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Croyle et al.

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[54] **VEHICLE NAVIGATION SYSTEM AND METHOD**

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[21] Appl. No.: **580,150**

[22] Filed: **Dec. 28, 1995**

[51] **Int. Cl.**[6] **G06G 7/48**

[52] **U.S. Cl.** ..... **701/213**; 701/214; 701/215; 701/208; 73/178 R

[58] **Field of Search** ..... 364/460, 461, 364/444.1, 449.1, 450, 447, 449.7, 449.3, 454, 453, 448, 440, 443; 340/988, 990, 995; 73/178 R; 342/357, 457, 352, 451; 701/207, 208, 213, 214, 215, 221, 220, 216

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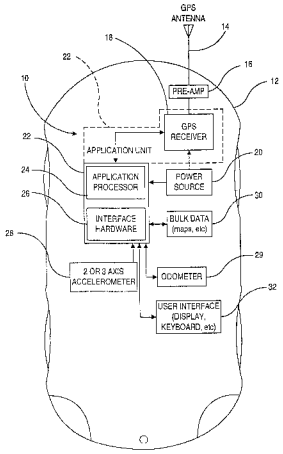
[57] **ABSTRACT**

The improved vehicle navigation system and method uses information from a Global Positioning System (GPS) to obtain velocity vectors, which include speed and heading components, for "dead reckoning" the vehicle position from a previous position. If information from the GPS is not available, then the improved vehicle navigation system uses information from an orthogonal axes accelerometer, such as two or three orthogonally positioned accelerometers, to propagate vehicle position. Because the GPS information should almost always be available, the improved vehicle navigation system relies less on its accelerometers, thereby allowing the use of less expensive accelerometers. The improved vehicle navigation system retains the accuracy of the accelerometers by repeatedly calibrating them with the velocity data obtained from the GPS information. The improved vehicle navigation system calibrates the sensors whenever GPS data is available (for example, once a second at relatively high speeds). Furthermore, the improved vehicle navigation system does not need to rely on map matching to calibrate sensors. System flexibility is improved because map matching is oblivious to the hardware, and the system hardware can be updated without affecting map matching or a change in the map database.

17 Claims, 13 Drawing Sheets



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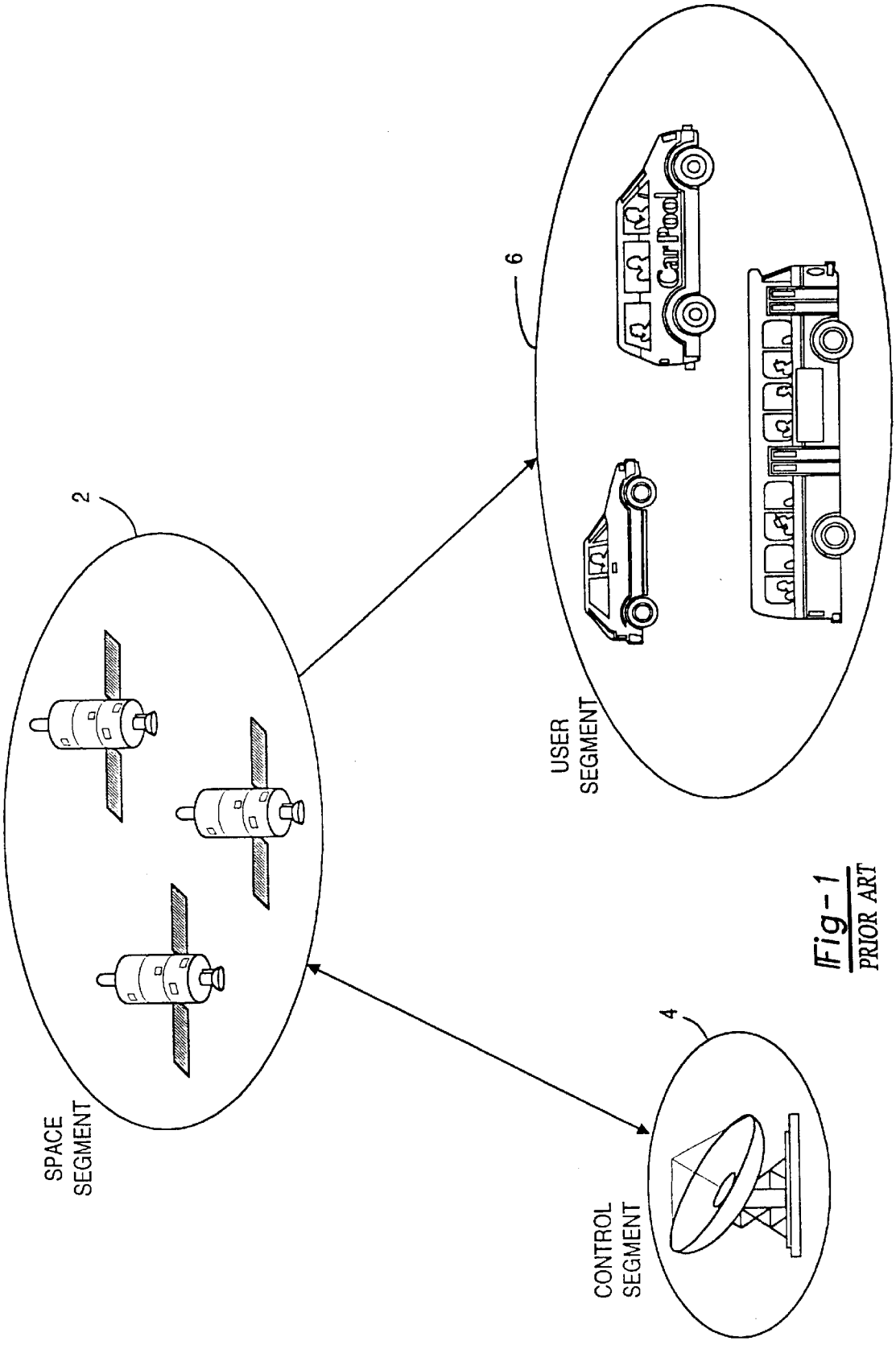

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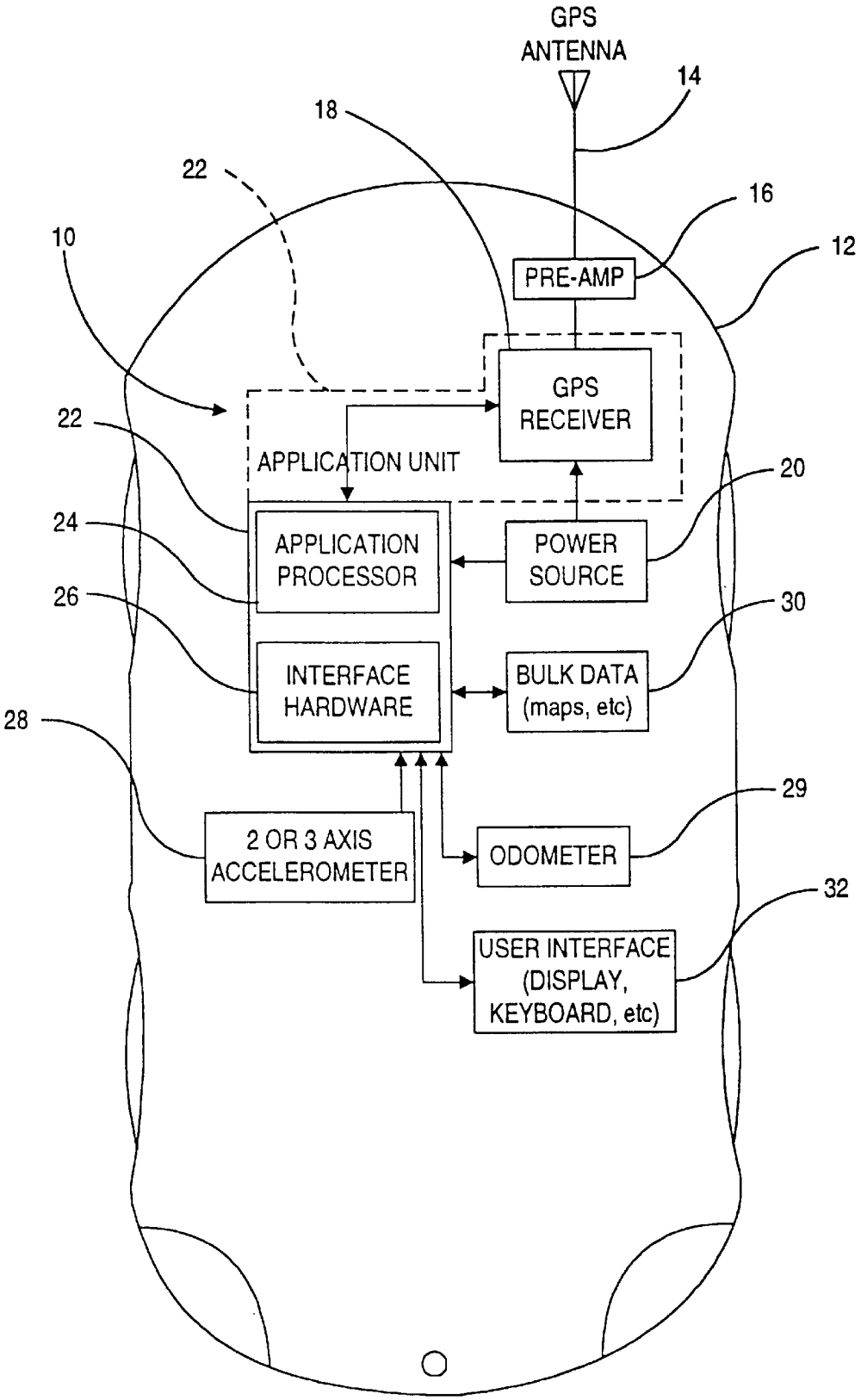

Fig-2a

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