



US005583776A

**United States Patent** [19][11] **Patent Number:** **5,583,776****Levi et al.**[45] **Date of Patent:** **Dec. 10, 1996**

[54] **DEAD RECKONING NAVIGATIONAL  
SYSTEM USING ACCELEROMETER TO  
MEASURE FOOT IMPACTS**

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[73] Assignee: **Point Research Corporation, Santa  
Ana, Calif.**

[21] Appl. No.: **405,087**

[22] Filed: **Mar. 16, 1995**

[51] Int. Cl.<sup>6</sup> ..... **G01C 22/00**

[52] U.S. Cl. .... **364/450; 364/443; 364/460**

[58] Field of Search ..... **364/449, 450,  
364/452, 460, 454, 443; 235/105; 340/944;  
73/490**

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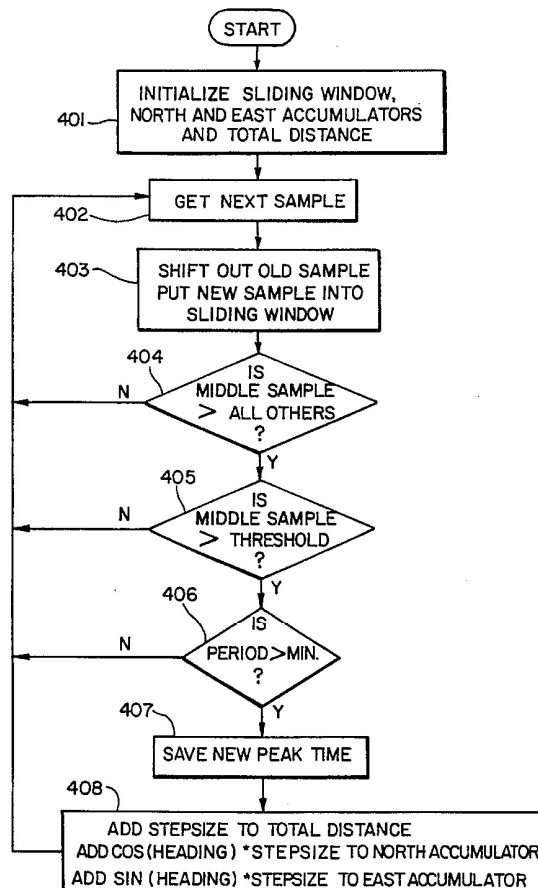
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[57] **ABSTRACT**

A microcomputer-assisted position finding system that integrates GPS data, dead reckoning sensors, and digital maps into a low-cost, self-contained navigation instrument is disclosed. A built-in radio frequency transponder allows individual positions to be monitored by a central coordinating facility. Unique dead reckoning sensors and features are disclosed for ground speed/distance measurement and computer-aided position fixes.

**15 Claims, 8 Drawing Sheets**



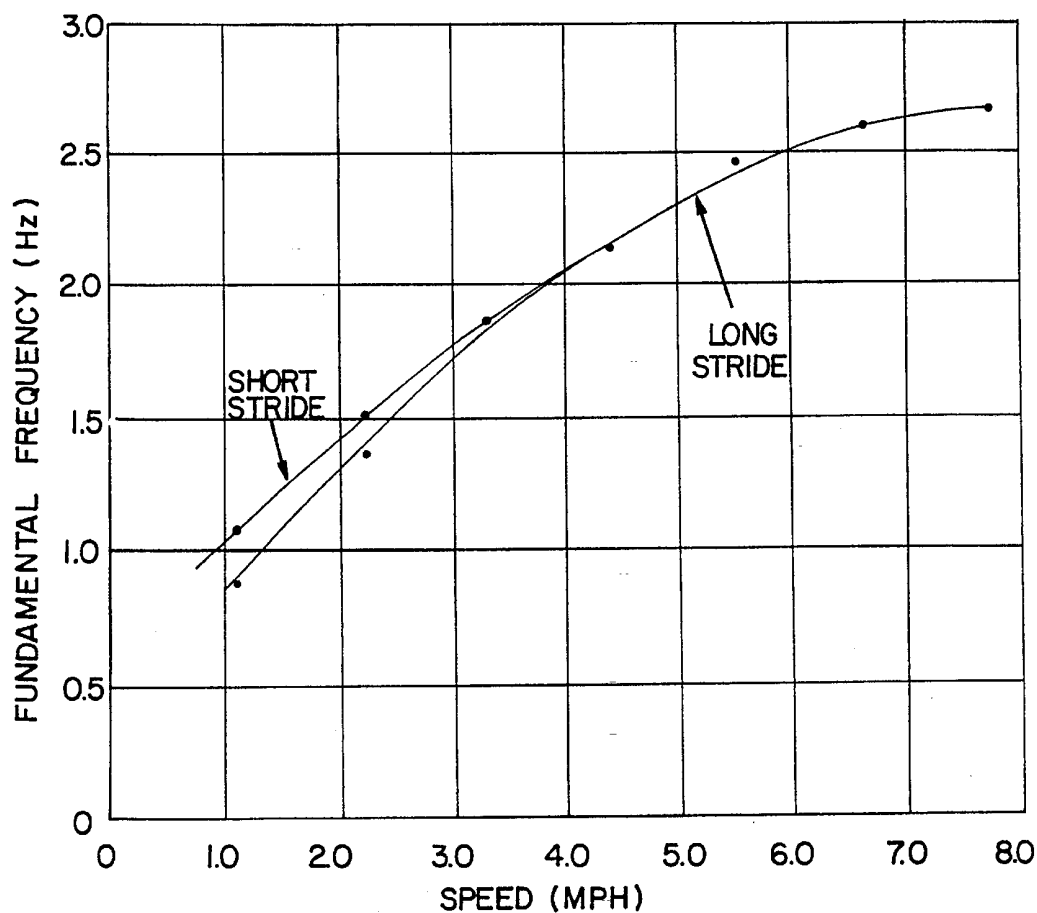


FIG. 1

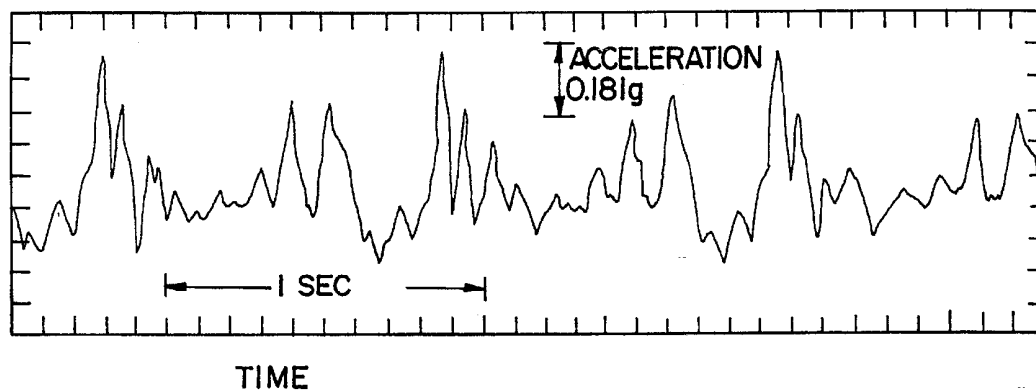


FIG. 2

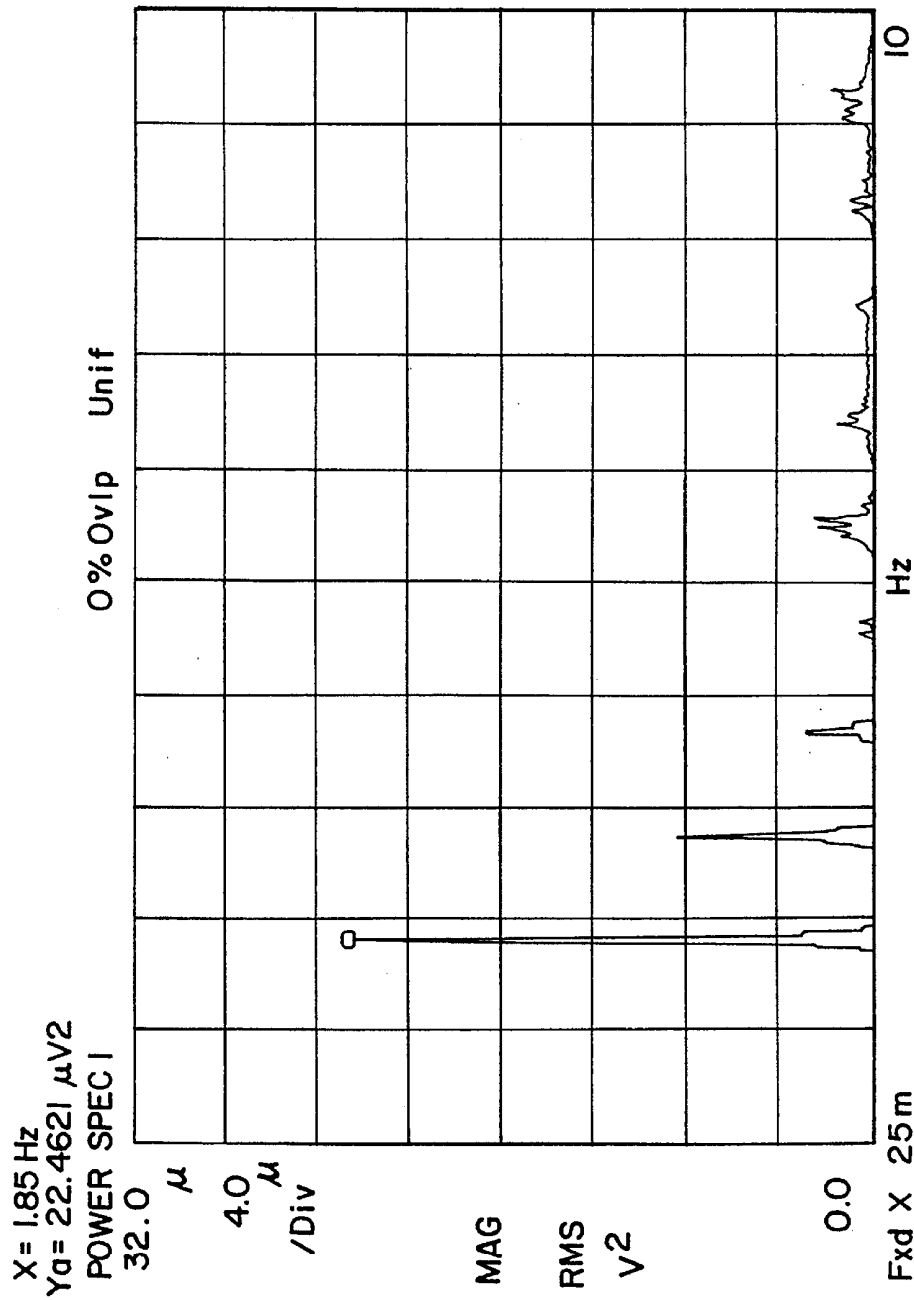


FIG. 3

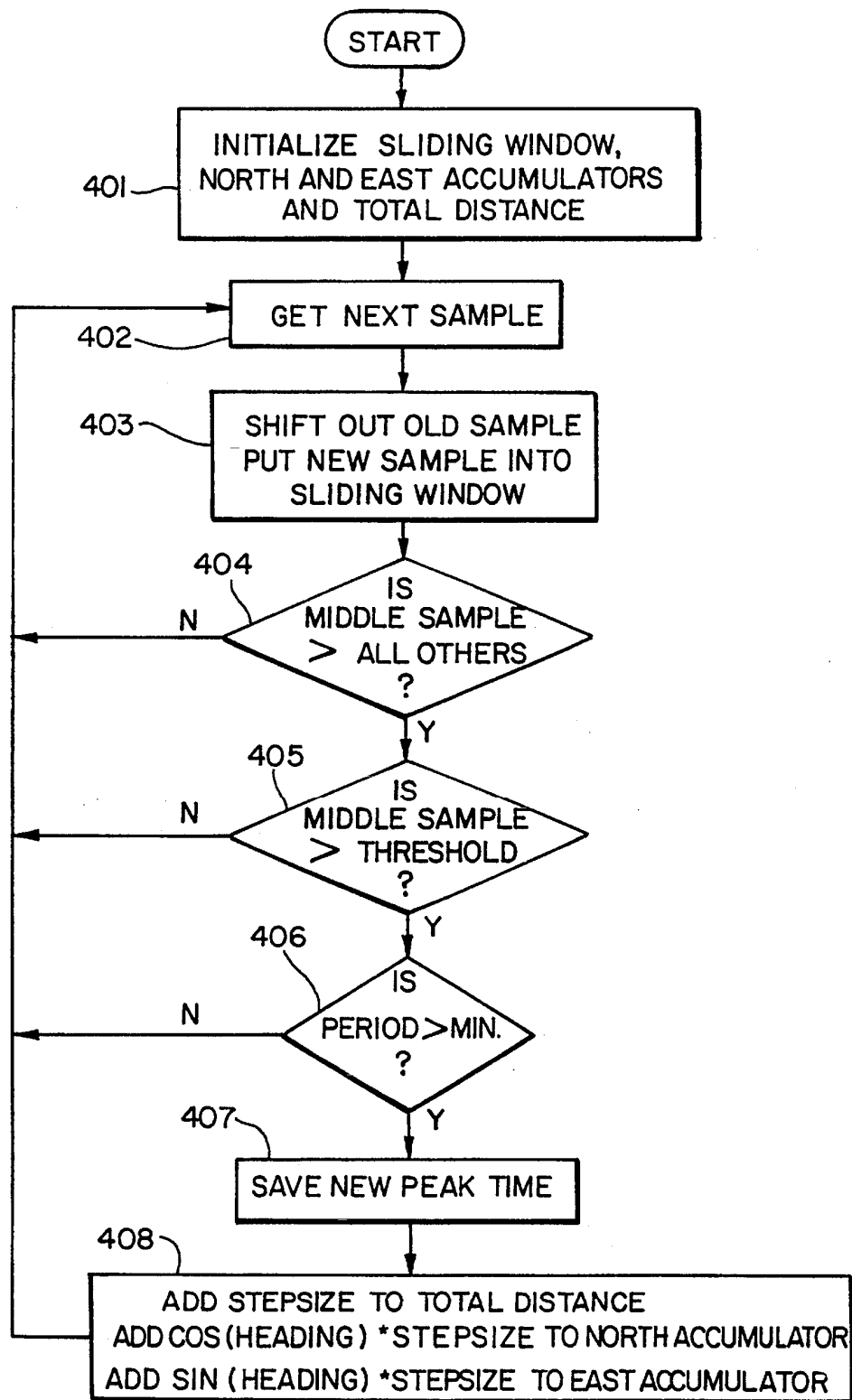


FIG. 4

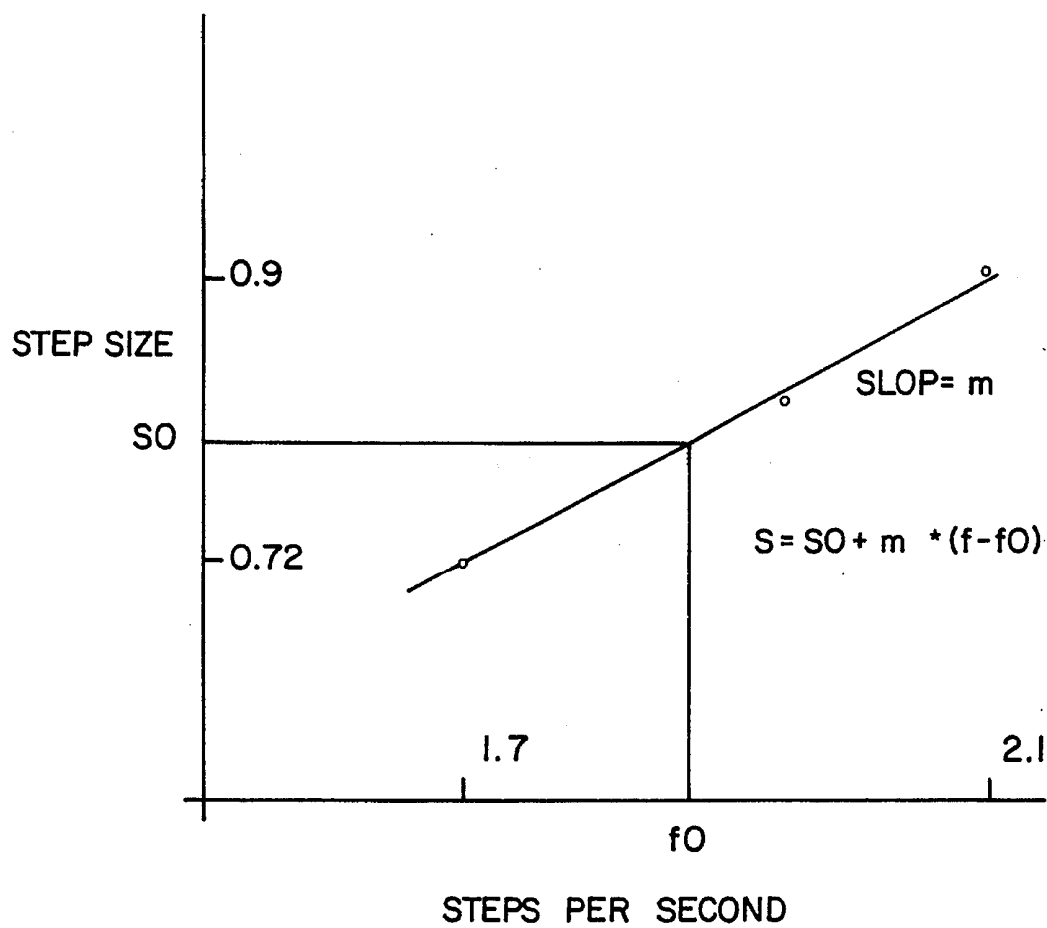


FIG. 5



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