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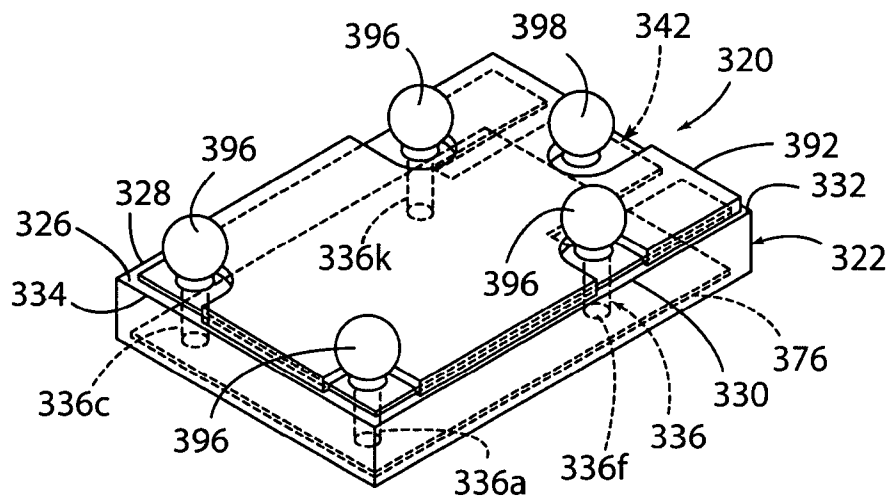
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2 October 2008

(54) Title: BALL GRID ARRAY RESONATOR



(57) Abstract: A ball grid array ceramic resonator (320) including a substrate (322) having one or more strips of conductive material (342) on opposed first and second surfaces of the substrate. One or more conductive vias (336) extend through the substrate and define termination ends in the respective substrate surfaces. In one embodiment, a plurality of conductive spheres/balls (396) defining respective ground pads are disposed over the ends of said vias terminating in said one or more strips of conductive material on said first or second surface and another conductive sphere is disposed over one of the strips of conductive material to define an RF signal input pad (398).

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## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/022999

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. H01P7/08

ADD. H01L23/498

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)

H01P 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 practical, search terms used)

EPO-Internal, WPI Data, INSPEC, COMPENDEX

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 127 906 A (BROOKS MARK [US] ET AL) 3 October 2000 (2000-10-03) column 2, line 50 - column 4, line 19 figures 3-10 abstract	1-8
A	----- EP 0 675 539 A (PLESSEY SEMICONDUCTORS LTD [GB]) 4 October 1995 (1995-10-04) column 4, line 33 - column 11, line 10 figures 1-9 abstract	1-8
A	----- WO 99/41799 A (ITRON INC [US]) 19 August 1999 (1999-08-19) page 3, line 31 - page 4, line 16 figures 1a,1b,1c abstract	1-8
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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 document 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.

\*Z\* document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2007/022999

## 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 allsearchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-8

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-8

Ball grid array resonator having a resonator pattern  
including L-shaped slots  
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2. claims: 9-16

Ball grid array resonator having a resonator pattern  
including longitudinal slots  
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3. claims: 17-25

Ball grid array resonator having a resonator pattern  
including meandering slots  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/022999

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 6127906	A	03-10-2000	US	6329890 B1	11-12-2001
EP 0675539	A	04-10-1995	GB	2288286 A	11-10-1995
			GB	2288074 A	04-10-1995
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