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(71) Applicant
LJK Holdings Limited

(Incorporated in the United Kingdom)

Forest Road, Hainault, Ilford, Essex, IG6 3HZ,
United Kingdom

(72) Inventor
Keith H Platt

(74) Agent and/or Address for Service
Hepworth Lawrence Bryer & Bizley
Gate House South, Westgate, Harlow, Essex,
CM20 1JN, United Kingdom

(51) INT CL⁵
G01F 23/24

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G1H H4AX H4B1

(56) Documents cited
GB 2229531 A GB 2176005 A GB 1549650 A
GB 1549649 A GB 0918870 A DE 002940084 A
US 4547768 A

(58) Field of search
UK CL (Edition K) G1H
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Online databases: WPI

(54) Liquid level indicator

(57) A device for indicating liquid level in a vessel e.g. water in a bath, comprises a liquid-repellant casing 11 which houses an audible alarm 12. The casing is constructed and arranged to contain a power source 22 maintained with the alarm 12 in an essentially liquid free state. The casing also includes switch means, e.g. spaced contacts 17, constructed and arranged such that a switch circuit can be completed by a liquid. The casing additionally includes means e.g. a suction pad 33, for detachably mounting the device in a vessel whose liquid level is to be indicated.

FIG.1

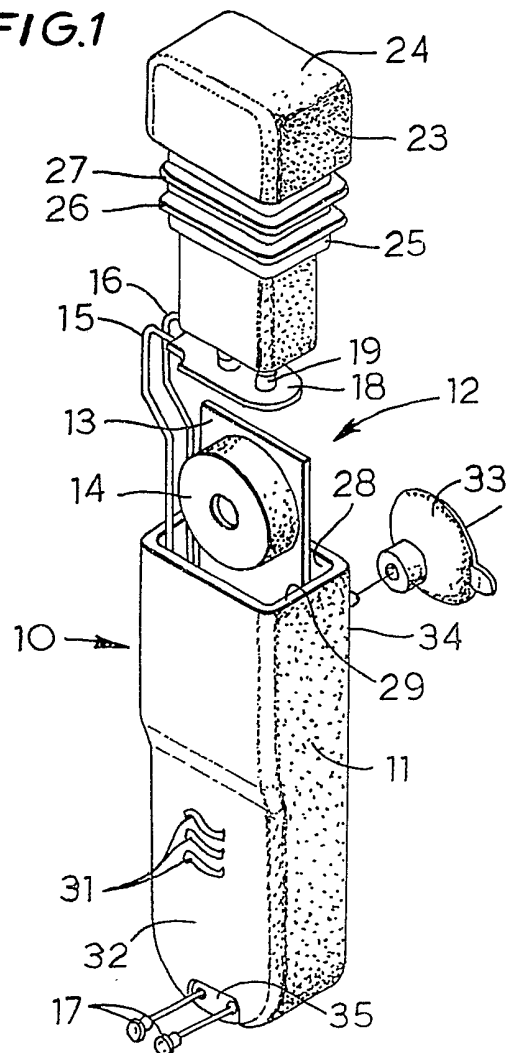
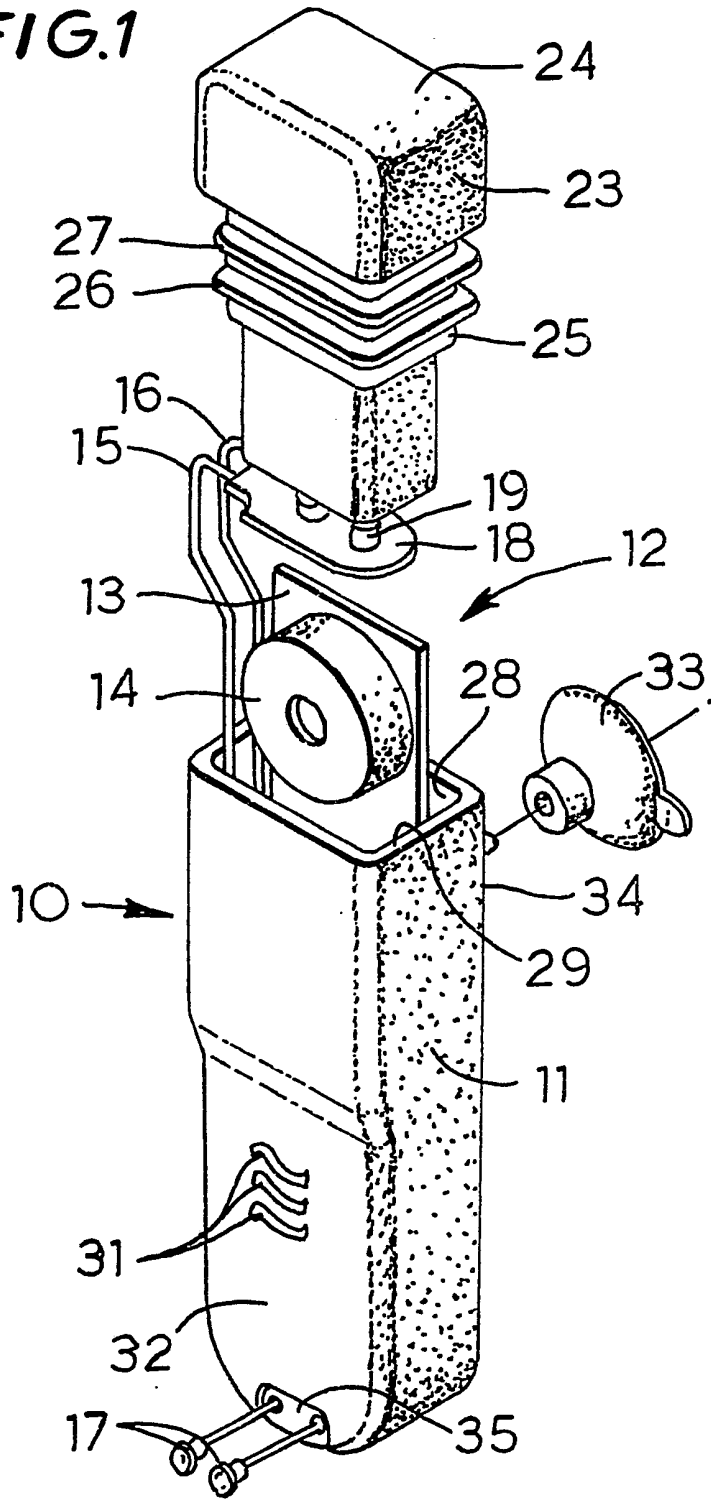


FIG. 1



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FIG. 2(a)

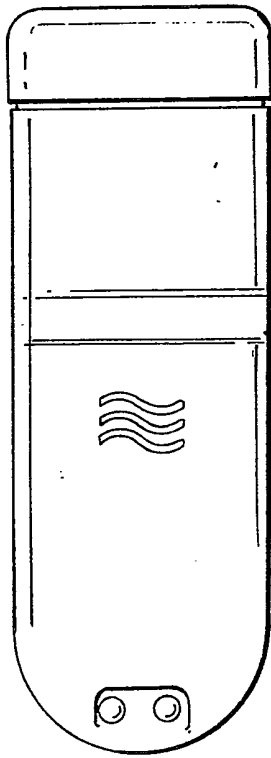


FIG. 2(b)

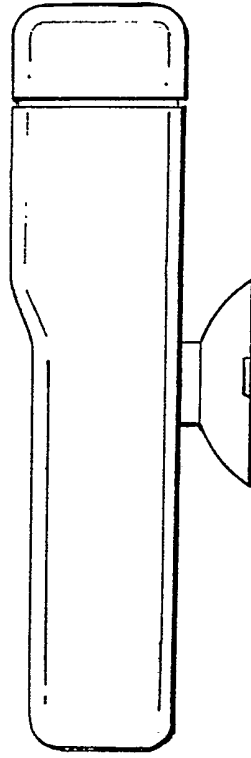


FIG. 2(c)

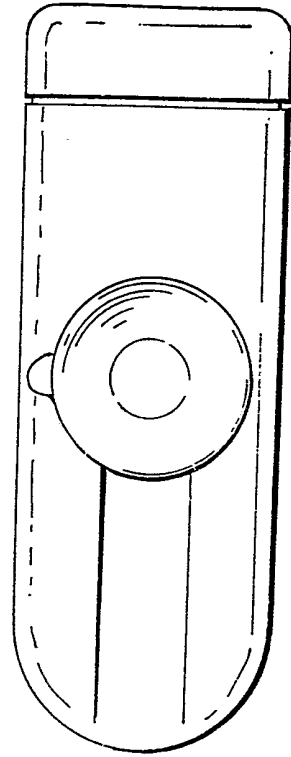


FIG. 3(a)

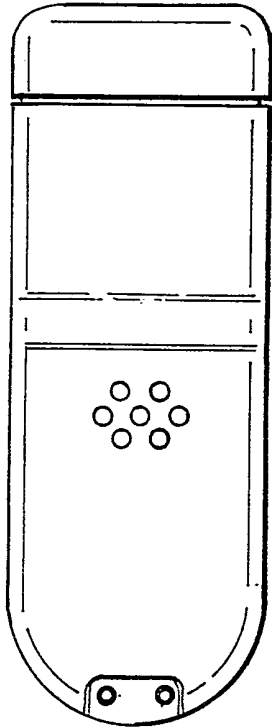


FIG. 3(b)

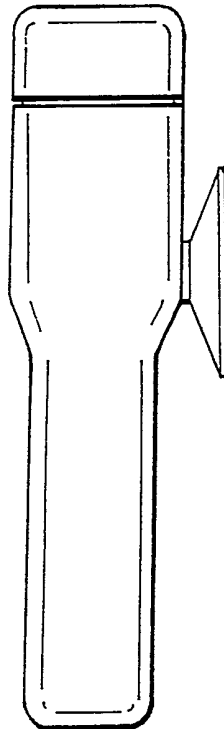


FIG. 3(c)

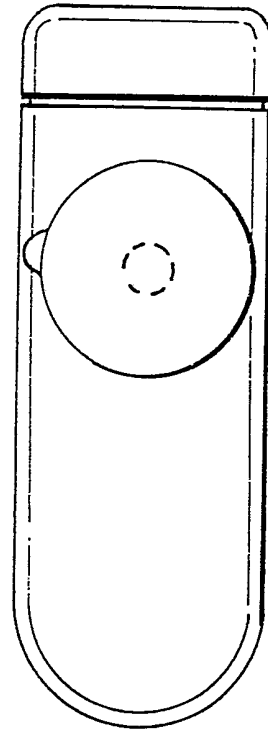




FIG.4(a)

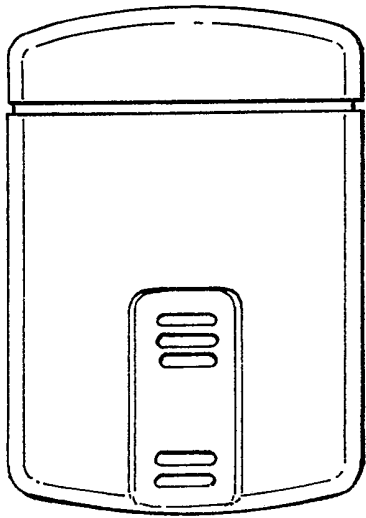


FIG.4(b)

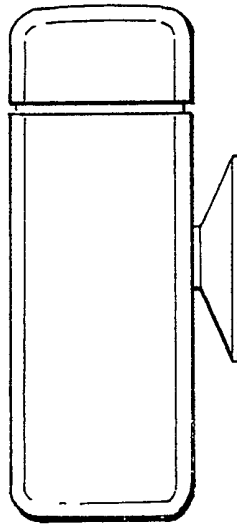


FIG.4(c)

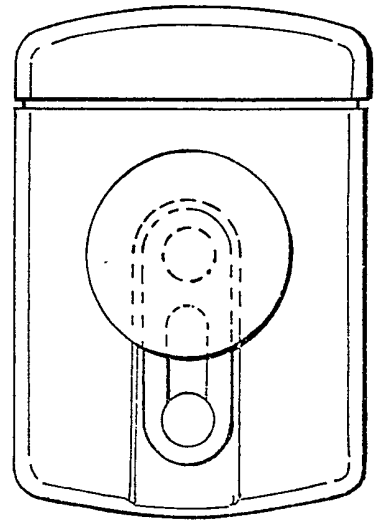


FIG.5(a)

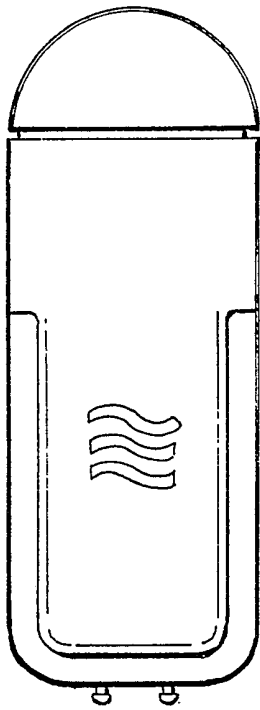


FIG.5(b)

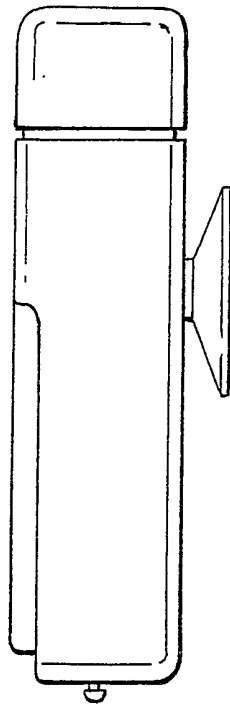


FIG.5(c)

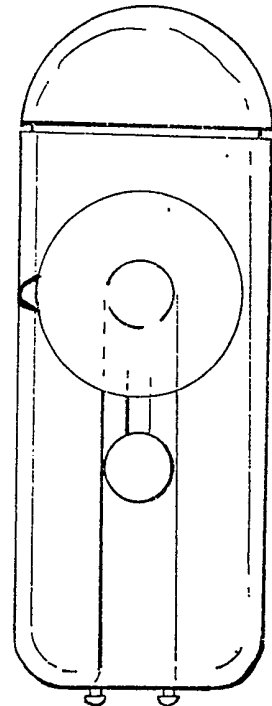


FIG. 6 (a)

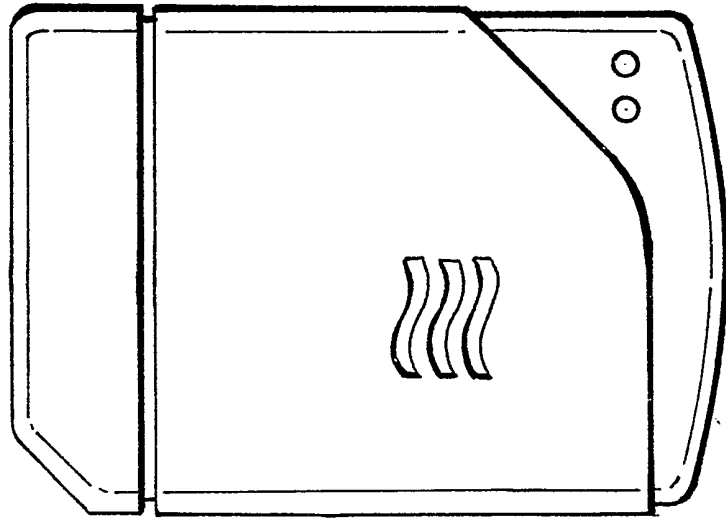


FIG. 6.(b)

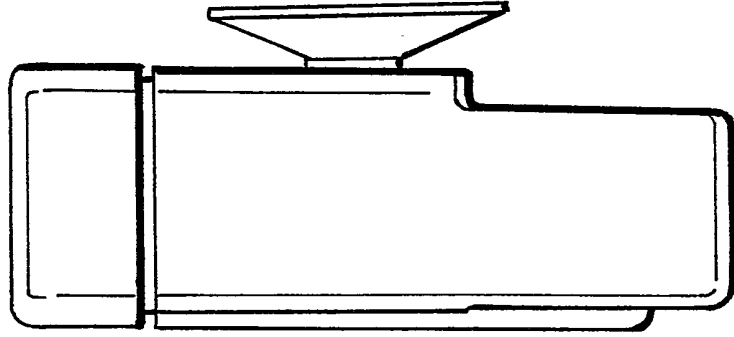
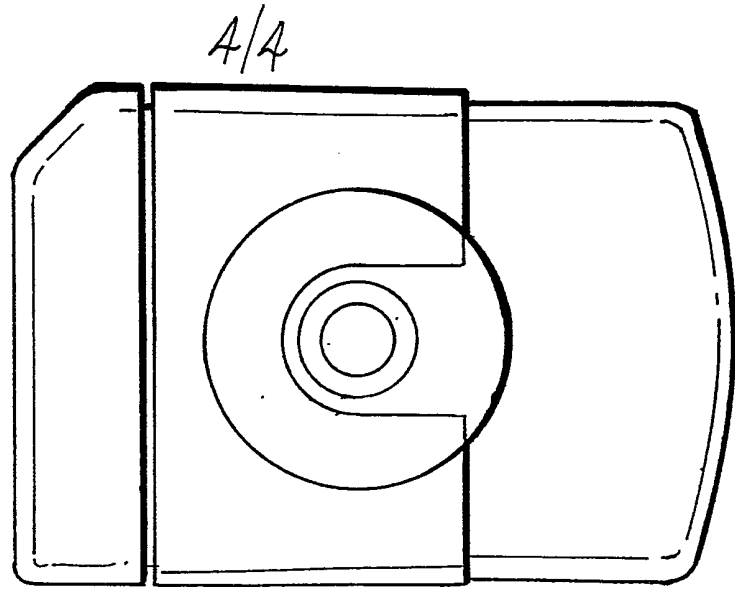


FIG. 6 (c)



LIQUID LEVEL INDICATOR

The present invention relates to a liquid level indicator and, in particular, to an indicator device especially useful in giving an audible warning at a desired level of filling of a domestic bath.

5

There are in the prior art numerous examples of liquid level indicators such as those disclosed in, for example, British Patent Specifications Nos. 518 029, 626 993, 866 841, 1 015 118, 1 276 956, 2 027 540 and 2 176 005.

10

However, all of those prior art indicators are based on some form of float system, that is to say a system where an indicator and/or alarm is activated by an element which floats on the surface of the liquid such as water and at a predetermined desired level activates a switch to activate the indicator and/or alarm. Thus, British Patent

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Specification No. 2 176 005 discloses a liquid level indicator comprising a waterproof casing containing a power source and an audible alarm. In that indicator, a switch connects the alarm device to the power source and there is a float for closing the switch. Also provided are releasable means for detachably mounting the indicator in a bath or other vessel whose liquid level is to be sensed. In operation, the float is raised by the liquid to close the switch and sound the alarm when the level of the liquid

20

in the vessel reaches the float.

5 A disadvantage of the prior art systems illustrated by the above-mentioned specifications is that all rely on a movable float of some kind. Thus, such prior art systems could all be deactivated by sticking of the float submerged at a level below the liquid surface.

10 We have now found surprisingly that the above disadvantage can be avoided by omitting any float member and by using the water or other conducting liquid to complete a circuit between two sensor contacts, thereby activating an audible alarm means.

15 Accordingly, the present invention provides a device for indicating liquid level in a vessel, which device comprises a liquid-repellant casing which houses audible alarm means and is constructed and arranged to contain a power source maintained with the alarm means in an essentially liquid-free state, switch means constructed and arranged such that
20 a switch circuit can be completed by said liquid, and means for detachably mounting the device in a vessel whose liquid level is to be indicated.

25 In the device of the invention the casing may be any convenient shape or size consistent with its use, preferably as a bath alarm. However, the preferred shape of casing is rectangular overall and more preferably the

casing is elongate. Also, while the casing must be water-
or other liquid-repellant, it need not be waterproof.
Thus, provided the power source and alarm means can be
maintained in an at least essentially liquid-free state,
5 that should be sufficient. Preferably, therefore, the
casing is watertight or water-resistant not waterproof.

In addition, in the device of the invention the audible
alarm means and the power source are preferably disposed
10 within an upper part of the casing. Furthermore, the
switch means are preferably disposed in a lower part of the
casing.

Preferably also, the switch means comprises a pair of
15 spaced sensor contacts. With such an arrangement the
sensor contacts may in use be disposed side-by-side or,
alternatively, they may be disposed with a second sensor
contact above a first sensor contact.

20 More preferably, in the device of the invention the casing
comprises a hollow body portion defining a mouth which is
uppermost in use and a hollow cap portion at least part of
which fits within the said mouth and extends down into the
hollow body portion at least essentially to exclude liquid
25 from outside. With such a device it is preferred that the
hollow body portion should house the audible alarm means
and the hollow cap portion should be constructed and
arranged to surround at least part of the power source.

As will be appreciated, the device of the invention may be constructed of any suitable material or materials. Preferably, however, the casing is formed of a plastics material. More preferably, the casing is injection
5 moulded.

Preferably, a hollow cap portion as defined immediately above is formed of a flexible or semi-flexible material such as a plasticised rubber and/or plastics compound.
10 Preferably also, the cap portion includes a downwardly extending skirt having one or more ribs on its outer surface constructed and arranged to engage in a watertight manner with the inside surface of the hollow body portion.

15 The device of the invention can be used with a standard the power source. Thus, the power source is preferably a standard 9 volt battery such as a PP3 battery.

In a preferred embodiment the device of the invention
20 includes audible alarm means comprising an alarm monitor circuit e.g. on a pcb, a sounder and a pair of spaced sensor contacts which can activate the sounder via the said monitor circuit when a conducting liquid bridges the contact gap. More preferably, the sounder comprises a
25 piezo electric crystal element.

Preferably also, the audible alarm means includes means to activate the alarm to provide an audible signal when the

power source is low on charge. In addition, other features may be provided, for example, temperature indicator means.

5 Where temperature indicator means are provided preferred temperature indicator means are a liquid crystal colour-coded thermometer strip. In addition, the temperature indicator means may include words and/or figures to indicate temperature.

10 In the device of the invention the mounting means may comprise at least one suction cap which may comprise plastics material such as PVC.

The invention will now be described by way of example only
15 with reference to the accompanying drawings, in which:-

Figure 1 is an exploded perspective view of one form of device in accordance with the invention;

20 Figures 2(a) to (c) show the device of Figure 1 assembled and (a) from the front, (b) from one side and (c) from the rear; and

25 Figures 3(a) to (c) through to Figures 6(a) to (c) show alternative forms of device in accordance with the invention.

Referring to Figures 1 and 2, the device 10 shown comprises

a hollow body portion 11, for example, of moulded plastics material housing alarm means 12. The alarm means 12 comprises a printed circuit board (pcb) 13 which provides an alarm monitor circuit (not specifically shown), together
5 with a sounder 14. The pcb 13 is connected to wires 15 and 16 which extend down through the housing 11 to sensor contacts 17 and upwards to a battery connector 18.

The connector 18 includes connector contacts 19 and 21
10 which can connect to a standard battery 22, for example, a 9 volt battery such as the PP3 battery shown. The battery 22 is at least partially accommodated in a cap portion 23, for example, formed of a plasticized rubber and/or plastics compound. The cap portion 23 includes an upper lid part 24
15 down from which extends a skirt 25 having ribs 26,27 to provide engagement in a watertight manner with inside surface 28 of the hollow body 11 when pushed down into mouth 29.

20 The hollow body portion 11 includes sound transmission apertures 31 in a front face 32 and a suction pad or cap 33 mounted on a rear face 34. The hollow body portion 11 also includes a recess 35 at the lower end of face 32 which houses the sensor contacts 17. When assembled for use the
25 device 10 is presented as a powered alarm in an elongate casing as shown in Figures 2(a) to 2(c).

In use, the device 10 may be mounted adhered to the side

of a bath via cap 33 with sensor contacts 17 positioned at the desired water level. Then, once the water in the bath reaches the desired level it completes the alarm monitor circuit and the battery 22 powers the circuit to activate
5 sounder 14. There is thus given an audible alarm to signal to the user that the bath tap(s) should be turned off.

Referring to Figures 3(a) to (c) through to Figures 6(a) to (c), those Figures show variations of the device of Figures
10 1 and 2. For example, there shown, inter alia, are variations in shape and configuration of the hollow body portion 11 and cap portion 23, in positioning of the sensor contacts 17, and in the pattern and/or shape of the apertures 31.

15

As will be appreciated from the above specific description, the device of the invention can provide an attractively styled, low cost, easy to use bath water level alarm which addresses a real need, and can appeal to a wide range of
20 consumers. The device can have particular appeal to parents with small children, older children, teenagers and elderly relatives, as it provides a loud audible alarm when bathwater has reached a preset level. Once the device is set, the bath can be left to fill until the alarm sounds
25 allowing busy parents:

(a) With small children time to prepare children for the bath, and

(b) Remove from teenagers,

and to relieve adults of the need to stay close to the bath whilst it is filling. The device provides all age groups with assurance that if they are distracted and forget that the bath is filling it will automatically sound an alarm once the preset level has been reached.

The water level monitor device can be attractively styled, simple to set and use and will operate for prolonged periods of time from a standard PP3 battery. The attractively styled injection moulded casing can simply be attached to the side of the bath with a moulded-in plastic sucker. The device is activated by the rising water level making contact with the bottom of the casing, and at all other times is dormant, using no power and requiring no action to switch it on or off, operation being completely automatic.

When activated, the alarm can emit a high pitched pulsed tone of sufficient intensity to be heard throughout the average sized domestic house, and can have a sound output comparable with a domestic smoke alarm.

The basis of the device is a larger body portion comprising an injection moulded plastic which houses at least part of a standard PP3 battery, the alarm monitor circuit and sounder, and water sensing terminals or contacts. A

separate removable cap, moulded in a plasticised "soft feel" rubber and/or plastics compound can house at least part of the battery and provide access to the battery. The device is water-resistant and the 9 volt circuit presents
5 no danger to the user.

The back of the device can house a PVC sucker which allows the device to be easily attached to the side of the bath. The alarm monitor printed circuit carries a piezo sounder
10 and associated circuitry and a battery "low" feature causes the alarm to bleep when the battery requires replacing.

The bathwater level monitor of the invention addresses a real need in the market, is simple to use and is designed
15 to have immediate "impulse buy" consumer appeal. Also, the casing design is such that individual "own brand" logo's can be moulded or printed onto the body of the device as required and a wide range of colour options are available for the cap and body.

20 Additional added value features also may include a liquid crystal colour-coded thermometer strip to advise mothers of the suitability of the water temperature for babies (SAFE, NOT SAFE) or actual temperature indication for adults (36°,
25 38°, 40° etc.)

As will be appreciated, the invention is not limited to the specific details described above. Thus, for example, while

the invention is described above mainly in terms of use to indicate the water level in a domestic bath, nevertheless it is equally useful in other situations where a vessel is required to contain a liquid at a certain level such as in a swimming pool, a sink, a cistern etc. That being so, numerous variations and modifications may be made within the spirit and scope of the claims which follow.

CLAIMS

1. A device for indicating liquid level in a vessel, which device comprises a liquid-repellant casing which houses audible alarm means and is constructed and arranged to contain a power source maintained with the alarm means in an essentially liquid free state, switch means constructed and arranged such that a switch circuit can be completed by said liquid, and means for detachably mounting the device in a vessel whose liquid level is to be indicated.
2. A device according to claim 1, wherein the casing is rectangular overall.
3. A device according to claim 1 or claim 2, wherein the casing is elongate.
4. A device according to any one of the preceding claims, wherein the audible alarm means and the power source are disposed within an upper part of the casing.
5. A device according to any one of the preceding claims, wherein the switch means are disposed in a lower part of the casing.
6. A device according to any one of the preceding claims,

wherein the switch means comprises a pair of spaced sensor contacts.

5 7. A device according to claim 6, wherein in use the sensor contacts are side-by-side.

8. A device according to claim 6, wherein in use the contacts are disposed with a second sensor contact above a first sensor contact.

10

9. A device according to any one of the preceding claims, wherein the casing comprises a hollow body portion defining a mouth which is uppermost in use and a hollow cap portion at least part of which fits within the said mouth and extends down into the hollow body portion at least essentially to exclude liquid from outside.

15

10. A device according to claim 9, wherein the hollow body portion houses the audible alarm means.

20

11. A device according to claim 9 or claim 10, wherein the hollow cap portion is constructed and arranged to surround at least part of the power source.

25

12. A device according to any one of the preceding claims, wherein the casing is formed of a plastics material.

13. A device according to claim 13, wherein the casing is

injection moulded.

14. A device according to any one of claims 9 to 13,
wherein the hollow cap portion is formed of a flexible or
5 semi-flexible material.

15. A device according to claim 14, wherein the flexible
or semi-flexible material is a plasticised rubber and/or
plastics compound.

10

16. A device according to claim 14 or claim 15, wherein
the cap portion includes a downwardly extending skirt
having one or more ribs on its outer surface constructed
and arranged to engage in a watertight manner with the
15 inside surface of the hollow body portion.

17. A device according to any one of the preceding claims,
wherein the power source is a standard 9 volt battery.

20

18. A device according to any one of the preceding claims,
wherein the audible alarm means comprises an alarm monitor
circuit, a sounder and a pair of spaced sensor contacts
which can activate the sounder via the said monitor circuit
when a conducting liquid bridges the contact gap.

25

19. A device according to claim 18, wherein the sounder
comprises a piezo electric crystal element.

20. A device according to any one of the preceding claims, wherein the audible alarm means includes means to activate the alarm to provide an audible signal when the power source is low on charge.

5

21. A device according to any one of the preceding claims, which includes temperature indicator means.

10

22. A device according to claim 21, wherein the temperature indicator means is a liquid crystal colour-coded thermometer strip.

15

23. A device according to claim 21 or claim 22, wherein the temperature indicator means includes words and/or figures to indicate temperature.

20

24. A device according to any one of the preceding claims, wherein the mounting means comprises at least one suction cap.

25. A device according to claim 1 substantially as hereinbefore described.

25

26. A device for indicating liquid level in a vessel substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

Relevant Technical fields

- (i) UK Cl (Edition K) G1H
- (ii) Int Cl (Edition 5) G01F 23/24

Search Examiner

V FLETCHER

Databases (see over)

- (i) UK Patent Office
- (ii) ONLINE DATABASES: WPI

Date of Search

14 FEBRUARY 1992

Documents considered relevant following a search in respect of claims 1-26

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 2229531 A (SIMPSON) Whole document	1, 4, 6, 12, 13, 17, 20, 24
Y	GB 2176005 A (FLETCHER) Whole document	1-6, 12, 13, 17, 20, 24
Y	GB 1549650 A (HONEYWELL) Lines 104-108 page 2	1-6, 12, 13, 17, 20, 24
Y	GB 1549649 A (HONEYWELL) Figure 5	1-6, 12, 13, 17, 20, 24
Y	GB 918870 A (AUTOMOTIVE PRODUCTS) Figure 3 lines 70-75 page 1, lines 107-113 page 2	1-6, 12, 13, 17, 20, 24
X	US 4547768 A (KULHAVY) Whole document	1-3, 6, 7
X	DE 2940084 A (RADDATZ) Whole document	1-3, 6, 7



Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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