	
Time Stamp:	15:53:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$3160
RAM confirmation Number	2816
Deposit Account	120400
Authorized User	Szumowski, Debra
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 CFR 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	cu72846_request.pdf	104199	no	1
			ca45bc20145317c4bac4a2965653b5eb9b03321f		
Warnings:					
Information:					
2		cu72846_application.pdf	2480439	yes	42
			b82fab7c71306b837c43732ba5e225f93af2f86c		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	31	
	Claims		32	41	
	Abstract		42	42	
Warnings:					
Information:					
3	Drawings-only black and white line drawings	cu72846_drawings.pdf	141277	no	5
			0a91501d5adc97204e81d47533a0d7186c409fd		
Warnings:					
Information:					
4	Oath or Declaration filed	cu72846_declaration.pdf	99270	no	2
			eea86d9a0614238961da9abd76f4c5117bae09e9		
Warnings:					
Information:					
5	Power of Attorney	cu72846_power.pdf	230263	no	3
			f3c269871958d5d7c4441c462beaf3d0ed89efa		

Warnings:					
Information:					
6	Application Data Sheet	Application_Data_Sheet_aia0014_r14-after-12-1-2015.pdf	1793155 b3963ca7b204e3a8ef7ee0e750eb99c2c8cf0eff	no	8
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	42382 386a04942767881cf8518f6c9d2f34bd33be5c0c	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			4890985		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					