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**Ito et al.**

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(54) **COMMUNICATIONS NAVIGATION SYSTEM, AND NAVIGATION BASE APPARATUS AND VEHICLE NAVIGATION APPARATUS BOTH USED IN THE NAVIGATION SYSTEM**

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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).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(51) **Int. Cl.**[7] ..... **G01C 21/00**; G01C 22/00; G01S 5/00; G06G 7/78; G06F 17/00; G06F 19/00

(52) **U.S. Cl.** ..... **701/200**; 701/117; 701/120; 701/201; 701/202; 701/209; 701/210; 701/211; 705/5; 340/910; 340/945; 340/994; 340/988; 340/990; 340/995; 340/953

(58) **Field of Search** ..... 701/200, 120, 701/210, 201, 211, 209, 202, 117; 340/988, 990, 995, 953, 910, 945, 994; 705/5

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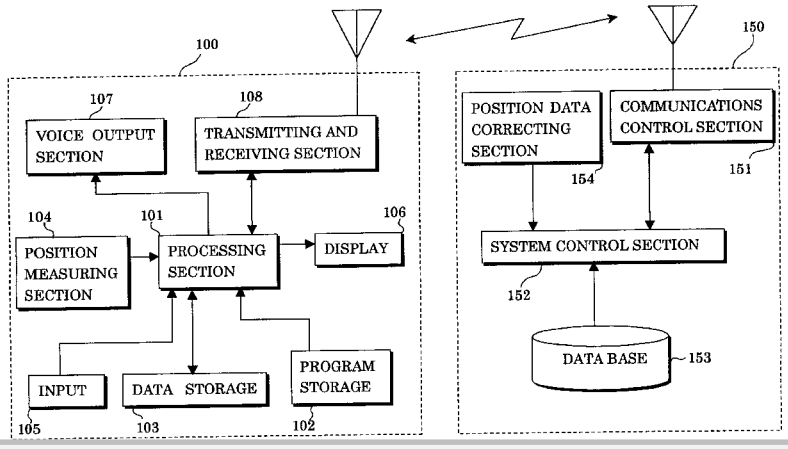
(57) **ABSTRACT**

A commucations navigation system in which data is transmitted and received between a navigation base apparatus provided at a navigation base and a vehicle navigation apparatus provided in a vehicle using communication. The vehicle navigation apparatus is adapted to transmit at least data concerning the current position of the vehicle and the destination thereof to the navigation base apparatus, and the navigation base apparatus stores navigation data in its data base and is adapted to determine a recommended route based on the transmitted data of the current position of the vehicle and the destination thereof and then extract data of the recommended route from the navigation data stored in the data base and transmit the extracted data to the navigation apparatus. The navigation base apparatus is adapted to be able to extract detailed navigation data only for a surrounding areas of a specified point on the recommended route from the navigation data stored in the data base and then transmit the detailed navigation data to the navigation apparatus. The specified point includes a departure point, a destination and a course-change point which are located on the recommended route. During traveling other places on the recommended route such as intermediate sections, the navigation apparatus transmits simple navigation data such as a simple map to the vehicle, thereby enabling to reduce an amount of data to be transmitted from the navigation base apparatus to the vehicle navigation apparatus.

**8 Claims, 45 Drawing Sheets**

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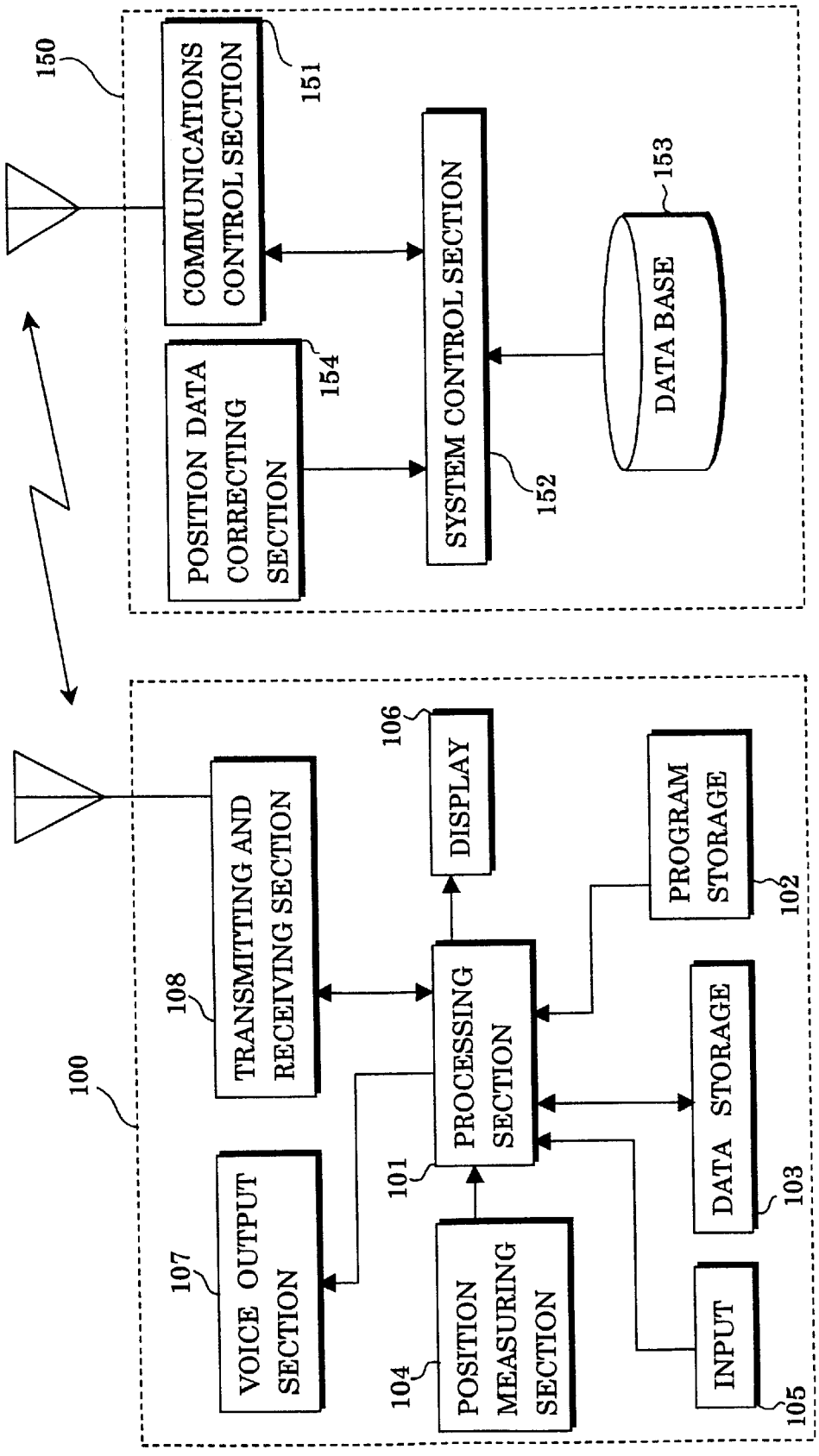


Fig. 1

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Fig. 2

(A)

| Road data | |
|---|---|
| Road Number | 65248 |
| Node Point Data | ND1, ND2, ····· |
| Road Name | xx road |
| Road Classification | Highway |
| Road Length | 45 Km |
| | |

(B)

| Intersection Data | |
|---|---|
| Intersection Number | 02564 |
| Intersection Name | Intersection xx |
| Intersection Position | Longitude:xx<br>Latitude:xx |
| | |

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Fig. 3

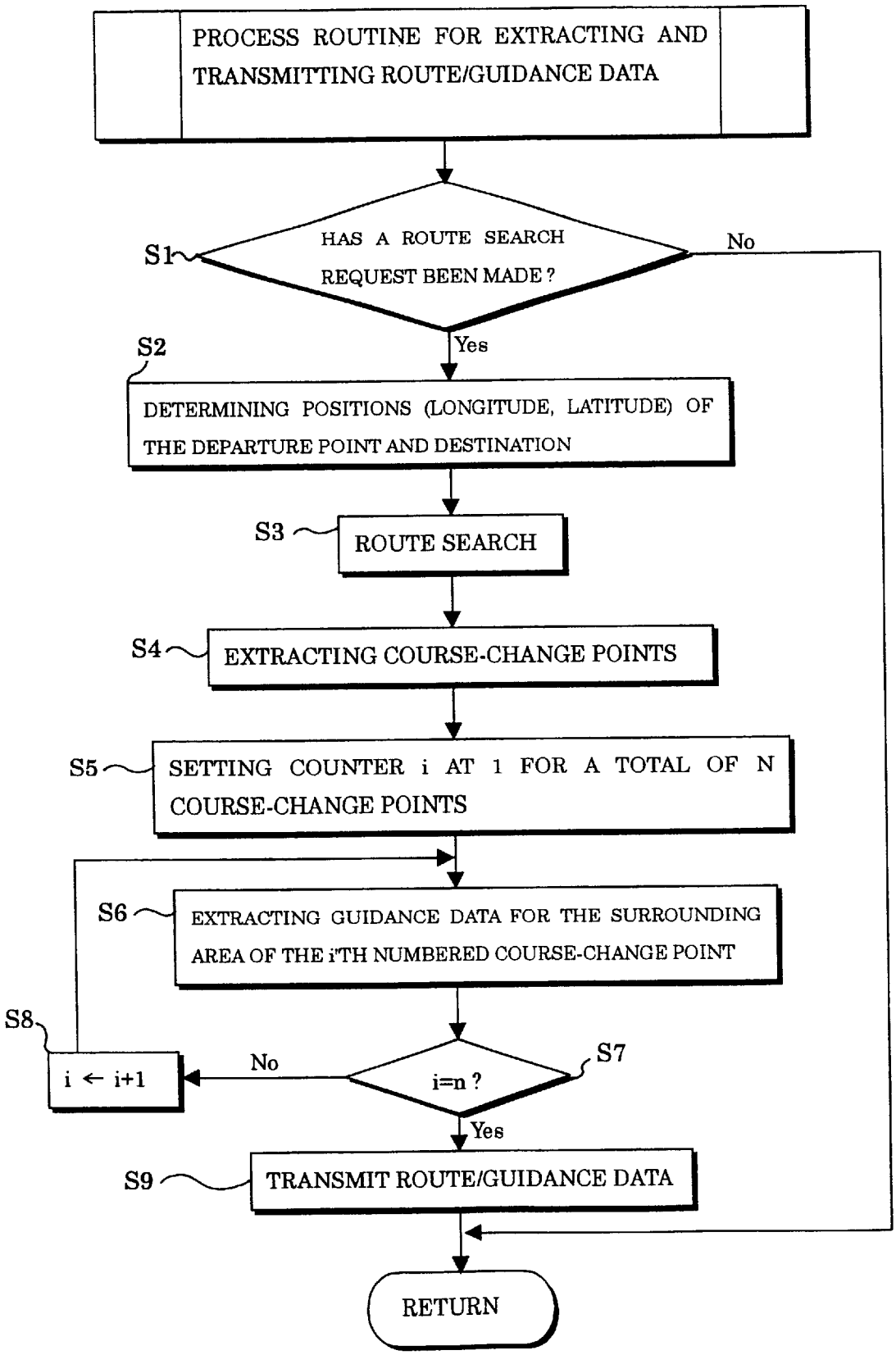


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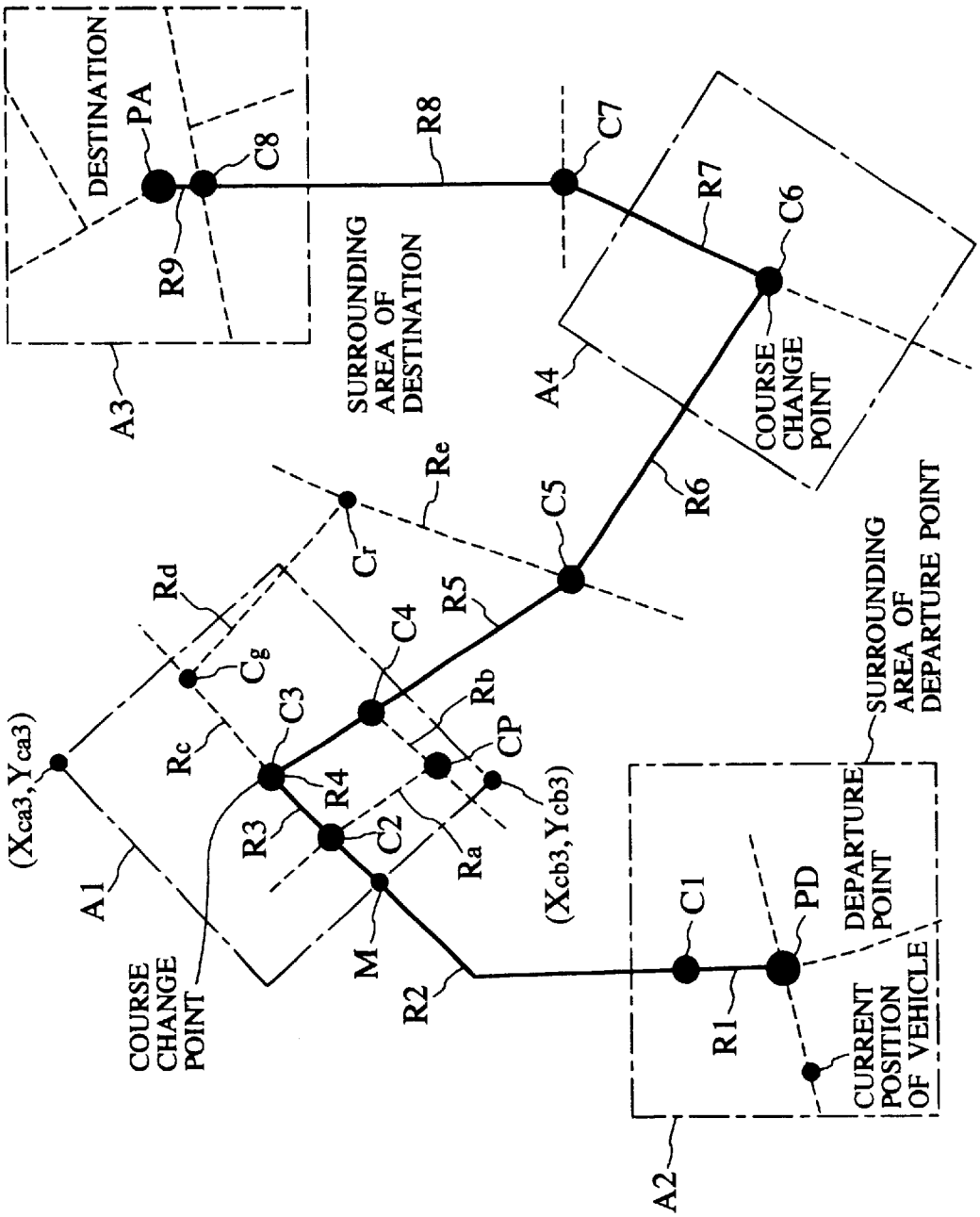
Fig. 4

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