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(54) **TREADMILL WITH PEDOMETER AND METHOD OF COUNTING THE NUMBER OF STEPS OF USER RUNNING OR WALKING ON TREADMILL**

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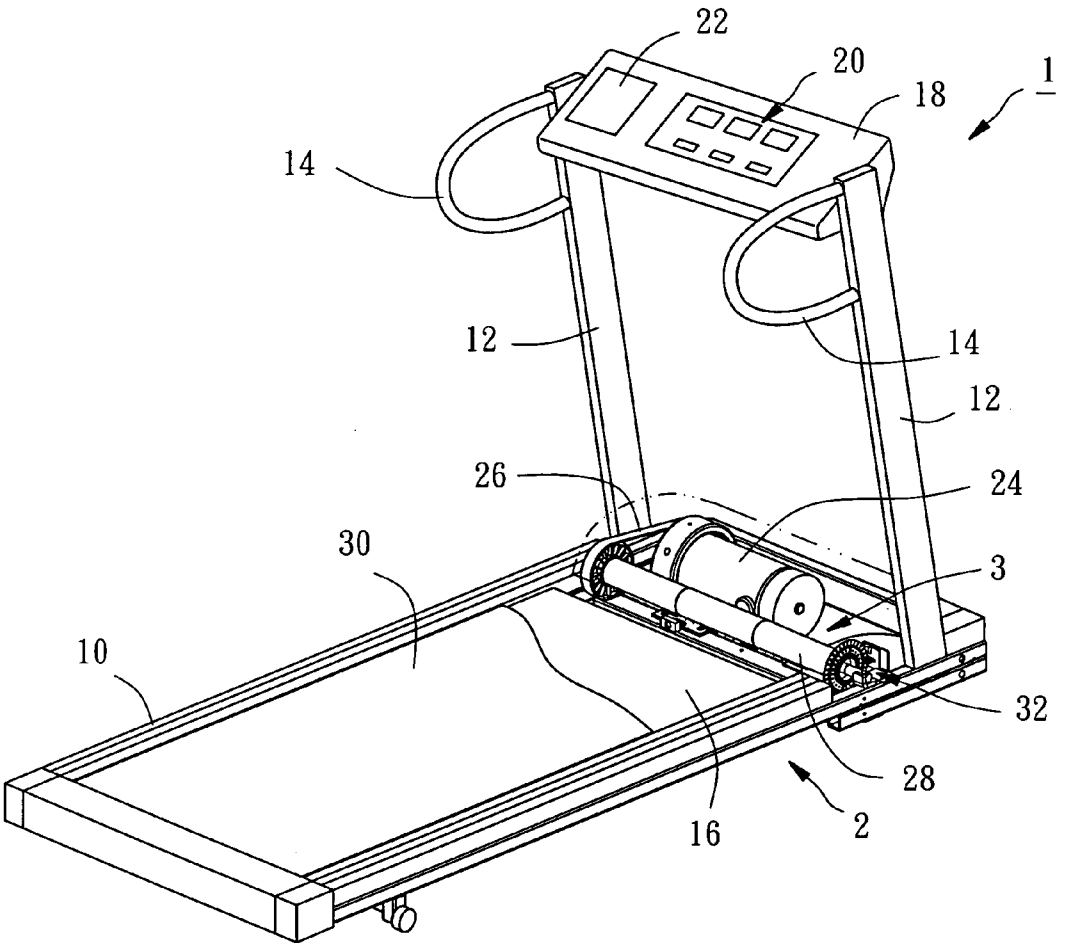
(57) **ABSTRACT**

A treadmill includes a base, a motion assembly and a pedometer system. The pedometer system has a sensor mounted on the base to monitor a speed of an element of the motion assembly, such as a motor, a transmission device, rollers or a running belt, a processor mounted on the base to detect instant variations of the speed of the element of the motion and count the instant variations, and a display mounted on the base to show a number of the instant variations. As a result, people running or walking on the treadmill of the present invention is informed the number of steps of running or walking.



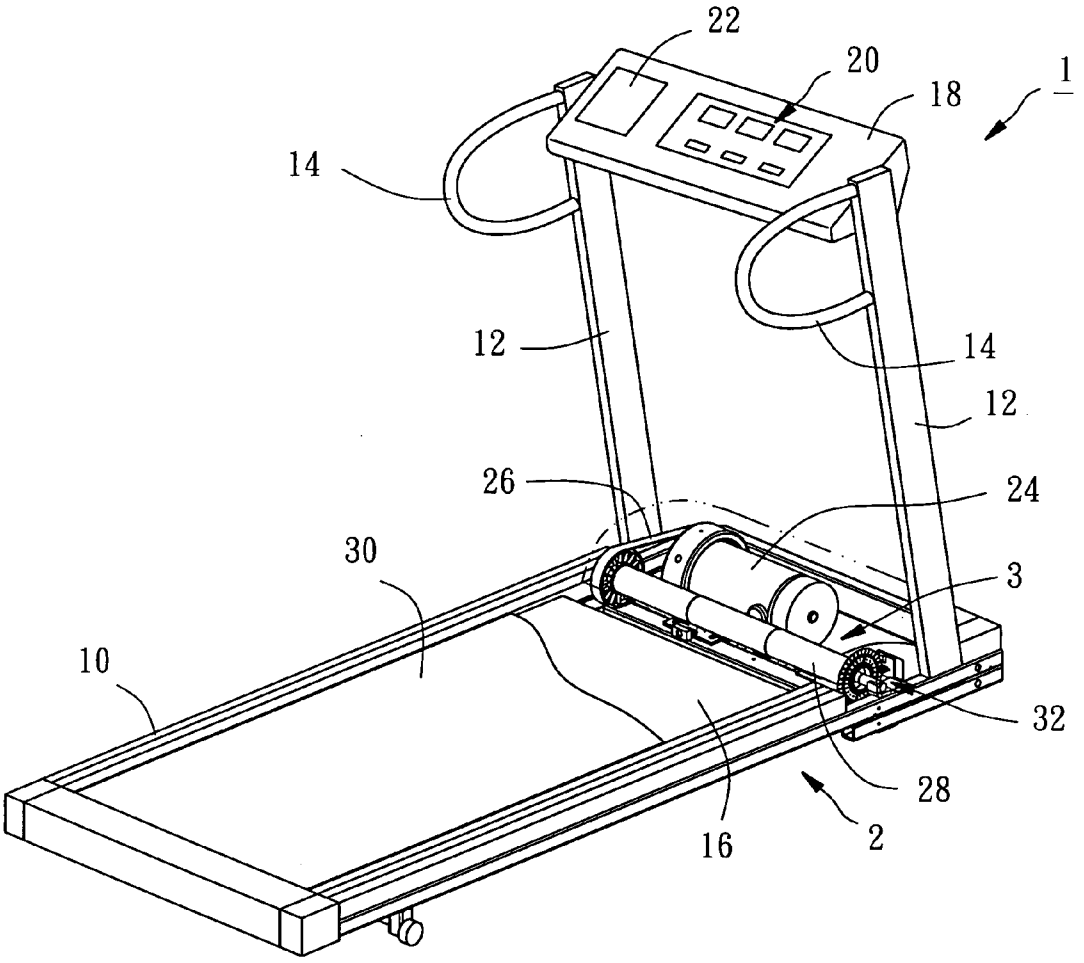


FIG. 1

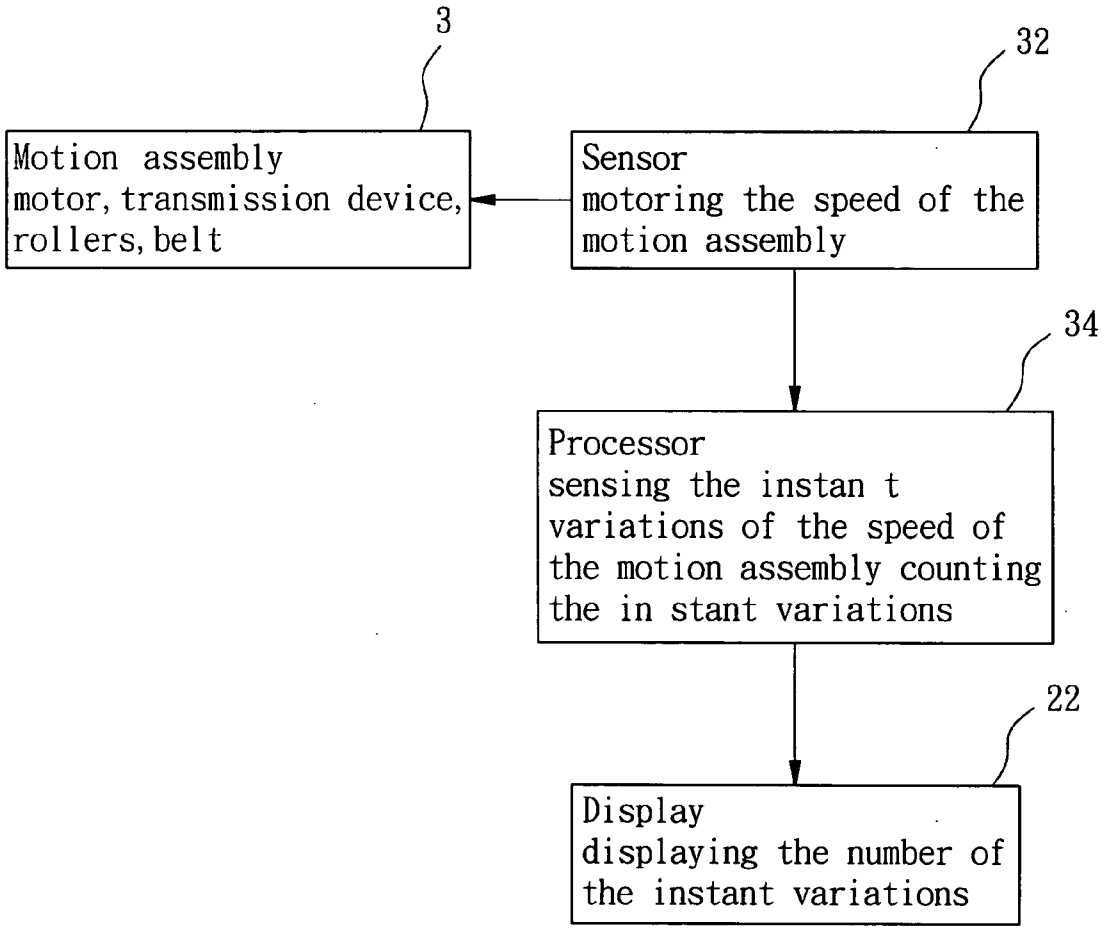

3
32
Motion assembly
motor, transmission device,
rollers, belt
Sensor
motoring the speed of the
motion assembly
34
Processor
sensing the instan t
variations of the speed of
the motion assembly counting
the in stant variations
22
Display
displaying the number of
the instant variations

FIG. 2

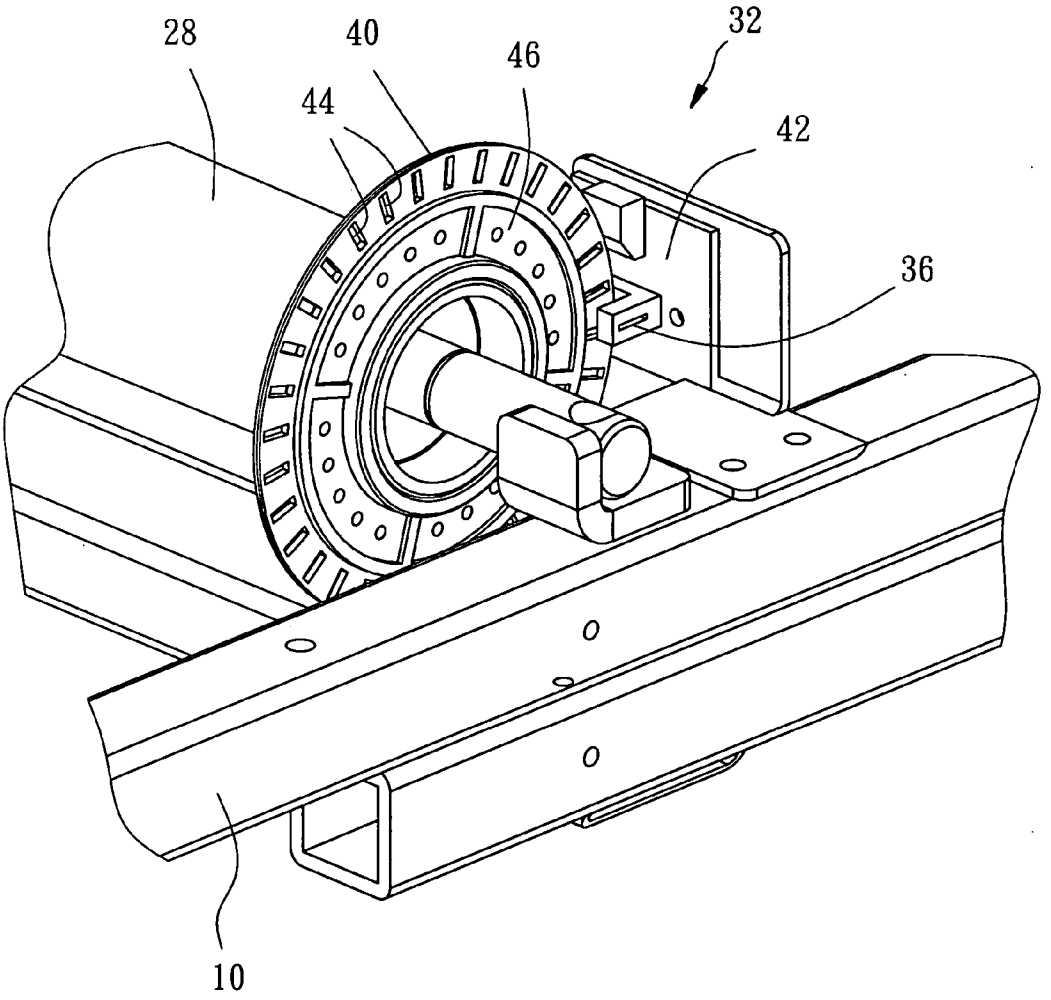


FIG. 3

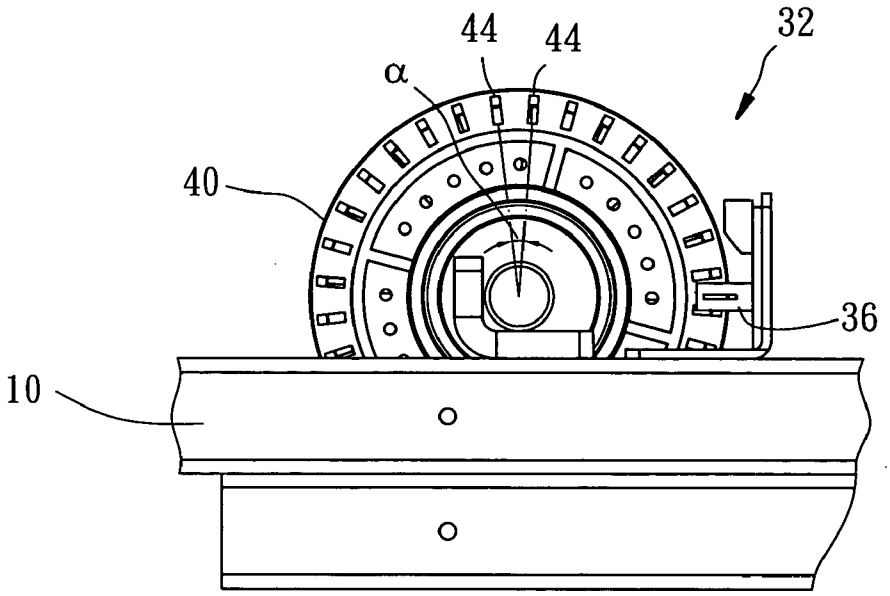


FIG. 4

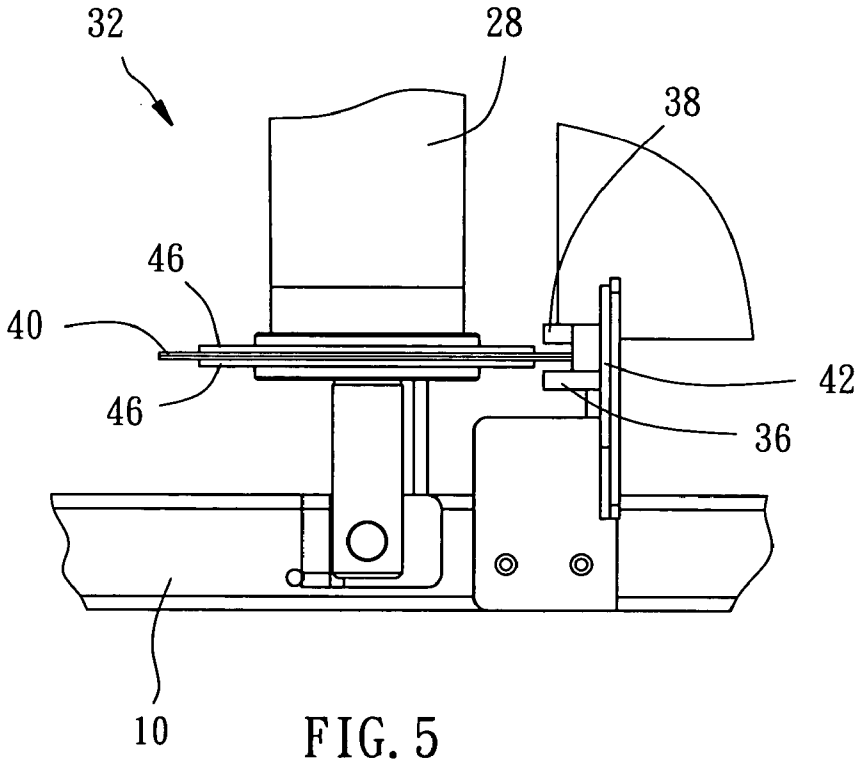


FIG. 5

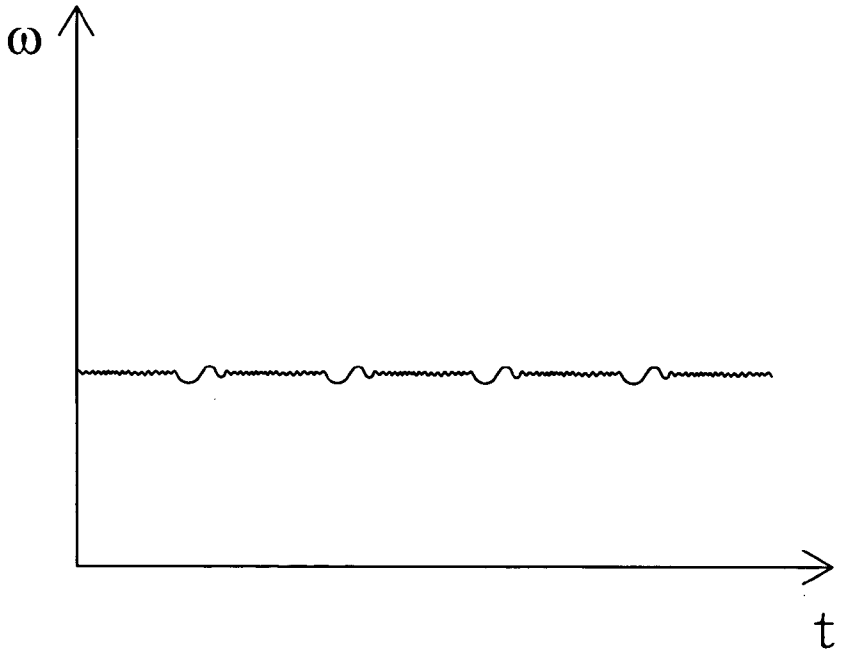


FIG. 6

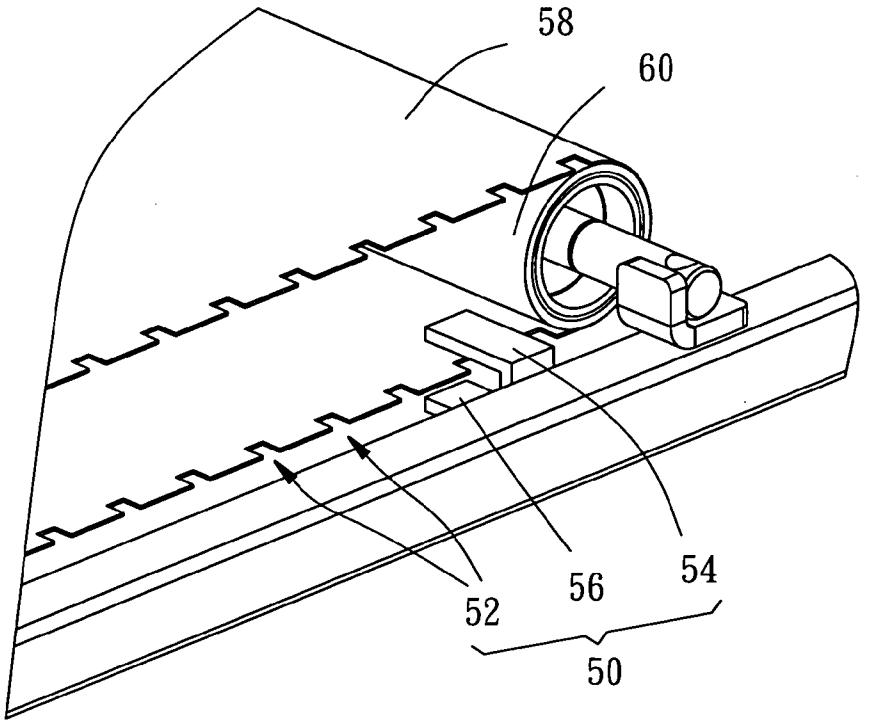


FIG. 7

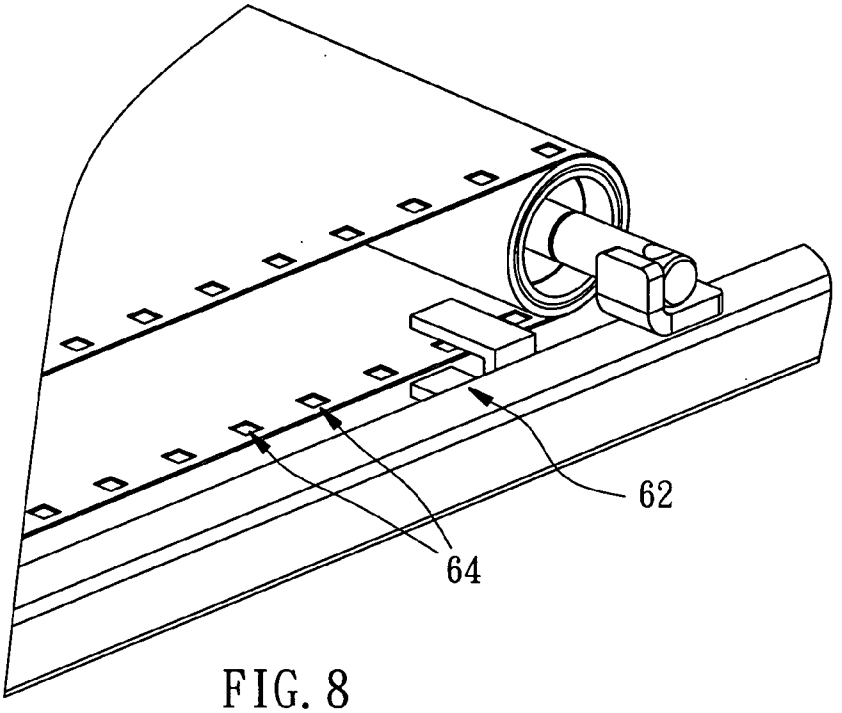


FIG. 8

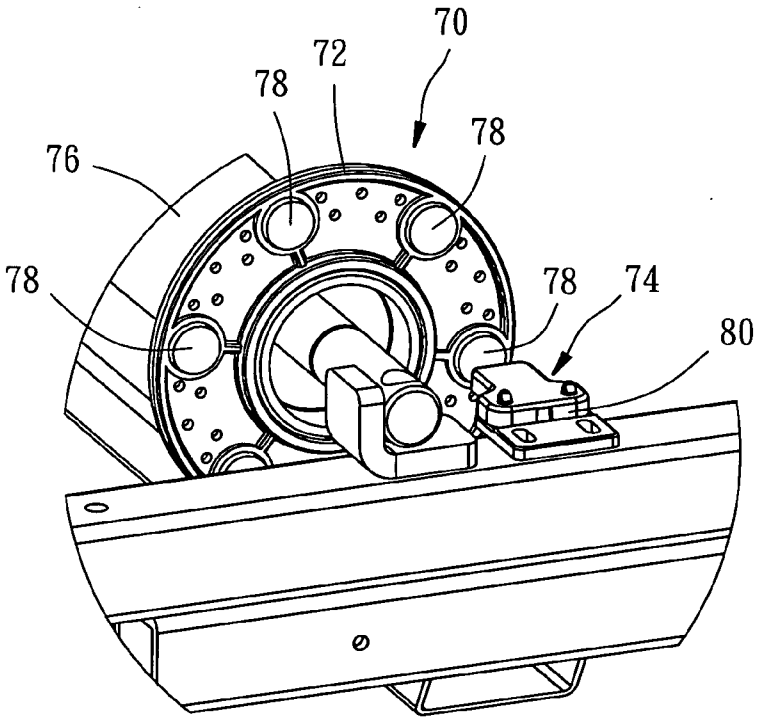


FIG. 9

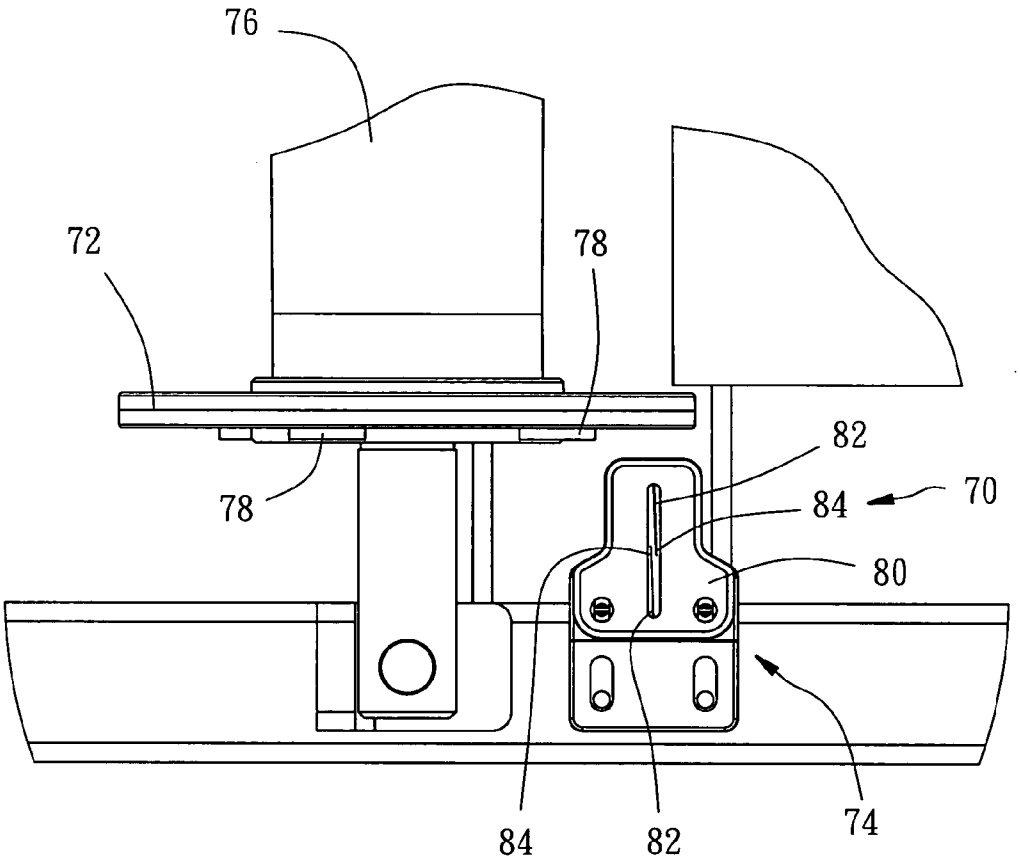


FIG. 10

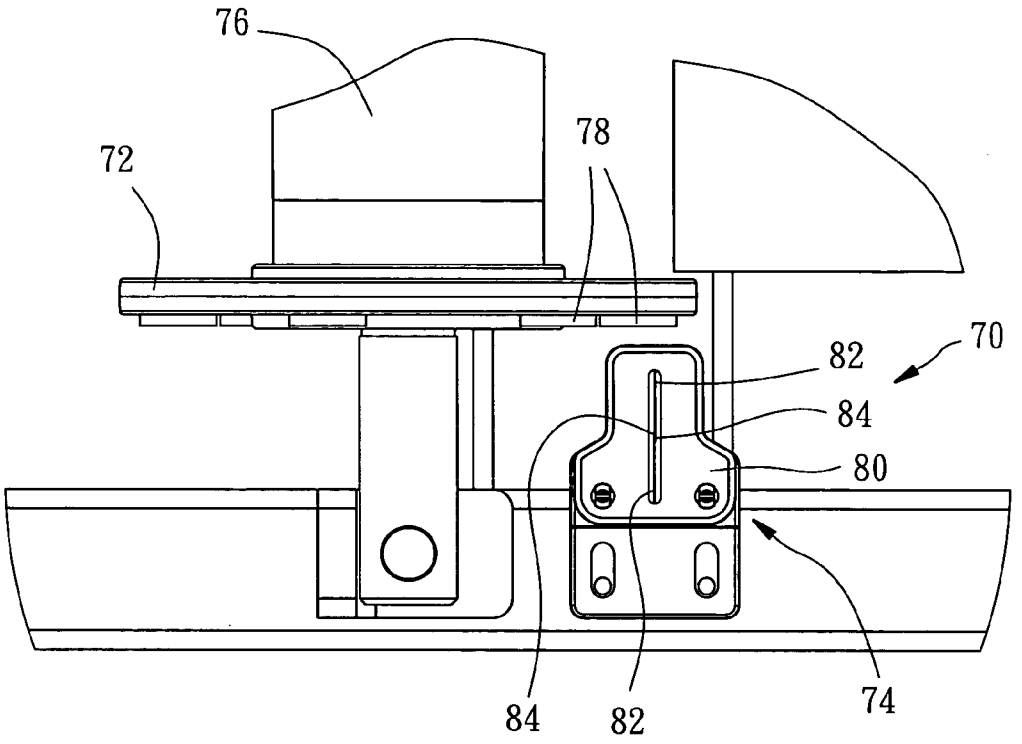


FIG. 11

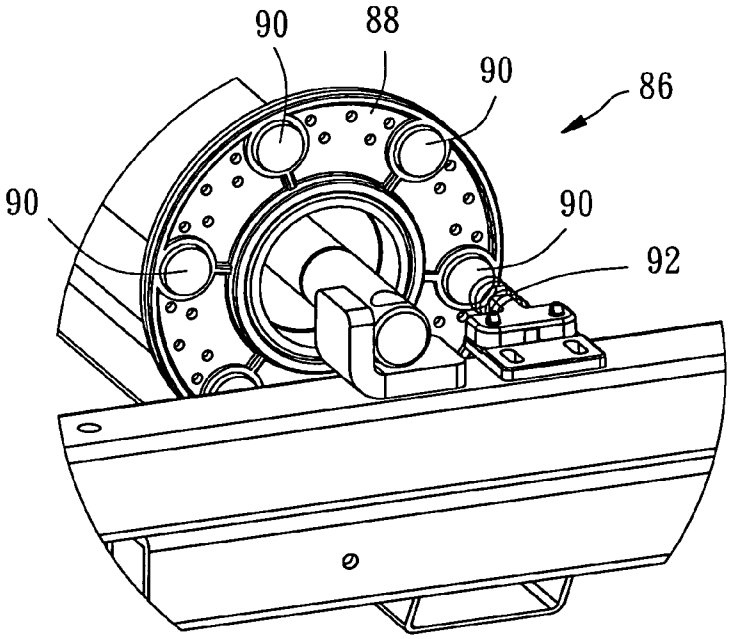


FIG. 12

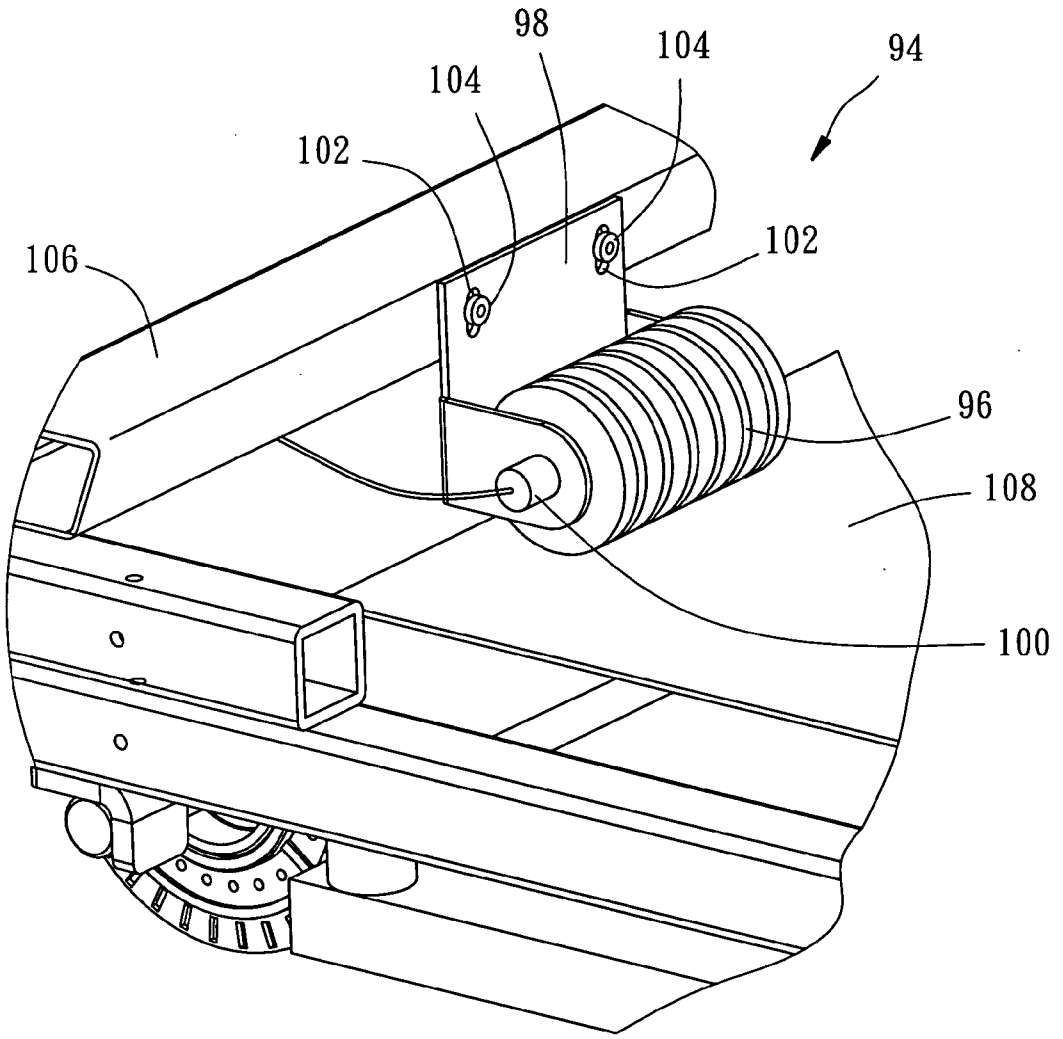


FIG. 13

TREADMILL WITH PEDOMETER AND METHOD OF COUNTING THE NUMBER OF STEPS OF USER RUNNING OR WALKING ON TREADMILL

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to an exercise equipment, and more particularly to a treadmill having the function of counting the number of steps of user walking or running on it.

[0003] 2. Description of the Related Art

[0004] Treadmill is common equipment for exercise and training. Early treadmill only provides user the speed of the belt and total miles etc. The new treadmill further provides user some of his/her physiological data, such as heartbeats, ventilations, and calorie consumption. These information tell user the status of exercise and his/her physiological status, such that user can arrange the desired exercise.

SUMMARY OF THE INVENTION

[0005] The primary objective of the present invention is to provide a treadmill, which provides user the number of steps of he/she walking or running on it.

[0006] According to the objective of the present invention, a treadmill comprises a base, a motion assembly and a pedometer system. The pedometer system has a sensor mounted on the base to monitor a speed of an element of the motion assembly, a processor mounted on the base to detect instant variations of the speed of the element of the motion and count a number of the instant variations, and a display mounted on the base to show the number of the instant variations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] **FIG. 1** is a perspective view of a first preferred embodiment of the present invention;

[0008] **FIG. 2** is a block diagram of the pedometer system of the first preferred embodiment of the present invention;

[0009] **FIG. 3** is a perspective view of the sensor of the first preferred embodiment of the present invention;

[0010] **FIG. 4** is a front view of the sensor of the first preferred embodiment of the present invention;

[0011] **FIG. 5** is a top view of the carrier of the sensor of the first preferred embodiment of the present invention;

[0012] **FIG. 6** is a chart of the variations of the sensed angular velocity;

[0013] **FIG. 7** is a perspective view of the sensor of a second preferred embodiment of the present invention;

[0014] **FIG. 8** is a perspective view of the sensor of a third preferred embodiment of the present invention;

[0015] **FIG. 9** is a perspective view of the sensor of a fourth preferred embodiment of the present invention;

[0016] **FIG. 10** and **FIG. 11** are top views of the sensor of the fourth preferred embodiment of the present invention;

[0017] **FIG. 12** is a perspective view of the sensor of a fifth preferred embodiment of the present invention, and

[0018] **FIG. 13** is a perspective view of the sensor of a seventh preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] As shown in **FIG. 3**, a treadmill **1** of the first preferred embodiment of the present invention includes a base **2**, a motion assembly **3** mounted on the base **2** and a pedometer system. The base **2** includes a base frame **10**, two upright frames **12** fixed to the base frame **10**, two handlebars **14** mounted on the upright frames **12**, a deck **16** fixed on the base frame **10** and a panel **18** with buttons **20** and a display **22** fixed on tops of the upright frames **12**. The motion assembly **3** includes a motor **24**, a transmission device **26**, two rollers **28** (only showing the front roller in **FIG. 1**) and a running belt **30**. The rollers **28** are pivoted on a front and a rear of the base frame **10**, and the running belt **30** is mounted on the rollers **30**. The transmission device **26** is a belt connecting the motor **24** and the front roller **28**, such that the motor **24** drives the running belt **30** running via the transmission device **26** and the front roller **28**.

[0020] **FIG. 2** shows the pedometer system of the present invention, which as a sensor **32**, a processor **34** and the display **22**. The sensor **32** monitors the speed of an element of the motion assembly **3**. The processor **34** detects instant variations of the speed and counts a number of the instant variations of the speed. And then, the result is shown on the display **22**, such that user knows how many steps does he/she walks or runs on the running belt **30**.

[0021] As shown in **FIG. 3** to **FIG. 5**, the sensor **32** of the first preferred embodiment of the present invention includes a light emitting device **36**, a receiver **38** and a light gate **40**. The light emitting device **36** and the receiver **38** are made in a single element, and the element has a mount **42** to be fixed on the frame **10** adjacent to the front roller **28**. The light emitting device **36** projects infrared rays to the receiver **38**. The light gate **40** is a disk fixed to the front roller **28** for rotation along with the roller **28** in synchronism. The light gate **40** has several apertures **44** with the same interval on a margin thereof. The light emitting device **36** and the receiver **38** are located at opposite sides of the light gate **40**, and the light gate **40** rotates to have the apertures **44** moving to a path of the infrared rays from the light emitting device **36**, such that the receiver **38** receives a series of intermittent light signals and transfers the light signals to electrical signals and transmits them to the processor **34**. The light gate **40** is provided with two weight members **46** on opposite sides thereof.

[0022] The processor **34** is installed in the panel **18** with a processing circuit and a counting circuit (not shown). The processing circuit receives the electrical signals from the receiver **38** and measures a time between two signals (Δt). The included angles (α) between the apertures **44** are known, so that we can get the angular velocity (ω) of the light gate **40** by dividing α by Δt. The angular velocity (ω) is also an indication of the speed of the roller **28** of the motion assembly **3**. In practice, a frequency of the signals may be taken as an indication of the speed.

[0023] As shown in **FIG. 6**, while the motion assembly rotates in a substantially constant speed, the angular velocity (ω) substantially is constant also. But when a person is running or walking on the running belt **30** and at the moment

that the foot is stepping on the running belt **30**, it provides the motion assembly **3** a loading to slow down the speed of all elements (including the running belt **30**, the rollers **28**, the transmission device **26** and the motor **24**), so that the sensor **32** detects an instant variation in the angular velocity (ω). The instant variation of the angular velocity (ω) substantially is a sine curve. The processor **34** records a "One Step" while one instant variation of the angular velocity (ω) is detected.

[**0024**] A method of identifying the instant variations of the angular velocity (ω) is calculation of the variation of angular velocity (ω) (i.e. angular acceleration). In practice, the processor is provided with a filter to delete extreme values. The rest values are calculated for the angular acceleration. While an angular acceleration is greater than 0.02 degree/sec^2, or the acceleration is greater than 0.15 km/hr^2, it is taken as a "One Step".

[**0025**] The counting circuit of the processor **34** counts the number of "One Step" and shows the number on the display **22**.

[**0026**] The sensor may be provided to monitor the speed of any element of the motion assembly, including the motor, the transmission device, the running belt or and the rollers, also for detection of the instant variations of the speed.

[**0027**] **FIG. 7** shows a sensor **50** of the second preferred embodiment of the present invention, which has a light gate **52**, a light emitting device **54** and a receiver **56**. The light gate **52** is teeth on an edge of a running belt **58**. The light emitting device **54** and the receiver **56** are located at opposite sides of the running belt **58** associated with the teeth **52**. Running of the running belt **58** makes the receiver **56** receive a series of intermittent light signals as above. **FIG. 8** shows a sensor **62** of the third preferred embodiment of the present invention, which is similar to the sensor **50** of the second preferred embodiment, except that the light gate **64** is apertures on a margin of the running belt **66**. The sensor **52** or **62** is preferred fixed at a position adjacent to the roller **60** or **68** that can reduce the effect of vibration of the running belt.

[**0028**] As shown in **FIG. 9**, a sensor **70** of the fourth preferred embodiment of the present invention includes a rotor **72** and a switch **74**. The rotor **72** is a disk, on which magnets **78** are fixed in a circulative pattern. The magnets **78** have the same interval. The switch **74** has a housing **80** and two conductive plates **82** therein. The plates **82** have ends fixed to the housing **80** and have free ends **84** suspended. The free ends **84** of the plates **82** are overlapped. The plates **82** are electrically connected to the processor via a wire (not shown). While the magnet **78** of the rotor **72** closes to the plates **82**, the free ends **84** of the plates **82** are in contact (**FIG. 11**). While the magnet **78** moves away from the plates **82**, the free ends **84** of the plates **82** are separated (**FIG. 10**). In other words, the rotor **72** provides a periodical magnetic field with a frequency directly proportional to the speed of the rotor **72**. The magnetic field makes the plates **82** of the switch **74** touching and separation repeatedly. As a result, the switch **74** produces a serious of digital signals with ON and OFF. As above, we can get the angular velocity (ω) of the rotor **72** by measuring the time between two ON signals or between two OFF signals, or just measuring the frequency of the digital signals to be an indication of the velocity of the rotor **72**. If the processor detects an instant variation in the velocity, it records a "One Step".

[**0029**] As shown in **FIG. 12**, the fifth preferred embodiment of the present invention provides a sensor **86** including a rotor **88** with magnets **90** thereon and a coil **92**. The rotor **88** produces a periodical magnetic field. With the electromagnetic induction, the coil **92** generates a current under the periodical magnetic field. While user is stepping the running belt, the loading slows down the motion assembly as well as the rotor **90**. The magnetic field is changed suddenly also to make the induction current has an instant variation. While the instant variation of the current is detected, the processor records a "One Step".

[**0030**] The sixth preferred embodiment of the present invention provides a method of counting the number of steps that user walks or runs on a treadmill. The current in the motor is monitored to be an indication of the speed of the motion assembly. While user is stepping the running belt, the current in the motor is increased to enlarge the torque output. As a result, while the current in the motor is detected with an instant variation, the processor records it as a "One Step".

[**0031**] As shown in **FIG. 13**, a sensor **94** of the seventh preferred embodiment of the present invention includes a wheel **96**, a mount **98** and a tachometer **100**. The wheel **96** is pivoted on the mount **98**, and the tachometer **100** is connected to the wheel **96** to detect the speed of rotation thereof. The mount **98** has two elongated slots **102** and two blots **104** inserted into the slots and screwed into a frame **106** of the treadmill, such that the mount **98** is movable to press the wheel **96** on a running belt **108**. The wheel **96** runs along with the running belt **108**, and the tachometer **100** monitors the speed of the wheel **96**. While an instant variation of the speed of the wheel **96** is detected, the processor records a "One Step".

[**0032**] Except the sixth preferred embodiment, the treadmill of the present invention may be a non-electric treadmill. In other words, the motion assembly only includes the rollers and the running belt but the motor and the transmission device.

What is claimed is:

1. A treadmill, comprising:

a base;

a motion assembly having two roller pivoted on the base and a running belt mounted on the rollers for rotation;

a sensor for monitoring a speed of an element of the motion assembly;

a processor for detecting instant variations of the speed of the element of the motion and to count the instant variations, and

a display for showing a number of the instant variations.

2. The treadmill as defined in claim 1, wherein the sensor has a light emitting device, a receiver and a light gate, and further wherein the light emitting device is mounted on the base to emit rays to the receiver, and the light gate is connected to the element of the motion to rotate along with the element in synchronism, which has apertures to be moved to a path of the rays from the light emitting device, such that while the light gate is rotated, the receiver receives intermittent light signals and transfer the signals to the processor to measure a time between two of the signals.

3. The treadmill as defined in claim 2, wherein the light gate is a disk with a weigh member thereon.

4. The treadmill as defined in claim 1, wherein the sensor has a light emitting device, a receiver and a light gate, and further wherein the light emitting device and the receiver are mounted on the base at opposite sides of the running belt, and the light emitting device emits rays to the receiver, and the light gate is apertures on the running belt, such that while the running belt is running, the receiver receives intermittent light signals and transfer the signals to the processor to measure a time between two of the signals.

5. The treadmill as defined in claim 1, wherein the sensor has a light emitting device, a receiver and a light gate, and further wherein the light emitting device and the receiver are mounted on the base at opposite sides of the running belt, and the light emitting device emits rays to the receiver, and the light gate is teeth on an edge of the running belt, such that while the running belt is running, the receiver receives intermittent light signals and transfer the signals to the processor to measure a time between two of the signals.

6. The treadmill as defined in claim 1, wherein the sensor has a rotor and a switch, wherein the rotor is connected to the element of the motion assembly, on which magnets are provided, whereby the magnets produce a periodical magnetic field while the rotor is rotating, and the switch is turned on and turned off repeatedly by periodical magnetic field to generate a serious of digital signals.

7. The treadmill as defined in claim 1, wherein the sensor has a rotor and a coil, wherein the rotor is connected to the element of the motion assembly, on which magnets are provided to produce a periodical magnetic field while the rotor is rotating, whereby the coil generates an induction current by the periodical magnetic field, and a value of the induction current is taken as an indication of the speed of the motion assembly.

8. The treadmill as defined in claim 1, wherein the senor has a wheel pivoted on the base and pressing the running belt to rotate along with the running belt and a tachometer connected to the wheel to detect a speed of the wheel.

9. A method of counting a number of steps that a person runs or walks on a treadmill, wherein the treadmill has a base and a motion assembly, and the motion assembly has a running and two rollers, comprising the steps of:

monitoring a speed of an element of the motion assembly of the treadmill;

detecting instant variations of the speed;

counting the instant variations of the speed, and

display a number of the instant variations of the speed.

10. The method as defined in claim 9, wherein a method of monitoring the speed of the element of the motion assembly of the treadmill comprises the steps of:

emitting rays to a light gate, wherein the light gate is moved along with the element of the motion assembly in synchronism, and the light gate has apertures to be moved to a path of the rays, so that while the light gate is rotating, the rays becomes intermittent signals by the light gate;

receiving the signals, and

measuring a time between two of the signals to calculate a speed of the light gate, wherein the speed of the light gate is taken as an indication of the speed of the element of the motion assembly.

11. The method as defined in claim 9, wherein a method of detecting instant variations of the speed comprises the steps of:

calculating a variation of the speed of the element of the motion assembly, and

recording the variation of the speed as the instant variation while the variation of speed is greater than 0.02 degree/sec^2 or 0.15 km/hr^2.

12. The method as defined in claim 9, wherein a method of monitoring the speed of the element of the motion assembly of the treadmill comprises the steps of:

providing a periodical magnetic field to a switch, wherein a frequency of the periodical magnetic field is directly proportional to the speed of the element of the motion assembly, and the switch is turned on and turned of repeatedly to produce a serious of ON and OFF signals, and

measuring a time between two of the ON signals or between two of the OFF signals to calculate the speed of the element of the motion assembly.

13. The method as defined in claim 9, wherein a method of monitoring the speed of the element of the motion assembly of the treadmill comprises the steps of:

providing a periodical magnetic field to a movable plate, wherein a frequency of the periodical magnetic field is directly proportional to the speed of the element of the motion assembly, and the switch is repeatedly by the periodical magnetic field to produce a serious of digital signals, and

measuring a frequency the digital signals to calculate the speed of the element of the motion assembly.

14. The method as defined in claim 9, wherein a method of monitoring the speed of the element of the motion assembly of the treadmill comprises the step of providing a periodical magnetic field to a coil, wherein a frequency of the periodical magnetic field is directly proportional to the speed of the element of the motion assembly, and the coil generates an induction current by the periodical magnetic field, and a method of detecting the instant variations of the speed comprises the step of detecting instant variations of the induction current.

15. The method as defined in claim 9, wherein a method of monitoring the speed of the element of the motion assembly of the treadmill comprises the step of measuring a current of a motor of the motion assembly, wherein a value of the current is taken as an indication of the speed of the motion assembly, and a method of detecting the instant variations of the speed comprises the step of detecting instant variations of the current.

* * * * *