



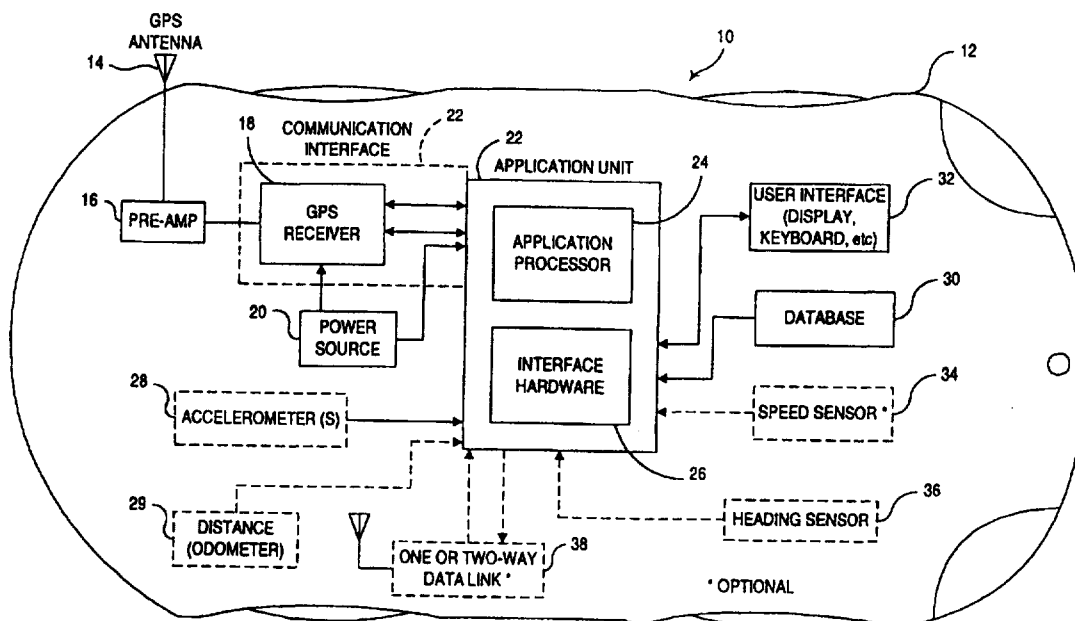
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(54) Title: A ZERO MOTION DETECTION SYSTEM FOR IMPROVED VEHICLE NAVIGATION SYSTEM



(57) Abstract

The improved vehicle navigation system can take advantage of the recent availability of low cost micro-machined and piezoelectric sensors, and partially overcomes the low dynamics and line of sight limitations of GPS receivers without resorting to the hard wired approach described above. The low cost sensors introduce system level errors due to their inherent DC offset and drift rates. The improved vehicle navigation system minimizes both the sensor induced errors and GPS low dynamic limitations by using a zero motion detection system as a self contained (within the navigation system), vehicle independent device.

* (Referred to in PCT Gazette No. 43/1997, Section II)

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G01C21/20

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)
IPC 6 G01C

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 331 563 A (MASUMOTO YUTAKA ET AL) 19 July 1994 see abstract see column 3, line 50 - column 4, line 35 ---	1,3-5,7, 10,11, 13,14,16
X	EP 0 488 594 A (SUMITOMO ELECTRIC INDUSTRIES) 3 June 1992 see column 3, line 10 - column 4, line 42 ---	1,4,5,7, 10,13, 14,16
A	US 4 912 645 A (KAKIHARA MASAKI ET AL) 27 March 1990 see column 2, line 5 - line 26 ---	2,3,11, 12
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/US 96/20854

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 5 166 882 A (STAMBAUGH JOHN S) 24 November 1992 see column 1, line 38 - line 50 see column 2, line 12 - line 62 -----	9,18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/20854

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5331563 A	19-07-94	JP 5157572 A	22-06-93
EP 0488594 A	03-06-92	JP 4208808 A	30-07-92
		DE 69107586 D	30-03-95
		DE 69107586 T	18-01-96
		US 5296855 A	22-03-94
US 4912645 A	27-03-90	JP 63238479 A	04-10-88
		JP 63238480 A	04-10-88
US 5166882 A	24-11-92	NONE	