(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 December 2014 (18.12.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/200712 A3

(51) International Patent Classification:
H01M 8/24 (2006.01) *G06F 9/48* (2006.01)
H01M 8/04 (2006.01) *H01M 8/10* (2006.01)
G06F 1/26 (2006.01) *H01M 8/12* (2006.01)
H01L 23/58 (2006.01) *H01M 16/00* (2006.01)

(21) International Application Number:
PCT/US2014/040114

(22) International Filing Date:
30 May 2014 (30.05.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/917,625 13 June 2013 (13.06.2013) US

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(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, 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, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, 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))*

[Continued on next page]

(54) Title: ON-CHIP INTEGRATED PROCESSING AND POWER GENERATION

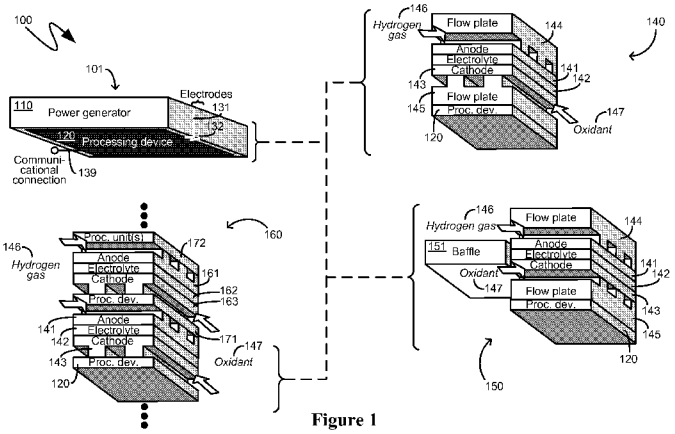

Figure 1

(57) Abstract: A self-powered processing device comprises both a processing device and a power generator that are physically, electrically, and thermally coupled to one another. The power generator can be a fuel cell that can be manufactured from materials that can also support processing circuitry, such as silicon-based materials. A thermal coupling between the power generator and the processing device can include a thermoelectric either generating electrical power from the temperature differential or consuming electrical power to generate a temperature differential. A computing device with self-powered processing devices also includes energy storage devices to store excess energy produced by the self-powered processing device and provide it back during times of need. The self-powered processing device comprises either a wireless or wired network connection, the latter being connectable to a slot on a backplane that can aggregate multiple self-powered processing devices and provide fuel delivery paths for them.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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:
5 March 2015

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/040114

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01M8/24 H01M8/04 G06F1/26 H01L23/58 G06F9/48
ADD. H01M8/10 H01M8/12 H01M16/00

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)
H01M G06F H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/286108 A1 (KIM SANG-UK [KR] ET AL) 19 November 2009 (2009-11-19) paragraphs [0002] - [0004] paragraph [0044] paragraphs [0238] - [0243]; figure 29 -----	1-10
X	JP 2006 024418 A (NISSAN MOTOR) 26 January 2006 (2006-01-26) abstract paragraphs [0044], [0045] -----	1-10
A	JP 2002 151873 A (ALPS ELECTRIC CO LTD; SONY CORP) 24 May 2002 (2002-05-24) abstract paragraph [0002] -----	3-5

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 January 2015	22/01/2015

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

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/040114

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2007/039641 A1 (HU YUFENG [US] ET AL) 22 February 2007 (2007-02-22) paragraphs [0005], [0123], [0124], [0130]	1-6,10
X	EP 1 837 735 A2 (LG ELECTRONICS INC [KR]) 26 September 2007 (2007-09-26)	9
A	paragraphs [0031] - [0047]; figure 1	7,8
A	EP 2 590 050 A1 (RESEARCH IN MOTION LTD [CA] BLACKBERRY LTD [CA]) 8 May 2013 (2013-05-08) paragraph [0113]	7-9
A	US 2006/192523 A1 (NOMOTO KAZUTOSHI [JP]) 31 August 2006 (2006-08-31) paragraph [0056]	7-9

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INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 2-6, 10(completely); 1(partially)

   Self-powered processing device with thermal coupling between power generator and processor. System comprising a plurality of such devices (claim 10).

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2. claims: 7-9(completely); 1(partially)

   Self-powered processing device with power-state transition control, i.e. during a transition the inertia of the power generator is compensated by an energy storage device (claim 9) or by computer-executable instructions that control the amount of power required by the processor (claims 7 and 8).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/040114

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