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(71) Applicant *(for all designated States except US)*: **ICON HEALTH & FITNESS, INC.** [US/US]; 1500 South 1000 West, Logan, UT 84321 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **ASHBY, Darren, C.** [US/US]; 144 South State Street, Richmond, UT 84333 (US).

(74) Agents: **JENSEN, Bradley, B.** et al.; Traskbritt, 230 South 500 East, Suite 300, P.O. Box 2550, Salt Lake City, UT 84110-2550 (US).

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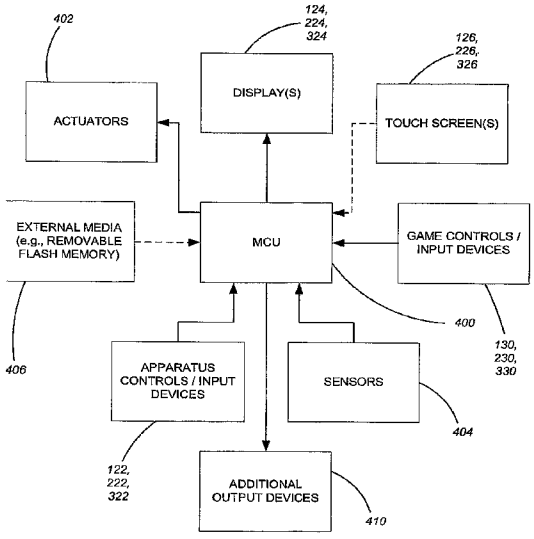
(54) **Title:** EXERCISE APPARATUSES, COMPONENTS FOR EXERCISE APPARATUSES AND RELATED METHODS



(57) **Abstract:** Exercise apparatuses, components for exercise apparatuses and related systems and methods are provided. In accordance with one embodiment, an exercise apparatus includes a frame, structure associated with the frame that is moveable relative to the frame in a predefined pattern, a console and at least one display associated with the console. A processor is in communication with the at least one display and controls both an operational parameter of the exercise apparatus and an interactive game. The game may be manipulated, at least in part, based on selective actuation of an input device by a user and, at least in part, by an aspect of an operational parameter of the exercise apparatus. Thus, for example, if an individual is exercising at a high level, as may be exhibited by a speed measurement, the game play may be altered to make the interactive game easier in some manner.

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EXERCISE APPARATUSES, COMPONENTS FOR EXERCISE APPARATUSES AND RELATED METHODS

PRIORITY CLAIM

This application claims the benefit of the filing date of United States Provisional Application Serial No. 60/792,029, filed April 14, 2006, for CONSOLE FOR EXERCISE APPARATUS AND APPARATUS INCORPORATING SAME.

TECHNICAL FIELD

The present invention is directed generally to exercise apparatuses and, more specifically, to exercise apparatuses incorporating an interactive game or some other entertainment system or device, as well as to related systems, components and methods.

BACKGROUND

Various types of equipment and apparatuses are used to help individuals exercise in their efforts to maintain good health and fitness. While the following is not an exhaustive list of such types of exercise equipment, examples of some conventional apparatuses include treadmills, elliptical trainers, stationary bicycles, recumbent bicycles and stair climbers. Conventionally, when a person utilizes these types of exercise equipment, the equipment remains in a defined location and, therefore, a person using the machine, while exhibiting physical movements, also remains generally at the same location. For example, a person using a treadmill, while exhibiting physical movements associated with walking or running, essentially stays in the same general location while walking or running due to the nature and operation of the treadmill.

For some users, training and exercising on a "stationary" exercise apparatus may become tedious or boring due to the fact that they do not change locations and their mind is preoccupied by the act of exercising. Many users may need to have a diversion to take their mind off of the exercise activity in which they are participating. In fact, numerous exercise facilities have placed televisions in areas where, for example, treadmills or elliptical trainers are being used by their patrons in an effort to help those individuals focus their minds on something other than the exercise activities in which they are participating. Additionally, or alternatively, some individuals have utilized music devices

to help divert their minds during exercise activities. However, television and music are not always sufficient diversions for one's mind as the television or music may be easily "tuned out" and simply become background noise. In other words, television and music may often lack the ability to effectively divert one's focus on something other than the exercise activity in which they are participating.

Some efforts have been made to incorporate other activities that may be participated in simultaneously with use of an exercise apparatus. For example, simulation devices have been used where one or more display screens or monitors are positioned around the exercise apparatus in an effort to provide a simulated environment during use of the exercise equipment. Thus, for example, as one rides a stationary bicycle, the displays or screens positioned around the bicycle may play video images in an effort to simulate the movement of a bicycle through a selected environment. Such a selected environment might attempt to emulate, for example, a solitude bicycle ride along a mountain trail or a beachfront highway, or it might try to emulate a competitive environment such as a well known bicycle race.

Another attempt at diverting one's mind during exercise includes the use of an electronic game system (e.g., a Playstation® type game system) while simultaneously exercising. This may include simply locating the exercise equipment near the game system (and an associated television to which the game system is connected) and attempting to simultaneously play a selected game while also trying to utilize the exercise apparatus. In some instances, the simultaneous operation of a game system and an exercise apparatus has even contemplated the measuring of a person's heart rate while exercising and then altering some aspect of the game play presented by the game system based on the level of measured heart rate.

Such efforts at providing a diversion while exercising have been met with varying levels of success. In many instances, the equipment associated with a simulation device has been cost prohibitive, size prohibitive, or both, making it difficult for the average user to take advantage of such a device or system.

Use of a game system while simultaneously exercising has also introduced various problems and issues. For example, operation of game system while simultaneously exercising on an exercise apparatus conventionally requires wiring that extends from a game controller being operated or manipulated by a user while the exercise equipment is

simultaneously being operated. Such wires are often exposed to moving components of the exercise equipment and may easily get tangled or caught in the moving components. Additionally, and perhaps more importantly, the wires may get caught or tangled in the legs or arms of a person using the exercise equipment causing potential injury to the person.

Therefore, it would be advantageous to provide an exercise apparatus having integral features that would create a diversion for a user during the use of such equipment. For example, it would be advantageous to provide an exercise apparatus with a game device or game system integrated therewith. Such integration may include physical integration of the game device or system with the exercise apparatus, electrical integration of the game device or system with the exercise apparatus of the game device or system with the exercise apparatus, or both.

It would also be advantageous to provide a diversion for a person exercising, wherein the diversion requires substantial focus of a person's mind making it difficult for the person to ignore the diversion or distraction. Moreover, it would be advantageous to provide a diversion which is functionally integral with, and affected by, a change in an operational parameter of the exercise equipment.

DISCLOSURE OF INVENTION

The present invention provides exercise apparatuses, components for exercise apparatuses, related systems and methods. For example, the present invention provides embodiments wherein an interactive game is integrated with the exercise apparatus. The game may be integrated physically, electronically, functionally or some combination thereof.

In accordance with one embodiment of the present invention, an exercise apparatus is provided. The exercise apparatus comprises a frame and structure associated with the frame that is moveable relative to the frame in a predefined pattern. The apparatus also includes a console and at least one display associated with the console. A primary processor is configured to both control at least one operational parameter of the exercise apparatus and to conduct an interactive game using the at least one display. It is noted that such a predefined pattern may include, for example foot pads associated with an elliptical trainer, pedals associated with a stationary bicycle, a circuitous belt associated

with a treadmill, crank arms, structural linkages, fly wheels, or other resistance structures associated with a variety of apparatuses (e.g., elliptical trainers, stationary bicycles, treadmills, steppers or stair climbers, striding apparatuses, rowing apparatuses, and skiing apparatuses).

In accordance with another embodiment of the present invention, another exercise apparatus is provided. The exercise apparatus comprises a frame and structure associated with the frame that is moveable relative to the frame in a predefined pattern. The apparatus also includes a console and at least one display associated with the console. A single processor is configured to both control at least one operational parameter of the exercise apparatus and to conduct an interactive game using the at least one display.

In accordance with a further embodiment of the present invention, another exercise apparatus is provided. The exercise apparatus comprises a frame and structure associated with the frame that is moveable relative to the frame in a predefined pattern. The apparatus also includes a console and at least one display associated with the console. A single primary processor is configured to both control at least one operational parameter of the exercise apparatus and to conduct an interactive game using the at least one display. A secondary processor may be configured to assist the primary processor with one or more specific tasks such a video processing.

In accordance with yet another embodiment of the present invention, another exercise apparatus is provided. The exercise apparatus comprises a frame and structure associated with the frame that is moveable relative to the frame in a predefined pattern. The apparatus also includes a console and at least one display associated with the console. At least one processor is in communication with the at least one display. At least one sensor is in communication with the at least one processor and configured to determine an aspect of at least one operational parameter of the exercise apparatus. The at least one sensor is further configured to provide an input signal to the at least one processor that is representative of the aspect of the at least one operational parameter. At least one game input device is selectively actuatable by a user of the exercise apparatus. The at least one game input device is in communication with the at least one processor and configured to provide an input signal to the at least one processor when actuated by a user. The at least one processor is configured to conduct an interactive game using the at least one display

based at least in part on the input signal from the at least one sensor and at least in part on the input signal from the at least one game input device.

In accordance with another embodiment of the present invention, a method of operating an exercise apparatus is provided. The method includes determining an aspect of at least one operational parameter of the at least one exercise apparatus and providing a signal to a processor representative of the aspect of the at least one operational parameter. At least one input device is selectively actuated and a signal representative of the actuation of the at least one input device is provided to the processor. An interactive game is conducted on at least one display of the exercise apparatus based in part on the signal representative of the aspect of the at least one operational parameter and based in part on the signal representative of the actuation of the at least one input device.

In accordance with one aspect of the present invention, a console is provided for an exercise apparatus. The console includes at least one function key configured to control an operational feature of an exercise apparatus and at least one display to show data related to the exercise apparatus. The console further includes at least one processor in communication with the at least one function key and the at least one display, wherein the at least one processor is configured to conduct an interactive game using the at least one display.

In accordance with another aspect of the present invention, yet another exercise apparatus is provided. The exercise apparatus includes a frame and structure associated with the frame that is moveable relative to the frame in a cyclical or repeating pattern. A console is coupled with the frame which may include at least one function key configured to control an operational feature of an exercise apparatus and at least one display. At least one processor is associated with the console, wherein the at least one processor is in communication with the at least one function key and the at least one display, and wherein the at least one processor is configured to conduct an interactive game using the at least one display.

BRIEF DESCRIPTION OF DRAWINGS

The foregoing and other advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIG. 1 is a perspective view of an exercise apparatus in accordance with one aspect of the present invention;

FIG. 2 is a front view of a console associated with the exercise apparatus shown in FIG. 1;

FIGS. 3A through 3D are enlarged views of a display associated with the exercise apparatus of FIG. 1 in accordance with certain embodiments of the present invention;

FIG. 4 is a perspective view of a component of the exercise apparatus shown in FIG. 1;

FIG. 5 is a perspective view of an exercise apparatus in accordance with another embodiment of the present invention;

FIG. 6 is a front view of a console associated with the exercise apparatus shown in FIG. 4;

FIG. 7 is a perspective view of an exercise apparatus in accordance with yet another embodiment of the present invention;

FIG. 8 is a block diagram showing a configuration of various components associated with a game system integrated into an exercise apparatus in accordance with another embodiment of the present invention;

FIG. 9 is a block diagram showing another configuration of various components associated with a game system integrated into an exercise apparatus in accordance with one embodiment of the present invention; and

FIG. 10 is a software system diagram illustrating software modules according to an embodiment of the present invention.

MODES FOR CARRYING OUT THE INVENTION

In accordance with various embodiments of the present invention, exercise apparatuses are configured to include a game device or a game system that is integrated in one or more ways with the exercise apparatus. For example, an exercise apparatus may include a console having keys, buttons, switches or other input devices (which may also be referred to herein as function keys) associated with controlling an operational parameter or feature of the exercise apparatus. The exercise apparatus may be configured, for example, as a treadmill, a stationary or recumbent bicycle, an elliptical trainer, a stair climber or some other apparatus used for exercise, fitness or training purposes. The

function keys may be configured, for example, to control an operational parameter of the exercise apparatus such as speed, inclination, resistance or some other function or parameter of the exercise apparatus during the operation thereof.

For example, referring to FIG. 1, an exercise apparatus is shown which is configured as an elliptical trainer 100. The elliptical trainer 100 includes a frame 102 having a base 104 and a support structure 106 coupled with, and extending upward from, the base 104. Also coupled with the base is a pair of spaced apart, elongated tracks 108. A pair of elongate structural components, referred to herein as a crank arms 110, extend between a rotational mechanism 112, which may include a wheel configured to rotate about a specified axis, and respective ones of the pair of elongated tracks 108. A first end of each crank arm 110 is coupled with the rotational mechanism 112 such that the first end travels along a circuitous path, such as in a substantially circular motion. A second end of each crank arm 110 has a roller 114, a slide mechanism or some other device that engages the elongated tracks 108 and enables displacement of the crank arm 110 relative to the elongated track 108. In the case of a roller 114, the roller 114 is configured to roll along the length of the track 108 in a reciprocating motion as the first end of the crank arm 110 travels along its defined path.

A pair of elongated structures, referred to herein as foot rails 116, are pivotally coupled with the crank arms 110. The foot rails 116 have one end coupled to an end of a pivoting handle bar 118. Each handle bar 118 is pivotally coupled with the support structure 106. A platform, referred to herein as a foot pad 120, is also coupled with each foot rail 116. Each foot pad 120 is sized and configured for a user place one of their feet thereon during use of the elliptical trainer 100.

During use of the elliptical trainer 100, a user places each foot on a foot pad 120, grasps an upper end of each handle bar 118, and then exerts force through the foot pads 120 and, optionally, through the handle bars 118, to cause the rollers 114 to roll along their associated elongated track 118. The pivotal connection between the foot rails 116 and the crank arms 110 cause the foot pads 120 to follow a generally elliptical circuitous path, while the upper ends of the handle bars 118 reciprocate in an alternating back-and-forth motion. The rotational mechanism 112 may also include a resistance mechanism to alter the level of resistance experienced by a user as they exert a force on the crank arms 110 via the foot rails 116 and foot pads 120. Such a resistance mechanism

may include, for example, a mechanical resistance mechanism or a mechanical resistance mechanism (such as so-called eddy current brake systems). The resistance mechanism may also be configured to be selectively altered according to the parameters of a selected exercise program or according to an input command of a user.

Thus, it is seen that a variety of structures or components are moveable relative to the frame 102 of the elliptical trainer 100 in a predefined pattern. For example, the foot pads 120, the handle bars 118, the foot rails 116, the rollers 114, the rotational mechanism 112 and the crank arms are each movable relative to the frame 102 in a predefined pattern. Even in embodiments where, for example, the foot pads 120 or associated foot rails 116 are adjustable with respect to width, stride length or other similar parameters, such components are still movable relative to the frame 102 in a predefined pattern during operation of the apparatus.

Similarly, as will become apparent upon reading the additional disclosure below, other apparatuses, such as a stationary bicycle 200 or a treadmill 300, include structures, which may include any of a variety of components that are movable relative to the frame. Besides those that are specifically depicted in the drawing figures, other exercise apparatuses, including, but not limited to, rowing apparatuses (rowers), striding apparatuses (striders), stair climbers or steppers, and skiing apparatuses (skiers) also include structure that is movable relative to an associated frame in a predefined pattern.

It is noted that the embodiment described with respect to FIG. 1 is illustrative and that the present invention may be used with a variety of differently configured elliptical trainers and that a variety of different features (for example, adjustable incline of the elongated tracks, an adjustable stride, heart rate monitoring devices to name a few) may be incorporated into such an apparatus. It will be apparent to those of ordinary skill in the art that the present invention is applicable to variety of configurations of elliptical trainers as well as to other types of exercise equipment. Likewise, various other embodiments described below are merely examples and one of ordinary skill in the art will recognize that various configurations of exercise apparatuses may be utilized in conjunction with the present invention.

Still referring to FIG. 1, the elliptical trainer 100 also includes a console 120 coupled to the support structure 106. The console 120 may be configured to house one or more electronic components associated with the elliptical trainer 100 as well as act as a

control or communications center for the elliptical trainer 100. For example, referring to FIG. 2 which shows an enlarged front view of the console 120 in accordance with one embodiment of the present invention, the console 120 may include one or more input devices 122 (and which may be referred to herein as function keys), such as buttons or switches, that are configured to alter an operational parameter of the elliptical trainer 100. Additionally, the console 120 may include one or more output devices, such as a display 124, to communicate certain information to a user of the elliptical trainer 100. In one embodiment, the display may include a color or a monochrome liquid crystal display (LCD), although other types of displays are contemplated as being used in conjunction with the present invention.

Thus, for example, one or more input devices 122 or function keys may be used to alter the level of resistance applied to the rotational mechanism 112. Additionally, one or more input devices 122 may be used to selectively actuate some other mechanism (e.g., an incline actuator) associated with operation of the elliptical trainer 100. One or more of the input devices 122 may be used to navigate a user interface exhibited by the display 124 for selection of a desired exercise program or regimen or for selection of information to be shown on the display (e.g., time elapsed, calories burned, heart rate, etc.). In another embodiment, an input device may be used for direct and immediate selection of an exercise program without resorting to the user interface associated with the display 124.

It is noted that the display 124 may also be configured to include a touch screen 126 such that the touch screen is used as an input device instead of, or in addition to, the previously described input devices 122 or function keys.

The display 124, or at least a portion of the display 124, may also be used to facilitate a diversion for the user of the elliptical trainer 100. For example, the display 124 may be used to display animation or video associated with an electronic game. Referring briefly to FIG. 3A, an enlarged view of a display 124 is shown wherein an animation associated with an electronic game is depicted. In one embodiment, the game may include a game similar to that which is known as TETRIS wherein a plurality of differently shaped blocks 128 drop from an upper part of the animation to a lower part of the animation where they are stacked together. A person playing the game may reorient the blocks and position them as they fall in an attempt to stack the blocks economically without any spaces between individual blocks. When a horizontal row is completely filled

with blocks (i.e., no spaces remaining), that row may disappear and any blocks stacked thereabove will shift downward. Depending a person's skill level and their success in stacking the blocks properly, the game may speed up such that the blocks 128 fall at a faster pace requiring the user's reaction to be quicker in orienting and placing the blocks 128 as they fall.

Referring briefly to FIGS. 1 and 4, in order to selectively control the orientation and placement of the blocks 128, a game input device 130 may be integrated into the elliptical trainer 100. For example, an input device 130 may include one or more buttons located in either, or both, of the handle bars 118. In one embodiment, the game input devices 130 may include, for example a directional button 130A (such as a rocker switch) as well as another input device such as a push button 130B.

If each of the handlebars 118 has such input devices 130 associated therewith, and considering the example of a TETRIS style game being played, a directional button 130A on one of the handle bars 118 may be used to reorient the blocks 128 of the game, while the directional button 130A on the other of the handle bars 118 may be used to horizontally position the blocks 129 as they move down the display 124. The push buttons 130B may be used, for example, to accelerate the rate at which the blocks 128 drop once a player is satisfied with their orientation and position.

In another embodiment, the directional buttons 130A and push buttons 130B may have different functions from the example described with respect to a TETRIS style game. For example, as depicted in FIG. 3B, a SPACE INVADERS type game may be shown on the display 124 wherein a first space ship 132 (or other animated structure or character) is selectively maneuvered by the player and fires missiles 134 or bullets at oncoming space ships 136 (or other animated structures or characters). In such an example, a directional button 130A may be used to selectively maneuver the first space ship 132 while the push button 130B may be used to selectively fire the missiles or bullets 134.

A variety of other games may also be played on the display 124 including electronic versions of card games, such as black jack or poker, or other popular arcade style games such as games similar to PAC-MAN, ASTEROIDS or pinball. Of course, such games are merely examples and are not to be considered limiting in any sense.

Additionally, in one embodiment of the present invention, the console 120 may be configured for receipt of a memory card or for connection to another apparatus, including

connection by wireless means (e.g., using IEEE 802.11 or Bluetooth protocols) so as to enable a user to download additional selected games to the console. In other embodiments, the console 120 may be configured for receipt of a memory card or for connection to another apparatus enabling a user to read or access selected games directly from the memory card or apparatus via the display 124 in the console 120.

Referring briefly to FIG. 3C, another view of the display 124 is shown wherein the display is in a "hybrid" mode showing a game on a portion of the display while showing information regarding the operation of the elliptical trainer 100 (or other exercise apparatus) in another part of the display 124.

A variety of configurations could be implemented in such a hybrid or mixed display mode. In one embodiment the display could be "split" wherein, for example half of the display 124 shows information or animation associated with the game while the other half of the display 124 shows information or data related to the operation of the elliptical trainer 100 (of course such a split could be at specified percentages other than 50/50 if so desired). In another configuration, the display could be configured to exhibit a "picture-in-picture" mode such as is used in various televisions to display multiple channels at a given time.

Referring briefly to FIG. 3D, the display is shown wherein only information and data (which may include, for example, a user interface) relating to the operation of the elliptical trainer 100 is shown. Thus, in one embodiment, the display 124 may be configured to selectively exhibit operational information (as shown in FIG. 3D), game animation (as shown in FIGS. 3A and 3B), or a mixture of both operational information and game animation (as shown in FIG. 3C). As discussed below, in another embodiment, multiple displays may be used such as, for example, where one display exhibits game play while another display exhibits a user interface or other information and data associated with operation of the elliptical trainer 100 or other apparatus.

Referring now to FIG. 5, an exercise apparatus configured as a stationary bicycle 200 is shown. The stationary bike 200 may include a frame 202 having a base 204 and a structural member 206 extending from the base 204. A resistance mechanism 208 is coupled to the base and a pair of pedals 210 and associated crank arms 212 (only one of each shown) are coupled to the resistance mechanism 208. The resistance mechanism 208 may include a mechanical, electromechanical, magnetic, electromagnetic or other similar

mechanism, as will be appreciated by those of ordinary skill in the art, to provide a desired resistance to the actuation of the pedals 210 and crank arms 212 by a user.

A seat 214 is coupled with the frame 202 by way of an appropriate support 216 or structural member and enables a user to sit while actuating the pedals 210 and crank arms 212. Handle bars 218 may be coupled with the structural member 206 for a user to hold on to and stabilize themselves while using the stationary bicycle 200.

The stationary bicycle also includes a console 220 coupled to the support structure 206. The console 220 may be configured to house one or more electronic components associated with the stationary bicycle 200 as well as act as a control or communications center for the stationary bicycle 200. For example, referring to FIG. 6 which shows an enlarged front view of the console 220 and handle bars 218 in accordance with one embodiment of the present invention, the console 220 may include one or more input devices 222, such as buttons or switches that are configured to alter an operational parameter of the stationary bicycle 200.

Additionally, the console 220 may include one or more output devices, such as a display 224, to communicate certain information to a user of the stationary bicycle 200. In one embodiment, the display may include a color or a monochrome liquid crystal display (LCD), although other types of displays are contemplated as being used in conjunction with the present invention. As also seen in FIG. 6, the handle bars 218, located to the sides of the console 220, may include game input devices 230 for selectively altering an aspect of game play when a user is using the stationary bicycle 200 and playing a game displayed on the associated display 224. The game input devices 230 shown in FIGS. 5 and 6 include multi-directional buttons or switches that enable a user to directionally control an animated character or feature in a plurality of directions, or that may be programmed such that actuating a specific switch or button 230A-230D effects a specific action associated with game play (e.g., jump, shoot, run, hold cards, place bet, etc.). It is noted that, when not in game play mode, the game input devices 230 may also be utilized to navigate a user interface or effect operational commands associated with the stationary bicycle 200.

Referring briefly to FIG. 7, another exercise apparatus in the form of a treadmill 300 is shown. The treadmill 300 includes a frame 302 including a base 304. A platform or deck 308 is disposed between the first and second sides of the base 304 and a

continuous or circuitous belt 310 is disposed about the deck 108. The belt 310 may also be disposed about a first roller 312 extending between the sides of the base 304 at one end of the frame 302 and a second roller (not specifically shown) extending between the sides of the base 306 at an opposing end of the frame 302. A drive, which may include an AC or a DC motor, may be coupled to one of the rollers to drive the belt 310 about the rollers and the deck 308. In one embodiment, such a drive may be housed between the two sides of the base 304 and, if desired, beneath a hood or faring 314 or other structure.

Columnar members 316, or other structural members, are coupled with the base 306 and extend upwardly from the frame 302 to a console 320. The columnar members 316 may also be structurally coupled to each other such as by one or more cross members 318 or by way of the console 320.

The console 320 may include various input and output devices. For example, one or more control buttons or function keys 322 may be used to control various aspects of operating the treadmill 300 such as on/off buttons or switches, speed control keys, incline control keys, keys for implementing workout programs or other input devices as will be appreciated by those of ordinary skill in the art. Additionally, the console 320 may include one or more displays 324 to provide a variety of information including, for example, information about the status of one or more operational characteristics of the treadmill 300 (e.g., speed, incline, programmed workout regimes, etc.) or information regarding a users workout (e.g., distance traveled, calories burned, etc.). In one embodiment, the display 324 may also be configured as a touch screen 326 acting as an input device as well as an output device.

The display 324 may also be configured to exhibit animation or video associated with an electronic game that can be played by a user of the treadmill 300 in a manner similar to that which is described above with respect to the elliptical trainer 100 and the stationary bicycle 200. To facilitate play of such a game, game input devices 330 integrated, for example, with the hand grips, supports 332 or other components of the treadmill 300, may be selectively actuated by a user of the treadmill 300 in a manner similar to the embodiments described hereinabove. Again, as noted previously, a variety of types and configurations of exercise apparatuses may be used in conjunction with the present invention and the previously described apparatuses (e.g., elliptical trainer 100,

stationary bicycle 200, and treadmill 300) are merely examples and should not be considered limiting.

It is noted that the drawings and description herein, such as in the subsequent description, may refer to and illustrate signals as a single signal for clarity of presentation and description. It will be understood by a person of ordinary skill in the art that the signal may represent a bus of signals, wherein the bus may have a variety of bit widths and the present invention may be implemented on any number of data signals including a single data signal. Furthermore, the signal may be implemented as a physical connection between to elements or a wireless connection between two elements.

Referring now to FIG. 8 in conjunction with FIGS. 1 through 7, a block diagram is shown of various hardware components associated with operating an exercise apparatus 100, 200, 300 including the interactive game play aspect associated therewith. A processor or processing element, such as a microcontroller unit (MCU) 400, is in communication with a variety of components. In one embodiment, the MCU 400 may include an 8-bit microcontroller unit having, for example, 64K flash memory and 4K random access memory (RAM) such as may be available from ZiLOG of San Jose, California. Of course other types and configurations of MCUs are contemplated and other types of processors may be utilized with the present invention.

The MCU may receive signals from the apparatus input devices 122, 222, 322 such as when a user of the exercise apparatus 100, 200, 300 actuates such input devices 122, 222, 322, for example, to select an exercise program or selectively alter the resistance of the apparatus (it is noted that, depending on the specific configuration, such an input signal could similarly be provided by actuation of a touch screen 126). The MCU 400 may then send a signal to an actuator 402 to carry out the instructions provided by the user.

For example, if an input device 122, 222, 322 sends a signal to the MCU indicating that the resistance provided by a resistance mechanism should be altered, the MCU 400 receives that signal, transmits a new signal (or, in another embodiment, relays the original signal) to an actuator associated with a resistance mechanism such that the resistance mechanism now provides the level of resistance selected by the user. The MCU 400 may also send an appropriate signal to the display 124, 224, 334 with instructions to exhibit the selected level of resistance on the display 124, 224, 334 so that

the user is apprised of the current level of resistance. Other operational parameters of the exercise apparatus 100, 200, 300 (e.g., speed, incline, etc.) may also be controlled in a similar manner.

It is noted that, as indicated by FIG. 8, multiple displays 124, 224, 324 may be used in a single exercise apparatus 100, 200, 300 so that, for example, in one embodiment, a first display may used primarily for exhibiting animation or video associated with game play, while a second display may be used for primarily exhibiting data or operational information associated with use of the exercise apparatus 100, 200, 300.

The MCU 400 may also send appropriate signals to other output devices 410 associated with the exercise apparatus such as, for example, speakers, headphone jacks or other auditory or visual indicators as will be appreciated by those of ordinary skill in the art.

One or more sensors 404 may be incorporated into the exercise apparatus 100, 200, 300 to assist in determining the operational status of the exercise apparatus 100, 200, 300 or for other desired purposes. For example, sensors 404 may be used to determine a speed (e.g., rotations per minute (RPM), miles per hour (MPH) or kilometers per hour (KPH)) associated with the operation of the apparatus, to determine a level of incline, to determine a level of resistance, or to determine other operational parameters associated with the exercise apparatus 100, 200, 300. The sensors 404 provide a signal to the MCU 400 so that the MCU knows whether the actual operational parameters of the exercise apparatus 100, 200, 300 match those that have been selected by a user based on the user's selective actuation of input devices 122, 222, 322 or by way of user selected exercise programs. The sensors 404 may also include sensors that monitor, for example, the heart rate of the person using the exercise apparatus 100, 200, 300. Such information may be communicated to the MCU 400 and used in accordance with desired exercise programs as will be appreciated by those of ordinary skill in the art.

Game input devices 122, 222, 322 are also in communication with the MCU and provide signals to the MCU 400 when actuated by a user in an effort to control game play being implemented by the MCU 400 and exhibited as video or animation on the display 124, 224, 324. In one embodiment, a program for the game may be stored on internal memory, such as on the flash memory of the MCU 400 for example, or it may be stored on a removable media 406 such, for example, a removable flash drive.

In one embodiment of the present invention, the various components shown and described with respect to FIG. 8 are integrated into the exercise apparatus 100, 200, 300. For example, as already described, the display 124, 224, 324 and apparatus input devices 122, 222, 322 (including the touch screen 126, 226, 326, if provided) may be formed as a part of the console 120, 220, 320. The game input devices 130, 230, 330 may be integrated into handle bars, 118, 218 or other components of the exercise apparatus 100, 200, 300. The sensors 404 and actuators 402 are integrated into the exercise apparatus 100, 200, 300 for operational control thereof as has been described herein and as will be appreciated by those of ordinary skill in the art. The MCU 400 or other processor may be located within an internal space defined by the console 120, 220, 320 or within some other housing associated with exercise device 100, 200, 300. Additionally, the console 120, 220, 320 (or some other structure) may house an appropriately configured socket or other connection to facilitate communication between removable media 406 and the MCU 400.

Such a configuration provides a variety of novel features including, for example, integrating the control of an electronic game with the control of the exercise apparatus. In other words, the same primary processor (e.g., the MCU 400) controls the operation of the exercise apparatus 100, 200, 300 (such as carrying on/off, speed, resistance, incline and exercise program commands) while also controlling the game play which is exhibited on the display 124, 224, 324 and altered or controlled in some manner by the game input devices 130, 230, 330. This enables the game play and the operation of the exercise apparatus to become interactive and integrated as will be discussed in further detail below. Thus, the exercise apparatus and game system may be physically, electronically and functionally integrated with each other.

Additionally, such physical integration of the various components described with respect to FIG. 8 eliminates the various external components of a gaming system in configurations where individuals have tried to use, for example, their Playstation® or similar gaming system while simultaneously using an exercise apparatus. In other words, the independent gaming consoles, independent displays, independent hand held controllers and the wires that extend between such components are all eliminated. The elimination of these independent, external components also provides a safer exercise environment since the display 124, 224, 324, the game input devices 130, 230, 330 and the game controller

(e.g., the MCU 400) are all fixed to the exercise apparatus 100, 200, 300 in some way so that they are not loose and won't fall and get caught in the movements of the apparatus or the movements of the individual using the apparatus.

Referring briefly to FIG. 9, a block diagram is shown of various hardware components associated with operation of an exercise apparatus 100, 200, 300 in accordance with another embodiment of the present invention. As previously discussed, an MCU 400 or other processor may in communication with a variety of components such as exercise apparatus input devices 122, 222, 322 (which may include one or more touch screens 126, 226, 326), game input devices 130, 230, 330, actuators 402, sensors 404 and external media 406. However, FIG. 9 illustrates that, while the MCU 400 or other processor or processing element may be used as a primary processor to control, for example, operation of the exercise apparatus 100, 200, 300 as well implement game play, additional secondary processors may also be integrated into the system. For example, a video processor 408 may be in communication with MCU 400 as well as the display (or displays) 124, 224, 324. Such a configuration may enable, for example, the use of higher resolution displays or multiple displays without overtaxing the resources of the primary processor (e.g., the MCU 400).

FIG. 10 illustrates a software system diagram illustrating possible software modules that may be used in carrying out software processes according to an embodiment of the present invention. The software may be carried out as computer executable instructions operating on the MCU 400 (see FIGS. 8 and 9) or other processor. Unless specified otherwise, the order in which the processes are described is not intended to be construed as a limitation. Furthermore, the processes may be implemented in any suitable hardware, software, firmware, or combinations thereof. By way of example, instructions for executing the software processes may be stored on a storage device (not shown) and transferred to memory or the processor (e.g., the MCU 400, see FIGS. 8 and 9), or may be stored as firmware in a volatile or non-volatile fashion in memory on the MCU 400 or other processor.

When executed as firmware or software, the instructions for performing the processes may be stored on a computer readable medium. A computer readable medium includes, but is not limited to, magnetic and optical storage devices such as disk drives,

magnetic tape, CDs (compact disks), DVDs (digital versatile discs or digital video discs), and semiconductor elements such as RAM, DRAM, ROM, EPROM, and Flash memory.

The software system diagram of FIG. 10 illustrates a system control module 412, an apparatus control module 414, and a game control module 416. The software system may also include an apparatus input sensors monitor 418, and apparatus actuators control module 420, a game input sensors monitor 422, a touch screen monitor 424, and a display controller 426. These modules may be referred to collectively herein as monitor and control operations.

Generally, the apparatus input monitor 418 performs operations based on input from apparatus input sensors. These operations may be functions, such as, for example, checking status and operational parameters of motors, linkages, actuators, and resistance mechanisms. Information from the input sensors may be collected, formatted, or stored, for further operation by the system control module 412 or apparatus control monitors 420.

Apparatus input may also include input from input devices (e.g., control buttons, switches, function keys and the like) for operation by the user. Furthermore, this user input may be for controlling operation of the exercise apparatus or for control of game operation. User input may also come from the touch screen monitor 424 in the form of game controls or exercise apparatus controls. Thus the user input may be a combination of dedicated control buttons and switches, reconfigurable control buttons and switches, and reconfigurable input from the touch screen monitor.

Generally, the apparatus actuator control module 420 may perform function to control operation of various elements, such as, for example, motors, linkages, actuators, and resistance mechanisms.

The apparatus control module 414 may receive information about the operation of the exercise apparatus and control function of the exercise apparatus through the apparatus actuator control modules 420. Similarly, the game control module 416 may receive information about the operation of the game, control function of the game, and control feedback from the game to the user via the display control 426 and auditory control.

By way of example, a module for controlling resistance to movement on an elliptical trainer or stationary bicycle may adjust the resistance based on parameters collected by the apparatus input monitors 418, the game input sensors 422, the touch

screen monitor 424, or the result from processing and decision making in the system control module 412, the apparatus control module 414, or game control module 416.

By way of a more detailed example, the apparatus input sensors may determine that a stationary bicycle is operating at a specific revolutions-per-minute. The console may indicate that the user wishes to increase the resistance to pedaling. The game input sensors 422, touch screen monitor 424, or combinations thereof, may indicate that the user is performing exceptionally well at the current game in operation. With some or all of this collected information, the game control module 416 may set flags, or generate information indicating that the exercise apparatus should be made less strenuous to operate as a reward for exceptional game operation.

In another embodiment, with some or all of this collected information, the apparatus control module 414 may set flags, or generate information indicating that the exercise apparatus should be made more strenuous due to input from the user indicating a desired increase in resistance to pedaling.

In yet another embodiment, with some or all of the above listed information being collected, the apparatus control module 414 may set flags, or generate information indicating that the game play should be made less difficult as a reward for exceptional exercise performance.

With the flags, information generated, or combinations thereof, the system control module 412 may determine that changes should be made to the function of the exercise apparatus, the function of the game, or combinations thereof. To carry out these changes, the system control module 412 may then set flags or generate information for the display controller 426, the apparatus actuator control modules 420, or combinations thereof.

Those of ordinary skill in the art will recognize that there are many ways to implement the system control, the apparatus control and the game control. For example, the system control could be implemented as a global loop that performs defined operations each time through the loop. The global loop could be free running wherein processing continues to occur regardless of timing. In another embodiment, the global loop could be based on a timer wherein the global loop executes once based on an event from a timer. At the end of processing, the global loop waits for the next timing event to process the operations in the global loop again.

In one embodiment, the monitor and control operations may be performed at a specific time or location within the global loop. In another embodiment, the monitor and control operations may be configured to execute based on an event. For example, the game input monitors may operate any time an interrupt event is received from an input sensor.

Furthermore, many operations, such as, for example, changes to the display, may exist partly in the game control, partly in the system control, and partly in the apparatus control. As another example, changes to resistance of a stationary bicycle may be performed partly by the apparatus control and partly by the system control.

Referring generally to the drawings, and as previously noted, the exercise functions of the exercise apparatus and the gaming functions may be implemented using a single primary processor (e.g., the MCU 400) within the console 120, 220, 320 of the exercise apparatus 100, 200, 300. In other words, the exercise apparatus 100, 200, 300 may include a processor (e.g., MCU 420) integrated within the console 120, 220, 320, wherein the processor is configured to control one or more operational parameters of the exercise apparatus 100, 200, 300 (e.g., resistance, speed or incline) while also controlling the game being played.

According to some embodiments of the invention, the gaming functions of an exercise apparatus 100, 200, 300 may be operational during such time that the exercise apparatus 100, 200, 300 is being operated by a user. For example, in one embodiment, a game may only be operational while a user is actively exercising by use of the exercise apparatus 100, 200, 300. Upon the cessation of use of the exercise apparatus 100, 200, 300 for exercise, a game may be paused, for example, by control functions programmed in the processor. In one embodiment a paused game may be resumed by the resumption of exercise using the exercise apparatus. In some particular embodiments, a user of the exercise apparatus 100, 200, 300 may be presented with an option to save the game at the paused point so that the user may return to the game at a later date or after a break in exercise. In other embodiments, a paused game may be automatically erased or reset after a pre-determined or programmed period of time. For instance, if a user terminates the use of the exercise apparatus 100, 200, 300, a game being played may be paused and may remain in a paused state until exercise is resumed, until a set period of time is reached

wherein the game may automatically shut-down, or until a user saves the game for later play.

In other embodiments of the invention, the termination of use of the exercise apparatus 100, 200, 300 for exercise may pause a game being played and shut down the display or result in the display reverting only to the display of exercise functions.

In one embodiment, and as already discussed hereinabove, the play of the game may be affected by the performance of a person using the exercise equipment. For example, while simultaneously playing a game and using the exercise apparatus, the user may be able to increase the speed of the exercise apparatus 100, 200, 300 (e.g., the rotations per minute (RPMs)) in order to effect the dynamics of the game being played. In a more specific example, upon increase of the RPMs of a stationary bike, the block configurations of a TETRIS style game may begin to drop at a slower pace providing a user with more time to make a decision as to how the falling block should be oriented and where it should be placed.

In another embodiment, the level of resistance, the level of incline or some other operational parameter of the exercise apparatus 100, 200, 300 may be used to effect the dynamics of the game being played, making it generally easier or harder depending on the operational parameter of the exercise apparatus 100, 200, 300 selected by the user.

In yet another embodiment, as also discussed hereinabove, operational parameters of the exercise apparatus 100, 200, 300 may be affected by how well a user does in game play. For example, if a person does exceptionally well in a particular game, some operational parameter of the exercise apparatus 100, 200, 300, such as the level of resistance, the speed of operation, or the level of incline may be adjusted as a reward to the user of the equipment for the exceptional game play.

In other embodiments, a game being played on the exercise apparatus may not be tied into the functions of the exercise apparatus 100, 200, 300. In other words, the speed, level, resistance, motion, or other operation of the exercise apparatus 100, 200, 300 may have no effect on the characteristics, function, or quality of a game being played.

Such integration of the operational features of the exercise apparatus 100, 200, 300 with the dynamics of a game may provide added motivation for a user to exercise more energetically and enthusiastically as they try to obtain personal best scores or compete with another user's personal best scores. Moreover, the integration of a game in the

console of an exercise apparatus provides a diversion that becomes difficult to "tune out" while exercising because it requires the user to focus their mind on a task other than the physical activities of exercising.

Integration of a gaming system with an exercise machine according to various embodiments of the present invention may reduce the cost of manufacture of exercise gaming equipment because the gaming capabilities may be integrated with an existing console of an exercise apparatus. The integration of game input devices with an exercise apparatus may also be advantageous in that additional accessories are not required to play games associated with the exercise apparatus.

For example, game controllers, external monitors or displays, and external control units may not be necessary. Furthermore, the integration of the gaming console and/or the game input devices or controllers with an exercise apparatus may reduce or eliminate the need for additional connection wires or cords required to operate a gaming console while exercising as previously discussed. The reduction in amount of or elimination of such wires and cords may promote a safer exercise environment. Furthermore, the compact nature of a gaming console integrated with an exercise apparatus may make the exercise apparatus more marketable because users will not need to buy additional equipment or accessories to perform gaming functions while operating an exercise apparatus.

While the invention may be susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and have been described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention includes all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the following appended claims.

CLAIMS

What is claimed is:

1. An exercise apparatus, comprising:

a frame;

structure associated with the frame that is moveable relative to the frame in a predefined pattern;

a console;

at least one display associated with the console;

a primary processor configured to both control at least one operational parameter of the exercise apparatus and to conduct an interactive game using the at least one display.

2. The exercise apparatus of claim 1, further comprising at least a first input device in communication with the primary processor, the at least a first input device being operable by a user to selectively provide instructions to the primary processor regarding the at least one operational parameter of the exercise apparatus.

3. The exercise apparatus of claim 2, wherein the at least one operational parameter of the exercise apparatus includes at least one of speed, incline and resistance.

4. The exercise apparatus of claim 2, further comprising at least a second input device in communication with the primary processor, the at least a second input device being operable by a user to selectively provide instructions to the primary processor regarding manipulation of at least one aspect of the interactive game.

5. The exercise apparatus of claim 1, further comprising at least one sensor in communication with the primary processor configured to determine a current state of the at least one operational parameter of the exercise apparatus.

6. The exercise apparatus of claim 5, wherein the primary processor is configured to alter at least one aspect of the interactive game based on information received from the at least one sensor.

7. The exercise apparatus of claim 1, wherein the primary processor is configured to control the at least one operational parameter, at least in part, based on at least one aspect of the interactive game.

8. The exercise apparatus of claim 1, further comprising at least one actuator in communication with the primary processor, wherein the primary processor controls the at least one operational parameter of the exercise apparatus by providing information to the at least one actuator.

9. The exercise apparatus of claim 1, wherein the primary processor and the at least one display are cooperatively configured to selectively display the interactive game and information regarding the at least one operational parameter of the exercise apparatus.

10. The exercise apparatus of claim 1, wherein the at least one display is configured as a touch screen.

11. The exercise apparatus of claim 1, wherein the at least one display includes at least a first display cooperatively configured with the primary processor to display at least a second display cooperatively configured with the primary processor to display information related to the at least one operational parameter and the interactive game.

12. The exercise apparatus of claim 1, wherein the primary processor is configured as a microcontroller.

13. The exercise apparatus of claim 1, wherein the primary processor is configured to communicate with at least one removable media device.

14. The exercise apparatus of claim 1, further comprising a second processor in communication with the primary processor.

15. The exercise apparatus of claim 14, wherein the second processor is also in communication with the at least one display and wherein the second processor is configured as a video processor.

16. The exercise apparatus of claim 1, wherein the structure associated with the frame and moveable relative to the frame in a predefined pattern further includes at least one rotational mechanism and a pair of cranks coupled therewith.

17. The exercise apparatus of claim 16, further comprising a pair of pedals, each pedal being coupled with an associated one of the pair of cranks.

18. The exercise apparatus of claim 16, further comprising a pair of foot rails, each foot rails being pivotally coupled an associated one of the pair of cranks.

19. The exercise apparatus of claim 1, wherein the structure associated with the frame and moveable relative to the frame in a predefined pattern further includes at least one circuitous belt.

20. The exercise apparatus of claim 1, wherein the structure associated with the frame and moveable relative to the frame in a predefined pattern further includes a pair of movable handle bars.

21. The exercise apparatus of claim 20, further comprising at least one input device in communication with the primary processor, the at least one input device being operable by a user to selectively provide instructions to the primary processor regarding manipulation of at least one aspect of the interactive game, the at least one input device being physically associated with at least one of the pair of movable handle bars.

22. An exercise apparatus, comprising:

a frame;

structure associated with the frame that is moveable relative to the frame in a predefined pattern;

a console;

at least one display associated with the console;

a single processor configured to both control at least one operational parameter of the exercise apparatus and to conduct an interactive game using the at least one display.

23. The exercise apparatus of claim 22, wherein the single processor and the at least one display are cooperatively configured to selectively display information regarding the at least one operational parameter of the exercise apparatus and the interactive game.

24. The exercise apparatus of claim 22, wherein the at least one display includes at a first display and a second display and wherein the single processor and the first display are cooperatively configured to exhibit the interactive game on the first display and wherein the single processor and the second display are cooperatively configured to display information regarding the at least one operational parameter of the exercise apparatus.

25. An exercise apparatus, comprising:

a frame;

structure associated with the frame that is moveable relative to the frame in a predefined pattern;

a console;

at least one display associated with the console;

a single primary processor configured to both control at least one operational parameter of the exercise apparatus and to conduct an interactive game using the at least one display.

26. The exercise apparatus of claim 25, further comprising at least one secondary processor in communication with the single primary processor.

27. The exercise apparatus of claim 26, wherein the at least one secondary processor includes a video processor in communication with the at least one display.

28. An exercise apparatus comprising

a frame;

structure associated with the frame that is moveable relative to the frame in a predefined pattern;

a console;

at least one display associated with the console;

at least one processor in communication with the at least one display;

at least one sensor in communication with the at least one processor and configured to determine an aspect of at least one operational parameter of the exercise apparatus and provide an input signal to the at least one processor representative of the aspect of the at least one operational parameter; and

at least one game input device selectively actuatable by a user of the exercise apparatus, wherein the at least one game input device is in communication with the at least one processor and configured to provide an input signal to the at least one processor when actuated by a user, and wherein the at least one processor is configured to conduct an interactive game using the at least one display based at least in part on the input signal from the at least one sensor and at least in part on the input signal from the at least one game input device.

29. The exercise apparatus of claim 28, wherein the at least one processor is further configured to control the at least one operational parameter of the exercise apparatus.

30. A method of operating an exercise apparatus, the method comprising:

determining an aspect of at least one operational parameter of the at least one exercise apparatus;

providing a signal to a processor representative of the aspect of the at least one operational parameter;

selectively actuating at least one input device;

providing a signal to the processor representative of the actuation of the at least one input device; and

conducting an interactive game on at least one display of the exercise apparatus based in part on the signal representative of the aspect of the at least one operational parameter and based in part on the signal representative of the actuation of the at least one input device.

31. The method according to claim 30, wherein the aspect of at least one operational parameter includes a current speed of operation of a cyclical mechanism of the exercise apparatus.

32. The method according to claim 30, further comprising selectively displaying information regarding the aspect of the at least one operational parameter and the interactive game on the at least one display of the exercise apparatus.

33. The method according to claim 30, further comprising configuring at the exercise apparatus as at least one of an elliptical trainer, a stationary bike and a treadmill.

34. A console for an exercise apparatus comprising:

at least one function key configured to control an operational feature of an exercise apparatus;

at least one display; and

at least one processor in communication with the at least one function key and the at least one display, wherein the at least one processor is configured to conduct an interactive game using the at least one display.

35. An exercise apparatus comprising:

a frame;

structure associated with the frame that is moveable relative to the frame in a predefined pattern;

a console;

at least one input device configured to control an operational feature of an exercise apparatus;

at least one display associated with the console; and

at least one processor associated with the console, the at least one processor being in communication with the at least one input device and the at least one display, wherein the at least one processor is configured to conduct an interactive game using the at least one display.

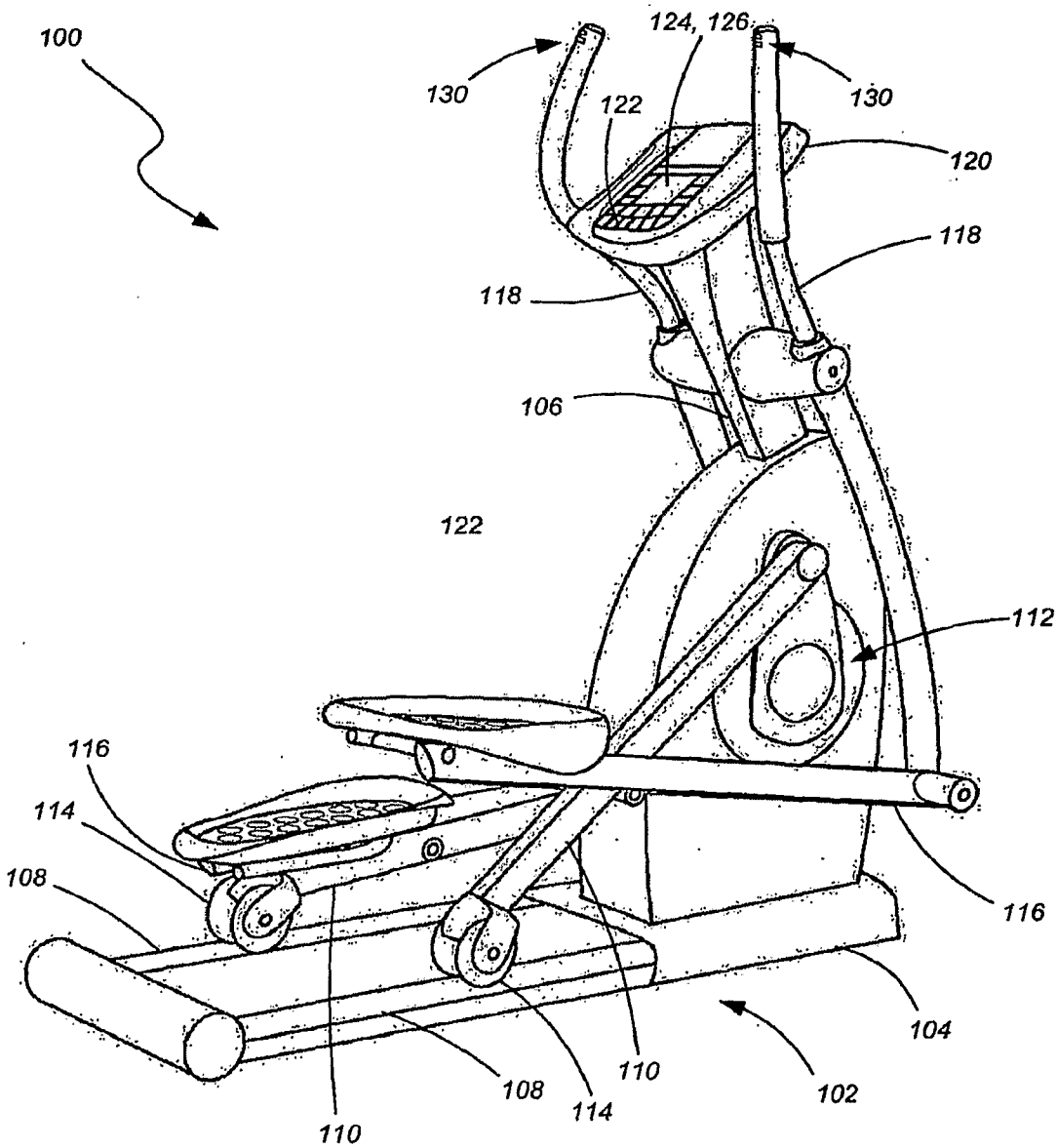

100
124, 126
130
130
122
120
118
118
106
122
112
116
114
108
116
104
102
110
108
114
110

FIG. 1

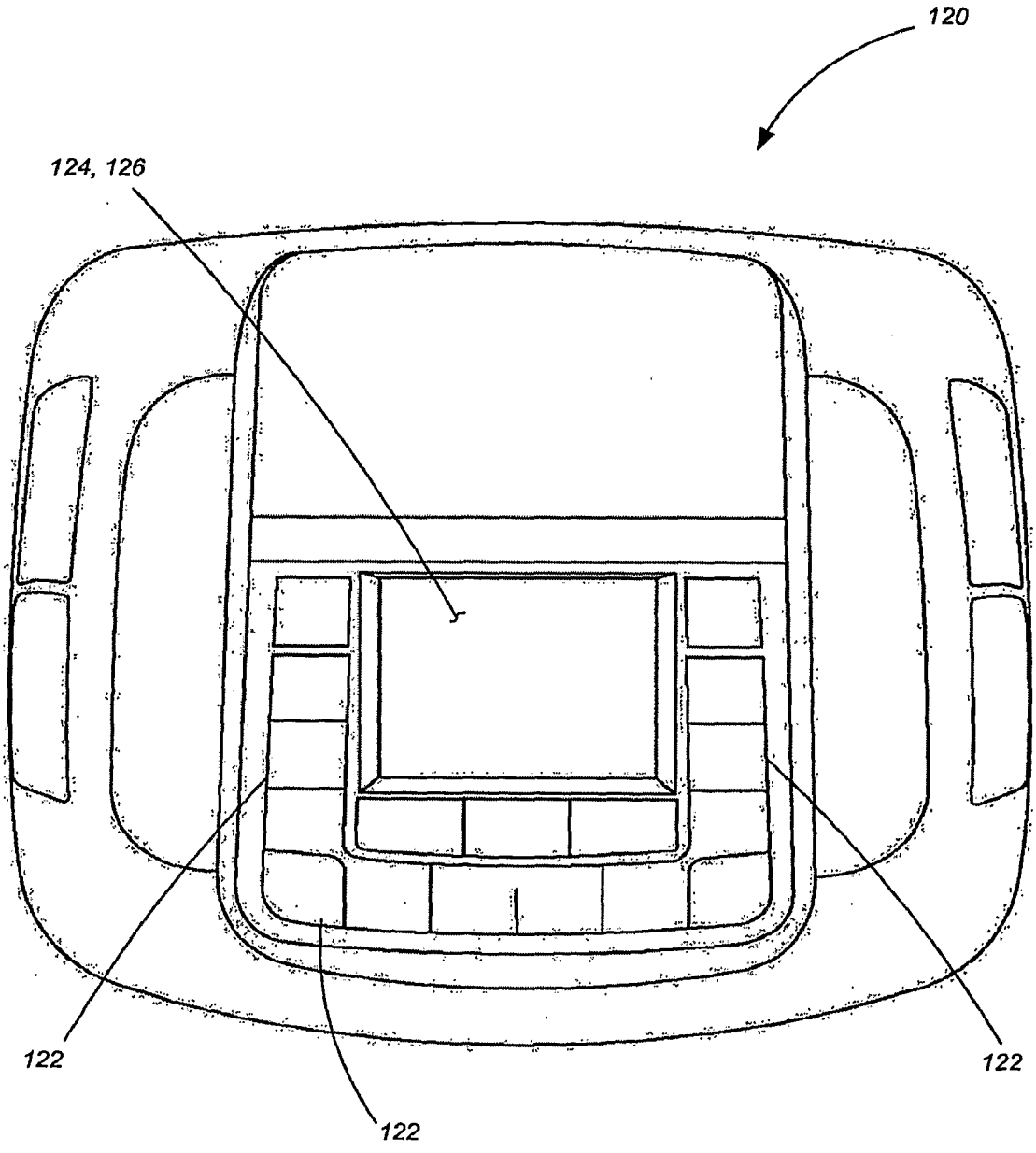


FIG. 2

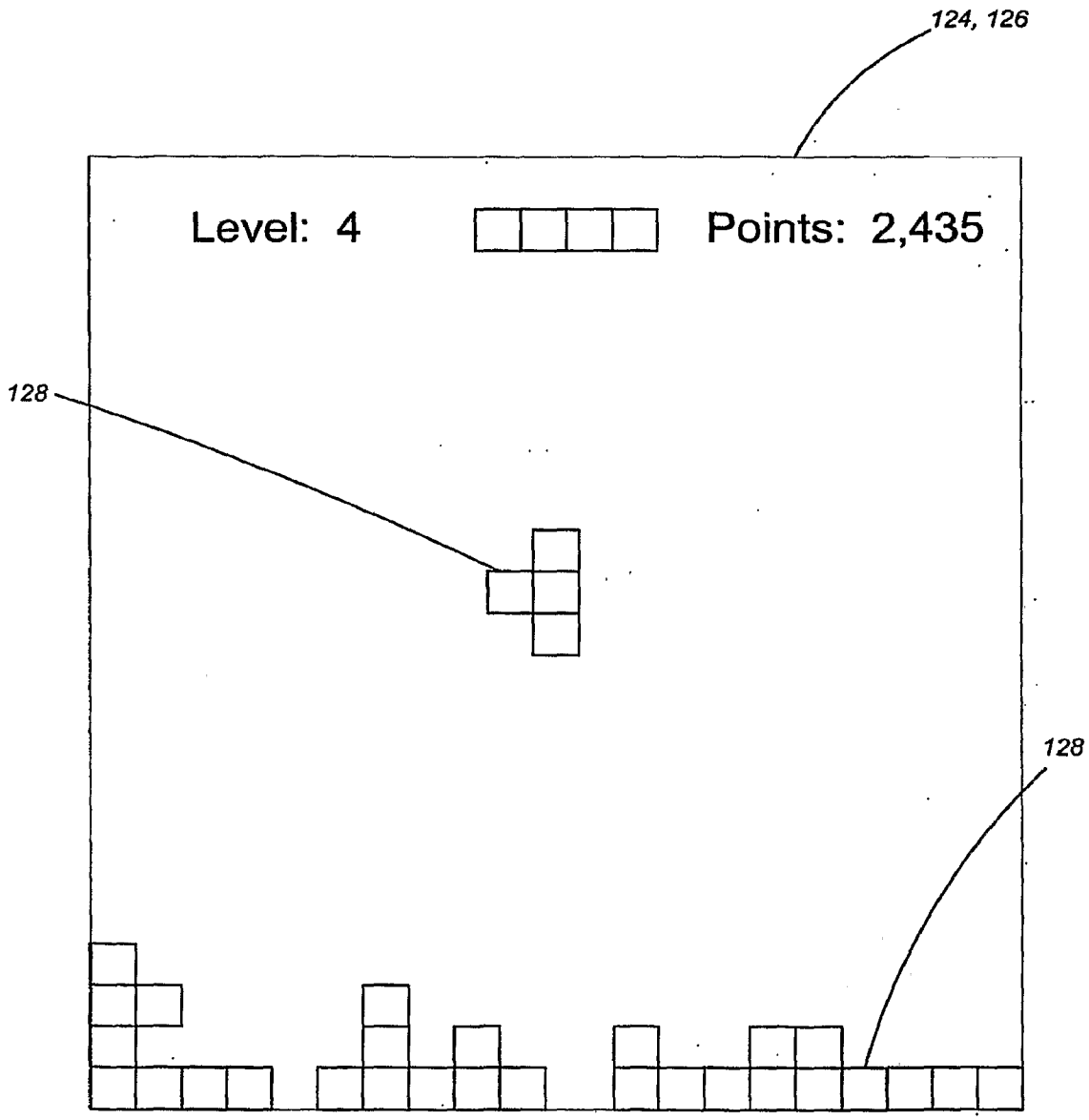


FIG. 3A

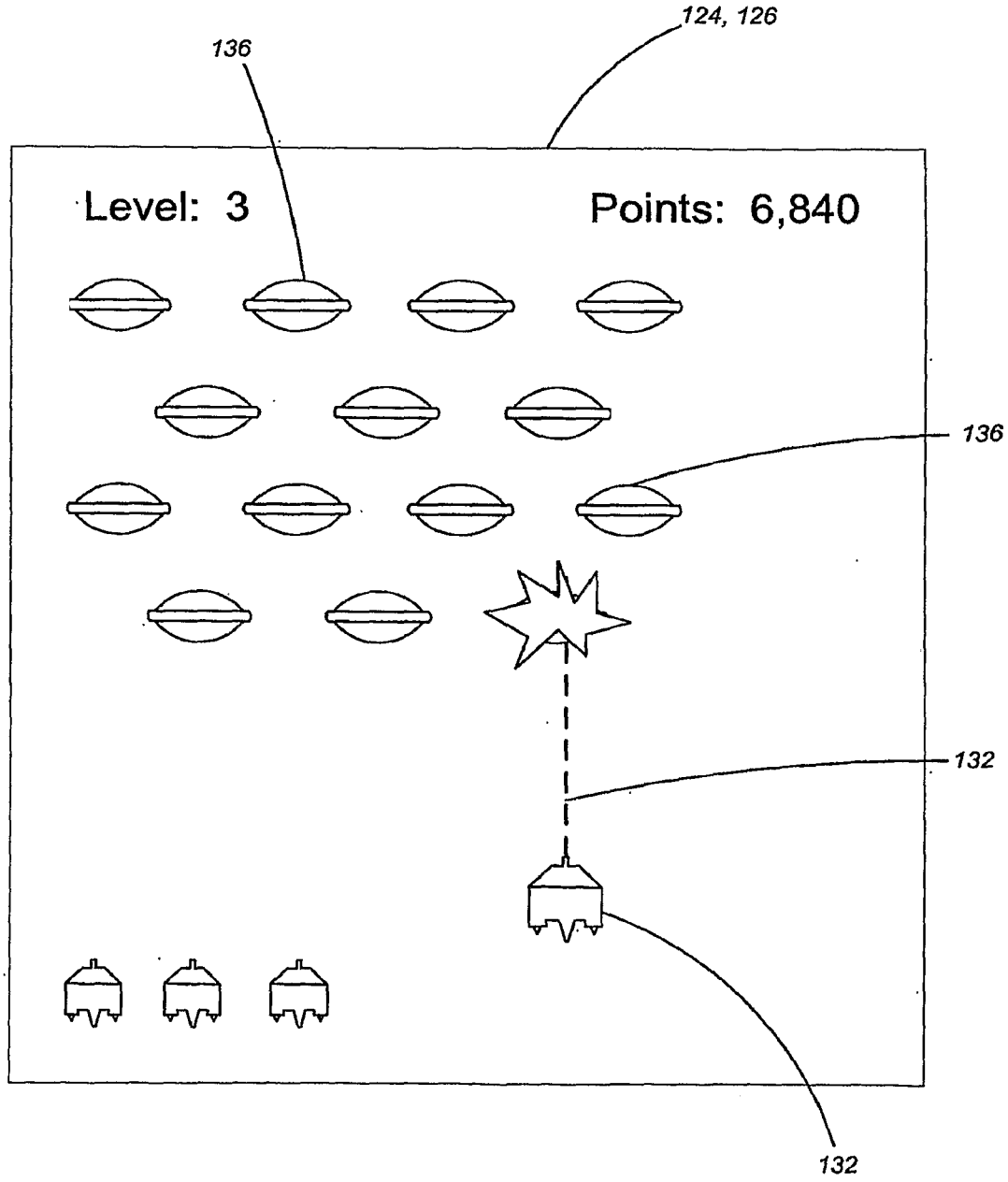


FIG. 3B

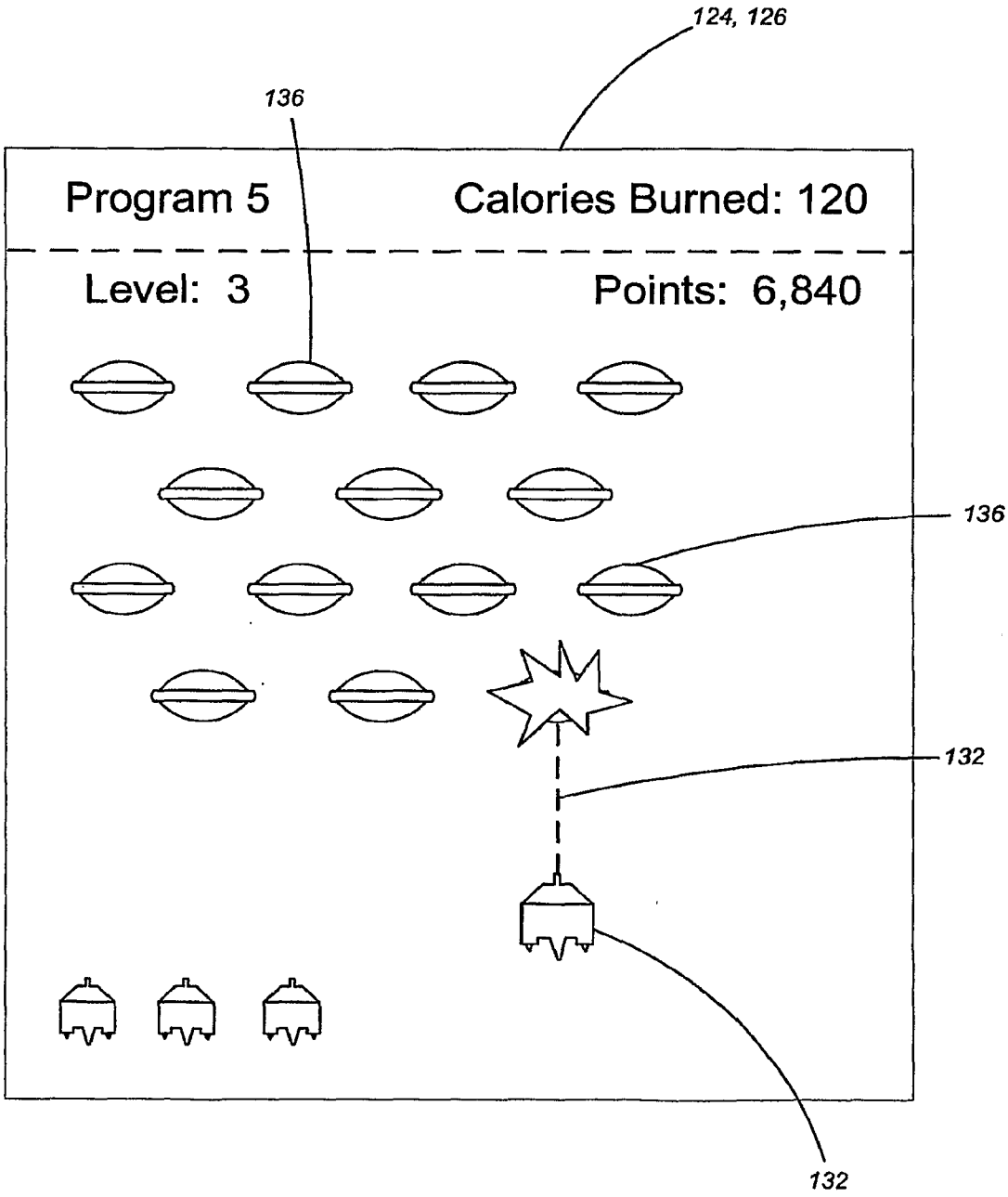

124, 126
136
Program 5
Calories Burned: 120
Level: 3
Points: 6,840
136
132
132

FIG. 3C

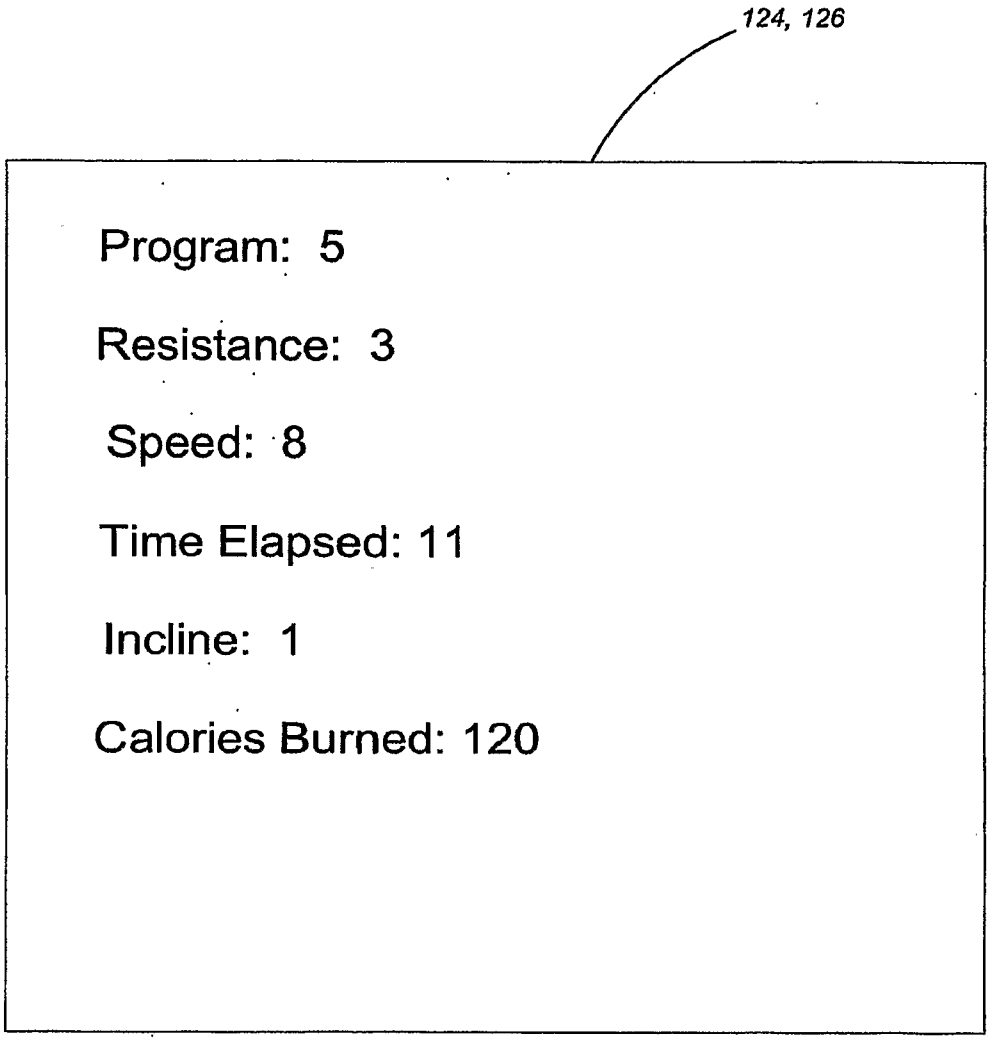

124, 126
Program: 5
Resistance: 3
Speed: 8
Time Elapsed: 11
Incline: 1
Calories Burned: 120

FIG. 3D

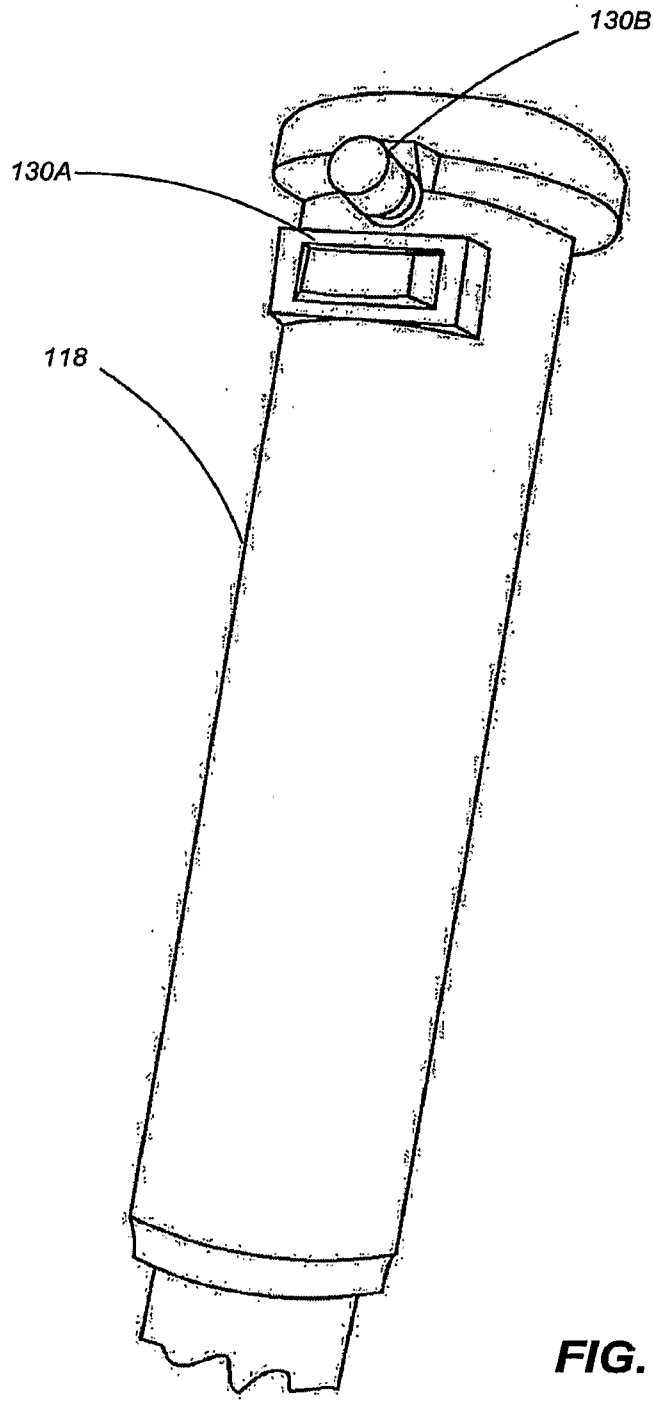


FIG. 4

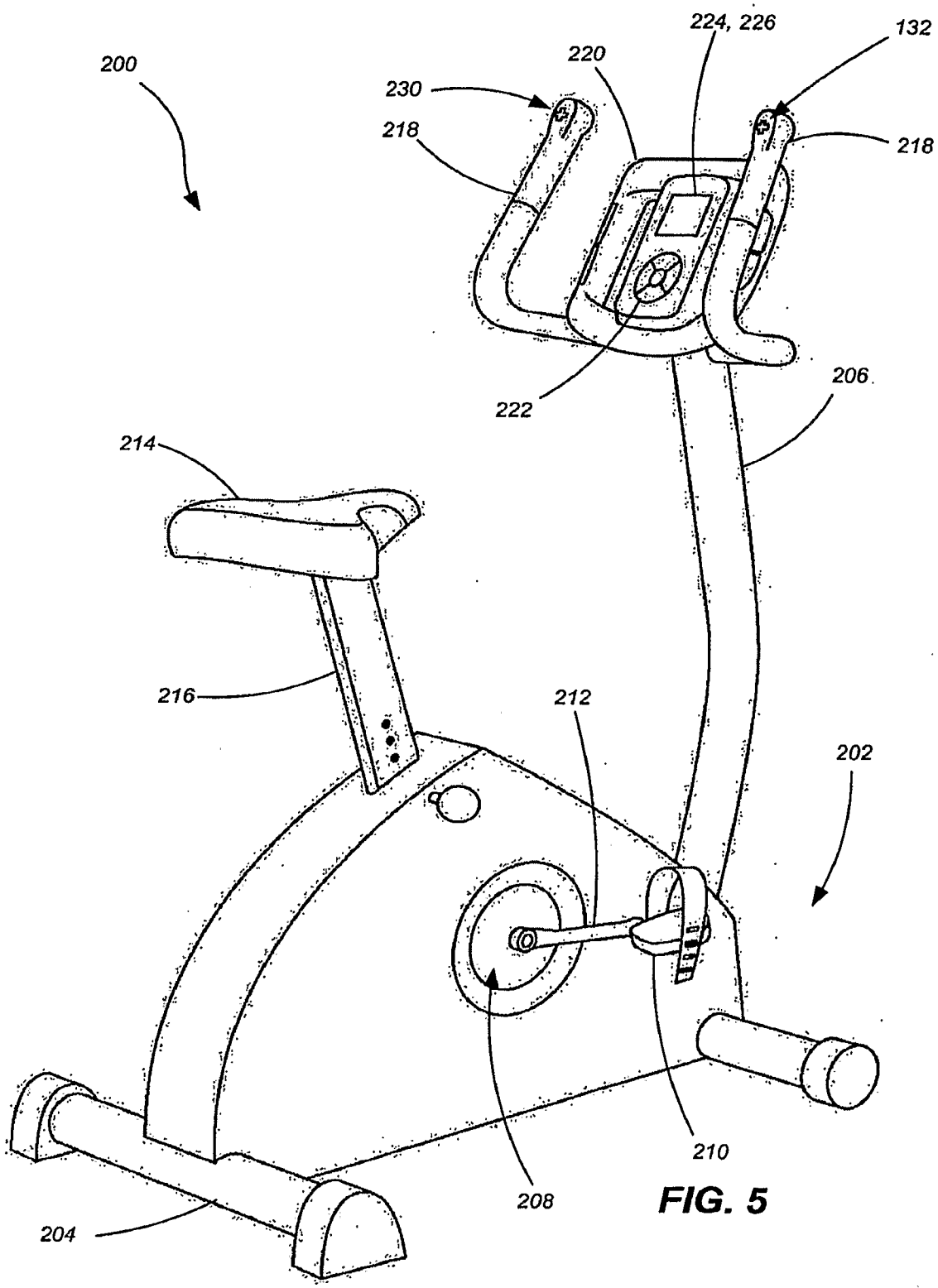

200
230
218
220
224, 226
132
218
222
206
214
216
212
202
210
208
204

FIG. 5

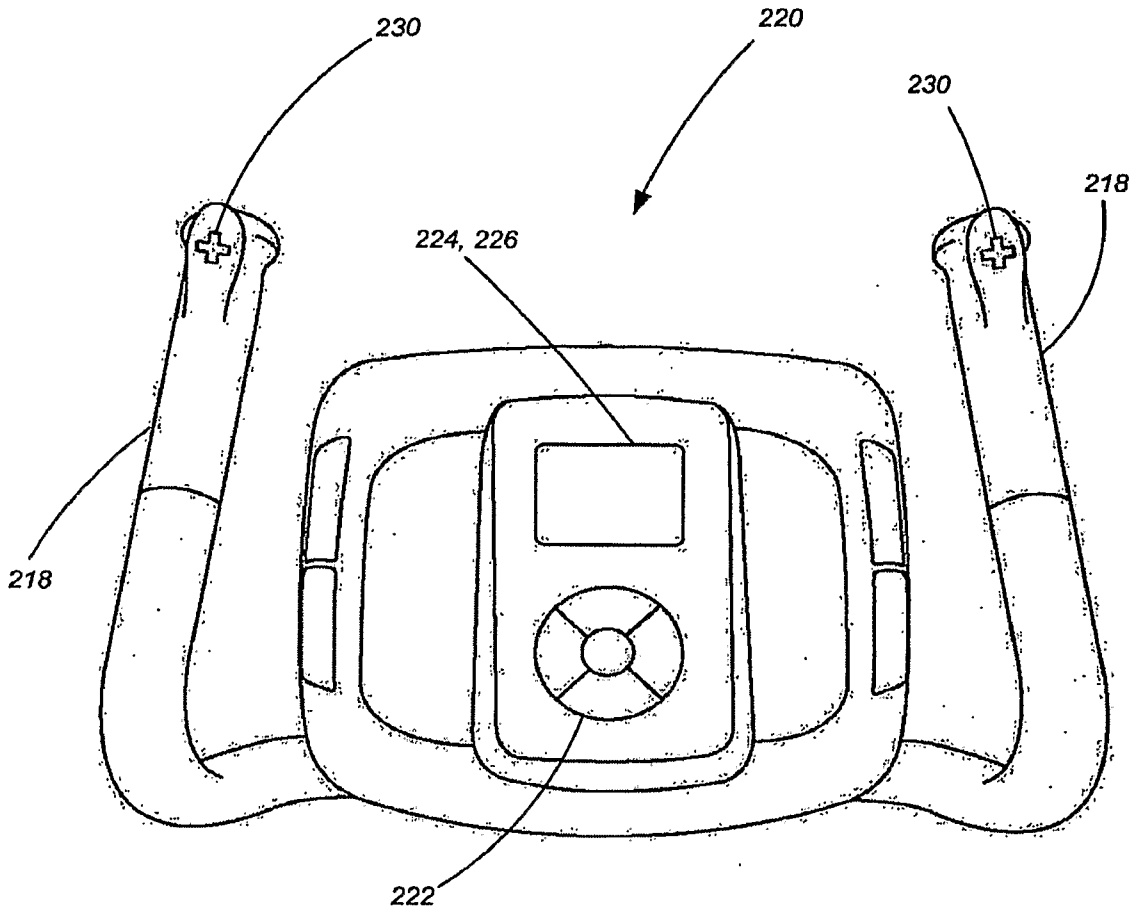
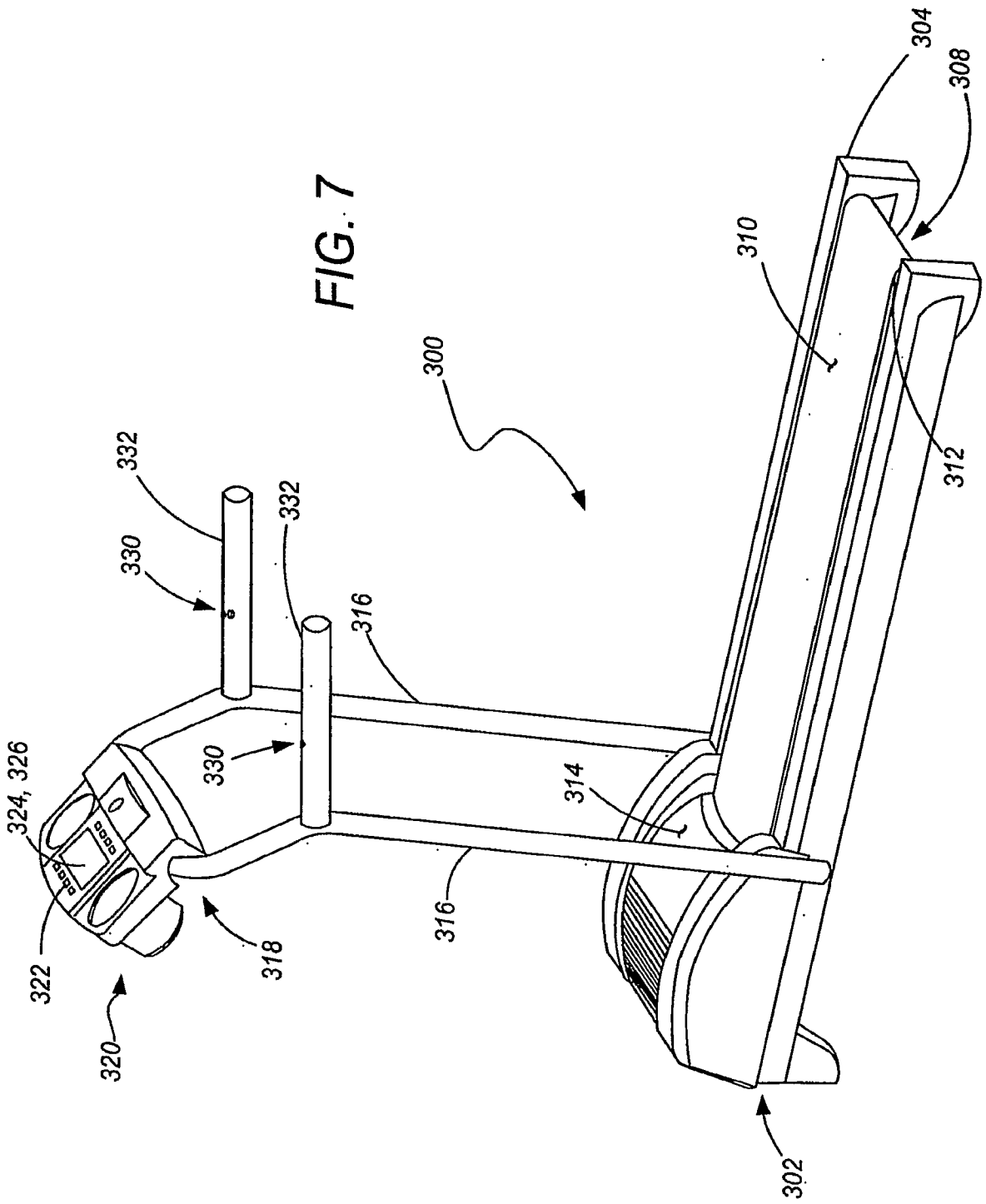


FIG. 6

FIG. 7


304
308
310
312
300
332
332
330
316
330
324, 326
314
322
318
316
320
302

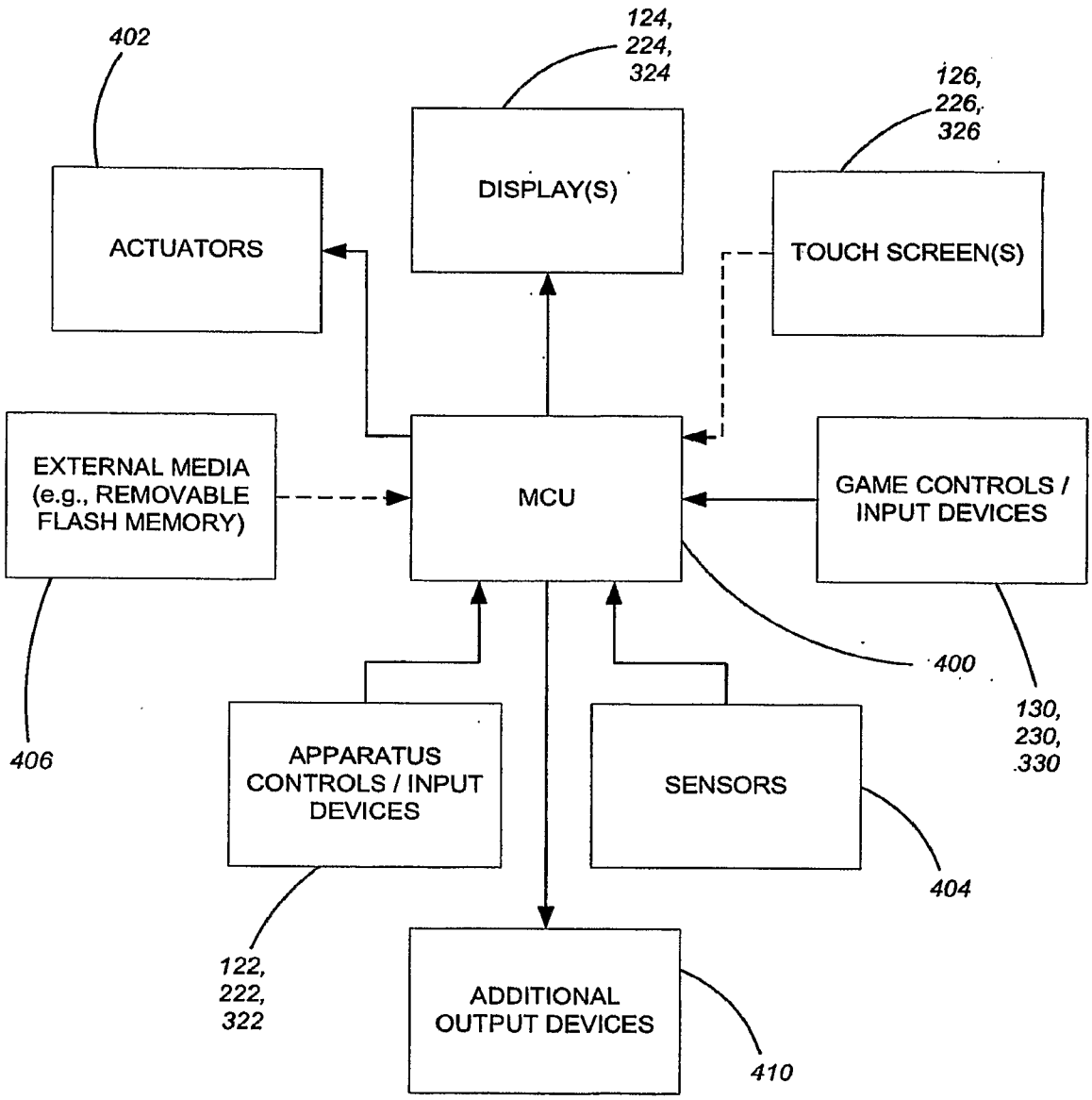

402
124,
224,
324
126,
226,
326
ACTUATORS
DISPLAY(S)
TOUCH SCREEN(S)
EXTERNAL MEDIA
(e.g., REMOVABLE
FLASH MEMORY)
MCU
GAME CONTROLS /
INPUT DEVICES
406
400
130,
230,
330
APPARATUS
CONTROLS / INPUT
DEVICES
SENSORS
404
122,
222,
322
ADDITIONAL
OUTPUT DEVICES
410

FIG. 8

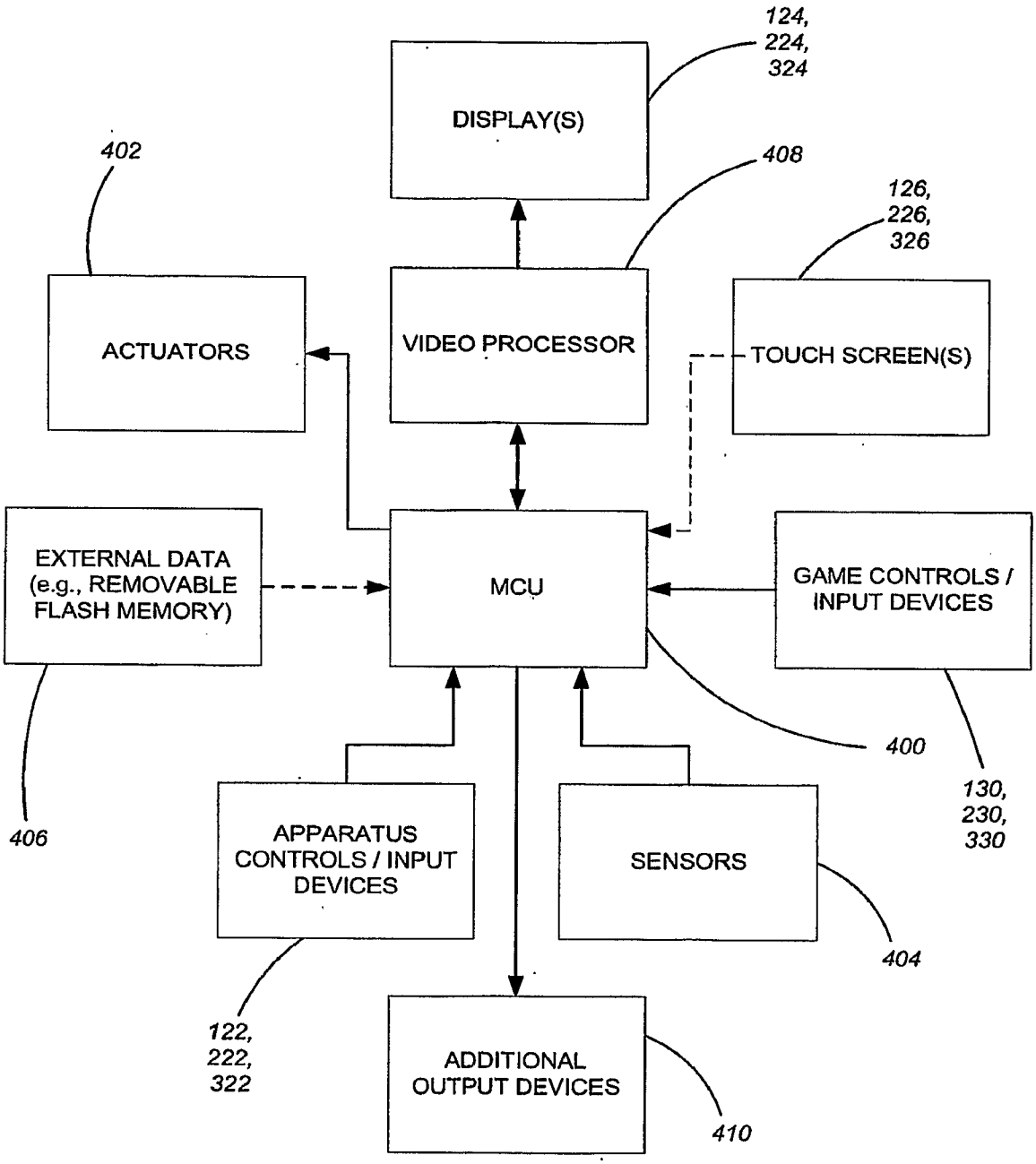

DISPLAY(S)
124, 224, 324
402
408
126, 226, 326
ACTUATORS
VIDEO PROCESSOR
TOUCH SCREEN(S)
EXTERNAL DATA (e.g., REMOVABLE FLASH MEMORY)
MCU
GAME CONTROLS / INPUT DEVICES
406
400
130, 230, 330
APPARATUS CONTROLS / INPUT DEVICES
SENSORS
404
122, 222, 322
ADDITIONAL OUTPUT DEVICES
410

FIG. 9

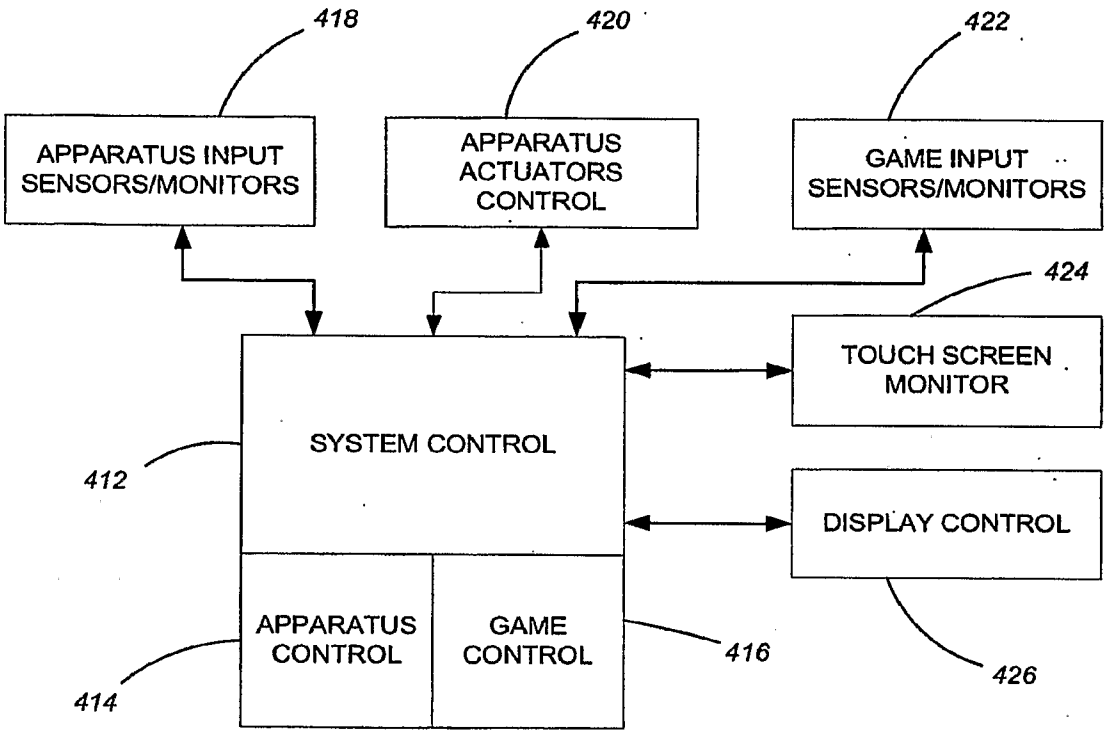

418
420
422
APPARATUS INPUT SENSORS/MONITORS
APPARATUS ACTUATORS CONTROL
GAME INPUT SENSORS/MONITORS
424
TOUCH SCREEN MONITOR
SYSTEM CONTROL
412
DISPLAY CONTROL
APPARATUS CONTROL
GAME CONTROL
416
414
426

FIG. 10