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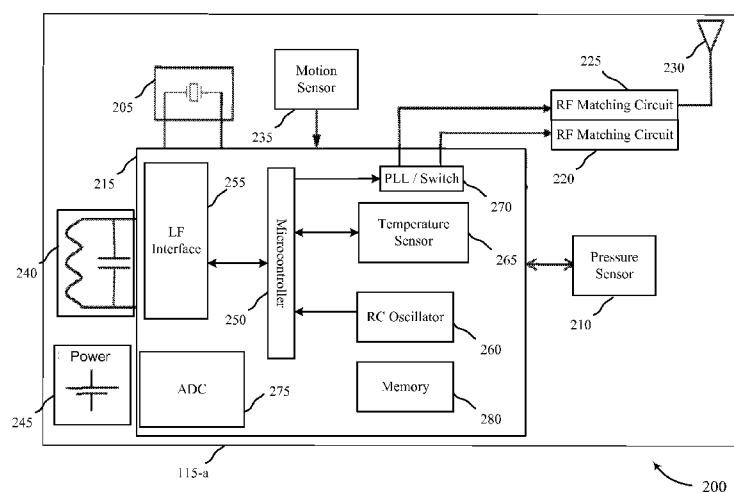
(54) **Title:** MULTI-FREQUENCY TIRE PRESSURE MONITORING DETECTOR

FIG. 2

(57) **Abstract:** Methods, systems, and devices are provided for tire pressure detectors that may operate according to one of two or more selectable frequencies. Tire pressure detectors may include an RF section to modulate pressure information from a pressure sensor onto an output signal. The frequency of the output signal may be selectable from two or more frequencies based on a frequency required by a vehicle that the tire pressure detector is to be used with. An RF matching circuit may be coupled between the RF section and an antenna, with an impedance of the RF matching circuit selected based of the frequency of the output signal. Such impedance matching may provide a constant power level output from the tire pressure detector independent of the frequency of the tire pressure detector transmissions.

# INTERNATIONAL SEARCH REPORT

International application No  
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A. CLASSIFICATION OF SUBJECT MATTER  
INV. B60C23/04 H04B1/04  
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)  
B60C H04B

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         | "Atmel Fractional-N PLL Transmitter IC",<br>1 August 2011 (2011-08-01), pages 1-26,<br>XP055154625,<br>2325 Orchard Parkway, San Jose, CA 95131<br>USA<br>Retrieved from the Internet:<br>URL:http://www.atmel.com/Images/doc9128.pdf<br>[retrieved on 2014-11-24]<br>the whole document | 1-9,<br>11-18         |
| Y         | -----<br>US 6 948 360 B2 (LIN XING P [US] LIN XING<br>PING [US]) 27 September 2005 (2005-09-27)<br>column 3, line 28 - column 5, line 30;<br>figure 2<br>-----<br>-/-                                                                                                                    | 10<br><br>1           |

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents :

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | US 2002/126005 A1 (HARDMAN GORDON E [US]<br>ET AL) 12 September 2002 (2002-09-12)<br>paragraph [0152] - paragraph [0156];<br>figure 17<br>-----                                                                                                         | 1                     |
| Y         | US 2012/119895 A1 (DENIAU JEAN-CHRISTOPHE<br>[US] ET AL) 17 May 2012 (2012-05-17)<br>paragraph [0017]<br>figures 1,2<br>-----                                                                                                                           | 10                    |
| A         | ATMEL (DATASHEET): "TMPS CONTROL AND<br>TRANSMITTER IC ATA6285/ATA6286",<br>TMPS CONTROL AND TRANSMITTER IC<br>ATA6285/ATA6286,,<br>no. 4968AS-AUTO-09/06,<br>1 September 2006 (2006-09-01), pages 1-18,<br>XP002494487,<br>the whole document<br>----- | 1                     |
| A         | US 2005/003771 A1 (DE RUIJTER HENDRICUS<br>[US] ET AL) 6 January 2005 (2005-01-06)<br>the whole document<br>-----                                                                                                                                       | 1                     |
| A         | US 2008/106350 A1 (MCKINZIE WILLIAM E [US]<br>MCKINZIE III WILLIAM E [US])<br>8 May 2008 (2008-05-08)<br>the whole document<br>-----                                                                                                                    | 1                     |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| US 6948360                                | B2 | 27-09-2005          | EP 1561607 A2              | 10-08-2005          |
|                                           |    |                     | US 2005150285 A1           | 14-07-2005          |
| -----                                     |    |                     |                            |                     |
| US 2002126005                             | A1 | 12-09-2002          | AT 478772 T                | 15-09-2010          |
|                                           |    |                     | AT 543669 T                | 15-02-2012          |
|                                           |    |                     | AU 8082301 A               | 05-02-2002          |
|                                           |    |                     | AU 2001280823 B2           | 12-01-2006          |
|                                           |    |                     | AU 2005244491 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244492 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244493 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244494 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244495 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244496 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244497 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244498 A1           | 12-01-2006          |
|                                           |    |                     | AU 2005244499 A1           | 12-01-2006          |
|                                           |    |                     | BR 0112781 A               | 30-09-2003          |
|                                           |    |                     | CA 2417430 A1              | 31-01-2002          |
|                                           |    |                     | CA 2676101 A1              | 31-01-2002          |
|                                           |    |                     | CA 2676102 A1              | 31-01-2002          |
|                                           |    |                     | CA 2743631 A1              | 31-01-2002          |
|                                           |    |                     | EP 1309460 A2              | 14-05-2003          |
|                                           |    |                     | EP 2113402 A2              | 04-11-2009          |
|                                           |    |                     | EP 2263889 A1              | 22-12-2010          |
|                                           |    |                     | EP 2272688 A2              | 12-01-2011          |
|                                           |    |                     | EP 2272689 A2              | 12-01-2011          |
|                                           |    |                     | ES 2348658 T3              | 10-12-2010          |
|                                           |    |                     | ES 2381940 T3              | 01-06-2012          |
|                                           |    |                     | JP 5099532 B2              | 19-12-2012          |
|                                           |    |                     | JP 5140790 B2              | 13-02-2013          |
|                                           |    |                     | JP 2004526217 A            | 26-08-2004          |
|                                           |    |                     | JP 2011225215 A            | 10-11-2011          |
|                                           |    |                     | JP 2011248903 A            | 08-12-2011          |
|                                           |    |                     | JP 2011254481 A            | 15-12-2011          |
|                                           |    |                     | MX PA03000674 A            | 01-11-2004          |
|                                           |    |                     | PE 02282003 A1             | 18-03-2003          |
|                                           |    |                     | US 2002126005 A1           | 12-09-2002          |
|                                           |    |                     | US 2004017291 A1           | 29-01-2004          |
|                                           |    |                     | WO 0207993 A2              | 31-01-2002          |
| -----                                     |    |                     |                            |                     |
| US 2012119895                             | A1 | 17-05-2012          | CN 101687447 A             | 31-03-2010          |
|                                           |    |                     | CN 103112324 A             | 22-05-2013          |
|                                           |    |                     | EP 2162304 A1              | 17-03-2010          |
|                                           |    |                     | JP 5502729 B2              | 28-05-2014          |
|                                           |    |                     | JP 2010533612 A            | 28-10-2010          |
|                                           |    |                     | KR 20100056447 A           | 27-05-2010          |
|                                           |    |                     | US 2009033478 A1           | 05-02-2009          |
|                                           |    |                     | US 2012117788 A1           | 17-05-2012          |
|                                           |    |                     | US 2012119895 A1           | 17-05-2012          |
|                                           |    |                     | WO 2009006518 A1           | 08-01-2009          |
| -----                                     |    |                     |                            |                     |
| US 2005003771                             | A1 | 06-01-2005          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| US 2008106350                             | A1 | 08-05-2008          | US 2008106350 A1           | 08-05-2008          |
|                                           |    |                     | US 2009039976 A1           | 12-02-2009          |
|                                           |    |                     | US 2011043298 A1           | 24-02-2011          |
|                                           |    |                     | US 2014145902 A1           | 29-05-2014          |
| -----                                     |    |                     |                            |                     |