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(54) **INTERACTIVE TOY**

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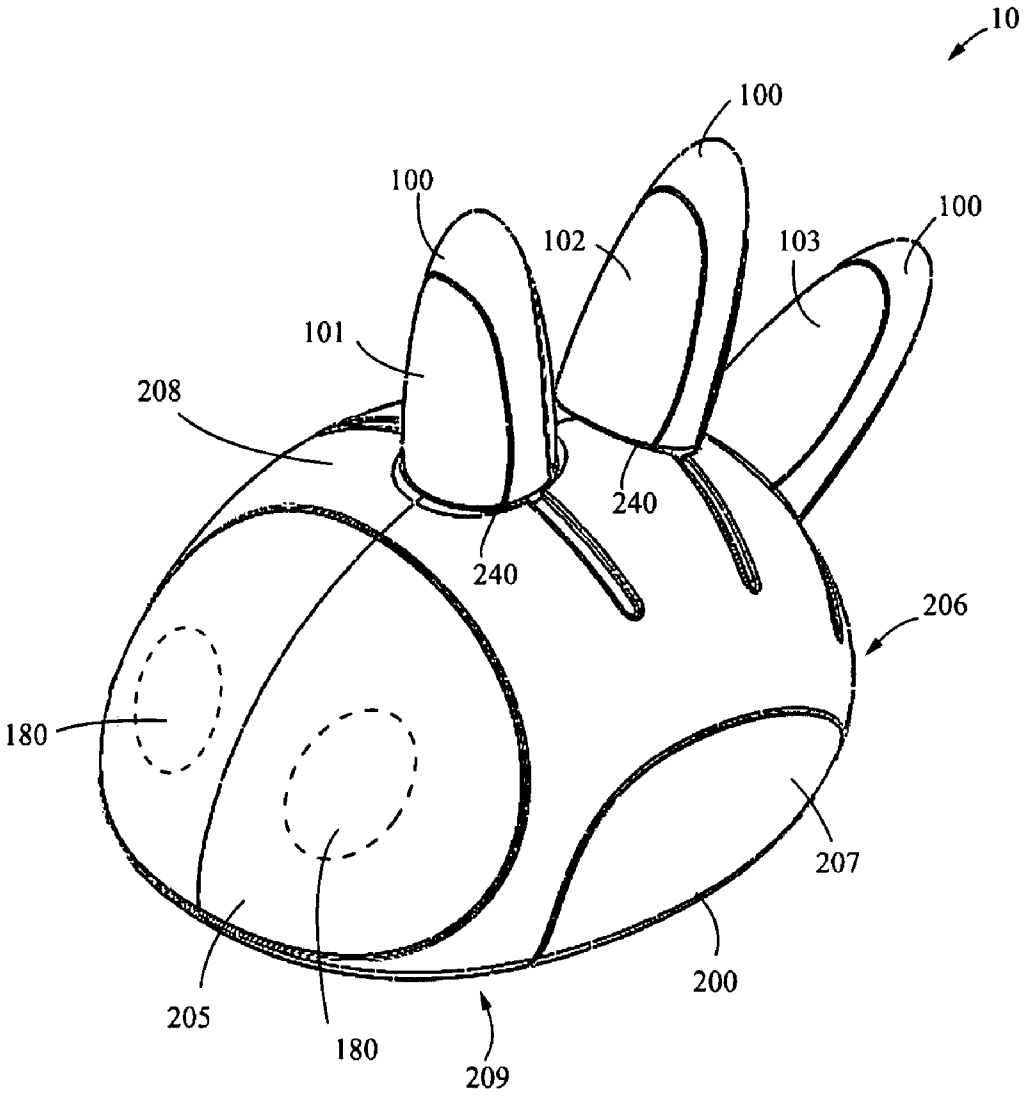
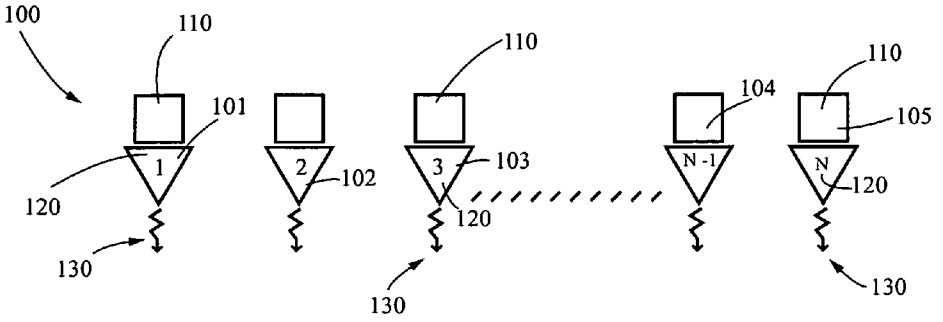
USPC **446/454**

(57) **ABSTRACT**

In an embodiment of the present invention, an interactive remote controlled toy (**10**) is provided. The toy (**10**) includes a vehicle (**200**) and a plurality of motion sensitive controllers (**100**) that cooperate to control the vehicle. The plurality of controllers (**100**) cooperate such that their relative orientation (**110**) determines the speed and direction the vehicle (**200**) moves.

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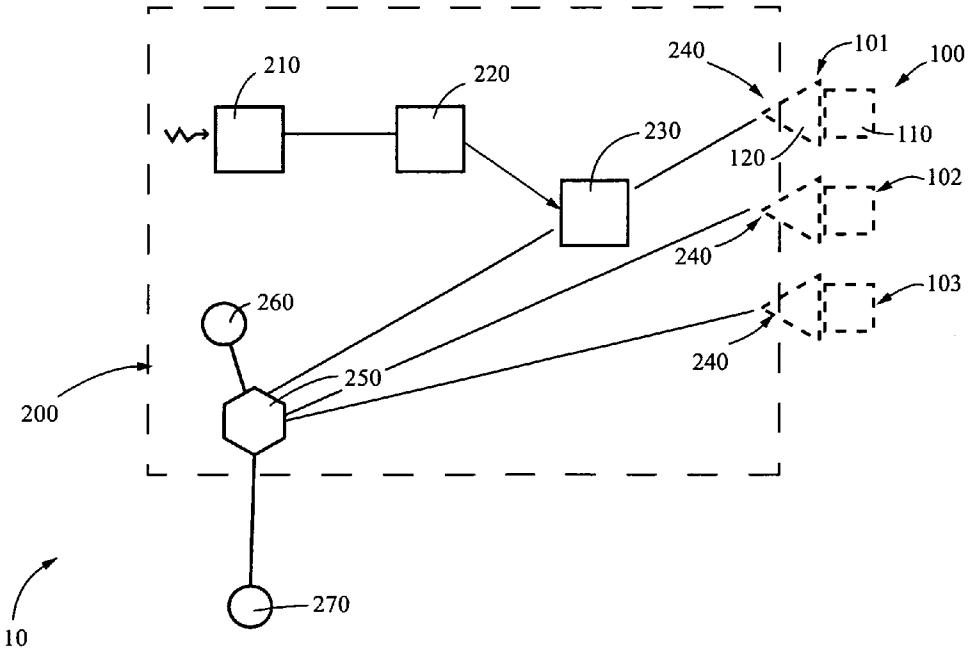
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250
200
270
10

Figure 1

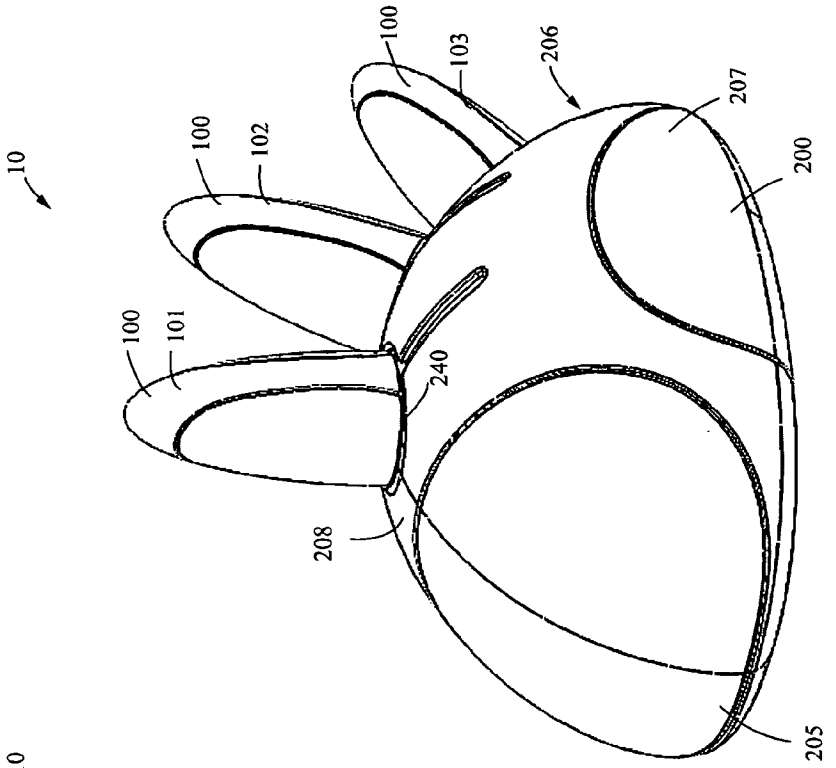

Figure 3

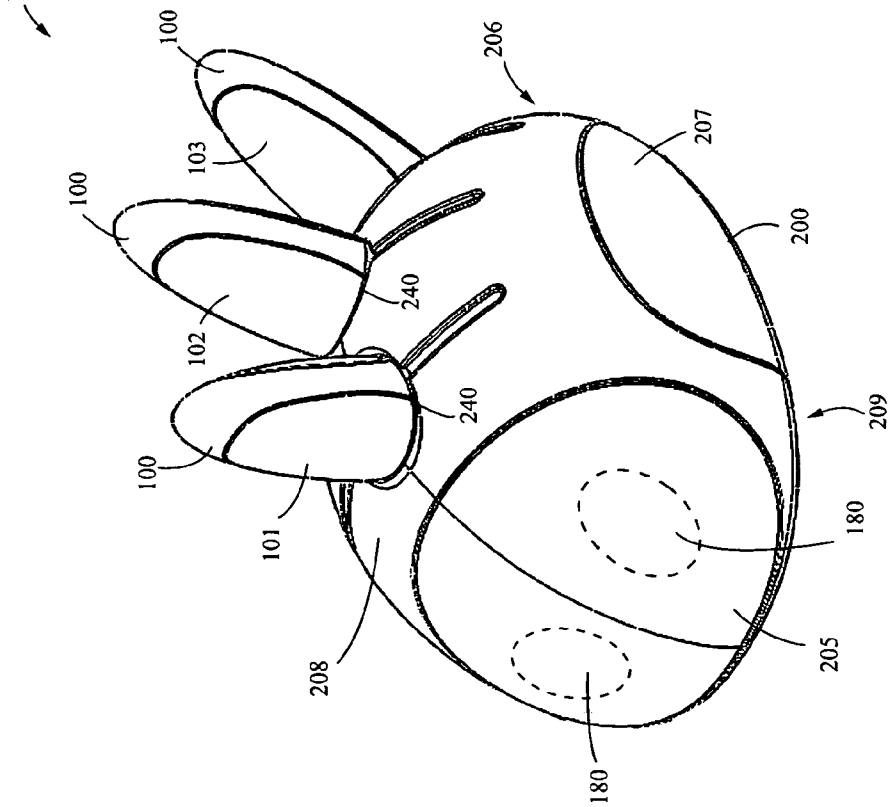

Figure 2

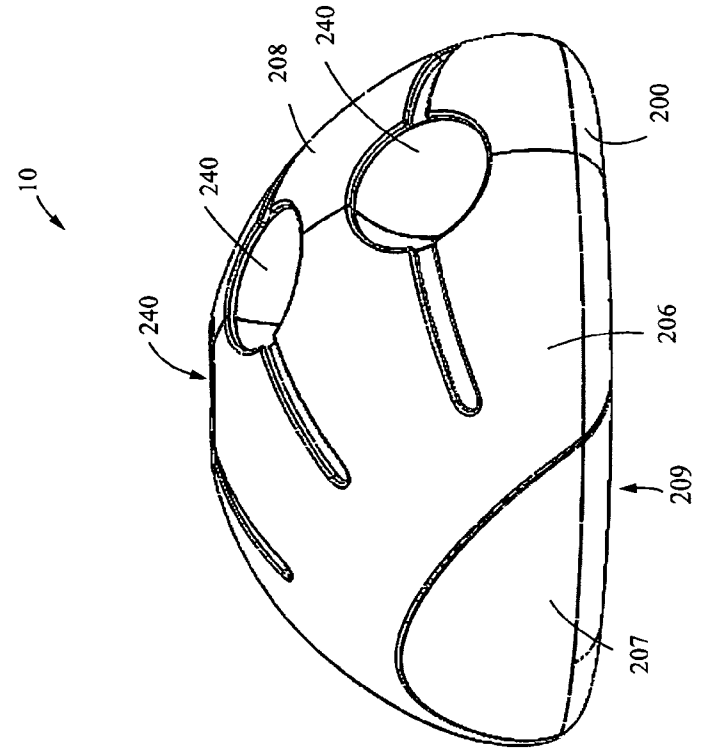

Figure 5

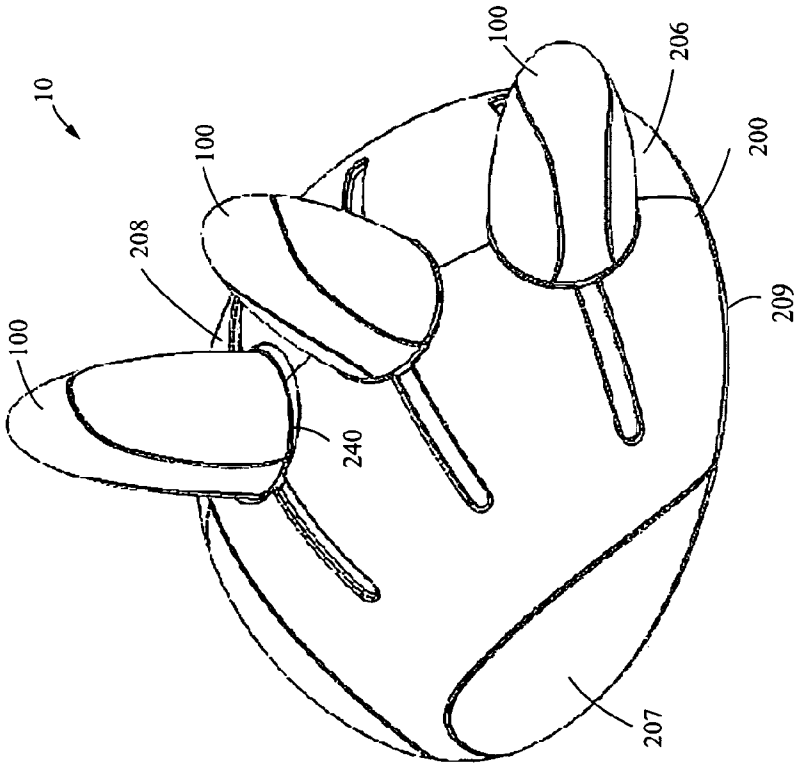

Figure 4

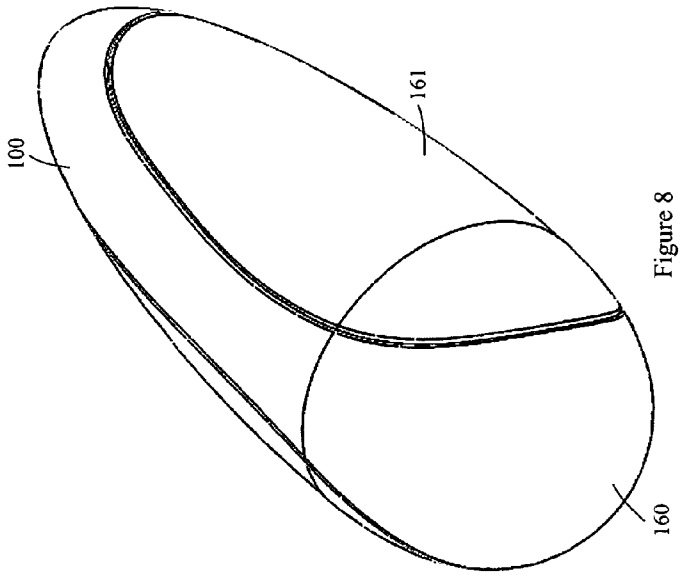

Figure 8

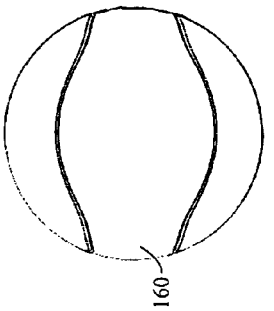

Figure 9B

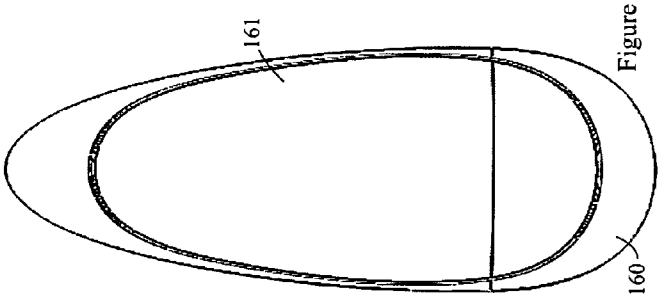

Figure 7

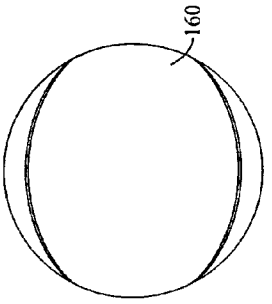

Figure 9A

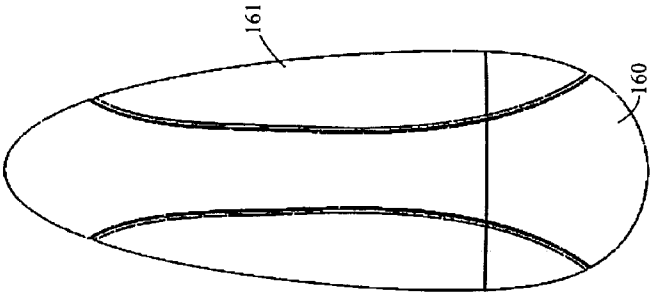

Figure 6

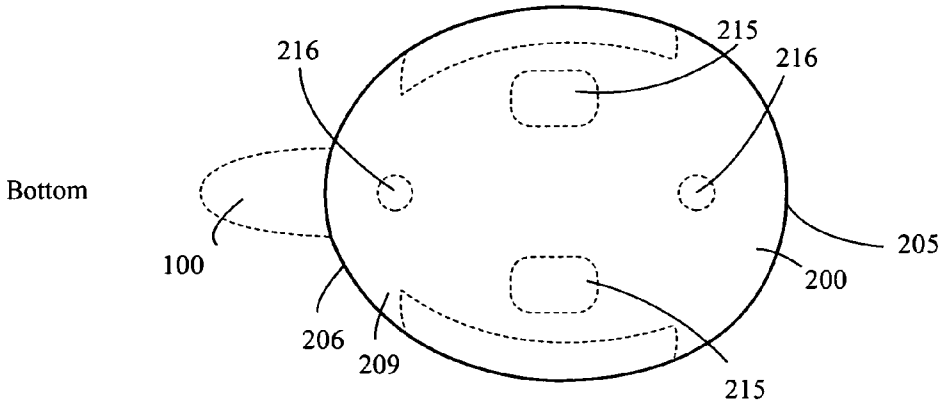

Figure 10

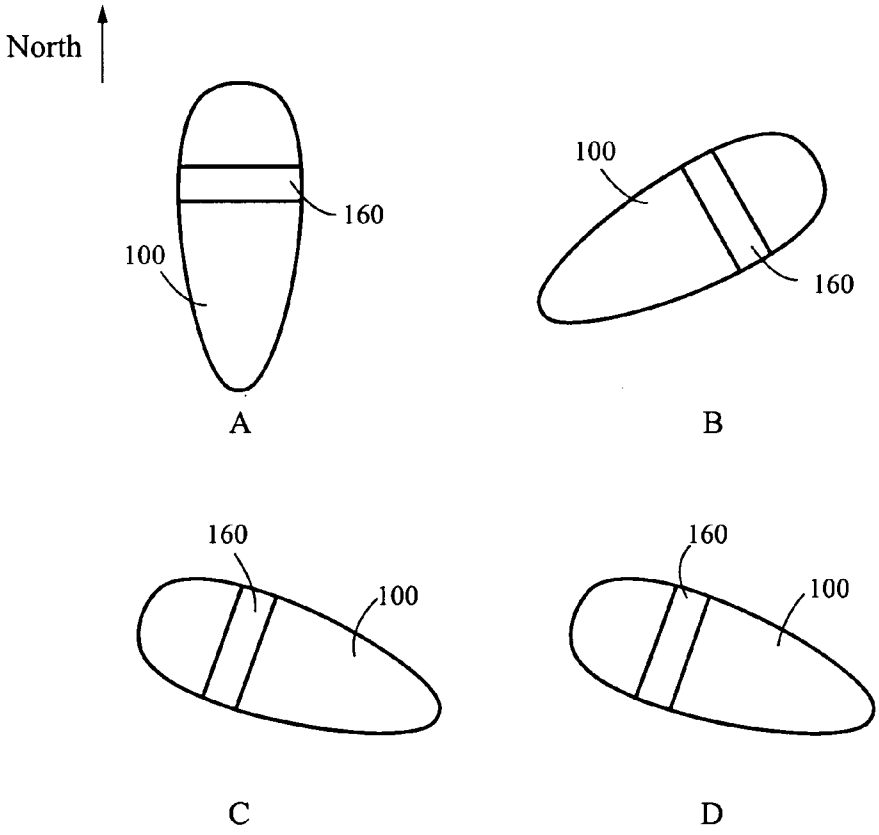

Figure 11

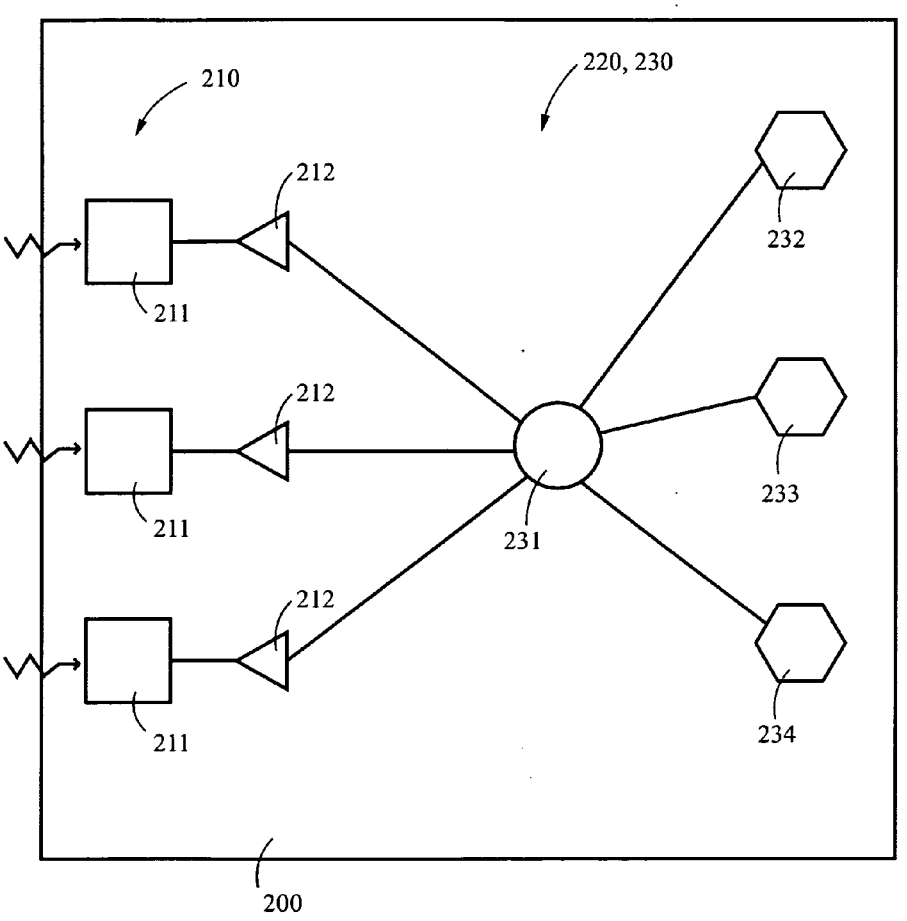

Figure 12

INTERACTIVE TOY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Patent Application No. 61/605,581, filed Mar. 1, 2012, the contents of which are incorporated herein by reference.

FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] N/A

TECHNICAL FIELD

[0003] The present invention generally relates to an interactive remote controlled toy used to assist individuals with disabilities.

BACKGROUND OF THE INVENTION

[0004] Autism is a neural social developmental disorder characterized by impaired interaction and communication. The invention is primarily intended to benefit autistic children, but can be used by any child. Users have to work together on verbal, physical, or non-verbal communicative levels. Specifically, users must be aware of each other's hand movements and must collectively work together to coordinate their movements. An autistic child would be able to learn via imitative play by observing peers or adults and their hand motions. The user also has to be very aware of his/her own movements. A child could greatly improve his/her spatial perception and motor planning as a result.

[0005] One of the ways in which the present invention could benefit a child with autism is with auditory processing in that a child with autism has to listen and process verbal directions from partner(s) in order to control the toy effectively. Another potential benefit is spatial orientation in that the toy is controlled by sensitive motion-based controls. The child has to be conscious of his or her own hand movement for the toy to go forward, backward, left or right in space. A third potential benefit is visual tracking The child has to visually follow the path of the toy as it moves through space. A further benefit is motor planning The child has to initiate, organize, and execute sequential movements in order to effectively maneuver the toy. Lastly, the child benefits from social interaction. A child with autism is required to be aware of his/her partner's actions while playing in a natural, unforced manner.

SUMMARY OF THE INVENTION

[0006] The present invention provides an interactive remote controlled toy. The toy includes a mobile robotic vehicle, and a plurality of motion sensitive controllers that generate data that is integrated to control the vehicle. The plurality of controllers cooperate such that their relative orientation determines the speed and direction of the vehicle.

[0007] In particular, an interactive remote controlled toy or vehicle includes a plurality of independently operative controllers with each controller having a control and a transmitter for sending at least one signal. A toy or vehicle has a receiver, control unit, and vehicle motion controller, the vehicle being responsive and moving by the collective signals received by the receiver from the controllers. The vehicle's response is both speed and direction of movement of the vehicle. In one embodiment, the control for each controller is an orientation sensor and the vehicle's response is the summation of all the signals received by all the controllers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] To understand the present invention, it will now be described by way of example, with reference to the accompanying FIGURES in which:

[0009] FIG. **1** is a schematic diagram of the overall system of the present invention;

[0010] FIG. **2** is an isometric front view of the interactive controlled toy of an embodiment of the present invention;

[0011] FIG. **3** is a perspective front view of the toy of FIG. **2**;

[0012] FIG. **4** is an isometric rear view of the toy of FIG. **2**;

[0013] FIG. **5** is a perspective rear view of the toy of FIG. **2**;

[0014] FIG. **6** is a top view of the controller of the toy of FIG. **2**;

[0015] FIG. **7** is a side view of the controller of the toy of FIG. **2**;

[0016] FIG. **8** is a front perspective view of the controller the toy of FIG. **2**;

[0017] FIG. **9**A is an end view of the controller of the toy of FIG. **2**;

[0018] FIG. **9**B is the opposite end view the toy of FIG. **2**;

[0019] FIG. **10** is a bottom view of the toy of FIG. **2**;

[0020] FIG. **11** shows some exemplary orientations of controllers; and,

[0021] FIG. **12** shows a schematic diagram of the circuitry within the vehicle.

DETAILED DESCRIPTION

[0022] While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments illustrated.

[0023] FIG. **1** shows a schematic diagram of the present invention. The system **10** includes a plurality of controllers **100** and a vehicle **200**. There can be any number of controllers (**101**,**102**, **103**,**104**,**105**) for the system. While N controllers are shown, in the preferred embodiment, three (**3**) controllers are shown (**101**,**102**,**103**). Each controller **100** includes within it at least two (**2**) components, that being a control **110** and a transmitter **120**.

[0024] The control **110** of each controller **100** involves the recognition of position and/or movement of the controller, i.e. location and/or orientation in space, and linear and/or rotational velocity and/or acceleration, as well as other types of tactile input, such as the presence/absence of touch, activation of buttons, and/or the application of light/hard pressure, etc. Recognition of the position and/or movement of the controller can be achieved with standard off-the-shelf inertial measurement units (IMUs), which incorporate digital accelerometers and/or gyroscopes that measure linear acceleration and/or rotational velocity. Information from these sensors can be integrated over time in standard ways to determine the change in location or orientation over time. For example, the controller can detect that it is in discrete positions such as "forward" (pointed straight ahead), "neutral" (pointed upward), "back" (pointed backwards), "left" (pointed ahead while rolled to the

left), and "right" (pointed ahead while rolled to the right). The controller might alternatively detect a continuous angular configuration in space (relative to gravity). The controller might alternatively detect that it is being moved, swung, or spun in a certain direction. Any of these inputs can be detected according to standard methods of using IMUs.

[0025] The controllers may additionally or alternatively incorporate sensors that allow them to establish their position relative to a global reference frame, such as a digital compass (which would allow reference to the planet earth), a camera that tracks a beacon (e.g. LED or fiducial marker) on the vehicle (which would allow reference to the vehicle) or a camera that tracks a set of beacons (e.g. LEDs or fiducial markers) arrayed around the room (which would allow reference to the local environment). For example, the room may be encircled by a ring of infrared LEDs that each blink according to a different prescribed pattern; each camera-equipped controller can then determine the direction it is pointing in the room according to the patterns it is able to see at any moment. By incorporating this global reference information with the movement information from the IMU, the controller can accurately determine its global position and orientation.

[0026] The transmitter **120** of each controller takes the movement, button pushed upon, or orientation of that particular controller **100** and turns it into a transmitted signal. There are numerous standard means for doing this, such as Wi-Fi, Bluetooth, ZigBee, other radio frequency (RF) protocols, optical transmission such as Consumer Infrared (IR) or IrDA, etc. The information to be transmitted from each controller would be a stream of up to six numerical values (three linear axes and three rotational axes) encoding position/movement relative to the chosen reference frame (the user, the vehicle, or the local environment).

[0027] The signals by the plurality of transmitters' signals are collected or received by one or more receivers **210** associated with the vehicle **200**, preferably therein. Those signals are passed to a central control unit **220** in the vehicle and processed into a processed signal and passed, via wiring, to the vehicle motion controller **230** which specifically direct the vehicle to move in a particular direction and speed by controlling the vehicle's drive system, such as a turret and a single wheel or multiple wheels. It is of course recognized that the transmitting system **120** in the controllers **100** must be matched with the receiving system **210** in the vehicle **200**.

[0028] In the preferred embodiment, the vehicle **200** has physical docking ports **240** for each of the controllers **100**. The docking ports **240** provide a place to store the individual controllers **100**, and, if desired, a place to charge the controllers when the vehicle is being charged.

[0029] Charging the vehicle's power source **250** can be accomplished by batteries, rechargeable batteries **260** and/or by regular A/C through an A/C connection and converter **270**.

[0030] The details of the controllers **100** and vehicle **200** are shown in more detail in FIGS. **2-9**. In the preferred embodiment, the interactive toy **10** of the present invention's vehicle **100** takes on a friendly, non-intimidating shape. Here, the vehicle has a front **205**, rear **206**, two sides **207**, a top **208**, and a bottom **209**. The controls **100** are stored in ports **240** in the top **208** of the vehicle **200** and the wheels/propulsion system is on the bottom **209**. In the preferred embodiment, the controllers **100** are sensitive to motion, orientation and possibly pressure and/or button input. The vehicle **200** is preferably electronically controlled and operates on rechargeable batteries. The controllers **100** likewise preferably operate on rechargeable batteries, which may be recharged by plugging them into the vehicle **200** or a separate charger (not shown). The controllers may each have two exposed electrical contacts for a connection to the vehicle's or charger's DC power supply, with corresponding contacts in the receptacle, or they may be inductively charged through the proximity of induction coils in both the controller and the vehicle/charger when the controller is placed in its receptacle.

[0031] In one embodiment, the vehicle is steered and propelled by two independently drivable wheels **215** with additional passive casters **216** or bearings for stability. In other embodiments, the drive wheels may rotate together while being steered relative to the chassis and additional wheels or casters; or the wheels may be omnidirectional and independently steerable; or the vehicle may locomote by other means such as walking

[0032] The vehicle **200** is controlled by users operating the controllers **200** to move along a surface such as a floor in response to the relative orientation of the controllers **100**. In an embodiment, each user points his/her controller **101**,**102**, **103** in a certain direction, and the vehicle **200** moves in response to the relative orientation of the controllers or the collective sum or pool of the controllers' positions/orientations.

[0033] For example, the direction/orientation of the controllers can be considered relative to the user, relative to a fixed frame of reference in the world (e.g. the room), or relative to the moving frame of reference of the vehicle. Additionally, the direction of motion of the vehicle can be considered relative to the direction in which the controllers are collectively oriented or the summation of the orientations, or a location in the room toward which the controllers are pointed.

[0034] So far the preferred embodiment of the system has been described where the controllers incorporate sensors (for recognizing their position and/or movement) and transmitters (for relaying this information to the vehicle), and in which the vehicle contains a receiver (for integrating this information into a control signal for directing its movement). In other embodiments, the sensors that measure the position/movement of the controllers may be placed external to the controllers, and the controllers themselves may be passive. For example, the vehicle may incorporate a camera that is able to see the controllers and infer their position and orientation through their color, shape, or emission of light. Alternatively, the room may be instrumented with cameras that can detect the controllers' position and orientation, as well as the vehicle's position, and an external computer system may control the movement of the vehicle according to its measurement of the controllers' position/movement. For example, the controllers may be equipped with spatially arrayed infrared LEDs that blink in different patterns, such that certain LEDs can only be viewed from certain angles; the cameras located on the vehicle or in the room may determine the controllers' position/movement according to the patterns that are visible at any moment.

[0035] The controllers, the vehicle, and/or an external computer system may communicate the position and/or movement information to each other in order to determine the appropriate behavior of the vehicle relative to the input from the controllers. This communication may take place over any of a standard set of technologies and protocols, including Wi-Fi, Bluetooth, ZigBee, other radio frequency (RF), optical, or sonic transmission.

[0036] In one embodiment, if there are two users and each has the controller pointed straight ahead (FIG. **11**A), the vehicle **200** will move straight ahead. However, if one user points his controller **100** straight to the left (FIG. **11** C), and the other user points his controller **100** straight ahead (FIG. **11**A), the vehicle **200** will move at a forty-five degree angle (the intermediate direction). The more in sync the controllers **101**,**102**,**103** are oriented, in the same pointed direction, the faster the vehicle **200** moves.

[0037] In another embodiment, the users may point their controllers at different locations in the room (e.g. on the floor). The vehicle will move to an average position in between the two commanded positions. In order for the vehicle to move to a desired location, rather than an intermediate location, the two users must agree to point their controllers at the same location.

[0038] The controllers have a body **161** shaped for easy grasping by children and a size so as to prevent a choking hazard. The orientation sensors **110** and transmitters **120** are built within the body **161**.

[0039] The vehicle **200** will not activate unless two or more controllers **100** are in use. The vehicle **200** also provides feedback features in which the user is rewarded or informed for correct or incorrect play and teamwork. When users have their controllers **100** pointed in similar directions (FIGS. **11**C and **11**D), one can assume they are correctly "reading" verbal or non-verbal cues from each other and working together.

[0040] In a further embodiment, each controller **100** has a color ribbon **160** running across the top or the top itself When the users' controllers **100** are pointed in similar directions, the color ribbon **160** turns green via a light source (not shown). If the users' controllers **100** are pointed in opposite directions, for example, the ribbon **160** will turn red from a light source (not shown). Additionally, when the users' controllers **100** are pointed in similar direction, the vehicle **200** will actually go faster as a form of positive feedback for good performance. The ribbon can be executed as other embodiments. The controller may have a linear pattern of 3 lights. One light indicates if the controller is pointing in the same direction, or similar, as the other controllers. Another light indicates if the controller's direction or orientation is offset at an angle right of other controllers' direction/orientation. The third light indicates if the controller is pointing in direction/orientation offset at an angle left of the other controller's direction/orientation. Thus, the user is constantly informed about his or her participation in play and is also given incentives to communicate with the other user(s). In addition, the vehicle **200** is provided with eyes **180** or other indicia (FIG. **2**). The eyes **180** give directional, visual feedback to the users indicating in which direction the vehicle **200** is traveling. They can, of course, include lights.

[0041] The movement of the vehicle **200** in response to the orientation controllers **101**,**102**,**103** is summarized in the following Table 1.

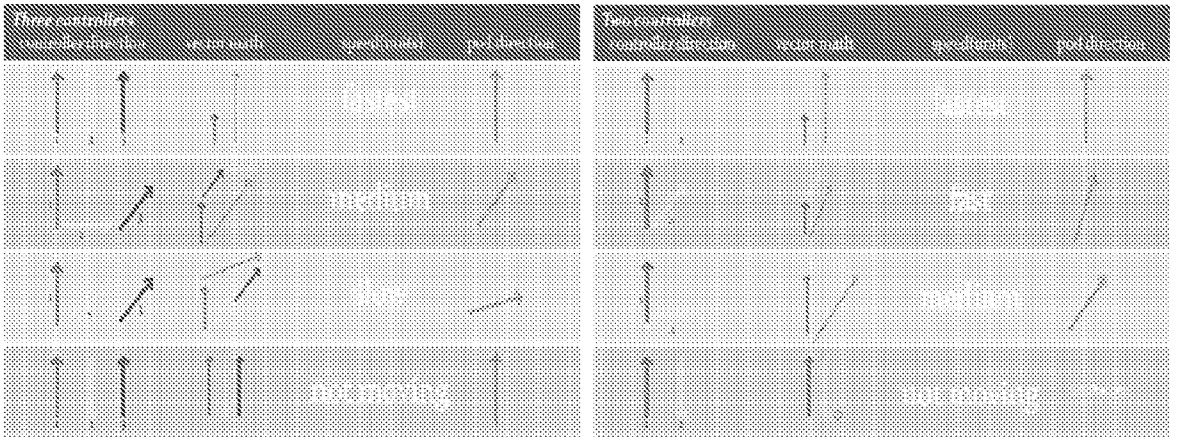

Table 1

[0042] Specifically, as shown generally in FIG. **12**, the signals by the plurality of transmitters' signals are received by **210** in the vehicle **200**. In the embodiment shown, there are three receivers **211** and amplifiers **212**. These signals are passed to a central control unit **220** in the vehicle **200** processes the signals received and performs a function to them, such as vector addition, and breaks the signal into three characteristics, that being direction forward/backwards, direction left/right, and speed. The three characteristics are transmitted to the circuitry controlling the direction forward/backward of the wheels **232**, the circuitry controlling the direction turning right/turning left of the wheels **233**, and the circuitry controlling the rotational speed of the wheels **234**.

[0043] It should be noted that controllers are not confined to physical orientation as a means to drive the direction of the vehicle. Each controller may have a joy stick, button pad etc., that works in conjunction with commands from the other controller to orient the direction and pace of the vehicle's movement. And, the vehicle itself may be the compilation of two or three total sub-vehicles. Each vehicle could be controlled as its own body, however, when joined with the other vehicles the connected bodies would function as a single unit and be controlled by multiple users.

[0044] The terms "first," "second," "upper," "lower," "top," "bottom," "right," "left," etc. are used for illustrative purposes relative to other elements only and are not intended to limit the embodiments in any way. The term "plurality" as used herein is intended to indicate any number greater than one, either disjunctively or conjunctively as necessary, up to an infinite number. The terms "joined," "attached," and "connected" as used herein are intended to put or bring two elements together so as to form a unit, and any number of elements, devices, fasteners, etc. may be provided between the joined or connected elements unless otherwise specified by the use of the term "directly" and/or supported by the drawings.

[0045] While the specific embodiments have been illustrated and described, numerous modifications come to mind without significantly departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying Claims.

What is claimed is:

1. An interactive remote controlled toy comprising:

a plurality of independently operative controllers, each controller having a control and a transmitter for sending at least one signal; and,

a vehicle having a receiver, control unit, and vehicle motion controller, the vehicle responsive and moving by the collective signals received by the receiver from the controllers.

2. The toy of claim **1** wherein the vehicle's response is both speed and direction of movement of the vehicle.

3. The toy of claim **1**, wherein the control for each controller is an orientation sensor.

4. The toy of claim **1** wherein the vehicle's response is the summation of all the signals received by all the controllers.

5. The toy of claim **1** wherein the plurality of controllers cooperate such that their relative orientation determines the direction the vehicle moves.

6. The toy of claim **5** wherein the plurality of controllers cooperate such that their relative orientation determines the speed the vehicle moves.

* * * * *