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Tsuji

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(54) **ELECTRONIC PEDOMETER**

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A63B 22/00 (2006.01)

(52) **U.S. Cl.** **482/3**; 482/8; 482/900; 377/24.2; 702/160

(58) **Field of Classification Search** 482/1–9, 482/54, 900–902; 235/105; 342/357.06; 36/132, 136; 377/24, 24.2; 702/160
See application file for complete search history.

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(57) **ABSTRACT**

To enhance precision in measurement of the number of steps even when a walk cycle changes. An acceleration detecting portion outputs a walk signal corresponding to a walk of a user detected by a walk sensor. A step number counting portion of a counting portion counts each signal which is judged to be beyond a first reference cycle range by a walk cycle comparing portion among signals from the acceleration detecting portion as the number of steps for one step, and when an extra-regulation step number processing portion judges that a predetermined number of signals each within a second reference cycle range among the signals each beyond the first reference cycle range is continuously outputted, counts the predetermined number of signals as the predetermined number of steps.

18 Claims, 3 Drawing Sheets

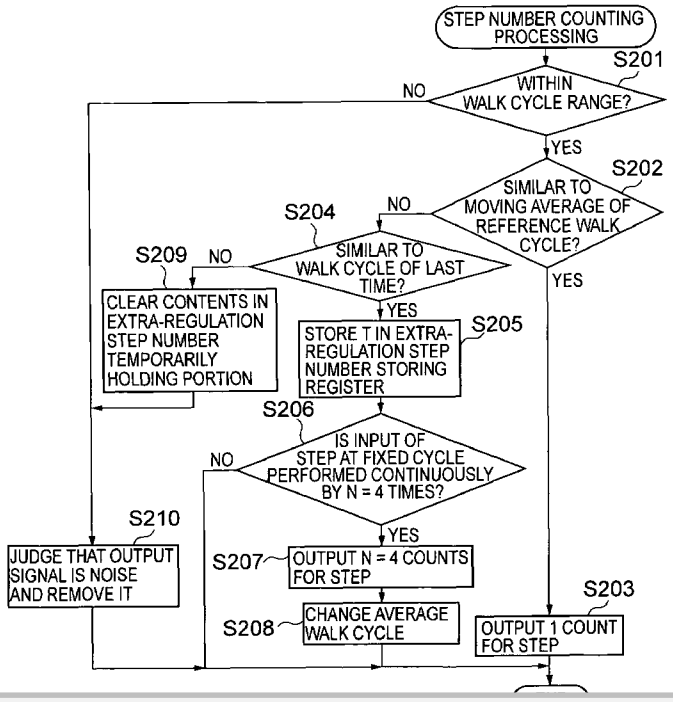


FIG. 1

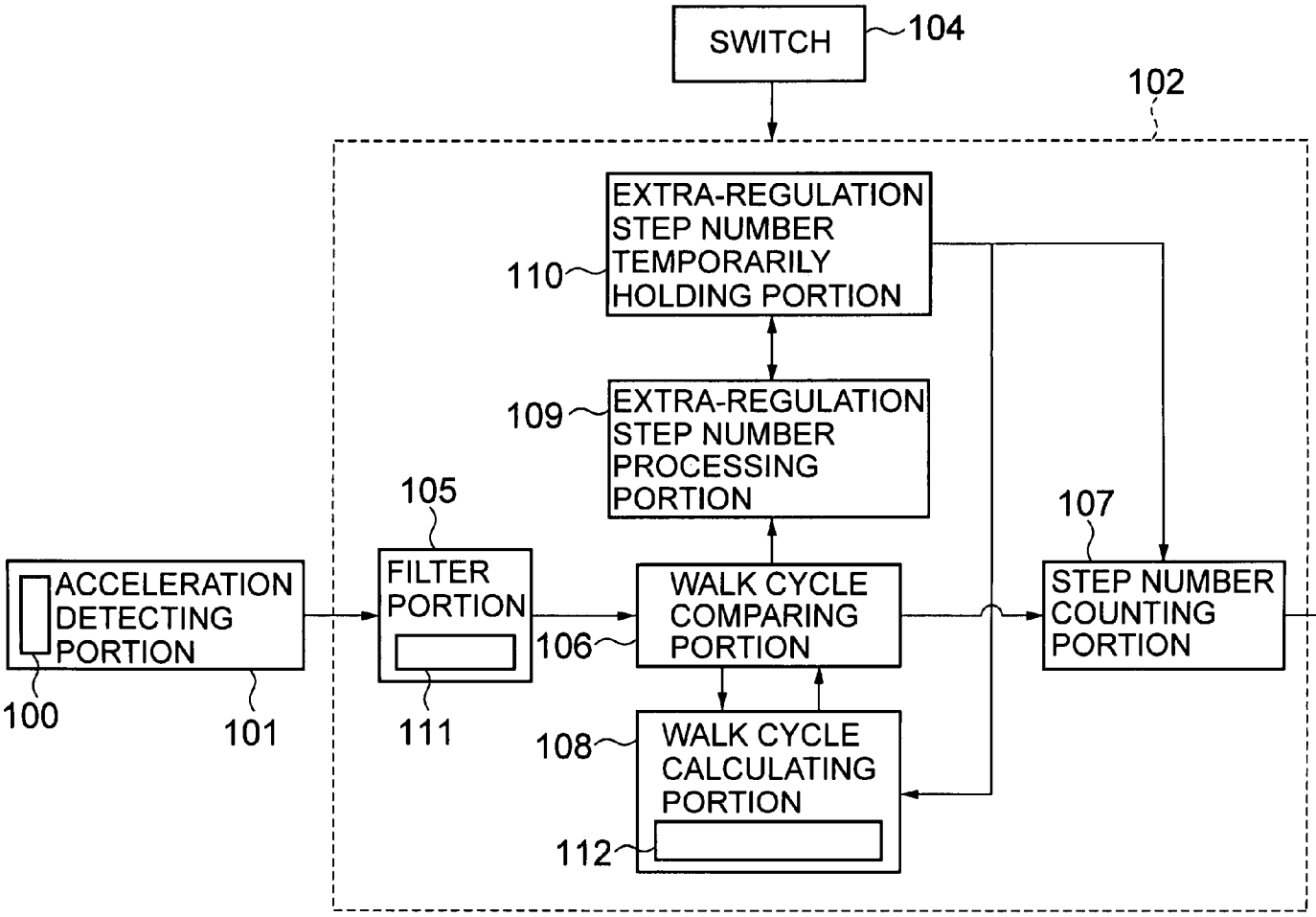


FIG. 2

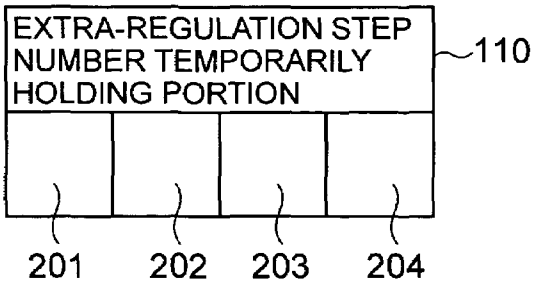


FIG. 3

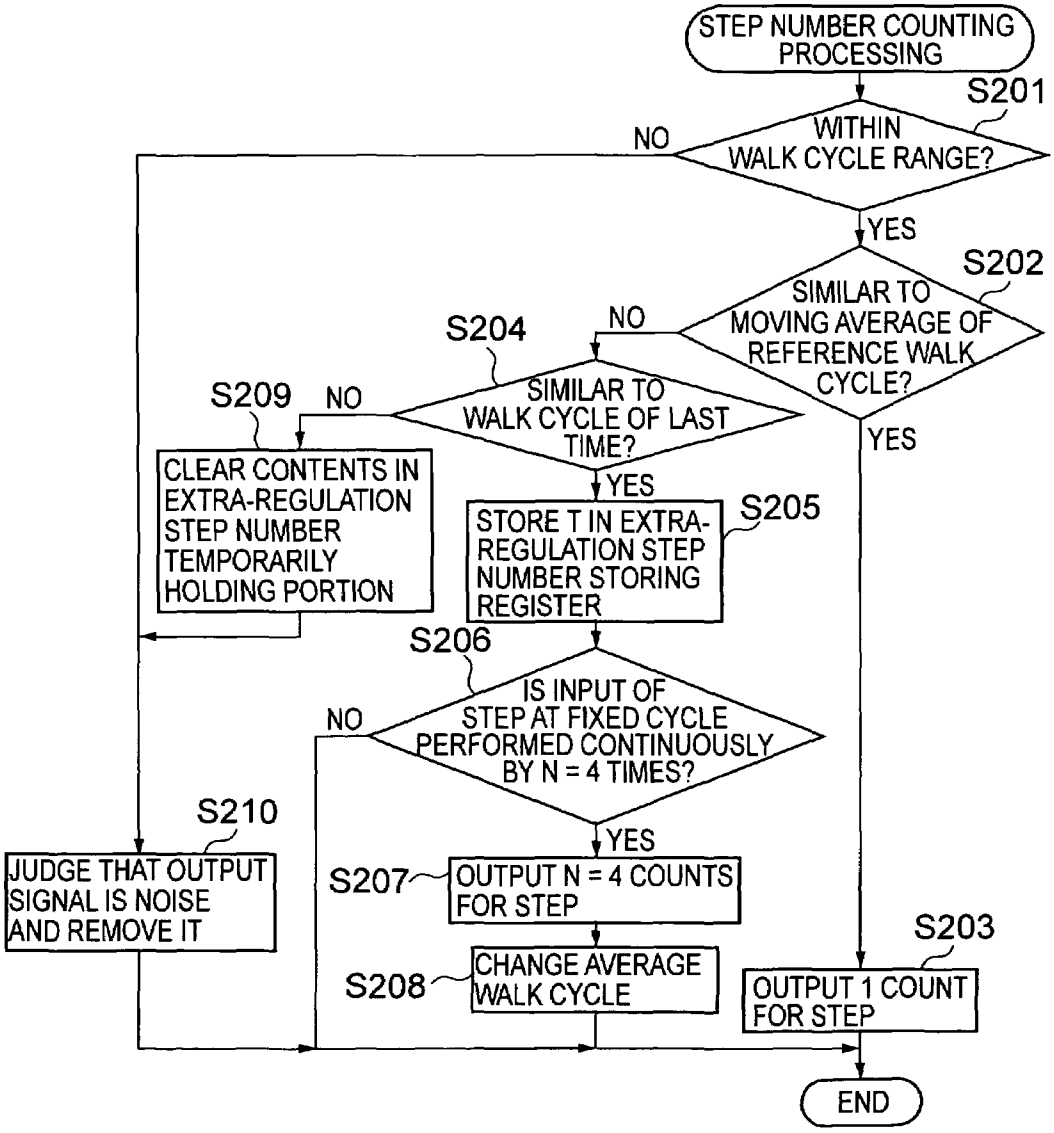
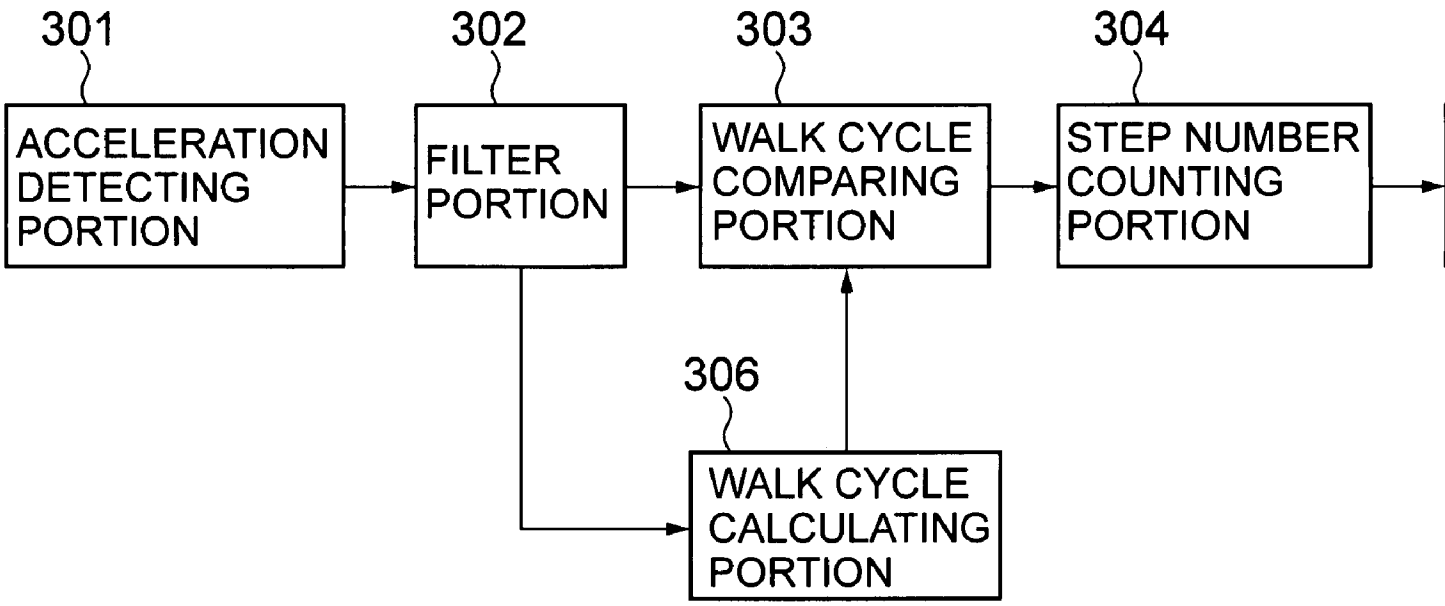


FIG. 4



ELECTRONIC PEDOMETER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electronic pedometer which is used by being mounted on a human body in order to electronically count the number of steps by a person having the electronic pedometer mounted thereon.

2. Description of the Prior Art

Heretofore, an electronic pedometer has been developed which is used by being mounted on a human body in order to count the number of steps by a user through an electronic processing.

In general, for counting of the number of steps, an acceleration caused by vertical movement of a user's body during walking is detected to count how many times the accelerations occur as the number of steps.

However, a problem arises in that various noises due to motions of daily life other than a walk are detected, and hence the number of steps cannot be precisely measured as has been pointed out formerly.

In order to solve this problem, there have been proposed a method in which after an acceleration is detected once, a predetermined dead zone time period is set to avoid misdetection due to noises (refer to Patent Document 1 for example), a method in which detection signals are counted as the number of steps only when it is detected that the detection signs are continuously outputted by the predetermined number of times (refer to Patent Document 2 and Patent Document 3 for example), and the like.

However, the acceleration is not only caused by a walk, but also caused by motions in daily life. Thus, it is impossible to distinguish the acceleration by a walk from the acceleration (caused by an office work for example) which regularly continues to enter the walk.

In order to improve this problem, a method is proposed in which a cycle in a walk is detected, and the number of steps is calculated from the cycle and a walk time period (refer to Patent Document 4 for example).

However, even if such measures are taken, a walk cycle is not usually maintained in a fixed state. A pace may be changed or a detection signal may be mixed with a noise. Hence, it is actually difficult in many cases to detect precisely a cycle.

FIG. **4** is a block diagram of a pedometer described in Patent Document 1 described above. The pedometer includes: an acceleration detecting portion **301**, which is used by being mounted on the body of a user, for detecting an acceleration caused by a walk of the user to output a signal (walk signal) corresponding to the walk; a filter portion **302** for outputting a signal having a predetermined cycle corresponding to a walk cycle from the output signal from the acceleration detecting portion **301**; a walk cycle calculating portion **306** for calculating a walk cycle as a reference by averaging a predetermined number of signals of the signals outputted from the filter portion **302**; a walk cycle comparing portion **303** for comparing a cycle of each signal outputted from the filter portion **302** with the walk cycle as the reference calculated in the walk cycle calculating portion **306** to output a signal having a cycle similar to the walk cycle as the above reference of the signals outputted from the filter portion **302**; a step number counting portion **304** for counting signals from the walk cycle comparing portion **303**; and a display portion **305** for displaying thereon a count

portion **302**, the walk cycle comparing portion **303**, the step number counting portion **304**, and the walk cycle calculating portion **306** can be configured with a central processing unit (CPU), and a storage portion for storing therein a program to be executed by the CPU.

The acceleration detecting portion **301** detects an acceleration caused by a walk of a walker to output a signal corresponding to the walk. The filter portion **302** outputs a signal having a predetermined cycle corresponding to a walk cycle from the output signal of the acceleration detecting portion **301**. The walk cycle calculating portion **306** calculates a walk cycle as a reference by averaging a predetermined number of signals of the signals outputted from the filter portion **302**. The walk cycle comparing portion **303** compares a cycle of each signal outputted from the filter portion **302** with the walk cycle as the reference calculated in the walk cycle calculating portion **306** to output a signal having a cycle similar to the walk cycle as the above reference of the signals outputted from the filter portion **302**. The step number counting portion **304** counts signals from the walk cycle comparing portion **303** as signals corresponding to the walk. The display portion **305** displays thereon data on the number of steps as a count value obtained through the counting in the step number counting portion **304**.

In such a manner, the electric pedometer is configured such that the walk cycle comparing portion **303** outputs the signals which are generated with a cycle similar to the walk cycle as the reference. Thus, a predetermined dead zone is provided so as not to detect any of the signals which are generated for time periods other than the time period similar to the time period having the walk cycle. As a result, it becomes possible to avoid that the noise is detected as the signal caused by the walk by mistake.

However, a walk cycle is not usually maintained in a fixed state. A pace may be changed or a detection signal may be mixed with a noise. Hence, it is actually difficult in many cases to detect precisely a cycle. Moreover, even if a dead zone time period is provided, precision in measurement of the number of steps is low. This is a problem.

<patent document 1> JP laid-open disclosure public patent bulletin 56-86309

<patent document 2> JP laid-open disclosure public patent bulletin 63-262784

<patent document 3> JP patent number 3017529

<patent document 4> JP patent number 2697911

It is an object of the present invention to enhance precision in measurement of the number of steps even when a walk cycle changes.

SUMMARY OF THE INVENTION

According to the present invention, there is provided an electronic pedometer having: walk detecting means, having a walk sensor, for outputting a walk signal corresponding to a walk of a user detected by the walk sensor; and counting means for counting the number of steps based on the walk signal from the walk detecting means, the walk sensor being used at least by being mounted on a body of the user, in which the counting means counts each signal within a first reference cycle range of signals from the walk detecting means as the number of steps for one step, and when a predetermined number of signals each within a second

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