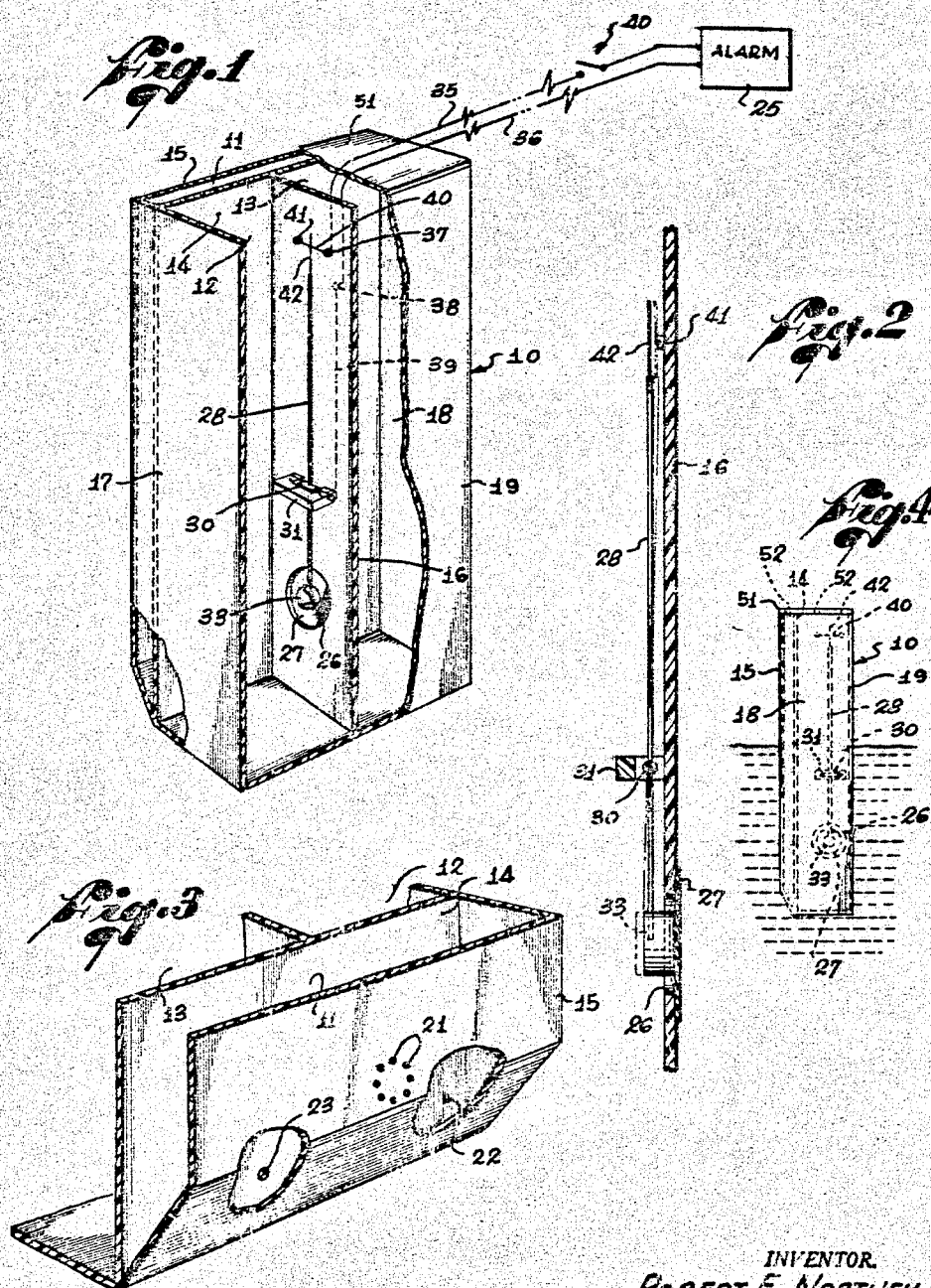


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R. E. NORTHEY
DETECTION AND ALARM APPARATUS FOR GUARDING
SWIMMING POOLS AND THE LIKE
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**DETECTION AND ALARM APPARATUS FOR
GUARDING SWIMMING POOLS AND THE
LIKE**

Robert E. Northey, Los Angeles, Calif., assignor to
Supertron Corporation, Los Angeles, Calif., a corpora-
tion of California

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This invention relates to alarm apparatus, and more particularly to an improved device for detecting the presence of a person in an unattended swimming pool and sounding an alarm.

In recent years, there has been a tremendous increase in the number of private swimming pools in residential areas, and such pools constitute an attraction for small children. Although most young children cannot swim, they are nevertheless attracted to the water, and enjoy playing around the edge of the pool. As a consequence, many children have fallen into unattended private pools and have drowned.

In many cities, studies have been made of ways and means to prevent drowning, and in many cases have resulted in the passage of city ordinances requiring that fencing be placed around all private pools, with an access gate which is to be locked while the pool is unattended. As is well known, however, children are also attracted to fences, and enjoy climbing over them. Although fences are effective to prevent very small children and babies from having access to the pool, they present little or no obstacle to many active children.

It frequently happens that an active youngster who cannot swim will climb over a pool fence, and fall in and drown while playing around the edge of the pool. In this situation, the fence and the locked gate actually become a barrier which unduly delays persons attempting to gain access to the pool to save the child. Undoubtedly, many children could have been saved had it not been necessary to use up time getting a gate unlocked and opened.

Not only is fencing an unsatisfactory solution; it is quite expensive, and it detracts from the appearance of the landscaping.

Another solution has been to provide alarm systems, to arouse the persons within the vicinity of a pool if a person falls in while it is unattended. However, prior art swimming pool alarm systems are characterized in that they are unduly subject to sounding false alarms, as in response to disturbance of the surface of the water due to strong winds and the like. Some prior art systems use floats which can be moved to activate an alarm. In these, false alarms may be sounded in response to gusts of wind moving the float, or from birds landing on the floats.

Still a further difficulty with prior art pool alarm systems is that they are not sufficiently sensitive to a rise in the overall water level where the surface of the water is calm. For example, if a child enters or slides slowly into the water at some distance from the detection system, the alarm will not be activated.

It is an object of this invention to provide a detection system for use in swimming pools, which is characterized by a sensitivity to detect only changes in water level caused by objects or persons entering the pool, and which minimizes false alarms.

It is another object of this invention to provide swimming pool alarm apparatus which can be made operative

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or inoperative as desired, and which causes an alarm to be sounded only when objects or persons enter the pool when it is unattended.

A further object of this invention is to provide detection and alarm apparatus for swimming pools which cannot be activated by random disturbances on the surface of the water.

A still further object of this invention is to provide a detection device for a swimming pool alarm which makes it unnecessary to use fences and like barriers around the pool, and which is highly reliable in warning persons in the vicinity of an unattended pool when a child of any size falls into the pool.

It is also an object of this invention to provide an improved swimming pool alarm system which is comprised of a minimum number of component parts of simple design and rugged construction, capable of reliable operation over a long operating life, which is relatively inexpensive, and which is more reliable than prior art swimming pool alarm systems.

The above and other objects and advantages of this invention will become apparent from the following description, taken in conjunction with the accompanying drawing of an illustrative embodiment thereof, in which:

Figure 1 is a perspective view, partly broken away, of my detection system, showing the location of three compartments and a contact closure element to be operated upon a rise in the water level to close a set of contacts for sounding an alarm;

Figure 2 is a sectional view of the panel separating two of the compartments, and showing the contact closure element pivotally mounted thereon for actuation by a diaphragm portion of the panel in response to a difference in water pressures on the opposite sides of the panel;

Figure 3 is a fragmentary perspective view of the lower portion of the detection device, showing the arrangement of openings to admit water into the various compartments in a manner to insure sounding of the alarm only in response to an increase in the level of the pool caused by a person or object entering the pool; and

Figure 4 is a side elevation view of the detection device in position in a pool, in readiness to detect the presence of a person or object entering in the water.

Referring to the drawing, my invention comprises a housing 10 having three separate compartments 11, 12, 13. In the device illustrated, one compartment 11 is formed by a panel 14 which is parallel to and co-extensive with one wall 15 of the housing. The remaining compartments 12, 13 are formed by a panel 16 parallel to the side walls 17, 18 and extending from the panel 14 to the opposite wall 19.

The different compartments are in fluid communication with the exterior of the housing 10, and for this purpose the wall 15 (see Figure 3) is provided with a plurality of apertures 21, and the adjacent panel 14 is provided with a pair of spaced apertures 22, 23 leading from the compartment 11 to the compartments 12, 13.

The apertures 21, 22, 23 are arranged so that water enters the compartment 11 rather rapidly, but enters the compartments 12, 13 from the compartment 11 relatively slowly. Furthermore, water enters the compartment 12 more slowly than through the compartment 13. To this end, both the apertures 22, 23 are smaller than the opening constituted by the plurality of apertures 21, and the aperture 22 is smaller than the opening 23. Also, both of the openings 22, 23 are located at points below the openings 21, and hence below the surface of water in compartment 11.

If the level of water surrounding the housing 10 increases, and is turbulent, the fact that the apertures 21 permit water to flow readily into compartment 11 means

that the surface of the water in the compartment 11 will reflect such turbulence.

Since the openings 22, 23 are disposed below the apertures 21, and since they are relatively small, water flows into the compartments 12, 13 at slower rates (and also at different rates inasmuch as the openings 22 and 23 are of different size), and the water level in the compartments 12, 13 rises smoothly, i.e., there is substantially no turbulence in compartments 12, 13.

If the object or person which causes the increase in the level of the water surrounding the housing 10 is removed, so that the surface of the surrounding water returns to its previous level, the water in the compartment 11 readily flows out of the apertures 21 so that the water level in such compartment 11 tends quickly to adjust to the surrounding water level. However, water flows out of the compartment 13 through the aperture 23 more slowly, and water flows from the compartment 12 through the aperture 22 even more slowly.

In my invention the different rates of water flow are utilized to activate an alarm 25 when a person enters a swimming pool in which the housing 10 is disposed, and to deactivate the alarm when the person leaves the pool. For this purpose, I provide an opening 26 near the lower end of the panel 16, and cover such opening, as on one side of the panel, with a diaphragm 27 (see Figure 2) which moves with respect to the opening 26 when pressures on the opposite sides thereof are unequal. Movement of the diaphragm 27 is utilized to actuate the alarm 25 when the surrounding water level increases, i.e., when the water level in the compartment 13 increases more rapidly than the water level in the compartment 12.

For actuating the alarm 25, I provide an elongated element of conductive material, such as a metal rod 28, which is vertically disposed adjacent the panel 16, and which is pivotally mounted adjacent its lower end to the panel. In the embodiment shown, the pivotal mounting is effected by inserting the rod 28 through a short cylindrical conductive fulcrum member 30, and journaling the ends of such member in a non-conductive (e.g., plastic) element 31 which is secured to the panel 16. Thus, the rod 28 is provided with a fulcrum adjacent its lower end, so that slight movement of the lower end thereof will result in a relatively large movement of its upper end.

The rod 28 is secured at its lower end in a weight 33, and in such a manner that the weight 33 normally rests against the diaphragm 27. The weight 33 in this example is a short cylindrical element, preferably of non-conductive material. The lower end of the rod 28 (as shown in Figure 2) is affixed to the weight element adjacent one end thereof. Thus, the greater portion of the mass of the weight 33 is disposed between the lower end of the rod and the diaphragm 27. Accordingly, the weight 33 urges the lower end of the rod 28 toward the diaphragm 27.

From the foregoing, it will be seen that movement of the diaphragm 27 to the left (in Figures 1 and 2) causes the weight 33 to be moved to the left, i.e., counterclockwise, thereby to move the upper end of the rod 28 clockwise toward the panel 16. If the diaphragm 27 is moved to the right, the weight 33 follows such movement to cause the upper end of the rod 28 to move away from the panel 16.

To control the alarm 25 with the above-described movements of the rod 28, the lead-in wires 35, 36 of the alarm apparatus are conductively connected to respective terminal pins 37, 38 secured in the panel 16, terminal 38 is conductively connected, as a wire 39, to the metal fulcrum 30. When the rod 28 is moved to a position adjacent the panel 16, connection is made with the terminal 37, thereby to complete the alarm circuit.

Although the rod 28 can be made to move directly against the terminal 37, I prefer to locate such terminal above the upper end and out of the path of the rod 28, and to connect a wire 40 between the terminal 37 and a spaced pin 41 secured to the panel 16. The upper end

of the rod 28 is disposed below the wire 40, and I provide a conductive element 42, such as metal ribbon, wire or the like, on the upper of the rod to engage the wire 40 upon movement of the rod to the point adjacent the panel 16.

With the above described arrangement of the wires 40, 42 the apparatus can be adjusted at the time of installation to insure the proper sensitivity for the system. This may be necessary for such reasons as, that in assembling the apparatus, the fulcrum member 30 may not be placed at the same location on the panel 16 at which detection devices, or the panel 16 may not be located in precisely the same position in all housings. All that is needed to make the necessary adjustment is to bend the wire extension 42 on the rod (or the wire 40 on the panel) toward or away from the panel to the position wherein the wires 40, 42 come into contact and the alarm sounds in response to a desired minimum weight (e.g., 10 pounds) of a person or object falling into the pool.

As previously mentioned, the removal of a person or object from the pool results in water flowing out of the various compartments as the surrounding pool water returns to its previous level. Since water passing out of the compartment 13 does so more rapidly than water passing out of the compartment 12, there exists a pressure differential on the diaphragm 27 (very shortly after the person or object is removed) to cause the diaphragm to move to the right. The weight 33 follows such movement, and causes the rod 28 to move counter-clockwise to disengage the wire contacts 40, 42, whereupon the alarm circuit is broken.

When the pool is in use and under surveillance, it will, of course be undesirable to have the alarm sounding while persons are swimming. All that is necessary to prevent the detection system from activating the alarm is to provide a simple switch 50 in one of the leads to the alarm circuit. The switch 50 is opened when it is not desirable to actuate the alarm, and is closed when the pool is not in use.

Referring to Figure 4, the housing 10 is shown disposed in water so that the level of the water is well above the diaphragm 27. The top 51 of the housing 10 is vented, as at 52 to insure equalization of air pressures inside the housing with the outside air pressure. Although the water level is shown considerably higher than the diaphragm 27, it will be recognized that the housing need not be inserted so far, it being sufficient that a portion of the diaphragm lies on the normal level of the water.

While I have described my invention with reference to a particular illustration, it will be apparent that many modifications may be made without departing from the spirit and scope of the invention. For example, the panel 16 may extend through the panel 14, and the panel 14 made half the width shown, thereby reducing the size of the chamber 11 and increasing the size of the chamber 13. In such arrangement, the aperture 23 may be replaced with an aperture or apertures in the portion of the panel 16 separating the chambers 11 and 13. Also, the wall 15 may be shortened at its lower end, so that the apertures 22 and/or 23 may connect their chambers directly to the surrounding water. Accordingly, I do not intend that my invention be limited, except as by the appended claims.

I claim:

1. An alarm system comprising: a housing to be immersed in a fluid medium having a partition therein to provide a pair of compartments, said compartments each having an opening therein so that they are in fluid communication with the surrounding medium, said openings being shaped to permit fluid to pass into and out of one compartment more rapidly than the other compartment; a diaphragm between said compartments movable in the presence of a difference in fluid pressures within said compartments; and indicating means operable by said diaphragm to provide perceptible indications of movement of fluid into said compartments.

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2. Apparatus to detect increases in the level of the surface of a liquid comprising: a housing to be immersed in the liquid, said housing having a pair of compartments; a diaphragm between the compartments, at least part of said diaphragm being below the normal level of the liquid when the housing is immersed therein; means to admit the liquid into said compartments at different rates, said means permitting the liquid to rise to the normal level thereof when the housing is immersed therein, said means operating upon an increase in level of the liquid to cause a temporary greater increase in the level in one compartment relative to the increase in the other; and indicating means operable by said diaphragm to provide perceptible indications of movement of fluid into said compartments.

3. Apparatus to detect increases in the level of the surface of a liquid comprising: a housing to be immersed in the liquid, said housing having a pair of compartments; a diaphragm between the compartments, at least part of said diaphragm being below the normal level of the liquid when the housing is immersed therein; means to admit the liquid into said compartments at different rates, said means permitting the liquid to rise to the normal level thereof when the housing is immersed therein, said means operating upon an increase in level of the liquid to cause a temporary greater increase in the level in one compartment relative to the increase in the other; and indicating means operable by said diaphragm to provide perceptible indications of movement of fluid into said compartments, said indicating means including a contact closure element movable with said diaphragm for closing an alarm circuit upon an increase in the level of the liquid above the normal level thereof.

4. An alarm system comprising: a housing to be immersed in a fluid medium having a partition therein to provide a pair of compartments, said compartments each having an opening therein so that they are in fluid communication with the surrounding medium, said openings being shaped to permit fluid to pass into and out of one compartment more rapidly than the other compartment; a diaphragm between said compartments movable in the presence of a difference in fluid pressures within said chambers; and indicating means operable by said diaphragm to provide perceptible indications of movement of fluid into said compartments, said indicating means including a contact closure element movable with said diaphragm for closing an alarm circuit upon an increase in the level of the liquid above the normal level thereof.

5. Apparatus to detect increases in the level of the surface of a liquid comprising: a housing to be immersed in the liquid having a plurality of compartments therein in fluid communication with the surrounding liquid, the fluid connections for two of said compartments being adapted to permit liquid to flow into and out of them at slower rates than through the remainder, and to permit liquid to flow into and out of one of them then the other; a diaphragm between said two compartments; and indicating means operable by said diaphragm to provide perceptible indications of movement of fluid into said compartments.

6. Apparatus to detect increases in the level of the surface of a liquid comprising: a housing to be immersed in the liquid having a plurality of compartments therein

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in fluid communication with the surrounding liquid, the fluid connections for two of said compartments being adapted to permit liquid to flow into and out of them at slower rates than through the remainder, and to permit liquid to flow into and out of one of them then the other; a diaphragm between said two compartments; and indicating means operable by said diaphragm to provide perceptible indications of movement of fluid into said compartments, said indicating means including a contact closure element movable with said diaphragm for closing an alarm circuit upon an increase in the level of the liquid above the normal level thereof.

7. An alarm system comprising: a housing having three compartments, one compartment being in fluid communication with the exterior of the housing, the remaining compartments each being in fluid communication with said one compartment, the fluid connections being such that fluid passes into and out of said one compartment more rapidly than the remaining compartments, and fluid passes into and out of one of said remaining compartments more rapidly than the other; a movable diaphragm interposed between said remaining compartments; means for producing a warning signal; and a switch for said means having a fixed contact and a movable contact, said movable contact being adapted for movement by said diaphragm to engage said fixed contact when fluid flows into said compartments.

8. A device for detecting an increase in the level of water in a swimming pool comprising: a housing to be partly immersed in the pool having a pair of abutting partitions arranged to form first, second and third compartments therein, wherein said second partition separates said second and third compartments, and said first partition forms one wall for both said second and third compartments, said first partition having a pair of spaced apertures of different sizes adjacent the lower portions of said second and third compartments, said housing having a plurality of apertures in the outer wall thereof adjacent said first compartment which are disposed above said spaced apertures; a movable diaphragm forming part of said second partition, part of said diaphragm being below the normal level of the pool; a conductive rod pivotally mounted adjacent its lower end on said second partition; a weight secured to the lower end of said rod and adapted to rest against said diaphragm; and a pair of electrical terminals secured to said second partition for connection to an external alarm circuit, one of said terminals being located adjacent the upper end of said rod, the other of said terminals being conductively connected to said rod, said rod normally being spaced from said second partition, said rod being adapted upon movement of the diaphragm in one direction to contact said one terminal to close the alarm circuit, said movement being effected by water entering said compartments when the level of the pool rises upon a person falling therein.

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