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(54) **MOBILE INTERACTIVE VIRTUAL REALITY PRODUCT** (52) **U.S. Cl. .... 482/54**

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(57) **ABSTRACT**

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**Publication Classification**

(51) **Int. Cl.<sup>7</sup> ..... A63B 22/02**

A novel form of virtual reality product is described which uses a powered mobile structure that follows a person as the person roams freely around a real physical terrain of arbitrary size that may simultaneously be portrayed in the virtual space. Virtual objects may be included in the portrayal. The product includes coded data source and imager combinations that provide information used by a control system and motive means to keep the structure in a known spatial relationship to the moving person. These also may provide data for avatar control and other purposes in the virtual space. The product may be used to stress persons in a virtual environment by requiring them to deal with, for example, varied and challenging terrain underfoot and long traverses.

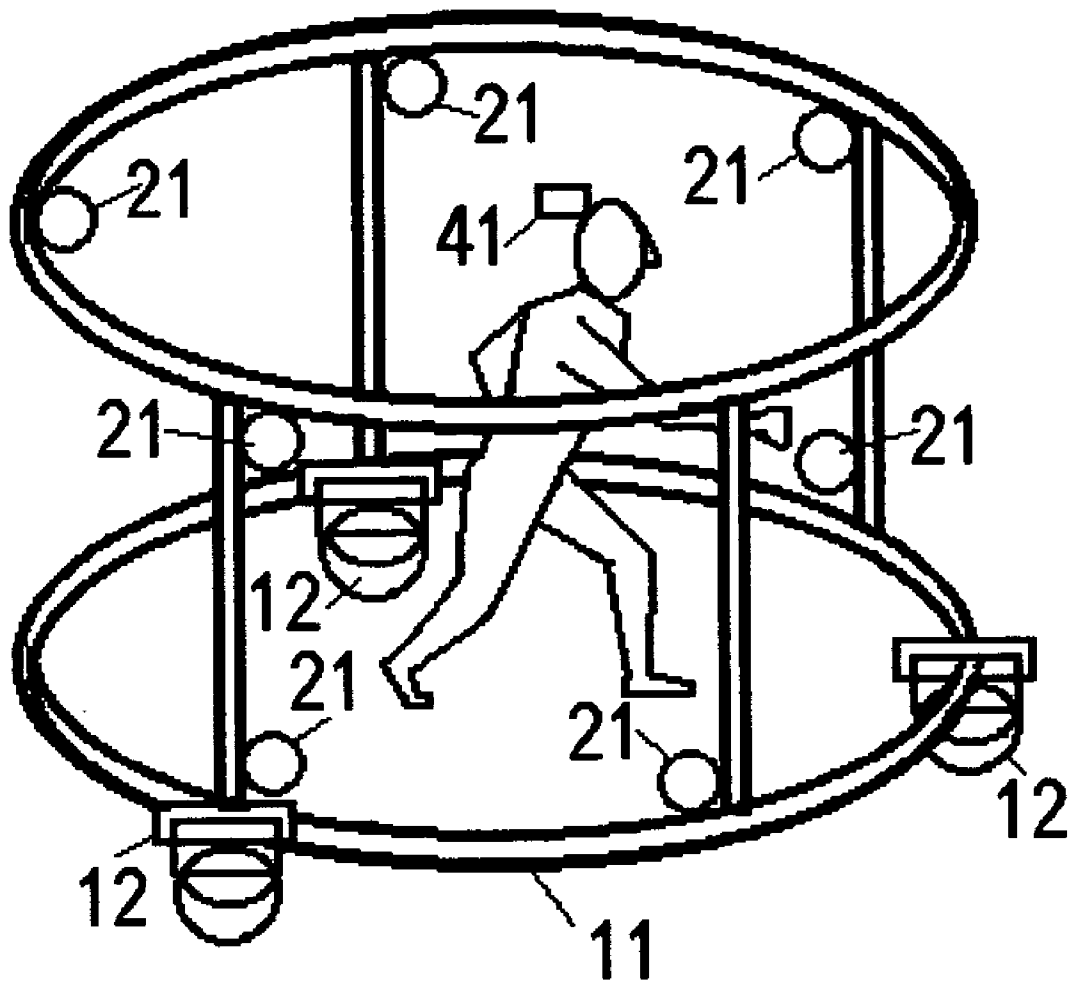


FIG. 1

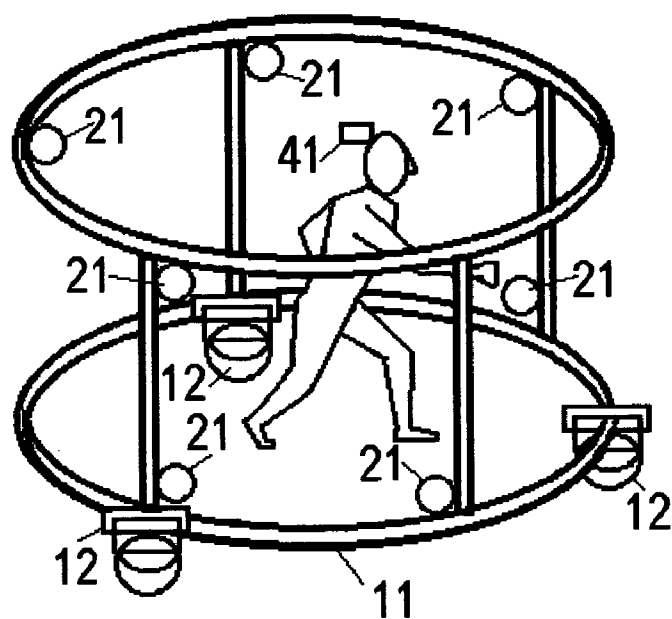
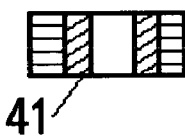
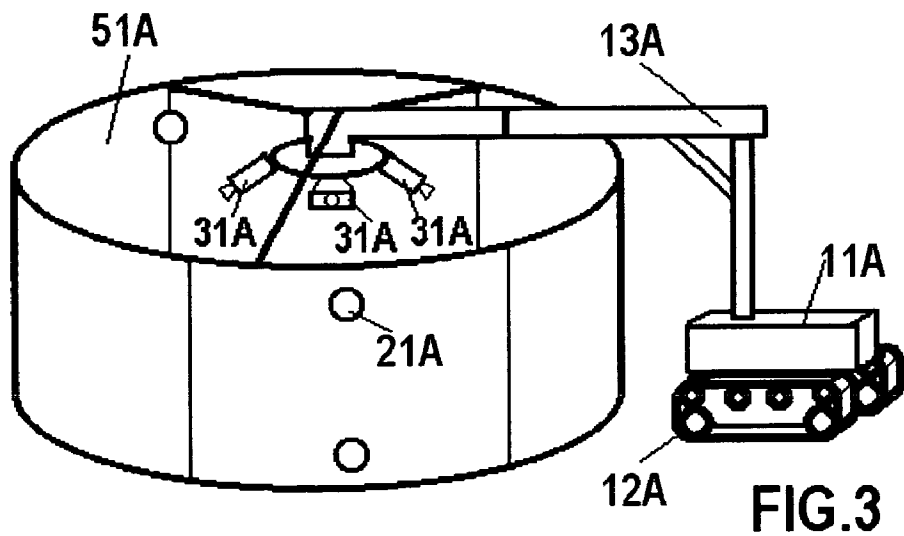


FIG. 2



## MOBILE INTERACTIVE VIRTUAL REALITY PRODUCT

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] PCT/US01/13742 published 8 Nov. 2001 as WO 01/84475 A1 is incorporated herein by reference. This application claims benefit of Provisional Application No. 60407797 C7605 filed 3 Sep. 2002.

### STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH AND DEVELOPMENT

[0002] Not applicable

### REFERENCE TO COMPACT DISK

[0003] Not applicable

### BACKGROUND OF THE INVENTION

[0004] The invention uses a mobile virtual reality environment that moves with a person on foot as the person performs actions and moves around on a physical surface of any size. The surface can exhibit a wide range of topological characteristics. Previous virtual reality environments, particularly those using avatars controlled by a person on foot, require that person to remain in a small area and move "in place" or on a linear or omni-directional treadmill. These previously known environments cannot provide adequate simulation, for instance, of the physical and mental stress of performing virtual mission-critical or gaming tasks while moving significant distances across various types of terrain. This serious inability of existing virtual reality environments to provide acceptable realism for many purposes is thereby surmounted by this invention.

### BRIEF SUMMARY OF THE INVENTION

[0005] The object of this invention is to provide a means whereby humans in virtual reality environments can perform activities and move for long distances in terrains that accurately impose the physical and mental stresses that would be encountered in the real-world situation being simulated by the virtual reality product. The product uses a mobile platform carrying a structure that follows the human and maintains a known spatial relationship between the moving human and the structure attached to the platform. This is done by means of a closed-loop information system working with platform actuator means. The structure carries sensor means to output information about the position and actions of the human both for maintaining the relationship and for providing data about the actions of the human that can be used to control avatars, evaluate performance or for other purposes. Various forms of display may be used to convey the visual portion of the virtual environment to the moving human participant. Using the present invention, physically real terrains can be incorporated in virtual reality simulations and can include, among many other possibilities, parking lots, open fields, rubble-covered combat zones, extended naturally-sloped rocky areas, and semi-submerged areas.

### BRIEF DESCRIPTION OF DRAWINGS

[0006] **FIG. 1.** Product providing free roaming mobile virtual reality environment with individual wheel drives.

[0007] **FIG. 2.** Coded data source for maintaining person medial within mobile product.

[0008] **FIG. 3** Product using projection enclosure and external motive source for tracking

### DETAILED DESCRIPTION OF THE INVENTION

[0009] The mobile interactive virtual reality product comprises a mobile platform **11** which in use moves on a surface, comprises an imager **21** which is attached to a structure which is attached to the platform, comprises at least one coded data source **41** attached at a person when the person is within the structure and is moving on the surface, where the imager views the coded data source and outputs a signal which causes the platform to move to keep the structure oriented with the person medial the structure.

[0010] The product can also comprise a display which displays images which can be viewed by the person when the person is within the structure. The display can comprise a wearable display device worn by the person. The display can comprise a screen display device **51A** attached to the structure on the platform. A projector **31** can project images on the screen display device. The screen display device can be a device with no projector such as a liquid crystal display.

[0011] The platform is adapted to move on the surface with velocities and accelerations which match the velocities and accelerations which can be achieved by a person. The structure can be within, and supported on, the platform as depicted in **FIG. 1** and the structure can be beyond, and supported from **13A**, the platform as depicted in **FIG. 3**. The platform can move by means of wheels **12**, by means of tracks **12A**, and by other mobility means.

[0012] The structure is mounted so that the structure moves with the platform. The structure and the platform are dimensioned and oriented so that when a person is within the structure and medial the structure the person can adopt various positions within the structure and on the surface.

[0013] The signal output by the imager can cause the platform to move such that the imager maintains an orientation relative to at least one coded data source.

[0014] The imager can have several components—which can be more and less than the seven depicted—all viewing the space within the structure from several locations.

[0015] The signal output by the imager represents coordinates of the coded data source relative to the field of view of the imager when the person is within the screen and when the coded data source is viewed by the imager. The signal can represent the identities of any components of the imager. The signal can also represent the values of any variable properties of the imager and of any imager components. The signal causes the platform to move when the person moves within the structure to keep the structure oriented with the person medial the structure.

[0016] There can be a plurality of coded data sources attached at a plurality of positions at the person, at objects with the person, on the surface, on the structure, and at any positions within and outside the structure. At least some coded data sources from the plurality of coded data sources will be viewed by the imager. In this case the signal also represents the identity of each viewed coded data source and

represents the coordinates of each viewed coded data source. The signal can also represent any variable properties of any viewed coded data source which has any variable properties.

[0017] The signal can also cause changes in the displayed images. The displayed image can be caused to change by changes in the field of view of the person.

[0018] The displayed images can be at least in part caused by a second signal representing motions of a second person moving with a second mobile interactive virtual reality product which is interchangeable with the mobile interactive virtual reality product described above.

[0019] "Person" here comprises human persons, non-human beings and non-sentient beings such as robots.

[0020] The product can also comprise a motion sensor which outputs a motion signal which causes the display device to cause the images to be unaffected by motions of the display device.

[0021] The imager and the coded data source can be those of patent application PCT/US01/13742 published 8 Nov. 2001 as WO 01/84475 A1 which is incorporated herein by reference.

[0022] Other equivalent forms of the platform, structure, motive means, display means, coded data sources, imagers, signal and control means will be obvious hereafter to

persons skilled in the art. Therefore, the invention is not limited to the particular examples shown and described here.

What I claim as my invention is:

1. A virtual reality apparatus comprising:

a platform;

a structure connected to the platform;

a motive means that drives the platform over a surface;

a coded data source on an independent person proximate the structure;

a signal from the coded data source;

an imager on the structure that detects the signal;

a control system that receives the signal and causes the motive means to maintain a medial location of the coded data source relative to the structure;

an information system generating virtual reality imagery that incorporates data from the coded data source; and

display means for presenting the imagery to the person.

2. The apparatus of claim 1 further comprising image motion stabilization means.

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