ABSTRACT

A container or box may include a plurality of side panels, a bottom panel, and a top panel. The panels are coupled together to form a box interior with a total interior volume \( V_t \). A separating panel is in the box and divides the box interior into a first chamber and a second chamber. The first chamber has a volume greater than or equal to 0.70 \( V_t \), and the second chamber has a volume less than or equal to 0.30 \( V_t \). An orientation sensing unit is provided that is housed entirely within the second chamber and is configured to sense and wirelessly transmit a signal with information on the orientation of the box.
FIG. 6

Start

Measure accelerometer

Determine what side is face up

Enter sleep mode for a predetermined length of time

Yes

Has same side been up the predetermined number of times?

No

Transmit signal
CONTAINER WITH ORIENTATION SENSOR

TECHNICAL FIELD

[0001] The present disclosure relates generally to a container for containing an object, and more particularly, but not exclusively, to a container that is capable of receiving an object and wirelessly provides an indication of the orientation of the container.

BACKGROUND

[0002] In many situations, it is desirable to know the orientation of an object in space. For example, in many games, the way an object is oriented will have an effect on the game. Rolling dice in the gambling game of craps, for example, causes two dice to land with one plane of each die oriented face up. The number of pips on the face up dice are totaled to provide the roll total.

[0003] Amusement devices are known in which electronics are provided within an object, such as a die, that provide the orientation of the device remotely to a receiver of some sort. While useful for their purposes, such as in games, these devices, however, are limited in that they are typically sealed objects, or the electronics occupy substantially all of the available volume within the object.

[0004] Other examples of objects in which the object’s orientation is used are smartphones and tablets, which employ three-axis accelerometers to determine the orientation of the device. Depending on the orientation, the screen will re-orient to be face up for the user, or move from portrait display to landscape. A large number of apps take advantage of the built-in sensor in creating games for the smartphones and tablets in which the user manipulates the device in space to interact with the game, while the three-axis accelerometer provides the necessary signals to the app to change the screen and provide the user with an immersive experience.

[0005] Still other examples include game controllers that use three-axis accelerometers and transmit signals to the video game console during game play. Through such handheld game controllers, a video game player is able to simulate the actual movement of an object, such as a tennis racket, during a video game and the representation of the tennis racket within the video game will follow similarly on the video screen.

SUMMARY

[0006] There is a need for a container that provides the orientation of the container, yet still has an available volume within the container for receiving an object.

[0007] This and other needs are met by embodiments of the present disclosure which provide a box comprising a plurality of side panels, a bottom panel and a top panel. The panels are coupled together to form a box interior with a total interior volume Vt. A separating panel is in the box and divides the box interior into a first chamber and a second chamber. The first chamber has a volume greater than or equal to 0.70 Vt, and the second chamber has a volume less than or equal to 0.30 Vt. An orientation sensing unit is provided that is housed entirely within the second chamber and is configured to sense and wirelessly transmit a signal with information on the orientation of the box.

[0008] The earlier stated needs are also met by other embodiments of the present disclosure which provide a container comprising a housing having a top, bottom and sides, which form an interior volume. The container has a false bottom within the interior volume, and an orientation sensing unit within the interior volume and between the false bottom and the housing bottom. The orientation sensing unit is configured to sense the orientation of the container and wirelessly transmit a signal providing information on the orientation of the container.

[0009] The earlier stated needs are also met by still further embodiments of the present disclosure which provide a method of sensing the orientation of a box containing an object, the box having a plurality of sides and a total interior volume Vt. The total interior volume is divided into a first chamber with a volume greater than or equal to 0.70 Vt and a second chamber with a volume less than or equal to 0.30 Vt. An orientation sensing unit is contained entirely within the second chamber. The orientation sensing unit is configured to sense the orientation of the box and wirelessly transmit a signal providing information on the orientation of the box. The method includes the steps of opening the box and placing an object within the first chamber and closing the box. The box is oriented to a rest position with one side of the box face up. The method further comprises wirelessly receiving the signal from the orientation sensing unit to determine the orientation of the box.

[0010] It is understood that other configuration of the subject technology will become readily apparent to those skilled in the art from the following detailed description, wherein various configurations of the subject technology are shown and described by way of illustration. As will be realized, the subject technology is capable of other and different configurations and its several details are capable of modification in various other respects, all without departing from the scope of the subject technology. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is an exploded perspective view of a container constructed in accordance with embodiments of the present disclosure.

[0012] FIG. 2 is a perspective view of the assembled container of FIG. 1 with two of the side panels removed to depict for illustrative purposes the interior of the container, and the container is a first exemplary orientation.

[0013] FIG. 3 is a cross-sectional view according to cross-section A-A of FIG. 2.

[0014] FIG. 4a is a plan view of the container of FIGS. 1 and 2, with the top panel removed for illustrative purposes, depicting the container without panel inserts.

[0015] FIG. 4b is the plan view of FIG. 4a, depicting the container with panel inserts.

[0016] FIG. 5 is a block diagram of the electronics board in accordance with exemplary embodiments of the present disclosure.

[0017] FIG. 6 is a flow chart for operating a microcontroller of the electronics board of FIG. 5 to provide the orientation of the container, in accordance with embodiments of the present disclosure.

[0018] FIG. 7 is a depiction of the assembled container of FIGS. 1 and 2, in a second exemplary orientation, with the electronics board of FIG. 5 shown in phantom for illustrative purposes.
DETAILED DESCRIPTION

[0019] The detailed description set forth below is intended as a description of various configurations of the subject technology and is not intended to represent the only configurations in which the subject technology may be practiced. The appended drawings are incorporated herein and constitute a part of the detailed description. The detailed description includes specific details for the purpose of providing a thorough understanding of the subject technology. However, it will be clear and apparent to those skilled in the art that the subject technology is not limited to the specific details set forth herein and may be practiced using one or more embodiments. In one or more instances, well-known structures and components are shown in block diagram form in order to avoid obscuring the concepts of the subject technology.

[0020] FIG. 1 illustrates an example container (or “box”) shown in exploded view constructed in accordance with one or more embodiments. Not all of the depicted components may be required, however, and one or more embodiments may include additional components not shown in the figure. Variations in the arrangement and type of the components may be made without departing from the spirit or scope of the claims set forth herein. Additional, different or fewer components may be provided.

[0021] The container 10 (or box 10) is depicted in exploded view in FIG. 1, and has a plurality of side panels 12, which in the illustrated embodiment, are generally square in shape. A top panel 20 and a bottom panel (not seen in FIG. 1) enclose the container to form an enclosed cube with a total interior volume Vt. In certain embodiments, the top panel 20 is readily removable and may be connected with a releasable snap fit. In certain other embodiments, the top panel 20 is hingedly connected to one of the side panels 12 and is not removable from the container 10. The side panels 12, the top panel 20 and the bottom panel may be considered to form a housing of the container.

[0022] An orientation sensing unit 16, provided on a circuit board, fits within the interior of the container 10, and in preferred embodiments, is positioned near and parallel to the bottom panel, as will become more apparent in FIGS. 2 and 3. A separating panel 18 fits over the orientation sensing unit 16 in the interior of the container 10. In certain preferred embodiments, the separating panel 18 is formed from the same material as the side panels 12, and colored similarly. The separating panel 18 is press fit into the interior of the container 10, in preferred embodiments. Due to the closeness of the fit of the separating panel 18 with the interior of the container 10, the coloring of the separating panel 18 to resemble that of the interior side of the side panels 12, and the depth in the container 10 at which the separating panel 18 is press fit, the separating panel acts as a “false bottom”. In other words, to an observer looking into the container 10, the separating panel 18 appears to be the bottom panel and the bottom of the container, such that the container 10 does not appear to include the orientation sensing unit 16.

[0023] The container has a plurality of retainers 14 that are formed at the edges of the side panels 12 and extend outwardly from the edges of the side panels 12 to form side cover receiving slots 13 on the four sides of the container 10, as best seen in FIGS. 4a and 4b. The interior of the container 10 is depicted in FIGS. 4a and 4b, in a plan view, with no orientation sensing unit 16 or separating panel 18 provided. As will be described later, posts 24 are provided on the bottom panel 40. Side covers 22 may be slid into the side cover receiving slots 13. Only side covers 22A and 22B are shown in FIG. 1 for illustrative purposes. Side covers 22 may also be provided for the top panel 20 and the bottom panel, although these side covers are not illustrated for ease of depiction. The side covers 22 may carry indicia on them so that the side covers 22 are distinguishable from one another, such that side cover 22A is readily distinguishable from side cover 22B, etc. Hence, when side covers 22 are provided for each of the side panels 12 and the top panel 20 and the bottom panel, the different sides of the container 10 are readily distinguishable from one another. As simple examples, each of the different side covers 22 may have a different color on them, or a different word. In certain embodiments, the side covers 22 have permanent indicia on them, such as printed or engraved material, or embedded color. In other embodiments, the indicia on the side covers 22 are not permanent, such as a dry erase marking.

[0024] FIG. 2 illustrates an assembled container 10, with no side covers 22 inserted, and for illustrative purposes only, two of the side panels 12 being transparent in order to depict the interior of the container 10 and the relative positioning of the orientation sensing unit 16 and the separating panel 18. FIG. 3 depicts a cross-section of the container 10, taken through the plane A-A of FIG. 2. As seen in FIGS. 2 and 3, a plurality of posts 24 is provided in certain exemplary embodiments. The posts 24 may be provided in the corners of the bottom panel 40, within the interior of the container 10. The orientation sensing unit 16 is supported by the posts 24, and the circuit board on which the orientation sensing unit 16 is provided is positioned on the posts 24 so that the electrical components of the orientation sensing unit 16 are towards the bottom panel (reference numeral 40), and the planar upper surface of the circuit board of the orientation sensing unit 16 faces toward the top panel 20. This places the electrical components within the spacing between the posts 24 and reduces the overall volume of the interior of the container 10 that is taken up by the orientation sensing unit. Further, this positioning provides a flat surface on which the separating panel 18 is placed when positioned within the container 10.

[0025] The separating panel 18 serves to separate or divide the interior of the container 10 into a first chamber 26 and a second chamber 28. The first chamber 26 is a larger chamber that is empty and an object can be placed into the first chamber 26 and the container 10 closed by closing or positioning the top panel 20 over the side panels 12. The separating panel 18 acts as a false bottom since it conceals the orientation sensing unit 16, which is entirely within the second chamber. In order to be an effective false bottom, the first chamber 26 should be larger than the second chamber 28 such that the presence of a second chamber is not suspected. In certain embodiments, the first chamber 26 has a volume that is greater than or equal to 0.70 Vt, where Vt is equal to the total interior volume of the container 10. In such embodiments, the second chamber 28 has a volume that is less than or equal to 0.30 Vt. In other embodiments, the first chamber 26 has a volume that is greater than or equal to 0.80 Vt, and the second chamber 28 has a volume that is less than or equal to 0.20 Vt. In still other embodiments, the first chamber 26 has a volume that is greater than or equal to 0.90 Vt, and the second chamber 28 has a volume that is less than or equal to 0.10 Vt.

[0026] FIG. 5 is a block diagram of the orientation sensing unit 16, constructed in accordance with embodiments of the present disclosure. The components of the orientation sensing unit 16 may comprise commercially available conventional elements. The orientation sensing unit 16 includes a three-
axis accelerometer 50, such as commonly employed in smartphones and tablets. Such a three-axis accelerometer 50 responds to changes in the orientation of the accelerometer 50 and produces signals with information as to the orientation of the accelerometer 50. When installed in a fixed position within an object, the accelerometer 50 will thus provide signals with information on the orientation of the object. In the embodiment of the container or box 10 of FIG. 1, the accelerometer will generate signals that indicate the orientation of the container or box 10.

A processor (microcontroller) 52 is coupled to the accelerometer 50 to receive signals from the accelerometer 50. Among other features, the processor 52 is programmable (or is configured) to receive the signals from the accelerometer 50 and interpret the signals to determine the orientation of the container or box 10. When the box 10 is in the shape of a cube, the processor 52 in accordance with embodiments of the present disclosure, will interpret the signals from the accelerometer 50 and determine which of the six faces of the cube is face up, i.e., the top-most face. The processor 52, following the differentiation of which of the six sides of the cube (i.e., the container or box 10) is face up based on the signal with the information on the orientation of the container or box 10 received from the accelerometer 50, produces a signal to be transmitted by a radio transmitter 54.

The radio transmitter 54 sends the position or orientation information in an encoded format, for example. The transmission can be done using any of a number of different transmission formats, such as Bluetooth, Zigbee, etc. In the disclosed embodiment, the transmission is the same type of transmission standard as a common garage door opener. The transmission signal may simply be a signal that indicates a number from one to six, each of the different numbers being respectively assigned to one of the six respective faces of the container or box 10.

A power source 56 is coupled to the accelerometer 50, the processor 52 and the radio transmitter 54 to power each of these components. The power source 56 is a battery in some embodiments, or is a rechargeable power source that can be recharged through inductive coupling for example. When the power source 56 is a battery, for example, the bottom panel 40 may be removed to allow access to the battery for replacement. When the power source 56 is an inductively coupled rechargeable power source, for example, the bottom panel does not have to be removed.

The orientation sensing unit 16 includes a circuit board 58 to which the components 50, 52, 54 and 56 are attached. The components are attached to the circuit board 58 on one side of the circuit board 58 so that the other side of the circuit board 58 presents a substantially planar surface. In this configuration, the components of the orientation sensing unit 16 may fit between the posts 24 and allow the second chamber 28 to be very low in volume. This allows the separating panel 18 to effectively serve as a false bottom and conceal the presence of a second chamber 26.

FIG. 6 is a flow chart showing an exemplary process flow for the processor 52. From the start step 60, the processor 52 obtains a measurement from the accelerometer 50. Depending on the signal received from the accelerometer 50, the processor 52 determines which side of the container or box 10 is face up, in step 64. In the embodiment of FIG. 6, the processor 64 then determines whether the same side has been up a predetermined number of times, in step 66. If the same side has been up the predetermined number of times ("Yes"), the processor 52 enters a sleep mode for a predetermined length of time, e.g., thirty seconds. Entering a sleep mode conserves power, as is well known. When the processor 52 exits the sleep mode after the predetermined length of time, the processor 52 will again obtain a measurement from the accelerometer 50 (step 62) and determine which side of the container or box 10 is face up (step 64) and if the same side is still up, will re-enter the sleep mode for the predetermined length of time. However, if the side of the container or box 10 has not been face up the predetermined number of times ("No"), then the processor 52 sends the signal to the transmitter 54 to cause the transmitter 54 to transmit the signal wirelessly.

The transmitted signal is available for reception and translation by a receiver (not shown) into a signal that can be recognized by a person. For example, the received signal can be converted into a visual signal on the receiver, which can display a number from one to six that represents the side of the container or box 10 that is face up. Alternatively, the received signal can be converted to a haptic signal, such as a vibration signal, that can be felt by the person. For example, the received signal can be converted to a number of vibrations at the receiver, with the number of vibrations being equal to the designated number of the side that is face up. Other types of signals to a person may be employed without departing from the scope of the present disclosure.

An example of the use of the container or box 10 will now be explained with reference to FIGS. 2 and 7. Consider FIG. 2 to be the initial position of the container or box 10. In this position, the bottom panel 40 is lowermost and the top panel 20 is face up. The orientation sensing unit 16 is parallel to the ground and at its lowest most position. Since the top panel 20 is face up in FIG. 2, the information signal sent by the accelerometer 50 to the processor 52 is determined to be a one (representing the top panel 20 being face up), and this information is transmitted by the radio transmitter 54 to a receiver (not shown). Assume that after the transmission is made, the container or box 10 is re-oriented to the position shown in FIG. 7. In this position, the bottom panel 40 is toward the left in the figure, top panel 20 is to the right, the side panel 22B is face on and the side panel 22A is face up. The orientation sensing unit 16 is shown in phantom in FIG. 7 to depict its re-orientation. The accelerometer 50 sends its information signal to the processor 52, which now determines that the container or box 10 is in a position in which side panel 22B is face up. This may represent the third side of the container or box 10, so that the processor 52 causes the transmitter 54 to transmit the number three to the receiver (not shown). If the container or box is not moved for the predetermined period of time from the position shown in FIG. 7, then the processor 52 enters the sleep mode, as discussed above with respect to FIG. 6.

The process described above is exemplary only, as other embodiments of using the container or box 10 may be employed without departing from the scope of the present disclosure. Furthermore, in use, an object, such as a piece of paper, may be placed into the first chamber 26 and the container or box 10 closed by closing the top panel 20 on top of the container or box 10 to close the object within the interior of the first chamber 26. A person placing the object into the first chamber 26 will not realize that there is a second chamber 28 containing an orientation sensing unit 16 because of the separating panel 18 acting as a false bottom and the relatively small volume of the second chamber 28 relative to the volume
of the first chamber. In certain embodiments, the object placed into the first chamber may have some relationship to one of the side covers. For example, the six side covers may each have a different word on them. The object placed into the first chamber may be a piece of paper with one of those words written on it by a person. That person may then position the container or box with the side cover matching the word face up, while another person holding a receiver (not shown) is not observing which side of the container or box is face up. The person holding the receiver is nonetheless able to tell the other person which word that person wrote and put into the first chamber of the container or box. This process is exemplary only, as other uses of the container or box may be done.

[0035] The container or box has been described and depicted as a cube. However, other shapes of the container may be used without departing from the scope of the disclosure. For example, a container with ten or twelve or more sides can be used. The container or box may be made different sizes, with certain embodiments being a cube with edges of one inch in length.

[0036] Different materials may be used to form the container or box. For example, the side panels and the bottom panel may be made of a plastic, or other suitable substantially rigid material. The retainers and the side panels may be formed integrally, for example, through a 3-D printing machine.

[0037] The word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" or as an "example" is not necessarily to be construed as preferred or advantageous over other embodiments. Furthermore, to the extent that the term "include," "have," or the like is used in the description or the claims, such term is intended to be inclusive in a manner similar to the term "comprise" as "comprise" is interpreted when employed as a transitional word in a claim.

[0038] All structural and functional equivalents to the elements of the various aspects described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed under the provisions of 35 U.S.C. §112, sixth paragraph, unless the element is expressly recited using the phrase "means for" or, in the case of a method claim, the element is recited using the phrase "step for".

[0039] The previous description is provided to enable any person skilled in the art to practice the various aspects described herein. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the claims are not intended to be limited to the aspects shown herein, but are to accord the full scope consistent with the language of the claims, wherein reference to an element in the singular is not intended to mean "one and only one" unless specifically so stated, but rather "one or more." Unless specifically stated otherwise, the term "some" refers to one or more. Pronouns in the masculine (e.g., his) include the feminine and neuter gender (e.g., her and its) and vice versa. Headings and subheadings, if any are used for convenience only and do not limit the subject disclosure.

What is claimed is:
1. A box comprising:
   a plurality of side panels, a bottom panel and a top panel, coupled together to form a box interior with a total interior volume Vt;
   a separating panel in the box, the separating panel dividing the box interior into a first chamber and a second chamber, where the first chamber having a volume greater than or equal to 0.70 Vt and the second chamber having a volume less than or equal to 0.30 Vt;
   an orientation sensing unit housed entirely within the second chamber and configured to sense and wirelessly transmit a signal with information on the orientation of the box.
2. The box of claim 1, wherein the orientation sensing unit includes a three-axis accelerometer, a processor coupled to receive signals from the accelerometer, a wireless transmitter coupled to the processor, and a power source coupled to the accelerometer, processor and wireless transmitter.
3. The box of claim 2, further comprising retainers formed at edges of the side panels and extending outwardly from the side panels to form a side cover receiving slot; and a plurality of planar side covers configured for retention between the retainers at opposite edges of respective side panels to thereby cover the side panels on an exterior of the box.
4. The box of claim 3, wherein the box is a cube.
5. The box of claim 3, wherein the box has greater than 6 sides.
6. The box of claim 4, wherein the processor is configured to differentiate which of six sides of the cube is face up based on the signal with information on the orientation of the box and produce a signal to be transmitted by the wireless transmitter indicating the orientation of the box.
7. The box of claim 2, wherein the wireless transmitter is a radio frequency transmitter.
8. The box of claim 2, wherein the wireless transmitter is a Bluetooth transmitter.
9. The box of claim 2, wherein the wireless transmitter is a Zigbee transmitter.
10. The box of claim 6, wherein the signal to be transmitted by the wireless transmitter indicating the orientation of the box indicates which side of the cube is face up.
11. The box of claim 2, wherein the separating panel is press fit into the box interior into a position to form the first and second chambers, enclosing the orientation and sensing unit in the box interior between the separating panel and the bottom panel.
12. The box of claim 11, wherein the power source is a battery.
13. The box of claim 12, wherein the power source is rechargeable via inductive coupling.
14. The box of claim 11, wherein the first chamber has a volume greater than or equal to 0.80 Vt and the second chamber has a volume less than or equal to 0.20 Vt.
15. The box of claim 11, wherein the first chamber has a volume greater than or equal to 0.90 Vt and the second chamber has a volume less than or equal to 0.10 Vt.
16. A container comprising:
   a housing having a top, bottom and sides, which form an interior volume;
   a false bottom within the interior volume; and
   an orientation sensing unit within the interior volume and between the false bottom and the housing bottom, the orientation sensing unit configured to sense the orienta-
17. The container of claim 16, wherein the container is a cube.

18. The container of claim 17, wherein the orientation sensing unit includes a three-axis accelerometer, a processor coupled to receive signals from the accelerometer, a wireless transmitter coupled to the processor, and a power source coupled to the accelerometer, processor and wireless transmitter.

19. The container of claim 18, wherein the processor is configured to differentiate which of six sides of the cube is face up based on the signal with information on the orientation of the box and produce a signal to be transmitted by the wireless transmitter indicating the orientation of the box.

20. A method of sensing the orientation of a box containing an object, comprising the steps:

- opening a box having a plurality of sides and a total interior volume $V_t$, the total interior volume being divided into a first chamber with a volume greater than or equal to 0.70 $V_t$ and a second chamber with a volume less than or equal to 0.30 $V_t$, and an orientation sensing unit configured to sense the orientation of the box and wirelessly transmit a signal providing information on the orientation of the box, the orientation sensing unit being contained entirely within the second chamber;

- placing an object within the first chamber and closing the box;

- orienting the box to a rest position with one side of the box face up; and

- wirelessly receiving the signal from the orientation sensing unit to determine the orientation of the box.

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