ABSTRACT

A monitoring system includes a sensing unit removably attachable to an exercise machine to record a number of repeated movements of a component of the exercise machine over a time period and a wireless transmitter to send the number and fitness information based on the number toward a remote fitness tracking device.
FIG. 6

- Machine Sensing Units
  - Accelerometer
  - Hall Effect Sensor
  - Ohmmeter
  - Optical Sensor
  - Transmitter

- Physiological Sensing Units
  - Oxygen Consumption Monitor
  - Blood Pressure Monitor
  - Heart Rate Monitor

- Processing Resources
  - Mobile Device
  - Fitness Tracking Device

- Memory Resources
  - Marking Counter
  - Timer
  - Electrical Resistance Determiner
  - Voltage Determiner
  - Current Determiner
  - Distance Determiner
  - Speed Determiner
  - Incline Determiner
  - Calorie Determiner
WIRELESS SENSOR TO PROVIDE PARAMETERS TO A FITNESS TRACKING DEVICE

RELATED APPLICATIONS


BACKGROUND

[0002] Aerobic exercise is a popular form of exercise that improves one’s cardiovascular health by reducing blood pressure and providing other benefits to the human body. Aerobic exercise generally involves low intensity physical exertion over a long duration of time. Typically, the human body can adequately supply enough oxygen to meet the body’s demands at the intensity levels involved with aerobic exercise. Popular forms of aerobic exercise include running, jogging, swimming, and cycling among others activities. In contrast, anaerobic exercise typically involves high intensity exercises over a short duration of time. Popular forms of anaerobic exercise include strength training and short distance running.

[0003] Many choose to perform aerobic exercises indoors, such as in a gym or their home. Often, a user will use an aerobic exercise machine to have an aerobic workout indoors. One such type of aerobic exercise machine is a treadmill, which is a machine that has a running deck attached to a support frame. The running deck can support the weight of a person using the machine. The running deck incorporates a tread belt that is driven by a motor. A user can run or walk in place on the tread belt by running or walking at the tread belt’s speed. The speed and other operations of the treadmill are generally controlled through a control module that is also attached to the support frame and within a convenient reach of the user. The control module can include a display, buttons for increasing or decreasing a speed of the tread belt, controls for adjusting a tilt angle of the running deck, or other controls. Other popular exercise machines that allow a user to perform aerobic exercises indoors include elliptical exercise machines, rowing machines, stepper machines, and stationary bikes to name a few.

[0004] One type of treadmill is disclosed in U.S. Patent Publication No. 2013/0274067 issued to Scott R. Watterson, et al. In this reference, an exercise system includes a simulation system simulating real-world terrain based on environmental and other real-world conditions. Using topographical or other data, an actual location can be simulated. The exercise system may include a speed, incline or other mechanisms that can be adjusted based on changes in simulated slope, and by amounts simulating actual air resistance due to movement, wind, or both. The simulated speed of the person, as well as speed and direction of simulated wind, are used to determine a simulated air speed. Based on the simulated air speed, the simulation system determines the simulated air resistance that would affect the person under real-world conditions, and changes reflective of the simulated air resistance are made to operating parameters of the exercise system. Simulation may occur by causing the user of the exercise system to expend about the same effort as if performing the exercise in the real-world conditions. Another type of treadmill is described in U.S. Pat. No. 6,997,852 issued to Scott R. Watterson, et al.

SUMMARY

[0005] In an preferred embodiment of the invention, a monitoring system includes a sensing unit removably attachable to an exercise machine to record a number of repeated movements of a component of the exercise machine over a time period and a wireless transmitter to send the recorded number of repeated movements to a remote fitness tracking device.

[0006] One aspect of the invention that may be combined with one or more other aspects herein, the component is a tread belt.

[0007] One aspect of the invention that may be combined with one or more other aspects herein, the component is a crank shaft.

[0008] One aspect of the invention that may be combined with one or more other aspects herein, the component is a pedal.

[0009] One aspect of the invention that may be combined with one or more other aspects herein, the repeated movements are reciprocating movements.

[0010] One aspect of the invention that may be combined with one or more other aspects herein, the repeated movements are rotational movements.

[0011] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit comprises an optical sensor to count markings on the component that pass through an optical view of the optical sensor.

[0012] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit comprises a magnetic sensor to count a passage of a magnetic field associated with the component.

[0013] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit comprises an attachment mechanism attachable to an external surface of the exercise machine.

[0014] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit includes memory and a processor.

[0015] One aspect of the invention that may be combined with one or more other aspects herein, where the memory comprises programmed instructions to cause the processor to determine the fitness information based on the number.

[0016] One aspect of the invention that may be combined with one or more other aspects herein, the programmed instructions cause the processor to receive an input from a heart rate monitor.

[0017] One aspect of the invention that may be combined with one or more other aspects herein, the fitness information is selected from a group consisting of a distance, a speed, and a calorie count.

[0018] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit is programmed to take time discrete measurements where an intervening time between measurement durations is at least twice as long as a measurement duration.

[0019] One aspect of the invention that may be combined with one or more other aspects herein, a monitoring unit includes a sensing unit removably attachable to an exercise machine to record of a number of repeated movements of a component of the exercise machine over a time period.

[0020] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit includes memory and a processor.
[0021] One aspect of the invention that may be combined with one or more other aspects herein, the memory comprises programmed instructions to cause the processor to determine fitness information based on the number.

[0022] One aspect of the invention that may be combined with one or more other aspects herein, the fitness information is selected from a group consisting of a distance, a speed, and a calorie count.

[0023] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit includes a wireless transmitter to send the fitness information toward a remote fitness tracking device.

[0024] One aspect of the invention that may be combined with one or more other aspects herein, the component is a tread belt.

[0025] One aspect of the invention that may be combined with one or more other aspects herein, the component is a crank shaft.

[0026] One aspect of the invention that may be combined with one or more other aspects herein, the component is a pedal.

[0027] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit is programmed to take time discrete measurements where an intervening time between measurement durations is at least twice as long as a measurement duration.

[0028] One aspect of the invention that may be combined with one or more other aspects herein, the programmed instructions cause the processor to receive an input from a heart rate monitor.

[0029] One aspect of the invention that may be combined with one or more other aspects herein, the component is a tread belt incorporated a running deck capable of supporting a weight of a user.

[0030] One aspect of the invention that may be combined with one or more other aspects herein, the tread belt extends from a first pulley to a second pulley incorporated into the running deck.

[0031] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit includes an optical sensor that tracks the number of times that a marking of the tread belt passes through an optical field of the sensing unit.

[0032] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit further includes a field containing a distance value associated with the marking.

[0033] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit further includes a counter containing a number of times that the marking passes through the optical field.

[0034] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit further includes a timer to record when the marking is in the optical view.

[0035] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit further includes a processor and memory.

[0036] One aspect of the invention that may be combined with one or more other aspects herein, the memory comprises programmed instructions to cause the processor to determine the speed at which the tread belt is moving based on timer information and the number of times that the marking passes through the optical field.

[0037] One aspect of the invention that may be combined with one or more other aspects herein, the memory comprises programmed instructions to cause the processor to send the speed to the remote fitness tracking device.

[0038] One aspect of the invention that may be combined with one or more other aspects herein, the component is a crank arm of a crank assembly attached to a flywheel.

[0039] One aspect of the invention that may be combined with one or more other aspects herein, at least one foot pedal is attached to the crank assembly, wherein the foot pedal travels along a reciprocating path in response to a performance of an exercise on the exercise machine.

[0040] One aspect of the invention that may be combined with one or more other aspects herein, the sensing unit includes an optical sensor that tracks the number of times that the crank arm passes through an optical field of the sensing unit.

[0041] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit further includes a field containing a distance value associated with the marking.

[0042] One aspect of the invention that may be combined with one or more other aspects herein, a counter containing a number of times that the crank arm passes through the optical field.

[0043] One aspect of the invention that may be combined with one or more other aspects herein, a timer to record when the crank arm is in the optical view.

[0044] One aspect of the invention that may be combined with one or more other aspects herein, a processor and memory.

[0045] One aspect of the invention that may be combined with one or more other aspects herein, the memory comprises programmed instructions to cause the processor to determine a speed value based on the number of times that the crank arm passes through the optical field within a time period.

[0046] One aspect of the invention that may be combined with one or more other aspects herein, the memory comprises programmed instructions to cause the processor to send the speed value to the remote fitness tracking device.

[0047] One aspect of the invention that may be combined with one or more other aspects herein, a monitoring unit includes a sensing unit programmed to take time discrete measurements of a number of rotations of a tread belt over a time period where an intervening time between measurement durations is at least twice as long as a measurement duration.

[0048] One aspect of the invention that may be combined with one or more other aspects herein, the monitoring unit includes memory and a processor where the memory comprises programmed instructions to cause the processor to determine fitness information based on the time discrete measurements.

[0049] One aspect of the invention that may be combined with one or more other aspects herein, the fitness information is selected from a group consisting of a distance, a speed, and a calorie count.

[0050] One aspect of the invention that may be combined with one or more other aspects herein, a wireless transmitter to send the fitness information toward a remote fitness tracking device.
BRIEF DESCRIPTION OF THE DRAWINGS

[0051] The accompanying drawings illustrate various embodiments of the present apparatus and are a part of the specification. The illustrated embodiments are merely examples of the present apparatus and do not limit the scope thereof.

[0052] FIG. 1 illustrates a perspective view of an example of a sensing unit attached to an exercise machine in accordance with the present disclosure.

[0053] FIG. 2 illustrates a side view of an example of a sensing unit attached to an exercise machine in accordance with the present disclosure.

[0054] FIG. 3 illustrates a side view of an example of a sensing unit attached to an exercise machine in accordance with the present disclosure.

[0055] FIG. 4 illustrates a side view of an example of a sensing unit attached to an exercise machine in accordance with the present disclosure.

[0056] FIG. 5 illustrates a diagram of an example of a signal in accordance with the present disclosure.

[0057] FIG. 6 illustrates a block diagram of an example of a monitoring system in accordance with the present disclosure.

[0058] FIG. 7 illustrates a side view of an example of a sensing unit attached to an exercise machine in accordance with the present disclosure.

[0059] FIG. 8 illustrates a top view of an example of a sensing unit attached to an exercise machine in accordance with the present disclosure.

[0060] Throughout the drawings, identical reference numbers designate similar, but not necessarily identical, elements.

DETAILED DESCRIPTION

[0061] Some commercially available treadmills include fitness monitoring features that track physiological parameters of the user. For example, a heart rate monitor may be built into a handle of the machine such that his or her heart rate is detected as the user operates the machine. The heart rate information is displayed to the user through a display of the treadmill’s control module. Other parameters that are displayed to the user include the distance that the user has run, the speed at which the user is currently running, and the incline at which the running deck is set. Some of these treadmills use such information to provide an estimation to the user about the number of calories that the user has consumed during the workout. The number of calories burned by the user can be helpful for users who are trying to lose weight or achieve other types of fitness goals.

[0062] To further assist users with their fitness goals, internet-based fitness programs can be in communication with some treadmills, stationary bikes, elliptical exercise machines, or other types of exercise machines. These exercise machines can convey calorie information to the fitness based programs where such information is stored. The user can access their information through the internet to track his or her progress, compare his or her workout accomplishments with others belonging to the fitness based programs, make future goals, perform other functions, or combinations thereof.

[0063] However, many exercise machines located within existing gyms and workout clubs do not include the ability to connect to the internet or other online programs. For these gyms and clubs, the cost of replacing their existing inventory for a new set of exercise machines that have the capability of sending the calorie information to the online fitness tracking program is prohibitive. The principles described herein include a monitoring system with a sensing unit that can be retrofitted to an existing treadmill or other type of exercise machine to gather data that can be used to calculate calorie information or other types of information.

[0064] For example, the sensing unit can include an optical sensor that can track the number of times that the tread belt rotates over time. The monitoring system can use the number of rotations to determine the speed at which the user is running and the distance that the user has already gone. The sensing unit can convey these calculated results to a mobile device carried by the user, which can retransmit such information to a fitness tracking device that, at least in part, operates the fitness tracking program. In other embodiments, the raw operating data of the exercise machine is gathered by the sensing unit and transmitted to the mobile device before the data is used to calculate fitness information. In such an example, the mobile device may include an application that gives the mobile device the capability of making such calculations. In such an example, the mobile device may make at least some calculations before sending the data to the fitness tracking device. In other examples, the mobile device may send the raw operating data to the fitness tracking device where the data is used to calculate the fitness data.

[0065] Particularly, with reference to the figures, FIG. 1 depicts an exercise machine 10, such as a treadmill. The exercise machine 10 includes a running deck 12 that can support the weight of a user and that is attached to a frame 14. The running deck 12 incorporates a tread belt 16 that extends from a first pulley 18 to a second pulley (not shown) at location 20. The underside of the tread belt’s mid-section is supported by a low friction surface that allows the tread belt’s underside to move without creating significant drag. The tread belt 16 is moved by a motor that is connected to the first pulley 18 and is disposed within a housing 24 formed in a front portion 26 of the running deck 12. As the tread belt 16 moves, a user positioned on the tread belt 16 can walk or run in place by keeping up with the tread belt’s speed.

[0066] A control module 42 is also supported by the frame 14. In the example of FIG. 1, a support member 30 positions a set of hand holds near the control module 42 such that a user can support himself or herself during exercise. The control module 42 allows the user to control at least one operating parameter of the exercise machine 10. The control module 42 may include controls to adjust the speed of the tread belt 16, adjust a volume of a speaker integrated into the exercise machine 10, adjust an incline angle of the running deck 12, select an exercise setting, control a timer, change a view on the first control module’s display 44, monitor the user’s health parameters, perform other tasks, or combinations thereof. Buttons, levers, touch screens, voice commands, or other mechanisms may be incorporated into the control panel and may be used by the user to control at least some of the functions mentioned above. The control module 42 can be used to control the functions mentioned above. Information relating to these functions may be presented to the user through the display 44. For example, a calorie count, a timer, a distance, a selected program, another type of information, or combinations thereof may be presented to the user through the display 44.

[0067] A monitoring system 50 may be incorporated into the exercise machine 10 to track repeated movements of a
component of the exercise machine 10. In the illustrated example, the component is the tread belt 16, and the monitoring system count the number of times that the tread belt 16 makes a complete revolution or a partial revolution. This is accomplished with a sensing unit 52 that is attached to an external surface 54 of the exercise machine’s frame 14 or another structure or surface of the exercise machine 10. In the illustrated example, the sensing unit 52 is attached an underside of an arm. The attachment mechanism that connects the sensing unit 52 to the exercise machine may be any appropriate type of attachment mechanism. For example, a plate, a rod, or another protrusion that may be used to connect the sensing unit. Further, ropes, magnets, wires, bolt holes, or other types of features that may assist in attaching the sensing unit to the exercise machine may be used. Further, the sensing unit may be adhered, glued, or otherwise connected to a location on the exercise machine.

Also, in the example of FIG. 1, the sensing unit 52 includes an optical sensor that can track the number of times that a marking 56 passes through an optical field of the sensing unit 52. For example, the marking 56 may be incorporated into, adhered to, or drawn on the tread belt 16 such that the marking 56 passes through the sensing unit’s optical field once every complete revolution. In other examples, the tread belt 16 may incorporate multiple markings that indicate a fractional revolution of the tread belt 16. The monitoring system 50 may also have a field that contains a value of the length of the tread belt 16. This length value can be combined with the number of revolutions to determine the distance that the user has already traveled during the workout.

Further, a timer may also track the moments when the markings enter and/or exit the optical field. Thus, the monitoring system 50 can determine how many revolutions have been made over a known period of time to determine the speed at which the user is running. In some examples, the marking 56 may have a known length, and the speed of the tread belt 16 may be determined by measuring the time that it takes for the marking to pass through the optical field. Further, a space between markings may also be known, and the time lapse between a first marking entering the optical field and a second marking entering the optical field may be used to determine the user’s speed. While the optical sensor has been described with reference to specific approaches for using markings to determine a distance and/or speed, any appropriate approach for determining the distance and/or speed with an optical sensor may be used in accordance with the present disclosure.

Any appropriate type of markings may be used in accordance with the principles described herein. For example, the marking may be a line that is drawn onto the visible surface of the tread belt 16. In other examples, the marking is a logo, a symbol, a letter, a number, another type of marking, or combinations thereof. The markings may be attached with any appropriate mechanism. For example, the marking may be adhered to the tread belt 16, drawn onto the tread belt 16, printed onto the tread belt 16, deformed into the tread belt 16, or otherwise attached to the tread belt 16. In other examples, the marking may include an indentation, a tattered thread, a tear in the tread belt’s material, a scuff mark, a chalk mark, or another type of feature of the tread belt that can be tracked by the sensing unit 52. In some examples, the sensing unit 52 identifies the moving tread belt of irregularities that can be tracked without any modifications being made to the tread belt or any other moving component of the exercise machine.

The values of the length and/or other tread belt parameters may be stored in the sensing unit 52. In such cases, the sensing unit 52 may calculate the distance and/or speed. In other examples, such values are stored in other locations. In these examples, the sensing unit 52 can retrieve these values or can send the collected raw data towards a fitness tracking device 58. In examples where the sensing unit 52 contains the length and other values of the tread belt 16, the values are sent with the collected raw data and are processed elsewhere.

The revolution information, timer information, the calculated speed, calculated distance, length value, and/or other information can be sent to a mobile device 60. In some instances, the mobile device 60 belongs to the user, such as a smart phone, and includes a downloadable application that is programmed to receive the information from the sensing unit 52. Such an application can also be programmed to make calculations that were not performed with the sensing unit 52. The mobile device 60 can send the calculated information, raw data, or other types of information to the fitness tracking device 58.

The fitness tracking device 58 may be any appropriate type of device that stores fitness information that can be accessed by the user at a later time. In some examples, the mobile device 60 has such a storage capacity, and the mobile device 60 is the fitness tracking device. In other examples, the fitness tracking device is a remote device, such as a database, in communication with either the mobile device 60 or the sensing unit 52 that stores the calculated information and/or the raw information. Such a fitness tracking device 58 can be accessible over the internet, and a user can retrieve his or her fitness information after the workout to track fitness progress, make fitness goals, compare fitness results with others who are signed up with a fitness tracking program, perform other functions, or combinations thereof. An example of a program associated with a fitness tracking device 58 may include the ifit® program administered through ICON Health and Fitness, Inc. with a place of business located in Logan, Utah, U.S.A. Such a program is accessible over the internet at www.iFit.com.

In some examples, the fitness tracking device 58 includes an ability to perform calculations on the information received from the sensing unit 52. For example, the distance and/or the speed may be calculated at the fitness tracking device 58. Further, the fitness tracking device 58 may include a library that associates parameters with a user identifier to associate the user with the appropriate received information.

When the user signs up with the fitness tracking program, the program may create a user profile. Such a profile may contain information such as a user identifier, a user height, a user weight, a user gender, passwords, user name, connections to other users in the fitness tracking program, other types of information, or combinations thereof. In response to receiving the measurements taken by the sensing unit 52 and/or the calculated data based on the measurements, the fitness tracking program may make additional calculations based on the user’s identifier. For example, the fitness tracking program may use the user’s weight and/or height to calculate a number of calories burned by the user during the workout.

The fitness tracking device 58 may also receive additional types of information about the workout other than the operating parameters of the exercise machine 10. For
example, the fitness tracking device 58 may receive heart rate information, oxygen consumption information, blood pressure information, other types of information, or combinations thereof to calculate additional fitness parameters or refine the calorie count calculations.

The fitness tracking device 58 may obtain the user identifier from the mobile device 60 or directly from the sensing unit 52. In examples, where the user owns a mobile device 60 that passes information from the sensing unit 52 to the fitness tracking device 58, the user identifier may be stored in the mobile device 60. In such an example, the user identifier can be sent with the information to the fitness tracking device 58 automatically. In other examples, the user can input his or her user identifier in the sensing unit 52, and the sensing unit 52 can send the user identifier with the obtained information.

In some instances, the sensing unit 52 also has a selectable identifier that automatically detects the identifier and allows the fitness tracking device 58 to associate the sensing unit 52 with the appropriate exercise machine. Machine parameters, such as the length of the tread belt 16, the type of exercise machine 10, the age of the exercise machine 10, unique characteristics of the exercise machine 10, and other types of information about the exercise machine 10 may be associated with the machine identifier. In this manner, the fitness tracking device 58 and/or the mobile device 60 are enabled to interpret the information received from the sensing unit 52. For example, such an identifier may prevent the mobile device 60 or the fitness tracking device 58 from trying to interpret measurements obtained on an elliptical exercise machine as though the information came from a treadmill or another type of exercise machine 10. Accordingly to one embodiment, the sensing unit 52 can detect the type of exercise machine based on power inputs, exerted forces, vibration detection, and the like.

Any type of wireless communication protocol may be used to communicate between the sensing unit and the mobile device, between the mobile device and the fitness tracking device, and/or the sensing unit and the fitness tracking device. For example, the wireless protocols may use a ZigBee protocol, a Z-Wave protocol, a Bluetooth protocol, a Low Energy Bluetooth protocol, a Wi-Fi protocol, a Global System for Mobile Communications (GSM) standard, another standard, or combinations thereof. In a specific example, a Wi-Fi protocol may be used to communicate between the mobile device and the fitness tracking device, and an Low Energy Bluetooth protocol may be used between the mobile device and the sensing unit.

FIG. 2 illustrates a side view of an example sensing unit 52 attached to an exercise machine 10 in accordance with the present disclosure. In this example, a portion of the housing 24 of the front portion 26 is removed for illustrative purposes to reveal a motor 62 electrically connected with an electrically conductive medium, such as a power cable 64. In this example, the electrically conductive medium is arranged to provide power from a power source 66 that is also internal to the housing 24 to the motor 62. In other examples, a cable may provide power from a source external to the exercise machine 10. The sensing unit 52 can measure an electrical property of the power cable 64 to determine the amount of power that is supplied to the motor 62. The electrical property can be transmitted from the sensing unit 52 to the mobile device 60 or directly to the fitness tracking device 58. The sensing unit 52 and/or the device to which the sensing unit 52 transfers the obtained electrical property can calculate the speed at which the motor 62 is moving the tread belt 16.

The sensing unit 52 may sense any appropriate type of electrical or magnetic property. For example, the electrical property may include a resistance, an impedance, a voltage, a current, a magnetically induced electrical property, an electric field, another type of electrical property, or combinations thereof. In some examples, the sensing unit 52 includes an ohmmeter, a voltmeter, an ammeter, a Hall effect sensor, another type of sensor that can gather or derive an electrical property of the power cable 64.

FIG. 3 illustrates a side view of an example sensing unit 52 attached to an exercise machine 10 in accordance with the present disclosure. In this example, the exercise machine 10 includes an accelerometer 68 that is attached to a portion of the running deck 12. As the running deck 12 moves to position the running deck 12 at a certain incline, the accelerometer 68 senses movement in at least one direction, such as a vertical direction. This movement can be used to derive the incline of the running deck 12. The raw data of the accelerometer 68 can be processed locally at the sensing unit 52 to determine the incline. In other examples, the raw or processed data may be sent to the mobile device 60 or the fitness tracking device 58 to determine the incline.

FIG. 4 illustrates a side view of an example sensing unit 52 attached to an exercise machine 10 in accordance with the present disclosure. In this example, the exercise machine 10 is an elliptical machine. The exercise machine 10 includes a base 72 that is attached to a frame 74. A lower portion of the frame 74 includes a housing 78 that supports a first flywheel 80 and a second flywheel (not shown). The flywheels are attached to one another through a crank assembly 82. The crank assembly 82 includes a crank arm 84 that is attached to a first shaft 86 that is connected to the first flywheel 80 on a first end and attached to a second shaft that is connected to the second flywheel.

The first shaft 86 is attached to an underside of a first track 88 that supports a first foot pedal 90, and the second shaft is attached to an underside of a second track 92 that supports a second foot pedal 94. The crank assembly 82 is shaped such that the first shaft 86 and the second shaft follow reciprocating paths. Consequently, the first foot pedal 90 follows the path of the first shaft 86, and the second foot pedal 94 follows the path of the second shaft. As a user stands on the foot pedals 90, 94 for a workout, the user’s feet also follow the reciprocating paths of the foot pedals 90, 94. In some examples, the first foot pedal 90 is slideable along the length of the first track 88. Likewise, the second foot pedal 94 is slideable along the length of the second track 92. Thus, in some examples, the first foot pedal 90 and the second foot pedal 94 are movable in multiple directions: down the length of the tracks and with the reciprocating paths traveled by the first shaft 86 and the second shaft.

The first foot pedal 90 is connected to a first arm support 96 through a first mechanical linkage 98, and the second foot pedal 94 is connected to a second arm support 100 through a second mechanical linkage 102. The first arm support 96 is connected to the frame 74 at a first arm pivot connection 104, and the second arm support 100 is connected to the frame 74 at a second arm pivot connection. In the example of FIG. 4, the first mechanical linkage 98 includes a first bottom section of the first arm support 96 being connected to a first far end of the first track 88 at a first joint 112. Likewise, the second mechanical linkage 102 includes a sec-
A control module 120 is connected to the frame 74 and may include multiple buttons, a display, a cooling vent, a speaker, another device, or combinations thereof. The control module 120 can include a resistance input mechanism that allows the user to control how much resistance is applied to the movement of the foot pedals and the arm supports. The control module 120 may also provide the user with an ability to control other functions of the exercise machine 10.

The sensing unit 52 may count the number of times that one of the components of the exercise machine 10 moves into and out of an optical field. For example, the sensing unit 52 may sense the number of times that the crank arm 84 moves into and out of the optical field. The sensing unit 52 may be positioned such that the crank arm 84 moves into and out of the sensing unit’s optical field once a revolution. The revolution count may be used to determine a distance traveled by the user, a speed of the user, a calorie count of the user, another fitness parameter, or combinations thereof. In other examples, the sensing unit 52 may sense the movement of the arm supports, the tracks, the foot pedals, the mechanical linkages, other components, or combinations thereof to determine the fitness parameters of the user. Such information may be sent to a mobile device 60 or directly to the fitness tracking device 58.

FIG. 5 illustrates a diagram of an example of a signal in accordance with the present disclosure. In this example, the x-axis 122 represents time, and the y-axis 124 represents an electrical current input. Line 126 represents the amount of current applied by a motor 62 of the exercise machine 10. Such a measurement may be taken off of a power cable 64 supplying electrical power to the motor 62. The dash marks 128 represent the moment that the sensing unit 52 measures the electrically property.

The sensing unit 52 may conserve energy by measuring the electrical characteristic or another characteristics of an operating parameter of the exercise machine 10 by measuring the characteristics just during individual time discrete measurement durations. Such measurement durations may be short and separated by intervening time periods. The intervening time periods may be longer than the measurement durations. In some cases, the measurement durations are less than a second, or even less than a microsecond. During such a short measurement duration, the sensing unit 52 may gather enough data points to construct line 126 to determine an operating parameter of the exercise machine to be used to determine fitness information about the user’s workout. In some cases, the sensors of the sensing unit 52 are off for a majority of the user’s workout, turning on just long enough to get a sufficient number of samples to make the fitness information calculations.

FIG. 6 illustrates a block diagram of an example monitoring system 50 in accordance with the present disclosure. The monitoring system 50 may include a combination of hardware and program instructions for executing the functions of monitoring system 50. In this example, the monitoring system 50 includes processing resources 130 that are in communication with memory resources 132. Processing resources 130 include at least one processor and other resources used to process programmed instructions. The memory resources 132 represent generally any memory capable of storing data such as programmed instructions or data structures used by the monitoring system 50. The programmed instructions shown stored in the memory resources 132 include a marking counter 134, a timer 136, an electrical resistance determiner 138, a voltage determiner 140, a current determiner 142, a distance determiner 144, a speed determiner 146, an incline determiner 148, and a calorie determiner 150. While this example is described with the above listed programmed instructions in the memory resources 132, in other examples, just a subset of these programmed instructions are included in the memory resources 132.

The memory resources 132 include a computer readable storage medium that contains computer readable program code to cause tasks to be executed by the processing resources 130. The computer readable storage medium may be a tangible and/or non-transitory storage medium. The computer readable storage medium may be an appropriate storage medium that is not a transmission storage medium. A non-exhaustive list of computer readable storage medium types includes non-volatile memory, volatile memory, random access memory, write only memory, flash memory, electrically erasable program read only memory, magnetic based memory, other types of memory, or combinations thereof.

The marking counter 134 represents programmed instructions that, when executed, cause the processing resources 130 to count the number of times that the markings pass by the sensing unit 52. An optical sensor 151 of the sensing unit 52 may be used to count the number of passes made by the marking. Any appropriate type of marking may be used. For example, the marking may be a color difference, a deformation, an adhered object, a mechanical component of the exercise machine 10, such as a crank arm 84 or other component, or combinations thereof. The timer 136 represents programmed instructions that, when executed, cause the processing resources 130 to track the amount of time that it takes for the marking to make a complete revolution. This may be accomplished by associating a time stamp with each count. In other examples, the timer 136 may track the time with a different mechanism.

The electrical resistance determiner 138 represents programmed instructions that, when executed, cause the processing resources 130 to determine the electrical resistance on a cable associated with a mechanism that drives a motor 62 or another device on the exercise machine 10. The electrical resistance may be used to determine the speed and distance that a user has achieved during his or her workout. Likewise, the voltage determiner 140 and the current determiner 142 respectively represent programmed instructions that, when executed, cause the processing resources 130 to determine the voltage or the current associated with the electrical cable providing power to the motor 62. In some examples, just a subset of the electrical resistance determiner 138, the voltage determiner 140, the current determiner 142 are incorporated into the memory resources 132. Determining any of these electrical properties may be based on measurements from a Hall effect sensor 152, an ohmmeter 154, a voltmeter, an ammeter, another type of meter for measuring an electrical and/or magnetic property, or combinations thereof.

The sensing unit 52 may send the operating parameters towards to fitness tracking device by sending the operating parameters directly to the fitness tracking device or to an intermediary device, such as the mobile device 60. The measurements about the exercise machine’s operating parameters may be sent to the mobile device 60 with a sensing unit transmitter 156. Likewise, the information obtained and/or
calculated by the mobile device 60 can be sent to the fitness tracking device 58 with a mobile transmitter 158. [0093] The distance determiner 144 represents programmed instructions that, when executed, cause the processing resources 130 to determine the distance that a user has achieved during the workout. The speed determiner 146 represents programmed instructions that, when executed, cause the processing resources 130 to determine the current speed of the user and/or other speeds of the user achieved earlier in during the workout. The incline determiner 148 represents programmed instructions that, when executed, cause the processing resources 130 to determine the incline of the running deck 12 or other component of the exercise machine 10 that affects the difficulty of the workout. In some examples, the incline is determined based on measurements from the accelerometer 68. However, any appropriate mechanism for determining the incline may be used.

[0094] The calorie determiner 150 represents programmed instructions that, when executed, cause the processing resources 130 to determine a calorie count based on the information available. Such available information may be personal data that may be part of an electronic profile of a fitness program, the fitness tracking device 58, the mobile device 60, or stored in another device or location. The calorie count may be based entirely on the measurements obtained from the operating parameters of the exercise machine 10. In alternative examples, the calorie count is based at least in part on additional information obtained with those other types of sensors. For example, a physiological sensing units 160 may be used to monitor a condition of the user. Such physiological sensing units 160 may include an oxygen consumption monitor 162, a blood pressure monitor 164, a heart rate monitor 166, another type of monitor, or combinations thereof.

[0095] Further, the memory resources 132 may be part of an installation package. In response to installing the installation package, the programmed instructions of the memory resources 132 may be downloaded from the installation package’s source, such as a portable medium, a server, a remote network location, another location, or combinations thereof. Portable memory media that are compatible with the principles described herein include DVDs, CDs, flash memory, portable disks, magnetic disks, optical disks, other forms of portable memory, or combinations thereof. In other examples, the program instructions are already installed. Here, the memory resources 132 can include integrated memory such as a hard drive, a solid state hard drive, or the like.

[0096] In some examples, the processing resources 130 and the memory resources 132 are located within the sensing unit 52, the mobile device 60, fitness tracking device 58. The memory resources 132 may be part of their main memory, caches, registers, non-volatile memory, or elsewhere in their memory hierarchy. Alternatively, the memory resources 132 may be in communication with the processing resources 130 over a network. Further, the data structures, such as the libraries, may be accessed from a remote location over the network connection while the programmed instructions are located locally. Thus, the monitoring system 50 may be implemented on the sensing unit 52, the mobile device 60, the fitness tracking device 58; a user device; a phone; an electronic tablet; a wearable computing device; a head mounted device; a server; a collection of servers; a networked device; a watch; a user interface in a car, truck, plane, boat, bus, another type of automobile; or combinations thereof. Such an implementation may occur through input mechanisms, such as push buttons, touch screen buttons, voice commands, dials, levers, other types of input mechanisms, or combinations thereof.

[0097] While the above embodiments have been described with specific reference to treadmills, the principles described in the present disclosure may be incorporated into any appropriate exercise machine. For example, the sensing unit may be attached to or positioned nearby elliptical exercise machines, rowing machines, stepper machines, stationary bikes, self-propelling bikes, stationary exercise machines, other types of exercise machines, or combinations thereof.

[0098] FIG. 7 depicts an example of a sensing unit 700 attached to a flywheel housing 702 of an exercise machine 703. A pedal 704 moves in a repeated movement defined by a crank arm 706 attached to the flywheel housing. As the crank arm 706 moves past the sensing unit 700, the sensing unit 700 detects the magnet's magnetic field. In response to detecting the magnetic field, the sensing unit 700 increments the count.

[0099] FIG. 8 depicts a tread deck 800 with a tread belt 802 surrounding the tread deck 800. Markings 804 are depicted on the tread belt 802, which can be detected by a sensing unit 806 attached to the treadmill 808.

[0100] Additionally, while the examples above have been described with specific approaches for obtaining operating parameters of the exercise machine, any appropriate type of approach may be used in accordance with the principles described in the present disclosure. For example, other types of sensors may be used, other than optical sensors, to determine the number of revolutions of a crank arm, tread belt, or other moving component. For example, a magnetic sensor may be incorporated into the crank arm, tread belt, or other moving component, and a magnetic sensor may count the number of times that the magnetic source passes by. In yet other examples, a sensor that determines an amount of friction between the running deck and the tread belt may be used to determine a speed. In further example, vibration sensors may be used to determine the speed of the crank arm, tread belt, or other component. Additionally, the incline may be determined with optical sensors, acoustic sensors, distance sensors, magnetic sensors, other types of sensors, or combinations thereof.

INDUSTRIAL APPLICABILITY

[0101] In general, the invention disclosed herein may provide a sensing unit that can be removably attached to an exercise machine. Such a monitoring system can be used to record a number of repeated movements of a component of the exercise machine over a time period. Such repeated movements may include the number of times that a tread belt rotates around a tread deck, the number of times that a crank shaft rotates about an axle, the number of times that a pedal moves in a circular motion, the number of times that a pedal moves in a reciprocating movement, another type of movement of any appropriate type of exercise machine component, or combinations thereof. A wireless transmitter may send the number to a remote fitness tracking device where the number is stored or processed. In some examples, some fitness information is derived from the number of repeated movements at the monitoring unit, and such fitness information may be sent to the fitness tracking device. In some instances, at least some of the fitness information is determined at the fitness tracking device.
Such a system may provide users an opportunity to use an online fitness tracking program without using an exercise machine that was originally built to record fitness information or to communicate with the fitness tracking devices that operate the fitness tracking program. The sensing units can be attached to or positioned nearby the exercise machine to record the exercise machine’s operating parameters.

A wireless transmitter may be used to communicate recorded information to the fitness tracking device or to an intermediate device, like a mobile device such as a phone, watch, or a wearable computing device. In some cases, the sensing units may perform some type of processing, such as data compression, prior to sending the number and/or other types of data to the fitness tracking device. In some examples, the sensing unit continuously sends the data to the fitness tracking device. In other examples, the sensing unit sends the data on a periodic basis. In yet other examples, the sensing unit may send the data based on event triggers. For example, an event that may trigger the sensing unit to send the information may include the conclusion of an exercise session. In response to detecting that the exercise session is completed, the sensing unit may send the number and any other information to the fitness tracking device.

Any appropriate protocol may be used to send the information to the fitness tracking device. In some examples, the sensing unit may have a Bluetooth connection with a mobile device like a smart phone, and the smart phone may have a Wi-Fi connection with the fitness tracking device. In such an example, the information may be sent from the sensing device to the smart phone, and then sent to the fitness tracking device. In other examples, the sensing unit may have a more direct connection to the fitness tracking device, or the sensing unit may be in communication with another device that is networked with the fitness tracking device.

The sensing unit may include any appropriate type of sensor for obtaining the measurements. For example, the sensing unit may include an optical sensor that counts at least one marking on the component as at least a portion of the component moves through an optical view of the optical sensor. Each time that a marking is identified as passing through the optical view, a counter may be incremented by one. The total number count within a period of time may indicate a value of a fitness parameter. For example, in situations where the markings are disposed along a treadmill belt and spaced a foot apart, a number of 5,280 may correspond to the user having traveled a distance of a mile. Continuing with the same example, if the such a count is achieved within 15.0 minutes, the monitoring device may determine that the user was traveling at an average speed of 4.0 miles per hour. In some examples, the monitoring unit may send just the count to the fitness tracking device. In other examples, the monitoring unit may send the time duration and the count to the fitness monitoring device. In yet other examples, the monitoring unit may send the count, time duration, and the calculated speed to the fitness monitoring device. In some cases, the fitness tracking device may generate a speed value or generate another value associated with another fitness parameter based on the information sent to the fitness tracking device.

In other examples, the sensing unit may include a magnetic sensor. In such an example, the magnetic sensor may be attached to a portion of the exercise machine where the magnetic sensor can come into cyclical contact with a magnetic field that is indicative of the repeated movements of a component of the exercise machine. For example, a magnet may be attached to a crack arm of a stationary bicycle or an elliptical exercise machine, and the magnetic sensor of the sensing unit may be attached to a housing of the exercise machine in a position that that the magnetic sensor is proximate the magnet of the crack arm when the crack arm is at a specific angular position. As a result, as the crack arm rotates, the magnetic sensor detects the magnetic field of the sensor every time that the crack arm approaches the angular position. Each time the crack arm passes, a counter can increment another count.

In another example, one or more magnets may be attached to a tread belt of a treadmill, and the magnetic sensor may be attached to a housing or another portion of the treadmill in such a location where the magnetic sensor can detect the presence of the magnet or magnets as they pass by. Each time the magnetic field is detected, the magnetic sensor can cause a counter to increment the count.

While the examples above have been described with reference to specific types of sensors in the sensing unit, any appropriate type of sensor may be used. For example, the sensors may detect changes in electrical properties, changes in magnetic properties, changes in optical properties, changes in other types of properties, other types of changes or combinations thereof. In such examples, the sensors may include ohmmeters, ammeters, multi-meters, optical sensors, proximity sensors, distance sensors, Hall effect sensors, magnetic sensors, other types of sensors, or combinations thereof.

In some cases, the repeated movements are rotational movements. Such movements involve forming a component rotating around a fixed axle, such as the crack arm in a stationary bicycle or fixed axles in an elliptical exercise machine. In other examples, the rotational movements may involve movements where the rotation is not based on movement around a fixed axle. For example, the rotations of the treadmill belt or linkages in elliptical exercise machines that are attached to the outer perimeter of a flywheel may involve rotations where the repeated rotation is not circular or the axle is moving. In yet other examples, the repeated movements may be reciprocating movements where the movements include a back and forth movement. For example, an elliptical exercise machine may include a reciprocating movement that is counted with the sensing unit. In other examples, a pedal of an exercise machine may have a reciprocating movement, such as the reciprocating motion involved in a stepper machine, a rowing machine, a cross country simulating machine, other types of machines, or combinations thereof.

The principles described herein may include a portable sensing unit that can be carried in the user’s bag. Such a sensing unit can give the user the freedom of using a wide selection of exercise machines and still have his or her fitness information automatically tracked when the sensing unit is attached to the exercise machine. For example, the user can go to any gym whether or not the gym’s equipment has the capability of communicating with the fitness program of the user’s choice. Further, gym owners may desire to give their customers the ability to participate in a fitness tracking program without having the expense of replacing their inventory. As a result, the gym owner can merely retrofit their existing equipment with the sensing units.

The exercise machine may include a running deck that can support the weight of a user. The running deck incorporates a tread belt that extends from a first pulley to a second pulley. The underside of the tread belt’s mid-section is supported by a low friction surface that allows the tread belt’s
underside to move without creating significant drag. The tread belt may be moved by a motor that is connected to the first pulley and is disposed within a housing formed in a front portion of the running deck. As the tread belt moves, a user positioned on the tread belt can walk or run in place by keeping up with the tread belt’s speed.

[0112] A monitoring system may be incorporated into the exercise machine to track repeated movements of a component of the exercise machine. In some cases, the component is the tread belt, and the monitoring system counts the number of times that the tread belt makes a complete revolution or a partial revolution. This is accomplished with a sensing unit that is attached to an external surface of the exercise machine’s frame or another structure or surface of the exercise machine. The sensing unit may be attached an underside of an arm. The attachment mechanism that connects the sensing unit to the exercise machine may be any appropriate type of attachment mechanism. For example, a plate, a rod, or another protrusion that may be used to connect the sensing unit. Further, ropes, magnets, wires, bolt holes, or other types of features that may assist in attaching the sensing unit to the exercise machine may be used. Further, the sensing unit may be adhered, glued, or otherwise stuck to a location on the exercise machine.

[0113] Also, the sensing unit may include an optical sensor that can track the number of times that a marking passes through an optical field of the sensing unit. For example, the marking may be incorporated into, adhered to, or drawn on the tread belt such that the marking passes through the sensing unit’s optical field once every complete revolution. In other examples, the tread belt may incorporate multiple markings that indicate a fractional revolution of the tread belt. The monitoring system may also have a field that contains a value of the length of the tread belt. This length value can be combined with the number of revolutions to determine the distance that the user has already traveled during the workout.

[0114] Further, a timer may also track the moments when the markings enter and/or exit the optical view. Thus, the monitoring unit can determine how many revolutions have been made over a known period of time to determine the speed at which the user is running. In some examples, the marking may have a known length, and the speed of the tread belt may be determined by measuring the time that it takes for the marking to pass through the optical field. Further, a space between markings may also be known, and the time lapse between a first marking entering the optical field and a second marking entering the optical field may be used to determine the user’s speed. While the optical sensor has been described with reference to specific approaches for using markings to determine a distance and/or speed, any appropriate approach for determining the distance and/or speed with an optical sensor may be used in accordance with the present disclosure.

[0115] Any appropriate type of markings may be used in accordance with the principles described herein. For example, the marking may be a line that is drawn onto the visible surface of the tread belt. In other examples, the marking is a logo, a symbol, a letter, a number, another type of marking, or combinations thereof. The markings may be attached with any appropriate mechanism. For example, the marking may be adhered to the tread belt, drawn onto the tread belt, printed onto the tread belt, deformed into the tread belt, or otherwise attached to the tread belt. In other examples, the marking may include an indentation, a tattered thread, a tear in the tread belt’s material, a scuff mark, a chalk mark, or another type of feature of the tread belt that can be tracked by the sensing unit. In some examples, the sensing unit identifies the moving tread belt of irregularities that can be tracked without any modifications being made to the tread belt or any other moving component of the exercise machine.

[0116] The values of the length and/or other tread belt parameters may be stored in the sensing unit. In such cases, the sensing unit may calculate the distance and/or speed. In other examples, such values are stored in other locations. In these examples, the sensing unit can retrieve these values or can send the collected raw data on towards a fitness tracking device. In examples where the sensing unit contains the length and other values of the tread belt, the values are sent with the collected raw data and are processed elsewhere. The revolution information, timer information, the calculated speed, calculated distance, length value, and/or other information can be sent to a mobile device. In some instances, the mobile device belongs to the user, such as a smart phone, and includes a downloadable application that is programmed to receive the information from the sensing unit. Such an application can also be programmed to make calculations that were not performed with the sensing unit. The mobile device can send the calculated information, raw data, or other types of information to the fitness tracking device.

[0117] The fitness tracking device may be any appropriate type of device that stores fitness information that can be accessed by the user at a later time. In some examples, the mobile device has such a storage capacity, and the mobile device is the fitness tracking device. In other examples, the fitness tracking device is a remote device, such as a database, in communication with either the mobile device or the sensing unit that stores the calculated information and/or the raw information. Such a fitness tracking device can be accessible over the internet, and a user can retrieve his or her fitness information after the workout to track fitness progress, make fitness goals, compare fitness results with others who are signed up with a fitness tracking program, perform other functions, or combinations thereof.

[0118] In some examples, the fitness tracking device includes an ability to perform calculations on the information received from the sensing unit. For example, the distance and/or the speed may be calculated at the fitness tracking device. Further, the fitness tracking device may include a library that associates parameters with a user identifier to associate the user with the appropriate received information. When the user signs up with the fitness tracking program, the program may create a user profile. Such a profile may contain information such as a user identifier, a user height, a user weight, a user gender, passwords, user name, connections to other users in the fitness tracking program, other types of information, or combinations thereof. In response to receiving the measurements taken by the sensing unit and/or the calculated data based on the measurements, the fitness tracking program may make additional calculations based on the user’s identifier. For example, the fitness tracking program may use the user’s weight and/or height to calculate a number of calories burned by the user during the workout.

[0119] The fitness tracking device may also receive additional types of information about the workout other than the operating parameters of the exercise machine. For example, the fitness tracking device may receive heart rate information, oxygen consumption information, blood pressure information,
tion, other types of information, or combinations thereof to calculate additional fitness parameters or refine the calorie count calculations.

[0120] The fitness tracking device may obtain the user identifier from the mobile device or directly from the sensing unit. In examples, where the user owns a mobile device that passes information from the sensing unit to the fitness tracking device, the user identifier may be stored in the mobile device. In such an example, the user identifier can be sent with the information to the fitness tracking device automatically. In other examples, the user can input his or her user identifier in the sensing unit, and the sensing unit can send the user identifier with the obtained information.

[0121] In some instances, the sensing unit also has a selectable identifier that automatically detects the identifier and allows the fitness tracking device to associate the sensing unit with the appropriate exercise machine. Machine parameters, such as the length of the tread belt, the type of exercise machine, the age of the exercise machine, unique characteristics of the exercise machine, and other types of information about the exercise machine may be associated with the machine identifier. In this manner, the fitness tracking device and/or the mobile device are enabled to interpret the information received from the sensing unit. For example, such an identifier may prevent the mobile device or the fitness tracking device from trying to interpret measurements obtained on an elliptical exercise machine as though the information came from a treadmill or another type of exercise machine. Accordingly to one embodiment, the sensing unit can detect the type of exercise machine based on power inputs, exerted forces, vibration detection, and the like.

[0122] Any type of wireless communication protocol may be used to communicate between the sensing unit and the mobile device, between the mobile device and the fitness tracking device, and/or the sensing unit and the fitness tracking device. For example, the wireless protocols may use a ZigBee protocol, a Z-Wave protocol, a Bluetooth protocol, a Low Energy Bluetooth protocol, a Wi-Fi protocol, a Global System for Mobile Communications (GSM) standard, another standard, or combinations thereof. In a specific example, a Wi-Fi protocol may be used to communicate between the mobile device and the fitness tracking device, and an Low Energy Bluetooth protocol may be used between the mobile device and the sensing unit.

[0123] In another example, the sensing unit is attached to an exercise machine in accordance with the present disclosure. In this example, the exercise machine is an elliptical machine. The exercise machine includes a base that is attached to a frame. A lower portion of the frame includes a housing that supports a first flywheel and a second flywheel. The flywheels are attached to one another through a crank assembly. The crank assembly includes a crank arm that is attached to a first shaft that is connected to the first flywheel on a first end and attached to a second shaft that is connected to the second flywheel.

[0124] The first shaft is attached to an underside of a first track that supports a first foot pedal, and the second shaft is attached to an underside of a second track that supports a second foot pedal. The crank assembly is shaped such that the first shaft and the second shaft follow reciprocating paths. Consequently, the first foot pedal follows the path of the first shaft, and the second foot pedal follows the path of the second shaft. As the user stands on the foot pedals for a workout, the user’s feet also follow the reciprocating paths of the foot pedals. In some examples, the first foot pedal is slideable along the length of the first track. Likewise, the second foot pedal is slideable along the length of the second track. Thus, in some examples, the first foot pedal and the second foot pedal are movable in multiple directions: down the length of the tracks and with the reciprocating paths traveled by the first shaft and the second shaft.

[0125] The first foot pedal is connected to a first arm support through a first mechanical linkage, and the second foot pedal is connected to a second arm support through a second mechanical linkage. The first arm support is connected to the frame at a first arm pivot connection, and the second arm support is connected to the frame at a second arm pivot connection. The first mechanical linkage may include a first bottom section of the first arm support being connected to a first arm support of the first track at a first joint. Likewise, the second mechanical linkage includes a second bottom section of the second arm support connected to a second far end of the second track at a second joint.

[0126] A control module is connected to the frame and may include multiple buttons, a display, a cooling vent, a speaker, another device, or combinations thereof. The control module can include a resistance input mechanism that allows the user to control how much resistance is applied to the movement of the foot pedals and the arm supports. The control module may also provide the user with an ability to control other functions of the exercise machine.

[0127] The sensing unit may count the number of times that one of the components of the exercise machine moves into and out of an optical field. For example, the sensing unit may sense the number of times that the crank arm moves into and out of the optical field. The sensing unit may be positioned such that the crank arm moves into and out of the optical field once a revolution. The revolution count may be used to determine a distance traveled by the user, a speed of the user, a calorie count of the user, another fitness parameter, or combinations thereof. In other examples, the sensing unit may sense the movement of the arm supports, the tracks, the foot pedals, the mechanical linkages, other components, or combinations thereof to determine the fitness parameters of the user. Such information may be sent to a mobile device or directly to the fitness tracking device.

[0128] The sensing unit may work with other types of sensors that are already built into the exercise machines, such as heart rate monitors or other types of sensors. Further, personal sensors worn by the user may also be used together with the sensing unit. Any appropriate data collected about the workout may be joined with the operating parameters and used to determine the fitness data. Thus, the sensing unit may operate in conjunction with other types of sensors.

What is claimed is:

1. A monitoring system, comprising:
   a sensing unit removably attachable to an exercise machine to record a number of repeated movements of a treadmill of the exercise machine over a time period, the sensing unit comprising an attachment mechanism attachable to an external surface of the exercise machine;
   memory and a processor, wherein the memory comprises programmed instructions to cause the processor to determine fitness information based on the recorded number of repeated movements; and
   a wireless transmitter to send the recorded number of repeated movements to a remote fitness tracking device.
2. The monitoring system of claim 1, wherein the repeated movements comprise reciprocating movements.

3. The monitoring system of claim 1, wherein the repeated movements comprise rotational movements.

4. The monitoring system of claim 1, wherein the sensing unit comprises an optical sensor to count at least one marking on the tread belt that pass through an optical view of the optical sensor.

5. The monitoring system of claim 1, wherein the sensing unit comprises a magnetic sensor to count a passage of a magnetic field associated with the tread belt.

6. The monitoring system of claim 1, wherein the fitness information is selected from a group consisting of distance, speed, and calorie count.

7. The monitoring system of claim 10, wherein the programmed instructions cause the processor to receive an input from a heart rate monitor.

8. The monitoring system of claim 1, wherein the sensing unit is programmed to take time discrete measurements where an intervening time between measurement durations is at least twice as long as a measurement duration.

10. The monitoring unit of claim 1, wherein the tread belt comprises a tread belt incorporated a running deck capable of supporting a weight of a user;

   wherein the tread belt extends from a first pulley to a second pulley incorporated into the running deck;

   wherein the sensing unit includes an optical sensor that tracks the number of times that a marking of the tread belt passes through an optical field of the sensing unit;

   wherein the monitoring unit further comprises:

   a field containing a distance value associated with the marking;

   a counter containing a number of times that the marking passes through the optical field;

   a timer to record when the marking is in the optical view;

   a processor and memory, where the memory includes programmed instructions to cause the processor to:

   cause the processor to determine the speed at which the tread belt is moving based on timer information and the number of times that the marking passes through the optical field; and

   send the speed to the remote fitness tracking device.

11. The monitoring unit of claim 1, wherein the sensing unit is programmed to take time discrete measurements of a number of rotations of a tread belt over a time period where an intervening time between measurement durations is at least twice as long as a measurement duration, wherein the memory comprises programmed instructions, which when accessed, cause the processor to determine fitness information based on the time discrete measurements; and [text missing or illegible when filed]