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Walters et al.

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(54) **PORTABLE NAVIGATION DEVICE WITH INTEGRATED GPS AND DEAD RECKONING CAPABILITIES**

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(52) **U.S. Cl.** **701/216**; 701/208
(58) **Field of Search** 701/216, 208, 701/201, 207, 209, 211, 213, 217; 340/990, 995, 944, 945; 455/426.1, 67.11, 423, 456, 461; 342/357.1

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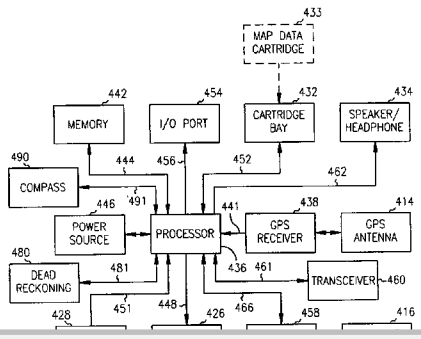
(57) **ABSTRACT**

Apparatus, systems and methods are provided for portable navigation devices with various integrated positioning functionality. The apparatus includes a portable electronic device having a processor in communication with a memory. The memory is adapted to store navigation related data. The navigation related data includes cartographic data including a number of locations and data indicative of thoroughfares of a plurality of types connecting certain ones of the locations. The portable electronic device includes a GPS receiver adapted to communicate with the memory and processor. And, the portable electronic device includes a dead reckoning component, including a rate gyro, pedometer, and/or accelerometer adapted to communicate to memory and processor.

29 Claims, 7 Drawing Sheets



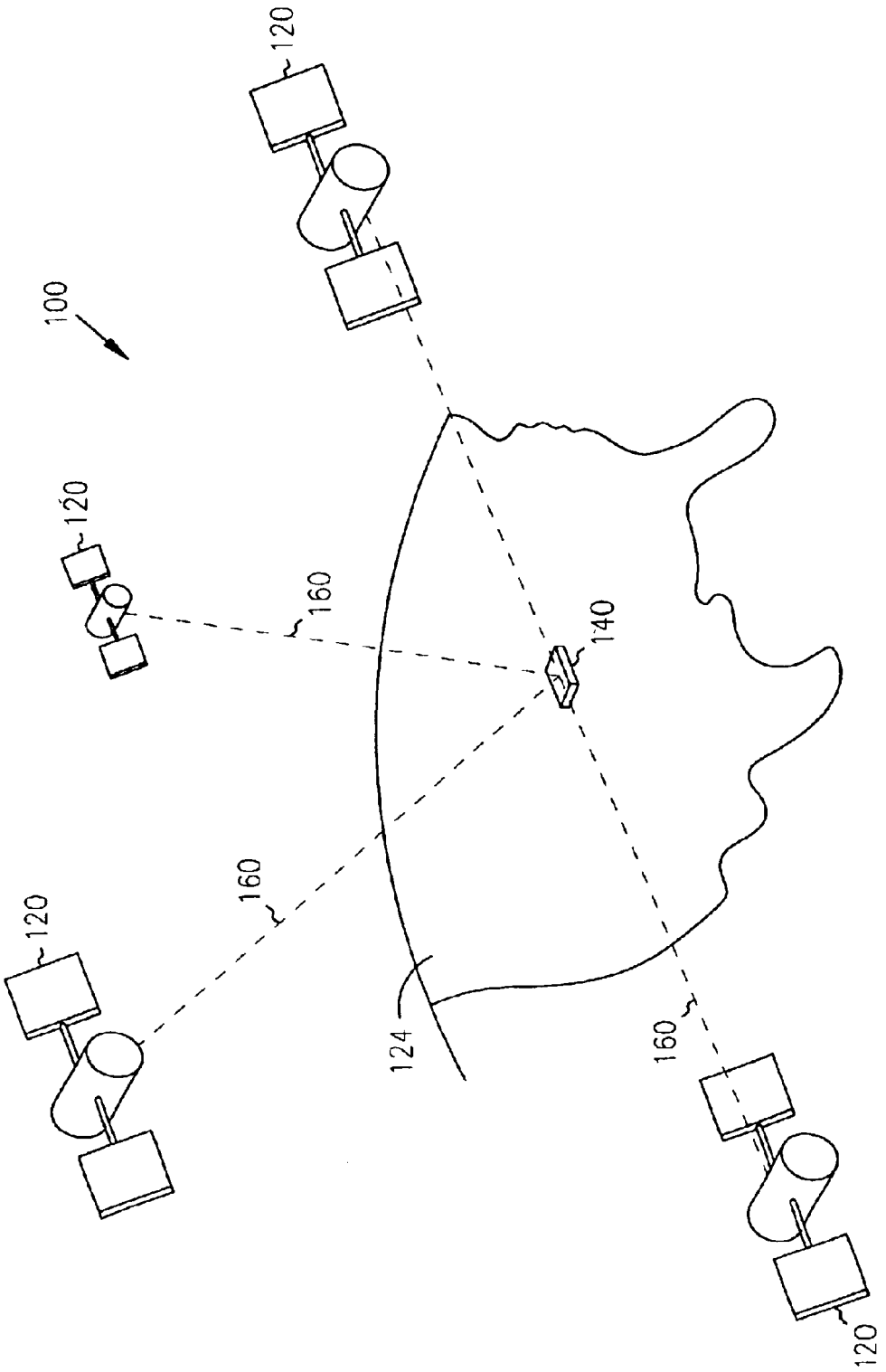


FIG. 1

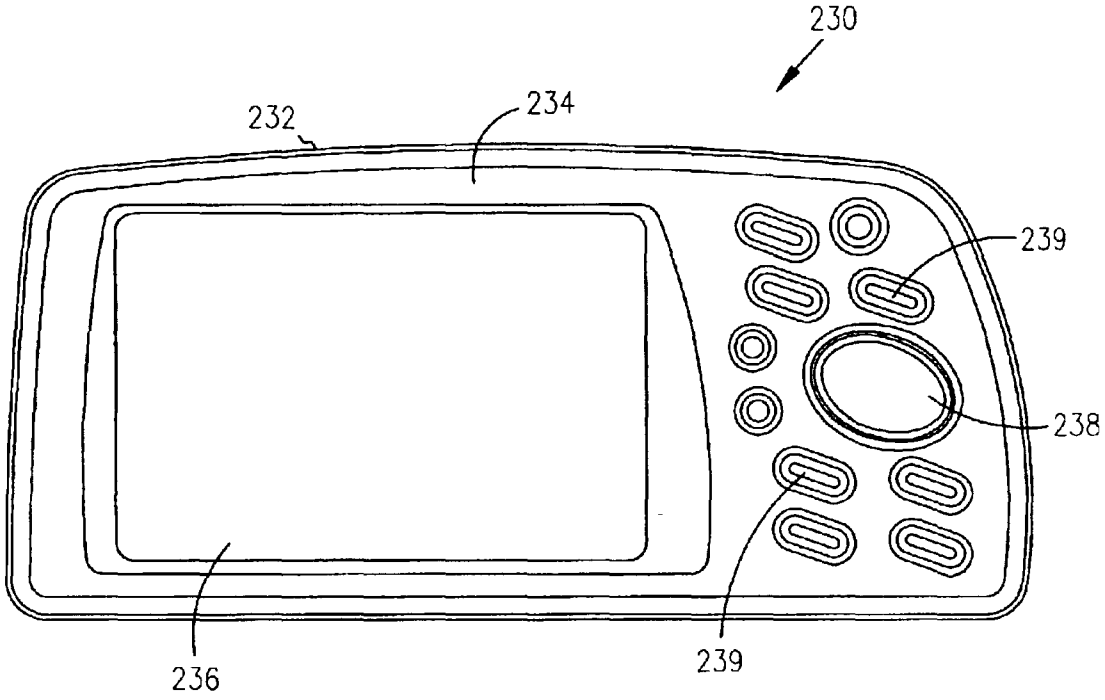


FIG. 2A

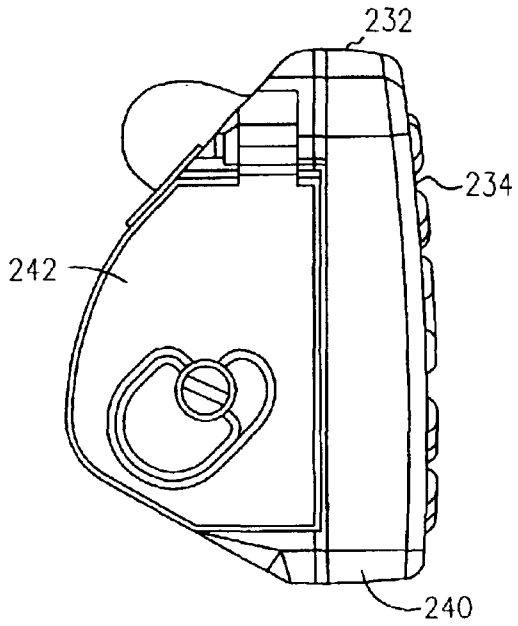


FIG. 2B

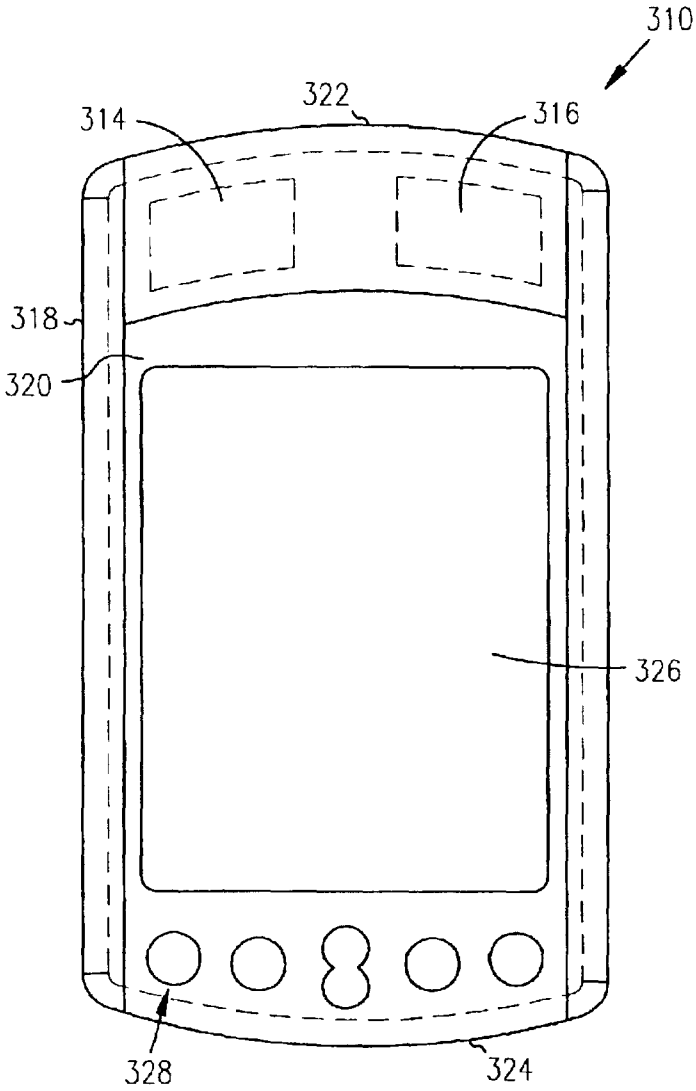


FIG. 3A

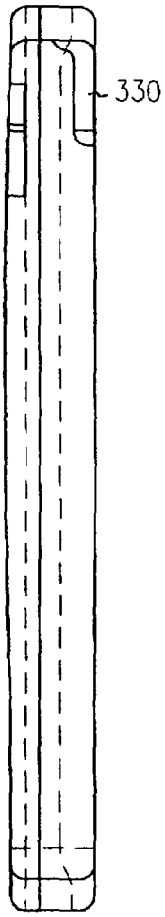


FIG. 3B

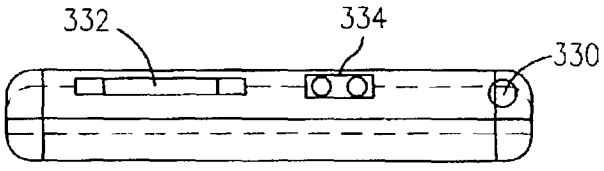


FIG. 3C

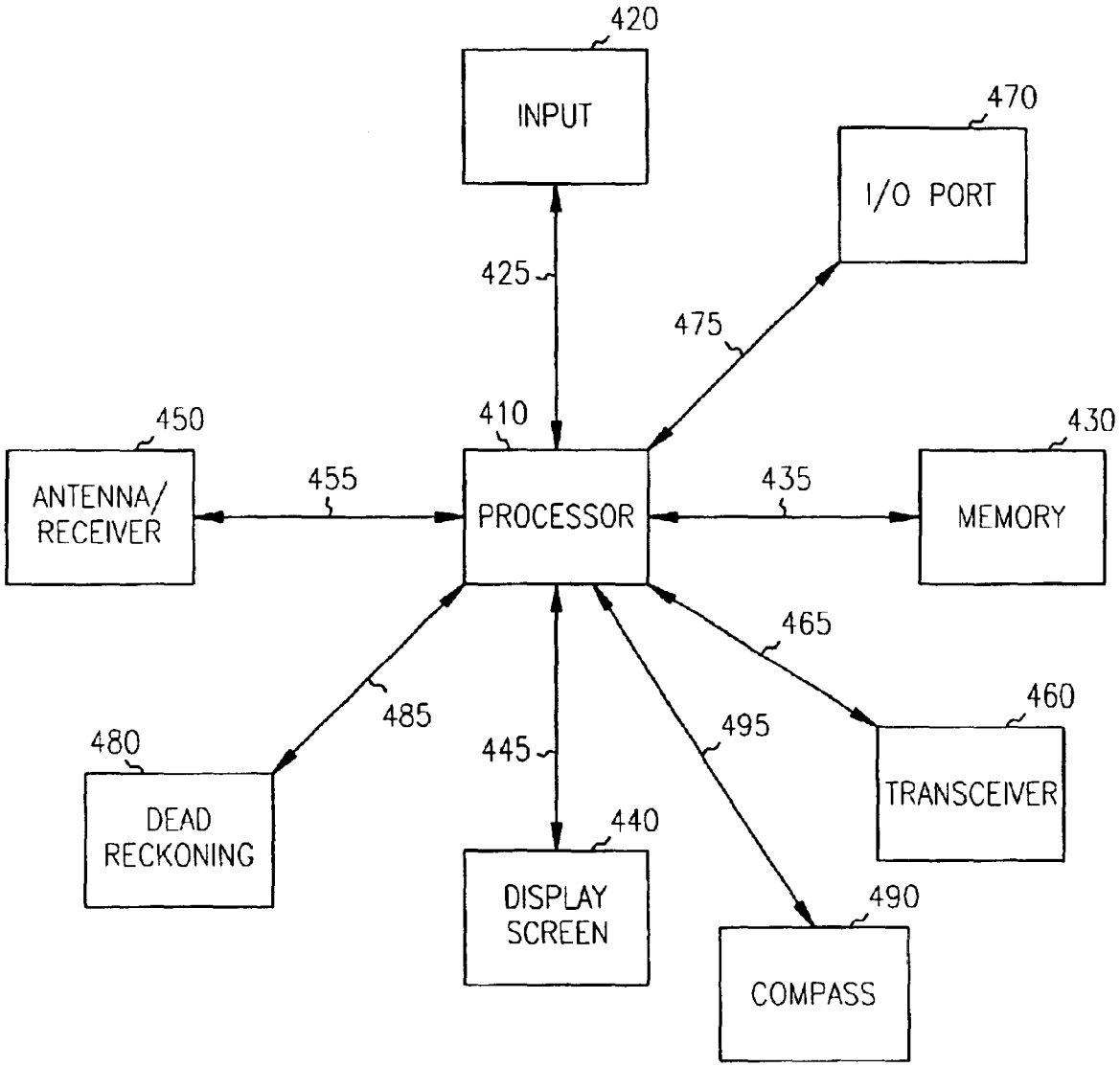


FIG. 4A

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