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**Matsuoka et al.**

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(54) **PORTABLE POSITION DETECTOR AND POSITION MANAGEMENT SYSTEM**

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

This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**<sup>7</sup> ..... **G01C 21/00**; G01S 21/00;  
G06G 7/78

(52) **U.S. Cl.** ..... **701/213**; 701/207; 701/216;  
701/217

(58) **Field of Search** ..... 701/207, 216,  
701/217, 213, 117

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(57) **ABSTRACT**

A portable position detector is equipped with a pedometer, a geomagnetic sensor, and an acceleration sensor. With the pedometer, the moved distance of a walker is detected by a calculation of “the number of steps×the length of a step”. With the walking time per step detected with the acceleration sensor, the length of a step is corrected so that it corresponds to the walking state. The moved direction of the walker is detected with the geomagnetic sensor. With this, the moved position of the walker is accurately detected by self-contained navigation. Particularly, even in the case where the position detector is located in a forest or between buildings where a signal cannot be received from a global positioning system (GPS) due to high buildings, banks, and forests, the position detector with a portable size and weight applicable to a walker can know with a practically sufficient degree of accuracy the position of a person carrying this portable detector by self-contained navigation.

**19 Claims, 20 Drawing Sheets**

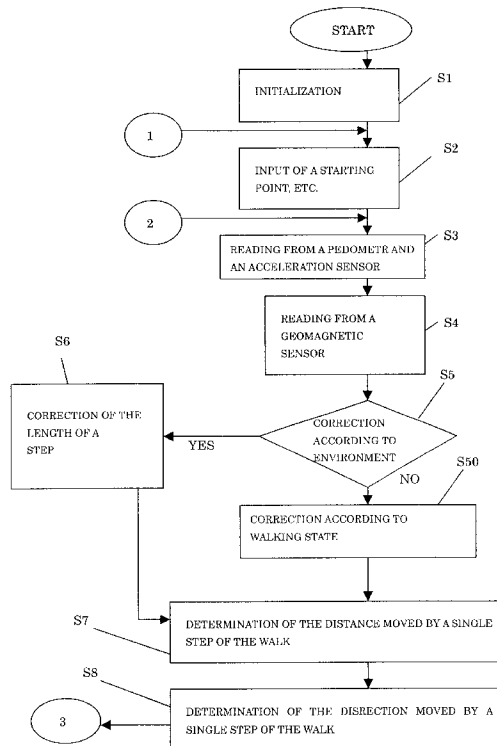


FIG. 1

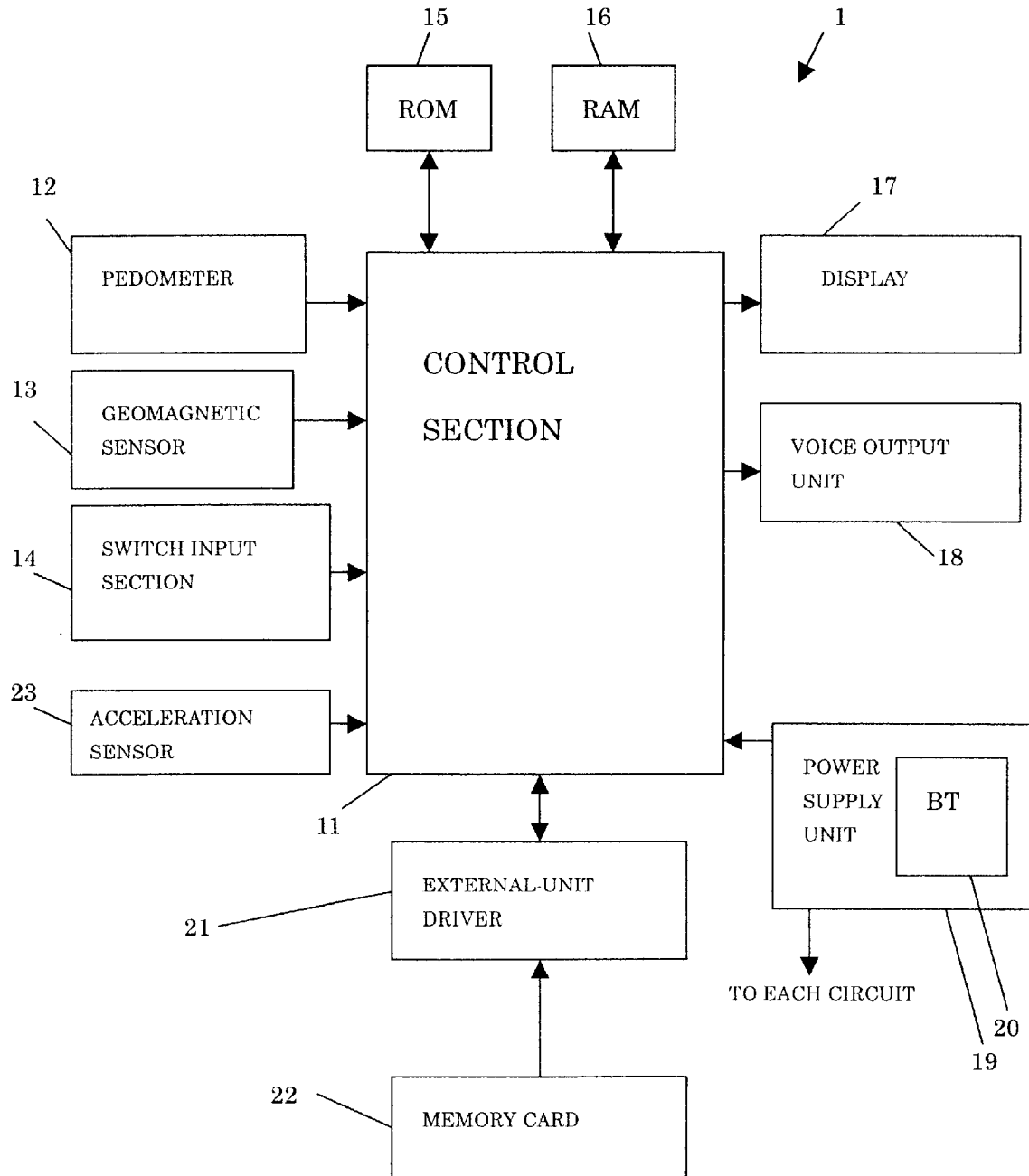


FIG. 2

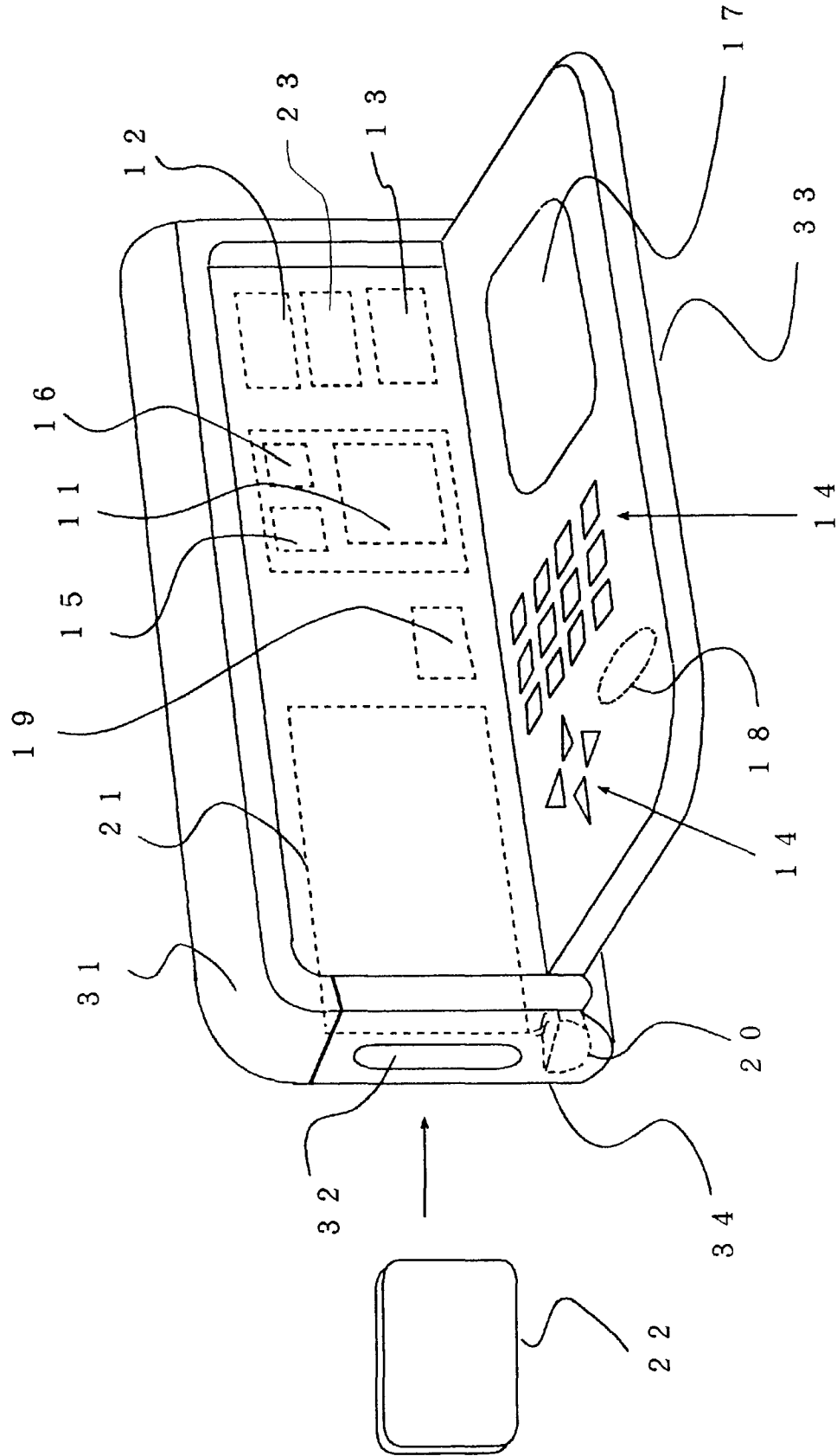


FIG. 3

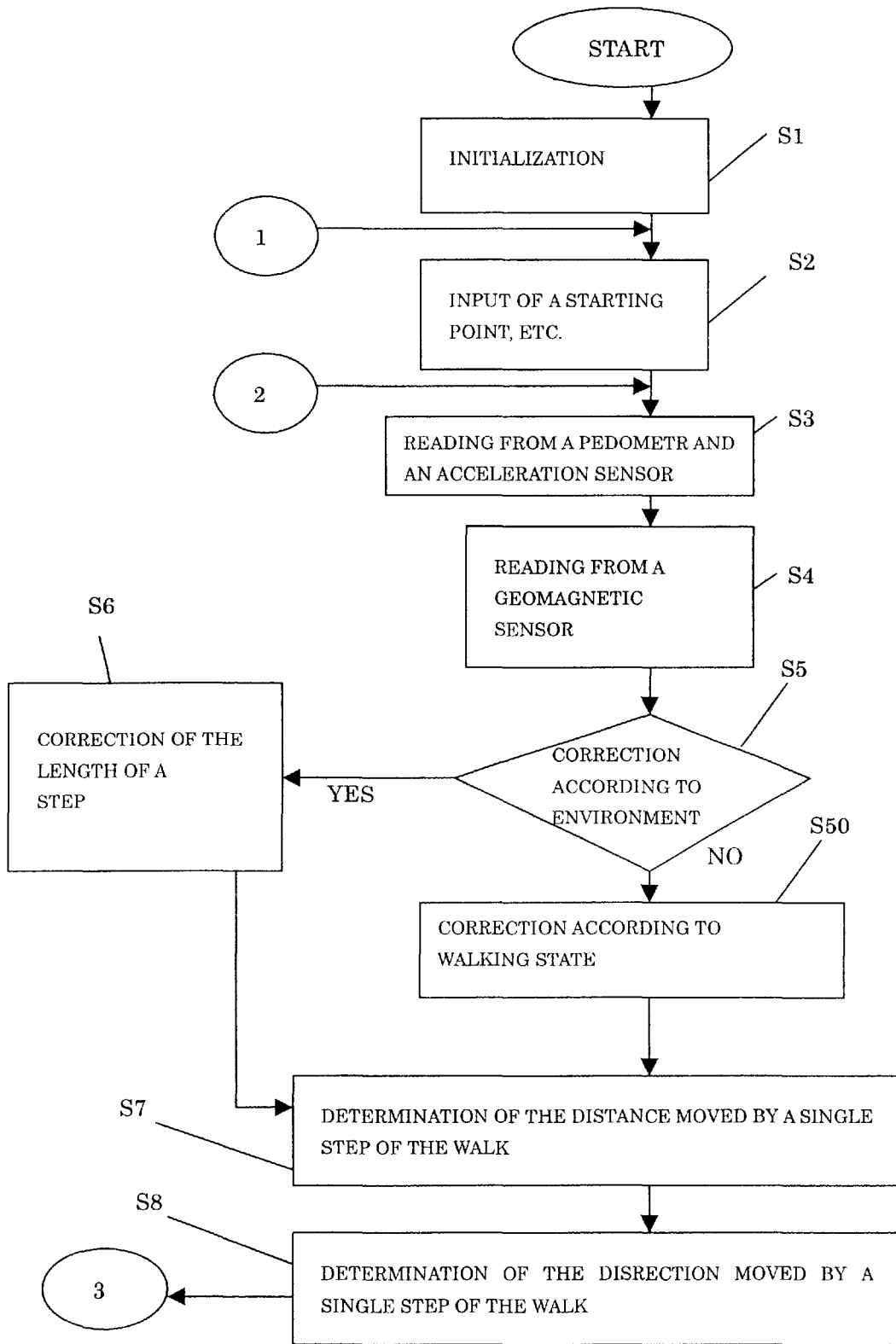
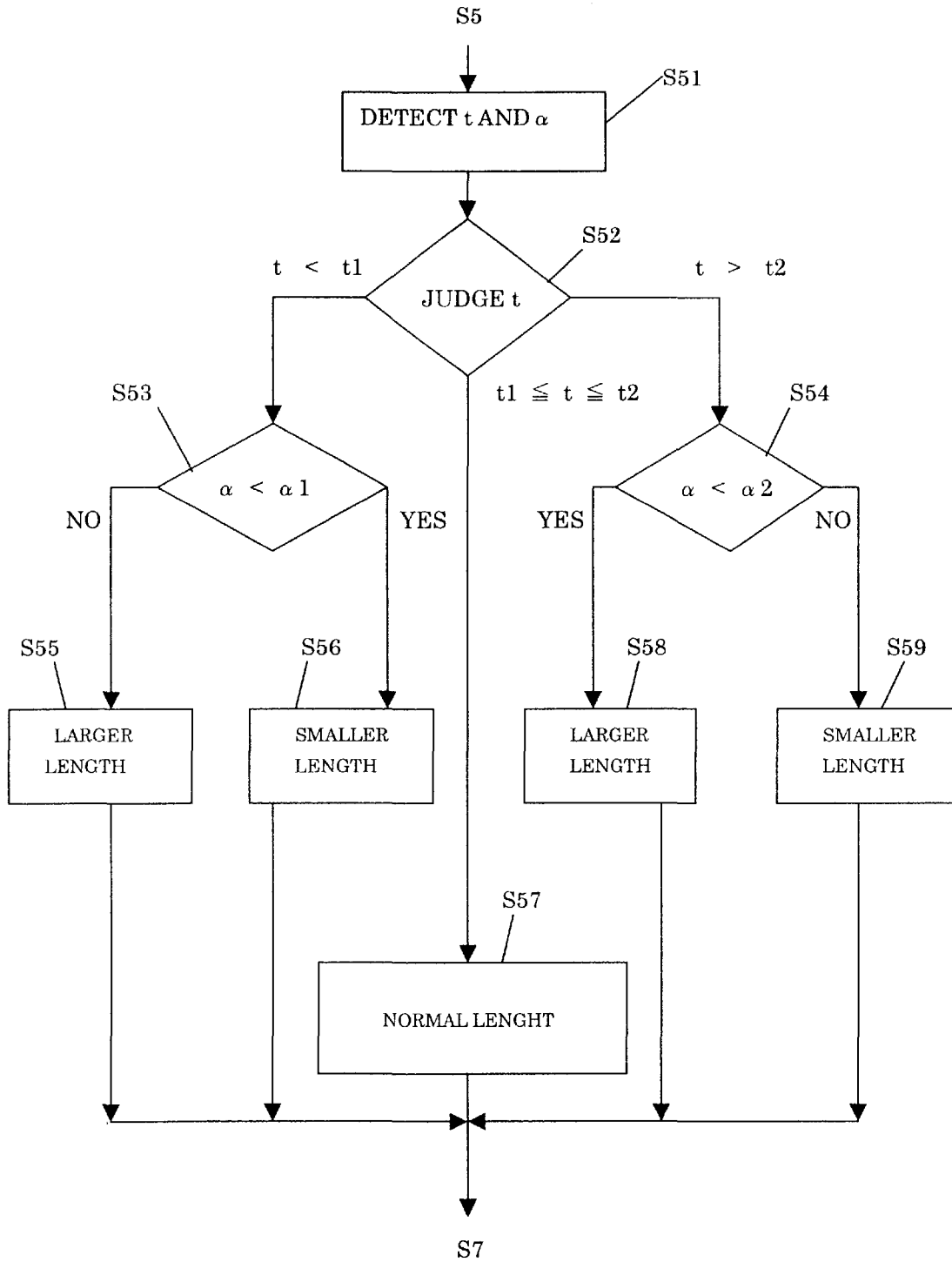


FIG. 4



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