United States Patent [19]

Lieb

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[54] **ALARM SYSTEM FOR THE SAFETY OF NON-SWIMMERS**

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[73] Assignee: **Manfred Dworcan,** Johannesburg, South Africa; a part interest

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.**..... **340/279,** 9/313, 340/235, 340/261, 340/421

[51] **Int. Cl.**..... **G08b 21/00,** B63c 9/00

[58] **Field of Search** 340/261, 279, 235, 283, 340/416, 421; 9/313

[56] **References Cited**

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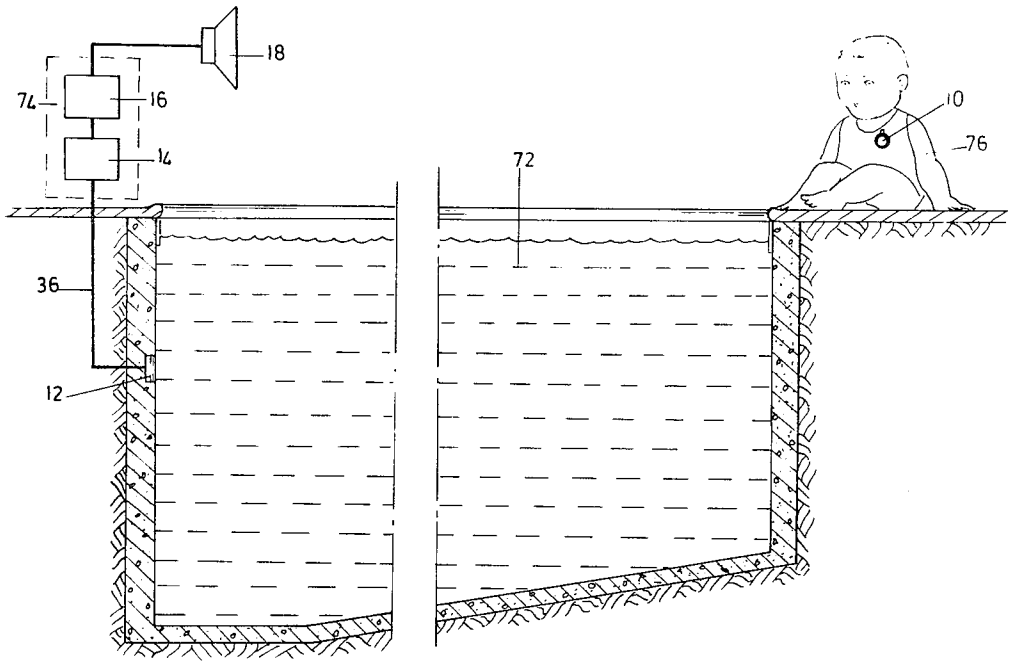
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[57] **ABSTRACT**

An alarm system for the safety of non-swimmers comprises a portable transmitter which is adapted to be attached to the body of the non-swimmer and to be activated on immersion in water, and a receiver adapted to operate an alarm on receiving the transmitted signal. The transmitted signal is a mechanical wave having a frequency which is ultrasonic.

13 Claims, 5 Drawing Figures



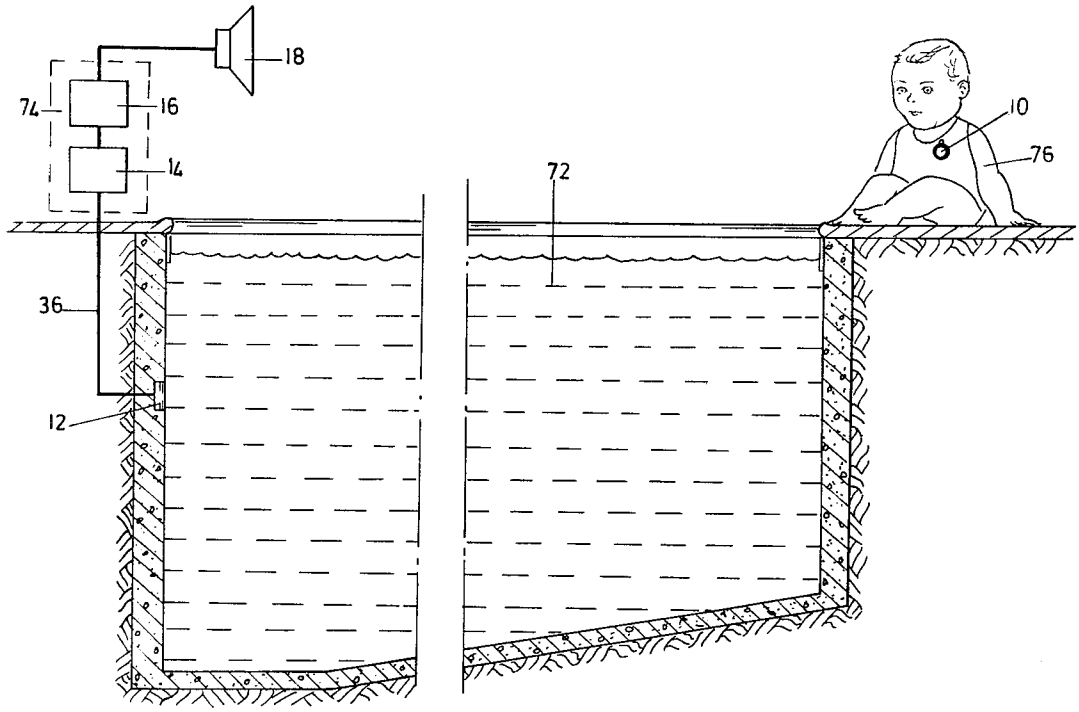


Fig. 1

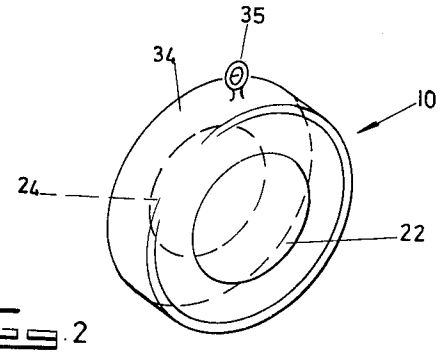


Fig. 2

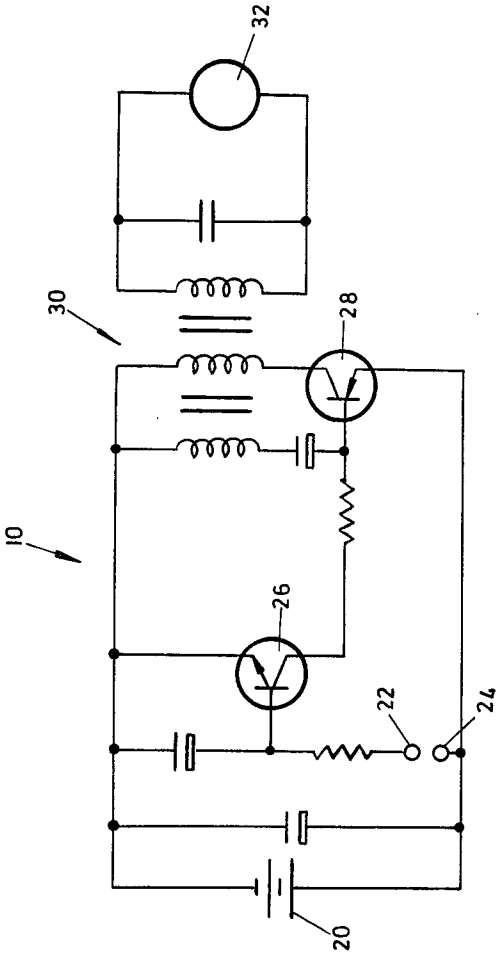


Fig. 3

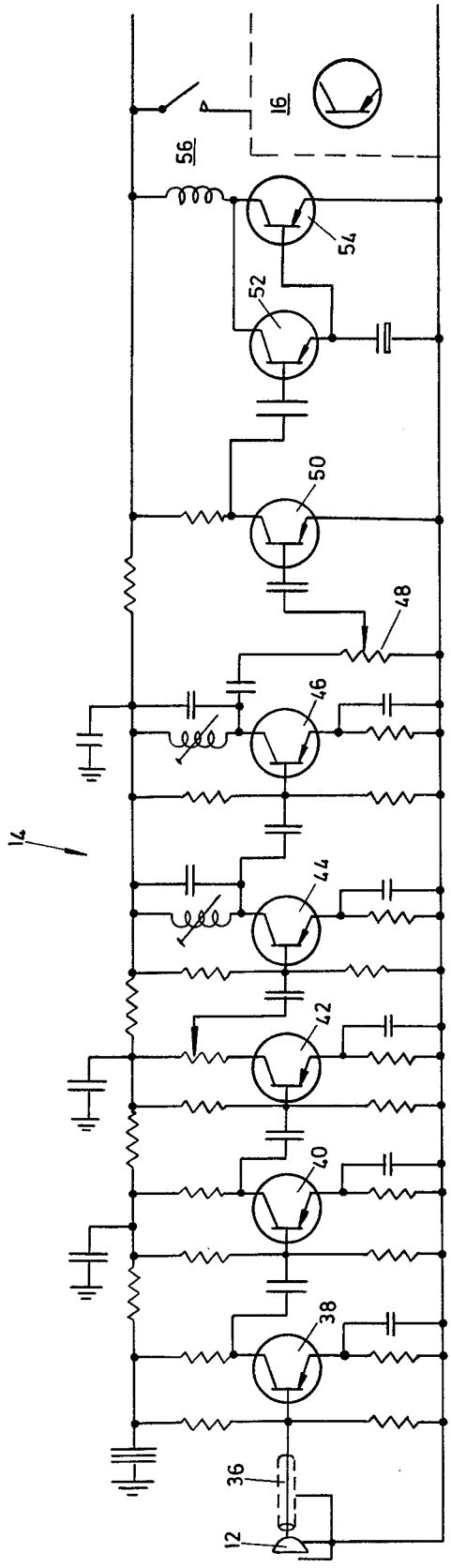


Fig. 4

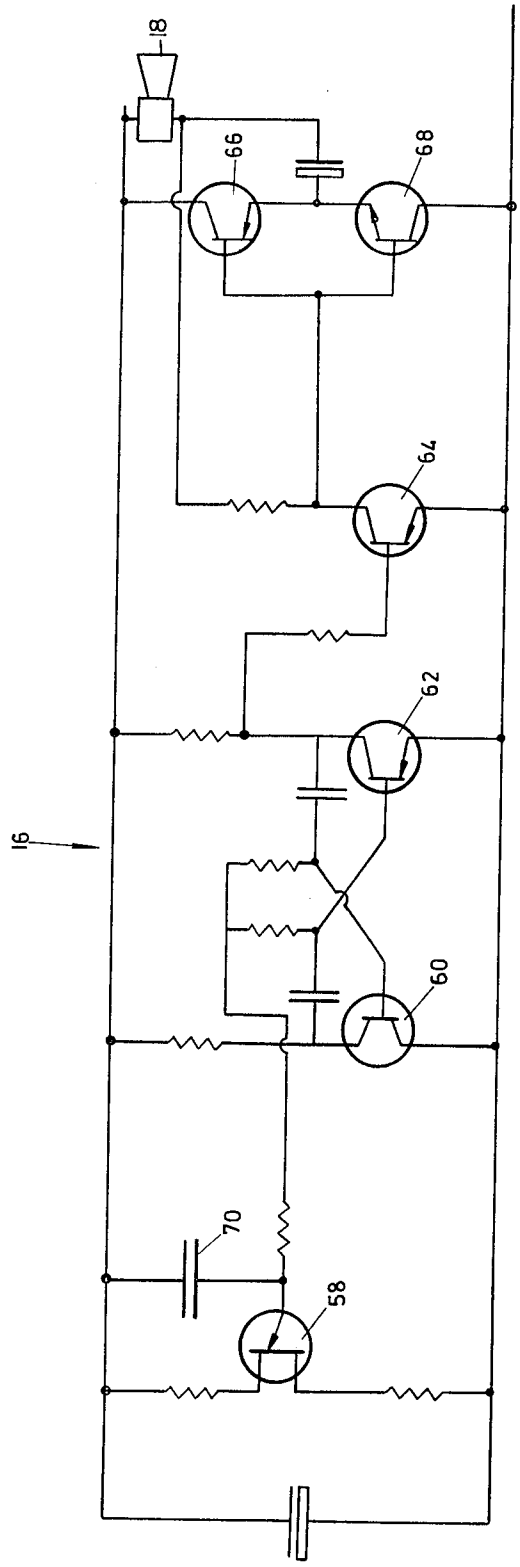


Fig. 5

ALARM SYSTEM FOR THE SAFETY OF NON-SWIMMERS

FIELD OF THE INVENTION

This invention relates to an alarm system for the safety of non swimmers exposed to open water.

BACKGROUND

An open body of water such as a swimming pool represents a danger to small children who cannot swim, and is a source of constant anxiety to parents of such children.

Unprotected swimming pools have been the cause of many small children loosing their lives, and with the rapid increase in the number of privately owned pools it has become necessary for some local authorities to legislate for the compulsory provision of protective fencing around such pools.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an alarm system to indicate entry of a child entering into a body of water.

It is a further object of the invention to provide a method of detecting the entry of a non-swimmer into the water of a swimming pool.

An alarm system for the safety of non swimmers according to the invention comprises a portable transmitter adapted to be attached to the body of a non-swimmer, means on the transmitter to actuate the transmitter on immersion in a body of water, a sensor adapted to be immersed in the body of water and further adapted to sense the output of the transmitter when actuated and, means to amplify the sensed signal and operate an alarm located out of the body of water.

Preferably the actuating means on the transmitter comprises two exposed electrodes on the transmitter adapted to be electrically bridged by the electrical conductivity of the water. The output stage of the transmitter may suitably consist of an electromechanical transducer capable of producing ultrasonic mechanical waves. Similarly the sensor may be a transducer capable of converting the sensed signal from the transmitter into an electrical signal which is then fed to the amplifying means to drive the alarm. The transmitted signal is preferably of a specific frequency and the amplifying means is adapted to respond only to signals of that frequency. Further according to the invention the system is included in a swimming pool.

Further according to the invention there is provided a method of detecting the entry of a non-swimmer into a swimming pool which consists in the steps of generating an underwater signal in the pool on immersion of the non-swimmer in the pool water, detecting the signal at a fixed underwater point in the pool, and adapting the signal to operate an alarm outside the pool.

BRIEF DESCRIPTION OF THE DRAWING

The invention will now be described with reference to the drawings in which:

FIG. 1 is a diagramatic view illustrating the components of the system,

FIG. 2 is a perspective view of the transmitter housing,

FIG. 3 is a circuit diagram of the transmitter,

FIG. 4 is the amplifier circuit, and

FIG. 5 is the alarm circuit.

DETAILED DESCRIPTION

FIG. 1 shows the alarm system comprising a transmitter **10**, a sensor **12**, a tuned amplifier **14**, an alarm circuit **16** and a loudspeaker **18**.

The transmitter circuit which is seen in FIG. 3 includes a replaceable mercury battery **20**, two spaced electrodes **22** and **24**, a switching transistor **26**, a modified tuned collector oscillator consisting of transistor **28** and a tuned circuit **30**, and a barium-titanate electro-mechanical transducer **32**.

The transmitter circuit is encapsulated in a small waterproof button shaped housing **34**, see FIG. **2**, made from epoxy resin. The electrode **22** is in the form of an exposed metal disc attached to one face of the housing and the electrode **24** is similarly exposed on the opposite side of the housing. The electrode **24** is in contact with the positive terminal of the battery **20** and forms the cover of the compartment in which the battery is housed.

The housing **34** of the transmitter includes a loop **35** to which a suitable chain or the like is attached to enable the transmitter to be securely attached to the clothing or body of a non-swimmer.

When the transmitter is not immersed in water, the base of the transistor **26** is floating and the transistor is biased to cut-off, there is consequently no base bias on the transistor **28** and the transmitter **10** is inoperative. If the transmitter is immersed in water, the electrical conductivity of the water bridges the exposed electrodes **22** and **24** and a path is formed from the positive terminal of the battery to the base of transistor **26** thereby switching it to supply a base bias to transistor **28.** The oscillator circuit **30** is slug tuned to oscillate at 65 Kc/s and to produce a signal of approximately 20 volts peak to peak across the transducer **32.** The transducer which is encased in the epoxy resin of the housing **34** will vibrate at the oscillator frequency. The vibration will be transmitted through the housing and create mechanical waves in the water having a frequency corresponding to that of the oscillator.

The sensor **12** (FIG. 4) is a barium-titanate electromechanical transducer. This transducer is also encapsulated in epoxy resin for waterproofing. The sensor **12** is connected by means of a co-axial cable **36** to the tuned amplifier **14.**

The tuned amplifier **14** includes three transistors **38, 40** and **42** which make up a conventional three stage amplifier, transistors **44** and **46** which are collector tuned to 65 Kc/s, a further amplifier transistor **50,** two transistors **52** and **54** connected as a Darlington pair and a relay **56.**

The amplifier stage comprising transistors **38, 40** and **42** is adapted to be over-driven to provide a limited signal at the collector of transistor **42** when only background noise is picked up by the sensor **12.** When an input signal having a frequency of **65** Kc/s is picked up by the sensor **12,** the signal at the collector of transistor **42** is accepted by the tuned circuits of transistors **44** and **46** and a signal is developed across a sensitivity control **48.** This signal is further amplified by transistor **50** and fed to the transistors **52** and **54** to operate the relay **56** which energizes the alarm operating circuit **16.**

The alarm operating circuit **16** (FIG. **5**), though shown seperately in FIG. **1,** is built into the same case

as the amplifier circuit **14**, and consists basically of a uni-junction transistor **58** which modulates an astable multi-vibrator oscillator consisting of transistors **60** and **62** directly coupled to an output stage consisting of transistors **64, 66** and **68** which drive the loudspeaker **18**. As mentioned above, when the relay **56** of the amplifier circuit closes, the alarm circuit is energized. The oscillator circuit of the transistor **58** will now function and is adapted to oscillate at about four cycles per second and produce a saw-tooth wave form. Base currents for transistors **60** and **62** are likewise varied and consequently the frequency of oscillation of the multivibrator is also varied. This varied signal is then fed to the output stage of the circuit to drive the loudspeaker **18**. The alarm produced by this circuit is distinctive and is unlikely to be confused with other alarms.

In use, referring again to FIG. **1**, the sensor **12** is partially embedded in the wall of a swimming pool **72** below the waterlevel. The co-axial cable **36** connects the sensor to a unit **74** which houses both the amplifier and alarm circuits **14** and **16** and is in turn connected to the loudspeaker **18**. The unit **74** and the loudspeaker are situated away from the pool **72**. The transmitter **10** is attached to the body of a non-swimmer **76**.

The unit **74** is continuously in the "on" condition and when the person **76** enters the water of the pool **72** the transmitter **10** will be actuated as described above and transmit mechanical waves having a frequency of 65 Kc/s throughout the area of the pool within the confines of the water. This signal will be picked up by the sensor **12** and operate the alarm as described above.

To ensure positive functioning of the system a 'test' circuit could be included in the circuitry of the transmitter **10** and the unit **74**.

The invention is not limited to the precise constructional details as herein described. The unit **74** could for example be water-proof and located in the water or wall of the pool, alternately the sensor **12** need not be embedded in the wall of the pool and could, for example, be suspended in the water from the side of the pool by the co-axial cable **36**.

I claim:

1. An alarm system for the safety of non-swimmers comprising a portable transmitter adapted to be attached to the body of a non-swimmer, means on the transmitter to actuate the transmitter on immersion in a body of water, a sensor adapted to be immersed in the body of water and further adapted to sense the output of the transmitter when actuated, and means to amplify the sensed signal and operate an alarm located out of the body of water.

2. An alarm system as claimed in claim **1** in which the actuating means on the transmitter comprises two electrodes which are adapted to be electrically bridged by the electrical conductivity of the water.

3. An alarm system as claimed in claim **2** in which the electrodes are exposed to the water.

4. An alarm system as claimed in claim **2** in which the transmitter has an output stage in the form of an electro-mechanical transducer.

5. An alarm system as claimed in claim **4** in which the output frequency of the transducer is ultrasonic.

6. An alarm system as claimed in claim **5** in which the frequency is in the range 50 – 70 Kc/s.

7. An alarm system as claimed in claim **1** in which the sensor comprises an electro-mechanical transducer.

8. An alarm system as claimed in claim **6** in which the amplifying means is frequency-selective.

9. An alarm system as claimed in claim **1** in which the alarm comprises a loudspeaker.

10. A swimming pool alarm system for the safety of non-swimmers comprising a portable transmitter adapted to be attached to the body of the non-swimmer, means on the transmitter to actuate the transmitter on immersion in the swimming pool water, a sensor situated below the surface of the swimming pool water and adapted to sense the output of the transmitter when actuated, means connected to the sensor and adapted to amplify the sensed signal and an alarm situated out of the swimming pool water connected to the amplifying means and adapted to be operated by the amplifying means in response to the sensed signal.

11. A swimming pool alarm system as claimed in claim **10** in which the transmitter actuating means comprises two electrodes on the transmitter which are adapted to be electrically connected by the conductivity of the swimming pool water.

12. A swimming pool alarm system as claimed in claim **10** in which the transmitter output stage comprises an electromechanical transducer adapted to vibrate at a predetermined ultrasonic frequency.

13. A swimming pool alarm system as claimed in claim **10** in which the amplifier is tuned to receive only the frequency of the signal transmitted by the transmitter.

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