



(51) International Patent Classification ⁶ :
G01C 21/20, G08G 1/0968
A1

(11) International Publication Number: WO 96/00373
(43) International Publication Date: 4 January 1996 (04.01.96)

(21) International Application Number: PCT/US95/07859
(22) International Filing Date: 23 June 1995 (23.06.95)
(30) Priority Data: 08/265,094 24 June 1994 (24.06.94) US
(60) Parent Application or Grant
(63) Related by Continuation
US 08/265,094 (CIP)
Filed on 24 June 1994 (24.06.94)
(71) Applicant (for all designated States except US): SHIELDS ENTERPRISES, INC. [US/US]; 212 E. Ohio Street, Chicago, IL 60611-3203 (US).
(72) Inventors; and
(75) Inventors/Applicants (for US only): BEHR, David, A. [US/US]; 960 Borden Drive, Roselle, IL 60172 (US). RAMAKRISHNAN, Ramesh [IN/US]; Apartment 320, 1850 West Palm Drive, Mount Prospect, IL 60056 (US).
(74) Agents: MARTIN, Alice, O. et al.; William Brinks Hofer Gilson & Lione, P.O. Box 10395, Chicago, IL 60610 (US).

(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).

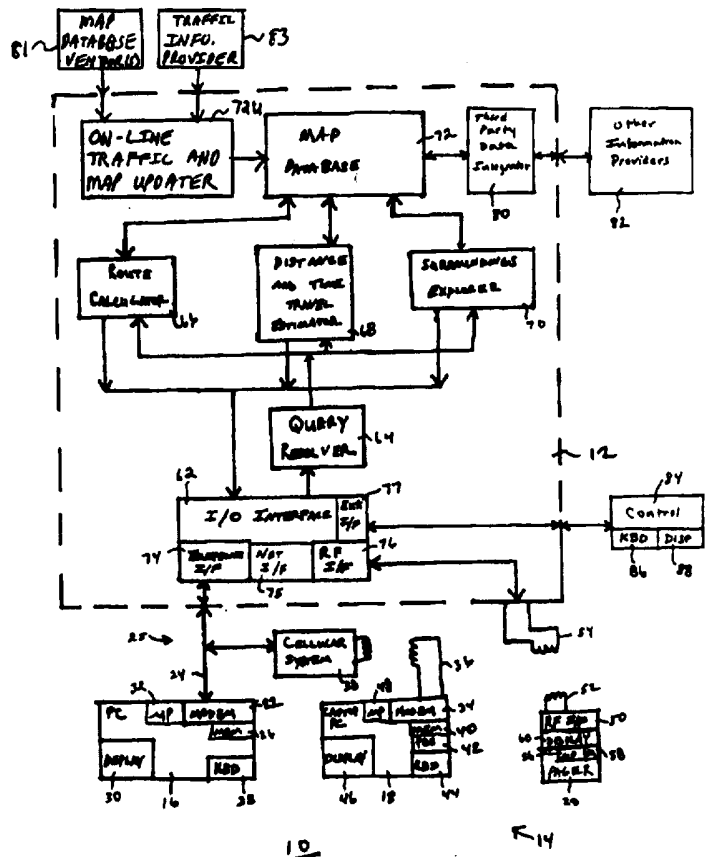
Published
With international search report.
With amended claims and statement.

Date of publication of the amended claims and statement:
1 February 1996 (01.02.96)

(54) Title: ELECTRONIC NAVIGATION SYSTEM AND METHOD

(57) Abstract

The invention provides a method and system for providing route guidance and other information from a base unit (12) to a remote unit (16, 18, 20) in response to a request from the remote unit. A query (120) 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 (72) located at the base unit. A response (160) 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 (figs. 6 to 10) and combined maneuver arms (fig. 39) and through the use of tokenized forms (fig. 40). 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.



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.

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

AMENDED CLAIMS

[received by the International Bureau on 28 December 1995 (28.12.95);
new claims 17-20 added; remaining claims unchanged (4 pages)]

(d) receiving said at least one of said plurality of tokenized forms at said remote unit; and

(e) at said remote unit, expanding said at least one of said plurality of tokenized forms received in step (d) into a textual driving instruction for annunciation to a user at said remote unit.

16. A method of electromagnetically transmitting route directions in a compact form, comprising the steps of:

(a) generating a set of maneuver arms to depict roads at an intersection on a display, each maneuver arm of the set of maneuver arms being represented by at least one set of endpoint coordinates;

(b) electromagnetically transmitting the set of endpoint coordinates to a remote unit; and

(c) controlling a display at the remote unit to depict said roads by joining said set of endpoint coordinates on said display.

17. A method of providing route guidance information from a central base unit to a mobile unit in response to a request from the mobile unit, the method comprising the steps of:

formatting a query at the mobile unit, the query including the request;

communicating the query from the mobile unit to the base unit;

calculating the route guidance information at the base unit in response to the query;

formatting a response to the query at the base unit, the response including the route guidance information and information indicative of a graphical representation of an intersection to be traversed, said representation including vectors defining streets and respective angles with

respect to the intersection; and street sign information located at said intersection; and
communicating the response from the base unit to the mobile unit, said communicating comprising a display.

18. A system for communicating routing information between a base unit and a mobile unit, the system comprising:

an input device at the mobile unit for providing an origin and a destination;
a processor of the base unit for calculating a route between the origin and the destination;
said route including a plurality of intersections to be traversed and the data generated by said processor defining said route;
information indicative of a graphical representation of an intersection to be traversed, said representation including vectors defining streets and respective angles with respect to the intersection; and street sign information located at said intersection; and

communication means for communicating the origin and the destination from the mobile unit to the base unit and for communicating the route from the base unit to the mobile unit.

19. A method of providing routing information to a mobile unit, the method comprising the steps of:

providing an origin and a destination from the mobile unit to a base unit, the base unit located remotely from the mobile unit;
calculating at the base unit a route to be traversed between the origin and the destination, the route including a plurality of intersections to be traversed, data generated by said step of calculating the route and information representing a selected plurality of intersections and information indicative of a graphical representation of an intersection to be traversed, said representation including a vector defining streets and respective angles with respect to the intersection; and street sign information located at said intersection;
providing the data to the mobile unit.

20. A system for providing route guidance information to a remote location from a central location, the system comprising:

- a mobile unit including input for providing at least a route destination and output for providing an indication of the route guidance information;
- a transmitter at the mobile unit for transmitting destination data and origin data from the mobile unit, the destination data being indicative of the route destination and the origin data being indicative of a route origin;
- a base unit at the central location, a receiver of the base unit for receiving the destination data and the origin data from the transmitter, a processor of said

base unit coupled with the receiver for calculating data defining a route to the route destination from a route origin responsive to receiving the destination data and the origin data, the transmitter of the base unit coupled to the processor and the transmitter for transmitting routing data indicative of the route; and information indicative of a graphical representation of an intersection to be traversed, said representation including a vector defining streets and respective angles and respective angles with respect to the intersection; and street sign information located at said intersection;

a receiver at the mobile unit for receiving the routing data from the transmitter of said base unit, said transmitter being coupled with the output means for providing the route guidance information to the output means responsive to the routing data.

STATEMENT UNDER ARTICLE 19

Claims are amended under PCT Article 19 by adding claims 17-20. These claims are fully supported in the disclosure (specification) and have no additional impact on the description or drawings. The present amendment is submitted within the time limits allowed by PCT Rule 46.