



(51) International Patent Classification:

H02H 9/00 (2006.01) *H01B 9/00* (2006.01)

(21) International Application Number:

PCT/US2017/032778

(22) International Filing Date:

16 May 2017 (16.05.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

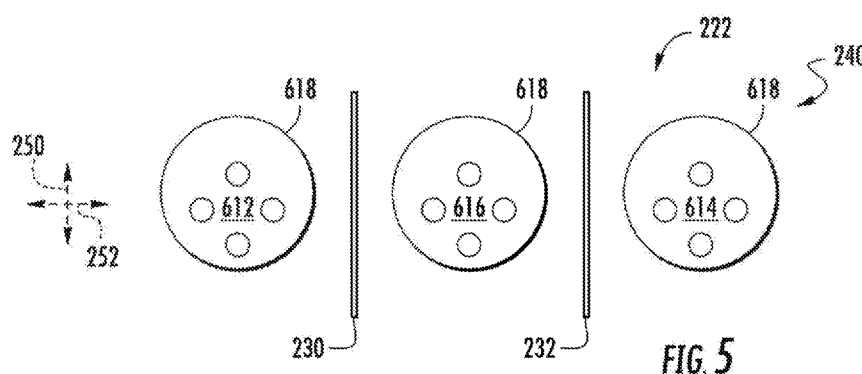
15/156,540 17 May 2016 (17.05.2016) US

(71) Applicant: GENERAL ELECTRIC COMPANY
[US/US]; 1 River Road, Schenectady, NY 12345 (US).(72) Inventors: WAGONER, Robert Gregory; 1501 Roanoke
Boulevard, Salem, VA 24153 (US). SCHNETZKA,
Harold Robert; 300 Garlington Road, Greenville, SC
29615 (US). SCHULZ, Wayne Allen; 1 River Road, Sch-
enectady, NY 12345 (US). AUSTIN, Douglas; 1 River
Road, Schenectady, NY 12345 (US). NEGEDE, Abiyu; 1
River Road, Schenectady, NY 12345 (US).(74) Agent: ZHANG, Douglas D. et al.; General Electric Com-
pany, Global Patent Operation, 901 Main Avenue, 3rd
Floor, Norwalk, CT 06851 (US).(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR,
KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

(54) Title: CABLE ARRANGEMENT OF AN ENERGY STORAGE SYSTEM



(57) **Abstract:** Systems and methods for regulating a short circuit current associated with an energy storage system are provided. In one embodiment, an energy storage system can include an energy storage device and a switching power supply coupled to the energy storage device. The energy storage system can further include one or more cables configured to couple the energy storage device to the switching power supply, and a magnetic framework positioned proximate the one or more cables. The magnetic framework can include one or more magnetic structures and can span at least a portion of the length of the cables. The one or more cables are positioned in a physical arrangement that, in conjunction with the magnetic framework, facilitates a selected inductance between the cables.



Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:

28 December 2017 (28.12.2017)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/032778

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02H9/00 H01B9/00
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)
H02H H01B

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	COOMBES COLIN D: "Techniques used to protect a DC system with more than 100kA short circuit current capacity", 2014 IEEE 36TH INTERNATIONAL TELECOMMUNICATIONS ENERGY CONFERENCE (INTELEC), IEEE, 28 September 2014 (2014-09-28), pages 1-3, XP032694524, DOI: 10.1109/INTLEC.2014.6972208 [retrieved on 2014-12-02] page 2, left-hand column, last paragraph page 3, right-hand column ----- -/--	1-20

☒ 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

26 October 2017

Date of mailing of the international search report

21/11/2017

Name and mailing address of the ISA/
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Castagné, Olivier

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/032778

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MOLLET R ET AL: "Understanding short circuit currents in DC power systems when used in conjunction with standby batteries", INTELEC 2002. 24TH. INTERNATIONAL TELECOMMUNICATIONS ENERGY CONFERENCE. MONTREAL, QUEBEC, CANADA, SEPT. 29 - OCT. 3, 2002; [INTELEC. INTERNATIONAL TELECOMMUNICATIONS ENERGY CONFERENCE], NEW YORK, NY : IEEE, US, vol. CONF. 24, 29 September 2002 (2002-09-29), pages 27-33, XP010614596, DOI: 10.1109/INTLEC.2002.1048630 ISBN: 978-0-7803-7512-3 page 29, left-hand column, paragraph 3 - right-hand column, paragraph 4 page 31, right-hand column - page 32 -----	1-20
X	H.C CLINE ET AL: "Fuse protection of DC systems", PROCEEDINGS OF THE AMERICAN POWER CONFERENCE, VOLUME 50, [CHICAGO, APRIL 18 - 20, 1988, 1 September 1995 (1995-09-01), XP055406709, US ISSN: 0097-2126 the whole document -----	1-20
X	BROZEK J P ED - INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS: "DC overcurrent protection-Where we stand", PROCEEDINGS OF THE INDUSTRY APPLICATIONS SOCIETY ANNUAL MEETING. HOUSTON, OCT. 4 - 9, 1992; [PROCEEDINGS OF THE INDUSTRY APPLICATIONS SOCIETY ANNUAL MEETING], NEW YORK, IEEE, US, 4 October 1992 (1992-10-04), page 1306, XP032138889, DOI: 10.1109/IAS.1992.244268 ISBN: 978-0-7803-0635-6 the whole document -----	1-20
A	JP 2013 187122 A (KAWAMURA ELECTRIC INC) 19 September 2013 (2013-09-19) abstract -----	1,16,19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/032778

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2013187122 A	19-09-2013	JP 5828783 B2	09-12-2015
		JP 2013187122 A	19-09-2013
