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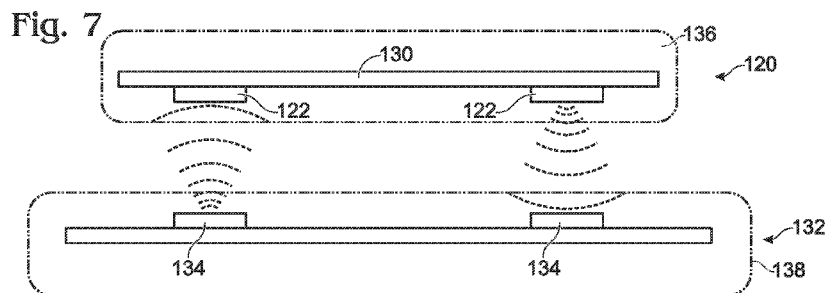
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(54) **Title:** SCALABLE HIGH-BANDWIDTH CONNECTIVITY



(57) **Abstract:** A scalable, high-bandwidth connectivity architecture for portable storage devices and memory modules may utilize EHF communication link chip packages mounted in various two-dimensional and three-dimensional configurations on planar surfaces such as printed circuit boards. Multiple electromagnetic communication links between devices distributed on major faces of card-like devices may be provided with respectively aligned pairs of communication units on each device. Adjacent communication units on a printed circuit board may transmit or receive electromagnetic radiation having different polarization, such as linear or elliptical polarization. Power and communication between communication devices may both be provided wirelessly.



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/037795

A. CLASSIFICATION OF SUBJECT MATTER INV. H04B5/00 H01L25/065 G06K19/07 G06K19/077 H05K1/14 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H04B H01L G06K H05K		
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 7 929 474 B2 (PETTUS MICHAEL GREGORY [US] ET AL) 19 April 2011 (2011-04-19)	1-5,7,9, 10, 14-17, 19,20, 22-25
Y	abstract column 5, line 40 - column 14, line 47 claims 1-8 figures 2-4 ----- -/--	6,11,18, 21,26
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search	Date of mailing of the international search report	
10 January 2013	21/01/2013	
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 Helms, Jochen	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/037795

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.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/037795

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/159829 A1 (MCCORMACK GARY D [US]) 24 June 2010 (2010-06-24) cited in the application	1-5, 7-10, 14-17, 19,20, 22-25
Y	abstract paragraphs [0028], [0045], [0050], [0051] figures 5, 10, 11	6,11,18, 21,26
A	----- US 2010/297954 A1 (ROFOUGARAN AHMADREZA [US] ET AL) 25 November 2010 (2010-11-25) abstract paragraphs [0018] - [0052] figures 1, 2a	1-5, 7-10, 14-17, 19,20, 22-25
A	----- US 2010/283700 A1 (RAJANISH FNU [US] ET AL) 11 November 2010 (2010-11-11) abstract paragraphs [0020] - [0024] figure 4	1-5, 7-10, 14-17, 19,20, 22-25
X	----- US 2008/159243 A1 (ROFOUGARAN AHMADREZA REZA [US]) 3 July 2008 (2008-07-03) abstract paragraphs [0051] - [0060] figures 3-5	12,13
X	----- US 2009/006677 A1 (ROFOUGARAN AHMADREZA REZA [US]) 1 January 2009 (2009-01-01) paragraphs [0126] - [0128], [0235] - [0243] figures 21, 22, 52-55	12,13
X	----- US 2009/218701 A1 (ROFOUGARAN AHMADREZA REZA [US]) 3 September 2009 (2009-09-03) paragraphs [0106], [0126] - [0150] figures 10, 21, 22, 24-27	27-42
X	----- US 2009/009337 A1 (ROFOUGARAN AHMADREZA REZA [US]) 8 January 2009 (2009-01-08)	43-59
Y	paragraphs [0063] - [0070], [0215] - [0222] figures 1, 2, 51, 52	6,11,18, 21,26

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/037795

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US 7929474	B2	19-04-2011	US 2009028177 A1 29-01-2009
			US 2011188417 A1 04-08-2011
			WO 2009002464 A2 31-12-2008
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			US 2011199213 A1 18-08-2011
			US 2012205452 A1 16-08-2012

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-5, 7-10, 14-17, 19, 20, 22-25

An electronic device comprising a dielectric client substrate,
at least a first data storage unit mounted to the client substrate, for storing digital information; and
a first client EHF communication unit having a first antenna, the first client communication unit mounted to the client substrate in communication with the at least a first data storage unit for converting between an EHF electromagnetic signal containing digital information conducted by the first antenna and a data signal conducted by the first data-storage circuit.

1.1. claims: 3-5, 7-10, 15-17, 19, 20, 23-25

The features of dependent claims 3-5, 7-10, 15-17, 19, 20, 23-25 differ from the feature of dependent claim 2.

2. claims: 12, 13

An IC package assembly having first, second, and intermediate dielectric substrate portions, a first EHF comm-link chip and a first antenna mounted to the first dielectric substrate portion, a second EHF comm-link chip and a second antenna mounted to the second dielectric substrate portion, the first EHF comm-link chip and the first antenna being configured as a transmitter and the second EHF comm-link chip and the second antenna being configured as a receiver, the second antenna being disposed relative to the first antenna to receive radiation transmitted by the first antenna, the intermediate dielectric substrate portion extending between the first and second antennas.

3. claims: 27-42

A system for communicating EHF electromagnetic signals between a first and a second communication apparatus, the first communication apparatus comprising a first EHF communication unit, a data storage unit and an inductive power receiver for converting received inductive energy into power for operating the first EHF communication unit and data storage unit.

4. claims: 6, 11, 18, 21, 26, 43-59

An EHF communication unit comprising a die including a transmitter circuit and a receiver circuit, a first antenna

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

operatively connected to the transmitter circuit, a second antenna operatively connected to the receiver circuit, the first and second antennas transmitting or receiving electromagnetic radiation having different respective polarization characteristics.
