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(54) **FLOATING APPARATUS FOR ALERTING PEOPLE OF THE PRESENCE OF VOLTAGE IN WATER**

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G01R 27/26 (2006.01)
G08B 21/08 (2006.01)
(Continued)

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CPC ***G08B 21/082*** (2013.01); ***G01R 1/04*** (2013.01); ***G01R 19/155*** (2013.01); ***G01R 19/16533*** (2013.01); ***H01H 83/00*** (2013.01)

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CPC G08B 21/082
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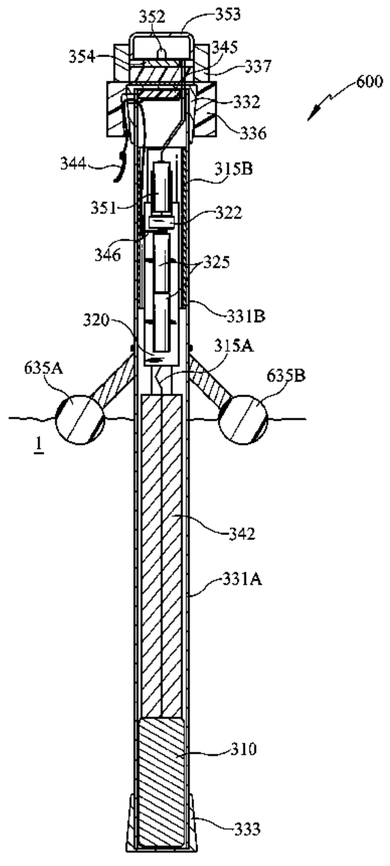
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(57) **ABSTRACT**

A floating apparatus for alerting people of the presence of voltage in water. When the floating apparatus is placed in water and in an active state, it detects when at least a threshold level of voltage is present in the water and generates an alert signal in response to detecting the threshold level of voltage is present. The floating apparatus may detect the threshold level of voltage is present without requiring that a ground wire be connected between an electrical circuit of the floating apparatus and a fixed structure exterior of the water such as soil surrounding the water.

16 Claims, 6 Drawing Sheets



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continuation of application No. 14/686,437, filed on Apr. 14, 2015, now Pat. No. 9,506,957.

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G01R 1/04	(2006.01)
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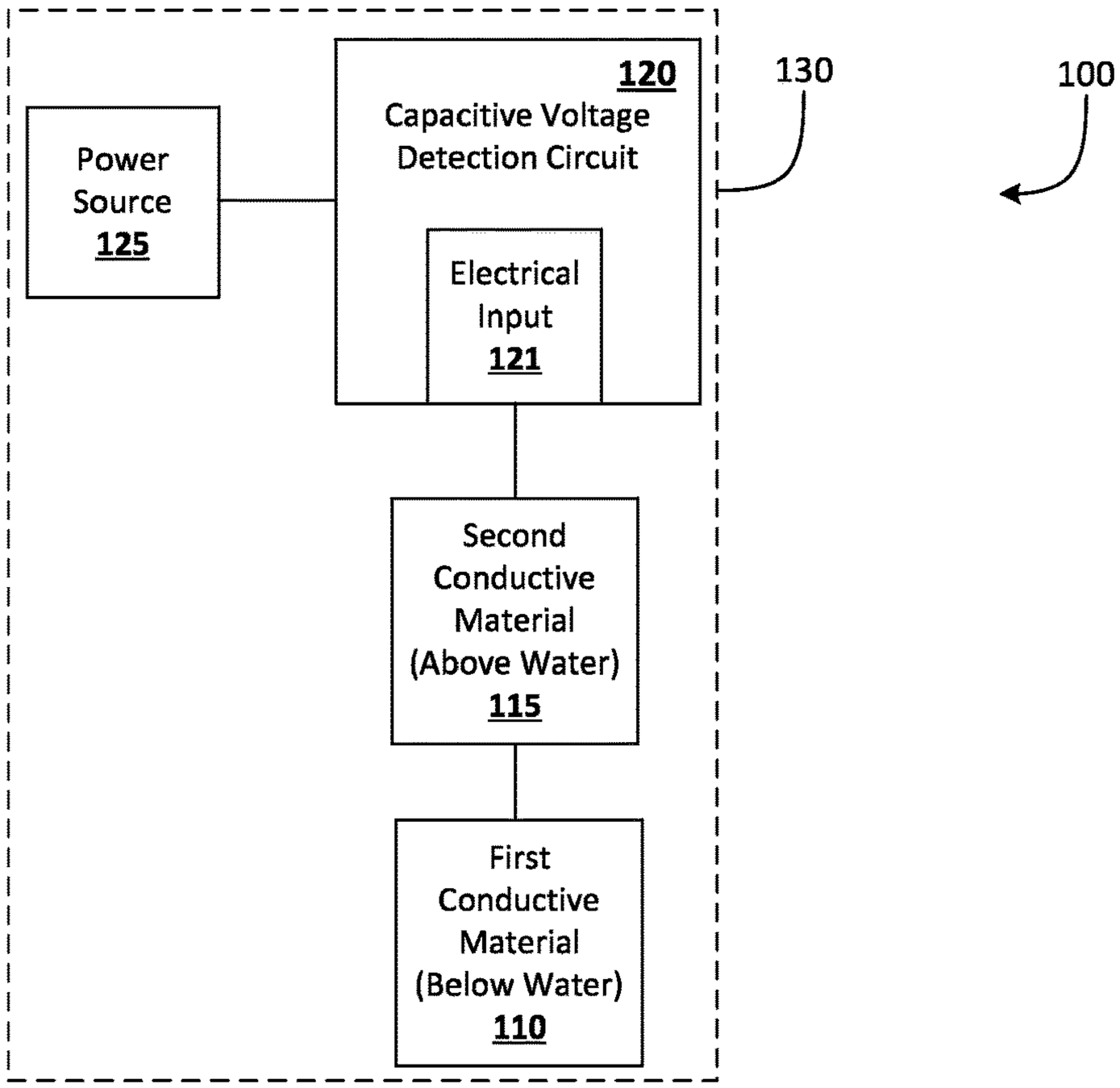

120
Capacitive Voltage Detection Circuit
130
100
Power Source 125
Electrical Input 121
Second Conductive Material (Above Water) 115
First Conductive Material (Below Water) 110

FIG. 1

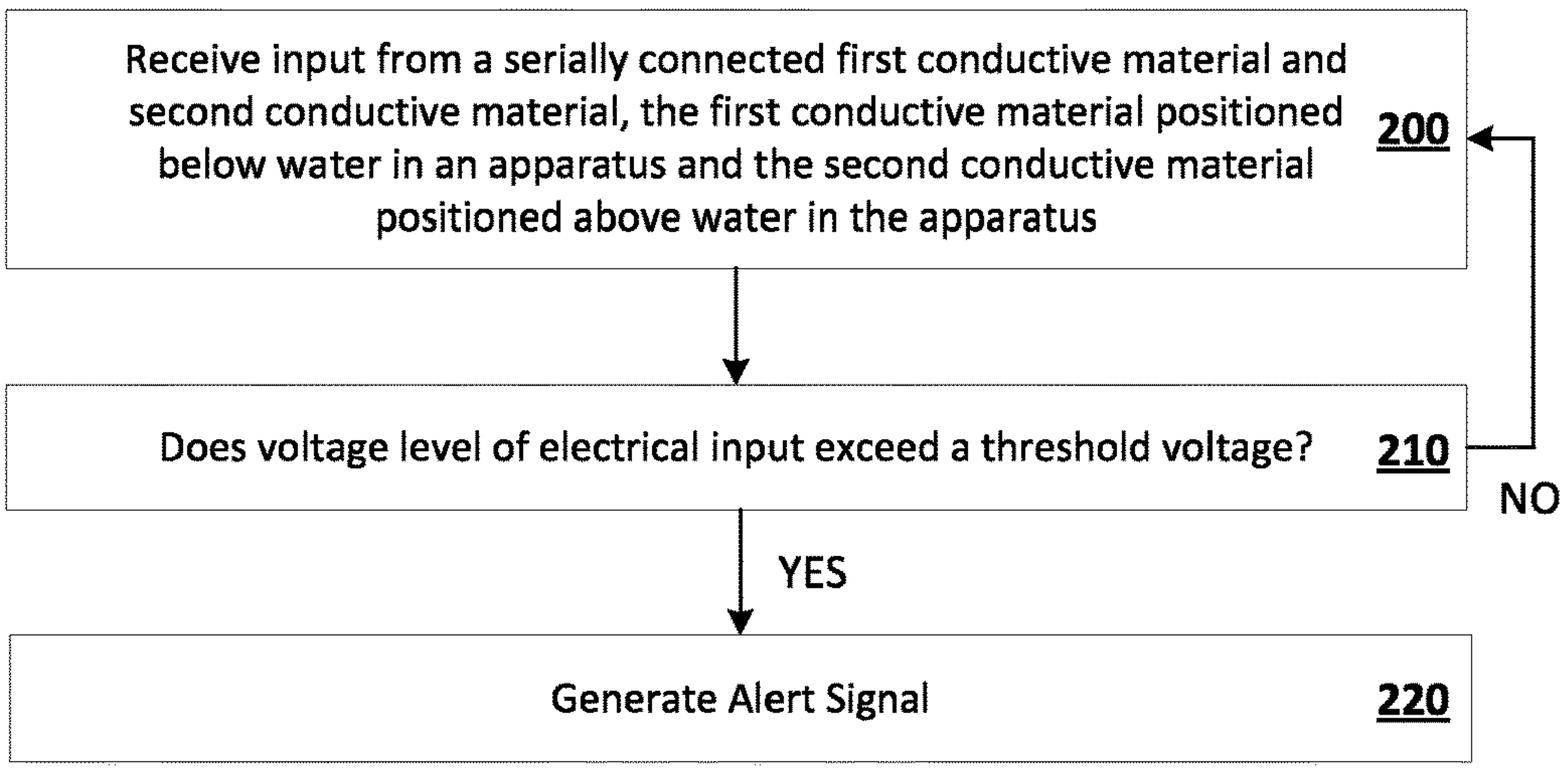

Receive input from a serially connected first conductive material and second conductive material, the first conductive material positioned below water in an apparatus and the second conductive material positioned above water in the apparatus 200
Does voltage level of electrical input exceed a threshold voltage? 210
NO
YES
Generate Alert Signal 220

FIG. 2

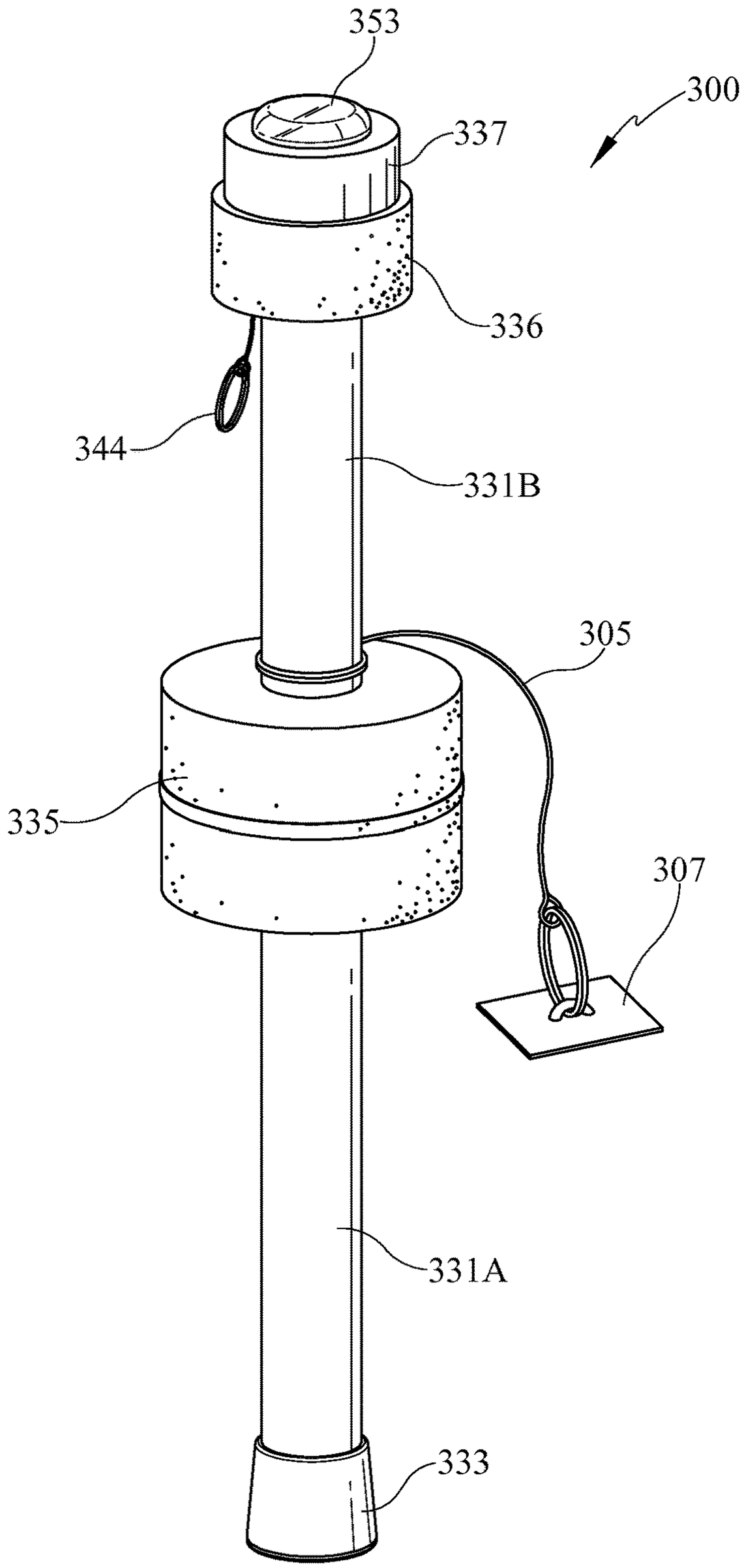


FIG. 3

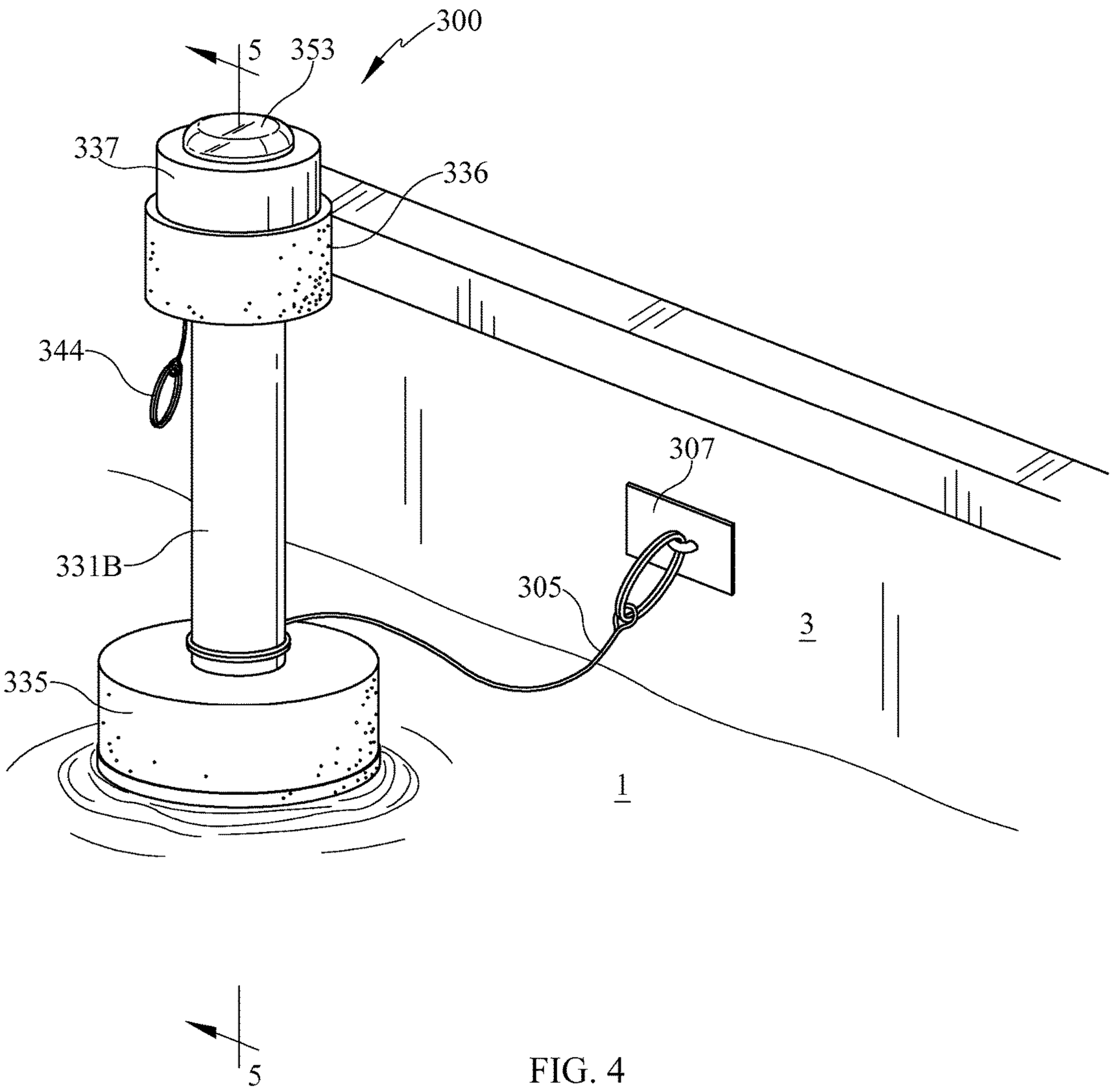


FIG. 4

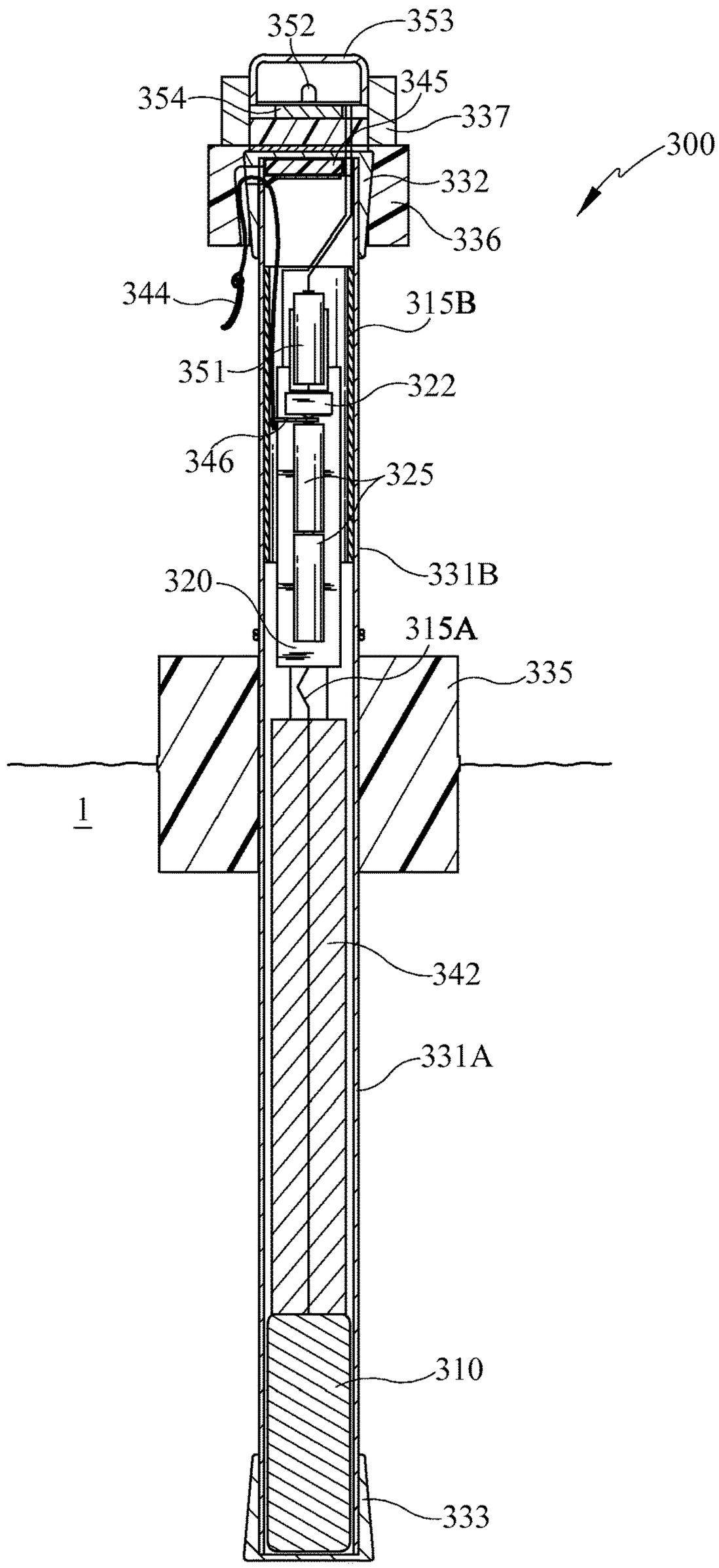

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FIG. 5

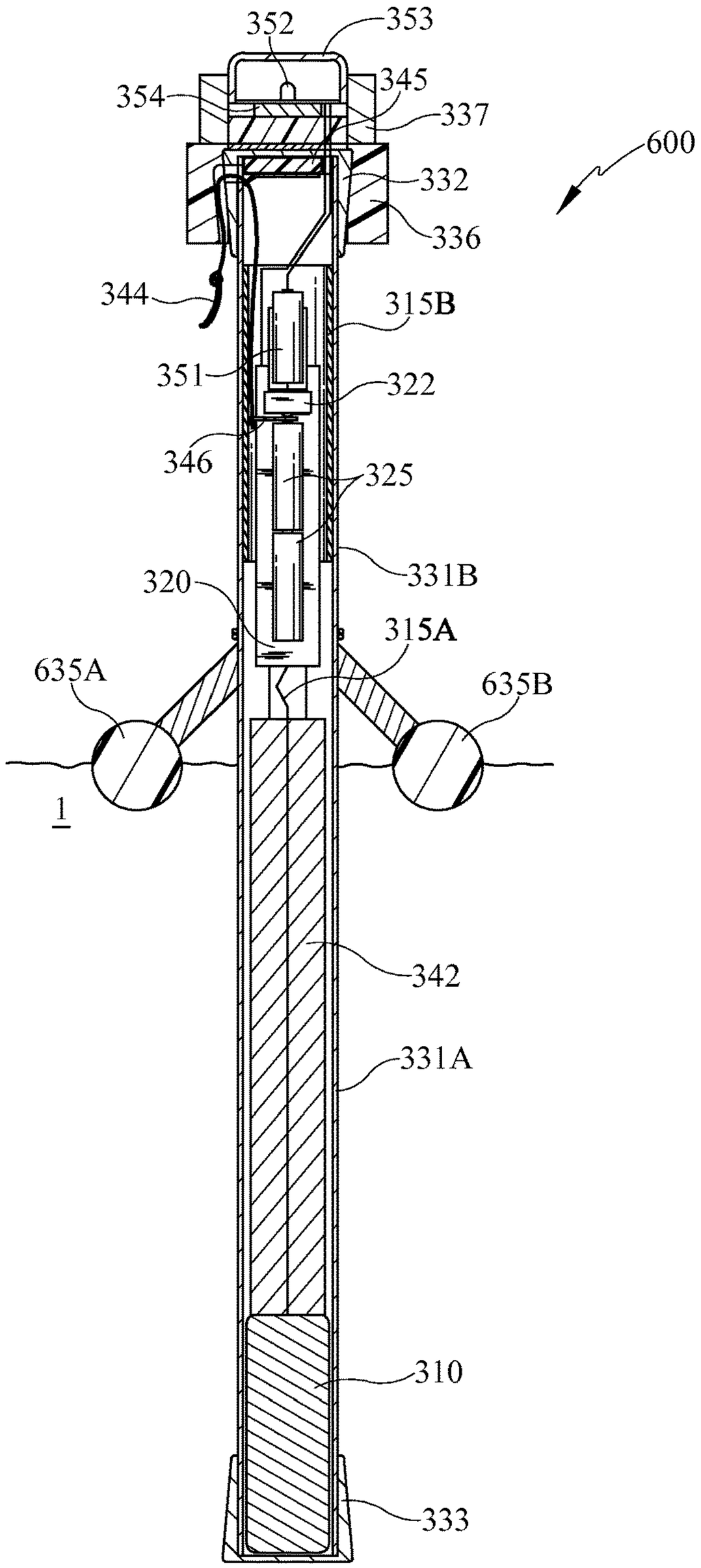

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FIG. 6

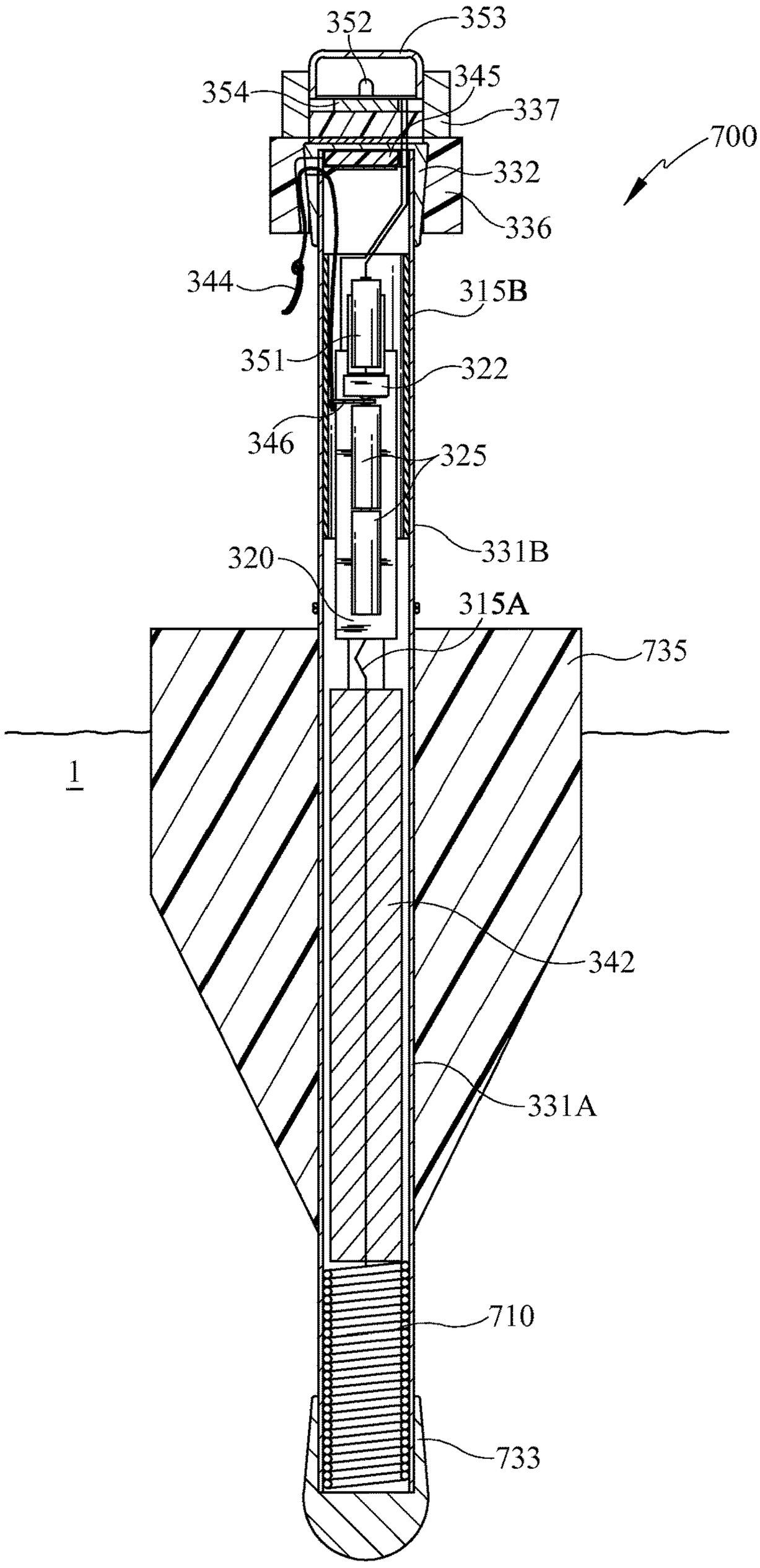

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FIG. 7

FLOATING APPARATUS FOR ALERTING PEOPLE OF THE PRESENCE OF VOLTAGE IN WATER

BACKGROUND

Voltage may be introduced into a body of water as a result of negligence, wear and tear of electrical components, improper installation of electrical components, and/or other factors. For example, voltage may be introduced into a pool as a result of a malfunctioning or improperly installed pool light, pump, and/or other pool apparatus. Also, for example, voltage may be introduced into an area of a lake near a dock due to a frayed portion of an extension cord contacting the water, wear and tear to an electrical system of the dock, etc.

Unfortunately, a source of voltage may be hidden, or not readily apparent, to people that may swim in or otherwise come in to contact with water having unsafe levels of voltage. Exposure of a human to an unsafe level of voltage in water can be harmful to the human when the human swims in or otherwise contacts the water. In many situations, exposure to an unsafe level of voltage in water may even lead to death—either as a direct result of exposure to the voltage or as an indirect result of drowning due to exposure to the voltage.

SUMMARY

This specification is directed generally to a floating apparatus for alerting people of the presence of voltage in water. When the floating apparatus is placed in water and in an active state, it detects when at least a threshold level of voltage is present in the water and generates an alert signal in response to detecting the threshold level of voltage is present. The floating apparatus may detect the threshold level of voltage is present without requiring that a ground wire be connected between an electrical circuit of the floating apparatus and a fixed structure exterior of the water such as soil surrounding the water.

The floating apparatus may comprise a first conductive material and a second conductive material that are enclosed in a housing and electrically coupled in series with one another and electrically coupled to, and providing input to, an electrical input of a capacitive voltage detection circuit. The floating apparatus may be configured so that, when it is placed in water, the first conductive material is surrounded by the water and the second conductive material is above the water and surrounded by air. The capacitive voltage detection circuit is configured to generate an alert signal in response to a voltage level provided to the electrical input exceeding a threshold voltage of the capacitive voltage detection circuit. The alert signal may, for example, cause at least one sensory alarm to be activated to alert people to the presence of voltage in the water that exceeds the threshold voltage.

Generally, in one aspect, a floating apparatus for alerting people of the presence of voltage in water includes a buoyant housing having a first housing portion and a second housing portion. When the floating apparatus is placed in water with the first housing portion submerged in the water, the buoyant housing is configured to maintain the first housing portion submerged in the water and maintain the second housing portion above the water. The floating apparatus further includes a capacitive voltage detection circuit, a first conductive material, and a second conductive material. The capacitive voltage detection circuit is enclosed within the buoyant housing, has an electrical input, and is configured to generate an alert signal in response to a voltage level provided to the electrical input exceeding a threshold voltage. The floating apparatus further comprises a first conductive material and a second conductive material. The first conductive material is electrically coupled to the electrical input and is at least partially enclosed within the first housing portion. The second conductive material is electrically coupled to the electrical input, is electrically in series with the first conductive materials, and is at least partially enclosed within the second housing portion.

These and other implementations of the technology may include one or more of the following features.

In some implementations, the first conductive material may include a counterweight fully enclosed in the first housing portion. The counterweight contributes to maintaining the first housing portion submerged in the water when the floating apparatus is placed in the water. In some of those implementations, the second conductive material comprises a portion of a conductive wire extending between the counterweight and the electrical input. An exterior surface of the counterweight may optionally be within one fourth of an inch of at least a portion of an interior surface of the first housing portion.

In some implementations, the floating apparatus further includes at least one sensory alarm coupled to the buoyant housing. The sensory alarm is activated in response to the alert signal being generated by the capacitive voltage detection circuit. In some of those implementations, the at least one sensory alarm includes a transducer that produces an audible sound when activated and/or a light source that produces visible light when activated. In some of those implementations, the alert signal comprises switching a switch to an active position, wherein a battery powers the at least one sensory alarm when the switch is in the active position and does not power the at least one sensory alarm when the switch is not in the active position.

In some implementations, the second conductive material comprises a metallic material at least partially surrounding the capacitive voltage detection circuit and fully enclosed in the second housing portion. In some of those implementations, there is no direct contact between the metallic material and the electrical input.

In some implementations, the buoyant housing further comprises a buoyant material portion positioned between the first conductive material and the second conductive material. In some of those implementations, a unitary shaft forms the first housing portion and the second housing portion, the buoyant material portion comprises a buoyant ring surrounding the unitary shaft, and/or the unitary shaft is formed from a buoyant material.

Generally, in another aspect, a floating apparatus for alerting people of the presence of voltage in water includes a buoyant housing having a first housing portion, a second housing portion, and a buoyant material portion. When the floating apparatus is placed in water with the first housing portion submerged in the water, the first housing portion is maintained submerged in the water, the buoyant material portion contacts the water, and the second housing portion is maintained above the water. The floating apparatus further includes a capacitive voltage detection circuit, a first conductive material, and a second conductive material. The capacitive voltage detection circuit is enclosed within the buoyant housing, has an electrical input, and is configured to generate an alert signal in response to a voltage level provided to the electrical input exceeding a threshold voltage. The first conductive material is electrically coupled to the first capacitor reference input and is at least partially

enclosed within the first housing portion. The second conductive material is electrically coupled to the electrical input, is electrically in series with the first conductive material, and is at least partially enclosed within the second housing portion.

These and other implementations of the technology may include one or more of the following features.

In some implementations, the first conductive material includes a counterweight fully enclosed in the first housing portion. The counterweight contributes to maintaining the first housing portion submerged in the water when the floating apparatus is placed in the water.

In some implementations, the floating apparatus further includes at least one sensory alarm coupled to the buoyant housing. The sensory alarm is activated in response to the alert signal being generated by the capacitive voltage detection circuit.

In some implementations, the buoyant material portion is at least partially submerged in the water when the floating apparatus is placed in the water.

Generally, in another aspect, a floating apparatus for alerting people of the presence of voltage in water includes a unitary shaft comprising a first portion and a second portion, and a buoyant material portion coupled to the unitary shaft and extending outward from the unitary shaft. When the floating apparatus is placed in water with the first portion submerged in the water, the first portion is maintained submerged in the water, the buoyant material portion contacts the water, and the second portion is maintained above the water. The floating apparatus further includes a non-contact capacitive voltage detection circuit. The non-contact capacitive voltage detection circuit is enclosed within the unitary shaft, is coupled to an antenna, and generates an alert signal in response to a voltage level of the antenna exceeding a threshold voltage. The antenna is at least partially enclosed within the first portion. The second conductive material is electrically coupled in series with the antenna and is at least partially enclosed within the second portion.

Generally, in another aspect, a floating apparatus for alerting people of the presence of voltage in water includes a capacitive voltage detection circuit, a first conductive material, and a second conductive material. The capacitive voltage detection circuit is configured to determine generate an alert signal in response to a voltage level provided to an electrical input of the circuit exceeding a threshold voltage. The first conductive material and the second conductive material are electrically connected in series with one another and are directly electrically coupled to the electrical input of the circuit. The floating apparatus further comprise a buoyant housing that encloses the capacitive voltage detection circuit, the first conductive material, and the second conductive material—and prevents water from infiltrating the buoyant housing and contacting the capacitive voltage detection circuit, the first conductive material, and the second conductive material. When the floating apparatus is placed in water in one or more orientations, the buoyant housing is configured to maintain at least a portion of the second conductive material above water and at least a portion of the first conductive material below water.

These and other implementations of the technology may include one or more of the following features.

In some implementations, the buoyant housing is configured to maintain the entirety of the second conductive material above the water when the floating apparatus is placed in the water in one or more orientations.

In some implementations, the buoyant housing is configured to maintain a majority of the mass of the first conductive material below the water when the floating apparatus is placed in the water in one or more orientations. In some of those implementations, the buoyant housing is configured to maintain at least eighty percent of the mass of the first conductive material below the water when the floating apparatus is placed in the water in one or more orientations.

In some implementations, the buoyant housing is configured to maintain the entirety of the capacitive voltage detection circuit above the water when the floating apparatus is placed in the water in one or more orientations.

It should be appreciated that all combinations of the foregoing concepts and additional concepts described in greater detail herein are contemplated as being part of the subject matter disclosed herein. For example, all combinations of claimed subject matter appearing at the end of this disclosure are contemplated as being part of the subject matter disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a schematic diagram of an example of a floating apparatus for alerting people of the presence of voltage in water.

FIG. **2** illustrates an example method of generating an alert signal in response to determining, based on electrical input of a first conductive material below water and a second conductive material above the water, that a voltage level exceeds a threshold voltage.

FIG. **3** illustrates a perspective view of another example of a floating apparatus for alerting people of the presence of voltage in water.

FIG. **4** illustrates the floating apparatus of FIG. **3** placed in water and tethered to a surface that is adjacent the water.

FIG. **5** illustrates a section view of the floating apparatus placed in water of FIG. **4**, taken along the section line **5-5** of FIG. **4**.

FIG. **6** illustrates a section view of another example of a floating apparatus for alerting people of the presence of voltage in water.

FIG. **7** illustrates a section view of another example of a floating apparatus for alerting people of the presence of voltage in water.

DETAILED DESCRIPTION

FIG. **1** illustrates a schematic diagram of an example of a floating apparatus **100** for alerting people of the presence of voltage in water. The floating apparatus **100** of FIG. **1** includes a housing **130** that encloses a first conductive material **110**, a second conductive material **115**, a capacitive voltage detection circuit **120**, and a power source **125**. The power source **125** powers the capacitive voltage detection circuit **120** and may include, for example, one or more batteries. In some implementations, the one or more batteries may optionally be periodically charged via a solar panel coupled to the housing **130** and associated circuitry.

When the floating apparatus **100** is placed in water in one or more orientations, the housing **130** is configured to maintain at least a portion of the first conductive material **110** below the water and at least a portion of the second conductive material **115** above the water. In some implementations, the floating apparatus **100** includes one or more structures that contribute to maintaining at least a portion of the first conductive material **110** below the water and at least a portion of the second conductive material **115** above the

water (when placed in the water in one or more orientations) and/or that bias the housing to an orientation in which at least a portion of the first conductive material **110** is below the water and at least a portion of the second conductive material **115** is above the water (when placed in the water in one or more orientations, such as any orientation). For example, one or more counterweights may cause the housing **130** to move to an orientation in water in which at least a portion of the first conductive material **110** is below the water and at least a portion of the second conductive material **115** is above the water—regardless of the particular orientation in which the housing **130** is originally placed in the water. The counterweight(s) may, for example, be enclosed in the housing **130** (e.g., the first conductive material **110** may be a counterweight in some implementations), form part of the housing **130**, and/or be coupled to an exterior of the housing (e.g., a "sinker" or other weight appended to the housing **130**). Also, for example, the housing **130** may comprise one or more buoyant materials to stabilize the floating apparatus **100** such that it maintains at least a portion of the first conductive material **110** below the water and at least a portion of the second conductive material **115** above the water in various water conditions. Additional detail on some examples of counterweight and buoyant material structures is provided below in describing FIGS. **3-7**.

The first conductive material **110** and the second conductive material **115** are electrically in series with one another and are coupled to the capacitive voltage detection circuit **120** via the electrical input **121**. In some implementations, one or more of the couplings between the first conductive material **110**, the second conductive material **115**, and the electrical input **121** are direct electrical couplings (e.g., via a wire extending between the conductive materials **110**, **115** and the electrical input **121**). In some implementations, one or more of the couplings are indirect electrical couplings (e.g., via an electromagnetic field without wires).

Generally, when the floating apparatus **100** is placed in water, the capacitive voltage detection circuit **120** determines, based on the input received via the electrical input **121**, a voltage level indicative of a level of voltage that is present in the water. For example, when the first conductive material **110** is at least partially below the water, the first conductive material **110** is electrically coupled to the water and provides input to the first input **121** that is indicative of the level of voltage (if any) that is present in the water. The first conductive material **110** and the water are separated by a dielectric such as the housing **130** and/or air between the first conductive material **110** and the housing **130**, and the first conductive material **110** and the water functionally form a capacitor. Accordingly, when voltage is present in the water, an electric charge will accumulate at the first conductive material **110** and the electric charge provided to the electrical input **121**. When the second conductive material **115** is at least partially above the water, the second conductive material **115** is electrically coupled to the air above the water. The second conductive material **115** and the air are separated by a dielectric such as the housing **130** and/or air between the second conductive material **115** and the housing **130**, and the second conductive material **115** and the air also functionally form a capacitor.

As described above, the first conductive material **110** and the second conductive material **115** are electrically in series with one another and each functionally form part of a respective capacitor. When the first conductive material **110** is at least partially below the water, the capacitor formed between the first conductive material **110** and the water will be of a smaller capacitance than that of the capacitor formed between the second conductive material **115** and the air. Accordingly, when the first conductive material **110** is at least partially below the water and the water has voltage, an electric charge will accumulate at the first conductive material **110** and the electric charge provided to the electrical input **121**. In many implementations, the voltage level provided to the electrical input **121** will be proportional to the voltage level of the water, but will be an order of magnitude less than the voltage of the water (e.g., based on design considerations of the floating apparatus **100**).

The capacitive voltage detection circuit **120** generates an alert signal when the voltage level provided to the electrical input **121** exceeds a threshold voltage. In some implementations, the alert signal is a signal that causes one or more sensory alarms to be activated such as a visual alarm (e.g., a light emitting diode or other light source) or an audible alarm (e.g., a transducer that transmits a high pitched sound when activated). The sensory alarm(s) may form part of the floating apparatus **100** and/or may be located remote from the floating apparatus **100**. The alert signal may be, for example, actuating a switch to cause power to be supplied to the sensory alarm(s) and the sensory alarm(s) resultantly activated—and/or a radio frequency (RF) or hard-wired signal that causes the sensory alarm(s) to be activated (e.g., an RF signal sent to a remote sensory alarm).

Turning to FIG. **2**, a flow chart is illustrated of an example method of generating an alert signal in response to determining, based on electrical input of a first conductive material below water and a second conductive material above the water, that a voltage level exceeds a threshold voltage. Other implementations may perform the steps in a different order, omit certain steps, and/or perform different and/or additional steps than those illustrated in FIG. **2**. FIG. **2** will be described with reference to a voltage detection circuit that perform the process. The voltage detection circuit may be, for example, the capacitive voltage detection circuits **120** and/or **320** illustrated in the Figures.

At step **200**, input is received from a serially connected first conductive material and second conductive material. The first conductive material is positioned below water in an apparatus and the second conductive material is positioned above water in the apparatus. For example, the electrical input **121** of capacitive voltage detection circuit **120** may receive input from the first conductive material **110** when it is positioned at least partially below water in the housing **130** and from the second conductive material **115** when it is positioned at least partially above the water in the housing **130**. As described herein, the first conductive material **110** and the water may functionally form a capacitor and the second conductive material **115** and the air may also functionally form a capacitor.

At step **210**, it is determined whether the voltage level of the electrical input exceeds a threshold voltage. If so, then the method proceeds to step **220**. If not, then the method returns to step **200**. For example, an integrated circuit and/or one or more discrete components (e.g., a field-effect transistor (FET)) of the capacitive voltage detection circuit **120** may determine if the voltage level exceeds a threshold voltage of the capacitive voltage detection circuit **120**. For instance, a field-effect transistor (e.g., a junction gate field-effect transistor (JFET) or a metal-oxide-semiconductor field-effect transistor (MOSFET)) of the capacitive voltage detection circuit **120** may be electrically coupled to the electrical input **121** and may have first properties when the voltage level of the electrical input **121** does not exceed a threshold voltage of the FET and may have second proper-

ties when the voltage level of the electrical input **121** exceeds the threshold voltage of the FET.

The threshold voltage is greater than zero and may be set in view of manufacturing preference, end user preference (e.g., via a dip switch or other user interface element), the sensitivity of the capacitive voltage detection circuit **120** (e.g., the threshold voltage of a FET), safety concerns, maintaining a balance between safety concerns and the minimization of false positives, and/or other factors. In some implementations, the threshold voltage may be a voltage between approximately 0.3V to 10 Volts. As will be understood by one of ordinary skill in the art having had the benefit of the present disclosure, the threshold voltage of step **210** may be an order of magnitude less than a voltage level of water for which it is desirable to proceed to step **220**. In other words, the voltage level of the water for which it is desirable to proceed to step **220** may not be fully transferred to the electrical input at step **200**—rather the voltage received at step **200** is less than, but proportional to, the voltage level of the water. For example, the voltage level of the water that may lead to the voltage level of the electrical input exceeding a threshold voltage of 0.6V may be approximately 10 Volts, 24 Volts, 48 Volts, and/or other desired voltage.

At step **220**, an alert signal is generated if the voltage differential exceeds the threshold voltage at step **210**. The alert signal is a signal that causes one or more sensory alarms to be activated. The alert signal may be, for example, actuating a switch to cause power to be supplied to the sensory alarm(s) and the sensory alarm(s) resultantly activated—and/or a radio frequency (RF) or hard-wired signal that causes the sensory alarm(s) to be activated. For instance, a FET of the capacitive voltage detection circuit may have second properties when the voltage level of the electrical input **121** exceeds the threshold voltage of the FET and when it has those second properties may cause voltage to be supplied to the sensory alarm(s) (or voltage to be supplied to a switch to thereby cause power to be supplied to the sensory alarm(s)).

With reference to FIGS. **3-5**, another example of a floating apparatus **300** for alerting people of the presence of voltage in water is illustrated. FIG. **3** illustrates a perspective view of the floating apparatus **300**, FIG. **4** illustrates the floating apparatus **300** placed in water **1** and tethered to a vertical surface **3** that is adjacent the water **1**, and FIG. **5** illustrates a section view of the floating apparatus **300** taken along the section line **5-5** of FIG. **4**.

The floating apparatus **300** has a buoyant housing that includes a first housing portion **331**A and a second housing portion **331**B. In the example of FIGS. **3-5**, a unitary cylindrical shaft forms the first housing portion **331**A and second housing portion **331**B. In other implementations, the first and second housing portions may take on other shapes (e.g., a triangular, square, or polygonal shaft), may not form a unitary structure (e.g., two separate shafts or other structures joined by an intermediary wire, shaft, or other structure), and/or may otherwise vary from the example illustrated in FIGS. **3-5**. When the floating apparatus **300** is placed in stable water and is in a stabilized condition, the first housing portion **331**A is the portion that is submerged in the water and the second housing portion **331**B is the portion that is above the water. For example, in FIG. **5** the first housing portion **331**A is the portion that is below the surface of the water **1** and the second housing portion **331**B is the portion that is above the surface of the water **1**. In some implementations, the unitary cylindrical shaft that forms the first housing portion **331**A and second housing portion **331**B may be formed from a dielectric material such as a thermoplastic material. For example, the unitary cylindrical shaft may be polyethylene, such as a schedule twenty polyethylene pipe cut to a desired length, such as sixteen inches.

The buoyant housing of the floating apparatus **300** also includes a buoyant ring **335** that surrounds the unitary cylindrical shaft that forms the first housing portion **331**A and second housing portion **331**B. The buoyant ring **335** is constructed from a buoyant material such as a plastic foam (e.g., polyethylene and/or polyurethane) and is positioned along the unitary cylindrical shaft to assist in maintaining the first housing portion **331**A above water when the floating apparatus **300** is placed in the water. Moreover, the buoyant ring **335** may lessen (relative to if the buoyant ring **335** was omitted from the floating apparatus **300**) the degree to which the vertical position (i.e., "up" and "down" in the water) and orientation of the floating apparatus **300** in the water are altered in response to contact with waves, contact with humans, etc.

The buoyant housing of the floating apparatus **300** also includes end caps **332** and **333** that are placed over opposed open ends of the unitary cylindrical shaft that forms the first housing portion **331**A and the second housing portion **331**B. The end caps **332** and **333** may be in friction fit and/or adhered (e.g., with a waterproof adhesive) to the unitary cylindrical shaft and may assist in preventing water intrusion into the interior of the housing. The buoyant housing of the floating apparatus **300** further includes a grommet **336** placed over the end cap **332**. The grommet **336** may be made from rubber or other elastic material and may assist in preventing water intrusion into the interior of the housing and/or to the light emitting diode (LED) **352**, transducer **354**, and/or wires or other components associated with the LED **352** and/or transducer **354**.

A capacitive voltage detection circuit **320** is enclosed within the housing. The capacitive voltage detection circuit **320** may be configured to detect that a threshold level of voltage is present near an area of measurement without requiring that a ground wire be connected between the capacitive voltage detection circuit **320** and a fixed structure remote from the floating apparatus **300** such as soil. The capacitive voltage detection circuit **320** may include an integrated circuit and/or discrete components to determine a level of voltage at an input thereof. For example, the capacitive voltage detection circuit **320** may perform one or more steps of the method of FIG. **2** to determine if a level of voltage satisfies a threshold voltage. In some implementations, the capacitive voltage detection circuit **320** may comprise, or share one or more similarities with, voltage detection circuits of capacitive voltage detectors known as "non-contact voltage detectors" and "capacitive voltage detectors". One non-limiting example of such a capacitive voltage sensor is the "2AC VOLTALERT" voltage detector manufactured by the FLUKE Corporation.

The depicted capacitive voltage detection circuit **320** is provided on a circuit board and the circuit board is in a substantially fixed position within the housing. The circuit board may be positioned within the housing using brackets, adhesives, structure that confines the circuit board to a space, and/or other means. As illustrated in FIG. **5**, the circuit board is arranged parallel with a longitudinal axis of the unitary cylindrical shaft that forms the first housing portion **331**A and the second housing portion **331**B, and the circuit board is perpendicular to the surface of the water **1** when the floating apparatus **300** is in a stable orientation (e.g., as illustrated in FIG. **5**). The circuit board also includes receptacles for receiving two batteries **325** and the recep-

tacles are electrically connected to the capacitive voltage detection circuit **320**. The batteries **325** provide power, via the receptacles, to the capacitive voltage detection circuit **320**. In some implementations, the capacitive voltage detection circuit **320** may be configured to use power from the batteries **325** (or use a greater extent of power from the batteries) only when at least some voltage is detected at an electrical input thereof. For example, the voltage detection circuit **320** may incorporate voltage sense circuitry at its electrical input that, when it senses at least some voltage, activates a switch to cause the batteries **325** to provide power to the capacitive voltage detection circuit **320**.

In FIG. **5**, a pull tab **346** is illustrated interposed between one of the two batteries **325** and one of the receptacles for the batteries, thereby preventing the capacitive voltage detection circuit **320** from being active (and the batteries **325** from being drained). The pull tab **346** is connected to a pull ring **344** via a string. A user may pull the pull ring **344** to permanently remove the pull tab **346** from being interposed between one of the two batteries **325** and one of the receptacles for the batteries, thereby activating the capacitive voltage detection circuit **320**. This may prevent the floating apparatus **300** from being active until the pull ring **344** is pulled by the user—thereby preventing premature drainage of the batteries **325** before the floating apparatus is intended to be used by the user. Moreover, this may prevent the floating apparatus **300** from being deactivated once the pull ring **344** is pulled by the user—thereby ensuring the floating apparatus **300** remains in an active state (monitoring for presence of voltage in water) once the pull ring **344** is pulled by the user—thereby preventing the floating apparatus **300** from being turned off and left in the water (which may provide a false sense of safety to people viewing the floating apparatus **300**).

In FIG. **5**, the string between the pull ring **344** and the pull tab **346** is also illustrated coupled to a pull ring of an expansion foam capsule **345**. When the user pulls the pull ring **344**, the pull ring of the expansion foam capsule may also be pulled, thereby causing an expansion foam to be emitted from the expansion foam capsule **345**. The expansion foam may expand (when emitted from the expansion foam capsule **345**) within the unitary cylindrical shaft to provide further resistance against water intrusion (e.g., intrusion through opening(s) for the string coupled to the pull ring **344** and/or intrusion through the opening capped by the end cap **332**). In some implementations, the expansion foam capsule **345** may be omitted or replaced with other structure such as a grommet sealed around the string. Also, in some implementations the pull tab **346** and pull ring may be omitted or replaced with other structure such as an on/off switch.

The capacitive voltage detection circuit **320** has an electrical input that is directly electrically coupled to a conductive wire **315**A that is directly electrically coupled to a conductive counterweight **310**. The conductive wire **315**A extends through a spacer **342** that maintains the conductive counterweight **310** in position within the housing. In other implementations, alternative structure may be utilized to maintain the conductive counterweight **310** in position such as an internal rib within the housing and/or adhesive. In some implementations, the portion of the conductive wire **315**A that is positioned between the capacitive voltage detection circuit **320** and the spacer **342** may be an antenna of a non-contact voltage detection circuit and/or may be at least partially encapsulated by a dielectric material. In some of those implementations, the portion of the conductive wire **315**A that is positioned between the capacitive voltage detection circuit **320** and the spacer **342** may be coupled (e.g., soldered or "twisted") serially to the portion of the conductive wire **315**A that extends through the spacer **342** to the conductive counterweight **310**.

The conductive counterweight **310** may have a weight that biases the floating apparatus to be maintained in a position such as that illustrated in FIG. **5**. For example, the counterweight may contribute to maintaining certain components of the floating apparatus **300** below the water. Also, for example, when waves, humans, and/or other forces contact the floating apparatus **300** and displace the vertical position and/or orientation of the floating apparatus **300**, the weight of the conductive counterweight **310** may assist in biasing the floating apparatus **300** toward the vertical position and/or orientation illustrated in FIG. **5**. In some implementations, the weight of the conductive counterweight **310** may be sufficient to "self-correct" the floating apparatus **300** to a vertical position and orientation where certain components of the floating apparatus **300** are below the water and other components are above the water—regardless of the orientation at which the floating apparatus **300** is placed in the water (or displaced once in the water).

When the conductive counterweight **310** is below the water **1** as illustrated in FIG. **5**, the conductive counterweight **310** is electrically coupled to the water and provides input to the capacitive voltage detection circuit **320** (via conductive wire **315**A) that is indicative of the level of voltage (if any) that is present in the water. The conductive counterweight **310** and the water **1** are separated by the second housing portion **331**B and an optional air gap between the second housing portion **331**B and the conductive counterweight **310**. Accordingly, the conductive counterweight **310** and the water **1** functionally form a capacitor. When voltage is present in the water **1**, an electric charge will accumulate at the conductive counterweight **310** and the electric charge provided, via conductive wire **315**A, to the capacitive voltage detection circuit **320**.

In some implementations, at least portions of an exterior surface of the conductive counterweight **310** may be within a half inch of an interior surface of the first housing portion **331**A and/or a distance between an interior surface of the first housing portion **331**A and an exterior surface of the first housing portion **331**A may be less than a half inch. For example, all or portions of the peripheral exterior surface of the conductive counterweight **310** may be within one fourth of an inch of an interior surface of the first housing portion **331**A and the distance between an interior surface of the first housing portion **331**A and an exterior surface of the first housing portion **331**A may be approximately one fourth of an inch. These and/or other configurations of the conductive counterweight **310** and/or the second housing portion **331**B may result in a distance between the conductive counterweight **310** and the water **1** that provides desired electromagnetic coupling between the water **1** and the conductive counterweight **310**.

As illustrated in FIG. **5**, a portion of the conductive wire **315**A is above water. When that portion of the conductive wire **315**A is above the water **1** as illustrated in FIG. **5**, it is electromagnetically coupled to air above the water **1** and that portion and the air functionally form a capacitor that is in series with the capacitor formed by the conductive counterweight **310** and the water **1**. Also illustrated in FIG. **5** is a conductive sheet of material **315**B that is provided peripherally of at least a portion of the capacitive voltage detection circuit **320**. In some implementations, the conductive sheet of material **315**B is adhered to or otherwise affixed (e.g., friction fit) to the interior surface of a portion of the second

housing portion **331**B and at least partially surrounds at least a portion of the capacitive voltage detection circuit **320**. The conductive sheet of material **315**B may be, for example, a sheet of aluminum and/or other metallic material (including metals and metal alloys). When the conductive sheet of material **315**B is above the water **1** as illustrated in FIG. **5**, the conductive sheet of material **315**B is electrically coupled to the air above the water and is also electromagnetically connected in series with the conductive wire **315**A. In some implementations, the conductive sheet of material **315**B may be omitted.

As described herein, the capacitive voltage detection circuit **320** generates an alert signal when it determines a voltage level provided to its electrical input (e.g., via conductive wire **315**A) exceeds a threshold voltage. In the example of FIGS. **3-5**, the alert signal generated by the capacitive voltage detection circuit **320** is the switching of a switch **322** (FIG. **5**) to an active position. When the switch **322** is in the active position, it closes a circuit that causes an alarm battery **351** to power a transducer **354** and an LED **352**. The alarm battery **351** does not power the transducer and the LED **352** when the switch is not in the active position.

When the alarm battery **351** provides power to the transducer **354**, the transducer **354** produces an audible sound such as a high pitched alarm sound to alert people of the presence of voltage in water. When the alarm battery **351** provides power to the LED **352**, the LED **352** produces visible light (the produced light may visually appear "continuous" or may "blink") to alert people to the presence of voltage in water. The LED **352** may emit red light in some implementations, and/or the lens **353** provided over the LED **352** may be colored to alter light emitted by the LED **352** so that it appears red to people viewing the altered light emitted by the lens **353**. Other LED colors and/or lens colors may be utilized. A grommet **337** surrounds a portion of the lens **353**, the LED **352**, and the transducer **354** and is coupled to the end cap **332**. The grommet **337** may be made from rubber or other elastic material and may assist in preventing water intrusion to the LED **352**, transducer **354**, and/or wires or other components associated with the LED **352** and/or transducer **354**.

The position of the LED **352** and/or transducer **354** may be adjusted in one or more implementations. For example, the transducer **354** may be enclosed in the second housing portion **331**B in some implementations. Also, in some implementations the LED **352** (or other light source) may be provided without providing the transducer **354**, or vice versa. Also, in some implementations one or more sensory alarms, such as a transducer and/or LED, may be provided remote from the floating apparatus **300** (with or without sensory alarms also being provided on the floating apparatus **300**). For example, the floating apparatus **300** may include an RF transmitter and the alert signal generated by the capacitive voltage detection circuit may be activation of the RF transmitter to transmit a certain frequency and/or encoded signal that is detected by an RF receiver to cause a remote sensory alarm to be activated.

FIGS. **3** and **4** illustrate a harness strap **305** that may be wrapped around or otherwise coupled to the floating apparatus **300**. The harness strap **305** is also coupled to a fastener **307**. As illustrated in FIG. **4**, the fastener **307** may be coupled to a surface, such as vertical surface **3**, to maintain the floating apparatus **300** in a desired area within the water **1**. This may be desirable to, for example, prevent the floating apparatus **300** from floating away in a large body of water such as a lake and/or to maintain the floating apparatus **300** in a lower traffic area of a pool.

FIG. **6** illustrates a section view of another floating apparatus **600** for alerting people of the presence of voltage in water and FIG. **7** illustrates a section view of yet another floating apparatus **700** for alerting people of the presence of voltage in water. In the examples illustrated in FIGS. **6** and **7**, many of the components are the same as those illustrated and described with respect to the floating apparatus **300**. Accordingly, the same numbering is provided for those components and description of those components with respect to FIGS. **6** and **7** is omitted for the sake of brevity.

The floating apparatus **600** of FIG. **6** has a buoyant housing that includes a first buoyant member **635**A and a second buoyant member **635**B in lieu of the buoyant ring **335** of FIGS. **3-5**. Each of the buoyant members **635**A, **635**B is longitudinally extending (e.g., extend into and out of the sheet of FIG. **6**) and constructed from a buoyant material such as a plastic foam. The buoyant members **635**A and **635**B function as dual hulls and are positioned to assist in maintaining the first housing portion **331**A above water when the floating apparatus **600** is placed in the water. Moreover, the buoyant members **635**A and **635**B may lessen (relative to if the buoyant members **635**A and **635**B were omitted from the floating apparatus **600**) the degree to which the vertical position (i.e., "up" and "down" in the water) and orientation of the floating apparatus **600** in the water are altered in response to contact with waves, contact with humans, etc.

The floating apparatus **700** of FIG. **7** has a buoyant housing that includes a single hull type buoyant member **735** in lieu of the buoyant ring **335** of FIGS. **3-5**. The single hull type buoyant member **735** is configured and positioned to assist in maintaining the first housing portion **331**A above water when the floating apparatus **700** is placed in the water. Moreover, the single hull type buoyant member **735** may lessen (relative to if the single hull type buoyant member **735** were omitted from the floating apparatus **700**) the degree to which the vertical position (i.e., "up" and "down" in the water) and orientation of the floating apparatus **700** in the water are altered in response to contact with waves, contact with humans, etc.

The floating apparatus **700** of FIG. **7** also has an unsheathed conductive wire coil **710** that is directly electrically coupled to the conductive wire **315**A in lieu of the conductive counterweight **310** of FIGS. **3-5**. The conductive wire coil **710** is positioned close (e.g., contacting or within a half inch) to the interior surface of the first housing portion **331**A. When the conductive wire coil **710** is below the water **1** as illustrated in FIG. **7**, the wire coil **710** is electrically coupled to the water **1** and provides input to the capacitive voltage detection circuit **320** (via conductive wire **315**A) that is indicative of the level of voltage (if any) that is present in the water **1**.

The floating apparatus **700** of FIG. **7** also has a weighted endcap **733** that is provided in lieu of the endcap **333** of FIGS. **3-5**. The weighted endcap **733** may include a quantity and/or density of material that weights the weighted endcap **733** so that it biases the floating apparatus **700** to be maintained in a position such as that illustrated in FIG. **7**. For example, the weighted endcap **733** may contribute to maintaining certain components of the floating apparatus **700** below the water and/or assist in biasing the floating apparatus **700** toward the vertical position and/or orientation illustrated in FIG. **7** when forces contact the floating apparatus **700** and displace the vertical position and/or orientation of the floating apparatus **700**. In some implementations

of the floating apparatus **700**, the end cap **333** may be used in lieu of the weighted endcap **733**.

Although FIGS. **6** and **7** illustrate specific variations that may be made to the floating apparatus **300** of FIGS. **3-5**, one of ordinary skill in the art, having had the benefit of the present disclosure, will recognize and appreciate that additional and/or alternative variations may be made. For example, multiple spherical buoyant nodes may be positioned in a "spider like" configuration and utilized in lieu of the buoyant material portions illustrated in FIGS. **3-7**. Also, for example, different shapes and configurations of the first housing portion and/or second housing portion may be utilized. Also, for example, components of FIGS. **3-5**, **6**, and/or **7** may be interchanged with similar components of others of FIGS. **3-5**, **6**, and/or **7**.

While several implementations have been described and illustrated herein, a variety of other means and/or structures for performing the function and/or obtaining the results and/or one or more of the advantages described herein may be utilized, and each of such variations and/or modifications is deemed to be within the scope of the implementations described herein. More generally, all parameters, dimensions, materials, and configurations described herein are meant to be exemplary and that the actual parameters, dimensions, materials, and/or configurations will depend upon the specific application or applications for which the teachings is/are used. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific implementations described herein. It is, therefore, to be understood that the foregoing implementations are presented by way of example only and that, within the scope of the appended claims and equivalents thereto, implementations may be practiced otherwise than as specifically described and claimed. Implementations of the present disclosure are directed to each individual feature, system, article, material, kit, and/or method described herein. In addition, any combination of two or more such features, systems, articles, materials, kits, and/or methods, if such features, systems, articles, materials, kits, and/or methods are not mutually inconsistent, is included within the scope of the present disclosure.

The invention claimed is:

1. A floating apparatus for alerting people of the presence of voltage in water, comprising:

a buoyant housing comprising a first housing portion and a second housing portion;

wherein, when the floating apparatus is placed in water with the first housing portion submerged in the water, the first housing portion is maintained submerged in the water and the second housing portion is maintained above the water;

a detection circuit enclosed within the buoyant housing, the detection circuit having an electrical input and configured to generate an alert signal in response to a voltage level provided to the electrical input exceeding a threshold voltage;

a first conductive material electrically coupled to the electrical input, the first conductive material at least partially enclosed within the first housing portion,

wherein the first conductive material comprises a counterweight fully enclosed in the first housing portion;

a second conductive material also electrically coupled to the electrical input, the second conductive material at least partially enclosed within the second housing portion,

wherein the second conductive material comprises a portion of conductive wire;

a sensory alarm coupled to the buoyant housing, wherein the sensory alarm is activated in response to the alter alert signal being generated by the detection circuit.

2. The floating apparatus of claim **1**, wherein the sensory alarm comprises a transducer that produces an audible sound when activated.

3. The floating apparatus of claim **2**, wherein the sensory alarm further comprises a light source that produces visible light when activated.

4. The floating apparatus of claim **2**, wherein generating the alert signal includes switching a switch to an active position, wherein a battery powers the sensory alarm when the switch is in the active position and does not power the sensory alarm when the switch is not in the active position.

5. The floating apparatus of claim **1**, wherein at least a portion of the counterweight is within a half inch of an interior surface of the first housing portion.

6. The floating apparatus of claim **5**, wherein a distance between an interior surface of the first housing portion and an exterior surface of the first housing portion is less than a half inch.

7. A floating apparatus for alerting people of the presence of voltage in water, comprising:

a unitary shaft that is capped on both ends to prevent water intrusion into an interior of the unitary shaft;

a non-contact capacitive voltage detection circuit in the interior of the unitary shaft, the non-contact capacitive voltage detection circuit coupled to an antenna and generating an alert signal in response to a voltage level of the antenna exceeding a threshold voltage;

a buoyant structure surrounding the unitary shaft;

a counterweight;

wherein the buoyant structure and the counterweight maintain the antenna above water when the floating apparatus is placed in the water; and

a sensory alarm coupled to the buoyant housing, wherein the sensory alarm is activated in response to the alert signal being generated by the detection circuit.

8. The floating apparatus of claim **7**, wherein the sensory alarm comprises a transducer that produces an audible sound when activated.

9. The floating apparatus of claim **7**, wherein the sensory alarm comprises a light source that produces visible light when activated.

10. The floating apparatus of claim **7**, wherein generating the alert signal includes switching a switch to an active position, wherein a battery powers the sensory alarm when the switch is in the active position and does not power the sensory alarm when the switch is not in the active position.

11. The floating apparatus of claim **7**, wherein the counterweight is fully enclosed in the interior of the unitary shaft.

12. The floating apparatus of claim **7**, wherein the counterweight is a weighted endcap that caps a first end of the unitary shaft.

13. The floating apparatus of claim **7**, wherein the threshold voltage is a voltage between 0.3 Volts and 10 Volts.

14. The floating apparatus of claim **7**, wherein the buoyant structure is a buoyant ring.

15. The floating apparatus of claim **7**, wherein the unitary shaft is formed from a dielectric material.

16. The floating apparatus of claim **15**, wherein the dielectric material is polyethylene.

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