

[54] **SWIMMING POOL SAFETY DEVICE**
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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 36,943, May 13, 1970, abandoned.

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[51] Int. Cl. **G08b 21/00**

[58] Field of Search **340/244, 261; 73/296, 308, 313, 314, 315, 319; 200/61.2, 61.45, 61.53, 84**

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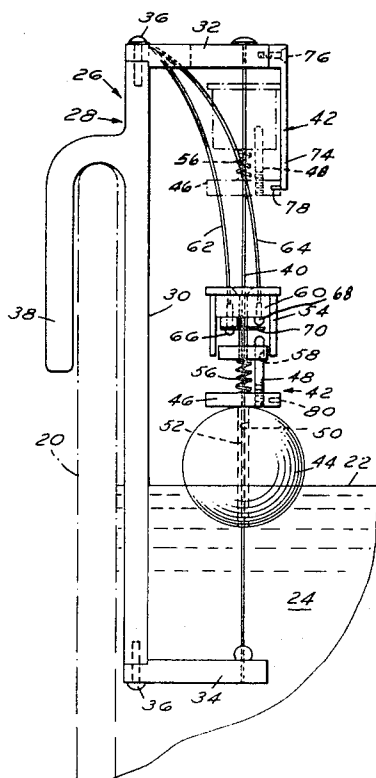
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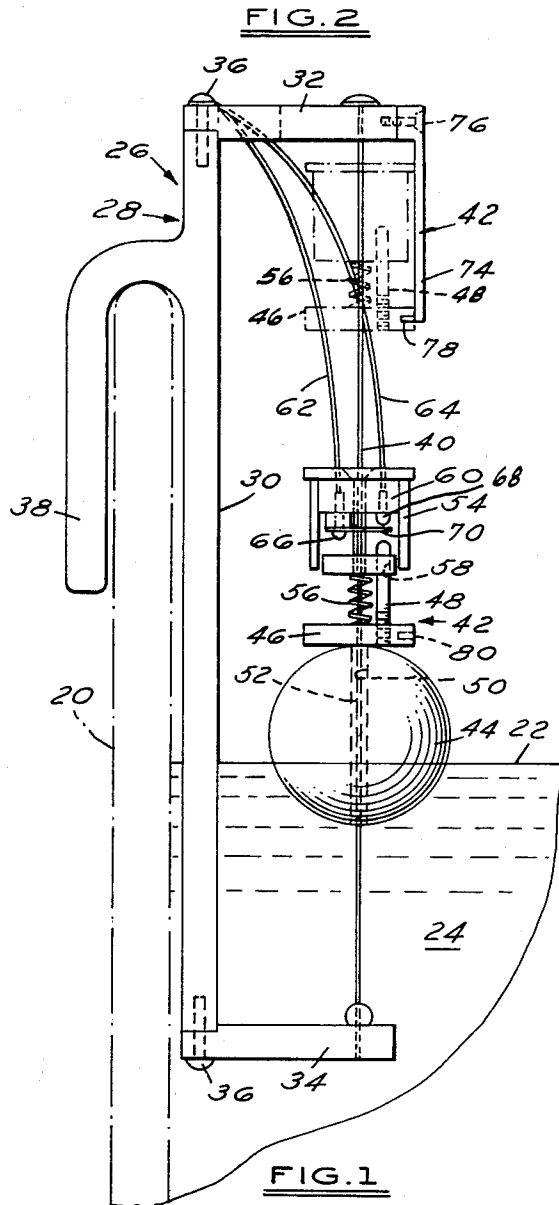
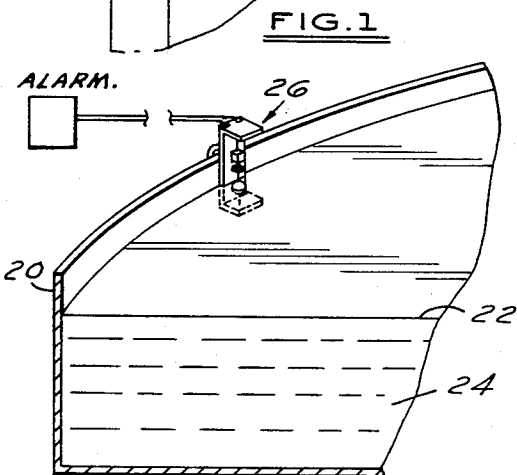
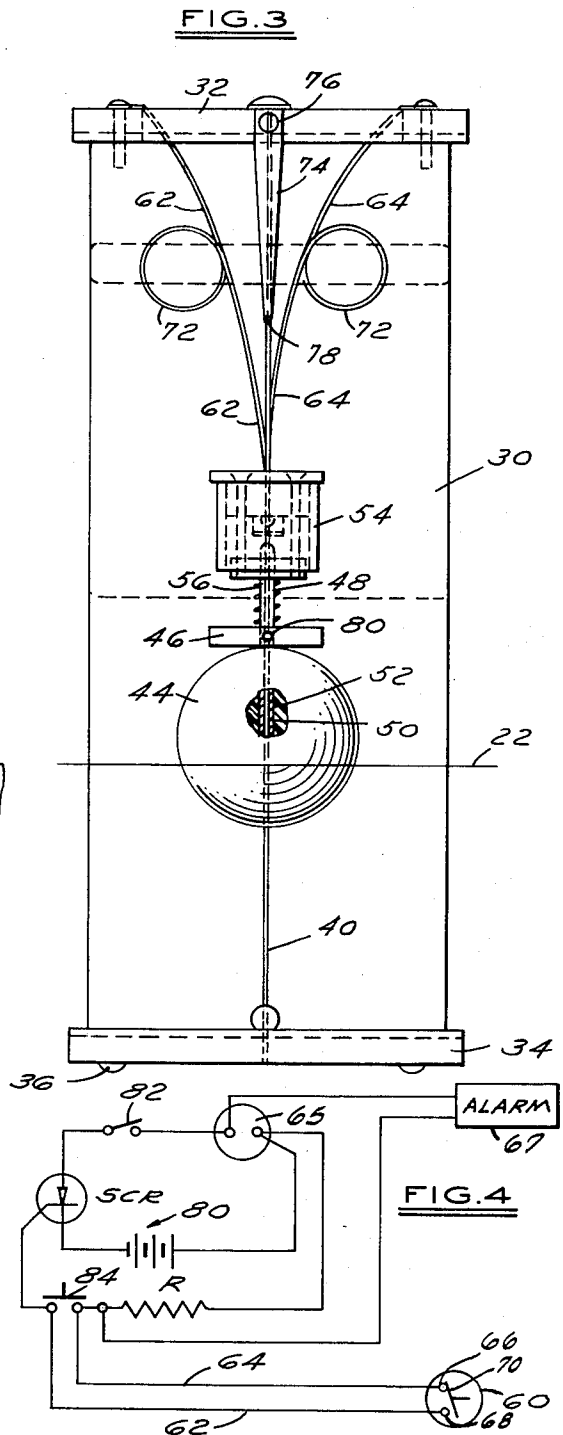
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[57] ABSTRACT

A safety device for a swimming pool including an alarm which is actuated in response to a wave in the pool generated by an object falling into the pool water. The device comprises a float freely slidable on a vertical rod partially submerged in the pool water, and a switch means carried by the float for actuation by sudden upward float movement caused by a pool wave. The mass of the switch means is sufficiently large in relation to the mass of the float so that it remains relatively stationary as the float bounces up on the wave because of the inertia of the switch means. Because the assembly is freely vertically movable on the rod, the device is operable without adjustment irrespective of the fact that the water level in the pool may vary.

13 Claims, 8 Drawing Figures





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FIG. 5

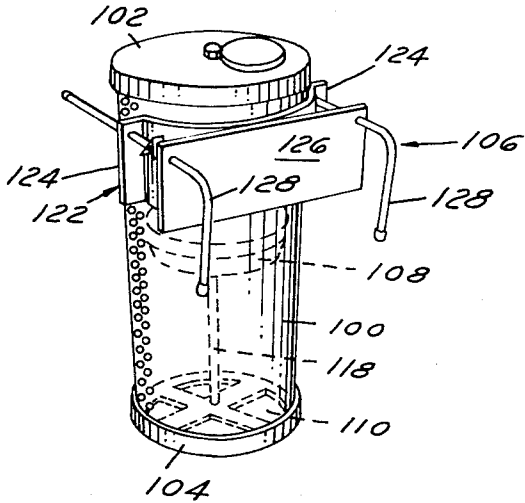
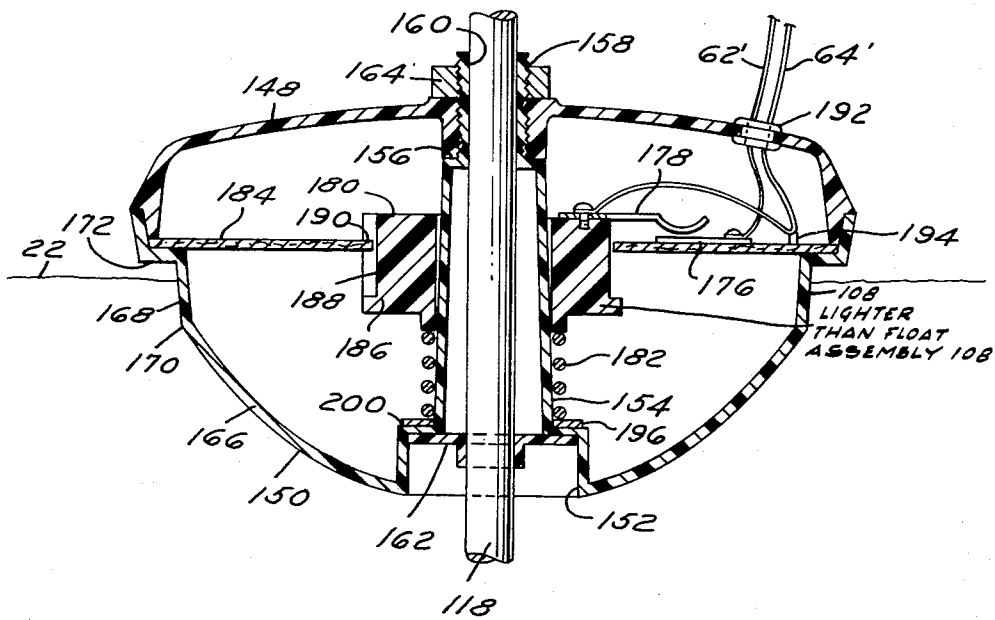
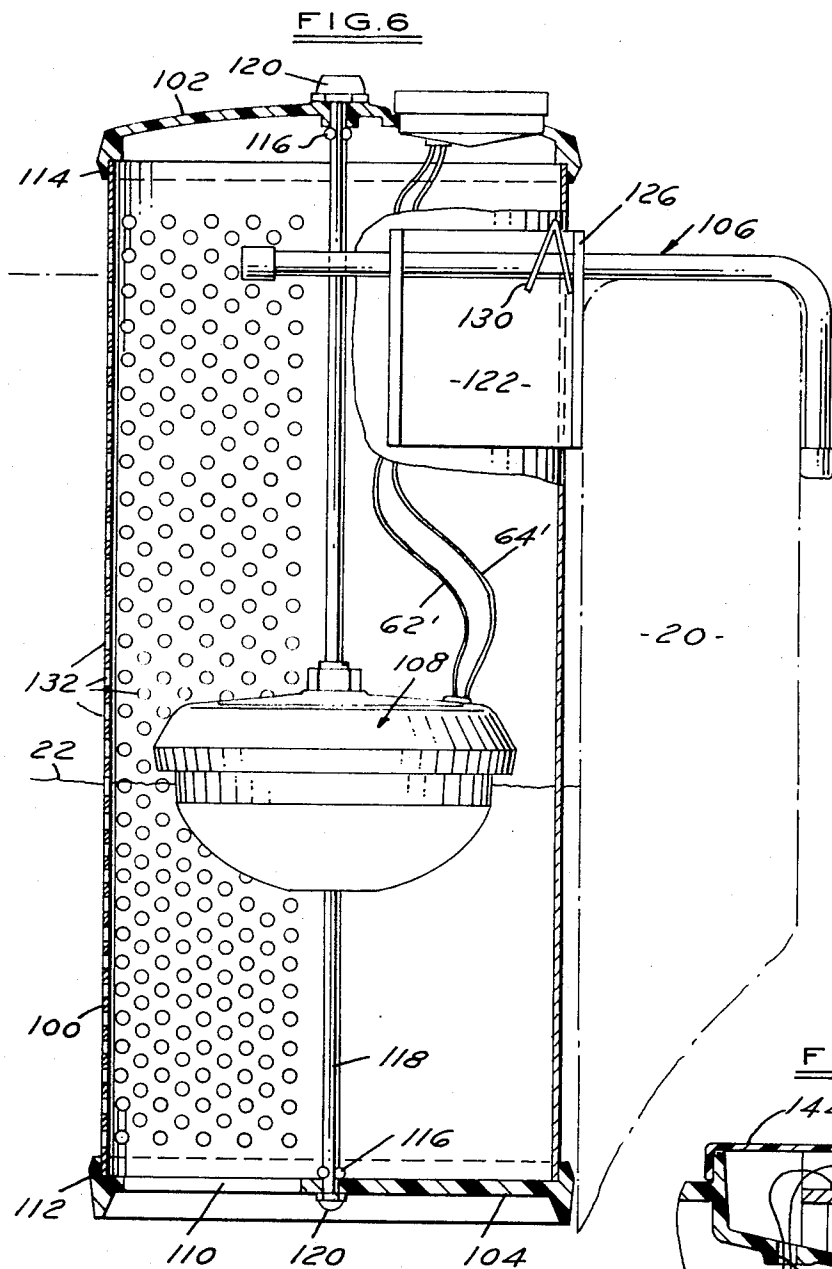
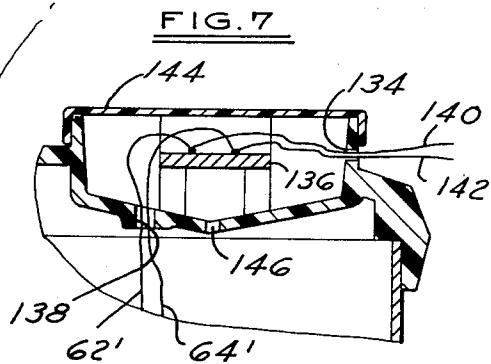


FIG. 8



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SWIMMING POOL SAFETY DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my prior application, Ser. No. 36,943, filed May 13, 1970, now abandoned.

BACKGROUND OF THE INVENTION

The invention pertains generally to the field of signal devices in the form of alarms, and is more specifically directed to a warning device for a swimming pool which is set off when a person or an object falls into the pool. The device embodying the invention is so constructed that it automatically adjusts to the water level of the pool within certain limits, and is responsive to a wave created on the pool surface by an object falling into the pool. The device also includes means for quickly and easily rendering it inoperative when the pool is in use or is attended.

Outdoor residential swimming pools have reached a level of popularity in recent years to where they are a common sight throughout the country. As it is virtually impossible to maintain around the clock surveillance of the pool area to guard against infants, pets, etc. who cannot swim from falling into the pool and drowning, various safety devices have been proposed to eliminate this danger. Codes have been adopted in some areas providing that pools be surrounded by a fence, but fences can be climbed, and gates left open or unlocked. Pool covers are available, but they are cumbersome and difficult to install, and further are not one hundred percent safe.

The need has therefore arisen for a warning device that will alert the homeowner or proprietor to an object falling into the pool when it is unattended. Various swimming pool safety devices have been proposed intended to be actuated to sound an alarm when an infant, pet or the like falls into the pool. Exemplary of such prior art are the following U.S. Pat. Nos. 2,896,038; 3,001,184, and 3,204,232. None of the devices disclosed in the above listed patents provides complete reliability and safety, coupled with simplicity and economy as does the device herein disclosed, as will become apparent from the following description.

SUMMARY OF THE INVENTION

A safety device for a swimming pool including a sensible alarm and means for actuating said alarm in response to a water wave produced by an object falling into the pool, comprising a float assembly retained in generally vertical position in the pool having upper and lower members yieldably biased apart, and a control circuit coupled to the sensible alarm including actuating means on the float assembly operable in response to relative movement between the float assembly members from a water wave striking the lower member to shift it toward the upper member while the latter remains relatively stationary due to its inertia, thereby actuating the alarm control circuit.

The sensible alarm may be in the form of an audible signal such as a horn, siren or the like; or it may be a visible signal, such as a flashing light.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a device embodying the invention mounted on the side wall of a swimming pool;

FIG. 2 is an enlarged side elevation of the device shown in FIG. 1;

FIG. 3 is a front elevation of the device;

FIG. 4 is a schematic representation of an electric circuit for controlling operation of the device;

FIG. 5 is a perspective view of a modified form of the sensing unit;

FIG. 6 is a side elevation partially in section of the modified sensing unit;

FIG. 7 is a fragmentary cross-sectional view through a portion of the top cover of the modified unit; and

FIG. 8 is a cross-sectional view through the modified float assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 there is shown part of the side wall 20 of an above-ground swimming pool filled to a predetermined level 22 with water 24. Mounted on the pool side wall 20 is a safety device 26 embodying the invention, which device is operable to actuate a sensible signal in the form of an audible alarm, a visible flasher, or other warning device, in response to a water wave striking the device 26.

In the event an object falls or is thrown into the pool, it will produce a water wave of an amplitude dependent upon the weight of the object and its size. The device is constructed so that a wave of predetermined amplitude will actuate the device to operate the signal whether it be an audible or visible warning signal. It has been found that a weight of about eighteen pounds is sufficient to actuate the alarm.

Turning to FIGS. 2 and 3, the device 26 comprises a frame 28 having an elongate base 30 and a pair of vertically spaced horizontal arms 32 and 34 joined to the base 30 as by screws or the like 36. On the side thereof opposite the arms, the base has an integral handle in the form of a hook 38 engageable over the upper marginal edge of the pool side wall 20 to retain the device in position. Extending vertically between and connected at its opposite ends to arms 32 and 34 is a slender rod or stiff wire 40 upon which a float assembly and actuator 42 is slidably mounted.

The float assembly-actuator 42 comprises a ball float 44 atop which is positioned a plate 46 having an upstanding pin 48. The ball 44 may be made of expanded plastic material such as polyurethane or the like, provided with a diametrical aperture 50 within which is seated a reinforcing sleeve 52 made out of metal or other wear-resistant material, the rod 40 extending through the sleeve 52 to retain the float in place. Plate 46 is also apertured to receive rod 40, and the plate rests on top of the ball 44.

A switch housing 54, which may be made of any suitable material such as plastic, metal or the like, is positioned on the rod 40 by an axial aperture extending through the housing to receive the rod, as shown. Housing 54 may be hermetically sealed to prevent entry of water, dirt or other contaminants, but is illustrated as being of open construction to show the parts therein. A coil spring 56 surrounds rod 40 and extends between plate 46 and the lower end wall of housing 54 and serves to yieldably bias these members apart and normally retain them in predetermined spaced relation. The lower end of the housing has an aperture 58 through which the upper end of pin 48 projects, and an electric switch 60 is secured in any convenient fashion

adjacent the upper end of the housing. A pair of electric wires 62 and 64 are connected to terminals on the switch 60, and extend out of the swimming pool over side wall 20 for connection at their opposite ends in an electric circuit described more fully hereinafter.

Switch 60 may be of any one of a number of commercially available designs. The one shown comprising a pair of contacts 66 and 68 connected to the wires 62 and 64, with a flexible contact arm 70 fixed to one contact and projecting into juxtaposition with the other contact. Relative upward movement of pin 48 shifts arm 70 into engagement with contact 68 to complete the circuit.

Housing 54 and the parts contained therein are of an appreciably greater mass or weight than the combined mass of ball float 44, plate 46 and pin 48. Hence the housing 60 or upper unit, as it may be called, has a greater inertia than the lower unit. The two units are biased apart by spring 56 and are capable of relative movement along rod 40. Each of the wires 62 and 64 has some slack therein to permit vertical movement of the entire assembly 42 along rod 40 without restraint. This slack may be provided by making a loop in each wire, as shown at 72 in FIG. 3. As the assembly 42 is freely slidable along rod 40, it will remain operably positioned floating on top of the water despite variations in the pool water level 22 within the limits of the length of rod 40. While the rod could be made long enough to reach the bottom of the pool, it has been shown only of sufficient length to accommodate slight variations in water level, because during the swimming season the pool is generally kept filled and is drained in the off season. Therefore the water level in the pool will usually not vary more than a few inches.

Shown in FIG. 4 is a schematic electrical diagram for the system, which may be powered by a battery or the like 80. The switch 60 is schematically represented in FIG. 4, with wire 62 connected to the gate of a silicon controlled rectifier SCR, and wire 64 leading to a resistor R and thence to an alarm 65. Closure of the switch 60 complete the circuit through the gate of the SCR, which then conducts, completing a circuit through battery 80 and the alarm 65 and another alarm 67, activating both. Irrespective of the subsequent opening of switch 60, the SCR device will continue to conduct until the circuit containing its anode and cathode and the battery is opened. A manually operated switch 82 is provided to render the circuit inoperative. Another manually operated switch 84 is also provided, such being in parallel with switch 60, for the purpose of testing the alarm circuit. Closure of switch 84 will complete the circuit in the same way as closure of switch 60, and provides a convenient way of testing the alarm.

Assuming the swimming pool to be filled with water to level 22, the operation of the device may be described as follows. The frame 28 is hung on the side of the pool by hook 38, with the lower end of the frame submerged so that ball float 44 floats freely on the surface of the water, as shown in FIGS. 2 and 3. If the water level varies somewhat, the ball 44 will continue to float, and the parts of the assembly 42 will remain in the relative positions shown because the entire assembly is supported by the ball and is free to move vertically along rod 40.

When an object falls into the water 24, it creates a wave, which when it reaches ball 44, causes the ball to bob upwardly on the wave crest, carrying with it plate

46 and actuating pin 48. This sudden upward movement shifts pin 48 against arm 70, moving it into contact with switch portion 68, completing the electric circuit momentarily. Turning to FIG. 4, it can be seen that closure of switch 60 completes the circuit to the gate of the SCR, which then conducts current from the battery 80 to the signal device or alarm, assuming of course that manual switch 82 has been previously closed. The SCR acts as a holding switch once rendered operative by closure of switch 60, and will continue to conduct, and hence operate the alarm, until switch 82 is opened, irrespective of the fact that closure of switch 60 is only momentary.

The greater mass of housing 54 results in it having sufficient inertia so that it moves little if at all as float 44 bobs up on the crest of a wave created by an object falling into the water. Therefore, upward movement of the float will cause pin 48 to close switch 60. The lower end portion of pin 48 is preferably threaded into plate 46 to provide adjustment of the pin in order to vary the sensitivity of the device. Spring 56 biases the members apart and is of sufficient tension to prevent relative movement therebetween sufficient to close switch 60 except upon a sudden upward force on the float. Therefore, ripples on the water caused by wind or rain, or variations in water level will not actuate the device.

In order to prevent damage to the safety device during pool use, means is provided for raising and retaining it out of the water without the necessity for completely removing it from the pool. Such means comprises a depending finger 74 fixed at its upper end to arm 32 as by a screw 76, and having a laterally projecting pin 78 at its lower end. Plate 46 is provided with an aperture 80 sized to accommodate pin 78. Finger 74 is sufficiently flexible so that when it is desired to render the device inoperative and prevent damage to it, as when swimmers are in the pool, the finger is pulled outwardly away from the base 30 and the assembly 42, save for the ball 44, is raised to the dotted outline position shown at 42a in FIG. 2, and the finger released to engage pin 78 in aperture 80. This retains the working parts of the device spaced above the water, preventing its actuation by waves from the swimmers, and also protects against damage to the device. To again render the device operative, it is merely necessary to disengage pin 78 from aperture 80 and lower the assembly onto ball float 44. This obviates the necessity of opening the control circuit switch, which is preferably located remote from the pool to prevent tampering.

In FIG. 5 a modified form of the sensing unit is shown adapted to be mounted on the side wall of an above-ground type swimming pool. It will be apparent to those skilled in the art that this modified unit may be readily adapted for mounting on in-ground pools by a change in the mounting arrangement. In this modification a float protecting housing comprising a cylindrical screen 100 having at opposite ends upper and lower covers 102 and 104 is secured to a side 20 of the pool by a bracket assembly 106 to extend at its lower end beneath the water level 22 with a float assembly 108 disposed within the housing to rise and fall with changes in the water level as well as bob in response to wave action to be sensed.

The bottom cover 104, as shown in FIG. 5, has large openings 110 to allow the ready movement of water therethrough and includes an upstanding peripheral flange 112 embracing the lower end of the screen. The

top cover 102 has a depending peripheral flange 114 embracing the upper end of the screen and the covers are tensioned toward each other and against opposite ends of the screen and against stop rings 116 on the rod 118 by nuts 120 threaded on the rod ends. The screen 100 is relatively rigid and self-supporting and is rigidly attached to the inner circumference of a flanged semi-circular plate 122 having oppositely outwardly extending flanges 124. The semi-circular plate is rigidly attached at its midpoint to a rectangular plate 126 which, when the unit is installed against the side 20 of the pool, will abut the pool side. Through the flanges 124 and rectangular plate 126 L-shaped rods 128 project and engage the pool side 20 and are adjustably held in position by V-shaped spring clips 130 mounted on the rods between the plates.

The screen 100 acts as a protective barrier around the float assembly 108 while permitting waves to essentially freely impinge on the float to actuate the alarm. I have found that with screen openings 132 of at least 3/16 inch in diameter, the sensitivity of the alarm is not reduced and yet debris, swimmers, or floating objects are prevented from interfering with the float action.

While not provision has been made for lifting the float assembly 108 from the water surface 22 as in the case of the first described embodiment, the protection afforded by the perforated housing makes it convenient and with no danger of damaging the unit to remove it from the pool, if desired, and lay it aside.

Top cover 102 is provided with a well 134 within which is received a terminal block 136. Conductors 62' and 64', connected to the block at one end, extend through an aperture 138 in the bottom of the well for connection to the float assembly 108. Conductors 140 and 142 extend through an aperture in the side of the well and are connected respectively to the conductors 62' and 64' at the terminal block. Conductors 140 and 142 lead away from the pool for connecting the unit to the remainder of the alarm system in similar fashion to the wires 62 and 64 in FIG. 4. A cap 144 closes the top of the well. A moisture drain hole 146 is provided in the bottom of the well. The covers 102 and 104 may be formed of molded plastic. The screen 100 may be of a noncorrosive metal. The rod 118 may be of a noncorrosive material such as stainless steel or aluminum.

The float assembly 108, as shown in FIGS. 6 and 8, is freely slidably carried or guided within the housing on the rod 118. The float assembly includes opposed interfitting molded plastic cup-shaped members 148 and 150 whose perimeters are shaped as shown to interfit in fluid-tight relation.

The lower member 150 may be formed to have an integral upwardly extending recess 152 formed within an upwardly extending integral hollow stem portion 154 having adjacent its upper end an inwardly stepped portion providing a shoulder 156 with an integral externally threaded nut receiving end portion 158 thereabove through which the rod 118 extends for guiding the upper end of the float assembly thereon. A lower rod bushing or guide member 162 is secured within the recess 152 and serves to center the lower end of the float assembly on the rod 118. The bore 160 through the upper end of the stem portion and the internal diameter of the rod bushing 162 are sufficiently oversized the external diameter of rod 118 to permit the float assembly to freely slide up and down the rod.

A nut 164 is threaded on to the stem portion 158 and bears against the upper side of the upper cup member 148 to urge such cup member at its center against the shoulder 156 to effect a fluid-tight seal thereat and to hold the interfitting perimeters of the cup members in fluid-tight sealed relation. It will be noted that any leakage of water along the rod 118 at the bushing 162 will be trapped within the stem 154 and cannot enter the hermetically sealed interior of the float.

The configuration of the float, and in particular the lower cup portion 150 thereof, is designed to improve sensitivity of response to a predetermined wave amplitude on the pool surface while being relatively insensitive to waves of a lesser amplitude. It will be noted that the lower cup member 150 has a generally spherical bottom portion 166 rising to a generally cylindrical portion 168 with the conjunction 170 of the spherical and cylindrical portions lying below the water level 22 and with the cylindrical portion extending above the water level. The cylindrical portion 168 above the water level 22 merges into a laterally outwardly, or radially outwardly, projecting portion 172 which in a quiescent condition of the float and pool surface is disposed slightly above the pool surface as best shown in FIG. 8. This laterally or radially outwardly projecting flange portion 172 provides a substantial reserve buoyancy for the float spaced above the quiescent water level. As a result, when a wave moves across the pool surface of an amplitude sufficient to crest above the lower surface of flange 172, there is suddenly applied to the float a substantial upward buoyant action which will cause the float to suddenly rise in the presence of this wave crest. On the other hand, smaller waves, such as ripples caused by wind action on the surface of the pool and the crests of which ripples do not reach the under surface of the flange 172 will not cause any sudden upward buoyant action giving rise to a sudden upward movement of the float. In this respect the shape of the float is superior to that of a sphere such as shown in the first embodiment.

Within the float switch mechanism is provided for completing an electric circuit through the conductors 62' and 64'. Such switch mechanism includes a pair of relatively movable contacts 176 and 178, which in the embodiment shown, are carried respectively by the float and by an inertial mass element or weight member 180. Resilient means in the form of a coil spring 182 is disposed between the float and the underside of the inertial mass for resiliently supporting the latter on the float. The mass of the weighted member 180 and the effective spring rate of the spring 182 are so related as to allow determined relative movement between the switch contacts upon a determined magnitude of bobbing of the float. In this embodiment the switch contacts are normally open and a determined bobbing of the float will cause such contacts to momentarily close and complete the electric circuit between the conductors 62' and 64'. Contact 176 is mounted on a horizontal nonconductive partition 184 whose perimeter is trapped between the interfitting edges of the cup members 148 and 150. Contact 176 may comprise a conductive strip secured to the partition in any suitable fashion. The partition is provided with a central aperture through which the weight member 180 extends, with the shape of such aperture loosely conforming to the exterior of the weight member. In the embodiment shown in FIG. 8 the weight has a generally cylindrical

exterior 186 with a vertically extending nub 188 received in a notch 190 in the partition. Such ribs and notches will serve to rotationally stabilize the weighted member 180 while permitting relative vertical movement between it and the partition. The contact 178 is secured to the weighted member 180 to overlies the contact 176 with the spring 182 supporting the weighted member such that the contacts are normally slightly separated. Securement of the contact 178 to the weighted member 180 may be effected in any suitable fashion. The conductors 62' and 64' extend through a fluid-tight gland 192, and conductor 62' may be attached to the partition 184 as at 194 with sufficient slack to permit nonrestraining connection to the contact 178. In assembly of the float a shim 196 of selected thickness is disposed beneath the bottom of the spring 182 and a step 200 whereby accurate predetermined spacing between the contacts 176 and 178 may be effected.

In the embodiment of FIGS. 1 to 3, the inertial mass which was composed of the housing 54 and the switch 60 was heavier than the float and its parts. In the embodiments of FIGS. 5 to 8, the opposite prevails, namely the inertial mass or weight member 180 and its contact 178 are lighter than the float and its parts. The essential relationships involve the inertia of the mass 180, the spring rate of spring 182 and the responsiveness of the float to bob in response to waves striking it. The mass of weight 180 must be such as to provide sufficient inertia so that upon sudden movement of the float in response to a wave of predetermined amplitude striking it, the float will develop sufficient impulse force so that the spring 182 supporting the mass 180 in preset relation to the float will be overcome and cause the contacts 176 and 178 to close momentarily. For example, if the spring rate is 0.41 pounds per inch and the gap between contacts 176 and 178 is 0.022 inch, I have found that an inertial mass 180 weighing three-fourths of an ounce will give a sufficiently sensitive response to waves of an amplitude desired to cause energization of the alarm.

Encapsulation of the contacts and the weight member 180 within the float serve to protect these critical parts of the unit and discourage tampering by curious and inexperienced persons.

What is claimed is:

1. An alarm system for a swimming pool comprising: a float, means for retaining the float for bobbing reaction to waves in the pool, an electrical circuit including an alarm, and mechanism buoyantly supported solely by said float for completing said circuit and including: first means having a determined inertial mass, resilient means disposed between the float and the first means for resiliently supporting the latter on the float, said determined inertial mass of the first means and the effective resiliency rate of the resilient means being related to allow determined relative movement between the first means and the float upon a determined magnitude of bobbing of the float, and electrical contact means connected to said electrical circuit for controlling the same and actuated in response to a determined relative movement between the float and said first means.

2. The invention defined in claim 1 characterized in that said circuit includes locking means for retaining

said alarm operative in response to momentary energization of said circuit.

3. The invention defined by claim 1 characterized in that said means for retaining the float for bobbing reaction to waves in the pool includes a stationary vertical rod supported on the pool and extending from above to below the water level thereof and upon which the float freely slidably bobs.

4. The invention defined by claim 3 characterized in that latching means are provided on the frame for locking the float thereon in inoperative position above the surface of the pool.

5. The invention defined in claim 1 characterized in that the electrical contact means includes an actuating finger on the first means and a contact member on the float.

6. The invention defined by Claim 1 characterized in that said means for retaining the float includes a protective housing surrounding the float and having openings therethrough allowing waves to enter the housing and impinge on the float.

7. The invention defined by claim 6 characterized in that said housing includes an encircling wall surrounding the float and means is provided within the housing for holding the float in the housing in spaced relation from the encircling wall and for free vertical movement within the housing.

8. An alarm system for a swimming pool, comprising: a hollow float,

a protective housing for the float open to the passage of wave action therethrough with the float disposed within the housing for free vertical movement in response to such wave action,

an electric circuit including an alarm, mechanism wholly enclosed within and buoyantly supported by the float for completing said circuit, said mechanism including first means having a determined inertial mass,

said mechanism further including spring means resiliently supporting the first means on and within the float,

said determined inertial mass of the first means and the effective rate of said spring means being related to allow determined relative movement between the first means and the float upon a determined magnitude of bobbing of the float, and

said mechanism further including electrical contact means connected to said electrical circuit for controlling the same and actuated in response to a determined relative movement between the float and said first means.

9. The invention defined by claim 8 characterized in that said float is hollow and defines an hermetically sealed chamber, and said mechanism is enclosed in said chamber.

10. The invention defined by claim 9 characterized in that said float comprises a pair of cup-shaped members disposed in opposed rim interfitting sealed relation.

11. The invention defined in claim 10 characterized in that the cups are vertically arranged and the lower cup is shaped to provide an integral internal hollow stem projecting upwardly through the other cup and secured thereto, and a guide rod carried by the protective housing extending vertically slidably through said stem.

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12. The invention defined by claim 8 characterized in that a vertical guide rod is supported within the protective housing and extends freely slidably through said hollow float and retains the float for vertical movement within the housing.

13. A device for completing an electrical circuit in response to predetermined wave motion in a body of water comprising, in combination: a float responsive to waves in said body of water and bob in response thereto, and mechanism buoyantly supported solely by the float for completing the electrical circuit and including:

first means having a determined inertial mass,

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resilient means disposed between the float and the first means for resiliently supporting the latter on the float,

said determined inertial mass of the first means and the effective resiliency rate of the resilient means being related to allow determined relative movement between the first means and the float upon a determined magnitude of bobbing of the float, and electrical contact means constructed and arranged for actuation by determined relative movement between the float and the first means.

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