



US006107944A

United States Patent [19]

[11] Patent Number: 6,107,944

Behr et al.

[45] Date of Patent: *Aug. 22, 2000

[54] ELECTRONIC NAVIGATION SYSTEM AND METHOD

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

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

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[*] 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).

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[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

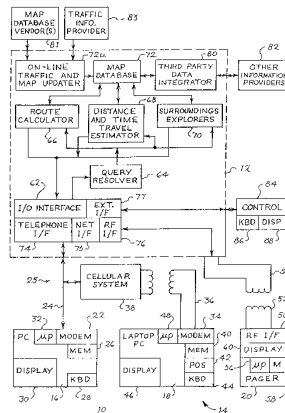
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18 Claims, 15 Drawing Sheets



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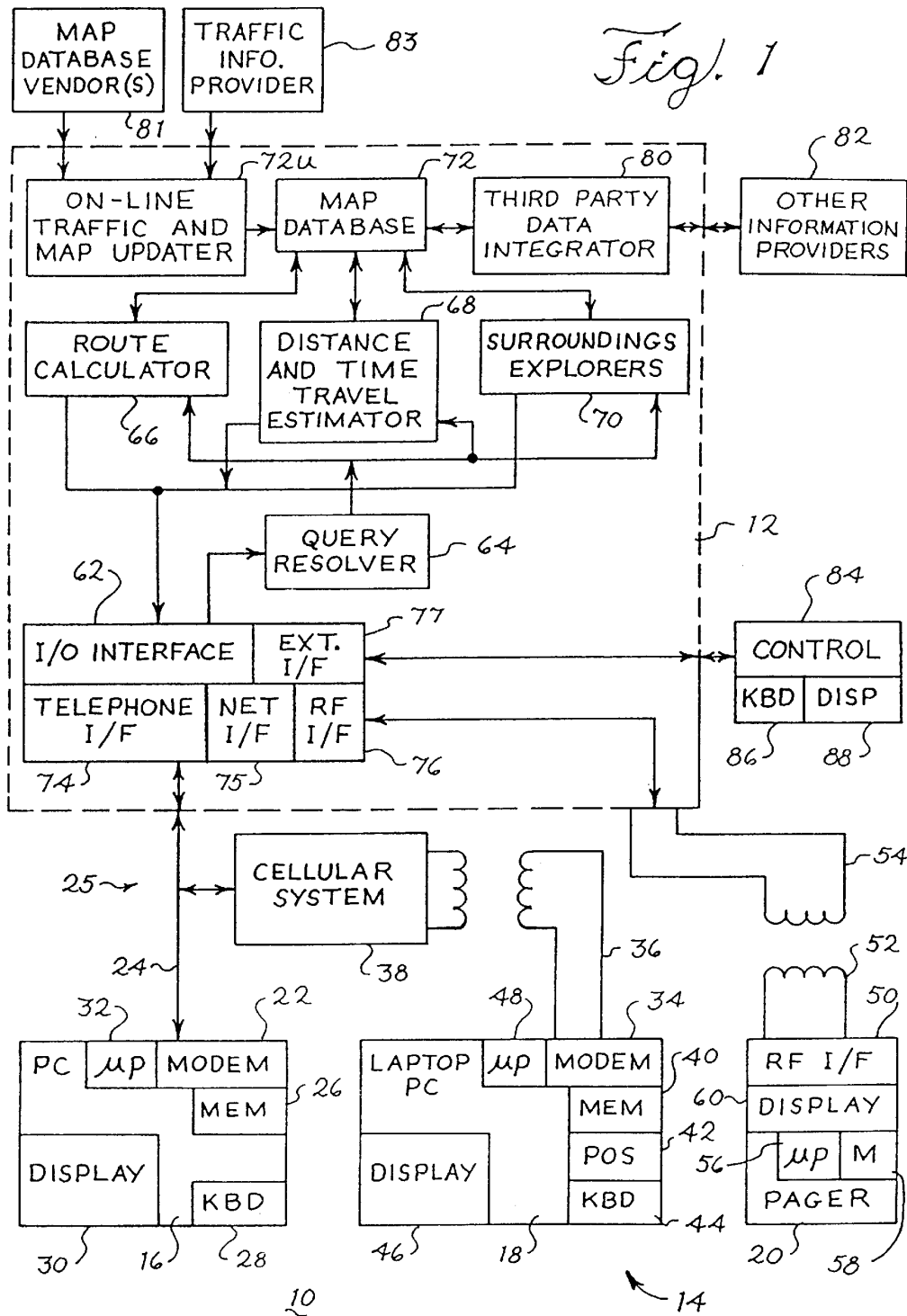
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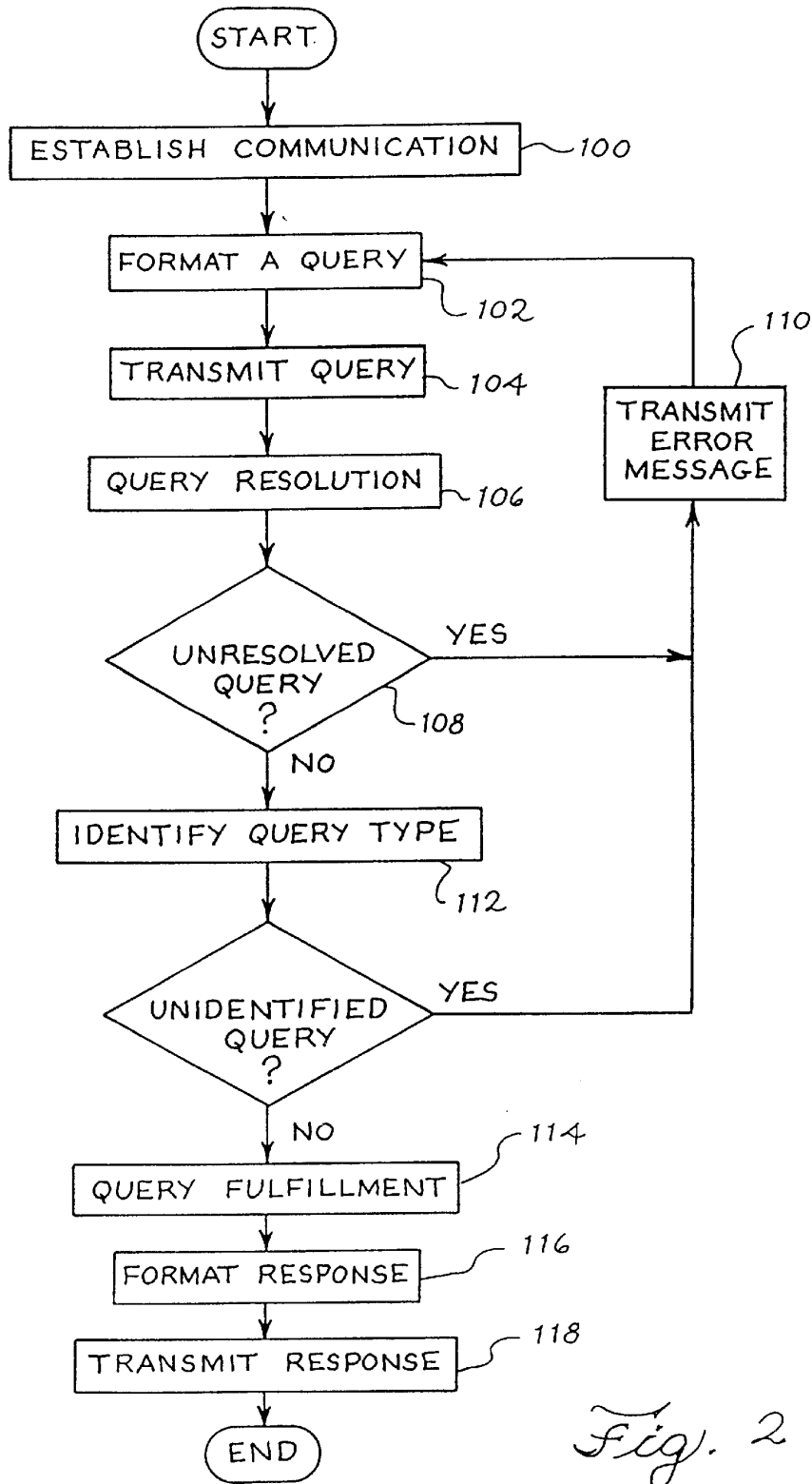


Fig. 2

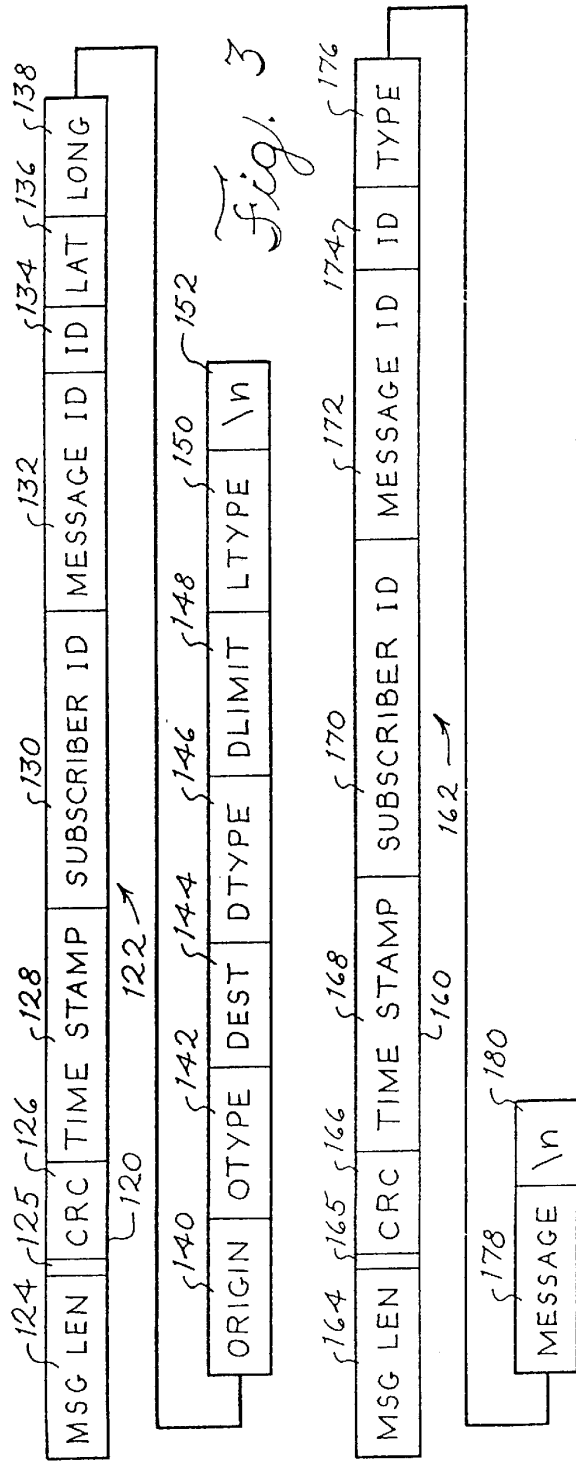


Fig. 3

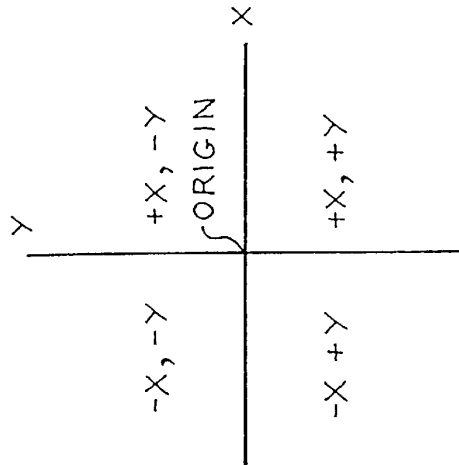


Fig. 5

Fig. 4

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