A vibrating motion base includes at least two motors each driving a respective eccentric load, wherein the motors may be controlled independently or in coordination with one another to selectively generate vibrations resulting in translational motion of the support frame, pivotal motion of the support frame, or a combination of translational and pivotal motion of the support frame.
DIRECTIONAL VIBRATING MOTION BASE

FIELD OF THE INVENTION

[0001] The invention relates generally to the field of remotely-controlled moving toys and figures, and more particularly to a steerable vibrating motion base for toys, figures and the like.

BACKGROUND OF THE INVENTION

[0002] It is known to impart translational motion to toys, dolls, figurines, and like objects by providing a motor that rotates a load eccentrically mounted on the motor shaft such that the load is rotated about an axis spaced from the center of gravity of the load. As the load is rotated, vibrations are generated, thereby causing the toy to move in a direction or curved path across the surface on which it is supported. The direction of movement or path will depend upon the orientation of the motor and load within the toy, and upon weight distribution in the toy itself. In order to move the toy in a reverse direction or path, the rotational direction of the motor is switched to an opposite rotational direction. The motor may be activated, and its direction of rotation selected, by a remote controller or by a switch on the toy itself.

[0003] What is needed, however, is a vibrating motion base for toys and the like which may be controlled directionally so that the toy can be steered wherever the user wishes or pivoted in place.

SUMMARY OF THE INVENTION

[0004] To meet this need, the present invention provides a vibrating motion base having at least two motors each driving a respective eccentric load, wherein the motors may be controlled separately or in coordination with one another to selectively generate vibrations resulting in translational motion of the support frame, pivotal motion of the support frame, or a combination of translational and pivotal motion of the support frame.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The nature and mode of operation of the present invention will now be more fully described in the following detailed description of the invention taken with the accompanying drawing figures, in which:

[0006] FIG. 1 is a schematic block diagram of a motion base apparatus of the present invention;

[0007] FIG. 2 is a side elevational view of a motion base formed in accordance with an embodiment of the present invention;

[0008] FIG. 3 is a top plan view of the motion base shown in FIG. 2;

[0009] FIG. 4 is a top plan view of a motion base formed in accordance with another embodiment of the present invention;

[0010] FIG. 5 is a side elevational view of a motion base formed in accordance with a further embodiment of the present invention;

[0011] FIG. 6 is a depiction of a remote controller for controlling a motion base of the present invention in accordance with a first control scheme; and

[0012] FIG. 7 is a depiction of a remote controller for controlling a motion base of the present invention in accordance with a second control scheme.

DETAILED DESCRIPTION OF THE INVENTION

[0013] FIG. 1 shows a motion base apparatus 10 of the present invention in schematic block diagram. Apparatus 10 generally comprises a motion base 12 and a remote controller 30 communicating with the motion base.

[0014] Motion base 12 includes a power source 14, a receiver 16, a motor drive circuit 18 receiving signals from receiver 16, and first and second motors 20A, 20B driven by motor drive circuit 18. First motor 20A includes a rotationally driven shaft 22A which carries a load 24A eccentrically mounted on shaft 22A such that the center of gravity of load 24A is spaced from the rotational axis of shaft 22A. A similar arrangement is provided with respect to second motor 20B, which includes a shaft 22B carrying an eccentrically mounted load 24B. As will be understood, when motors 20A, 20B are energized, the rotation of eccentrically mounted loads 24A, 24B will generate respective vibrations acting on motion base 12 at the attachment locations of motors 20A, 20B to the motion base. In accordance with the present invention, the generated vibrations are used to impart translational and rotational motion to motion base 12 in a controlled manner as will be described further herein.

[0015] Remote controller 30 includes a power source 32, a transmitter 34 matched with receiver 16 on motion base 12 for wireless or wired communication with receiver 16, and directional controls 36 enabling a user to input control commands that are communicated from transmitter 34 to receiver 16.

[0016] Reference is now made to FIGS. 2 and 3, which illustrate an embodiment of motion base 12 formed in accordance with the present invention. Motion base 12 is intended to support and move a toy, doll, figurine, or other object designated by reference letter T in FIG. 2. Object T is shown in phantom line in FIG. 2 and is not considered part of the motion base apparatus of the present invention.

[0017] Motion base 12 includes a support frame 13, which may be a molded plastic part or other support structure. As can be seen in FIG. 2, power source 14, a printed circuit board 15, and motors 20A, 20B are mounted on an upwardly facing surface of support frame 13, and a damping layer 17 is affixed to a downwardly facing surface of the support frame. Power source 14 is preferably a battery or series of batteries. Receiver 16 and motor drive circuit 18 are preferably incorporated on printed circuit board 15 as shown in FIG. 3.

[0018] In the present embodiment, first and second motors 20A and 20B are arranged “back to back” on support frame 13 such that the rotational axes of shafts 22A and 22B are aligned with one another and eccentric loads 24A and 24B are on opposite sides of motion base 12. A pair of brackets 21A, 21B is shown for holding motors 20A, 20B in place on support frame 13, however other attachment mechanisms may be used. In this configuration, motors 20A, 20B and loads 24A, 24B are symmetrically arranged with respect to a central axis of motion base 12, and first motor 20A, shaft 22A, and load 24A are identical to their counterparts second motor 20B, shaft 22B, and load 24B. As will be understood, simultaneous operation of motors 20A, 20B such that shafts 22A, 22B rotate in the same rotational direction at the same rotational speed (rpm) will generate balanced vibrations of the same frequency and strength on each opposite side of motion base 12, thereby causing the motion base to move in a substantially
straight translational direction along a table, floor, or other flat surface. Motion base 12 can be moved in an opposite translational direction by reversing the common rotational direction of shafts 22A, 22B. Motion base 12 can also be pivoted by driving the first and second motors differently. For example, first motor 20A may be operated to rotate its load 24A in an opposite rotational direction from load 24B such that the vibrations exert a moment of inertia about a center of gravity of motion base 12 to pivot the motion base. As another example, one of the motors 20A, 20B may be driven while the other motor is not, again providing an imbalance resulting in pivotal motion of motion base 12. As yet another example, motors 20A, 20B may be driven to rotate loads 24A, 24B in the same rotational direction but at different rotational speeds, thereby causing motion having both a translational component and a pivotal component such that the motion base follows a curved path. As will be appreciated, the distribution of two controllable vibration mechanisms on motion base 12 enables the motion base to be directionally steered along any desired path.

Damping layer 17 is desirable to reduce noise, such as “clicking” noise that results from plastic vibrating on a hard surface. A wide variety of materials may be selected for this purpose, including but not limited to foam, styrofoam, felt, and brushes.

FIG. 4 shows another embodiment of the present invention generally similar to the embodiment shown in FIGS. 2 and 3, except that one of the motors 20A, 20B is arranged at an opposite end of the support frame such that shafts 22A, 22B are no longer coaxial. The principles of operation remain the same.

An embodiment shown in FIG. 5 may be used to mimic an upright robot-style toy configuration wherein the motors 20A, 20B form support legs in cooperation with tubes of damping material 217 (the tubes are shown sectioned in FIG. 5 to reveal the motors). The non-shaft ends of motors 20A, 20B are affixed to a side of support frame 13, and the shaft ends of the motors are pointed downward. The eccentric loads 24A, 24B are spaced away from contact with a supporting surface by damping tubes 217, which extend beyond the eccentric loads to engage a support surface.

By way of non-limiting examples, two possible embodiments of remote controller 30 are shown in FIGS. 6 and 7. In FIG. 6, remote controller 30 includes directional controls generally identified by reference numeral 36, a transmission antenna 38, an on/off switch 40, and an LED power indicator 41. Remote controller 30 of FIG. 6 is intended to be used in a control scheme wherein first motor 20A and second motor 20B are controlled independently of one another. Accordingly, specific directional controls 36 include a forward control button 42A depressible to drive first motor 20A in a first rotational direction, e.g. clockwise, and a reverse control button 44A depressible to drive the first motor in an opposite rotational direction, e.g. counterclockwise. Forward control button 42A and reverse control button 44A may be coupled to one another to form a single actuator button, wherein an upper portion of the actuator button corresponds to forward control button 42A and a lower portion of the actuator button corresponds to reverse control button 44A. Forward control button 42A and reverse control button 44A may be designed as simple toggle controls (on/off), or they may control rotational speed of the motor in proportion to an extent of depression of the button by a user. Directional controls 36 further include a forward control button 42B and a reverse control button 44B functioning in a manner similar to control buttons 42A and 44A to drive second motor 20B. As will be understood, the remote controller 30 shown in FIG. 6 allows a user to control motor 20A and motor 20B independently of each other to steer motion base 12.

FIG. 7 shows another possible embodiment of remote controller 30 wherein directional controls 36 include a forward control button 42, a reverse control button 44, a left control button 46, and a right control button 48. In this embodiment, each control button provides coordinated drive signals to both motors 20A and 20B. Forward control button 42 rotates motors 20A and 20B such that each motor and its associated eccentric load generates vibrations for moving motion base 12 in a forward direction, whereas reverse control button 44 drives motors 20A, 20B in an opposite manner to move the motion base in a reverse direction. Left control button 46 drives motors 20A, 20B in a manner that causes motion base 12 to turn or pivot to the left, while right control button 48 drives the motors so as to cause the motion base to turn or pivot to the right.

Those skilled in the art will recognize that a variety of remote controllers for toy vehicles and the like are commercially available and can be used in practicing the present invention.

While each of the embodiments described herein is limited to two motors, it is contemplated to provide more than two motors, each motor with its own eccentric load, to generate vibrations at more locations on the motion base.

As will be appreciated from the foregoing description, the present invention provides an inexpensive remotely-controlled motion base for toys and the like that can be steered in any direction.

What is claimed is:

1. A motion base apparatus comprising:
   a support frame;
   a first motor carried by the support frame, the first motor including an shaft having an axis of rotation;
   a first load eccentrically mounted on the shaft of the first motor to rotate with the shaft to generate vibrations;
   a second motor carried by the support frame, the second motor including an shaft having an axis of rotation;
   a second load eccentrically mounted on the shaft of the second motor to rotate with the shaft to generate vibrations;
   a power source carried by the support frame; and
   motor control electronics for connecting the power source to the first and second motors to energize the first and second motors, wherein the first and second motors are controllable to selectively generate vibrations resulting in translational motion of the support frame, pivotal motion of the support frame, or a combination of translational and pivotal motion of the support frame.

2. The motion base apparatus according to claim 1, wherein the motor control electronics includes motor control circuitry carried by the support frame and a remote controller in communication with the motor control circuitry for enabling a user to send control commands to the motor control circuitry.

3. The motion base apparatus according to claim 2, wherein the remote controller includes a plurality of control buttons enabling a user to control the first and second motors independently of one another.

4. The motion base apparatus according to claim 2, wherein the remote controller includes a plurality of control buttons enabling a user to control the first and second motors together in coordination with one another.

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