US 20070229397A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0229397 A1

Sefton (43) Pub. Date: Oct. 4, 2007

(54) VIRTUAL REALITY SYSTEM

(75) Inventor: **Robert T. Sefton**, Bloomfield Village, MI (US)

Correspondence Address:
HOWARD & HOWARD ATTORNEYS, P.C.
THE PINEHURST OFFICE CENTER, SUITE #101
39400 WOODWARD AVENUE
BLOOMFIELD HILLS, MI 48304-5151 (US)

(73) Assignee: **Volo, LLC**, Birmingham, MI (US)

(21) Appl. No.: **11/753,910**

(22) Filed: **May 25, 2007**

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/792,593, filed on Mar. 3, 2004, now Pat. No. 7,224,326.

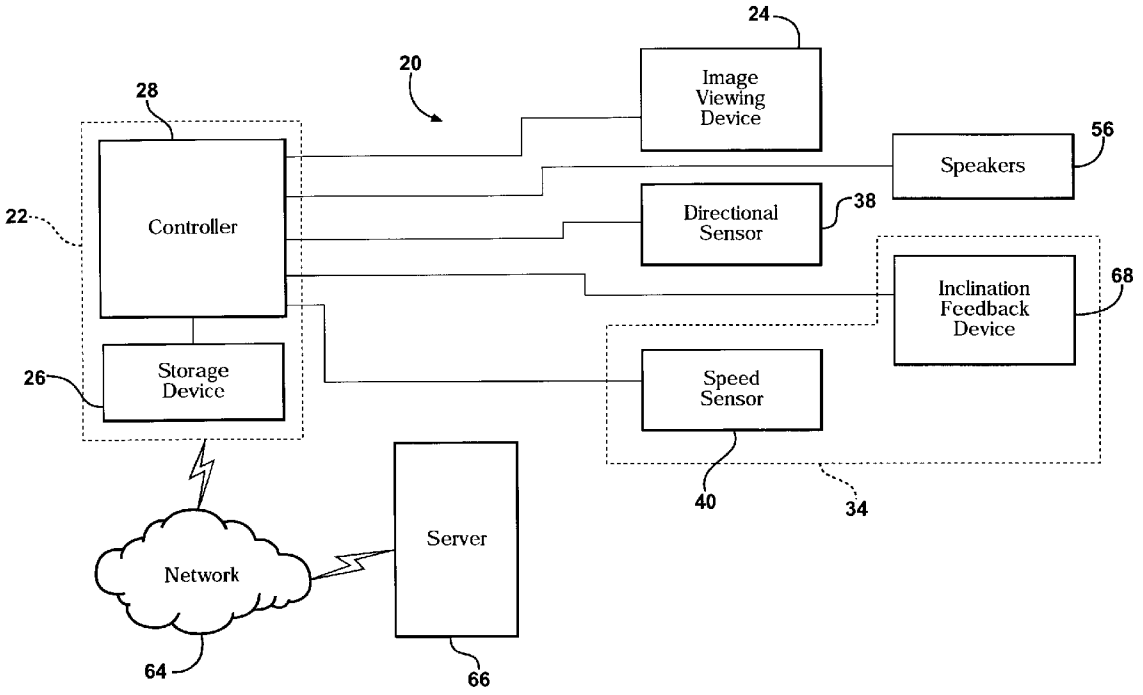
Publication Classification

(51) **Int. Cl.**
G09G 5/00 (2006.01)

(52) **U.S. Cl.** **345/8**

(57) **ABSTRACT**

A virtual reality (VR) system includes an image playback system that sends images to an image viewing device, such as a pair of display glasses. Each image has a 360-degree field of view. A user views a portion of the images. The portion of the image viewed is determined by a directional sensor mounted to the display glasses. The images are advanced according to a speed sensor attached to a moving device, such as a stationary bicycle. The VR system simultaneously coordinates the portion of the images viewed by the user by coordinating signals from the directional sensor and the speed sensor. The user may also give commands to the playback system based on the positioning of the directional sensor.



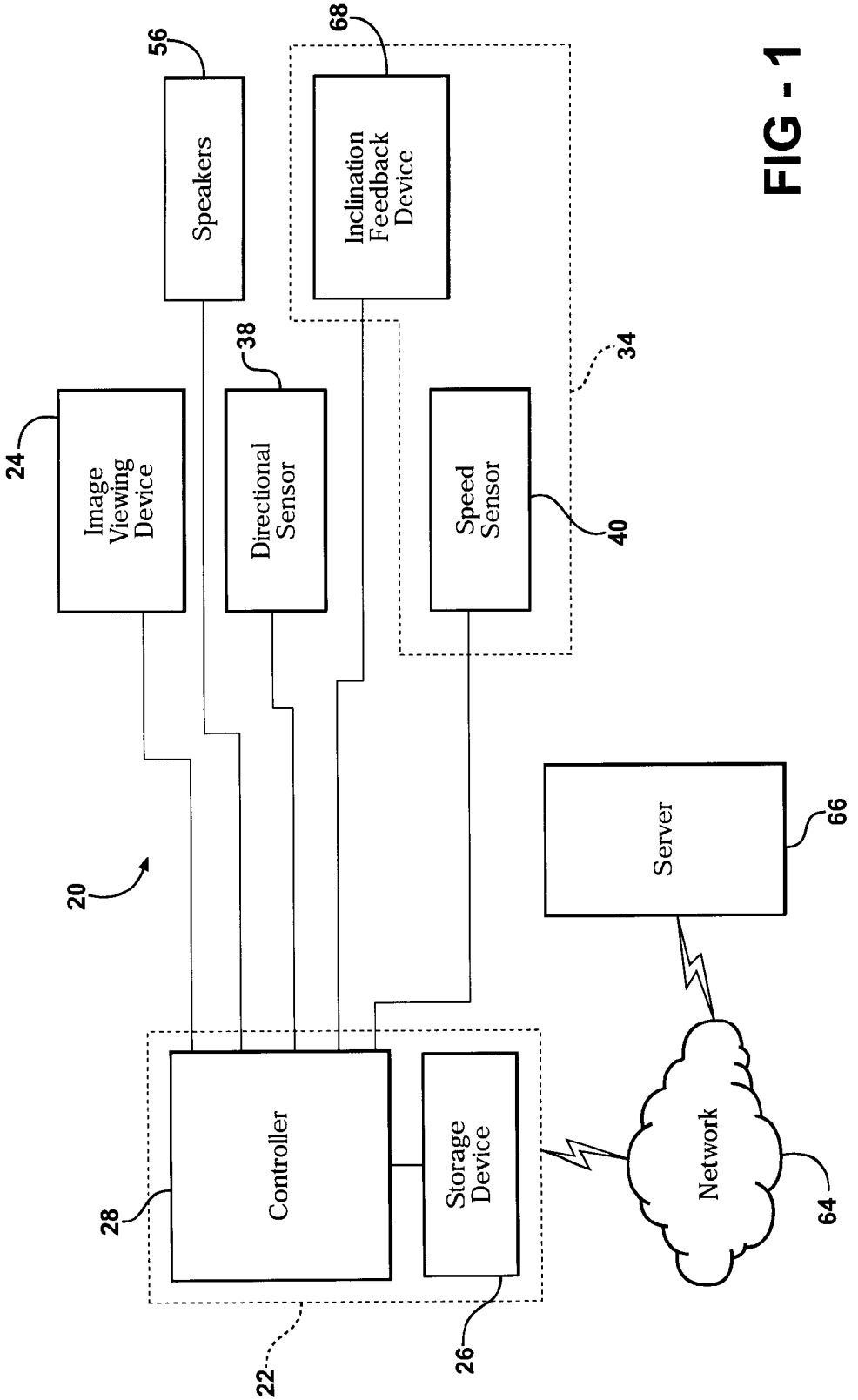

56
Speakers
68
Inclination Feedback Device
38
Directional Sensor
34
24
Image Viewing Device
Speed Sensor
40
20
Server
66
Controller
Storage Device
Network
28
64
22
26

FIG - 1

FIG - 2

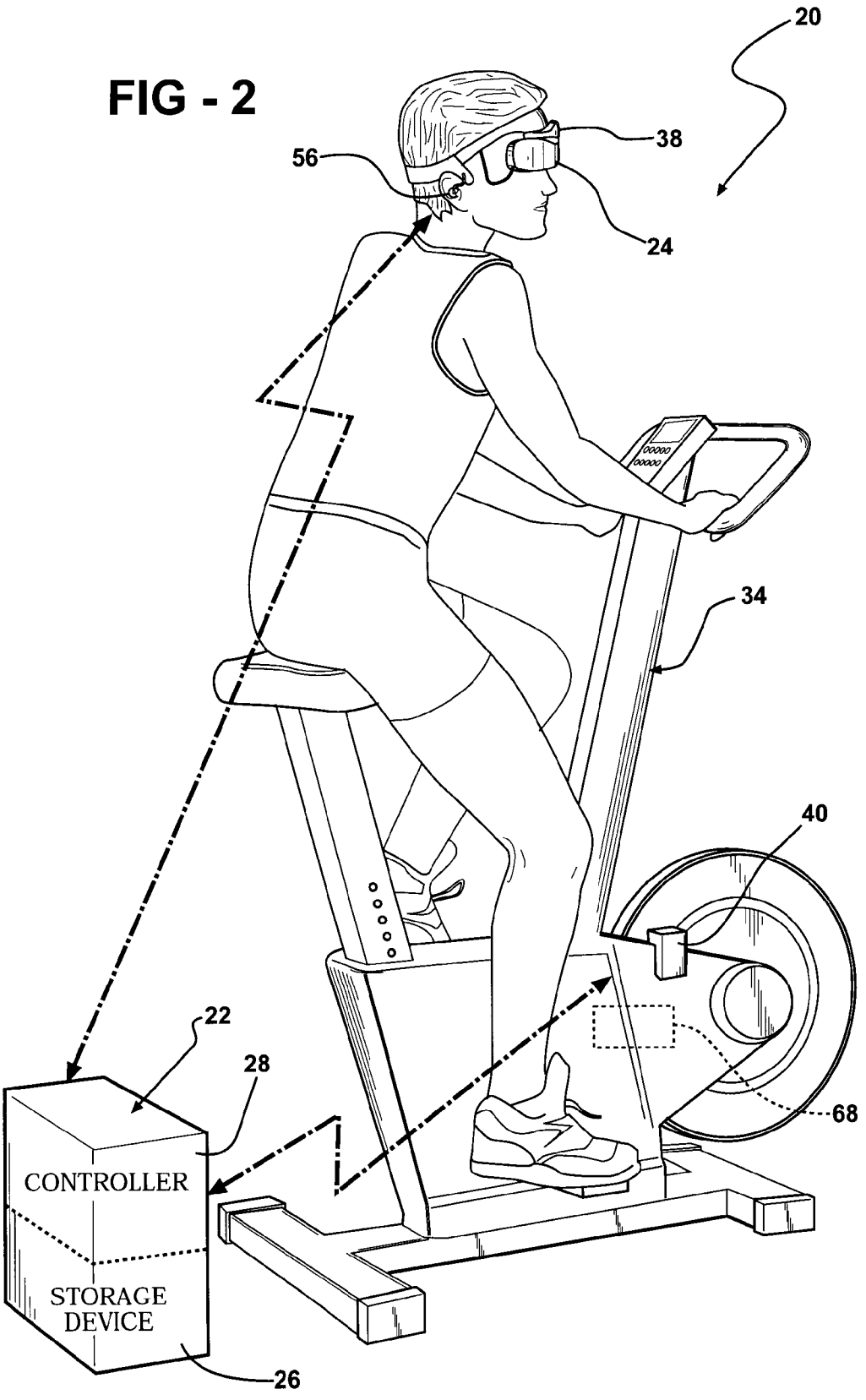


FIG - 3

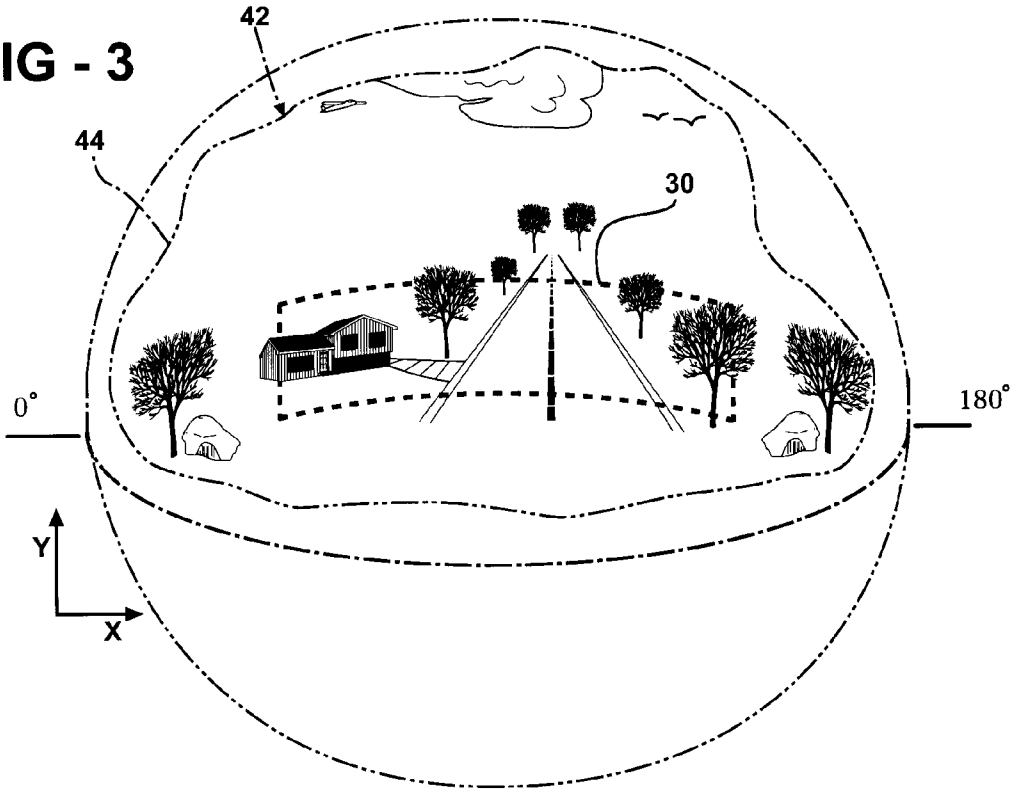


FIG - 4

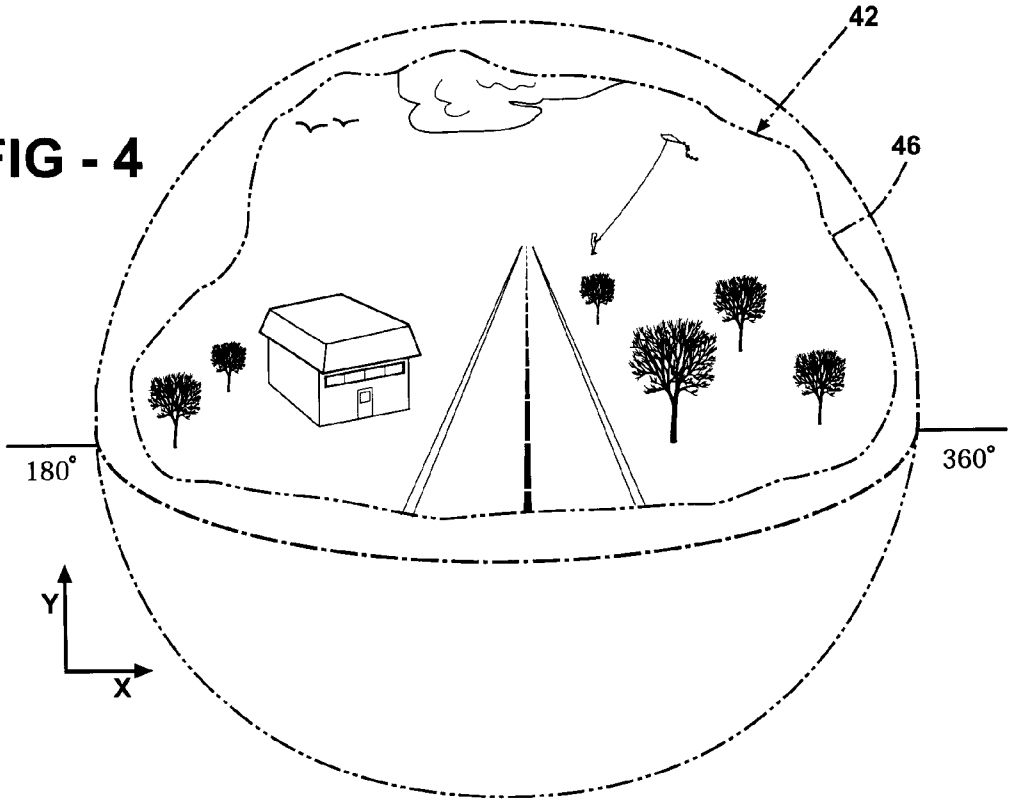


FIG - 5

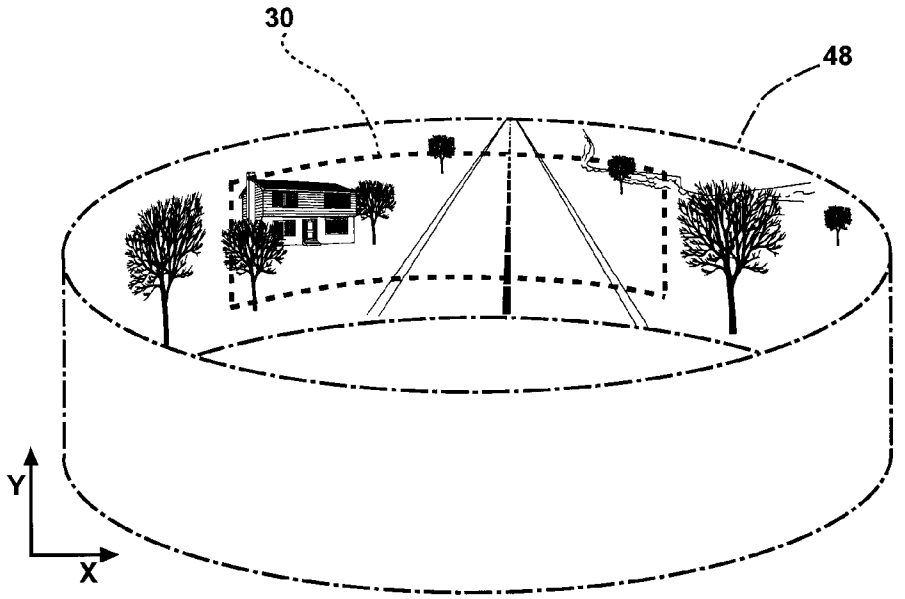


FIG - 6

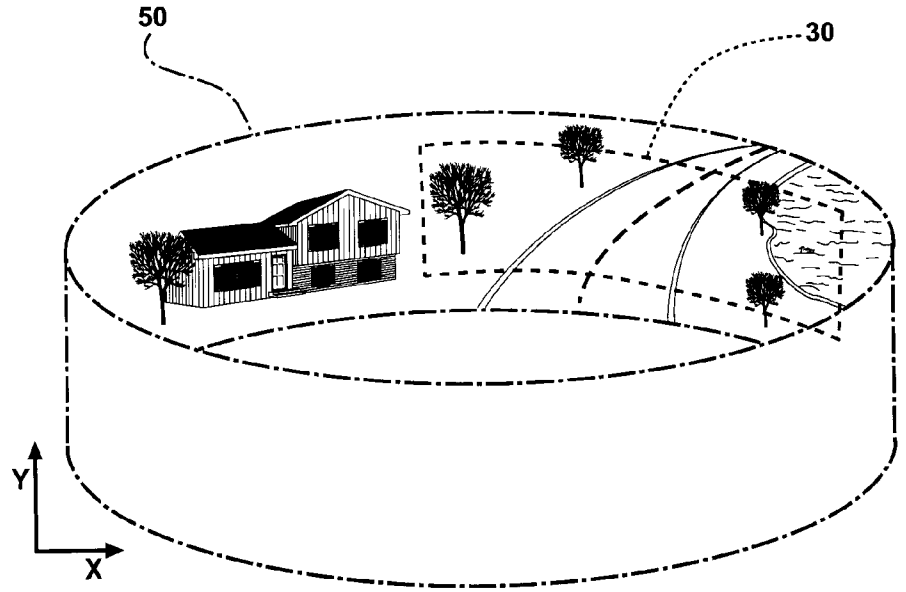


FIG - 7

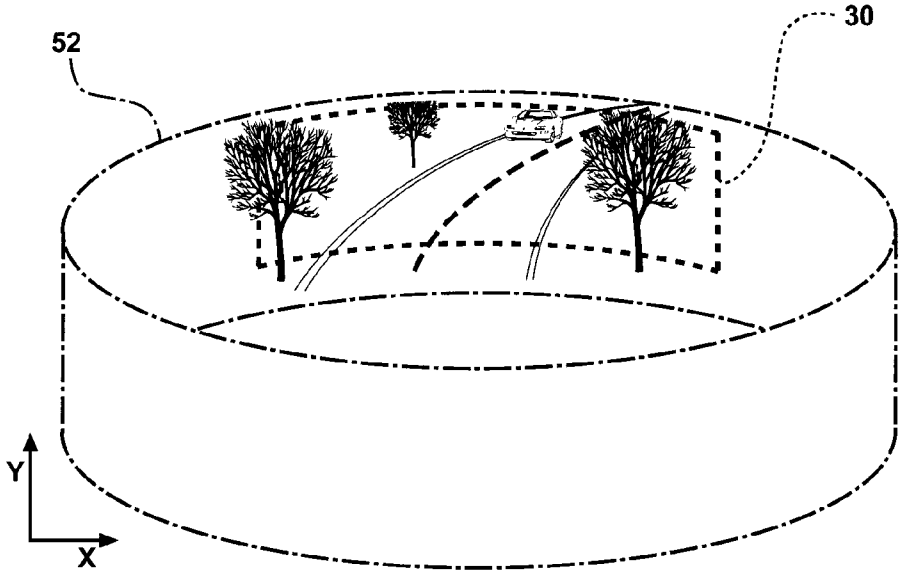
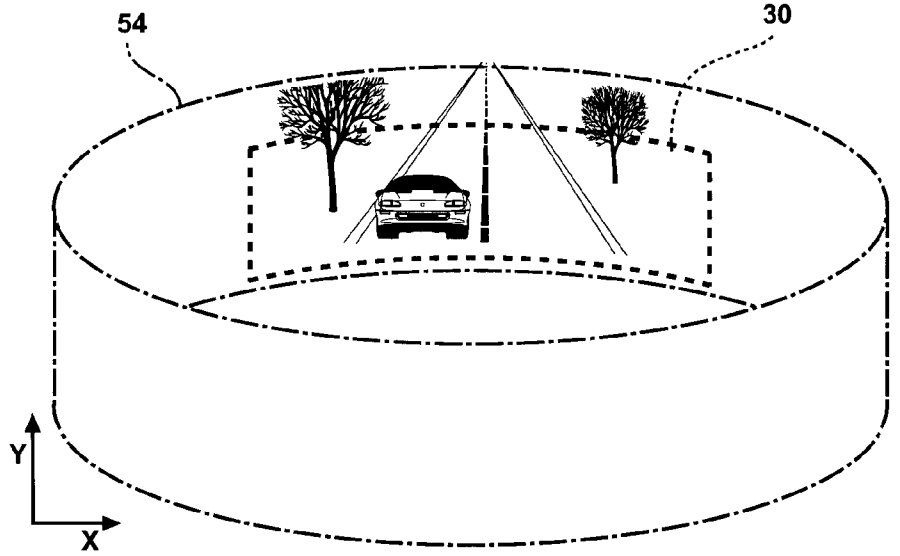


FIG - 8



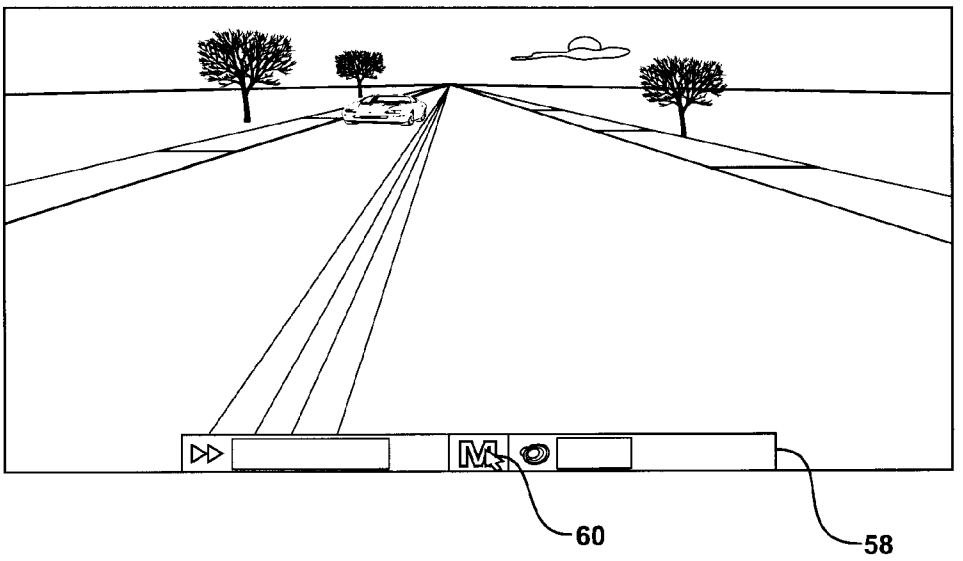

60
58

FIG - 9

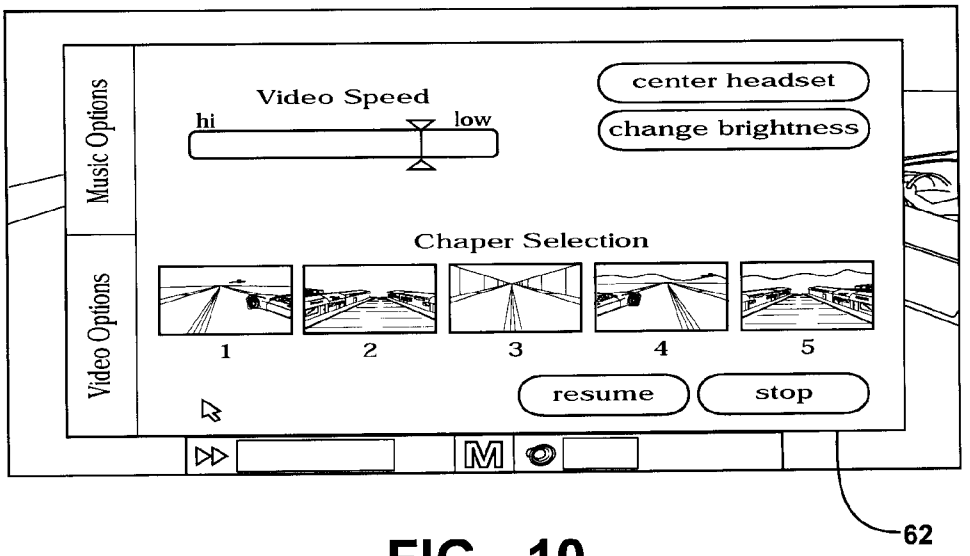

Music Options
Video Options
Video Speed
hi
low
center headset
change brightness
Chaper Selection
1
2
3
4
5
resume
stop
62

FIG - 10

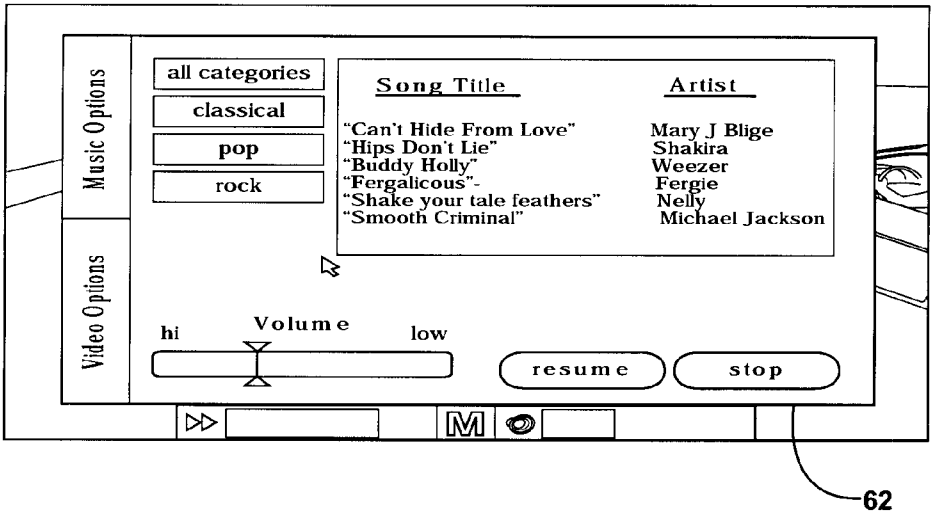

Music Options
Video Options
all categories
classical
pop
rock
Song Title
Artist
"Can't Hide From Love"
"Hips Don't Lie"
"Buddy Holly"
"Fergalicous"-
"Shake your tale feathers"
"Smooth Criminal"
Mary J Blige
Shakira
Weezer
Fergie
Nelly
Michael Jackson
hi
Volume
low
resume
stop
62

FIG - 11

VIRTUAL REALITY SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

[0001] This patent application is a continuation-in-part of co-pending patent application Ser. No. 10/792,593, filed on Mar. 3, 2004, now U.S. Pat. No. 7,224,326.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The subject invention relates generally to virtual reality (VR) systems. The invention relates specifically to VR systems coupled with an exercise apparatus.

[0004] 2. Description of the Related Art

[0005] Various VR systems are well known in the prior art in which a user views a plurality of images. Two such VR systems are disclosed in U.S. Pat. Nos. 5,499,146 (the '146 patent) to Donahe et al. and 6,244,987 (the '987 patent) to Ohsuga et al.

[0006] The '146 patent discloses a VR system having an image playback system for storing a plurality of images having a 360-degree field-of-view. The images are previously recorded using a plurality of video cameras and electronically "stitched" together to create the images with the 360-degree field-of-view. The playback system is operatively connected to a display and a directional sensor. The display and directional sensor are mounted to a helmet that is worn by a user. The display shows a portion of each image based on the position of the helmet, as measured by the directional sensor. The plurality of images are sequenced and displayed for the user at a predetermined rate.

[0007] The '987 patent discloses a VR system having an image playback system for storing a plurality of images. The playback system is operatively connected to a display and a speed sensor. The speed sensor is attached to an exercise apparatus for measuring a speed of a user operating the exercise apparatus. The display presents the plurality of images to the user at a rate determined by the speed measured by the speed apparatus.

[0008] Although these systems may provide some advantages over other systems, there remains an opportunity for a VR system that provides a more realistic environment of 360-degree images that are dynamically viewed by a user. There also remains an opportunity for a VR system having a "hands-free" operator interface to change the parameters of the playback of the images.

BRIEF SUMMARY OF THE INVENTION AND ADVANTAGES

[0009] The invention provides a virtual reality (VR) system including a playback system having a storage device. The storage device maintains a plurality of images where each image has a field-of-view defining an X direction and a Y direction. An image viewing device is in communication with the playback system for displaying a portion of the plurality of images to a user. A directional sensor is in communication with the playback system for defining a viewing direction of the user as both an X direction coordinate and a Y direction coordinate. The playback system includes a controller in communication with the storage device for coordinating the portion of the plurality of images displayed by the image viewing device with the X and Y direction coordinates of the directional sensor. The controller recognizes a command from the user based on positioning of said directional sensor.

[0010] The invention also includes a method of operating the VR system. The method includes the steps of maintaining a plurality of images where each image has a 360-degree field-of-view defining an X direction and a Y direction. A viewing direction of a user is determined as both an X direction coordinate and a Y direction coordinate. The method also includes the step of displaying a portion of the plurality of images to the user based on the viewing direction. The method further includes the steps of recognizing a command from the user based on positioning of the directional sensor and changing an operating aspect of the VR system based on the command.

[0011] Accordingly, the invention provides a VR system with a "hands-free" user interface that allows operation of the system without keyboards, mice, or other hand or foot operated devices. This allows a user to continue to operate the VR system, such as when exercising, without interruption.

[0012] Another aspect of the invention provides the VR system described above wherein the storage device also maintains inclination data corresponding to the images. The VR system also includes a forward and rearward moving device for defining a Z direction. A speed sensor is operatively connected to the moving device and operatively communicating with the playback system for providing a rate of change of the plurality of images in the Z direction. The controller is in communication with the storage device for simultaneously coordinating the X and Y directions of the directional sensor and the Z direction of the speed sensor. The VR system also includes an inclination feedback device operatively connected to the moving device and in communication with the storage device for changing the operation of the forward and reward moving device based upon the inclination data.

[0013] Accordingly, this aspect of the invention provides a VR system with a more realistic VR experience which simulates uphill and downhill movement coordinated with the plurality of images viewed by the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0015] FIG. **1** is a block diagram of a preferred embodiment of a virtual reality system in accordance with the subject invention;

[0016] FIG. **2** is a perspective view of the preferred embodiment of the virtual reality system where a stationary bicycle is implemented as an exercise apparatus;

[0017] FIG. **3** is a forward-looking segment defining a first image and a portion of the first image viewed by a user;

[0018] FIG. **4** is a backward-looking segment of the first image and another portion of the first image viewed by the user;

[0019] FIG. **5** is a forward-looking segment defining a second image and a portion of the second image viewed by the user;

[0020] FIG. **6** is a forward-looking segment of a third image and a portion of the third image viewed by the user;

[0021] FIG. **7** is a forward-looking segment of a fourth image and a portion of the fourth image viewed by the user;

[0022] FIG. **8** is a forward-looking segment of a fifth image and a portion of the fifth image viewed by the user;

[0023] FIG. **9** is a forward-looking portion of an image viewed by the user showing an operator interface bar and an arrow indicating the viewing direction of the user;

[0024] FIG. **10** is a video options menu viewed by the user; and

[0025] FIG. **11** is an audio options menu viewed by the user.

DETAILED DESCRIPTION OF THE INVENTION

[0026] Referring to the Figures, wherein like numerals indicate like parts throughout the several views, a virtual reality (VR) system is shown at **20** in FIG. **1**. The VR system **20** broadly includes an image playback system **22** and an image viewing device **24** in communication with each other.

[0027] The image playback system **22** includes a storage device **26** and a controller **28** in communication with each other. The storage device **26** may be a hard disk drive, a digital versatile disc (DVD), a compact disc (CD), a Blu-ray disc (BD), a semiconductor-based memory device, or other suitable data storage device known to those skilled in the art. The storage device **26** maintains a plurality of images. Each image has a field-of-view defining an X direction and a Y direction. In a preferred embodiment, the X direction field-of-view is defined as 360 degrees and the Y direction field-of-view is defined as 180 degrees. However, those skilled in the art appreciate the field-of-view of the X direction may be less than 360 degrees and the field-of-view of the Y direction could be less than 180 degrees. The 360 degrees of the X direction and the 180 degrees of the Y direction represent a completely spherical image.

[0028] The images are preferably generated using a camera with a 360-degree field-of-view lens. One suitable lens is the "ParaMax360" produced by Panosmart of Antibes, France. In a first alternative, the images may be produced by several standard lenses then combined to create the 360 degree field-of-view. A second alternative is for the images to be computer generated. Those skilled in the art realize other suitable lenses and alternatives to generate the 360 degree field-of-view images.

[0029] In the preferred embodiment, the plurality of images is compressed before storage. This allows an increased amount of images to be stored on the storage device **26**. The images are then decompressed before being displayed. Several acceptable compression/decompression algorithms (Codecs) are known to those skilled in the art. However, it is preferred that the XviD codec is implemented. The XviD codec is open-source software available via the Internet at www.xvid.org.

[0030] In the preferred embodiment, position, elevation, and/or inclination data is associated with each image and stored on the storage device **26** along with the images. This data may be collected simultaneously while the camera generates the images by using a global positioning system (GPS) receiver (not shown). The GPS receiver receives position and elevation data from a plurality of GPS satellites. Inclination data can be calculated based on changes in elevation between the images.

[0031] As stated above, the image viewing device **24** communicates with the image playback system **22**. The image viewing device **24** displays a portion **30** of the plurality of images to a user. In the preferred embodiment, the image viewing device **24** is further defined as a pair of display glasses (not separately numbered) worn on the head of the user. The portion **30** of the plurality of images displayed by the display glasses **24** is preferably 140 degrees in the X direction and 90 degrees in the Y direction. Those skilled in the art realize that display glasses **24** with alternate dimensional configurations are also possible. An example of suitable display glasses **24** is the "i-glasses SVGA Pro" model manufactured by i-O Display systems, LLC, a division of Ilixco, Inc., both of Menlo Park, Calif. However, a variety of suitable display glasses **24** exists and could be implemented in the VR system **20**. Further, the image viewing device **24** could be a flat or curved screen or monitor positioned in front of and/or about the user.

[0032] The VR system also preferably includes a forward and rearward moving device **34**. In the preferred embodiment, the forward and rearward moving device **34** is an exercise apparatus for allowing the user to exercise. The exercise apparatus is illustrated in FIG. **2** as a stationary bicycle. However, a different type of exercise apparatus could be implemented, including, but not limited to, a treadmill, a stair climber, or an elliptical trainer. Those skilled in the art will also realize that other types of moving devices **34** could be utilized in the subject invention without deviating from the scope of the subject invention.

[0033] Preferably, the image playback system **22**, image viewing device **24**, and forward and rearward moving device **34** communicate with each other across one or more wireless interfaces (not shown). There may be other wireless interfaces for communicating among other components in the VR system **10**. In the preferred embodiment, the wireless interfaces operate using radio waves. Preferably, the wireless interfaces utilize Bluetooth® technology as described by the Bluetooth Special Interest Group headquartered in Overland Park, Kans. Other radio wave interfaces, such as 802.11, PCS, etc., may also be implemented. In a first alternative embodiment, the wireless interfaces operate using frequencies in the optical band, such as the infrared standards developed by the Infrared Data Association (IRDA) of Walnut Creek, Calif. In a second alternative embodiment, the communication between the image playback system **22** and the other components of the VR system **20** is accomplished using a hardwired interface. This hardwired interface may involve transmission of electrons over a conductive wire or pulses of light over a fiber-optic cable.

[0034] In order to specifically monitor the movement of the user in the X and Y directions, the VR system includes a directional sensor **38**. The directional sensor **38** communicates with the image playback system **22**. In particular, the

directional sensor **38** defines a viewing direction of the user in both of the X and Y directions. That is, the directional sensor **38** provides an X direction coordinate and a Y direction coordinate corresponding to the viewing direction of the user. In the preferred embodiment, the directional sensor **38** is attached to the display glasses **24**. This allows a portion of the plurality of images displayed by the display glasses **24** to change in the X and Y directions as the user moves the display glasses **24** by moving his or her head. The directional sensor **38** preferably includes a wireless interface for communicating with the of the playback system **22**. An example of a suitable directional sensor **24** is the "InterTrax2" manufactured by InterSense of Burlington, Mass. As appreciated by those skilled in the art, any suitable directional sensor **38** may be used, including sensors that monitor the viewing direction and movement of human eyes. Furthermore, in the embodiment where the image viewing device **24** is a screen or monitor, the directional sensor **38** could be mounted directly to the head and/or different areas of the user.

[**0035**] In order to monitor the movement of the user in a Z direction, a speed sensor **40** is provided. The speed sensor **40** is operatively connected to the forward and rearward moving device **34** such that the forward and rearward moving device **34** defines the Z direction. The speed sensor **40** is also in communication with the image playback system **22** to provide a rate of change of the plurality of images in the Z direction. In the embodiment illustrated by FIG. **2**, the speed sensor **40** is operatively connected to a rotating wheel, pedal crank, or similar part of the stationary bicycle **36**. The speed sensor **40** preferably includes a wireless interface for wirelessly communicating with the playback system **22**.

[**0036**] Referring to FIGS. **3** and **4**, one of the images of the plurality of 360-degree field-of-view images is illustrated and is defined as a first image **42**. A forward-looking segment **44** of the first image **42**, defined by the X-direction between 0 and 180 degrees, is shown in FIG. **3**. A portion **30** of the image viewed by the image viewing device **24** is shown with a broken line. The portion **30** of the image is illustrated as a rectangle but could be of any suitable shape or size. FIG. **4** illustrates a backward-looking segment **46**, defined by the X-direction between 180 and 360 degrees.

[**0037**] In the preferred embodiment, the controller **28** simultaneously coordinates the X and Y directions of the directional sensor **38** and the Z direction of the speed sensor **40**. The viewing direction and the rate of change are interlaced to automatically change the portion **30** of the plurality of images displayed by the image viewing device **24** in the X, Y, and Z directions when the user moves the directional sensor **38** in at least one of the X and Y directions and simultaneously moves the moving device **34** in the Z direction. In particular, the controller **28** automatically changes the portion **30** of the images displayed by the image viewing device **24** throughout the 360-degree field-of-view.

[**0038**] The preferred embodiment of the image playback system **22** also includes a frame buffer (not shown). The frame buffer receives the portion **30** of the plurality of images and retransmits the portion **30** at a constant frame rate. This retransmission at a constant frame rate prevents "slow motion" or blurry images from being received by the user. The frame buffer may be implemented as software within the controller **28** or as a separate hardware module within the image playback system **22**. For example, the constant frame rate may be at 30 frames/second, which is the standard frame rate of the National Television Standards Committee (NTSC).

[**0039**] FIGS. **5** through **8** illustrate the coordination between the X and Y directions of the directional sensor **38** and the Z direction of the speed sensor **40**. For simplification of illustration, only the forward-looking portions of the images are shown. Several of the plurality of images that would be present between FIGS. **5** and **6**, between FIGS. **6** and **7**, etc., are omitted to further simplify the illustration.

[**0040**] As the user operates the stationary bicycle **36** of the preferred embodiment, the plurality of images are advanced in the Z direction. The first image **42**, shown in FIG. **3**, will advance to a second image **48**, shown in FIG. **5**, which will advance to a third image **50**, shown in FIG. **6**, to a fourth image **52**, shown in FIG. **7**, and finally to a fifth image **54**, shown in FIG. **8**. The user, however, does not see the entirety of each of the images **42**, **48**, **50**, **52**, **54**. Instead, the user views the portion **30** of each image **42**, **48**, **50**, **52**, **54** as shown by the broken line. As the user moves his or her head, the directional sensor **38** sends a signal to the controller **28** which, in turn, changes the portion **30** that is viewed by the user.

[**0041**] As the images are advanced, the user can turn his or her head to the right or left, i.e. in the X direction, or up and down, i.e., in the Y direction, to view the objects in the X direction's 360-degree field-of-view. For example, the user looking relatively straight ahead in FIG. **5** can turn his or her head to the right get a better view of the lake to the right of the road as shown in FIG. **6**. Also, the user can look up, as shown in FIG. **7**, or down, as shown in FIG. **8**, to focus on an approaching vehicle. If the user stops pedaling the stationary bicycle **36**, the progression of images stops. The user may then also turn his or her head to get a better look at any objects in the stationary 360-degree field-of-view of the X direction.

[**0042**] In addition to providing video images to the user, the VR system **20** preferably is capable of providing audio to the user as well. To this end, the storage device **26** preferably includes a plurality of audio files. These audio files are preferably music. However, alternatively, these audio files may correspond to the video images being displayed to the user. For example, the audio files may be recorded during the recording of the video images such that environmental noise (e.g. passing cars, nature, etc.) may correspond to the video images.

[**0043**] The VR system **20** also includes at least one speaker **56** in communication with the playback system. The at least one speaker **56** receives an audio signal from the storage device **26** and coverts the audio signal into sound waves. In the preferred embodiment, the at least one speaker **56** is implemented as a pair of stereo headphones (not separately numbered). Of course, those skilled in the art realize other techniques to implement the at least one speaker **56**.

[**0044**] In the preferred embodiment, a headset **57** supports the display glasses **24**, the directional sensor **38**, and the headphone speakers **56**. This headset **57** is preferably in wireless communication with the playback system **22** such that data may be communicated back and forth between the headset **57** and the playback system **22**.

[0045] The controller **28** of the playback system **22** also recognizes and receives commands from the user. Preferably, the controller **28** recognizes these commands based on positioning of the directional sensor **38**. Specifically, in the preferred embodiment, the controller **28** recognizes a command from the user when the viewing direction of the user corresponds to a predetermined area of X and Y directional coordinates for a predetermined period of time. The controller **28** then changes an operating aspect of the VR system **20** based on the command. For example, FIG. **9** illustrates a portion **30** of an image displayed by the image viewing device **24**. The image viewing device also displays an operator interface bar **58** and an arrow **60** indicating the viewing direction of the user. Preferably, the operator interface bar **58** is hidden from the view of the user, but appears depending on the viewing direction of the user. Alternatively, the operator interface bar **58** may be continuously visible to the user.

[0046] Still referring to FIG. **9**, the user can select to open a menu **62** by "holding" the arrow **58** on the "M" of the operator interface bar **58** for a short period of time (e.g., 1.5 seconds). Said another way, the user opens the menu **62** by moving his or her head such that the arrow **60** moves on the "M" for the short period of time.

[0047] In an alternative embodiment, the controller **28** may recognize the command based on a predetermined change in position, or motion, of the viewing direction of the user. For example, the predetermined change in position could be achieved by the user quickly nodding his or hear head, thus quickly changing the viewing direction received by the directional sensor **38**.

[0048] The menu **62**, as best seen in FIGS. **10** and **11**, is preferably a hierarchical-type menu having a plurality of sub-menus. FIG. **10** shows a video options menu **62**. In the preferred embodiment, the video options menu **62** includes a selectable display of different courses (or chapters), a selector to change the brightness of the image viewing device **24**, a selector to remap the position of (i.e., center) the directional sensor **38**, and a variable selector to synchronize the speed sensor **40** to the number of video images displayed. Selection again occurs by the user simply moving the arrow **58** to a desired selection (by moving his or her head) and "holding" the arrow **58** there for a short period of time. FIG. **11** shows an audio options menu **62**. The audio options menu **62** allows the user to select the audio file or files to be played via the speaker **56**. The volume of the audio may also be adjusted via the audio options menu **62**. Of course, those skilled in the art will realize other menus and sub-menus that could be implemented to allow the user further control over the VR system **20**.

[0049] The technique of recognizing and receiving commands from the user as described above is ideal for the VR system **20** since the user does not need to use his or her hands to send a command. Instead, the VR system **20** of the subject invention provides a completely "hands-free" user interface. The user need not remove the display glasses **24** or otherwise interrupt their exercise routine in order to change video images, audio selection, or other features of the VR system **20**.

[0050] Referring to FIGS. **1** and **2**, the VR system preferably includes an inclination feed back device **68**. The inclination feedback device **68** is in communication with the storage device **26** and receives inclination data from the storage device **26**. The inclination feedback device **68** is also operatively connected to the forward and rearward moving device **34** for changing the operation of the moving device **34** based on the inclination data. Said another way, the inclination feedback device **68** changes the "feel" of the moving device **34** based on the inclination data, providing a more realistic VR experience.

[0051] For example, in an embodiment where the moving device **34** is implemented as part of a stationary bicycle, the inclination feedback device **68** may change the tension on the pedals that is felt by the user. When images depict going uphill, the tension increases; while when images depict the going downhill, the tension decreases. In another embodiment, where the moving device **34** is a treadmill, the inclination feedback device **68** may change the inclination of the treadmill's moving belt. As such, the inclination of the belt may be adjusted to match the inclination of the current image as stored in the inclination data.

[0052] Referring now to FIG. **1**, the image playback system **22** is preferably in communication with a network **64**. The network **64** may be a local area network (LAN), a wide area network (WAN), the Internet, or other network known to those skilled in the art. A server **66** is also in communication with the network **64**, such that the image playback system **22** and the server **66** are also in communication with one another.

[0053] The server **66** includes various video images and files, audio files, and/or associated data. These images, files, and/or data may be transmitted from the server to the playback system **22** for use by the user. Therefore, the playback system **22** need not require the user to change DVDs or CDs in order to travel a different course or listen to a different selection of music.

[0054] Preferably, the server **66** is in communication with a plurality of playback systems **22**. In addition to providing files and data to the playback systems **22**, the server **66** facilitates competitions, i.e., races, between the users of the various exercise apparatus **34**. As such, the server **66** receives speed sensor **40** data from each exercise apparatus **34**. The server **66** can then determine a winner based on the distance traveled for a certain period of time. Alternatively, other criteria may be used to determine the winner, such as, but not limited to highest average speed. Furthermore, the server **66** may provide feedback to each user based on the performance of the other users. For example, each image viewing device **24** may show a representation of a race course corresponding to the images shown to the user with a position of each user on the race course. Further, a lap time of each other user may be shown. Further, each image viewing device **24** may display a representation of each user superimposed on the plurality of images. This allows the user to see when he or she is passing another user or is being passed by another user.

[0055] The VR system **20** may also present various other content to the user, besides the plurality of images described above. This other content includes, but is not limited to, Internet data such as webpages and email, television programs, radio stations, and DVD content such as movies.

[0056] The present invention has been described herein in an illustrative manner, and it is to be understood that the

terminology which has been used is intended to be in the nature of words of description rather than of limitation. Obviously, many modifications and variations of the invention are possible in light of the above teachings. The invention may be practiced otherwise than as specifically described within the scope of the appended claims.

What is claimed is:

1. A virtual reality (VR) system comprising:

a playback system having a storage device for maintaining a plurality of images where each image has a field-of-view defining an X direction and a Y direction;

an image viewing device in communication with said playback system for displaying a portion of said plurality of images to a user;

a directional sensor in communication with said playback system for sensing a viewing direction of the user to define both an X direction coordinate and a Y direction coordinate;

said playback system having a controller in communication with said storage device for coordinating said portion of said plurality of images displayed by said image viewing device with said X and Y direction coordinates of said directional sensor; and

said controller recognizing a command from the user based on positioning of said X and Y direction coordinates of said directional sensor.

2. A VR system as set forth in claim 1 wherein said controller recognizing a command from the user based on positioning of said directional sensor is further defined as said controller recognizing a command from the user when said viewing direction of the user corresponds to a predetermined area of X and Y directional coordinates for a predetermined period of time.

3. A VR system as set forth in claim 1 wherein said image viewing device displays a menu image in response to said controller recognizing a menu command from the user.

4. A VR system as set forth in claim 1 wherein said storage device also maintains at least one audio file.

5. A VR system as set forth in claim 4 further comprising at least one speaker in communication with said playback system for receiving an audio signal from said storage device and converting said audio signal into sound waves corresponding to said at least one audio file.

6. A VR system as set forth in claim 1 further comprising:

a forward and rearward moving device for defining a Z direction; and

a speed sensor operatively connected to said moving device and in communication with said playback system for providing a rate of change of said plurality of images in said Z direction.

7. A VR system as set forth in claim 6 wherein said controller simultaneously coordinates said X and Y directions of said directional sensor and said Z direction of said speed sensor such that said viewing direction and said rate of change are interlaced to automatically change said portion of said plurality of images displayed by said image viewing device in said X, Y, and Z directions when the user moves the directional sensor in at least one of the X and Y directions and simultaneously moves the moving device in the Z direction.

8. A VR system as set forth in claim 1 wherein said controller automatically changes said portion of said images displayed by said image viewing device throughout said field-of-view.

9. A VR system as set forth in claim 1 wherein said image viewing device is further defined as display glasses adapted to be worn by the user.

10. A VR system as set forth in claim 9 wherein said directional sensor is attached to said display glasses such that said portion of said plurality of images automatically changes as said glasses move in said X and Y directions.

11. A VR system as set forth in claim 6 wherein said forward and rearward moving device is further defined as an exercise apparatus for allowing a user to exercise.

12. A VR system as set forth in claim 1 wherein said image playback system further includes a frame buffer operatively communicating with said image viewing device for displaying said portion of said plurality of images to the user at a constant frame rate.

13. A VR system as set forth in claim 6 wherein said storage device includes inclination data corresponding to said images.

14. A VR system as set forth in claim 13 further comprising an inclination feedback device operatively connected to said forward and reward moving device and in communication with said storage device for changing the operation of said forward and reward moving device based upon said inclination data.

15. A method of operating a virtual reality (VR) system comprising:

maintaining a plurality of images where each image has a 360-degree field-of-view defining an X direction and a Y direction;

determining an X direction coordinate and a Y direction coordinate corresponding to a viewing direction of a user;

displaying a portion of the plurality of images to the user based on the viewing direction;

recognizing a command from the user based on positioning of the X and Y direction coordinates; and

changing an operating aspect of the VR system based on the command.

16. A method as set forth in claim 15 further comprising the step of sensing a rate of change of the plurality of images moving in a Z direction;

17. A method as set forth in claim 16 further comprising the step of simultaneously coordinating the X and Y directions and the Z direction and interlacing the viewing direction and the rate of change for automatically changing the plurality of images in the X, Y, and Z directions as the user changes the viewing direction in at least one of the X and Y directions and simultaneously moves in the Z direction.

18. A method as set forth in claim 15 wherein the step of determining a viewing direction of a user is further defined as monitoring any movement of the user.

19. A method as set forth in claim 15 wherein the step of displaying a portion of the plurality of images to the user is further defined as displaying a portion of the plurality of images to the user at a constant frame rate.

20. A virtual reality (VR) system comprising:

a playback system having a storage device for maintaining a plurality of images where each image has a field-of-view defining an X direction and a Y direction and inclination data corresponding to said images;

an image viewing device in communication with said playback system for displaying a portion of said plurality of images to a user;

a directional sensor in communication with said playback system for defining a viewing direction of the user as both an X direction coordinate and a Y direction coordinate;

said playback system having a controller in communication with said storage device for coordinating said portion of said plurality of images displayed by said image viewing device with said X and Y direction coordinates of said directional sensor;

a forward and rearward moving device for defining a Z direction;

a speed sensor operatively connected to said moving device and operatively communicating with said playback system for providing a rate of change of said plurality of images in said Z direction;

said playback system having a controller in communication with said storage device for simultaneously coordinating said X and Y directions of said directional sensor and said Z direction of said speed sensor; and

an inclination feedback device operatively connected to said moving device and in communication with said storage device for changing the operation of said forward and reward moving device based upon said inclination data.

* * * * *