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(54) **EXERCISE SIMULATOR AND METHOD FOR ENCOURAGING EXERCISE**

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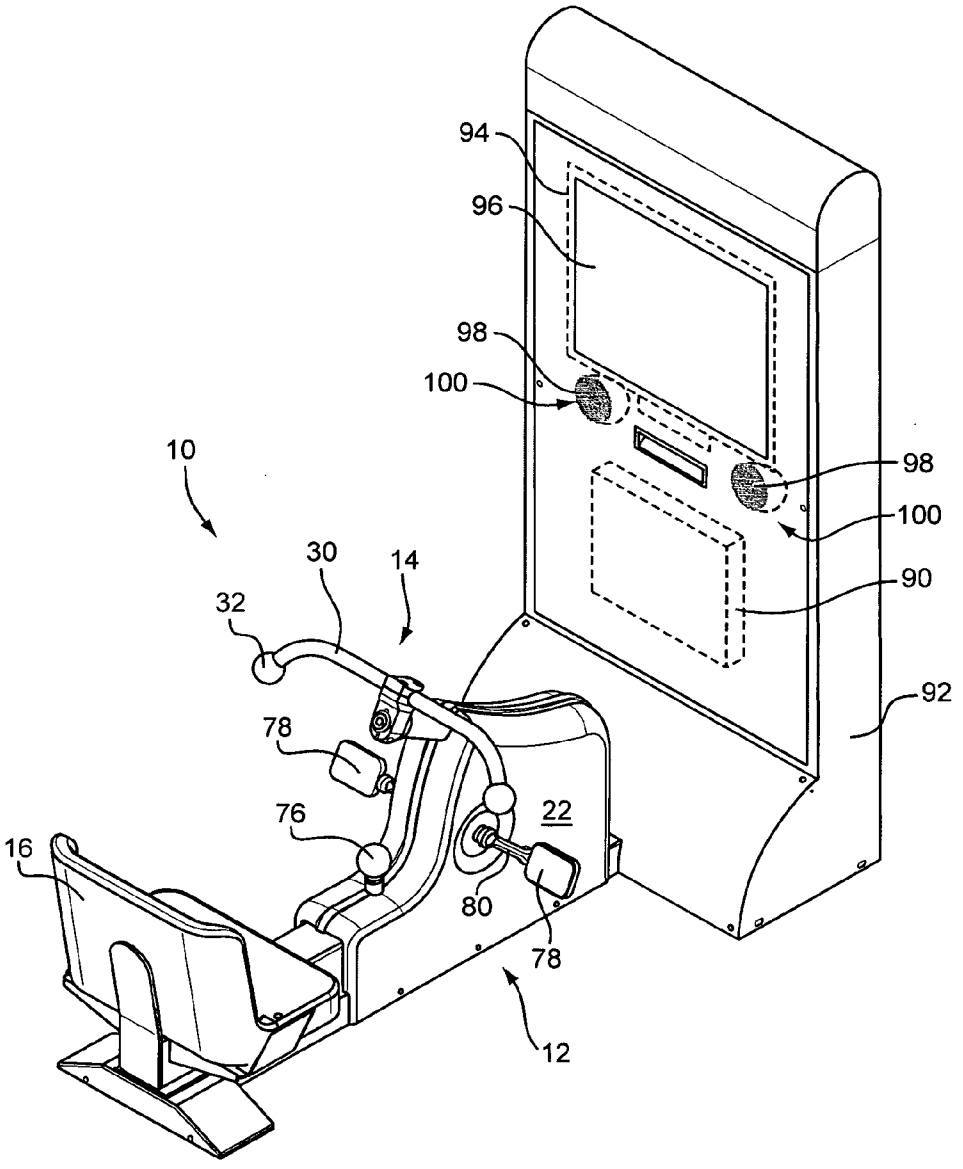
(57) **ABSTRACT**

An exercise simulator and a method of encouraging exercise are disclosed. The exercise simulator has a steering component including a user-movable element and a steering sensor. The sensor outputs a sensor signal indicative of the amount of movement of the user-movable element to provide steering input to a computer. The computer has a program and data for providing a visually displayable simulated environment. The visually displayable simulated environment is navigable by user input comprising movement of the user-movable element. The visually displayable simulated environment can be part of a computer animated game.



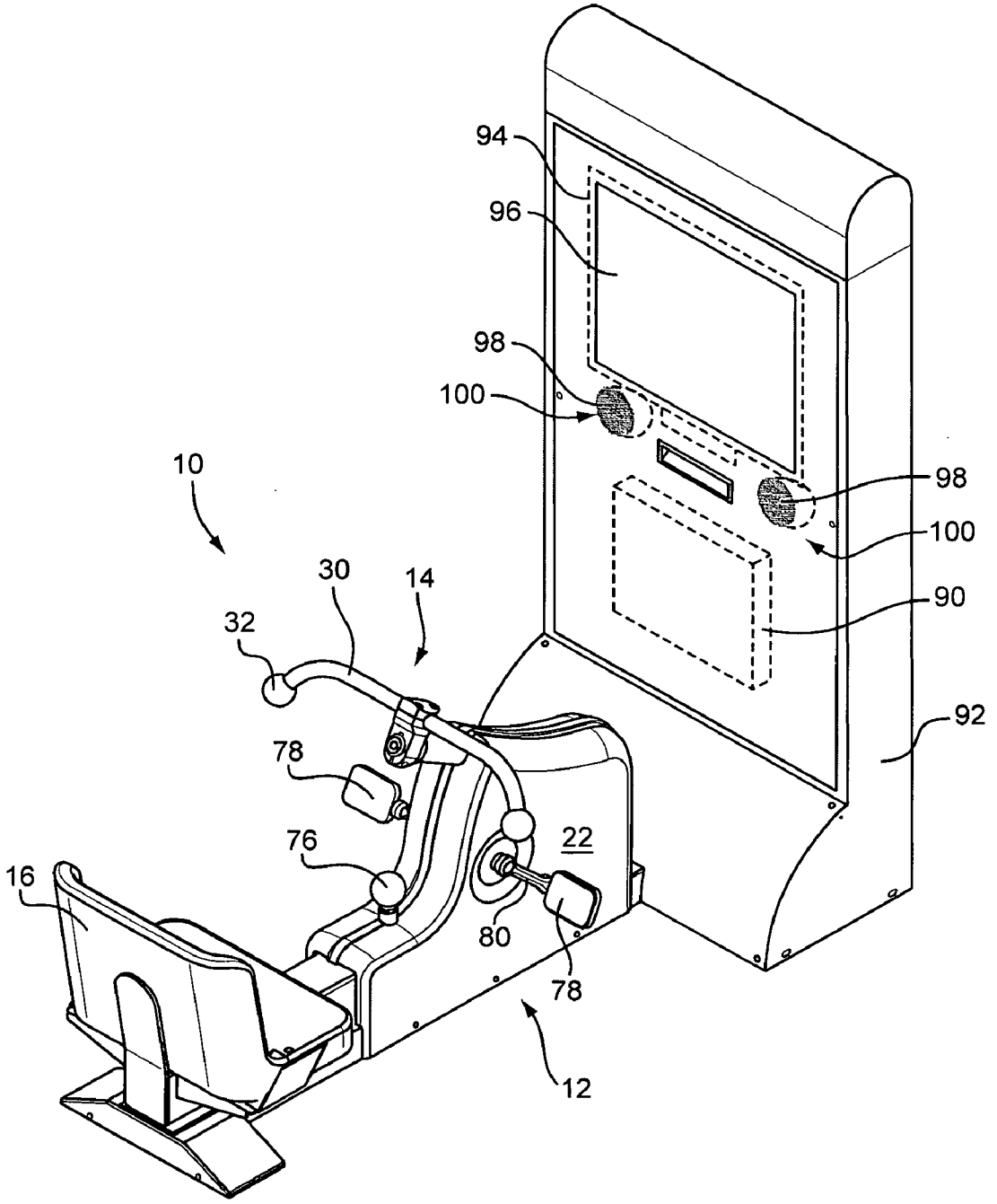


Fig. 1

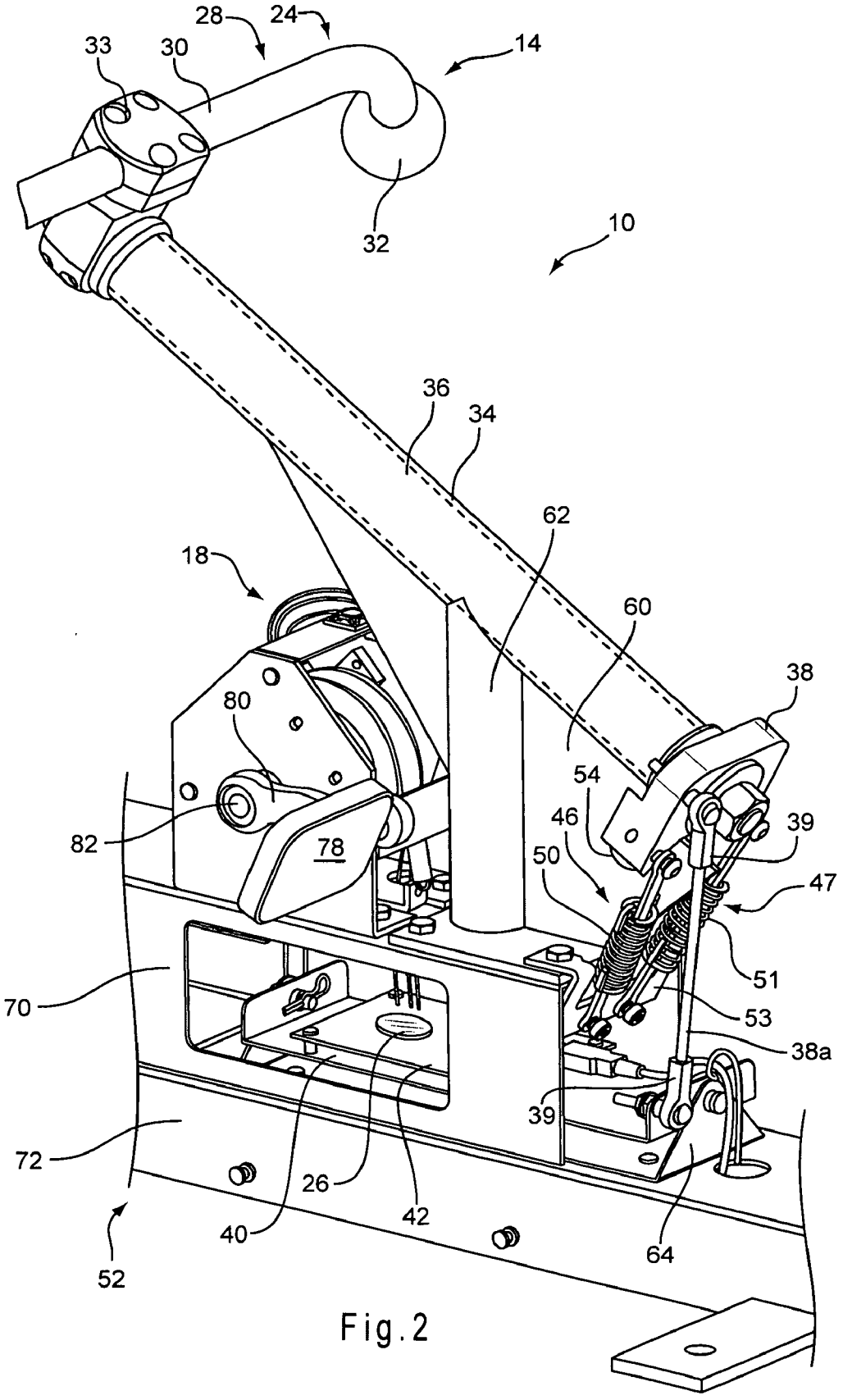

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Fig. 2

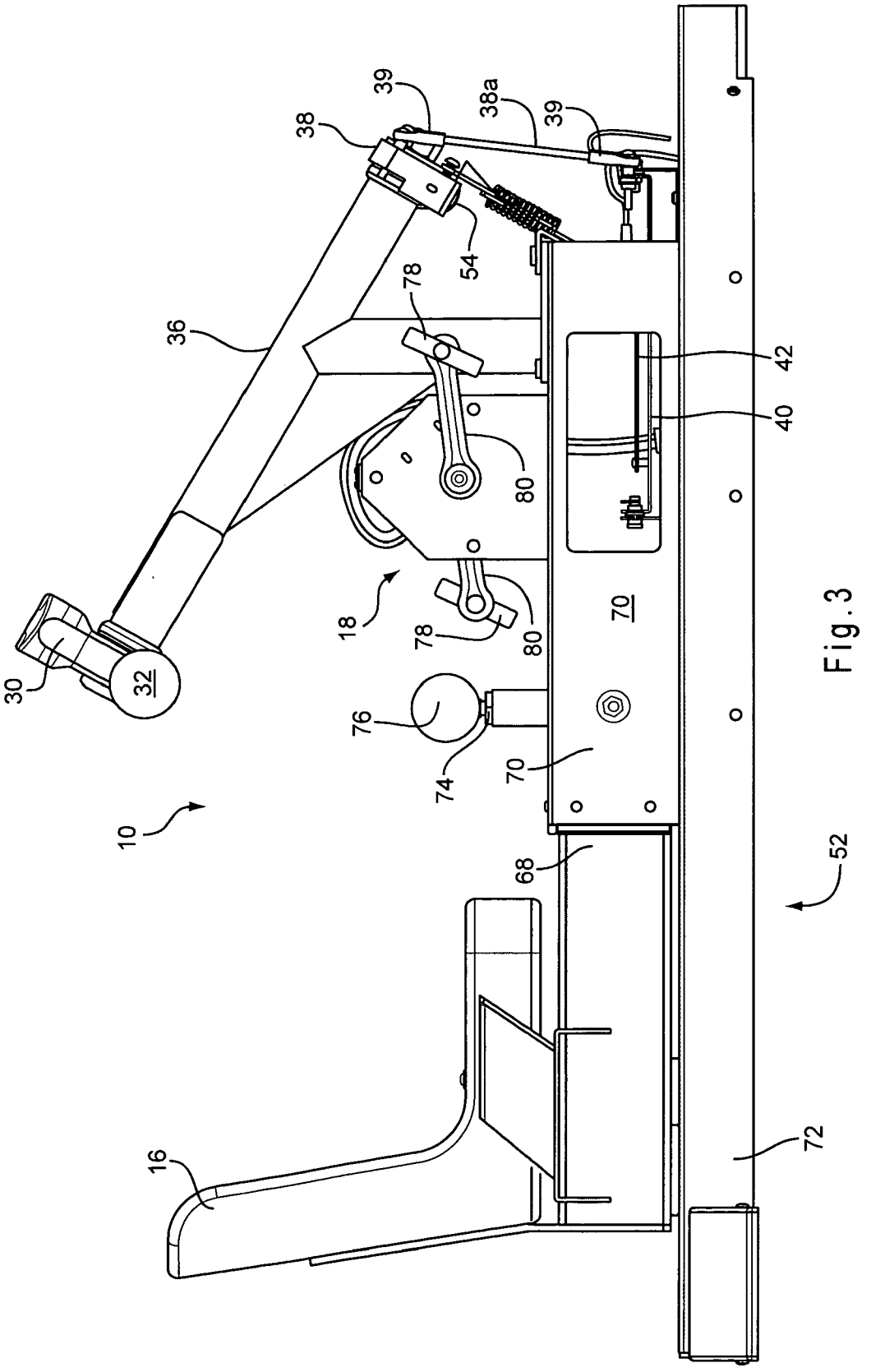

Fig. 3

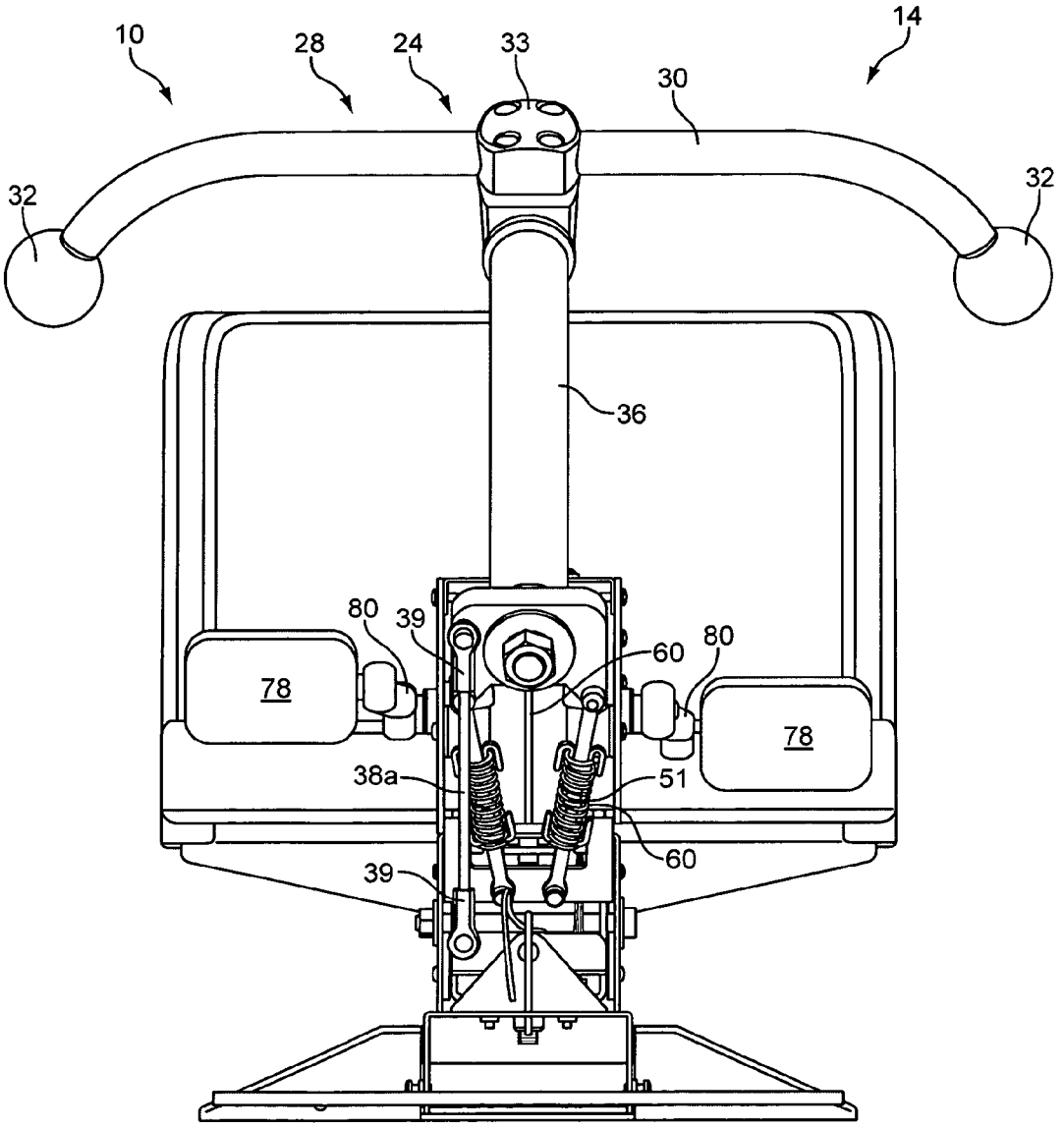

Fig.4

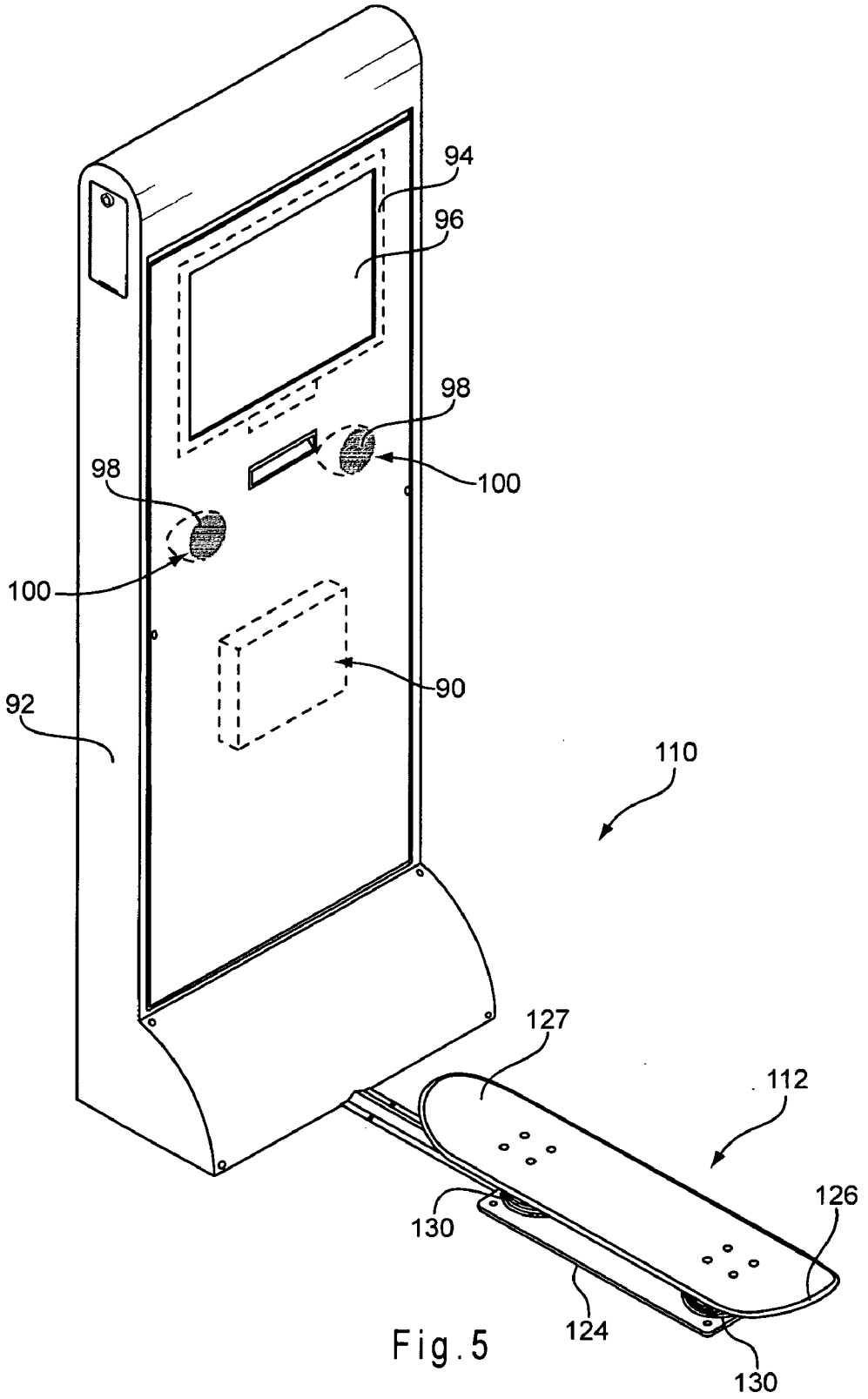

Fig. 5

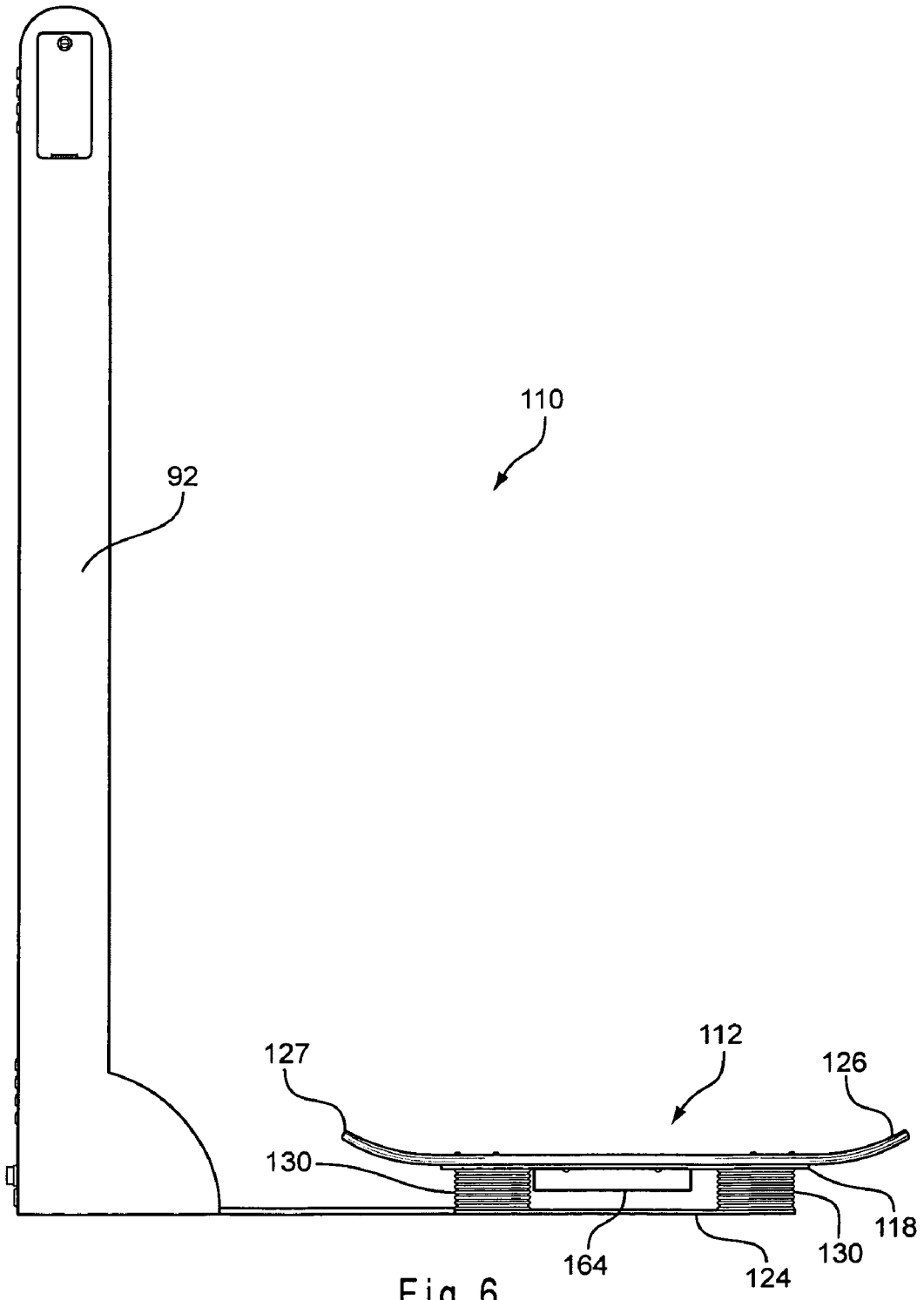

Fig.6

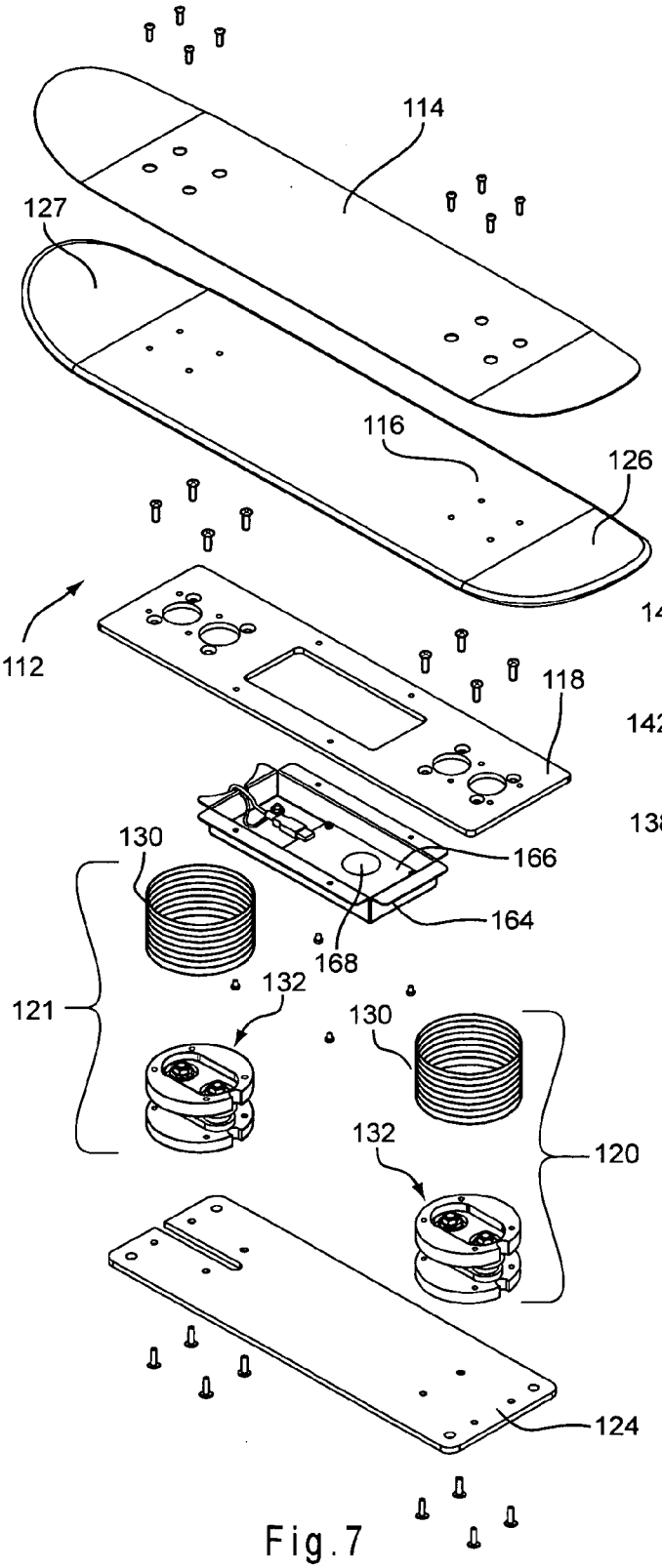
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Fig.7

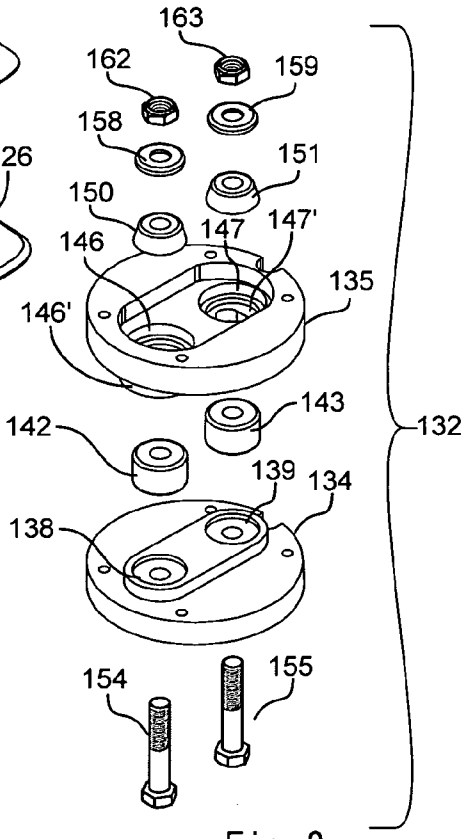
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Fig.8

EXERCISE SIMULATOR AND METHOD FOR ENCOURAGING EXERCISE

TECHNICAL FIELD

[0001] This invention relates to an exercise simulator for encouraging people, in particular, younger children, to exercise. The exercise simulator and method for encouraging exercise are particularly suitable for use indoors at quick-service restaurants and other locations frequented by younger children.

BACKGROUND OF THE INVENTION

[0002] The fitness and health of children has been declining for several decades. A decline in exercise has contributed to declining fitness and health. Thus, there is a need to encourage exercise among children.

[0003] While many adults frequent indoor gyms to exercise, such gyms are generally not fun for children. Indoor exercise for fitness is often tolerable for adults but generally not tolerable for younger children. Thus, there is a need to make indoor exercise fun for children.

[0004] Traditionally, younger children obtained much of their exercise by playing games outside. However, conditions may not always be suitable for playing outdoor games. For example, it may be too dark, hot, cold, rainy, and even too dangerous to play outside. Also, outdoor play is often inconvenient when traveling close or far. Thus, there is a need to make exercise more convenient and more suitable during adverse weather and environmental conditions. There is also a need for simulating an environment, which may be an outdoor environment, while exercising indoors.

SUMMARY OF THE INVENTION

[0005] In one aspect of the invention, an exercise simulator is provided. In various embodiments the exercise simulator is especially suitable for use by children. The exercise simulator has a steering component including a user-movable element and a steering sensor for outputting a sensor signal indicative of the amount of movement of the user-movable element. The purpose of the sensor is to provide steering input to a computer. The computer has a program and data for providing a visually displayable simulated environment. The visually displayable simulated environment is navigable by user input including movement of the user-movable element. The computer is configured to receive the sensor signal. As used herein, the term "exercise simulator" includes an exercise device or devices for exercising. Such devices may include a component or components that display a visually simulated environment, which may be an outdoor or a virtual environment.

[0006] The exercise simulator may also include a variety of optional components. For example, the exercise simulator may include a display for displaying the visually displayable simulated environment to the user. The user-movable element may include a user-rotatable element and the user input may include rotation. The sensor may be mechanically linked to the steering component so that rotation of the user-rotatable element rotates the sensor. The sensor may be an accelerometer. The exercise simulator may also include an electronic circuit capable of converting the sensor signal into a digital signal. The electronic circuit may be capable of converting the sensor signal into a mouse format.

[0007] In one embodiment, the exercise simulator has a speed component. The speed component may include user-rotatable cranks. The exercise simulator may include a seat and a speed sensor for outputting a speed signal indicative of the speed of rotation of the user-rotatable cranks to provide a speed input to the computer. The user-movable element of the steering component may include a handlebar, a non-horizontal steering shaft attached to the handlebars, a sensor platform rotatable around a substantially horizontal axis, and a sensor attached to the sensor platform. The steering shaft is connected to the sensor platform so that rotation of the steering shaft causes rotation of the sensor platform around the horizontal axis. The steering component may include a flange attached to the steering shaft. The flange is connected to the sensor platform by a length adjustable connection member. Adjustment of the length of the connection member allows the rotational relationship between the sensor platform and the steering shaft to be calibrated. The exercise simulator may include a frame and two springs attached to the flange. One purpose of the springs is to center the steering component.

[0008] In another embodiment, the exercise simulator also includes a user platform for supporting the weight of a user. The exercise simulator may also have a base wherein the user platform is flexibly attached to the base so that the user platform may be tilted. The sensor may be an accelerometer attached to the user platform. The user platform may be flexibly attached to the base by two or more aligned fasteners, the fasteners inside flexible bushings.

[0009] In a second aspect of the invention, a method of encouraging exercise by simulating an environment is provided. The method includes sensing the movement of a user-movable element and transmitting a sensor signal indicative of the amount of movement of the user-movable element. The sensor signal is received by a computer comprising a program and data for providing a visually displayable simulated environment. A simulated environment is displayed based on the data and the sensor signal. The simulated environment is navigable by user input including movement of the user-movable element. The simulated environment may be an outdoor environment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIGS. **1-4** depict a bicycle embodiment of the invention. FIGS. **1** and **3** are perspective and side views, respectively, of the bicycle embodiment with and without a cover, respectively. FIGS. **2** and **4** are perspective and elevation views, respectively, without the cover of the steering component from the side and front, respectively.

[0011] FIGS. **5-8** depict a skateboard embodiment of the invention. FIGS. **5** and **6** are perspective and side elevation views of the skateboard embodiment, respectively. FIGS. **7** and **8** are exploded views of the steering component and a centering component, respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0012] In one aspect of the invention, an exercise simulator having an input device and a computer is provided. A first embodiment of the exercise simulator is a bicycle exercise simulator **10** as shown in FIGS. **1-4**. Bicycle exercise simulator **10** has a bicycle input device **12** and a computer **90**.

[0013] Bicycle Input Device

[0014] Bicycle input device **12** has a steering component **14**, a seat **16**, a speed component **18**, and a cover **22**. Cover **22** partially covers steering component **14** and speed component **18** for safety reasons.

[0015] Steering component **14** includes a user-movable element **24** and a steering sensor **26**. User-movable element **24** includes a user-rotatable element **28**, which includes handlebar **30**. Handlebar **30** is attached at its ends to knobs **32**. Alternatively handlebar **30** could have grips. (not shown) at its ends. Handlebar **30** is attached by a stem **33** to a steering shaft **34**. Steering shaft **34** is partially contained within shaft housing **36**.

[0016] Steering shaft **34** is mechanically linked to steering sensor **26**. Steering sensor **26** may rotate around steering shaft **34** or may rotate around a different axis as discussed below. A flange **38** is at the end of shaft **34** opposite handlebar **30**. Flange **38** is attached to shaft **34** so that flange **38** rotates with shaft **34**. The attachment may include a key matched to a keyway. Flange **38** is attached by a length adjustable connection member **38**a to a sensor platform **40**. Sensor circuitry **42** including steering sensor **26** is mounted on sensor platform **40**. Alternatively steering sensor **26** may be mounted to sensor platform **40** and sensor circuitry **42** may be mounted to a stationary portion of bicycle input device **12**. Sensor **26** senses the rotation of user-rotatable element **28** and outputs a sensor signal indicative of the amount of movement of user-movable element **24**, which may be user-rotatable element **28**. The sensor signal output from steering sensor **26** can be analog or digital. If the sensor signal output is analog, sensor circuitry **42** transforms the analog sensor signal into a digital sensor signal for computer **90**. The digital sensor signal may be in a format suitable for a parallel port, serial port (e.g., RS-232), a USB port etc., for example. A mouse format for input via a USB port is preferred for the digital sensor signal. For purposes of this invention, the sensor signal refers to both transformed and non-transformed sensor signals.

[0017] Flange **38** can also be used to provide a self-centering capability to user-movable element **24**. In particular, flange **38** is attached to resilient members **46** and **47**. Resilient members **46** and **47** preferably include springs **50** and **51** working in opposition to return steering component **14** to its center when the user is not providing input, e.g., return handlebar **30** to a horizontal position when a user releases handlebar **30**. Resilient members **46**, **47** are attached to a frame **52** via a bracket **53**. Flange **38** may also have a pair of resilient stops **54** located on the right and left sides of flange **38** to prevent over-rotation of user-rotatable element **28** which could result in damage to springs **50** and **51** from over-extension. One of the pair of stops **54** contacts a plate **60** when user-rotatable element **28** reaches its limit position. Plate **60** is attached to shaft housing **36** and a steering support **62**.

[0018] Sensor platform **40** is mounted to bicycle input device **12** so that it can rotate around an axis, preferably substantially horizontal. A sensor cradle **64** provides horizontally aligned mounting points for sensor platform **40** to have a substantially horizontal axis. Sensor **26** is preferably a linear capacitative accelerometer or mems inertial sensor. The accelerometer has an inertial axis for which it measures acceleration or tilt. The accelerometer axis is substantially perpendicular to the axis of rotation of sensor platform **40**.

[0019] The length of connection member **38***a* can be adjusted to allow the rotational relationship between sensor platform **40** and steering shaft **34** to be adjusted. Such an adjustment allows the sensor input to be calibrated so that when steering component **14** has successfully self-centered itself via resilient members **46** and **47**, the sensor input corresponds to zero user input. Both ends of connection member **38***a* are disposed in a respective receiving member **39** in a threaded relationship to allow the length adjustment by turning connection member **38***a*. Rotation of connection member **38***a* translates angular movement to a vertical movement which, in turn, results in tilting movement of sensor platform **40**.

[0020] Seat **16** may be any kind of seat suitable for bearing the weight of a user while the user uses exercise simulator **10**. Seat **16** is supported by frame **52** having a seat support **68**, a support **70** and a base **72**. Support **68** is connected to support **70**, which provides support to speed component **18**. The distance between seat **16** and speed component **18** may be adjustable to accommodate users of different leg length. For example, seat **16** is shown at the end of a base **72** in FIG. **1** while in FIG. **3** seat **16** is forward of the end of base **72**. The distance between seat **16** and speed component **18** may be adjusted by raising a peg **74** having a knob **76** and further withdrawing or inserting support **68** from support **70**. Peg **74** fits in holes (not shown) in support **68**.

[0021] Speed component **18** has pedals **78** attached to user-rotatable crank arms **80**. Crank arms **80** are attached at opposite ends to a spindle **82**. A resistance mechanism (not shown) provides resistance to pedaling. The resistance mechanism may be any suitable resistance mechanism as known in the art for stationary bicycles, and may be composed of friction plates, for example. A speed sensor provides a speed signal indicative of the rate of pedaling. The speed sensor is connected to sensor circuitry **42**, which receives the speed signal. The speed signal can be analog or digital. If the speed signal is analog, sensor circuitry **42** can transform the speed signal into a digital speed signal. Preferably sensor circuitry **42** combines the steering sensor signal and the steering signal into a single digital sensor signal having a steering sensor signal component and a steering signal component.

[0022] Computer

[0023] Computer **90** may be housed in a console **92** along with a display **94**, associated with a transparent portion **96**, and speakers **98**, associated with speaker openings **100**. Computer **90** may be a personal computer having a processor, USB ports, hard drive storage for storing the program and data, internet access, graphics card, etc. Computer **90** may be a general purpose computer or a specialized computer having hardware specialized for the exercise simulator. Computer **90** has a program and data, both for providing a visually displayable simulated environment. The simulated environment is displayed on display **94** and sounds for the simulated environment are played through speakers **98**. Computer **90** receives a sensor signal from sensor circuitry **42**. Based on the signal, computer **90** allows a user to navigate simulated environment based on the program and data. For example, a user may be presented in the simulated environment with a choice of going left or right. The user can then turn handlebar **30** left to go left in the simulated environment. In addition, the speed of movement in the simulated environment may or may not be dependent on the speed signal. The visually displayable simulated environment can be part of a computer animated game.

[0024] Skateboard Input Device

[0025] A second embodiment of the exercise simulator is a skateboard exercise simulator **110** as shown in FIGS. **5-8**.

Skateboard exercise simulator **110** has a skateboard input device or steering component **112** and computer **90**. Skateboard input device **112** has a non-slip surface **114**, a platform **116**, a mounting plate **118**, flexible supports **120** and **121**, and a base **124**. Surface **114** is a surface that has good anti-slip properties to prevent a user from slipping off skateboard input device **112** while standing on a tilting skateboard input device **112**. Any such suitable surface may be used including a rubberized surface or a sandpaper-type surface. Surface **114** is attached to platform **116**. Platform **116** has upwardly sloping ends **126** and **127** and is generally shaped like a skateboard. Platform **116** is attached to mounting plate **118**. Mounting plate **118** is attached to flexible supports **120** and **121**, which are attached to base **124**. Base **124** may be attached to a platform or to a floor.

[0026] Flexible supports **120** and **121** as shown are identical, although this is not necessarily required. Each flexible support has a boot or cover **130** to cover a truck **132**. Truck **132** has shoes **134** and **135**. Shoe **134** has receiving portions **138** and **139** for receiving middle bushings **142** and **143**. Similarly, shoe **135** has lower receiving portions **146'** and **147'** for receiving middle bushings **142** and **143**. Shoe **135** has upper receiving portions **146** and **147** for receiving outside bushings **150** and **151**. Shoes **134** and **135** are held together by fasteners, illustrated as bolts **154** and **155**, washers **158** and **159**, and nuts **162** and **163**. Fasteners **154** and **155** can be any suitable fastener including bolts (as shown), screws or rivets, for example. Preferably, trucks **132** are aligned so that the four middle bushings and the fasteners contained within are substantially aligned to provide a tilt axis for a user to tilt the skateboard steering component **112**. The number of middle bushings and fasteners may be varied. Depending upon the number of fasteners, the number of linearly aligned fasteners can be 2, 3, 4 or more.

[0027] A sensor platform **164** is attached to the under side of mounting plate **118** between flexible supports **120** and **121**. Sensor circuitry **166** is supported by sensor platform **164**. Sensor circuitry **166** is similar or identical to sensor circuitry **42**. Sensor circuitry **166** may not have conversion capabilities for a speed signal as there generally is not a speed component for the skateboard embodiment **110**. Associated with sensor circuitry **166** is sensor **168**. Sensor **168** may be the same or similar to sensor **26**. Sensor **168** provides via sensor circuitry **166** a sensor signal to computer **90**.

[0028] Method of Encouraging Exercise

[0029] In a second aspect of the invention, a method of encouraging exercise by simulating an environment is provided. The method includes sensing the rotation of a user-movable element and transmitting a first sensor signal indicative of the amount of movement of the user-movable element. The sensor signal is received by a computer comprising a program and data for providing a visually displayable simulated environment. A simulated environment is displayed based on the data and the sensor signal. The simulated environment is navigable by user input including movement of the user-movable element.

[0030] The method may also include adjustably linking the user-movable element to a sensor so that rotation of the user-movable element around one axis causes rotation of a sensor around the same or a different axis. The sensor senses directly or indirectly the rotation of the user-movable element and outputs a sensor signal. The method may include transforming the sensor signal into a second sensor signal having a different format such as a digital format or a mouse format. The method may also include sensing the movement of a speed component and transmitting a speed signal indicative of the amount of movement of the speed component. The speed signal is received by the computer. The speed signal may be combined with the sensor signal to provide a second signal having a sensor signal portion and a speed signal portion. While the invention has been described with respect to certain preferred embodiments, as will be appreciated by those skilled in the art, it is to be understood that the invention is capable of numerous changes, modifications and rearrangements and such changes, modifications and rearrangements are intended to be covered by the following claims.

1. An exercise simulator comprising

a steering component including a user-movable element and a steering sensor for outputting a sensor signal indicative of the amount of movement of the user-movable element to provide steering input to a computer;

the computer comprising a program and data for providing a visually displayable simulated environment, the visually displayable simulated environment being navigable by user input comprising movement of the user-movable element, the computer configured to receive the sensor signal.

2. The exercise simulator of claim **1** further comprising a display for displaying the visually displayable simulated environment to the user.

3. The exercise simulator of claim **1** wherein the user-movable element comprises a user-rotatable element and the user input comprises rotation.

4. The exercise simulator of claim **3** wherein the steering sensor is mechanically linked to the steering component so that rotation of the user-rotatable element rotates the steering sensor.

5. The exercise simulator of claim **4** wherein the steering sensor comprises an accelerometer.

6. The exercise simulator of claim **1** further comprising an electronic circuit capable of converting the sensor signal into a digital signal.

7. The exercise simulator of claim **6** wherein the electronic circuit is capable of converting the sensor signal into a mouse format.

8. The exercise simulator of claim **1** further comprising a seat and a speed component including user-rotatable cranks.

9. The exercise simulator of claim **8** further comprising a speed sensor for outputting a speed signal indicative of the speed of rotation of the user-rotatable cranks to provide a speed input to the computer.

10. The exercise simulator of claim **8** wherein the user-movable element of the steering component comprises a handlebar.

11. The exercise simulator of claim **10** wherein the steering component further comprises a non-horizontal steering shaft, the steering shaft attached to the handlebars.

12. The exercise simulator of claim **11** further comprising a sensor platform rotatable around a substantially horizontal axis, the steering sensor attached to the sensor platform, the steering shaft connected to the sensor platform so that rotation of the steering shaft causes rotation of the sensor platform around the horizontal axis.

13. The exercise simulator of claim **12** wherein the steering component further comprises a flange, the flange attached to the steering shaft and connected to the sensor platform by a length adjustable connection member, wherein adjustment of

the length of the connection member allows the rotational relationship between the sensor platform and the steering shaft to be calibrated.

14. The exercise simulator of claim **13** further comprising a frame and two springs attached to the flange and the frame for centering the steering component.

15. The exercise simulator of claim **1** further comprising a user platform for supporting the weight of a user.

16. The exercise simulator of claim **15** further comprising a base wherein the user platform is flexibly attached to the base so that the user platform may be tilted.

17. The exercise simulator of claim **16** wherein the sensor is an accelerometer attached to the user platform.

18. The exercise simulator of claim **16** wherein the user platform is flexibly attached to the base by two or more aligned fasteners, the fasteners inside flexible bushings.

19. A method of encouraging exercise by simulating an environment comprising

sensing the movement of a user-movable element;

transmitting a sensor signal indicative of the amount of movement of the user-movable element;

receiving the sensor signal by a computer comprising a program and data for providing a visually displayable simulated environment; and

displaying a simulated environment based on the data and the sensor signal, the simulated environment being navigable by user input comprising movement of the user-movable element.

* * * * *