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United States Patent [19]

[11] Patent Number: 6,107,944

Behr et al.

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[54] ELECTRONIC NAVIGATION SYSTEM AND METHOD

FOREIGN PATENT DOCUMENTS

[75] Inventors: David A. Behr, Roselle; Ramesh Ramakrishnan, Mount Prospect, both of Ill.

0 379 198 A3 7/1990 European Pat. Off. .
0 585 950 A2 9/1993 European Pat. Off. .
41 41 597 A1 12/1991 Germany .
3150699 6/1991 Japan .
6266997 9/1994 Japan .

[73] Assignee: Navigation Technologies Corporation, Rosemont, Ill.

(List continued on next page.)

OTHER PUBLICATIONS

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Hoffman, Steve and Stewart, Charles, "Text-based Routing: An Affordable Way Ahead?", Proceedings of the IEEE-IEE Vehicle Navigation & Information System Conference, Ottawa, Canada-VNIS 1993.

(List continued on next page.)

[21] Appl. No.: 09/151,255

Primary Examiner-Brent A. Swarthout

[22] Filed: Sep. 10, 1998

Attorney, Agent, or Firm-Frank J. Kozak; Lawrence M. Kaplan

Related U.S. Application Data

[57] ABSTRACT

[63] Continuation of application No. 08/494,198, Jun. 23, 1995, Pat. No. 5,808,566, which is a continuation-in-part of application No. 08/265,094, Jun. 24, 1994, Pat. No. 5,543,789.

The invention provides a method and system for providing route guidance and other information from a base unit to a remote unit in response to a request from the remote unit. A query is formatted at the remote unit, the query including the request, and is transmitted from the remote unit to the base unit. Requested route guidance information is calculated at the base unit in response to the query, using a large up-to-date database located at the base unit. A response to the query is formatted at the base unit, the response including route guidance information. The response is then transmitted from the base unit to the remote unit for display. The transmission is made in a compact form through the use of maneuver arms and combined maneuver arms and through the use of tokenized forms. A maneuver arm represents a road at an intersection, for depiction on a display, by one or two endpoint coordinates. The tokenized forms are expanded at the remote unit into textual driving instructions for each of one or more languages. In addition, the amount of information available at a remote unit can be increased by providing the remote unit with information from the base unit which is not adequately covered by any databases on-board the remote unit.

[51] Int. Cl. 7 G08G 1/123
[52] U.S. Cl. 340/995; 340/988; 701/208; 701/209; 701/211

[58] Field of Search 340/995, 990, 340/991, 988, 905; 701/209, 211, 208, 210

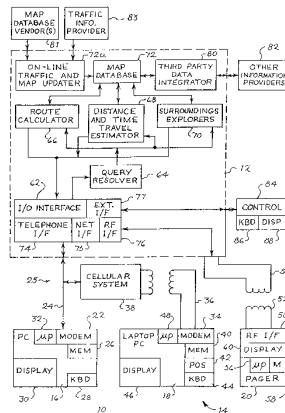
[56] References Cited

U.S. PATENT DOCUMENTS

4,301,506 11/1981 Turco .
4,311,876 1/1982 Endo et al. 340/905
4,428,057 1/1984 Setliff et al. .
4,466,125 8/1984 Kanayama 340/990
4,481,584 11/1984 Holland .
4,546,439 10/1985 Esparza .
4,570,227 2/1986 Tachi et al. .
4,642,775 2/1987 Cline et al. .
4,733,356 3/1988 Haeussermann et al. .

(List continued on next page.)

18 Claims, 15 Drawing Sheets



U.S. PATENT DOCUMENTS

4,758,959	7/1988	Thoone et al. .	
4,780,717	10/1988	Takanabe et al.	340/995
4,812,843	3/1989	Champion, III et al.	340/905
4,819,174	4/1989	Furuno et al.	340/995
4,951,212	8/1990	Kurihara et al.	340/395
4,954,958	9/1990	Savage et al. .	
4,954,959	9/1990	Moroto et al.	340/995
4,974,170	11/1990	Bouve et al.	395/357
5,043,902	8/1991	Yokoyama et al.	340/988
5,067,081	11/1991	Person	340/995
5,113,178	5/1992	Yasuda et al.	340/995
5,126,941	6/1992	Gurmu et al.	340/989
5,172,321	12/1992	Ghaem et al.	340/995
5,187,810	2/1993	Yoneyama et al.	340/905
5,214,757	5/1993	Mauney et al.	395/161
5,243,528	9/1993	Lefebvre	340/995
5,262,775	11/1993	Tamai et al.	340/995
5,283,575	2/1994	Kao et al.	340/990
5,289,572	2/1994	Yano et al.	395/155
5,291,412	3/1994	Tamai et al. .	
5,291,413	3/1994	Tamai et al. .	
5,293,163	3/1994	Kakihara et al.	340/988
5,293,484	3/1994	Dabbs, III et al.	340/825.44
5,359,527	10/1994	Takanabe et al.	340/990
5,396,429	3/1995	Hanchett .	
5,406,490	4/1995	Braegas 340/905	
5,406,493	4/1995	Goto et al. 340/995	
5,424,951	6/1995	Nobe et al. .	
5,465,088	11/1995	Braegas 340/905	
5,537,323	7/1996	Schulte .	
5,543,789	8/1996	Behr et al. 340/995	
5,559,707	9/1996	DeLorme et al. 340/995	
5,579,535	11/1996	Orlen et al. 340/995	
5,614,895	3/1997	Ohomori et al. 340/995	
5,699,255	12/1997	Ellis et al. 340/995	

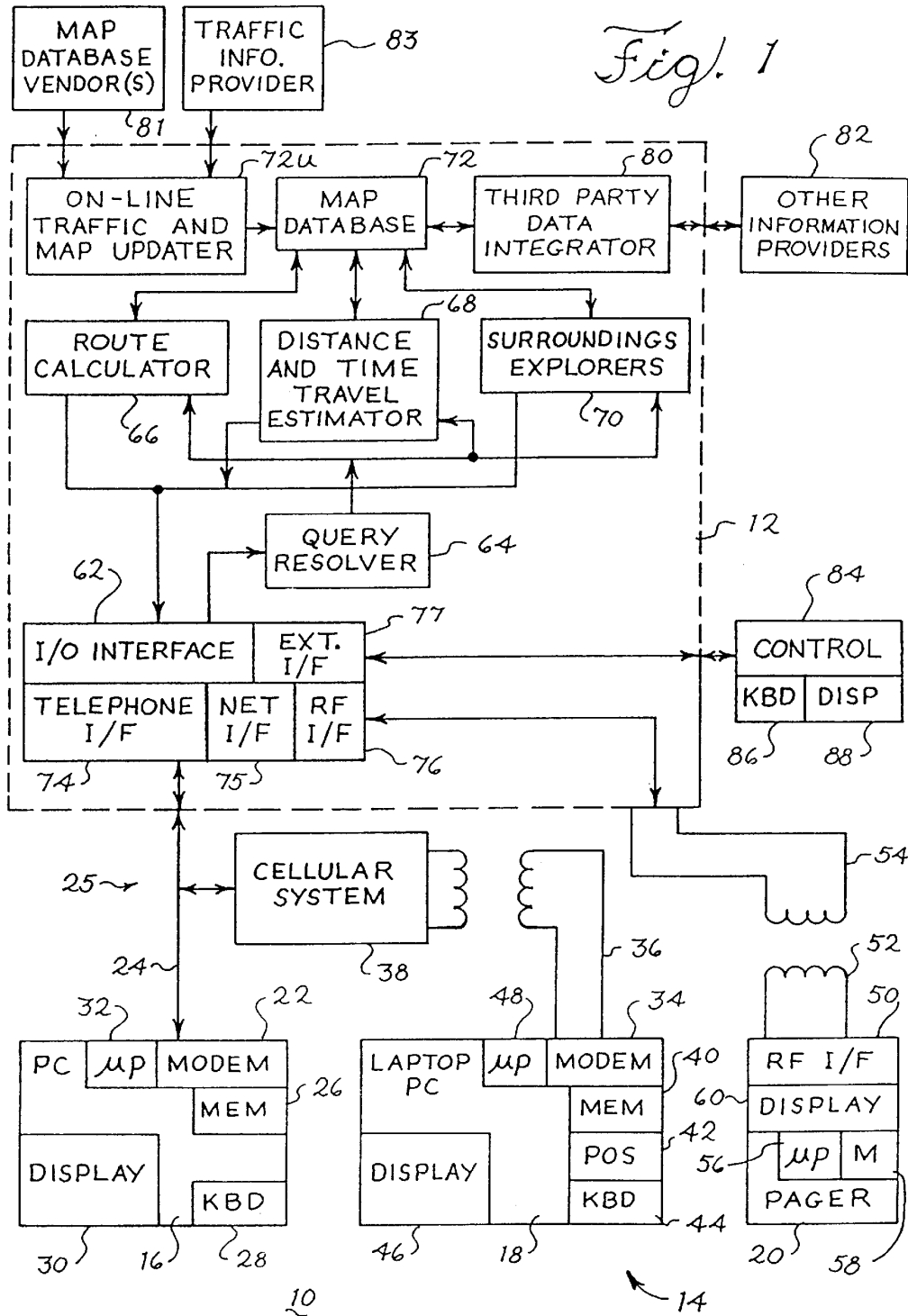
FOREIGN PATENT DOCUMENTS

WO 92/		
14215	8/1992	WIPO .
WO 92/21001	11/1992	WIPO .

OTHER PUBLICATIONS

PCT—Notification of Transmittal of the International Search Report, dated Nov. 2, 1995, in International application No. PCT/US95/07859, Application Shields Enterprises, Inc.

“Smart cars. Smart Highways.” Collier, W. Clay and Weiland, Richard J. *IEEE Spectrum*, Apr. 1994, pp. 27–33.



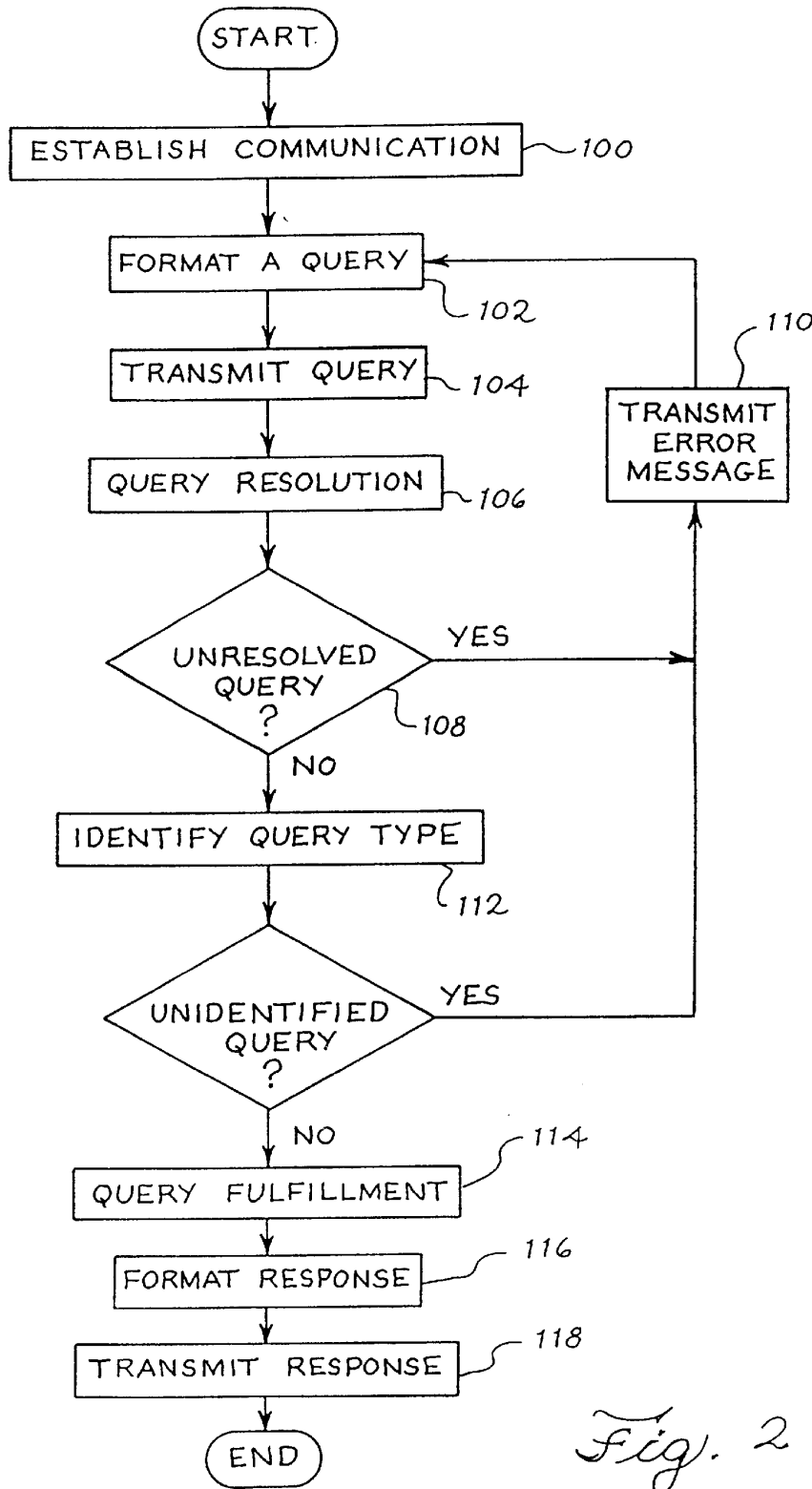
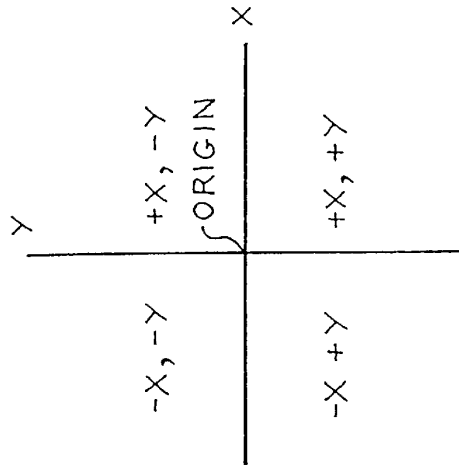
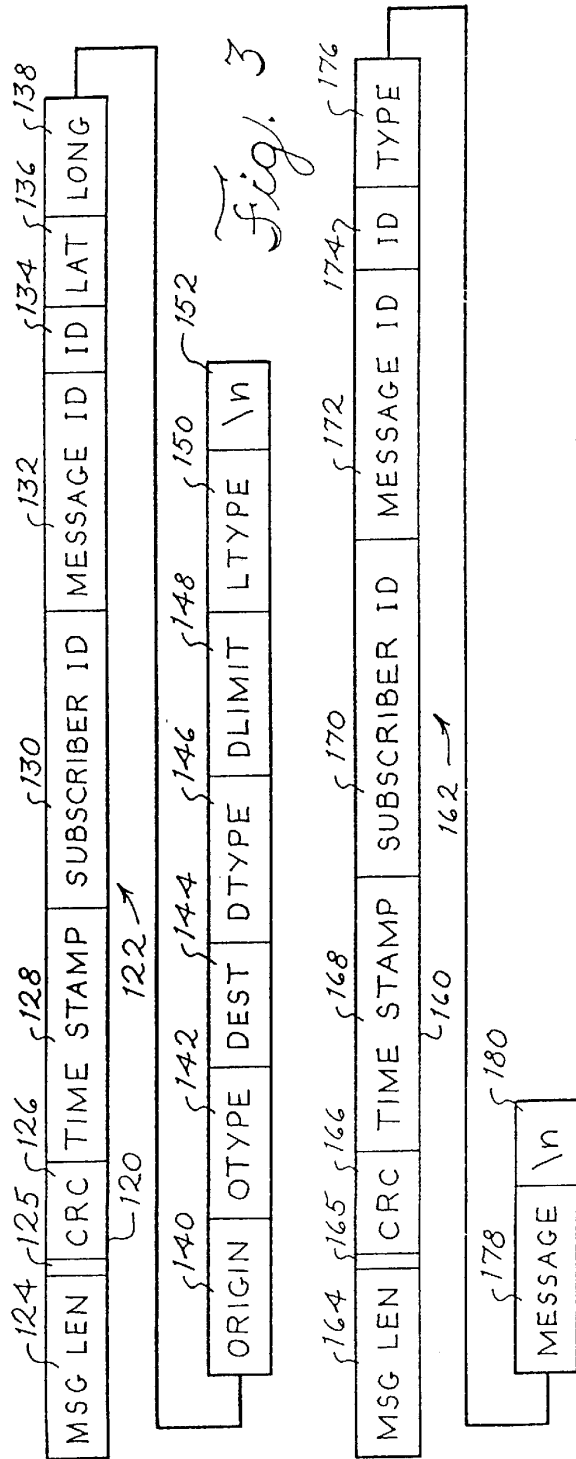


Fig. 2



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