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(54) **SYSTEM FOR MONITORING EXERCISE PERFORMANCE**

(76) Inventor: **Min-Chang Chen**, Taichung Hsien (TW)

Correspondence Address:
HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 8910
RESTON, VA 20195 (US)

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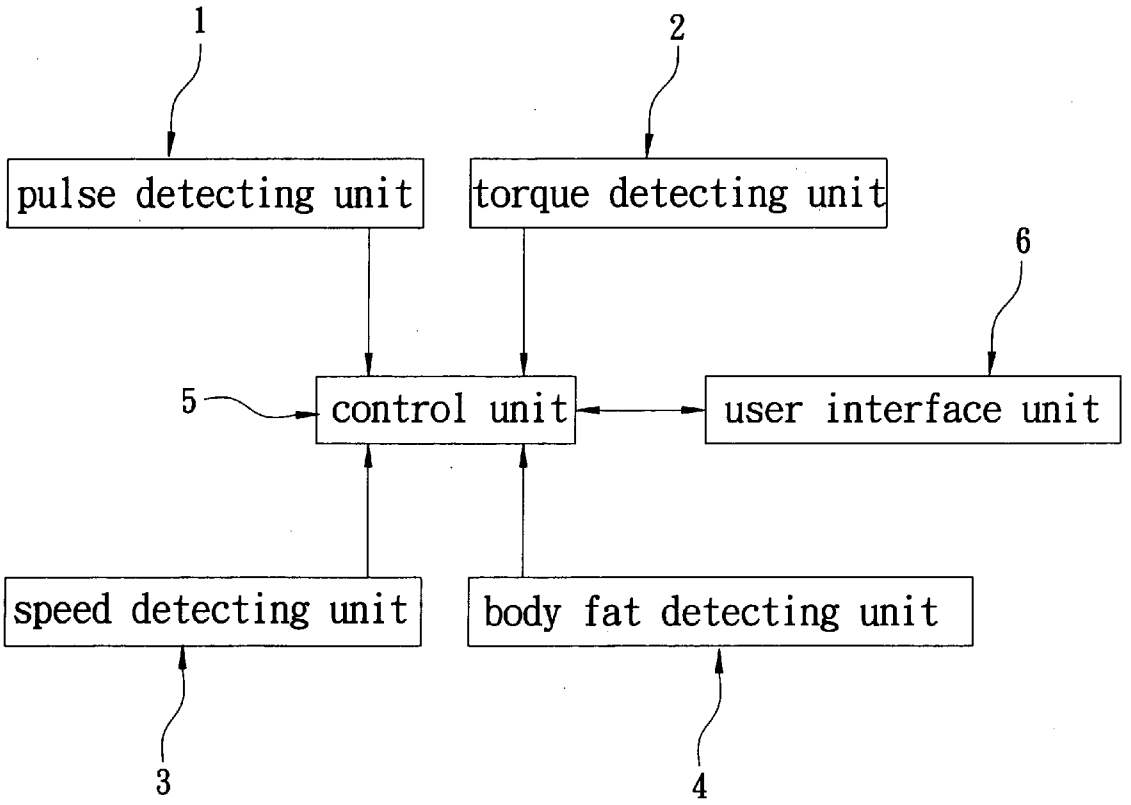
(57) **ABSTRACT**

A system adapted for use with an exercise machine for monitoring exercise performance includes: a pulse detecting unit adapted for detecting a pulse of a user; a torque detecting unit adapted to detect a torque exerted by the user; a user interface unit for allowing user input of user-specific parameters and displaying data to the user; and a control unit electrically coupled to the other elements. The control unit determines a target exercise amount for the user with reference to the pulse, the torque, and the user-specific parameters. The control unit further determines an actual exercise amount during exercise by the user with reference to the torque. The user interface unit displays the target exercise amount through an exercise indicating pattern that is selectively activated according to the actual exercise amount.



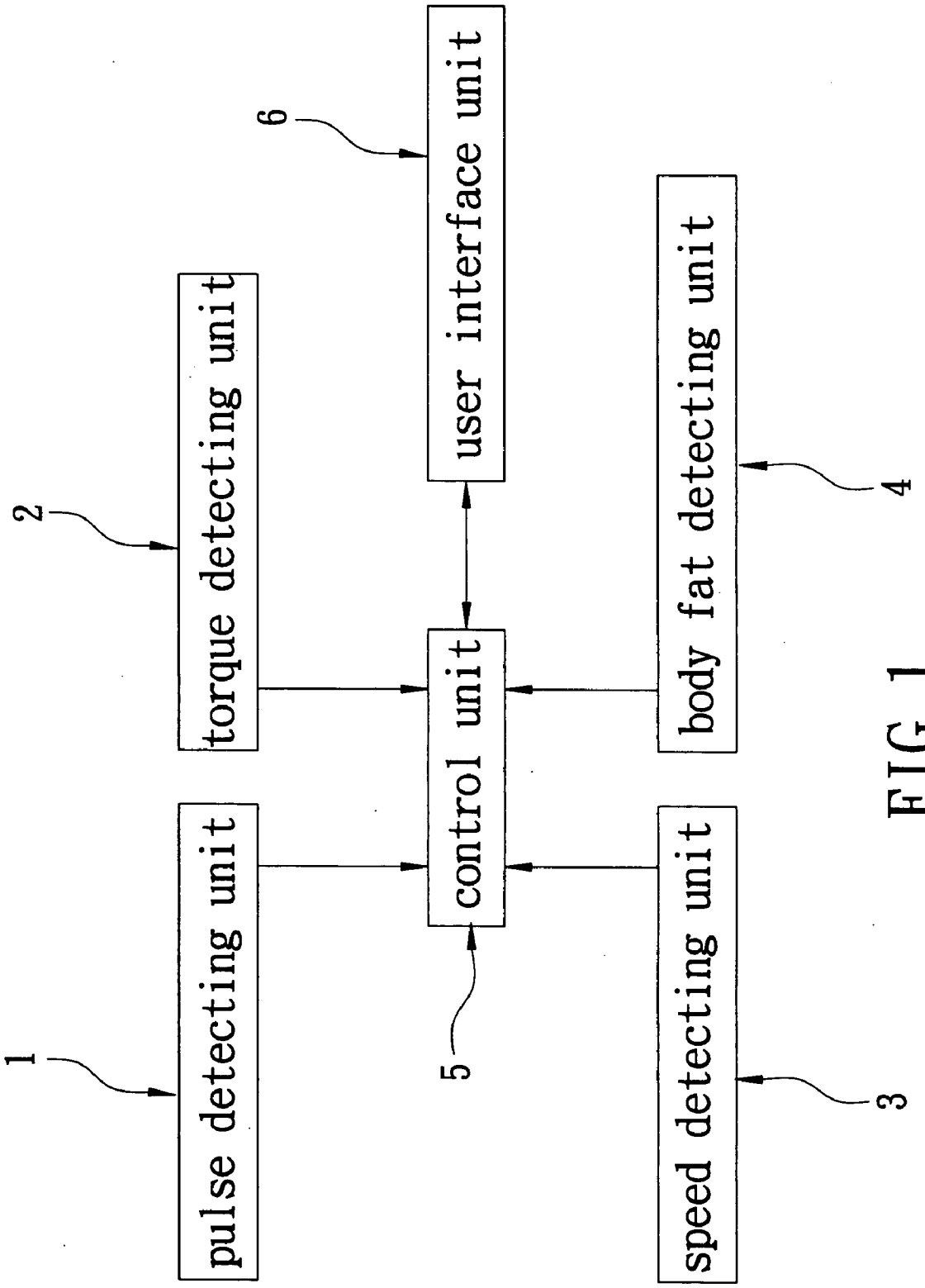

pulse detecting unit
1
torque detecting unit
2
speed detecting unit
3
body fat detecting unit
4
control unit
5
user interface unit
6

FIG. 1

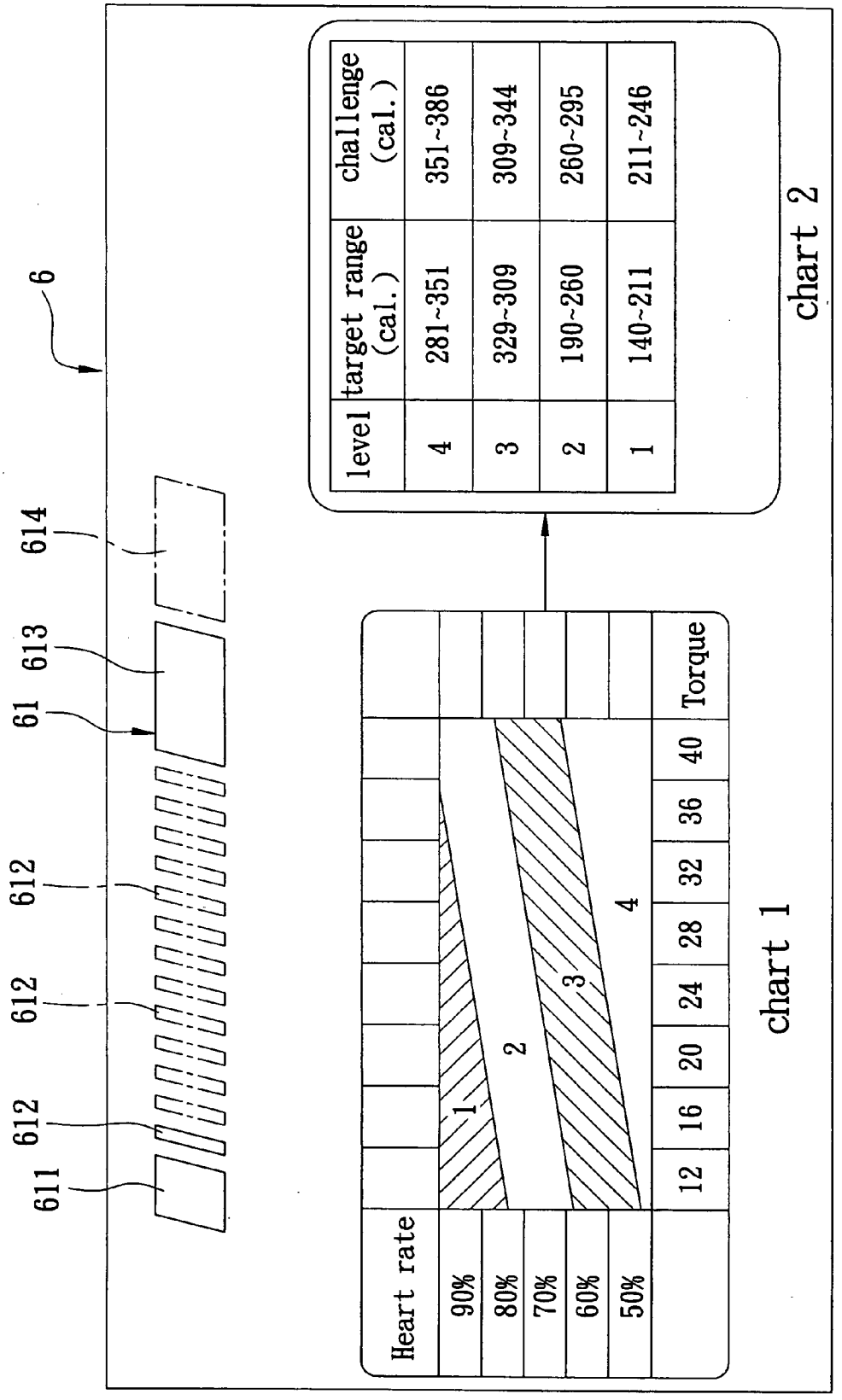

6
611
612
612
612
612
61
613
614
chart 1
Heart rate
90%
80%
70%
60%
50%
12
16
20
24
28
32
36
40
Torque
1
2
3
4
chart 2
level
target range (cal.)
challenge (cal.)
4
281~351
351~386
3
329~309
309~344
2
190~260
260~295
1
140~211
211~246

FIG. 2

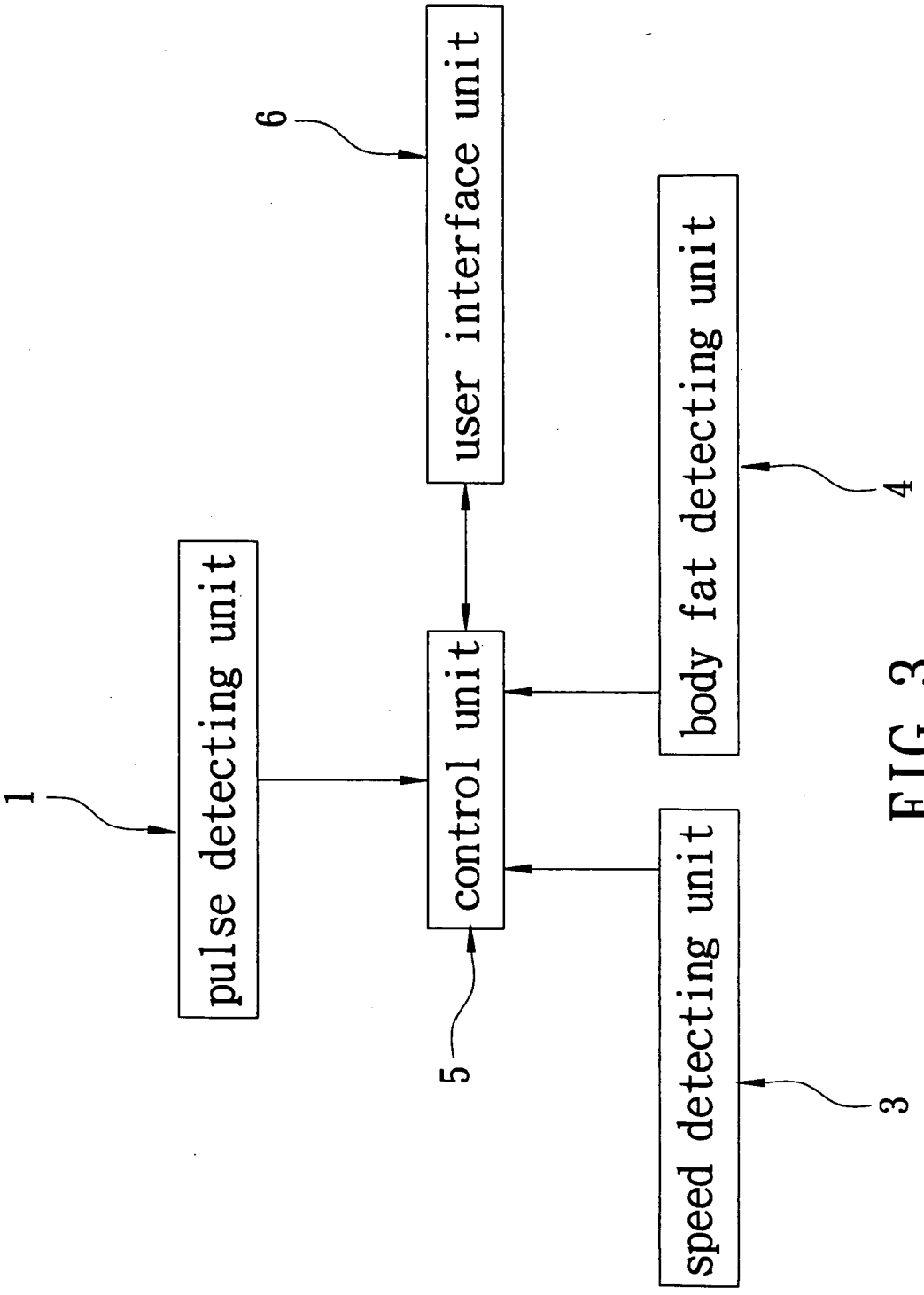

user interface unit
6
pulse detecting unit
1
control unit
5
body fat detecting unit
4
speed detecting unit
3

FIG. 3

SYSTEM FOR MONITORING EXERCISE PERFORMANCE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a system adapted for use with an exercise machine for monitoring exercise performance.

[0003] 2. Description of the Related Art

[0004] An exercise system is disclosed in Taiwanese Utility Model Publication No. M257858 entitled, "Handle Capable of Detecting Human Physiological Characteristics For Exercise Apparatus." The handle is adapted for use with an exercise apparatus and includes a pair of grip bars, a pair of conductive strips, a processing unit, and a display interface.

[0005] The grip bars are mounted on the exercise apparatus, and may be grasped by a user operating the exercise apparatus. The conductive strips are respectively mounted on the grip bars, and are adapted to detect physiological parameters of the user operating the exercise apparatus, such as a pulse of the user. The display interface displays fitness data to the user and allows user input of user-specific parameters, such as height, weight, and sex. The processing unit is electrically coupled to the conductive strips and the display interface.

[0006] The processing unit receives signals from the conductive strips, the display interface, and various sensors, and processes the signals to display various data, such as calculated distance, on the display interface. The processing unit is capable of calculating fitness data of the user operating the exercise apparatus, examples of which include heart rate, body fat, and amount of exercise performed by the user (calculated as, for example, consumed calories) . The processing unit may factor the user-specific parameters into these calculations of the fitness data of the user.

[0007] A drawback of the above conventional device, however, is that any time that the user may pause from exercising (e.g., to take a drink or go to the restroom) is not included in the calculations of the fitness data. This may result in the inaccurate calculation of the fitness data. For example, if a heart rate of the user, which is calculated with reference to the pulse of the user detected by the conductive strips, is used to determine consumed calories of the user operating the exercise apparatus, any temporary stop by the user results in inaccuracies in the determination of the calories consumed by the user.

[0008] In addition, if it is assumed the exercise apparatus is a stationary bicycle, since the energy exerted by the user operating the exercise apparatus is different during simulated uphill or downhill travel, it would be inaccurate to calculate consumed calories simply on the basis of speed and distance. Similarly, the determination of other fitness data may become inaccurate if such uphill and downhill travel is not factored into the calculations.

SUMMARY OF THE INVENTION

[0009] Therefore, the object of this invention is to provide a system adapted for use with an exercise machine for monitoring exercise performance that increases the accuracy of exercise amount determinations, and that displays data in an easy-to-understand manner.

[0010] According to a first aspect of the present invention, the system comprises: a pulse detecting unit adapted for detecting a pulse of a user operating the exercise machine; a user interface unit for allowing user manipulation to input user-specific parameters and to select an exercise mode, and for displaying data to the user; and a control unit electrically coupled to the pulse detecting unit and the user interface unit. The control unit determines a target exercise amount for the user with reference to the user-specific parameters and the exercise mode selected by the user. The control unit further determines an actual exercise amount during exercise by the user with reference to the pulse detected by the pulse detecting unit. The user interface unit displays, according to control by the control unit, an exercise indicating pattern representing the target exercise amount of the user, the exercise indicating pattern including a plurality of regions that are selectively activated according to the actual exercise amount of the user.

[0011] According to a second aspect of the present invention, the system comprises: a pulse detecting unit adapted for detecting a pulse of a user operating the exercise machine; a user interface unit for allowing user manipulation to input user-specific parameters and for displaying data to the user; and a control unit electrically coupled to the pulse detecting unit and the user interface unit. The control unit determines, following a predetermined period of exercise by the user, a target exercise amount for the user with reference to the pulse detected by the pulse detecting unit and the user-specific parameters. The control unit further determines an actual exercise amount during exercise by the user with reference to the pulse detected by the pulse detecting unit. The user interface unit displays, according to control by the control unit, an exercise indicating pattern representing the target exercise amount of the user, the exercise indicating pattern including a plurality of regions that are selectively activated according to the actual exercise amount of the user.

[0012] According to a third aspect of the present invention, the system comprises: a pulse detecting unit adapted for detecting a pulse of a user operating the exercise machine; a torque detecting unit adapted to detect a magnitude of torque exerted by the user when the exercise machine is operated; a user interface unit for allowing user manipulation to input user-specific parameters and for displaying data to the user; and a control unit electrically coupled to the pulse detecting unit, the torque detecting unit, and the user interface unit. The control unit determines, following a predetermined period of exercise by the user, a target exercise amount for the user with reference to the pulse detected by the pulse detecting unit, the torque detected by the torque detecting unit, and the user-specific parameters. The control unit further determines an actual exercise amount during exercise by the user with reference to the torque detected by the torque detecting unit. The user interface unit displays, according to control by the control unit, an exercise indicating pattern representing the target exercise amount of the user. The exercise indicating pattern includes a plurality of regions that are selectively activated according to the actual exercise amount of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Other features and advantages of the present invention will become apparent in the following detailed descrip-

tion of the preferred embodiments with reference to the accompanying drawings, of which:

[0014] FIG. **1** is a schematic circuit block diagram of a device for monitoring exercise performance according to a first preferred embodiment of the present invention;

[0015] FIG. **2** is schematic view, illustrating an example of data displayed by a user interface unit shown in FIG. **1**; and

[0016] FIG. **3** is a schematic circuit block diagram of a system for monitoring exercise performance according to a second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Before the present invention is described in greater detail, it should be noted that like elements are denoted by the same reference numerals throughout the disclosure.

[0018] FIG. **1** shows a schematic circuit block diagram of a first preferred embodiment of a system adapted for use with an exercise machine (not shown) for monitoring exercise performance. The system includes a pulse detecting unit **1**, a torque detecting unit **2**, a speed detecting unit **3**, a body fat detecting unit **4**, a control unit **5**, and a user interface unit **6**.

[0019] The pulse detecting unit **1** is adapted for detecting a pulse of a user operating the exercise machine. As an example, the pulse detecting unit **1** may be mounted on hand grips of the exercise machine. Since the different techniques for detecting the pulse of the user operating the exercise machine are well known in the art, a detailed description thereof will be omitted herein for the sake of brevity.

[0020] The torque detecting unit **2** is adapted for detecting a magnitude of torque exerted by the user when the exercise machine is operated. As an example, the torque detecting unit **2** may be mounted on a drive gear of the exercise machine.

[0021] The speed detecting unit **3** is adapted for detecting a motional speed of an element of the exercise machine undergoing some form of repetitive motion. As an example, if it is assumed that the exercise machine is a stationary bicycle, the speed detecting unit **3** may be mounted on a rotating wheel rim of the stationary bicycle to thereby detect a rotational speed of the wheel rim.

[0022] The body fat detecting unit **4** is adapted to detect a body fat amount of the user operating the exercise machine. As an example, the body fat detecting unit **4** may be mounted on the hand grips of the exercise machine, and may cooperate with the control unit **5** to utilize bioelectrical impedance analysis in a known manner to predict a body fat level of the user operating the exercise machine.

[0023] The user interface unit **6** allows user manipulation to input user-specific parameters (e.g., sex, height, weight, and age) , and to select an exercise mode. The user interface unit **6** further operates to display data to the user.

[0024] The control unit **5** is electrically coupled to the pulse detecting unit **1**, the torque detecting unit **2**, the speed detecting unit **3**, the body fat detecting unit **4**, and the user interface unit **6**. The control unit **5** performs control to display the motional speed detected by the speed detecting unit **3**, and the body fat amount of the user through the user interface unit **6**. In addition, the control unit **5** determines, following a predetermined period of exercise by the user, a target exercise amount, which is a goal amount of exercise to be performed by the user, as well as an actual exercise amount, which is a real-time calculation of the actual amount of exercise performed by user. It is to be noted that the control unit **5** may automatically determine the exercise mode of the user, rather than the user inputting the desired exercise mode via the user interface unit **6** as described above. As an example, the control unit **5** may automatically select the exercise mode following a predetermined period of detecting the pulse of the user.

[0025] The target exercise amount may be determined by the control unit **5** with reference to any one or a combination of the pulse detected by the pulse detecting unit **2**, the body fat amount detected by the body fat detecting unit **4**, the torque detected by the torque detecting unit **2**, the user-specific parameters input by the user, and the exercise mode selected by the user (or automatically selected by the control unit **5**). In this embodiment, the control unit **5** determines the actual exercise amount with reference to the torque detected by the torque detecting unit **2**. Alternatively, the control unit **5** may determine the actual exercise amount with reference to the torque detected by the torque detecting unit **2**, in combination with one or both the motional speed detected by the speed detecting unit **3** and the pulse detected by the pulse detecting unit **1**.

[0026] Through control by the control unit **5**, the user interface unit **6** displays an exercise indicating pattern **61** representing the target exercise amount of the user, as shown in FIG. **2**. The exercise indicating pattern **61** includes a plurality of regions **611**, **612**, **613**, **614** that are selectively activated according to the actual exercise amount of the user. As an example, the region **611** represents a warm-up period, the activation of which indicates completion of an amount of exercise by the user equal to a predetermined warm-up amount, the regions **612** respectively represent progressive exercise periods, the progressive activation of which indicates that the user has performed progressively increasing amounts of exercise, the region **613** represents an exercise goal period, the activation of which indicates that the user has performed an amount of exercise equal to the target exercise amount, and the region **614** represents a challenge exercise period, the activation of which indicates that the user has performed an amount of exercise that exceeds the target exercise amount. Alternatively, the regions **611**, **612**, **613**, **614** of the exercise indicating pattern **61** may be activated to indicate the actual exercise amount of the user in a progressively decreasing manner from all of the regions **611**, **612**, **613**, **614** to none of the regions **611**, **612**, **613**, **614**.

[0027] The target exercise amount may be a total number of calories to be consumed by the user operating the exercise machine. In this case, the exercise indicating pattern **61** represents the total number of calories that is targeted for burning through exercise by the user operating the exercise machine.

[0028] The control unit **5** may perform control to display other data through the user interface unit **6**. For example, utilizing one or more of the user-specific parameters, such as age, and the pulse detected by the pulse detecting unit **1**, the control unit **5** may determine if the user performing exercise is exceeding a safe level of exercise and provide a visual or sound indication to the user of the same.

[0029] As another example, using the torque detected by the torque detecting unit **2**, and using a heart rate calculated with reference to the pulse detected by the pulse detecting unit **1**, the control unit **5** is able to calculate a cardio-respiratory fitness level map of the user operating the exercise machine. In this case, the control unit **5** displays the cardio-respiratory fitness level map on the user interface unit **6** as shown in chart **1** of FIG. **2**, and selects one of the levels as a suitable fitness level for the user operating the exercise machine.

[0030] As yet another example, using the torque detected by the torque detecting unit **2** and the user-specific parameters, the control unit **5** is able to translate the information of chart **1** into a chart of target and challenge calorie ranges for the different levels as shown in chart **2** of FIG. **2**.

[0031] The regions **611**, **612**, **613**, **614** of the exercise indicating pattern **61** are then activated while the user is performing exercise (i.e., on a real-time basis) based on the calculated target and challenge calorie ranges, as well as on the selected suitable fitness level.

[0032] FIG. **3** shows a second preferred embodiment of a system adapted for use with an exercise machine for monitoring exercise performance. In the second preferred embodiment, the torque detecting unit **2** of the first preferred embodiment (see FIG. **1**) has been omitted from the configuration.

[0033] With this structure, the control unit **5** determines the actual exercise amount with reference to the pulse detected by the pulse detecting unit **2**. The target exercise amount may be determined by the control unit **5** with reference to any one or a combination of the pulse detected by the pulse detecting unit **2**, the body fat amount detected by the body fat detecting unit **4**, the user-specific parameters input by the user, and the exercise mode selected by the user (or automatically selected by the control unit **5**). All other aspects of the second preferred embodiment are identical to the first preferred embodiment.

[0034] The system for monitoring exercise performance of the present invention has the following advantages:

[0035] 1. In the first preferred embodiment, since the actual exercise amount is determined by the control unit **5** at least partially with reference to the torque detected by the torque detecting unit **2**, an accurate calculation of the actual exercise amount is possible. That is, the actual exercise amount is calculated only when the user is actually performing exercise and not when the user is temporarily resting. Furthermore, this use of torque ensures that the varying exercise amounts when simulating uphill and downhill travel (such as when the exercise machine is a stationary bicycle) are taken into account in the calculations.

[0036] 2. The target exercise amount may be a total number of calories to be consumed by the user operating the exercise machine, and the exercise indicating pattern **61** may represent the total number of calories that is targeted for burning through exercise by the user operating the exercise machine. Hence, the target and actual exercise amounts are displayed in an easy-to-understand format to thereby allow the user to quickly ascertain his or her present exercise state, thus enhancing the overall exercise experience.

[0037] While the present invention has been described in connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

What is claimed is:

1. A system adapted for use with an exercise machine for monitoring exercise performance, said system comprising:

a pulse detecting unit adapted for detecting a pulse of a user operating the exercise machine;

a user interface unit for allowing user manipulation to input user-specific parameters; and

a control unit electrically coupled to said pulse detecting unit and said user interface unit, said control unit automatically selecting an exercise mode of the user with reference to the pulse detected by said pulse detecting unit, said control unit determining a target exercise amount for the user with reference to the user-specific parameters and the exercise mode automatically selected by said control unit, said control unit further determining an actual exercise amount during exercise by the user with reference to the pulse detected by said pulse detecting unit.

2. The system of claim 1, wherein said user interface unit allows user manipulation to select the exercise mode, said control unit determining the target exercise amount for the user with reference to the user-specific parameters and the exercise mode selected by the user.

3. The system of claim 1, wherein said user interface unit displays, according to control by said control unit, an exercise indicating pattern representing the target exercise amount of the user, the exercise indicating pattern including a plurality of regions that are selectively activated according to the actual exercise amount of the user.

4. The system of claim 3, wherein the regions of the exercise indicating pattern are activated to indicate the actual exercise amount of the user in a progressively increasing manner from none of the regions to all of the regions.

5. The system of claim 3, wherein the regions of the exercise indicating pattern are activated to indicate the actual exercise amount of the user in a progressively decreasing manner from all of the regions to none of the regions.

6. The system of claim 1, wherein the target exercise amount is a total number of calories to be consumed by the user operating the exercise machine.

7. A system adapted for use with an exercise machine for monitoring exercise performance, said system comprising:

a pulse detecting unit adapted for detecting a pulse of a user operating the exercise machine;

a user interface unit for allowing user manipulation to input user-specific parameters; and

a control unit electrically coupled to said pulse detecting unit and said user interface unit, said control unit determining, following a predetermined period of exercise by the user, a target exercise amount for the user with reference to the pulse detected by said pulse detecting unit and the user-specific parameters, said control unit further determining an actual exercise amount during exercise by the user with reference to the pulse detected by said pulse detecting unit.

8. The system of claim 7, wherein said user interface unit displays, according to control by said control unit, an exercise indicating pattern representing the target exercise amount of the user, the exercise indicating pattern including a plurality of regions that are selectively activated according to the actual exercise amount of the user.

9. The system of claim 8, wherein the regions of the exercise indicating pattern are activated to indicate the actual exercise amount of the user in a progressively increasing manner from none of the regions to all of the regions.

10. The system of claim 8, wherein the regions of the exercise indicating pattern are activated to indicate the actual exercise amount of the user in a progressively decreasing manner from all of the regions to none of the regions.

11. The system of claim 7, wherein the target exercise amount is a total number of calories to be consumed by the user operating the exercise machine.

12. A system adapted for use with an exercise machine for monitoring exercise performance, said system comprising:

a pulse detecting unit adapted for detecting a pulse of a user operating the exercise machine;

a torque detecting unit adapted to detect a magnitude of torque exerted by the user when the exercise machine is operated;

a user interface unit for allowing user manipulation to input user-specific parameters; and

a control unit electrically coupled to said pulse detecting unit, said torque detecting unit, and said user interface unit, said control unit determining, following a predetermined period of exercise by the user, a target exercise amount for the user with reference to the pulse detected by said pulse detecting unit, the torque detected by said torque detecting unit, and the user-specific parameters, said control unit further determining an actual exercise amount during exercise by the user with reference to the torque detected by said torque detecting unit.

13. The system of claim 12, wherein said user interface unit displays, according to control by said control unit, an exercise indicating pattern representing the target exercise amount of the user, the exercise indicating pattern including a plurality of regions that are selectively activated according to the actual exercise amount of the user.

14. The system of claim 13, wherein the regions of the exercise indicating pattern are activated to indicate the actual exercise amount of the user in a progressively increasing manner from none of the regions to all of the regions.

15. The system of claim 13, wherein the regions of the exercise indicating pattern are activated to indicate the actual exercise amount of the user in a progressively decreasing manner from all of the regions to none of the regions.

16. The system of claim 12, wherein the target exercise amount is a total number of calories to be consumed by the user operating the exercise machine.

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