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OR 3,482,237

Dec. 2, 1969 H. F. HAMBURG ETAL 3,482,237

ALARM SYSTEM FOR SWIMMING POOLS AND THE LIKE

Filed Oct. 22, 1965 2 Sheets-Sheet 1

Fig. 1

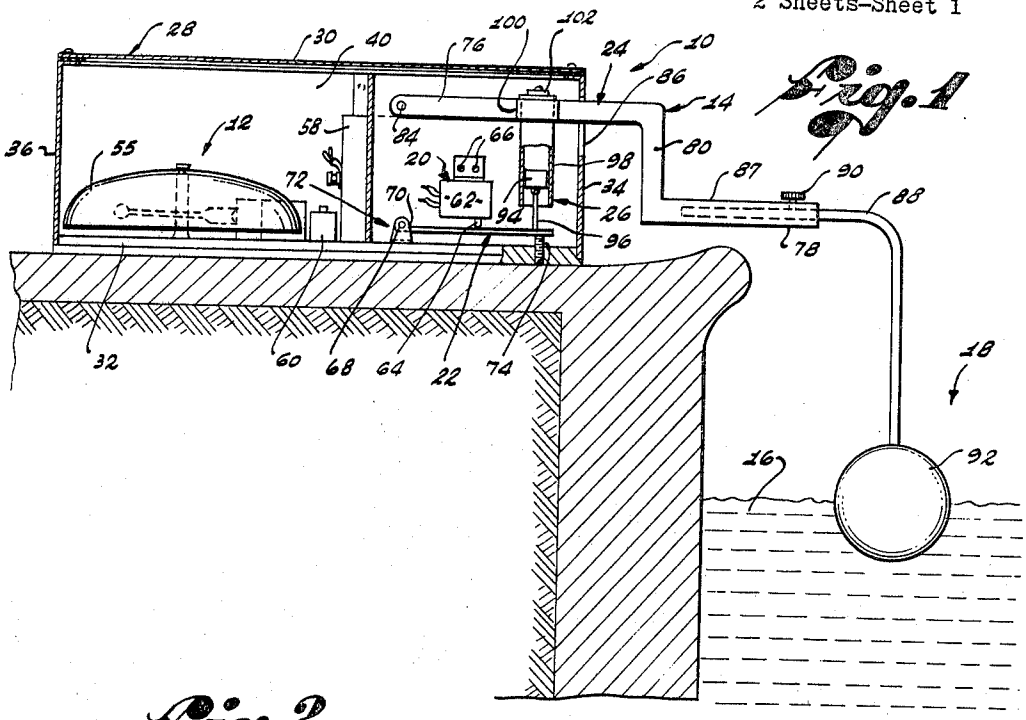
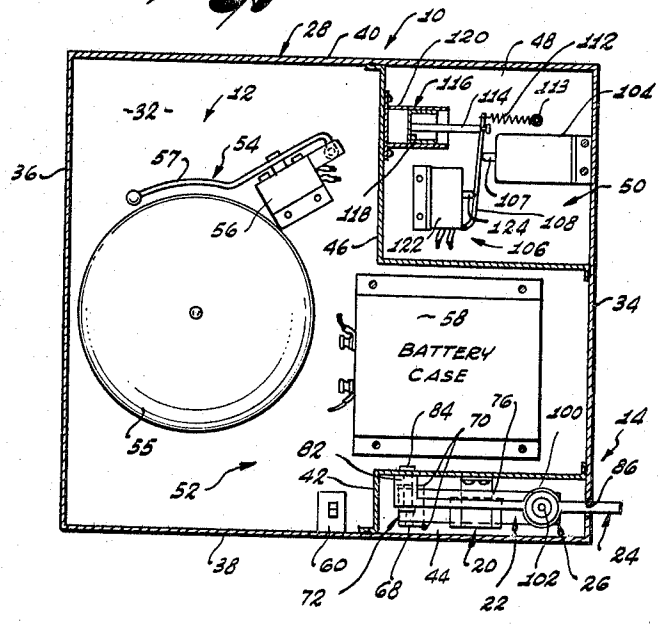


Fig. 2



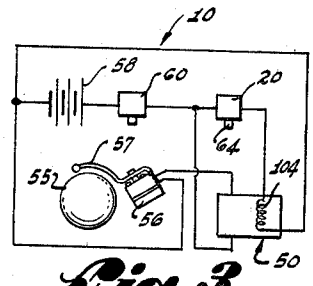


Fig. 3

Fig. 4

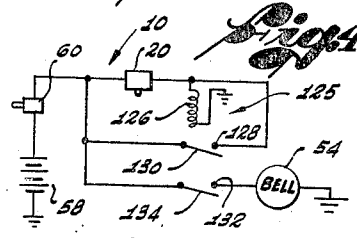


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Fig. 5

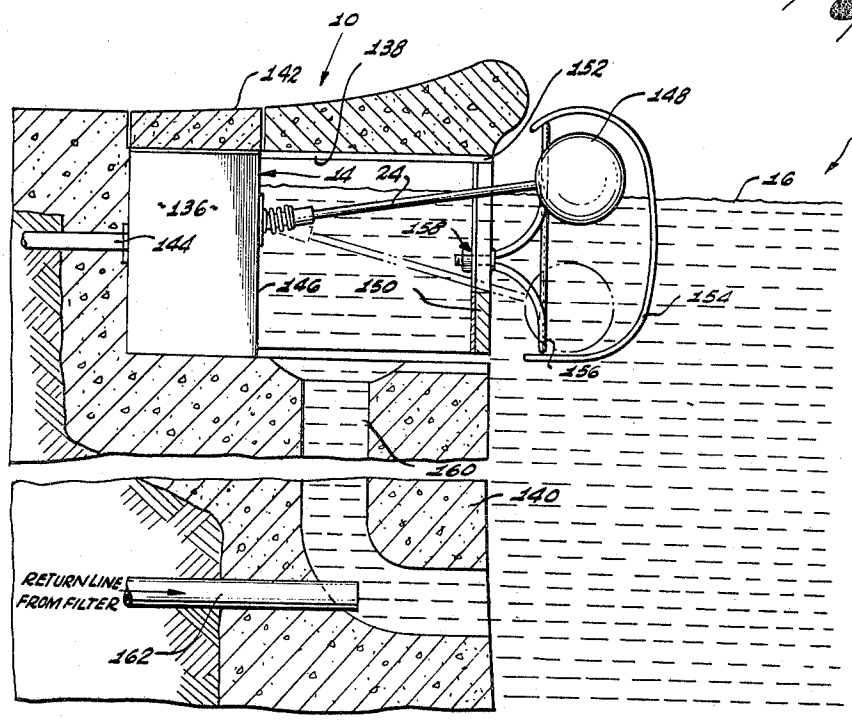
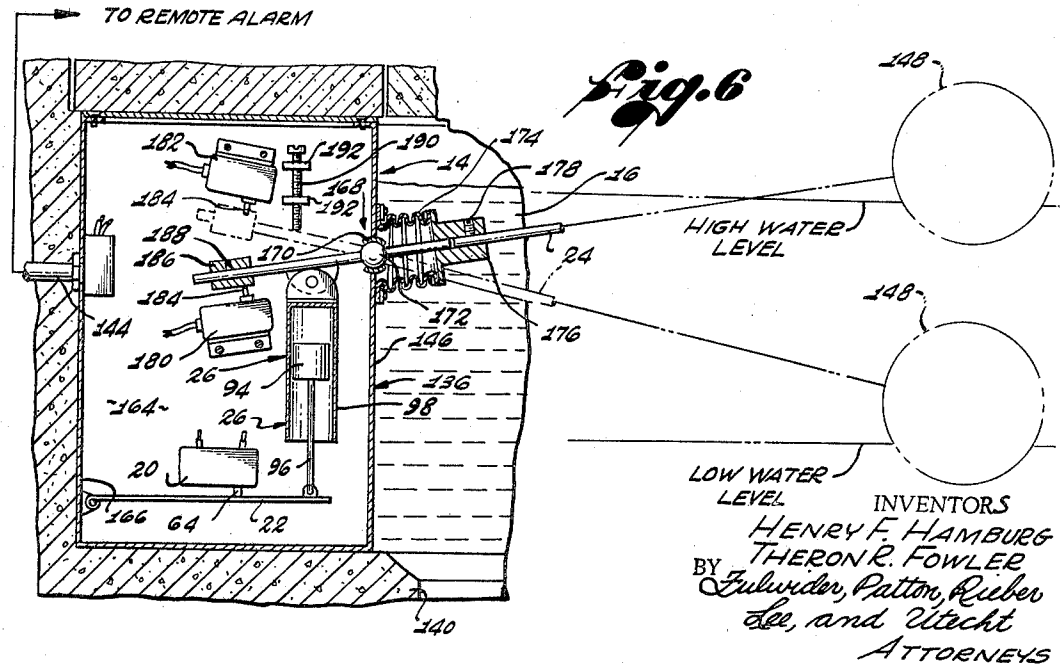


Fig. 6



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ALARM SYSTEM FOR SWIMMING POOLS AND THE LIKE

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ABSTRACT OF THE DISCLOSURE

An alarm system for a swimming pool having a float for rising and falling with the water level, an alarm adapted for actuation by a switch, and a motion-sensitive coupling between the float and the actuator of the alarm switch for transmitting motion of the float to the actuator only when the velocity of the float exceeds a preselected velocity.

The present invention relates to alarm systems and, more particularly, to a novel alarm system for swimming pools and the like.

Although swimming pools provide a source of pleasurable recreation for individuals and families alike, when unattended, they present a serious danger, particularly to small children. The alarming news reports of accidental child drownings attest to this fact.

In an attempt to reduce this needless loss of life, numerous systems have been devised to generate an alarm signal when an object or body, falls or jumps into an unattended swimming pool. Such systems operate either in response to sound waves developed in the water, or by waves produced at the surface of the water. In both cases however, some sort of threshold device is included in an attempt to insure that the alarm system will not be accidentally energized by wind, rain, falling leaves, small stones and the like, and that it will always be energized by objects at least the size of a small baby falling into the associated swimming pool.

Unfortunately, presently available swimming pool alarm systems, including such threshold devices, are generally relatively complex, both in structure and in operation, and are likewise quite expensive. Also, some type of special mounting arrangement is usually required for the alarm systems. For these, as well as other reasons, swimming pool alarm systems have found only limited use.

It is therefore an object of the present invention to provide a simplified, inexpensive alarm system for swimming pools which overcomes the disadvantages of presently available systems, while including all the necessary and desirable characteristics and features of swimming pool alarms.

Another object of the present invention is to provide an alarm system of the foregoing character which operates only in response to sudden changes in swimming pool water level adjacent the alarm (surface waves) of the type caused by a large object, at least the size of a baby, falling or jumping into the pool.

A further object of the present invention is to provide an alarm system of the foregoing character which is easy to install and which in one form is easily transportable from one location to another or removable for storage when not in use.

The foregoing as well as other objects and advantages of the present invention may be more clearly understood by reference to the following detailed description when taken with the drawings, which, by way of example only, illustrate two forms of alarm systems embodying the features of the present invention.

In the drawings:

FIGURE 1 is a sectional side view of a portable form of alarm system stationed on top of the deck of a swimming pool;

FIGURE 2 is a sectional top view of the alarm system of FIGURE 1;

FIGURE 3 is a wiring diagram of the electrical circuitry for the alarm system of FIGURE 1;

FIGURE 4 is a wiring diagram of an alternate form of the circuitry for the alarm system of FIGURE 1;

FIGURE 5 is a sectional side view of the water level sensing portion of a different form of alarm system including an alarm located at a station remote from the swimming pool, the water level sensing portion being stationed in the side wall of the swimimng pool; and

FIGURE 6 is a enlarged fragmentary sectional side view of a portion of the water level sensing portion illustrated in FIGURE 5.

In the drawings, the alarm system is represented generally by the numeral **10** and includes an alarm portion **12** and a water movement sensing portion **14** for actuating the alarm portion when objects or bodies above a certain predetermined mass fall, drop or jump into the water **16** of a swimming pool **18**.

Generally speaking, the sensing portion **14** includes an alarm actuating switch **20** and a pair of movable members **22** and **24** connected by a motion-sensitive, fluid coupling device **26** having a predetermined threshold of coupling operation. The movable member **22** is adapted to operate the alarm-actuating switch **20** while the movable member **24** is adapted to sense and move in response to movement of the water **16** in the swimming pool **18**.

If there is only gentle movement of the water **16**, as during normal pool water circulation, or minor wave motion, as produced by wind, rain, falling leaves and the like, then the movable member **24** moves slowly with the pool water. Such motion of the movable member **24** is below the threshold of coupling operation of the coupling device **26** and the movement of the movable member **24** is not coupled to the movable member **22**, which remains stationary relative to the movable member **24**. Under such conditions, there cannot be an actuation of the alarm portion **12** by the actuating switch **20**.

However, if a large object or body, at least about the size and weight of a small child or baby, falls or jumps into the swimming pool **18**, waves are developed in the water **16** which produce rapid movement of the movable member **24**, equal to or above the threshold of operation of the coupling device **26**. When this occurs, the coupling device **26** connects the movable member **24** to the movable member **22**, causing the movable member **22** to move with the movable member **24** to operate the switch **20** and actuate the alarm portion **12** of the system **10**. This operation is simple, rapid, and dependable, and provides a true warning indication that an object at least the size of a baby has fallen or jumped into the unattended swimming pool **18** and, more than likely, needs immediate assistance.

Referring now more particularly to FIGURES 1 and 2, a portable form of the alarm system **10** is illustrated. As represented, the alarm system is supported by a transportable housing **28**, here illustrated as comprising a rectangular box having a removable top **30**, a flat bottom **32**, and front, rear, left and right side walls **34**, **36**, **38** and **40** extending upwardly from the bottom. In the ilustrated form, a generally L-shaped partition **42** is connected, as by welding, to the front and left side walls **34** and **38** at a front left corner of the housing and forms an elongated, rectangular compartment **44** for supporting the water motion sensing portion **14** of the alarm system **10**. A generally L-shaped partition **46** is connected to the front and

right side walls 34 and 40 at the front right corner of the housing to define a compartment 48 for a time control unit 50 for the alarm portion 12 of the system 10. The remainder of the housing 28 defines a compartment 52 for the alarm portion 12 which, in the illustrated form, includes a conventional bell alarm 54 including the bell 55, a solenoid 56, and a clapper 57 actuated by the solenoid. The bell alarm 54 is supported by and rests upon the bottom 32 of the housing 28. The bottom 32 also supports a battery 58 and a manually operable, normally open, master control switch 60 for electrically connecting the battery 58 to the bell alarm 54 to energize the alarm upon operation of the actuating switch 20.

In the illustrated form of the water movement sensing portion 14, the actuating switch 20 is a normally open switch supported within a case 62 and having a movable switch arm 64 extending from the case. The case 62 is connected to the partition 42 parallel to the left side wall 38 of the housing 28 by a pair of screws 66 with the switch arm 64 facing in a downward direction within the compartment 44.

The movable member 22 is also stationed within the compartment 44 and, in the illustrated form, comprises a flat arm pivotally supported at one end by a pin 68 extending between side arms 70 of a bifurcated hinge unit 72 on the bottom 32 of the housing 28. An opposite end of the movable member 22 rests on an adjustable set screw 74 extending upward through the bottom 32. Thus supported, the movable member 22 lies generally parallel to the bottom 32 directly below the movable switch arm 64 of the actuating switch 20 and is adapted for swinging movement in a vertical plane above the set screw 74 to operate the actuating switch.

The movable member 24 of the sensing portion 14 includes generally horizontal inner and outer portions 76 and 78 and a generally vertical connecting portion 80 therebetween. One end of the horizontal portion 76 includes an enlarged, laterally extending tubular head 82 pivotally connected by a pivot pin 84 to the partition 46 above the hinge unit 72 for the movable member 22. The opposite end of the horizontal portion 76 is connected to the vertical portion 80 and extends through a vertical opening 86 in the front wall 34 of the housing 28 for movement in the vertical plane of the movable member 22.

The outer end 87 of the horizontal portion 78 is tubular and is adapted to slidably receive one end of an L-shaped arm 88. The L-shaped arm 88 is releasably secured within the tubular portion 87 by a thumb screw 90, while an opposite end of the arm is connected to the top of a float 92. The float 92 is adapted to ride on top of the surface of the water 16 in the swimming pool 18 when the transportable housing 28 is located adjacent the edge of the pool on top of the pool deck. The location of the float 92 within the water 16 is adjustable by sliding the L-shaped arm 88 inward or outward within the tubular portion 87 and by the same token, the L-shaped arm and float are removable from the movable member 24 when it is desired to transport the alarm system 10 or to place the system in storage.

The coupling device 26 between the movable members 22 and 24 may take various forms, each having the characteristic of a predetermined motion threshold of operation below which the movable member 24 moves freely, independent of the movable member 22 and at and above which movements of the movable member 24 are imparted to the movable member 22 causing the movable member 22 to operate the actuating switch 20 and energize the alarm portion 12 of the system 10.

In the illustrated form, the motion sensitive coupling device 26 comprises a dash pot including a piston 94 and a cylinder 98. The piston 94 is connected by a vertical rod 96 to the movable member 22 above the set screw 74 while the cylinder 98 has an open bottom for receiving the piston 94 and a top portion stationed within a ring 100 formed in the horizontal inner portion 76 of the movable member 24.

The upper end of the cylinder 98 includes a conventional bleed valve 102 for allowing the escape and entry of fluid from and to the top of the cylinder as the piston 94 moves up and down within the cylinder. In addition, the inner walls of the cylinder 98 and the outside of the piston 94 are shaped such that there is a certain amount of fluid passage around the piston as it moves up and down within the cylinder. A dash pot is commonly considered to be a velocity sensitive and responsive device. Therefore, by control of the fluid flow in and out of the cylinder 98 with movement of the piston 94, the velocity threshold of coupling operation for the dash pot comprising the device 26 may be preset or altered as desired.

In particular, because of the fluid coupling provided by the piston 94 and cylinder 98, as well as the passage of fluid from within and without the cylinder, when the movable member 24 moves slowly in response to movements of the water 16 in the swimming pool 18, fluid within the cylinder has sufficient time to leak out of the cylinder as the movable member 24 moves downward and to return when the movable member 24 moves upward. Under such conditions, the movable member 22 remains stationary as the movable member 24 moves up and down. Depending upon the opening provided by the bleed valve 102 and the design of the cylinder 98 and piston 94, at and above a particular velocity for the movable member 24 there is insufficient fluid leakage from the cylinder during its downward stroke and insufficient fluid entry into the cylinder during its upward stroke such that a vacuum is created within the cylinder during the upward travel of the movable member 24 which causes the piston to move with the cylinder in an upward direction. As this occurs, the movable member 22 moves with the piston to operate the switch 24 by depressing the movable switch arm 64. The value of the upward velocity of the movable member 24 at which the coupling device 26 produces a following movement of the movable member 22 is considered to be the velocity threshold for the coupling device. The greater the fluid leakage from and fluid entry into the cylinder 98, of course, the higher the threshold and the lower the seepage from and fluid entry into the cylinder, the lower the threshold.

Adjustment of the set screw 74 also provides a degree of control over the actuation of the alarm system 10 since the closer the movable member 22 to the switch 20, the shorter the movement of the member 22 required to actuate the switch and the alarm portion 12 of the system 10. Likewise, the further the movable member 22 from the switch 20, the greater the travel of the movable member 22 required to operate the switch. The position of the set screw 74 in controlling the distance between the movable arm 22 and the actuating switch 20, thus controls the minimum height of surface wave which will cause the movable arm 22 to operate the actuating switch and hence the alarm portion of the system 10.

Accordingly, in the alarm system 10, the fluid coupling device 26 and set screw arrangement 74 require a predetermined minimum wave velocity for the water 16 within the pool 18 before there is any coupling between the movable members 24 and 22 and thereafter a minimum height surface wave before the switch 20 is actuated by the movable arm 22 to energize the alarm. These controls are preferably adjusted to correspond to the minimum splash and water movement created by a small baby jumping or falling into a swimming pool 18 from the edge thereof. Water movement within the pool 18 below the velocity threshold and surface waves below the minimum determined by the set screw arrangement 74 will not produce an actuation of the alarm system 10 thereby preventing accidental energizing of the alarm and insuring that when the alarm is sounded, there is a true indication

that an object or body at least the size of a small baby has fallen, dropped or jumped into the swimming pool.

In summary then, when an object or body of a predetermined minimum size and weight falls into the swimming pool **18**, surface waves are developed in the pool causing the movable member **24** to move up and down at a velocity equal to or in excess of the predetermined velocity threshold of the coupling device **26**. With movement of the movable member **24** at or in excess of the operating threshold of the coupling device **26**, the coupling device transmits movements of the movable member **24** to the movable member **22** causing the movable member **22** to move upwardly with the movable member **24**—downward movement of the movable member **22** being limited by the set screw **74**.

The height of a surface wave generated by the falling body is sufficient to cause the movable member **22** to engage the switch arm **64** of the actuating switch **20** with vertical movement of the movable member **24**. Accordingly, vertical movement of the movable member **22** momentarily closes the normally open actuating switch **20**, which again reopens with downward vertical movement of the movable member **22** away from the actuating switch.

As illustrated most clearly in FIGURE 3, which represents a wiring diagram for the alarm system **10** illustrated in FIGURES 1 and 2, the momentary closing of the actuating switch **20** completes a series loop circuit including the battery **58**, the previously closed master switch **60**, and a solenoid **104** of the time control unit **50**. Briefly, in addition to the solenoid **104**, the time control unit **50** includes a time control switch unit **106** having a fast operate time and a slow release time. Current flow through the solenoid **104** energizes the control switch unit **106** to rapidly close and complete a current path from the battery **50** through the master control switch **60**, the control switch unit **106** and the solenoid **56** for the bell alarm **54**, back to the battery. Current flow through the solenoid **56** actuates the clapper **57** to repeatedly and rapidly move against the bell **55** to sound an alarm.

Since the closing of the actuating switch **20** is only momentary, current flows through the solenoid **104** of the time control unit **50** only for a short period of time. However, due to the slow release of the control switch unit **106**, current continues to flow to the bell alarm solenoid **56** for a predetermined period of time. Thereafter, however, the control switch unit **106** opens to stop the alarm and a subsequent operation of the actuating switch **20** is required to repeat the operation.

The structural arrangement of one form of the time control unit **50** is most clearly illustrated in FIGURE 2, within the compartment **48** defined by the partition **46**. As represented, the solenoid **102** is supported on the bottom **32** of the housing **28** with a movable plunger **107** extending therefrom and movable in and out of the winding of the solenoid. The outer end of the plunger **107** engages one side of a switch actuating arm **108** hinged for swinging movement toward and away from the solenoid **102** by a vertical pin **110** connected at one end of the arm. A coil spring **112** is connected to an opposite end of the arm **108** and to a vertical pin **113** to continuously urge the arm toward the plunger **107**. The opposite end of the switch acuating arm **108** is also connected to a rod **114** extending from a viscous damping unit **116**. Viscous damping unit **116** produces the slow release time for the control switch unit **106** and in the illustrated form comprises a piston **118** connected to the end of the rod **114** for movement within a cylinder **120** connected to the inside wall of the partition **46**.

A normally open control switch **122** is stationed on a side of the switch actuating arm **108** opposite the plunger **107** with a movable switch arm **124** engaging the actuating arm. Thus positioned movement of the plunger **107** away from the winding of the solenoid **102** produces a counterclockwise swinging movement of the switch actuating arm **108** (when viewed from the top) to close the normally open control switch **122** and to drive the piston **118** into the cylinder **120**. Upon termination of current flow through the solenoid **102**, the switch actuating arm **108** remains in its counterclockwise position to close the control switch **122** despite the spring force exerted on the arm **108** by the spring **112**. Slowly, however, the viscous damping unit **116** allows the switch actuating arm **108** to return to its normal position under the force of the spring **112** at which time the control switch **122** returns to its normally open condition, terminating current flow to the bell alarm **54**.

An alternate form of the electrical circuitry for the alarm system **10** is illustrated in FIGURE 4. The circuit of FIGURE 4 does not include a time control unit. Rather the circuit includes a self-latching feature which maintains the bell alarm **54** in operation after the actuating switch **20** has opened and until the master control switch **60** is manually opened by a pool attendant. To accomplish this, the circuit of FIGURE 4 includes a relay **125** having a winding **126** and two pair of normally open contacts **128, 130** and **132, 134**. The winding **126** is connected in two different series loop circuits. The first loop circuit includes the actuating switch **20**, the master control switch **60** and the battery **58**. The second loop circuit includes the pair of normally open contacts **128, 130** the master control switch **60** and the battery **58**. The pair of normally open contacts **132, 134** are connected in series with the master control switch **60**, the bell alarm **54**, and the battery **58**.

In the circuit of FIGURE 4, momentary closing of the actuating switch **20** completes a series circuit from the battery **58** through the winding **126** to close both pairs of normally open contacts. The closing of the pair of normally open contacts **132, 134**, completes a current path from the battery **58** through the master control switch **60** to the bell alarm **54** to actuate the alarm. The closing of the pair of normally open contacts **128, 130**, short circuits the actuating switch **20** to complete a series circuit directly from the battery **58** through the master control switch **60** and the winding **126**. This maintains the relay **125** and hence the bell alarm **54** in an operating condition until such time as the master control switch **60** is manually opened.

An alternate form of the water movement sensing portion **14** for a built in version of the swimming pool alarm system **10** is illustrated in FIGURES 5 and 6. The alarm portion **12** for the system may be at a remote location and may include an audio or visual alarm or alternatively may include the electrical circuitry illustrated and described in connection with FIGURES 3 and 4.

The sensing portion **14** of the alarm system **10** is supported within a box **136**, preferably formed of a corrosion resistant material, located in a generally rectangular recess **138** in the side wall **140** of the swimming pool **18**. A portion of the coping block **142** above the recess **140** is removable to allow the box **136** to be slipped into the recess from the deck of the pool. The box **136** sits at the back of the recess **138** with a conduit **144** for the wiring to the alarm portion **12** extending from the back of the box.

The movable member **24** of the sensing portion **14** extends from the front **146** of the box **136** through the recess **138** and into the pool **18** where it connects to a float **148** for riding on top of the surface of the water **16** in the pool. The front of the recess **138** is partially covered by a tile plate **150** with a vertical opening **152** for receiving the movable member **24**. A grill **154** supported by a ring **156** extends over and above and below the float **148** to protect the float **148** while allowing for movement of the float in a vertical plane. The ring **156** is connected to the tile plate **150** through a bolt-nut combination **158**.

Water from the pool **18** is permitted to flow through the opening **152** into the recess **138** outside the box **136**.

To prevent stagnation of the water within the recess **138** and to insure complete water circulation, the side wall **140** of the pool **18** includes a outlet port **160** leading from the recess **138** to the side of the pool. The port **160** communicates with the water circulation system for the swimming pool and preferably the return **162** from the filter of the circulation system. The water flow from the circulation system into the outlet port **160** creates a suction in the port which draws surface water from the pool **18** to the recess **136** down the port and back into the pool.

Within the box **136**, the physical arrangement of the movable members **22** and **24**, and coupling device **26** is very similar to that of the corresponding parts of the water movement sensing portion described in connection with FIGURES 1 and 2. In particular, the case of the actuating switch **20** is connected to a side wall **164** of the box **136** with the movable switch arm **64** facing in a downward direction.

The movable member **22** comprises a flat arm pivotally connected to a back **166** of the box with the front end pivotally connected to the vertical rod **96** of the coupling device **26**. Thus supported, the movable member **22** is adapted to move up and down in a vertical plane in response to vertical movements of the rod **96**.

As before, the rod **96** connects to the piston **94** within the cylinder **98**. The cylinder **98**, in turn, is pivotally connected at its upper end to a portion of the movable member **24** between its innermost end and a pivot support **168** for the movable member to the front wall **146** of the box **136**.

The movable member **24** comprises an elongated rod while the pivot support **168** includes an annular socket **170** in the front wall **146** and a ball **172** integral with the rod and seated within the socket. Surrounding the movable member **24** immediately outside the box is a bellows-type seal **174** connected to the front wall **146**, as by a plurality of screws. The outer end of the bellows seal **174** is sealed by a tubular plug **176** connected to the rod by a set screw **178**. The bellows seal prevents pool water from sepping around the movable member **24** into the ball and socket connection.

In addition to the movable members **22** and **24**, and the coupling device **26**, the box **136** provides support for high and low water level indicating switches **180** and **182**. The high and low water level indicating switches **180** and **182** are connected to the side wall **164** of the box **136** and lie in a substantially vertical plane below and above the horizontal plane of the ball and socket combination, respectively. The high and low water level indicating switches **180** and **182** each includes a movable switch arm **184** adapted to be contacted and actuated by a contact block **186** connected to the inner end portion of the movable member **22** by a set screw **188**. An adjustable screw **190** extends through a pair of lateral arms **192** adjacent the low water level indicating switch **182** to act as a stop member by engaging the movable member **22** in its low water level position.

The high and low water level indicating switches **180** and **182** are spaced vertically on either side of the ball and socket combination far enough that they will only be contacted by the block **186** when the water in the pool is either at a high or low level. When contacted by the block **186** however, the switches operate in combination with external circuitry (not shown) to produce either a visual or audible indication of the low or high water condition or alternatively automatically start or stop the water supply to the pool **18**.

The balance of the operation of the movable member **24** and the coupling device **26** to produce movement of the movable member **22** is as previously described in connection with FIGURES 1 and 2. Thus, minor surface waves in the pool **18** will not produce a movement of the movable member **22**. On the other hand, movement of the movable member **24** at a rate greater than or equal to the threshold of the device **26** will cause the movable member **22** to move with the movable member **24** to operate the actuating switch **20** and thereby energize the alarm portion **12** of the system **10**.

Accordingly, the present invention provides an improved alarm system for swimming pools and the like which is extremely simple in design yet which possesses a threshold of operation preventing accidental operation of an alarm and insuring that when the alarm is sounded an object at least the size of a small baby has fallen or jumped into the swimming pool.

We claim:

1. An alarm system for swimming pools, comprising,
an alarm actuating switch;
a first movable member for operating said switch;
a second movable member for moving in response to swimming pool water movement;
and motion sensitive coupling means between said first and second movable members for connecting said first movable member to move with said second movable member, operate said switch and actuate said alarm when motion of said second movable member relative to said first movable member exceeds a predetermined value, said motion sensitive coupling means being a fluid coupling means including a piston connected to one of said movable members, and means defining a piston receiving cylinder connected to the other of said movable members.

2. The alarm system of claim **1**, including:
means for pivotally supporting said first movable member for movement in a generally vertical plane;
and means for pivotally supporting said second movable member for movement in a generally vertical plane.

3. The alarm system of claim **1**, including:
an alarm;
an electrical power source;
an alarm control means including a solenoid and a solenoid actuated control switch having a fast operating time and a slow release time;
circuit means connecting said source, actuating switch, and solenoid in series and said source, alarm and alarm control switch in series;
a plunger actuated by said solenoid;
a movable arm pivotally connected for swinging movement toward and away from said plunger to operate said control switch;
means continuously urging said arm toward said plunger;
and viscous damping means connected to said movable arm to permit a slow return of said movable arm toward said plunger after operation of said control switch.

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