



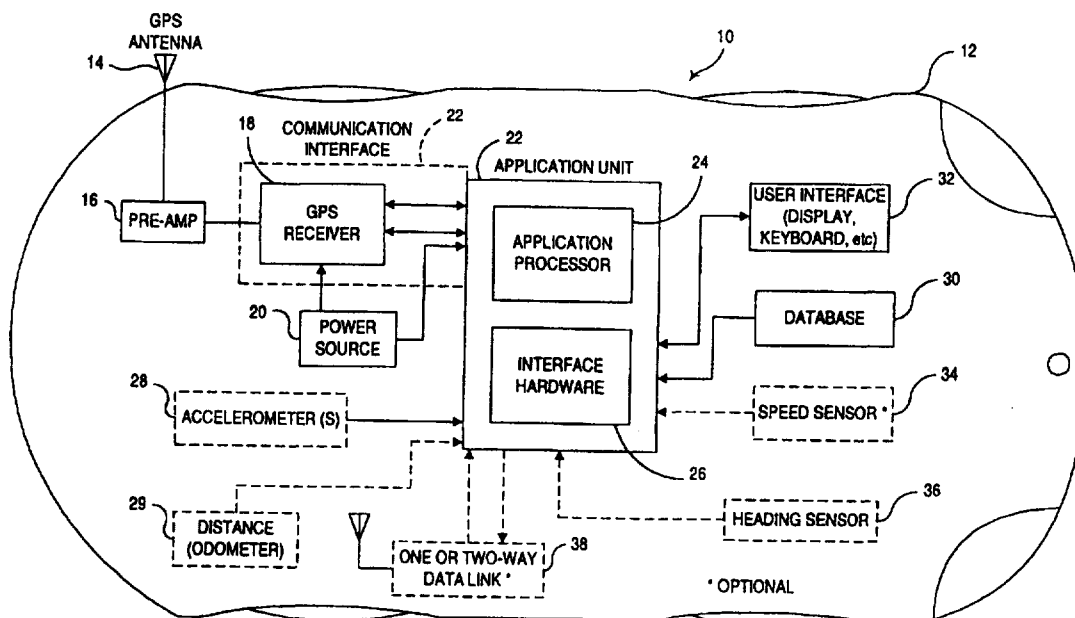
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G01C 21/20	A1	(11) International Publication Number: WO 97/24584
		(43) International Publication Date: 10 July 1997 (10.07.97)

(21) International Application Number: PCT/US96/20854
 (22) International Filing Date: 27 December 1996 (27.12.96)
 (30) Priority Data:
 08/579,903 28 December 1995 (28.12.95) US
 (71) Applicant (for all designated States except US): ROCKWELL INTERNATIONAL CORPORATION [US/US]; 2135 West Maple Road, Troy, MI 48084 (US).
 (72) Inventors; and
 (75) Inventors/Applicants (for US only): CROYLE, Steven, R. [US/US]; 27201 Gardenway Road, Franklin, MI 48025 (US). SPENCER, Larry, E., II [US/US]; 525 Joslyn Road, Lake Orion, MI 48362 (US).
 (74) Agent: SLENZAK, Laura, M.; Rockwell International Corporation, 2135 West Maple Road, Troy, MI 48084 (US).

(81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
Published
With a revised version of the international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.
 (88) Date of publication of the revised version of the international search report: 9 October 1997 (09.10.97)

(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)

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgystan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

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
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in 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.
- "&" document member of the same patent family

Date of the actual completion of the international search

12 August 1997

Date of mailing of the international search report

14.08.97

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Hunt, J

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	